

DƯƠNG MINH TRÍ

# SƠ ĐỒ CHÂN LINH KIỆN BÁN DẪN

XUẤT BẢN LẦN THỨ 6

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- IC TUYẾN TINH
  - IC LOGIC 74XX, 4XXX
  - CÁC BỘ NHỚ BÁN DẪN
  - TRANSISTOR, THYRISTOR  
TRIAC, SMD.



NHÀ XUẤT BẢN KHOA HỌC VÀ KỸ THUẬT

DƯƠNG MINH TRÍ

SƠ ĐỒ CHÂN  
LINH KIỆN BÁN DẪN

(In lần thứ sáu, có sửa chữa và bổ sung)



NHÀ XUẤT BẢN KHOA HỌC VÀ KỸ THUẬT

## **LỜI MỞ ĐẦU**

Việc tra cứu nhanh chóng sơ đồ chân các linh kiện bán dẫn cùng một số đặc trưng kỹ thuật quan trọng rất cần thiết trong việc sửa chữa, bảo hành, thiết kế các mạch điện tử. Quyển sách này được xuất bản để đáp ứng nhu cầu trên của các bạn làm trong ngành điện – điện tử. Sách được chia làm năm phần chính: IC logic TTL, IC logic CMOS, IC tuyến tính và transistor. Phần IC logic TTL và CMOS có bảng sự thật đính kèm. IC tuyến tính bao gồm hầu hết các linh kiện điện – điện tử đã và sẽ chắc chắn có mặt trong các thiết bị, máy móc, sách tạp chí điện tử nhập từ các nước phương Tây. Phần phụ lục có địa chỉ các công ty sản xuất linh kiện bán dẫn trên internet.

Bên cạnh kỹ thuật vi sinh và vật liệu, kỹ thuật thông tin (Information Technology) đã làm thay đổi hẳn cấu trúc nền công nghiệp hiện tại. Các ngành công nghiệp về năng lượng và nguyên liệu như than và thép đã mất dần vai trò quan trọng so sánh với kỹ thuật thông tin. Người ta tính rằng kỹ thuật thông tin trên thị trường thế giới sẽ tăng từ 500 tỷ Dollar Mỹ (1989) đến khoảng 1600 tỷ Dollar Mỹ trong năm 2000. Sự tiến triển vượt bậc của máy tính điện tử và kỹ thuật thông tin đã biến “thông tin” “sự hiểu biết” thành một loại nguyên vật liệu vô cùng quý báu với các đặc tính: Nó có thể được cất giữ trong khoảng không gian rất bé, có thể được vận chuyển với tốc độ áng sáng và không bị hao mòn mất giá trị sau khi sử dụng và truyền đạt. Kỹ thuật thông tin hiện đại dựa hoàn toàn vào điện tử và vi điện tử. Liệu kỹ thuật thông tin mở ra một thế giới mới, trong đó mọi người đều có thể tiếp cận những thông tin hiểu biết tập thể của cả nhân loại hay nó sẽ chỉ là những công cụ của các thế lực độc quyền ở các nước công nghiệp phát triển sẽ thống trị mọi người và xã hội trên thế giới với những kiến thức được cất giữ trong các ngân hàng dữ liệu, sách, báo, tạp chí...? Đó là một vấn đề bức xúc của các nước nghèo trên thế giới.

Với độ tổ hợp càng cao của IC, càng nhiều chức năng của các thiết bị và hệ thống máy móc trong công nghiệp được vận hành với linh kiện điện tử thay vì với các linh kiện điện cơ hay cơ khí. Khuynh hướng này không thay đổi theo thời gian cho kết quả là công việc của các nhà sản xuất máy móc thiết bị thành một phần công việc của các nhà sản xuất linh kiện điện tử và ngược lại. Đã từ lâu các nhà sản xuất thiết bị, hệ thống máy móc nhanh chóng nhận ra rằng việc sử dụng IC thương mại, loại "Standard" có sẵn trên thị trường không phải là kinh tế nhất. Độ tổ hợp của IC càng cao, phức tạp, IC càng có nhiều chức năng thì giá thành của nó càng cao vì nó không được sử dụng rộng rãi, số lượng sản xuất ít. Ví dụ mạch Flip Flop thích nghi với mỗi mạch số, nhưng với một bộ đếm 24 bit chỉ được sử dụng trong những trường hợp đặc biệt. Bộ tổ hợp phức tạp và số lượng sản xuất cao là hai thông số đối nghịch nhau trong việc sản xuất IC logic. Chỉ có bộ nhớ là thỏa mãn cùng một lúc hai thông số này cho cả nhà sản xuất IC và người sử dụng. Những dữ liệu được cho vào hay thay đổi trong bộ nhớ hoàn toàn tùy người sử dụng. Nếu người ta muốn có cùng một lúc hai thông số này cho mạch logic, người ta phải đi đến việc phát triển việc chế tạo các IC theo yêu cầu của người sử dụng (Semicustom chip, ASIC – Application Specific Integrated Circuit). Việc này dẫn đến kỹ thuật Gate–Arrays, EPLD ( Electronic Programmable Logic Devices) vô cùng hấp dẫn. Với kỹ thuật này nhà sản xuất IC có thể thỏa mãn người đặt hàng các IC có độ tổ hợp rất phức tạp 1000 cổng, 10000 cổng hay hơn...với số lượng IC được sản xuất thấp hơn 10000, thấp hơn 1000 và thấp hơn 100 mà vẫn kinh tế! Kinh tế có nghĩa là giá thành thấp và IC được sản xuất trong một thời gian ngắn... vài tuần lễ sau khi hệ thống các cổng đã được xác định và mô phỏng trên máy tính để thỏa mãn các yêu cầu của người đặt hàng về độ chính xác. Với kỹ thuật này cần phải có sự làm việc chung rất nhuần nhuyễn giữa nhà sản xuất IC và người tiêu thụ. Máy tính điện tử có thể thay thế dần vai trò của các phòng thí nghiệm điện tử, các "Breadboard".

*Người kỹ sư không cần phải ngồi lắp ráp các linh kiện với nhau để thử xem mạch điện có “chạy” không. Với công cụ CAD mạch điện được lắp ráp và mô phỏng trên màn hình máy tính. Các câu hỏi về thời gian trễ, về độ dốc của xung... được máy tính trả lời chuẩn xác và nhanh chóng trên màn hình.*

*Khi các nhà sản xuất thiết bị máy móc, nắm cả quá trình sản xuất IC, họ đạt đến việc là tất cả hiểu biết quan trọng và chiều sâu phát triển của cả hệ thống máy móc của họ sản xuất nằm trong tay họ. “Know – how” của họ khó lòng bị đánh cắp.*

*Với nội dung như trên, đầu thế kỷ 21 điện tử và vi điện tử là “chìa khóa kỹ thuật”, động cơ của nền công nghiệp ở các cường quốc kinh tế thay vì than, thép, hóa dầu, xe hơi...trong quá khứ. Như thế điện tử và vi điện tử đóng vai trò quyết định sự thành công trong sự cạnh tranh thương nghiệp rất quyết liệt giữa các nước trên thế giới trong những năm sắp tới. Vì điện tử đã thành “nguồn nguyên vật liệu” chiến lược cho các cường quốc kinh tế, đặc biệt các cường quốc kinh tế khan hiếm nguyên vật liệu. Với cấu trúc transistor hiện nay, biên giới kỹ thuật dự đoán là  $0,3\mu m$  và biên giới vật lý khoảng  $0,1\mu m$ . Bộ nhớ Giga-Bit sẽ được chế tạo trên một chip và sản xuất hàng loạt trước năm 2010. Vùng kinh tế hay nước nào thực hiện được kỹ thuật Gigabit đầu tiên cho mạch logic sẽ là thế lực không chế nền kinh tế trên thế giới trong thập niên đầu tiên của thế kỷ 21. Đối với nước ta điện tử là sự hợp lý hóa, đặc biệt là sự tiết kiệm thời gian năng lượng, nguyên vật liệu của nền kinh tế cả nước. Kết hợp việc nhập các thiết bị mới với việc tự lắp ráp, chế tạo các thiết bị điện – điện tử từ các linh kiện bán dẫn thương mại là hợp lý. Vì hiện nay trong nước có nhiều từ chuyên môn trong lĩnh vực điện – điện tử chưa được dịch một cách chính xác và thống nhất, tạm thời chúng tôi để nguyên một số từ bằng Anh ngữ để tránh sự nhầm lẫn của tác giả lẫn người đọc. Đó cũng là một điều bức xúc của tác giả khi không thể diễn đạt phần lớn của các linh kiện bằng tiếng Việt.*

Tác giả và nhà xuất bản đã cố gắng tối đa để tránh những lỗi lầm có thể xảy ra. Chúng tôi hết sức cảm ơn sự chỉ dẫn của quý độc giả những lỗi lầm nếu có cùng những ý kiến bổ sung. Thư từ xin các bạn vui lòng gửi về.

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01 Mạc Đĩnh Chi Q.1, Tp.HCM  
Thành phố Hồ Chí Minh, ngày 16.04.1989

## LỜI MỞ ĐẦU (In lần thứ VI năm 2005)

Cách đây khoảng 15 năm cuốn "Sơ Đồ Chân Linh Kiện Bán Dẫn" được in lần đầu tiên, năm nay sách được in lại lần thứ sáu. Sau một thời gian dài, sách đã chứng tỏ sự hữu ích của nó đối với ai làm việc trong ngành điện tử hay trong những ngành nghề khác cần phải giải quyết những vấn đề liên quan đến điện tử.

Vì lý do kỹ thuật bạn đọc chú ý từ 74LS600 trở đi cần phải xem bản tên IC theo số trang của sách. Sách chỉ cho biết sơ đồ chân của linh kiện, còn đặc trưng kỹ thuật chi tiết độc giả có thể tham khảo trong các tài liệu của nhà sản xuất hay trên mạng Internet. Địa chỉ một số nhà sản xuất được ghi trong chương 10.2, trang 665. Các bạn có thể lên internet (v.d. Google...) đánh trực tiếp tên IC (v.d. MAX 232...) mà không cần phải tìm theo địa chỉ nhà sản xuất.

Tác giả rất mong được sự đóng góp ý kiến của quý độc giả.

DƯƠNG MINH TRÍ

PHÂN VIỆN VẬT LÝ  
VIỆN KHOA HỌC VÀ CÔNG NGHỆ VIỆT NAM

## LỜI MỞ ĐẦU

(in lần thứ III)

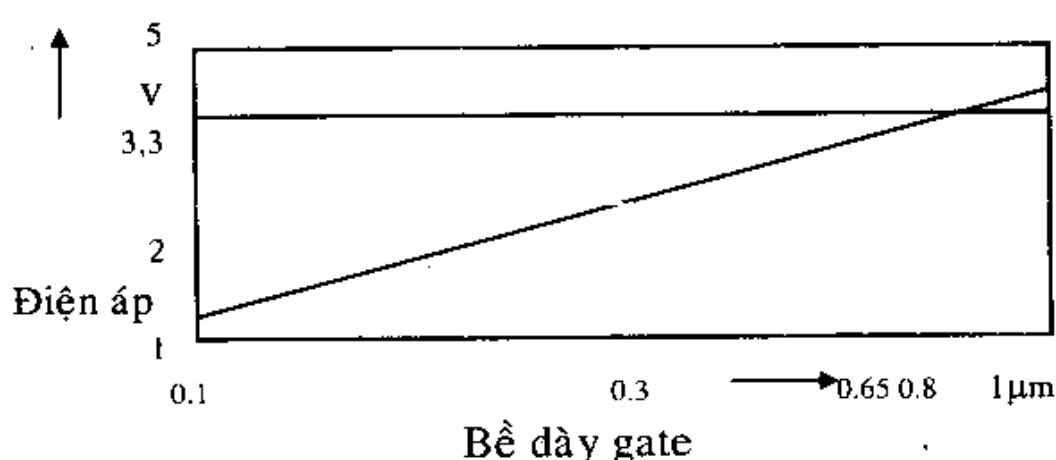
Đáp ứng yêu cầu của bạn đọc, quyển "Sơ đồ chân linh kiện bán dẫn" được tái bản lại. Lần in thứ III sách được bổ sung thêm trong phần linh kiện tuyến tính khoảng 1500 IC mới trong công nghiệp. Phần bộ nhớ bán dẫn được bổ sung thêm EEPROM. Phần quang điện tử được cắt đi vì quyển "Linh kiện Quang điện tử" đã được xuất bản. Trong chương 5 là phần so sánh IC của SNG (Nga) với các nước khác.

Từ giữa những năm 80 đến nay công nghệ chế tạo linh kiện bán dẫn có những phát triển đậm nét để hỗ trợ cho sự phát triển của công nghệ thông tin, sự tự động hóa trong công nghiệp : Các IC có công suất tiêu tốn bé hơn, thông minh hơn... Nhiều hiệu ứng lượng tử được ứng dụng để chế tạo 1/k bán dẫn mà hiệu ứng hóa lý không thực hiện được.

Điện áp cấp cho IC được hạ xuống 3,3V để đáp ứng một số yêu cầu kỹ thuật:

1/ Cho những bộ nhớ DRAM có độ tổ hợp lớn, cấu trúc MOS khoảng từ 0,8 đến 0,5  $\mu\text{m}$ . Với cấu trúc này, bề dày của gate khoảng từ 12 - 20nm. Với điện áp 5V, điện trường ở Gate-oxid đạt tới một giới hạn nguy hiểm là 3,5-4,5MV/cm. Trong hình dưới đây, điện áp cấp tối ưu cho IC liên hệ tuyến tính với bề dày của Gate (theo Log).

Với bề dày của Gate là 0,8 $\mu\text{m}$  ta có điện áp cấp tối ưu là 3,3V



2/ Khi các bộ vi xử lý làm việc với công suất cao, chip của  $\mu$ P cùng vỏ bọc phải chịu đựng một công suất tiêu tán quá cao, dễ hư hỏng. Khi điện áp cấp giảm xuống còn 3,3V công suất tiêu tán giảm đi còn khoảng 44% so với trước.

3/ Giảm đi 56% công suất tiêu tán, có nghĩa là kéo dài đời sống của accu dùng cho hệ thống xách tay.

4/ Với điện áp thấp, chip có thể chứa trong những vỏ bọc bé hơn. Như thế tiết kiệm được diện tích mạch in, tấm giải nhiệt bé hơn.. hay không cần thiết nữa.

Nói tóm lại, từ khoảng 10 năm trước đây, người ta đã nhận thức việc cần thiết phải hạ điện áp cấp cho mạch bán dẫn còn khoảng 3,3V để đáp ứng cho các công việc mà mạch bán dẫn phải có công suất rất cao, đòi hỏi vận tốc làm việc nhanh hơn, với nhiều chức năng hơn, nhưng công suất tiêu tán và nhiễu điện phải thấp. Trọng lượng và thể tích của thiết bị phải thu nhỏ lại và đời sống accu cấp điện cho thiết bị phải dài hơn.

Một phát triển rất thú vị nữa là công nghệ chế tạo IC công suất thông minh (Smart - Power - ICs). Đầu dầu trong công việc này là công ty SGS - Thomson tại Ý.

Từ giữa thế kỷ đã qua, rơ le là 1 linh kiện điện cơ đã chứng tỏ rất thích hợp cho việc đóng mở năng lượng điện. Rơ le hoàn toàn không có một đối thủ cạnh tranh nào cho đến khi kỹ nguyên bán dẫn bắt đầu. Nói như thế không có nghĩa là rơ le không còn đóng 1 vai trò quan trọng trên thị trường thế giới trong tương lai, chỉ có thể nói rằng càng ngày nó càng chịu nhiều áp lực từ các công cụ bán dẫn. Rơ le có ưu điểm có thể cho 1 điện trở gần vô cực hay bằng không. Tuy nhiên nó hoạt động chậm chạp, tiếp điểm rơ le đắt tiền (kim loại quý) nhưng dễ hư hỏng. Trong xe hơi rơ le vẫn tiếp tục đóng vai trò quan trọng :

- Tinh điện trong xe hơi có thể tạo điện thế lên đến 30kV làm hư hỏng các mạch điện MOS, nhưng không thể làm hỏng rơ le.
- Các đèn chiếu sáng khi mới bật, dòng điện có thể tăng gấp 10 hay 15 lần so với dòng điện cần thiết vì hiệu ứng điện trở ngoại. Rơ le có thể chịu đựng nổi các dòng điện lớn này mà không cần mạch bảo vệ như các 1/k bán dẫn.
- Rơ le không nhạy cảm với các nhiễu điện từ như các 1/k bán dẫn.

Lúc ban đầu của thế hệ bán dẫn, transistor loại germani như những 1/k đơn chiếc được chế tạo. Chúng đã là những công cụ thật tuyệt vời, nhưng những radio với transistor loại germani không thể hoạt động tốt trên bãi biển, vì nhiệt độ ở đấy thường vượt quá giới hạn để chúng có thể còn làm việc chính xác. Với các transistor loại silic, những giới hạn này không còn nữa, đến  $150^{\circ}\text{C}$  hay hơn, transistor silic hoạt động vẫn rất chính xác.

Trong lĩnh vực điều khiển dòng điện công suất lớn, thyristor là một linh kiện cổ điển. Thyristor được phát triển nhanh chóng cho các máy móc có công suất lớn được dùng trong đầu máy xe lửa, các cơ xưởng tự động, trong các mạng điện có dòng tải rất lớn... Đến nay nó vẫn giữ vai trò này. Với kỹ thuật GTO (Gate Turn Off) . Người ta có thể đóng mở một GTO - Thyristor bằng một xung điện dương hoặc một xung điện âm. Dòng điện điều khiển còn khá lớn.

Ngày nay cho việc điều khiển công suất vừa và nhỏ người ta dùng transistor loại bipolar hay mos công suất. MOSFET có vận tốc làm việc cao, tuy nhiên điện trở khi MOSFET dẫn điện còn khá cao. Transistor bipolar có các ưu điểm như đạt được điện áp ngược cao, điện trở khi transistor dẫn thấp . Đặc biệt trong lĩnh vực tuyển tính nó làm việc rất chính xác, offset thấp. Tuy nhiên nó có những hạn chế như công suất điều khiển còn cao, vận tốc làm việc bị hạn chế, đặc biệt diện tích của emitter trong một linh kiện bipolar hạn chế tối đa việc tổ hợp cao. Ngoài ra một điều nghịch lý thường xảy ra : transistor loại bipolar hay mos thường làm nhiệm vụ bảo vệ cầu chì - linh kiện thực ra phải bảo vệ nó !

Một ý tưởng thành hình từ những năm 80. Đó là sự kết hợp tính chất ưu việt của ba loại công nghệ bipolar, CMOS và DMOS ( xem phần phụ lục ) hình thành công nghệ BCD để chế tạo Smart-Power-ICs ( IC công suất thông minh ).

Trong những ICs này mạch bipolar xử lý phần tuyển tính , CMOS giữ chức năng phần digital và DMOS ở ngoài ra cho phần công suất . Smart Power ICs không chỉ làm nhiệm vụ đóng mở, kiểm soát dòng điện mà còn đủ sức chịu đựng những sự cố kỹ thuật rất xấu ( vd : mạch điện bị nối tắt, nhiệt độ quá cao ... ) , sau đó nó phải làm việc lại bình thường sau khi sự cố kỹ thuật được khắc phục .

Với công nghệ hỗn hợp này , người ta có thể tổ hợp các macrocells CMOS đạt độ phức tạp như một microcomputer . Và thực sự ngày nay trong các Smart - Power - ICs đã có mặt microcontroller ! Với phần mềm người ta có thể thay đổi chức năng làm việc của 1 Smart - Power - ICs . Ví dụ điển hình là L9942 . Nó đọc các lệnh từ bus và xử lý như một linh kiện ngoại vi của  $\mu$ P . L9942 là một IC điều khiển động cơ điện của các thiết bị trong xe hơi . Bên trong L9942 gồm có : 8 MHz - CPU ST6; 128 Byte RAM; 4 Kbyte EEPROM/ROM; 8-Bit- A/D; 8-Bit Timer; cầu DMOS-H hoạt động với dòng điện 7A.Tất cả các chức năng kể cả việc chọn lựa công việc cho các ngõ ra đều có thể thực hiện với phần mềm . Như thế dù với độ tổ hợp rất cao , có nhiều chức năng phức tạp , một Smart - Power - ICs vẫn có thể làm việc cho nhiều thiết bị khác nhau như trong một máy đánh chữ xách tay, máy vẽ đường biểu diễn, máy in kim .... Công suất ở ngõ ra của một Smart - Power - ICs điều khiển một máy in loại 24 kim là khoảng 250W! Với BCD II , người ta làm việc với cấu trúc  $2,5 \mu m$  và khoảng 12 - 14 mặt nạ . Ngày nay với thế hệ BCD V , cấu trúc chiều dài Gate còn  $0,6 \mu m$  với tổ hợp có bộ nhớ Flash . Một IC được định nghĩa là Smart - Power - ICs khi nó đạt các điều kiện :

- Làm việc ít nhất với  $0,5 A / 50V ; 2 W$
- Kết hợp các mạch logic và mạch công suất trong cùng một IC .
- Một số ứng dụng của Smart Power ICs : Màn hình Plasma ( 160V ) , viễn thông ( 500V ) , nguồn điện đóng mở ( switching power supply ) ( 300 - 1000V ), điều khiển động cơ ( 400... 800V ) , thiết bị siêu âm ( 200V ), điện tử trong xe hơi ( 50V / 20A ), mạch quét trong tivi ( 1000 - 1500V ) .... Trong xe hơi , Smart - Power - ICs có thể được dùng như công tắc thông minh cho hệ thống nối dây multiplex . Với giải pháp này số dây điện và số công tắc cơ học trên xe hơi - Những phần tử được coi như dễ hư hỏng nhất trong xe hơi - được giảm thiểu tối đa . Người ta tính với cách nối dây điện như trước , một xe hơi đời mới cần có khoảng 200 kg dây điện!! Công nghệ bán dẫn hiện nay trên thế giới đạt số doanh thu cho mỗi năm khoảng 120 tỷ USD . Những tiến bộ trong kỹ thuật bán dẫn đạt được tới năm 2010 có thể được tiên đoán như sau :

Năm	1995	1998	2001	2004	2007	2010
Kích thước ( $\mu m$ )	0,35	0,25	0,18	0,13	0,10	0,07
DRAM ( bit )	64M	256M	1G	4G	16G	64G
Transistor/cm <sup>2</sup> cho $\mu P$	4M	7M	13M	25M	50M	90M
Tần số ( MHz )	200	500	1000	1500	2000	2400
Điện áp cấp (V)	3,3	2,5	1,8	1,5	1,2	0,9
Kích thước của chip (DRAM , mm <sup>2</sup> )	190	280	420	640	960	1400
Công suất CPU (W)	15	30	40	120	200	240
Giá tiền cho mỗi bit (milli - Cent)	0,017	0,007	0,003	0,001	0,0005	0,0002

Tác giả mong rằng trong lần tái bản này, quý độc giả được tiếp xúc với ít nhiều thông tin mới trong lĩnh vực linh kiện bán dẫn. Tác giả rất mong sự đóng góp ý kiến của quý độc giả. Ở đây tác giả xin chân thành cảm ơn tất cả anh chị đã đóng góp ý kiến về nội dung lần hình thức trong lần in trước.

### DƯƠNG MINH TRÍ

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# 1. IC TUYẾN TÍNH

## 1.1 ĐẠI CƯƠNG

IC tuyến tính là những mạch tổ hợp mà điện áp ra là một hàm liên tục đối với điện áp vào. Trong khi đó IC giao tiếp bao gồm cả mạch tuyến tính lẫn mạch logic. IC tuyến tính và IC giao tiếp thường tùy theo mạch điện mà có thể trao đổi chức năng của nhau.

IC tuyến tính rất phong phú, trong khuôn khổ sách này chỉ bao gồm sơ đồ chân IC tuyến tính thường dùng nhất trong công nghiệp.

Các IC có cùng sơ đồ chân nhưng chức năng có thể có những khác biệt. Ví dụ LM324 và TL084 có sơ đồ chân hoàn toàn giống nhau, nhưng TL084 là loại IC khuếch đại thuật toán có ngõ vào JFET với  $R_{in} \approx 10^6 M\Omega$  trong khi LM324 có điện trở vào  $R_{in} \approx 2M\Omega$ .

Các IC có chức năng hoàn toàn tương đương và sơ đồ chân giống nhau có thể có ký hiệu khác nhau tùy theo hãng chế tạo. Ví dụ : LM555 (National Semiconductor) =  $\mu A555$  (Fairchild) = MC555 MC1555 = MC1455 (Motorola) = NE555 (Signetics) = CA555 (RCA) = SN72555 (Texas Instr.) = TDC0555 = SE555 (Thomson) = AM555 (Advanced Microdevices) = RC555 (Nhật)...

Trừ những trường hợp có chú thích, hình sơ đồ chân IC luôn được vẽ và đọc số thứ tự chân theo hướng nhìn từ trên IC xuống (Top View). IC khuếch đại thuật toán thường bị hỏng vì các xung nhiễu, tự kích. Bảo vệ bằng diốt là một biện pháp hữu hiệu, rẻ tiền. Tùy theo yêu cầu mà diốt được mắc nối đầu ở ngõ vào của IC hay từ các chân IC ở ngõ vào và ra với đất và điện áp nguồn hay cùng một lúc. Người ta thường dùng diốt Zener để khống chế điện áp nhiễu.

## 1.2 IC TUYẾN TÍNH VỚI KỸ THUẬT CMOS

IC tuyến tính với kỹ thuật CMOS có nhiều ưu điểm hơn so sánh với IC loại bipolar... Điện áp và dòng điện cấp cho IC thấp. Giống như các mạch digital với kỹ thuật CMOS, các mạch CMOS có tổng trở vào rất lớn và dòng điện rò ở ngõ vào rất bé (ca. 1pA). Ngõ vào có mạch điện bảo vệ chống tĩnh điện làm hỏng IC. Xin xem bảng T.1 so sánh các ĐTKT giữa ba loại IC tuyến tính bipolar, BIFET và CMOS . Loại TCL 271,OP đơn có thêm chân BIAS SELECT. Với điện áp cấp 10V :

a. Low-Bias-Mode : Chân Bias select được nối điện áp cấp, ta có dòng điện cấp cho IC khoảng  $10\mu A$  và Slew Rate khoảng  $0,04 V/\mu s$  với tần số  $100kHz$ , công suất tiêu tán (cstt) khoảng  $100 \mu W$ .

b. Medium-Bias-Mode :  $0,6V/\mu s$ ;  $0,7MHz$

Dòng điện cấp chỉ lớn bằng  $1/10$  so sánh với IC LM741, khoảng  $150\mu A$ . Chân Bias Select có điện áp từ  $0,8V$  đến  $9,2V$ .

c. High-Bias-Mode :  $4,5V/\mu s$  ;  $2,5 MHz$ , dòng điện cấp khoảng  $1mA$ , cstt khoảng  $10mW$ . Chân Bias Select được nối với đất.

Loại OP kép và bốn như TCL 272... không có chân Bias Select. Nhà sản xuất đã định sẵn cho từng loại với các ký hiệu TCL 27L2 (Low-Bias) hay TLC27M2 (Medium Bias) hay TLC272 (High Bias).

Với điện áp Bias Select ta định được dòng điện ở tầng chót mạch điện của IC. Dòng điện này càng bé thì IC hoạt động càng chậm với công suất tiêu tán thấp. IC tuyến tính CMOS và BIFET có thể thay thế loại bipolar nếu có sơ đồ chân giống nhau.

### **1.3 CÁC NHÓM ỨNG DỤNG CỦA OPA VÀ CÁC BĂNG ĐẶC TRƯNG KỸ THUẬT IC TUYẾN TÍNH**

Có thể nói OPA là loại thường gặp và cũng là quan trọng nhất trong nhóm IC tuyến tính. Ngoài các loại phổ thông (v.d.: LM 741), để đáp ứng các yêu cầu chính xác của các mạch điện cho những công việc khác nhau , rất nhiều loại OPA được chế tạo. Chúng ta có thể liệt kê một số nhóm chính như sau :

#### **Sự trôi thấp .**

Loại OPA với sự trôi thấp rất thích hợp cho các ứng dụng mà sự chính xác cần phải được đảm bảo trong một khoảng nhiệt độ khá rộng. OPA được thiết kế một cách tối ưu sao cho trị số điện thế offset ngõ vào và sự thay đổi trị số này cực bé khi nhiệt độ thay đổi . Điện thế offset ngõ vào phát sinh do sự khác biệt 2 điện trở collector và 2 điện thế  $V_{BE}$  CỦA 2 transistor trong mạch khuỷch đại vi sai được tổ hợp ở tầng đầu của OPA . Với loại OPA có sự trôi thấp , trị số điện thế offset trôi từ  $0,1\mu V/^{\circ}C$  đến  $5\mu V/^{\circ}C$ . Với OPA loại bipolar dòng bias ( $I_{in(bias)}$ ) có trị số trong khoảng nA và với OPA được thiết kế với FET thì dòng khoảng  $0.01pA$  đến  $50pA$ . Chúng ta cần đến OPA có dòng bias thấp trong những ứng dụng có điện trở hồi tiếp lớn hay điện trở nội của nguồn điện lớn ( ví dụ trong các bộ tích phân, nguồn dòng..) hay trong các bộ khuỷch đại điện, sample & hold, mạch biến đổi dòng/diện thế .Dòng bias đóng vai trò như một dòng rò của tụ điện trong mạch sample & hold, nó rút ngắn thời gian bắt giữ tín hiệu một cách nhanh chóng .

#### **Tiếng ồn thấp**

Loại OPA có tiếng ồn thấp được sử dụng trong các mạch như đo ánh sáng, bức xạ, mạch photodiode, mạch thu nhận tín hiệu ...

#### **Băng tần rộng**

OPA loại này có băng tần lớn hơn 5MHz. Mạch khuỷch đại có sự khởi động nhanh và vận tốc thay đổi điện thế ở ngõ ra rất cao. Dùng OPA loại này chúng ta giảm bớt sai số về pha ở tần số cao và có thể tái lập lại các sóng phức tạp thật chính xác . OPA loại này thích hợp cho các mạch điện tạo xung, video , khởi động nhanh và mạch chuyển kênh ( multiplex).

#### **Cao thế**

OPA loại này được chế tạo sao cho trị số điện áp ở ngõ ra có thể thay đổi khá lớn và hoạt động với nguồn điện trị số khá rộng điện áp ngõ ra từ  $\pm 10$  V đến  $\pm 145V$  (đến 290V ). Hầu hết OPA loại này có vỏ bọc cách điện , cảm biến

nhiệt với bộ ngắt điện tự động. Ngõ vào được trang bị với FET để giảm tối đa dòng bias ở ngõ vào vì các OPA loại này hoạt động trong các mạch khuỷch đại có điện trở rất lớn.

### Dòng lớn

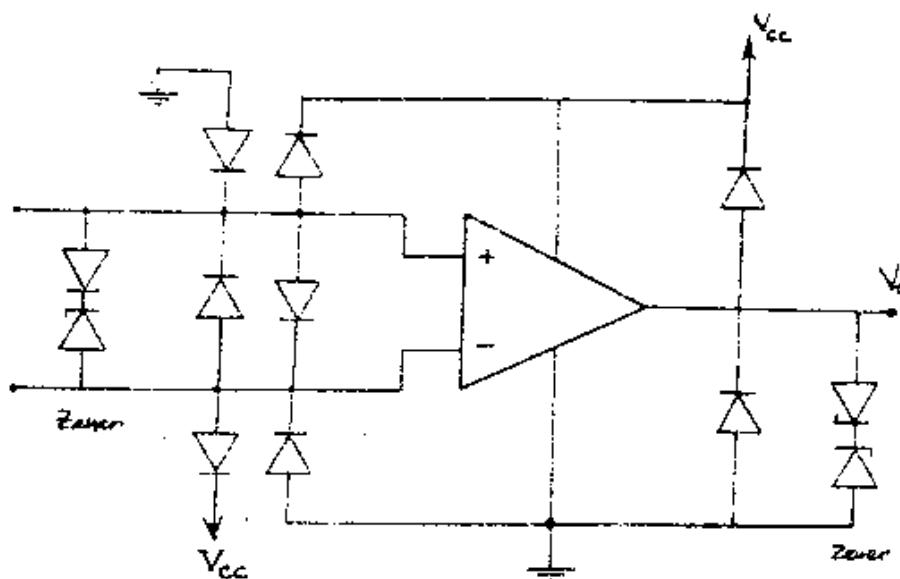
Các OPA loại này cung cấp một dòng điện ở ngõ ra từ  $\pm 1A$  đến  $\pm 10A$ . Chúng được dùng với tải có điện trở bé, dây đồng trực hay các mạch khuỷch đại công suất phụ. Giống như OPA cao thế, chúng có vỏ bọc cách điện, cảm biến nhiệt với mạch ngắt điện tự động.

### Bộ đệm với hệ số khuỷch đại 1 (Unity-Gain Buffer / Power Booster)

Loại OPA này được dùng để khuỷch đại dòng điện ở ngõ ra của mạch khuỷch đại khác, đệm một tổng trở. Nó có thể dùng trong một mạch khuỷch đại có hồi tiếp với OPA khác để tạo thành một mạch khuỷch đại dòng có trị số cường độ dòng điện ở ngõ ra lớn hơn 10A. Ngoài ra ta còn có các loại OPA khác cho mục đích đặc biệt hoạt động trong khoảng nhiệt độ rộng, đặc biệt cho việc thiết kế các mạch đo đặc xử lý tín hiệu từ các cảm biến ta có thêm một số nhóm OPA như sau :

- a. Mạch khuỷch đại dụng cụ
- b. Mạch khuỷch đại chính xác
- c. Mạch khuỷch đại logarit
- d. Mạch khuỷch đại điện tích

(Xin xem trong chương 14 cuốn "Cảm biến và ứng dụng" cùng tác giả.)



Bảo vệ IC khuỷch đại thuật toán bằng Diode

TECHNOLOGY	BIPOLAR <sup>1</sup>	BIFFET <sup>2</sup>	LinCMOS (bias levels)		
			LOW	MEDIUM	HIGH
V <sub>CC</sub> MAX REC	±15	±15	16	16	16
V <sub>CC</sub> MIN REC	±5	±5	1	1	1
V <sub>CC</sub> SPECFD	±15	±15	10**	10**	10**
V <sub>O</sub> mV	1–10	3–20	2–10	2–10	2–10
±V <sub>O</sub> uV/degC	5–20*	10	0.7	2	5
I <sub>O</sub>	2–750nA	5p–2nA	1–300pA	1–300pA	1–300pA
I <sub>B</sub>	20–800nA	30p–10nA	1–600pA	1–600pA	1–600pA
V <sub>ICR</sub> V	±13 or V <sub>CC</sub> –1.5	±12	–0.2 to 9	–0.2 to 9	–0.2 to 9
V <sub>DD</sub> IN 10kohms	24–26 or V <sub>CC</sub> –1.5	24–77	0–7.8 RL = 1M	0–7.8 RL = 100k	0–7.8 RL = 10k
Avo V/mV	15–200	15–200	20–500	15–280	7.5–40
CMRR dB	70–90	70–76	70–88	70–88	65–82
I <sub>CC</sub>	0.5–3.3mA	1.4–2.8mA	10–40μA	150–400μA	1–2.2mA
B <sub>1</sub> MHz	0.7–1	3	0.1	0.7	2.3
SR V/μS	0.5	13	0.04	0.6	4.5
en μV/VHz	22*	18	70	38	30
@ 1kHz					
in pAVHz	0.55*	0.01	0.013*	0.013*	0.013*
@ 1kHz					

1)bipolar;uA741/MC1438

LM324

2)bfet:TL - 080 - Serie

### T.1.1 : Bảng so sánh ba loại IC tuyến tính

	INPUT OFFSET VOLTAGE (mV)	INPUT OFFSET CURRENT (pA)	INPUT BIAS CURRENT AT 25°C (μA)	RESPONSE TIME (μS)	SUPPLY CURRENT (mA)	SUPPLY VOLTAGE RANGE (V)		OUTPUT TYPE
						Min	Max	
<b>Dual</b>								
TLC372	12.0	1	5	0.65	750	3	16	Open Drain
TLC393	10	1	5	2.10	50	3	16	Open Drain
TLC3702	10	1	5	2.30	50	3	16	Totem Pole*
<b>Quad</b>								
TLC374	12.0	1	5	0.65	1000	3	16	Open Drain
TLC339	10	1	5	2.10	100	3	16	Open Drain
TLC3704	10	1	5	2.30	100	3	16	Totem Pole*

\*Totem Pole Outputs are HCMOS and TTL compatible

### T.1.2 : Các bộ so sánh loại CMOS

	SUPPLY CURRENT (μA)	POWER DISSIPATION (mW)	SUPPLY RANGE (V)	MAX FREQUENCY (MHz)	MAX TIMING PERIOD	MAX TIMING ERROR	OUTPUT CURRENT (mA)
			Min Max				
<b>Single</b>							
TLC551	350	1	1 18	2.1	Hours	3%	+10/-100
TLC555	350	1	2(3)* 18	2.1	Hours	3%	+10/-100
<b>Dual</b>							
TLC552	1000	2	1 18	2.1	Hours	3%	+10/-100
TLC556	1000	2	2(3)* 18	2.1	Hours	3%	+10/-100

\*Indicates for industrial Temp Range

### T.1.3 : IC thời gian loại CMOS

## T.1.4 : Khuếch đại thuật toán loại bipolar

A range of bi-polar operational amplifiers with differential inputs and low-impedance outputs for use as inverting, non-inverting and differential amplifiers. The range offers amplifiers to suit audio, instrumentation, high power and general purpose applications. For suitable sockets refer to the Connectors/Terminals section.

### Additional data - bi-polar op-amps

device	ratings				typical characteristics at 25°C			
	Supply voltage range (V)	Abs. max. diff. input voltage (V)	Abs. max. power dissipation (mW)	Test conditions	Open loop voltage gain (dB)	IP bias current (mA)	Slew rate, response time (V/us)	Dc voltage swing (V)
AD847	±4.5 to ±18	8	1.6	V <sub>cc</sub> = ±5 V	70	3300	200	±3.6
AD648/648	±4.5 to ±18	—	—	V <sub>cc</sub> = ±15 V	100 min	0.01	1.8	±1.3
L165	±6 to ±18	±15	20 (W)	V <sub>cc</sub> = ±15 V	80	200	8	±24
L272	4 to 28	±28	1.1W	V <sub>cc</sub> = 24 V	70	300	1	±23
LM11	±2.5 to ±20	1	500	V <sub>cc</sub> = ±15 V	109	0.04	0.3	±12
LM12	±30	±30	90 (W min)	V <sub>cc</sub> = ±30 V	94 min	300 max	3	—
LM301	±5 to ±18	30	500	V <sub>cc</sub> = ±15 V	88	70	0.4	±13
LM308	±5 to ±18	30	500	V <sub>cc</sub> = ±15 V	102	1.6	—	±13
LM324	3 to 32	37	625	V <sub>cc</sub> = 5 V	100*	45	—	28 or ±14
LM348	±10 to ±18	24	500	V <sub>cc</sub> = 5 V	96*	30	0.6	28 or ±14
LM358	3 to 30	32	570	V <sub>cc</sub> = 5 V	100*	40	0.6	V = 1.5 max
LM366	4 to 12	—	668	V <sub>cc</sub> = 6 V	26	250	—	—
LM725	±4 to ±22	±5	500	V <sub>cc</sub> = ±15 V	130	42	0.25	±13.5
LM833	±15	±30	500	V <sub>cc</sub> = ±15 V	119	500	7	±13.5
LM6361	4.75 to 32	±8	—	V <sub>cc</sub> = ±15 V	117	2000	300	V <sub>cc</sub> = +14.2, V <sub>cc</sub> = -13.4
LM6364	4.75 to 32	±8	—	V <sub>cc</sub> = ±15 V	68	2500	300	V <sub>cc</sub> = +14.2, V <sub>cc</sub> = -13.4
LM6365	4.75 to 32	±8	—	V <sub>cc</sub> = ±15 V	80	2500	300	V <sub>cc</sub> = -14.2, V <sub>cc</sub> = -13.4
LP224	3 to 32	32	—	V <sub>cc</sub> = 5 V	100	2	0.014	3.5
MC33078/33079	36 V, V <sub>cc</sub> to V <sub>ss</sub>	30	1.27 W	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	110	300	7	13.8
MC33171/33172/33174	3 to 44 ±15 to ±22	44	—	V <sub>cc</sub> = ±15 V, V <sub>ss</sub> = -15 V	114	20	2.1	14.2
NE531	±5 to ±22	15	300	V <sub>cc</sub> = ±15 V	95	400	35	±15
NE5532	±3 to ±20	±0.5	1.2 W	V <sub>cc</sub> = ±15 V	100	200	9	±13
NE5534	±3 to ±20	±0.5	800	V <sub>cc</sub> = ±15 V	100	500	13	±13.5
NE5538	±8 to ±12	—	550	V <sub>cc</sub> = ±8 V	52	5000	600	+2.7 to -2.2
OP-07	±3 to ±18	±30	500	V <sub>cc</sub> = ±15 V	132	±2.2	0.17	±13
OP-27	±4 to ±18	±0.7	500	V <sub>cc</sub> = ±15 V	123	±15	2.8	±13
OP-37	±4 to ±18	±0.7	500	V <sub>cc</sub> = ±15 V	123	±15	1.7	±13
OP-77	±3 to ±18	±30	500	V <sub>cc</sub> = ±15 V	135	±2	0.3	±13
OP-90	1.6 to 36 ±0.8 to ±18	V = -20 to V + 20	500	V <sub>cc</sub> = ±1.5 V to ±15 V	106	4	0.012	±12
OP-97	±2.25 to ±20	±1	500	V <sub>cc</sub> = ±15 V	126	±0.03	0.2	±14
OP-200	±20 max	±30	500	V <sub>cc</sub> = ±15 V	130	0.1	0.15	±12.2
OP-400	±20 max	±30	500	V <sub>cc</sub> = ±15 V	130	0.75	0.15	±12.2
OP-470	±18 max	±1	500	V <sub>cc</sub> = ±15 V	112	25	2	±13
OP-471	±18 max	±1	500	V <sub>cc</sub> = ±15 V	108	25	8	±13
OP-490	±18 max	V = -20 to V + 20	500	V <sub>cc</sub> = ±1.5 V to ±15 V	106	4.2	0.012	±11.5
PM-1008	±20 max	±1	500	V <sub>cc</sub> = ±15 V	115	±0.03	0.2	±14
PM-1012	±20 max	±1	500	V <sub>cc</sub> = ±15 V	120	±0.03	0.2	±14
RC4558	±3 to ±18	±30	680	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	85	150	1.7	±13
741CP/N	±5 to ±18	±30	500	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	106	80	0.5	±13
741S	±5 to ±18	±30	625	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	100	200	20	±13
747	±7 to ±18	±30	670	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	106	80	0.5	±13
74E	±7 to ±18	±30	500	V <sub>cc</sub> = +15 V, V <sub>ss</sub> = -15 V	106	80	0.6	±13
μA759	7 to 36 ±3.5 to ±18	30	1.3 (W)	V <sub>cc</sub> = ±15 V	106	50	0.5	±12.5

V<sub>cc</sub> = -15 V

## T.1.5 : Khuếch đại thuật toán có ngả vào FET

A range of F.E.T. input operational amplifiers offering very low input bias and offset currents. The range of BiFET™ and DiFET® amplifiers combine the best features of bi-polar and F.E.T. input op-amps.

Additional data - F.E.T. input op-amps

device	ratings			typical characteristics at 25°C				
	Supply voltage range (V)	Abs. max. diff. input voltage (V)	Abs. max. power dissipation (mW)	Test conditions	Open loop voltage gain (dB)	I/P bias current (pA)	Slew rate, (V/μs)	O/P voltage swing (V)
AD549	±5 to ±18	+ V <sub>s</sub> - V <sub>t</sub>	500	V <sub>dd</sub> ± 15 V	120	0.15	3	- 12 min + 12 max
AD711/712	±4.5 to ±18	-	-	V <sub>dd</sub> ± 15 V	100	25	20	± 13
LF347/351/353	±5 to ±18	± 30	500	V <sub>dd</sub> + 15 V	110	50	13	± 13.5
LF355	±4 to ±18	± 30	500	V <sub>dd</sub> + 15 V	106	30	5	± 13
LF411	+ 18 abs. max	± 30	-	V <sub>dd</sub> ± 15 V V <sub>t</sub> ± 15 V	98	60	25	V <sub>dd</sub> = 13.9 V <sub>t</sub> = - 14.7
LF412	+ 18 abs. max	± 30	-	V <sub>dd</sub> ± 15 V V <sub>t</sub> ± 15 V	103	50	13	V <sub>dd</sub> = 14 V <sub>t</sub> = - 14
OP-42	±20 abs. max	40	500	V <sub>dd</sub> ± 15 V	108	130	50	+ 12.5 - 11.5
OPA111	±5 to ±18	± 36	500	V <sub>dd</sub> ± 15 V	125	± 0.0008	2	± 12
OPA121	±5 to ±18	± 36	500	V <sub>dd</sub> ± 15 V	114	± 0.001	2	± 12
OPA404	±5 to ±18	± 36	1000	V <sub>dd</sub> ± 15 V	100	± 1	35	+ 13.2 - 13.8
OPA605	±5 to ±18	± 36	500	V <sub>dd</sub> ± 15 V	110	± 0.6	30	± 12
TL081/082/084	±3.5 to ±18	± 30	680	V <sub>dd</sub> ± 15 V	76	30	3.5	± 13.5
TL071/072/074	±3 to ±18	± 30	680	V <sub>dd</sub> ± 15 V	106	30	13	± 13.5
TL081/082/084	±3 to ±18	± 30	680	V <sub>dd</sub> ± 15 V	106	30	13	± 13.5

BiFET™ is a trade mark of Texas Instruments Inc.

DiFET® is a trade mark of the Burr-Brown Corporation.  
Please refer to relevant section for full device details.

## T.1.6 : Khuếch đại thuật toán loại BIMOS

A range of C-MOS operational amplifiers offering the advantages of very high input resistance and low input currents together with very low supply voltage operation and low power consumption. Included in the range are BiMOS amplifiers which combine C-MOS and bi-polar technologies, both on a single monolithic chip. In this form the user benefits from F.E.T. input stage of the amplifier which provides high input impedance and a wide common-mode input voltage range as well as benefiting from the bi-polar output stage which provides high output current capability.

Additional data - C-MOS op-amps

device	ratings			typical characteristics at 25°C				
	Supply voltage range (V)	Abs. max. diff. input voltage (V)	Abs. max. power dissipation (mW)	Test conditions	Open loop voltage gain (dB)	I/P bias current (pA)	Slew rate, response time (V/μs), s	O/P voltage swing (V)
TSC900	4.5 to 16	-	500	V <sub>s</sub> <sup>+</sup> = + 5V V <sub>s</sub> <sup>-</sup> = - 5V	130	50 max	0.2	- 4.7 to + 3.5
TSC911	±3 to ±8	-	375	V <sub>t</sub> = ± 5 V	120	70 max	2.5	V <sub>s</sub> <sup>+</sup> = + 0.3 V to V <sub>s</sub> <sup>-</sup> = - 0.9
CA3130	6 to 16 ±3 to ±8	± 8	630	V <sub>t</sub> = + 15 V	110	5	10	13
CA3140	4 to 36 ±2 to ±18	± 8	630	V <sub>t</sub> = + 15 V	100	5	9	13
CA3160	5 to 16 2.5 to 8	± 8	630	V <sup>+</sup> = 15 V V <sup>-</sup> = 0 V	110	5	10	V <sub>s</sub> <sup>+</sup> = 13.3 V <sub>s</sub> <sup>-</sup> = 0.002
CA3240	4 to 36 ±2 to ±18	± 8	630	V <sub>t</sub> = + 15 V	100	5	9	13
CA3260	4 to 16 ±2 to ±8	± 8	630	V <sup>+</sup> = 15 V V <sup>-</sup> = 0 V	110	5	10*	V <sub>s</sub> <sup>+</sup> = 13.3 V <sub>s</sub> <sup>-</sup> = 0.002
CA5130	5 to 16 ±2.5 to ±8	± 8	630	V <sup>+</sup> = 15 V V <sup>-</sup> = 0 V	110	5	10*	V <sub>s</sub> <sup>+</sup> = 13.3 V <sub>s</sub> <sup>-</sup> = 0.002
CA5160	5 to 16 ±2.5 to ±8	± 8	630	V <sup>+</sup> = 5 V V <sup>-</sup> = 0 V	102	2	10*	V <sub>s</sub> <sup>+</sup> = 13.3 V <sub>s</sub> <sup>-</sup> = 0.002
CA5260	4.5 to 16 ±2.25 to ±8	± 8	630	V <sup>+</sup> = 15 V V <sup>-</sup> = 0 V	80	2	8	V <sub>s</sub> <sup>+</sup> = 4.7 V <sub>s</sub> <sup>-</sup> = 0 V
ICL7611	18 Abs. max.	±  (V <sub>s</sub> <sup>+</sup> + 0.3) - (V <sub>s</sub> <sup>-</sup> - 0.3)	250	V <sub>t</sub> = ± 5 V R <sub>t</sub> = 10 kΩ	98	1	1.6	± 4.5
ICL7641	18 Abs. max.	±  (V <sub>s</sub> <sup>+</sup> + 0.3) - (V <sub>s</sub> <sup>-</sup> - 0.3)	375	V <sub>t</sub> = ± 5 V R <sub>t</sub> = 10 kΩ	98	1	1.6	± 4.5
ICL7642	18 Abs. max.	±  (V <sub>s</sub> <sup>+</sup> + 0.3) - (V <sub>s</sub> <sup>-</sup> - 0.3)	375	V <sub>t</sub> = ± 5 V R <sub>t</sub> = 1 MΩ	104	1	0.016	± 4.9 (R = 100 kΩ)

\* V<sub>s</sub><sup>+</sup> = 7.5V V<sub>s</sub><sup>-</sup> = 7.5V Please refer to relevant sections for full device details.

**additional data -C-MOS op-amps (cont.)**

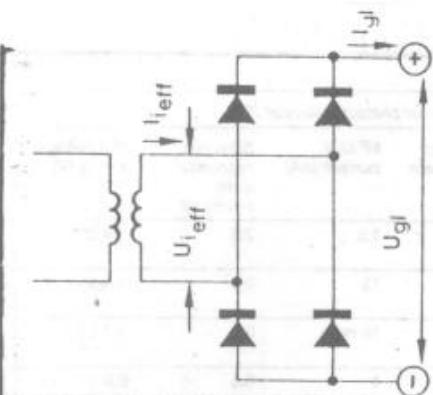
device	ratings						typical characteristics at 25°C			
	Supply voltage range (V)	Abs. max. diff. input voltage (V)	Abs. max. power dissipation (mW)	Test conditions	-	Open loop voltage gain (dB)	I/P bias current (nA)	Slow rate response time (V/μs), μs	O/P voltage swing (V)	
ICL7650S	±4.5 to ±18	± V <sup>+</sup> + 0.3  –  V <sup>-</sup> – 0.3	375	V <sup>+</sup> = +5 V V <sup>-</sup> = –5 V	150	1.5	2.5	±4.85		
ICL7652	±2.5 to ±8	±[ V <sup>+</sup> + 0.3  –  V <sup>-</sup> – 0.3 ]	375	V <sup>+</sup> = +5 V V <sup>-</sup> = –5 V	150	15	0.5	±4.85		
MAX430	±15	—	375	V <sup>+</sup> = +15 V V <sup>-</sup> = –15 V	150	10 max.	0.5	±14.5		
TLC251	1 to 16	±18	725	V <sub>DD</sub> = 10 V	109	1	0.6	8.6		
TLC271	3 to 16	±18	725	V <sub>DD</sub> = 10 V	109	1	0.6	8.6		
TLC272	3 to 16	±18	725	V <sub>DD</sub> = 10 V	92	1	4.5	8.6		
TLC274	3 to 16	±18	875	V <sub>DD</sub> = 10 V	92	1	4.5	8.6		

\* V<sup>+</sup> = +7.5 V, V<sup>-</sup> = 7.5 V Please refer to relevant sections for full device details.

## T.1.6

### RS232 Selection Table

Part Number	Power Supply (V)	No. of RS-232 Drivers/Rx	No. of Ext. Caps	Nominal Cap. Value (μF)	SHDN & Three-State	Rx Active in SHDN State	Data Rate (kbps)
MAX220	+5	2/2	4	4.7/10	No	—	120
MAX222	+5	2/2	4	0.1	Yes	—	200
MAX223 (MAX213)	+5	4/5	4	1.0 (0.1)	Yes	—	120
MAX225	+5	MAX2	5/5	—	Yes	—	120
MAX230 (MAX200)	+5	5/0	0	—	Yes	—	120
MAX231 (MAX201)	+5 and +7.5 to +13.2	5/0	4	1.0 (0.1)	Yes	—	120
MAX232 (MAX202)	+5	2/2	4	1.0 (0.1)	Yes	—	120 (64)
MAX232-A	+5	2/2	4	0.1	Yes	—	200
MAX233 (MAX203)	+5	2/2	0	—	Yes	—	120
MAX233-A	+5	2/2	0	—	Yes	—	200
MAX234 (MAX204)	+5	4/0	4	1.0 (0.1)	No	—	120
MAX235 (MAX205)	+5	5/5	0	—	Yes	—	120
MAX236 (MAX206)	+5	4/3	4	1.0 (0.1)	Yes	—	120
MAX237 (MAX207)	+5	5/3	4	1.0 (0.1)	No	—	120
MAX238 (MAX208)	+5	4/4	4	1.0 (0.1)	No	—	120
MAX239 (MAX209)	+5 and +7.5 to +13.2	3/5	2	1.0 (0.1)	No	—	120
MAX240	+5	5/5	4	1.0	Yes	—	120
MAX241 (MAX211)	+5	4/5	4	1.0 (0.1)	Yes	—	120
MAX242	+5	2/2	4	0.1	Yes	—	200
MAX243	+5	2/2	4	0.1	No	—	200
MAX244	+5	8/10	4	1.0	—	—	120
MAX245	+5	8/10	0	—	Yes	—	120
MAX246	+5	8/10	0	—	Yes	—	120
MAX247	+5	8/9	0	—	Yes	—	120
MAX248	+5	8/8	4	1.0	Yes	—	120
MAX249	+5	6/10	4	1.0	Yes	—	120



T.1.8 : Các IC ổn áp thông dụng

Typ	$V_o$ (stab) [V]	$I_o$ max. [A]	$V_i$ min. [V]	$V_i$ max. [V]	Hạn dòng bên trong	Hạn nhiệt quá tải	Safe-Area	$V_o$	Số chân
LM78L05	5	0.1	7	20	×	×	—	TO-5, TO-92	1, 2
TBA 625 A	5	0.13	8	20	—	—	—	TO-5	3
LM342-05	5	0.2	7.5	20	—	—	—	TO 202-P	4
$\mu$ A 78M05	5	0.2	7	20	—	—	—	TO-5	1
LM 341-5.0	5	0.5	7.5	20	—	—	—	TO 202-P	4
L 129	5	0.85	7.5	20	—	—	—	TO 126	5
LM 309 K	5	—1	7	35	—	—	—	TO-3	6
LM340-05	5	1.5	7	35	—	—	—	TO-220	7
LM 323 K	5	3	7.5	20	—	—	—	TO-3	6
LM 5000	5	3	9	20	—	—	—	TO-3	8
LM 342-6	6	0.2	8	25	—	—	—	TO-202 P	4
LM 341-6.0	6	0.5	7.2	25	—	—	—	TO-202 P	4
$\mu$ A 78M06	6	0.5	9	21	—	—	—	TO-5	1
LM 340-6	6	1.5	8	25	—	—	—	TO-220; TO-3	7, 6
$\mu$ A 7806	6	1.5	8	25	—	—	—	TO-3; TO-220	6, 7
LM 78L08	8	0.1	10.5	23	—	—	—	TO-5, TO-92	1, 2
LM 342-8	8	0.2	11	23	—	—	—	TO-202	4
$\mu$ A 78M08	8	0.5	11.5	23	—	—	—	TO-5	1
LM 341-8.0	8	0.5	10.5	25	—	—	—	TO-202	4
$\mu$ A 7808	8	1.5	10.5	25	—	—	—	TO-3; TO-220	6, 7
LM 340-8	8	1.5	10.5	25	—	—	—	TO-3; TO-220	6, 7
TBA 435	8.5	0.14	11.5	20	—	—	—	TO-5	3
LM342-10	10	0.2	13	25	—	—	—	TO-202	4
TBA 625 B	12	0.1	15	27	—	—	—	TO-5	3
LM 78L12	12	0.1	14.5	27	—	—	—	TO-5; TO-92	1, 2
LM 342-12	12	0.2	15	30	—	—	—	TO-202	4
LM 341-12	12	0.5	14.5	30	—	—	—	TO-202	4
$\mu$ A 78M12	12	0.5	14.5	30	—	—	—	TO-5	1
L 130	12	0.72	14.5	27	—	—	—	TO-126	5
LM 340-12	12	1.5	17.5	30	—	—	—	TO-3; TO-220	6, 7
$\mu$ A 7812	12	1.5	14.5	30	—	—	—	TO-3; TO-220	6, 7
TBA 625 C	15	0.1	18	27	—	—	—	TO-5	3
LM 78L15	15	0.1	17.5	30	—	—	—	TO-5; TO-92	1, 2
LM 342-15	15	0.2	18	30	—	—	—	TO-202	4
$\mu$ A 78M15	15	0.2	17.5	30	—	—	—	TO-5	1
LM 341-15	15	0.5	17.5	30	—	—	—	TO-202	4
L 131	15	0.6	17.5	27	—	—	—	TO-126	5
LM 340-15	15	1.5	17.5	30	—	—	—	TO-3; TO-220	6, 7
$\mu$ A 7815 C	15	1.5	17.5	30	—	—	—	TO-3; TO-220	6, 7
LM 78L18	18	0.1	21.4	33	—	—	—	TO-5, TO-92	1, 2
LM 342-18	18	0.2	21	33	—	—	—	TO-202	4
LM 341-18	18	0.5	20.7	30	—	—	—	TO-202	4
LM 340-18	18	1	21	33	—	—	—	TO-3; TO-220	6, 7
$\mu$ A 7818	18	1.5	21	33	—	—	—	TO-3; TO-220	6, 7
$\mu$ A 78M20	20	0.5	23	36	—	—	—	TO-5	1
LM 78L24	24	0.1	27.5	38	—	—	—	TO-5, TO-92	1, 2
LM 342-24	24	0.2	27.2	38	—	—	—	TO-202	4
LM 341-24	24	0.5	27	38	—	—	—	TO-202	4
LM 340-24	24	1	27	38	—	—	—	TO-3; TO-220	6, 7
$\mu$ A 7824	24	1.5	27	38	—	—	—	TO-3; TO-220	6, 7

TÊN IC	HÌNH	TÊN IC	HÌNH
μA 107A = LM 107		μA 3301 = LM 3900	
μA 109D = LM 709		μA 3302 = LM 339	
μA 110 = LM 710		μA 3303 = MC 3303	
μA 117 x. LM 117		μA 3401 = LM 3900	
μA 155 = LM 555		μA 3403 = MC 3403	
μA 208 / 210 = TBA 810		μA 3486/87 x.MC 3486/87	
μA 220D = TBA 120S		μA 3680 4X TEL. RELAY DRIVER	167
μA 223D = TBA 120U		μA 4136 = RC 4136	
μA 277 = UAA 180		μA 4558 = MC 4558	
μA 290 = MC 1310P		μA 5348 Smoke Detector/Timer/Interc	1267
μA 301/201/101 = LM 301		μA 55107/108 x. MC 75107/75108	
μA 302D = TCA 345A		μA 55110 x. SN 55110	
μA 305/105 = LM 305/105		μA 6685 Ultra Fast 1x Voltage Comparator	2049a
μA 307/207/107 = LM 307/207/107		μA 6965 = ULN 2001	
μA 308/208/108 = LM 308		μA 78LXX = 78LXX	
μA 309/209/109 = LM 309/209/109		μA 78MG pos/Inp:40V,Out:5-30V/0.5	42
μA 310 D = TCA 205 A Proximity Sw.		μA 78MXX = 78MXX	
μA 311/211/111 = LM 311		μA 78SXX = 78XX 2A	
μA 317/217/117 = LM 317		μA 78XX = 78XX	30
μA 318	1	μA 79HG	41
μA 321/221/121 Precision Preamp	553	μA 79MG neg/Inp:40V,Out5-30V,0.5A	42
μA 323SC = LM 323		μA 79XX = 79XX	
μA 324/224/124 = LM 324		μA 9614/15 x. SN 75114/115	
μA 339 = LM 339		μA 9636 Line-Driver/RS423/V24	760
μA 348 = LM 348		μA 9637 " Receiver/RS422A/423A	761
μA 350 = LM 350		μA 9638 " Driver/RS422A	762
μA 398/298/198 = LF 398		μA 9639 x. μA 9637	
μA 431 = TL 431		μA 9640/41 = AM 26S10/11	
μA 494 = TL 494		μA 9665/66/67/68 = ULN 2001/2/3/4	
μA 555/556 = LM 555/556		μA 75107B/108B Dual Line Receivers	163
μA 685 Fast Comparator	863	μA 75110ADC Dual Line Drivers	162
μA 709 = LM 709		μA 75150 " "	210
μA 710/711 = LM 710/711		μA 75154 x. SN 75154	
μA 714 = OP07		μA 75450 Dual pos. AND Periph.Driv	206
μA 723/725/733 x. LM 723/725/733		μA 75452/462/472 Peripheral Driver	209
μA 739/749 = LM 739	160	μA 75491/492 MOS to LED Drvrs	205
μA 741/747/748 x. LM 741/747/748		μA 78S40 Switching Regl.	1649
μA 759HC Power OPA , 500mA	1	μA 79GU1C	42
μA 760 = LM 760		μA 8T13 x. SN 75121	
μA 771 = LF 351		μA 8T14 x. SN 75122	
μA 772 = LF 353		μA 8T23 x. SN 75123	
μA 774 JFET QUAD OPA	6	μA 8T24 x. SN 75124	
μA 775 = LM 339		μA 96172...178 x. SN 75172...178	
μA 776 = MC 1776		μPC 55 A = LM 709 N	
μA 0802 = MC 1408		μPC 151 = LM 741	
μA 0802DM = MC 1508		μPC 156 = LM 308A	
μA 1391 = MC 1391		μPC 157 C = LM 301	
μA 1458 = LM 1458		μPC 159 = LM 318	
μA 1488/1489 x.MC 1488/1489		μPC 251 = LM 747	
μA 1558 = MC 1558		μPC 254 = OP 07	
μA 2030 = TDA 2030		μPC 271 = LM 311	
μA 2111 = LH 2111		μPC 272 = LM 319	
μA 2240 = XR 2240		μPC 301/311/319= LM 301/311/319	
μA 26LS31/32 x.AM26LS31/32		μPC 324/339 = LM 324/339	
μA 2901 = LM 339		μPC 354 = OP 07	
μA 2903 = LM 2903		μPC 451 = LM 324	
μA 3046 = CA 3046		μPC 454 = LT 1002	
μA 3054 = CA 3054		μPC 649 = LF 398	
μA 3086 = CA 3086		μPC 741 = LM 741	

TEN IC	HINH	TEN IC	HINH
$\mu$ PC 78MXX = 78MXX		AD 581 Prec. +10V Ref.	736
$\mu$ PC 78XX = 78XX		AD 582 Sample and Hold	25/1123
$\mu$ PC1251 = LM 358		AD 583 Sample and Hold	1126
$\mu$ PC4560	7	AD 584 Volt. Ref. 10/7,5/2,5	636/1114
$\mu$ PD 5555/5556 x. ICM 7555/7556		AD 585 Sample and Hold	1128
$\mu$ PD 75212 CD-Display/Keyb. Control	1918	AD 586 Volt. Ref. 5V	1116
1B 31/32	2014	AD 587 " 10V	1117
78 XX	30/35	AD 588 10/5/-5/-10V Volt.Ref.	1119
78GK 5V-30V/1A/12W/inp.max 40V	43	AD 589 Volt. Ref. 1,2V	1120
78HGK 5V-24V/5A/50W/inp.max 40V	43	AD 590 2-Wire Current Temp. Transd	1854
78HXCK	37	AD 592 Precision IC Temperatur Transducer	2063
78LXX	34/35	AD 594/595	106
78MXX	32	AD 596	107
78SXX # 78XX		AD 597 Thermocouple Cond.&Sel Point Typ K	2057
79 XX = MC 79XX	31/593	AD 611 = LF 441	
79GK neg./-2.2 to -30V/1A/12W	41	AD 620 Low Power Instrumentation Amplifier	2076
79HGK neg./-2.2 to -24V/5A/50W	41	AD 621 Low Drift Instrumentation Amplifier	2077
79LXX	34/35	AD 624 Precision Instrumentation Amplifier	2067
79MXX	33	AD 625 Precis. Instrument Ampl.	1132
8T 13/14 x.SN 75121/122		AD 626 Single Suply	2060
8T 23/4/6 x.SN 75123/4/6		AD 633 Analog Multiplier	2193
8T125/6/7/8/9 x.SN 75125/6/7/8/9		AD 636 True RMS-to-DC Converter	1263
9636 x.MC 3488		AD 637 Wideband RMS-to-DC Converter	2190
9640DC/PC x. MC26S10L/P		AD 648 Precis.,Low Power	7
9640NC x. MC 3440AP		AD 650 V to F/F to V Converter	1142
9665/6/7/8 x MC 1411/2/3/6		AD 652 " "	1186
AD 54KH = HA 5180		AD 654 VOLTAGE-FREQUENZ CONVERTER	295
AD OP07 = OP07		AD 660 16-Bit Serial/Byte DAC	1341
AD 0042 = LH 0042		AD 667 x. AD 767	
AD 201 = LM 201		AD 670 Signal Conditioning 8-Bit ADC	2086
AD 202/204 Isolation Amplifier	2195	AD 674B+A191 x. AD 574A 15us Conversion Time	
AD 230-41 +5V RS-232DrivRecei	913	AD 684 Sample and Hold	1130
AD 301/201/101 = LM 301/..		AD 689 Volt. Ref. 8.192V	1122
AD 386 Sample and Hold	1115	AD 693 Loop-Powered 4-20mA Sensor Transm	2062
AD 389 Sample and Hold	1124	AD 694 4-20mA Transmitter	2059
AD 504 = OP 05		AD 704 /705/706 Picoampere Input Bipolar OPA	2078
AD 507 = HA 2625		AD 707 /708 Ultra Low Offset and Drift OPA	2079
AD 509 = HA 2525		AD 711 BIFET OPA	1
AD 510J = OP07E		AD 712 BIFET OPA	7
AD 510K/L x. LT 1001		AD 713 Quad BIFET OPA	6
AD 515 = HA 5180		AD 734 10MHz, 4-Quadrant Multiplier/Divider	2068
AD 517 x. OP 07		AD 736 True RMS-to-DC Converter	2061
AD 518 x. LM 118		AD 741 = LM 741	
AD 524 Precis. Instrument Ampl.	1233	AD 746 = LM 6218	
AD 526 Software Progr. Gain Amplifier	2070	AD 767 12 Bit ADC	1061
AD 534 Internally Trimmed Precision Multiplier	2072	AD 774B x. AD 574A 8us Conversion Time	
AD 536 True RMS-to-DC Converter	1263	AD 818 130MHz,500V/us,80ns OPA	793
AD 537 Voltage to Frequency Conv.	1184	AD 820 /822 Rail-to-Rail FET Input OPA	2082
AD 538AD	135	AD 834 500MHz,4-Quadrant Multiplier	2066
AD 545 = HA 5180		AD 835 250MHz, Voltage Output	2065
AD 546 = LPC 660		AD 840/841/842 = HA 2540/41/42	
AD 548 Precis.,Low Power OPA	1	AD 843 34MHz, CBFET, Fast Setting OPA	2098
AD 549 Electrometer Amplifier	1	AD 847 200V/us OPA = LM 6361	
AD 557 8 Bit DAC, uP	1042	AD 848/849 = LM 6164/6165	
AD 558 8-Bit DAC A3264-Compatible	2075	AD 1154 16 Bit Sample and Hold	1127
AD 565A/566A High Speed 12Bit D/A	1249	AD 1408 x.MC 1408	
AD 574A 12-Bit ADC 35us Conversion Time	2192	AD 1508 x.MC 1508	
AD 578 High Speed 12 Bit A/D	1246	AD 2700/2710 10V Precision Ref.	1262
AD 580 Prec. +2,5V Ref.	735	AD 2701 " "	1262

TÊN IC	HINH	TÊN IC	HINH
AD 3554 " " "	1266	ADC 0811 = MC 145041	-
AD 7224 8-Bit DAC/Output Amplifier	1251	ADC 0820 A/D with Track/Hold	1247
AD 7225/26 CMOS Quad 8-Bit DAC	1252	ADC 0831/0832	284
AD 7228 CMOS 8 BIT D/A CONVERTER	296	ADC 0834	284
AD 7237 /7247 LCMOS Dual 12-Bit DACPORTs	2080	ADC 0838	284
AD 7245/T248 x. MX 7245/7248		ADC 0852/854 Multipl. Comp.8BitDA	1527
AD 7501/03 Analogmultiplexer CMOS	1135	ADC12451 x MAX180	
AD 7502 " " "	1137	ADDAC 08 = DAC 08	
AD 7510/11 Analogswit.100 /350ns	1170	ADEL 2020 90MHz,500V/us,60ns OPA	797
AD 7512 " " "	1173	ADG 200 x. DG 200	
AD 7520 CMOS 10/12-Bit Multiplying	1244	ADG 201/202 Analogswitches 50 /300ns	1159
AD 7521 D/A Converter	1245	ADG 211A/212A Analogswit.115/600ns	1165
AD 7523 CMOS 8-Bit Multiplying DAC	1253	ADG 221/222 Analogswit.90 /300ns	1167
AD 7524 8-Bit Buffered Multipl.DAC	1254	ADG 333 x. MAX 333	
AD 7525	1313	ADG 406-409 x. DG 406-409	
AD 7528/7628 8-Bit Multiplying DAC	1255	ADG 411-413 x. DG 411-413	
AD 7530/31 10/12Bit MultiplyingDAC	1250	ADG 417-419 x. DG 417-419	
AD 7533 10-Bit Multiplying DAC	1256	ADG 426 x. DG 406	
AD 7534 14 Bit CMOS DAC	1525	ADG 431 x. MAX 312	
AD 7535-7538 x. MX 7535-7538		ADG 432 x. MAX 313	
AD 7541 CMOS 12Bit Multiplying DAC	1257	ADG 433 x. DG 413	
AD 7542 CMOS uP Compat: 12-Bit DAC	1258	ADG 441-442 x. DG 441-442	
AD 7543 CMOS Serial Input 12BitDAC	1259	ADG 444-445 x. DG 444-445	
AD 7545 12-Bit Buff. Multipl.DAC	1260	ADG 451-453 x. MAX 312-314	
AD 7547/7548 x. MX 7547/48		ADG 466/467 x. DG 466/467	
AD 7572 High-Speed CMOS 12-Bit A/D	1242	ADG 506 Analogmultiplexer CMOS	1140
AD 7574 uP Compatible 8-Bit A/D	1241	ADG 507 " " "	1143
AD 7575 /7576 x. MX 7575/7567		ADG 508 " " "	1146
AD 7578 x. MX 7578		ADG 509 " " "	1150
AD 7581 CMOS 8Bit Data Acquisition	1240	ADG 511-513 x. MAX 391-393	
AD 7582 x. MX 7582		ADG 526 Analogmultiplexer CMOS	1153
AD 7590/91 Analogswit.90 /400ns	1176	ADG 527A " " "	1156
AD 7592 " " "	1179	ADG 528 Analogmultiplexer CMOS	1133
AD 7628 8-Bit Multiplying DAC	1255	ADG 529 " " "	1134
AD 7672 x. MX 7672		ADG 661-663 x. MAX 391-393	
AD 7710 /7712 LCMOS Signal Cond. ADC	2087	ADG 751 x. MAX 4529	
AD 7711 / 7713 LCCMOS Conditioning ADC	2196	ADM 202 /203 x. MAX 202/203	
AD 7820 FAST 8-BIT-A/D-CONVERTER	297	ADM 205..209/211/213 x. MAX 205..209/211/213	
AD 7821 x. MX 7821		ADM 222 /223/232/242 x. MAX 222/223/232/242	
AD 7824 CMOS 8-Bit A/D-Multiplexer	1238	ADM 230 /231 x. MAX 230/231	
AD 7828 CMOS 8-Bit A/D-Multiplexer	1239	ADM 232..239 / 241 x. MAX 232..239 / 241	
AD 7837/7847 x. MX 7837 / 7847		ADM 232A x. MAX 202	
AD 7845 12 Bit DAC	1499	ADM 485 5V EIA RS-485 Transceiver	2056
AD 7846 16 Bit DAC	1599	ADM 660 x. MAX 660	
AD 7870 12 Bit,100kHz ADC	1061	ADM 690...695 µP Supervisory Circuits	2053
AD 8551 OPA Singl. 1,5MHz 0,4V/us	272	ADM 696 /697 x. MAX 696/697	
AD 9300 Video Multiplexer CMOS	1182	ADM 698 /699 µP Supervisory Circuits	2054
AD 9621/2/3/4 220/350MHz OPA	782	ADM 705-709 x. MAX 705-709	
AD22003/4 11-Channel Lamp Monitor	1669	ADM 800/802/805/809/810 x. MAX 800..810	
AD22100 Voltg Output Temperatur Sensor 200	2053a	ADM1232 x. MAX 1232	
AD22401 SensorInterf/Watchd.Timer	1670	ADM1485 x. MAX 485	
AD2S90AP 12-Bit-Resolver/Digital Converter	2191	ADM5170 Octal.RS 232,RS423 Line Driver	2052
ADC 908 x. AD 7574		ADM5180 Octal.RS 232,RS423 Line Receiver	2051
ADC 207 7 Bit Video Flash ADC	1598	ADM8828/8829 x. MAX 1719-1721	
ADC 574 x. AD 574		ADOP 27/37 = HA 5127/37	
ADC 674 x. MX 674A		ADP 667 x. MAX 667	
ADC 774 x. MAX 174		ADS 128 x. MAX 187	
ADC 801-805	26	ADS 574 x. AD 574	
ADC 0808/0809 8-Bit-A/D-Converter	283	ADS 774 x. MAX 174	

TEN IC	HINH	TEN IC	HINH
ADS 784 MAX 147		BA 6290 Track,Fok-Motor-Driver	477
ADVFC 32 V to F/F to V Converter	1152	BA 6296 CD Motor Driver	1894
ADXL 05 Accelerometer & Signal Conditioning	2058	BA 6351 Servo Driver Amplifier	1895
ADXL 50 Accelerometer & Signal Conditioning	2058	BA 12003 = ULN 2003	
ADXL181 Accelerometer & Signal Conditioning	2058	BB 3553 DC-300Mhz Buffer Amplifier	1288
AK 93C45 = 93C46		BB 3554 Wideband Fast Setting OPA	1266
AM 26LS30 Dual/Quad Line Driver	1650	BQ 2001 Energy Management IC	1752
AM 26LS31 Line-Driver/RS422A	763	BQ 2003 Fast Charge IC	1753
AM 26LS32/33/34 Line-Recv./RS44	764	BQ 2004 * * *	1751
AM 26S10/11 Quadruple Bus Transc.	1620	BQ 2005 Dual-Batt. Fast Charge	1750
AM 301/201/101 = LM 101		BQ 2010 Gas Gauge IC	1747
AM 311/211/111 = LM 311		BQ 2011 * * *	1748
AM 450-2/2M = HA 2505/2502		BQ 2012 * * *	1749
AM 452-2/2M = HA 2525/2522		BQ 2013 Fast Charge IC	1746
AM 460-2/2M = HA 2605/2602		BQ 2203A Control./Batt.Monitor	57 / 1745
AM 462-2/2M = HA 2625/2620		BTS 629	1932
AM 592 = NE 592		BUF 03 Buffer	951
AM 685=LT 685 HIGHSPEED COMPARATOR	298	CA 081/2/4 = TL 081/2/4	
AM 723 = LM 723		CA 124 x. LM 324	
AM 733 = LM 733		CA 301/201/101 = LM 301	
AM 741 = LM 741		CA 307 = LM 307	
AM 747 = LM 747		CA 308/208/108 = LM 308	
AM 748 = LM 748		CA 311/211/111 = LM 311	8
AM6012 12-Bit High Speed D/A	792	CA 324 = LM 324	
AM7650 x. ICL 7650		CA 339/239/139 = LM 339	
AMP 01/2/3/5 Instrument-Ampl.	947 / 950	CA 358E/258/158 = LM 358P	
AMP 04 Precision Instrumentation Amplifier	2069	CA 555 = LM 555	
AN 1393 = LM 393		CA 723 = LM 723	
AN 455B = LM 1458		CA 741 = LM 741	
AN 6551 = LM 1458		CA 747 = LM 747	
AN 6564 = LM 324		CA 748 = LM 748	
AN 6912 = LM 2901		CA 1458/2458 = LM 1458	7
AN 6914 = LM 2903		CA 1558 = MC 1558	
AN 7116 = TBA 820		CA 2002 = TDA 2002	44
AN 8373 CD-Servo-Ampl.	1893	CA 2447 = CA 747	4
AN 8374 CD-Servo-Processor	1892	CA 2458 = LM 1458	
AN 8387 CD-Spin.Colt,Foc.Mot. Driv	1891	CA 2902 x. LM 324	
AY-3-1014A/1015D UAR/T	232	CA 2904 x. LM 358	
B 060/1/2/4/6 = TL 060/1/2/4/6		CA 3000	1001
B 080/1/2/3/4 = TL 080/1/2/3/4		CA 3001	1002
B 109D/110 = LM 709		CA 3019 Dioden-Arrays	1000
B 165 = TCA 365		CA 3020 Wide Band Power OPA	1473
B 315/325/360/380 Transistorarray	299	CA 3026 = CA 3049 Differential OPA	131
B 555/556 = LM 555/556		CA 3028A 1 KHUECH DAI VISAI 350MHZ	165
B 611D = TCA 311		CA 3039 Dioden-Arrays	997
B 615D	96	CA 3040	1003
B 621/25/31/35 = TCA 321/25/31/35		CA 3045 x. CA 3046	
B 654D = SN 28654		CA 3046 = CA 3086 Transistor-Array	18
B 761/765 = TAA 761/765		CA 3048 4-Independent +AC Ampl.	
B 861D = TAA 761A		CA 3049 HF-Differential OPA	131
B 865D = TAA 861A		CA 3052 4-Independent +AC Ampl.	300
B 2761/2765 = TAA 2761/2765		CA 3053 x. CA 3028	
B 3170H/3171H = LM 317T	40	CA 3054 Differential Amplifier	301
B 3370H/3371H = LM 337T		CA 3058 x.CA 3059	
B 4761/65 = TAA 4761/65		CA 3059 ZERO VOLTAGE SWITCH	142
BA 612 5 Darl. Transistor	1682	CA 3060A,B OPA	302
BA 618 7x LED-LCD Driver	1732	CA 3078 Micropower OPA	1475
BA 715 = LM 1458		CA 3079 = CA 3059	
BA 6218 Motor Driver	700	CA 3080 OTA (50V/S)	19

TÊN IC	HINH	TÊN IC	HINH
CA 3081 NPN TRANSISTOR ARRAY	166	CM 8870 x. MT 8870	
CA 3082 x. CA 3081		CMOS 555 / 556 CMOS Timer x. LM555/556	
CA 3083 5x NPN Transistor	992	COM 8116 BAUD RATE GENERATOR	133
CA 3085E Voltage Ref. 1.8-26V	45	CS 2907 = LM 2907	
CA 3086 = CA 3046 NPN Transistor Array	18	CS 2917 = LM 2917	
CA 3089 FM/ZF SYSTEM	151	CS 3471 = MC 3471	
CA 3094 Power lout OPA	1005	CX 193 CD-Disc-Motor-Servo	1896
CA 3096 3x NPN ;2x PNP Trans.	999	CX 7935 CD-CIRC-Decoder	1754
CA 3097 Thyristor / Transistor Array	990	CXA 1101 Dolby B Type Noise Reduct	1820
CA 3098 Prog. Schmitt-Trigger	303	CXD 2553 CD-Audio-Muting	1852
CA 3100 Wideband Amplifier	304	DAC 08 Fast 8 Bit D/A	590 /1037
CA 3102	991	DAC 0800/0801/0802 = DAC 08	
CA 3130 MOSFET IN/OUTPUT 1,5.10TOhm	196	DAC 0806LCJ/N 6 Bit D/A	27 /591
CA 3140 MOS IN/BIPOLAR OUTPUT1,5.10TOhm	196	DAC 0807 LCJ/N 7 Bit D/A	27 /591
CA 3141 Dioden-Arrays	995	DAC 0808 LCJ/N 8 Bit D/A	27 /591
CA 3146 Transistor Array	557	DAC 0830/0831/0832 8Bit μP comp. 2 Buffered	2127
CA 3160 BiMOS OPA	196	DAC 1020/1021/1022 = AD 7533	
CA 3161 BCD-7-Segment-Dec	46	DAC 1220/1221/1222 = AD 7521	
CA 3162 A/D Converter	47	DAC 1265/1266 = AD 565/566	
CA 3164 DETECTOR/ALARM IC	141	DAC 1508 = MC 1508	
CA 3168 2-Digit BCD/Decoder/Dri	1008	DAC 8048 8 Bit 4x DAC x.MP 7628	
CA 3169 Relay-,Lamp-and Motor Dr	1004	DAC 8420 12-Bit Serial V-Outp.DAC	1596
CA 3179 1,25 GHz Divider	1009	DCP010505 DC-DC Converter Isol. 1W 5V	2202
CA 3183 5x NPN Trans. I(C)=75mA	998	DCP010515 DC-DC Converter Isol. 1W +/-15V	2202
CA 3193 BiMOS Precision OPA	1476	DG 129 Analog Switch	1785
CA 3199 1.25GHz/4-Divider	1010	DG 180/181/182	242 /529
CA 3207 Sequencer Driver	1006	DG 183/184/185 Analog Switch	1786
CA 3208 Latch Driver	1007	DG 186/187/188 = DG 387 " "	
CA 3227 5x NPN Transistor 3GHz	993	DG 189/190/191 " "	1853
CA 3240 A.E Dual BiMOS OPA	7	DG 200 Dual SPST CMOS Anal. Switch	530
CA 3240 iA,E1 Dual BiMOS OPA	4	DG 201/202/211/212	220
CA 3242 Quad Power Driver	494a	DG 243 = DG 189	
CA 3246 NPN Trans./1diff.Pair 3GHz	994	DG 271 = DG 201	
CA 3260 BiMOS,Dual OPA	1480	DG 300 TTL COMPAT. CMOS ANALOGSWIT	439
CA 3260 Dual OPA	1783	DG 301	440
CA 3290 Voltage Comparators	1522	DG 302 TTL COMPAT. CMOS ANALOGSWIT	441
CA 3302 = MC 3302		DG 303 " "	442
CA 3306 6 Bit,Flash CMOS ADC	1514	DG 304 CMOS ANALOGSWITCH	443
CA 3401 = LM 3900		DG 305 " "	444
CA 3410 Quad BiMOS OPA,x.LF 347	8	DG 306 " "	445
CA 3420 2V/300uA BiMOS-OPA	1478	DG 307 " "	446
CA 3440 Nanopower BiMOS OPA	1482	DG 308A " "	307
CA 3450 220MHz;330V/us OPA	1483	DG 309 " "	307
CA 3493 Precision OPA	1484	DG 381 " "	308
CA 3524/2524/1524 x. XR 3524		DG 384 " "	309
CA 3600 CMOS-Transistor-Array	996	DG 387 " "	310
CA 5010 x. ICL 8069		DG 390 " "	311
CA 5130 BiMOS uP OPA	1489	DG 401/403/405 High-Speed Analog Switches	2380
CA 5160 Frequ. Compens.,x. CA 5130		DG 406 16-Chan.CMOS Anal.Multiplex	1850
CA 5260 x. LM 1458		DG 407 " " " "	1837
CA 5420 Low Power x. CA 5160		DG 408 8- " " " "	1843
CA 5470 Quad uP BiMOS-E OPA	6	DG 409 4- " " " "	1834
CA 607B Micropower OPA	1486	DG 411-413 Quad. SPST Analog Switches	2374
CA 6741 OPA	1485	DG 417 CMOS Analog Switch	1727
CD 22100 Matrix Switch	1597	DG 418 " " "	1729
CD 74HCT22106 Matrix Switch	1597	DG 419 " " "	1730
CDG 2214 Analog Switch 20mA	1744	DG 421 Dual Analogswitch,uP Comp.	957B
CIC 482	305	DG 423/425 Dual Analogswitch	830
CIC 2852/2862/2863	306	DG 428 8-Channel Analog Multiplex.	1835

TEN IC	HINH	TEN IC	HINH
DG 429 4-	1836	EL 2018 High Voltg. Comparator	1995
DG 441-442 Quad SPST Analog Switches	2376	EL 2019 Fast,High Voltg.Comparator	1982
DG 444-445 Quad SPST Analog Switches	2346/2349	EL 2020 50MHz Curr. Feedback Ampl.	1992
DG 458/459 x. MAX4508/4509		EL 2030 120MHz	1847
DG 506/507 CMOS Analog Multiplexer	1075	EL 2031 550MHz Buffer Amplifier	1991
DG 508/509	1077	EL 2037 Servo Motor Driver	2008
DG 528-529 8-Channel Latchable Multiplexers	2370/2372	EL 2038 1GHz OPA	2008
DG 534 4-Channel Video Multiplexer	1838	EL 2039 High Slew Rate OPA	1996
DG 538 8-	1839	EL 2040	2009
DG 540 x. MAX 4545		EL 2041 Wideband ...OPA	1997
DG 542 x. MAX 4546		EL 2044 Video OPA 60MHz +/- 2-18V	1847
DG 643 x. MAX 4546		EL 2045 100MHz,Gain-of-2 OPA	1847
DG5140-5145 x. IH 5140-5145		EL 2070 200MHz Current Feedb. OPA	2010
DG9461 x. MAX 4544		EL 2071 150MHz Curr. Feedback Ampl	1993
DGM 181 Analog Switch CMOS DG181	528	EL 2072 730MHz Closed Loop Buffer	1990
DM 7820/30 x.SN 55182/83		EL 2073 200MHz OPA	1847
DM 8820/30 x.SN 75182/83		EL 2074 400MHz OPA	1847
DM 8837 = MC 3437		EL 2075 2GHz Gain-of-10 OPA	1847
DP 8480 ECL/TTL Level Translator	1549	EL 2082 Current Mode Multiplier	1981
DP 8481	1556	EL 2090 100MHz DC Restored Vid.Amp	1988
DP 8570/72 Real Time Clock/ uP	795	EL 2099 Video Distribution Ampl.	1980
DS 1820 1-wire Digital Thermometer	2216	EL 2120 100MHz Curr.Feedback Ampl	1993
DS 232 = MAX 232		EL 2130 85MHz	1847
DS 12285 = MAX 232		EL 2160 130	1847
DS 1488/1489 = MC 1488/1489		EL 2171 150MHz Curr. Feedback Ampl	1993
DS 14C88/89 x.SN 75188/189		EL 2190/95 = HA 5190/95	
DS 26LS31/32 x. AM 26LS31/32		EL 2210/11 Dual Video OPA	7
DS 26LS31/32/33 x. AM 26LS31/32/33		EL 2223 Dual 500MHz OPA	1998
DS 26S10 x. MC 26S10		EL 2224 Dual 60MHz OPA	1998
DS 26S10/11 x.AM 26LS10/11		EL 2242 Dual,Single Supply OPA	2000
DS 3486 = MC 3486		EL 2243 Dual,Single Supply OPA	2000
DS 3487 x. MC 3487		EL 2244 Dual 60MHz OPA	7
DS 3632 = MC 1472		EL 2245 Dual 100MHz OPA	7
DS 3650/3652 = MC 3450/3452		EL 2252 2x 50MHz Comparator/Rec.	2001
DS 3651 = MC 3430		EL 2260 Dual 130MHz OPA	7
DS 3652 x. MC3452		EL 2410/11 Quad Video OPA	6
DS 3653 = MC 3432		EL 2423 4x De-Compensated OPA	2007
DS 3680 Quad Telephone Relay Driv.	1545	EL 2423CN Quad De-Compensated OPA	6
DS 3691 x. AM 26LS30		EL 2424CM Quad 60MHz OPA H.6	2007
DS 3695 x. TL 3695		EL 2444	6
DS 3893/96/97 x. SN 75ALS053/6/7		EL 2445 Quad 100MHz OPA	6
DS 55XXX x. SN 55XXX		EL 2460 Quad 130MHz OPA	6
DS 7820/30 x.SN 55182/183		EL 3038 2A Servo Motor Driver	1975
DS 8820/30 x.SN 75182/183		EL 4083 Current Mode Multiplier	1983
DS 8831/8832	765	EL 4084	1984
DS 8837 = MC 3437		EL 4089 DC Restored Video Ampl.	1987
DS75107/108/110 x.MC 75107/8/10		EL 4094 Video Gain Control/Fader.	1986
DS75XXX x SN 75XXX		EL 4095 * * */Multiplexer	1985
DS90LV017 x. MAX9110		EL 4393 3x 80MHz Video Amplifier	1989
EHA XXXX = HA XXXX		EL 4581 Video Sync Separator	1979
EL 400 200MHz Current Feedb. OPA	2011	EL 4583 Video Sync Separator	2002
EL 2001 70MHz Buffer Ampl.	1999	EL 5003 High Speed CRT Driver	1978
EL 2002 180MHz Buffer Ampl.	1999	EL 7104 Power MOSFET Driver	1717
EL 2003 100MHz Video Line Driver	1994	EL 7114	1718
EL 2004 350 MHz FET Buffer	1974	EL 7134 C Line Driver	1719
EL 2005 High Accuracy FET Buffer	1974	EL 7144 C Power MOCFET Driver	1720
EL 2006 High Gain Fast FET Inv.OPA	1976	EL 7182	2003
EL 2008 55MHz,1A Buffer Ampl.	1980	EL 7202	1721
EL 2009 90MHz,1A	1980	EL 7212	1722

TÊN IC	HINH	TÊN IC	HINH
EL 7222	1723	HA 5320	1043
EL 7232	2003	HA12017 Low Noise Preamplifier	511
EL 7242 Dual	1724	HADC 574 x. MX 574A	
EL 7252	1681	HF 10 = MF 10	
EL 7262	2004	HF201 = DG 201	
EL 7272	2004	HFA 0001 1000V/us;350MHz OPA	1506
ELH 0002 = LH 0002		HFA 0002 LN,WB OPA	1
ELH 0021 1A Power OPA	1972	HFA 0003 = LT 1016	
ELH 0032 Fast OPA	1973	HFA 0005 420V/us;300MHz	1506
ELH 0033 Fast Buffer Amplifier	1974	HI 574A x. AD 574	
ELH 0041 = LH 0041		HI 574A x. MX674A	
ELH 0101 Power OPA	1977	HI 774 x. MAX 174	
EN 2015/16 x. EP 2015/16	2013	HI 7106 x. ICL 7106	
EP 2015 Fast Quad PNP Array	1685	HI 7131 x. MAX131	
EP 2016 Fast Quad NPN	1686	HI0-0508/0509 x. DG 508/509	
ESM 1600B/028	312	HI1- 200-2/4/5 Analog Swit. 100ns	1013
EXO 3C Quarzoszill./prog. F.Divid	791a	HI1- 201-HS " 75 50ns	1019
FA 5205 Spin,Track,Focus-Mot.Drv	1898	HI1- 201-X " 100 185ns	1021
GSA 1011 Key-Board & Display Contr	1897	HI1- 300 x. HI2-300 1026	1027
HA OP07 = OP07		HI1- 301 " " 1028	1029
HA 2400/04/05 PRAM Progr.Amplifier	1490	HI1- 302 " " "	1030
HA 2406 Digitally set. 4 Ch. Ampl.	1490	HI1- 303 " " "	1031
HA 2420/25 12-Bit/4 us,Sample & H	1523	HI1- 304-307 x. DG 304-307	
HA 2500/02/05 Precision 30V/us OPA	1492	HI1- 381 " " 1032	1033
HA 2510/12/15 60V/us OPA	1492	HI1- 381-2/5 " 75 /300ns	1013
HA 2520/22/25 uncomp. 120V/us OPA	1492	HI1- 384 Analog Switches 75 300n	1014
HA 2529 x.HA 2520 & Iout :+/-30mA	1492	HI1- 507A	1047
HA 2539 600V/us , 600MHz OPA	1497	HI1- 508	1049
HA 2540 400V/us , 200ns OPA	1501	HI1- 509	1050
HA 2541 250V/us,90ns,40MHz	1494	HI1- 518	1041
HA 2542 300V/us,70MHz,Io = 100mA	1496	HI1- 539 Analog Multiplexers	1036
HA 2544 150V/us,50MHz Video OPA	1502	HI1/3- 506 Analog Multiplexer	1045
HA 2548 120V/us,150MHz,Precis.OPA	1492	HI1/3- 506A	1046
HA 2600/02/05 12MHz,Zin 500M OPA	1492	HI1/3- 507	1044
HA 2620/22/25 100MHz,Zin 500M OPA	1492	HI1/3- 508A	1056
HA 2640/45 Vo = +/-35V OPA	1492	HI1/3- 509A	1057
HA 2650/55	7	HI1/3- 516	1039
HA 2720/25 x. ICL 8021		HI1/3- 524 Analog Multiplexers	1035
HA 4741 Quad OPA	1504	HI1/3- 546	1052
HA 5004 100MHz Curr. Feedback OPA	1509	HI1/3- 547	1053
HA 5101/5111 Low Noise OPA	1498	HI1/3- 548	1054
HA 5102/04/12/14 Low Noise OPA	1512	HI1/3- 549	1055
HA 5121 Low Noise,WB,Prec.	1517	HI1/3-1818A	1059
HA 5122	7	HI1/3-1828	1040
HA 5127 Ultra Low Noise OPA	1517	HI1-5040-2/5 " 75 370ns	1020
HA 5130/35 x. HA 5177		HI1-5041 " " 75 300ns	1023
HA 5134	6	HI1-5042 Analog Switches 75 370ns	1022
HA 5137 x. HA 5127		HI1-5043 " " "	1024
HA 5141	1	HI1-5044-2/5 Analog Swit.75 /370ns	1012
HA 5142 x. HA 5102		HI1-5045 " " "	1024
HA 5144 x. HA 5104		HI1-5046-2/5 " 75/50 370ns	1017
HA 5147 x. HA 5127		HI1-5047-2/5 " " "	1018
HA 5151	1	HI1-5048 " " 50 370ns	1025
HA 5152/54 x. HA 5102		HI1-5049 " " 50 "	1024
HA 5160/62 Wideband,JFET OPA	1507	HI1-5050 " " "	1022
HA 5170 Precision JFET OPA	1	HI1-5051 " " "	1024
HA 5177 Ultra Low Offset x.HA5127		HI2- 300 " " 75	
HA 5180 Low Bias Curr. JFET OPA	1	HI2- 301 x. HI1-301	
HA 5190/95 Wide Band,Fast Sett.OPA	1515	HI2- 381/387 x. DG 381/387	26 /1027

TÊN IC	HÌNH	TÊN IC	HÌNH
HI2-0304/305 x. DG 304/305		HT 2880 8 " "	1800
HI3/HI4/HI4P/HI6-0201 x. DG 201		HT 2880 A 8 Toy Gun Sounds II	1801
HI3-0304-307 x. DG 304-307		HT 2880 D 4 Melodien 4 Ton I	1802
HI3-0381/384/387/390 x. DG 381/384/387/390		HT 2880 E " " " II	1802
HI3-0508/509 x. DG 508/509		HT 2880 I " " " III	1802
HIN 202/206/207/208 x. MAX 202...208		HT 2880 J 8 Melodien I	1802
HIN 211/213 x. MAX 211/213		HT 2880 Q " " II	1802
HIN 232/233 x. MAX 202/203		HT 2881 A 8 Sound Generator	1803
HKZ 101S Half	1693	HT 2883 Sound Generator	1787
HS 574A x. MX574A		HT 2883 D/E/F/I 8Submarine S.	788 /1790
HT 12 D/F Receiver	1813	HT 2884 8 Sound Gen. with 5 LED	1805
HT 12 E Transmitter	1812	HT 2884 B 8 Melodien 1804/	1806
HT 88	313	HT 2885 Sound Generator	1787
HT 600 Encoder	1930	HT 6010 = HT 12 E	
HT 614 Decoder	1930	HT 6030 = HT 12 F	
HT 680 Encoder	1818	ICL 232 5V,Multi-Channel RS-232 Drivers/Re	1011
HT 681 Decoder	1819	ICL 420-423 x. MAX 420-423	
HT 2810 A Sound Gen. Smal Chicken	1821	ICL 7106	28 /732
HT 2810 B Car Siren 1	1822	ICL 7107	28 /732
HT 2810 C " " 2	1823	ICL 7109 AD-DA Converter	1919
HT 2810 D Ding Dong	1824	ICL 7115 14 Bit ADC , uP comp.	1970B
HT 2810 E Bird Sound	1825	ICL 7116	176
HT 2811 " " (Dual Ton)	1826	ICL 7117	175
HT 2812	827 /1830	ICL 7126	48 /732
HT 2812 A Airplan		ICL 7129	29
HT 2812 B Rocket		ICL 7135	29
HT 2812 C Siren II		ICL 7136=YC 7136	314
HT 2812 D Police Car		ICL 7137 3,5 Digit A/D	1248
HT 2812 G Siren I		ICL 7139 3 3/4 Digit Autorg.Multim	1851
HT 2812 H Dialing Tone		ICL 71C03 x. ICL7135	
HT 2812 J Chicken Sound		ICL 7605/06 Auto-Zero Instrum. OPA	1508
HT 2812 K Ambulance		ICL 7611/12/14/16 Single OPA	1270
HT 2813	1831	ICL 7621/22 Dual OPA CMOS+AB63	1275
HT 2813 D Sound (Ghost)		ICL 7631/32 Triple OPA	127
HT 2813 E Bird I		ICL 7641/42 Quad OPA	1278
HT 2813 F " II		ICL 7650 Chopper Stabilized OPA	1281
HT 2813 G Cow		ICL 7652 " " "	1283
HT 2813 H Little Dog		ICL 7660 DC-DC Converter 5V to +/-15V	139/522
HT 2820 A Two Horse Sounds	1833	ICL 7662 DC-DC " 1,5V to 10V/4,5V to 20V	318
HT 2820 B Rifle Gun & Bombing		ICL 7663 Volt.Reg./J1-16V	1303
HT 2820 C Two Car Alarm Sounds		ICL 7664 Regulator -2V to -16V	1304
HT 2820 D Two Door Bell Sounds		ICL 7665 Prog.Under/Over Volt.Dete	525
HT 2820 F Bombing & Explosion		ICL 7667 Dual Power MOSFET Driver	146
HT 2820 I Motorcycle Sound		ICL 7673 Auto.Battery Backup Swit.	524
HT 2820 M Bombing & Machine Gun		ICL 7675/7676 Power Supply Sup.Cir	535
HT 2821 Sound Generator	1808	ICL 7677 CMOS Power Fail Detector	549
HT 2821 A Bombing & Machine Gun	1809	ICL 7680 +5 +/-15V Volt.Conv./Reg.	646
HT 2821 E Break & Explosion	1810	ICL 8013 4-Quadrant Analog Multipl	527
HT 2830 Sound Generator	1814	ICL 8038 =XR 8038 200kHz	49
HT 2830 B Helicopter Sound		ICL 8048 Log/Antilog Amplifier	519
HT 2830 C A929Train Sound		ICL 8049 " "	520
HT 2830A Jet Plane & Motorcycle		ICL 8063 Power Trans. Driver/Ampl.	1855
HT 2843 A 4 Sound Generator	1815	ICL 8069 1,2V Ref. C:50ppm D:100ppm	481/521
HT 2844 " " "	816 /1817	ICL 8211/8212 Volt.Level Det.	140/526
HT 2844 C Animal Sound		ICL 8240 = XR 2240	
HT 2844 M 4 Helicopter Sound		ICM 7038	197
HT 2844 P 4 Jet Plane "		ICM 7170 Real-Time Clock,uP Bus	548
HT 2844 T 4 Alarm Sounds		ICM 7207 Oscillator/Divider	247
HT 2860 6 ALARM SOUNDS	1799	ICM 7208 Timer/COUNT.Com.Cath.	247 /186

TÊN IC	HÌNH	TÊN IC	HÌNH
ICM 7209 CLOCK GEN.	177	IP 3527/2527/1527 = SG 3527...	
ICM 7211/M LCD Driver.Latch	544/545	IP 33063 x. MC 33063	
ICM 7212/M LED Driver.Com Anod	546/547	IP 34060/63 x. MC 34060/63	
ICM 7213 CLOCK GEN.	184	IP 35060/34060 =MC 35060...	
ICM 7216 A Timer/Counter Com. Cath	136	IP 35060/63 x. MC 35060/63	
ICM 7216 B Frequency Counter/Timer	1867	IP 35063/34063/33063 = MC 35063...	
ICM 7216 C " "	1868	IR 3702=LM324	
ICM 7217 Timer/Counter/LED/Com.Ano	1016	IR 94558 = LM 14558	
ICM 7217A/C Com.Cathode/Mux/4 Dig.	537	ISO 1016 Analog Speech Memory	936 /1845
ICM 7217B 4 DIGIT Com. Anode	171	ISO 122/124 P/I Isolation Amplifier	2203
ICM 7218B Com.Cathode. 8 LED Driver Serial	541	ITT 652/654/656 = MC 1411/12/13	
ICM 7218A Com. Anode, 8 LED Driver Serial	539	ITT 3064 = MC 13010	
ICM 7218C Com. Anode, 8 LED Driver Parallel	540	KA 301=LM 301	
ICM 7218D Com.Cathode,8 LED Driver Parallel	543	KA 319/219 = LM 319/219	
ICM 7218E LED/Com.Anode/Driver/Int	1015	KA 331 = LM 331	
ICM 7224 Counter	138	KA 431=TL 431	
ICM 7225 =ICM 7224		KA 710 = LM 710	
ICM 7226A Timer/Counter Com.Anode	532	KA 2201 = TBA 820	
ICM 7226B " " Cath.	60	KA 3524 = LM 3524D	
ICM 7227 COUNTER/TIMER	317	KF 347 x.CA 3410	
ICM 7228 = ICM 7218		KF 351 x.CA 3140	
ICM 7231 LCD,8 Digits/Interface	534	KF 442 = LF 442	
ICM 7232 LCD,10 Digits/Interface	538	KS 272 x.CA 5260	
ICM 7233 LCD,4 Alphanum./Interface	533	KS 274 x.CA 5470	
ICM 7234 x. MAX 7234		L 70 = LT 1031	
ICM 7240/50/60 Timer/Counter	610	L 120 Phase Control IC	319
ICM 7242 Timer/Counter	531	L 123=LM 723	
ICM 7243A/B Interface/LED Com.Anod	536	L 129/5=TDA 1405	
ICM 7249 5 1/2 LCD Counter		L 130/12=TDA 1412	
ICM 7250 pin 15 : Carry out	610	L 131/15=TDA 1415	
ICM 7555 # LM 555 CMOS (200mW)	246/10	L 146=TDB 1146	
ICM 7556 # LM 556 CMOS (300mW)	11	L 149 4A Linear Driver	711
ICS 1700 Charger Controller NiCd	1848	L 165=TCA 365	97
ICS 1702N Reflex-Lade-Controller	1933	L 194-5/12/15 ON AP CO CHINH LUU	137
IH 5040-5045/5047 CMOS Analog Switches	2327/2328	L 200 85-36V/2A	3 /121 /191
IH 5048..5051 CMOS Analog Switches	616	L 201/2/3 = ULN 2001/2/3	
IH 5049 x. HI1-5049		L 272 Dual Power OP	1349
IH 5050 x. HI1-5050		L 290 DC-Motors/Tachometer-Conver	862
IH 5051 x. HI1-5051		L 291 5Bit D/A + Position Amplif.	861
IH 5108 x. Max 358		L 292 Driver f. DC Motors;2,5A	876
IH 5140..5145 " " "	615	L 293 Quadruple Half-H Driver	766
IH 5208 x. Max 359		L 294 Power Controller-Driver	878
IH 5341	1070	L 295 enoid,Hammer,Needle,Relay25	879
IH 5352	1071	L 296 4A Switching Regulator	143
IH 6108 x. DG 508		L 297 Unipolar Stepper Motors-Dri	880
IH 6116 x. DG 506		L 298 DC-Motors 2X Full-H Driver	881
IH 6208 x. DG 509		L 387 Very Low Drop 5V Regulator	1352
IH 6216 x. DG 507		L 601/2/3/4=ULN 2801/2/3/4	
IM 4702 BAUD RATE GEN.	134	L 604	386
INA 101 Accuracy Instrumentation Amplifier	2208	L 702 A9772A Darlington quad Array	494
INA 105 Precision Unity Gain Diff. Amplifier	2199/2206	L 20XX=78SXX	
INA 110 Fast-Settling FET Input Instr. Amplifie	2207	L 2605/10 = 780510	
INA 117 Prec. High Common Mode Diff. Ampl.	2200	L 2720/22/24 Low Drop Dual 1A OPA	1351
INA 118 Instr. Amplifier G:1-10000>98dB	2198	L 4620 Liquit Level Alarm	1774
INA 125 Instr. Amplifier G: 4-10000	2201	L 48XX x. LM 78XX Low Dropout (0.4V) Regl.	
INA 155 Instr. Amplifier G: 10-50 > 86 dB	2198	L 4901 Dual 5V Regulator/Reset	1353
INA 2137 Audio Diff.-Line Rec. 6dB	2209	L 4902 " " " "/Disable	1353
IP 3525/2525/1525 = SG 3525...		L 4903 " " " " "	894
IP 3526/2526/1526 = SG 3526...		L 4904 " " " /Reset	1354

TÊN IC	HÌNH	TÊN IC	HÌNH
L 4905 x. L4901		LF 13201/13202 = DG 201/202	
L 4940 5/8,5/10/12V 1.5A Regul.	30	LF 13202 = DG 212	
L 4941 5V/1A Very Low Drop Regul.	30	LF 13508/509 = DG 508/509	
L 4960 2.5A Switching Regulator	1355	LH 0002	2021
L 4962 1.5A "	1357	LH 0003 Wide Bandwidth OP	2050
L 4970A 10A Switching Regulator	2163	LH 0004 High Voltage OP	2049
L 4972A 2A Switching Regulator	2157	LH 0024 High Slew Rate OP	3
L 4973 3A Step Down Switching Regulator	2140	LH 0032 = HA 2542	
L 4974 3,5A Switching Regulator	2157	LH 0033 Fast Buffer Amplifier	1293
L 4975 5A Switching Regulator	2163	LH 0036 Instrument. Ampl.	554
L 4977 7A Switching Regulator	2163	LH 0038 " "	555
L 5832 Solenoid Controller	1358	LH 0041 0,2 Amp. Power OP	2048
L 6201/02 DC-Motors/0,3 Ohm	865 /866	LH 0042 x.CA 3140T	
L 6203 Bridge Driver	867	LH 0044 x. LT 1001	
L 6210 Dual Schottky Diode Bridge	868	LH 0053C SAMPLE AND HOLD	214
L 6219 Step Motor Driver 50V	2138	LH 0063 " " "	1288
L 6221 Quad Darlington Switch	1360	LH 0070 Volt. Ref. 10V = AD 581	
L 6222 " Transistor "	1363	LH 0075 Progr. Prec. Volt.Ref. pos	1857
L 6223 Progr. Stepper Motor Driver	869	LH 0076 " " " neg	1858
L 6374 4x Driver 40V, 0,1A	2156	LH 0084 Dig.-Prog.-Gain Instr.Ampl	552
L 6506 Current Controller f.Step.M	877	LH 0101 2A OPA	1268
L 7150/52 50V Quad Darlington Swi	1361	LH 2003/2033 100MHz Video Buffer	2030
L 7180/82 80V-Quad Darlington Swit	496	LH 2108 Dual Super Beta OPA	1386
L 78 XX = 78XX		LH 4104 Fast Settling Power OPA	2047
L 78M00 x. 78MXX		LIU 01 Serial Data Receiver	953
L 78S00 x. 78SXX		LM 56 Dual Output Thermostat	2391
L 79XX = 79XX		LM 60/61 2.7V Temperatur Sensor -40 to +125	2390
L 9350 High Side Driver	1771	LM 10CN OPA and Voltage Ref.	1861
L 9355 6A Switchmode HS Driver	1772	LM 10CWM " "	1862
LA 4145 = TBA 820		LM 10H " "	25
LA 6324 = LM 324		LM 11 Precision OPA	1612
LA 6358/6458		LM 12CLK 10A OPA	1131
LA 6458 = LM 1458		LM 90 Bandfilter	958
LA 6510 CD-Trac.,Focus-Mot.-Driv	1899	LM 101 = LM 301	
LA 6515 CD 2x HF Amplifier	1903	LM 105/205/305 pos. Voltage Ref.	1695
LA 6532 Focus,Trac,Coil,Spind,Sled	1901	LM 106/7/8/9/11=LM306/7/8/9/11	
LAS 15 XX = 78XX	30	LM 117/18/19/23/24=LM317/18...24	
LB 1231/32/33/34 = ULN 2001...2004		LM 129 6.9V Voltage Ref.	1389
LB 1645 CD Motor Driver	1860	LM 131/231 x. LM 331	
LF 147 = LF 347		LM 134/5/6/7/8/9=LM334/5/6/7/8/9	
LF 151/53/55/56/57=LF351/53/55/5	57	LM 140K-XX(XX V,1A)	37
LF 247/51/53/55/56/57=LF347/51..		LM 146/8/9 = LM 346/8/9	
LF 311/211/111	8	LM 150K/250K x.LM 350K	
LF 347/247/147 JFET	6	LM 158 = LM 358	
LF, 351/251/151 JFET	1	LM 159/359 Prog. Norton Ampl.	213
LF 353/253/153 JFET	7	LM 163 Instrumentation Amplifier	2241
LF 355/255/155 JFET 12V/ s	1	LM 185 x. LM 385	
LF 356/256/156 JFET	1	LM 192/193 = LM 392/393	
LF 357/257/157 JFET	1	LM 199 Temp. Compens.Precis.Ref	1393
LF 358	7	LM 201/6/7/8/9 = LM 301/6/7/8/9	
LF 398/298/198 F,N,H Sample & Ho	51	LM 211/17/18/19 = LM311/17/18/19	
LF 400 x. CA 3100		LM 223 = LM 323+A1115	
LF 411 JFET INPUT OPA	1	LM 224 x. LM 324	
LF 412 CD/CP Dual JFET INPUT OPA	7	LM 234 x. LM 334+A1116	
LF 441/42/44 JFET OPA	7/6	LM 236 Voltage Ref. 2,5V	512
LF 451 JFET INPUT	1	LM 239 x. LM 339	
LF 453 JFET INPUT	7	LM 246/48/49/58 = LM346/48/49/58	
LF 1055AM = LF 155A		LM 258 x. LM 358	
LF 13201 = DG 201		LM 285 x.LM 385	

TÊN IC	HÌNH	TÊN IC	HÌNH
LM 292/93 = LM 392/93		LM 555 Timer	10 /624
LM 301/201/101 Precise OPA	2	LM 556	11
LM 302/102 Voltage Followers	2026	LM 565 = NE 565	
LM 304 Progr. Voltage Regulator	1700	LM 566 = NE 566	
LM 305 x. LM 105		LM 567 PLL-IC/Ton Decoder	59 /622
LM 306/206/106 Diff. Comparator	589a /288	LM 607 Precision OPA	
LM 307/207/107 OPA+A1128	603a /272	LM 611 OPA/Voltg. Ref.1,2V-6,3V	1225
LM 308/208/108 Precision OPA	629	LM 612 Dual Comparator & Ref.	2029
LM 309K 5V Regulator	39	LM 613 Dual OPA & Comparator & Ref	2044
LM 310/210/110 Voltage Followers	2026	LM 614 Quad OPA & Adj. Reference	2043
LM 311/211/111	8	LM 615 Quad Comparator & Adj. Ref	2028
LM 312/212/112 OPA	2045	LM 628/629 Precision Motor Controller	2396
LM 313 = ICL 7660		LM 637/627 Precision OPA	2042
LM 317/217/117 1,5A/1,2V-37V	40 /213	LM 675 Power OPA	2040
LM 318/218/118 Precision OPA	293	LM 703 = SN 76603	12
LM 319/219/119 High Speed Dual Comparator	118	LM 709 = SFC 2709 = UA 709	3
LM 320K = 79XXKC		LM 710	13
LM 320L,ML	33	LM 711	14
LM 320T = 79XXCKC		LM 715 High Speed OP	2041
LM 321/221/121 Instrument. Ampl.	553	LM 723 = MC1723=TDB0723=SFC2723	15
LM 323K/223/123 ON AP 5V/3A	657	LM 725 Instrumentation Ampl.	1733
LM 324/224/124 Quad OPA+A1084	6	LM 733 Differential Video Ampl.	204
LM 329 x.LM 129		LM 739 = TBA 231=XR 4739	16
LM 330T 5V/150mA positive Regulator	30	LM 741 = MC1741=TBA221=SFC2741	1
LM 331/231/131 V to F & F to V 100KHz	2005	LM 747 = CA 747=TDB 0747	4
LM 333 = LT 1033		LM 748 OPA	2
LM 334/234/134 ADJ.CURRENT SOURCE	292 /627	LM 759 Power OPA	1/1865
LM 335/235/135	112	LM 828 x. MAX 828	
LM 336 2,5V Reference Diode 20ppm	620a /512	LM 833 Dual OPA = LM 1458	
LM 336-5,0 5V Reference Diode 20 ppm	521 /620a	LM 1042 Fluid Level Detector	2024
LM 337/237/137 Negative Regulators+A1152	120	LM 1201 Video Amplifier System	644
LM 338/238/138	119	LM 1310	322
LM 339/239/139 OPEN COLLECTOR !	9	LM 1458/1558 intern.Compensat. Dual OPA	7
LM 340TXX = 78XX	30 /208	LM 1496 x.MC 1496	
LM 341/342 P-XX = 78MXX		LM 1514 = MC 1514	
LM 343/143 +1- 40V OPA	1	LM 1524 = LM 3524	
LM 344/144 +1- 36V; 30V/us OPA	2	LM 1558 = LM 1458	
LM 346/246/146 Progr. Quad OPA	98	LM 1575 1A Step Down Voltage Regulator	2134
LM 348/248/148	6	LM 1577 3+A130A Step Down Voltage Regul	2135
LM 349/249/149	6	LM 1578 = LM 3578	
LM 350 3A ADJ.REG.1,2V-33V	149	LM 1578/2578/3578 Switching Regulator	2150
LM 358/258/158 Low Power 2x OPA+A1163	7	LM 1596/1496 = MC 1596	
LM 359 = LM 159		LM 1801 SMOKE DETECTOR	212
LM 363 Instrumentation Amplifier	2241	LM 1830 Fluid Detector 5,5...10V	1844
LM 368 5/10 = LT 1019 5/10		LM 1875 20W Audio Ampl.	2040
LM 380 Audio AMPLIFIER / 2,5W	145 /54	LM 1876 Dual 20W Audio Amplifier	2132
LM 381 Low Noise Dual Preamplifier	1672	LM 1877 Dual Power Audio Ampl.	2039
LM 383 = TDA 2002 7W Audio Amplifier	626	LM 1881 Video Separator	1277
LM 385-1,2/2,5 Voltage Ref. Diode 80ppm	320 /481	LM 1886 TV-Video Matrix - D/A	1713
LM 386 Power Audio Amplifier	56	LM 1900 = LM 3900	
LM 387 Low Noise Preamplifier	24	LM 1971 Audio Attenuator/Mute	2219
LM 389 Audio Power Ampl./ NPN Trans Array	57	LM 2524 = LM 3524	
LM 390 1W Audio Amplifier	58	LM 2574 0,5A Step-Down Voltage Regulator	2126
LM 391 Audio Power Driver	207	LM 2575 1A Step-Down Voltage Regulator	2134
LM 392 Low Power OPA/ Voltage Comparator	321 /625	LM 2576 3A Step-Down Voltage Regulator	2134
LM 393 Volt. Dual Comparator/Low Offset A1	52 /621	LM 2577 3A Step-Down Voltage Regulator	2135
LM 394/194 Supermatch Pair	2046	LM 2578 = LM 3578	
LM 399 x. LM 199		LM 2579 SWITCH REGULATOR	323
LM 431 y. TL 431		LM 2825 1A DC-DC Converter 3/5V Output	2136

TEN IC	HINH	TEN IC	HINH
LM 2877 4 Watt Audio Ampl.	2038	LM 13600/13700	62
LM 2878 Dual 5W Audio Ampl.	2038	LM 18293 4-Channel Push Pull Drive	r 766
LM 2879 8 " "	2037	LM 75107/75108 = MC 75107	
LM 2900 = LM 3900		LM 75110 = MC 75S110	
LM 2901 F.N = LM 339		LM 77000 = LM 759	1/1865
LM 2902DP Low Power Quad OPA	6	LMC 660 Quad CMOS OPA	6
LM 2903 Low Offset Dual Voltage Comparator	52	LMC 662 CMOS Dual OPA	7b
LM 2904 = LM 358		LMC 668 = ICL 7650	
LM 2907 FREQ. TO VOLTAGE CONV. 10kHz	211	LMC 6022 Low Power CMOS Dual OPA	7b
LM 2917 FREQ. TO VOLTAGE CONV. 10kHz	211	LMC 6024 " " "	6
LM 2924 = LM 392		LMC 6032 CMOS Dual OPA	7
LM 2925	1676	LMC 6034 CMOS Quad OPA	6
LM 2930-5/8 5V/8V OUTPUT Low Drop	152	LMC 6041 CMOS Single OPA	2034
LM 2931-5 = 7805		LMC 6042 " Dual OPA	7b
LM 2935T Dual +5V Regul.	1617	LMC 6044 " Quad OPA	6
LM 2937 500mV Low Dropout Regl. 5/8/10V	30	LMC 6061 Precision CMOS 1x OPA	2034
LM 2940 = 7805/12 Low Drop		LMC 6062 " " 2x "	7b
LM 2941C 5...12V Volt. Reg. 1A	698	LMC 6064 " " 4x "	6
LM 3045/46/54 = CA 3045/46/54		LMC 6081 Precision CMOS 1x OPA	2034
LM 3050/86 = CA 3080/86		LMC 6082 " " 2x "	7b
LM 3089 = CA 3089		LMC 6084 " " 4x "	6
LM 3301 = MC 3301		LMC 6482 CMOS 2x Rail to Rail I/O OPA	7b
LM 3302 x. CA 3290		LMC 6484 CMOS 4x Rail to Rail I/O OPA	6
LM 3303/4 Quad OPA	6	LMC 7660 = ICL 7560	
LM 3401 = MC 3401		LMF 60 Low-pass Filter	1344
LM 3524 = SG 3524	84	LP 265 x. LP 365	
LM 3578/2578/1578 SWIT. REGULATOR	324/2150	LP 311 x. LM 311 Low Power Comparator	
LM 3875 40W Audio Power OPA	2036	LP 324/124 Quad Low Power OPA	6
LM 3900/2900/1900 Quad OPA	61	LP 339 Low Power LM 339 (80 uA)	9
LM 3908	660	LP 365 4x Comparator, micropower	736b
LM 3909 LED FLASHER/OSCILLATOR	173	LP 1232 = ULN 2002	
LM 3911 Temperatur Controller	71/174	LP 2902 = LP 324	
LM 3914 BAR GRAPH DISPLAY DRIVER	172	LP 2950 Low Drop Regulator	34
LM 3915 3 dB-Bar-Graph-Displ.Driv	479	LP 2951/C Voltage Regl. 100mA	1696
LM 3940 1A Low Drop Regulator 5V to 3,3V	152	LP 2980 / 2981 x. MAX8873	
LM 4136 Quad OPA	2033	LP 2982/2985 x. MAX 8877	
LM 4250 Low Power,Low Offset OPA	1519	LPC 660 Low Power CMOS Quad OPA	6
LM 4558 x. LM 1458		LPC 661 " " " 1x "	2034
LM 4700 30 W Audio Amplifier/ Mute&Standby	2125	LPC 662 " " " 2x "	7b
LM 4830	2218	LS 107/207/307	714 / 715
LM 4860 1W Audio Amplifier / Shutdown Mode	2128	LS 141=LM 741	
LM 4861 0,5W Audio Ampl.	2139	LS 159 = TBA 331	
LM 5000 = NE 555=CA 555	10	LS 204 = LM1458	
LM 6118 Fast Settling Dual OPA	7	LS 404 = LM 324	
LM 6181 100mA,100MHz OPA	2034	LS 709 = LM 709	
LM 6313 High Speed/Power OPA	2032	LS 776 = LM 4250	
LM 6361/6261/6161 High Speed OPA	2035	LS 1240 Electronic two-Tone-Ringer	2137
LM 6362/6262/6162 High Speed OPA+A1284	2035	LS 4558 x. LM 1458	
LM 6364/6264/6164 " " "	"	LS 7220 KEYLESS LOCK/SEQ.DET.	63
LM 6365/6265/6165 " " "	"	LS 7225 Keyless Lock	1708
LM 6685 Ultra Fast 1x Comparator	2027	LS 7232 Switch/Dimmer	1856
LM 6687 Ultra Fast 2x Comparator	2025	LT 111/311 = LM 311	
LM 78LXX = 78LXX		LT 117/8/9 = LM 117/8/9 x.LM 11	
LM 78XX = 78XX	30	LT 123/323 x. LM 323	
LM 79XX = 79XX	31/593	LT 138/338 x. LM 338	
LM 9140BYZ Volt. Ref 2,5/5V	513	LT 150/350 x. LM 350	
LM A11804B30 Two Way Audio Amplification	2218	LT 317/117A = LM 317	
LM 11600A = LM 13600		LT 323/123A = LM 323	
LM 13080 Prog. Power OPA	2031	LT 337/137A = LM 337	

TÊN IC	HÌNH	TÊN IC	HÌNH
LT 350 x. LM 317		LT 1078 Dual Micropower OPA	7a/2149
LT 574A x. AD 574		LT 1079 Quad Micropower OPA	6\2154
LT 580 Volt. Ref. 2.5V x. AD 581		LT 1080 5V RS232 DRIVER	332
LT 581 " " 10V = AD 581		LT 1081 5V RS232 DRIVER	333
LT 685 High Speed Comparator	298	LT 1082 Switching Regulator 1A/75V	2151
LT 1001 Precision OPA = OP 07		LT 1083/84/85 MU/CU -5/-12V,3..7A	709
LT 1002 Individual Amplifiers	620a-	LT 1085CK/CT 3A	710
LT 1003 = LM 323		LT 1086-12/-5 12V,1.5A / 5V,1.5A	40
LT 1004 = LM 385		LT 1088	436
LT 1005 Logic Contr. 5V Regulator	1382	LT 1097 x. LT 1012	
LT 1006 OPA	2110	LT 1101 Precision,Micropower Instrument Ampl.	2188
LT 1007 = OP 027A		LT 1102 30V/ $\mu$ s, JFET Input Instrument Ampl.	2189
LT 1008 = LM 108		LT 1103/1105 Offline Switching Regulator	2185
LT 1009/M = LM 336/136/A		LT 1107/1108 Micrp. DC/DC Converter 5/12V	2178b
LT 1009SMD 2.5V Volt. Ref.	726	LT 1109 DC/DC Converter Adj&Fixed 5/12V	2178a
LT 1010 Fast 150mA Power Buffer	1379	LT 1115 Ultra-Low-Noise/Distortion Audio OPA	727/729
LT 1011 = LM 111		LT 1116 x. MAX 913	
LT 1012 Low Noise OPA	727	LT 1126 Dual Decompensated, Prec. OPA	7b/SMD728
LT 1013 = OP 04 Dual Precis. OPA	728	LT 1127 Quad	1278
LT 1014 = LM 124 Dual Precis. OPA		LT 1161 Quad High-Side MOSFET Driver	2177a
LT 1015 Ultra Fast Precis. Compar.	1395	LT 1170/1171/1172 5/2.5/12.5A Switching Regl.	2186
LT 1017 Micropower Dual Comparator	1397	LT 1178 Dual, Single Supply, Precision OPA	728
LT 1018 x. LT 1017		LT 1180 5V RS232 Dual Driver/Receiver,0.1 $\mu$ F	2180
LT 1019-2.5/5/10 Precision Ref.	620	LT 1181 5V RS232 Dual Driver/Receiver,0.1 $\mu$ F	2178
LT 1020 Voltage Ref. & Comparator	723	LT 1193 Video Diff-Amp 500V/ $\mu$ s 80MHz	2173
LT 1021DCN Volt. Ref. 5V	514	LT 1206 250mA/60MHz Current Feedback Ampl.	2223
LT 1022 Precision JFET OPA	1380	LT 1208 Dual 45MHz,400V/ $\mu$ s OPA	7b
LT 1024 2x Compensated Precis. OPA	1387	LT 1209 Quad 45MHz, 400V/ $\mu$ s OPA	6/1278
LT 1025 Thermocouple Cold-Junc.Com	1404	LT 1217 10MHz Current Feedback Amplifier	2182
LT 1028 Low Noise Precis. OPA	631/729	LT 1224 400V/ $\mu$ s OPA	1286
LT 1029 = LM 336 2.5V Ref.		LT 1257 12 Bit D/A Converter	707a
LT 1030 QUAD RS232 DRIVER	325	LT 1262 x. MAX 662	
LT 1031 Precis. 10V Ref. = AD 581		LT 1270/1270A 8/10A Switching Regulators	2174
LT 1032 RS232 & RS423 Driver	722	LT 1280A x. MAX222	
LT 1033 On ap. max 3A/1.2..32V	633	LT 1360 50MHz,800V/ $\mu$ s OPA	1731
LT 1034 Dual Ref.	721	LT 1431CZ Volt. Ref. 5V	515
LT 1035 Logic Contr. 5V/3A Regl.	1391	LT 1526 PWM	1400
LT 1036 Logic Controlled 12V/5V		LT 1761 x. MAX 8877/8	
LT 1037 = OP 37		LT 3524/1524 = LM 3524/1524	
LT 1038CK 10A Positiv Adj. Voltage Regulator	40	LT 3524/1524 = SG 3524	
LT 1039	326	LT 3525/1525 = SG 3525/1525	
LT 1040	327	LT 3526 x. LT 1526	
LT 1042 Window Comparator 2.8..16V		LT 3527/1527 = SG 3527	
LT 1044 = ICL 7660		LTC 485 x. MAX 485	
LT 1051 x. LT 1078		LTC 486 Quad Low Power RS 485 Driver	2184
LT 1052 = ICL 7650		LTC 487 Quad Low Power RS 485 Drvner	2183
LT 1054 Voltage Converter 3.5..15V	1705	LTC 490 / 491x. MAX 490/491	
LT 1055 JFET OP	1	LTC 660 x. MAX 660	
LT 1056 = LF 356		LTC 690/691 x. MAX 690/691	
LT 1057	328	LTC 692-695 x. MAX 692-695	
LT 1058	329	LTC 699 x. MAX 699	
LT 1059	330	LTC 902 x. MAX 216	
LT 1060	331	LTC 1040 Dual Micropower Compar.	1399
LT 1062 = MAX 280		LTC 1041 Bang-Bang Controller	1402
LT 1070 5A Switching Regulator	632	LTC 1042 WINDOW COMPARATOR	334
LT 1071/72 = LT 1070 2.5A *		LTC 1043 2x Instr. Switched C	1405
LT 1073 DC/DC Converter 5/12V	2146	LTC 1044 x. MAX+A15341044	
LT 1074CT/HVCT Switching Regl. 5A/45-64V	2155	LTC 1046 x. ICL 7660	
LT 1076 Switching Regulator 2A / 45V	2155	LTC 1049 Low Power Chopper Stabilized OPA	2147

TEN IC	HINH	TEN IC	HINH
LTC 1050 Precision Chopper OPA	2148	MAX 110/111 2-Channel +/- 14 Bit Serial ADC	2131
LTC 1051 Dual Precision Chopper OPA	7b/2175	MAX 130/131 x. ICL 7106	
LTC 1052 Chopper Stabilized OPA	1385	MAX 132 +/- 18-Bit ADC Serial Interface	2093
LTC 1053 Quad Precision Chopper OPA	6/2152	MAX 133/134	335
LTC 1059 = MF5		MAX 136 3.5 Digit CMOS A/D	704
LTC 1060 Dual Switched C Filter	1401	MAX 138/140 3.5 Digit, Charge-Pump, LED	336
LTC 1061 3x Switched C Filter	1406	MAX 139 3.5 Digit, Charge-Pump, LCD	336
LTC 1062 = MAX 280		MAX 146/147 2.7V 8-Channel, Serial 12-Bit ADC	2318
LTC 1090 10-Bit A/D, Serial I/O, 8-Channel MUX	2179	MAX 150/154/158 = AD 7820/24/28	
LTC 1096 Sampling 8-Bit Serial I/O ADC	2220	MAX 160/61/62 x. AD 7574/81/72	
LTC 1098 Sampling 8-Bit Serial I/O ADC	2221	MAX 163/164/167 12 Bit CMOS A/D	697
LTC 1099 High Speed 8-Bit A/D & Sample/Hold	2181	MAX 170 12-Bit-A/D Converter	667
LTC 1100 Precision,Chopper Instrument Ampl.	2187	MAX 171 "	702
LTC 1144 Voltage Converter Switched Cap.	2214	MAX 172 10us CMOS 12-Bit ADC	1243
LTC 1152 Rail-to-Rail In/Output Zero Drift OPA	2144	MAX 174 x. AD774B	
LTC 1153 Auto-Reset Electronic Circuit Breaker	2177	MAX 178 Calibrated 12-Bit ADC	2357
LTC 1154 High-Side MOSFET Driver	2176	MAX 180/181 8-Channel, 12-Bit Data Acquisition	2375
LTC 1155 Dual High Side MOSFET Driver	2145	MAX 182 Calibrated 4-Channel 12-Bit ADC	2358
LTC 1232 Microprocessor Supervisory Circuit	2167	MAX 186 Low Power, 8-Ch Serial 12-Bit ADC	2233
LTC 1257 12-Bit Voltage Output DAC	2168	MAX 187 / 189 5V, LP, 12 Bit Serial ADC	2085
LTC 1286 12-Bit ADC, Sampling	2210	MAX 188 x. MAX 186	
LTC 1290 12-Bit Data Acquisition System	2213	MAX 200 5V RS 232 Transceiver / 0,1µF Ex.	2102
LTC 1298 12-Bit ADC, Sampling	2215	MAX 201/202/203/204 5V RS232 Transceivers	2112
LTC 1321 / 1322 RS232/EIA 562/RS485 Transceivers	2142	MAX 202E x. MAX 232E	
LTC 1335 RS232/EIA 562/RS485 Transceivers	2142	MAX 205 5V RS 232 Transceiver / 0,1µF Ex.	2113
LTC 1384 x. MAX 242		MAX 206 5V RS 232 Transceiver / 0,1µF Ex.	2114
LTC 1385 x. MAX3385		MAX 207 5V RS 232 Transceiver / 0,1µF Ex.	2115
LTC 1480 x. MAX3486		MAX 208 5V RS 232 Transceiver / 0,1µF Ex.	2116
LTC 1481 x. MAX 481		MAX 209 5V RS 232 Transceiver / 0,1µF Ex.	2117
LTC 1483 x. MAX 483		MAX 211 5V RS 232 Transceiver / 0,1µF Ex.	2107
LTC 1487 x. MAX487		MAX 212 +3V, True RS232 Transceiver	2108
LTC 1685/1686/1687 x. MAX3088/3087/3086		MAX 213 5V RS 232 Transceiver / 0,1µF Ex.	2107
LTC 7652 x. LTC 1052		MAX 216 Apple Talk Interface Transceiver	2265
LTKA 00/01 Thermocouple-Amplifier	1368	MAX 218 1.8-4.25V, RS232 Dual Transceiver	2104
LTZ 1000 Ultra Precis.Volt.Ref. 7V	724	MAX 220 x. MAX 232	
LTZ 1054	731	MAX 222 5V, RS232 Driver / Receivers	2118
LZ 1083 = LM 317		MAX 223 x. MAX 241	
M 706 50Hz Time Basis	1859	MAX 225 5V, RS232 Driver / Receivers	2100
M 5290 CD Suppl. Contr.	1904	MAX 230 RS-232 Drivers/Receivers	641
M 5293 " " "	1900	MAX 231 RS-232 Drivers/Receivers	691
M 5450 LED-uP-Driver;Relay Driver	1084	MAX 232 5V Dual RS-232 Transmitter Receiv.	2225
M 5451 " " " "	1085	MAX 232E +/-15kV ESD Protect. 5V RS 232	2105
M 8438 Serial Inp. LCD Driv./32Se	1362	MAX 233 RS-232 Drivers/Receivers	640
M 8439 " " " "	1366	MAX 234 RS-232 Drivers/Receivers	693
M 51841 = LM 555		MAX 235 RS-232 Drivers/Receivers	694
M 5278D05 = 7805		MAX 236..240	685
M 54516 = BA 612		MAX 241 5V,Multich.,RS 232, Drivers/Receivers	2107
M 54524/25/23/26 = ULN 2001...2004		MAX 242 x. MAX 222	
M 54641 CD Motor Driv.	1902	MAX 243 x. MAX 232	
MA 1458 = LM 1458		MAX 244 5V, RS232 Driver / Receivers	2101
MAA 501 = LM 709		MAX 245 5V, RS232 Driver / Receivers	2109
MAA 723/41/48 = LM 723/41/48		MAX 246 5V, RS232 Driver / Receivers	2169
MAB 01/MAC 01 = REF 01		MAX 247 5V, RS232 Driver / Receivers	2170
MAB 355/356/357/398 = MACXX=LF 3XX		MAX 248 5V, RS232 Driver / Receivers	2158
MAT 01 2x NPN Transis. 0,2uV/month	956	MAX 249 5V, RS232 Driver / Receivers	2171
MAT 02 " " Low Noise	954	MAX 250/251 RS232 Drivers/Receivers	716
MAT 03 2x PNP " "	955	MAX 260/261/262 uP Prog. C Filter	1306
MAT 04 4x NPN " "		MAX 263/264 Prog. Uni. Filters	1312
MAX 038 Functionsgen. 0,1-20MHz	1728	MAX 265/266 Resistor/Prog.Filter	1307

TÊN IC	HÌNH	TÊN IC	HÌNH
MAX 267/268 Bandpass Filters	1312	MAX 494 x. MAX 475 Rail-to-Rail OPA	
MAX 280 Precis. 5.Order LP Filter	717	MAX 495 x. MAX 473 Rail-to-Rail OPA	
MAX 301/303/305 High-Speed Analog Switches	2272	MAX 500 8-Bit CMOS D/A Converter	695
MAX 306-309 x. DG 406-409		MAX 504 5V, Serial 10-Bit DACs	2081
MAX 310/311 RF/Video Multiplexer	1072	MAX 515 x. MAX 504	
MAX 312-314 10ohm Quad Analog Switches	2355	MAX 531 5V, Serial 12-Bit DAC	2165
MAX 317-319 x. DG 417-419		MAX 532 Dual,Serial Input, 12-Bit DAC	2252
MAX 320-322 Precision SPST Analog Switches	2285	MAX 538 / 539 5V, Serial 12-Bit DAC	2074
MAX 323-325 Precision SPST Analog Switches	2280	MAX 543/SMD DIP8 12-Bit A/D	696
MAX 331/32 = DG 201/02		MAX 551 /552 3/5V 12 Bit, Serial, Multipl. DAC	2121
MAX 333 Quad SPDT CMOS Anal.Swit.	611	MAX 600/602 110V/220VAC to 5VDC Full Wav	637
MAX 334 # DG 202		MAX 601 " " Half Wave	638
MAX 336 /337 x. DG 506/507		MAX 610/612 = MAX 600/602	
MAX 338-339 8-/Dual 4-Channel Analog Multiplexers	2345/2348	MAX 611 110V-220V -> 5VDC Half Wave	638
MAX 341/348 Analog Switch 100V	433	MAX 625 4x High Side Power Switch	1687
MAX 343 Analogswitch 100V	434	MAX 626 /627/628 Dual Power MOSFET Driv.	2124
MAX 345 Analogswitch 100V	435	MAX 630 CMOS Switching Regulator	671
MAX 348 = MAX 341		MAX 631/632/633 Fixed/Adj. S. Regulator	670
MAX 349-350 8-/Dual 4-Channel Multiplexers	2337	MAX 634 CMOS Inverting S. Regulator	672
MAX 351-353 x. DG 411-413		MAX 635 -5V/Adj. Switching Regulator	673
MAX 358 " x. HI1-508		MAX 636 -12V/Adj. Switching Regulator	673
MAX 359 " x. HI1-509		MAX 637 -15V/Adj. Switching Regulator	673
MAX 361-362 x. DG441-442		MAX 638 5V Fixed/Adj. Regulator	674
MAX 364-365 x. DG 444-445		MAX 639 / 640/ 653 5/3.3V DC-DC CONVT	2096
MAX 366-367 Signal-Line Circuit Protectors	686	MAX 641 5/12/15V " "	675
MAX 381-385 Precision Analog Switches	2288	MAX 642/643 = MAX 641	
MAX 391-393 Quad SPST Analog Switches	2347	MAX 644/645/647	676
MAX 398-399 8-/Dual 4-Channel Analog Switch	2279/2276	MAX 646 x. MAX 644 / FET	678
MAX 400 = OP 07		MAX 649 / 651/652 5V DC-DC CONTROLLER	2172
MAX 406 /407 1,2µA max, Single OPA	2122	MAX 654/655/657/659	677
MAX 408 Fast OPA	1	MAX 656/658	679
MAX 409 1,2µA max,	2112a	MAX 660 Charge-Pump Voltage Converter	2090
MAX 410 28 MHz Prec. OPA	1731	MAX 662 12V/30mA Flash Memory	2083
MAX 414 " " Quad OPA	6	MAX 663 = ICL 7663	1303
MAX 417 1,2µA max , Single OPA	2122	MAX 664 = ICL 7664	1304
MAX 418/419 1,2µA max , Quad OPA	2129	MAX 666 = MAX 664 /Battery Detect	714
MAX 420/421/422/423	476	MAX 667 5V, Progr. Low Dropout Voltage Reg.	2084
MAX 428 Fast OPA	7	MAX 670/671 10V Precis.Volt. Ref.	733
MAX 430/432 +/-15V Chopper OPA	1281	MAX 672/673 5V/10V " "	734
MAX 448 4X Fast OPA	6	MAX 680 Volt. Conv. 5V to +/-10V	715
MAX 450/451 10MHz Videoamplifier	705	MAX 687 / 688 / 689 Low Drop Regulator	2166
MAX 452 50MHzVideoampl./Multiplexer	706	MAX 690/692/694 uP Supervisory IC	1300
MAX 453 2 Channel 50MHzVideoampl./Multiple	707	MAX 691/693/695 " " "	1300
MAX 454 4 Channel 50MHz/Videoampl./Multiple	668	MAX 696/697 " " "	1295
MAX 455 8 Channel 50MHzVideoampl./Multiple	708	MAX 698/699 Power-on Reset/Watchdog Controllers	
MAX 457 2x CMOS 70MHz Videoamplifier	669	MAX 704 x. MAX 690	
MAX 460 High Accuracy Fast Buffer	1265	MAX 705-708 uP Supervisory Circuits	2344
MAX 471 Prec.High-Side Current Sense Ampl	2089	MAX 709 Power Supply Monitor / Reset	2322
MAX 472 " "	2097	MAX 712/713 NiCd/NiMH Charg.Contr	1688
MAX 473 Single, 10MHz, 3V Singel Supl. OPA	2091	MAX 714 Batt.Supply System	1689
MAX 474 Dual, 10MHz, 3V Singel Supl. OPA	2091	MAX 724 5A DC-DC Regulator 1690-	1692
MAX 475 Quad, 10MHz, 3V Singel Supl. OPA	6	MAX 726/727/728/729 2A DC-DC Regl	1292
MAX 477 300MHz OPA	2369	MAX 732 /733 Step-up PWM Reg. 12V 200mA	2123
MAX 478/479 x. LT 1078/1079		MAX 734 Flash Memory Programming Supply	2230
MAX 480 x. OP 90		MAX 735/755 -5V/Adjustable PWM Regulators	2281
MAX 481/483/485/487 RS485/422 Transceiver	2095	MAX 786 Power Supply Controller	2267
MAX 488/490 RS485/422 Transceivers	2103	MAX 791 uP Supervisory Circuit	2234
MAX 489/491 RS485/422 Transceivers	2099	MAX 798 Controller for CPU Power	2271
MAX 492 x. MAX 474 Rail-to-Rail OPA		MAX 800 X. MAX 691	

TÊN IC	HINH	TÊN IC	HINH
MAX 802 / 805 X. MAX 690		MAX 7231/32/33/34 Tripl. LCD Decod	1310
MAX 802 /804/805/806 x. MAX 690		MAX 7624 x.AD 7524	
MAX 809/810 3-Pin uP Reset Circuits	2235	MAX 8211/B212 x. ICL 8211/B212	
MAX 811/812 uP Voltage Monitors / Reset	2238	MAX 8863/64 Low-Drop Linear Regulators	2282
MAX 813L uP Supervisory Circuits	2344	MAX 8867/8868 Low-Drop Linear Regulators	2277
MAX 828/829 Switched Cap. Voltage Inverters	2302	MAX 8873/8874 Regl. T:3.15,S:2.84,R:2.8V	2319
MAX 830...833 5V/3.3V/3V/Adj. DC-DC Regl.	2236	MAX 8877/8878 Low-Dropout Regulator 2.5-5V	2303
MAX 850-853 Negative Charge-Pump Power Su	2275	MB 3759 = TL 494	
MAX 860/1 x. ICL 7660		MB 3763 2x Direc. Motor Driver	1907
MAX 870/871 Switched Cap. Voltage Inverters	2278	MC 8T26 x.N8T26	
MAX 882/883/884 5V/3.3V/Adj. Linear Regl.	2231	MC 8T26A Quad Bus Transceiver	835
MAX 894/895 Dual High-Side P-Ch. Switches	2228	MC 8T28 Noninverting Bus Transc	1655
MAX 912/913 Ultra-Fast TTL Comparators	2315	MC 8T28P " " "	836
MAX 931...934 Comparator & 2% Reference	2229	MC 8T95/6/7/8 Hex 3State/Invert	1657
MAX 951...954 OPA & Comparator & Ref.	2224	MC 8T97 Quad Bus Transceiver	842
MAX 1044 x. LTC 1144		MC 8T98 " " "	844
MAX 1232 Microprocessor Monitor	2232	MC 1310P = LM 1310	
MAX 1406 +/-15kV ESD-Protected 230kbps RS232	2289	MC 1330 Video Detector	1630
MAX 1480 Isolated RS-485/RS-422	2239	MC 1350 IF Amplifier	1630
MAX 1488/1489 x. MC 1488/1489		MC 1357 IF Ampl. & Quadr.Detect	1627
MAX 1680/81 Switched-Capacitor Voltage Conve	2331	MC 1373 TV Video Modulator	1651
MAX 1719-21 Switched-Capacitor Voltage Invert	2326	MC 1377 PAL/NTSC Encoder	1664
MAX 2003 x. BQ 2003		MC 1378 Color TV Video Overl.Syn	899
MAX 2611 DC-to-Microwave 1100MHz Amplifier	2306	MC 1382 Multisync Monitor TTL	1639
MAX 2620 10MHz to 1050MHz RF Oscillator	2308	MC 1383 Multimode Monitor Proces	1638
MAX 3080-3089 10Mbps RS485/422 Transceiver	2304	MC 1400 = LT 1019	
MAX 3095/3096 x. DS26LS32		MC 1403 Low Volt. Ref. 2.5V	594
MAX 3100 SPI/Microwire-Comp. UART in QSOP	2297	MC 1404U10/5 x. REF-01/02	598a
MAX 3185 +/-15kV ESD-Protected 230kbps RS2	2296	MC 1406 D/A Converter	703
MAX 3186 x. SN75186		MC 1408 8-Bit Multiplying D/A 27	591
MAX 3221 +/-15kV ESD-Prot. RS232 Transc.	2237	MC 1411/12/13/ = ULN 2001/2/3/4	
MAX 3222/3232/3237/3241 1MbpsRS232 Transc	2314/2316	MC 1414 Dual Diff. Volt. Comp.	591a
MAX 3385 +/-ESD Protected RS232 Transceiver	2305	MC 1437 x. MC 1537	
MAX 3483/85/86 10Mbps RS485/422 Transceive	2300	MC 1439 34V/us OPA	37 /1614
MAX 3488/90 10Mbps RS485/422 Transceivers	2323	MC 1445 x.CA 555	
MAX 3491 10Mbps RS485/422 Transceivers	2321	MC 1454 1 Watt OPA	1662
MAX 4193 = MAX 630		MC 1455 = LM 555	
MAX 4391 = MAX 634		MC 1456	1
MAX 4420 6A Single MOSFET Driver	2269	MC 1458S/1558S 10V/ us x.LM1458	
MAX 4426-4428 1.5A MOSFET Driver	2310	MC 1466 Voltage/Current Regl.	1622
MAX 4429 x. MAX 4420	2270	MC 1468 +/- 15V Regulator	658
MAX 4450-4451 210MHz SS Rail-to-Rail OPA	2339/2342	MC 1472 NAND Driver,2X,positiv	586
MAX 4501/4502 SPST,CMOS Analog Switches	2292/2301	MC 1488 = SN 75188	64
MAX 4508-4509 Single 8-to-1/Dual 4-to-1 Multipl	2340	MC 1489	65
MAX 4529 Bidirectional RF/Video Switch	2336	MC 1490 Wideband OPA/AGC	1615
MAX 4541 - 4544 Dual SPST/SPDT Analog Switc	2373/2377	MC 1495 Four-Quadrant Multiplier	1661
MAX 4545-4547 300MHz Bidi. RF/Video Switch	2371	MC 1496	874
MAX 4565-4567 350MHz Bidirect. RF/Video Swi	2371	MC 1500 = MC 1400	
MAX 4581/82/83 x. 4051/52/53 Logic CMOS		MC 1503/1403 2.5V Ref	594
MAX 4610 x. 4066 Logic CMOS		MC 1504/1505/U5/U6/U10 = MC 1404	
MAX 4613 Quad,SPST Analog Switch	2268	MC 1508 8-Bit Multiplying D/A 27	591
MAX 4614-4616 Quad SPST Analog Switches	2295	MC 1514 x. 1414	
MAX 4657/4658/4659 x. DG 417/418/419		MC 1536/1436 = HV(30V),Int.comp.	1
MAX 5352 / 5353 12-Bit Voltage Output DAC	2222	MC 1537/1437 Dual 709 OPA	571
MAX 6006 x. LT 1004		MC 1539 34V/us OPA x.MC 1439	
MAX 6190-6195 1.25/2.04/2.5/3/4.5/5V Voltage R	2325	MC 1545	199
MAX 6198 4.096V Voltage References	2325	MC 155 = LM 1558	
MAX 7129 x. ICL 7129		MC 1554 1 Watt OPA	1662
MAX 7219/7221 Serially Interfaced 8 LED Drivers	2240	MC 1555 = LM 555	

TÊN IC	HÌNH	TÊN IC	HÌNH
MC 1556	1	MC 3524/3424/3324	123
MC 1558 = MC 1458		MC 3525/3425	124
MC 1568 = MC 1468		MC 3550/52 Quadruple Line Recei.	1559
MC 1590 Wideband OPA/AGC	1616	MC 3553/3453 Quad. Line Driver	1563
MC 1594 x.1494		MC 3556 x. ICM 7556	
MC 1596/1496 Balanced Modul./Dem	579	MC 4558 2MHz to 2.5MHz	7
MC 1709/10/11/23/33=LM709/10..33		MC 4741 Quad 741 OPA	6
MC 1741/47/48 = LM 741/47/48		MC 5556 = LM 556	
MC 1776 Programmable OP	570	MC 6875 Clock Generator/2 Phase	1667
MC 26S10 x. AM 26S10		MC 6880 x.NBT26	
MC 2830 IC D/K VOI TIENG NOI	337	MC 6885/6/7/8 x.MC8T95/6/7/8	
MC 2831 FM Transm.l.cordless Tel	559	MC 6899 x.MC 8T28	
MC 2833 FM Transmitter	558	MC 78 XX = 78XX	
MC 3301 = LM 3900		MC 78LXX	34
MC 3302 x.CA 3290		MC 78MXX	32
MC 3303/3403/3503 1xSupply/3-36V	6	MC 78TXX 3A pos. fixed VR	30
MC 3325 Automotive Voltage Regl.	1645	MC 79 XX	31/478 /593
MC 3334 High Energy Ignition IC	1665	MC 79LXX	35
MC 3335 Dual Conversion FM Recei	1625	MC 10318 8-Bit A/D	562
MC 3340P electronic Attenuator	598	MC 10319 * * Flash Conv.	561
MC 3346 = CA 3046		MC 10320 Triple 4Bit Video DAC	1643
MC 3356 Wideband FSK Receiver	925	MC 10321 7-Bit A/D *	560
MC 3357 FM IF	826	MC 10322 8-Bit Video DAC/TTLinput	572
MC 3358/3458/3558 Dual OPA	7	MC 13010 TV Parallel Sound IF&AFT	578
MC 3359 Narrowband FM IF	681	MC 13055 Wideband FSK Receiver	1629
MC 3361 FM IF	1621	MC 13060 Miniwatt Audio Outp. 889	1627
MC 3362 Dual Conversion FM Recei	940	MC 14051/052/053/066 x. Logic CMOS 4XXX	
MC 3363 * * *	941	MC 14411/145411 BAUD RATE GEN.	468
MC 3367 Single Convers.FM Recei	942	MC 14433 3,5 Digit A/D	1422
MC 3373 IR-RECEIVER/PREAMPL.	338/592	MC 14442 8Bit A/D & parall.Interf	1432
MC 3386 = CA 3086		MC 14443/47 A/D	1430
MC 3397 Transient Protektor	● 1653	MC 14467 / 14468 Ionization Smoke Detector	2204
MC 3399 Automotive Driver Switch	1666	MC 14469 Asynchr. Receiv./Transm.	1420
MC 3401 = LM 3900		MC 14471	736a
MC 3403 = MC 3303		MC 14497 PCM Remote Transm. 592	1421
MC 3405 Dual OPA/Dual Volt.Compa	1623	MC 14573/4/5 Quad Progr. OPA/Comp	1442
MC 3417 Delta Modulator/Demodul.	926	MC 14576/77 Dual Video Amplifiers	1441
MC 3420	661	MC 14578 Micro-Power Comparator	550
MC 3423/3523 Overvolt.Sensing IC	122	MC 33001 JFET OP	1
MC 3424/25 = MC 3524/3525		MC 33002 * *	7
MC 3430/31/32/33 4X Comparator	584	MC 33004 * *	6
MC 3437 Hex Bus Receiver	589	MC 33030 DC Servo Motor Contr.	814
MC 3440/3441 4X Bus Transceivers	575	MC 33033 Brushless DC Motor Contr	566
MC 3446 * * *	574	MC 33034 * *	567
MC 3447 Octal Bidir.Bus Transc.	838	MC 33035 * *	568
MC 3448 Quad Bus Transc. IEEE488	841	MC 33039 Closed-Loop Brushless M.	565
MC 3450/3452 4X Line Receivers	585	MC 33060/34060/35060 Prec. PWM	1632
MC 3453 Quad Line Driver	770	MC 33063 xem MC 35063	
MC 3456 x. ICM 7556		MC 33064 Undervolt. Sensing IC	900
MC 3467 Triple Preamplifier	1663	MC 33065 Current Mode Controller	825
MC 3469 Floppy Disk Write Contr.	339	MC 33066 x. 34066	*
MC 3470 Floppy Disk Read Ampl.	573	MC 33071/2/4 OPA Single Supply	38724
MC 3471 Floppy Disk Write Contr.	1326	MC 33072 x. CA 3240AE	
MC 3479 Stepper Motor Driver IC	815	MC 33074 x. CA 3410AE	
MC 3486 4X EIA-422/23 LineReceiv	588	MC 33077/78 Low Noise OPA	7
MC 3487 * * *	587	MC 33079 Low Noise OPA	6
MC 3488 Dual EIA-423/232 Driver	1624	MC 33129/34129 Current Mode Contr	1628
MC 3503 = MC 3303		MC 33151/34151 Dual MOSFET Driver	1626
MC 3505/17/20/23=MC3405/17/20/23		MC 33152/153 Dual MOSFET Drivers	1633

TEN IC	HINH	TEN IC	HINH
MC 33160 = MC 34160	.	MC 145011 x. MC 145010	
MC 33163 Power Switching Regulat.	1640	MC 145026 Encoder	341
MC 33164 Micropower Undervolt.Sen	1635	MC 145027 Decoder	341
MC 33166 Power Switching Regl.	1644	MC 145028/29 "	341
MC 33171/2/4 Single Supply OPA	38724	MC 145030	645
MC 33178/9 OPA High Outp Current	7/6	MC 145031 Encoder	1424
MC 33181/2/4 JFET OPA	1. /7	MC 145032 Decoder	1426
MC 33272/282 10V/us OPA	7	MC 145033 Encoder/Decoder	1425
MC 33274/284 10V/us OPA	6	MC 145034/35 "	1427
MC 34001/2/4= MC 35001/2/4		MC 145040/41 8Bit A/D serial Interf	1429
MC 34017/1/2/3 Tel.Sound1/2/.5KHz	340	MC 145050/51 10-Bit A/D ser. Interf	1437
MC 34050 DUAL EIA422/423 Transcei	945	MC 145053 10-Bit A/D ser. Interf.	1438
MC 34051 " "	946	MC 145106 PLL Freq. Synthesizer	1443
MC 34060 xem MC 35060		MC 145145 4Bit PLLFreq.Synthesizer	1440
MC 34061 Prog. Overvolt. Contr.	662	MC 145146-2 4Bit PLL Freq. Synth.	1446
MC 34062 " "	663	MC 145149 Dual PLL Freq. Synth.	1449
MC 34063/34064 x. MC 35063/33064		MC 145151 Parall.-Input Freq.Synth	1448
MC 34065/6 x.MC 33065/6		MC 145152 PLL Freq. Synthesizer	1451
MC 34066 Resonant Mode Controller	1631	MC 145155 " " "	1454
MC 34071 x. CA 3140AE		MC 145156 " " "	1458
MC 34072 x. CA 3240AE		MC 145157 " " "	1460
MC 34074 x. CA 3410AE		MC 145158 " " "	1462
MC 34080/81 = TL 081		MC 145159 " " "	1464
MC 34082/35082 = TL 082		MC 145160/66/67 PLL/46/49MHz	467 /1469
MC 34083/84/85 = TL 083/84/85		MC 145168/69 " " Telefon	1471
MC 34114 Tel Speech Network	909a	MC 145170 PLL Freq. Synthesizer	1465
MC 34115 Delta Modulator/Demodul.	944	MC 145406 x. MAX 1406	
MC 34118 Voice Switch.Speak.Phone	680	MC 145421	870
MC 34119 400mW Audio Amplifier	485	MC 145425	871
MC 34129 Single-Ended Control. 1A	553a	MC 145502	872
MC 34151 = ICL 7667		MC 145557	873
MC 34152/3 x.MC 33152/3		MCCF 3334 x. MC 3334	
MC 34160 uP Voltage Regulator	569	MDA 2010 = TDA 2010	
MC 34163/4/6 x.MC 33163/4/6		MDA 4050 = TDA 4050	
MC 34181/2/4 JFET OPA 1/	7/6	MF 5 Switcheed Capacitor Filter	2022
MC 35001/34001/33001 JFET OPA	1	MF 10 = LTC 1060	
MC 35002/34002/33002 JFET 2 OPA	7	MH 7106 = ICL 7106	
MC 35004/34004/33004 JFET 4 OPA	6	MIC 426-428 x. MAX 426-428	
MC 35060/34060 PWM IC	580	MIC4420/26/27/28/29 x. MAX 4420/26/27/28/29	
MC 35061 Prog. Overvolt. Contr.	664	MK 50250	66
MC 35062 " " "	663	ML 237 6 Chann.Touch Contr.Interf	1869
MC 35063/34063/33063 DC/DC Conv.	582	ML 920 Remote Control Receiver	1870
MC 35071/2/4 OPA Single Supply 1/	7/6	ML 922	1871
MC 35080/81 = TL 081/81		ML 923 " "	1872
MC 35082/35083 x. TL 082		ML 924 " "	1873
MC 35084/5 x.MC34084/5SMDpin8,9nc		ML 926/27 " "	7356
MC 35171/2/4 Single Supply OPA 1/	7/6	ML 928/9 Remote Ctrl. Receiver	1874
MC 35181/2/4 JFET OPA 1/	7/6	ML 8204 Ton IC	1742
MC 44602 Current Mode Controller	1641	ML 8205 " "	1743
MC 44802 PLL Tuning/1,3GHz Prescl	1647	MLM 311/211/111 = LM 311	8
MC 7S107/75108 Dual Line Drvers	577	MLM 324/224/124 = LM 324	
MC 7S125 x.SN 75125		MLM 339/239/139 =LM 339	
MC 75127/128/129 x.SN75127/8/9		MLM 358=LM 358	
MC 75S110 " " "	576	MLM XXX = LM XXX	
MC 141620 Enhanced Comb Filter	1472	MLT 04 4-Channel/Quadrant Analog Multiplier	2064
MC 143403	6	MM 5314	67
MC 144110 Hex D/A	1434	MM 5450	2006
MC 144111 Quad D/A serial Input	1436	MM 5837	68
MC 145010 Photoel. Smoke Detector	735a	MM 53C200/201	643

TÊN IC	HÌNH	TÊN IC	HÌNH
MM 58174 Real Time Clock/ uP	1121	MXT 429 x. MX 4420	2270
MM 58274 Real Time Clock/ uP	1118	N 5556/58/95/96 = MC 1456/58/95/96	
MM 74C922 Keyboard/Switch Encoder	999B	N 5709/23/41/47/4B=MC 1709/23/41..	
MM 74C945/946/947	639	N 8T26 Quad. Bus Transceiver	165/1561
MP 574A x. AD 574A		N 8T28/95/96 x. MC8T28/95/96	
MP 5010 H = LM 385		N 8T37 x.MC 3437	
MP 5531/5532 = MC 1404		N 9602 2X retrigg. Multivibrator	802
MP 7574 x. MX 7574		NCS 766 x. MAX 4501	
MP 7628 8 Bit 4x DAC	1062	NE 521/522 Speed Dual Comparator	69
MPQ 6001 4x Compl.2 Trans.0,3A;400 MHz	542	NE 527/529 Voltage Comparator	70
MPQ 6501 4x Compl.2 Trans.;350MHz	551a	NE 530 OPA	1
MPQ 6700 4x Compl.2 Trans.;400MHz	561a	NE 531	489
MSA-0611 x. MAX 2611		NE 532	7
MT 8870 DTMF-Receiver	1928	NE 538 OPA	1
MT 8880 DTMF-Transceiver	1928	NE 542 = LM 387	
MTA 1200 Intelligent Batt. Managm.	1734	NE 544 Servo IC	72
MUX 08 8-Channel Analogmultiplexer	973	NE 555/556 = LM 555/556	
MUX 16 16- " "	976	NE 558 4X NE555 (us - gio)	499
MUX 24 4- * Differential *	978	NE 564/565 Ton Decoder	342
MUX 28 8- " "	979	NE 566 Functionsgen.FM-Modulator	343
MV 500 Remote Transmitter	1875	NE 567 = LM 567 Ton Decoder	
MV 601 Remote Receiver	1876	NE 568 150MHz PLL	1939a
MX 536A x. AD 536A		NE 570/571 Compressor/Expander	157
MX 565/566 x. AD 565/566		NE 572	158
MX 574A x. AD 574A		NE 575	159
MX 580/581/584 x. AD 580/581/584		NE 587/589 BCD-Dec.;7Dig.com.Anod	813
MX 636 x. AD 636		NE 592 Video Amplifier	74
MX 674A x. AD 674B		NE 594 Fluorescence Displ. Driver	344
MX 7224 CMOS 8-Bit DAC/Output Amplifier	2227	NE 602 RF-Oscill. + 2X Mixer	503
MX 7225/7226/7228 x. AD 7225/26/28		NE 604/614 FM IF System	154
MX 7245/7248 12-Bit Voltage-Output DACs	2359/2362	NE 605 FM IF System	155
MX 7501-7503 x. AD 7501-7503		NE 612 VHF Mixer / Oscillator+A2012	150
MX 7506/7507 CMOS Analog Multiplexers	2365	NE 614 2X FM Ampl.	855
MX 7520/21/23/24/28/30 x. AD 7520...7530		NE 644 Servo Driver	75
MX 7533/7534 x. AD 7533/7534		NE 645/646	148
MX 7535 uP Compatible 14-Bit DACs	2364	NE 5044/45 Prog.7-Chan.-RC-Encoder	345
MX 7536 uP Compatible 14-Bit DACs	2363	NE 5050 ASK/FSK-Modem;300kBit/s	857
MX 7637 Dual 12 Bit Multiplying D/A Converter	2361	NE 5080 FSK-Modem-Transm.>MBaud	858
MX 7538 uP Compatible 14-Bit DACs	2367	NE 5081 FSK-Modem-Receiver >M Baud	859
MX 7541-7545 x. AD 7541-7545		NE 5090 8X Relay Driver	852
MX 7547 Dual 12 Bit Multiplying DACs	2360	NE 5170 8Bit Bus Driver RS232C/423	860
MX 7548 uP Comp. 12-Bit DAC	2352	NE 5181 8Bit Bus Driver 10MBit/s	864
MX 7572 x. AD 7572		NE 5205 RF-WB-Amplifier	497
MX 7574 x. AD 7574		NE 5212 fiber Receiver	
MX 7575/7576 uP Comp. 5us/10us 8-Bit ADCs	2363	NE 5212 Transimpedanz-Ampl.f Glas-	498
MX 7578 Calibrated 12-Bit ADC	2341	NE 5230 Low Voltage OPA	482
MX 7581 x. AD 7581		NE 5240 Dolby digital audio decoder	156
MX 7582 Calibrated 4-Channel 12-Bit ADC	2356	NE 5501 = ULN 2001	
MX 7628 x. AD 7628		NE 5514 Quad OPA	76
MX 7672 3bus Conversion Time12-Bit ADC	2356	NE 5517N Dual OPA	62
MX 7820 x. AD 7820		NE 5532 DUAL LOW NOISE OPA	7
MX 7821 660ns uP Comp. 8-Bit ADC	2266	NE 5533 " " "	78
MX 7824 x. AD 7824		NE 5534 = OP 37 Low Noise OPA	3
MX 7828 x. AD 7828		NE 5535 Dual OPA	7
MX 7837 Dual 12-Bit Multiplying DACs	2360	NE 5537 Sample&Hold;6pA Leakage C.	856
MX 7845 x. AD 7845		NE 5539 HF OPA	80
MX 7847 Dual 12-Bit Multiplying DACs	2351	NE 5560 bao ve qua ap,qua dong	1078
MXL 1001/1013 x. LT 1001/1013		NE 5561 han che dong dien	1079
MXL 1016 x. LT 1016		NE 5570 Brushless DC motor controller	853

TEN-IC	HINH	TEN-IC	HINH
NE 5592 2X Video W/R Amplifier	500	OP 295 Dual Rail-to-Rail OPA	7
NE 5900 Telefon-Tondecoder	502	OP 297 Dual Low Bias Current Precision OPA	x.OP 290
NJM 062/064/072/082=TL062/064/072/082	2	OP 400 Quad Low Offset,Low Power OPA	2071
NJM 386 LF Amplifier 500mW	1779	OP 413 Low Noise,Low Drift,Single Supply OPA	2071
NJM 387 Low Noise Dual Amplifier	1780	OP 420 Quad Micropower OPA	2071/
NJM 555 Timer	1781	OP 421 Quad Precision OPA	6
NJM 2068 = LM 1458		OP 467 Quad Precision 170V/us 200ns OPA	2071/
NJM 2902/03/04 = LM 324/393/358		OP 470 Quad Very Low Noise OPA	2071
NJM 4556/58	7	OP 471 High Speed Low Noise Quad OPA	2071
NJM 5532	7	OP 482 Low Power High Speed JFET DualOPA	6/2257
OM 931/961	493	OP 490 Quad Low Power OPA	2071
OP 01 OPA 18V/us,x. LT 1023	1	OP 491 Single Supply Rail-to-Rail In/Output OPA	6
OP 02 Compensated OPA	1	OP 492 Quad Single Supply OPA	6
OP 03 Dual-Matched OPA	78	OP 495 Quad Rail-to-Rail OPA	2071
OP 04 x LT 1013		OP 497 Picoampere Input Current Quad OPA	2071
OP 05	630	OPA 27/37 = HA 5127/37	
OP 06 High Gain (1kV/V) OPA	2	OPA 27HT -55C to 200C OPA	1517
OP 07 Super Low Offset OP	1286	OPA 37HT -55C to 200C OPA	1517
OP 08 Precis. Low Input Curr. OPA	2	OPA 111 Low Noise OPA	1
OP 09 X. RC 4136		OPA 121 Precision OPA	2205
OP 10/11/12 = LT 1002/1014/1012		OPA 128 Electrometer-Grade OPA	1
OP 14 x. LM 1458		OPA 132 FET Input, 8 MHz 20V/us	1517
OP 15/16 x. LT 1055/1056		OPA 336 x. EL2171 Single Supply OPA	
OP 17 x. LF 157		OPA 343 x. EL 2171 * 5,5MHz 6V/us	
OP 18 Externally Compensated OPA	2	OPA 347 x. EL2171 0.35MHz 0.17 V/us	
OP 19 1,2V/us Compensated OPA	1	OPA 353 x. EL 2171 44MHz 22V/us	
OP 20 Micropower Precis. OPA OP07		OPA 404 Quad High Speed Precision OPA	6
OP 21 High Speed OPA x.OP07		OPA 445 +/- 45V FET-Input OPA	1
OP 22A/E.. = HA 2720/25		OPA 627 Precision High Speed OPA	1
OP 27 Precision Low Noise OPA	217/OP77	OPA 637 x. OPA 627	
OP 37 PRECIS./FAST OPA (17V/uS)	228/OP77	OPA 703 x.EL 2171 1MHz 0.6V/us OPA	
OP 41 x. CA 3193		OPA2111 = HA 5102	
OP 42 50V/us Precision OPA	1/2255	OPA2237 1x Supply FET Inp.1.4MHz 0.5V/us	7b
OP 47 = HA 5147		OPA2244 1x Supply 0.43MHz 0.1V/us OPA	7b
OP 77 Ultralow Offset Voltage OPA	1286/2261	OPA2337 1x Supply 3MHz 1,2V/us OPA	7b
OP 90 Micropower Low Voltage OPA	1/2260	OPA2340 1x Supply 5.5MHz 6V/us OPA	7b
OP 97 Low Power Precision OPA	2256	OPA2350 1x Supply 38MHz 22V/us OPA	7b
OP 113 Low Noise,Low Drift,Single Supply OPA	1	OPA3680 3X OPA 300MHz 1800V/us	2211
OP 176 Bipolar/JFET, Audio OPA	1	PBD 3545/3548 2A Ohm/Inductiv Driv	1136
OP 177 x. OP07 Ultraprecision OPA		PBL 3717 Step Motor Driver	2143
OP 183 5MHz Single Supply OPA	1	PBL 3770 bipolar Step Motor Contr	1376
OP 200 Dual Low Offset,Low Power OPA	x.OP 290	PBL 3771 Precis. Step Motor Contr.	1373
OP 207 = LT 1002		PBM 3960 D/A Converter	1373
OP 213 Low Noise,Low Drift,Single Supply OPA	7	PC16550 x. MX3100	
OP 215 x. CA 3240AE		PCD 3311/2 MFV/Melodie Gen./IC-Bus	505
OP 220 x. OP 249 Dual Micropower OPA		PCF 2100P LCD-Driver;40 Seg.	837
OP 221 x. OP 249 Dual Low Power OPA		PCF 2110 LCD-Driver;60 Seg.+ 2 LED	843
OP 227/237 x. LT 1024		PCF 2111 LCD-Driver;64 Seg.	845/847
OP 249 Dual Precision JFET High Speed OPA	7/2264	PCF 8574 Remote 8-bit I/O expander/I2C-bus	2397
OP 270 Dual Very Low Noise Precision OPA	x.OP 290	PCF 8576 LCD-Driver;160 Seg.	848
OP 271 x. OP 290 High Speed Dual OPA		PCF 8577 LCD-Driver;32/64 Seg.	851
OP 275 Dual Bipolar/JFET Audio OPA	7	PCF 8584 I2C-bus Controller	2398
OP 279 Rail-to-Rail Multimedia OPA	7	PCM 54 D/A-Converter	1937
OP 282 Low Power High Speed JFET DualOPA	7	PCM 56 "	1938
OP 283 5MHz Single Supply OPA	7	PGA 100 Programmable Gain Amplif.	1289
OP 285 Dual 9 MHz Precision OPA	7	P15A101 x. MAX4615	
OP 290 Precision , Micropower Dual OPA	2094	PM 108/308 = LM 108/308	
OP 291 Single Supply Rail-to-Rail In/Output OPA	7	PM 139 x.CA 139	
OP 292 Dual Single Supply OPA		PM 155/355 = LF 155/355	

TÊN IC	HÌNH	TÊN IC	HÌNH
PM 156/356 x. LF 156/356		RPT 86/87	972
PM 741/747 x. LM 741/747		RS 232	487/1488
PM 0820 = ADC 0820		RS 485	1479
PM 1008 = LM 308		RV 3301 = MC 3301	
PM 1558 = LT 1013M		RV 4136 x. RC 4136	
PM 2108 x. LH 2108		RV 4193 x. MAX 4193	
PM 4136 x. RC 4136		RV 4391 x. MAX 4391	
PM 7533 = AD 7533		RV 4558 x. MC 4558	
PM 7574 x. MX 7574		S 5556/58/96 = MC 1556/58/96	
PS XXX x. MAX XXX		S 5709/23/41 = MC 1709/23/41	
PS4066 x. 4XXX logic CMOS		S 81250 = 7805	
PWM 125 = SG 3525		SA 555/556 = LM 555/556	
PXO 600/1000 2x prog. Quarzoscoll.	998B	SA 571 = NE 571	
RC 555 = LM 555		SA 602 = NE 602	
RC 709 = MC 1709		SA 604/614 = NE 604	
RC 714CH = OP 07C		SA 605 = NE 605	
RC 723/741/747 = LM 723/741/747		SA 723/747 x. LM 723/747	
RC 1437 = MC 1437		SA 5230	482
RC 1458 = LM 1458		SA 5534 = NE 5534	
RC 1488/1489 = MC 1488/1489		SA 9106 Power Meter	1929
RC 1556 = MC 1456CG		SAA 1000 15V/Ultrasound Transmitt.	653
RC 1558 = MC 1558		SAA 1027 Stepper Motor Controller	692
RC 2207/2211 = XR 2207/2211		SAA 1042 Stepper Motor Driver	581
RC 3302 = MC 3302		SAA 1043 Synchr.imp.-Gen.Videosign	507
RC 3403 = MC 3403		SAA 1044 FHT-Freq.coup.PALSECNTSC	508
RC 4136 81	1060	SAA 1099	147
RC 4151 = XR 4151 10kHz		SAA 1500 State of Charge f. NiCd	1737
RC 4152 x. XR 4151 100kHz		SAA 3004 remote-transm.7x64 Comm	509
RC 4153	346	SAA 3006 x. SAA3010	
RC 4156	6	SAA 3006/10 rem-transm.32x64Comm	510
RC 4193 Micropower Switching Regul	1335	SAA 3007 Remote Transm. 20x64 Comm	846
RC 4195 +/- 15V Voltage Regulator	1934	SAA 3007/3008 x. SAA 3004	
RC 4391 MAX4391		SAA 3010 IR Remote Control Transmitter RC5	2106
RC 4558/4559 = RC 1458		SAA 7010 CD Demodulator	1906
RC 4739 = LM 739		SAA 7210 CD Decoder,IxIS-Bus	1908
RC 4741 = HA 4741		SAA 7220 CD Stereo Digi Filter Ixl	1905
RC 5532/34 = HA 5102/01		SAA 7310 CD Data Decoder	1909
RC 75107/108/110 = MC75107/108/110		SAB 0600/0601/0602	86
REF 01 Voltage Ref. 10V	960	SAB 3210 D/K PHAT IR	347
REF 02CN8 Volt. Ref. 5V	516	SAD 1024 Anal.MOS Schifreg. 2x512	480
REF 03 " 2,5V	968	SAE 0700 Signalton Generator	348
REF 05 " 5V	969	SAE 0800 Gong (3,2,1 Ton)	1784
REF 08 " -10V	970	SAJ 141	87
REF 25 Voltage Ref. 2,5V 1%,2%		SAJ 220S	651
REF 43 " 2,5V	971	SAJ 270E	652
REF 50 " 5V 1%,2%		SAJ 310 CMOS IC CHO DONG HO	349
REF191-195/198 x. MAX 6191-6195/6198		SAK 215 "	360
RM 709 = MC 1709		SB 3032 x. MAX 798	
RM 714 x. OP 07		SB 3050/3052 A2262+A2246x. MAX 786	
RM 723/33/41/47/48=MC1723/33/.48		SC 41342/43/44 x. MC145026/27/28	
RM 1537 = MC 1537		SCL 5604E	1269
RM 1558 = LT 1013M		SD 5000 Quad FET Switch	884
RM 2207 = XR 2207		SD2 CMOS PHOTO/SMOKE DET. IC	170
RM 4136 x.RC 4136		SDA 2208-2 DIEU KHIEN TU XA VOI IR	351
RM 4151 = XR 4151		SE 521/22 H. Speed 2x Comparator	69
RM 4193 x. RC 4193		SE 527/29 Voltage Comparator	70
RM 4558 = MC 4558		SE 530/538	1
RM 5532 = HA 5102		SE 555/556/592 = LM 555/556/592	
RPT 82/83/85 PCM-Line Repeater	952	SE 566/567 = LM 566/567	

TEN IC	HINH	TEN IC	HINH
SE 5532 = HA 5102		SL 446A ZERO VOLTAGE SWITCH	258
SE 5534 = NE 5534		SL 486 IR Receiver	1877
SE 5537 = LF 398		SL 490 DIEU KHIEN TU XA/IR/PHAT	352
SFC 2046	18	SL 541B HIGH SLEW RATE OP	234
SFC 2101 Precise OPA	2	SL 560C_300MHZ LOW NOISE AMPL.	221
SFC 2301/09 = LM 301/309 "	2	SL 561B TIEN KHUECH DAI	218
SFC 2315	96	SL 1430	1264
SFC 2458 = LM 1458"		SL 1431/2	1874a
SFC 2723/2741 = LM 723/741		SL 3045/046/127 x. CA3045/046/127	
SFC 2761/2861 = TAA 761/861		SL 3145 1.6GHz x. CA 3046	
SFC 27XX = LM 7XX		SL 3227 3GHZ NPN TRANS. ARRAYS	237
SG 117 = LM 117		SL 6270	1789
SG 140K-XX = LM 140K-XX		SL 6310	1741
SG 150K/250K x.LM 150K/250K		SLB 0587 Dimmer IC for Halogen Lamps	2141
SG 308/208/108 = LM 308...		SM 2120 Dyn.Range Processor 2x VCA	715a
SG 309/209/109 = LM 309...		SM 2122 " " "	717a
SG 311/211/111 = LM 311...		SM 5807 Digital Filter	1913
SG 317/217/117 = LM 317...		SM 5840	1911
SG 318/218/118 = LM 318...		SMP 10/11 Sample and Hold	980
SG 323/223/123 = LM 323...		SMP 81 " "	981
SG 324/224/124 = LM 324...		SN 28654 N Servo Driver	85
SG 337/237/137 = LM 337...		SN 29776P = SAK 215	
SG 338 x. LM 338		SN 52101AL/104L = LM 101AH/101H	
SG 350K = LM 350K		SN 52108/109 = LM 108/109	
SG 3XX/2XX/1XX = LM 3XX/2XX/1XX...		SN 55107/108 x.MC 75107/108	
SG XXX = LM XXX		SN 55109/110 x.MC 75110	
SG 1458/68 = MC 1458/68		SN 55121/122 x.SN 75121/122	
SG 1495/96 x.MC1495/96		SN 55451...454 x. SN75451...	
SG 1501J/T x.MC 1568L/58G		SN 55461/62/63/64 Dual Peripheral Driver+A23	768/2263
SG 1503 x. SG 1503		SN 55474	769
SG 1524/2524 X. SG 3524		SN 55ALS056/57 Trapezoidal W.Inter	1564
SG 1525/2525 x. SG 3525		SN 55ALS126 Quadruple Line Drivers	1565
SG 1526 xem SG 3526		SN 55ALS130 Quadruple Line Drivers	1578
SG 1536/1436 = MC 1536/1436		SN 55ALS192 Quadruple Line Drivers	1584
SG 1556/1456 = MC 1556/1456		SN 55ALS194 " " "	1585
SG 1568 x. MC 1568		SN 55ALS195 " " "	1580
SG 1595/96 x. MC 1595/96		SN 55XXX x. SN 75XXX	
SG 2501/3501 x.MC1468		SN 65076 Diff. Bus Transceivers	1586
SG 2524/5/6/7 x. SG 3524/5/6/7		SN 65176 Diff. Bus Transceivers	1581
SG 3045/49/83 x. CA 3045/49/83		SN 65ALS180 Diff. Driver/Receiver	1591
SG 3183 x. CA 3183		SN 65C188	64
SG 3503 = MC 1403		SN 65C198 Quadr. Line Driver	1567
SG 3524/2524/1524=XR 3524		SN 72555 = LM 555	
SG 3525/2525/1525A Regulating PWM	281	SN 72558 = LM 1458	
SG 3526/2526/1526 PWM Control IC	583	SN 75061 Driver/Receiver/Squelch	1574
SG 3527/2527/1527	281	SN 75076 Diff. Bus Transceivers	1586
SG 78XX=LM 78XX		SN 75107/108 = MC 75107/108	
SG 79XX x.LM79XX		SN 75109/110/112 x. SN75110	
SG+A2218 1527/2527 x. SG 3527+A2411		SN 75111 Quadruple Line Driver/Com. Enable	787
SH 0002 = LH 0002		SN 75113 Line Driver	788
SH 323/123 = LM 323		SN 75114 Line-Driver	771
SHC 298 = LF 298		SN 75115 " Receiver	772
SHC 5320 = LH 0053		SN 75116 " Transceiver	773
SHM-IC-1/1M = HA 2425/20		SN 75117 Line-Transceiver	737
SI 786 x. MAX786		SN 75118 " " /Output 3-State	738
SI 7652/7660 x ICL 7652/7660		SN 75119 " " " "	739
SI 7661	139	SN 75121 Line-Driver	740
SL 441C PROP. TEMPERATUR CONTROL	222	SN 75122 x. SN 75124	
SL 443A ZERO VOLTAGE SWITCH	259	SN 75123 x. SN 75121/IBM360	

TÊN IC	HÌNH	TÊN IC	HÌNH
SN 75124 Line-Receiver/IBM360	741	SN 75512 Vacuum Fluorescent Display Drivers	818
SN 75125 " " "	370 /742	SN 75513 Vacuum Fluorescent Display Drivers	819
SN 75126 Quadr. Line Driver	1571	SN 75518 Vacuum Fluorescent Display Drivers	822
SN 75127 Line-Receiver/IBM360-370	743	SN 75551 Electroluminescent Row Drivers	824
SN 75129 Line-Receiver/IBM360-370	744	SN 75552 Electroluminescent Row Drivers	828
SN 75130 Quadr. Line Driver	1571	SN 75553 Electroluminescent Column Drivers	829
SN 75136 Line-Transceiver	745	SN 75554 Electroluminescent Column Drivers	831
SN 75138 Line-Transceiver/OC-Oulp.	746	SN 75647 = ULN 2002	
SN 75140/141 Line-Receiver	747	SN 75ALS053 Quad Futurebus Transceiver	1590
SN 75145 Dual Differential Line Receiver	748	SN 75ALS056 Trapezoidal-Waveform ....	820
SN 75150 Line-Driver/RS232	749	SN 75ALS057 ...Interface Bus Transceivers	823
SN 75151 " " /RS422A	750	SN 75ALS085 LAN Access/Driv./Receiv	1577
SN 75152 Line-Receiver/V24-Mil 188	751	SN 75ALS126 Quadruple Line Drivers	803
SN 75153 Line-Driver/RS422A	752	SN 75ALS130 Quadruple Line Drivers	804
SN 75154 Line-Receiver/V24	753	SN 75ALS160 Octal Interface Bus Transceiver	758/2381
SN 75155 Line Driver and Receiver	754	SN 75ALS161 Octal Interface Bus Transceiver	759/2383
SN 75157 Line Receiver/RS422A-423A	755	SN 75ALS162 Octal Interface Bus Transceiver	774/2382
SN 75158 Line Driver/RS422A	756	SN 75ALS163 Octal Interface Bus Transceiver	775/2385
SN 75159 Dual Differential Line Driver	757	SN 75ALS164 Octal Interface Bus Transceiver	776/2384
SN 75160B Octal General-Purpose Interface...	758 &	SN 75ALS165 " " " "	2387
SN 75161B ...Bus Transceiver / IEEE488	759 &	SN 75ALS165 Octal Interface Bus Transceivers	777
SN 75162 " " " "	774 &	SN 75ALS170 3x Diff. Bus Transceiver	1568
SN 75163 " " " "	775 &	SN 75ALS171 3x Diff. Bus Transceiver	1579
SN 75164 " " " "	776 &	SN 75ALS180 Diff. Driver/Receiver	1591
SN 75172 Line-Driver/RS422A/PN1360	778	SN 75ALS191 Dual Diff.Line Receiver	1566
SN 75173 " Receiver/RS422A/423A	779	SN 75ALS192 Quadruple Differential Line Driver	799
SN 75174 " Driver/RS422A/PN1360	780	SN 75ALS193 Quadruple Differential Line Receiv	800/2388
SN 75175 " Receiver/RS422A/423A	781	SN 75ALS194 Quadruple Differential Line Driver	2368
SN 75176 Diff. Bus Transceivers	1581	SN 75ALS195 Quadruple Differential Line Receiv	2389
SN 75177/78 Diff. Bus Repeaters	1592	SN 75ALS197 Quad. Diff.Line Receiver	1582
SN 75179 Line Transceiver/RS422A	784	SN 75ALS199 Quad. Diff.Line Receiver	1583
SN 75182 Line Receiver	785	SN 75ALSXXX x.SN75XXX	
SN 75183 " Driver	786	SN 75C1154 Quadr. Drivers/Receiver	1588
SN 75185/75C185 x. MAX 3185		SN 75C1167/1168 RS 422 Transceiver	2394
SN 75186 Quadr. Driver/Receiver	1600	SN 75C1406 Triple Drivers/Receiver	1573
SN 75188/75189 = MC 1488/1489		SN 75C185 Multiple Drivers/Receiver	1587
SN 75207 Line Receiver/RS422A/423A	789	SN 75C188/189 x. SN75188/189	64
SN 75372 Dual MOSFET DRIVER	790	SN 75C198 Quadruple Line Drivers	1567
SN 75374 Quadruple MOSFET DRIVER	791	SN 75CXXX x.SN75XXX	
SN 75423/424 x. ULN 2803/04		SN 76115 = LM 1310	
SN 75435 Peripheral Drivers	1602	SN 76131 = LM 739	
SN 75436/37/38 Peripheral Drivers	794	SN 76514N = MC 1496P	
SN 75439 Quadr. Penpheral Drivers	1603	SN 76591P = MC 1391P	
SN 75446 Penpheral Drivers	807	SN 76600 x. MC 1350	
SN 75447 Comp.TTL/CMOS/Peripheral Driver	808	SN 76603 = LM 703	
SN 75448 Peripheral Driver/non latch up	809	SN 95176 Diff. Bus Transceiver	1572
SN 75449 " " " "	810	SN65C1154 Quadr. Drivers/Receiver	1588
SN 75451-454 pos. AND-NAND-OR-NOR	1601	SN65C1406 Triple Drivers/Receiver	1573
SN 75461...464 Peripheral Drivers	812 /	SN751177/78 Dual Diff. Driver /Receiver.	1589
SN 75465...469 DarlingtonTransistor Array	1604	SN751730 Triple Line Driver / Receiver	1593
SN 75466 = MC 1411		SN754410/11 Quad. Half-H-Driver	1595
SN 75467 = MC 1412		SO 41P/42	487
SN 75468 = MC 1413		SP 202E/232A x. MAX202	
SN 75469 x. SN75466		SP 233A x. MAX203	
SN 75471/72/73/74 Peripheral Drivers	832	SP 574B x. MX574A	
SN 75475 = MC 1472		SP 674A/B x. MX674A	
SN 75476..479 Dual Peripheral Drivers	1610	SP 774B x. AD774B	
SN 75478 Peripheral Drivers	833	SP 1674 x. AD 774B	
SN 75501/65501 AC Plasma Display Drivers	817	SP 2500/02/05/10/12/15=HA2500/...	

TEN IC	HINH	TEN IC	HINH
SP 2520/22/25/41/42 = HA 2520/...		TA 75393 = LM 393	
SP 2600/02/05/20/22/25 = HA 2600/...		TA 75458 = LM 1558	
SP 4541 1GHz + 256 High Speed Divider	1879	TA 75458/558 = MC 1458/MC 4558	
SP 4632 1GHz + 64 Prescaler	1880	TA 75902 = LM 324	
SP 4633 1GHz + Non Self Osc.	1881	TA 76494 = TL 494	
SP 4653 1GHz + 256 Prescaler	1882	TA 76524 = SG 3524	
SP 4656 1,2GHz + 128 Prescaler	1883	TA 780XX = MC 78XX	
SP 8680 575 MHz ; 10/11 Divider	2015	TA 78L0XX = MC 78LXX	
SP 8716 520 MHz Div + 40/41	1768	TA 78LXXXP/AP = 78LXX	
SP 8718 " 64/65	1768	TA 790XX = MC 79XX	
SP 8719 " 80/81	1768	TAA 131 KHUECH DAI TAN SO THAP	3/353
SP 8782 1GHz Div + 16/17,32/33	1769	TAA 521/522 = LM 709	
SP 8832 3,5GHz + 2 Divider	713	TAA 550 Temp. Comp. Z-Diode	
SPT 574 x. AD 574		TAA 761/762 IN NPN/OUT Open Collector	178
SPT 674 x. MX674A		TAA 765 IN NPN/OUT Open Collector	20
SPT 774 x. MAX174		TAA 780 1,1V Volt.Ref.	642
SSM 2013 Voltage Controlled Amplifier	820a	TAA 861/862/865	20
SSM 2014 Operational Voltage Controller	705a	TAA 2761/2762/65 IN NPN/OUT Open Collector	88
SSM 2015 Microphone Preamplifier	840	TAA 4761/62/65 4x OP IN NPN/OUT Open Colle	89
SSM 2016 Differential Audio Amplifier+A2499	836a	TAB 1043 Quad Programmable OPA	236
SSM 2024 4x Current Controlled Amp	828	TAB 1453=TAE 1453	90
SSM 2044 Volt.Contr.Filter/Oscill.	929	TAB 4453	6
SSM 2045 Music Voicing System	930	TAE 1041 Battery Low Level Indicator	1735
SSM 2047 Music Voicing System	931	TAE 1100/1101 Battery Low Level Indicator	1736
SSM 2100 Log/Antilog Amplifier	932	TAE 1453A IN PNP/OUT Open Collector	20
SSM 2110 True RMS-to-DC Converter	827	TAE 1453G	180
SSM 2300 8-Channel Multiplexed S/H	957	TAE 2453 IN PNP/OUT OC	7
SSS 140BA-87 = MC 1408L8		TAE 4453 IN PNP/OUT OC	6
SSS 150BA-8Z = MC 1508L8		TAE 4463 Quad PNP OPA/2-36V	6
SSS 201/301 x. LM 201/301		TAF 1453A # TAA 765A	20
SSS 741 = MC 1741		TAF 1453G	180
SSS 1558 = MC 1558		TAF 2453 IN PNP/OUT OC	7
ST 662A x. MAX662		TAF 4453 IN PNP/OUT OC	6
STC 28XX = 78XX		TAF 4463 x. TAE 4463	
STK 020/011/015/016/035/024/031	491	TBA 22 A/E = LM 741	
STK 035/075/080	491	TBA 120 FM-demodulator	488
STK 050	492	TBA 221B/222B = LM 741	
SW 01 Quad SPST Analogswitch	983	TBA 231 = LM 739	
SW 02 4x normally closed Analogswitch	983	TBA 271 = TAA 550	
SW 06F 2x normally open Analogswitch	987	TBA 281 = LM 723	
SW 06G " closed "	987	TBA 324 = LM 324	
SW 201 4x normally closed Analogswitch	984	TBA 331 = CA 3046	
SW 202G " open "	985	TBA 800 AUDIO AMPL. 5W	21
SW 7510 4x normally open Analogswitch	986	TBA 810 AUDIO AMPL. 7W	22
SW 7511 4x normally closed Analogswitch	986	TBA 820 AUDIO AMPL. 2W	23
TA 7179 x. MC 1468		TBA 915	490
TA 7205 LF Amplifier 9..18V/6W/4		TBB 146 PLL Frequency-synthesizer	354
TA 7336 = LM 386		TBB 324/0747/0748=LM 324/747/748	
TA 7502/04 = MC 1709/MC 1741		TBB 1331A	93
TA 7505 = LM 301		TBB 1458 = MC 1458	
TA 7555 = MC 1455		TBB 2331B = TBE 4335A	88
TA 78MXX = MC 78MXX		TBB 4331 = TBE 4335A	89
TA 8521 Batterie Charger IC	1925	TBC 2332B IN DARL/OUT OC	88
TA 8523 Batterie Charger IC	720	TBC 4332A IN DARL/OUT OC	89
TA 8532 Batterie Charger IC	1634	TBE 2335B IN DARL/OUT OC	88
TA 75060/62/61/64 = TL 060/.../064		TBE 4335A IN DARL/OUT OC	89
TA 75070/71/72/74 = TL 070/.../074		TC 04/05 Voltage Ref. 1,25V/2,5V	1739
TA 75339/58/93 = LM 339/58/93		TC 172/173 BiMOS PWM Controller	1761
TA 75358 = LM 358		TC 385-1,2 = LM 385-1,2	

TÊN IC	HÌNH	TÊN IC	HÌNH
TC 426/427/428 MOSFET Driver 1,5A	1762	TCM 850-853 x. MAX 850-853	
TC 429 " " 6A	1763	TD 310 Triple IGBT / MOS Driver	2226
TC 620 Temperatur Sensor	1778	TD 10324 = LM 324	
TC 621 " "	1758	TD 300 15V Triple IGBT / MOS Driver	2153
TC 626 " "	1782	TD 310	2143a
TC 675 NiCd/Ni-H Battery Charger	1759	TD 62001/2/3 = MC 1411/12/13	
TC 676 NiCd/Ni-H Battery Charger	1760	TD 62081/82/83/84 = ULN 2801/2/3/4	
TC 915 Auto Zero OPA	1740	TD 62477 = MC 1472	
TC 918 CMOS OPA	1282	TD 62479 x. MC 1374	
TC 962 x. ICL 7662		TDA 0159 Proximity Sensor	360
TC 1014/1015/1070/1071 x. MAX8873/4		TDA 0161/162 " "	113
TC 1188/1189 x. MAX8863/4		TDA 0200 Voltage Regulator 2.85...36V, 2A	121
TC 1219/1220 x. MAX1719/20/21		TDA 0470 Orgelgatler	129
TC 1426/27/28 1,2A MOSFET Driver	1762	TDA 1010A LF Amplifier 2W	361
TC 3704 Dual CMOS Voltage Comparator	1791	TDA 1011 2 to 6 W audio pre- / amplifier	362
TC 4401 6A Open Drain MOSFET Driver	1765	TDA 1013B 4W Audio Amplifier&DC Vol. Contr	2111
TC 4423 = ICL 7667		TDA 1015 0.5W audio pre- / amplifier	363
TC 4426-28 x. MAX4426-28		TDA 1020 12W Audio Amplifier	2088
TC 4437/38/39 Power Logic CMOSQuad Driver	1766/1767	TDA 1023 TRIAC Controller	271
TC 4457/58/59 Power Logic CMOSQuad Driver	1766/1767	TDA 1024 10W Stereo Amplifier /Car Radio	364
TC 4467/68/69 Power Logic CMOSQuad Driver	1766/1767	TDA 1029 Signal-Sources Switch	1923
TC 4487/88/89 Power Logic CMOSQuad Driver	1766/1767	TDA 1034 High Speed OPA	193
TC 4Sxx x. Logic 1 gate chuông 3.10		TDA 1037 OPA LF 4...28V/8W	365/490
TC 7016R x. ICL 7106R		TDA 1041	115
TC 71XX x. ICL 71XX		TDA 1085C PHASE CONTROL IC	168
TC 7650 x. ICL 7650		TDA 1154 DP	115
TC 7652/60/62 = ICL 7650/60/62		TDA 1170 TV-Vertical Deflection Sy	1081
TC 7660 x. ICL 7660		TDA 1180 TV-Horizontal-Processor	1082
TC 7662 x. ICL 7662		TDA 1185A Triac Phase Contr. 169	564
TC 9400/01/02 V/F-F/V Converter 100kHz	1773	TDA 1405/12/15 = 78M05/12/15 32	36
TCA 105 CÔNG TÁC NGUỒNG	187	TDA 1510	366
TCA 205/305 Proximity Switch	1683	TDA 1512	367
TCA 311A/312/315A	96	TDA 1514A 50W hi-fi Amplifier	2246
TCA 321/322/325	96	TDA 1515A 2x12W stereo car radio amplifier	368
TCA 331A/335A	93	TDA 1516Q 2x11W stereo car radio amplifier	369
TCA 332 OPA IN DARL/OUT OC	179	TDA 1518Q 2x11W stereo car radio amplifier	370
TCA 345 CÔNG TÁC NGUỒNG	188	TDA 1519A 2x 11W Stereo Car Radio Ampl.	2247
TCA 365	97	TDA 1521 / Q 2x 12W hi-fi Audio Amplifier	2251
TCA 372 Dual Power OPA 1A x.L 272		TDA 1530 Stereo Power Amplifier	
TCA 520	484	TDA 1543 CD Dual 16 Bit Stereo D/A	1912
TCA 671=CA 3086		TDA 1553	1846
TCA 785 IC CAT PHA	274	TDA 1560Q 40W Car Radio Amplifier	2248
TCA 871 = CA 3086		TDA 1670 Vertical Deflection IC	1083
TCA 940	490	TDA 1770A Vertical Deflection IC	1086
TCA 965 CUA SO DIEN AP	183	TDA 1905 5W-Audio-Amplifier	1087
TCA 971/871/671	18	TDA 2002 AUDIO AMPL.8W/2 OHM 490	626
TCA 1365 OPA CÔNG SUẤT 3,5A	355	TDA 2003 # TDA 2002 10W	490
TCA 1560B IC D/K DONG CO BUOC	356	TDA 2004 2x AF Input 28V 3.5A 2x6.5W	144
TCA 1561B IC D/K DONG CO BUOC	357	TDA 2005 x.TDA 2004;20W/M:Bridge A	
TCA 2365 Power OPA	358	TDA 2006 12W	277
TCA 2465 OPA CÔNG SUẤT +/-3V-20V	358	TDA 2020	490
TCA 3089 = CA 3089		TDA 2030 18W H663	278/490
TCA 4511	359	TDA 2040 20W Hi-Fi Audio Amplifier	2164
TCA 5600 uP Power Supply Control	597	TDA 2050 32W Hi-Fi Audio Amplifier	2164
TCF 5600 x. TCA 5600		TDA 2086 PHASE CONTROL IC	216
TCF 6000 Peripheral Clamping Array	1652	TDA 2088 PHASE CONTROL IC	227
TCM 320AC36 Voice-Band Audio uP	1940	TDA 2320 Mini Stereo Amplifier	1776
TCM 680 x.MAX680		TDA 2593 TV Syn./Deflection Contr.	1089
TCM 828/829 x. MAX828		TDA 2747/48 = LM 747/48	

TEN IC	HINH	TEN IC	HINH
TDA 2822 = L 272		TDE 1767 x.TDE 17B7	
TDA 3190 TV Sound System	596	TDE 17B7 Power Compar./Relais Driv	374
TDA 3301/03 TV Color Processor	595	TDE 1798 * * *	849
TDA 3330 * * PAL/NTSC	556	TDE 3247 Power Comparator	885
TDA 3810 Spacial,Stereo & Pseudo Sound Circ	2249	TDE 4060/61 IR/PREAMPL. 4,5..6,5V	376
TDA 4050B TIEN KHUECH DAI/IR/9...1	294	TDF 1607/1647 x, TDE 1647	
TDA 4605 Control Circuit for Switch Mode Power	2162	TDF 1778 Dual Power Interface	377
TDA 7000 FM Radio (mono) 2,7..10V	1884	TDF 1798 x, TDE 1798	
TDA 7010 FM-Mono-Receiver	719	TEA 1007 Phase Control IC	378
TDA 7050T	371	TEA 1024 Zero Voltage Switch	1213
TDA 7052 LF Amplifier 1,2W	767	TEA 1041T Battery/Accu State Displ	1935
TDA 7053 2x 1W Stereo Amplifier	2250	TEA 1100 Battery Monitor NiCd/NiMH Charg.	2212
TDA 7241 Bridge Amplifier 20W	1775	TEA 1124 Zero Voltage Switch	1213
TDA 7275 Motor Speed Regulator	1777	TEA 1510	110
TDA 7294 100V / 100W DMOS Audio Amplifier	2120	TEA 1511	111
TDA 7302 Stereo Audio Processor	1088	TEA 2017 Hor./Vert. Defl. Monitor	1096
TDA 7910 OPA CONG SUAT _18V/10,5A	372	TEA 2025	114
TDA 8133 5,1V & 8,5V Regulator	1367	TEA 2029 Color TV Defl. Processor	1102
TDA 8134 5V & 12V Regulator	1364	TEA 2162 IC NGUON DIEN DC	379
TDA 8135 5V/Adjust. Volt. Regl.	203	TEA 2260 Swit Mode Power Suppl Pri	1103
TDA 8136 2X 12V Regulator/pin5:nc	1364	TEA 3717/18 IC DIEU KHIEN DONG CO	109
TDA 8137 2X 5,1V * /Disable/Reset	1367	TEA 5110 5V DUAL REGULATOR	201
TDA 8138 5,1V +12V Regulator/Disable/Reset+,	200	TEA 5115 5-Channels Video-Switch	1105
TDA 8139 5,1V/Adj. Regl./Disable	1417	TEA 5116 *	1106
TDA 8153 RGB Video Output Ampl.	1090	TEA 5170 Swit Mode Power Suppl Sec	1101
TDA 8176 TV Vertical Deflection IC	1092	TEA 5500 Coder/Decoder	506
TDA 8190 TV Sound Channel/DC-Contr	1093	TEA 7034 ON AP/LOW-DROP	380
TDA 8196 Audio Switch/DC-Vol.Contr	1094	TEA 7105 ON AP/RESET	291
TDB 0062/64 = TL 062/64		TEA 7605/10/85 5V/10V/8,5V Regl.	30
TDB 0071/72/74 = TL 071/72/74		TEA 76XX = 78MXX	
TDB 0081/82/84 = TL 081/82/84		TEB /TEC/TEF/TFL 4033	6
TDB 0117/23/24 = LM 317/23/24		TEB 1033 = TEC 1033/TEF 1033	7
TDB 0146	98	TFA 1001W FOTODIODE VOI KHUECH DAI	381
TDB 0155/56/57/58=LF 355/56/57/58		TL 010 Adj.-Ratio Current Mirrors	1333
TDB 0200 = L 200 19/38	121	TL 011/012/014/021 NPN Current Mirrors	153
TDB 0555/56 = LM 555/56		TL 022 Dual Low Power OPA	269
TDB 0723/47/48= LM 723/47/48		TL 026 Diff.High Frequency Amplifier / AGC	164
TDB 1146 = L 146 # LM723 ON AP 2-7		TL 030 Disk-Memory Read Amplifier	1334
TDB 16XX = 78MXX	32	TL 044 Quad Low Power OPA	1325
TDB 2022	116	TL 060/61/62/64 JFET LOW POWER OP	261
TDB 2331/2332/2335	88	TL 066 ADJ. LOW POWER JFET OPA	268
TDB 29XX = 79XX		TL 068 Voltage Follower, 36V , 1MHz	161
TDB 3403 = MC 3403	6	TL 070/71/72/74 JFET LOW POWER OP	262
TDB 4558 = MC 4558		TL 075 JFET Low Noise Quad OPA	262
TDB 78XX/T	30/31	TL 080/81/82/83/84/85 JFET OPA	263
TDB 7910	202	TL 087/088 LOW OFFSET JFET OPA	264
TDC 0117 = LM 317		TL 136C = LM324	
TDC 0155/156/157	1	TL 170/172 CONG TAC HIEU UNG HALL	382
TDC 0555/0723 = NE 555/723		TL 182 BiMOS-Switch,100 ,350ns	1090
TDC 2022 = TDB 2022		TL 185 BiMOS-Switch,150 ,350ns	1112
TDC 29XX = 79XX		TL 188 BiMOS-Switch,150 ,350ns	1104
TDC 4558	7	TL 191 BiMOS-Switch,300 ,350ns	1107
TDE 0155/156/157	1	TL 271 CMOS OPA	659
TDE 0160 IC cam bien den gan	1095	TL 287/288 LOW OFFSET JFET OPA	266
TDE 1607 POWER COMPARATOR	373	TL 291/292/294 HIGH FREQ. OPA	267
TDE 1647 POWER COMPARATOR	373/883	TL 317LP/M/C 0,1A/1,2V-37V	213
TDE 1667 POWER COMPARATOR/MEMORY	374	TL 321 Low Bias(45nA)	265
TDE 1737 * /Relais Onv. 375	882	TL 322 Dual Low Power OPA	7b
TDE 1747 POWER COMPARATOR	373	TL 331 DIFFERENTIAL COMPARATOR	289

TÊN IC	HÌNH	TÊN IC	HÌNH
TL 431 Prog. Precise Ref.	383	TLC 261/262/264 CMOS OPA	282
TL 493/494 Switching Regulator	384	TLC 271/251 PROG. LP CMOS OPA	276
TL 495 x.TL 595		TLC 272/252 LINCMOS DUAL OPA	279
TL 496 9V Power Supply Controll.	1337	TLC 274/254 LINCMOS QUAD OPA	280
TL 497 Switching Voltage Regulat.	1336	TLC 27L2/L4 x.TLC 272/272	
TL 500/501 Analog Processor	1339	TLC 27M2/M4 x.TLC 272/274	
TL 502/503 Digital Processor	1340	TLC 339 Micropower LinCMOS Comparators	285
TL 505 A/D Converter	1342	TLC 354 Quadruple Differential Comparators	1371
TL 506 2X DIFF.COMP./STROBES	287	TLC 372 DUAL CMOS DIFF. COMPARATOR+A	285
TL 507 CP A/D Converter	385	TLC 374 QUAD CMOS DIFF. COMPARATOR	286
TL 510 Diff. Comparator/Strobe	1327	TLC 393 Micropower LinMOS Comparators	285
TL 514 2X TL510	1322	TLC 532/533 x. TL 532	
TL 520/21/22 A/D-8-Channel/Multip	1324	TLC 540/541 8-Bit A/D serial Con	1347
TL 530/531 8-Bit A/D Digital I/O	1345	TLC 549 8-Bit A/D Serial Control	1343
TL 532/533 " "	1346	TLC 551/552 x.TLC 555/556	
TL 592 Differential Video Amplifier	2286	TLC 555/551 # LM555 CMOS TIMER	
TL 593/594 PWM Control Circuits	1331	TLC 556/552 # LM556 2X CMOS TIMER	
TL 595 PWM Control	1329	TLC 0820 = ADC0820	
TL 601 Analog Switch,200 ,400ns	1108	TLC 20 = MF 10	
TL 604 Analog Switch,200 ,400ns	1109	TLC 2252 Very Low Power Dual OPA	7
TL 607 Analog Switch,200 ,400ns	1110	TLC 2262 Rail to Rail Dual OPA	7
TL 610 Analog Switch,100 ,400ns	1111	TLC 2272 " " "	7
TL 710 Differential Comparator	1328	TLC 2543 12 Bit A/D-11 Analog Inp.	1950
TL 712 Differential Comparator	1057a	TLC 2652 = ICL 7652	
TL 721 Differential Comparator	1059a	TLC 2932 High Performance PLL	1946
TL 780 Positiv Voltage Regl.1% 30	387	TLC 320AD57C Sigma Delta StereoA/D	1947
TL 783 1,25V to 125V adj. Regul.	1338	TLC 3702/04 Micropower LinCMOS Comparato	285
TL 808 = ADC0809		TLC 5510 8-Bit High Speed A/D Conv	1948
TL 810 Diff. Comparator	1330	TLC 5620 Quad 8-Bit D/A Converter	1952
TL 811 2XChann. Comparator/Strobe	1332	TLC 5628 Octal 8-Bit D/A Converter	1951
TL 820 Dual Comparators	1323	TLC 7135 x. ICL7135	
TL 1451 Dual PWM Control IC	1945	TLC 7705 Micropower Volt.Surveis.	1953
TL 1525/27	281	TLE 2425 Precision Virtual Ground	1954
TL 16C450 Asynchr. Communicat. El.	1576	TLE 3101 Phase Control IC	484
TL 16C451/452 " "	1570	TLE 3102 " "	465
TL 16C550 Asynchr. Communicat. El	1594	TLE 3103 / 3104	466 / 467
TL 2218-285 Current Mode SCSI Term	1944	TLE 4201 IC DIEU KHIEN DONG CO	474
TL 2525/27	281	TLE 4202 " " "	438
TL 3030 CONG TAC HIEU UNG HALL	388	TLE 4205 Motor Driver 1A/6-32V	1291
TL 3471 = LM 741		TLE 4211 Double Low Side Switch 1A	1589a
TL 3525/27	281	TLE 4214 " " " 0,5A	1613
TL 3695 Diff. Bus Transceiver	1569	TLE 4220/24 Low Side Switch 4A	1325a
TL 3741 = LM 741		TLE 4801/02/03 CONG TAC HALL	389
TL 4810 Vacuum Flourescent Dis.Dri	805	TLE 4820 Diff.-Gear Tooth Sensor	1866
TL 5001C PWM Control IC	1939	TLE 4951 IC KIEM SOAT DONG DIEN	390
TL 5632 8 Bit 3 Channel D/A Conv.	1941	TLV 1543 3.3V 10 Bit A/D Convert.	1958
TL 5812 Vacuum Flourescent Dis.Dri	806	TLV 2217-33 3.3V Fixed Volt. Ref.	1959
TL 75LPXXQ/Y Low Dropout Volt.Reg	1942	TLV 2252/62 Rail-TO-Rail Dual OPA	7
TL 7700 Supply Voltage Supervisors	1365	TLV 320AC36 3V Voice-Band Audio up	
TL 7702/05/09/12/15A Volt. Visors	198	TLV 320AC37 " " " "	
TL 7726 Hex Clamping Circuits	1949	TMP-01 Progr. Temp. Sensor/Contr	811
TL 7757 Supply Voltage Supervisor Reset IC	2133	TMS 57014A Dual Audio D/A Convert.	1955
TL 7770-XX Over-Voltage Protect.		TP 1321/22/26 = HA 5195/2520/2600	
TL 04 = MF4	1100	TP 1332/1339 = HA 2645/2620	
TL 10 / 20 x. MF 10		TP 1341/2/4 = HA 2540/39/5160	
TL 139 x. TLC 339		TP 1345/46 = HA 5162/80	
TL 251/52/54 x.TLC 271/72/74		TP 4856/66 = HA 2420-25/5320	
TL 25L2/L4 x.TLC 272/274		TPIC 04 Intell. 4x Switch	1607
TL 25M2/M4 x.TLC 272/274		TPIC 06 " " MOSFET Latch	1606

TEN IC	HINH	TEN IC	HINH
TPIC 1301 3-Half H-Bridge DMOS Arr.	1956	U 427/428 Driver f. IR-Diodes	1211
TPIC 2322 3X Comm. Source DMOS ARR.	1960	U 429P/430 Driver f. IR-Diode	701
TPIC 2404 Power 4X Low Side Switch	1943	U 448 Amplif. f. Piezo Microfon	1890
TPIC 2801 Octal Intell.Power Swit.	1605	U 477/478 Car Lamp Contr	1764
TPIC 28D2 8X Power Switch Ser. Inv	1961	U 479 x. U 4790 " " "	
TPIC 3322 3X Comm Drain DMOS Array	1962	U 482	462
TPIC 5322 3X Logic Level DMOS Arr.	1963	U 490 One-Shot Power Control	1205
TPIC 5404 Quad Power DMOS Array	1964	U 624BS	473
TPIC 5424 H-Bridge DMOS Array	1965	U 626BS = U 624BS	
TPIC 5621 3-Phase Bridge DMOS Arr	1966	U 634BS/636BS = U624BS	
TPIC 6273 Power Driver	2226	U 640 DIEU KHIEN THOI GIAN	396
TPIC 6595 Power 8-Bit Shift Regist	1967	U 642B MACH D/K QUAT NUOC XE HOI	397
TPIC 6A595 8-Bit Shift Register	1968	U 643 Car Blinker	1886
TPIC 6B595 8-Bit Shift Register	1970	U 656 Frequency Div.+256/1,56GHz	1711
TPIC0298 Dual Full-H Driver	1611	U 664B,BS = U 624BS	
TPS 6734/35/55 x. MAX 734/735/755		U 665 Div.+960/1024,30...1000MHz	1712
TPS 7101 1.2V to 9.75V Voltg.Regul.	1957	U 670B/671B/672 CONG TAC/MUC NUOC	398
TPS 7133/48 3.3/4.85V Volt. Regul.	1957	U 682 Div.+64/256,30...1000MHz	1701
TPS 7150 5V Voltage Regulator	1957	U 690B D/K KHOANG CACH THOI GIAN	399
TS 271/72/74 x. TLC 271/72/74		U 810/11/12 CHIA 64/128/256	400
TS 27L2/4 x. TLC 272/274		U 821 " " "	1671
TS 27M2/4 x. TLC 272/274		U 833 = U 813 /ECL Output	1927
TS 372	290	U 846 Hall Switch	1618
TS 374 x.TLC 374		U 847 1,3GHz Divider	
TS 555 / 556 CMOS TIMER single / dual	10 / 11	U 865BS = U 665B	
TSC '426 x. ICL 7667		U 880B Double Flasher	1210
TSC 900 Low Power,Precis. OPA	830a	U 891 1.1 GHz Divider,5V	1709
TSC 912 Dual CMOS OPA	7	U 893 CHIA 64/128/256	401
TSC 1426 x. MAX 626		U 1096B MACH D/K 30 DIEM LED	1738
TSC 4420/4426/4427-29 x.MAX4420/26/27-29		U 1634	394
TSC 71XX = ICL 71XX		U 1637	395
TSC 7211 x. ICM 7211		U 2000B COMPUTERFLASH IC	460
TSC 7650/52/60/62=ICL7650/52/60/62		U 2008 Phase Control/Current Feedb	1199
TSL 213 64x1 Integr. Opto Sensor	1957a	U 2010 Phase Control/Current Feedb	1200
TSL 230 Prog. Light to Frequency	1969	U 2043 Car Alarm and blinker	1702
TSL 235 Light to Frequency Convert	1971	U 2066/67 Stereo Contr. Display	1675
TSL 250/51/52 Light/Volt. Sensor	1971	U 2068B " "	437
TSL 260/61/62 IR Light/Volt.Sensor	1971	U 2100 Triac's & Relay's Timer	1197
TTB 78XXT	30	U 2228 Car Transistor Ignition	1887
TTB 78XXT 0-3	37	U 2342 PLL Stereodecoder	1706
U 106BS Zero Voltage Switch	105	U 2343 " " "	1707
U 111 Triac Control/Feedback	1203	U 2350 PWM Speed Control/for per-	1196
U 175/176 Impulsgenerator	1703	U 2351 manent excited DC Motors	1194
U 208B Triac Control/Retrigger	1201	U 2391 Operational Timer Counter	1202
U 209 Phase Control	1884	U 2400 Autom.Recharging/NiCd Batt.	1190
U 210B IC CAT PHA/Load Curr.Feedb	1206	U 2401 Battery Charger/NiCd Batt.	1191
U 211 Phase Control/Feedback	1207	U 2472 Car Blinker	1677
U 212 " " /SCR & Triac	1208	U 2501 IR Preamplifier 7..14V	1684
U 217 Zero-Volt. Swi./Temperatur	1188	U 2502 IR Receiver/Amplifier	1694
U 221 Timer/Dimmer/Touch Sensor	1209	U 2507B THU IR/TIEN KHUECH DAI	402
U 237/247/257/267B	392	U 2509B " " "	403
U 243 Car Blinker	1699	U 2602 Safety Switch-off in Irons	1192
U 244B/254B/237B/257B DIEU KHIEN	393	U 2604 Safety Switch-off in Irons	1193
U 263 Zero Volt. Swit./Temperatur	1189	U 2605/06/07/08 " " "	1198
U 327 Transmitter	1673	U 2634B/2637B=U 1634B/1637B	
U 329 IR Remote Control	1674	U 2800 Triac Contr.f.Room Thermos.	1195
U 338 TV & VTR Remote Contr.Recv.	1697	U 303B Receiver = U 338	
U 412 LF Amplif.	1678	U 3042 D/A Converter	
U 420 " "	1679	U 3082M/U 3084M DRIVER IC	404

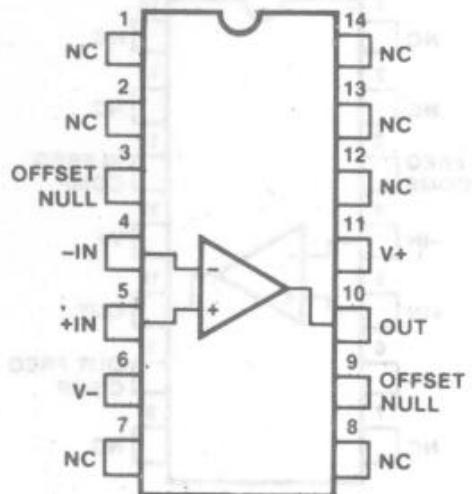
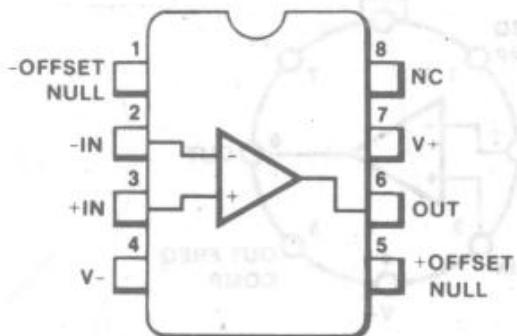
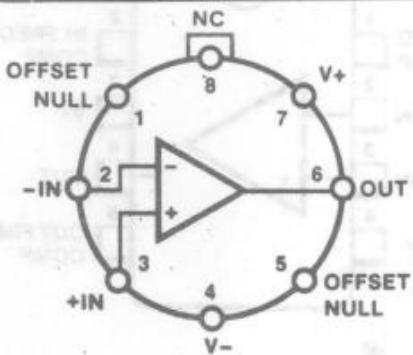
TÊN IC	HINH	TÊN IC	HINH
U 3634B/3637B = U 1634B/1637B		UC 2730 x. UC 1730	
U 4076B IC PHAT TIN HIEU	405	UC 2840 x. UC 1840	
U 4790/4791 Car Lamp Controller	1704	UC 2842/3/4/5 x. UC 1842	
U 6037 Light Timer 1...20s	1840	UC 2843	555a
U 6039B D/K THOI GIAN	406	UC 2844/45 Current Mode Controller	1642
U 6040 D/K THOI GIAN/XE HOI	407	UC 2960 = UC 1730	
U 6043	1885	UC 3176 Bridge Amplifier	655
U 6046/6047 LONGTIME TIMER 3s..20h	408	UC 3525/2525 = SG 3525/2525	
U 6048/6049 LONGTIME TIMER 6...16V	409	UC 3526/2526 = SG 3526/2526	
U 6050B MULTIPLEXCONTROL 8 CH./TRA	410	UC 3527/2527 = SG 3527/2527	
U 6052B MULTIPLEXCONTROL 8 CH./REC	411	UC 3611 = UC 1611	
U 6055	1841	UC 3634	647
U 6056	1842	UC 3637	648
U 6060 1GHz Divider ,30...1000MHz	1680	UC 3705	654
U 6080/81/82 PWM Dimmer	1889	UC 3717 Step Motor Driver	649
U 6083 PWM Controller 18...100%	895	UC 3722 5 Channels on/off Circuit	656
U 6316 PLL	1888	UC 3730 x. UC 1730	
U 6502 5 GHz Frequency Divider	1710	UC 3840 x. UC 1840	
UA 124/148/308 x. LM 124/148/308		UC 3842/3/4/5 x. UC 1842	
UA 311/17/18 x. LM 311/17/18		UC 3843 x. UC 2843	
UA 705 Low Drop 0,6A = 78XX		UC 3844/45 x. UC 2844/45	
UA 714 x. OP 07		UC 3846/47 x. 1846	
UA 733/41/48 = LM 733/41/48		UC 3906/2906 IC NAP DIEN accu chi	415
UA 776 Prog. OPA	1370	UC 78XX/79XX = 78XX/79XX	
UA 1558 x. LM 358		UC OP01 x. CA 3140	
UA 2240 Progr.Timer:10us-days,Coun	1113	UC OP02 x. CA 3493	
UA 3730 Security Lock 10.E12 Combi	1034	UCN 4801A 8x Latch & Driver	195
UA 78H05 x. LM 323		UCN 5800 Sink Driver Birnos 2MHz	905
UA 9665/66/68 = ULN 2001/02/03		UCN 5801 8Bit Latch Sink Driv.2MHz	906
UAA 145/146 Phase Control IC	1212	UCN 5804 Step Motor Controller	1375
UAA 170 D/K LED / DOT	132	UCN 5810 10Bit ser./par.Source Dri	907
UAA 180 D/K LED / BAND	461	UCN 5815 8Bit Latch,Source Driver	908
UAA 190 Display f. Tuning	650	UCN 5818 32Bit ser./par.Driver5MHz	909
UAA 1016 Zero Volt. Switch	1646	UCN 5821/23 8Bit ser.Inp.Latch Dri	910
UAA 1041 Automotive Direct. Ind.	1648	UCN 5832 32Bit ser.Inp.Latched5MHz	911
UAA 2016 Power Driver	2290	UCN 5833 " " "	912
UAA 3000 Dimmer	100	UCN 5841 8 Darlington Transistor 1.82W	2393
UAA 4002 Driver for Power-Transist	1097	UDN 2543/47 Source/Sink-Driver	891 /892
UAA 4003DP PWM-COTROLLER/DC-MOTOR	412	UDN 2580/85 Source/Sink-Driver	896
UAA 4006 Controller f. Supply unit	1716	UDN 2595 Source/Sink-Driver	893
UAA 4713 Body heat Triac Control.		UDN 2878/79 Quad 5A/4A Darling.Swi	1214
UAA 5001 = TEA 2162 x. UAA 4006		UDN 2916 PWM Motor Driver	1216
UAF 1780/81/82 2X Power Comparalor	886	UDN 2936 Brushless DC Motor Contr.	1217
UC 137/337/150/350=LM137/337/150/	350	UDN 2944 Quad 4A/60V Source Driver	1218
UC 317/217/117 = LM 317		UDN 2981/84 Source/Sink-Driver	897
UC 337/237/137 = LM 337		UDN 2987 Source/Sink-Driver	898
UC 350/250/150 = LM 350		UDN 5703 Quad OR Power Drivers	1222
UC 1524/2524/3524 x.SG1524...3524		UDN 5706 Quad AND " "	1222
UC 1525/2525/3525 x.SG1525...3525		UDN 5712 = MC 1472	
UC 1526/2526/3526 x. SG 1526...		UDN 6116 High Voltage Driver 110V	887
UC 1527/2527/3527 x.SG1527...3527		UDN 6118 " " 80V	888
UC 1611 Quad Schotliky Diode Array	413	UGN 3055 Multiplexed Hall Sensor	1058
UC 1634/37 x. UC 3634/37		UGN 3113/3132/33/75/77 Hall Swit.	1224
UC 1705/17 x. UC 3705/17		UGN 3235 Dual Output Hall Switch	1221
UC 1730/2730/3730 K/S NHET DO	414	UGN 3275 Complementary Hall Latch	1226
UC 1840 Prog./off-line/PWM Contr.	1416	UGN 3501 Linear Output Hall Sensor	1229
UC 1842/3/4/5 Current Mode PWM	1369	UGN 3503 Ratiometric,linear Hall S	1229
UC 1846/47 Current Mode PWM	1403	UGN 5275 Complementary Hall Latch	1231
UC 2634/37 x. UC 3634/37		UGO 5140 Hall Sensor-Lamp/Solenoid	1230

TEN IC	HINH	TEN IC	HINH
UGS 3055 Multiplexed Hall Sensor	1058	UM 3481/82/83 = CIC 482	305
UGS 3119 Hall Effect Switch	1224	UM 34810A 16 Melodic Gen.	305
ULN 2001 DTL TTL PMOS CMOS 7x Darl. 50V	17	UM 34811A " " " Butterfly	305
ULN 2002 PMOS 14-25V	17	UM 34813A 12 " " Song of Joy	305
ULN 2003 TTL, CMOS 5V	17	UM 3484 Westminster Chime Function	305
ULN 2004 CMOS, PMOS 6-15V	17	UM 3491-1 Melodic Gen. X'mas	1798
ULN 2064/68/74 TTL 5V . 50V/1,5A	194	UM 3491-2 12 Melodie	1798
ULN 2065/69/75 TTL 5V 80V/1,5A	194	UM 3491-3 Clock Chime 1..12	1798
ULN 2066/70/76 P/CMOS 6-15V 50V/1,5A	194	UM 3491-4 Melody + Clock Chime	1798
ULN 2067/71/77 CMOS PMOS 6-15V 80V/1,5A	194	UM 3492 Melody Gen.	1807
ULN 2429 Fluid Detector	1234	UM 3511A Orgel Gen	1276
ULN 2801 General Purpose 8x Darl. 50V 0.5A	190	UM 3561 3 Siren Sound Generator	416
ULN 2802 PMOS 14-25V 8x Darl. 50V 0.5A	190	UM 3750 Encoder / Decoder Progr.	2130
ULN 2803 TTL CMOS 5V 8x Darl. 50V 0.5A	190	UM 3751 = UM 3754	
ULN 2804 CMOS 6-15V 8x Darl. 50V 0.5A	190	UM 3752 Progr. Encoder/Decoder	1793
ULN 2805 350mA 74/74S Logic 50V 0.5A	190	UM 3753 " "	1794
ULN 3311/3312 Precision Light Sen.	1227	UM 3754 = UM 3751	1795
ULN 3330/60/63 Optoelectronic Swit	1228	UM 3755 " "	1796
ULN 3390 " "	1228	UM 3758 Encoder / Decoder Progr.	2130
ULN 3751 +/- 3,5A OP	1219	UM 5000 Voice Synthesizer	1725
ULN 3755 Dual +/- 3,5A OP	1220	UM 5100 Voice Processor	1726
ULN 3793 LF Bridge Amplifier 21 W	1863	UMC 7106 = ICL 7106	
ULN 8126 = SG 3526		UMN 6450 Hall Effect Vane Switch	1232
ULQ 2001/2/3/4R 7x Darlington Arr.	189	UND 2901 Driver/Current Limiter	550
ULQ 2460 Electronic Spark Timing	501	UND 2983A = L 603	
ULS 8126 = SG 1526		UPC 157/165/251 = LM201/208/1458	
UM 3161 Melodic Generator	1792	UPC 271/272 = LM 211/219	
UM 3161-1 JINGLE Bells, Santa Claus		UPC 301/11/19/24/39=LM301/11/19..	
UM 3161-10 I will follow him		UPC 356/357 = LF 356/357	
UM 3161-11 Love Me Tender,...True		UPC 358/393 = LM 358/393	
UM 3161-12 Such a Wonderfull Day		UPC 451 = LM 224	
UM 3161-13 Easter Parade		UPC 1458/4558 = LM 1458	
UM 3161-16 Tomorrow		UPC 1555 = LM 555	
UM 3161-17 We Wish You a Merry X'mas		UPC 1558 = LM 1458	
UM 3161-18 Wedding March (Wagner)		UPC 3403 = MC 3403	
UM 3161-19 For Elise		UPC 4741 = LM 741	
UM 3161-2 Jingle Bells		V8 020 High-Voltage Transistor	1770
UM 3161-21 Happy Birthday/Congrat.		V1 7660 x. ICL 7660	
UM 3161-23 Mary Had a Little Lamb		VM 200/201 Smart Solid State Relay	1098
UM 3161-24 Twinkle Tw. Little Star		VN 02ANSP 0.35Ohm,7A High Side Smart	2254
UM 3161-25 Marsch of the Toy Soldiers		VN 03 4A Solid State Relay	2395
UM 3161-26 Rockbye Baby		VN 05NSP 0.18Ohm,13A Power Solid State	2254
UM 3161-27 Choral Symphony		VN 16BSP 0.06Ohm, 5.6A Relay	2254
UM 3161-29 When the Saints Go Marching		VND 05B Smart Power Solid State Relay 1,6A	2055
UM 3161-3 Silent Night		VND 10BSP 0.1Ohm,3.4A Solid State Relay	2392
UM 3161-31 Lullaby (Schuber)		VOGAD 6270 LF Preampl. (Speech)	671B
UM 3161-32 Cuckoo Waltz		X 9103/04/9503 R long time Memory	1374
UM 3161-34 The Train is Running Fast		X 9C103/104/503 Potentiometer IC	1931
UM 3161-36 Happy New Year		X 9CMME Potentiometer IC	1931
UM 3161-38 Mama + Home Sweet Home		XB 087 Signal Laser Control	1910
UM 3161-4 Jingle Bells + Rudolph		XC 488A0 Laser Control	1915
UM 3161-5 Home Sweet Home		XE 0004 Data Access Arrangement	1535
UM 3161-6 Let Me Call You Sweetheart		XE 0005 " " "	1539
UM 3161-68 It's Small World		XE 0006 " " "	1540
UM 3161-7 Congratulations		XE 1112 " " "	1533
UM 3161-8 Happy Birthday to You		XE 1201/1203 MOSART	1538
UM 3161-9 Wedding Marsch (Medelsohn)		XE 1212 1200bps Component MODEM	1542
UM 3161-99 Bi Bi Bi Sound		XE 1212E x. XE 1212 without DAA	1546
UM 3480-1 12 Melodie Generator	1797	XE 1214 1200bps Component MODEM	1547

TÊN IC	HINH	TÊN IC	HINH
XE 2400/A 2400bps Component MODEM	1548	XR 2284/2288 HV AC Plasma Drivers	604
XE 2400A-E 2400bps without DAA	1554	XR 2524 = XR 1524	84
XE 2400MNP Error Correcting MODEM	1553	XR 2525/2527	281
XE 9624FD FAX/DATA Component MODEM	1555	XR 2543 = XR 1543	
XE 9624FD-E " "	1552	XR 2556	426
XR 082/083/084 = TL 082/083/084		XR 2567 TON DECODER	253
XR 094	417	XR 3403/3503 x. CA 5470	6
XR 095	418	XR 3470 = MC 3470	
XR 096 Quad Progr. JFET OPA	1524	XR 3524/2534/1534	84
XR 205 Waveform Generator	1534	XR 3525/3527	281
XR 210 FSK MODULATOR/DEMULATOR	256	XR 3543 = XR 1543	
XR 215 PLL	419	XR 4136 = RC 4136	81
XR 320 Timing IC	1530	XR 4151 VOLTAGE TO FREQ.CONV 10kHz	241
XR 346/246/146 # TDB 0146		XR 4194 +/-50mV to +/-42V/200mA	427
XR 494/5 PWM Regulator	531 /1536	XR 4195 -15V 2X ON AP	428
XR 555/556 # LM 555/556		XR 4202 Programm. Quad OPA	617
XR 558/559 Quad Timing IC	1532	XR 4212 # LM 324	
XR 567A Precision Ton Decoder	59	XR 4558 = MC 1458	
XR 1000/1008 Low Pass Filter	612	XR 4739	16
XR 1310 = MC 1310		XR 4741	6
XR 1458 = MC 1458		XR 5532 = NE 5532	
XR 1468 +/- 15V/100mA Volt.Reg.	619	XR 5533/34 = NE 5533/34 Dual OP	
XR 1488/9 = MC 1488/9		XR 6118/6128 Fluoresc. Driver/85V	603
XR 1524/2524/3524 PWM	84	XR 7000 Log Video Amplifier	600
XR 1525/2525/3525A PWM Regulators	281	XR 8038 = ICL 8038 200 kHz	49
XR 1527/2527/3527A " "	281	XR 9201 8 BIT P COMP. D/A CONVERTER	244
XR 1543/2543/3543 SUPERVISORY IC	248	XR 13600 = LM 13600	
XR 1568 = XR 1468		XR 14412 FSK MODEM SYSTEM	618
XR 2001/2/3/4 HV/600mA Darl.Tr.Ar	17	XRC 240 PCM REPEATER	238
XR 2011/12/13/14 HV/750mA	17	XRC 262 PCM Repeater	1537
XR 2103 FSK MODEM Filter	609	XRC 277 # XRC 240 LOW VOLTAGE	
XR 2120 PSK MODEM Filter	608	XRC 587/C588 T1C PCM Repeater	599
XR 2120A 212A/V.22 MODEM FILTER	607	XRL 555CP=ICM 7555 CMOS TIMER	10
XR 2121/2122 BELL 212A MO/DEM	224	XRL 556 Micropower Dual Timer	11
XR 2123 PHASE-SHIFT-KEYING MO/DEM	219	XRS 200 Multi Funct. PLL System	602
XR 2125 DATA BUFFER	223	XRT 5600/5620 PCM Line Repeater	1543
XR 2200 RELAY DRIVER	420	XRT 5640 PCM AMI Line Receiver	1544
XR 2201/02/03/04=ULN2001/02/03/04	17	XRT 5650 PCM AMI Line Receiver	1550
XR 2206 Function Generator max. 1MHz	101	XRT 5660 2Mbit/s Repeater	1551
XR 2207 VCO	245	XRT 5700/5720 2MBit/s PCM Line Rep	1557
XR 2208 MULTIPLIER	421	XRT 5750 PCM Line Receiver	1558
XR 2209 PRECIS. OSCILLATOR	254	XRT 5760 2MBit/s Repeater	1562
XR 2211 FSK DEMUL. TON DECODER	249	XTR 101 4mA to 20mA two-wire Transmitter	2194
XR 2212 PRECISION PLL	251	XTR 110 Voltage-to-Current Converter/Transm	2197
XR 2213 " "	252	YC 7106/7107 = ICL 7106/7107	
XR 2216 MONOLITHIC COMPANDOR	239	YC 7136	314 /732
XR 2228 Multiplier / Detector	422	YM 2201/2601 CD Signal Processor	1916
XR 2230 PWM CONTROL SYSTEM	257	YM 3015 D/A Converter	1917
XR 2240 Progr. Timer/Counter	102	YM 3020 " "	1914
XR 2242 Long-Range Timer	103	YM 3531/3811 CD Servo Controller	
XR 2243 TIMER ( uS TO DAYS)	250	ZN 404 Volt. Ref. 2,45V	517
XR 2247 Floppy Disk Write Ampl.	1526	ZN 409 PRECISION SERVO IC	230
XR 2264/65 PULSE PROP. SERVO	104 /423	ZN 410E MOTOR SPEED CONTROLLER	229
XR 2266 Servo Controller (Radio)	601	ZN 411 MOTOR SPEED CONTROLLER	226
XR 2271 Fluorescent Displ. Driver	424	ZN 414/5/6 AM-Radio Receiver	181 /235/260
XR 2272 HIGH VOLT DISPLAY DRIVER	425	ZN 423 1,26V Volt.Ref.	635
XR 2276 BAR-GRAF-DISPLAY-GEN.	231	ZN 424 Gated OPA	415 /1418
XR 2277/2278 Dot/Bar Graph Gen.	606	ZN 425 DAD CONVERTER,8BIT	470
XR 2279 " "	605	ZN 426 8 BIT D/A CONVERTER	472

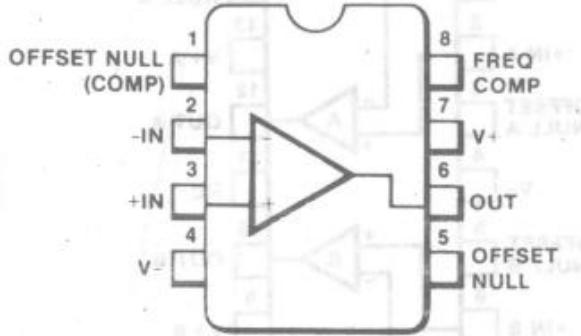
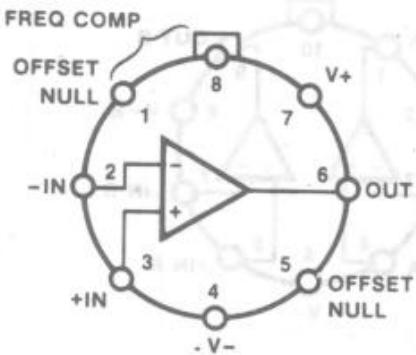
TÊN IC	HÌNH	TÊN IC	HÌNH
ZN 427 8 BIT A/D	"	463	
ZN 428 8 BIT D/A	"	471	
ZN 429 8-Bit D/A		1407	
ZN 432 10-Bit A/D		1409	
ZN 433 10-Bit A/D ,Tracking		1410	
ZN 434 4 Bit D/A Converter		665	
ZN 435 8 Bit A/D-D/A Converter		429	
ZN 436 6-Bit D/A		1408	
ZN 439 8 BIT ADC		1439	
ZN 440 6-Bit Flash Video Conv.		1414	
ZN 447/8/9 8-Bit A/D ,uP,1/4 LSB		1413	
ZN 458 2,45V Precision Volt.Ref		1618	
ZN 459 Ultra Low Noise Amplifier		469	
ZN 460 Ultra Low Noise Preamp.		1921	
ZN 470/2 Microphone Ampl.		411 /1412	
ZN 473 Tone Ringer/Dial Pulse Rej		1926	
ZN 475 Microphone Ampl./Half Brid		1920	
ZN 476 " " /Bridge		1922	
ZN 477 " " "			
ZN 478 " " Low Voltage		1924	
ZN 480 Ring detector & Pulse rej.		660	
ZN 482 KHUECH DAI MAY VI AM		430	
ZN 559 8 Bit DAC		1122B	
ZN 1034E/P Precision Counter Timer		130	
ZN 1036E/D PROG. COUNT/TIMER		273	
ZN 1060E SWITCH MODE REG. CONTROL		225	
ZN 1066E/J SWTCHING REG. CONTROL		275	
ZNA 234 TV Pattern Gen.		518	
ZNREF 025 2,5 REF		431	
ZNREF 040 4,0V REF		431	
ZNREF 050 4,9V REF		431	
ZNREF 062 6,2V REF		431	
ZNREF 100 9,8V REF		634	

## 1.5 SƠ ĐỒ CHÂN IC TUYẾN TÍNH



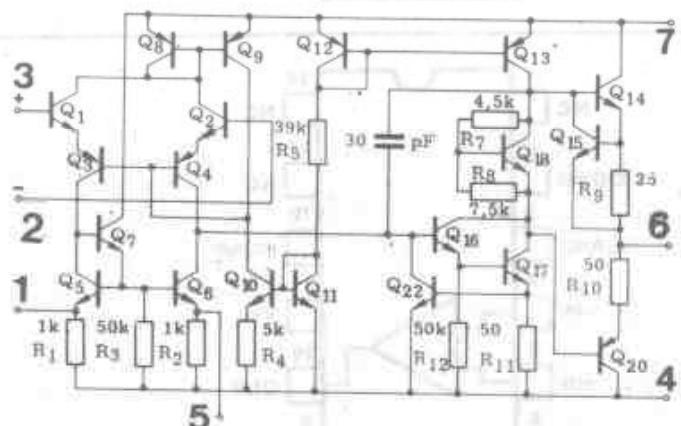
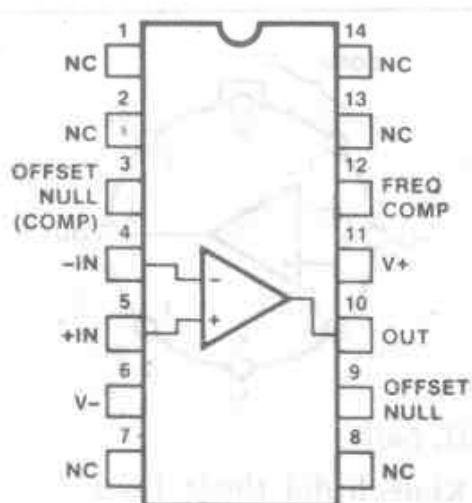
H. 1a/b/c

Khuếch đại thuật toán  
Operational Ampl.

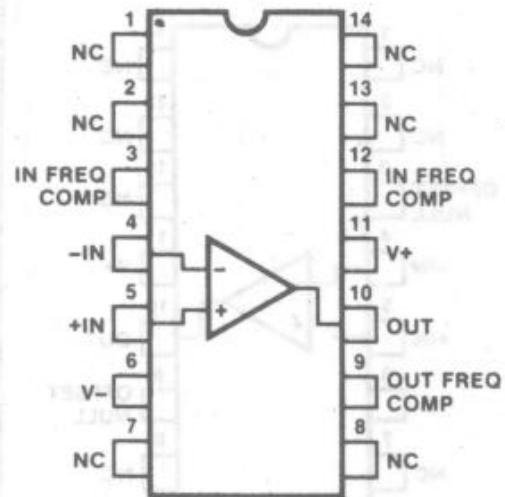
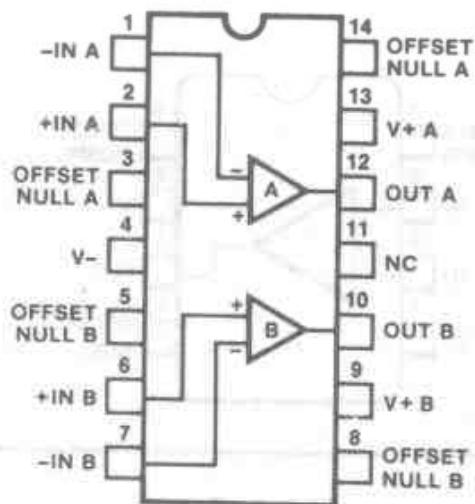
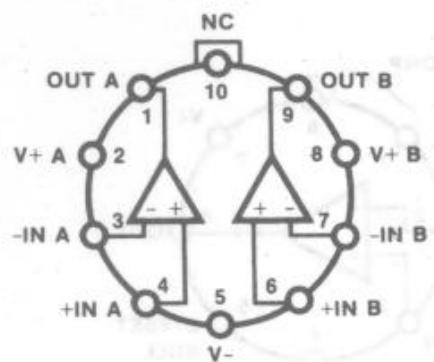
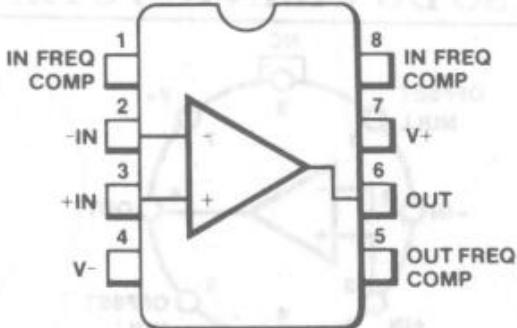
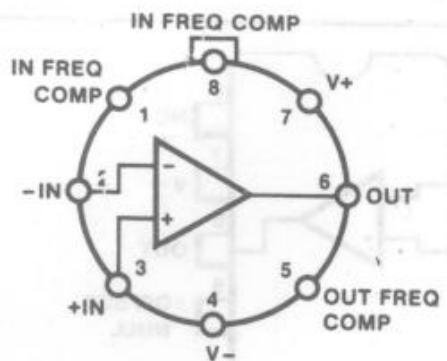


H. 2a/b/c

Khuếch đại thuật toán



Mạch điện LM 741

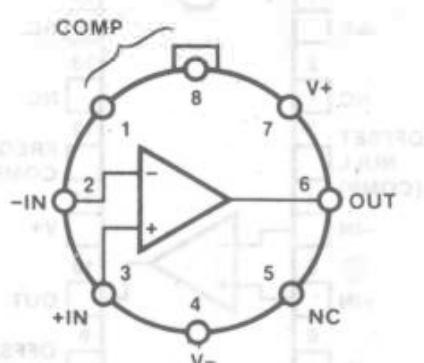
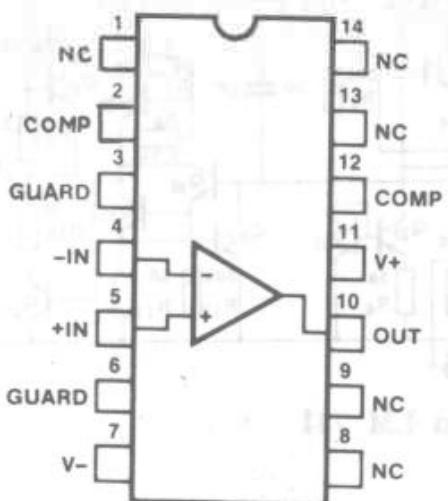


### H. 3a/b/c

## Khuếch đại thuật toán Operational Amplifier

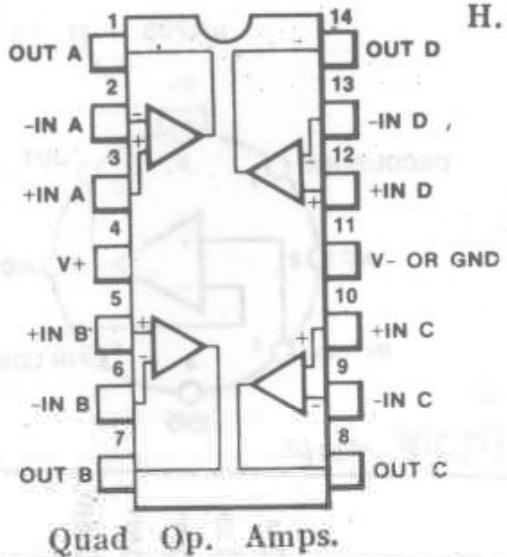
H, 4a/b

## Khuếch đại thuật toán Dual Op. Amps

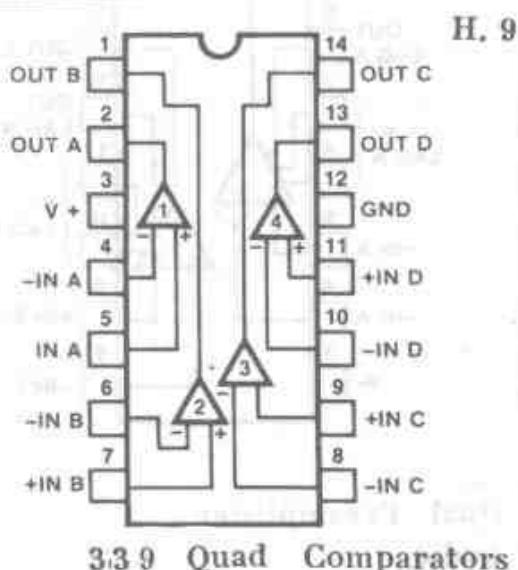
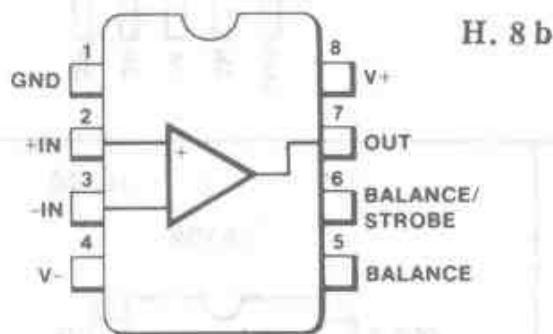
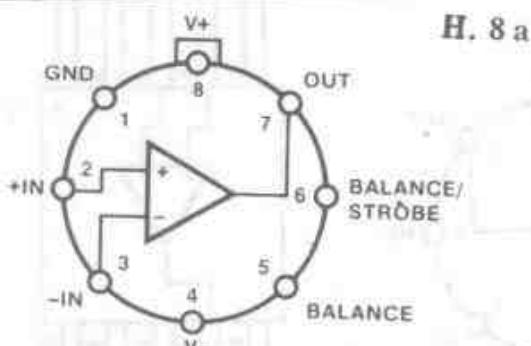


H. 5a/b

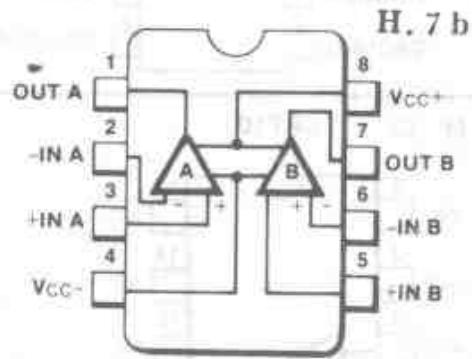
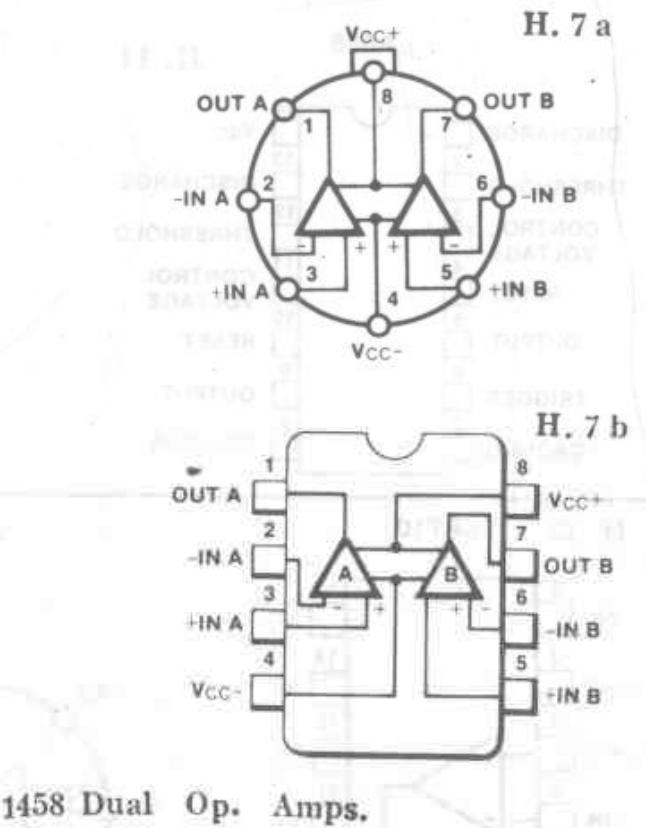
Khuếch đại thuật toán



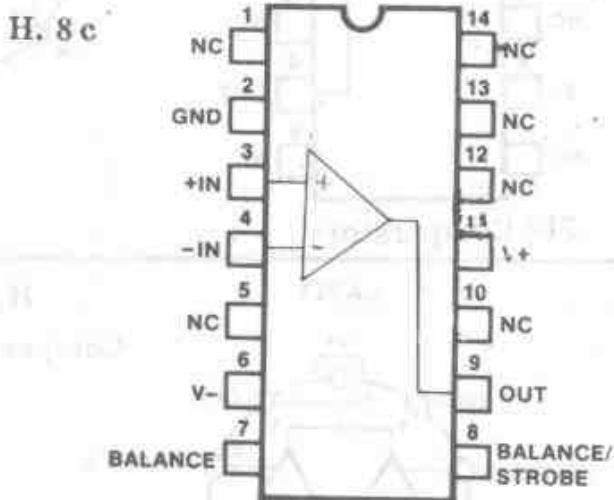
Quad Op. Amps.



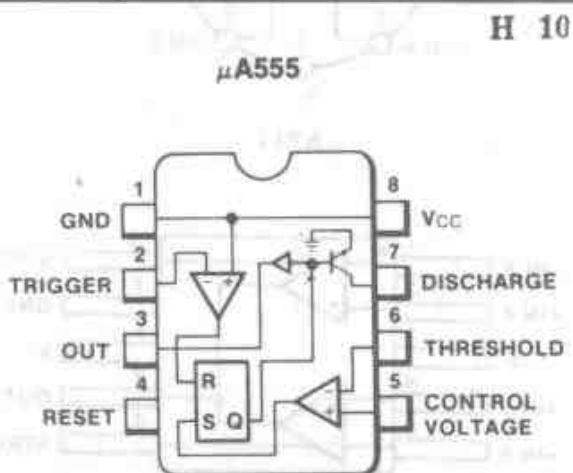
33.9 Quad Comparators



1458 Dual Op. Amps.

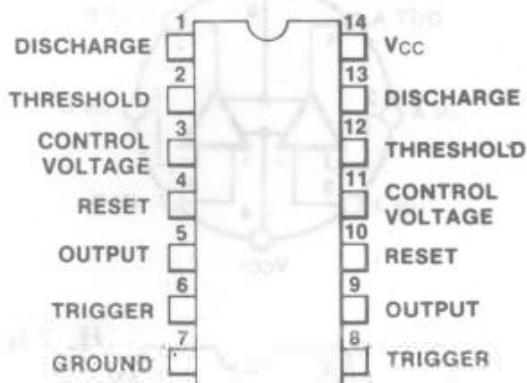


311 Comparator



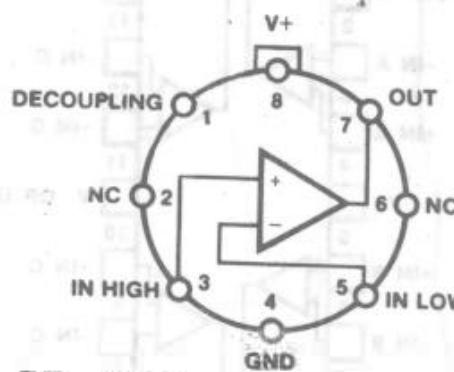
$\mu$ A556

H. 11



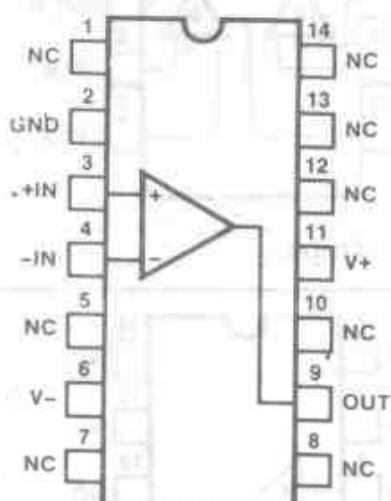
$\mu$ A703

H. 12

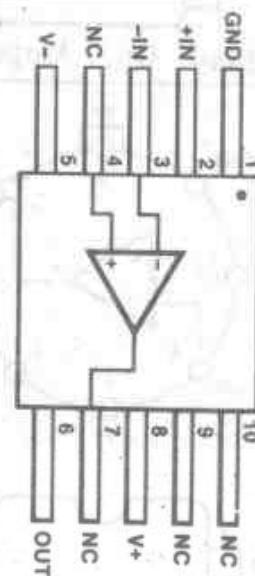
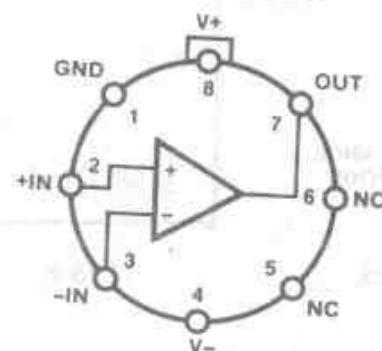


H. 13

$\mu$ A710



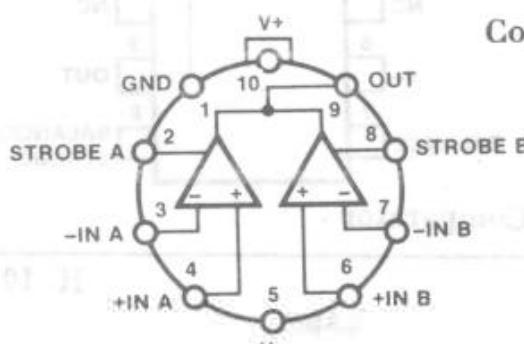
$\mu$ A710



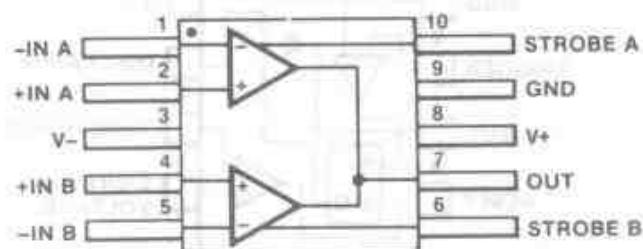
710 Comparators

$\mu$ A711

H. 14  
Comparators

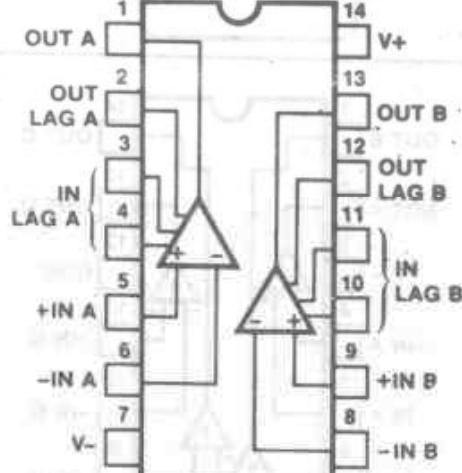


$\mu$ A711

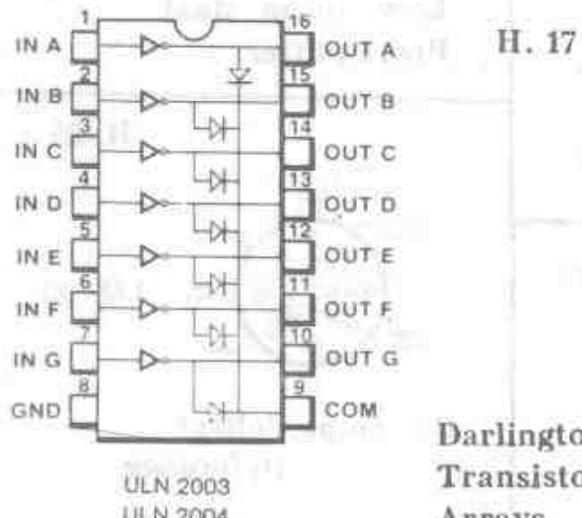
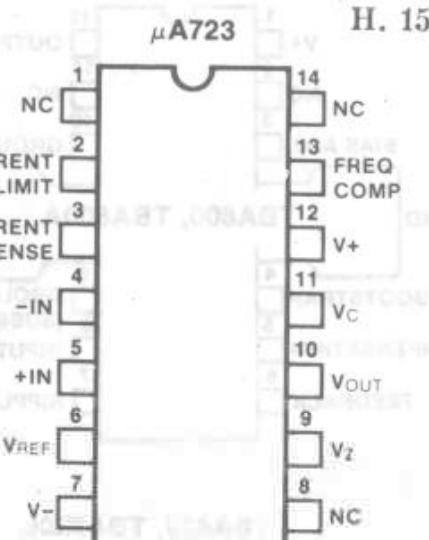
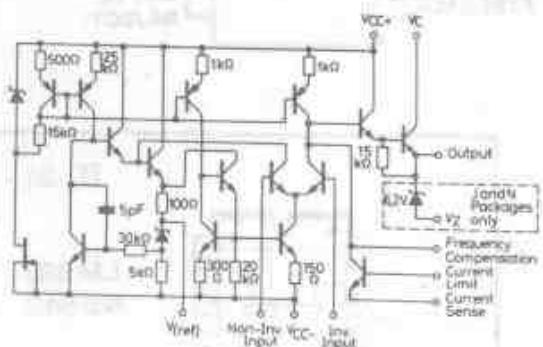
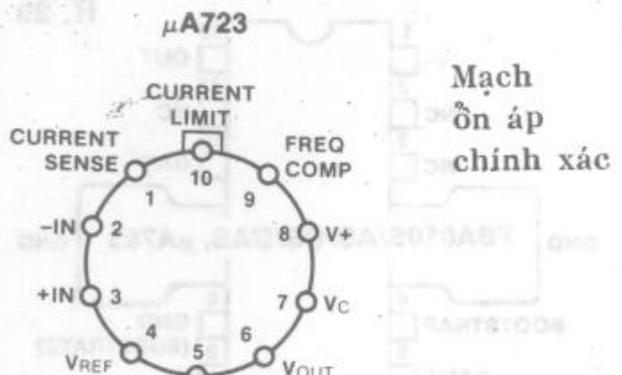


$\mu$ A739

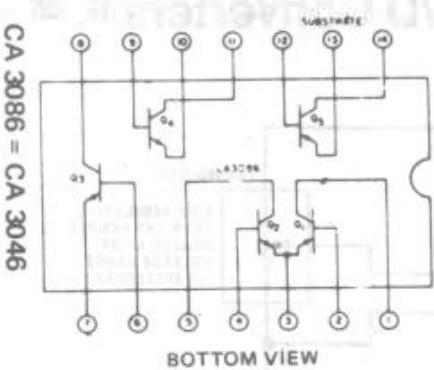
H. 16



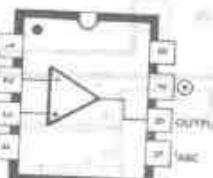
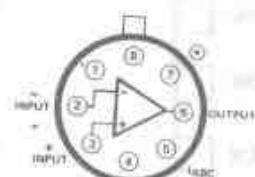
Dual Preamplifier  
Audio



Darlington  
Transistor  
Arrays

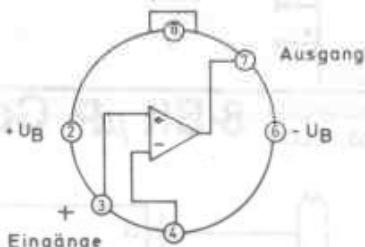


Transistor Arrays

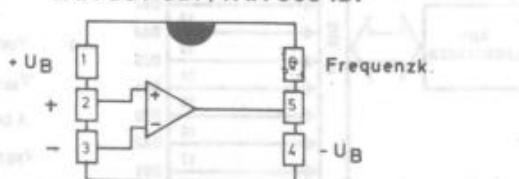


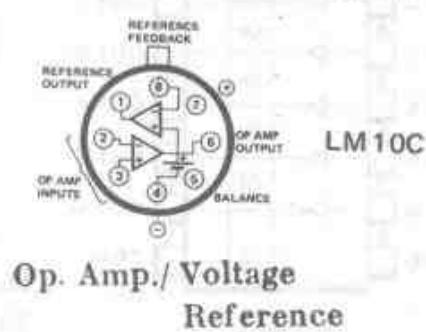
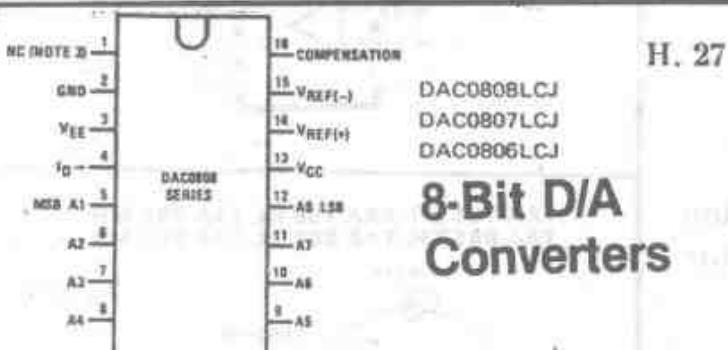
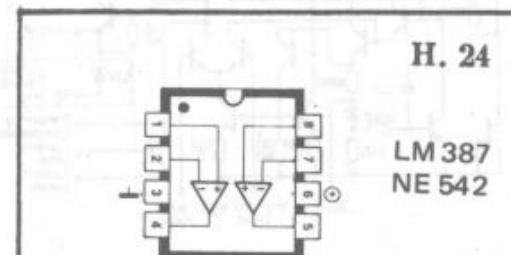
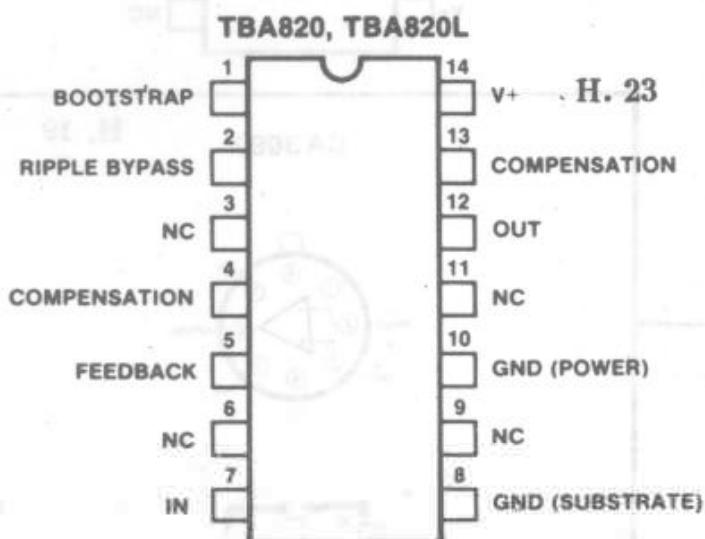
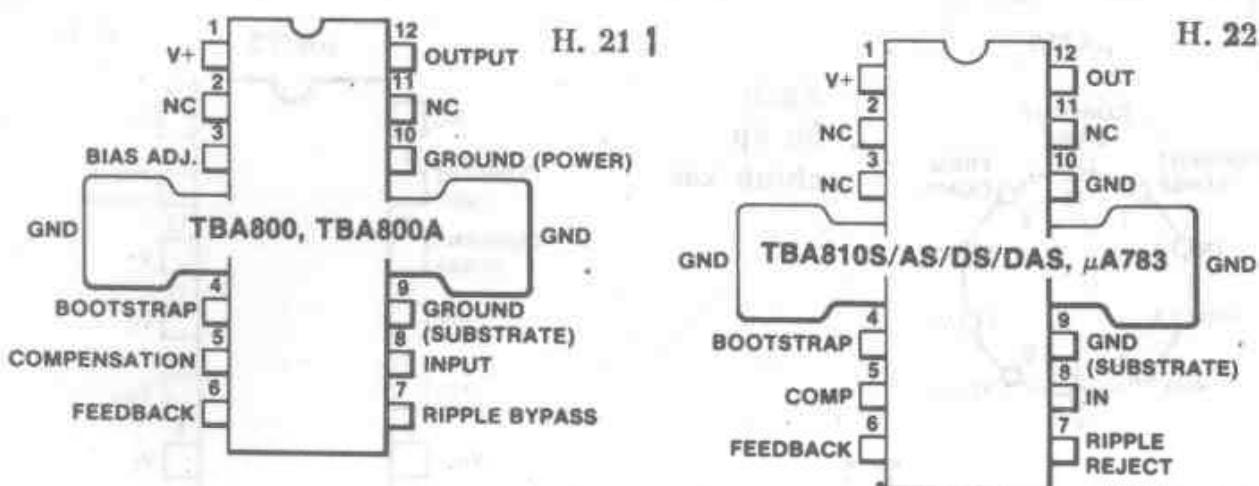
TAA 761 CH, TAA 765 IH, TAA 762 MH  
TAA 861 CH, TAA 865 IH, TAA 862 MH

Frequenzk.

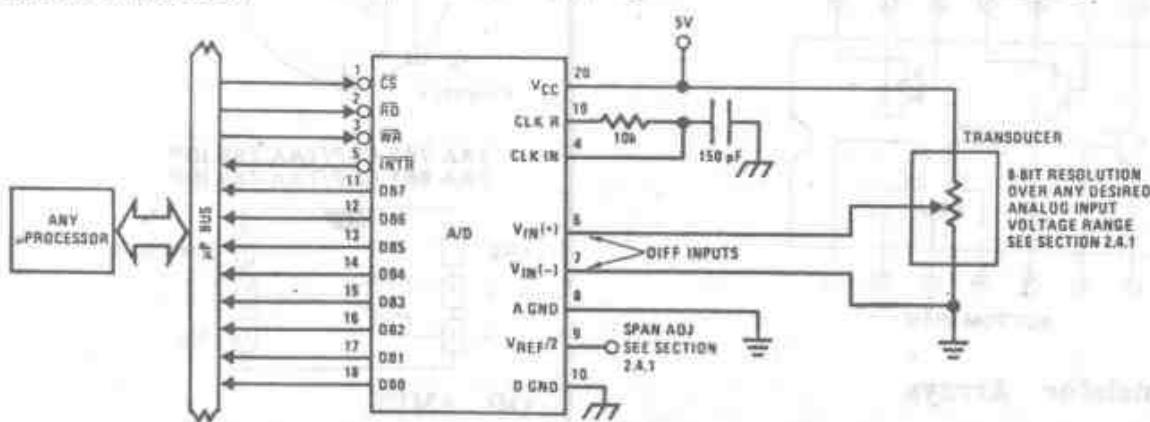


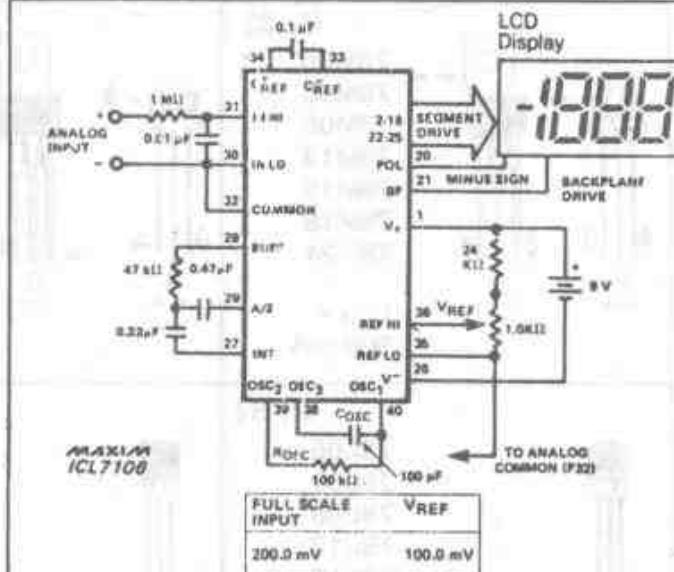
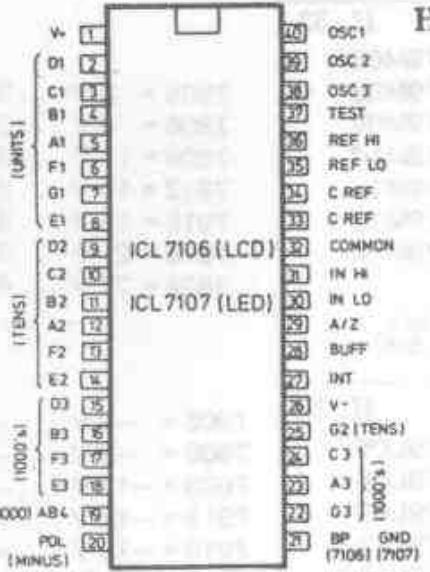
TAA 761 CDP/TAA 765 IDP  
TAA 861 CDP/TAA 865 IDP



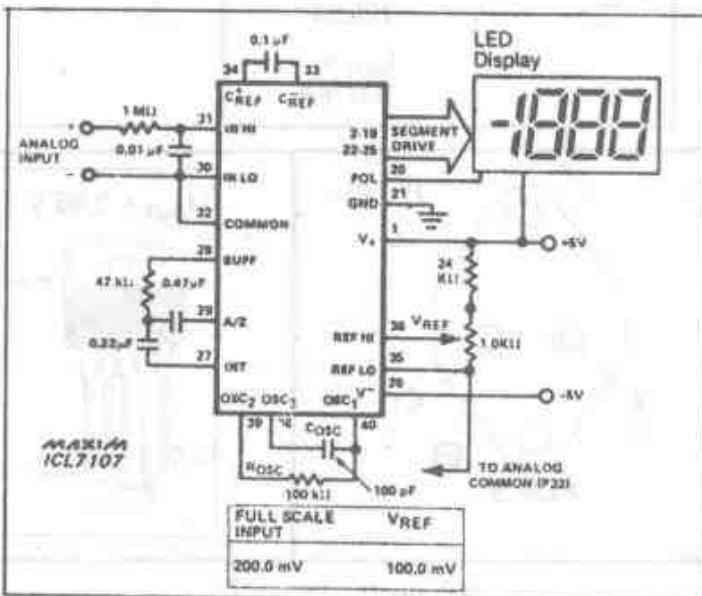
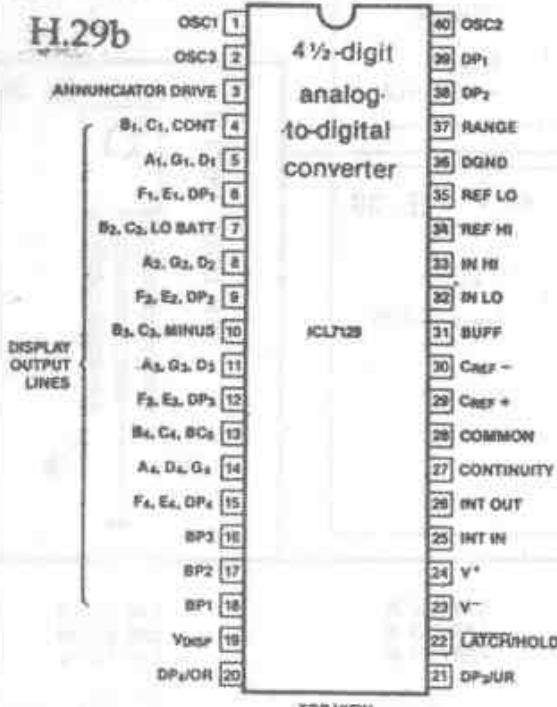


## 8-Bit μP Compatible A/D Converters H. 26

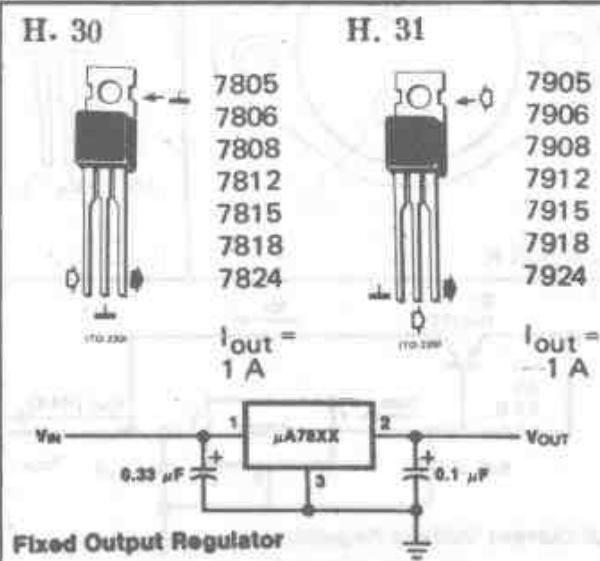
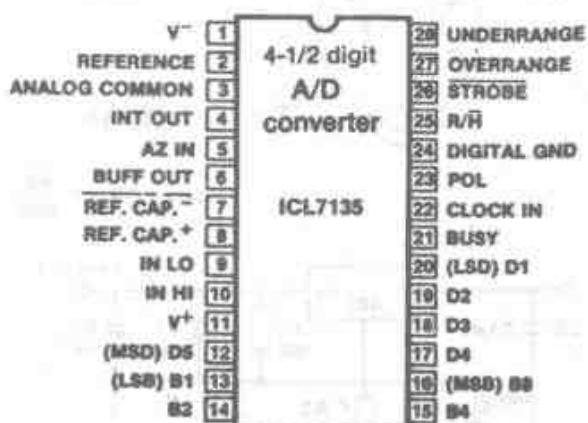


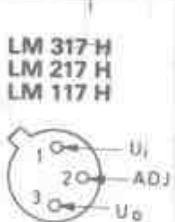
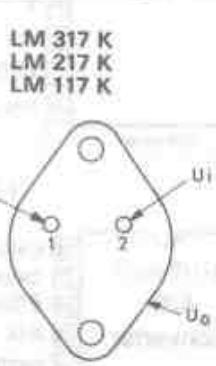
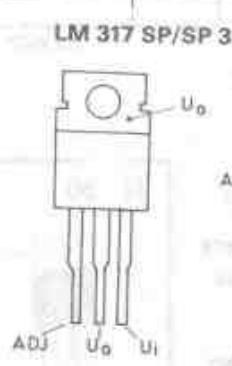
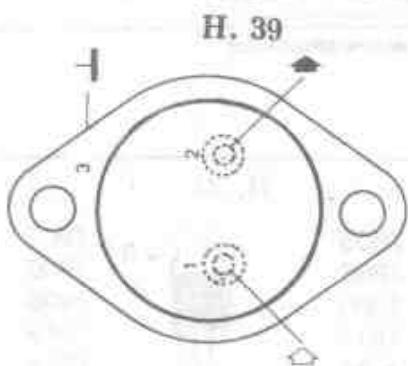
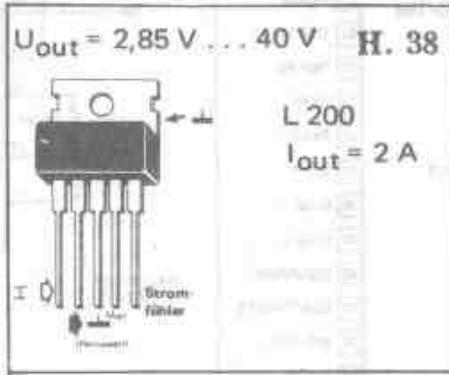
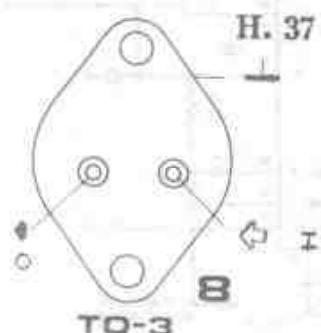
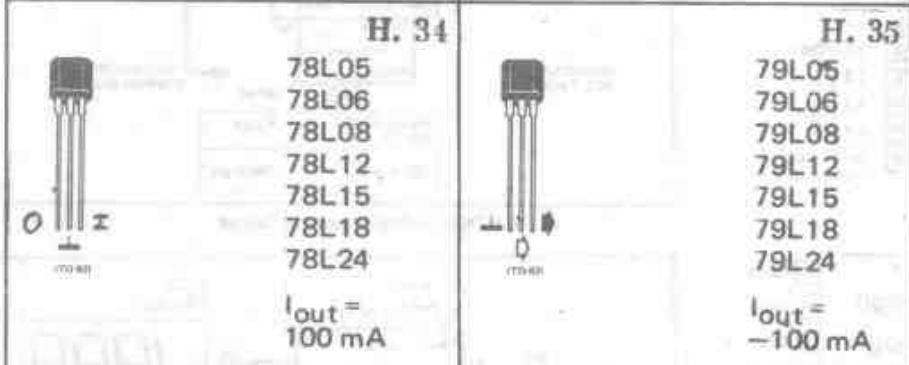
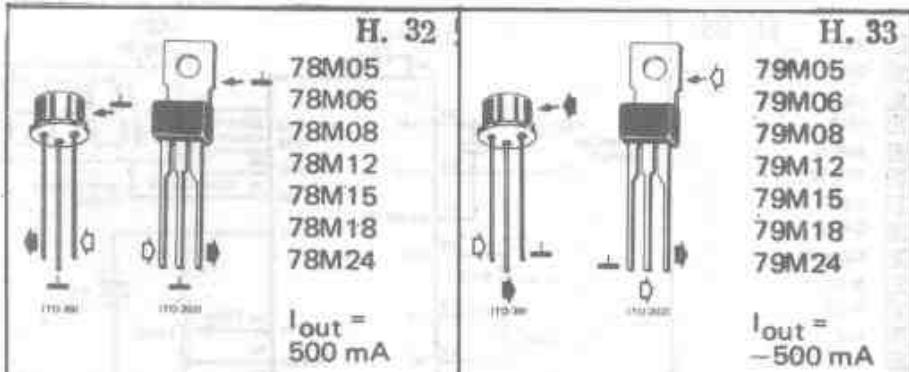


ICL7106 Typical Operating Circuit



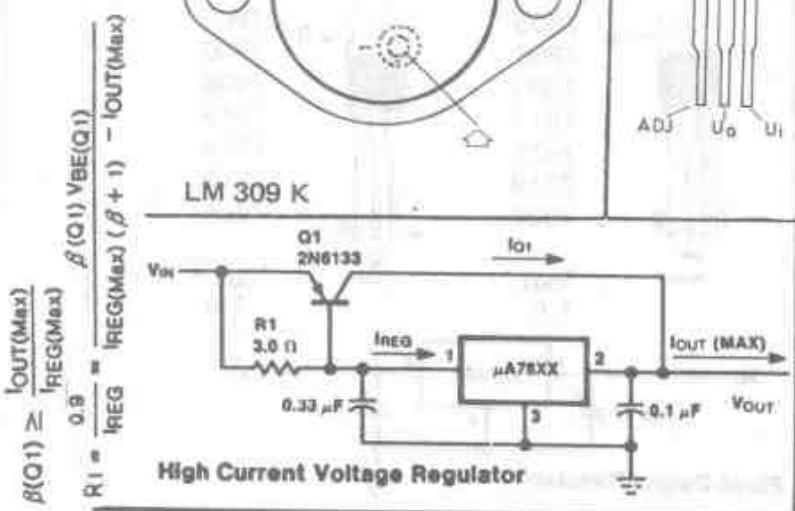
ICL7107 Typical Operating Circuit



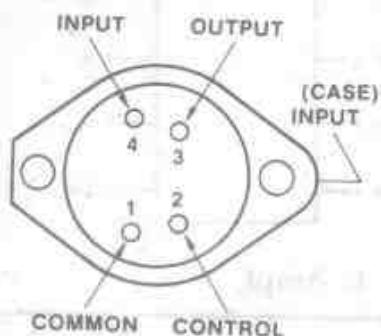


H. 40

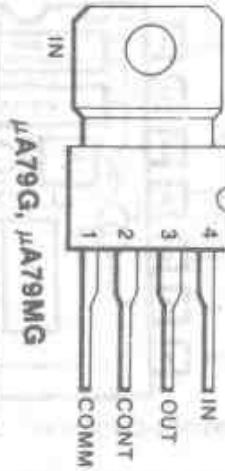
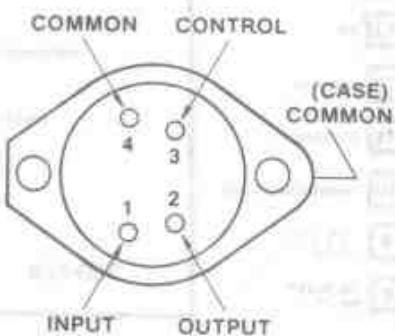
$$U_0 = 1,25 \left(1 + \frac{R_z}{240}\right)$$



$\mu$ A79G,  $\mu$ A79HG H. 41



$\mu$ A78G H. 43

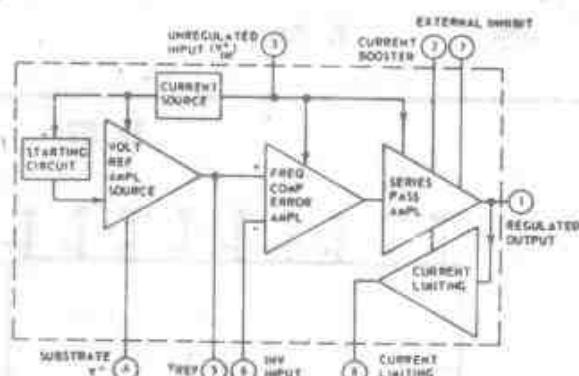


H. 44



2002

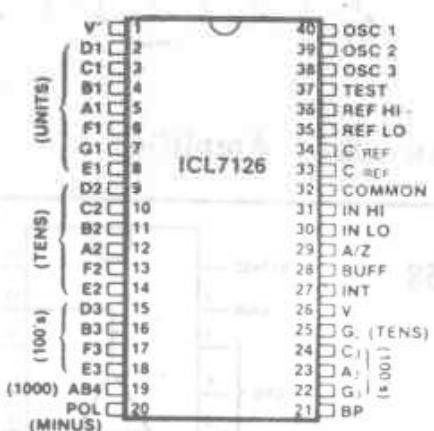
### Khuếch đại tần số thấp



3085

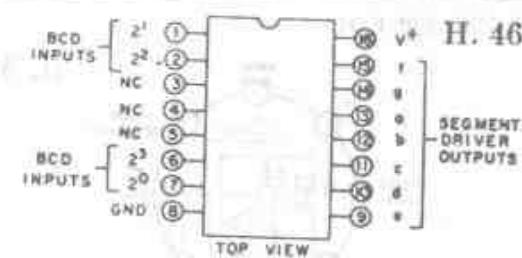
H. 45

Ôn áp 1,8 V - 26 V

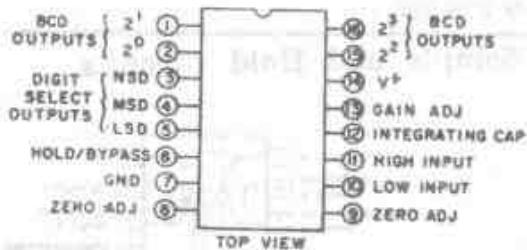


7126 A/D 3 1/2-stell. Low Power

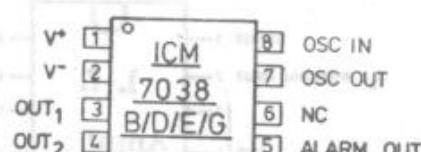
H.48



3161 E BCD-7-Segment-Dec.



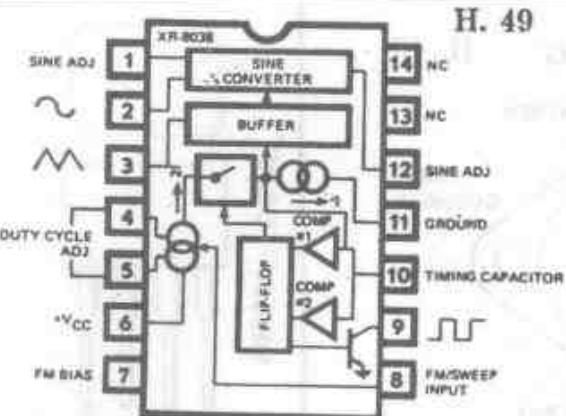
3162 E A/D Converter H.47



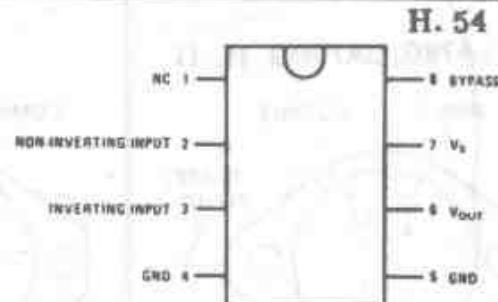
7038 Clock 16 Stufen-Teiler

Bộ chia 16 nấc

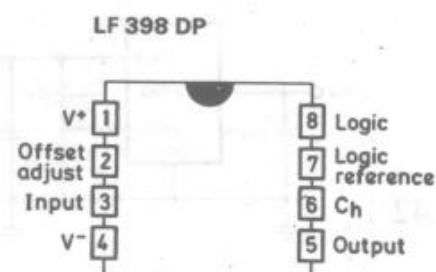
H.50



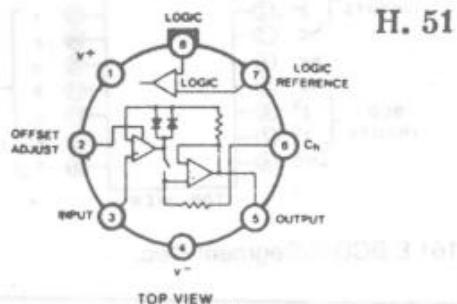
8038 Funktions-Generator



380-N 8 l. f. Ampl.

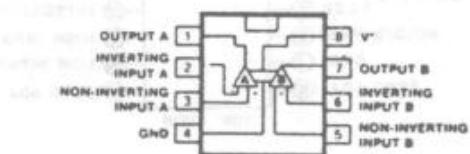


198, 298, 398, N



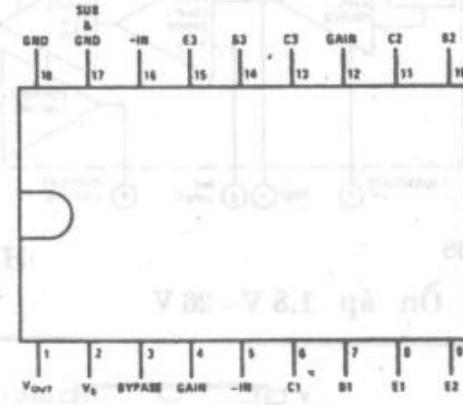
198, 298, 398, H

### Sample and Hold Circuits

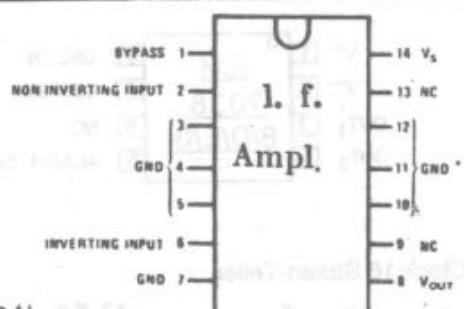


193, 293, 2903 Dual SampComp.

**H.52**

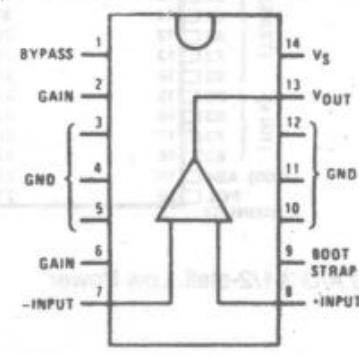


389 N Audio Amplifier

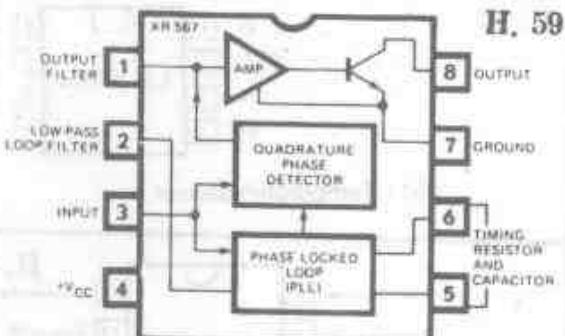


380 N

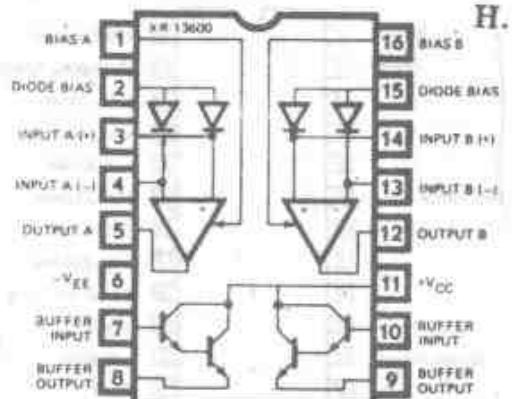
390



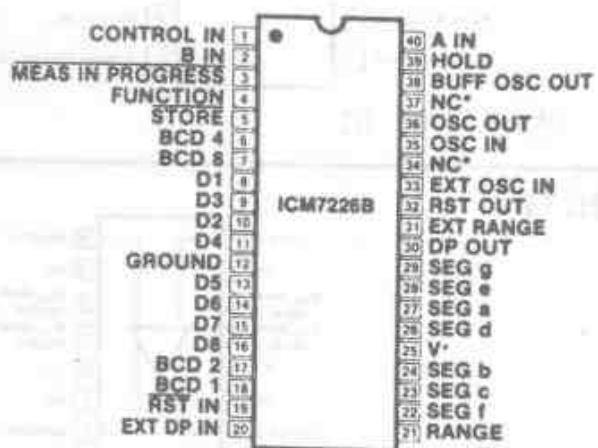
l. f. Ampl. 1W



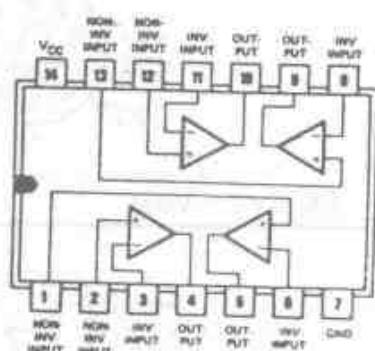
567 Ton-Decoder



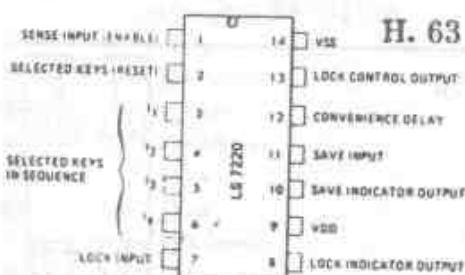
13600 Dual Transconductance



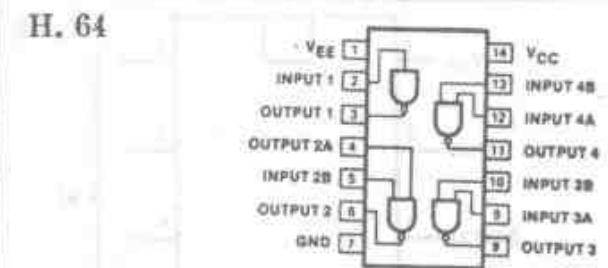
## 10 MHz Universal Counter



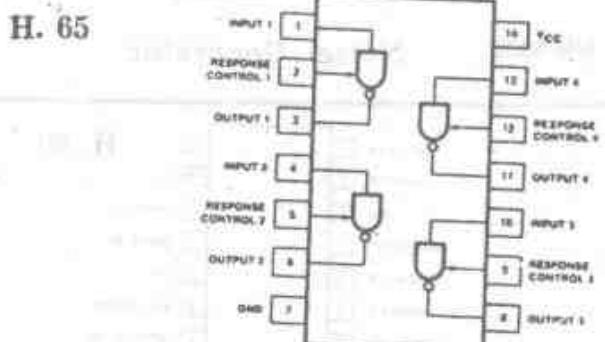
1900 / 2900 / 3900 4-fach-OP



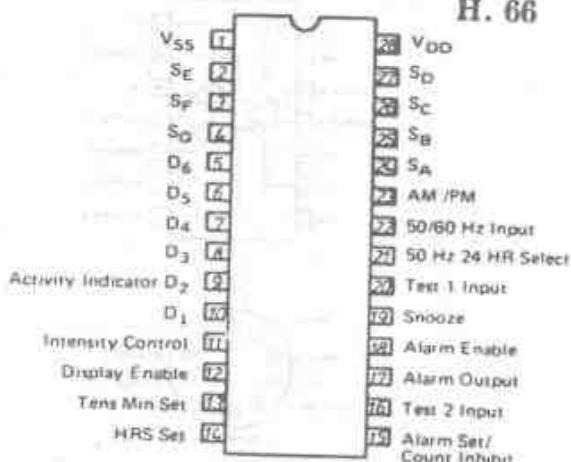
7220



Quad line Driver



1489 Quad Line-Receiver

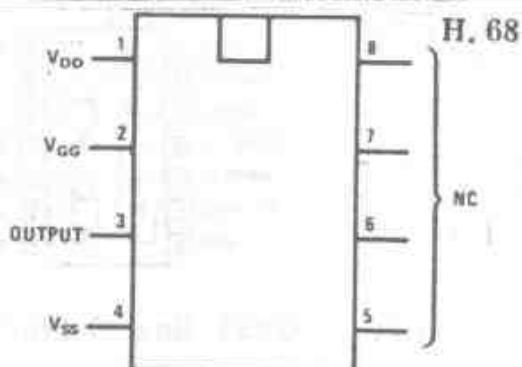


MK50250

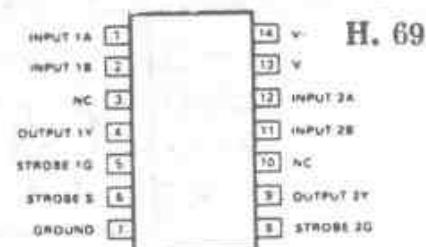
Mạch đồng hồ



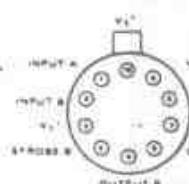
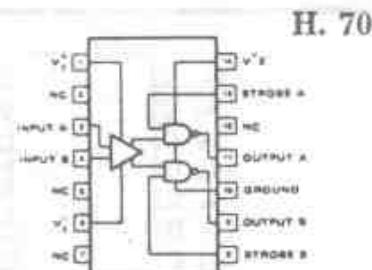
MM 5314  
Mạch đồng hồ



MM 5837  
Noise Generator



521, 22 High Speed Dual Comp.

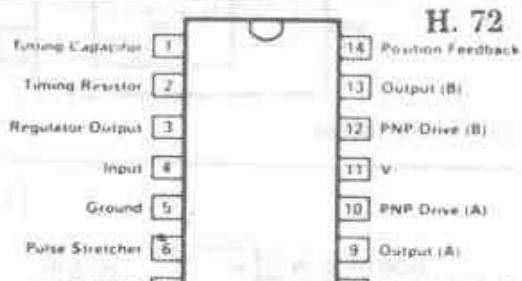


527, 529 Spannungs-Komparator

H. 71

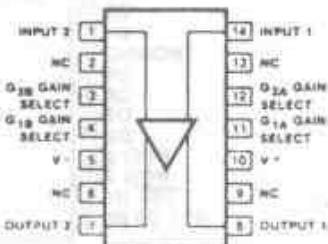


3911 Temperatur-Sensor

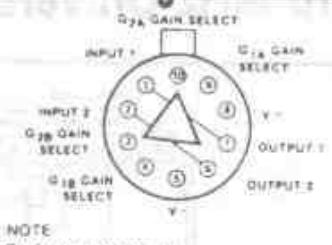


NE 544 Servo-IC

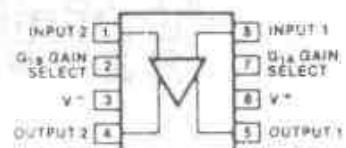
H. 74



592 DH, FH, N 14 Video-Verst.

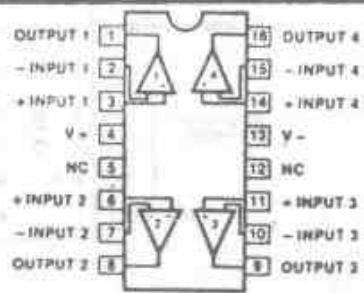


592 H Video-Verst.

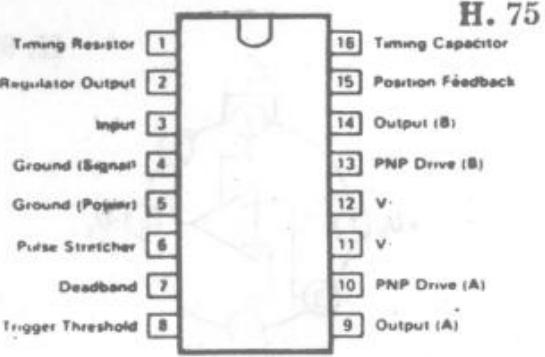


592 DE, FE Video-Verst.

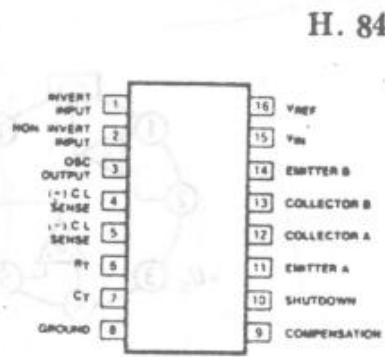
H. 76



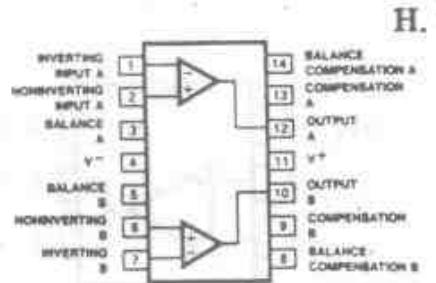
5514 F, N, D



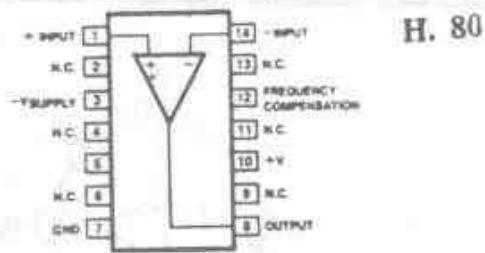
644 Servo-Driver



3524

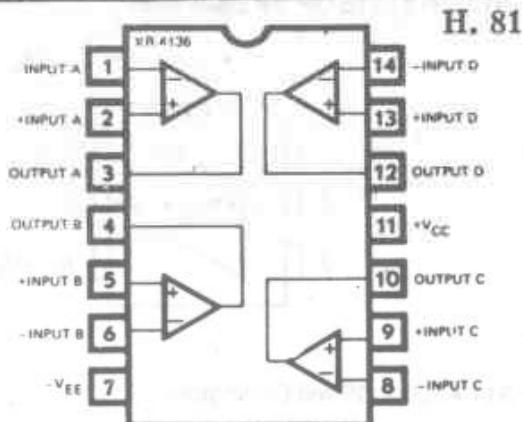


5533 Dual Op. Amps

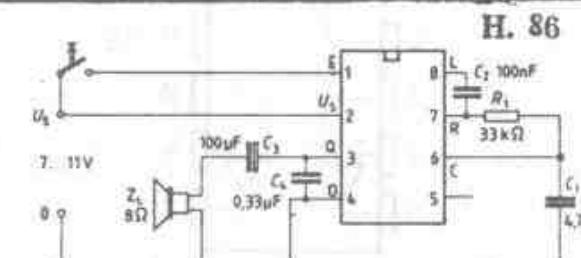


5539, F, N, D HF-OP

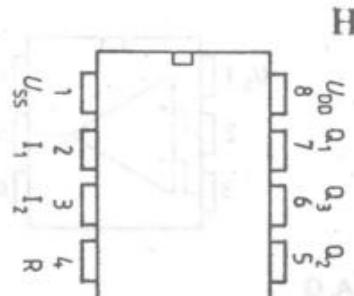
Khuếch đại tần số cao



4136 4-fach-OP 3 MHz

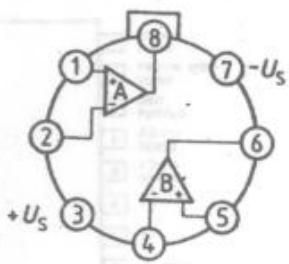


0600 / 0601 / 0602 Gong-IC

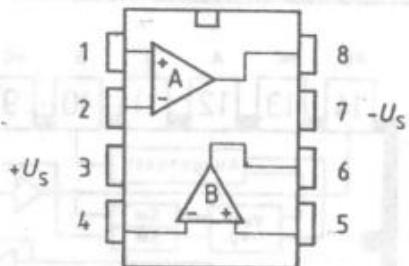


Bộ chia  
SAJ 141 Teiler 1000/100/10:1

H. 88

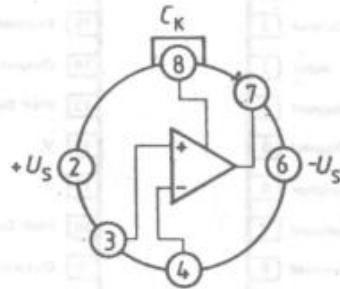


2331 / 2335 2-fach-OP mit Darlington

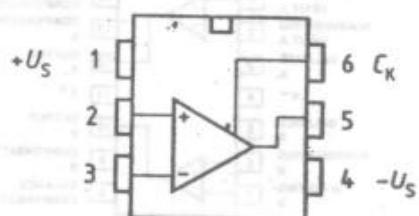


2331/2332/2335 2-fach-OP mit Darlington

H. 93

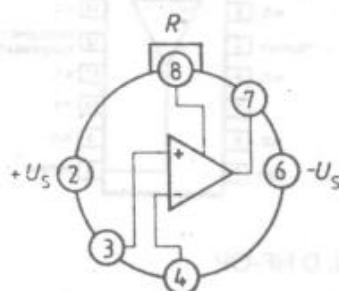


331 / 332 / 335 OP mit Darlington-

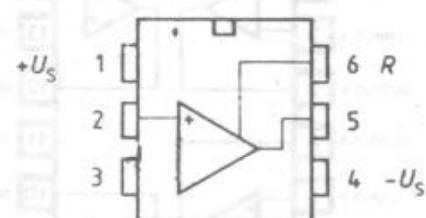


331 / 332 / 335 OP mit Darlington-

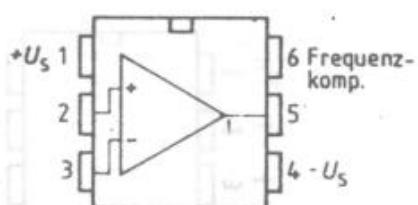
H. 96



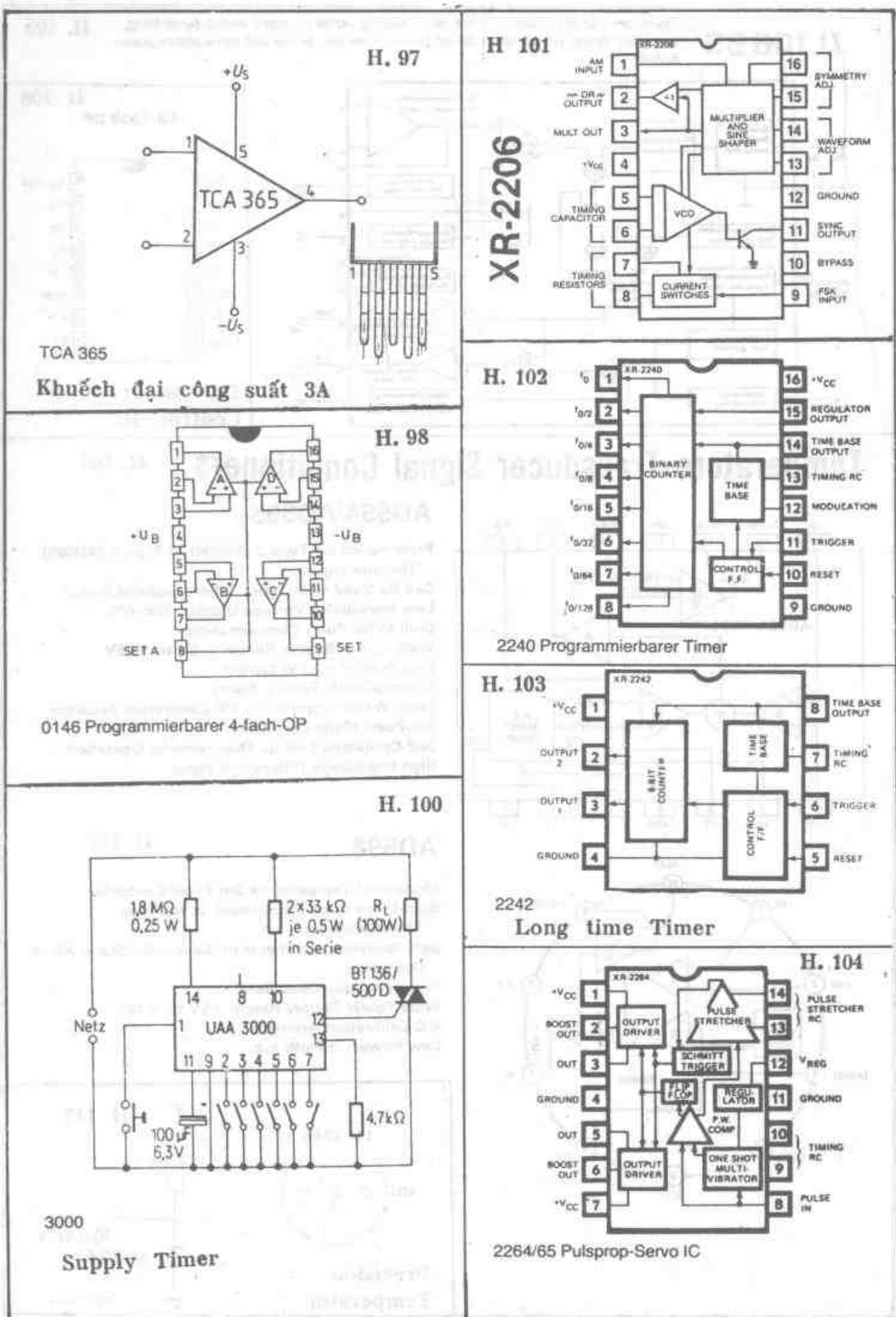
311 / 312 / 315 OP mit Darlington-



311 A / 312 OP mit Darlington-



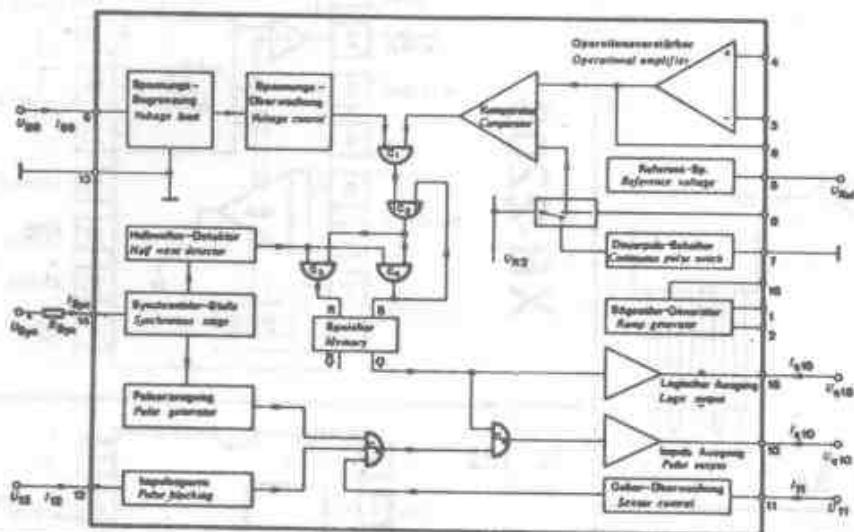
1453 A, G



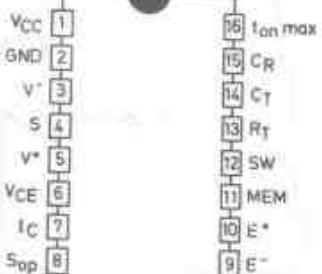
# U 106 BS

Thyristor- and triac control in the zero crossing mode for static switch, burst firing, two-point driver, proportional driver, power timer, etc. in one and three phase power supply.

H. 105



H. 108  
UAA 4003 DP



DC - Motor  
Control IC

## Temperature Transducer Signal Conditioners

H. 106

### AD594/AD595

Pretrimmed for Type J (AD594) or Type K (AD595)  
Thermocouples

Can Be Used with Type T Thermocouple Inputs

Low Impedance Voltage Output: 10mV/ $^{\circ}$ C

Built-In Ice Point Compensation

Wide Power Supply Range: +5V to  $\pm 15V$

Low Power: <1mW typical

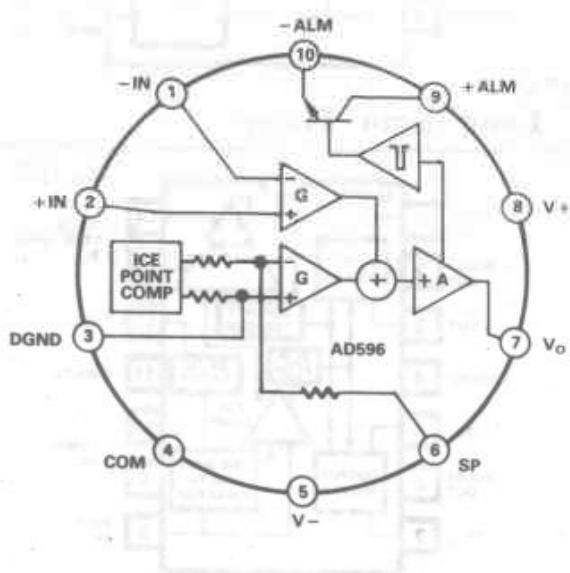
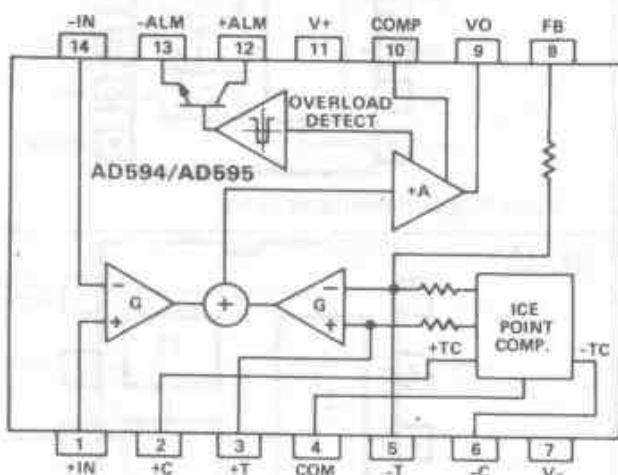
Thermocouple Failure Alarm

Laser Wafer Trimmed to  $1^{\circ}$ C Calibration Accuracy

Set-Point Mode Operation

Self-Contained Celsius Thermometer Operation

High Impedance Differential Input



### AD596

H. 107

Monolithic Temperature Set-Point Controller  
Built-In Ice Point Compensation for Type J  
Thermocouples

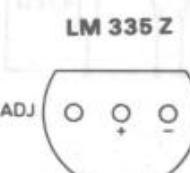
Self-Contained Temperature Sensor for Stand-Alone  
Operation

Programmable Dead Band

Wide Power Supply Range +5V to  $\pm 15V$

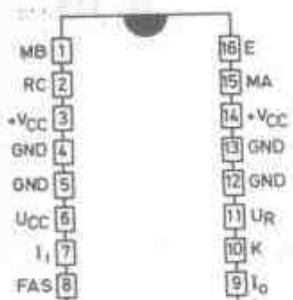
4 $^{\circ}$ C Calibration Accuracy

Low Power:  $\pm 1mW$  typ

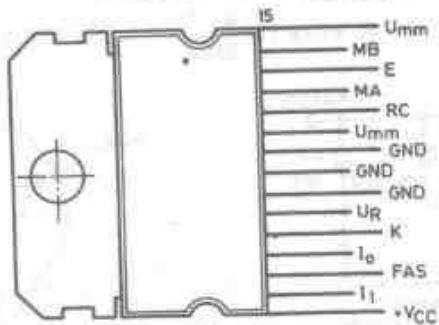


Precision  
Temperatur

TEA 3717 DP



TEA 3717 SP H. 109



Step motor control

Auxiliary output  
for BTL application

Output (2)

Bootstrap (2)

Power ground

Power ground

Feedback (2)

Positive input (2)

Ripple rejection

2025

VCC

Output (1)

Bootstrap (1)

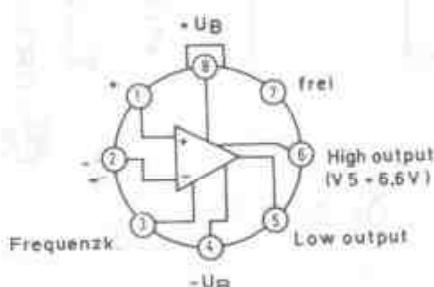
Power ground

Power ground

Feedback (1)

Positive input (1)

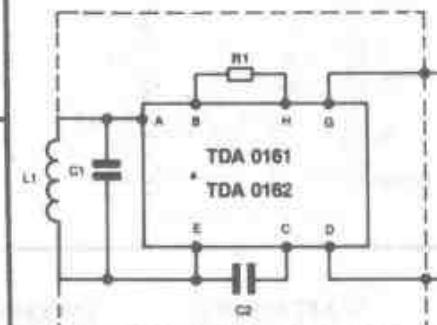
Ground (substrat)

H. 114  
Stereo  
Ampl.TDB 2022 CM  
TDC 2022 CM

H. 116

Khuếch đại  
cao tần

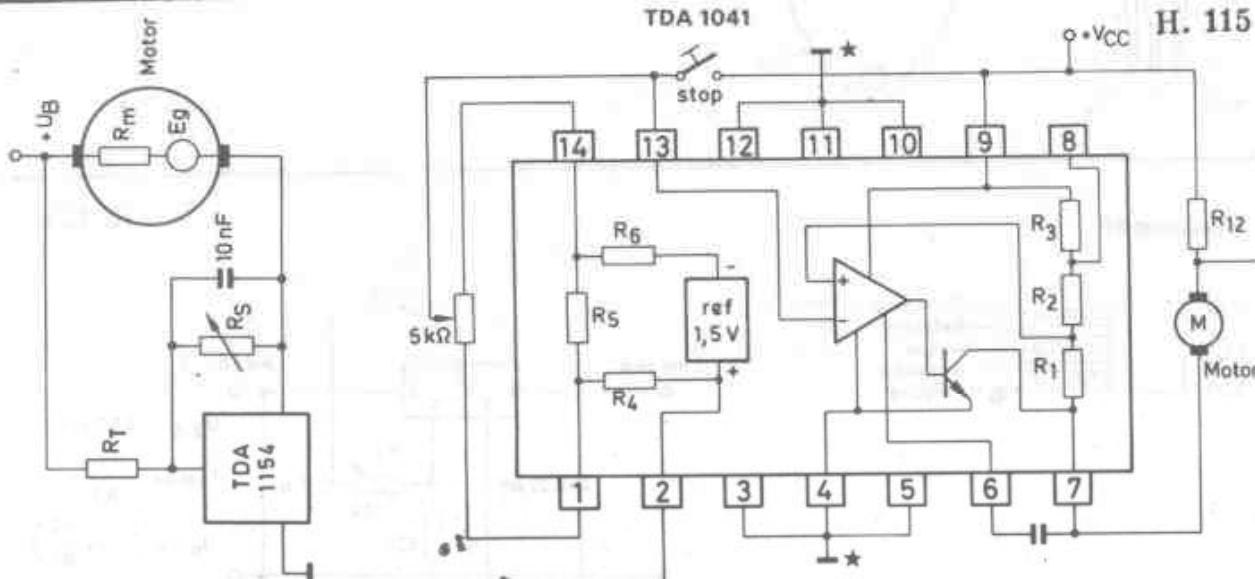
TEA 1510 DP/FP

TEA 1511 DP  
Triac control

H. 113

IC đóng mở  
khi đến gần

TDA 1041



$U_B = 12V$   
 $R_m = 14,7\Omega$   
 $R_T = 290\Omega$   
 $R_S = 1k\Omega$  (total)  
 $E_g = 2,65V$   
 $I_m = 110mA$

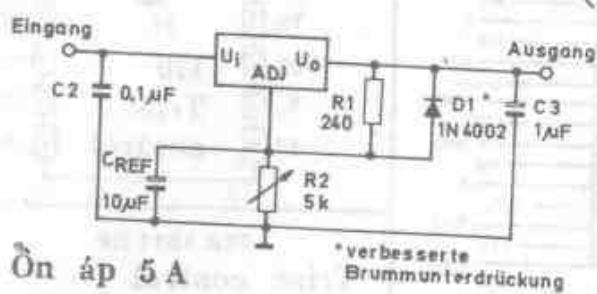
$R_1 = 6,8k\Omega$   
 $R_2 = 1,2k\Omega$   
 $R_3 = 1,4k\Omega$   
 $R_4 = 1 k\Omega$   
 $R_5 = 2,7k\Omega$   
 $R_6 = 2,3k\Omega$

$$1V < E_g < 3V \quad R_{12} = \frac{R_{MOT}}{2,7}$$

$$1,8V < E_g < 6V \quad R_{12} = \frac{R_{MOT}}{6}, R_3 \text{ kurzgeschlossen}$$

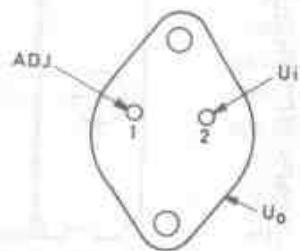
Ôn định  
vòng quay  
DC motor

### Betriebsschaltung

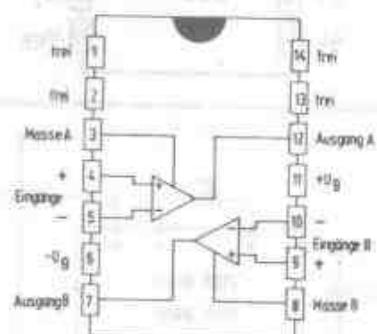


LM 338 K

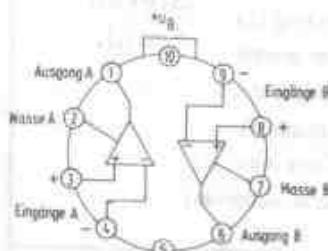
H. 119



LM 319 DP  
LM 219 DP  
LM 119 DG



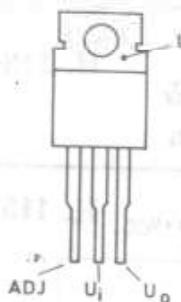
LM 319 H  
LM 219 H  
LM 119 H



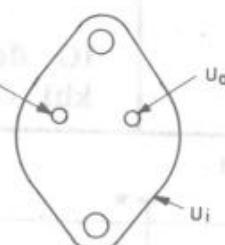
Dual Comparator

H. 118

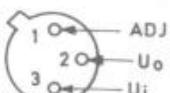
LM 337 SP/SP 3



LM 337 K  
LM 237 K  
LM 137 K



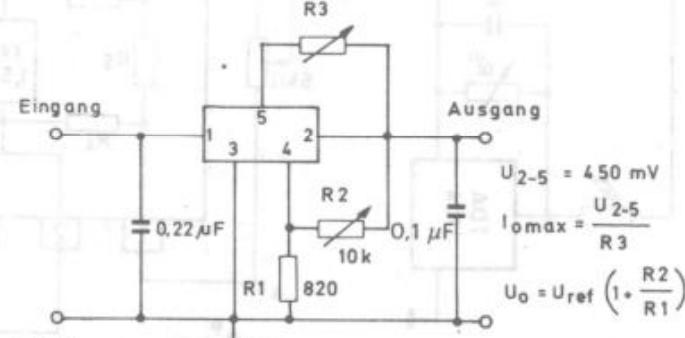
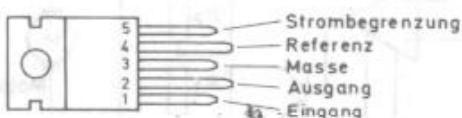
LM 337 H  
LM 237 H  
LM 137 H



On áp ám

$$-U_o = 1,25 \left(1 + \frac{R_2}{120}\right)$$

TDA 0200 SP



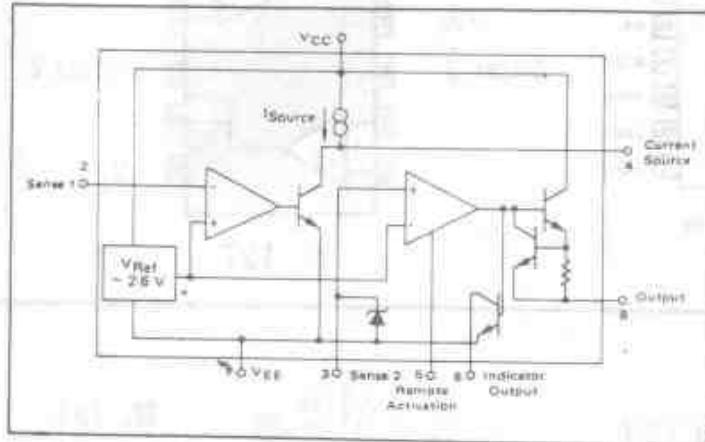
$U_i$ (V)	$I_o$ (A)	$T_j$ ( $^{\circ}\text{C}$ )	$-U_o$ (V)	$I_o$ (A)
40	3,6	-25...150	2,85...36	0...2

On áp

## MC3423 MC3523

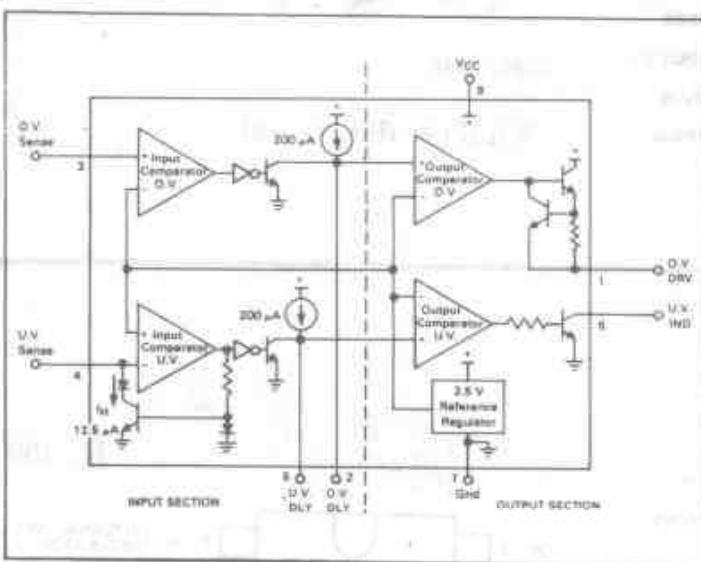
H. 122

### Overvoltage «Crowbar» sensing Circuit



## MC3425 MC3425A H. 124 MC3525 MC3525A

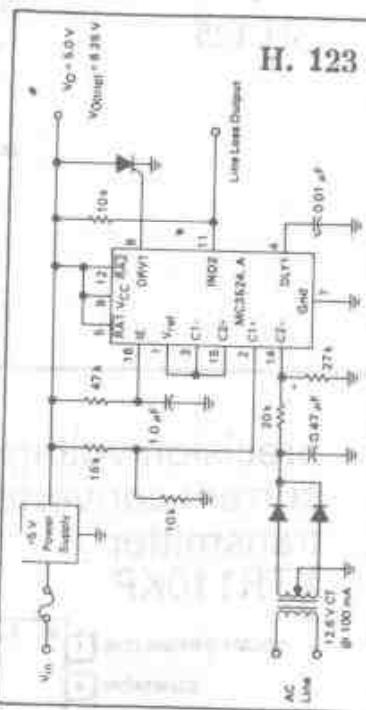
### Power Supply Supervisory/over-under-Voltage Protection Circuit



## MC3424, MC3524, MC3324,

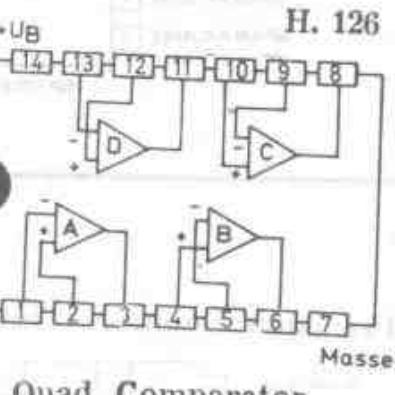
H. 123

### Overvoltage Protection of 5.0 Supply with Line Loss Detector



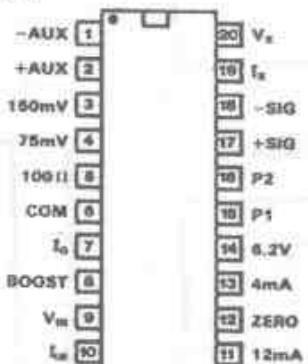
## ESM 1600 B ESM 1602 B

H. 126

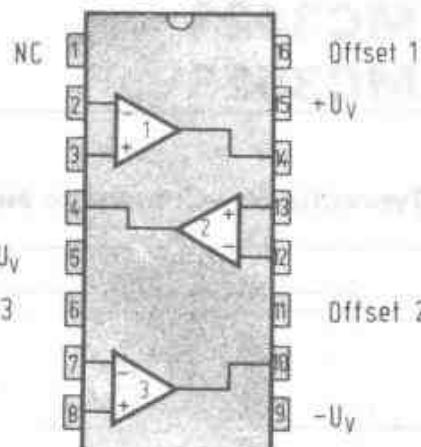


Quad Comparator

4 to 20 mA sensor  
transmitter  
AD693AD

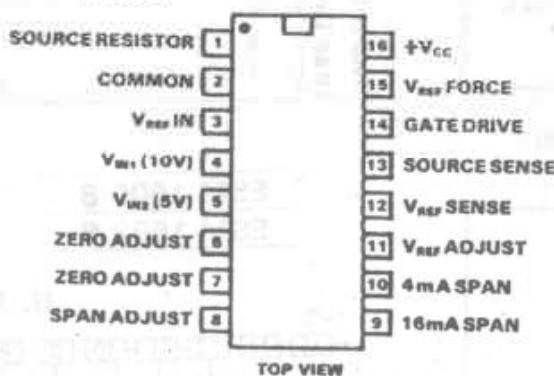


H.125

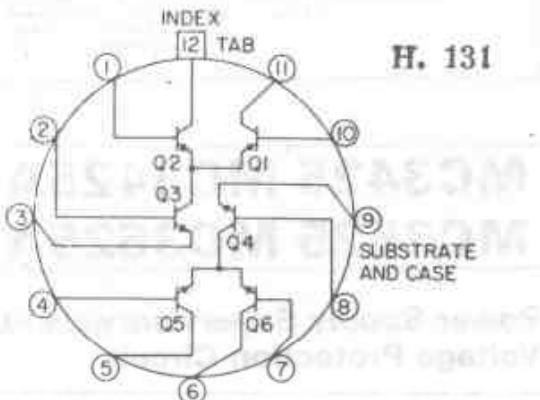


H. 127

precision voltage to  
current converter/  
transmitter  
**XTR110KP**



H.128

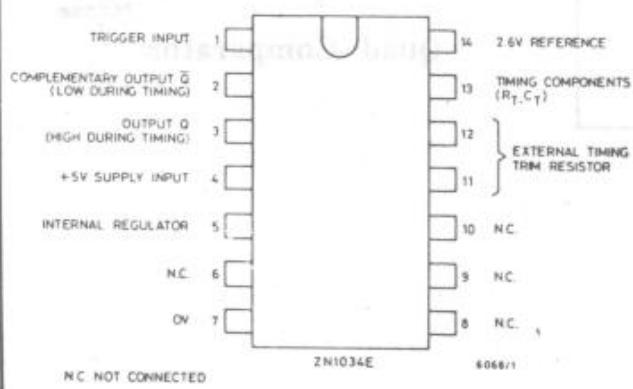


H. 131

3026, 3049

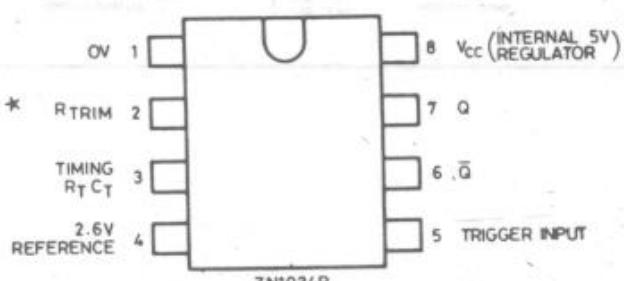
## Khuếch đại vi sai

## Precision Counter Timer



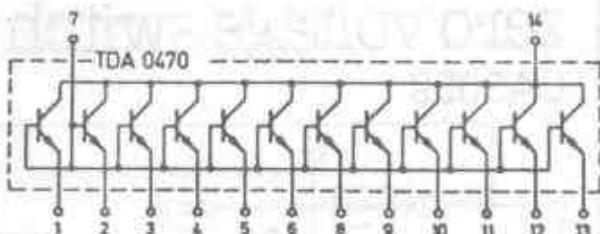
NIC NOT CONNECTED

ZN 1034E



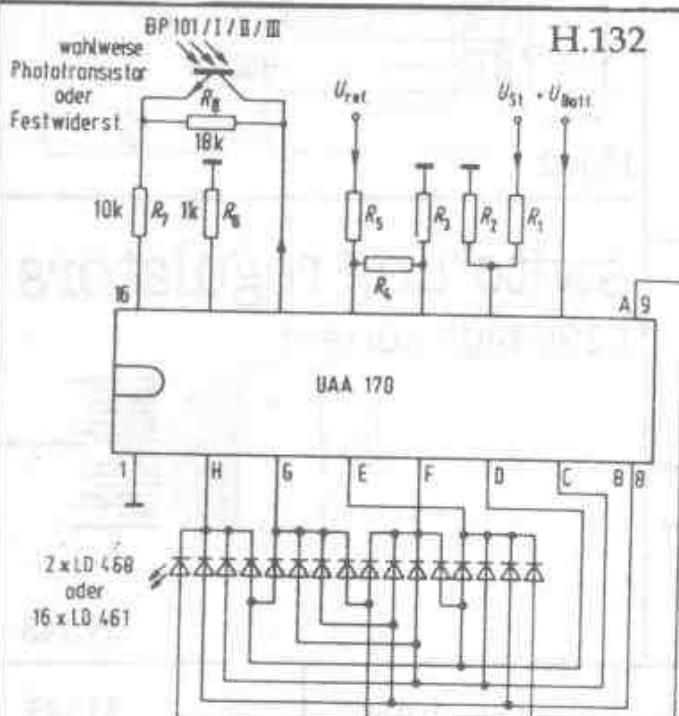
\* CONNECT TO OV DIRECT OR VIA R<sub>TRIM</sub>

ZN 1034 P



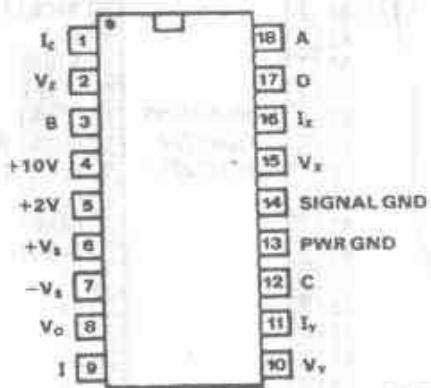
Innenschaltung des TDA 0470

H.129



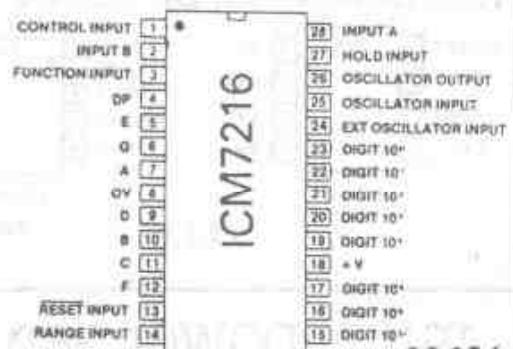
H.132

real-time analogue  
computational unit  
AD538AD



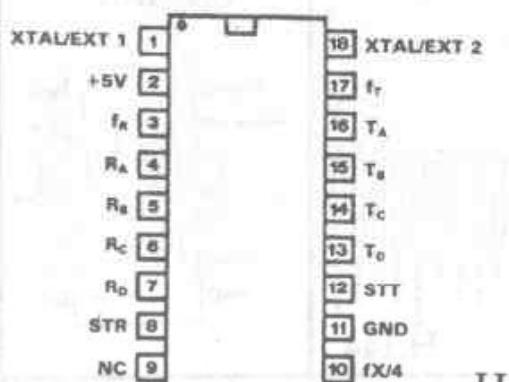
H.135

universal counter

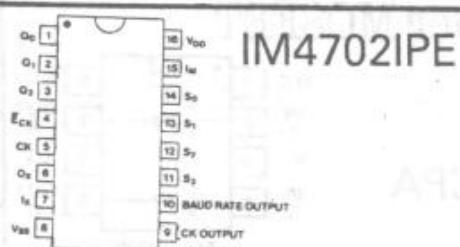


H.136

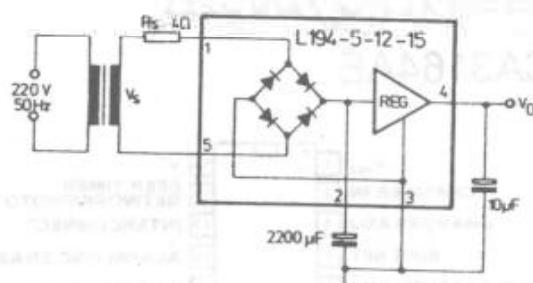
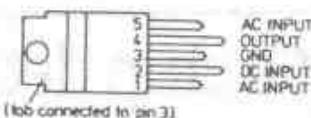
COM 8116P



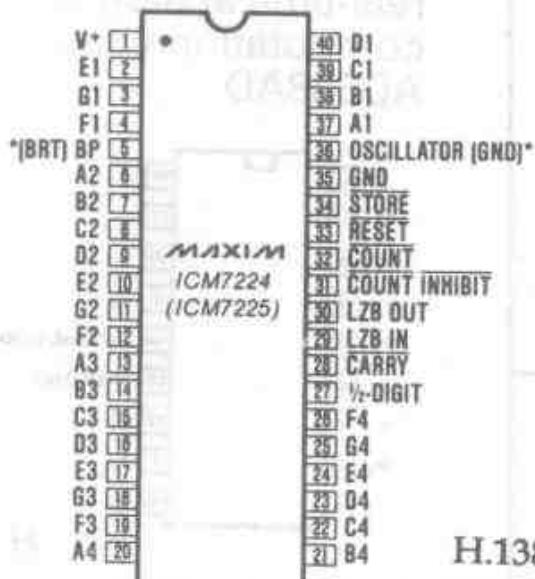
H.133



H.134

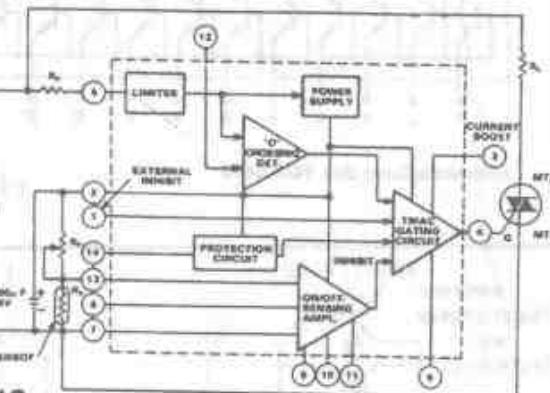


H.137



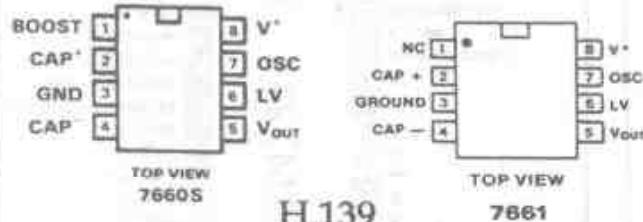
H.138

## zero voltage switch CA3059



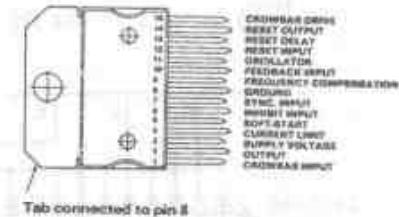
H.142

## voltage converters ICL7660SCPA, Si7661CJ



H.139

7661



H.143

## micropower sensors

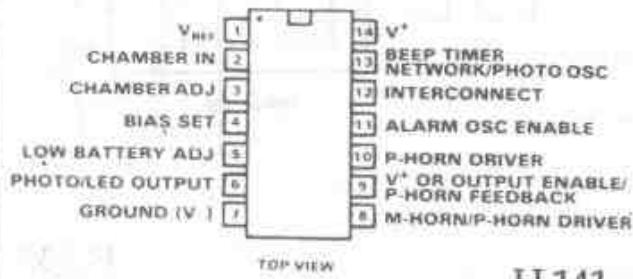
ICL8212CPA,  
ICL8211CPA

H.140



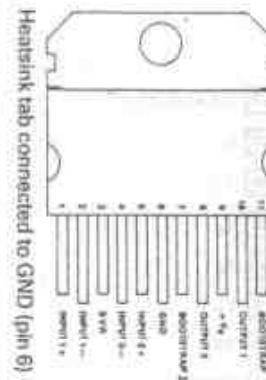
## single chip detector/ alarm system

CA3164AE



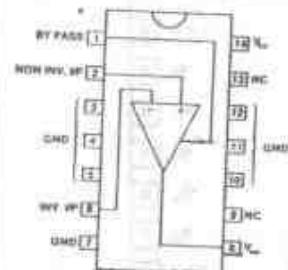
H.141

## TDA 2004



H.144

## LM380

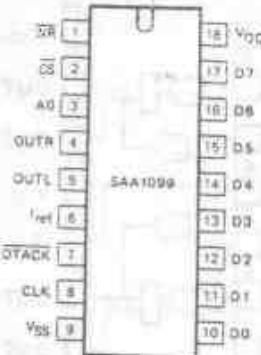


## dual power MOSFET driver

ICL7667CPA

H.146

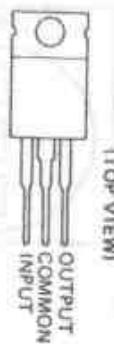
# FM IF System



Microprocessor controlled stereo sound generator  
for sound effects and music synthesis

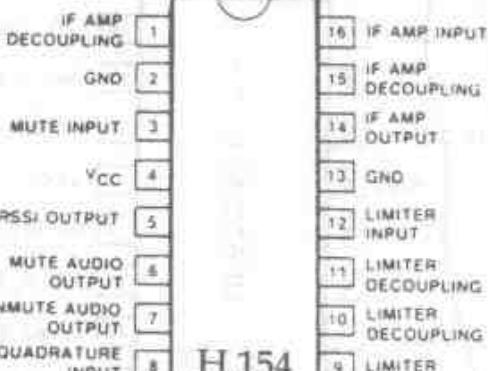
H.147

LM2930-5  
LM2930-8

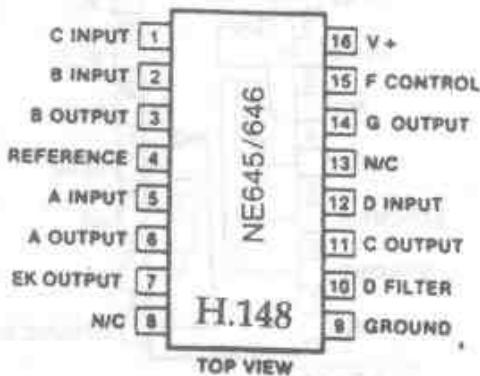


(TOP VIEW)

H.152



H.154

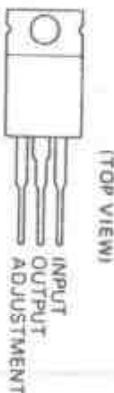


H.148

TOP VIEW

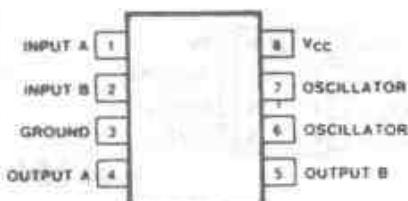
Dolby\* noise reduction systems.

LM350



(TOP VIEW)

H.149

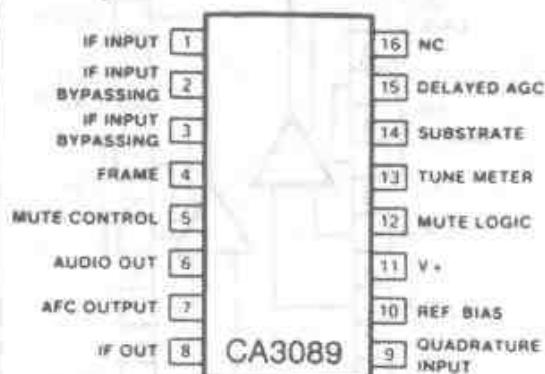


NE612

H.150

NE/SA602

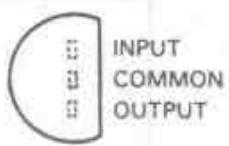
H.151



CA3089

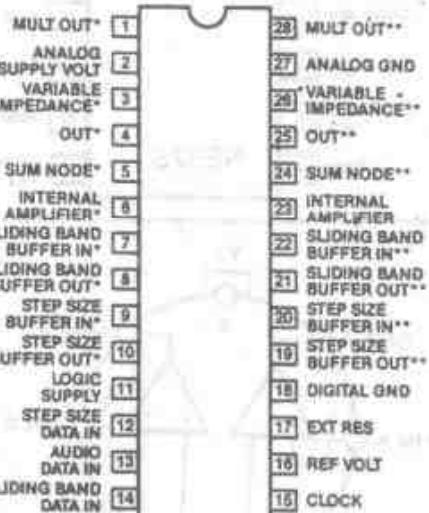
TL011, TL012  
TL014, TL021

(TOP VIEW)



H.153

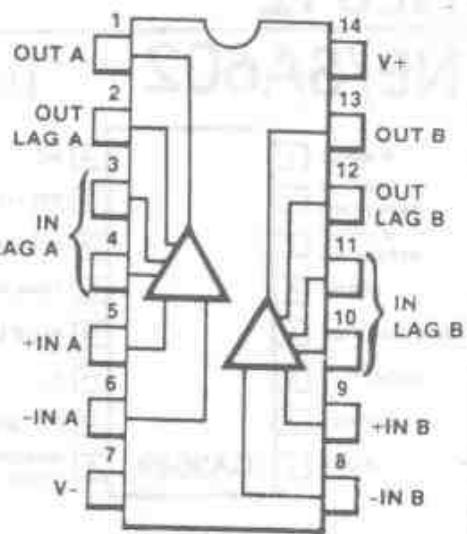
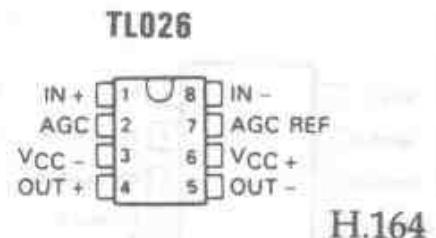
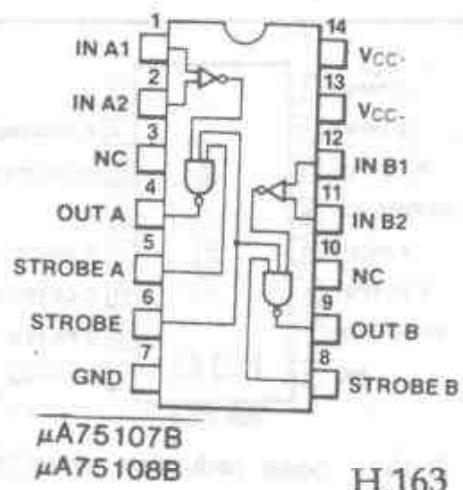
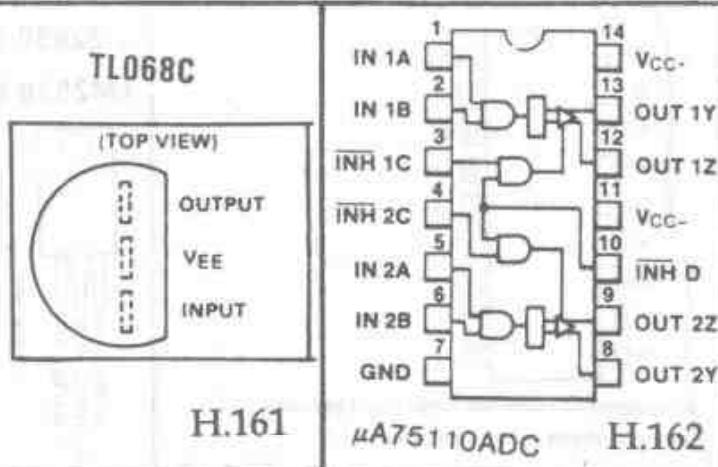
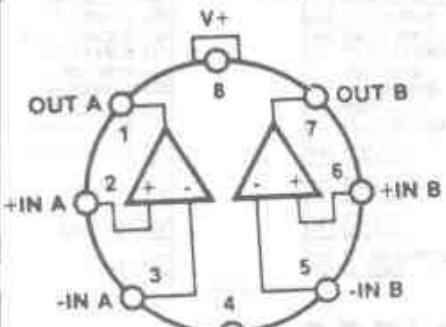
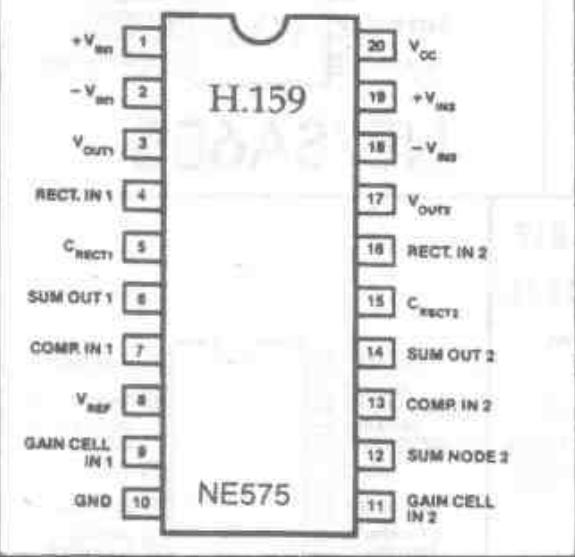
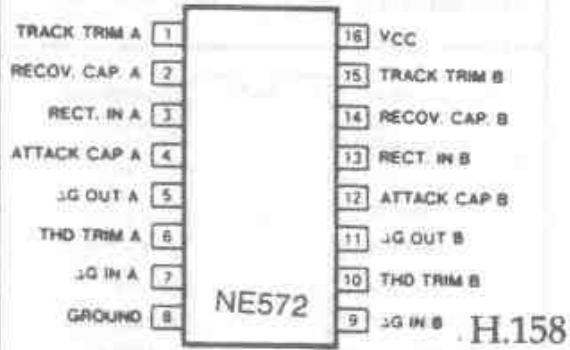
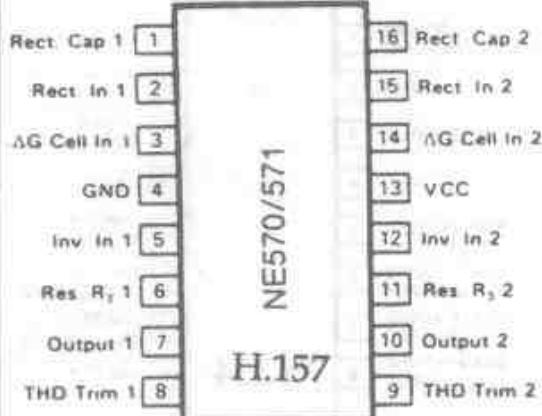
NE/SA605

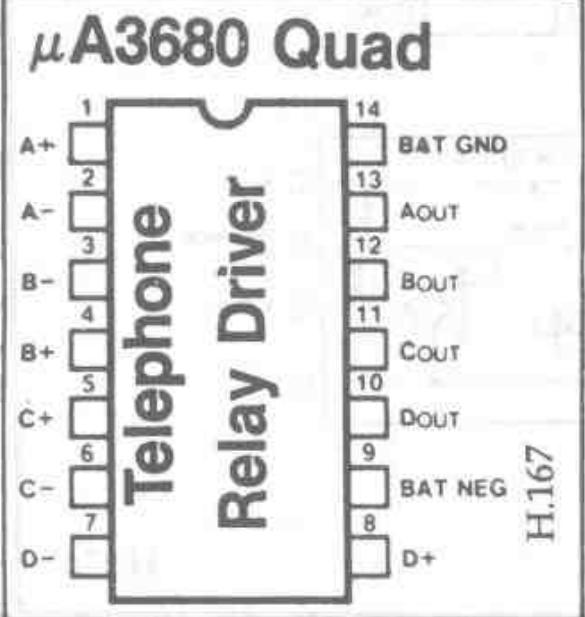
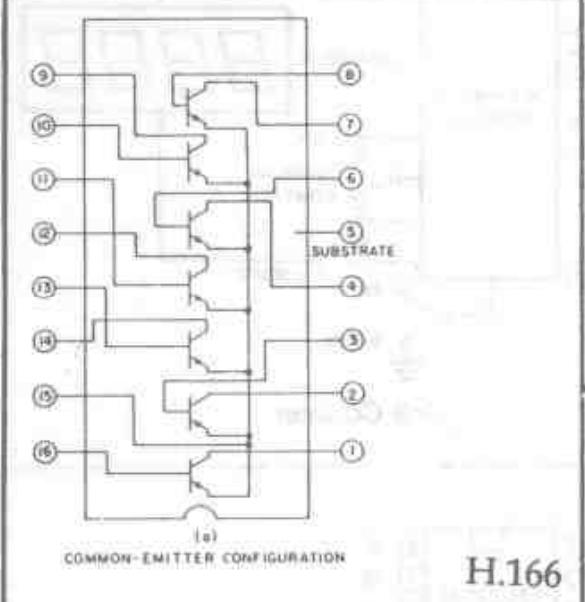
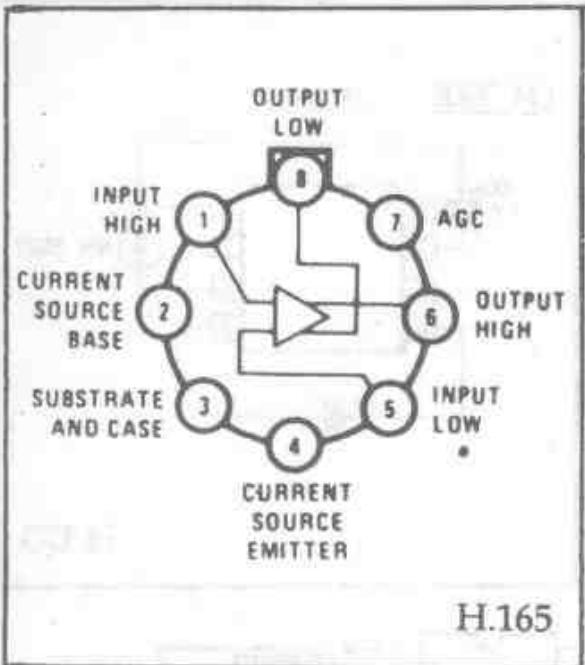


NE5240

H.156

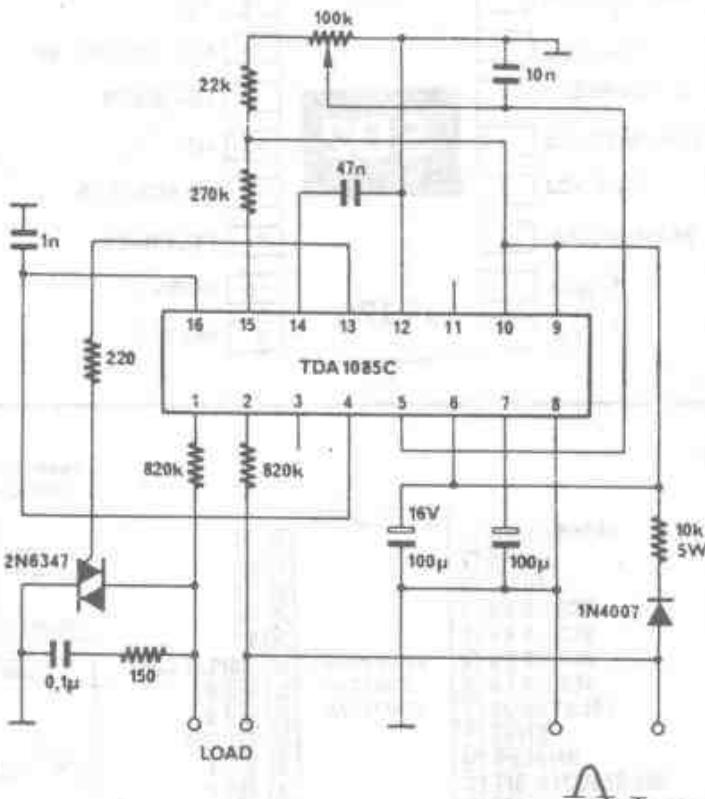
# Compandor





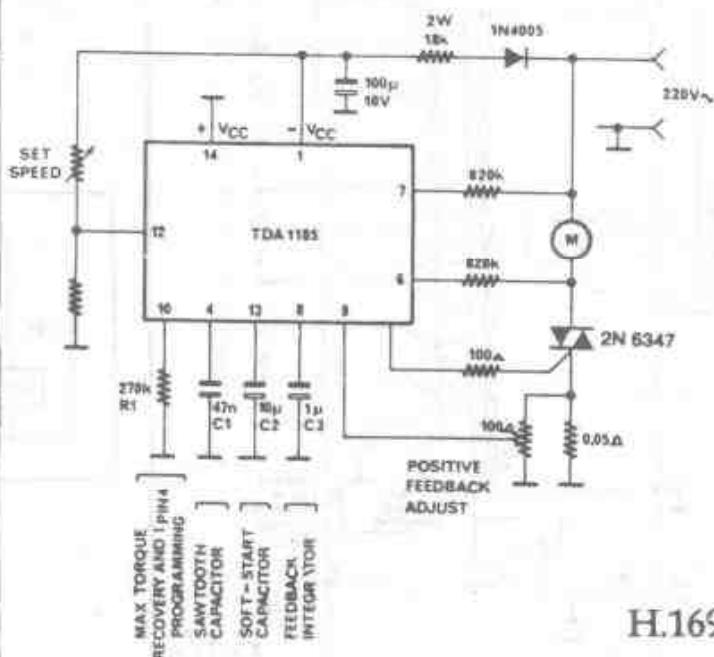
### **H.168 Motor Speed Control Circuits**

TDA 1085-C ( $T_A = 0$  to  $70^\circ\text{C}$ ), Case 648



### **Motor Speed Control Circuits**

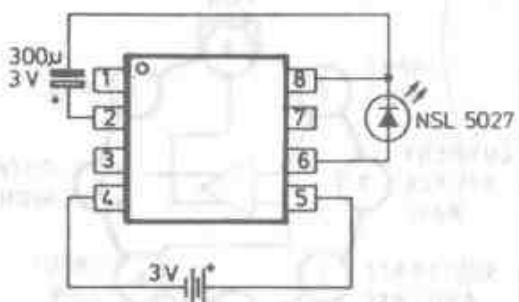
TDA 1185 ( $T_A = 0$  to  $70^\circ\text{C}$ ), Case 646



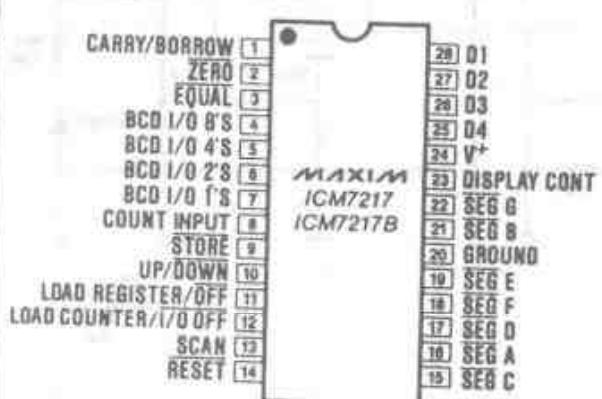
# CMOS Photo-Electric Smoke Detector Integrated Circuit



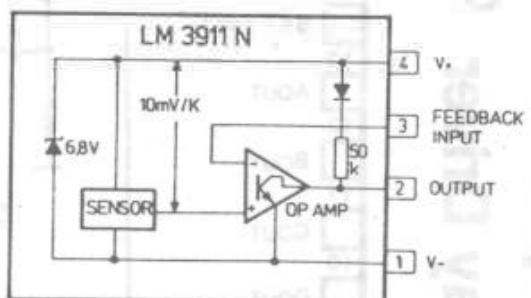
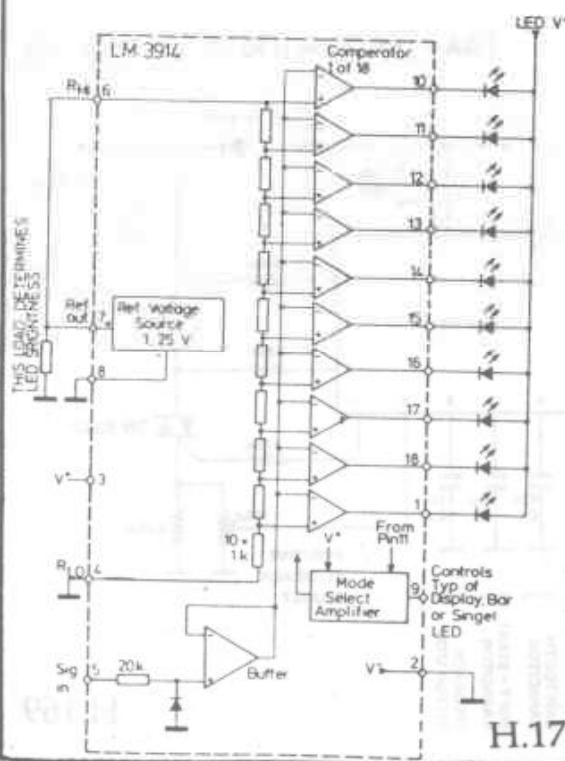
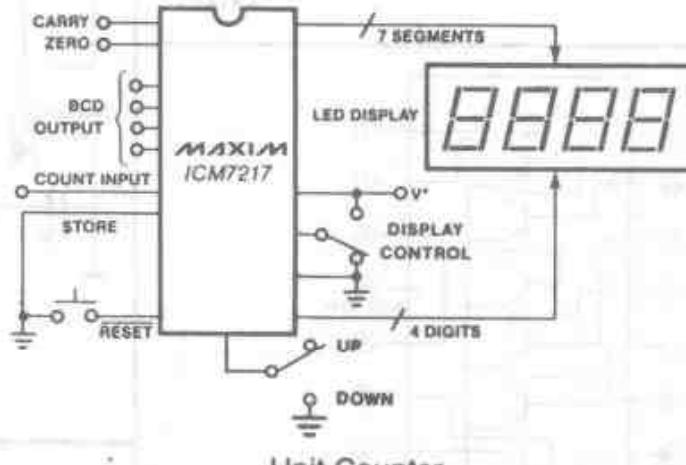
LM 3909 3V Blinker

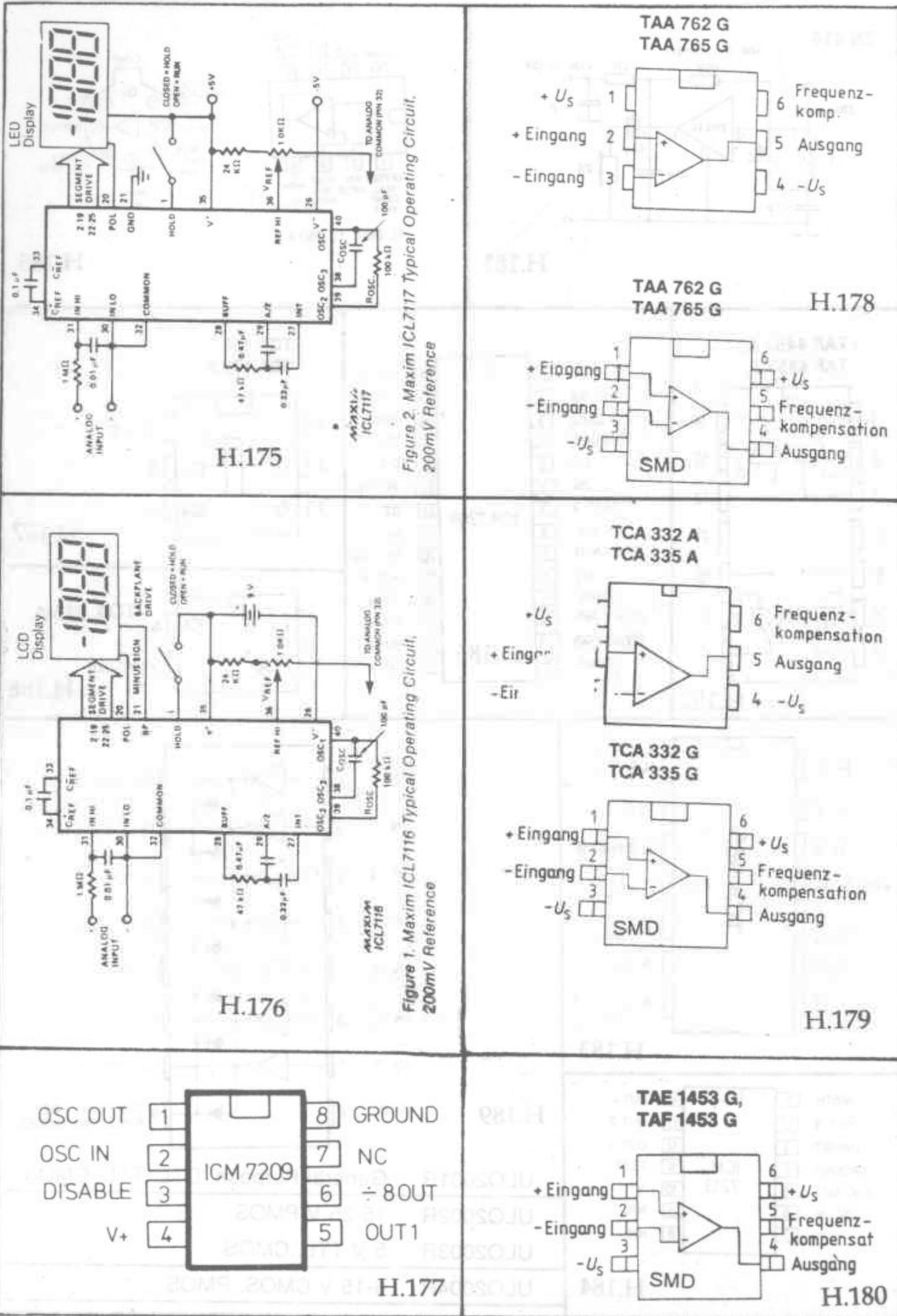


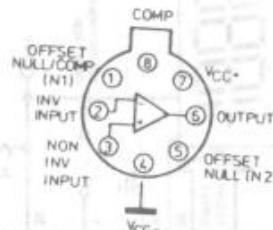
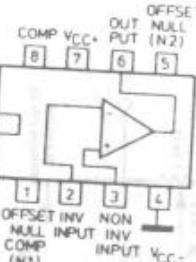
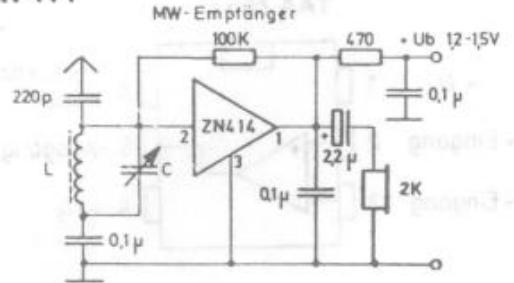
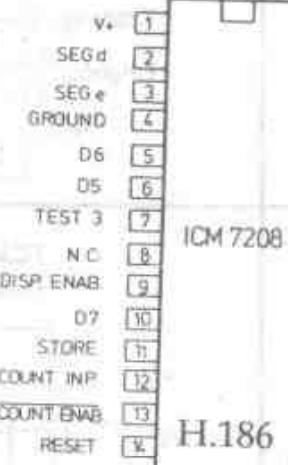
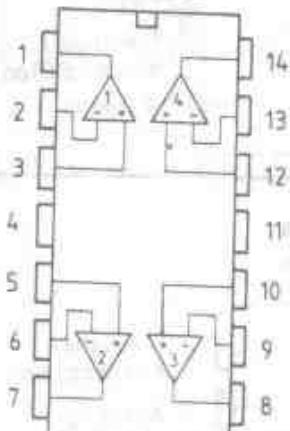
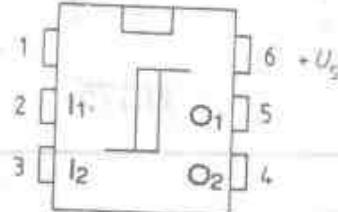
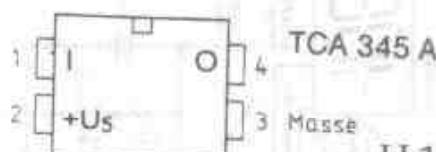
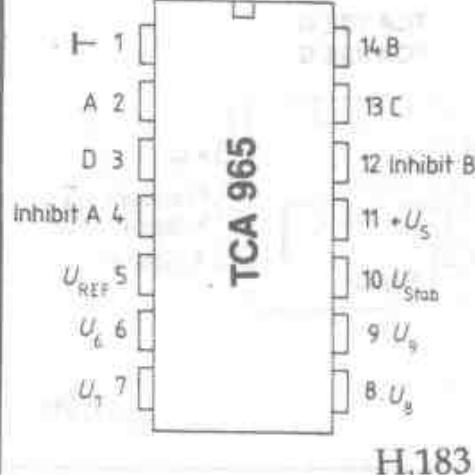
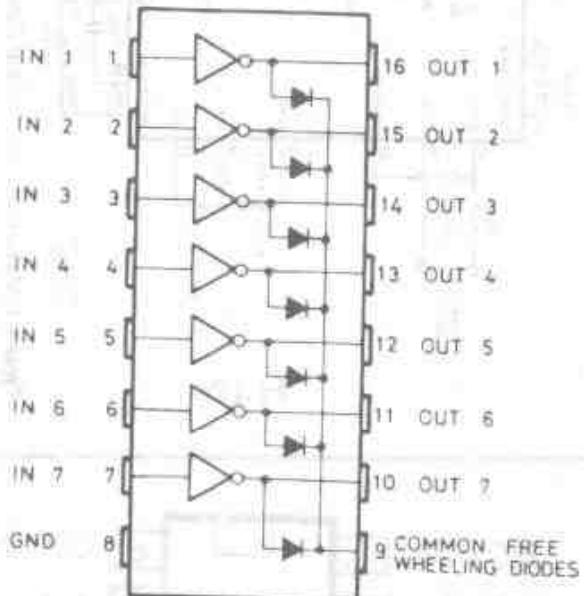
H.173



H.171





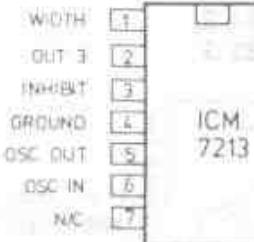
**ZN 414****H.181****H.185****TAE 4453 A,  
TAF 4453 A****H.186****TCA 105,  
TCA 105 B****H.187****H.188****H.183****H.189**

ULQ2001R General Purpose, DTL, TTL, CMOS

ULQ2002R 15-25 V PMOS

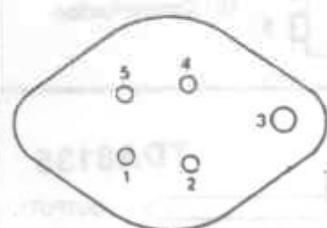
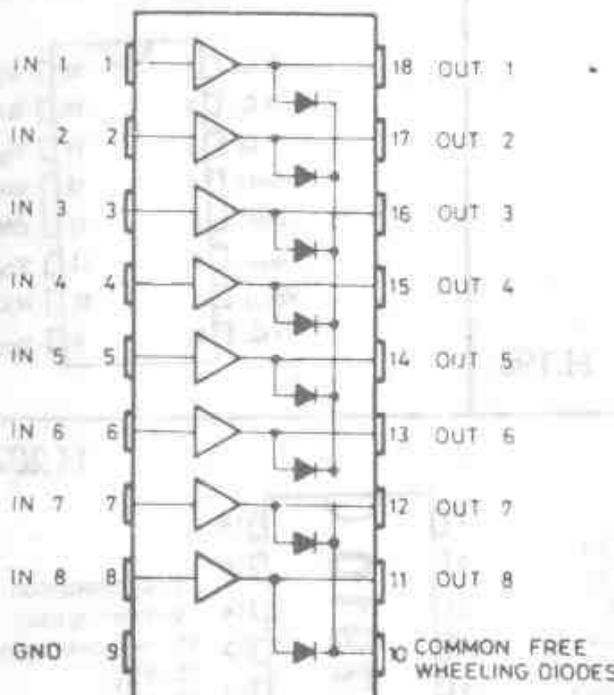
ULQ2003R 5 V TTL, CMOS

ULQ2004R 6-15 V CMOS, PMOS

**H.184**

### ULN2801A-ULN2805A

H.190

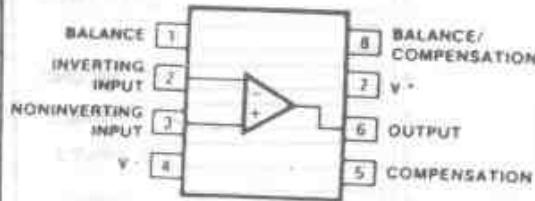


PIN 1 - In  
PIN 2 - Out  
PIN 3 - L  
PIN 4 - ref  
PIN 5 - I<sub>min</sub>

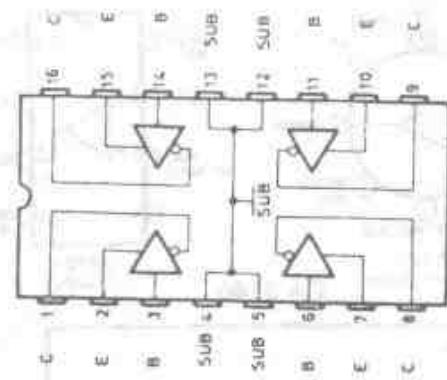
L200C  
L200

H.191

### TDA 1034 N PACKAGE



H.193

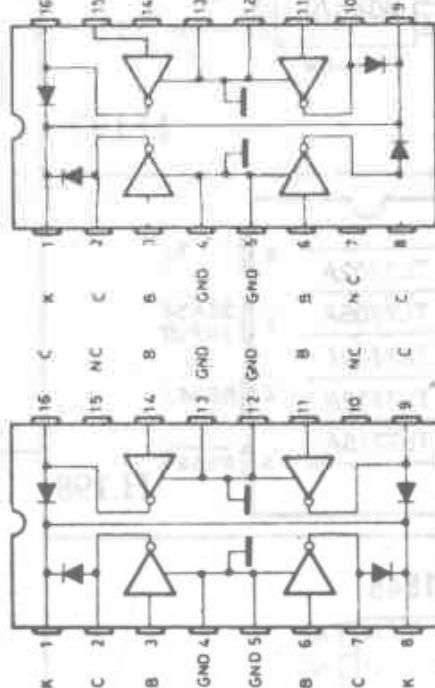


ULN2074B / 75B

ULN2076B / 77B

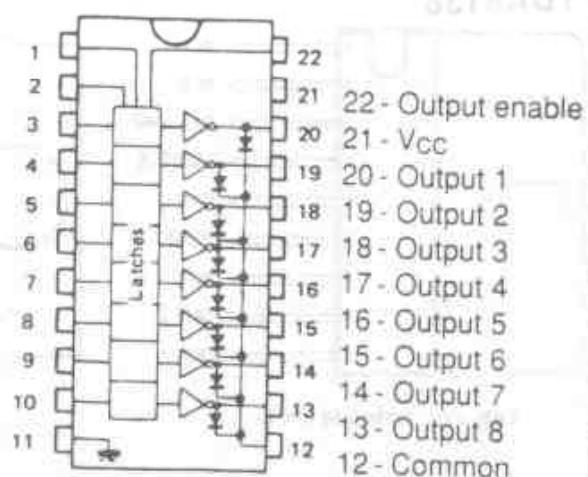
ULN2068B / 69B  
ULN2064B / 65B  
ULN2066B / 67B  
ULN2070B / 71B

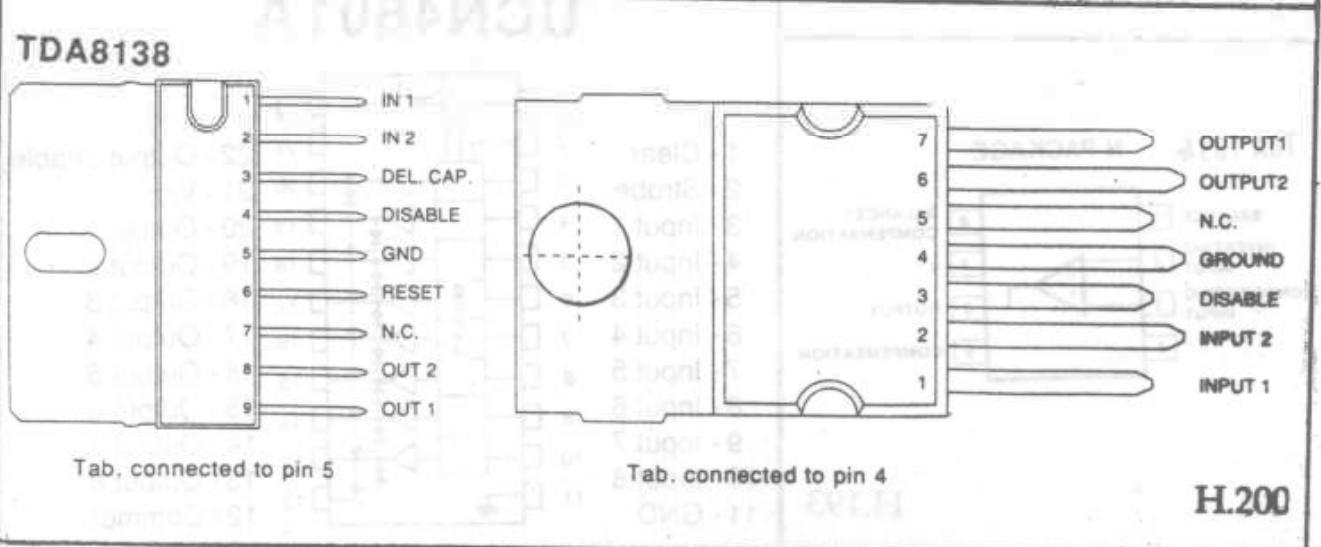
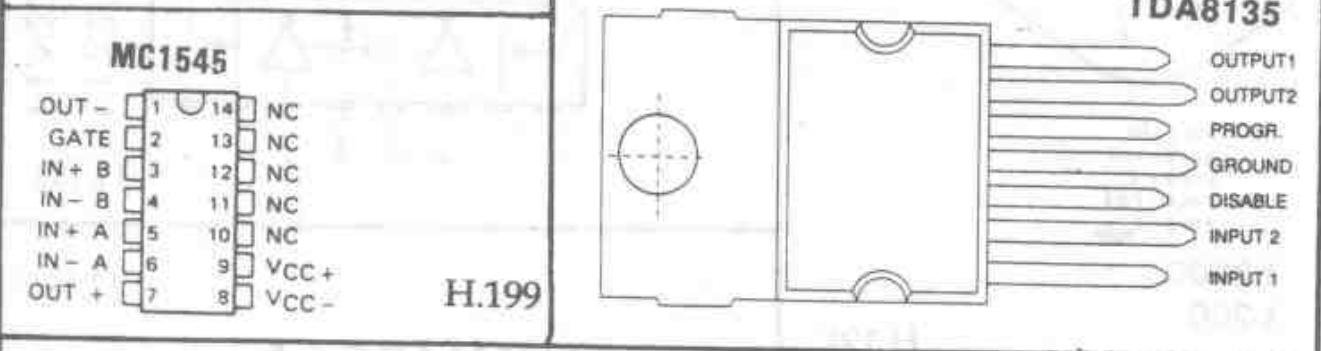
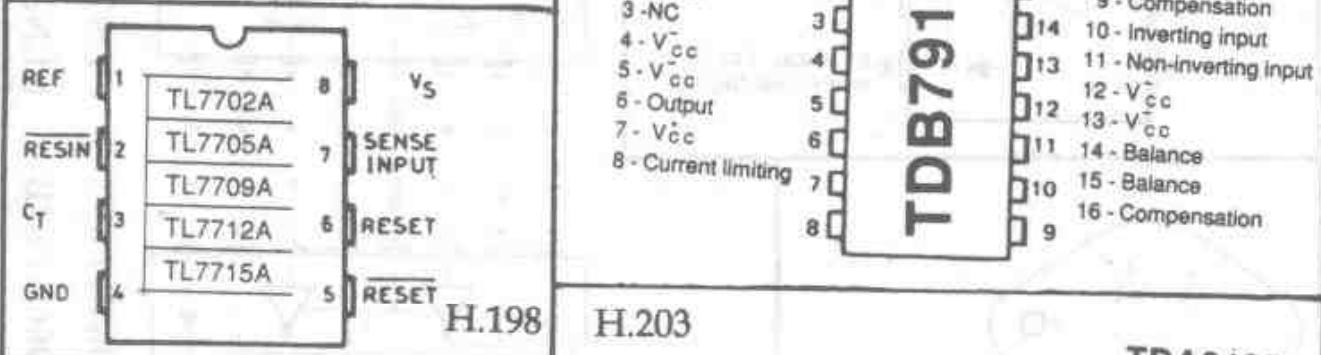
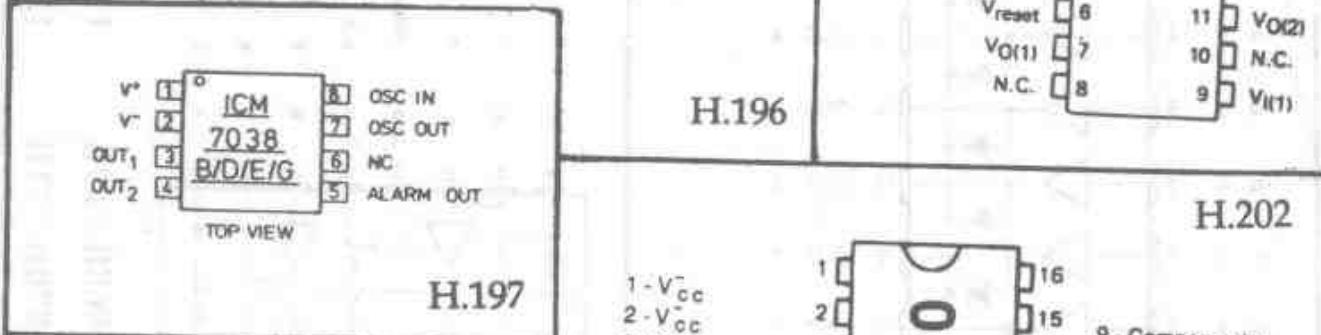
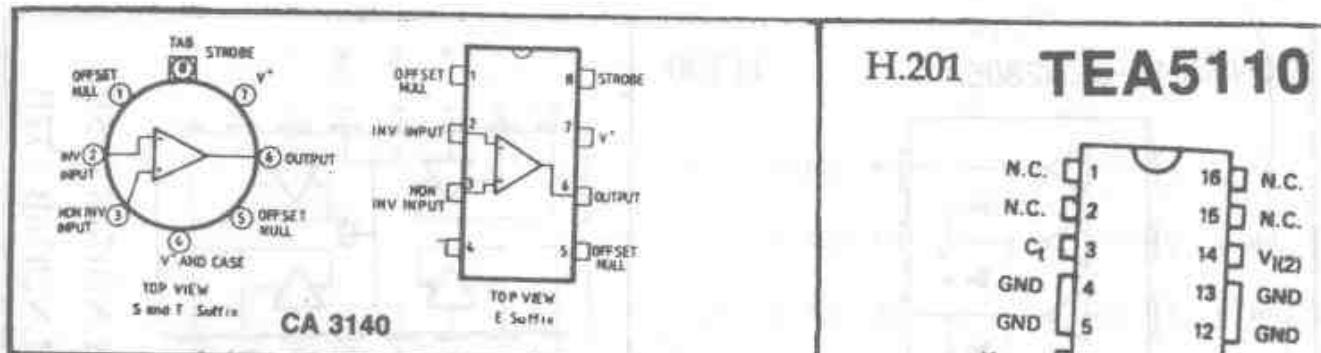
H.194

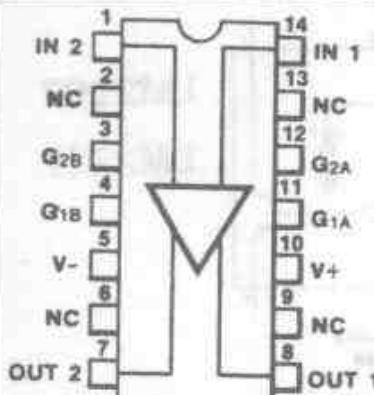


H.195

### UCN4801A

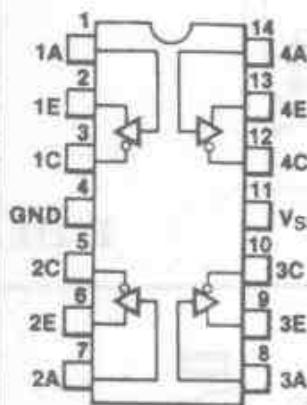
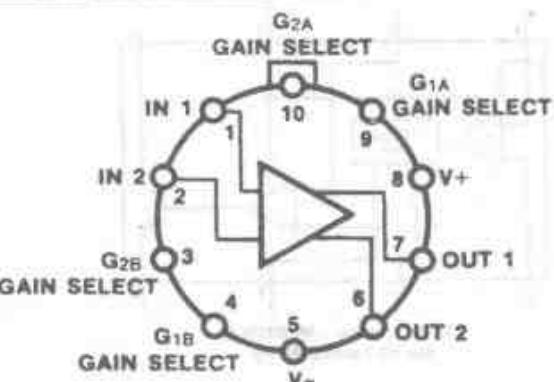




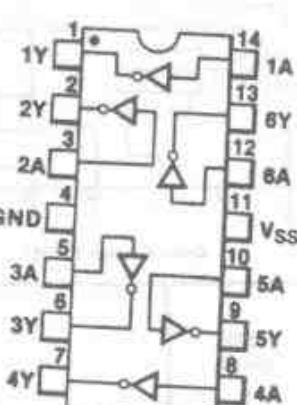


**μA733**

H.204

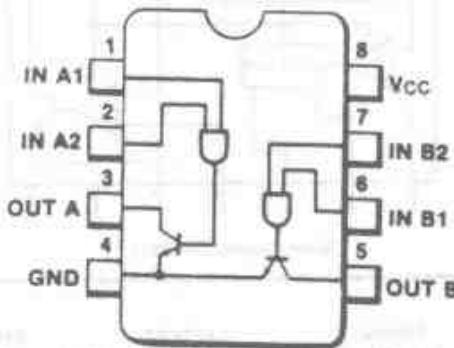


**μA75491**



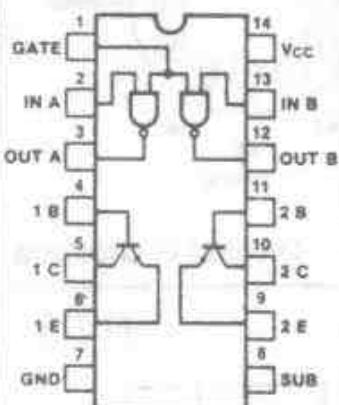
**μA75492**

H.205

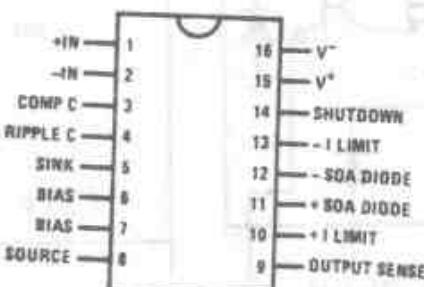


**75452A/B**

**μA75462 • μA75472**

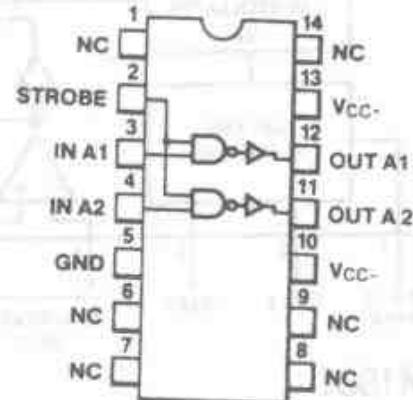


**μA75450B** H.206



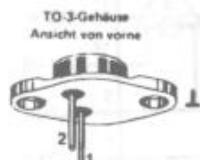
**LM391**

H.207

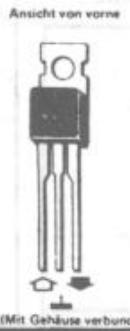


**μA75150**

H.210



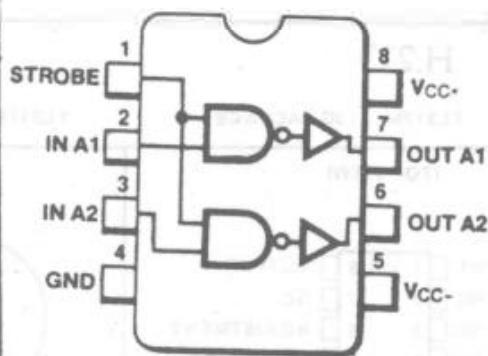
**LM340K**

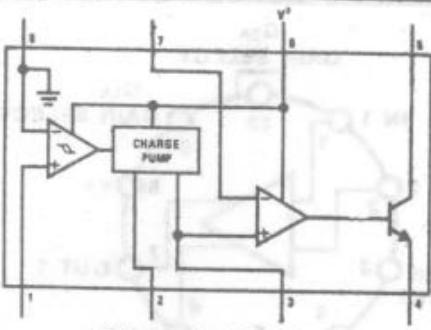


(Mit Gehäuse verbunden)

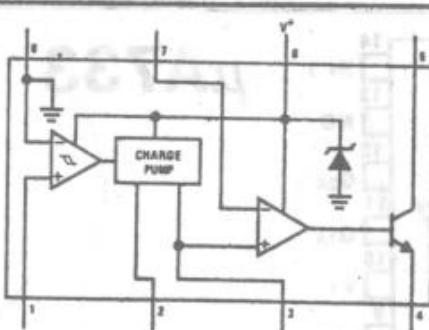
1 In  
2 out

H.208

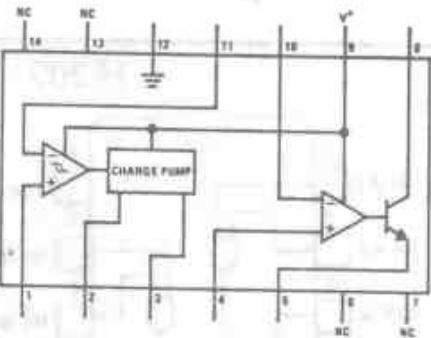




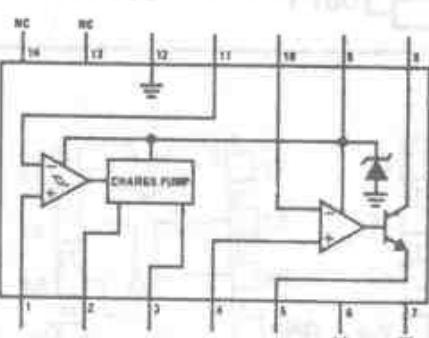
Order Number LM2907N-8  
See NS Package N08B



Order Number LM2917N-8  
See NS Package N08B

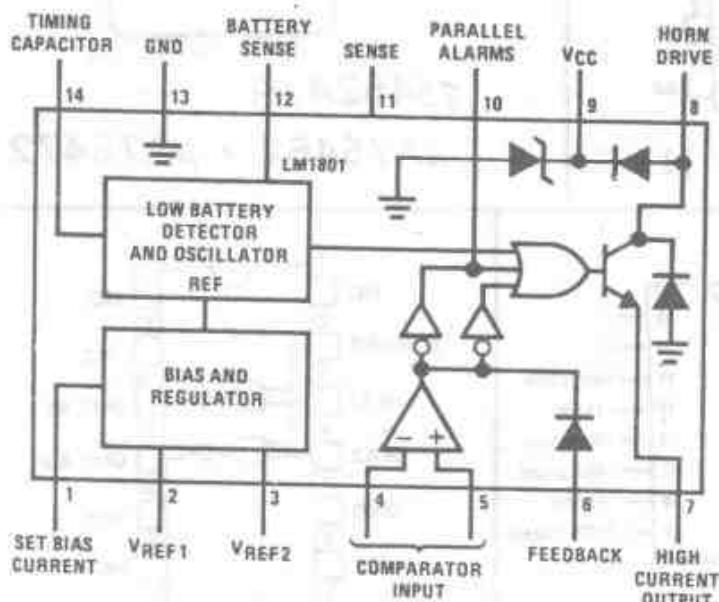


Order Number LM2907J

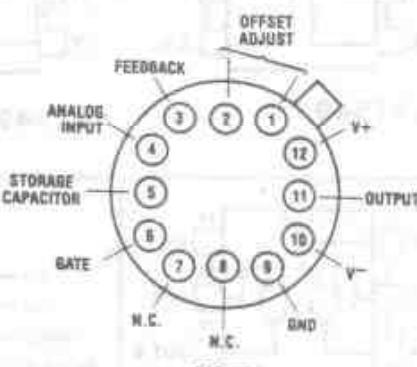


Order Number LM291

H.211

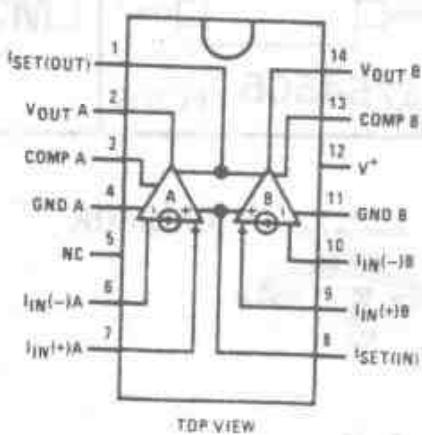


H.212



LH0053G or LH0053CG

H.215



LM159J or LM359J

H.213

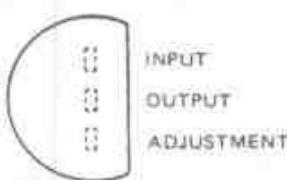
TL317M... JG PACKAGE

TL317C... LP SILECT PACKAGE

[TOP VIEW]

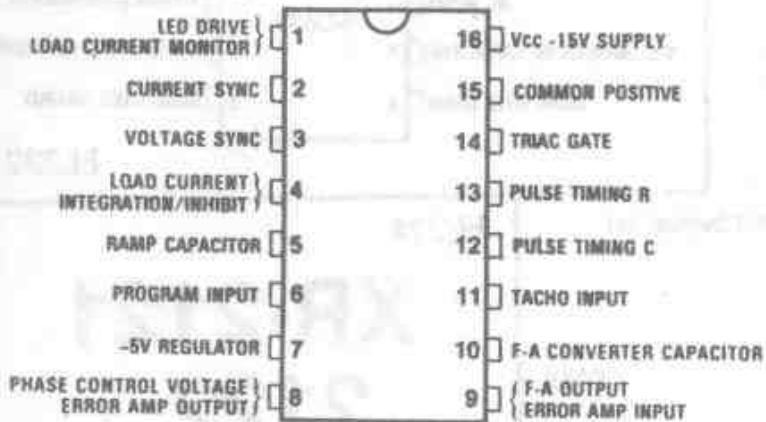
INPUT	1	8	OUTPUT
NC	2	7	NC
NC	3	6	ADJUSTMENT
NC	4	5	NC

[TOP VIEW]

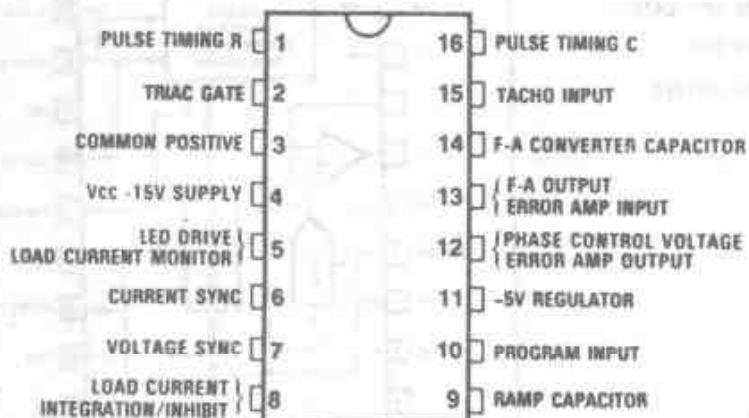


# TDA2086

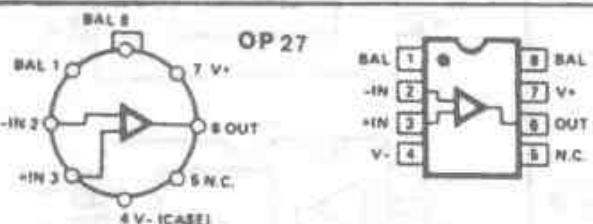
H.216



MP16

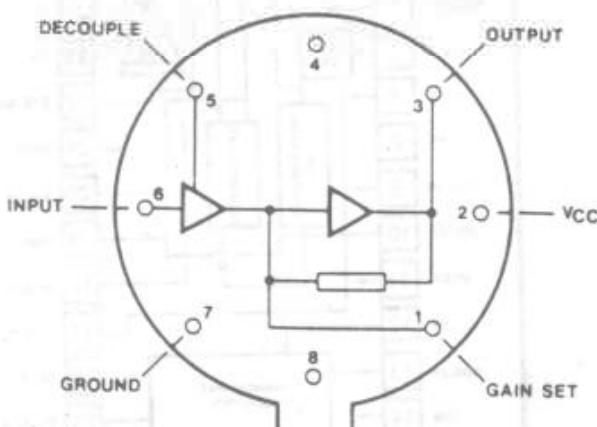


DP16



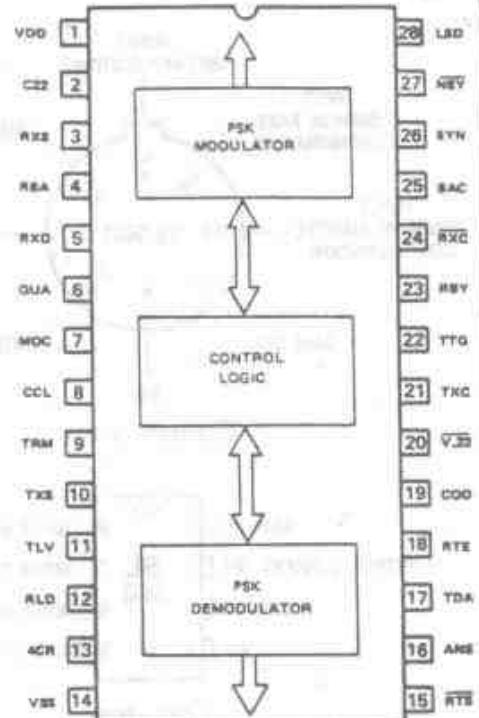
H.217

# SL561B, SL561C

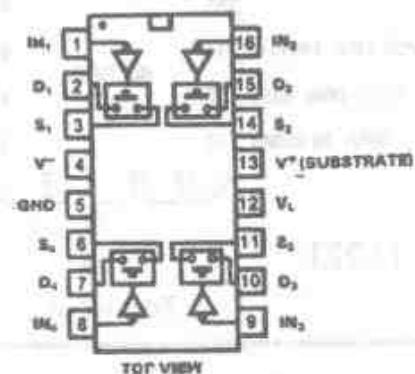


H.218

# XR-2123

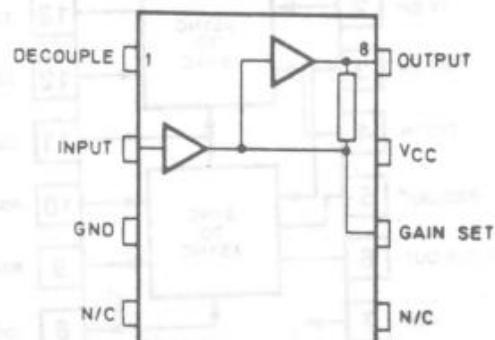


H.219

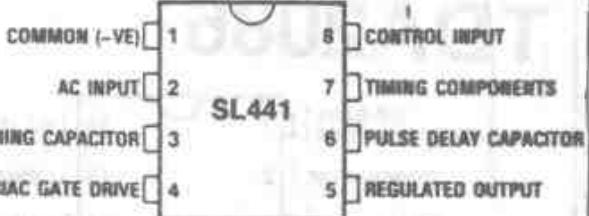
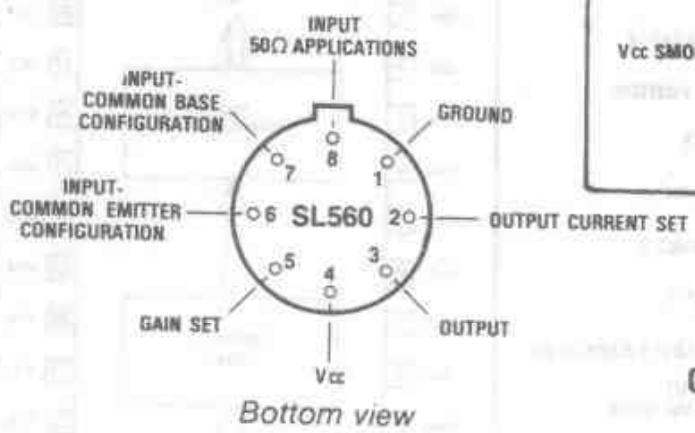


DG201

H.220



# SL560C



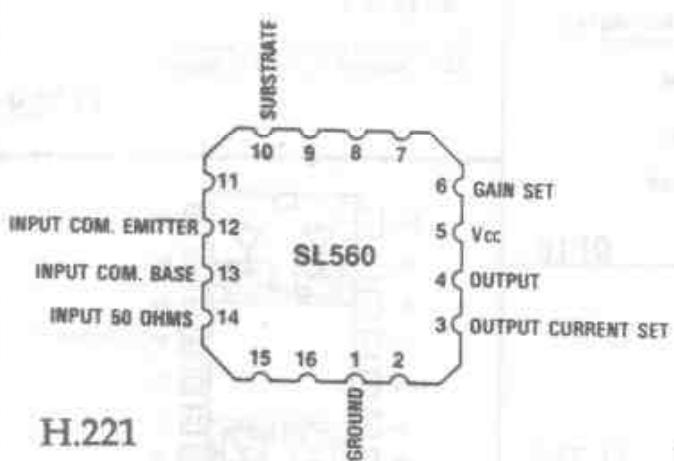
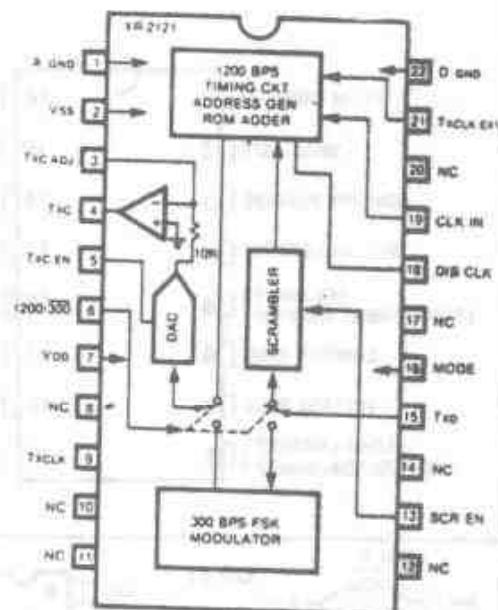
H.222

H.224

# XR-2121 2122

CM8

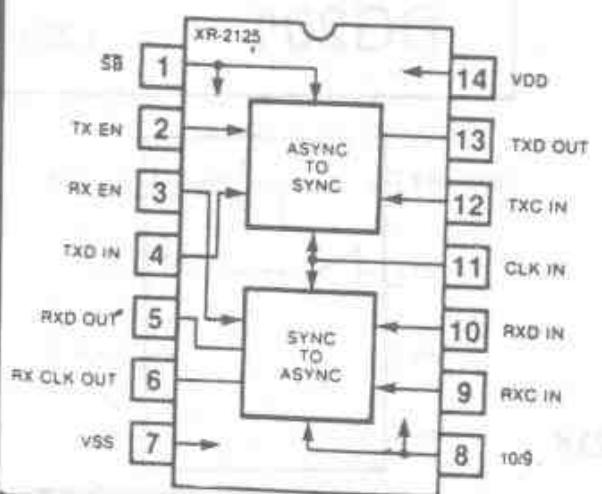
DP8



H.221

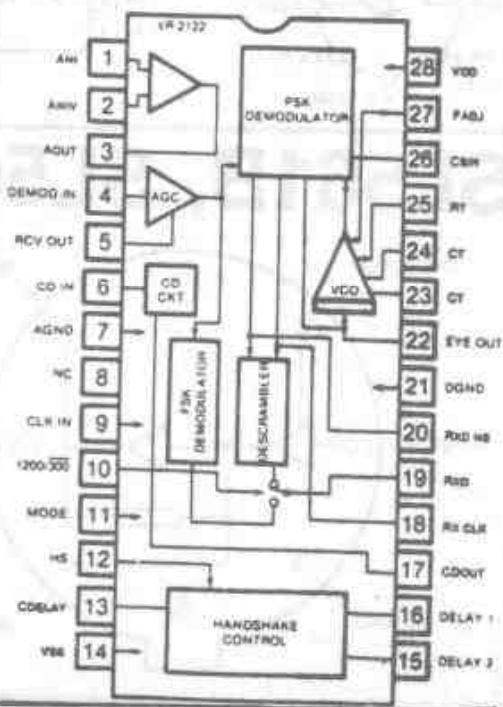
LC16

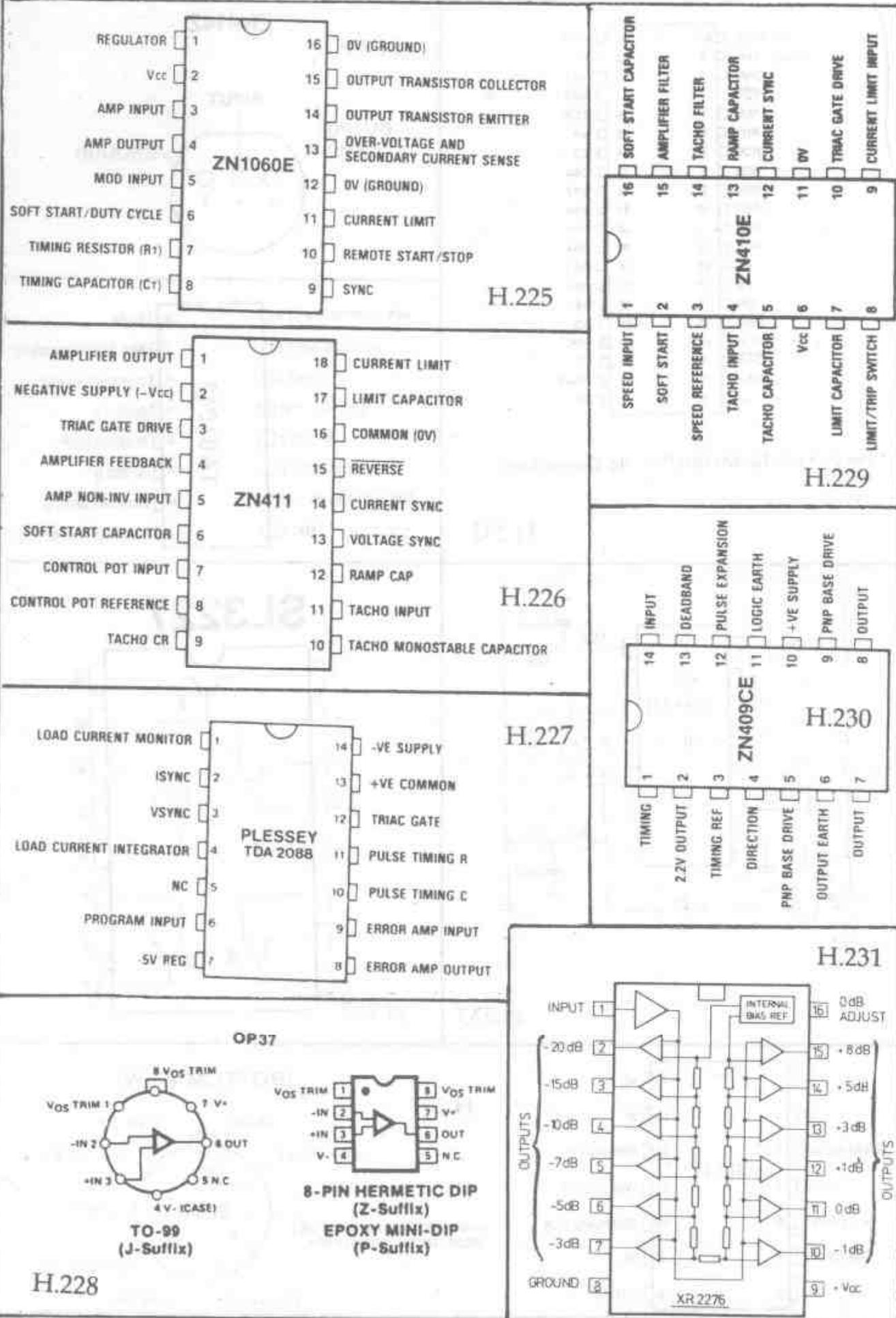
Top view



H.223

# XR-2125





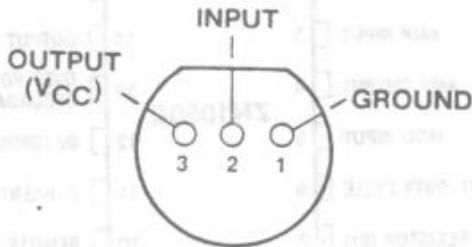
V <sub>CC</sub> (+5V)	1	TCP
'V <sub>DD</sub> (-12V)	2	EPS
GND	3	NB1
RDE	4	NB2
RD8	5	TSB
RD7	6	NP
RD6	7	CS
RD5	8	DB8
RD4	9	DB7
RD3	10	DB6
RD2	11	DB5
RD1	12	DB4
PE	13	DB3
FE	14	DB2
OR	15	DB1
SWE	16	SO
RCP	17	EOC
ROAV	18	DS
DAV	19	TBMT
SI	20	XR

\* Pin 2: AY-3-1014A/1015D — No Connection.

H.232

ZN414Z

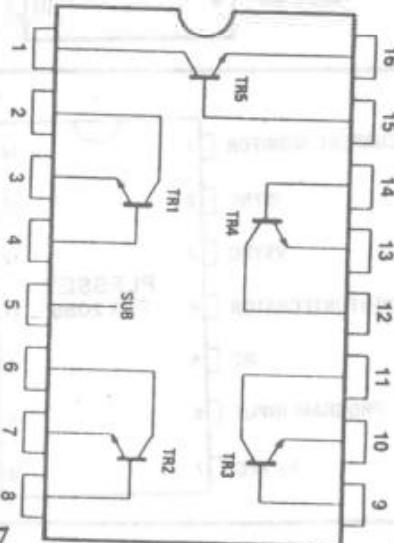
H.235



NON-INVERTING INPUT A	1	BIAST
INVERTING INPUT A	2	NON-INVERTING INPUT C
OUTPUT A	3	INVERTING INPUT C
POSITIVE SUPPLY	4	OUTPUT C
OUTPUT B	5	NEGATIVE SUPPL
INVERTING INPUT B	6	OUTPUT D
NON-INVERTING INPUT B	7	INVERTING INPUT D
BIAST 2	8	NON-INVERTING INPUT D

H.236

SL3227

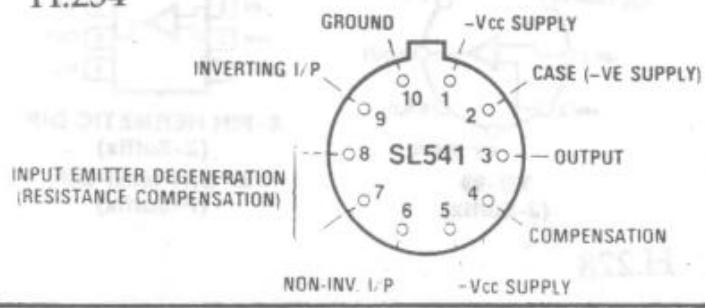


H.237

R <sub>c</sub>	1	14	NC
NC	2	13	R <sub>c</sub>
INVERTING I/P	3	12	NON-INV.I/P
EARTH	4	11	+V <sub>cc</sub> SUPPLY
-V <sub>cc</sub> SUPPLY	5	10	COMPENSATION
SUBSTRATE	6	9	NC
NC	7	8	OUTPUT

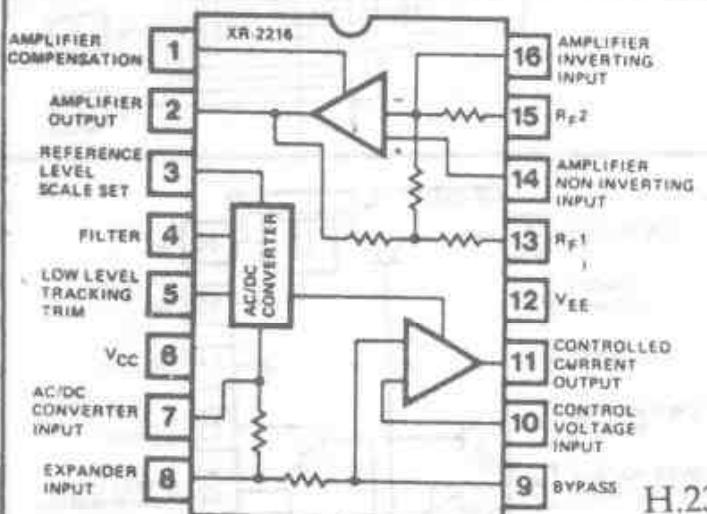
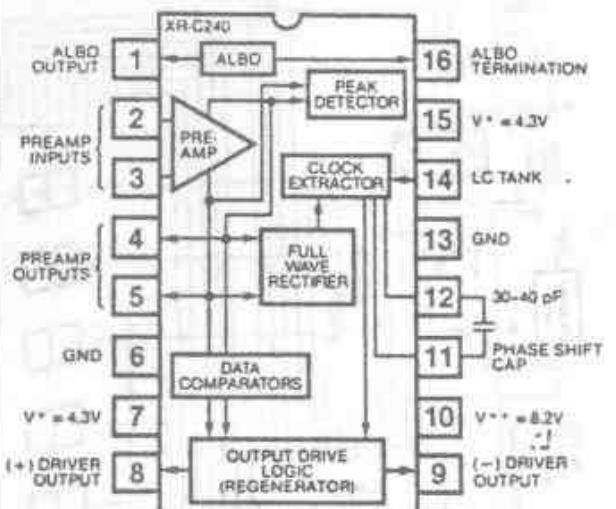
H.234

(BOTTOM VIEW)

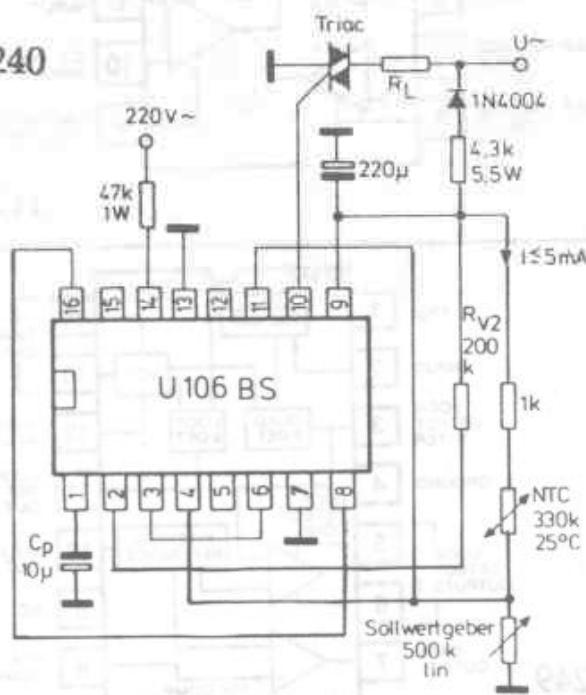


# XR-C240

H.238

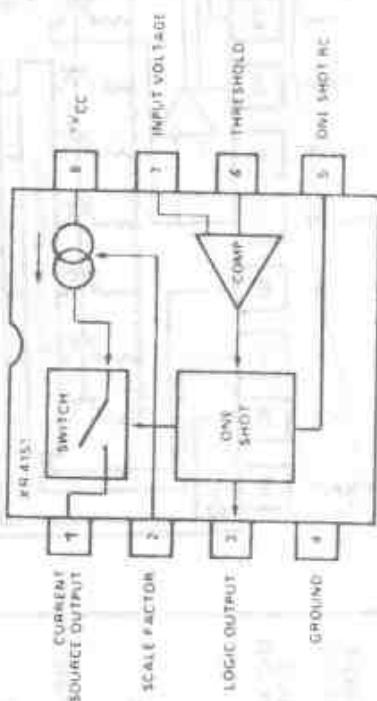


H.239



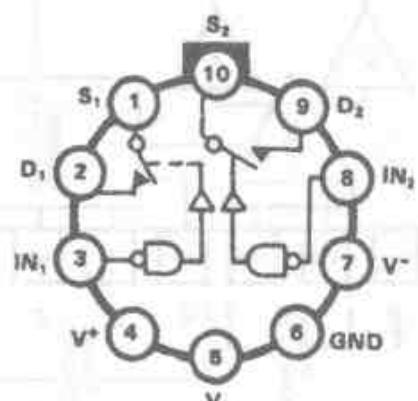
H.240

# XR-4151



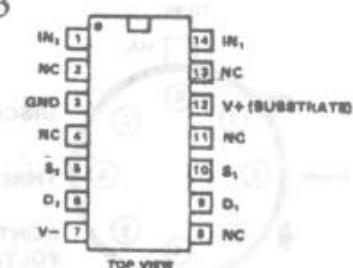
H.241

# DG180BA

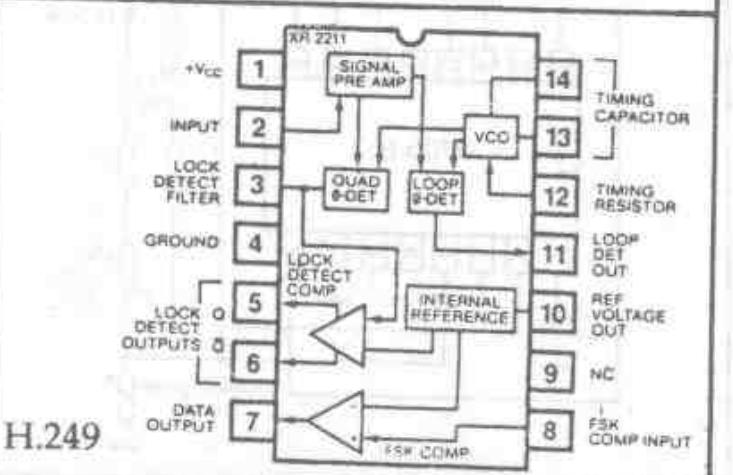
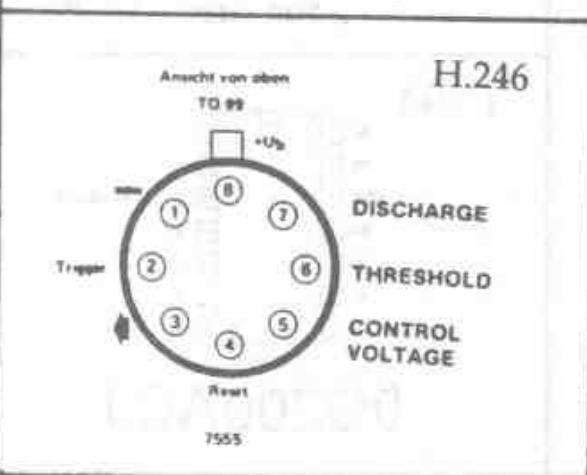
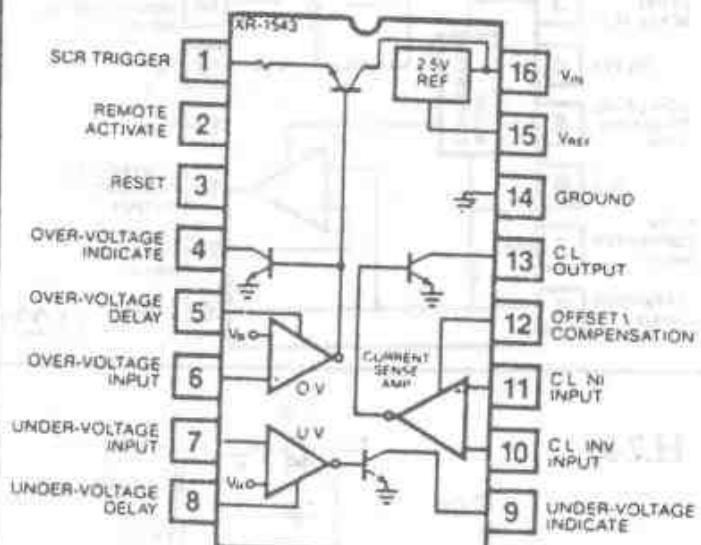
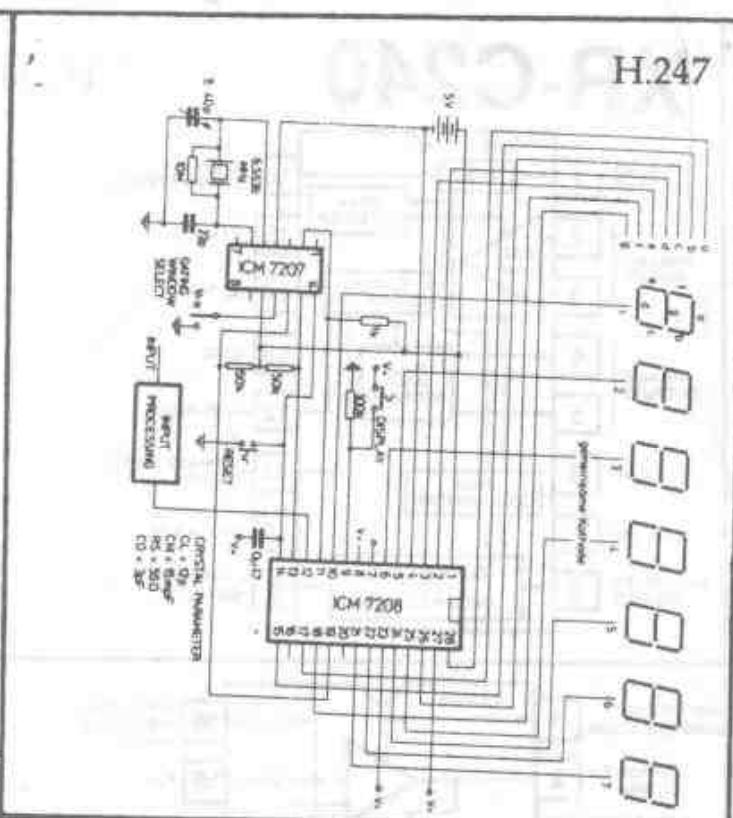
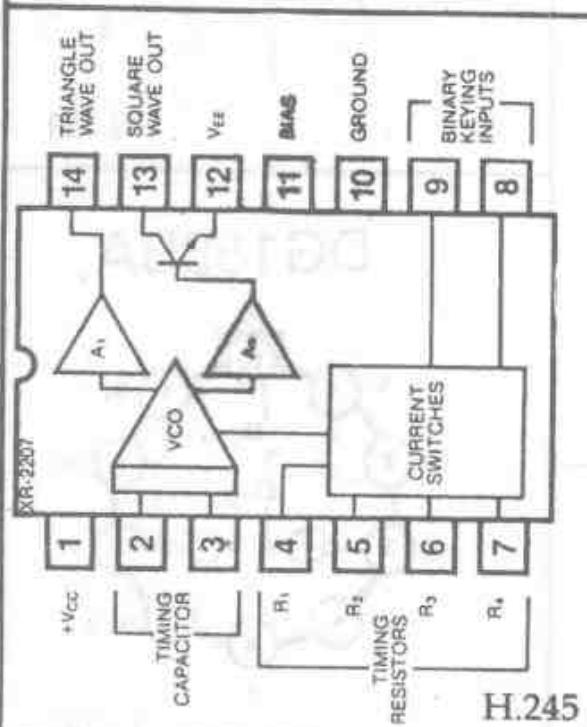
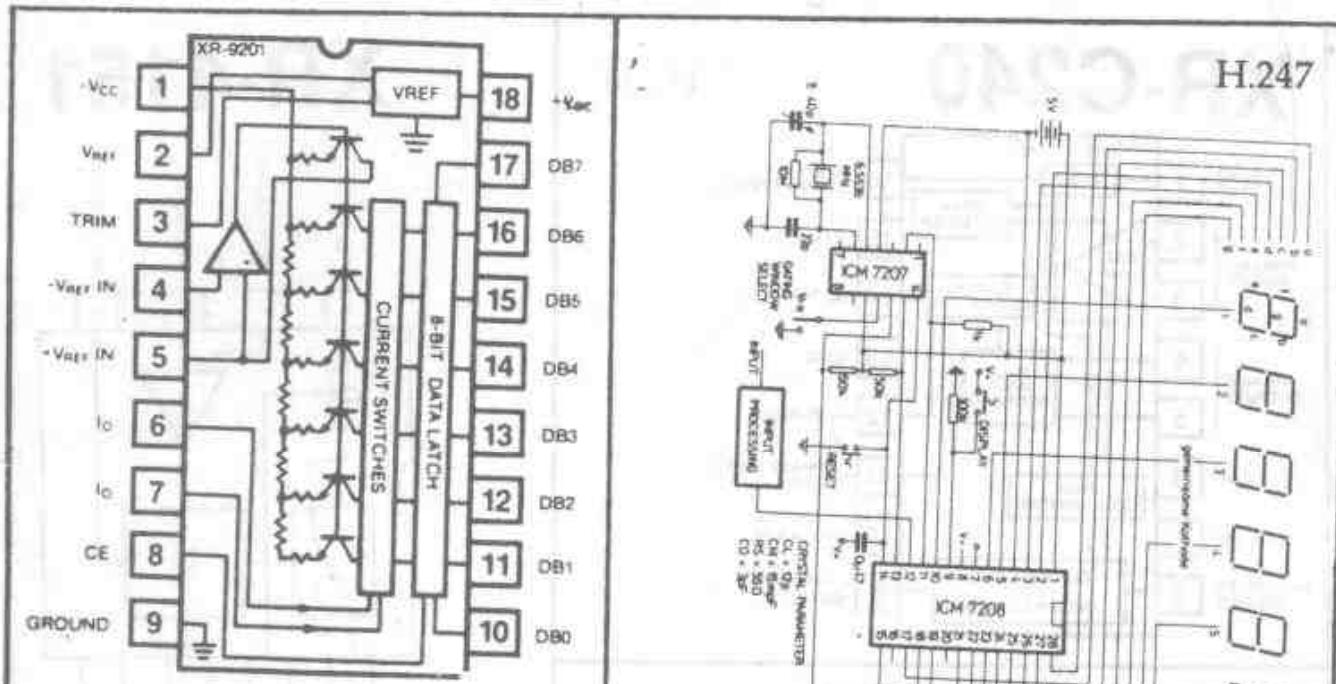


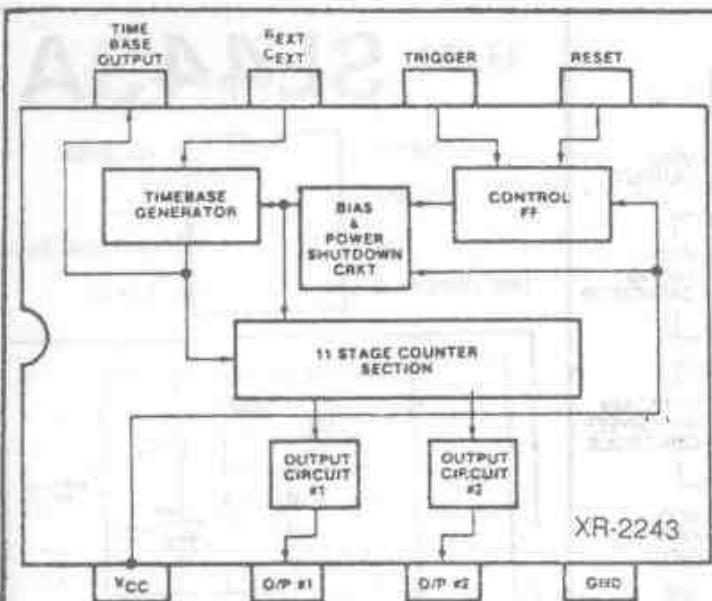
H.242

H.243

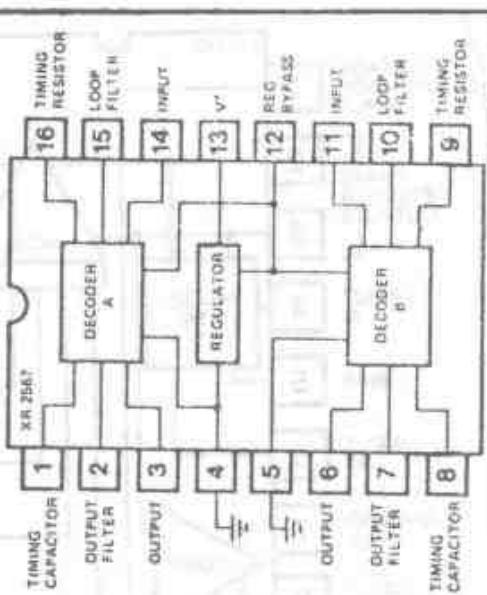


# DG200ACJ

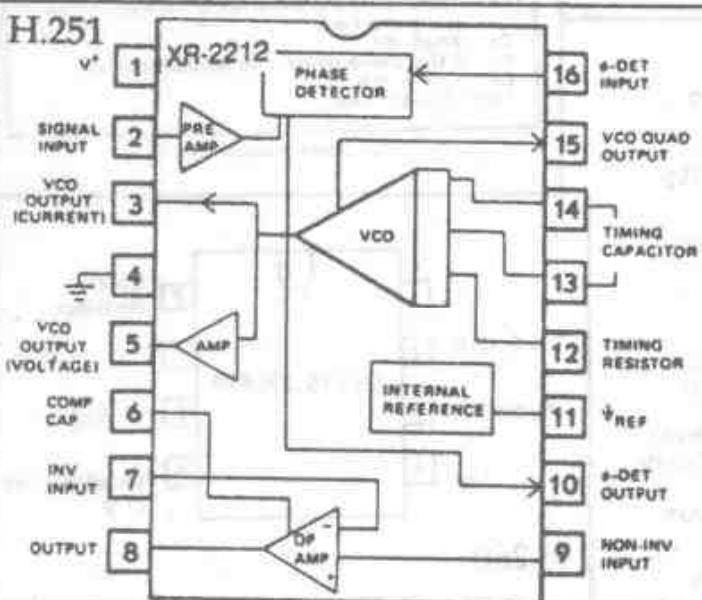




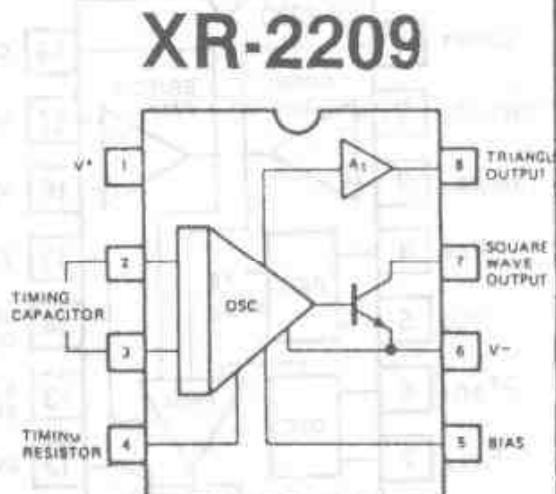
H.250



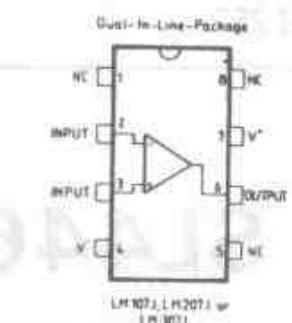
H.253



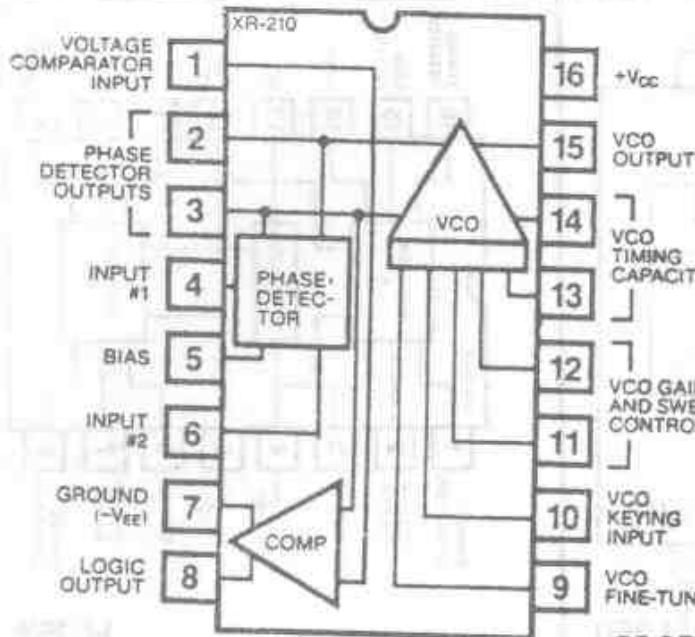
H.254



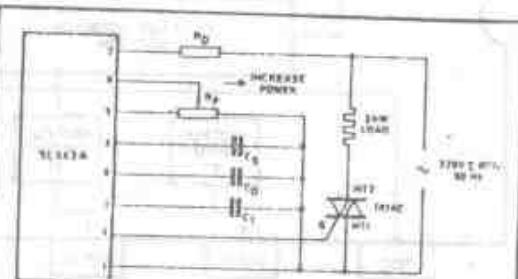
The diagram illustrates the internal architecture of the XR-2213 IC. It features a central VCO (Voltage Controlled Oscillator) connected to a loop phase detector. A lock phase detector is also present. A preamp stage is connected to the signal input. Two oscillator outputs are buffered and fed into the loop phase detector. The circuit includes power supply pins (+POWER SUPPLY, VCC, GND) and a comparator (COMP) stage.



H.255

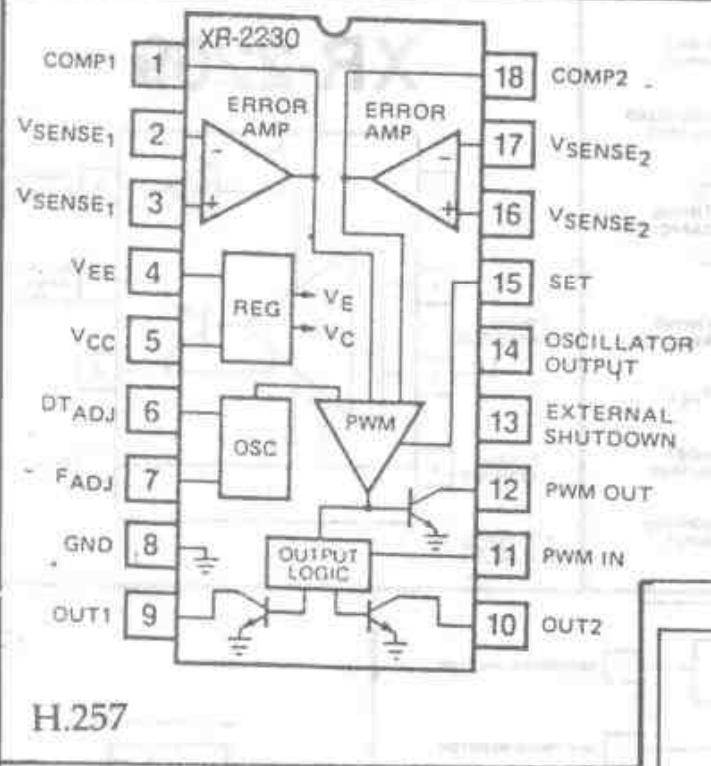


# SL443A



Component values  
 $R_b = 8.2k\Omega \pm 5\%$  7W  
 $R_g = 100k\Omega$  (Control characteristic of linear potentiometer is shown in Fig.3)  
 $C_s = 220\mu F$  16V  
 $C_t = 0.47\mu F$  (Ramp period = 20 seconds nominal)  
 $C_R = 15nF \pm 10\%$   
TRIAC TAG:255 - 400

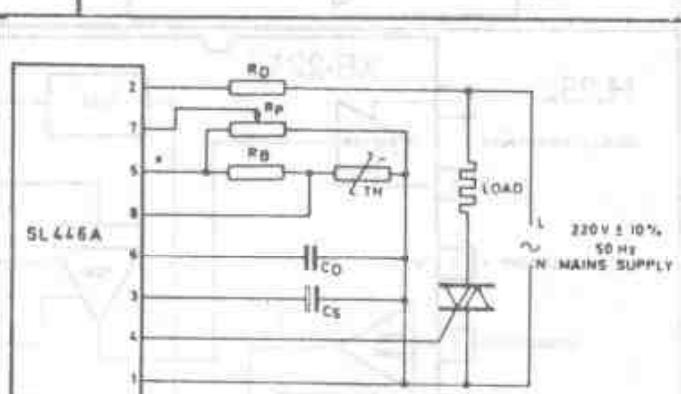
Fig.1 Cooker hotplate control



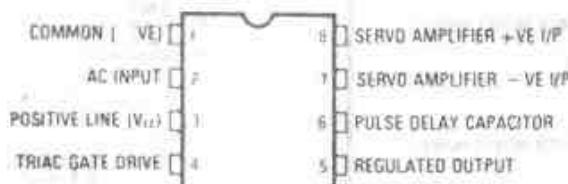
# H.260



# H.258

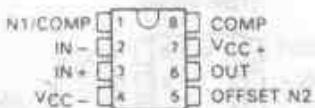


# SL446A

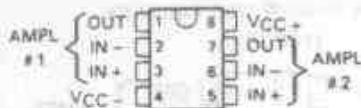


Components are to be standardised so that heating elements in the range 400 to 1200W may be used. The circuit is to provide linear temperature control over the domestic temperature range of +5°C to +35°C.

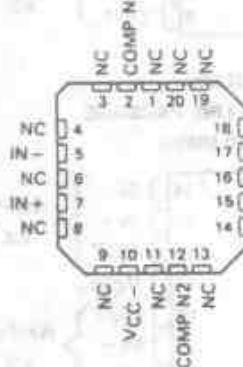
TL060, TL060A, TL060B  
D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



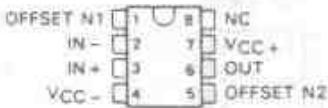
TL062, TL062A, TL062B  
D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



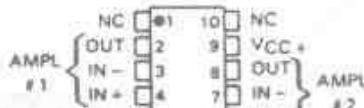
TL061  
FH OR FK CHIP-CARRIER PACKAGE  
(TOP VIEW)



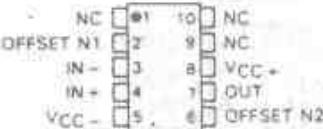
TL061, TL061A, TL061B  
D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



TL062  
U FLAT PACKAGE  
(TOP VIEW)



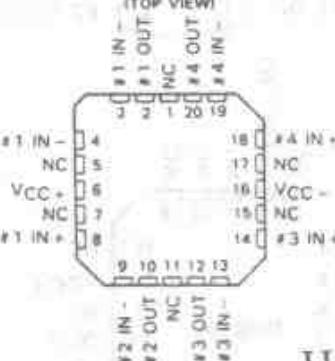
TL061  
U FLAT PACKAGE  
(TOP VIEW)



TL064  
D. J. OR W PACKAGE  
TL064A, TL064B  
D. J. OR N PACKAGE  
(TOP VIEW)



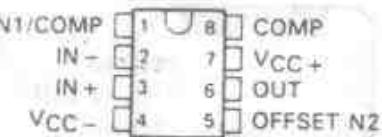
TL064  
FH OR FK CHIP-CARRIER PACKAGE  
(TOP VIEW)



H.261

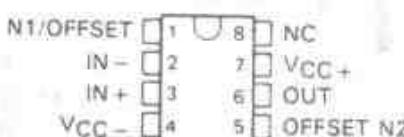
TL070, TL070A

D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



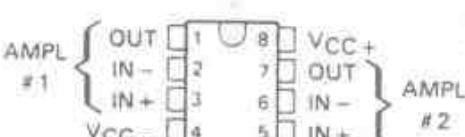
TL071, TL071A, TL071B

D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)

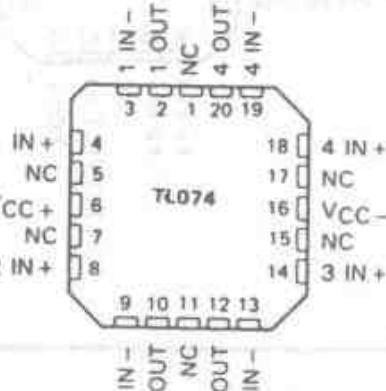
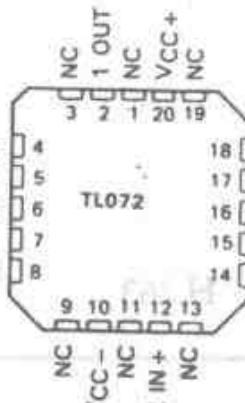
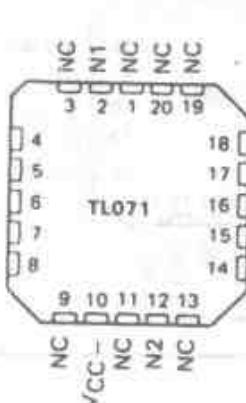
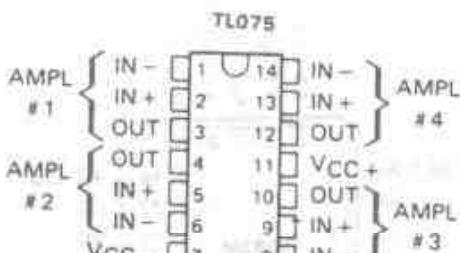
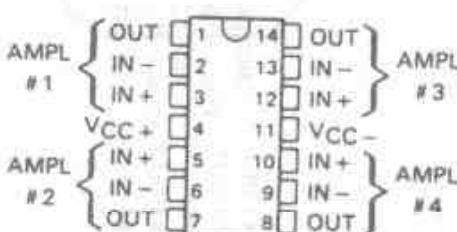


TL072, TL072A, TL072B

D. JG. OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



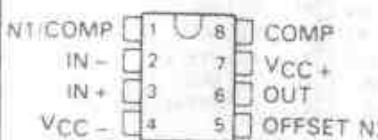
TL074, TL074A, TL074B



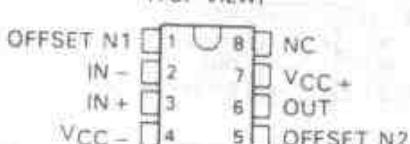
H.262

95

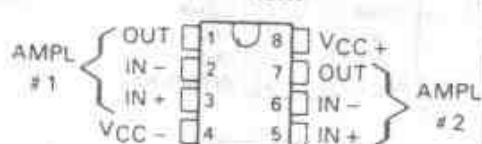
**TL080, TL080A**  
JG OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



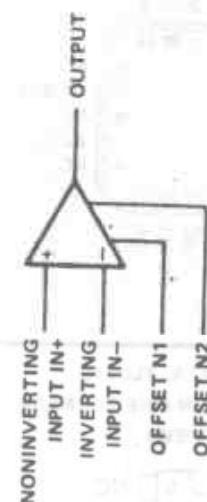
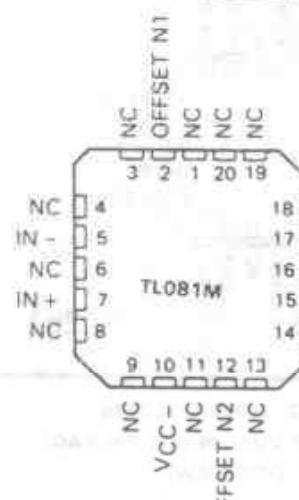
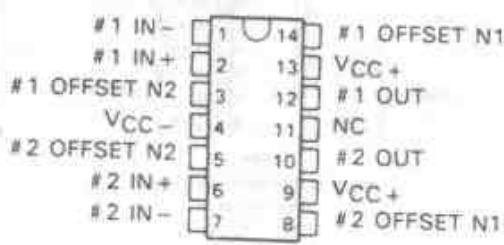
**TL081, TL081A, TL081B**  
JG OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



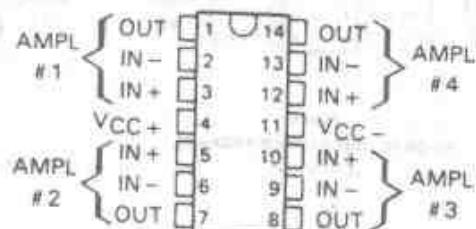
**TL082, TL082A, TL082B**  
JG OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



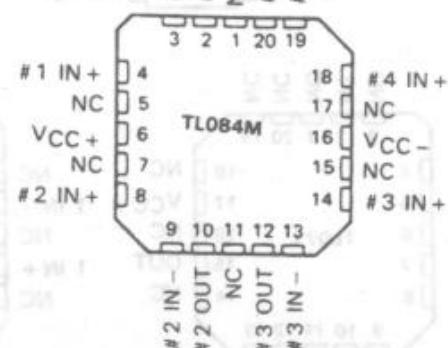
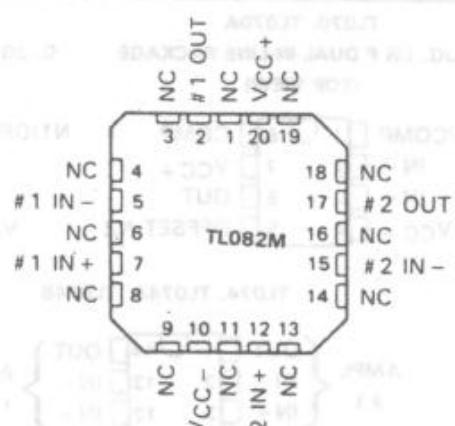
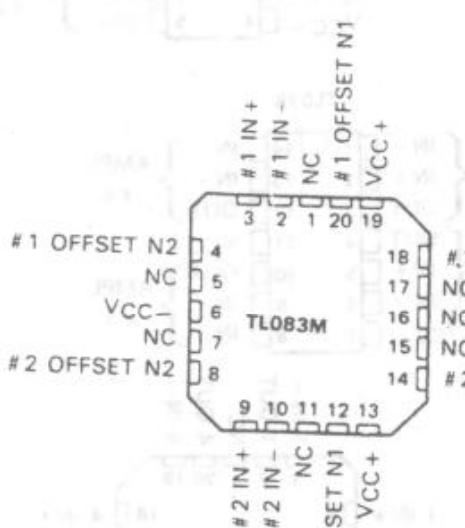
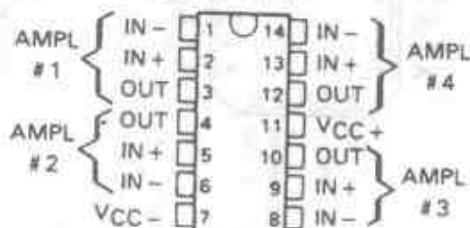
**TL083, TL083A**  
J OR N DUAL-IN-LINE PACKAGE  
(TOP VIEW)

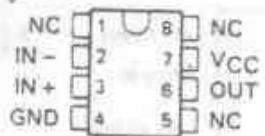


**TL084, TL084A, TL084B**  
J OR N DUAL-IN-LINE PACKAGE  
(TOP VIEW)

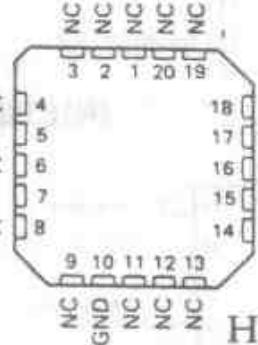


**TL085**  
N DUAL-IN-LINE PACKAGE  
(TOP VIEW)

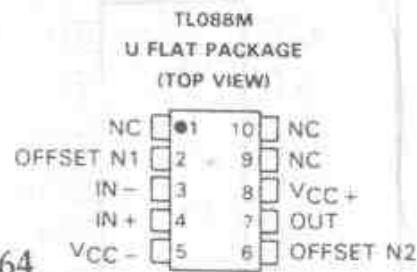
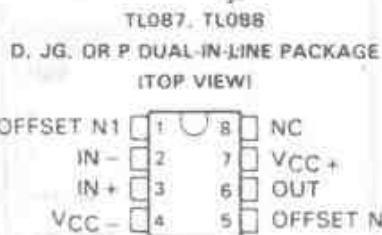




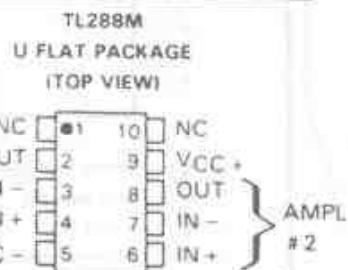
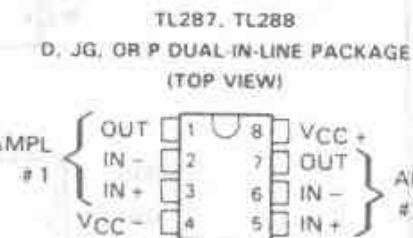
TL321M . . . FH OR FK  
CHIP CARRIER PACKAGE  
(TOP VIEW)



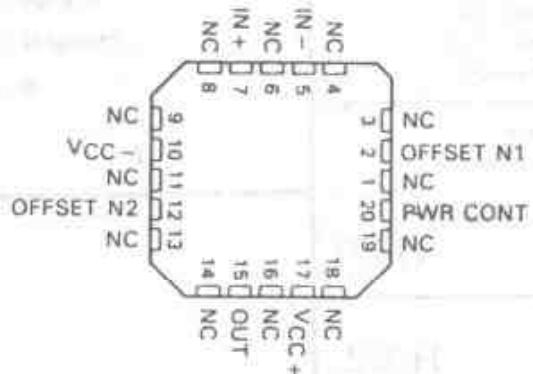
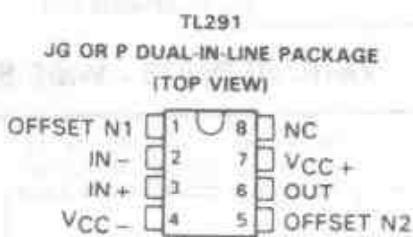
H.265



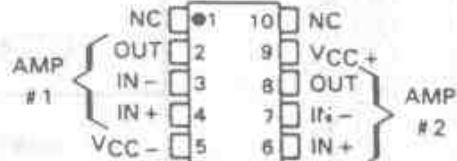
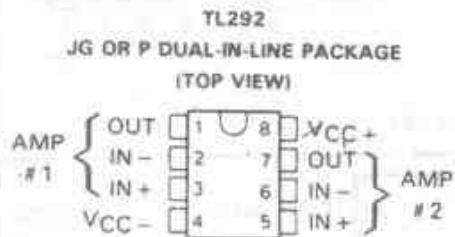
H.264



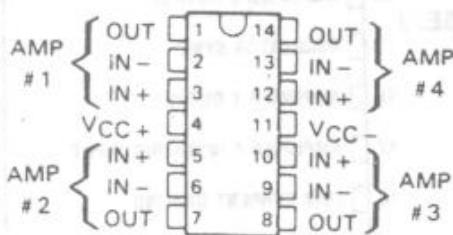
H.266



H.268

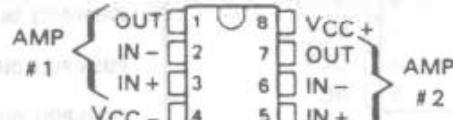


TL294  
J OR N DUAL-IN-LINE PACKAGE  
(TOP VIEW)



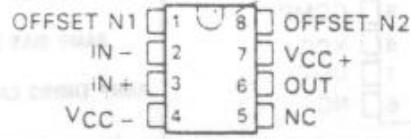
H.267

TL022C . . . JG OR P  
DUAL-IN-LINE PACKAGE  
(TOP VIEW)

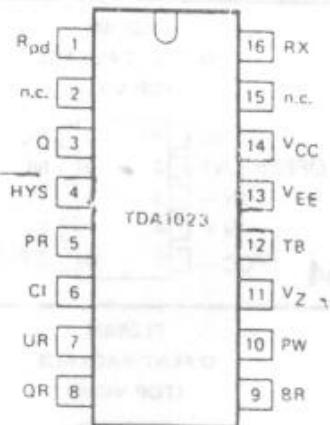


H.269

OP-07C, OP-07D, OP-07E

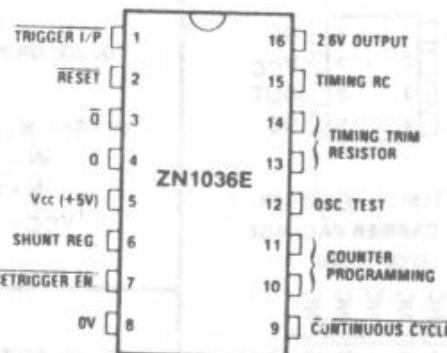


H.270



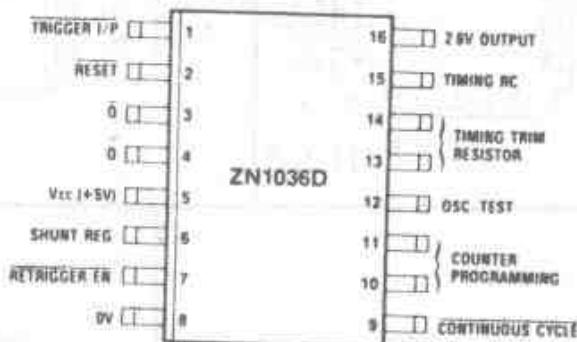
- 1 R<sub>pd</sub> internal pull-down resistor connection  
 2 n.c. not connected  
 3 Q output  
 4 HYS hysteresis control input  
 5 PR proportional range control input  
 6 CI Control input  
 7 UR unbuffered reference input  
 8 OR output of reference buffer  
 9 BR buffered reference input  
 10 PW pulse width control input  
 11 V<sub>Z</sub> reference supply output  
 12 TB firing burst repetition time control input  
 13 VEE ground connection  
 14 VCC positive supply connection  
 15 n.c. not connected  
 16 RX external resistor connection

H.271

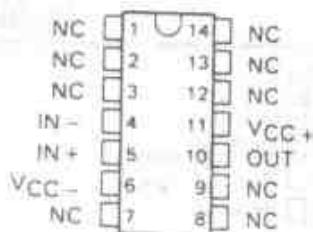
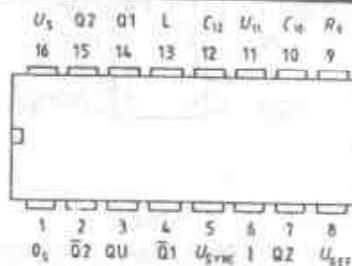


H.273

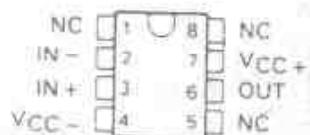
**ZN1036E (DP16)**



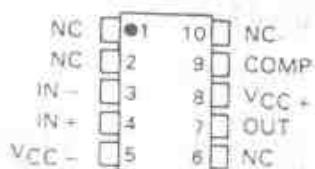
**ZN1036D (MP16 - WIDE BODY)**



LM107 JG PACKAGE  
LM207, LM307 D, JG, OR P PACKAGE  
(TOP VIEW)

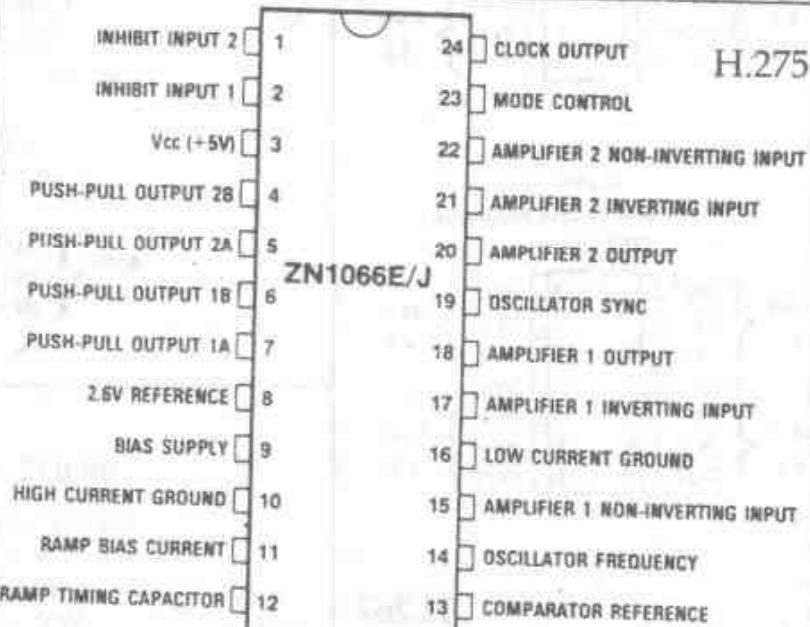


LM107 U FLAT PACKAGE  
(TOP VIEW)



H.274

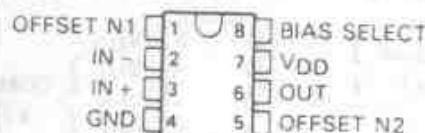
TCA 785



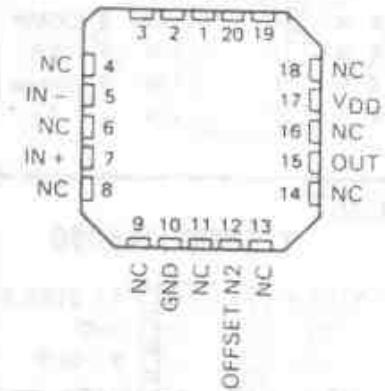
H.275

## TLC251B, TLC271

H.276

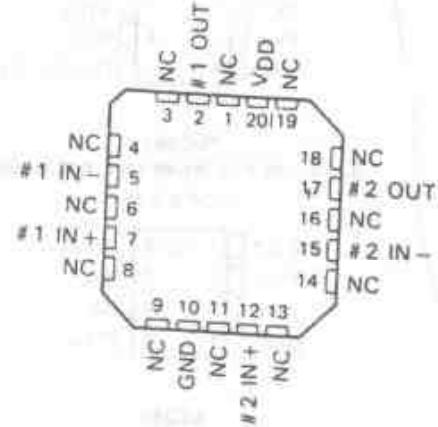
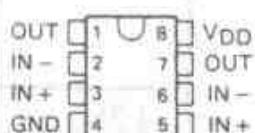
FH OR FK PACKAGE  
(TOP VIEW)

NC  
OFFSET N1  
NC  
BIAS SELECT  
NC



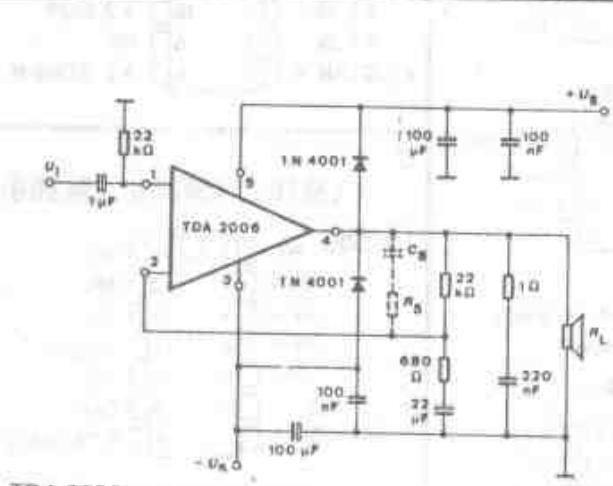
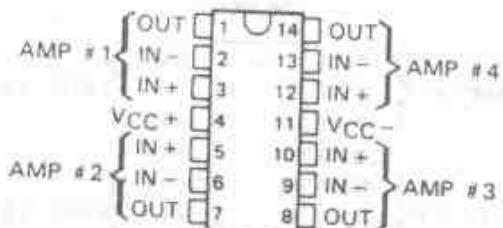
H.279

## TLC252 TLC272

FH OR FK PACKAGE  
(TOP VIEW)

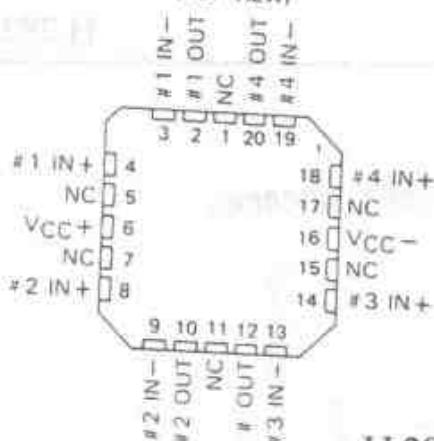
TLC254

TLC274

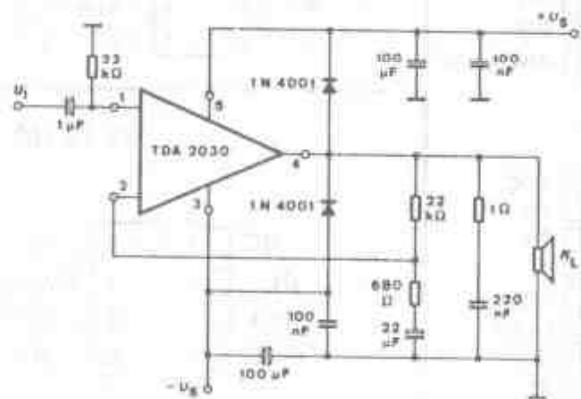


TDA 2006

H.277

FH OR FK PACKAGE  
(TOP VIEW)

H.280



TDA 2030

H.278

H.281

SG1525A, SG1527A . . . J

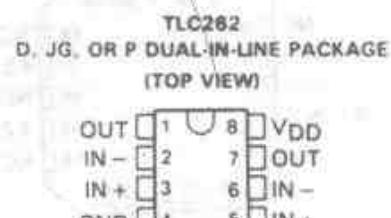
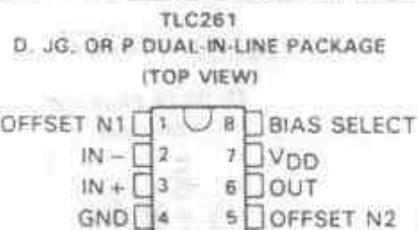
SG2525A, SG2527A . . . J OR N

SG3525A, SG3527A . . . J OR N

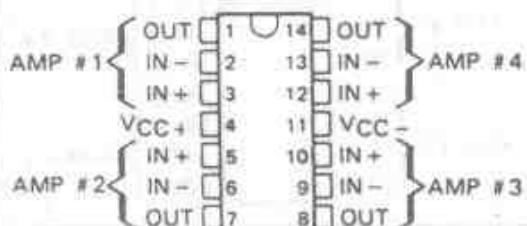
DUAL-IN-LINE PACKAGE

(TOP VIEW)

INVERTING INPUT	1	16	REFERENCE
NONINVERTING INPUT	2	15	VCC (VI)
SYNC	3	14	OUTPUT B
OSCILLATOR OUT	4	13	V <sub>C</sub>
C <sub>T</sub>	5	12	GND
R <sub>T</sub>	6	11	OUTPUT A
DISCHARGE	7	10	SHUTDOWN
SOFT-START	8	9	COMPENSATION

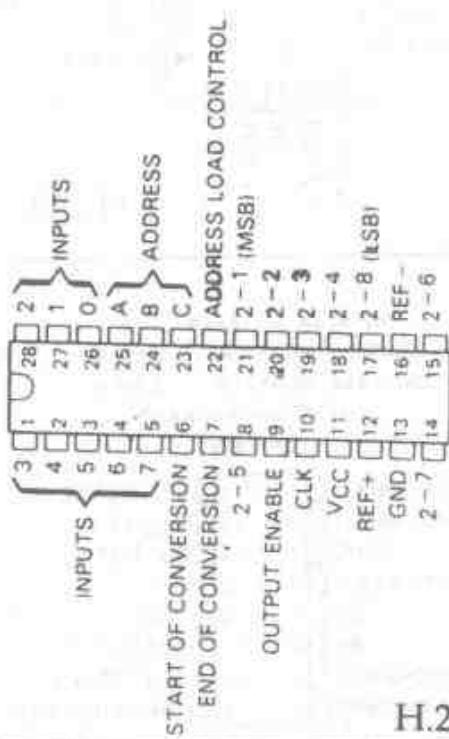


TLC264  
D. J. OR N DUAL-IN-LINE PACKAGE  
(TOP VIEW)



H.282

### ADC0808, ADC0809



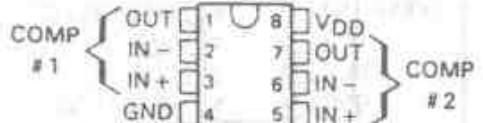
H.283

H.285

TLC 393

TLC 3702

TLC372M, TLC372C

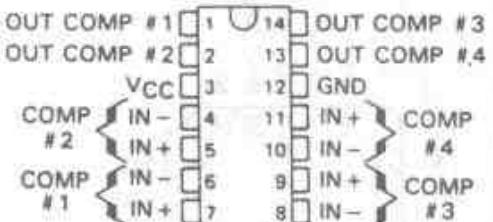


H.286

TLC 339

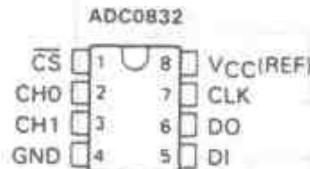
TLC 3704

TLC374M, TLC374C



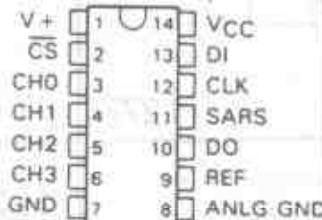
H.284

ADC0831

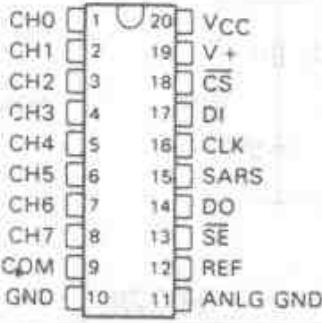


N DUAL-IN-LINE PACKAGE  
(TOP VIEW)

ADC0834

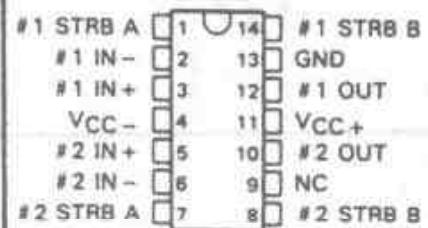


ADC0838



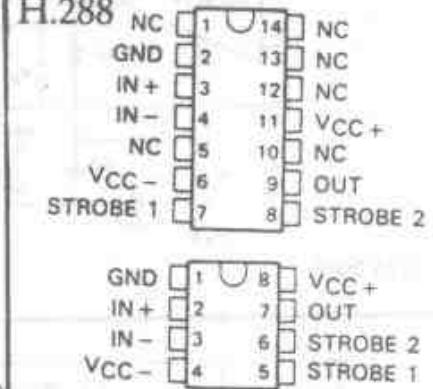
H.287

TL506M, TL506C



LM106, LM206, LM306

H.288

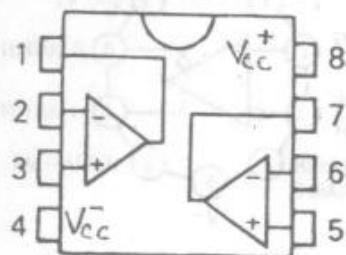


TL331M



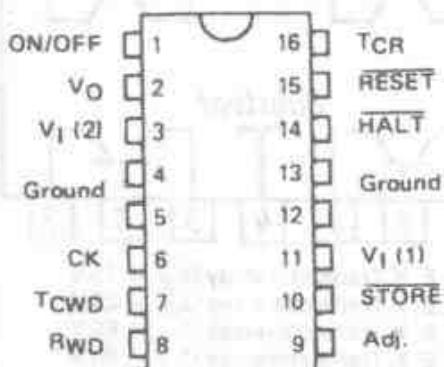
H.289

## TS372

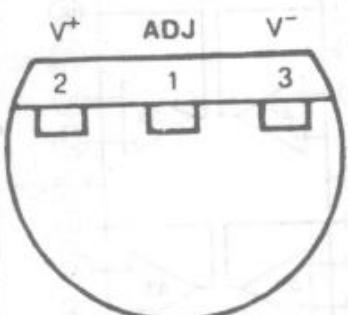


H.290

## TEA7105



H.291



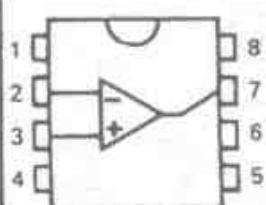
## LM134 LM234-LM334

H.292

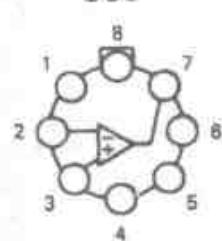
H.293

## LM118-LM218 LM318

### TO-99



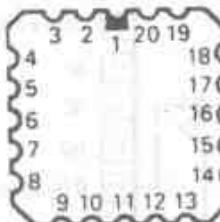
### DIP8/CERDIP8/ SO8



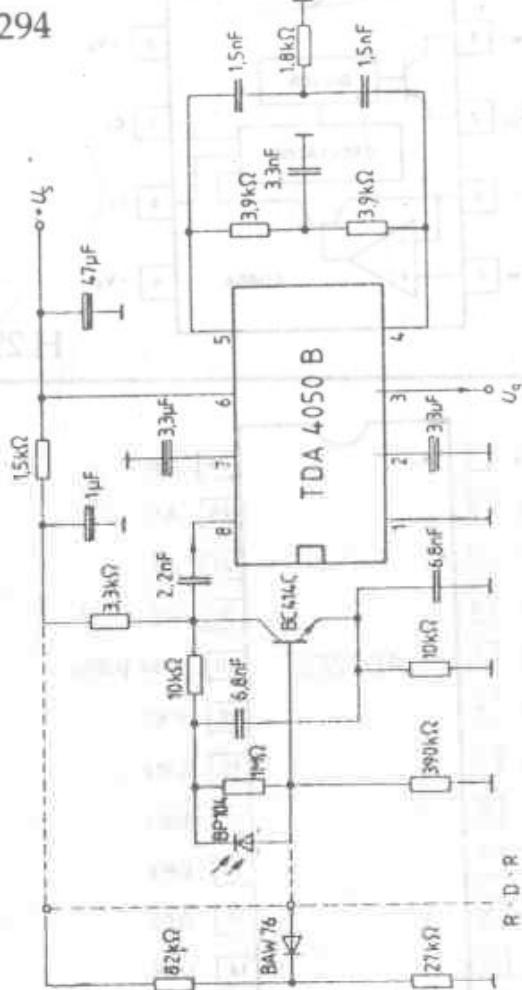
- 1 - Balance/Compensation 1
- 2 - Inverting input
- 3 - Non-inverting input
- 4 - V<sub>CC</sub>

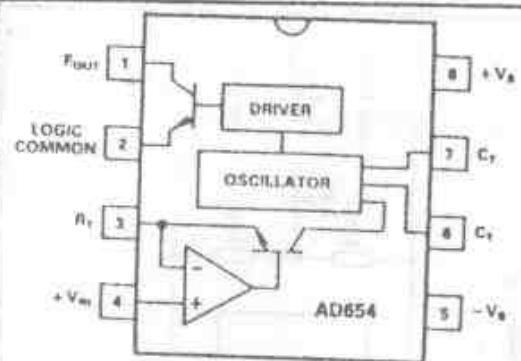
- 5 - Balance/Compensation 3
- 6 - Output
- 7 - V<sub>CC</sub>

### LCC 20

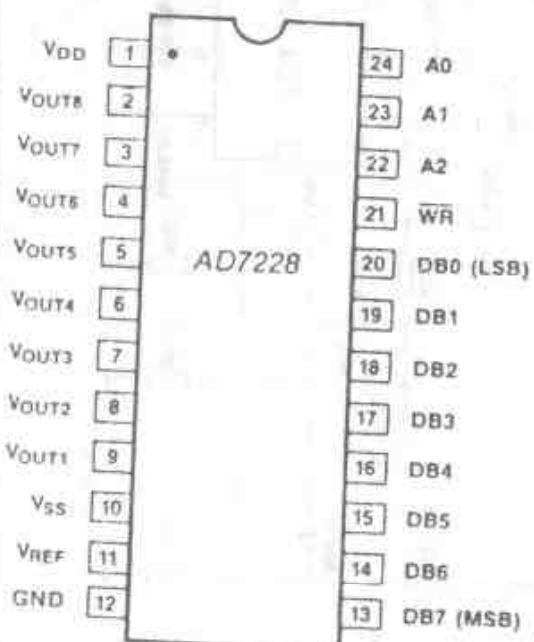


H.294

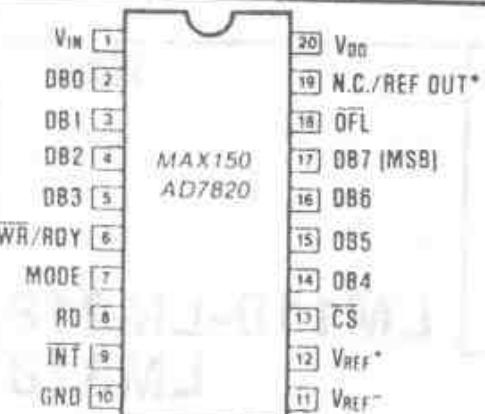




H.295

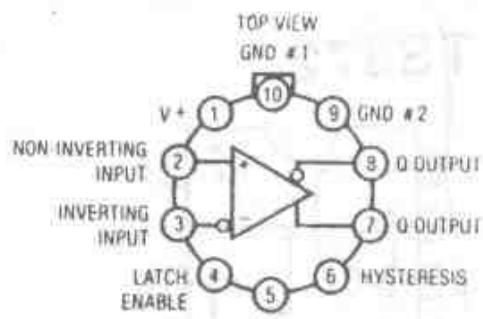


H.296



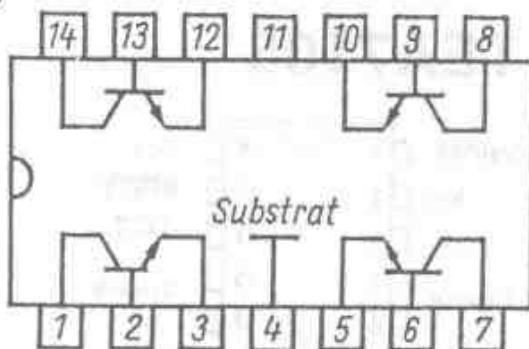
H.297

H.298

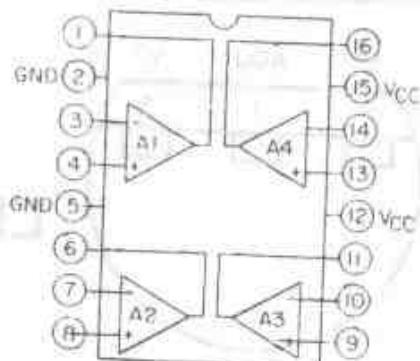


LT 685 C/MH High Speed Comparator

H.299

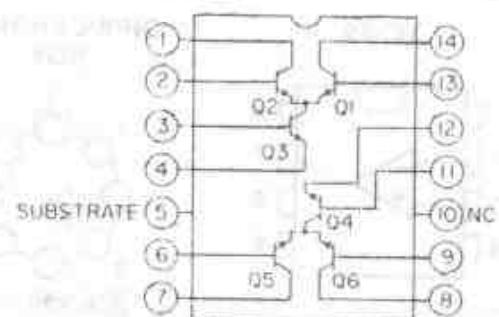


B 315 D, E, K Transistorarray  $U_{CE} = 15\text{ V}$   
 B 325 D, E, K Transistorarray  $U_{CE} = 25\text{ V}$   
 B 360 D, E, K Transistorarray  $U_{CE} = 60\text{ V}$   
 B 380 D, E, K Transistorarray  $U_{CE} = 80\text{ V}$   
 Kollektorstrom 0,5 A



3048, 3052

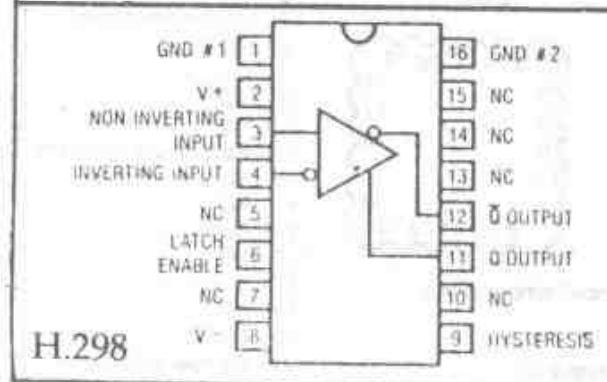
H.300

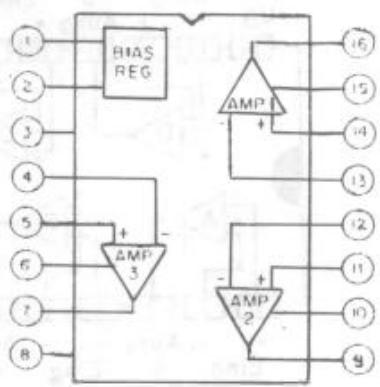


3054 Differential-Verst.

H.301

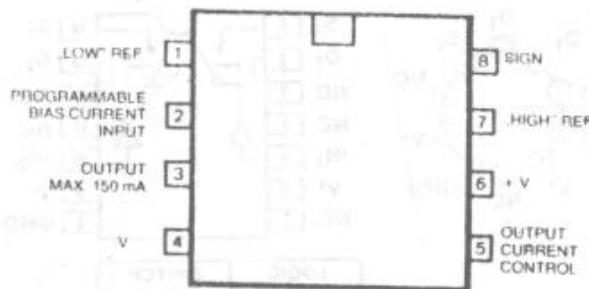
H.298





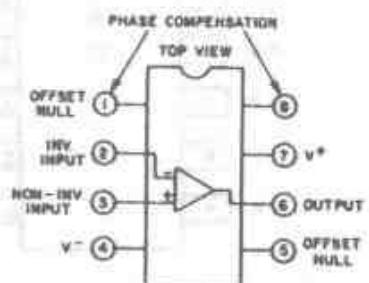
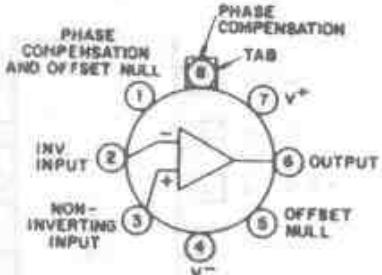
3060 A, B OP

H.302

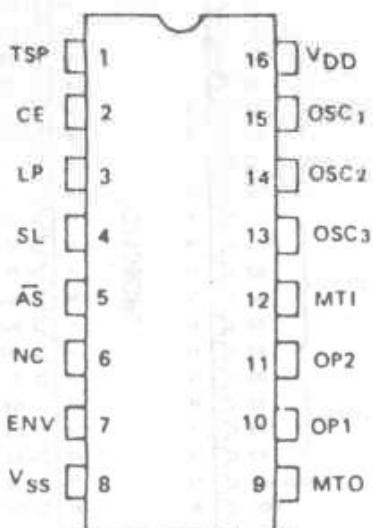


3098 Progr. Schmitt-Trigger

H.303

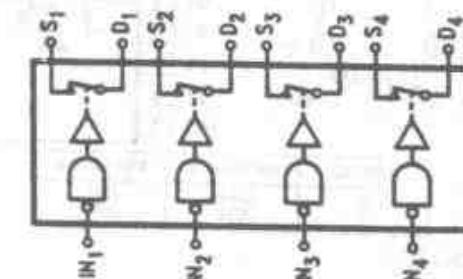


3100 S.T Breitband OP



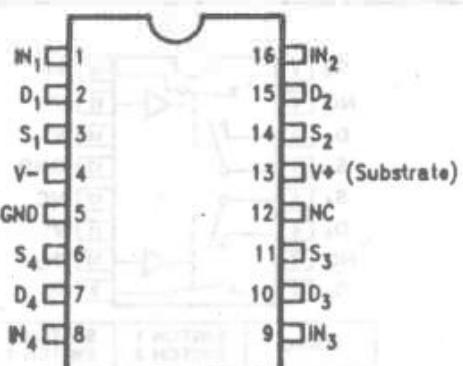
3482 12-Melodien-Ic

H.305



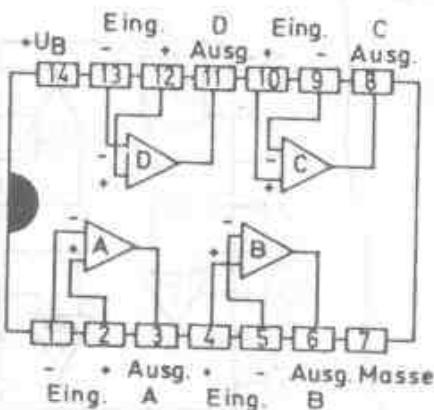
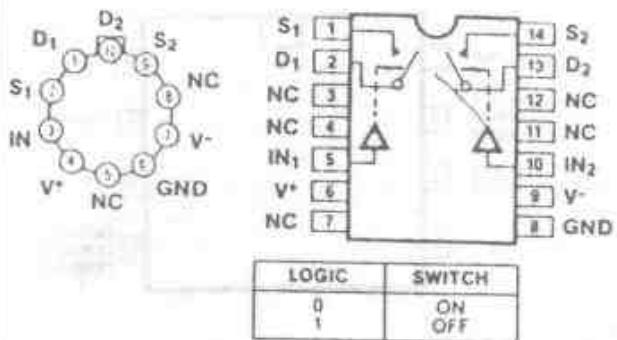
2862, 2863, 2852 Melodie IC

H.306



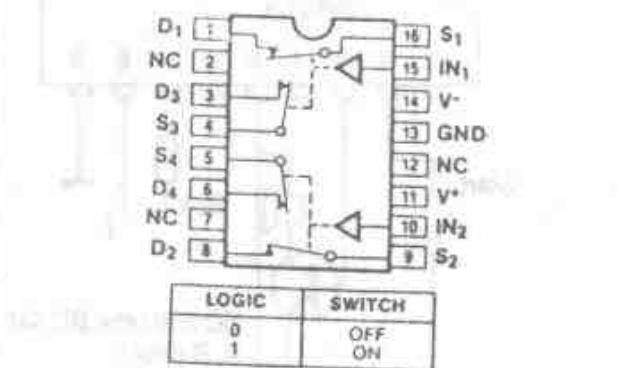
DG 308 A/309

H.307

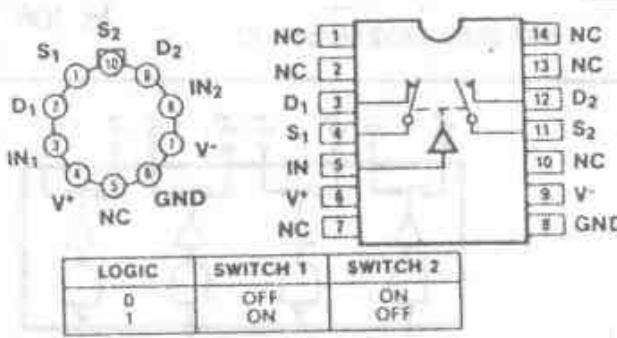


ESM 1600 B, 1602 B

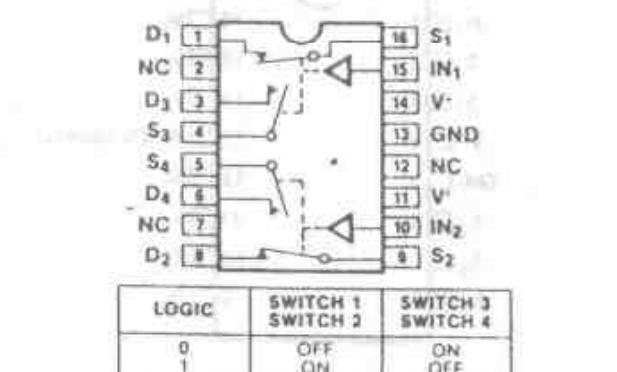
**H.312**



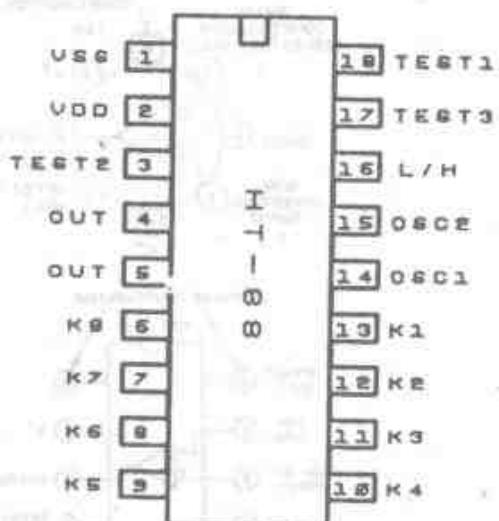
**H.309**



**H.310**

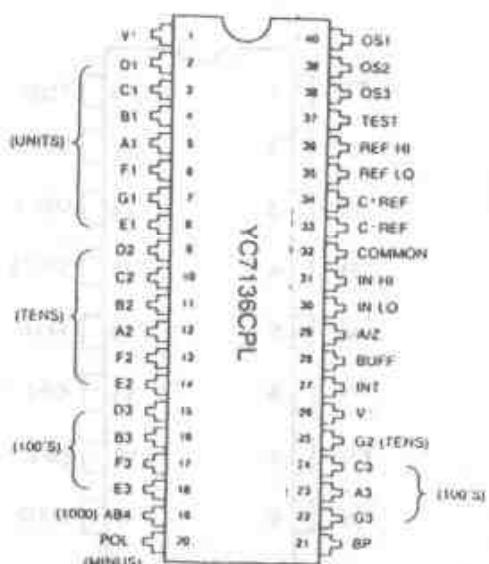


**H.311**



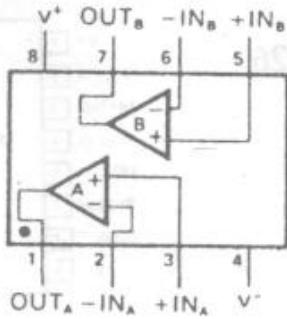
HT-88 Sound IC U8.3...5V

**H.313**



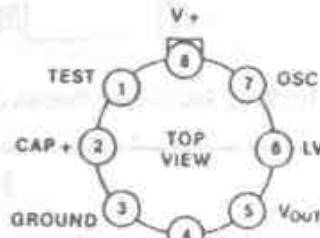
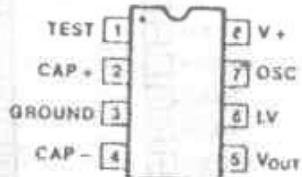
YC 7136 3½ Digit Panel-Meter

**H.314**



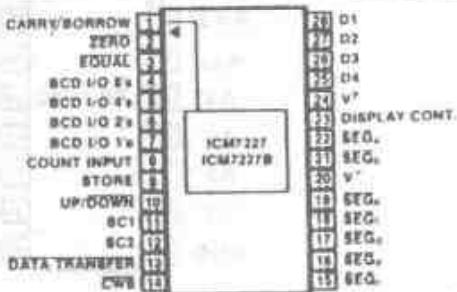
ICL 7612 Dual-OP

H.315



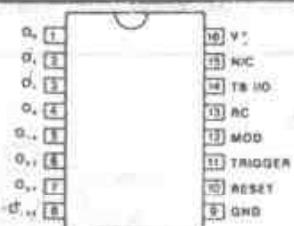
ICL 7662 CMOS Voltage Converter

H.316



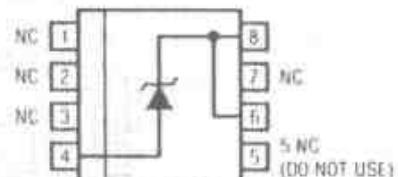
ICM 7227/B Zähler/Timer

H.317



ICM 7240 Programmierbarer Timer

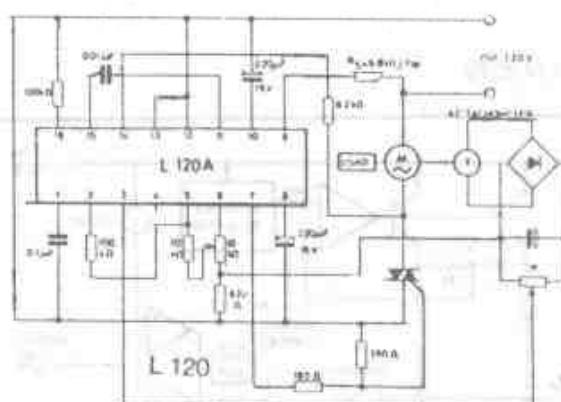
H.318



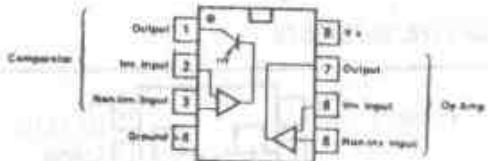
LM 385 Spannungs-Referenz SMD

H.320

RAMP VOLTAGE	1	16	CURRENT GENERATOR
AMPLIFIER OUTPUT	2	15	OUTPUT LOGIC CIRCUIT
NON INV AMPLIF INPUT	3	14	ZERO CURRENT DETEC.
DC REFERENCE VOLTAGE	4	13	GND
INV AMPLIFIER INPUT	5	12	GND
STABILIZED DC SUPPLY	6	11	CHOPPER
GATE PULSE OUTPUT	7	10	NEG RECTIFIER SUPPLY
POSITIVE RECTIFIER SUPPLY	8	9	AC SUPPLY

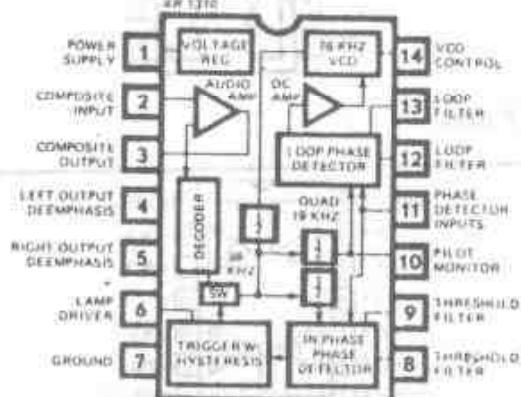


H.319



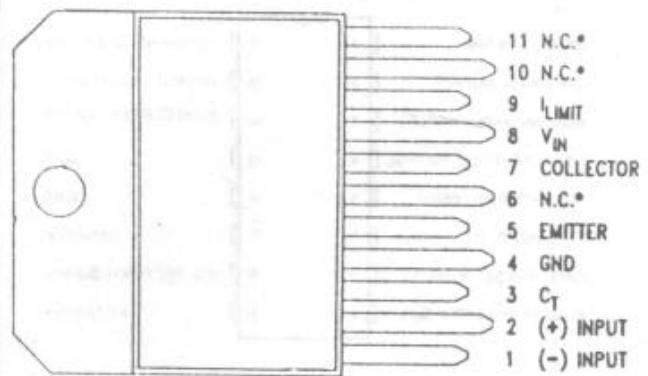
LM 392

H.321

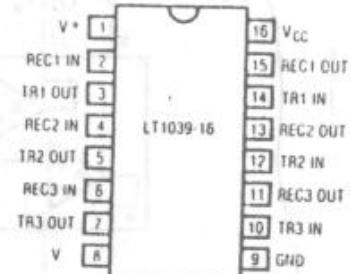


1310 Stereo-Demodulator

H.322

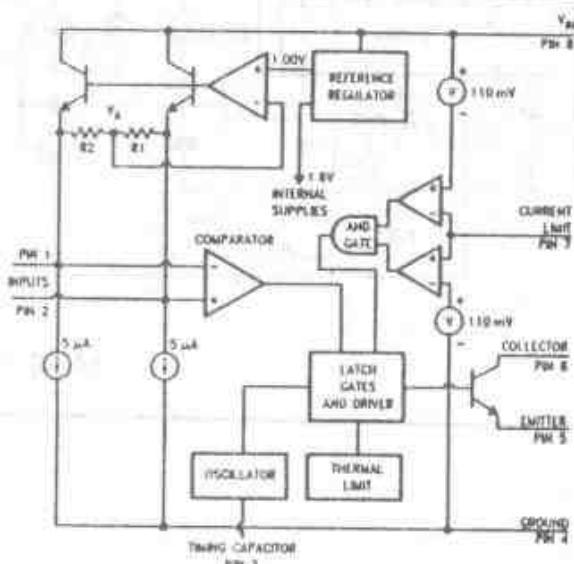


H.326

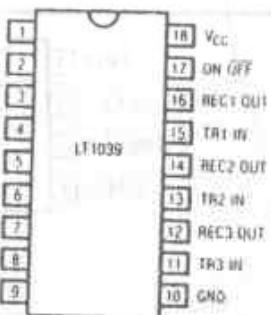


LM 2579

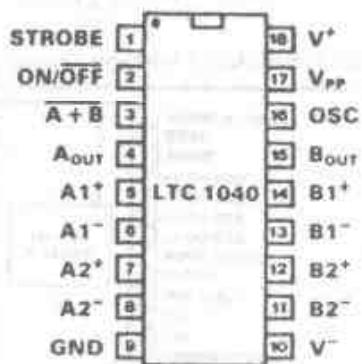
H.323



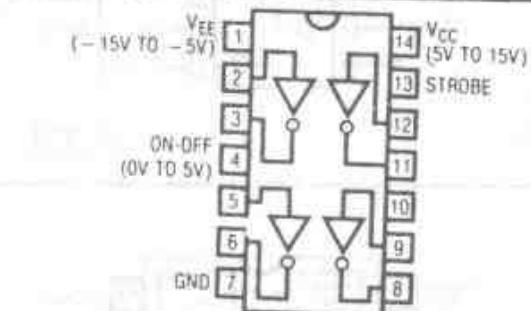
LT 1039 RS 232 Driver/Receiver



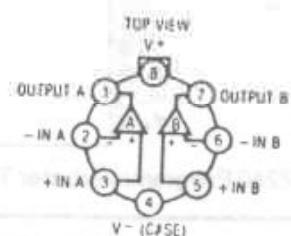
H.327



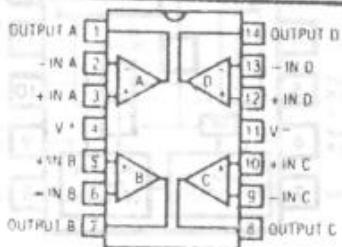
LT 1040 Dual Micopower Comparator



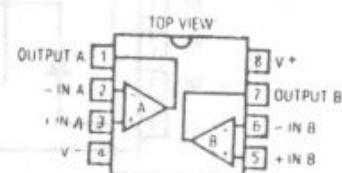
H.328



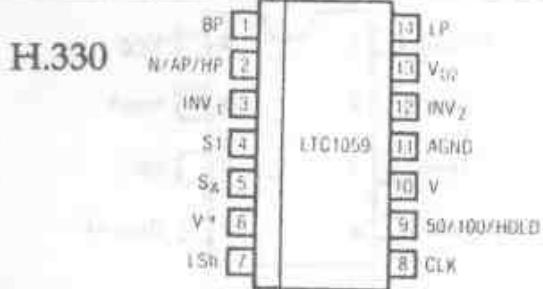
H.325



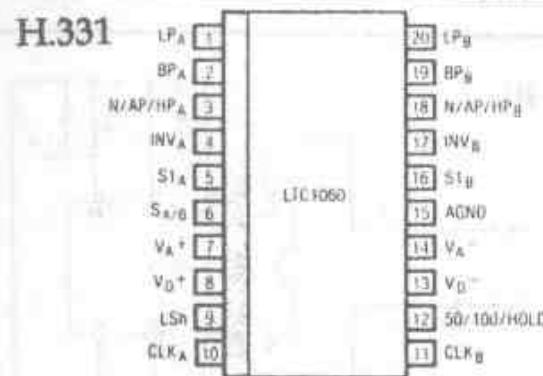
H.329



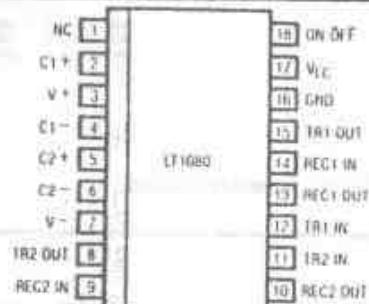
LT 1057 JFET High Speed OP



LT 1059 Universal-Filter

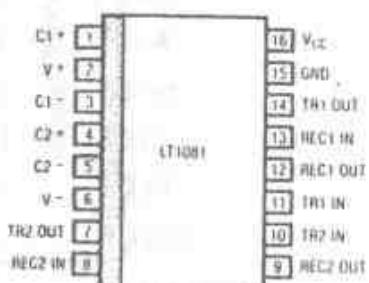


LT 1060 Dual-Filter



LT 1080

H.332



LT 1081

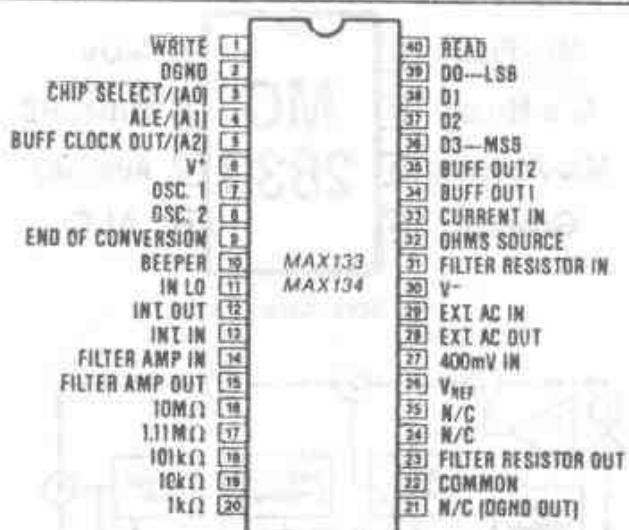
H.333



LTC 1042

H.334

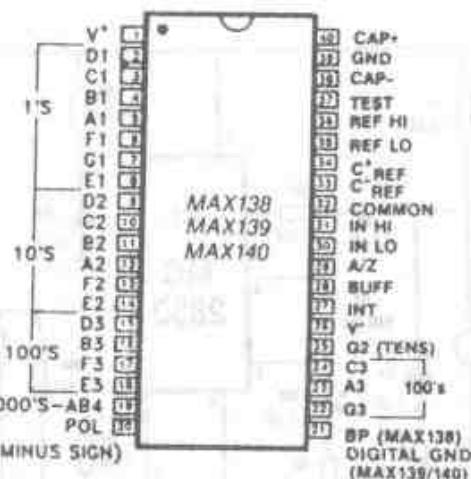
+2,8 . . . +16 V



MAX 133/134 3½

A/D

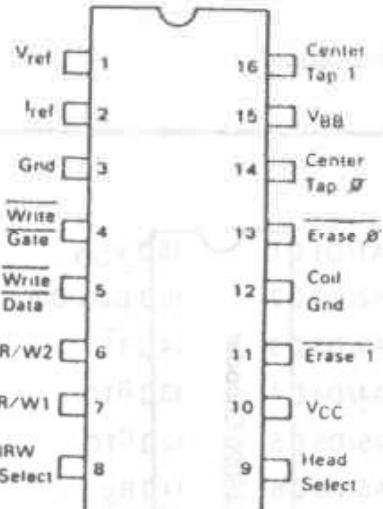
H.335



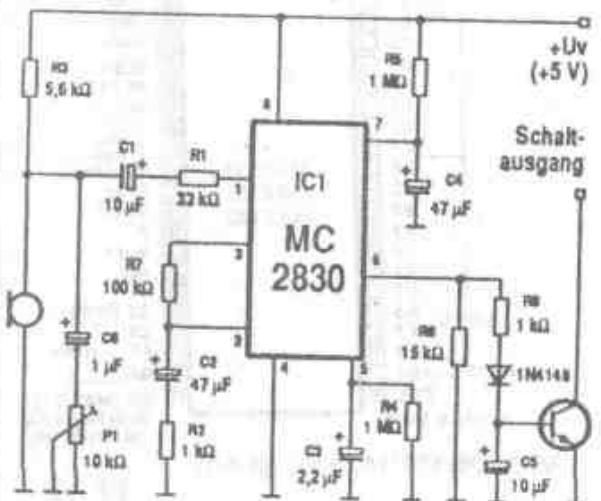
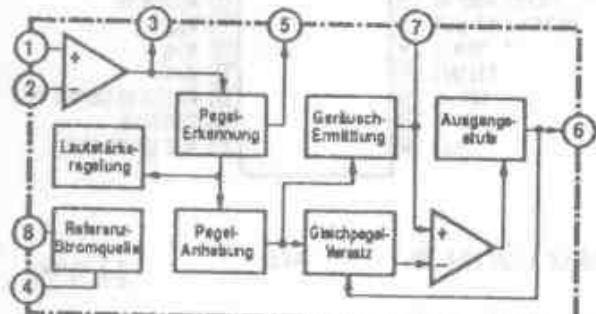
MAX 138/139/140 3½ Digit A/D

H.336

H.339

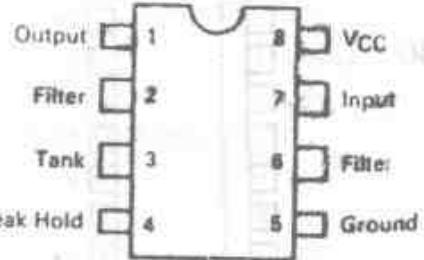


MC 3469 P Floppy Disk Write Controller



MC 2830

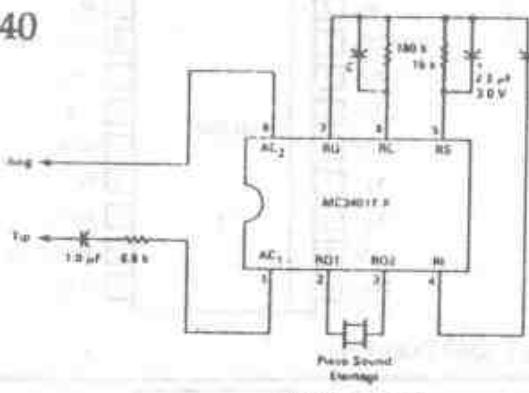
H.337



MC 3373

H 338

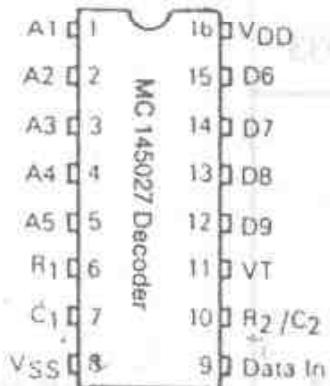
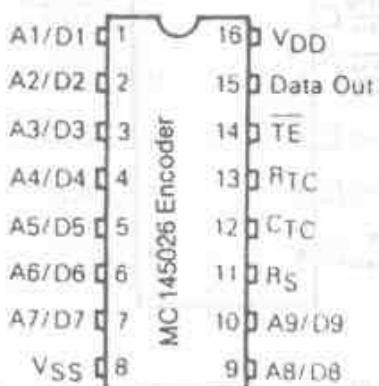
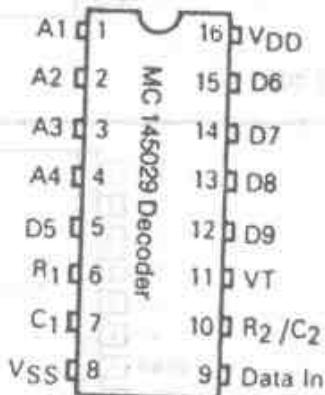
H.340



MC34017-1, C = 1000  $\mu$ F  
 MC34017-2, C = 500  $\mu$ F  
 MC34017-3, C = 2000  $\mu$ F

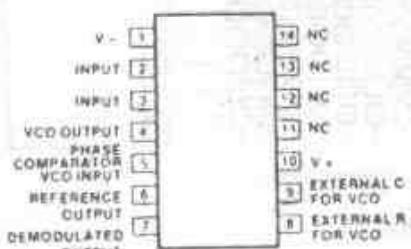
MC 34017 Telefon-Sound

H.341

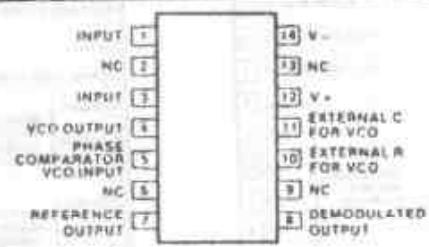




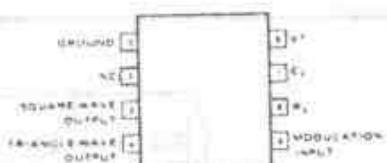
## 564 Ton-Decoder



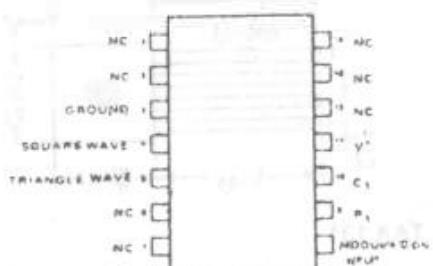
565 F. N Ton-Decoder



565 D Ton-Decoder



## 566 N, D Funktions-Gen



## 566 F Funktions-Gen.

H342

H.344



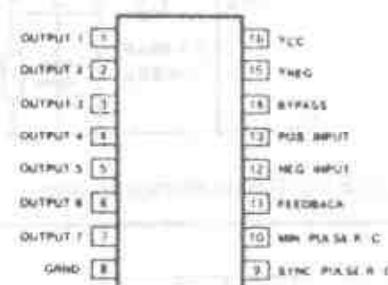
#### 594 Fluoreszenz-Display-Treiber

H.345



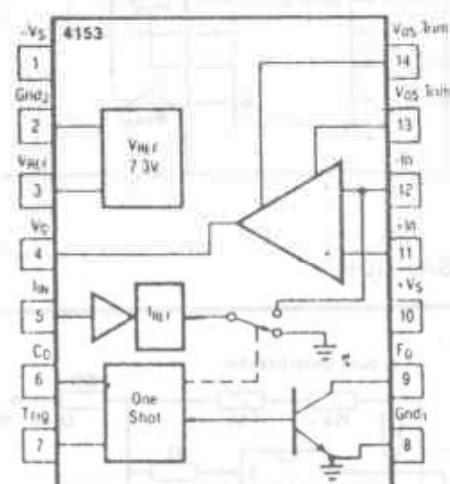
5044 Progr. 7-Kan.-RC-Encoder

H.345

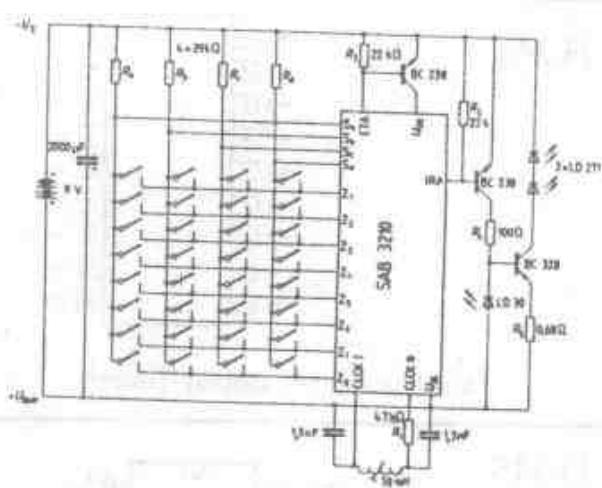


5045 7-Kan.-RG-Decoder

H.346

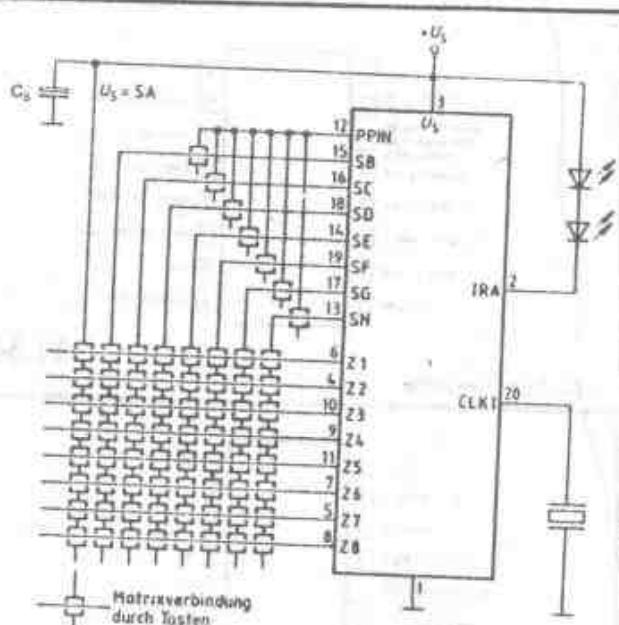


RC 4153 Voltage-to-Frequency-Converter



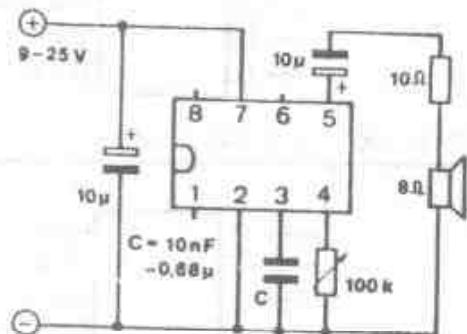
SAB 3210

H.347



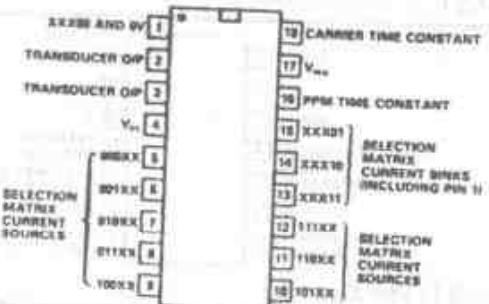
SDA 2208-2

H.351



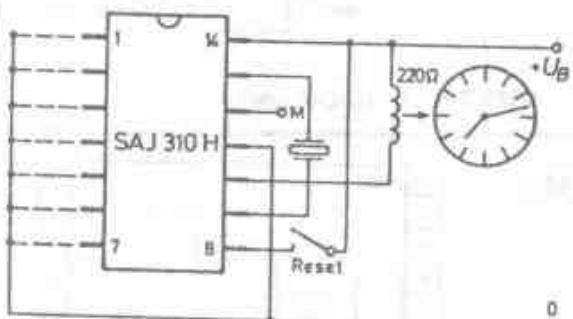
SAE 0700 Signaltongenerator

H.348



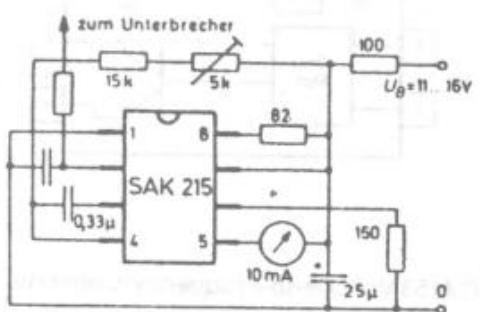
SL 490

H.352

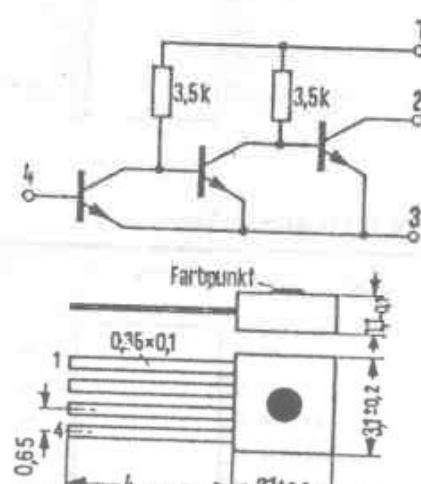


SAJ 310 H

H.349

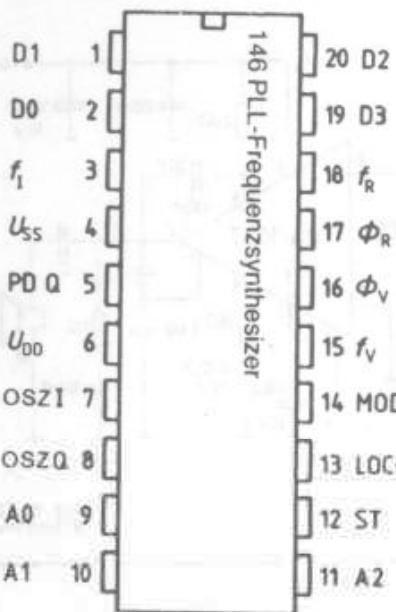


H.350

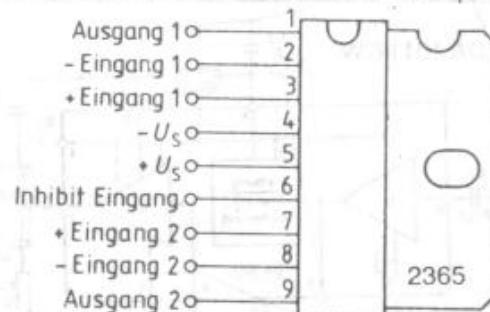


TAA 131

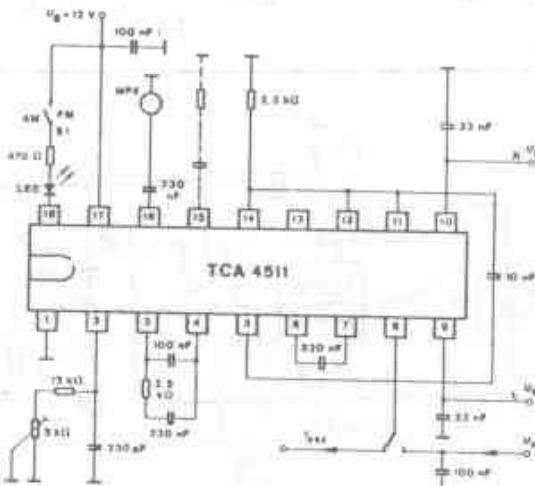
H.353



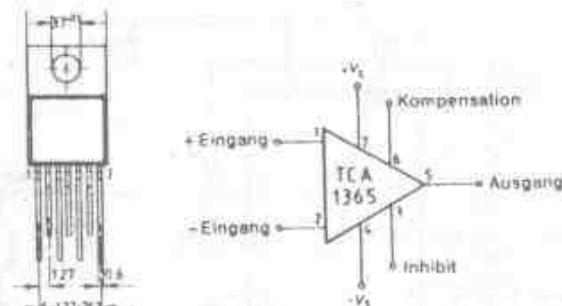
H.354



2365

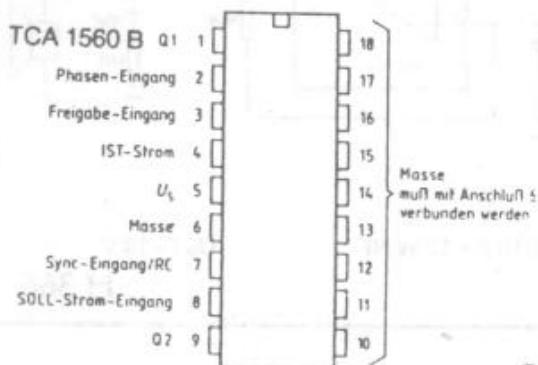


H.359

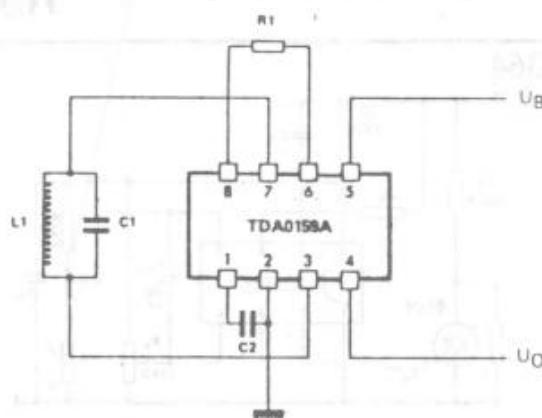


TCA 1365

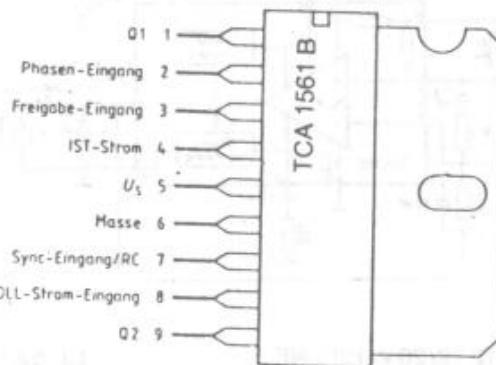
H.355



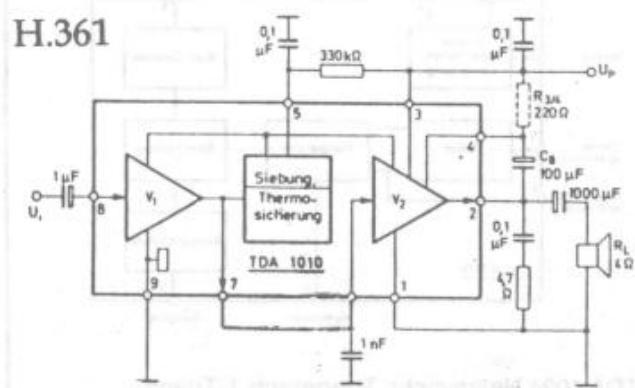
H.356

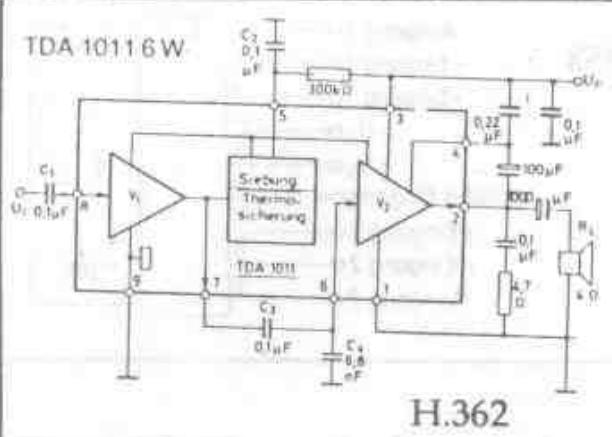


H.360

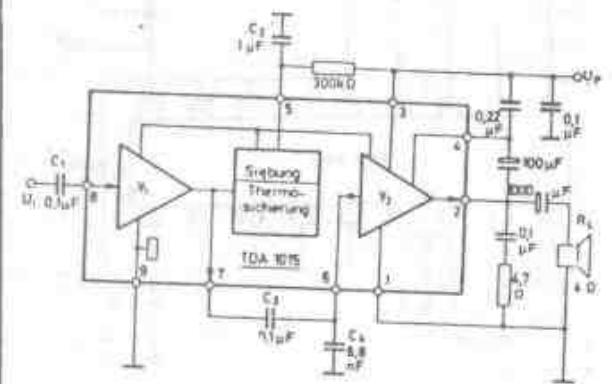


H.357





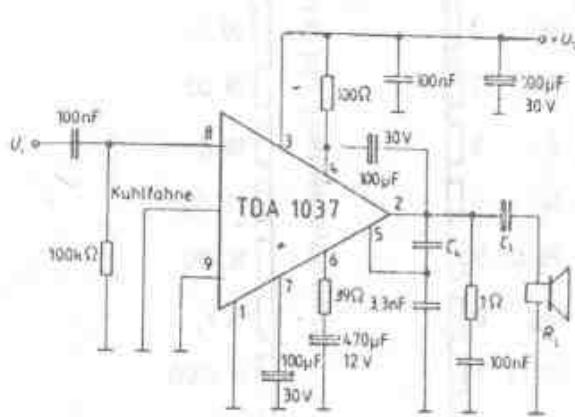
H.362



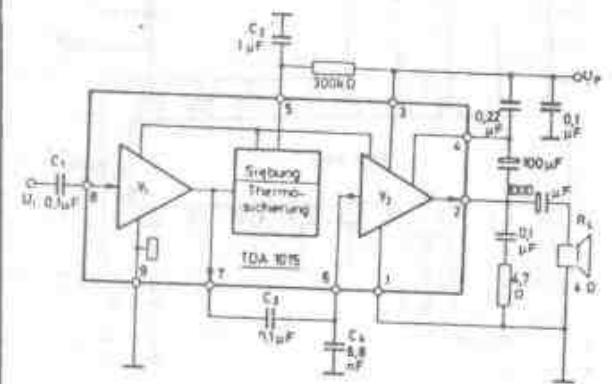
TDA 10154W.

$U_B$  3.6–18 V

H.363



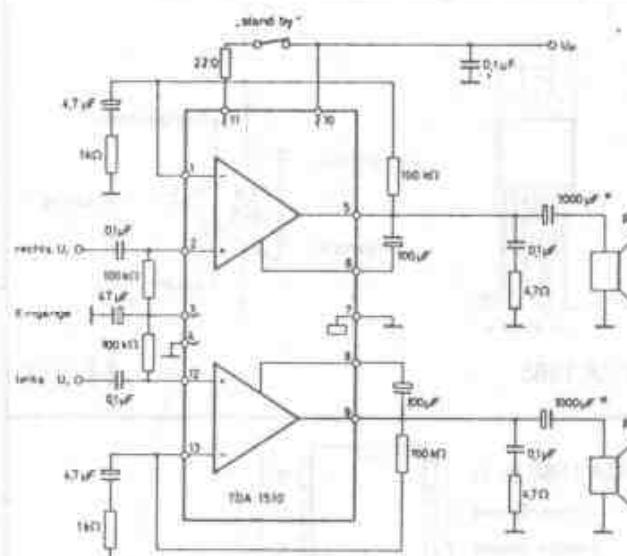
H.365



TDA 10154 W.

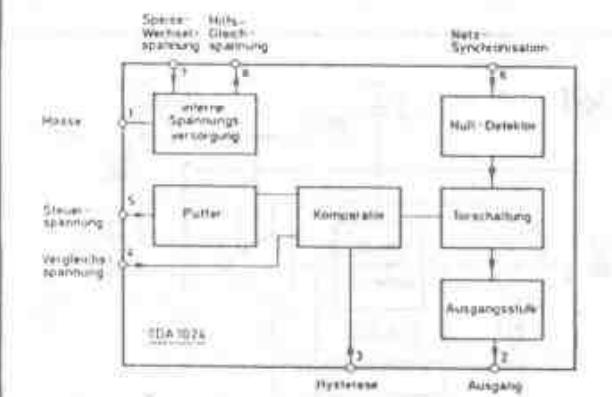
$U_B$  3.6–18 V

H.363

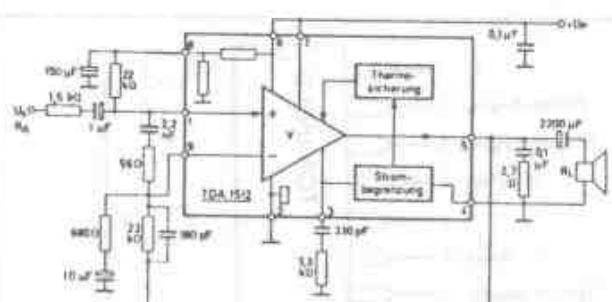


**U<sub>B</sub> 6–18 V**

H.366

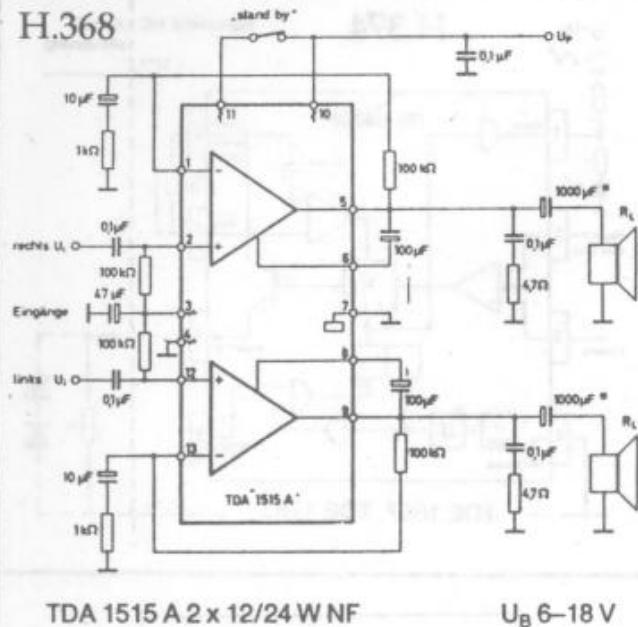


### TDA 1024 Netzsynchron. Triggersch. f. Triacs

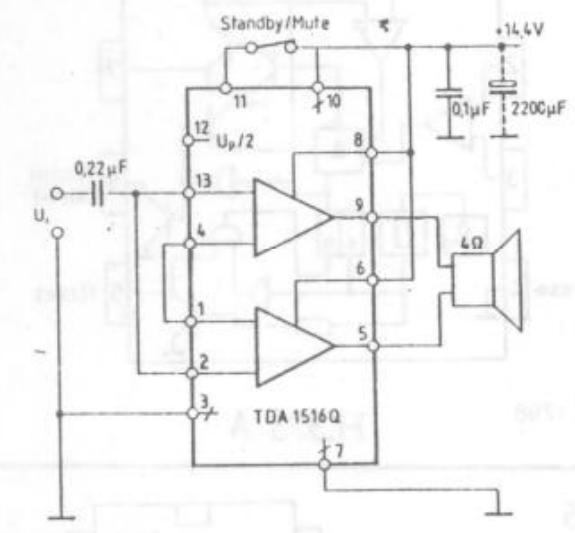


TDA 1512 12/20 W HiFi-NF-

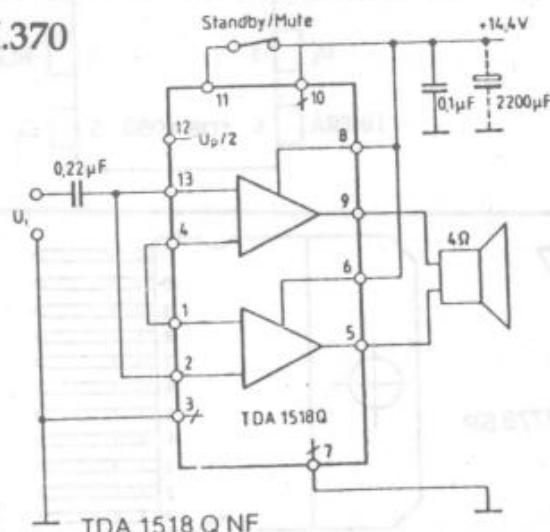
H.367

**H.368**

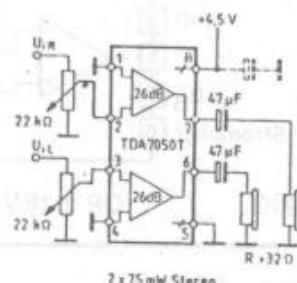
TDA 1515 A 2 x 12/24 W NF

 $U_B$  6–18 V

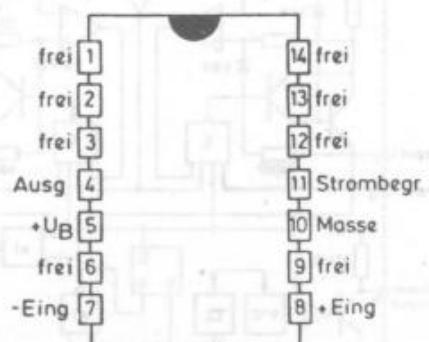
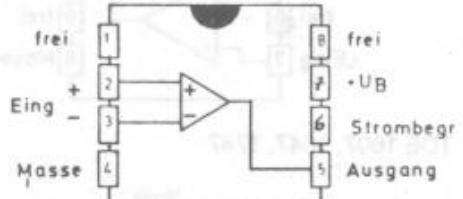
TDA 1516 Q NF

**H.369****H.370**

TDA 1518 Q NF

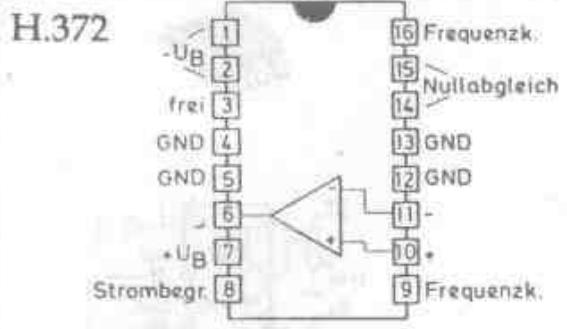


TDA 7050 T 150 mW NF-Verstärker 3 V, SMD

**H.371****TDE 1737 DP**

TDE 1737

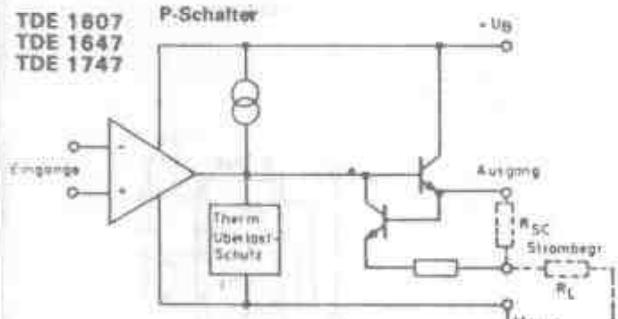
**H.375**



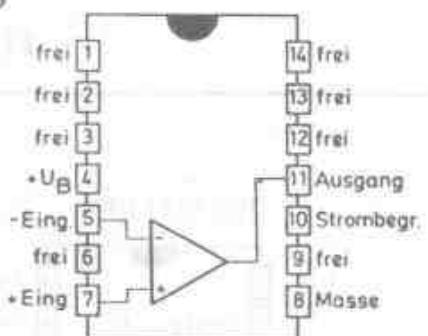
TDB 7910

OP ± 18 V, 10,5 A

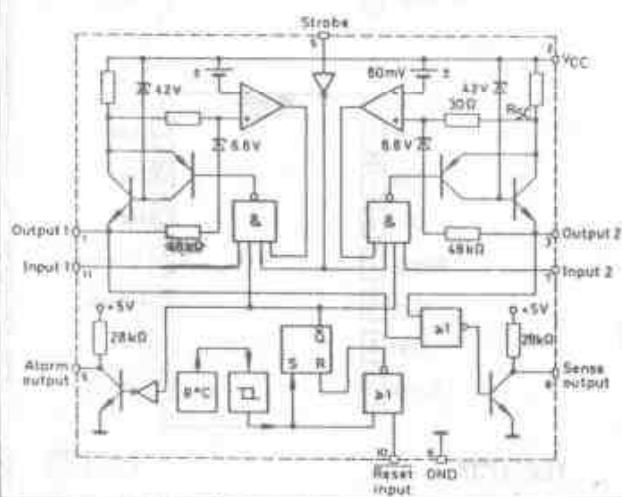
TDE 1607 TDE 1647 TDE 1747



H.373

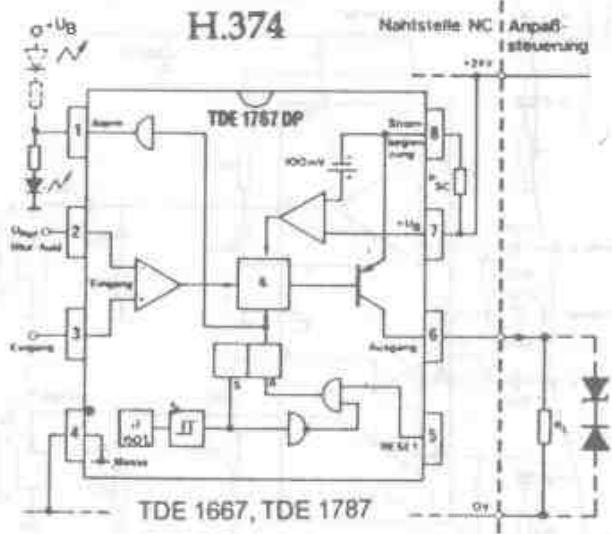


TDE 1607, 1647, 1747

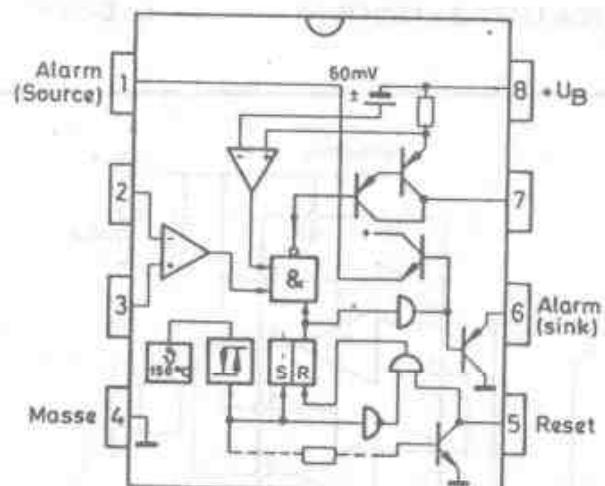


H.374

Nahstelle NC | Anpaß-  
steuerung



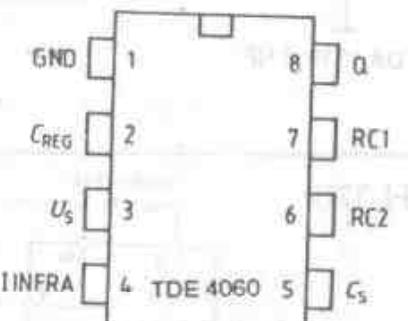
TDE 1667, TDE 1787



TDE 1798

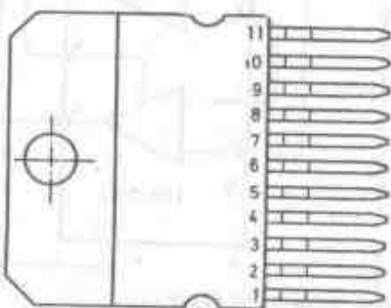
H.375 A

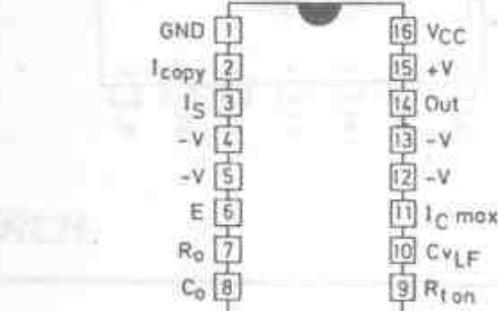
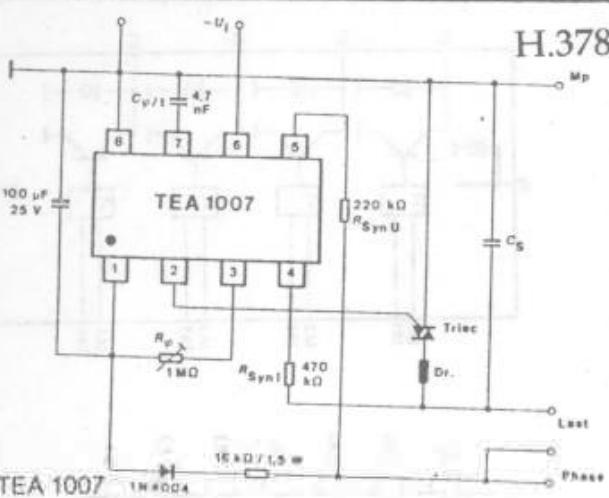
H 376



H 377

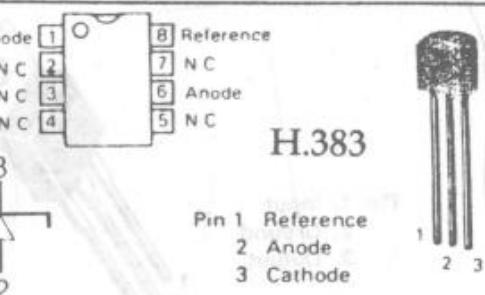
TDF 1778 SP





TEA 2162, UAA 5001

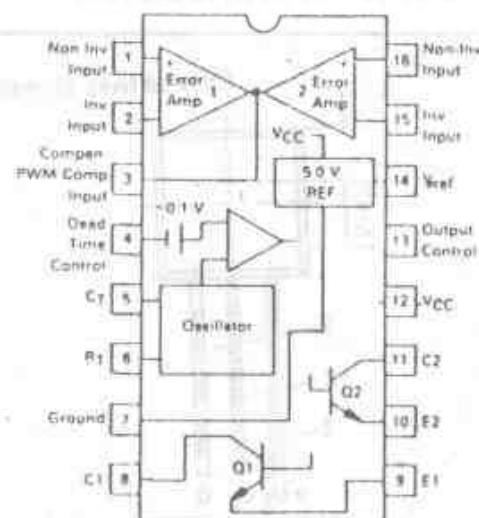
H.379



H.383

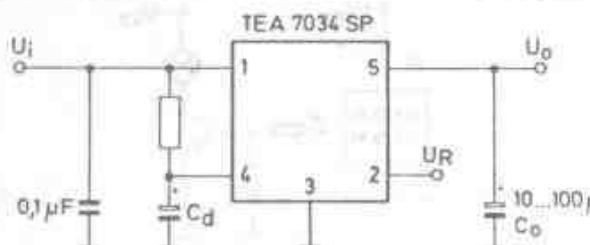
Pin 1 Reference  
2 Anode  
3 Cathode

431, LP, P, JG, Programmierb. Präz. Ref.



TL 494 Schaltregler

H.384



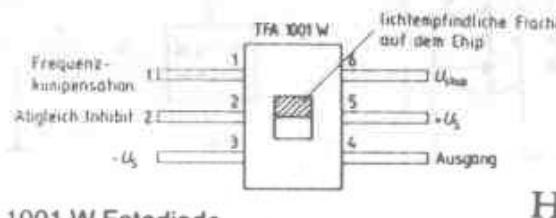
TEA 7034 SP Low-drop

H.380



TL 507 CP A/D-Converter

H.385



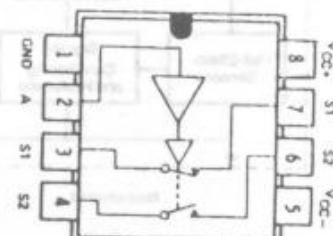
1001 W Fotodiode

H.381

Pin 1 = Ausgang  
Pin 2 = Masse  
Pin 3 =  $+U_S$



H.382



604

886.1

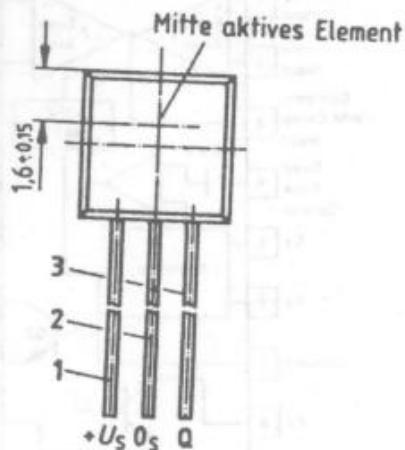
H.386

Pin 1. Input  
2. Ground  
3. Output

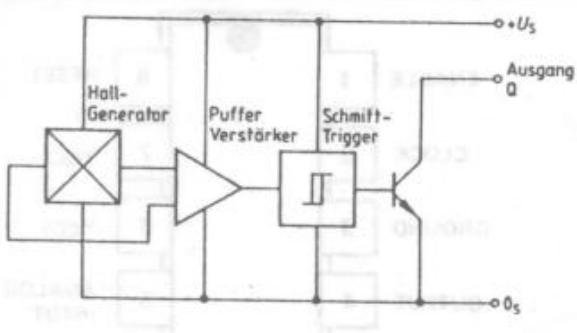


TL 780 pos. Spannungsregler  $\pm 1\%$   
TL 780-05, -12, -15 (5, 12 und 15 V)

H.387

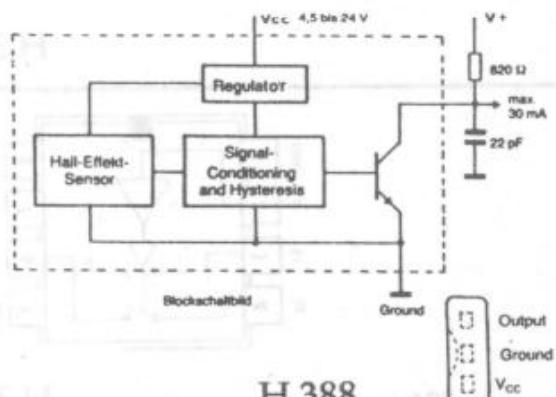


TLE 4901 Halt-Schalter 4,5 ... 30 V  
TLE 4902 Halt-Schalter 4,5 ... 6,8 V  
TLE 4903 Halt-Schalter 4,3 ... 24 V



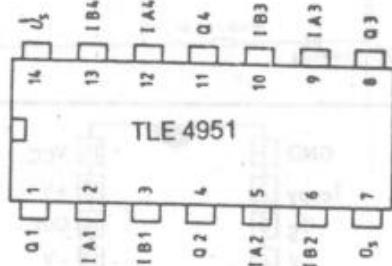
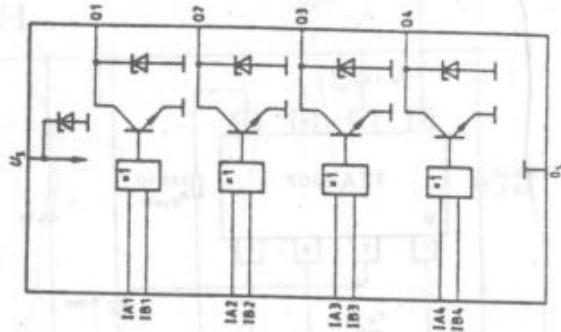
TLE 4902

H.389

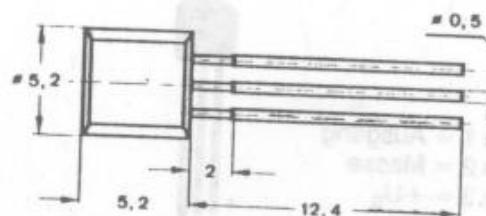
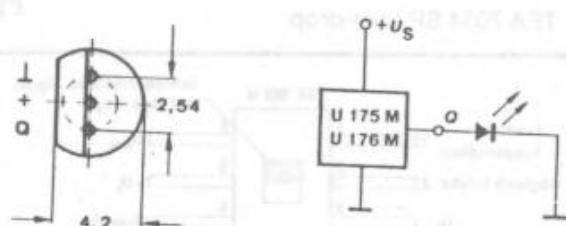
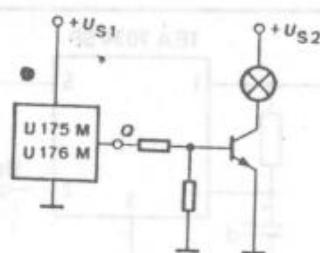


3030 Hall-Schalter

H.388

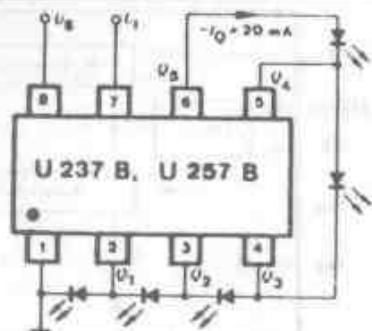


H.390

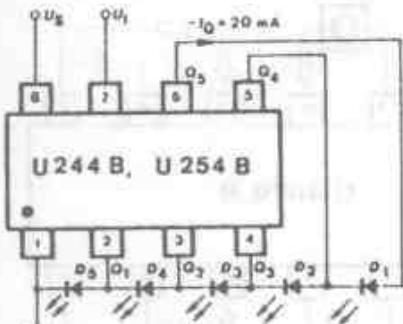


U 175 M, U 176 M Impulsgen.

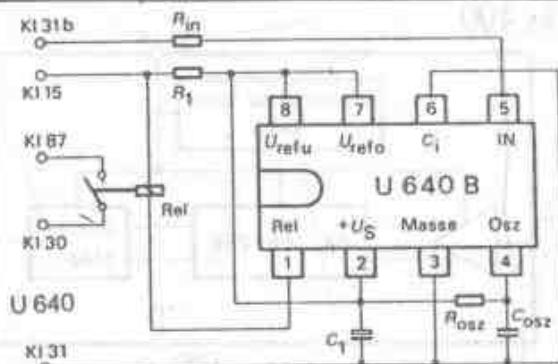
H.391



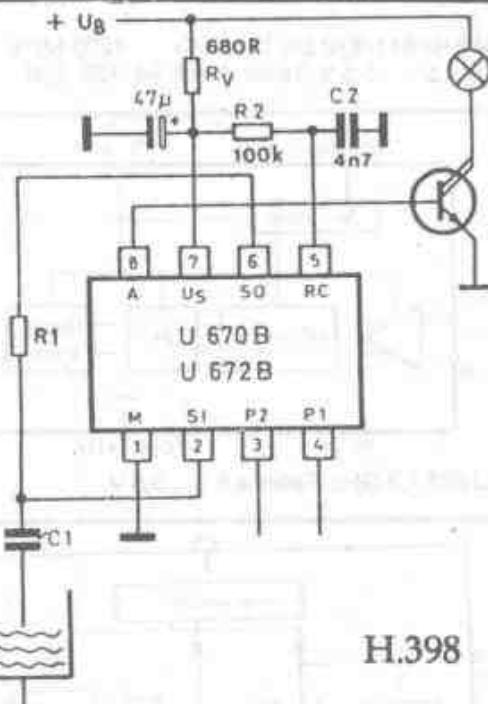
237 / 257 LED-Bandscala



H.392



H.396



H.398

U 670 B Niveauschalter  $R_V = 680 \Omega$ ,  $U_B = 8-24 V$

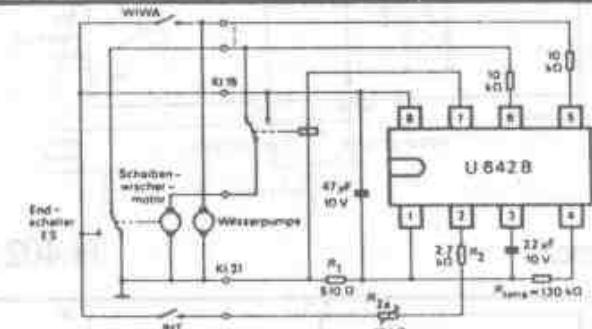
DIV. 2/4/8 INPUT	1	16 GROUND
LOCK INDICATOR OUTPUT	2	15 OSC. INPUT
PHASE DETECTOR OUTPUT	3	14 OSC. OUTPUT
DISABLE INPUT	4	13 +VIN
DRIVER A OUTPUT	5	12 BUFFER AMP. OUTPUT
DRIVER B OUTPUT	6	11 BUFFER AMP. INPUT
SENSE AMP. INPUT	7	10 LOOP AMP. OUTPUT
5V REF. OUTPUT	8	9 LOOP AMP. INV. INPUT

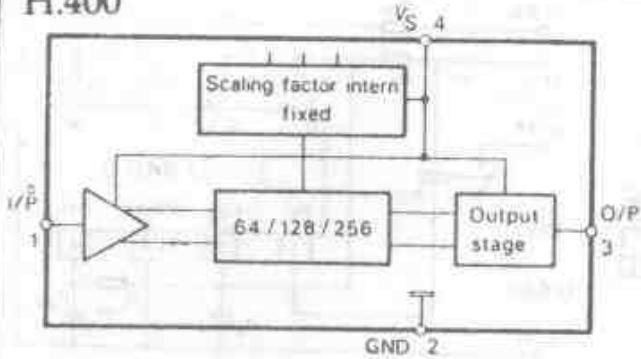
UC 1634/2634/3634  
Phase Locked Frequency Controller

H.394

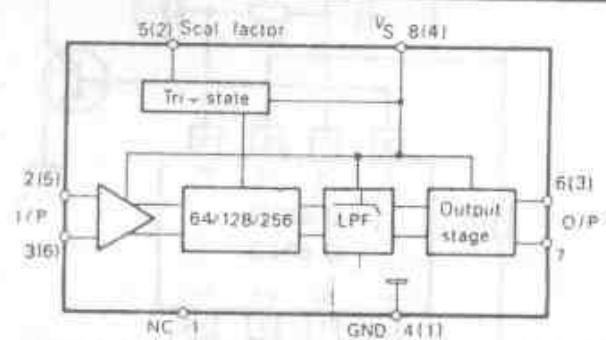
+Vm	1	18 ISET
Ct	2	17 E/A OUTPUT
-Vm	3	16 -E/A
Aout	4	15 +E/A
-Vs	5	14 SHUTDOWN
+Vs	6	13 -C/L
Bout	7	12 +C/L
+Bm	8	11 +Am
-Bm	9	10 -Am

UC 1637/2637/3637 Switch Mode Controller  
- für DC Motor Drive

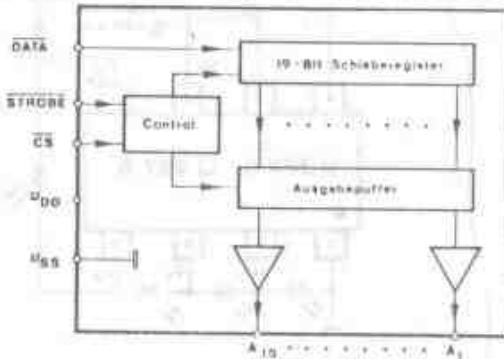


**H.400**

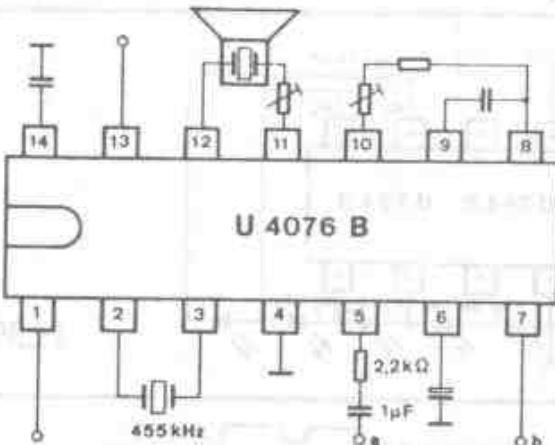
U 810/811/812 BS Teiler 70 ... 1200 MHz  
V<sub>S</sub> 4,5 ... 5,5 V, Teiler durch 64, 128, 256

**H.401**

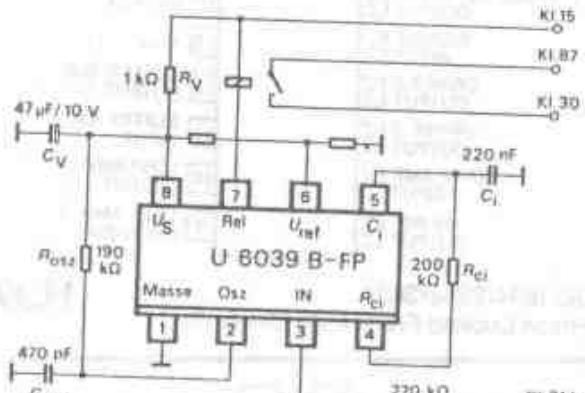
U 893 1,3 GHz-Teiler 4,5 ... 5,5 V

**H.401****H.404**

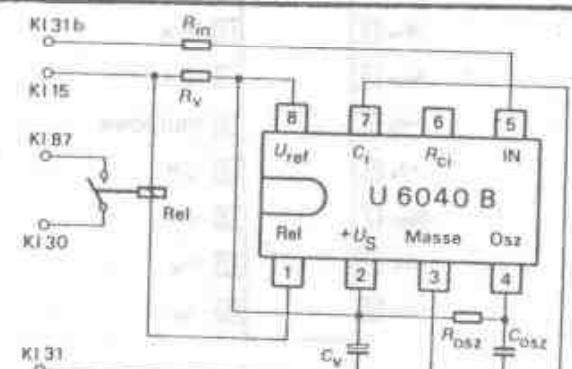
U 3082, U 3084 M

**H.405**

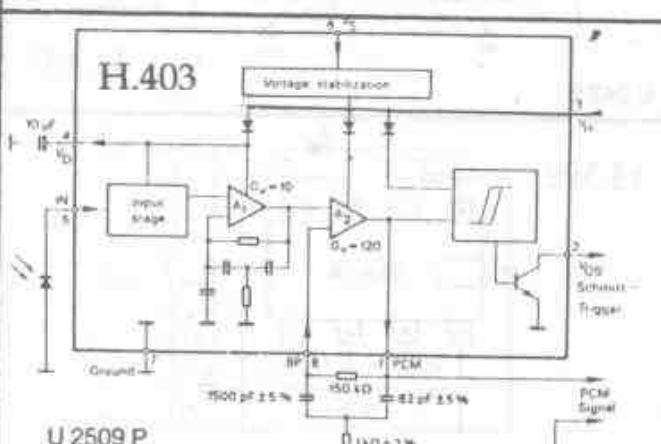
4076 B



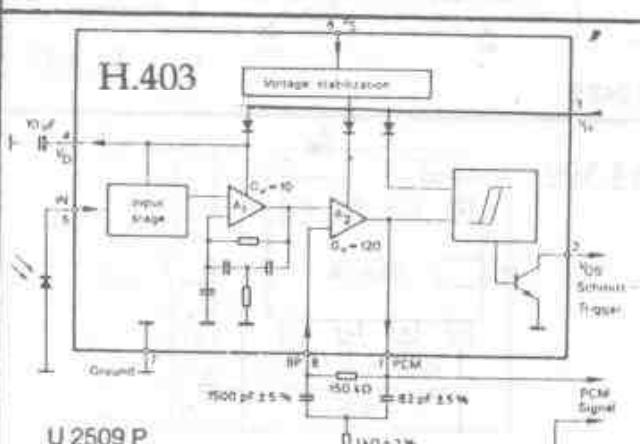
U 6039

**H.406**

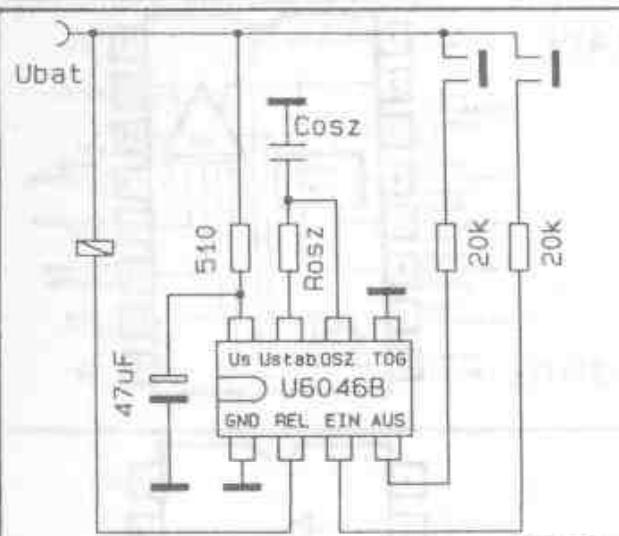
U 6040

**H.407****H.402**

U 2507 P

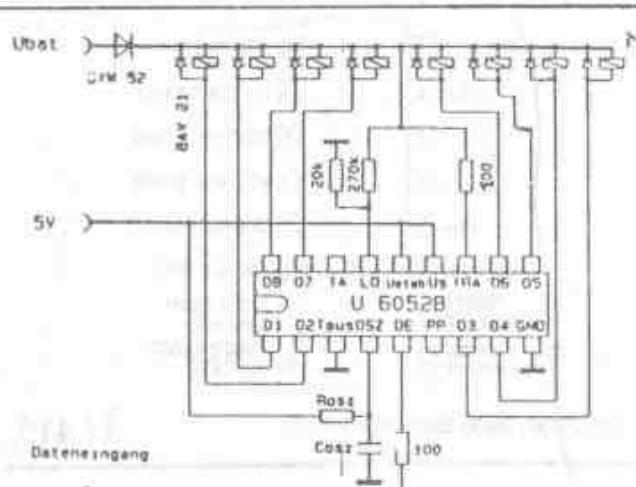
**H.402****H.403**

U 2509 P



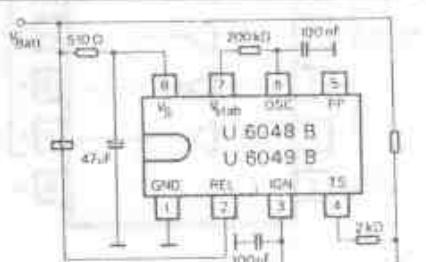
U 6046/6047

H.408



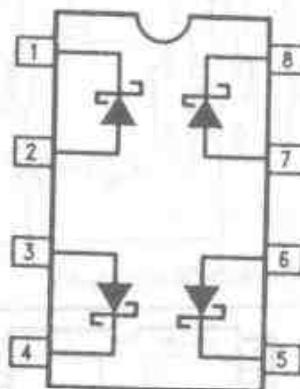
U 6052 B

H.411



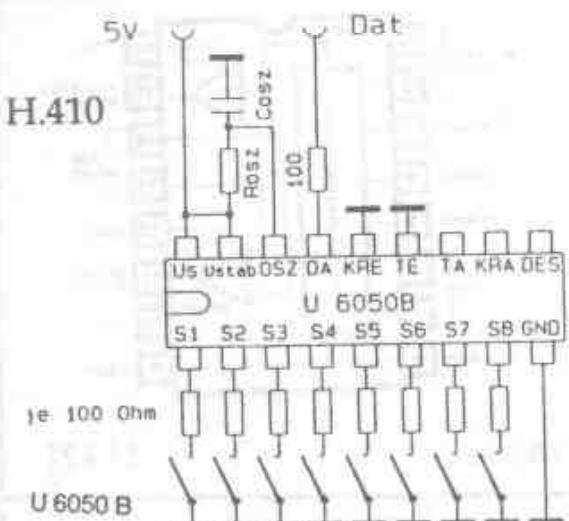
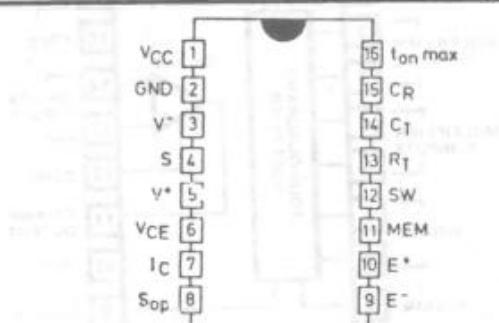
U 6048/6049

H.409



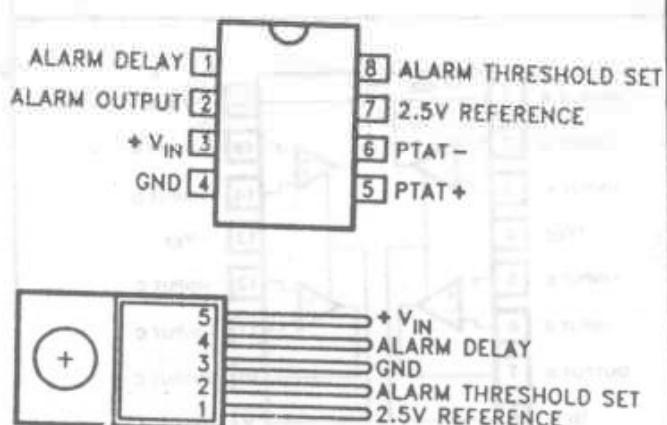
UC 1611, 3611 Quad Schottky Diode Array

H.413

je 100 Ohm  
U 6050 B

UAA 4003 DP PWM-Controller

H.412

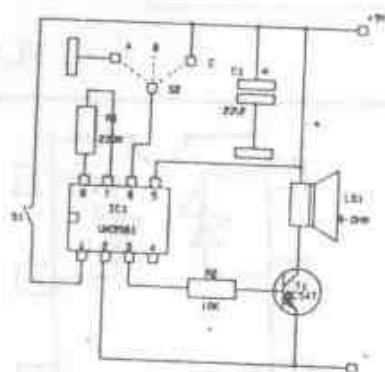


UC 1730/2730/3730

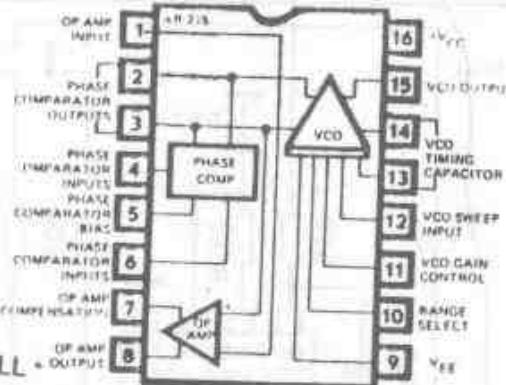
H.414

C/S OUT	1
C/S -	2
C/S +	3
C/L	4
+V <sub>IN</sub>	5
GROUND	6
POWER INDICATE	7
OVER-CHARGE TERMINATE	8
OVER-CHARGE INDICATE	9
VOLTAGE SENSE	13
CHARGE ENABLE	12
TRICKLE BIAS	11
STATE LEVEL CONTROL	10
	15 DRIVER-SOURCE
	16 DRIVER-SINK
	14 COMPENSATION

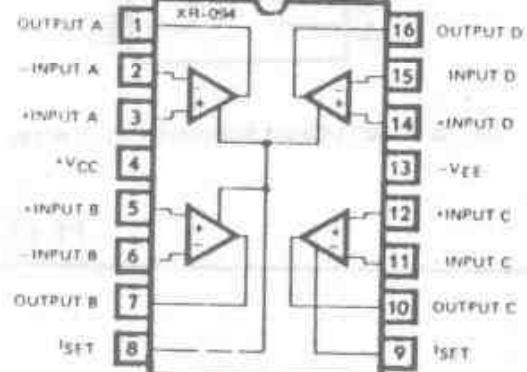
UC 2906/3906 Batterie-Lader

UM 3561 Vielfach-Sirene U<sub>B</sub> 3 V

H.419

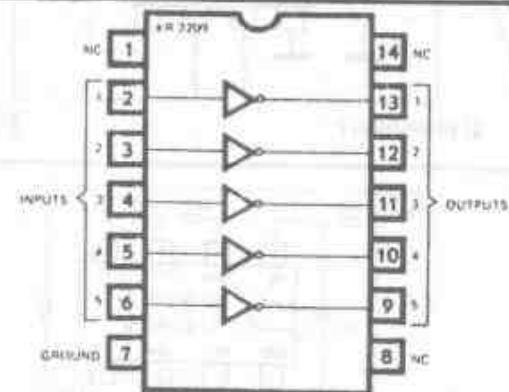


H.415



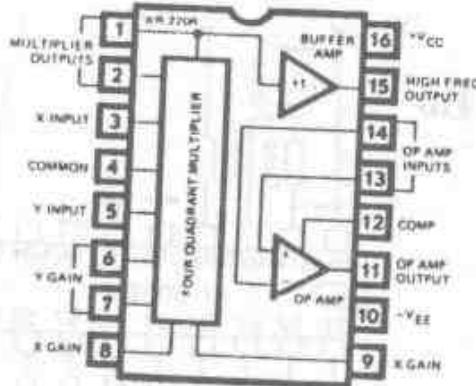
XR-094 4-fach IFET Op Amp

H.417



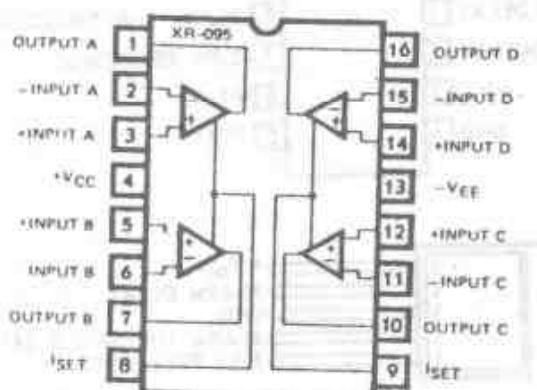
XR 2200 Relais-Treiber

H.420



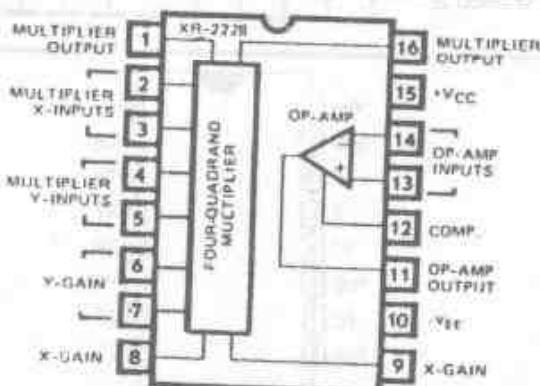
XR 2208

H.421



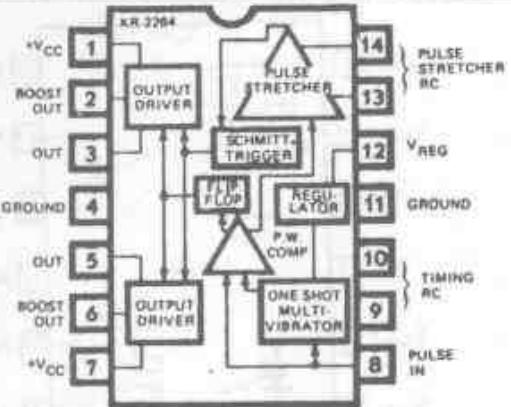
XR 095 4-fach IFET Op Amp

H.418



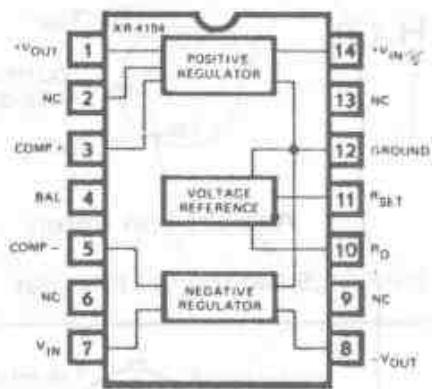
XR 2228

H.422

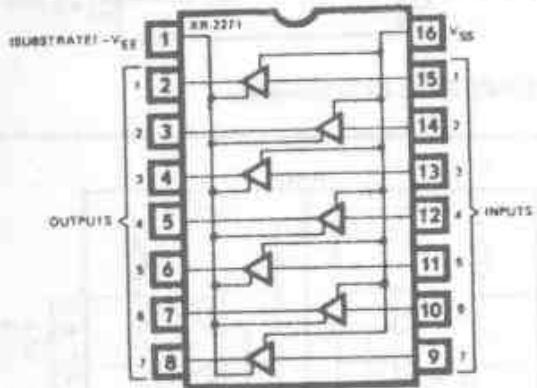


2264/65 Pulsprop-Servo IC

H.427

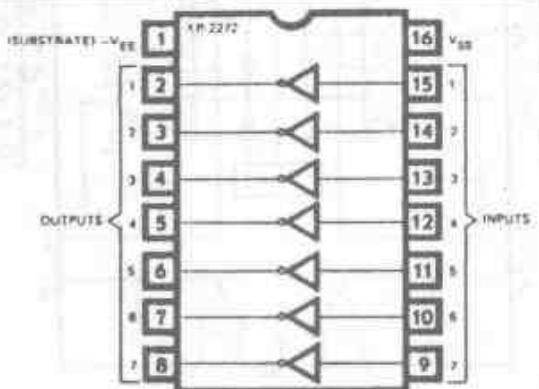


H.423



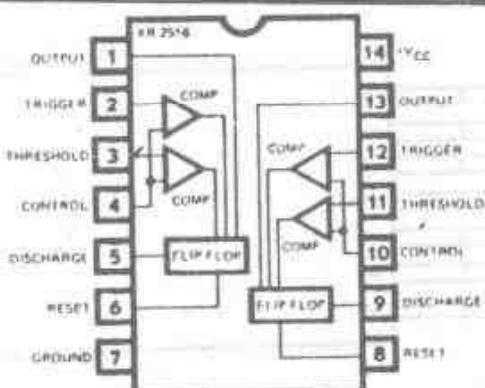
XR 2271 Display-Treiber

H.424



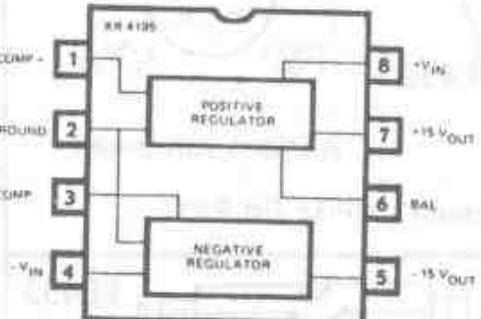
XR 2272 High Volt Display-Treiber

H.425



XR 2556 Dual-Timer

H.426



H.428

DB, 1	+V <sub>CC</sub>
DB, 2	CLOCK R.C.
DB, 3	MODE
DB, 4	DOWN
DB, 5	UP
DB, 6	RESET
DB, 7	V <sub>REF D/A</sub>
DB, 8	ANALOGUE OUTPUT
GND 9	V <sub>REF A/D</sub>

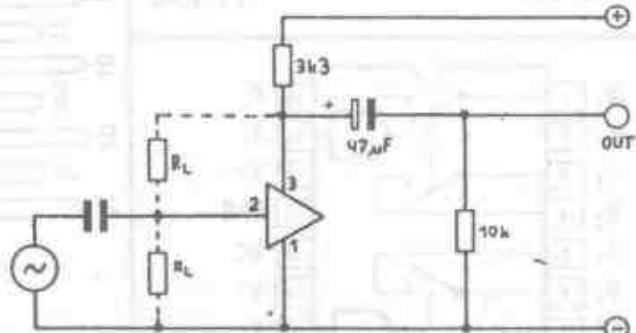
ZN 435 8 Bit, DVA-AD-Converter

H.429

BOTTOM VIEW

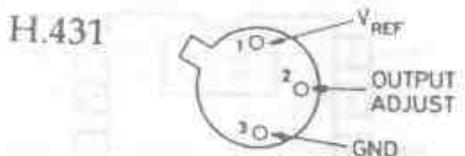


PIN NAMES  
1 COMMON (-)  
2 INPUT  
3 OUTPUT SUPPLY (+)



ZN 482

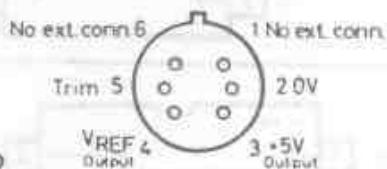
H.430



H.431

Ansicht von unten

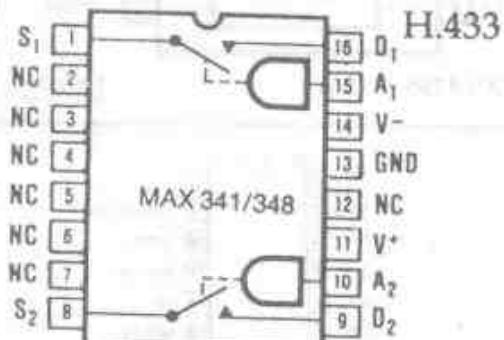
ZNREF 025, 040, 050, 062 Präz.-Ref.



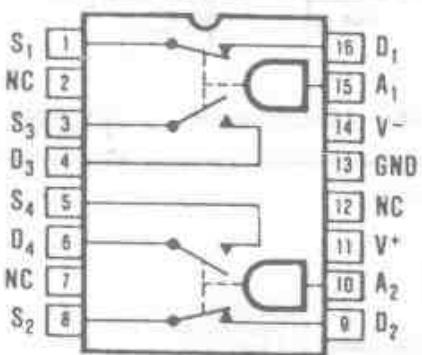
H.432

### Ansicht von unten

ZNREF 100 Präz.-Ref. 9,8 V

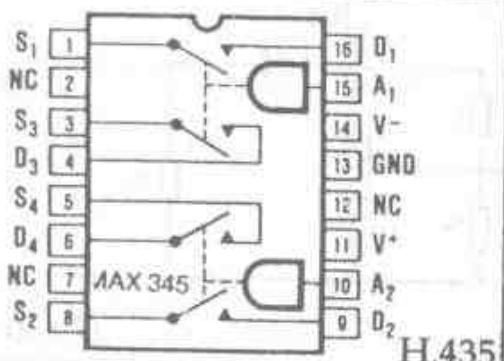


H.433

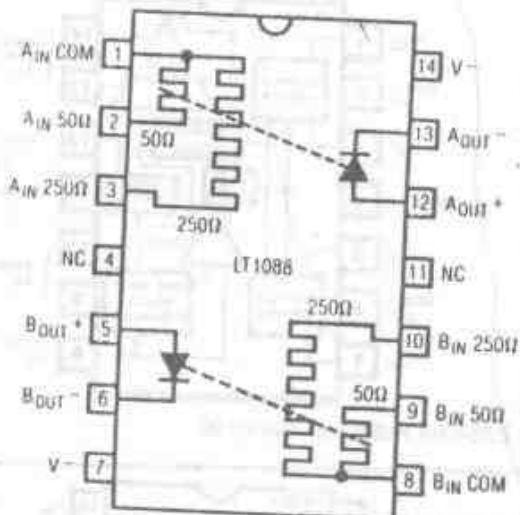


MAX 343

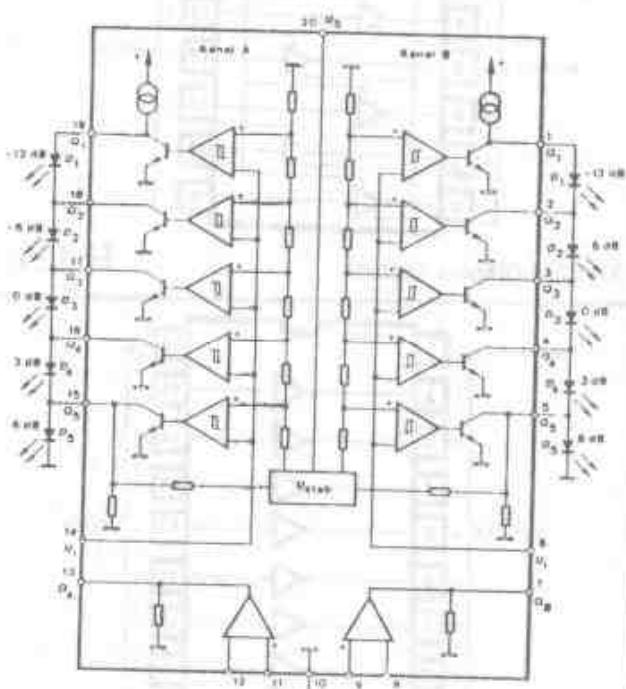
H 434



H.435

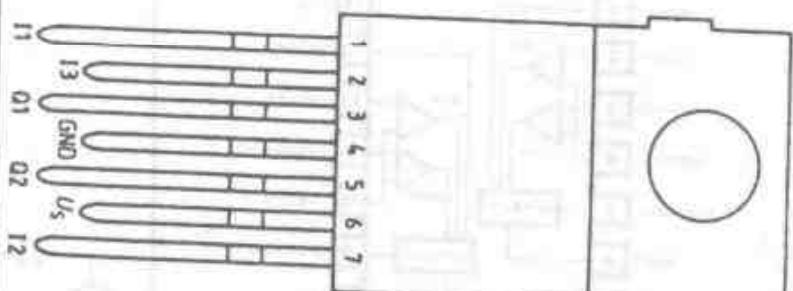


LT1088 RMS-DC-Converter



U 2068 B Stereo-LED

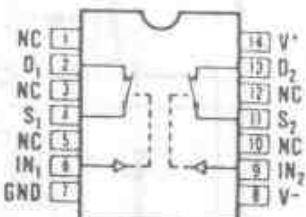
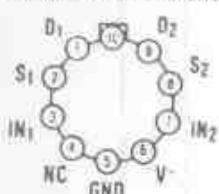
H.437



TLE 4202

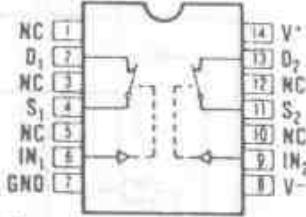
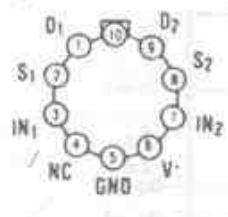
H.438

H.439

V<sup>+</sup> [SUBSTRATE AND CASE]

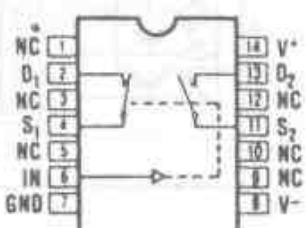
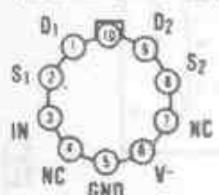
LOGIC	SWITCH
0	OFF
1	ON

DG 300 TTL

V<sup>+</sup> [SUBSTRATE AND CASE]

LOGIC	SWITCH
0	OFF
1	ON

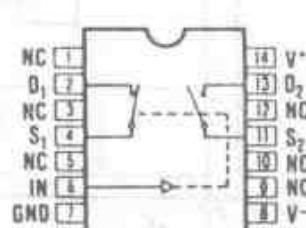
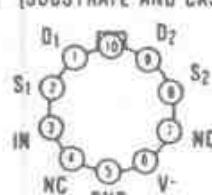
H.443

V<sup>+</sup> [SUBSTRATE AND CASE]

LOGIC	SWITCH 1	SWITCH 2
0	OFF	ON
1	ON	OFF

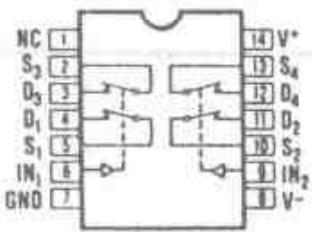
DG 301

H.440

V<sup>+</sup> [SUBSTRATE AND CASE]

LOGIC	SWITCH 1	SWITCH 2
0	OFF	ON
1	ON	OFF

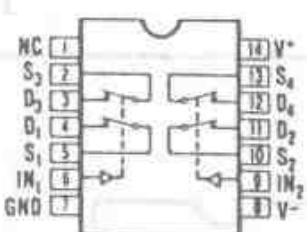
H.443



LOGIC	SWITCH
0	OFF
1	ON

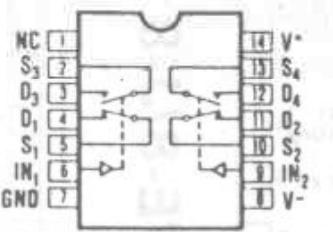
DG 302

H.441



LOGIC	SWITCH
0	OFF
1	ON

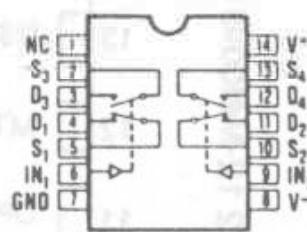
H.445



LOGIC	SWITCH 1 SWITCH 2	SWITCH 3 SWITCH 4
0	OFF	ON
1	ON	OFF

DG 303

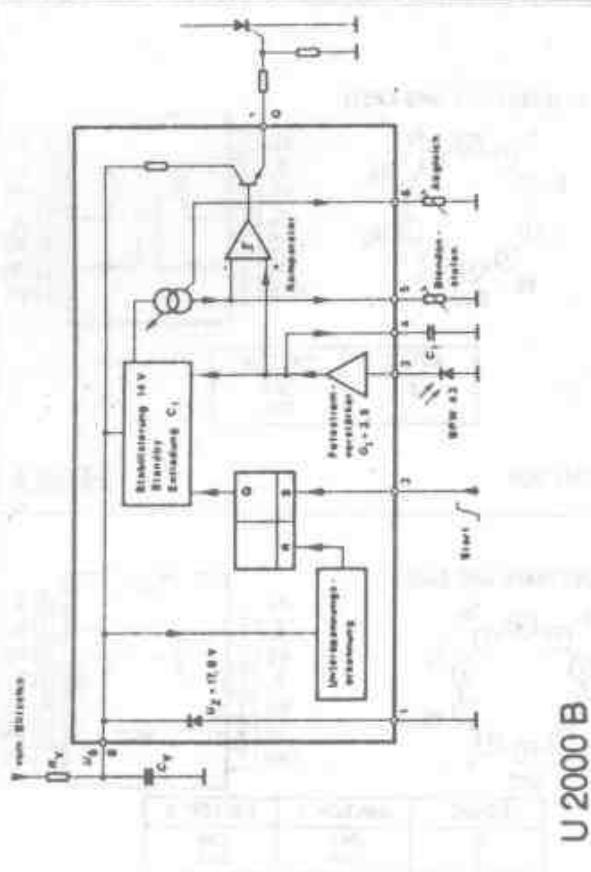
H.442



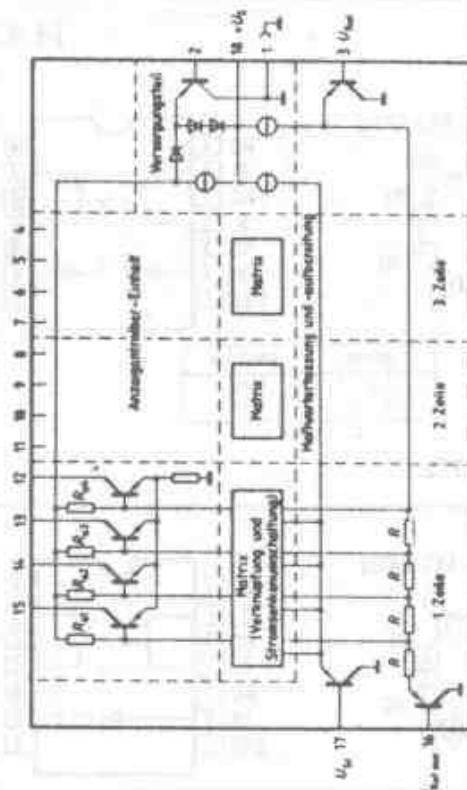
LOGIC	SWITCH 1 SWITCH 2	SWITCH 3 SWITCH 4
0	OFF	ON
1	ON	OFF

DG 307

H.446



U2000 B

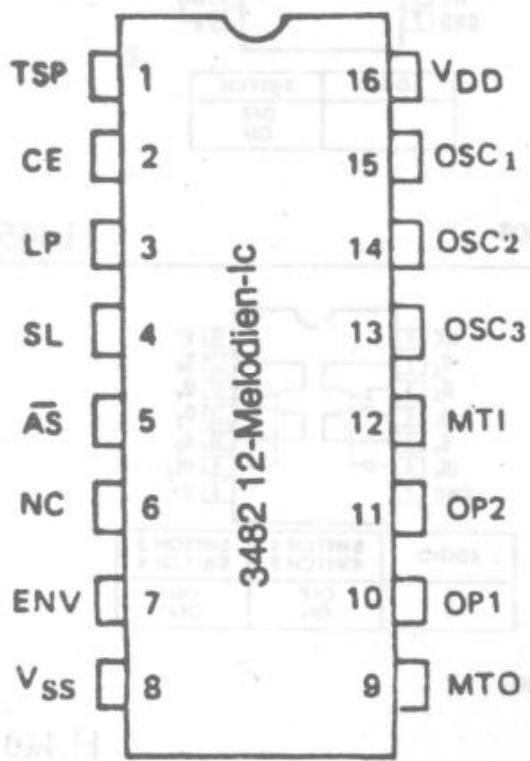


180 LED

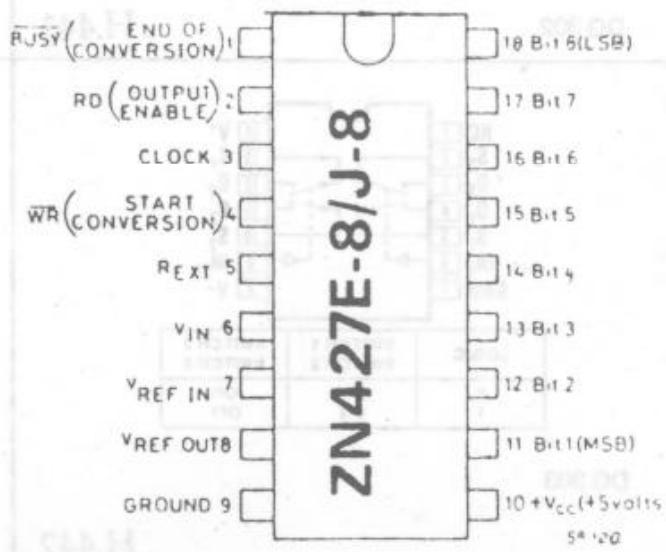
H.460

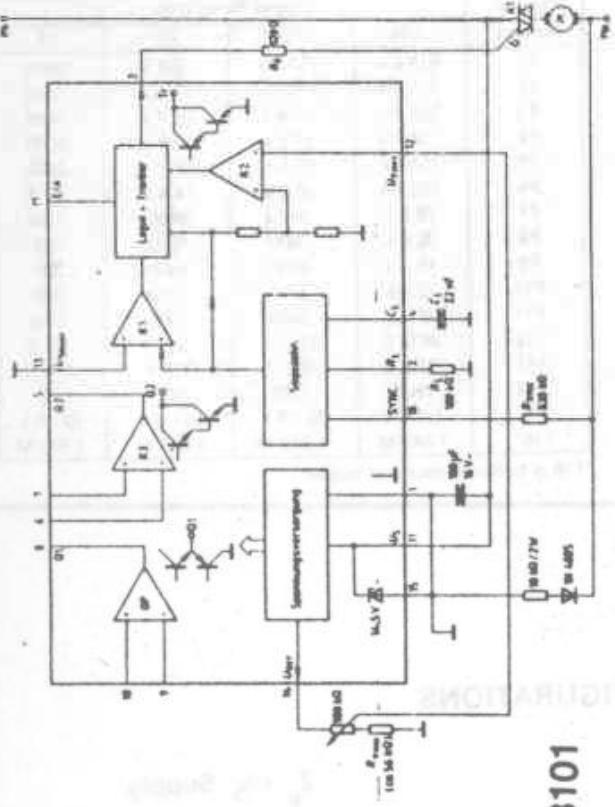
H.461

H.462



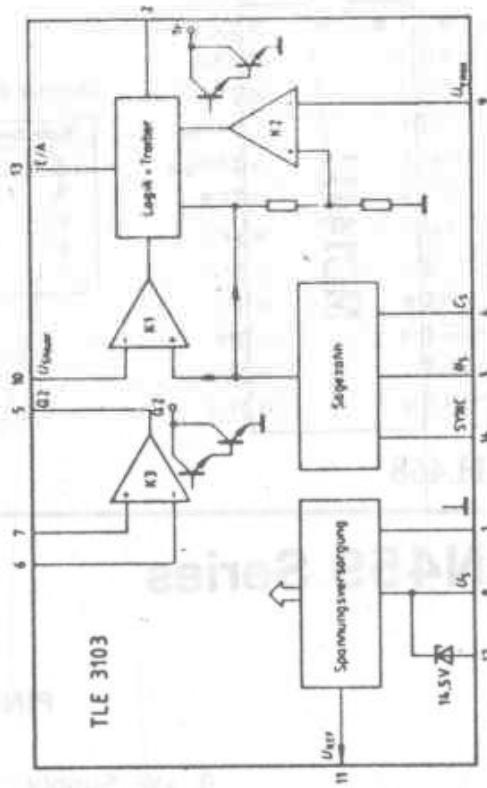
H.463



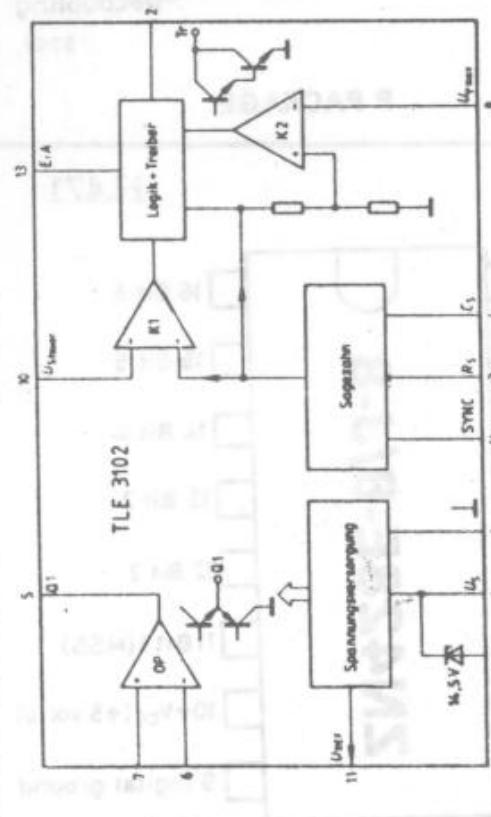


3101

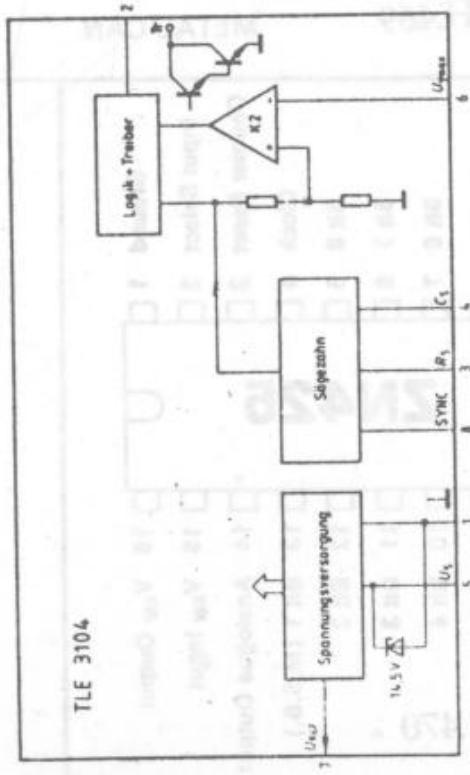
H.464



H.466



H.465



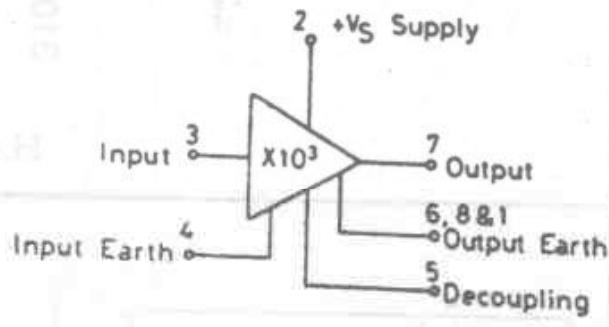
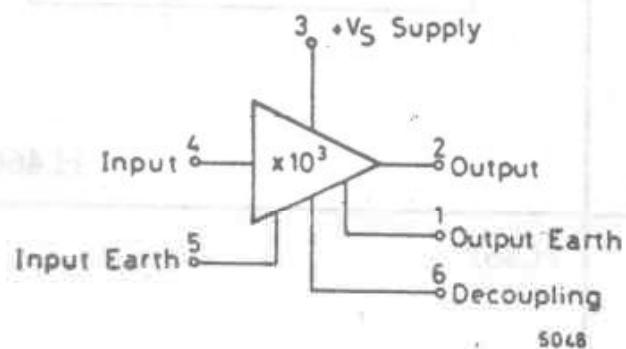
Output Number	Output Rates (Hz)			
	X64	X16	X8	X1
F1	614.4 k	153.6 k	76.8 k	9600
F2	460.8 k	115.2 k	57.6 k	7200
F3	307.2 k	76.8 k	38.4 k	4800
F4	230.4 k	57.6 k	28.8 k	3600
F5	153.6 k	38.4 k	19.2 k	2400
F6	115.2 k	28.8 k	14.4 k	1800
F7	76.8 k	19.2 k	9600	1200
F8	38.4 k	9600	4800	600
F9	19.2 k	4800	2400	300
F10	12.8 k	3200	1600	200
F11	9600	2400	1200	150
F12	8613.2	2153.3	1076.6	134.5
F13	7035.5	1758.8	879.4	109.9
F14	4800	1200	600	75
F15	921.6 k	921.6 k	921.6 k	921.6 k
F16*	1.843 M	1.843 M	1.843 M	1.843 M

\*F16 is buffered oscillator output

H.468

## ZN459 Series

### PINNING CONFIGURATIONS

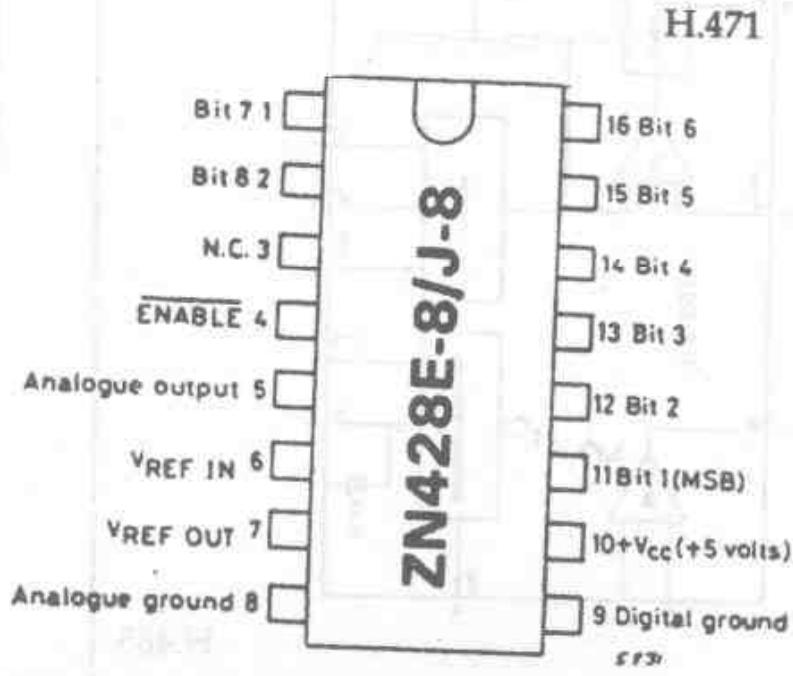


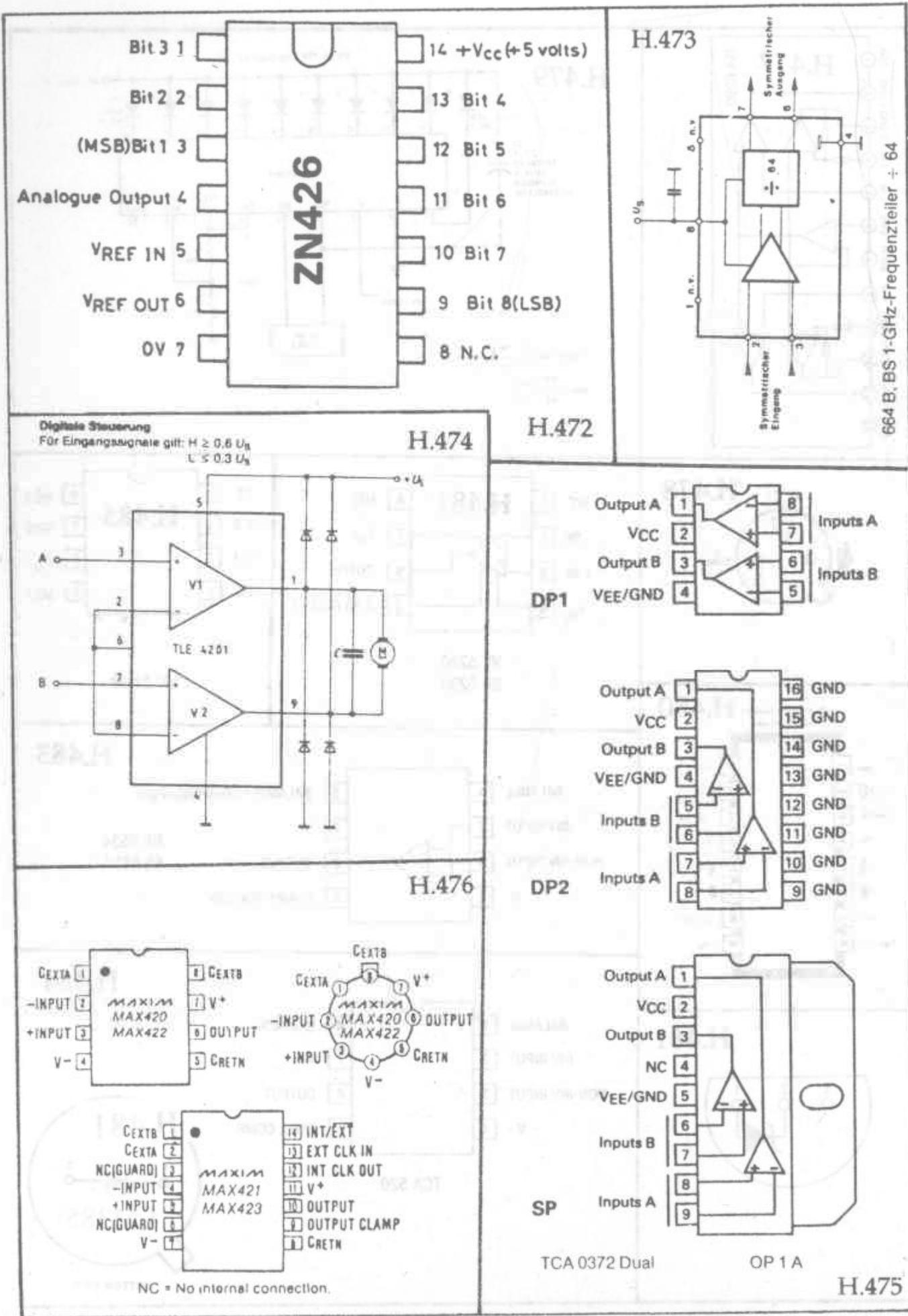
H.469 METAL CAN

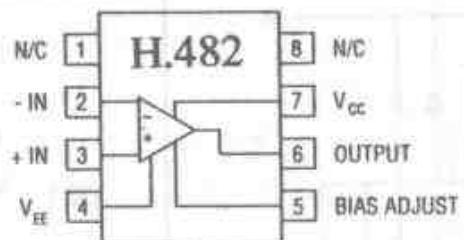
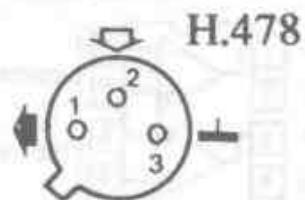
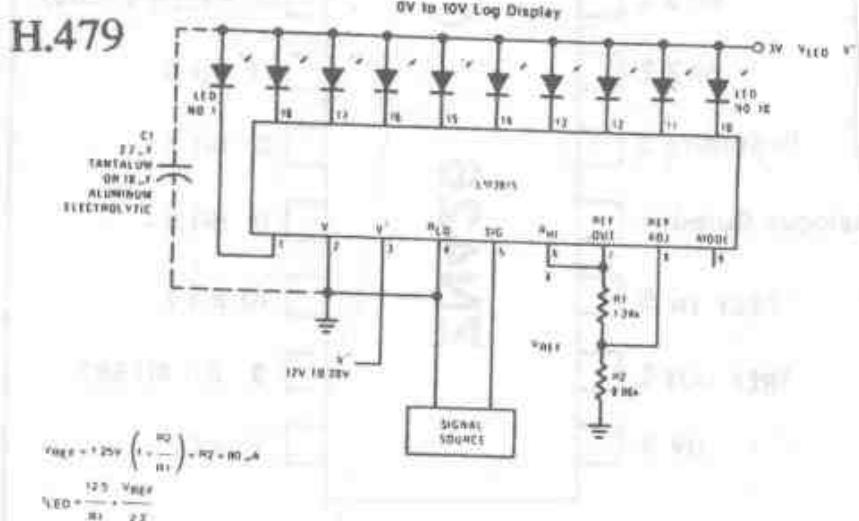
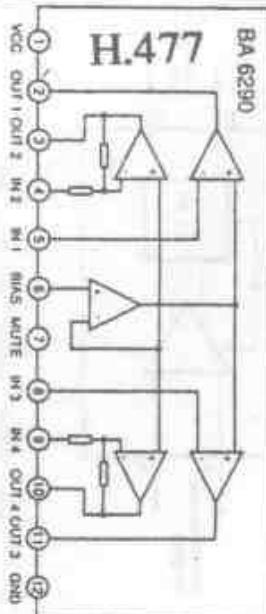
P PACKAGE



H.470



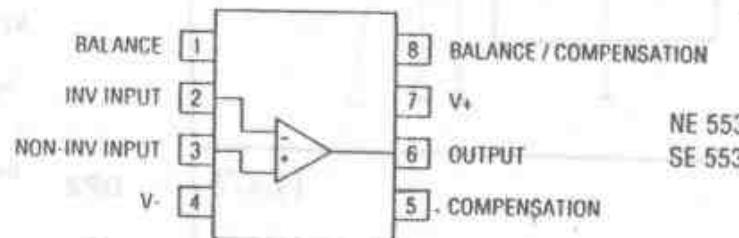
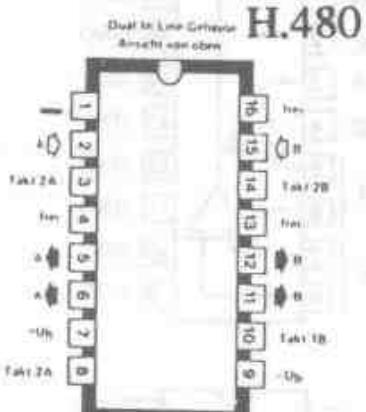




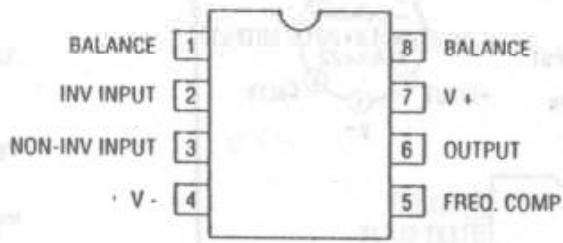
NE 5230  
SA 5230



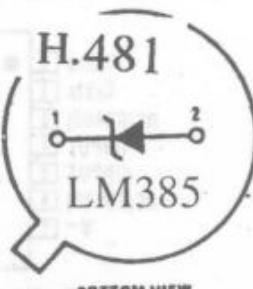
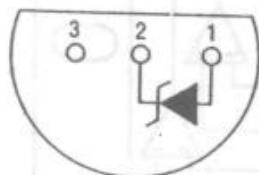
MC 34119



NE 5534  
SE 5534

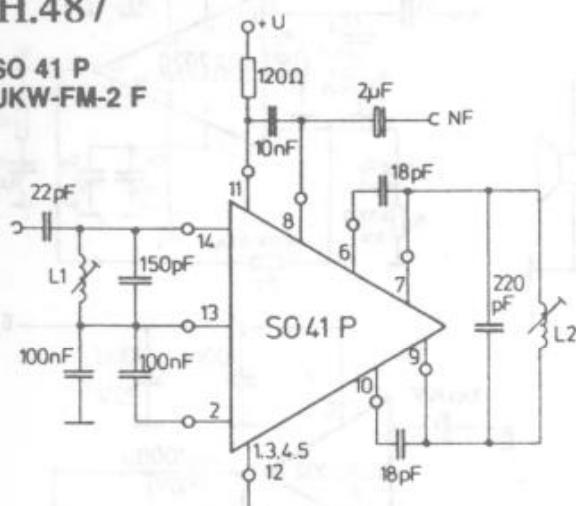


TCA 520

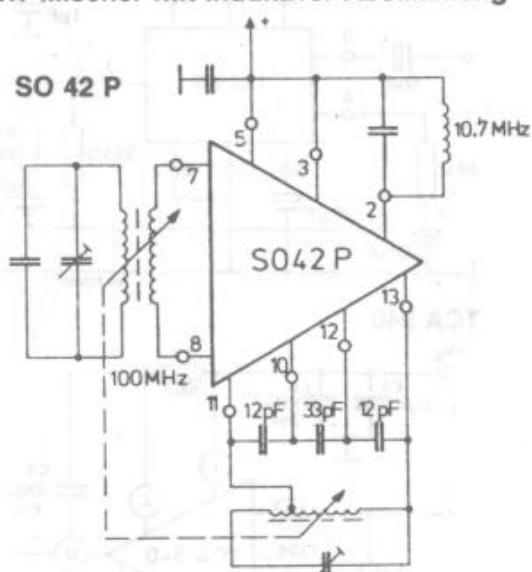


H.487

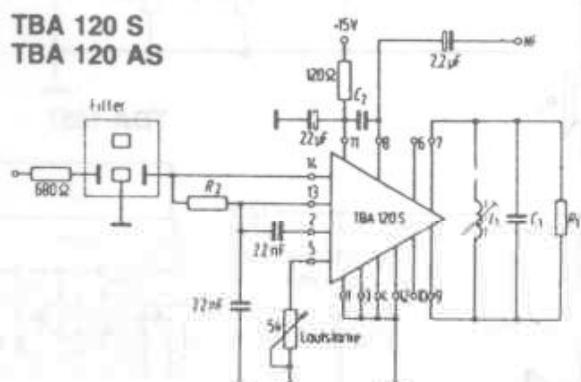
**SO 41 P  
UKW-FM-2 F**



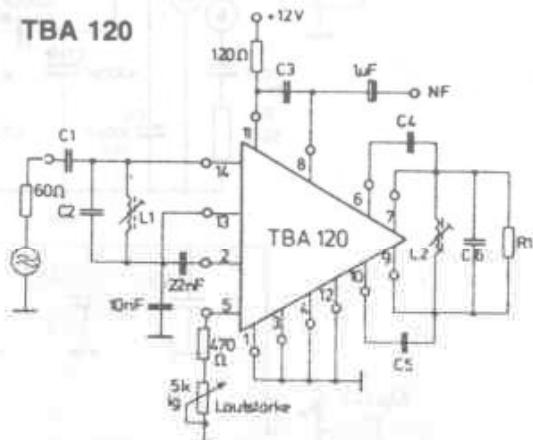
**UKW-Mischer mit induktiver Abstimmung**



**TBA 120 S  
TBA 120 AS**

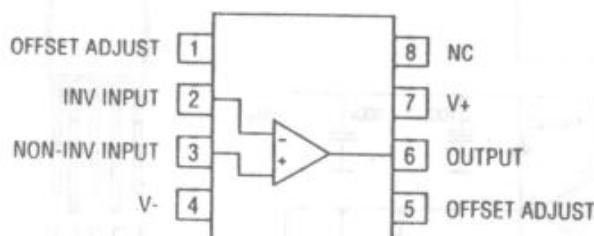


**TBA 120**

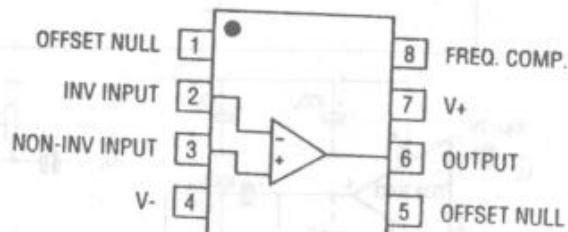


Ton-ZF in FS-Geräten	Ton-ZF in FS-Geräten amerik. Norm	FM-ZF in RF-Mono-Geräten	FM-ZF in RF-Stereo-Geräten
C <sub>1</sub> C <sub>2</sub> L <sub>1</sub> R <sub>1</sub> R <sub>2</sub> Filter (Murata)	1.5 nF 22 nF 8 Wdg 10 680 Ω SFC 5.5 MA	2.2 nF 22 nF 8 Wdg 10 1 kΩ SFC 4.5 MA	470 pF 22 nF 8 Wdg 10 330 Ω SFE 10.7 MA
			330 pF 470 pF 12 Wdg 1 kΩ 330 Ω SFE 10.7 MA

H.488

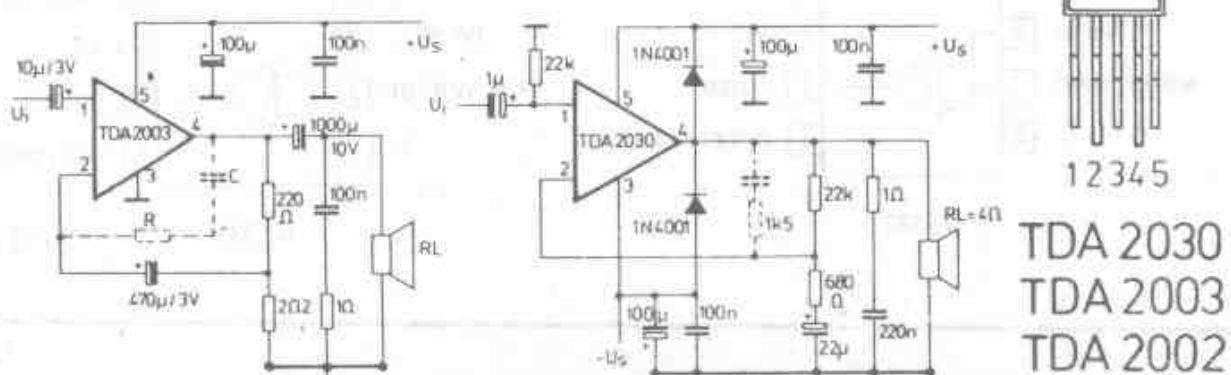
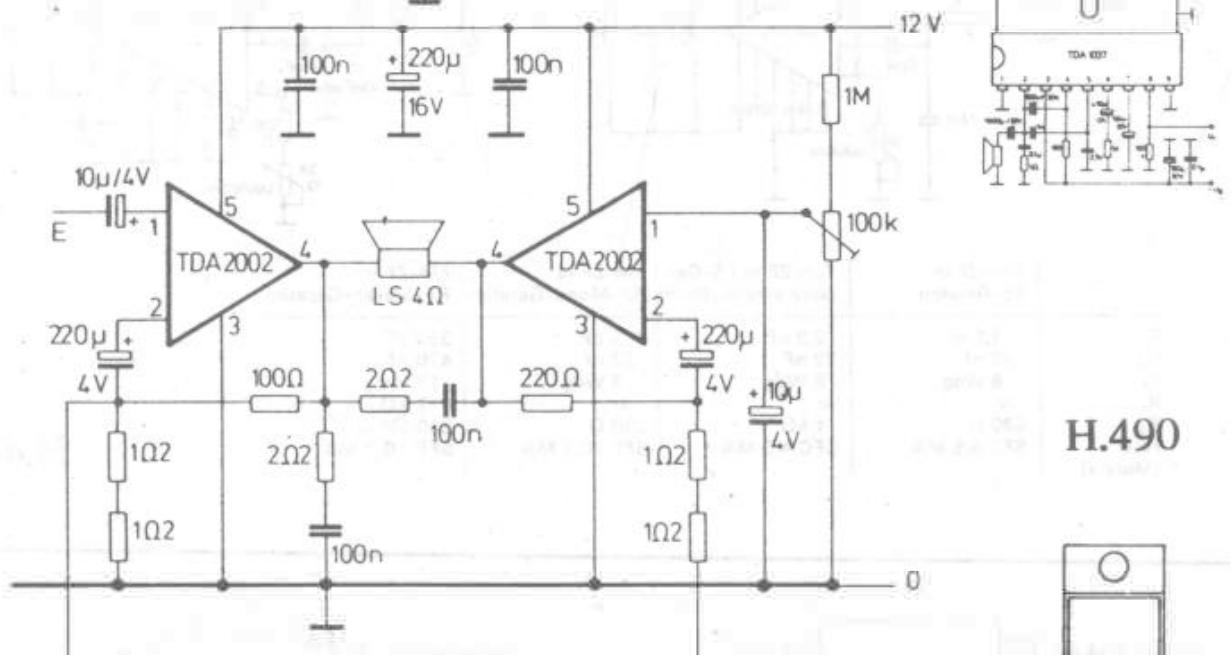
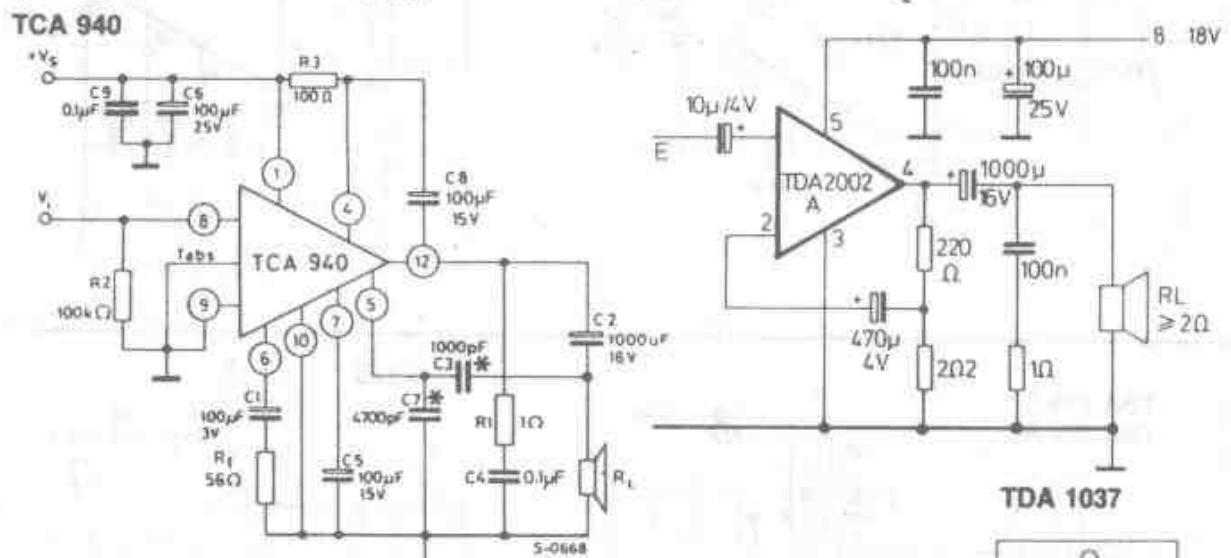
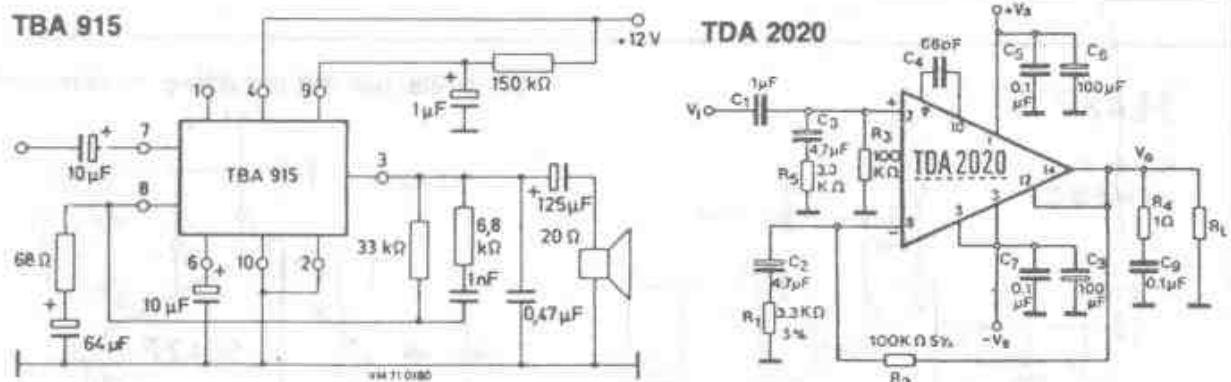


NE 530



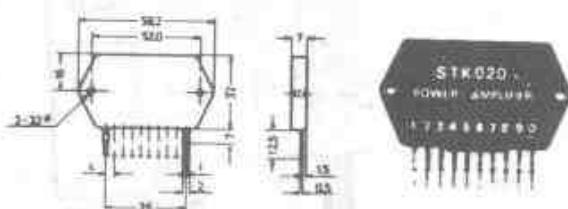
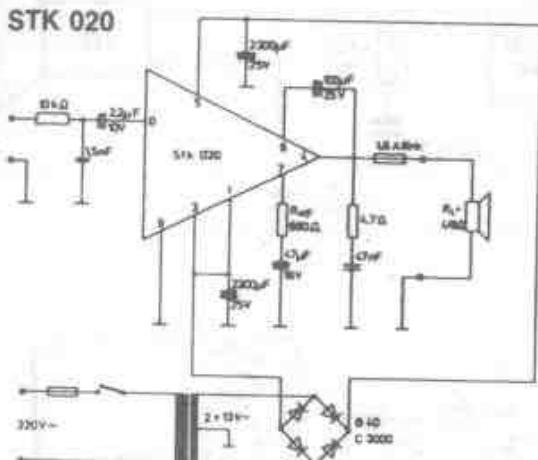
NE 531

H.489

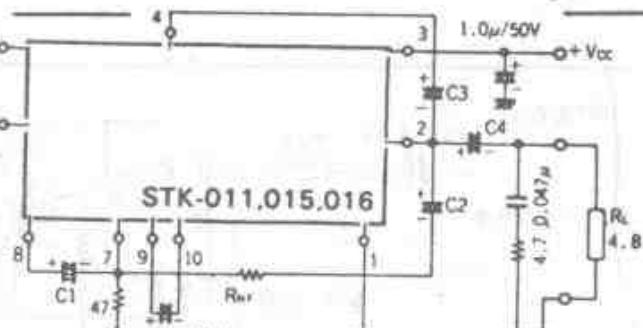
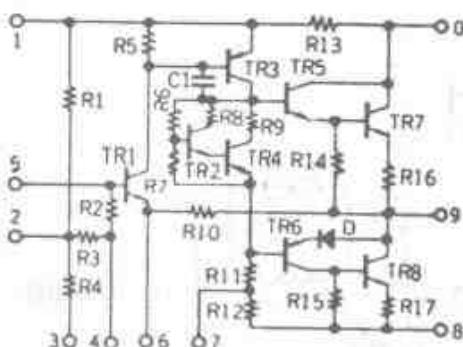


H.491

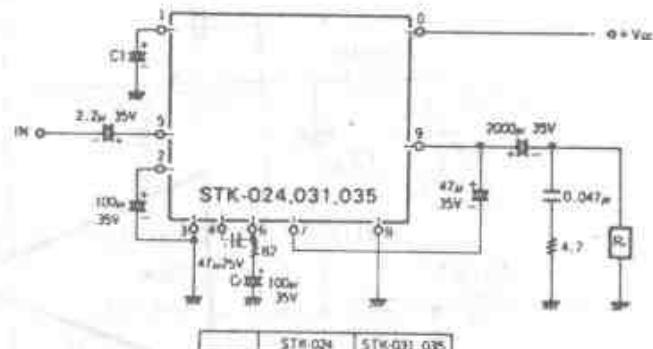
STK 020



STK 035

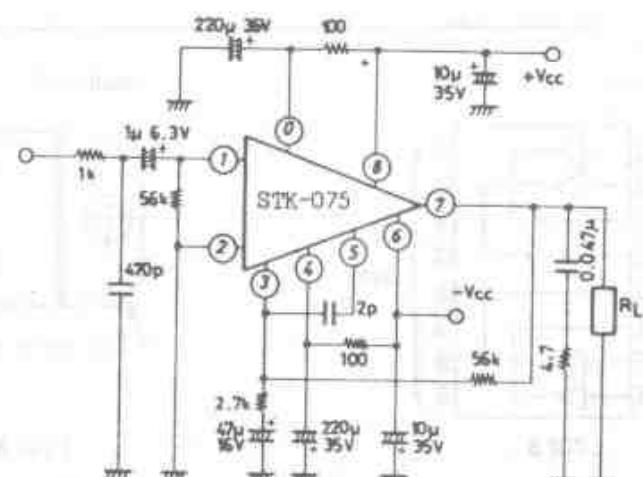
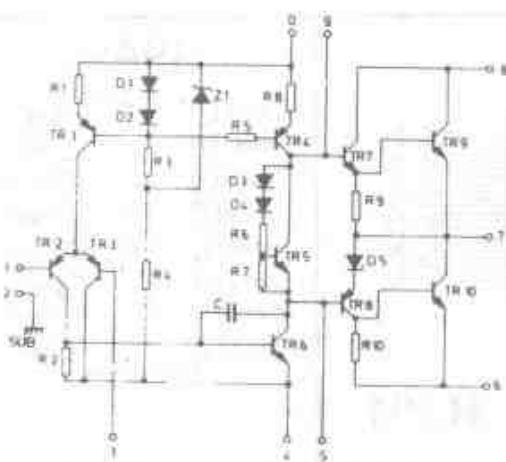


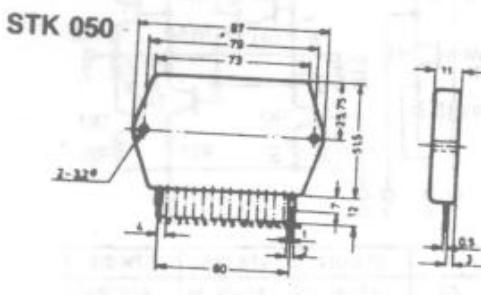
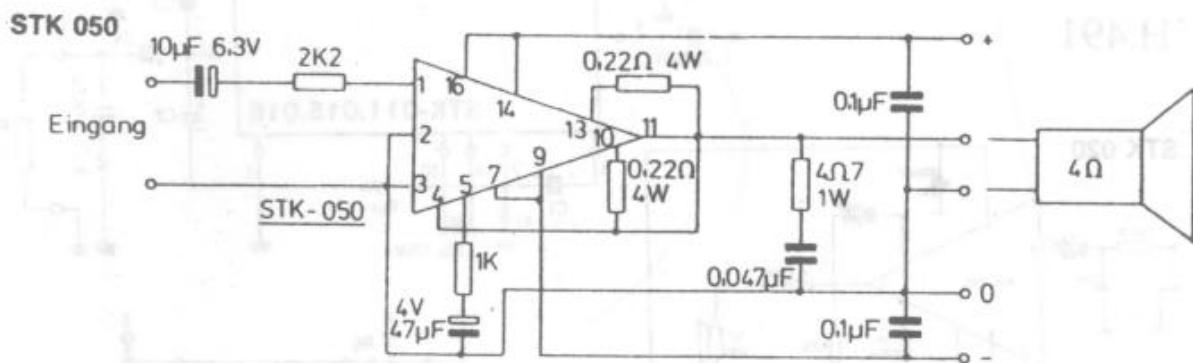
	STK-011	STK-015	STK-016
C1	47μ/6.3V	47μ/6.3V	47μ/25V
C2	22μ/25V	22μ/35V	22μ/35V
C3	22μ/25V	47μ/25V	47μ/25V
C4	1000μ/25V	1000μ/35V	2200μ/35V
Rm	3k	2.2k	2.2k



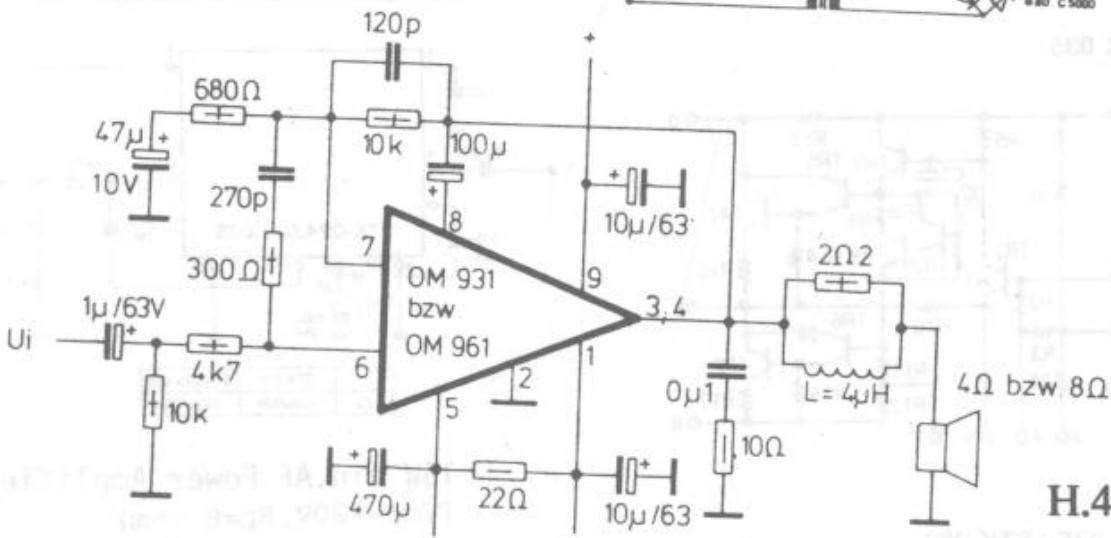
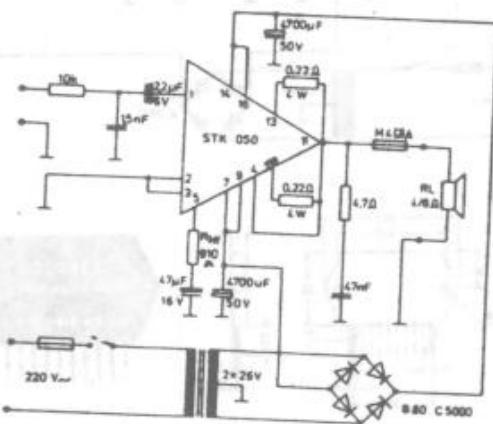
15W min.AF Power Amplifier  
(Vcc=±20V, RL=8 ohm)

STK 075 / STK 080

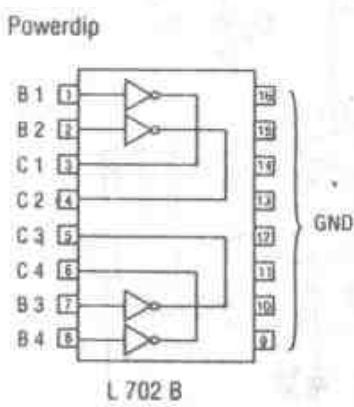




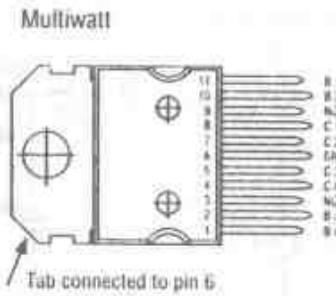
H.492



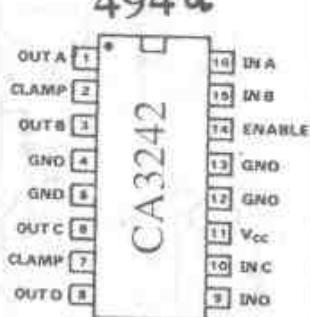
H.493



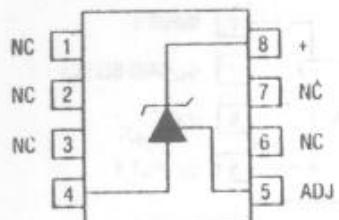
L 702 B



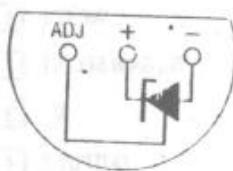
L 702 N



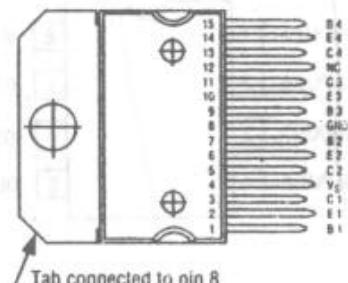
H.494



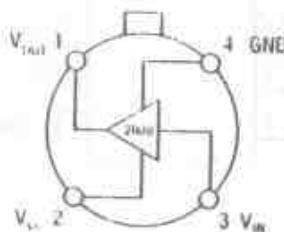
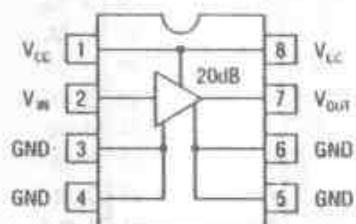
bottom view



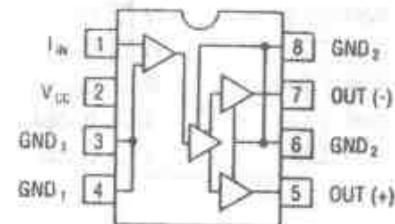
H.495



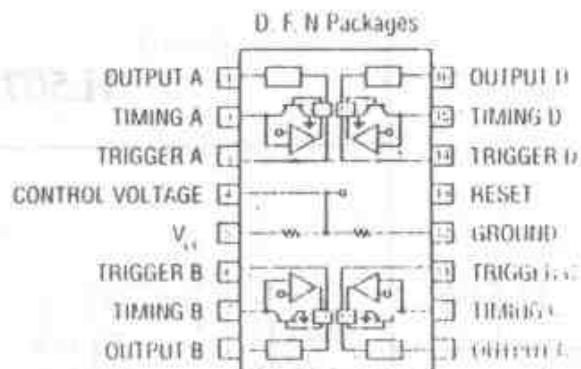
H.496



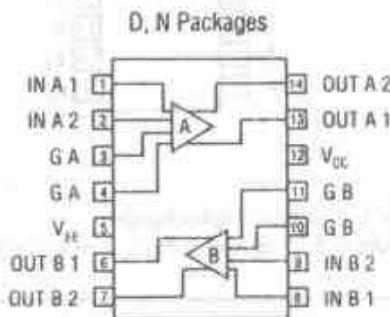
H.497



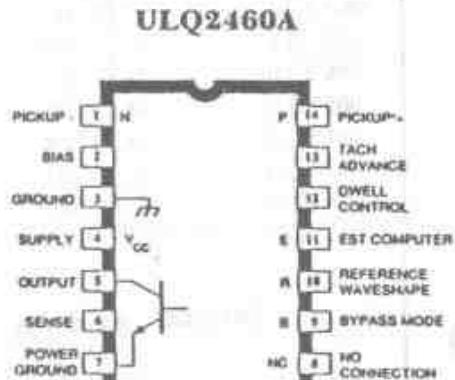
H.498



H.499



H.500

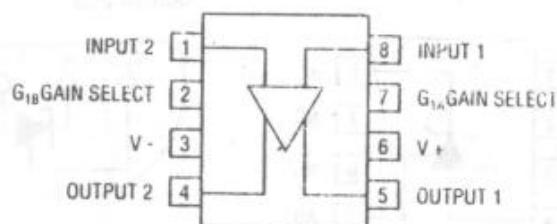
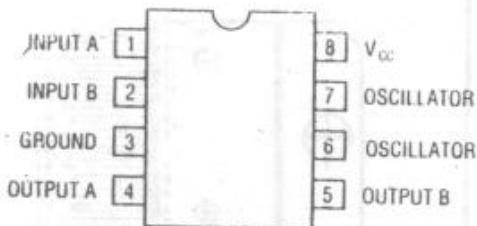


H.501

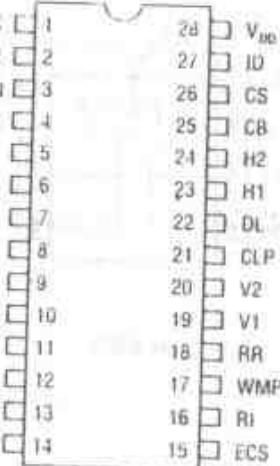
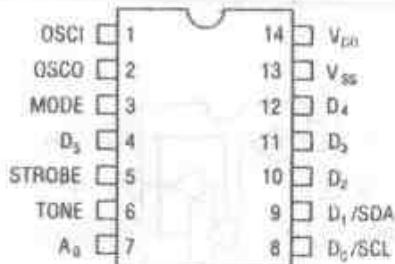
INPUT 1	5V
V <sub>REF</sub> 2	ANALOG OUT
EXT CLOCK IN/XTAL1 3	TRI-STATE ENABLE
XTAL2 4	ENVELOPE
TEST IN 5	BIT 1
CLEAR IN 6	BIT 2
COUNT IN PROGRESS 7	BIT 3
OV 8	DATA VALID

NE 5900

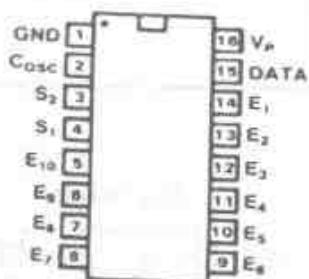
H.502



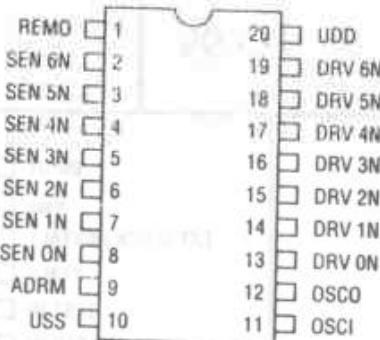
H.503



H.504

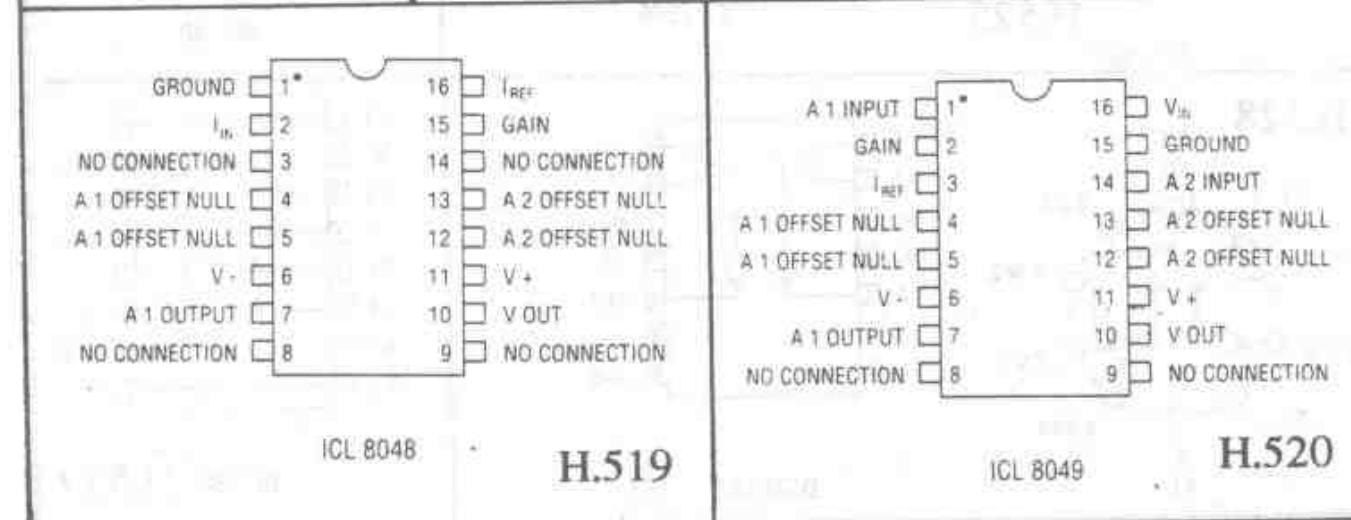
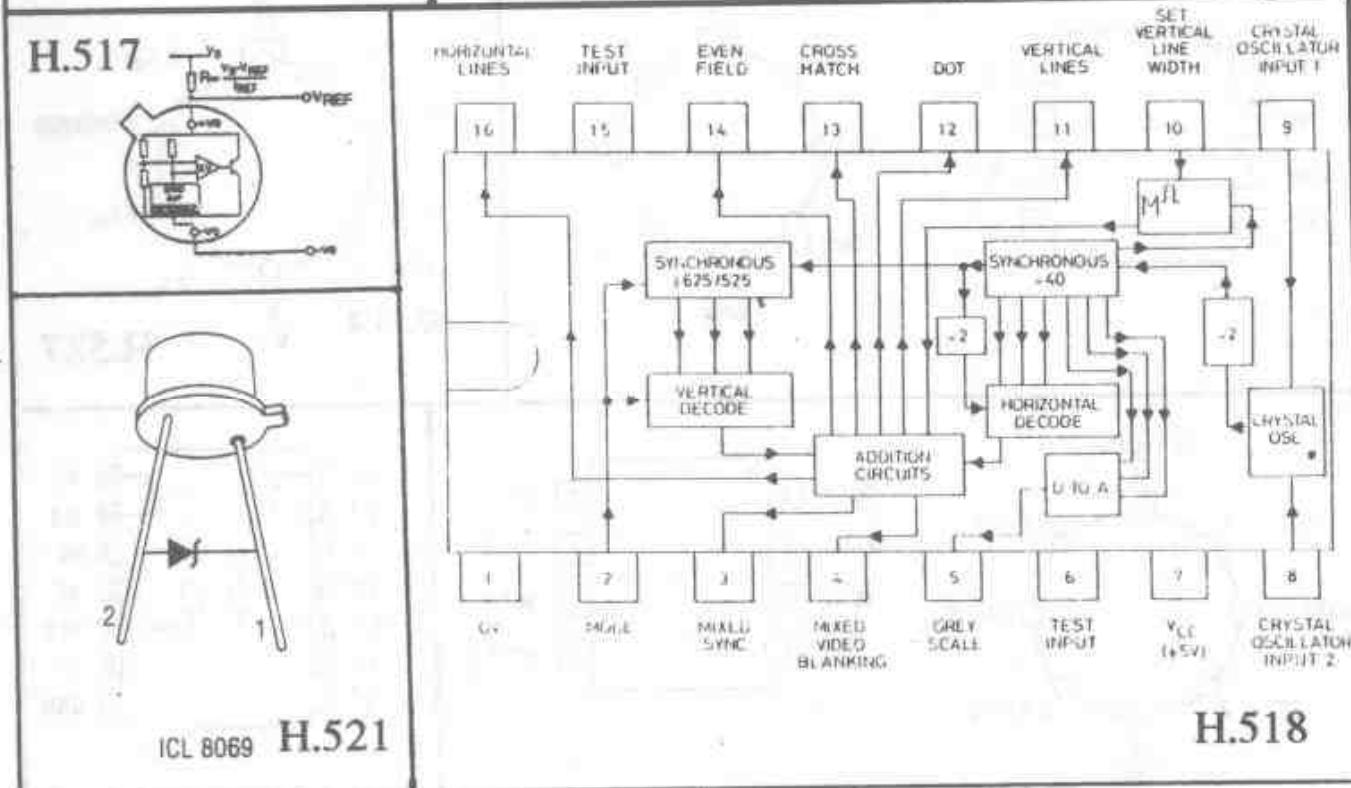
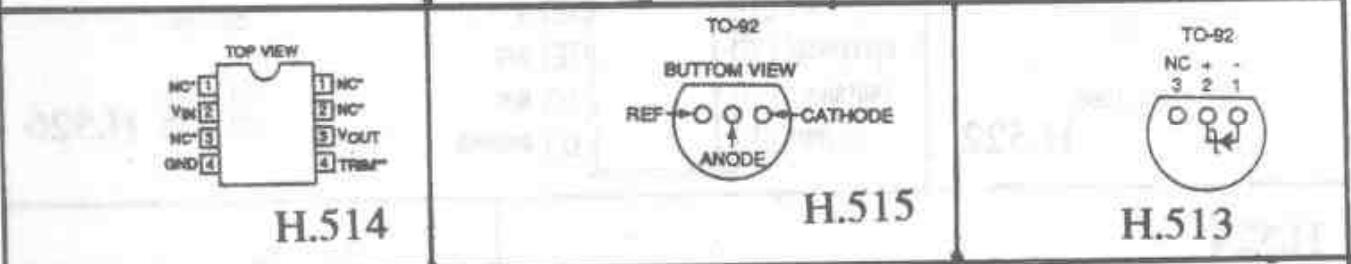
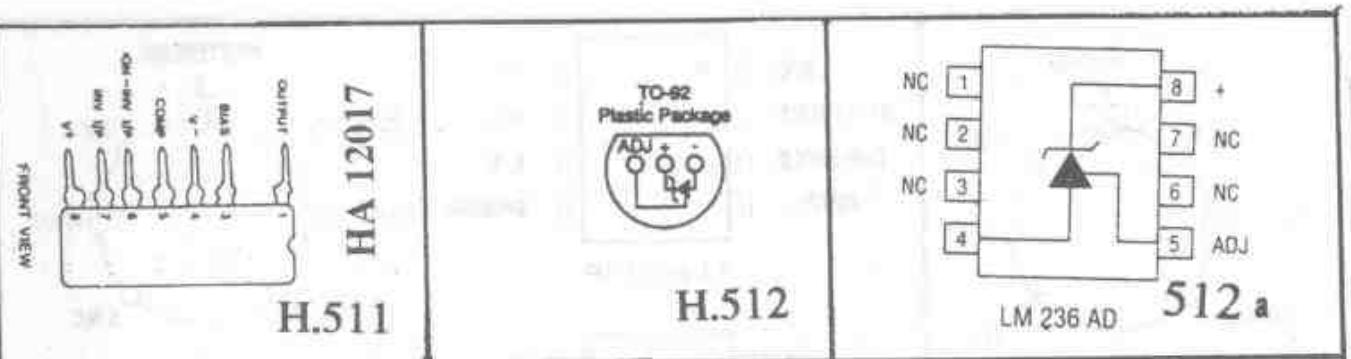


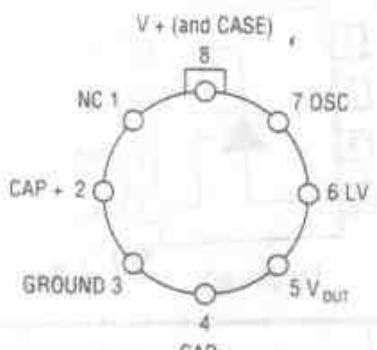
H.506



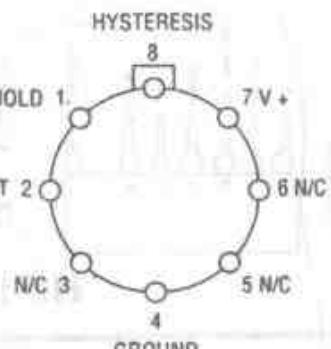
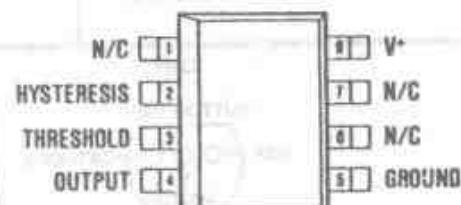
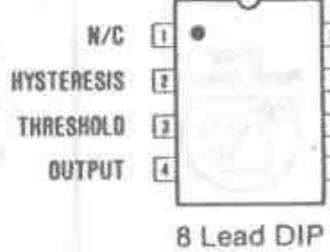
H.508

H.509



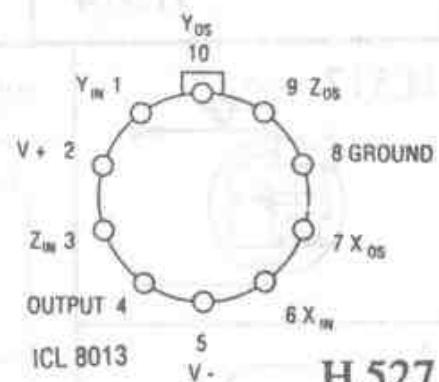
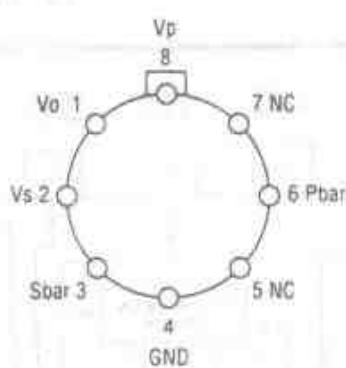
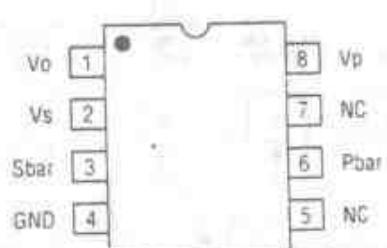


**H.522**

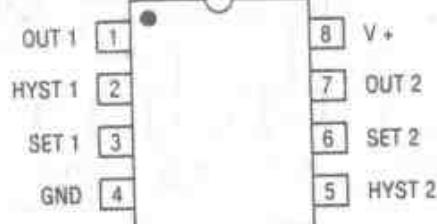
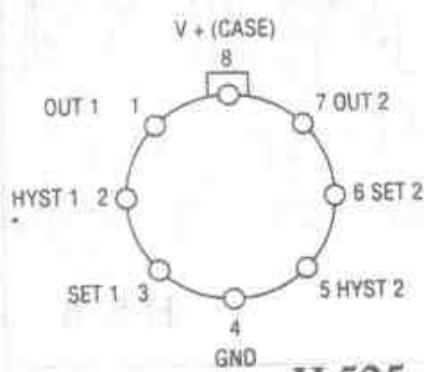


**ICL 8211  
ICL 8212 H.526**

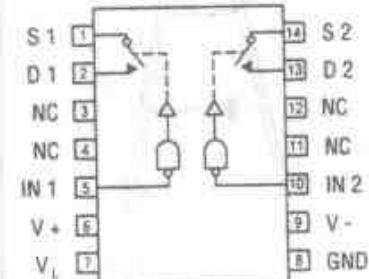
**H.524**



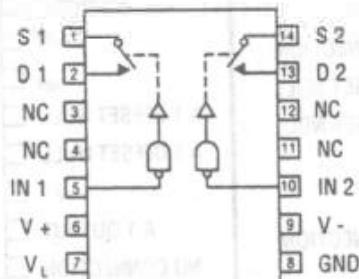
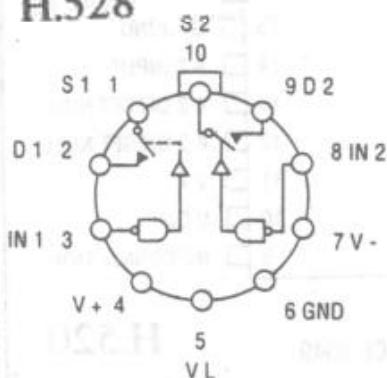
**H.527**



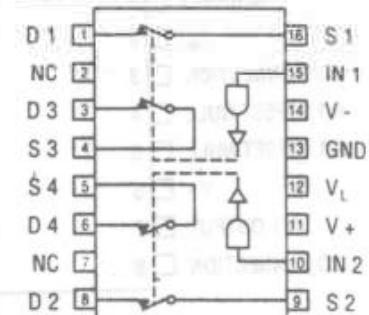
**ICL 7665**



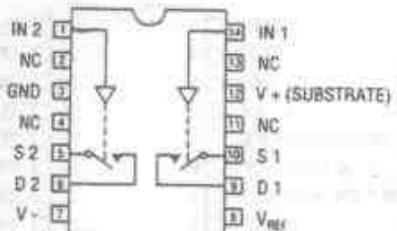
**H.528**



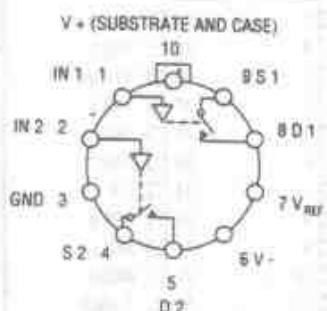
**DGM 181**



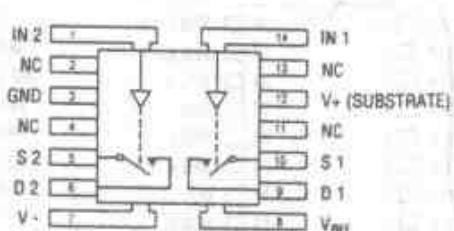
**H.529**



DG 200

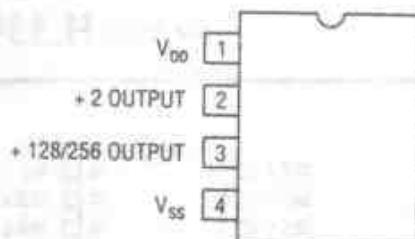


DG 200



DG 200

H.530



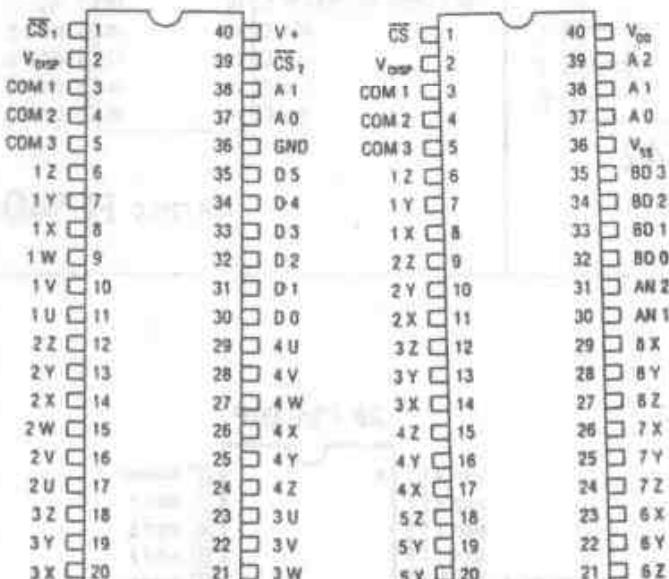
ICM 7242

H.531

CONTROL IN	1*	40	A IN
8 IN	2	39	HOLD
MEAS IN PROGRESS	3		BUFF OSC OUT
FUNCTION	4		NC *
STORE	5		OSC OUT
BCD 4	6		OSC IN
BCD 8	7		NC *
DP	8		EXT OSC IN
SEG e	9		RST OUT
SEG g	10		EXT RANGE
SEG a	11		D 1
V <sub>ss</sub>	12		D 2
SEG d	13		D 3
SEG b	14		D 4
SEG c	15		D 5
SEG f	16		V <sub>dd</sub>
BCD 2	17		D 6
BCD 1	18		D 7
RST IN	19		D 8
EXT DP IN	20		RANGE

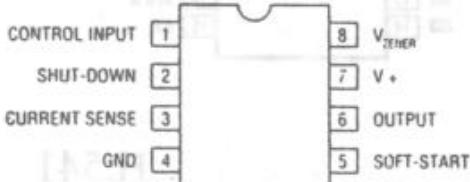
ICM 7226 A

H.532

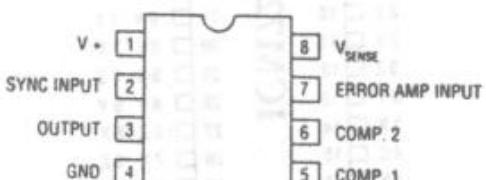


ICM 7233 H.533 H.534 ICM 7231

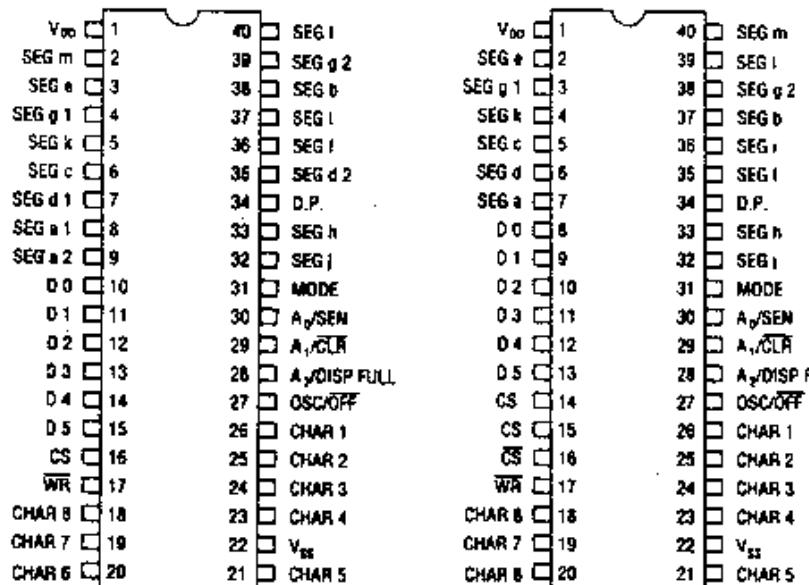
H.535



ICL 7675



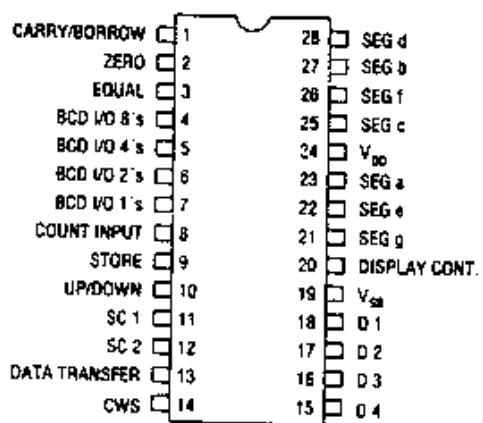
ICL 7676



ICM 7218 A H.539

ICM 7243 A H.536

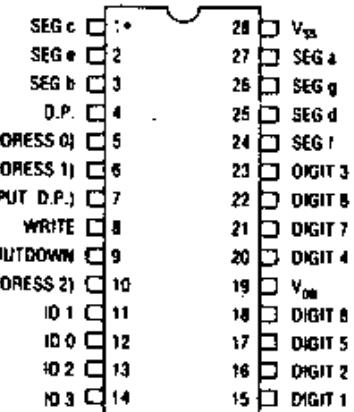
ICM 7243 B



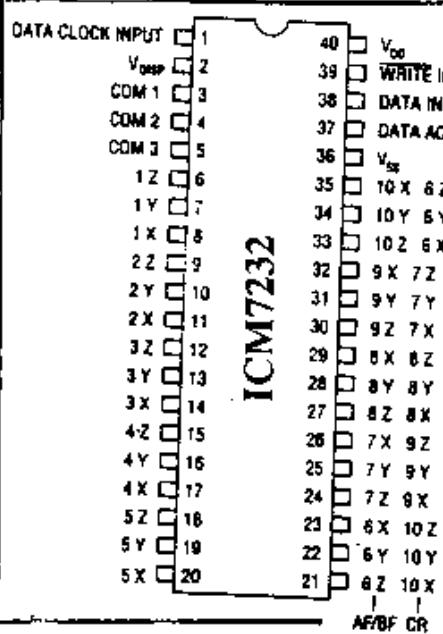
H.542

MPO 6001

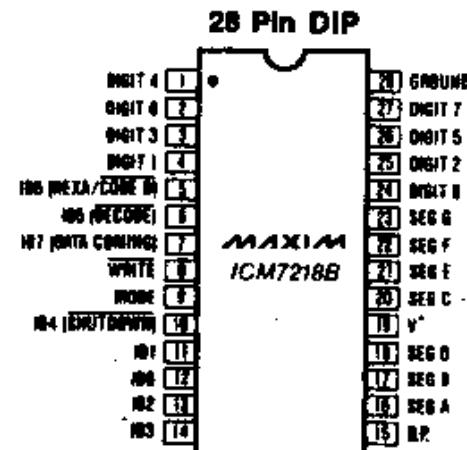
ICM 7218 C H.540



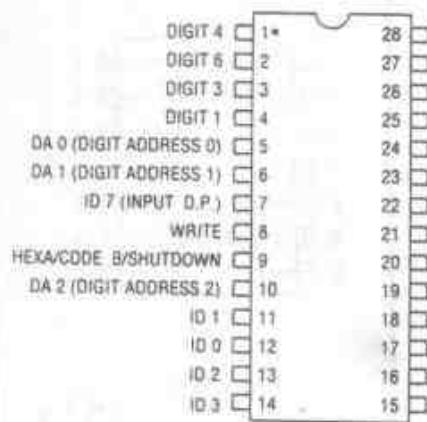
ICM 7217 A H.537



H.538



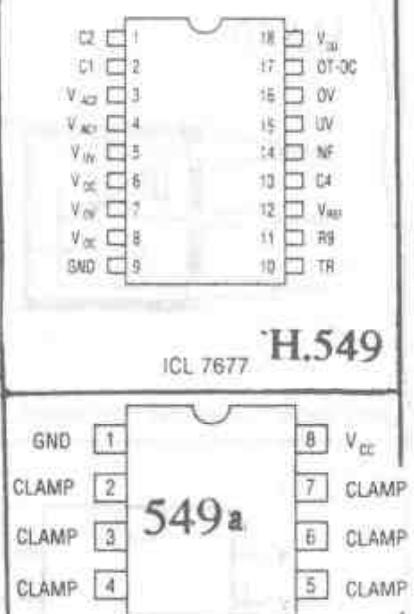
H.541



ICM 7218 D H.543



H.544



ICL 7677 H.549



ICM 7211 M

H.545

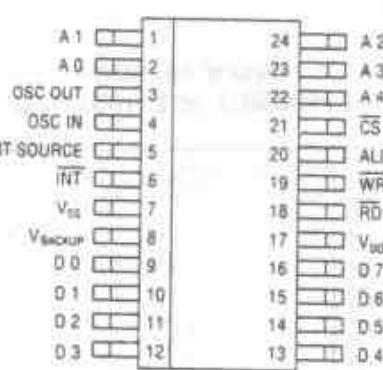


ICM 7212

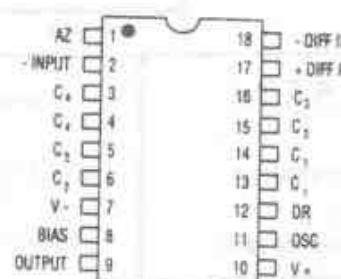
H.546



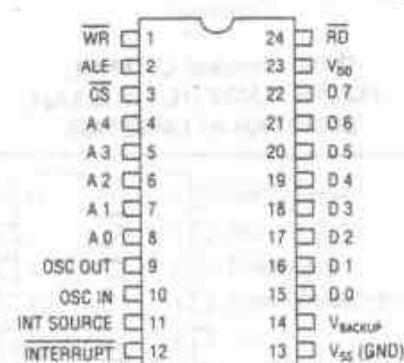
H.547



ICM 7170



ICM 7170 H.548

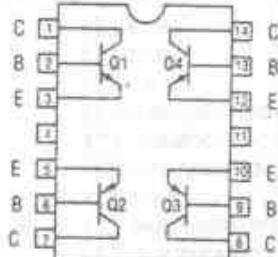


ICM 7170

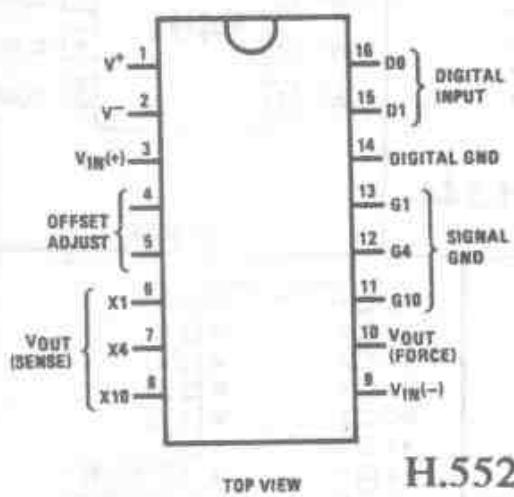
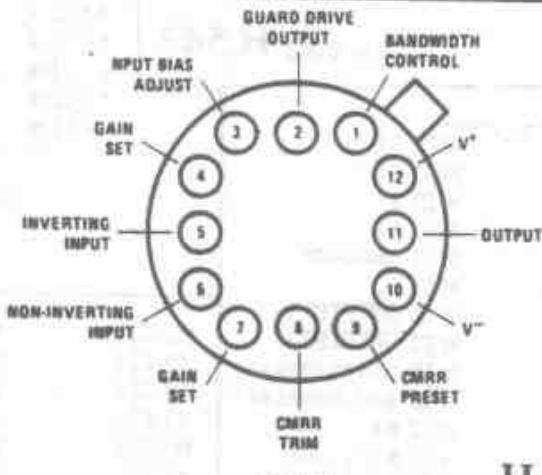
**H.550**

UND 2901 Treiber mit Strombegr. 1,5 A/1,5-45 V

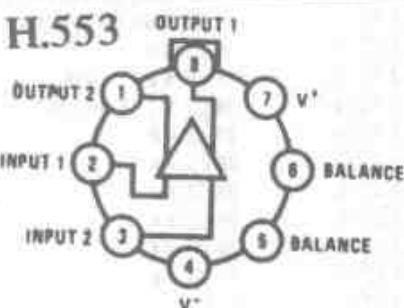
V <sub>DD</sub>	1	*	16	NC
COMP OUT	2		15	IN +
IN A	3		14	NC
IN B	4		13	BUFF OUT
OUT A	5		12	IN -
OUT B	6		11	R <sub>bias</sub>
IN C	7		10	V <sub>SS</sub>
OUT C1	8		9	OUT C2



MPO 6501

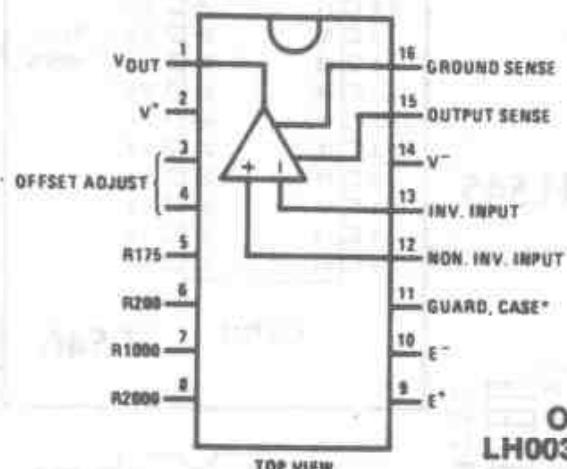
**551 a****H.552****H.554**

Order Number LH0038G or LH0038CG



Note: Pin 4 connected to case.

TOP VIEW

Order Number LM121H,  
LM221H, LM321H, LM121AH,  
LM221AH or LM321AH**H.555**Order Number  
LH0038D or LH0038CD

DRIVE OUTPUT	1	14	V <sub>CC</sub>
DRIVE GROUND	2	13	START/RUN OUTPUT
RAMP INPUT	3	12	C <sub>SOFT-START</sub>
SYNC/INHIBIT INPUT	4	11	FEEDBACK/PWM INPUT
R <sub>T/C</sub>	5	10	ERROR AMP INV. INPUT
V <sub>REF</sub> 2.5 V	6	9	ERROR AMP NON-INV. INPUT
GND	7	8	V <sub>REF</sub> 1.25 V

**MC 34129**

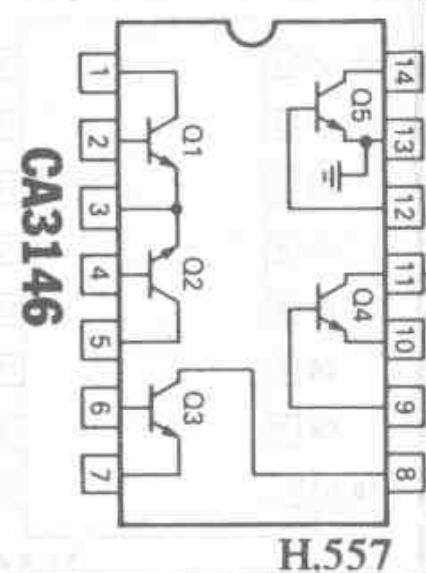
**553 a**

COMPENSATION	1*	14	V <sub>REF</sub>
NC	2	13	NC
VOLTAGE FEEDBACK	3	12	V <sub>CC</sub>
NC	4	11	V <sub>C</sub>
CURRENT SENSE	5	10	OUTPUT
NC	6	9	GND
R <sub>T/C</sub>	7	8	POWER GROUND

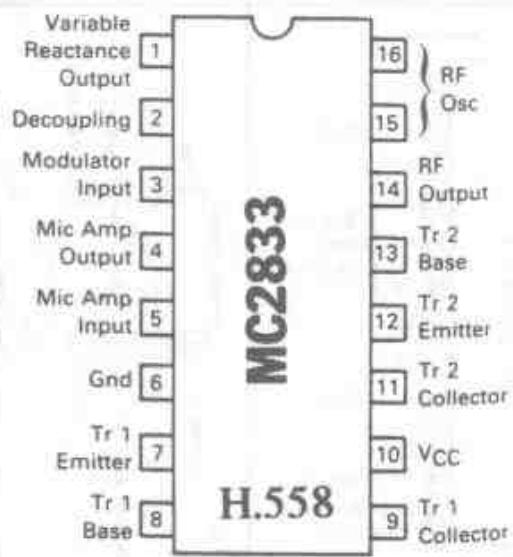
**555 a**



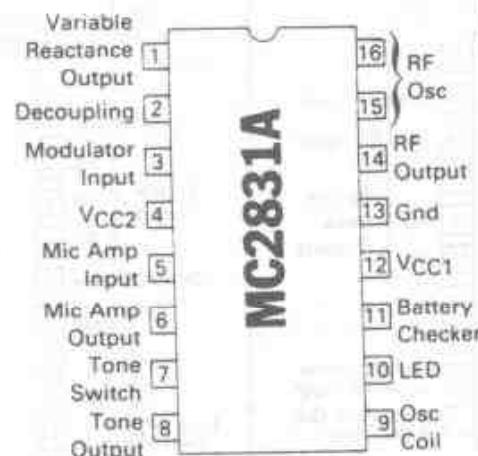
H.556



H.557

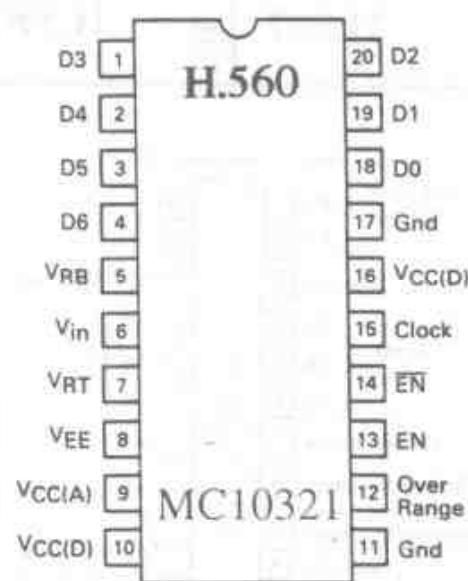
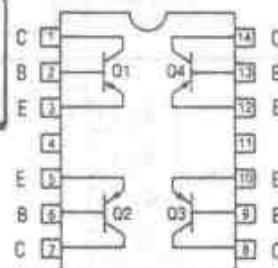


H.558

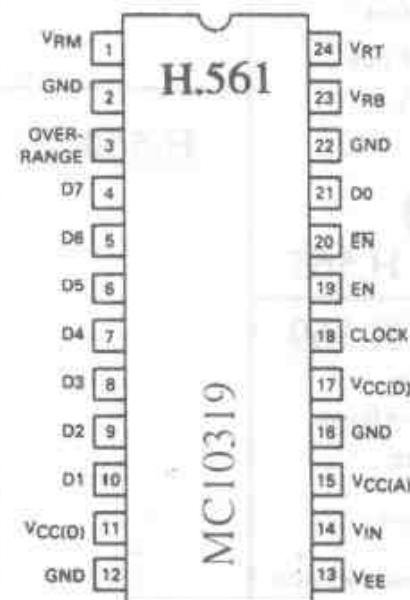


H.559

561 a



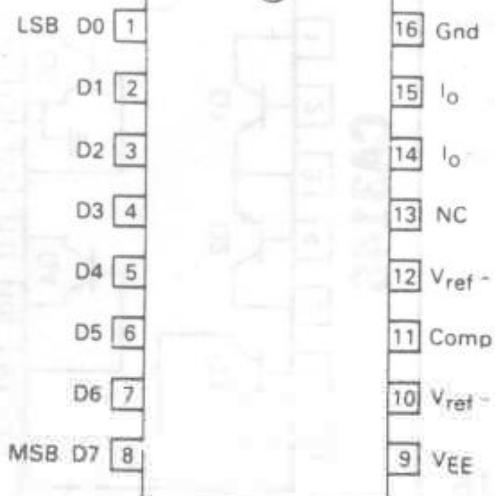
H.560



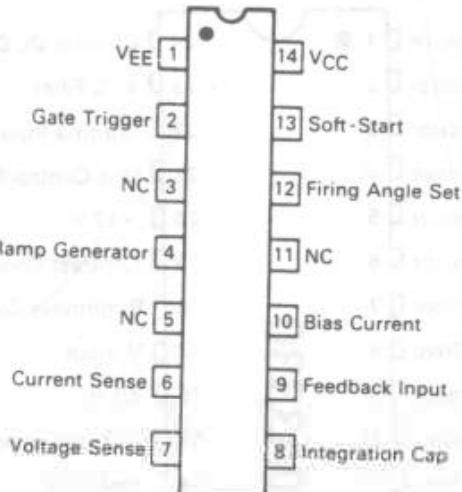
H.561



UAA2016

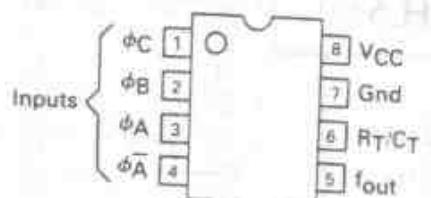
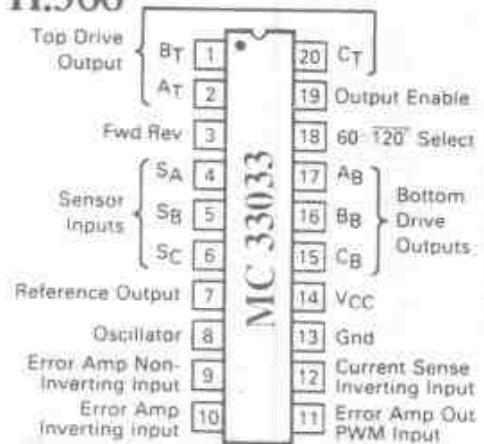


H.562



H.564

H.566



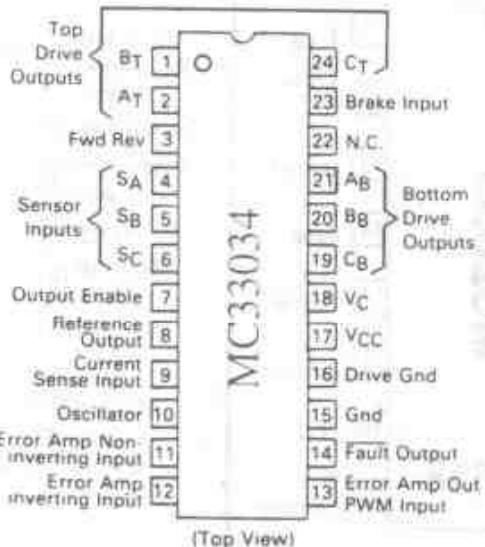
(Top View)

**MC33039**

H.565



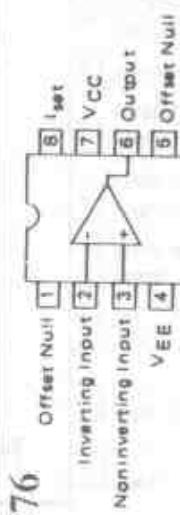
H.569



MC33034

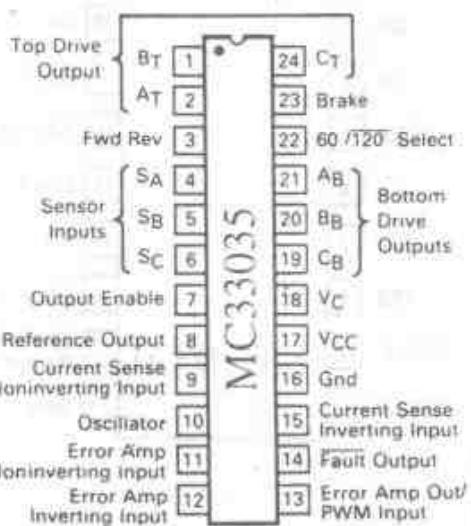
(Top View)

H.567

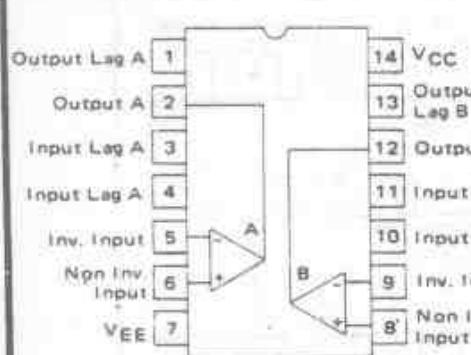


(Top View)

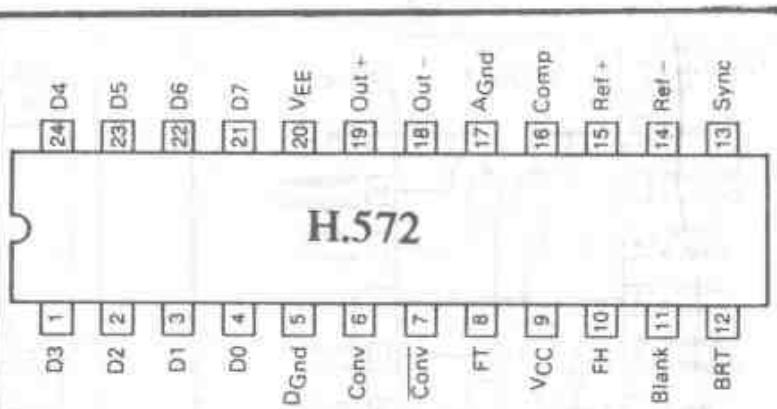
H.570



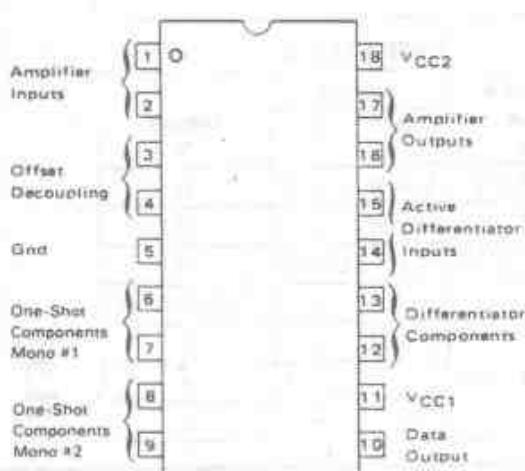
H.568



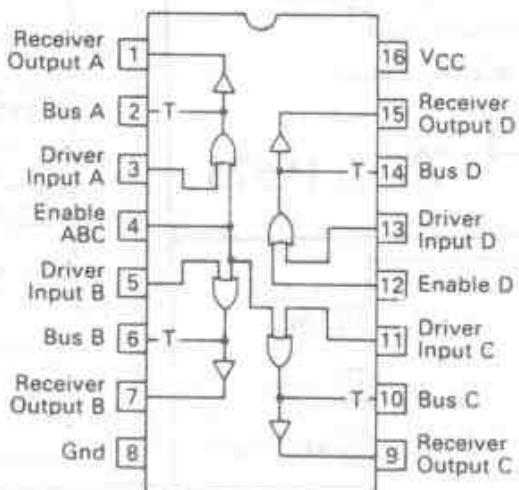
**H.571**



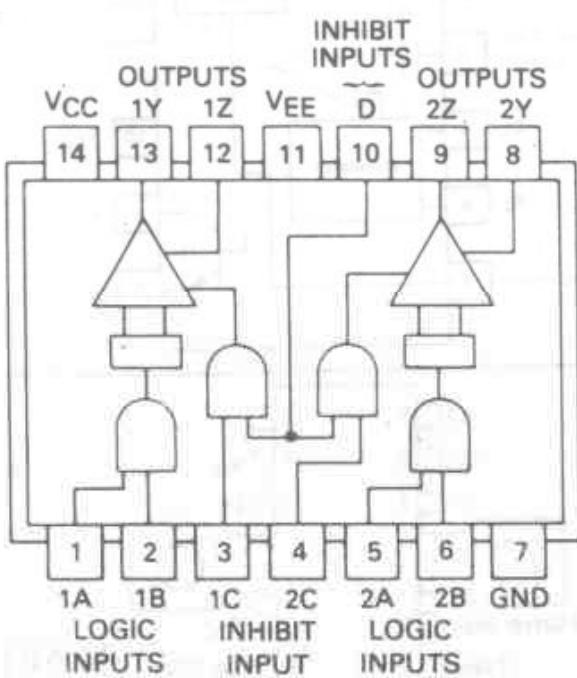
**H.572**



**H.573**



**H.574**



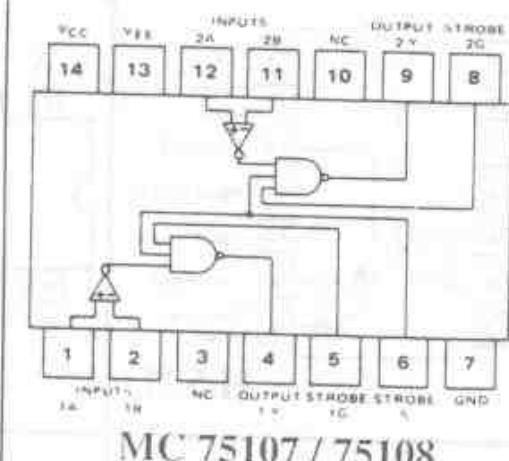
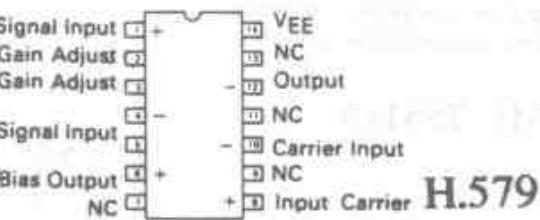
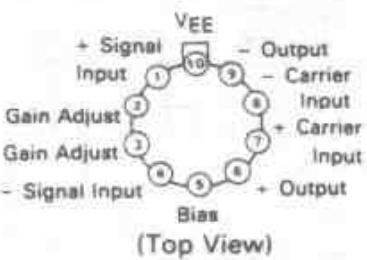
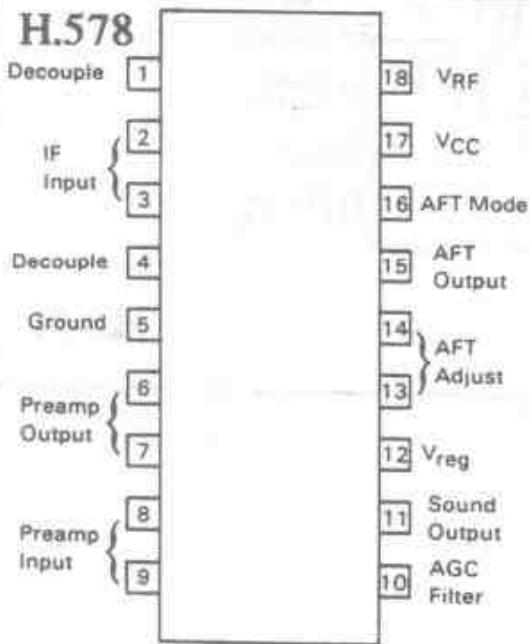
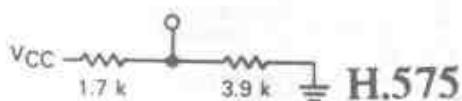
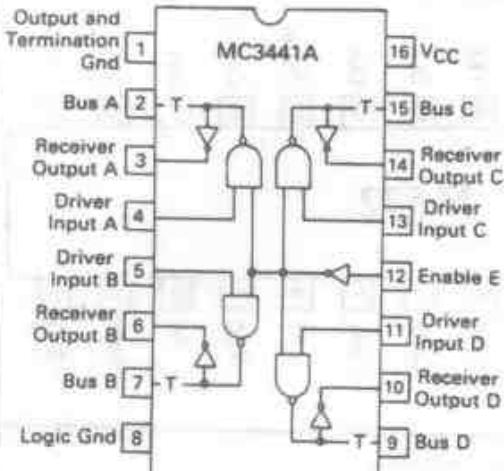
**TRUTH TABLE**

LOGIC INPUTS		INHIBITOR INPUTS		OUTPUTS	
A	B	C	D	Y	Z
L or H	L or H	L	L or H	H	H
L or H	L or H	L	H	H	H
L	L or H	H	H	L	H
L or H	L	H	H	L	H
H	H	H	H	H	L

Low output represents the "on" state.  
High output represents the "off" state.

**MC 75S110**

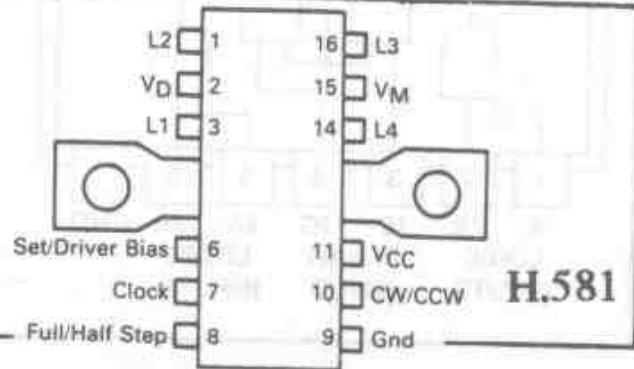
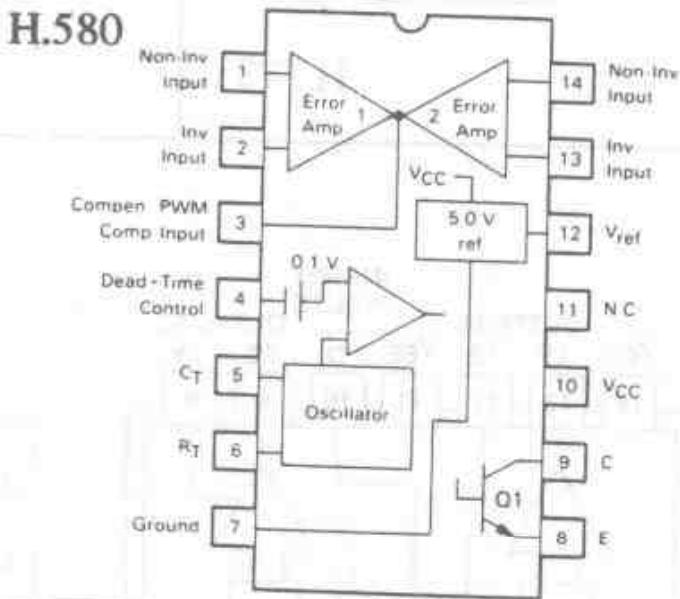
**H.576**

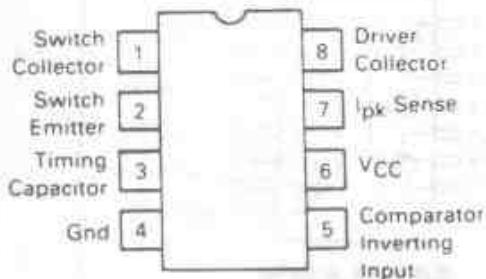


TRUTH TABLE

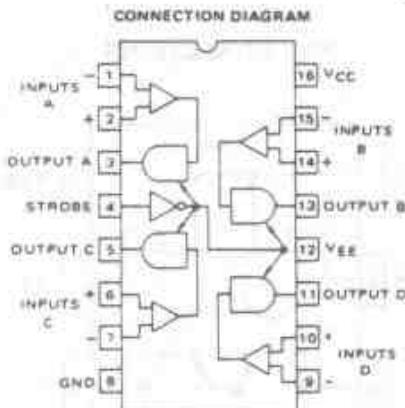
Differential Inputs A-B	Strobes		Output Y
	G	S	
V <sub>ID</sub> ≥ 25 mV	L or H	L or H	H
-25 mV < V <sub>ID</sub> < 25 mV	L or H	L	H
	L	L or H	H
V <sub>ID</sub> ≤ -25 mV	L or H	L	H
	L	L or H	H
	H	H	L

**H.577**

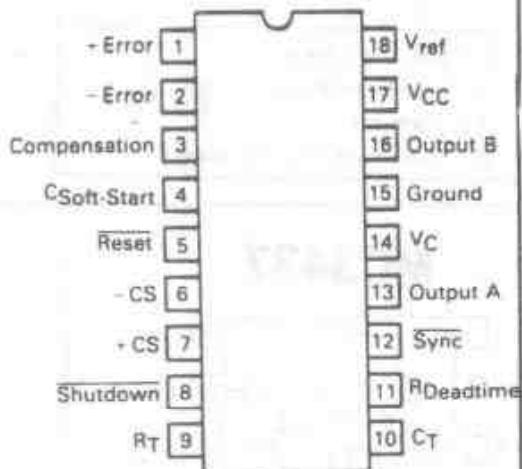




## MC3430 thru MC3433



**MC34063  
MC35063  
MC33063** H.582



Top View

**SG1526  
SG2526**

H.583

H.584

TRUTH TABLE  
MC3430 and MC3432

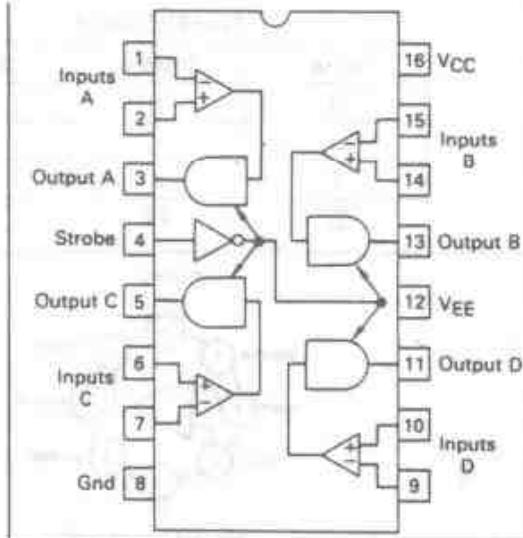
Input	Strobe	Output	Device
$V_{ID} \geq 7.0 \text{ mV}$	L	H	MC3430
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Z	MC3432
$-7.0 \text{ mV} \leq V_{ID} \leq 7.0 \text{ mV}$	L	Off	MC3432
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Off	MC3430
$V_{ID} \leq -7.0 \text{ mV}$	L	I	MC3430
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Z	MC3432
$V_{ID} \geq 7.0 \text{ mV}$	L	On	MC3432
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Off	MC3430

TRUTH TABLE  
MC3431 and MC3433

Input	Strobe	Output	Device
$V_{ID} \geq 12 \text{ mV}$	L	H	MC3431
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Z	MC3433
$-12 \text{ mV} \leq V_{ID} \leq 12 \text{ mV}$	L	Off	MC3431
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Off	MC3433
$V_{ID} \leq -12 \text{ mV}$	L	I	MC3431
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Z	MC3433
$V_{ID} \geq 12 \text{ mV}$	L	On	MC3433
$T_A = 0 \text{ to } 70^\circ\text{C}$	H	Off	MC3431

L = Low Logic State    Z = Third (High Impedance)  
H = High Logic State    I = Indeterminate State  
 $R_S \leq 200 \Omega$

**MC3450  
MC3452**



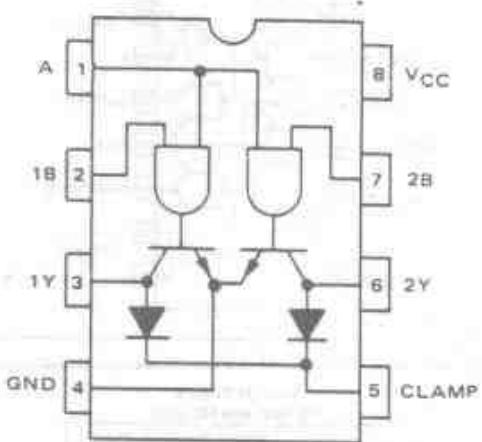
TRUTH TABLE

Input	Strobe	Output	
		MC3450	MC3452
$V_{ID} \geq +25 \text{ mV}$	L	H	Off
	H	Z	Off
$-25 \text{ mV} \leq V_{ID} \leq +25 \text{ mV}$	L	I	I
	H	Z	Off
$V_{ID} \leq -25 \text{ mV}$	L	L	L
	H	Z	Off

L = Low Logic State  
H = High Logic State  
Z = Third (High Impedance) State  
I = Indeterminate State

H.585

### PIN CONNECTIONS



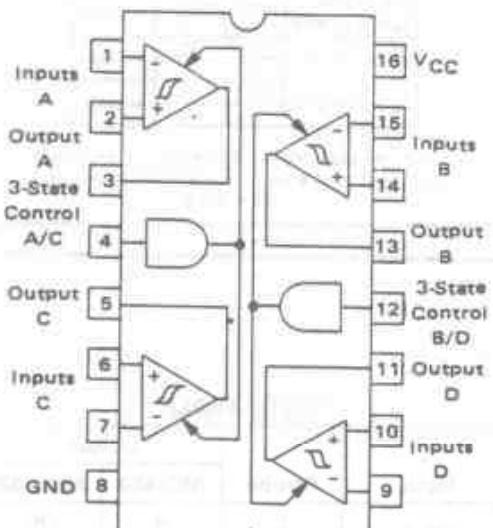
Positive Logic:  $Y = AB + 1B$

**MC1472** H.586

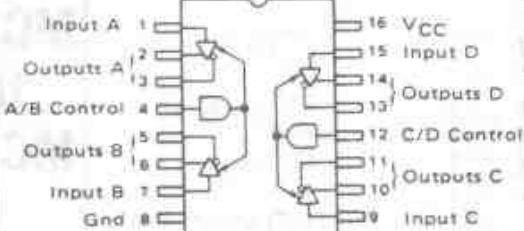
### TRUTH TABLE

A	B	Y
L	L	H ("OFF" STATE)
L	H	
H	L	
H	H	L ("ON" STATE)

**MC3486**



H.588



**MC3487**

### TRUTH TABLE

Input	Control Input	Non-Inverting Output	Inverting Output
H	H	H	L
L	H	L	H
X	L	Z	Z

L = Low Logic State

H = High Logic State

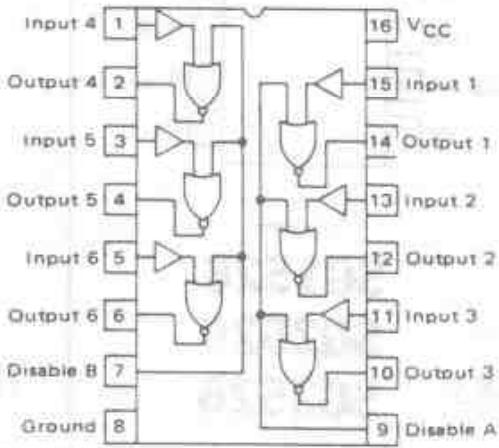
X = Irrelevant

Z = Third-State (High Impedance)

**H.587**

H.589

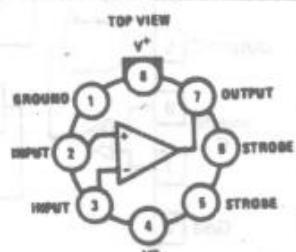
**MC3437**



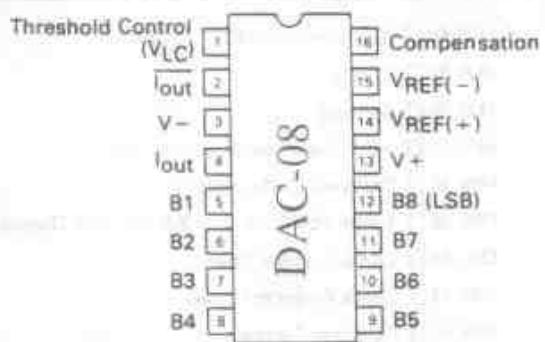
### TRUTH TABLE

Input	Disable	Output
0	L	H
0	H	L
1	L	L
1	H	L

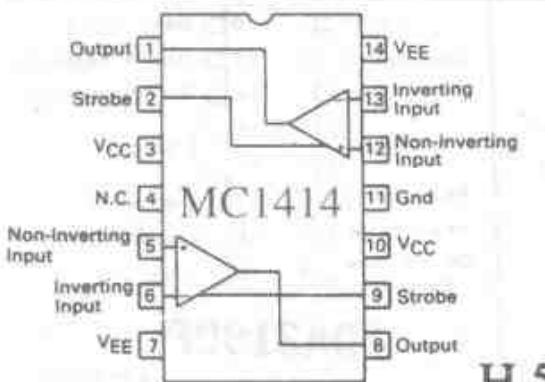
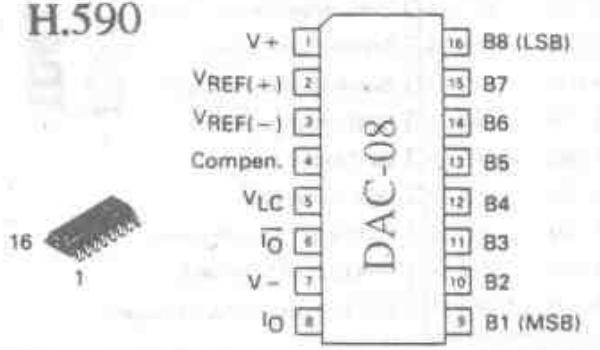
28



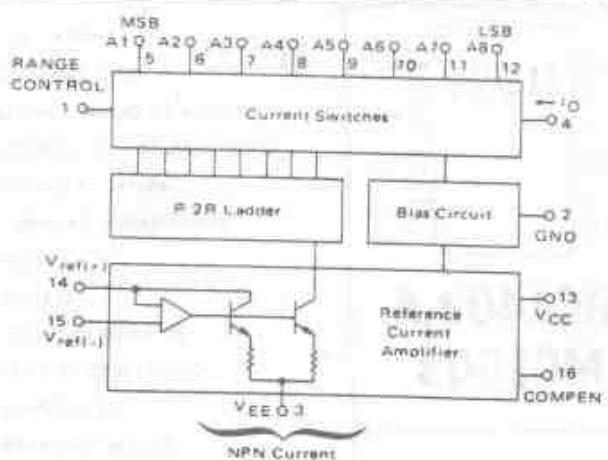
**H.589 a**



H.590



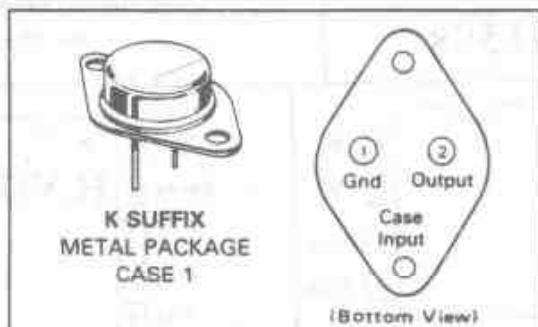
H.591a



**MC1408**

**MC1508**

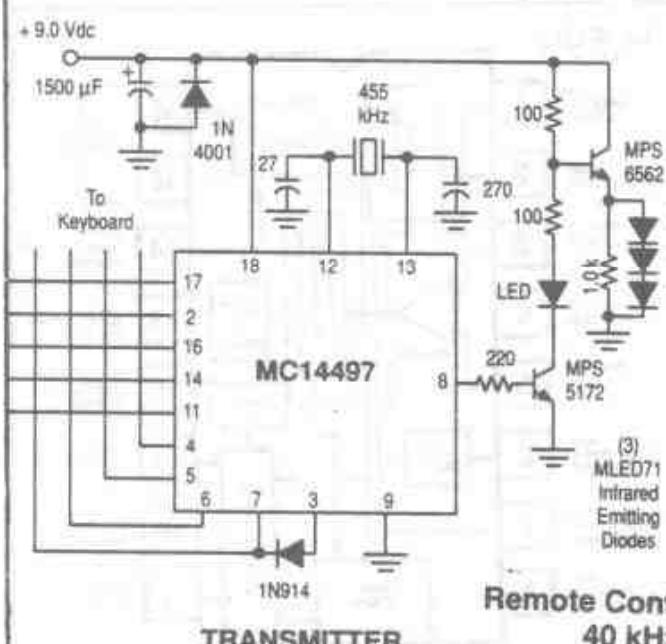
H.591



**MC7900**

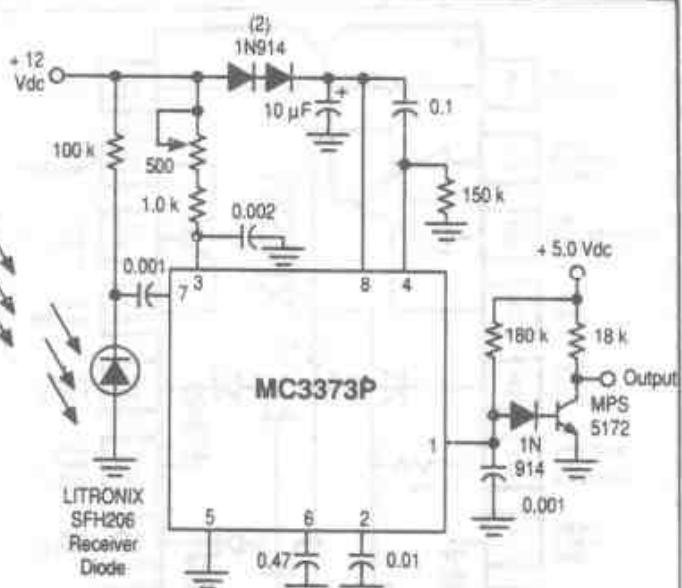
**Series**

H.593



TRANSMITTER

Remote Control Application  
40 kHz Carrier



RECEIVER

H.592

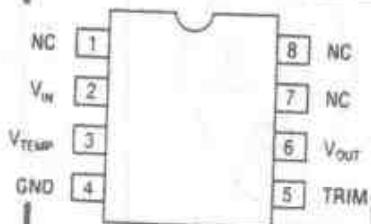


**MC1403,A  
MC1503**

**MC3340P**



**H.598**



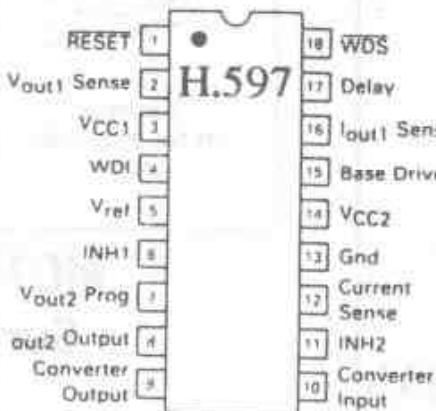
**MC 1404**

**H.598 a.**

**H.595**

Chroma Input	1 (1)	(44) 40	Hue Control/NTSC Switch
ACC Capacitor	2 (2)	(43) 39	+12 V
Chroma DL Driver, Emitter	3 (3)	(42) 38	Ground
Chroma DL Driver, Collector	4 (4)	(41) 37	1.0 V Composite Video Input
Saturation Control	5 (5)	(40) 36	Delayed Luma Input
Identification Capacitor	6 (6)	(39) 35	Luma DL Drive and 3.0 Inverted Output
V Input	7 (10)	(38) 34	Luma Emitter Load
U Input	8 (11)	(37) 33	Luma Collector Load
90° Loop Capacitor	9 (12)	(36) 32	Contrast Control
Oscillator Loop Filter	10 (13)	(35) 31	Black Level Clamp
Crystal Drive	11 (14)	(34) 30	Brightness Control
Crystal Feedback	12 (15)	(33) 29	Peak Beam Limit Adjust
Ground	13 (16)	(32) 28	Frame Pulse Input
Blue Output	14 (18)	(31) 27	Sandcastle Pulse Input
Blue Output Clamp Capacitor	15 (19)	(30) 26	OSD Input Green
Blue Output Feedback	16 (20)	(29) 25	OSD Input Red
Green Output	17 (21)	(28) 24	OSD Input Blue
Green Output Clamp Capacitor	18 (22)	(27) 23	OSD Input Fast Blanking
Green Output Feedback	19 (23)	(26) 22	Red Output Feedback
Red Output	20 (24)	(25) 21	Red Output Clamp Capacitor

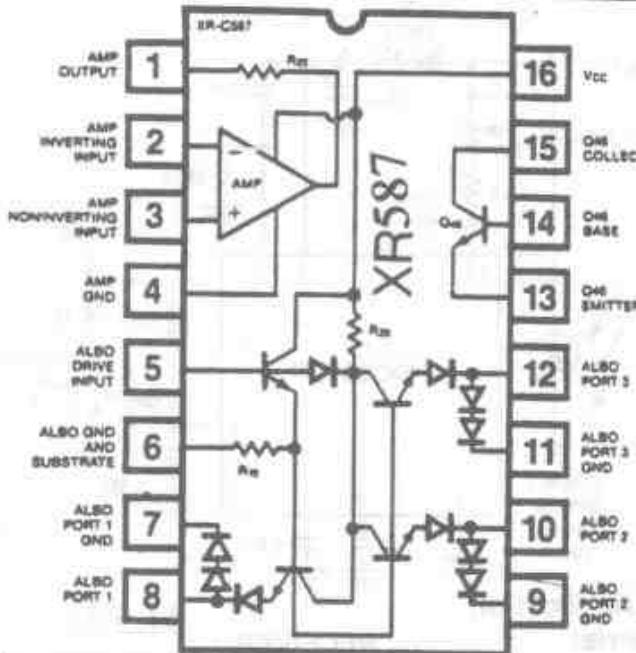
**TDA3301B  
TDA33303**



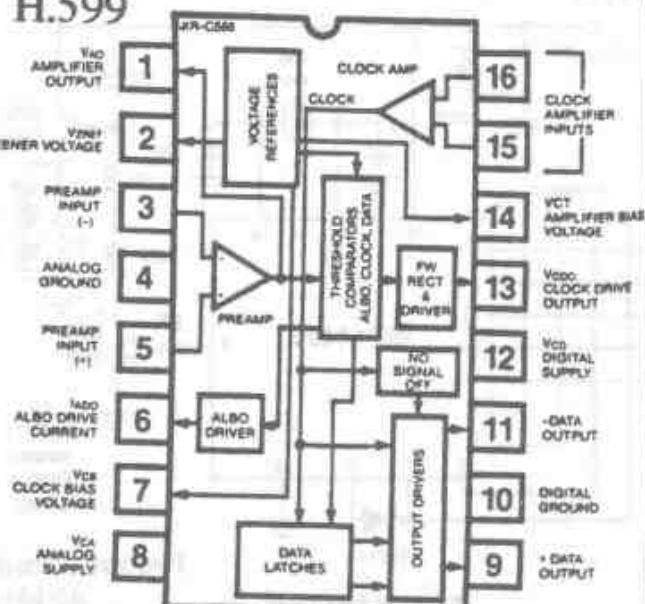
IF Input	1	16	Deemphasis
Decoupling	2	15	Ripple Rejection
Decoupling	3	14	Supply Voltage
Ground	4	13	Ground
Phase Shift	5	12	
Phase Shift	6	11	Output
DC Volume	7	10	Compensation
Control	8	9	Gain

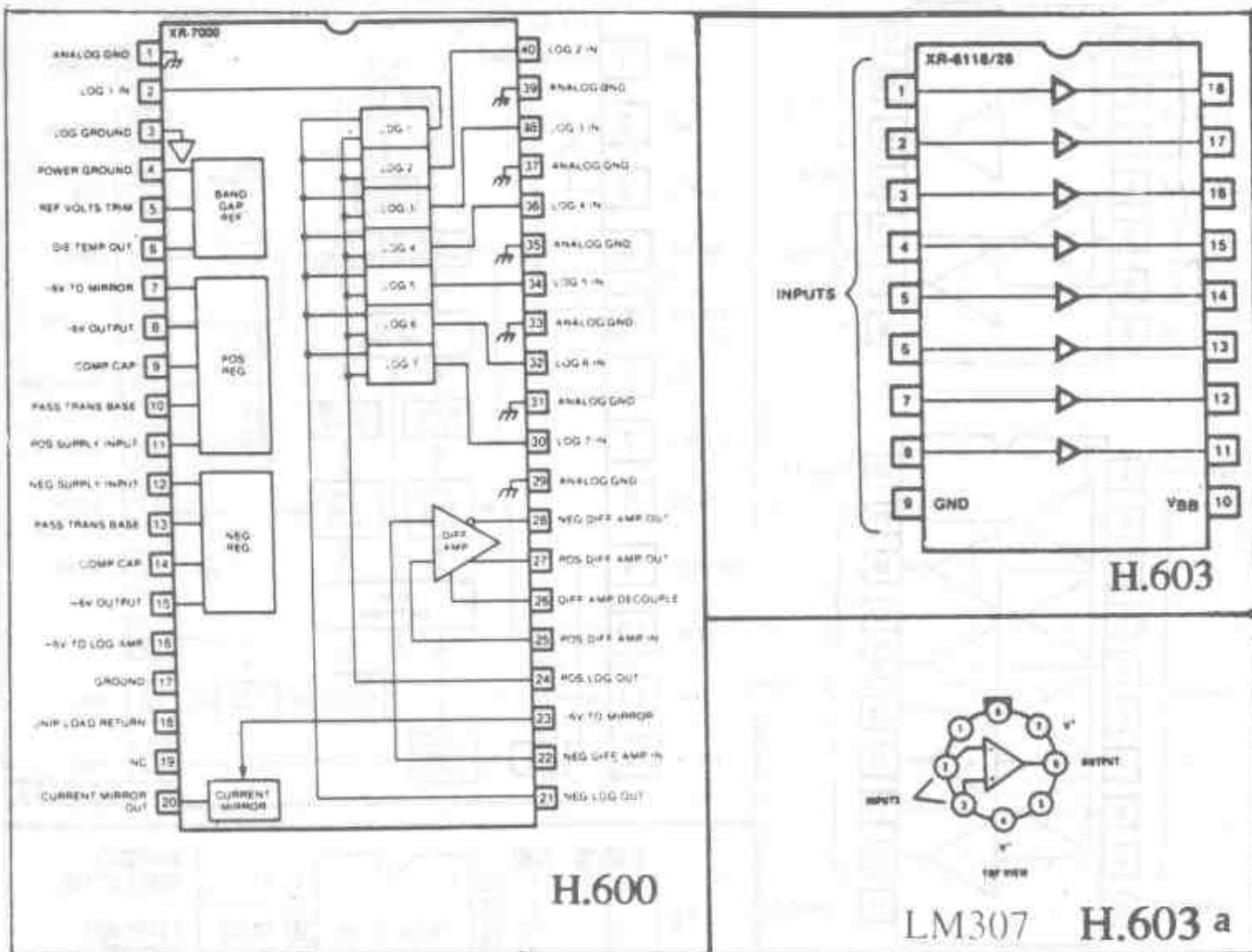
**TDA3190P**

**H.596**

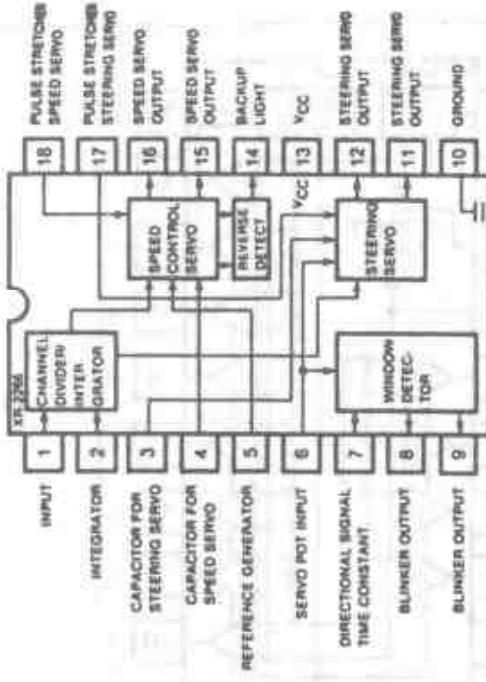


**H.599**

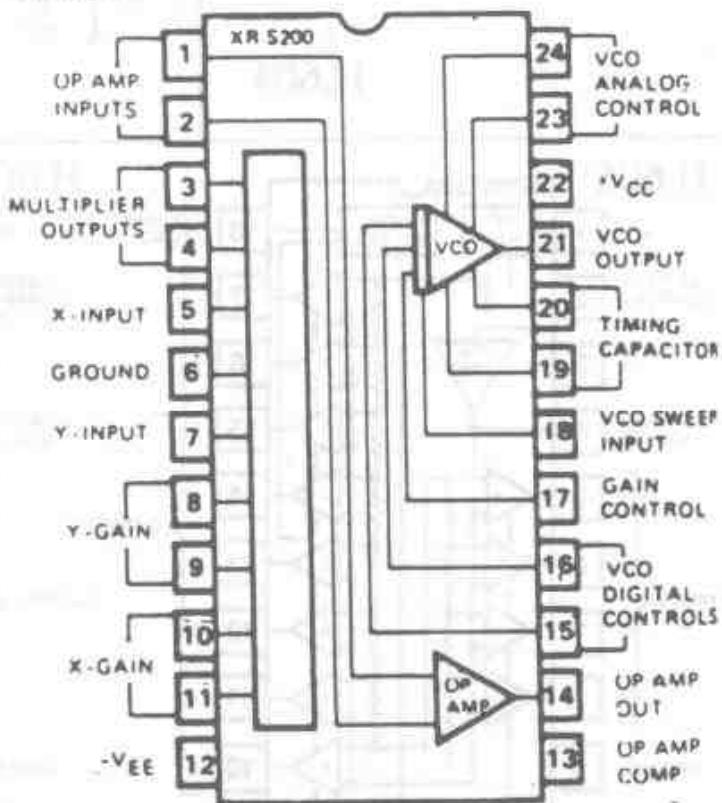


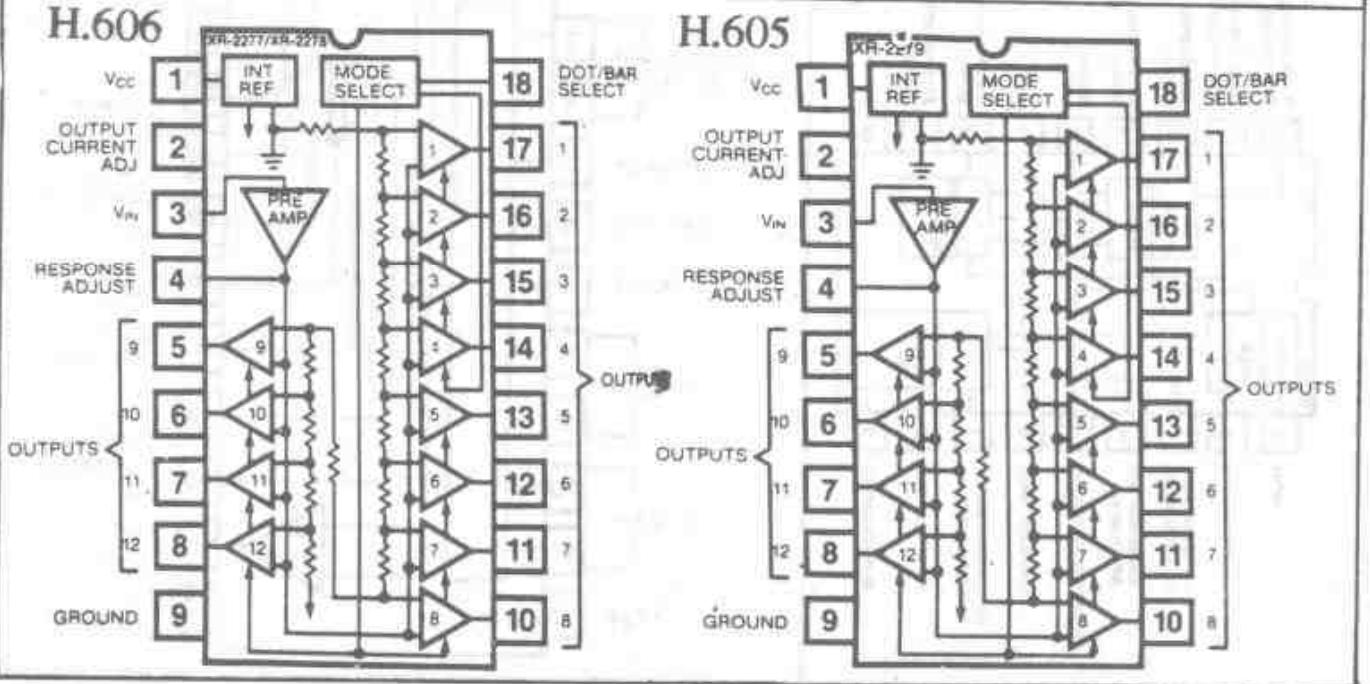
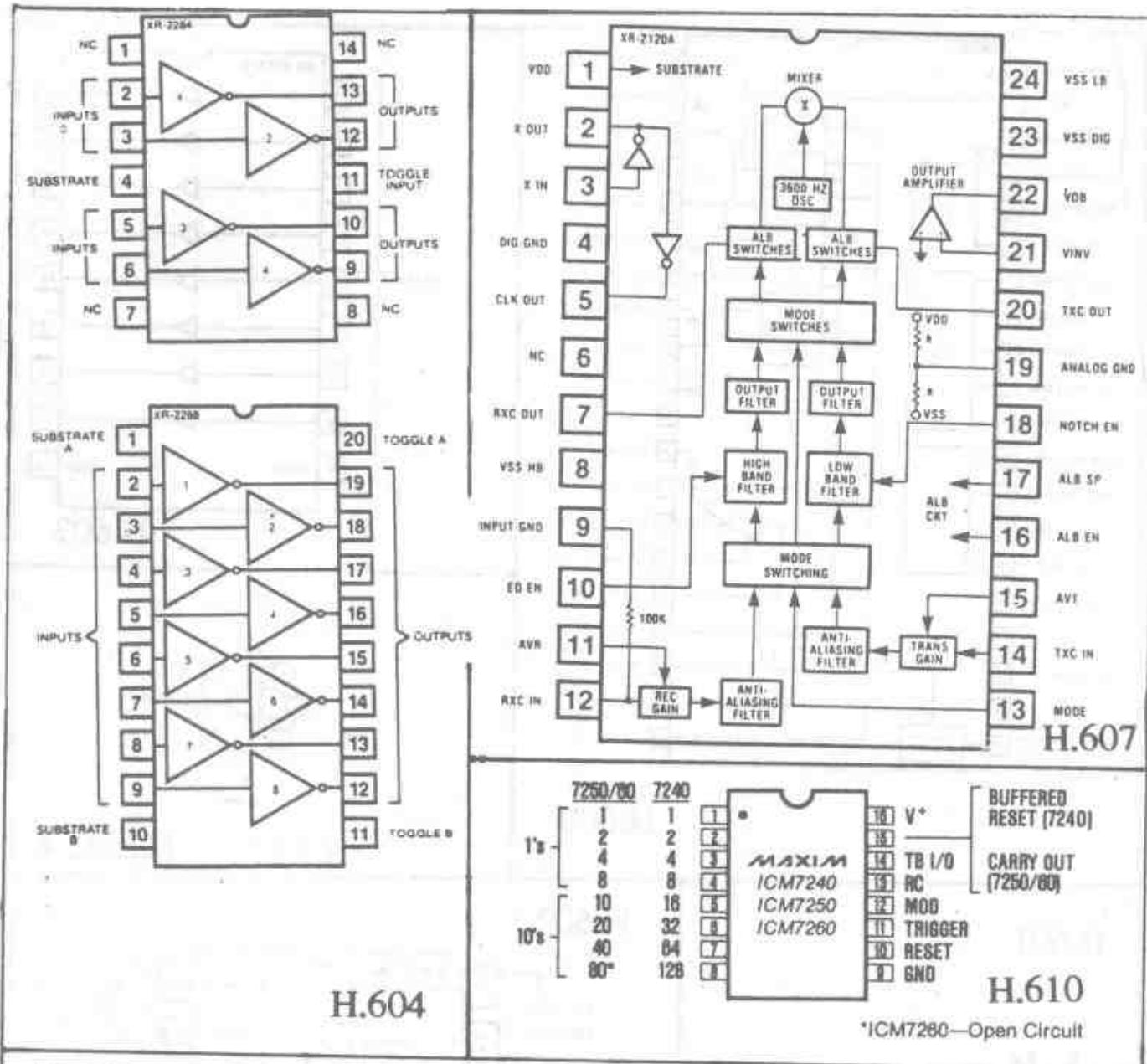


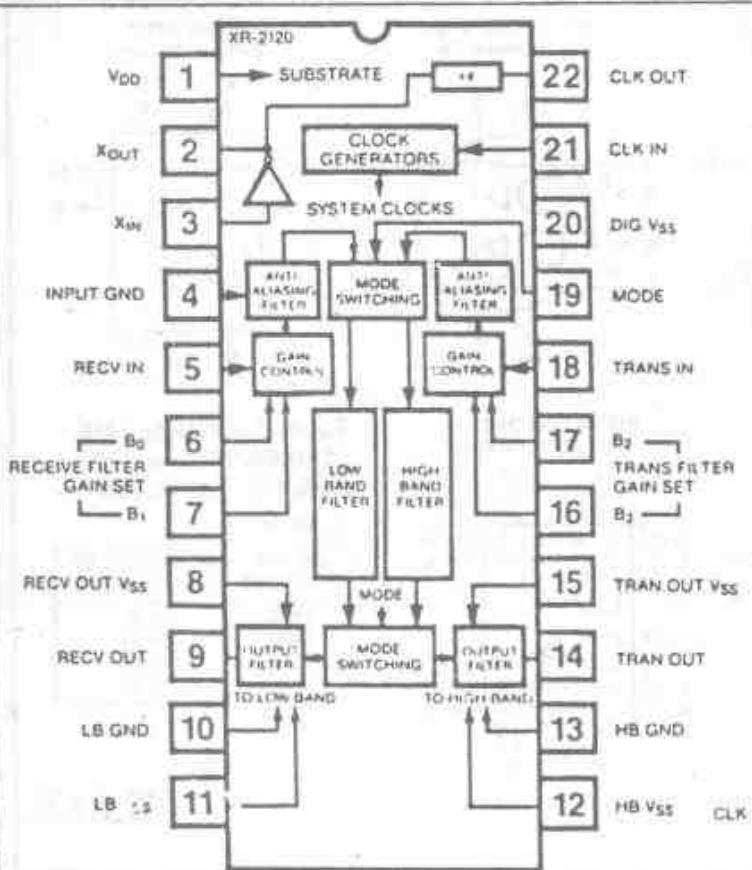
H.601



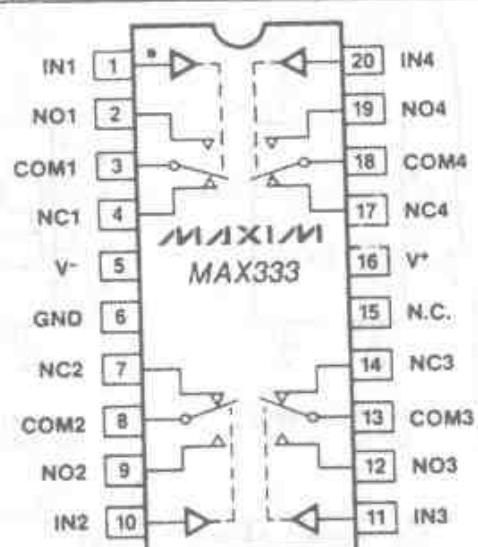
H.602



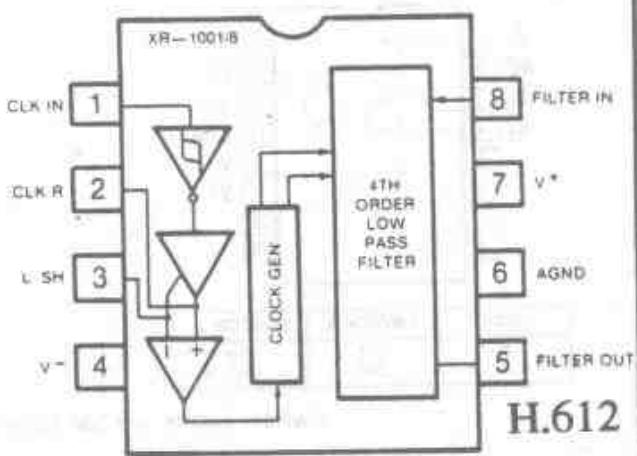
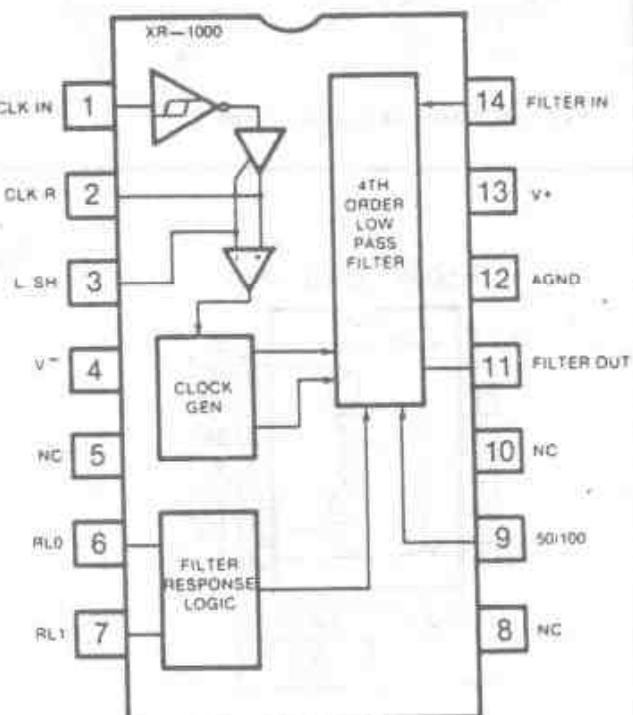




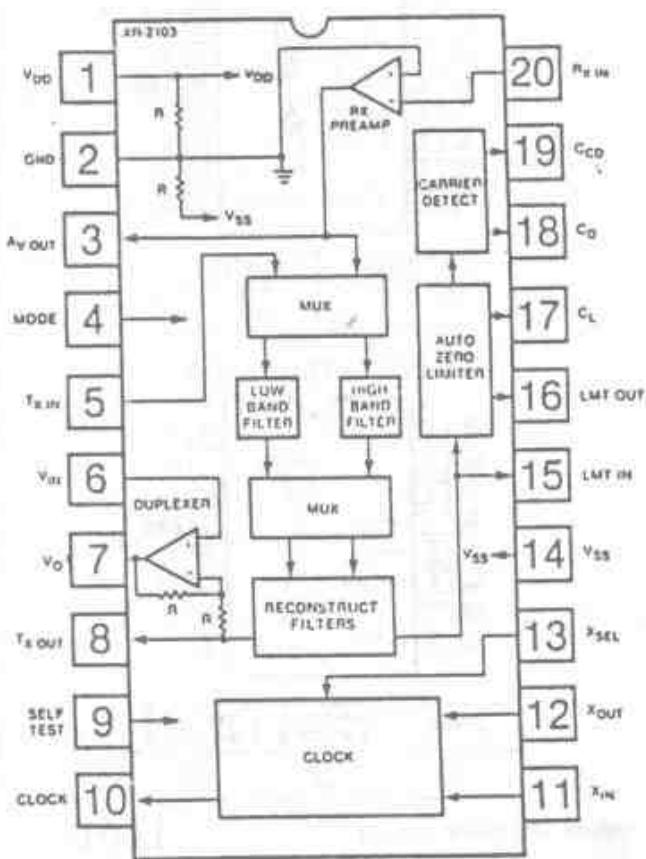
H.608

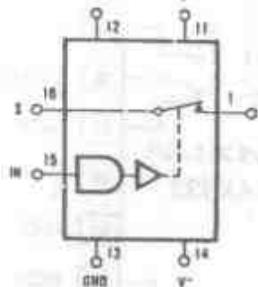
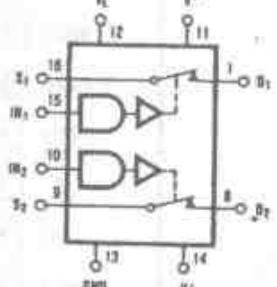
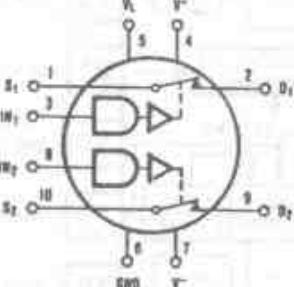
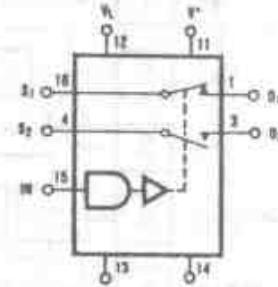
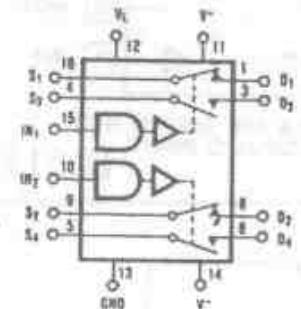
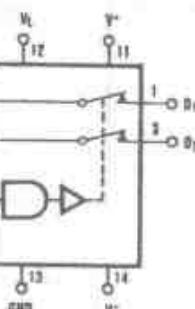
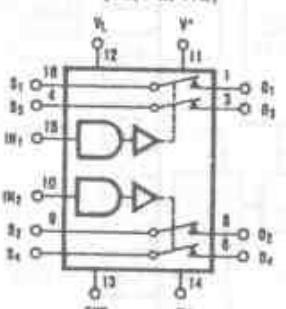


SWITCHES ARE SHOWN WITH  
LOGICAL 0 INPUT  
H.611



H.609



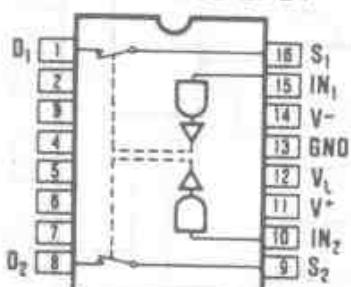
IH5140 SPST  
DIP (JE, PE, WE)IH5141 Dual SPST  
DIP (JE, PE, WE)IH5141 Dual SPST  
TO-100 Metal CanIH5142 SPDT  
DIP (JE, PE, WE)IH5143 Dual SPDT  
DIP (JE, PE, WE)IH5144 DPST  
DIP (JE, PE, WE)IH5145 Dual DPST  
DIP (JE, PE, WE)Table 1. USING THE  
5140 FAMILY WITH  
ONLY 2 SUPPLIES(V<sub>L</sub> tied to V<sup>+</sup>)

SUPPLY	MIN. LOGIC I/P VOLTAGES FOR "1" STATE
±15V	+12.6V
±12V	+9.6V
±10V	+7.6V
±5V	+2.6V

Note: Switch states are for logic "1" input.

H.615

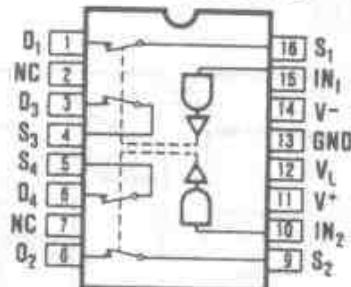
IH5048 - Dual SPST



LOGIC	SWITCH
0	OFF
1	ON

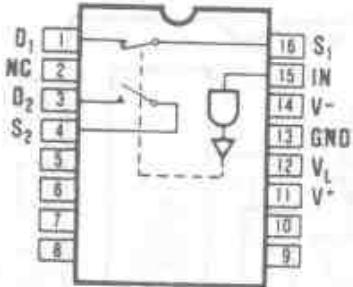
Top View

IH5049 - Dual DPST



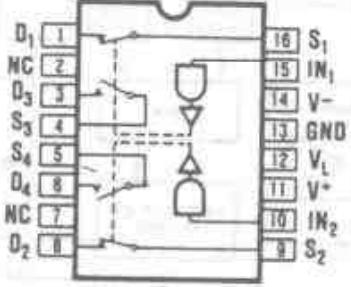
LOGIC	SWITCH
0	OFF
1	ON

IH5050 - SPDT



LOGIC	SWITCH 1	SWITCH 2
0	OFF	ON
1	ON	OFF

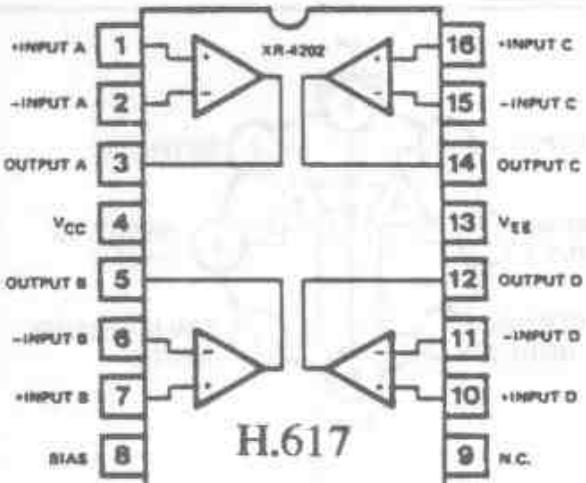
IH5051 - Dual SPDT



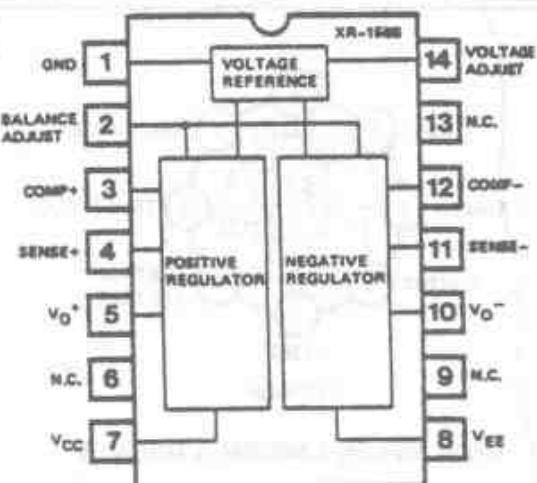
LOGIC	SWITCH 1 SWITCH 2	SWITCH 3 SWITCH 4
0	OFF	ON
1	ON	OFF

Switch states are for Logic "1" Inputs (Positive Logic).

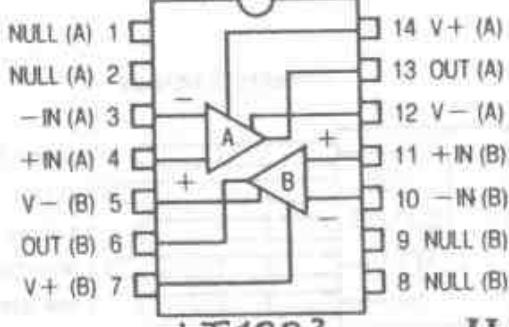
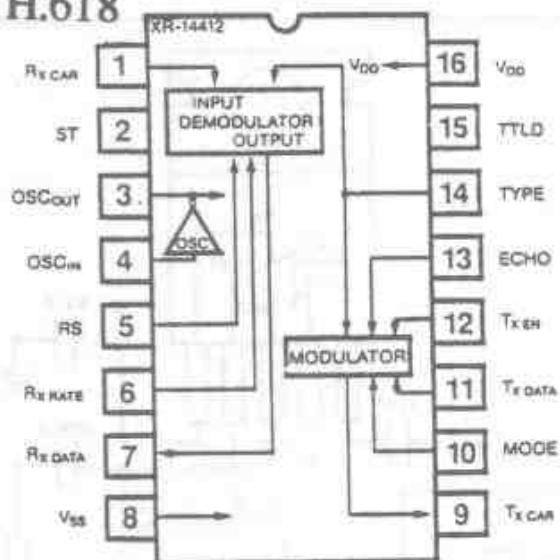
H.616



**H.619**

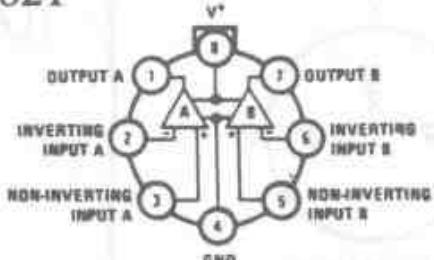


**H.618**

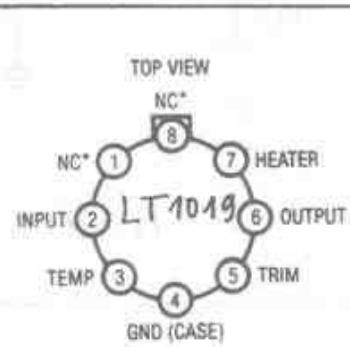


**H.620**

**H.621**



**Order Number LM193H, LM193AH,  
LM293H, LM293AH, LM393H or LM393AH**



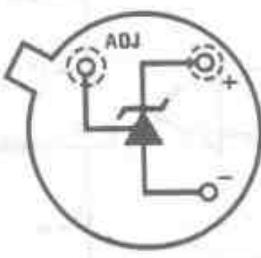
METAL CAN H PACKAGE

\* INTERNALLY CONNECTED. DO NOT CONNECT EXTERNALLY.

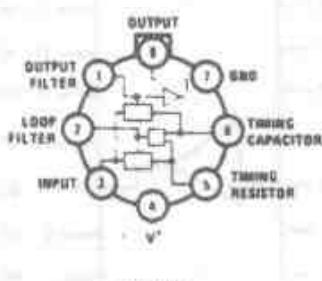


PLASTIC DIP 8 PACKAGE

\* INTERNALLY CONNECTED. DO NOT CONNECT EXTERNALLY.

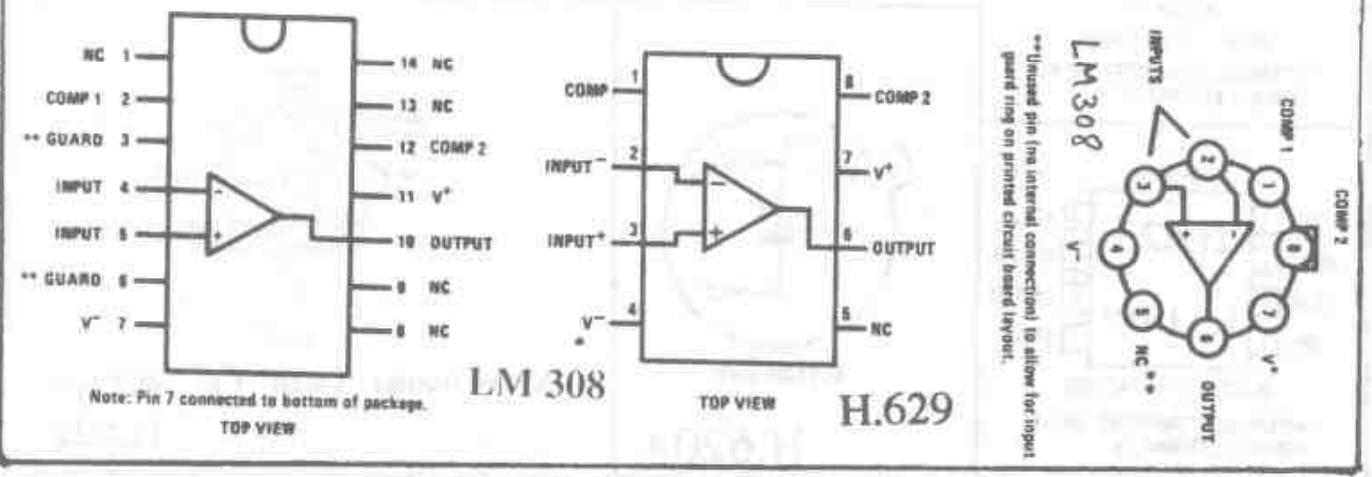
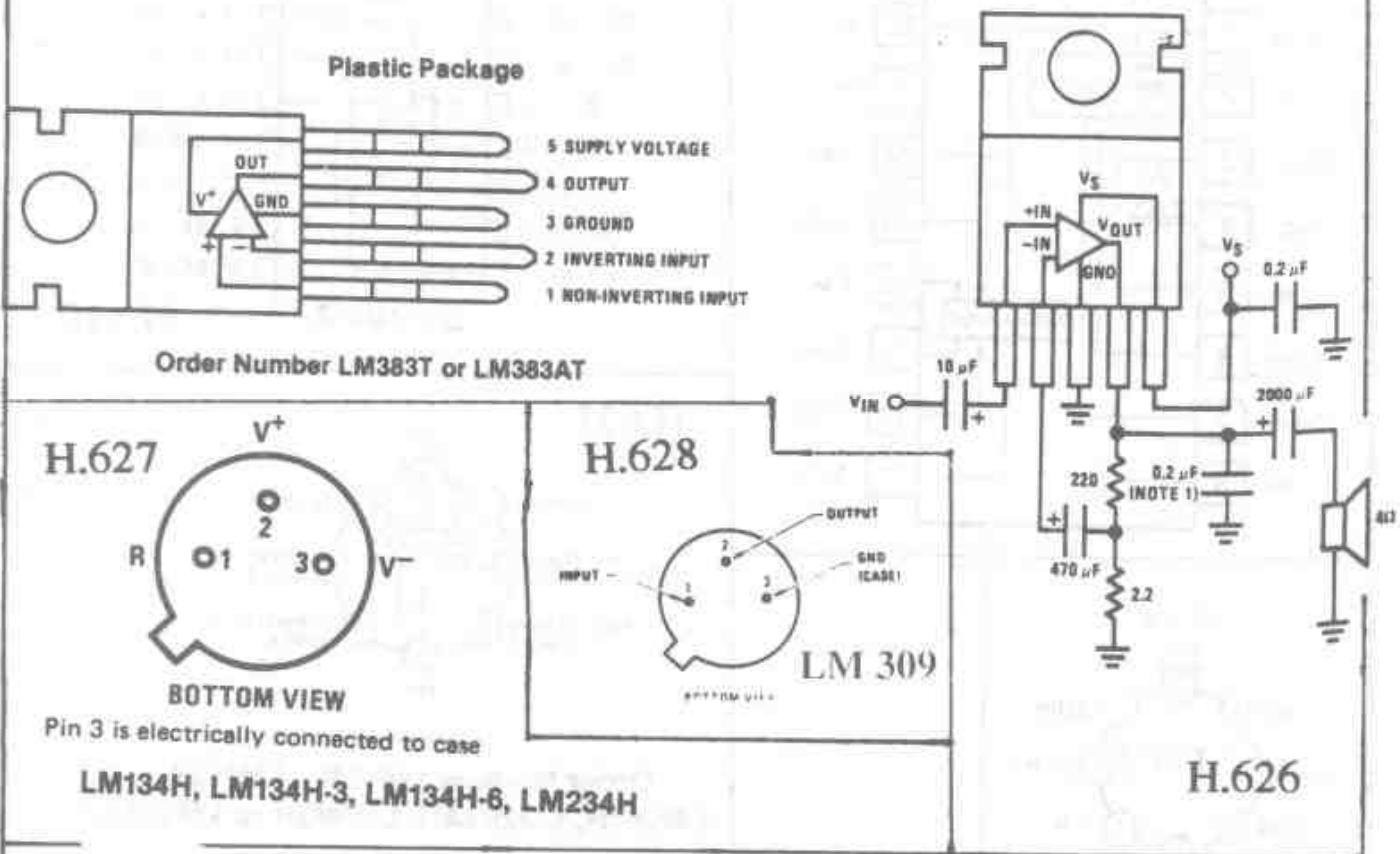
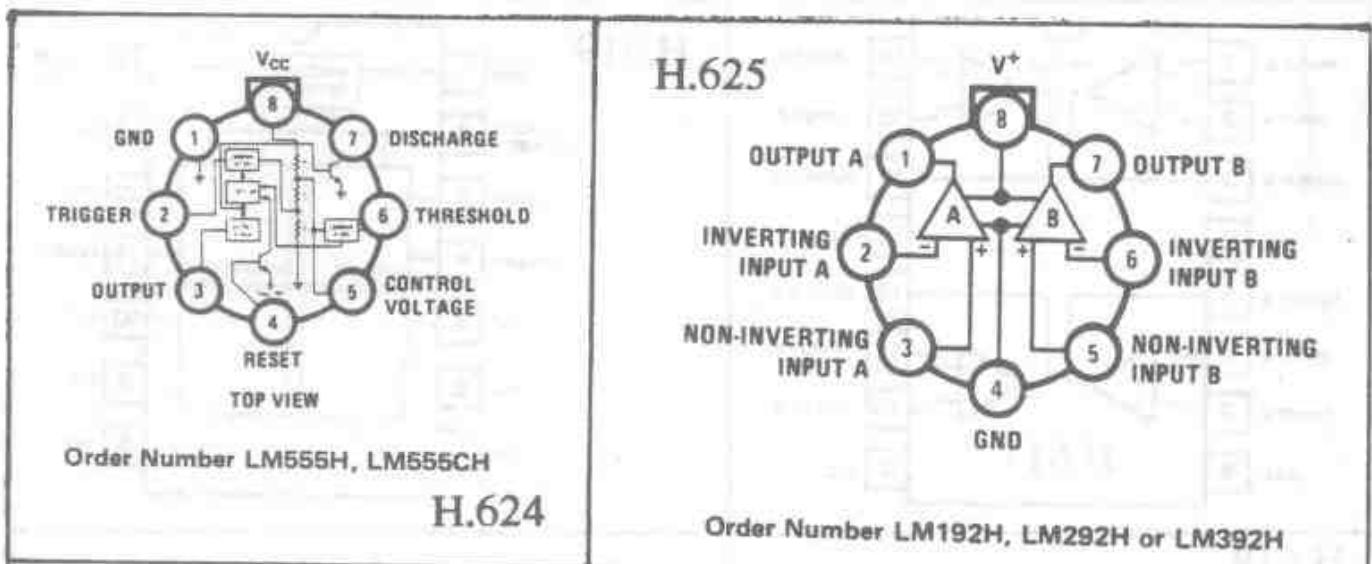


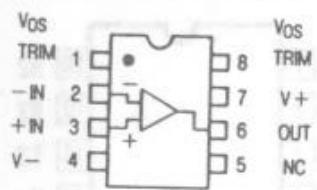
**H.620.a**



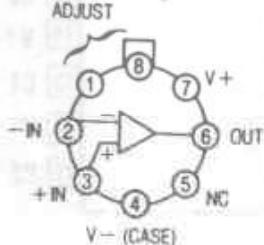
**Order Number LM567H or LM567CH**

**H.622**

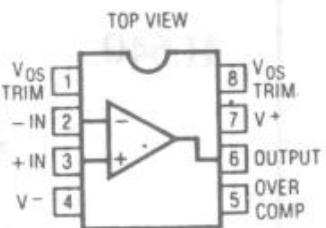




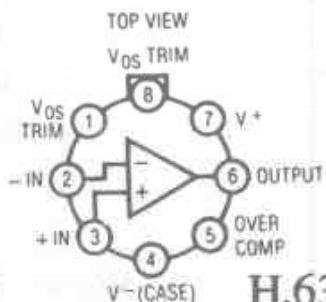
TOP VIEW  
OFFSET  
ADJUST



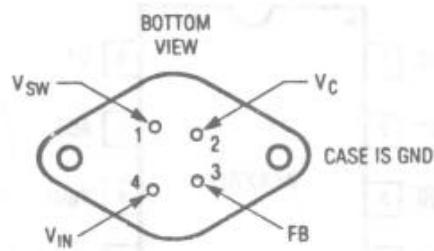
H.630



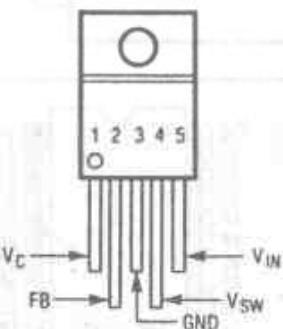
LT1028



H.631

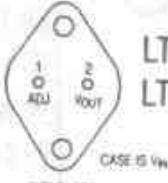


LT1070



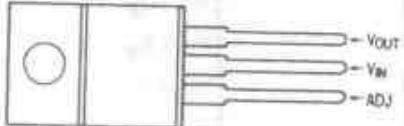
H.632

BOTTOM VIEW



LT1033MK  
LT1033CK

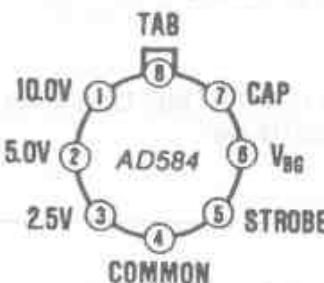
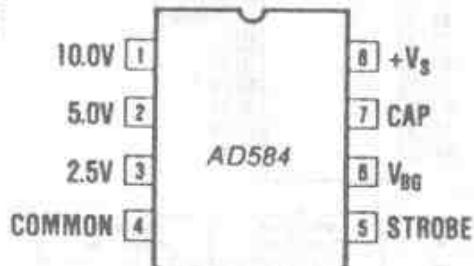
FRONT VIEW



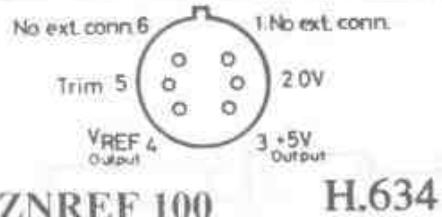
T PACKAGE  
LT1033CT

H.633

H.636

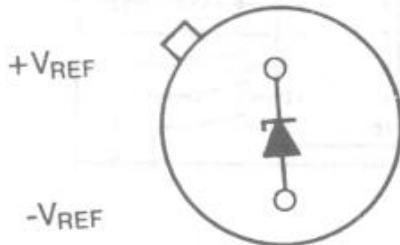


AD 584 Präz. Spanng. Referenz  
+ 10,0 V, + 7,5 V, + 5,0 V, + 2,5 V/10 mA



ZNREF 100

H.634



ZN 423

H.635

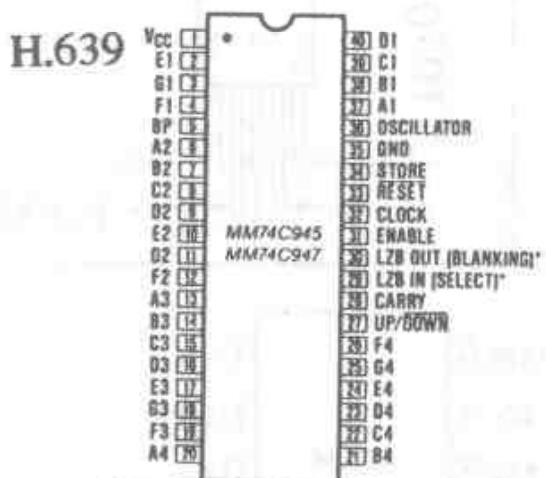


MAX 600/602 AC To DC Regulator  
(110/220 V AC To 5,0 V DC)

H.637



H.638

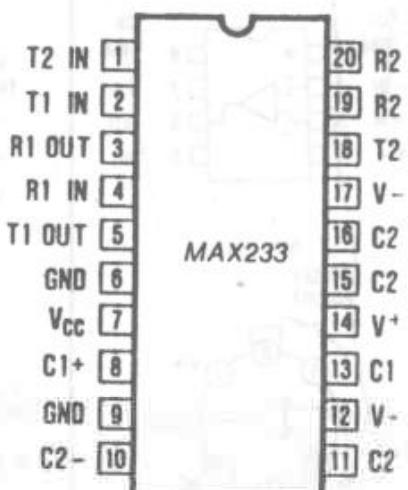


Note:

PIN #	MM74C945 FUNCTION	MM74C947 FUNCTION
29	Select	L2B In
30	Blanking	L2B Out

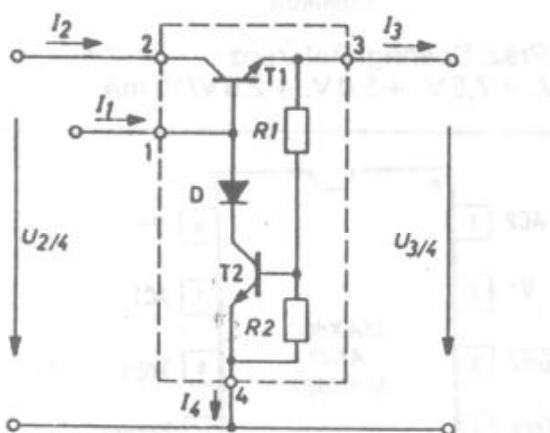
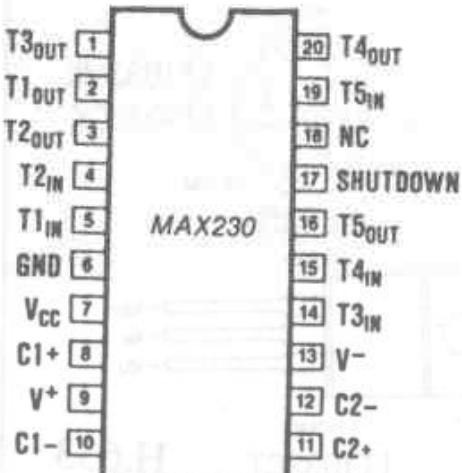
MM 74 C 945/74 C 947 4 Digit Up/Down Counter/Decoder/Driver

H.640



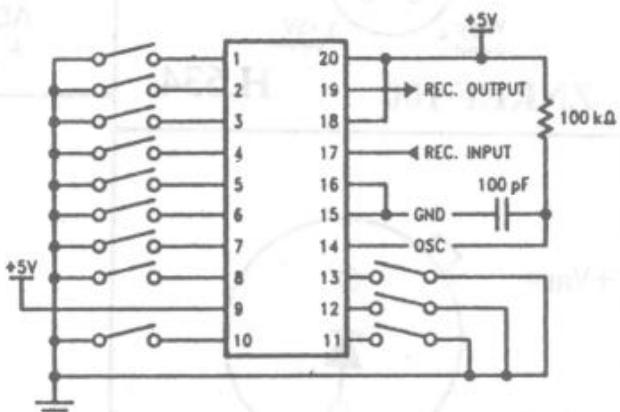
MAX 233 RS-232 Drivers/Receivers

H.641



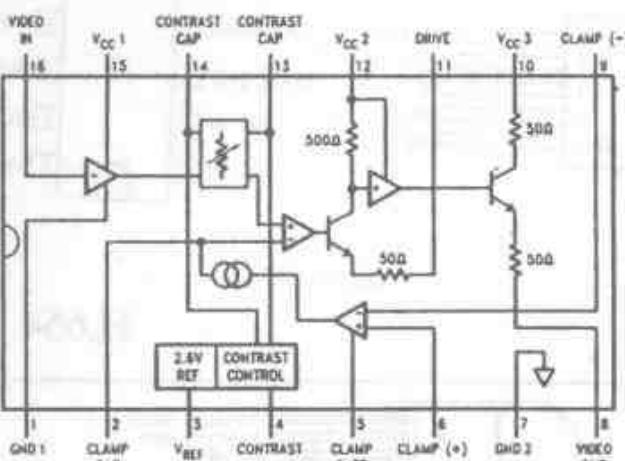
TAA 780 1,1 V-Stabilisierungsschaltung

H.642

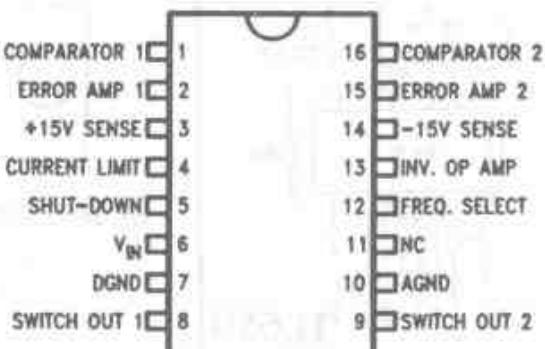


MM 53 C 200/201 Encoder/Decoder

H.643



LM 1201 Video Amplifier System H.644

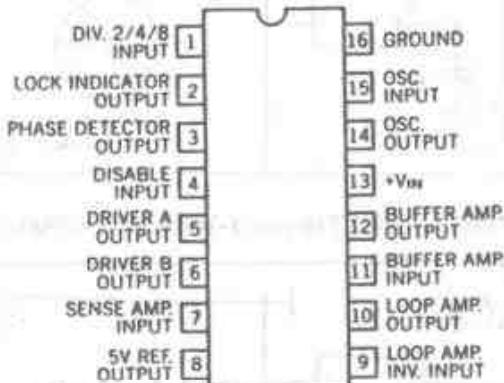


ICL 7680 +5 V to  $\pm$  15 V Schaltregler H.646

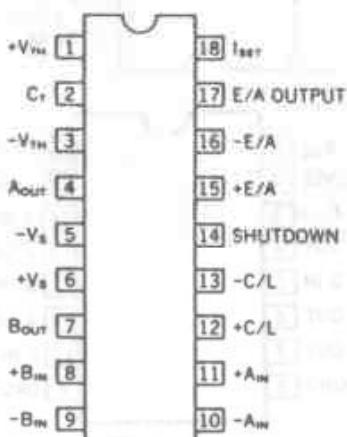
H.645

A0	1	*	20	DSC IN
A8	2		19	OSC OUT 1
A1	3		18	OSC OUT 2
A2	4		17	VSS
A3	5		16	ENCODER OUT
A4	6		15	DECODER OUT
A5	7		14	VDD
A6	8		13	DECODER RESET
A7	9		12	DECODER IN
ENCODE ENABLE	10		11	STATUS

MC 145030 Remot Control Encoder/Decoder

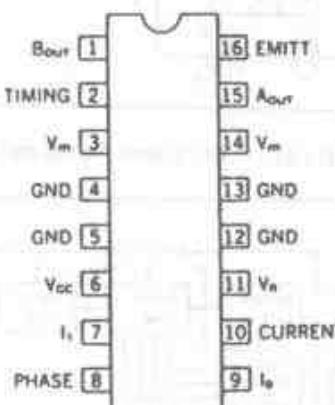


UC 1634/2634/3634 Phase Locked Frequency Controller H.647



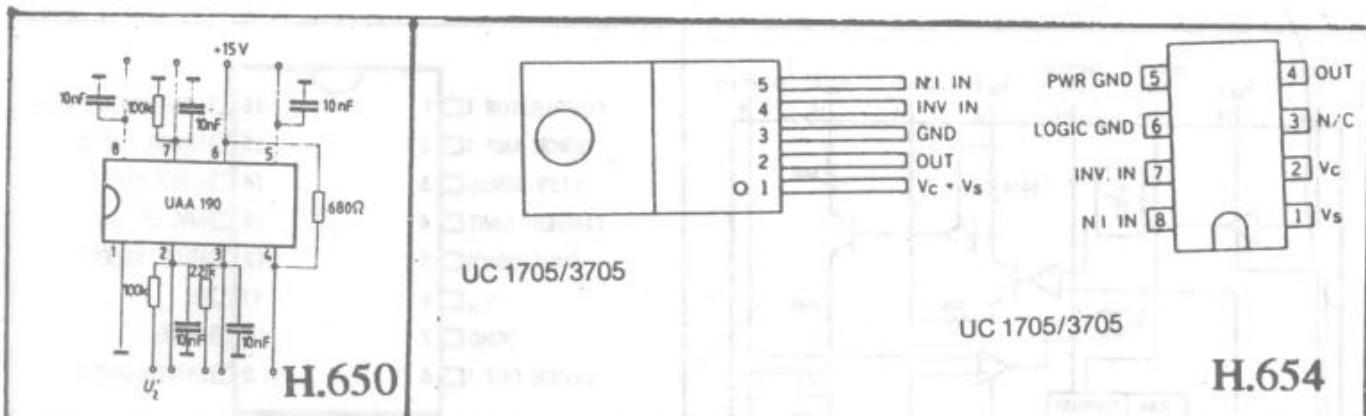
UC 1637/2637/3637 Switch Mode Controller für DC Motor Drive

H.648

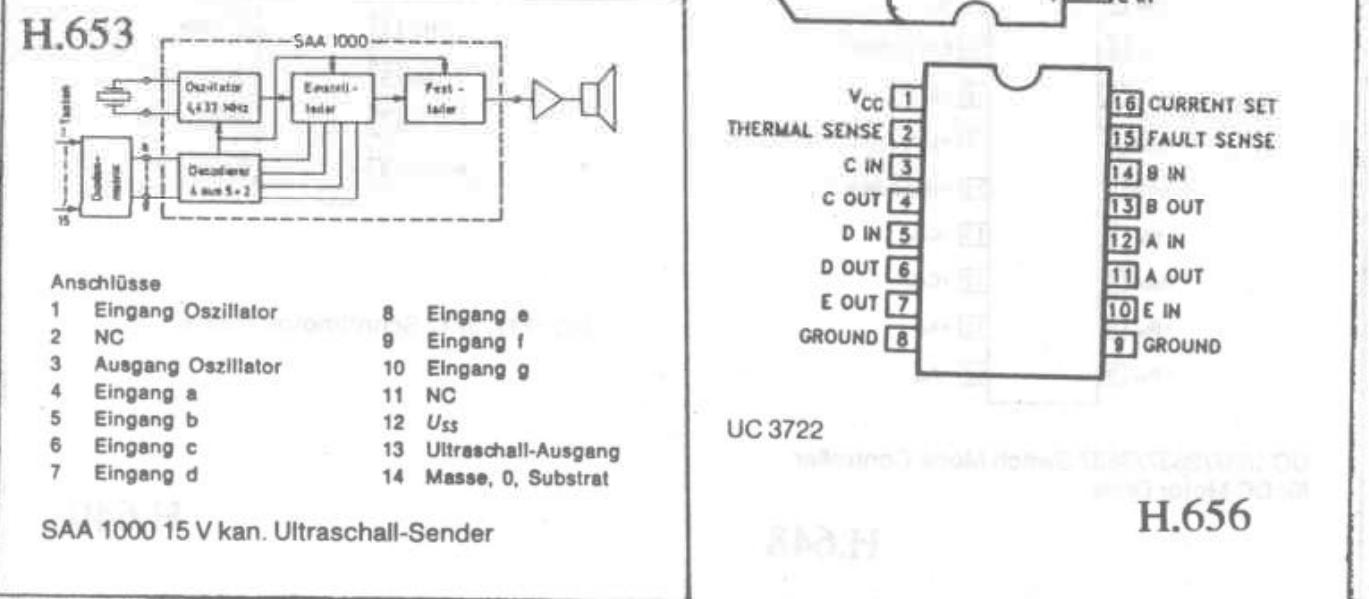
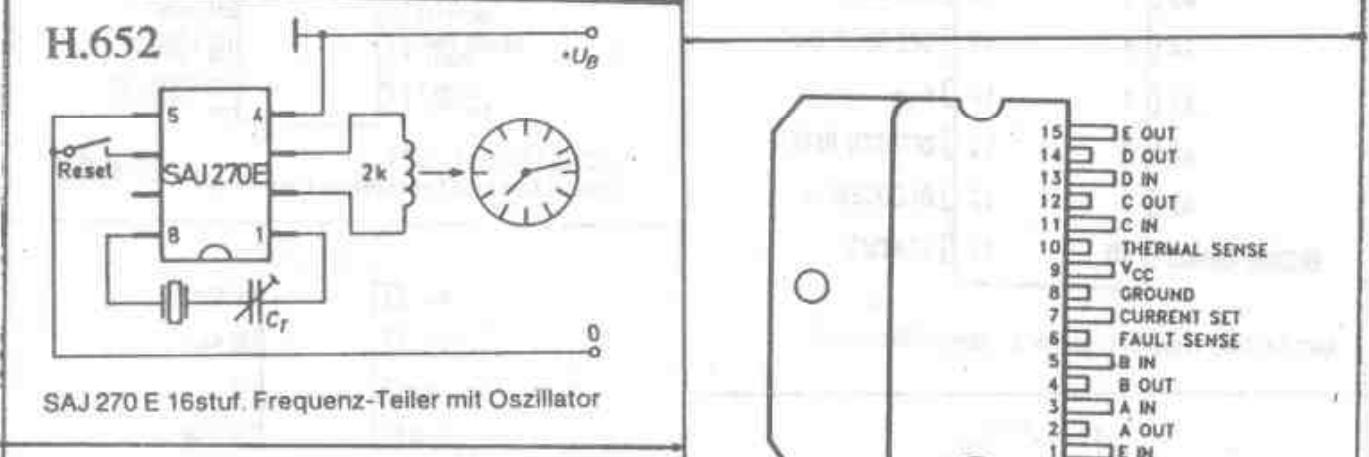
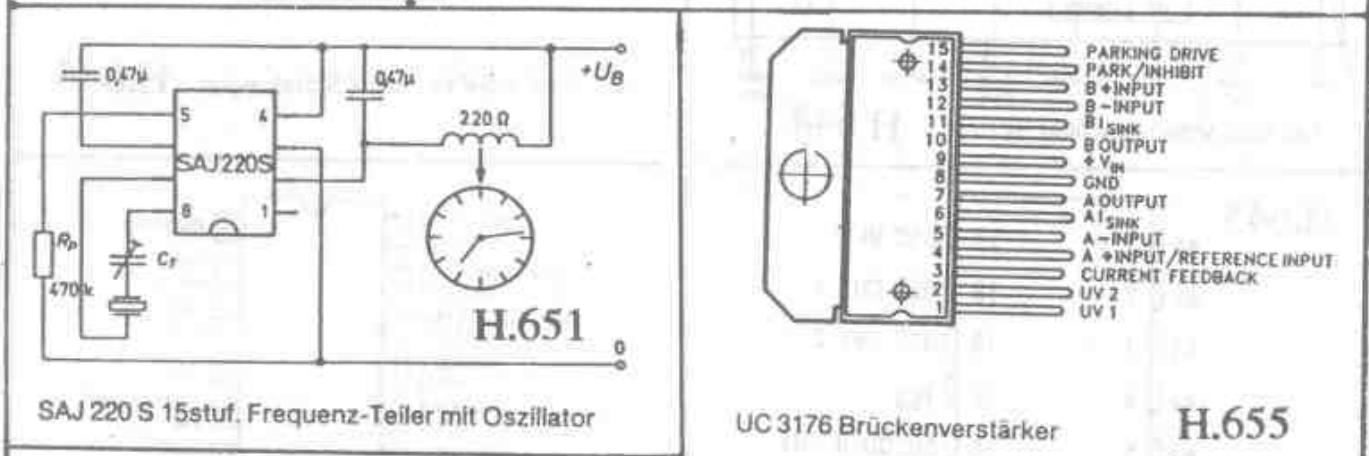


UC 1717/3717 Schrittmotor-Treiber

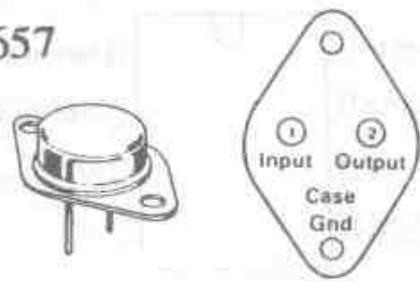
H.649



UC 1705/3705  
H.654



## H.657

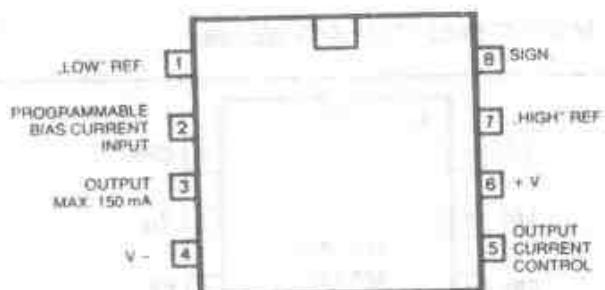


(Bottom View)

LM 123/223/323 K Spannungsregler 5 V ... 3 A

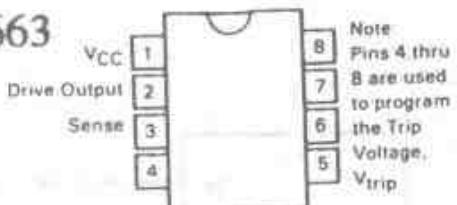
Pin 1. INPUT 1  
2. GROUND 2  
3. OUTPUT 3  
123 K-55 ... + 153 °C  
223 K-25 ... + 150 °C  
323 K- 0 ... + 125 °C

LM 123/223/323 K Spannungsregler 5 V ... 3 A

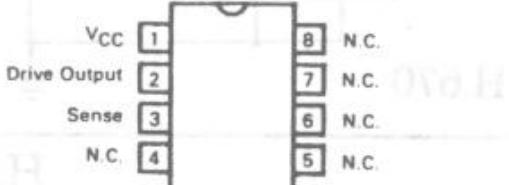


3098 Progr. Schmitt-Trigger

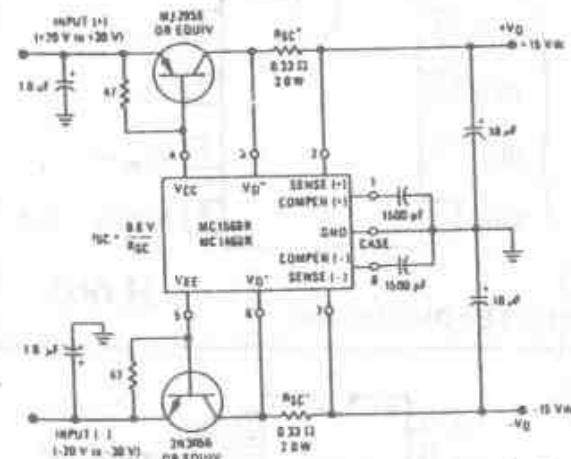
## H.660



34062, 35062 Programmierb. Übersp.-Überw.



35061, A Programmierb. Übersp.-Überw. H.664



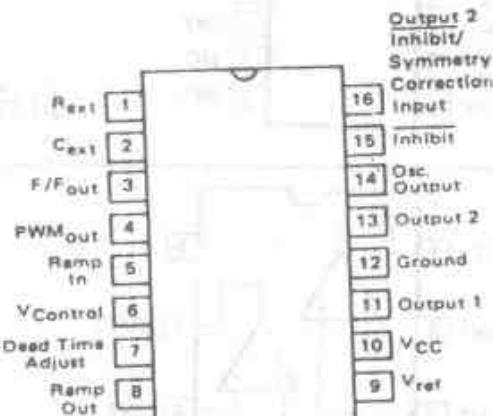
MC 1468/1568 ± 15 V Regler

## H.658

OFFSET N1	1	8	BIAS SELECT
IN -	2	7	VDD
IN +	3	6	OUT
GND	4	5	OFFSET N2

TL 271 Lin CMOS OP

## H.659

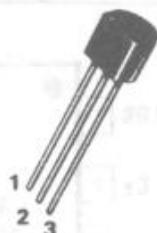


3420, 3520 Schaltregler

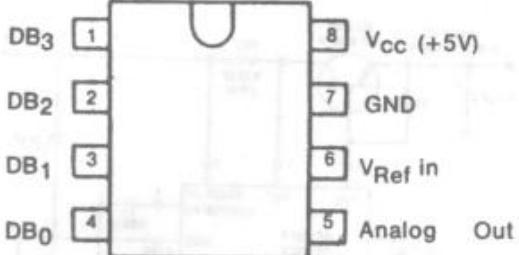
## H.661

## H.662

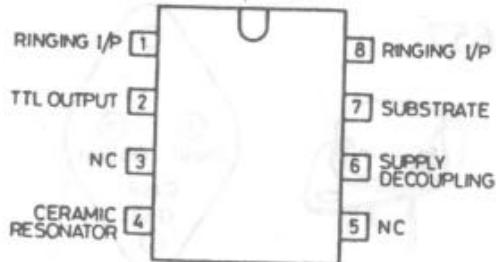
Pin 1. VCC  
2. Drive Output  
3. Sense



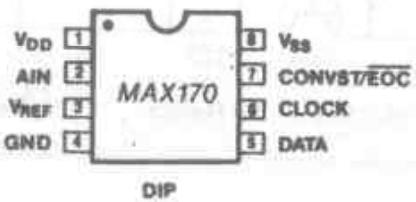
34061, A Programmierb. Übersp.-Überw.



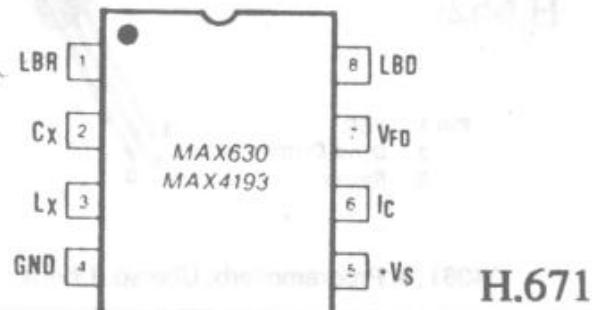
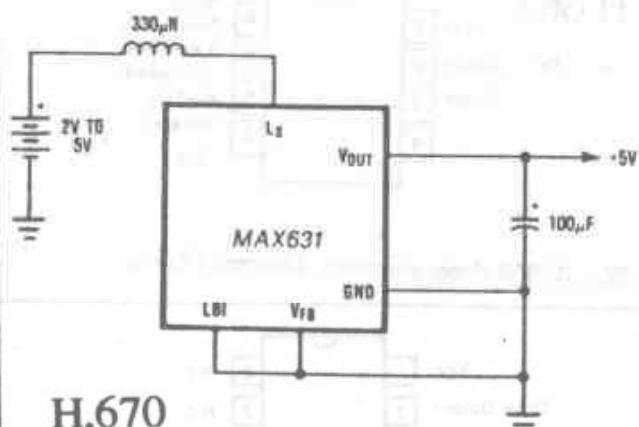
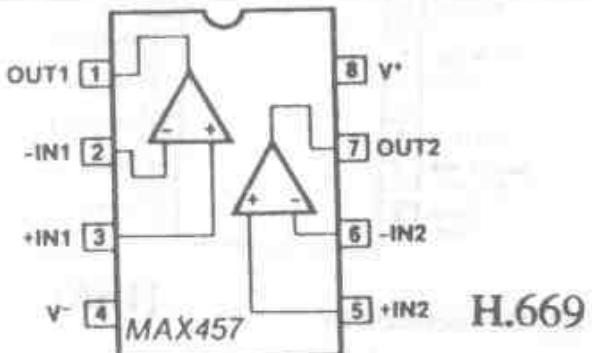
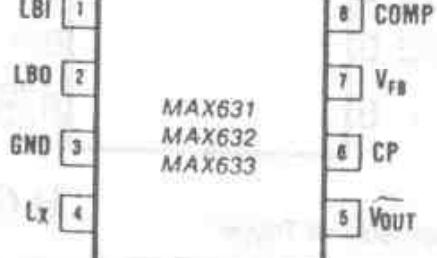
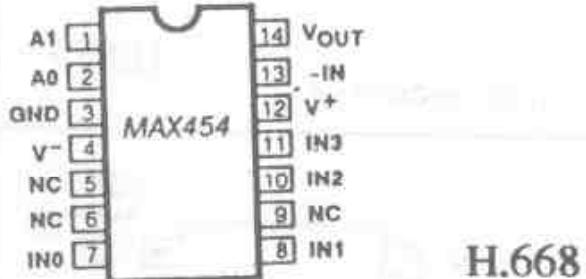
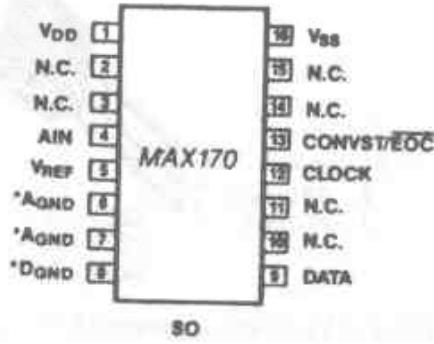
H.665



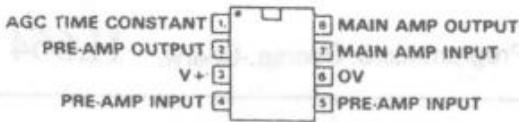
H.666



H.667



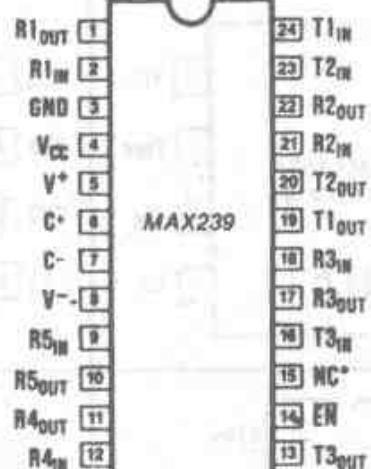
VOGAD 6270



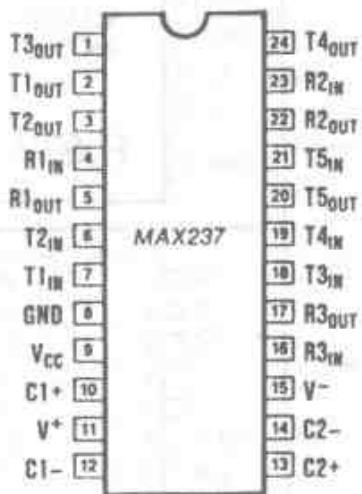
<p><b>H.672</b></p> <p>MAX634 MAX4391</p> <table border="1"> <tr><td>LBR</td><td>1</td><td>VFB</td><td>8</td><td>HP GND</td></tr> <tr><td>LBD</td><td>2</td><td>VREF</td><td>7</td><td>CTL</td></tr> <tr><td>Cx</td><td>3</td><td>+Vs</td><td>6</td><td>HP GND</td></tr> <tr><td>GND</td><td>4</td><td>Lx</td><td>5</td><td>PR</td></tr> </table>	LBR	1	VFB	8	HP GND	LBD	2	VREF	7	CTL	Cx	3	+Vs	6	HP GND	GND	4	Lx	5	PR	<p><b>H.675</b></p> <p>MAX641 MAX642 MAX643</p> <table border="1"> <tr><td>LBI</td><td>1</td><td>COMP</td><td>8</td><td>OUT</td></tr> <tr><td>LBO</td><td>2</td><td>VFB</td><td>7</td><td>LX1</td></tr> <tr><td>GND</td><td>3</td><td>EXT</td><td>6</td><td>N.C.</td></tr> <tr><td>Lx</td><td>4</td><td>VOUT</td><td>5</td><td></td></tr> </table>	LBI	1	COMP	8	OUT	LBO	2	VFB	7	LX1	GND	3	EXT	6	N.C.	Lx	4	VOUT	5		<p><b>H.676</b></p> <p>MAX644 MAX645 MAX647</p> <table border="1"> <tr><td>LX2</td><td>1</td><td>HP GND</td><td>14</td><td>NC</td></tr> <tr><td>V+</td><td>2</td><td>CTL</td><td>13</td><td>CPL</td></tr> <tr><td>I.C.</td><td>3</td><td>HP GND</td><td>12</td><td>RLI1</td></tr> <tr><td>VREF</td><td>4</td><td>PR</td><td>11</td><td>RL01</td></tr> <tr><td>LBO</td><td>5</td><td>OUT</td><td>10</td><td>TL01</td></tr> <tr><td>LBI</td><td>6</td><td>LX1</td><td>9</td><td>TLI1</td></tr> <tr><td>GND</td><td>7</td><td>N.C.</td><td>8</td><td>RXO</td></tr> </table>	LX2	1	HP GND	14	NC	V+	2	CTL	13	CPL	I.C.	3	HP GND	12	RLI1	VREF	4	PR	11	RL01	LBO	5	OUT	10	TL01	LBI	6	LX1	9	TLI1	GND	7	N.C.	8	RXO																																																		
LBR	1	VFB	8	HP GND																																																																																																																											
LBD	2	VREF	7	CTL																																																																																																																											
Cx	3	+Vs	6	HP GND																																																																																																																											
GND	4	Lx	5	PR																																																																																																																											
LBI	1	COMP	8	OUT																																																																																																																											
LBO	2	VFB	7	LX1																																																																																																																											
GND	3	EXT	6	N.C.																																																																																																																											
Lx	4	VOUT	5																																																																																																																												
LX2	1	HP GND	14	NC																																																																																																																											
V+	2	CTL	13	CPL																																																																																																																											
I.C.	3	HP GND	12	RLI1																																																																																																																											
VREF	4	PR	11	RL01																																																																																																																											
LBO	5	OUT	10	TL01																																																																																																																											
LBI	6	LX1	9	TLI1																																																																																																																											
GND	7	N.C.	8	RXO																																																																																																																											
<p><b>H.673</b></p> <p>MAX637</p>	<p><b>H.677</b></p> <p>MAX654 MAX655 MAX657 MAX659</p> <table border="1"> <tr><td>LX2</td><td>1</td><td>HP GND</td><td>14</td><td>NC</td></tr> <tr><td>V+</td><td>2</td><td>CTL</td><td>13</td><td>CPL</td></tr> <tr><td>VCC</td><td>3</td><td>HP GND</td><td>12</td><td>DL</td></tr> <tr><td>VREF</td><td>4</td><td>PR</td><td>11</td><td>PR</td></tr> <tr><td>LBO</td><td>5</td><td>OUT</td><td>10</td><td>OUT</td></tr> <tr><td>LBI</td><td>6</td><td>LX1</td><td>9</td><td>LXI</td></tr> <tr><td>GND</td><td>7</td><td>N.C.</td><td>8</td><td>N.C.</td></tr> </table>	LX2	1	HP GND	14	NC	V+	2	CTL	13	CPL	VCC	3	HP GND	12	DL	VREF	4	PR	11	PR	LBO	5	OUT	10	OUT	LBI	6	LX1	9	LXI	GND	7	N.C.	8	N.C.	<p><b>H.679</b></p> <p>MAX656 MAX658</p> <table border="1"> <tr><td>VCC</td><td>1</td><td>NC</td><td>14</td><td>NC</td></tr> <tr><td>V+</td><td>2</td><td>CTL</td><td>13</td><td>CPL</td></tr> <tr><td>GND</td><td>3</td><td>D</td><td>12</td><td>DL</td></tr> <tr><td>VREF</td><td>4</td><td>PR</td><td>11</td><td>PR</td></tr> <tr><td>LBO</td><td>5</td><td>OUT</td><td>10</td><td>OUT</td></tr> <tr><td>LBI</td><td>6</td><td>LXI</td><td>9</td><td>LXI</td></tr> <tr><td>GND</td><td>7</td><td>N.C.</td><td>8</td><td>N.C.</td></tr> </table>	VCC	1	NC	14	NC	V+	2	CTL	13	CPL	GND	3	D	12	DL	VREF	4	PR	11	PR	LBO	5	OUT	10	OUT	LBI	6	LXI	9	LXI	GND	7	N.C.	8	N.C.																																																							
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<p><b>H.674</b></p> <p>MAX638</p> <table border="1"> <tr><td>VOUT</td><td>1</td><td>COMP</td><td>8</td><td>NC</td></tr> <tr><td>LBO</td><td>2</td><td>VFB</td><td>7</td><td>RF INPUT</td></tr> <tr><td>LBI</td><td>3</td><td>+Vs</td><td>6</td><td>GND</td></tr> <tr><td>GND</td><td>4</td><td>Lx</td><td>5</td><td>AUDIO MUTE</td></tr> </table>	VOUT	1	COMP	8	NC	LBO	2	VFB	7	RF INPUT	LBI	3	+Vs	6	GND	GND	4	Lx	5	AUDIO MUTE	<p><b>H.678</b></p> <p>MAX646</p> <table border="1"> <tr><td>Vcc</td><td>1</td><td>NC</td><td>14</td><td>NC</td></tr> <tr><td>V+</td><td>2</td><td>CTL</td><td>13</td><td>CPL</td></tr> <tr><td>GND</td><td>3</td><td>D</td><td>12</td><td>DL</td></tr> <tr><td>VREF</td><td>4</td><td>PR</td><td>11</td><td>PR</td></tr> <tr><td>LBO</td><td>5</td><td>OUT</td><td>10</td><td>OUT</td></tr> <tr><td>LBI</td><td>6</td><td>LX1</td><td>9</td><td>LXI</td></tr> <tr><td>GND</td><td>7</td><td>N.C.</td><td>8</td><td>N.C.</td></tr> </table>	Vcc	1	NC	14	NC	V+	2	CTL	13	CPL	GND	3	D	12	DL	VREF	4	PR	11	PR	LBO	5	OUT	10	OUT	LBI	6	LX1	9	LXI	GND	7	N.C.	8	N.C.	<table border="1"> <tr><td>FO</td><td>1</td><td>GND</td><td>28</td><td>NC</td></tr> <tr><td>FI</td><td>2</td><td>CPL</td><td>27</td><td>CPRI</td></tr> <tr><td>CD</td><td>3</td><td>DL</td><td>26</td><td>RLI1</td></tr> <tr><td>Vcc</td><td>4</td><td>PR</td><td>25</td><td>RL01</td></tr> <tr><td>HTO+</td><td>5</td><td>OUT</td><td>24</td><td>TL01</td></tr> <tr><td>HTO-</td><td>6</td><td>LXI</td><td>23</td><td>TLI1</td></tr> <tr><td>HTI</td><td>7</td><td>N.C.</td><td>22</td><td>RXO</td></tr> <tr><td>TXO</td><td>8</td><td></td><td>21</td><td>RXI</td></tr> <tr><td>TXI</td><td>9</td><td></td><td>20</td><td>RLI2</td></tr> <tr><td>MCO</td><td>10</td><td></td><td>19</td><td>RL02</td></tr> <tr><td>MCI</td><td>11</td><td></td><td>18</td><td>TL02</td></tr> <tr><td>MUT</td><td>12</td><td></td><td>17</td><td>TLI2</td></tr> <tr><td>VLC</td><td>13</td><td></td><td>16</td><td>CPT</td></tr> <tr><td>CT</td><td>14</td><td></td><td>15</td><td>Vg</td></tr> </table> <p><b>H.680</b></p>	FO	1	GND	28	NC	FI	2	CPL	27	CPRI	CD	3	DL	26	RLI1	Vcc	4	PR	25	RL01	HTO+	5	OUT	24	TL01	HTO-	6	LXI	23	TLI1	HTI	7	N.C.	22	RXO	TXO	8		21	RXI	TXI	9		20	RLI2	MCO	10		19	RL02	MCI	11		18	TL02	MUT	12		17	TLI2	VLC	13		16	CPT	CT	14		15	Vg
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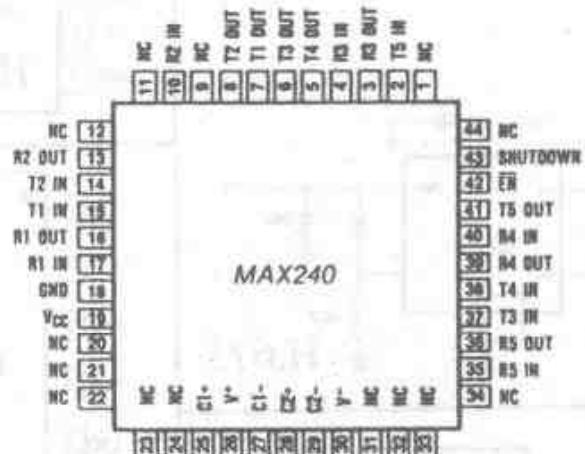
MAX 236 RS-232 Drivers/Receivers



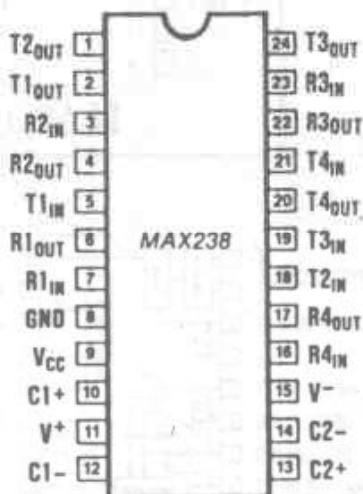
MAX 239 RS-232 Drivers/Receivers



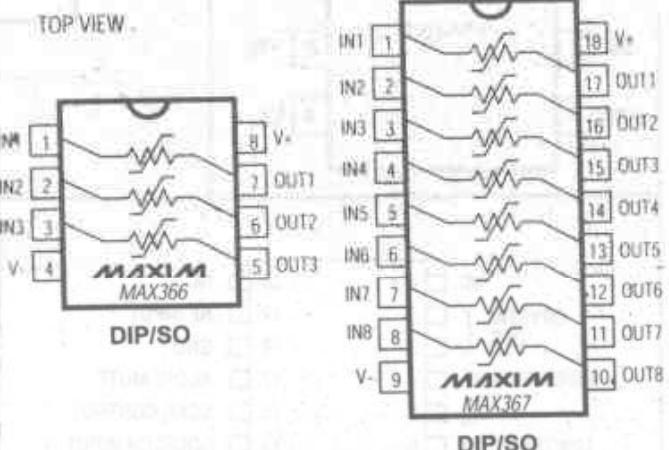
MAX 237 RS-232 Drivers/Receivers



MAX 240 RS-232 Drivers/Receivers



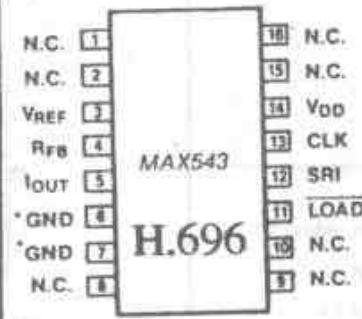
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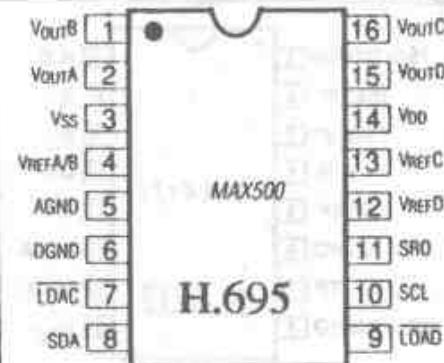
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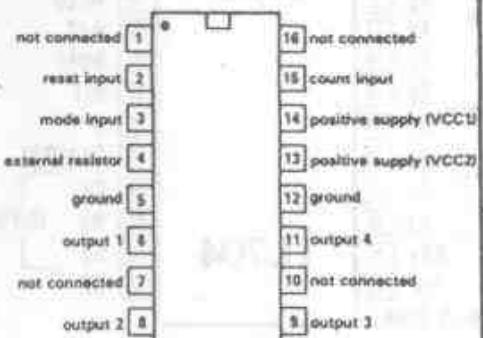
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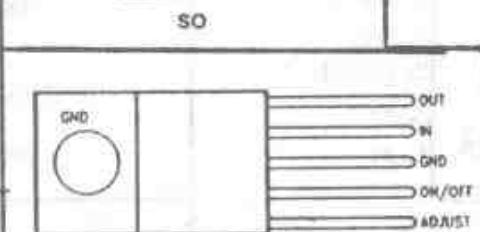
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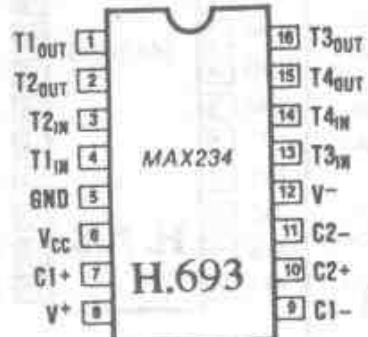
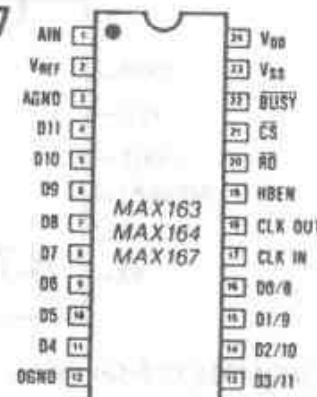
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SAA 1027 Schrittmotorsteuerung



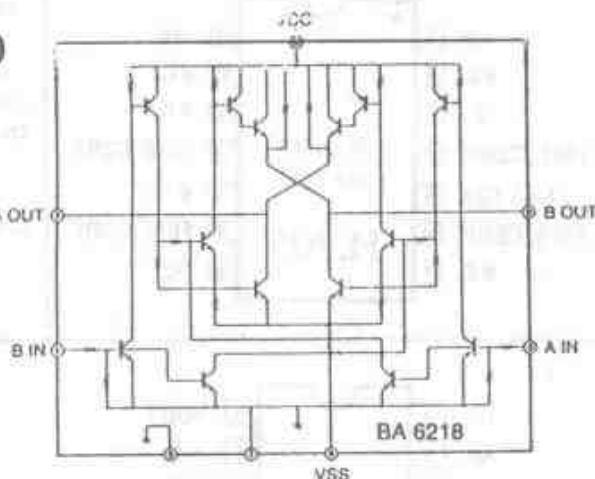
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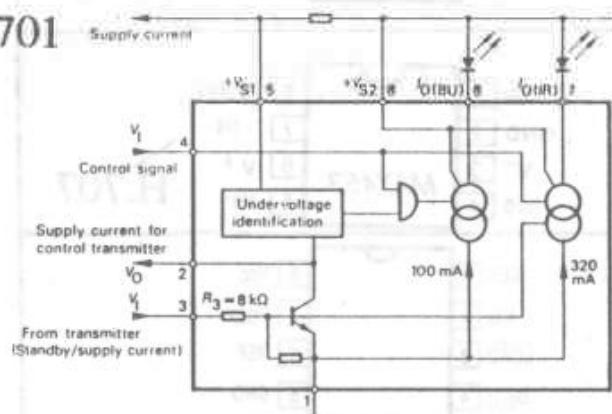
MAX 234 RS-232 Drivers/Receivers



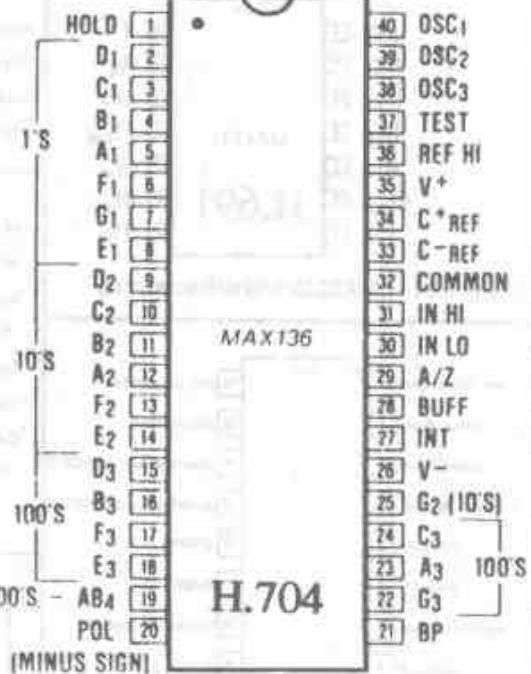
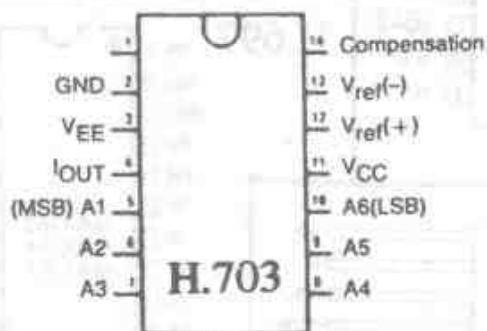
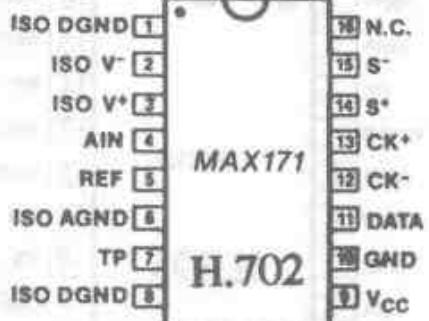
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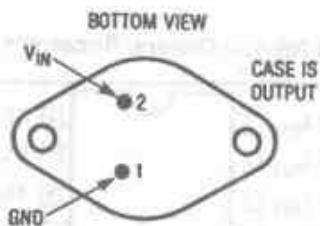
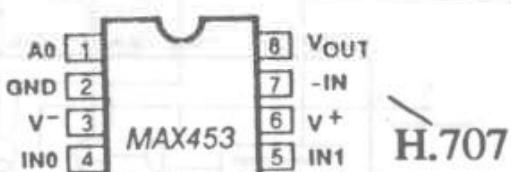
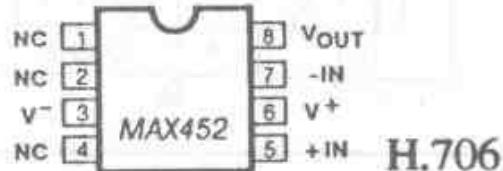
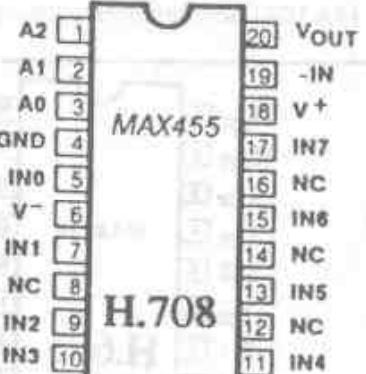
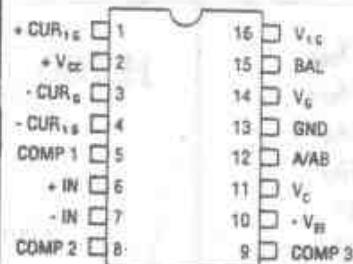
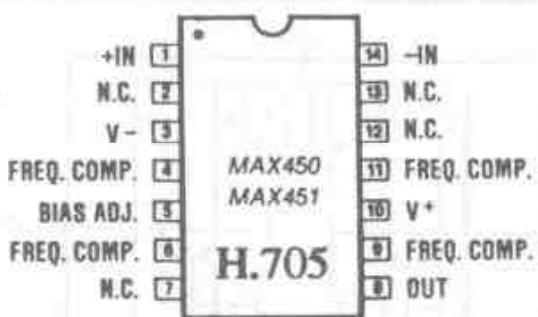
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MAX 235 RS-232 Drivers/Receivers



MC 1406 L D/A-Converter



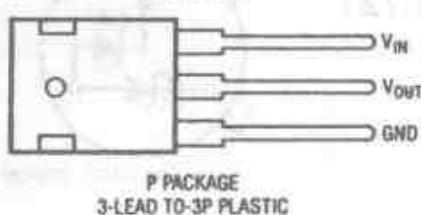
K PACKAGE  
2-LEAD TO-3 METAL CAN

LT 1083/84/85 MU/CU -5/-12 V, 7.5/5.0/3.0 A

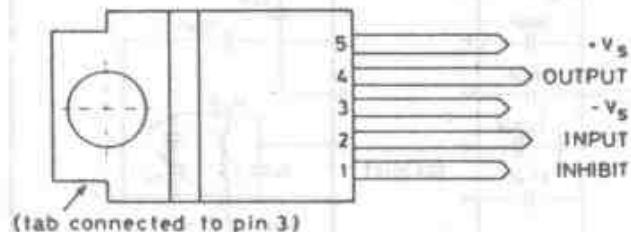
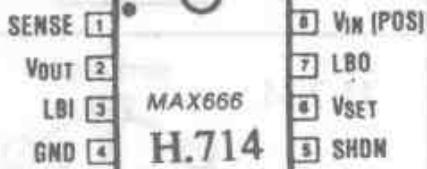
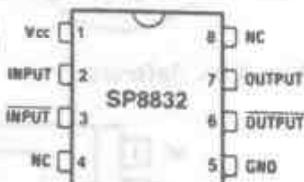
**H.709**

LT 1257 12 Bit D/A Wandler

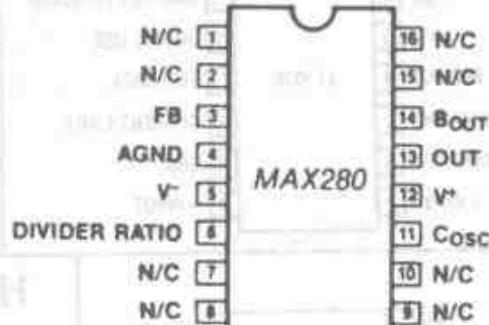
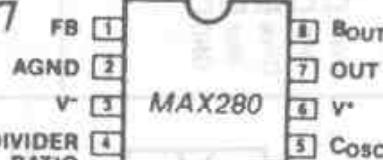
FRONT VIEW

**H.710**

LT 1083/84 CP -5/-12 V, 7,5/5,0 A

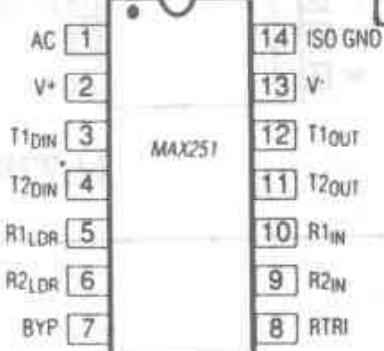
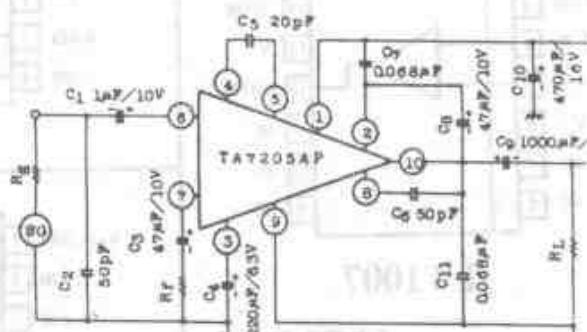
**H.711****H.713**

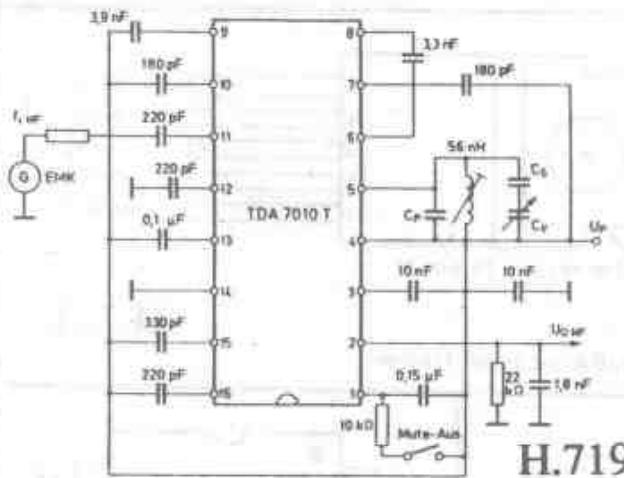
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INPUT	2	7	OUTPUT
INPUT	3	6	OUTPUT
NC	4	5	GND

2120 **H.715a****H.717**

SHDN	1	14	VCC
D1	2	13	D2
T1LDR	3	12	R2OUT
T1IN	4	11	R2DIN
T2IN	5	10	R1DIN
T2LDR	6	9	R1OUT
GND	7	8	EN

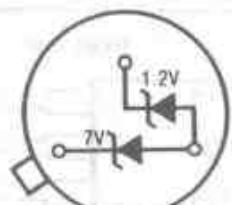
2122

**H.717a****H.718**

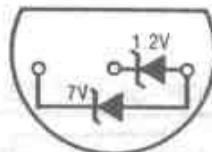


H.719

H.721



H PACKAGE, BOTTOM VIEW

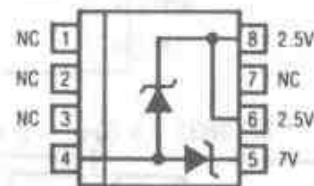
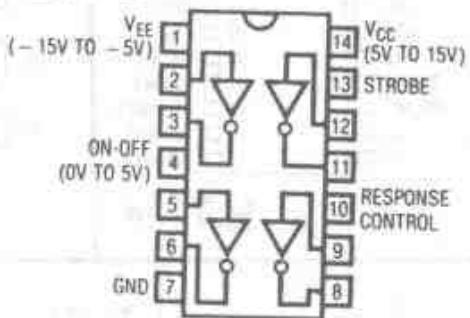


Z PACKAGE  
TO-92 PLASTIC  
BOTTOM VIEW

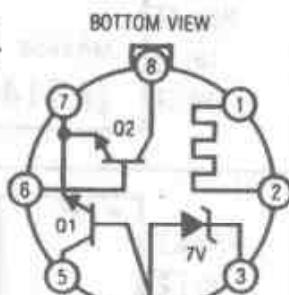
LT 1034 Präz. 1,2 V Referenz



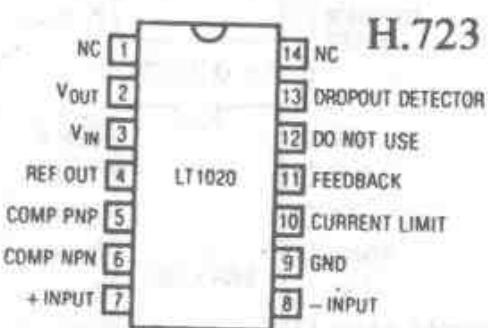
H.722



H.724



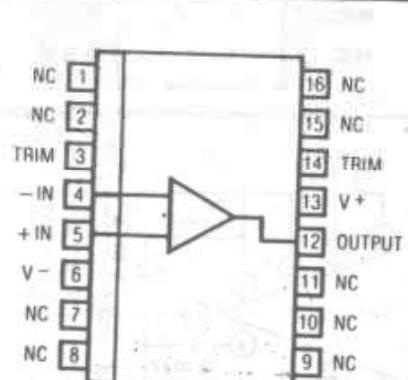
LTZ 1000 Ultra Präz. Referenz (7 V)



H.723



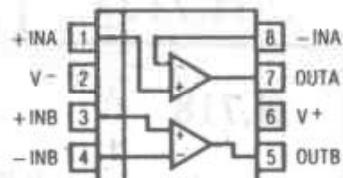
H.726



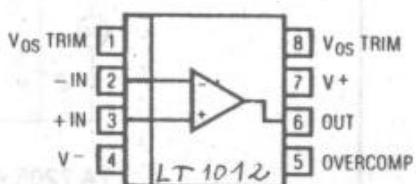
LT1007

H.725

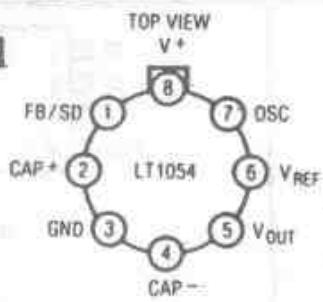
H.728



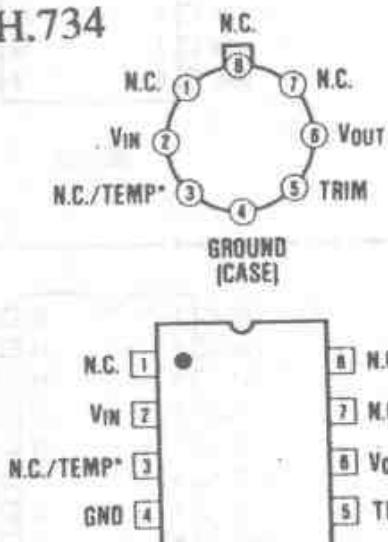
H.729



H.727

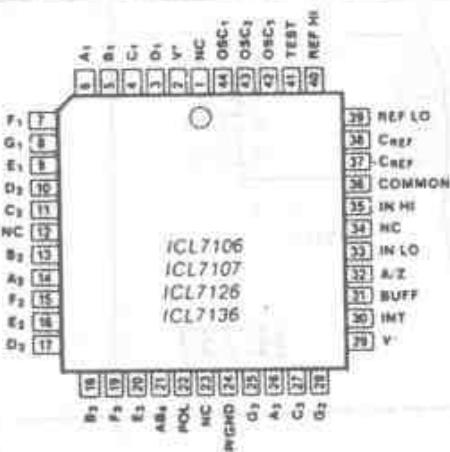
**H.731**

LT 1054 Voltage Converter (3.5 . . . 15 V)

**H.734****H.733**

C1	1 *	16	TEST
C2	2	15	LOW SUPPLY TRIP
DETECT	3	14	V <sub>SS</sub>
STROBE	4	13	R1
V <sub>DD</sub>	5	12	OSC
IRED	6	11	LED
UD	7	10	FEEDBACK
BRASS	8	9	SILVER

MC 145010

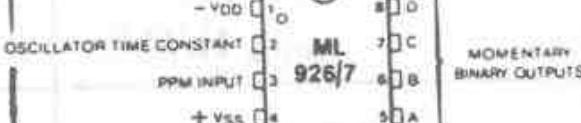
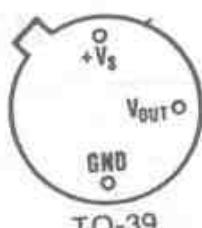
**H.732**

MC 14471

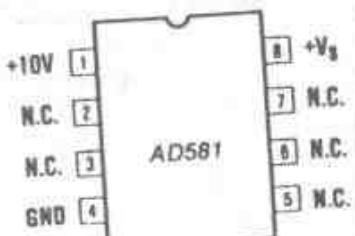
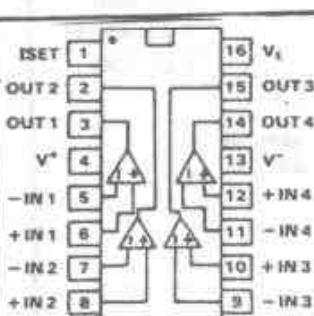
14	FINE ADJUST
15	OUTPUT FORCE
16	FINE ADJUST
17	*15V
18	TEST POINT
19	N/C
20	N/C



TO-52

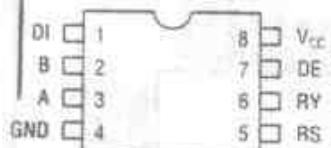
**H.735****H.735b**

TO-39

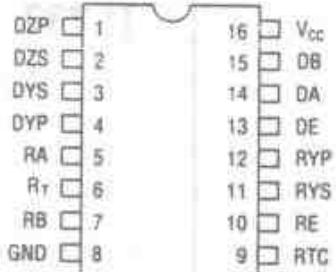
**H.736****LP365N**

DET COMP OUT	1 *	16	GUARD HI-Z
NC	2	15	DETECT INPUT
LOW V SET	3	14	GUARD LO-Z
LOW V COMP OUT	4	13	SENSITIVITY SET
LED	5	12	C <sub>x</sub>
V <sub>DD</sub>	6	11	SILVER
R <sub>x</sub>	7	10	BRASS
FEEDBACK	8	9	V <sub>SS</sub>

**H.736a**



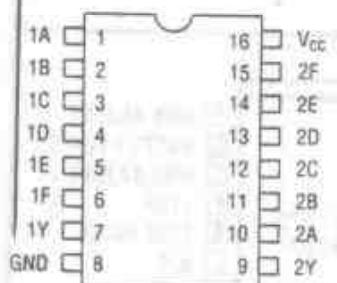
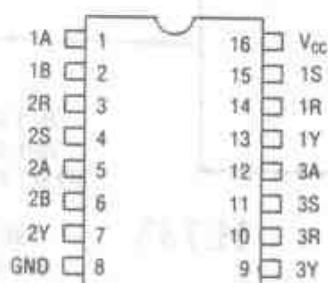
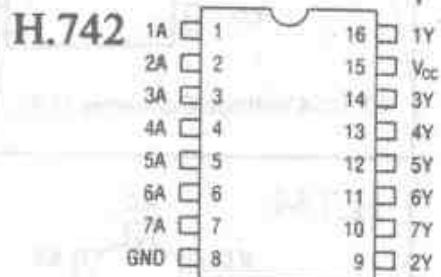
SN75117

**H.737**

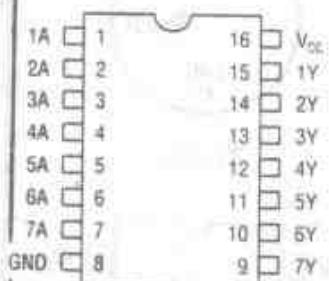
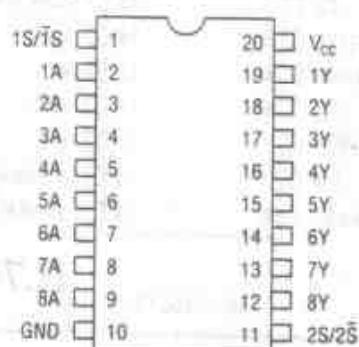
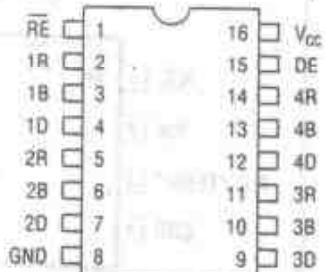
SN75118

**H.738**

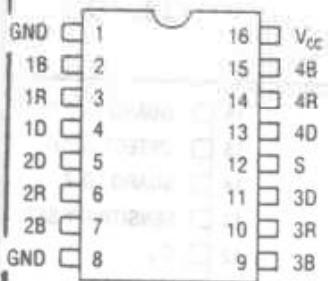
SN75119

**H.739**SN75121  
SN75123 **H.740**SN75122  
SN75124 **H.741**

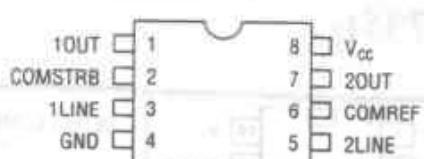
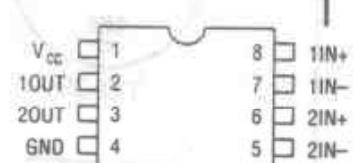
SN75125

SN75127 **H.743**SN75129 **H.744**

SN75136

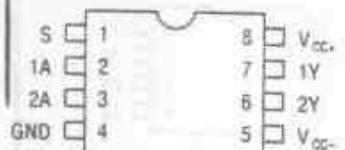
**H.745**

SN75138

**H.746**SN75140  
SN75141

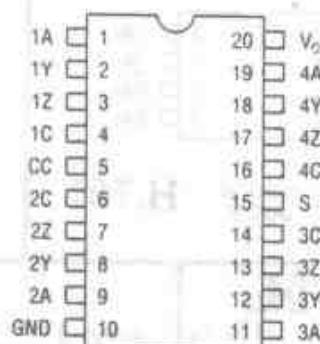
SN75146

**H.748**



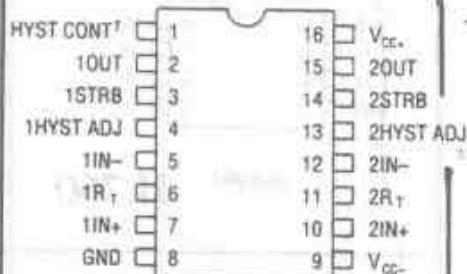
SN75150

H.749



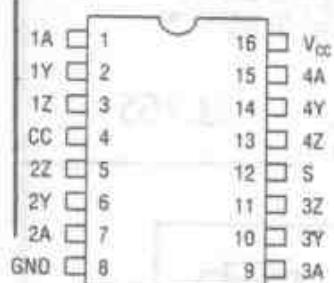
SN75151

H.750



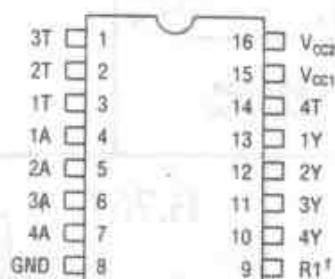
SN75152

H.751



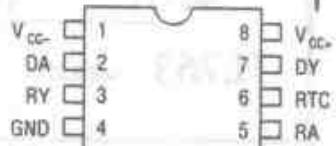
SN75153

H.752



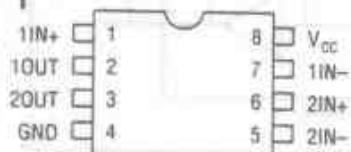
SN75154

H.753

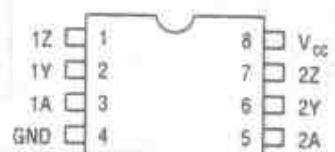


SN75155

H.754

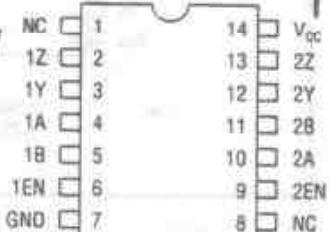


SN75157



SN75158

H.757

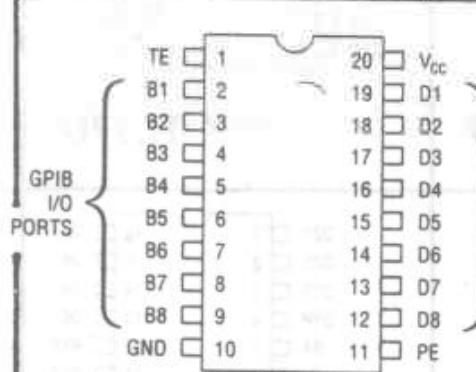


SN75159

NC - No internal connection

H.755

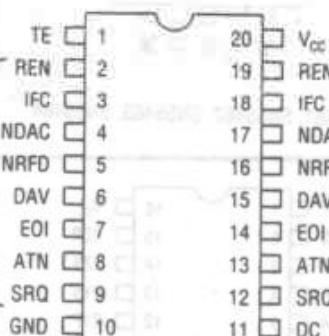
H.756



SN75160B

TERMINAL I/O PORTS

GPIB I/O PORTS

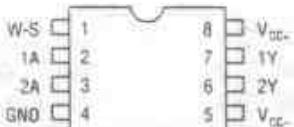


SN75161B

TERMINAL I/O PORTS

H.758

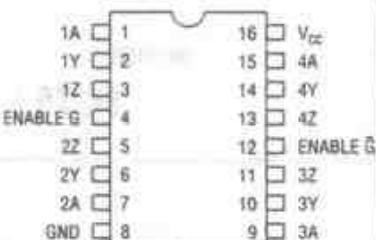
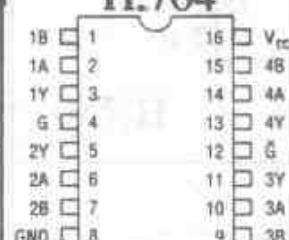
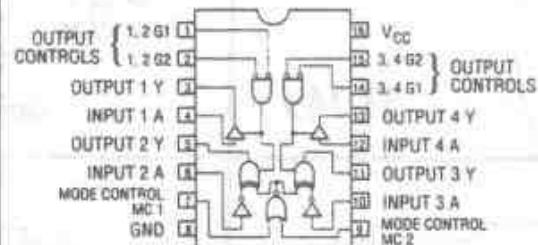
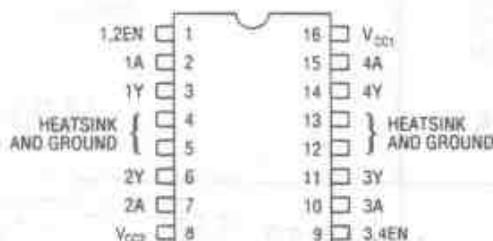
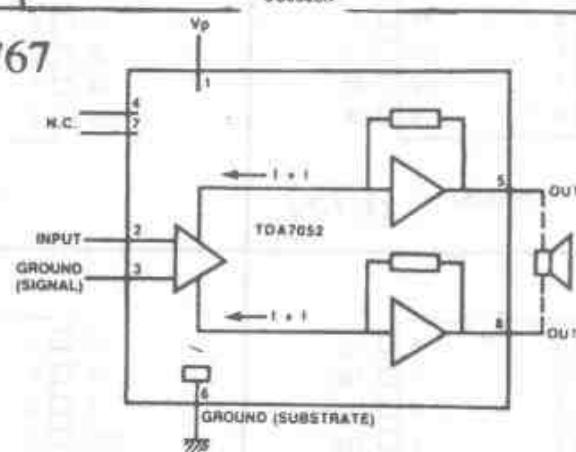
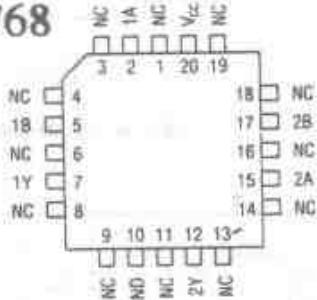
H.759



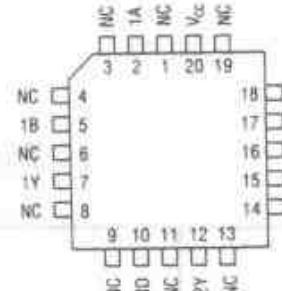
uA9636AC

**H.760**uA9637AC  
uA9639C**H.761**

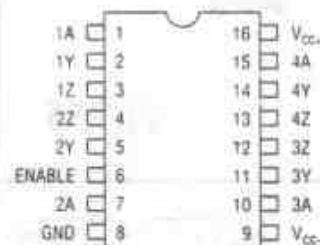
uA9638C

**H.762****H.763** AM26LS31CAM26LS32/A  
AM26LS33/AC**H.765**DS8831N  
DS8832NL293D  
L293**H.766****H.767****H.768**

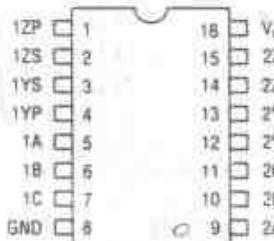
SN55461, SN55462, SN55463, SN55464



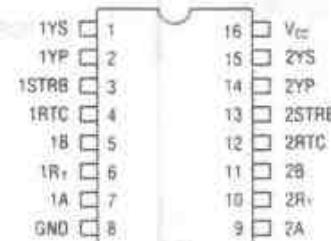
SN5547 - SN55474

**H.769**

MC3453

**H.770**

SN75114

**H.771**

SN75115

**H.772**

SN75116

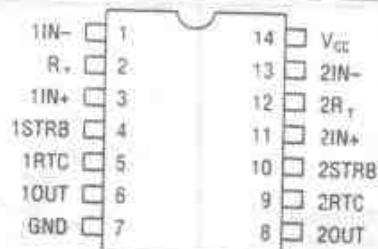
**H.773**

<p><b>H.774</b></p> <p>SN75162B</p>	<p><b>H.775</b></p> <p>SN75163B</p>	
<p><b>H.776</b></p> <p>SN75164B</p>	<p><b>H.777</b></p> <p>SN75ALS165</p>	
<p><b>H.778</b></p> <p>SN75172</p>	<p><b>H.779</b></p> <p>SN75173</p>	<p><b>H.780</b></p> <p>SN75174</p>
<p><b>H.781</b></p> <p>SN75175</p>	<p><b>H.782</b></p> <p># OPTIONAL CAPACITOR CB CONNECTED HERE DECREASES SETTLING TIME.</p>	



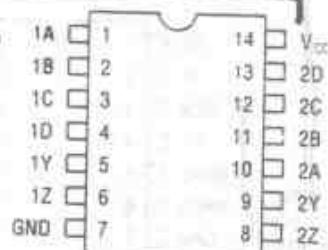
SN751798

H.784

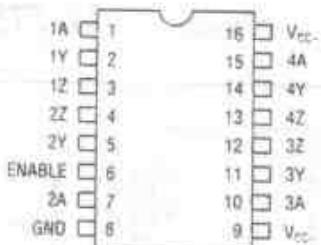


SN75182 H.785

H.786



SN75183



SN75111

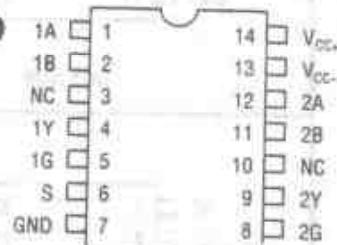
H.787



SN75113

H.788

H.789



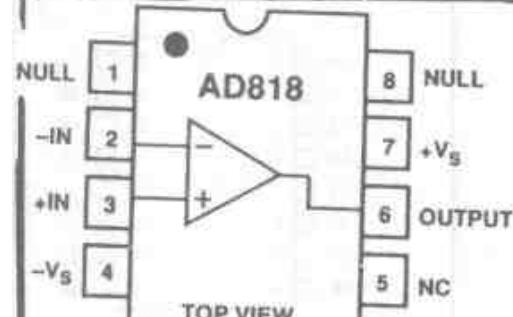
SN75207

NC - No internal connection

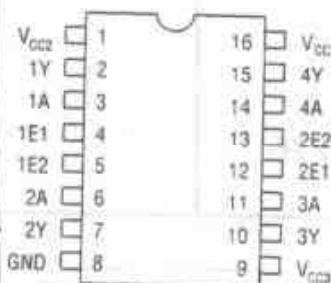


SN75372

H.790



H.793



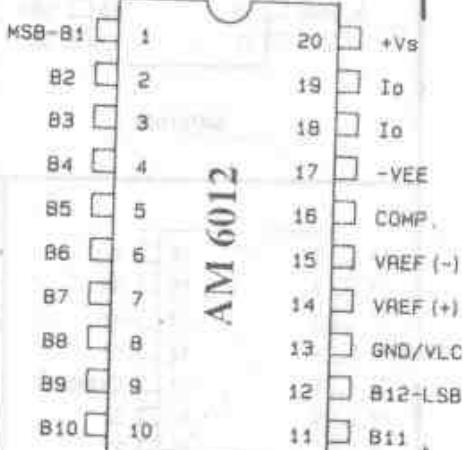
SN75374

H.791

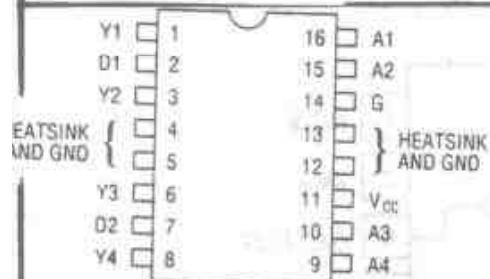
EXO-3C Typen



H.791a



H.792

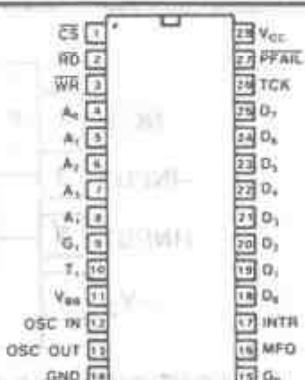


SN75436

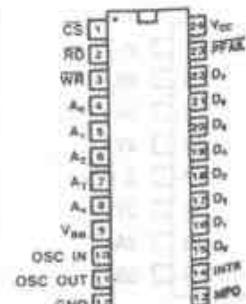
SN75437

SN75438

H.794

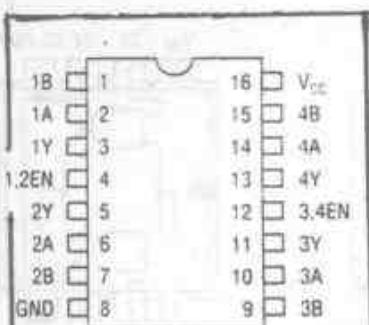


DP8570AN

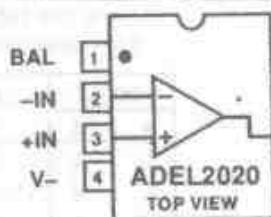


DP8572AN

H.795



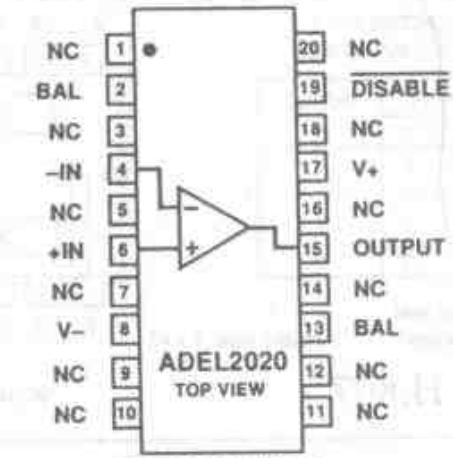
SN75ALS195



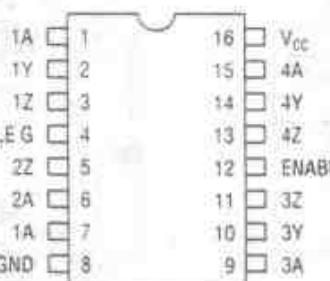
BAL  
-IN  
+IN  
V-

DISABLE  
V+  
OUTPUT  
BAL

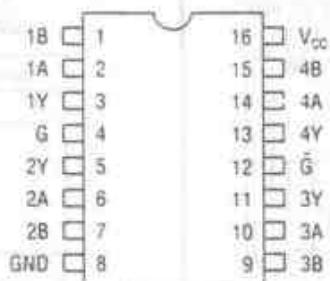
ADEL2020  
TOP VIEW



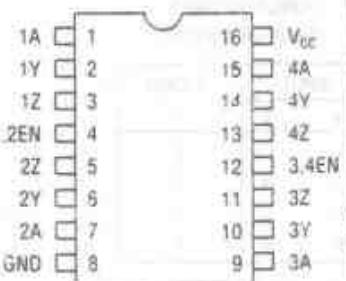
NC = NO CONNECT



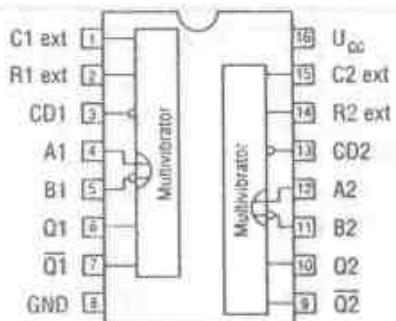
SN75ALS192



SN75ALS193



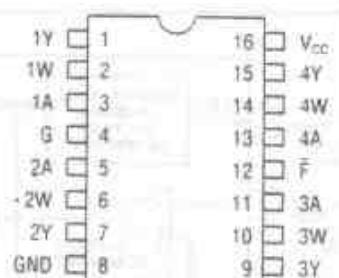
SN75ALS194



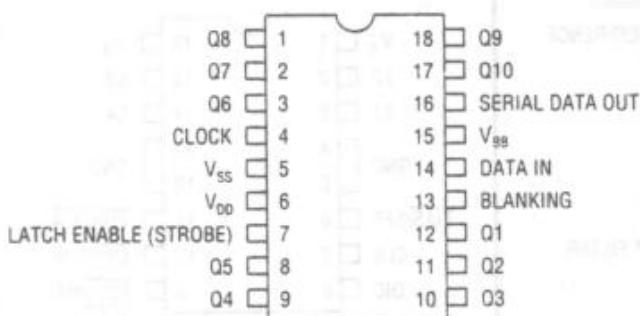
N 9602



SN75ALS126

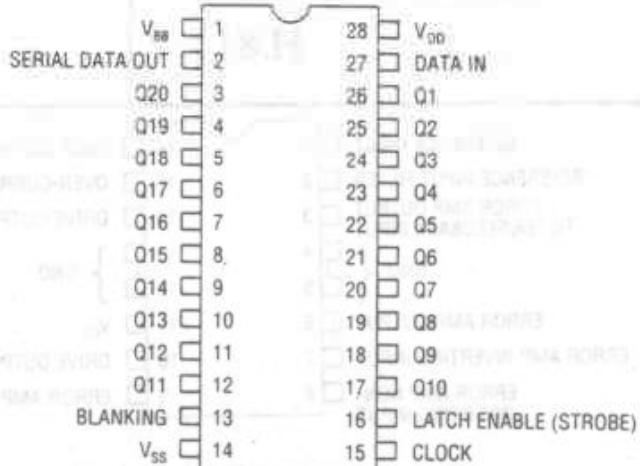


SN75ALS130



TL4810B

H.805



TL5812

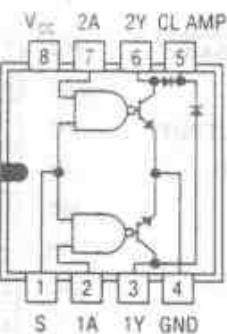
H.806

FUNCTION TABLE  
(EACH AND DRIVER)

INPUTS		
A	S	Y
L	L	L
L	H	L
H	L	L
H	H	H

H = high level  
L = low level

positive logic:  $Y = AS$



H.807

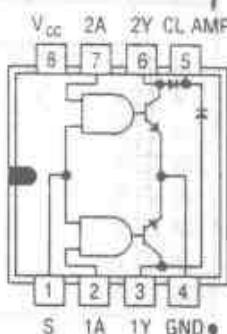
SN75446

FUNCTION TABLE  
(EACH NAND DRIVER)

INPUTS		
A	S	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = high level  
L = low level

positive logic:  $Y = \overline{AS}$



H.808

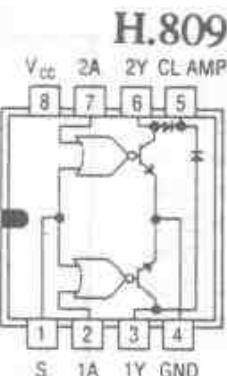
SN75447

FUNCTION TABLE  
(EACH OR DRIVER)

INPUTS		
A	S	Y
L	L	L
L	H	H
H	L	H
H	H	H

H = high level  
L = low level

positive logic:  $Y = A + S$



SN75448

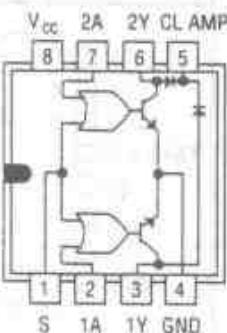
H.809

FUNCTION TABLE  
(EACH NOR DRIVER)

INPUTS		
A	S	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = high level  
L = low level

positive logic:  $Y = \overline{A + S}$



SN75449

H.811

H.812

H.813 NE 587 / 589

REFERENCE INPUT	1	16	OVER-CURRENT DELAY
REFERENCE INPUT FILTER	2	15	OVER-CURRENT REFERENCE
ERROR AMP OUTPUT FILTER/FEDBACK INPUT	3	14	DRIVE OUTPUT A
GND	4	13	{ GND }
ERROR AMP OUTPUT	5	12	
ERROR AMP INVERTING INPUT	6	11	$V_{CC}$
ERROR AMP NON-INVERTING INPUT	7	10	DRIVE OUTPUT B
	8	9	ERROR AMP INPUT FILTER

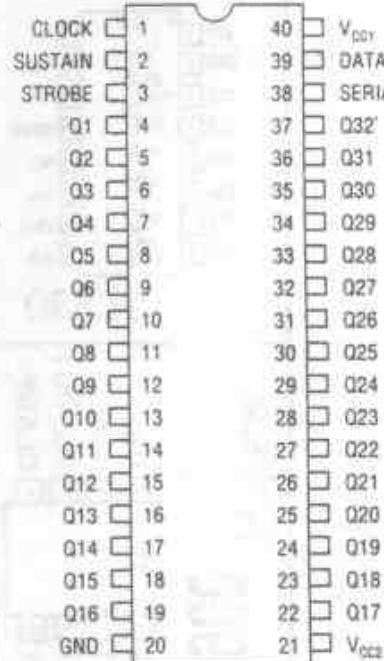
Pins 4, 5, 12 and 13 are electrical ground and heat sink pins for IC

H.814

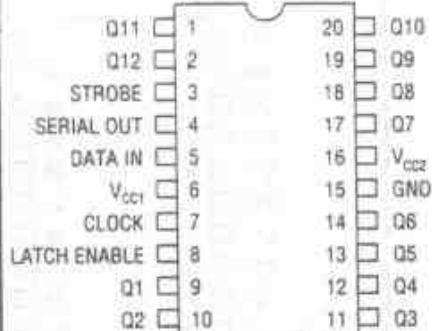
$V_B$	1	16	$V_M$
$L_2$	2	15	$L_3$
$L_1$	3	14	$L_4$
GND	4	13	GND
BIAST/SET	6	12	PHASE A
CLK	7	11	CW/CCW
OIC	8	10	FULL/HALF STEP

MC 3479

H.815

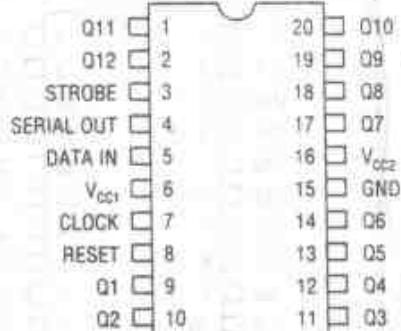


H.817 SN75501E



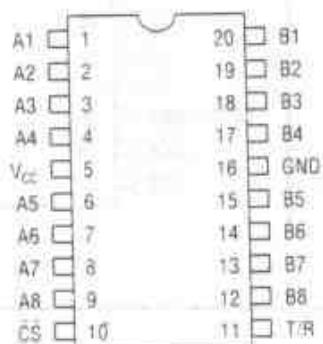
H.818

SN75512B



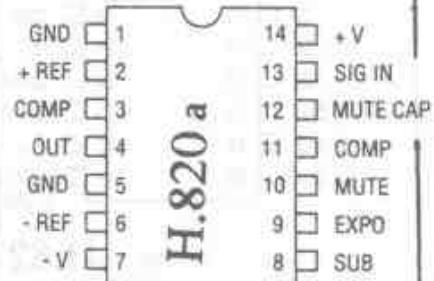
H.819

SN75513B

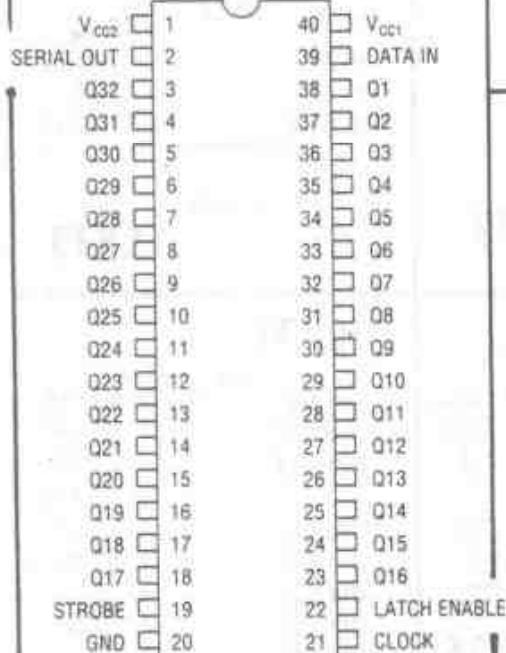


H.820

SN75ALS056

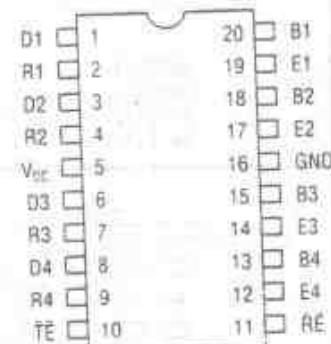


H.820 a

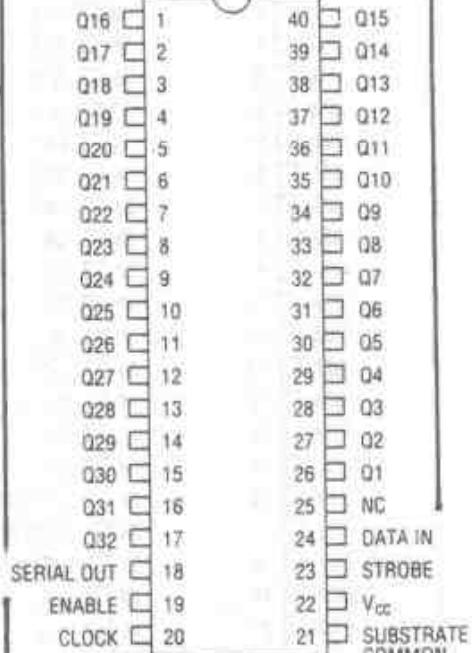


SN75518

H.822

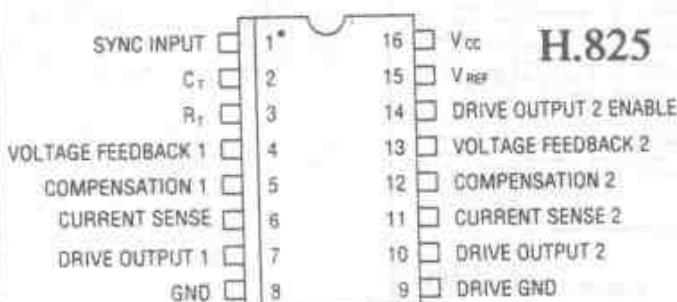


SN75ALS057

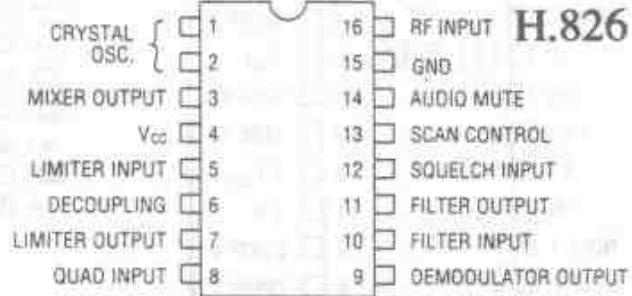


H.824

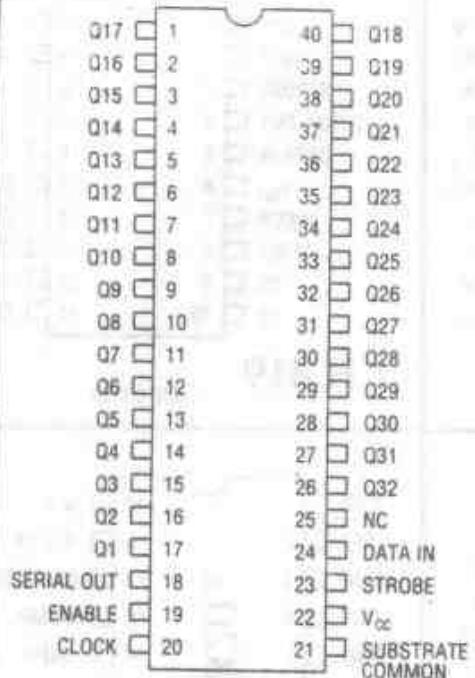
SN75551



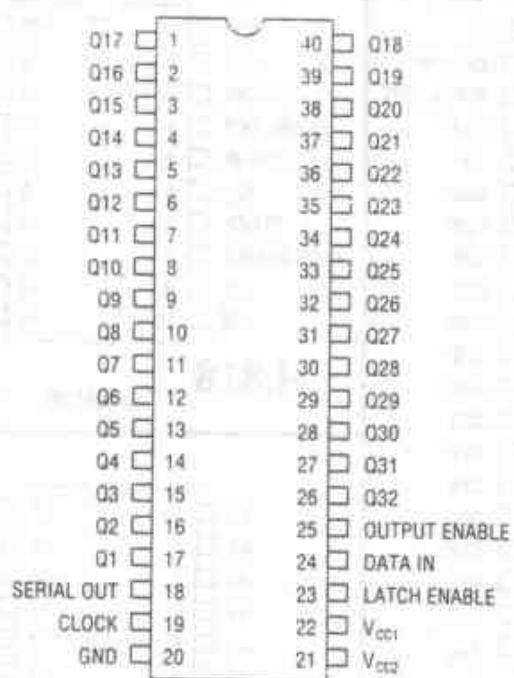
H.825



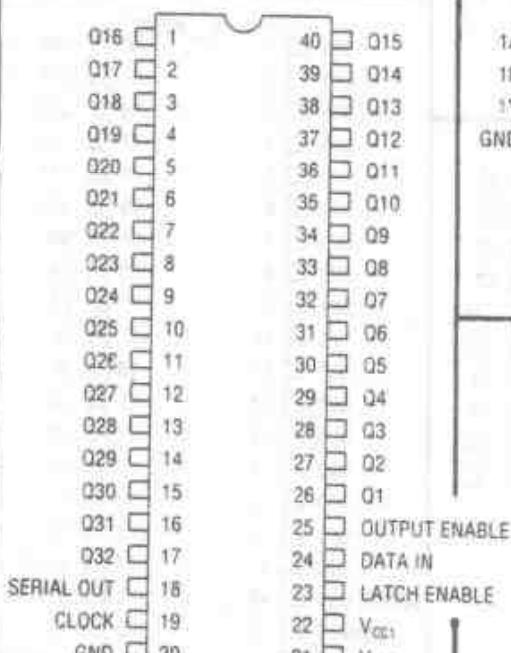
H.826



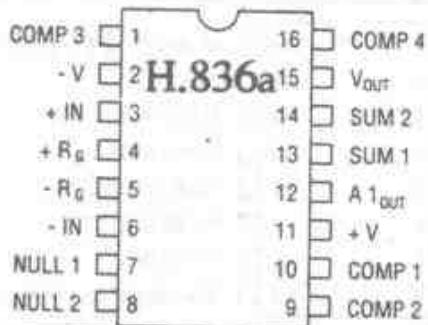
SN75552 H.828



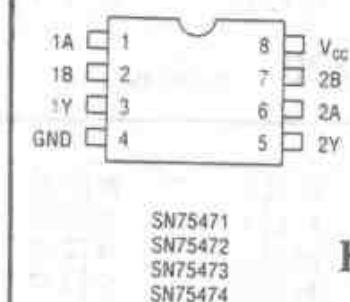
SN75553 H.829



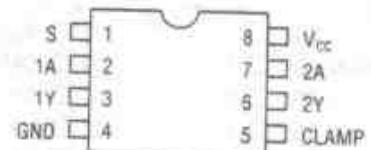
SN75554 H.831



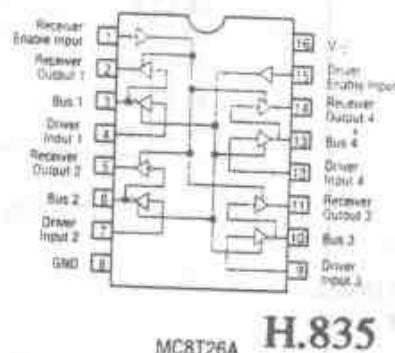
H.836a



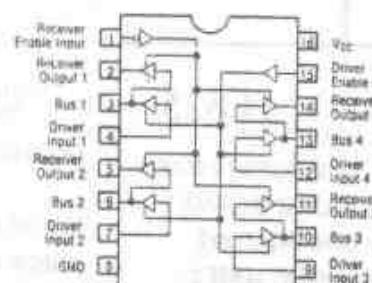
H.832



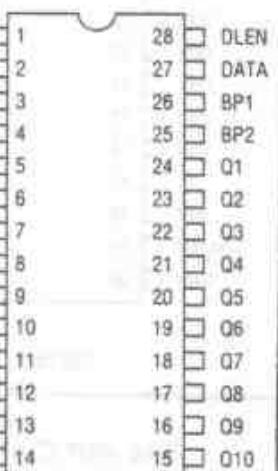
SN75478 H.833

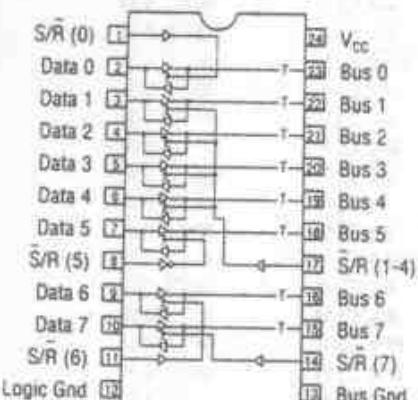


H.835



H.836

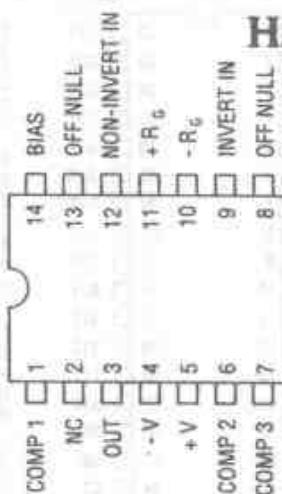




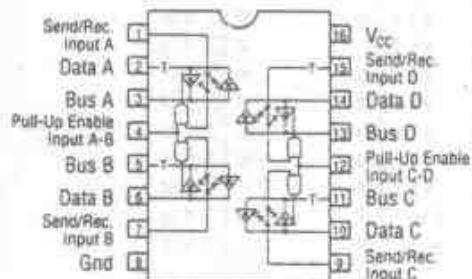
H.838



H.839

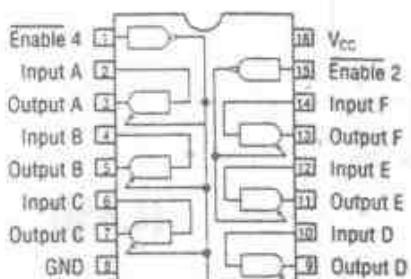


SSM 2015

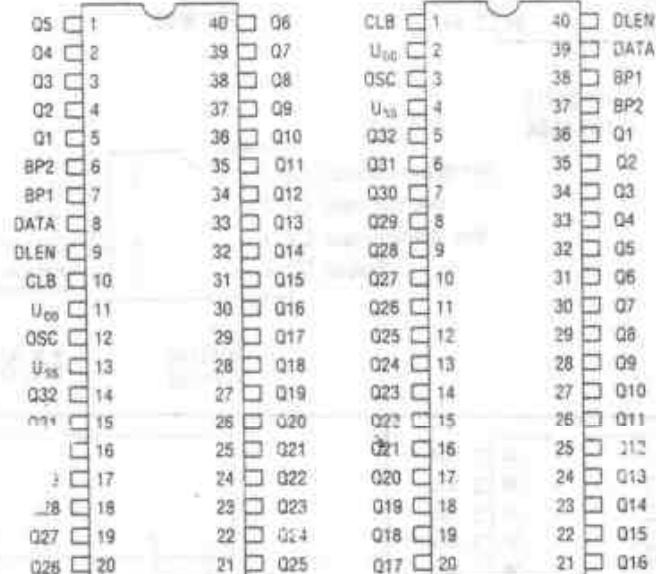


H.841

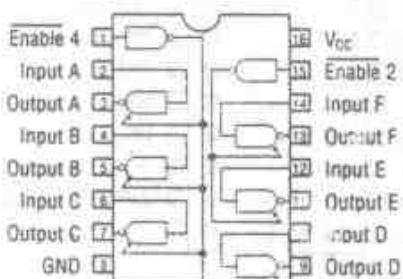
-T-O = Bus Termination



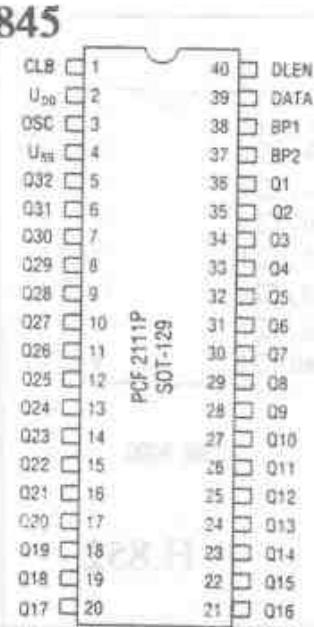
H.842



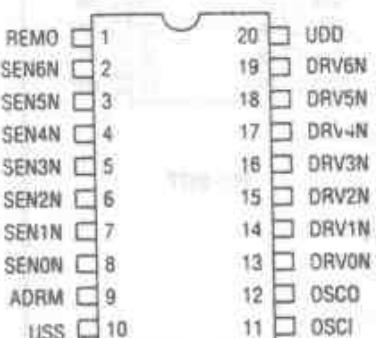
PCF 2110T  
SOT-158A  
H.843



H.844



H.845



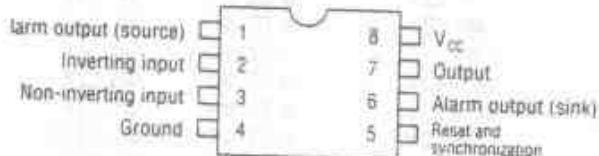
SAA 3007

	PIN NO.	SYMBOL DESCRIPTION
SDA	1	40 SDA $I^2C$ bus data input/output
SCL	2	39 SCL $I^2C$ bus clock input/output
SYNC	3	38 S21 Cascade synchronization input/output
CLK	4	37 S20 External clock input/output
V <sub>DD</sub>	5	36 S19 Positive supply voltage
OSC	6	35 S18 Oscillator input
A0	7	34 S17 A0
A1	8	33 S16 A1 $I^2C$ bus subaddress inputs
A2	9	32 S15 A2
SA0	10	31 S14 SA0, $I^2C$ bus slave address Bit 0 input
V <sub>SS</sub>	11	30 S13 V <sub>SS</sub> Logic ground
V <sub>CC</sub>	12	29 S12 V <sub>CC</sub> LCD supply voltage
BP0	13	28 S11 BP0
BP2	14	27 S10 BP2 LCD backplane outputs
BP1	15	26 S9 BP1
BP3	16	25 S8 BP3
S0	17	24 S7 S0 LCD segment outputs
S1	18	23 S6 S1
S2	19	22 S5 S2
S3	20	21 S4 S3

H.847

SDA	1	56 S 39
SCL	2	55 S 38
SYNC	3	54 S 37
CLK	4	53 S 36
V <sub>DD</sub>	5	52 S 35
OSC	6	51 S 34
A0	7	50 S 33
A1	8	49 S 32
A2	9	48 S 31
SA0	10	47 S 30
U <sub>SS</sub>	11	46 S 29
U <sub>CC</sub>	12	45 S 28
BP0	13	44 S 27
BP2	14	43 S 26
BP1	15	42 S 25
BP3	16	41 S 24
S0	17	40 S 23
S1	18	39 S 22
S2	19	38 S 21
S3	20	37 S 20
S4	21	36 S 19
S5	22	35 S 18
S6	23	34 S 17
S7	24	33 S 16
S8	25	32 S 15
S9	26	31 S 14
S10	27	30 S 13
S11	28	29 S 12

PCF 8566

PCF 2111T  
SOT-158ATDE1798  
TDF1798

H.849

Q32	1	40 SDA
Q31	2	39 SCL
Q30	3	38 USS
Q29	4	37 A0 OSC
Q28	5	36 A1
Q27	6	35 UDD
Q26	7	34 A2 BP2
Q25	8	33 BP1
Q24	9	32 Q1
Q23	10	31 Q2
Q22	11	30 Q3
Q21	12	29 Q4
Q20	13	28 Q5
Q19	14	27 Q6
Q18	15	26 Q7
Q17	16	25 Q8
Q16	17	24 Q9
Q15	18	23 Q10
Q14	19	22 Q11
Q13	20	21 Q12

PCF 8577



NE 5090

H.851

DATA	1	24 V <sub>CC</sub>
CLOCK	2	23 PHASE <sub>IN</sub>
CE	3	22 PHASE <sub>IL</sub>
RESET	4	21 PHASE <sub>IH</sub>
DAC REF <sub>IN</sub>	5	20 PHASE <sub>IL</sub>
OSC OUT	6	19 PHASE <sub>3H</sub>
RT/CT	7	18 PHASE <sub>3L</sub>
LOOP FILTER <sub>2</sub>	8	17 HS <sub>1</sub>
LOOP FILTER <sub>1</sub>	9	16 HS <sub>2</sub>
FEEDBACK	10	15 HS <sub>3</sub>
INV	11	14 CURRENT SENSE
NON-INV	12	13 G <sup>+</sup>

NOTE: 1. Available in SOL.

H.852

ME 5570

H.853

IF AMP DECOUPLING	1	16	IF AMP INPUT
GND	2	15	IF AMP DECOUPLING
MUTE INPUT	3	14	IF AMP OUTPUT
V <sub>cc</sub>	4	13	GND
RSSI OUTPUT	5	12	LIMITER INPUT
AUDIO OUTPUT	6	11	LIMITER DECOUPLING
DATA OUTPUT	7	10	LIMITER DECOUPLING
QUADRATURE INPUT	8	9	LIMITER OUTPUT

NE614

**H.855**

INPUT	1	14	V <sub>os</sub> ADJ
NC	2	13	NC
V <sub>-</sub>	3	12	V <sub>+</sub>
NC	4	11	LOGIC
NC	5	10	LOGIC REF
NC	6	9	NC
OUTPUT	7	8	C <sub>1</sub>

NOTE 1. SO and non-standard pinouts.

NE 5537

**H.856**

+ V <sub>cc</sub>	1	20	RECEIVER IN (CARRIER IN)
HIGH-PASS FILTER	2	19	TRANSMIT IN (DATA IN)
AMP OUT (+)	3	18	GND
DET IN (+)	4	17	TRANS CARRIER (PNP BASE)
DET IN (-)	5	16	LINE-DRIVE AMP FEEDBACK
AMP OUT (-)	6	15	TRANS CARRIER (NPN BASE)
DET OUT (+)	7	14	OSC BIAS (+V <sub>cc</sub> /2)
DET OUT (-)	8	13	OSC I/O / TANK
AM REJ	9	12	OSC FEEDBACK/SWITCH
IMPULSE FILTER	10	11	RECEIVER OUT (DATA OUT)

NOTE 1. SOL - Released in Large SO package only

NE 5050

**H.857**

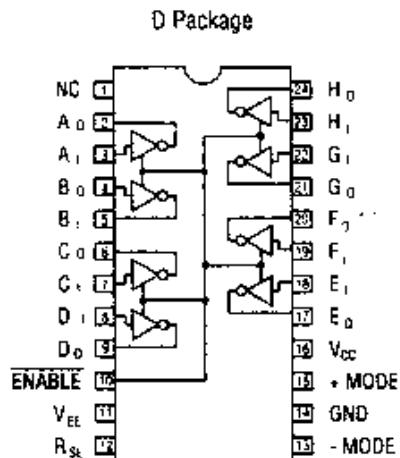
OSC 1	1	16	OSC 2
JABBER FLAG	2	15	REGULATOR BYPASS
JABBER CONTROL	3	14	DATA INPUT
V <sub>cc1</sub>	4	13	GND 1
TRANSMIT GATE	5	12	OSC 3
FSK OUTPUT	6	11	GND 2
CABLE GND	7	10	N.C.
V <sub>cc2</sub>	8	9	N.C.

NE 5080

**H.858**

V <sub>cc1</sub>	1	20	NC
CT	2	19	FSK INPUT
LT	3	18	INPUT BYPASS
MT	4	17	ANALOG GND
F <sub>7</sub>	5	16	INPUT DETECTION TIMING
F <sub>1</sub>	6	15	INPUT DETECTION TIMING
F <sub>1</sub>	7	14	INPUT LEVEL DETECTION
F <sub>4</sub>	8	13	INPUT LEVEL DETECT
V <sub>cc2</sub>	9	12	DIGITAL GND
INPUT LEVEL FLAG	10	11	DATA OUTPUT

NE 5081

**H.859**

NE 5170

**H.860**

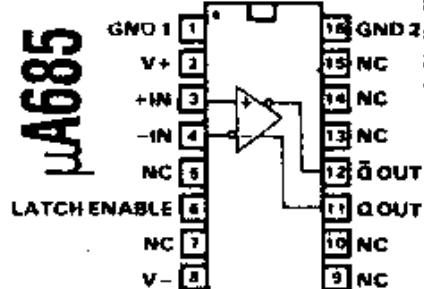
ERRY	1	16	POS/OUT
SG <sub>-</sub>	2	15	POS/IN
SC <sub>-</sub>	3	14	- V <sub>s</sub>
SC <sub>-</sub>	4	13	GND
SC <sub>-</sub>	5	12	DAC/OUT
SC <sub>-</sub>	6	11	N.C.
SIGN	7	10	- V <sub>s</sub>
Strobe	8	9	DAC/IN

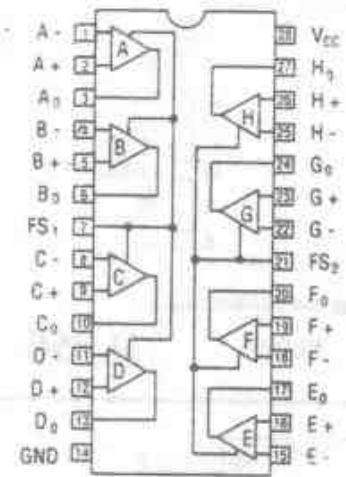
L291

**H.861**

FTB	1	16	FTA
VAB	2	15	VAA
V <sub>sr</sub>	3	14	STA
TACHO	4	13	STB
+ V <sub>s</sub>	5	12	FTF
V <sub>ss</sub>	6	11	GND
VM8	7	10	STF
VMA	8	9	- V <sub>s</sub>

L290

**H.862****H.863**



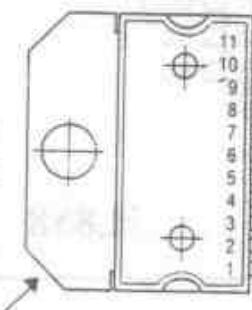
NE 5181 H.864

SENSE	1	20	V <sub>ee</sub>
ENABLE	2	19	BOOT 2
N.C.	3	18	IN 2
GND	4	17	GND
GND	5	16	GND
GND	6	15	GND
GND	7	14	GND
N.C.	8	13	IN 1
OUT 2	9	12	BOOT 1
+ V <sub>g</sub>	10	11	OUT 1

L6201

SENSE	1	18	V <sub>ee</sub>
ENABLE	2	17	BOOT 2
N.C.	3	16	IN 2
GND	4	15	GND
GND	5	14	GND
GND	6	13	GND
N.C.	7	12	IN 1
OUT 2	8	11	BOOT 1
V <sub>g</sub>	9	10	OUT 1

L6202



L6203

ENABLE	K	1	16	K
SENSE	OUT 1	2	15	CUT 4
V <sub>ref</sub>	A	3	14	A
BOOT 2	GND	4	13	GND
IN 2	GND	5	12	GND
GND	A	6	11	A
IN 1	BOOT 1	7	10	OUT 3
BOOT 1	OUT 1	8	9	K
OUT 1	V <sub>g</sub>			
V <sub>g</sub>	OUT 2			

H.867

K	1	16	K
OUT 1	2	15	CUT 4
A	3	14	A
GND	4	13	GND
GND	5	12	GND
A	6	11	A
OUT 2	7	10	OUT 3
K	8	9	K

L6210

H.868

OUT 2	1	20	SENSE
OUT 1	2	19	OUT 3
BSTP	3	18	OUT 4
GND	4	17	GND
GND	5	16	GND
COM	6	15	V <sub>dd</sub>
V <sub>g</sub>	7	14	RC
DA/CLEV	8	13	IN 4
DA/OPLO	9	12	IN 3
IN 1	10	11	IN 2

H.869

L6223

V <sub>ss</sub>	1*	24	V <sub>dd</sub>
V <sub>ref</sub>	2	23	LO1
LI	3	22	LO2
LB	4	21	Rx
VD	5	20	RE2
D11	6	19	RE1
D21	7	18	TDC/RDC
DCLK	8	17	CCI
D10	9	16	MSI
D20	10	15	TE1
SE	11	14	TE2
PD	12	13	Tx

V <sub>ss</sub>	1*	24	V <sub>dd</sub>
V <sub>ref</sub>	2	23	LO1
LI	3	22	LO2
LB	4	21	Rx
VD	5	20	BCLK
D11	6	19	CLKOUT
D21	7	18	XTL
DCLK	8	17	CCI
D10	9	16	TONE
D20	10	15	EN1
MU/A	11	14	EN2
PD	12	13	Tx

H.872

VAG	1	16	VDD
AO	2	15	RDD
AI	3	14	RCE
POI	4	13	RDC
CCI	5	12	TDC
MSI	6	11	TDD
TDF	7	10	TDE
VSS	8	9	VDG

MC 145502

MC 145421 H.870

MC 145425 H.871

+ SIGNAL INPUT	1	14	V <sub>ee</sub>
GAIN ADJUST	2	13	NC
GAIN ADJUST	3	12	- OUTPUT
- SIGNAL INPUT	4	11	NC
BIAS	5	10	- CARRIER INPUT
+ OUTPUT	6	9	NC
NC	7	8	+ CARRIER INPUT

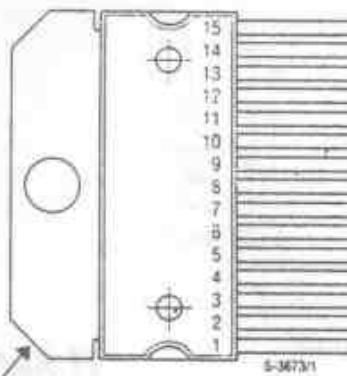
MC1496

H.874

V <sub>ss</sub>	1*	16	VF <sub>x</sub> +
GND <sub>A</sub>	2	15	VF <sub>x</sub> -
VF <sub>x0</sub>	3	14	GS <sub>x</sub>
V <sub>cc</sub>	4	13	TS <sub>x</sub>
FS <sub>x</sub>	5	12	FS <sub>x</sub>
D <sub>x</sub>	6	11	D <sub>x</sub>
BCLK <sub>x</sub> /CLKSEL	7	10	BCLK <sub>x</sub>
MCLK <sub>x</sub> /PON	8	9	MCLK <sub>x</sub>

H.873

MC 145557



MOTOR  
R<sub>2</sub>  
INHIBIT (CE 1)  
INHIBIT (CE 2)  
OSCILL. (R)  
OSCILL. (C)  
OUTPUT (ERR. AMPL.)  
GND  
INPUT (ERR. AMPL.)  
INPUT  
OUTPUT C.S.A.  
COMP. INPUT  
+V<sub>C</sub>  
R<sub>S1</sub>  
MOTOR

L292

H.876

R/C	1	18	V <sub>CC</sub>
OSC	2	17	REF 2
SYNC	3	16	REF 1
POWER ENABLE	4	15	V <sub>SENSE 3</sub>
IN 1	5	14	OUT 1
IN 2	6	13	OUT 2
IN 3	7	12	OUT 3
IN 4	8	11	OUT 4
GND	9	10	V <sub>SENSE 1</sub>

L6506

H.877

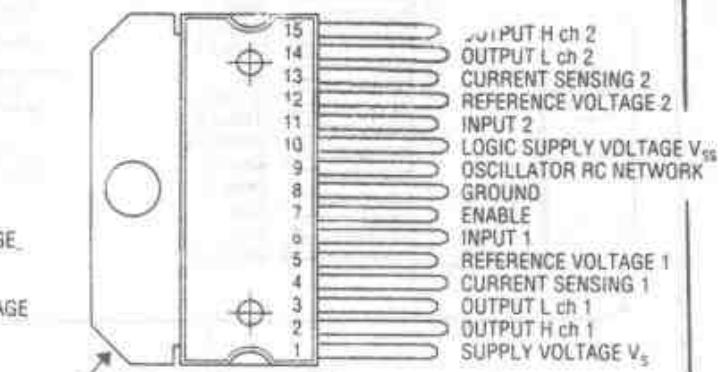
H.878



SINK OUTPUT  
CURRENT SENSING  
ENABLE  
TIMING  
INPUT VOLTAGE  
GND  
DIAGNOSTIC OUTPUT  
LOGIC SUPPLY VOLTAGE  
ON TIME LIMITER  
SOURCE OUTPUT  
POWER SUPPLY VOLTAGE

L294

Tab connected to pin 6



INPUT H ch 2  
OUTPUT L ch 2  
CURRENT SENSING 2  
REFERENCE VOLTAGE 2  
INPUT 2  
LOGIC SUPPLY VOLTAGE V<sub>SS</sub>  
OSCILLATOR RC NETWORK  
GROUND  
ENABLE  
INPUT 1  
REFERENCE VOLTAGE 1  
CURRENT SENSING 1  
OUTPUT L ch 1  
OUTPUT H ch 1  
SUPPLY VOLTAGE V<sub>S</sub>

L295

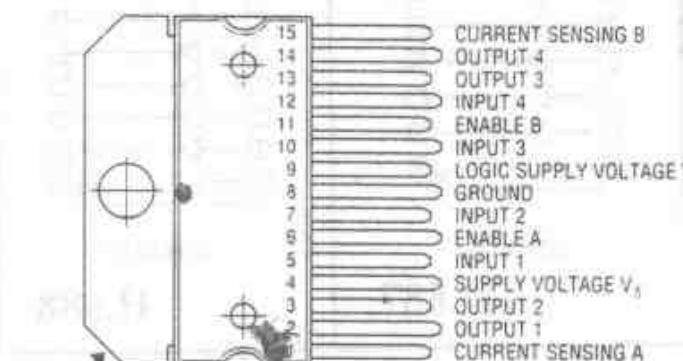
H.879

Darlington Arrays

SYNC	1	20	RESET
GND	2	19	HALF/FULL
HOME	3	18	CLOCK
A	4	17	CW/CCW
INH 1	5	16	OSC
B	6	15	V <sub>CC</sub>
C	7	14	SENS 1
INH 2	8	13	SENS 2
D	9	12	V <sub>S</sub>
TABLE	10	11	CONTROL

L297

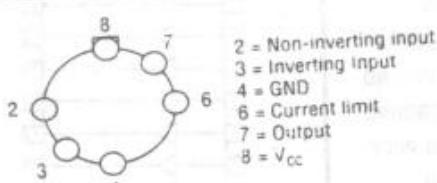
H.880



CURRENT SENSING B  
OUTPUT 4  
OUTPUT 3  
INPUT 4  
ENABLE B  
INPUT 3  
LOGIC SUPPLY VOLTAGE V<sub>SS</sub>  
GROUND  
INPUT 2  
ENABLE A  
INPUT 1  
SUPPLY VOLTAGE V<sub>S</sub>  
OUTPUT 2  
OUTPUT 1  
CURRENT SENSING A

L298N

H.881



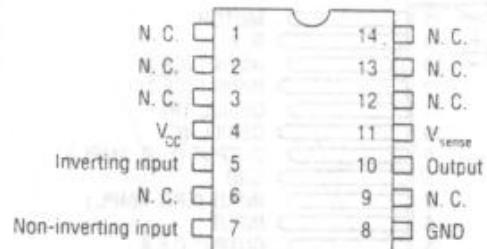
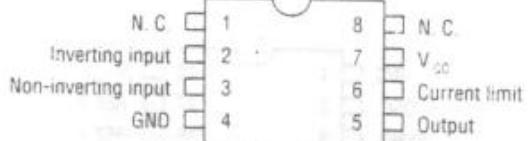
TDE1737

H.882

TDE1647

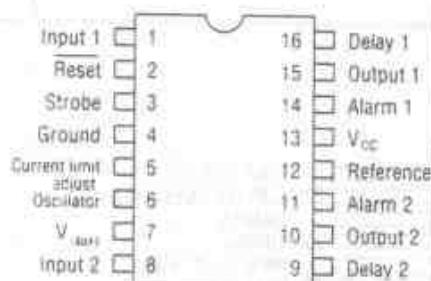
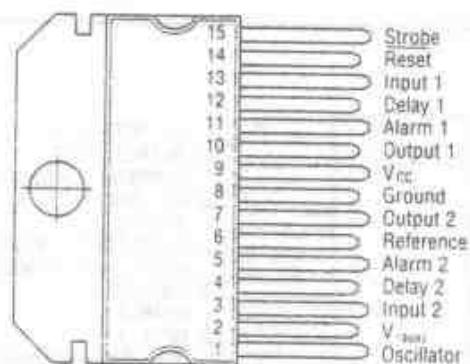
2 = Inverting input  
3 = Non-inverting Input  
4 = GND  
6 = Output  
7 = V<sub>sense</sub>  
8 = V<sub>CC</sub>

H.883

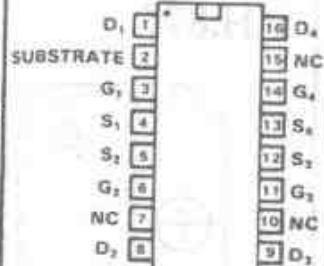


TDE3247

**H.885**



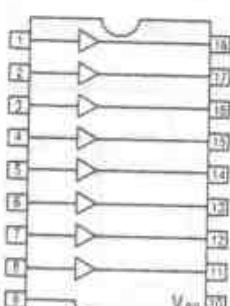
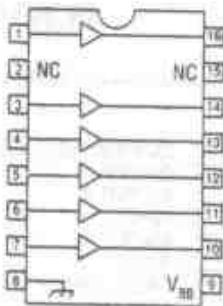
**SD5000N**



**H.884**

UAF1780 + UAF1781 + UAF1782

**H.886**

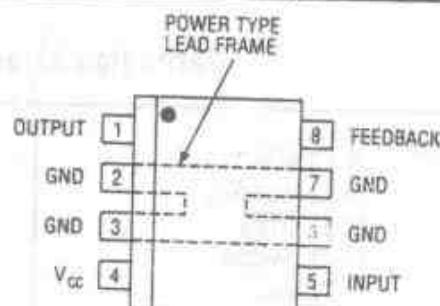


UDN 6116

**H.887**

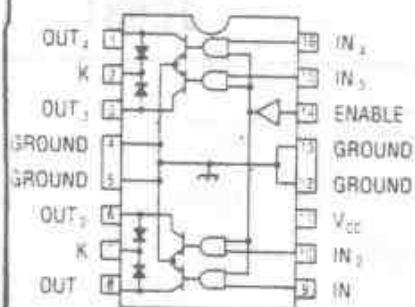
UDN 6118

**H.888**



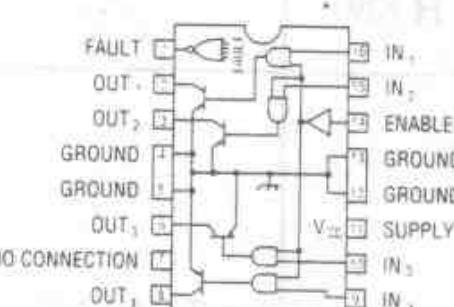
MC 13060

**H.889**



UDN 2543 B

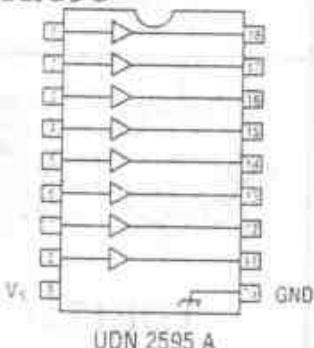
**H.891**



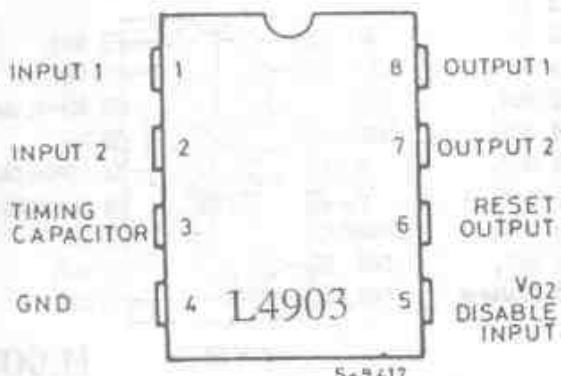
UDN 2547

**H.892**

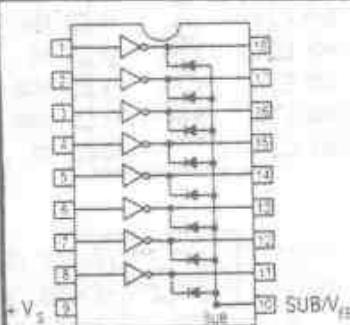
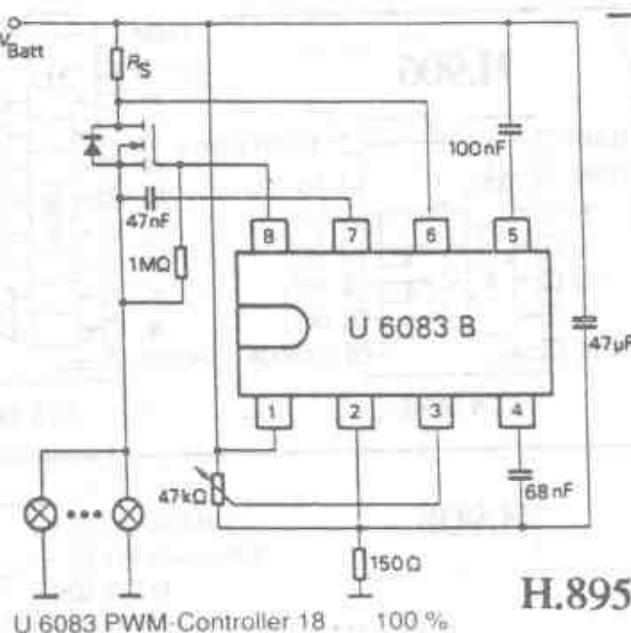
**H.893**



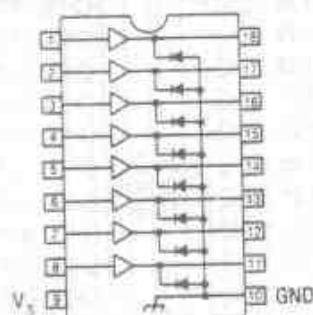
UDN 2595 A



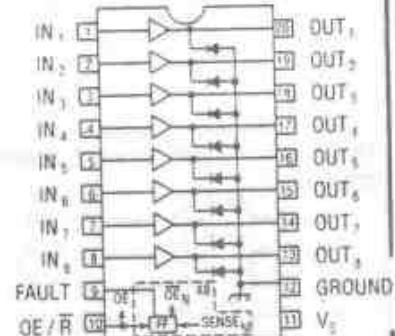
H.894



H.896



H.897

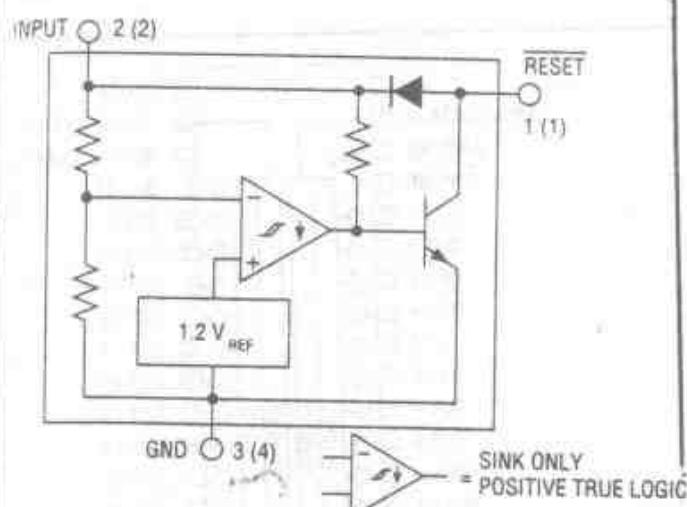


H.898

LOCAL/REM.	1 (1)	(44) 40	H. SYNC IN
H. PLL FILTER	2 (2)	(43) 39	COMP. SYNC. OUT
H. VCO {	3 (3)	(42) 38	V. OUT/SYNC IN
	4 (4)	(41) 37	CLOCK PLL FILTER
BURST GATE OUT	5 (5)	(40) 36	CLOCK $V_{cc}$
PAL/NTSC MODE	6 (7)	(38) 35	CLOCK OUTPUT
GROUND	7 (8)	(37) 34	CLOCK GROUND
3.58/4.43 IN	8 (9)	(36) 33	{ CLOCK
CHROMA PLL FILTER	9 (10)	(35) 32	} VCO
CHROMA {	10 (11)	(34) 31	KILLER FILTER
VCO	11 (12)	(33) 30	QUAD. LOOP FILTER
R-Y CLAMP	12 (13)	(32) 29	PAL IDENT. CAP
B-Y CLAMP	13 (14)	(31) 28	$V_{cc}$
R INPUT	14 (15)	(30) 27	COMP. VID. OUT
G INPUT	15 (16)	(29) 26	GROUND
B INPUT	16 (18)	(27) 25	OVERLAY ENABLE
-Y OUTPUT	17 (19)	(26) 24	REM.VID. IN
CHROMA OUT	18 (20)	(25) 23	ACC FILTER
LOC. VID. CLAMP	19 (21)	(24) 22	-Y INPUT
CHROMA IN	20 (22)	(23) 21	REM. VID. CLAMP

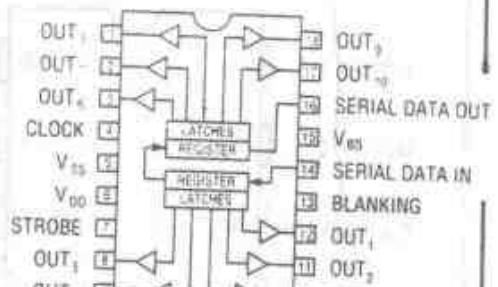
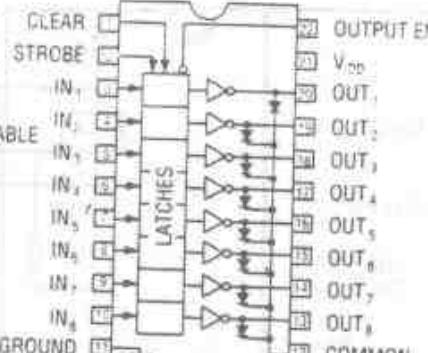
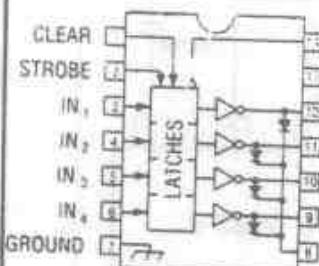
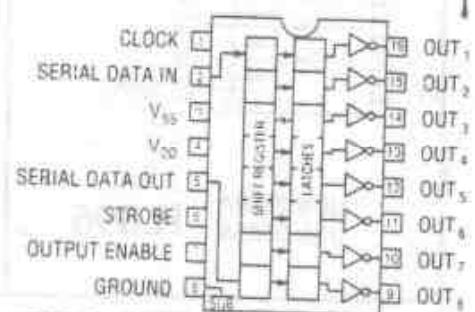
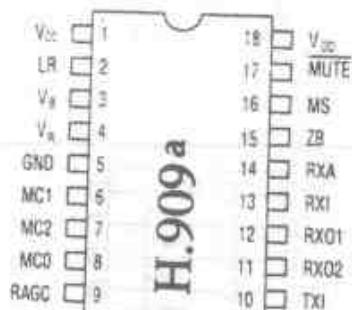
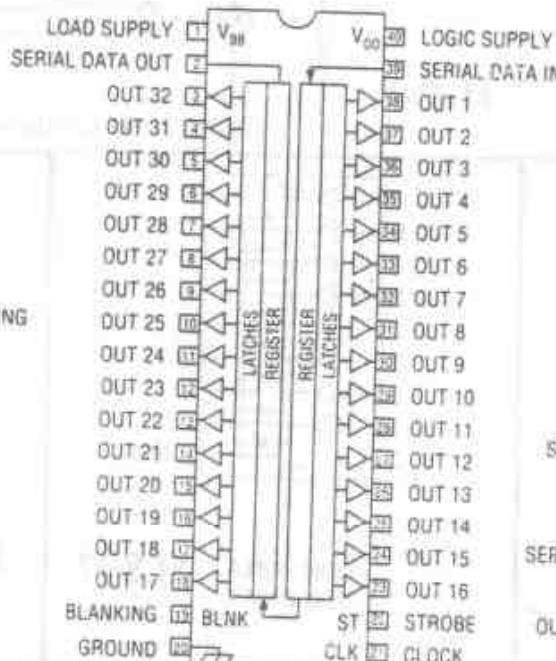
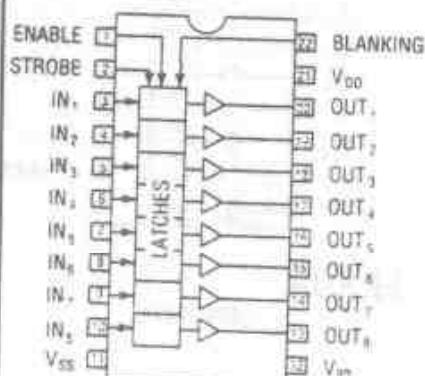
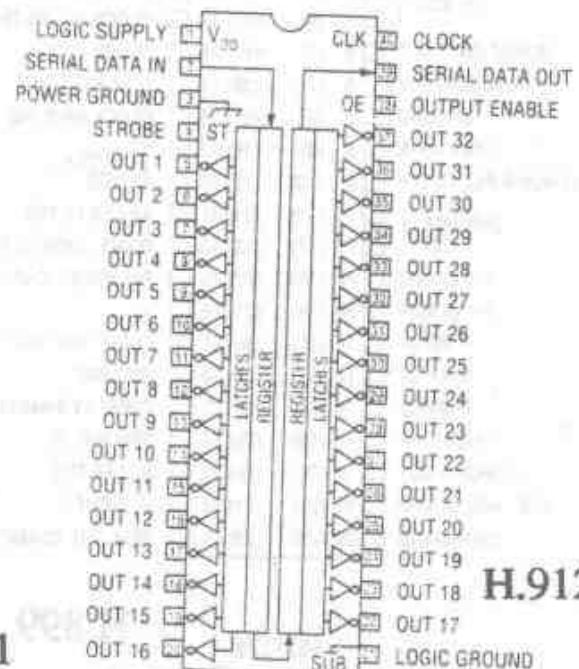
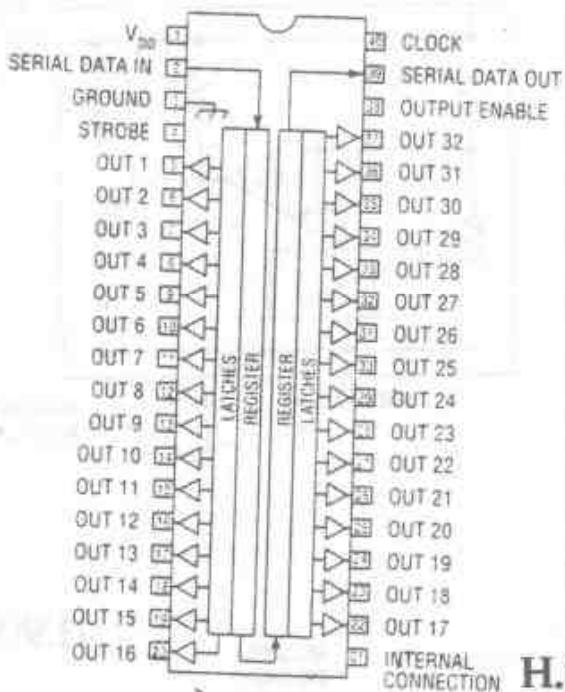
H.899

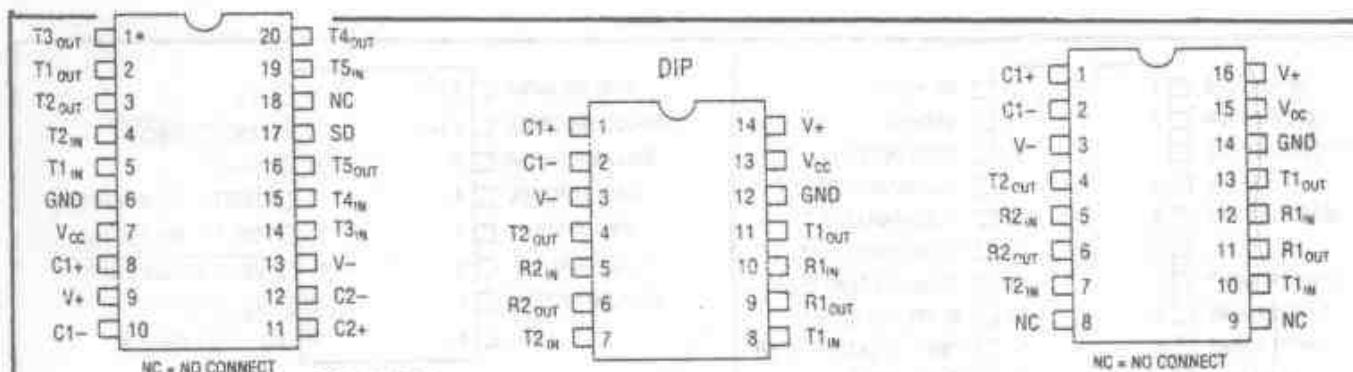
MC 1378



H.900

MC 33064  
MC 34064

**H.906****H.907****H.908****H.910****H.912**



AD 230

**H.913**

AD 231

AD 231

C1+	1	16	V <sub>cc</sub>
V+	2	15	GND
C1-	3	14	T1 <sub>out</sub>
C2+	4	13	R1 <sub>in</sub>
C2-	5	12	R1 <sub>out</sub>
V-	6	11	T1 <sub>in</sub>
T2 <sub>out</sub>	7	10	T2 <sub>in</sub>
R2 <sub>in</sub>	8	9	R2 <sub>out</sub>

T2 <sub>in</sub>	1*	20	R2 <sub>out</sub>
T1 <sub>in</sub>	2	19	R2 <sub>in</sub>
R1 <sub>out</sub>	3	18	T2 <sub>out</sub>
R1 <sub>in</sub>	4	17	V-
T1 <sub>out</sub>	5	16	C2-
GND	6	15	C2+
V <sub>cc</sub>	7	14	V+
C1+	8	13	C1-
GND	9	12	V-
C2-	10	11	C2+

T1 <sub>out</sub>	1	16	T3 <sub>out</sub>
T2 <sub>out</sub>	2	15	T4 <sub>out</sub>
T2 <sub>in</sub>	3	14	T4 <sub>in</sub>
T1 <sub>in</sub>	4	13	T3 <sub>in</sub>
GND	5	12	V-
V <sub>cc</sub>	6	11	C2-
C1+	7	10	C2+
V+	8	9	C1-

AD 232

AD 233

AD 234

T4 <sub>out</sub>	1	24	R3 <sub>in</sub>
T3 <sub>out</sub>	2	23	R3 <sub>out</sub>
T1 <sub>out</sub>	3	22	T5 <sub>in</sub>
T2 <sub>out</sub>	4	21	SD
R2 <sub>in</sub>	5	20	EN
R2 <sub>out</sub>	6	19	T5 <sub>out</sub>
T2 <sub>in</sub>	7	18	R4 <sub>in</sub>
T1 <sub>in</sub>	8	17	R4 <sub>out</sub>
R1 <sub>out</sub>	9	16	T4 <sub>in</sub>
R1 <sub>in</sub>	10	15	T3 <sub>in</sub>
GND	11	14	R5 <sub>out</sub>
V <sub>cc</sub>	12	13	R5 <sub>in</sub>

T3 <sub>out</sub>	1*	24	T4 <sub>out</sub>
T1 <sub>out</sub>	2	23	R2 <sub>in</sub>
T2 <sub>out</sub>	3	22	R2 <sub>out</sub>
R1 <sub>in</sub>	4	21	SD
R1 <sub>out</sub>	5	20	EN
T2 <sub>in</sub>	6	19	T4 <sub>in</sub>
T1 <sub>in</sub>	7	18	T3 <sub>in</sub>
GND	8	17	R3 <sub>out</sub>
V <sub>cc</sub>	9	16	R3 <sub>in</sub>
C1+	10	15	V-
V+	11	14	C2-
C1-	12	13	C2+

T3 <sub>out</sub>	1	24	T4 <sub>out</sub>
T1 <sub>out</sub>	2	23	R2 <sub>in</sub>
T2 <sub>out</sub>	3	22	R2 <sub>out</sub>
R1 <sub>in</sub>	4	21	T5 <sub>in</sub>
R1 <sub>out</sub>	5	20	T5 <sub>out</sub>
T2 <sub>in</sub>	6	19	T4 <sub>in</sub>
T1 <sub>in</sub>	7	18	T3 <sub>in</sub>
GND	8	17	R3 <sub>out</sub>
V <sub>cc</sub>	9	16	R3 <sub>in</sub>
C1+	10	15	V-
V+	11	14	C2-
C1-	12	13	C2+

AD 235

AD 236

AD 237

**H.924**

T2 <sub>out</sub>	1*	24	T3 <sub>out</sub>
T1 <sub>out</sub>	2	23	R3 <sub>in</sub>
R2 <sub>in</sub>	3	22	R3 <sub>out</sub>
R2 <sub>out</sub>	4	21	T4 <sub>in</sub>
T1 <sub>in</sub>	5	20	T4 <sub>out</sub>
R1 <sub>out</sub>	6	19	T3 <sub>in</sub>
R1 <sub>in</sub>	7	18	T2 <sub>in</sub>
GND	8	17	R4 <sub>out</sub>
V <sub>cc</sub>	9	16	R4 <sub>in</sub>
C1+	10	15	V-
V+	11	14	C2-
C1-	12	13	C2+

R1 <sub>out</sub>	1*	24	T1 <sub>in</sub>
R1 <sub>in</sub>	2	23	T2 <sub>in</sub>
GND	3	22	R2 <sub>out</sub>
V <sub>cc</sub>	4	21	R2 <sub>in</sub>
V+	5	20	T2 <sub>out</sub>
C+	6	19	T1 <sub>out</sub>
C-	7	18	R3 <sub>in</sub>
V-	8	17	R3 <sub>out</sub>
R5 <sub>in</sub>	9	16	T3 <sub>in</sub>
R5 <sub>out</sub>	10	15	NC
R4 <sub>out</sub>	11	14	EN
R4 <sub>in</sub>	12	13	T3 <sub>out</sub>

NC = NO CONNECT

AD 238

AD 239

AD 241

T3 <sub>out</sub>	1*	28	T4 <sub>out</sub>
T1 <sub>out</sub>	2	27	R3 <sub>in</sub>
T2 <sub>out</sub>	3	26	R3 <sub>out</sub>
R2 <sub>in</sub>	4	25	SD
R2 <sub>out</sub>	5	24	EN
T2 <sub>in</sub>	6	23	R4 <sub>in</sub>
T1 <sub>in</sub>	7	22	R4 <sub>out</sub>
R1 <sub>out</sub>	8	21	T4 <sub>in</sub>
R1 <sub>in</sub>	9	20	T3 <sub>in</sub>
GND	10	19	R5 <sub>out</sub>
V <sub>cc</sub>	11	18	R5 <sub>in</sub>
C1+	12	17	V-
V+	13	16	C2-
C1-	14	15	C2+

RF GROUND	1	20	RF INPUT
OSC Emitter	2	19	GROUND
OSC Collector	3	18	DATA OUTPUT
RF V <sub>cc</sub>	4	17	+ COMPARATOR
Mixer Output	5	16	- COMPARATOR
IF V <sub>cc</sub>	6	15	SQUELCH STATUS
Limiter Input	7	14	SQUELCH CONTROL
Limiter Bias	8	13	BUFFERED OUTPUT
Limiter Bias	9	12	DEMODULATOR FILTER
Quad Bias	10	11	QUAD INPUT

MC 3356

**H.925**

ANALOG INPUT	1 (-)	16	V <sub>cc</sub>
ANALOG FEEDBACK	2 (+)	15	ENCODE/DECODE
SYLLABIC FILTER	3	14	CLOCK
GAIN CONTROL	4	13	DIGITAL DATA INPUT (-)
REF INPUT (+)	5	12	DIGITAL THRESHOLD
FILTER INPUT (-)	6	11	COINCIDENCE OUTPUT
ANALOG OUTPUT	7	10	V <sub>cc</sub> /2 OUTPUT
V <sub>EE</sub>	8	9	DIGITAL OUTPUT

MC 3417

**H.926**

ABS VAL	1	18	PRE BIAS
LOG (ABS VAL)	2	17	INPUT
V <sub>REF</sub>	3	16	+V <sub>cc</sub>
GND	4	15	NC
R.M.S.	5	14	-V <sub>EE</sub>
LOG (R.M.S.)	6	13	C <sub>AV</sub>
BASE	7	12	LOG SCALE
EMIT	8	11	-LOG IN
LOG OUT	9	10	+ LOG IN

2110

**H.927**

NC	1	16	+V
1 IN	2	15	4 IN
1 CONTROL	3	14	4 CONTROL
1 OUT	4	13	4 OUT
2 OUT	5	12	3 OUT
2 CONTROL	6	11	3 CONTROL
2 IN	7	10	3 IN
GND	8	9	-V

2024

**H.928**

SIG IN +	1	16	+V
Q CONTROL	2	15	SIG IN -
OUT	3	14	C <sub>1A</sub>
C <sub>4A</sub>	4	13	FREQ. CONTROL
C <sub>4B</sub>	5	12	C <sub>1B</sub>
C <sub>3A</sub>	6	11	C <sub>2A</sub>
C <sub>3B</sub>	7	10	C <sub>2B</sub>
GND	8	9	-V

2044

**H.929**

2 POLE OUT	1	16	+V <sub>cc</sub>
SIG IN	2	17	0
C <sub>1</sub>	3	16	LIN MIX 1
C <sub>2</sub>	4	15	LIN MIX 2
F <sub>c</sub>	5	14	EXPO MIX
C <sub>3</sub>	6	13	MIX CUT
C <sub>4</sub>	7	12	MIX 2+IN
4 POLE OUT	8	11	MIX 1-IN
GND	9	10	-V <sub>EE</sub>

2045

**H.930**

PAN	1	18	+V <sub>cc</sub>
Q	2	17	G <sub>REF</sub>
C <sub>4</sub>	3	16	R OUT
C <sub>3</sub>	4	15	C <sub>BP</sub>
GND	5	14	L OUT
C <sub>2</sub>	6	13	CHAN OUT
C <sub>1</sub>	7	12	MASTER GAIN
SIG IN	8	11	F <sub>REF</sub>
F <sub>c</sub>	9	10	-V <sub>EE</sub>

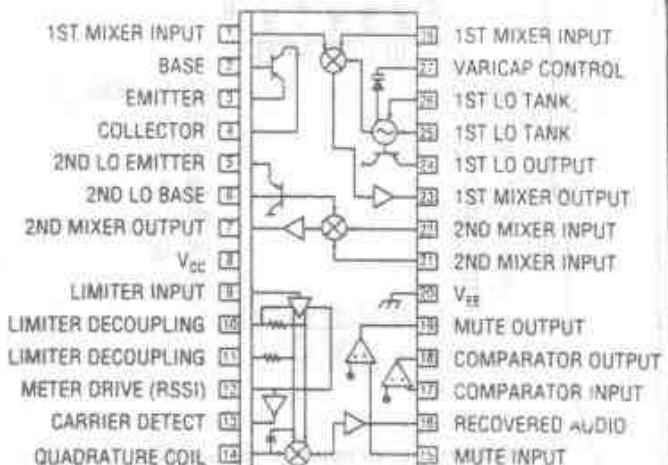
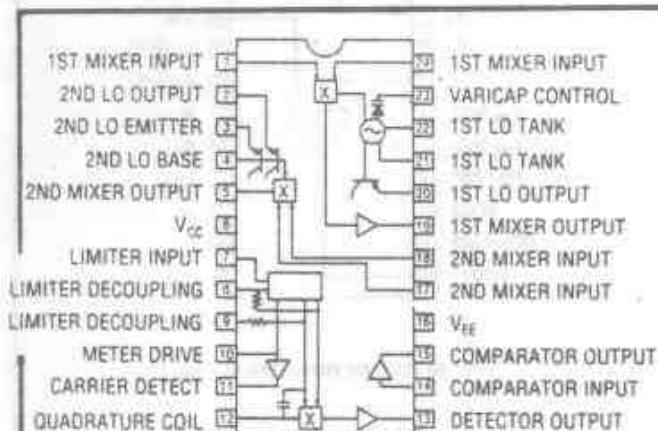
2047

**H.931**

GND 1	1	16	FEEDBACK
TEMP ADJ	2	15	COMP 2
COMP 1	3	14	OUT
V +	4	13	COMP 3
GND 2	5	12	SIG IN
REF IN	6	11	GND 3
V -	7	10	REF OUT
NC	8	9	REF COMP

2100

**H.932**



H.940

H.941

MIXER DPL	1	28	2ND IF AMP IN
MIXER OUT	2	27	DATA BUFFER OUT
MIXER IN	3	26	DATA BUFFER IN
OSC. DCPL.	4	25	1ST IF AMP OUT
OSC. BASE	5	24	V <sub>cc</sub>
OSC. EMIT.	6	23	1ST IF AMP IN
ISRC DCPL	7	22	AUDIO BUFFER OUT
IF GND	8	21	AUDIO BUFFER IN
V <sub>cc</sub>	9	20	LOW BATTERY DET
REC AUDIO	10	19	1.2 V SELECT
QUAD TANK	11	18	V <sub>cc</sub>
QUAD TANK	12	17	V <sub>ee</sub>
DEMOD. GND	13	16	RECEIVER ENABLE
COMPARATOR I/P	14	15	COMPARATOR O/P

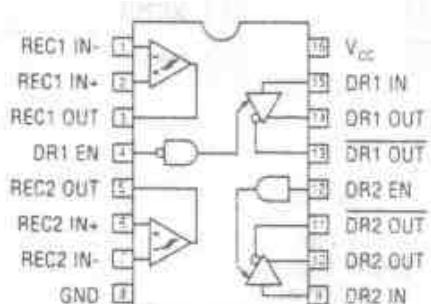
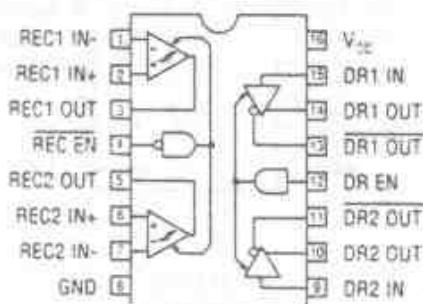
MC 3367

H.942

ANALOG INPUT (-)	1	16	V <sub>cc</sub>
ANALOG FEEDBACK (+)	2	15	ENCODE/DECODE
SYLLABIC FILTER	3	14	CLOCK
GAIN CONTROL	4	13	DIGITAL DATA INPUT (-)
REF INPUT (+)	5	12	DIGITAL THRESHOLD
FILTER INPUT (-)	6	11	COINCIDENCE OUTPUT
ANALOG OUTPUT	7	10	V <sub>cc</sub> /2 OUTPUT
V <sub>ee</sub>	8	9	DIGITAL OUTPUT

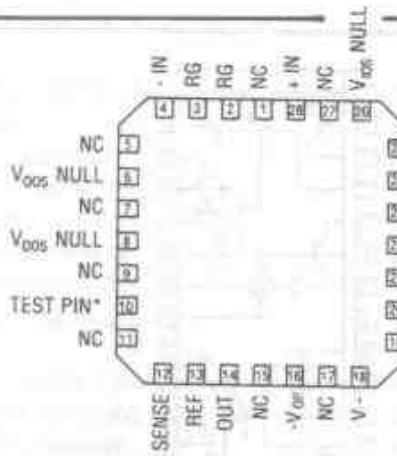
MC 34115

H.944



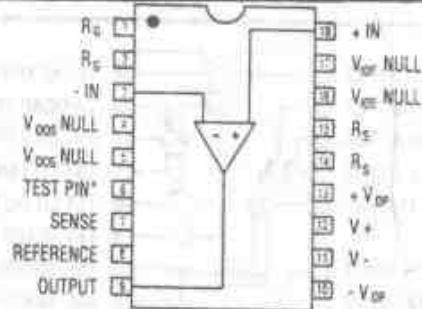
H.945

H.946



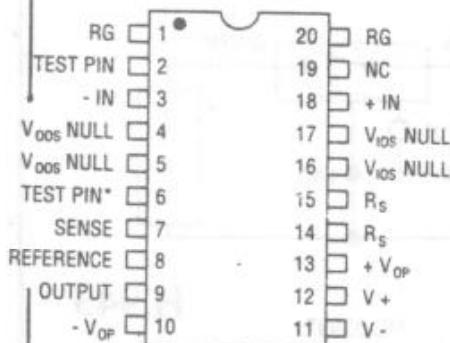
\* Make no electrical connection to these pins

AMP 01 LCC



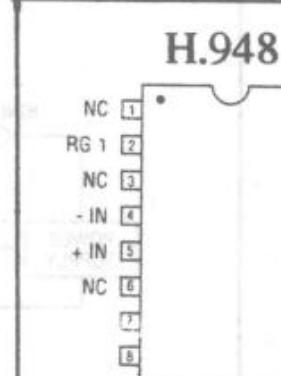
\* Make no electrical connection to these pins

AMP 01 CERDIP

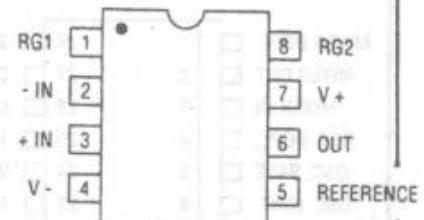


\* Make no electrical connection to these pins

AMP 01 SOL



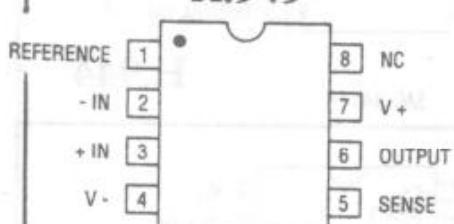
AMP 02  
16-PIN SOL  
(S-Suffix)



AMP 02

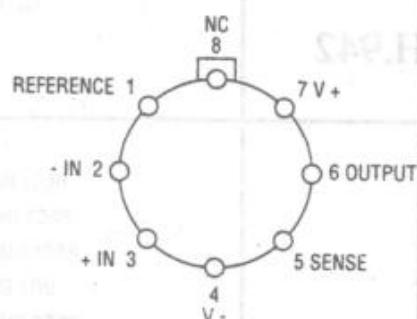
CERDIP  
(Z-Suffix)

EPOXY MINI-DIP  
(P-Suffix)

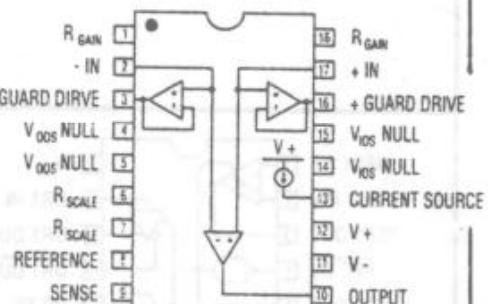


AMP 03

8 PIN  
EPOXY MINI-DIP  
(P-Suffix)

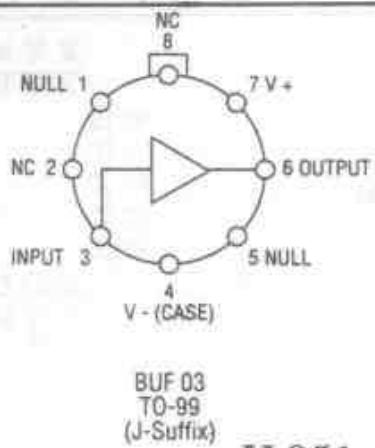


AMP 03  
TO-99  
(J-Suffix)

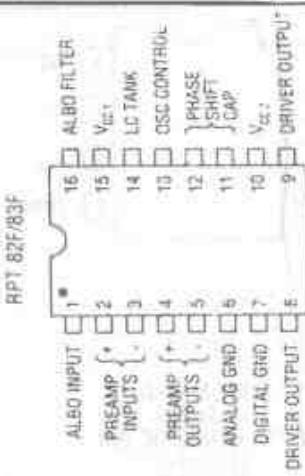


AMP 05

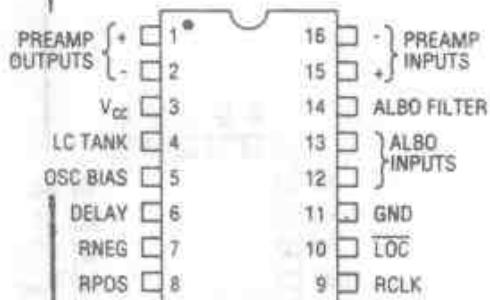
H.950



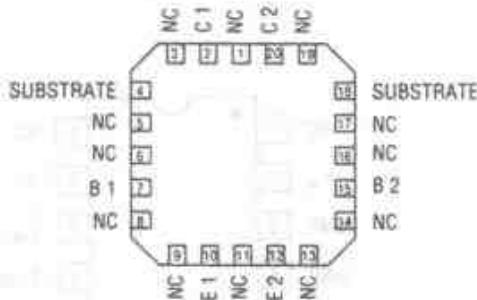
H.951

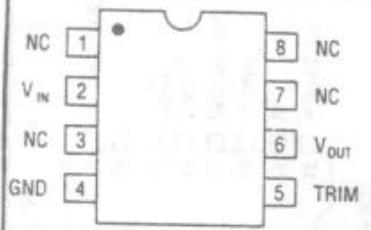


RPT 85F



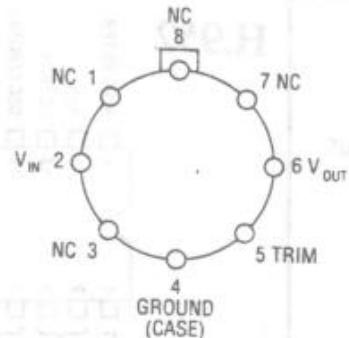
LIU 01





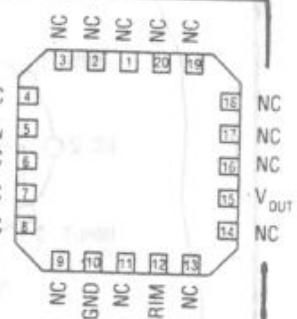
REF 01

EPOXY MINI-DIP  
 (P-Suffix)  
 8-PIN HERMETIC DIP  
 (Z-Suffix)  
 8-PIN SO  
 (S-Suffix)

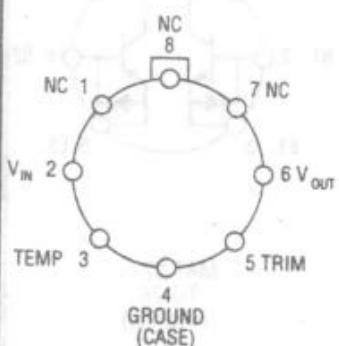


REF 01-J  
 TO-99  
 (J-Suffix)

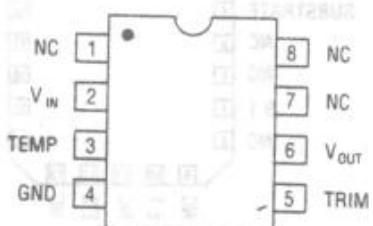
H.960



REF 01 LCC

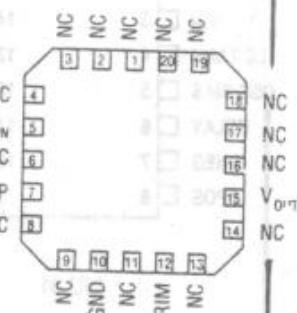


REF 02  
 TO-99  
 (J-Suffix)



REF 02

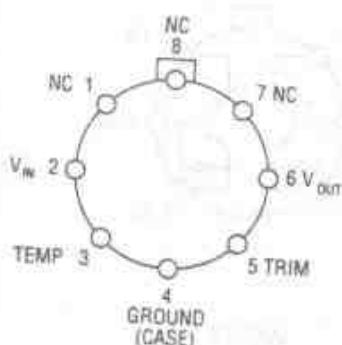
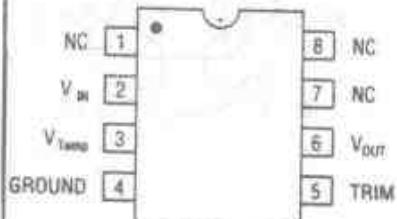
8-PIN HERMETIC DIP  
 (Z-Suffix)  
 EPOXY MINI-DIP  
 (P-Suffix)  
 8-PIN SO  
 (S-Suffix)



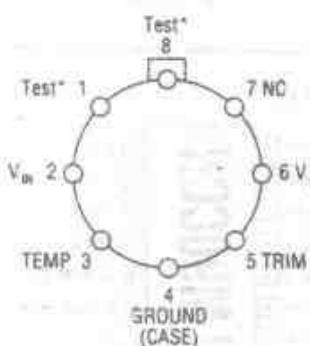
H.964

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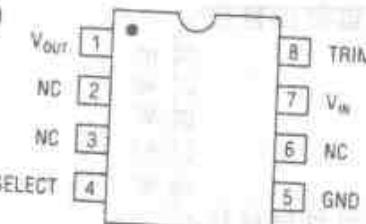
H.968



REF 05 H.969

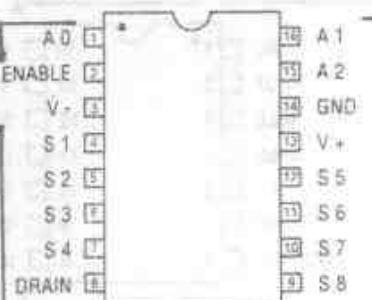


H.970

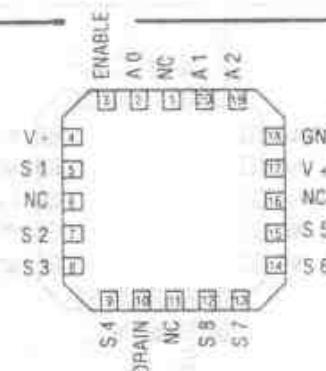


H.972

RPT 86/87



MUX DB

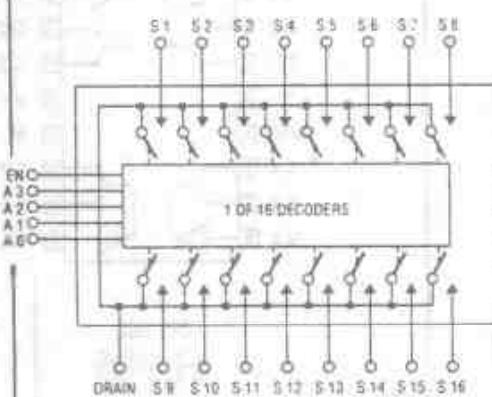


MUX 08 LCC

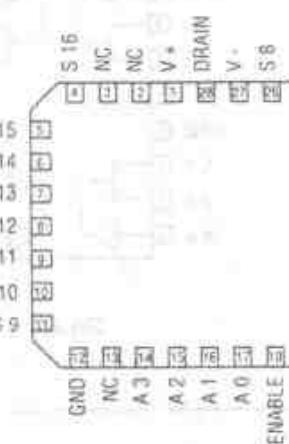
H.973



MIX 15

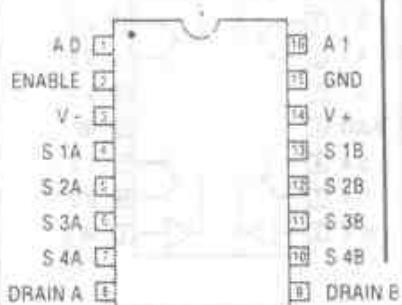


MUX 16



H.976

MUX 16 LCC/PLCC



MUX 24

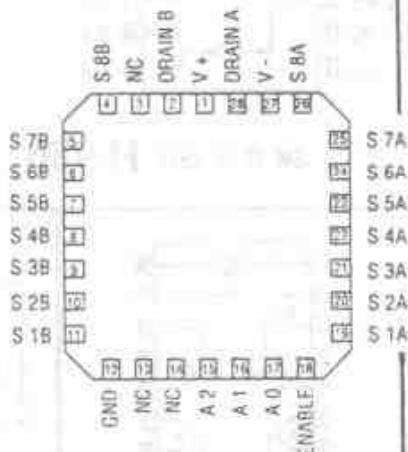
H.978



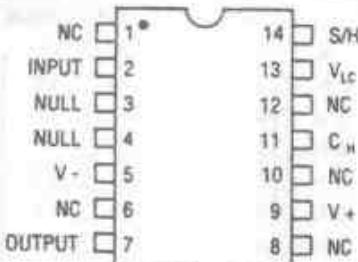
1 OF 8 DECODERS

H.979

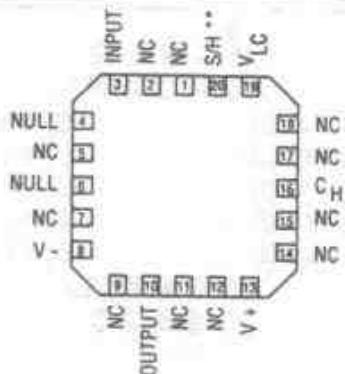
MUX 2B



MUX 28 LCC/PLCC

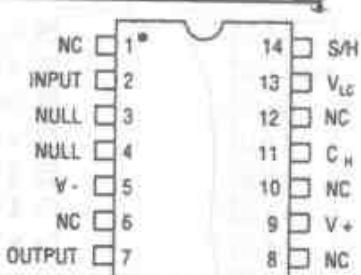


SMP 10/11-Y

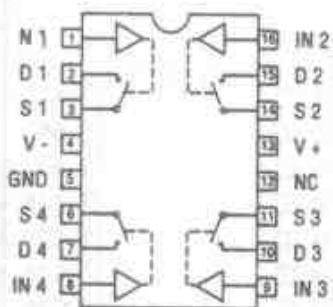


H.980

SMP 11 LCC

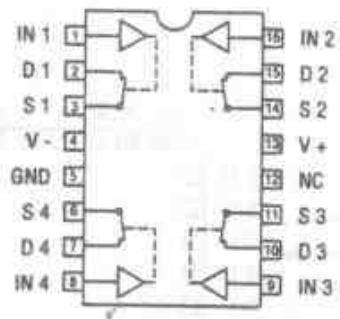
SMP 81  
14-PIN HERMETIC DIP  
(Y-Suffix)

H.981



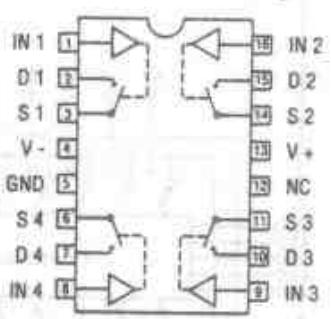
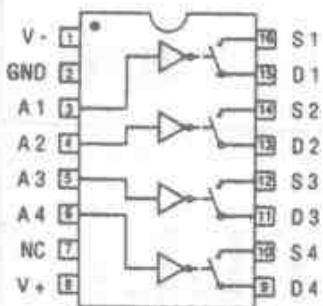
SW 01/02

H.983

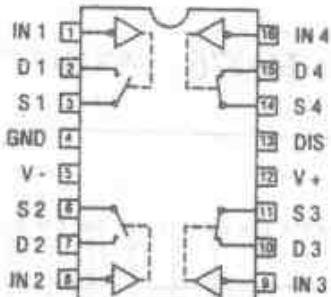


SW 201

H.984

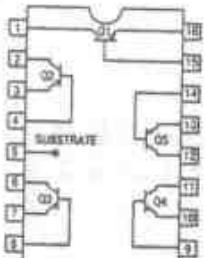
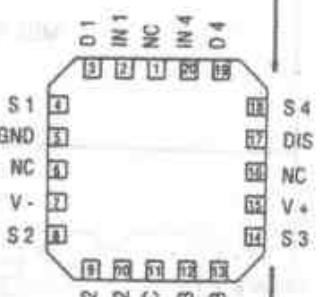
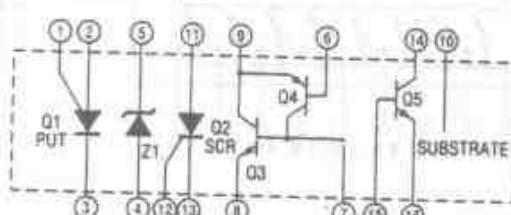
SW 202  
H.985

SW 7510/7511 H.986

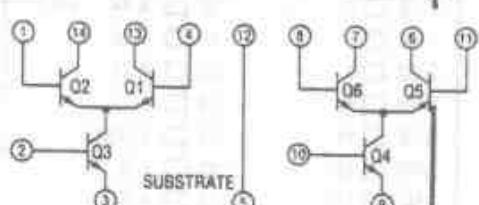


SW 06

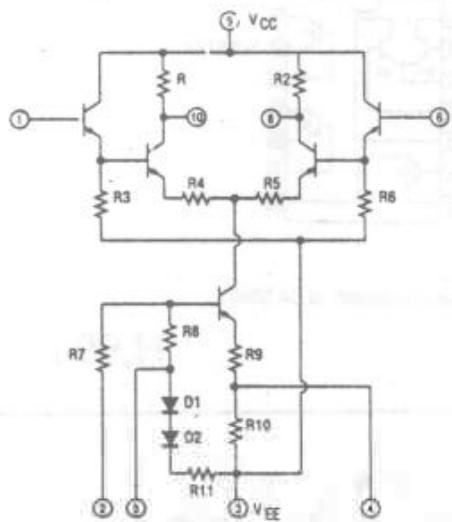
H.987

H.989  
Schematic diagram of CA 3127

Schematic diagram of CA 3097E H.990

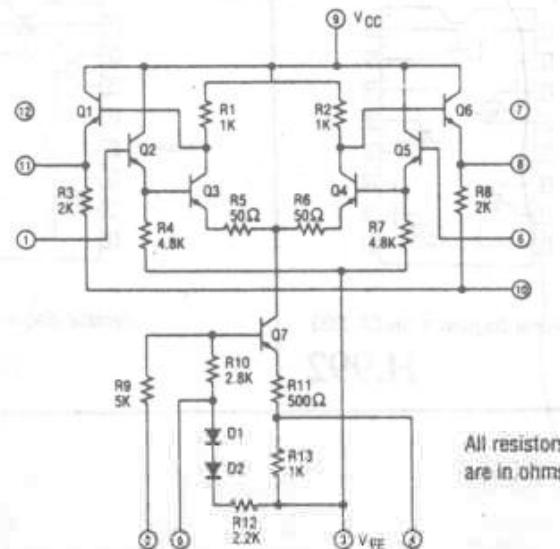
Schematic Diagram for CA 3102  
H.991





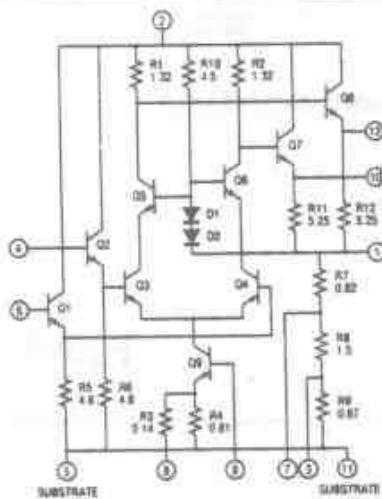
Schematic Diagram of CA 3000

H.1001



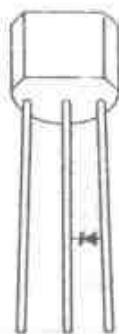
\* Internal Connection - DO NOT USE

H.1002



ALL RESISTANCE VALUES IN KΩ'S

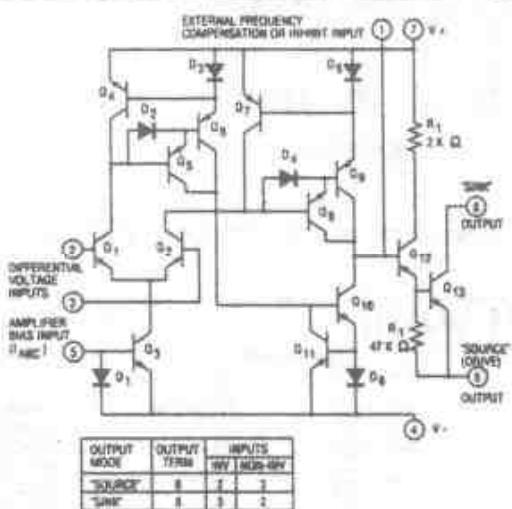
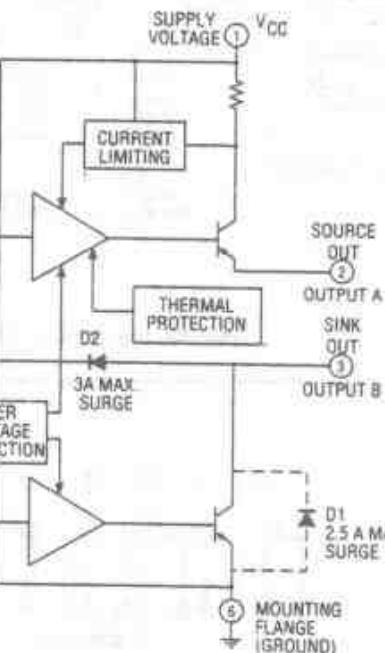
H.1003



ICL 8069

1003 a

Schematic Diagram of CA 3001



Schematic diagram of CA 3094

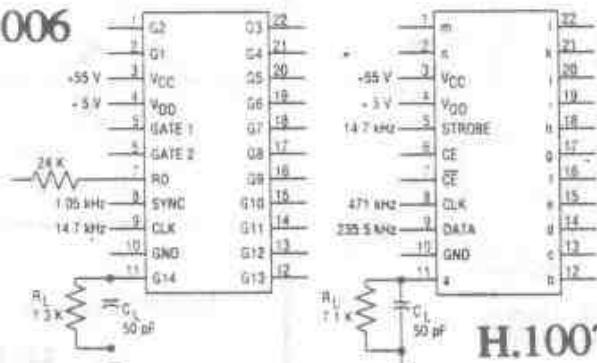
Plastic Package

H.1005

1/2 H driver function diagram  
CA 3169

H.1004

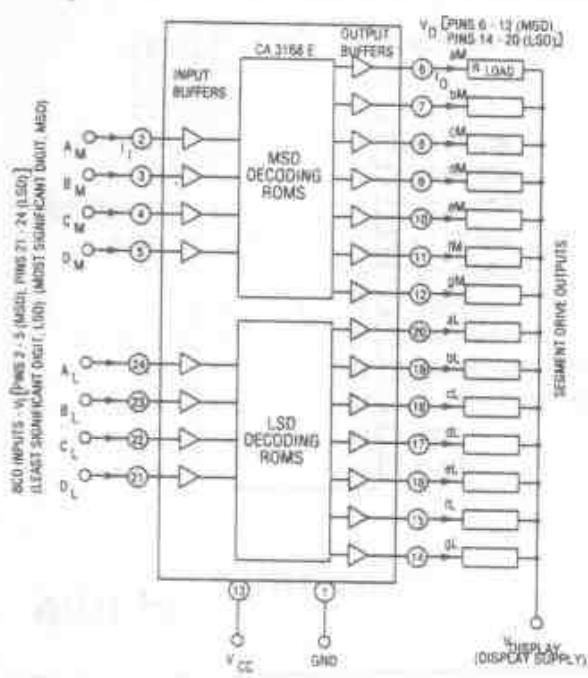
H.1006



Sequencer-driver (CA 3207E)

Segment-latch driver (CA3208E)

H.1007



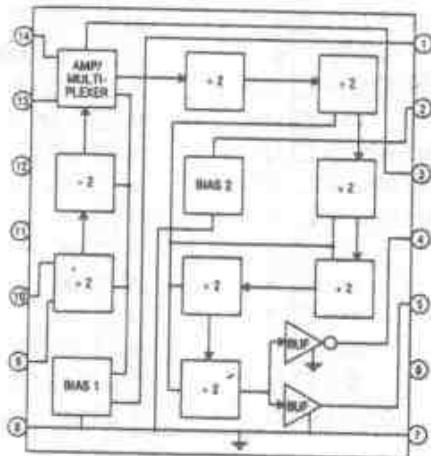
CA 3168

H.1008

## 1.25 GHz-Teiler

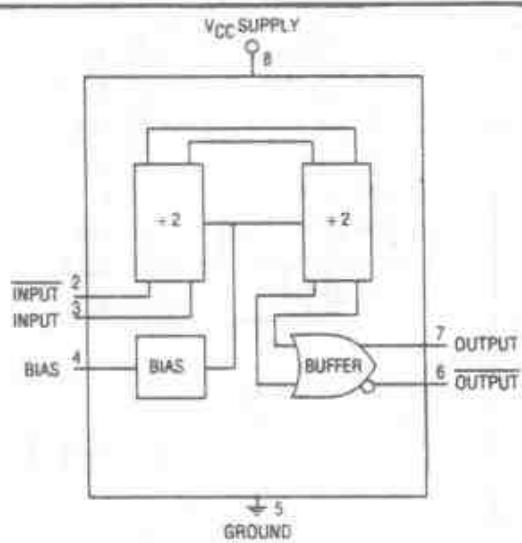
## Features:

- Broadband operation - DC to 1.25 GHz
- High sensitivity - 5 mV typ.
- Standard TTL or ECL power supply
- Dual mode operation - VHF/UHF (+54/+256)
- Power Dissipation - 325 mW typ.
- Requires only a single power supply



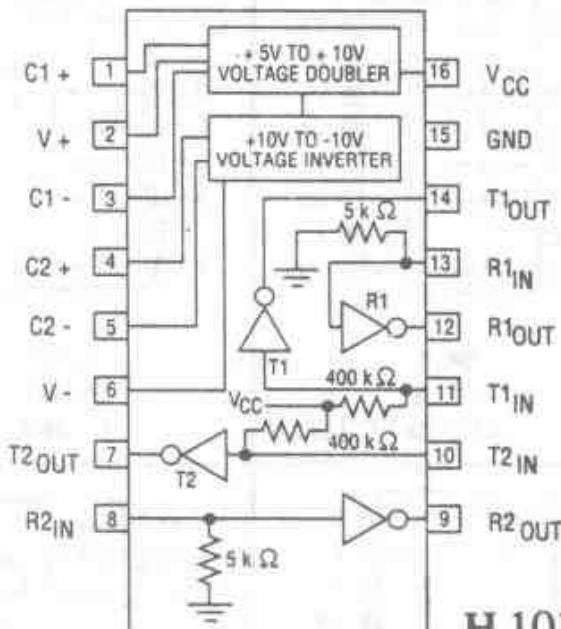
H.1009

CA 3179 block diagram



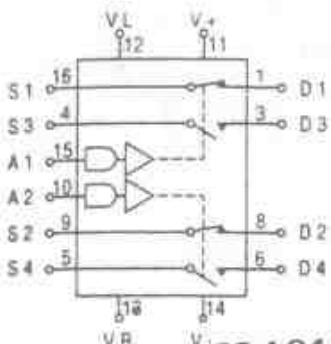
CA 3199

H.1010



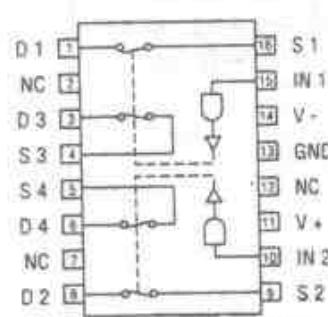
H.1011

## ICL 232 Functional Diagram

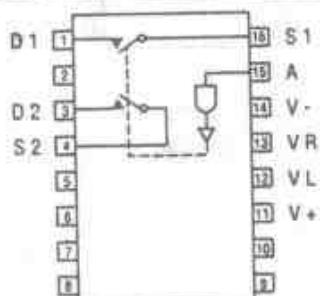


HI1-0381-2

H.1013



HI 384



DPST

HI-5044

GROUND	1*	40	SEG a
SEG c	2	39	SEG g
SEG e	3	38	SEG d
SEG b	4	37	SEG i
D.P.	5	36	NC
ID 6	6	35	NC
ID 5	7	34	NC
ID 7 (INPUT D.P.)	8	33	DECODE
WRITE	9	32	HEXA/CODE B
SHUTDOWN	10	31	DIGIT 3
ID 4	11	30	DIGIT 6
DA 2 (DIGIT ADDRESS 2)	12	29	DIGIT 7
DA 0 (DIGIT ADDRESS 0)	13	28	DIGIT 4
DA 1 (DIGIT ADDRESS 1)	14	27	NC
NC	15	26	NC
ID 1	16	25	NC
ID 0	17	24	V+
ID 2	18	23	DIGIT 8
ID 3	19	22	DIGIT 5
DIGIT 1	20	21	DIGIT 2

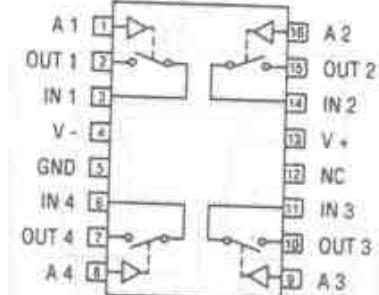
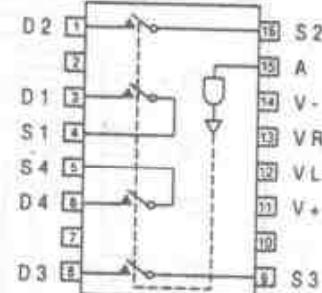
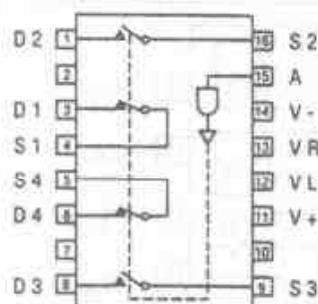
CARRY/BORROW	1	28	D 1
ZERO	2	27	D 2
EQUAL	3	26	D 3
BCD I/O 8's	4	25	D 4
BCD I/O 4's	5	24	V <sub>DD</sub>
BCD I/O 2's	6	23	DISPLAY CONT
BCD I/O 1's	7	22	SEG g
COUNT INPUT	8	21	SEG b
STORE	9	20	V <sub>SS</sub>
UP/DOWN	10	19	SEG e
LOAD REGISTER/DFF	11	18	SEG f
LOAD COUNTER/I/O OFF	12	17	SEG d
SCAN	13	16	SEG a
RESET	14	15	SEG c

ICM 7217

H.1016

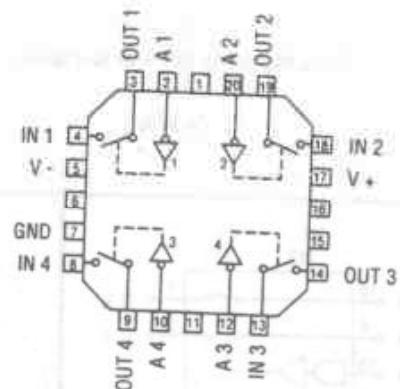
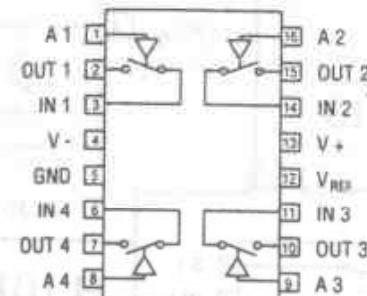
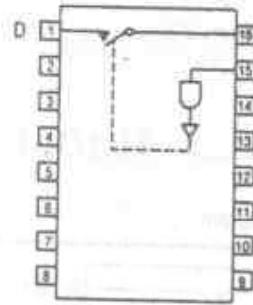
H.1015

ICM 7218 E



HI 201 HS

H.1019



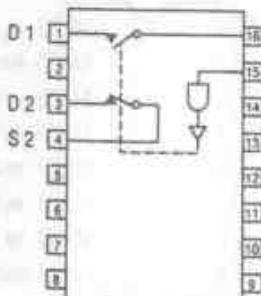
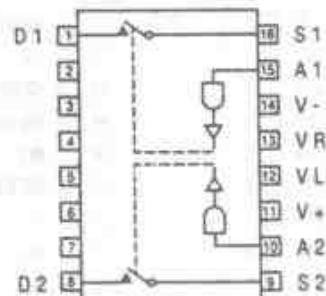
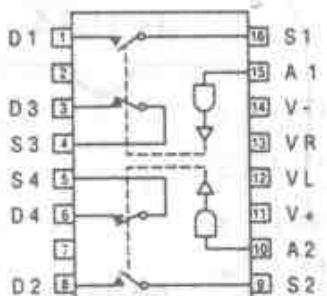
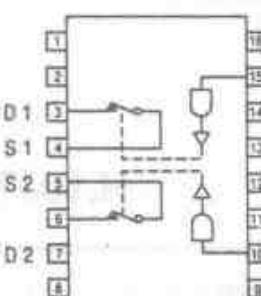
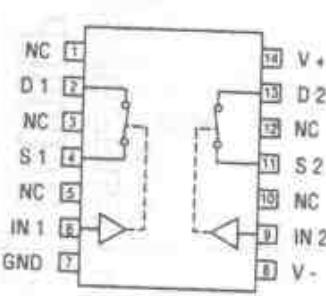
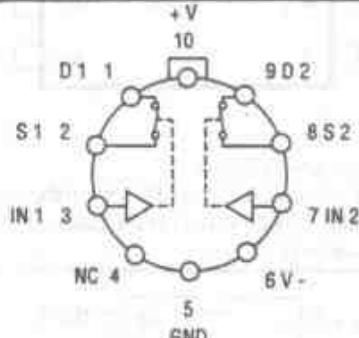
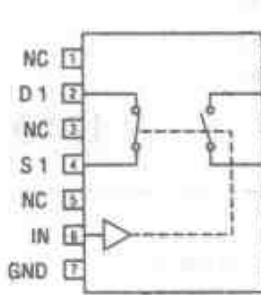
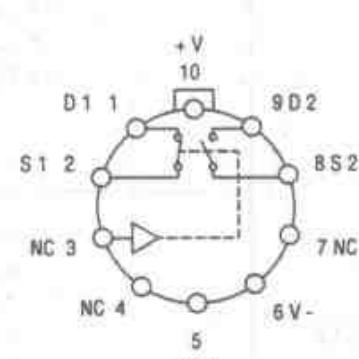
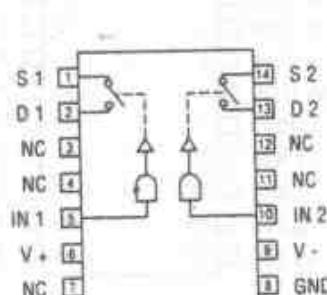
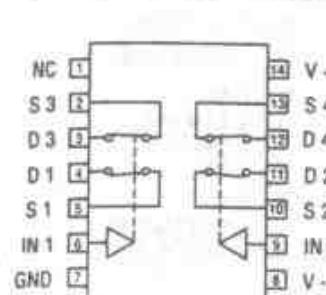
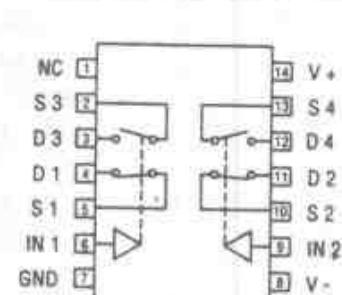
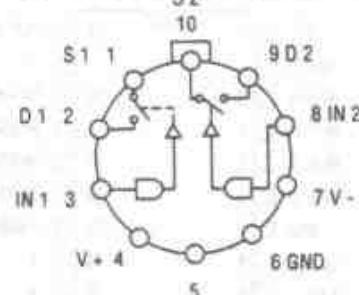
HI 201 HS

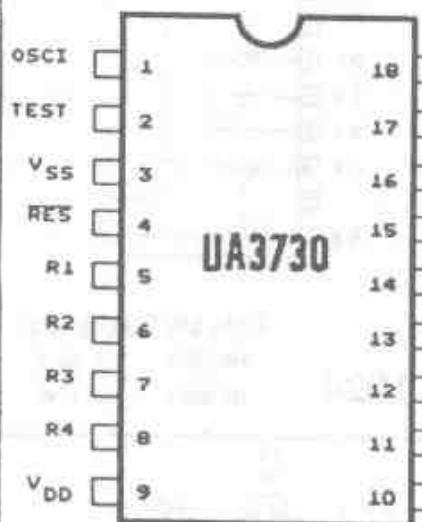
SPST  
HI-5040

H.1020

HI1-201-X

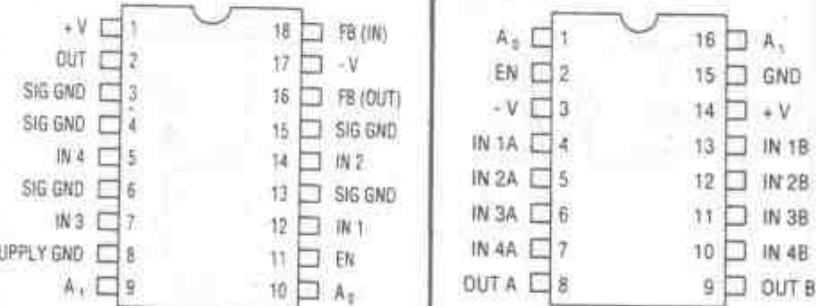
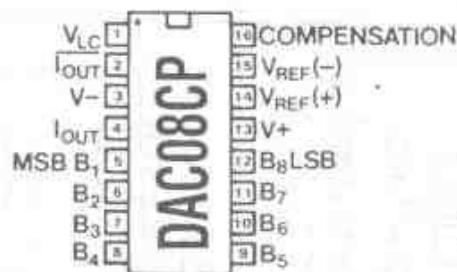
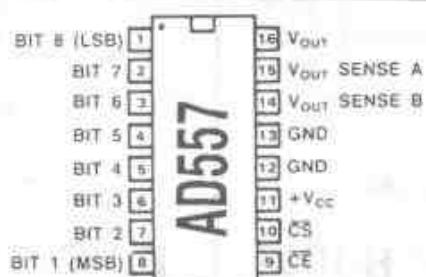
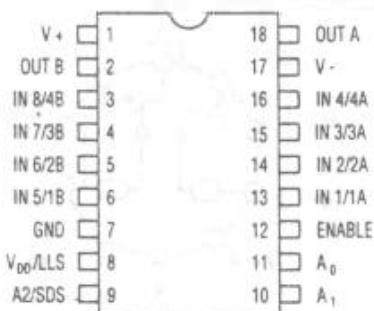
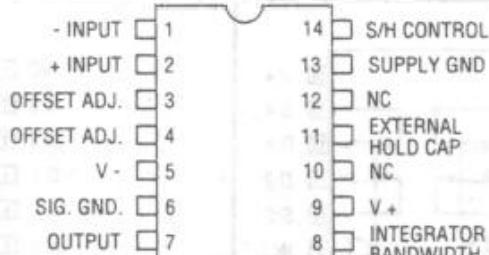
H.1021

 <p><b>SPDT</b> HI-5042 HI-5050 <b>H.1022</b></p>	 <p><b>DUAL CONTROL</b> <b>DUAL SPST</b> HI-5041 <b>H.1023</b></p>	 <p><b>DUAL SPDT</b> HI-5043 <b>DUAL DPST</b> HI-5045 HI-5051 HI-5049 <b>H.1024</b></p>
 <p><b>DUAL SPST</b> HI-5048 <b>H.1025</b></p>	 <p>HI 300 <b>H.1026</b></p>	 <p>HI 300 <b>H.1027</b></p>
 <p>HI 301 <b>H.1028</b></p>	 <p>HI 301 <b>H.1029</b></p>	 <p>HI 381 <b>H.1032</b></p>
 <p>HI302 <b>H.1030</b></p>	 <p>HI 303 <b>H.1031</b></p>	 <p>HI 381 <b>H.1033</b></p>

**H.1034**

UA 3730 Security Lock

U<sub>B</sub> 3–6 V, Standby 5  $\mu$ A, 10<sup>12</sup> Combinations  
Alarm and 60-sec.-wide pulse output due to an incorrect password

**HI 524 H.1035****HI-539 H.1036****H.1037****H.1039****HI 1828A****H.1042****H.1041****HI 518****HR5320****H.1043**

+ V SUPPLY	1	28	OUT A
OUT B	2	27	- V SUPPLY
NC	3	26	IN 8A
IN 8B	4	25	IN 7A
IN 7B	5	24	IN 6A
IN 6B	6	23	IN 5A
IN 5B	7	22	IN 4A
IN 4B	8	21	IN 3A
IN 3B	9	20	IN 2A
IN 2B	10	19	IN 1A
IN 1B	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
NC	13	16	ADDRESS A <sub>1</sub>
NC	14	15	ADDRESS A <sub>2</sub>

+ V SUPPLY	1	28	OUT
NC	2	27	- V SUPPLY
NC	3	26	IN 8
IN 16	4	25	IN 7
IN 15	5	24	IN 6
IN 14	6	23	IN 5
IN 13	7	22	IN 4
IN 12	8	21	IN 3
IN 11	9	20	IN 2
IN 10	10	19	IN 1
IN 9	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
NC	13	16	ADDRESS A <sub>1</sub>
ADDRESS A <sub>2</sub>	14	15	ADDRESS A <sub>2</sub>

HI1-507

**H.1044**

HI1-506

**H.1045**

+ V SUPPLY	1	28	OUT
NC	2	27	- V SUPPLY
NC	3	26	IN 8
IN 16	4	25	IN 7
IN 15	5	24	IN 6
IN 14	6	23	IN 5
IN 13	7	22	IN 4
IN 12	8	21	IN 3
IN 11	9	20	IN 2
IN 10	10	19	IN 1
IN 9	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
V <sub>REF</sub>	13	16	ADDRESS A <sub>1</sub>
ADDRESS A <sub>2</sub>	14	15	ADDRESS A <sub>2</sub>

+ V SUPPLY	1	28	OUT A
OUT B	2	27	- V SUPPLY
NC	3	26	IN 8A
IN 8B	4	25	IN 7A
IN 7B	5	24	IN 6A
IN 6B	6	23	IN 5A
IN 5B	7	22	IN 4A
IN 4B	8	21	IN 3A
IN 3B	9	20	IN 2A
IN 2B	10	19	IN 1A
IN 1B	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
V <sub>REF</sub>	13	16	ADDRESS A <sub>1</sub>
NC	14	15	ADDRESS A <sub>2</sub>

HI1-506A

**H.1046**

HI1-507A

**H.1047****H.1049**

A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	A <sub>2</sub>
- V SUPPLY	3	14	GND
IN 1	4	13	+ V SUPPLY
IN 2	5	12	IN 5
IN 3	6	11	IN 6
IN 4	7	10	IN 7
OUT	8	9	IN 8

**H.1050**

A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	GND
- V SUPPLY	3	14	+ V SUPPLY
IN 1A	4	13	IN 1B
IN 2A	5	12	IN 2B
IN 3A	6	11	IN 3B
IN 4A	7	10	IN 4B
OUT A	8	9	OUT B

+ V SUPPLY	1	28	DUT
NC	2	27	- V SUPPLY
NC	3	26	IN 8
IN 16	4	25	IN 7
IN 15	5	24	IN 6
IN 14	6	23	IN 5
IN 13	7	22	IN 4
IN 12	8	21	IN 3
IN 11	9	20	IN 2
IN 10	10	19	IN 1
IN 9	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
V <sub>REF</sub>	13	16	ADDRESS A <sub>1</sub>
ADDRESS A <sub>3</sub>	14	15	ADDRESS A <sub>2</sub>

HI1-546

H.1052

+ V SUPPLY	1	28	OUT A
OUT B	2	27	- V SUPPLY
NC	3	26	IN 8A
IN 8B	4	25	IN 7A
IN 7B	5	24	IN 6A
IN 6B	6	23	IN 5A
IN 5B	7	22	IN 4A
IN 4B	8	21	IN 3A
IN 3B	9	20	IN 2A
IN 2B	10	19	IN 1A
IN 1B	11	18	ENABLE
GND	12	17	ADDRESS A <sub>0</sub>
V <sub>REF</sub>	13	16	ADDRESS A <sub>1</sub>
NC	14	15	ADDRESS A <sub>2</sub>

HI1-547

H.1053

H.1054

A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	A <sub>2</sub>
- V SUPPLY	3	14	GND
IN 1	4	13	+ V SUPPLY
IN 2	5	12	IN 5
IN 3	6	11	IN 6
IN 4	7	10	IN 7
OUT	8	9	IN 8

HI1-548

H.1055

A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	GND
- V SUPPLY	3	14	+ V SUPPLY
IN 1A	4	13	IN 1B
IN 2A	5	12	IN 2B
IN 3A	6	11	IN 3B
IN 4A	7	10	IN 4B
OUT A	8	9	OUT B

HI1-549

H.1056

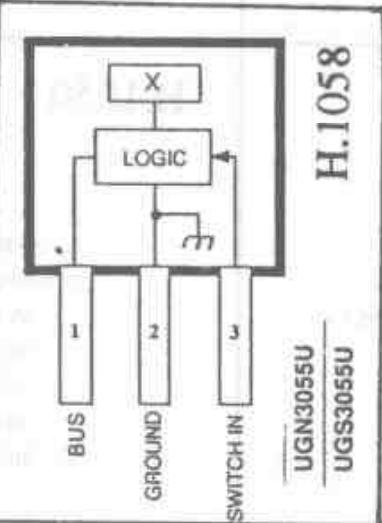
A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	A <sub>2</sub>
- V SUPPLY	3	14	GND
IN 1	4	13	+ V
IN 2	5	12	IN 5
IN 3	6	11	IN 6
IN 4	7	10	IN 7
OUT	8	9	IN 8

HI1-508A

H.1057

A <sub>0</sub>	1	16	A <sub>1</sub>
ENABLE	2	15	GND
- V SUPPLY	3	14	+ V SUPPLY
IN 1A	4	13	IN 1B
IN 2A	5	12	IN 2B
IN 3A	6	11	IN 3B
IN 4A	7	10	IN 4B
OUT A	8	9	OUT B

HI1-509A



ADDRESS A <sub>1</sub>	1	16	ADDRESS &
+5.0V SUPPLY	2	15	- V SUPPLY
ENABLE	3	14	+ V SUPPLY
ADDRESS A <sub>2</sub>	4	13	IN 1
IN 8	5	12	OUT
IN 7	6	11	IN 2
IN 6	7	10	IN 3
IN 5	8	9	IN 4

HI-1818A

H.1059

H.1057a

NC	1	8	V <sub>CC</sub>
IN +	2	7	OUT +
IN -	3	6	OUT -
OE	4	5	GND

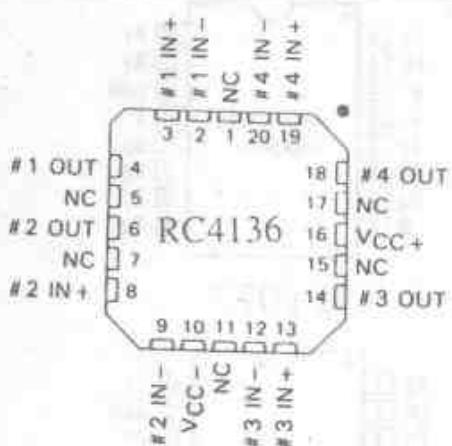
TL712

NC = No internal connection

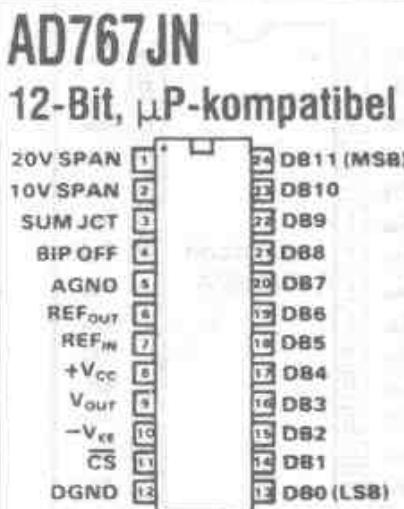
NC	1	8	GND
IN -	2	7	OUT -
IN +	3	6	OUT +
NC	4	5	V <sub>EE</sub>

TL721

H.1059a

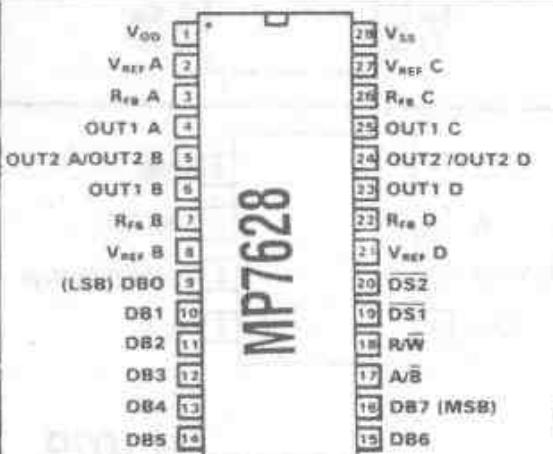


H.1060

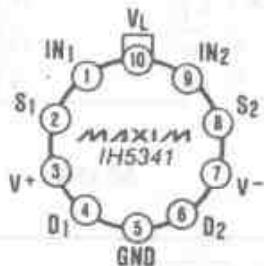


**AD7870**

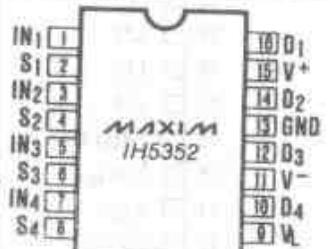
H.1061



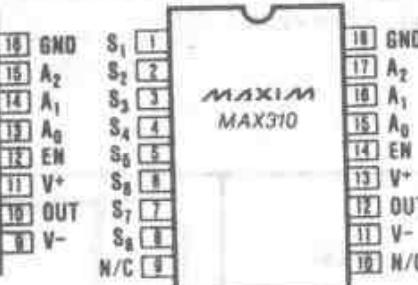
H.1062



H.1070

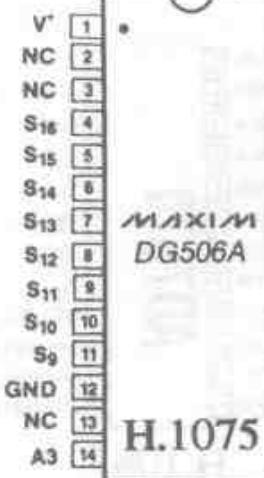


H.1071

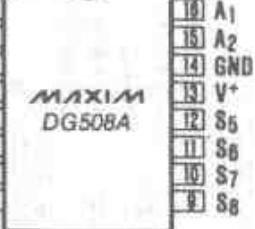
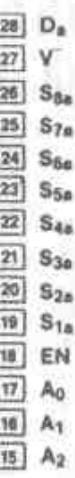


MAX310				ON Channel	MAX311			
A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	EN		A <sub>1</sub>	A <sub>0</sub>	EN	ON Channel
0	0	0	1	1	0	0	1	1A + 1B
0	0	1	1	2	0	1	1	2A + 2B
0	1	0	1	3	1	0	1	3A + 3B
0	1	1	1	4	1	1	1	4A + 4B
1	0	0	1	5	X	X	0	ALL OFF
1	0	1	1	6				
1	1	0	1	7				
1	1	1	1	8				
X	X	X	0	ALL OFF				





H.1075

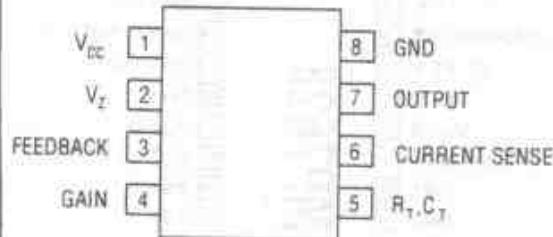
MAXIM  
DG507A

H.1077



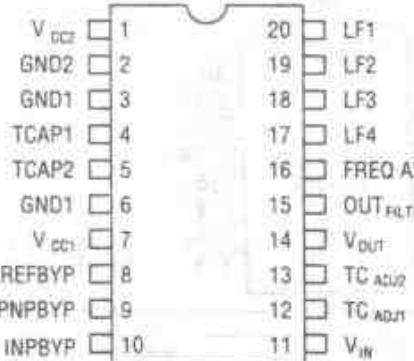
NE 5560

H.1078

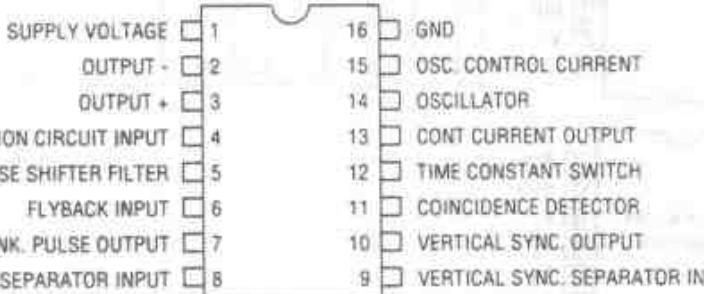


NE 5561

H.1079

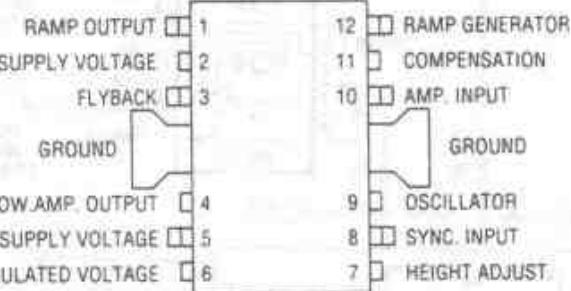


NF 568



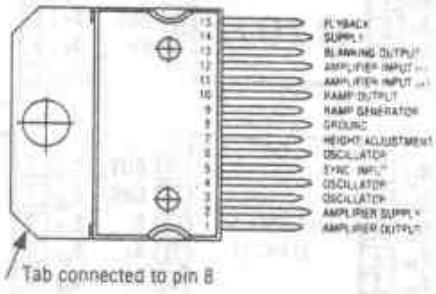
TDA 1180 P

H.1082



TDA 1170

H.1081



TDA 1670 A

H.1083

V <sub>SS</sub>	1	40	OUTPUT BIT 18
OUTPUT BIT 17	2	39	OUTPUT BIT 19
OUTPUT BIT 16	3	38	OUTPUT BIT 20
OUTPUT BIT 15	4	37	OUTPUT BIT 21
OUTPUT BIT 14	5	36	OUTPUT BIT 22
OUTPUT BIT 13	6	35	OUTPUT BIT 23
OUTPUT BIT 12	7	34	OUTPUT BIT 24
OUTPUT BIT 11	8	33	OUTPUT BIT 25
OUTPUT BIT 10	9	32	OUTPUT BIT 26
OUTPUT BIT 9	10	31	OUTPUT BIT 27
OUTPUT BIT 8	11	30	OUTPUT BIT 28
OUTPUT BIT 7	12	29	OUTPUT BIT 29
OUTPUT BIT 6	13	28	OUTPUT BIT 30
OUTPUT BIT 5	14	27	OUTPUT BIT 31
OUTPUT BIT 4	15	26	OUTPUT BIT 32
OUTPUT BIT 3	16	25	OUTPUT BIT 33
OUTPUT BIT 2	17	24	OUTPUT BIT 34
OUTPUT BIT 1	18	23	DATA ENABLE
BRIGHTNESS CONTROL	19	22	DATA IN
V <sub>DD</sub>	20	21	CLOCK IN

M 5450

H.1084

V <sub>SS</sub>	1	40	OUTPUT BIT 18
OUTPUT BIT 17	2	39	OUTPUT BIT 19
OUTPUT BIT 16	3	38	OUTPUT BIT 20
OUTPUT BIT 15	4	37	OUTPUT BIT 21
OUTPUT BIT 14	5	36	OUTPUT BIT 22
OUTPUT BIT 13	6	35	OUTPUT BIT 23
OUTPUT BIT 12	7	34	OUTPUT BIT 24
OUTPUT BIT 11	8	33	OUTPUT BIT 25
OUTPUT BIT 10	9	32	OUTPUT BIT 26
OUTPUT BIT 9	10	31	OUTPUT BIT 27
OUTPUT BIT 8	11	30	OUTPUT BIT 28
OUTPUT BIT 7	12	29	OUTPUT BIT 29
OUTPUT BIT 6	13	28	OUTPUT BIT 30
OUTPUT BIT 5	14	27	OUTPUT BIT 31
OUTPUT BIT 4	15	26	OUTPUT BIT 32
OUTPUT BIT 3	16	25	OUTPUT BIT 33
OUTPUT BIT 2	17	24	OUTPUT BIT 34
OUTPUT BIT 1	18	23	OUTPUT BIT 35
BRIGHTNESS CONTROL	19	22	DATA IN
V <sub>DD</sub>	20	21	CLOCK IN

M 5451

H.1085

BLANKING OUTPUT	1	20	AMPLIFIER INPUT (-)
SUPPLY (+)	2	19	AMPLIFIER INPUT (+)
FLYBACK	3	18	RAMP OUTPUT
NC	4	17	RAMP GENERATOR
GND	5	16	GND
GND	6	15	GND
AMPLIFIER OUTPUT	7	14	HEIGHT ADJUST.
AMPLIFIER SUPPLY	8	13	NC
OSCILLATOR	9	12	OSCILLATOR
OSCILLATOR	10	11	SYNC. INPUT

TDA 1770 A

H.1086

OUTPUT	1	16	GND
V <sub>s</sub>	2	15	GND
BOOTSTRAP	3	14	GND
THRESHOLD	4	13	GND
MUTING	5	12	GND
INVERT. IN	6	11	GND
SVR	7	10	GND
NON INVERT. INPUT	8	9	GND

TDA 1905

H.1087

C REF	1	28	SCL	BUS
+ Vs	2	27	SEN	INPUTS
GND	3	26	SDA	
TREBLE	{ (L) 4	25	DIG. GND	
TONE	{ (R) 5	24	OUT (LF)	FRONT
	{ (IN) R 5	23	OUT (RF)	OUT
	{ OUT (R) 7	22	OUT (LR)	REAR
RIGHT	{ R 3 8	21	OUT (RR)	OUT
INPUTS	{ P 2 9	20	8 OUT (P)	BASS
	{ R 1 10	19	8 IN (R)	TONE
MONO	11	18	8 OUT (L)	
LEFT	{ L 3 12	17	8 IN (L)	LEFT
INPUTS	{ L 2 13	16	OUT (L)	INPUTS
	{ L 1 14	15	IN (L)	

TDA 7302

H.1088

1	16
2	15
3	14
4	13
5	12
6	11
7	10
8	9

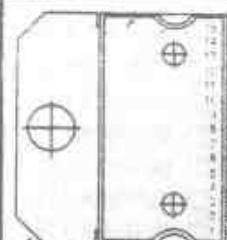
- 1 - Supply Voltage
- 2 - Output stage supply voltage
- 3 - Output pulse
- 4 - Selection of output pulse duration
- 5 - Decoupling
- 6 - Reference pulse (fly-back) for the 2nd phase comparator
- 7 - Sand castle pulse
- 8 - Vertical synchro output
- 9 - Synchro separator output
- 10 - Noise separator input
- 11 - V.C.R. switching
- 12 - Time constant switching
- 13 - First phase comparator output
- 14 - Ramp oscillator capacitance
- 15 - Adjustment of the charge current
- 16 - Ground



H.1090

Tab connected to pin 6

H.1089



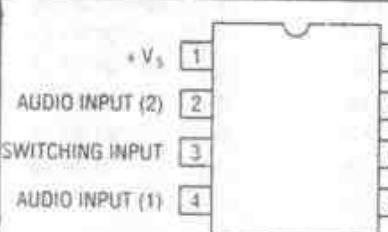
TDA 8176

**H.1092**

PIN L-LOC  
S-LOC  
RESET  
HEQ-IC-ADJ  
POWER AMP V-S  
NC  
P-2WCH AMP GND  
GND  
FL BACK  
TC  
VIA FACE SUPPLY  
RAMP GND  
RAMP GND  
COMPENSATION  
AMPL. IN

TURN OFF MUTING □ 1  
SOUND IF INPUT □ 2  
IF DECOUPLING □ 3  
IF DECOUPLING □ 4  
GND □ 5  
GND □ 6  
DETECTOR (FM) □ 7  
DETECTOR (FM) □ 8  
DEEMPHASIS AND VCR OUT □ 9  
VCR INPUT □ 10

AF PA INPUT □ 20  
AF PA FEEDBACK □ 19  
SUPPLY VOLTAGE □ 18  
AF PA OUTPUT □ 17  
GND □ 16  
GND □ 15  
DCVC OUTPUT □ 14  
VOLUME CONTROL POT □ 13  
TONE CONTROL POT □ 12  
TONE CONTROL CAPACITOR □ 11



TDA 8190

**H.1094**

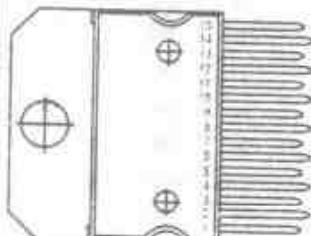
OUTPUT 1 (COLLECTOR) □ 1  
OUTPUTS 1 AND 2 (EMITTER) □ 2  
OUTPUT 2 (COLLECTOR) □ 3  
HYSTERESIS ADJUSTMENT □ 4  
DETECTOR FILTER CAPACITOR □ 5  
SENSING RANGE ADJUSTMENT □ 6  
OSCILLATOR CIRCUIT □ 7

TDA 8190

**H.1093**

GROUND □ 14  
SWITCHING PERIOD CAPACITOR □ 13  
SWITCH INPUT □ 12  
V<sub>CC</sub> □ 11  
DECOUPLING □ 10  
ZENER OUTPUT □ 9  
NC □ 8

TDE 0160 DP/FP

**H.1095**

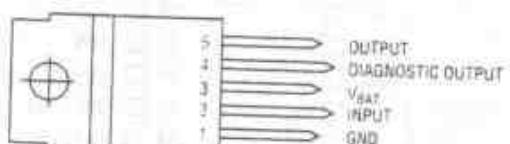
TDA 2017

1 - Line Output  
2 - Muting Output  
3 - Line Flyback Input  
4 - Phase detector  
5 - Line Oscillator  
6 - Synchro Separator  
7 - Video Input  
8 - Ground  
9 - Frame Oscillator  
10 - Power Amplifier Negative Output  
11 - V<sub>CC1</sub>  
12 - Flyback Generator Supply  
13 - Flyback Generator  
14 - Frame Power Supply  
15 - Frame Output

**H.1096**

I<sub>B2</sub> □ 1  
V- □ 2  
I<sub>NR</sub> □ 3  
SE □ 4  
E □ 5  
R- □ 6  
R<sub>1</sub> □ 7  
C<sub>r</sub> □ 8  
I<sub>H1</sub> □ 16  
V+ □ 15  
V<sub>CC</sub> □ 14  
V<sub>CE</sub> □ 13  
I<sub>C</sub> □ 12  
R<sub>S0</sub> □ 11  
R<sub>D</sub> □ 10  
GND □ 9

UAA 4002 DP

**H.1097**

VM 201

**H.1098**

1 S	1	14	2 S
1 D	2	13	2 D
NC	3	12	NC
NC	4	11	NC
1 A	5	10	2 A
V <sub>CC</sub>	6	9	V <sub>EE</sub>
V <sub>LL</sub>	7	8	V <sub>ref</sub>

TL 182

**H.1099**

1 RESIN	1	16	V <sub>CC</sub>
1 CT	2	15	2 RESIN
1 RESET	3	14	2 CT
1 RESET	4	13	2 RESET
1 VSU	5	12	2 RESET
1 VSO	6	11	2 VSU
1 SCR DRIVE	7	10	2 VSO
GND	8	9	2 SCR DRIVE

TL 7770-5  
TL 7770-12  
TL 7770-15

**H.1100**

Csf	1	8	RT
V <sub>CC</sub>	2	7	CT
Pout	3	6	EOUT
Gnd	4	5	E-

TEA 5170

+ INPUT FRAME AMPLIFIER	1	28	SAFETY INPUT
- INPUT FRAME AMPLIFIER	2	27	VIDEO INPUT
FRAME SAW-TOOTH OUTPUT	3	26	H. SYNCHRO CAPACITOR (TIP LEVEL)
FRAME OUTPUT	4	25	VIDEO IDENTIFICATION CAPACITOR
FRAME RAMP GENERATOR	5	24	MUTING + 50/60 HZ IDENT. OUTPUT
GROUND POWER	6	23	V.C.R. INPUT
SWITCH MODE POWER SUPPLY OUTPUT	7	22	PHASE COMPARATOR Ø 1 CAPACITOR
$V_{cc}$	8	21	GROUND SUBSTRAT
S-M-P-S INPUT REGULATION	9	20	A.G.C. KEY PULSE OUTPUT
HORIZ. OUTPUT	10	19	V.C.O. INPUT
S. SANDCASTLE OUTPUT	11	18	V.C.O. OUTPUT
HORIZ. FLY-BACK INPUT	12	17	V.C.O. 90° REF
HORIZ. SAW-TOOTH	13	16	PHASE COMPARATOR Ø 2 CAPACITOR
CURRENT REFERENCE	14	15	STARTING AND SAFETY CAPACITOR

TEA 2029 C

H.1102

- 1 - IS Transformer demagnetization sensing input  
 2 - IN Secondary pulses input  
 3 - IMAX Power transistor current limitation input  
 4 - GND Ground  
 5 - GND Ground  
 6 - E Error amplifier input (invertin)  
 7 - S Error amplifier output  
 8 - C2 Overload integration capacitor



- 9 - C1 Soft-start capacitor  
 10 - CO Oscillator capacitor  
 11 - RO Oscillator resistor  
 12 - GND Ground  
 13 - GND Ground  
 14 - OUT Power output  
 15 - V+ Positive output stage supply  
 16 - VCC Power supply

TEA 2260

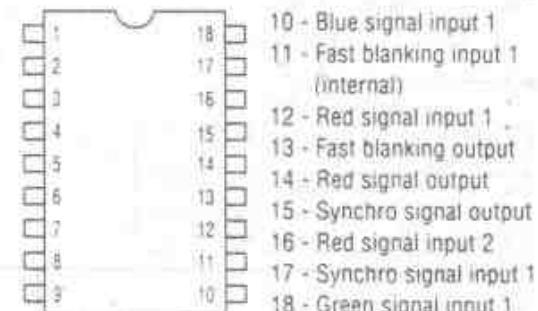
H.1103



TL 188

H.1104

- 1 - Synchro signal input 2  
 2 - Green signal input 2  
 3 - 'C' select input  
 4 - Green signal output  
 5 - Ground  
 6 - Blue signal output  
 7 - Shunt regulator supply input  
 8 - Blue signal input 2  
 9 - Fast blanking input 2 (external)



TEA 5115

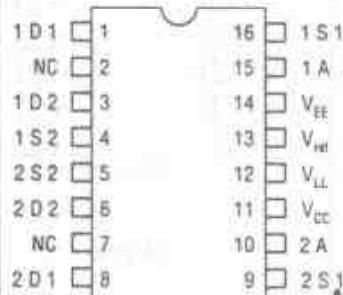
H.1105

- 1 - Synchro signal input 2  
 2 - Green signal input 2  
 3 - 'C' select input  
 4 - Green signal output  
 5 - Ground  
 6 - Blue signal output  
 7 - Shunt regulator supply input  
 8 - Blue signal input 2  
 9 - Fast blanking input 2



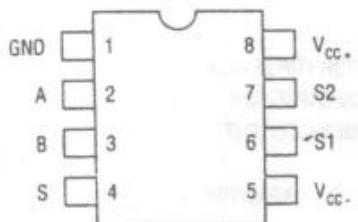
TEA 5116

H.1106



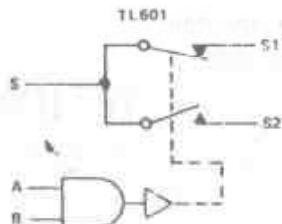
H.1107

TL 191



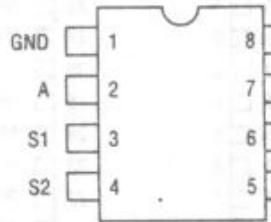
H.1108

TL 601



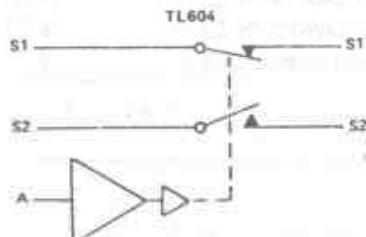
FUNCTION TABLE

LOGIC INPUTS		ANALOG SWITCH	
A	B	S1	S2
L	X	OFF (OPEN)	ON (CLOSED)
X	L	OFF (OPEN)	ON (CLOSED)
H	H	ON (CLOSED)	OFF (OPEN)



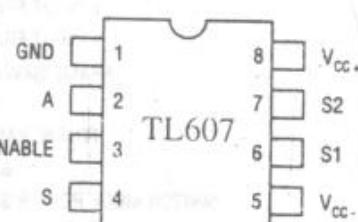
H.1109

TL 604



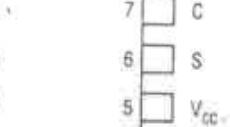
FUNCTION TABLE

LOGIC INPUT		ANALOG SWITCH	
A		S1	S2
H		ON (CLOSED)	OFF (OPEN)
L		OFF (OPEN)	ON (CLOSED)



H.1110

TL 607



H.1111

TL 610

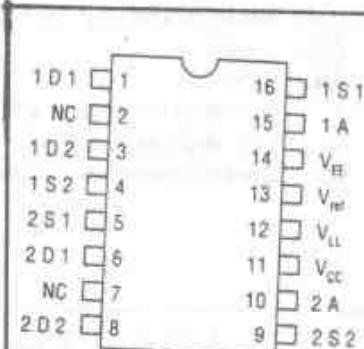
FUNCTION TABLE

LOGIC INPUT		ANALOG SWITCH	
A		S1	S2
H		ON (CLOSED)	OFF (OPEN)
L		OFF (OPEN)	ON (CLOSED)

INPUTS		ANALOG SWITCH	
A	ENABLE	S1	S2
X	L	OFF (OPEN)	OFF (OPEN)
L	H	OFF (OPEN)	ON (CLOSED)
H	H	ON (CLOSED)	OFF (OPEN)

H = high logic level  
L = low logic level  
X = irrelevant

Switch positions shown are for all inputs high



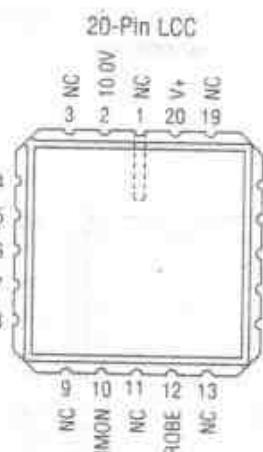
TL 185

H.1112

Q0	1	16	V <sub>CC</sub>
Q1	2	15	REGULATOR
Q2	3	14	TIME BASE
Q3	4	13	R/C
Q4	5	12	MODULATION
Q5	6	11	TRIGGER
Q6	7	10	RESET
Q7	8	9	GND

UA 2240

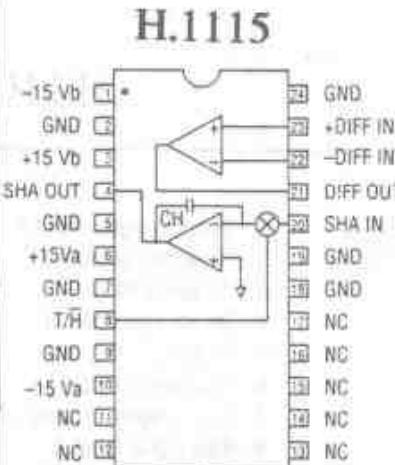
H.1113



NC = NO CONNECT

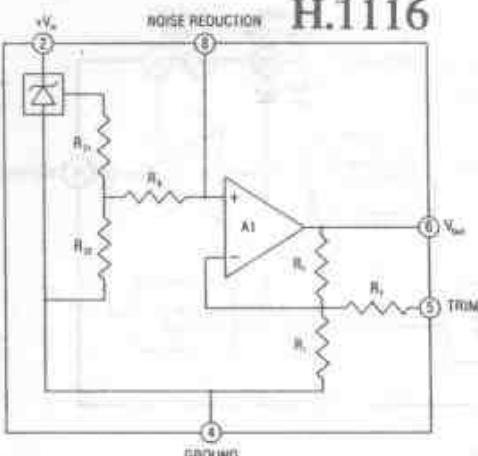
AD584

H.1114



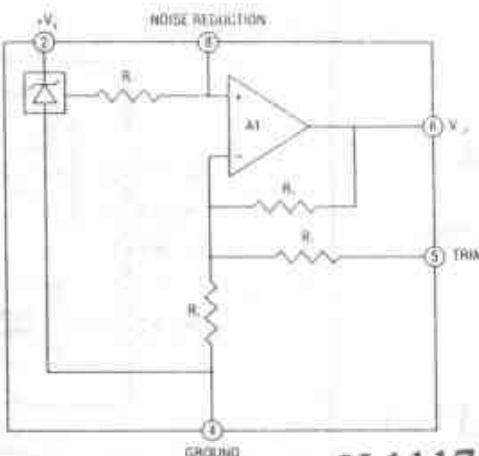
NC = NO CONNECT  
±15Vb = DIFF AMP ONLY  
±15Va = SHA ONLY

AD386



NOTE: PINS 1, 3 & 7 ARE INTERNAL TEST POINTS.  
MAKE NO CONNECTIONS TO THESE POINTS.

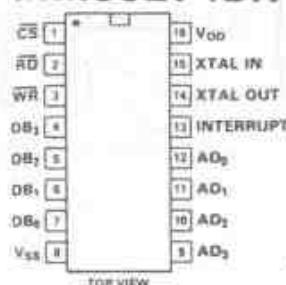
AG586 Functional Block Diagrams



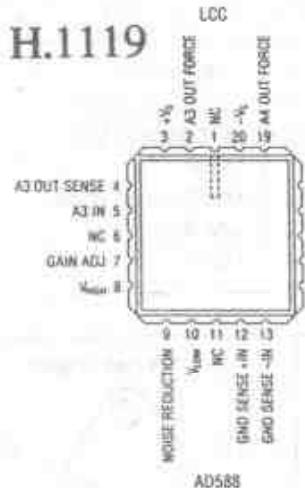
AD587 Functional Block Diagram

## AD587 Functional Block Diagram

MM58274BN



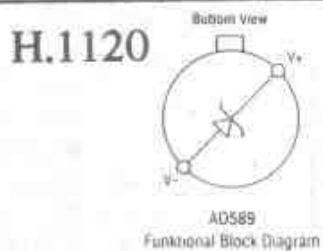
H.1118



DIP

A3 OUT FORCE	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 18	-V <sub>1</sub>
	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 15	A4 OUT FORCE
A3 OUT SENSE	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 14	A4 OUT SENSE
	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> 13	A4 +IN
A3 +IN	<input type="checkbox"/> 5	<input checked="" type="checkbox"/> 12	BAL ADJ.
GAIN ADJ.	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 11	V <sub>C1</sub>
V <sub>REF</sub>	<input type="checkbox"/> 7	<input checked="" type="checkbox"/> 10	GND SENSE -IN
NOISE REDUCTION	<input type="checkbox"/> 8	<input checked="" type="checkbox"/> 9	GND SENSE +IN
V <sub>DD</sub>			

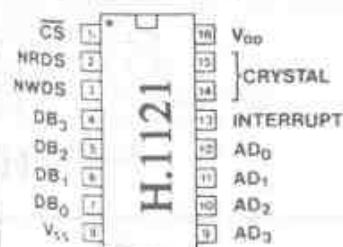
AD 588



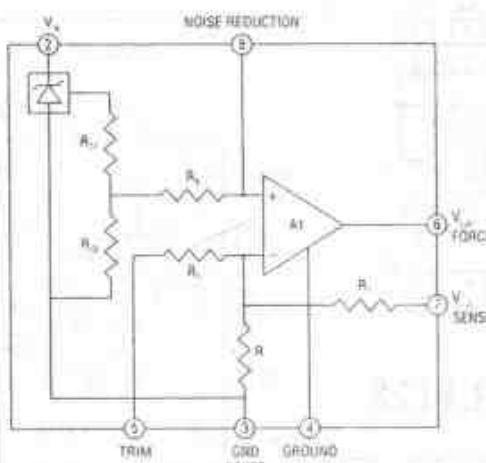
## ADS89

### Functional Block Diagram

-MM58174AN

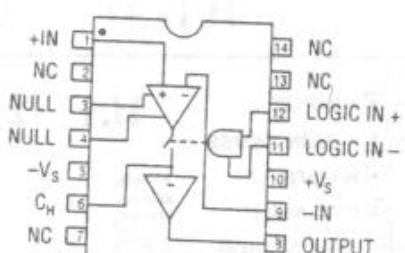


H.1122 b

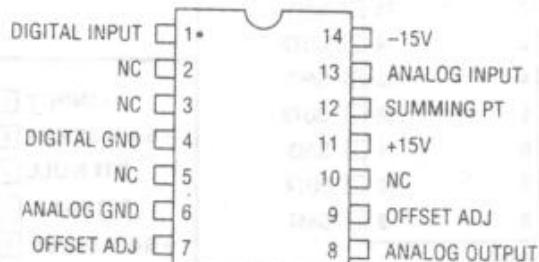


ADS-B9 Functional Flow Specification

H.1122



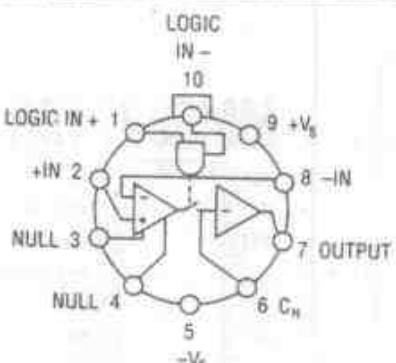
AD582



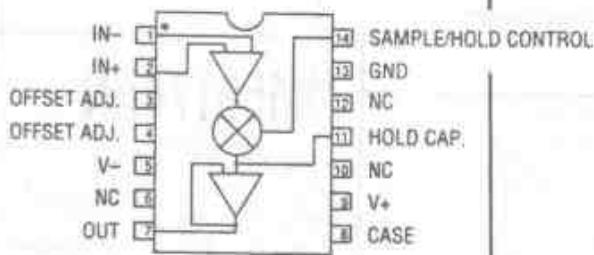
AD 389

H.1123

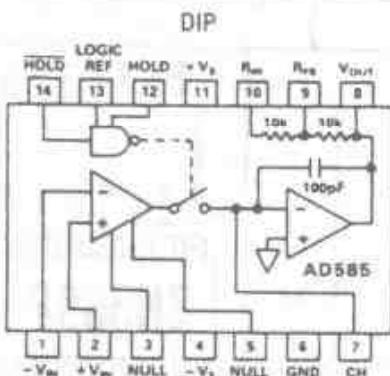
H.1124



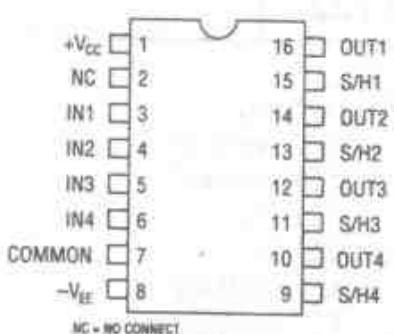
H.1125



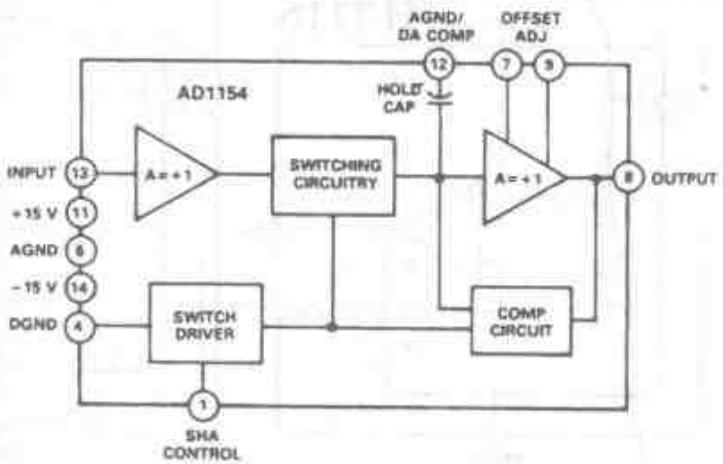
H.1126



H.1128



H.1130



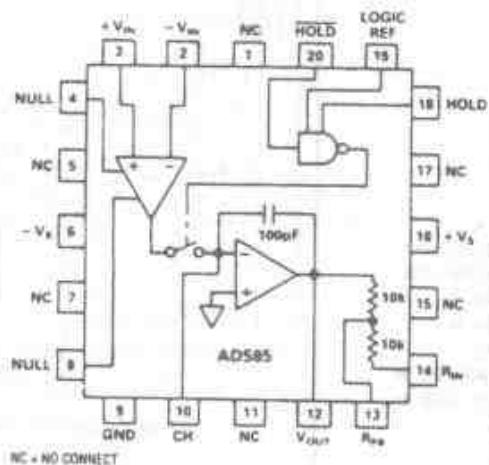
AD1154

H.1127

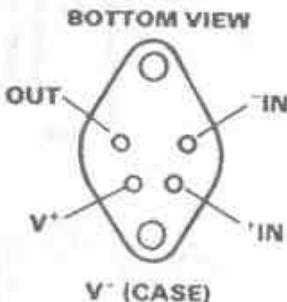
PIN DESIGNATIONS

PIN	DESCRIPTION	PIN	DESCRIPTION
1	SHA CONTROL	8	SHA OUTPUT
2	NO CONNECTION	9	OFFSET ADJUST
3	NO CONNECTION	10	NO CONNECTION
4	DIGITAL GROUND	11	+15 V
5	NO CONNECTION	12	ANA GND/DA COMP
6	ANALOG GROUND	13	SHA INPUT
7	OFFSET ADJUST	14	-15 V

LCC/PLCC PACKAGE

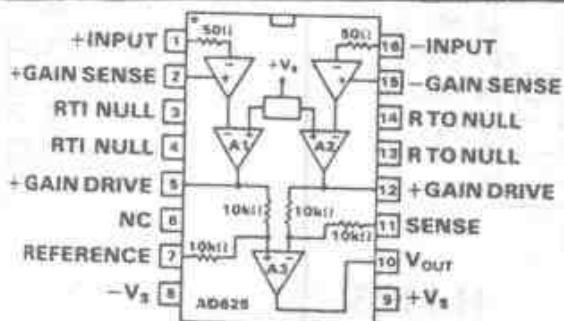


AD585



LM12CLK

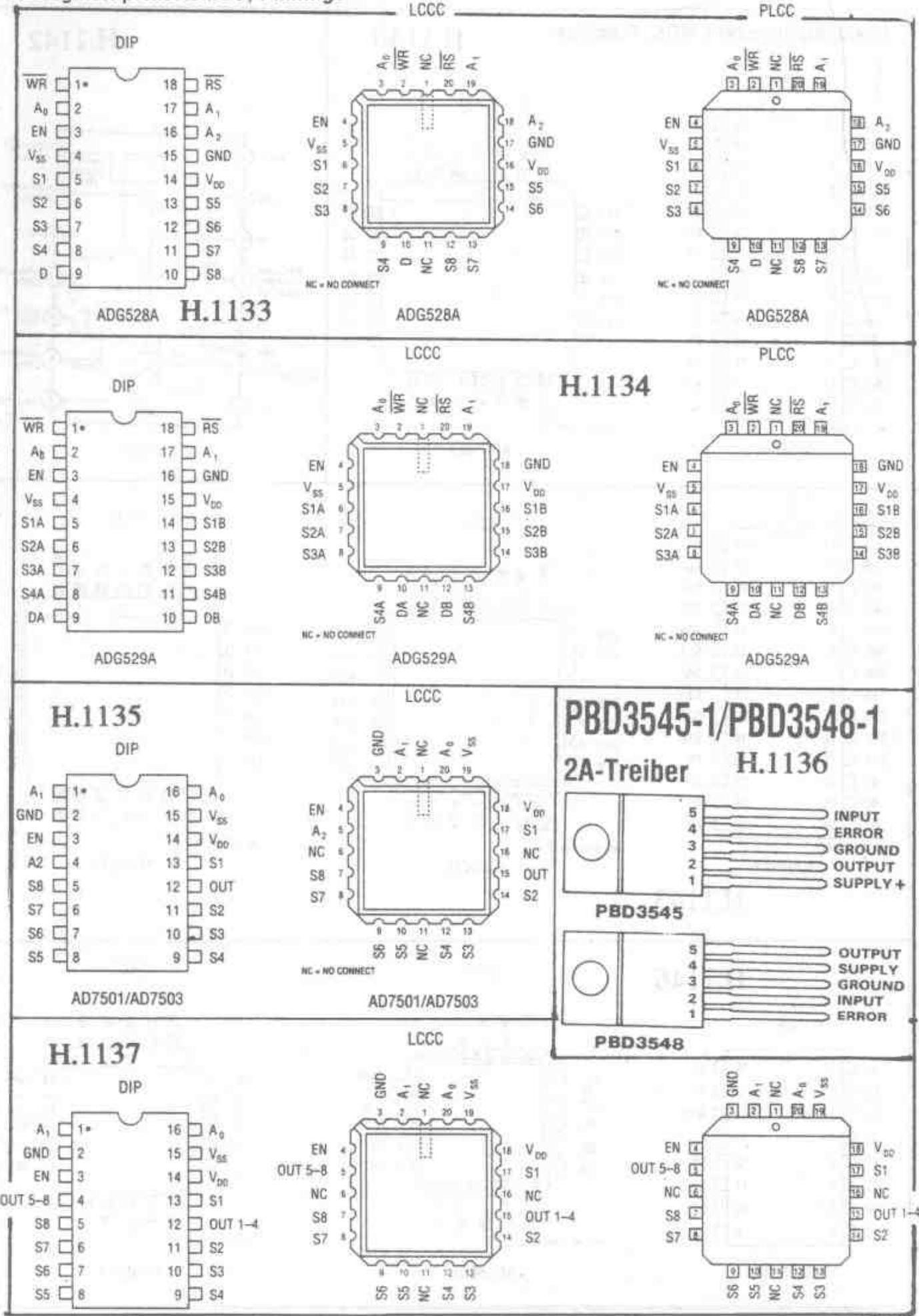
H.1131



H.1132

AD625JN

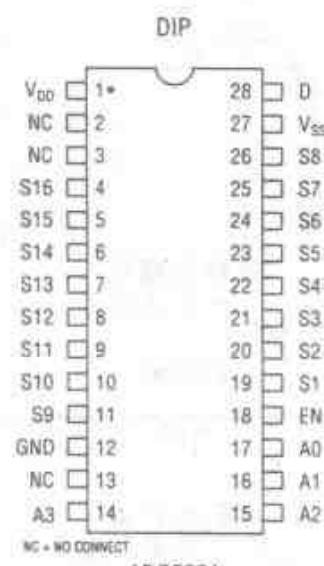
## Analogmultiplexer CMOS, Pinnings



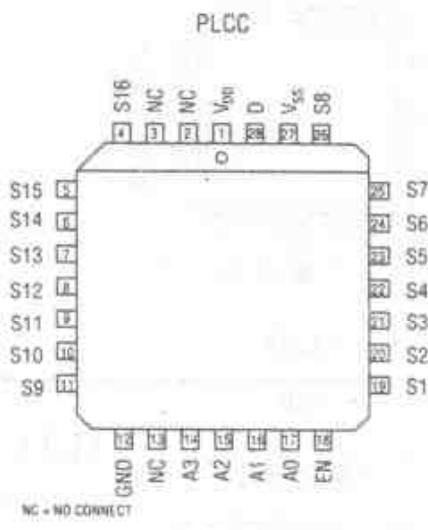
## Analogmultiplexer CMOS, Pinnings

H.1140

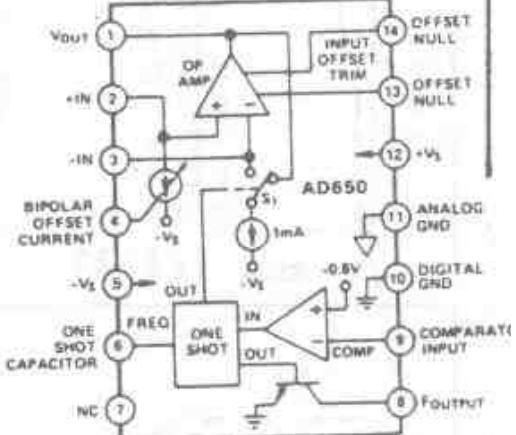
H.1142



ADG506A



ADG506A

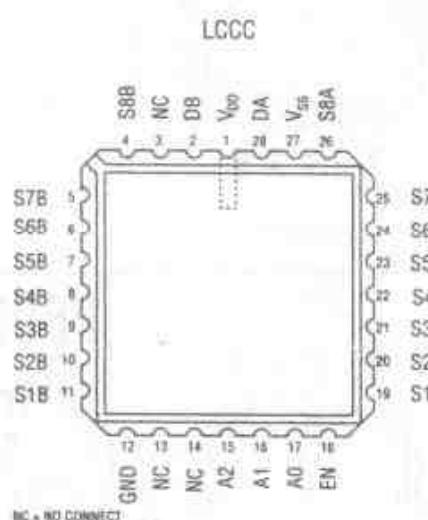


AD650



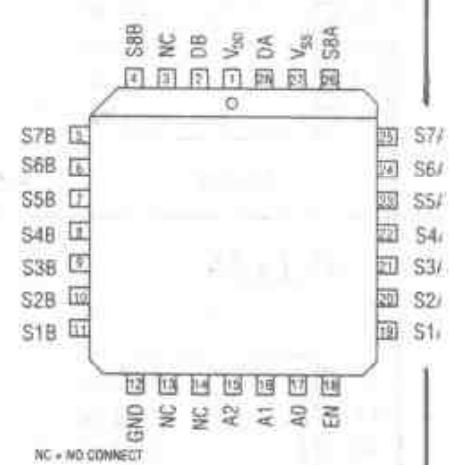
MC = NO CONNECT

ADG507A



Indra Connect

ADG507A

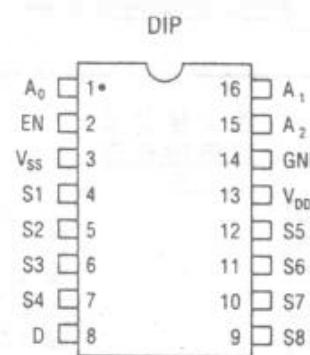


NC = NO CONNECT

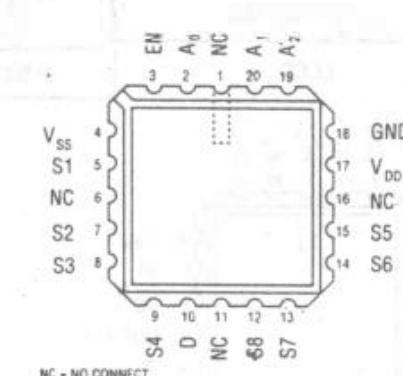
ADG507A

H.1143

H.1146

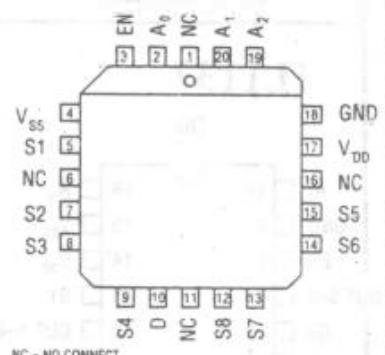


ADG508A



NC = NO CONNECT

ADG508A



NC - NO CONNECT

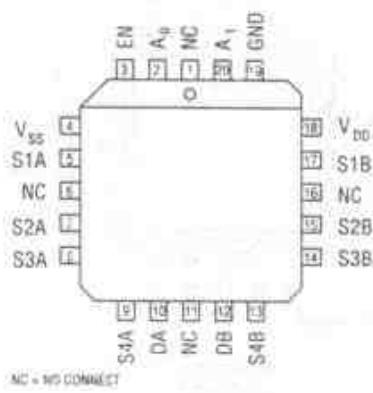
ADG508A

**H.1150**

DIP

A <sub>0</sub>	1*	16	A <sub>1</sub>
EN	2	15	GND
V <sub>SS</sub>	3	14	V <sub>DD</sub>
S1A	4	13	S1B
S2A	5	12	S2B
S3A	6	11	S3B
S4A	7	10	S4B
DA	8	9	DB

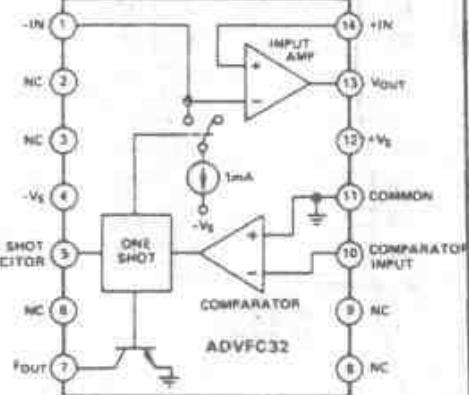
ADG509A



ADG509A

**H.1152**

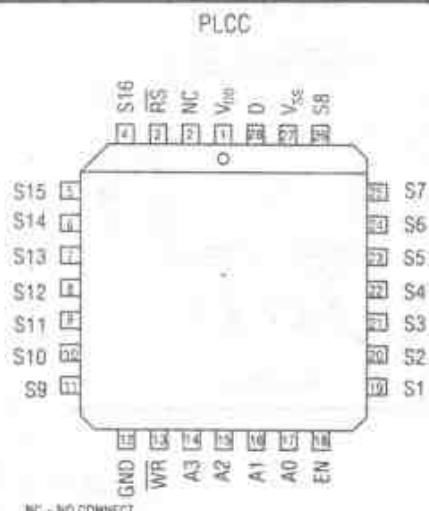
"N" PACKAGE



ADVFC32

V <sub>DD</sub>	1*	28	D
NC	2	27	V <sub>SS</sub>
RS	3	26	S8
S16	4	25	S7
S15	5	24	S6
S14	6	23	S5
S13	7	22	S4
S12	8	21	S3
S11	9	20	S2
S10	10	19	S1
S9	11	18	EN
GND	12	17	A0
WR	13	16	A1
A3	14	15	A2

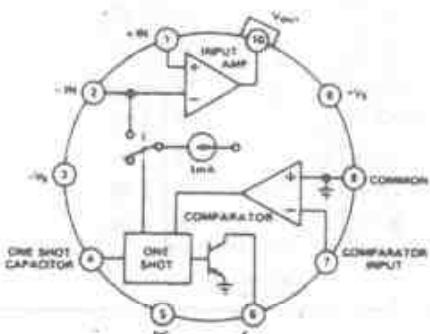
ADG526A



ADG526A

**H.1153**

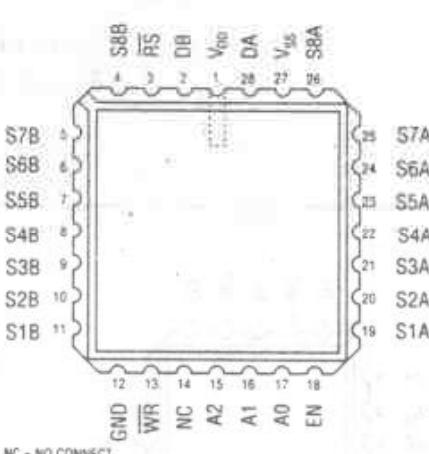
"H" PACKAGE - TO-100



ADVFC32

V <sub>DD</sub>	1*	28	DA
DB	2	27	V <sub>SS</sub>
RS	3	26	S8A
S8B	4	25	S7A
S7B	5	24	S6A
S6B	6	23	S5A
S5B	7	22	S4A
S4B	8	21	S3A
S3B	9	20	S2A
S2B	10	19	S1A
S1B	11	18	EN
GND	12	17	A0
WR	13	16	A1
NC	14	15	A2

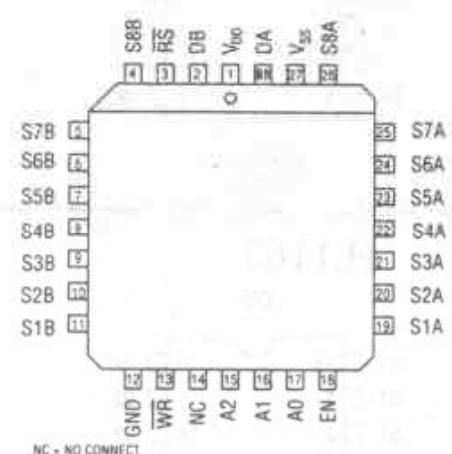
ADG527A



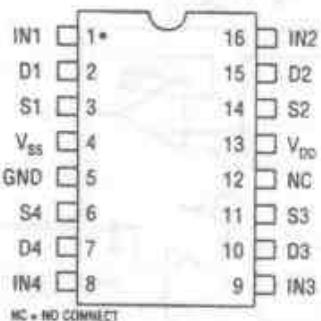
ADG527A

**H.1156**

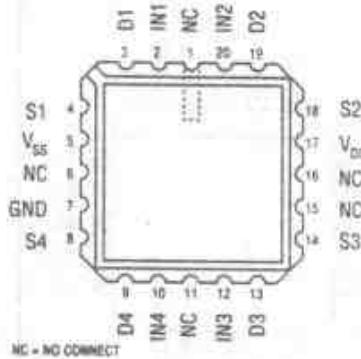
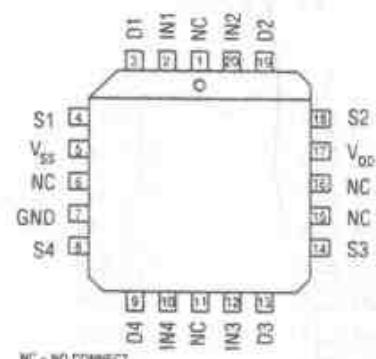
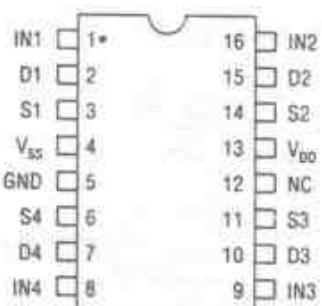
PLCC



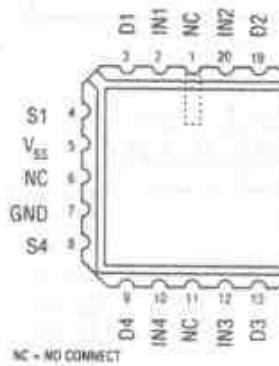
ADG527A

**H.1159 DIP**

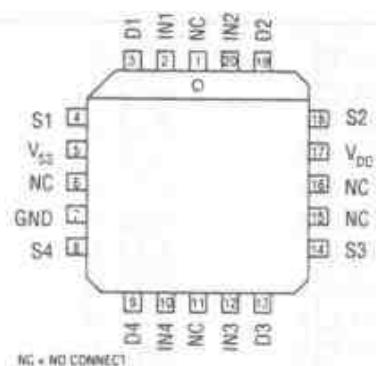
NC = NO CONNECT

ADG201A  
ADG202AADG201A  
ADG202AADG201A  
ADG202A**DIP**

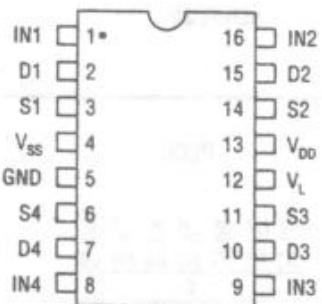
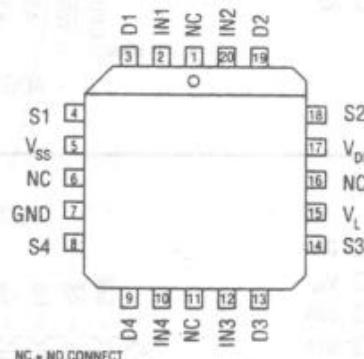
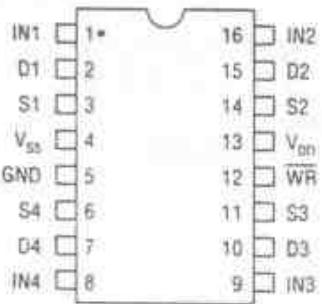
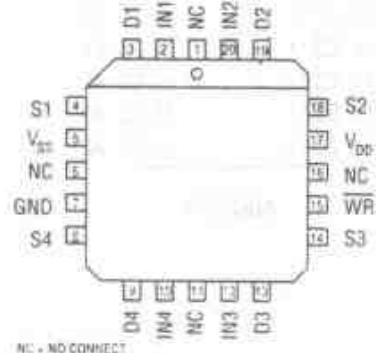
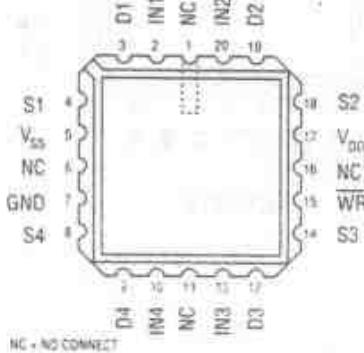
ADG201HS

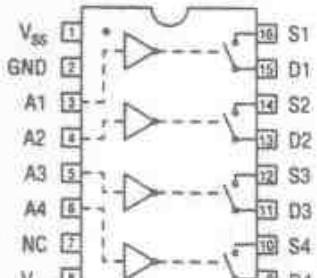
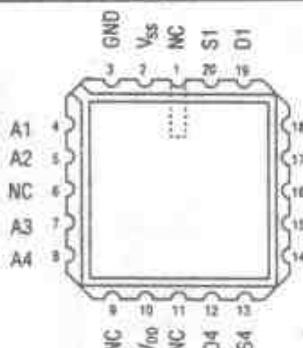
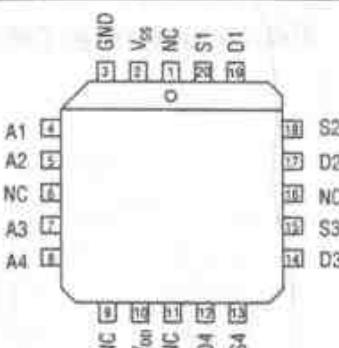
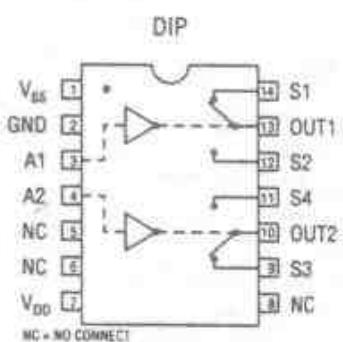


ADG201HS

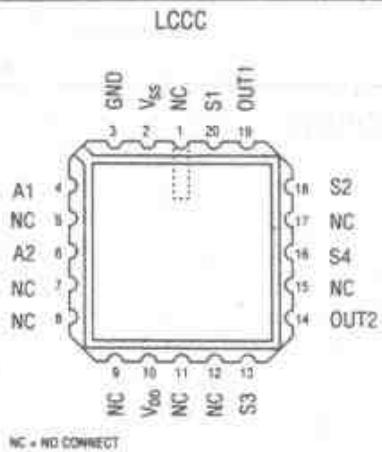


ADG201HS

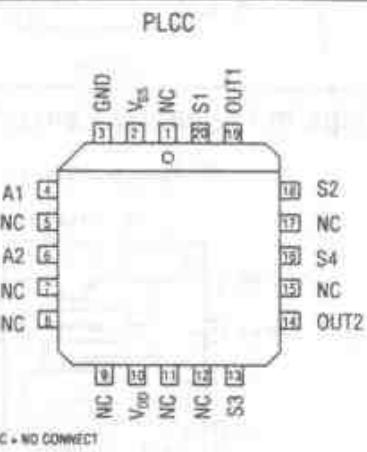
**DIP**ADG211A  
ADG212AADG211A  
ADG212A**H.1165****H.1167****DIP**ADG221  
ADG222ADG221  
ADG222

**H.1170 DIP**AD7510DI  
AD7511DIAD7510DI  
AD7511DIAD7510DI  
AD7511DI**H.1173**

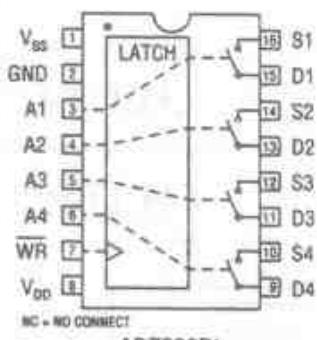
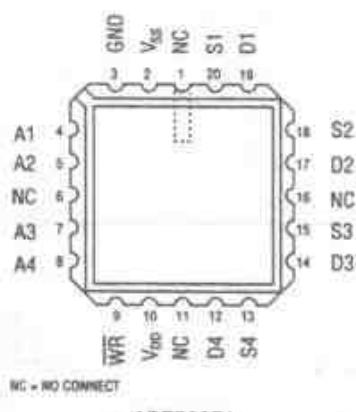
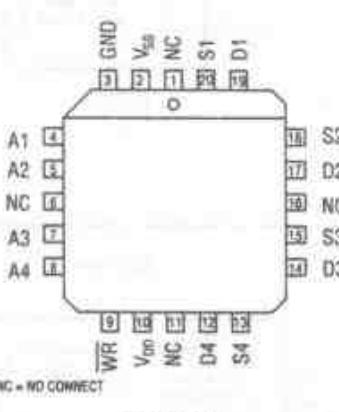
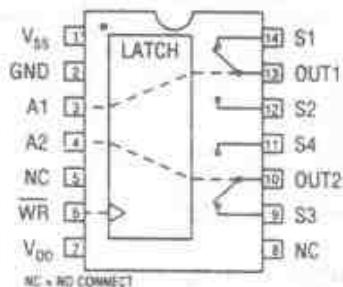
AD7512DI



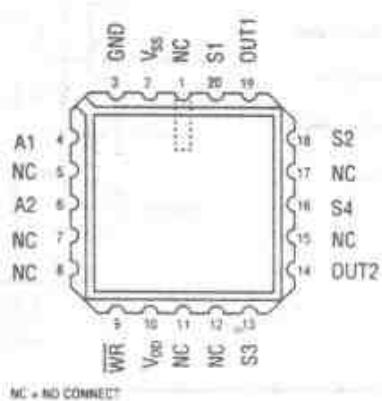
AD7512DI



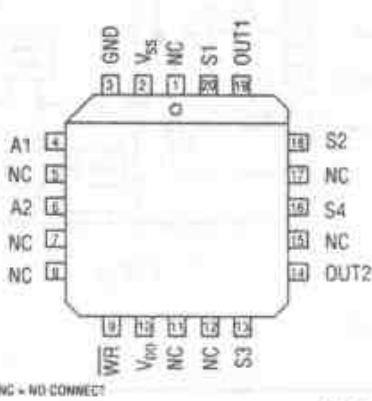
AD7512DI

**H.1176****16 PIN DIP**AD7590DI  
AD7591DIAD7590DI  
AD7591DIAD7590DI  
AD7591DI**H.1179****14 PIN DIP**

AD7592DI

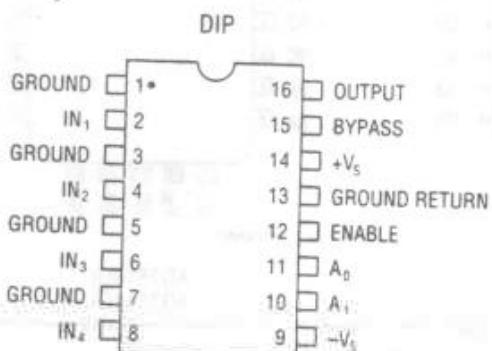


AD7592DI

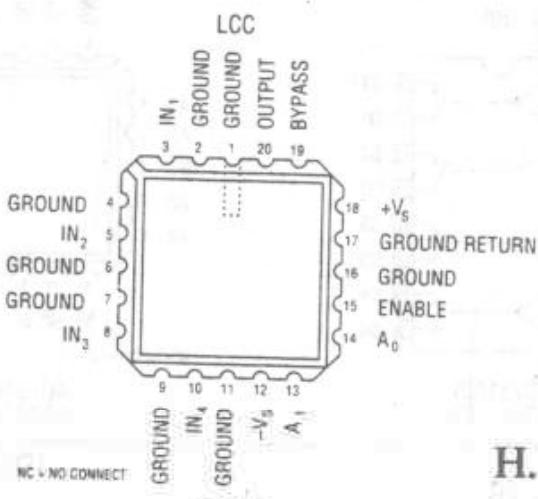


AD7592DI

## Video Multiplexer CMOS, Pinnings



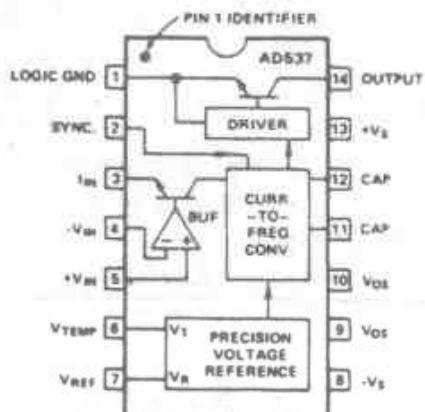
AD9300



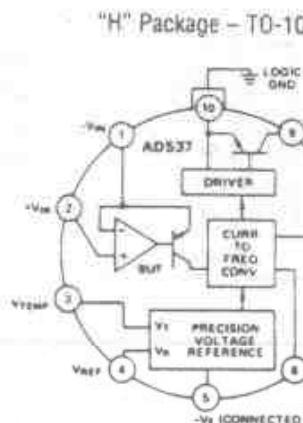
H.1182

## Voltage to Frequency Converter, Pinnings

"D" Package - TO-116



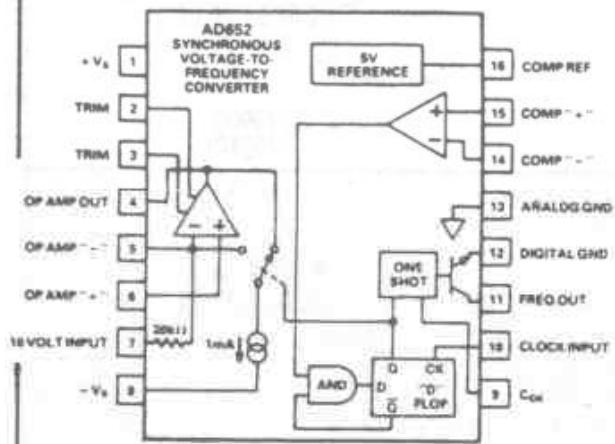
AD537



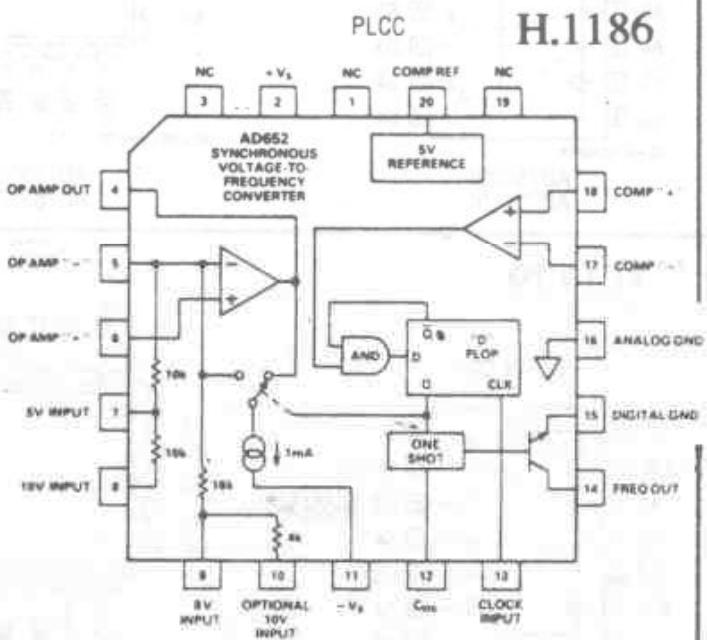
AD537

H.1184

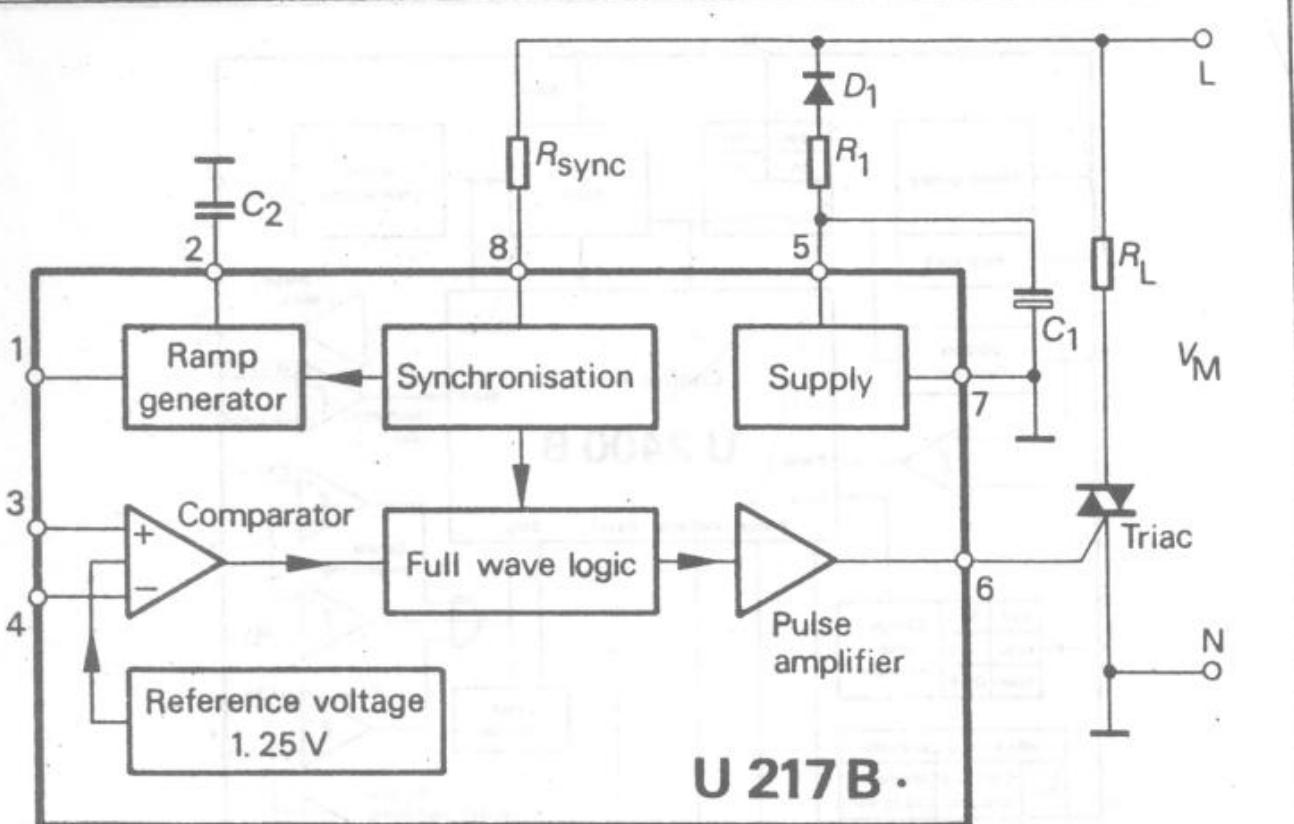
CERDIP



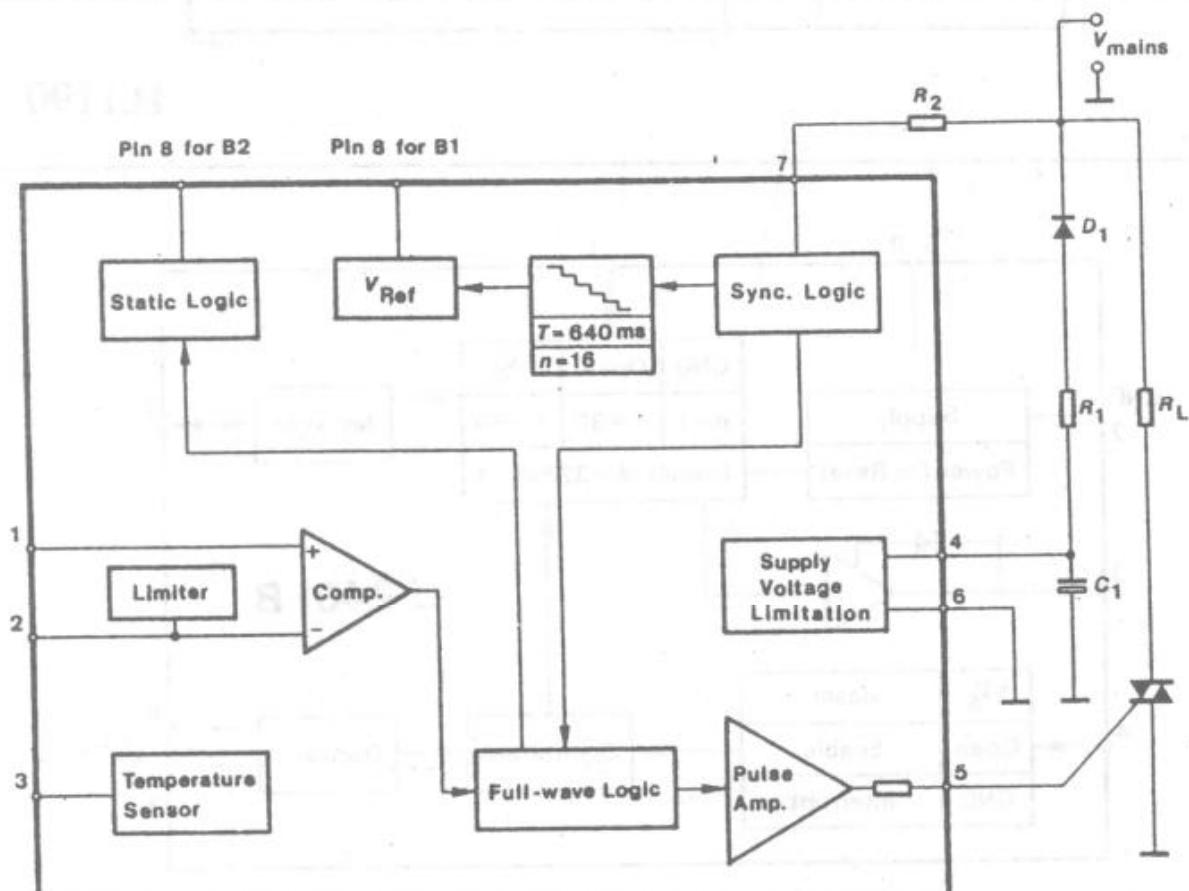
AD652



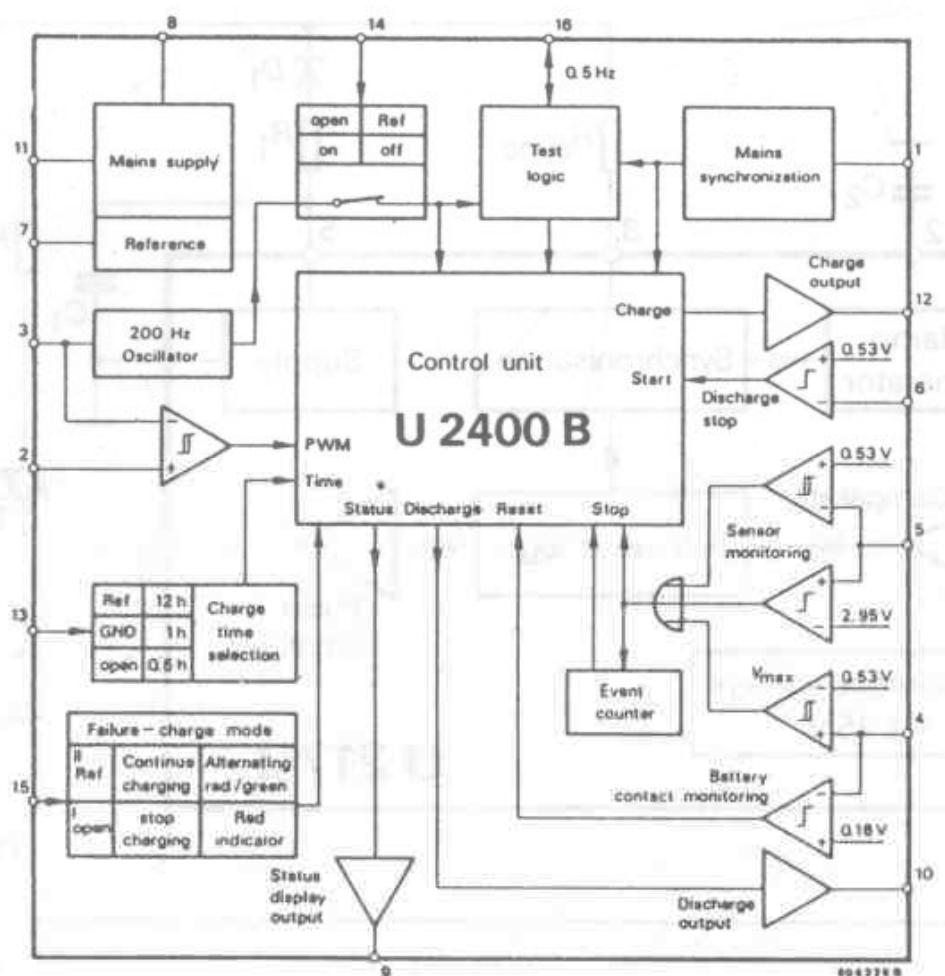
AD652



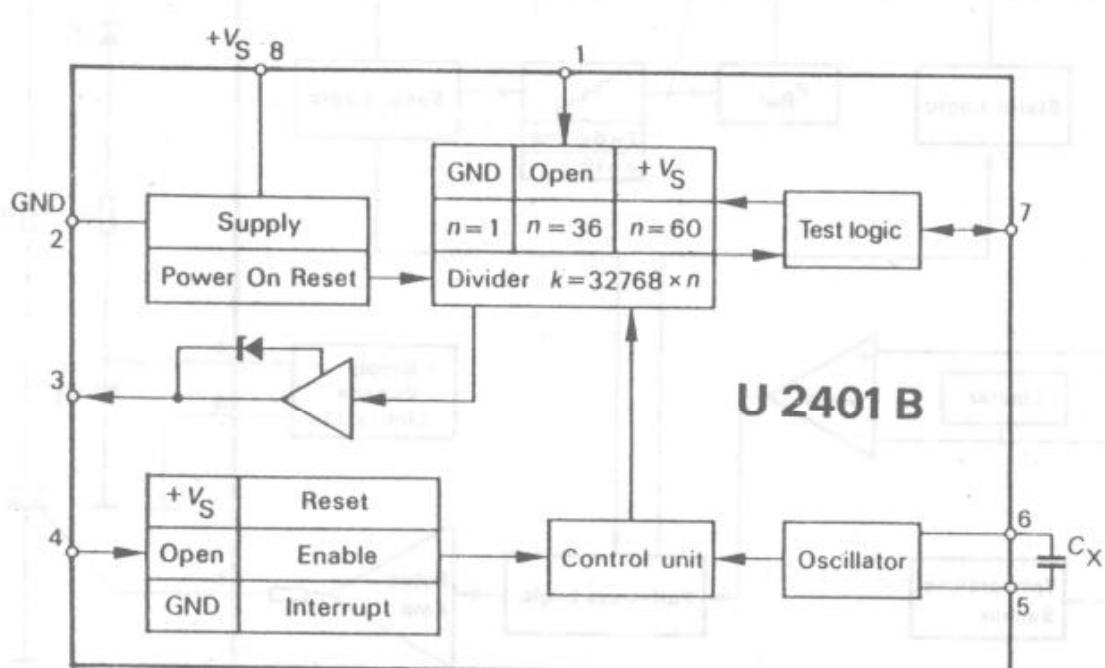
H.1188



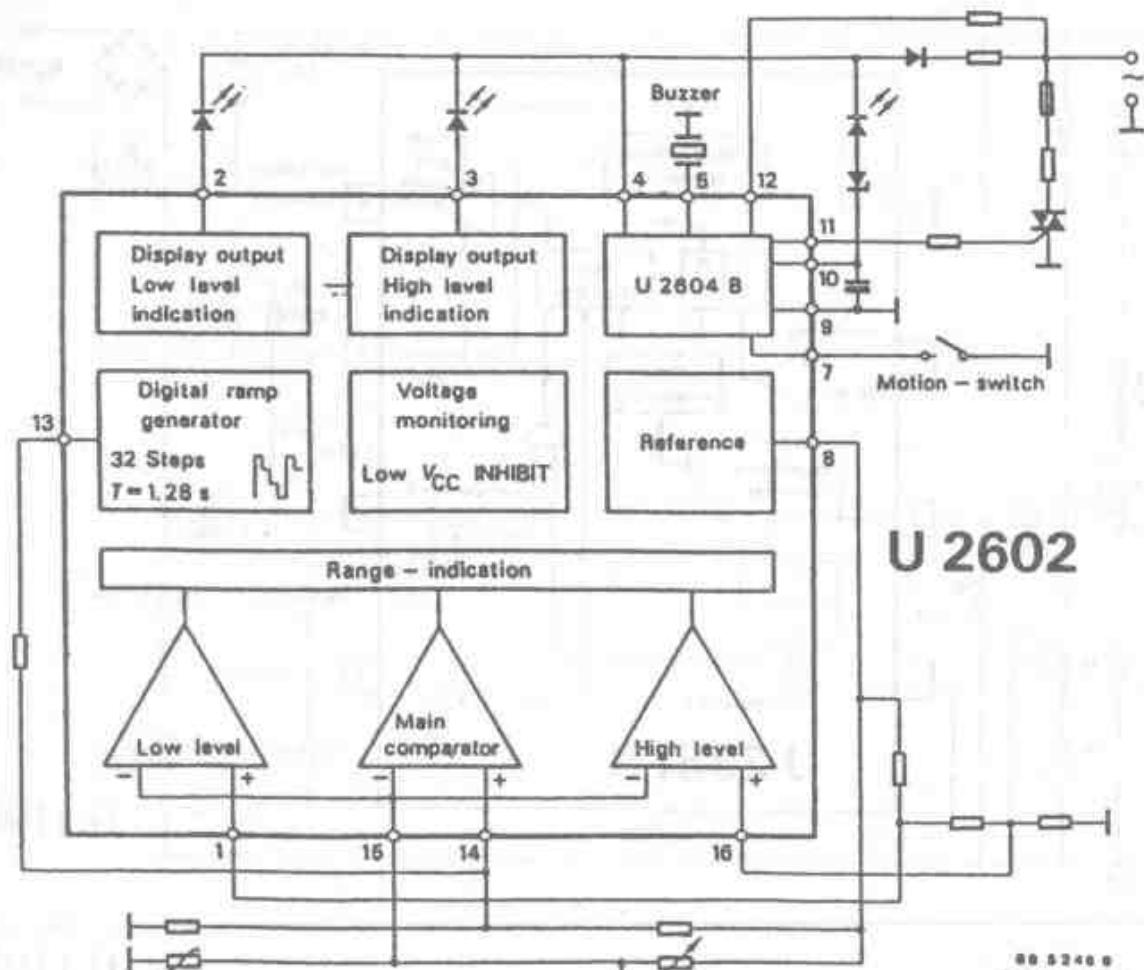
H.1189



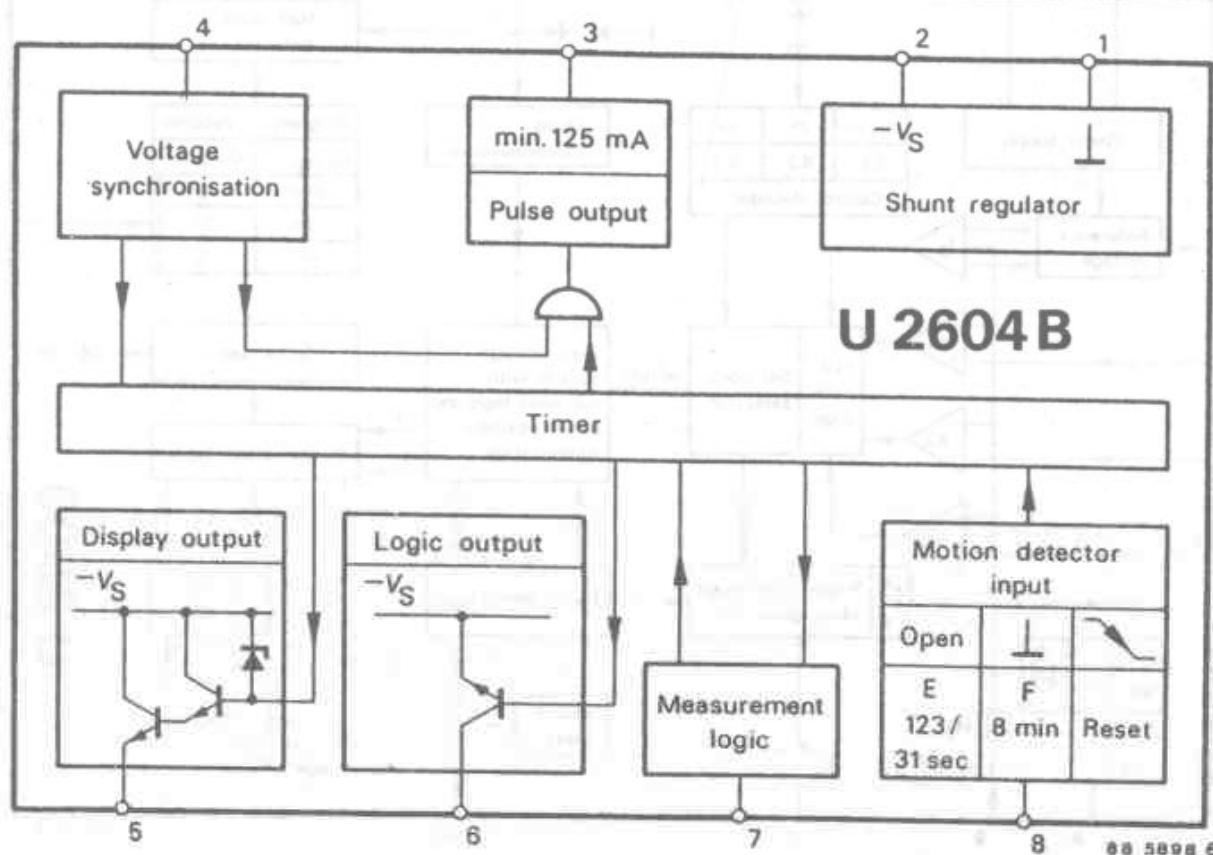
H.1190



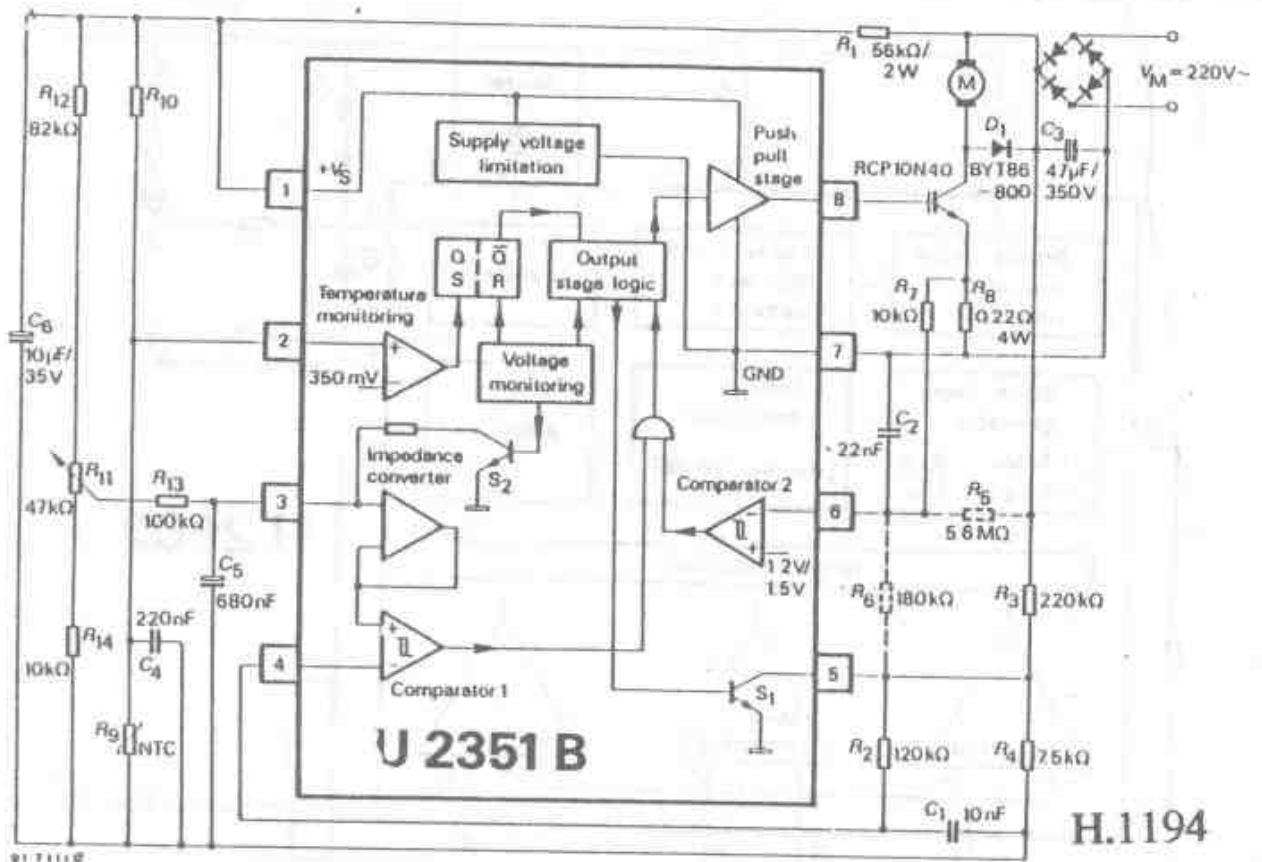
H.1191



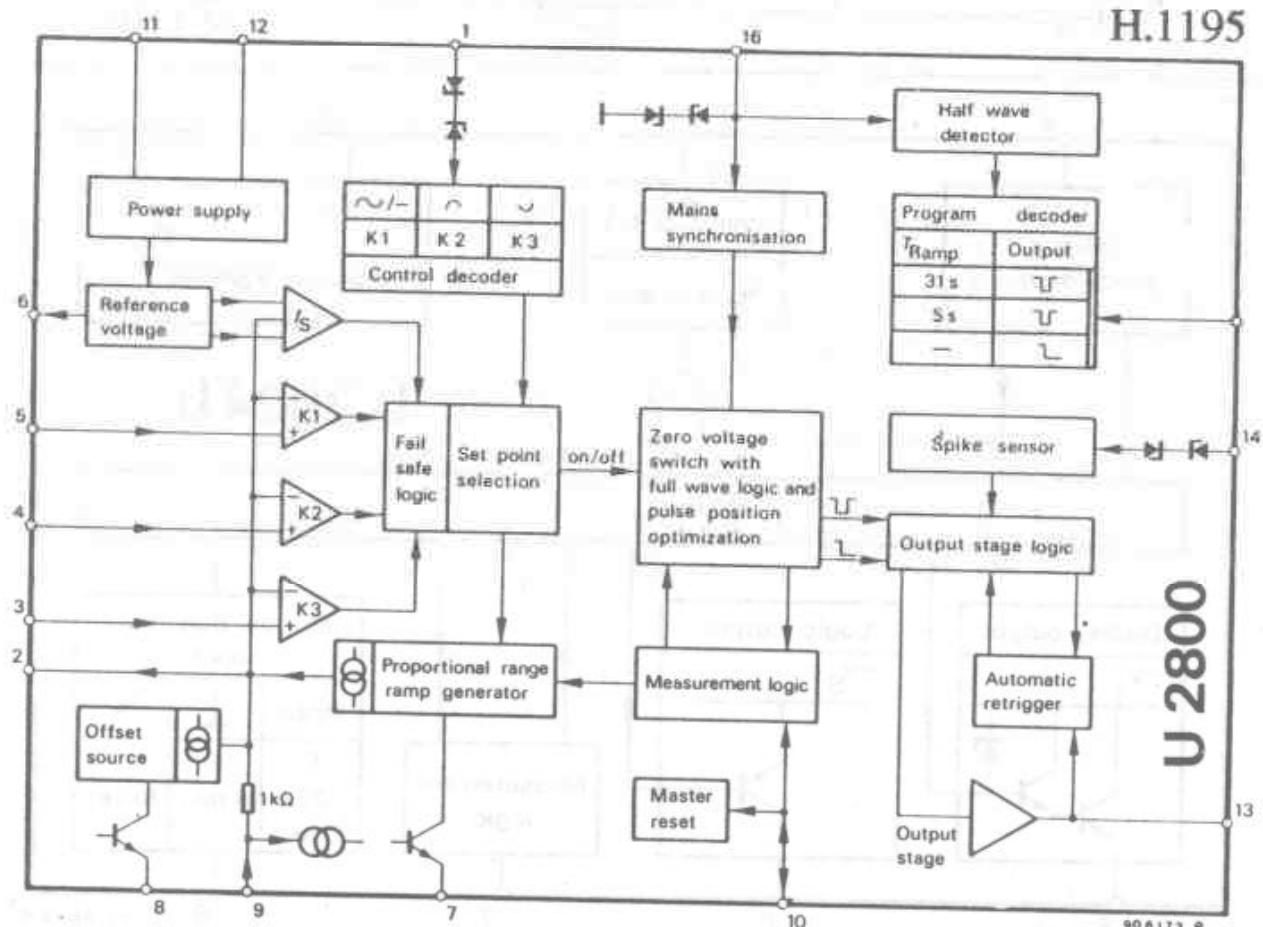
H.1192

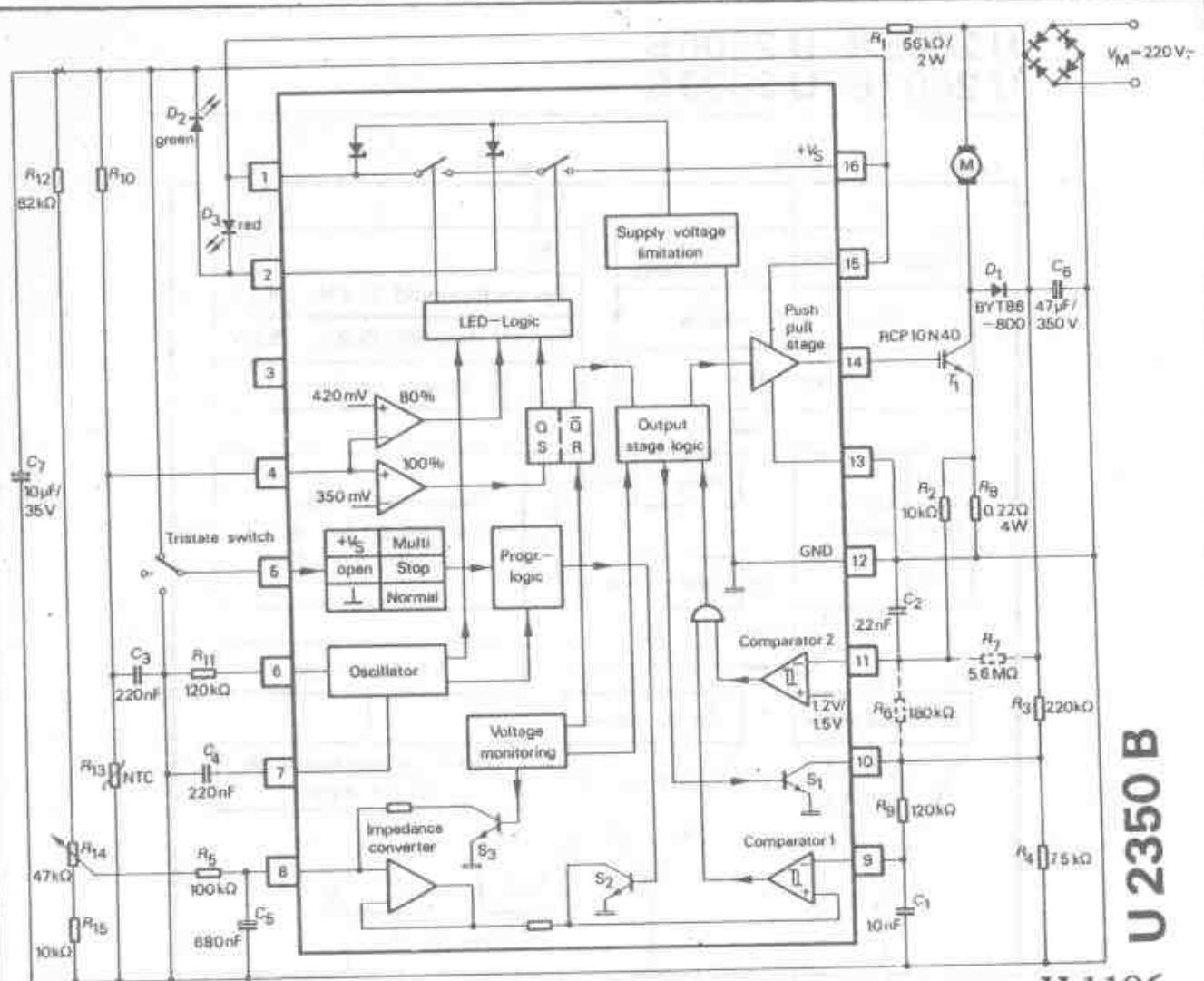


H.1193

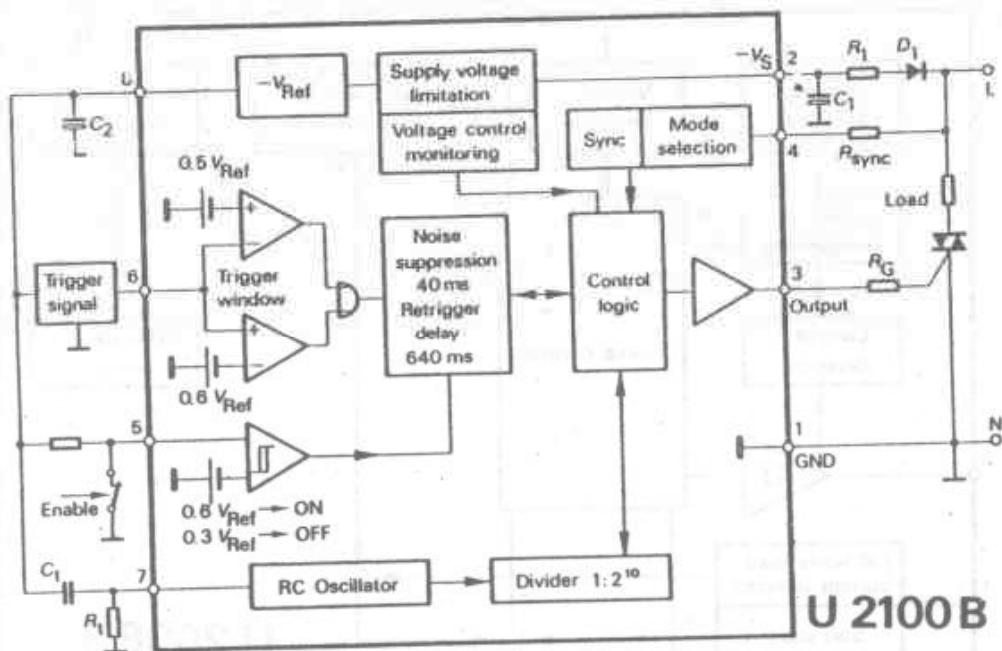


H.1194



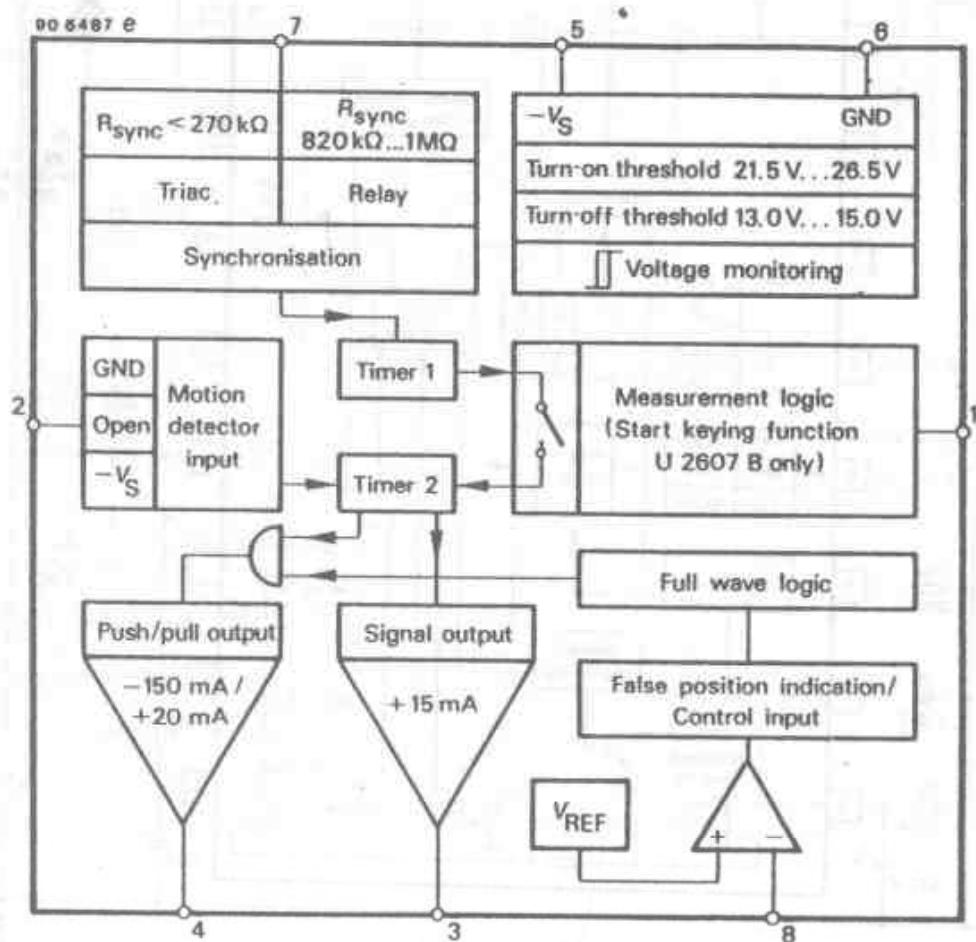


H.1196



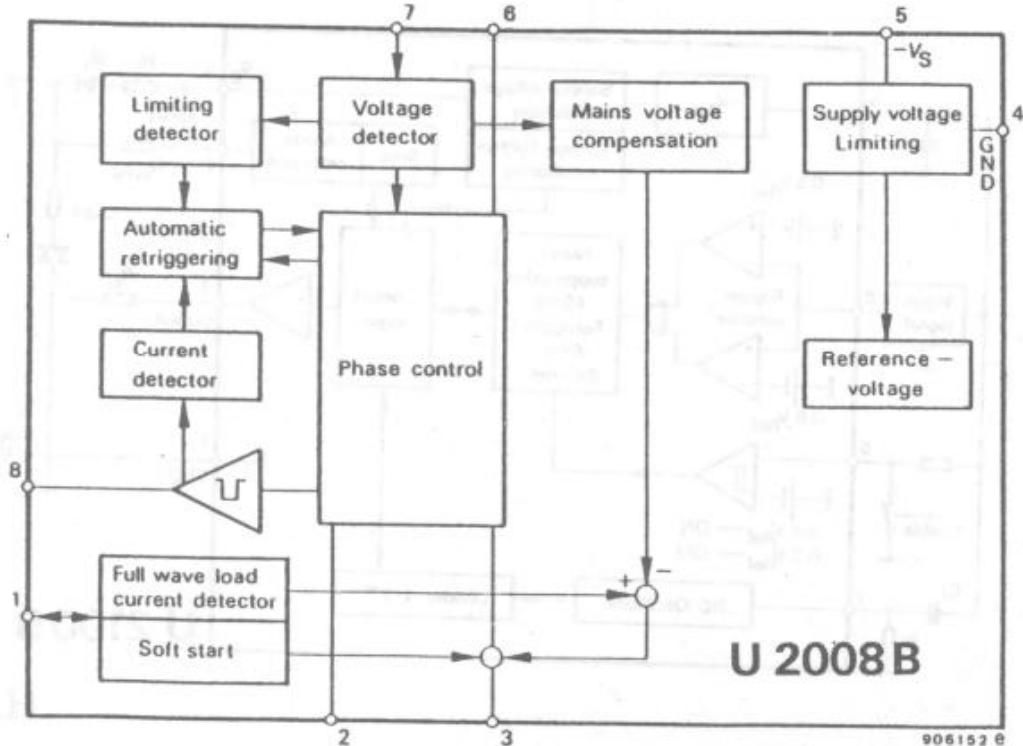
H.1197

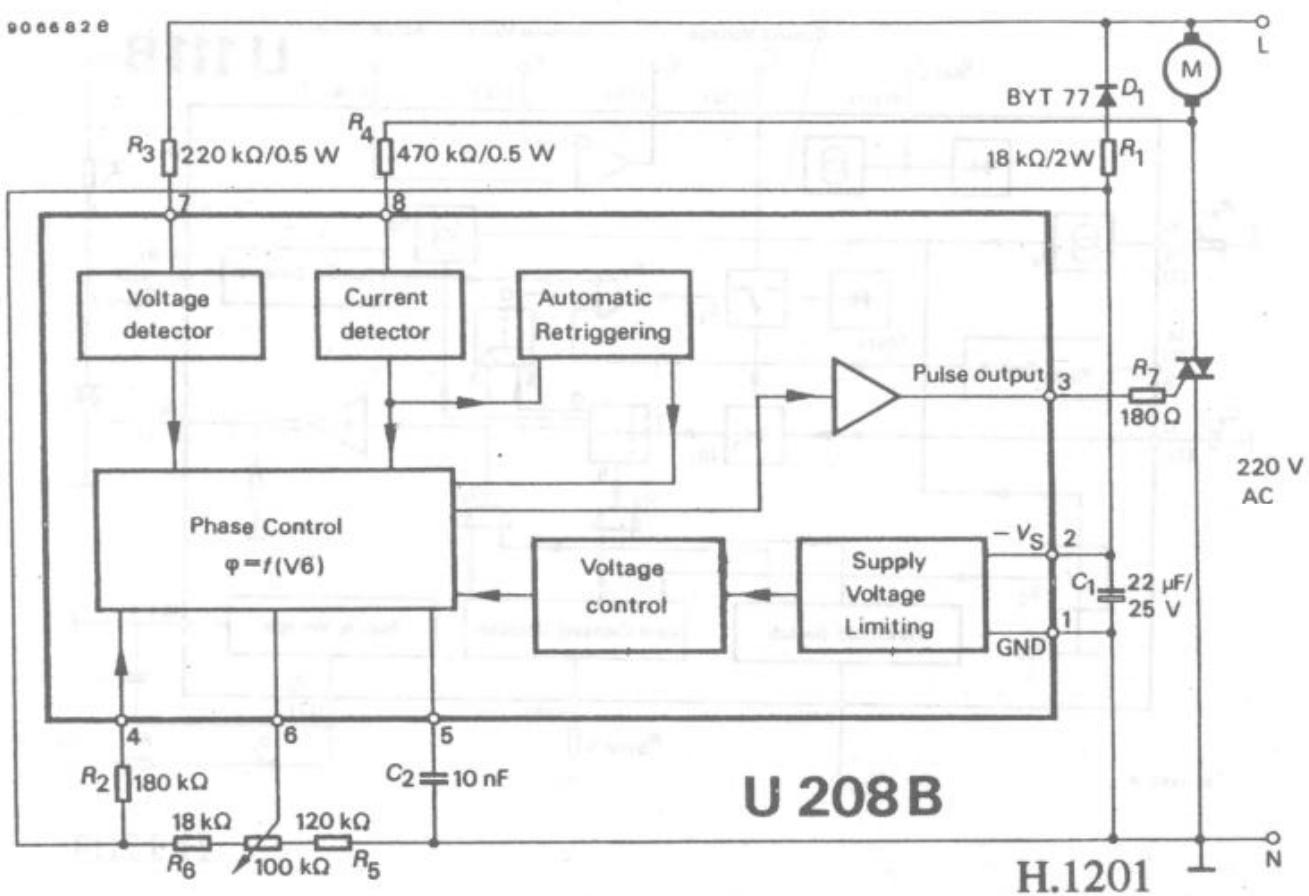
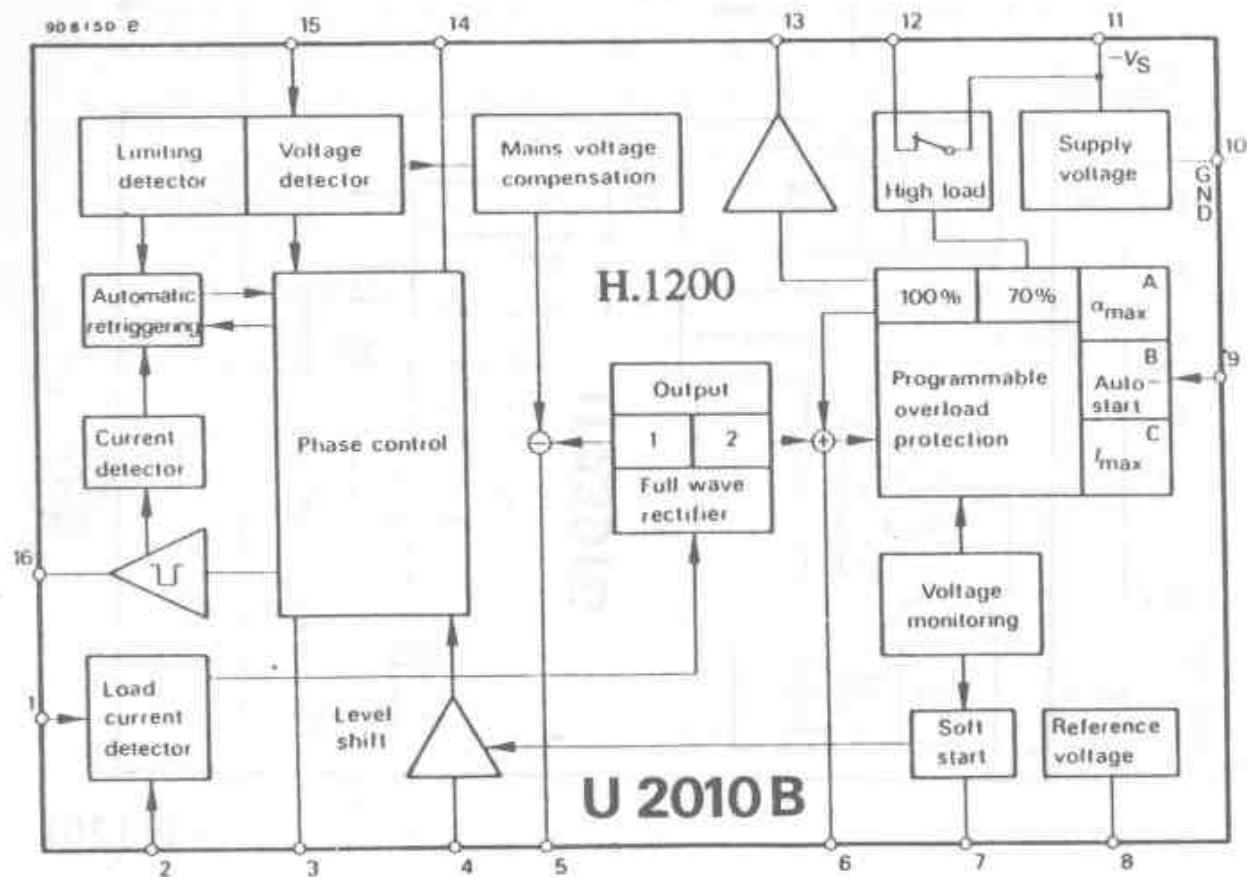
# U 2605B · U 2606B U 2607B · U 2608B

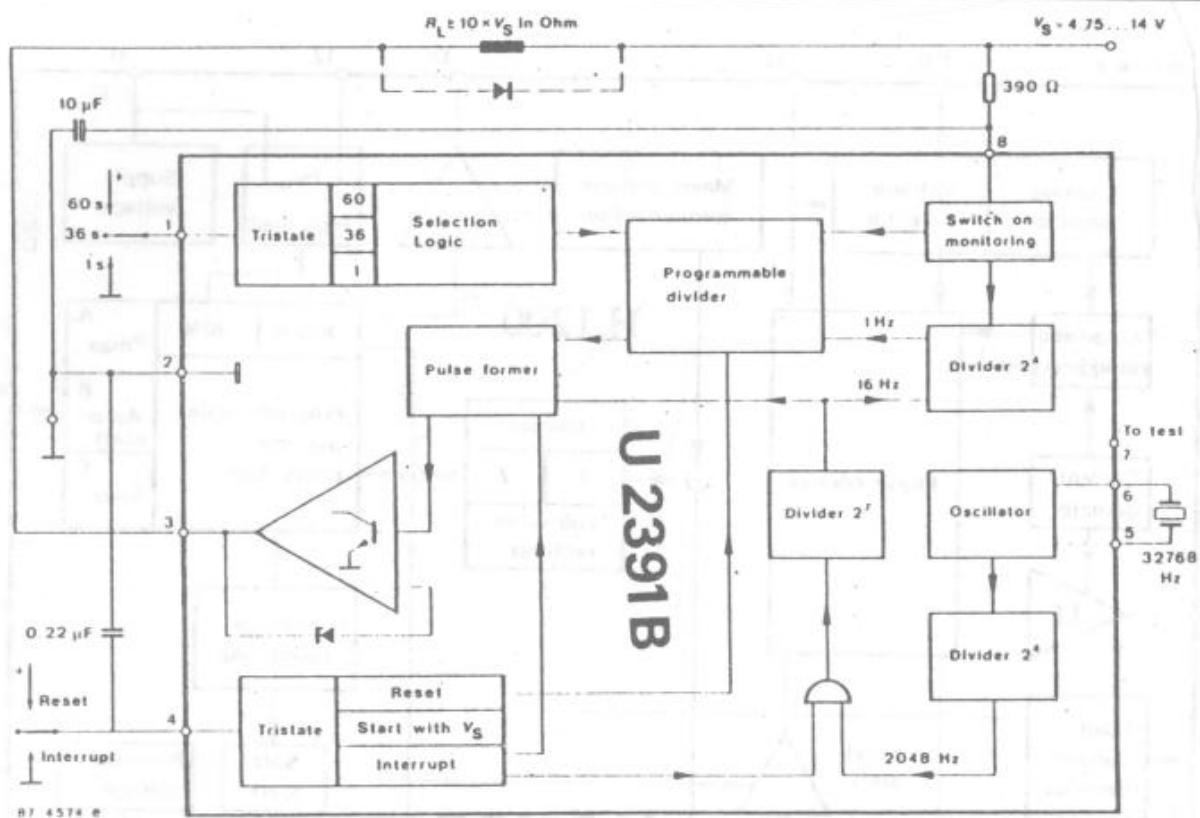


H.1198

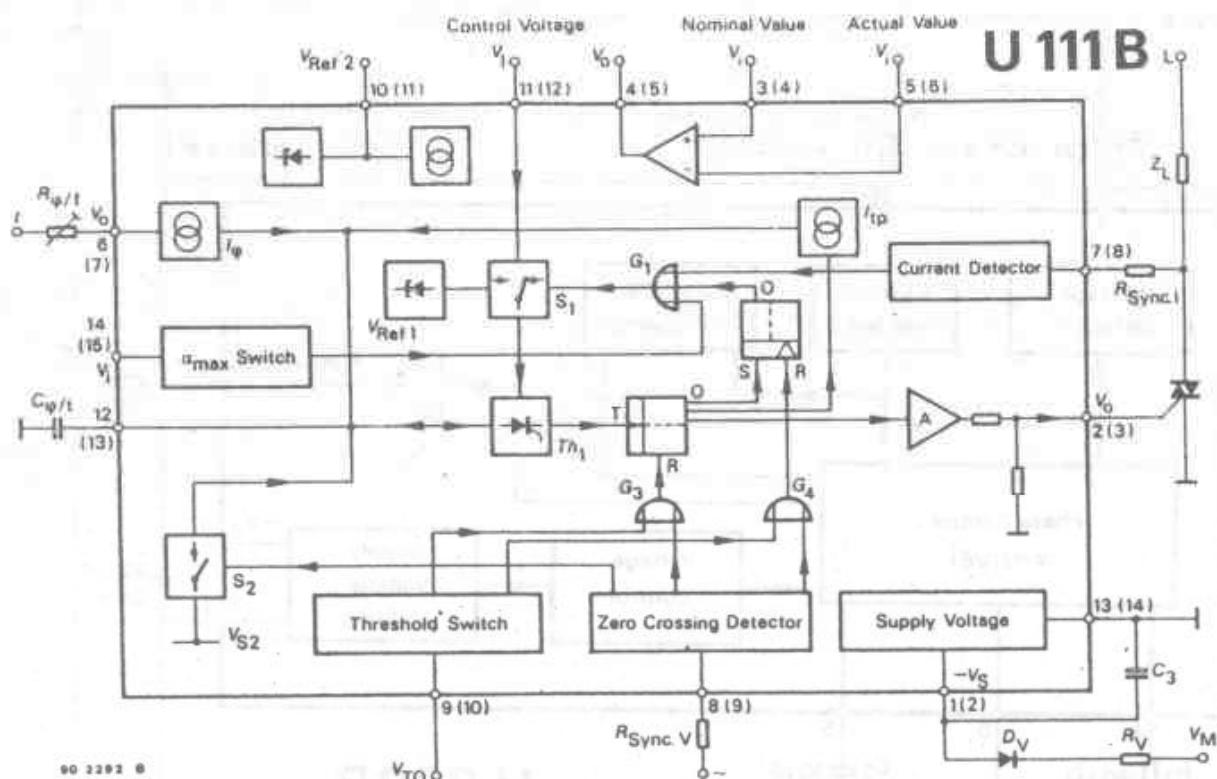
H.1199



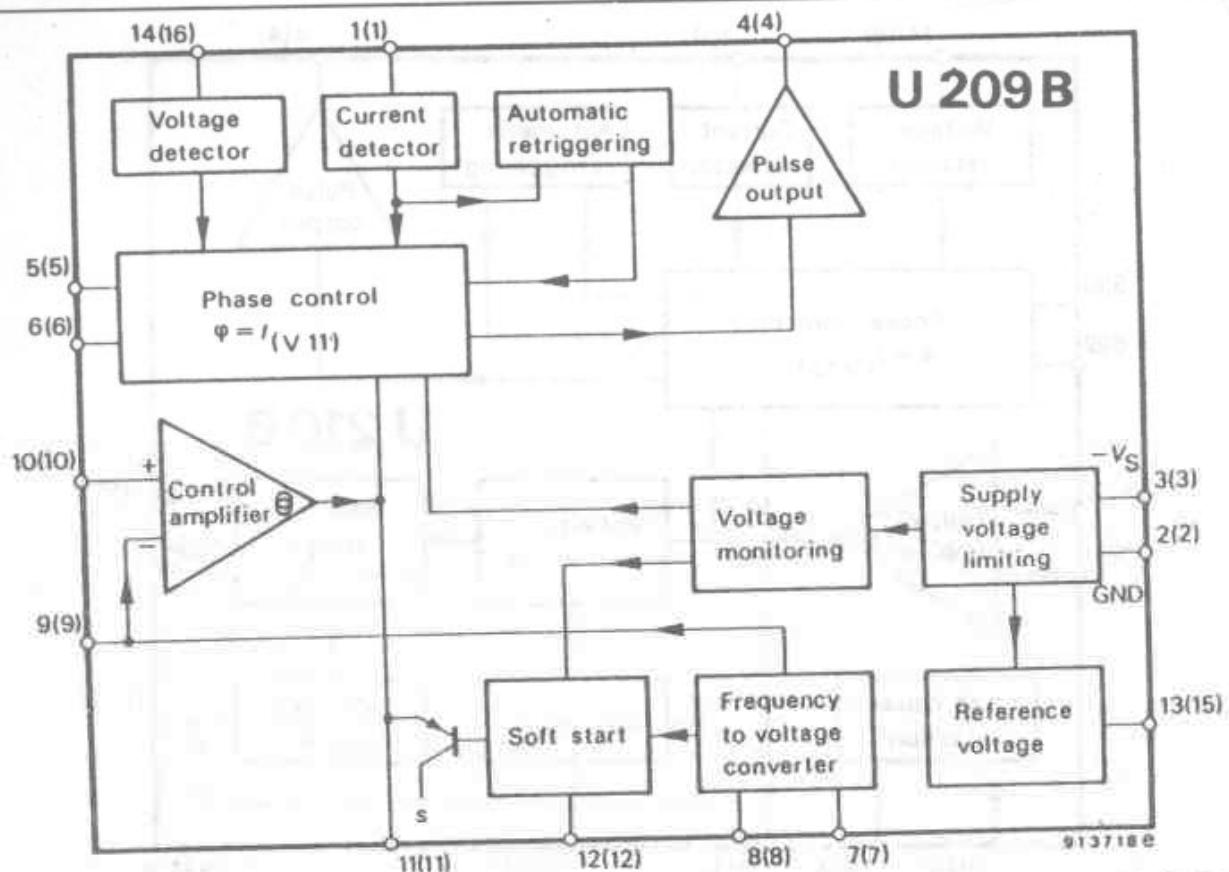




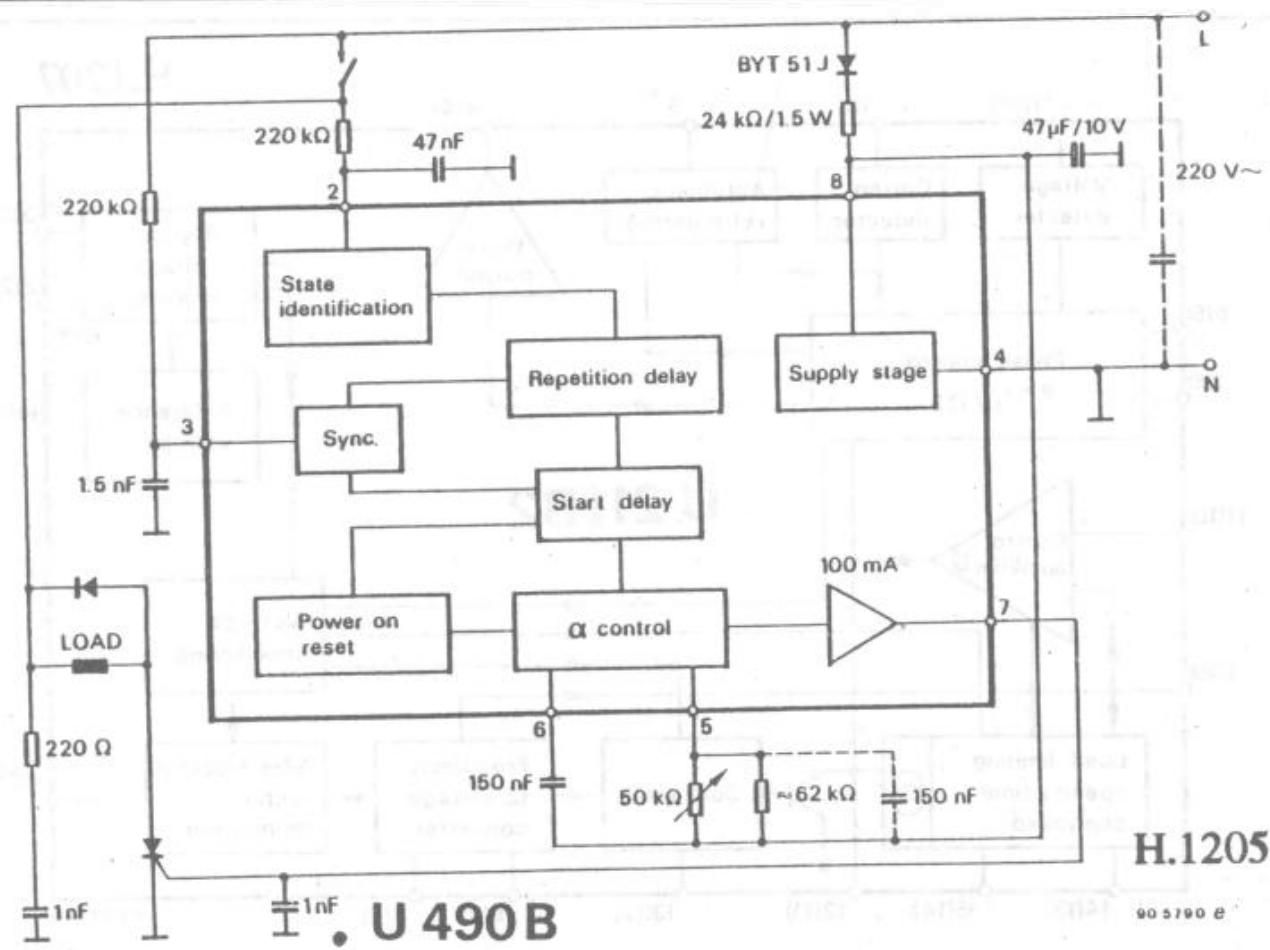
H.1202



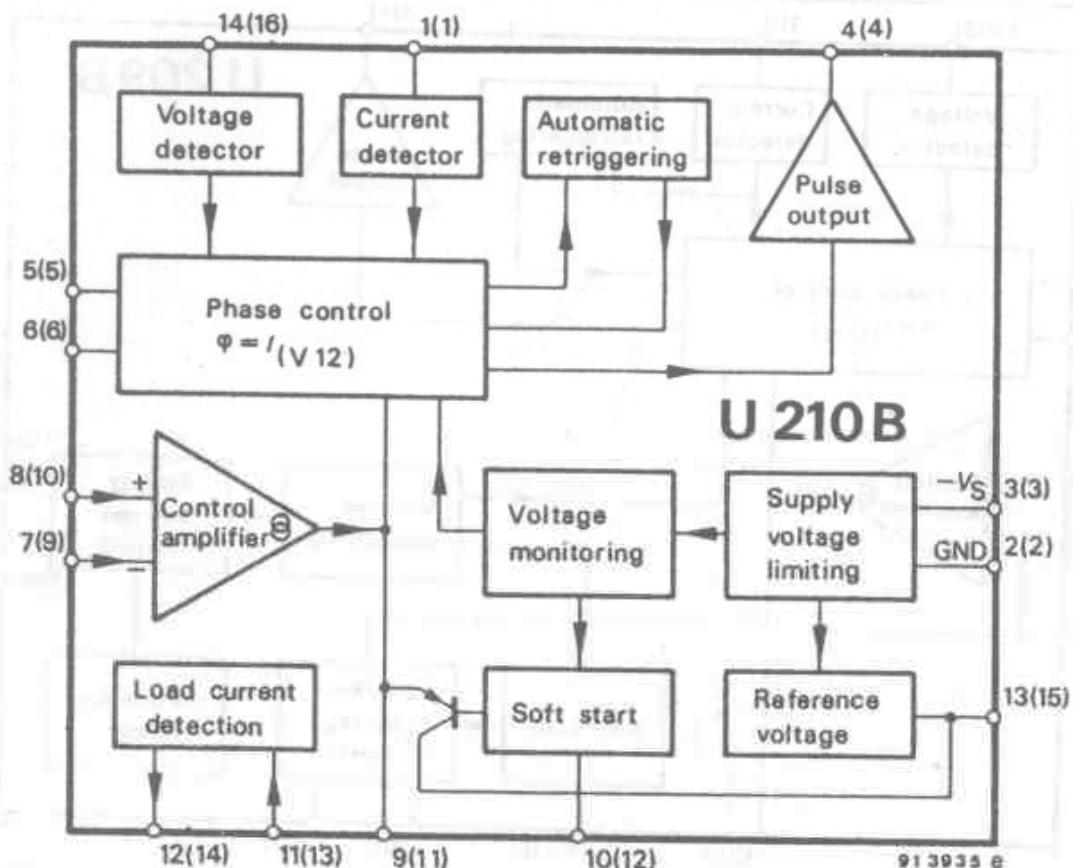
H.1203



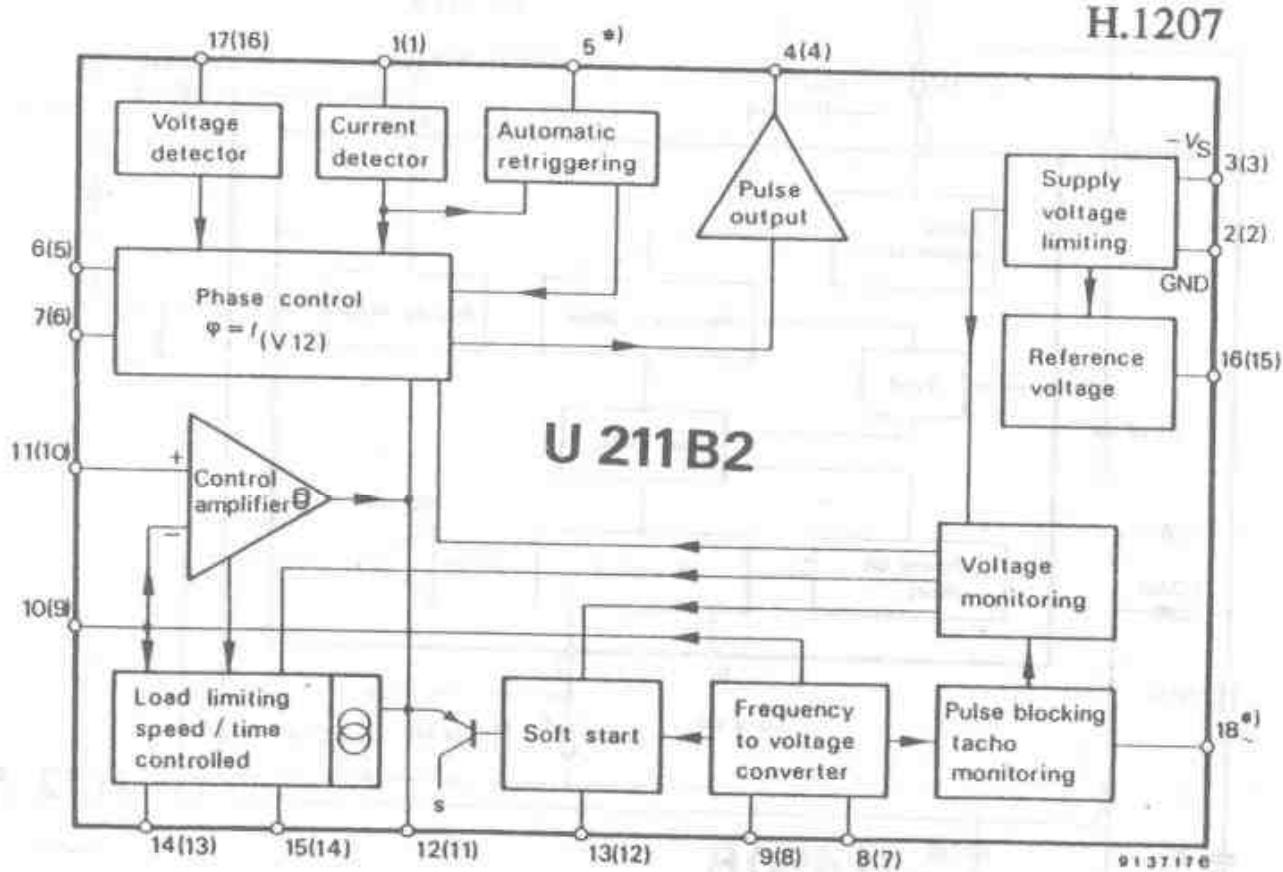
H.1204



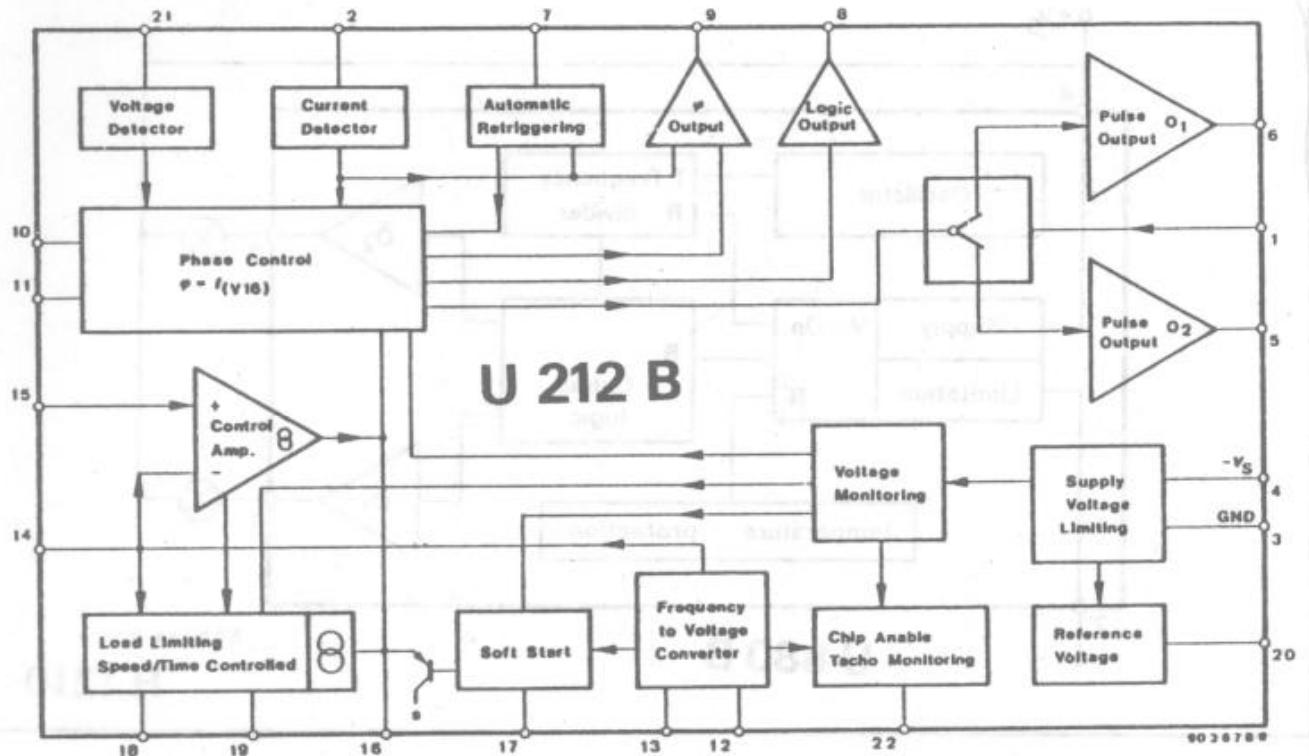
H.1205



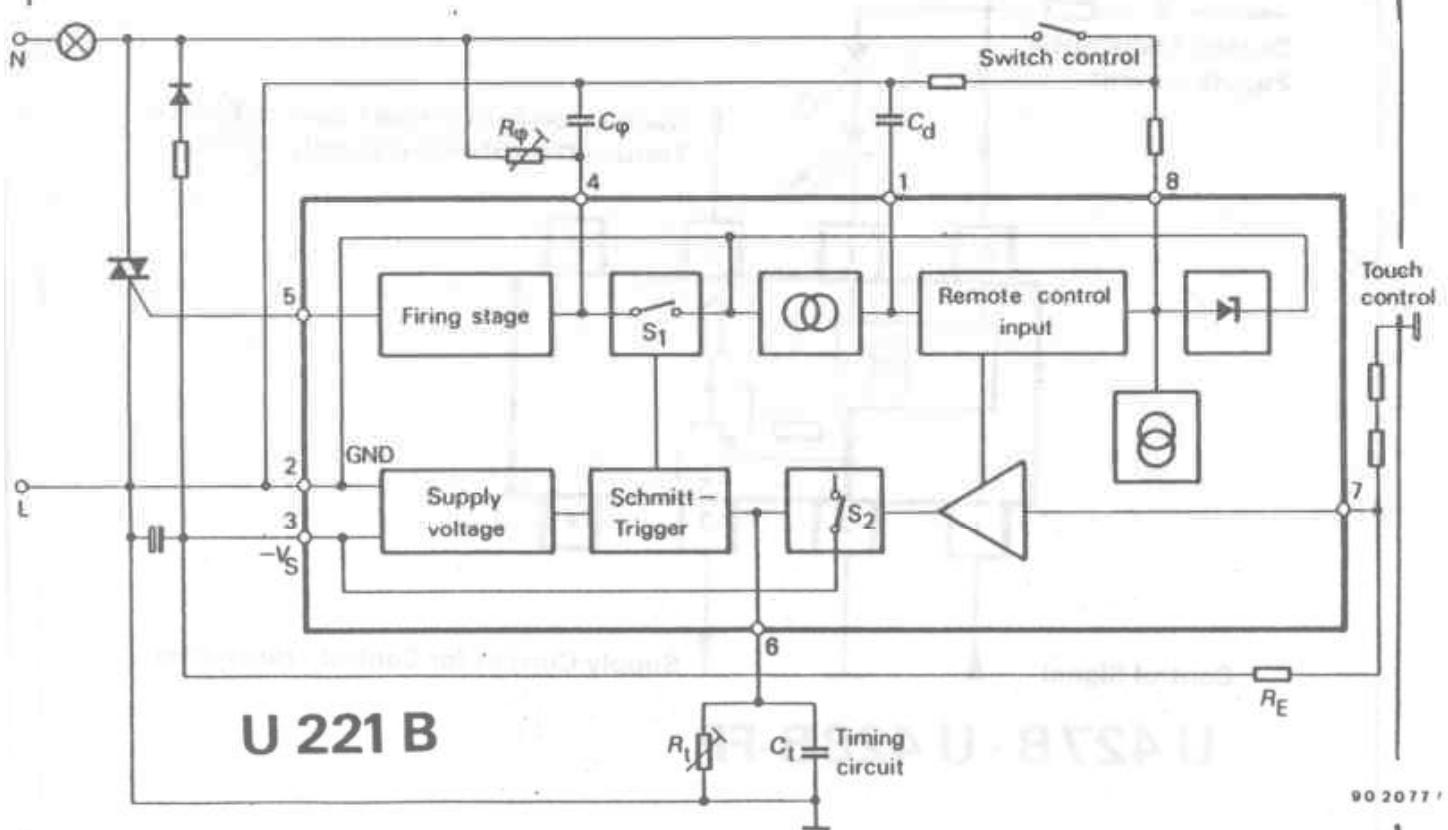
H.1206



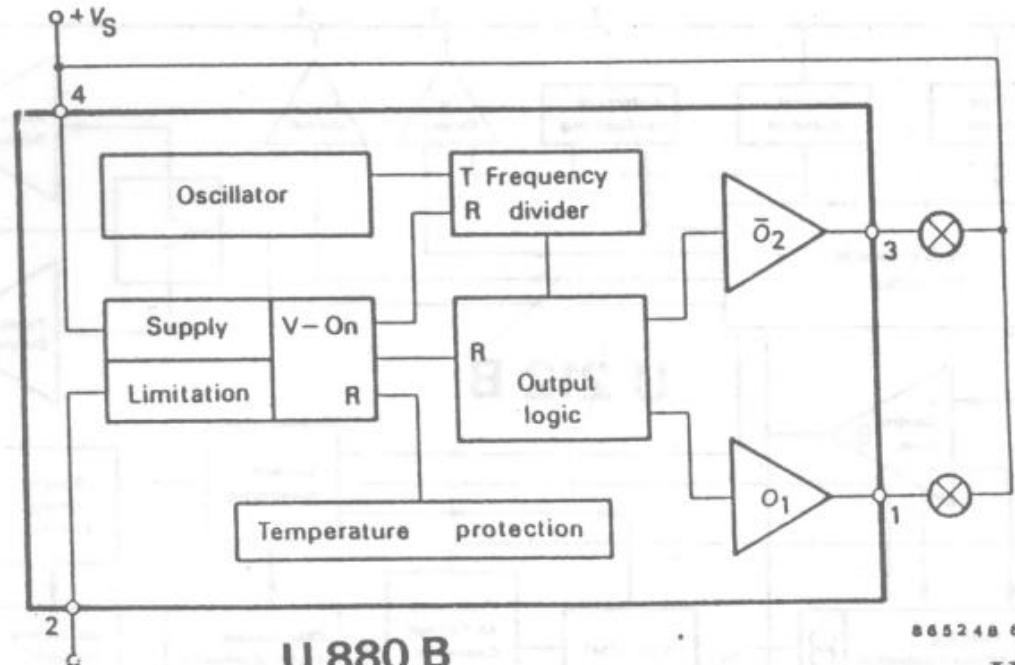
H.1207



H.1208



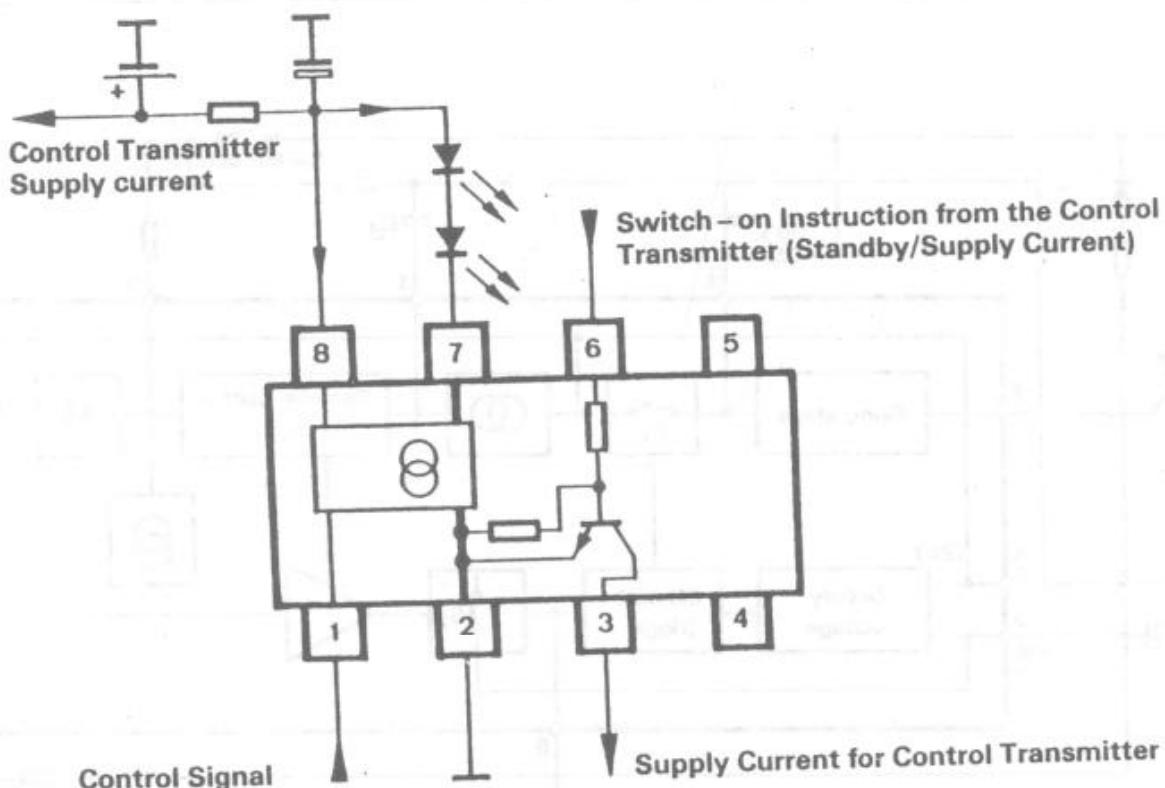
H.1209



**U 880 B**

865248 6

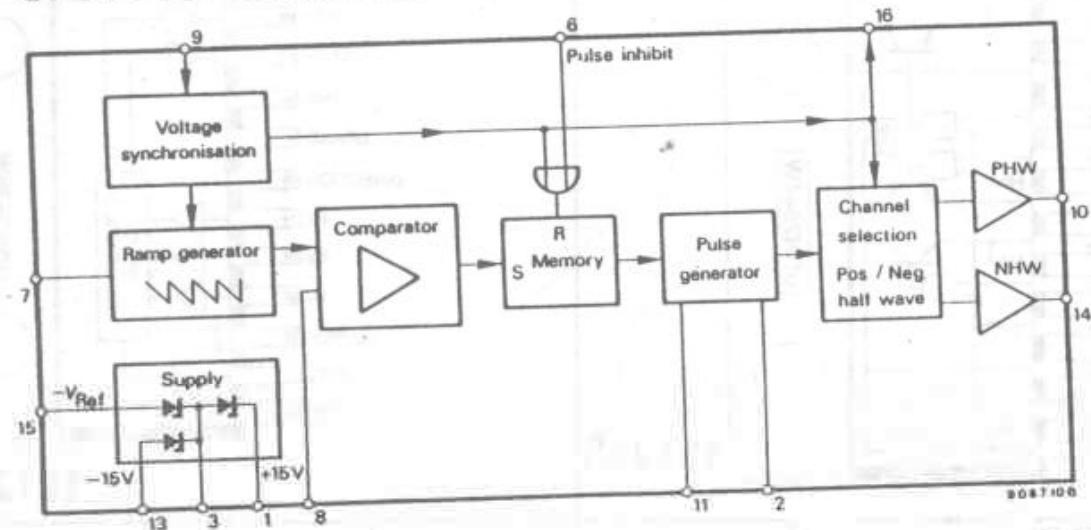
**H.1210**



**U 427B · U 428B-FP**

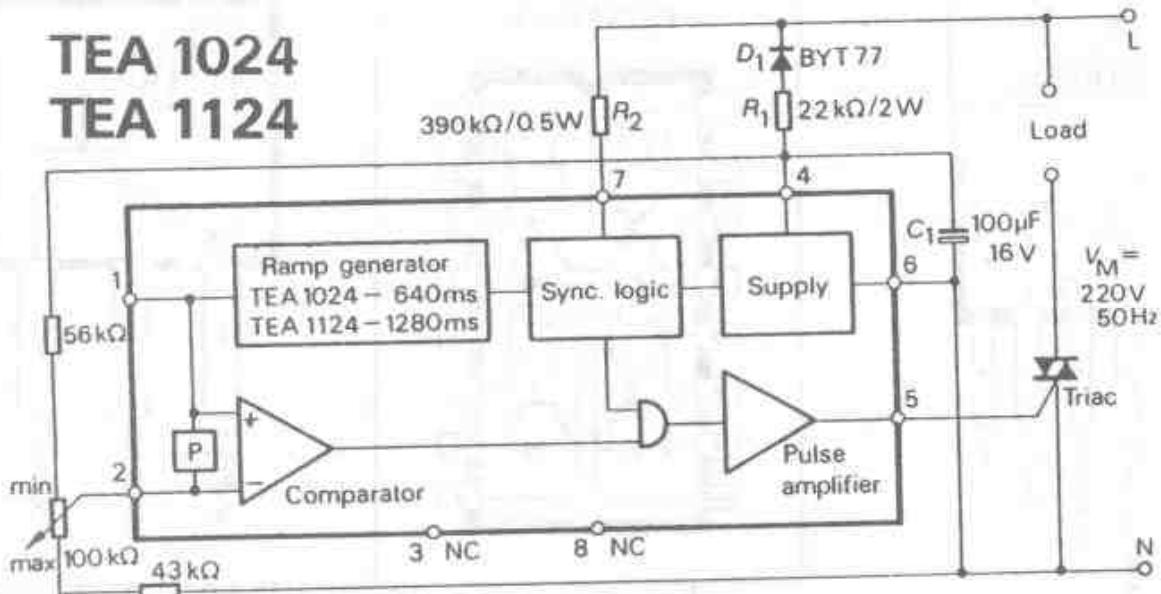
**H.1211**

## UAA 145 · UAA 146



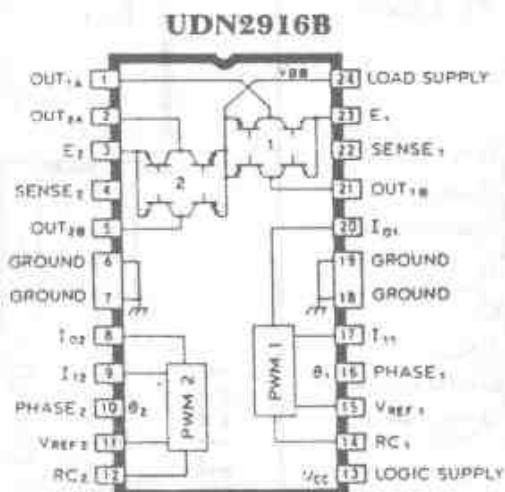
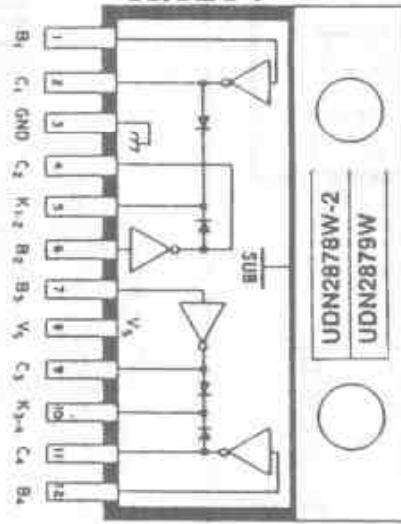
H.1212

## TEA 1024 TEA 1124

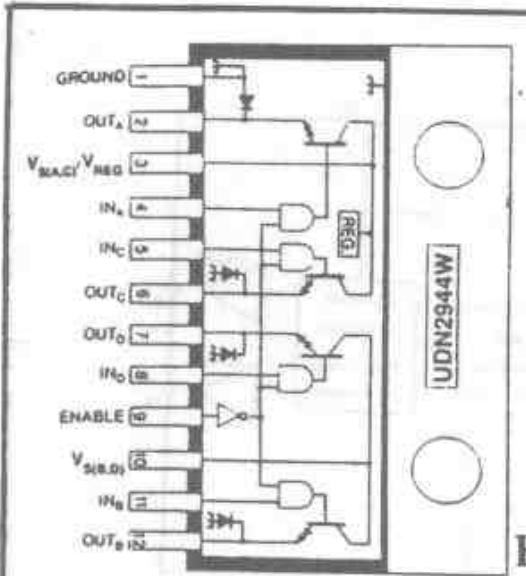


H.1213

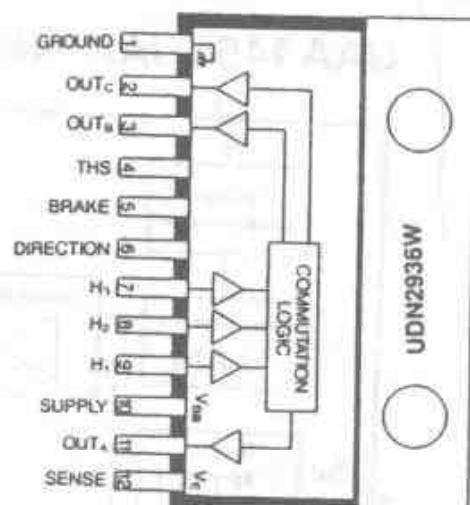
H.1214



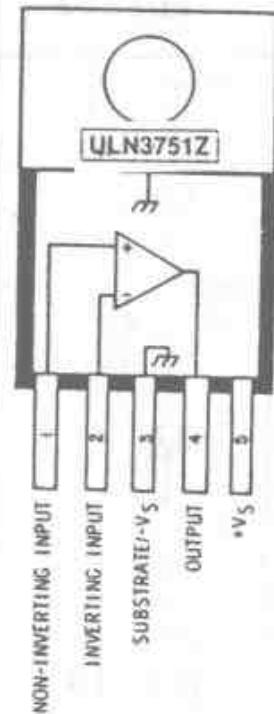
H.1216



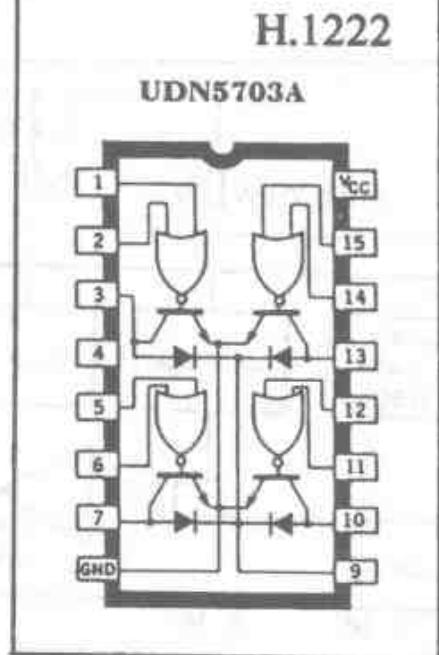
H.1218



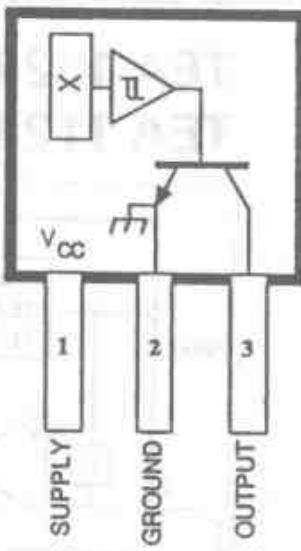
H.1217



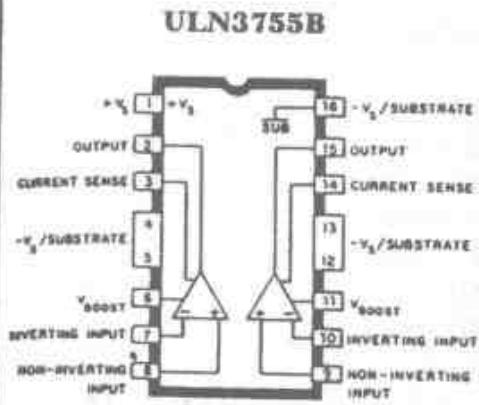
H.1219



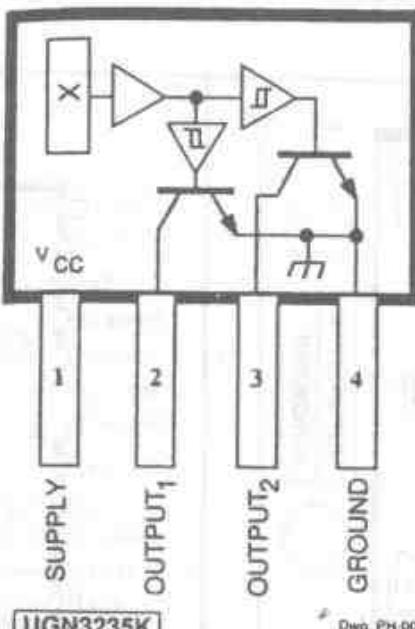
H.1222



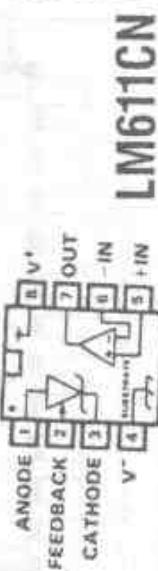
H.1220

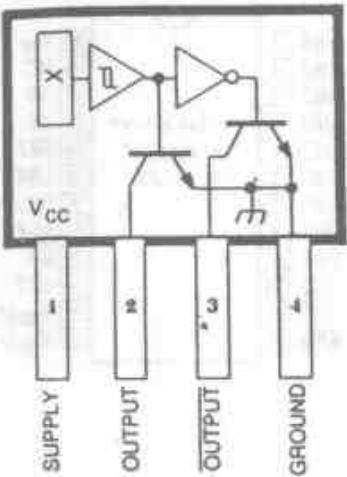


H.1221

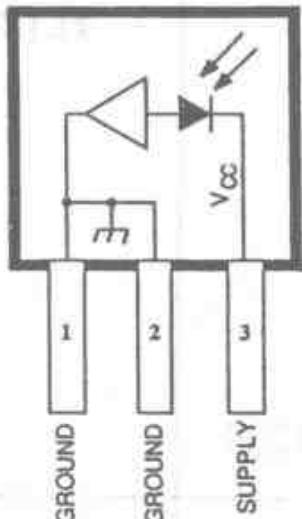


H.1225



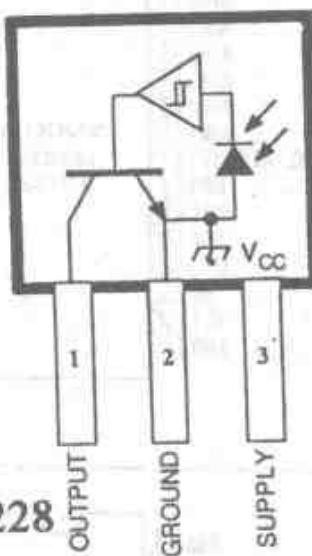


H.1226

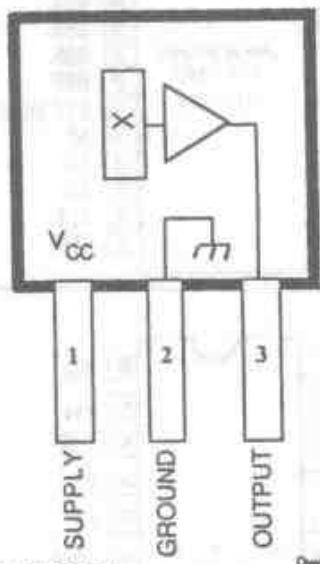


H.1227

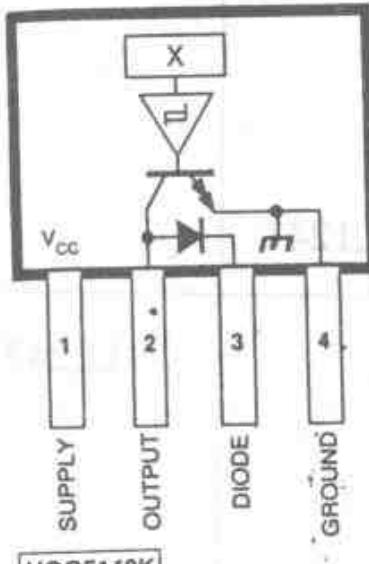
ULN3330/60/63T



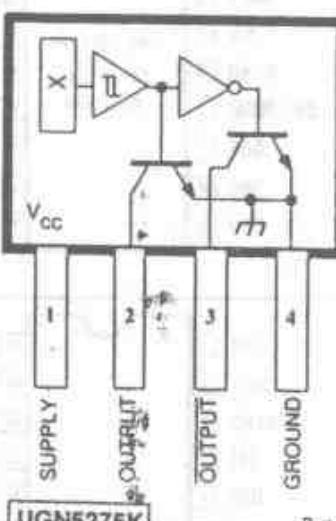
H.1228



H.1229



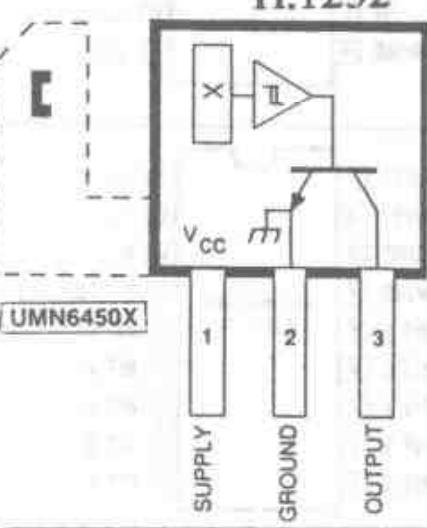
H.1230



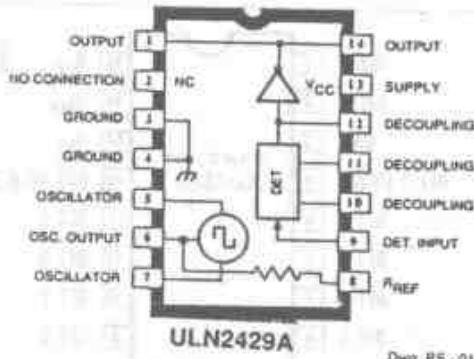
Pinning is shown viewed from branded side.

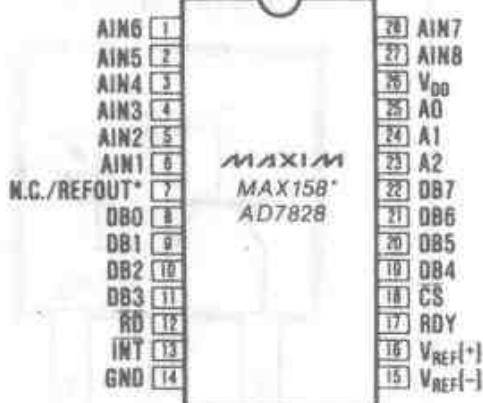
H.1231

H.1232

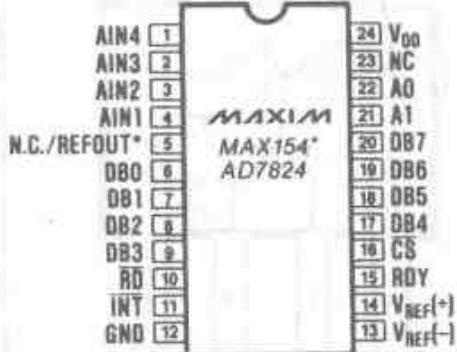


H.1234

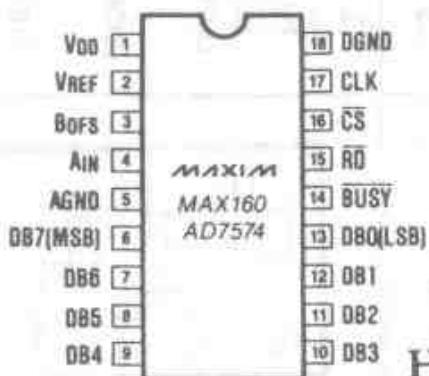




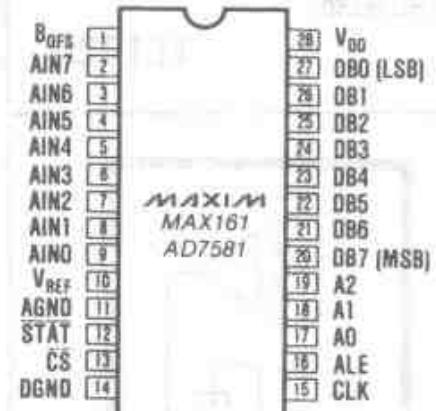
H.1239



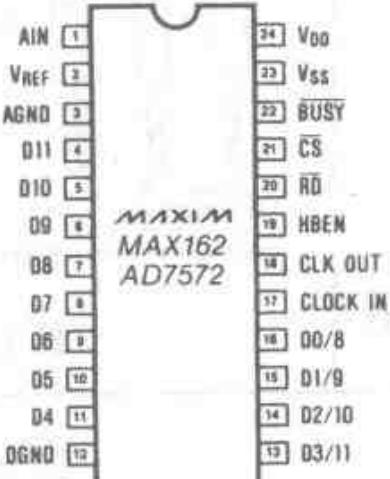
H.1238



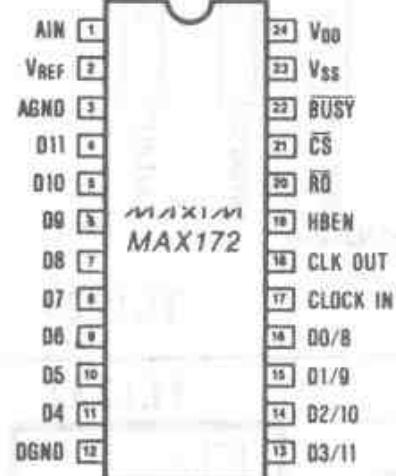
H.1241



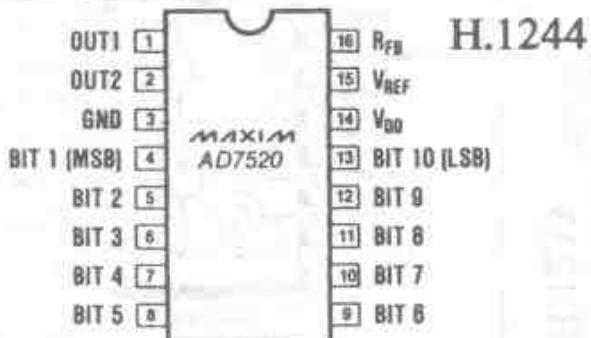
H.1240



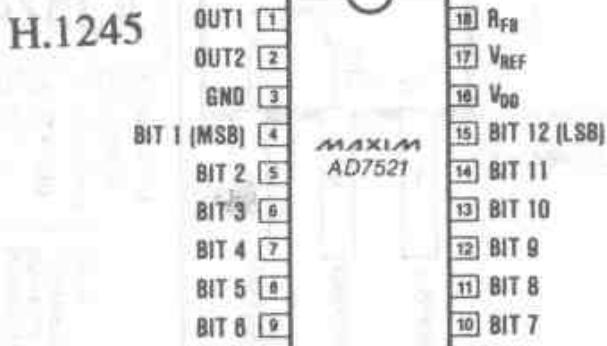
H.1242



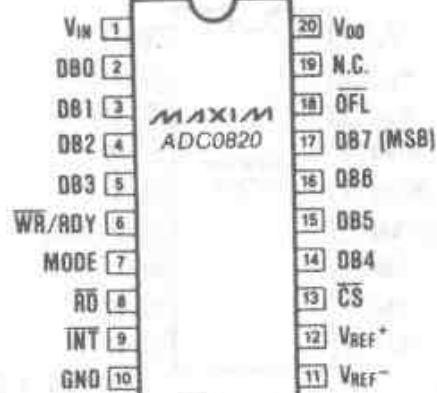
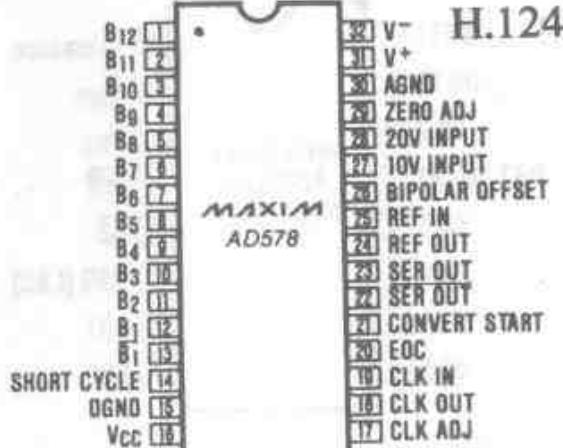
H.1243



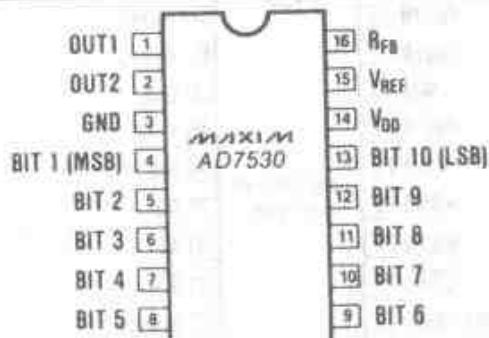
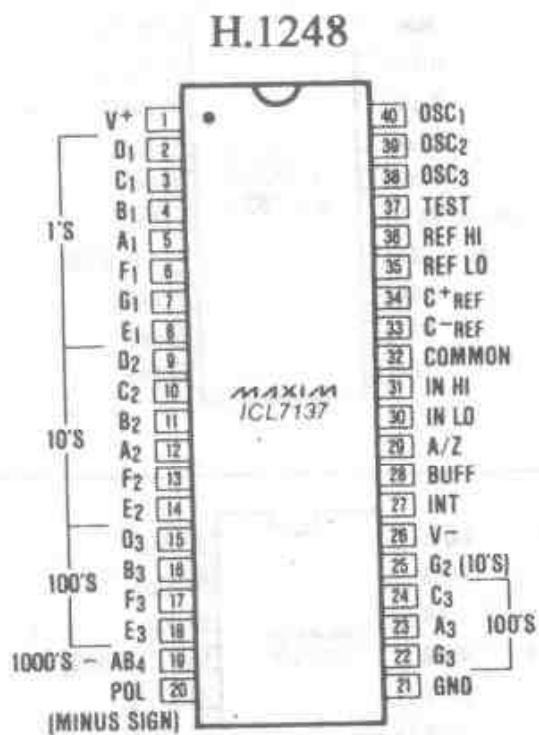
H.1244



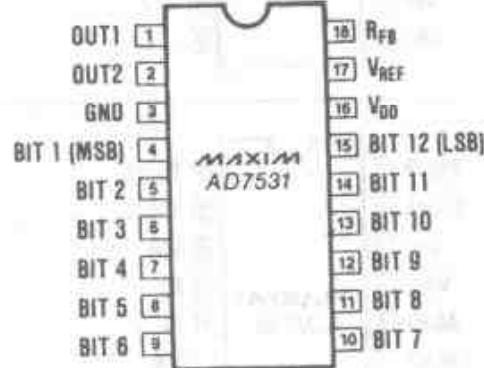
H.1245



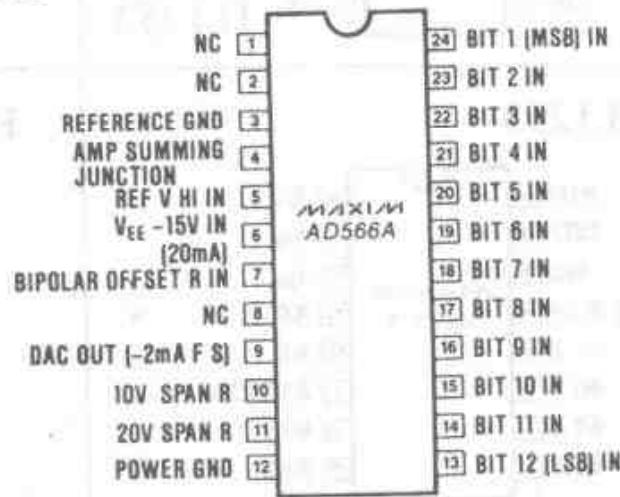
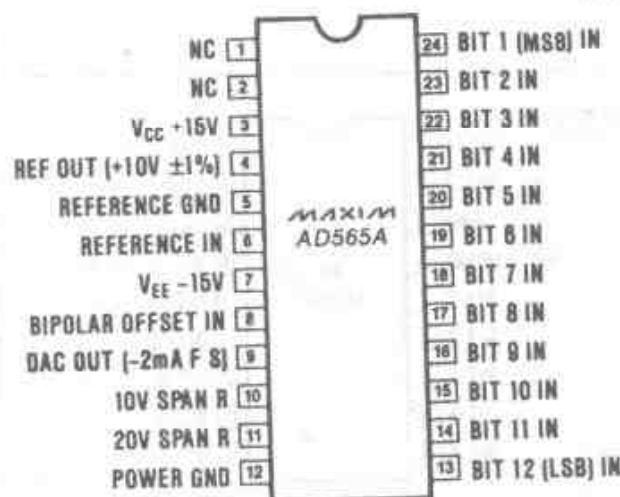
**H.1247**

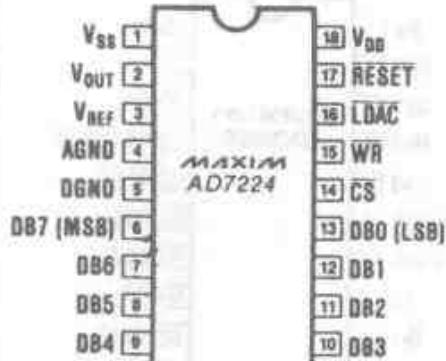


**H.1250**

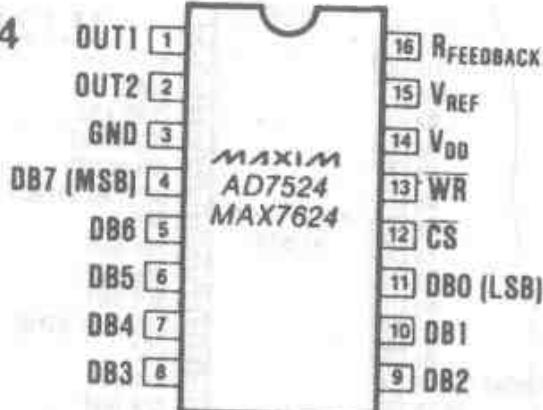


**H.1249**

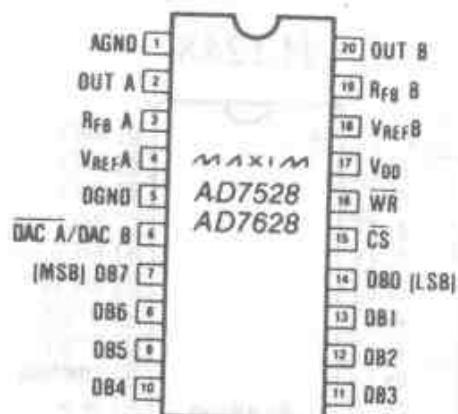




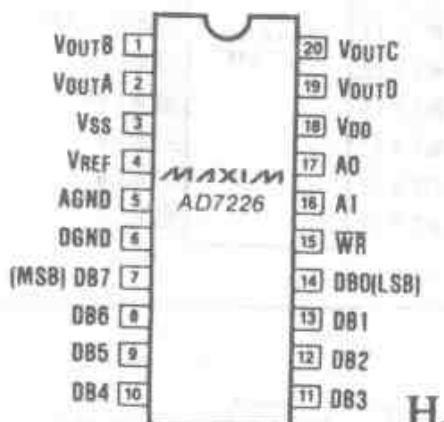
H.1251



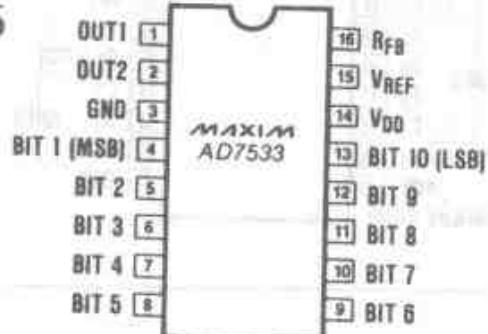
H.1254



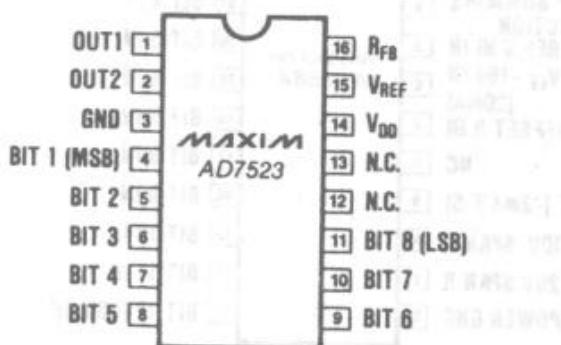
H.1255



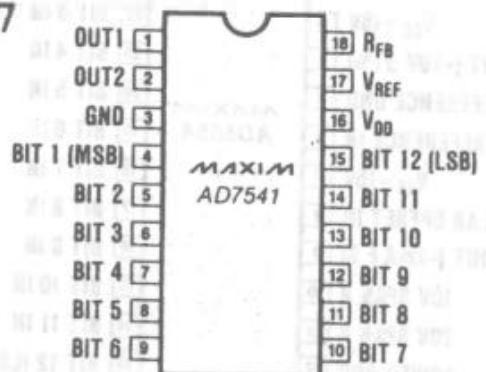
H.1252



H.1253



H.1257





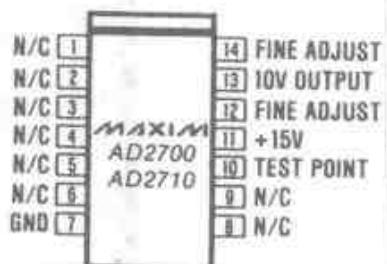
H.1258



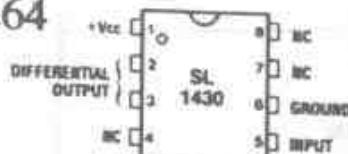
H.1259



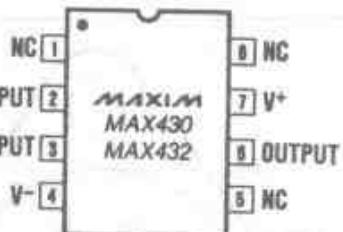
H.1260



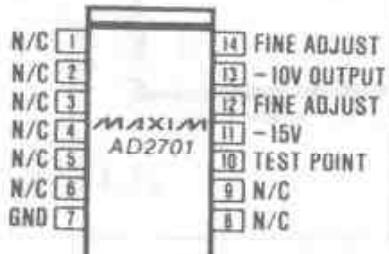
H.1264



SL 1430 TV iF-preamplifier  
U<sub>B</sub> 7 ... 13,5 V, 22 dB gain at 40 MHz

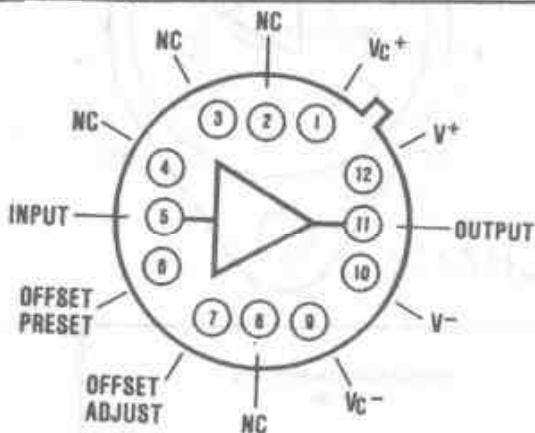


H.1261

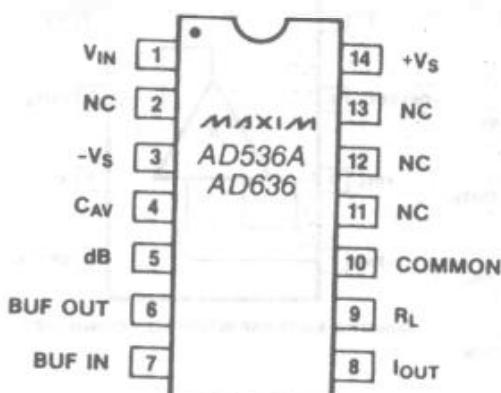
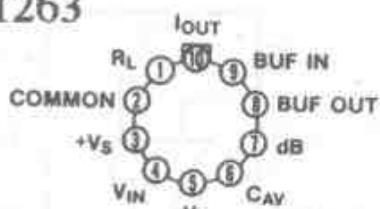


H.1262

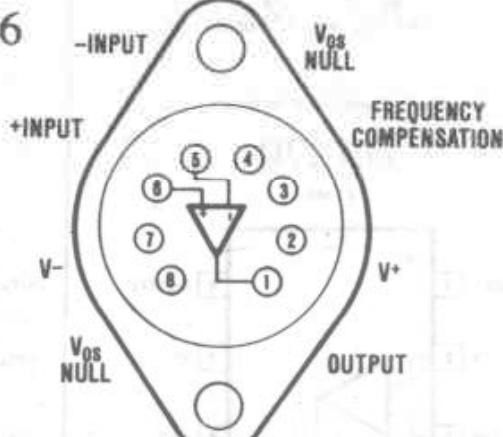
H.1265



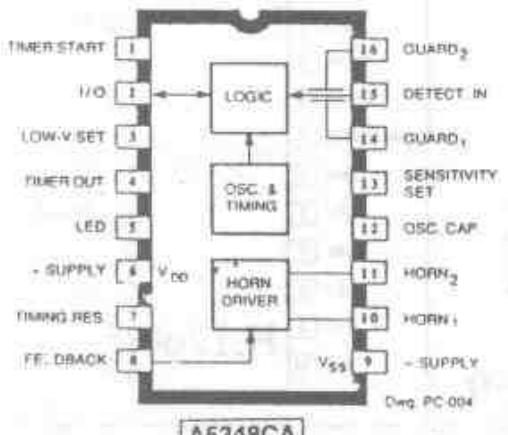
H.1263



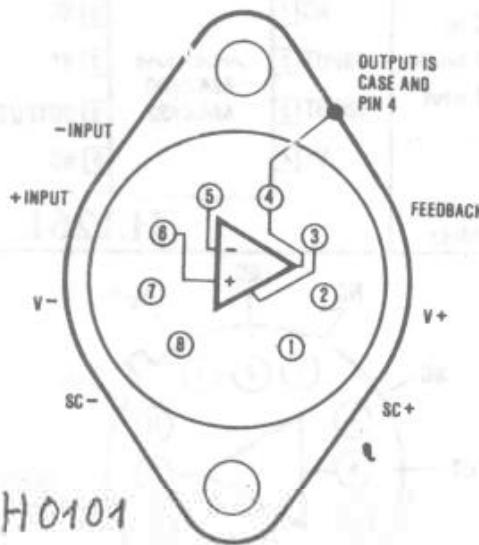
H.1266



Note:  
There is no internal case connection



H.1267

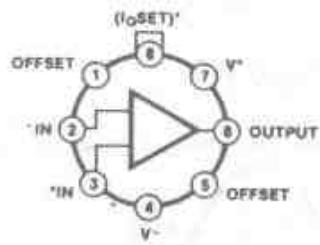


SCL5604E

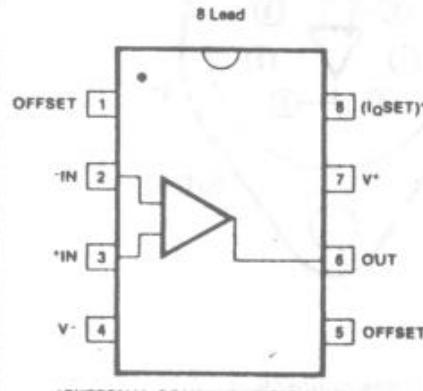


H.1269

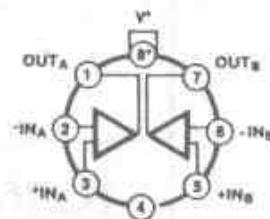
SINGLES—ICL7611/12/14/16  
TO-99



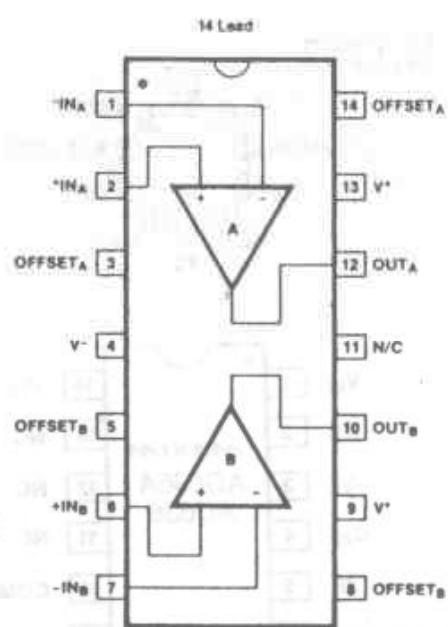
H.1270



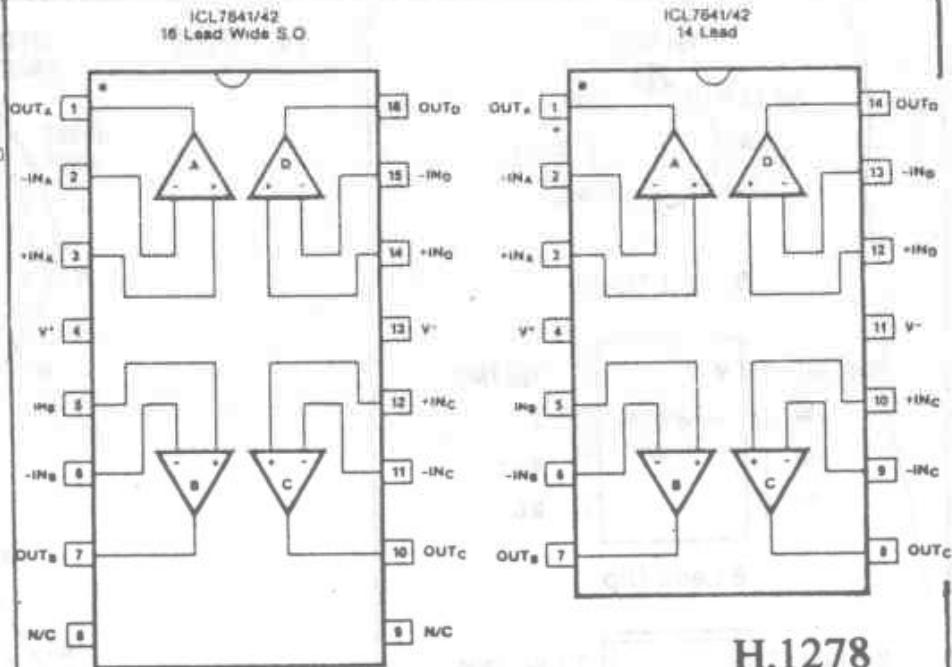
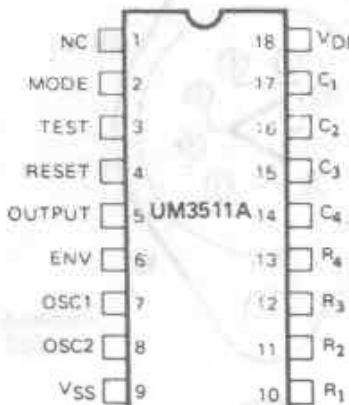
DUALS—ICL7621/22  
TO-99



H.1275

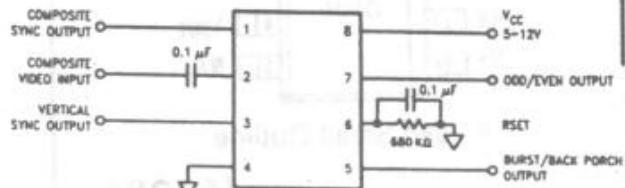


## H.1276



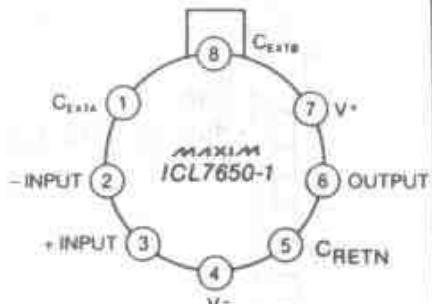
UM 3511 A Orgel Generator

## H.1278



LM 1881 Video Sync Separator U<sub>B</sub> 5 . . . 12 V

## H.1281



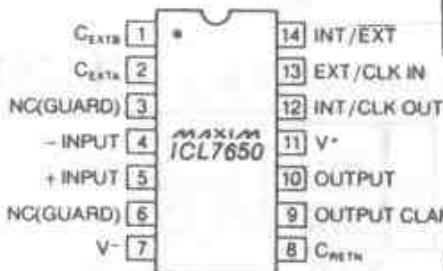
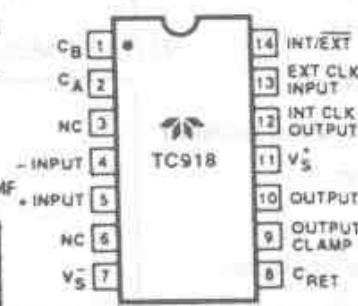
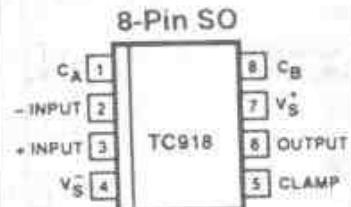
## H.1277



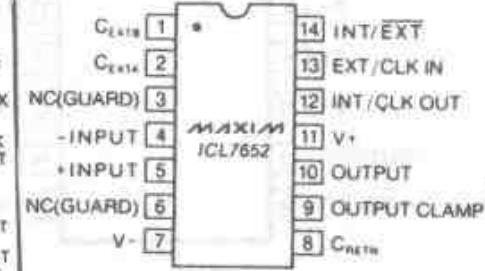
## H.1283



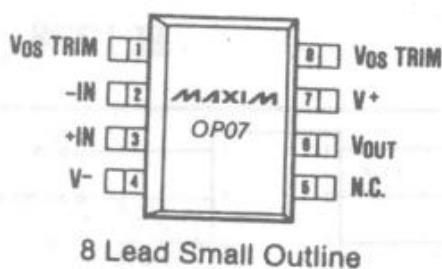
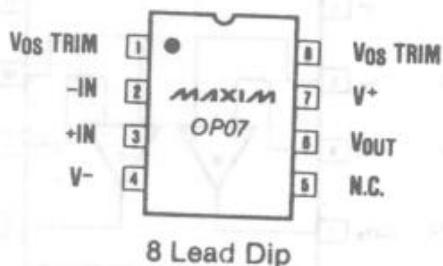
## H.1282



NC = NO INTERNAL CONNECTION



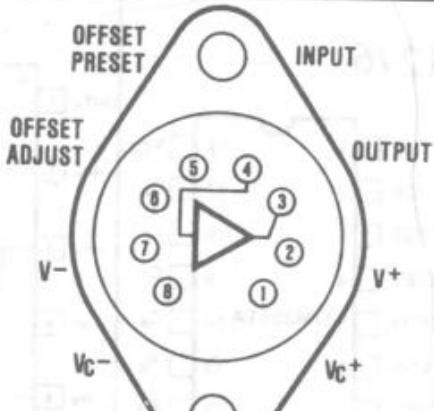
NC = NO INTERNAL CONNECTION



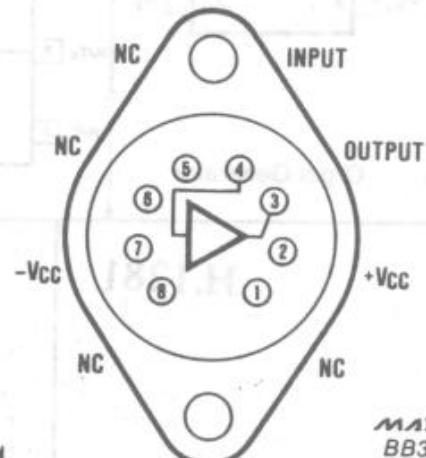
8 Lead Small Outline

H.1286

H.1288



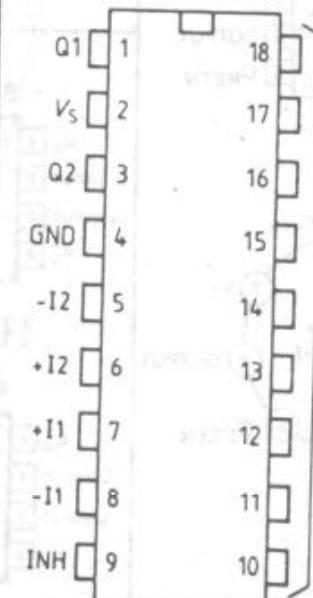
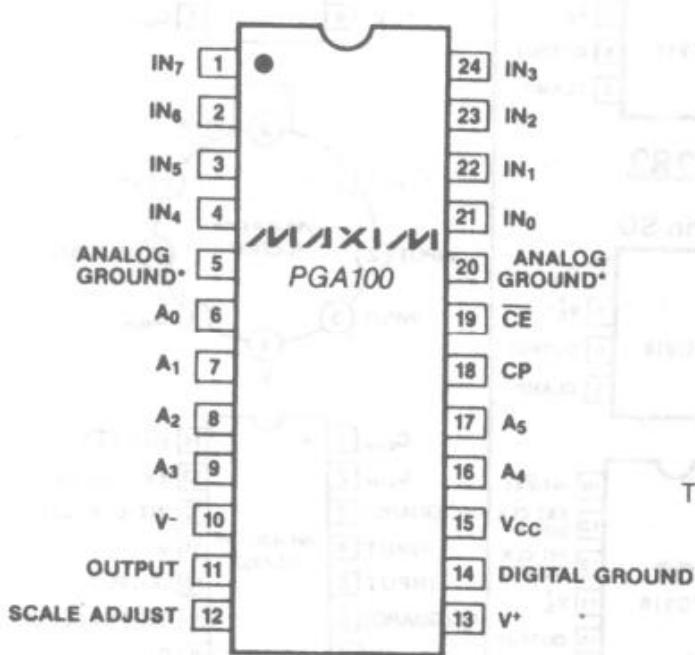
MAXIM  
LH0063



MAXIM  
BB3553

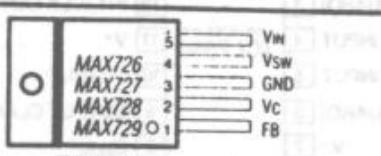
NO CONNECTION  
TO CASE

H.1289



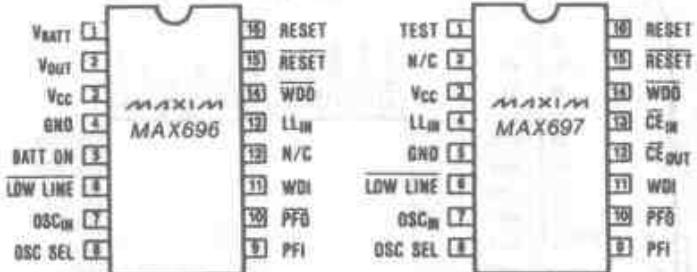
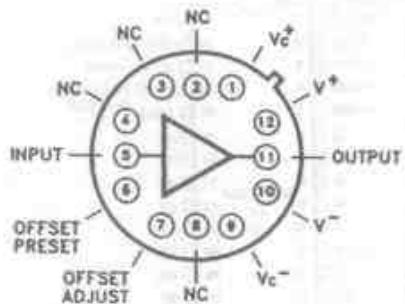
TLE 4205 Motor Driver max. 1 A, 6–32 V

H.1291



MAX726  
MAX727  
MAX728  
MAX729

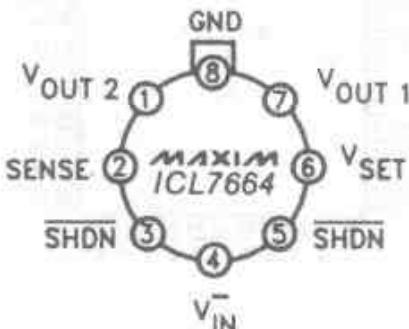
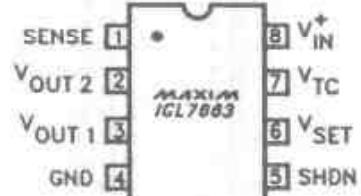
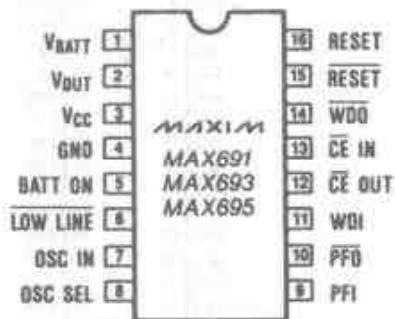
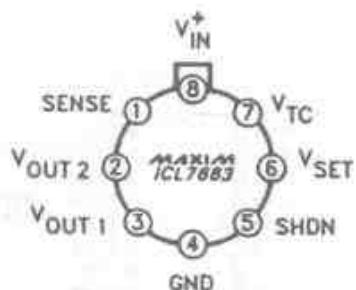
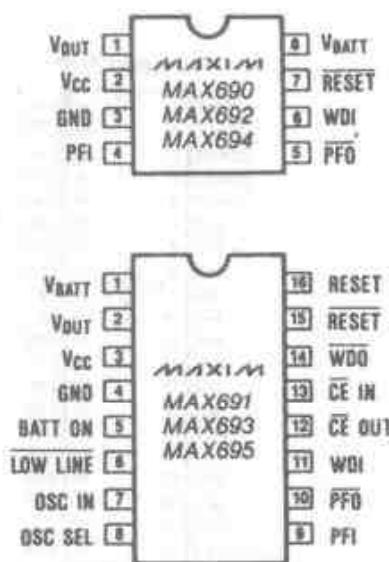
H.1292



LH0033

H.1293

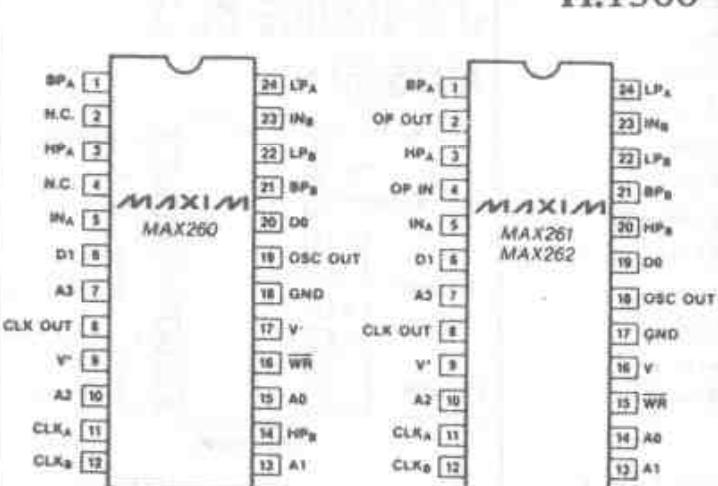
H.1295



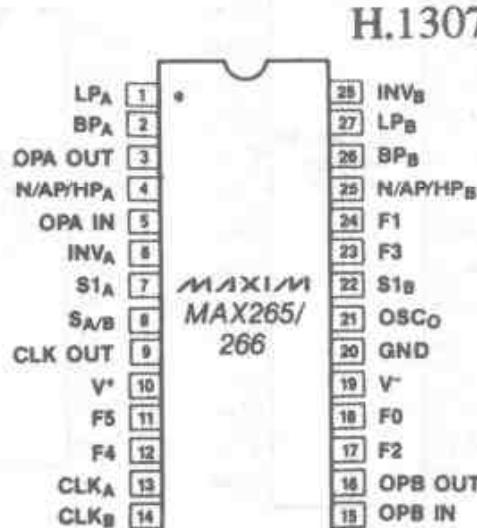
H.1300

H.1302

H.1304



H.1306

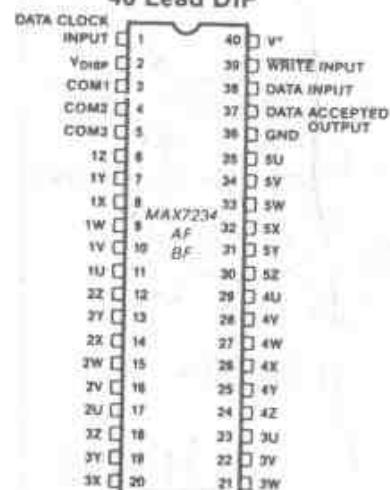




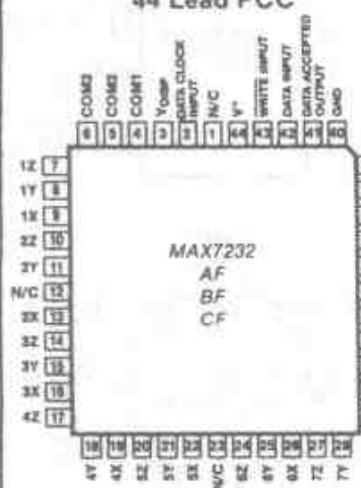
44 Lead PCC



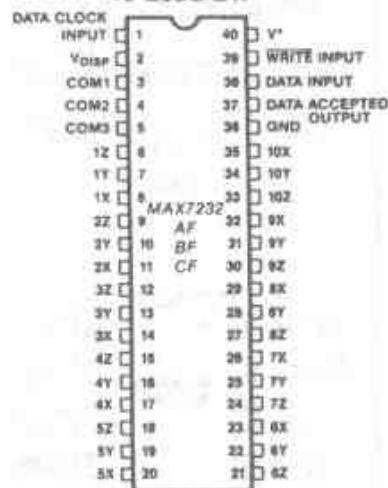
40 Lead DIP



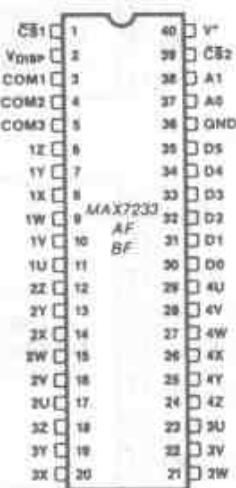
44 Lead PCC



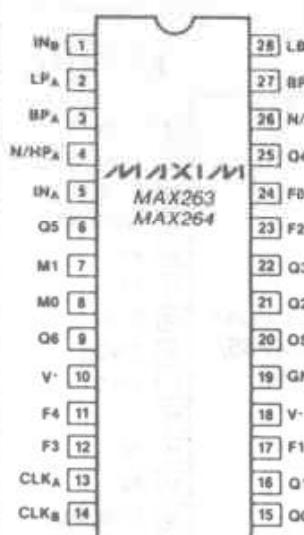
40 Lead DIP



40 Lead DIP

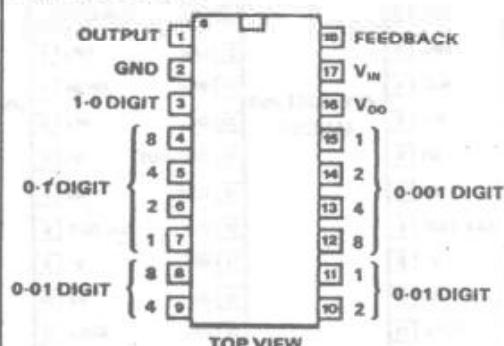


H.1310

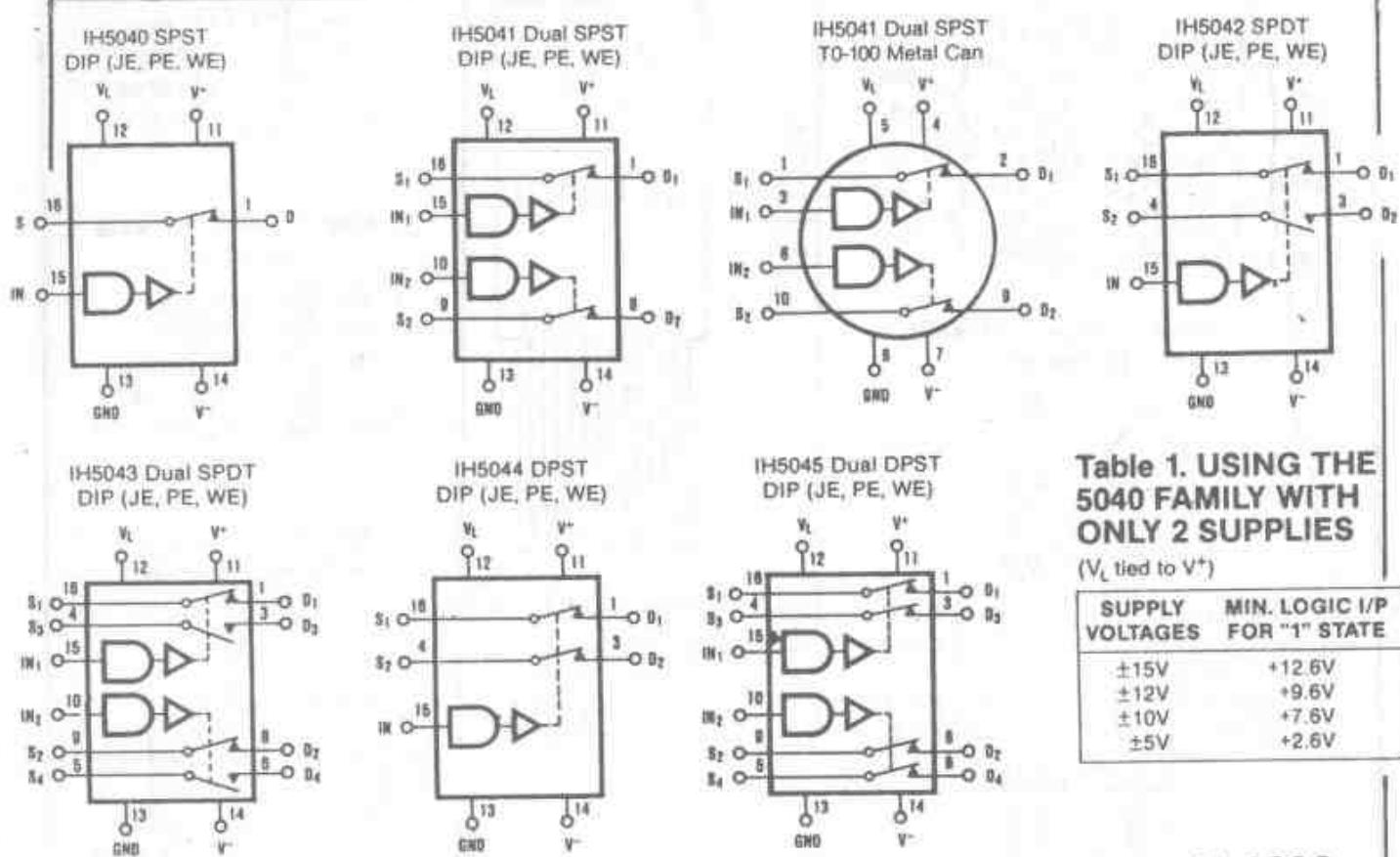


H.1312

## Potentiometer-ICs 3½-stellige BCD AD7525LN



H.1313



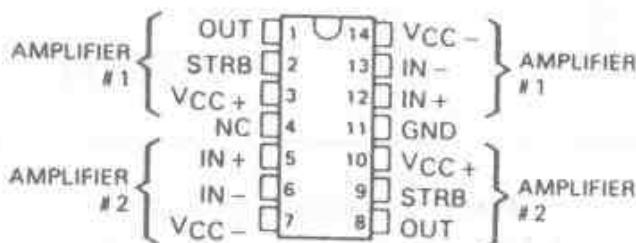
**Table 1. USING THE 5040 FAMILY WITH ONLY 2 SUPPLIES**  
( $V_L$  tied to  $V^+$ )

SUPPLY VOLTAGES	MIN. LOGIC I/P FOR "1" STATE
$\pm 15V$	+12.6V
$\pm 12V$	+9.6V
$\pm 10V$	+7.6V
$\pm 5V$	+2.6V

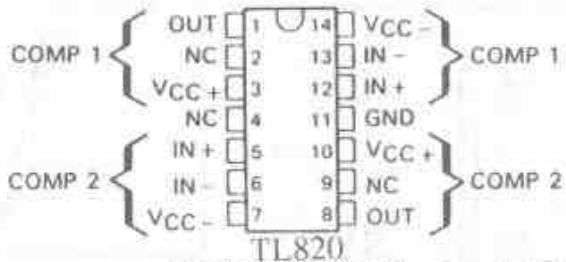
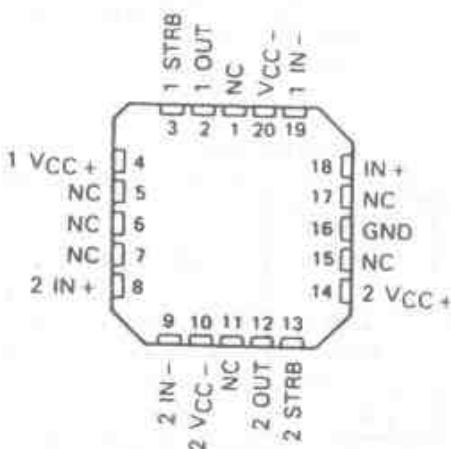
H.1320

Note: Switch states are for logic "1" input.

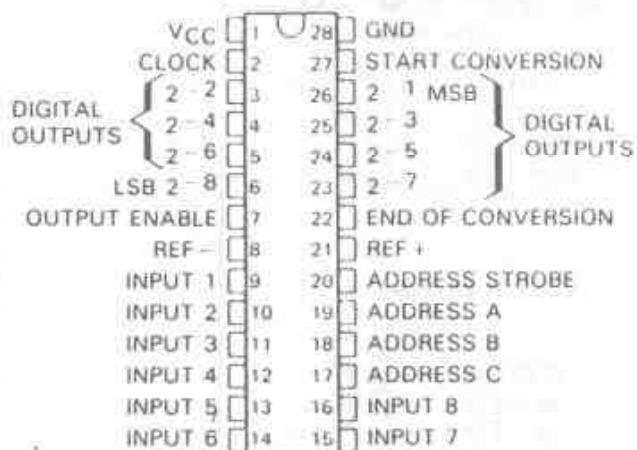
H.1322



TL514M  
FH OR FK CHIP CARRIER  
(TOP VIEW)

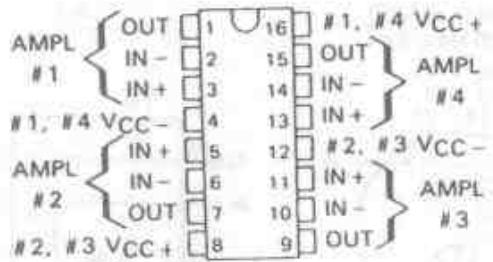


H.1323

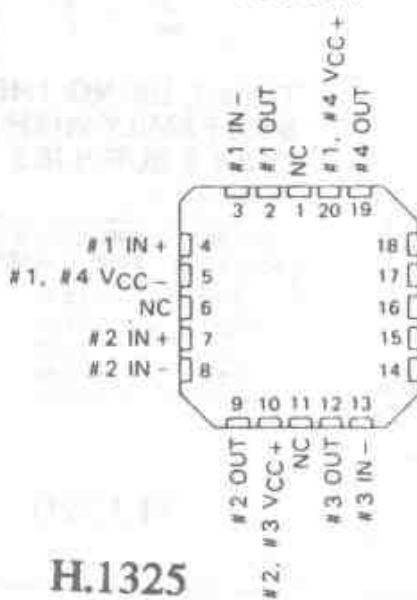


H.1324

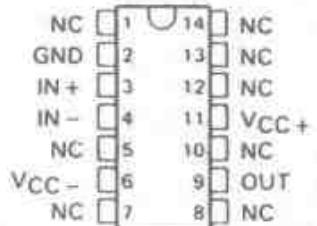
TL520, TL521, TL522



TL044M . . . FH OR FK PACKAGE  
(TOP VIEW)

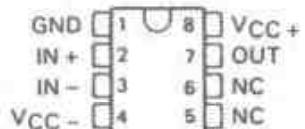


H.1325

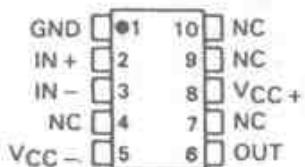


TL710

JG OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)

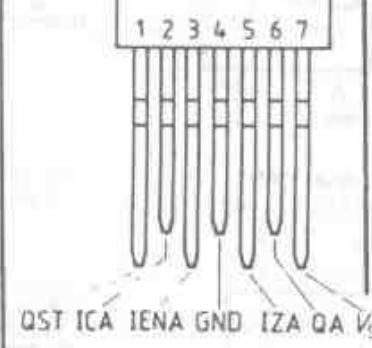


U FLAT PACKAGE  
(TOP VIEW)

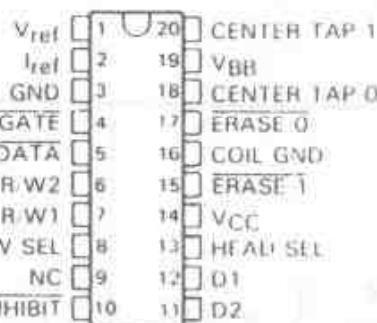


H.1328

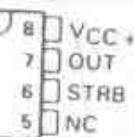
H.1325a



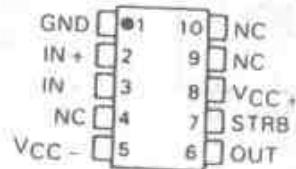
H.1326



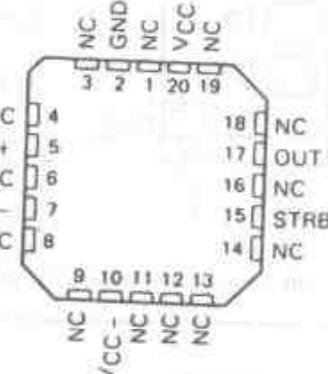
MC3471



TL510M . . . U FLAT PACKAGE  
(TOP VIEW)



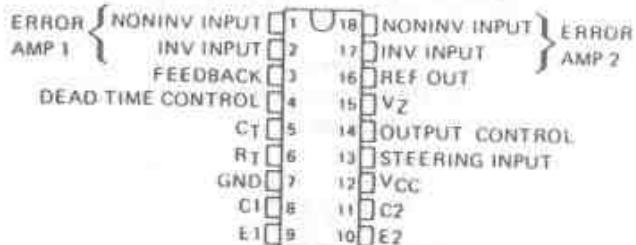
TL510M . . . FH OR FK  
CHIP CARRIER PACKAGE  
(TOP VIEW)



H.1327

H.1329

TL495/TL595C . . . N  
DUAL-IN-LINE PACKAGE (TOP VIEW)

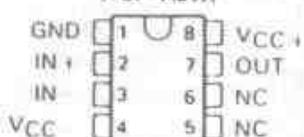


FUNCTION TABLE

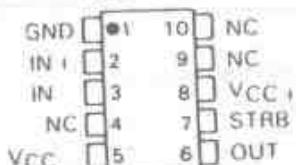
INPUTS		OUTPUT FUNCTION
OUTPUT CONTROL	STEERING INPUT	
V <sub>I</sub> < 0.4 V	Open	Single ended or parallel output
V <sub>I</sub> > 2.4 V	Open	Normal push-pull operation
V <sub>I</sub> > 2.4 V	V <sub>I</sub> < 0.4 V	PWM Output at Q1
V <sub>I</sub> > 2.4 V	V <sub>I</sub> > 2.4 V	PWM Output at Q2

TLB10M . . . JG PACKAGE  
TLB10C . . . JG OR P PACKAGE

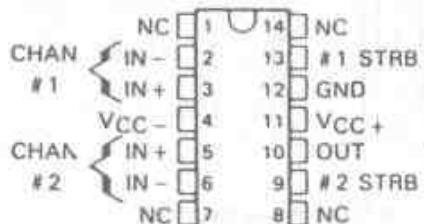
(TOP VIEW)



TLB10M . . . U PACKAGE  
(TOP VIEW)

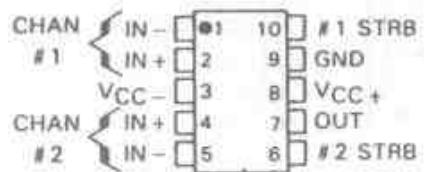


H.1330



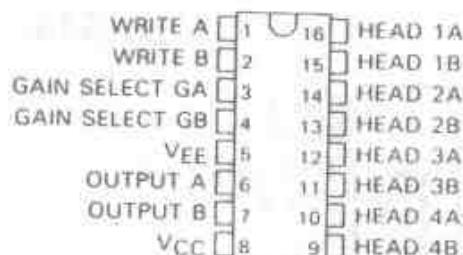
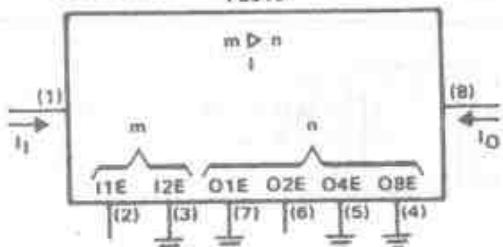
H.1332

TLB11M . . . U FLAT PACKAGE  
(TOP VIEW)



H.1333

TL010



TL030 H.1334

TL593C . . . N

DUAL-IN-LINE PACKAGE (TOP VIEW)

AMP 1	NONINV INPUT	1	16	NONINV INPUT	CURRENT LIMIT AMP
	INV INPUT	2	15	INV INPUT	
	FEEDBACK	3	14	REF OUT	
	DEAD TIME CONTROL	4	13	OUTPUT CONTROL	
C1		5	12	VCC	
R1		6	11	C2	
GND		7	10	E2	
C1		8	9	E1	

TL594M . . . J

TL594L, TL594C . . . J OR N

DUAL-IN-LINE PACKAGE (TOP VIEW)

AMP 1	NONINV INPUT	1	16	NONINV INPUT	ERROR AMP 2
	INV INPUT	2	15	INV INPUT	
	FEEDBACK	3	14	REF OUT	
	DEAD TIME CONTROL	4	13	OUTPUT CONTROL	
C1		5	12	VCC	
R1		6	11	C2	
GND		7	10	E2	
C1		8	9	E1	

H.1331

RM4193 . . . JG

RC4193 . . . JG OR P

DUAL-IN-LINE PACKAGE  
(TOP VIEW)

LBR	1	8	LBD
CX	2	7	VFB
LX	3	6	IC
GND	4	5	VCC

#### FUNCTION TABLE

PIN	FUNCTION	DESCRIPTION
1	LBR	Low battery resistor
2	CX	External capacitor
3	LX	External inductor
4	GND	Ground
5	VCC	Supply voltage
6	IC	Reference set control
7	VFB	Feedback voltage
8	LBD	Low battery detector

H.1336

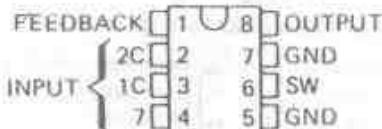
TL497AM . . . J

TL497AI, TL497AC . . . J OR N

DUAL-IN-LINE PACKAGE

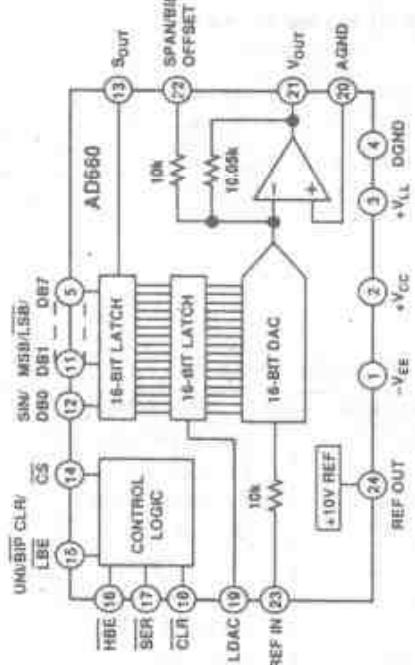
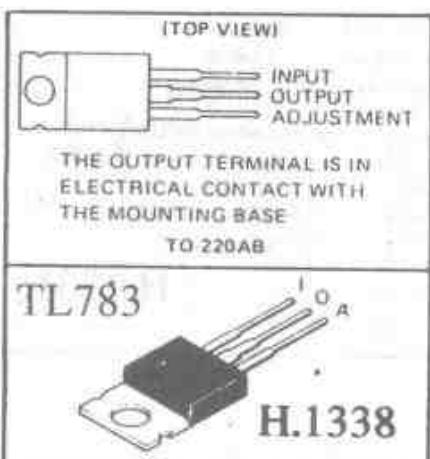
(TOP VIEW)

COMP INPUT	1	14	VCC
INHIBIT	2	13	CUR LIM SENS
FREQ CONTROL	3	12	BASE DRIVE <sup>1</sup>
SUBSTRATE	4	11	BASE <sup>1</sup>
GND	5	10	COL OUT
CATHODE	6	9	NC
ANODE	7	8	EMIT OUT



H.1337

Pins 5 and 7 are connected together internally.



H.1341

VCC	1	14	ZERO CAP 2
ANALOG IN	2	13	ZERO CAP 1
REF OUT	3	12	INTEG RES
REF IN	4	11	INTEG IN
GND	5	10	INTEG OUT
B IN	6	9	GND
A IN	7	8	COMP OUT

H.1342

ANALOG INPUT 1	1	18	CZ
ANALOG INPUT 2	2	17	
REF OUTPUT	3	16	VCC+
REF INPUT	4	15	BUFFER OUTPUT
ANALOG GND	5	14	INTEGRATOR INPUT
Cref +	6	13	INTEGRATOR OUTPUT
Cref -	7	12	VCC-
CONTROL B INPUT	8	11	DIGITAL COMMON
CONTROL A INPUT	9	10	COMPARATOR OUTPUT

H.1339

H.1340

TL502 N DUAL IN-LINE PACKAGE  
(TOP VIEW)

CONTROL B OUTPUT	1	20	VCC
DIGIT ENABLE	2	19	CONTROL A OUTPUT
OUTPUTS	3	18	20.0001
D1 (LSB)	4	17	OSCILLATOR INPUT
D2	5	16	TRIGGER
D3	6	15	COMPARATOR INPUT
D4	7	14	G
D5 (MSB)*	8	13	F
7 SEGMENT	9	12	E
DRIVER	10	11	D
OUTPUTS			7 SEGMENT DRIVER OUTPUTS
DIGITAL COMMON			

TL503 N DUAL IN-LINE PACKAGE  
(TOP VIEW)

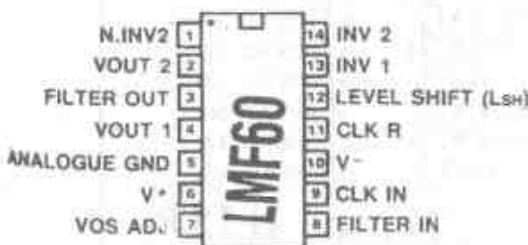
CONTROL B OUTPUT	1	16	VCC
DIGIT ENABLE	2	15	CONTROL A OUTPUT
OUTPUTS	3	14	OSCILLATOR INPUT
D1 (LSB)	4	13	TRIGGER
D2	5	12	COMPARATOR INPUT
D3	6	11	Q3
D4	7	10	Q2
D5 (MSB)*	8	9	Q1
DIGITAL COMMON			

\* Pin 18 of TL502 provides an output of free oscillation frequencies  
- 20.000

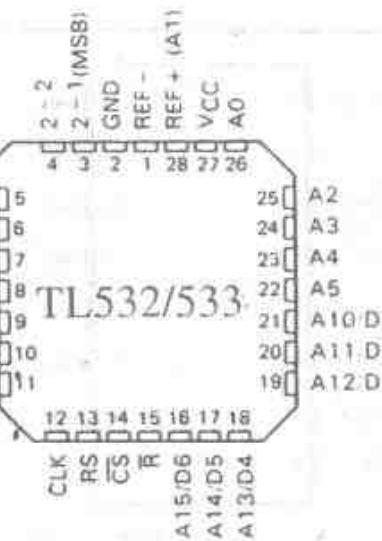
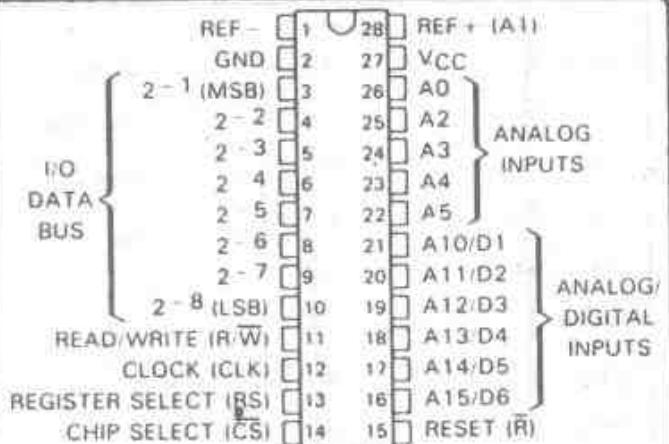
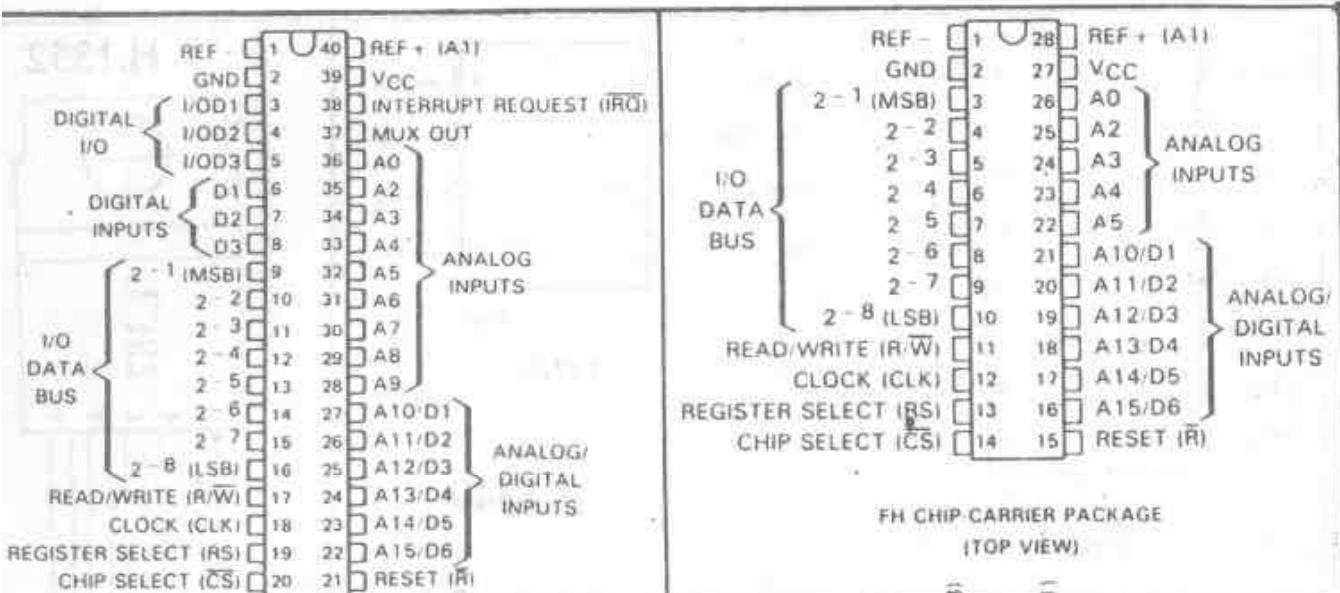
\* D5, the most significant bit, is also the sign bit.

REF I	1	8	VCC
ANALOG IN	2	7	INPUT/OUTPUT CLOCK
REF	3	6	DATA OUT
GND	4	5	CS

H.1343

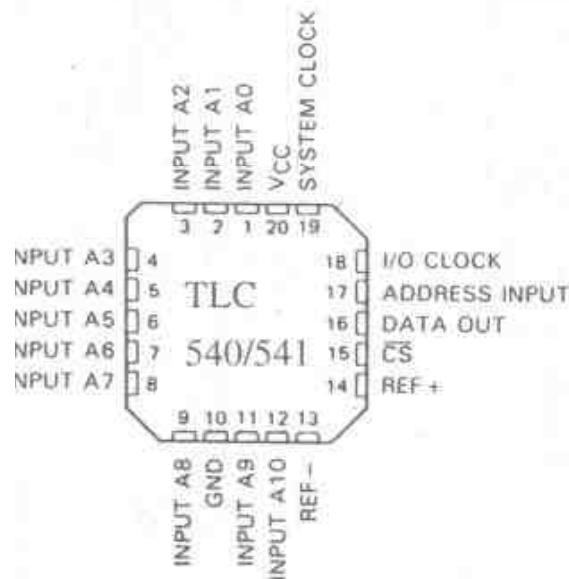


H.1344



### H.1345

### H.1347



INPUT A0	1	20	VCC
INPUT A1	2	19	SYSTEM CLOCK
INPUT A2	3	18	I/O CLOCK
INPUT A3	4	17	ADDRESS INPUT
INPUT A4	5	16	DATA OUT
INPUT A5	6	15	CS
INPUT A6	7	14	REF +
INPUT A7	8	13	REF -
INPUT A8	9	12	INPUT A10
GND	10	11	INPUT A9

**TLC540/541**

### FUNCTION TABLE

ADDRESS/CONTROL					DESCRIPTION	
R/W	RS	CS	R	CLK		
X	X	X	L <sup>1</sup>		Reset	
L	H	L	H	↓	Write bus data to control register	
H	L	L	H	↑	Read data from analog conversion register	
H	H	L	H	↑	Read data from digital data register	
X	X	H	H	X	No response	

H = High-level, L = Low-level, X = irrelevant.

↓ = High-to-low transition, ↑ = Low-to-high transition.

<sup>1</sup>For proper operation, Reset must be low for at least three clock cycles.

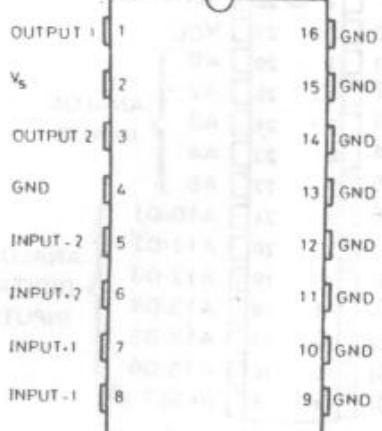
### H.1346

ADDRESS/CONTROL					DESCRIPTION	
R/W	RS	CS	R	CLK		
X	X	X	L <sup>1</sup>		Reset	
L	H	L	H	↓	Write bus data to control register	
H	L	L	H	↑	Read data from analog conversion register	
H	H	L	H	↑	Read data from digital data register	
X	X	H	H	X	No response	

H = High-level, L = Low-level, X = irrelevant.

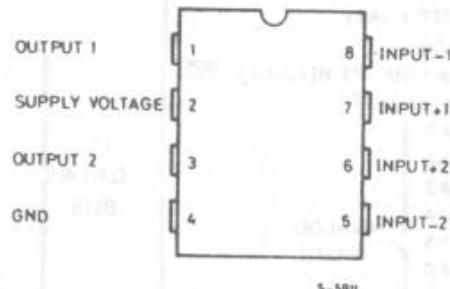
↓ = High-to-low transition, ↑ = Low-to-high transition.

<sup>1</sup>For proper operation, Reset must be low for at least three clock cycles.



5-5905

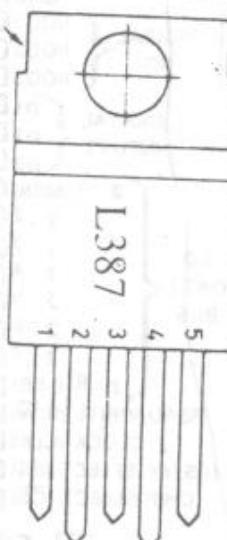
L272



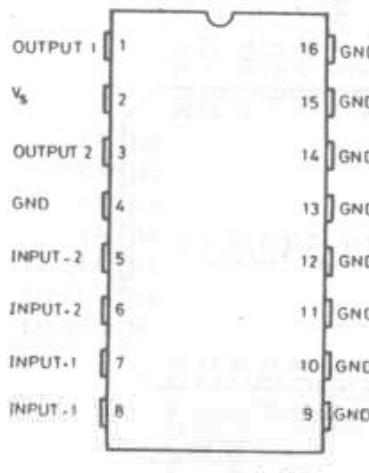
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L272M

H.1352

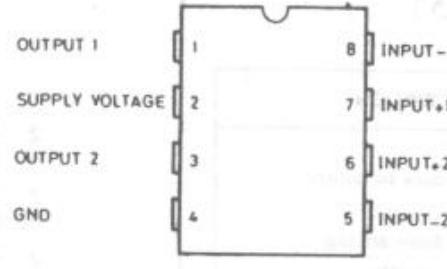


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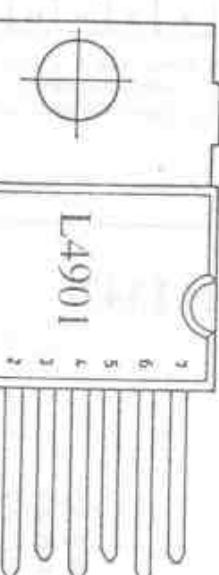
L2720



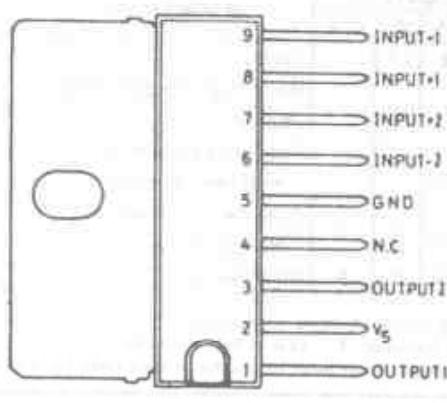
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L2722

H.1349



5-5307



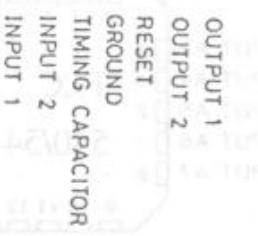
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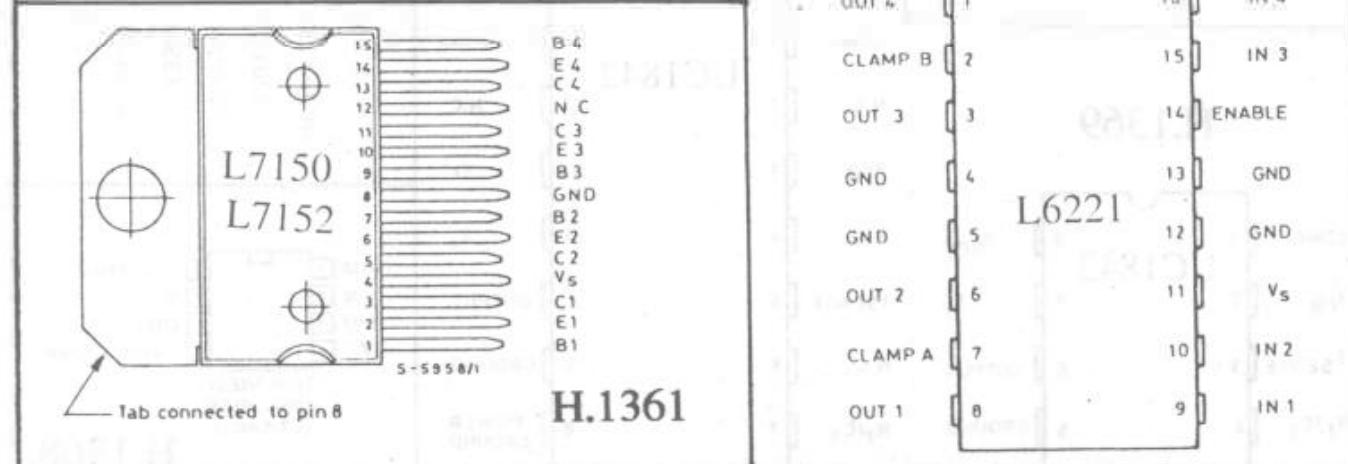
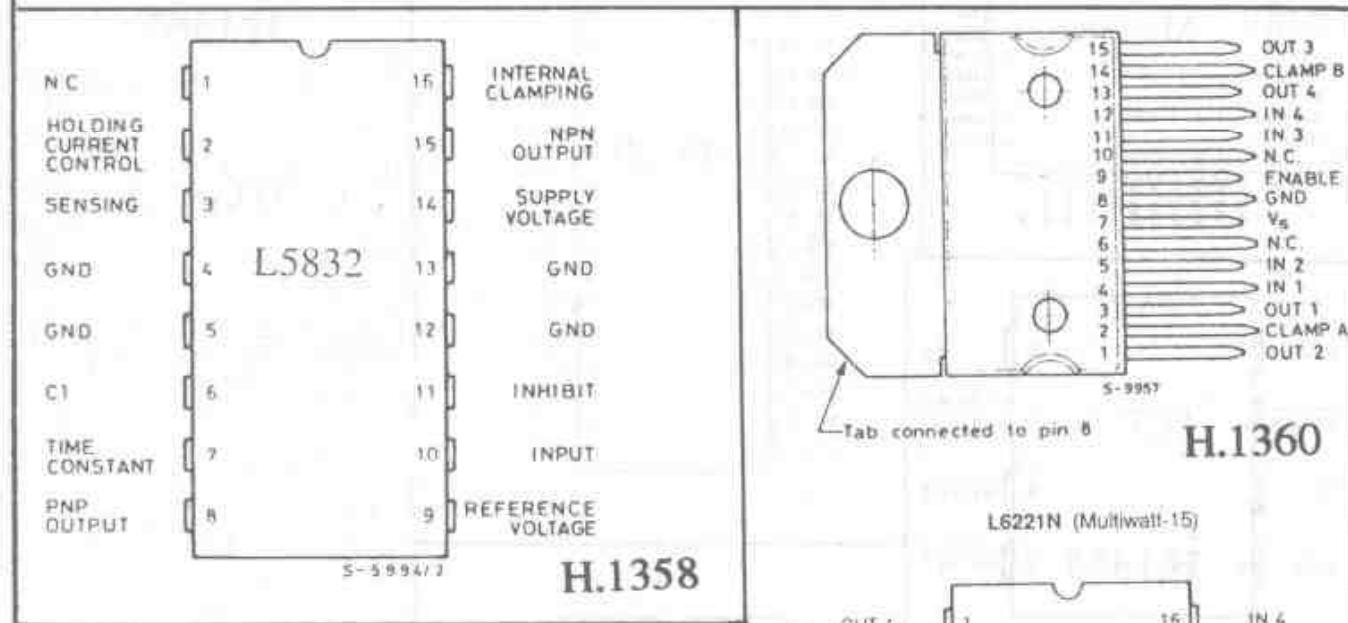
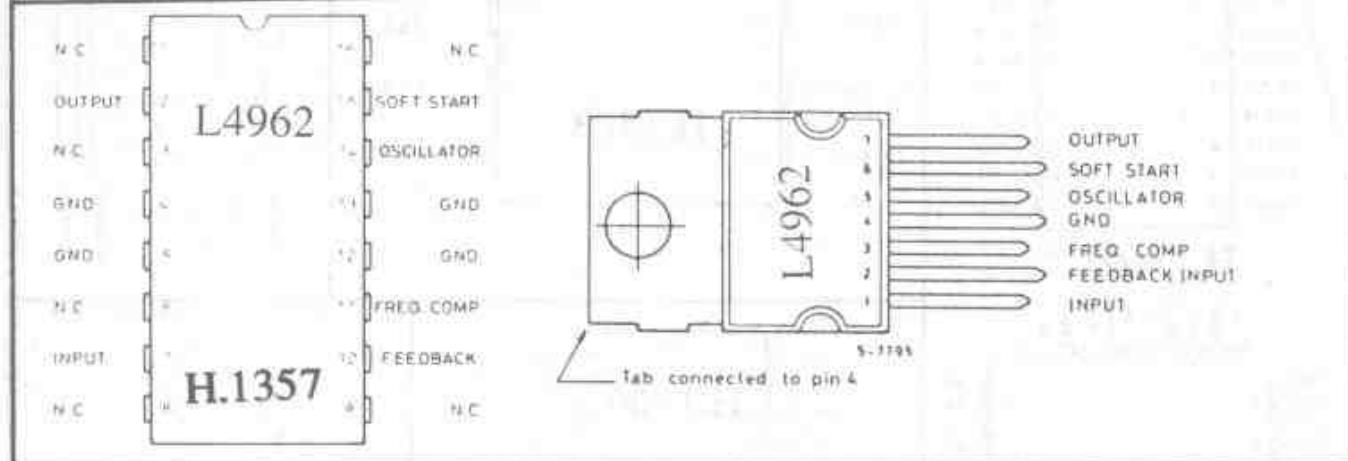
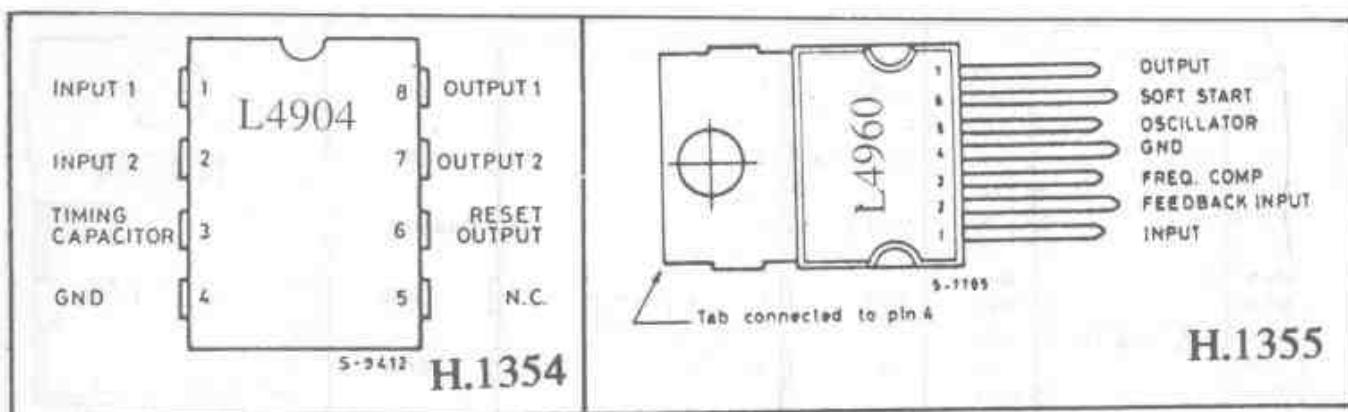
L2724



5-7841

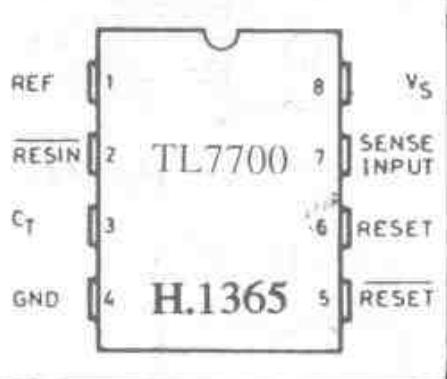
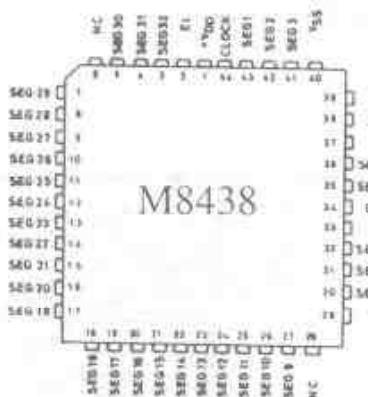
H.1353



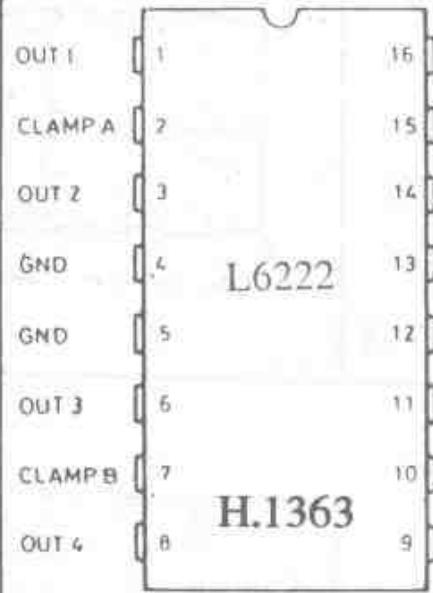
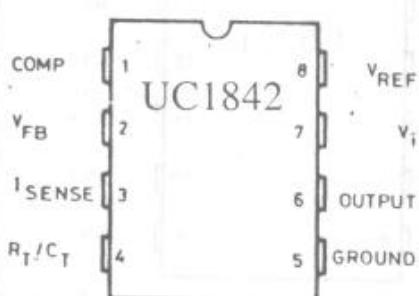




H.1362 \$-8308



H.1369



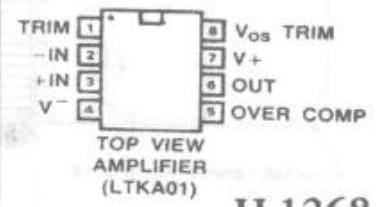
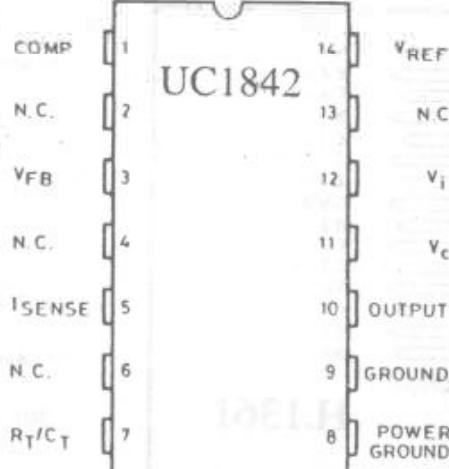
H.1363



H.1367



M8439



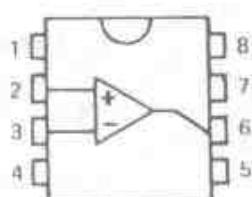
H.1368

TO99

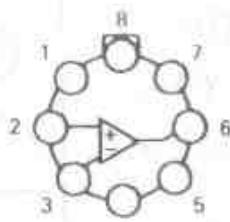
DIP8  
SO8

H.1370

LCC20



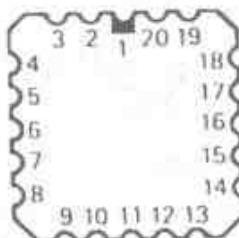
- 1 - Offset null  
2 - Inverting input  
3 - Non-inverting input  
4 - V<sub>cc</sub>



- 5 - Offset null  
6 - Output  
7 - V<sub>cc</sub>  
8 - I<sub>set</sub>

UA776

- 1 - NC  
2 - Offset null  
3 - NC  
4 - NC  
5 - Inverting input  
6 - NC  
7 - Non-inverting input  
8 - NC  
9 - NC  
10 - V<sub>cc</sub>



- 11 - NC  
12 - Offset null  
13 - NC  
14 - NC  
15 - Output  
16 - NC  
17 - V<sub>cc</sub>  
18 - NC  
19 - NC  
20 - I<sub>set</sub>

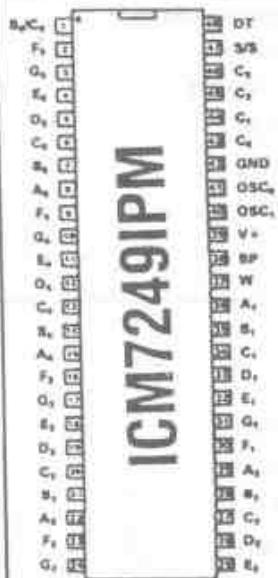
## D OR N PACKAGE

(TOP VIEW)

COMP #1 OUT	1	14	COMP #3 OUT
COMP #2 OUT	2	13	COMP #4 OUT
VDD	3	12	GND
COMP #1 { IN -	4	11	IN + } COMP
COMP #2 { IN +	5	10	IN - } #4
COMP #1 { IN -	6	9	IN + } COMP
COMP #1 { IN +	7	8	IN - } #3

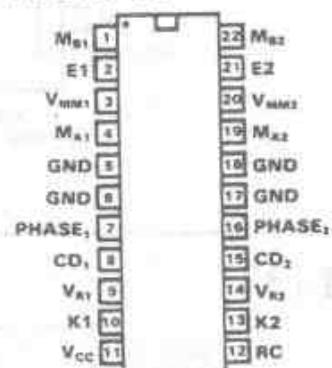
H.1371

TLC354C, TLC354L, TLC354M



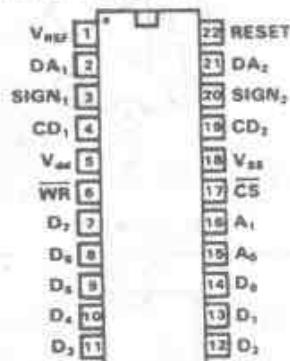
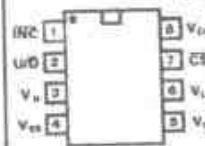
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PBL3771

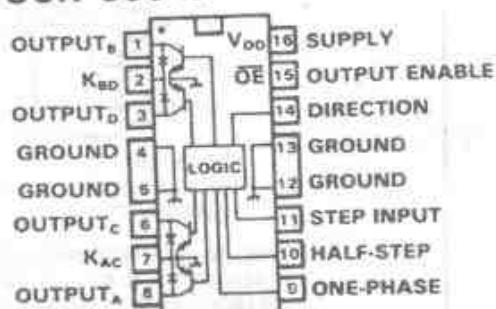


H.1373

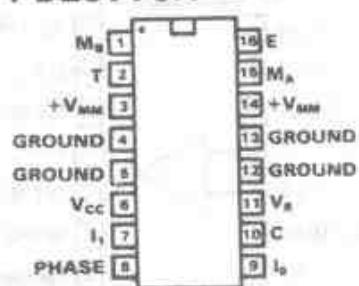
PBM 3960

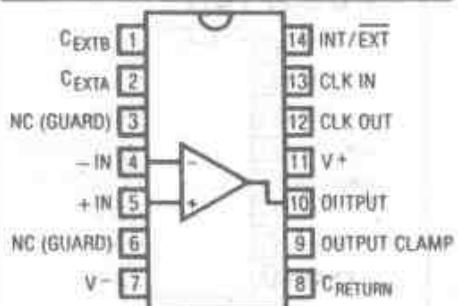
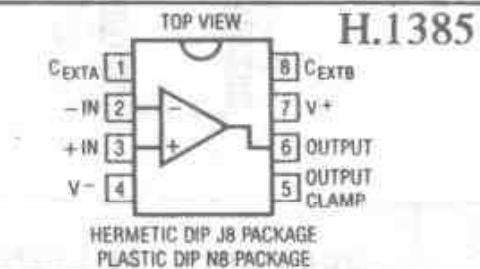
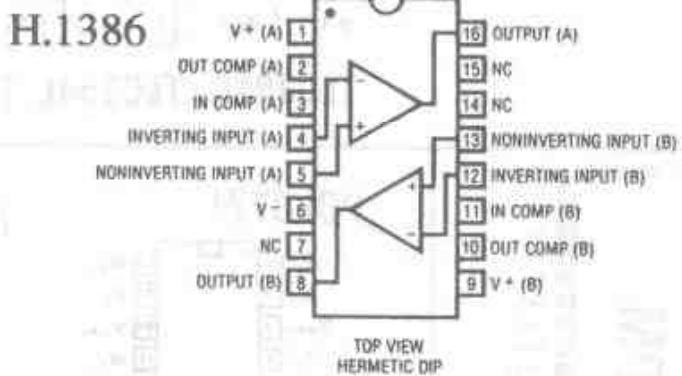
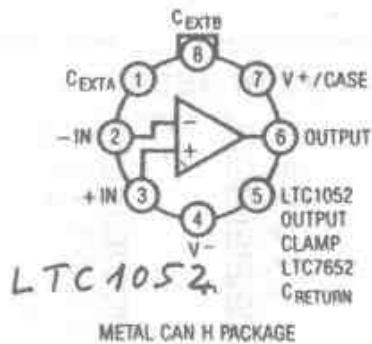
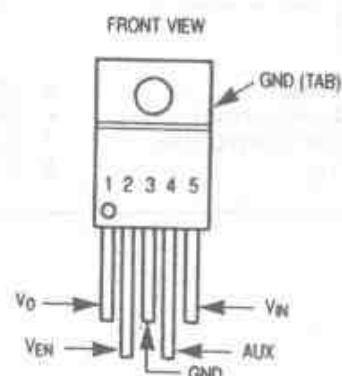
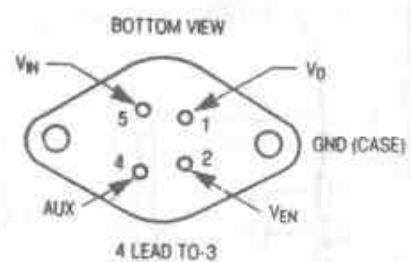
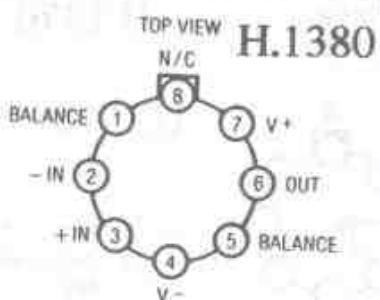
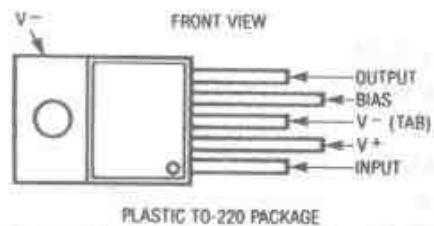
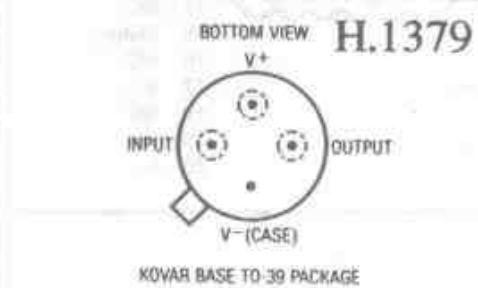
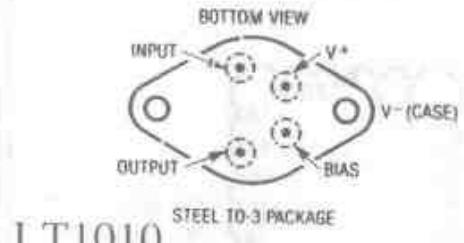
H.1374 X9103P  
X9503P  
X9104P

UCN-5804B H.1375

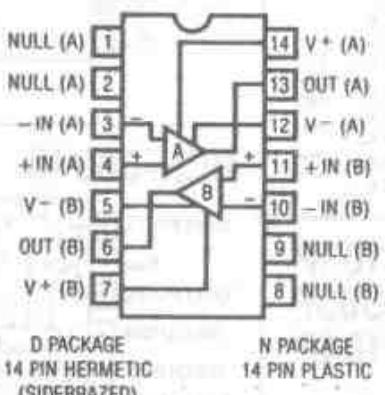


PBL3770A H.1376





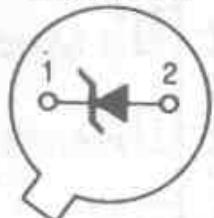
**H.1387**



**LT1024**

NOTE: DEVICE MAY BE OPERATED EVEN IF INSERTION IS-REVERSED; THIS IS DUE TO INHERENT SYMMETRY OF PIN LOCATIONS OF AMPLIFIERS A AND B (NOTE 2).

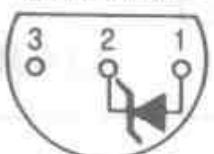
BOTTOM VIEW



LM129

H PACKAGE  
TO-46 METAL CAN

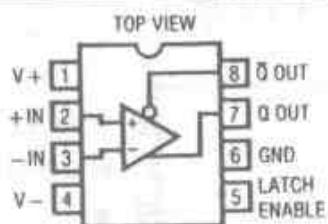
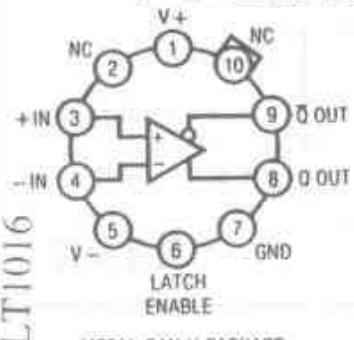
BOTTOM VIEW



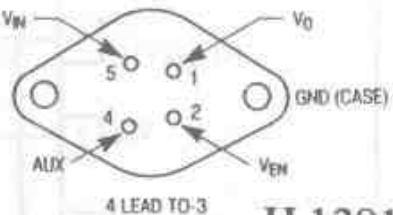
Z PACKAGE  
TO-92 PLASTIC

H.1389

TOP VIEW H.1395

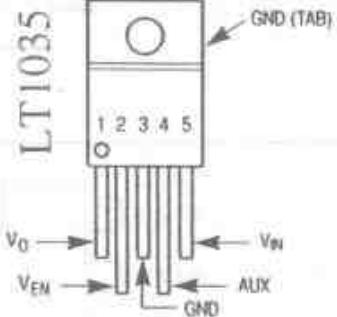


BOTTOM VIEW

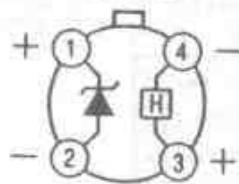


H.1391

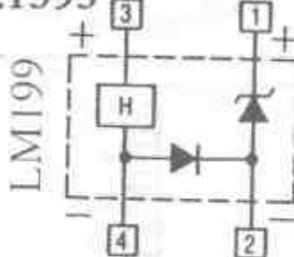
FRONT VIEW



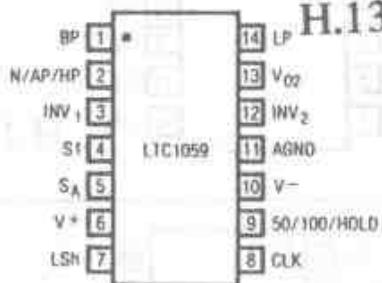
TOP VIEW



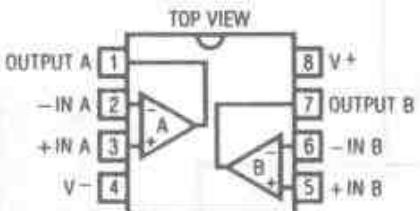
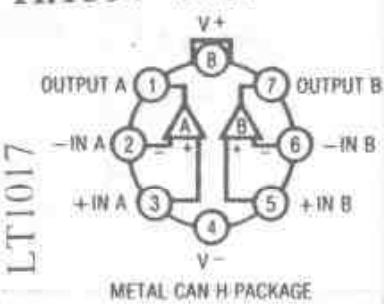
H.1393



H.1398

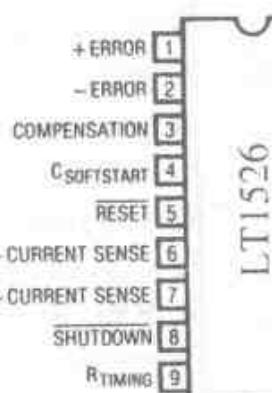


TOP VIEW H.1397

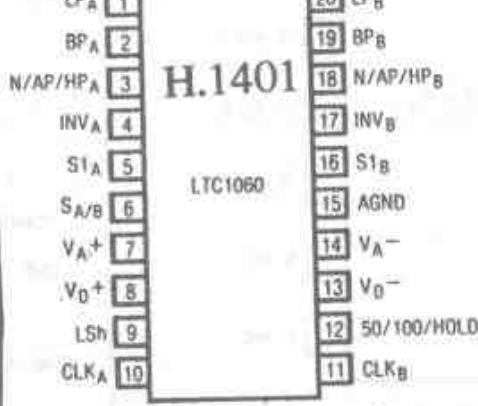


H.1399

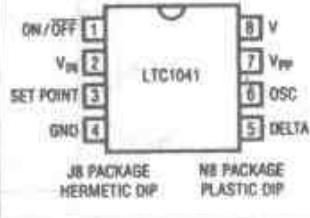
H.1400

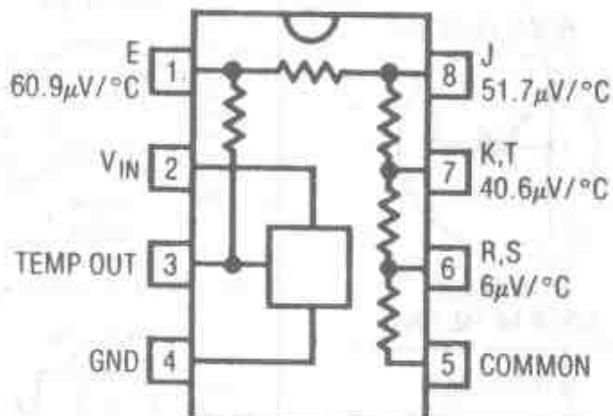
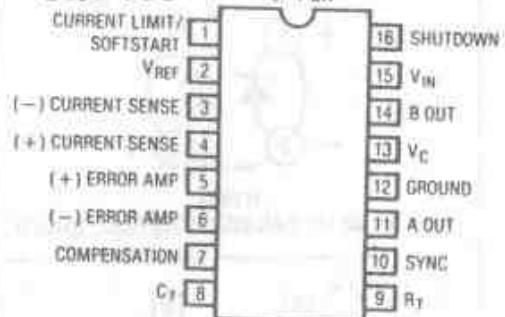
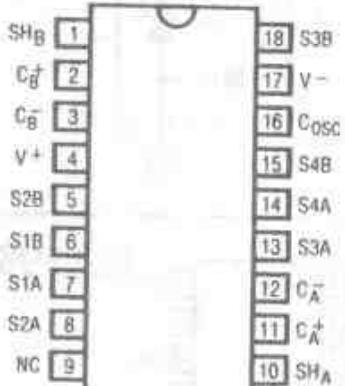
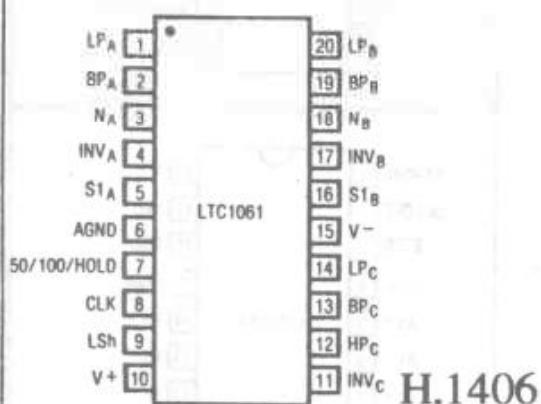
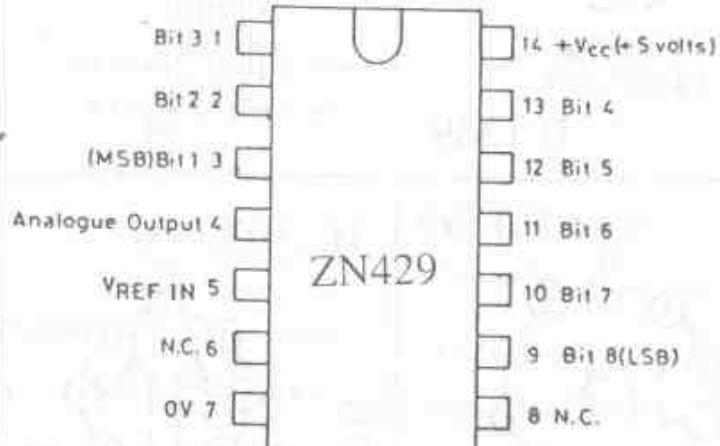
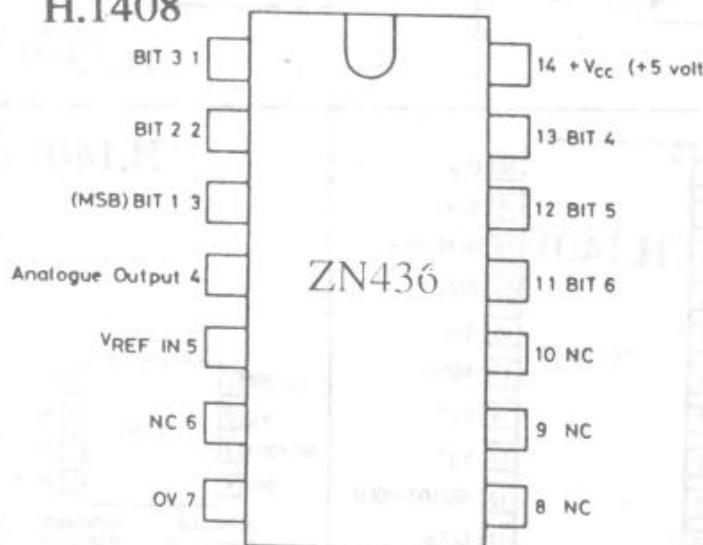
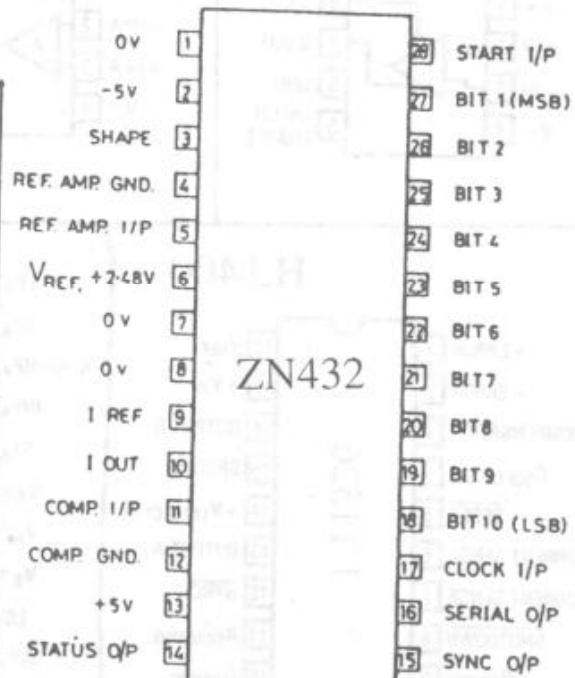


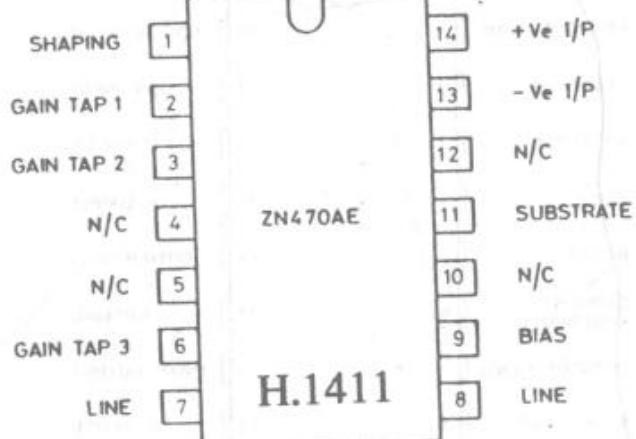
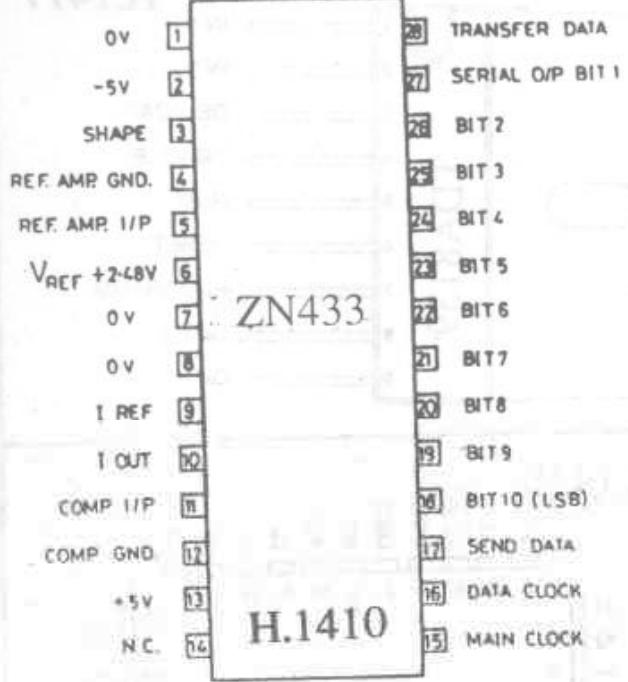
H.1401



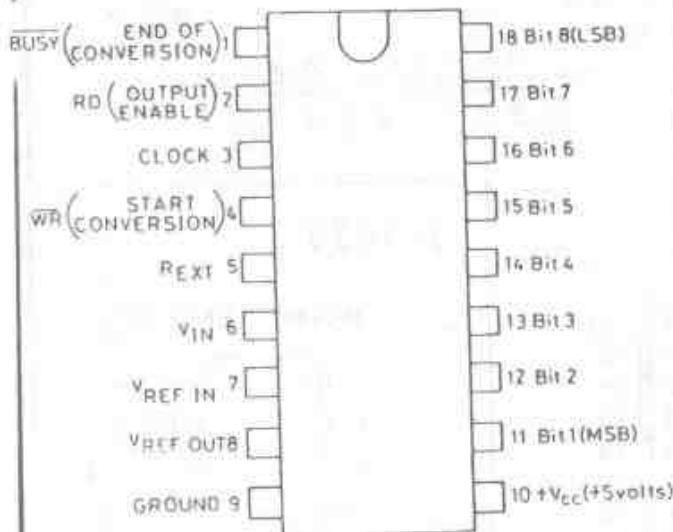
H.1402



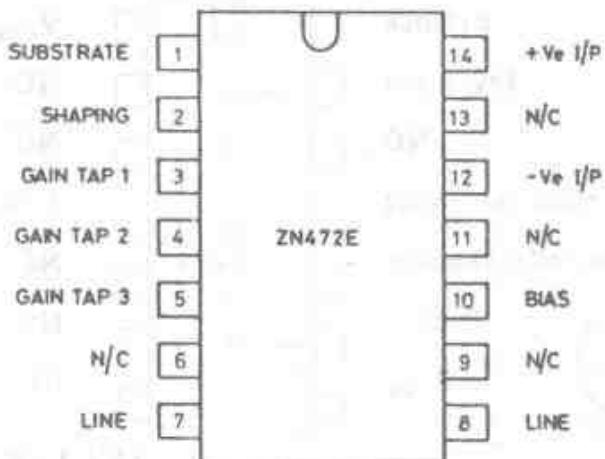
**H.1403****H.1404****H.1405****H.1406****H.1407****H.1408****ZN436****ZN432**



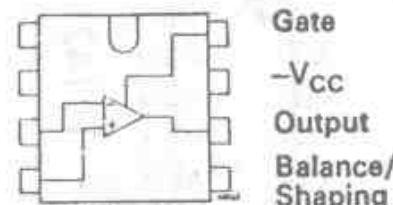
**H.1413**



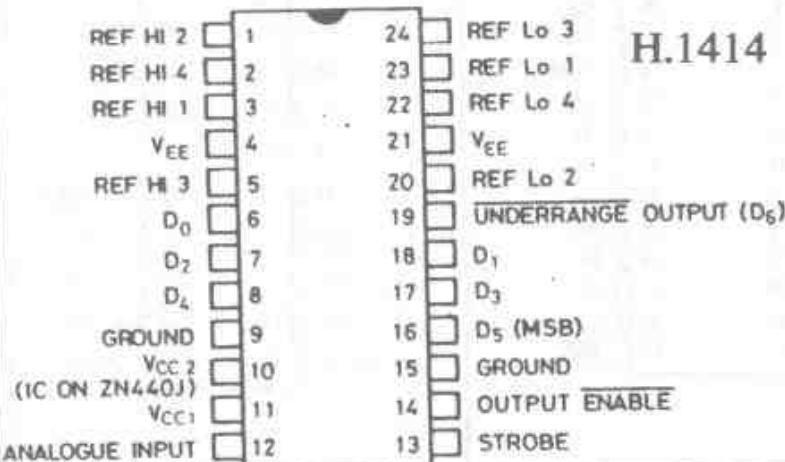
**H.1412**



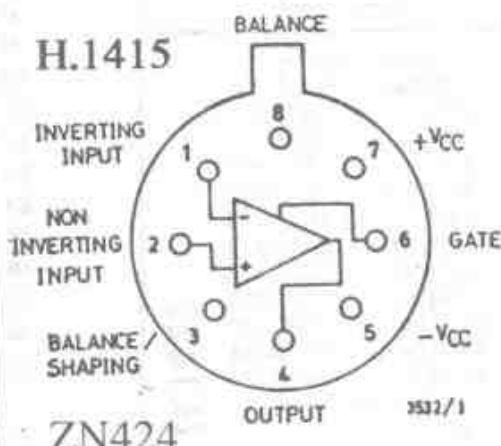
+V<sub>CC</sub>  
Balance  
Inv. input  
Non inv. input



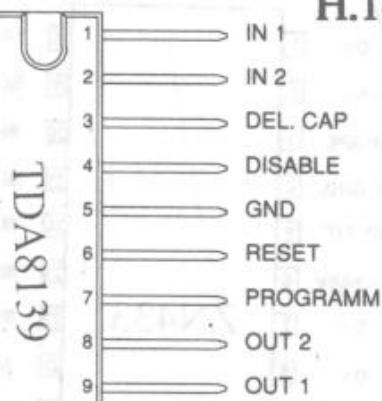
**H.1414**



**H.1415**



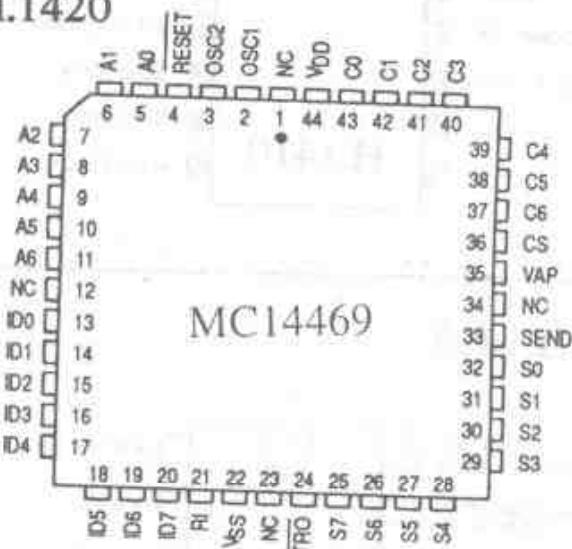
H.1417



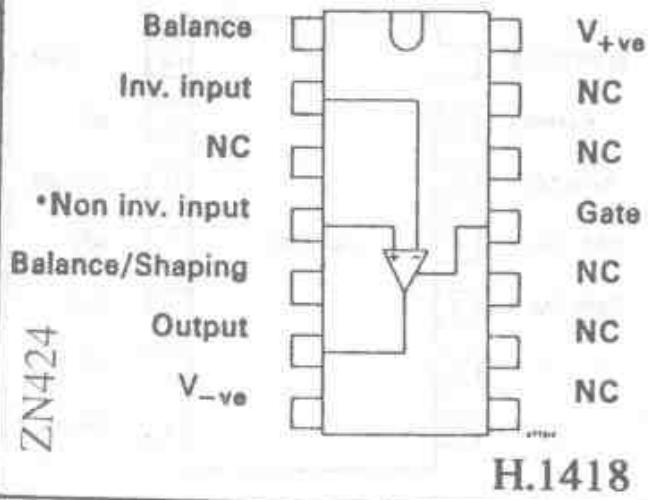
H.1416



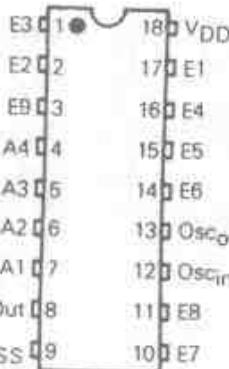
H.1420



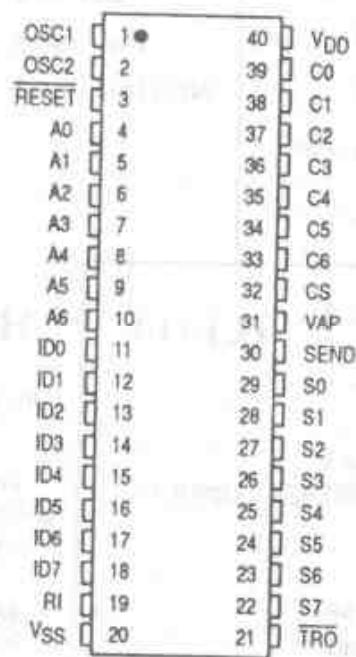
ZN424



H.1418



H.1421



H.1422

H.1424



MC145032 DECODER

A0	1	*	28	V <sub>DD</sub>
A1	2		27	V <sub>SS</sub>
A2	3		26	OSC-R2
A3	4		25	OSC-C
A4	5		24	OSC-R1
A5	6		23	V <sub>D</sub>
A6	7		22	C <sub>B</sub>
A7	8		21	RXDATA
A8	9		20	RESET
A9	10		19	MODE
A10	11		18	C <sub>E</sub>
A11	12		17	A16/D3
A12	13		16	A15/D2
A13/D0	14		15	A14/D1

H.1426

MC145033 ENCODER/DECODER

A0	1	*	28	V <sub>DD</sub>
A1	2		27	V <sub>SS</sub>
A2	3		26	OSC-R2
A3	4		25	OSC-C
A4	5		24	OSC-R1
A5	6		23	V <sub>D</sub>
A6	7		22	C <sub>B</sub>
A7	8		21	RXDATA
A8	9		20	RESET
A9	10		19	DATAOUT
A10	11		18	TXEN
A11	12		17	C <sub>E</sub>
A12	13		16	STATUS
A13	14		15	A14

H.1425

MC145034 ENCODER

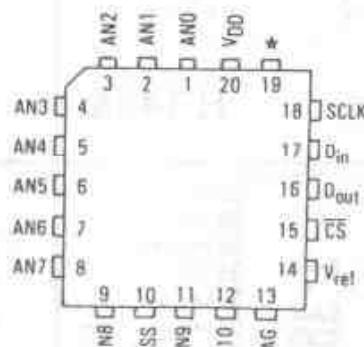
A0	1	*	28	V <sub>DD</sub>
A1	2		27	V <sub>SS</sub>
A2	3		26	OSC-R2
A3	4		25	OSC-C
A4	5		24	OSC-R1
A5	6		23	N.C.
A6	7		22	N.C.
A7	8		21	N.C.
A8	9		20	N.C.
A9	10		19	DATAOUT
A10	11		18	TXEN
A11	12		17	A16/D3
A12	13		16	A15/D2
A13/D0	14		15	A14/D1

H.1427

H.1428

MC145035 DECODER

A0	1	*	28	V <sub>DD</sub>
A1	2		27	V <sub>SS</sub>
A2	3		26	OSC-R2
A3	4		25	OSC-C
A4	5		24	OSC-R1
A5	6		23	V <sub>D</sub>
A6	7		22	C <sub>B</sub>
A7	8		21	RXDATA
A8	9		20	RESET
A9	10		19	MODE
A10	11		18	C <sub>E</sub>
A11	12		17	A16/D3
A12	13		16	A15/D2
A13/D0	14		15	A14/D1



\* NOTE:  
A/D CLK (MC145040)  
EOC (MC145041)

H.1430

A1	1	*	16	A0
A2	2		15	Ch 1
Ramp Start	3		14	V <sub>DD</sub>
Ramp Cap	4		13	Ch 2
V <sub>SS</sub>	5		12	Ch 3
Ref Current	6		11	Ch 4
Comp Out	7		10	Ch 5
V <sub>ref</sub>	8		9	Ch 6

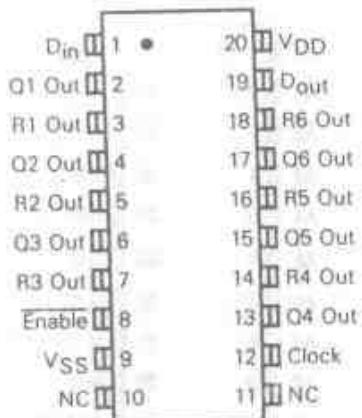
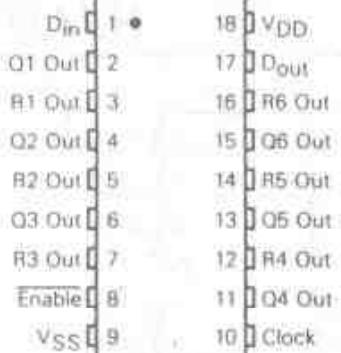
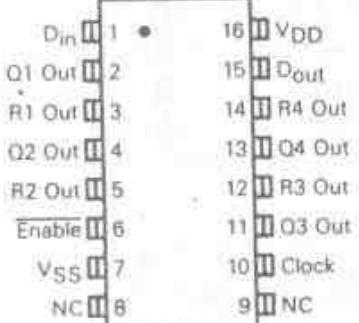
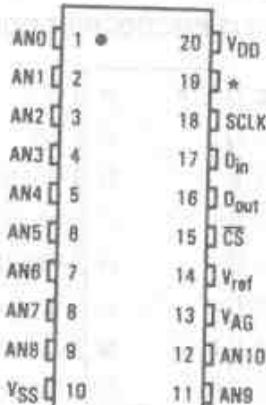
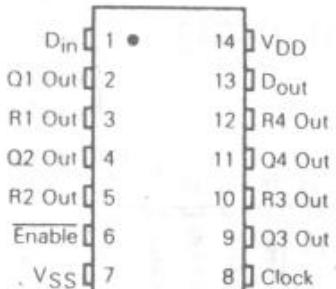
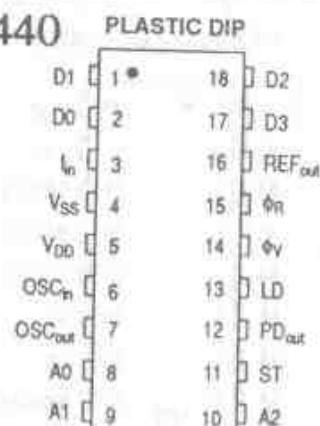
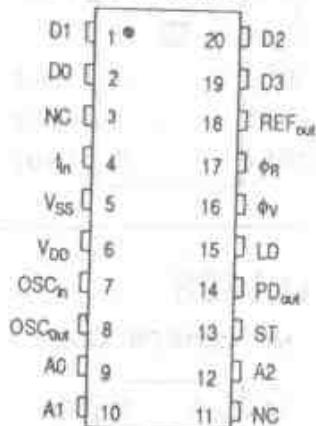
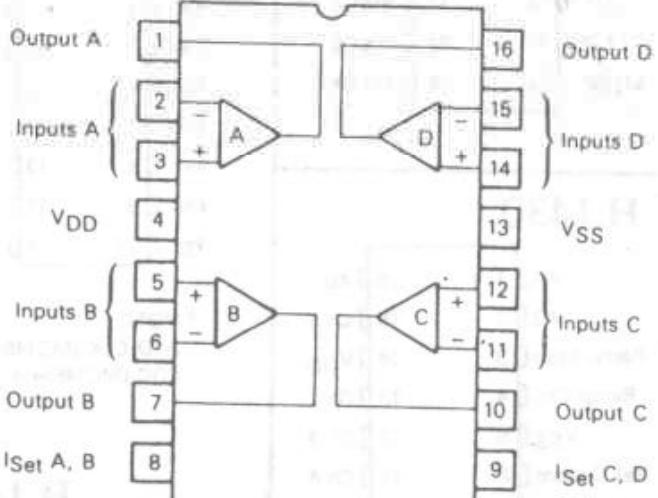
H.1432

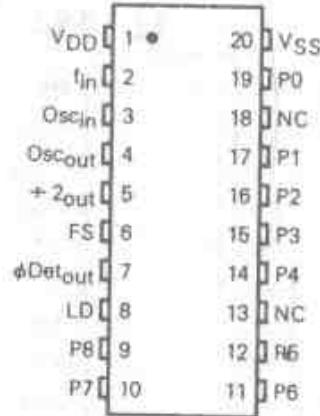
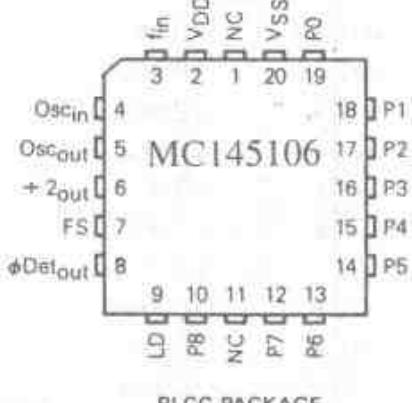
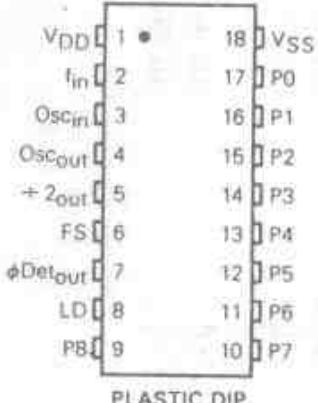
VAG	1	*	28	V <sub>ref</sub> (AN1)
VSS	2		27	V <sub>DD</sub>
D7	3		26	AN0
D6	4		25	AN2
D5	5		24	AN3
D4	6		23	AN4
D3	7		22	AN5
D2	8		21	P0(AN10)
D1	9		20	P1(AN11)
D0	10		19	P2(AN8)
R/W	11		18	P3(AN9)
E	12		17	P4(AN6)
RS1	13		16	P5(AN7)
CS	14		15	Reset

D6	4	3	2	1	28	27	26	25	AN2
D5	5							24	AN3
D4	6							23	AN4
D3	7							22	AN5
D2	8							21	P0(AN10)
D1	9							20	P1(AN11)
D0	10							19	P2(AN8)
R/W	11							18	P3(AN9)
12	13	14	15	16	17	18			
RS1									
C5									
Reset									
P5(AN7)									
P4(AN6)									
P3(AN9)									

MC14442

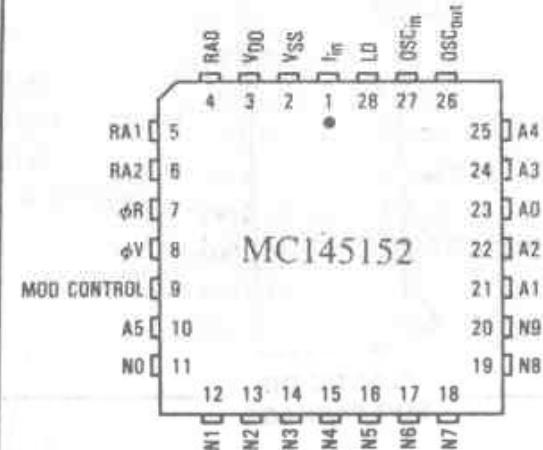
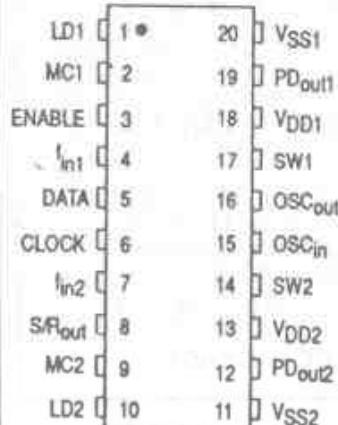
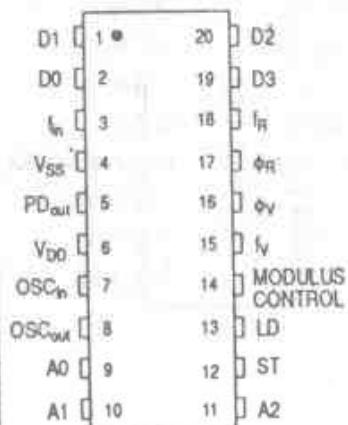
H.1429

**MC144110DW****H.1434****MC144110P****MC144111DW****MC144111P H.1436****H.1440****SOG PACKAGE****H.1437****H.1438****H.1439****H.1441**



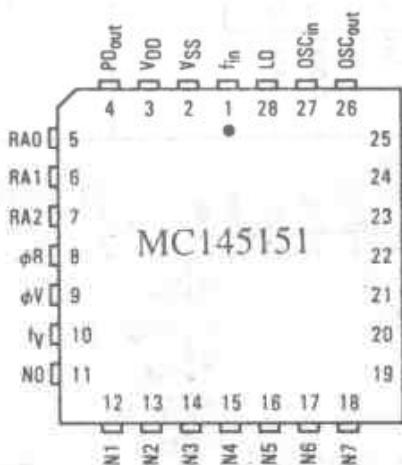
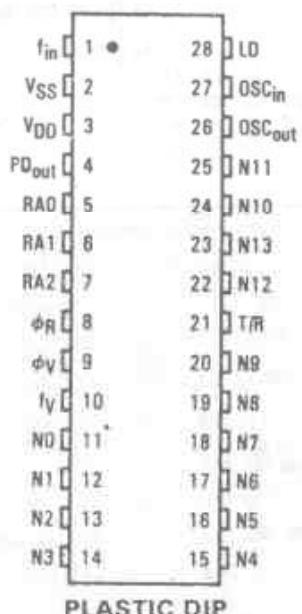
H.1443

H.1446

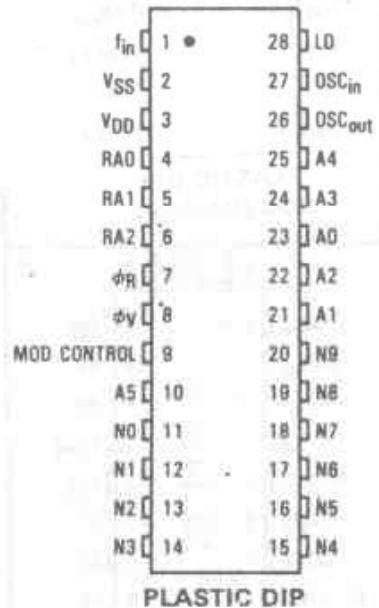


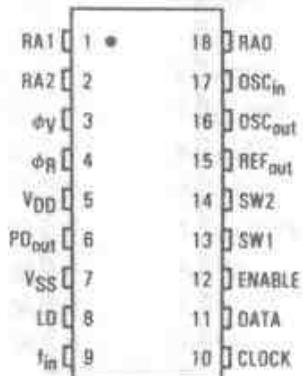
H.1449

H.1448



H.1451

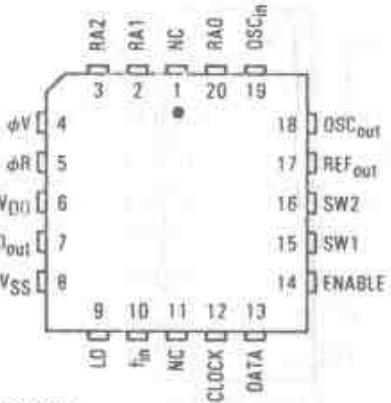


**H.1454**

PLASTIC DIP

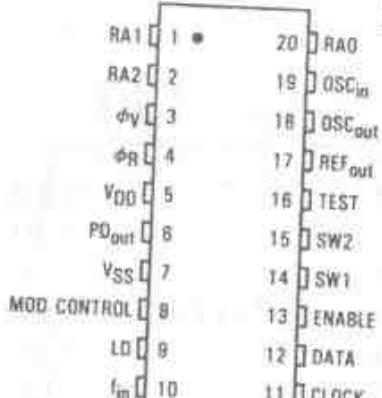
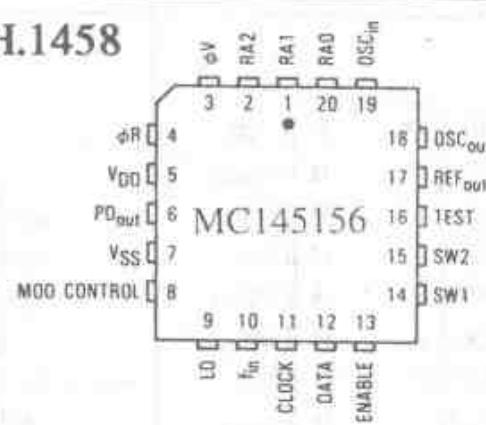


SOG PACKAGE

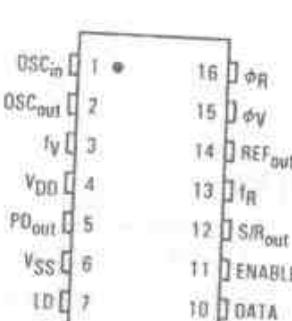
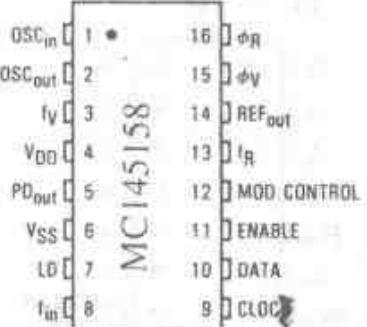
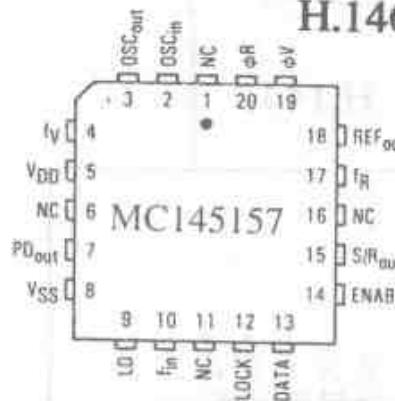


NC = NO CONNECTION

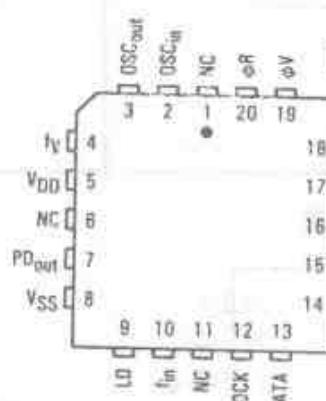
PLCC PACKAGE

**H.1458**PLASTIC DIP  
SOG PACKAGE

PLCC PACKAGE

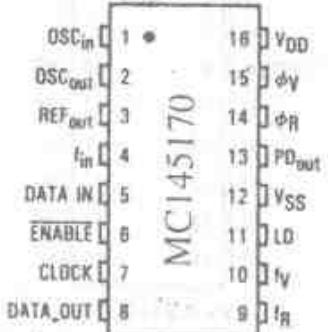
PLASTIC DIP  
SOG PACKAGE

H.1460

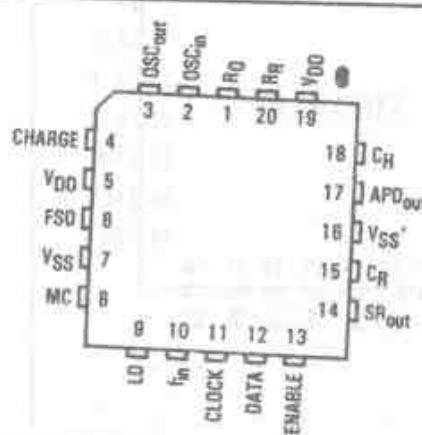


H.1462

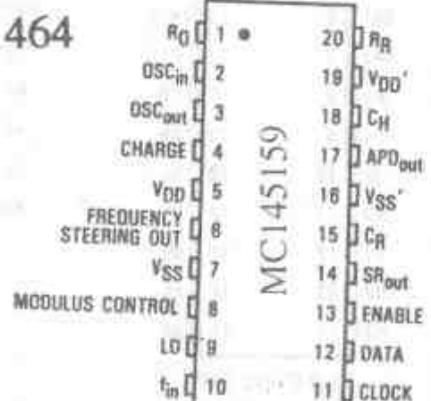
NC = NO

**H.1465**

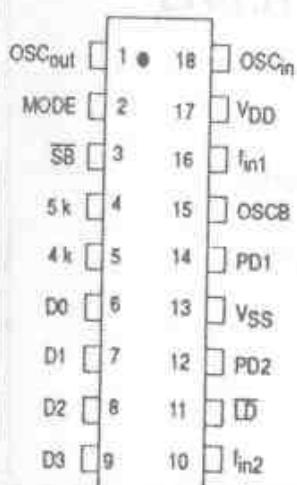
MC145170



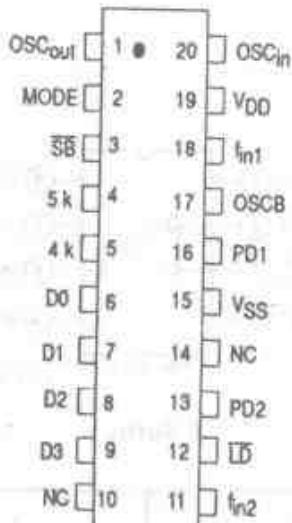
H.1464



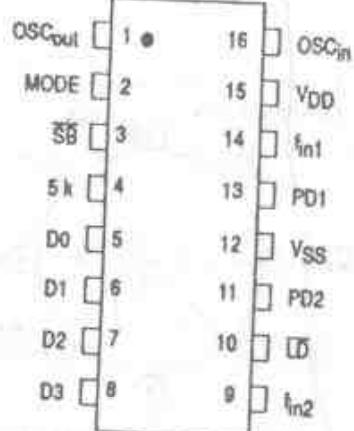
MC145160P



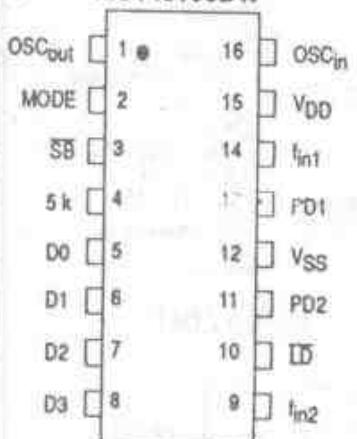
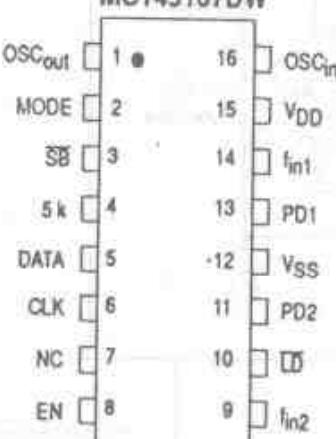
MC145160DW



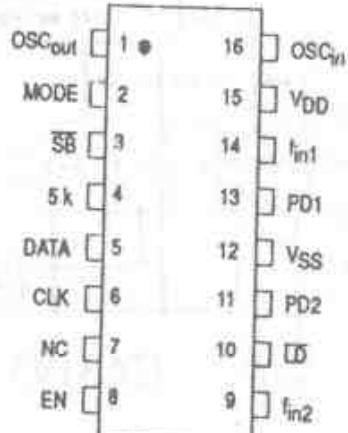
MC145168



H.1467

MC145166P  
MC145166DWMC145167P  
MC145167DW

MC145169

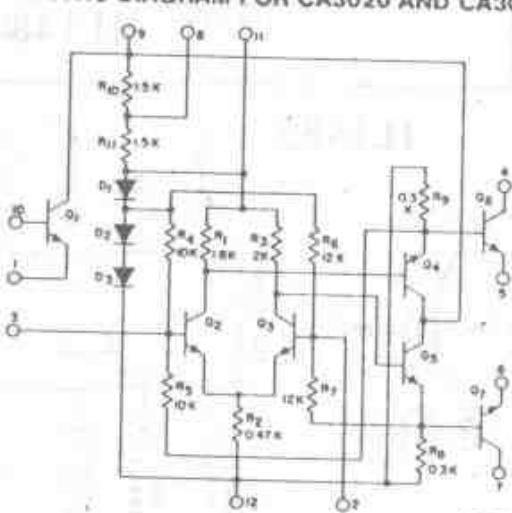


H.1469

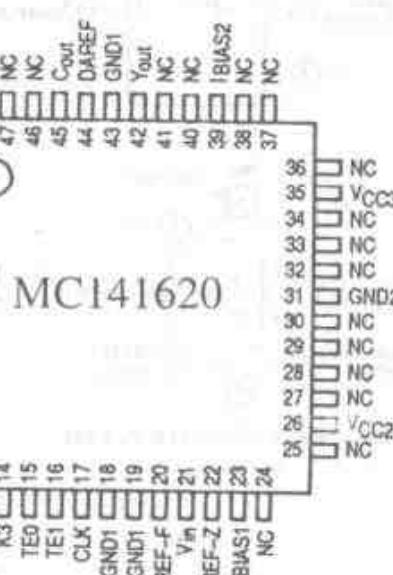
H.1471

H.1472

SCHEMATIC DIAGRAM FOR CA3020 AND CA3020A

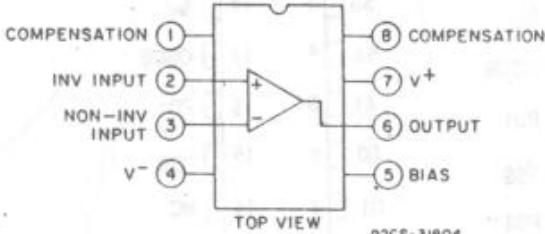
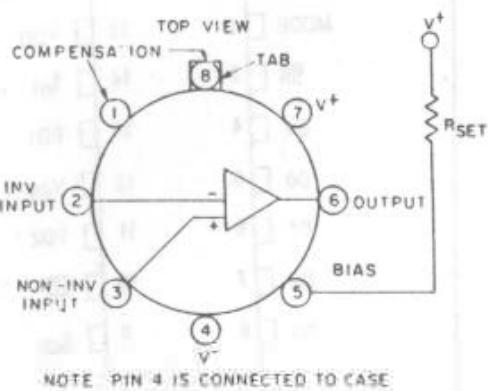


H.1473



# CA3078, CA3078A

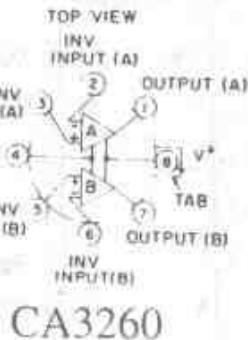
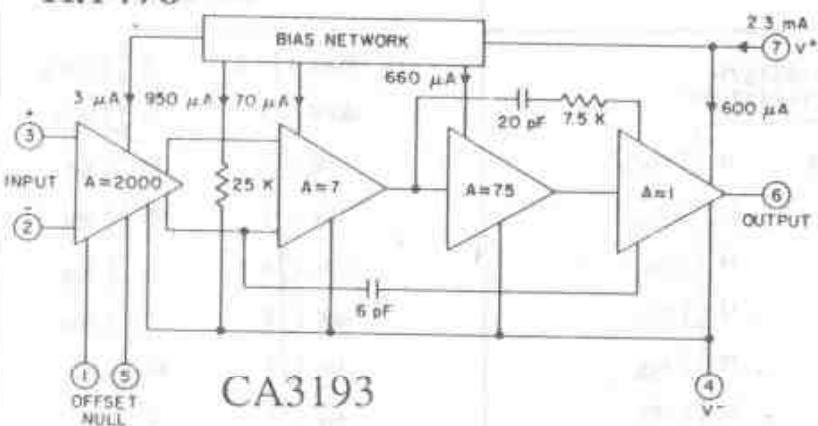
H.1475



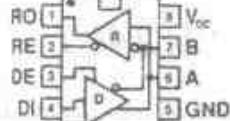
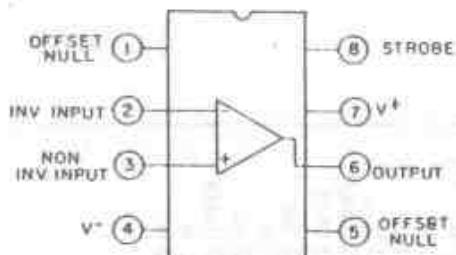
92CS-31804

E Suffix

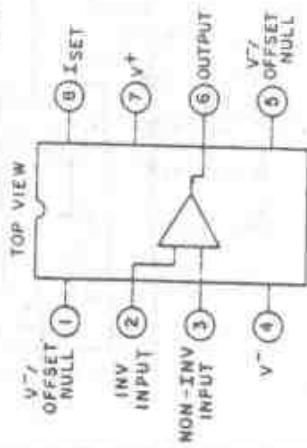
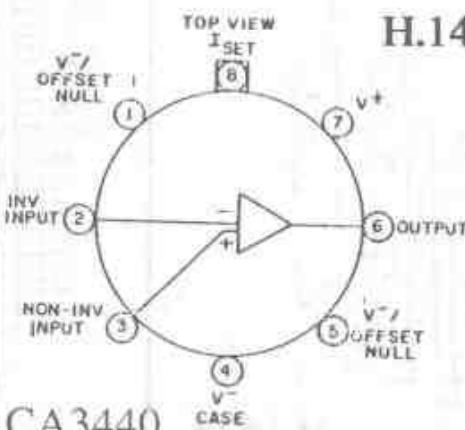
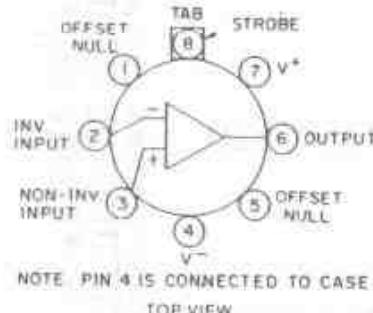
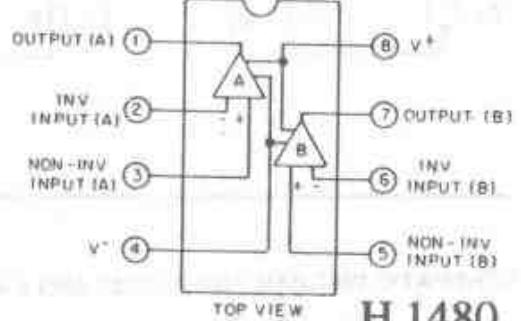
H.1476

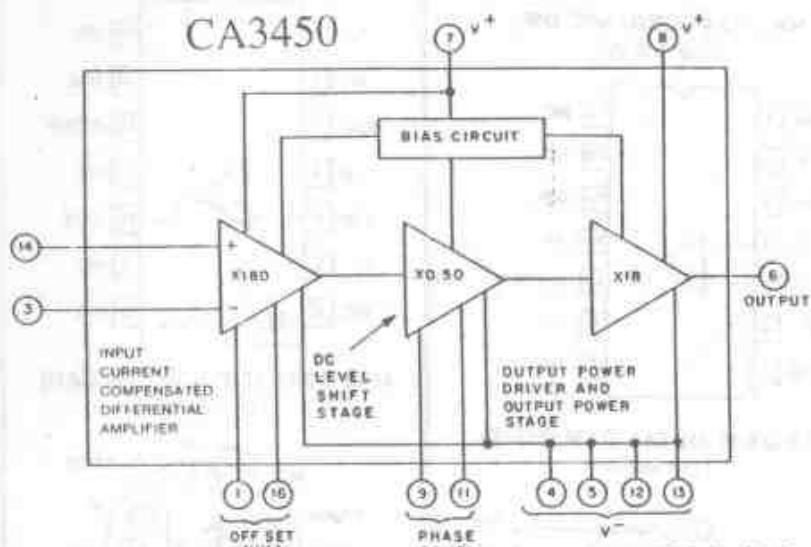
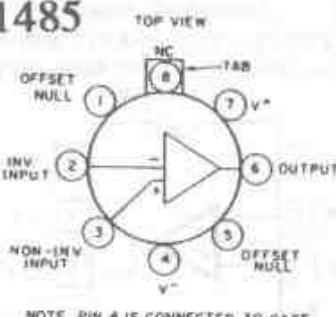
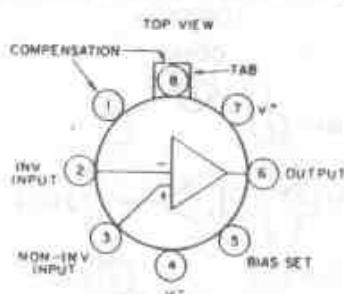
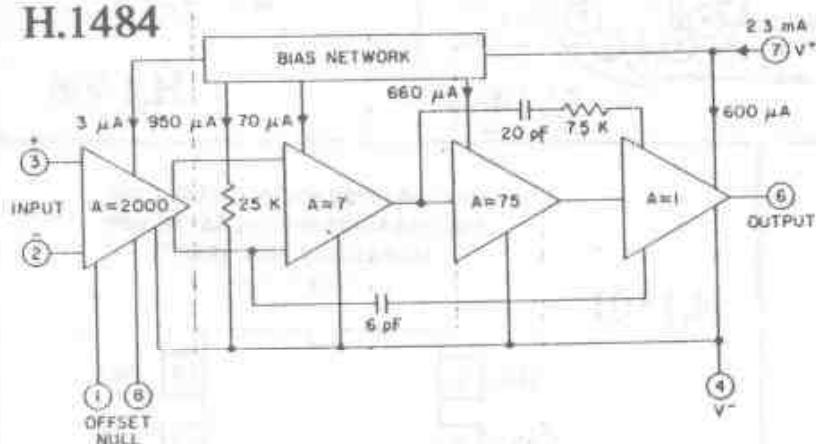


H.1478

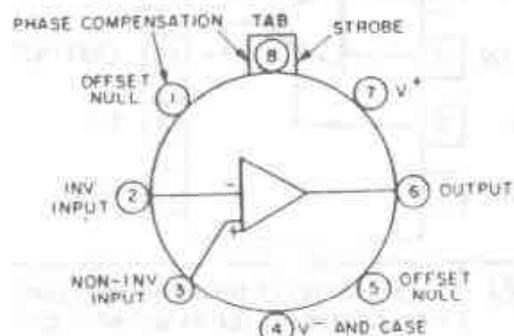
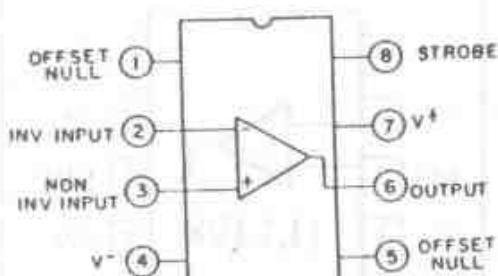
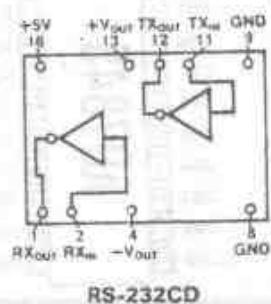
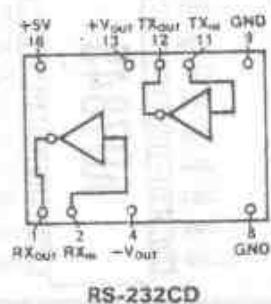
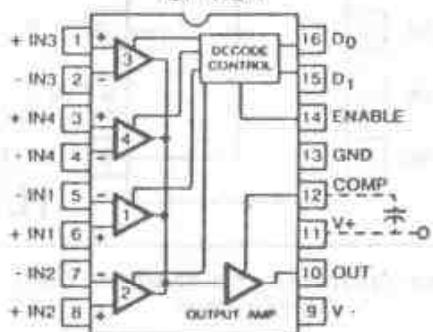


H.1479



**CA3450****H.1485****CA6741T****H.1484**

CA3493A and CA3493.

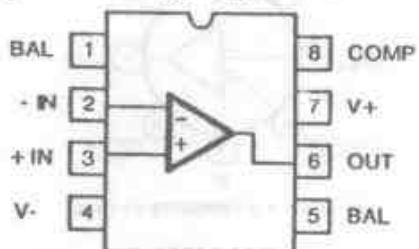
**H.1489****H.1488****HA1-2400/04/05 (CERAMIC DIP)**  
TOP VIEW

TRUTH TABLE

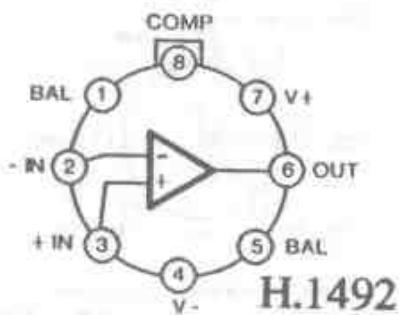
D <sub>1</sub>	D <sub>0</sub>	EN	SELECTED CHANNEL
L	L	H	1
L	H	H	2
H	L	H	3
H	H	H	4
X	X	L	NONE

**H.1490**

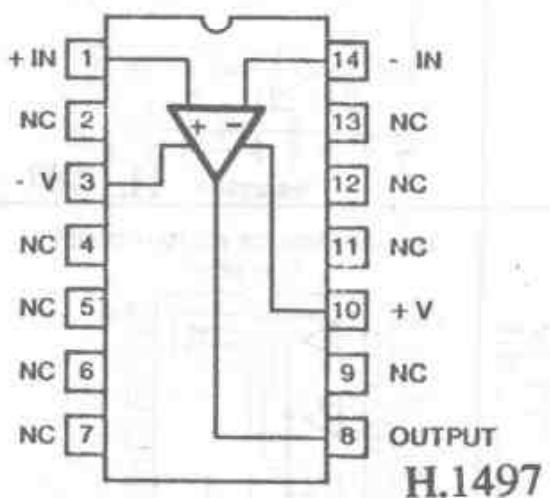
HA9P2505 (SOIC)  
HA7-2500/02/05 (CERAMIC MINI-DIP)  
HA3-2505 (PLASTIC MINI-DIP)  
TOP VIEW



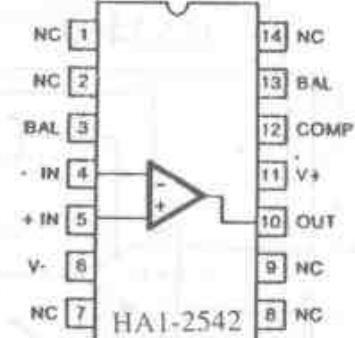
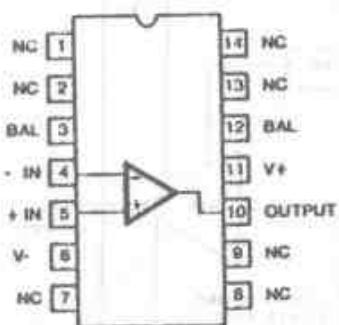
HA2-2500/02/05 (TO-99 METAL CAN)  
TOP VIEW



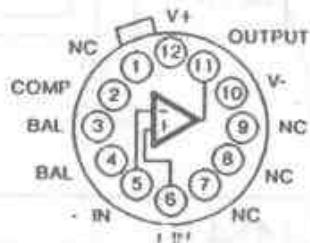
HA1-2539/2539C (CERAMIC DIP)  
HA3-2539/2539C (PLASTIC DIP)  
HA9P2539/2539C (SOIC)  
TOP VIEW



HA1-2541 CERAMIC DIP  
TOP VIEW



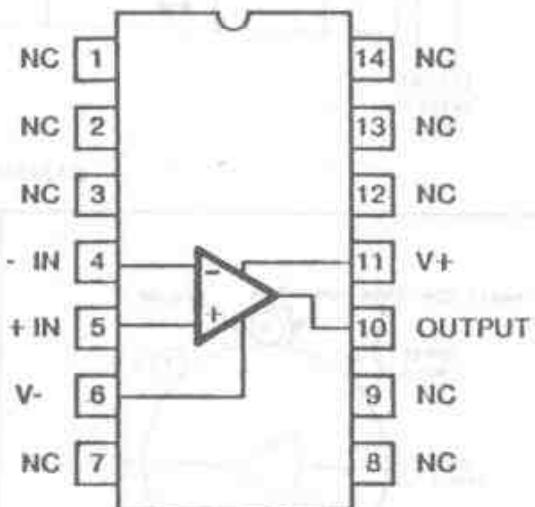
HA2-2542 (TO-8 METAL CAN)  
TOP VIEW



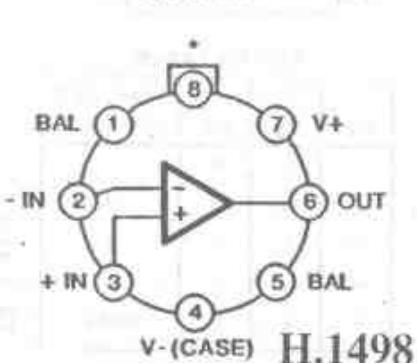
H.1496

H.1501

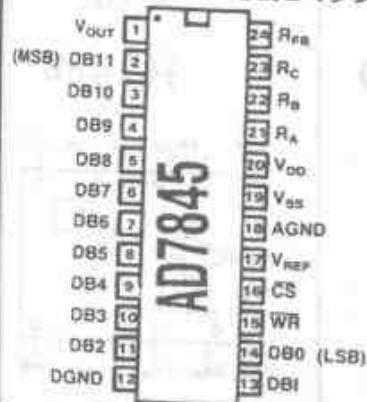
HA1-2540/2540C (CERAMIC DIP)  
HA3-2540/2540C (PLASTIC DIP)  
HA92540/2540C (SOIC)  
TOP VIEW



HA2-5101/5111 (TO-99 METAL CAN)  
TOP VIEW

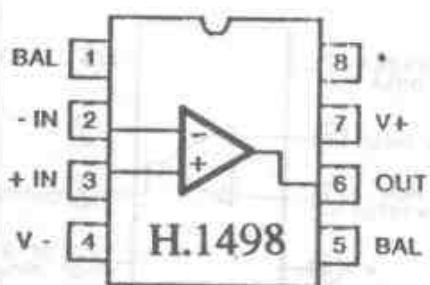


H.1498

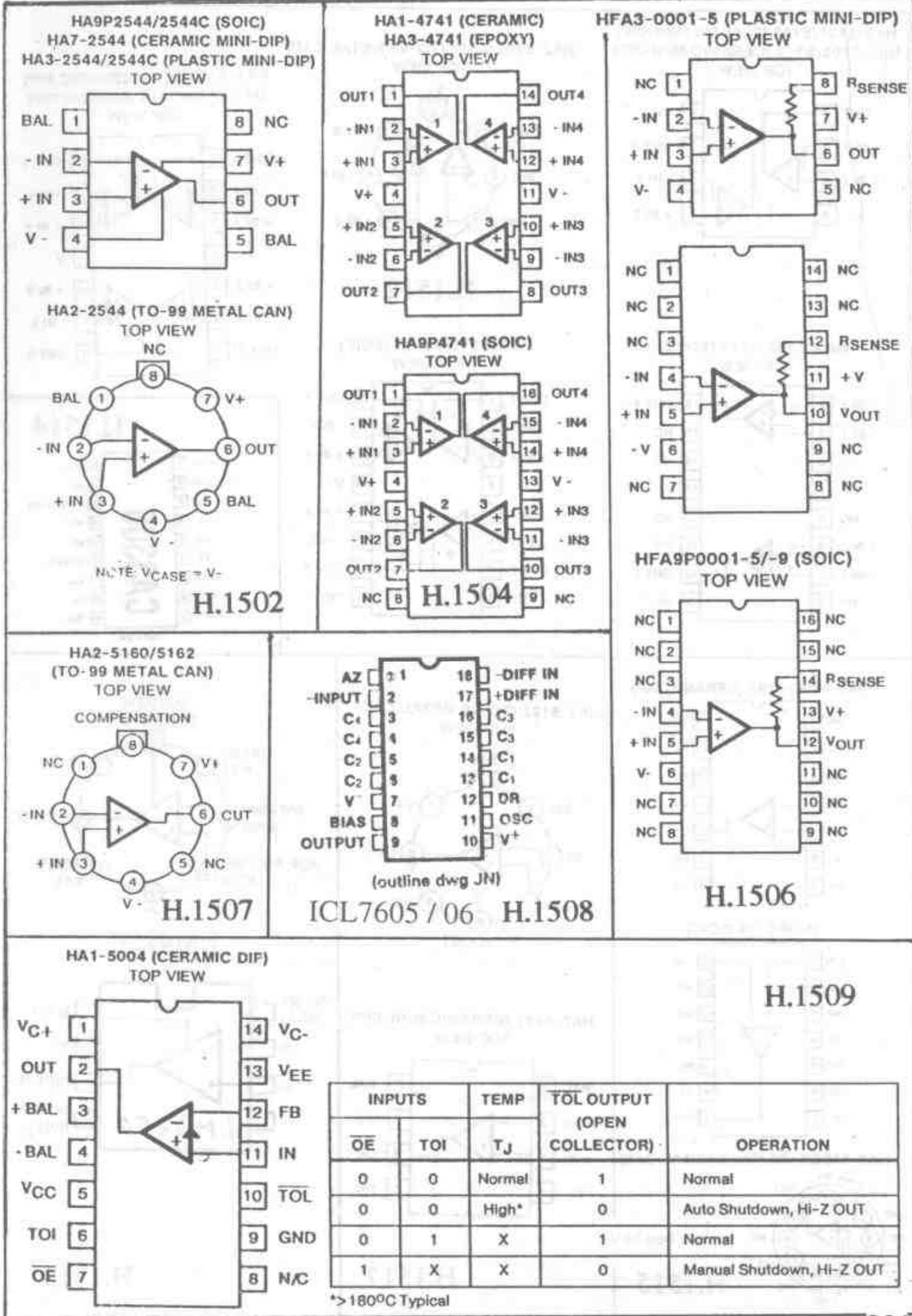


H.1499

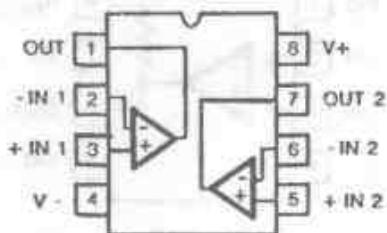
HA3-5101/5111 (PLASTIC MINI-DIP)  
HA7-5101/5111 (CERAMIC MINI-DIP)  
HA9P5101/5111 (SOIC)  
TOP VIEW



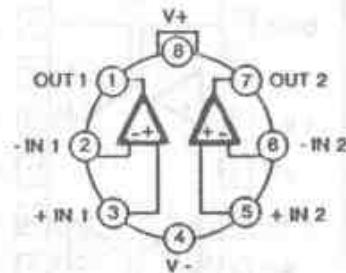
H.1498



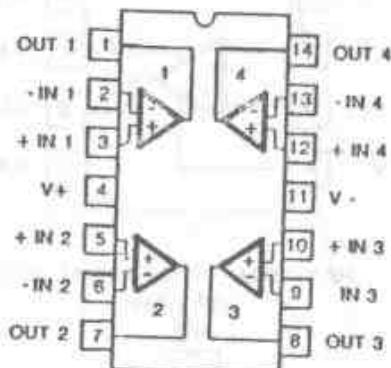
HA1-5102/5112 (PLASTIC MINI-DIP)  
HA7-5102/5112 (CERAMIC MINI-DIP)  
TOP VIEW



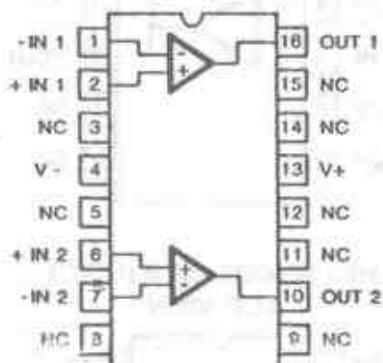
HA2-5102/5112 (TO-99 METAL CAN)  
TOP VIEW



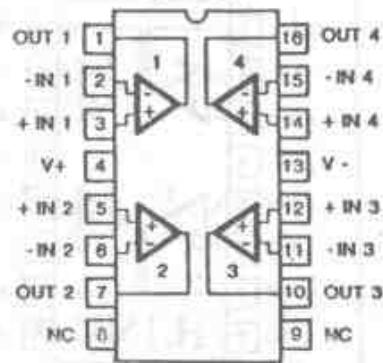
HA1-5104/5114 (CERAMIC DIP)  
HA3-5104/5114 (PLASTIC DIP)  
TOP VIEW



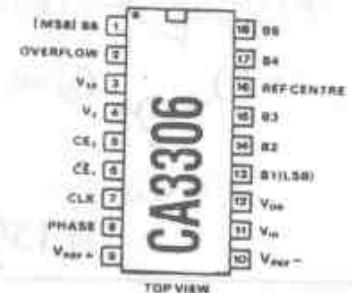
HA9P5102/5112 (SOIC)  
TOP VIEW



HA9P5104/5114 (SOIC)  
TOP VIEW

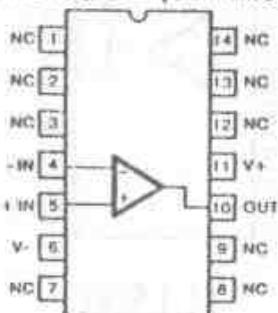


H.1512

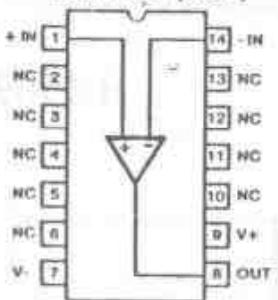


**CA3306**

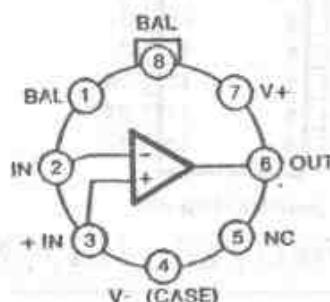
HA1-5190/5195 (CERAMIC DIP)



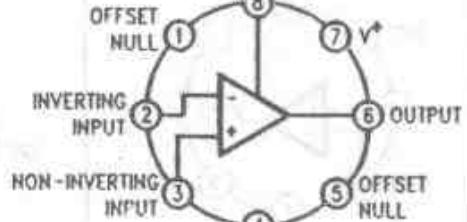
HA9P5195 (SOIC)



HA2-5127 (TO-99 METAL CAN)  
TOP VIEW

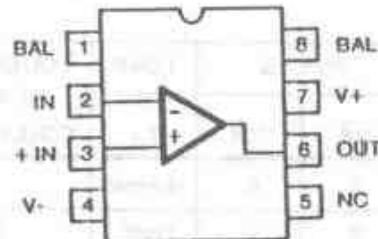


QUIESCENT  
CURRENT SET

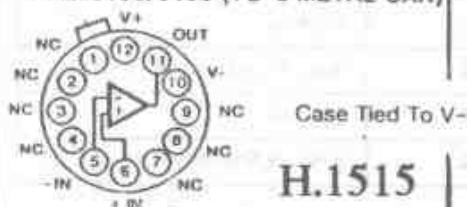


**LM4250**

HA7-5127 (CERAMIC MINI-DIP)  
TOP VIEW



HA2-5190/5195 (TO-8 METAL CAN)

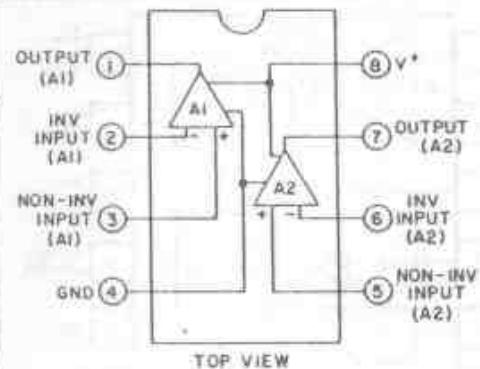


Case Tied To V-

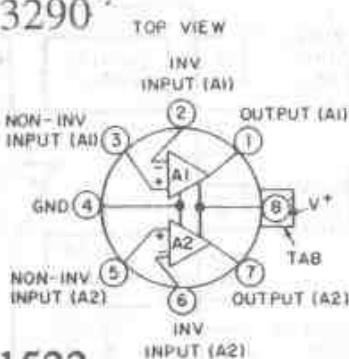
H.1515

H.1517

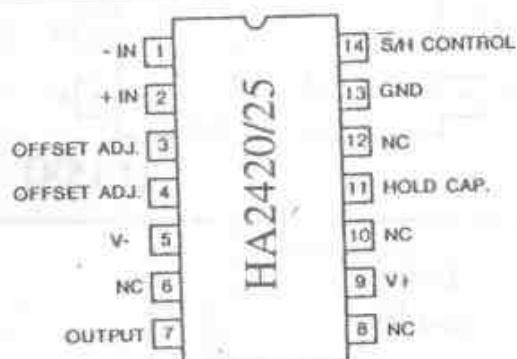
H.1519



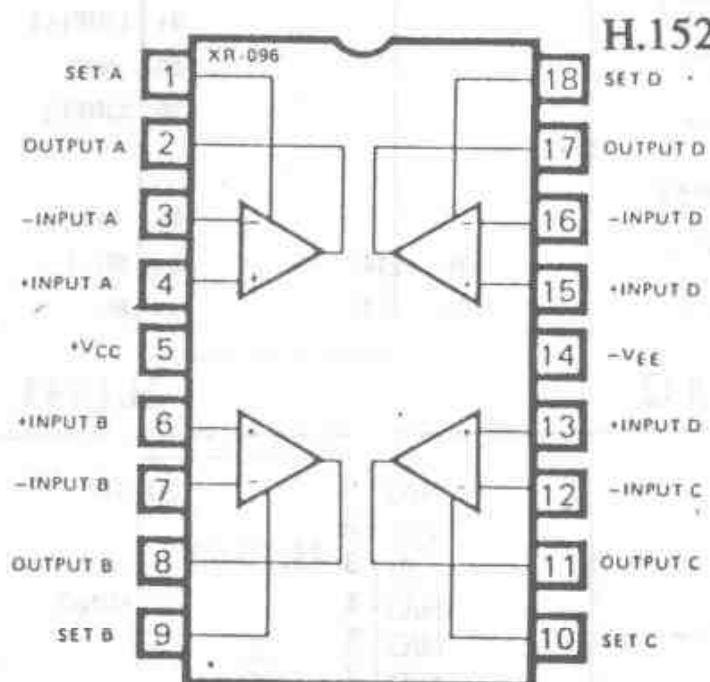
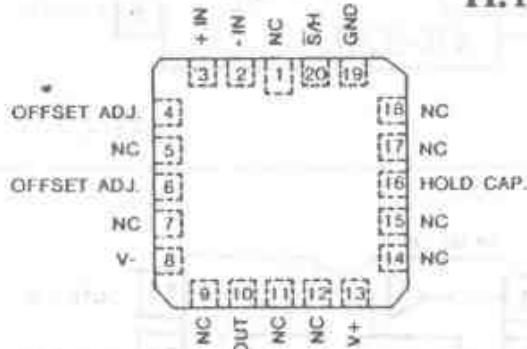
**CA3290**



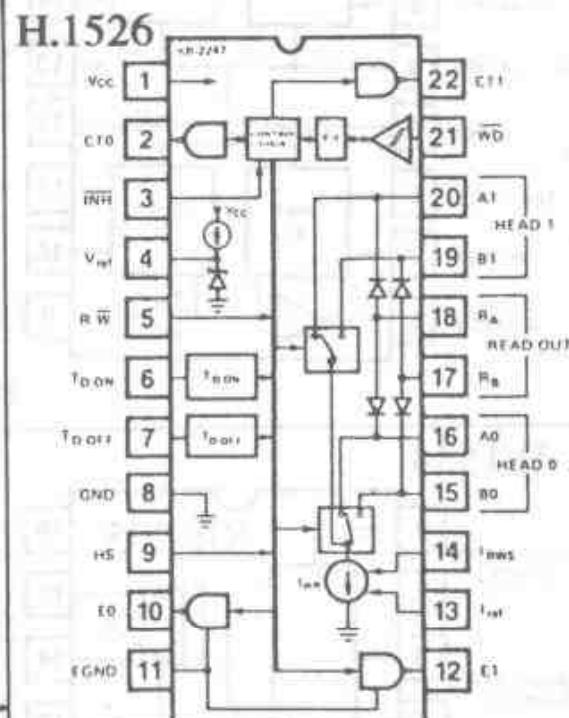
**H.1522**



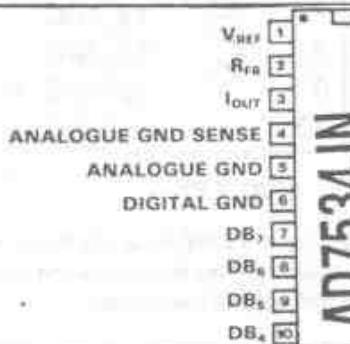
**20 PAD LCC/PLCC  
TOP VIEW**



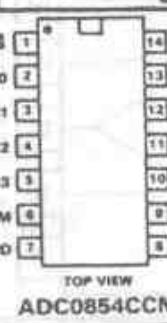
**H.1524**



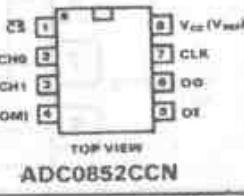
**H.1527**

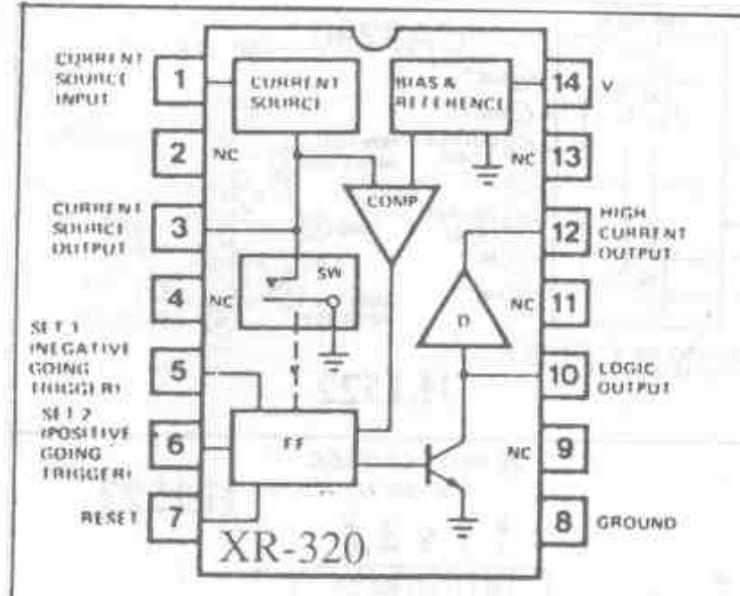


**H.1525**

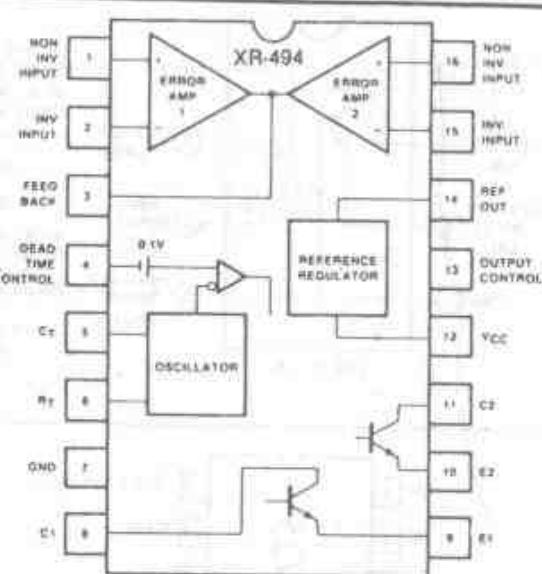


**ADC0854CCN**

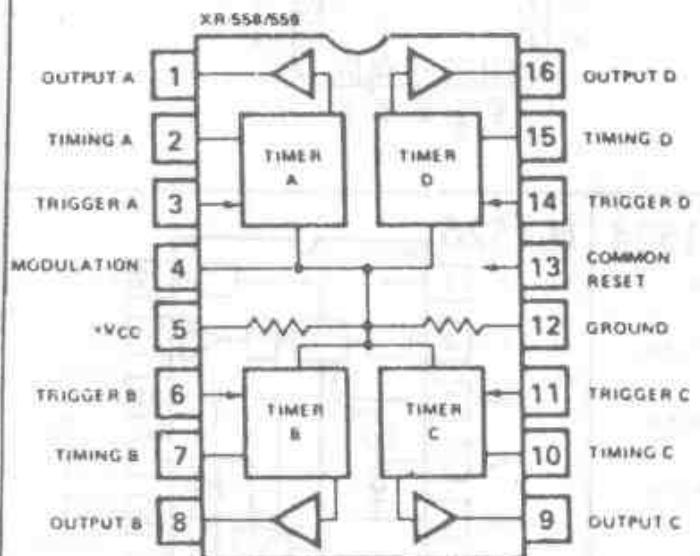




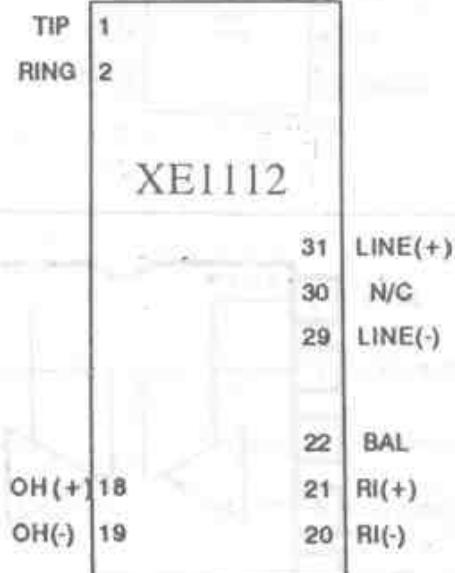
H.1530



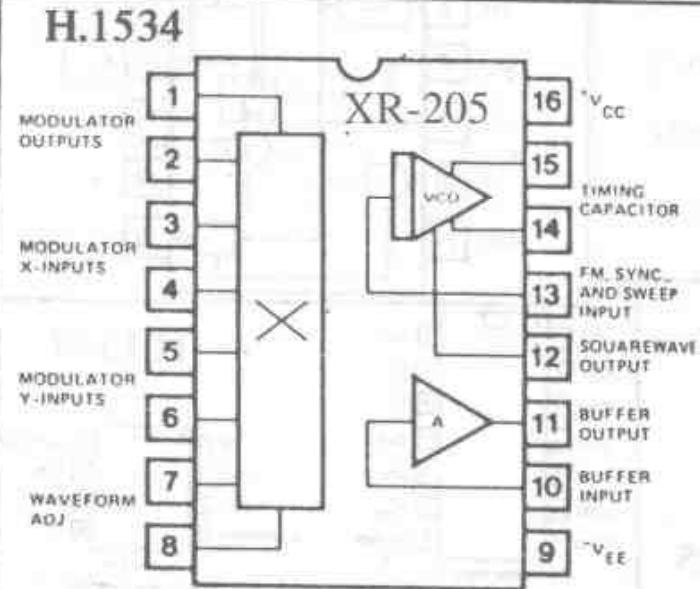
H.1531



H.1532



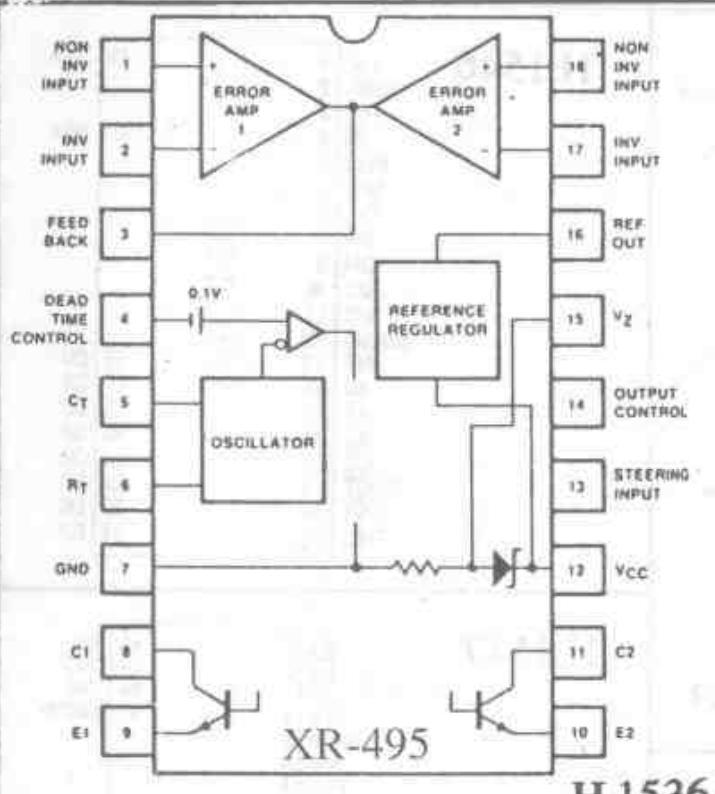
H.1533



N/C	1	20	TIP
Vcc	2		
RI	3	17	RING
N/C	4		
N/C	5		
N/C	6		
T1	7	14	N/C
OH	8	13	N/C
GND	9	12	N/C
T2	10	11	N/C

(top view)

Pin 17 & 20 have 1500V isolation from the rest of the circuitry. This isolation should be preserved throughout the system.



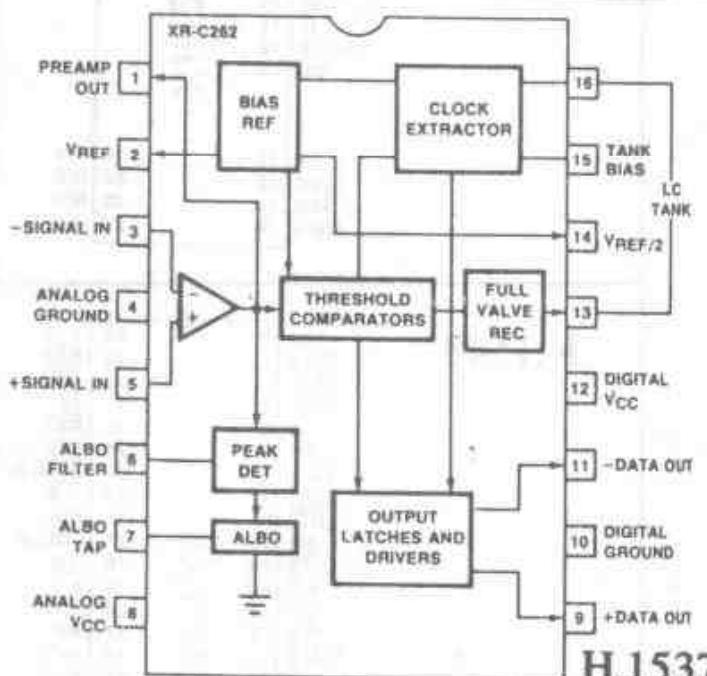
H.1536

N/C	1	20	TIP
Vcc	2		
RI	3		
RCVR	4	17	RING
XMIT	5		
XFMR	6		
T1	7	14	N/C
OH	8	13	N/C
GND	9	12	N/C
T2	10	11	N/C

(top view)

Pin 17 & 20 have 1500V isolation from the rest of the circuitry. This isolation should be preserved throughout the system.

H.1539



H.1537

N/C	1	20	TIP
Vcc	2		
RI	3		
N/C	4	17	RING
N/C	5		
N/C	6		
T1	7	14	N/C
OH	8	13	N/C
GND	9	12	N/C
T2	10	11	N/C

(top view)

Pin 17 & 20 have 1500V isolation from the rest of the circuitry. This isolation should be preserved throughout the system.

H.1540

H.1542

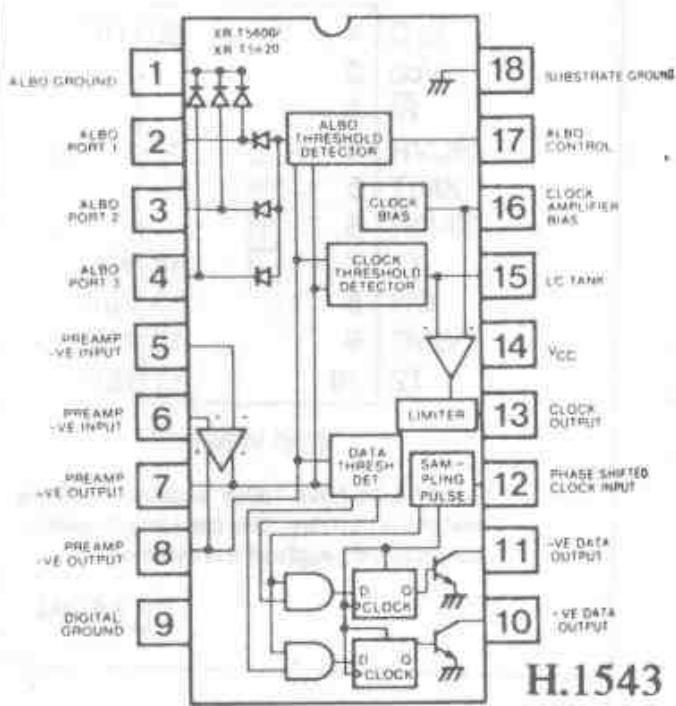
NON	1	40	TIP
INV	2	39	
FEED	3		
BACK	4		
DEAD	5		
TIME	6		
CONTROL	7		
CT	8		
RT	9		
GND	10		
C1	11		
E1	12		
	13		
AUDIO IN	14		
AUDIO OUT	15		
AGND	16		
RDY	17		
BURDET	18		
TREADY	19		
TREMPTY	20		
+5V	21		
-5V	22		
TIP	23		
RING	24		

XE1201/1203

H.1538

VDD	1	40	TIP
GND	2	39	
Vcc	3		
RI	4		
PDS	5		
N/C	6		
TXL	7		
PS	8		
OH	9		
N/C	10		
N/C	11		
AUDIO	12		
INT	13		
A0	14		
A1	15		
A2	16		
CS	17		
DGST	18		
DIST	19		
EHC	20		

XE1212

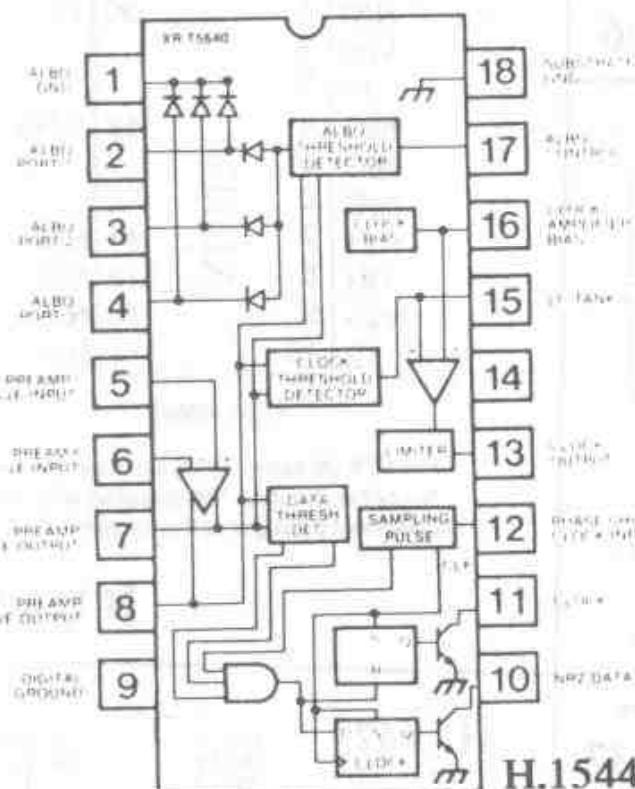


H.1543

H.1546

Vcc	1	40	TXA
GND	2		
Vcc	3		
RI	4	37	RXA
PDS	5		
N/C	6		
TXL	7		
PS	8		
OH	9		
N/C	10		
N/C	11		
AUDIO	12		
INT	13	28	D0
AD	14	27	D1
A1	15	26	D2
A2	16	25	D3
CS	17	24	D4
DOST	18	23	D5
DIST	19	22	D6
EHC	20	21	D7

XE1212E



H.1544

H.1547

AA	1	40	Vcc
HS	2	39	GND
CD	3	38	VDD
DTR	4	37	AUDIO
RXDC	5		
N/C	6		
EHC	7		
RXDM	8		
TXD	9		
CLKOUT	10		
RI	11		
AADIS	12		
OH	13		
+TIP	17	24	TXL
N/C	18	23	N/C
N/C	19	22	N/C
RING	20	21	N/C

XE1214

H.1548

-5V	1	40	+5V
TCLK	2	39	DSR
RXD	3	38	DCD
RCLK	4	37	SI
AR	5	36	RST
TM	6	35	VPO
TCLO	7	34	REMLB
TCL1	8	33	D/S
DTR	9	32	N/C
S/A	10	31	LCLLB
CTS	11	30	OH
B/C	12	29	SH
TXD	13	28	N/C
RTS	14	27	N/C
XCLK	15	26	N/C
RI	16	25	N/C
TIP	18	24	N/C
RING	20	23	N/C
		22	AMP
		21	GND

XE2400/A

H.1549

VEE	1	16	VCC
DO	2	15	Q0
D1	3	14	Q1
D2	4	13	Q2
D3	5	12	Q3
D4	6	11	Q4
LE	7	10	OE
GND	8	9	GND

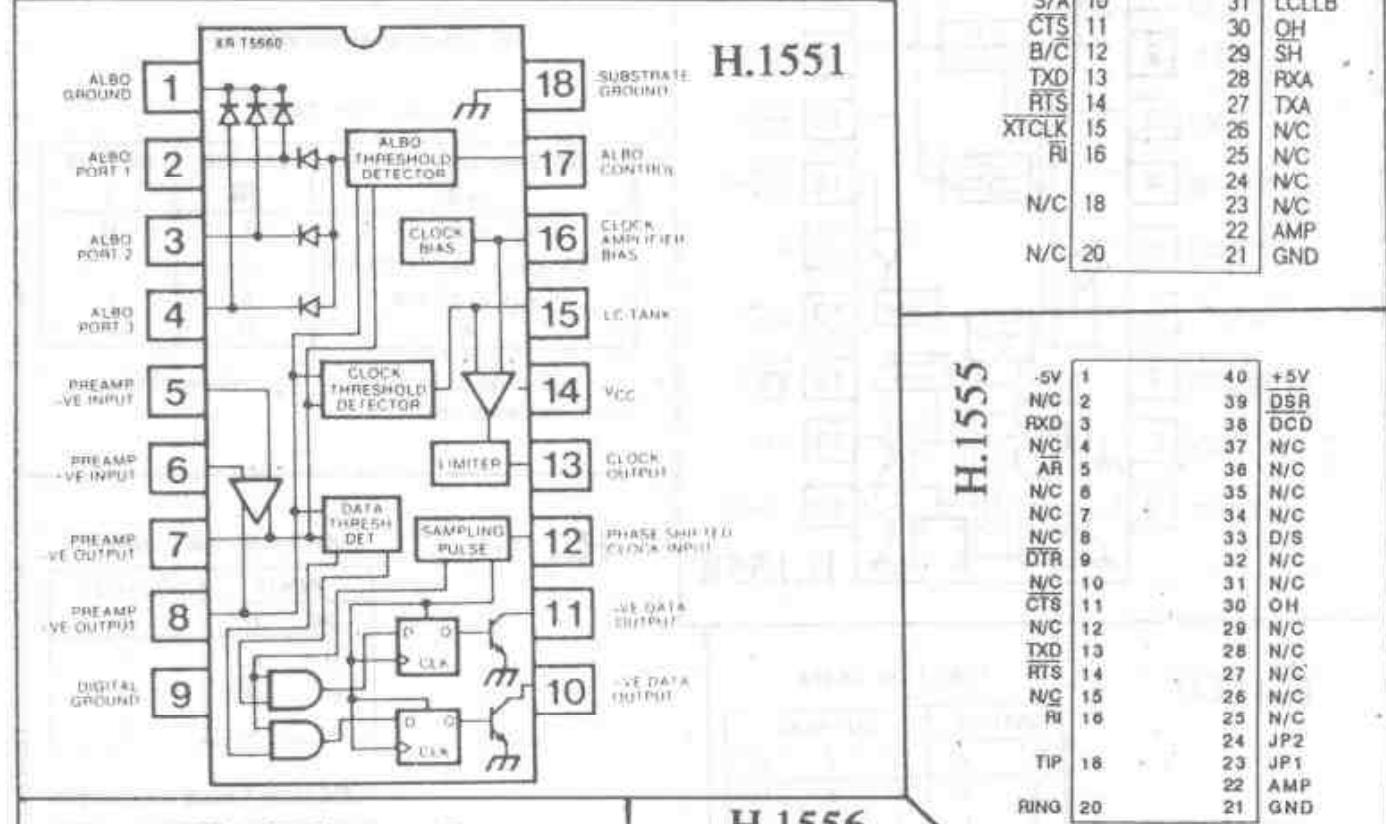
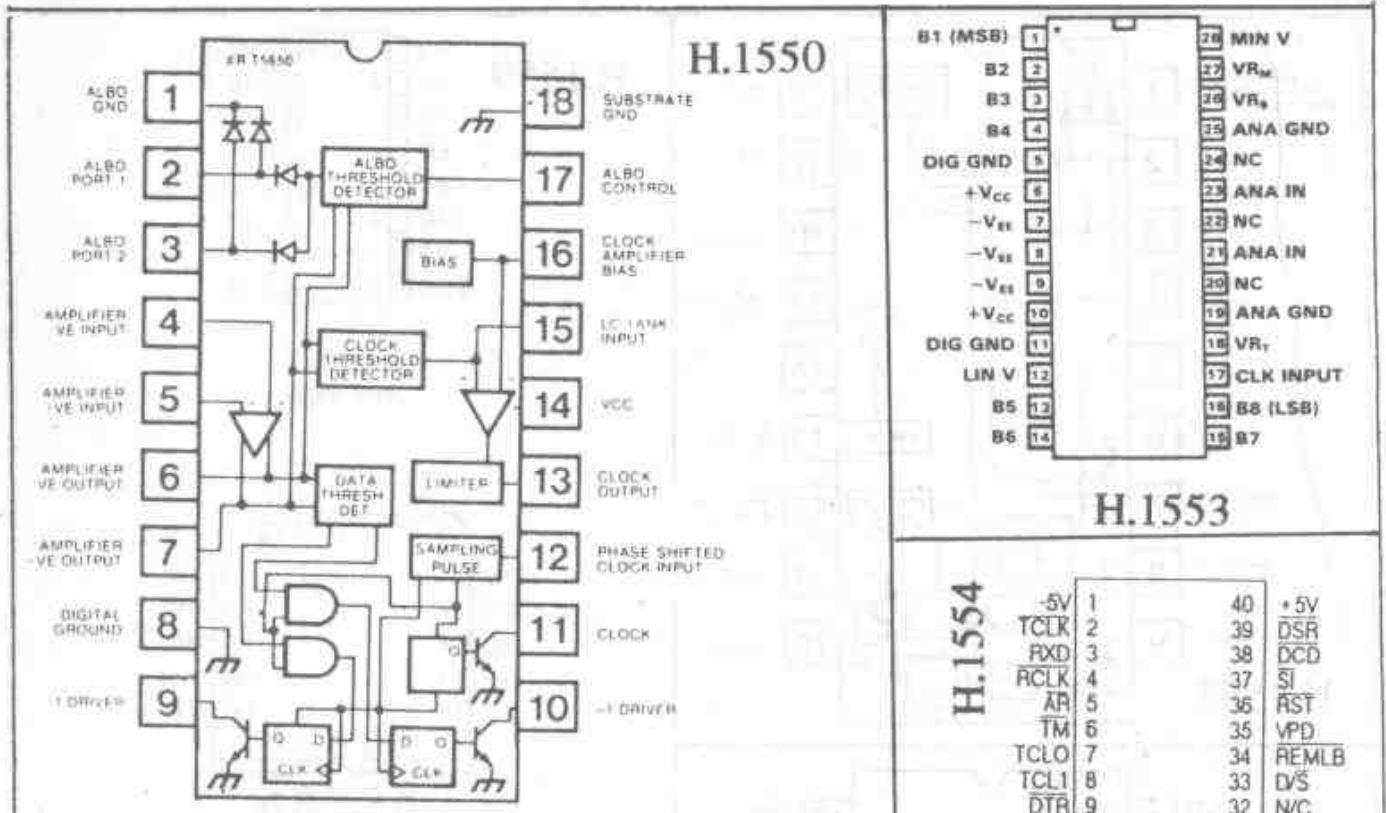
FUNCTION TABLE  
(EACH LATCH/TRANSLATOR)

OE	LE	D	$\bar{Q}$
H	X	X	Z
L	L	L	H
L	L	H	L
L	H	X	$\bar{Q}_0$

H.1545

AMPL #1	{ IN +	1	14	BAT GND
	{ IN -	2	13	OUTPUT AMPL #1
AMPL #2	{ IN -	3	12	OUTPUT AMPL #2
	{ IN +	4	11	OUTPUT AMPL #3
AMPL #3	{ IN +	5	10	OUTPUT AMPL #4
	{ IN -	6	9	BAT NEG
AMPL #4	IN -	7	8	IN + AMPL #4

DS3680	14	13	12	11	10	9	8



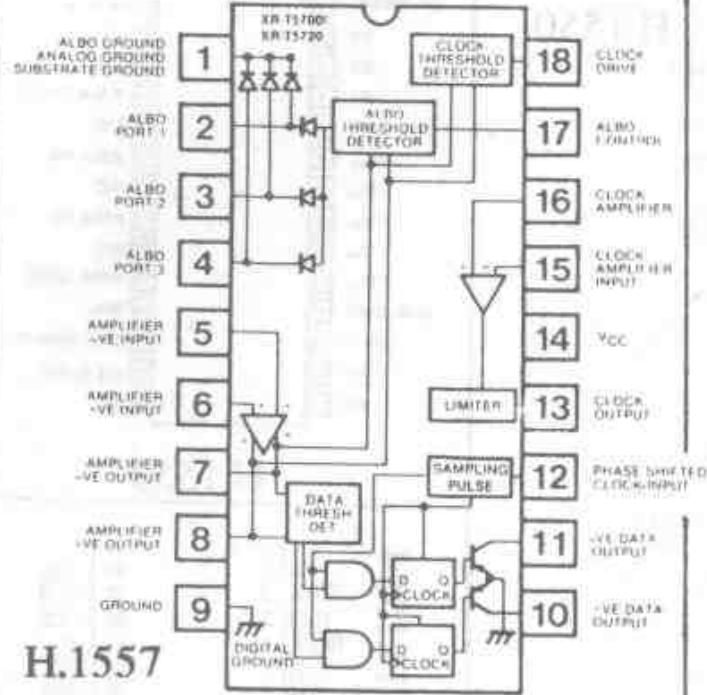
-SV	1	N/C	2	39	40	+5.0
PXO	3	N/C	3	38	DSS	
N/C	4	N/C	37	DCC		
AR	5	AR	37			
N/C	6	N/C	36			
N/C	7	N/C	35			
N/C	8	N/C	35			
DTR	9	N/C	35			
N/C	10	N/C	31			
CTS	11	CTS	30			
N/C	12	N/C	29			
TXO	13	N/C	28			
RTS	14	N/C	27			
N/C	15	N/C	26			
RH	16	N/C	25			
N/C	18	N/C	24			
N/C	20	N/C	24			
	21	GN00	JP2			
	22	AMR	JP1			

H.1552

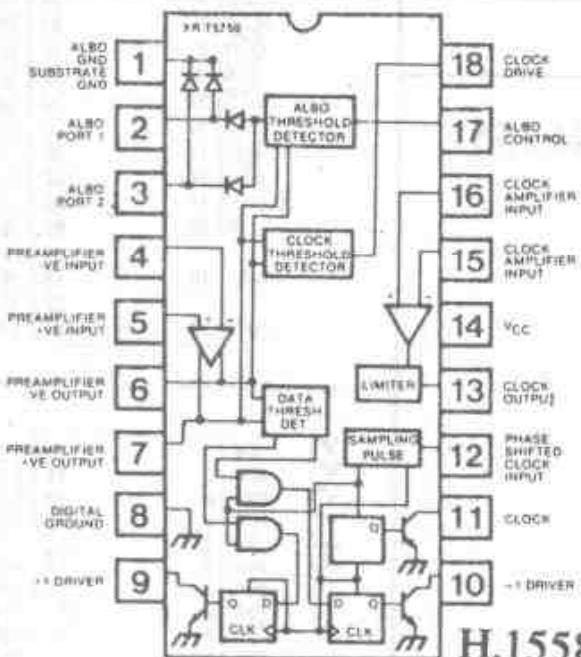
V <sub>EE</sub>	1	16	V <sub>CC</sub>
Q <sub>0</sub>	2	15	D <sub>0</sub>
Q <sub>1</sub>	3	14	D <sub>1</sub>
Q <sub>2</sub>	4	13	D <sub>2</sub>
Q <sub>3</sub>	5	12	D <sub>3</sub>
Q <sub>4</sub>	6	11	D <sub>4</sub>
OE	7	10	LE
GND	8	9	GND

**FUNCTION TABLE  
(EACH LATCH/TRANSLATOR)**

OE	LE	D	G
H	L	H	L
H	L	L	H
H	H	X	Q <sub>O</sub>
L	X	X	L



H.1557



H.1558

H.1560

FUNCTION TABLE

INPUTS		OUTPUTS		
G†	A	Y	F	W
L	X	L	H	H
X	L	L	H	H
H	H	H	H	L
H	H	S	L	H

H = high level, L = low level,  
X = irrelevant, S = shorted to  
ground  
†G and F are common to the four  
drivers. If any of the four Y  
outputs is shorted, the Fault-Flag  
will respond.

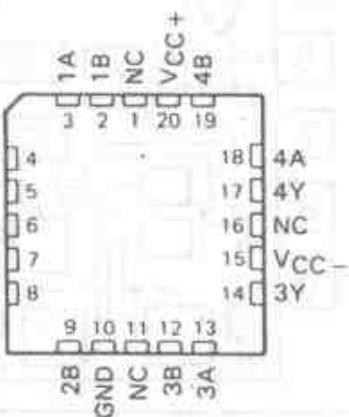
1Y	1	16	VCC
1W	2	15	4Y
1A	3	14	4W
G	4	13	4A
2A	5	12	F
2W	6	11	3A
2Y	7	10	3W
GND	8	9	3Y

H = high level, L = low level,  
X = irrelevant, S = shorted to  
ground  
†G and F are common to the four  
drivers. If any of the four Y  
outputs is shorted, the Fault-Flag  
will respond.

H.1559

1B	1	16	VCC+
1A	2	15	4B
1Y	3	14	4A
EN	4	13	4Y
2Y	5	12	VCC-
2A	6	11	3Y
2B	7	10	3A
GND	8	9	3B

FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

DIFFERENTIAL INPUTS A-B	ENABLE EN	OUTPUT Y
$V_{ID} \geq 25 \text{ mV}$	L	H
$-25 \text{ mV} < V_{ID} < 25 \text{ mV}$	L	?
$V_{ID} \leq -25 \text{ mV}$	L	L
X	H	Z

H = high level, L = low level, ? = indeterminate,  
Z = impedance (off)

H.1561

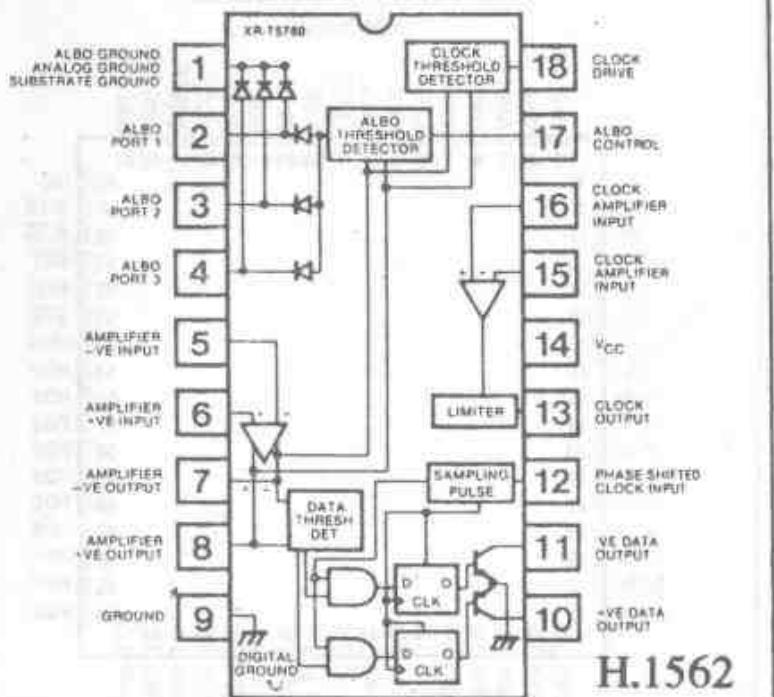
FUNCTION TABLE (DRIVER)

INPUT		OUTPUT
DE	D	B
H	L	H
H	H	L
L	X	Z

FUNCTION TABLE (RECEIVER)

INPUT		OUTPUT
RE	B	R
1R	2	DE
1B	3	4R
1D	4	4B
2R	5	4D
2B	6	3R
2D	7	3B
GND	8	3D

H = high level  
L = low level  
X = irrelevant  
Z = high impedance



SN55ALS056 . . . J OR W PACKAGE

(TOP VIEW)

A1	1	20	B1
A2	2	19	B2
A3	3	18	B3
A4	4	17	B4
V <sub>CC</sub>	5	16	GND
A5	6	15	B5
A6	7	14	B6
A7	8	13	B7
AB	9	12	B8
CS	10	11	T/R

SN55ALS057 . . . J OR W PACKAGE

(TOP VIEW)

D1	1	20	B1
R1	2	19	E1
D2	3	18	B2
R2	4	17	E2
V <sub>CC</sub>	5	16	GND
D3	6	15	B3
R3	7	14	E3
D4	8	13	B4
R4	9	12	E4
TE	10	11	RE

H.1564

1A	1	16	V <sub>CC</sub> +
1Y	2	15	4A
1Z	3	14	4Y
2Z	4	13	4Z
2Y	5	12	3Z
ENABLE	6	11	3Y
2A	7	10	3A
GND	8	9	V <sub>CC</sub> -

FK PACKAGE  
(TOP VIEW)

FUNCTION TABLE

INPUTS	OUTPUTS
G A	Y F
L X	L H
H H	H H
H H	S L

H.1565

1Y	1	16	V <sub>CC</sub>
1F	2	15	4Y
1A	3	14	4F
1,2G	4	13	4A
2A	5	12	3,4G
2F	6	11	3A
2Y	7	10	3F
GND	8	9	3Y

H.1566

V <sub>CC</sub>	1	8	1Y
1A	2	7	1Z
2A	3	6	2Y
GND	4	5	2Z

75ALS191  
FUNCTION TABLE (EACH DRIVER)

INPUT	OUTPUTS
A	Y Z
H	H L
L	L H

SN55ALS126 . . . FK PACKAGE  
(TOP VIEW)

1F	1	16	V <sub>CC</sub>
1Y	2	15	4A
1A	3	14	4F
1,2G	4	13	4A
NC	6	16	NC
2A	7	15	3,4G
2F	8	14	3A
2Y	9	11	3F
GND	10	12	3Y
NC	11	13	3A

NC—No internal connection

H.1563

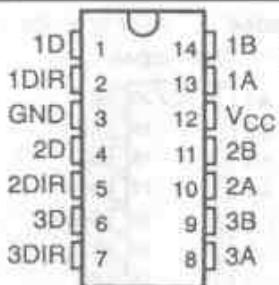
FUNCTION TABLE

LOGIC INPUT	ENABLE INPUT	OUTPUT CURRENT	Z	Y
H	H	ON	OFF	
L	H	OFF	ON	
H	L	OFF	OFF	
L	L	OFF	OFF	

V <sub>CC</sub> -	1	14	V <sub>CC</sub> +
1A	2	13	SM
1Y	3	12	4A
2A	4	11	4Y
2B	5	10	3B
2Y	6	9	3A
GND	7	8	3Y

INPUTS	OUTPUT
SM A B	Y
H H H	L
H L X	H
H X L	H
L X X	Z

SN75C198



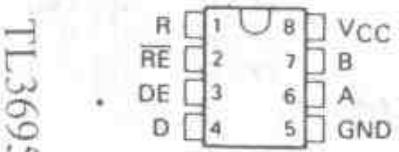
H.1568

## Function Table (each driver)

INPUT D	DIR	OUTPUTS	
		A	B
H	H	H	L
L	H	L	H
X	L	Z	Z

## Function Table (each receiver)

DIFFERENTIAL INPUTS A - B	DIR	OUTPUT R
$V_{ID} \geq 0.3\text{ V}$	L	H
$-0.3\text{ V} < V_{ID} < 0.3\text{ V}$	L	?
$V_{ID} \leq -0.3\text{ V}$	L	L
X	H	Z



## FUNCTION TABLE (DRIVER)

INPUT	ENABLE		OUTPUTS	
	D	DE	A	B
H	H		H	L
L	H		L	H
X	L		Z	Z

## FUNCTION TABLE (RECEIVER)

DIFFERENTIAL INPUTS	ENABLE	OUTPUT
A - B	RE	R
$V_{ID} \geq 0.2\text{ V}$	L	H
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	L	?
$V_{ID} \leq -0.2\text{ V}$	L	L
X	H	Z
Inputs Open	L	H

H = high level, L = low level, ? = indeterminate,  
X = irrelevant, Z = high impedance (off)

H.1569

TL16C451 . . . FN PACKAGE  
(TOP VIEW)

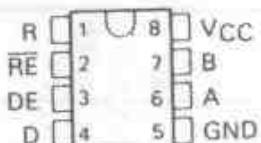
NC—No internal connection

TL16C452 . . . FN PACKAGE H.1570  
(TOP VIEW)

SOUT1	10	9	8	7	6	5	4	3	2	1	68	67	66	65	64	63	62	61	-80	INT1
DTR1	11																		59	INT2
RTS1	12																		58	SLIN
CTS1	13																		57	INIT
DB0	14																		56	AFD
DB1	15																		55	STB
DB2	16																		54	GND
DB3	17																		53	PDO
DB4	18																		52	PD1
DB5	19																		51	PD2
DB6	20																		50	PD3
DB7	21																		49	PD4
GND	22																		48	PD5
VCC	23																		47	PD6
RTSO	24																		46	PD7
DTRO	25																		45	INTO
SOUT0	26																		44	BDO
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43			
GND		CT50	PLSDC0	RIO	DSR0	C50	A2	A1	AO	IOW	IOR	CS2	RESET	VCC	SIN0	GND	GND			

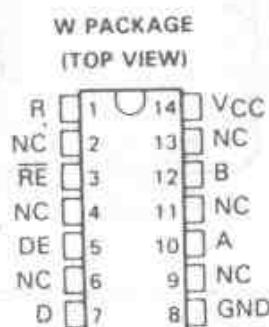
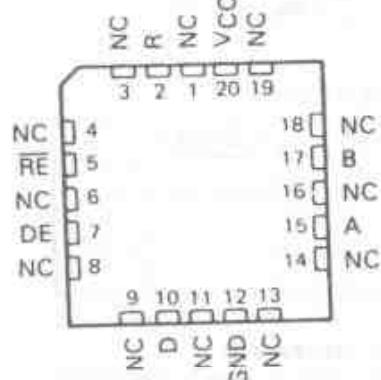
INPUTS		OUTPUTS	
G	A	Y	F
L	X	L	H
H	H	H	H
H	S	L	L

**H** = high level, **L** = low level  
**X** = irrelevant, **S** = short circuit to ground



H.1572

SN95176

W PACKAGE  
(TOP VIEW)

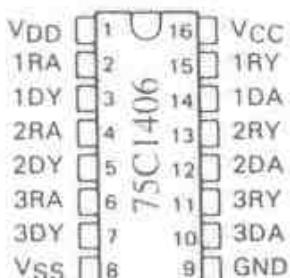
NC—No internal connection

FUNCTION TABLE (DRIVER)

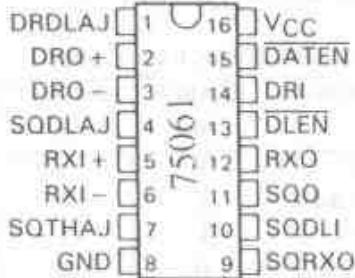
INPUT	ENABLE	OUTPUTS	
		A	B
H	H	H	L
L	H	L	H
X	L	Z	Z

FUNCTION TABLE (RECEIVER)

DIFFERENTIAL INPUTS A - B	ENABLE RE	OUTPUT	
		R	?
$V_{ID} \geq 0.2 \text{ V}$	L	H	
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	L		L
$V_{ID} \leq -0.2 \text{ V}$	L		
X	H	Z	



H.1573



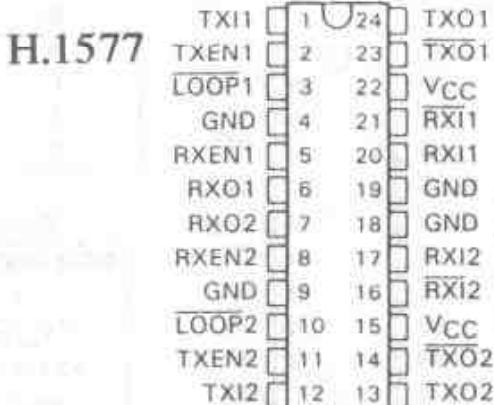
H.1574



TL16C450

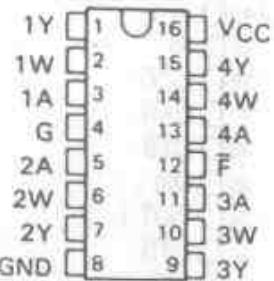
FN PACKAGE  
(TOP VIEW)

H.1576

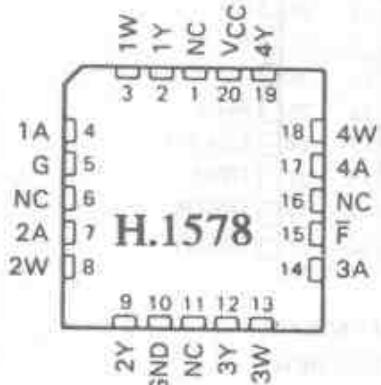


H.1577

75ALS085



SN55ALS130 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

FUNCTION TABLE

INPUTS	OUTPUTS			
G†	A	Y	F	W
L	X	L	H	H
X	L	L	H	H
H	H	H	H	L
H	H	S	L	H

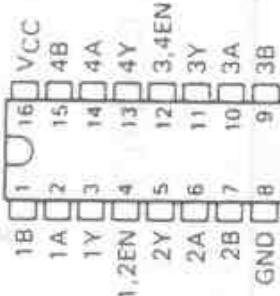
H = high level, L = low level,  
X = irrelevant, S = shorted to  
ground

†G and F are common to the four  
drivers. If any of the four Y  
outputs is shorted, the Fault-Flag  
will respond.

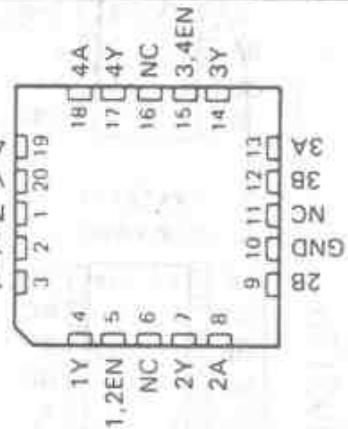
**H.1579**



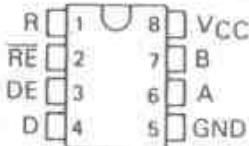
**H.1580**



SN55ALS195 . . . FK PACKAGE  
(TOP VIEW)



**H.1581**



**SN75176**

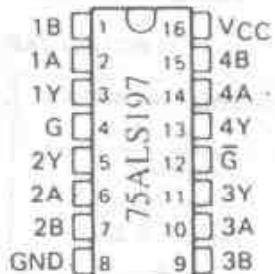
FUNCTION TABLE (DRIVER)

INPUT	ENABLE	OUTPUTS	
		A	B
H	H	H	L
L	H	L	H
X	L	Z	Z

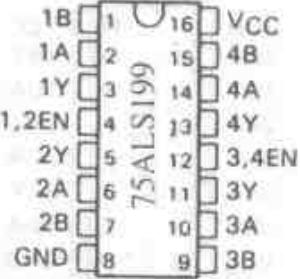
FUNCTION TABLE (RECEIVER)

DIFFERENTIAL INPUTS	ENABLE	OUTPUT
A - B	RE	R
$V_{ID} \geq 0.2 \text{ V}$	L	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	L	?
$V_{ID} \leq -0.2 \text{ V}$	L	L
X	H	Z

**H.1582**



**H.1583**



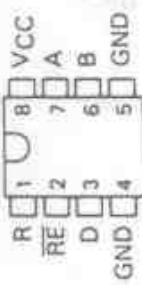
FUNCTION TABLE (EACH DRIVER)

INPUT	ENABLE	OUTPUTS			
		DE	CDE	A	B
H		H	H	H	L
L		H	H	L	H
X		L	X	Z	Z
X		X	L	Z	Z

FUNCTION TABLE (EACH RECEIVER)

DIFFERENTIAL INPUTS	ENABLE	OUTPUT
A - B	RE	R
$V_{ID} \geq 0.3 \text{ V}$	L	H
$-0.3 \text{ V} < V_{ID} < 0.3 \text{ V}$	L	?
$V_{ID} \leq -0.3 \text{ V}$	L	L
X	H	Z

## H.1586



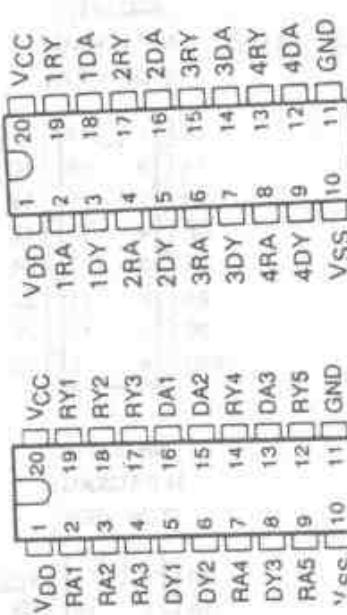
FUNCTION TABLE  
(DRIVER)

INPUT D	OUTPUTS	
	A	B
H	H	L
L	L	H†

†These levels assume that the open-collector outputs (A) and the open-emitter outputs (B) are connected to a pullup and pull-down resistor, respectively.

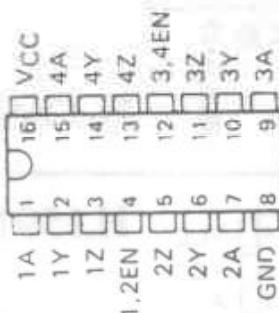
FUNCTION TABLE (RECEIVER)

DIFFERENTIAL INPUTS A - B	ENABLE		OUTPUT	
	V <sub>ID</sub> ≥ 0.2 V	V <sub>ID</sub> < 0.2 V	V <sub>ID</sub> ≤ -0.2 V	V <sub>ID</sub> ≥ -0.2 V
X	L	L	L	H

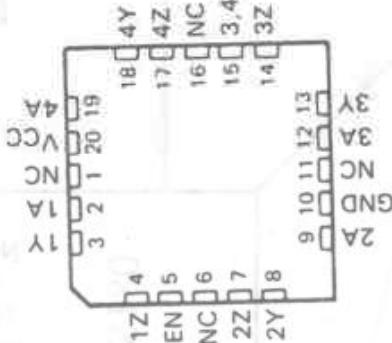


## H.1587

## H.1585



SN55ALS194... FK PACKAGE  
(TOP VIEW)



NC—No internal connection

FUNCTION TABLE (EACH DRIVER)

INPUT	OUTPUT ENABLE	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
H	X	L	H
L	X	L	H
X	L	H	Z

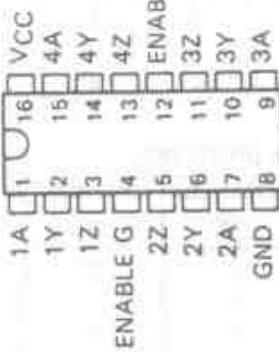
NC—No internal connection

FUNCTION TABLE (EACH DRIVER)

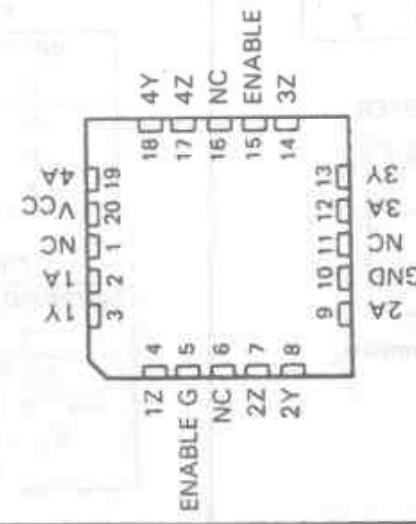
INPUT	ENABLER A	OUTPUTS		
		G	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

## H.1588

## H.1584



SN55ASL192... FK PACKAGE  
(TOP VIEW)



H.1589

SN751177  
N PACKAGE  
(TOP VIEW)

1B	1	16	VCC
1A	2	15	1D
1R	3	14	1Y
RE	4	13	1Z
2R	5	12	DE
2A	6	11	2Z
2B	7	10	2Y
GND	8	9	2D



SN751178  
N PACKAGE  
(TOP VIEW)

1B	1	16	VCC
1A	2	15	1D
1R	3	14	1Y
1DE	4	13	1Z
2R	5	12	2DE
2A	6	11	2Z
2B	7	10	2Y
GND	8	9	2D

H.1589a

SN751177, SN751178  
FUNCTION TABLE OF EACH DRIVER

INPUT D	ENABLE DE	OUTPUT	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

SN751177

FUNCTION TABLE OF EACH RECEIVER

DIFFERENTIAL INPUTS A - B	ENABLE RE	OUTPUT R
$V_{ID} \geq 0.2\text{ V}$	L	H
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	L	?
$V_{ID} \leq -0.2\text{ V}$	L	L
X	H	Z

SN751178

FUNCTION TABLE OF EACH RECEIVER

DIFFERENTIAL INPUTS A - B	OUTPUT R
$V_{ID} \geq 0.2\text{ V}$	H
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	?
$V_{ID} \leq -0.2\text{ V}$	L

H = high level, L = low level, ? = indeterminate,  
X = irrelevant, Z = high impedance (off)

VCC	1	20	BG GND
D1	2	19	BUS GND
R1	3	18	B1
D2	4	17	B2
R2	5	16	BUS GND
LOGIC GND	6	15	B3
D3	7	14	B4
R3	8	13	BUS GND
D4	9	12	RE
R4	10	11	TE

SN75ALS053

FN CHIP CARRIER PACKAGE  
(TOP VIEW)

R1	3	2	1	20	19	VCC	BG GND	BUS GND
D2	4					18	B1	
R2	5					17	B2	
LOGIC GND	6					16	BUS GND	
D3	7					15	B3	
R3	8					14	B4	
D4	9	10	11	12	13			BUS GND
R4	14	TE	RE					

H.1590

SN75ALS180

NC	1	14	VCC
R	2	13	VCC
RE	3	12	A
DE	4	11	B
D	5	10	Z
GND	6	9	Y
GND	7	8	NC

H.1591

NC — No internal connection

FUNCTION TABLE (DRIVER)

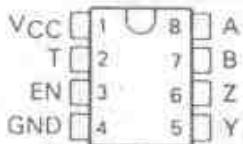
INPUT D	ENABLE DE	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

FUNCTION TABLE (RECEIVER)

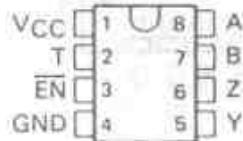
DIFFERENTIAL INPUTS A - B	ENABLE RE	OUTPUT	
		R	Z
$V_{ID} \geq 0.2\text{ V}$	L	H	
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	L		?
$V_{ID} \leq -0.2\text{ V}$	L	L	
X	H	Z	Z

SN75177B . . . D, JG, OR P PACKAGE  
(TOP VIEW)

H.1592



SN75178B . . . JG OR P PACKAGE  
(TOP VIEW)



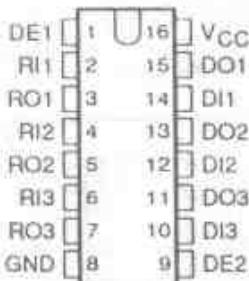
SN75177B FUNCTION TABLE

DIFFERENTIAL INPUTS A-B	ENABLE EN	OUTPUTS		
		T	Y	Z
$V_{ID} \geq 0.2\text{ V}$	H	H	H	L
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	H	?	?	?
$V_{ID} \leq -0.2\text{ V}$	H	L	L	H
X	L	Z	Z	Z

SN75178B FUNCTION TABLE

DIFFERENTIAL INPUTS A-B	ENABLE EN	OUTPUTS		
		T	Y	Z
$V_{ID} \geq 0.2\text{ V}$	L	H	H	L
$-0.2\text{ V} < V_{ID} < 0.2\text{ V}$	L	?	?	?
$V_{ID} \leq -0.2\text{ V}$	L	L	L	H
X	H	Z	Z	Z

H.1593



SN751730

FUNCTION TABLE OF EACH DRIVER

INPUTS		OUTPUT	
DI	DE1	DE2	DO
L	X	X	L
X	L	X	L
X	X	L	L
H	H	H	H

FUNCTION TABLE OF EACH RECEIVER

INPUT	OUTPUT
RI	RO
L	H
H	L
OPEN	H

D0	1	40	VCC
D1	2	39	RI
D2	3	38	DCD
D3	4	37	DSR
D4	5	36	CTS
D5	6	35	MR
D6	7	34	OUT 1
D7	8	33	DTR
RCLK	9	32	RTS
SIN	10	31	OUT 2
SOUT	11	30	INTRPT
CS0	12	29	RXRDY
CS1	13	28	A0
CS2	14	27	A1
BAUDOUT	15	26	A2
XIN	16	25	ADS
XOUT	17	24	TXRDY
WR1	18	23	DDIS
WR2	19	22	RD2
VSS	20	21	RD1

TL16C550  
FN PACKAGE

(TOP VIEW)

D4	6	5	4	D3	D2	D1	D0	NC	VCC	RI	DCD	DSR	CTS
D5	7									39	MR		
D6	8									38	OUT 1		
D7	9									37	DTR		
RCLK	10									36	RTS		
SIN	11									35	OUT 2		
NC	12									34	NC		
SOUT	13									33	INTRPT		
CS0	14									32	RXRDY		
CS1	15									31	A0		
CS2	16									30	A1		
BAUDOUT	17									29	A2		
XIN	18	19	20	21	22	23	24	25	26	27	28		
XOUT													
WR1													
WR2													
VSS													
NC													
RD1													
RD2													
DDIS													
TXRDY													
ADS													

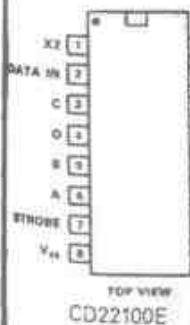
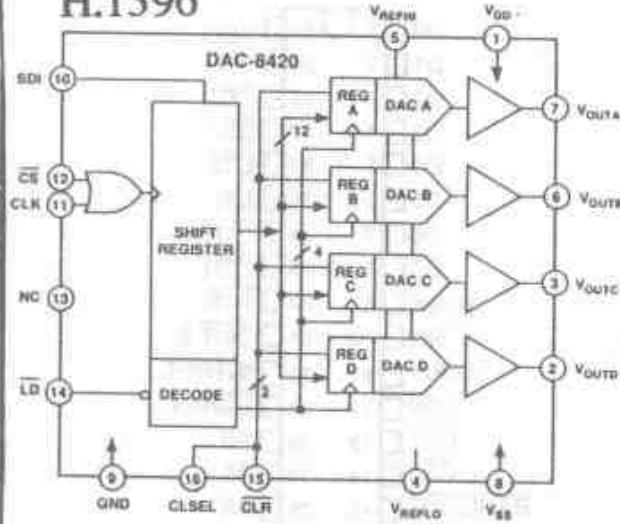
H.1594

1,2EN	1	16	VCC1
1A	2	15	4A
1Y	3	14	4Y
HEATSINK AND GROUND	4	13	HEATSINK AND GROUND
5	12		GROUND
2Y	6	11	3Y
2A	7	10	3A
VCC2	8	9	3,4EN

SN754410/11

H.1595

H.1596

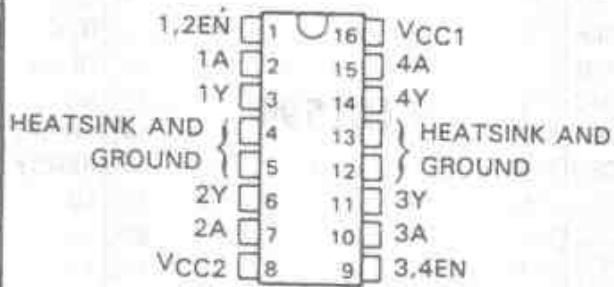


H.1597



TOP VIEW  
CD74HCT22106F

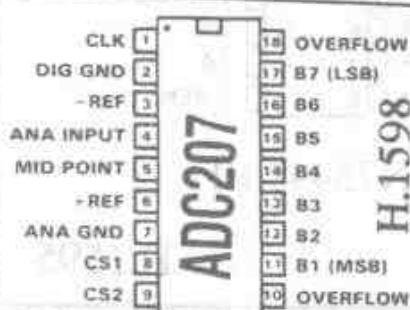
H.1597



SN 754411

**FUNCTION TABLE  
(EACH DRIVER)**

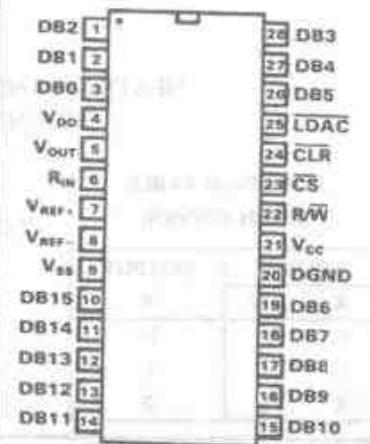
INPUTS†		OUTPUT
A	EN	Y
H	H	H
L	H	L
X	L	Z



H.1598

**AD7846AD** H.1599

## 16-Bit



**FUNCTION TABLE (EACH RECEIVER)**

LOOPBACK	INPUTS		OUTPUT
	LB	A	B <sup>†</sup>
H	X	H	L
H	X	L	H
L	L	X	L
L	H	X	H

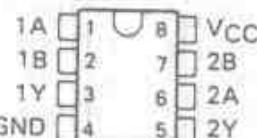
**FUNCTION TABLE (EACH DRIVER)**

LOOPBACK	INPUT	OUTPUT
LB	A	Y†
H	H	L
H	L	H
L	X	L

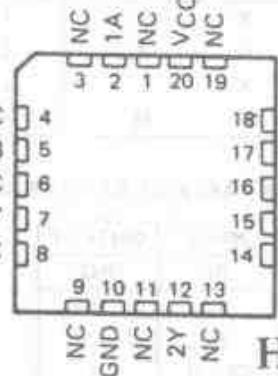
<sup>f</sup> Voltages are RS-232-C, EIA-232-D, and V.28 levels

H = high level, L = low level, X = irrelevant

H.1600



SN55451B, SN55452B,  
SN55453B, SN55454B, . . . FK PACKAGE  
(TOP VIEW)



H.1601

1Y	1	16	1A
1, 2 CLAMP	2	15	2A
2Y	3	14	G
HEATSINK	4	13	HEATSINK
AND GND	5	12	AND GND
3Y	6	11	VCC
3, 4 CLAMP	7	10	3A
4Y	8	9	4A

FUNCTION TABLE  
(EACH NAND DRIVER)

INPUTS	OUTPUT	
A	G	Y
L	X	H
X	L	H
H	H	L

H.1602

1Y	1	16	1A
1, 2D	2	15	2A
2Y	3	14	G
HEATSINK	4	13	HEATSINK
AND GND	5	12	AND GND
3Y	6	11	VCC
3, 4D	7	10	3A
4Y	8	9	4A

SN75439

FUNCTION TABLES  
(Each Channel 1 or  
Channel 4 Driver)

INPUTS	OUTPUT	
A	G	Y
H	L	L
L	X	H
X	H	H

(Each Channel 2 or  
Channel 3 Driver)

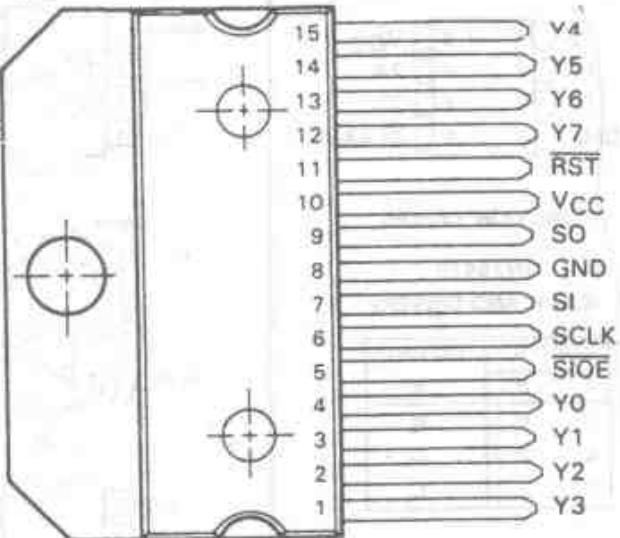
INPUTS	OUTPUT	
A	G	Y
L	L	L
H	X	H
X	H	H

1B	1	16	1C
2B	2	15	2C
3B	3	14	3C
4B	4	13	4C
5B	5	12	5C
6B	6	11	6C
7B	7	10	7C
E	8	9	COM

75465...469

H.1604

H.1605



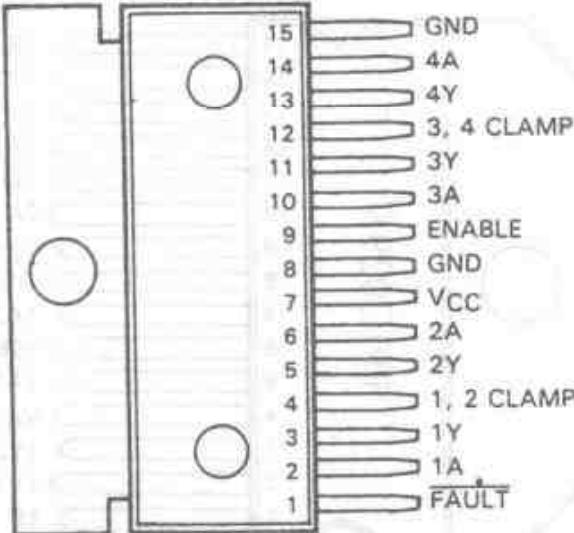
1, 4 CLAMP	1	20	CLR
ENBL	2	19	LGND
1 IN	3	18	4 IN
1 DRAIN	4	17	4 DRAIN
HEATSINK	5	16	HEATSINK
AND GND	6	15	AND GND
2 DRAIN	7	14	3 DRAIN
2 IN	8	13	3 IN
VCC	9	12	VDD
F	10	11	2, 3 CLAMP

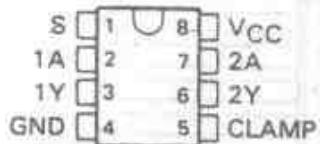
TPIC2406

FUNCTION TABLE  
(each channel)

FUNCTION	INPUTS			OUTPUT	FAULT
	ENBL	CLR	IN	Y	F
NORMAL OPERATION	X	L	X	H	H
	L	H	L	H	H
	L	H	H	L	H
THERMAL SHUTDOWN	H	H	X	Q0	H
	X	X	X	H	L

H.1607





#### FUNCTION TABLES

**SN75476**  
(EACH AND DRIVER),

INPUTS	OUTPUT	
A	S	Y
H	H	H
L	X	L
X	L	L

**SN75477**  
(EACH NAND DRIVER)

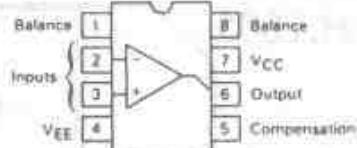
INPUTS	OUTPUT	
A	S	Y
H	H	L
L	X	H
X	L	H

**SN75478**  
(EACH OR DRIVER)

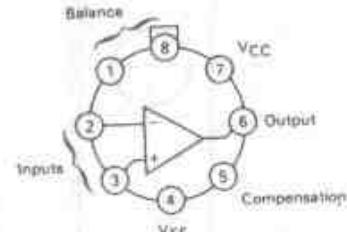
INPUTS	OUTPUT	
A	S	Y
H	X	H
X	H	H
L	L	L

**SN75479 H.1610**  
(EACH NOR DRIVER)

INPUTS	OUTPUT	
A	S	Y
H	X	L
X	H	L
L	L	H



LM11C



TLE4214

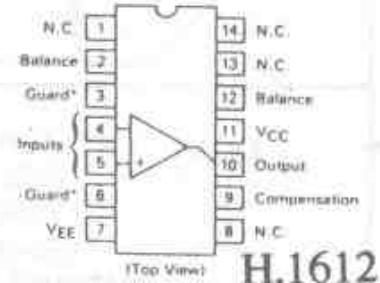
H.1613



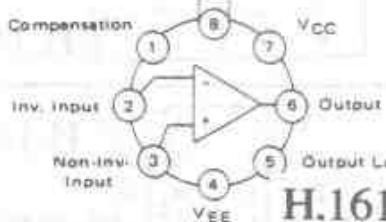
G SUFFIX  
METAL PACKAGE  
CASE 501

MC1439

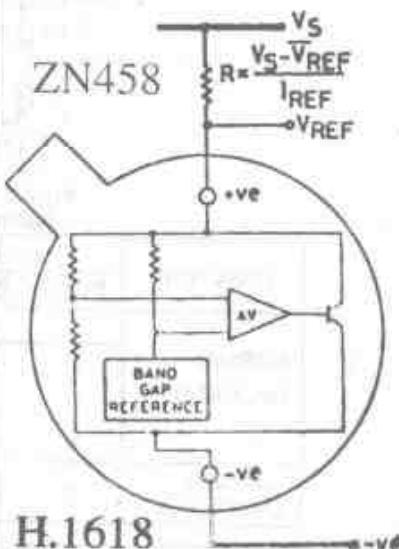
Compensation



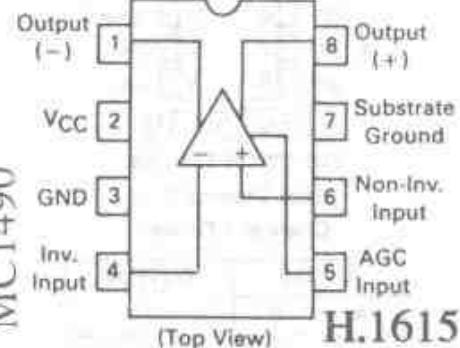
H.1612



H.1614



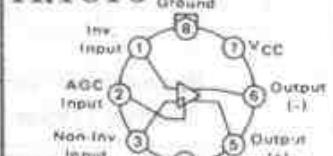
H.1618



H.1615

MC1490

H.1616



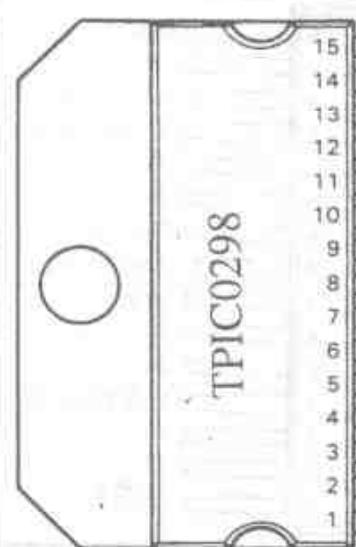
MC1590

H.1617



LM2935

- Pin 1. Input
- 2. Main Output
- 3. Ground
- 4. Switch Reset
- 5. Standby Output

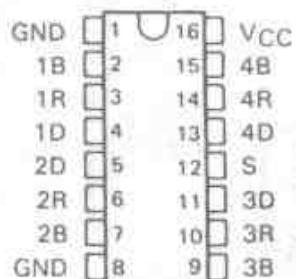


FUNCTION TABLE  
(EACH CHANNEL)

INPUTS	OUTPUT	
A	EN	Y
H	H	H
L	H	L
X	L	Z

H = high-level  
L = low-level  
X = irrelevant  
Z = high-impedance (off)

AM26S10C, AM26S11C . . . D, J, OR N PACKAGE  
(TOP VIEW)



H.1620

AM26S10  
FUNCTION TABLE  
(TRANSMITTING)

INPUTS		OUTPUTS	
S	D	B	R
L	H	L	H
L	L	H	L

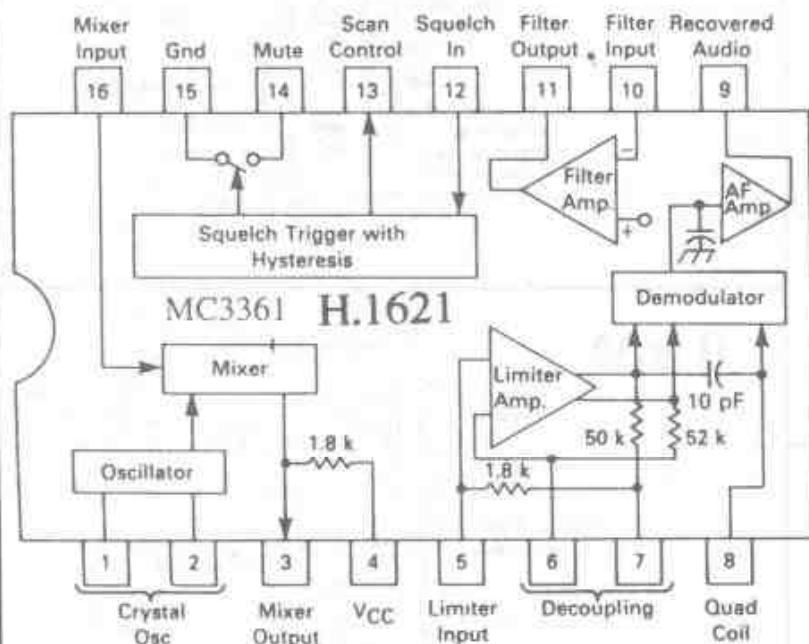
AM26S11  
FUNCTION TABLE  
(TRANSMITTING)

INPUTS		OUTPUTS	
S	D	B	R
L	H	H	L
L	L	L	H

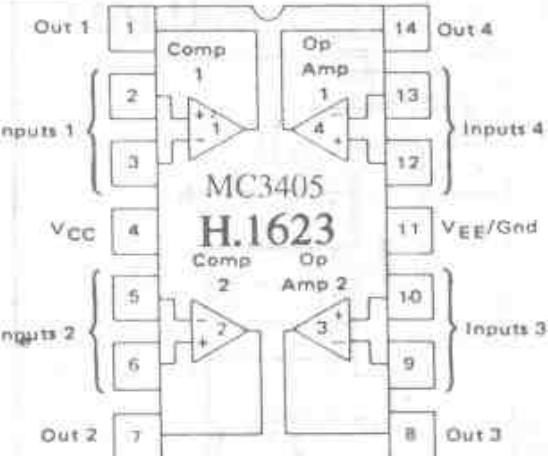
AM26S10 AND AM26S11  
FUNCTION TABLE  
(RECEIVING)

INPUTS			OUTPUT
S	B	D	R
H	H	X	L
H	L	X	H

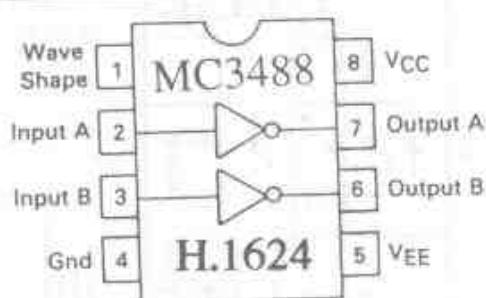
H = high level, L = low level, X = irrelevant



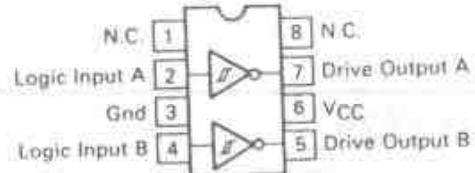
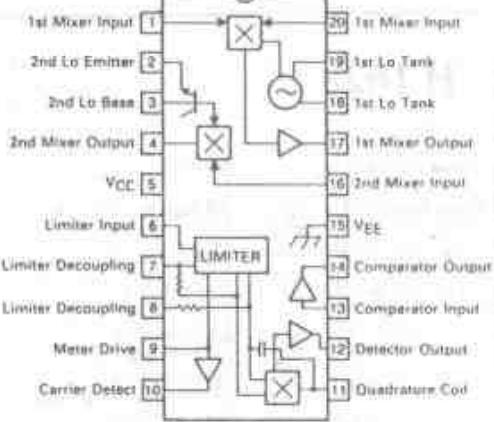
MC3361 H.1621



H.1623



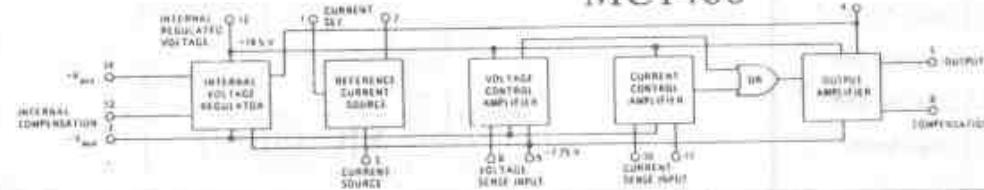
H.1624 MC3335



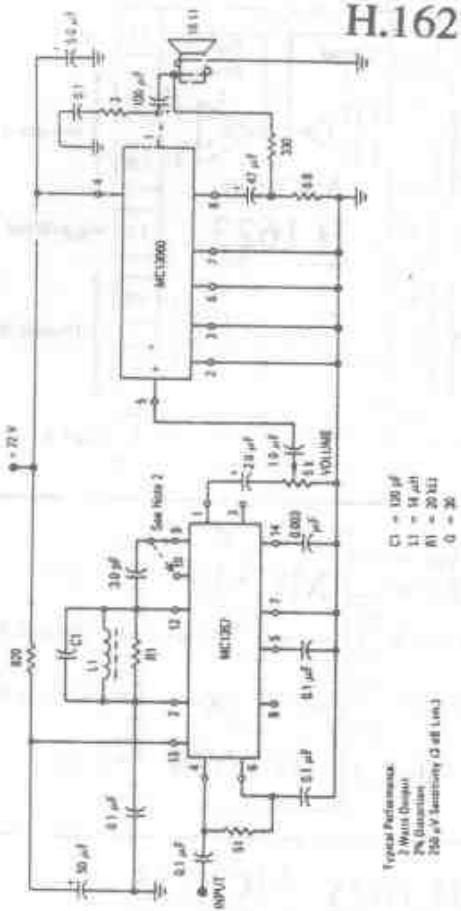
MC34151 H.1626

H.1622

MC1466



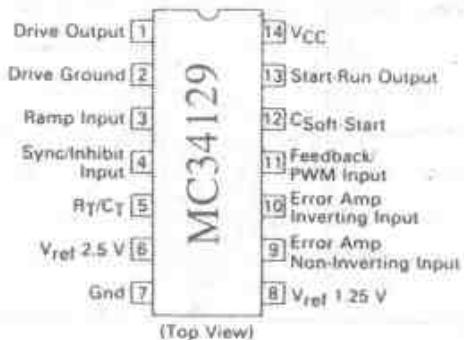
## H.1627



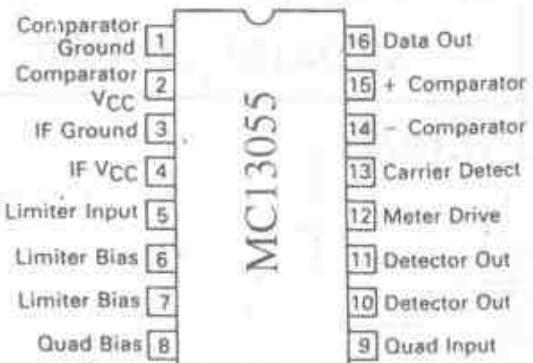
Typical Performance:  
1. Gain Output  
2. Gain  
3. 50 dB  
4. 20 dB  
5. 20 dB

C<sub>1</sub> = 100 pF  
L<sub>1</sub> = 14 pH  
R<sub>1</sub> = 20 kΩ  
Q = 20

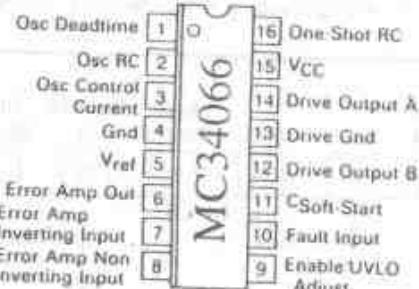
## H.1628



## H.1629



## H.1631



## H.1632

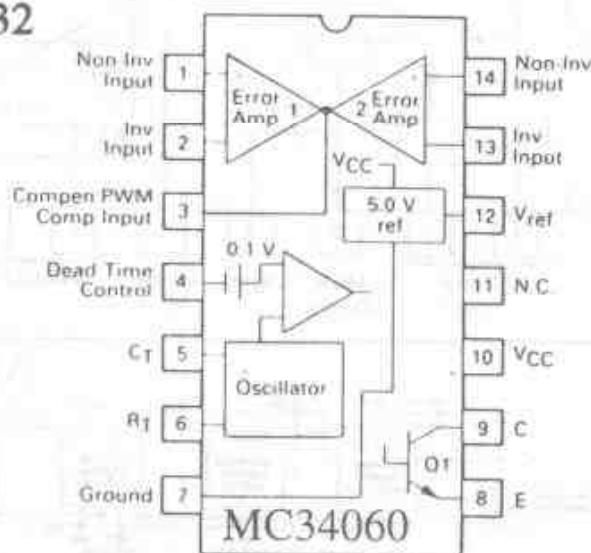
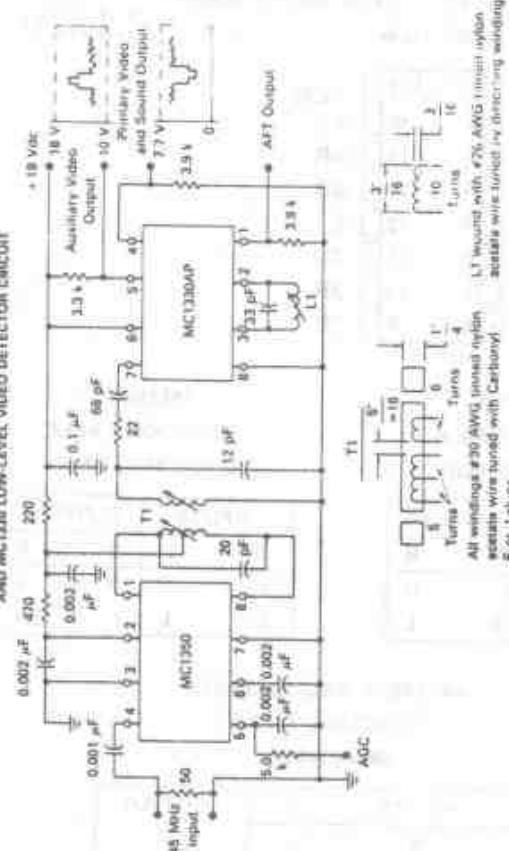
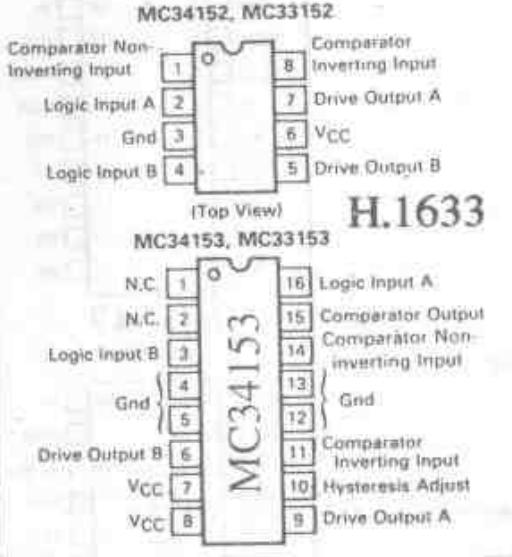


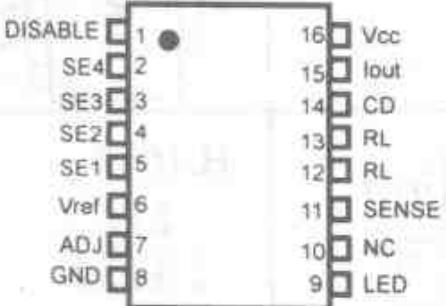
FIGURE 1 — TYPICAL MC13060 VIDEO IF AMPLIFIER AND MC1307 LOW-LEVEL VIDEO DETECTOR CIRCUIT



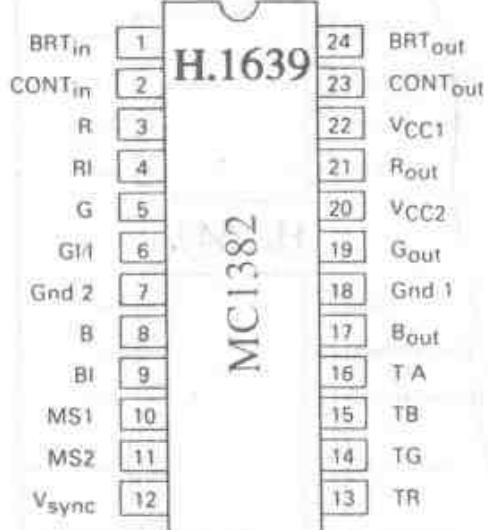
## H.1630



H.1634 TAB532P



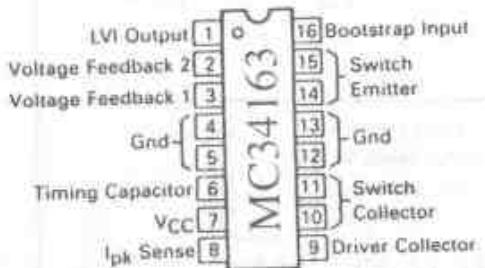
H.1637



MC1382

MC1439

H.1640



H.1635

- Pin 1. Reset
- 2. Input
- 3. Ground

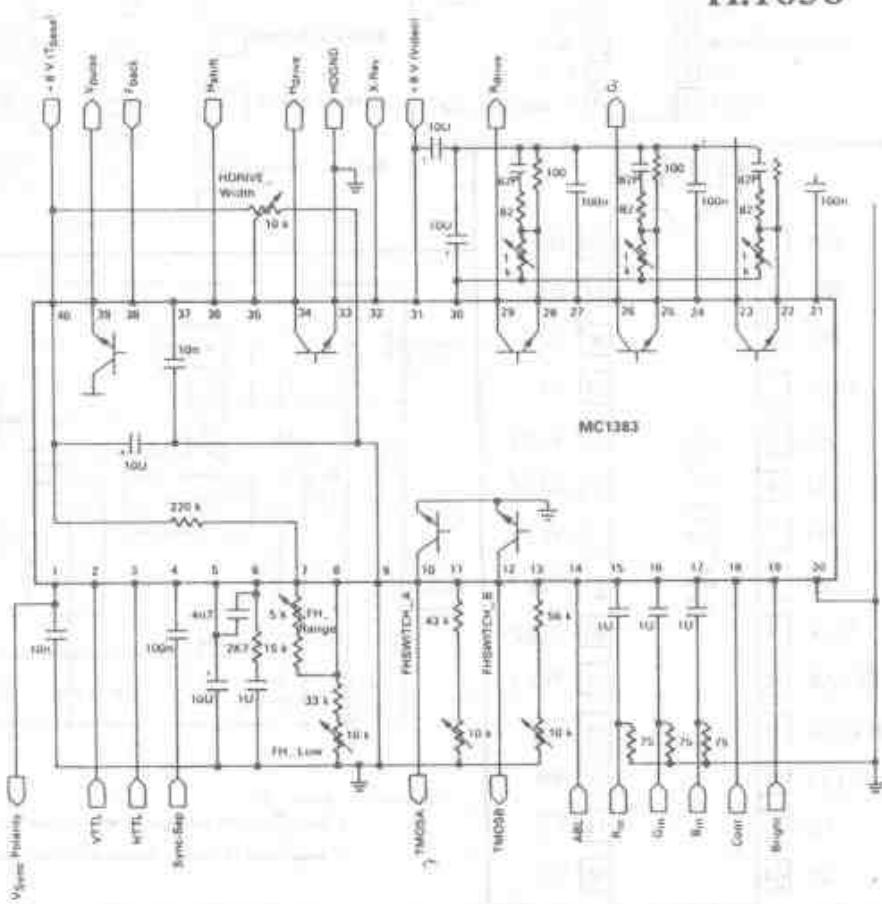
P SUFFIX  
PLASTIC PACKAGE  
CASE 29  
(TO-226AA)

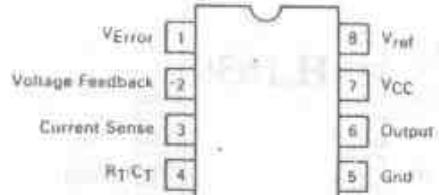
MC34164



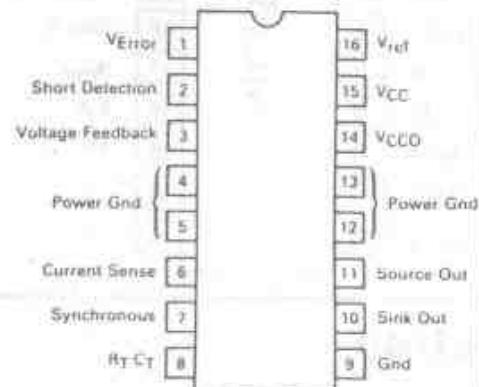
Pin 1. Reset  
2. Input  
3. N.C.  
4. Ground  
5. N.C.  
6. N.C.  
7. N.C.  
8. N.C.

H.1638





H.1641

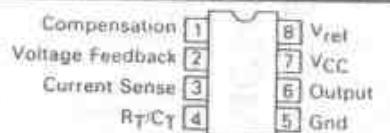


MC34166

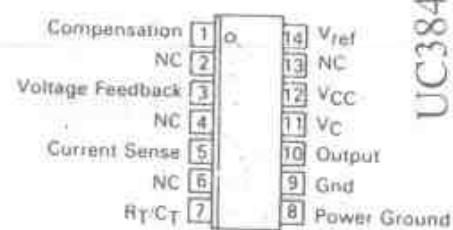


Pin 1. Voltage Feedback Input  
 2. Switched Output  
 3. Ground  
 4. Input Voltage  
 5. Compensation  
 (Heatsink surface connected to Pin 3)

H.1644



H.1642



MC10320

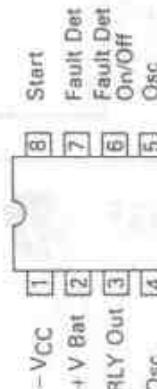
UC3844/45



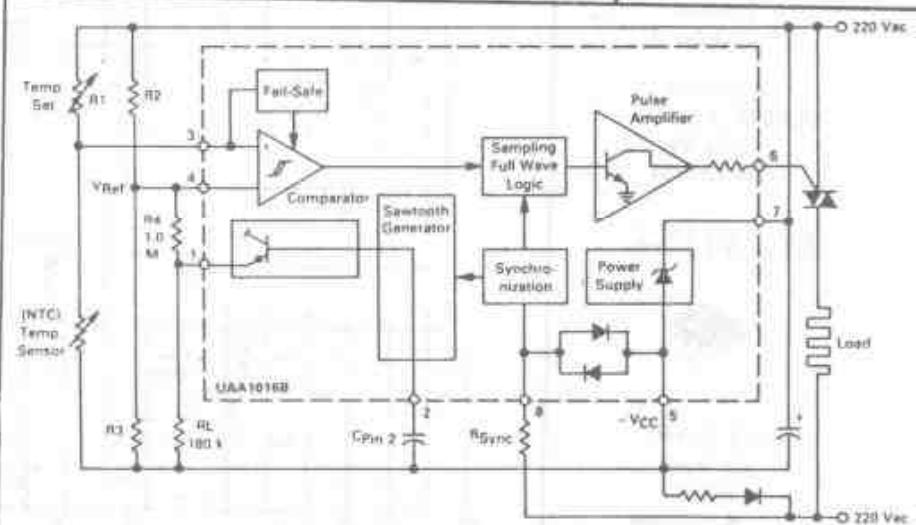
MC3325

H.1645

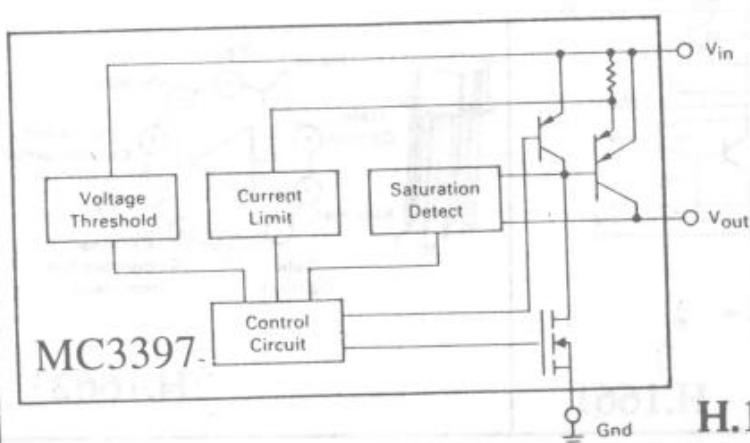
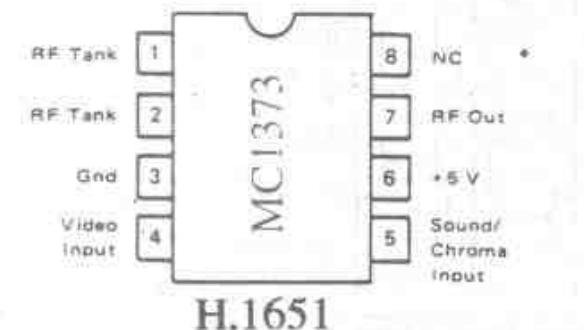
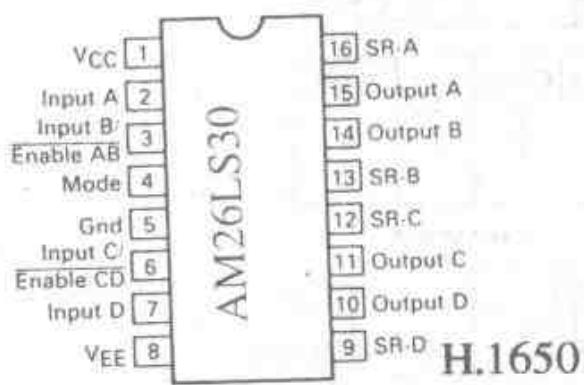
H.1648



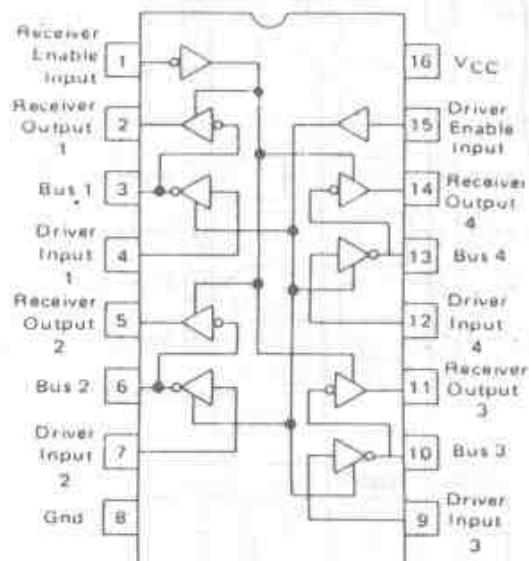
UAA1041



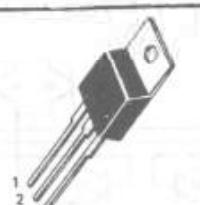
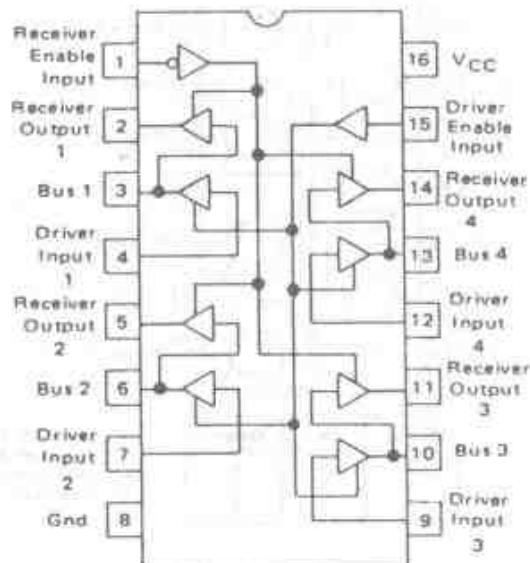
H.1646



PIN CONNECTIONS — MC8T26A  
(MC6880A)



PIN CONNECTIONS — MC8T28  
(MC6889)

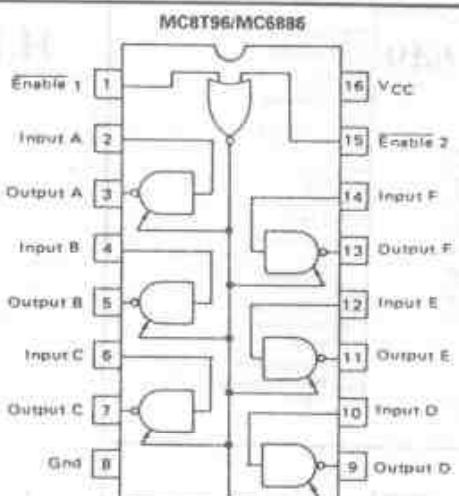
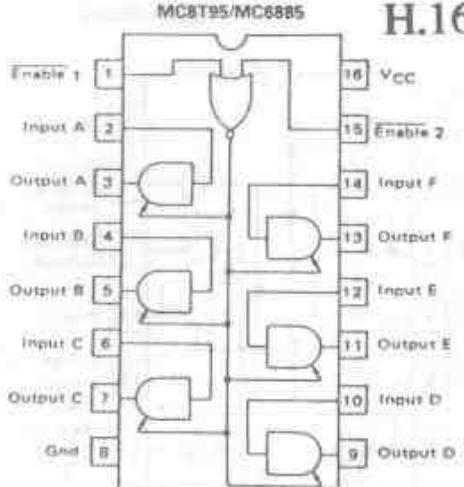


T SUFFIX  
PLASTIC PACKAGE  
CASE 221A

PIN 1. Input  
2. Output  
3. Ground

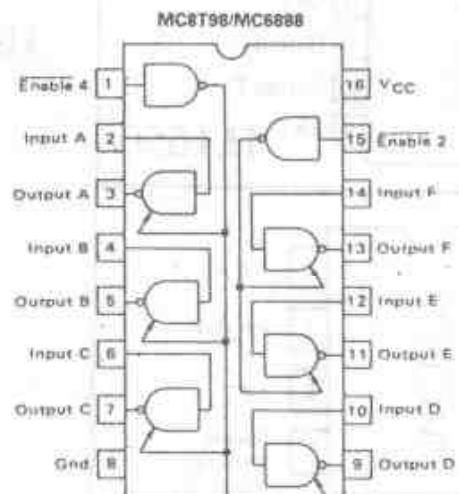
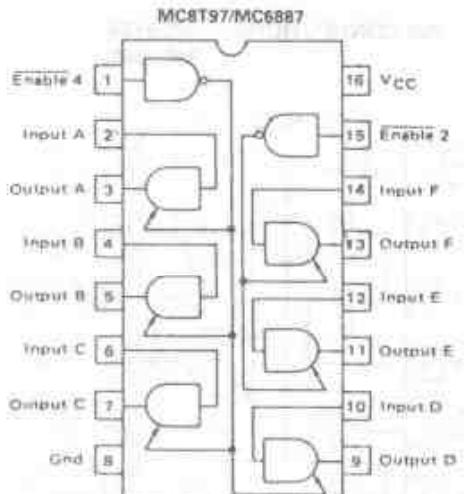
**H.1653**

H.1657



Enable 2	Enable 1	Input	Output
L	L	L	L
L	L	H	Z
L	H	X	Z
H	L	X	Z
H	H	X	Z

Enable 2	Enable 1	Input	Output
L	L	L	H
L	L	H	L
L	H	X	Z
H	L	X	Z
H	H	X	Z

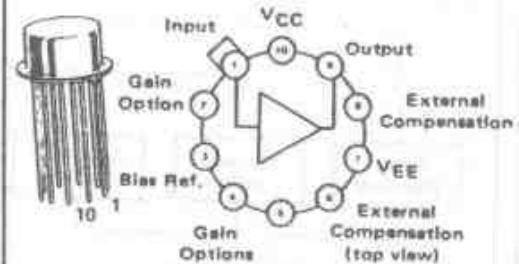
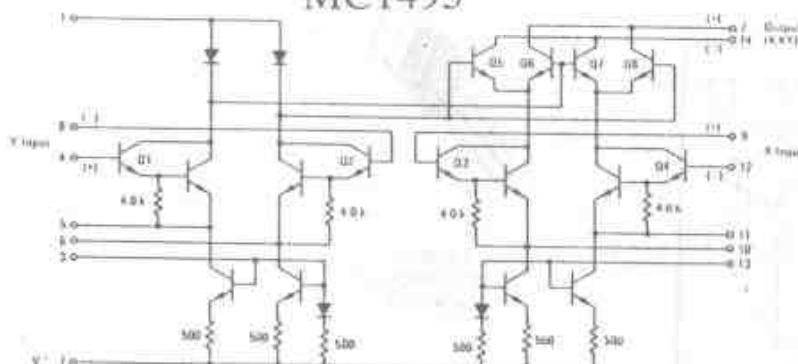


Enable	Input	Output
L	L	L
L	H	H
H	X	Z

L = Low Logic State  
H = High Logic State  
Z = Third (High Impedance) State  
X = Irrelevant

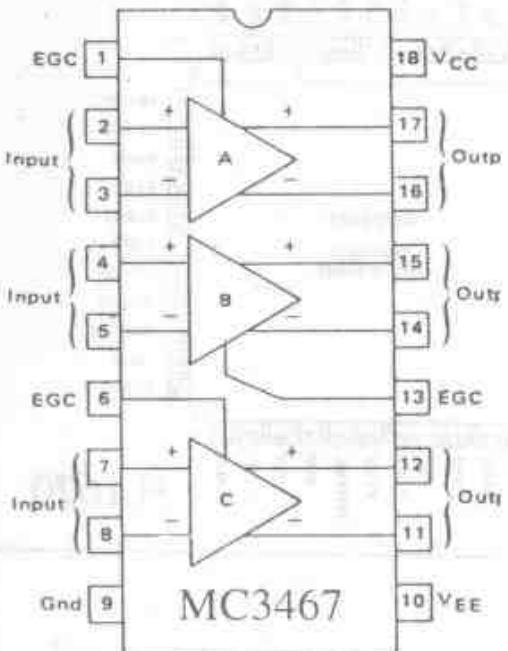
Enable	Input	Output
L	L	H
L	H	L
H	X	Z

MC1495



H.1661

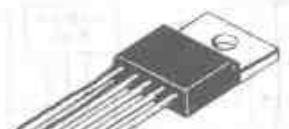
H.1662



H.1663

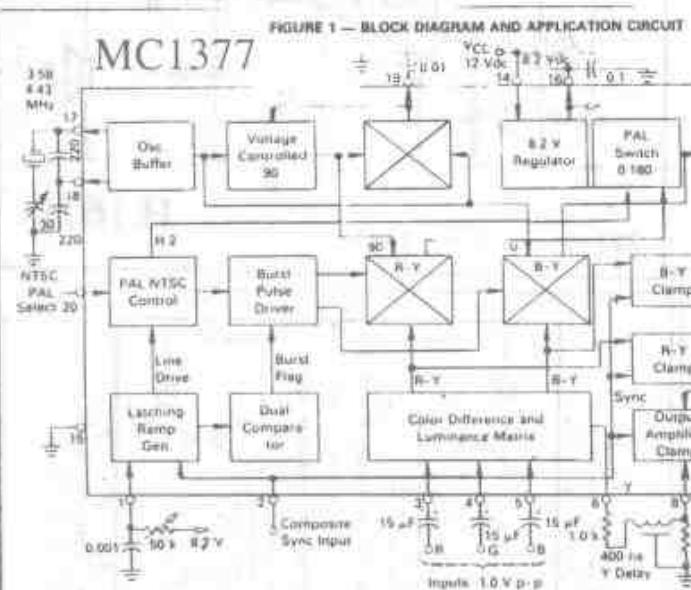
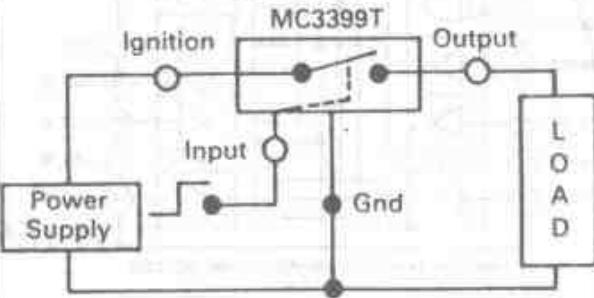
T SUFFIX  
PLASTIC PACKAGE  
CASE 314D

- Pin 1. Ignition  
2. Output  
3. Output  
4. Ground  
5. Input

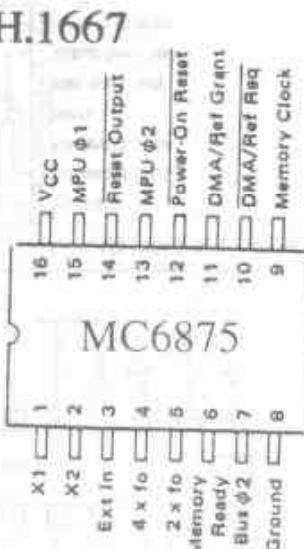


MC3399  
(Heatsink surface  
connected to Pin 2)

### BLOCK DIAGRAM

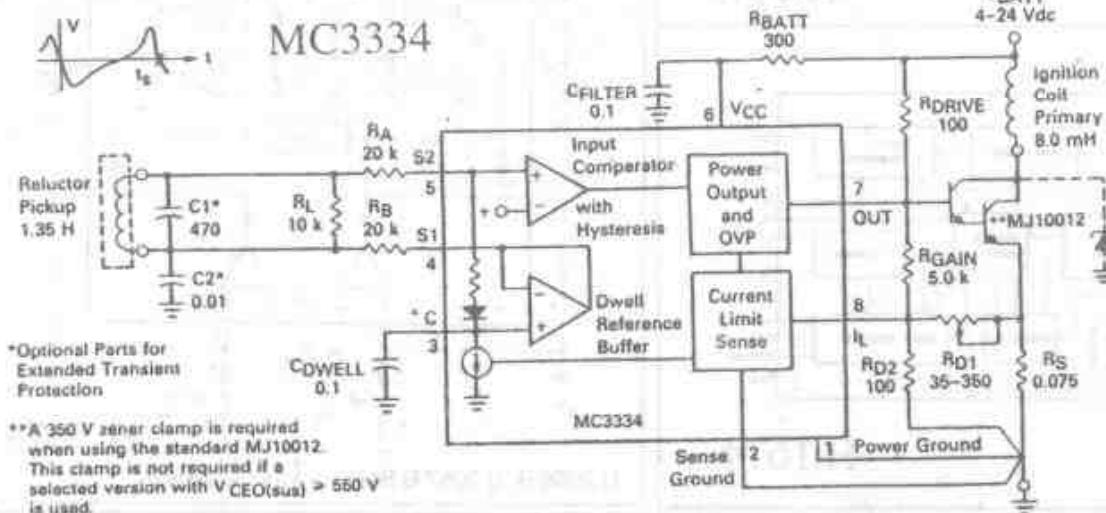


H.1664

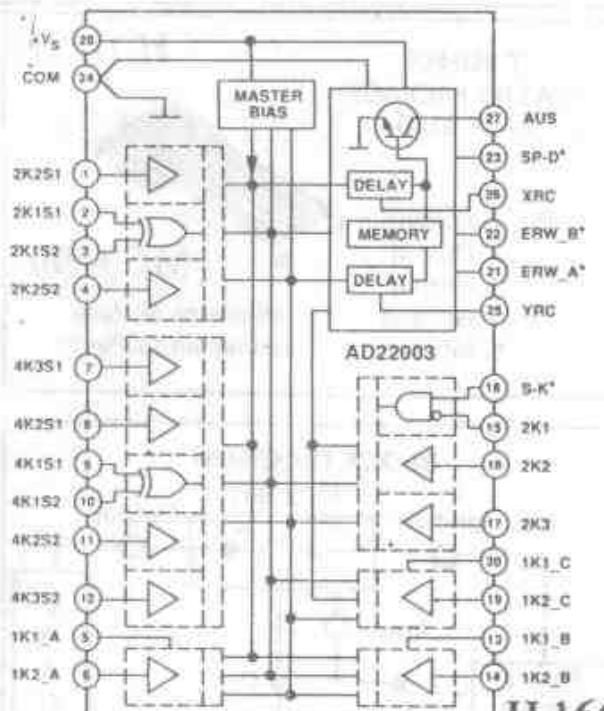


H.1667

MC3334

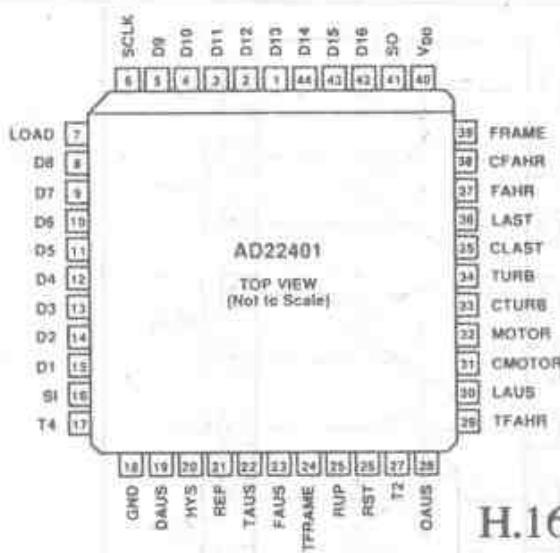


H.1665

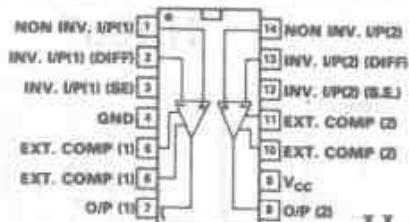


H.1669

\* THIS FUNCTION ONLY PINNED-OUT ON AD22003

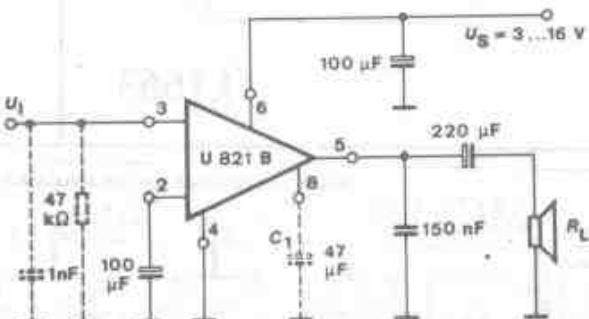


H.1670



LM 381 LN-Dual OP

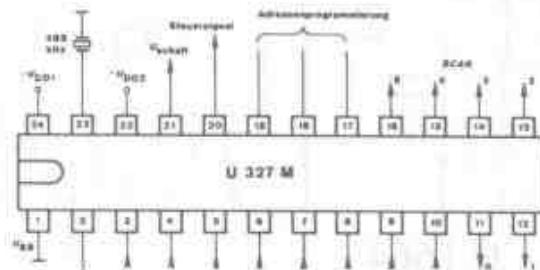
H.1672



821

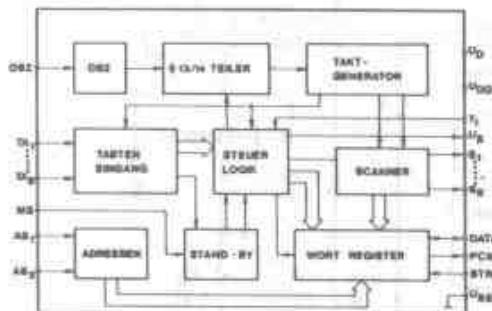
1 W

H.1671



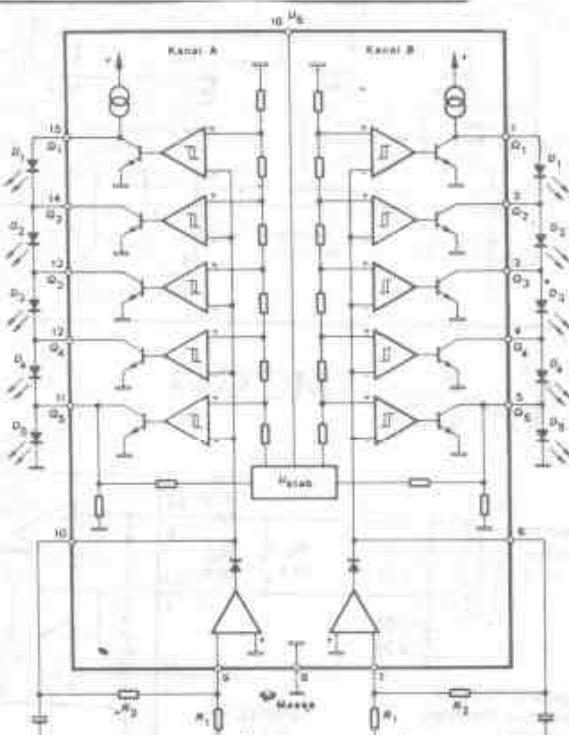
U 327 M

H.1673



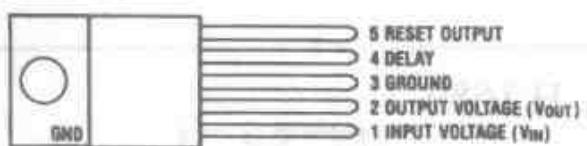
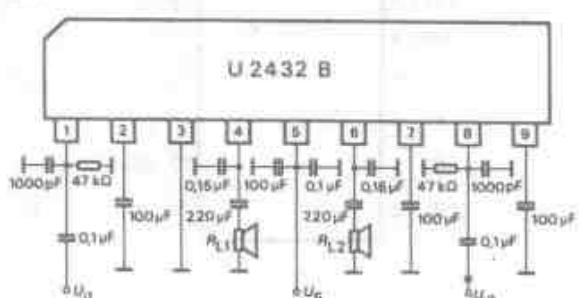
H.1674

U 329 IR-

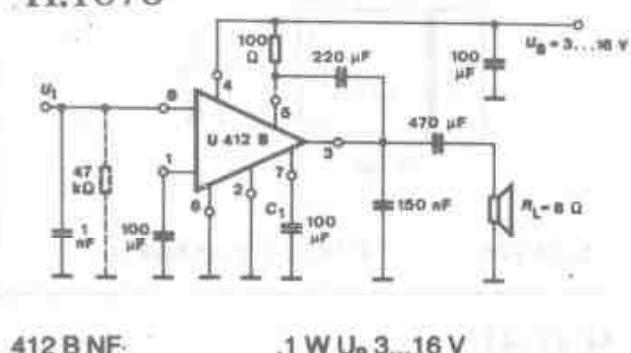
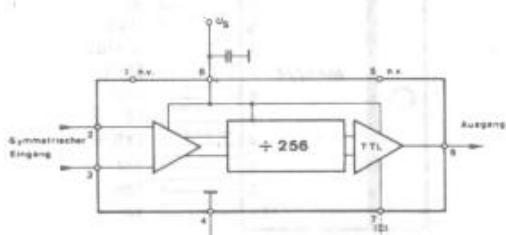
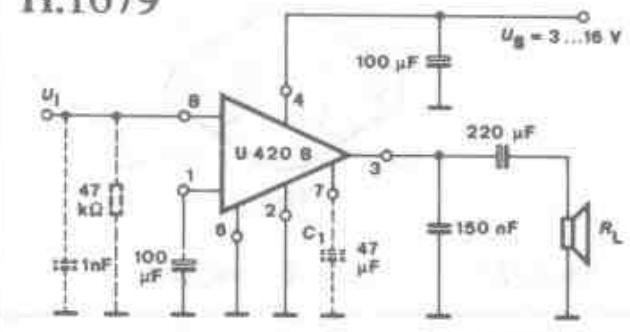


U 2066 B, U 2067 B Stereo-Aussteueranz.

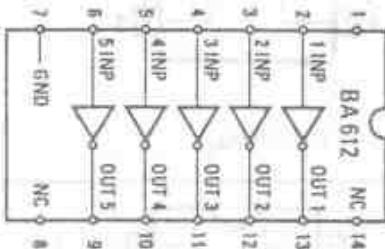
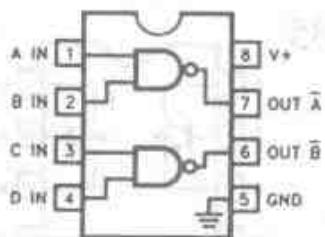
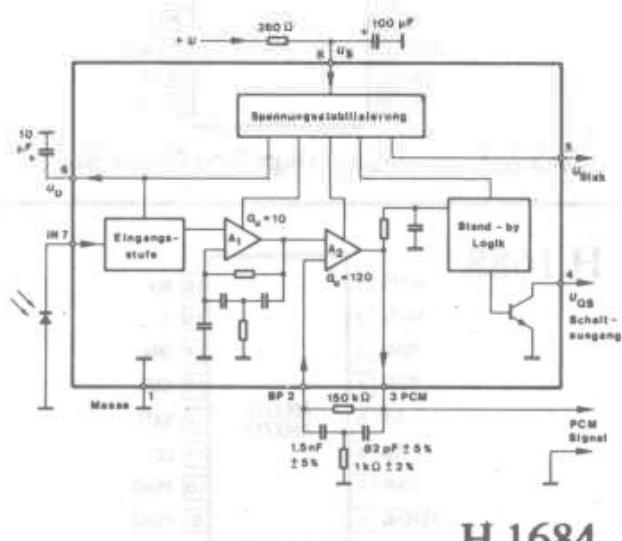
H.1675

**H.1676****H.1677**

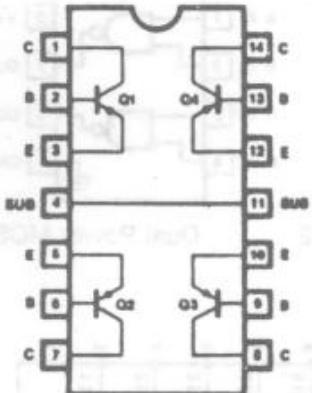
U 2472 B 1,8 V ... 8 V, 200 mW

**H.1678****H.1679**

U 6060 B

**H.1681****H.1682****H.1683****H.1684**

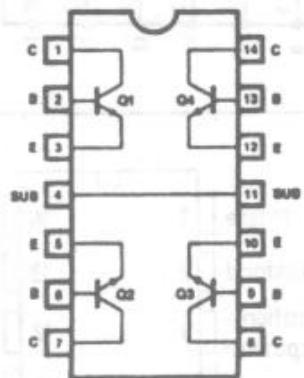
H.1685



EP 2015

PNP Array

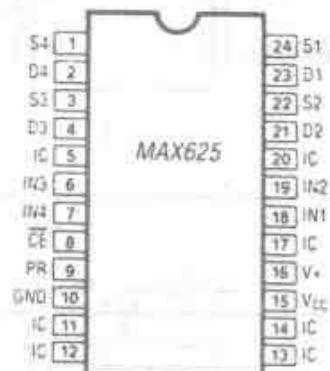
H.1686



EP 2016 C

NPN Array

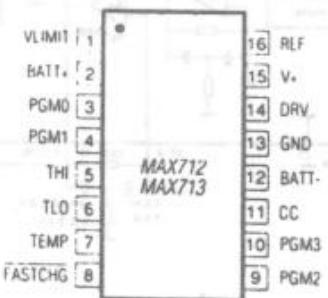
H.1687



MAX 625

Quad High-Side Power Switch

H.1688



MAX 712/713

NiCd/NiMH Batt.-Lade Controller

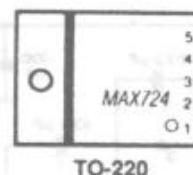
H.1689



MAX 714

Batt. Supply-System

H.1690

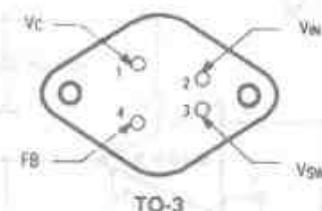


MAX 724

5 A DC-DC Regulator

H.1691

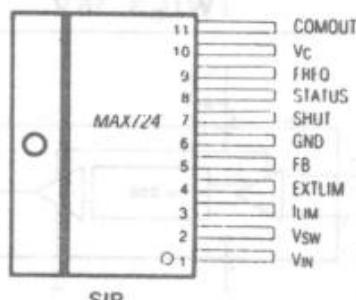
BOTTOM VIEW



MAX 724

5 A DC-DC Regulator

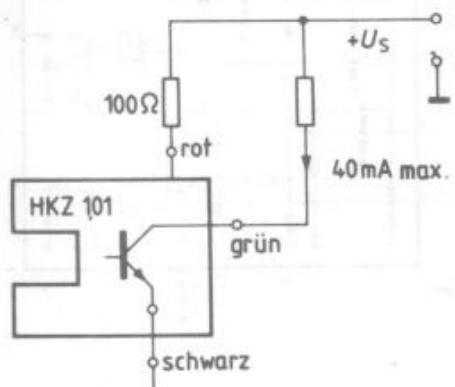
H.1692



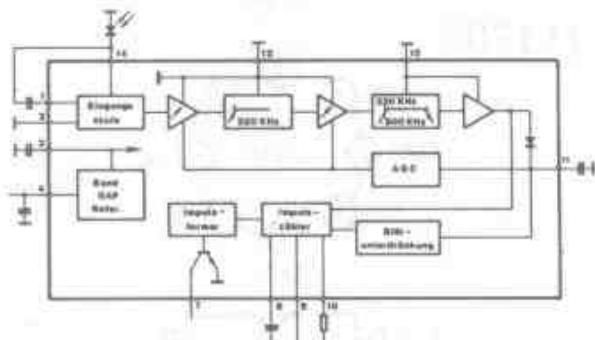
MAX 724

5 A DC-DC Regulator

H.1693



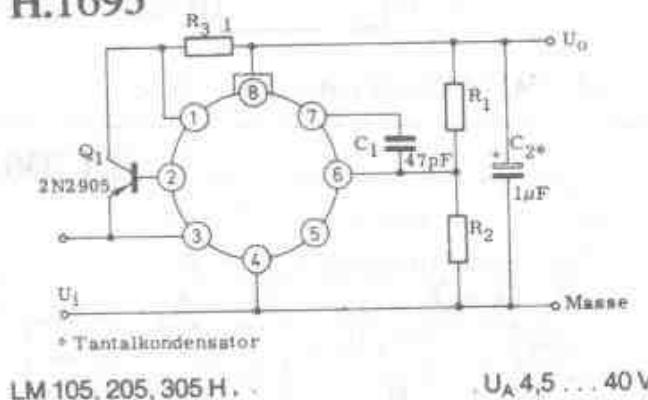
101 Hall-



U-2502 IR

H.1694

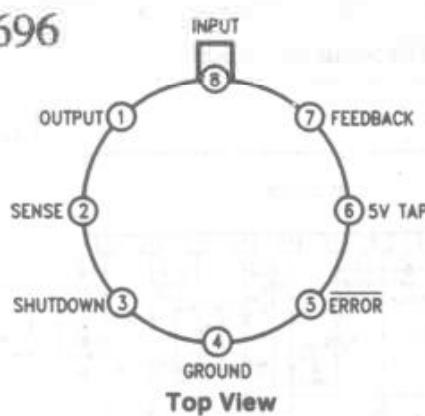
H.1695



LM 105, 205, 305 H.

$U_A$  4,5...40 V

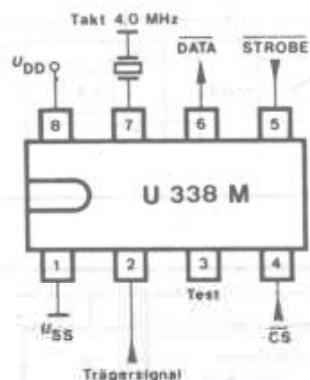
H.1696



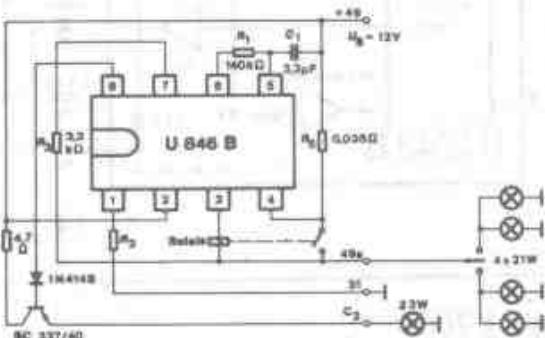
LP 2951

100 mA

H.1697

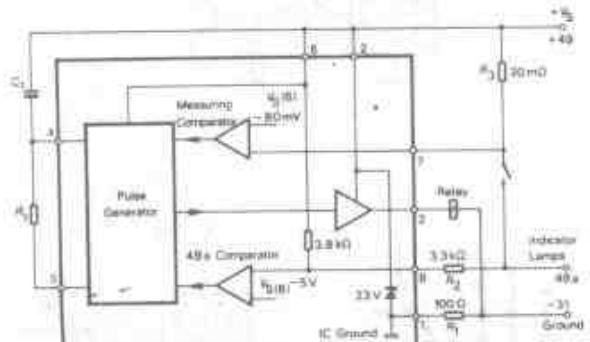


U 338 M. U 3038 M



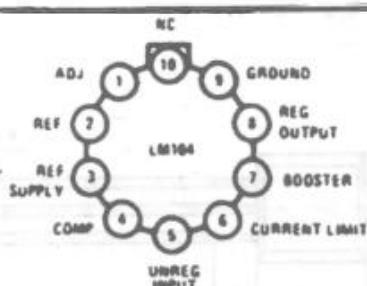
H.1698

846 B



H.1699

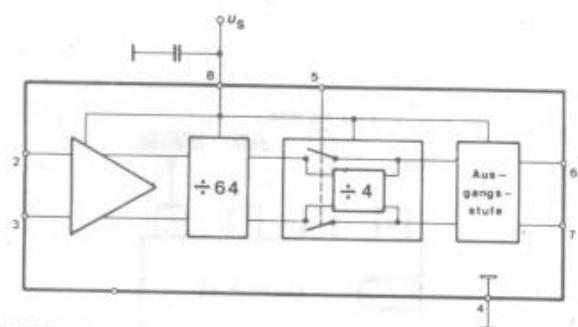
U 243



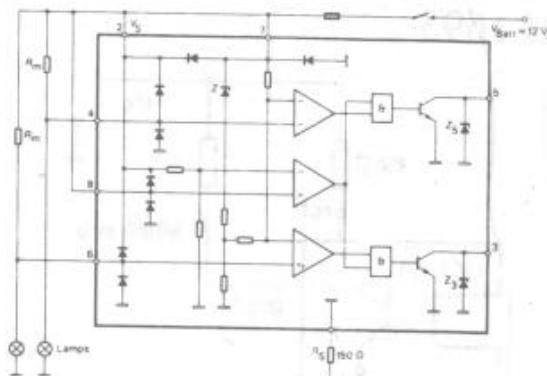
Note: Pin 5 connected to case  
Top view

H.1700

H.1701

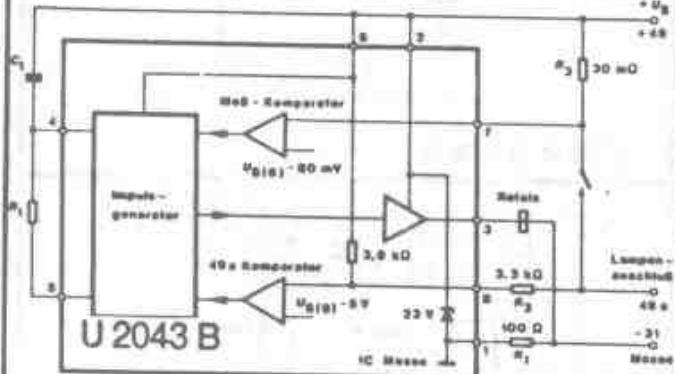


U 682 BS

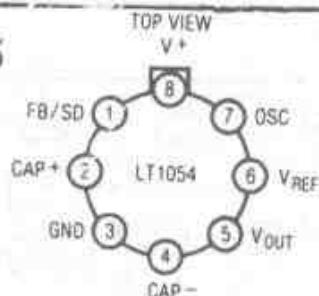


114790 B/479

H.1704

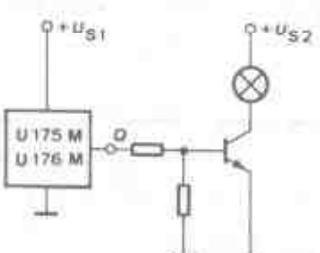


H.1705



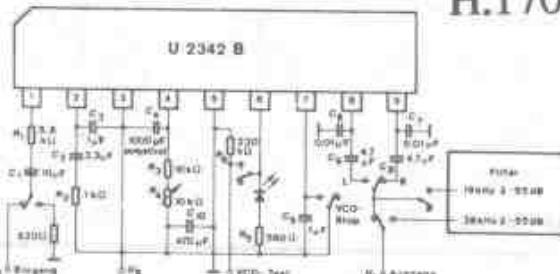
H.1702

H.1703

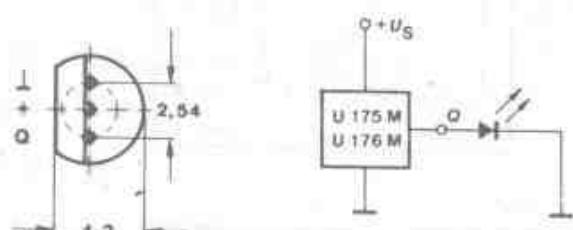


LT 1054 Voltage Converter (3.5...15 V)

H.1706

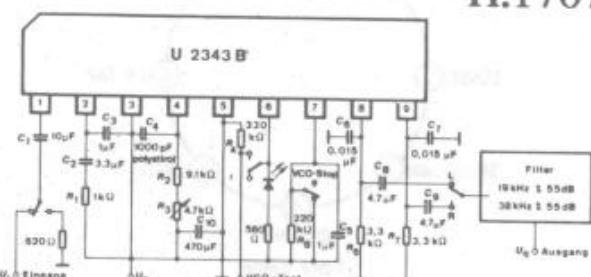


U2342-B PI 1 - Stereo Decoder



A technical drawing showing a rectangular base with a central slot. A vertical dimension line indicates a height of 5,2 from the bottom to the top edge of the base. A horizontal dimension line indicates a width of 5,2 from the left side to the right edge of the base. A gap of 2 is shown between the base and a horizontal bar above it. The total length of the horizontal bar is 12,4. A tolerance of +/- 0,5 is indicated at the top right.

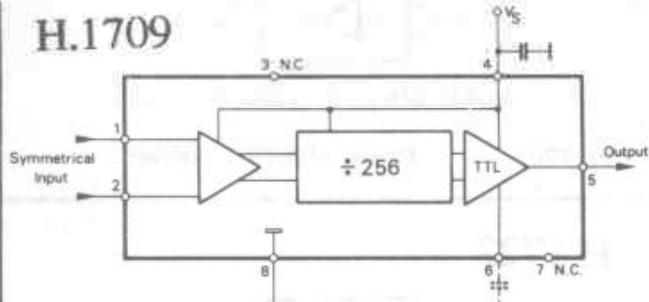
U 175 M, U 176 M Impulsgen.



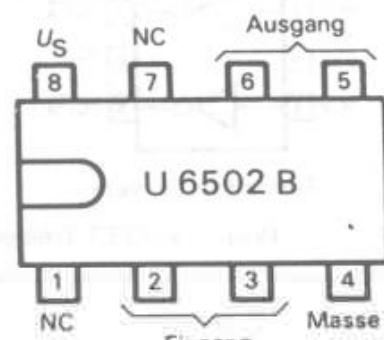
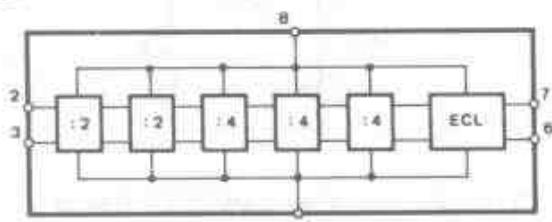
## U 2343 B PLL-Stereodecoder

**H.1708**

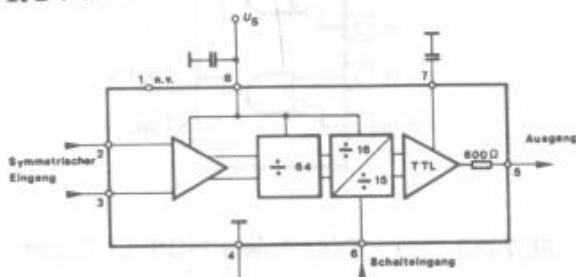
LS 7225

**H.1709**

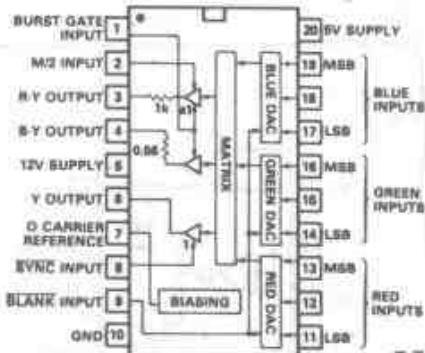
U 891 1,1 GHz-Teiler 4,5...5,5 V

U 6502 B 5 GHz  $\div 2$ **H.1710****H.1711**

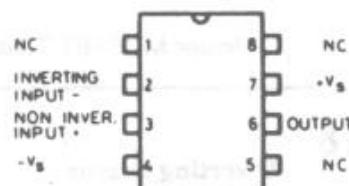
U 656 BS!

**H.1712**

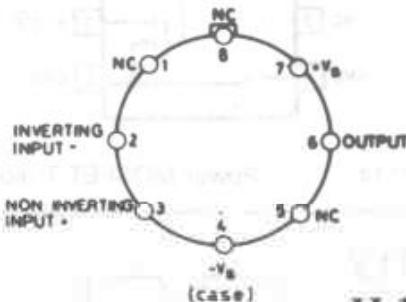
U 665 B, U 865 BS 1 GHz



LM 1886 N TV-Video Matrix D/A

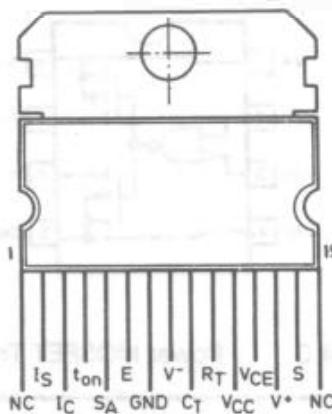
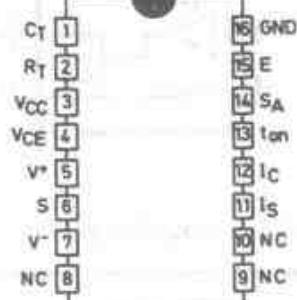
**H.1713**

LS 307

**H.1715**

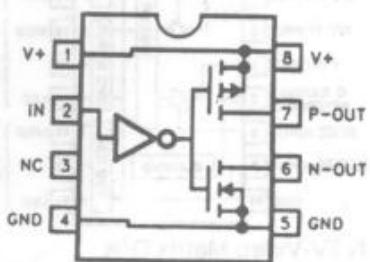
LS 107, 207

± 18 V

**H.1716**

UAA 4006

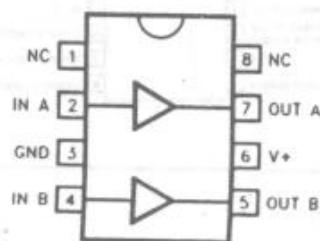
H.1717



EL 7104

Power MOSFET Treiber

H.1721

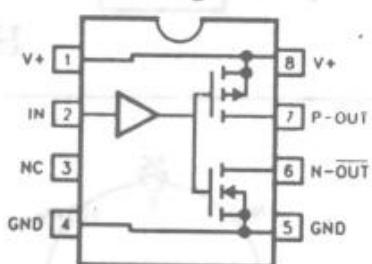


EL 7202

Power MOSFET Treiber

H.1718

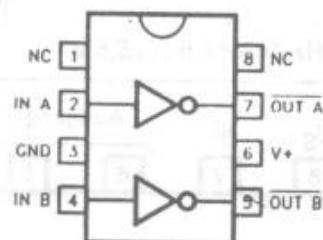
Inverting Driver



EL 7114

Power MOSFET Treiber

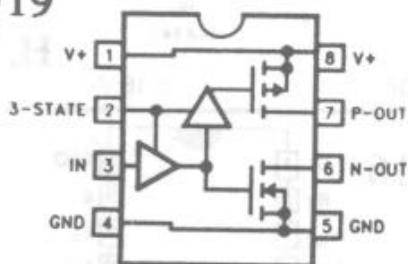
H.1722



EL 7212

Power MOSFET Treiber

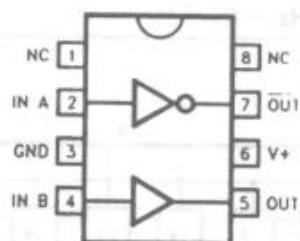
H.1719



EL 7134 C

Line Driver

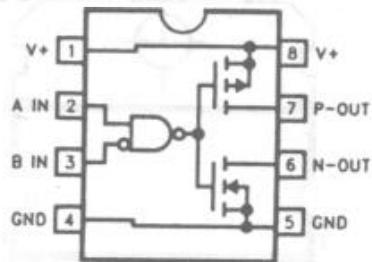
H.1723



EL 7222

Power MOSFET Treiber

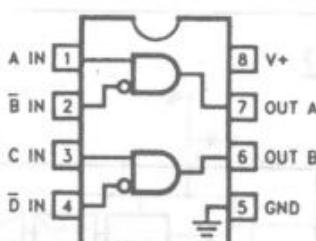
H.1720



EL 7144 C

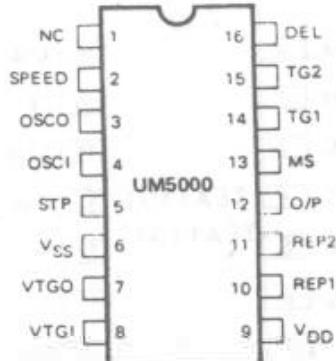
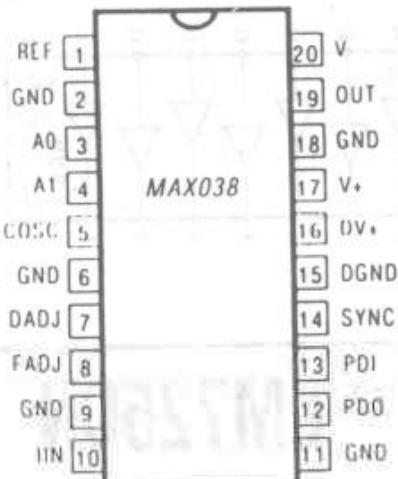
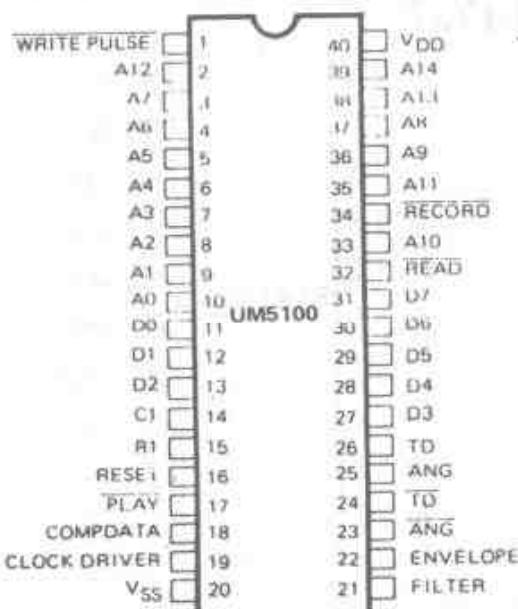
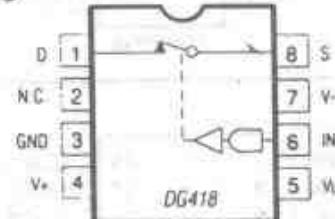
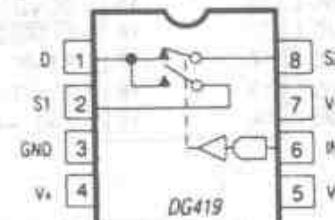
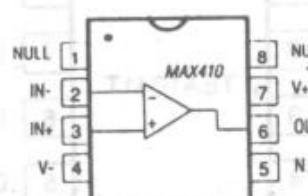
Power MOSFET Treiber

H.1724

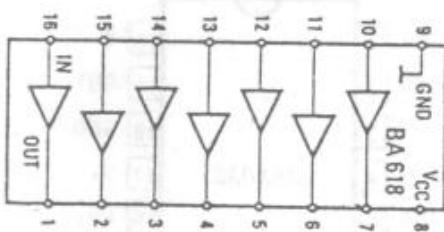


EL 7242

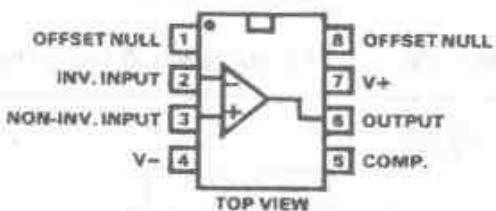
Dual Power MOSFET Driver

**H.1725****H.1728****H.1726****H.1729****H.1730****H.1727****H.1731**

H.1732



H.1733 LM725CN

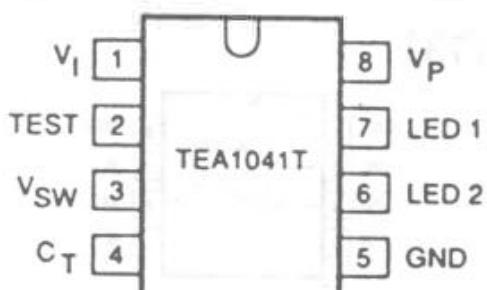


H.1734



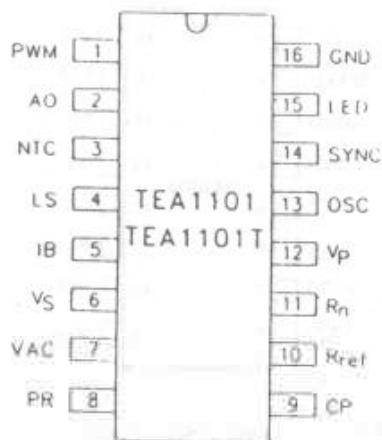
MTA 1200 Intelligent Batt. Management

H.1735



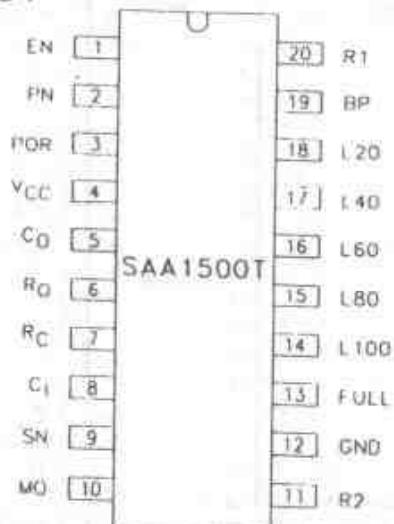
TAE 1041 Batt. Low-Level indicator

H.1736



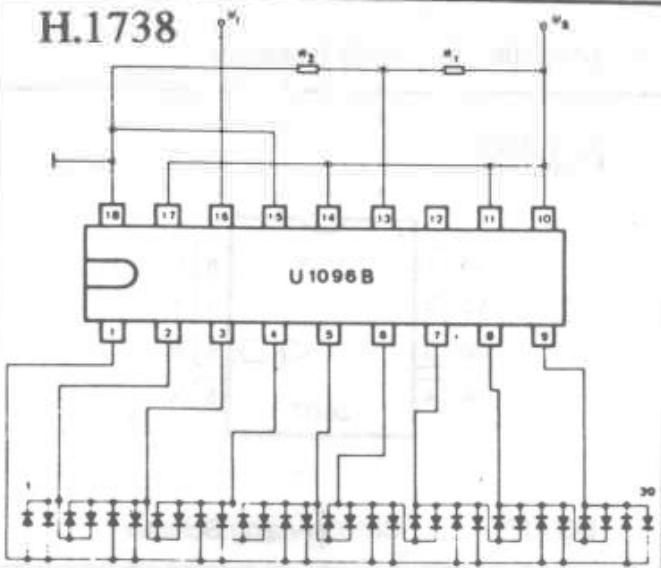
TAE1100/1101 Batt. Monitor f. NiCd und NiMH

H.1737

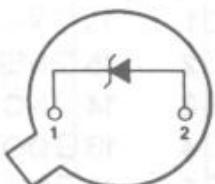


SAA 1500T State-of-Charge indicator f. NiCd/NiMH

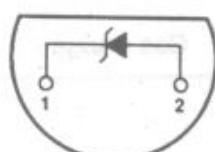
H.1738



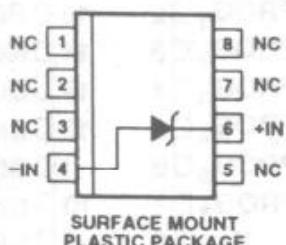
H.1739



TO-52  
HERMETIC PACKAGE  
(BOTTOM VIEW)

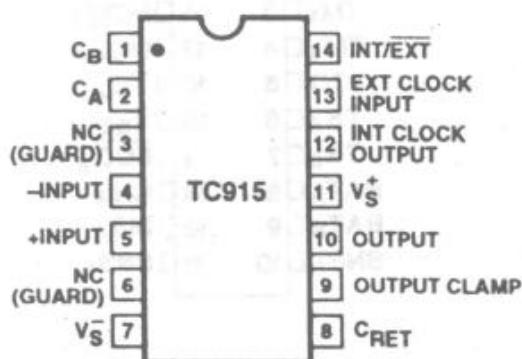


TO-92  
PLASTIC PACKAGE  
(BOTTOM VIEW)

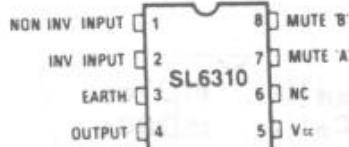


TC 04/05

H.1740



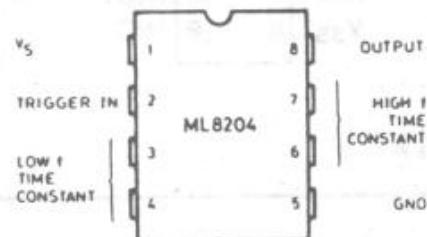
TC 915 High-Voltage, Auto-Zeroed OP, U<sub>B</sub> 7–32 V, Offset 10 mV



H.1741

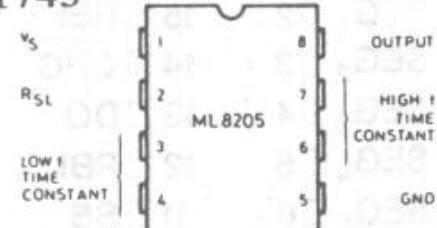
SL 6310 500 mW Audio Amplifier

H.1742



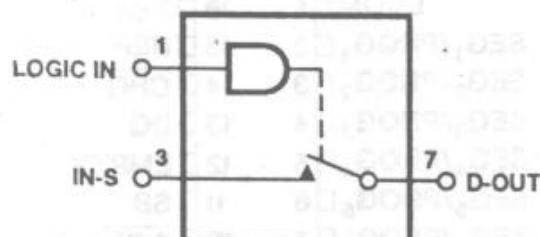
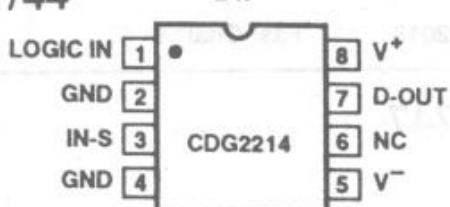
Ton IC

H.1743



Ton IC

H.1744



NOTES:

1. One SPST switch per package.
2. Switch shown in logic "1" position.
3. Logic "0"  $\leq 1V$ ; Logic "1"  $\geq 4.5V$
4. Logic "0" = ON; Logic "1" = OFF

CDG 2214

20 mA

**H.1745**

V <sub>OUT</sub>	1	16	V <sub>CC</sub>
BC <sub>P</sub>	2	15	BC <sub>S</sub>
NC	3	14	CE
A	4	13	CE CON1
BCF	5	12	CE CON2
NC	6	11	BCL
THS	7	10	RST
V <sub>SS</sub>	8	9	NC

BQ 2203 A

**H.1748**

MODE	1	16	V <sub>CC</sub>
SEG <sub>1</sub>	2	15	REF
SEG <sub>2</sub>	3	14	NC
SEG <sub>3</sub>	4	13	DQ
SEG <sub>4</sub>	5	12	RBI
SEG <sub>5</sub>	6	11	SB
PFC	7	10	DISP
V <sub>SS</sub>	8	9	SR

BQ 2011 Gas Gauge IC

**H.1746**

MODE	1	16	V <sub>CC</sub>
SEG <sub>1</sub>	2	15	REF
SEG <sub>2</sub>	3	14	CHG
SEG <sub>3</sub>	4	13	DQ
SEG <sub>4</sub>	5	12	RBI
SEG <sub>5</sub>	6	11	SB
PFC	7	10	DISP
V <sub>SS</sub>	8	9	SR

BQ 2013

Fast Charge

**H.1749**

LCOM	1	16	V <sub>CC</sub>
SEG <sub>1</sub> /PROG <sub>1</sub>	2	15	REF
SEG <sub>2</sub> /PROG <sub>2</sub>	3	14	NC
SEG <sub>3</sub> /PROG <sub>3</sub>	4	13	DQ
SEG <sub>4</sub> /PROG <sub>4</sub>	5	12	EMPTY
SEG <sub>5</sub> /PROG <sub>5</sub>	6	11	SB
SEG <sub>6</sub> /PROG <sub>6</sub>	7	10	DISP
V <sub>SS</sub>	8	9	SR

BQ 2012 Gas Gauge IC

**H.1747**

LCOM	1	16	V <sub>CC</sub>
SEG <sub>1</sub> /PROG <sub>1</sub>	2	15	REF
SEG <sub>2</sub> /PROG <sub>2</sub>	3	14	CHG
SEG <sub>3</sub> /PROG <sub>3</sub>	4	13	DQ
SEG <sub>4</sub> /PROG <sub>4</sub>	5	12	EMPTY
SEG <sub>5</sub> /PROG <sub>5</sub>	6	11	SB
SEG <sub>6</sub> /PROG <sub>6</sub>	7	10	DISP
V <sub>SS</sub>	8	9	SR

BQ 2010

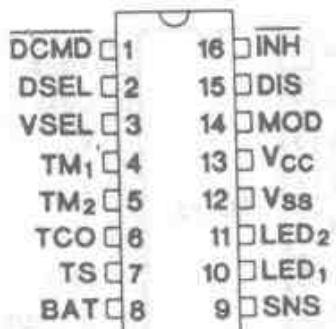
Gas Gauge IC

**H.1750**

DCMD <sub>A</sub>	1	20	FCC <sub>B</sub>
DVEN	2	19	CH <sub>B</sub>
TM <sub>1</sub>	3	18	MOD <sub>B</sub>
TM <sub>2</sub>	4	17	MOD <sub>A</sub>
TCO	5	16	V <sub>CC</sub>
TSA	6	15	V <sub>SS</sub>
TS <sub>B</sub>	7	14	FCC <sub>A</sub>
BATA	8	13	CH <sub>A</sub>
BAT <sub>B</sub>	9	12	DIS <sub>A</sub>
SNSA	10	11	SNS <sub>B</sub>

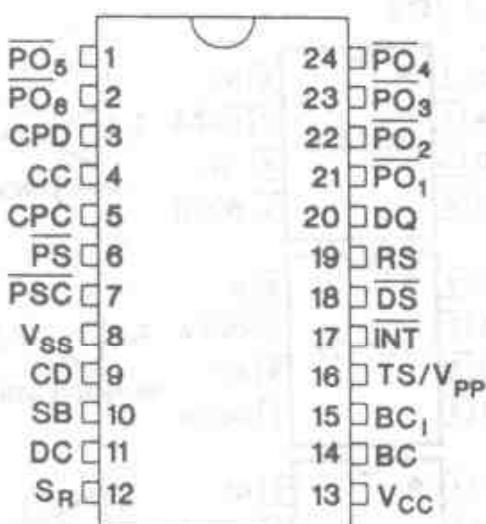
BQ 2005

Dual-Batt. Fast Charge

**H.1751**

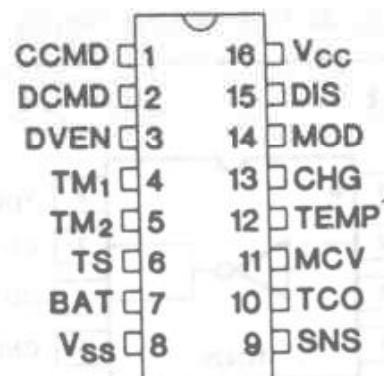
BQ 2004

Fast Change IC

**H.1752**

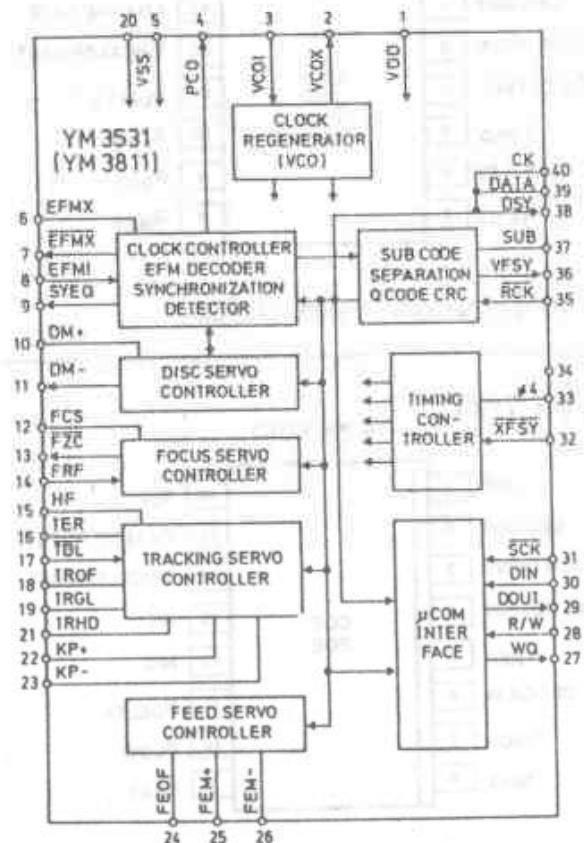
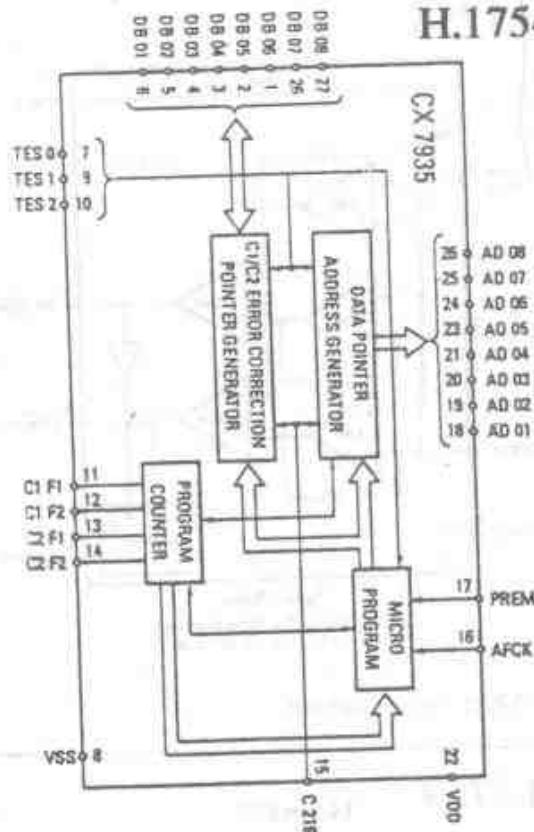
BQ 2001

Energy Management IC

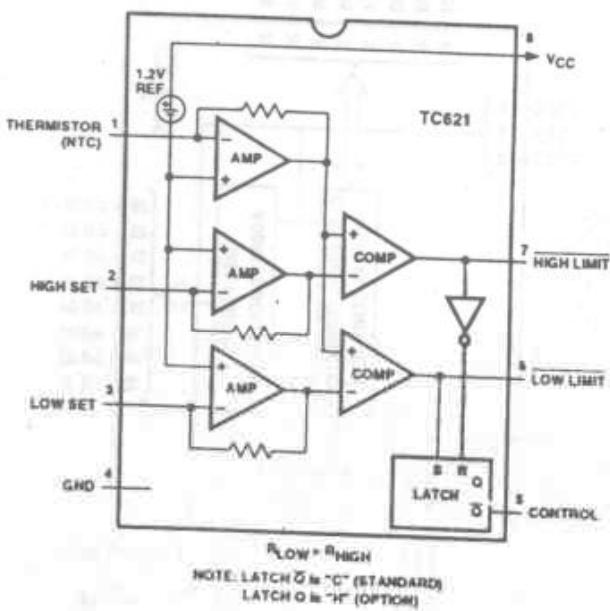
**H.1753**

BQ 2003

Fast Charge IC

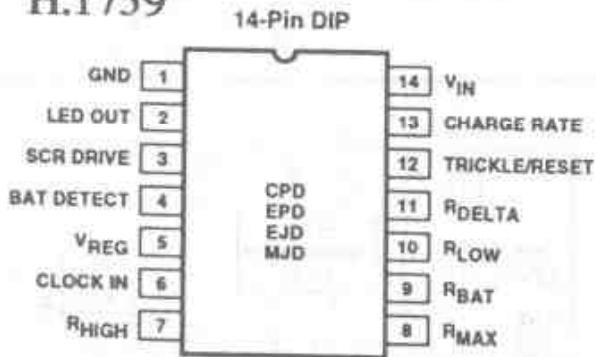
**H.1754****H.1756**

## H.1758



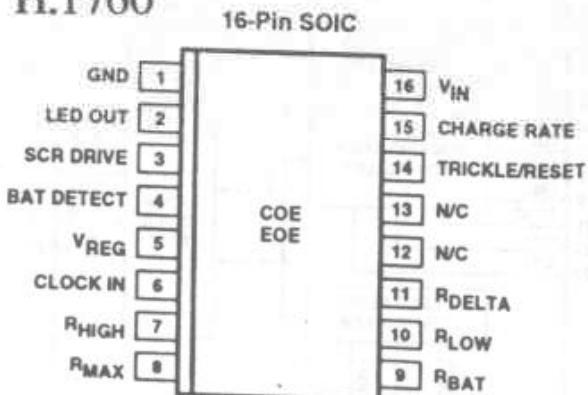
TC 621 Temp. Sensor

## H.1759



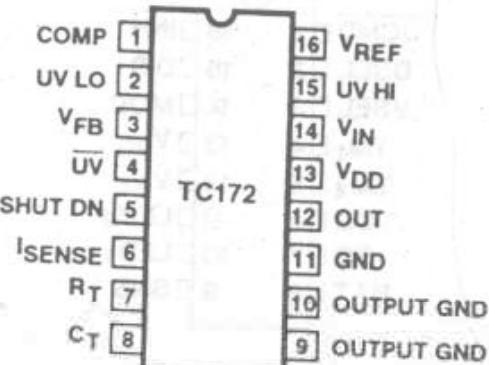
TC 675 NiCd/Ni-H Batt. Charger

## H.1760



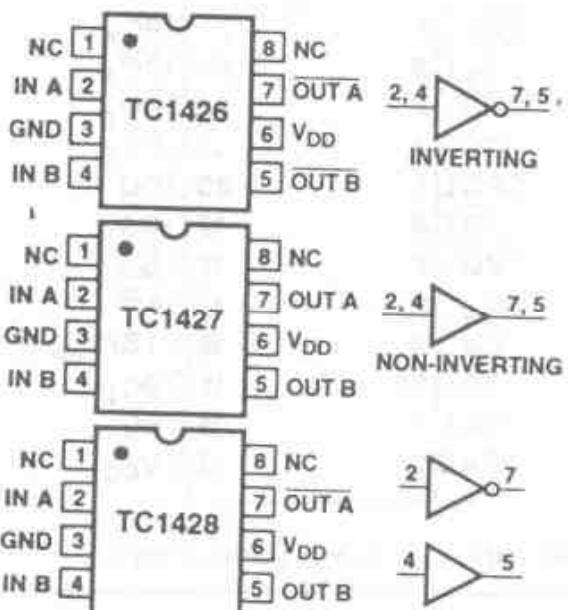
TC 676 NiCd/Ni-H Batt. Charger

## H.1761



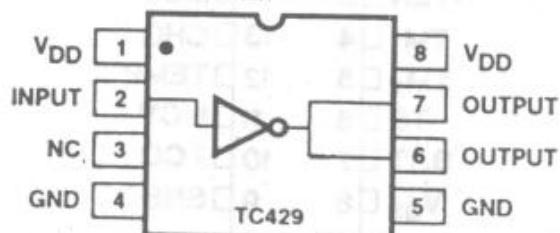
TC 172/173 BIMOS PWM Controller

## H.1762

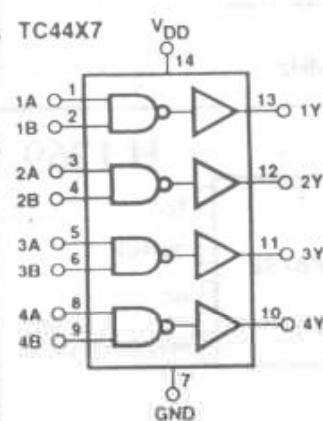
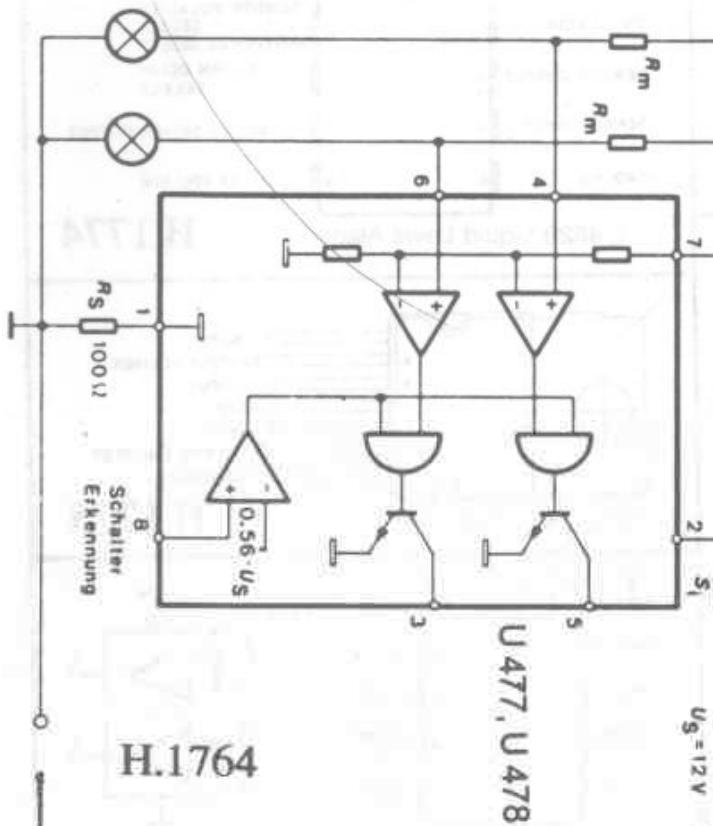


TC 1426/27/28 1.2 A MOSFET-DRIVER

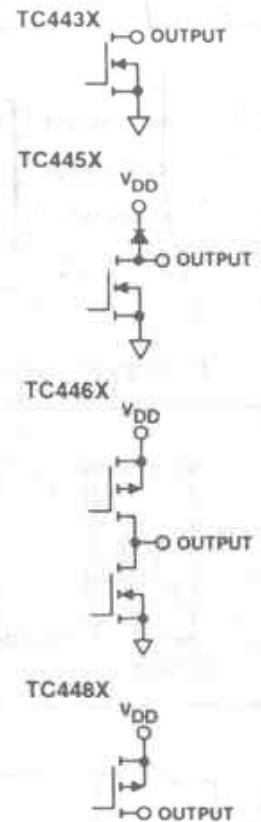
## H.1763



TC 429 MOSFET-DRIVER 6A 7-18 V

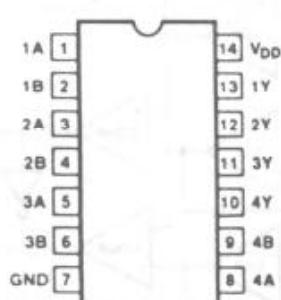
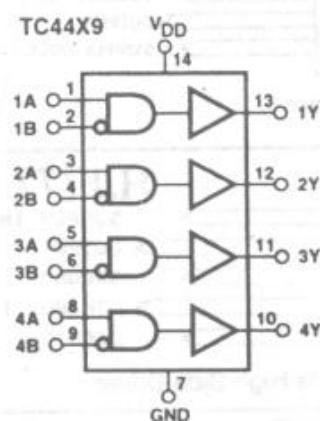
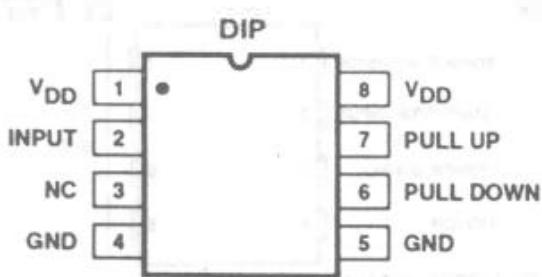


**H.1767**



**U477, U478**

**H.1765**



TC 4437/38/39      TC 4467/68/69  
 TC 4457/58/59      TC 4487/88/89  
 Power Logic CMOS Quad Drivers

**H.1766**

TC 4437, TC 4438, TC 4439  
 TC 4457, TC 4458, TC 4459  
 TC 4467, TC 4468, TC 4469  
 TC 4487, TC 4488, TC 4489

SOIC, SOT23, ESD, TSSOP

TQFP, QFN, LQFP, QFP

TO-220, TO-247, TO-263

TO-252, TO-256, TO-264

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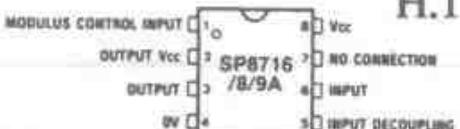
TO-807, TO-808, TO-809

TO-810, TO-811, TO-812

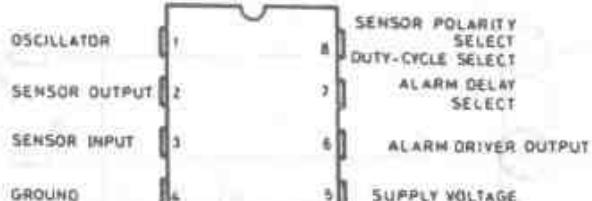
TO-813, TO-814, TO-815

TO-816, TO-817, TO-818

TO-819,



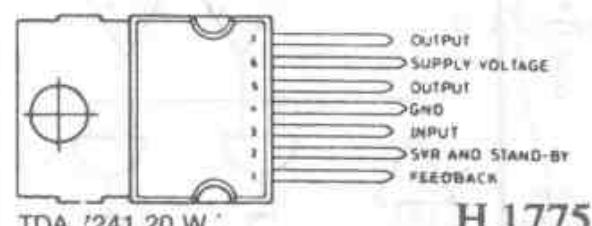
SP 8716/8/9 A 520 MHz



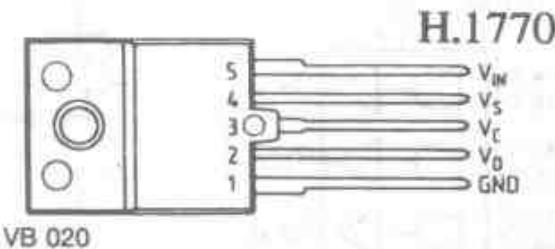
H.1774



SP 8782 A/B 1 GHZ 16/17, 32/33

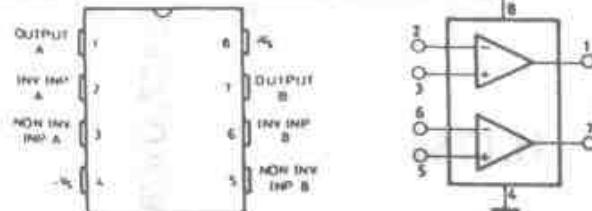


H.1775

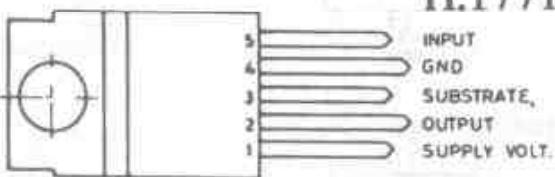


VB 020

H.1776

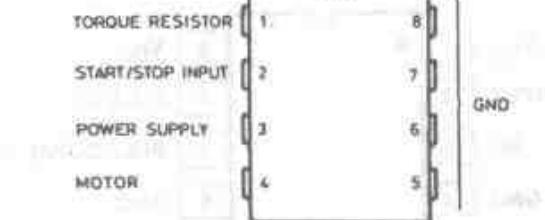


TDA 2320 A Mini Stereo

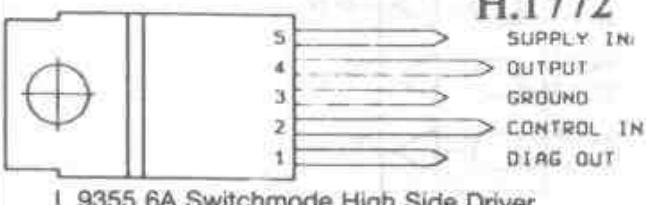


L 9350 High Side Driver

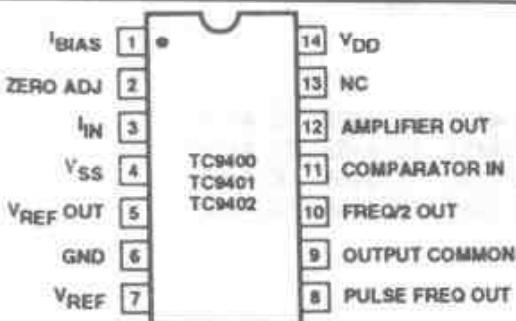
H.1777



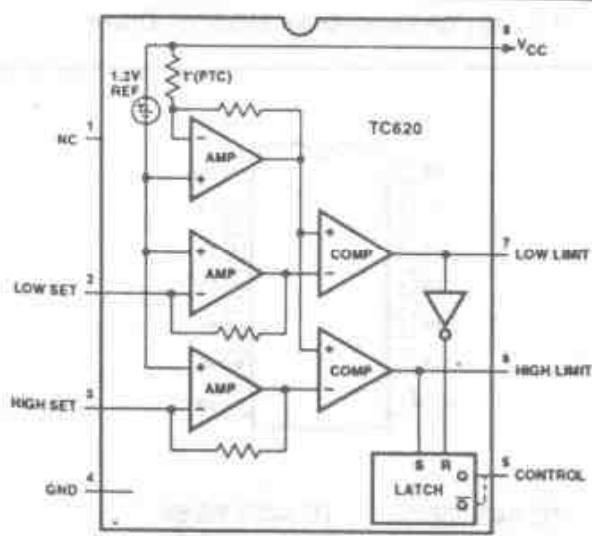
TDA 7275 A Motor Speed Regulator



L 9355 6A Switchmode High Side Driver



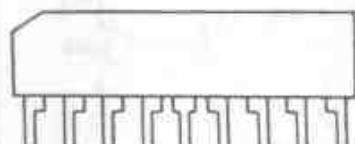
TC 9400/1/2 VF/FV Converter



$R_{LOW} = R_{HIGH}$   
NOTE: LATCH Q = "C" (STANDARD)  
LATCH Q = "H" (OPTION)

H.1778

TC 620 Temp. Sensor

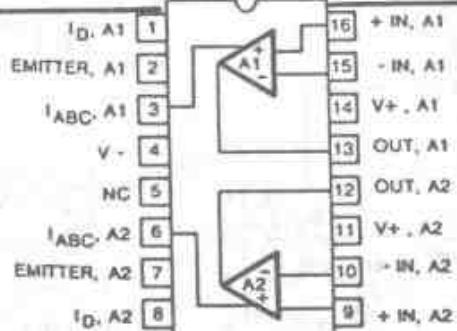
**H.1779**

NJM 386 S

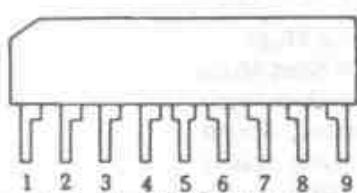
**PIN CONNECTION**

1. GAIN
2. -INPUT
3. +INPUT
4. NC
5. GND
6. OUTPUT
7. V<sup>+</sup>
8. BY PASS
9. GAIN

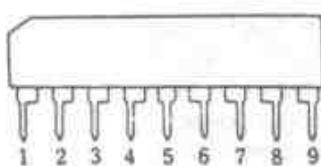
500 mW



CA 3280 E, F Dual OP

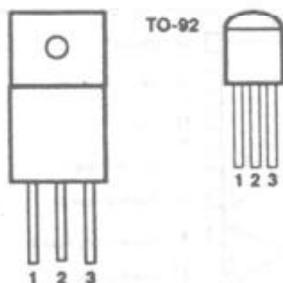
**H.1783**

NJM 387 S

**H.1780****PIN FUNCTION**

1. Control Voltage
2. Threshold
3. Discharge
4. V<sup>+</sup>
5. GND
6. Trigger
7. Output
8. Reset
9. Control Voltage

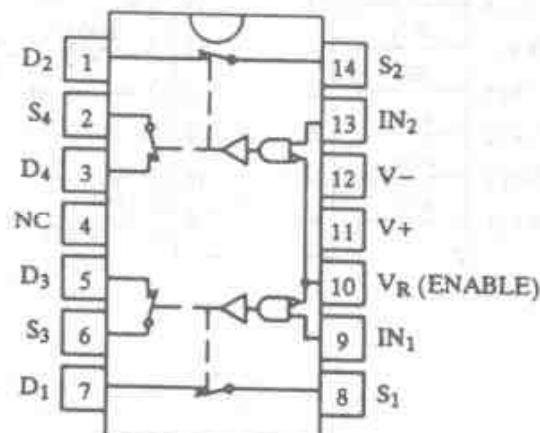
NJM 555 S Timer



TC 626 Temp. Sensor 4,5–18 V

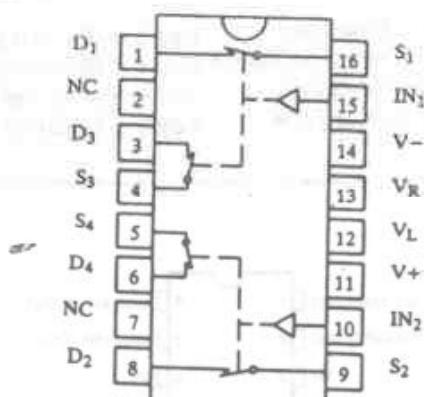
**H.1781**

SAE 0800 Gong (3, 2 und 1 Ton)

**H.1784**

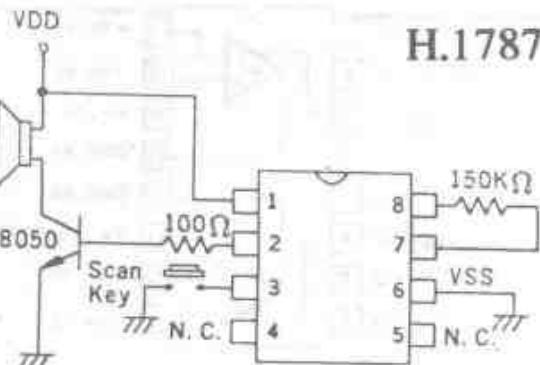
DG 129

Dual JFET

**H.1785**

DG 183/184/185 Dual JFET

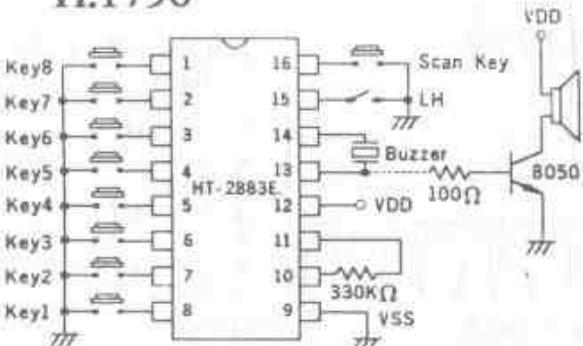
**H.1786**



H.1787

HT 2883/2885 Sound Generator

H.1790



HT 2883 E/F/I/D 8 Sound

- Key 1 = Bonus Music
- Key 2 = Game Start Music
- Key 3 = Game Over Music
- Key 4 = Bombing Sound
- Key 5 = Shooting Sound
- Key 6 = Shooting Sound Missile
- Key 7 = "Do" Sound
- Key 8 = Explosion Sound

HT 2883 F 8 Sound

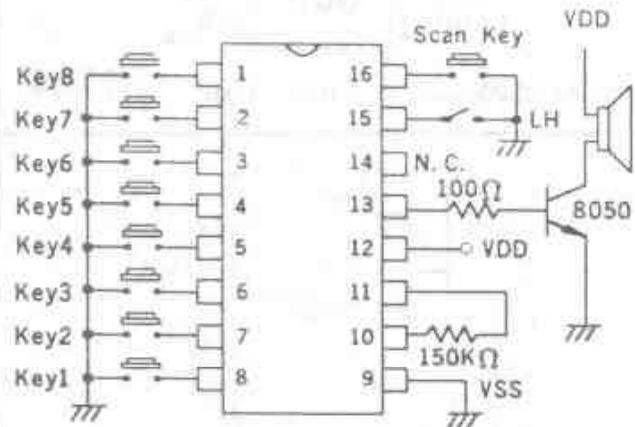
- Key 1 = Bonus Music
- Key 2 = Game Start Music
- Key 3 = Game Over Music
- Key 4 = Helicopter Sound
- Key 5 = Bombing Sound
- Key 6 = Helicopter Sound
- Key 7 = Shooting Sound
- Key 8 = Explosion Sound

HT 2883 I 8 Sound

- |                          |                      |
|--------------------------|----------------------|
| Key 1 = Game Start Music | Key 5 = Low Speed    |
| Key 2 = Bonus Music      | Key 6 = Brake Sound  |
| Key 3 = Game Over Music  | Key 7 = Crash Sound  |
| Key 4 = High Speed       | Key 8 = Start Engine |

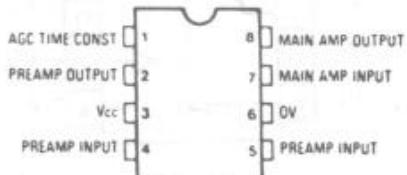
HT 2883 D 8 Sound

- |                       |                              |
|-----------------------|------------------------------|
| Key 1 = Dialing Sound | Key 5 = Redialing Tone       |
| Key 2 = Key Ton 1     | Key 6 = Ringing Ton          |
| Key 3 = Key Ton 2     | Key 7 = Busy Ton             |
| Key 4 = Key Ton 3     | Key 8 = Melody London Bridge |

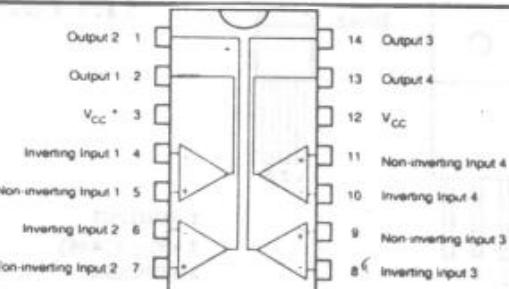


HT 2883 Sound Generator

- |                     |                       |
|---------------------|-----------------------|
| Key 1 = Rifle Gun   | Key 5 = Bombing 2     |
| Key 2 = Machine Gun | Key 6 = Bombing 1     |
| Key 3 = TV Game     | Key 7 = Machine Gun 2 |
| Key 4 = Dual Tone   | Key 8 = Machine Gun 1 |



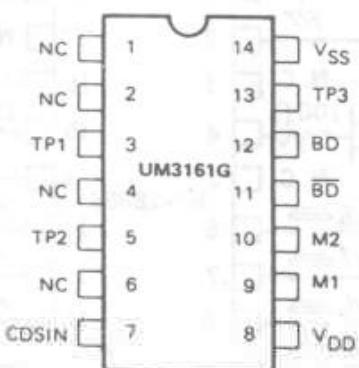
SL 6270 Gain Control Preamplifier H.1789



H.1791

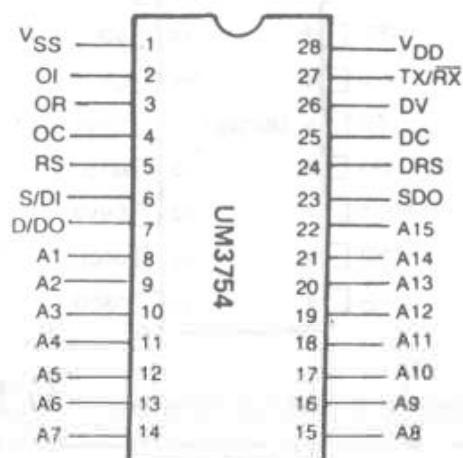
TC 3704C, I, M Dual CMOS Voltage Comparator

H.1792



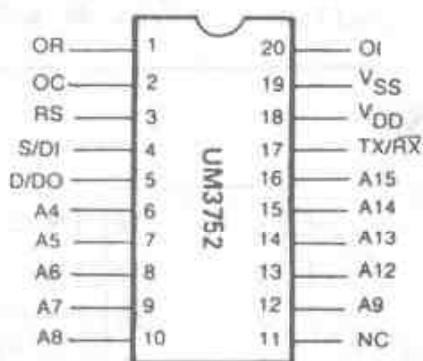
UM 3161-1...99 Melodie IC

H.1795



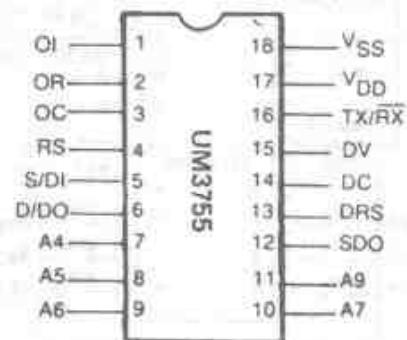
UM 3754 Programmierbarer Encoder/Decoder

H.1793



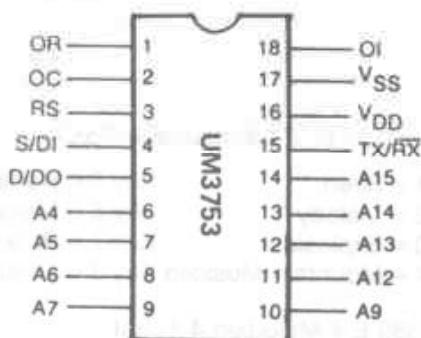
UM 3752 Programmierbarer Encoder/Decoder

H.1796



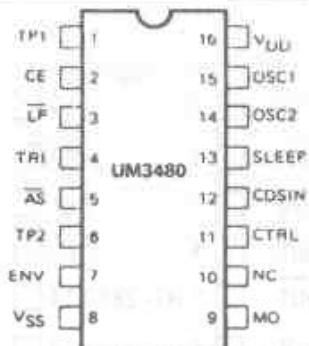
UM 3755 Programmierbarer Encoder/Decoder

H.1794

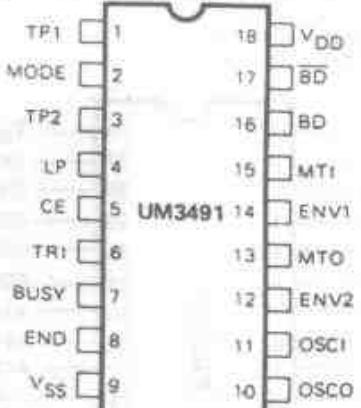


UM 3753 Programmierbarer Encoder/Decoder

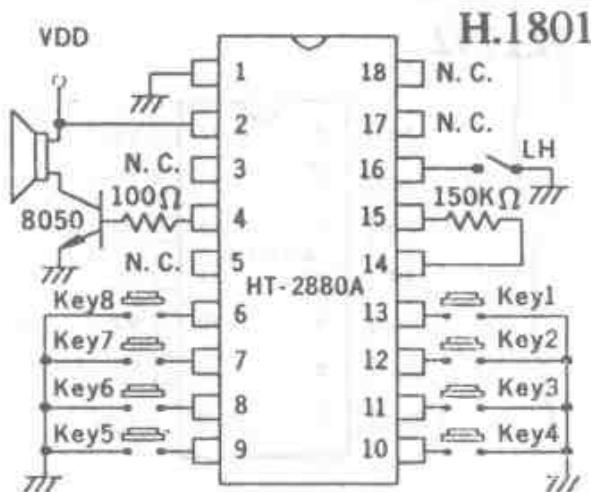
H.1797



UM 3480-1 12 Melodie Generator



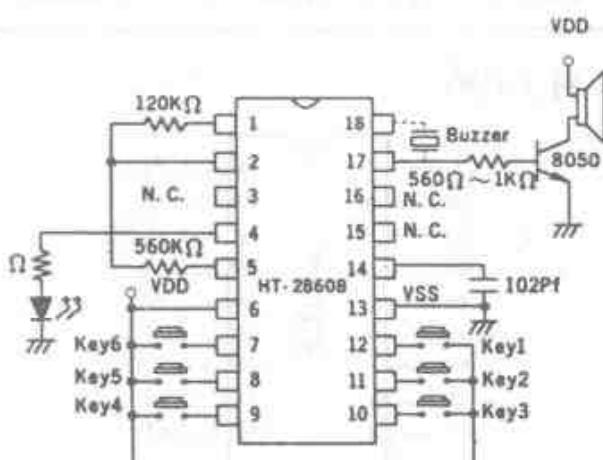
UM 3491-1...4 Melodie Generator H.1798



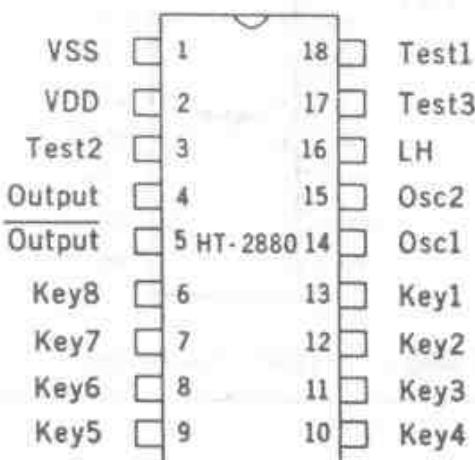
HT 2880 A 8 Toy Gun Sounds II

Key 1 = Rifle Gun      Key 5 = Bombing 2  
 Key 2 = Machin Gun 3      Key 6 = Bombing 1  
 Key 3 = TV Game      Key 7 = Machin Gun 2  
 Key 4 = Dual Tone      Key 8 = Machin Gun 1

H.1799



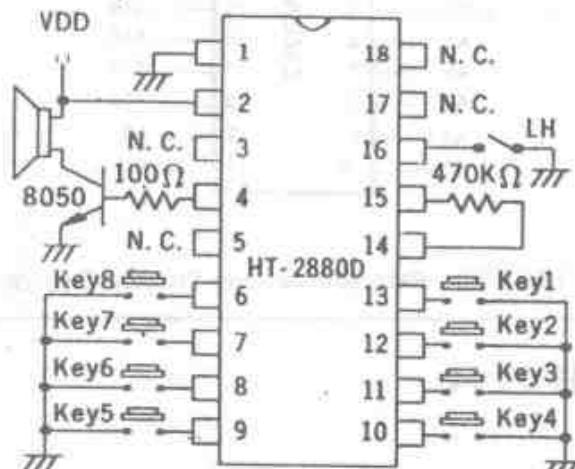
HT 2860 B 6 Alarm-Sounds



HT 2880 8 Sound Generator

H.1800

H.1802



HT 2880 D, E, J 4 Melodien 4 Ton I

Key 1 = Siren      Key 5 = Bombing  
 Key 2 = Melody 1      Key 6 = Melody (2)  
 Key 3 = Explosion      Key 7 = Rifle Gun  
 Key 4 = Mountain Musican Key 8 = London Bridge

HT 2880 E 4 Melodien 4 Ton II

Key 1 = Dingle Bells (1) Key 5 = Happy Birthday  
 Key 2 = Siren Key 6 = Phone Bell  
 Key 3 = Dingle Bells (2) Key 7 = Wedding March  
 Key 4 = Alarm Key 8 = Explosion

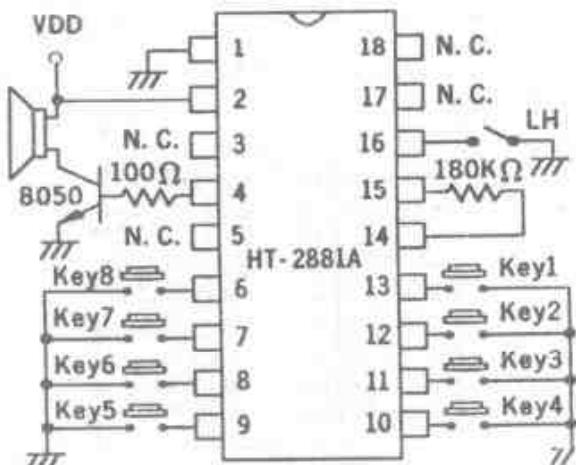
HT 2880 | 4 Melodien 4 Ton III

Key 1 = London Bridge Key 5 = Oh, My Darling!  
Key 2 = Siren Key 6 = Phone Bell  
Key 3 = Happy Birthday Key 7 = Are You Sleeping?  
Key 4 = Alarm Key 8 = Explosion

HT 2880 J 4 Melodien I

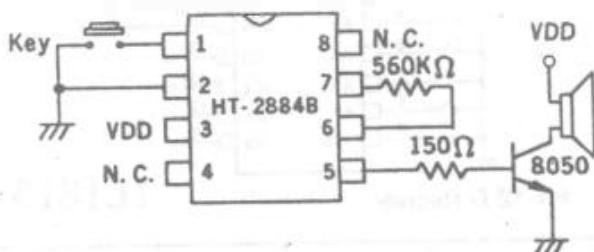
- Key 1 = London Bridge
- Key 2 = Happy Birthday
- Key 3 = 'Oh, My Darling'
- Key 4 = Are You Sleeping?
- Key 5 = Wedding March
- Key 6 = Little Bees
- Key 7 = Row Your Bopl
- Key 8 = Mary Mad A Little Lamb

H.1803



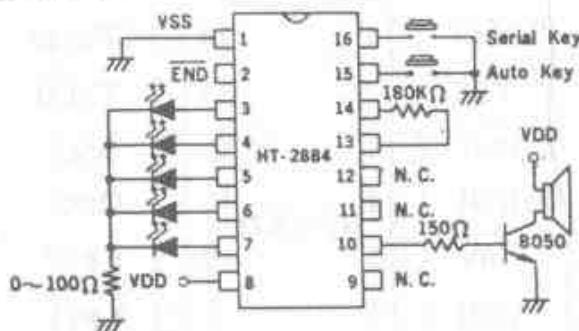
HT 2881 A 8 Sound Generator

Key 1 = Emergency Key 5 = Boom Drop  
Key 2 = Machine Gun Key 6 = Jet Engine  
Key 3 = Laser Gun Key 7 = Space Scan Up  
Key 4 = Rocket Fire Key 8 = Space Scan Down



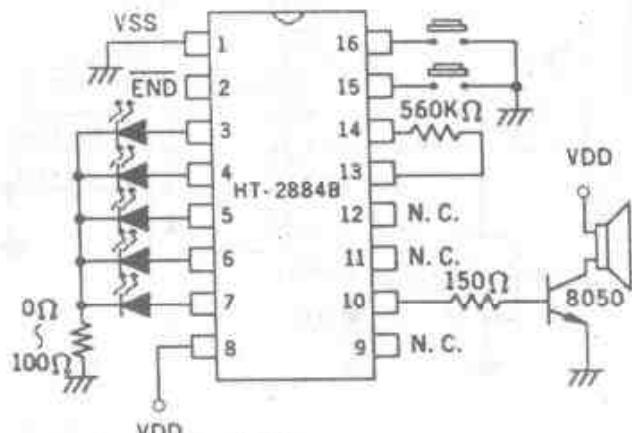
HT 2884 B 8 Melodien

H.1805



## HT 2884 A 8 Sound Gen. mit Flash

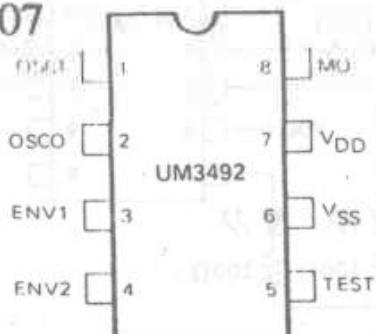
Key 1 = Machine Gun 3 Key 5 = Bombing 1  
Key 2 = TV Game Key 6 = Machin Gun 2  
Key 3 = Dual Tone Key 7 = Machin Gun 1  
Key 4 = Bombing 2 Key 8 = Rifle Gun



Key 1 = London Bridge  
Key 2 = It come upon  
Key 3 = Clementine  
Key 4 = Are You Sleeping  
Key 5 = The cassions go  
Key 6 = Bee.  
Key 7 = Row, Row you boat  
Key 8 = Mary had a little lamb

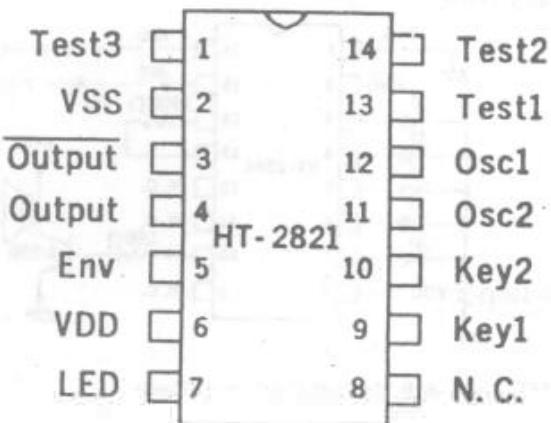
H.1806

H-1807



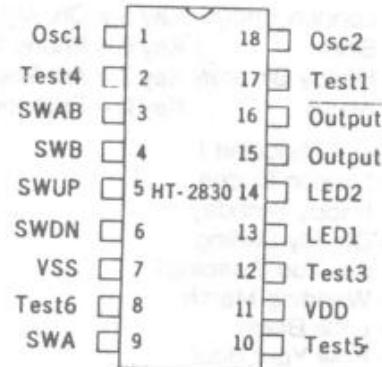
UM 3492

Melodie Generator 1,3-4,5 V



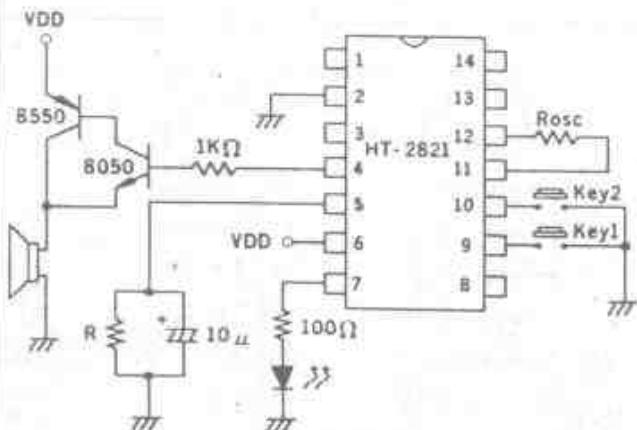
HT 2821 Sound Generator

H.1808



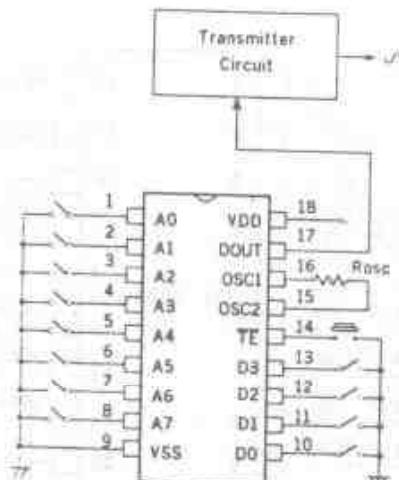
HT 2830 Sound Generator

H.1811



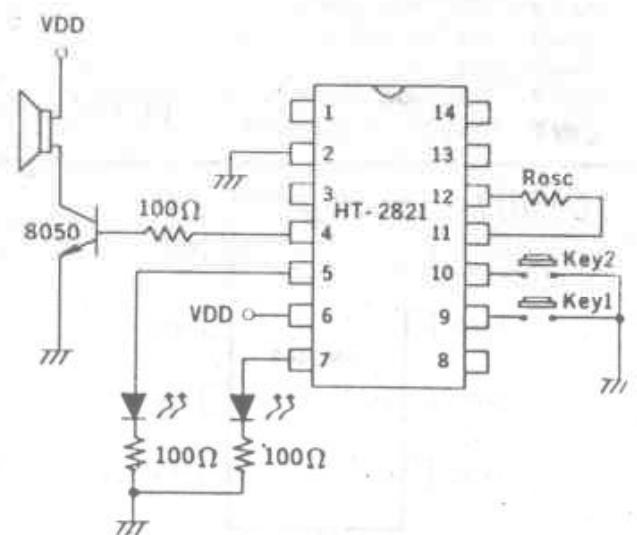
HT 2821 Bombing & Machin Gun

H.1809



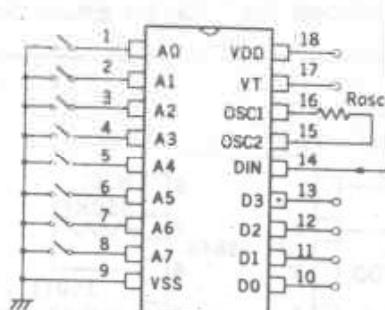
HT 12 E Transmitter

H.1812



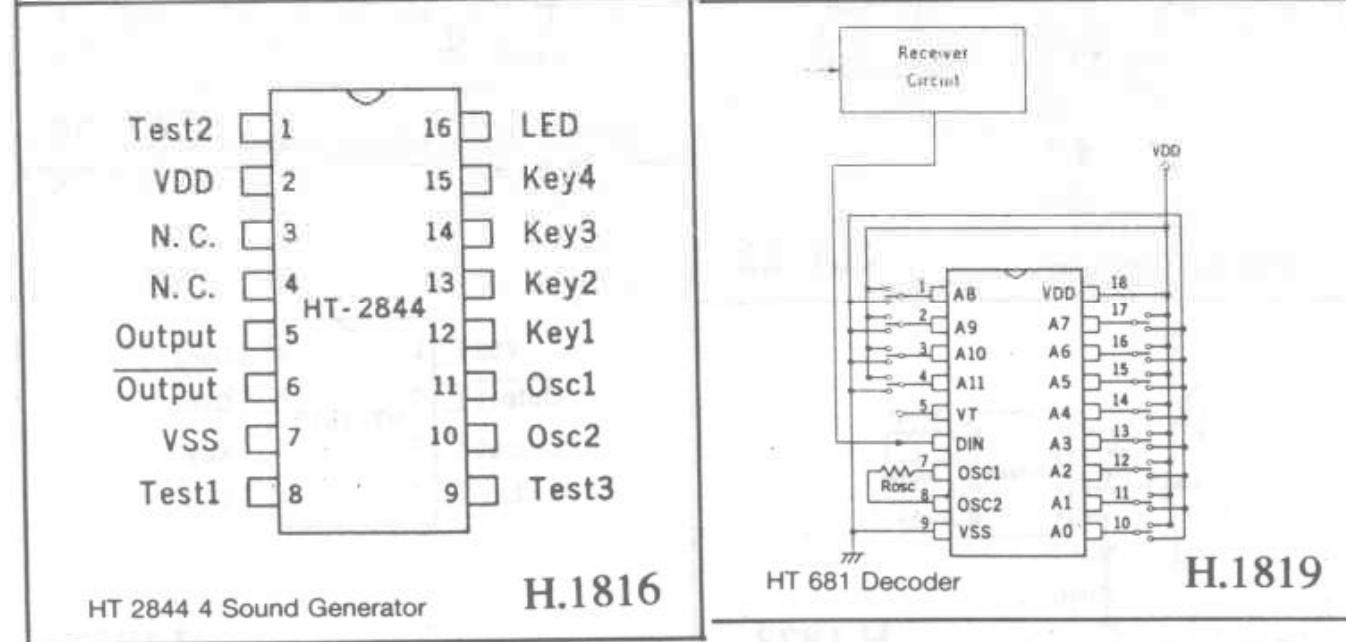
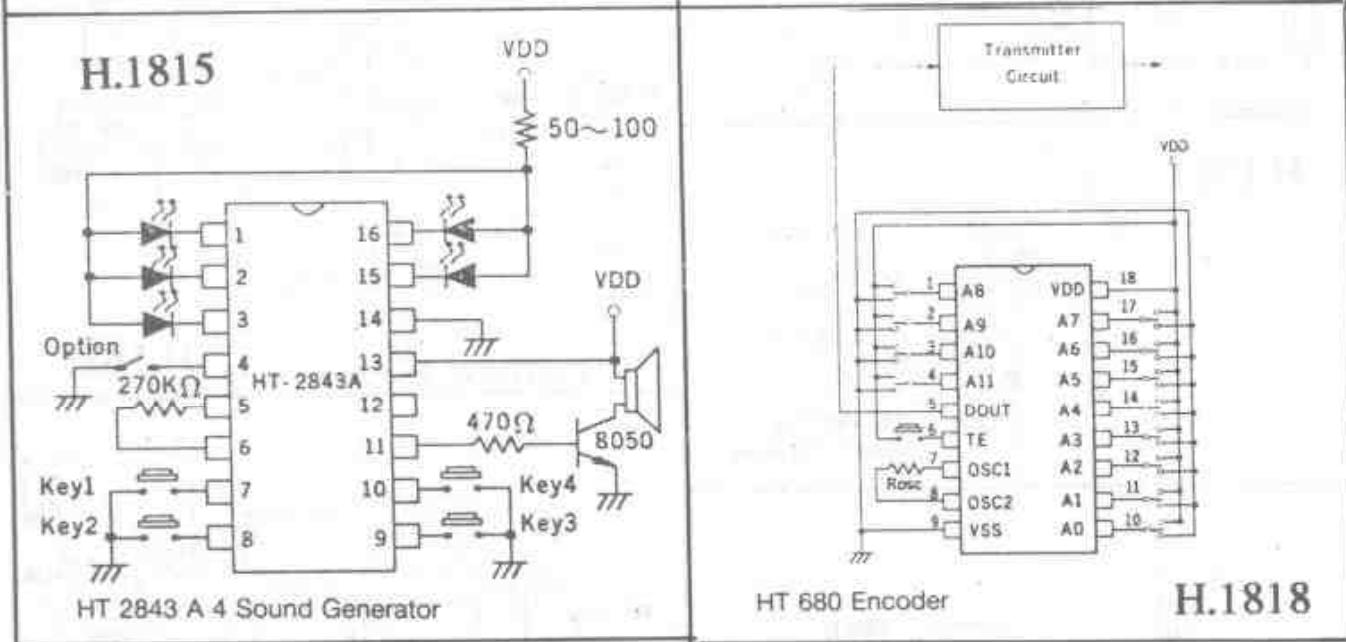
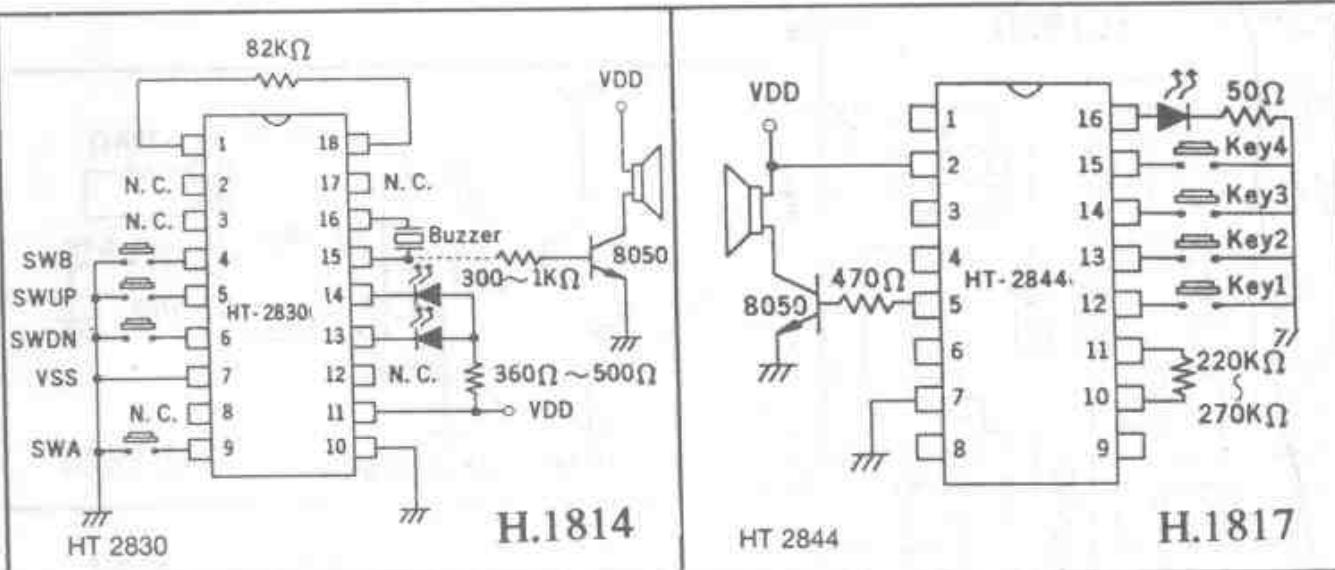
HT 2821 Break & Explosion

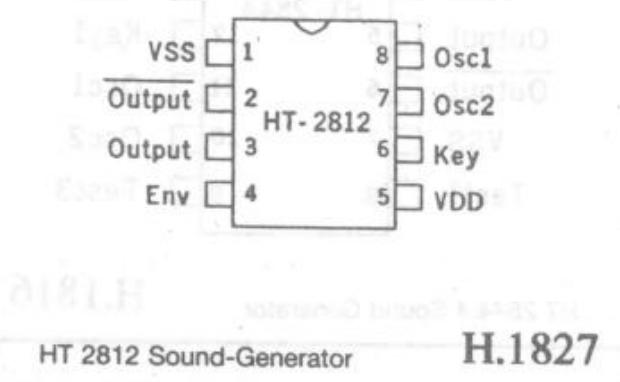
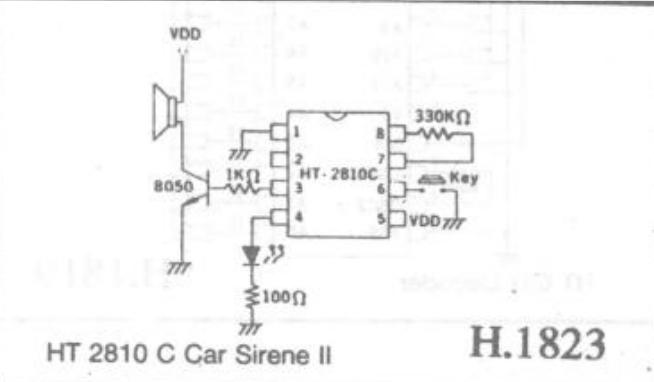
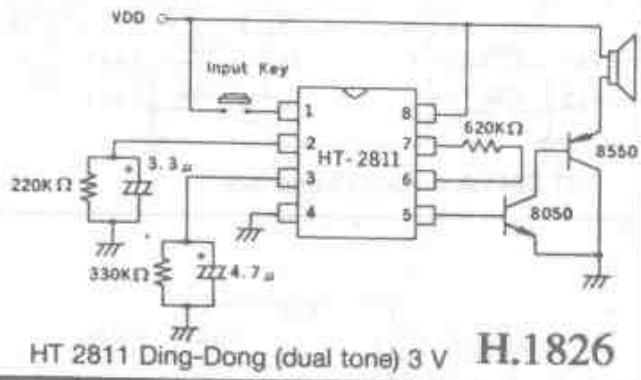
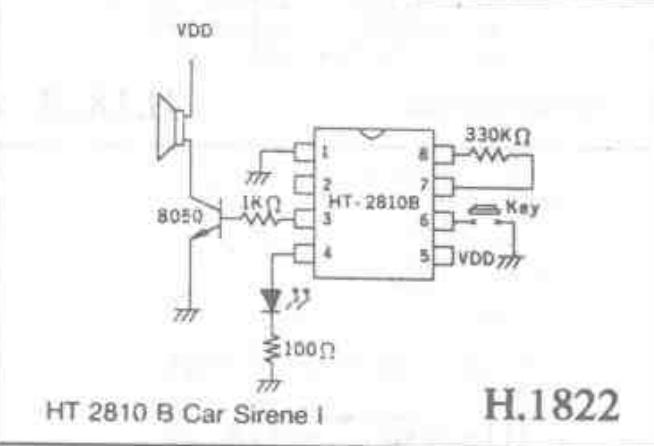
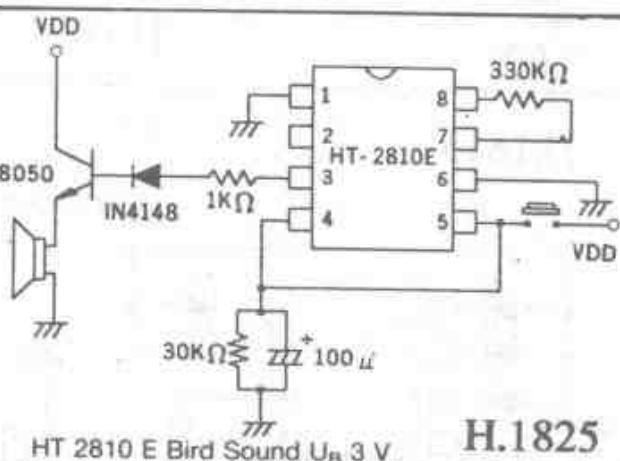
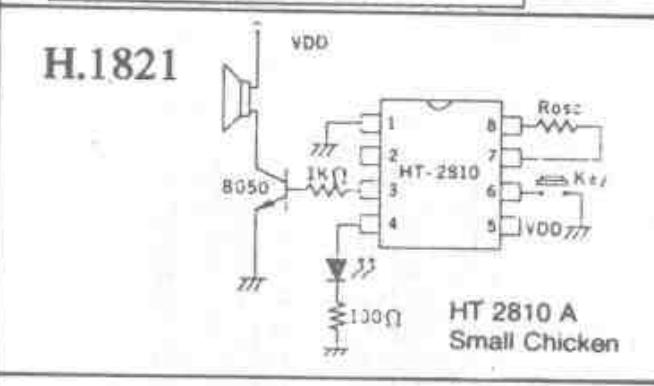
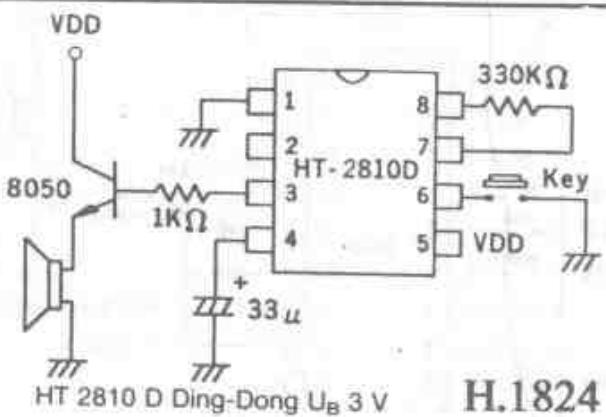
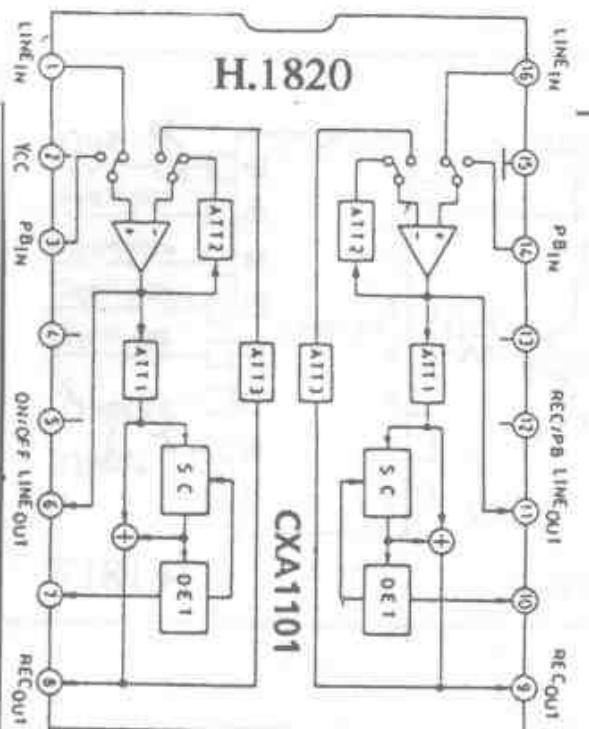
H.1810

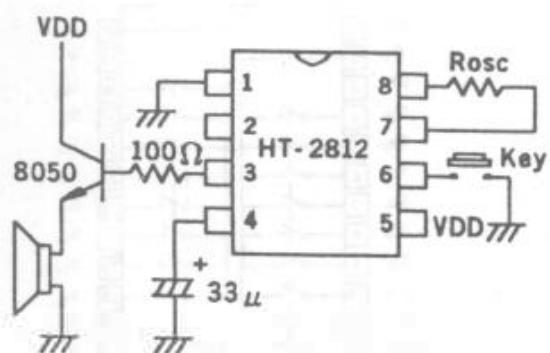


HT 12 D Reciver

H.1813

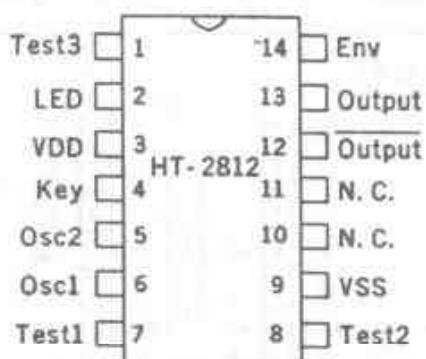




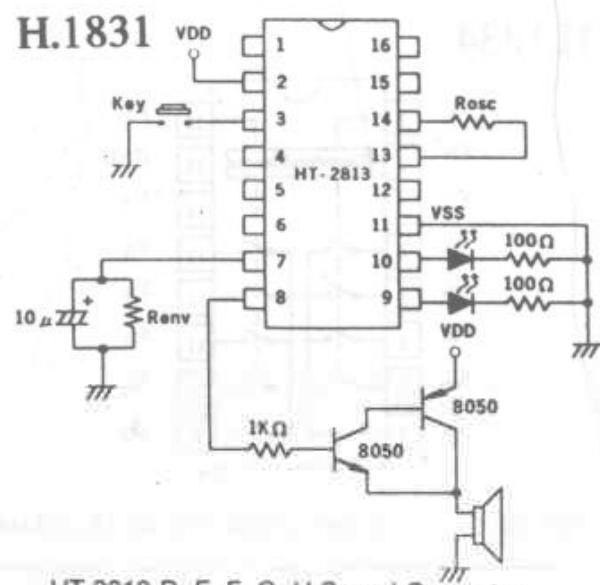


HT 2812 Sound-Generator

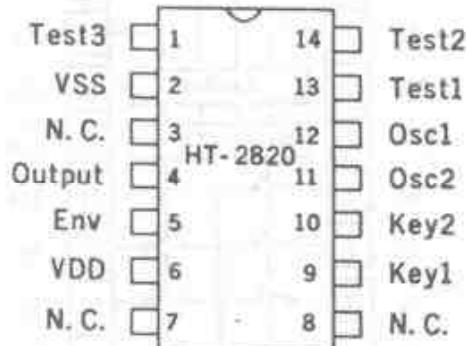
H.1828



H.1829

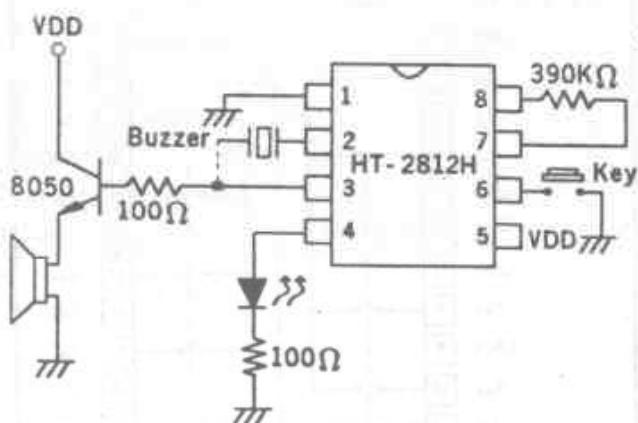


HT 2813 D, E, F, G, H Sound Generator



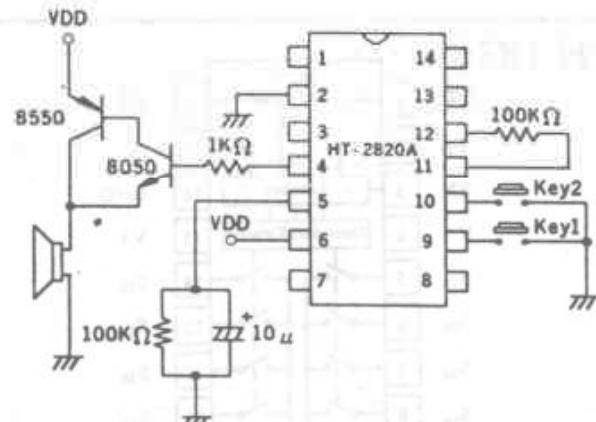
HT 2820 Sound Generator

H.1832



HT 2812 H Dialing Ton

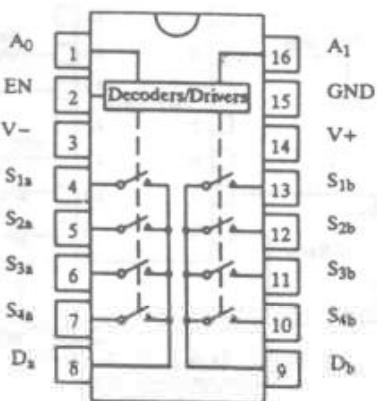
H.1830



HT 2820 A Two Horse Sound

H.1833

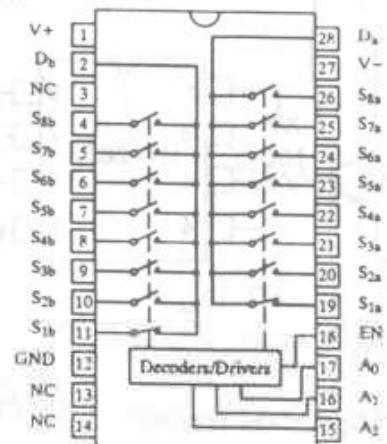
### H.1834



DG 409

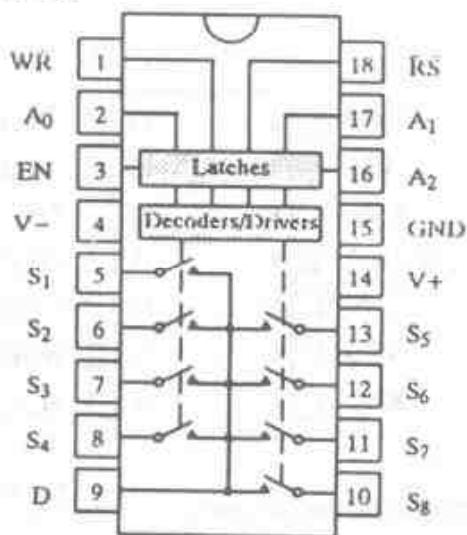
4 Kan. CMOS Analog Multiplexer

### H.1837



DG 407 16-Chan. CMOS Analog Multiple

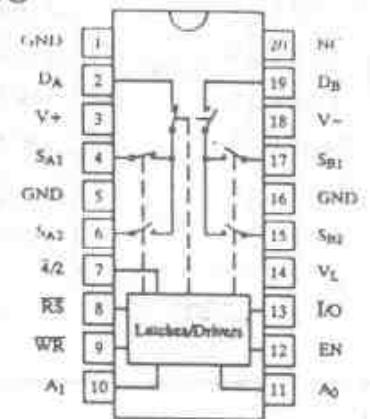
### H.1835



DG 428

Single 8-Channel Analog Multiplexer

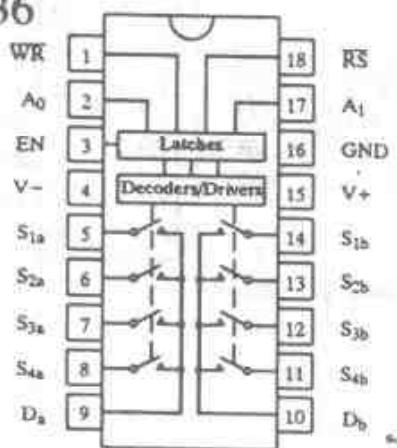
### H.1838



DG 534

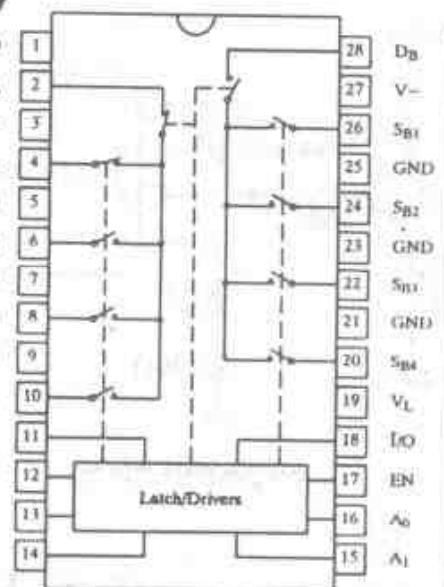
4-Channel Video Multiplexe

### H.1836



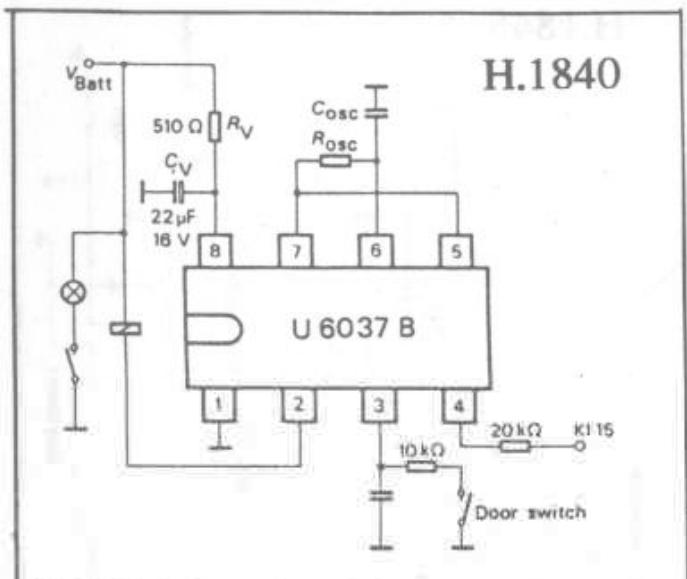
DG 429

Single 4-Channel Analog Multiplexer



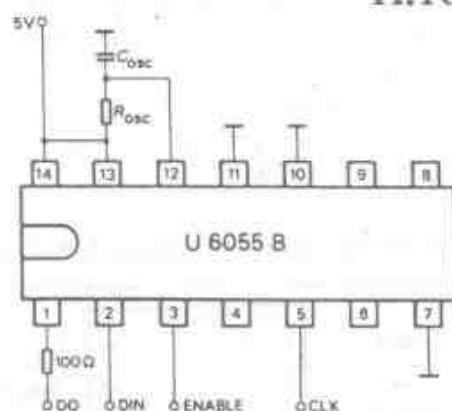
DG 538

8-Channel Video Multiplex



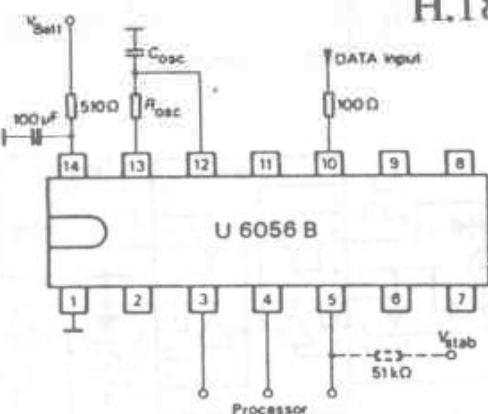
U 6037 Licht Timer 1 s . . . 20 s

H.1840



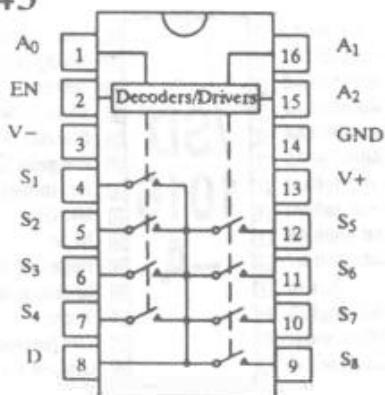
U 6055 B Microcomputer controlled Local Multiplex System 8/16 bit

H.1841



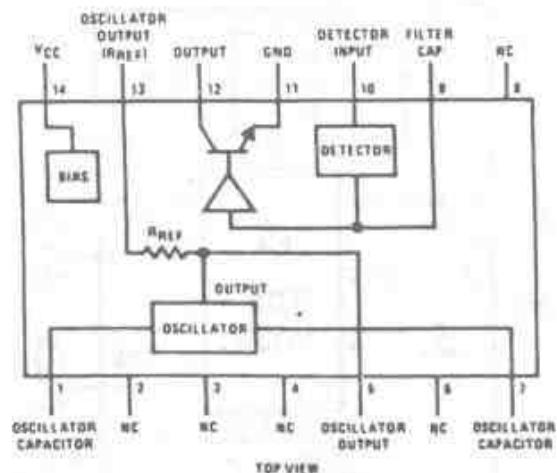
U 6056B Microcomputer controlled Local Multiplex System 8/16 bit

H.1843

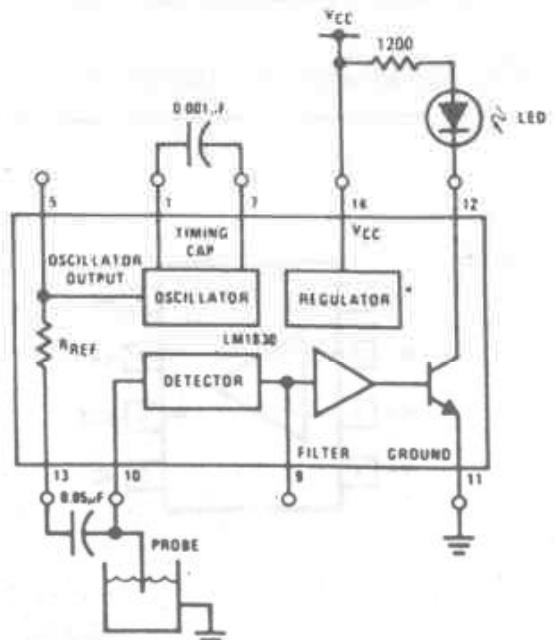


DG 408

8 Kan. CMOS Analog Multiplexer



TOP VIEW



LM 1830 Fluid Detector U<sub>B</sub> 5,5 . . . 10 V

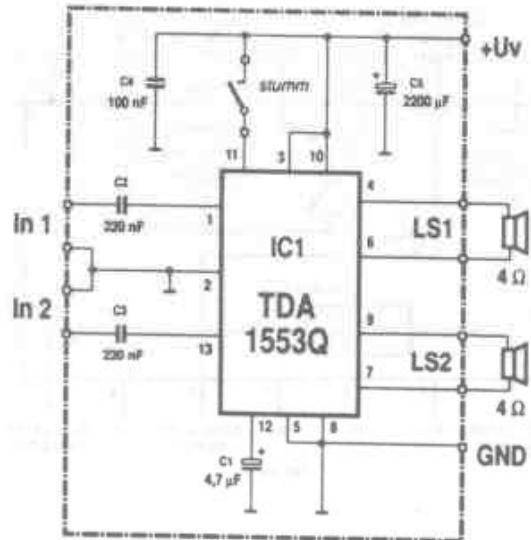
H.1844

## H.1845

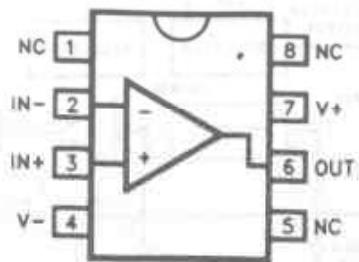


ISD 1016 analoger Sprach-Speicher

## H.1846

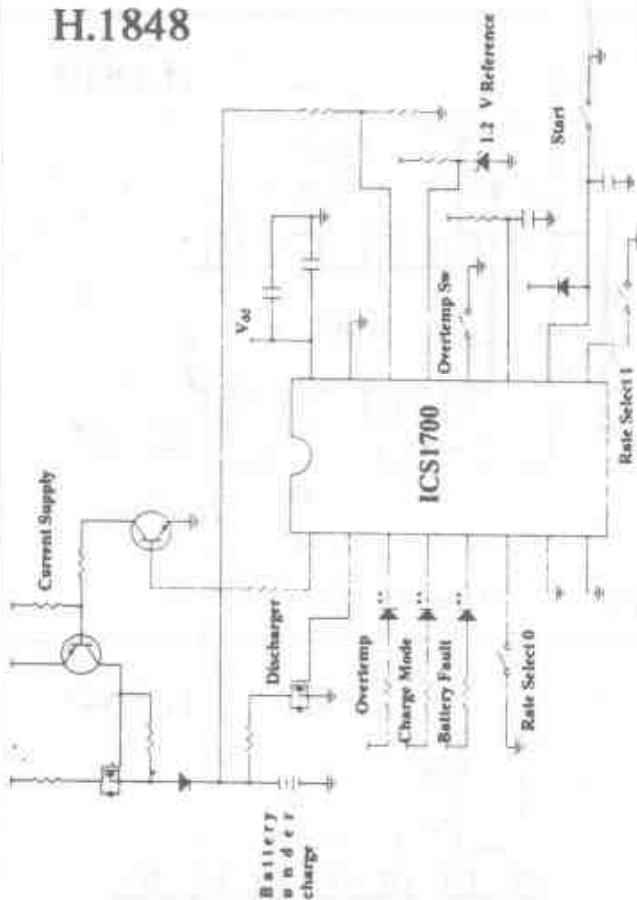


TDA 1553Q Stereo NF Leistungsverst.



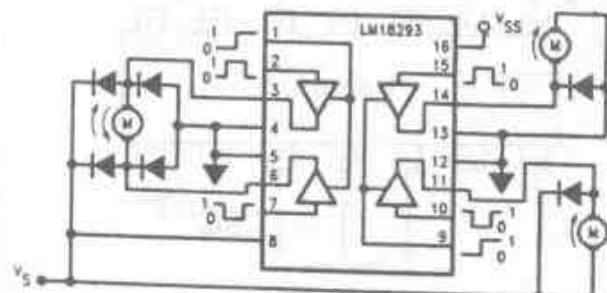
EL 2044 Video OP 60 MHz Bandbr. H.1847

## H.1848



ICS 1700 intellig. Schnellade-Contr. f. NiCd-Akkus

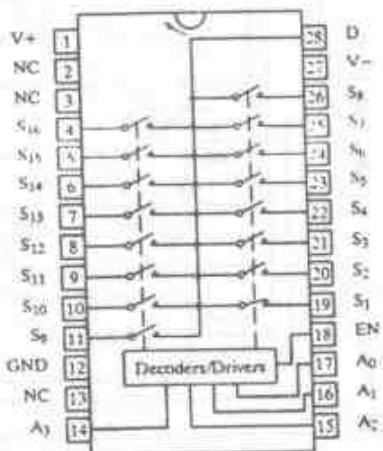
ENABLE 1	1	16	V <sub>SS</sub>
INPUT 1	2	15	INPUT 4
OUTPUT 1	3	14	OUTPUT 4
GROUND	4	13	GROUND
GROUND	5	12	GROUND
OUTPUT 2	6	11	OUTPUT 3
INPUT 2	7	10	INPUT 3
V <sub>S</sub>	8	9	ENABLE 2



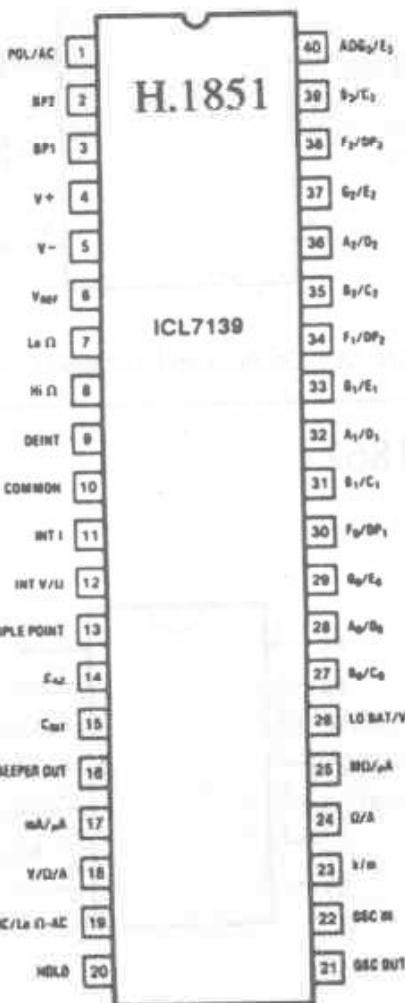
LM 18293 4-Channel Push Pull Driver  
V<sub>S</sub> 4,5 ... 36 V, 1 A output current

## H.1849

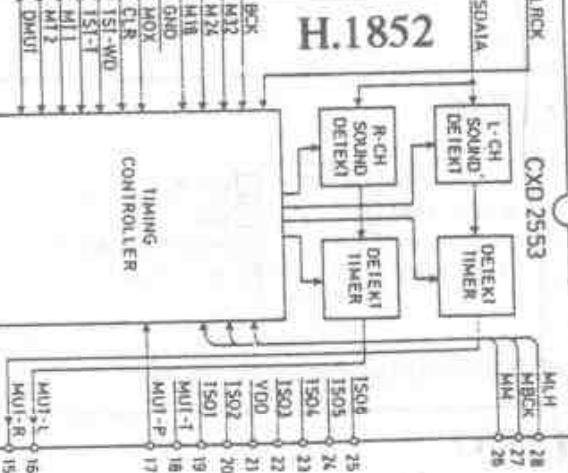
## H.1850



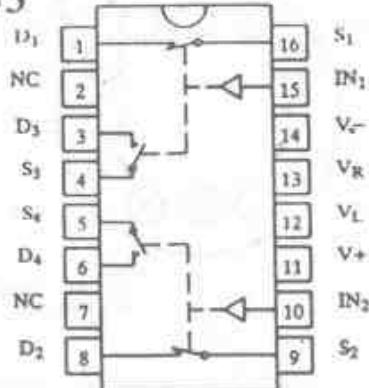
DG 406 16-Chan. CMOS Analog-Multiplexer



ICL 7139 3 1/2-Digit Autoranging Multimeter  
400 mV, 4 V, 400 V/4 mA, 40 mA, 400 mA, 4 A



## H.1853

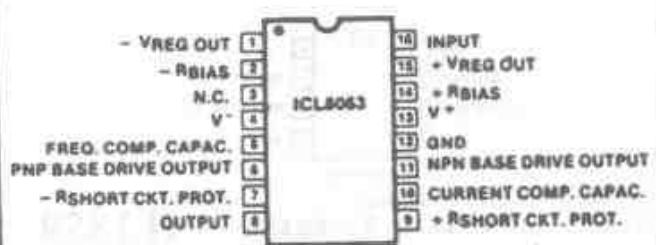


DG 189/190/191/243 Quad CMOS Analog Schalter

## H.1854

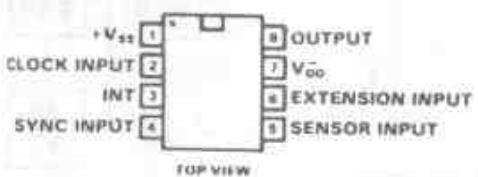


AD 590 2-Wire Current Outp. Temp. Transducer



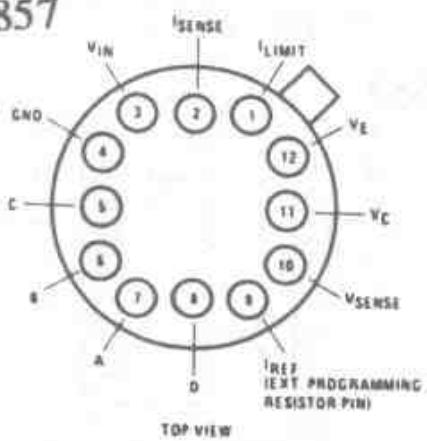
ICL 8063 Power Trans. Driver/Amplifier H.1855

### H.1856



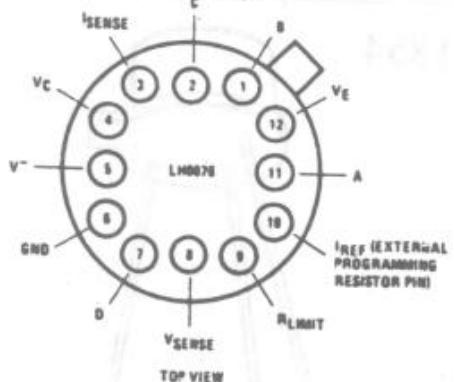
LS 7232 Schalter/Dimmer U<sub>B</sub> 15 V/1 mA

### H.1857

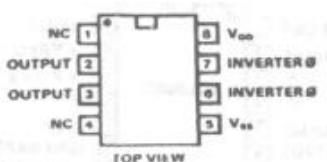


LH 0075 Posit. Prec. Programmable Regulator  
U<sub>A</sub> 0 ... 27 V, I<sub>A</sub> 200 mA

### H.1858 Metal Can Package

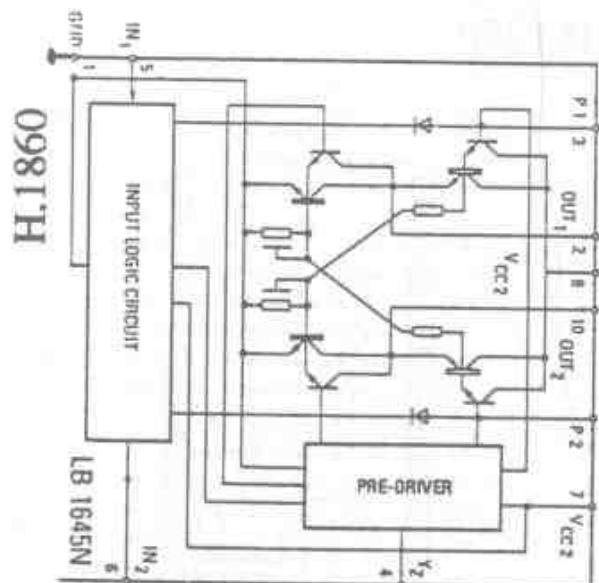


LH 0076 Neg. Prec. Programmable Regulator  
U<sub>A</sub> 0 ... 27 V, I<sub>A</sub> 200 mA

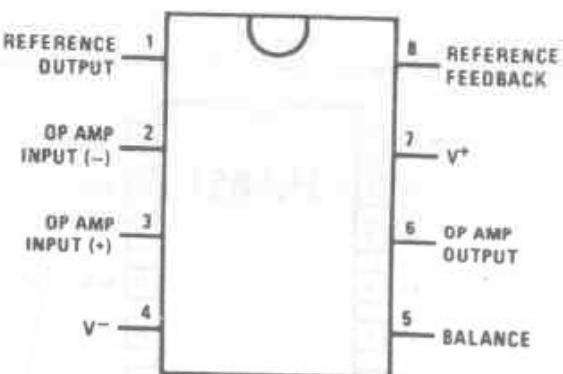


M 706 BI 50 Hz Zeitbasis  
U<sub>B</sub> 3,5 ... 15 V, Quarz: 3,2768 MHz

### H.1859

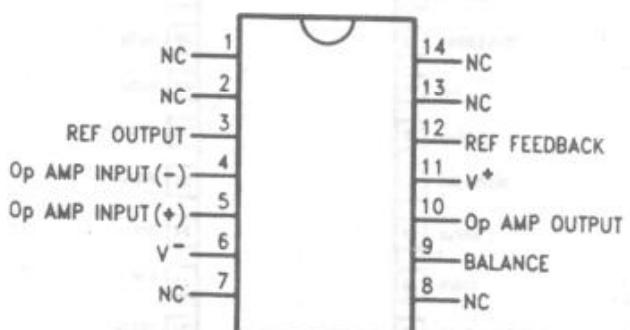


### H.1861



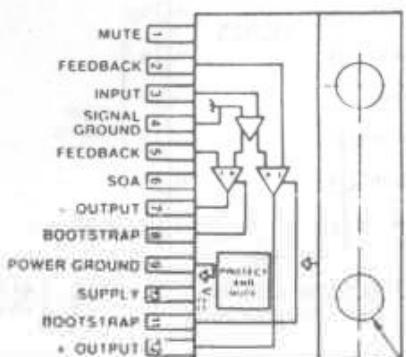
LM 10 CN, CLN Op Amp and Voltage Reference

### H.1862



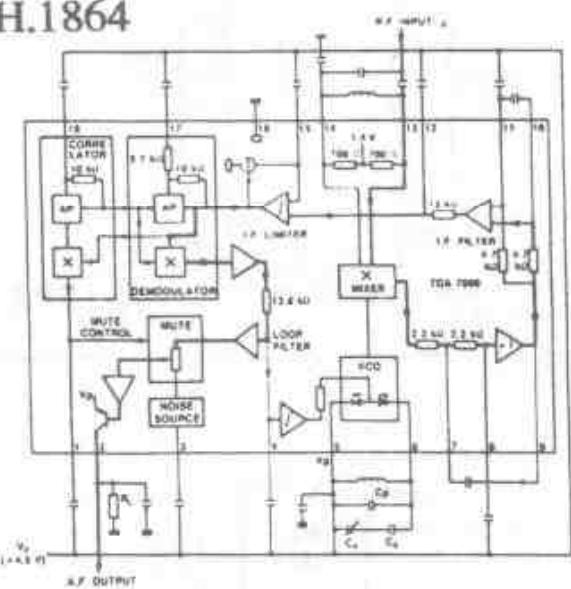
LM 10 CWM, CLWM Op Amp and Voltage Reference

## H.1863

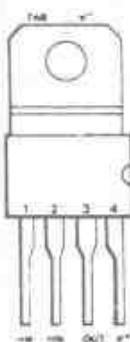


ULN 3793 NF-Brückeverstärker, UB 8 ... 18 V,  
P<sub>tot</sub> 21 W an 4 Ω

## H.1864

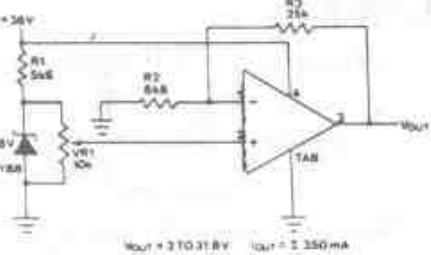


TDA 7000 FM-Radio (Mono) UB 2.7 ... 10 V  
HF-Ber. 1.5 MHz bis 110 MHz



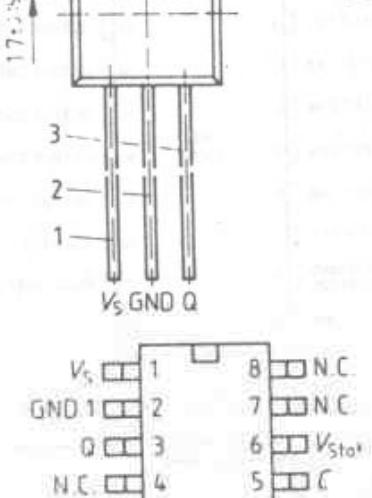
LM 759 CP Leistungs-Operationsverstärker  
U<sub>B</sub> ± 18 V

## H.1865



Stamp side

## H.1866



TLE 4920 Diff. Gear Tooth Sensor IC  
V<sub>S</sub> 4.5 ... 24 V, Schaltfrequ. 10 ... 12 000 Hz

## H.1867

CONTROL INPUT	1	INPUT A
INPUT B	2	HOLD INPUT
FUNCTION INPUT	3	OSC OUTPUT
DIGIT 1 OUTPUT	4	OSC INPUT
DIGIT 3 OUTPUT	5	EXT OSC INPUT
DIGIT 2 OUTPUT	6	DECIMAL POINT OUTPUT
DIGIT 4 OUTPUT	7	ICM7216B
V <sub>BB</sub>	8	SEG G OUTPUT
DIGIT 5 OUTPUT	9	SEG E OUTPUT
DIGIT 8 OUTPUT	10	SEG A OUTPUT
DIGIT 7 OUTPUT	11	SEG D OUTPUT
DIGIT 6 OUTPUT	12	V <sub>DD</sub>
RESET INPUT	13	SEG B OUTPUT
RANGE INPUT	14	SEG C OUTPUT
	15	SEG F OUTPUT

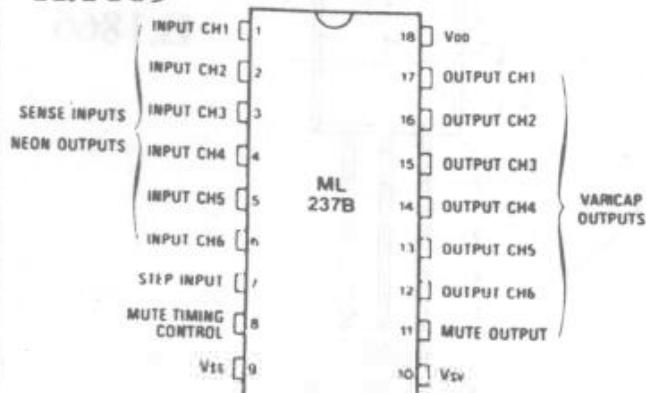
ICM 7216 B Frequenz-Zähler/Timer

## H.1868

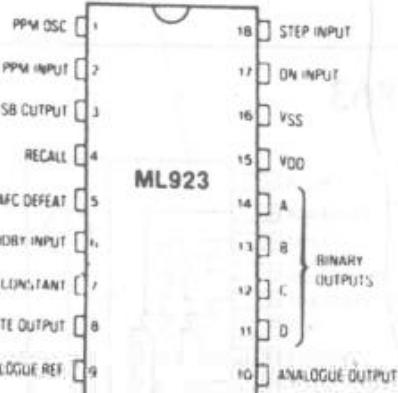
CONTROL INPUT	1	INPUT A
MEASUREMENT IN PROGRESS	2	HOLD INPUT
DIGIT 1 OUTPUT	3	OSC OUTPUT
DIGIT 3 OUTPUT	4	OSC INPUT
DIGIT 2 OUTPUT	5	EXT OSC INPUT
DIGIT 4 OUTPUT	6	DECIMAL POINT OUT
V <sub>BB</sub>	7	ICM7216D
DIGIT 5 OUTPUT	8	SEG G OUTPUT
DIGIT 8 OUTPUT	9	SEG E OUTPUT
DIGIT 7 OUTPUT	10	SEG A OUTPUT
DIGIT 6 OUTPUT	11	SEG D OUTPUT
RESET INPUT	12	V <sub>DD</sub>
EX. D.P. INPUT	13	SEG B OUTPUT
RANGE INPUT	14	SEG C OUTPUT
	15	SEG F OUTPUT

ICM 7216 C Frequenz-Zähler/Timer

### H.1869



ML 237 B G-Channel touch control interface



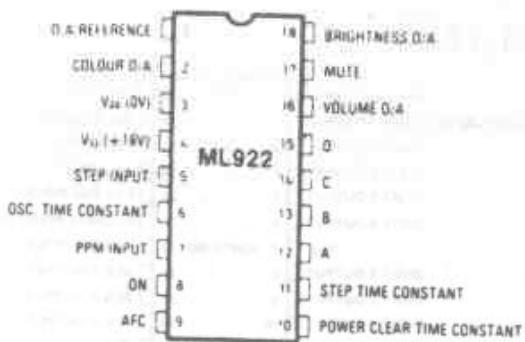
ML 923 Remote control receiver  
Ub 14 ... 18 V, 16 channel select

### H.1872



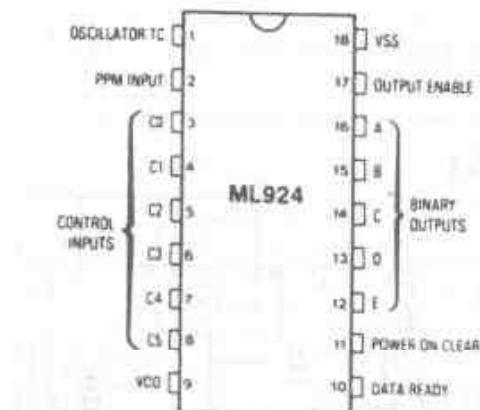
ML 920 Remote control receiver  
Ub 14 ... 18 V

### H.1870



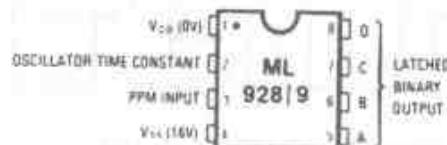
ML 922 Remote control receiver  
Ub 14 ... 18 V

### H.1871



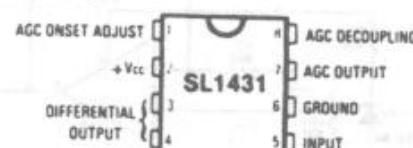
ML 924 Remote control receiver  
Ub 12 ... 18 V

### H.1873

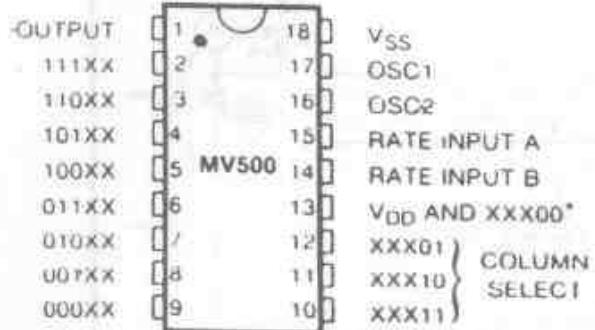


ML 928/9 Remote control receivers  
Ub 12 ... 18 V

### H.1874

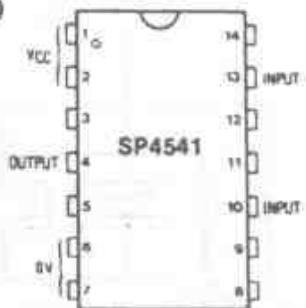


SL 1431/2 TV-Preamplifiers with AGC Generator  
Ub 7 ... 13,5 V

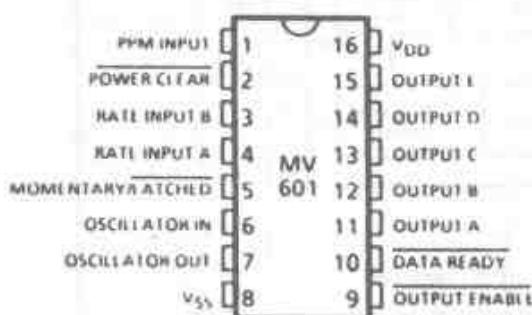


MV 500 remote control transmitter  
U<sub>B</sub> 3 ... 9 V

H.1875



SP 4541 1 GHz + 256 high speed dividers  
V<sub>C</sub> + 4.5 ... 5.5 V, V<sub>in</sub> 17.5 ... 200 m V<sub>rms</sub>



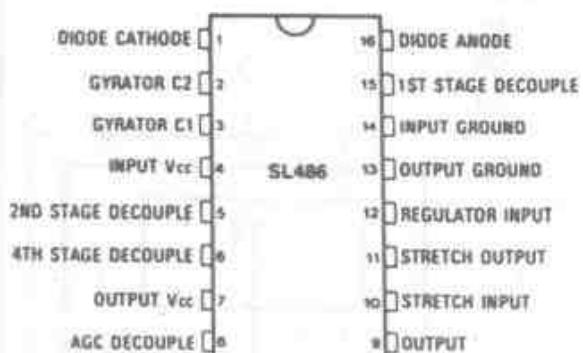
MV 601 remote control receiver  
U<sub>B</sub> 5 V

H.1876



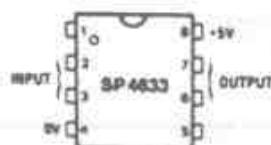
SP 4632 1 GHz + 64 Prescaler  
V<sub>C</sub> = 5 V, Imp. sens 3 ... 17.5 mV

H.1880

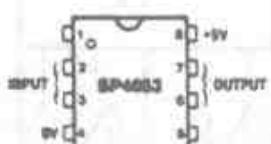


SL 486 IR-remote control preamplifier

H.1877

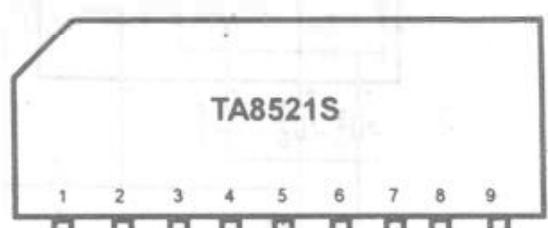


SP 4633 1 GHz + 64 non self oscillating Prescaler  
V<sub>C</sub> + 5 V, 1.5-15 mV

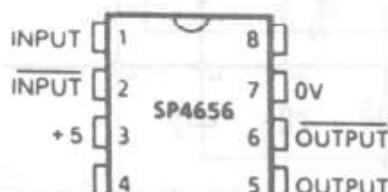


SP 4653 1-GHz + 256 Prescaler  
V<sub>C</sub> + 5 V

H.1882

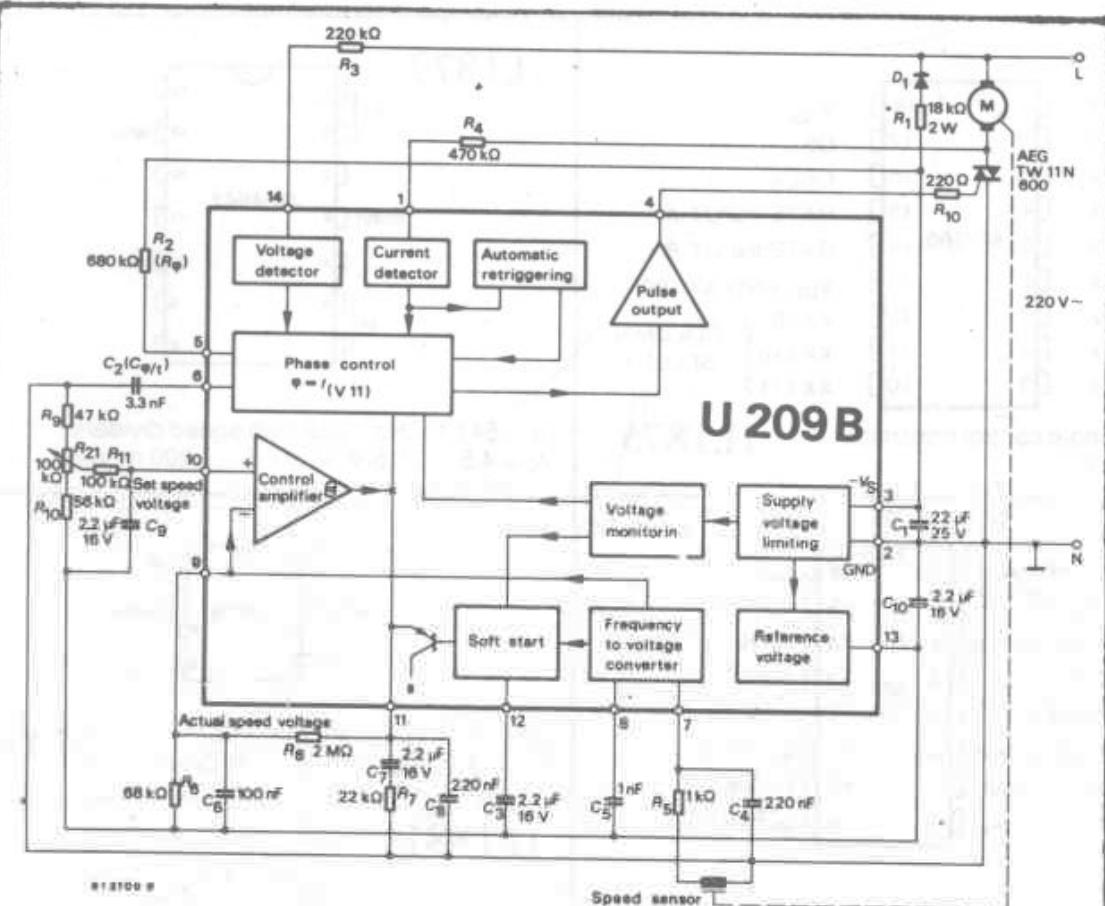


TA 8521 S Batterie Lader IC H.1878



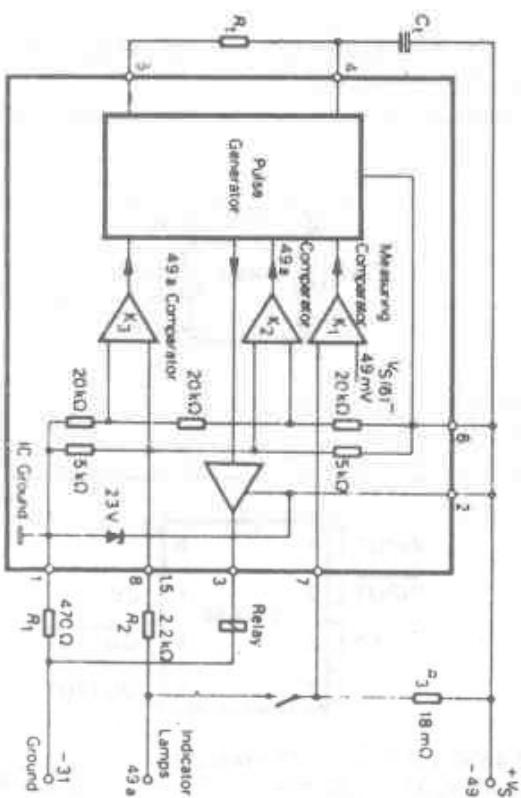
SP 4656 1.2 GHz + 128 Prescaler  
V<sub>C</sub> + 5 V, 32 ... 38 mA

H.1883



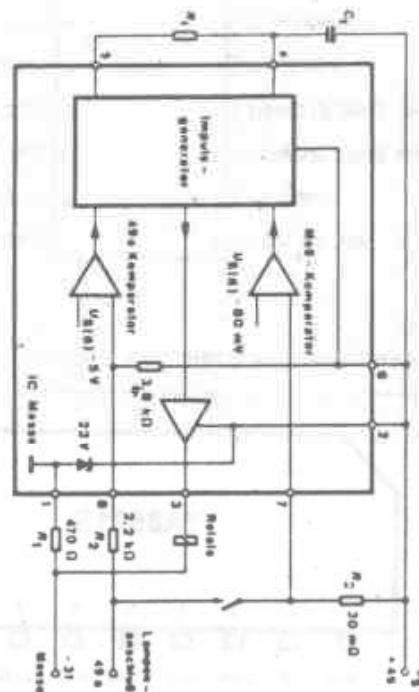
H.1884

U 6043



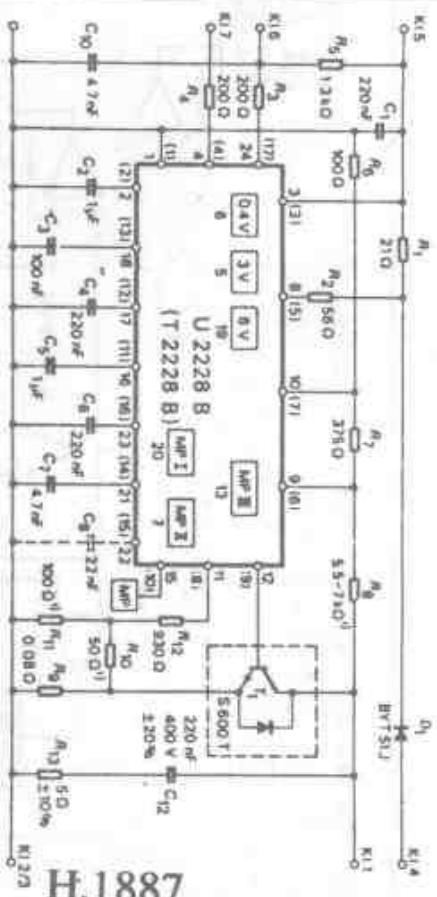
H.1885

U 643



H.1886

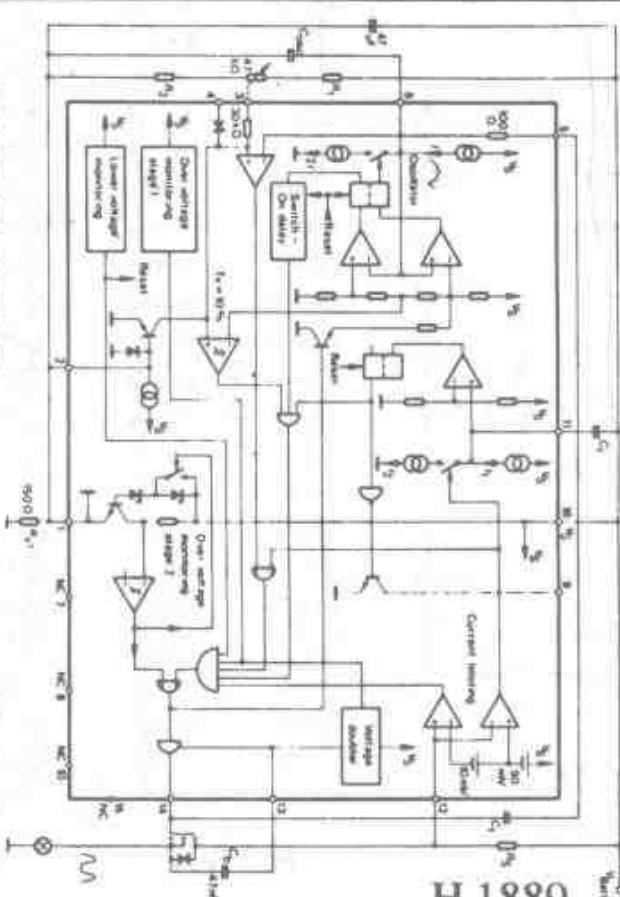
U 2228



H.1887

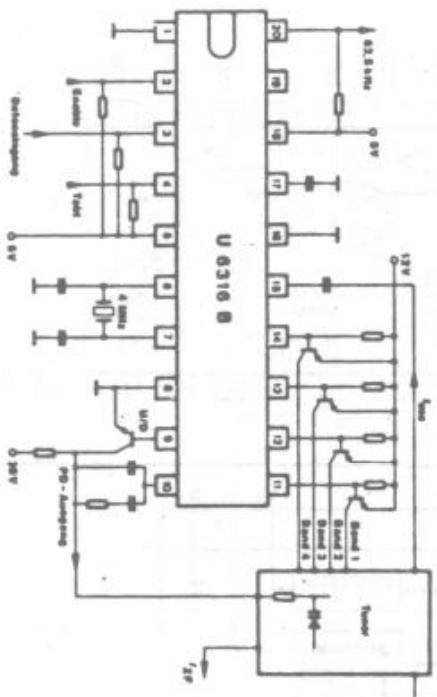
U 6080/6081/6082

(Dimmer)



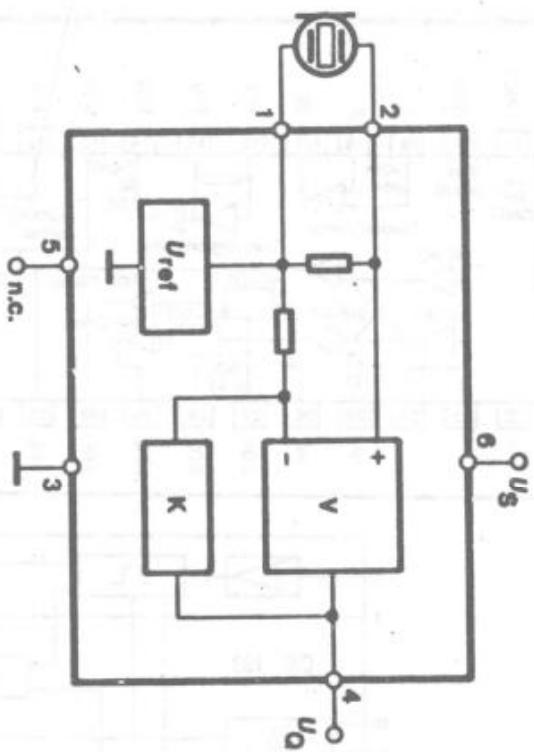
H.1889

U 6316 B PLL

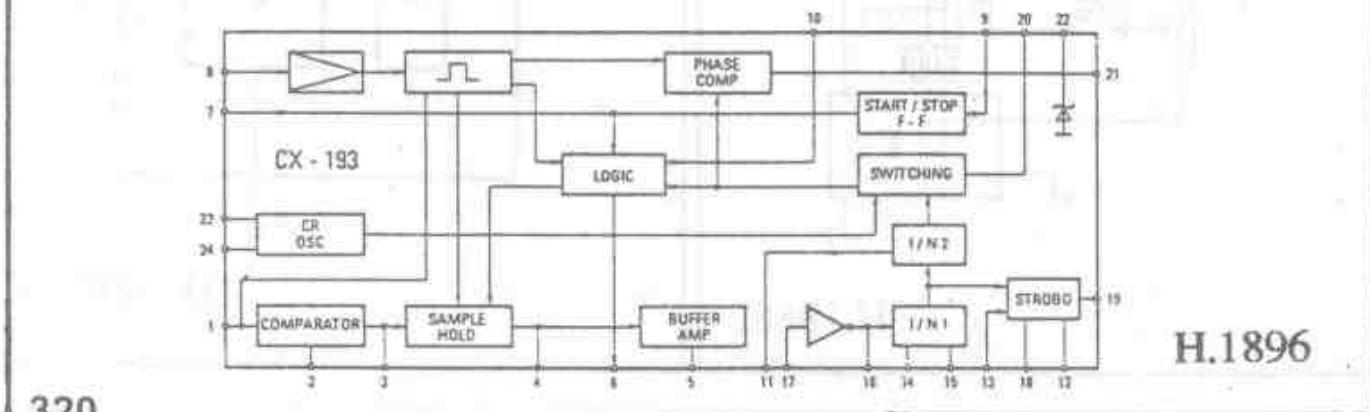
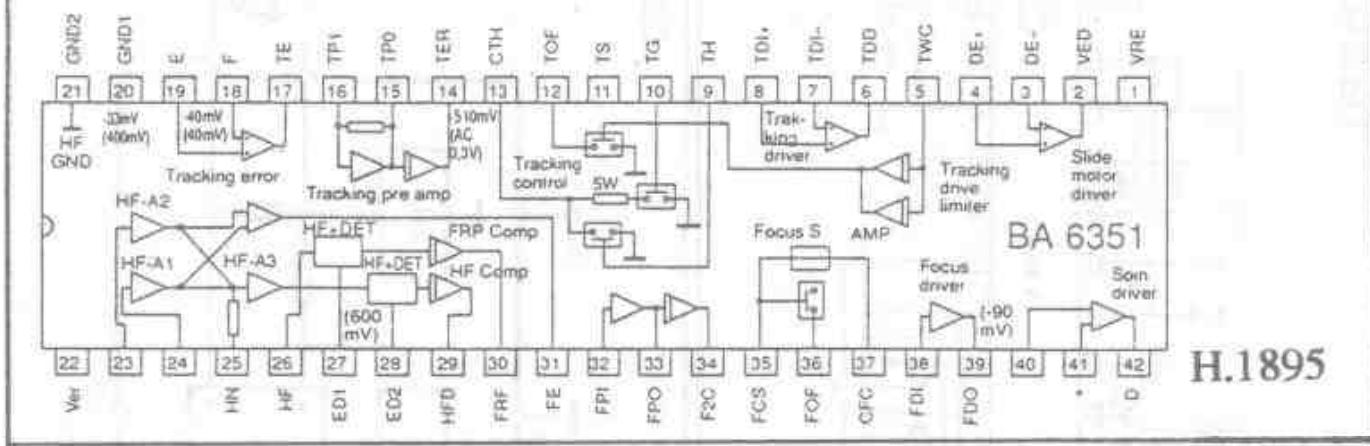
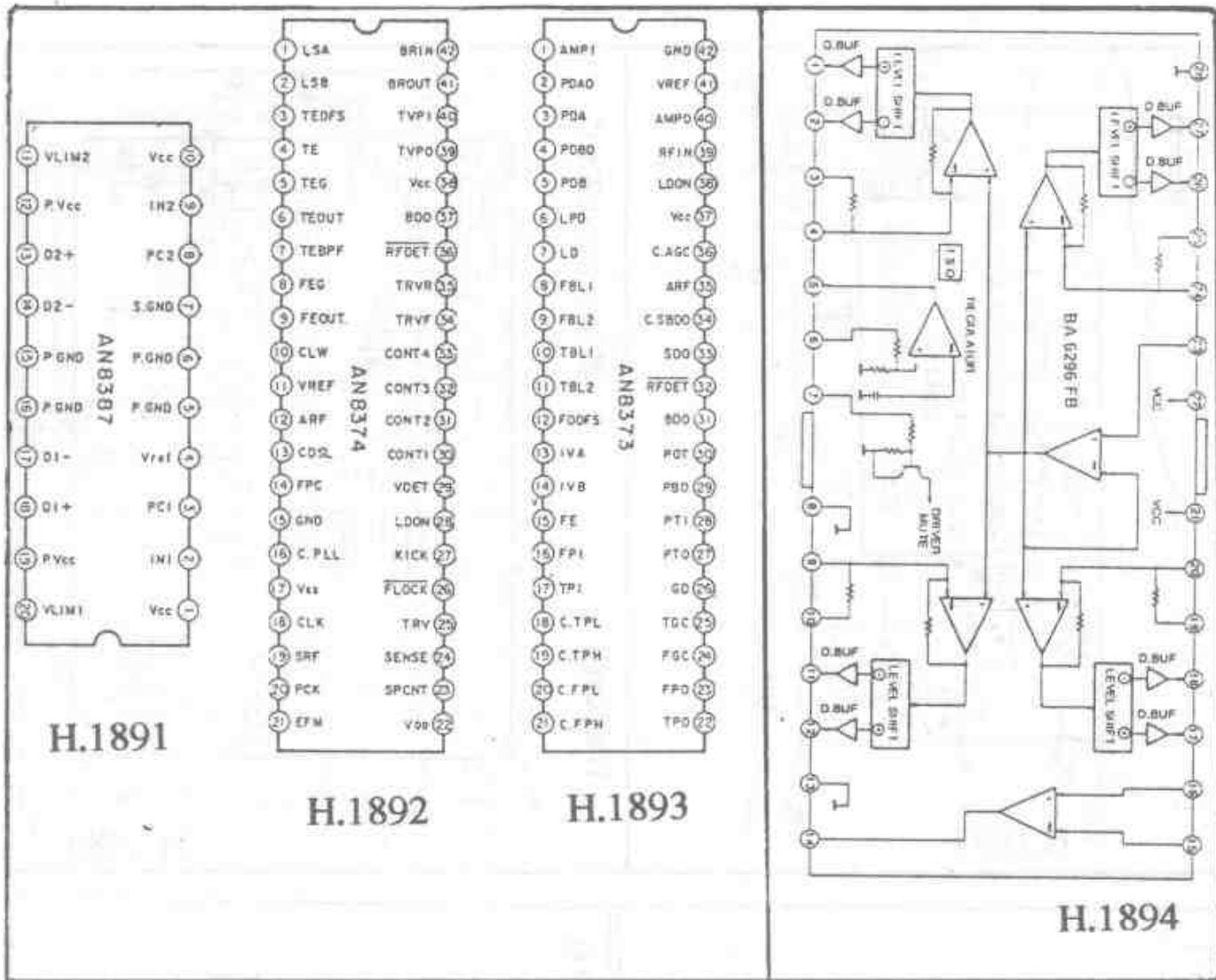


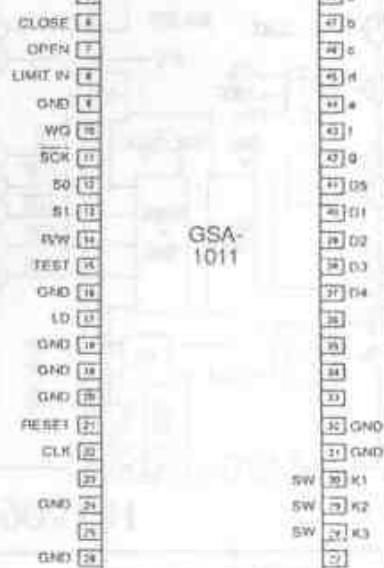
H.1888

U 448 B

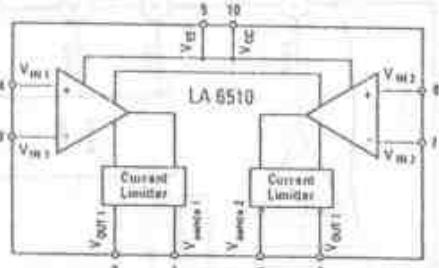
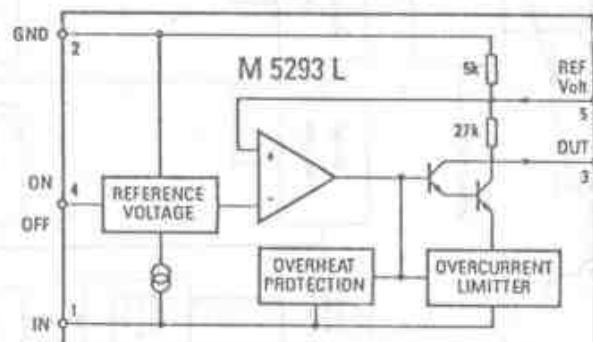
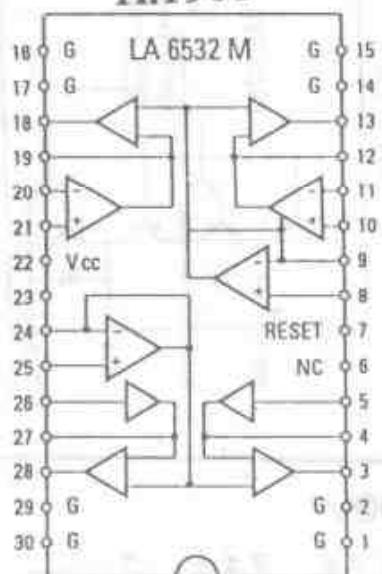
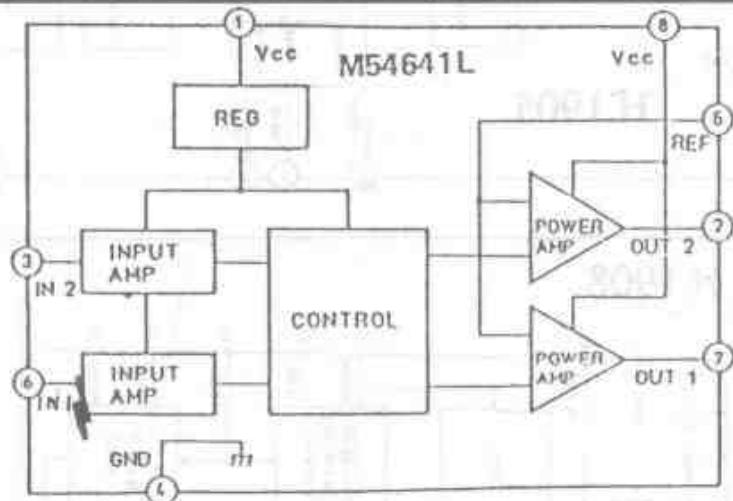
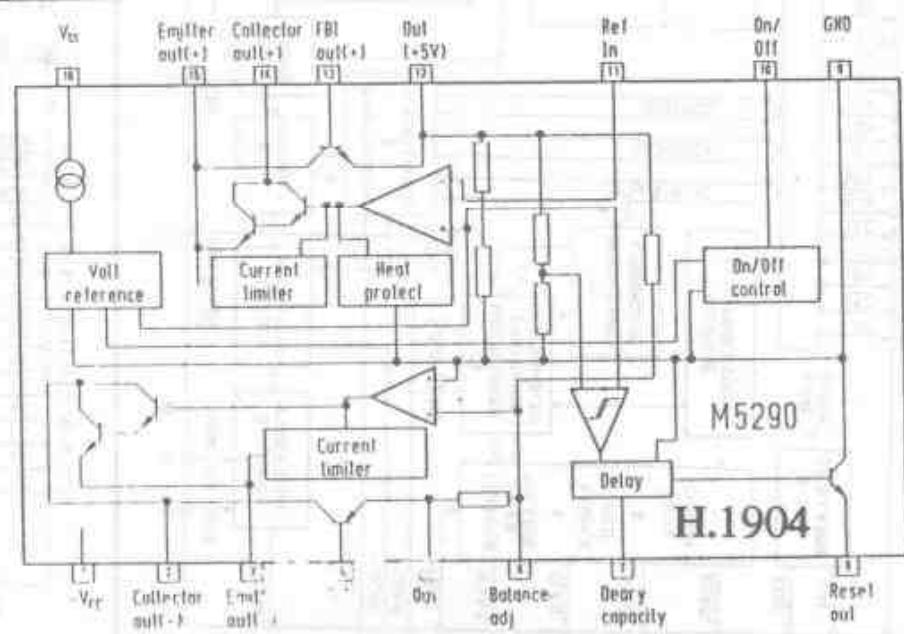
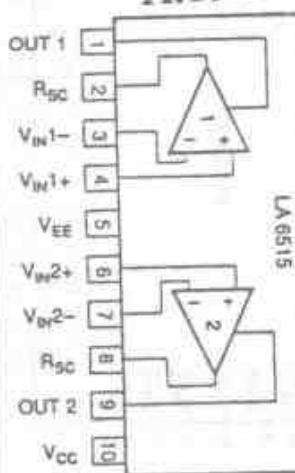


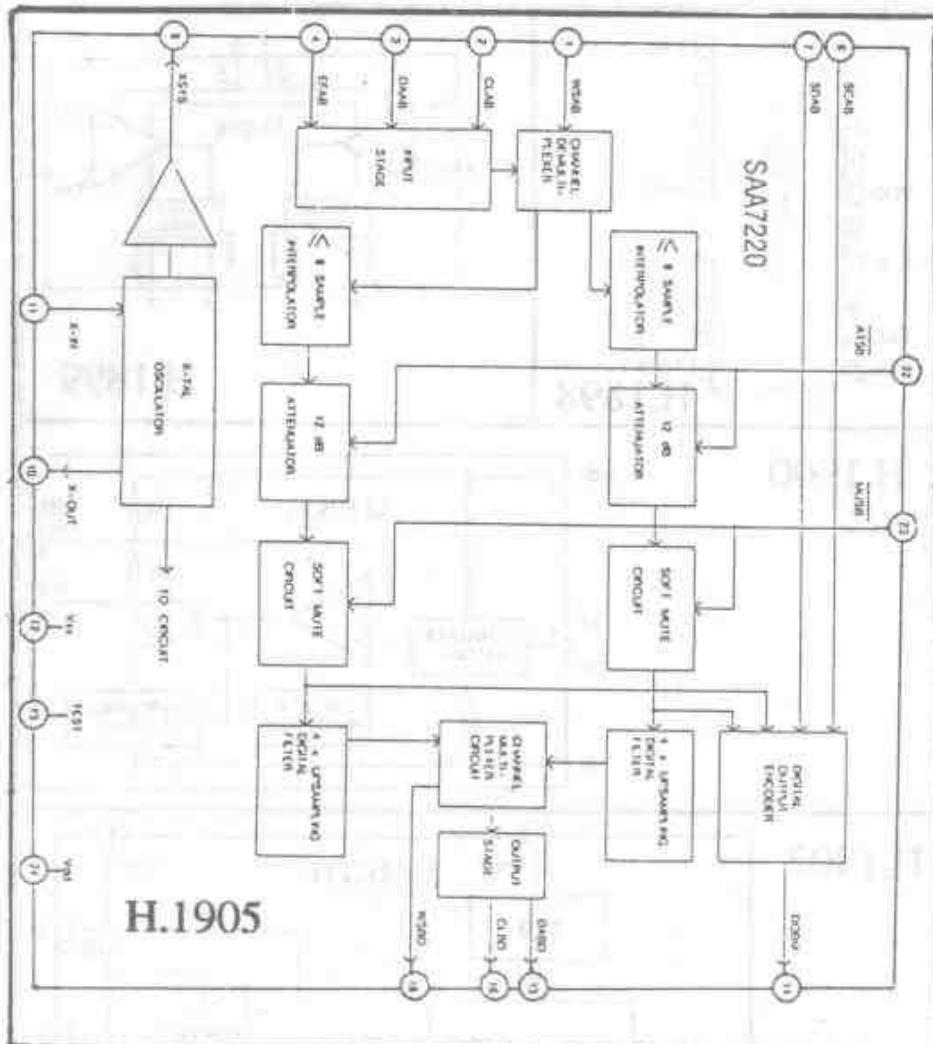
H.1890



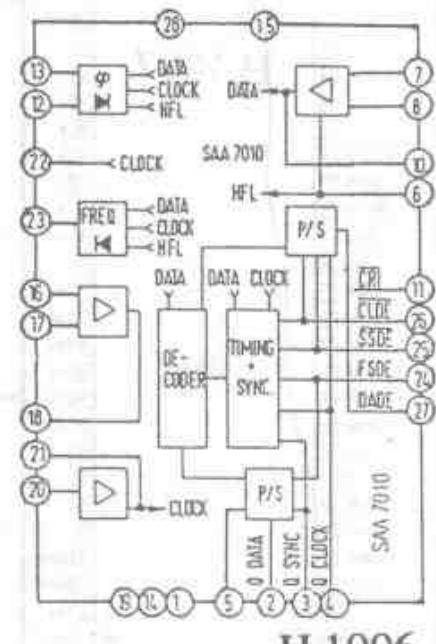
**H.1897**

GSA-1011

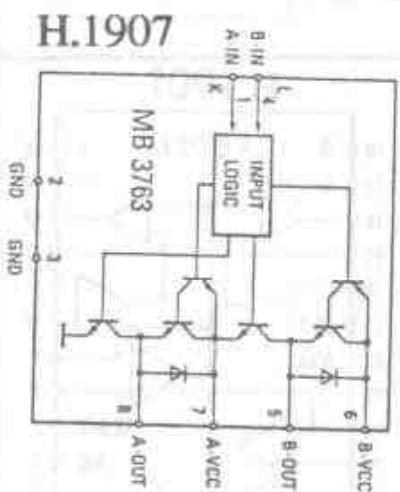
**H.1898****H.1899****H.1900****H.1901****H.1902****H.1903****H.1904**



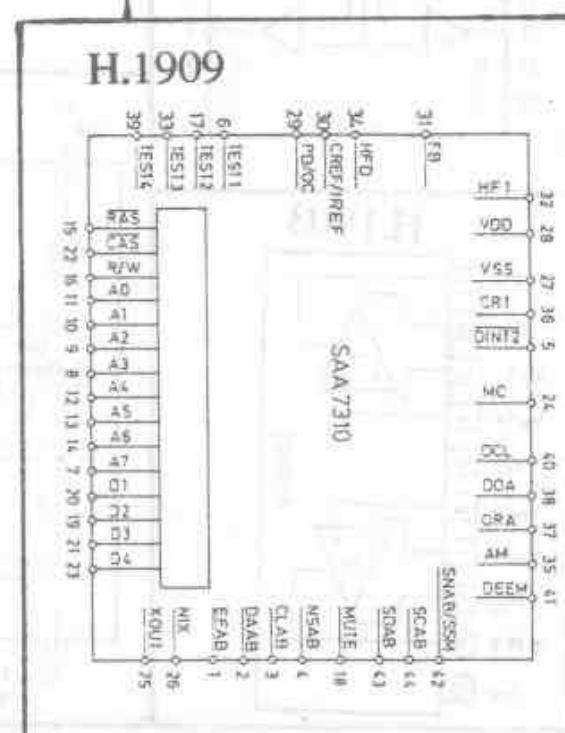
H.1905



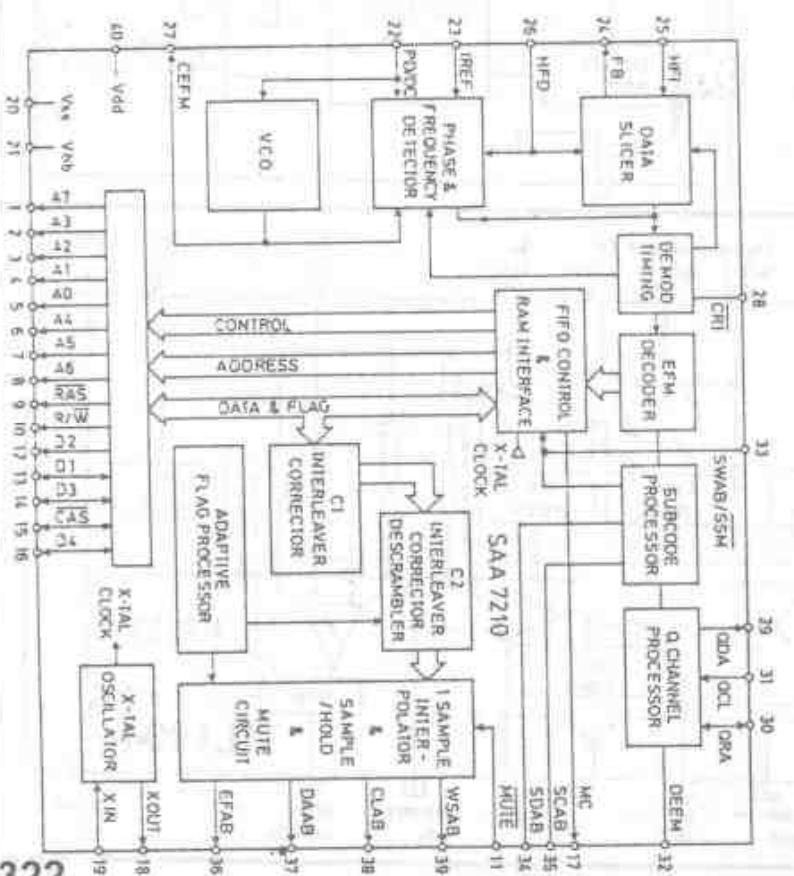
H.1906



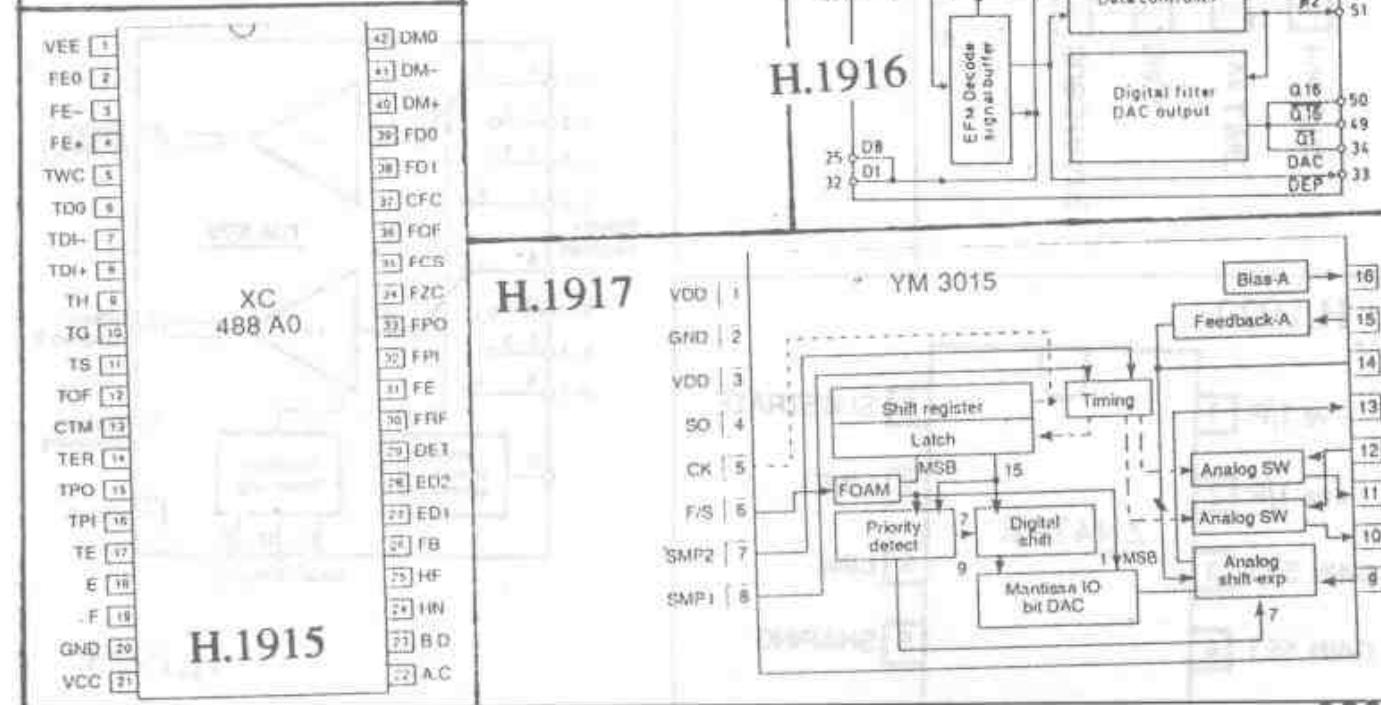
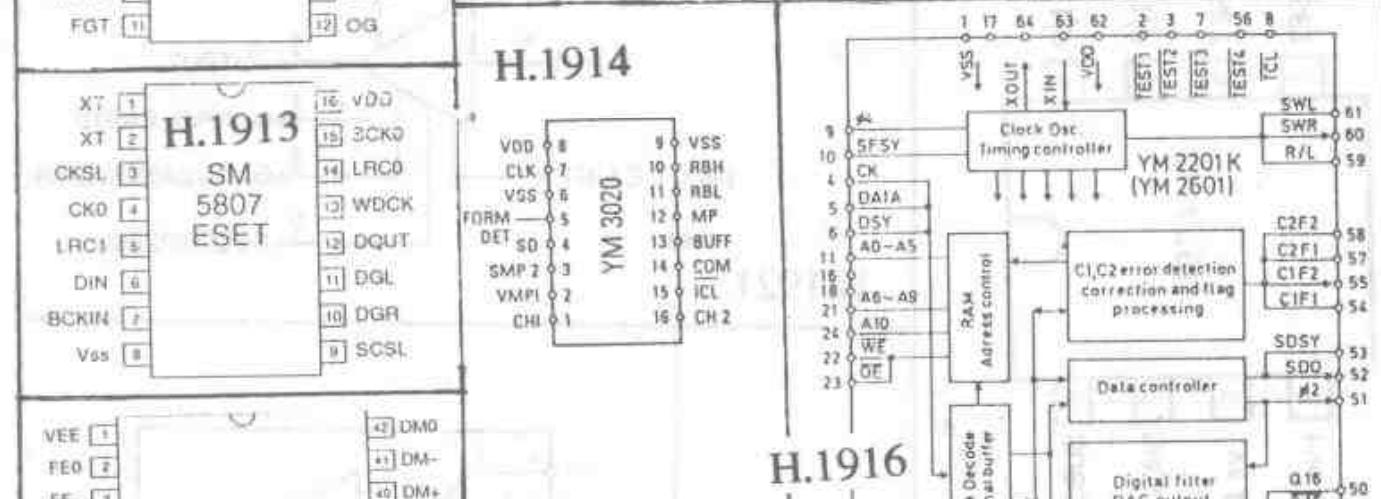
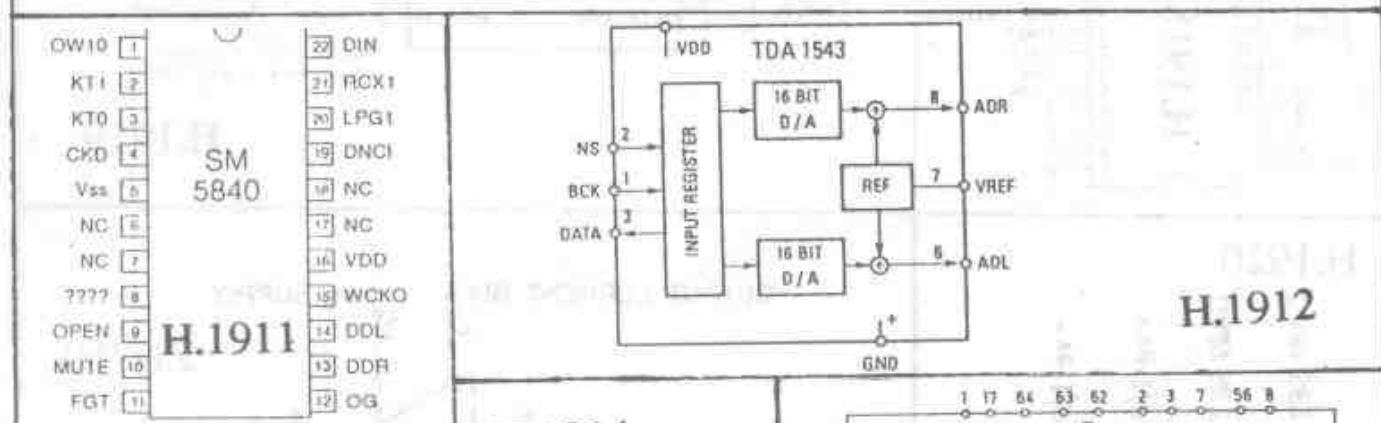
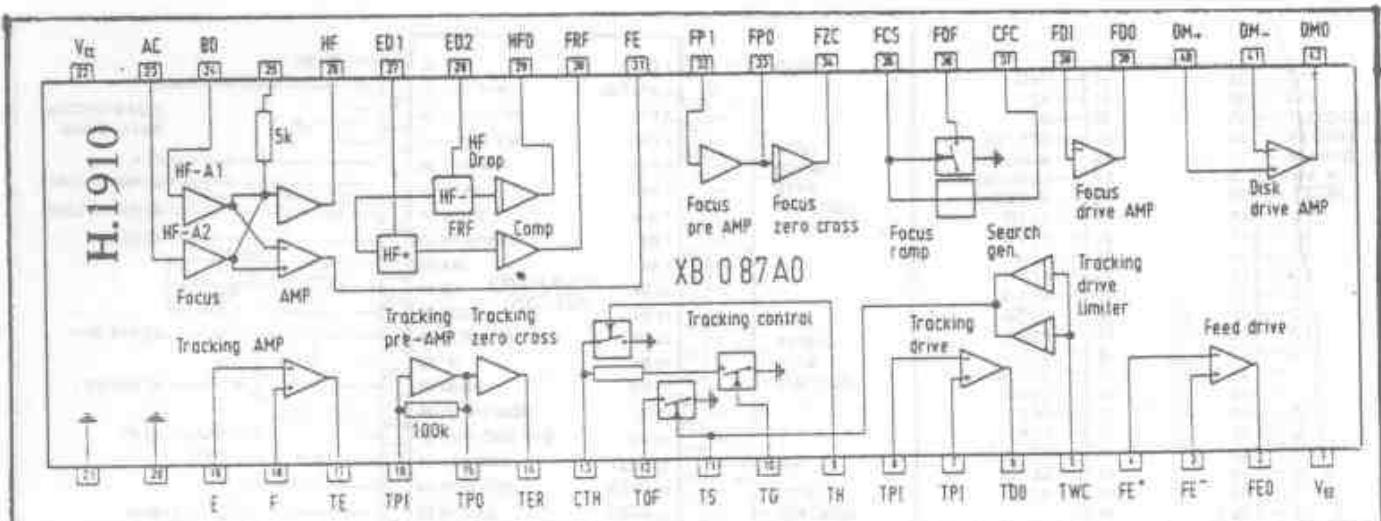
H.1907

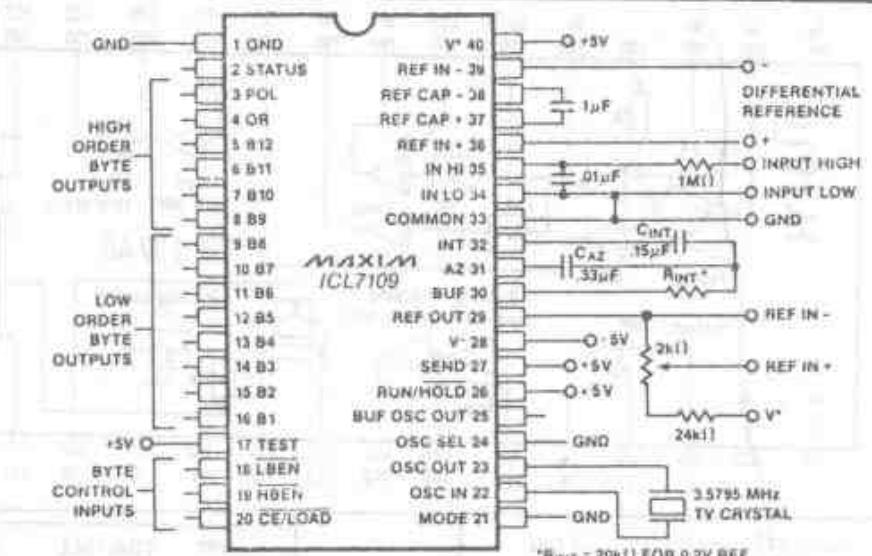


H.1909



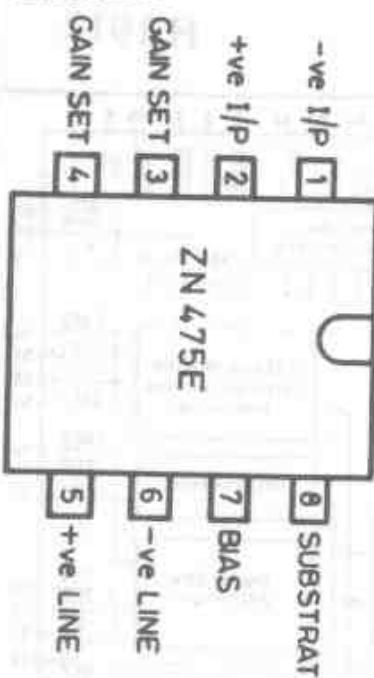
H.1908



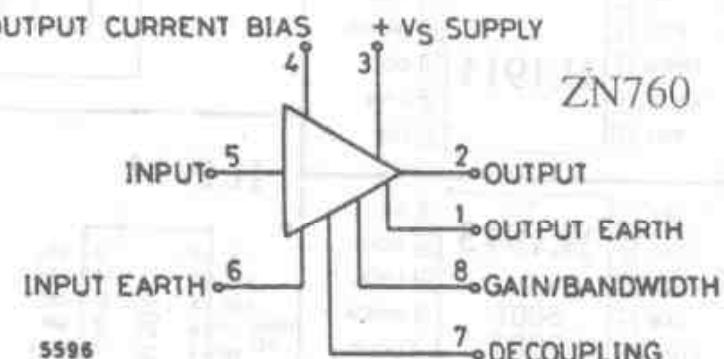


H.1919

H.1920

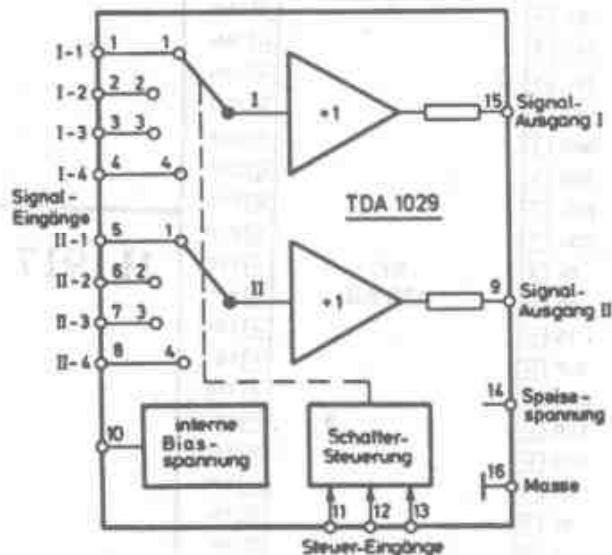
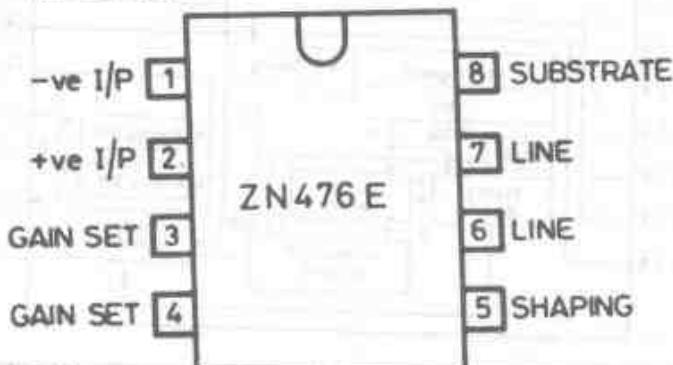


OUTPUT CURRENT BIAS

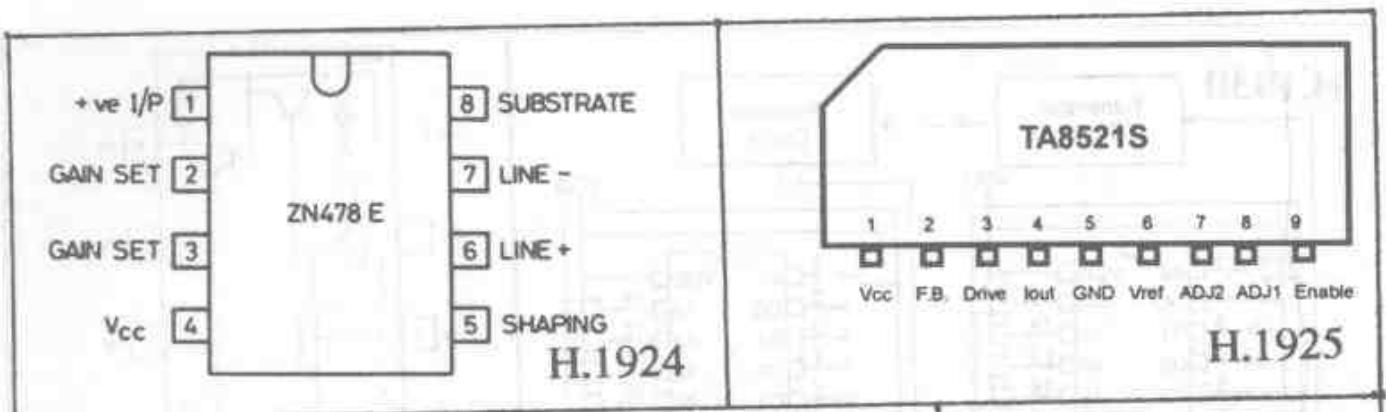


H.1921

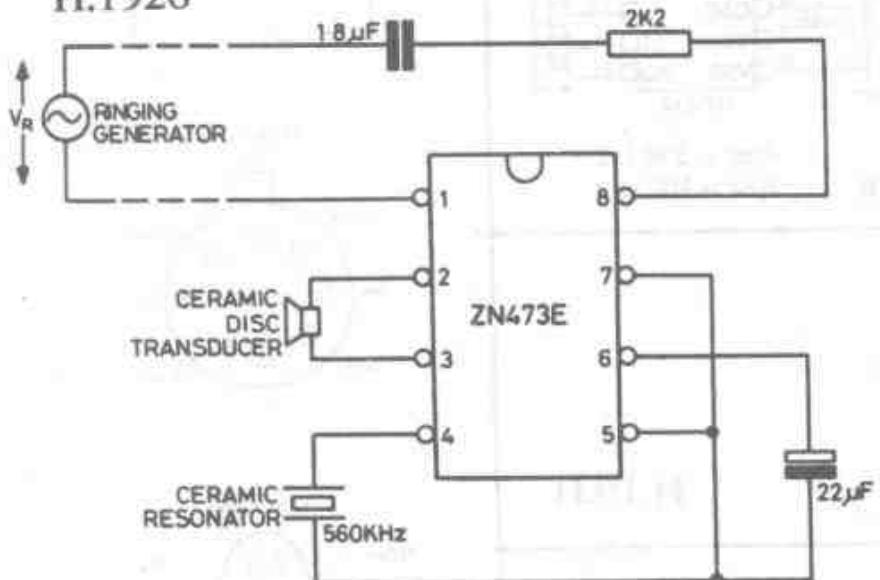
H.1922



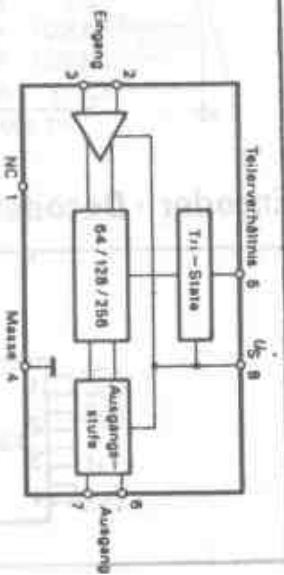
H.1923



**H.1926**

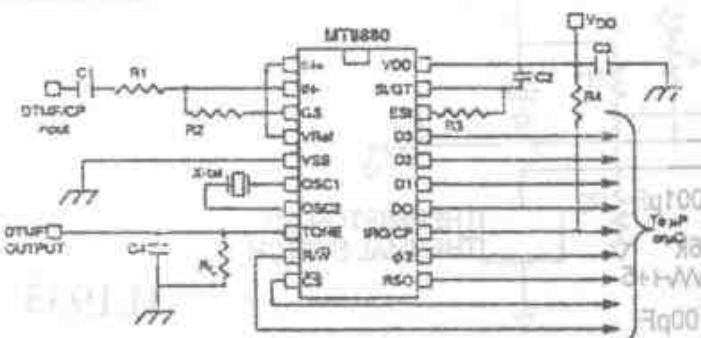
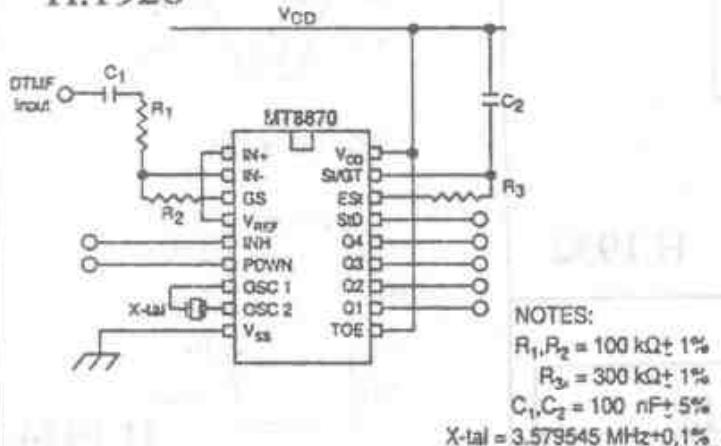


**U 813 BS, U 833 BS**



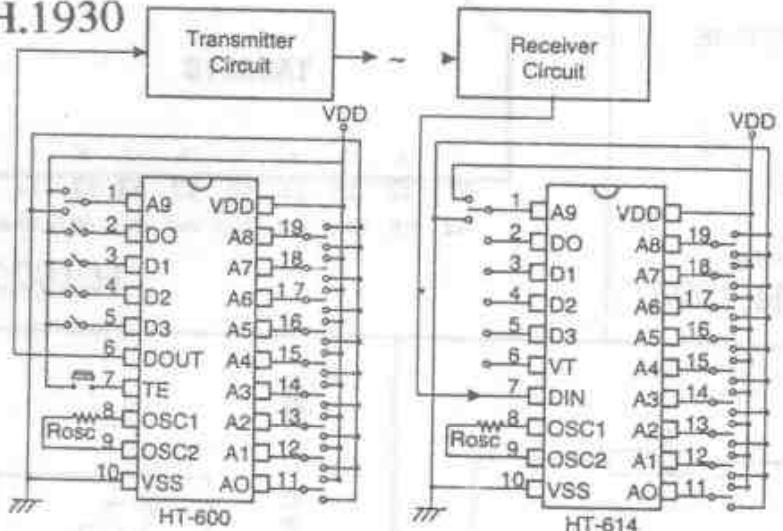
**H.1927**

**H.1928**

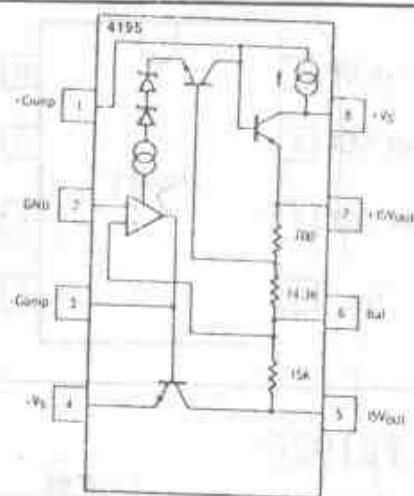
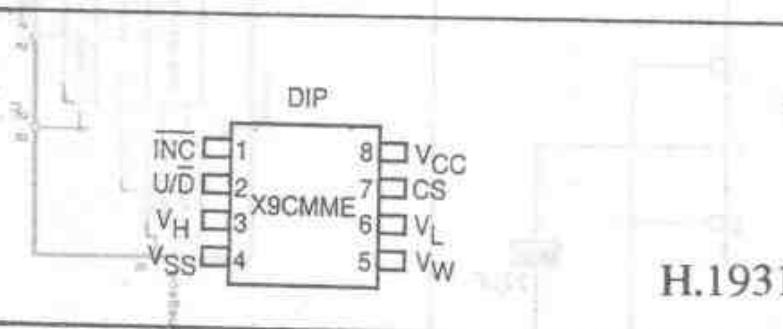
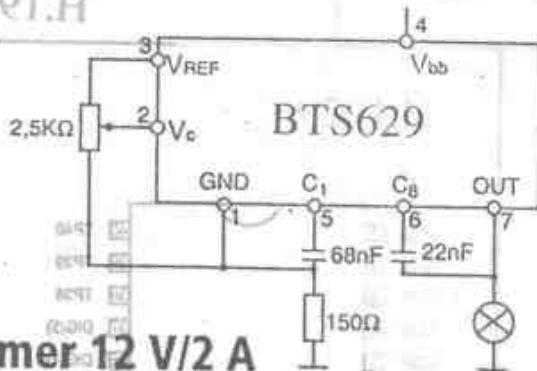
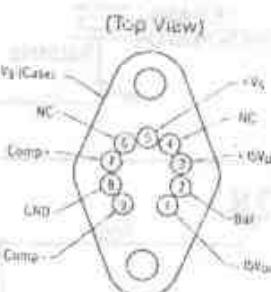
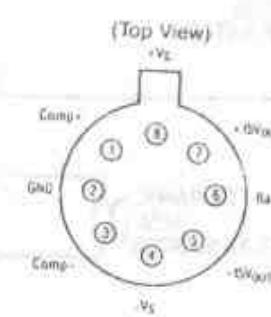


**H.1929**

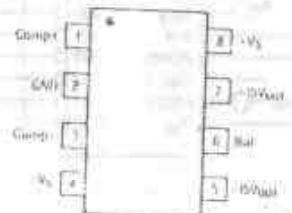
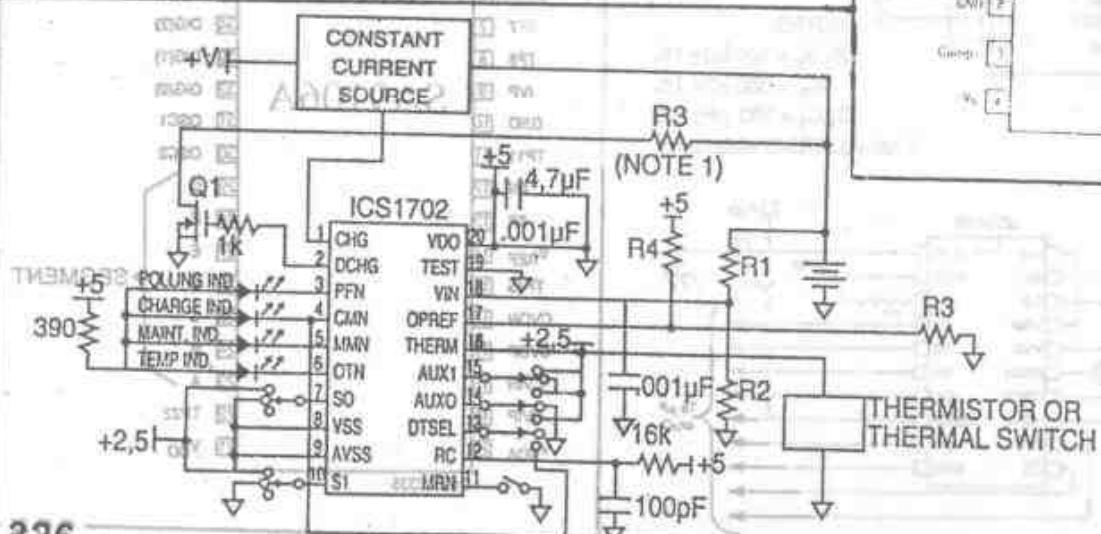


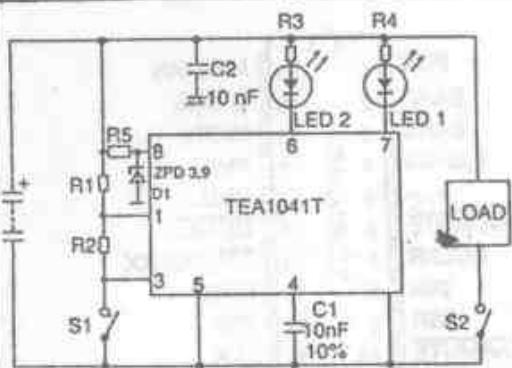
**H.1930**

Rosc = 390 kΩ  
Fosc = 100 kHz

**Encoder - Decoder - Bausteine****H.1931****TZQ1.H****Dimmer 12 V/2 A****H.1932**

RC 4195 ± 15 V

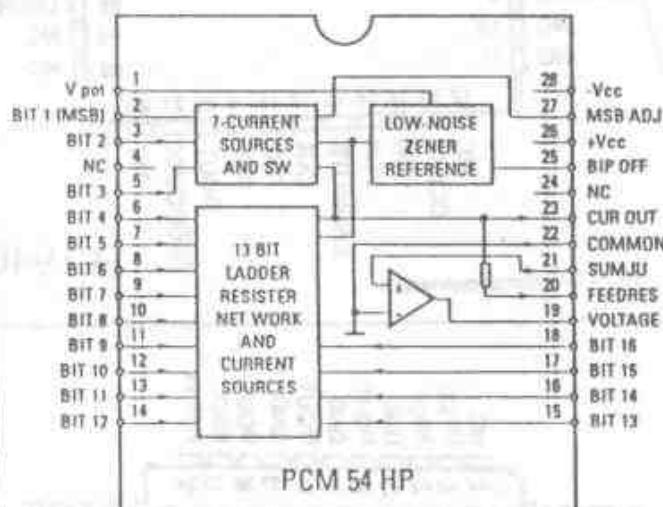
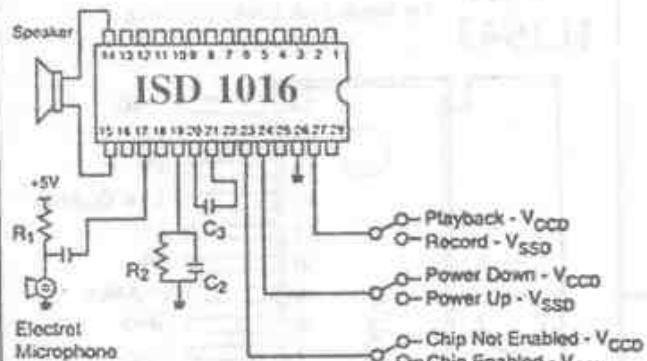
**H.1934****H.1933**



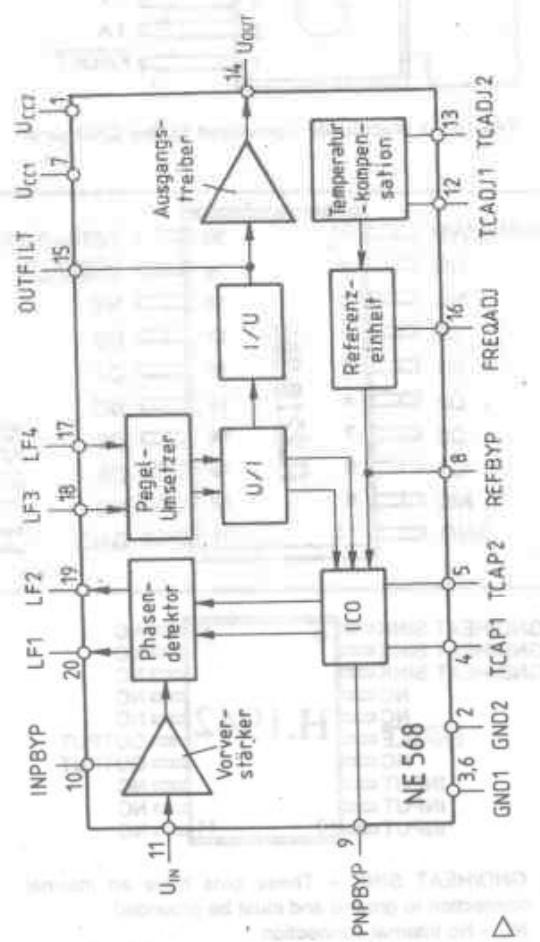
R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub> und D<sub>1</sub> nur erforderlich bei U<sub>B</sub>>4V  
R<sub>1</sub>+R<sub>2</sub>=2kΩ

H.1935

H.1936

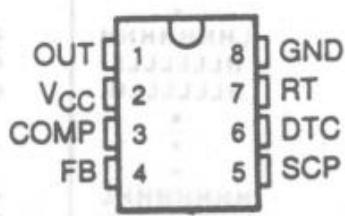
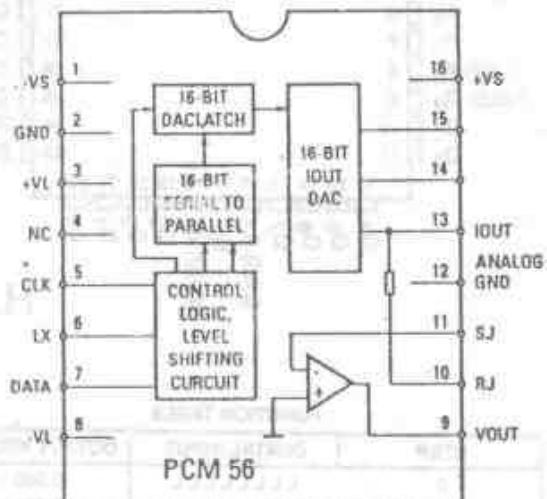


H.1937



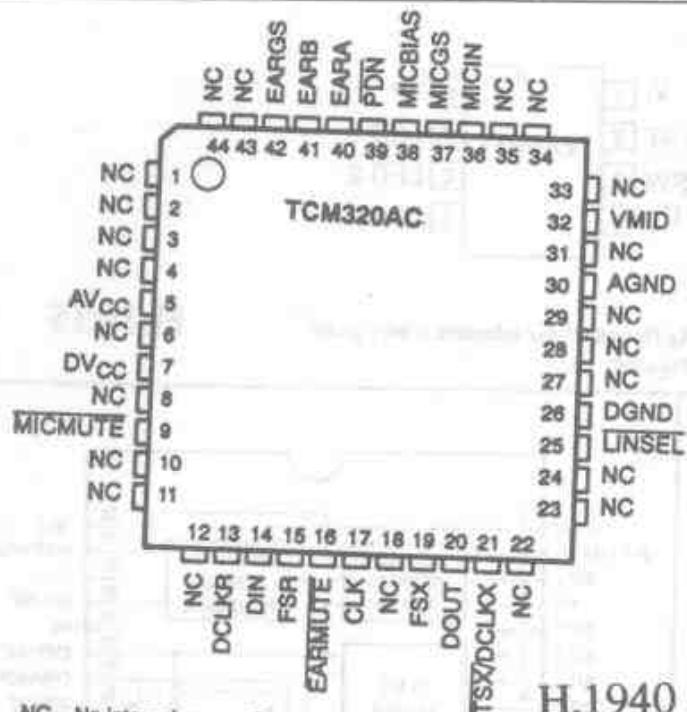
H.1939a

H.1938

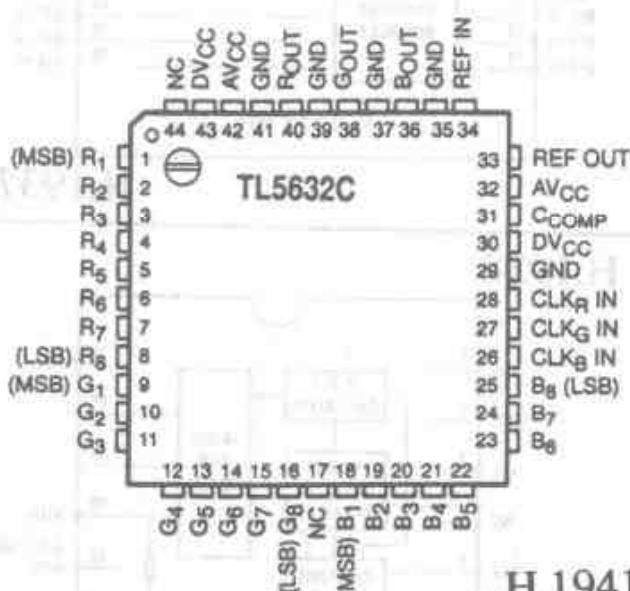


TL5001C

H.1939



NC – No internal connection



H.1941

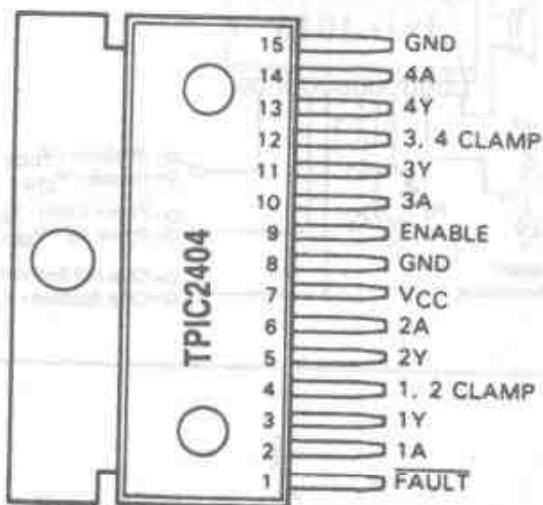
#### **FUNCTION TABLE**

STEP	DIGITAL INPUT	OUTPUT VOLTAGE
0	LLLLLLLL	3.980 V
1	LLLLLLH	3.984 V
*	*	*
*	*	*
*	*	*
127	LHHHHHHHH	4.488 V
128	HLLLLLLL	4.492 V
129	HLLLLLH	4.996 V
*	*	*
*	*	*
*	*	*
254	HHHHHHHL	4.996 V
255	HHHHHHHH	5.000 V

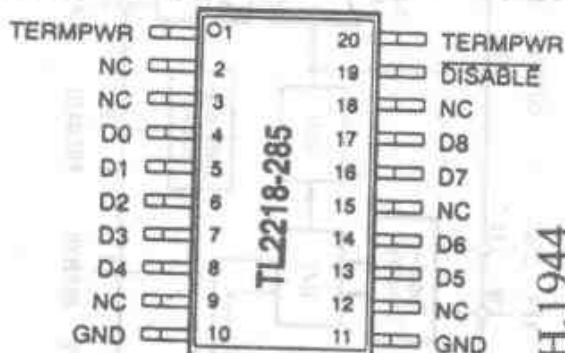


H.1943

**KN SINGLE-IN-LINE PACKAGE  
(TOP VIEW)**



The tab is electrically connected to the GND pins.



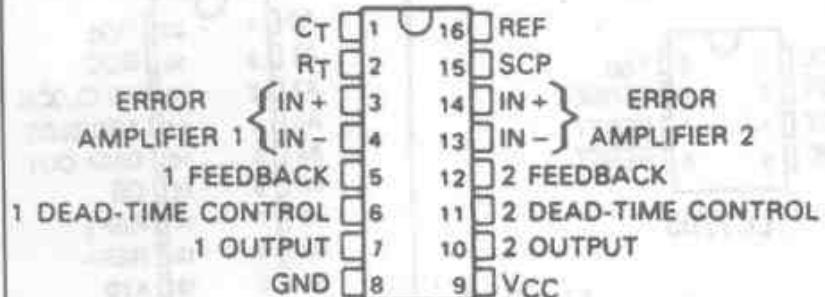
H. 1944



GND/HEAT SINK - These pins have an internal connection to ground and must be grounded.

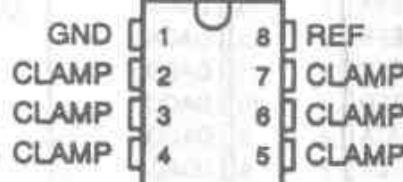
NC - No internal connection

<sup>T</sup>The PW package is only available in lead-end taped and reeled (order device TL75LPXXOPWLE).



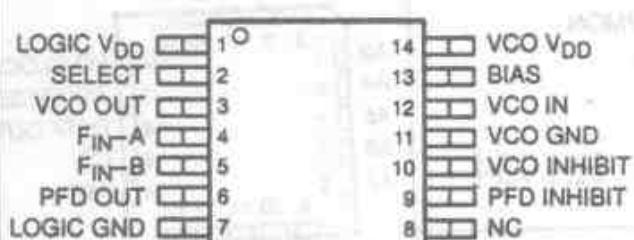
TL1451AC

H.1945



TL7726

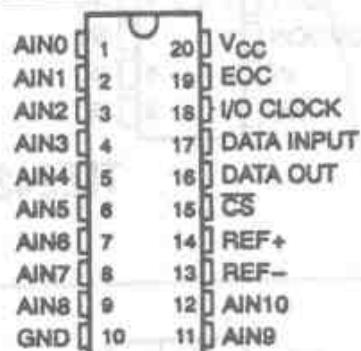
H.1949



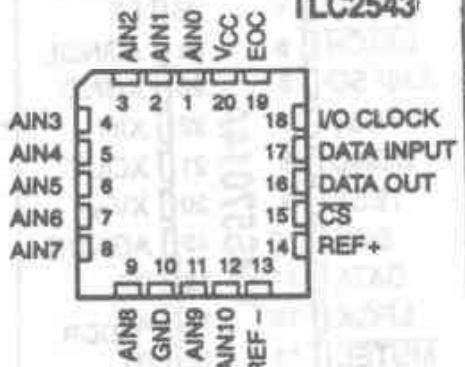
NC - No internal connection

TLC2932

H.1946

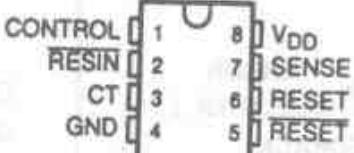
FN PACKAGE  
(TOP VIEW)

TLC2543

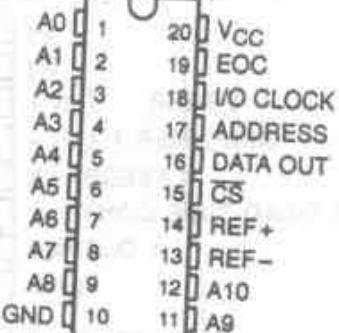




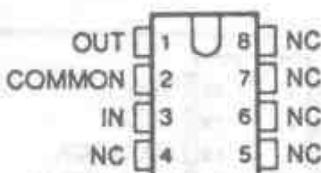
TLC5620 H.1952



TLC7705

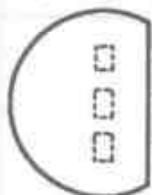


FN PACKAGE  
(TOP VIEW) TLV1543



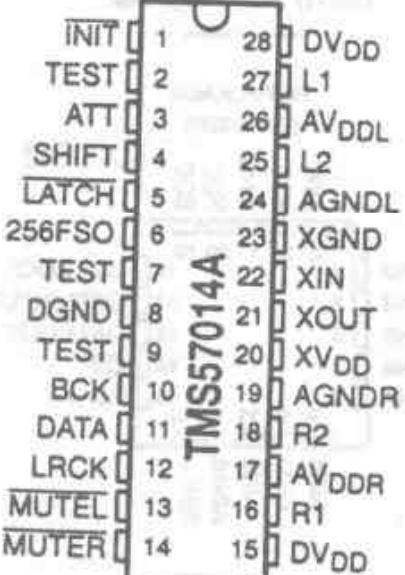
TLE2425

(TOP VIEW)



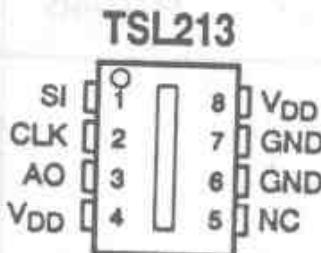
H.1953

H.1954



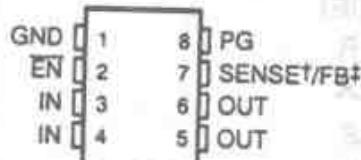
H.1955

H.1957a



TSL213

H.1957



PW PACKAGE  
(TOP VIEW)

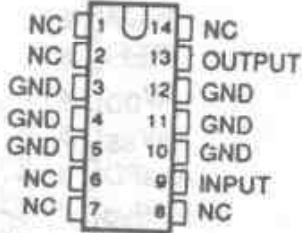


NC – No internal connection

<sup>#</sup>SENSE – Fixed voltage options only  
(TPS7133, TPS7148, and TPS7150)

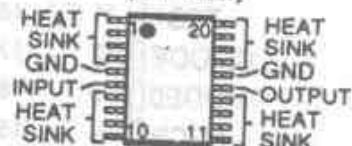
<sup>#</sup>FB – Adjustable version only (TPS7101)

H.1959



NC – No internal connection

PW PACKAGE  
(TOP VIEW)



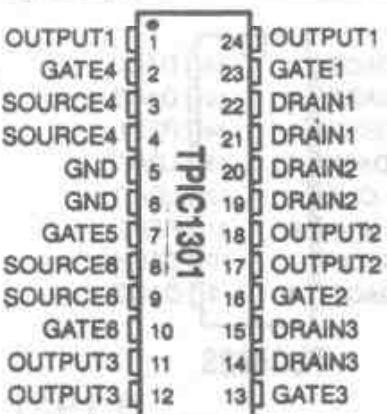
HEAT SINK – These pins have an internal resistive connection to ground and should be grounded.

KC PACKAGE  
(TOP VIEW)



TLV2217-33

H.1956



TPS7101Q, TPS7133Q, TPS7148Q, TPS7150Q

DRAIN1	1	8	GATE1
GATE2	2	7	SOURCE/GND
DRAIN2	3	6	SOURCE/GND
DRAIN3	4	5	GATE3

TPIC2322L

H.1960

DRAIN2	1	16	SOURCE1
SOURCE2/GND	2	15	DRAIN1
GATE2	3	14	GATE1
GND	4	13	GND
GND	5	12	GND
GATE4	6	11	GATE3
SOURCE4/GND	7	10	DRAIN3
DRAIN4	8	9	SOURCE3

## DW PACKAGE

(TOP VIEW) TPIC5404

GND	1	20	SOURCE2/GND
SOURCE4/GND	2	19	GATE2
GATE4	3	18	NC
NC	4	17	NC
DRAIN4	5	16	DRAIN2
SOURCE3	6	15	SOURCE1
DRAIN3	7	14	DRAIN1
GATE3	8	13	GATE1
NC	9	12	NC
NC	10	11	NC

H.1964

SOURCE1	1	8	GATE1
GATE2	2	7	GND
SOURCE2	3	6	DRAIN
SOURCE3	4	5	GATE3

TPIC3322L

H.1962

GND	1	20	SOURCE2/GND
SOURCE4/GND	2	19	GATE2
GATE4	3	18	NC
NC	4	17	NC
DRAIN4	5	16	DRAIN2
SOURCE3	6	15	SOURCE1
DRAIN3	7	14	DRAIN1
GATE3	8	13	GATE1
NC	9	12	NC
NC	10	11	NC

NC - No internal connection

TPIC5424L

NE PACKAGE  
(TOP VIEW)

DRAIN2	1	16	SOURCE1
SOURCE2/GND	2	15	DRAIN1
GATE2	3	14	GATE1
GND	4	13	GND
GND	5	12	GND
GATE4	6	11	GATE3
SOURCE4/GND	7	10	DRAIN3
DRAIN4	8	9	SOURCE3

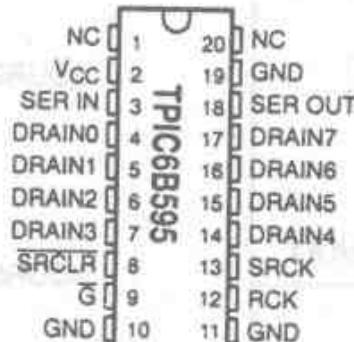
H.1965

GND	1	16	DRAIN1
SOURCE1	2	15	DRAIN1
SOURCE1	3	14	GATE1
SOURCE2	4	13	DRAIN2
SOURCE2	5	12	DRAIN2
SOURCE3	6	11	GATE2
SOURCE3	7	10	DRAIN3
GATE3	8	9	DRAIN3

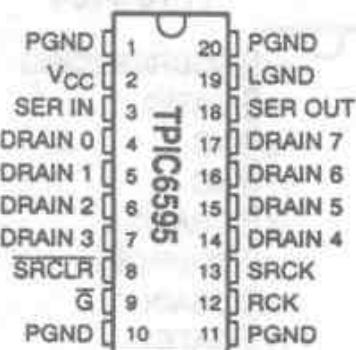
H.1963



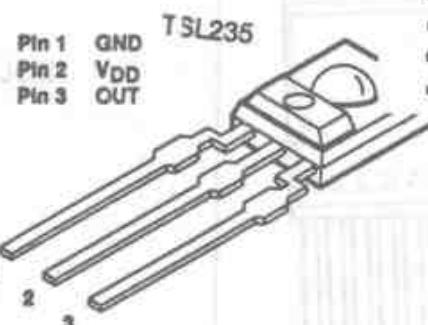
H.1966



H.1970



H.1967

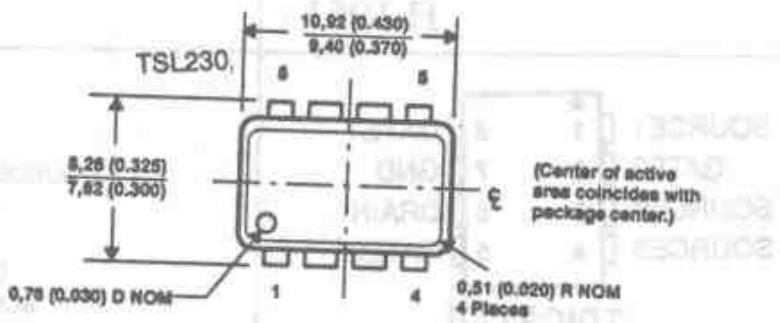


H.1970B

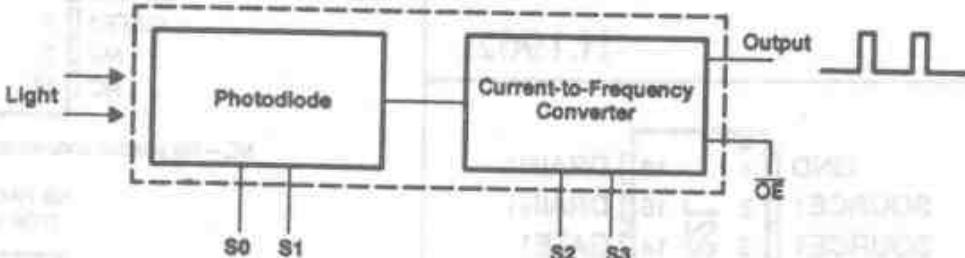
H.1971



H.1968



H.1969



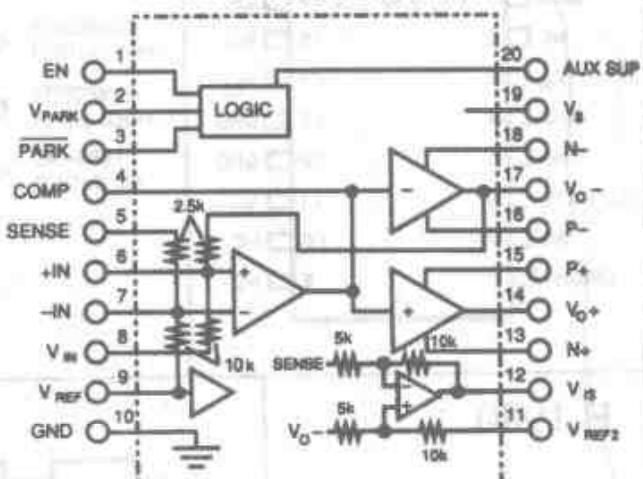
## Terminal Functions

TERMINAL NAME	NO.	I/O	DESCRIPTION
GND	4		Ground
OE	3	I	Enable for f <sub>O</sub> (active low)
OUT	6	O	Scaled-frequency (f <sub>O</sub> ) output
S0, S1	1, 2	I	Sensitivity-select inputs
S2, S3	7, 8	I	f <sub>O</sub> scaling-select inputs
V <sub>DD</sub>	5		Supply voltage

## Selectable Options

S1 S0		SENSITIVITY	S3 S2		f <sub>O</sub> SCALING (divide-by)
L	L	Power Down	L	L	1
L	H	1x	L	H	2
H	L	10x	H	L	10
H	H	100x	H	H	100

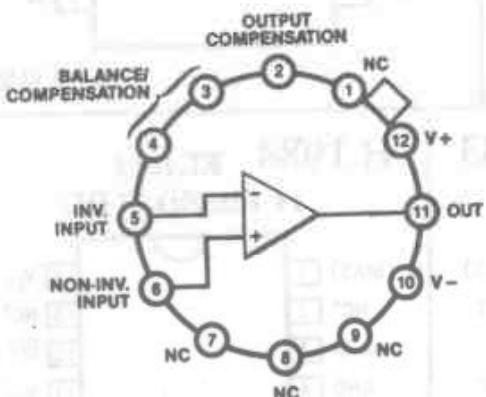
### EL3038C



Top View

H.1972

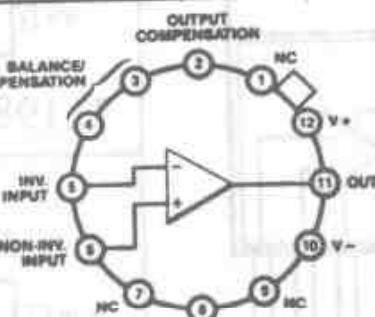
H.1975



Top View

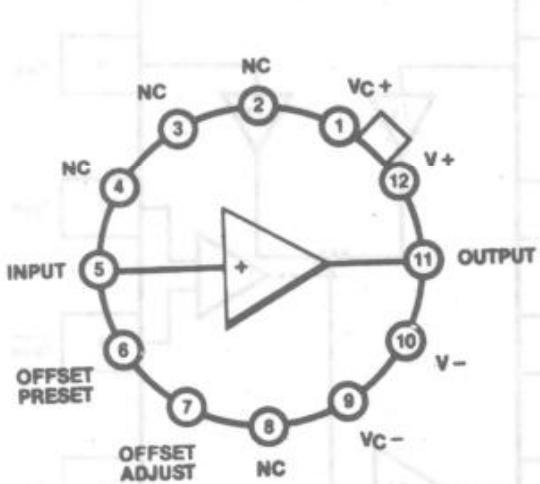
Case is electrically isolated.

H.1973



Top View

H.1976

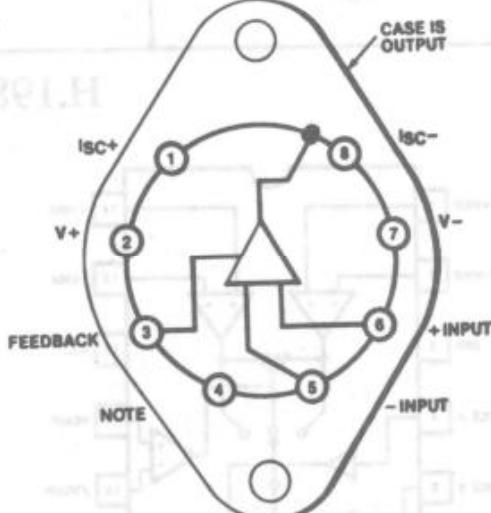


Top View

Note: Case is electrically isolated.

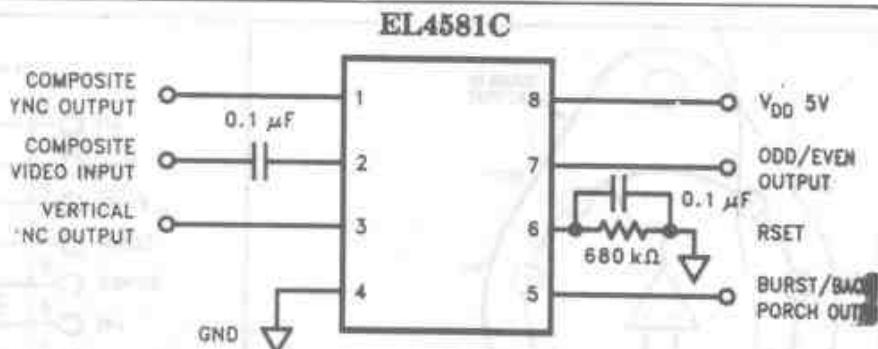
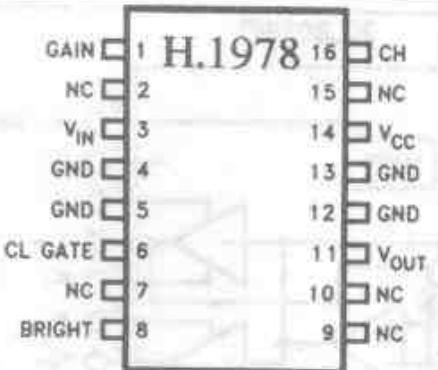
H.1974

H.1977



Top View

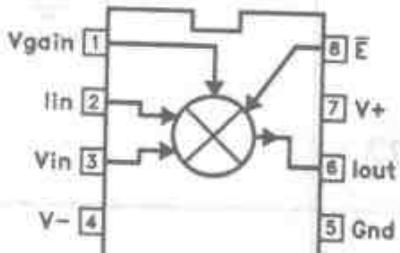
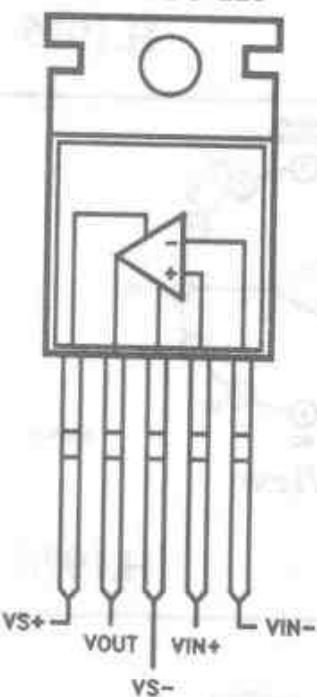
Note: Electrically connected internally.  
No connection should be made to pin.



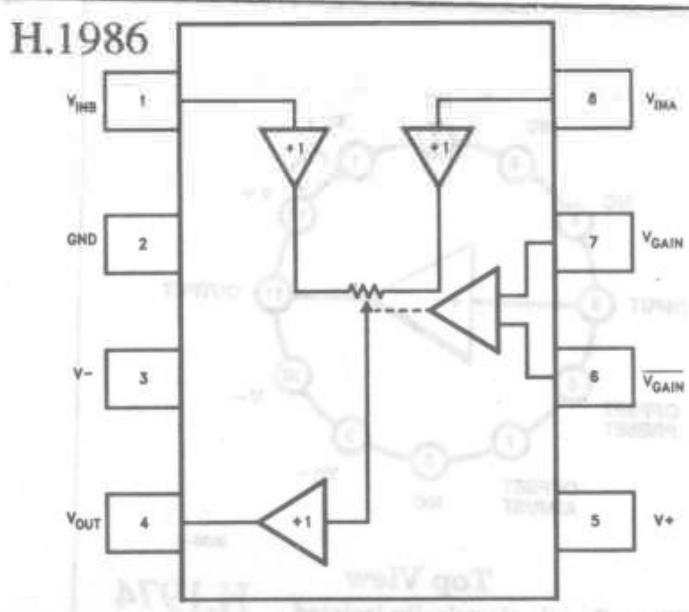
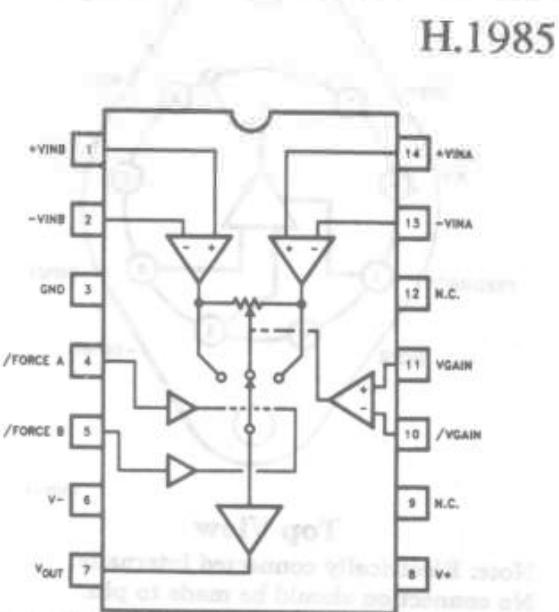
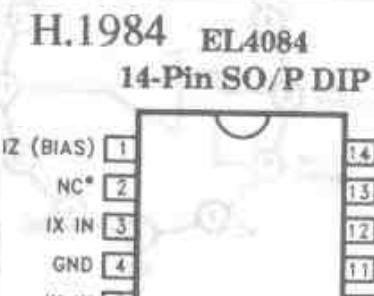
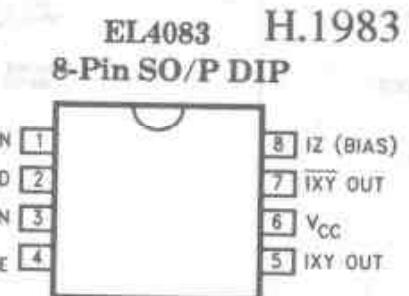
H.1979

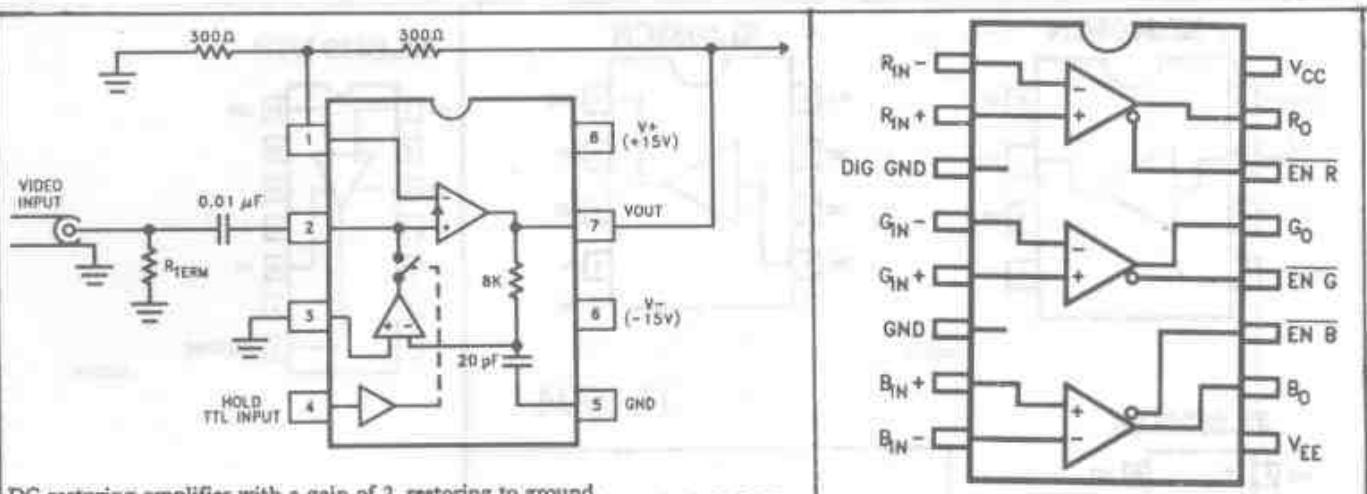
H.1980

5-Pin TO-220



H.1981

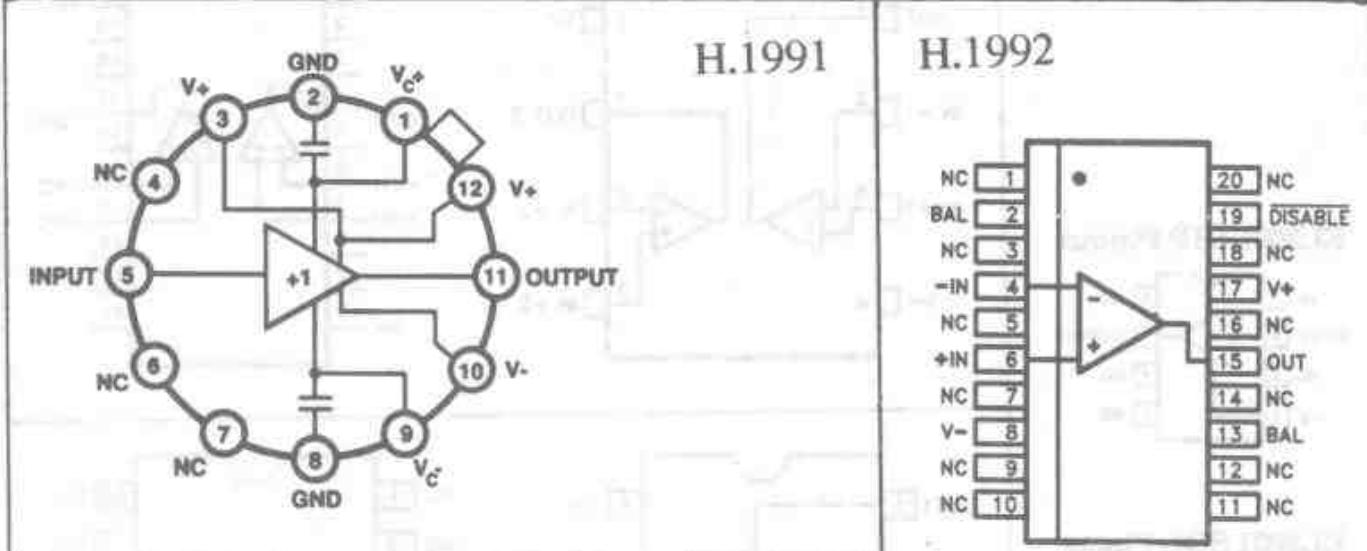
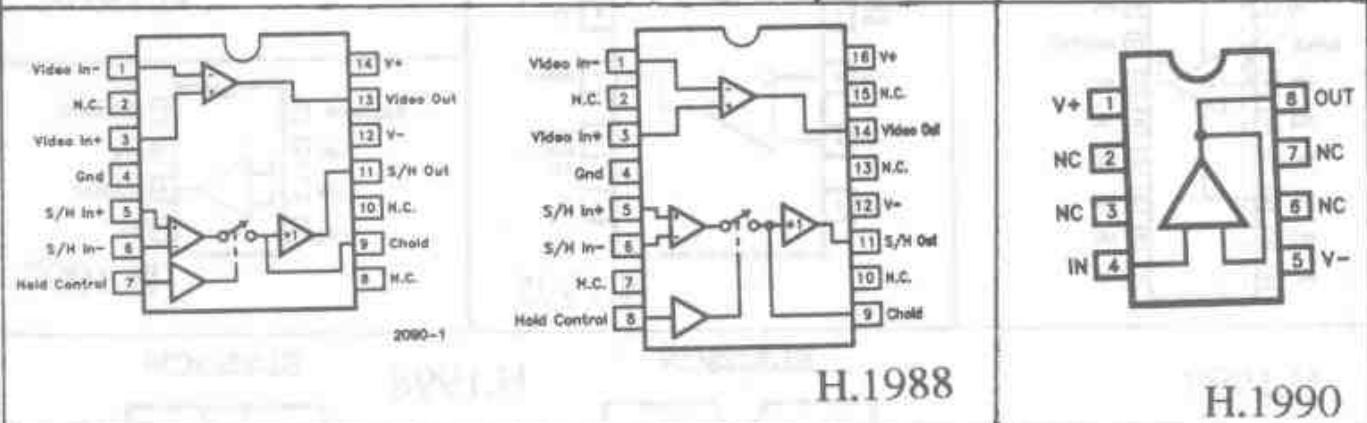




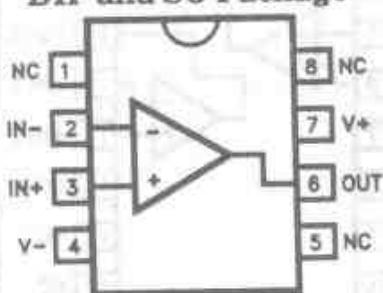
DC restoring amplifier with a gain of 2, restoring to ground.

H.1987

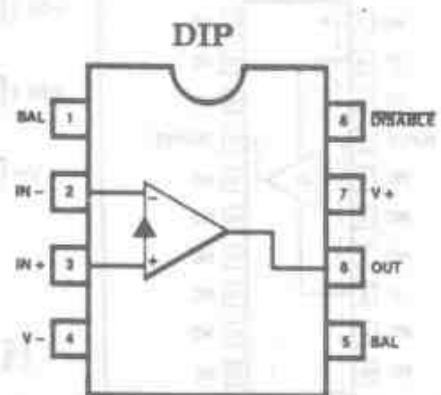
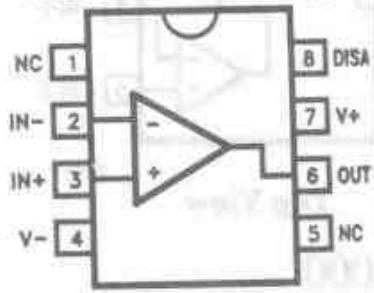
H.1989

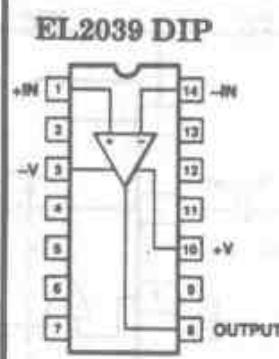
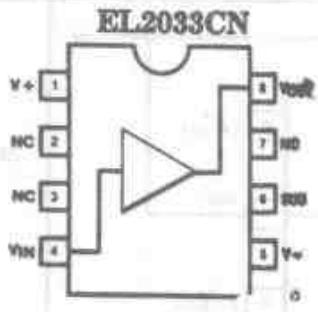
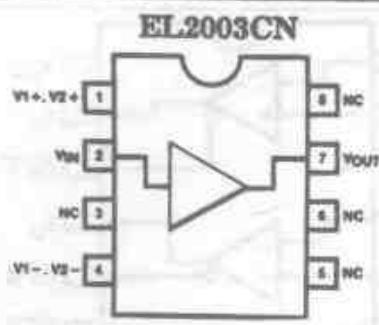


**EL2171**  
DIP and SO Package

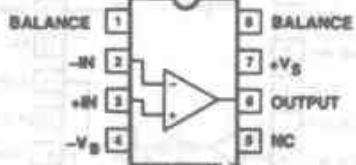
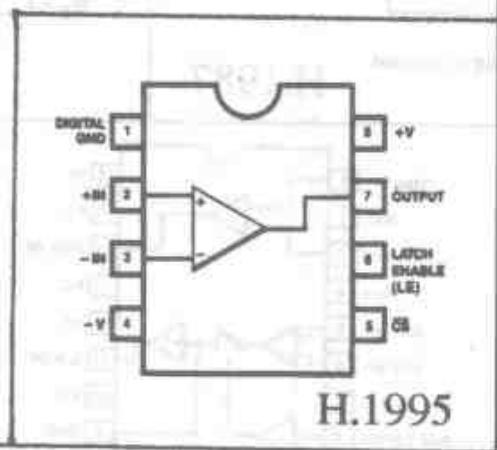
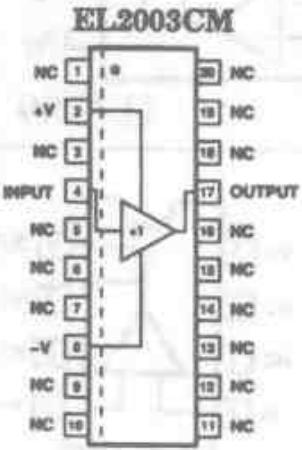
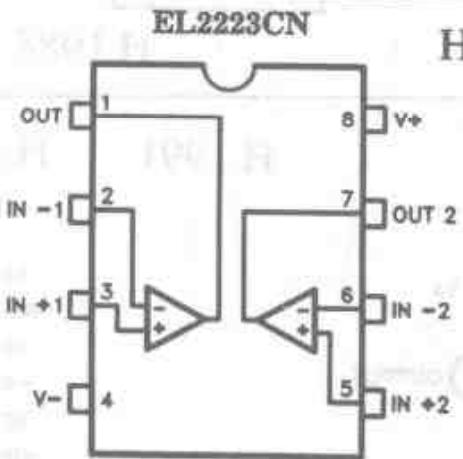
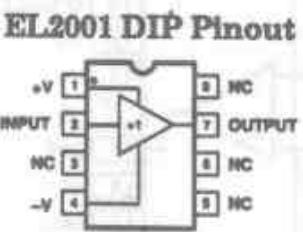
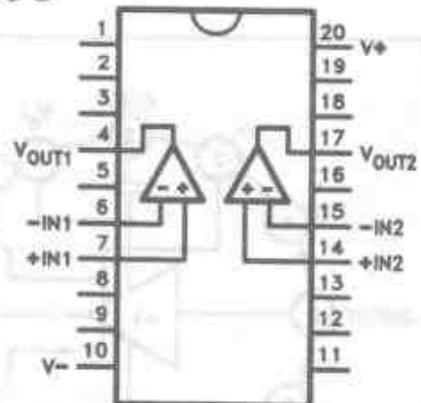
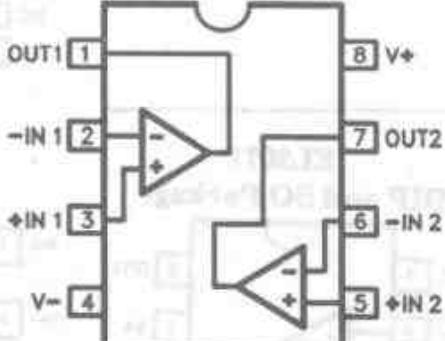
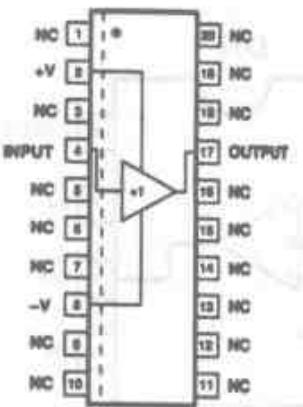
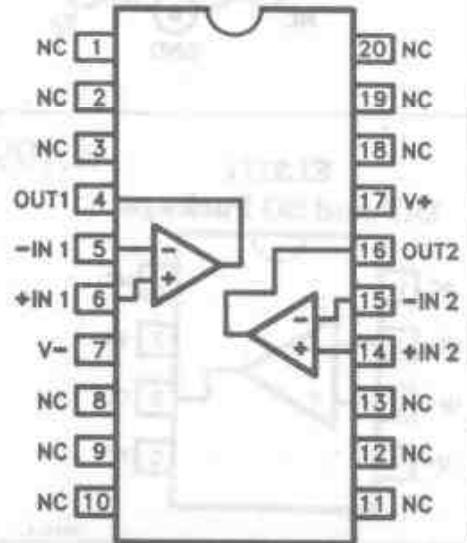


**EL2071**  
DIP and SO Package



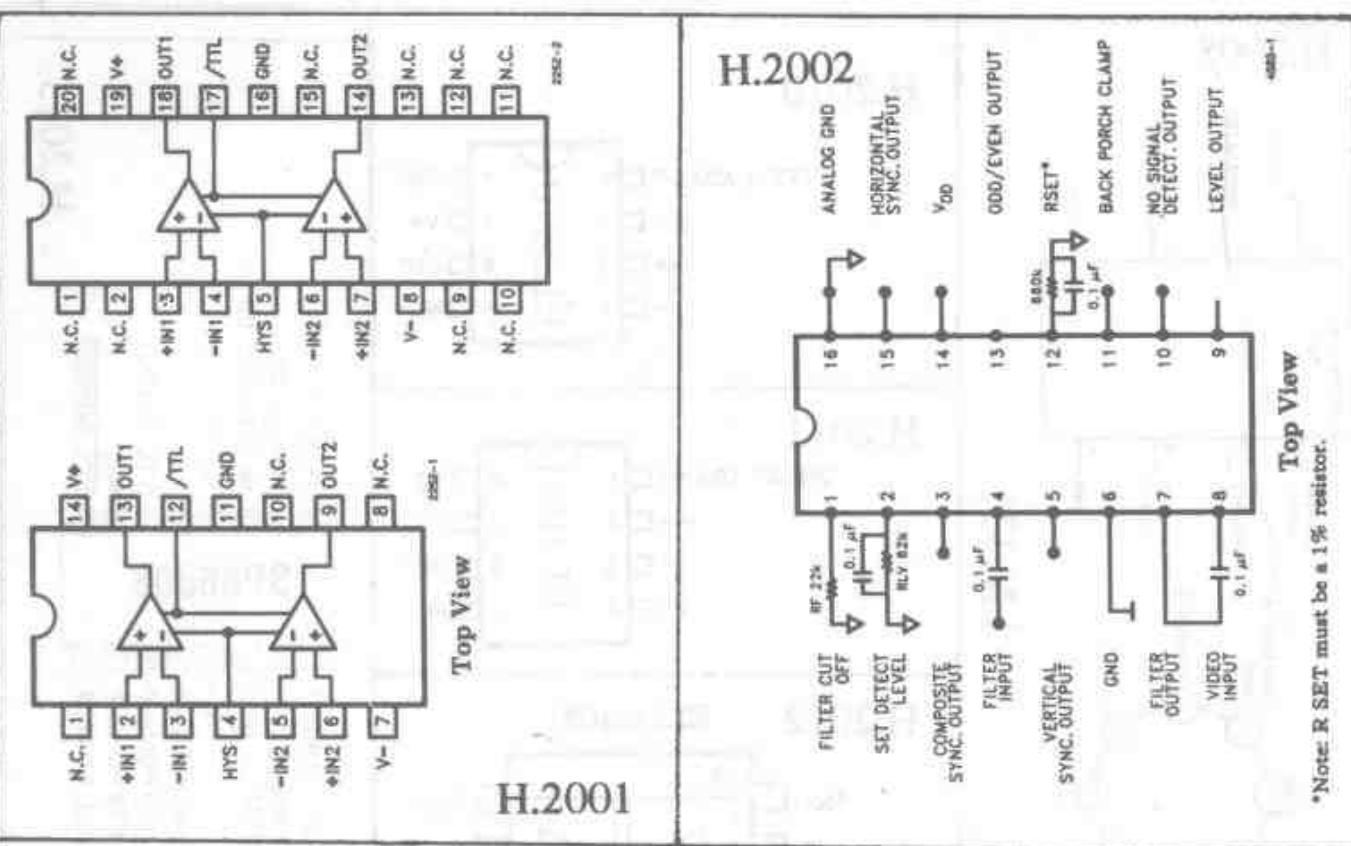


2003-1

**H.1994****H.1997****H.1999****H.1998****EL2001 SOL Pinout****H.2000**

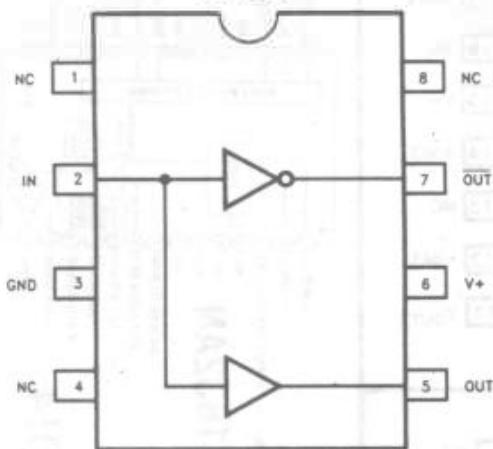
2242-1

**Top View**

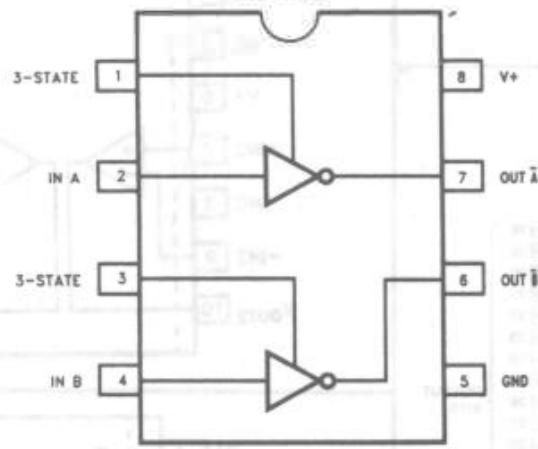


### CCD Driver/Dual Channel 3-State Line Driver

EL7182



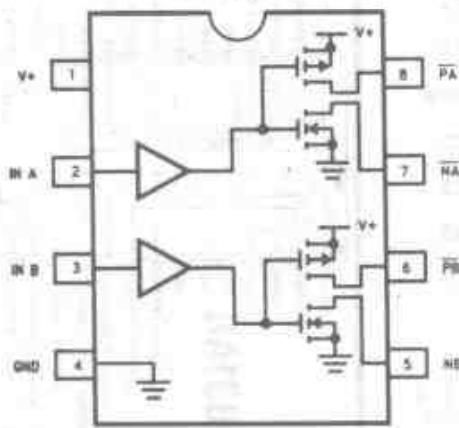
EL7232



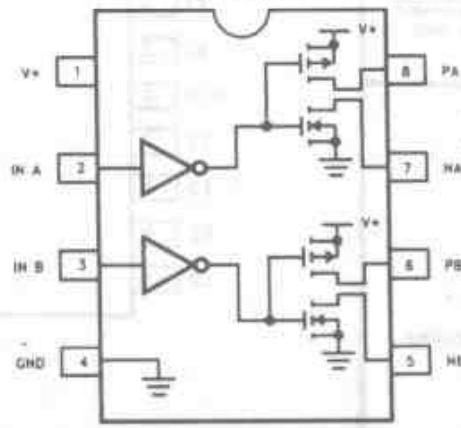
H.2003

### Dual Channel—Isolated Drains, 2.0 Amps

EL7262



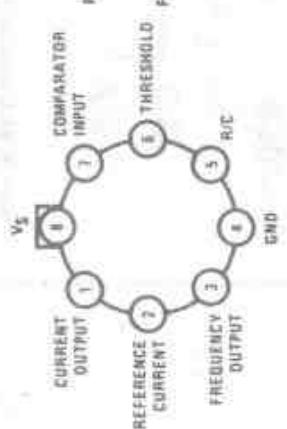
EL7272



H.2004

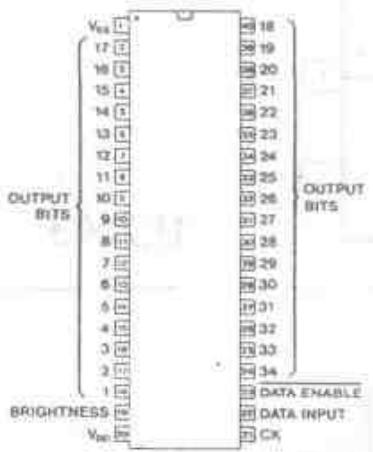


H.2005

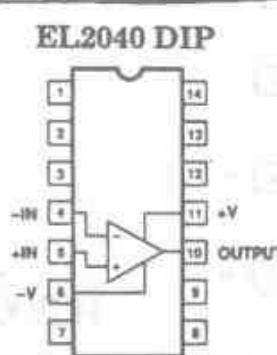


H.2006

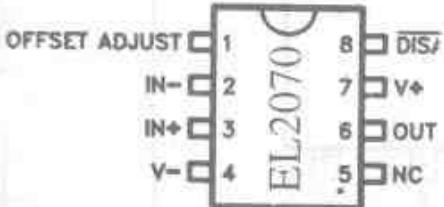
MM5450N



H.2009

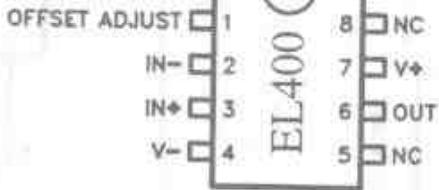


338



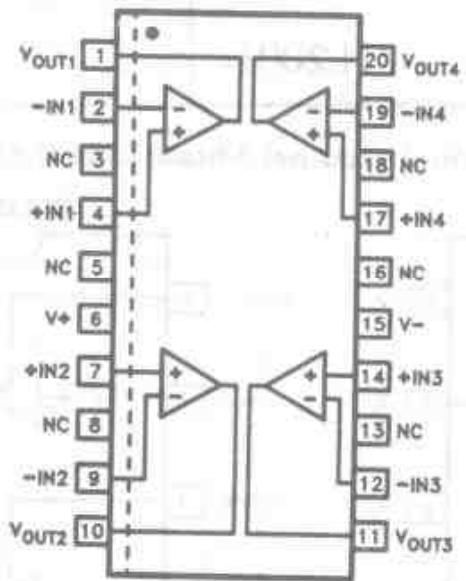
LM331

H.2011



H.2012

**EL2423CM**



C1	1	•	20	C4
NC	2		19	NC
B1	3		18	B4
E1	4		17	E4
E1	5		16	E4
SUB	6		15	SUB
E2	7		14	E3
E2	8		13	E3
B2	9		12	B3
C2	10		11	C3

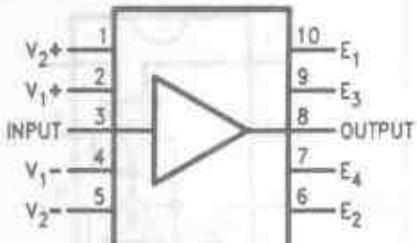
H.2013

1	CLOCK INHIBIT	1	CLOCK INPUT
2	CONTROL INPUT	2	INPUT BIAS
3	PE1	3	MASTER SET INPUT
4	PE2	4	V <sub>E</sub> (TTL O/P)
5	V <sub>CC</sub>	5	V <sub>E</sub>
6	Q/P STAGE V <sub>CC-A</sub>	6	TTL OUTPUT
7	PE1 PULL-UP	7	N.C.
8	PE2 PULL-UP	8	ECL OUTPUT
9		9	

The diagram illustrates the internal structure of the BRIDGE SECTION. It starts with two inputs: INPUT and INPUT-. These signals pass through a HUTCH/SETAD/NC block. The output of this block goes to a JERROD/NC block. From there, it splits into two paths: one to a GAIN/SENSE block and another to a GAIN/COMM block. The GAIN/SENSE path also receives input from a SIGNAL COMM block. The outputs of the GAIN/SENSE and GAIN/COMM blocks are summed at a SUMMER block. This summer's output is then processed by a GAIN block, followed by a FILTER block. The final output is labeled 16332.

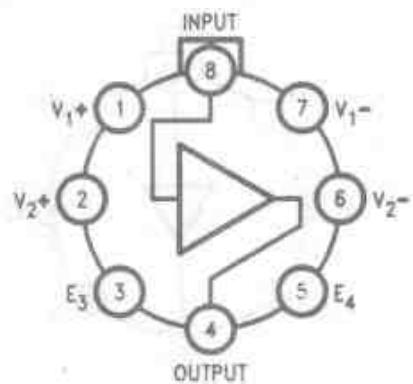
1B32AN

H.2014

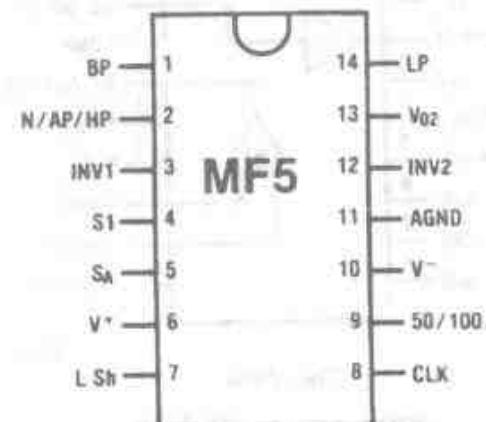


## Buffer

Metal Can Package

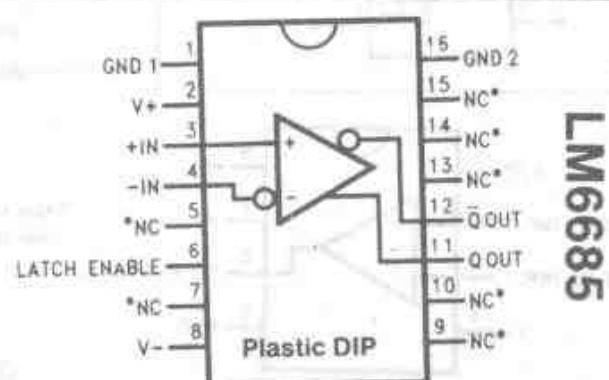
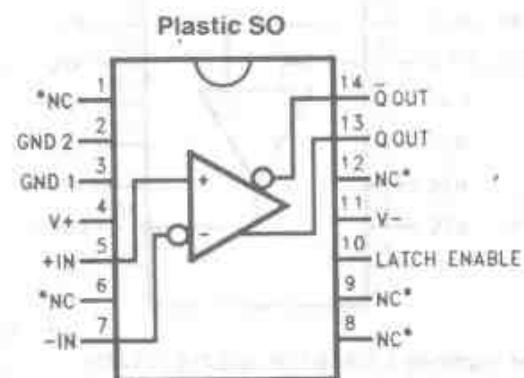


Order Number LH0002H,  
H.2021



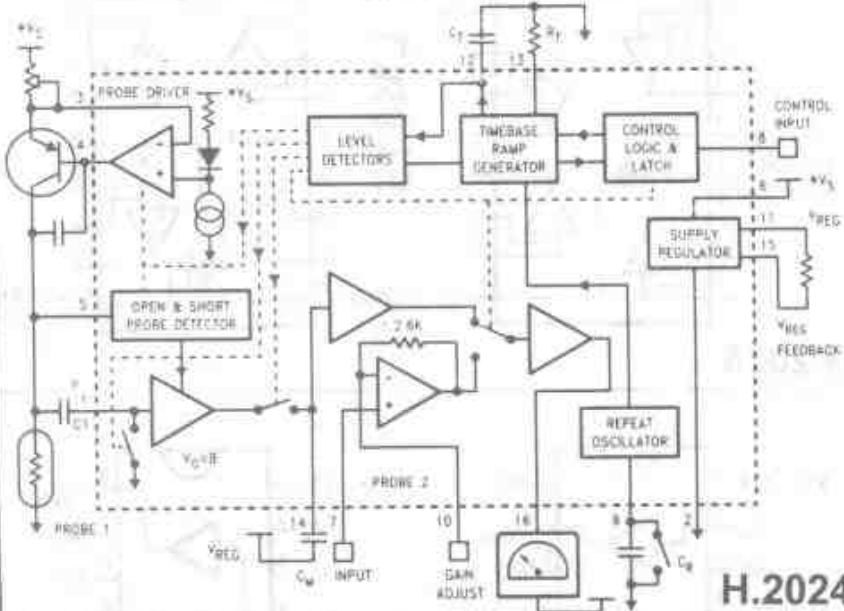
H.2022

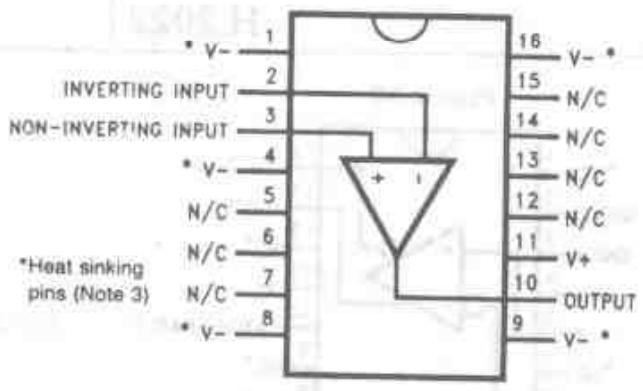
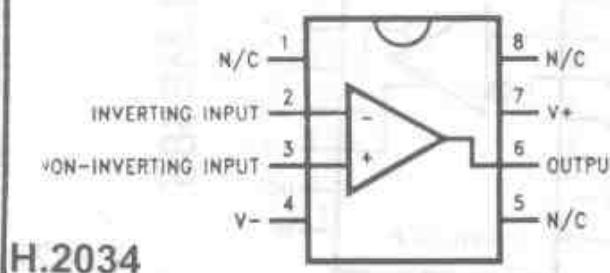
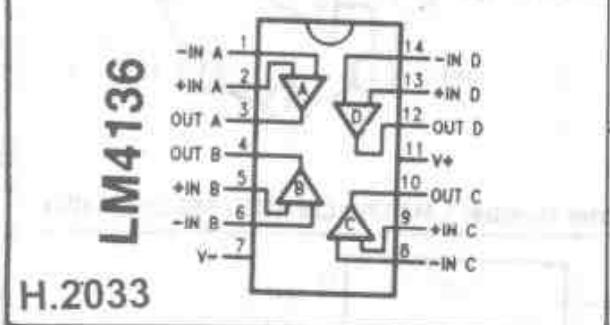
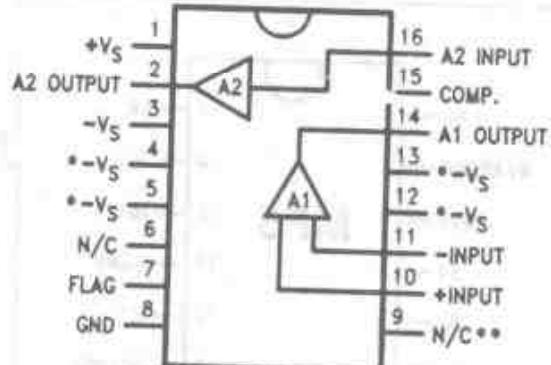
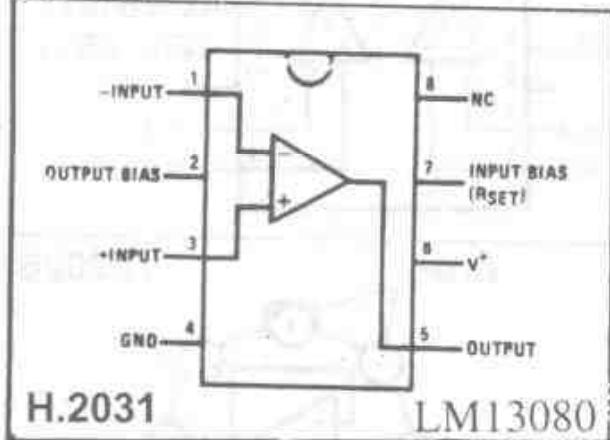
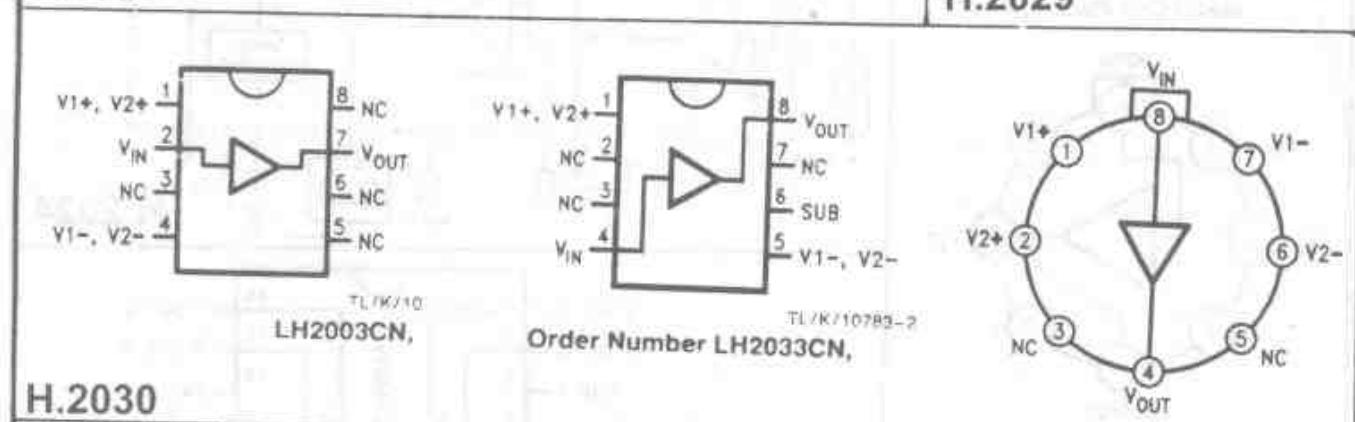
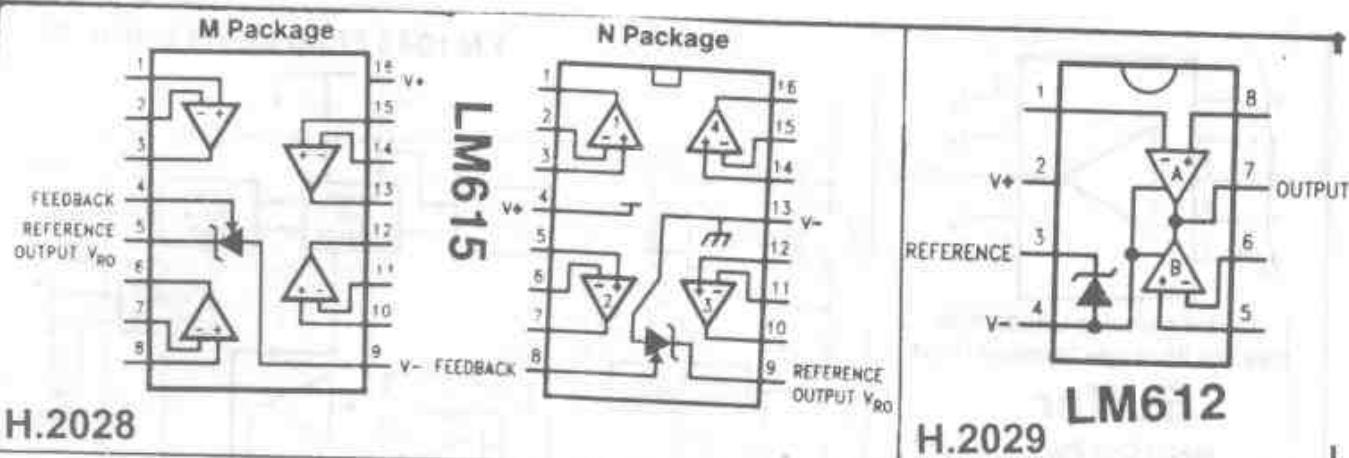
Order Number LM102H, LM102H/883 or LM302H

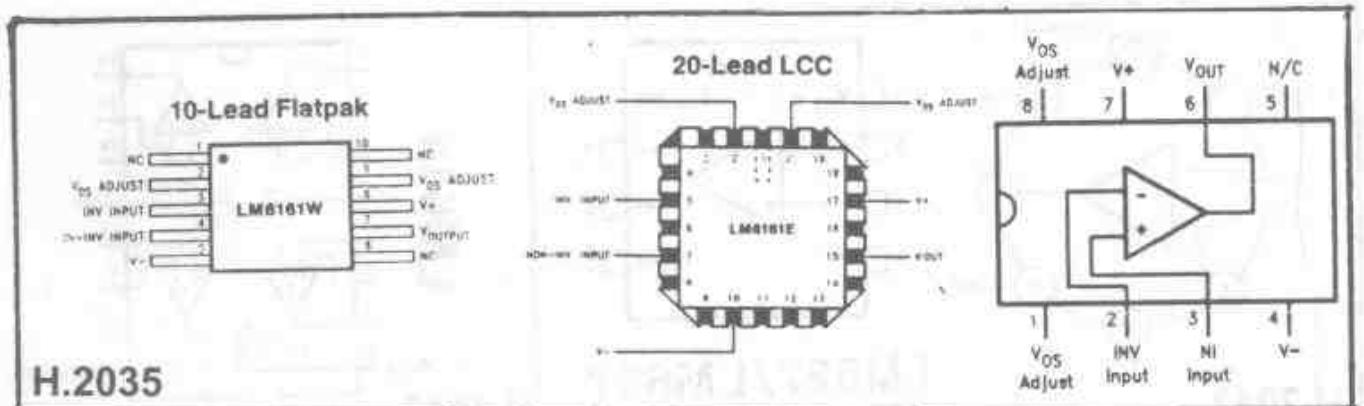


H.2027

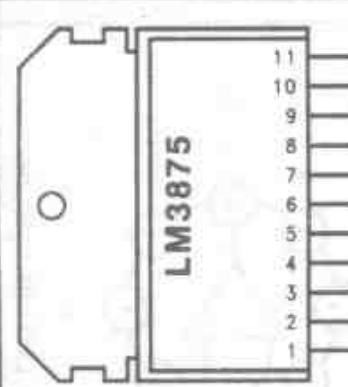
## LM1042 Fluid Level Detector



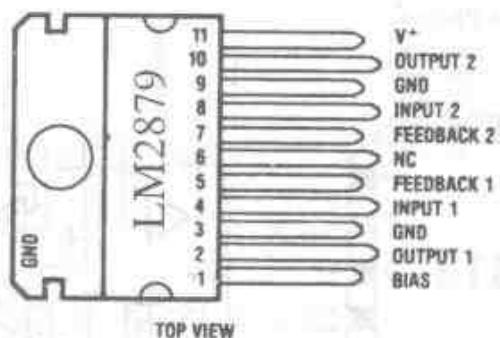




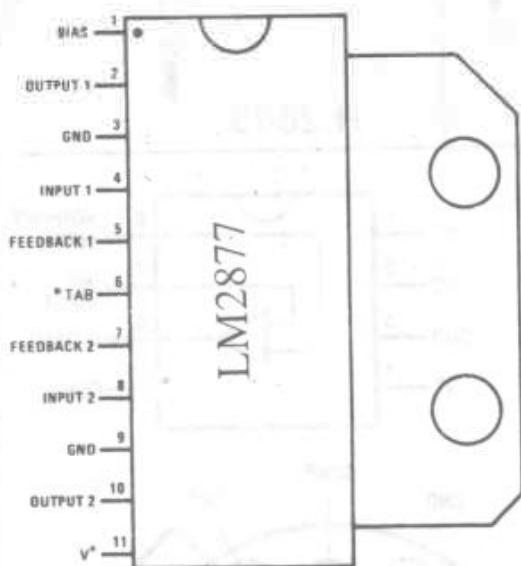
H.2035



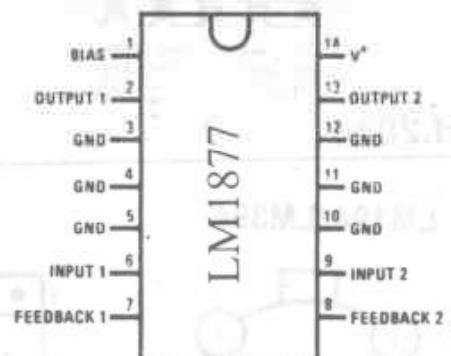
H.2036



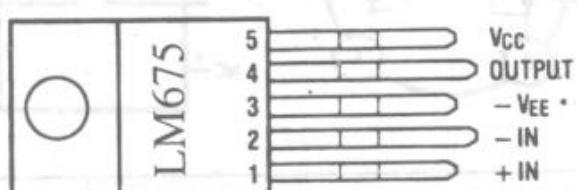
H.2037



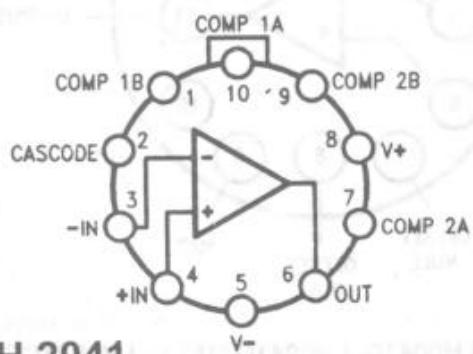
H.2038



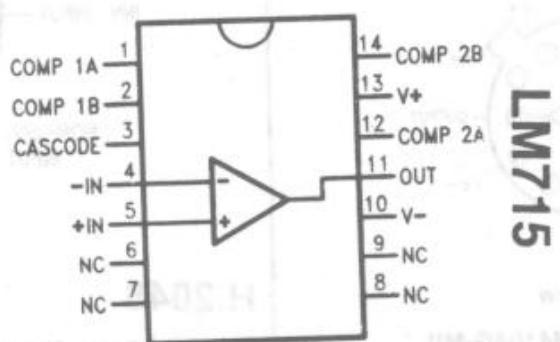
H.2039



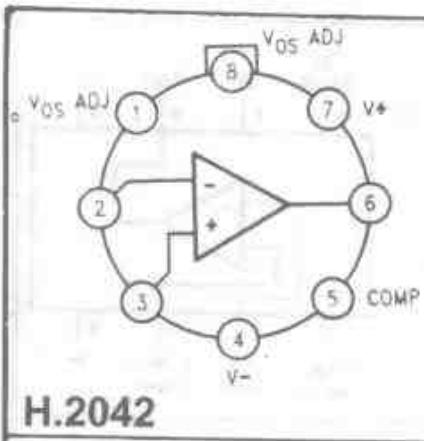
H.2040



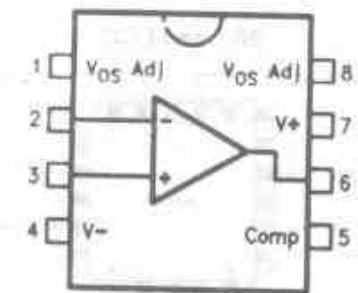
H.2041



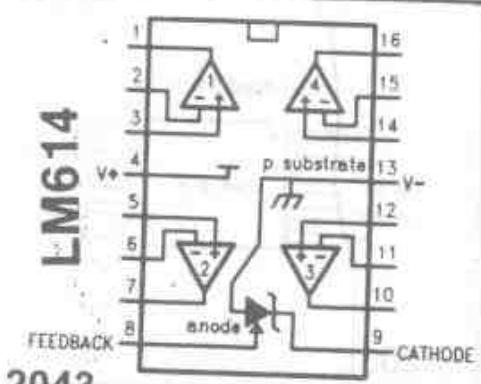
LM715



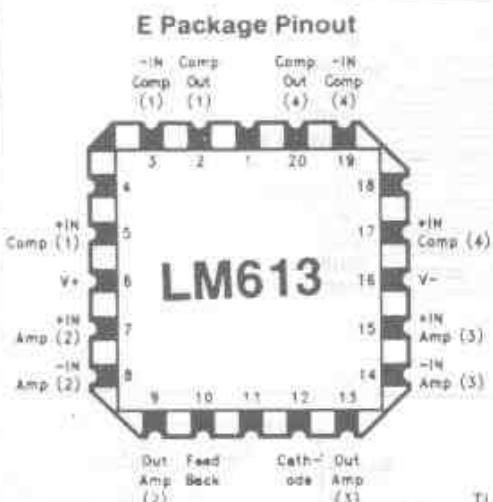
H.2042



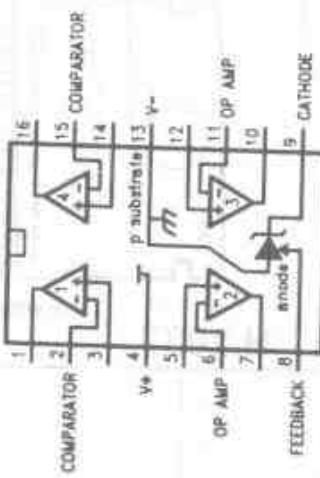
**LM627/LM637**



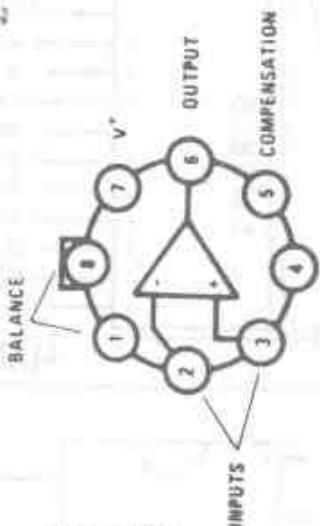
H.2043



H.2044

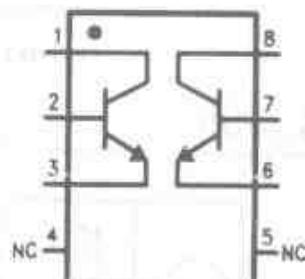
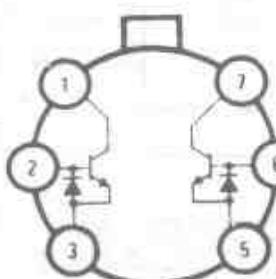


H.2045

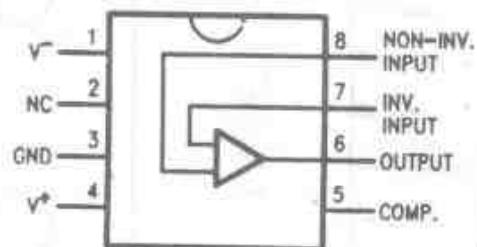


LM112H, LM212H, LM312H

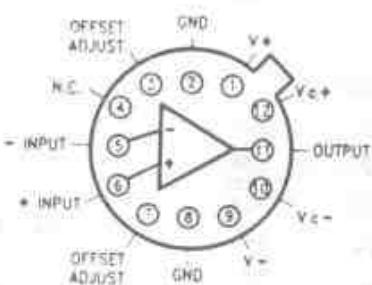
**LM194/LM394**



H.2046



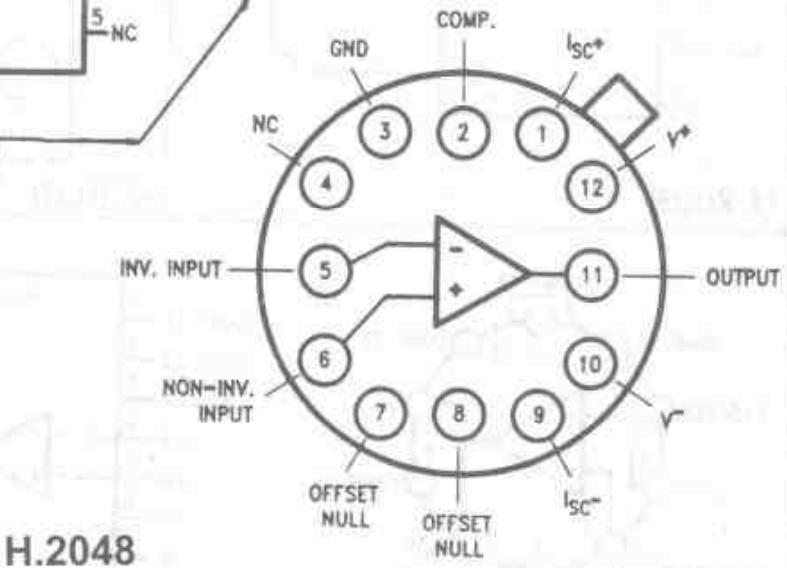
H.2047



Top View

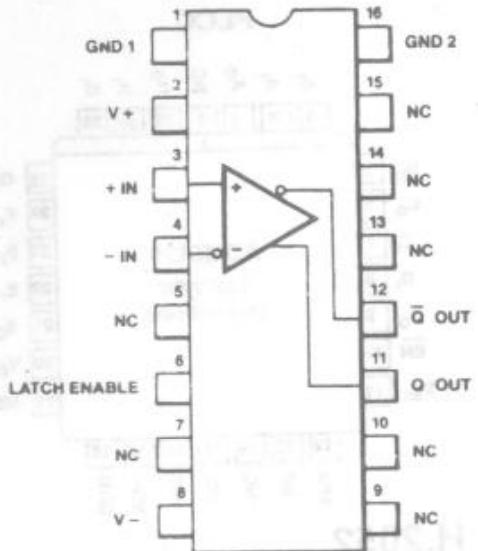
Order Number LH4104G-MIL

H.2048

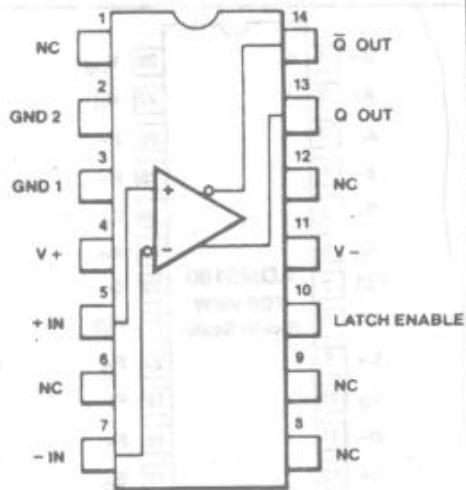


Order Number LH0041G, LH0041G/883 or LH0041CG

TL/K/10115

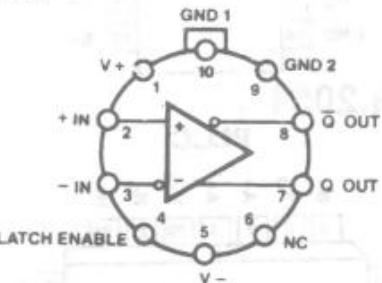


**μA6685**



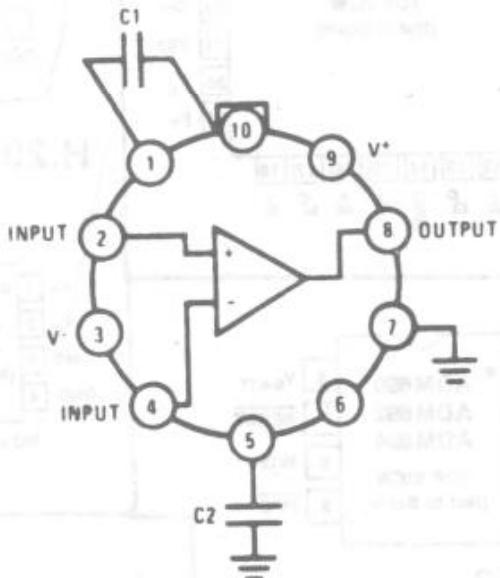
ultra fast single voltage comparator

## H.2049



**H.2049a**

## H.2050



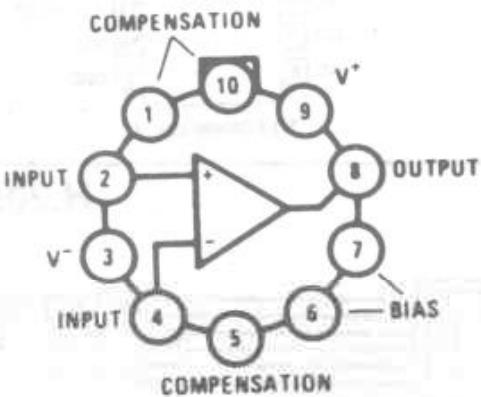
Top View

TL/H/5561-2

Order Number LH0003H or LH0003CH  
See NS Package Number H10G

### Typical Compensation

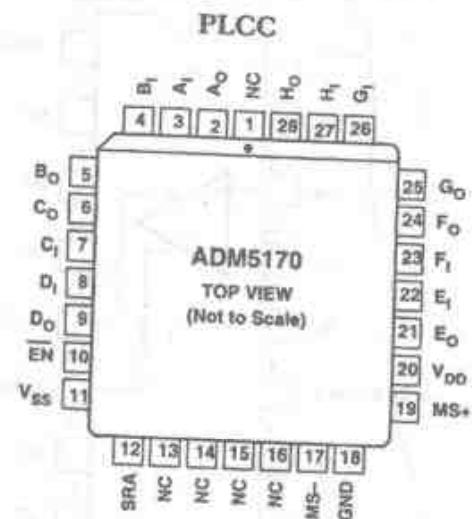
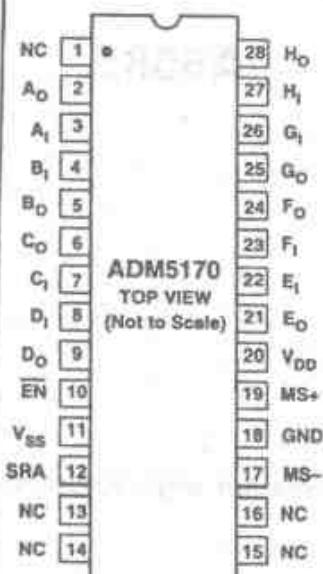
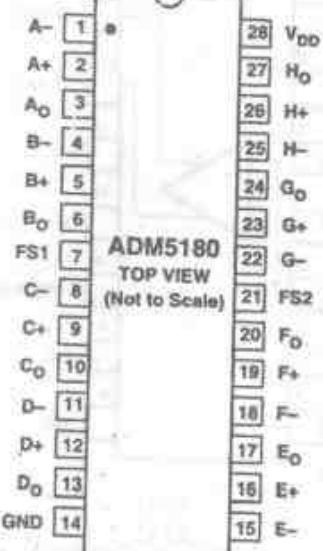
Circuit Gain	C <sub>1</sub> pF	C <sub>2</sub> pF	Slew Rate		Full Output Frequency R <sub>L</sub> > 200Ω, V <sub>OUT</sub> = ±10V kHz
			R <sub>L</sub> > 200Ω, V/μsec	R <sub>L</sub> > 200Ω, V <sub>OUT</sub> = ±10V	
≥ 40	0	0	70	400	
≥ 10	5	30	30	350	
≥ 5	15	30	15	250	
≥ 2	50	50	5	100	
≥ 1	90	90	2	50	



TL/H/5559-2

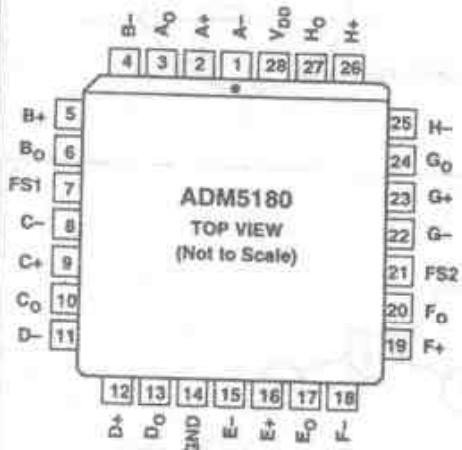
Note: Pin 7 must be grounded or connected to a voltage at least 5V more negative than the positive supply (Pin 9). Pin 7 may be connected to the negative supply, however, the standby current will be increased. A resistor may be inserted in series with Pin 7 to Pin 9. The value of the resistor should be a maximum of 100 kΩ per volt of potential between Pin 3 and Pin 9.

Order Number LH0004H,



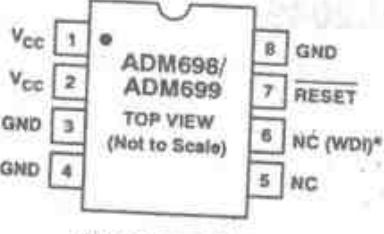
H.2051

PLCC



NC = NO CONNECT

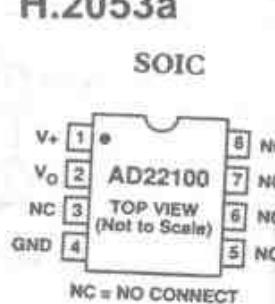
H.2052



(\* ADM699 ONLY)

H.2054

?IN CONFIGURATION (SOIC)

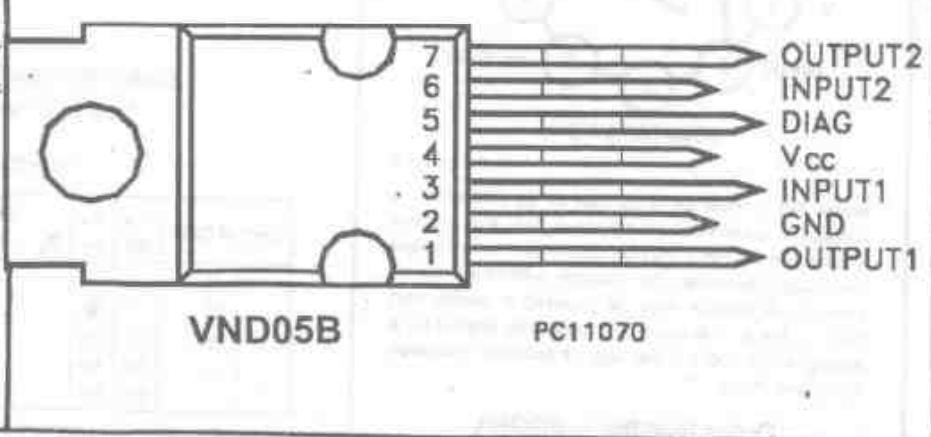
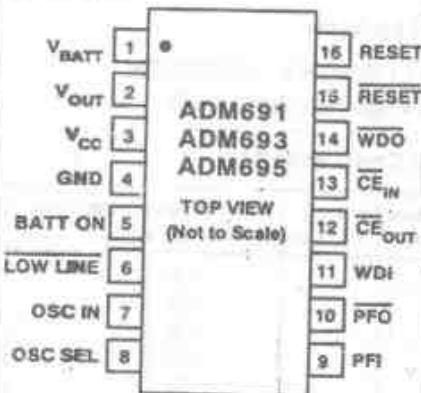


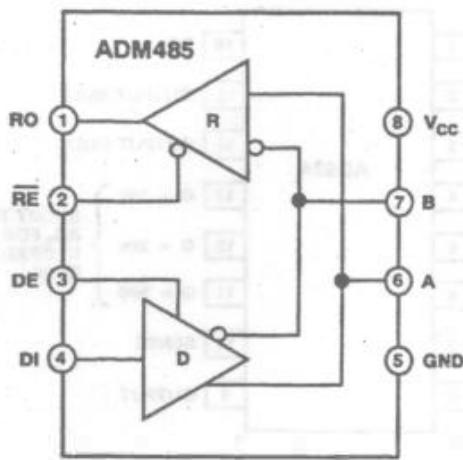
NC = NO CONNECT



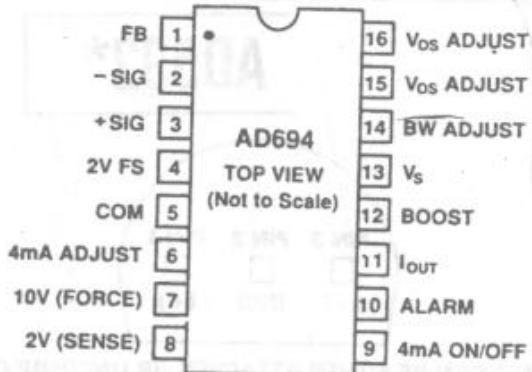
(\* ADM699 ONLY)

H.2053

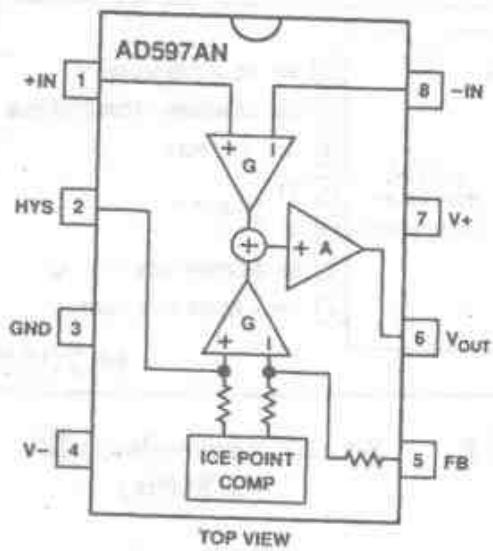




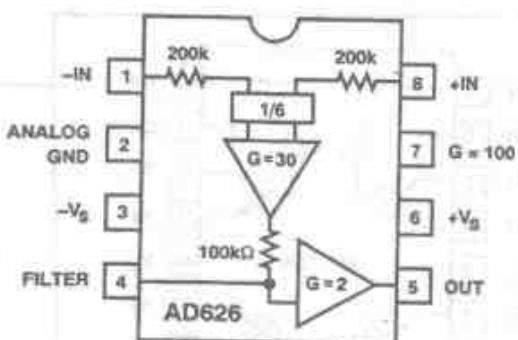
H.2056



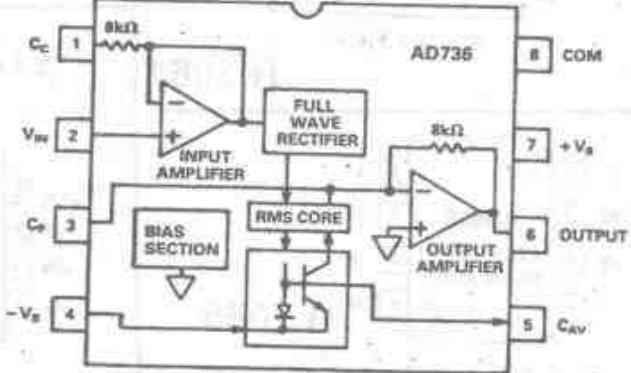
H.2059



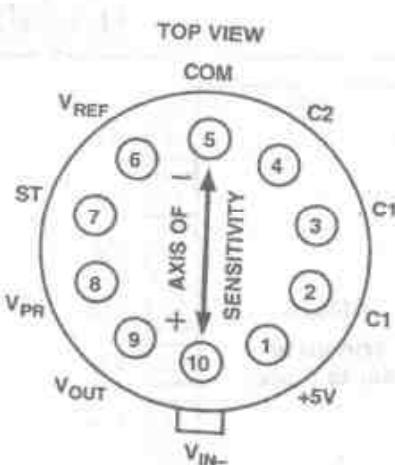
H.2057



H.2060

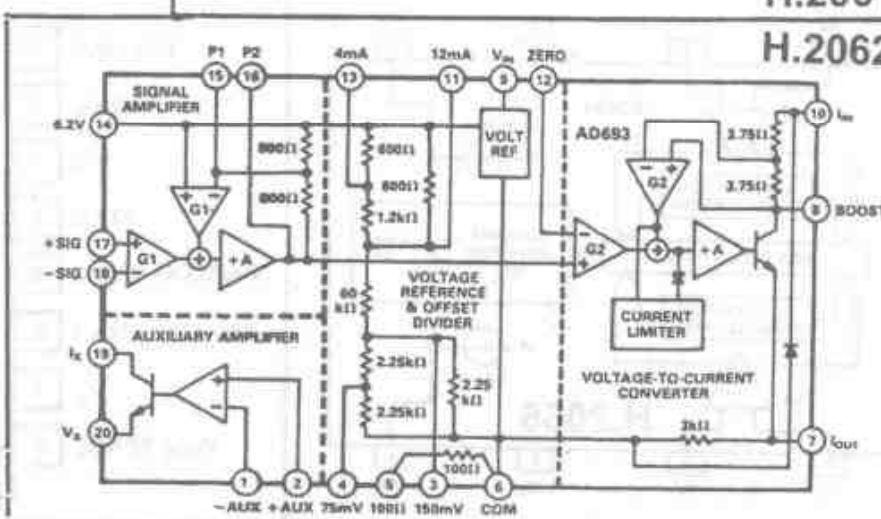


H.2061

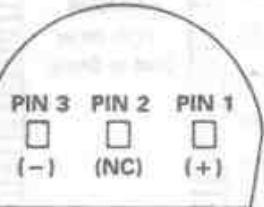


NOTE:  
AXIS OF SENSITIVITY IS  
IN PLANE OF PIN 5 TO TAB.

H.2058



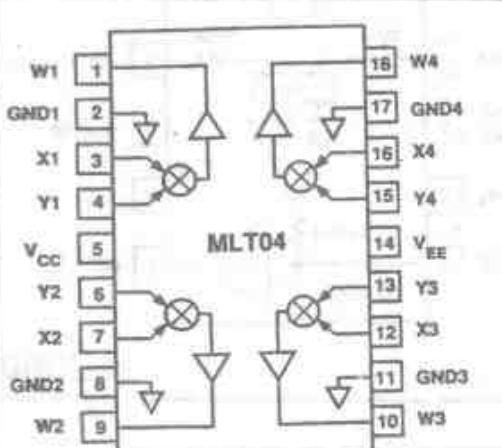
# AD592\*



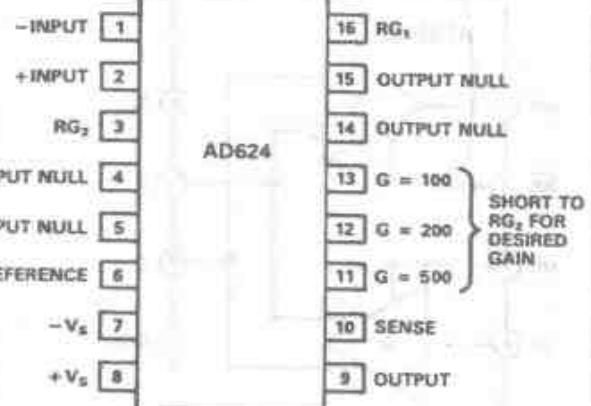
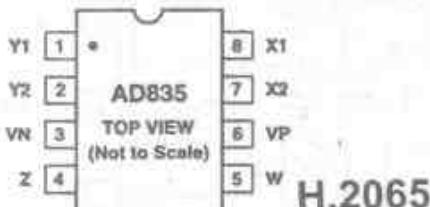
\*PIN 2 CAN BE EITHER ATTACHED OR UNCONNECTED

BOTTOM VIEW

H.2063

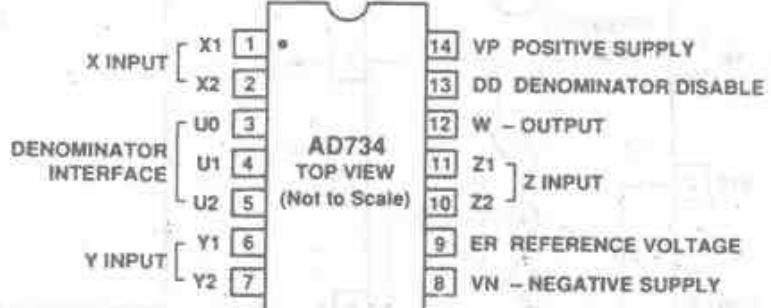


H.2064



FOR GAIN OF 1000 SHORT RG<sub>1</sub> TO PIN 12  
AND PINS 11 AND 13 TO RG<sub>2</sub>

H.2067

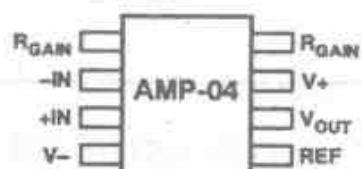


H.2068

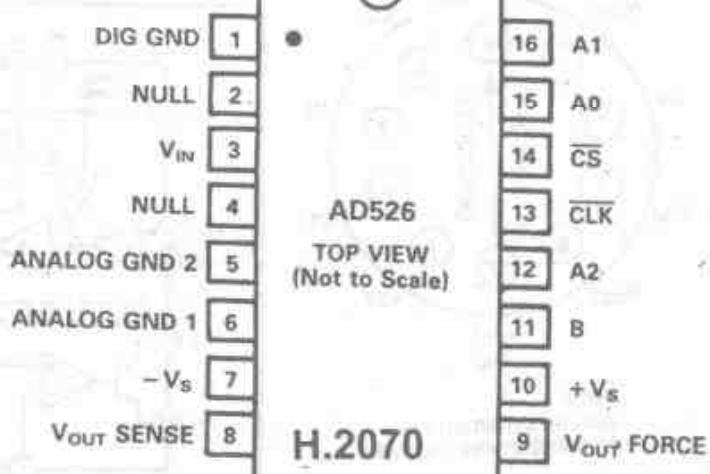
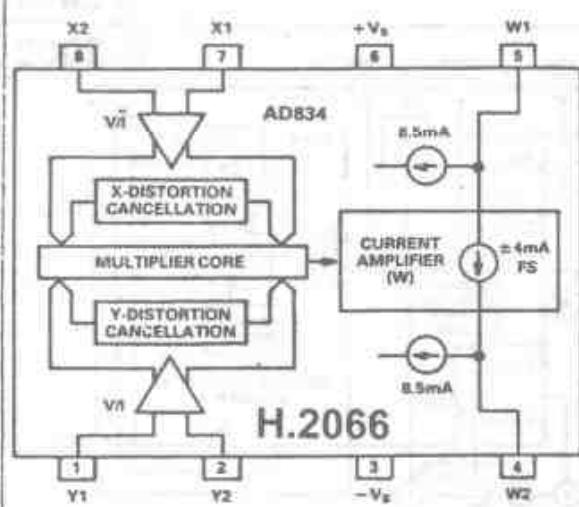
8-Lead Epoxy DIP  
(P Suffix)

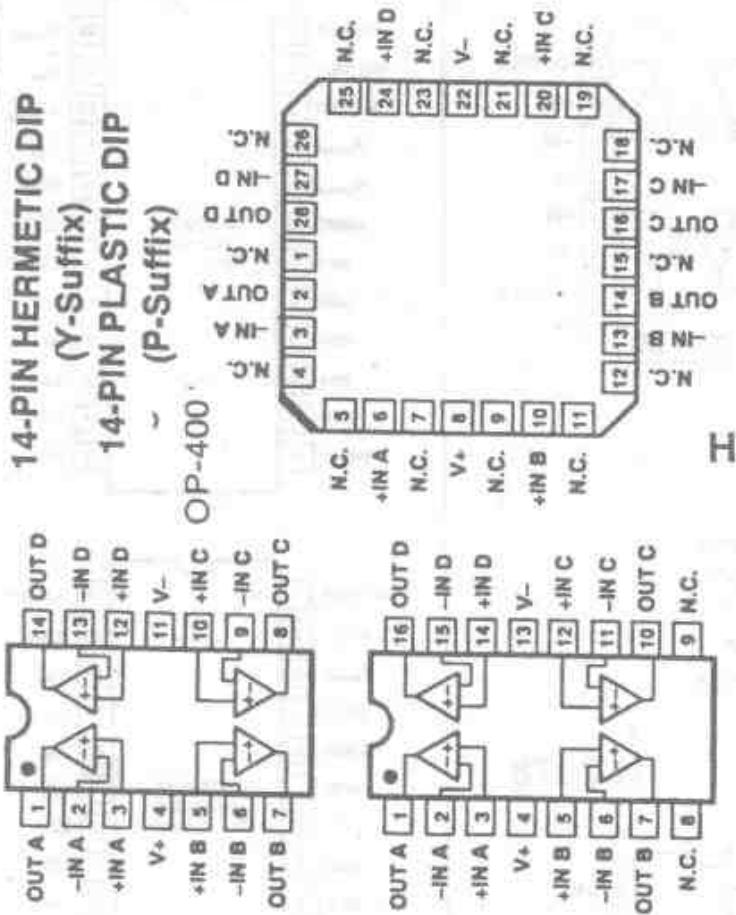


8-Lead Narrow-Body SO  
(S Suffix)

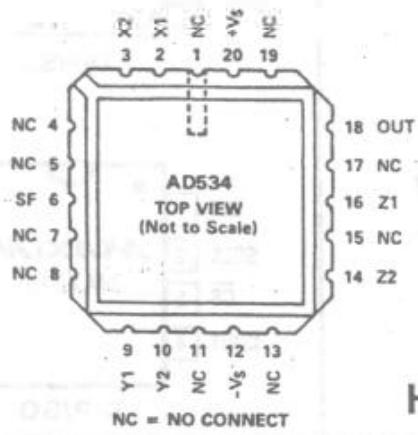
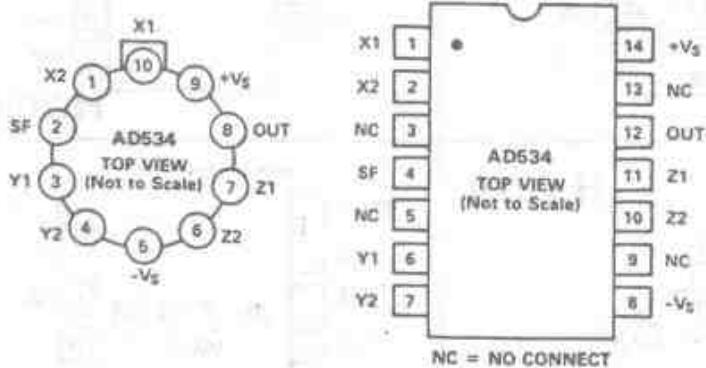
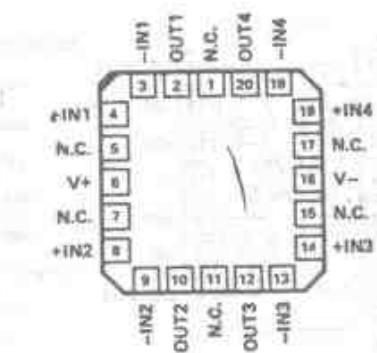


H.2069

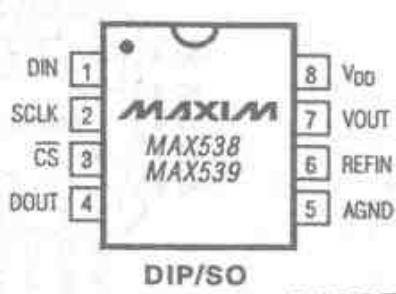




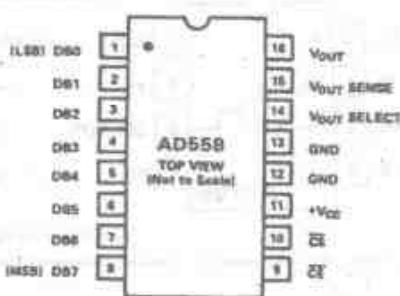
H.2071



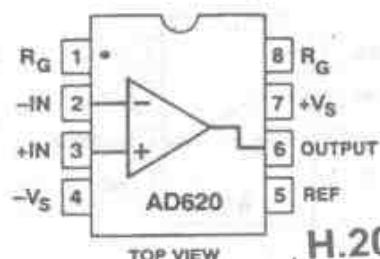
H.2072



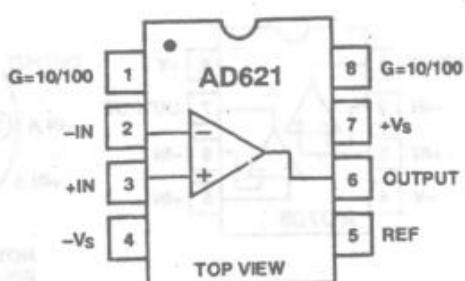
H.2074



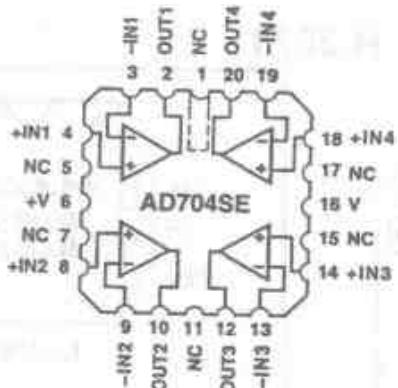
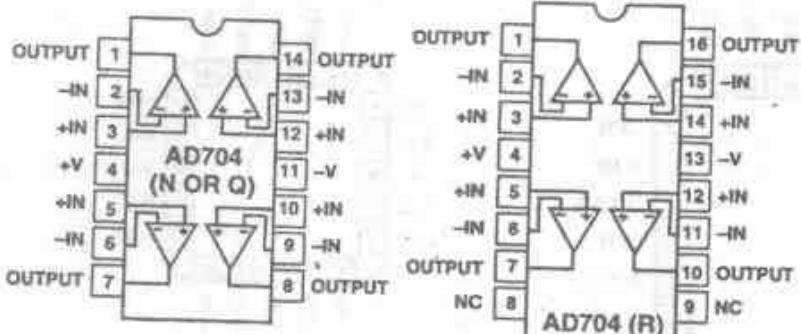
H.2075



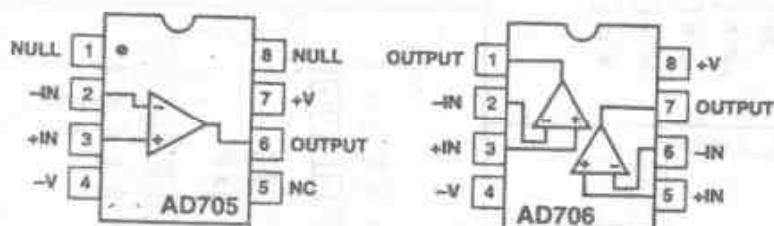
H.2076



H.2077



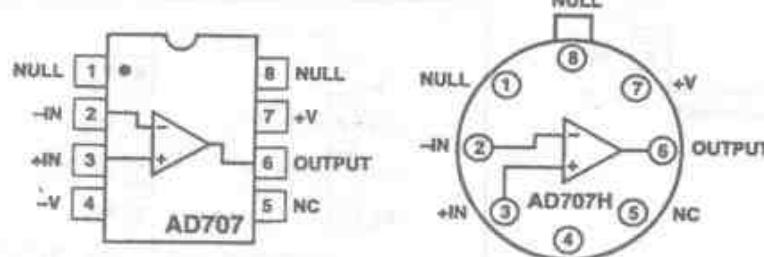
H.2078



NC = NO CONNECT

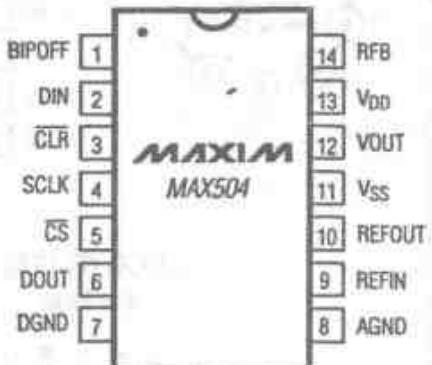


H.2080



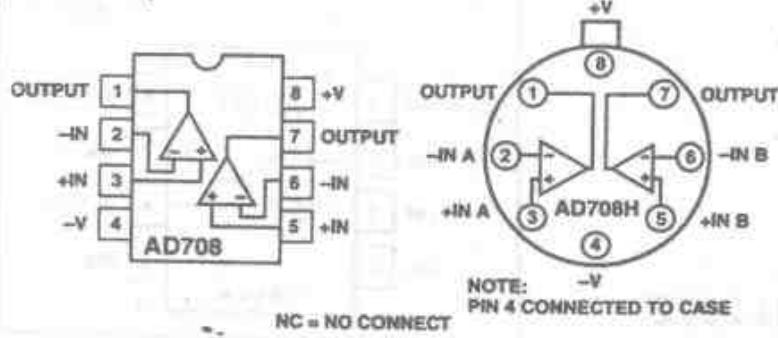
NOTE: PIN 4 CONNECTED TO CASE

H.2079



DIP/SO

H.2081

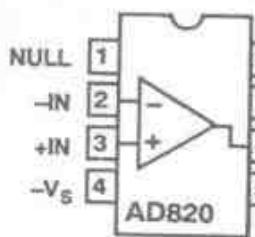


NC = NO CONNECT



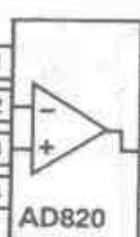
DIP/SO

**8-Pin  
Plastic Mini-DIP**



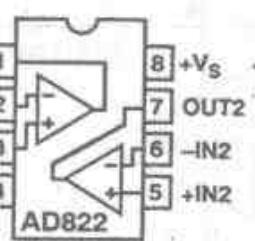
NC = NO CONNECT

**8-Pin  
SOIC**

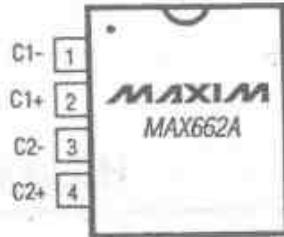


NC = NO CONNECT

**8-Pin Plastic DIP,  
Cerdip and SOIC**



H.2082



C1- 1 SHDN  
C1+ 2 GND  
C2- 3 VOUT  
C2+ 4 VCC

**MAXIM**  
MAX662A

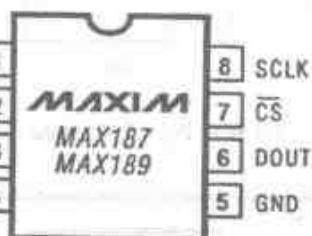
H.2083



DD 1 IN  
OUT 2 LBO  
LBI 3 SET  
GND 4 SHDN

**MAXIM**  
MAX667

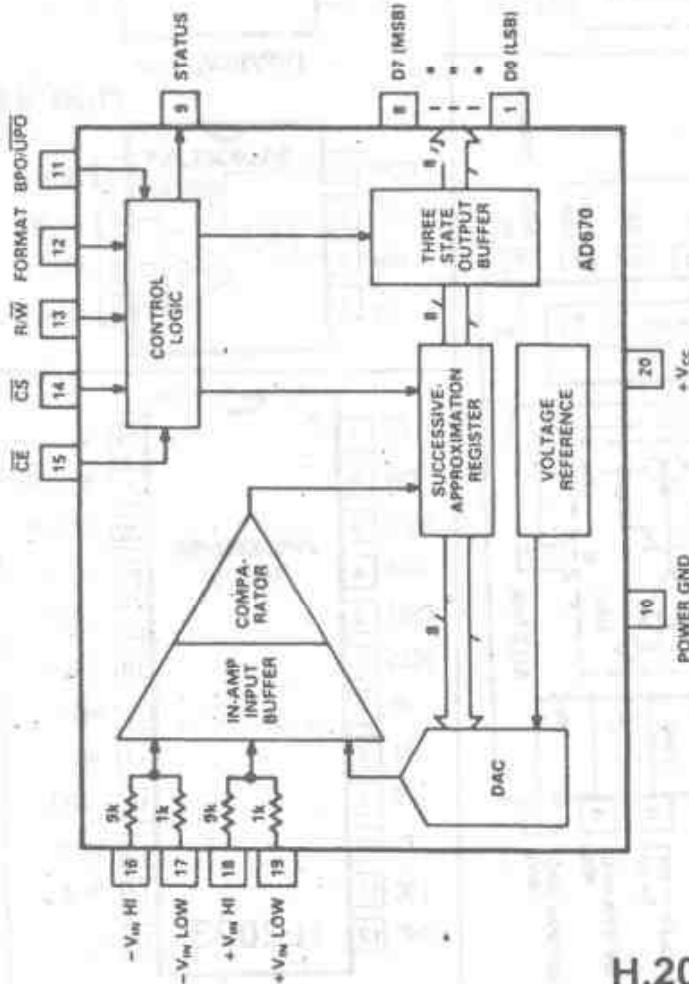
H.2084



VDD 1 SCLK  
AIN 2 CS  
SHDN 3 DOUT  
REF 4 GND

**MAXIM**  
MAX187  
MAX189

H.2085

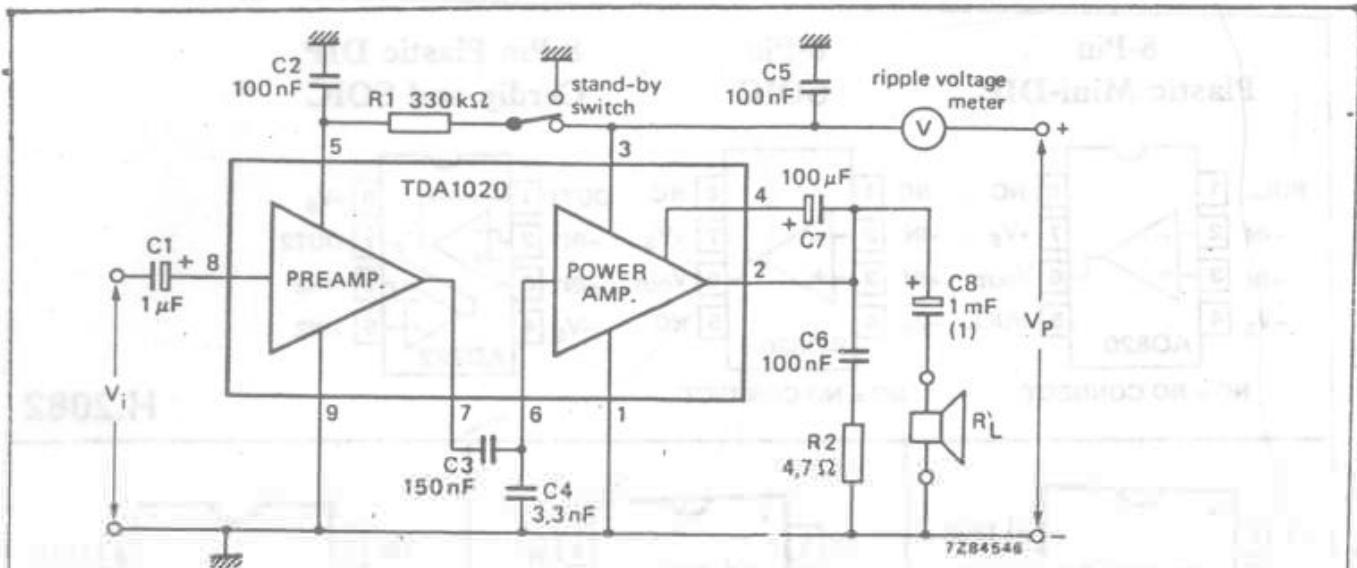


H.2086



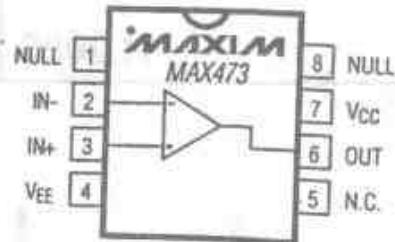
H.2087



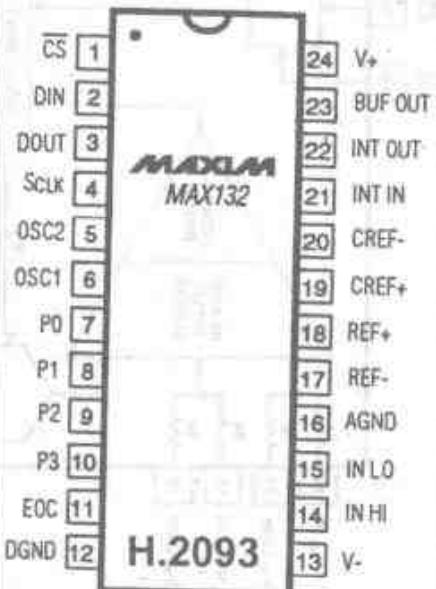
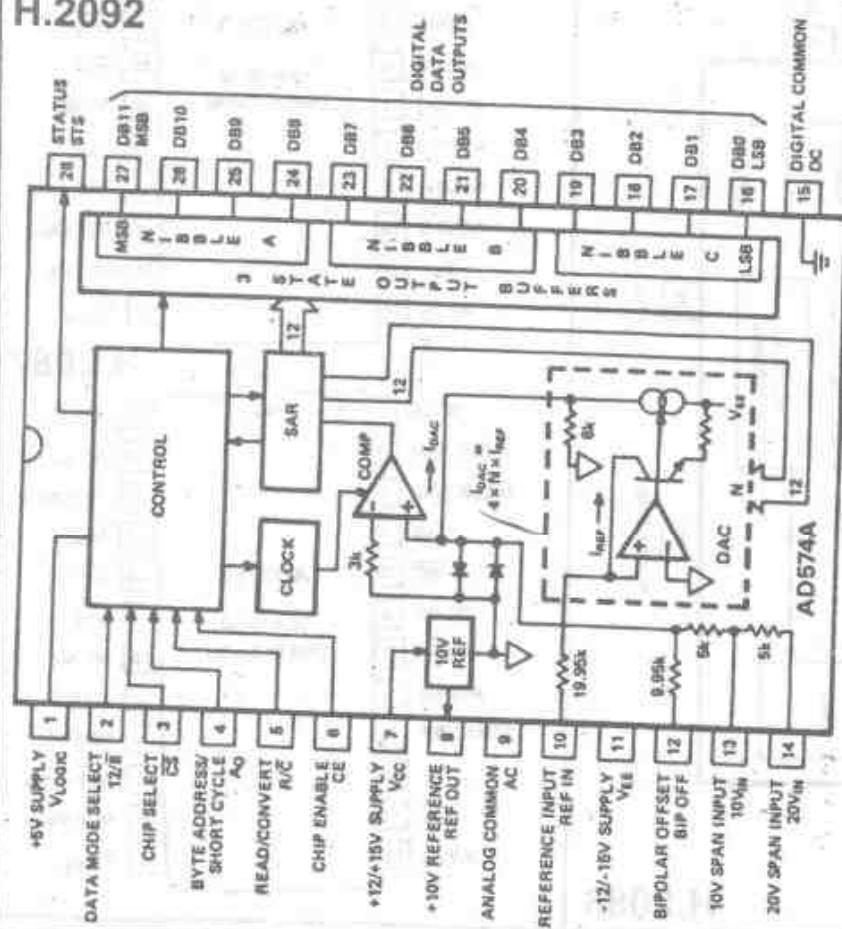


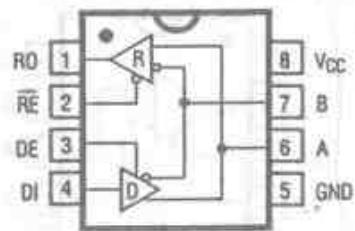
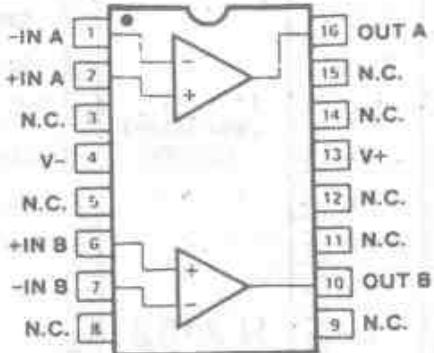
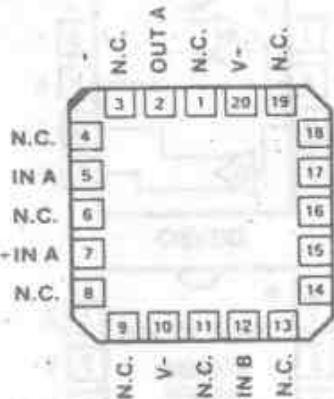
(1) With  $R_L = 2 \Omega$ , preferred value of  $C_8 = 2200 \mu F$ .

H.2088



H.2092





LCC  
(RC-Suffix)

**OP290** 16-PIN SOL  
(S-Suffix)

H.2095



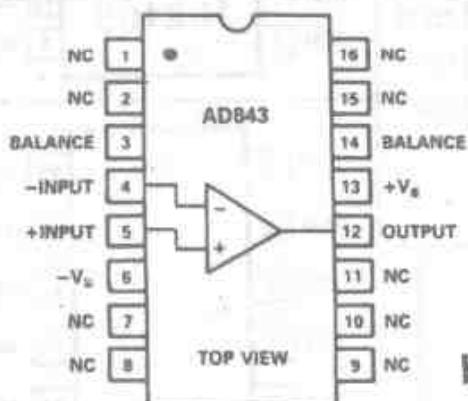
H.2094



H.2096

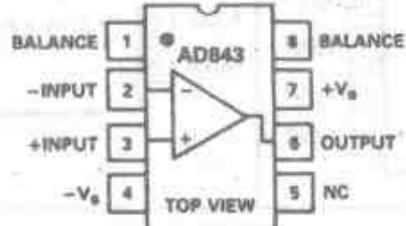


H.2097



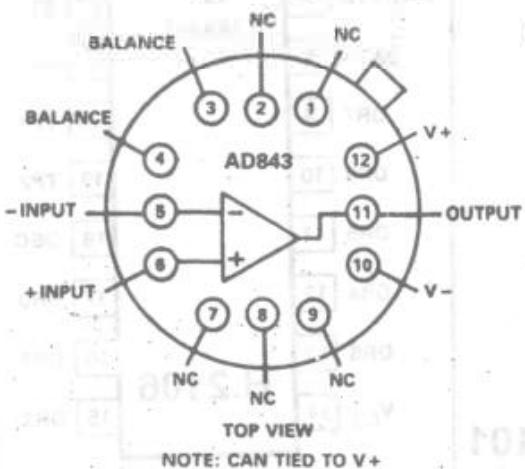
NC = NO CONNECT

LCC (E-20A) Package

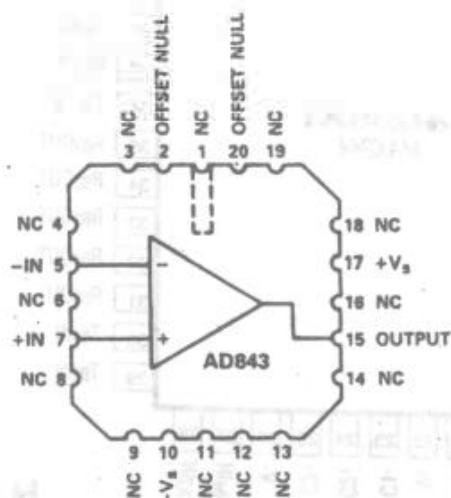


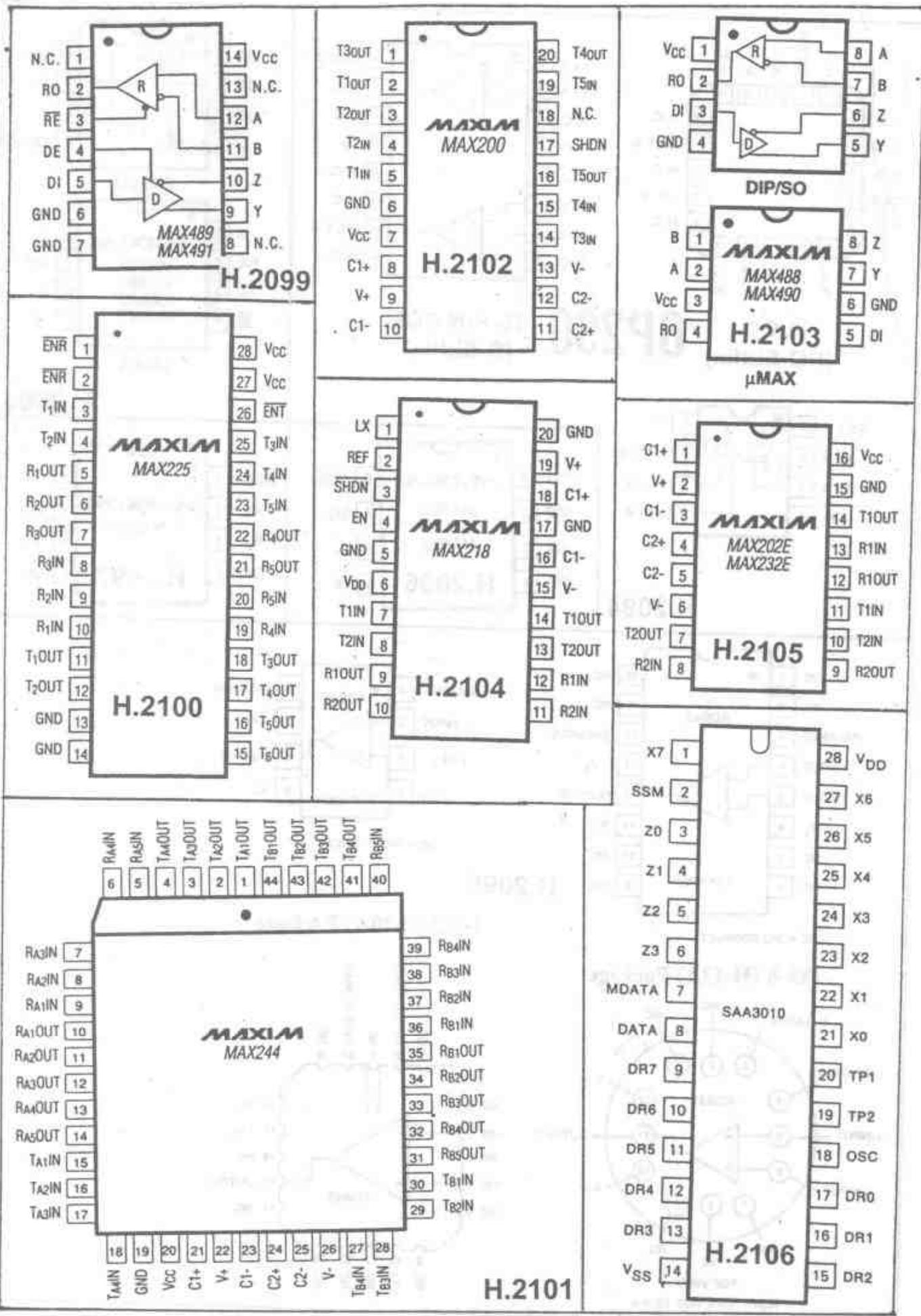
NC = NO CONNECT

. TO-8 (H-12A) Package



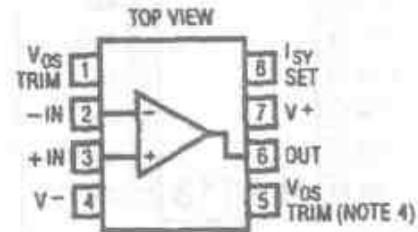
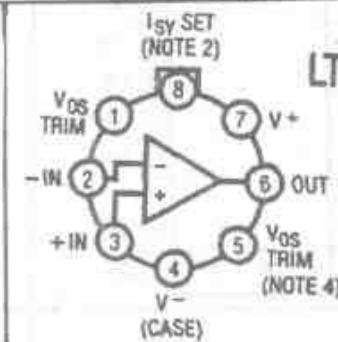
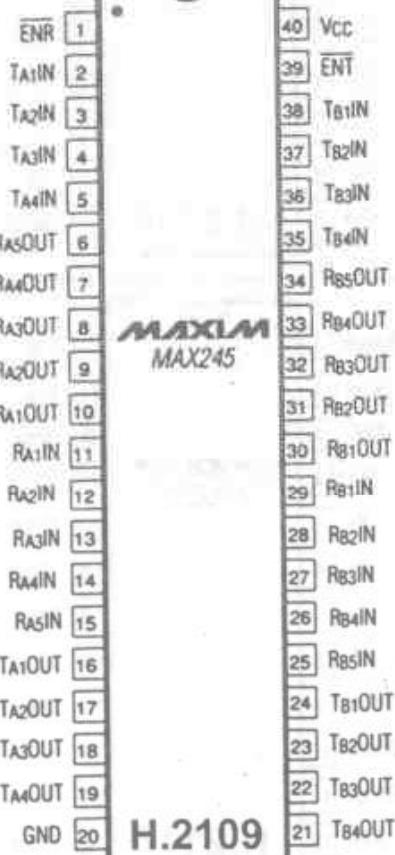
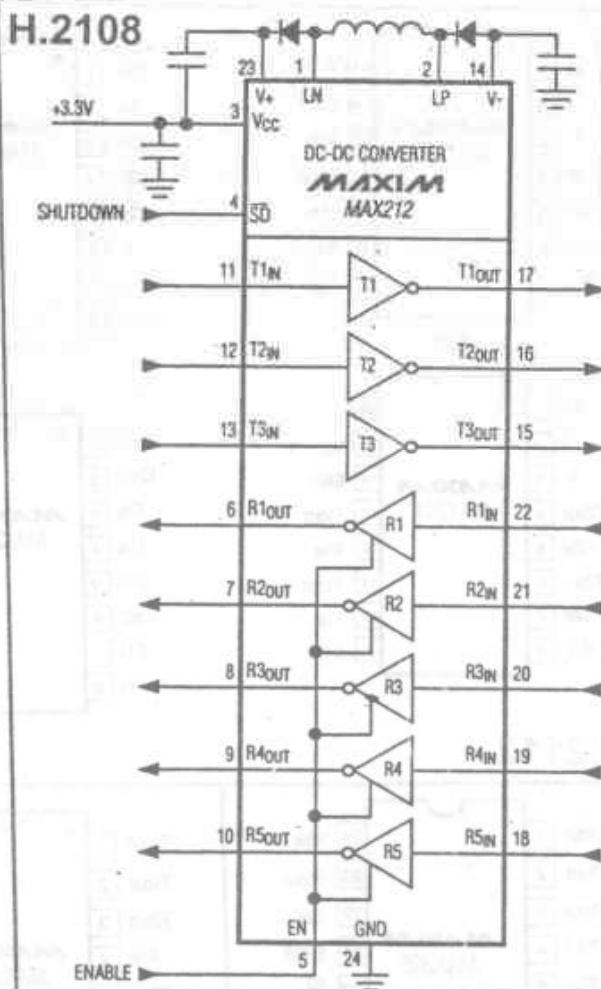
NOTE: CAN TIE TO V+





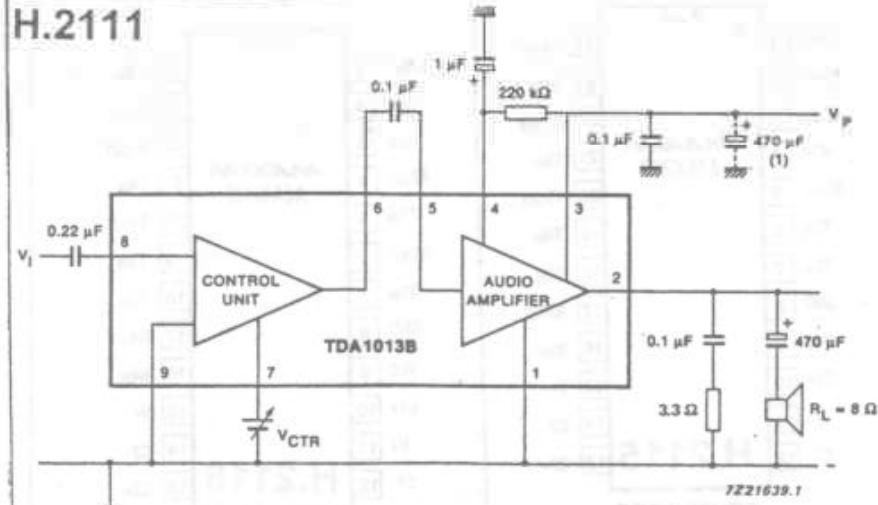


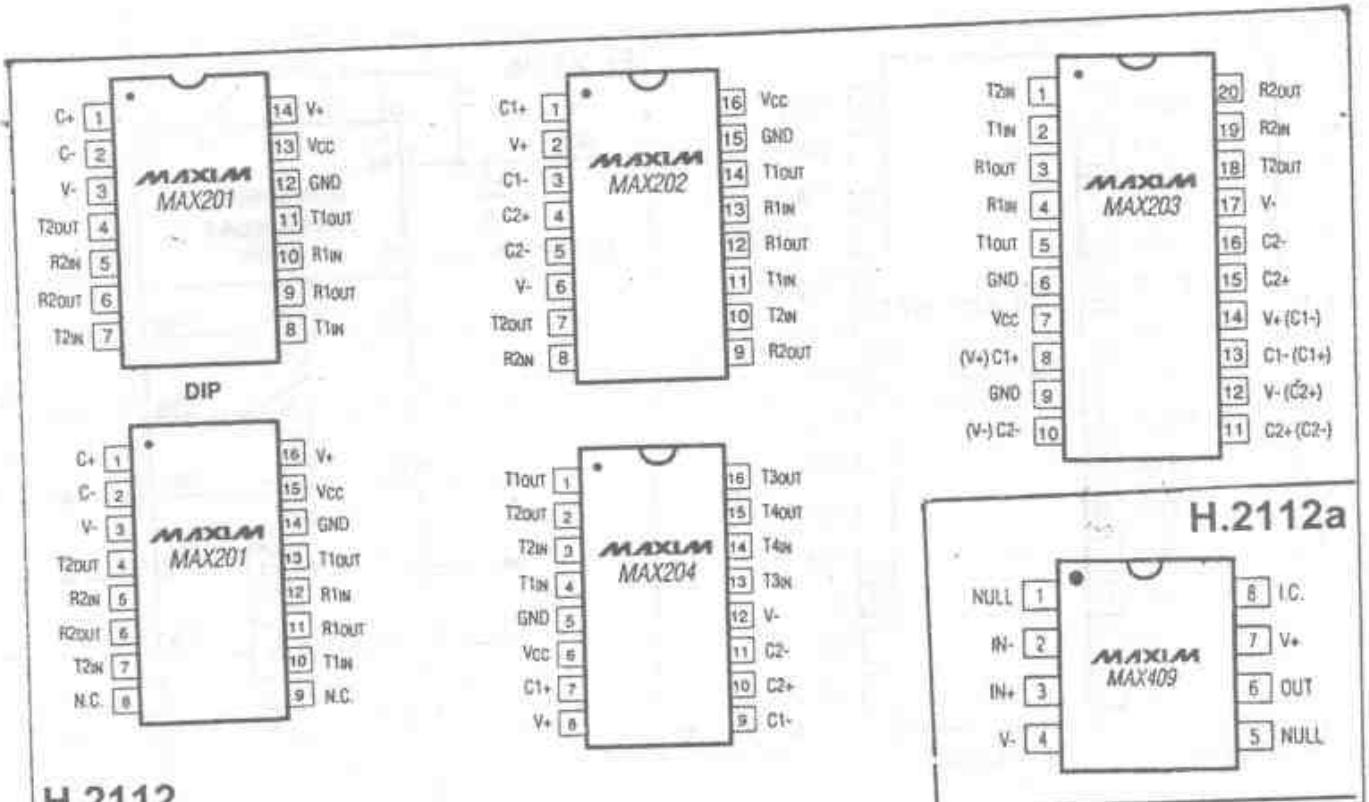
H.2107



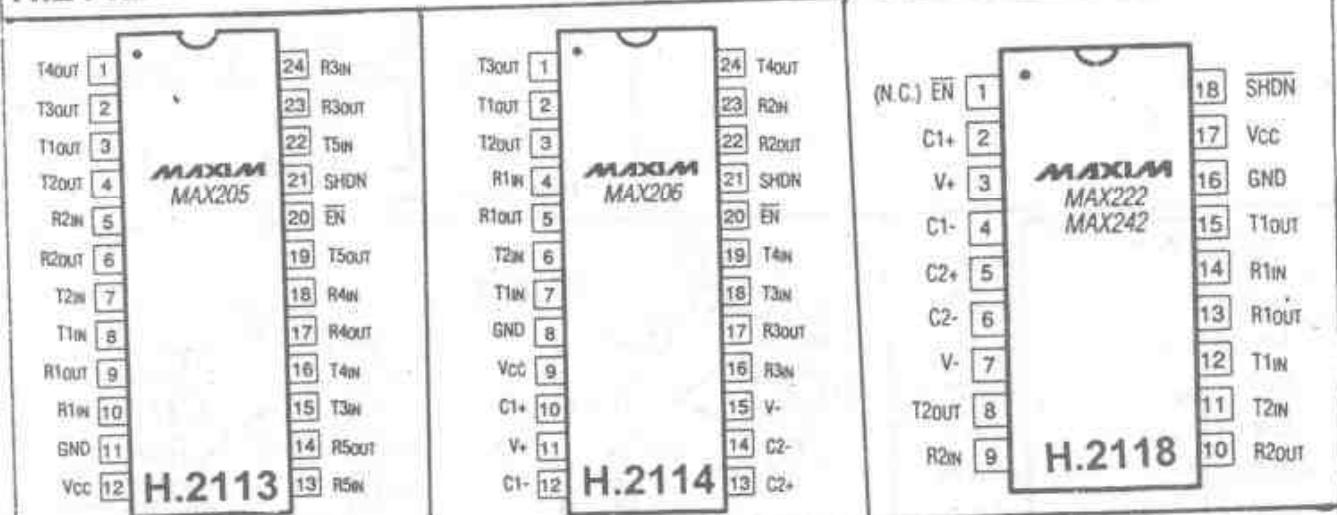
H.2110

H.2111





H.2112

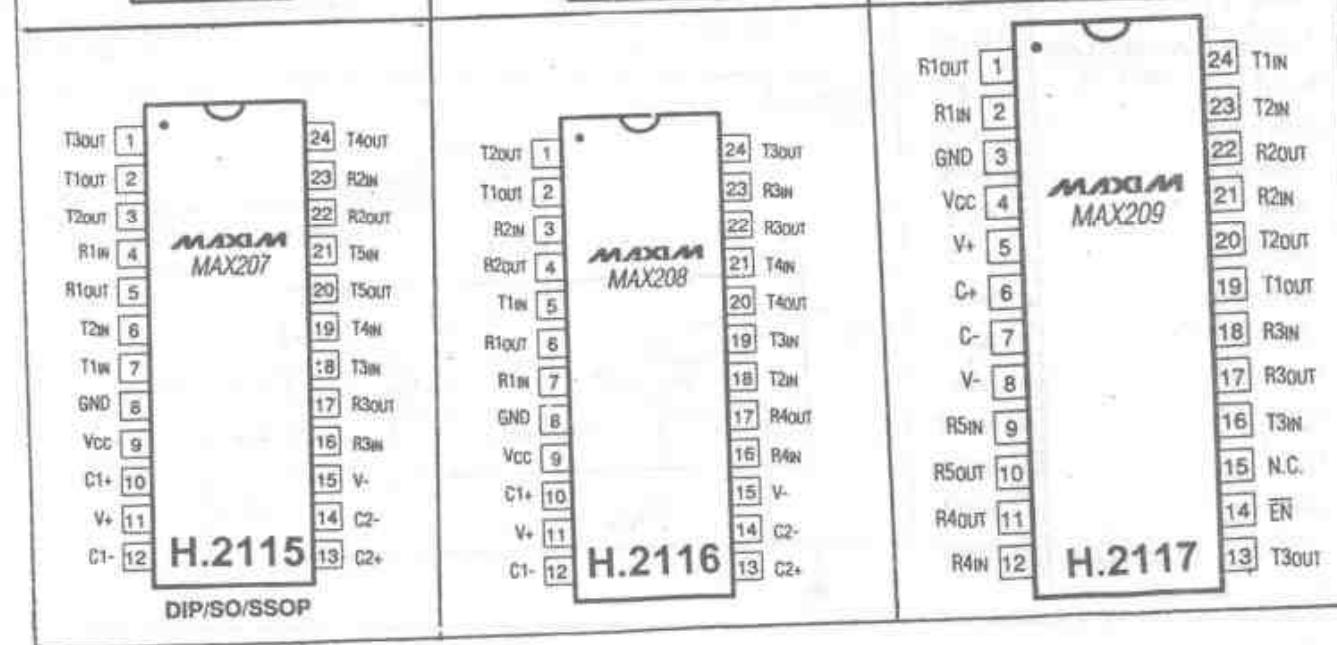


H.2113

H.2114

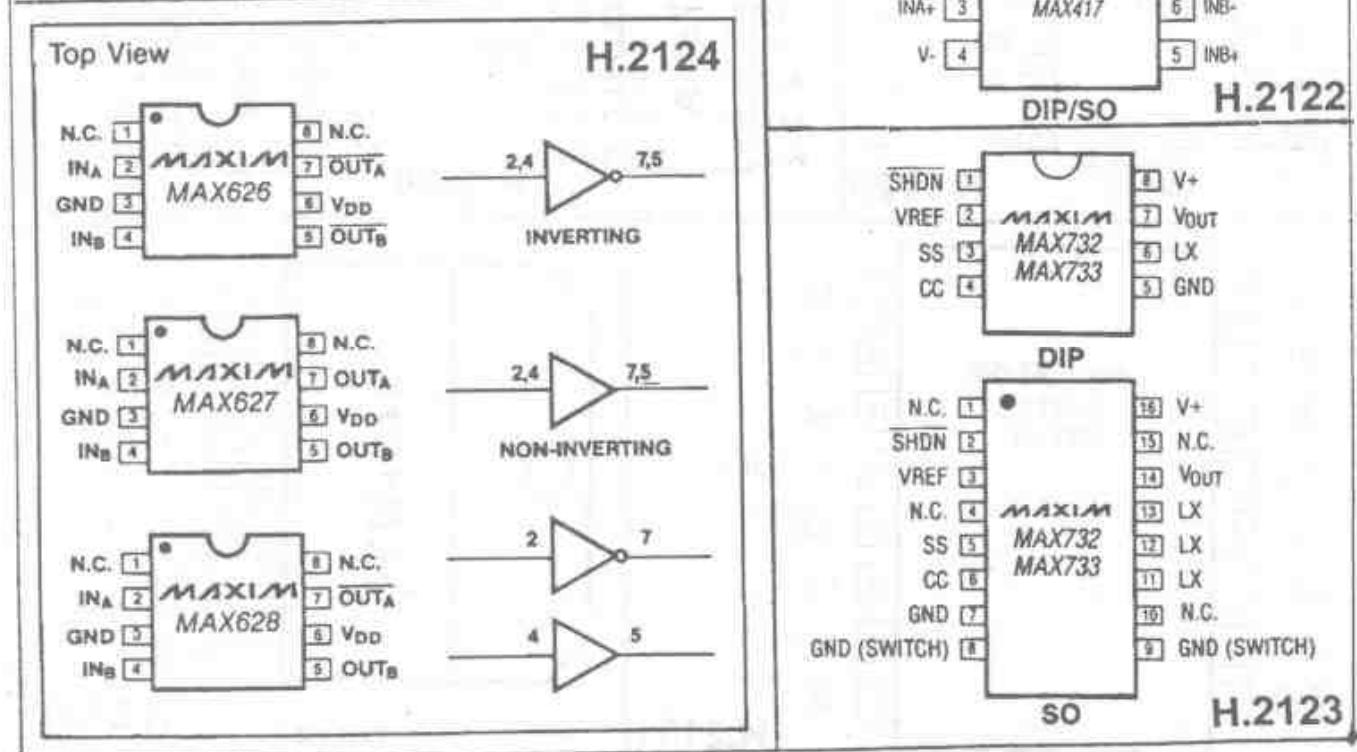
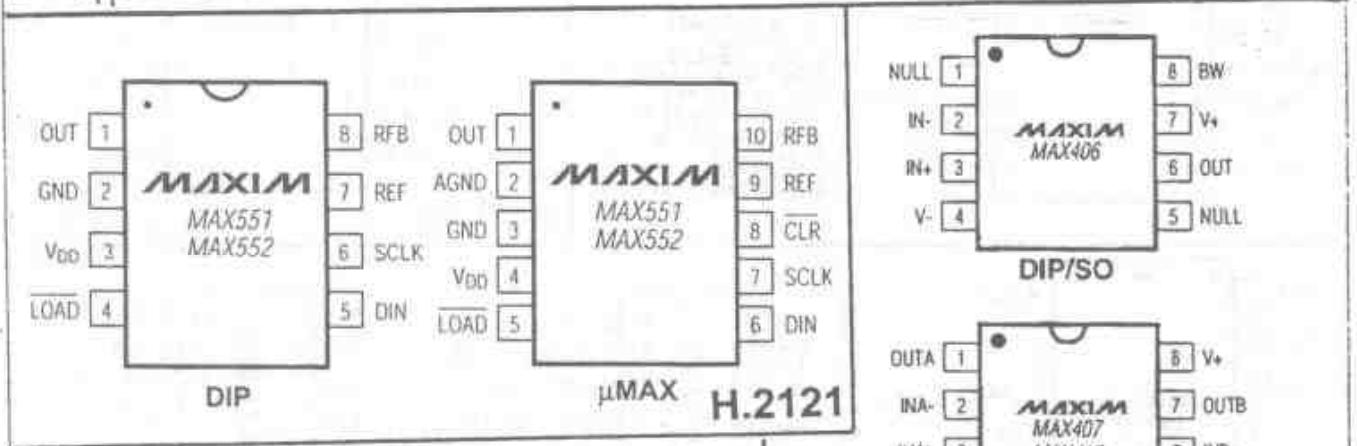
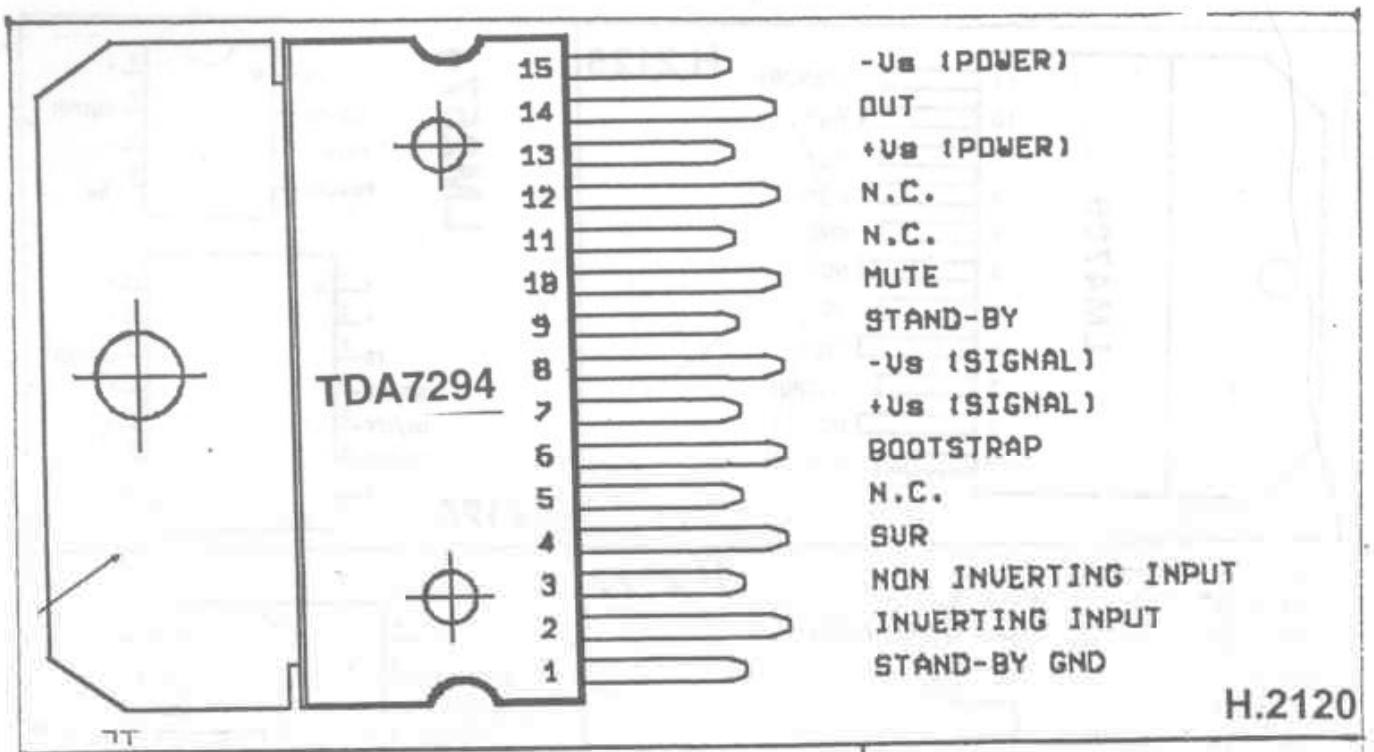


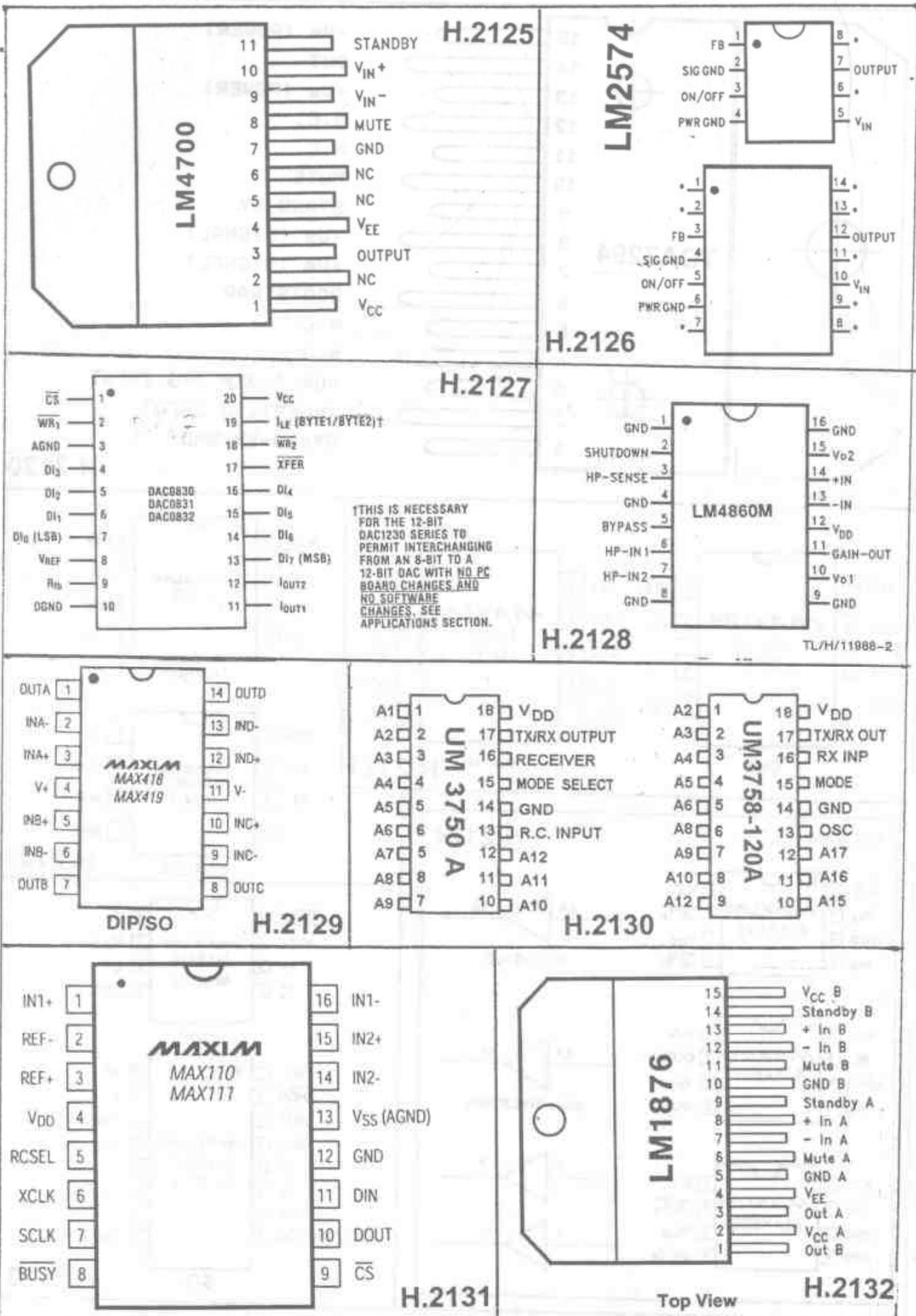
H.2117

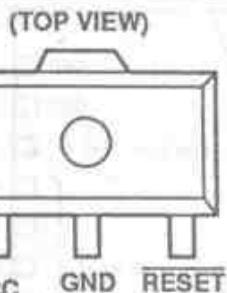
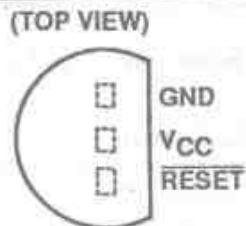
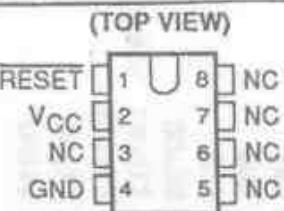


H.2115

H.2116

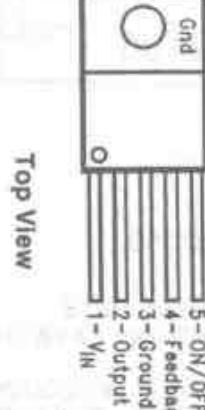
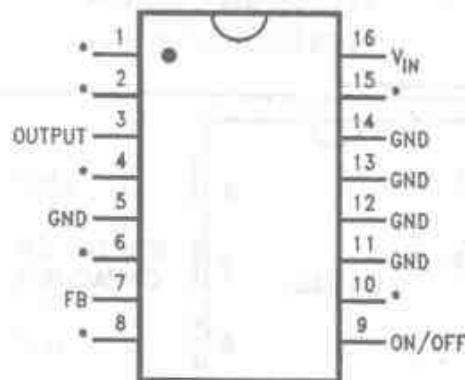




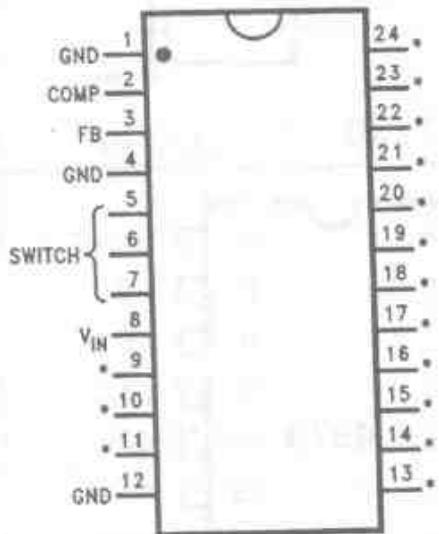


H.2133

GND is in electrical contact with the tab.



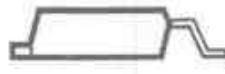
CASE IS GROUND



TAB IS GND

COMP	1
FEEDBACK	2
GND	3
SWITCH	4
V <sub>IN</sub>	5

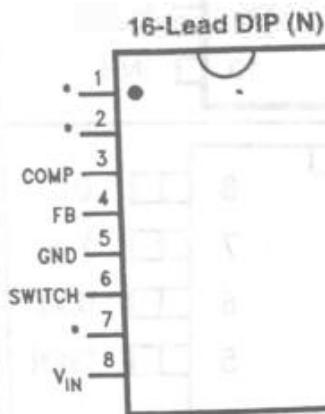
Top View



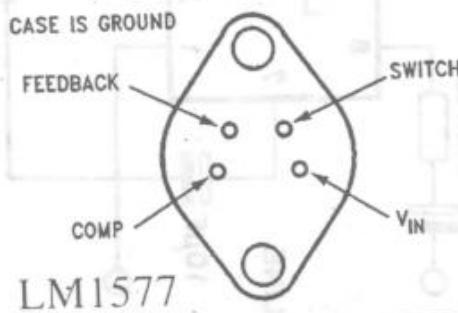
Side View

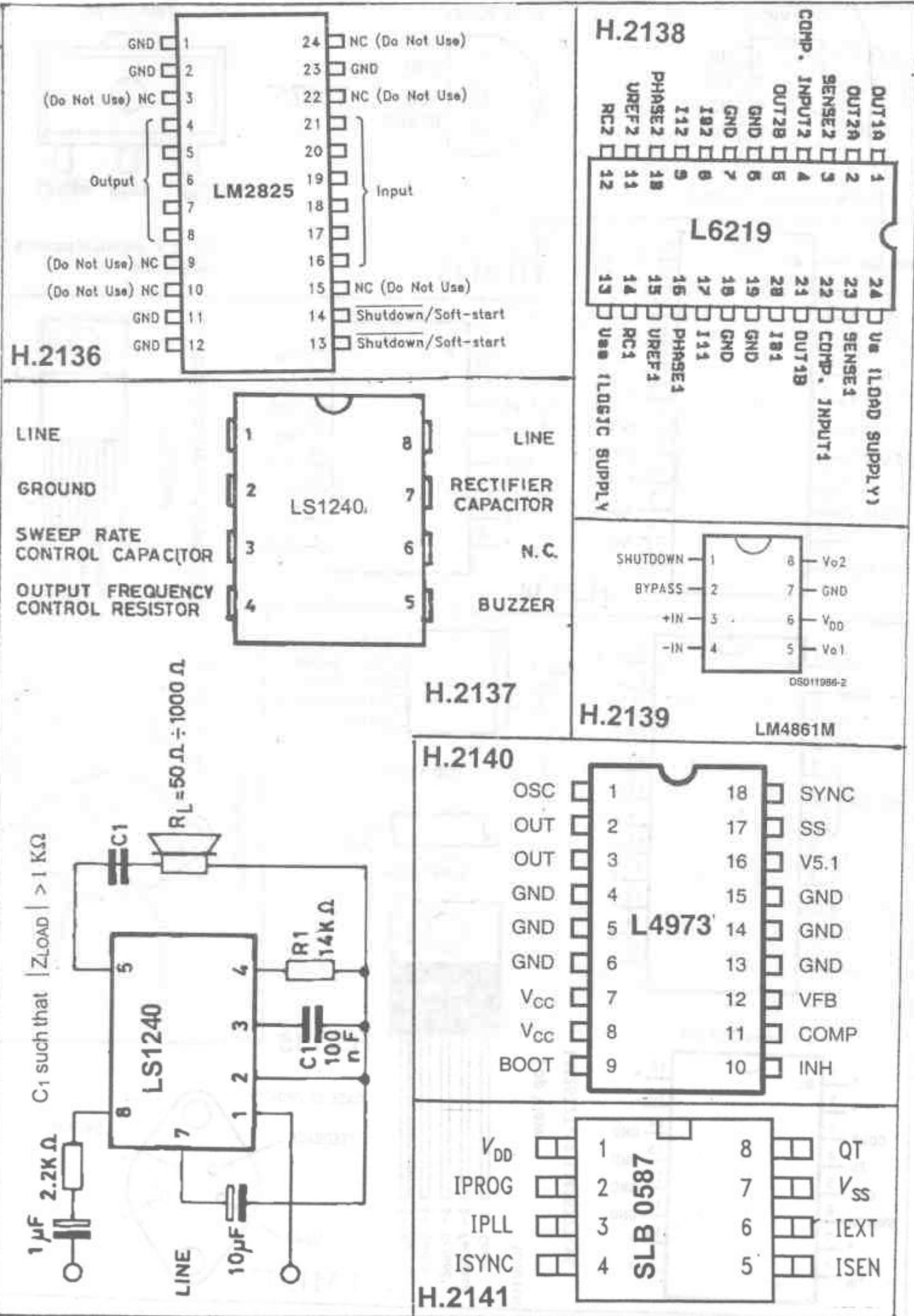


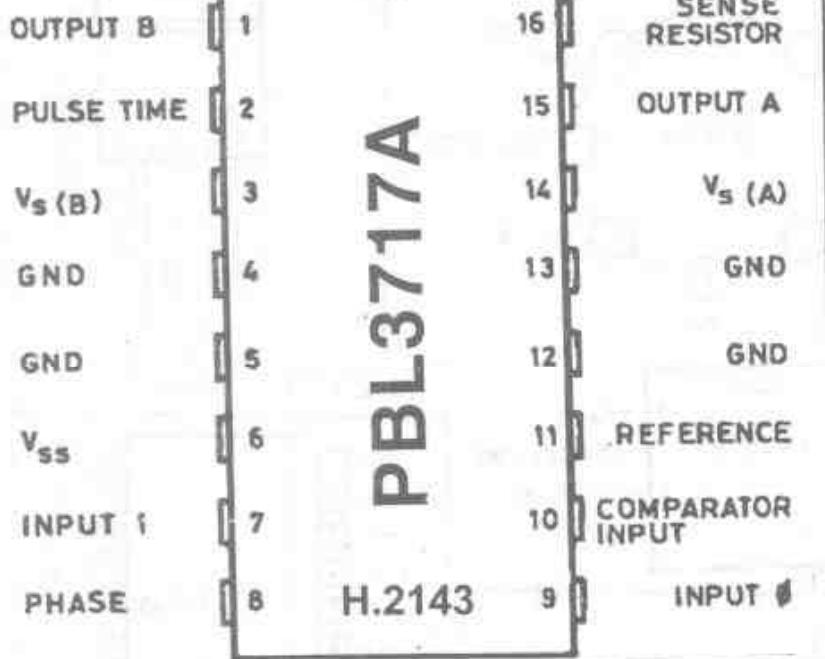
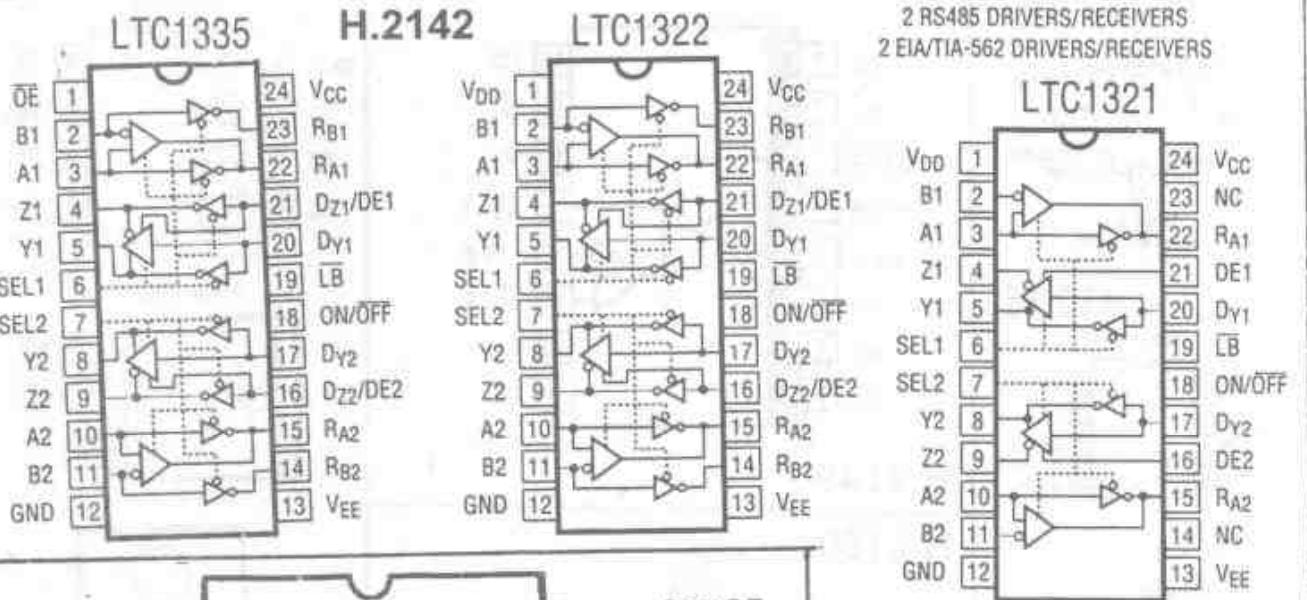
H.2135



LM2577T-12, LM2577T-15,  
LM1577







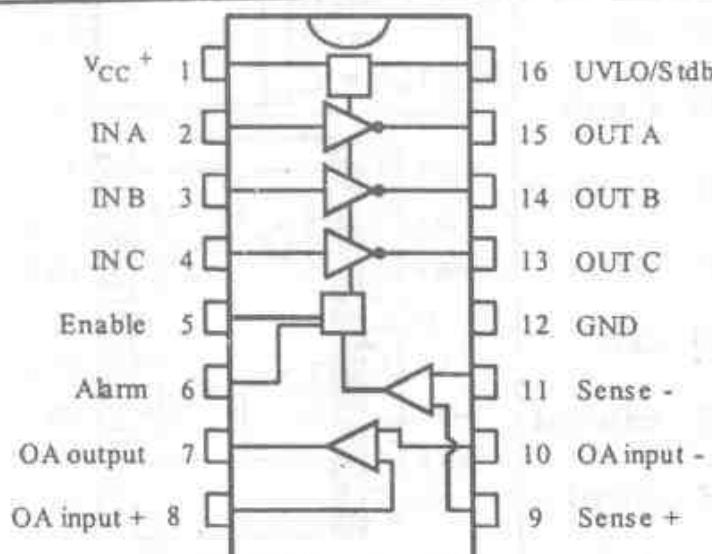
N8 PACKAGE  
8-LEAD PDIP  
S8 PACKAGE  
8-LEAD PLASTIC SO

T<sub>JMAX</sub> = 110°C, θ<sub>JA</sub> = 130°C/W (N8)  
T<sub>JMAX</sub> = 110°C, θ<sub>JA</sub> = 200°C/W (S8)

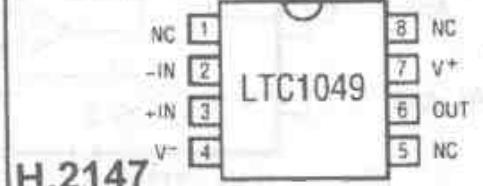
**H.2144**



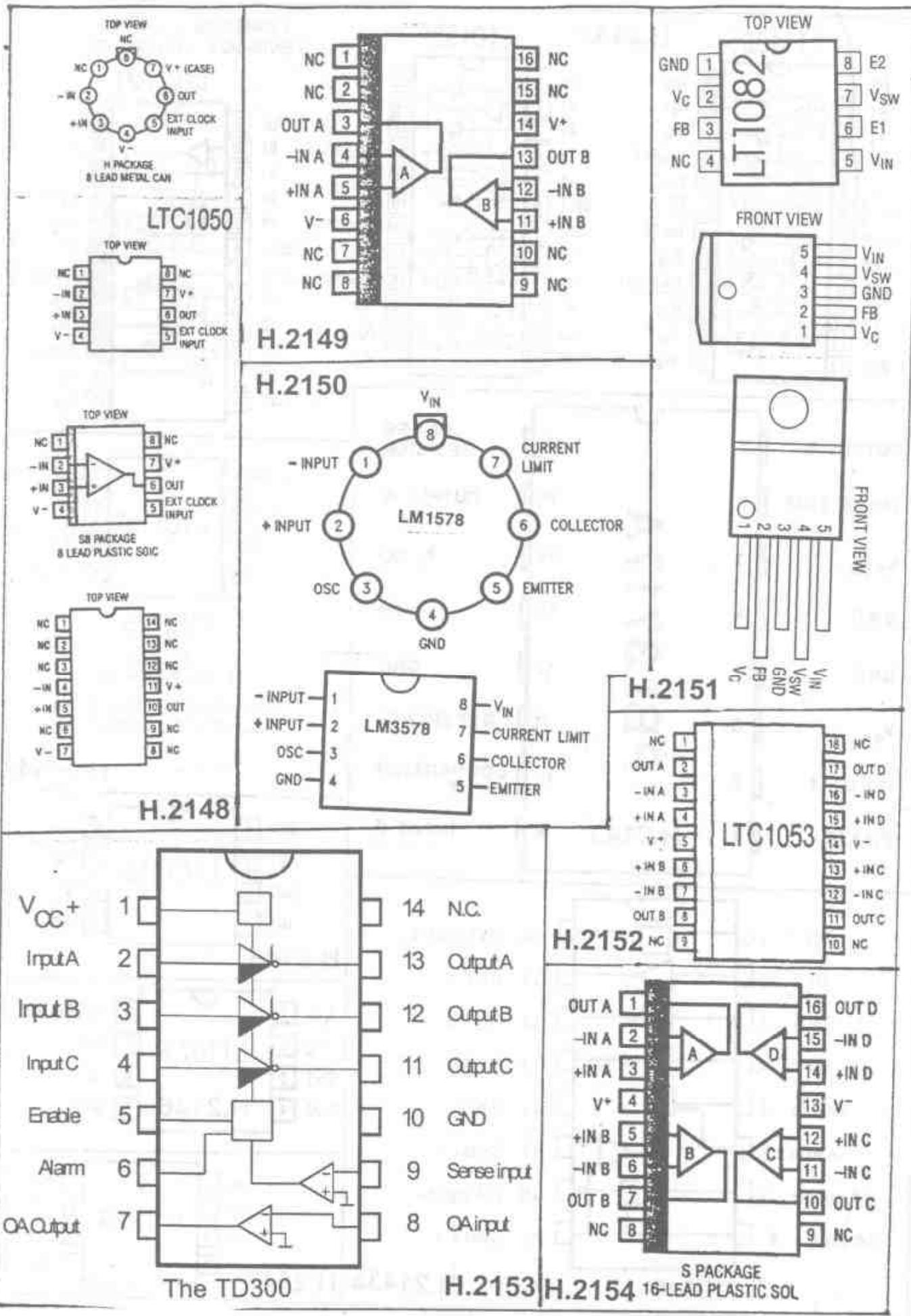
**H.2145**

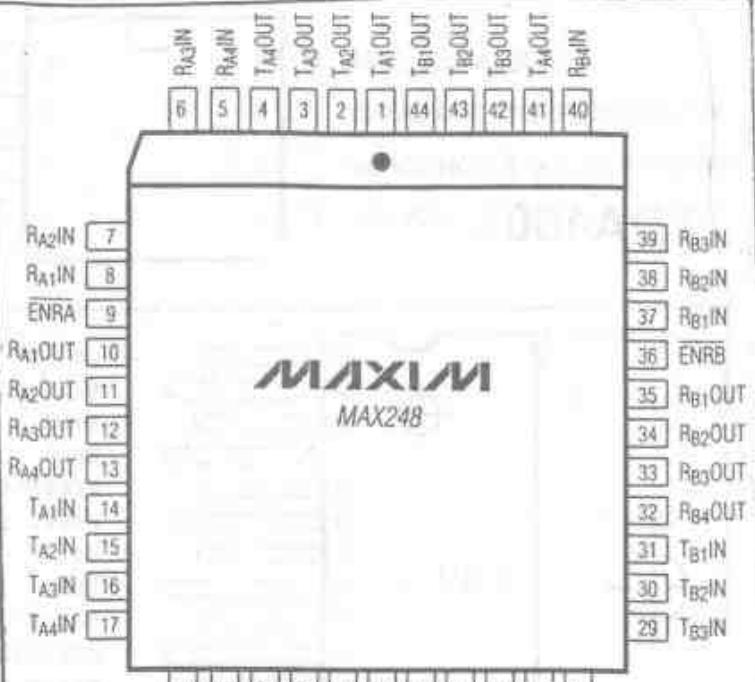
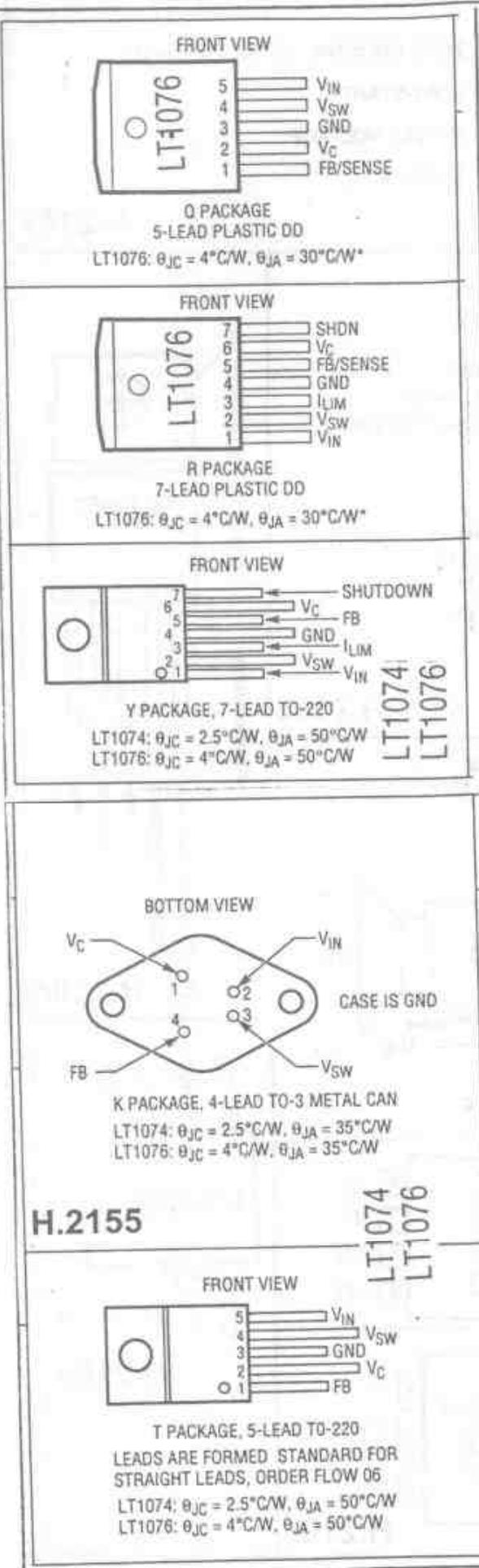


**H.2143a**



**H.2147**





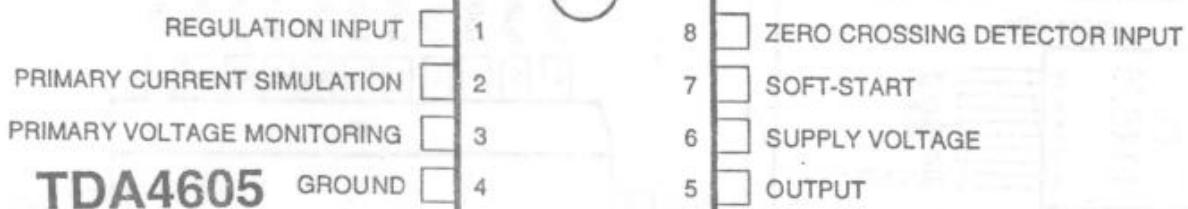
**H.2158**

BOOTSTRAP	<input type="checkbox"/>	1	20	<input type="checkbox"/> OUTPUT
RESET DELAY	<input type="checkbox"/>	2	19	<input type="checkbox"/> N.C.
RESET OUT	<input type="checkbox"/>	3	18	<input type="checkbox"/> C OSC
P.FAIL INPUT	<input type="checkbox"/>	4 L4972	17	<input type="checkbox"/> R OSC
GND	<input type="checkbox"/>	5	16	<input type="checkbox"/> GND
GND	<input type="checkbox"/>	6	15	<input type="checkbox"/> GND
FREQ. COMP.	<input type="checkbox"/>	7	14	<input type="checkbox"/> Ustart
SOFT START	<input type="checkbox"/>	8	13	<input type="checkbox"/> Uref
FEEDBACK IN.	<input type="checkbox"/>	9	12	<input type="checkbox"/> N.C.
SYNC INPUT	<input type="checkbox"/>	10	11	<input type="checkbox"/> VI

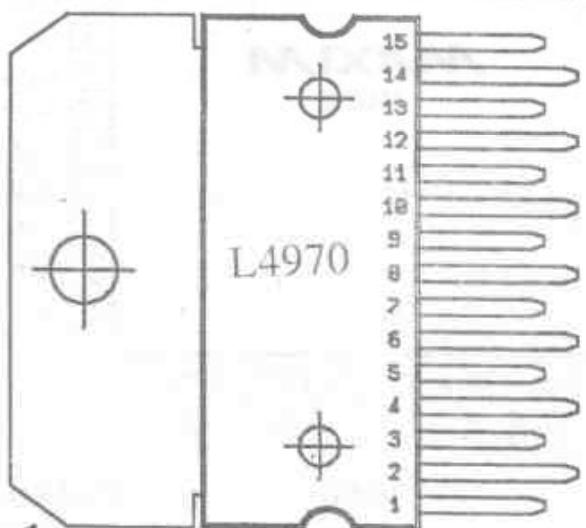
**H.2157**

Us	<input type="checkbox"/>	1	28	<input type="checkbox"/> V <sub>C</sub>
Ucp	<input type="checkbox"/>	2	19	<input type="checkbox"/> Upump
O <sub>2</sub>	<input type="checkbox"/>	3	18	<input type="checkbox"/> O <sub>3</sub>
O <sub>1</sub>	<input type="checkbox"/>	4	17	<input type="checkbox"/> O <sub>4</sub>
GND	<input type="checkbox"/>	5 L6374	16	<input type="checkbox"/> GND
GND	<input type="checkbox"/>	6	15	<input type="checkbox"/> GND
I <sub>1</sub>	<input type="checkbox"/>	7	14	<input type="checkbox"/> Diag
I <sub>2</sub>	<input type="checkbox"/>	8	13	<input type="checkbox"/> C <sub>3</sub>
I <sub>3</sub>	<input type="checkbox"/>	9	12	<input type="checkbox"/> 3st/P <sub>p</sub>
I <sub>4</sub>	<input type="checkbox"/>	10	11	<input type="checkbox"/> Ref

**H.2156**



H.2162



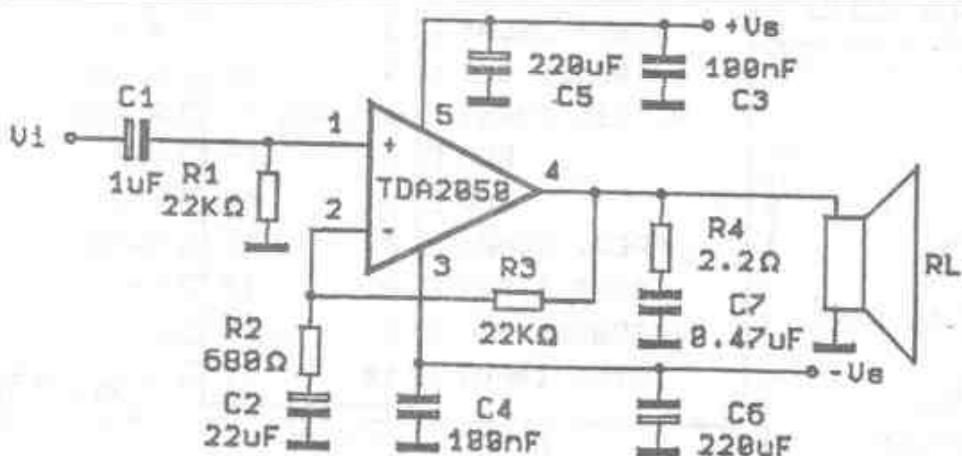
H.2162-37

U<sub>START</sub>  
U<sub>ref</sub> 5.1V  
SYNC  
SOFT START  
FEEDBACK INPUT  
FREQ. COMPENSATION  
U<sub>I</sub>  
GND  
OUTPUT  
BOOTSTRAP  
RESET DELAY  
RESET OUT  
RESET INPUT  
C<sub>osc</sub>  
R<sub>osc</sub>

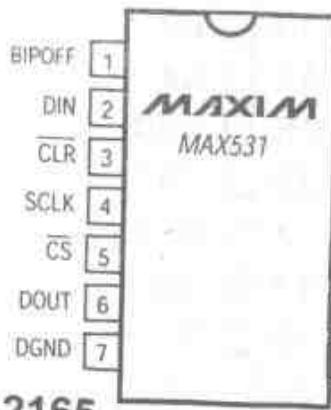


Tab connected to pin 3

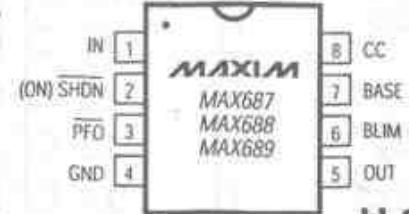
H.2163



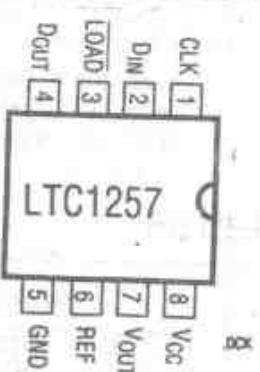
H.2164



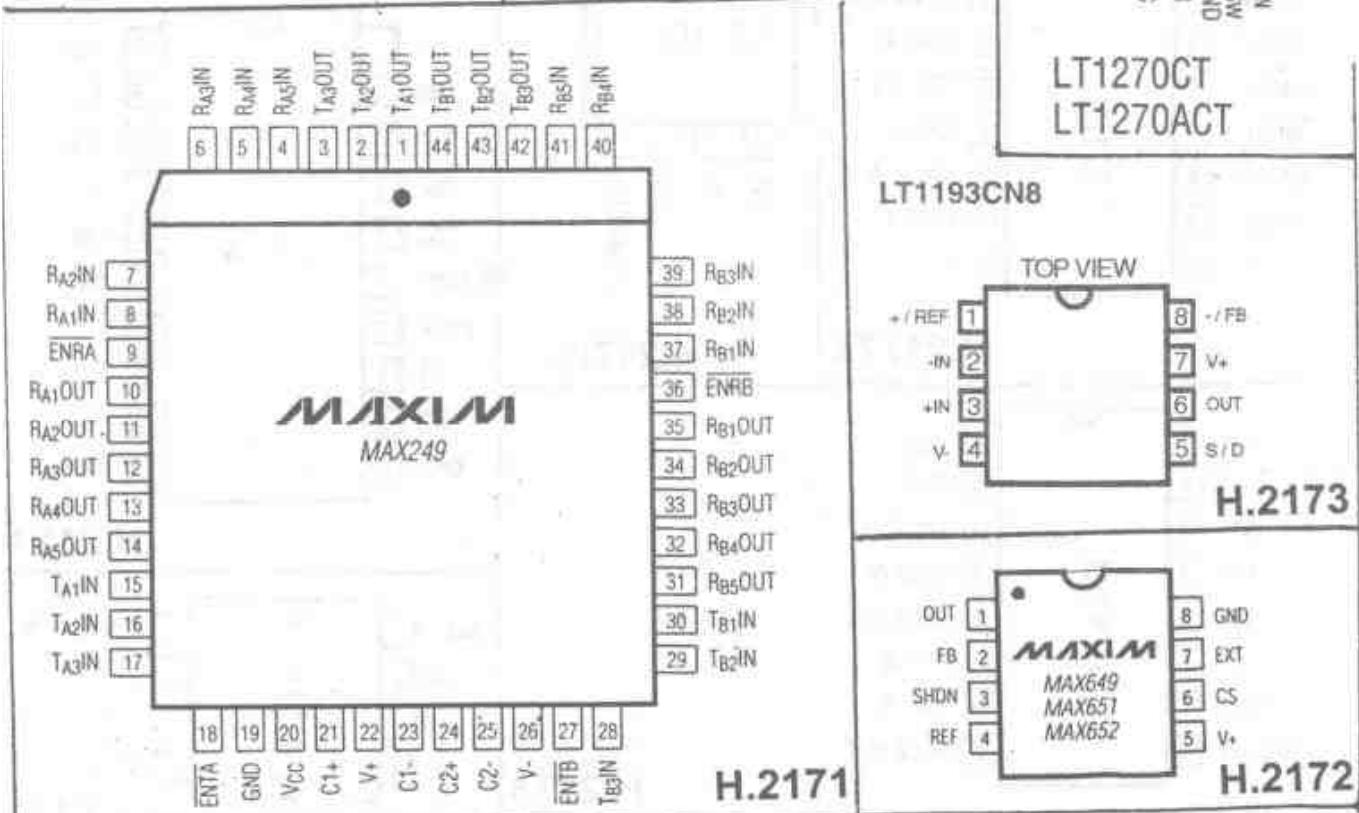
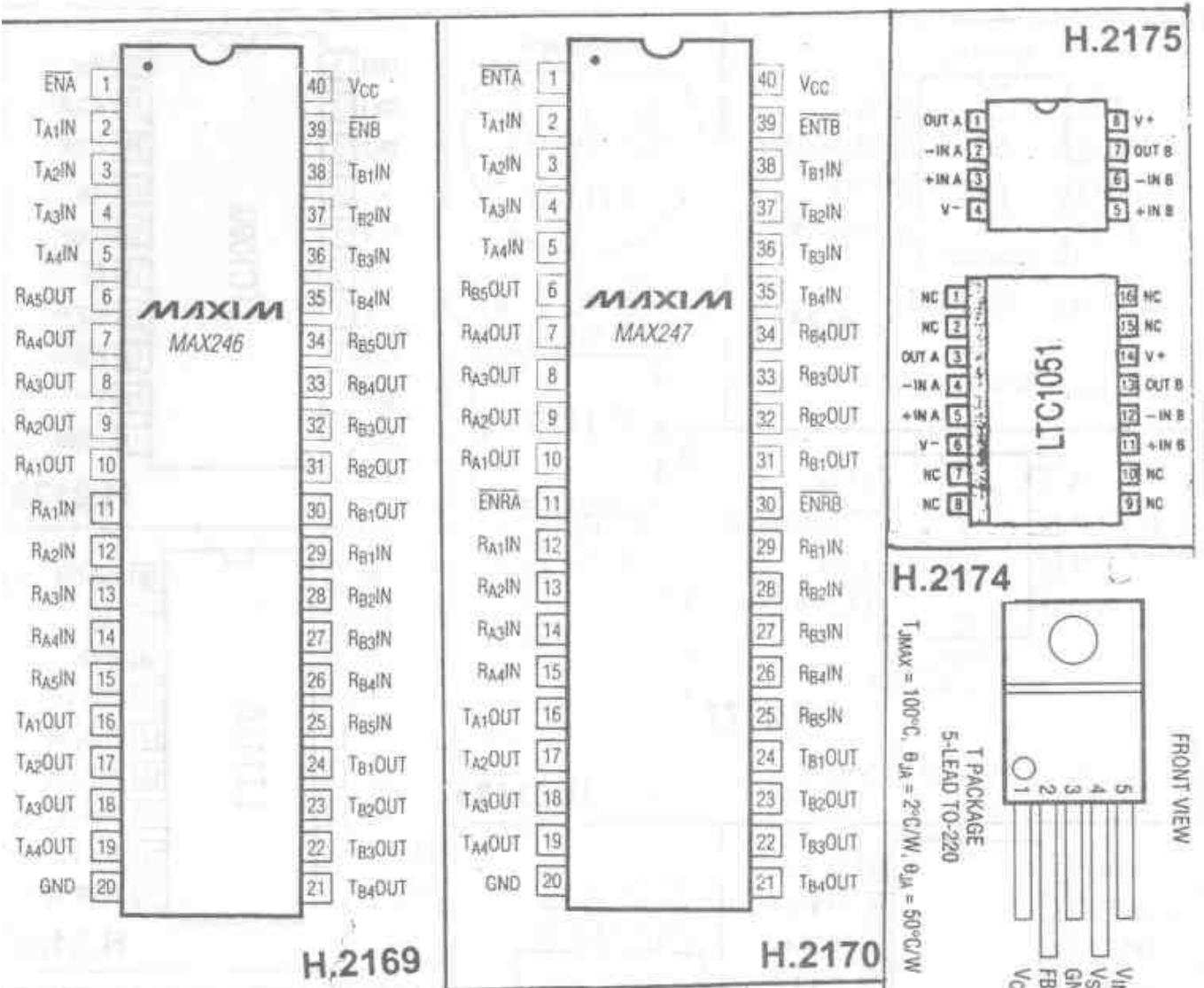
H.2165

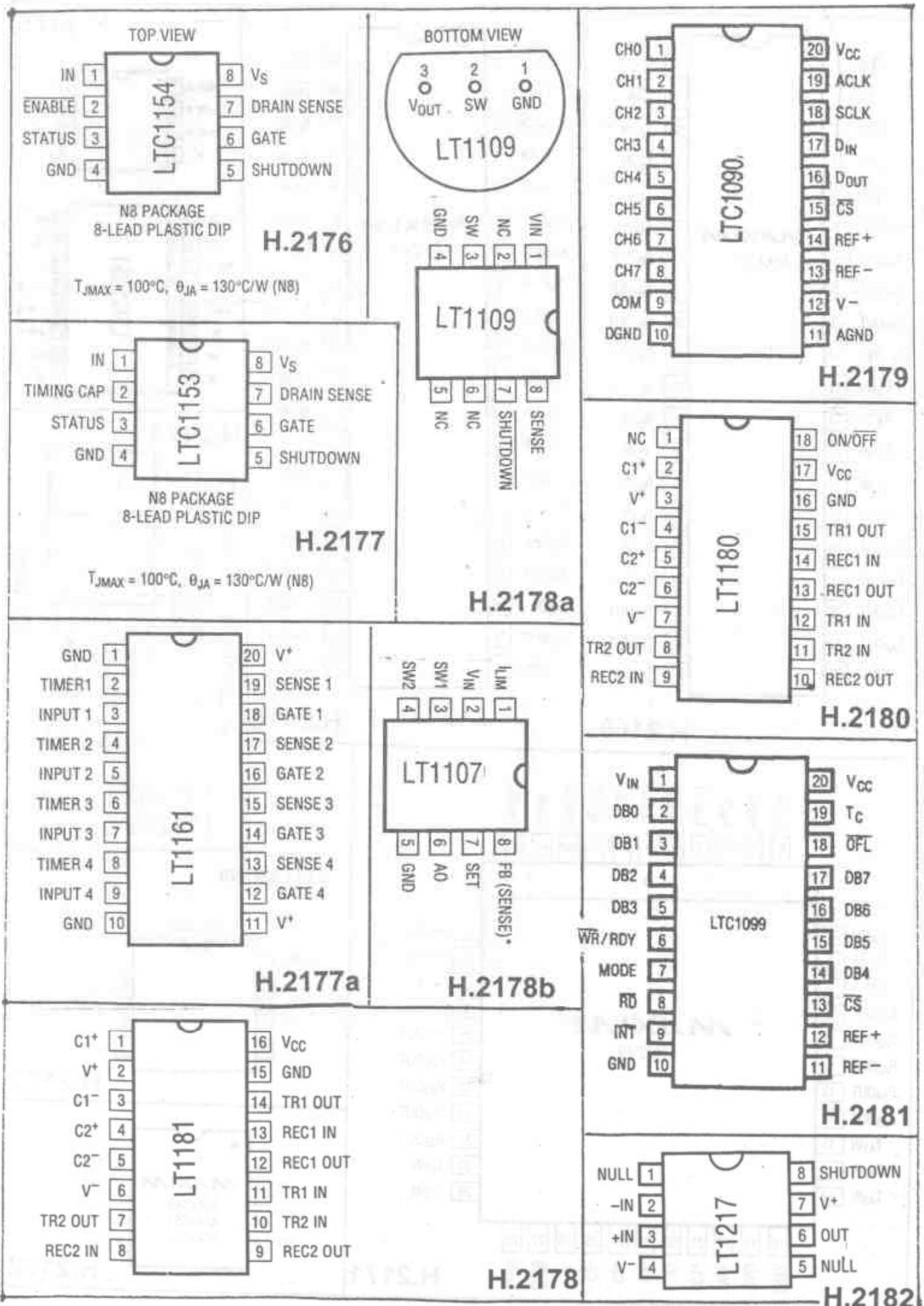


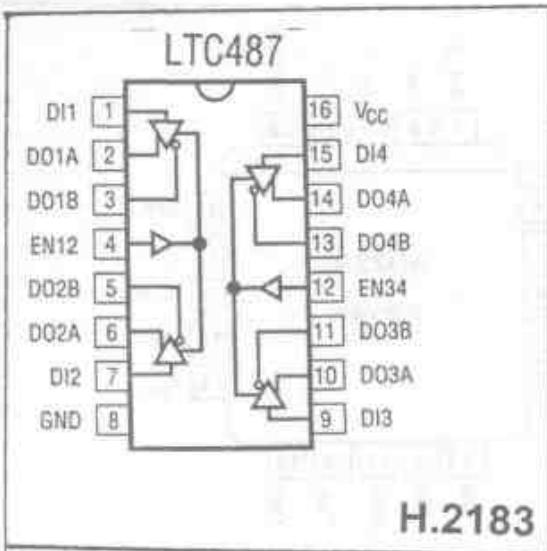
H.2166



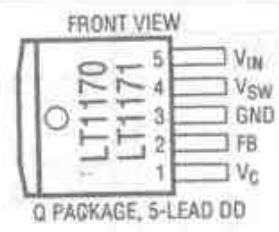
H.2168





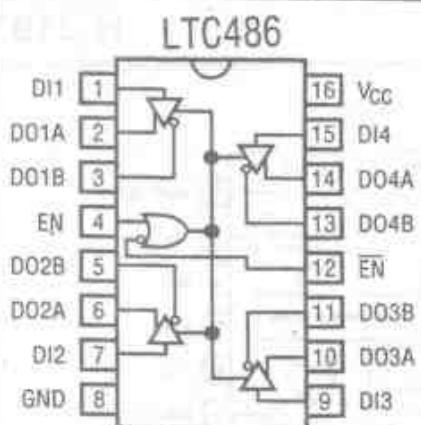


H.2183

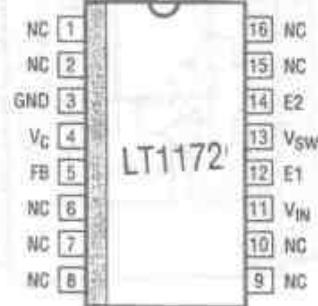
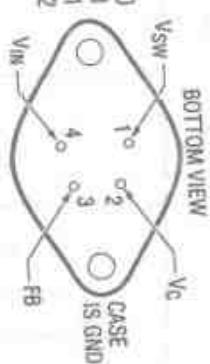


T<sub>JMAX</sub> = 100°C, θ<sub>JA</sub> = \*°C/W

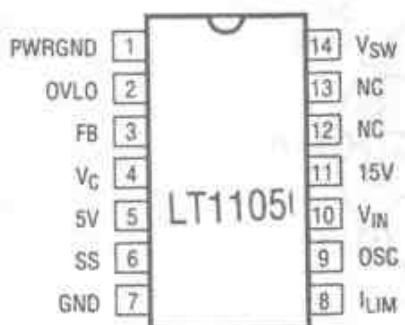
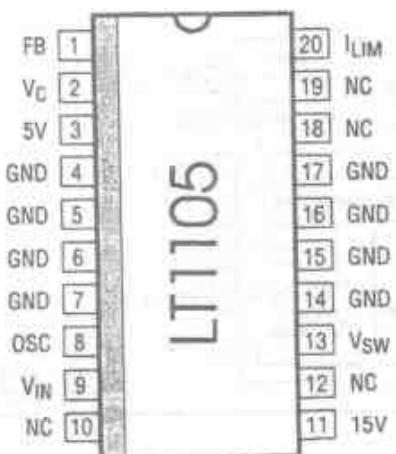
\*θ will vary from approximately 25°C/W with 2.8 sq. in. of 1oz. copper to 45°C/W with 0.20 sq. in. of 1oz. copper. Somewhat lower values can be obtained with additional copper layers in multilayer boards.



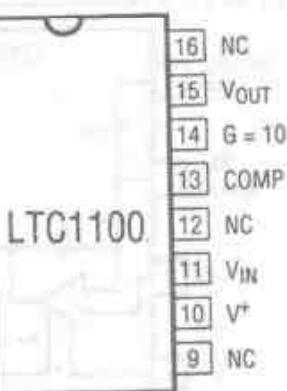
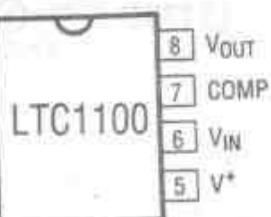
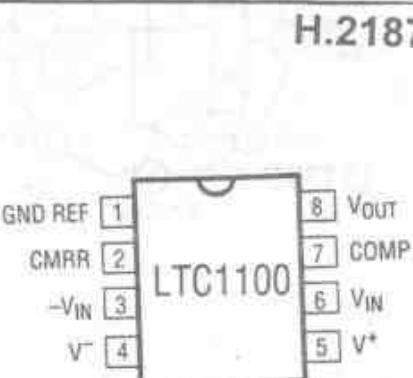
H.2184

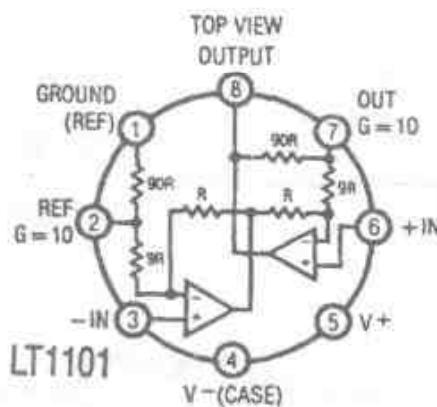
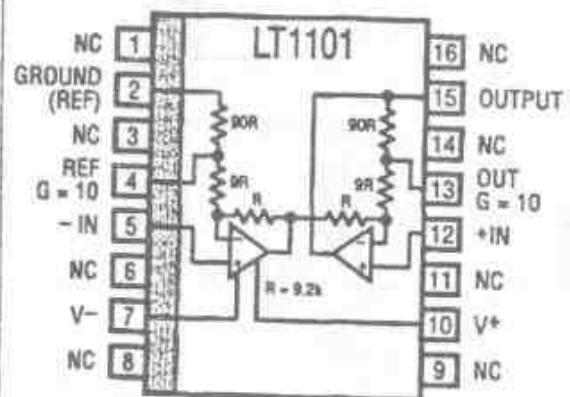
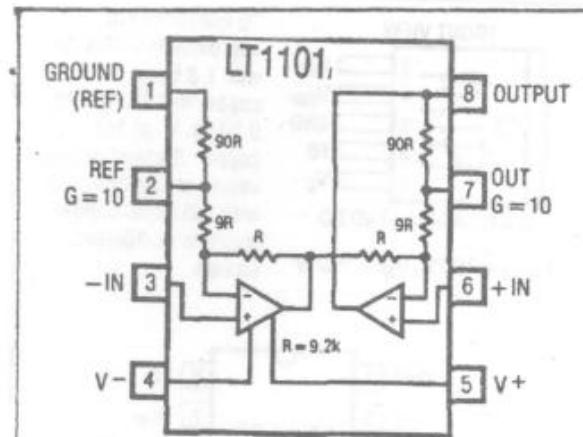


H.2186

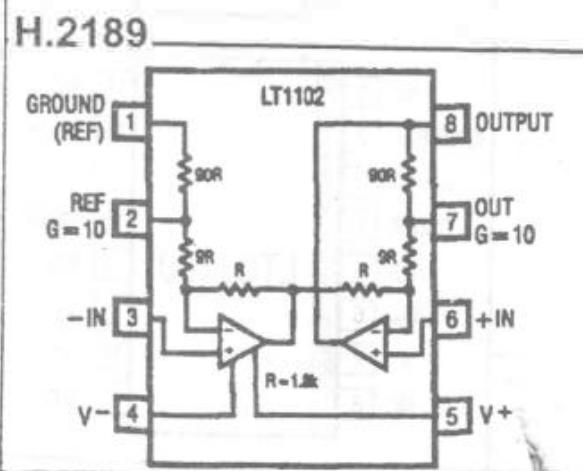


H.2185

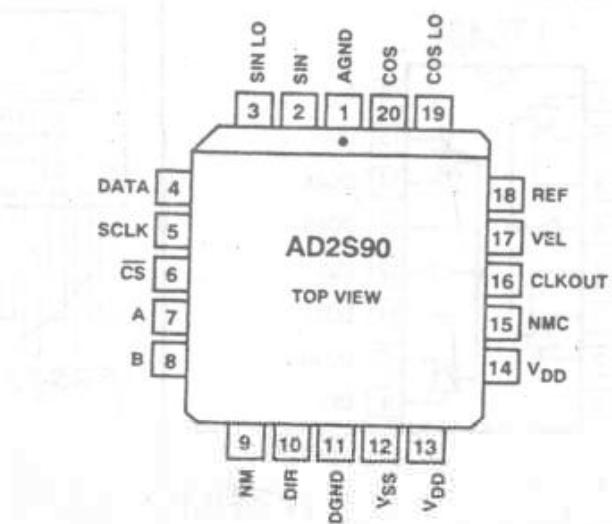




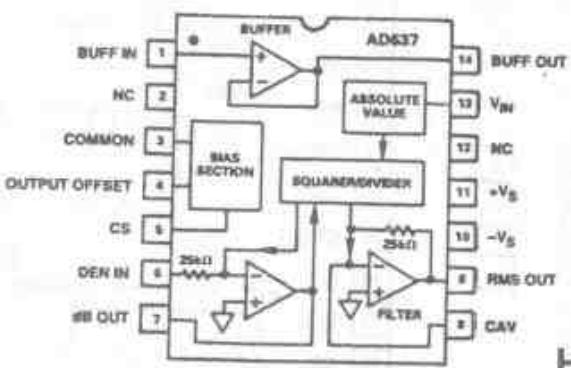
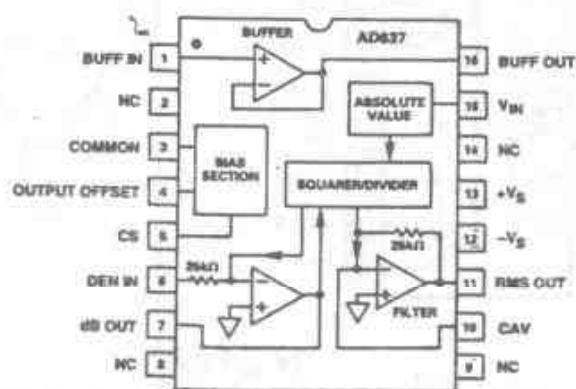
H.2188



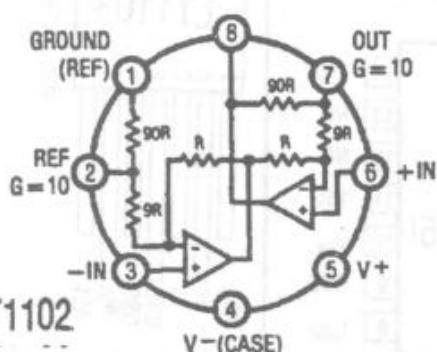
LT1102

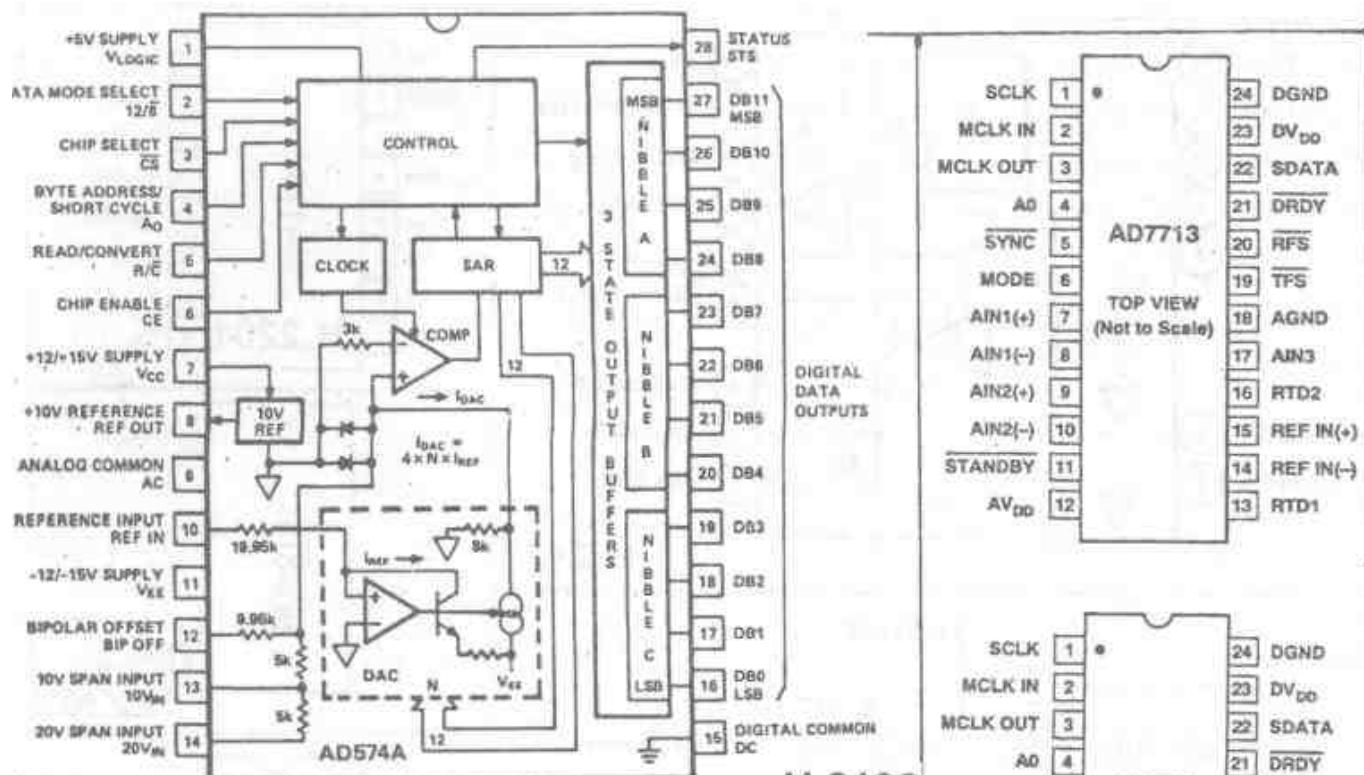


H.2191

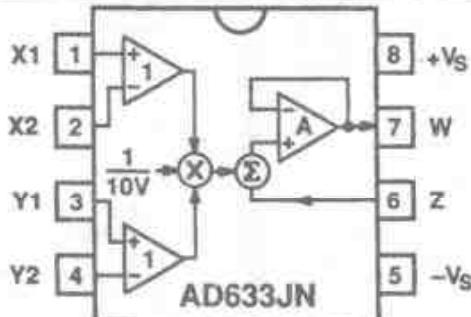


H.2190

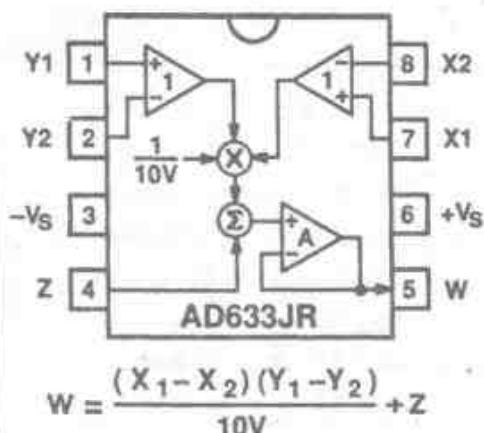




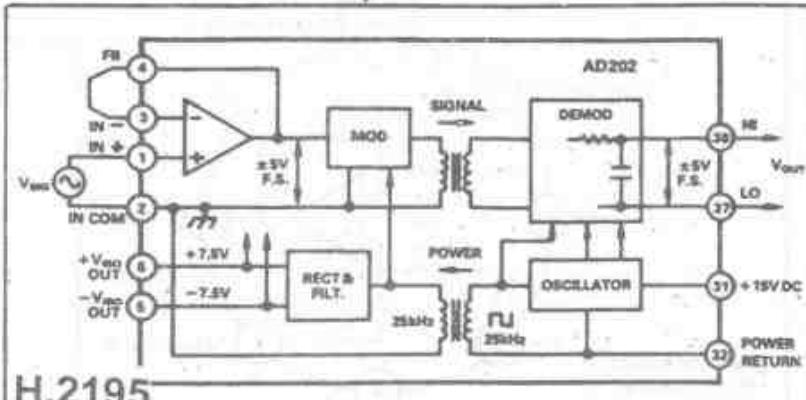
H.2192



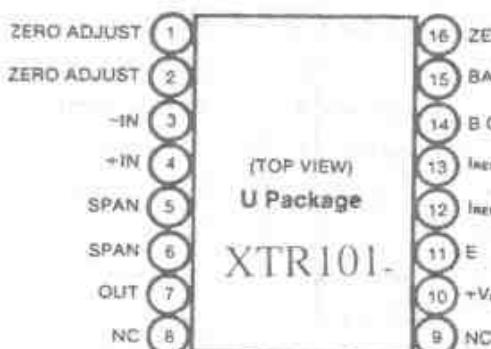
H.2196



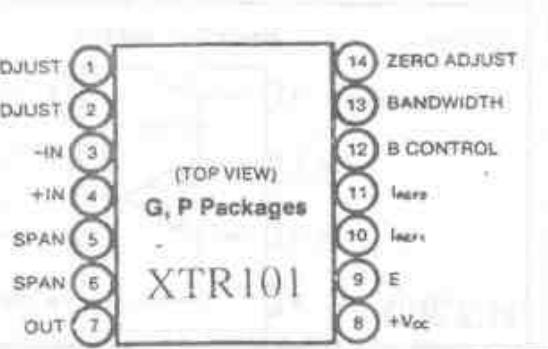
H.2193

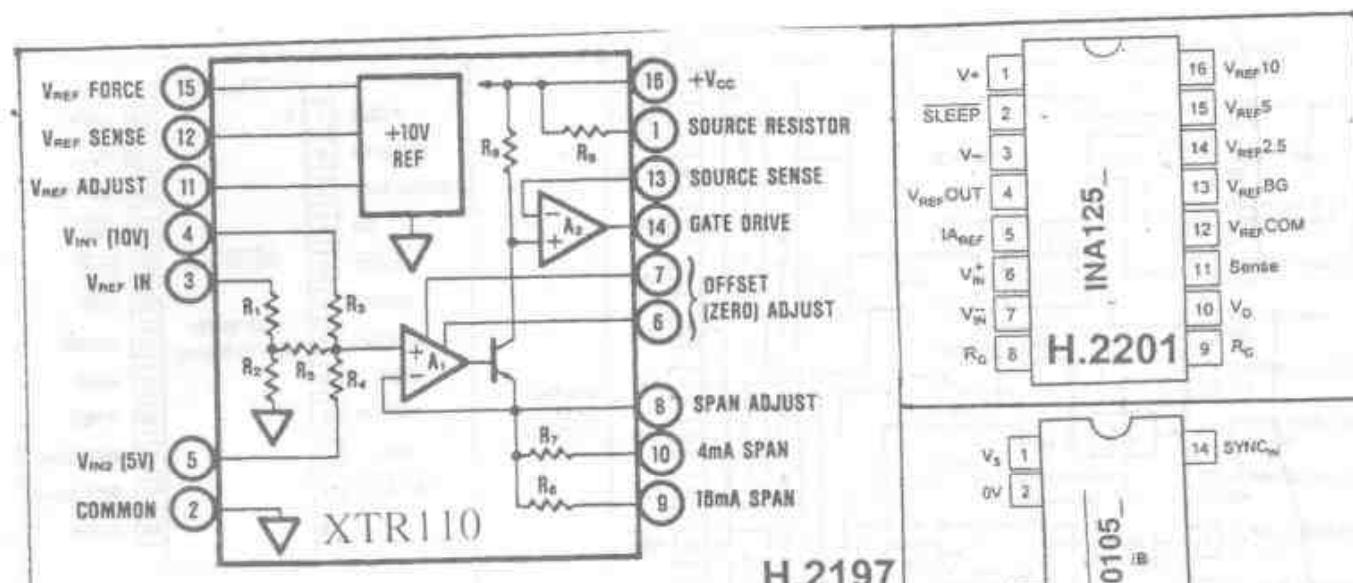


H.2195

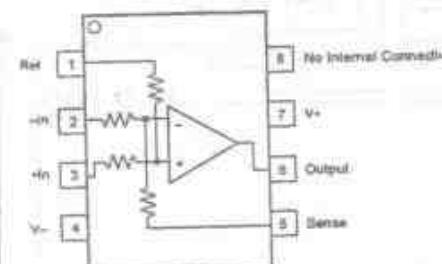


H.2194





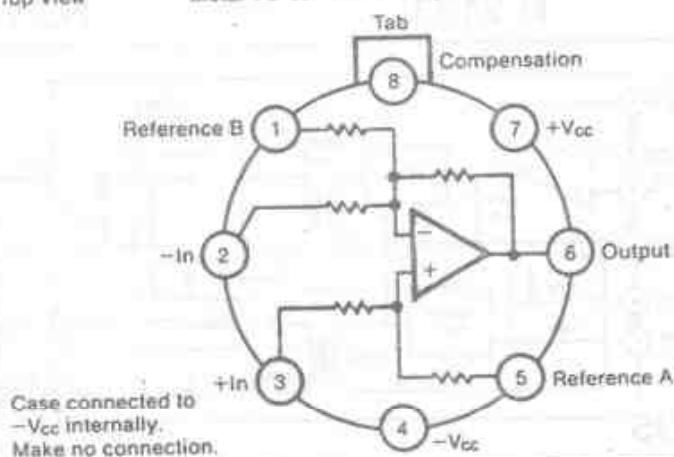
INA105\_



H.2198 H.2199

Top View

Metal TO-99—INA117AM, BM



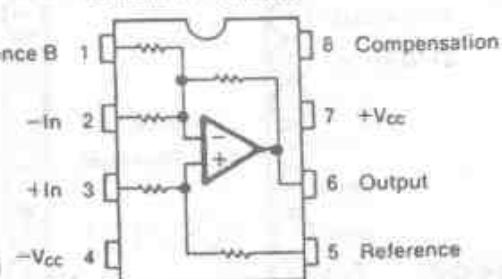
H.2203

1	16	Guard Hi-Z
2	15	Detect Input
3	14	Guard Lo-Z
4	13	Sensitivity Set
5	12	Osc Capacitor
6	11	Silver
7	10	Brass
8	9	VSS

**MC14467-1:**

Top View

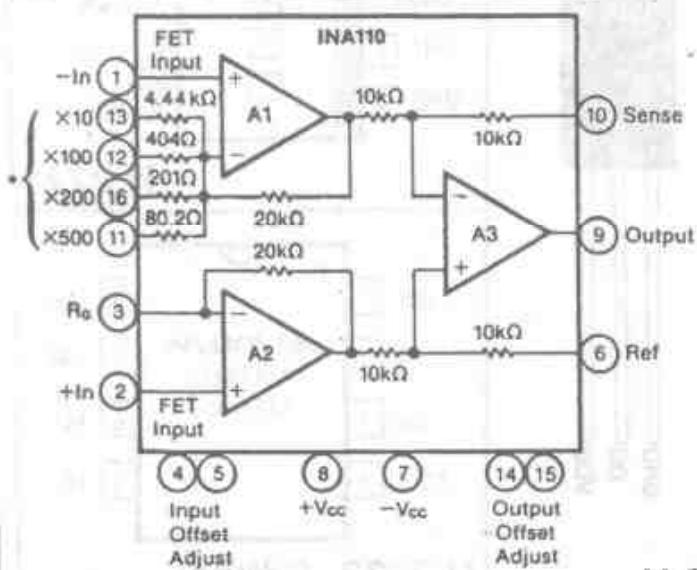
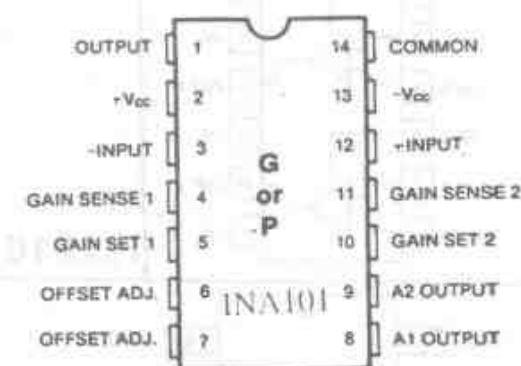
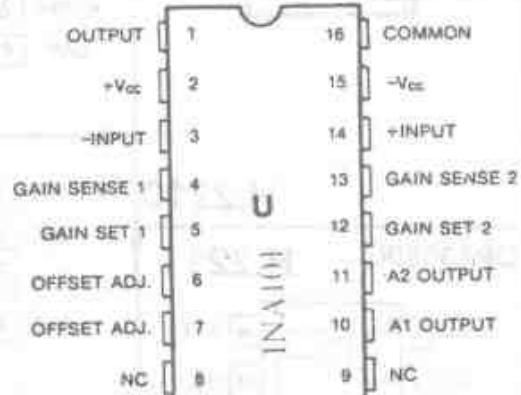
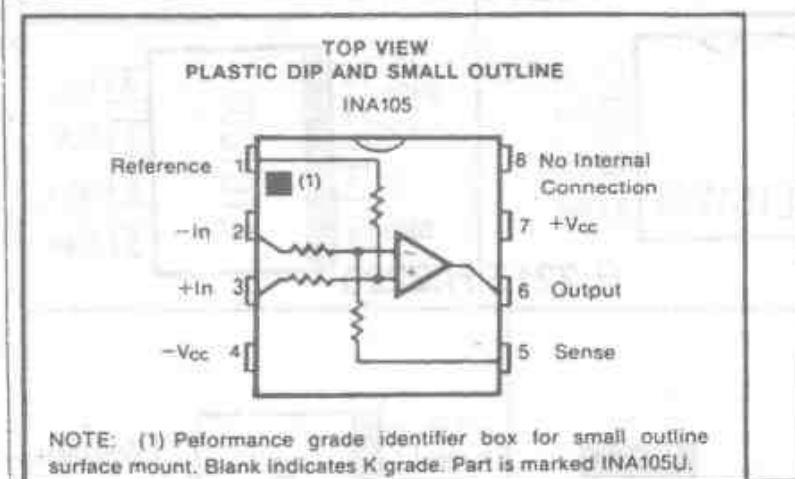
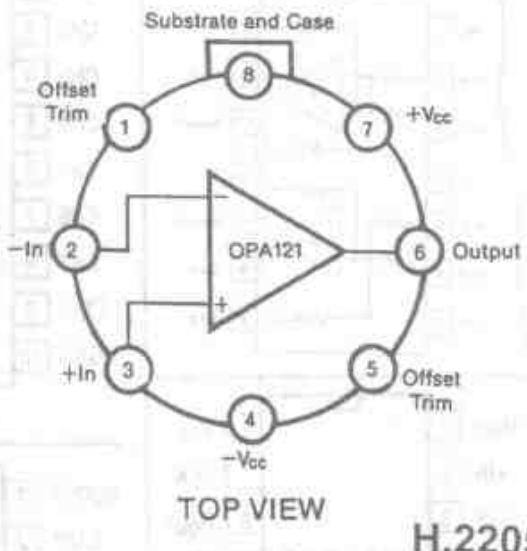
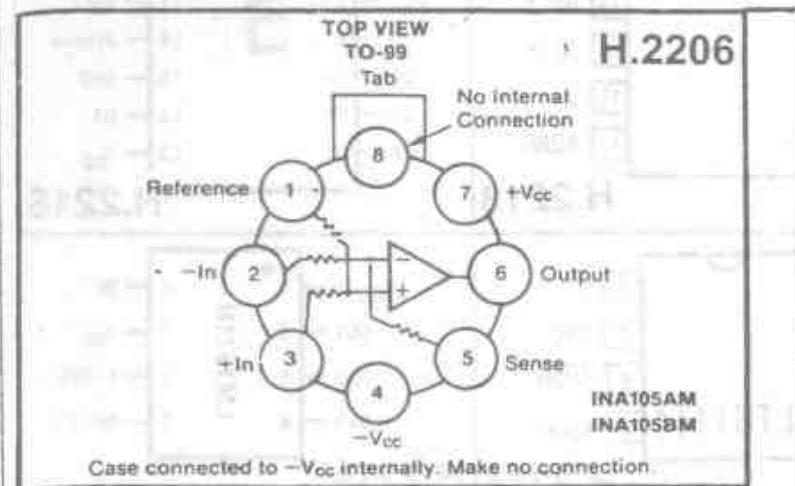
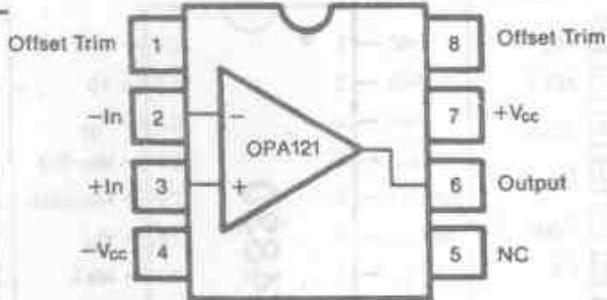
Plastic DIP—INA117P



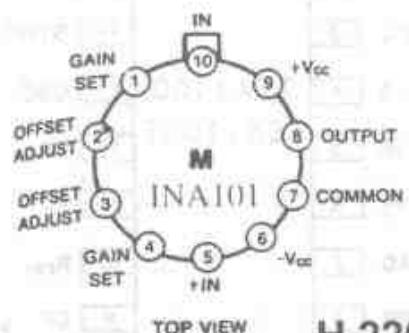
H.2200

1	16	Guard Hi-Z
2	15	Detect Input
3	14	Guard Lo-Z
4	13	Sensitivity Set
5	12	Osc Capacitor
6	11	Silver
7	10	Brass
8	9	VSS

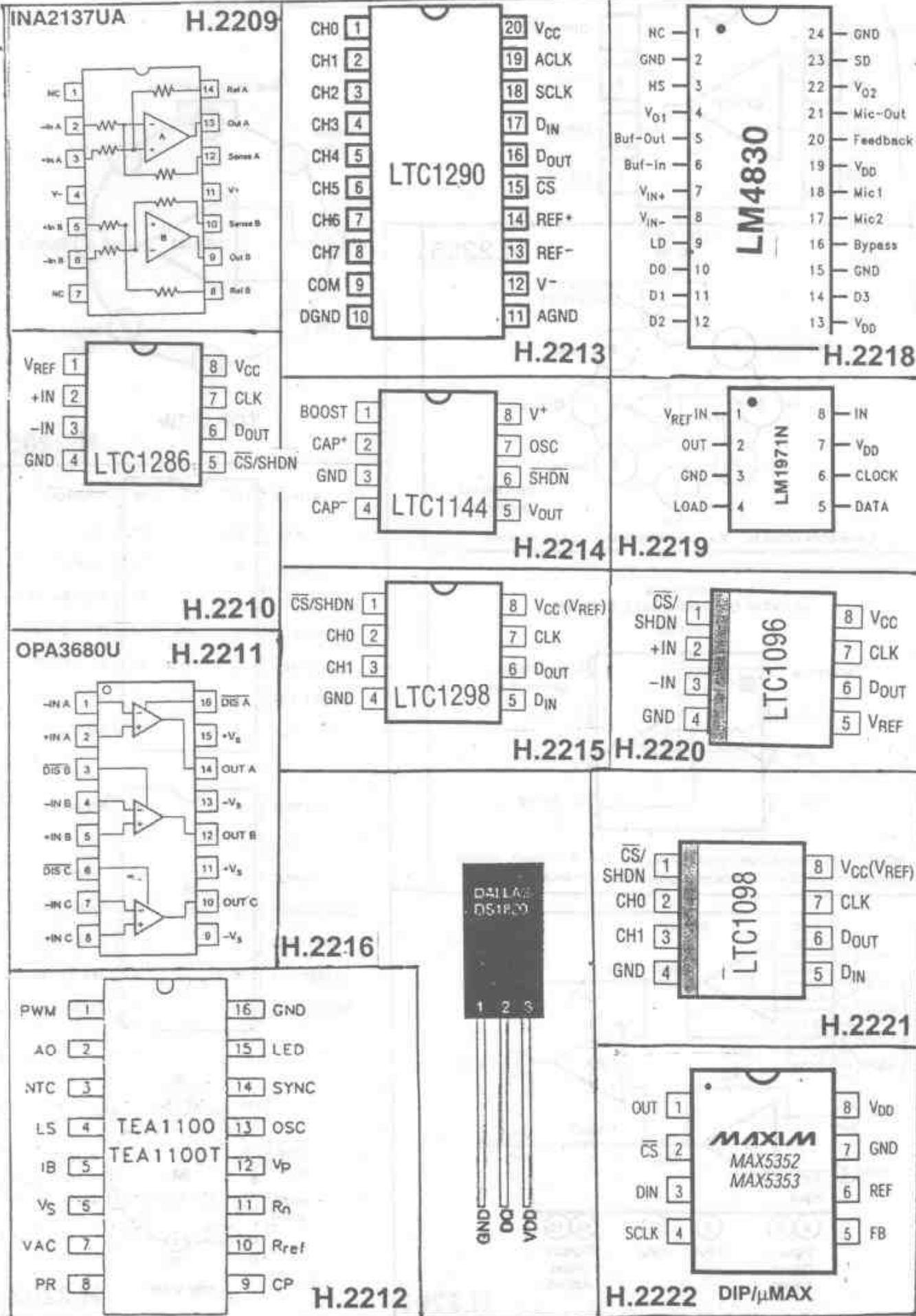
**MC14468:**

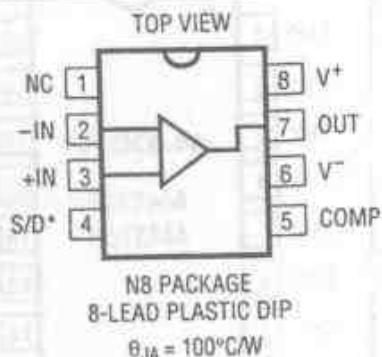


**H.2207**



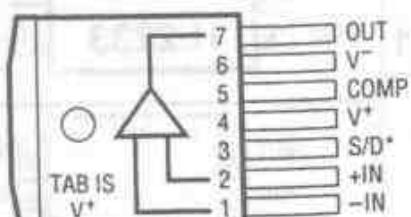
**H.2208**





**LT1206**

**FRONT VIEW**

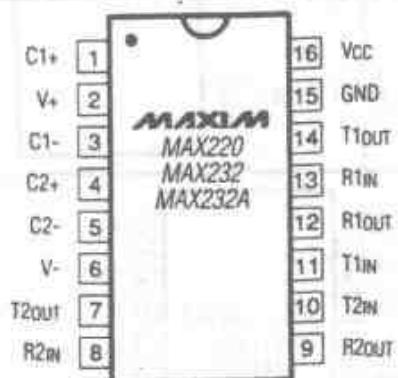


H.2223



DIP/SO/ $\mu$ MAX

H.2224



DIP/SO

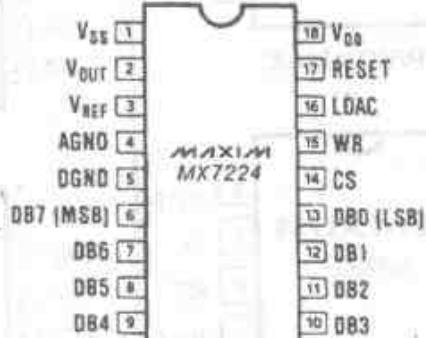
H.2225

CAPACITANCE ( $\mu\text{F}$ )					
DEVICE	C1	C2	C3	C4	
MAX220	4.7	4.7	10	10	4.7
MAX232	1.0	1.0	1.0	1.0	1.0
MAX232A	0.1	0.1	0.1	0.1	0.1

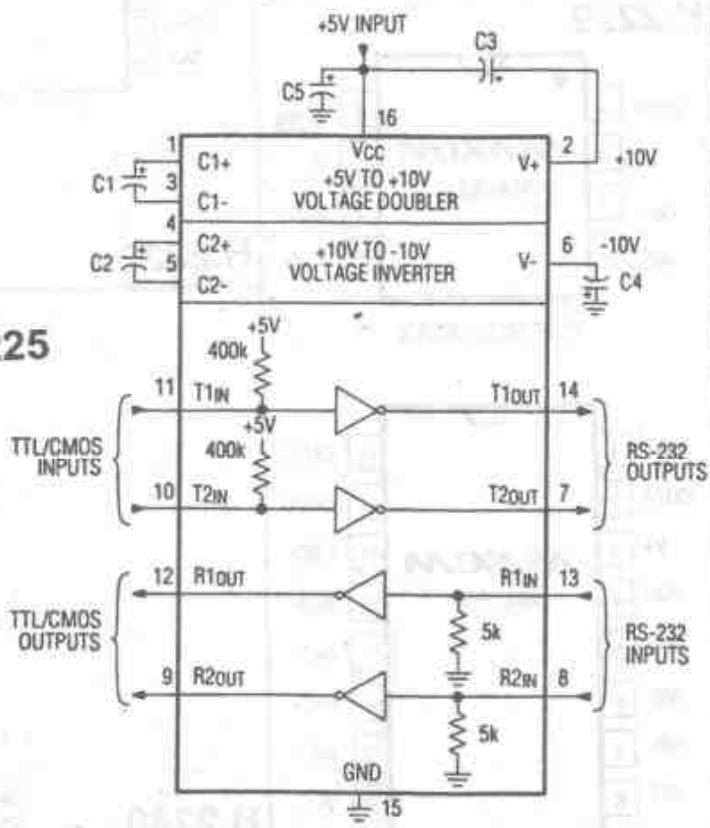


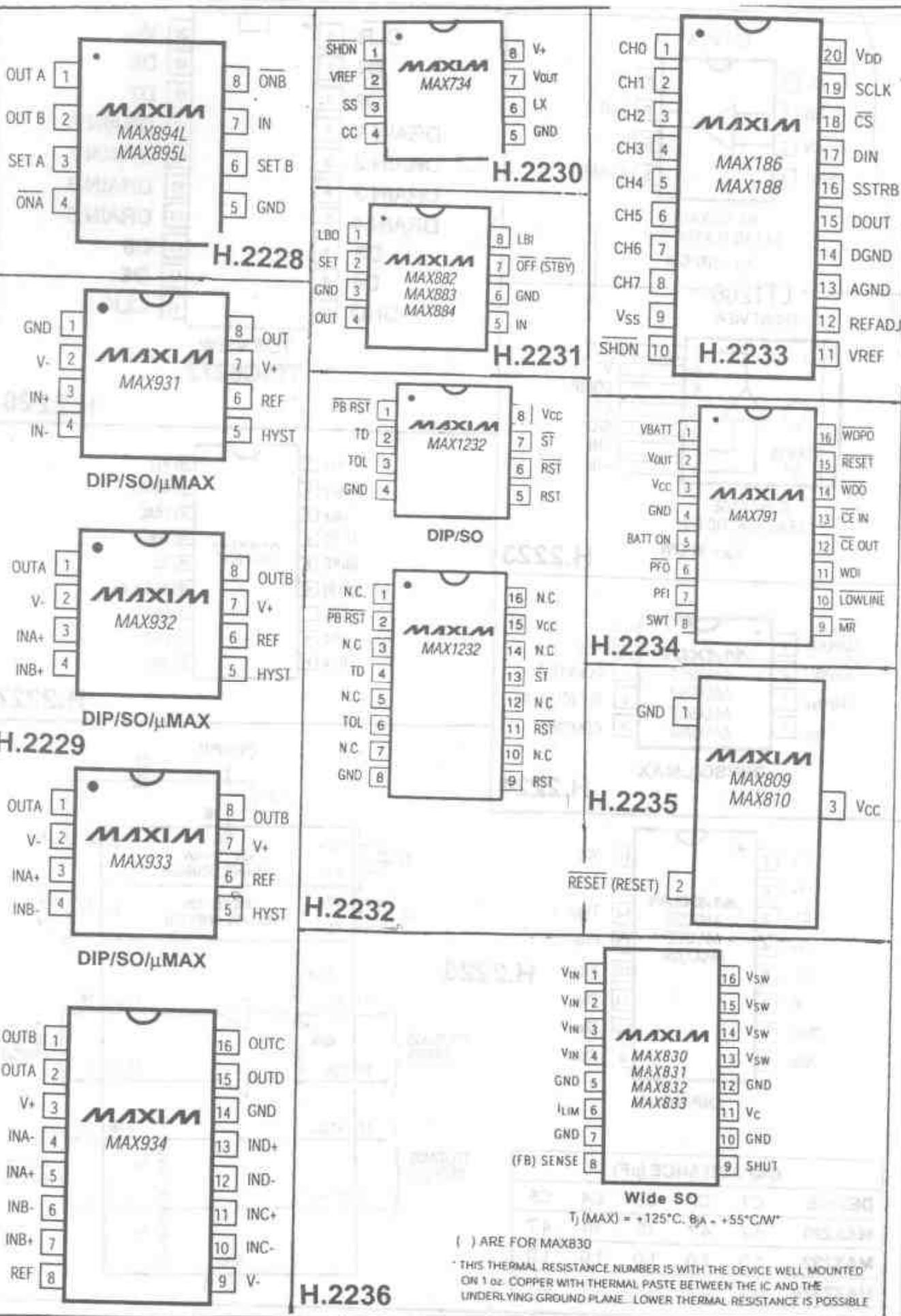
**TOP VIEW**  
**TPIC6273**

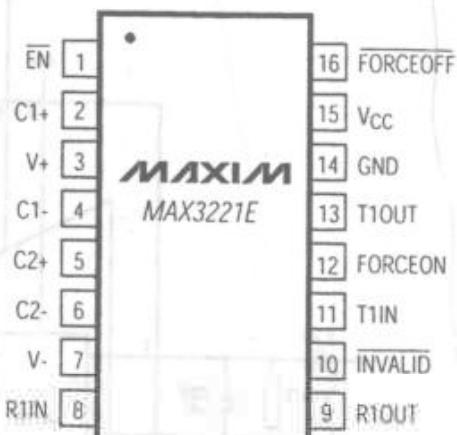
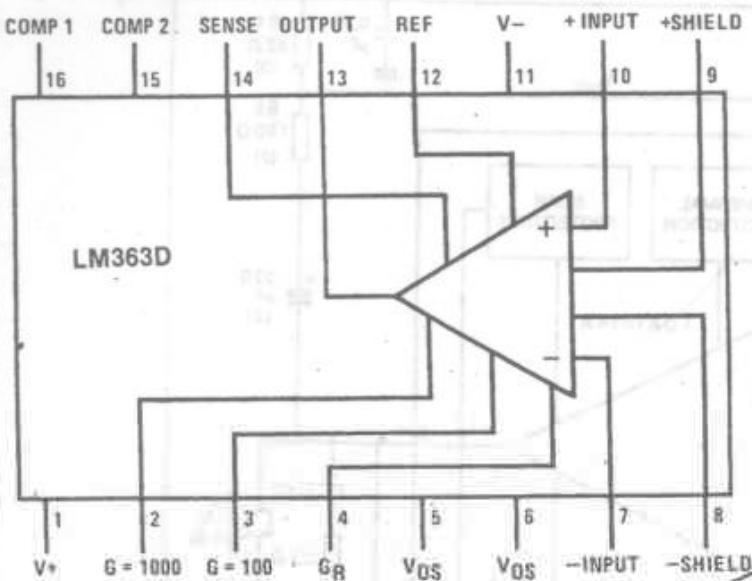
H.2226



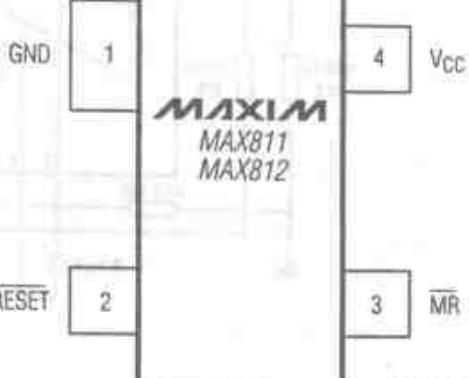
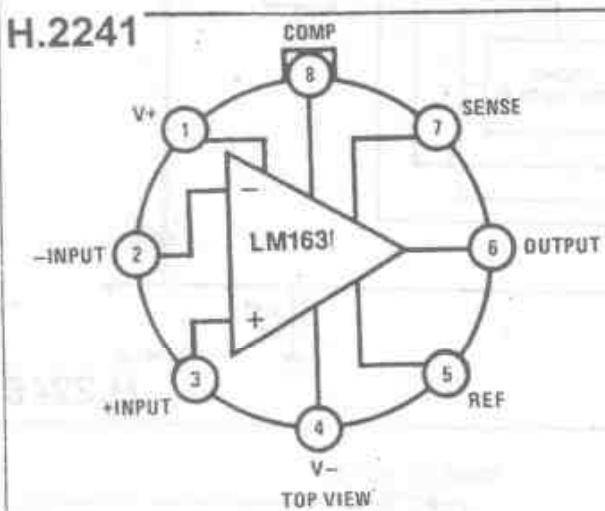
H.2227



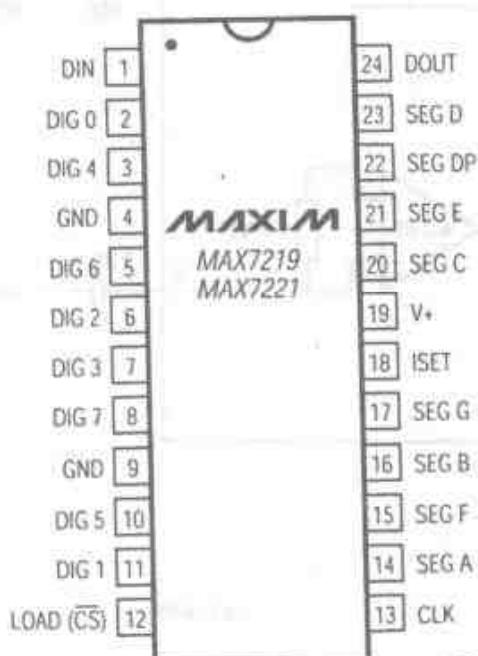




H.2237

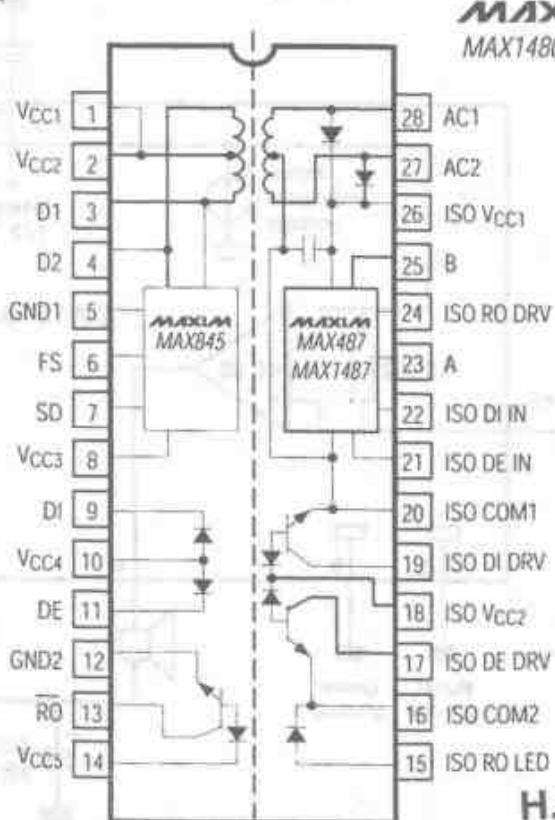


H.2238

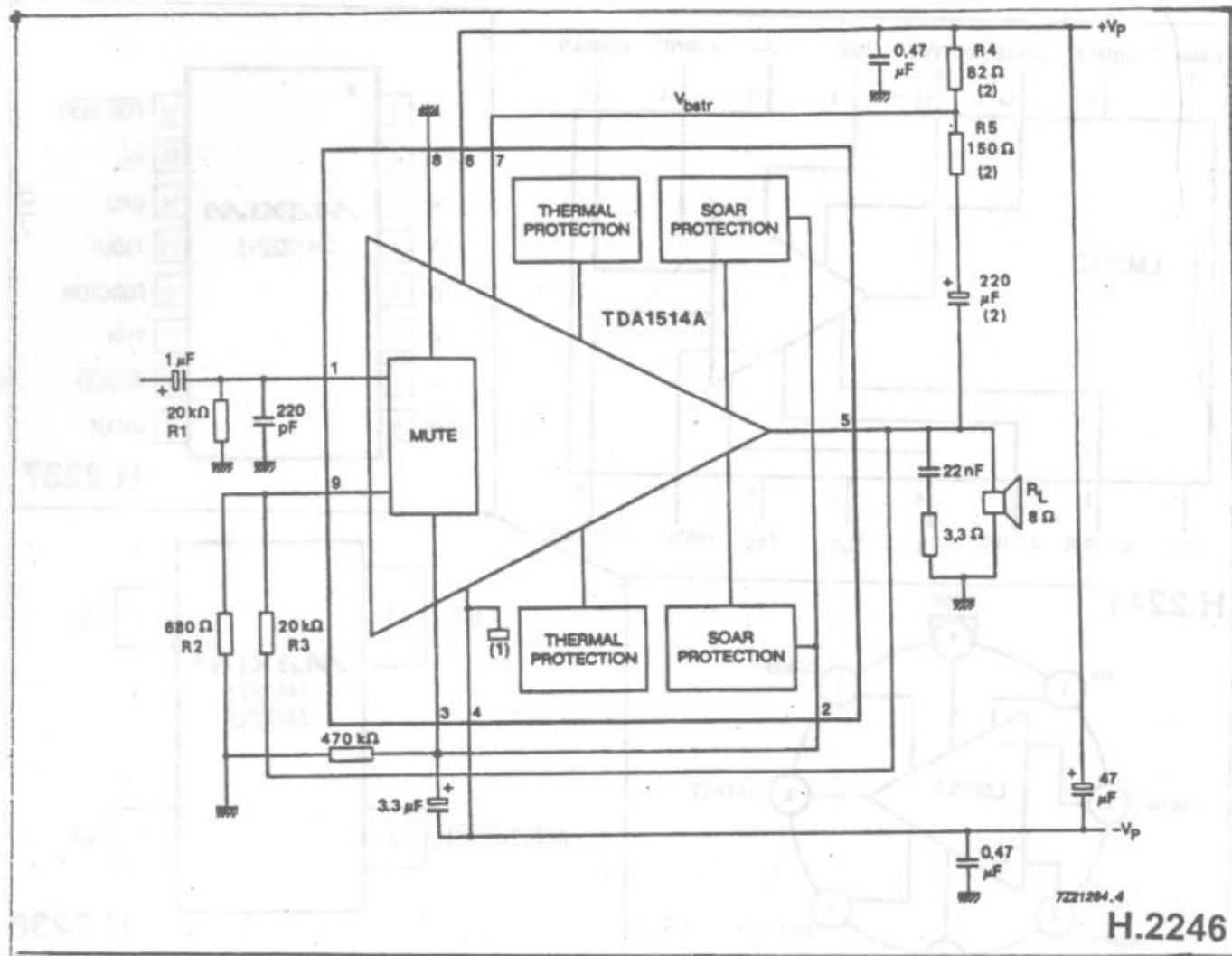


(1) MAX7221 ONLY

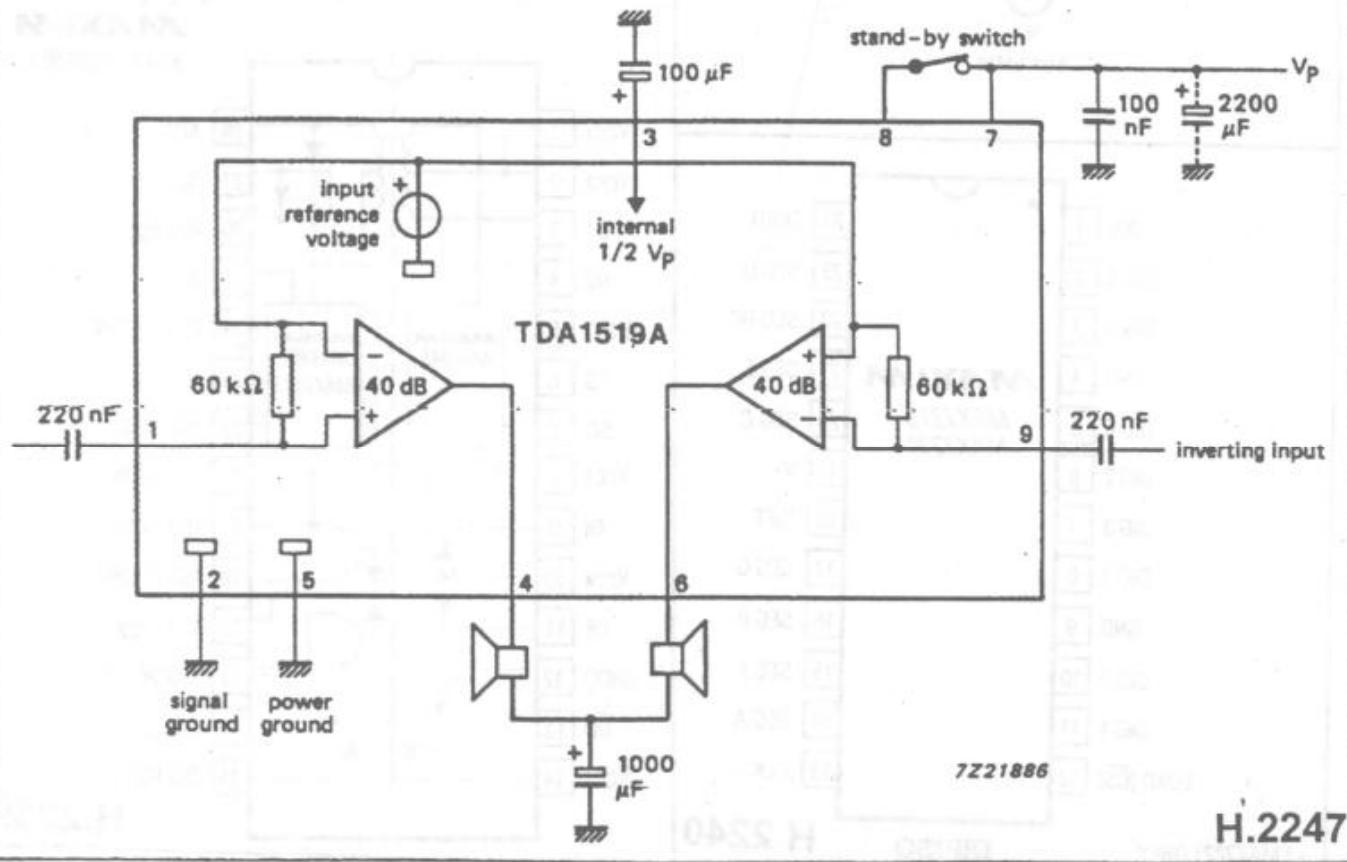
H.2240



H.2239

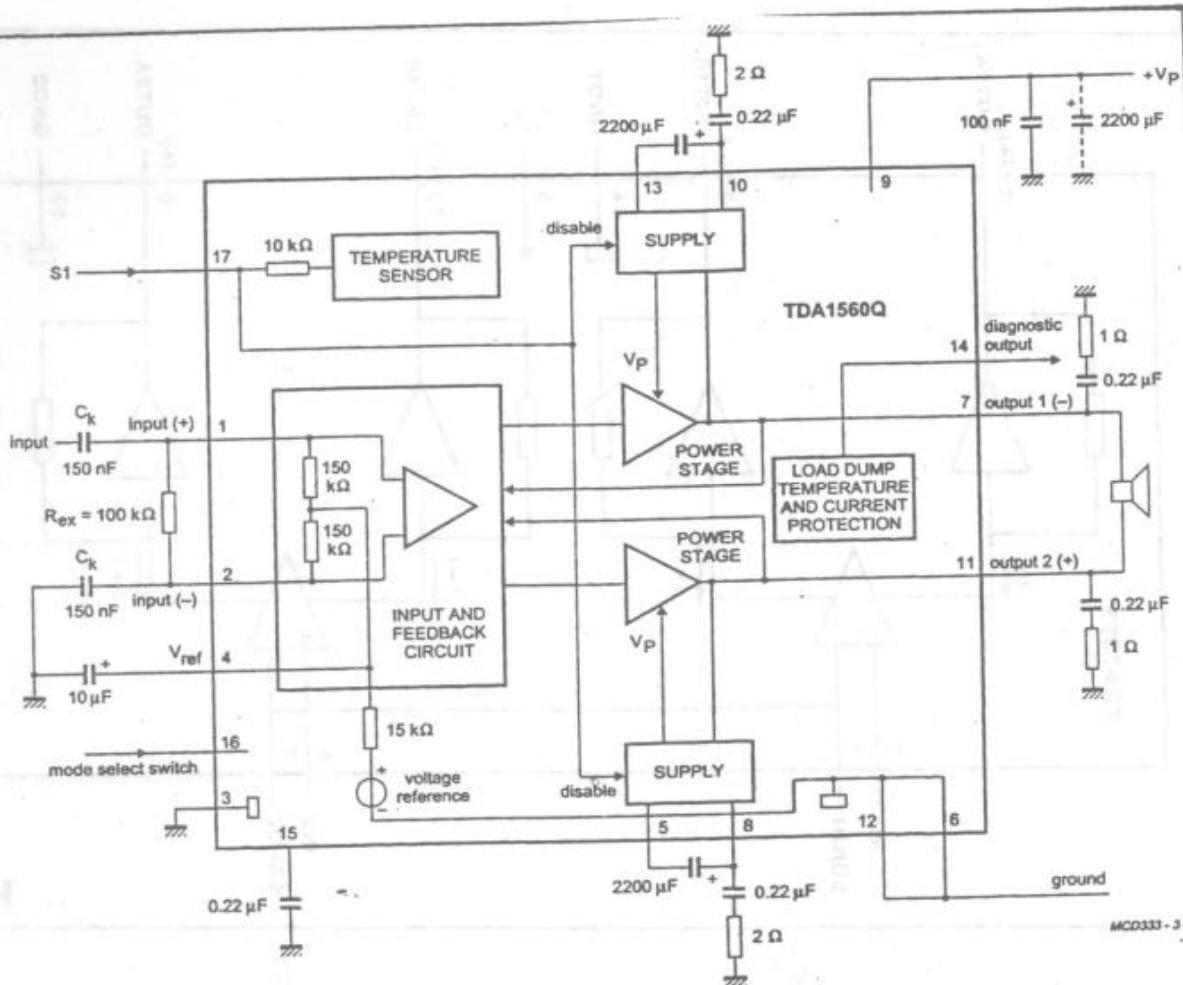


H.2246



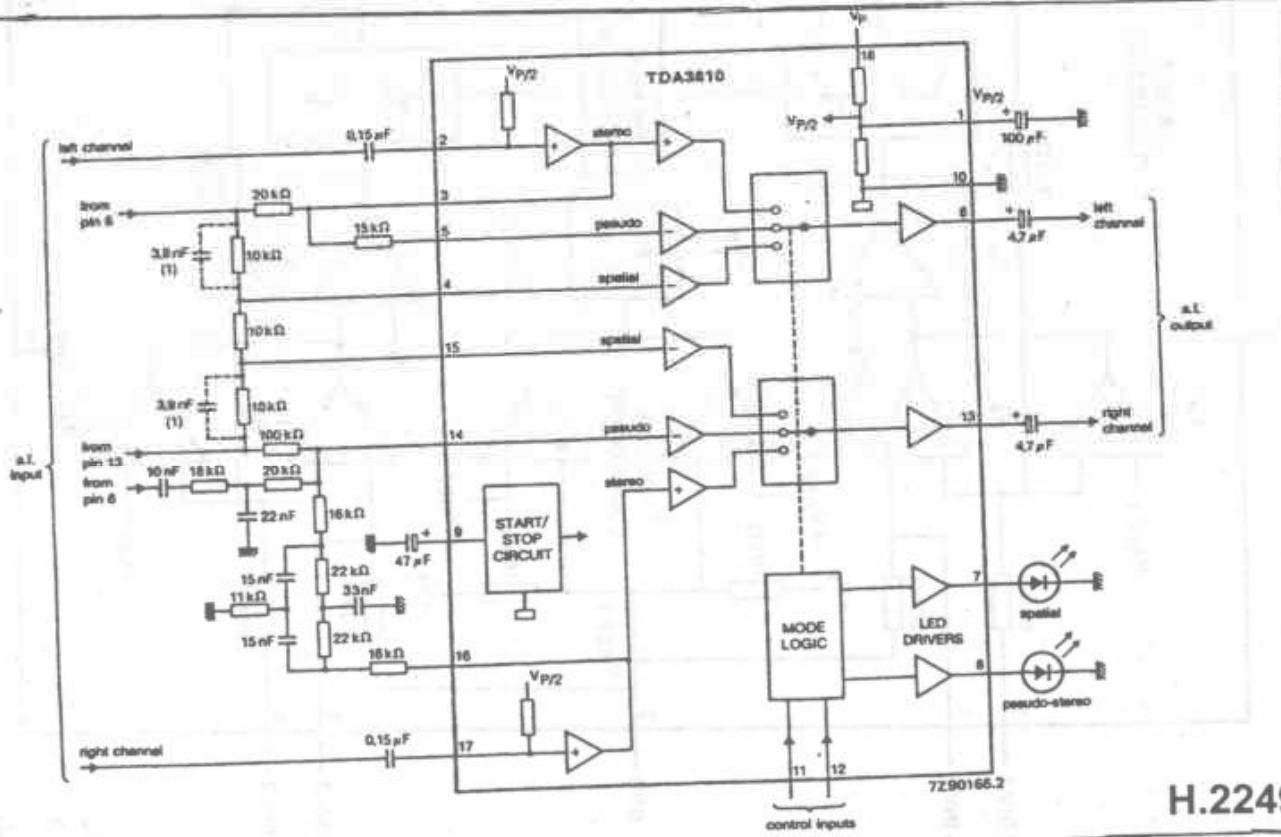
7221886

H.2247

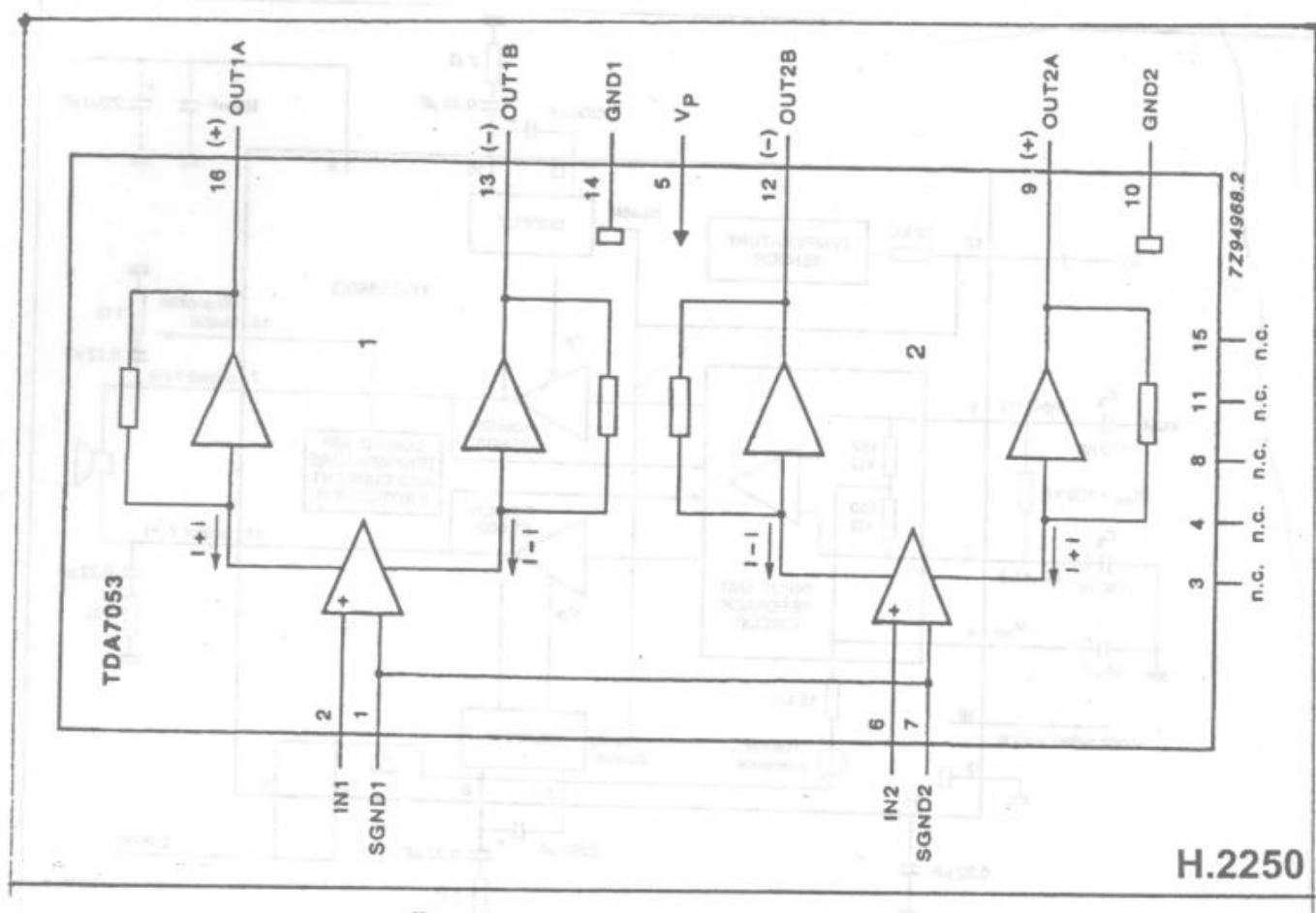


H.2248

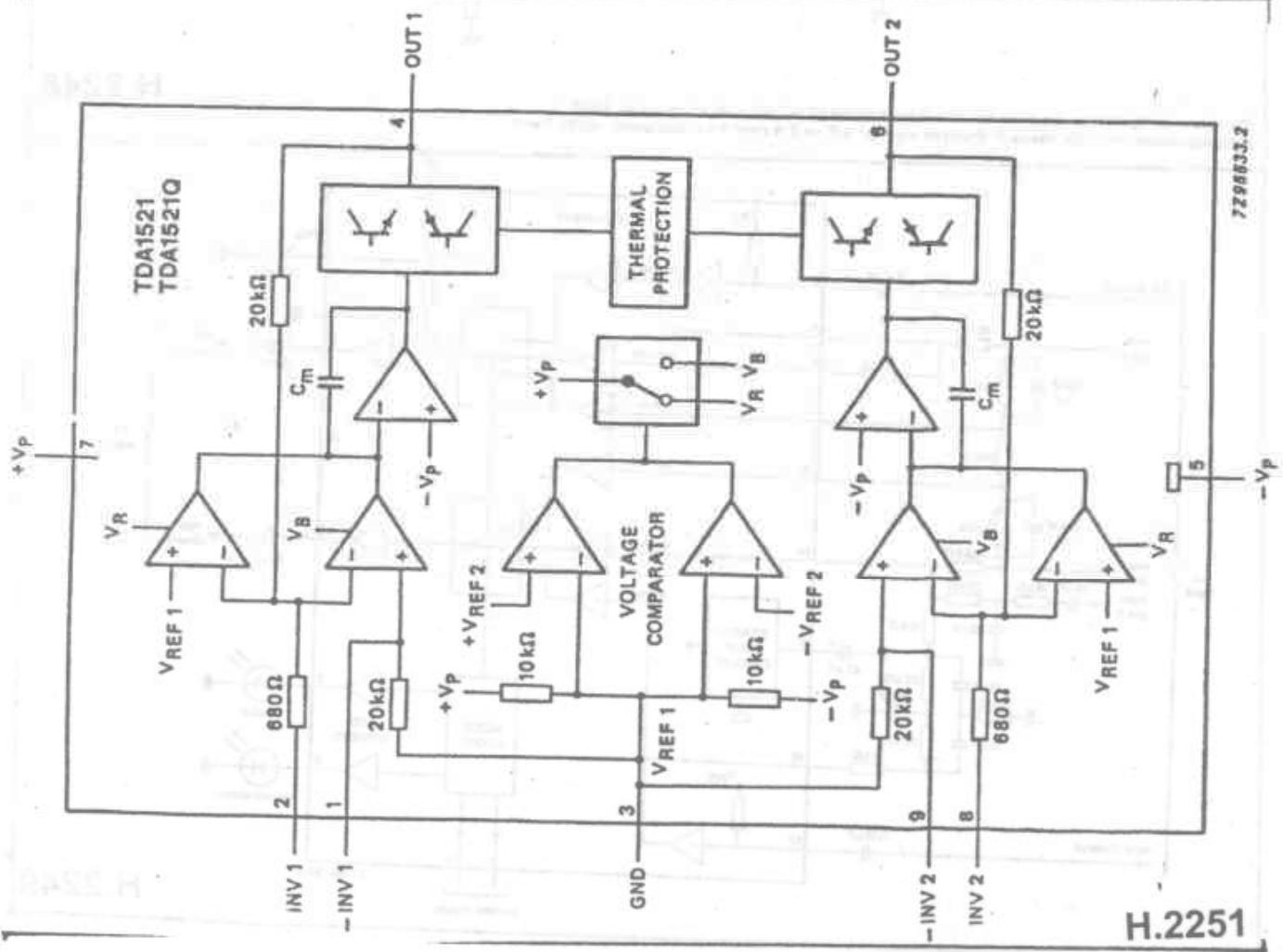
The values for  $C_k$  and  $R_{ex}$  are given for a low frequency roll off ( $-3\text{ dB}$ ) of  $40\text{ Hz}$ ; see also Table 1.  
In this application circuit the device is driven on input pin 1. If pin 2 is used the output power will be lower.



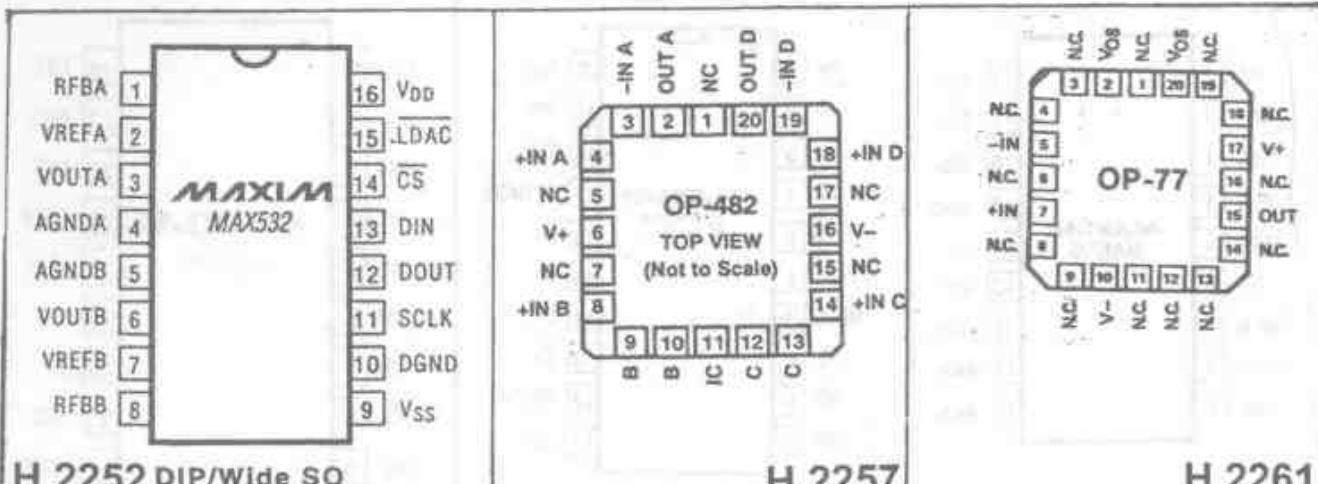
H.2249



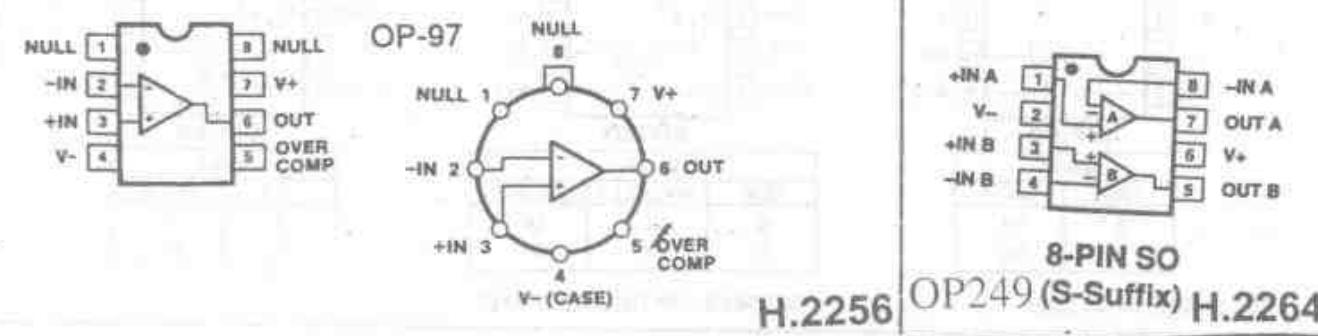
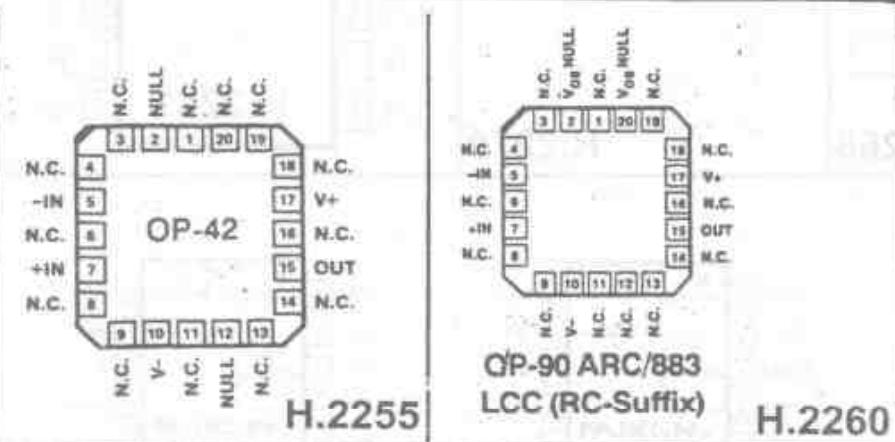
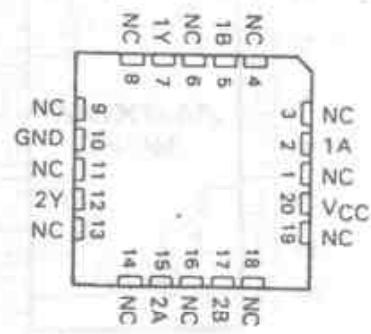
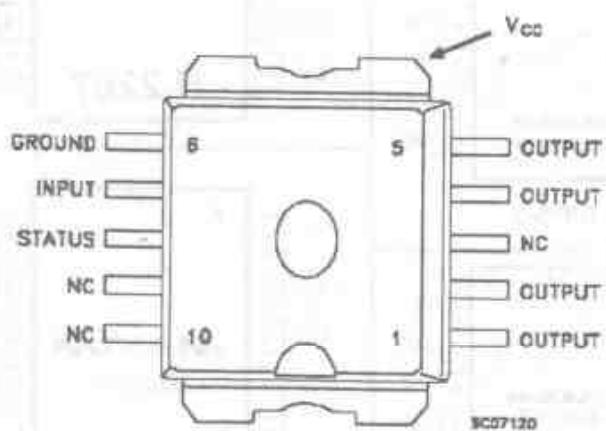
H.2250



H.2251

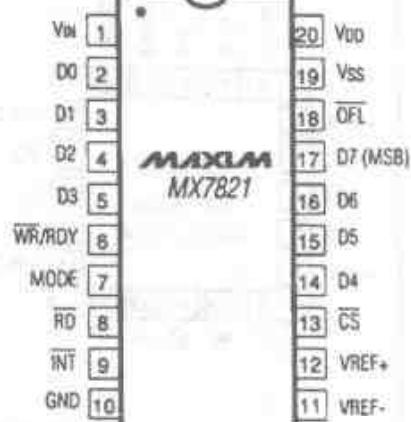


H.2254 H.2263

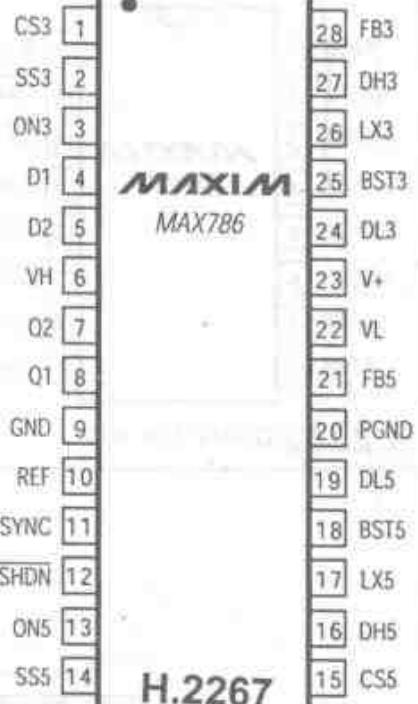




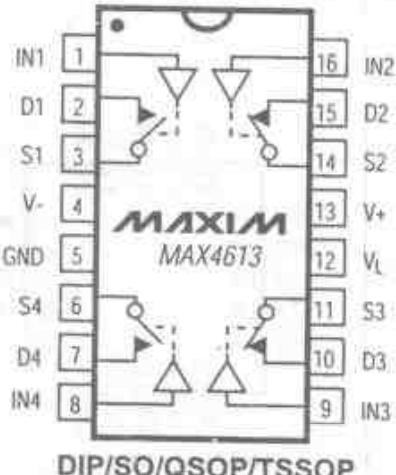
H.2265



H.2266



H.2267

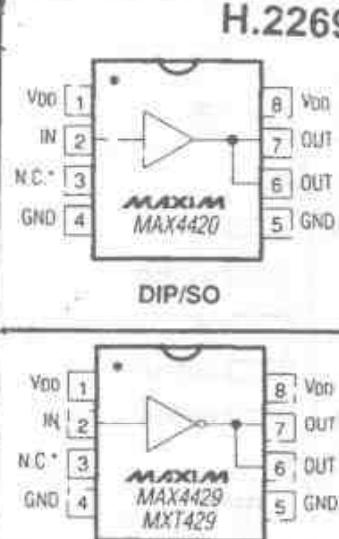


DIP/SO/QSO/P/TSSOP

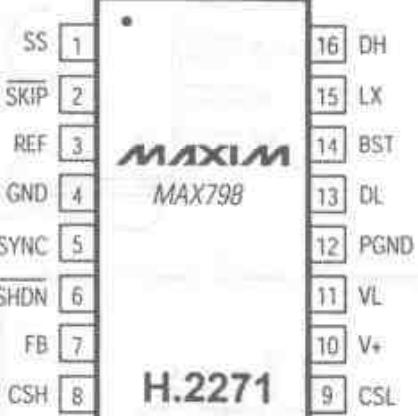
LOGIC	SW <sub>1</sub> , SW <sub>4</sub>	SW <sub>2</sub> , SW <sub>3</sub>
0	OFF	ON
1	ON	OFF

SWITCHES SHOWN FOR LOGIC "0" INPUT

H.2268



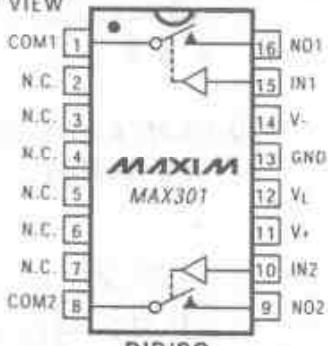
H.2269



H.2271

## H.2272

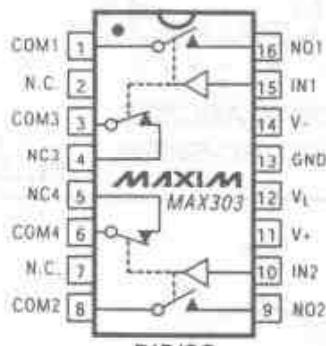
TOP VIEW



DIP/SO

MAX301

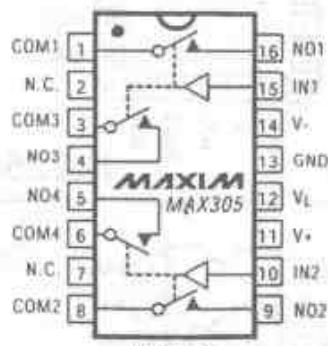
LOGIC	SWITCH
0	OFF
1	ON



DIP/SO

MAX303

LOGIC	SWITCHES 1, 2	SWITCHES 3, 4
0	OFF	ON
1	ON	OFF



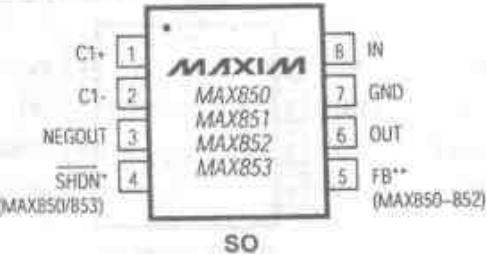
DIP/SO

MAX305

LOGIC	SWITCH
0	OFF
1	ON

LCC packages on last page.

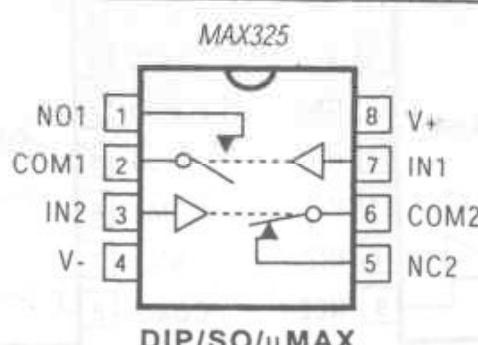
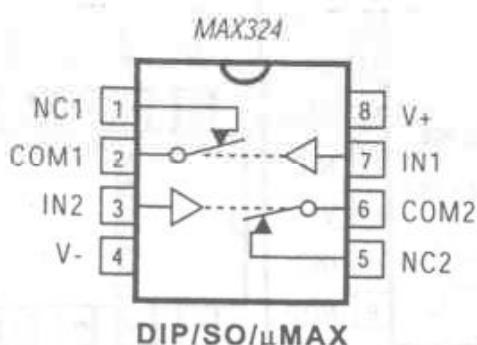
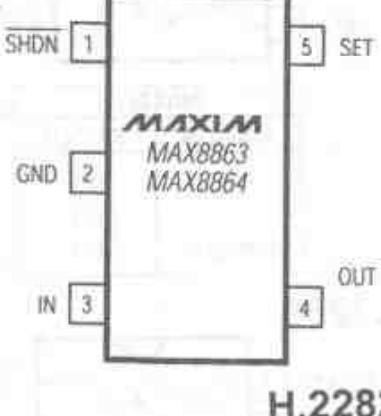
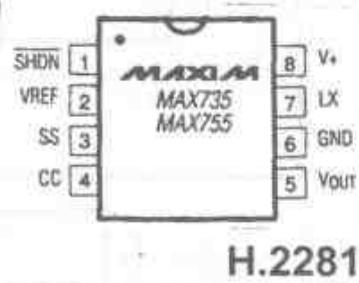
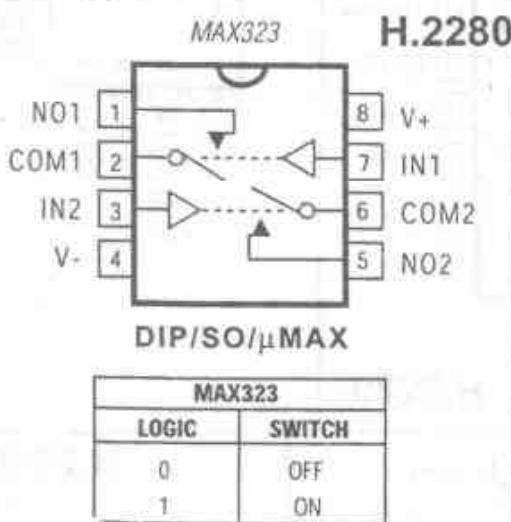
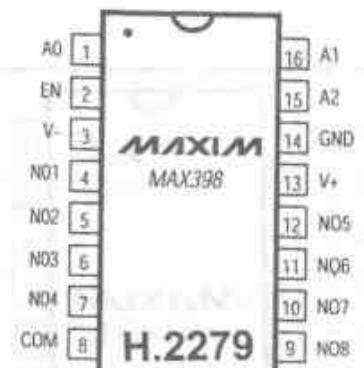
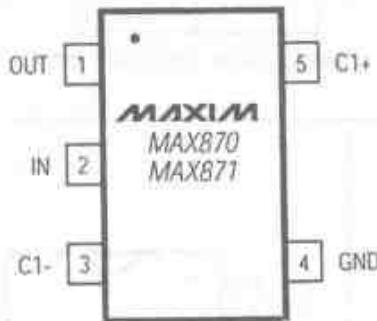
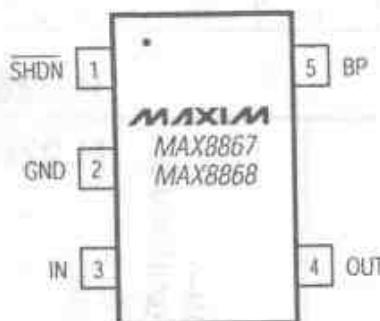
SWITCHES SHOWN FOR LOGIC "0" INPUT



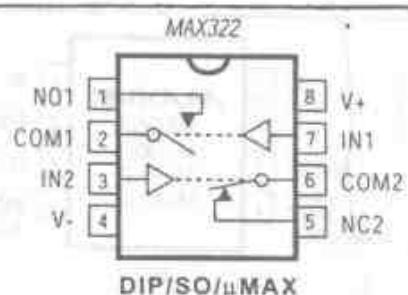
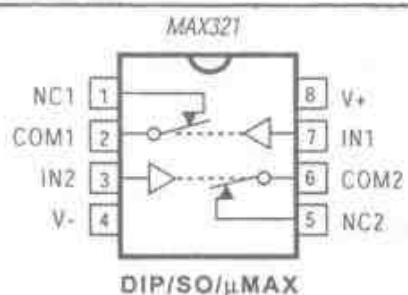
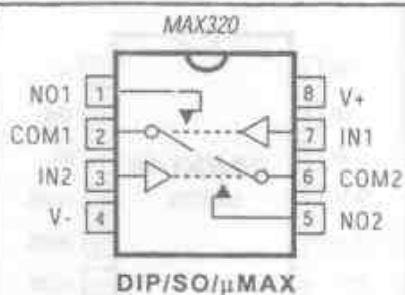
\* SHDN (MAX851)  
\*\* OSC (MAX852)

\*\* CONT (MAX853)

H.2275



SWITCHES SHOWN FOR LOGIC "0" INPUT



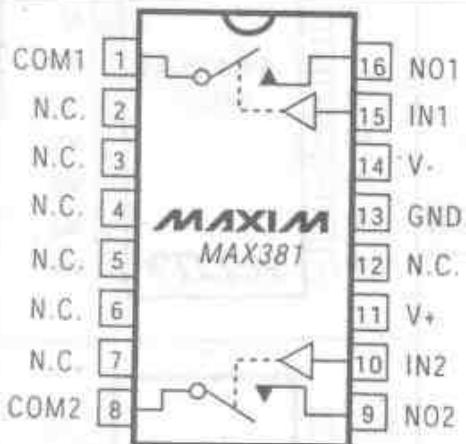
MAX320	
LOGIC	SWITCH
0	OFF
1	ON

MAX321	
LOGIC	SWITCH
0	ON
1	OFF

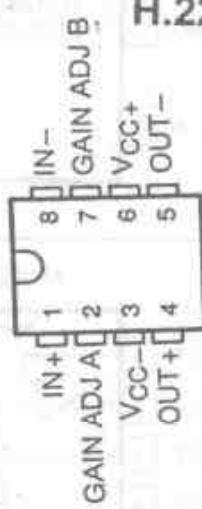
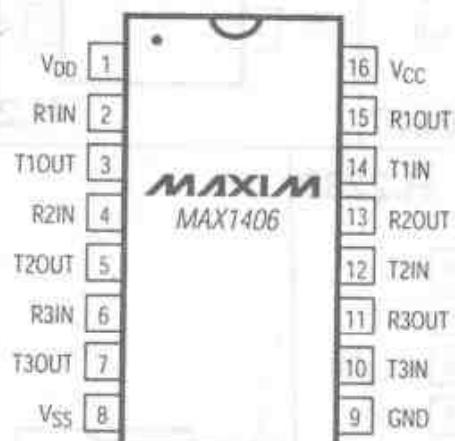
MAX322		
LOGIC	SWITCH 1	SWITCH 2
0	OFF	ON
1	ON	OFF

SWITCHES SHOWN FOR LOGIC "0" INPUT

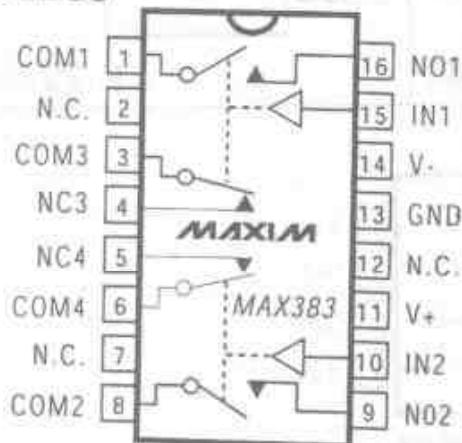
H.2285



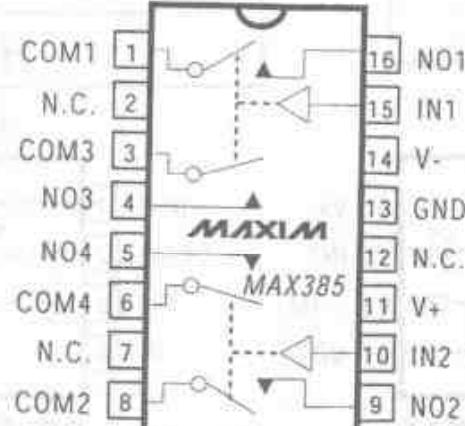
LOGIC IN	SWITCH
0	OFF
1	ON
PWR OFF	OFF



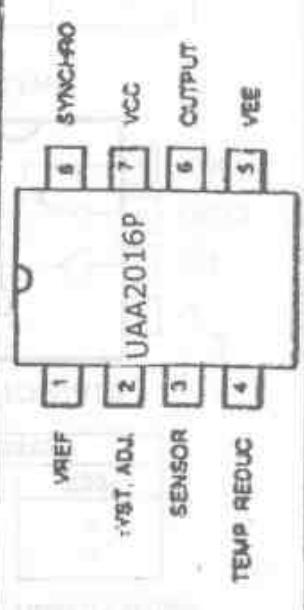
H.2289



MAX383			
LOGIC IN	COM	NC	NO
0	NC	COM	OFF
1	NO	OFF	COM
PWR OFF	OFF	OFF	OFF

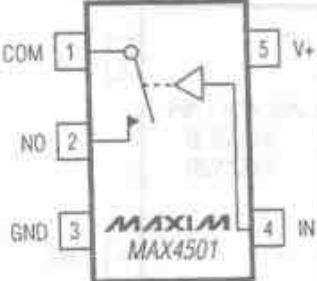
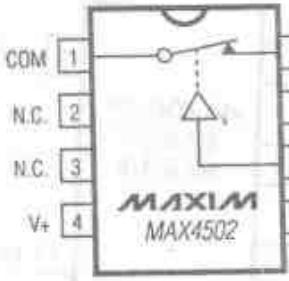
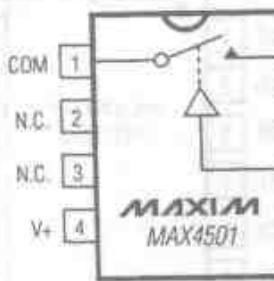


MAX385	
LOGIC IN	COM, NO
0	OFF
1	ON
PWR OFF	OFF



H.2288

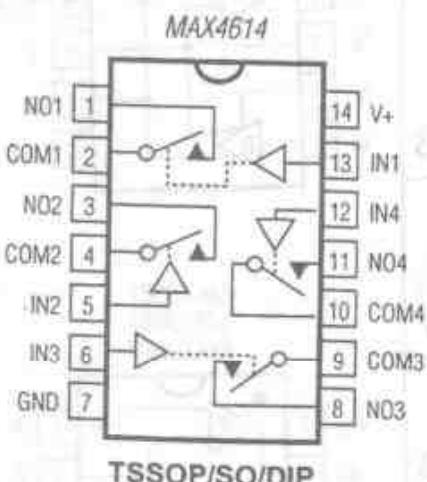
H.2290



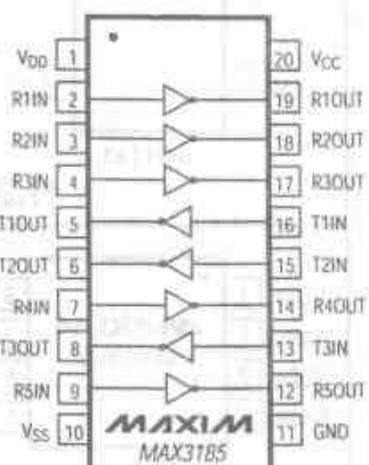
INPUT	SWITCH STATE	
	MAX4501	MAX4502
LOW	OFF	ON
HIGH	DN	OFF

H.2292

H.2295



INPUT	SWITCH STATE
LOW	OFF
HIGH	ON

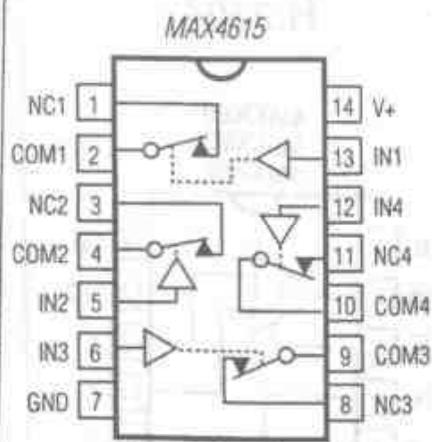


H.2297

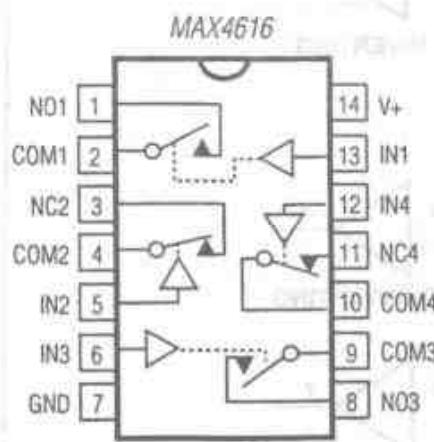
H.2300

H.2301

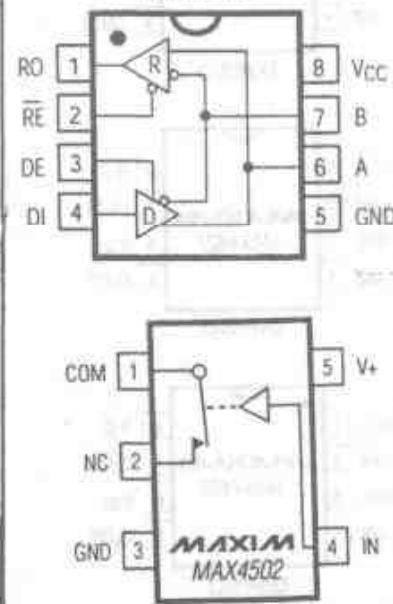
H.2296

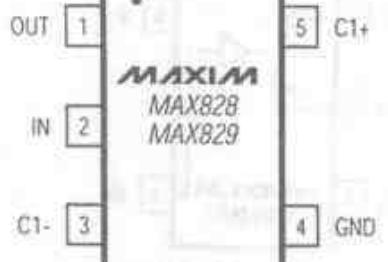


INPUT	SWITCH STATE
LOW	ON
HIGH	OFF



INPUT	NO1, NO3	NC2, NC4
LOW	OFF	ON
HIGH	ON	OFF

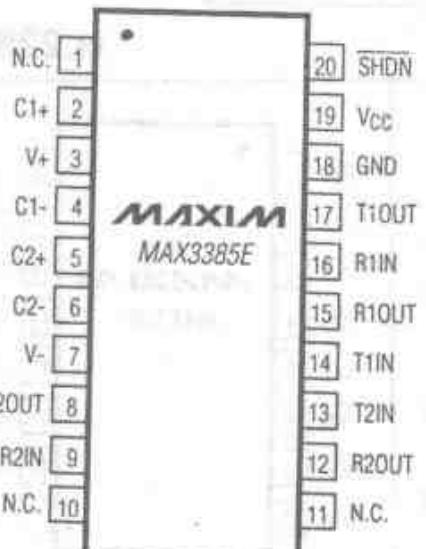
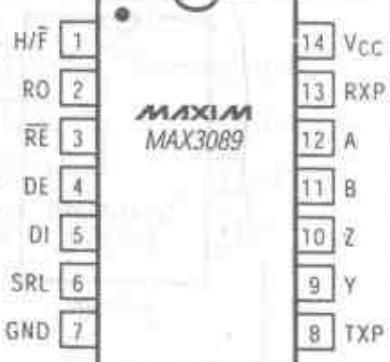




H.2302



H.2303



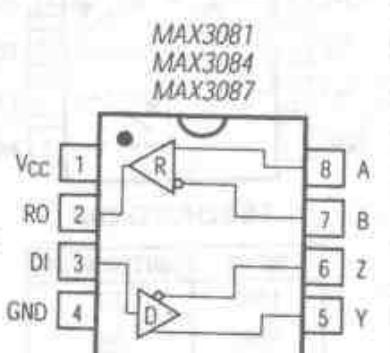
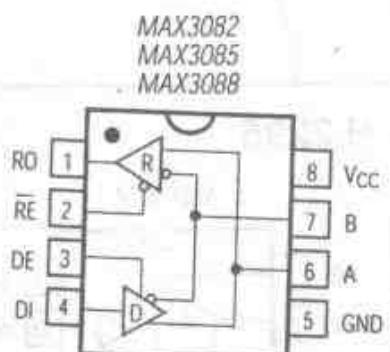
H.2305



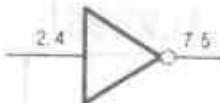
H.2306



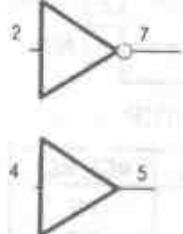
H.2308



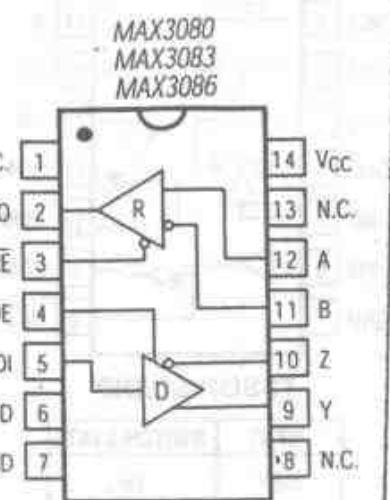
INVERTING

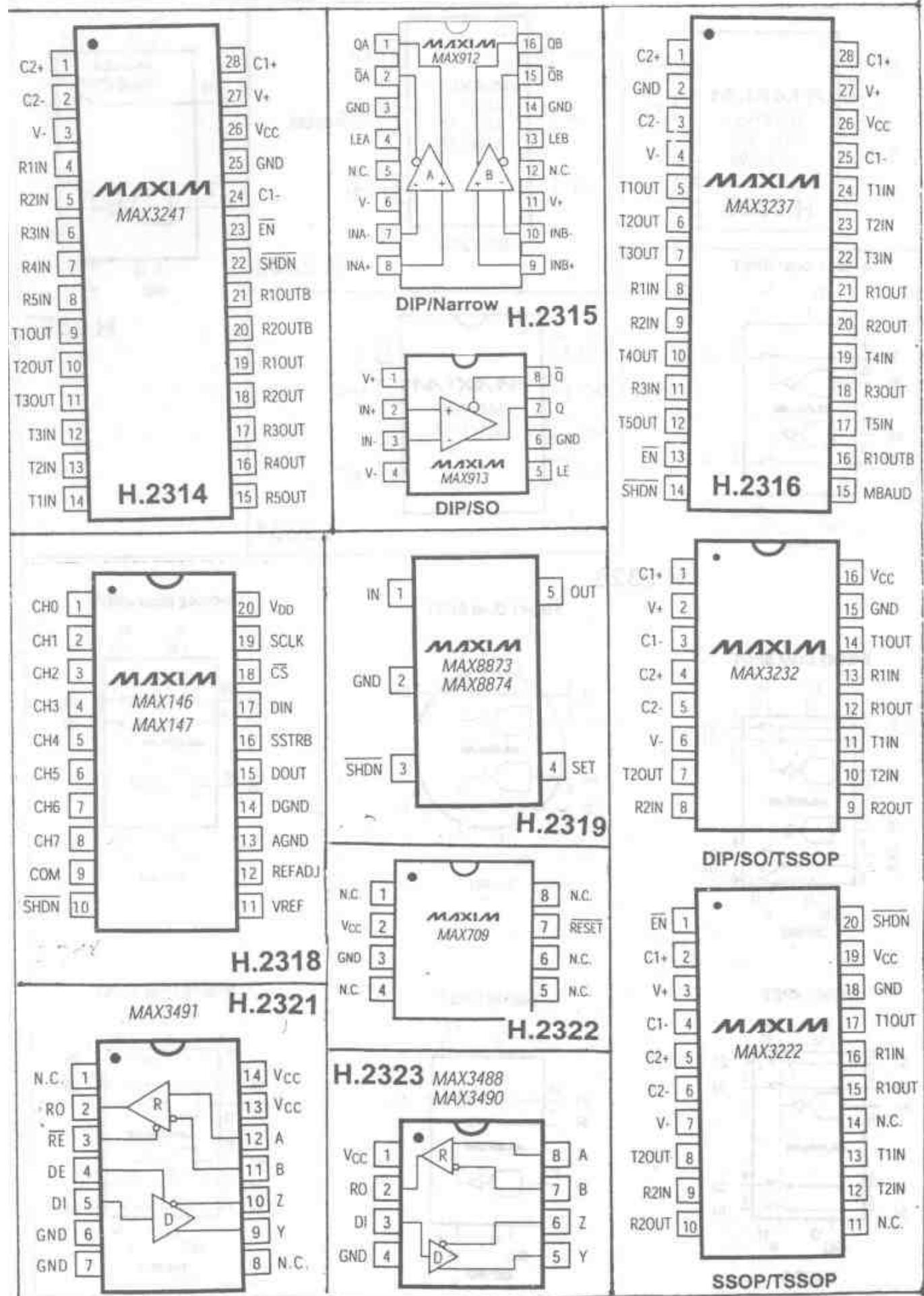


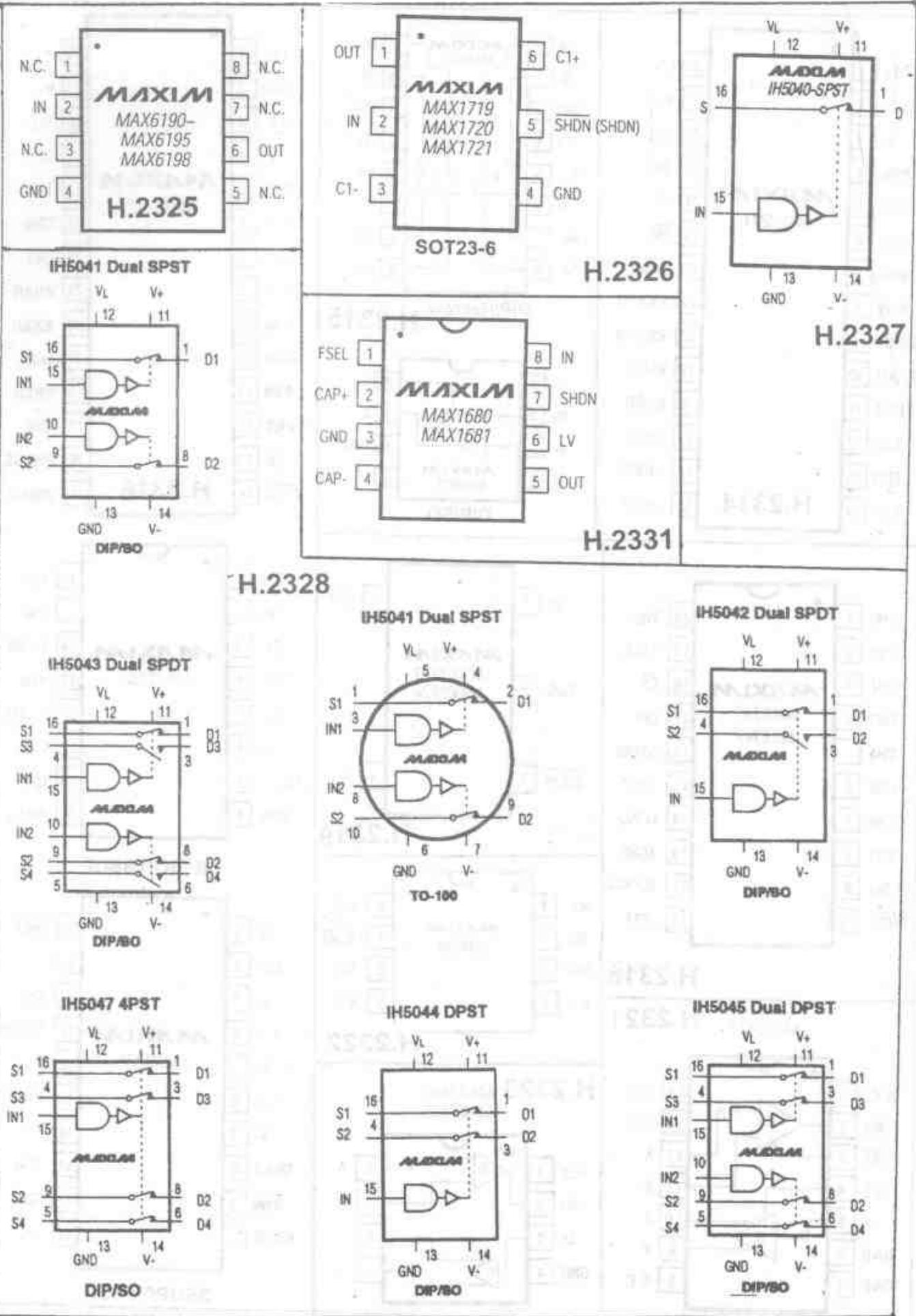
NONINVERTING



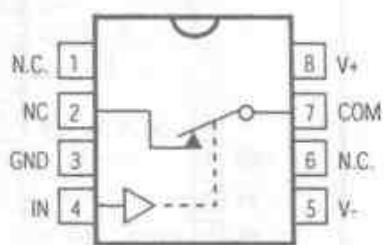
H.2310





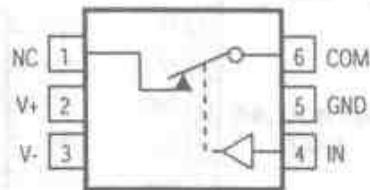


MAX4529

DIP/SO/ $\mu$ MAX

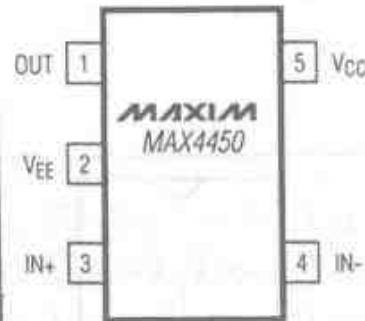
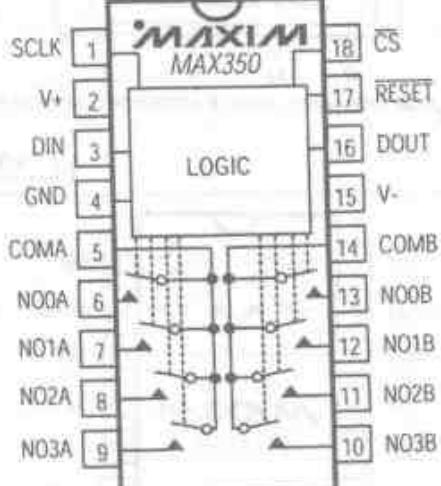
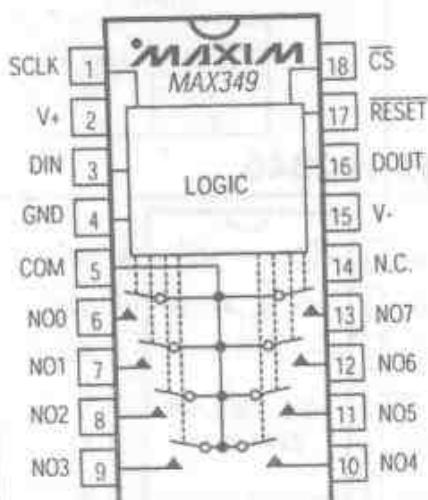
LOGIC	SWITCH
0	ON
1	OFF

MAX4529



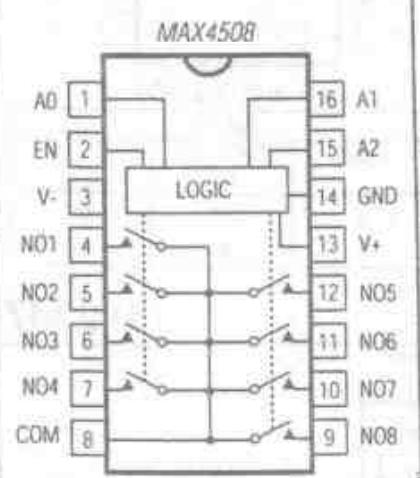
SOT23-6

H.2336



H.2337

H.2342



H.2340

MAX4509



H.2341



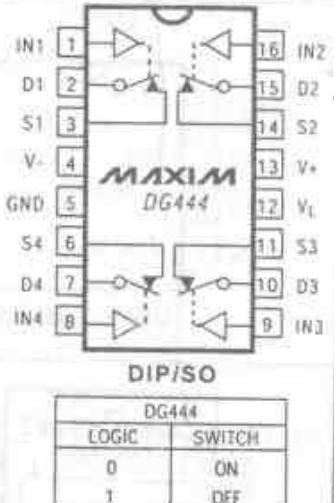
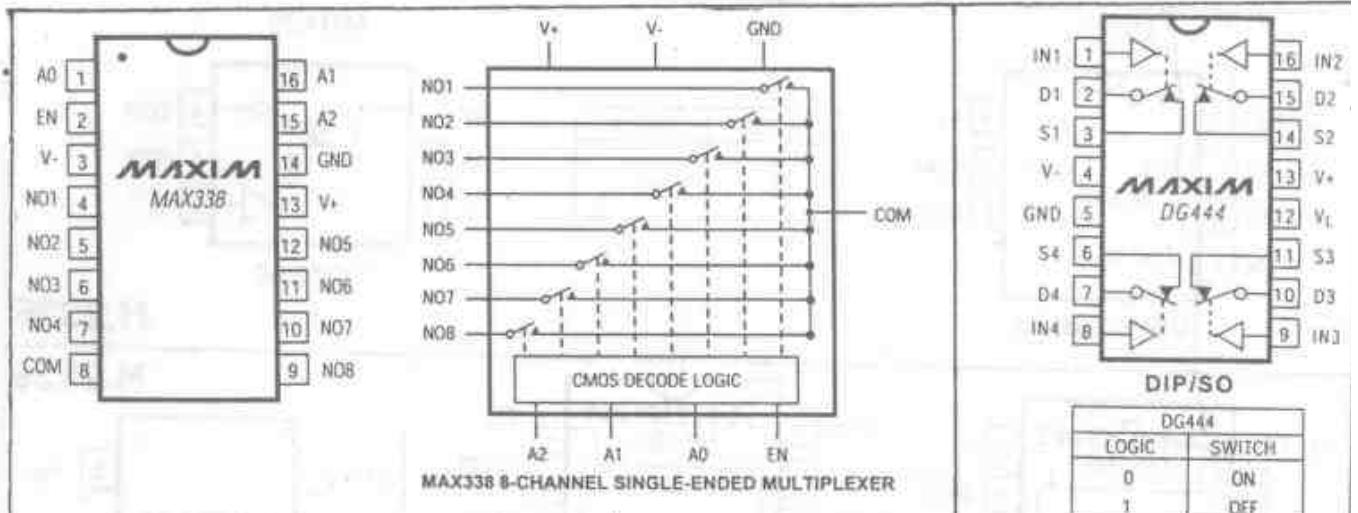
DIP/SO



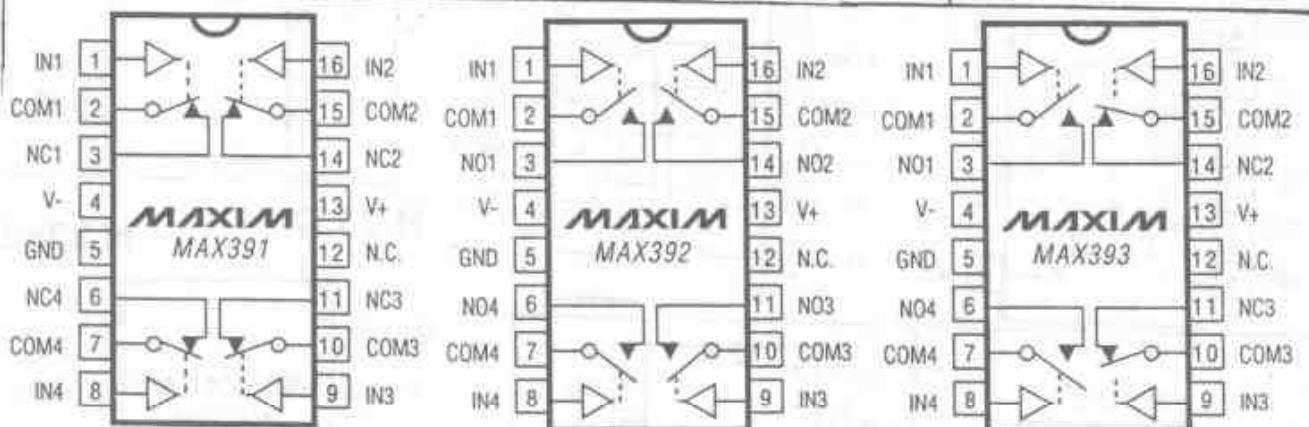
DIP/SO

H.2344

( ) ARE FOR MAX813L ONLY.



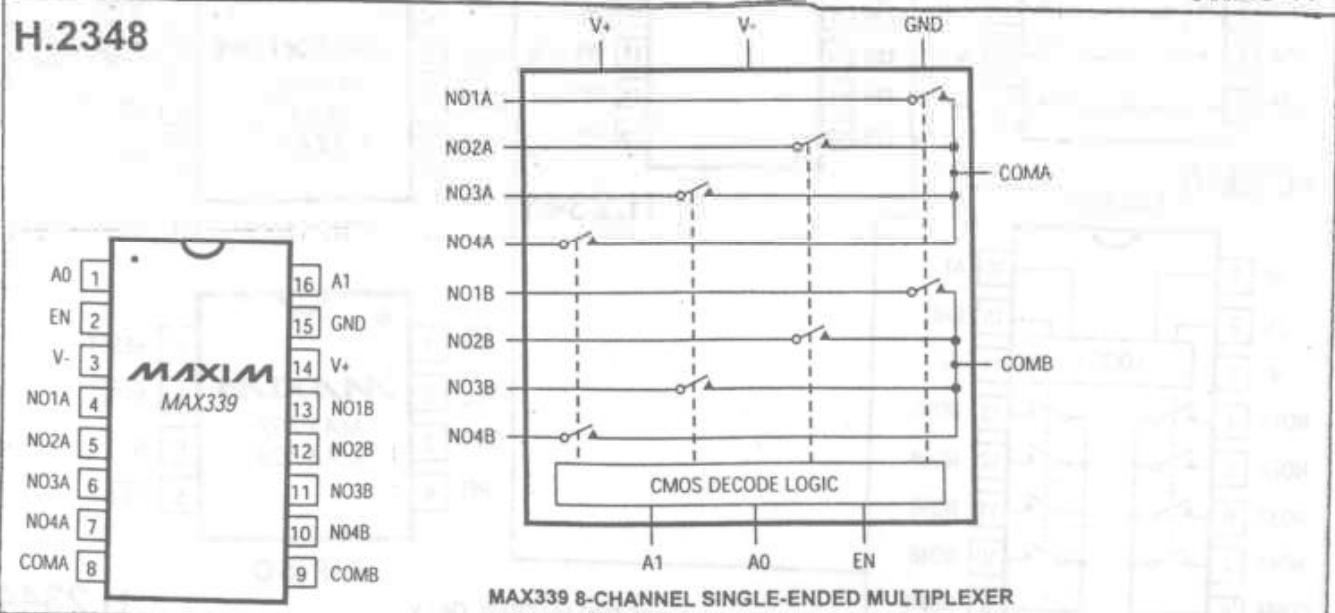
H.2345 H.2346

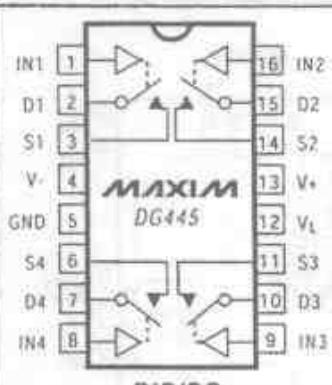


SWITCHES SHOWN FOR LOGIC "0" INPUT

H.2347

H.2348



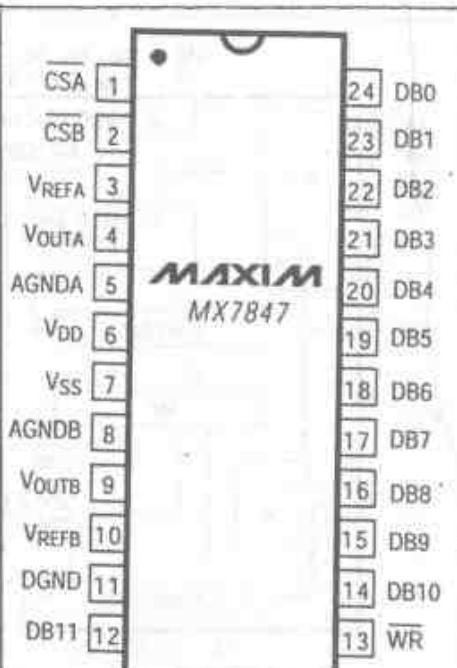


DG445	
LOGIC	SWITCH
0	OFF
1	ON

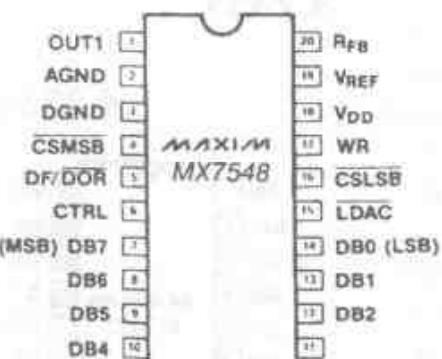
H.2349



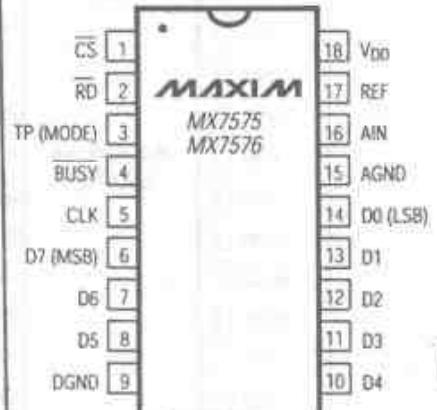
H.2350



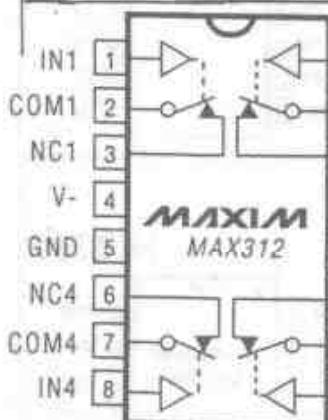
H.2351



H.2352



H.2353



DIP/SO/TSSOP

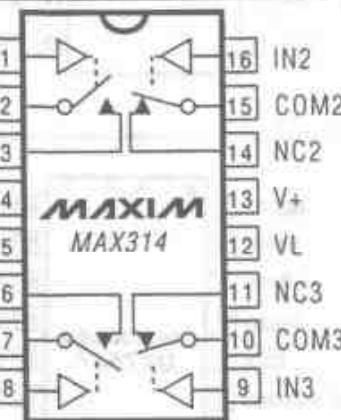
SO/MAX312	
LOGIC	SWITCH
0	ON
1	OFF

H.2355



DIP/SO/TSSOP

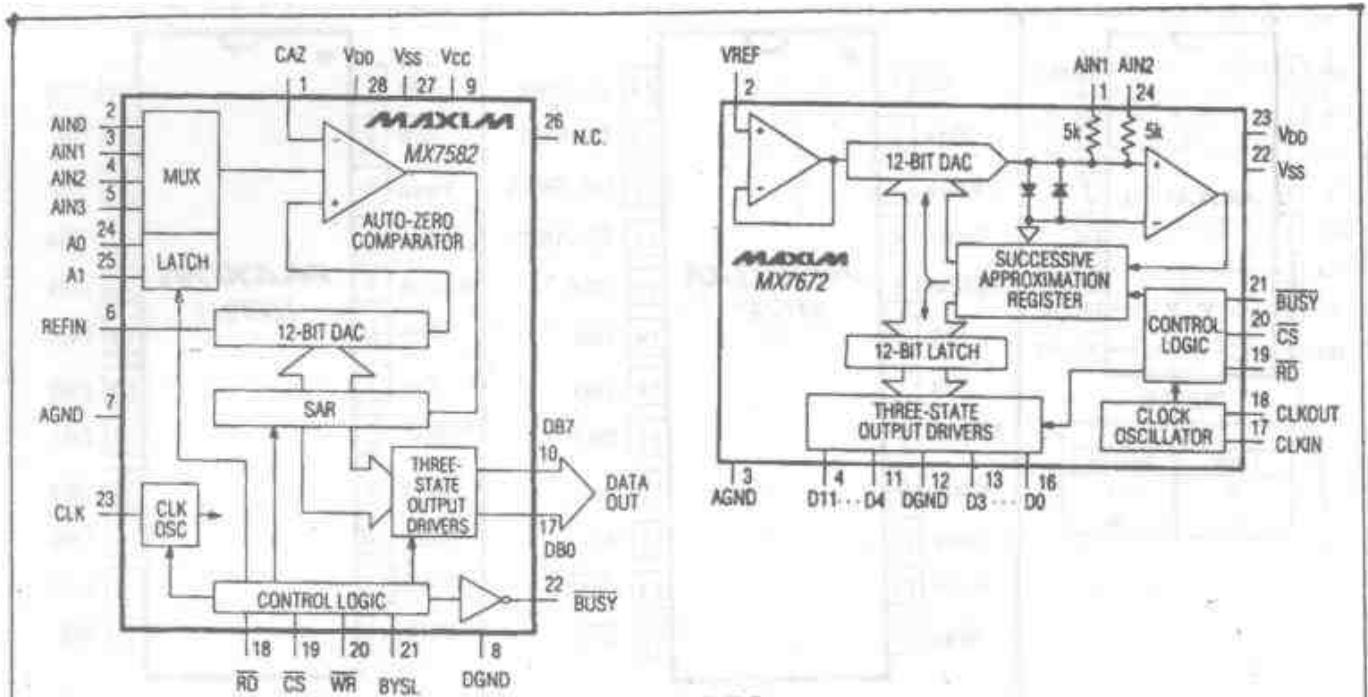
MAX313	
LOGIC	SWITCH
0	OFF
1	ON



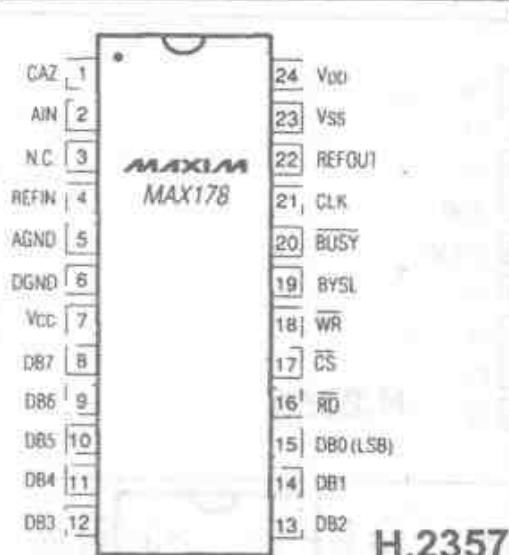
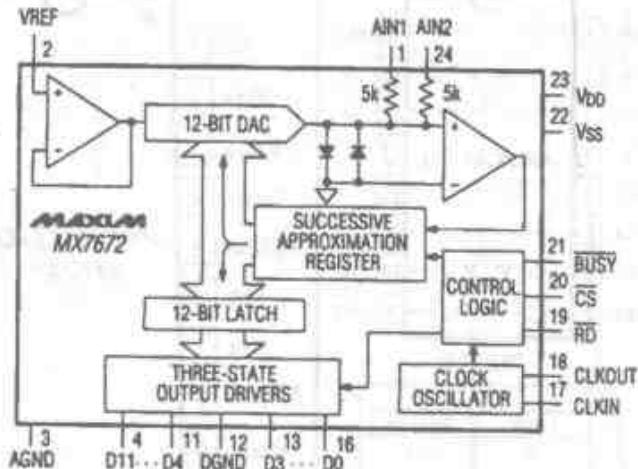
DIP/SO/TSSOP

MAX314	SWITCHES 1,4	SWITCHES 2,3
LOGIC	SWITCHES	SWITCHES
0	OFF	ON
1	ON	OFF

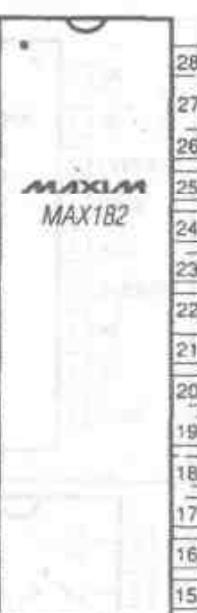
SWITCHES SHOWN FOR LOGIC "0" INPUT



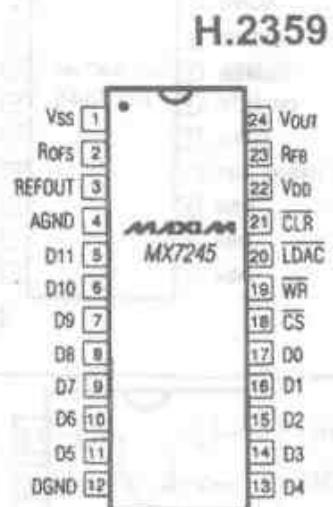
H.2356



H.2357



H.2358



H.2359



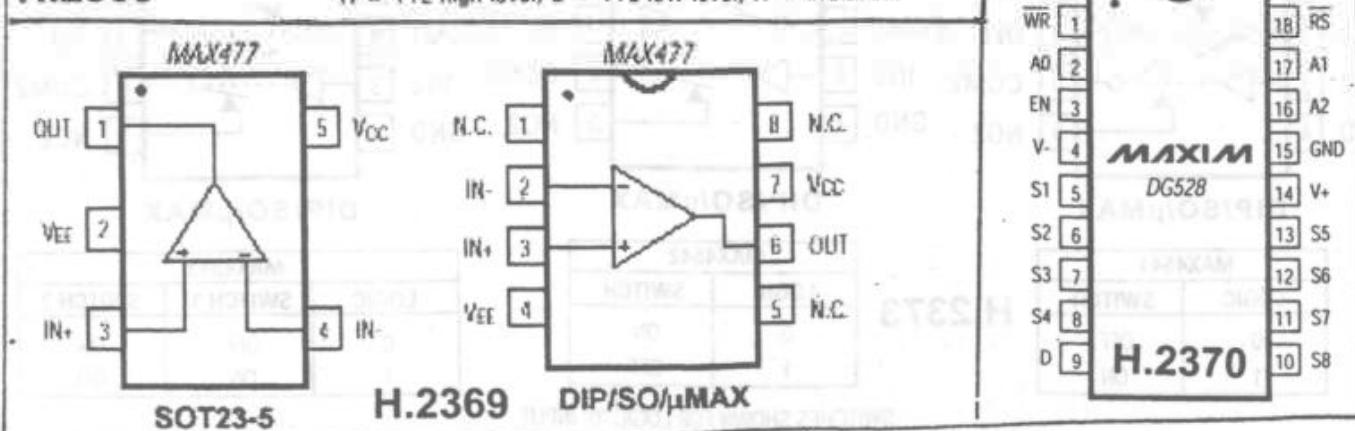
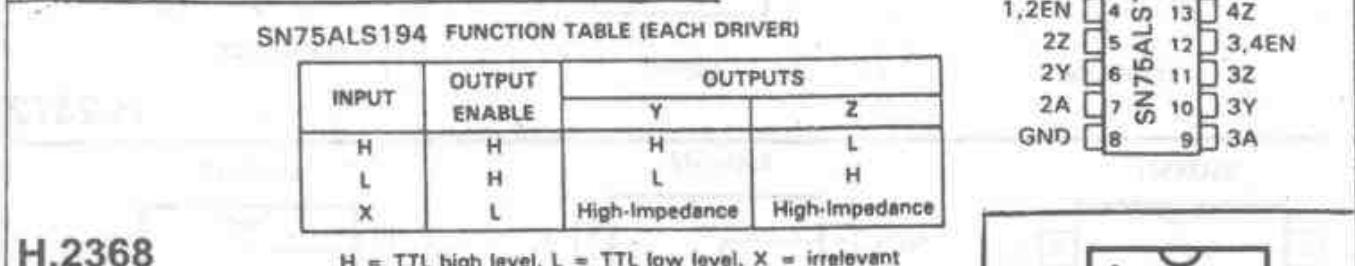
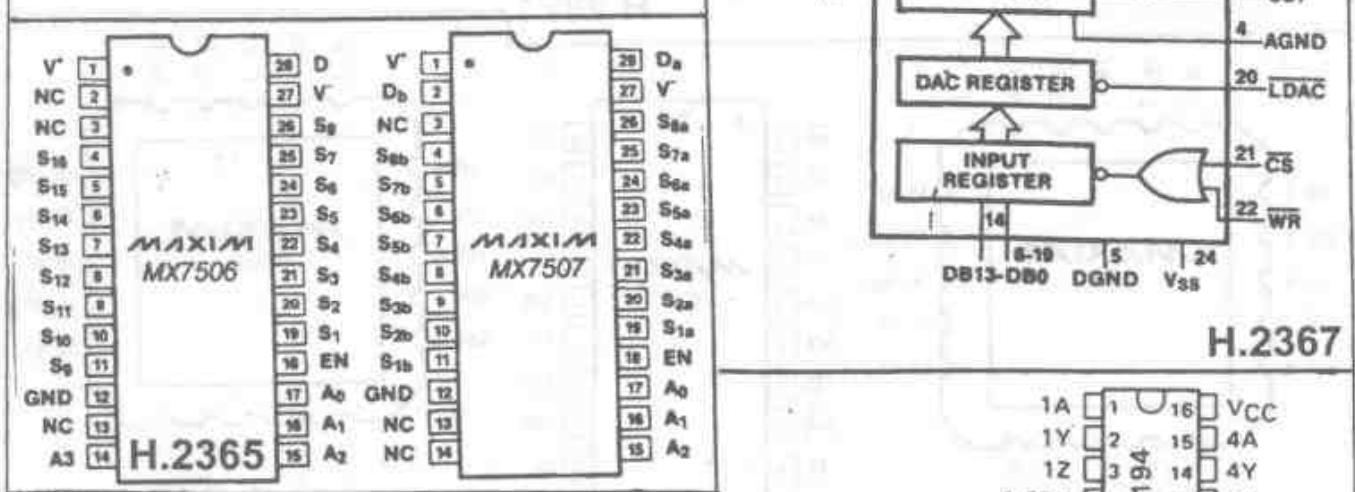
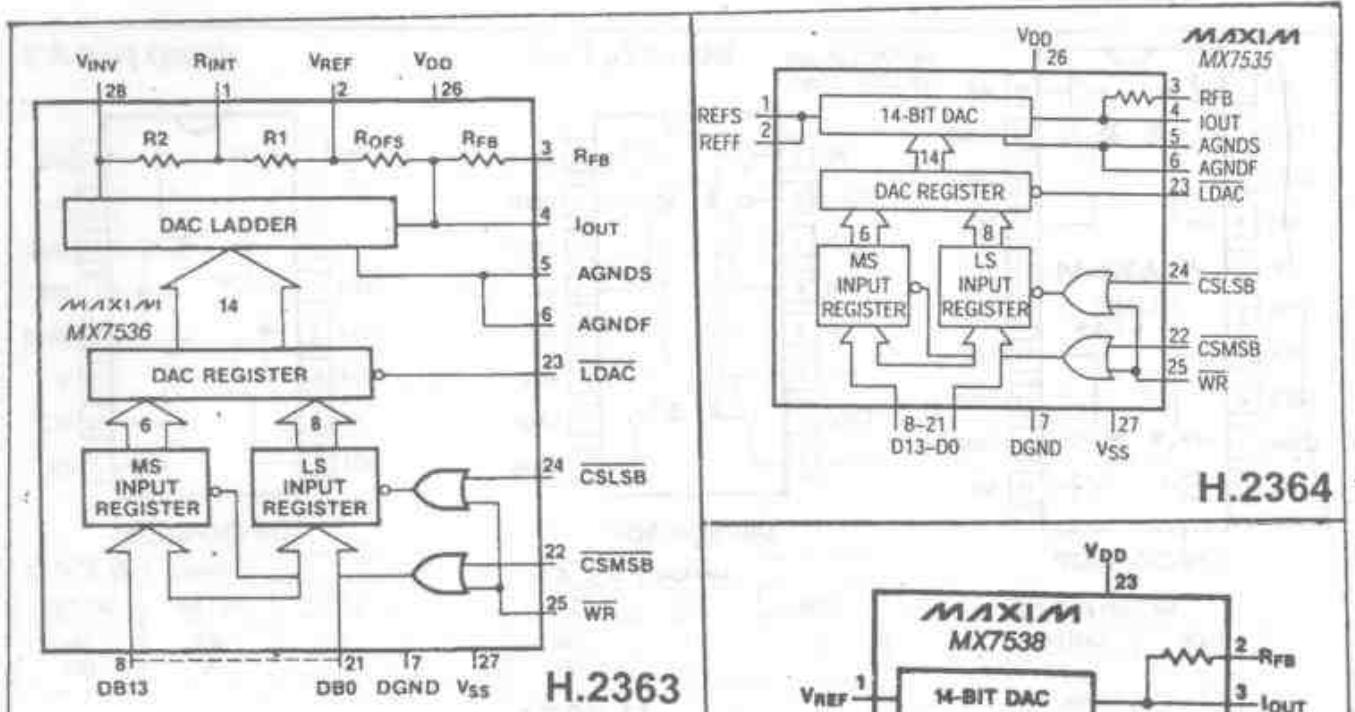
H.2360

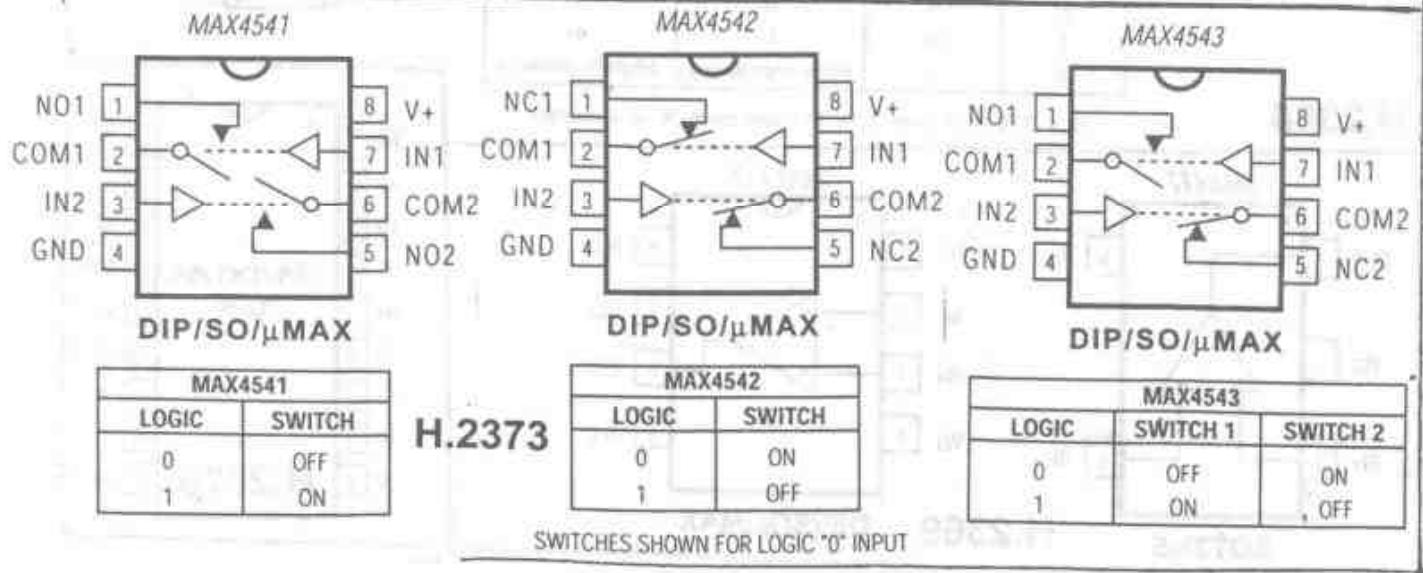
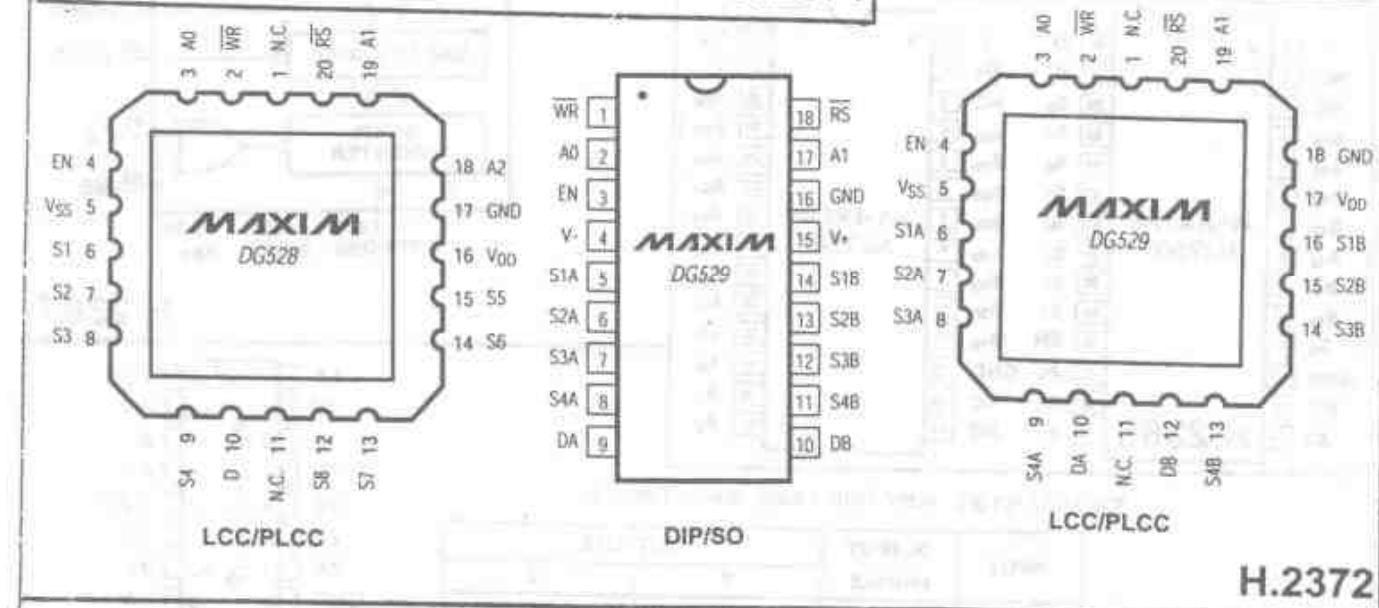
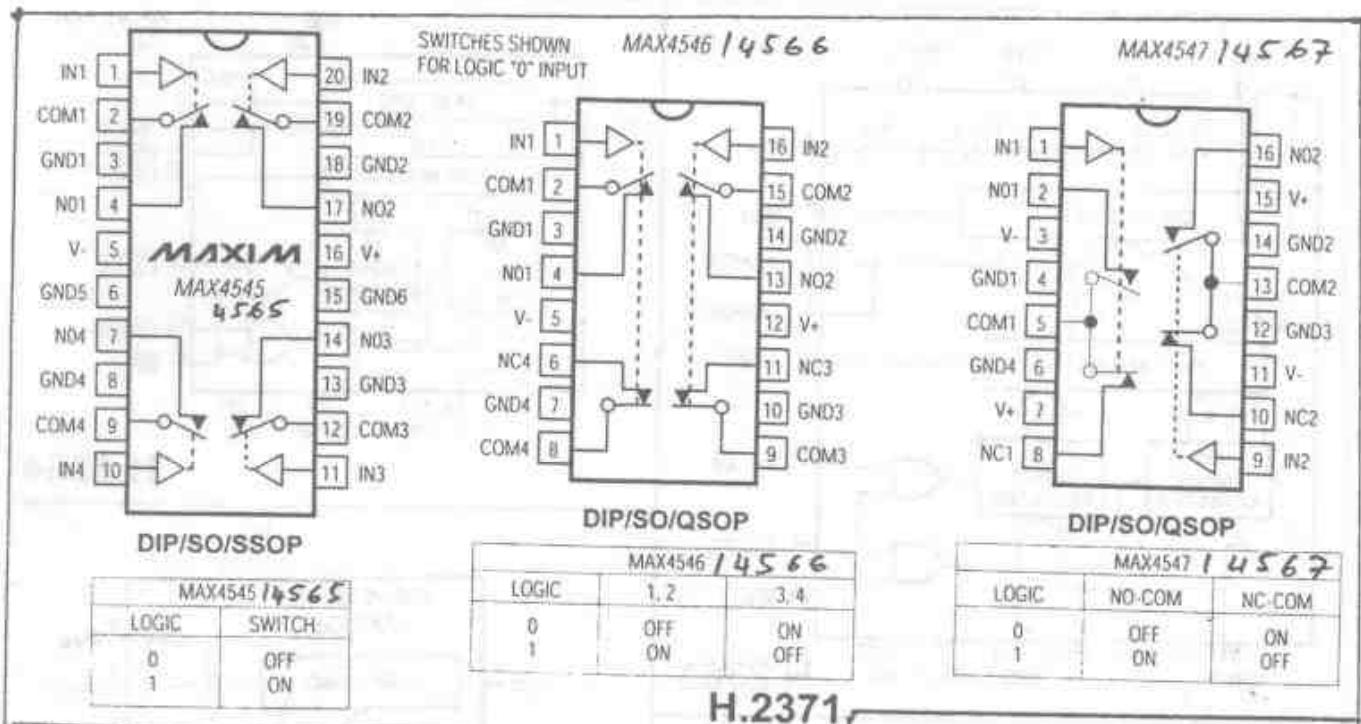


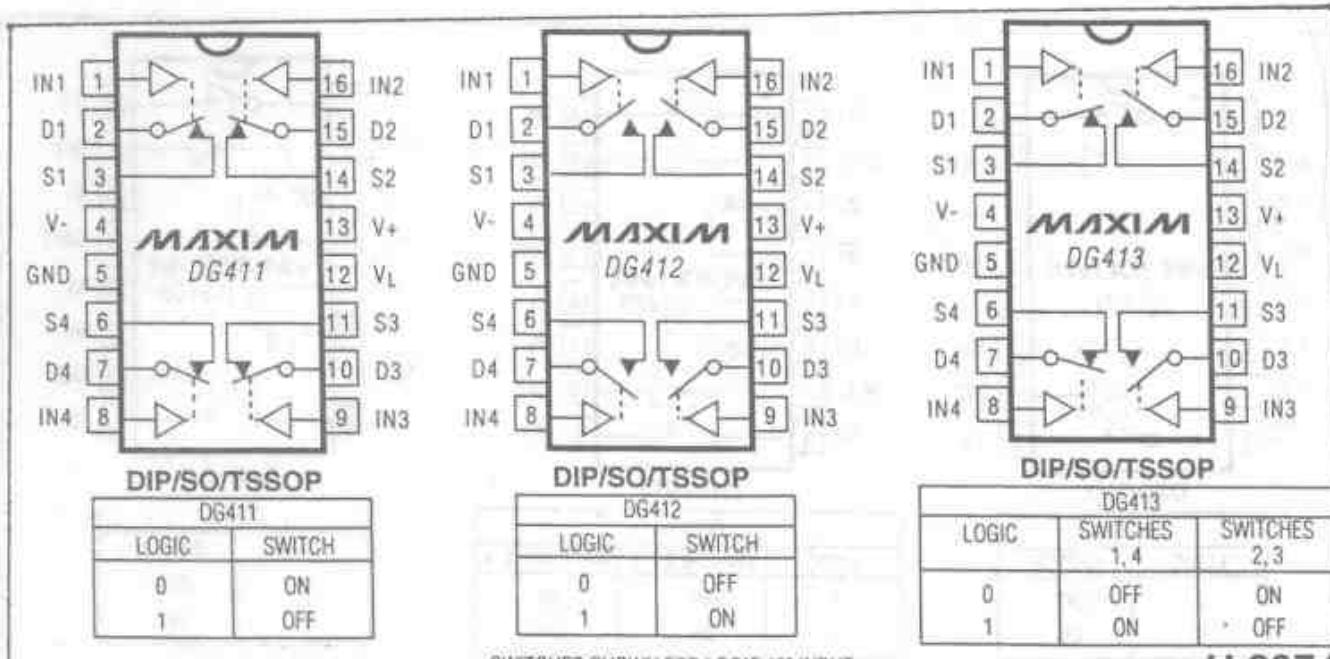
H.2361



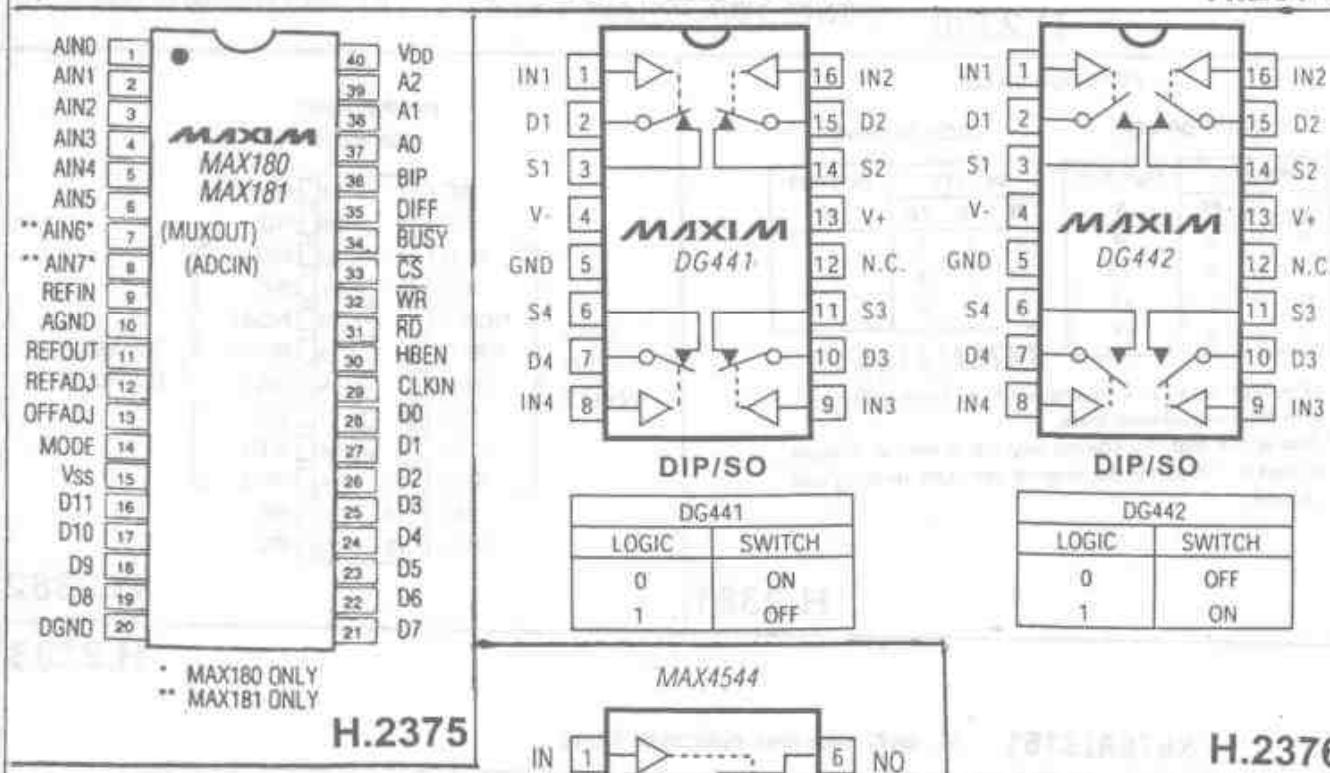
H.2362



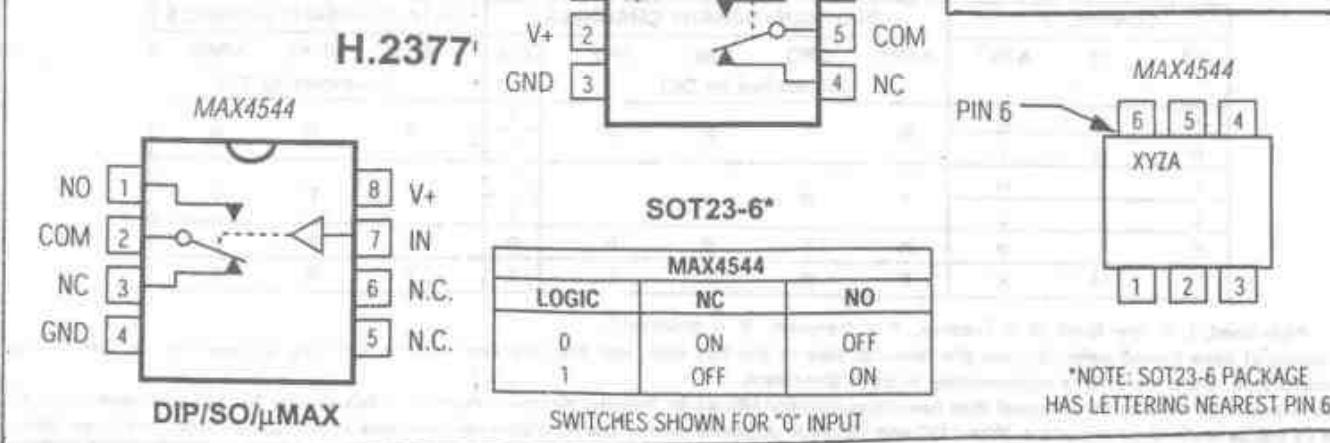


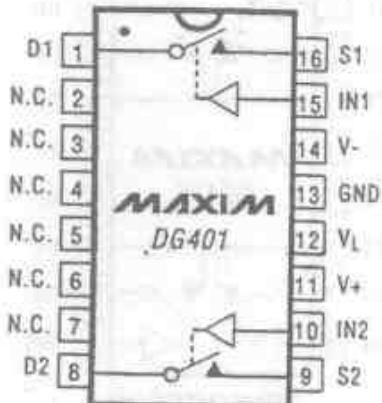


H.2374



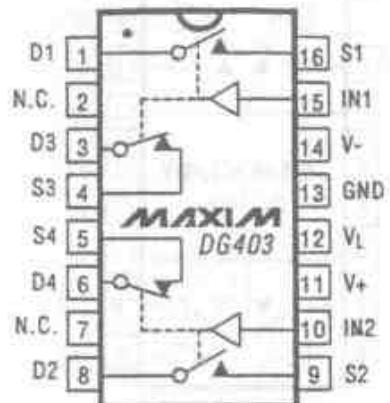
\* MAX180 ONLY  
\*\* MAX181 ONLY





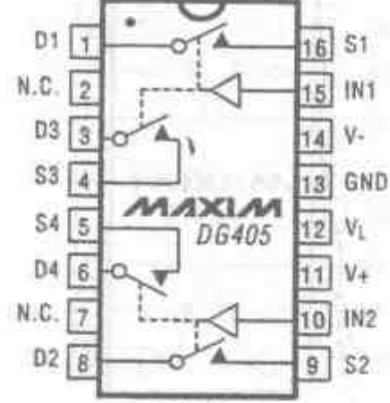
DIP/SO

DG401	
LOGIC	SWITCH
0	OFF
1	ON



DIP/SO

DG403		
LOGIC	SWITCHES 1, 2	SWITCHES 3, 4
0	OFF	ON
1	ON	OFF



DIP/SO

DG405	
LOGIC	SWITCH
0	OFF
1	ON

N.C. = NOT INTERNALLY CONNECTED

H.2380

SWITCHES SHOWN FOR LOGIC "0" INPUT

## FUNCTION TABLES

## EACH DRIVER

INPUTS			OUTPUT
D	TE	PE	B
H	H	H	H
L	H	X	L
H	X	L	Z <sup>†</sup>
X	L	X	Z <sup>†</sup>

## EACH RECEIVER

INPUTS			OUTPUT
B	TE	PE	D
L	L	X	L
H	L	X	H
X	H	X	Z

SN75ALS160

H = high level, L = low level, X = irrelevant,  
Z = high-impedance state.<sup>†</sup>This is the high-impedance state of a normal 3-state output modified by the internal resistors to VCC and ground.

H.2381

DW PACKAGE  
(TOP VIEW)TERMINAL  
I/O PORTS

H.2382

H.2383

## SN75ALS161 RECEIVE/TRANSMIT FUNCTION TABLE

CONTROLS			BUS-MANAGEMENT CHANNELS				DATA-TRANSFER CHANNELS			
DC	TE	ATN <sup>†</sup>	ATN <sup>†</sup>	SRQ	REN	IFC	EOI	DAV	NDAC	NRFD
H	H	H	R	T	R	R	T	T	R	R
H	H	L					R			
L	L	H	T	R	T	T		R	T	T
L	L	L					T			
H	L	X	R	T	R	R	R	R	T	T
L	H	X	T	R	T	T	T	T	R	R

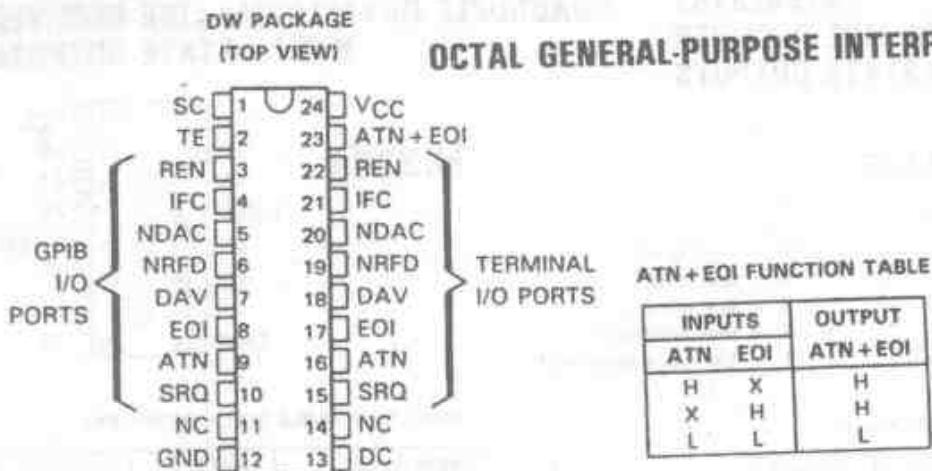
H = high level, L = low level, R = receive, T = transmit, X = irrelevant

Direction of data transmission is from the terminal side to the bus side, and the direction of data receiving is from the bus side to the terminal side. Data transfer is noninverting in both directions.

<sup>†</sup>ATN is a normal transceiver channel that functions additionally as an internal direction control or talk enable for EOI whenever the DC and TE inputs are in opposite states. When DC and TE are in opposite states, the ATN channel functions as an independent transceiver only.

SN75ALS164

## OCTAL GENERAL-PURPOSE INTERFACE BUS TRANSCEIVER



H.2384

RECEIVE/TRANSMIT FUNCTION TABLE

CONTROLS			BUS-MANAGEMENT CHANNELS				DATA-TRANSFER CHANNELS				
SC	DC	TE	ATN <sup>†</sup>	ATN <sup>†</sup>	SRQ	REN	IFC	EOI	DAV	NDAC	NRFD
	H	H	H	R	T			T	T	R	R
	H	H	L					R	R	T	T
	L	L	H	T	R			T	R	T	T
	L	L	L					R	R	T	T
	H	L	X	R	T			T	T	R	R
	L	H	X		R			R	R		
	H										
	L										

H = high level, L = low level, R = receive, T = transmit, X = irrelevant

Direction of data transmission is from the terminal side to the bus side, and the direction of data receiving is from the bus side to the terminal side. Data transfer is noninverting in both directions.

<sup>†</sup>ATN is a normal transceiver channel that functions additionally as an internal direction control or talk enable for EOI whenever the DC and TE inputs are in the same state. When DC and TE are in opposite states, the ATN channel functions as an independent transceiver only.

FUNCTION TABLES

EACH DRIVER			EACH RECEIVER		
INPUTS			OUTPUT		
D	TE	PE	B	B	OUTPUT
H	H	H	H	L	
L	H	X	L	H	
H	X	L	Z		
X	L	X	Z		

SN75ALS163

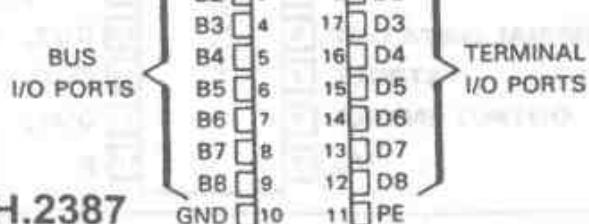
H.2385

H = high level, L = low level, X = irrelevant, Z = High-impedance state.

FUNCTION TABLES

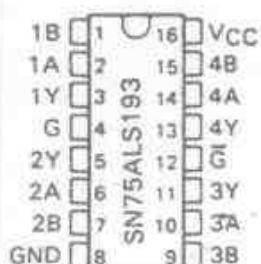
SN75ALS165			EACH DRIVER			EACH RECEIVER					
INPUTS			OUTPUT			INPUTS			INPUTS		
D	TE	PE	B	B	OUTPUT	D	TE	PE	B	OUTPUT	
H	H	H	H	L		L	L	H	L		
L	H	X	L	H		H	L	H	H		
H	X	L	Z			X	H	X	Z		
X	L	X	Z			X	X	L	Z		

H = high level, L = low level, X = irrelevant, Z = high-impedance state.

<sup>†</sup>This is the high-impedance state of a normal 3-state output modified by the internal resistors to VCC and ground.

H.2387

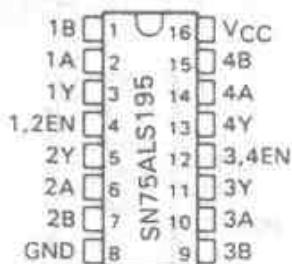
**SN75ALS193**  
QUADRUPLE DIFFERENTIAL LINE RECEIVER  
WITH 3-STATE OUTPUTS



H.2388

H = high level  
L = low level  
X = irrelevant  
? = indeterminate  
Z = high-impedance (off)

**SN75ALS195**  
QUADRUPLE DIFFERENTIAL LINE RECEIVER  
WITH 3-STATE OUTPUTS



H.2389

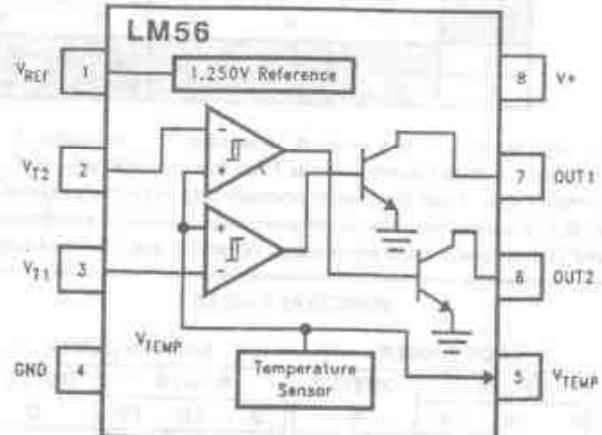
FUNCTION TABLE (EACH RECEIVER)

DIFFERENTIAL A-B	ENABLES		OUTPUT Y
	G	$\bar{G}$	
$V_{ID} \geq 0.2 \text{ V}$	H	X	H
	X	L	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	H	X	?
	X	L	?
$V_{ID} \leq -0.2 \text{ V}$	H	X	L
	X	L	L
X	L	H	Z

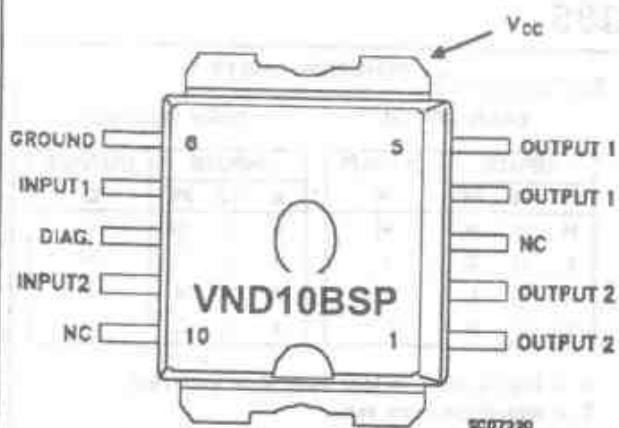
DIFFERENTIAL A-B	ENABLES		OUTPUT Y
	G	$\bar{G}$	
$V_{ID} \geq 0.2 \text{ V}$	H	X	H
	X	L	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	H	X	?
	X	L	?
$V_{ID} \leq -0.2 \text{ V}$	H	X	L
	X	L	L
X	L	H	Z



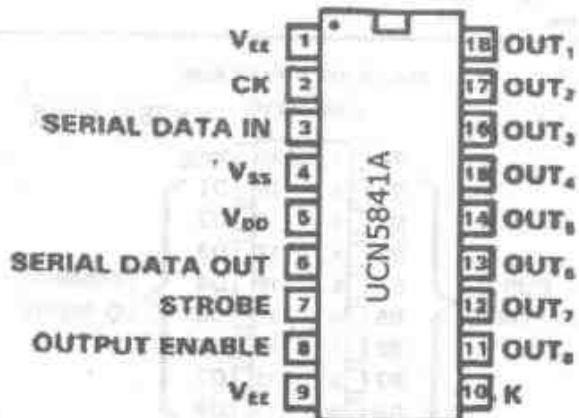
H.2390

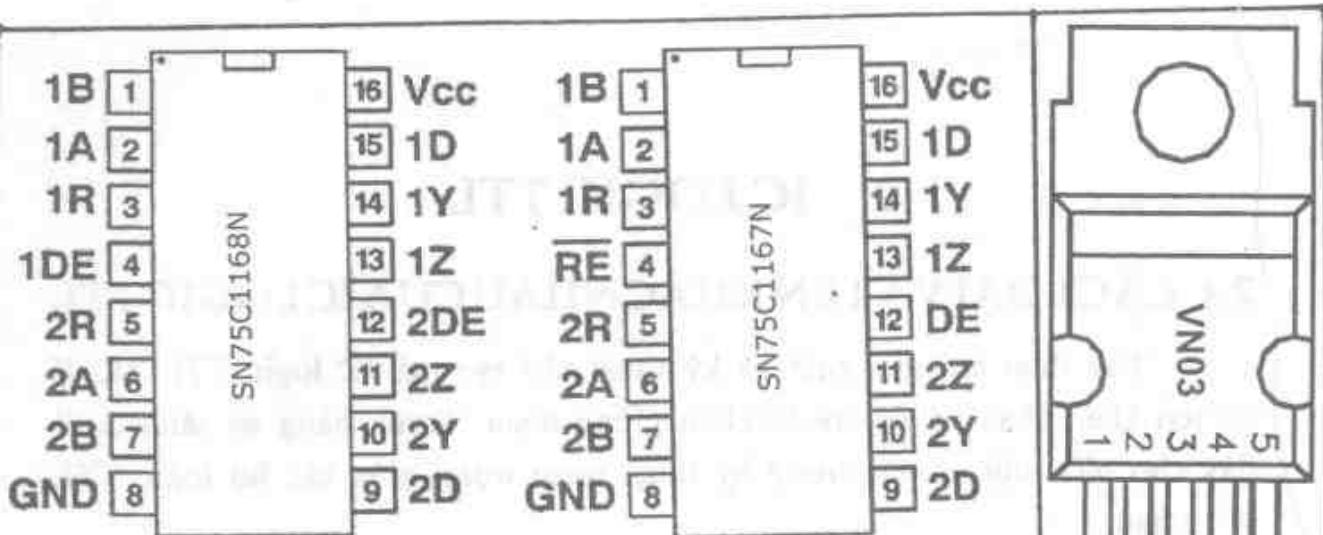


H.2391

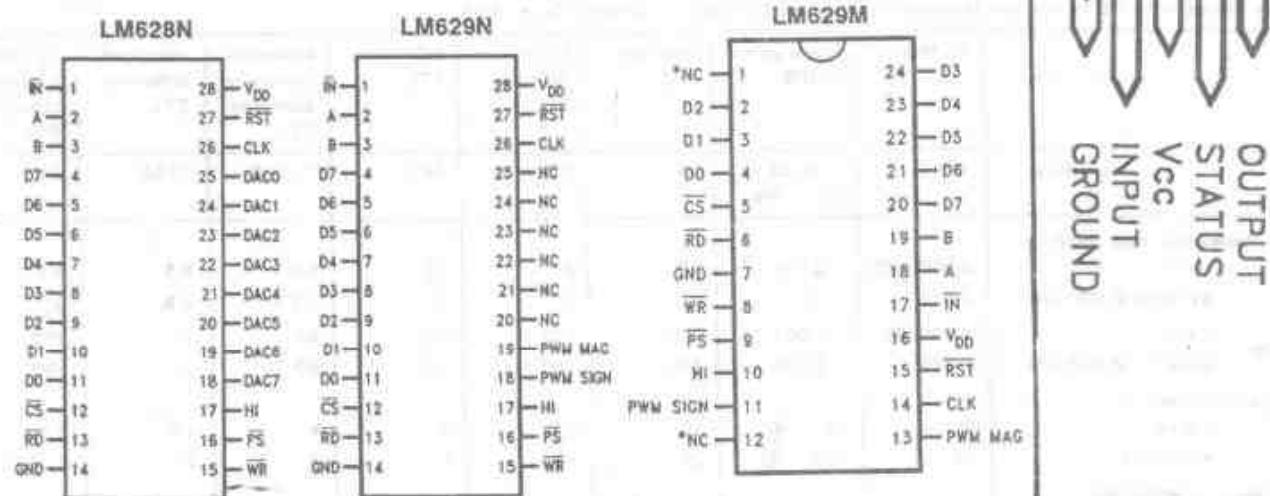


H.2392





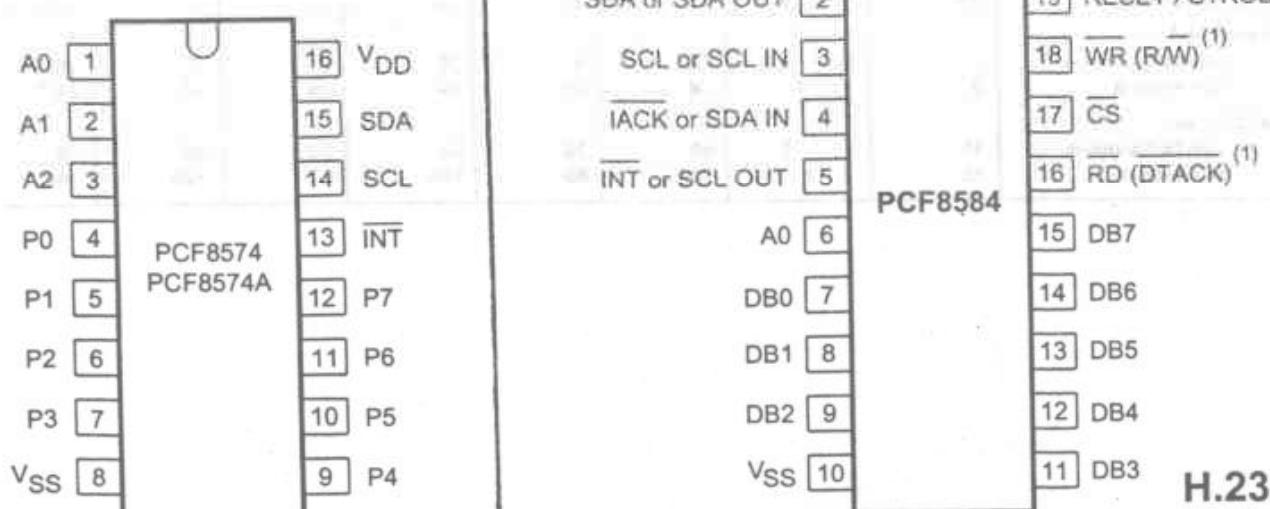
H.2394



H.2396

H.2395

H.2397



H.2398

## 2. IC LOGIC TTL

### 2.1 CÁC LOẠI VÀ TÊN KHÁC NHAU CỦA IC LOGIC TTL

Tùy theo nơi sản xuất và kỹ thuật chế tạo mà IC logic TTL 74XX có tên khác nhau dù có sơ đồ chân giống nhau. Trong bảng so sánh dưới đây cho biết một số đặc trưng kỹ thuật quan trọng giữa các họ logic TTL với nhau.

Comparison of CMOS and TTL technologies:  
supply voltage  $V_{CC} = 5$  V; ambient temperature  $T_{amb} = 25^\circ\text{C}$ ; load capacitance  $C_L = 15 \mu\text{F}$

parameters	technology	HCMOS	metal gate CMOS	standard TTL	low-power Schottky TTL	Schottky TTL	advanced low-power Schottky TTL	advanced Schottky TTL	Fairchild advanced Schottky TTL
		74HC	4000 CD HE	74	74LS	74S	74ALS	74AS	74F
Power dissipation, typ. (mW)									
Gate static		0.0000025	0.001	10	2	19	1.2	8.5	5.5
dynamic @ 100 kHz		0.075	0.1	10	2	19	1.2	8.5	5.5
Counter static		0.000005	0.001	300	100	500	60	—	190
dynamic @ 100 kHz		0.125	0.120	300	100	500	60	—	190
Propagation delay (ns)									
Gate typical		8	94 40	10	9.5	3	4	1.5	3
maximum		14	190 80	20	15	5	7	2.5	4
Delay/power product (pJ)									
Gate at 100 kHz		0.52	9 4	100	19	57	4.8	13	16.5
Maximum clock frequency (MHz)									
typical		55	4 12	25	33	100	60	160	125
D-type flip-flop minimum		30	2 6	15	25	75	40	—	100
Counter typical		45	2 6	32	32	70	45	—	125
minimum		25	1 3	25	25	40	—	—	100
Output drive (mA)									
standard outputs		4	0.51 0.8	16	8	20	8	20	20
bus outputs		6	1.6	48	24	64	24	48	64
Fan-out (LS-loads)									
standard outputs		10	1 2	40	20	50	20	50	50
bus outputs		15	4	120	60	160	60	120	160

# Bảng so sánh TTL74XXX-TTLFLXXX

## TTL-ICs(F1/SN)

Typ	SN	Typ	SN
FLH 101	SN 7400 N	FLJ 181	SN 7493 N
FLH 111	SN 7410 N	FLJ 191	SN 7495 N
FLH 121	SN 7420 N	FLJ 201	SN 74190 N
FLH 131	SN 7430 N	FLJ 211	SN 74191 N
FLH 141	SN 7440 N	FLJ 221	SN 7491 AN
FLH 151	SN 7450 N	FLJ 231	SN 7490 N
FLH 161	SN 7451 N	FLJ 241	SN 74192 N
FLH 171	SN 7453 N	FLJ 251	SN 74193 N
FLH 181	SN 7454 N	FLJ 261	SN 7496 N
FLH 191	SN 7402 N	FLJ 271	SN 74107 N
FLH 191 S	SN 7402 NS 1	FLJ 281	SN 74104 N
FLH 201	SN 7401 N	FLJ 291	SN 74105 N
FLH 201 S	SN 7401 NS 1	FLJ 301	SN 74100 N
FLH 201 T	SN 7401 NS 3	FLJ 311	SN 74198 N
FLH 211	SN 7404 N	FLJ 321	SN 74199 N
FLH 221	SN 7480 N	FLJ 331	SN 7497 N
FLH 231	SN 7482 N	FLJ 341	SN 74110 N
FLH 241	SN 7483 N	FLJ 351	SN 74111 N
FLH 271	SN 7405 N	FLJ 361	SN 74118 N
FLH 271 S	SN 7405 NS 1	FLJ 371	SN 74119 N
FLH 271 T	SN 7405 NS 3	FLJ 381	SN 74196 N
FLH 281	SN 7442 N	FLJ 391	SN 74197 N
FLH 291	SN 7403 N	FLJ 401	SN 74160 N
FLH 291 S	SN 7403 NS 1	FLJ 411	SN 74161 N
FLH 291 T	SN 7403 NS 3	FLJ 421	SN 74162 N
FLH 291 U	SN 7426 N	FLJ 431	SN 74163 N
FLH 341	SN 7486 N	FLJ 441	SN 74164 N
FLH 351	SN 7413 N	FLJ 451	SN 74165 N
FLH 361	SN 7443 N	FLJ 461	SN 74166 N
FLH 371	SN 7444 N	FLJ 471	SN 74167 N
FLH 381	SN 7408 N	FLK 101	SN 74121 N
FLH 391	SN 7409 N	FLK 111	SN 74122 N
FLH 401	SN 74181 N	FLK 121	SN 74123 N
FLH 411	SN 74182 N	FLL 101	SN 7441 AN
FLH 421	SN 74180 N	FLL 101	SN 74141 N
FLH 431	SN 7485 N	FLL 111	SN 7445 N
FLH 441	SN 7478 N	FLL 111 T	SN 74145 N
FLH 451	SN 74 H 183 N	FLL 121	SN 7446 N
FLH 481	SN 7406 N	FLL 121 T	SN 7447 N
FLH 481 T	SN 7416 N	FLQ 101	SN 7489 N
FLH 491	SN 7407 N	FLQ 111	SN 7481 N
FLH 491 T	SN 7417 N	FLQ 121	SN 7484 N
FLH 501	SN 7412 N	FLY 101	SN 7460 N
FLH 511	SN 7423 N	FLY 111	SN 74150 N
FLH 521	SN 7425 N	FLY 121	SN 74151 N
FLH 531	SN 7437 N	FLY 131	SN 74163 N
FLH 541	SN 7438 N	FLY 141	SN 74154 N
FLH 551	SN 7448 N	FLY 151	SN 74155 N
FLJ 101	SN 7470 N	FLY 161	SN 74156 N
FLJ 111	SN 7472 N		
FLJ 121	SN 7473 N		
FLJ 131	SN 7476 N		
FLJ 141	SN 7474 N		
FLJ 151	SN 7475 N		
FLJ 161	SN 7490 N		
FLJ 161 S	SN 7490 NS 1		
FLJ 171	SN 7492 N		

## 2.2 CÁCH ĐỌC BẢNG SỰ THẬT

Dòng đầu tiên cho biết rằng có sự xóa đồng bộ khi xung xóa CLEAR ở trạng thái L. Tất cả 4 ngõ ra  $Q_A \dots Q_D$  đều ở trạng thái L không bị ảnh hưởng bởi những trạng thái của các ngõ vào khác. Trong các dòng khác CLEAR ở trạng thái H và không ảnh hưởng gì. Dòng thứ hai diễn tả rằng, khi xung đồng hồ CLOCK ở trạng thái low (trong khi CLEAR là high), các trạng thái ở các ngõ vào khác không tác động gì cả và các ngõ ra giữ trạng thái như trước khi trạng thái ổn định của CLEAR = H và CLOCK = L được thành lập. Các dòng khác còn chỉ rằng xung CLOCK chỉ ảnh hưởng các ngõ ra khi nó tăng lên ( $\uparrow$ ) cho nên dòng thứ hai còn nhấn mạnh rằng các ngõ ra sẽ không thay đổi khi xung CLOCK = H hay đổi sang trạng thái từ H thành L.

Dòng thứ 3 diễn tả sự nạp dữ kiện đồng bộ các bộ nhớ, và nói rằng khi S1 và S0 cùng H, không cần chú ý đến trạng thái ở ngõ vào liên tục (serial input). Dữ kiện ở A sẽ được nạp ở  $Q_A$ , dữ kiện ở B sẽ được nạp vào  $Q_B$  và tiếp tục ... sau khi xung đồng hồ CLOCK chuyển từ L sang H ( $\uparrow$ ).

Dòng thứ tư và thứ năm cho thấy việc nạp dữ kiện H và L từ ngõ vào liên tục dịch chuyển bên phải (shift-register serial input) và sự dịch chuyển các dữ kiện đã nạp trước đây 1 bit. Dữ kiện trước ở  $Q_A$  giờ ở  $Q_B$ , trước ở  $Q_B$  giờ ở  $Q_C$ , trước ở  $Q_C$  giờ ở  $Q_D$ . Dữ kiện trước ở  $Q_D$  không còn trong bộ nhớ nữa. Sự nạp và dịch chuyển các dữ kiện xảy ra lúc xung CLOCK chuyển từ Low sang High và khi S1 là Low và S0 là High. Trạng thái ở các ngõ vào từ A đến D không ảnh hưởng gì. Dòng thứ 6 và thứ 7 cho thấy việc nạp dữ kiện H và L từ ngõ vào liên tục dịch chuyển bên trái (shift-left serial input) và sự dịch chuyển các dữ kiện đã nạp trước đây 1 bit. Dữ kiện trước ở  $Q_B$  giờ ở  $Q_A$ , trước ở  $Q_C$ ,  $Q_D$  giờ ở  $Q_B$  và  $Q_C$ . Dữ kiện trước ở  $Q_A$  giờ không còn ở trong bộ nhớ nữa. Sự nạp và dịch chuyển các dữ kiện xảy ra lúc xung CLOCK chuyển từ Low sang High và khi S1 là High và S0 là Low. Các trạng thái ở các ngõ vào từ A đến D không ảnh hưởng gì.

FUNCTION TABLE type SN74194.

CLEAR	MODE S1 S0	CLOCK	INPUTS		PARALLEL				OUTPUTS			
			LEFT	RIGHT	A	B	C	D	QA	QB	QC	QD
L	X X	X	X X	X X	X	X	X	X	L	L	L	L
H	X X	L	X X	X X	X	X	X	X	QA0	QB0	QC0	QD0
H	H H	T	X X	a b c d	a	b	c	d	a	b	c	d
H	L H	T	X H	X X	X	X	X	X	H	QA <sub>n</sub>	QB <sub>n</sub>	QC <sub>n</sub>
H	L H	T	X L	X X	X	X	X	X	L	QA <sub>n</sub>	QB <sub>n</sub>	QC <sub>n</sub>
H	H L	T	H X	X X	X	X	X	X	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	H
H	H L	T	L X	X X	X	X	X	X	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	L
H	L L	X	X X	X X	X	X	X	X	QA0	QB0	QC0	QD0

Dòng cuối cùng cho thấy cả hai trạng thái S1 và S0 đều L, trạng thái tất cả các ngõ vào khác không ảnh hưởng gì, và như ở dòng thứ hai, các ngõ ra giữ trạng thái cũ như trước khi CLEAR = H và cả hai ngõ vào S1 và S0 = L được thành lập.

## 2.3 CHỮ VIẾT TẮT

### 2.3.1 Chữ viết tắt trong các bảng sự thật

L Low, thấp

H High, cao

X Trạng thái không có ý nghĩa

Z Ngõ ra Tri-State đang ở trạng thái có tổng trở cao

↑ Xung dương chuyển từ mức logic thấp sang cao ở những ngõ vào của xung đồng bộ.

↓ Xung âm, chuyển từ mức logic cao sang thấp ở những ngõ vào của xung đồng bộ.

↔ Xung dương, mức logic cao

↙ Xung âm, mức logic thấp

J, K, S, R, D Tên ngõ vào của những FlipFlops

**TOGGLE** Cả hai ngõ ra của một flipflop' thay đổi mức logic sau mỗi xung đồng bộ hay sau mỗi chuyển đổi tích cực của xung đồng bộ.

**Q, Q'** Những ngõ ra của bộ nhớ, bộ đếm, bộ đẩy...

**Q<sub>o</sub>, Q<sub>o'</sub>** Mức logic của Q,  $\overline{Q}$  trước khi trạng thái ổn định được liệt kê trong bảng sự thật của những ngõ vào được thành lập.

### 2.3.2 Chữ viết tắt trong các sơ đồ chân

**NC** No internal connection, chân IC không có nối với mạch điện bên trong IC

**CK** CLOCK, xung đồng hồ

**CLR** CLEAR, xung xóa

**PR** PRESET

**OC** Output Control ở ngõ ra Tri-State

**X, X'** Những ngõ ra của một bộ giãn (expander) hay những ngõ vào của cổng có thể mở rộng.

### 2.3.3 Chữ viết tắt đặc trưng kỹ thuật

**V<sub>cc</sub>** Điện áp nguồn

**V<sub>I</sub>** Input voltage, điện áp vào

**V<sub>IL</sub>** Điện áp vào ở trạng thái thấp

**V<sub>IH</sub>** Điện áp vào ở trạng thái cao

**V<sub>O</sub>** Điện áp ra

**V<sub>OL</sub>, V<sub>OH</sub>** Điện áp ra ở trạng thái thấp, cao

**I<sub>I</sub>, I<sub>O</sub>** Dòng điện vào ra

**I<sub>OL</sub>** Dòng điện rò ở ngõ ra Tri-State trong trạng thái thấp

$I_{o2H}$	Dòng điện rò ở ngõ ra Tri-State trong trạng thái cao.
$T_A$	Nhiệt độ môi trường quanh IC
$t_{pd}$	Thời gian trễ trung bình xung
$t_{pLH}$	Thời gian trễ khi ngõ ra chuyển từ L sang H
$t_{pHL}$	Thời gian trễ khi ngõ ra chuyển từ H sang L
GND	Ground, đất

## 2.4 KÝ HIỆU, HÀM BOOLE VÀ BẢNG SỰ THẬT CỦA NHỮNG CỔNG LOGIC CƠ BẢN

Inverter	AND	NAND	OR	NOR	EX - OR	EX - NOR												
$Y = \bar{A}$	$Y = A \cdot B$	$Y = \overline{A \cdot B}$	$Y = A + B$	$Y = \overline{A + B}$	$Y = A \oplus B$	$Y = \overline{A \oplus B}$												
A	Y	A	B	Y	A	B	Y	A	B	Y	A	B	Y	A	B	Y		
L	H	L	L	L	L	H	L	L	L	H	L	L	L	L	L	H	L	H
H	L	H	L	L	H	L	H	H	L	L	H	L	H	L	H	L	L	L
L	H	L	H	H	L	H	H	L	H	L	H	L	H	H	L	H	L	L
H	H	H	H	L	H	H	H	H	H	L	H	H	H	L	H	H	H	H

## 2.5 THIẾT KẾ MẠCH VỚI IC HỌ 74XXX

### 2.5.1 Nguồn nuôi

Để tổng trở của nguồn nuôi được giữ thấp, cần phải có những tụ điện mắc giữa hai cực. Đó là các tụ gốm có trị số từ  $1\mu F$  đến  $100nF$ . Để các tụ điện đạt hiệu quả cao nên nối chúng càng gần mạch in càng tốt. Cứ 4 đến 6 IC thì cần một tụ điện. Các tụ điện này cần có tính cao tần tốt, mặt khác góc

hao của tụ điện ( $I_C$ ) phải khá lớn để các dao động được hình thành bởi các tụ và độ tự cảm của mạch in được suy giảm mạnh.

### 2.5.2 Tải điện dung

Tải điện dung cho những mạch TTL không được vượt quá  $100\text{pF}$ . Mục đích để những ngõ ra không quá tải với dòng nạp và phóng điện, các mức logic được đảm bảo. Trường hợp cần làm trễ tín hiệu với những tụ điện khá lớn nên mắc vào trước đáy điện trở  $= 270\Omega$  cho loại schottky 74S và  $R = 1\text{k}\Omega$  cho loại power Schottky 54LS/74LS.

### 2.5.3 Diốt khóa ở ngõ vào (Input Clamping Diode)

Ở ngõ vào cổng TTL đều có diốt khóa, trừ loại 74L. Mục đích để triệt tiêu bớt các điện áp âm từ các tín hiệu phản hồi, do đó nhiều của hệ thống logic bị ngăn chặn.

### 2.5.4 Cách nối song song các ngõ ra

Để nâng cao Fan-out chỉ được nối cao nhất hai ngõ ra hoặc hai ngõ vào với nhau. Để biết chính xác sự phân bố dòng điện, chỉ nên nối 2 cổng song song với nhau khi cả hai cổng ở trong cùng một IC.

### 2.5.5 Đáy đất

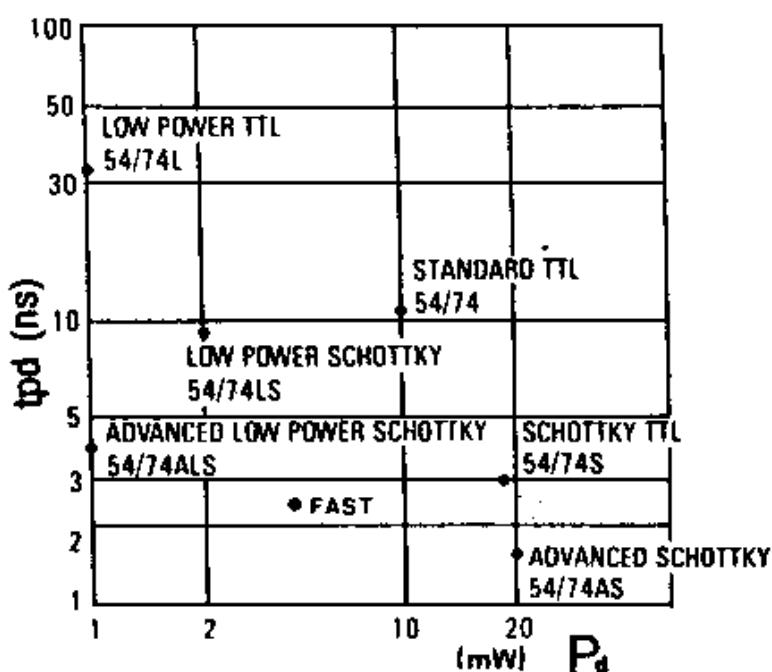
Để tránh sự sụt áp trên dây đất, mạch điện phải được thiết kế sao cho mạch đất có điện trở bé và độ tự cảm bé. Mạch đất và mạch nối điện áp nguồn  $V_{CC}$  phải có độ rộng ít nhất  $2,5\text{mm}$  để sự ảnh hưởng của hiệu ứng ngoài da được giữ thật thấp. Mạch điện với độ rộng từ  $0,5$  đến  $1\text{mm}$  có tự cảm  $L = 10\text{nH/cm}$ .

### 2.5.6 Những ngõ vào không dùng tới

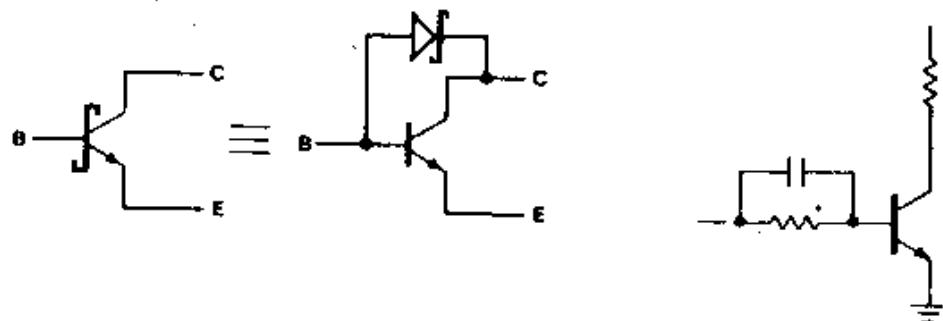
Những ngõ vào của AND và NAND nên nối với  $V_{CC}$  qua một điện trở  $R = 1\text{k}\Omega$ . Những ngõ vào của OR và NOR nên nối với đất. Ngõ vào của các logic khác (flip-flop, bộ đếm...) nên nối với đất.

## 2.6 CÁC ĐẶC TRƯNG KỸ THUẬT TIÊU BIỂU CỦA NHỮNG HỘ TTL

Mỗi họ TTL có những đặc điểm riêng, khác nhau ở các điểm quan trọng : Công suất tiêu tán, vận tốc và khả năng làm việc với tải điện dung. Hình H2.6.1 cho ta sự liên quan giữa công suất tiêu tán và vận tốc làm việc. Với hai họ Standard-TTL và L-TTL các transistor trong mạch tổ hợp nhận dòng điện cực gốc B thường nhiều hơn cần thiết, transistor bão hòa rất nhanh. Để cho transistor bão hòa ngưng dẫn điện, ta cần một thời gian khá dài để điện áp bão hòa bị triệt tiêu. Điều đó cần một thời gian trễ khá lớn. Để một transistor làm việc nhanh, nó cần phải có khả năng ngưng dẫn điện nhanh. Điều này đưa đến một hậu quả là độ khuyếch đại dòng điện bé.



H.2.6.1



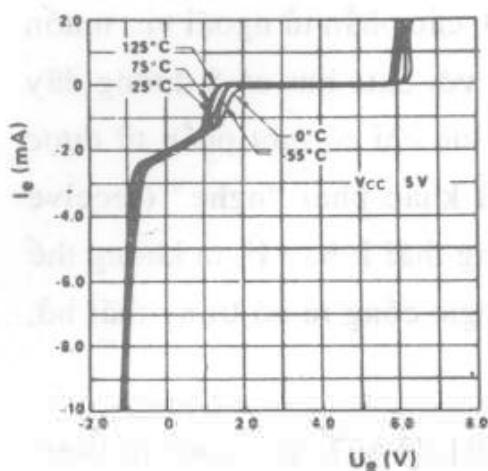
Schottky-Transistor

### H.2.6.2

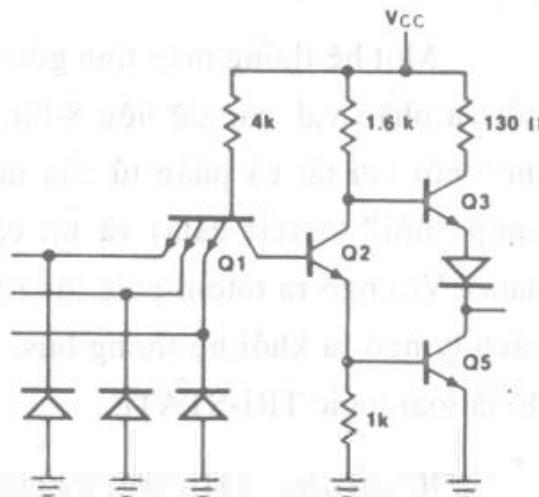
Để giải quyết sự bế tắc này, người ta nối giữa cực gốc B và cực góp C một diốt Schottky (H.2.6.2). Khi dẫn điện diốt Schottky có điện áp thuận bé (khoảng 0,3V), bé hơn điện áp thuận của lớp tiếp giáp BC của transistor. Khi cực góp C gần bão hòa thì diốt Schottky lập tức dẫn bớt dòng điện của cực gốc B. Diốt Schottky giữ không cho transistor bão hòa. Transistor cũng ngắt điện rất nhanh khi dòng điện cực gốc B không còn. Với giải pháp này transistor vẫn giữ 1 trị số khuếch đại dòng điện lớn.

Để Transistor làm việc nhanh, một tụ điện "gia tốc" khoảng 25-100pF được mắc song song với điện trở ở cực gốc B tạo một xung điện làm giảm nhanh chóng điện tích ở cực gốc khi transistor ngắt điện và gia tăng dòng điện khi transistor dẫn điện. (H.2.6.2).

Với họ ALS và AS điện dung ký sinh và thời gian đóng mở transistor được giảm đi rất nhiều. So sánh với họ LS, họ ALS làm việc nhanh hơn và công suất tiêu tán bé hơn. Họ AS làm việc nhanh gấp đôi so sánh với họ S. Hình H.2.6.3 cho ta sự liên quan giữa điện áp và dòng điện vào của 1 TTL-Puffer. Với một điện áp khoảng 6V ở các cực phát / ngõ vào H.2.6.4 xảy ra hiệu ứng thác (Avalanche-Effect).

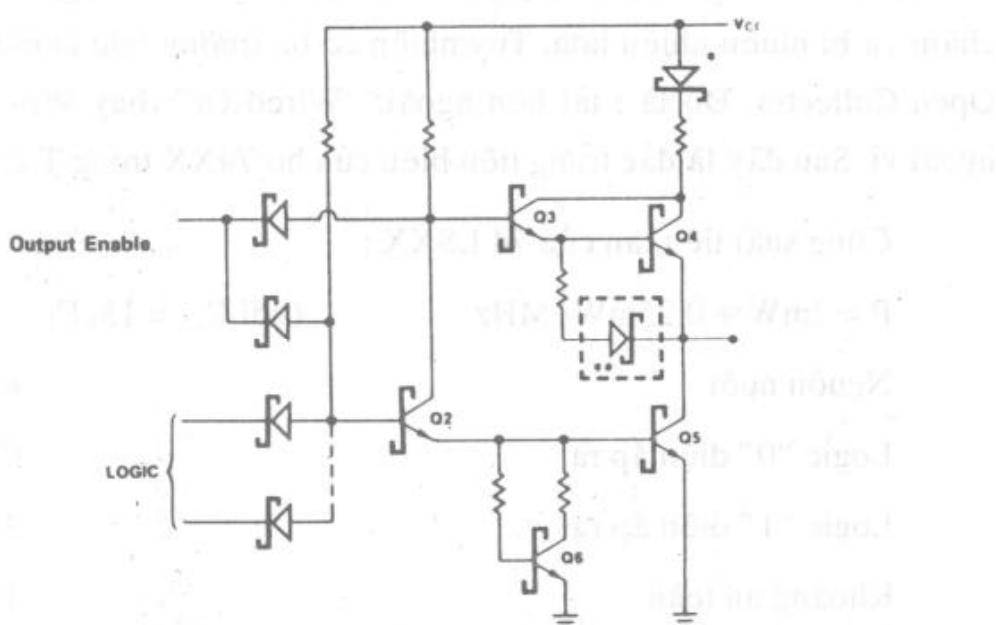


H.2.6.3



H.2.6.4

Trong trường hợp này điện trở nối tiếp ở ngõ vào rất bé và dòng thắc dâng cao nhanh chóng với điện áp vào. Để tránh IC hư hỏng, ta phải giữ dòng điện của tín hiệu bé hơn 5mA và điện áp vào  $< 5.5V$ . Thông thường cổng ra loại TTL hay CMOS có trạng thái H hay L được giữ bởi một bipolar transistor hay MOSFET. Với họ TTL người ta gọi đó là ngõ ra totem-pole có tổng trở thấp cho cả hai mức logic H hay L, thời gian đóng mở nhanh và chống nhiễu tốt. Tuy nhiên trong vài trường hợp loại ngõ ra totem-pole không thích hợp.



H.2.6.5

Một hệ thống máy tính gồm CPU, bộ nhớ, các phần tử ngoại vi... muốn gởi và nhận v.d. các dữ liệu 8-bit. Giải pháp là với data bus có 8 đường dây điện nối với tất cả các phần tử của máy tính. Mỗi lúc chỉ có một phần tử được phép "nói" (assert data) và tất cả các phần tử khác phải "nghe" (receive data). Với ngõ ra totem-pole lúc nào cũng ở trạng thái L hay H, ta không thể cách ly ngõ ra khỏi hệ thống bus. Ta cần loại logic cung cấp ra có trạng thái hở, đó là loại logic TRI-STATE.

IC của họ TTL loại có những ngõ ra TRI-STATE có trang bị thêm "phản kiểm soát ở ngõ vào" sẽ làm ngõ ra ngưng hoạt động hay hoạt động bình thường. Trường hợp ngõ ra ngưng hoạt động, tổng trở nó rất cao. Như thế người ta có thể nối nhiều ngõ ra loại này với bus tín hiệu (data bus). Trong hình H.2.6.5 nếu có một tín hiệu L ở ngõ vào output enable qua diode nối với cực gốc Q<sub>3</sub>, Q<sub>2</sub> và Q<sub>3</sub> sẽ bị ngắt điện. Ngõ ra sẽ ngưng hoạt động dù các ngõ vào khác ở trạng thái nào. Trường hợp được trả lại tự do ở trạng thái H hay L, tính chất loại TRI-STATE IC giống như những IC khác.

Ngoài ra ta còn có IC với ngõ ra Open Collector (O.C.). Điện trở ở cực gác (khoảng vài trăm đến vài nghìn Ohms) cần được nối thêm giữa cực gác C và điện áp cấp. Với điện trở có trị số bé, ta có vận tốc làm việc nhanh, tính miêu nhiều tốt, tuy nhiên công suất tiêu tán tăng. IC với ngõ ra O.C làm việc chậm và bị nhiễu nhiều hơn. Tuy nhiên có ba trường hợp ta cần chọn IC loại Open Collector. Đó là : tải bên ngoài, "Wired-Or" (hay Wired-and) và bus ngoại vi. Sau đây là đặc trưng tiêu biểu của họ 74XX trong T.2.6.1

Công suất tiêu tán của 74 LSXX :

$$P = 2mW + 0,25mW/MHz \quad (\text{với } C_{tải} = 15pF)$$

Nguồn nuôi	+ 5V
Logic "0" điện áp ra	0,2V
Logic "1" điện áp ra	3V
Khoảng an toàn	1V

Khoảng nhiệt độ làm việc	0°C ~ 70°C
Khoảng nhiệt độ bảo quản	- 65° + 150°C
Điện áp cao nhất cho phép	+7V
Điện áp thấp nhất	-0,5V
Điện áp cao nhất giữa hai ngõ vào	+5,5V
Điện áp cao nhất giữa ngõ vào và đất	+ 5,5V
Điện áp cao nhất giữa ngõ ra và đất	+5,5V
Điện áp thấp nhất giữa ngõ vào và đất	-0,8V
Điện áp cao nhất giữa ngõ ra và đất (tốt nhất giữ dòng điện < 1mA)	-0,8V
Nhiệt độ hàn với mỏ hàn	265°C
Nhiệt độ hàn cao nhất với bể thiếc / chì hàn	240°C

#### T.2.6.1

#### 74HC/HCT

SYMBOL	PARAMETER	74HC			74HCT			UNIT	CONDITIONS
		min.	typ.	max.	min.	typ.	max.		
V <sub>CC</sub>	DC supply voltage	2.0	5.0	6.0	4.5	5.0	5.5	V	
V <sub>I</sub>	DC input voltage range	0		V <sub>CC</sub>	0		V <sub>CC</sub>	V	
V <sub>O</sub>	DC output voltage range	0		V <sub>CC</sub>	0		V <sub>CC</sub>	V	
T <sub>amb</sub>	operating ambient temperature range	-40		+85	-40		+85	°C	see DC and AC CHAR. per device
T <sub>amb</sub>	operating ambient temperature range	-40		+125	-40		+125	°C	
t <sub>r, ff</sub>	input rise and fall times except for Schmitt-trigger inputs		5.0	1000 500 400		8.0	500	ns	V <sub>CC</sub> = 2.0 V V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6.0 V

#### Note

For analog switches, e.g. "4016", "4051 series", "4351 series", "4066" and "4067", 10 V is specified as the maximum operating voltage.

#### T.2.6.2

Hệ logic HCMOS (high-speed-CMOS) được chế tạo với kỹ thuật CMOS có các ĐTKT :

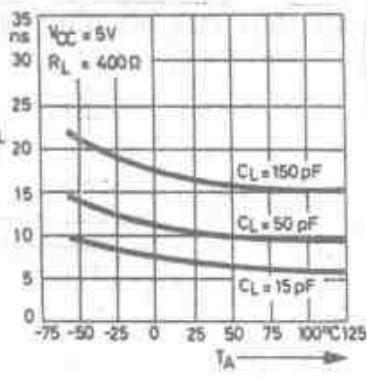
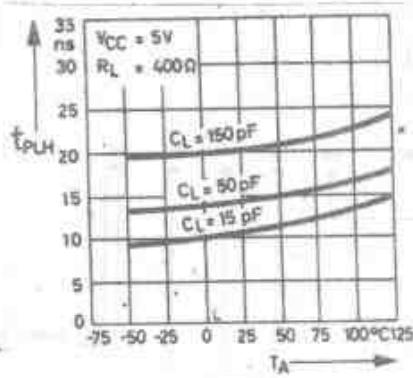
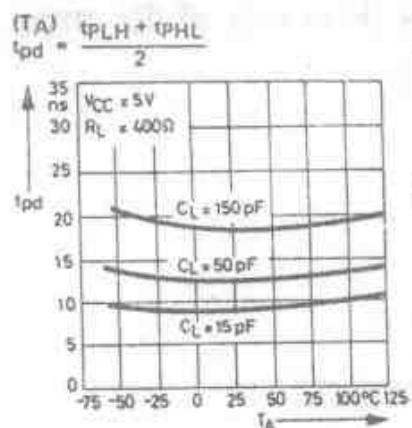
- Dòng điện cần cho IC rất bé.
- Không nhạy cảm với nhiễu, sự thay đổi nhiệt độ và hiệu ứng Latch-up.
- Vận tốc làm việc nhanh và chịu đựng số tải giống như loại bipolar LS-TTL.
- Mức logic ở ngõ ra là 0,1V và  $V_{CC} - 0,1V$ .
- Tất cả đều có đệm, trừ loại 74HCU.
- Thời gian trễ cho một cổng khoảng 8ns.
- Khoảng làm việc tới 60MHz.
- HCMOS-ICs có thể chịu đựng đến 10 tải LS-TTL (4mA) và loại ngõ ra cho Bus Driver đến 15 tải LS-TTL (6mA).
- Ngõ vào có mạch bảo vệ chống tĩnh điện.
- HCMOS có chức năng và sơ đồ chân giống như LS-TTL và CMOS-4000.
- Loại công tắc tín hiệu analog làm việc đến 10V.
- Thời gian lên / xuống của tín hiệu ở ngõ ra giống nhau.
- Khoảng nhiệt độ làm việc từ  $-40^{\circ}$  đến  $+85^{\circ}$  hoặc  $-40^{\circ}$  đến  $+125^{\circ}C$ .
- Điện áp tối đa từ  $-0,5V$  đến  $+7V$ .
- Công suất tiêu tán tối đa từ 400mW đến 500mW.

Có 3 loại HCMOS : 74HC, 74HCT và 74HCU. Trong hai bảng T.2.6.2 và T.2.6.3 cho ta chế độ làm việc thông thường của ba loại HCMOS.

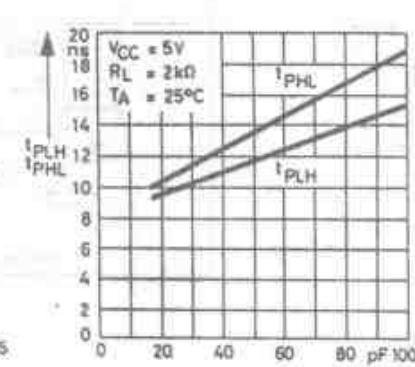
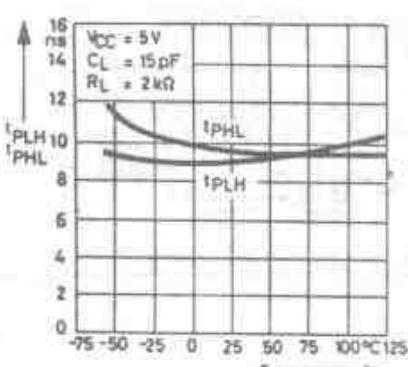
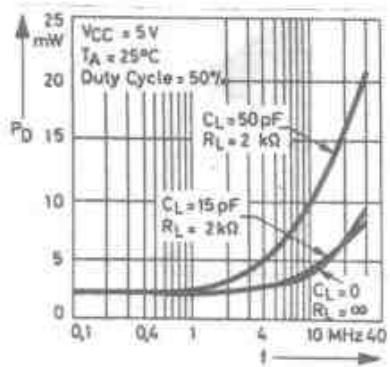
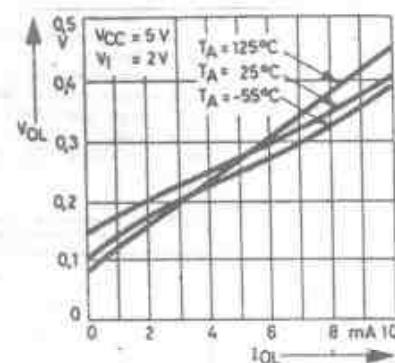
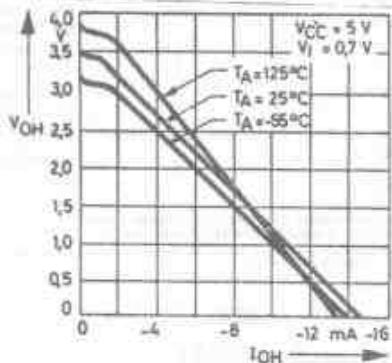
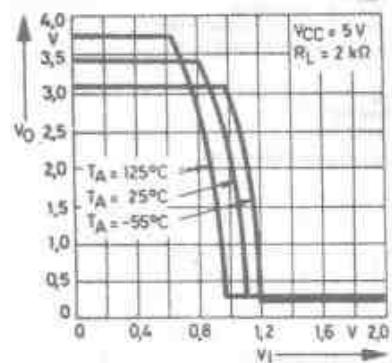
#### **74HCU**

SYMBOL	PARAMETER	74HCU			UNIT	CONDITIONS
		min.	typ.	max.		
$V_{CC}$	DC supply voltage	2.0	5.0	6.0	V	
$V_I$	DC input voltage range	0		$V_{CC}$	V	
$V_O$	DC output voltage range	0		$V_{CC}$	V	
$T_{amb}$	operating ambient temperature range	$-40$		$+85$	$^{\circ}C$	see DC and AC CHAR per device
$T_{amb}$	operating ambient temperature range	$-40$		$+125$	$^{\circ}C$	

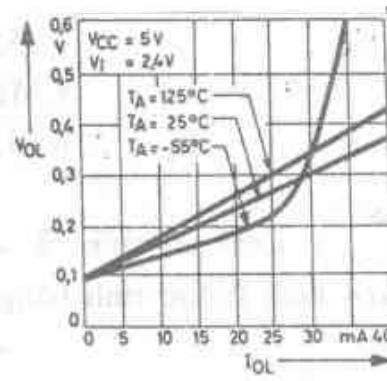
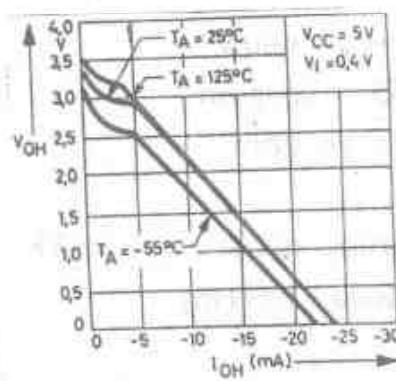
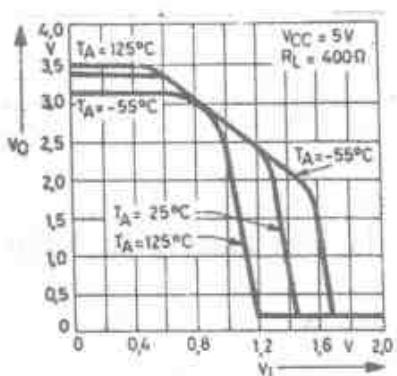
# Các đặc trưng kỹ thuật của cỗng NAND



## Low Power Schottky TTL

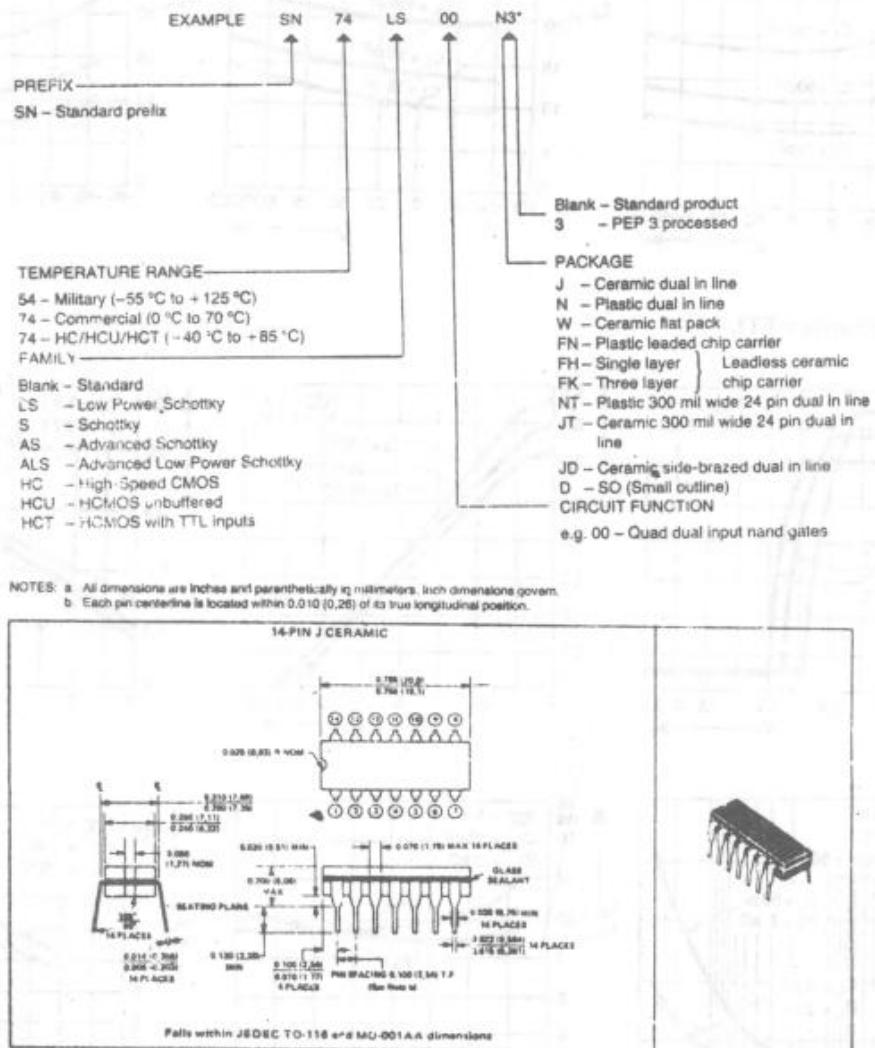


## Standard TTL



### 2.7 ĐẶC TRƯNG CƠ HỌC CỦA IC 74XXX

Với mã số của tên IC74XXX ta có thể biết thêm một số đặc trưng kỹ thuật của nó như sau:



IC Liên Xô với mã số

K155 = vỏ nhura

KM155 = vỏ gốm

K531 = vỏ gốm

Loại có chữ  $\exists$ , trước mã số, v.d.  $\exists K\dots$  là loại hàng xuất khẩu với kích thước tính bằng Inch (2,54cm).

## 2.8 MỤC LỤC THEO CHỨC NĂNG CỦA HỘP TÍM 74XXX

GATES AND BUFFERS							
00	Quad 2 input NAND gate	63	Hex current sensing gate				
01	Quad 2 input NAND gate (open collector)	64	4-2-3 2 input A/O/INV				
02	Quad 2 input NOR gate	65	4-2-3-2 input A/O/INV				
03	Quad 2 input NAND gate (open collector)	86	Quad exclusive OR gate				
04	Hex inverter	125	Quad 3 state buffer				
05	Hex inverter (open collector)	125A	Quad 3 state buffer (low enable)				
06	Hex inverter Buffer 30V O/P	126	Quad 3 state buffer				
07	Hex buffer 30V O/P	126A	Quad 3 state buffer (high enable)				
08	Quad 2 input AND gate	128	Quad 2 input NOR line driver				
09	Quad 2 input AND gate (open collector)	132	Quad 2 input Schmitt trigger				
10	Triple 3 input NAND gate	133	13 input NAND				
11	Triple 3 AND gate	134	12 input 3 state NAND				
12	Triple 3 input NAND gate (open collector)	135	Quad exclusive OR/NOR				
13	Dual NAND Schmitt trigger	136	Quad exclusive OR gate				
14	Hex Schmitt trigger	260	Dual 5 input AND/OR invert gate				
15	Triple 3 input AND gate (open collector)	265	Quad delay gates				
16	Hex inverter/buffer 15V O/P	266	Quad exclusive NOR gate (open collector)				
17	Hex buffer 15V O/P	365A	Hex buffer W/Common enable (3 state)				
18	Dual 4 NAND Schmitt trigger	366A	Hex inverter W/Common enable (3 state)				
19	Hex NAND Schmitt trigger	367A	Hex buffer 4 bit and 2 bid (3 state)				
20	Dual 4 input NAND gate	368A	Hex inverter 4 bit and 2 bid (3 state)				
21	Dual 4 input AND gate	386	Quad 2 input exclusive OR gate				
22	Dual 4 input NAND gate (open collector)	425	Quad 3 state gates active low enable				
23	Dual 4 input NOR expandable VP	426	Octal buffer gates enable non inverted				
24	Quad 2 NAND Schmitt trigger	466	Octal buffer gated enable – inverted				
25	Dual 4 input NOR strobe	467	Octal buffer gated enable non inverted				
26	Quad 2 input NAND (high voltage)	468	Octal buffer gated enable inverted				
27	Triple 2 input NOR gate	800	Tripple 4-Input AND/NAND driver				
28	Quad 2 input NOR buffer	802	Tripple 4-Input OR/NOR driver				
30	8 input NAND gate	804	Hex 2-input NAND driver				
31	Delay elements	805	Hex 2-input NOR driver				
32	Quad 2 input OR gate	808	Hex 2-input AND driver				
33	Quad 2 input NOR gate (open collector)	832	Hex 2-input OR driver				
37	Quad 2 input NAND buffer	1000	Buffered '00' (24mA IOL)				
38	Quad 2 input NAND buffer (open collector)	1002	Buffered '02' (24mA IOL)				
39	Quad 2 input NAND buffer (open collector)	1003	Buffered '03' (24mA IOL)				
40	Dual 4 input NAND buffer	1004	Buffered '04' (24mA IOL)				
50	Dual 2 Wide 2 input A/O/INV	1005	Buffered '05' (24mA IOL)				
51	Dual NAND-OR invert gate	1008	Buffered '08' (24mA IOL)				
52	Expandable 2-2-2-3 input A/O	1010	Buffered '10' (24mA IOL)				
53	4 wide 2 input A/O/INV	1011	Buffered '11' (24mA IOL)				
54	4 wide 2 input AND-OR invert gate	1020	Buffered '20' (24mA IOL)				
55	2 wide 4 input AND-OR invert gate	1032	Buffered '32' (24mA IOL)				
60	Dual 4 input expander	1034	Buffered '34' (24mA IOL)				
61	Triple 3 input expander	1035	Buffered '35' (24mA IOL)				
62	3-2-2-3 input expander						
FLIP FLOPS							
70	J-K preset + clear	103	Dual J-K	113	Dual J-K with preset	376	Quad J-K
71	R-S preset + clear	104	Gated J-K preset + clear	113A	Dual J-K with preset	377	Octal D-type with enable
72	J-K preset + clear	105	Gated J-K preset + clear	114	Dual J-K preset + clear	378	Hex D-type
73	Dual J-K	106	Dual J-K preset + clear	114A	Dual J-K preset + clear	379	Quad D-type
73A	Dual J-K	107	Dual J-K with clear	171	Quad D-type + clear	574	Octal D-type (data flow thru 374)
74	Dual D-type	107A	Dual J-K with clear	174	Hex D-type	575	'574 with clear
74A	Dual D-type	108	Dual J-K preset + clear	175	Quad D-type	576	Octal D-type (inverting)
76	Dual J-K	109	Dual J-K preset + clear	273	Octal D-type	577	'576 with clear
78A	Dual J-K	109A	Dual J-K preset + clear	276	Dual J-K	874	Octal D-type
78	Dual J-K	110	J-K with data lock out	374	Octal D-type	876	Octal D-type
78A	Dual J-K	111	Dual J-K with data lock out				
101	J-K	112	Dual J-K preset + clear				
102	J-K	112A	Dual J-K preset + clear				

**TRANSCEIVERS, RECEIVERS, LINE DRIVERS**

140	Dual 4-input NAND driver	620	Octal bus transceiver	800	Triple 4-Input AND/NAND driver
226	4 bit transceiver	621	Octal bus transceiver	802	Triple 4-Input OR/NOR driver
240	Octal 3 state driver	622	Octal bus transceiver	804	Hex 2-input NAND driver
241	Octal 3 state driver	623	Octal bus transceiver	805	Hex 2-input NOR driver
242	Quad bus transceiver	638	Octal bus transceiver	808	Hex 2-input AND driver
243	Quad bus transceiver	639	Octal bus transceiver	832	Hex 2-input OR driver
244	Octal 3 state driver	640	Octal bus transceiver	1240	Reduced power 240
245	Octal bus transceiver	641	Octal bus transceiver	1241	Reduced power 241
436	Line/memory driver	642	Octal bus transceiver	1242	Reduced power 242
437	Line/memory driver	643	Octal bus transceiver	1243	Reduced power 243
440	Tri-directional transceiver	644	Octal bus transceiver	1244	Reduced power 244
441	Tri-directional transceiver	645	Octal bus transceiver	1538	Reduced power 638
442	Tri-directional transceiver	646	Octal bus transceiver with registers	1639	Reduced power 639
443	Tri-directional transceiver	647	Octal bus transceiver with registers	1640	Reduced power 640
444	Tri-directional transceiver	648	Octal bus transceiver with registers	1641	Reduced power 641
446	Quad bus transceivers	649	Octal bus transceiver with registers	1642	Reduced power 642
448	Tri-directional transceiver	651	Octal bus transceiver with registers	1643	Reduced power 643
449	Quad bus transceiver	652	Octal bus transceiver with registers	1644	Reduced power 644
540	Octal 3 state driver/buffer	653	Octal bus transceiver with registers	1645	Reduced power 645
541	Octal 3 state driver/buffer	654	Octal bus transceiver with registers		

**DECODERS**

42A	BCD decimal decoder	185A	Binary to BCD converter
43A	Excess 3 to decimal decoder	246	BCD 7 segment decoder
44A	Excess 3 to decimal decoder	247	BCD to 7 segment decoder/driver (O.C.)
45	BCD to decimal decoder 30V O/P	248	BCD to 7 segment decoder/driver
48A	BCD 7 segment decoder 30V O/P	249	BCD to 7 segment decoder/driver (O.C.)
47	BCD to 7 segment decoder/driver (O.C.)	251	8 input multiplexer (3 state)
48	BCD to 7 segment decoder/driver	253	Dual 4 input multiplexer (3 state)
49	BCD to 7 segment decoder/driver (O.C.)	257	Quad 2 line to 1 line selector
131	3 to 8 line with address registers	258	Quad 2 line to 1 line selector
137	Decoder/multiplexer	298	Quad 2 input multiplexer W/Output latches
138	1 of 8 decoder/multiplexer	347	LS47 with 7 volt output
139	Dual 1 of 4 decoder/multiplexer	348	3state LS148
141	BCD decimal decoder/driver	351	Dual data selector
142	Counter latch decimal decoder driver	352	Dual 4 to 1 data selector/multiplexer
143	Counter latch 7 segment decoder driver	353	Dual 4 to 1 data select (3 state)
144	Counter latch 7 segment decoder driver	354	Data selector/multiplexer
145	BCD to decimal decoder/driver	355	Data selector/multiplexer
147	10 to 4 line encoder	356	Data selector/multiplexer
148	8 to 3 line encoder	357	Data selector/multiplexer
150	16 bit data selector	398	Quad 2 input multiplexer with storage
151	8 input multiplexer	399	Quad 2 input/multiplexer W/Storage (25LS09)
152	8 input multiplexer	445	LS145 with 7 Volt output
153	Dual 4 input multiplexer	447	LS247 with 7 Volt output
154	4 to 16 line decoder	508	1 to 8 decoder
155	Dual 1 of 4 decoder	539	Dual 1 to 4 decoder
156	Dual 1 of 4 decoder (Open collector)	604	16 to 8 multiplexer
157	Quad 2 input multiplexer (non inverting)	605	16 to 8 multiplexer
158	Quad 2 input multiplexer (inverting)	606	16 to 8 multiplexer
159	4 to 16 line decoder	607	16 to 8 multiplexer
184	BCD to Binary converter		

**COMPARATORS**

85	4 bit magnitude comparator	686	8 bit magnitude comparator
521	8 bit magnitude comparator	687	8 bit magnitude comparator
682	8 bit magnitude comparator	688	8 bit magnitude comparator
684	8 bit magnitude comparator	689	8 bit magnitude comparator
685	8 bit magnitude comparator	695	8 bit magnitude comparator

### COUNTERS

56	Frequency divider	191	Up/down binary counter	590	8 bit binary counter with output registers
57	Frequency divider	192	Up/down decade counter	591	8 bit binary counter with output registers
68	50 MHz counter	193	Up/down binary counter	592	8 bit binary counter with input registers
69	50 MHz counter	196	Decade counter	593	8 bit binary counter with 3 state I/O, registers
90	Decade counter	197	4 bit binary counter	668	4 bit decade counter, synchronous reset
92	Divide by 12 counter	290	Decade counter	669	4 bit decade counter, synchronous reset
93	4 bit binary counter	292	30 bit programmable frequency divider	690	LS160A W/Latch
160	BCD Decade counter	293	4 bit binary counter	691	LS161A W/Latch
161	4 bit binary counter	294	4 bit binary counter frequency divider	692	LS162A W/Latch
162	BCD decade counter	390	Dual 'LS90	693	LS163A W/Latch
163	4 bit binary counter	393	Dual 'LS92	696	Up/down W/Latch
168	Decade up/down counter	490	Dual 'LS90	697	Up/down counter W/Latch
169	Binary up/down counter	560	4 bit decade counter	698	Up/down counter W/Latch
176	Decade counter	561	4 bit binary counter	699	Up/down counter W/Latch
177	Binary counter	568	4 bit decade counter	867	8 bit synchronous bidirectional counter
190	Up/down decade counter	569	4 bit binary counter	869	8 bit synchronous bidirectional counter

### REGISTERS

91	8 bit shift register	323	8 bit shift/storage register (25LS23)	595	8 bit shift register with output register
94	4 bit shift register PISO	173A	Quad D register (3 state)	596	8 bit shift register with output register
95	4 bit shift register PISO	178	4 bit shift register PIFO	597	8 bit shift register with input register
96	5 bit shift register	179	4 bit shift register PIFO	598	8 bit shift register with 3 state I/O, register
164	8 bit shift register SIPO	194	4 bit shift register PIFO	599	8 bit shift register with output register
165	8 bit PISO shift register	195	4 bit shift register PIFO	671	4 bit shift register W/latch
166	8 bit PISO shift register	198	8 bit shift register PIFO	672	4 bit shift register W/latch
199	8 bit shift register PIFO	395A	4 bit cascadable shift register (3 state)	673	16 bit shift register
295B	4 bit shift register (3 state)	396	Octal storage register	674	16 bit shift register
299	4 bit universal PIFO shift register	594	8 bit shift register with output register	870	Dual 16 + 4 register
322A	8 bit shift register (25LS22)			871	Dual 16 + 4 register

### ARITHMETIC

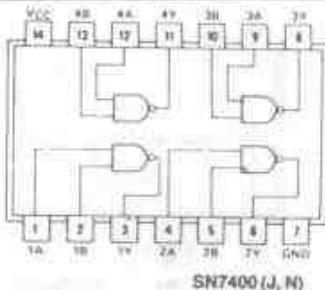
80	Gated full adder	284	4 + 4 multiplier
82	2 bit binary full adder	285	4 + 4 multiplier
83A	4 bit binary full adder	293	4 bit multiplier
97	8 bit binary rate multiplier	381	ALU/Function generator
187	4 bit rate multiplier	382	4 bit arithmetic function generator
181	4 bit ALU	384	8 bit multiplier
182	Carry look ahead unit	385	Quad adder/subtractor
183	Dual carry save full adder	681	4 bit binary accumulator
261	4 + 2 binary multiplier	881	Arithmetic logic unit/function generator
274	4 + 2 binary multiplier	882	32 bit look ahead carry generator
275	7 + 4 binary multiplier	888	8-Bit slice
281	4 bit parallel binary accumulator	1616	16 + 16 multimode multiplier
283	4 bit full adder		

### LATCHES

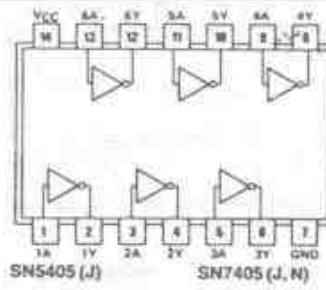
75	Quad bistable latch	373	Octal transparent latch
77	4 bit latch	375	Quad latch
100	Dual quad latch	563	Octal D-latches, inverted outputs
116	Dual quad latch + enable + clear	564	Octal D-latches, inverted outputs
118	Hex S-R	573	Octal D-type transparent latches
119	Hex S-R	580	Octal D-type latch
173	Quad 3 state register	873	Octal transparent latch
259	8 bit addressable latch	880	Octal transparent latch
279	Quad S-R latch		

OSCILLATORS			
124	Dual voltage controlled oscillator	626	Voltage controlled oscillator (improved 326)
320	Crystal controlled oscillator	627	Voltage controlled oscillator (improved 327)
321	Crystal controlled oscillator	628	Voltage controlled oscillator (Temp. comp. 624)
624	Voltage controlled oscillator (improved 324)	629	Voltage controlled oscillator (improved 124)
625	Voltage controlled oscillator (improved 325)		
MULTIVIBRATORS			
121	Multivibrator	221	Dual monostable Multivibrator (Schmitt trigger)
122	Multivibrator	422	Multivibrator (No trigger from clear)
123	Multivibrator	423	Multivibrator (No trigger from clear)
ERROR DETECTION			
630	Error detection and correction (T.S.) 16 bit	634	32 bit error detection and correction (T.S.)
631	Error detection and correction (O.C.) 16 bit	635	32 bit error detection and correction (O.C.)
632	Error detection and correction (T.S.) 32 bit with byte write	636	8-Bit error detection and correction (T.S.)
633	Error detection and correction (O.C.) 32 bit with byte write	637	8-Bit error detection and correction (O.C.)
MEMORY MAPPERS			
610	Memory mapper W/Latch (T.S.)	612	Memory mapper (T.S.) No latch
611	Memory mapper W/Latch (O.C.)	613	Memory mapper (O.C.) No latch
MEMORY CONTROLLERS			
600	Memory refresh controller trans. 4K/16K	603	Memory refresh controller cycle steal
601	Memory refresh controller trans. 84K	608	Memory cycle controller
602	Memory refresh controller cycle steal		
FIRST-IN, FIRST-OUT, MEMORIES			
222	Asynchronous fifo memory (T.S.) 16 x 4 bit	227	Asynchronous fifo memory (O.C.) 16 x 4 bit
224	Asynchronous fifo memory (T.S.) 16 x 4 bit	228	Asynchronous fifo memory (O.C.) 16 x 4 bit
225	Asynchronous fifo memory 16 x 5 bit		
MISCELLANEOUS			
120	Dual pulse synchroniser	297	Digital phase locked loop
170	4 + 4 register file	412	Input/output port MPU
172	16 bit register	428	System controller for TMS8000
180	9 bit odd/even parity generator	670	4 + 4 register files
278	9 bit priority register	890	Controller for 888
280	9 bit parity generator/checker	2000	Direction discriminator

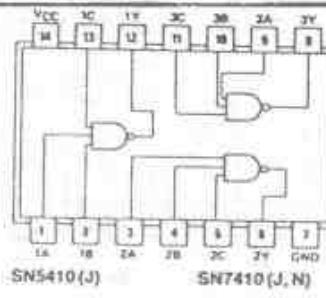
## 2.9 SƠ ĐỒ CHÂN



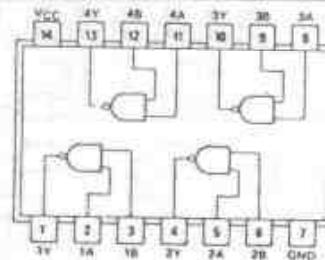
QUADRUPLE 2-INPUT  
POSITIVE-NAND GATES



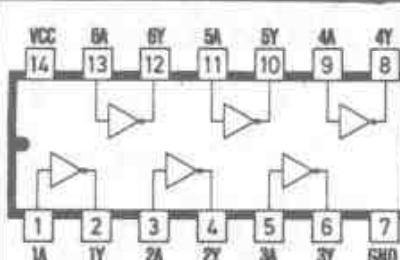
HEX INVERTERS  
WITH OPEN-COLLECTOR OUTPUTS



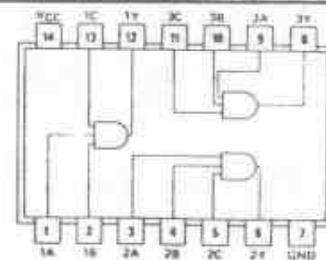
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POSITIVE-NAND GATES



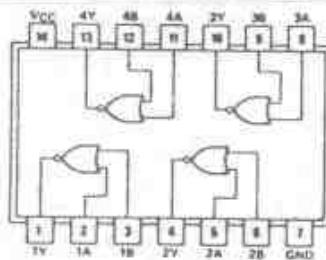
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POSITIVE-NAND GATES  
WITH OPEN-COLLECTOR OUTPUTS



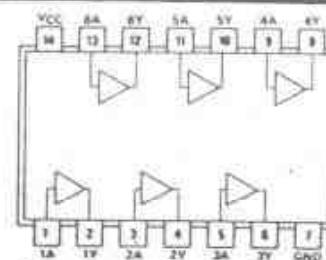
HEX INVERTER BUFFERS/DRIVERS  
WITH OPEN-COLLECTOR  
HIGH-VOLTAGE OUTPUTS



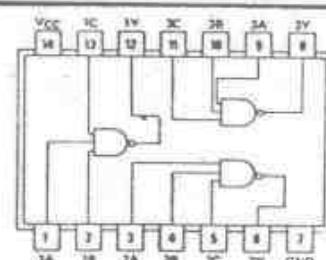
TRIPLE 3-INPUT  
POSITIVE-AND GATES



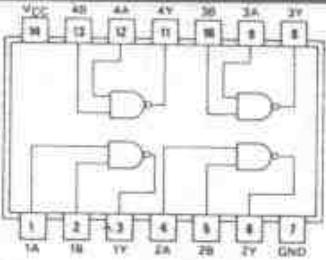
QUADRUPLE 2-INPUT  
POSITIVE-NOR GATES



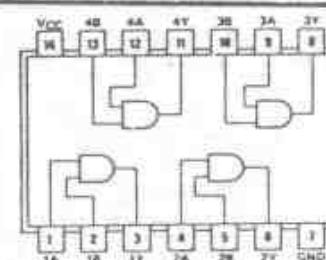
HEX BUFFERS/DRIVERS  
WITH OPEN-COLLECTOR  
HIGH-VOLTAGE OUTPUTS



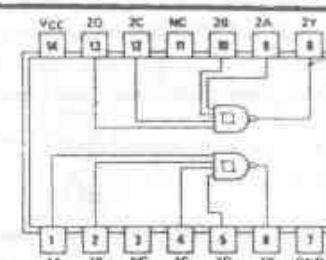
TRIPLE 3-INPUT  
POSITIVE-NAND GATES  
WITH OPEN-COLLECTOR OUTPUTS



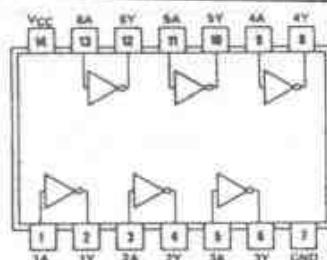
QUADRUPLE 2-INPUT  
POSITIVE-NAND GATES  
WITH OPEN-COLLECTOR OUTPUTS



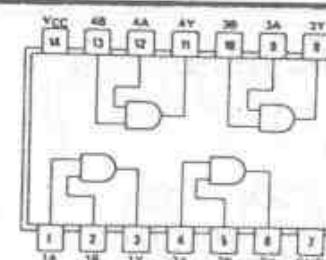
QUADRUPLE 2-INPUT  
POSITIVE-AND GATES



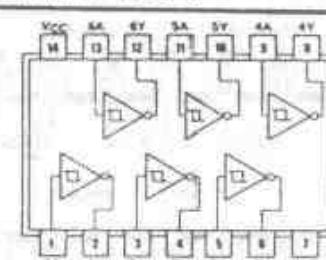
DUAL 4-INPUT  
POSITIVE-NAND  
SCHMITT TRIGGERS



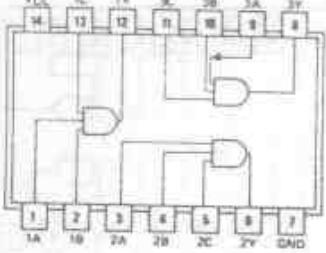
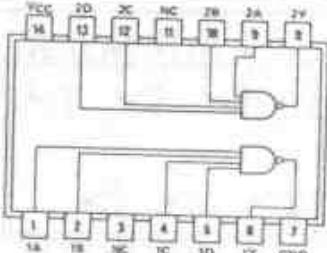
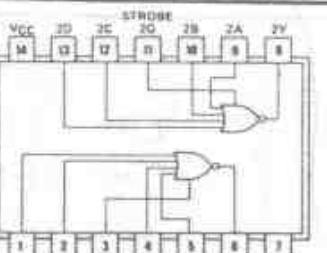
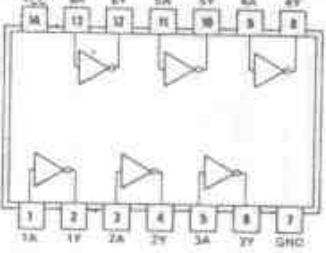
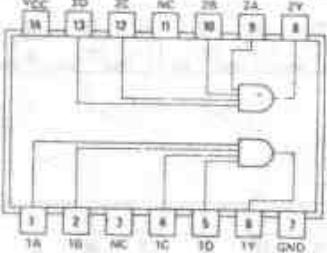
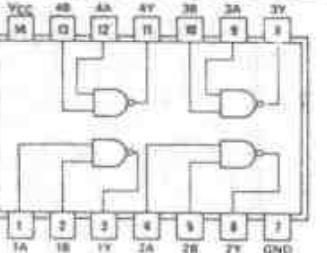
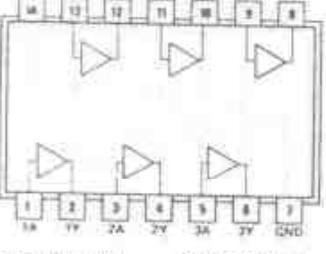
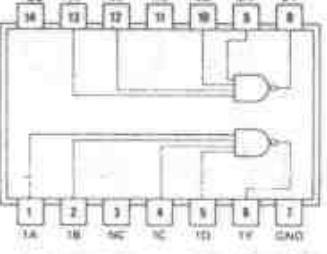
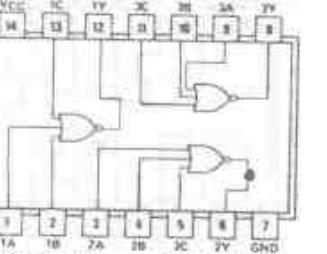
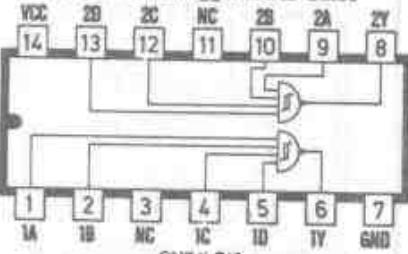
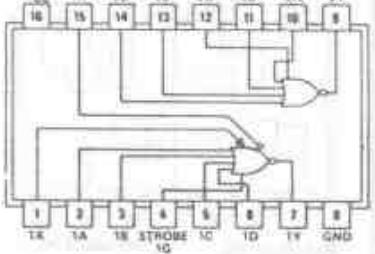
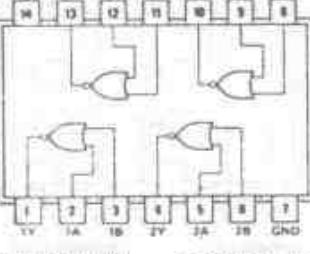
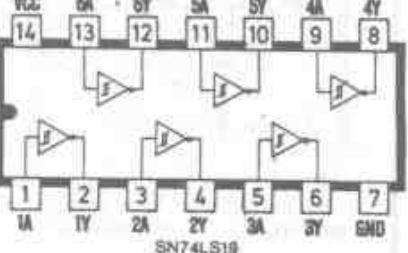
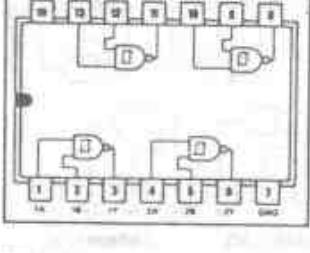
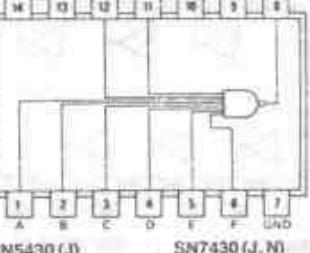
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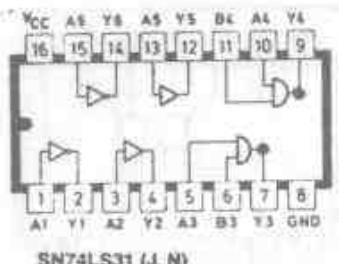


QUADRUPLE 2-INPUT  
POSITIVE-AND GATES  
WITH OPEN-COLLECTOR OUTPUTS

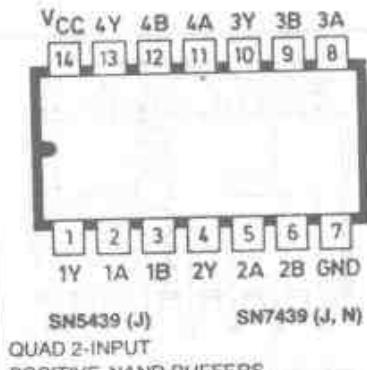
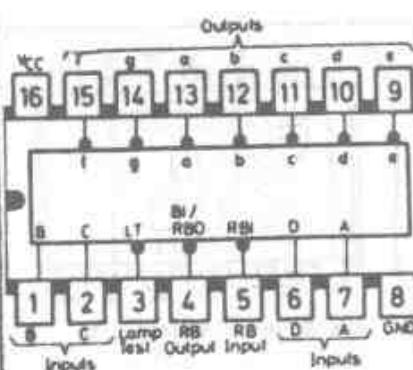


HEX SCHMITT-TRIGGER  
INVERTERS

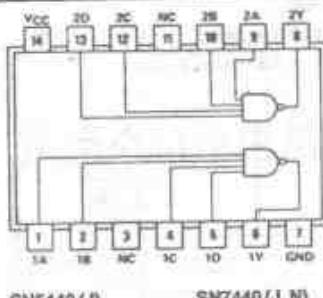
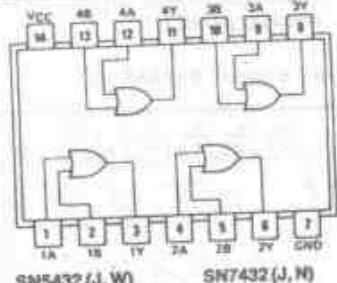
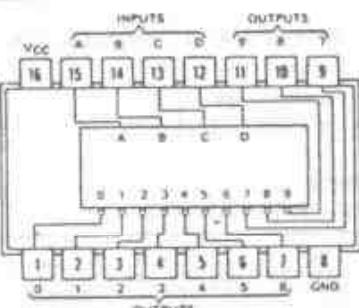
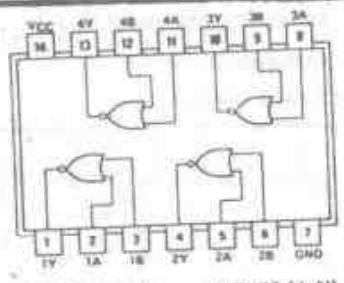
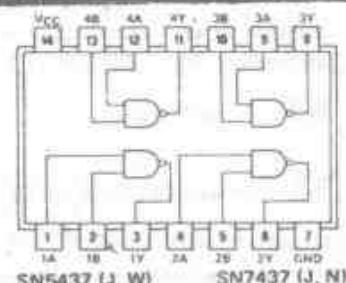
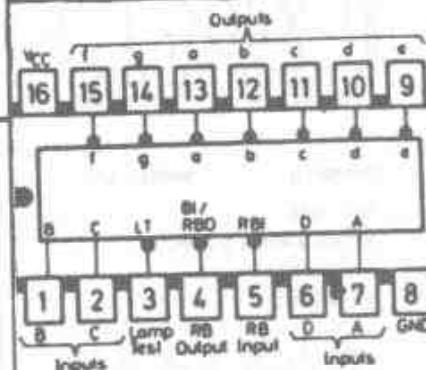
 <p><b>SN54ALS15(J)      SN74ALS15(N)</b> TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS</p>	 <p><b>SNS420(J)      SN7420(J, N)</b> DUAL 4-INPUT POSITIVE-NAND GATES</p>	 <p><b>SN5425 (J, W)      SN7425 (J, N)</b> DUAL 4-INPUT POSITIVE-NOR GATES</p>
 <p><b>SN5416 (J, W)      SN7416 (J, N)</b> HEX INVERTER BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS</p>	 <p><b>SNS4ALS21(J)      SN74ALS21(N)</b> DUAL 4-INPUT POSITIVE-AND GATES</p>	 <p><b>SN5426 (J)      SN7426 (J, N)</b> QUADRUPLE 2-INPUT HIGH-VOLTAGE INTERFACE POSITIVE-NAND GATES</p>
 <p><b>SN5417 (J, W)      SN7417 (J, N)</b> HEX BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS</p>	 <p><b>SNS422 (J, W)      SN7422 (J, N)</b> DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS</p>	 <p><b>SN5427 (J, W)      SN7427 (J, N)</b> TRIPLE 3-INPUT POSITIVE-NOR GATES</p>
 <p><b>Dual Schmitt Trigger NAND Gates</b> <b>SN74LS18</b></p> <p><b>SCHMITT TRIGGER POSITIVE NAND GATE WITH TOTEM POLE OUTPUT</b></p>	 <p><b>SNS423 (J, W)      SN7423 (J, N)</b> EXPANDABLE DUAL 4-INPUT POSITIVE-NOR GATES</p>	 <p><b>SN5428 (J, W)      SN7428 (J, N)</b> QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS</p>
 <p><b>Hex Schmitt Trigger Inverters</b> <b>SN74LS19</b></p> <p><b>SCHMITT TRIGGER INVERTER WITH TOTEM POLE OUTPUT</b></p>	 <p><b>SNS4LS24 (J or W)      SN74LS24 (J or N)</b> SCHMITT TRIGGER POSITIVE NAND GATE WITH TOTEM POLE OUTPUT</p>	 <p><b>SNS430 (J)      SN7430 (J, N)</b> 5-INPUT POSITIVE-NAND GATES</p>



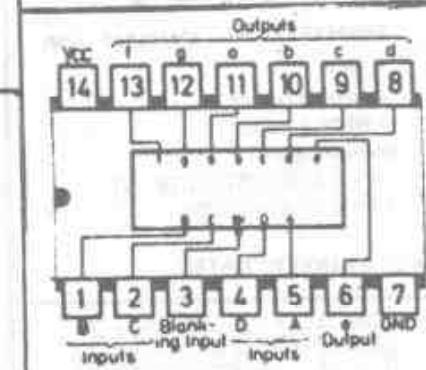
DELAY ELEMENTS

QUAD 2-INPUT  
POSITIVE-NAND BUFFERS46 ACTIVE-LOW, OPEN-COLLECTOR,  
30-V OUTPUTS47 ACTIVE-LOW, OPEN-COLLECTOR,  
15-V OUTPUTSBCD-TO-SEVEN-SEGMENT  
DECODERS/DRIVERS

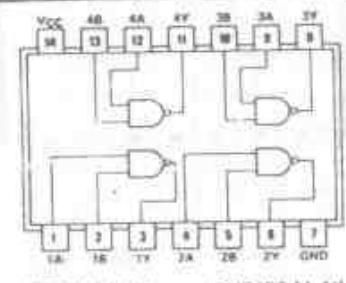
BST: I

DUAL 4-INPUT  
POSITIVE-NAND BUFFERSQUADRUPLE 2-INPUT  
POSITIVE-OR GATESSN5448 (J, W)      SN7448 (J, N)  
INTERNAL PULL-UP OUTPUTSQUADRUPLE 2-INPUT  
POSITIVE-NOR BUFFERS  
WITH OPEN-COLLECTOR OUTPUTS

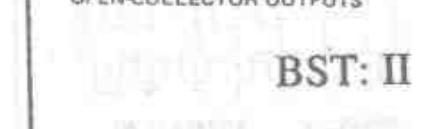
4 LINE-TO-10-LINE DECODERS

QUADRUPLE 2-INPUT  
POSITIVE-NAND BUFFERS

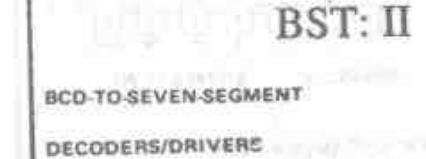
SN54LS49 (J, W)      SN74LS49 (J, N)



SN5445 (J, W)      SN7445 (J, N)

QUADRUPLE 2-INPUT  
POSITIVE-NAND BUFFERS  
WITH OPEN-COLLECTOR OUTPUTSLAMP, RELAY, OR MOS DRIVER  
80-mA CURRENT SINK  
OUTPUTS OFF FOR INVALID CODES

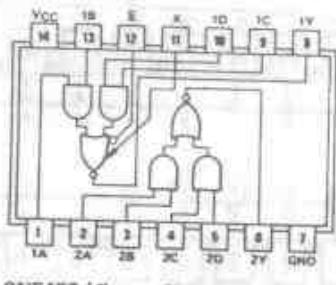
OPEN-COLLECTOR OUTPUTS



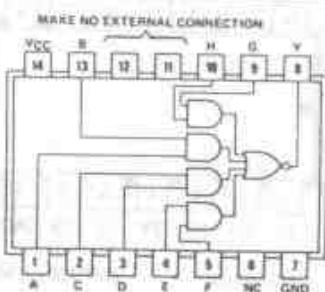
BST: II

BCD-TO-SEVEN-SEGMENT

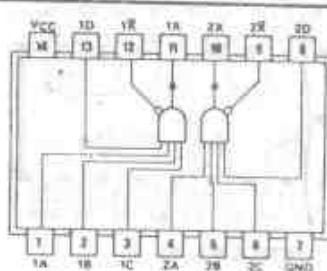
DECODERS/DRIVERS



DUAL 2-WIDE 2-INPUT  
AND-OR-INVERT GATES  
(ONE GATE EXPANDABLE)

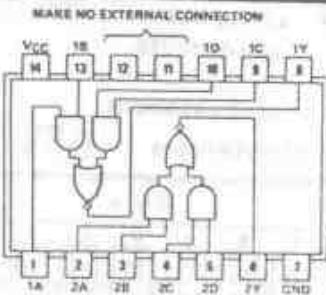


'54  
positive logic:  
 $Y = AB + CD + EF + GH$

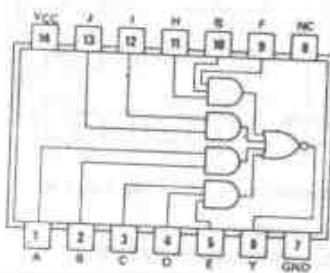


positive logic:

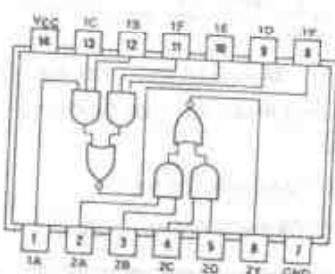
X = ABCD when connected to X and  $\bar{X}$  inputs  
of SN5423/SN7423, SN5450/SN7450, or  
SN5453/SN7453



'51, 'S51  
DUAL 2-WIDE 2-INPUT  
positive logic:  
 $Y = AB + CD$

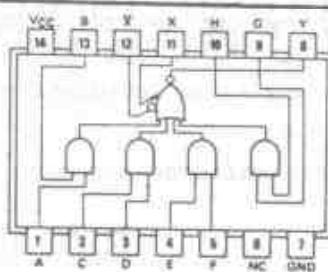


'LS54  
positive logic:  
 $Y = AB + CDE + FGH + IJ$

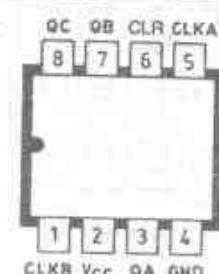


'LS51  
2-WIDE 3-INPUT,  
2-WIDE 2-INPUT  
positive logic:  
 $1Y = (1A \cdot 1B \cdot 1C) + (1D \cdot 1E \cdot 1F)$   
 $2Y = (2A \cdot 2B) + (2C \cdot 2D)$

#### AND-OR-INVERT GATES

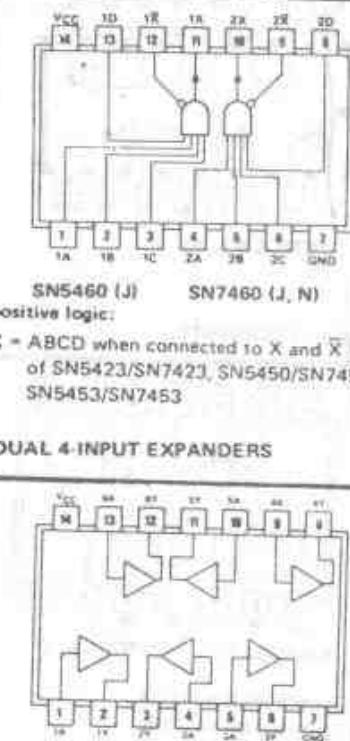


#### EXPANDABLE 4-WIDE AND-OR-INVERT GATES



SN54LS56 (JG)      SN74LS56 (JG, P)  
SN54LS57 (JG)      SN74LS57 (JG, P)

#### FREQUENCY DIVIDERS

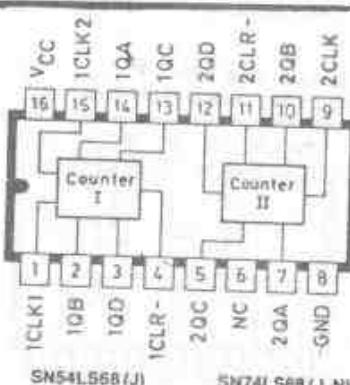


SN54S65 (J, W)      SN74S65 (J, N)

#### 64 TOTEM-POLE OUTPUT

#### 65 OPEN-COLLECTOR OUTPUT

#### 4-2-3-2 INPUT AND-OR-INVERT GATES



DUAL 40 MHz DECADE COUNTER

BST: I

**BST: I**

**DUAL 40 MHz 4 BIT BINARY COUNTER**

**SN5470 (J) SN7470 (J, N)**  
If inputs  $J$  and  $K$  are not used, they must be grounded.  
Preset or clear function can occur only when the clock input is low.

Inputs			Outputs	
Preset	Clear	Clock	$J$	$K$
L	H	X	X	X
H	L	X	X	X
L	L	X	X	X
H	H	$\uparrow$	L	L
H	H	$\uparrow$	H	L
H	H	$\uparrow$	L	H
H	H	$\uparrow$	H	H
H	H	L	X	X

Positive Logik:  $J = J_1 \cdot J_2 \cdot J$   
 $K = K_1 \cdot K_2 \cdot K$

**AND-GATED J-K POSITIVE-EDGE TRIGGERED FLIP-FLOPS WITH PRESET AND CLEAR**

**SN5472 (J) SN7472 (J, N)**

**AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH PRESET AND CLEAR**

**SN5473 (J, W) SN7473 (J, N) SNS4HC73 (J) SN74HC73 (N) SN54LS73A (J, W) SN74LS73A (J, N)**

**'73 FUNCTION TABLE**

INPUTS			OUTPUTS		
CLEAR	CLOCK	J	K	$Q$	$\bar{Q}$
L	X	X	X	L	H
H	$\uparrow$	L	L	$Q_0$	$\bar{Q}_0$
H	$\uparrow$	H	L	H	L
H	$\uparrow$	L	H	L	H
H	$\uparrow$	H	H	TOGGLE	

**'LS73A, 'HC73 FUNCTION TABLE**

INPUTS			OUTPUTS		
CLEAR	CLOCK	J	K	$Q$	$\bar{Q}$
L	X	X	X	L	H
H	$\downarrow$	L	L	$Q_0$	$\bar{Q}_0$
H	$\downarrow$	H	L	H	L
H	$\downarrow$	L	H	L	H
H	$\downarrow$	H	H	TOGGLE	
H	H	X	X	$Q_0$	$\bar{Q}_0$

**DUAL J-K FLIP-FLOPS WITH CLEAR**

**SN5475 (J, W) SN7475 (J, N)**

**FUNCTION TABLE (Each Latch)**

INPUTS			OUTPUTS	
D	G		$Q$	$\bar{Q}$
L	H		L	H
H	H		H	L
X	L		$Q_0$	$\bar{Q}_0$

**H** = high level, **L** = low level, **X** = irrelevant  
 $Q_0$  = the level of  $Q$  before the high-to-low transition of G

**4-BIT BISTABLE LATCHES**

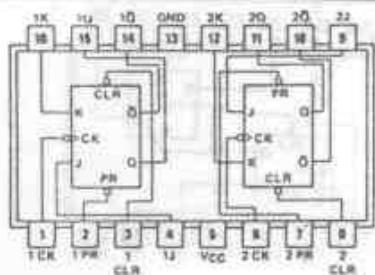
**SN5477 (W) SN54HC77 (J) SN74HC77 (N) SN54LS77 (W)**

**FUNCTION TABLE (Each Latch)**

INPUTS			OUTPUTS	
D	G		$Q$	$\bar{Q}$
L	H		L	H
H	H		H	L
X	L		$Q_0$	$\bar{Q}_0$

**H** = high level, **L** = low level, **X** = irrelevant  
 $Q_0$  = the level of  $Q$  before the high-to-low transition of G

**4-BIT BISTABLE LATCHES**



SN5476 (J, W) SN7476 (J, N)  
SN54HC76 (J) SN74HC76 (N)  
SN54LS76A (J, W) SN74LS76A (J, N)

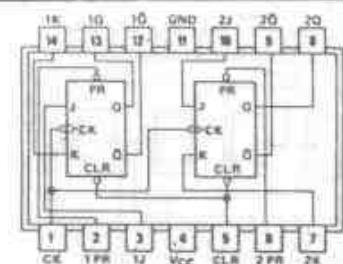
#### 76 FUNCTION TABLE

INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	O	$\bar{O}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	O <sub>0</sub>	$\bar{O}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	

#### 'LS76A, 'HC76 FUNCTION TABLE

INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	O	$\bar{O}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	O <sub>0</sub>	$\bar{O}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	↓	X	X	O <sub>0</sub>	$\bar{O}_0$

#### DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

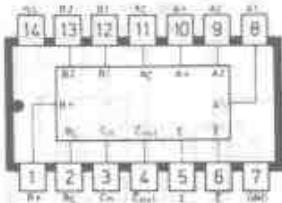


SN54HC78 (J) SN74HC78 (N)  
SN54LS78A (J, W) SN74LS78A (J, N)

#### FUNCTION TABLE

INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	O	$\bar{O}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	O <sub>0</sub>	$\bar{O}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	↓	X	X	O <sub>0</sub>	$\bar{O}_0$

#### DUAL J-K FLIP-FLOPS WITH PRESET, COMMON CLEAR, AND COMMON CLOCK



SN5480 (J, W) SN7480 (J, N)

GATED COMPLEMENTARY INPUTS  
COMPLEMENTARY SUM OUTPUTS

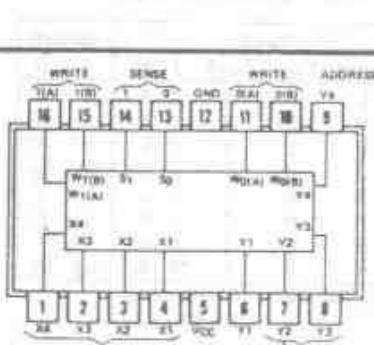
#### FUNCTION TABLE (See Notes 1, 2, and 3)

INPUTS			OUTPUTS		
C <sub>n</sub>	B	A	$\bar{C}_{n+1}$	$\bar{Z}$	$Z$
L	L	L	H	H	L
L	L	H	H	L	H
L	H	L	H	L	H
L	H	H	L	H	L
H	L	L	H	L	H
H	L	H	L	H	L
H	H	L	L	H	L
H	H	H	L	H	L

H = high level, L = low level

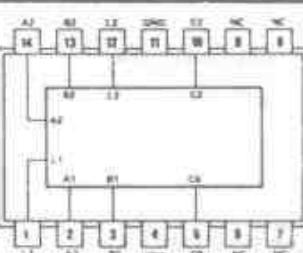
- NOTES: 1. A =  $\bar{A}_n + \bar{A}_n^*$  + A<sub>1</sub>-A<sub>2</sub>, B =  $\bar{B}_n + B_1 + B_1^*$ .  
2. When A<sub>1</sub> is used as an input, A<sub>1</sub> or A<sub>2</sub> must be low. When B<sub>1</sub> is used as an input, B<sub>1</sub> or B<sub>2</sub> must be low.  
3. When A<sub>1</sub> and A<sub>2</sub> or B<sub>1</sub> and B<sub>2</sub> are used as inputs, A<sub>0</sub> or B<sub>0</sub>, respectively, must be open or used to perform dot-AND logic.

BST: II



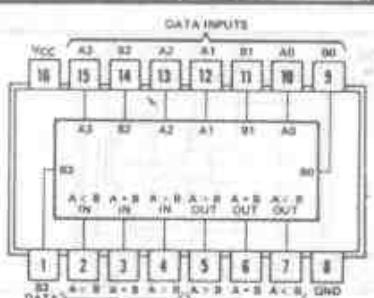
SN5481A (J, W) SN7481A (J, N)

16-BIT RANDOM-ACCESS MEMORIES



SN5482 (J, W) SN7482 (J, N)

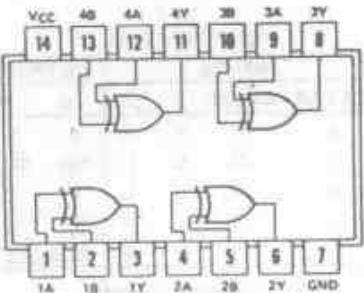
2-BIT BINARY FULL ADDERS



4-BIT MAGNITUDE COMPARATORS

BST: I

BST: I



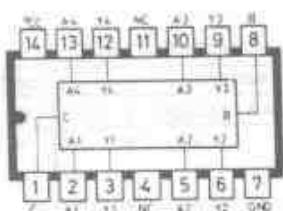
SN5486 (J, W) SN7486 (J, N)

## FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

H = high level, L = low level

## QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

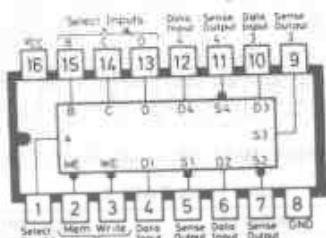


SN74H87

Control inputs		Outputs			
B	C	Y1	Y2	Y3	Y4
L	L	A1	A2	A3	A4
H	L	H	H	H	H
L	H	A1	A2	A3	A4
H	H	L	L	L	L

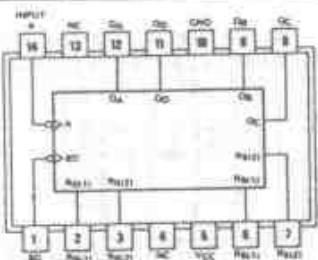
Positive Logik

## 4-Bit Komplementierer



SN7489

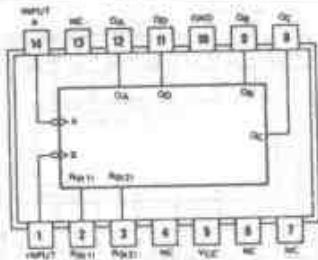
## 64 Bit RAM



SN5490A (J, W) SN7490A (J, N)

## DIVIDE-BY-TWO AND DIVIDE-BY FIVE

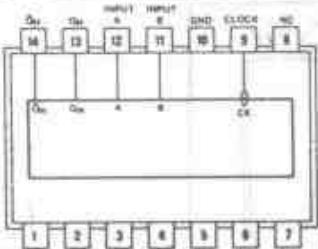
## DECADE COUNTERS BST: II



SN5493A (J, W) SN7493A (J, N)

## DIVIDE-BY-TWO AND DIVIDE-BY-EIGHT

## 4-BIT BINARY COUNTERS BST: II



SN5491A (J) SN7491A (J, N)

## SERIAL-IN, SERIAL-OUT GATED INPUT

## FUNCTION TABLE

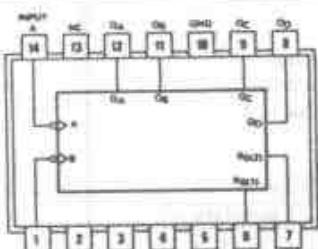
INPUTS		OUTPUTS	
AT t <sub>n</sub>	AT t <sub>n+8</sub>	AT t <sub>n</sub>	AT t <sub>n+8</sub>
A	B	D <sub>H</sub>	D <sub>H</sub>
H	H	H	L
L	X	L	H
X	L	L	H

H = high, L = low

X = irrelevant

t<sub>n</sub> = Reference bit time, clock lowt<sub>n+8</sub> = Bit time after 8 low-to-high clock transitions

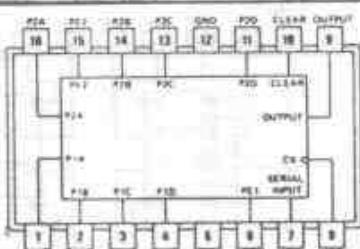
## 8-BIT SHIFT REGISTERS



SN5492A (J, W) SN7492A (J, N)

## DIVIDE-BY-TWO AND DIVIDE-BY-SIX

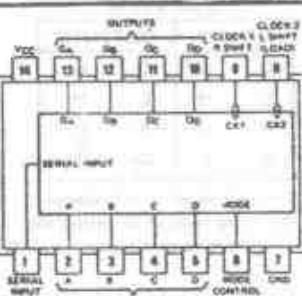
## DIVIDE-BY-TWELVE COUNTERS



SN5494 (J, W) SN7494 (J, N)

## DUAL ASYNCHRONOUS PRESETS

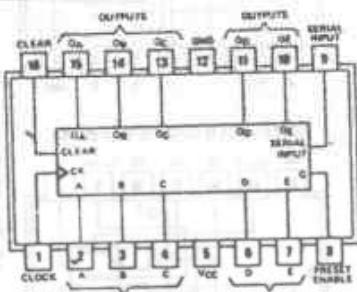
## 4-BIT SHIFT REGISTERS BST: III



SN5495A (J, W) SN7495A (J, N)

## PARALLEL IN/PARALLEL OUT SHIFT RIGHT, SHIFT LEFT SERIAL INPUT

## 4-BIT SHIFT REGISTERS BST: III

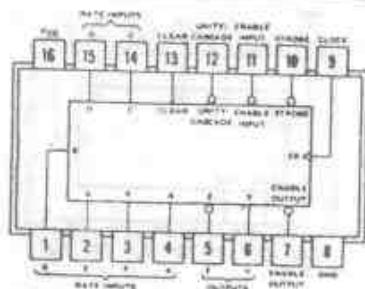


SN5496 (J, W) SN7496 (J, N)

## ASYNCHRONOUS PRESET

## 5-BIT SHIFT REGISTERS

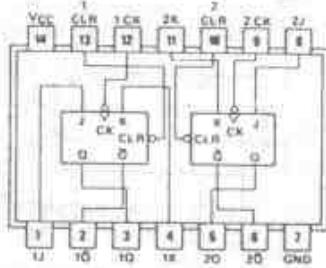
## BST: III



SN5497 (J, W)

SN7497 (J, N)

**BST: III**  
SYNCHRONOUS 8-BIT BINARY  
RATE MULTIPLIERS



SN54107 (J)

SN74107 (J, N)

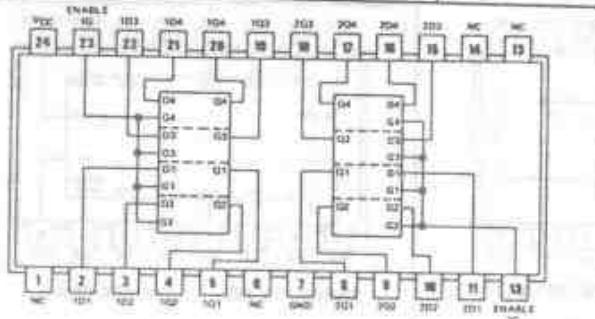
SN54HC107 (J)

SN74HC107 (N)

SN54LS107A (J)

SN74LS107A (J, N)

## DUAL J-K FLIP-FLOPS WITH CLEAR



SN54100 (J, W)

SN74100 (J, N, NT)

NC = No internal connection

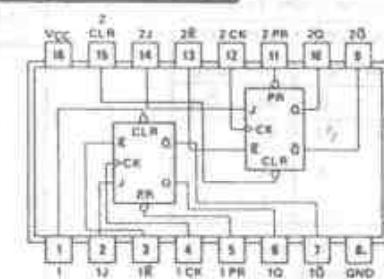
**FUNCTION TABLE**  
(Each Latch)

INPUTS	OUTPUTS
D G*	Q $\bar{Q}$
L H	L H
H H	H L
X L	Q <sub>0</sub> $\bar{Q}_0$

H = high level, X = irrelevant

Q<sub>0</sub> = the level of Q before the high-to-low transition of G

## 8-BIT BISTABLE LATCHES

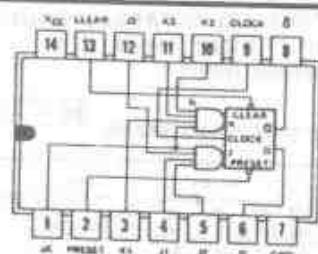


SN54109 (J, W)

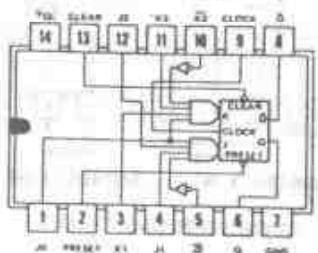
SN74109 (J, N)

## DUAL J-K POSITIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET AND CLEAR

INPUTS	OUTPUTS					
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H	H*
H	H	I	L	L	L	H
H	H	I	L	H	Q <sub>0</sub>	$\bar{Q}_0$
H	H	I	H	H	H	L
H	H	L	X	X	Q <sub>0</sub>	$\bar{Q}_0$



SN54104 (J) SN74104 (J or N)



SN54105 (J) SN74105 (J or N)

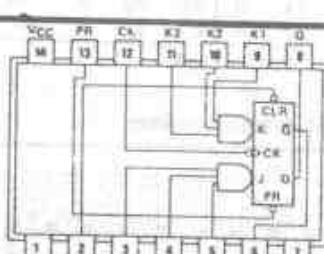
## featuring

- Buffered Clock Input
- Direct Preset and Clear
- Common JK Gate Input

## logic

## TRUTH TABLE

INPUT AT <sub>t<sub>0</sub></sub>	OUTPUT AT <sub>t<sub>0</sub>+1</sub>
J <sub>t<sub>0</sub></sub> J <sub>t<sub>0</sub>+1</sub> K <sub>t<sub>0</sub></sub> K <sub>t<sub>0</sub>+1</sub> D	Q <sub>t<sub>0</sub></sub> $\bar{Q}_{t0}$
L <sub>t<sub>0</sub></sub> X X	Q <sub>t<sub>0</sub></sub> $\bar{Q}_{t0}$
H L <sub>t<sub>0</sub></sub> L <sub>t<sub>0</sub>+1</sub>	Q <sub>t<sub>0</sub></sub> $\bar{Q}_{t0}$
H L L H	L H
H H L	H L
H H H	Q <sub>t<sub>0</sub></sub> $\bar{Q}_{t0}$

† SN54104/SN74104: J = J<sub>t<sub>0</sub></sub> · J<sub>t<sub>0</sub>+1</sub>,  
K = K<sub>t<sub>0</sub></sub> · K<sub>t<sub>0</sub>+1</sub>  
SN54105/SN74105: J = J<sub>t<sub>0</sub></sub> · J<sub>t<sub>0</sub>+1</sub>,  
K = K<sub>t<sub>0</sub></sub> · K<sub>t<sub>0</sub>+1</sub>\* These low levels must be maintained while  
the clock is low.NOTES:  
A. t<sub>0</sub> = 3H time before clock pulse.  
B. t<sub>0</sub>+1 = 3H time after clock pulse.  
C. H = high, L = low, X = irrelevant.

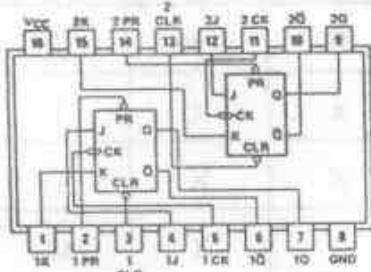
SN54110 (J, W) SN74110 (J, N)

## FUNCTION TABLE

INPUTS	OUTPUTS					
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H	H*
H	H	I	L	L	L	H
H	H	I	L	H	Q <sub>0</sub>	$\bar{Q}_0$
H	H	I	H	H	H	L
H	H	I	L	X	Q <sub>0</sub>	$\bar{Q}_0$

positive logic: J = J<sub>1</sub> · J<sub>2</sub> · J<sub>3</sub>K = K<sub>1</sub> · K<sub>2</sub> · K<sub>3</sub>

## AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH DATA LOCKOUT

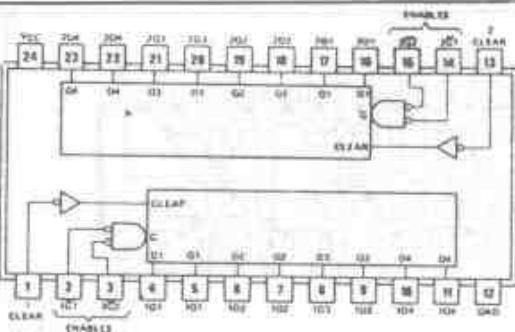


SN54111 (J, W) SN74111 (J, N)

FUNCTION TABLE

INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q <sub>0</sub>	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	

DUAL J-K MASTER-SLAVE FLIP-FLOPS  
WITH DATA LOCKOUT

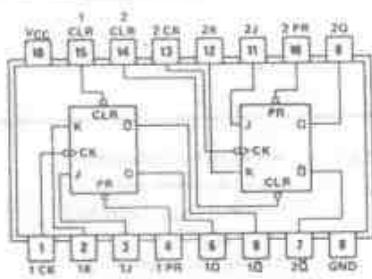


SN54116 (J, W) SN74116 (J, N, NT)

FUNCTION TABLE  
(EACH LATCH)

INPUTS			OUTPUT
CLEAR	ENABLE	DATA	Q
H	I	L	L
H	I	L	H
H	X	H	$\bar{Q}_0$
H	H	X	$\bar{Q}_0$
L	X	X	L

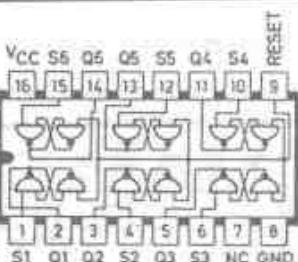
DUAL 4-BIT LATCHES



SN54ALS112 (J) SN74ALS112 (N)

INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q <sub>0</sub>	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q <sub>0</sub>	$\bar{Q}_0$

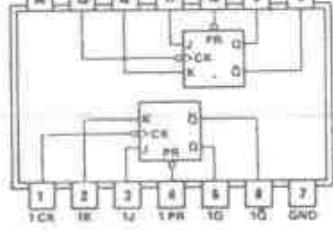
DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET AND CLEAR



SN54118 (J, W) SN54118 (J or N)

HEX SET-RESET LATCH

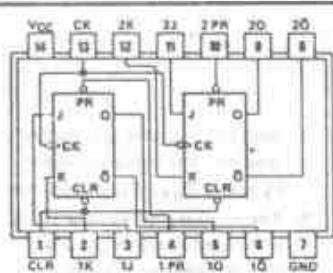
S	Reset	Q
0	x	1
1	1	Store
1	0	0



SN54ALS113 (J) SN74ALS113 (N)

INPUTS			OUTPUTS		
PRESET	CLOCK	J	K	Q	$\bar{Q}$
L	X	X	X	H	L
H	I	L	L	Q <sub>0</sub>	$\bar{Q}_0$
H	-	H	L	H	L
H	I	L	H	L	H
H	-	H	H	TOGGLE	
H	H	X	X	Q <sub>0</sub>	$\bar{Q}_0$

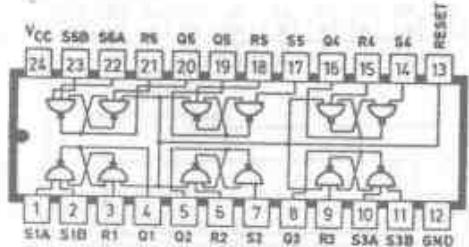
DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET



SN54ALS114 (J) SN74ALS114 (N)

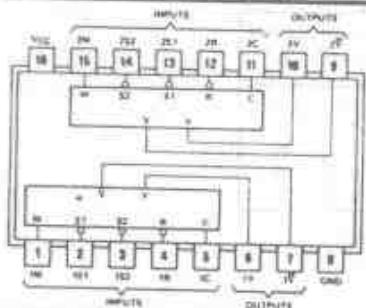
INPUTS			OUTPUTS			
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q <sub>0</sub>	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q <sub>0</sub>	$\bar{Q}_0$

DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET, COMMON CLEAR, AND COMMON CLOCK



SN54119 (J, W)    SN74119 (J, N)  
HEX SET-RESET LATCH

SA	SB	R	Reset	Q
0	X	X	X	1
X	0	X	X	1
1	1	0	X	0
1	1	X	0	0
1	1	1	1	Store



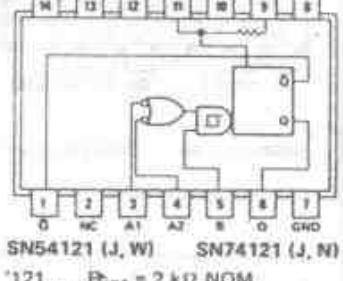
SN54120 (J, W)    SN74120 (J, N)

#### DUAL PULSE SYNCHRONIZERS/DRIVERS

FUNCTION TABLE

INPUTS			FUNCTION	
R	S <sub>1</sub>	S <sub>2</sub>		
X	L	X	Pass Output Pulses	
X	X	L	Pass Output Pulses	
L	H	H	Inhibit Output Pulses	
H	↓	H	Start Output Pulses	
H	H	↓	Start Output Pulses	
↑	H	H	Stop Output Pulses	
H	N	H	Continue†	

† Operation initiated by last ↓ transition continues.



SN54121 (J, W)    SN74121 (J, N)

\*121 ... R<sub>int</sub> = 2 kΩ NOM

NC—No internal connection

#### MONOSTABLE MULTIVIBRATORS

FUNCTION TABLE

INPUTS			OUTPUTS	
A <sub>1</sub>	A <sub>2</sub>	B	Q	Q̄
L	X	H	L	H
X	L	H	L	H*
X	X	L	L	H*
H	H	X	L	H*
H	I	H	↑	↑
I	H	H	↑	↑
I	I	H	↑	↑
L	X	↑	↑	↑
X	L	↑	↑	↑

- NOTES: 1. An external capacitor may be connected between C<sub>ext</sub> (positive) and R<sub>ext</sub>/C<sub>ext</sub>.  
2. To use the internal timing resistor, connect R<sub>int</sub> to V<sub>CC</sub>. For improved pulse width accuracy and repeatability, connect an external resistor between R<sub>ext</sub>/C<sub>ext</sub> and V<sub>CC</sub> with R<sub>int</sub> open-circuited.

SN54122 (J, W)    SN74122 (J, N)

SN54LS122 (J, W)    SN74LS122 (J, N)

\*122 ... R<sub>int</sub> = 10 kΩ NOM

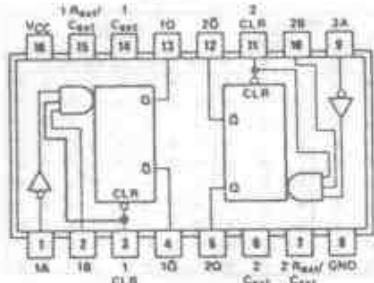
\*LS122 ... R<sub>int</sub> = 10 kΩ NOM

FUNCTION TABLE

INPUTS			OUTPUTS	
CLEAR	A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>
L	X	X	X	X
X	H	H	X	X
X	X	X	L	X
X	X	X	L	H*
H	L	X	↑	H
H	L	X	H	↑
H	X	L	↑	H
H	X	L	H	↑
H	H	I	H	H
H	I	I	H	H
H	I	H	H	H
I	L	X	H	H
I	X	L	H	H

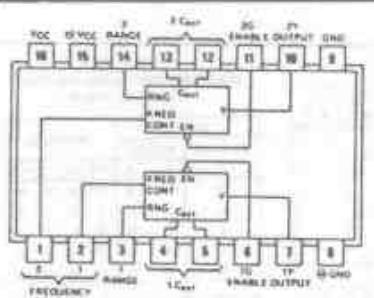
- NOTES: 1. An external timing capacitor may be connected between C<sub>ext</sub> and R<sub>ext</sub>/C<sub>ext</sub> (positive).  
2. For accurate repeatable pulse widths, connect an external resistor between R<sub>ext</sub>/C<sub>ext</sub> and V<sub>CC</sub> with R<sub>int</sub> open-circuited.

#### RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR



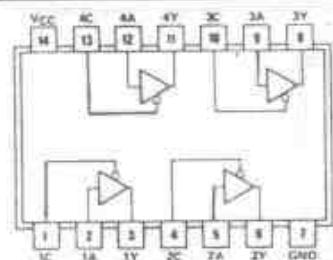
**SN54123 (J, W)      SN74123 (J, N)**

#### DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR



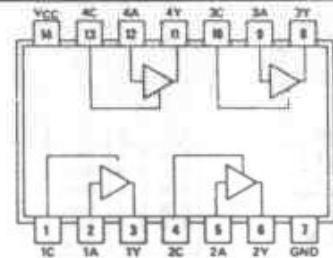
**SN54S124 (J, W)      SN74S124 (J, N)**

#### DUAL VOLTAGE-CONTROLLED OSCILLATORS



**SNS4125 (J, W)      SN74125 (J, N)**  
positive logic:  
 $Y = A$   
Output is off (disabled) when C is high.

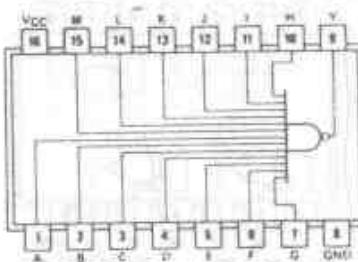
#### QUADRUPLE BUS BUFFER GATES WITH THREE-STATE OUTPUTS



**SNS4126 (J, W)      SN74126 (J, N)**  
positive logic:  
 $Y = A$   
Output is off (disabled) when C is low.

#### QUADRUPLE BUS BUFFER GATES WITH THREE-STATE OUTPUTS

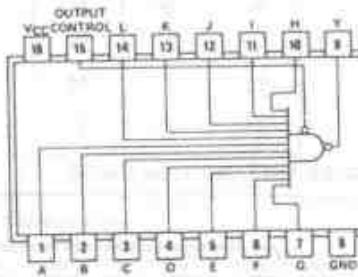
FUNCTION TABLE	
INPUTS	OUTPUTS
CLEAR	A   B   D   G
L	X   X   L   H
X	H   X   L   H*
X	X   L   L   H*
H	L   T   L   U
H	L   H   L   U
T	L   H   L   U



**SN54ALS133 (J)      SN74ALS133 (N)**

positive logic:  
 $Y = ABCDEFGHIJKLM$

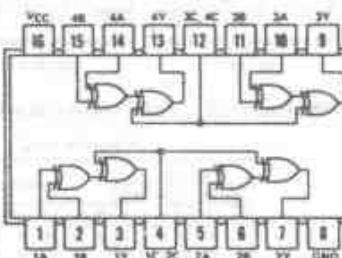
#### 13-INPUT POSITIVE-NAND GATES



**SN54S134 (J, W)      SN74S134 (J, N)**

positive logic:  
 $Y = ABCDEFGHIJKL$   
Output is off (disabled) when output control is high.

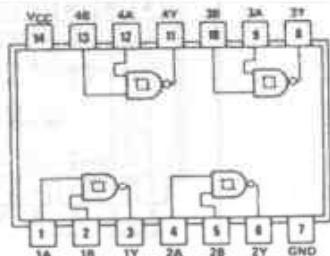
#### 12-INPUT POSITIVE-NAND GATES WITH THREE-STATE OUTPUTS



**SN54ALS131 (J)      SN74ALS131 (N)**

#### 3 LINE TO 8 LINE DECODER/DEMUX

#### EDGE TRIGGERED ADDRESS REGISTERS

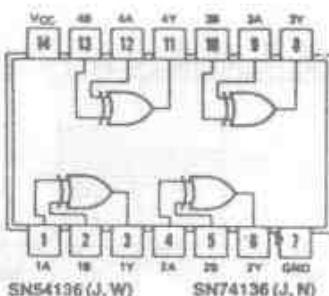


**SNS4132 (J, W)      SN74132 (J, N)**

#### QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS

Inputs	Output
A   B   C	Y
L   L   L	L
L   H   L	H
H   L   L	H
H   H   L	L
L   L   H	H
L   H   H	L
H   L   H	L
H   H   H	H

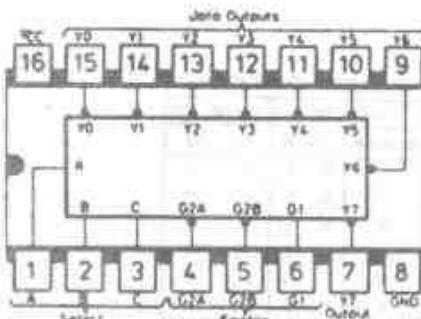
#### QUAD EXCLUSIVE-OR GATES



Positive logic:  $Y = A \oplus B = AB + \bar{A}\bar{B}$

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

#### QUAD EXCLUSIVE-OR GATES

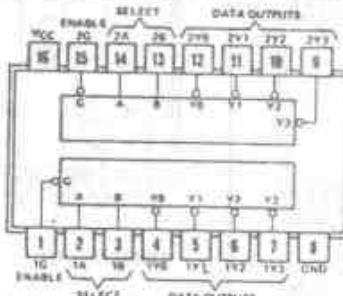


'LS138, 'E138  
FUNCTION TABLE

INPUTS		OUTPUTS										
ENABLE	SELECT	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	L	L	L	L	L	L	L	L	L	L	L
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	L	H	H	N	H	H	H	H	H
H	L	L	H	L	H	H	N	H	H	H	H	H
H	L	L	H	L	H	H	N	H	H	H	H	H
H	L	L	H	L	H	H	N	H	H	H	H	H

\*G2 = G3A = G2B  
H = High level, L = Low level, X = irrelevant

#### 3-TO-8 LINE DECODERS/MULTIPLEXERS

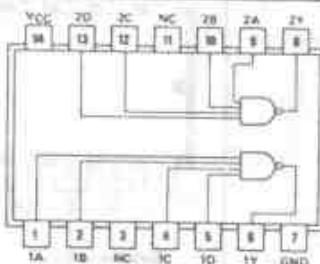


'LS139, 'E139  
(EACH DECODER/DEMULPLEXER)  
FUNCTION TABLE

INPUTS		OUTPUTS						
ENABLE	SELECT	C	B	A	Y0	Y1	Y2	Y3
H	X	X	X	X	H	H	H	H
L	L	L	L	L	L	L	L	L
L	S	H	H	L	H	H	H	H
L	H	L	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H

\* = High level, L = Low level, S = irrelevant

#### DUAL 2-TO-4 LINE DECODERS/MULTIPLEXERS



SN54ALS137 (J) SN74ALS137 (J or N)

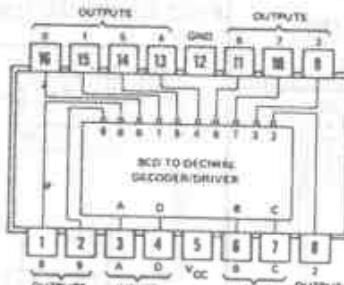
#### FUNCTION TABLE

INPUTS		OUTPUTS												
ENABLE	SELECT	G1	G2	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	L	X	X	X	H	H	H	H	H	H	H	H	H	H
L	H	L	L	L	L	H	H	H	H	H	H	H	H	H
L	M	L	L	H	L	H	H	H	H	H	H	H	H	H
L	H	L	L	H	H	L	H	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	H
H	H	L	X	X	X	X	X	X	X	X	X	X	X	X

\* = High level, L = Low level, X = irrelevant

#### 3-LINE TO 8-LINE DECODER/DEMULPLEXER WITH ADDRESS LATCHES

#### DUAL 4-INPUT POSITIVE-NAND 50-OHM LINE DRIVERS

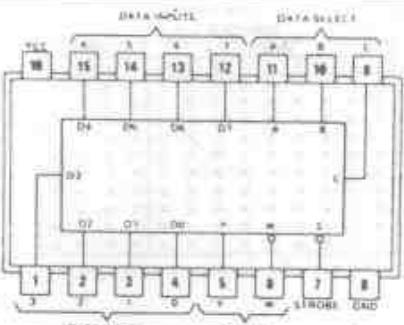


Inputs	Output
D C B A	DR
L L L L	0
L L L H	1
L L H L	2
L L H H	3
L H L L	4
L H L H	5
L H H L	6
L H H H	7
H L L L	8
H L L H	9
H L H L	None
H L H H	None
H H L L	None
H H L H	None
H H H L	None
H H H H	None

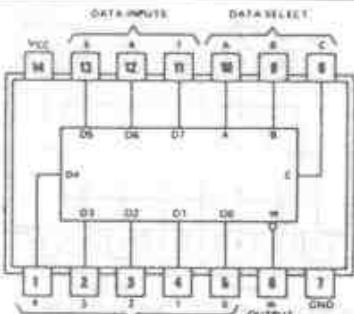
#### BCD-TO-DECIMAL DECODER/DRIVER

DRIVES COLD-CATHODE INDICATOR TUBES  
ESTAB REVERSE - NO BURNOUT  
STROBE STAYS BURNED HIGH





**SN54151A (J, W)**  
**SN54ALS151 (J)**



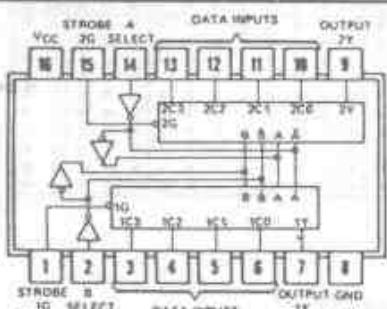
**SN74151A (J, N)**  
**SN74ALS151 (N)**

'181A, 'LE181, 'S181 FUNCTION TABLE			
INPUTS	OUTPUTS		
SELECT	STROBE	V	W
X X X	H	L	H
L L L	L	00	00
L L H	L	01	01
L H L	L	02	02
L N H	L	03	03
H L L	L	04	04
H L H	L	05	05
H H L	L	06	06
H H H	L	07	07

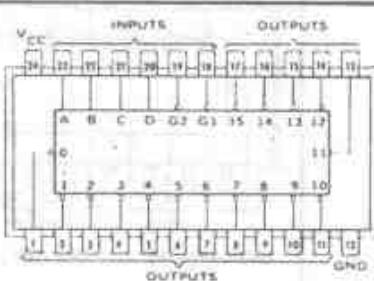
H = high level, L = low level, X = irrelevant  
E0, E1 = E15 = the complement of the level of the respective S input  
D0, D1 ... D7 = the level of the Q respective input

'182A, 'LE182 FUNCTION TABLE			
SELECT	OUTPUT		
C B A		W	
L L L		00	00
L L H		01	01
L H L		02	02
L H H		03	03
H L L		04	04
H L H		05	05
H H L		06	06
H H H		07	07

### 1-OF-8 DATA SELECTORS/MUXES



**SN54153 (J, W)**  
**SN74153 (J, N)**

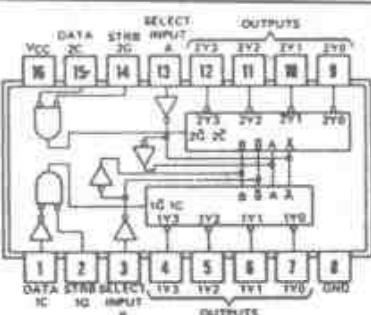


**SN54154 (J, W)**  
**SN74154 (J, N, NT)**

Inputs				Output		
G1	G2	D	C	B	A	Low*
L	L	t	L	L	L	0
L	L	t	L	L	H	1
L	L	L	L	H	L	2
L	L	L	H	L	L	3
L	L	L	H	L	H	4
L	L	L	H	H	L	5
L	L	L	H	H	H	6
L	L	L	H	L	L	7
L	L	H	L	L	L	8
L	L	H	L	H	L	9
L	L	H	L	H	H	10
L	L	H	H	L	L	11
L	L	H	H	L	H	12
L	L	H	H	H	L	13
L	L	H	H	H	H	14
L	H	X	X	X	X	None
H	L	X	X	X	X	None
H	H	X	X	X	X	None

### 4-LINE TO 16-LINE DECODERS/DEMUXES

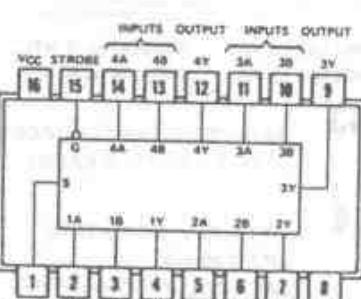
#### DUAL 4-LINE TO 1-LINE DATA SELECTORS/MUXES



**SN54155 (J, W)**  
**SN74155 (J, N)**

FUNCTION TABLES 2-LINE TO 4-LINE DECODER OR 1-LINE TO 4-LINE DEMULTIPLEXER			
INPUTS	OUTPUTS		
SELECT	STROBE	DATA	T1V0 T1V1 T1V2 T1V3
X X	H	TC	X H H H
L L	L	TC	0 L H H
L L	H	TC	0 R L H
H H	L	TC	0 R R L
H H	H	TC	0 R R R

FUNCTION TABLES 3-LINE TO 8-LINE DECODER OR 1-LINE TO 8-LINE DEMULTIPLEXER			
INPUTS	OUTPUTS		
SELECT	STROBE	DATA	T2V0 T2V1 T2V2 T2V3 T1V0 T1V1 T1V2 T1V3
X X X	H	TC	000 001 010 011 100 101 110 111
L L L	L	TC	000 001 010 011 100 101 110 111
L L H	L	TC	000 001 010 011 100 101 110 111
L H L	L	TC	000 001 010 011 100 101 110 111
L H H	L	TC	000 001 010 011 100 101 110 111
H L L	L	TC	000 001 010 011 100 101 110 111
H L H	L	TC	000 001 010 011 100 101 110 111
H H L	L	TC	000 001 010 011 100 101 110 111
H H H	L	TC	000 001 010 011 100 101 110 111



**SN54157 (J)**  
**SN74157 (N)**

**SN54LS158 (J, W)**  
**SN74LS158 (J, N)**

### 157 NONINVERTED DATA OUTPUTS

### 158 INVERTED DATA OUTPUTS

FUNCTION TABLE			
INPUTS	OUTPUTS		
STROBE	SELECT	A	B
H	X	X	L
L	L	L	X
L	H	X	H
L	H	X	L
L	H	X	H

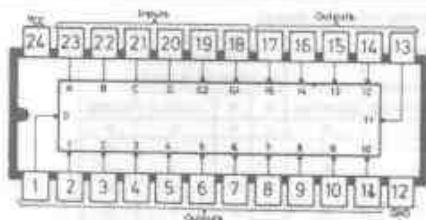
H = high level, L = low level, X = irrelevant

### QUAD 2- TO 1-LINE DATA SELECTORS/MUXES

#### 155 TOTEM-POLE OUTPUTS

#### 156 OPEN-COLLECTOR OUTPUTS

#### DECODERS/DEMUXES



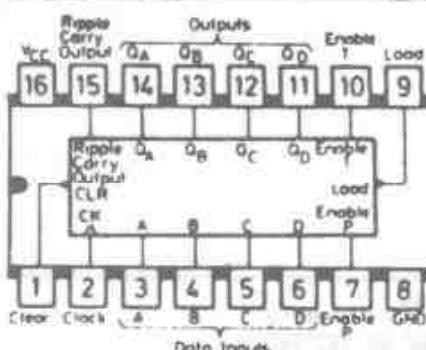
SN74159

## OPEN-COLLECTOR OUTPUTS

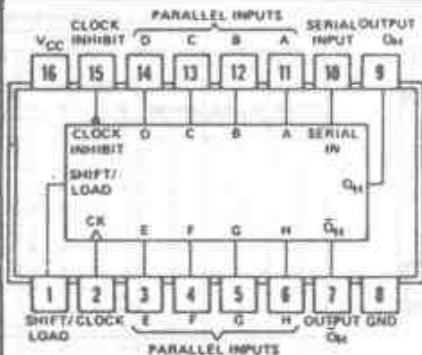
Inputs		Output				
S1	S2	D	C	B	A	QH*
L	L	L	L	L	L	0
L	L	L	L	L	H	1
L	L	L	L	H	L	2
L	L	L	L	H	H	3
L	L	L	E	L	L	4
L	L	L	E	L	H	5
L	L	L	E	H	L	6
L	L	L	E	H	H	7
L	L	H	L	L	L	8
L	L	H	L	L	H	9
L	L	H	L	H	L	10
L	L	H	L	H	H	11
L	L	H	H	L	L	12
L	L	H	H	L	H	13
L	L	H	H	H	L	14
L	L	H	H	H	H	15
H	L	X	X	X	X	None
H	H	X	X	X	X	None

4-TO 16-LINE

## DECODERS/DEMULTIPLEXERS



## SYNCHRONOUS 4-BIT COUNTERS

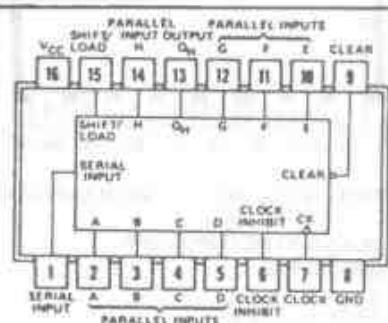
**160** DECADE, DIRECT CLEAR**161** BINARY, DIRECT CLEAR**162** DECADE, SYNCHRONOUS CLEAR**163** BINARY, SYNCHRONOUS CLEAR

SN54165 (J, W)

SN74165 (J, N)

Shift/ Load	Clock Inhibit	Inputs				Internal Outputs QA...QH	Output QH
		Clock	Serial	Parallel	QA...QH		
L	X	X	X	a...h	a	b	h
H	L	L	X	X	QAO	QBO	QHO
H	L	f	H	X	H	QAn	QGn
H	L	t	L	X	L	QAn	QGn
H	H	t	X	X	QAO	QBO	QHO

## PARALLEL-LOAD 8-BIT SHIFT REGISTERS WITH COMPLEMENTARY OUTPUTS



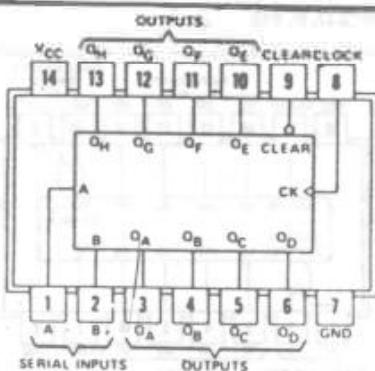
SN54166 (J, W)

SN74166 (J, N)

PARALLEL/SERIAL INPUT  
SERIAL OUTPUT

FUNCTION TABLE							
CLEAR	SHIFT/ LOAD	INPUTS				INTERNAL OUTPUTS QA...QH	OUTPUT QH
		CLOCK INHIBIT	CLOCK	SERIAL	PARALLEL A...H		
L	X	X	X	X	X	L	L
H	X	L	L	X	X	QAO	QBO
H	L	L	t	X	a...h	a	b
H	H	L	t	H	X	H	QAn
H	H	L	t	L	X	L	QAn
H	X	H	t	X	X	QAO	QBO

## 8-BIT SHIFT REGISTERS



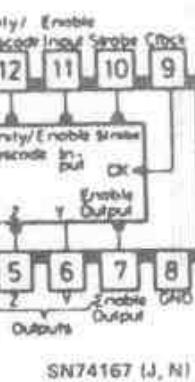
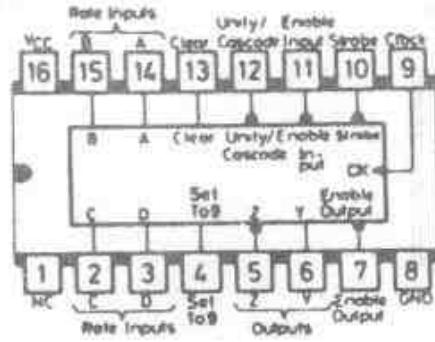
SN54164 (J, W)

SN74164 (J, N)

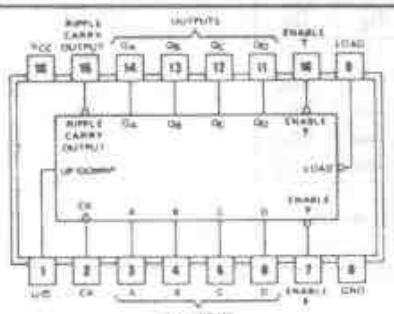
## ASYNCHRONOUS CLEAR

Inputs				Outputs			
Clear	Clock	A	B	QA	QB...QH		
L	X	X	X	L	L	L	
H	L	X	X	QAO	QBO	QHO	
H	↑	H	H	H	QAn	QGn	
H	↑	L	X	L	QAn	QGn	
H	↑	X	L	L	QAn	QGn	

## 8-BIT PARALLEL OUTPUT SERIAL SHIFT REGISTERS



### SYNCHRONOUS DECADE RATE MULTIPLIERS

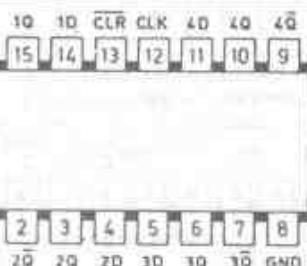


### 4-BIT UP/DOWN SYNCHRONOUS COUNTERS

**168** DECADE

**169** BINARY

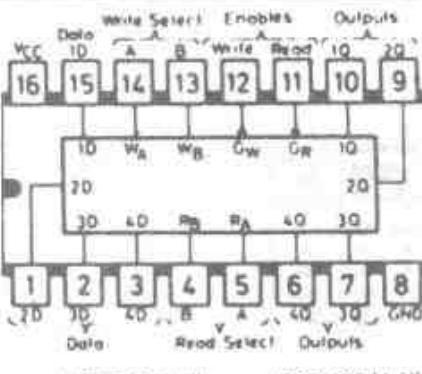
NOTES:  
 A. H = High level, L = low level, X = irrelevant. All remaining entries are numeric counts.  
 B. This is a simplified illustration of the clear function. The states of clock and strobe can affect the logic level of Y and Z. A low unity/enable will cause output Y to remain high.  
 C. Each rate illustrated assumes a constant value at rate inputs. However, these illustrations in no way prohibit variable rate inputs.  
 D. These input conditions exceed the range of the decimal rate inputs.  
 E. Unity/enable or  $\bar{E}$  is used to inhibit output Y.



SN54S168 (J, W)      SN74S168 (J, N)

### QUAD D-TYPE FLIP-FLOPS WITH CLEAR

BST: III

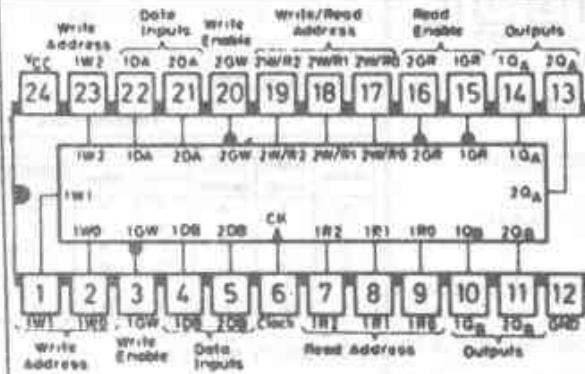


SEPARATE READ/WRITE ADDRESSING  
SIMULTANEOUS READ AND WRITE  
OPEN-COLLECTOR OUTPUTS  
EXPANDABLE TO 1024 WORDS

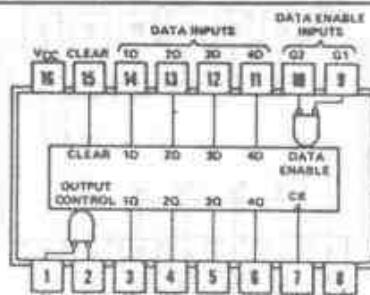
Write		Word		Read			
Write Inputs		W <sub>A</sub>	W <sub>B</sub>	R <sub>B</sub>	R <sub>A</sub>	G <sub>B</sub>	Output
L	L	0	1	2	3		W <sub>B1</sub> W <sub>B2</sub> W <sub>B3</sub> W <sub>B4</sub>
L	H	0	0	0	0		W <sub>B1</sub> W <sub>B2</sub> W <sub>B3</sub> W <sub>B4</sub>
H	L	0	0	0	0		W <sub>B1</sub> W <sub>B2</sub> W <sub>B3</sub> W <sub>B4</sub>
H	H	0	0	0	0		W <sub>B1</sub> W <sub>B2</sub> W <sub>B3</sub> W <sub>B4</sub>
X	X	0	0	0	0		W <sub>B1</sub> W <sub>B2</sub> W <sub>B3</sub> W <sub>B4</sub>

Positive Logic

### 4-BY-4 REGISTER FILES

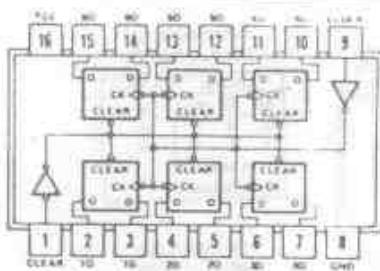


16-BIT REGISTER FILE

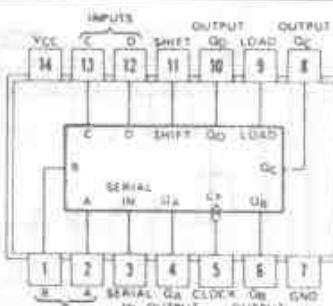


BST: III 3-STATE OUTPUTS

4-BIT D-TYPE REGISTERS



SNS4174 (J, W)

SINGLE RAIL OUTPUTS  
COMMON DIRECT CLEAR

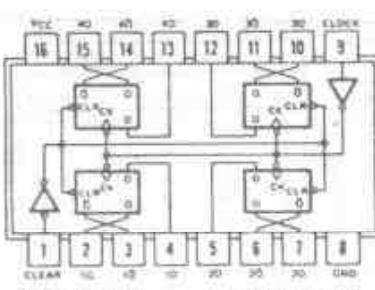
SN74174 (J, N)

## HEX D-TYPE FLIP-FLOPS

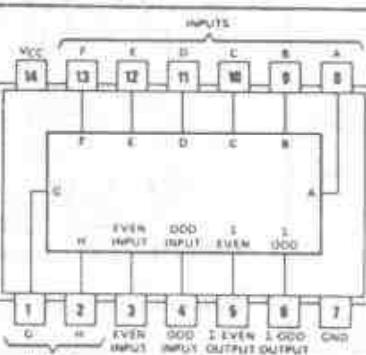
FUNCTION TABLE  
(EACH FLIP FLOP)

INPUTS				
CLEAR	CLOCK	D	Q	Q̄
L	X	X	L	H
H	—	H	H	L
H	—	L	L	H
H	L	X	Q <sub>0</sub>	Q̄ <sub>0</sub>

L = high level (steady state)  
H = low level (steady state)  
— = irrelevant  
X = transition from low to high level  
Q<sub>0</sub> = the level of Q before the indicated steady-state input conditions were established.  
Input conditions were established.  
T = 176, 177A, and 178 units

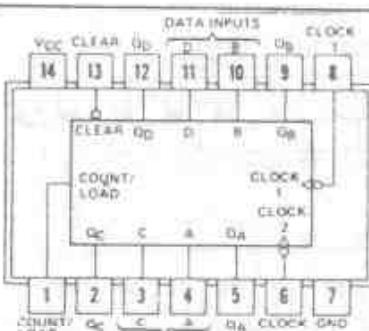


SNS4175 (J, W)

COMPLEMENTARY OUTPUTS  
COMMON DIRECT CLEAR

SN74175 (J, N)

## QUAD D-TYPE FLIP-FLOPS



SNS4180 (J, W)

SN74180 (J, N)

## 9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

SNS4176, SN74176  
FUNCTION TABLES  
(See Note A)

COUNT	OUTPUT
	Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>
0	L L L L
1	L L L H
2	L L H L
3	L L H H
4	L H L L
5	L H L H
6	L H H L
7	L H H H
8	H L L L
9	H L L H

H = high level; L = low level.

NOTE A: Output Q<sub>3</sub> connected to clock-2 input.B: Output Q<sub>0</sub> connected to clock-1 input.SNS4177, SN74177  
FUNCTION TABLE  
(See Note A)

COUNT	OUTPUT
	Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>
0	L L L L
1	L L L H
2	L L H L
3	L L H H
4	L H L L
5	L H L H
6	L H H L
7	L H H H
8	H L L L
9	H L L H
10	H L H L
11	H L H H
12	H H L L
13	H H L H
14	H H H L
15	H H H H

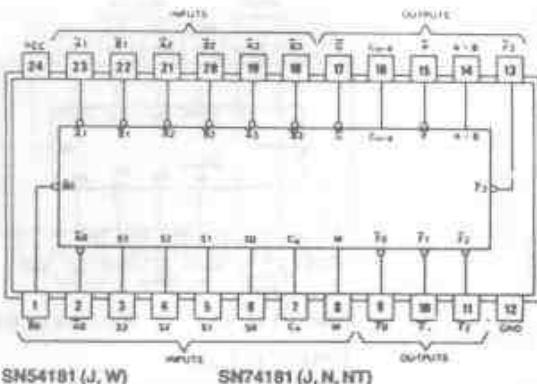
H = high level; L = low level.

NOTE A: Output Q<sub>3</sub> connected to clock-2 input.B: Output Q<sub>0</sub> connected to clock-1 input.

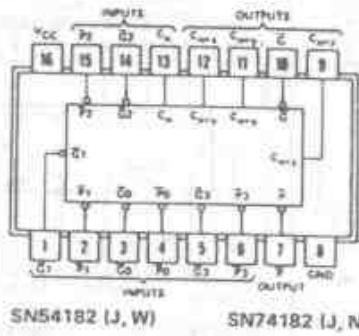
## PRESETTABLE COUNTERS/LATCHES

## 176 DECADE (81-QUINARY)

## 177 BINARY



16 ARITHMETIC OPERATIONS  
16 LOGIC FUNCTIONS



LOOK-AHEAD CARRY GENERATORS

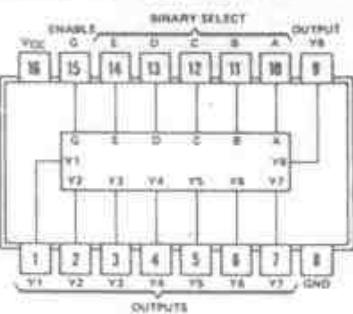
FUNCTION TABLE FOR C <sub>0</sub> <sub>15</sub> OUTPUT	
INPUTS	OUTPUT
G <sub>0</sub> P <sub>0</sub> C <sub>n</sub>	C <sub>0</sub> <sub>15</sub>
L X X X	H
X L R	H
All other combinations	L

FUNCTION TABLE FOR C <sub>0</sub> <sub>15</sub> OUTPUT	
INPUTS	OUTPUT
G <sub>1</sub> G <sub>0</sub> P <sub>1</sub> P <sub>0</sub> C <sub>n</sub>	C <sub>0</sub> <sub>15</sub>
L X X X X	H
X L L X X	H
X X L L H	H
All other combinations	L

## BST: VII

H = High level, L = Low level, X = Indeterminate.  
Any inputs not shown in a given table are indeterminate with respect to their outputs.

### ARITHMETIC LOGIC UNITS/FUNCTION GENERATORS



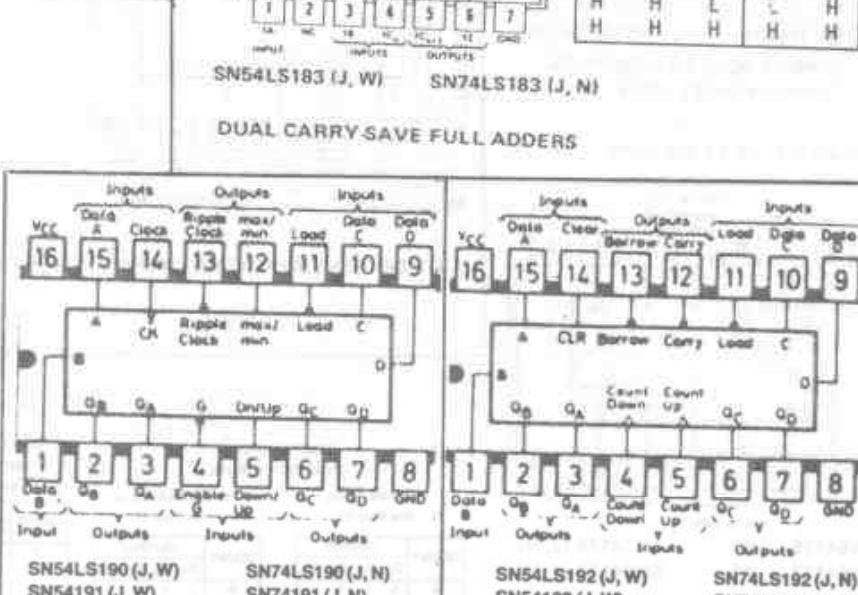
### CODE CONVERTERS

#### CASCADEABLE TO N-BITS

#### 184 BCD-TO-BINARY

#### 185 BINARY-TO-BCD

## BST: III, IV



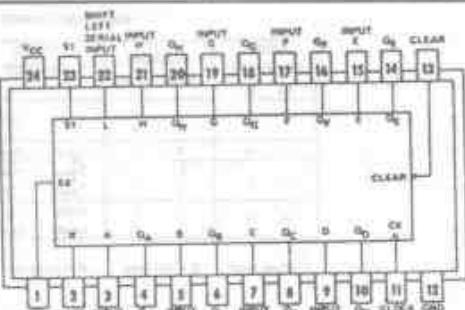
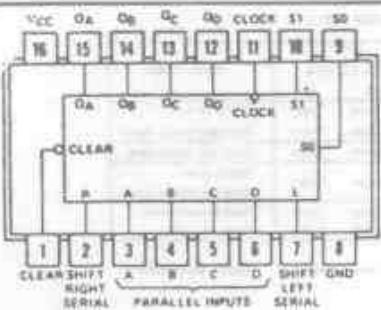
### SYNCHRONOUS UP/DOWN DUAL CLOCK COUNTERS

#### 190 BCD

#### 191 BINARY

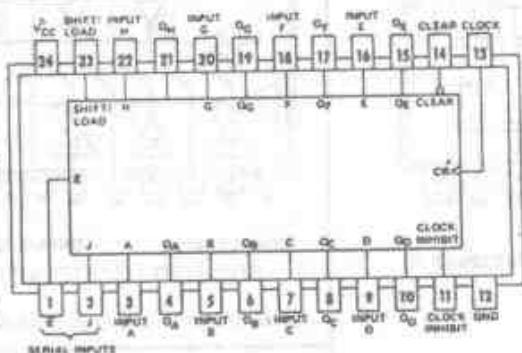
#### 192 BCD WITH CLEAR

#### 193 BINARY WITH CLEAR



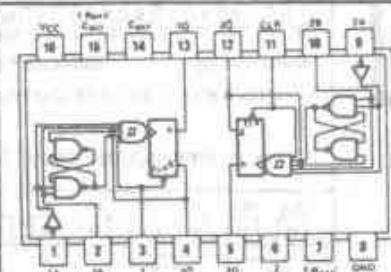
## BST: IV

### 8-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTERS



### J-K SERIAL INPUTS

### 8-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTERS

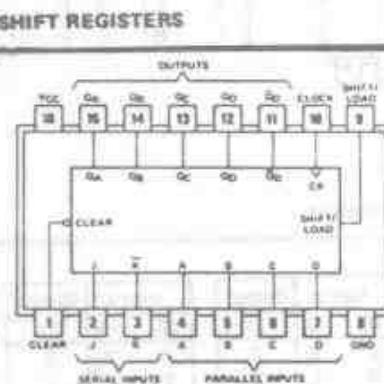


## BST: IV

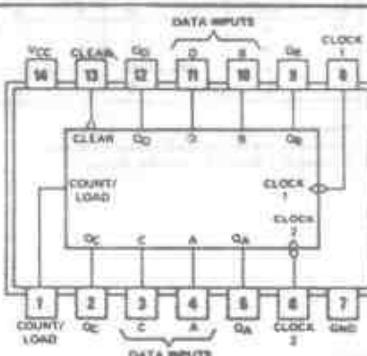
### DUAL MONOSTABLE MULTIVIBRATORS



### 4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTERS



### 4-BIT PARALLEL-ACCESS SHIFT REGISTERS

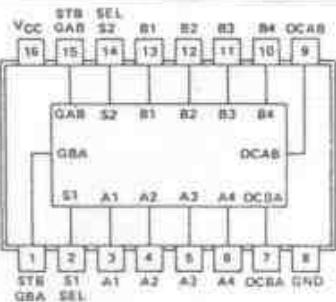


### PRESETTABLE COUNTERS/LATCHES (LS 176; 177)

196 DECADE/BI-QUINARY

197 BINARY

ASYNCHRONOUS FIRST-IN, FIRST-OUT MEMORIES



BUS-MANAGEMENT FUNCTION TABLE

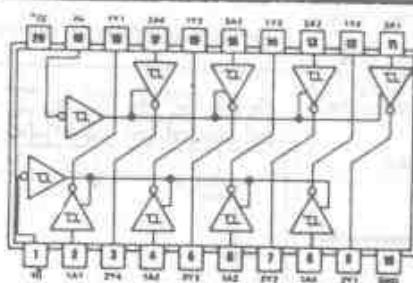
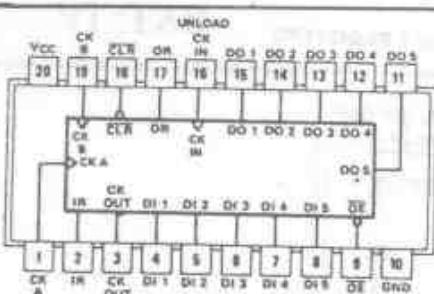
MODE CONTROLS S2 S1	STROBES GAB GSA	A-TO-B LATCHES		B-TO-A LATCHES		OPERATION
		t	z	1	z	
L L	X H	Latch	Trans	Trans	Trans	Pass B to A
L H	X X	Latch	Trans	Latch	Trans	Read out stored data
H L	L X	Trans	Trans	Latch	Trans	Pass A to B
H H	L L	Trans	Latch	Trans	Latch	Read out stored data
	H H	Latch	Latch	Latch	Latch	Read in both buses Save bus data

H = High level    L = Low level    X = Invertant    Latch = latched    Trans = transparent

SN54S226 (J, W)

SN74S226 (J, N) 4-BIT PARALLEL LATCHED BUS TRANSCEIVERS

## 3-STATE OUTPUTS

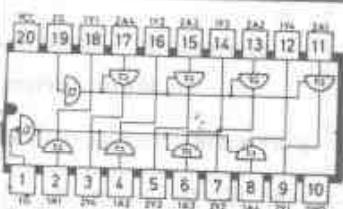


Inputs	Output
G A	Y
H X	Z
L L	H
L H	L

SN54ALS240 (J)    SN74ALS240 (N)

## INVERTED 3-STATE OUTPUTS

## OCTAL BUFFERS/LINE DRIVERS/LINE RECEIVERS



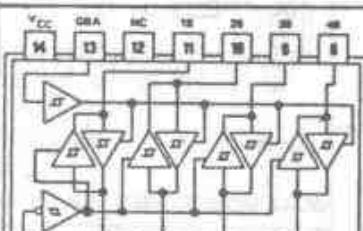
Inputs	Output
1G	1A
1	1Y
2	X
3	Z
4	L
5	L
6	H
7	H
8	9
9	10

Inputs	Output
2G	2A
2	2Y
3	X
4	Z
5	L
6	L
7	H
8	H

SN54LS241 (J)    SN74LS241 (J, N)

## NONINVERTED 3-STATE OUTPUTS

## OCTAL BUFFERS/LINE DRIVERS/LINE RECEIVERS



## FUNCTION TABLE (EACH TRANSCEIVER)

CONTROL INPUTS	'L2342 DATA PORT STATUS		'L2343 DATA PORT STATUS	
	GAB	GSA	A	B
H H	O	I	O	I
L H	*	*	*	*
H L	ISOLATED		ISOLATED	
L L	I	O	I	O

\*Possibly destructive oscillation may occur if the transceivers are connected in both directions of series.  
I = Input, O = Output, S = Inverting Output.

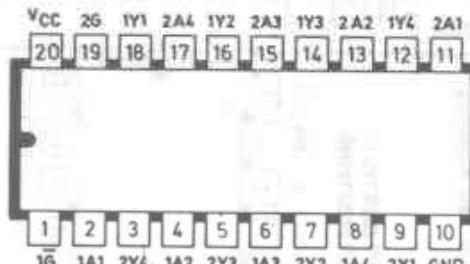
SN54ALS243 (J)  
SN54LS242 (J, W)  
SN74ALS243 (N)  
SN74LS242 (J, N)

## QUADRUPLE BUS TRANSCEIVERS

242 INVERTED 3-STATE OUTPUTS

243 NONINVERTED 3-STATE OUTPUTS

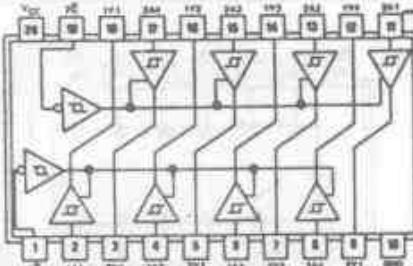
## 3-STATE OCTAL BUS DRIVER



SN74AS231 (J)    SN74AS231 (N)

## INVERTING LOGIC

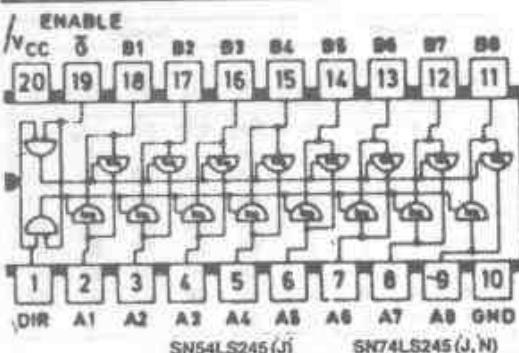
## 3-STATE OCTAL BUS DRIVER



**SN54ALS244 (J) SN74ALS244 (N)**

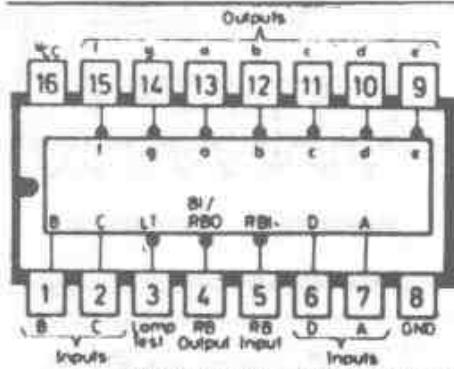
OCTAL BUFFERS/LINE

#### **DRIVERS/LINE RECEIVERS**



#### NONINVERTED 3-STATE OUTPUTS

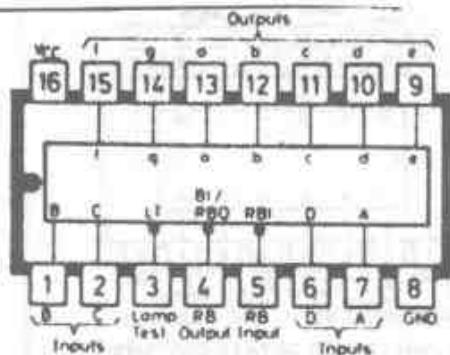
## OCTAL BUS TRANSCIVERS



## BCD-TO-SEVEN SEGMENT DECODERS/DRIVERS

246 ACTIVE-LOW, OPEN-COLLECTOR, 30-V OUTPUTS

247 ACTIVE-LOW, OPEN-COLLECTOR, 15-V OUTPUTS

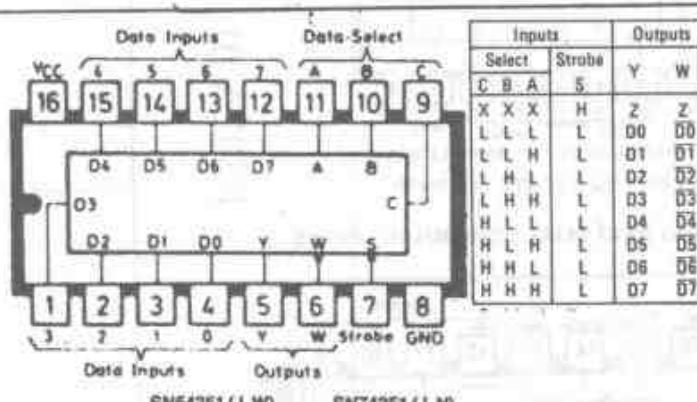


**SN54LS248 (J, W) SN74LS248 (J, N)**

## **BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS**

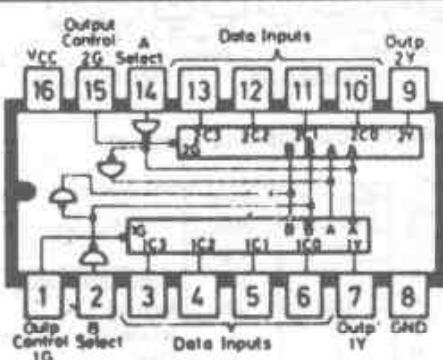
248 INTERNAL PULL-UP OUTPUTS

BST-II 249 OPEN-COLLECTOR OUTPUTS



#### TRUE AND INVERTED 3-STATE OUTPUTS

## DATA SELECTORS/MULTIPLEXERS

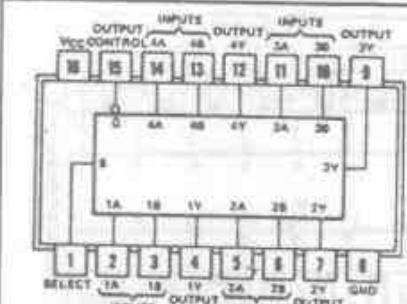


**SN54LS253 (J, W)**

3-STATE OUTPUTS

Select Inputs		Data Inputs				Output Control		Output
B	A	C0	C1	G2	C3	G	Y	
X	X	X	X	X	X	H	Z	
L	L	L	X	X	X	L	L	
L	L	H	X	X	X	L	H	
L	H	X	L	X	X	L	L	
L	H	X	H	X	X	L	H	
H	L	X	X	L	X	L	L	
H	L	X	X	H	X	L	H	
H	H	X	X	X	H	L	H	

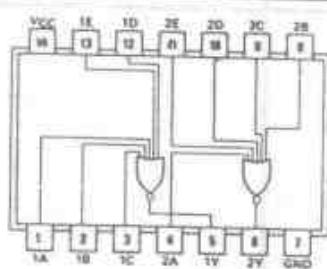
#### DUAL DATA SELECTORS/MULTIPLEXERS



SN54ALS257 (J, W)

NONINVERTED 3-STATE OUTPUTS

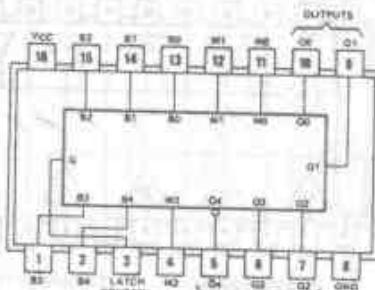
## QUAD DATA SELECTORS/MULTIPLEXERS



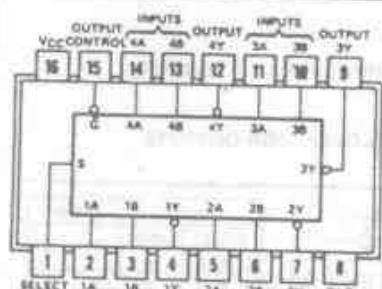
SN74ALS257 (N)

NONINVERTED 3-STATE OUTPUTS

## DUAL 5-INPUT POSITIVE NOR GATES



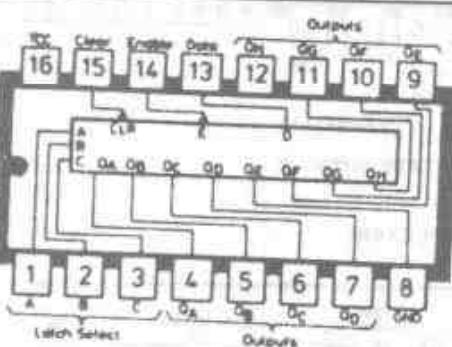
SN54S260 (J, W) SN74S260 (J, N)

2-BIT BY 4-BIT PARALLEL  
BINARY MULTIPLIERS

SN54ALS258 (J, W)

INVERTED 3-STATE OUTPUTS

## QUAD DATA SELECTORS/MULTIPLEXERS



SN74ALS258 (N)

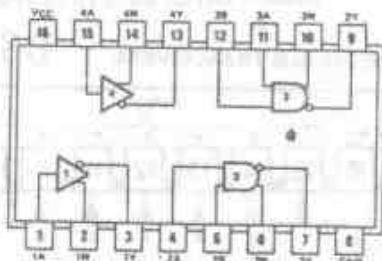
## EIGHT-BIT ADDRESSABLE LATCHES

Inputs Clear G	Output of Addressed Latch	Each other Output	Function
H L	D	Q <sub>0</sub>	Addressable Latch
H H	Q <sub>0</sub>	Q <sub>0</sub>	Memory
L L	D	L	8-Line Demultiplexer
L H	L	L	Clear

 $\bar{G}$  = Enable

Select Inputs C B A	Latch Addressed
L L L	0
L L H	1
L H L	2
L H H	3
H L L	4
H L H	5
H H L	6
H H H	7

Latch Control G	Inputs			Outputs				
	M2	M1	M0	Q4	Q3	Q2	Q1	Q0
L	X	X	X	Q4	Q3 <sub>0</sub>	Q2 <sub>0</sub>	Q1 <sub>0</sub>	Q0 <sub>0</sub>
H	L	L	L	H	L	L	L	L
H	L	L	H	Q4	Q3	Q2	Q1	Q0
H	L	H	H	Q4	Q3	Q2	Q1	Q0
H	L	H	L	Q4	Q3	Q2	Q1	Q0
H	H	L	L	Q4	Q3	Q2	Q1	Q0
H	H	L	H	Q4	Q3	Q2	Q1	Q0
H	H	H	L	Q4	Q3	Q2	Q1	Q0
H	H	H	H	H	L	L	L	L



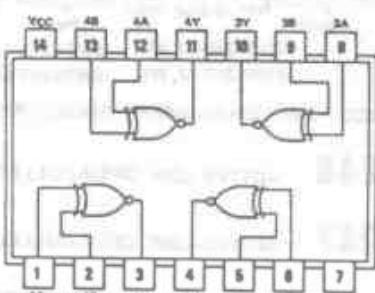
SN54265 (J, W) SN74265 (J, N)

## QUAD COMPLEMENTARY-OUTPUT ELEMENTS

## FUNCTION TABLE

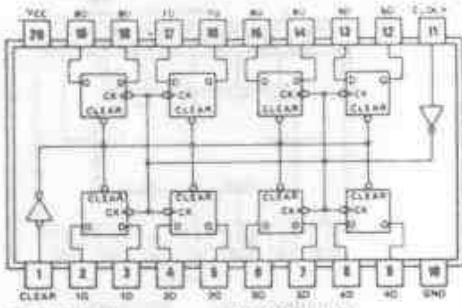
INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	H

H = high level, L = low level



SN54HC266 (J) SN74HC266 (N)

QUAD 2-INPUT EXCLUSIVE-NOR GATES  
WITH OPEN-COLLECTOR OUTPUTS

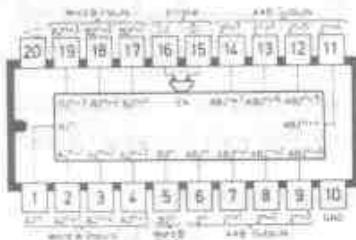


SN54273 (J)      SN74273 (J, N)

COMMON CLOCK  
SINGLE-RAIL OUTPUTS

Inputs	Output
Clear	0
Clock 0	0
L	X
H	1
H	1
H	L
H	L
X	Q0

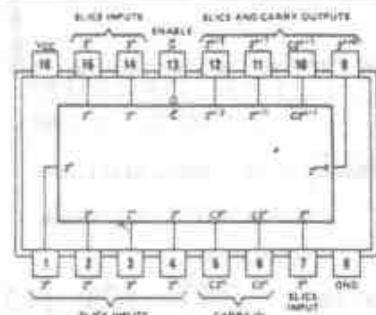
#### OCTAL D-TYPE FLIP-FLOPS



SN54S274 (J)      SN74S274 (J, N)

3-STATE OUTPUTS  
B-BIT PRODUCTS  
SUB-MULTIPLE PRODUCTS

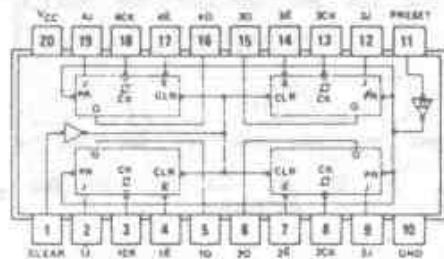
#### 4-BIT-BY 4-BIT BINARY MULTIPLIERS



SN54LS275 (J)      SN74LS275 (J, N)

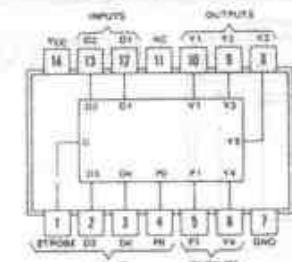
3-STATE OUTPUTS

#### 7-BIT SLICE WALLACE TREES



SN54276 (J)

SN74276 (J, N)



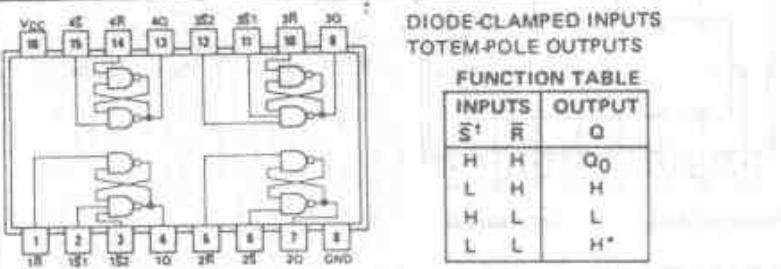
SN54278 (J, W)

SN74278 (J, N)

LATCHED DATA INPUTS  
PRIORITY OUTPUT GATING

4-BIT CASCADEABLE  
PRIORITY REGISTERS

Inputs	Internal				Outputs								P1
	D1	D2	D3	D4	Q1	Q2	Q3	Q4	Y1	Y2	Y3	Y4	
L	H	X	X	X	S	X	X	X	H	L	L	H	
L	H	X	X	X	H	X	X	X	L	H	L	H	
L	H	L	H	X	H	H	L	X	L	L	H	L	
L	H	L	L	H	H	H	H	L	L	L	H	H	
L	H	L	L	L	H	H	H	M	L	L	L	L	
L	L	X	X	X	X	X	X	X	Same function of Q nodes as on 1st 5 lines				
H	L	X	X	X	X	X	X	X	L	L	L	L	
H	H								Internal Q levels are same function of Q inputs as on first 5 lines				
H	H								L	L	L	L	H



SN54279 (J, W)

SN74279 (J, N)

DIODE-CLAMPED INPUTS  
TOTEM-POLE OUTPUTS

#### FUNCTION TABLE

INPUTS	OUTPUT
S <sup>†</sup> R	Q <sub>0</sub>
H H	Q <sub>0</sub>
L H	H
H L	L
L L	H*

#### QUAD S-R LATCHES

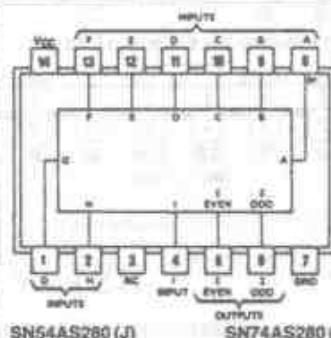
Q<sub>0</sub> = the level of Q before the indicated input conditions were established.

\*This output level is pseudo stable; that is, it may not persist when the S and R inputs return to their inactive (high) level.

†For latches with double S inputs:

H = both S inputs high

L = one or both S inputs low



9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

#### N-BIT CASCADEABLE

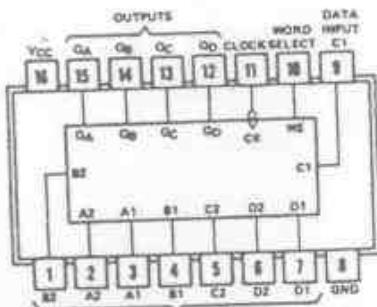
Number of Inputs A Thru I that are high	Outputs	
	$\Sigma$ EVEN	$\Sigma$ ODD
0, 2, 4, 6, 8	H	L
1, 3, 5, 7, 9	L	H

SEPARATECLOCKS  
EDGE-TRIGGERING  
COMMON DIRECT CLEAR  
AND PRESET

Common Inputs	Inputs		Output			
	Preset	Clear	Clock	J	K	
L	H		X	X	X	H
H	L		X	X	X	L
L	L		X	X	X	H+
H	H		↓	L	H	Q <sub>0</sub>
H	H		↓	H	H	H
H	H		↓	L	L	L
H	H		↓	H	L	Toggle Q <sub>0</sub>
H	H		H	X	X	

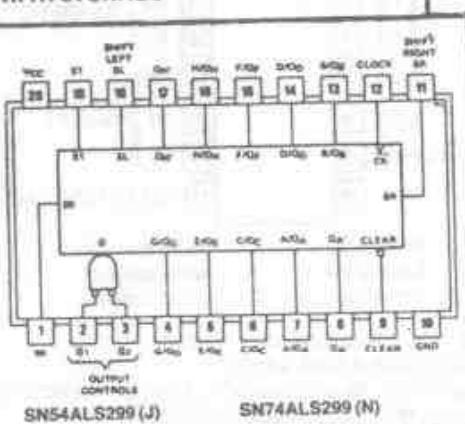
#### QUAD J-K FLIP-FLOPS





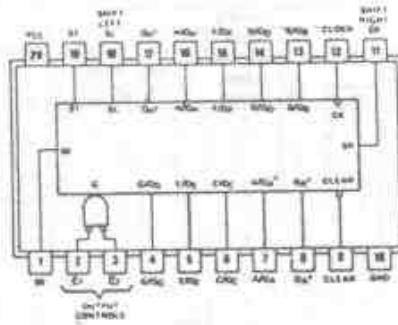
Inputs	Outputs
Word Select Clock	Q <sub>A</sub> Q <sub>B</sub> Q <sub>C</sub> Q <sub>D</sub>
L ↓	a <sub>1</sub> b <sub>1</sub> c <sub>1</sub> d <sub>1</sub>
H ↓	a <sub>2</sub> b <sub>2</sub> c <sub>2</sub> d <sub>2</sub>
X H	Q <sub>A0</sub> Q <sub>B0</sub> Q <sub>C0</sub> Q <sub>D0</sub>

#### QUAD 2-INPUT MULTIPLEXERS WITH STORAGE



3-STATE OUTPUTS BST: V

#### 8-BIT BIDIRECTIONAL UNIVERSAL SHIFT/STORAGE REGISTERS



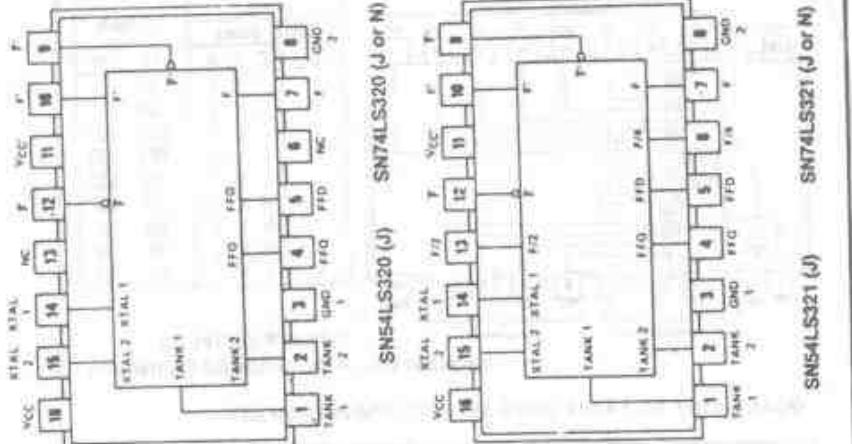
3-STATE OUTPUTS

BST: V

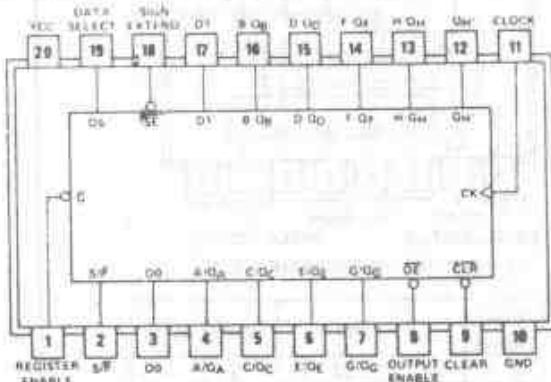
#### 8-BIT BIDIRECTIONAL UNIVERSAL SHIFT/STORAGE REGISTERS

3-STATE OUTPUTS

8-LINE TO 3-LINE PRIORITY ENCODERS

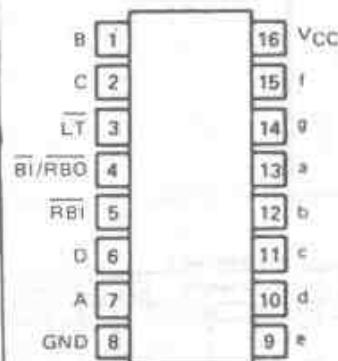


#### CRYSTAL CONTROLLED OSCILLATOR

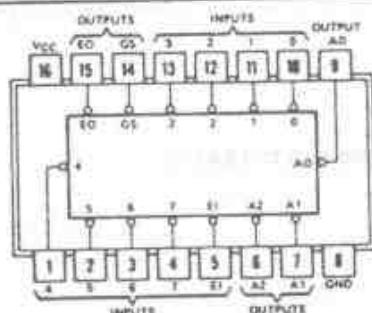


#### BST: V

#### 8-BIT SHIFT REGISTER WITH SIGN EXTEND



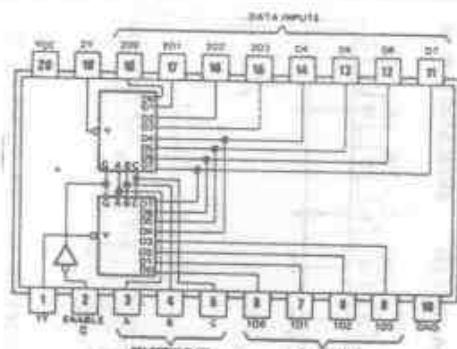
#### BCD-TO-SEVEN-SEGMENT DECODERS / DRIVERS



#### BST: I

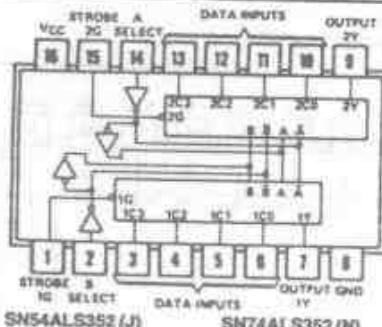
FUNCTION TABLE										INPUTS									OUTPUTS				
	INPUTS									OUTPUTS									A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	Q <sub>S</sub>	Q <sub>O</sub>
	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	I <sub>5</sub>	I <sub>6</sub>	I <sub>7</sub>	I <sub>8</sub>	I <sub>9</sub>	I <sub>10</sub>	I <sub>11</sub>	I <sub>12</sub>	I <sub>13</sub>	I <sub>14</sub>	I <sub>15</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	Q <sub>S</sub>	Q <sub>O</sub>		
H	X	X	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z	Z	H	H	H	H	H	
L	H	H	H	H	H	H	H	H	H	Z	Z	Z	Z	Z	Z	Z	Z	H	L	L	H	L	
L	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	L	L	H	H	H	L	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	X	X	X	X	X	X	X	X	X	L	H	H	H	H	H	H	H	L	L	L	H	H	
L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	H	H	

H = High logic level, L = Low logic level, X = Inexistent  
Z = High impedance state



3-STATE OUTPUTS  
SN74351 (N) 4 COMMON DATA INPUTS

DUAL 8-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER

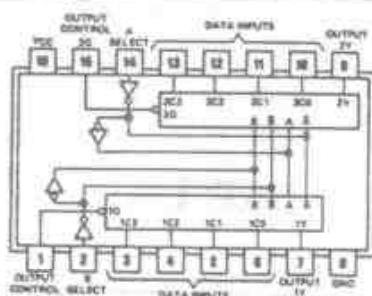


INVERTING VERSION OF 'LS153

Select Inputs	Data Inputs				Strobe	Output
B A	C0	C1	C2	C3	G	Y
X X	X	X	X	X	H	H
L L	L	X	X	X	L	H
L H	X	X	X	X	L	L
L H	X	H	X	X	L	L
H L	X	X	L	X	L	H
H L	X	X	H	X	L	L
H H	X	X	X	L	L	H
H H	X	X	X	H	L	L

DUAL 4-LINE TO 1-LINE

DATA SELECTORS/MULTIPLEXERS

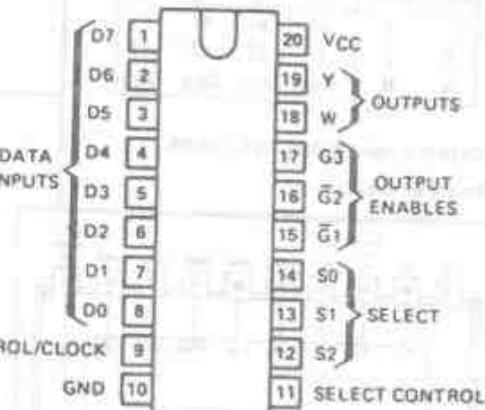


INVERTING VERSION OF 'LS253

DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

Inputs			Outputs	
Enable	Select		1Y	2Y
H	X X X		Z	Z
L	L L L		100	200
L	L L H		101	201
L	L H L		102	202
L	L H H		103	203
L	H L L		04	04
L	H E H		05	06
L	H H L		06	06
L	H H H		07	07

3-STATE OUTPUTS  
SN74351 (N) 4 COMMON DATA INPUTS



SN54LS' (J)  
SN54HC354 (J)  
SN54HC356 (J)  
SN74LS' (J, N)  
SN74HC354 (N)  
SN74HC356 (N)

OUTPUTS: 3-STATE (LS354, LS356, HC354, HC356)  
OPEN COLLECTOR (LS355, LS357)  
DATA REGISTERS: TRANSPARENT (LS354, LS355, HC354)  
EDGE TRIGGERED (LS356, LS357, HC356)

6-LINE TO 1-LINE DATA

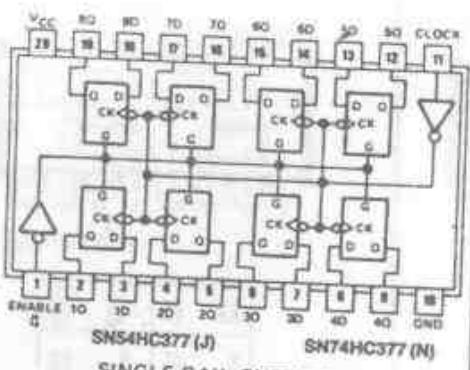
SELECTORS / MULTIPLEXERS / REGISTERS

FUNCTION TABLE

SELECT <sup>1</sup>	INPUTS			CLOCK (LS354, LS356)	OUTPUT ENABLES	OUTPUTS
	DATA CONTROL (LS354, LS356)	CLOCK (LS356, LS357)	OUTPUT ENABLES			
S2 S1 S0	G1 G2 G3	W Y	G1 G2 G3	W Y		
X X X	X	X	X	X	H X X	Z Z
X X X	X	X	X	X	H X X	Z Z
X X X	X	X	X	L	X X L	Z Z
L L L	L	L	L	T	L L H	00 00
L L L	M	M	M	HwL	L L H	00 <sub>2</sub> 00 <sub>2</sub>
L L H	L	L	L	T	L L H	01 01
L L H	H	H	H	HwL	L L H	01 <sub>2</sub> 01 <sub>2</sub>
L H L	L	L	L	T	L L H	02 02
L H L	H	H	H	HwL	L L H	02 <sub>2</sub> 02 <sub>2</sub>
L H H	L	L	L	T	L L H	03 03
L H H	H	H	H	HwL	L L H	03 <sub>2</sub> 03 <sub>2</sub>
H L L	L	L	L	T	L L H	04 04
H L L	H	H	H	HwL	L L H	04 <sub>2</sub> 04 <sub>2</sub>
H L H	L	L	L	T	L L H	05 05
H L H	H	H	H	HwL	L L H	05 <sub>2</sub> 05 <sub>2</sub>
H H L	L	L	L	T	L L H	06 06
H H L	H	H	H	HwL	L L H	06 <sub>2</sub> 06 <sub>2</sub>
H H H	L	L	L	T	L L H	07 07
H H H	H	H	H	HwL	L L H	07 <sub>2</sub> 07 <sub>2</sub>

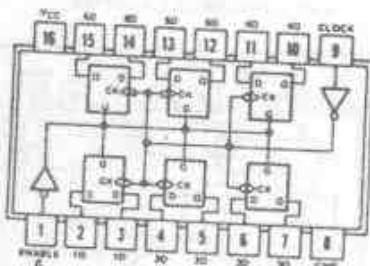
<sup>1</sup> High level (steady state)  
L = low level (steady state)  
X = irrelevant (any input, including transition)  
Z = high impedance (idle state)  
T = transition from low to high level  
D0...D7 = the level of steady-state inputs at inputs D0 through D7, respectively, at the time of the next-to-high clock transition in the case of LS356 and LS357  
D0<sub>2</sub>...D7<sub>2</sub> = the level of steady-state inputs at inputs D0 through D7, respectively, before the next-to-high clock transition of data control or clock  
<sup>\*</sup> This column shows the input address sense with EC low.





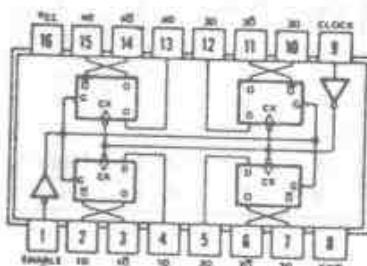
SINGLE-RAIL OUTPUTS  
COMMON ENABLE  
COMMON CLOCK

#### OCTAL D-TYPE FLIP-FLOPS



SINGLE-RAIL OUTPUTS  
COMMON ENABLE  
COMMON CLOCK

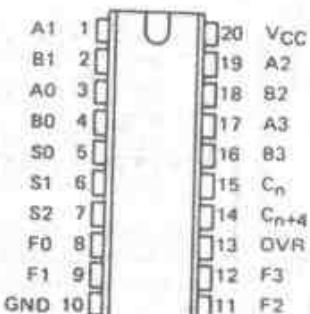
#### HEX D-TYPE FLIP-FLOPS



DOUBLE-RAIL OUTPUTS  
COMMON ENABLE  
COMMON CLOCK

#### QUAD D-TYPE FLIP-FLOPS

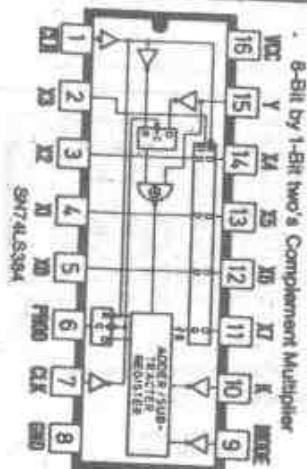
Inputs	Output		
Enable	Clock	D	Q
H	X	X	Q <sub>0</sub>
L	↑	H	H
L	↑	L	L
L	L	X	Q <sub>0</sub>



#### LS 381A ; LS 382

Selection			Arithmetic/Logic
S2	S1	S0	Operation
L	L	L	Clear
L	L	H	B minus A
L	H	L	A minus B
L	H	H	A plus B
H	L	L	A ≈ B
H	H	L	A + B
H	H	H	AB
			Preset

#### ARITHMETIC LOGIC UNITS / FUNCTION GENERATORS



8-BIT BY 1-BIT TWO'S-COMPLEMENT  
MULTIPLIERS

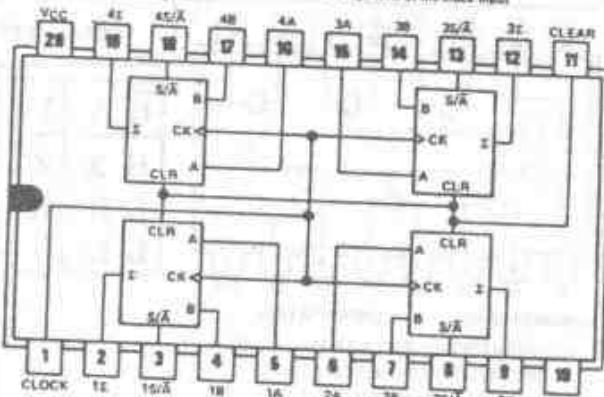
**bst: V**

#### FUNCTION TABLE

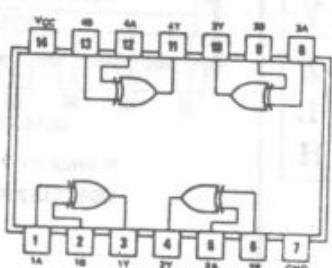
SELECTED FUNCTION	INPUTS			DATA IN CARRY FLIP-FLOP		Z OUTPUT	
	CLEAR	DATA 1	CLOCK	BEFORE	AFTER	BEFORE	AFTER
Clear	—	0 0 0 0	—	L	L	L	L
Add	—	0 0 0 0	—	L	L	0	0
Subtract	—	0 0 0 0	—	L	L	0	0

H = High Level, L = Low Level, X = Indeterminate.

T = Transition from low to high level at the clock input.

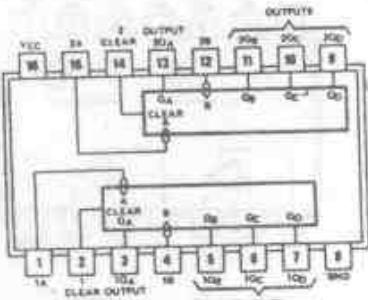


#### QUADRUPLE SERIAL ADDERS / SUBTRACTORS



QUAD 2-INPUT EXCLUSIVE-OR GATES

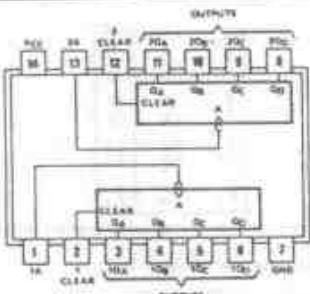
Inputs	Output	
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L



SN54390 (J, W)      SN74390 (J, N)  
BI-QUINARY OR BCD SEQUENCES

DUAL DECADE COUNTERS

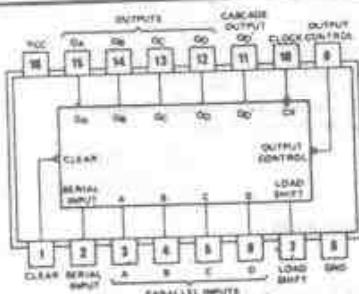
BST: II



SN54393 (J, W)      SN74393 (J, N)

DUAL 4-BIT BINARY COUNTERS

BST: II

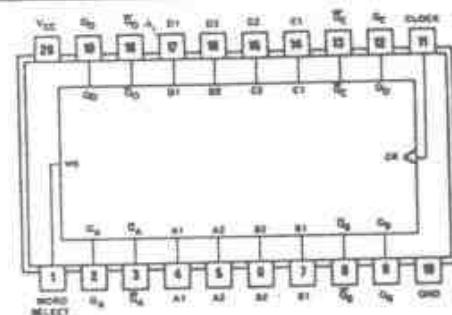


SN54LS395A (J, W)      SN74LS395A (J, N)

3-STATE OUTPUTS

BST: VI

4-BIT UNIVERSAL SHIFT REGISTERS

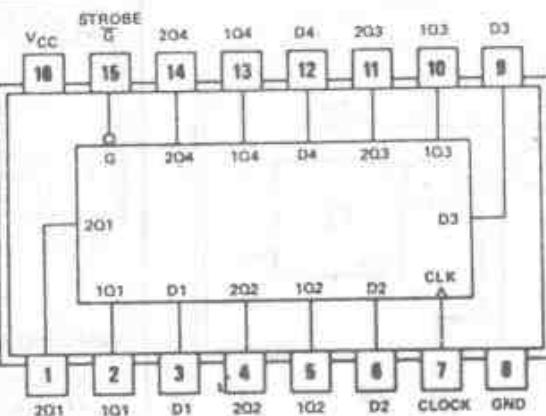


SN54LS398 (J)      SN74LS398 (J, N) \*

DOUBLE-RAIL OUTPUTS

QUAD 2-INPUT MULTIPLEXERS WITH STORAGE

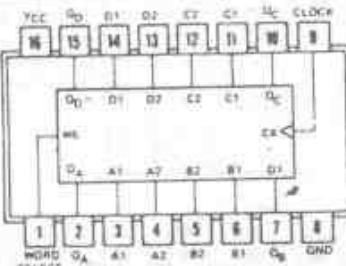
BST: V



SN54LS396 (J or W)      SN74LS369 (J or N)

BST: VI

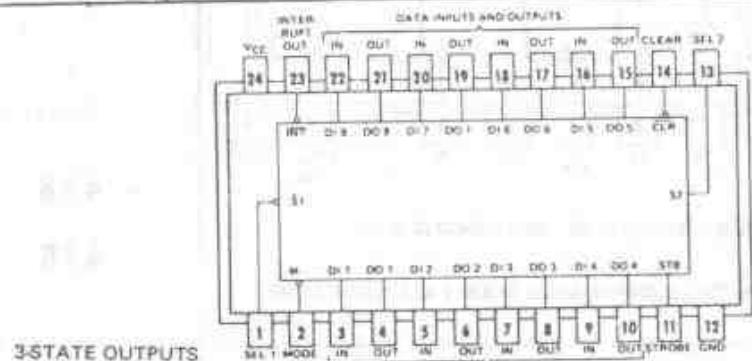
OCTAL STORAGE REGISTERS



SN54LS399 (J,W)      SN74LS399 (J, N)

BST: V

QUAD 2-INPUT MULTIPLEXERS WITH STORAGE



SN54S412 (J)      SN74S412 (J, N)

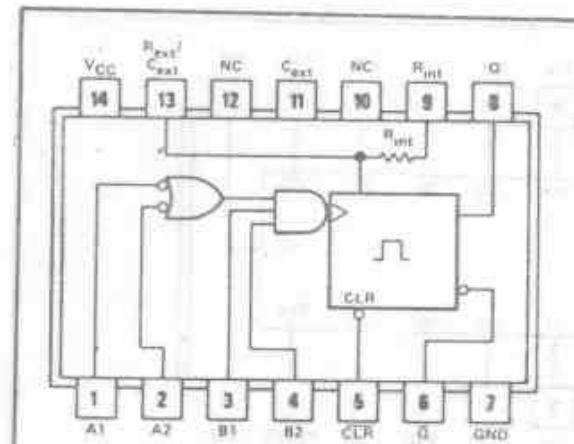
MULTI-MODE BUFFERED 8-BIT LATCHES

DATA LATCHES FUNCTION TABLE

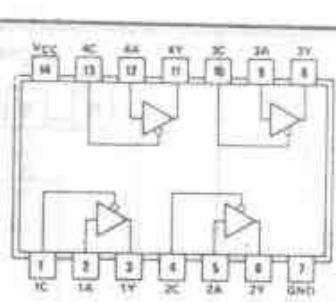
FUNCTION	CLEAR	$\bar{S}1$	$S2$	STB	DATA IN	DATA OUT
Clear	L	H	H	X	X	L
	L	L	L	H	X	L
De-select	X	L	X	L	X	Z
	X	L	H	X	X	Z
Hold	H	H	H	L	X	DD
	H	L	L	H	L	DD
Data Bus	H	H	L	H	X	L
	H	H	L	H	X	H
Data Bus	H	L	L	H	H	L
	H	L	L	H	H	H

STATUS FLIP-FLOP FUNCTION TABLE

CLEAR	$\bar{S}1$	$S2$	STB	INT
L	H	X	X	H
L	X	L	X	H
H	X	X	I	L
H	L	H	X	L

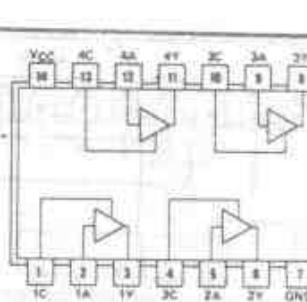


SN54LS422 (J or W) SN74LS422 (J or N)



SN54425 (J, W) SN74425 (J, N)

3-STATE OUTPUTS  
ACTIVE-LOW ENABLING



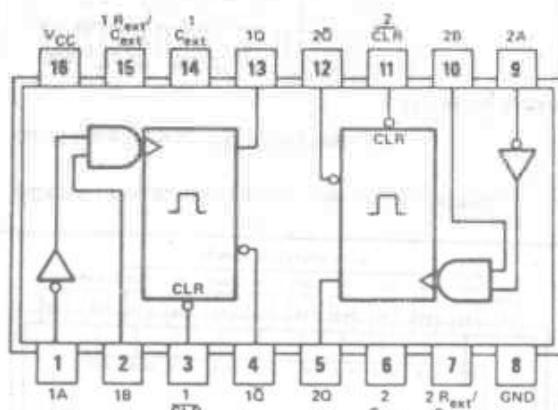
SN54426 (J, W) SN74426 (J)

3-STATE OUTPUTS  
ACTIVE-HIGH ENABLING

#### IUD GATES

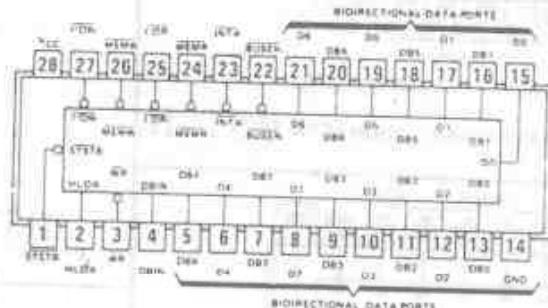
C	A	Y
H	X	Z
L	H	H
L	L	L

C	A	Y
L	X	Z
L	H	H
L	L	L



SN54LS423 (J or W) SN74LS423 (J or N)

#### RETRIGGERABLE MONOSTABLE MULTIVIBRATOR



SN74S428 (N)  
SN74S438 (N)

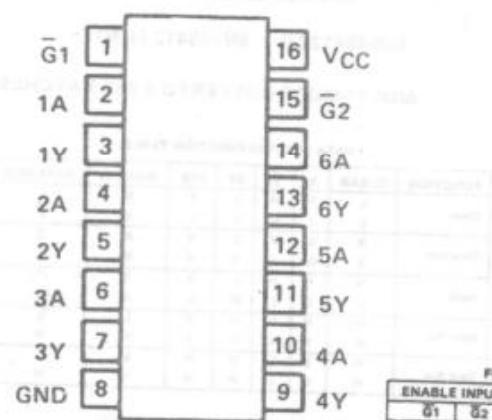
#### SYSTEM CONTROLLER FOR 8080A

428

BIDIRECTIONAL DATA PORTS

438

BIDIRECTIONAL DATA PORTS



SN54S436 (J, W) SN74S436 (J, N)  
SN54S437 (J, W) SN74S437 (J, N)

FUNCTION TABLE		INPUT	OUTPUT
G1	G2		
L	L	L	H
L	H	H	L
X	H	X	H
H	X	X	H

#### LINE DRIVER / MEMORY DRIVER CIRCUITS

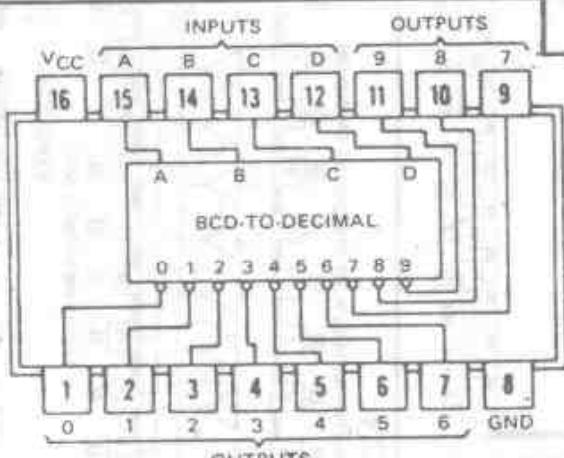


DEVICE	OUTPUT	LOGIC
'LS440	Open-Collector	True
'LS441	Open-Collector	Inverting
'LS442	3-State	True
'LS443	3-State	Inverting
'LS444	3-State	True/Inverting
'LS448	Open-Collector	True/Inverting

FUNCTION TABLE

INPUTS		TRANSFERS BETWEEN BUSES							
CS	S1	S0	BA	BS	SC	'LS440	'LS441	'LS444	'LS448
H	X	X	X	X	X	None	None	None	None
X	H	H	X	X	X	None	None	None	None
X	X	X	H	H	H	None	None	None	None
X	L	L	X	H	H	None	None	None	None
X	H	L	H	H	X	None	None	None	None
L	L	X	L	L	A-B, A-C	A-B, A-C	A-B, A-C	A-B, A-C	1G
L	H	L	X	L	B-C, B-A	B-C, B-A	B-C, B-A	B-C, B-A	1A1
L	H	L	L	X	C-A, C-B	C-A, C-B	C-A, C-B	C-A, C-B	1Y1
L	L	X	L	H	A-B	X-B	X-B	X-B	1A2
L	L	H	X	L	B-C	B-C	B-C	B-C	1Y2
L	H	L	H	X	C-A	C-A	C-A	C-A	1A3
L	L	X	H	L	A-C	A-C	A-C	A-C	1Y3
L	H	L	X	H	B-A	B-A	B-A	B-A	1A4
L	H	L	H	X	C-B	C-B	C-B	C-B	1Y4

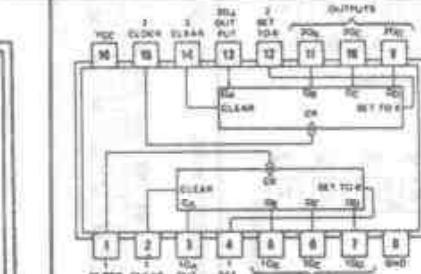
QUAD TRIDIRECTIONAL BUS TRANSCEIVERS

465  
466

SN74ALS465, SN74ALS466

467  
4682 separate active low enable inputs  
each control four buffers

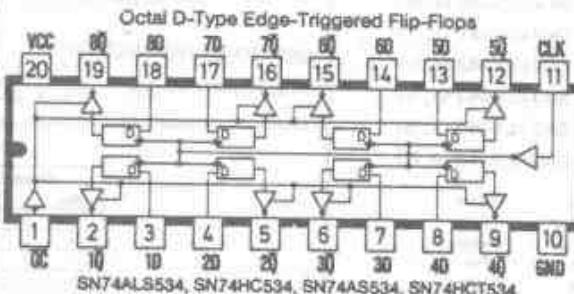
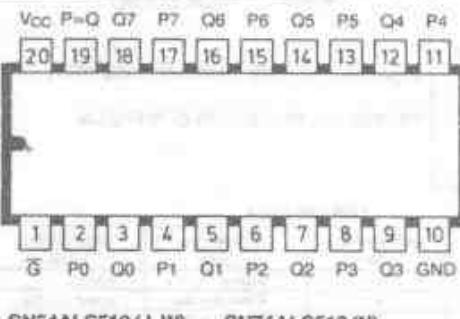
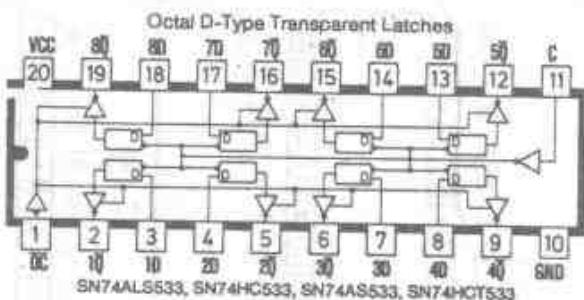
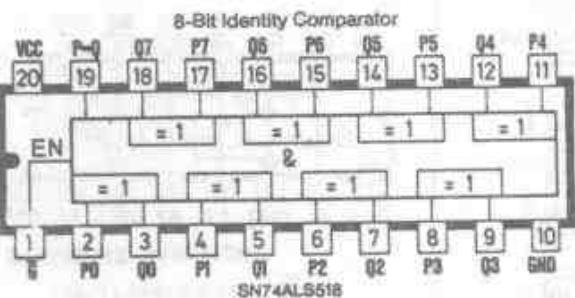
OCTAL BUFFERS WITH 3-STATE OUTPUTS



COUNT	BCD COUNT SEQUENCE (EACH COUNTER)			
	00	00	00	00
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	H	L	L
4	L	H	L	H
5	L	H	H	L
6	L	H	H	H
7	H	L	L	L
8	H	L	L	H
9	H	L	H	L

CLEAR/SET-TO-0 FUNCTION TABLE (EACH COUNTER)

INPUTS	OUTPUTS
CLEAR	SET-TO-0
00	00
01	01
10	10
11	11



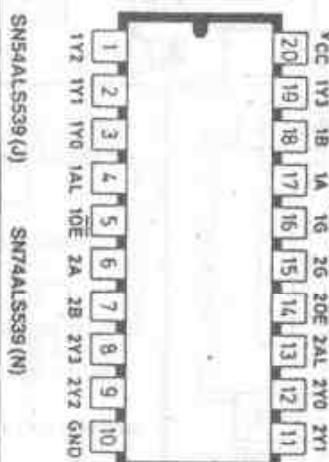
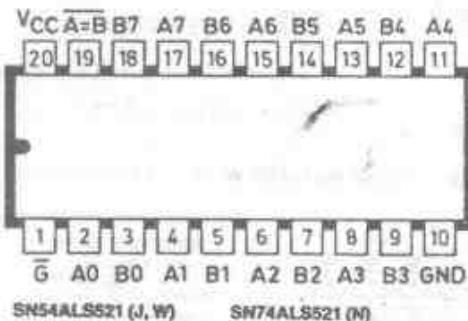
(INVERTED 374)

#### OCTAL D-TYPE FLIP FLOPS – INVERTING



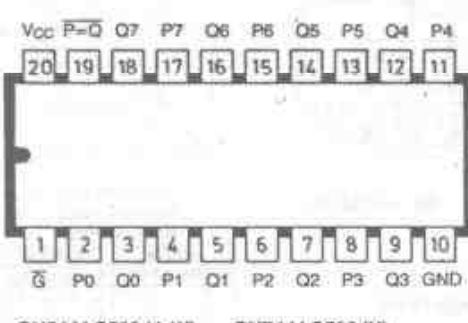
3-State Outputs  
Output polarity control  
Multiple enables for expansion.  
Data Demultiplexing Capability

#### 1-OF-8 LINE DECODERS

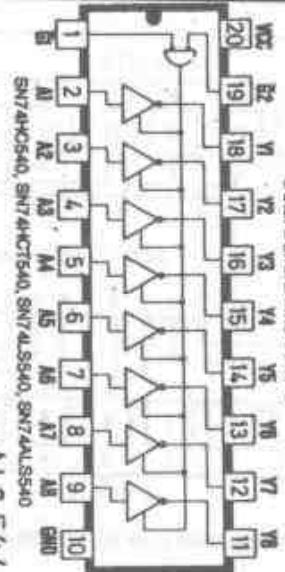


3-State Outputs  
Output polarity control  
Data multiplexing capability

#### DUAL 1-OF-4 LINE DECODERS

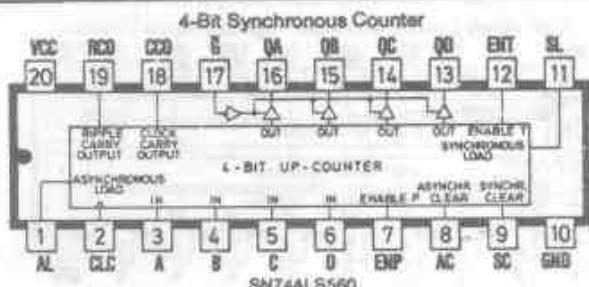


#### OCTAL COMPARATOR



ALS 541

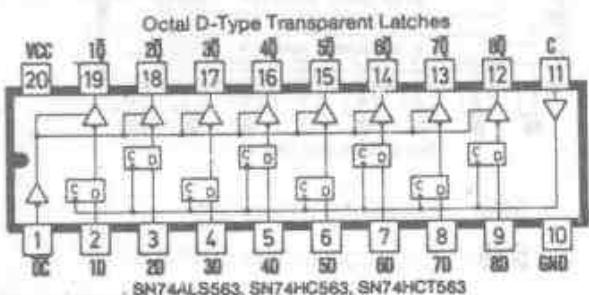
OCTAL BUFFERS AND LINE DRIVERS  
WITH 3-STATE OUTPUTS



SN54ALS560 (J)  
SN54ALS561 (J)

SN74ALS560 (N)  
SN74ALS561 (N)

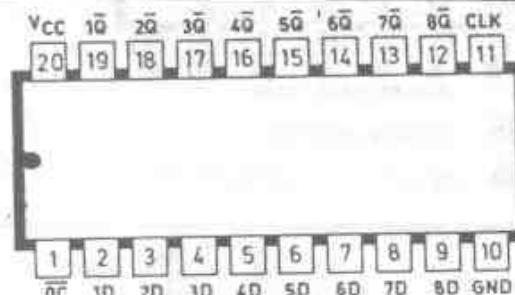
**SYNCHRONOUS 4-BIT COUNTERS  
WITH 3-STATE OUTPUTS**



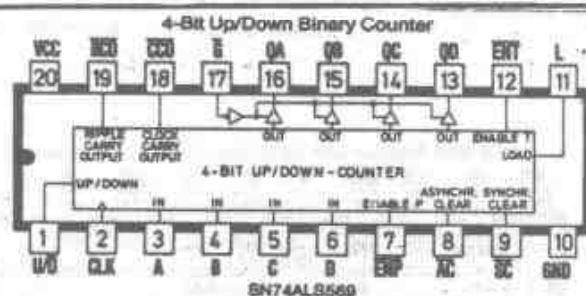
SN54ALS563 (J)

SN74ALS563 (N)

**OCTAL TRANSPARENT LATCHES  
WITH INVERTED OUTPUTS**



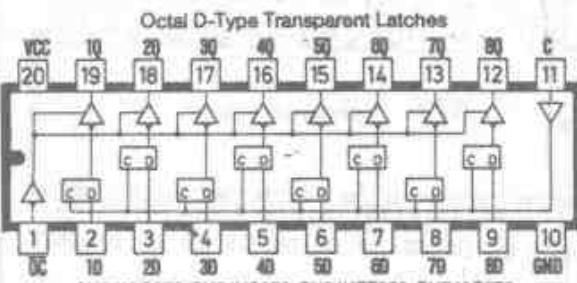
**OCTAL EDGE-TRIGGERED FLIP-FLOPS  
WITH INVERTED OUTPUTS**



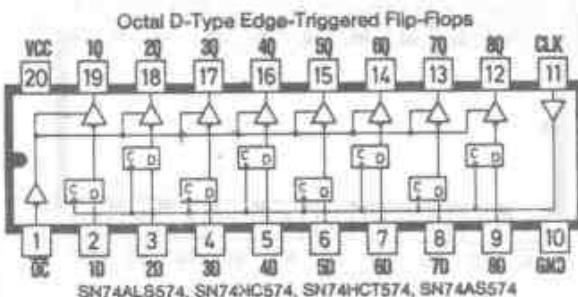
SN54ALS568 (J)  
SN54ALS569 (J)

SN74ALS568 (N)  
SN74ALS569 (N)

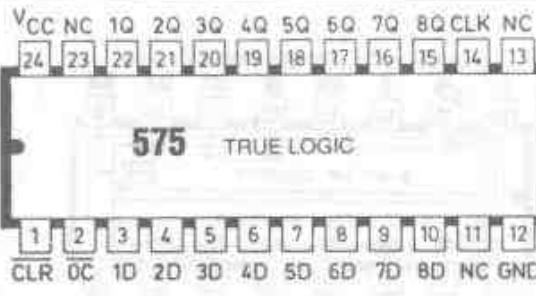
**SYNCHRONOUS UP-DOWN COUNTERS WITH 3-STATE OUTPUTS**



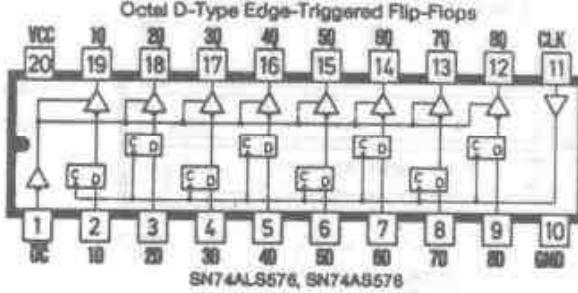
**OCTAL D-TYPE TRANSPARENT LATCHES**



**OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS**



**OCTAL D-TYPE FLIP FLOPS**



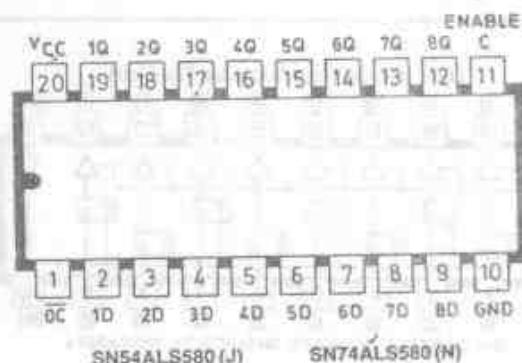
**OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS  
WITH INVERTED OUTPUTS**



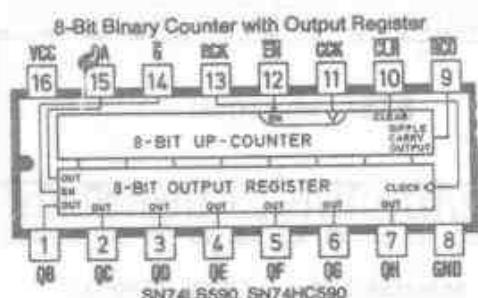
**577** INVERTING LOGIC



OCTAL D-TYPE FLIP FLOPS WITH SYNCHRONOUS CLEAR

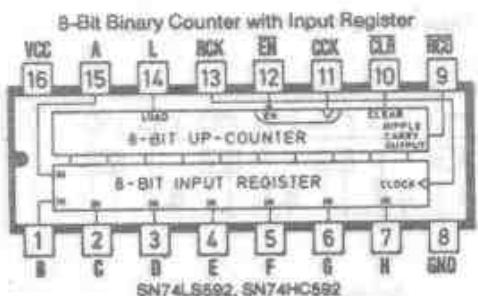


OCTAL D-TYPE TRANSPARENT LATCHES  
WITH INVERTED OUTPUTS



**590** 3 STATE OUTPUTS

**591** OPEN COLLECTOR OUTPUTS



PARALLEL REGISTER INPUTS

PARALLEL 3-STATE I/O

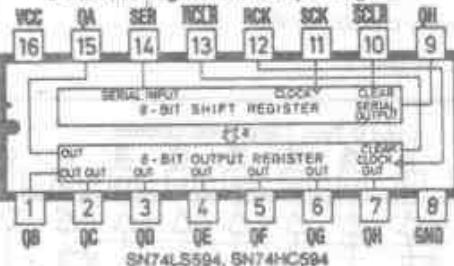
STORAGE REGISTER INPUTS

SHIFT REGISTER OUTPUTS

8-Bit Binary Counter with Input Register and I/O Terminal



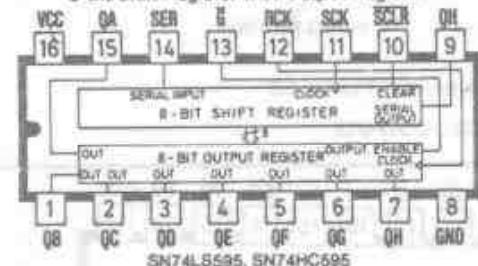
8-Bit Shift Register with Output Register



**594** TOTEM POLE OUTPUTS

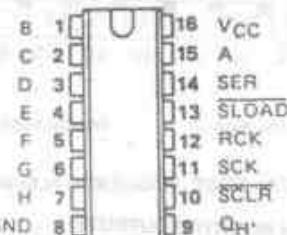
**599** OPEN COLLECTOR OUTPUTS

8-Bit Shift Register with Output Register



**595** 3-STATE OUTPUTS

**596** OPEN COLLECTOR OUTPUTS



8 BIT PARALLEL STORAGE

REGISTER INPUTS

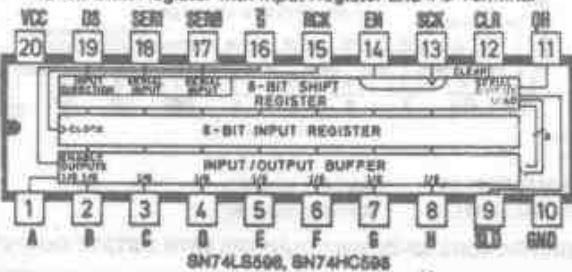
B-BIT SHIFT REGISTERS

WITH INPUT REGISTER

SN54HC597 (J)

SN74HC597 (N)

8-Bit Shift Register with Input Register and I/O Terminal



Chú ý : Từ IC 600 trở đi, các IC có thứ tự theo số trang như sau :

450: 600-603/604-607/610-613/616-617/608

456: 614-615

451: 620-623/624/625/626/627/628/629/630-631

452: 632-637/639/640/642

453: 641/645/643/644/646-649/651-654

456: 666-667

454: 668-669/670/671/672/673/674/677/678

455: 679-680/681/682-685/686-687/688-689

456: 614-615/666-667/690-693/696-699/716/718

457: 724/746-747/756-757/758-759/760/762/763

458: 783/785/795-798

459: 800/802/804/805/808/810/811

460: 821-826/832

461: 841-846/850-851

462: 852/856-857/861-864

463: 866/867/869/870-874/876/877/878

464: 879-882/888/890

465: 885/963-964/990-991/992-993

466: 994-995/996/1000/1002/1003-1005/1008/1010-1011

467: 1020/1032/1034-1036/1181/1240/1241

468: 1242-1245/1616/1620-1623/1638-1640/1642-1645(1641)

469: 1804/1805/1808/1832/2000/2240/2242/8003

470: 2541(2540)/2620/2623/2640/2645/29806/29809

471: 29806/29809/29827/29828

472: 29861/29862/29863/29864 ; 473: 5400-5470

474: 5472-54104/HC/HCT583/5555/7014/6323/7030

475: HC/HCT7046/7080/7132/7403

476: HC/HCT7404/7597/7731

477: HC/HCT9014/9015/9046/9115/40103/40102

478: HC/HCT40104/40105/ALS34/35/229

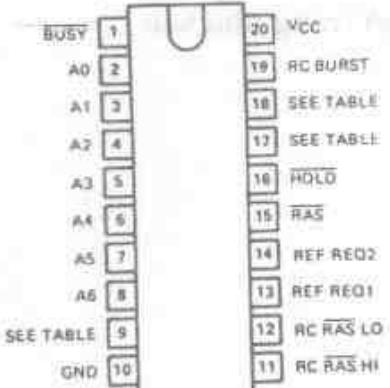
479: ALS232/233/250/264/282/286

480: ALS526-528/29821/29822

481: ALS29823/29824/29825/29826

482: ALS29826/29841/29842/29843/29844

483: ALS29845/29846

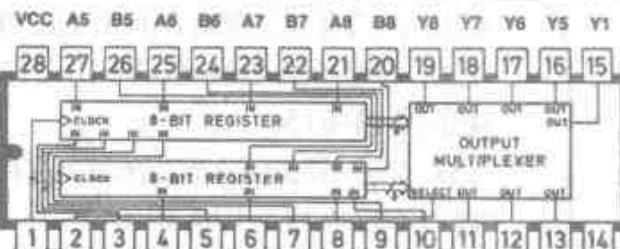


#### MEMORY REFRESH CONTROLLERS

- 600** TRANSPARENT, BURST 4K or 16K
- 601** TRANSPARENT, BURST 64K
- 602** CYCLE STEAL, BURST 4K or 16K
- 603** CYCLE STEAL, BURST 64K

H.614-615

X.Tr.: 397



SN74LS604 thru SN74LS607...J OR N PACKAGE

- 604** 3-STATE OUTPUTS - MAXIMUM SPEED
- 605** OPEN COLLECTOR O/P - MAXIMUM SPEED
- 606** 3-STATE OUTPUTS - GLITCH FREE
- 607** OPEN COLLECTOR O/P - GLITCH FREE

#### OCTAL 2-INPUT MULTIPLEXED LATCHES

INPUTS				OUTPUTS
A1-A8	B1-B8	SELECT A/B	CLOCK	
A-data	B-data	L	↑	Y1-Y8
A-data	B-data	H	↑	B-data
X	X	X	L	A-data
X	X	L	H	Z or Off
X	X	H	H	B register stored data
				A register stored data

H = high level (steady state)

X = irrelevant

Off = H if pull-up resistor is connected to open-collector output

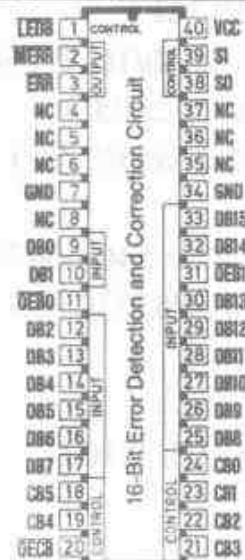
↑ = transition from low to high level

L = low level (steady state)

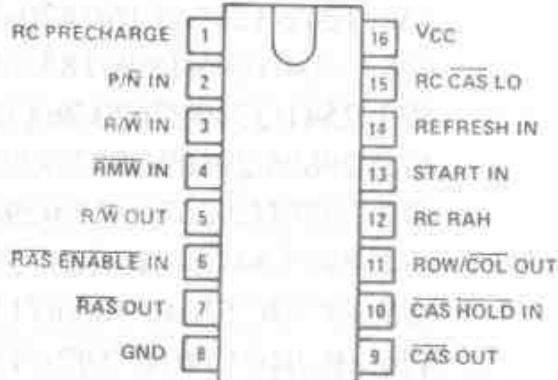
Z = high-impedance state



SN74LS610



SN74ALS616 1617



SN54LS608 (J) SN74LS608 (J or N)

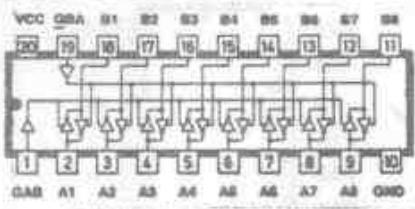
#### MEMORY CYCLE CONTROLLER

#### MEMORY MAPPERS

- 610** 3-STATE LATCHED O/P
- 611** OPEN COLLECTOR LATCHED O/P
- 612** 3-STATE OUTPUTS
- 613** OPEN COLLECTOR OUTPUTS

MEMORY CYCLE	MODE	INPUT CONDITIONS							
		P/R IN	R/W IN	R/W IN	RAS ENABLE IN	CAS HOLD IN	START IN	REFRESH IN	
READ		H	H	H	L	H	I	L	
WRITE		H	L	H	L	H	I	L	
READ MODIFY WRITE	PAGE	H	H	L	L	H	I	L	
READ	NORMAL	S-	H	H	L	H	I	L	
WRITE	NORMAL	S-	S-	H	L	H	I	L	
READ MODIFY WRITE	NORMAL	S-	H	L	L	H	I	L	
REFRESH	REFRESH	H	H	-	L	H	I	H	
EXTERNAL REFRESH	REFRESH	H	H	-	H	H	I	L	

\* High, S - Low, + Intermediate, I - Low-to-High transition



**SN74LS620 THRU SN74LS623**

**620** 3-STATE, INVERTING LOGIC

**621** OPEN COLLECTOR, TRUE LOGIC

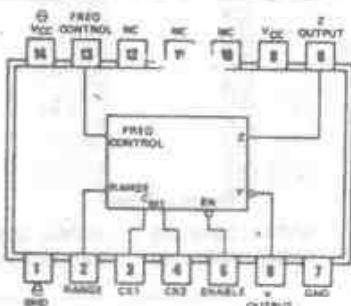
**622** OPEN COLLECTOR, INVERTING

**623** 3-STATE, TRUE LOGIC

#### FUNCTION TABLE

ENABLE	INPUTS	OPERATION
G <sub>A</sub>	G <sub>B</sub>	'L5820, 'L5821, 'L5823
L	L	B data to A bus
H	H	A data to B bus
H	L	Isolation
L	H	B data to A bus
L	H	A data to B bus

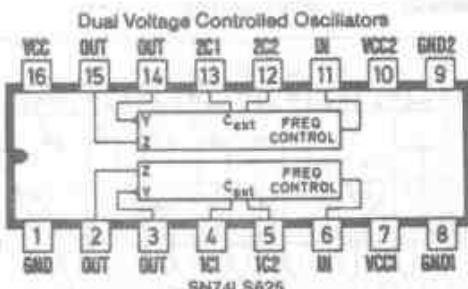
#### OCTAL BUS TRANSCEIVERS



**SN54LS624 (J, W) SN74LS624 (J, N)**

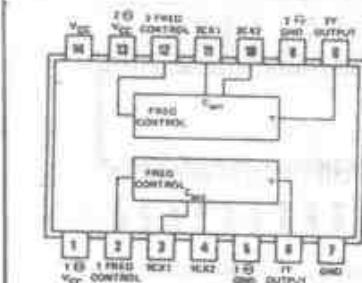
TWO-PHASE OUTPUTS  
ENABLE CONTROL  
RANGE CONTROL

#### VOLTAGE-CONTROLLED OSCILLATORS



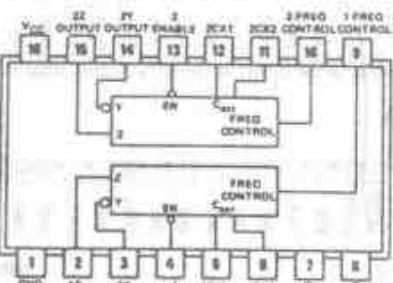
TWO-PHASE OUTPUTS

#### DUAL VOLTAGE-CONTROLLED OSCILLATORS



**SN54LS627 (J, W) SN74LS627 (J, N)**

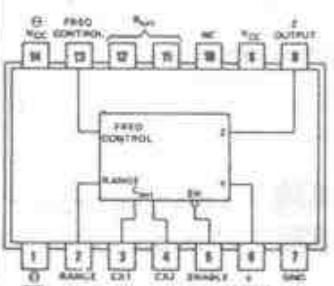
#### DUAL VOLTAGE-CONTROLLED OSCILLATORS



**SN54LS628 (J, W) SN74LS628 (J, N)**

TWO-PHASE OUTPUTS  
ENABLE CONTROL

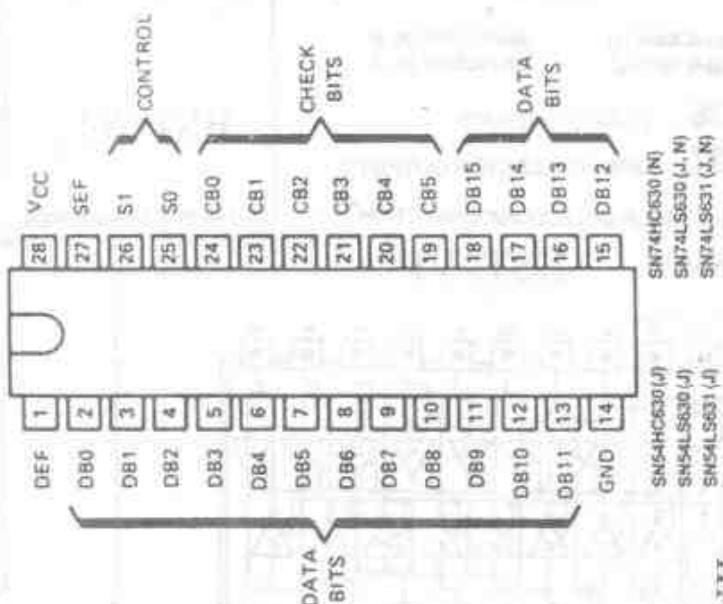
#### DUAL VOLTAGE-CONTROLLED OSCILLATORS



**SN54LS629 (J, W) SN74LS629 (J, N)**

ENABLE CONTROL  
RANGE CONTROL

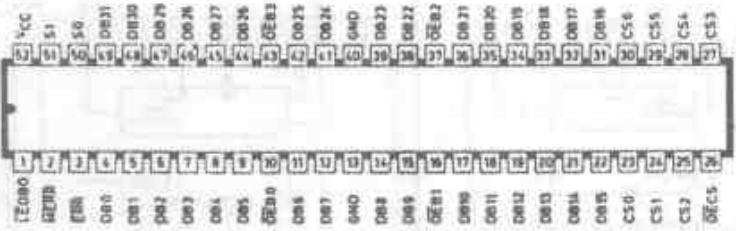
#### DUAL VOLTAGE-CONTROLLED OSCILLATORS



#### 16-BIT PARALLEL ERROR DETECTION AND CORRECTION CIRCUITS

**630** 3-STATE OUTPUTS

**631** OPEN COLLECTOR OUTPUTS



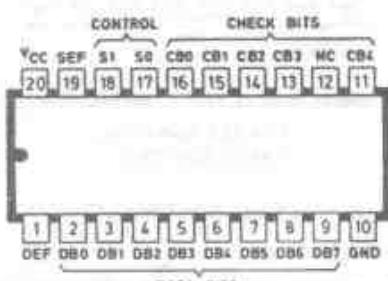
SN54ALS632 (JD)      SN74ALS632 (JD)  
 SN54HC632 (J)      SN74HC632 (N)  
 SN54ALS633 (JD)      SN74ALS633 (JD)

**632** 3-STATE OUTPUTS

**633** OPEN COLLECTOR OUTPUTS

INCORPORATES BYTE WRITE CAPABILITY

32-BIT PARALLEL ERROR DETECTION AND CORRECTION CIRCUITS



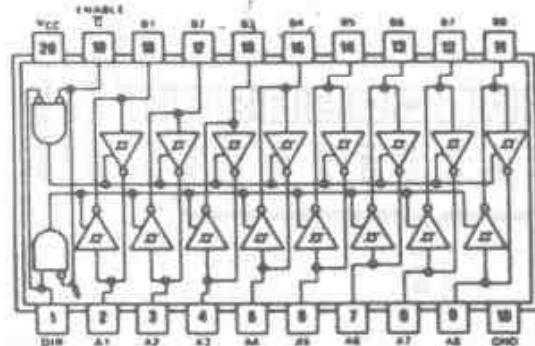
SN54LS636 (J)      SN74LS636 (N, J)  
 SN54LS637 (J)      SN74LS637 (N, J)

**636** 3 STATE OUTPUTS

**637** OPEN-COLLECTOR OUTPUTS

8 BIT ERROR DETECTION/CORRECTION  
CIRCUITS

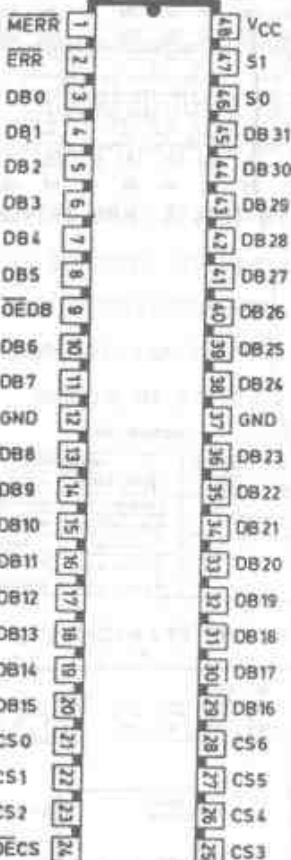
BST: VI



SN54ALS638 (J)      SN74ALS638 (N)  
 A BUS OUTPUTS ARE O/C  
 B BUS OUTPUTS ARE 3-STATE

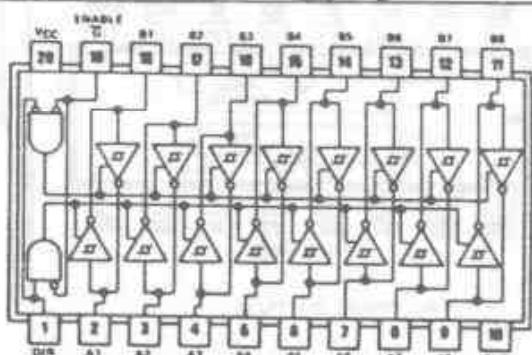
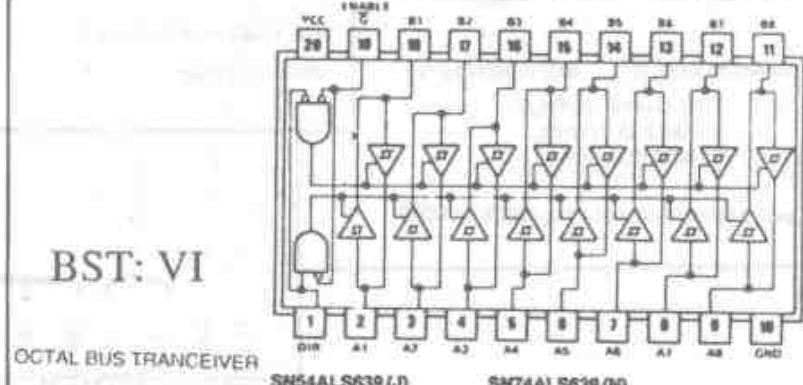
OCTAL BUS TRANSCIEVER

BST: VI



SN54ALS634 (JD)      SN74ALS634 (JD)  
 SN54ALS635 (JD)      SN74ALS635 (JD)

A BUS OUTPUTS ARE O/C  
 B BUS OUTPUTS ARE 3-STATE

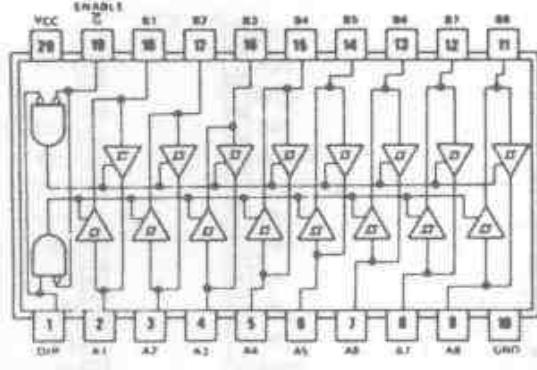


**640** 3 STATE INVERTING

**642** OPEN-COLLECTOR INVERTING

BST: V

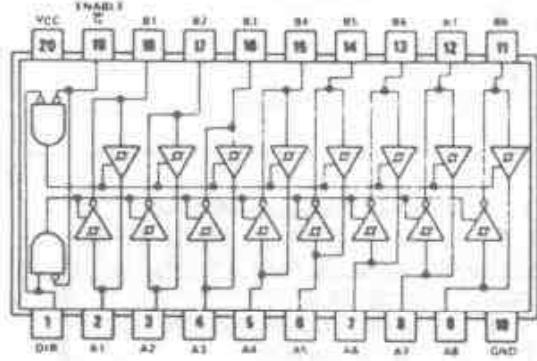
OCTAL BUS TRANSCIEVERS



SN54ALS' (J)      SN74ALS' (N)  
 SN54AS' (J)      SN74AS' (N)  
 SN54LS' (J)      SN74LS' (J or N)  
 SN54HC645 (J)    SN74HC645 (N)

#### OCTAL BUS TRANSCEIVERS

**641** OPEN COLLECTOR, TRUE      BST: V  
**645** 3-STATE, TRUE



#### OCTAL BUS TRANSCEIVERS

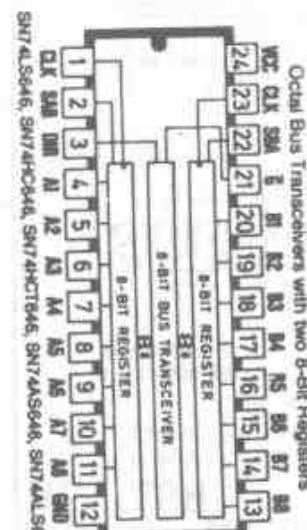
**643** 3-STATE OUTPUTS  
**644** OPEN COLLECTOR O/P  
 TRUE AND INVERTING LOGIC      BST: V

#### 8-BIT D-TYPE TRANSPARENT READ BACK LATCHES WITH 3-STATE OUTPUTS

OF RB	1	24	VCC
OE1	2	23	OE2
1D	3	22	1Q
2D	4	21	2Q
3D	5	20	3Q
4D	6	19	4Q
5D	7	18	5Q
6D	8	17	6Q
7D	9	16	7Q
8D	10	15	8Q
CLR	11	14	PRE
GND	12	13	C

**666** True Outputs  
**667** Inverting Outputs  
 (TOP VIEW)

#### BST: VI



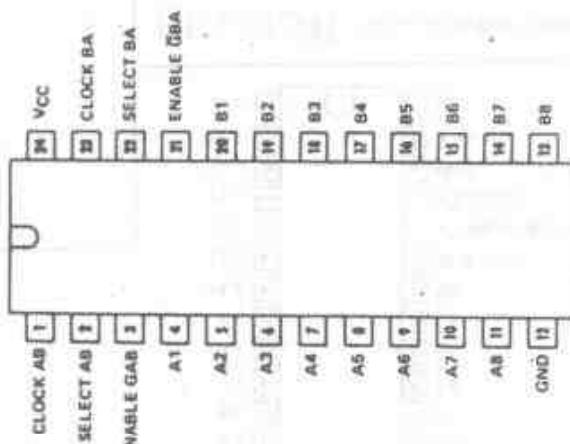
SN54LS' (JT)  
 SN54AS646 (JT)  
 SN54HC646 (JT)  
 SN54AS648 (JT)  
 SN54HC648 (JT)

SN74LS' (JT or NT)  
 SN74AS646 (NT)  
 SN74HC646 (NT)  
 SN74AS648 (NT)  
 SN74HC648 (NT)

#### OCTAL BUS TRANCEIVERS AND REGISTERS

**646** 3 STATE O/P, TRUE LOGIC  
**647** OPEN-COLLECTOR O/P, TRUE LOGIC  
**648** 3-STATE O/P, INVERTING LOGIC  
**649** OPEN COLLECTOR O/P, INVERTING LOGIC

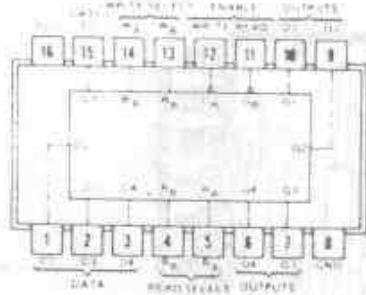
INDEPENDANT REGISTERS FOR A AND B BUSES  
 MULTIPLEXED REAL-TIME AND STORED DATA



#### OCTAL BUS TRANCEIVERS AND REGISTER

**651** INVERTING LOGIC 3-STATE OUTPUTS  
**652** TRUE LOGIC 3-STATE OUTPUTS  
**653** INVERTING LOGIC OPENCOLLECTOR OUTPUTS  
**654** TRUE LOGIC OPEN COLLECTOR OUTPUTS

INDEPENDANT REGISTERS AND ENABLES FOR A AND B BUSES  
 MULTIPLEXED REAL-TIME AND STORED DATA



SN54HC670 (J)      SN74HC670 (N)  
SN54LS670 (J, W)      SN74LS670 (J, N)

3-STATE OUTPUTS  
SIMULTANEOUS READ/WRITE  
EXPANDABLE TO 1024 WORDS

### BST: VIII 4-BY 4 REGISTER FILES

SR SER	1		20	VCC
SCK	2		19	CASC
A	3		18	QA
B	4		17	QB
C	5		16	QC
D	6		15	QD
SL SER	7		14	SO
SCLR	8		13	S1
RCK	9		12	G
GND	10		11	R/S

**671** DIRECT SR CLEAR

**672** SYNCHRONOUS SR CLEAR

4-BIT UNIVERSAL

SHIFT REGISTERS/STORAGE REGISTERS

WITH 3-STATE OUTPUTS      **BST: VIII**

CS	1		24	VCC
SH CLK	2		23	Y15
R/W	3		22	Y14
STRCLK	4		21	Y13
MODE/STRCLK	5		20	Y12
SER/Q15	6		19	Y11
Y0	7		18	Y10
Y1	8		17	Y9
Y2	9		16	Y8
Y3	10		15	Y7
Y4	11		14	Y6
GND	12		13	Y5

SN54LS673 (J)

SN74LS673 (J or N)

16-BIT SHIFT REGISTERS

**673** SERIAL-IN, SERIAL OUT SHIFT REGISTER WITH  
16 BIT PARALLEL OUT STORAGE REGISTER

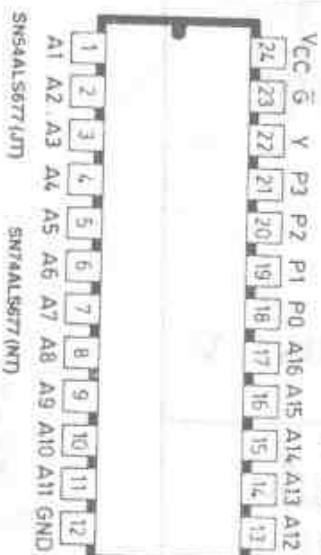
\* SERIAL TO PARALLEL CONVERSION

**BST: VI**

16-BIT SHIFT REGISTERS

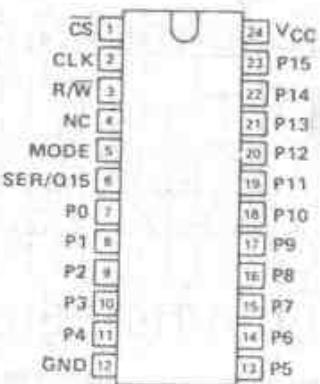
**674** PARALLEL IN, SERIAL OUT  
SHIFT REGISTER

\* PARALLEL TO SERIAL CONVERSION



SN54ALS677 (J)

SN74ALS677 (N)



SN54LS674 (J)

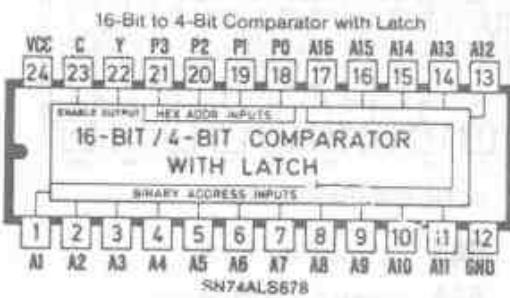
SN74LS674 (N)

**BST: VI**

ADDRESS COMPARATOR

**677**

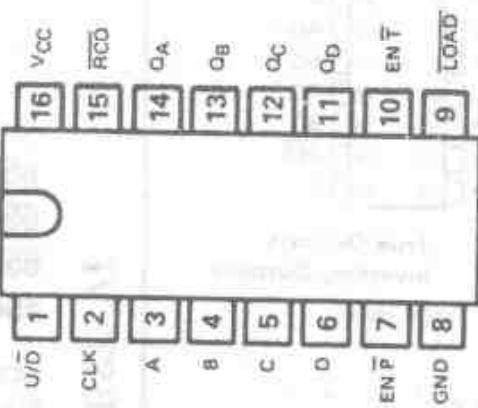
16 TO 4 BIT COMPARATOR WITH ENABLE



ADDRESS COMPARATOR

**678**

16 TO 4 BIT COMPARATOR WITH LATCH



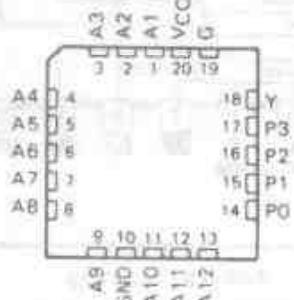
SYNCHRONOUS 4-BIT UP-DOWN COUNTERS

**668** DECADE COUNTER

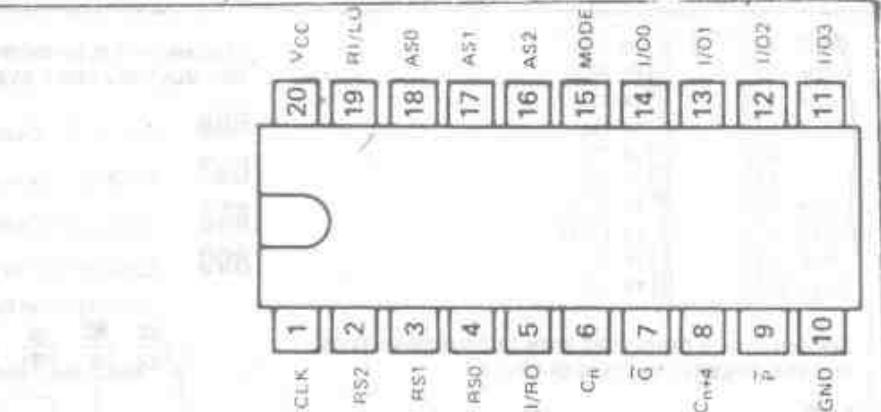
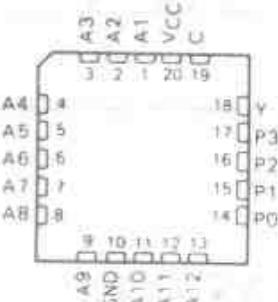
**669** BINARY COUNTER



SN54ALS679 FK PACKAGE  
(TOP VIEW)



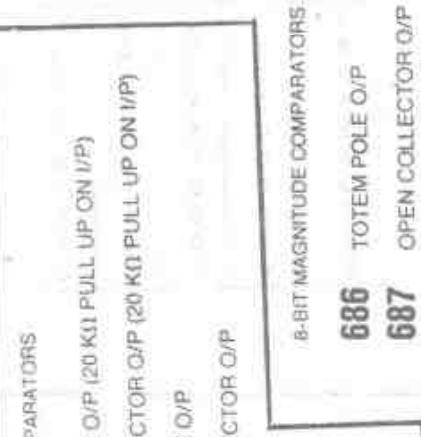
SN54ALS680 FK PACKAGE  
(TOP VIEW)



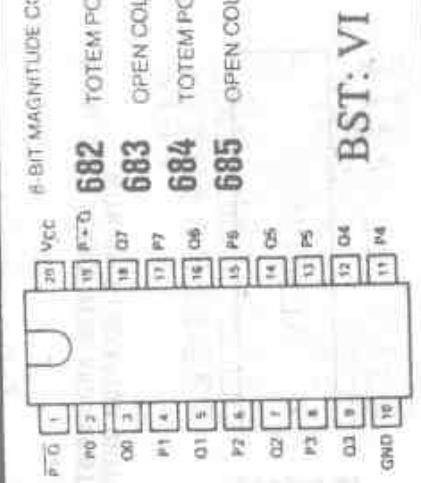
4-BIT PARALLEL BINARY ACCUMULATORS



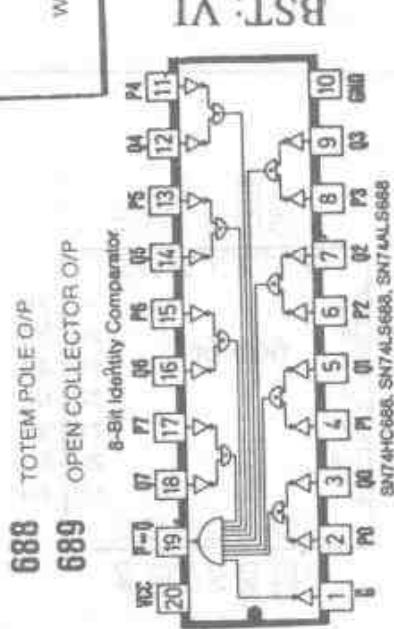
BST: VI

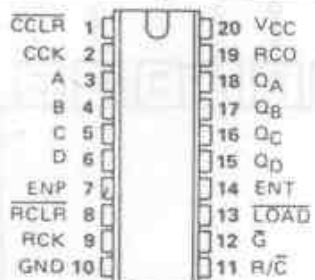


BST: VI



8-Bit Identity Comparator





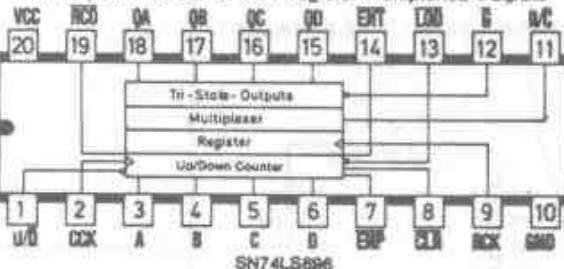
## SYNCHRONOUS COUNTERS WITH OUTPUT REGISTERS AND MULTIPLEXED 3-STATE OUTPUTS

- 690** DECADE COUNTER, DIRECT CLEAR
  - 691** BINARY COUNTER, DIRECT CLEAR
  - 692** DECADE COUNTER, SYNCHRONOUS CLEAR
  - 693** BINARY COUNTER, SYNCHRONOUS CLEAR

## SYNCHRONOUS UP/DOWN COUNTERS WITH OUTPUT REGISTERS AND MULTIPLEXED 3-STATE OUTPUTS

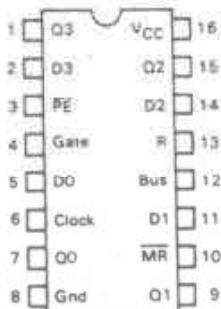
- 696** DECADE COUNTER, DIRECT CLEAR  
**697** BINARY COUNTER, DIRECT CLEAR  
**698** DECADE COUNTER, SYNCHRONOUS CLEAR  
**699** BINARY COUNTER, SYNCHRONOUS CLEAR

### 4-Bit Up/Down Counter with Register/Multiplexed Outputs



**74LS716**  
**74LS718**

## PROGRAMMABLE MODULO-N COUNTERS



SN54LS/74LS716

COUNT	OUTPUT			
	Q3	Q2	Q1	Q0
9	1	0	0	1
8	1	0	0	0
7	0	1	1	1
6	0	1	1	0
5	0	1	0	1
4	0	1	0	0
3	0	0	1	1
2	0	0	1	0
1	0	0	0	1
0	0	0	0	0

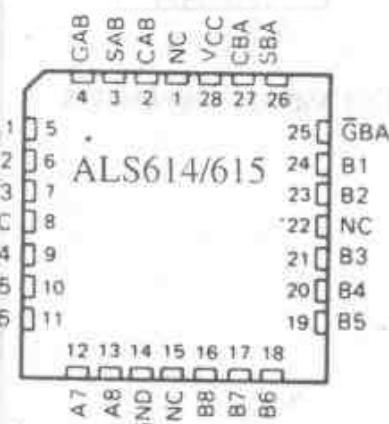
SN54LS/74LS71B

COUNT	OUTPUT			
	Q3	Q2	Q1	Q0
15	1	1	1	1
14	1	1	1	0
13	1	1	0	1
12	1	1	0	0
11	1	0	1	1
10	1	0	1	0
9	1	0	0	1
8	1	0	0	0
7	0	1	1	1
6	0	1	1	0
5	0	1	0	1
4	0	1	0	0
3	0	0	1	1
2	0	0	1	0
1	0	0	0	1
0	0	0	0	0



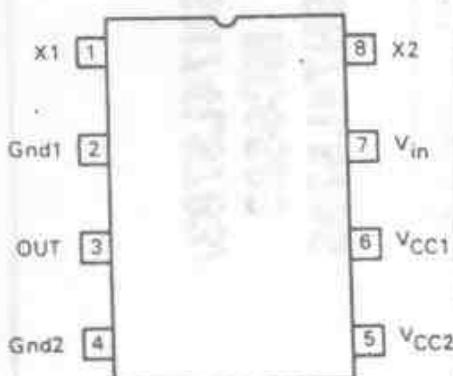
CAB	<input type="checkbox"/>	24	VC
SAB	<input type="checkbox"/>	23	CB
GAB	<input type="checkbox"/>	22	SB
A1	<input type="checkbox"/>	21	GB
A2	<input type="checkbox"/>	20	B1
A3	<input type="checkbox"/>	19	B2
A4	<input type="checkbox"/>	18	B3
A5	<input type="checkbox"/>	17	B4
A6	<input type="checkbox"/>	16	B5
A7	<input type="checkbox"/>	15	B6
A8	<input type="checkbox"/>	14	B7
GND	<input type="checkbox"/>	13	B8

OCTAL BUS TRANSCEIVERS AND REGISTERS  
WITH OPEN COLLECTOR OUTPUTS



### OCTAL BUFFERS AND LINE DRIVERS WITH OPEN-COLLECTOR OUTPUTS

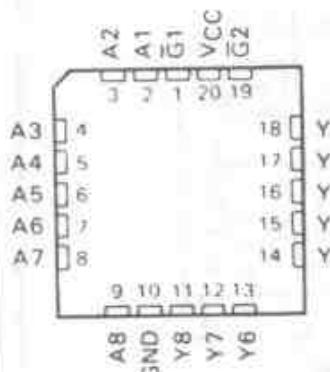
**SN74LS724**



#### VOLTAGE-CONTROLLED OSCILLATOR

G1	1	20	VCC
A1	2	19	G2
A2	3	18	Y1
A3	4	17	Y2
A4	5	16	Y3
A5	6	15	Y4
A6	7	14	Y5
A7	8	13	Y6
A8	9	12	Y7
GND	10	11	Y8

ALS746, SN54ALS746 ... FK PA  
(TOP VIEW)



#### OCTAL BUFFERS AND LINE DRIVERS WITH INPUT PULL-UP RESISTORS

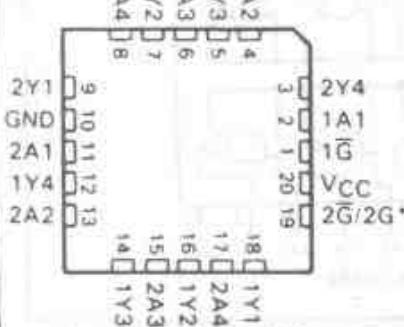
1A1	1	14	VCC
NC	2	13	G8A
A1	3	12	NC
A2	4	11	B1
A3	5	10	B2
A4	6	9	B3
AA	7	8	B4

**ALS758/759**  
SN54 FK PACKAGE  
(TOP VIEW)

GBA	1	14	VCC
NC	2	13	NC
NC	3	12	NC
NC	4	11	NC
NC	5	10	NC
NC	6	9	NC
NC	7	8	NC
A1	8	18	NC
NC	9	17	NC
A2	10	16	B1
NC	11	15	NC
A3	12	14	B2
NC	13	13	NC
NC	14	12	NC
NC	15	11	NC
NC	16	10	NC
NC	17	9	NC
NC	18	8	NC
NC	19	7	NC
NC	20	6	NC

FUNCTION TABLE	Inputs	Outputs	FUNCTION TABLE	Inputs	Outputs
ALS758	A10/A11	Y1-Y8	ALS759	A10/A11	Y1-Y8
ALS758	Y1-Y8	A1-A8	ALS759	Y1-Y8	A1-A8
ALS758	A1-A8	Y1-Y8	ALS759	A1-A8	Y1-Y8
ALS758	Y1-Y8	A1-A8	ALS759	Y1-Y8	A1-A8

#### OCTAL BUFFERS AND LINE DRIVERS WITH OPEN-COLLECTOR OUTPUTS



SN54ALS, SN54AS FK PACKAGE  
(TOP VIEW)

**ALS756/757**

OCTAL BUFFERS AND LINE DRIVERS WITH OPEN-COLLECTOR OUTPUTS

1G	1	20	VCC
1A1	2	19	2G
2Y4	3	18	1Y1
1A2	4	17	2A4
2Y3	5	16	1Y2
1A3	6	15	2A3
2Y2	7	14	1Y3
1A4	8	13	2A2
2Y1	9	12	1Y4
GND	10	11	2A1

ALS760, SN54AS760 FK PACKAGE  
(TOP VIEW)

1G	1	20	VCC
1A1	2	19	1A1
2Y4	3	18	2G
1A2	4	17	1Y1
2Y3	5	16	1Y2
1A3	6	15	2A3
2Y2	7	14	1Y3
1A4	8	13	2A2
2Y1	9	12	1Y4
GND	10	11	2A1

SN54ALS, SN54AS FK PACKAGE  
(TOP VIEW)

1G	1	20	VCC
1A1	2	19	2G
2Y4	3	18	1Y1
1A2	4	17	2A4
2Y3	5	16	1Y2
1A3	6	15	2A3
2Y2	7	14	1Y3
1A4	8	13	2A2
2Y1	9	12	1Y4
GND	10	11	2A1

**ALS762/763**

**SN74LS783/  
MC6883  
SN74LS785**

**SYNCHRONOUS  
ADDRESS  
MULTIPLEXER**

1	A11	VCC	40
2	A10	A12	39
3	A9	A13	38
4	A8	A14	37
5	Oscin	A15	36
6	OscOut	Z7	35 (RAST)
7	VClk	Z6	34
8	DA0	Z5	33
9	H5	Z4	32
10	WE	Z3	31
11	CAS	Z2	30
12	RAS0	Z1	29
13	0	Z0	28
14	E	S0	27
15	R/W	S1	26
16	A0	S2	25
17	A1	A7	24
18	A2	A6	23
19	A3	A5	22
20	Gnd	A4	21

**TRI-STATE OCTAL BUFFERS**

LS795

INPUTS			OUTPUT
$\bar{G}_1$	$\bar{G}_2$	A	Y
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	L

**TRUTH TABLES**

LS796

INPUTS			OUTPUT
$\bar{G}_1$	$\bar{G}_2$	A	Y
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	H

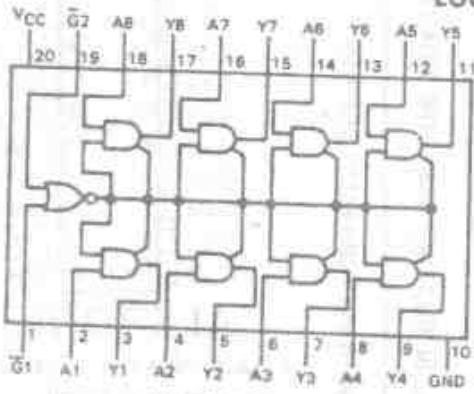
LS797

INPUTS		OUTPUT
$\bar{G}$	A	Y
H	X	Z
L	H	H
L	L	L

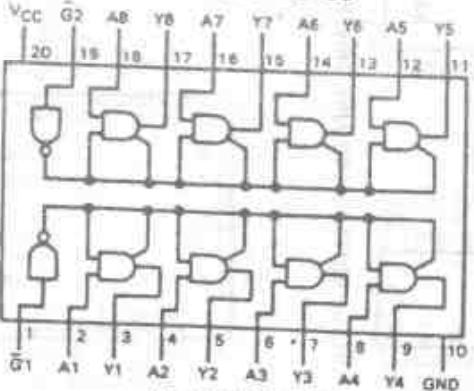
LS798

INPUTS		OUTPUT
$\bar{G}$	A	Y
H	X	Z
L	H	L
L	L	H

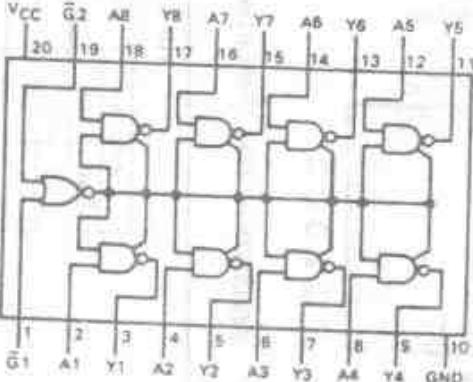
**LOGIC DIAGRAMS**



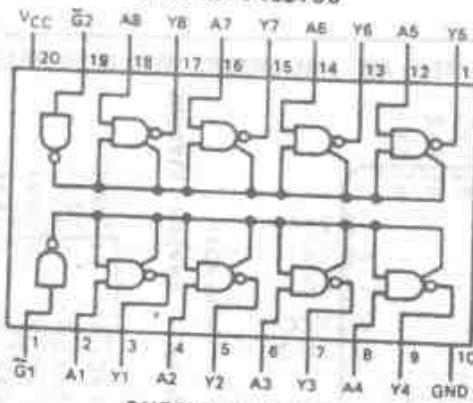
SN54LS/74LS795



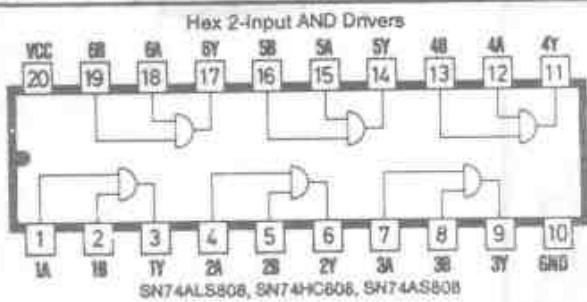
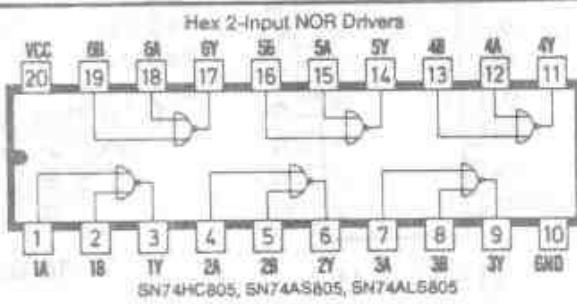
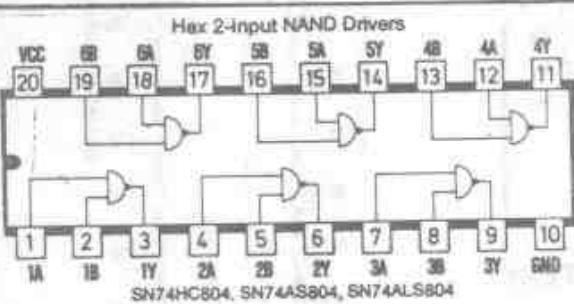
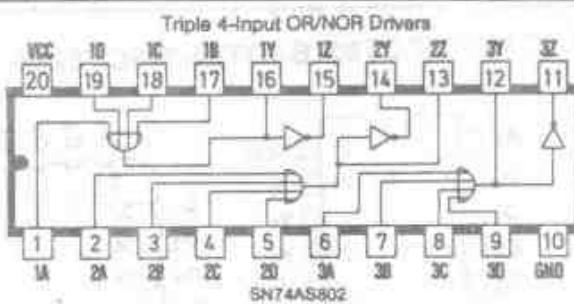
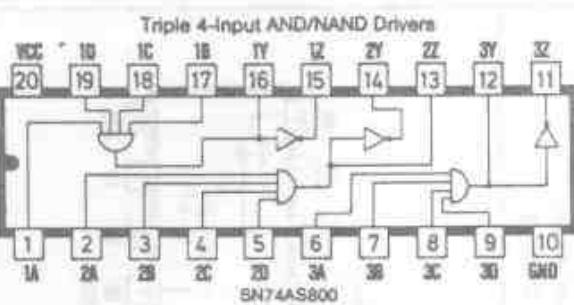
SN54LS/74LS797



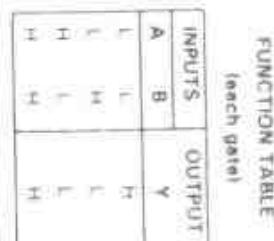
SN54LS/74LS796



SN54LS/74LS798

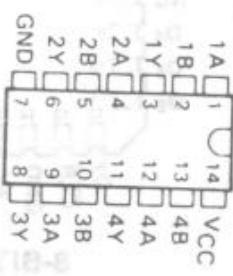
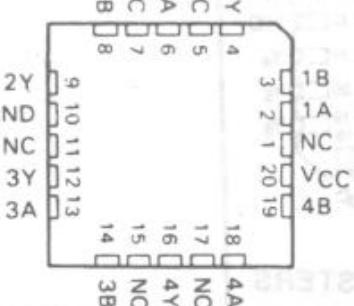
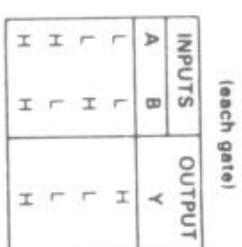


#### QUADRUPLE 2-INPUT EXCLUSIVE NOR GATES



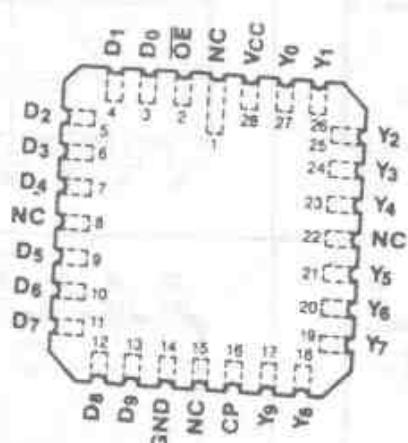
ALS810, SN54AS810  
(TOP VIEW)

#### QUADRUPLE 2-INPUT EXCLUSIVE NOR GATES WITH OPEN-COLLECTOR OUTPUTS



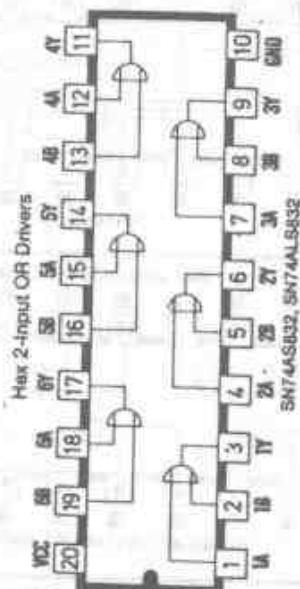
54ALS811, SN54AS811  
(TOP VIEW)

IDT54/74FCT821B/IDT54/74FCT822B

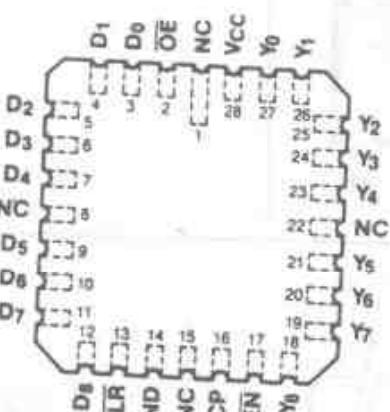
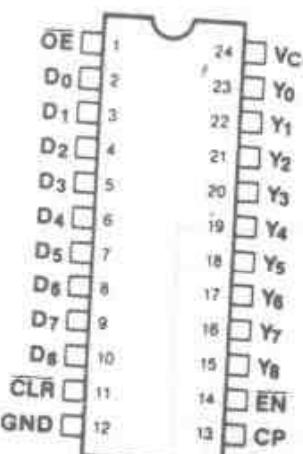


BST: VII

10-BIT REGISTERS



IDT54/74FCT823B/IDT54/74FCT824B

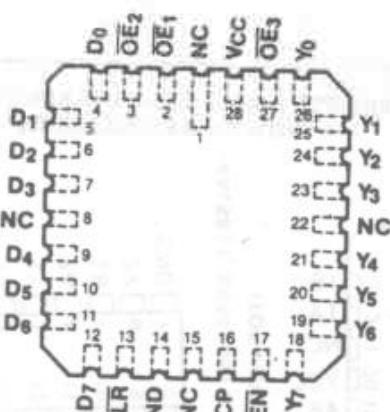
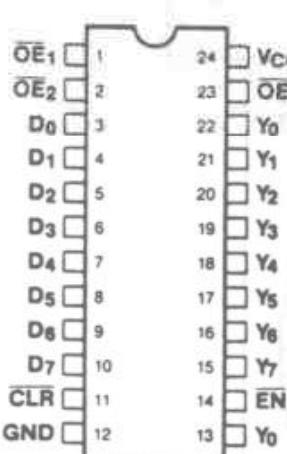


BST: VII

9-BIT REGISTERS

BST: VII

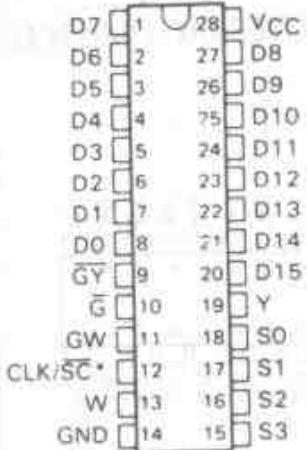
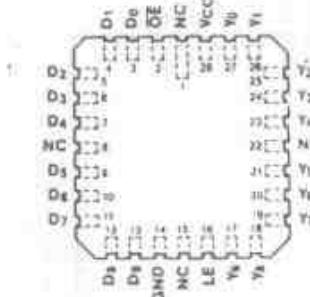
IDT54/74FCT825B/IDT54/74FCT826B



8-BIT REGISTERS

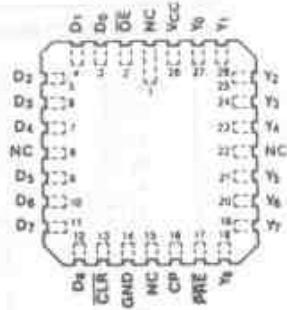
1 OF 16 DATA SELECTORS/MUXES WITH 3-STATE OUTPUTS

IDT54/74FCT841B/IDT54/74FCT842B 10-BIT LATCHES

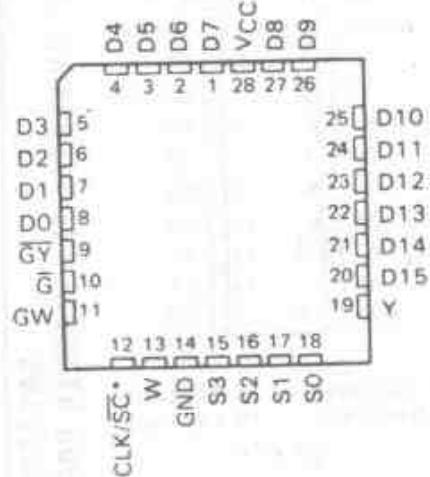
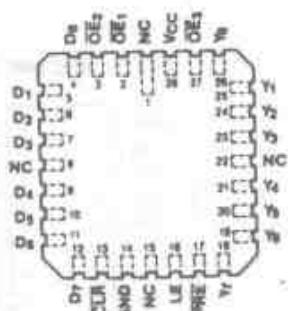


74AS850, SN74AS851 . . . FN PACKAGE  
(TOP VIEW)

IDT54/74FCT843B/IDT54/74FCT844B 9-BIT LATCHES



IDT54/74FCT845B/IDT54/74FCT846B 8-BIT LATCHES



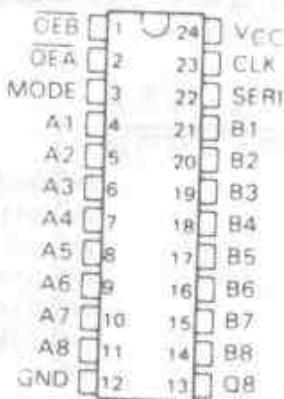
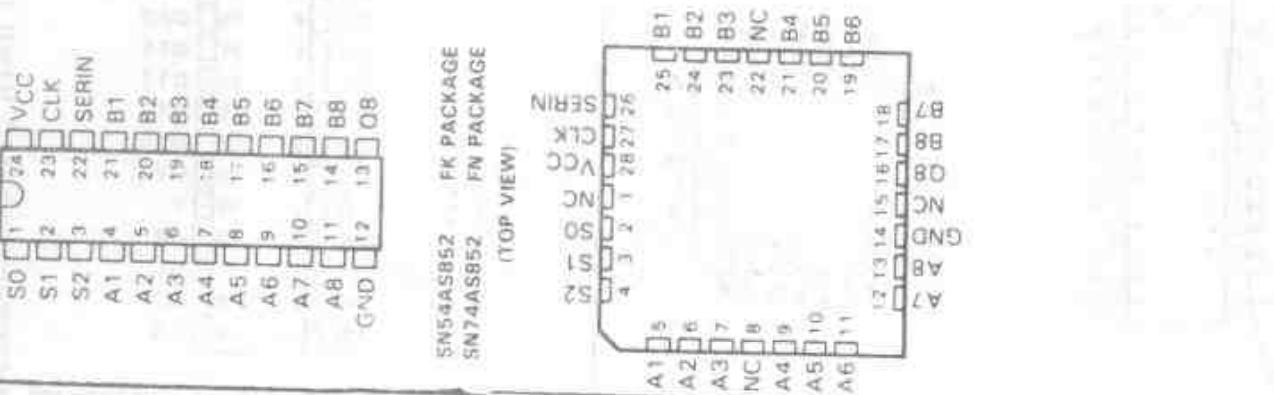
FUNCTION TABLES  
IDT54/74FCT841/43/45B

IDT54/74FCT842/44/46B

INPUTS					INTERNAL OUTPUTS		FUNCTION
CLR	PRE	OE	LE	D <sub>i</sub>	Q <sub>i</sub>	Y <sub>i</sub>	
H	H	H	X	X	X	Z	Hi-Z
H	H	H	H	H	L	Z	Hi-Z
H	H	H	H	L	H	Z	Hi-Z
H	H	H	L	X	NC	Z	Latched (Hi-Z)
H	H	L	H	H	L	L	Transparent
H	H	L	H	L	H	H	Transparent
H	H	L	L	X	NC	NC	Latched
H	L	L	X	X	H	H	Preset
L	H	L	X	X	L	L	Clear
L	L	L	X	X	H	H	Preset
L	H	H	L	X	L	Z	Latched (Hi-Z)
H	L	H	L	X	H	Z	Latched (Hi-Z)

INPUTS					INTERNAL OUTPUTS		FUNCTION
CLR	PRE	OE	LE	D <sub>i</sub>	Q <sub>i</sub>	Y <sub>i</sub>	
H	H	H	X	X	X	Z	Hi-Z
H	H	H	H	L	L	Z	Hi-Z
H	H	H	H	H	H	Z	Hi-Z
H	H	H	L	X	NC	Z	Latched (Hi-Z)
H	H	L	H	L	L	L	Transparent
H	H	L	H	H	H	H	Transparent
H	H	L	L	X	NC	NC	Latched
H	L	L	X	X	H	H	Preset
L	H	L	X	X	L	L	Clear
L	L	L	X	X	H	H	Preset
L	H	H	L	X	L	Z	Latched (Hi-Z)
H	L	H	L	X	H	Z	Latched (Hi-Z)

# 8-BIT UNIVERSAL TRANSCEIVER PORT CONTROLLERS



SN54AS856 FK PACKAGE  
SN74AS856 FN PACKAGE

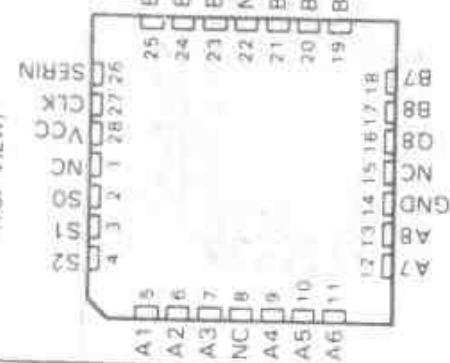
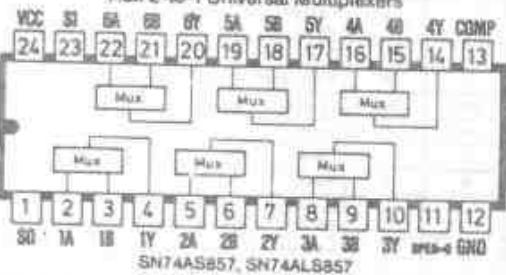
(TOP VIEW)

## 8-BIT UNIVERSAL TRANSCEIVER PORT CONTROLLERS

SN54AS856, SN74AS856

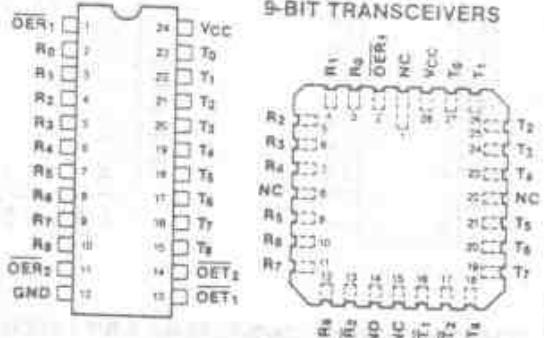


## Hex 2-to-1 Universal Multiplexers



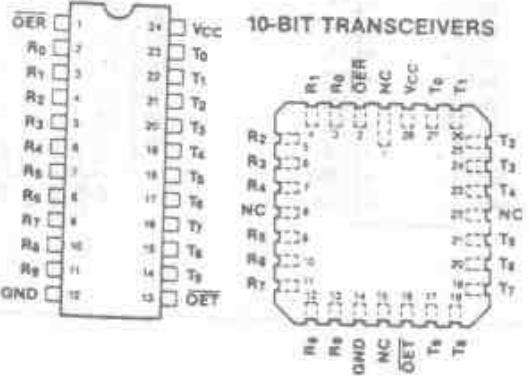
IDT54/74FCT863B/IDT54/74FCT864R

## 9-BIT TRANSCEIVERS



IDT54/74FCT861B/IDT54/74FCT862B

## 10-BIT TRANSCEIVERS

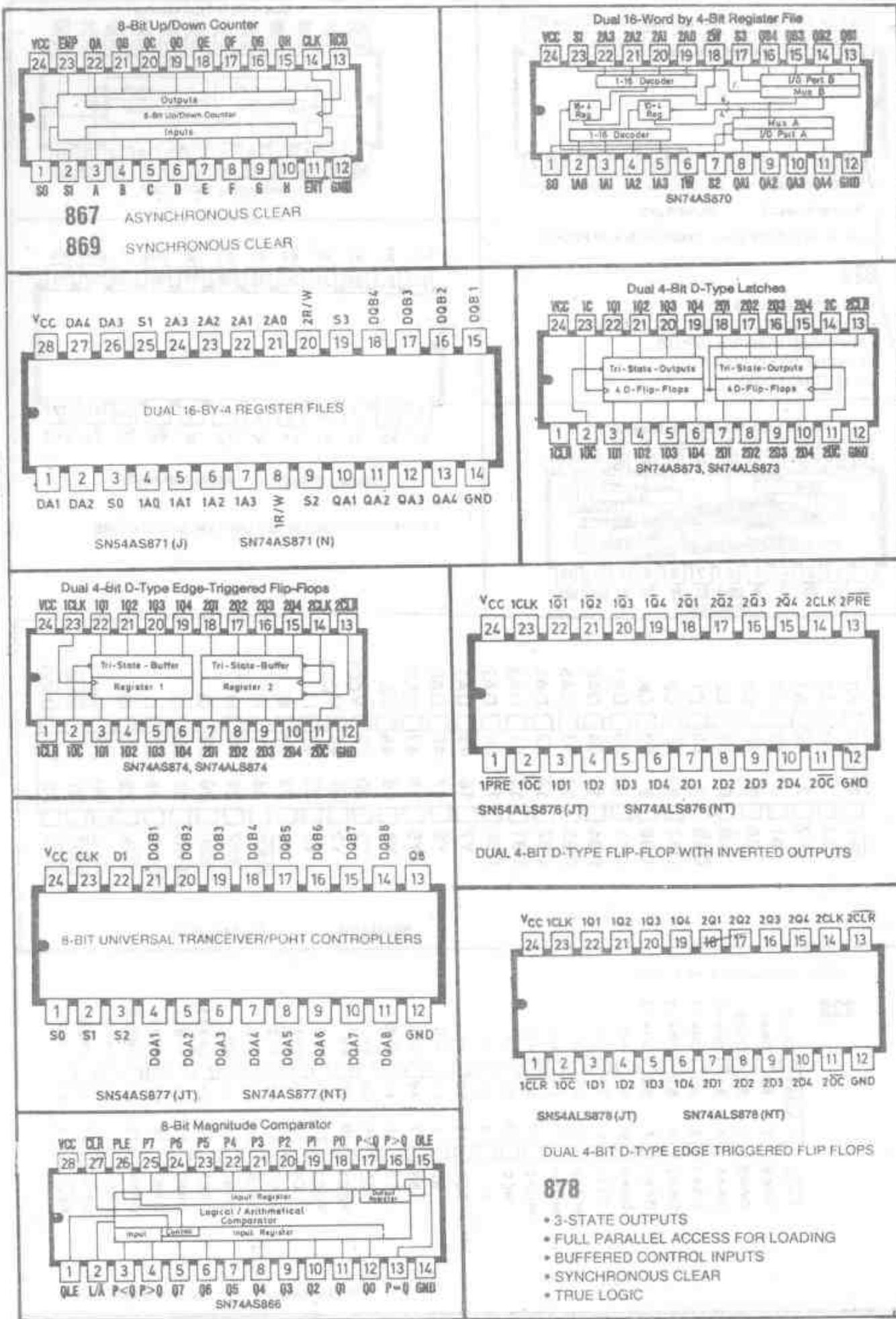


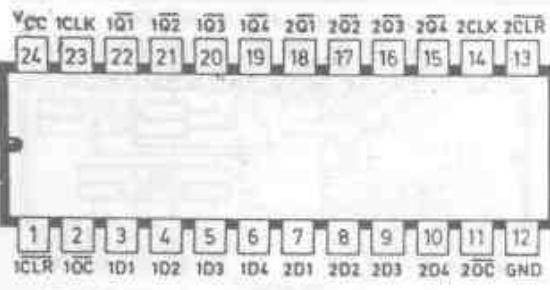
IDT54/74FCT861B/IDT54/74FCT862B (Non-inverting)

INPUTS			OUTPUTS		FUNCTION	
OER	OER	R <sub>i</sub>	T <sub>j</sub>	R <sub>i</sub>	T <sub>j</sub>	
L	H	L	N/A	N/A	L	Transmitting
L	H	H	N/A	N/A	H	Transmitting
H	L	N/A	L	L	N/A	Receiving
H	L	N/A	H	H	N/A	Receiving
H	H	X	X	Z	Z	Hi-Z

IDT54/74FCT862B/IDT54/74FCT864B (Inverting)

INPUTS			OUTPUTS		FUNCTION	
OER	OER	R <sub>i</sub>	T <sub>j</sub>	R <sub>i</sub>	T <sub>j</sub>	
L	H	L	N/A	N/A	H	Transmitting
L	H	H	N/A	N/A	L	Transmitting
H	L	N/A	L	H	N/A	Receiving
H	L	N/A	H	L	N/A	Receiving
H	H	X	X	Z	Z	Hi-Z



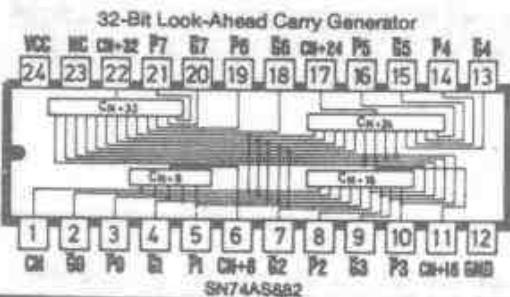


SN54ALS879 (JT) SN74879 (NT)

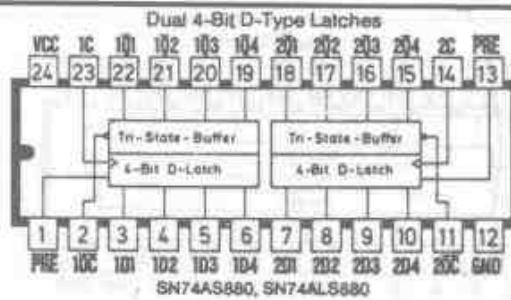
## DUAL 4-BIT D-TYPE EDGE TRIGGERED FLIP FLOPS

879

- 3-STATE OUTPUTS
  - FULL PARALLEL ACCESS FOR LOADING
  - BUFFERED CONTROL INPUTS
  - SYNCHRONOUS CLEAR
  - INVERTING LOGIC



SN74AS882



SN74AS880, SN74ALS880

— 1 —

$V_{CC}$	$\bar{A}1$	$\bar{B}1$	$\bar{A}2$	$\bar{B}2$	$\bar{A}3$	$\bar{B}3$	$G$	$\bar{C}_{N+L}$	$\bar{P}$	$A=B$	$\bar{F}3$
24	23	22	21	20	19	18	17	16	15	14	13
1	2	3	4	5	6	7	8	9	10	11	12
$\bar{B}0$	$\bar{A}0$	$S_3$	$S_2$	$S_1$	$S_0$	$C_N$	$M$	$\bar{F}_0$	$\bar{F}_1$	$\bar{F}_2$	$GND$

SNS4AS881A (JT) SN77AS881A (NT)

## ARITHMETIC LOGIC UNITS/FUNCTION GENERATORS

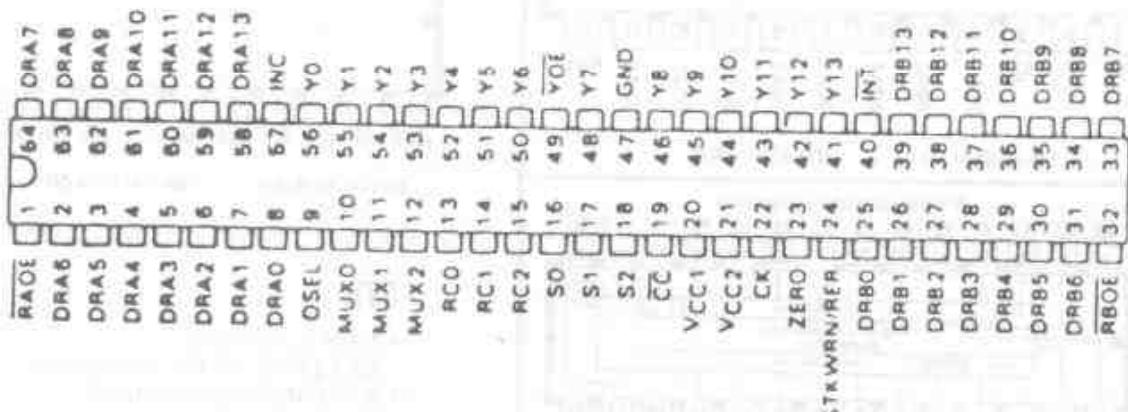


SN54AS868 (J)

SN74AS888(N)



890



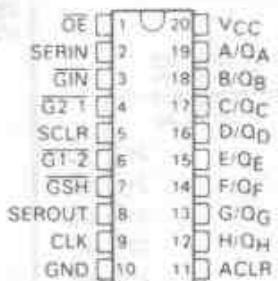
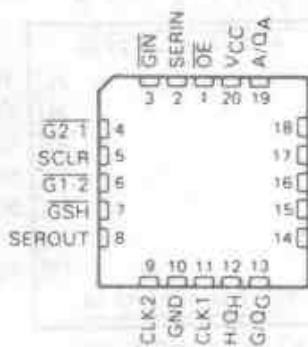
SN54AS890(J)

SN74AS880/N

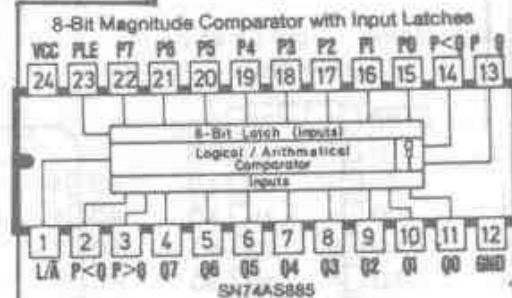
# **SN54ALS963, SN54ALS964, SN74ALS963, SN74ALS964 DUAL-RANK 8-BIT SHIFT REGISTERS WITH 3-STATE OUTPUTS**



SN54ALS963 . . . FK PACKAGE  
(TOP VIEW)



SN54ALS964 FK PACKAGE  
[TOP VIEW]



**SN74ALS993** **SEVEN READ-BACK LATCHES** **WITH 3-STATE OUTPUTS**



SN74ALS992 FN PACKAGE  
(TOP VIEW)



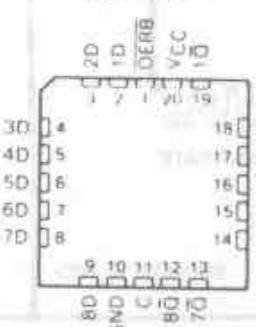
**SN74ALS990, SN74ALS991**  
**8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES**



SN74ALS99D FN PACKAGE  
(TOP VIEW)



SN74ALS991 FN PACKAGE



SN74ALS993 FN PACKAGE  
(TOP VIEW)

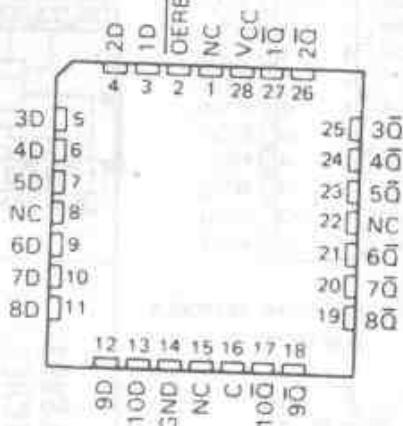


**SN74ALS994, SN74ALS995**  
**10-BIT D-TYPE TRANSPARENT READ-BACK LATCHES**

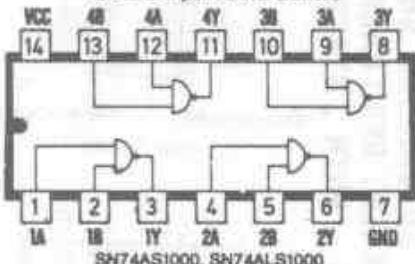
**SN74ALS995 DW OR NT PAI**  
**(TOP VIEW)**



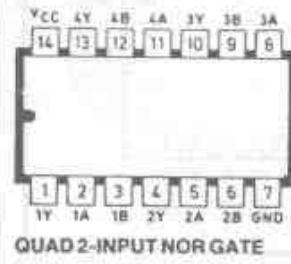
**SN74ALS995 FN PACKAGE**  
**(TOP VIEW)**



**Quad 2-Input NAND Buffers**



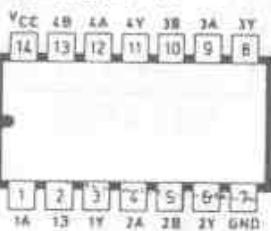
positive logic:  $Y = A + B$



**1002**

SN54ALS1002 (J)

positive logic:  $Y = AB$

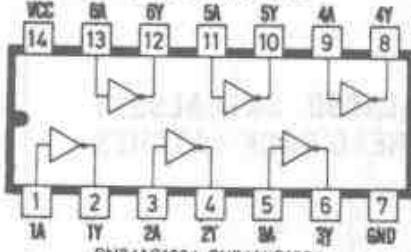


QUAD 2-INPUT NAND GATE (OC)

**1003**

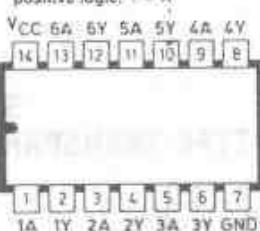
SN54ALS1003 (J) SN74ALS1003 (N)

Hex Inverting Drivers



SN74ALS1004, SN74ALS1004

positive logic:  $Y = \bar{A}$

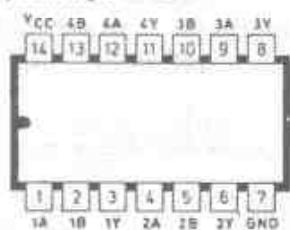


HEX INVERTORS (O.C. OUTPUTS)

**1005**

SN54ALS1005 (J) SN74ALS1005 (N)

positive logic:  $Y = AB$

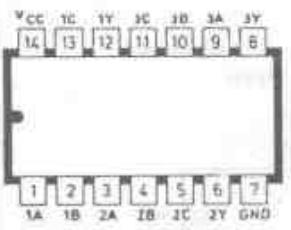


QUAD 2-INPUT AND GATE

**1008**

SN54ALS1008 (J) SN74ALS1008 (N)

positive logic:  $Y = ABC$

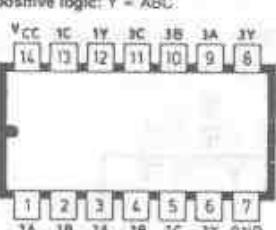


TRIPLE 3-INPUT NAND GATE

**1010**

SN54ALS1010 (J) SN74ALS1010 (N)

positive logic:  $Y = ABC$

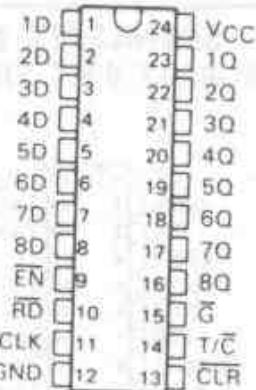


TRIPLE 3-INPUT AND GATE

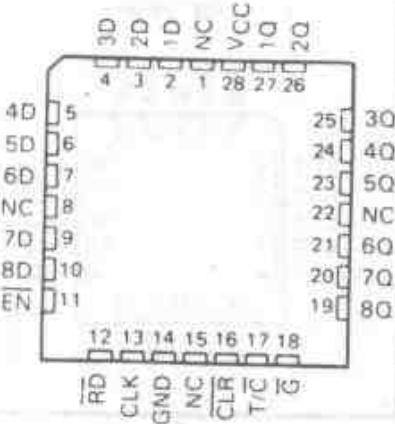
**1011**

SN54ALS1011 (J) SN74ALS1011 (N)

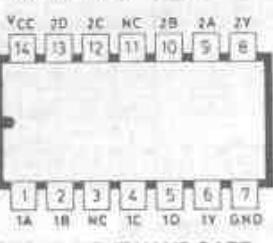
**SN74ALS996**  
**8-BIT D-TYPE EDGE-TRIGGERED READ-BACK LATCHES**



**FN PACKAGE**  
**(TOP VIEW)**



positive logic: Y = ABCD

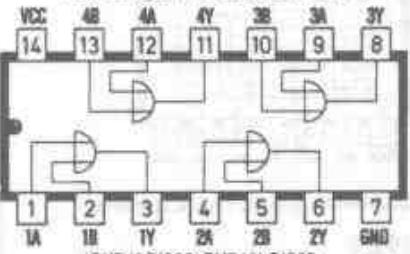


1020

SN54ALS1020 (J)

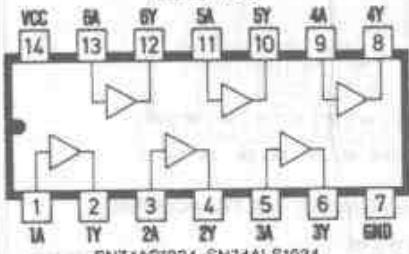
SN74ALS1020 (N)

Quad 2-Input OR Buffers/Drivers



SN74AS1032, SN74ALS1032

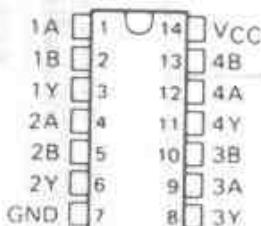
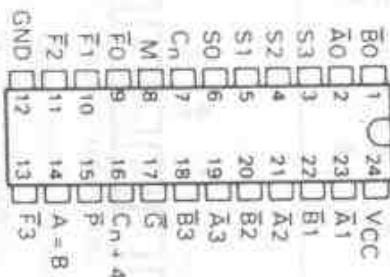
Hex Drivers



SN74AS1034, SN74ALS1034

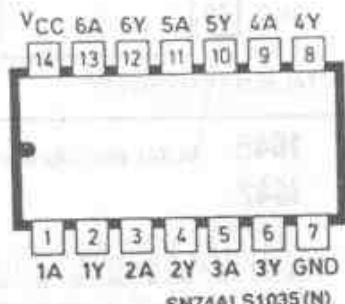
## SN54AS1181, SN74AS1181 ARITHMETIC LOGIC UNITS/FUNCTION GENERATORS

SN54AS1181 FK PACKAGE  
SN74AS1181 FN PACKAGE  
(TOP VIEW)



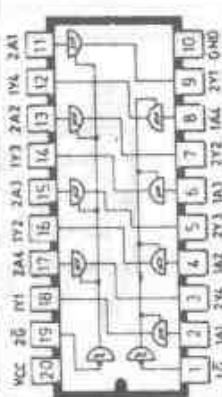
QUADRUPLE 2-INPUT POSITIVE-NOR DRIVERS

SN54AS1036A FK PACKAGE  
(TOP VIEW)



HEX NON INVERTING BUFFERS WITH  
OPEN COLLECTOR OUTPUTS

SN54ALS1240 (J)  
SN54ALS1240 (N)  
OCTAL BUFFERS/LINE DRIVERS /  
LINE RECEIVERS /  
INVERTED 3-STATE OUTPUTS





## HEX 2-INPUT NAND DRIVERS

SN74AS1804

TOP VIEW	
5B	1
6Y	2
6A	3
6B	4
VCC	5
1A	6
1B	7
1Y	8
2A	9
2B	10
20	5A
19	5Y
18	4B
17	4A
16	4Y
15	GND
14	3Y
13	3B
12	3A
11	2Y

## HEX 2-INPUT AND DRIVERS

5B	1	20	5A
6Y	2	19	5Y
6A	3	18	4B
6B	4	17	4A
CC	5	16	4Y
TA	6	15	GND
TB	7	14	3Y
TY	8	13	3B
2A	9	12	3A
2B	10	11	2Y

HEX 2 INPUT OR DRIVERS

SN74AS1832

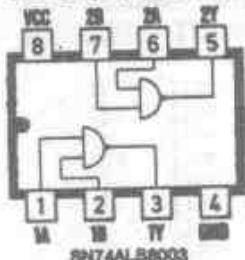
58	1	20	5A
6Y	2	19	5Y
6A	3	18	4B
6B	4	17	4A
VCC	5	16	4Y
1A	6	15	GND
1B	7	14	3Y
1Y	8	13	3B
2A	9	12	3A
2B	10	11	2Y

## HEX 2-INPUT NOR DRIVERS

SN74AS1805

(TOP VIEW)	
58	1
6Y	2
6A	3
6B	4
VCC	5
1A	6
1B	7
1Y	8
2A	9
2B	10
	20
	19
	18
	17
	16
	15
	14
	13
	12
	11
	5A
	5Y
	4B
	4A
	4Y
	GND
	3Y
	3B
	3A
	2Y

### Dual 2-input NAND Gates



B.S.T. VIII

**2000 DIRECTION DISCRIMINATOR**

# OCTAL BUFFERS AND LINE DRIVERS/MOS DRIVERS WITH 3-STATE OUTPUTS

SN54ALS2240 FK PACKAGE

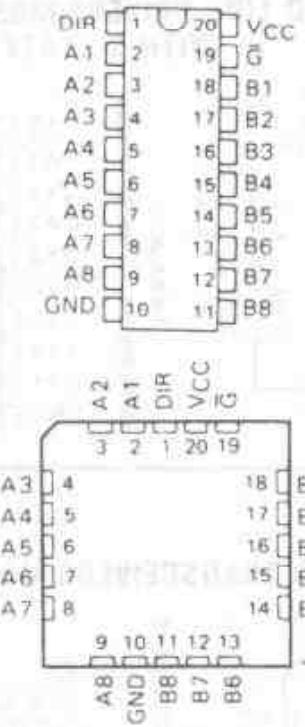
1G	1	20	VCC
1A1	2	19	2G
2Y4	3	18	1Y1
1A2	4	17	2A4
2Y3	5	16	1Y2
1A3	6	15	2A3
2Y2	7	14	1Y3
1A4	8	13	2A2
2Y1	9	12	1Y4
GND	10	11	2A1

1A2	4	3	2	1	20	19
2Y3	5	17	2A4	18	1Y1	
1A3	6	16	1Y2	17		
2Y2	7	15	2A3	18		
1A4	8	14	1Y3	19		
	9	10	11	12	13	

SN54ALS2242 . . . FK PACKAGE

## QUADRUPLE BUS TRANSCEIVERS/MOS DRIVER

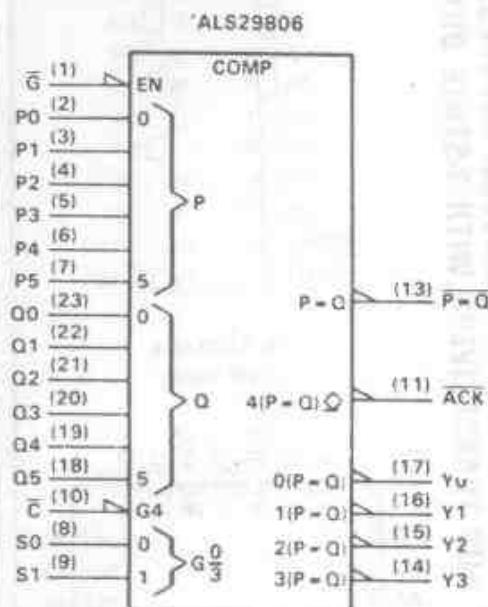
**SN74AS2640, SN74AS2645  
OCTAL BUS TRANSCEIVER/MOS DRIVER**



FUNCTION TABLE

CONTROL		OPERATION	
INPUTS		AS2640	AS2645
G	DIR		
L	L	B data to A bus	B data to A bus
L	H	A data to B bus	A data to B bus
H	X	Isolation	Isolation

**SN54ALS29806, SN74ALS29806  
COMPARATOR AND 2- TO 4-BIT DECODER**



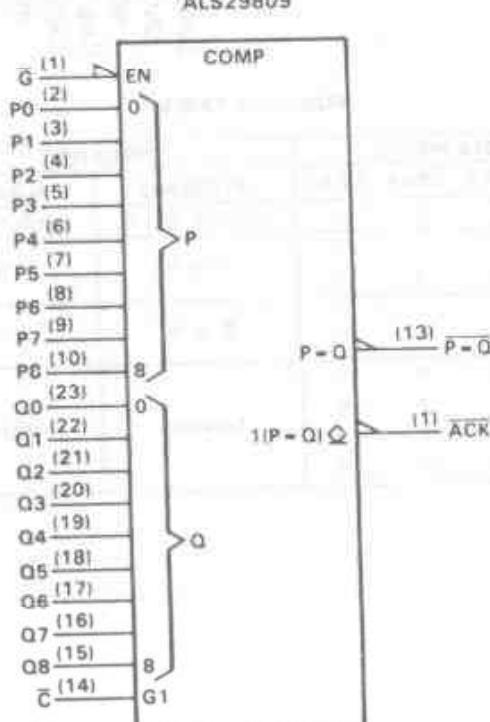
FUNCTION TABLE  
FOR  $\bar{P} = \bar{Q}$  AND ACK OUTPUTS

INPUTS			OUTPUTS	
$\bar{G}$	P,Q	$\bar{C}$	$\bar{P} = \bar{Q}$	ACK
H	X	X	H	H
X	$P \neq Q$	X	H	H
L	$P = Q$	L	L	L
L	$P = Q$	H	L	H

FUNCTION TABLE  
FOR DECODER OUTPUTS

INPUTS				OUTPUTS			
$\bar{G}$	P,Q	S1	S0	$Y_3$	$Y_2$	$Y_1$	$Y_0$
H	X	X	X	H	H	H	H
X	$P \neq Q$	X	X	H	H	H	H
L	$P = Q$	L	L	H	H	H	L
L	$P = Q$	L	H	H	H	L	H
L	$P = Q$	H	L	H	L	H	H
L	$P = Q$	H	H	L	H	H	H

**SN54ALS29809, SN74ALS29809  
COMPARATOR AND 2- TO 4-BIT DECODER**



FUNCTION TABLE

INPUTS			OUTPUTS	
$\bar{G}$	P,Q	$\bar{C}$	$\bar{P} = \bar{Q}$	ACK
H	X	X	H	H
X	$P \neq Q$	X	H	H
L	$P = Q$	L	L	L
L	$P = Q$	H	L	H

**SN74ALS29827, SN74ALS29828  
10-BIT BUFFERS AND BUS DRIVERS WITH 3-STATE OUTPUTS**



FN PACKAGE  
(TOP VIEW)



**SN74ALS29861, SN74ALS29862**  
**10-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

GBA	1	24	VCC
A1	2	23	B1
A2	3	22	B2
A3	4	21	B3
A4	5	20	B4
A5	6	19	B5
A6	7	18	B6
A7	8	17	B7
A8	9	16	B8
A9	10	15	B9
A10	11	14	B10
GND	12	13	GBAB

**FN PACKAGE  
(TOP VIEW)**



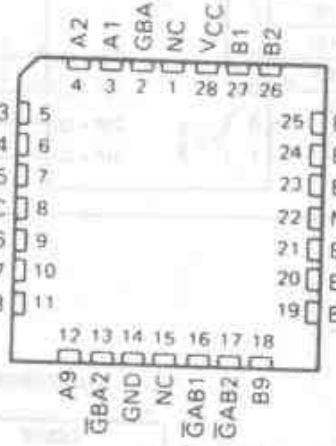
**FUNCTION TABLE**

INPUTS	OPERATION	
GBAB	ALS29861	ALS29862
L H	A to B	$\bar{A}$ to B
H L	B to A	$\bar{B}$ to A
H H	Isolation	Isolation
L L	Latch A and B (A = B)	Latch A and B (A = $\bar{B}$ )

**SN74ALS29863, SN74ALS29864**  
**9-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

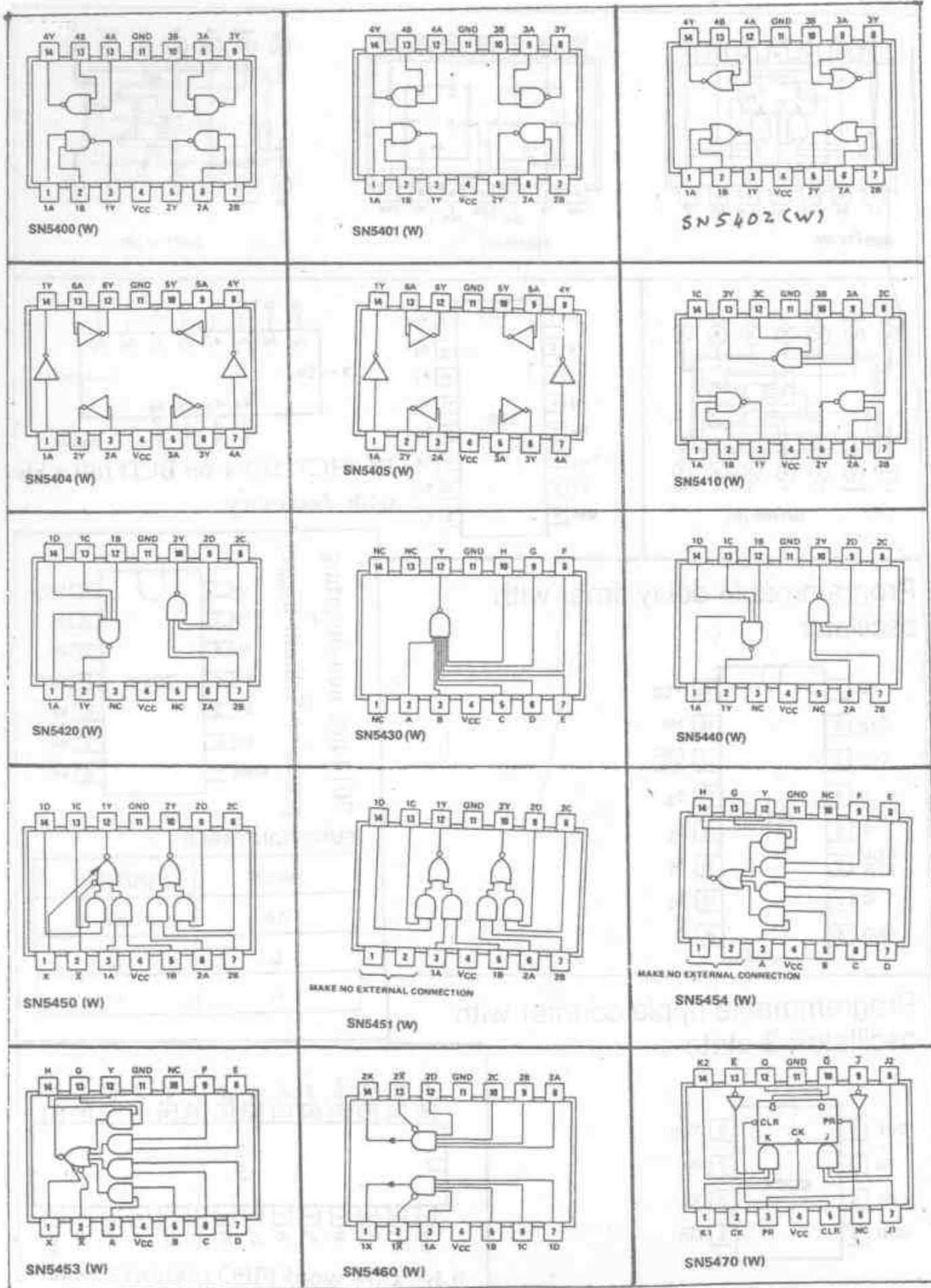
GBA1	1	24	VCC
A1	2	23	B1
A2	3	22	B2
A3	4	21	B3
A4	5	20	B4
A5	6	19	B5
A6	7	18	B6
A7	8	17	B7
A8	9	16	B8
A9	10	15	B9
GBA2	11	14	GBA2
GND	12	13	GBA1

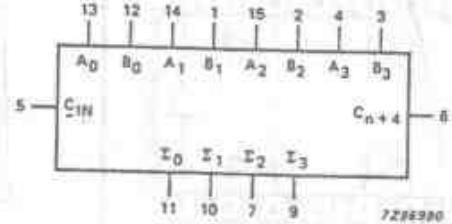
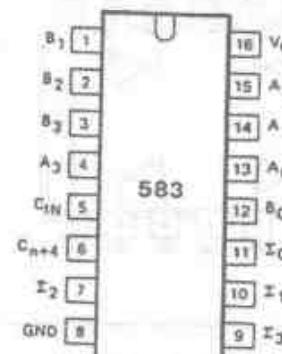
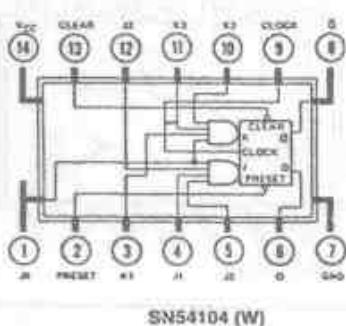
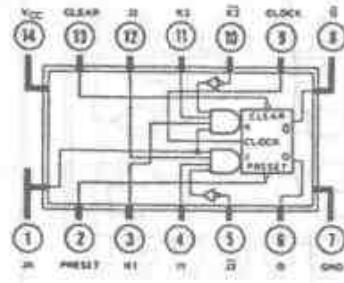
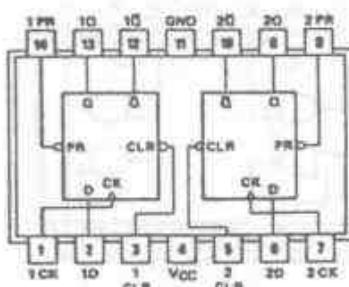
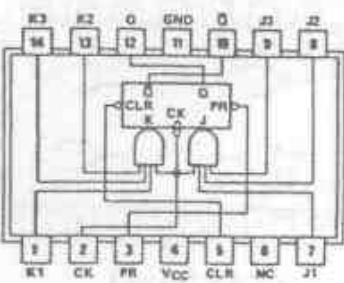
**FN PACKAGE  
(TOP VIEW)**



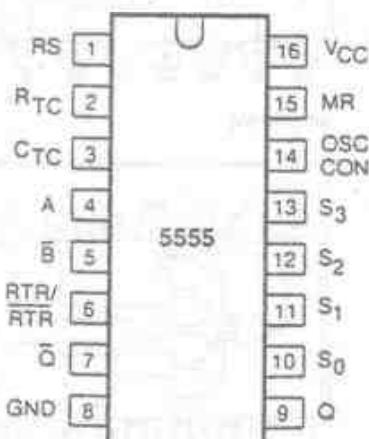
**FUNCTION TABLE**

ENABLE INPUTS				OPERATION	
GBA1	GBA2	GBA1	GBA2	ALS29863	ALS29864
L	L	L	L	Latch A and B	Latch A and B
L	L	H	X		
L	L	X	H	A to B	$\bar{A}$ to $\bar{B}$
H	X	L	L		
X	H	L	L	B to A	$\bar{B}$ to $\bar{A}$
H	X	H	X		
H	X	X	H		
X	H	X	H	Isolation	Isolation
X	H	H	X		

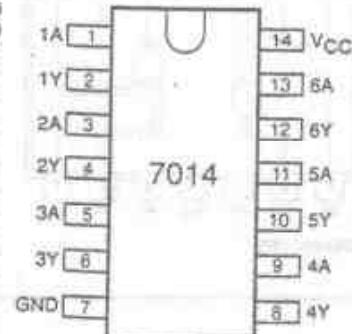




Programmable delay timer with oscillator



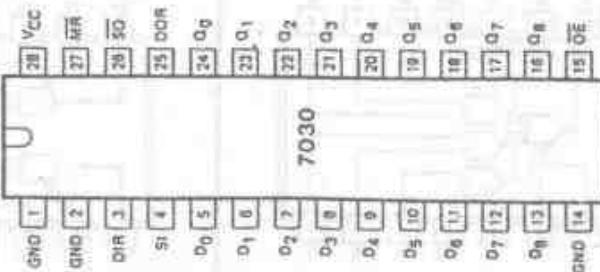
7014 hex non-inverting precision Schmitt-trigger



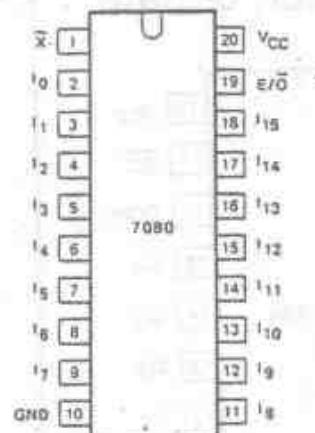
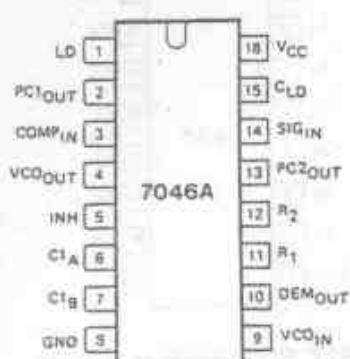
FUNCTION TABLE

INPUT	OUTPUT
nA	nY
L	L
H	H

Programmable ripple counter with oscillator; 3-state



9-bit x 64-word FIFO register ; 3-state



FUNCTION TABLE

INPUTS		OUTPUTS
$I_n$	X	E/O
$\Sigma = E$	H	H
$\Sigma \neq E$	L	L

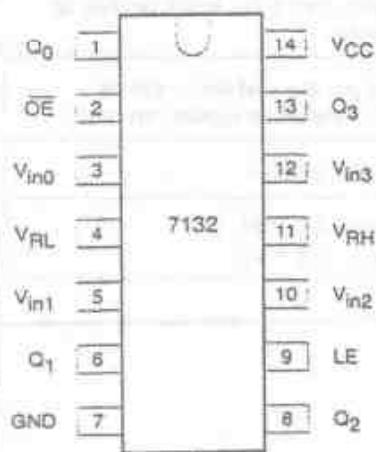
H = HIGH voltage level  
L = LOW voltage level  
E = even

74HC/HCT7046 phase-locked-loop with lock detector

74HC/HCT7080 16-bit odd/even parity generator/checker

Quad precision adjustable  
Schmitt-trigger/comparator with output latches  
3-state

FUNCTION TABLE for PAST mode (table 1)



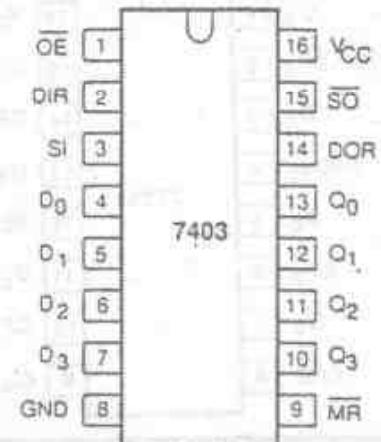
$V_{inn}$ (rising edge)	LE	OE	$Q_n$
$V_{inn} < V_{LL}$	L	L	H
$V_{LL} < V_{inn} < V_{RH}$	L	L	H
$V_{HH} > V_{inn} > V_{RH}$	L	L	L
$V_{inn} > V_{HH}$	L	L	L
$V_{inn}$ (falling edge)	LE	OE	$Q_n$
$V_{HH} > V_{inn} > V_{RL}$	L	L	L
$V_{LL} < V_{inn} < V_{RL}$	L	L	H
$V_{inn} < V_{LL}$	L	L	H
$V_{inn} = X$	H	L	$Q_{n-1}$
$V_{inn} = X$	X	H	Z

FUNCTION TABLE for Comparator mode (table 2)

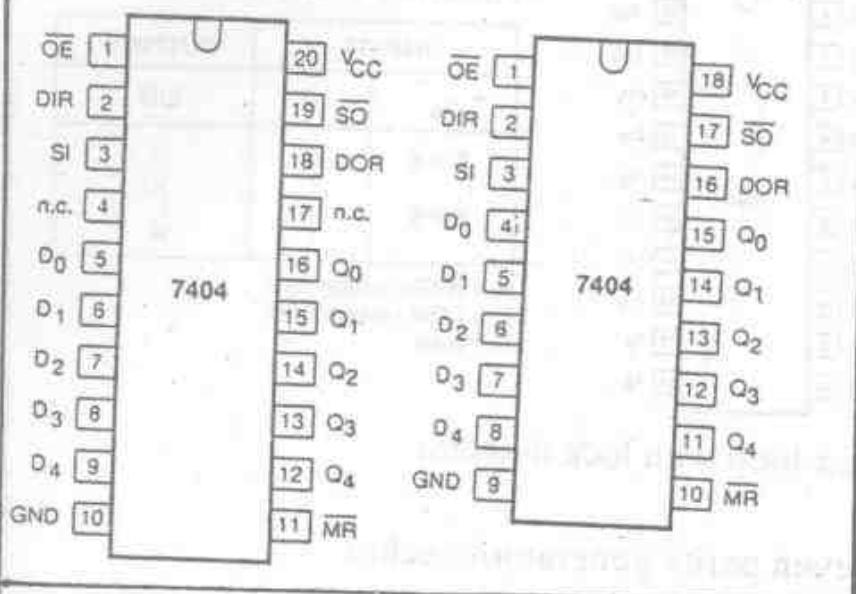
INPUT	LE	OE	$Q_n$
$V_{inn} < V_{ref}$	L	L	L
$V_{inn} > V_{ref}$	L	L	H
$V_{inn} = X$	H	L	$Q_{n-1}$
$V_{inn} = X$	X	H	Z

H = HIGH voltage level  
L = LOW voltage level  
Z = high impedance OFF-state  
X = don't care

4-Bit  $\times$  64-word FIFO  
register; 3-state



## 5-Bit x 64-word FIFO register; 3-state

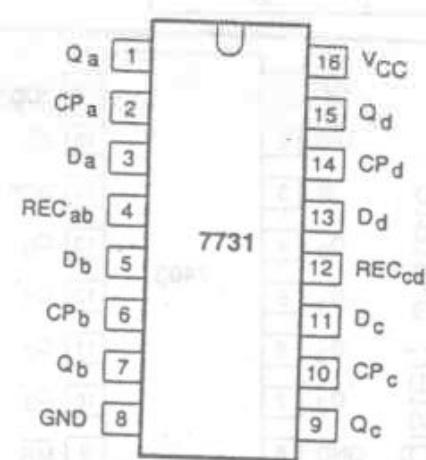


8-BIT SHIFT REGISTER  
WITH INPUT LATCHES

FUNCTION TABLE 74HC7597

LE	SH <sub>CP</sub>	PL	MR	FUNCTION
L	X	X	X	data enabled to input latches (transparent)
H	X	X	X	data stored into latches (non-transparent)
X	X	L	H	data transferred from input latches to shift register
X	X	L	L	invalid logic, state of shift register indeterminate when signals removed
X	X	H	L	shift register cleared
X	↑	H	H	shift register clocked Q <sub>n</sub> = Q <sub>n-1</sub> , Q <sub>0</sub> = D <sub>S</sub>

## Quad 64-bit static shift register



FUNCTION TABLE

INPUT		OUTPUT
REC	CP	MODE
L	↑	shift
H	↑	recycle

### Notes to Function Table

1. L = LOW voltage level
2. H = HIGH voltage Level
3. ↑ = LOW-to-HIGH CP transition

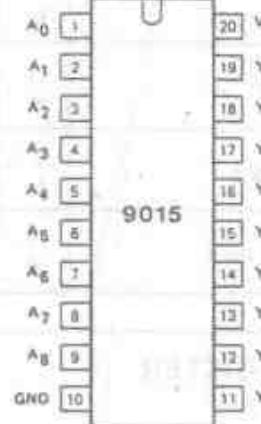
## NINE WIDE SCHMITT

### TRIGGER BUFFER/LINE DRIVER; INVERTING



FUNCTION TABLE

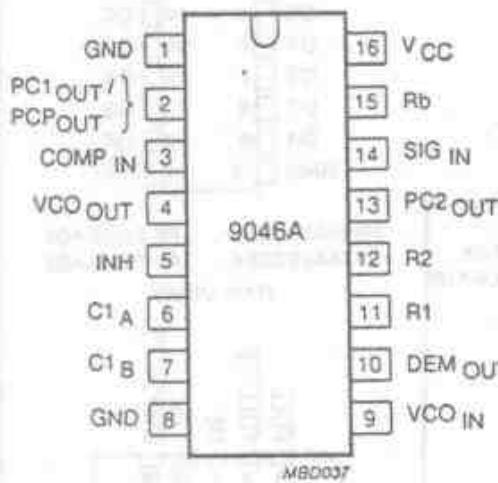
INPUTS	OUTPUTS
$A_n$	$\bar{Y}_n$
L	H



FUNCTION TABLE

INPUTS	OUTPUTS
$A_n$	$\bar{Y}_n$
L	H

### PLL with bandgap controlled VCO



FUNCTION TABLE

INPUTS	OUTPUTS
$A_n$	$\bar{Y}_n$
L	Z
H	L

H = HIGH voltage level  
L = LOW voltage level  
Z = high impedance OFF-state



### NINE WIDE SCHMITT TRIGGER

#### BUFFER; OPEN DRAIN OUTPUTS



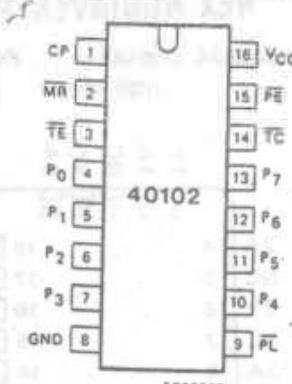
INPUTS	OUTPUTS
$A_n$	$\bar{Y}_n$
L	Z
H	L

H = HIGH voltage level  
L = LOW voltage level  
Z = high impedance OFF-state

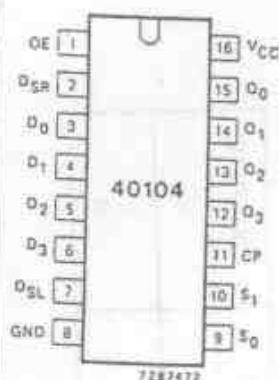
### 8-BIT SYNCHRONOUS BINARY DOWN COUNTER



### 8-BIT SYNCHRONOUS BCD DOWN COUNTER

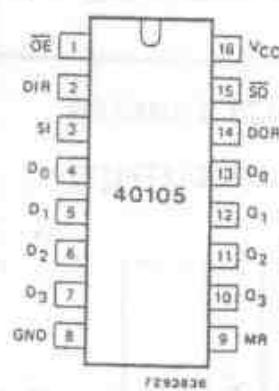


### 4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTER; 3-STATE

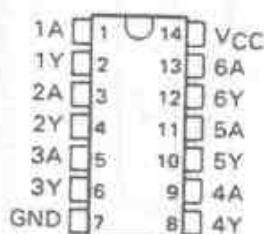


OPERATING MODES	INPUTS (OE = HIGH)					OUTPUTS at $t_{n+1}$			
	S <sub>1</sub>	S <sub>0</sub>	DSR	DSL	D <sub>0</sub> to D <sub>3</sub>	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>
reset	L	L	X	X	X	L	L	L	L
shift left	H	L	X	H	X	Q <sub>1</sub> Q <sub>0</sub>	Q <sub>2</sub> Q <sub>1</sub>	Q <sub>3</sub> Q <sub>2</sub>	L H
shift right	L	H	L	X	X	L	H	Q <sub>0</sub> Q <sub>1</sub>	Q <sub>1</sub> Q <sub>2</sub>
parallel load	H	H	X	X	L	L	H	L	H

### 4-BIT X 16-WORD FIFO REGISTER

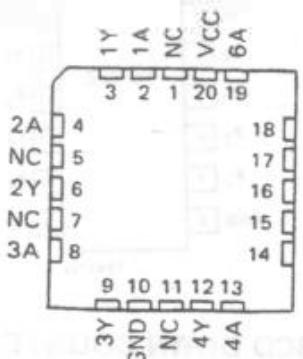


SN54ALS34, SN54AS34 . . . J PACKAGE  
SN74ALS34, SN74AS34 . . . D OR N PACKAGE  
(TOP VIEW)



### HEX NONINVERTERS

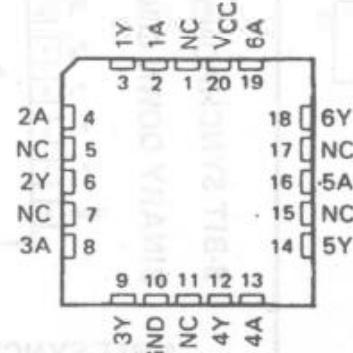
SN54ALS34, SN54AS34 . . . FK PACKAGE  
(TOP VIEW)



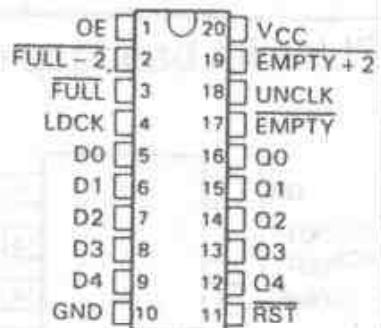
SN54ALS35A . . . J PACKAGE  
SN74ALS35A . . . D OR N PACKAGE  
(TOP VIEW)



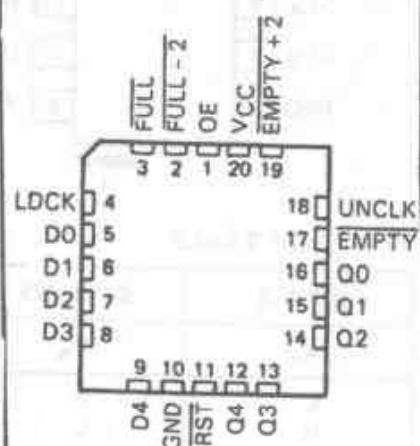
Noninverters with Open-Collector Outputs



### 16 × 5 ASYNCHRONOUS FIRST-IN FIRST-OUT MEMORIES



SN54ALS229A . . . FK PACKAGE  
SN74ALS229A . . . FN PACKAGE  
(TOP VIEW)



### FUNCTION TABLE (each buffer)

INPUT A	OUTPUT Y
H	H
L	L



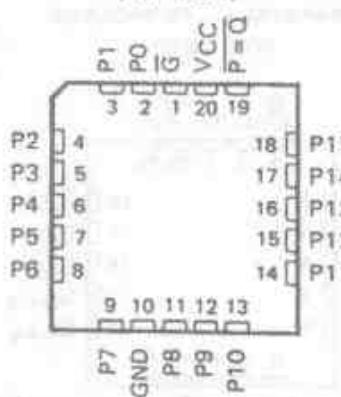
G	1	20	VCC
P0	2	19	P=Q
P1	3	18	P15
P2	4	17	P14
P3	5	16	P13
P4	6	15	P12
P5	7	14	P11
P6	8	13	P10
P7	9	12	P9
GND	10	11	P8

G	1	20	VCC
P0	2	19	P=Q
P1	3	18	Q11
P2	4	17	P11
P3	5	16	Q10
P4	6	15	P10
P5	7	14	Q9
P6	8	13	P9
P7	9	12	Q8
GND	10	11	P8

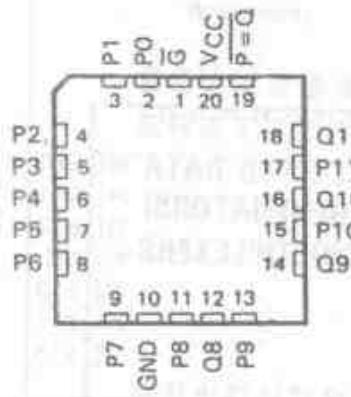
G	1	16	VCC
P0	2	15	P=Q
P1	3	14	P11
P2	4	13	P10
P3	5	12	P9
P4	6	11	P8
P5	7	10	P7
GND	8	9	P6

### FUSE-PROGRAMMABLE IDENTITY COMPARATORS

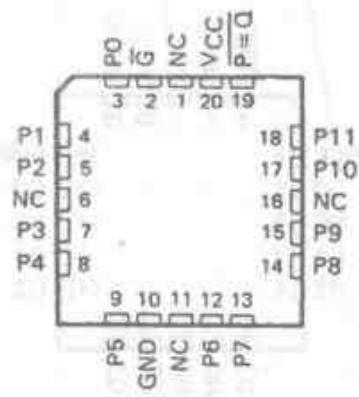
SN54ALS526 . . . FK PACKAGE  
(TOP VIEW)



SN54ALS527 . . . FK PACKAGE  
(TOP VIEW)



SN54ALS528 . . . FK PACKAGE  
(TOP VIEW)



### 10-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SN54ALS29821 . . . JT PACKAGE  
SN74ALS29821 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS29821 . . . FK PACKAGE  
SN74ALS29821 . . . FN PACKAGE

(TOP VIEW)



SN54ALS29822 . . . JT PACKAGE  
SN74ALS29822 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS29822 . . . FK PACKAGE  
SN74ALS29822 . . . FN PACKAGE

(TOP VIEW)



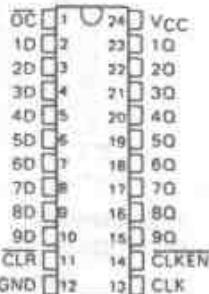
ALS29821 FUNCTION TABLE (EACH FLIP-FLOP)

INPUTS	OUTPUT		
	OC	CLK	D
OC	I	H	Q
L	I	L	H
L	I	L	X
L	I	L	X
H	I	L	Z

ALS29822 FUNCTION TABLE (EACH FLIP-FLOP)

INPUTS	OUTPUT		
	OC	CLK	D
OC	I	H	Q
L	I	L	X
L	I	L	X
L	I	L	X
H	I	L	Z

## 9-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS



SN54ALS29823 . . . FK PACKAGE  
SN74ALS29823 . . . FN PACKAGE

(TOP VIEW)



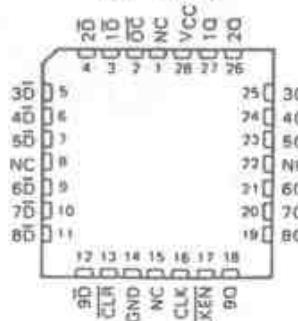
SN54ALS29824 . . . JT PACKAGE  
SN74ALS29824 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS29824 . . . FK PACKAGE  
SN74ALS29824 . . . FN PACKAGE

(TOP VIEW)



SN54ALS29825 . . . FK PACKAGE  
SN74ALS29825 . . . FN PACKAGE

(TOP VIEW)

'ALS29823 FUNCTION TABLE

INPUTS		OUTPUT		OUTPUT	
$\bar{OC}$	$\bar{CLR}$	$\bar{CLKEN}$	CLK	$\bar{D}$	D
L	L	X	X	L	L
L	H	L	H	L	H
L	H	L	H	L	H
L	H	H	H	L	X
L	H	X	X	X	X
L	H	X	X	X	X
L	H	X	X	Z	Z

'ALS29824 FUNCTION TABLE

INPUTS		OUTPUT		OUTPUT	
$\bar{OC}$	$\bar{CLR}$	$\bar{CLKEN}$	CLK	$\bar{D}$	D
L	L	X	X	L	L
L	H	L	H	L	H
L	H	L	H	L	H
L	H	H	H	L	X
L	H	X	X	X	X
L	H	X	X	X	X
L	H	X	X	Z	Z

'ALS29825 FUNCTION TABLE

INPUTS		OUTPUT		OUTPUT	
$\bar{OC}$	$\bar{CLR}$	$\bar{CLKEN}$	CLK	$\bar{D}$	D
L	L	X	X	L	L
L	H	L	H	L	H
L	H	L	H	L	H
L	H	H	H	L	X
L	H	X	X	X	X
L	H	X	X	X	X
L	H	X	X	Z	Z

SN54ALS29B25 . . . JT PACKAGE  
SN74ALS29B25 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS29825 . . . FK PACKAGE  
SN74ALS29825 . . . FN PACKAGE

(TOP VIEW)



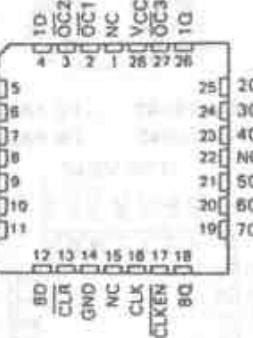
SN54ALS29826 . . . JT PACKAGE  
SN74ALS29826 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS29826 . . . FK PACKAGE  
SN74ALS29826 . . . FN PACKAGE

(TOP VIEW)



8-BIT BUS INTERFACE FLIP-FLOPS  
WITH 3-STATE OUTPUTS

'ALS29826 FUNCTION TABLE

INPUTS				OUTPUT Q
OC*	CLR	CLKEN	CLK	
L	L	X	X	X
E	H	L	↑	H
L	H	L	↑	L
L	H	H	X	X
H	X	X	X	Z

OC\* = H if any of OC1, OC2, or OC3 is high.  
 OC\* = L if all of OC1, OC2, and OC3 are low.

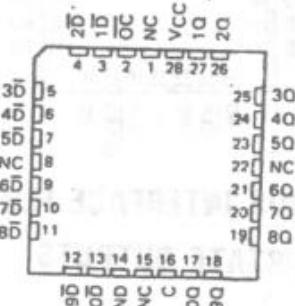


SN54AS29841 . . . FK PACKAGE  
 SN74AS29841 . . . FN PACKAGE  
 (TOP VIEW)



SN54AS29842 . . . FK PACKAGE  
 SN74AS29842 . . . FN PACKAGE

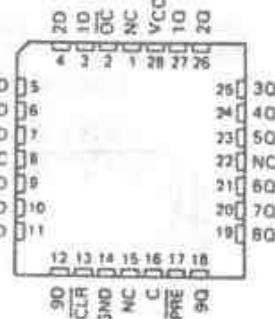
(TOP VIEW)



9-BIT BUS INTERFACE  
 D-TYPE LATCHES WITH  
 3-STATE OUTPUTS

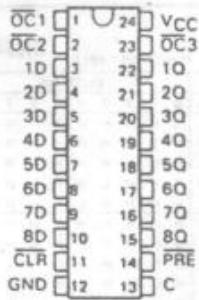


SN54AS29843 . . . FK PACKAGE  
 SN74AS29843 . . . FN PACKAGE  
 (TOP VIEW)



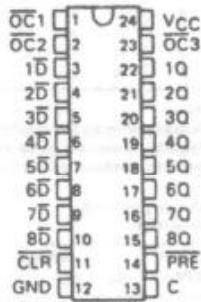
SN54AS29844 . . . FK PACKAGE  
 SN74AS29844 . . . FN PACKAGE  
 (TOP VIEW)





SN54AS29845 . . . FK PACKAGE  
SN74AS29845 . . . FN PACKAGE

(TOP VIEW)



SN54AS29846 . . . FK PACKAGE  
SN74AS29846 . . . FN PACKAGE

(TOP VIEW)



### 8-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

INPUTS						OUTPUT	
PRE	CLR	OC1	OC2	OC3	C	D	Q
L	H	L	L	L	X	X	H
H	L	L	L	L	X	X	L
L	L	L	L	L	X	X	H
H	H	L	L	L	H	L	L
H	H	L	L	L	H	H	H
H	H	L	L	L	L	X	Q <sub>0</sub>
X	X	X	X	H	X	X	Z
X	X	X	H	X	X	X	Z
X	X	H	X	X	X	X	Z

INPUTS								OUTPUT
PRE	CLR	OC1	OC2	OC3	C	D	Q	
L	H	L	L	L	X	X	H	
H	L	L	L	L	X	X	H	
L	L	L	L	L	X	X	H	
H	H	L	L	L	H	L	H	
H	H	L	L	L	H	H	L	
H	H	L	L	L	L	X	Q <sub>0</sub>	
X	X	X	X	H	X	X	Z	
X	X	X	H	X	X	X	Z	
X	X	H	X	X	X	X	Z	



'48, 'LS48  
FUNCTION TABLE348, '349, 'LS248, 'LS249  
FUNCTION TABLE

DECIMAL OR FUNCTION	INPUTS					BU/RBO	OUTPUTS					NOTE	
	LT	RBI	D	C	S	A	e	s	c	d	f	g	
0	H	#	L	L	L	L	H	H	H	H	H	H	L
1	H	X	L	L	H	H	L	H	H	L	L	L	L
2	H	X	L	L	H	L	H	H	L	H	H	L	H
3	H	X	L	E	H	M	H	H	H	H	L	L	H
4	H	X	L	H	L	L	H	L	H	L	L	M	H
5	H	X	L	H	L	H	H	C	H	H	S	M	H
6	H	X	L	H	H	L	H	L	L	H	H	H	H
7	H	X	L	H	W	H	H	H	H	L	L	L	H
8	H	X	L	H	L	L	H	H	H	H	H	H	H
9	H	X	L	H	L	H	H	H	H	L	H	H	H
10	H	X	L	H	L	H	L	L	H	M	H	H	H
11	H	X	L	H	H	H	H	L	H	M	L	H	H
12	H	X	N	H	L	L	H	L	N	L	L	M	H
13	H	X	N	H	L	N	H	L	L	H	M	H	H
14	H	X	N	H	H	L	H	L	L	H	H	H	H
15	H	X	N	H	H	H	H	L	L	L	L	L	H
BI	X	X	X	X	X	L	L	S	L	L	L	L	2
RBI	H	L	L	L	L	L	L	L	L	L	L	L	3
LT	L	X	X	X	X	H	H	H	H	H	H	H	4

H = high level, L = low level, X = irrelevant.

- NOTES: 1. The blanking input (RBI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBO) must be open or high, if blanking of a decimal zero is not desired.
2. When a low logic level is applied directly to the blanking input (RBI), all segment outputs are low regardless of the level of any other input.
3. When ripple-blanking input (RBO) and inputs A, B, C, and D are at a low level with the temp-test input high, all segment outputs go low and the ripple-blanking output (RBO) goes to a low-level (response condition).
4. When the blanking input/ripple-blanking inputs (BU/RBO) is open or held high and a low is applied to the temp-test input, all segment outputs are high.

1BU/RBO is wire-AND logic serving as blanking input (RBI) and/or ripple-blanking output (RBO).

'49, 'LS49  
FUNCTION TABLE

DECIMAL OR FUNCTION	INPUTS					BU	OUTPUTS					NOTE
	D	C	S	A	BU		e	s	c	d	f	
0	L	L	L	L	H	H	H	H	H	H	M	L
1	L	L	H	H	H	L	H	M	L	L	L	L
2	L	L	H	H	H	H	H	H	L	H	L	H
3	L	L	H	H	H	H	H	H	H	L	L	H
4	L	H	L	L	H	L	N	H	L	L	M	H
5	L	H	L	H	H	H	L	H	H	H	H	H
6	L	H	H	L	H	L	L	H	M	H	H	H
7	L	H	H	H	H	M	H	H	H	L	L	L
8	L	H	L	C	H	H	H	H	H	L	N	H
9	L	H	L	H	H	H	H	H	H	L	L	H
10	M	L	H	L	H	L	L	S	L	H	M	H
11	M	L	H	H	H	L	L	H	M	L	H	H
12	M	H	L	L	H	L	L	L	L	H	M	H
13	M	H	L	H	H	L	L	H	L	H	M	H
14	M	H	H	L	H	L	L	H	M	H	H	H
15	M	H	H	H	H	H	L	L	L	L	L	L
BI	X	X	X	X	L	L	L	L	L	L	L	2

H = high level, L = low level, X = irrelevant.

- NOTES: 1. The blanking input (RBI) must be open or held at a high logic level when output functions 0 through 15 are desired.
2. When a low logic level is applied directly to the blanking input (RBI), all segment outputs are low regardless of the level of any other input.

Truth table (see note A) TYPE SN74LS68

COUNT	Q <sub>D</sub>	Q <sub>C</sub>	Q <sub>B</sub>	Q <sub>A</sub>
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	L	H	L
5	L	L	H	H
6	L	L	H	L
7	L	L	H	H
8	H	L	L	L
9	H	L	L	H
10	H	L	H	L
11	H	L	H	H
12	H	H	L	L
13	H	H	L	H
14	H	H	H	L
15	H	H	H	H

Note A:  
Output Q<sub>A</sub> externally connected to clock 2 input for counter I.  
For counter II this connection has been made internally.

SN74LS83

INPUT	OUTPUT			
	WHEN Q <sub>B</sub> = L	WHEN Q <sub>B</sub> = H	WHEN Q <sub>D</sub> = L	WHEN Q <sub>D</sub> = H
A1	B1	A2	B2	C1
B1	B2	A1	A2	C2
A2	A1	B1	B2	C3
B2	A1	B1	B2	C4
C1	C2	C3	C4	C5
C2	C1	C3	C4	C5
C3	C2	C1	C4	C5
C4	C2	C3	C1	C5
C5	C4	C3	C2	C1

H = high level, L = low level.  
NOTE: Input conditions at A1, B1, A2, B2, and C4 are used to determine outputs C1 and C2 and the value of the internal carry C5. The values at C3, A3, B3, A4, and B4 are then used to determine outputs C3, C4, and C5.

LS383 LS293,

'93A, 'LS93

COUNT SEQUENCE

(See Note C)

COUNT	OUTPUT
0	L L L L
1	L L L H
2	L L H L
3	L L H H
4	L H L L
5	L H L H
6	H L L L
7	H L L H
8	H L H L
9	H L H H
10	H H L L
11	H H L H

COUNT	OUTPUT
0	L L L L
1	L L L H
2	L L H L
3	L L H H
4	L H L L
5	L H L H
6	L H H L
7	L H H H
8	H L L L
9	H L L H
10	H L H L
11	H L H H
12	H H L L
13	H H L H
14	H H H L
15	H H H H

'92A, 'LS92, '93A, 'LS93  
RESET/COUNT FUNCTION TABLE

RESET INPUTS	OUTPUT
R <sub>D(1)</sub> R <sub>D(2)</sub>	Q <sub>D</sub> Q <sub>C</sub> Q <sub>B</sub> Q <sub>A</sub>
H H	L L L L
L X	COUNT
X L	COUNT
X L L X	COUNT

- NOTES: A. Output Q<sub>A</sub> is connected to input B for BCD count.  
B. Output Q<sub>C</sub> is connected to input A for bi-quinary count.  
C. Output Q<sub>D</sub> is connected to input B.  
D. H = high level, L = low level, X = irrelevant.

IBit A, typical of all

Preset Inputs				Internal	
P1E1	P1A	P2E2	P2A	Preset A	
L	X	L	X	H	Inactive
L	X	X	L	H	Inactive
X	L	L	X	H	Inactive
X	L	X	L	H	Inactive
H	H	X	X	L	Inactive
X	X	H	H	L	Inactive

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## Wahrheitstabelle des Registers

Internal Presets				Inputs		Internal Outputs			Output	
A	B	C	D	Clear	Clock	Serial	Q <sub>A</sub>	Q <sub>B</sub>	Q <sub>C</sub>	Q <sub>D</sub>
H	H	H	H	H	X	X	L	E	L	L
L	L	L	L	L	X	X	H	H	H	H
H	H	H	H	L	L	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>
L	H	L	H	L	L	X	H	Q <sub>B0</sub>	H	Q <sub>D0</sub>
H	H	H	H	L	T	H	H	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>
H	H	H	H	L	T	H	H	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>
H	H	H	H	L	T	L	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>

FUNCTION TABLE SN74LS95B

MODE CONTROL	CLOCKS Z (L) T (R)	SERIAL	PARALLEL				OUTPUTS			
			A	B	C	D	Q <sub>A</sub>	Q <sub>B</sub>	Q <sub>C</sub>	Q <sub>D</sub>
H	H	X	X	X	X	X	Q <sub>A1</sub>	Q <sub>B1</sub>	Q <sub>C1</sub>	Q <sub>D1</sub>
H	-	X	X	X	X	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>
H	-	X	X	X	X	X	Q <sub>B1</sub>	Q <sub>C1</sub>	Q <sub>D1</sub>	Q <sub>A0</sub>
L	L	H	X	X	X	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>
L	X	-	H	X	X	X	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>A0</sub>
L	X	-	L	X	X	X	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>A0</sub>	Q <sub>B0</sub>
T	L	L	X	X	X	X	Q <sub>D0</sub>	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>
T	L	L	X	X	X	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>
T	H	L	X	X	X	X	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>A0</sub>
T	H	H	X	X	X	X	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>A0</sub>	Q <sub>B0</sub>

Transitions from external connection of Q<sub>B</sub> to A, Q<sub>C</sub> to B, and Q<sub>D</sub> to C. Serial data is entered at input Z.

STATE AND/OR RATE FUNCTION TABLE (See Note A) SN7497

CLEAR	ENABLE	STROBE	INPUTS						OUTPUTS			NOTES
			BINARY RATE						LOGIC LEVEL OR NUMBER OF PULSES			
			F	K	D	C	S	A	CLOCK PULSES	UNITY/CASCADE	Y	Z
L	X	H	0	0	0	0	0	0	0	0	0	0
L	L	L	0	0	0	0	0	0	0	0	1	C
L	L	L	0	0	0	0	0	0	0	1	1	C
L	L	L	0	0	0	0	0	0	0	2	2	C
L	L	L	0	0	0	0	0	0	0	4	4	C
L	L	L	0	0	0	0	0	0	0	8	8	C
L	L	L	0	0	0	0	0	0	0	16	16	C
L	L	L	0	0	0	0	0	0	0	32	32	C
L	L	L	0	0	0	0	0	0	0	64	64	C
L	L	L	0	0	0	0	0	0	0	128	128	C
L	L	L	0	0	0	0	0	0	0	256	256	C
L	L	L	0	0	0	0	0	0	0	512	512	C
L	L	L	0	0	0	0	0	0	0	1024	1024	C
L	L	L	0	0	0	0	0	0	0	2048	2048	C
L	L	L	0	0	0	0	0	0	0	4096	4096	C

NOTES: A. H = High level, L = low level, X = irrelevant.  
 B. This is a simplified illustration of the clear function. The states of clock and strobe can affect the logic level of Y and Z. A low unity/cascade will cause output Y to remain high.  
 C. Each rate illustrated requires a constant value of rate inputs; however, these illustrations do not prohibit variable rate inputs.  
 D. Unity/cascade is used to inhibit outputs Y.

$$M_{T_{10}} = \frac{18 + 321 \mu s}{64} = 40 \mu s$$

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Clear	Preset Enable	Inputs					Outputs				
		Preset	clock	serial	Q <sub>A</sub>	Q <sub>B</sub>	Q <sub>C</sub>	Q <sub>D</sub>	Q <sub>E</sub>		
L	L	XXXXXX	X	X	L	L	L	L	L		
L	X	ELLLL	X	X	L	L	L	L	L		
H	H	HHHHH	X	X	H	H	H	H	H		
H	H	LLLLL	L	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>E0</sub>		
H	H	HLHLH	L	X	H	Q <sub>B0</sub>	H	Q <sub>D0</sub>	H		
H	L	XXXXX	L	X	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	Q <sub>D0</sub>	Q <sub>E0</sub>		
H	L	XXXXX	T	H	H	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>		
H	L	XXXXX	T	L	L	Q <sub>An</sub>	Q <sub>Bn</sub>	Q <sub>Cn</sub>	Q <sub>Dn</sub>		

III

FUNCTION TABLE SN74184

BCD WORDS	INPUTS						OUTPUTS						NOTES
	(See Note A)						(See Note B)						
0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	0	0	0	0	
32	0	0	0	0	0	0	0	0	0	0	0	0	
33	0	0	0	0	0	0	0	0	0	0	0	0	
34	0	0	0	0	0	0	0	0	0	0	0	0	
35	0	0	0	0	0	0	0	0	0	0	0	0	
36	0	0	0	0	0	0	0	0	0	0	0	0	
37	0	0	0	0	0	0	0	0	0	0	0	0	
38	0	0	0	0	0	0	0	0	0	0	0	0	
ANY	0	0	0	0	0	0	0	0	0	0	0	0	

H = High level, L = low level, X = irrelevant.  
 NOTES: A. Input conditions other than those shown produce high at outputs Y1 through Y5.  
 B. Outputs Y6, Y7, and Y8 are not used for BCD 10's complement conversion.  
 C. When these devices are used as complement converters, input E is used as a mode control. With this input low, the BCD 8's complement is generated; when it is high, the BCD 10's complement is generated.

When these devices are used as complement converters, input E is used as a mode control. With this input low, the BCD 8's complement is generated;

### SN54185A and SN74185A binary-to-BCD converters

The function performed by these 6-bit binary-to-BCD converters is analogous to the algorithm:

- Examine the three most significant bits. If the sum is greater than four, add three and shift left one bit.
- Examine each BCD decade. If the sum is greater than four, add three and shift left one bit.
- Repeat step b. until the least-significant binary bit is in the least-significant BCD location.

TABLE II

SN54185A, SN74185A

PACKAGE COUNT AND DELAY TIMES  
FOR BINARY-TO-BCD CONVERSION

INPUT (BITS)	PACKAGES REQUIRED	TOTAL DELAY TIME (ns)	
		TYP	MAX
4 to 6	1	75	40
7 or 8	3	50	80
9	4	75	120
10	6	100	100
11	7	125	200
12	8	125	200
13	10	150	240
14	12	175	260
15	14	175	260
16	16	200	270
17	18	225	360
18	21	275	360
19	24	250	400
20	27	275	440

## IV

BINAR Y WORD	FUNCTION TABLE				OUTPUTS
	INPUTS	SHIFT/ SELECT	ENABLE	Y <sub>0</sub> Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub> Y <sub>7</sub>	
0 1	L L L L L L	S	—	0 0 0 0 0 0 0 0	
1 2	L L L L L H	S	—	0 0 0 0 0 0 0 1	
2 3	L L L L H L	S	—	0 0 0 0 0 0 1 0	
3 4	L L L L H H	S	—	0 0 0 0 0 0 1 1	
4 5	L L L H L L	S	—	0 0 0 0 0 1 0 0	
5 6	L L L H L H	S	—	0 0 0 0 0 1 0 1	
6 7	L L L H H L	S	—	0 0 0 0 0 1 1 0	
7 8	L L L H H H	S	—	0 0 0 0 0 1 1 1	
8 9	L L H L L L	S	—	0 0 0 0 1 0 0 0	
9 10	L L H L L H	S	—	0 0 0 0 1 0 0 1	
10 11	L L H L H L	S	—	0 0 0 0 1 0 1 0	
11 12	L L H L H H	S	—	0 0 0 0 1 0 1 1	
12 13	L L H H L L	S	—	0 0 0 0 1 1 0 0	
13 14	L L H H L H	S	—	0 0 0 0 1 1 0 1	
14 15	L L H H H L	S	—	0 0 0 0 1 1 1 0	
15 16	L L H H H H	S	—	0 0 0 0 1 1 1 1	
16 17	L H L L L L	S	—	0 0 0 1 0 0 0 0	
17 18	L H L L L H	S	—	0 0 0 1 0 0 0 1	
18 19	L H L L H L	S	—	0 0 0 1 0 0 1 0	
19 20	L H L L H H	S	—	0 0 0 1 0 0 1 1	
20 21	L H L H L L	S	—	0 0 0 1 0 1 0 0	
21 22	L H L H L H	S	—	0 0 0 1 0 1 0 1	
22 23	L H L H H L	S	—	0 0 0 1 0 1 1 0	
23 24	L H L H H H	S	—	0 0 0 1 0 1 1 1	
24 25	L H H L L L	S	—	0 0 1 0 0 0 0 0	
25 26	L H H L L H	S	—	0 0 1 0 0 0 0 1	
26 27	L H H L H L	S	—	0 0 1 0 0 0 1 0	
27 28	L H H L H H	S	—	0 0 1 0 0 0 1 1	
28 29	L H H H L L	S	—	0 0 1 0 0 1 0 0	
29 30	L H H H L H	S	—	0 0 1 0 0 1 0 1	
30 31	L H H H H L	S	—	0 0 1 0 0 1 1 0	
31 32	L H H H H H	S	—	0 0 1 0 0 1 1 1	
32 33	H L L L L L	S	—	0 1 0 0 0 0 0 0	
33 34	H L L L L H	S	—	0 1 0 0 0 0 0 1	
34 35	H L L L H L	S	—	0 1 0 0 0 0 1 0	
35 36	H L L L H H	S	—	0 1 0 0 0 0 1 1	
36 37	H L L H L L	S	—	0 1 0 0 0 1 0 0	
37 38	H L L H L H	S	—	0 1 0 0 0 1 0 1	
38 39	H L L H H L	S	—	0 1 0 0 0 1 1 0	
39 40	H L L H H H	S	—	0 1 0 0 0 1 1 1	
40 41	H L H L L L	S	—	0 1 0 0 1 0 0 0	
41 42	H L H L L H	S	—	0 1 0 0 1 0 0 1	
42 43	H L H L H L	S	—	0 1 0 0 1 0 1 0	
43 44	H L H L H H	S	—	0 1 0 0 1 0 1 1	
44 45	H L H H L L	S	—	0 1 0 0 1 1 0 0	
45 46	H L H H L H	S	—	0 1 0 0 1 1 0 1	
46 47	H L H H H L	S	—	0 1 0 0 1 1 1 0	
47 48	H L H H H H	S	—	0 1 0 0 1 1 1 1	
48 49	H H L L L L	S	—	0 1 0 1 0 0 0 0	
49 50	H H L L L H	S	—	0 1 0 1 0 0 0 1	
50 51	H H L L H L	S	—	0 1 0 1 0 0 1 0	
51 52	H H L L H H	S	—	0 1 0 1 0 0 1 1	
52 53	H H H L L L	S	—	0 1 0 1 0 1 0 0	
53 54	H H H L L H	S	—	0 1 0 1 0 1 0 1	
54 55	H H H L H L	S	—	0 1 0 1 0 1 1 0	
55 56	H H H L H H	S	—	0 1 0 1 0 1 1 1	
56 57	H H H H L L	S	—	0 1 0 1 1 0 0 0	
57 58	H H H H L H	S	—	0 1 0 1 1 0 0 1	
58 59	H H H H H L	S	—	0 1 0 1 1 0 1 0	
59 60	H H H H H H	S	—	0 1 0 1 1 0 1 1	
60 61	H H H H H H	S	—	0 1 0 1 1 1 0 0	
61 62	H H H H H H	S	—	0 1 0 1 1 1 0 1	
62 63	H H H H H H	S	—	0 1 0 1 1 1 1 0	
63 64	H H H H H H	S	—	0 1 0 1 1 1 1 1	
64 65	ALL X X X X X X	S	—	0 1 1 1 1 1 1 1	

### SN74LS221

#### FUNCTION TABLE (EACH MONOSTABLE)

INPUTS	OUTPUTS
CLEAR	A S Q Q̄
L	X X L H
X	H X L H
X	X X L H
H	L L L H
H	X X X H

After see description and switching characteristics

### SN74LS245

#### FUNCTION TABLE

ENABLE	DIRECTION CONTROL	OPERATION
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H = High Level, L = Low Level, X = Inactive

#### FUNCTION TABLE

CLEAR	MODE	INPUTS		OUTPUTS	
		CLOCK	SERIAL	PARALLEL	Q <sub>0</sub> Q <sub>1</sub> ... Q <sub>6</sub> Q <sub>7</sub>
S <sub>1</sub> S <sub>0</sub>	LEFT	X	X	X	L L L L L L
S <sub>1</sub> S <sub>0</sub>	RIGHT	X	X	X	Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub> Q <sub>4</sub> Q <sub>5</sub> Q <sub>6</sub> Q <sub>7</sub>
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H
S <sub>1</sub> S <sub>0</sub>	—	X	X	X	S H H H H H

#### FUNCTION TABLE

CLEAR	SHIFT/ LOAD	INPUTS		OUTPUTS	
		CLOCK	INHIBIT	CLOCK	SERIAL
L	X	X	X	X	X
H	X	L	X	X	X
H	L	X	X	X	X
H	H	L	X	X	X
H	H	H	L	X	X
H	H	H	H	L	X
H	H	H	H	H	L
H	H	H	H	H	H

#### FUNCTION TABLES

TABLE 1- ARITHMETIC FUNCTIONS

Mode Control (M) = Low

ALU SELECTION A <sub>2</sub> A <sub>1</sub> A <sub>0</sub>	ACTIVE HIGH DATA	
	C <sub>0</sub> = H (with carry)	C <sub>0</sub> = L (no carry)
L L L	F <sub>0</sub> = L, F <sub>1</sub> = F <sub>2</sub> + F <sub>3</sub> + H	F <sub>0</sub> = H
L L H	F = S MINUS A	F = S MINUS A - 1
L H L	F = A MINUS B	F = A MINUS B - 1
L H H	F = A PLUS S PLUS 1	F = A PLUS S
H L L	F = B PLUS 1	F <sub>0</sub> = B <sub>0</sub>
H L H	F = B PLUS 1	F <sub>0</sub> = B <sub>0</sub>
H H L	F = A PLUS 1	F <sub>0</sub> = A <sub>0</sub>
H H L	F = A PLUS 1	F <sub>0</sub> = A <sub>0</sub>

TABLE 2- LOGIC FUNCTIONS

Mode Control (M) = High

Carry Input (C<sub>0</sub>) = X (Inhibit)

ALU SELECTION	ACTIVE HIGH DATA FUNCTION
A <sub>2</sub> A <sub>1</sub> A <sub>0</sub>	F <sub>0</sub> = L
L L L	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
L L H	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
L H L	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
L H H	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
H L L	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
H L H	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
H H L	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>
H H H	F <sub>0</sub> = A <sub>0</sub> ⊕ B <sub>0</sub> ⊕ C <sub>0</sub>

TABLE 3- SHIFT-MODE FUNCTIONS

C<sub>0</sub> = M = A<sub>2</sub> = A<sub>1</sub> = L, and A<sub>2</sub> = H (F<sub>0</sub> = D<sub>0</sub>)

FUNCTION	INPUTS BEFORE 1				CLOCK INPUT	OUTPUTS AFTER 1			
	REGISTER SELECTION R <sub>0</sub> R <sub>1</sub> R <sub>2</sub>	INPUT/ OUTPUT R <sub>0</sub> R <sub>1</sub>	SHIFT MATRIX INPUTS F <sub>0</sub> F <sub>1</sub> F <sub>2</sub> F <sub>3</sub>	INPUT/ OUTPUT L/RQ		SHIFT MATRIX OUTPUTS VALU & INPUTS Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>	INPUT/ OUTPUT L/RQ		
LOAD	L L X	Z	10 11 12 13	Z	1	Z 10 11 12 13 Z	1		
LSL	L H L	G <sub>0</sub>	Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>	0 1	0	G <sub>0</sub> G <sub>1</sub> G <sub>2</sub> G <sub>3</sub> 0 1	0		
LSA	L H H	G <sub>0</sub>	Q <sub>0</sub> Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>	0 1	1	G <sub>0&lt;/sub</sub>			



FUNCTION TABLE SN74LS395A

CLEAR	LOAD/SHIFT CONTROL	INPUTS		3-STATE OUTPUTS				CASCADE	
		CLOCK	SERIAL	A	B	C	D	OUTPUT	Q <sub>0</sub>
L	X	X	X	X	X	X	X	L	L
H	H	H	X	X	X	X	X	Q <sub>0</sub>	Q <sub>0</sub>
H	H	I	X	X	C	S	S	I	I
H	L	H	X	X	X	X	X	Q <sub>0</sub>	Q <sub>0</sub>
H	L	I	H	X	X	X	X	H	Q <sub>0</sub>
H	L	I	L	X	X	X	X	Q <sub>0</sub>	Q <sub>0</sub>

When the output control is high, the 3-state outputs are disabled so the high impedance state. However, sequential operations of the registers and the output at Q<sub>0</sub> are not effected.

ERROR FUNCTION TABLE SN74LS630, SN74LS631

Total Number of Errors		Error Page		Data Correction
16-Bit Data	8-Bit Checkword	SEF	DEF	
0	0	L	L	Not Applicable
1	0	H	L	Correction
0	1	H	L	Correction
1	1	H	H	Interrupt
2	0	H	H	Interrupt
0	2	H	H	Interrupt

FUNCTION TABLE SN74LS396

STROBE G	CLOCK	INPUTS			OUTPUTS						
		DATA			BYTE 1		BYTE 2				
01	02	03	04	101	102	103	104	201	202	203	204
H	X	X	X	L	L	L	L	L	L	L	L
L	I	S	S	D	S	S	S	101 <sub>1</sub>	102 <sub>1</sub>	103 <sub>1</sub>	104 <sub>1</sub>

H = High level (steady state), L = low level (steady state), S = irrelevant logic level, including transitions.  
I = transition from low to high level.  
101<sub>1</sub>, 102<sub>1</sub>, 103<sub>1</sub>, 104<sub>1</sub> = the level of 101, 102, 103, and 104, respectively, before the most recent 1 transition of the clock.

SN74LS636, SN74LS637

CHECKWORD BIT	K-BIT DATA WORD						
	0	1	2	3	4	5	6
CB0	X	S	X	S			
CB1	S	X	X	X	X		
CB2	X	X	X	S	S		
CB3	S	X	S			X	X
CB4		S	S	S	S	X	X

LS634 FUNCTION TABLE

INPUTS	DATA	SER	OPCODE
CS	REF	MODE	CLS
H	X	H or L	X
H	I	I	I
L	X	X	X
L	X	X	H
L	H	X	I
L	H or L	X	I

H = High level, L = low level, I = irrelevant.  
DEVICE A OUTPUT B OUTPUT LOGIC  
LS638 Open-Collector 3-State Inverting  
LS639 Open-Collector 3-State True

LS634 = pattern of 16-bit bits of the shift register before the most recent 1 transition of the clock.  
OTS = present content of 16-bit bits of the shift register.  
OTS = content of 16-bit bits of the storage register before the most recent 1 transition of the clock.  
P15 = level of input P15.

ERROR SYNDROME TABLE

ERROR LOCATION	SYNDROME ERROR CODE				
	CB0	CB1	CB2	CB3	CB4
DB0	L	L	H	L	H
DB1	L	H	L	L	H
DB2	H	L	L	L	H
DB3	L	L	H	H	L
DB4	L	H	L	H	L
DB5	H	L	L	H	L
DB6	H	L	H	L	L
DB7	H	H	L	L	L
CB0	L	H	H	H	H
CB1	H	L	H	H	H
CB2	H	H	L	H	H
CB3	H	H	H	L	H
CB4	H	H	H	H	L
NO ERROR	H	H	H	H	H

## VI

FUNCTION TABLE SN74LS646 THRU SN74LS649

INPUTS			DATA I/O*		OPERATION OR FUNCTION			'L5646, 'L5647	'L5648, 'L5649
G	DHR	CAB	CBA	SAR	SRA	AT THRU AS	B1 THRU BS	'L5646, 'L5647	'L5648, 'L5649
L	H	H or L	H or L	X	X	Input	Input	Isolation	Isolation
L	H	I	I	X	X	Output	Input	Store A and B Data	Store A and B Data
L	L	X	X	X	L	Output	Input	Real Time B Data to A Bus	Real Time B Data to A Bus
L	L	X	X	X	H	Output	Input	Stored B Data to A Bus	Stored B Data to A Bus
L	H	X	X	L	X	Input	Output	Real Time A Data to B Bus	Real Time A Data to B Bus
L	H	H or L	X	X	X	Output	Output	Stored A Data to B Bus	Stored A Data to B Bus

\*H = High level, L = low level, X = irrelevant, I = low-to-high level transition.

The data output functions may be enabled or disabled by various signals at the G and DHR inputs. Data input functions are always enabled, i.e., data at the bus sites will be stored on every low-to-high transition on the clock inputs.

FUNCTION TABLE SN74LS651 THRU SN74LS654

INPUTS			DATA I/O*		OPERATION OR FUNCTION			'L5651	'L5652
GAS	GBA	CAB	CBA	SAR	SRA	AT THRU AS	B1 THRU BS	'L5651	'L5652
L	H	H or L	H or L	X	X	Input	Input	Isolation	Isolation
L	H	I	I	X	X	Output	Input	Store A and B Data	Store A and B Data
L	L	X	X	X	L	Output	Input	Real Time B Data to A Bus	Real Time B Data to A Bus
L	L	X	X	X	H	Output	Input	Stored B Data to A Bus	Stored B Data to A Bus
H	H	X	X	L	X	Input	Output	Real Time A Data to B Bus	Real Time A Data to B Bus
H	H	H or L	X	X	X	Output	Output	Stored A Data to B Bus	Stored A Data to B Bus
H	L	H or L	H or L	H	H	Output	Output	Stored B Data to A Bus	Stored B Data to A Bus

\*H = High level, L = low level, X = irrelevant, I = low-to-high level transition.

The data output functions may be enabled or disabled by various signals at the GAS and GBA inputs. Data input functions are always enabled, i.e., data at the bus sites will be stored on every low-to-high transition on the clock inputs.

FUNCTION TABLE L5672

INPUTS			SHIFT REGISTER FUNCTIONS				STORAGE REGISTER FUNCTIONS					
FS	R/N	SHCLK	STROBE	MODE/CLK	SER/DS	SHIFT	READ FROM SERIAL OUTPUT	WRITE INTO SERIAL INPUT	PARALLEL LOAD	CLEAR	LOAD	
H	X	X	I	X	Z	YES	NO	YES	NO			
X	X	I	I	I	I	YES	YES	NO	NO			
L	L	I	X	X	O16	YES	YES	NO	NO			
L	H	X	X	I	O16	YES	YES	NO	NO			
L	H	I	I	I	I	NO	YES	YES	YES			
L	H	I	H	H	Y15	NO	YES	YES	NO			
L	L	X	H	I	Z	NO	NO	NO	NO			

I = high level, L = low level, X = irrelevant.

NOTES: 1. The last line of function table applies only to those devices having single inputs, i.e., 'L5688 thru 'L5691. 2. The F > D function can be generated by applying the F > D and F < D outputs to a 2-input NAND gate.

SN74182

FUNCTION TABLE  
FOR  $\bar{P}$  OUTPUT

INPUTS				OUTPUT
$\bar{P}_3$	$\bar{P}_2$	$\bar{P}_1$	$\bar{P}_0$	$\bar{P}$
L	L	L	L	L
All other combinations				H

'LS292, 'LS294 FUNCTION TABLE

CLEAR	CLK 1	CLK 2	Q OUTPUT MODE
L	X	X	Cleared to L
H	!	L	Count
H	L	H	Count
H	H	X	Inhibit
H	X	H	Inhibit

FUNCTION TABLE FOR  $\bar{G}$  OUTPUT

INPUTS							OUTPUT
$\bar{G}_3$	$\bar{G}_2$	$\bar{G}_1$	$\bar{G}_0$	$\bar{P}_3$	$\bar{P}_2$	$\bar{P}_1$	$\bar{G}$
L	X	X	X	X	X	X	L
X	L	X	X	L	X	X	L
X	X	L	X	L	L	X	L
X	X	X	L	L	L	L	L
All other combinations							H

## VII

FUNCTION TABLES  
IDT54/74FCT821/23/25B

INPUTS					INTERNAL OUTPUTS		FUNCTION
OE	CLR	EN	D <sub>i</sub>	CP	Q <sub>i</sub>	Y <sub>i</sub>	
H	X	L	L	!	L	Z	Hi-Z
H	L	X	X	X	L	Z	Clear
H	H	H	X	X	NC	Z	Hold
H	H	L	L	!	L	Z	Load
H	H	L	L	!	H	Z	
H	H	L	L	!	L	N	
H	H	L	L	!	H	L	

CONTROL FUNCTION TABLE

Memory Cycle	Control S1 S0	EDAC Function	Data I/O	Check Word I/O	Error Flags	
					SEF	DEF
WRITE	L L	Generate Check Word	Input Data	Output Check Word	L	L
READ	L H	Read Data & Check Word	Input Data	Input Check Word	L	L
READ	H H	Latch & Flag Errors	Latch Data	Latch Check Word	Enabled	
READ	H L	Correct Data Word & Generate Syndrome Bits	Output Corrected Data	Output Syndrome Bits	Enabled	

## IDT54/74FCT822/24/26B

INPUTS					INTERNAL OUTPUTS		FUNCTION
OE	CLR	EN	D <sub>i</sub>	CP	Q <sub>i</sub>	Y <sub>i</sub>	
H	X	L	L	!	H	Z	Hi-Z
H	L	X	X	X	L	Z	Clear
H	H	H	X	X	NC	Z	Hold
H	H	L	L	!	H	Z	Load
H	H	L	L	!	L	N	
H	H	L	L	!	H	L	

H = HIGH

L = LOW

X = Don't Care

NC = No Change

! = LOW-to-HIGH Transition

Z = High Impedance

SN74LS630, SN74LS631

logic

**SN74LS670**

WRITE FUNCTION TABLE (SEE NOTES A, B, AND C)

WRITE INPUTS			WORD			
W <sub>B</sub>	W <sub>A</sub>	Q <sub>D</sub>	0	1	2	3
L	L	L	Q = D	Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>0</sub>
L	H	L	Q <sub>0</sub>	Q = D	Q <sub>0</sub>	Q <sub>0</sub>
H	L	L	Q <sub>0</sub>	Q <sub>0</sub>	Q = D	Q <sub>0</sub>
H	H	L	Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>0</sub>	Q = D
X	X	H	Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>0</sub>

NOTES: A, H = high level, L = low level, X = irrelevant, Z = high impedance (open)

B, Q = D1 - The four selected internal flip-flop outputs will assume the states applied to the four external data inputs.

C, Q<sub>0</sub> - the level of Q before the indicated input conditions were established.

D, W081 - The first bit of word 0, etc.

READ FUNCTION TABLE (SEE NOTES A AND D)

READ INPUTS			OUTPUTS			
R <sub>B</sub>	R <sub>A</sub>	Q <sub>D</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>
L	L	L	W081	W082	W083	W084
L	H	L	W1B1	W1B2	W1B3	W1B4
H	L	L	W2B1	W2B2	W2B3	W2B4
H	H	L	W3B1	W3B2	W3B3	W3B4
X	X	H	Z	Z	Z	Z

**FUNCTION TABLE SN74LS071, SN74LS672**

G	R <sub>B</sub>	R <sub>A</sub>	ECLR	Z1	Z2	SERIAL INPUTS	PARALLEL INPUTS	PARALLEL OUTPUTS	GASC*		
						LS257	LS257	A	B	C	D
L	L	L	X	X	1	X	X	X	X	X	X
L	L	H	X	X	L	X	X	X	X	X	X
L	H	L	L	X	X	X	X	X	X	X	X
L	H	L	H	1	1	X	H	X	X	X	X
L	H	H	L	1	1	X	L	X	X	X	X
L	H	H	L	1	1	L	X	X	X	X	X
L	H	H	H	1	1	X	X	X	X	X	X
H	X	X	L	H	1	X	X	X	X	X	X
H	X	X	H	L	1	X	X	X	X	X	X
L	H	X	E	X	X	X	X	X	X	X	X

\*When the output control G is high, the 3-state outputs are disabled to the high impedance state. However, sequential operation of the shift register and the output at GASC are not affected.

**SN74LS2000**

M2	M1	M0	MODE DESCRIPTION
0	0	0	Direction Discriminator direction discriminator inhibit
0	0	1	single count pulse, synchronous with Us1
0	1	0	single count pulse, synchronous with Us2
0	1	1	double count pulse, synchronous with Us1
1	0	0	double count pulse, synchronous with Us2
1	0	1	quadruple counting
1	1	0	Pulse width measurement 1. Us1 = gate signal Us2 "H" = up counting 2. Us1 = gate signal Us2 "L" = down counting
1	1	1	Frequency measurement Us1 = frequency to be measured Us2 = start/stop gate

**VIII****FUNCTION TABLE**

INPUTS		OUTPUT Y			
OUTPUT CONTROL	SELEC T	A	B	LS257	LS258
H	X	X	X	Z	Z
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

## 2.11 NHỮNG IC 74XXX VÀ IC CMOS 4XXX CÓ CHỨC NĂNG TƯƠNG ĐƯỜNG

<b>AND GATES</b>	<b>COPRATORS</b>	<b>OR GATES</b>
7408            4081	7485            4585	7432            4071
7411            4073		
7421            4082		
<b>EXCLUSIVE OR GATES</b>	<b>NAND GATES</b>	<b>NOR GATES</b>
7486            4070	7400            4011	7402            4001
	7410            4023	7427            4025
	7420            4012	
	7430            4068	
<b>INVERTERS</b>	<b>EXCLUSIVE NOR GATES</b>	<b>COMPLEX GATES</b>
7404            4069	74266           4077	7451            4506
<b>BUS-ORIENTED 3-STATE CIR</b>	<b>ARITHMETIC OPERATORS</b>	<b>SCHMITT TRIGGERS</b>
74LS367        4503	7483            4008	74132           4093
<b>LATCHES</b>	74181           4581	7414            4584
7475            4042	74182           4582	<b>COUNTERS</b>
74173           4076		74160           40160
74279           4044		74161           40161
74259           4099		74162           40162
<b>SHIFT REGISTERS</b>	<b>FLIP-FLOPS</b>	74163           40163
74164           4034	7473            4027	74192           4510
74165           4021	7474            4013	74193           4516
74166           4014	74174           40174	74191           4029
74194           40194	74175           40175	74390           4518
LS299           4094		74393           4520
74195           40195	<b>MUXPLEXERS DATA/SELECTORS</b>	LS716           4522
	74157           4519	LS718           4526
<b>DISPLAY DECODER/DRIVERS</b>	74153           4539	<b>PRIORITY ENCODERS</b>
7448            4558	74251           4521	74148           4532
		<b>MULTIVIBRATORS</b>
	<b>DECODERS/ DEMUXPLEXERS</b>	74123           4528
	74155           4556	

### 3. IC LOGIC CMOS

#### 3.1 ĐẠI CƯƠNG

CMOS được viết tắt từ Complementary – Metall – Oxide – Silicon. Đầu tiên CMOS được nghiên cứu để sử dụng trong kỹ thuật hàng không vũ trụ. Với các đặc tính như không bị lệ thuộc vào lưỡi điện, miễn nhiễu ... ngày nay CMOS được sử dụng rộng rãi trong điện tử công nghiệp, điện tử y khoa, kỹ thuật xe hơi và cả trong kỹ thuật máy tính điện tử. CMOS có một số đặc tính quan trọng:

- Công suất tiêu tán bé: 02,5nW per Gate (static).
- Điện áp làm việc từ 3V đến 15V, max 18V.
- CMOS chống nhiễu tốt.
- Khoảng nhiệt độ làm việc:
  - \* Thương mại : - 40°C -+85°C
  - \* Quân sự : -55°C-+125°C
- DC Fan Out > 50

Lúc không làm việc, 2 transistor kênh P và N không bao giờ dẫn điện cùng một lúc. Vì thế dòng điện chạy từ Vdd đến Vss chỉ là dòng điện rò khoảng 0,5nA cho mỗi cổng. Với điện áp +5V công suất tiêu tán cho mỗi cổng chỉ có 2,5nW. Công suất tiêu tán (cstt) của CMOS tăng nhanh với tần số làm việc và cao hơn so với loại LS-TTL trong khoảng từ 100kHz đến 2MHz. Nhưng trên thực tế cstt cho IC CMOS trong lúc làm việc không bao giờ lớn hơn cstt của IC TTL ngay trong lúc không làm việc ! Có hai lý do:

- Các cổng CMOS chỉ dẫn điện khi nó làm việc (khi các cổng Clock và Data được kích).
- Trên thực tế lúc làm việc với tần số cao, không phải cổng nào của IC CMOS cũng làm việc.

### 3.2 ĐIỆN ÁP

CMOS có thể hoạt động từ 3V đến 15V. Tuy nhiên với điện áp nhỏ hơn 4,5V thời gian trễ sẽ gia tăng (vận tốc làm việc chậm lại), tổng trở ra cũng lớn hơn và đồng thời tính chống nhiễu sẽ giảm. Với điện áp lớn hơn 15V ta cũng có những bất lợi:

- Công suất tiêu tán lúc CMOS hoạt động tăng cao.
- Với những xung nhiễu từ nguồn vượt quá điện áp đánh thủng (20V), tạo ra hiệu ứng SCR – latch-up và làm hỏng IC nếu dòng không được hạn chế từ bên ngoài. Trường hợp bắt buộc phải dùng điện áp cao hơn 15V (cao nhất 18V) cần phải có điện trở hạn dòng bên ngoài.

### 3.3 THỜI GIAN TRỄ

Điện áp càng cao thì CMOS hoạt động càng nhanh. Thời gian trễ gia tăng với nhiệt độ và tải điện dung.

### 3.4 TÍNH MIỄN NHIỄU (Noise immunity)

CMOS chống nhiễu rất tốt, thường là 45% điện áp cấp, 2,25V với điện áp 5V và 4,5V cho điện áp 10V. Thời gian trễ của CMOS đóng vai trò như một bộ lọc nhiễu. Xung 10ns biến mất sau một chuỗi các cổng CMOS, sau một chuỗi các TTL thì được khuyếch đại. Vì tính chất đặc biệt này CMOS được dùng để thiết kế trong các mạch điện của các thiết bị công nghiệp phải hoạt động trong một môi trường đầy nhiễu điện và điện từ. Với điện áp cấp +5V CMOS vẫn làm việc bình thường với sự mất ổn định của điện áp cấp hay điện áp nhiễu đến 1V.

### 3.5 GIAO TIẾP VỚI HỌC TTL

Với điện áp 5V CMOS giao tiếp thẳng với TTL. Tổng trở vào của CMOS rất lớn, TTL có thể tải vô số cổng CMOS mà không làm mất Fan Out ở trạng thái LOW.

Trạng thái High của TTL thường chỉ có 3,5V. Ta nên mắc vào ngõ ra của TTL một điện trở nâng áp (pull up resistor) từ  $1k\Omega$  với điện áp 5V để trạng thái High được kéo lên đến 4,5V hay hơn. Khi CMOS hoạt động với điện áp  $> 5V$  sự giao tiếp thẳng với TTL lên cao 15V.

Các IC 4009, 4010 4049 và 4050 tạo sự giao tiếp giữa mức điện CMOS và TTL khi CMOS dùng điện áp  $> 5V$ .

### 3.6 ĐIỆN DUNG NGÕ RA/VÀO

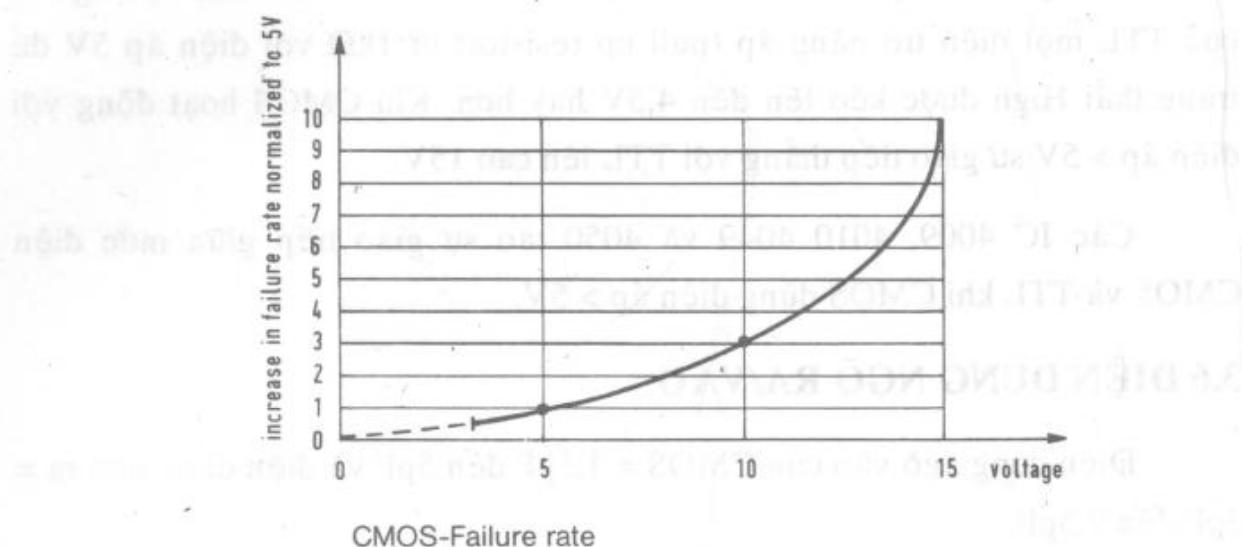
Điện dung ngõ vào của CMOS = 1,5pF đến 5pF và điện dung ngõ ra = 3pF đến 7,5pF.

### 3.7 NHỮNG CHÚ Ý KHI SỬ DỤNG CMOS

Vì ngõ vào của CMOS có điện trở vào lên đến  $10^{14}\Omega$ , điện dung  $\approx 1pF$  rất bé với dòng điện rò không đáng kể ( $10pA$ ), nếu không có biện pháp bảo vệ thích hợp, lớp  $SiO_2$  của gate ở ngõ vào có thể bị phá hủy vì tĩnh điện nạp vượt quá một trị số cho phép  $\approx 100V$ . Tĩnh điện của nylon  $\approx 2,2kV$ ; 1 bao plastic  $\approx 2$  đến  $4kV$  có thể dễ dàng làm hỏng lớp oxid của gate.

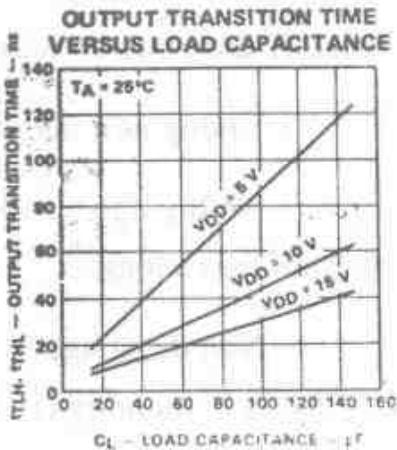
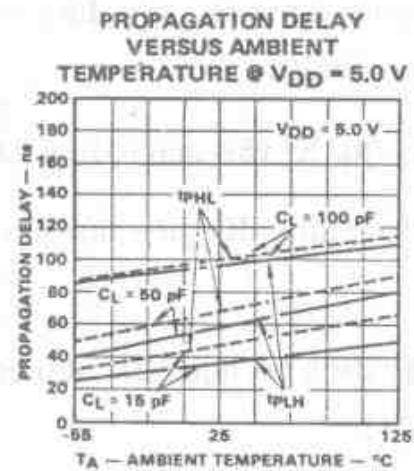
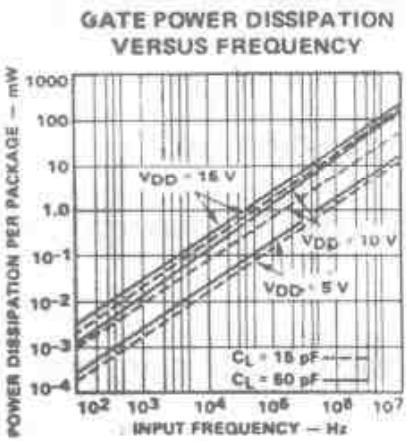
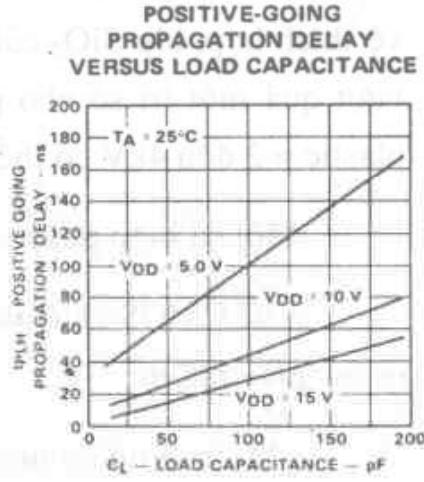
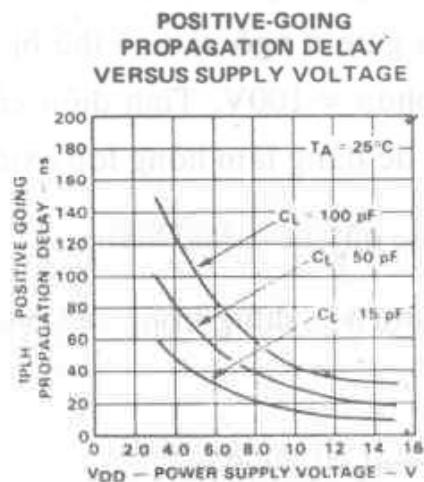
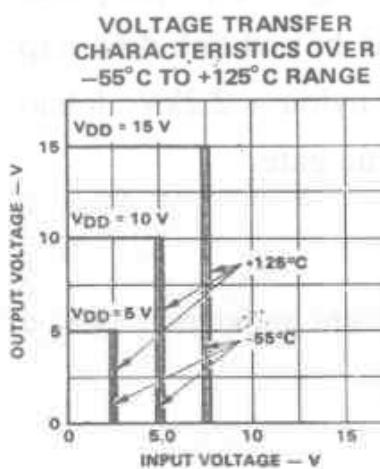
Một số biện pháp sau đây nên thực hiện:

- IC CMOS chưa dùng nên đựng trong các ống nhựa antistatic hay bọc trong giấy nhôm.
- Mỏ hàn nên dùng loại có nối đất.
- Bàn làm việc và người làm việc nên được nối đất (qua một điện trở  $1M\Omega$  để đảm bảo an toàn lao động).
- Không nên tháo hay ráp IC vào mạch điện đang có điện áp.
- Những ngõ vào không dùng đến nên nối với  $V_{SS}$  hay  $V_{DD}$  hay ngõ ra của một mạch logic.
- Nên dùng nguồn cấp điện bé hơn 12V nếu có thể để giảm tỉ số IC CMOS bị hư hỏng (H.3.7.1).



### H.3.7.1

#### 4000B SERIES CHARACTERISTICS



### **3.8 CÔNG SUẤT TIÊU TÁN MỘT CỔNG NAND 4000B**

$$P = 10nW + 1,5mW/MHz; (C_L = 15pF, V_{DD} = 10V)$$

$$P = 10nW + 3,38mW/MHz; (C_L = 15pF, V_{DD} = 15V)$$

### **3.9 NHỮNG CHÚ Ý CẦN THIẾT KHI THIẾT KẾ MẠCH VỚI IC CMOS**

- Tất cả các chân không dùng nên nối với đất hay điện áp cấp để tránh loại logic có lê ... cho IC.

- Những tín hiệu vào thay đổi mức logic quá chậm sẽ làm IC CMOS dao động và IC bị trigger nhiều lần. Điện áp cấp cho IC ổn áp kém và không sạch dễ đưa đến trường hợp này vì điện áp ngưỡng vào của IC tùy thuộc vào điện áp cấp. Với các xung đồng bộ có thời gian lên chậm IC CMOS cũng thường hiểu sai. Flip-flops, Register và Latch – ICs có thời gian giữ (hold time) khá lâu. Dữ liệu vào thường phải chờ sau khi sườn xung đồng bộ đã xuất hiện.

- IC CMOS cùng loại có đặc trưng kỹ thuật khác nhau với các nhà chế tạo khác nhau.

- Dòng ra của IC CMOS loại B cho toàn dải nhiệt độ làm việc khoảng 0,36mA đủ để thúc 1 cổng LS – TTL.

IC logic CMOS loại 4000A, 4000UB không có đếm; 4000A/B, 4000B có đếm.

Loại có đếm có những ưu điểm sau:

- Tổng trở ra không tùy thuộc vào điện áp ra, vì thế độ dốc xung lên hay xung xuống đều bằng nhau.

- Khoảng an toàn lớn hơn.

- Loại không có đếm có thời gian trễ bé hơn.

IC CMOS với ký hiệu B (có đệm) hay UB (không có đệm) là những loại có đặc trưng kỹ thuật đạt những tiêu chuẩn tối thiểu của công nghiệp. Cổng và bộ đảo của của loại UB chỉ được cấu tạo có một tầng. Với độ khuyếch đại bé loại UB có độ an toàn và tính chất truyền tín hiệu kém. Nhưng với độ khuyết đại kém, loại UB có những ưu điểm khi các cổng và bộ đảo được dùng với chế độ tuyến tính như những bộ dao động, monoflop hoặc bộ khuyếch đại. Ở ngõ ra ta được những tín hiệu sạch và ổn định. Và vì chỉ cấu tạo bởi một tầng, UB có vận tốc làm việc nhanh hơn. Chỉ có một số IC CMOS được chế tạo theo loại UB như: 4000, 4001, 4002, 40011, 4023, 4025, 4041, 4049 và 4069. Còn lại đều là B.

### 3.10 LOGIC CMOS LOẠI MỘT CỔNG

## 1 Gatter CMOS

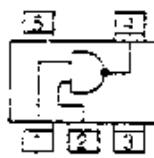


Abb.1

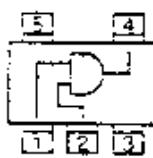


Abb.2

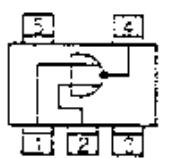


Abb.3

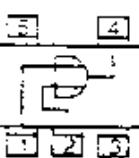


Abb.4

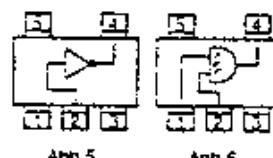


Abb.5

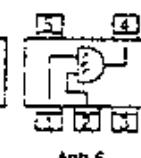


Abb.6

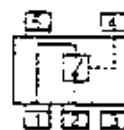


Abb.7

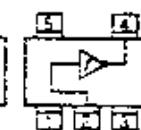


Abb.8

### 1 Gatter CMOS

Abmessungen 2,9 x 1,6 mm • Funktion wie Standard CMOS Serie.

Best.-Nr.	Type	entspricht	Abb.	Code
17 16 62-55	TC 4 S 11 F	CD 4011 B	1	C1
17 16 70-55	TC 4 S 81 F	CD 4081 B	2	C2
17 16 89-55	TC 4 S 01 F	CD 4001 B	3	C3
17 16 97-55	TC 4 S 71 F	CD 4071 B	4	C4
17 17 19-55	TC 4 S U 69 F	CD 4069 UB	5	C6
17 17 27-55	TC 4 S 30 F	CD 4030 B	6	C8
17 17 35-55	TC 4 S 66 F	CD 4066 B	7	C9
17 17 43-55	TC 4 S 584 F	CD 4584 B	8	CA

### 3.11 HỘI LOGIC CMOS 4XXX XẾP THEO CHỨC NĂNG

#### NOR/NAND

4002	Dual 4-Input NOR
4012	Dual 4-Input NAND
4025	Triple 3-Input NOR
4023	Triple 3-Input NAND
4001	Quad 2-Input NOR
4000	Dual 3-Input NOR plus inverter
4011	Quad 2-Input NAND
4078	8-Input NOR/OR
4068	8-Input NAND/AND
4077	Quad Exclusive NOR Gate
40107	Dual 2-Input NAND Buffer/Driver
4093	Quad 2-Input NAND Schmitt Trigger

#### OR/AND (Hoặc/ Và)

4072	Dual 4-Input OR
4082	Dual 4-Input AND
4075	Triple 3-Input OR
4073	Triple 3-Input AND
4071	Quad 2-Input OR
4081	Quad 2-Input AND
4507	Quad Exclusive OR Gate

#### BUFFERS / INVERTERS / TRANSCEIVER

4007	Dual complementary pair plus Inverter
4069	Hex Inverter
4502	Hex Inverter/buffer (3-state)
4503	Hex Buffer (3-State non-inverting)
40097	3-State Hex Non-Inverting Buffer

40098	3-State Hex Inverting Buffer
4009	Hex Buffer/Converter (Inverting)
4049	Hex Buffer/Converter (Inverting)
4010	Hex Buffer/Converter (Non-inverting)
4050	Hex Buffer/Converter (Non-invert)
4041	Quad true/complement buffer
4755	Transceiver for serial data communication
40107	Dual 2-Input NAND Buffer/Driver
40240	Octal Buffers with 3-State Outputs
40244	" " "
40245	Octal Bus Transceiver with 3-State Outputs

#### INTERFACE

4738	IEC/IEEE Bus Interface
40109	Quad low-to-high voltage
4009/4049	Hex high-to-low voltage (invert)
4010/4050	Hex high-to-low voltage (non-inverting)
40107	Dual 2-Input NAND Buffer/Driver
40115/40116	8-bit bidirectional CMOS-to-TLL level converter

#### SCHMITT TRIGGER (Trigor Schmitt)

4093	Quad 2-Input NAND
40106	Hex Schmitt Trigger
40014	Hex Schmitt Trigger

#### COMPLEX GATES/AOI (Cổng phức tạp/ Và-Hoặc-Đảo)

4037	Triple AND-OR bi-phase pairs
4030/4070	Quad exclusive-OR
4077	Quad exclusive-NOR
4019	Quad AND/OR Select
4085	Dual 2-wide 2-Input AND/OR invert

4086	Expandable 4-wide 2-Input AND/OR invert (AOI)
4048	Multifunctional expandable 8-Input (3-State output)
4501	Triple Gate
4506	Dual Expandable AND-OR-Invert

#### DECODERS/ENCODERS (Bộ giải mã/Bộ mã hóa)

4028	BCD-to Decimal Decoder
4532	8-Input Priority Encoder
40147	10-line to 4-line BCD priority Encoder
4514	4-bit Latch/4-to-16 line Decoder (output high)
4515	4-bit Latch/4-to-16 line Decoder (output low)
4555	Dual 1-of-4 Decoder/Demultiplexer (output high)
4556	Dual 1-of-4 Decoder/Demultiplexer (output low)

#### MULTIVIBRATORS

4047	Low power Monostable/astable
4098	Dual Monostable
4528	Dual Retriggerable Resettable Monostable Multivibrator
4538	Dual precision Monostable

#### FLIP-FLOPS

4013	Dual "D" set/reset
4027	Dual "J-K" set/reset
4095	Gated "J-K Master-Slave" (non-inverting)
4096	Gated "J-K Master Slave" (non-inverting and inverting)
40175	Quad "D"
40174	Hex "D"
4076	4-bit "D" with 3-state outputs
40374	Octal D-Type Flip-Flop with 3-State Outputs

## LATCHES

4042	Quad clocked "D"
4043	Quad NOR R/S (3-state) outputs
4044	Quad NAND R/S (3-state outputs)
4508	Dual 4 bit
40373	Octal Transparent Latch with 3-State Outputs
4099/4727	8-bit addressable
4723	Dual 4-bit addressable

## REGISTERS

### *Shift Registers-Static*

4015	Dual 4-Stage with serial input/parallel output
4006	18-Stage
4031	64-Stage
4517	Dual 64-bit
4014	8-Stage with synchronous parallel or serial input/serial output
4021	8-bit with asynchronous parallel input or synchronous serial input/serial output
4035	4-bit parallel-in/parallel-out with J-K input and true/complement output
40104	4-bit universal bidirectional with 3-state outputs
40194	4-bit universal bidirectional with asynchronous master reset
40195/74C195	4-bit universal
4034	8-bit bidirectional parallel or serial input/parallel out
40100	32-bit-left/right
4094	8-bit shift-and-store bus
4562	128-bit
4549/4559	Successive Approximation
4557	10-to-64 Variable Length
4731	Quad 64-bit static

### ***Shift Registers-Dynamic***

4062            200-Stage

### ***FIFO Buffer Register***

40105            4bit x 16 word

### ***Storage Registers***

4099/4724        8-bit addressable Latch

4076            4-bit "D"-type/3-stage outputs

40108/40208      4 x 4 Multiport

## **COUNTERS/DIVIDER**

### ***Binary Ripple***

4024/4727        7-Stage

4040            12-Stage

4020            14-Stage

4060            14-Stage Counter/Divider and Oscillator

### ***Synchronous (Đồng bộ)***

4017            Decade Counter/Divider plus 10 decoded decimal outputs

4022            Divide-by-8 Counter/Divider with 8 decimal outputs

4018            Presettable divide-by-N Counter fixed or programmable

4059            Programmable-divide-by-N Counter

4029            Presettable up/down Counter binary or BCD-decade

4510            Presettable 4-bit BCD up/down

4516            Presettable 4-bit binary up/down

40102            Presettable 2-Decade BCD down

40103            Presettable 8-bit binary down

40192            Presettable 4-bit BCD up/down

40193            Presettable 4-bit binary up/down

4518            Dual BCD up Counter

4520            Dual binary up Counter

4521            24-Stage Binary Counter

4522            4-bit BCD Programmable Down Counter

4526	4-bit Binary Programmable Down Counter
4534	Real Time 5-Decade Counter
4553	3-Digit BCD Counter
4568	Phase Comparator and Programmable
4569	High Speed Programmable Divide-by-N Dual 4-bit BCD/Binary Counter
4722	Programmable Timer/Counter
40160	Decade Counter/asynchronous clear
40161	Binary Counter/asynchronous clear
40162	Decade Counter/synchronous clear
40163	Binary Counter/synchronous clear

#### TIMERS (Thời gian chuẩn)

4045	21-Stage
4536	Programmable
4722	Programmable Timer/Counter
4541	Programmable Oscillator/Timer
4753	Universal Timer Module

#### FREQUENCY GENERATOR (Mạch phát tần số)

4702	Programmable Bit Rate Generator
4566	Industrial Time Base Generator

#### DISPLAY DRIVERS

##### *With Counter*

4026	Decade Counter/Divider with 7 Segment display outputs and display enable
4033	Decade Counter/Divider with 7 Segment display outputs and ripple blanking
40110	Up/Down Counter-Latch-Decoder-Driver

##### *For Light-Emitting-Diode Drive*

4511/4311/4368	BCD-to-7-Segment Latch/Decoder/Driver
4558	BCD-to-7-Segment Decoder

## DISPLAY DRIVERS

### *For Liquid-Crystal-Display Drive*

- 4054            4-Segment
- 4055            BCD-to-7-Segment Decoder/Driver with "display-frequency" output
- 4056            BCD-to-7-Segment Decoder/Driver with strobed-latch function
- 4543            BCD-to-7-Segment Latch/Decoder
- 4754            18-Element Bar Graph 2 LCD-Driver

## QUAD BILATERAL SWITCHES

- 4016            For transmission or multiplexing of analog or digital signal
- 4066            "                 "                 "
- 4316            Quad Analog Switch with Level Translation

## MULTIPLEXERS/DEMULITPLEXERS

### *Analog*

- 4053            Triple 2-channel
- 4052            Differential 4-channel
- 4051            Single 8-channel
- 4097            Differential 8-channel
- 4067            Single 16-channel
- 4741            4 X 4 Cross point Switch
- 4351/52/53      Analog Multiplexers/Demultiplexer with latch

### *Digital*

- 4019            Quad AND/OR select
- 4555            Dual 1-of-4 Decoder/Demultiplexer (outputs high)
- 4556            Dual 1-of-4 Decoder/Demultiplexer (outputs low)
- 40257          Quad 2-line-to-1-line
- 4512            8-channel
- 4539            Dual 4-Input

## **PHASE-LOCKED LOOP**

**4046                  Micropower PLL**

## **ARITHMETIC OPERATORS**

**4008                  4-bit full Adder with parallel carry out**  
**4032                  Triple serial Adder, positive logic**  
**4038                  Triple serial Adder, negative logic**  
**4063/4585            4-bit magnitude Comparator**  
**4030/4070/4507      Quad exclusive-OR Gate**  
**4077                  Quad exclusive-NOR Gate**  
**4560                  NBCD Adder (natural binary coded decimal Adder)**

## **ALU/RATE MULTIPLIERS**

**40181/4057            4-bit arithmetic logic unit**  
**4527                  BCD rate Multiplier**  
**4089                  Binary Rate Multiplier**  
**40182                  Look-ahead-carry block**  
**4554                  2x2-Bit Parallel Binary Multiplier**

## **PARITY GENERATOR/CHECKER**

**40101                9-bit**  
**4531                13-Input Parity Checker Generator**

## **FREQUENCY SYNTHESIZER**

**4750                Frequency Synthesizer**  
**4752                A.C Motor Control Circuits**

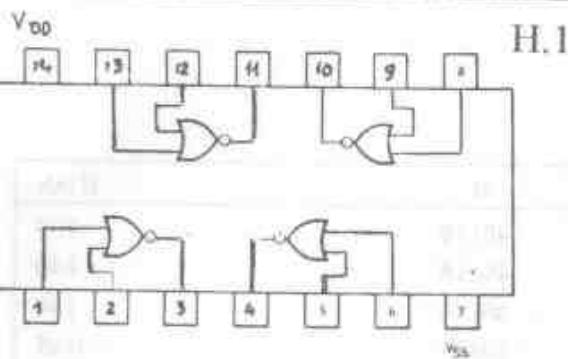
### 3.12 HỘI LOGIC CMOS 4000 XẾP THEO SỐ THỨ TỰ

IC	Hình	IC	Hình
4000	85	4041	31
4001	1	4042	29
4002	2	4043	30
4006	3	4044	32
4007	6	4045	33
4008	5	4046	34
4009	88	4046	96
4010	90	4047	35
4011	4	4048	93
4012	7	4049	36
4013	8	4050	39
4014	9	4051	37
4015	10	4052	38
4016	11	4053	40
4017	12	4054	94
4018	13	4055	95
4019	14	4056	95
4020	15	4057	99
4021	17	4059	97
4022	16	4060	98
4023	20	4062	100
4024	21	4063	101
4025	18	4066	42
4026	86	4067	43
4027	19	4067	102
4028	22	4068	41
4029	23	4069	44
4030	24	4070	45
4031	25	4071	46
4032	89	4072	104
4033	91	4073	48
4034	28	4075	49
4035	26	4076	47
4037	87	4077	50
4038	92	4078	51
4040	27	4078	52
		4082	103

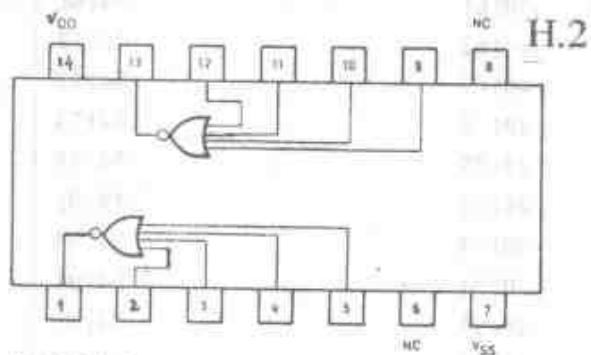
IC	Hình	IC	Hình
4085	53	4528	65
4086	54	4529	119
4089	105	4530	120
4093	56	4531	67
4094	108	4532	68
4095	110	4534	118
4096	106	4536	121
4097	102	4536	122
4098	65	4538	123
4099	109	4539	69
4104	55	4541	125
4311	58	4543	70
4316	151	4549	124
4351	152	4553	126
4352	153	4554	128
4353	154	4555	71
4368	58	4556	71
4501	111	4557	73
4501	115	4558	127
4502	107	4559	124
4503	112	4562	129
4506	113	4566	130
4507	4030	4568	131
4508	114	4569	132
4510	57	4572	134
4511	58	4580	136
4512	59	4582	74
4513	175	4583	133
4514	60	4584	138
4515	61	4585	135
4516	63	4702	75
4517	116	4703	72
4518	64	4710	76
4519	117	4720	77
4520	64	4722	78
4521	62	4723	79
4522	64	4724	80
4526	64	4725	81
4527	66	4727	82

IC	Hình	IC	Hình
4731	83	40110	139
4737	159	40115	140
4738	160	40116	140
4741	84	40147	74147
4750	162	40160	74160
4751	163	40161	74161
4752	164	40162	74162
4753	155	40163	74163
4754	156	40174	74174
4755	158	40175	74175
14408	158	40192	74192
14409	158	40193	74193
14410	158	40194	74194
14411	173	40195	74195
14412	173	40208	146
14415	158	40240	161
14419	166	40244	158
14422	169	40245	157
14431	172	40257	74257
14433	167	40373	149
14435	170	40374	150
14440	165		
14450	168		
14451	171		
40097	174		
40098	174		
40100	137		
40101	141		
40102	142		
40103	142		
40104	143		
40105	144		
40106	143		
40107	147		
40108	145		
40109	148		

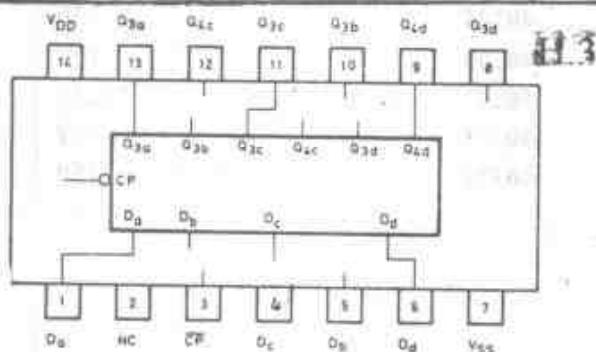
### 3.13 SƠ ĐỒ CHÂN



**4001B** Quad 2-Input NOR Gate



**4002B** Dual 4-Input NOR Gate



**4006B** 18-Stage Static Shift Register

Pin Names

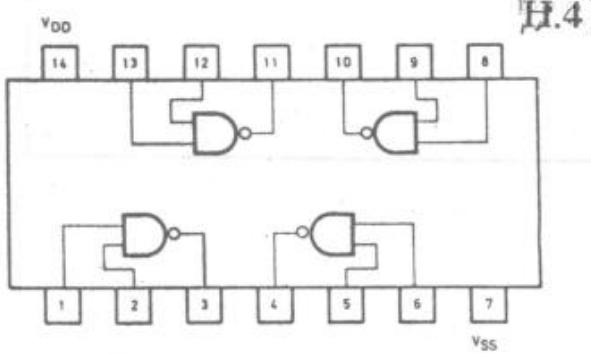
D<sub>a</sub>-D<sub>d</sub>

Data Inputs

CP

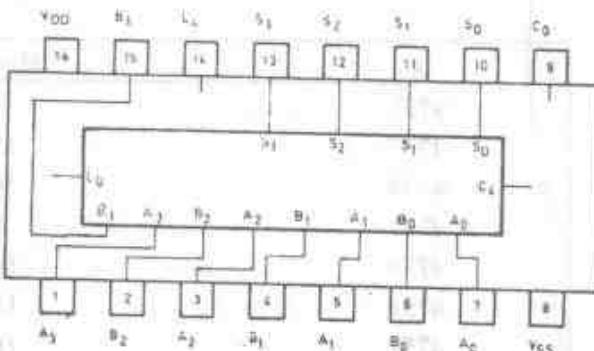
Clock Input (H-L Edge-Triggered)

Q<sub>3a</sub>-Q<sub>3d</sub>, Q<sub>4a</sub>, Q<sub>4d</sub> Data Outputs



**4011B** Quad 2-Input NAND Gate

**4008B** 4-Bit Binary Full Adder



H.5

Pin Names

A<sub>0</sub>-A<sub>3</sub>, B<sub>0</sub>-B<sub>3</sub>

C<sub>0</sub>

S<sub>0</sub>-S<sub>3</sub>

C<sub>4</sub>

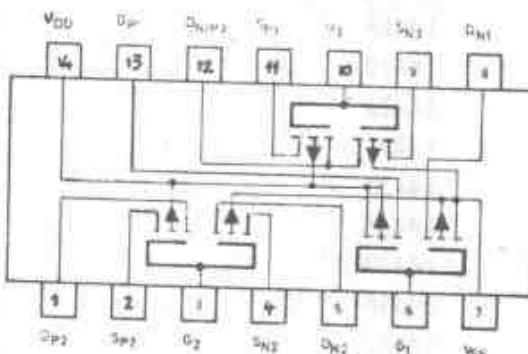
Data Inputs

Carry Input

Sum Outputs

Carry Output

**4007UB** Dual Complementary Pair Plus Inverter



H.6

Pin Names

S<sub>p2</sub>, S<sub>n2</sub>

Source Connection to Second and Third p-channel Transistors

D<sub>p1</sub>, D<sub>n2</sub>

Drain Connection from the First and Second p-channel Transistors

D<sub>n1</sub>, D<sub>n2</sub>

Drain Connection from the First and Second n-channel Transistors

S<sub>n2</sub>, S<sub>n3</sub>

Source Connection to the Second and Third n-channel Transistors

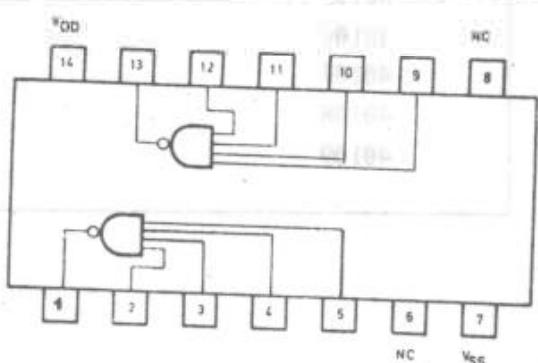
D<sub>n1</sub>, D<sub>n2</sub>

Common Connection to the Third p-channel and n-channel Transistor Drains

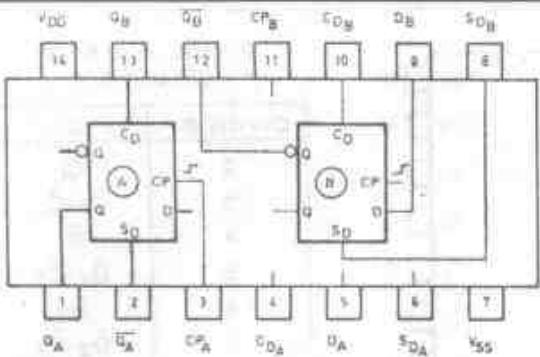
G<sub>1</sub>-G<sub>2</sub>

Gate Connection to n- and p-channel Transistors 1,2 and 3

H.7



**4012B** Dual 4-Input NAND Gate



### 4013B Dual D Flip-Flop

**Pin Names**

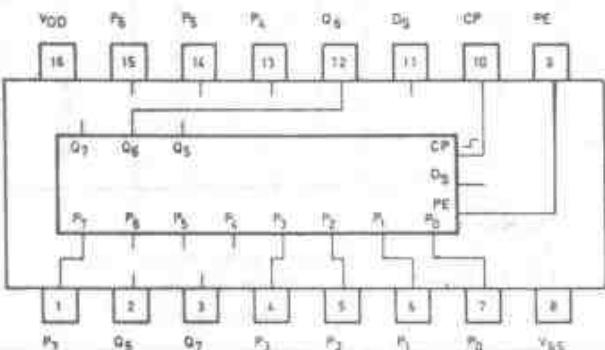
D	Data Input
CP	Clock Input (L = H Edge-Trigged)
SD	Asynchronous Set Direct Input (Active HIGH)
CD	Asynchronous Clear Direct Input (Active HIGH)
Q	True Output
Q'	Complement Output

ASYNCHRONOUS INPUTS		OUTPUTS	
S <sub>D</sub>	C <sub>D</sub>	Q	Q'
L	H	L	H
H	L	H	L
H	H	H	H

SYNCHRONOUS INPUTS		OUTPUTS	
CP	D	Q <sub>n+1</sub>	Q' <sub>n+1</sub>
L	L	L	H
L	H	H	L

Conditions: S<sub>D</sub> = C<sub>D</sub> = LOW

H.8



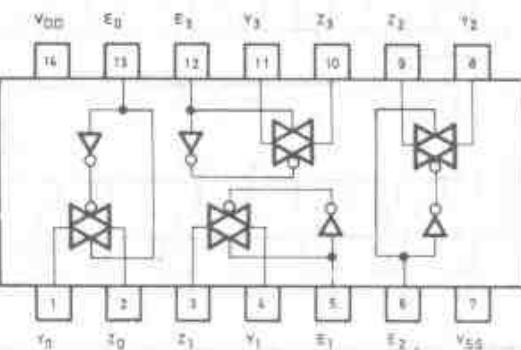
### 4014B 8-Bit Shift Register

**Pin Names**

PE	Parallel Enable Input
P <sub>0</sub> -P <sub>7</sub>	Parallel Data Inputs
D <sub>5</sub>	Serial Data Input
CP	Clock Input (L = H Edge-Trigged)
Q <sub>0</sub> -Q <sub>2</sub> , Q <sub>4</sub>	Buffered Parallel Outputs from the Last Three Stages

H.9

### 4016B Quad Bilateral Switches



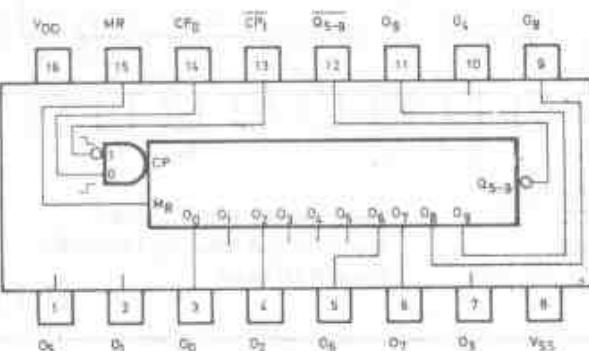
H.11

**Pin Names**

E <sub>1</sub> -E <sub>8</sub>	Enable Inputs
Y <sub>1</sub> -Y <sub>8</sub>	Input/Output Terminals
Z <sub>1</sub> -Z <sub>8</sub>	Input/Output Terminals

H.12

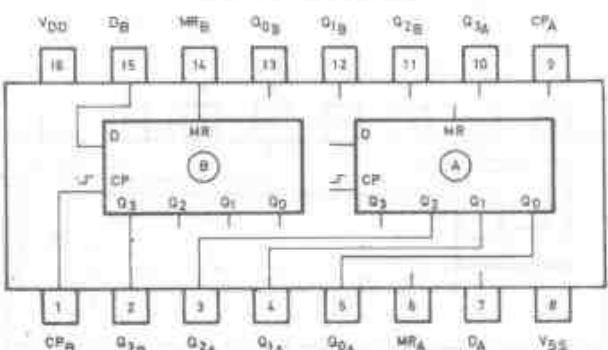
### 4017B 5-Stage Johnson Counter



#### FUNCTIONAL TRUTH TABLE

MR	CP <sub>0</sub>	CP <sub>1</sub>	OPERATION
H	X	X	Q <sub>0</sub> = Q <sub>5-9</sub> = H; Q <sub>1</sub> -Q <sub>9</sub> = L
L	H	H → L	Counter Advances
L	L → H	L	Counter Advances
L	L	X	No Change
L	X	H	No Change
L	H	L → H	No Change
L	H → L	L	No Change

### 4015B Dual 4-Bit Static Shift Register



H.10

D <sub>B</sub> , D <sub>A</sub>	Serial Data Input
MR <sub>B</sub> , MR <sub>A</sub>	Master Reset Input (Active HIGH)
CP <sub>B</sub> , CP <sub>A</sub>	Clock Input (L = H Edge-Trigged)
Q <sub>3B</sub> , Q <sub>2B</sub> , Q <sub>1B</sub> , Q <sub>0B</sub>	Parallel Outputs
Q <sub>3A</sub> , Q <sub>2A</sub> , Q <sub>1A</sub> , Q <sub>0A</sub>	Parallel Outputs

CP <sub>0</sub>	CP <sub>1</sub>	MR	Q <sub>0</sub> -Q <sub>9</sub>
CP <sub>0</sub>	CP <sub>1</sub>	MR	Q <sub>0</sub> -Q <sub>9</sub>
CP <sub>0</sub>	CP <sub>1</sub>	MR	Q <sub>0</sub> -Q <sub>9</sub>
CP <sub>0</sub>	CP <sub>1</sub>	MR	Q <sub>0</sub> -Q <sub>9</sub>
CP <sub>0</sub>	CP <sub>1</sub>	MR	Q <sub>0</sub> -Q <sub>9</sub>

# 4018B

5-Stage Johnson Counter

## PIN NAMES

PL	Parallel Load Input
$P_0 - P_4$	Parallel Inputs
D	Data Input
CP	Clock Input (L-H Edge-Triggered)
MR	Master Reset Input
$\bar{Q}_0 - \bar{Q}_4$	Buffered Outputs (Active LOW)

H.13

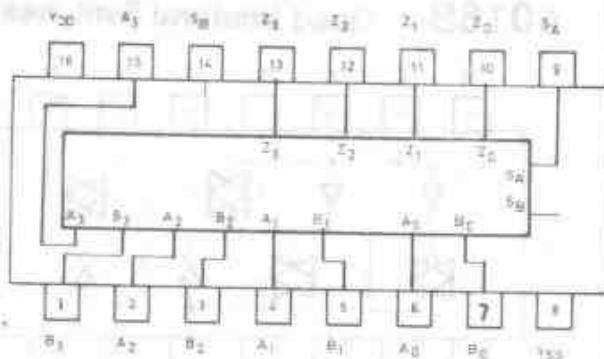


## DIVIDE-BY-N MODE SELECTION

DIVIDE BY	D INPUT
2	$\bar{Q}_0$
3	$\bar{Q}_0 \cdot \bar{Q}_1$
4	$\bar{Q}_1$
5	$\bar{Q}_1 \cdot \bar{Q}_2$
6	$\bar{Q}_2$
7	$\bar{Q}_2 \cdot \bar{Q}_3$
8	$\bar{Q}_3$
9	$\bar{Q}_3 \cdot \bar{Q}_4$
10	$\bar{Q}_4$

# 4019B Quad 2-Input Multiplexer

H.14



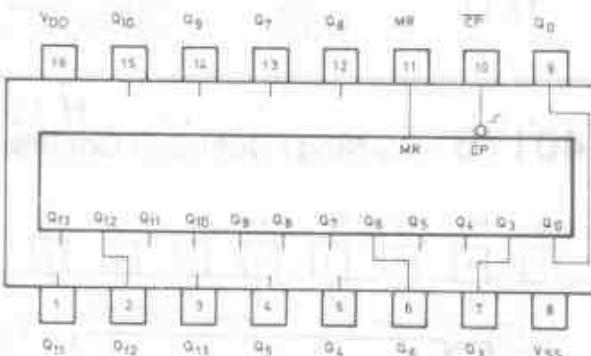
## TRUTH TABLE

SELECT	INPUTS	OUTPUT		
S <sub>A</sub>	S <sub>B</sub>	A <sub>1</sub>	B <sub>n</sub>	Z <sub>n</sub>
L	L	1	X	L
H	1	1	X	L
H	L	1	A	H
L	H	1	L	L
L	H	X	H	H
H	H	H	X	H
H	H	X	H	H
H	H	L	L	L

## Pin Names

S<sub>A</sub>, S<sub>B</sub>: Select Inputs (Active HIGH)  
A<sub>0</sub>-A<sub>3</sub>, B<sub>0</sub>-B<sub>3</sub>: Multiplexer Inputs  
Z<sub>0</sub>-Z<sub>3</sub>: Multiplexer Outputs

# 4020B 14-Stage Binary Counter



## Pin Names

CP: Clock Input (H-L Triggered)  
MR: Master Reset Input (Active HIGH)  
Q<sub>0</sub>, Q<sub>3</sub>-Q<sub>13</sub>: Parallel Outputs

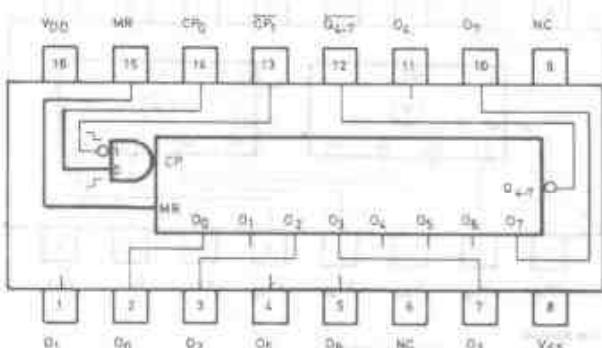
H.15

## FUNCTIONAL TRUTH TABLE

MR	CP <sub>0</sub>	CP <sub>1</sub>	OPERATION
H	X	X	$Q_0 = Q_{4-7} = H; Q_1-Q_7 = L$
L	H	H-L	Counter Advances
L	L-H	L	Counter Advances
L	L	X	No Change
L	X	H	No Change
L	H	L-H	No Change
L	L-L	L	No Change

H = HIGH Level  
L = LOW Level  
L-H = LOW-to-HIGH Transition  
H-L = HIGH-to-LOW Transition  
X = Don't Care

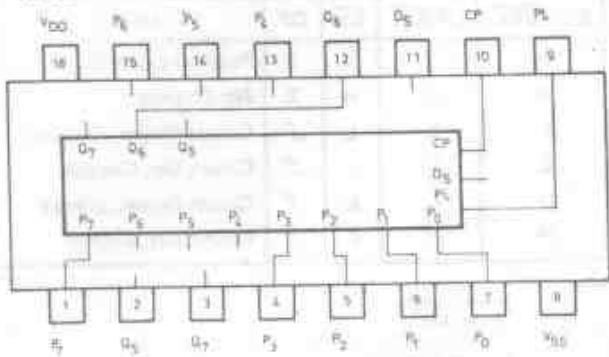
# 4022B 4-Stage Divide-by-8 Johnson Counter



## Pin Names

CP<sub>0</sub>: Clock Input (L-H Edge-Triggered)  
CP<sub>1</sub>: Clock Input (H-L Edge-Triggered)  
MR: Master Reset Input  
Q<sub>0</sub>-Q<sub>7</sub>: Decoded Outputs  
Q<sub>4-7</sub>: Carry (Active LOW) Output

### 4021B 8-Bit Shift Register

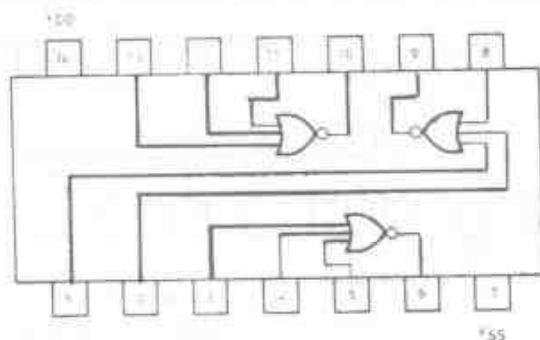


#### Pin Names

PL	Parallel Load Input	H.17
P <sub>0</sub> -P <sub>7</sub>	Parallel Data Inputs	
D <sub>S</sub>	Serial Data Input	
CP	Clock Input (L +H Edge Triggered)	

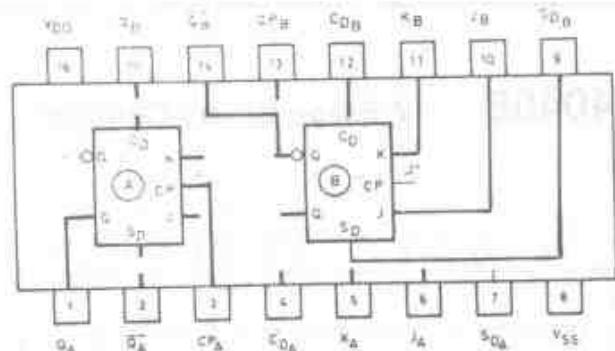
Q<sub>5</sub>-Q<sub>7</sub> Buffered Parallel Outputs from the Last Three Stages

### 4025B Triple 3-Input NOR Gate



H.18

### 4027B Dual JK Flip-Flop H.19

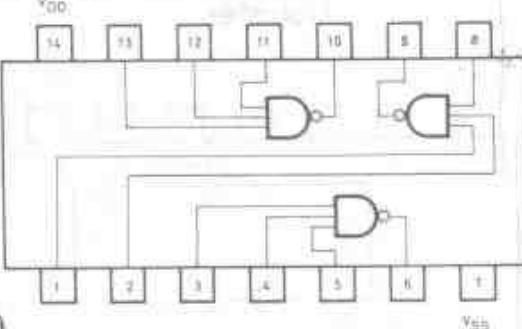


SYNCHRONOUS INPUTS	OUTPUTS
CP J K	Q <sub>n+1</sub> $\bar{Q}_{n+1}$
J L L	NO CHANGE
J H L	H L
J L H	L H
J H H	$\bar{Q}_n$ Q <sub>n</sub>

Conditions: S<sub>D</sub> = C<sub>D</sub> = LOW

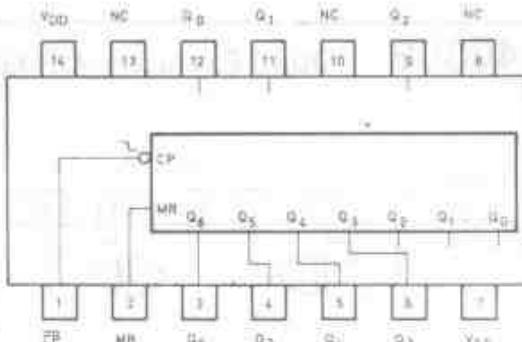
ASYNCHRONOUS INPUTS	OUTPUTS
S <sub>D</sub> C <sub>D</sub>	Q $\bar{Q}$
L H	L H
H L	H L
H H	H H

### 4023B Triple 3-Input NAND Gate



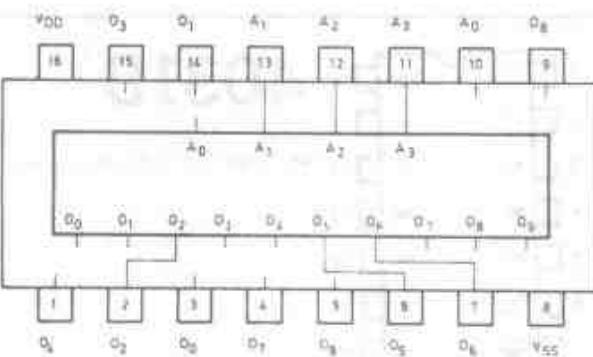
H.20

### 4024B 7-Stage Binary Counter



H.21

### 4028B 1-of-10 Decoder H.22



#### Pin Names

A<sub>0</sub>-A<sub>3</sub>  
Q<sub>0</sub>-Q<sub>9</sub>

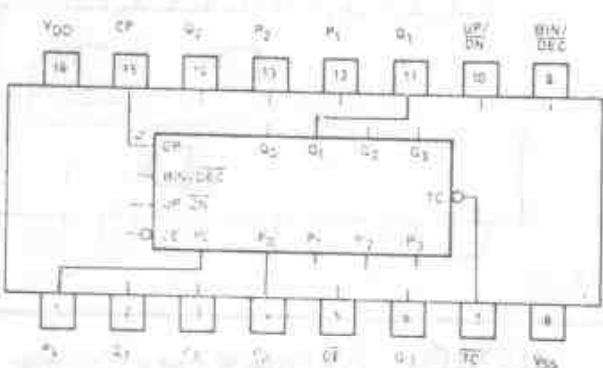
Address Inputs, 1-2-4-8 BCD  
Outputs (Active HIGH)

#### TRUTH TABLE

INPUTS	OUTPUTS							
	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>
L L L L	L	L	L	L	L	L	L	L
L L L H	L	L	L	H	L	L	L	L
L L H L	L	L	H	L	L	L	L	L
L L H H	L	L	H	H	L	L	L	L
L H L L	L	H	L	L	L	L	L	L
L H L H	L	H	L	H	L	L	L	L
L H H L	L	H	H	L	L	L	L	L
L H H H	L	H	H	H	L	L	L	L
H L L L	H	L	L	L	L	L	L	L
H L L H	H	L	L	H	L	L	L	L
H L H L	H	L	H	L	L	L	L	L
H L H H	H	L	H	H	L	L	L	L
H H L L	H	H	L	L	L	L	L	L
H H L H	H	H	L	H	L	L	L	L
H H H L	H	H	H	L	L	L	L	L
H H H H	H	H	H	H	L	L	L	L

**4029B**

## Synchronous Up/Down Counter



MODE SELECTION TABLE

PL	BIN/DEC	UP/DN	$\bar{CE}$	CP	+ MODE
H	X	X	X	X	Parallel Load ( $P_n \rightarrow Q_n$ )
L	X	X	H	X	No Change
L	L	L	L	$\bar{S}$	Count Down, Decade
L	L	H	L	$\bar{S}$	Count Up, Decade
L	H	L	L	$\bar{S}$	Count Down, Binary
L	H	H	L	$\bar{S}$	Count Up, Binary

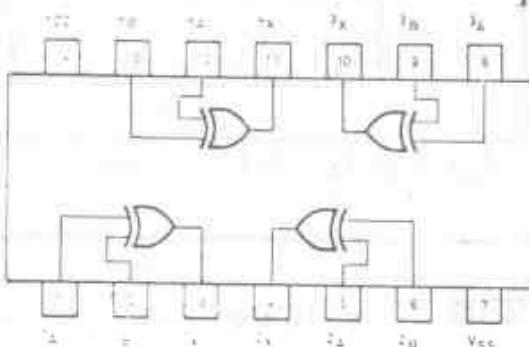
Pin Names:

PL: Parallel Load Input  
 D1-D4: Parallel Data Inputs  
 BIN/DEC: Binary/Decade Control Input  
 UP/DN: Up/Down Control Input  
 CE: Count Enable Input (Active LOW)  
 CP: Clock Input (L-H Edge-Triggered)  
 Q1-Q4: Buffered Parallel Outputs  
 TC: Terminal Count Output (Active LOW)

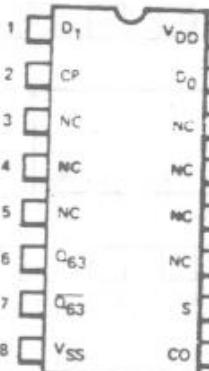
H.23

**4030B**

## Quad Exclusive-OR Gate



H.24

**4031B**

64-Stage Static Shift Register

## PIN NAMES

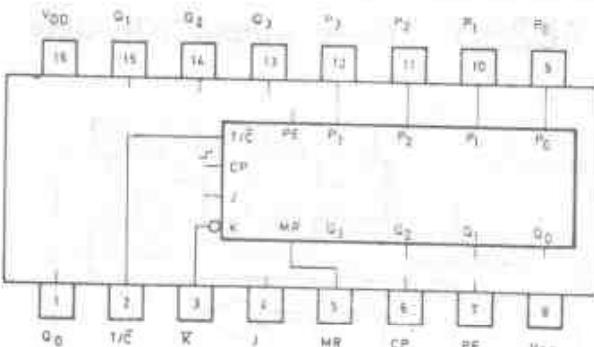
D<sub>1</sub>, D<sub>0</sub>: Data Inputs  
 S: Data Select Input  
 CP: Clock Input (L-H Edge-Triggered)  
 CO: Buffered Clock Output  
 Q<sub>63</sub>: Buffered Output from the 64th Stage  
 Q̄<sub>63</sub>: Complementary Buffered Output from the 64th Stage

S	D <sub>0</sub>	D <sub>1</sub>	Data Into Flip-Flop 1
L	L	X	L
L	H	X	H
H	X	L	L
H	X	H	H

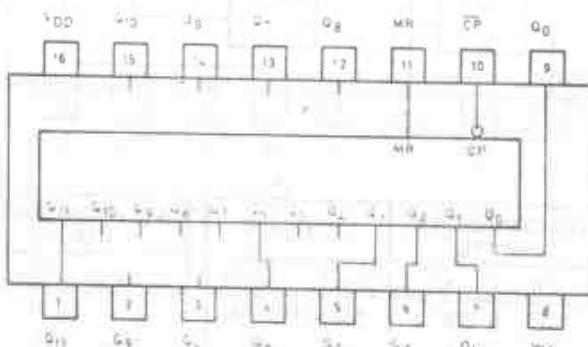
H.25

**4035B**

## 4-Bit Universal Shift Register



H.26

**4040B** 12-Stage Binary Counter

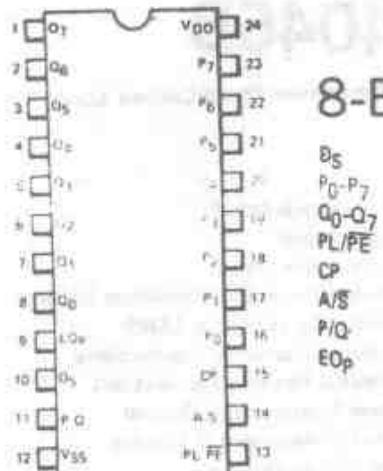
H.27

Pin Names:

CP: Clock Input (H-L Triggered)  
 MR: Master Reset Input  
 Q0-Q11: Parallel Outputs

# 4034B

## 8-BIT UNIVERSAL BUS REGISTER



**S<sub>5</sub>** Serial Data Input  
**P<sub>0</sub>-P<sub>7</sub>** Parallel Data Inputs/Outputs  
**Q<sub>0</sub>-Q<sub>7</sub>** Parallel Data Inputs/Outputs  
**PL/PE** Parallel Load/Parallel Enable Input  
**CP** Clock Input  
**A/S** Asynchronous/Synchronous Mode Control Input  
**P/Q** Data Transfer Mode Control Input  
**EO<sub>p</sub>** Output Enable Input for P<sub>n</sub> Parallel Data Inputs/Outputs

MODE SELECTION TABLE

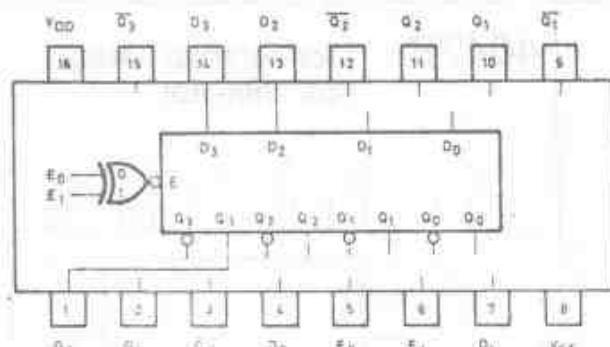
EO <sub>p</sub>	PL/PE	P/Q	A/S	MODE	OPERATION
L	L	L	X	Serial	Synchronous Serial data input, P and Q parallel data outputs disabled.
L	L	H	X	Serial	Synchronous Serial data input, Q Parallel data output.
L	H	L	L	Parallel	Q Synchronous Parallel data inputs, P Parallel data outputs disabled.
L	H	L	H	Parallel	Q Asynchronous Parallel data inputs, P Parallel data outputs disabled.
L	H	H	L	Parallel	P Parallel data inputs disabled, Q Parallel data outputs, synchronous data recirculation.
L	H	H	H	Parallel	P Parallel data inputs disabled, Q Parallel data outputs, asynchronous data recirculation.
H	L	L	X	Serial	Synchronous serial data input, P Parallel data output.
H	L	H	X	Serial	Synchronous serial data input, Q Parallel data output.
H	H	L	L	Parallel	Q Synchronous Parallel data input, P Parallel data output.
H	H	L	H	Parallel	Q Asynchronous Parallel data input, P Parallel data output.
H	H	H	L	Parallel	P Synchronous Parallel data input, Q Parallel data output.
H	H	H	H	Parallel	P Asynchronous Parallel data input, Q Parallel data output.

X = Don't Care, H = HIGH Level, L = LOW Level

Note:  
Outputs change at positive transition of clock in the serial mode and when the A/S input is LOW in the parallel mode.  
During transfer from parallel to serial operation, A/S should remain LOW in order to prevent Q<sub>5</sub> transfer into flip-flops.

H.28

## 4042B Quad D Latch



Pin Numbers

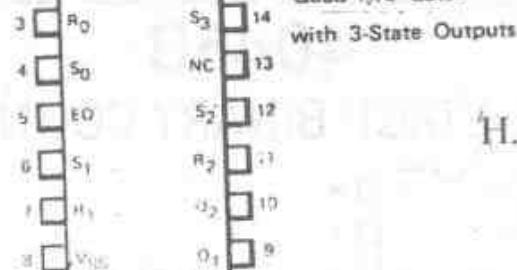
D<sub>0</sub>-D<sub>3</sub> Data Inputs  
 E<sub>0</sub>, E<sub>1</sub> Enable Inputs  
 Q<sub>0</sub>-Q<sub>3</sub> Parallel Latch Outputs  
 Q<sub>0</sub>-Q<sub>3</sub> Complementary Parallel Latch Outputs

### TRUTH TABLE

E <sub>0</sub>	E <sub>1</sub>	LATCH CONDITION
L	L	Enabled
L	H	Not Enabled
H	L	Not Enabled
H	H	Enabled

H.29

## 4043B



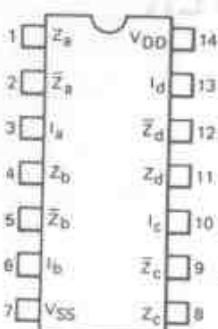
EO Common Output Enable Input  
 S<sub>0</sub>-S<sub>3</sub> Set Inputs  
 R<sub>0</sub>-R<sub>3</sub> Reset Inputs  
 Q<sub>0</sub>-Q<sub>3</sub> 3-State Buffered Latch Outputs

### TRUTH TABLE

INPUTS			OUTPUT
EO	S <sub>n</sub>	R <sub>n</sub>	Q <sub>n</sub>
L	X	X	High Impedance
H	H	L	H
H	L	H	L
H	H	H	H
H	L	L	No Change

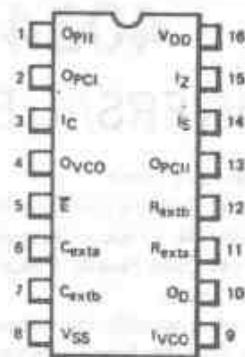
### 4041B

Quad True/Complement Buffer



#### PIN NAMES

- $I_a, I_b, I_c, I_d$  Buffer Input  
 $Z_a, Z_b, Z_c, Z_d$  Buffered True Output  
 $\bar{Z}_a, \bar{Z}_b, \bar{Z}_c, \bar{Z}_d$  Buffered Complementary Output



### 4046B

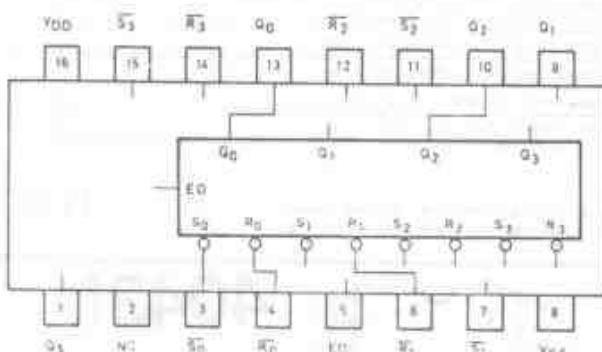
Micropower Phase-Locked Loop

$I_{\text{Z}}$	Zener Diode Input
$I_S$	Signal Input
$I_C$	Comparator Input
$I_{\text{VCO}}$	Voltage-Controlled Oscillator Input
$E$	Enable Input (Active LOW)
$C$	External Capacitor Connections
$R$	External Resistor Connections
$OPII$	Phase Comparator I Output
$OPII$	Phase Comparator II Output
$OPCII$	Phase Pulse Output
$OD$	Demodulator Output
$IVCO$	Voltage-Controlled Oscillator Output

H.31

H.34

### 4044B Quad R/S Latch, 3-State



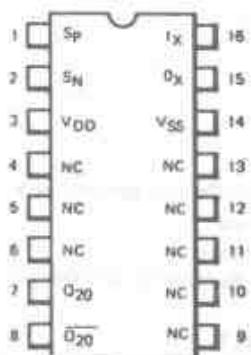
INPUTS			OUTPUT
EO	$\bar{S}_n$	$\bar{R}_n$	$Q_n$
L	X	X	High Impedance
H	L	H	H
H	H	L	L
H	L	L	L
H	H	H	No Change

Pin Names  
EO  
 $S_1, S_2$   
 $R_1, R_2$   
 $Q_0-Q_3$

Output Enable Input  
Set Inputs (Active HIGH)  
Reset Inputs (Active LOW)  
3-State Buffered Latch Outputs

H.32

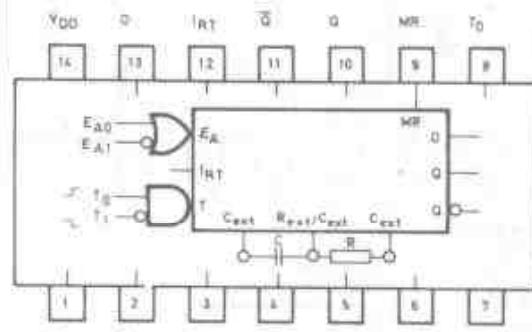
### 4045B 21-STAGE BINARY COUNTER



#### PIN NAMES

- $I_X$  External Crystal Input  
 $S_p$  Source Connection-to-p-channel transistor  
 $S_n$  Source Connection-to-n-channel transistor  
 $O_X$  External Crystal Output  
 $Q_{20}$  Data Output  
 $\bar{Q}_{20}$  Complimentary Data Output

### 4047B Monostable/Astable Multivibrator



$C_{\text{ext}}$	External Capacitor Connection
$R_{\text{ext}}$	External Resistor Connection
$R_{\text{ext}}/C_{\text{ext}}$	Common External Capacitor and Resistor Connection
$INT$	Retrigger Input
$T_2$	Trigger Input (L-HL Triggers)
$T_1$	Trigger Input (H-L Triggers)
$E_{AII}$	Enable Input (Active HIGH)
$E_{AI}$	Enable Input (Active LOW)
$MRE$	Master Reset
$Q$	Oscillator Output
$Q\bar{Q}$	True and Complimentary Buffered Outputs

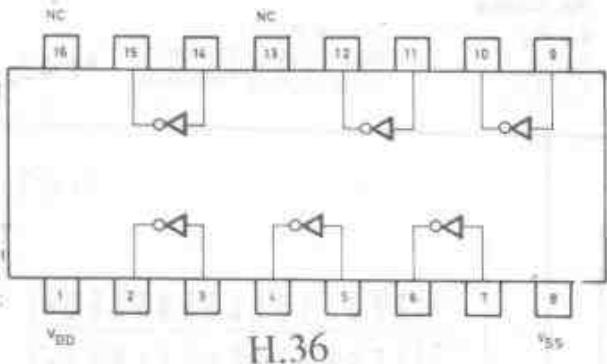
H.33

H.35

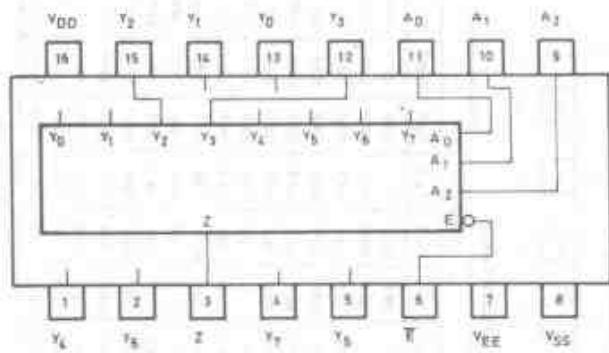
# MODE SELECTION 4047B

INPUTS						FUNCTION
$\overline{E_{A0}}$	$\overline{E_{A1}}$	$T_0$	$T_1$	$I_{R/T}$	MR	
H	X	L	H	L	L	Astable Multivibrator (Free Running)
X	L	L	H	L	L	Astable Multivibrator (Free Running)
L	H	L	H	L	L	Astable Multivibrator (True Setting)
L	X	L	H	L	L	Astable Multivibrator (Complement Setting)
L	H	X	L	L	L	Monostable Multivibrator (Positive-Edge Triggering)
L	H	H	X	L	L	Monostable Multivibrator (Negative-Edge Triggering)
L	H	X	L	X	L	Monostable Multivibrator (Retriggering)
X	X	X	X	X	H	Reset

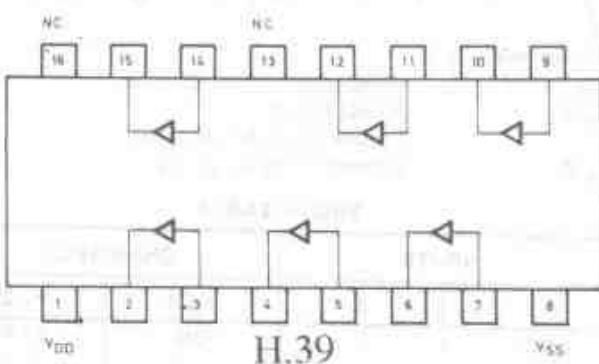
## 4049B Hex Inverting Buffer



## 4051B 8-Channel Analog Multiplexer/Demultiplexer



## 4050B Hex Non-Inverting Buffer



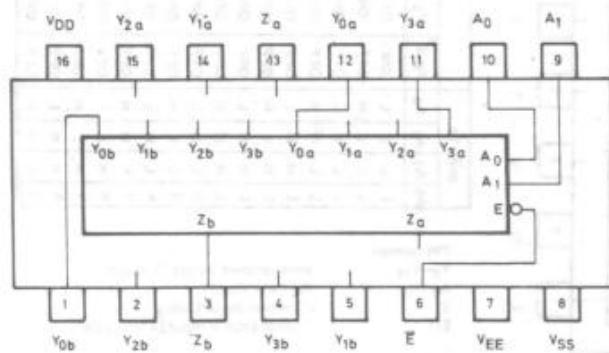
INPUTS			CHANNELS							
$\overline{E}$	$A_2$	$A_1$	$Y_0-Z$	$Y_1-Z$	$Y_2-Z$	$Y_3-Z$	$Y_4-Z$	$Y_5-Z$	$Y_6-Z$	$Y_7-Z$
L	L	L	ON	OFF						
L	L	H	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
L	L	M	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
L	L	H	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
L	H	L	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
L	H	H	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
L	H	H	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
L	N	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
L	N	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
H	X	X	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

### Pin Names

$Y_0-Y_7$ : Independent Inputs/Outputs  
 $A_0-A_2$ : Address Inputs  
 $E$ : Enable Input (Active LOW)  
 $Z$ : Common Input/Output

H.37

## 4052B Dual 4-Channel Analog Multiplexer/Demultiplexer



### TRUTH TABLE

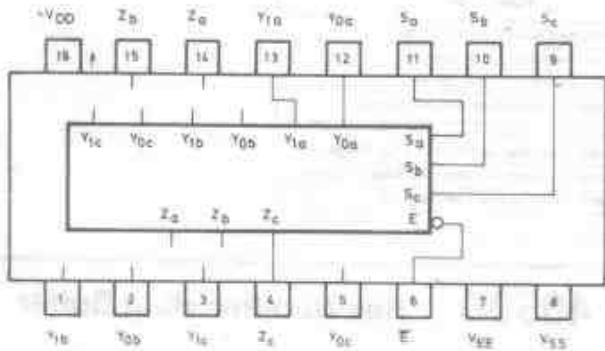
INPUTS			CHANNELS			
$\overline{E}$	$A_2$	$A_1$	$Y_0-Z$	$Y_1-Z$	$Y_2-Z$	$Y_3-Z$
L	L	L	ON	OFF	OFF	OFF
L	L	H	OFF	ON	OFF	OFF
L	H	L	OFF	OFF	ON	OFF
L	H	H	OFF	OFF	OFF	ON
H	X	X	OFF	OFF	OFF	OFF

### Pin Names

$Y_{0a}-Y_{3a}$ : Independent Inputs/Outputs  
 $Y_{0b}-Y_{3b}$ : Independent Inputs/Outputs  
 $A_0, A_1$ : Address Inputs  
 $E$ : Enable Input (Active LOW)  
 $Z_a, Z_b$ : Common Input/Output

H.38

**4053B** Triple 2-Channel Analog Multiplexer/Demultiplexer



### Pin Names

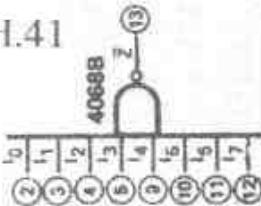
$Y_{0a}-Y_{0c}$ , $Y_{1a}-Y_{1c}$	Independent Input/Outputs
$S_a-S_c$	Select Inputs
$E$	Enable Input (Active LOW)
$Z_a-Z_c$	Common Input/Outputs

## TRUTH TABLE

INPUTS		CHANNELS	
$\bar{E}$	S	$Y_0-Z$	$Y_1-Z$
L	L	ON	OFF
L	H	OFF	ON
H	X	OFF	OFF

H.40

4.41



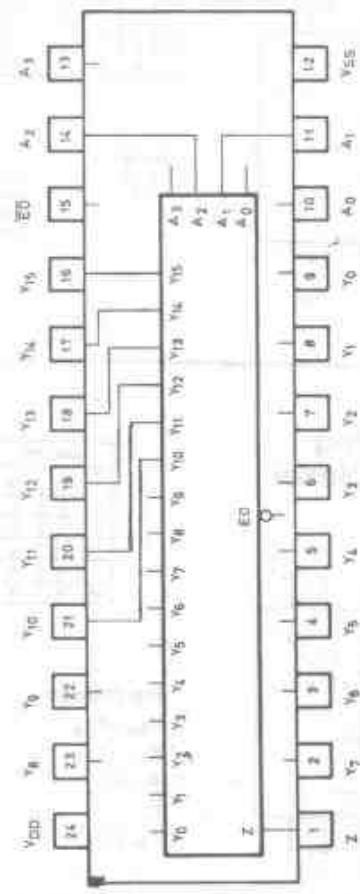
**4068B**  
8-INPUT  
NAND GATE



### PIN NAMES

$\bar{Z}$  NAND Gate  
Inputs  
Output  
(Active LOW)

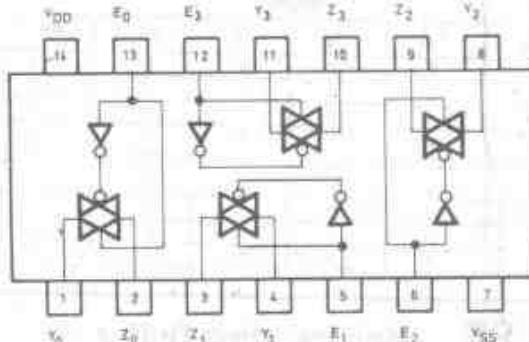
4067B 16-Channel Analog Multiplexer/Demultiplexer



Pin Names  
Y<sub>3</sub>-Y<sub>15</sub>  
A<sub>5</sub>-A<sub>3</sub>  
Z  
EO

Indirect Inputs/Outputs  
Address Inputs  
Common Input/Output  
Output Enable Input (Active-Low)

**4066B Quad Bilateral Switches**



## Pin Names

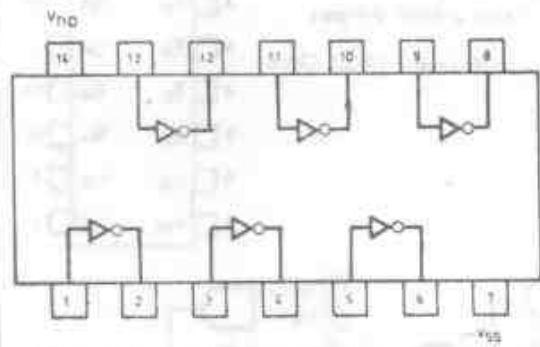
$$E_0-E_2$$

$E_0-E_3$	Enable Inputs
$Y_0-Y_3$	Input/Output Terminals
$Z_0-Z_3$	Input/Output Terminals

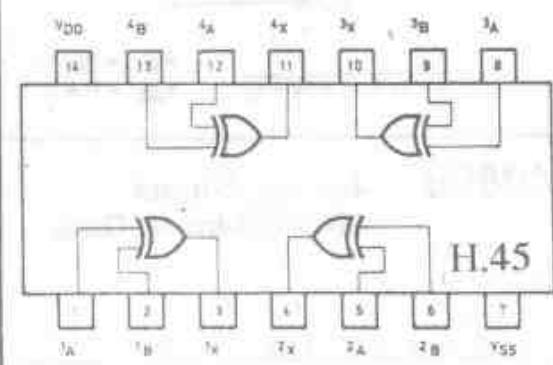
H.42

H.43

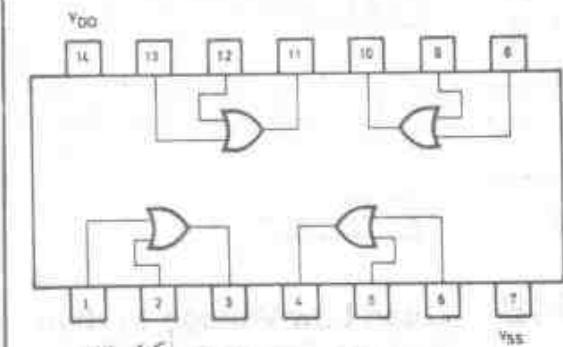
**4069UB** Hex inverter H.44



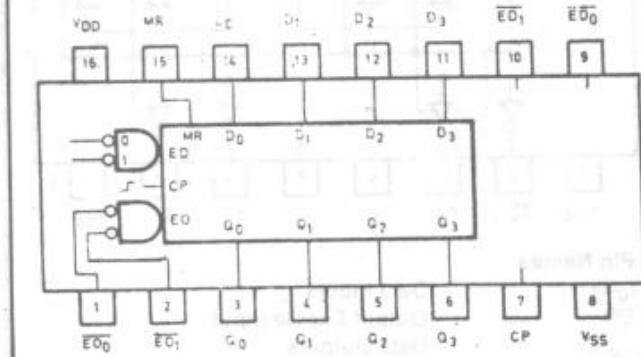
**4070B** Quad Exclusive-OR Gate



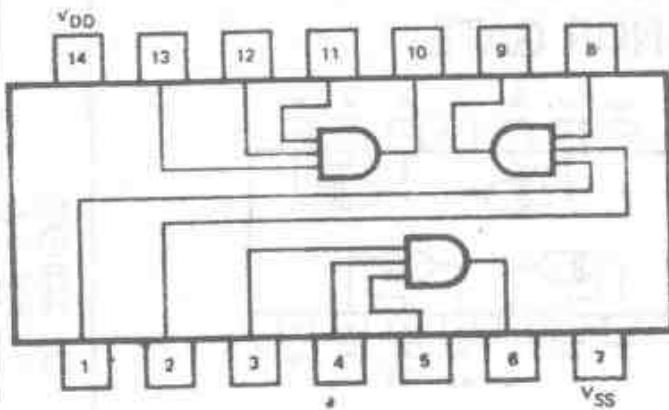
**4071B** Quad 2-Input OR Gate



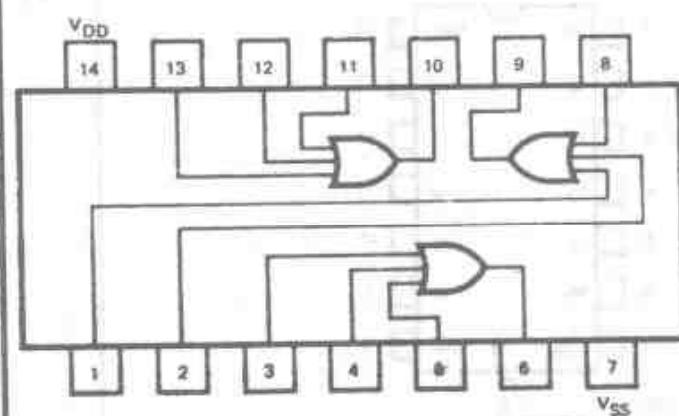
**4076B** Quad D Flip-Flop, H.47  
3-State



H.48 **4073B**  
TRIPLE 3-INPUT AND GATE



H.49 **4075B**  
TRIPLE 3-INPUT OR GATE



#### TRUTH TABLE

INPUTS		OUTPUTS	
$\bar{ED}_0$	$\bar{ED}_1$	$D_n$	$Q_{n+1}$
H	X	X	$Q_n$
X	H	X	$Q_n$
L	L	L	L
L	L	H	H

#### CONDITIONS:

MR =  $\bar{EO}_0 = \bar{EO}_1 = \text{LOW}$

L = LOW Level

H = HIGH Level

X = Don't Care

$Q_{n+1}$  = State After Positive Clock Transition

#### Pin Names

$D_0, D_3$

$\bar{ED}_0, \bar{ED}_1$

$\bar{EO}_0, \bar{EO}_1$

CP

MR

$Q_0, Q_3$

#### Data Inputs

Data Enable Inputs (Active LOW)

Output Enable Inputs (Active LOW)

Clock Input (L +H Edge-Triggered)

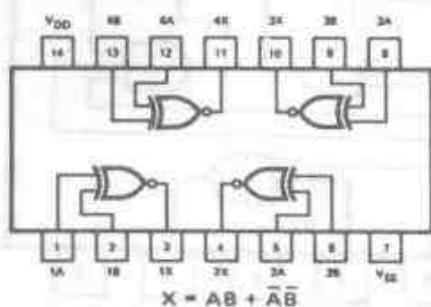
Master Reset Input

Data Outputs

# 4077B

H.50

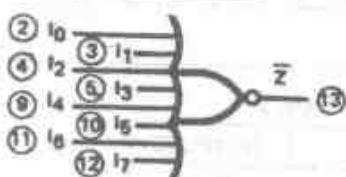
## QUAD EXCLUSIVE-NOR GATE



# 4078B

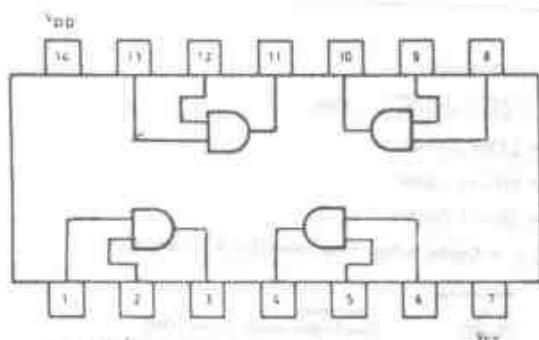
H.51

## 8-INPUT NOR GATE



# 4081B

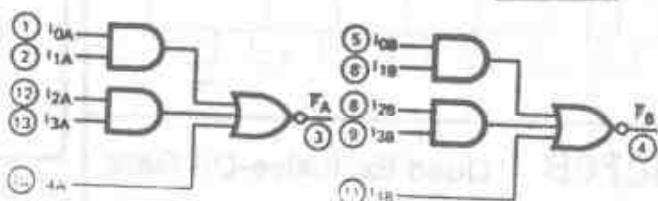
Quad 2-Input AND Gate



H.52

H.53

4085B

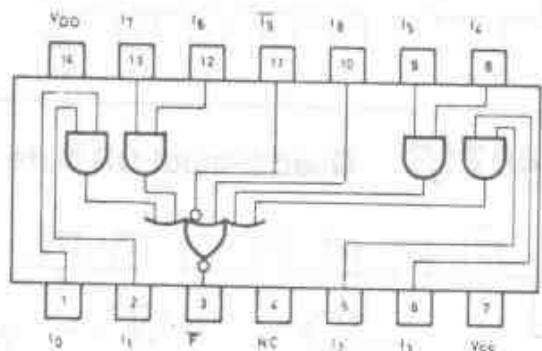
Dual 2-Wide 2-Input  
AND-OR-Invert (AOI) Gate

$$\bar{F} = \overline{I_0 \oplus I_1 + I_2 \oplus I_3 + I_4}$$

 $V_{DD} = \text{Pin 14}$   
 $V_{SS} = \text{Pin 7}$ 

# 4086B

H.54

4-Wide, 2-Input  
AND-OR-Invert Gate

Pin Names:

I<sub>0</sub>-I<sub>3</sub>I<sub>2</sub>

F

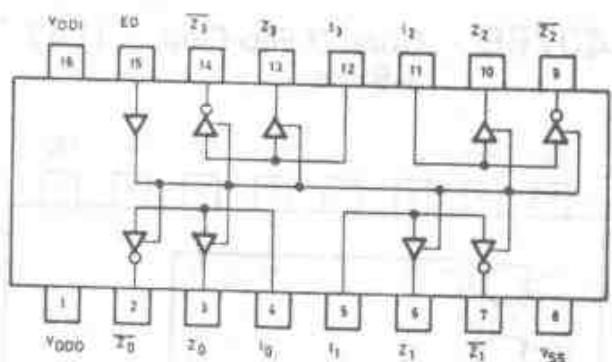
Gate Inputs:

Data Input (Active LOW)

Output (Active LOW)

# 4104B

H.55

Quad Low Voltage to High  
Voltage Translator,  
3-State

Pin Names:

I<sub>0</sub>-I<sub>3</sub>E<sub>O</sub>Z<sub>0</sub>-Z<sub>3</sub>

Data Inputs

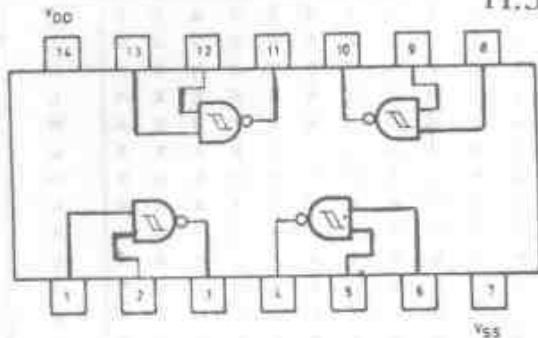
Output Enable Input

Data Outputs

Complimentary Data Outputs

**4093B****Quad 2-Input NAND Schmitt Trigger**

H.56

**MODE SELECTION TABLE**

PL	UP/DN	CE	CP	MODE
H	X	X	X	Parallel Load ( $P_n \rightarrow Q_n$ )
L	X	H	X	No Change
L	L	L	—	Count Down, Decade
L	H	L	—	Count Up, Decade

Pin Names

PL

 $P_0-P_3$ 

CE

CP

UP/DN

MR

TC

 $Q_0-Q_3$ 

Parallel Load Input (Active HIGH)

Parallel Inputs

Count Enable Input (Active LOW)

Clock Pulse Input

(L→H Edge Triggered)

Up/Down Count Control Input

Master Reset Input

Terminal Count Output (Active LOW)

Parallel Outputs



MV4311/MV4511



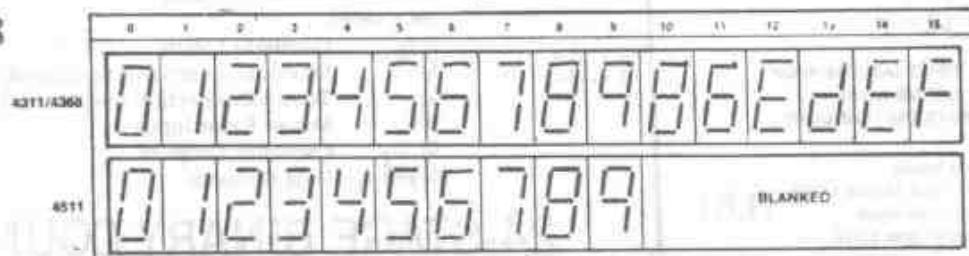
MV4368

**MV4311 MV4368 MV4511****LATCHED 7-SEGMENT DECODER/DRIVERS**

Inputs	MV4311 Outputs	Display	MV4511 Outputs	Display
LE RBI D C B A	a b c d e f g RBO			
H X X X X	STABLE	H	STABLE	STABLE
L L L L L	LLL L L L	L	BLANK	BLANK
L H L L L	HHHHHHH	H	0	0
X L L L L	LHHHLLE	1	1	1
L E H L	HHLPHLH	2	2	2
L L H H	HHHHLLH	3	3	3
L H H L	LHHLLHH	4	4	4
L L H H	HHHLLHH	5	5	5
L H H L	HHHHHHH	6	6	6
L H H H	HHHLLLL	7	7	7
L H H H	HHHHHHH	8	8	8
L H H H	HHHLLHH	9	9	9
L H H H	HHHLLHH	A	A	BLANK
L H H H	LLHHHHL	B	B	BLANK
L H H H	HHHHHLH	C	C	BLANK
L H H H	HHHHHHL	D	D	BLANK
L H H H	HHLLHHH	E	E	BLANK
L H H H	HHLLHHH	F	F	BLANK
X X X X X	LLL L L L	G	BLANK	BLANK

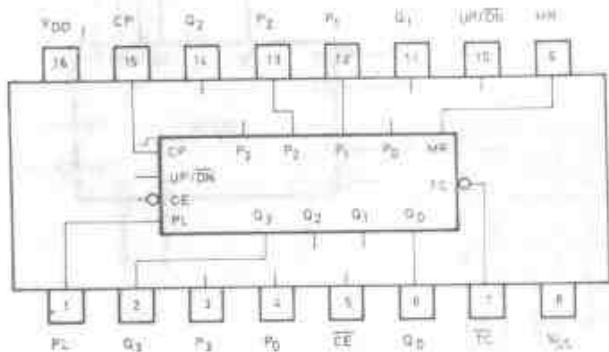
A,B,C,D	Address (Data) inputs
LE	Latch Enable input
BI	Blanking Input
LT	Lamp Test input
RBI	Ripple Blanketing Input
RBO	Ripple Blanketing Output
a,b,c,d,e,f,g	Segment outputs
Vdd	Positive supply
Vss	Ground

H.58





## 4516B Up/Down Counter H.63



### Pin Names

PL	Parallel Load Input (Active HIGH)
P <sub>0</sub> -P <sub>3</sub>	Parallel Inputs
CE	Count Enable Input (Active LOW)
CP	Clock Pulse Input (L → H Edge-Triggered)
Up/Dn	Up/Down Count Control Input
MR	Master Reset Input
TC	Terminal Count Output (Active LOW)
Q <sub>0</sub> -Q <sub>3</sub>	Parallel Outputs

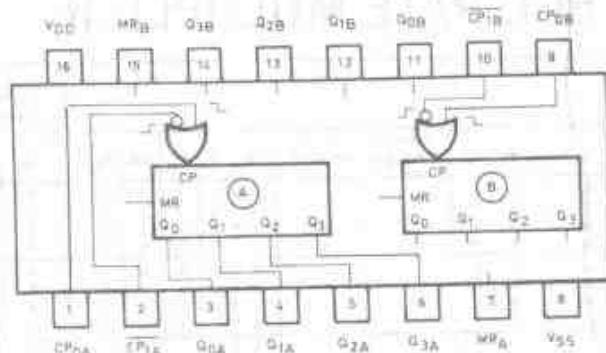
### MODE SELECTION TABLE

PL	UP/DN	CE	CP	MODE
H	X	X	X	Parallel Load (P <sub>n</sub> → Q <sub>n</sub> )
L	X	H	X	No Change
L	L	L	↑	Count Down, Binary
L	H	L	↑	Count Up, Binary

45228 • 45268

## 4518B Dual 4-Bit Decode Counter H.63

## 4520B Dual 4-Bit Binary Counter



### Pin Names

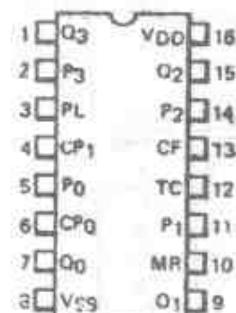
CP <sub>0A</sub> -CP <sub>0B</sub>	Clock Input (L → H Triggered)
CP <sub>1A</sub> -CP <sub>1B</sub>	Clock Input (H → L Triggered)
MR <sub>A</sub> -MR <sub>B</sub>	Master Reset Inputs
Q <sub>0A</sub> -Q <sub>3A</sub>	Outputs
Q <sub>0B</sub> -Q <sub>3B</sub>	Outputs

H.64

### TRUTH TABLE

CP <sub>0</sub>	CP <sub>1</sub>	MR	MODE
/	H	L	Counter Advances
L	/	L	Counter Advances
/	X	L	No Change
X	/	L	No Change
/	L	L	No Change
H	/	L	No Change
X	X	H	Reset (Asynchronous)

## PROGRAMMABLE 4-BIT BCD/BINARY DOWN COUNTER



### MODE SELECTION TABLE

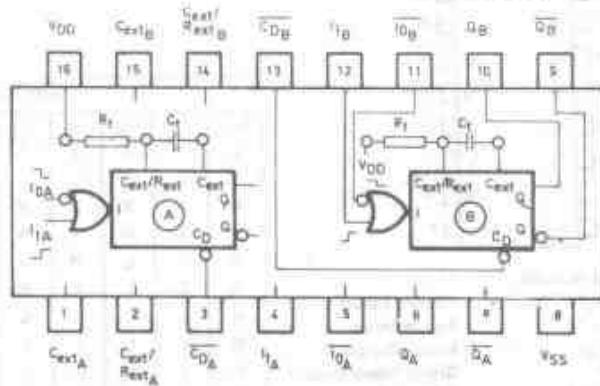
MR	PL	CP <sub>0</sub>	CP <sub>1</sub>	MODE
H	X	X	X	RESET (ASYNCHRONOUS)
L	H	X	X	PRESET (ASYNCHRONOUS)
L	L	/	H	NO CHANGE
L	L	V	V	NO CHANGE
L	L	V	X	NO CHANGE
L	L	X	/	NO CHANGE
L	L	X	V	COUNTER ADVANCES
L	L	V	V	COUNTER ADVANCES

## 4528B 4098B

### Dual Retriggerable Resettable Monostable Multivibrator

TRUTH TABLE		
CD	Trigger	Reset
H-H	H-L	L
L-H	L-H	X
G <sub>0</sub> -G <sub>1</sub>	G <sub>0</sub> -G <sub>1</sub>	X
Q <sub>0</sub> -Q <sub>1</sub>	Q <sub>0</sub> -Q <sub>1</sub>	X
C <sub>ext</sub> /C <sub>ext</sub>	C <sub>ext</sub> /C <sub>ext</sub>	X
C <sub>ext</sub> /R <sub>ext</sub>	C <sub>ext</sub> /R <sub>ext</sub>	X
C <sub>ext</sub> /R <sub>ext</sub>	C <sub>ext</sub> /R <sub>ext</sub>	X

Pin Names		
Input (H → L Triggered)		
Input (L → H Triggered)		
Clear Direct (Active LOW) Input		
Output		
Complementary (Active LOW) Output		
External Capacitor Connections		
External Capacitor Resistor Connections		

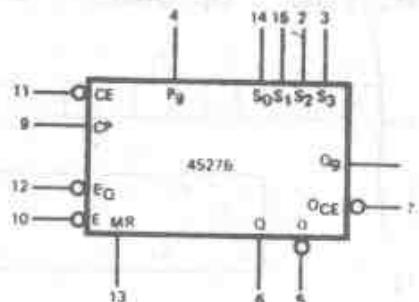


H.65

# 4527B

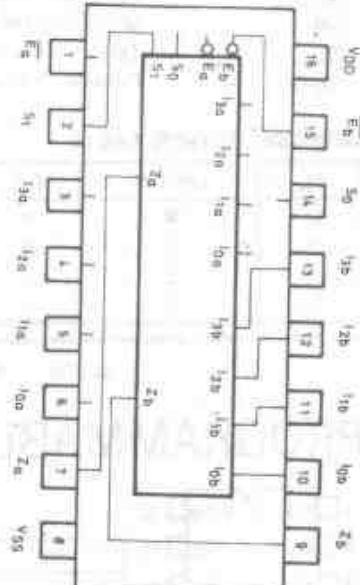
## BCD RATE MULTIPLIER

INPUTS				OUTPUTS											
				OUTPUT LOGIC LEVEL OR NUMBER OF OUTPUT PULSES											
S <sub>3</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>0</sub>	NUMBER OF PULSES ON INPUT CP	CE	E	E <sub>O</sub>	MR	P <sub>B</sub>	Q	Q̄	Q <sub>O</sub>	Q̄ <sub>O</sub>	Q <sub>CE</sub>	
L	L	L	L	10	L	L	L	L	L	L	H	1	1	1	
L	L	L	H	10	L	L	L	L	L	1	1	1	1	1	
L	L	H	L	10	L	L	L	L	L	2	1	1	1	1	
L	L	H	H	10	L	L	L	L	L	3	1	1	1	1	
L	H	E	L	13	L	L	L	L	L	4	4	1	1	1	
L	H	L	H	10	L	L	L	L	L	5	5	1	1	1	
L	H	H	L	10	L	L	L	L	L	6	6	1	1	1	
L	H	H	H	10	L	L	L	L	L	7	7	1	1	1	
H	L	L	L	10	L	L	L	L	L	8	8	1	1	1	
H	L	L	H	10	L	L	L	L	L	9	9	1	1	1	
H	L	H	L	10	L	L	L	L	L	10	10	1	1	1	
H	H	L	L	10	L	L	L	L	L	11	11	1	1	1	
H	H	H	L	10	L	L	L	L	L	12	12	1	1	1	
H	H	H	H	10	L	L	L	L	L	13	13	1	1	1	
X	X	X	X	10	H	L	L	L	L	-	-	-	-	-	
X	X	X	X	10	L	H	L	L	L	H	-	1	1	1	
X	X	X	X	10	L	L	H	L	L	-	1	1	1	1	
H	X	X	X	10	L	L	L	H	L	10	10	H	L	H	
L	X	X	X	10	L	L	L	H	L	11	11	H	L	H	
X	X	X	X	10	L	L	L	H	L	12	12	H	L	H	



H.66  
V<sub>DD</sub> = PIN 16  
V<sub>SS</sub> = PIN 8

## 4539B Dual 4-Input Multiplexer



INPUTS	OUTPUT		
S <sub>0</sub>	S <sub>1</sub>	E	Z
X	X	H	L
L	L	L	I <sub>0</sub>
H	L	L	I <sub>1</sub>
L	H	L	I <sub>2</sub>
H	H	L	I <sub>3</sub>

H.69  
PIN NAMES  
I<sub>0</sub>, I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub>, I<sub>0a</sub>, I<sub>1b</sub>, I<sub>2b</sub>, I<sub>3b</sub>  
S<sub>0</sub>, S<sub>1</sub>  
E<sub>0</sub>, E<sub>1</sub>  
Z<sub>0</sub>, Z<sub>0</sub>  
Multiplexer Inputs  
Select Inputs  
Enable Inputs (Active LOW)  
Multiplexer Outputs

## 4531B 13-INPUT PARITY CHECKER GENERATOR



PIN NAMES  
I<sub>0</sub>-I<sub>12</sub>  
FUNCTION  
Parity Inputs  
Buffered Output

TRUTH TABLE													Z
INPUTS													OUTPUT
I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	I <sub>5</sub>	I <sub>6</sub>	I <sub>7</sub>	I <sub>8</sub>	I <sub>9</sub>	I <sub>10</sub>	I <sub>11</sub>	I <sub>12</sub>	Z
All Thirteen													L
Any One													H
Any Two													L
Any Three													H
Any Four													L
Any Five													H
Any Six													L
Any Seven													H
Any Eight													L
Any Nine													H
Any Ten													L
Any Eleven													H
Any Twelve													L
All Thirteen													H

## 4532B 8-INPUT PRIORITY ENCODER



PIN NAMES  
I<sub>0</sub>-I<sub>7</sub>  
Priority Inputs  
E<sub>In</sub>  
E<sub>Out</sub>  
GS  
A<sub>0</sub>-A<sub>2</sub>  
FUNCTION  
Enable Input  
Enable Output  
Group Select Output  
Address Outputs

INPUTS										OUTPUTS				
E <sub>In</sub>	I <sub>7</sub>	I <sub>6</sub>	I <sub>5</sub>	I <sub>4</sub>	I <sub>3</sub>	I <sub>2</sub>	I <sub>1</sub>	I <sub>0</sub>	GS	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	E <sub>Out</sub>	
L	X	X	X	X	X	X	X	X	L	L	L	L	L	
H	L	L	L	L	L	L	L	L	L	L	L	L	H	
H	H	X	X	X	X	X	X	X	H	H	H	H	L	
H	L	H	X	X	X	X	X	X	H	H	H	H	L	
H	L	L	H	X	X	X	X	X	H	H	H	H	L	
H	L	L	L	H	X	X	X	X	H	H	H	H	L	
H	L	L	L	L	H	X	X	X	H	H	H	H	L	
H	L	L	L	L	L	H	X	X	H	H	H	H	L	
H	L	L	L	L	L	L	H	X	H	H	H	H	L	
H	L	L	L	L	L	L	L	H	H	H	H	H	L	
H	L	L	L	L	L	L	L	L	H	H	H	H	L	

# 4543B

## BCD TO 7-SEGMENT LATCH/DECODER/DRIVER FOR LIQUID CRYSTALS



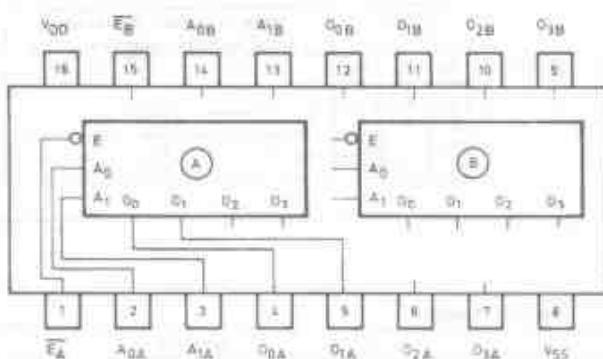
A<sub>0</sub>-A<sub>3</sub> Address (Data) Inputs  
EL Latch Enable Input  
IB Blanking Input  
CP Clock Control Input  
d-g Segment Outputs

TRUTH TABLE

CP*	EL	I <sub>B</sub>	INPUTS					OUTPUTS							DISPLAY
			I <sub>B</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	S	B	E	D	F	G		
X	X	X	X	X	X	X	X	L	L	L	L	L	L	L	BLANK
L	H	L	L	L	L	L	L	H	H	H	H	H	H	L	9
L	H	L	L	L	L	H	L	H	H	H	L	L	L	L	1
L	H	L	L	L	H	L	H	H	H	L	H	L	H	H	2
L	H	L	L	L	H	H	H	H	H	H	H	L	H	H	3
L	H	L	L	H	L	L	H	L	H	N	L	L	H	H	4
L	H	L	L	H	L	H	H	H	L	H	L	H	H	H	5
L	H	L	L	H	H	L	H	L	H	H	H	H	H	H	6
L	H	L	L	H	H	H	H	H	H	H	L	L	L	L	7
L	H	L	H	L	L	H	H	H	H	H	H	H	H	H	8
L	H	L	H	L	H	H	H	H	H	H	H	L	H	H	9
L	H	L	H	H	L	L	L	L	L	L	L	L	L	L	BLANK
L	H	L	H	H	H	L	H	H	H	H	H	L	L	L	BLANK
L	H	L	H	H	H	L	H	H	H	H	H	L	L	L	BLANK
L	H	L	H	H	H	L	H	H	H	H	H	L	L	L	BLANK
L	H	L	H	H	H	L	H	H	H	H	H	L	L	L	BLANK
L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	**
L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	**
L	***	***	***	***	***	***	***	***	***	***	***	***	***	***	Inverse of the above Output Combinations
L	***	***	***	***	***	***	***	***	***	***	***	***	***	***	Display as Above

H.70

## 4555B Dual 1-of-4 Decoder/Demultiplexer

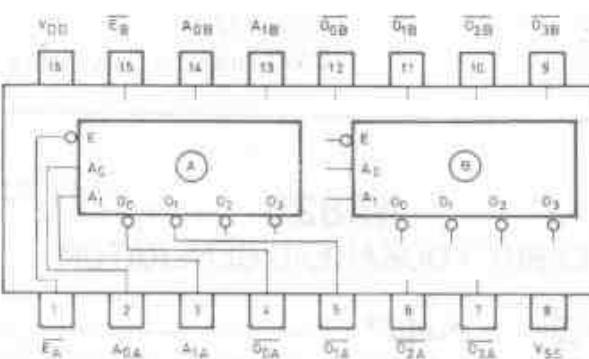


Pin Names

E Enable Input (Active LOW)  
A<sub>0</sub>, A<sub>1</sub> Address Inputs  
O<sub>0</sub>-O<sub>3</sub> Outputs (Active HIGH)

H.71

## 4556B Dual 1-of-4 Decoder/Demultiplexer



Pin Names

E Enable Input (Active LOW)  
A<sub>0</sub>, A<sub>1</sub> Address Inputs  
O<sub>0</sub>-O<sub>3</sub> Outputs (Active LOW)

4555B TRUTH TABLE

E	A <sub>0</sub>	A <sub>1</sub>	O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>
L	L	L	H	L	L	L
L	H	L	L	H	L	L
L	L	H	L	L	H	L
L	H	H	L	L	L	H
H	X	X	L	L	L	L

4556B TRUTH TABLE

E	A <sub>0</sub>	A <sub>1</sub>	̄O <sub>0</sub>	̄O <sub>1</sub>	̄O <sub>2</sub>	̄O <sub>3</sub>
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L
H	X	X	H	H	H	H

H.72

## 4703B/4703BX

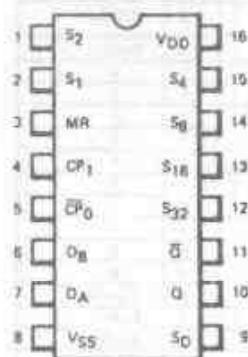
### FIRST-IN FIRST-OUT (FIFO) BUFFER MEMORY

16	VDD	28	PIN NAMES
16	16	28	Parallel Data Inputs
15	15	27	Serial Data Input
14	14	26	Parallel Load Input
13	13	25	Serial Input Clock Input (HIGH-to-LOW Triggered)
12	12	24	Serial Output Clock Input (HIGH-to-LOW Triggered)
11	11	23	Serial Input Enable (Active LOW)
10	10	22	Transfer to Stack Input (Active LOW)
9	9	21	Transfer Out Serial Input (Active LOW)
8	8	20	Transfer Out Parallel Input
7	7	19	Serial Output Enable Input (Active LOW)
6	6	18	Output Enable Input (Active LOW)
5	5	17	Master Reset Input (Active LOW)
4	4	16	Input Register Full Output (Active LOW)
3	3	15	Output Register Empty Output (Active LOW)
2	2	14	Parallel Data Outputs
1	1	13	Serial Data Output

4557B

H.73

## 1-TO-64 BIT VARIABLE LENGTH SHIFT REGISTER



TRUTH TABLE			
INPUTS		OPERATION	
MR	CP <sub>0</sub>	CP <sub>1</sub>	
L	L	—	NO CHANGE
L	—	H	NO CHANGE
L	H	X	NO CHANGE
L	X	L	NO CHANGE
L	—	H	SELECTED REGISTER SHIFTS
L	L	—	SELECTED REGISTER SHIFTS
H	X	X	MASTER RESET

REGISTER SELECTION TABLE						
SELECT INPUTS						REGISTER LENGTH
S <sub>32</sub>	S <sub>16</sub>	S <sub>8</sub>	S <sub>4</sub>	S <sub>2</sub>	S <sub>1</sub>	
L	L	L	L	L	L	1-BITS
L	L	L	L	L	H	2-BITS
L	L	L	L	H	L	3-BITS
L	L	L	L	H	H	4-BITS
L	L	L	H	L	L	5-BITS
L	L	L	H	L	H	6-BITS
-	-	-	-	-	-	-
-	-	-	-	-	-	-
H	L	L	L	L	L	13-BITS
H	L	L	L	L	H	14-BITS
H	L	L	L	H	L	15-BITS
-	-	-	-	-	-	-
-	-	-	-	-	-	-
H	H	H	H	L	L	61-BITS
H	H	H	H	L	H	62-BITS
H	H	H	H	H	L	63 BITS
H	H	H	H	H	H	64 BITS

L = LOW Level  
H = HIGH Level

Note: Shift Register Length equals the sum of the Register Length Select Input "Word" (S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub>, ..., and S<sub>n-1</sub>)

$D_A$ , $D_B$	Serial Data Inputs
$S_0$	Data Select Input
$S_1$ , $S_2$ , $S_4$ , $S_{16}$ , $S_{32}$	Register Length Select Inputs
$\overline{CP}_0$	Clock Input ( $H \rightarrow L$ Triggered)
$CP_1$	Clock Input ( $L \rightarrow H$ Triggered)
MR	Master Reset Input
Q	Data Output
Q	Complementary Data (Active LOW) Output

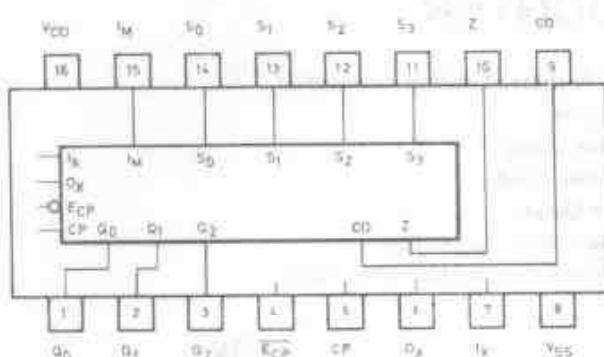
4582B

H.74

## CARRY LOOKAHEAD GENERATOR



## 4702B Programmable Bit Rate Generator



PIN NAMES

CP	External Clock Input
ECP	External Clock Enable Input (Active LOW)
I <sub>X</sub>	Crystal Input
I <sub>M</sub>	Multiplexed Input
S <sub>0</sub> -S <sub>3</sub>	Rate Select Inputs
CO	Clock Output
O <sub>X</sub>	Crystal Drive Output
O <sub>G</sub> -O <sub>2</sub>	Scan Counter Outputs
Z	Bit Rate Output

TABLE 2  
TRUTH TABLE FOR RATE SELECT INPUTS

S <sub>3</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>0</sub>	Output Rate (Z) Note 1
L	L	L	L	Multiplexed Input (I <sub>M</sub> )
L	L	L	H	Multiplexed Input (I <sub>M</sub> )
L	L	H	L	50 Baud
L	L	H	H	75 Baud
L	H	L	L	134.5 Baud
L	H	L	H	200 Baud
L	H	H	L	600 Baud
L	H	H	H	2400 Baud
H	L	L	L	3800 Baud
H	L	L	H	4800 Baud
H	L	H	L	1800 Baud
H	L	H	H	1200 Baud
H	H	L	L	2400 Baud
H	H	L	H	300 Baud
H	H	H	L	150 Baud
H	H	H	H	110 Baud

TABLE 1  
CLOCK MODES AND INITIALIZATION

I <sub>X</sub>	E <sub>CP</sub>	CP	OPERATION
—	H	L	Clocked from I <sub>X</sub>
X	L	—	Clocked from CP
X	H	H	Continuous Reset
X	L	—	Reset During First CP < HIGH Time

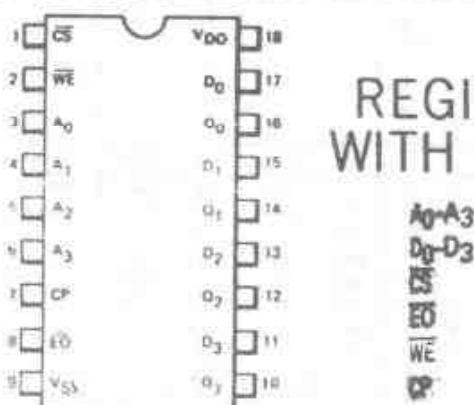
Note 1: Actual output frequency is 18 times the indicated output rate, assuming a clock frequency of 2.4576 MHz.

H = HIGH Level  
L = LOW Level  
X = Don't Care  
— = 1st HIGH Level  
Clock Pulse  
After E<sub>CP</sub> Goes  
LOW  
Clock Pulse

H.75

## 4710B/4710BX

### REGISTER STACK • 16x4 RAM WITH 3-STATE OUTPUT REGISTER



H.76

D<sub>0</sub>-D<sub>3</sub>

Address Inputs

Data Inputs

Chip Select Input (Active LOW)

Output Enable Input (Active LOW)

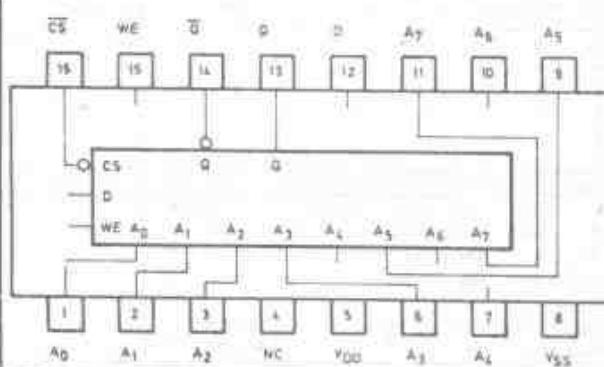
Write Enable Input (Active LOW)

Clock Input (Outputs Change on LOW to HIGH Transition)

Outputs

H.77

## 4720B 256-Bit RAM, 3-State



MODE SELECTION

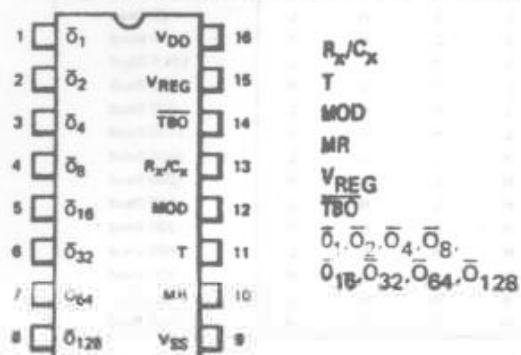
CS	WE	Q	Q̄	MODE
L	H	Data Written Into Memory	Complement of Data Written Into Memory	Write
L	L	Data Written Into Memory	Complement of Data Written Into Memory	Read
H	X	High Impedance	High Impedance	Inhibit

#### Pin Names

CS	Chip Select Input (Active LOW)
WE	Write Enable Input
D	Data Input
A <sub>0</sub> -A <sub>7</sub>	Address Inputs
Q	3-State Output (Active HIGH)
Q̄	3-State Output (Active LOW)

# 4722B

## PROGRAMMABLE TIMER/COUNTER

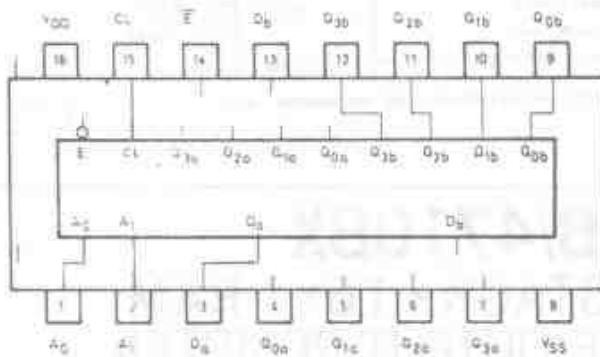


External Resistor/Capacitor Connection  
Trigger Input  
Modulation Input  
Master Reset Input  
Regulator Output  
Time Base Output (Open Drain)  
Data Outputs (Active Low-Open Drain)

H.78

## 4723B Dual 4-Bit Addressable Latch

H.79



MODE SELECTION		
E	CL	MODE
L	L	Addressable Latch
H	L	Memory
L	H	Dual 4-Channel Demultiplexer
H	H	Clear

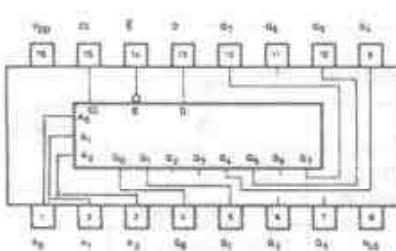
TRUTH TABLE									
CL	E	D	A <sub>0</sub>	A <sub>1</sub>	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	MODE
H	H	X	X	X	L	L	L	-	Clear
H	L	L	L	L	L	L	L	-	Demultiplex
H	L	H	L	L	H	L	L	-	
H	L	L	H	L	L	L	L	L	
H	L	H	H	L	L	H	L	L	
H	L	L	L	H	L	L	L	L	
H	L	H	L	H	L	L	H	L	
H	L	L	H	H	L	L	L	L	
L	H	X	X	X	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Memory
L	L	L	L	L	L	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Addressable
L	L	H	L	L	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Latch
L	L	L	H	L	Q <sub>N-1</sub>	L	Q <sub>N-1</sub>	Q <sub>N-1</sub>	
L	L	H	H	L	Q <sub>N-1</sub>	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	
L	L	L	L	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	L	Q <sub>N-1</sub>	
L	L	H	L	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	H	Q <sub>N-1</sub>	
L	L	L	H	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	L	
L	L	H	H	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	H	

### Pin Names

- A<sub>0</sub>, A<sub>1</sub> Address Inputs
- D<sub>0</sub>, D<sub>1</sub> Data Inputs
- E Enable Input (Active LOW)
- CL Clear Input (Active HIGH)
- Q<sub>0a</sub>-Q<sub>3a</sub>, Q<sub>0b</sub>-Q<sub>3b</sub> Parallel Latch Outputs

## 4724B 8-Bit Addressable Latch

H.80



MODE SELECTION		
E	CL	MODE
L	L	Addressable Latch
H	L	Memory
L	H	Active HIGH 8-Channel Demultiplexer
H	H	Clear

TRUTH TABLE									
CL	E	D	A <sub>0</sub>	A <sub>1</sub>	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	MODE
H	H	X	X	X	L	L	L	L	CLEAR
H	L	L	L	L	L	L	L	L	DEMULTIPLEX
H	L	H	L	L	H	L	L	L	
H	L	L	H	L	L	L	L	L	
H	L	H	H	L	L	H	L	L	
H	L	L	L	H	L	L	L	L	
H	L	H	L	H	L	L	L	L	
H	L	L	H	H	L	L	L	L	
L	H	X	X	X	Q <sub>N-1</sub>	—	—	—	MEMORY
L	L	L	L	L	L	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	ADDRESSABLE
L	L	H	L	L	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	LATCH
L	L	L	H	L	Q <sub>N-1</sub>	L	Q <sub>N-1</sub>	Q <sub>N-1</sub>	
L	L	H	H	L	Q <sub>N-1</sub>	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	
L	L	L	L	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	L	Q <sub>N-1</sub>	
L	L	H	H	H	Q <sub>N-1</sub>	Q <sub>N-1</sub>	Q <sub>N-1</sub>	L	
L	L	H	H	H	Q <sub>N-1</sub>	—	—	—	

L = LOW Level

H = HIGH Level

X = Don't Care

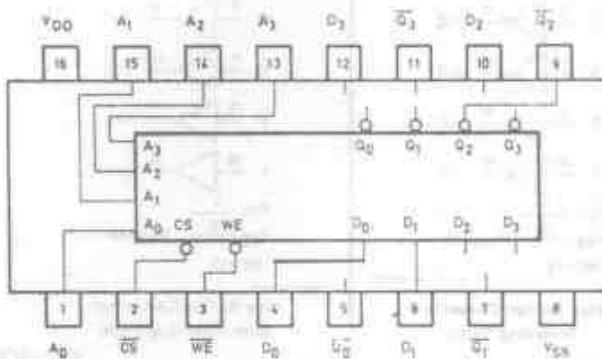
Q<sub>N-1</sub> = State Before the Positive

Transition of the Enable Input

4725B

**64-Bit RAM,  
3-State**

H.81



CS	WE	OUTPUTS	MODE
L	L	High Impedance	Write
L	H	Outputs are Complement of Data Written into Location	Read
H	X	High Impedance	Inhibit

## Pin Names

Chip Select Input (Active LOW)  
Write Enable Input (Active LOW)  
Data Inputs  
Address Inputs  
3-State Outputs (Active LOW)

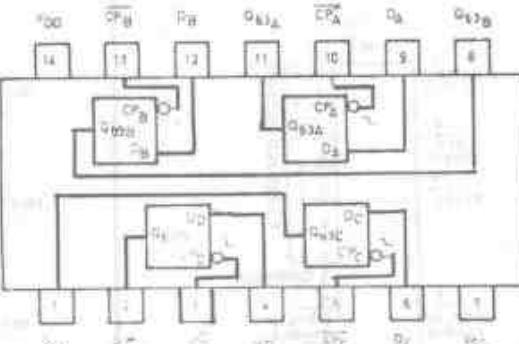
4727B

## 7-STAGE COUNTER



H82

## **4731B Quad 64-Bit Static Shift Register**



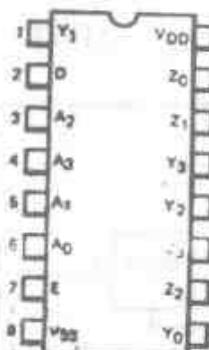
© 2013 Pearson

**Block 14: Edge-Integrated  
Rutherford Outputs from the  
45th Hemisphere Position**

4741B

## 4 x 4 CROSS POINT SWITCH

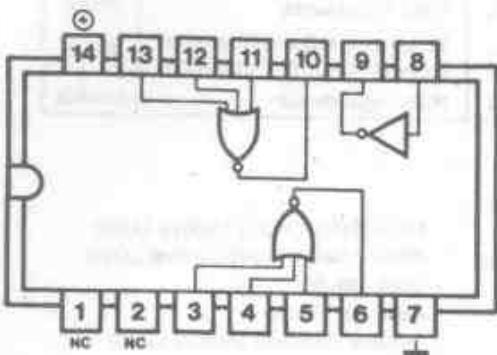
HL84



Analog Input/Outputs  
Analog Input/Outputs  
Address Inputs  
Digital Input  
Enable Input

PIN NAMES

DUAL 3-INPUT NOR-GATE PLUS INVERTER  
4000



H.85

A	3	2	G+A
B	5	4	H+B
C	7	6	I+C
D	9	10	J+D
E	11	12	K+E
F	14	15	L+F
V <sub>CC</sub>	1	8	V <sub>DD</sub> +16
V <sub>SS</sub>	6	16	V <sub>SS</sub>
NC	13		NC

92CS-4140R2  
Hex Buffer/Converter  
Inverting Type

CD4009A  
CD4009B

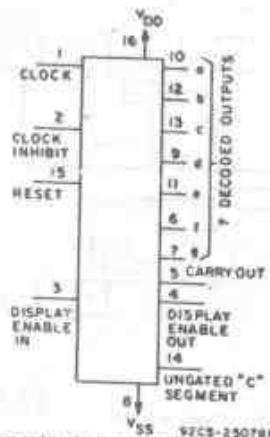
H.88

A	3	2	G+A
B	5	4	H+B
C	7	6	I+C
D	9	10	J+D
E	11	12	K+E
F	14	15	L+F
V <sub>CC</sub>	1	8	V <sub>DD</sub> +16
V <sub>SS</sub>	6	16	V <sub>SS</sub>
NC	13		NC

92CS-1750F  
Hex Buffer/Converter  
Non-Inverting Type

CD4010A  
CD4010B

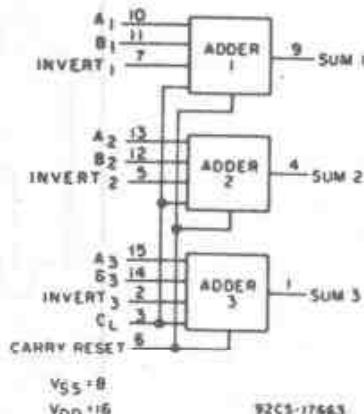
H.90



Decade Counter/Divider with 7-Segment Display Outputs and Display Enable

CD4026A  
CD4026B

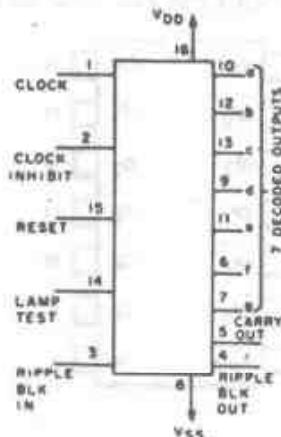
H.86



92CS-17663  
Triple Serial Adder  
Positive Logic

CD4032A  
CD4032B

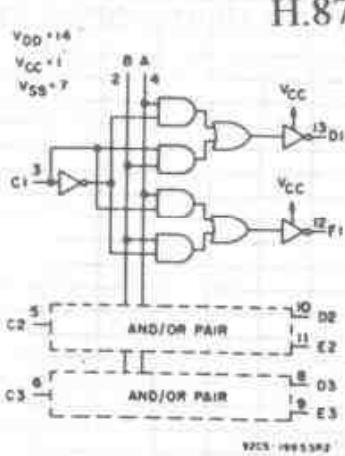
H.89



Decade Counter/Divider  
with 7-Segment Display  
Outputs and Ripple Blanking

CD4033A  
CD4033B

H.91



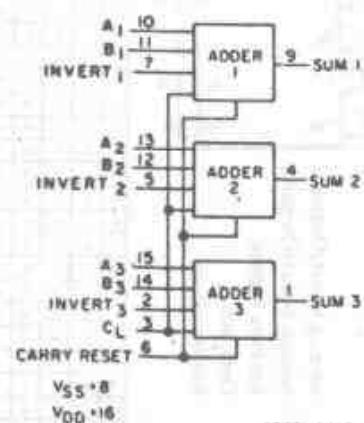
Triple AND/OR Bi-Phase  
Pair

CD4037A

530

4037

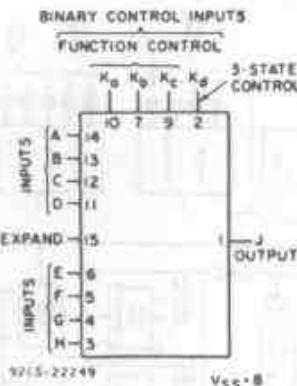
INPUT		OUTPUT	
A	B	D	E
0	0	1	1
1	0	C	$\bar{C}$
0	1	$\bar{C}$	C
1	1	0	0



92CS-17663  
Triple Serial Adder  
Negative Logic

CD4038A  
CD4038B

H.92



Multi-Function Expendable  
8-Input Gate

H.93

CD4048A  
CD4048B

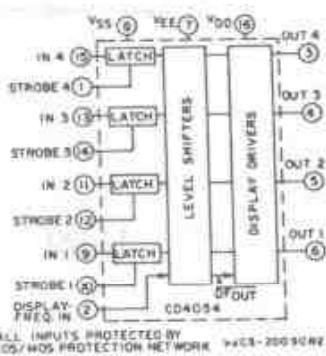
FUNCTION TRUTH TABLE

OUTPUT FUNCTION	BOOLEAN EXPRESSION	K <sub>a</sub>	K <sub>b</sub>	K <sub>c</sub>	UNUSED INPUT*
NOR	J= $\overline{A+B+C+D+E+F+G+H}$	0	0	0	V <sub>SS</sub>
OR	J=A+B+C+D+E+F+G+H	0	0	1	V <sub>SS</sub>
OR/AND	J=(A+B+C+D)·(E+F+G+H)	0	1	0	V <sub>SS</sub>
OR/NAND	J=(A+B+C+D)·(E+F+G+H)	0	1	1	V <sub>SS</sub>
AND	J=ABCDEF GH	1	0	0	V <sub>DD</sub>
NAND	J=ABCDEF GH	1	0	1	V <sub>DD</sub>
AND/NOR	J=ABCD+EFGH	1	1	0	V <sub>DD</sub>
AND/OR	J=ABCD+EFGH	1	1	1	V <sub>DD</sub>

K<sub>d</sub>=1 Normal Inverter Action

K<sub>d</sub>=0 High Impedance Output

EXPAND Input=0

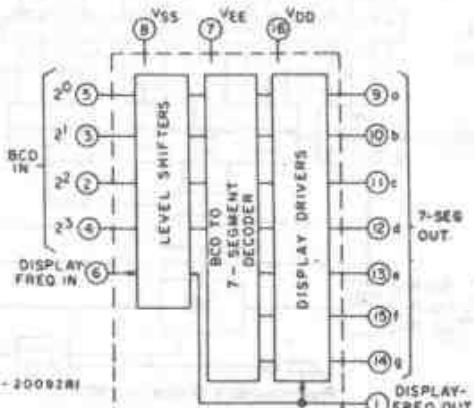


4-Segment Liquid-Crystal  
Display Driver

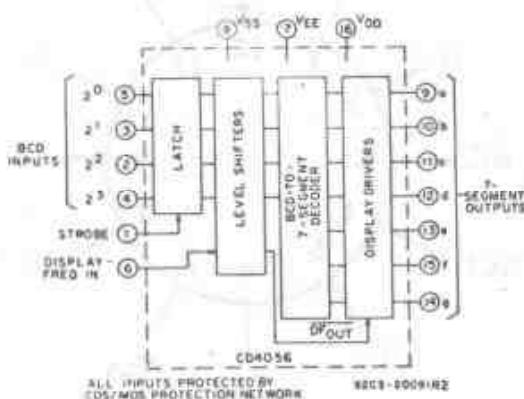
CD4054B

H.94

H.95



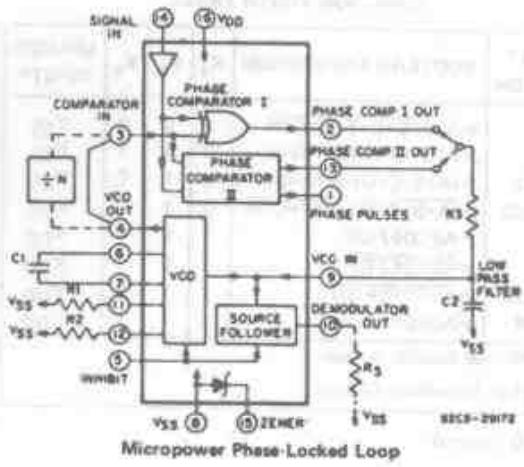
BCD-to-7-Segment Decoder/Driver  
with "Display-Frequency" Output  
Liquid-Crystal Display Driver  
CD4065B



BCD-to-7-Segment Decoder/Driver  
with Strobed-Latch Function  
Liquid-Crystal Display Driver  
CD4056B

TRUTH TABLE FOR CD4055B and CD4056B

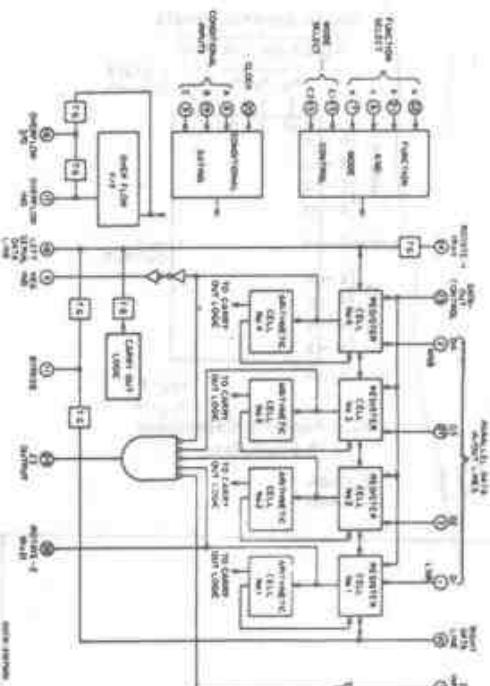
INPUT CODE	OUTPUT STATE							DISPLAY CHARACTER
	a	b	c	d	e	f	g	
2 <sup>0</sup> 0	1	1	1	1	1	1	0	□
2 <sup>0</sup> 0	0	1	1	0	0	0	0	□
2 <sup>0</sup> 0	1	1	0	1	1	0	1	□
2 <sup>0</sup> 0	1	1	1	1	1	0	0	□
2 <sup>0</sup> 0	0	1	1	0	0	1	1	□
2 <sup>0</sup> 0	1	0	1	1	0	1	1	□
2 <sup>0</sup> 0	1	0	1	0	1	1	1	□
2 <sup>0</sup> 0	0	1	1	0	1	1	1	□
2 <sup>0</sup> 1	1	1	1	1	1	1	1	□
2 <sup>0</sup> 1	1	1	1	1	1	1	0	□
2 <sup>0</sup> 1	1	1	1	1	1	0	1	□
2 <sup>0</sup> 1	1	1	1	1	0	1	1	□
2 <sup>0</sup> 1	1	1	1	0	1	1	1	□
2 <sup>0</sup> 1	1	1	0	1	1	1	1	□
2 <sup>0</sup> 1	1	0	1	1	1	1	1	□
2 <sup>0</sup> 1	1	0	1	1	1	0	1	□
2 <sup>0</sup> 1	1	0	1	0	1	1	1	□
2 <sup>0</sup> 1	1	0	1	0	1	1	0	□
2 <sup>0</sup> 1	1	0	0	1	1	1	1	□
2 <sup>0</sup> 1	1	0	0	1	1	1	0	□
2 <sup>0</sup> 1	1	0	0	1	1	0	1	□
2 <sup>0</sup> 1	1	0	0	1	0	1	1	□
2 <sup>0</sup> 1	1	0	0	1	0	1	0	□
2 <sup>0</sup> 1	1	0	0	0	1	1	1	□
2 <sup>0</sup> 1	1	0	0	0	1	1	0	□
2 <sup>0</sup> 1	1	0	0	0	1	0	1	□
2 <sup>0</sup> 1	1	0	0	0	0	1	1	□
2 <sup>0</sup> 1	1	0	0	0	0	0	1	□
2 <sup>0</sup> 1	1	0	0	0	0	0	0	□
2 <sup>0</sup> 1	1	0	0	0	0	0	0	BLANK



H.96

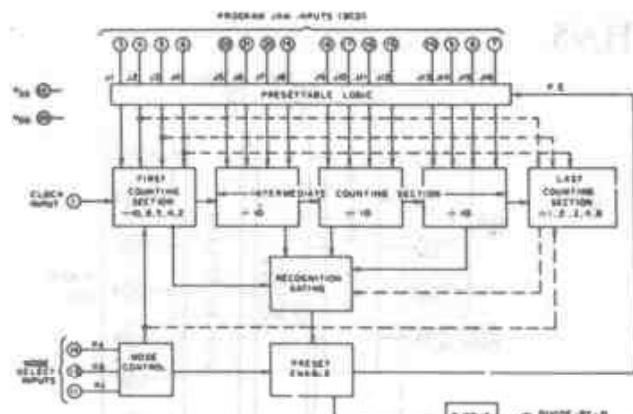
Micropower Phase-Locked Loop

CD4046A  
CD4046B



H.99

4-Bit Arithmetic Logic Unit  
CD4057A



H.97

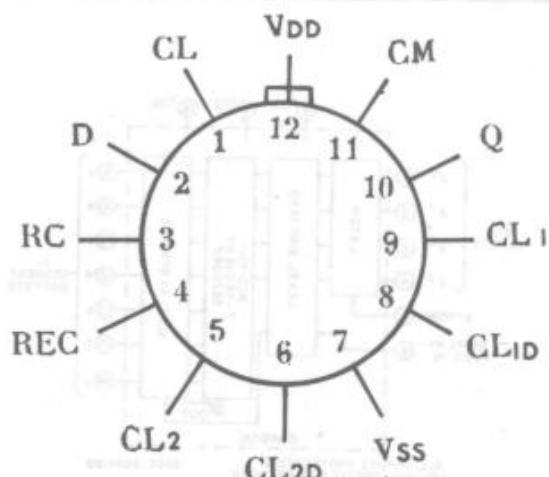
Programmable Divide-by-'N'  
Counter

CD4059A

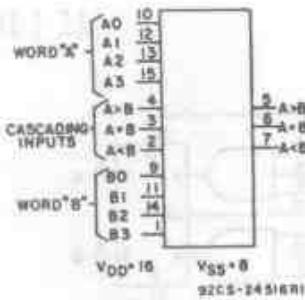
H.98

200-Stage Dynamic Shift Register

CD4062A



H.100



4-Bit Magnitude Comparator

CD4063B

H.101

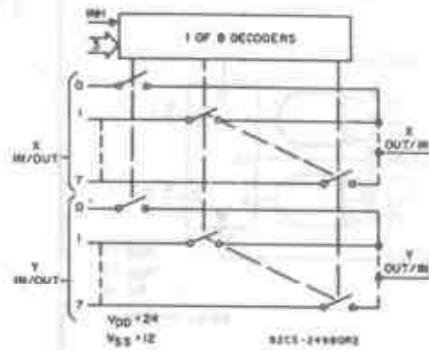
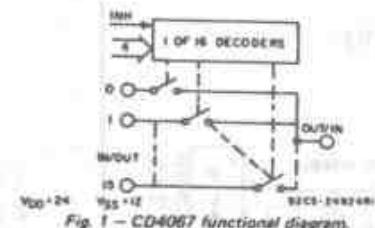
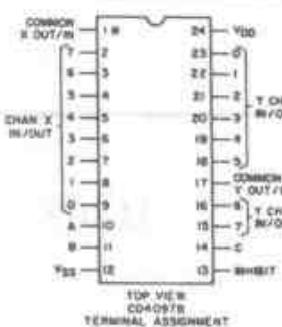
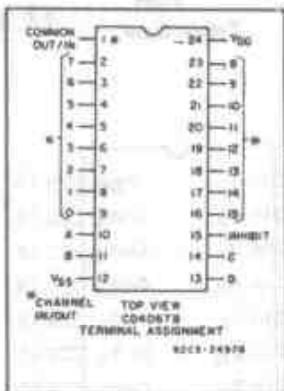
INPUTS								OUTPUTS		
COMPARING				CASCAADING						
A3, B3	A2, B2	A1, B1	A0, B0	A < B	A = B	A > B	A < B	A = B	A > B	
A3 > B3	X	X	X	X	X	X	0	0	1	
A3 = B3	A2 > B2	X	X	X	X	X	0	0	1	
A3 = B3	A2 = B2	A1 > B1	X	X	X	X	0	0	1	
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	0	0	1	
A3 = B3	A2 = B2	A1 = B1	A0 = B0	0	0	1	0	0	1	
A3 = B3	A2 = B2	A1 = B1	A0 = B0	0	1	0	0	1	0	
A3 = B3	A2 = B2	A1 = B1	A0 = B0	1	0	0	1	0	0	
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	1	0	0	
A3 = B3	A2 = B2	A1 < B1	X	X	X	X	1	0	0	
A3 = B3	A2 < B2	X	X	X	X	X	1	0	0	
A3 < B3	X	X	X	X	X	X	1	0	0	

X = Don't Care

Logic 1 ≡ High Level

Logic 0 ≡ Low Level

## CD4067B, CD4097B



CD4067 TRUTH TABLE

A	B	C	D	Inh	Selected Channel
X	X	X	X	1	None
0	0	0	0	0	0
1	0	0	0	0	1
0	1	0	0	0	2
1	1	0	0	0	3
0	0	1	0	0	4
1	0	1	0	0	5
0	1	1	0	0	6
1	1	1	0	0	7
0	0	0	1	0	8
1	0	0	1	0	9
0	1	0	1	0	10
1	1	0	1	0	11
0	0	1	1	0	12
1	0	1	1	0	13
0	1	1	1	0	14
1	1	1	1	0	15

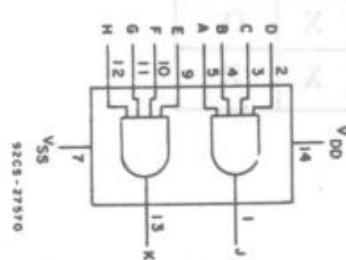
CD4067 TRUTH TABLE

A	B	C	Inh	Selected Channel
X	X	X	1	None
0	0	0	0	0X, 0Y
1	0	0	0	1X, 1Y
0	1	0	0	2X, 2Y
1	1	0	0	3X, 3Y
0	0	1	0	4X, 4Y
1	0	1	0	5X, 5Y
0	1	1	0	6X, 6Y
1	1	1	0	7X, 7Y

H.103

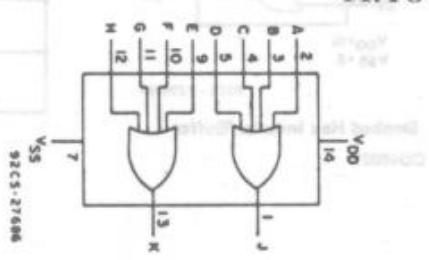
CD4062B

Dual 4-Input AND Gate



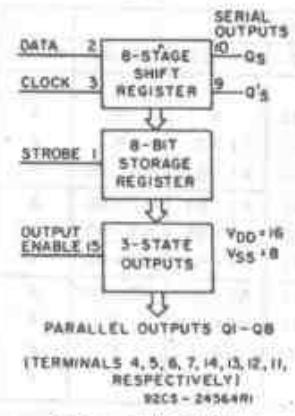
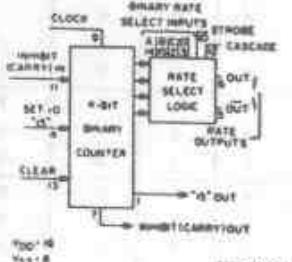
CD4072B

Dual 4-Input OR Gate

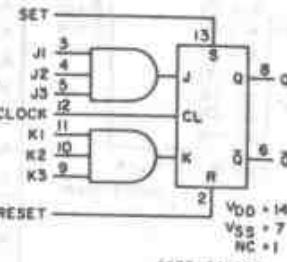


H.104

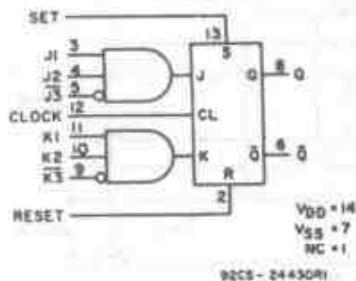
H.105



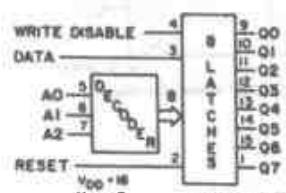
H.110



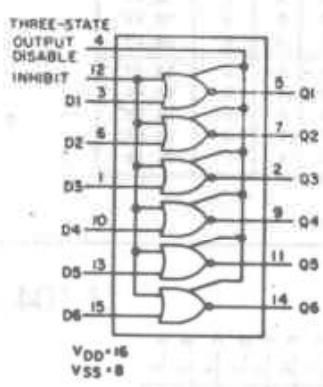
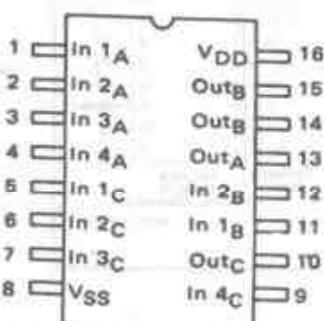
H.106



H.109

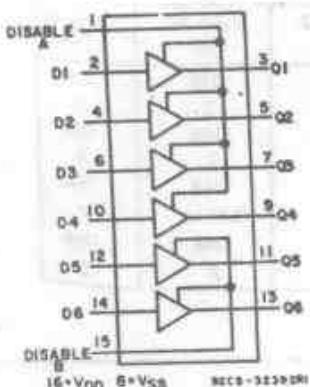
4501  
Triple Gate

H.111



4502

Disable	Inhibit	D <sub>n</sub>	Q <sub>n</sub>
0	0	0	1
0	0	1	0
0	1	X	0
1	X	X	Z



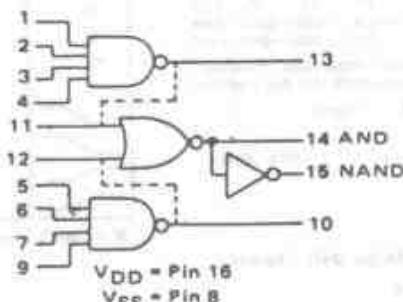
**4503**

D <sub>N</sub>	DISA (B)	Q <sub>N</sub>
0	0	0
1	0	1
X	1	Highz

Hex Buffer  
3-State Non-Inverting  
CD4503B

H.112

**4501**



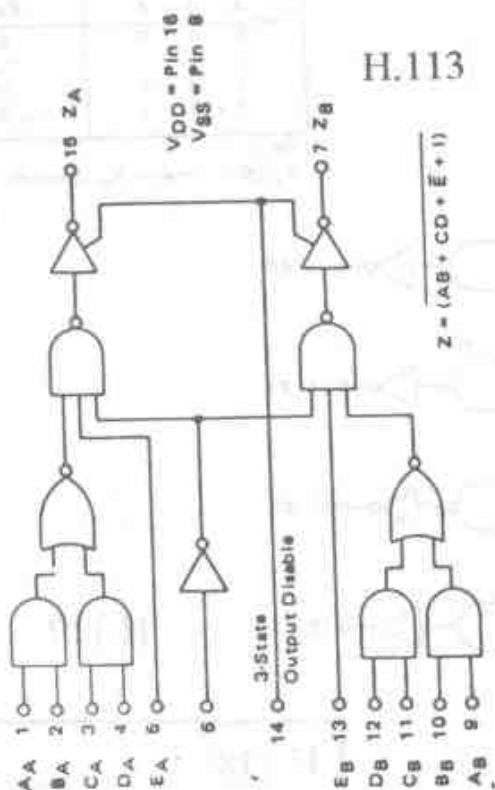
Use Dotted Connection Externally to Obtain 8-Input AND/NAND

Note: Pin 14 must not be used as an input to the inverter.

H.115

**4506**

LOGIC DIAGRAM



**4508**

TRUTH TABLE

RESET	DISABLE	STROBE	D INPUT	Q OUTPUT
0	0	1	1	1
0	0	1	0	0
0	0	0	X	LATCHED
1	0	X	X	0
X	1	X	X	Z

1 = HIGH LEVEL

0 = LOW LEVEL

X = DON'T CARE

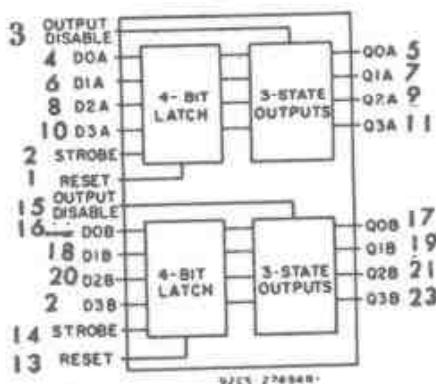
Z = HIGH IMPEDANCE

**4506**

A	B	C	D	E	INHIBIT	DISABLE	Z
0	0	0	0	1	0	0	1
0	0	0	X	1	0	0	1
0	X	X	0	1	0	0	1
X	0	0	X	1	0	0	1
X	0	X	0	1	0	0	1
X	0	X	X	1	0	0	1
1	1	X	X	X	X	0	0
X	X	1	1	X	X	0	0
X	X	X	0	X	X	0	0
X	X	X	X	X	1	0	0
X	X	X	X	X	X	1	High Impedance

X = Don't Care

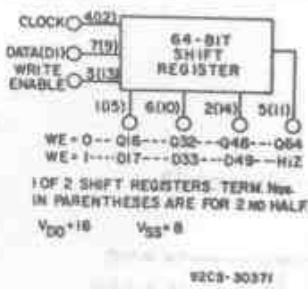
H.114



V<sub>SS</sub> 12

Dual 4-Bit Latch

V<sub>DD</sub> 24 CD4506B



Dual 64-Bit Shift Register  
CD4517B

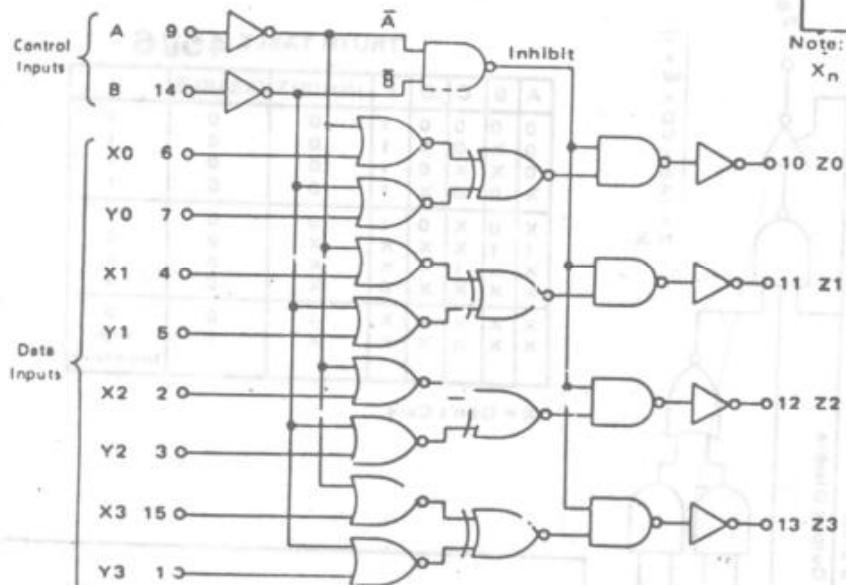
Clock	Write Enable	Data	Stage 16 Tap	Stage 32 Tap	Stage 48 Tap	Stage 64 Tap
0	0	X	Q16	Q32	Q48	Q64
0	1	Z		Z	Z	Z
1	0	X	Q16	Q32	Q48	Q64
1	1	Z		Z	Z	Z
	0	DI In	Q16	Q32	Q48	Q64
	1	DI In	D17 In	D33 In	D49 In	Z
	0	X	Q16	Q32	Q48	Q64
	1	X	Z	Z	Z	Z

X = Don't Care

Z = High Impedance

H.116

4519B  
4-Bit AND/OR Selector



TRUTH TABLE

4519

CONTROL INPUTS		OUTPUT
A	B	Z <sub>n</sub>
0	0	0
0	1	Y <sub>n</sub>
1	0	X <sub>n</sub>
1	1	X <sub>n</sub> ⊕ Y <sub>n</sub>

Note:

X<sub>n</sub> ⊕ Y<sub>n</sub> means X<sub>n</sub> (Exclusive NOR) Y<sub>n</sub>

H.117

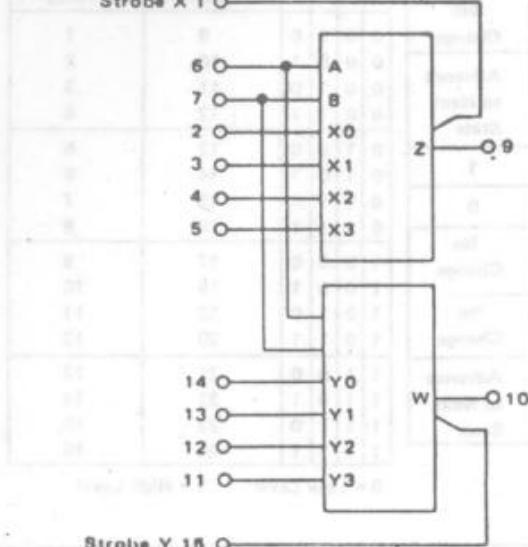
H.118

4534B  
Real Time 5-Decade Counter

1	C <sub>ext</sub>	V <sub>DD</sub>	24
2	MR	Clock B	23
3	E <sub>out</sub>	C <sub>ext</sub>	22
4	Clock A 3-St BCD	C <sub>ext</sub>	21
5	Mode A	Q <sub>0</sub>	20
6	Mode B	Q <sub>1</sub>	19
7	DS1	Q <sub>2</sub>	18
8	DS2	Q <sub>3</sub>	17
9	SR	DS4	16
10	SC	3-St Dig	15
11	DS5	DS3	14
12	V <sub>SS</sub>	C <sub>out</sub>	13

**4529B**  
Dual 4-Channel Analog  
Data Selector

3 State Output Enable  
Strobe X 1 O



V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

Dual 4-Channel Mode  
2 Outputs

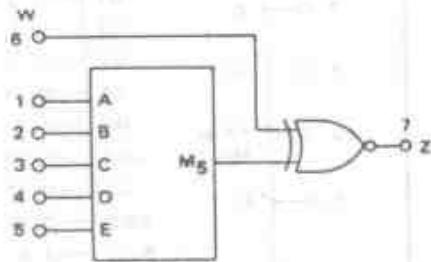
Single 8-Channel Mode  
1 Output  
(Z and W tied together)

TRUTH TABLE						
ST	X	STY	B	A	Z	W
-	-	-	0	0	X0	Y0
-	-	-	0	1	X1	Y1
-	-	-	1	0	X2	Y2
-	-	-	1	1	X3	Y3
0	0	0	0	0	X0	Y0
0	0	0	0	1	X1	Y1
0	0	1	0	0	X2	Y2
0	0	1	0	1	X3	Y3
0	1	0	0	0	0	0
0	1	0	0	1	0	1
0	1	1	0	0	0	0
0	1	1	0	1	0	1
0	1	1	1	0	0	0
0	1	1	1	1	0	1
1	0	0	0	0	0	0
1	0	0	0	1	0	0
1	0	1	0	0	0	0
1	0	1	0	1	0	0
1	0	1	1	0	0	0
1	0	1	1	1	0	0
1	1	0	0	0	0	0
1	1	0	0	1	0	0
1	1	1	0	0	0	0
1	1	1	0	1	0	0
1	1	1	1	0	0	0
1	1	1	1	1	0	0

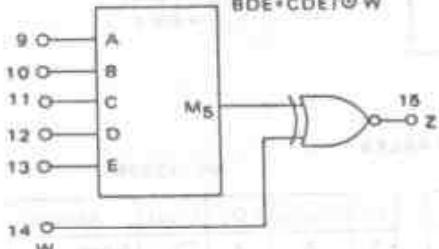
H.119

φ = Don't Care

**4530B**  
Dual 5-Input Majority Logic Gate



$$Z = M_5 \oplus W = (ABC + ABD + ABE + ACD + ACE + ADE + BCD + BCE + BDE + CDE) \oplus W$$



\* M<sub>5</sub> is a logical "1" if any three or more inputs are logical "1".

⊕ ≡ Exclusive NOR ≡ Exclusive OR

TRUTH TABLE

M <sub>5</sub>	W	Z
0	0	1
0	1	0
1	0	0
1	1	1

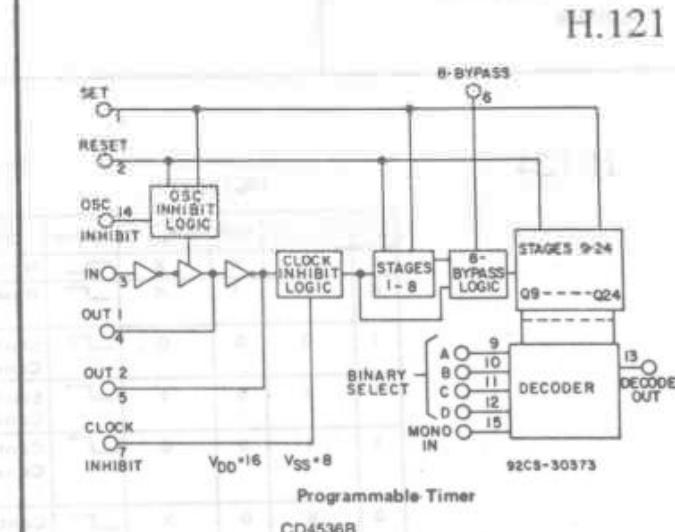
V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

**4530**  
LOGIC TABLE

INPUTS A B C D E	W	Z
For all combinations of inputs where three or more inputs are logical "0"	0	1
	1	0
For all combinations of inputs where three or more inputs are logical "1"	0	0
	1	1

H.120

H.121



TRUTH TABLE

IN1	SET	RESET	CLOCK INH	OSC INH	OUT1	OUT2	DECODE OUT
/	0	0	0	0	/	/	No Change
/	0	0	0	0	/	/	Advance to Next State
X	1	0	0	0	0	1	1
X	0	1	0	0	0	1	0
X	0	0	1	0			No Change
0	0	0	0	X	0	1	No Change
1	0	0	0	/	/	/	Advance to Next State

0 = Low Level

1 = High Level

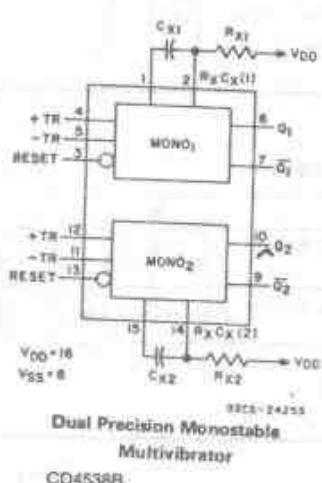
X = Don't Care

DECODE OUT SELECTION TABLE

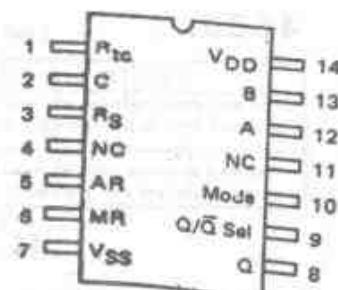
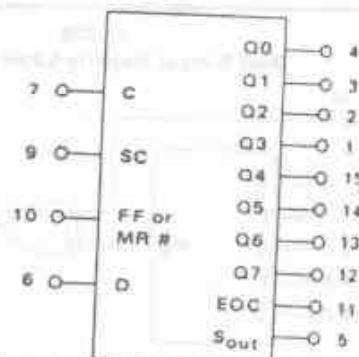
D	C	B	A	NUMBER OF STAGES IN DIVIDER CHAIN	
				8-BYPASS = 0	8-BYPASS = 1
0	0	0	0	9	1
0	0	0	1	10	2
0	0	1	0	11	3
0	0	1	1	12	4
0	1	0	0	13	5
0	1	0	1	14	6
0	1	1	0	15	7
0	1	1	1	16	8
1	0	0	0	17	9
1	0	0	1	18	10
1	0	1	0	19	11
1	0	1	1	20	12
1	1	0	0	21	13
1	1	0	1	22	14
1	1	1	0	23	15
1	1	1	1	24	16

0 = Low Level      1 = High Level

H.123



H.125

4541B  
Programmable Oscillator/Timer4559 4549B  
Successive Approximation Register

H.124

MC14549B TRUTH TABLES

S <sup>n</sup>	SC <sub>t-1</sub>	MR	MR <sub>t-1</sub>	Clock	Action
X	X	X	X	/	None
X	X	1	X	/	Reset
1	0	0	0	/	Start Conversion
1	X	0	1	/	Start Conversion
1	1	0	0	/	Continue Conversion
0	X	0	X	/	Continue Previous Operation

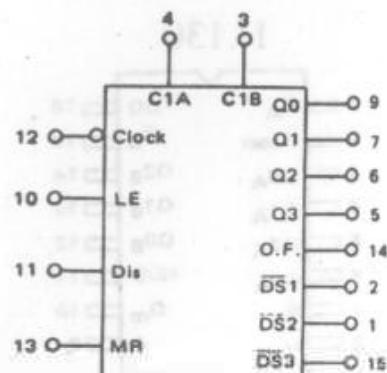
X = Don't Care

t-1 = State at Previous Clock /

MC14559B

SC	SC <sub>t-1</sub>	EOC	Clock	Action
X	X	X	/	None
1	0	0	/	Start Conversion
X	1	0	/	Continue Conversion
0	0	0	/	Continue Conversion
0	X	1	/	Retain Conversion Result
1	X	1	/	Start Conversion

4553B  
3-Digit BCD Counter



V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

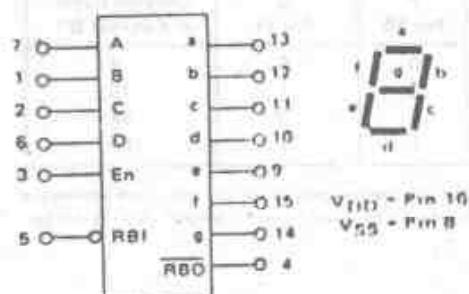
TRUTH TABLE

INPUTS				OUTPUTS
MASTER RESET	CLOCK	DISABLE	LE	
0	/	0	0	No Change
0	/	0	0	Advance
0	X	1	X	No Change
0	1	/	0	Advance
0	1	/	0	No Change
0	0	X	X	Latched
0	X	X	1	Latched
1	X	X	0	Q <sub>0</sub> = Q <sub>1</sub> = Q <sub>2</sub> = Q <sub>3</sub> = 0

X = Don't Care

H.126

4558B  
BCD-to-Seven Segment Decoder



V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

AUXILIARY INPUT TRUTH TABLE

Enable Pin 3	RBI Pin 5	BCD Input Code	RBO Pin 4	Function Performed
0	0	X	0	Lamp Test
0	1	X	1	Blank Segments
1	1	0	1	Display Zero
1	0	0	0	Blank Segments
1	X	1-9	1	1-9 Displayed

X = Don't Care

RBI = Ripple Blanketing Input

RBO = Ripple Blanketing Output

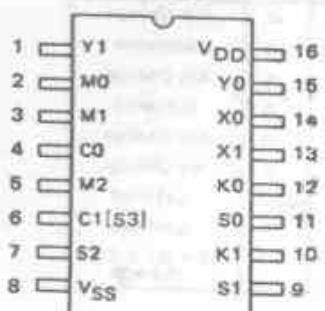
H.127

TRUTH TABLE

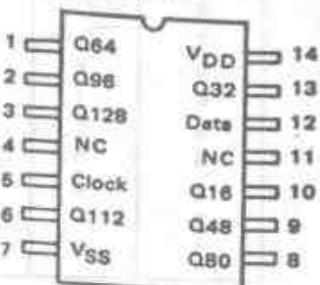
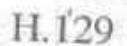
INPUTS										OUTPUTS*						
En Pin 3	RBI Pin 5	D Pin 6	C Pin 2	B Pin 1	A Pin 7	a Pin 13	b Pin 12	c Pin 11	d Pin 10	e Pin 9	f Pin 15	g Pin 14	RBO Pin 4	DISPLAY		
1	1	0	0	0	0	1	1	1	1	1	1	0	1	0	0	
1	X	0	0	0	1	0	0	0	0	1	1	0	1	1	1	
1	X	0	0	1	0	1	1	0	1	1	0	1	1	1	2	
1	X	0	0	1	1	1	1	1	1	0	0	0	1	1	3	
1	X	0	1	0	0	0	1	1	0	0	1	1	1	1	4	
1	X	0	1	0	1	1	0	1	1	0	1	1	1	1	5	
1	X	0	1	1	0	0	0	1	1	1	1	1	1	1	6	
1	X	0	1	1	1	1	1	0	0	0	0	0	1	1	7	
1	X	1	0	0	0	1	1	1	1	1	1	1	1	1	8	
1	X	1	0	0	1	1	1	1	0	0	1	1	1	1	9	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Blank	
0	0	X	X	X	X	1	1	1	1	1	1	1	0	0	8	
0	1	X	X	X	X	0	0	0	0	0	0	0	1	0	Blank	

\* All non-valid BCD input codes produce a blank display.

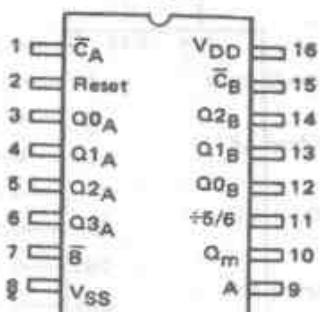
X = Don't Care



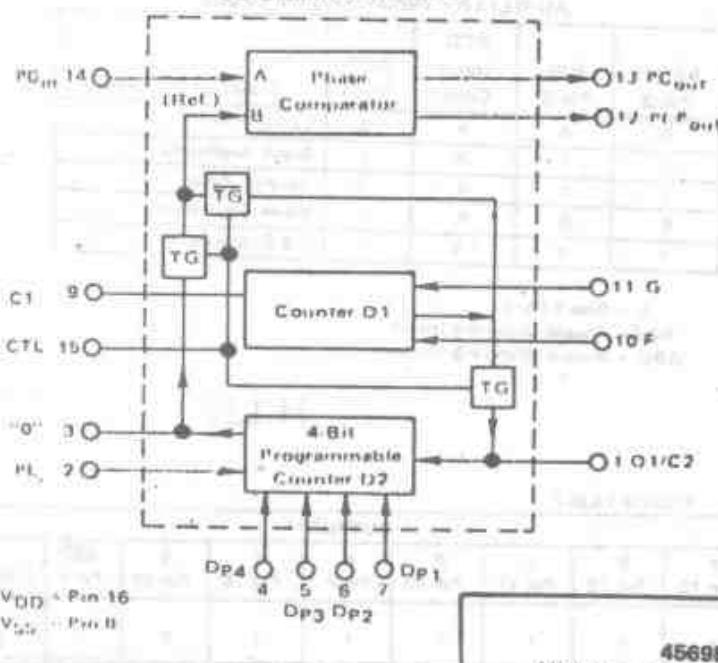
4582B  
128-Bit Static Shift Register



**4586B**  
**Industrial Time Base  
Generator**



4568B  
Phase Comparator and  
Programmable Counters



H.131

### TRUTH TABLE

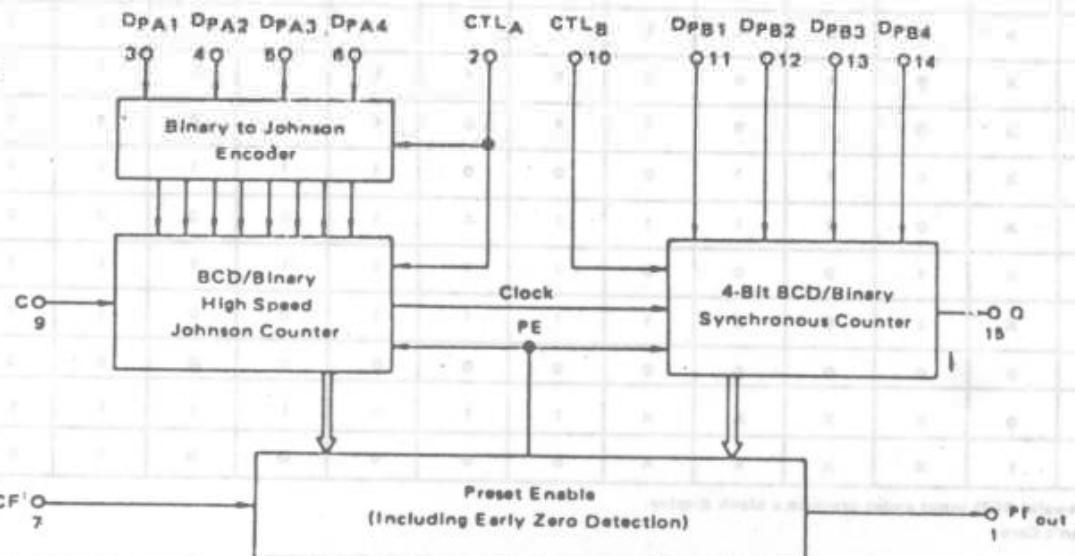
F Pin 10	G Pin 11	Division Ratio of Counter D1
0	0	4
0	1	16
1	0	64
1	1	100

The divide by zero state on the programmable divide by N 4-bit binary routine (D2) is illegal.

**4569B**  
**High Speed Programmable  
Divide-by-N Dual 4-Bit  
BCD/Binary Counter**

CTL = "0" for Binary Count  
CTL = "1" for BCD Count

V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

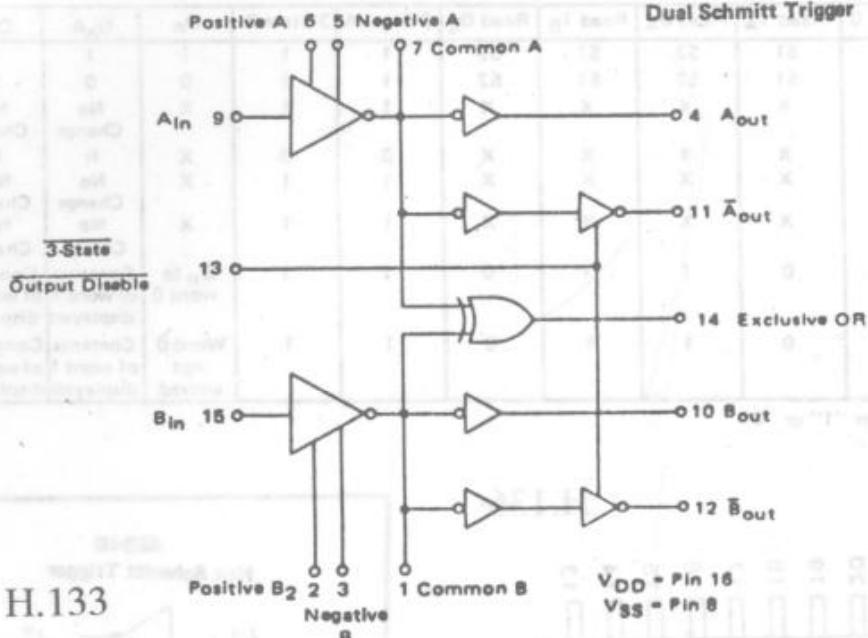


H.132

## LOGIC DIAGRAM

4593B

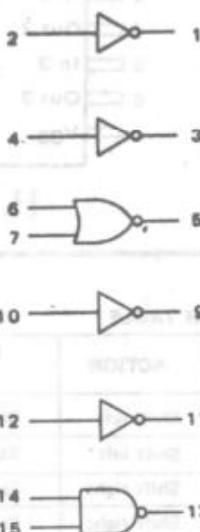
#### Dual Schmitt Trigger



INPUTS		OUTPUTS					
A	B	D <sub>11</sub>	A <sub>out</sub>	B <sub>out</sub>	C <sub>out</sub>	D <sub>out</sub>	①
0	0	0	0	0	0	0	0
0	1	0	0	1	0	1	0
1	0	0	0	0	-	-	-
1	1	0	0	1	-	0	1
1	0	0	1	0	0	0	1
1	1	0	1	0	0	1	0
1	1	1	1	1	0	0	0

H.133

4572



V<sub>DD</sub> = Pin 16

YSS = Pin 8

$$5 = \overline{6 + 7}$$

$$13 = \overline{14 + 15}$$

H.134

4585B

4 O	$(A > B)_{in}$	
6 O	$(A = B)_{in}$	
8 O	$(A < B)_{in}$	$(A > B)_{out}$ O13
10 O	A0	
11 O	B0	
7 O	A1	$(A = B)_{out}$ O3
9 O	B1	
2 O	A2	
1 O	B2	$(A < B)_{out}$ O12
15 O	A3	
14 O	B3	

V<sub>DD</sub> = Pin 16  
V<sub>SS</sub> = Pin 8

TRUTH TABLE E

Truth Table						
Inputs				Outputs		
Comparing			Cascading			
A3, B3	A2, B2	A1, B1	A0, B0	A < B	A = B	A > B
A3 > B3	X	X	X	X	X	1
A3 = B3	A2 > B2	X	X	X	X	1
A3 = B3	A2 = B2	A1 > B1	X	X	X	1
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	1
A3 = B3	A2 = B2	A1 = B1	A0 = B0	0	0	1
A3 = B3	A2 = B2	A1 = B1	A0 = B0	0	1	X
A3 = B3	A2 = B2	A1 = B1	A0 = B0	1	0	X
A3 < B3	A2 = B2	A1 = B1	A0 < B0	X	X	X
A3 < B3	A2 = B2	A1 < B1	X	X	X	1
A3 < B3	A2 < B2	X	X	X	X	1
A3 < B3	X	X	X	X	X	1

X = Don't Care

TRUTH TABLE 4580

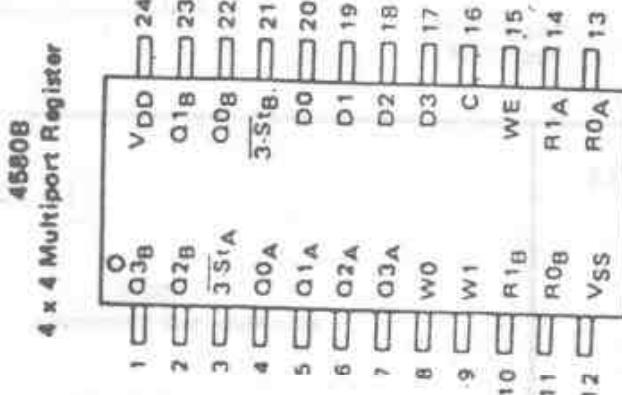
Clock	WE	Write 1	Write 0	Read 1A	Read 0A	Read 1B	Read 0B	3-State A	3-State B	Dn	QnA	QnB
1	S1	S2	S1	S2	S1	S2	S1	1	1	1	1	1
1	S1	S2	S1	S2	S1	S2	S1	1	1	0	0	-0
X	X	X	X	X	X	X	X	1	1	X	No Change	No Change
0	X	X	X	X	X	X	X	1	1	X	R	R
1	X	X	X	X	X	X	X	1	1	X	No Change	No Change
1	0	0	0	0	1	1	0	1	1	Dn to word 0	Contents of word 1 displayed	Contents of word 2 displayed
0	0	0	0	0	1	1	0	1	1	Word 0 not altered	Contents of word 1 displayed	Contents of word 2 displayed

S1 and S2 refer to input states of either "1" or "0"

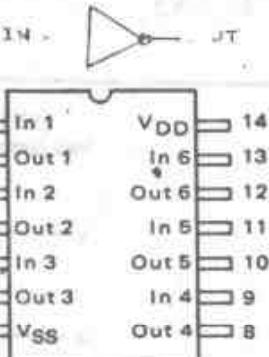
R implies high resistance  $\sim 10^9$  ohms.

X = Don't care

H.136

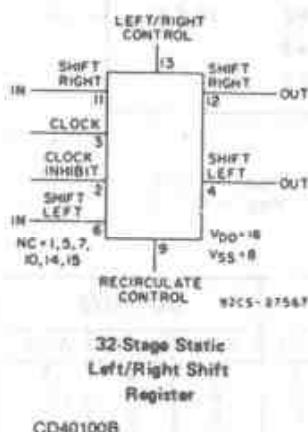


4584B  
Hex Schmitt Trigger



H.138

H.137



CONTROL TRUTH TABLE

LEFT/RIGHT CONTROL	CLOCK INHIBIT	RECIRCULATE CONTROL	ACTION	INPUT BIT ORIGIN
1	0	1	Shift left	Shift left input
1	0	0	Shift left	Stage 1
0	0	1	Shift right	Shift right input
0	0	0	Shift right	Stage 32
X	1	X	No shift	-

DATA TRANSFER TABLE\*

DATA INPUT	INITIAL STATE		LEVEL CHANGE	RESULTING STATE	
	CLOCK INHIBIT	INTERNAL STAGE		INTERNAL STAGE Q	OUTPUT
0	0	X	/	0	NC
X	0	0	/	NC	0
1	0	X	/	1	NC
X	0	1	/	NC	1
X	1	1	X	NC	NC

0 = Low level 1 = High level X = Don't care

\*For Shift-Right Mode

Data Input = SHIFT-RIGHT INPUT (Term. 11)

Internal Stage = Stage 1 (Q1)

Output = SHIFT-LEFT-OUTPUT (Term. 12)

NC = No change

For Shift-Left Mode

Data Input = SHIFT-LEFT INPUT (Term. 6)

Internal Stage = Stage 32 (Q32)

Output = SHIFT-RIGHT-OUTPUT (Term. 11)

TRUTH TABLE

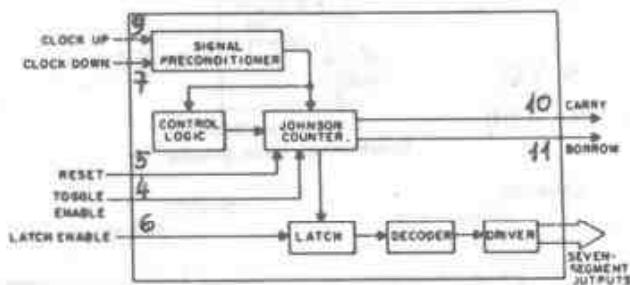
CLOCK UP*	CLOCK DOWN*	LATCH ENABLE	TOGGLE ENABLE	RESET	COUNTER	DISPLAY
	X	0	0	0	Increments by 1	Follows Counter
X		0	0	0	Decrements by 1	Follows Counter
		X	X	0	No Change	No Change
X	X	X	X	1	Goes to 00000	Follows Counter (Display = <u>00000</u> )
X	X	X	1	0	Inhibited	Remains Fixed
	X	1	0	0	Increments by 1	Remains Fixed
X		1	0	0	Decrements by 1	Remains Fixed

X = Don't care

1 = High State

0 = Low State

\* Typically 100 ns between clock-up and clock-down positive transitions are required to ensure proper counting.

8 V<sub>SS</sub>, 16 V<sub>DD</sub>

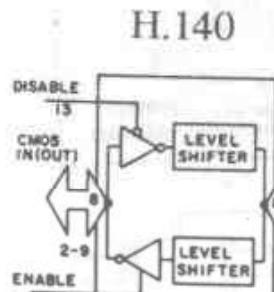
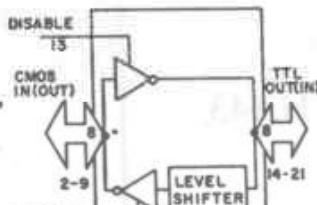
92CS-29200

Decade Up-Down Counter/  
Decoder/Latch/Driver

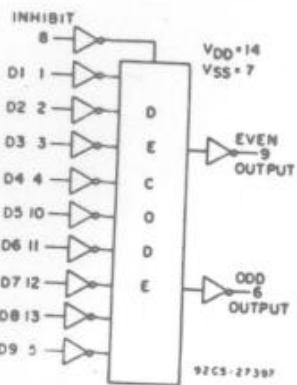
CD40110B

1a  
2g  
3f  
12e  
15b  
13d

H.139

V<sub>DD</sub>=1  
V<sub>CC</sub>=22  
V<sub>SS</sub>=118-Bit Universal Bidirectional  
CMOS/TTL Level Converter  
CD40115V<sub>DD</sub>=1  
V<sub>CC</sub>=22  
V<sub>SS</sub>=11,128-Bit Universal Bidirectional  
CMOS/TTL Level Converter  
CD40116

40116				FUNCTION	
Enable	Disable	Enable	Disable	4015	
X	0	0	0	0	Convert CMOS Level to TTL Level
1	-1	1	1	1	Convert TTL Level to CMOS Level
0	1	0	1	1	High Impedance (Z)
		1	0	1	Invalid



9-Bit Parity Generator/Checker  
CD40101B

40101

H.141

INPUTS		OUTPUTS	
D1 - D9	Inhibit	Even	Odd
$\Sigma 1'S = \text{Even}$	0	1	0
$\Sigma 1'S = \text{Odd}$	0	0	1
X	1	0	0

Logic diagram for CD40103B.

TRUTH TABLE

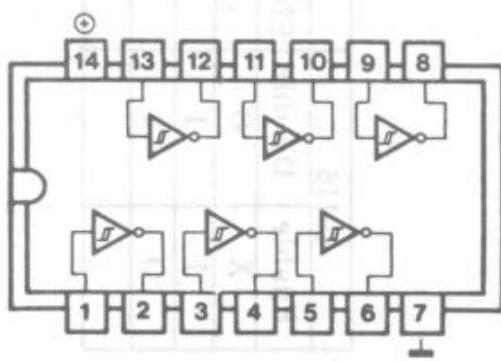
CONTROL INPUTS		PRESET MODE	ACTION
CLR	APE	SPE	Inhibit counter
1	1	1	Count down
1	1	0	Preset on next positive clock transition
1	0	X	Preset asynchronously
0	X	X	Clear to maximum count

Note: 1. 0 = Low level  
1 = High level  
X = Don't care

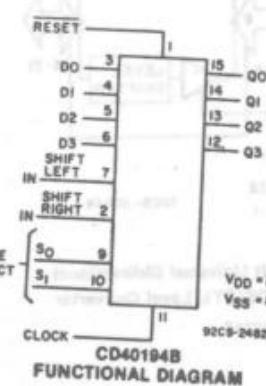
2. Clock connected to clock input
3. Synchronous operation: changes occur on negative-going positive clock transitions
4. JAM inputs: CD40102B BCD; MSD = J1,J5,J6,J4 (J7 is MSB)  
LSD = J3,J2,J1,J0 (J3 is MSB)
- CD40103B Binary; MSB = J7, LSB = J0

HEX SCHMITT TRIGGER

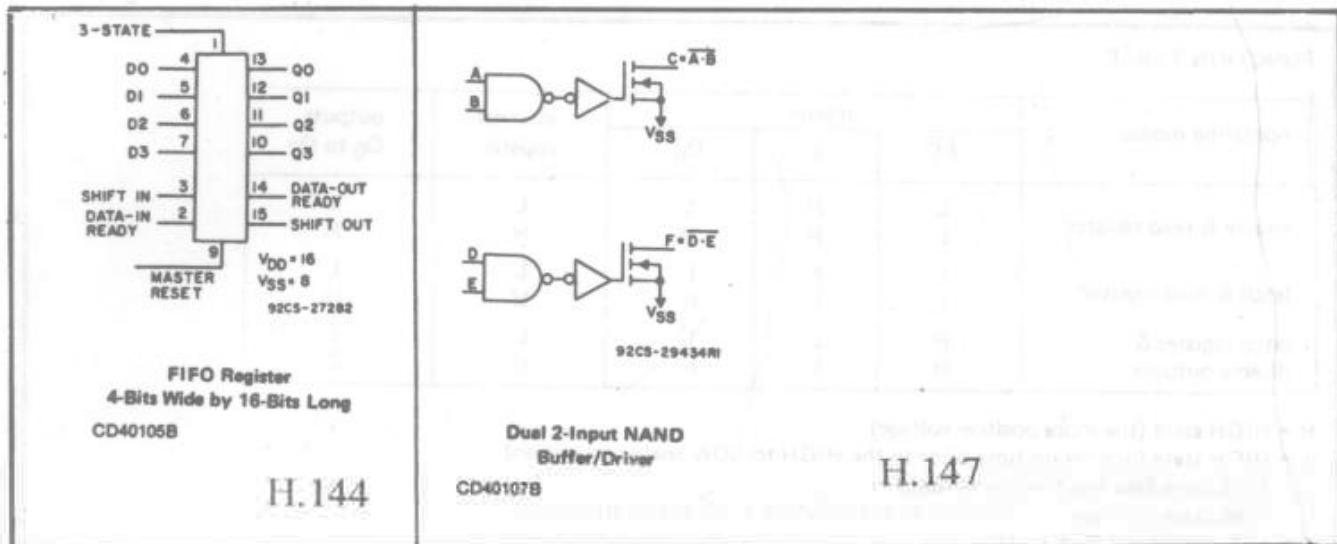
40106



H.143



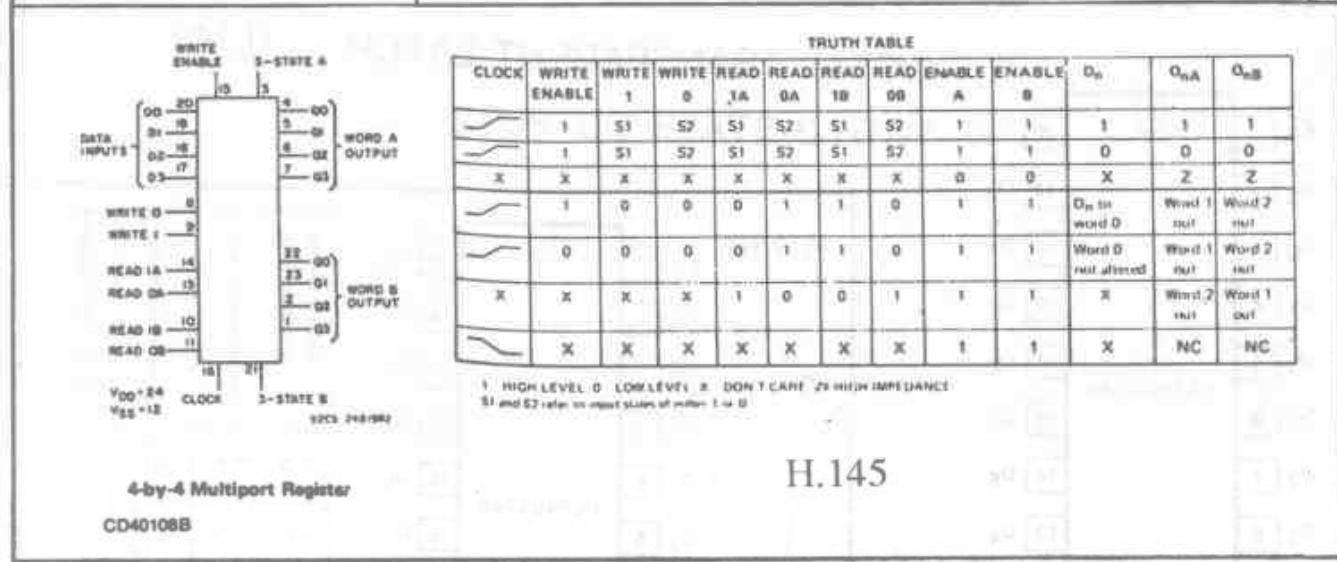
CD40104B FUNCTIONAL DIAGRAM



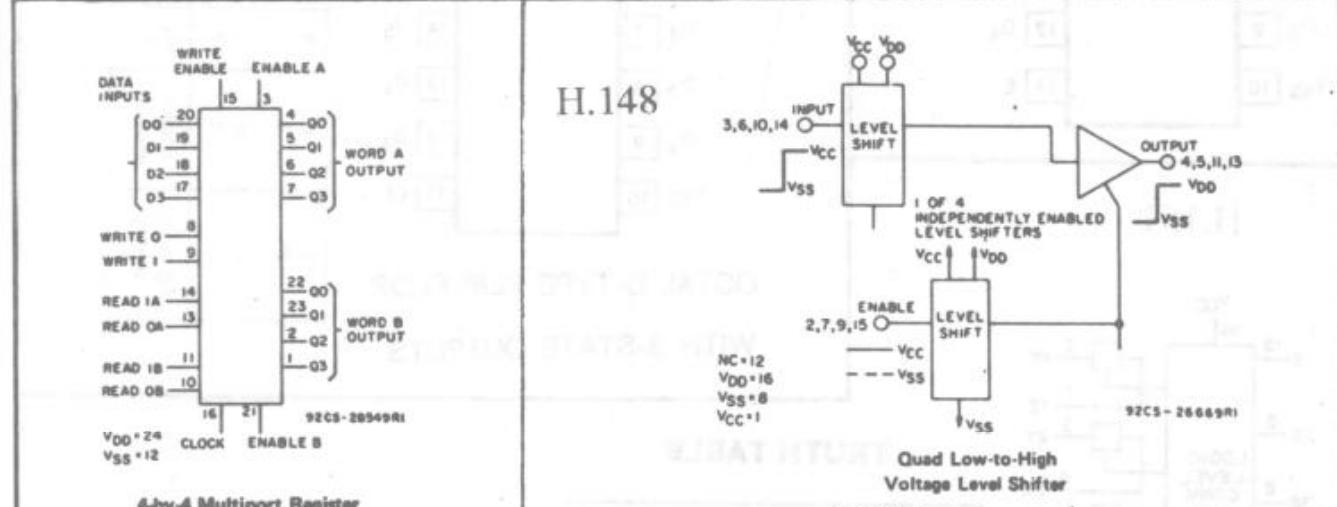
H.144

Dual 2-Input NAND  
Buffer/Driver  
CD40107B

H.147



H.145



H.146

MODE	INPUTS		OUT PUTS
	A, B, C, D	Enable A, B, C, D	E, F, G, H
Low to high level shift	0	1	0
	1	1	1
	X	0	Z

FUNCTION TABLE

operating modes	inputs			internal register	outputs O <sub>0</sub> to O <sub>7</sub>
	$\bar{E}_O$	E	D <sub>n</sub>		
enable & read register	L	H	L	L	L
	L	H	H	H	H
latch & read register	L	L	I	L	L
	L	L	h	H	H
latch register & disable outputs	H	L	I	L	Z
	H	L	h	H	Z

H = HIGH state (the more positive voltage)

h = HIGH state (one set-up time prior to the HIGH-to-LOW enable transition)

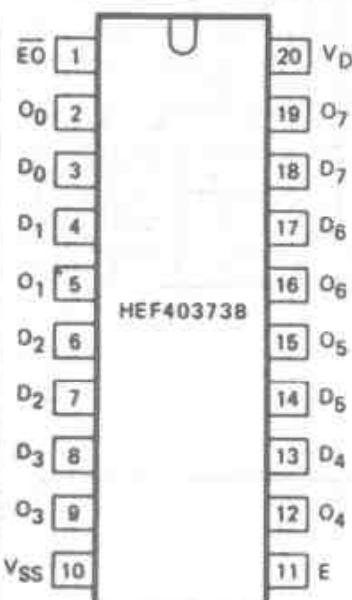
L = LOW state (the less positive voltage)

I = LOW state (one set-up time prior to the HIGH-to-LOW enable transition)

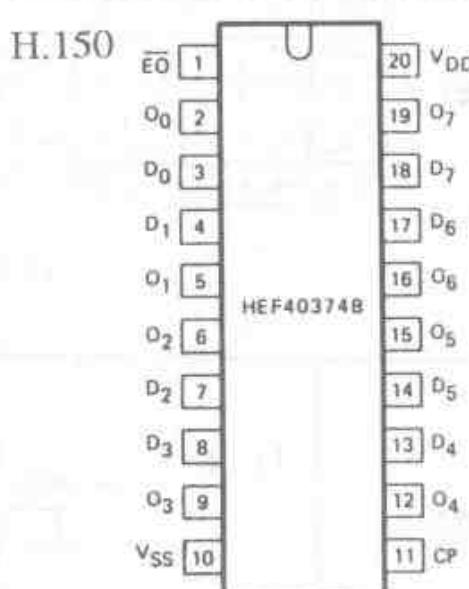
Z = high impedance OFF-state

## OCTAL TRANSPARENT LATCH WITH 3-STATE OUTPUTS

H.149

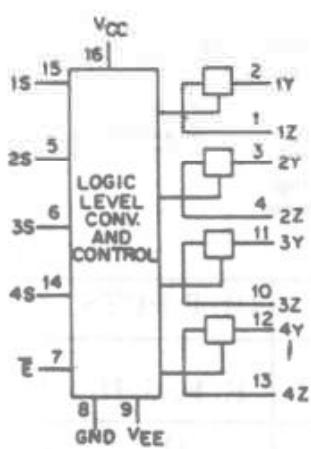


H.151



operating modes	inputs			internal register	outputs O <sub>0</sub> to O <sub>7</sub>
	$\bar{E}_O$	CP	D <sub>n</sub>		
load & read register	H	L	L		
load register & disable outputs	/	/	/		
	x	x	-		
	H	H	H		
	N	N	H		

## OCTAL D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS



INPUTS		SWITCH
$\bar{E}$	S	
L	L	OFF
L	H	ON
H	X	OFF

4316

## Quad Analog Switch with Level Translation

A4	1	20	VCC
A6	2	19	A2
N.C.	3	18	A1
A COMMON	4	17	AO
A7	5	16	A3
A5	6	15	SO
E1	7	14	N.C.
E2	8	13	S1
VEE	9	12	S2
GND	10	11	LE

**4351**

H.152

TRUTH TABLE  
CD54/74HC/HCT4351

INPUT STATES					"ON" SWITCHES $\overline{LE} = H^*$
$\overline{E1}$	$E2$	$S2$	$S1$	$S0$	
L	H	L	L	L	$A_0$
L	H	L	L	H	$A_1$
L	H	L	H	L	$A_2$
L	H	L	H	H	$A_3$
L	H	H	L	L	$A_4$
L	H	H	L	H	$A_5$
L	H	H	H	L	$A_6$
L	H	H	H	H	$A_7$
H	L	X	X	X	None

X = Don't Care.

\* When  $\overline{LE}$  is low S0-S2 data are latched and switches cannot change state.

B0	1	20	VCC
B2	2	19	A1
N.C.	3	18	A2
B COMMON	4	17	A COMMON
B3	5	16	AO
B1	6	15	A3
ET	7	14	N.C.
E2	8	13	SO
VEE	9	12	S1
GND	10	11	LE

**4352**

H.153

TRUTH TABLE  
CD54/74HC/HCT4352

INPUT STATES				"ON" CHANNELS $\overline{LE} = H^*$
$\overline{E1}$	$E2$	$S1$	$S0$	
L	H	L	L	$A_0, B_0$
L	H	L	H	$A_1, B_1$
L	H	H	L	$A_2, B_2$
L	H	H	H	$A_3, B_3$
H	L	X	X	None

B1	1	20	VCC
B0	2	19	B COMMON
N.C.	3	18	A COMMON
C1	4	17	A1
C COMMON	5	16	AO
CO	6	15	SO
E1	7	14	N.C.
E2	8	13	S1
VEE	9	12	S2
GND	10	11	LE

**4353**

H.154

TRUTH TABLE CD54/74HC/HCT4353

INPUT STATES					"ON" CHANNELS $\overline{LE} = H^*$
$\overline{E1}$	$E2$	$S2$	$S1$	$S0$	
L	H	L	L	L	$C_0, B_0, A_0$
L	H	L	L	H	$C_0, B_0, A_1$
L	H	L	H	L	$C_0, B_1, A_0$
L	H	L	H	H	$C_0, B_1, A_1$
L	H	H	L	L	$C_1, B_0, A_0$
L	H	H	L	H	$C_1, B_0, A_1$
L	H	H	H	L	$C_1, B_1, A_0$
L	H	H	H	H	$C_1, B_1, A_1$
H	X	X	X	X	None
X	L	X	X	X	None

**Analog  
Multiplexers/  
Demultiplexers  
With Latch**



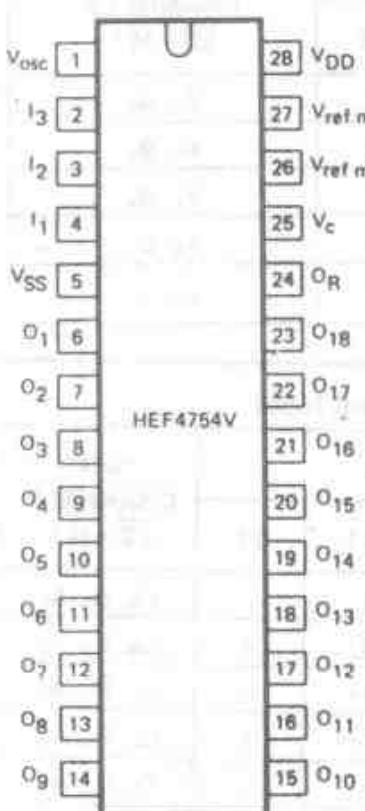
12-bit predivider

W	X	clock for programmable counter CP/X
L	L	X = 1
L	H	X = 16
H	L	X = 256
H	H	X = 4096

## FUNCTION TABLES

Inputs			operating mode
LFC	Y	Z	
L	L	H	counter
L	H	L	divider
H	H	L	delayed LOW to HIGH edge
H	L	H	delayed HIGH to LOW edge
H	H	H	transient pulse suppression
L	H	H	frequency recognition
LFC	L	L	digital pulse duration selector

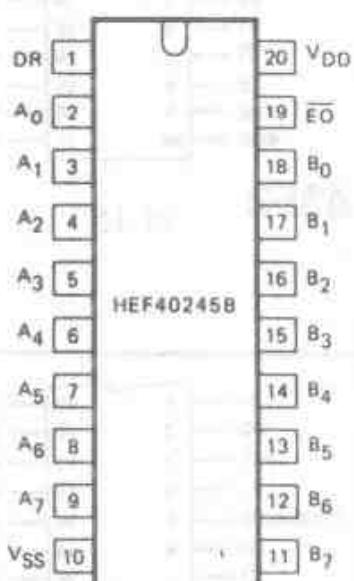
H.155



## PINNING

V<sub>osc</sub> oscillator terminal  
V<sub>DD</sub> control voltage input  
V<sub>c</sub> reference voltage inputs  
I<sub>1</sub> thermometer/pointer  
I<sub>2</sub> choice select input  
I<sub>3</sub> peak value; reset/9 or 18 bars  
I<sub>4</sub> choice select input  
O<sub>1</sub> to O<sub>18</sub> reset; repetitively reset  
OR choice select input  
O<sub>1</sub> to O<sub>18</sub> bar outputs  
O<sub>R</sub> back plate output

H.156



## FUNCTION TABLE

inputs		inputs/outputs	
EO	DR	A <sub>n</sub>	B <sub>n</sub>
L	L	A = B	input
L	H	input	B = A
H	X	Z	Z

OCTAL BUS TRANSCEIVER

WITH 3-STATE OUTPUTS

## FUNCTION TABLE

I <sub>1</sub>	I <sub>2</sub> *	I <sub>3</sub>	mode
L	L	X	pointer; 18 bars
L	H	X	pointer; 9 bars
H	L	X	thermometer; no peak value
H	H	L	thermometer; peak value, repetitively reset
H	H	H	thermometer; peak value, manually reset

PINNING		
TST	1	28 V <sub>DD</sub>
MLO	2	27 TT0
ML1	3	26 TT1
DIO0	4	25 CP
DIO1	5	24 ERR
DIO2	6	23 DP
DIO3	7	22 MI
DIO4	8	21 MO
DIO5	9	20 MOS
DIO6	10	19 HD
DIO7	11	18 BUSY
RX	12	17 START
TX	13	16 R
V <sub>SS</sub>	14	15 AS
HEF4755V		
TST	1	1 TST
MLO	2	2 MLO
ML1	3	3 ML1
DIO0	4	4 DIO0
DIO1	5	5 to to
DIO2	6	6 DIO7
DIO3	7	7
DIO4	8	8
DIO5	9	9
DIO6	10	10
DIO7	11	11
RX	12	12 RX
TX	13	13 TX
V <sub>SS</sub>	14	14 AS
		15
		16 R
		17 START
		18 BUSY
		19 HD
		20 MOS
		21 MO
		22 MI
		23 DP
		24 ERR
		25 CP
		26 TT1
		27 TT0
		28 V <sub>DD</sub>

Test pin; during normal use connected to V<sub>SS</sub>. When TST is HIGH (V<sub>DD</sub>), internal check points are connected to the data bus.

Input code for message length (see Table 1).

Bidirectional data bus.

Mode input: receive  
Mode input: transmit  
Mode input: asynchronous

see  
Table  
2

Reset; a positive signal resets all internal registers.

Input start in transmitting mode; synchronization input (from MOS) in synchronous receiving mode.

Output busy; active during receiving or transmitting a message.

Hamming distance; determines the length of the redundancy byte:  
LOW = 7 bit (HD = 4)  
HIGH = 15 bit (HD = 6)

Output message synchronization used in synchronous mode.

Message output.

Message input.

Output data pulse; take-over pulse for data on the data bus.

Output error; an active output means that at least 1 transmission error is recognized.

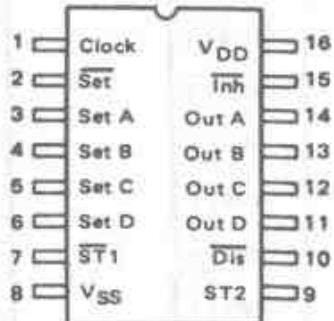
Clock input; in synchronous mode equal to the transmission bit rate.

Programming of the permissible time tolerance in bit distortion (see Table 3).

Positive supply voltage: 4,5 V to 12,5 V (is the logic HIGH level). Ground (is the logic LOW level).

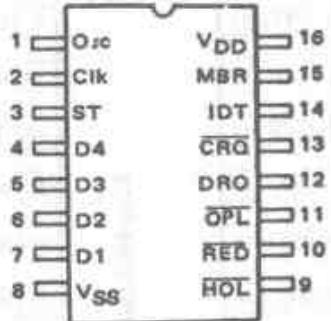
### MC14415

#### Quad Precision Timer/Driver



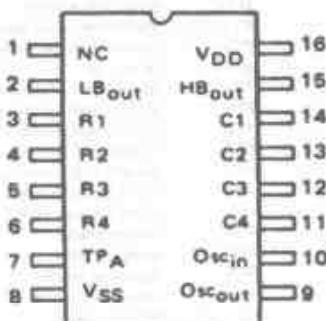
### MC14408

#### Binary to Phone Pulse Converter Subsystem



### MC14409

#### Binary to Phone Pulse Converter Subsystem



### MC14410

#### 2-of-8 Tone Encoder

H.158

Octal buffers with 3-state outputs

#### TRUTH TABLE

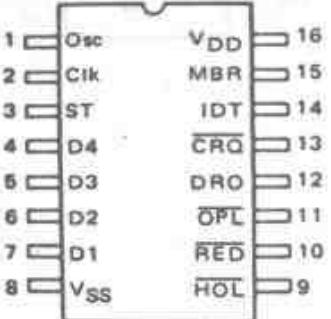
inputs		output
I <sub>n</sub>	EO	O <sub>n</sub>
H	L	H
L	L	L
X	H	Z

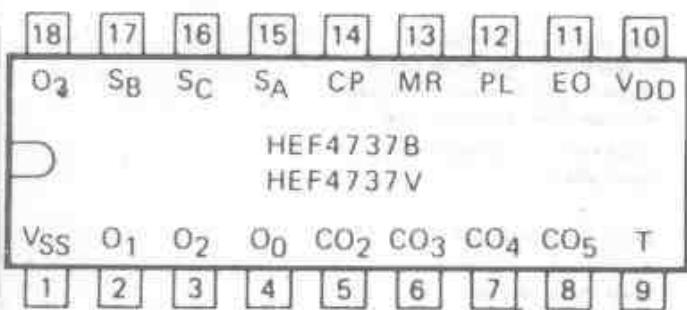
H = HIGH state (the more positive voltage)

L = LOW state (the less positive voltage)

X = state is immaterial

Z = high impedance off state



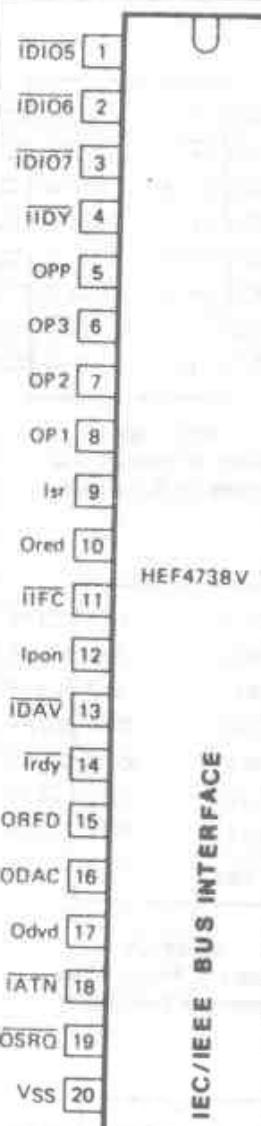


### PINNING

CP	count input
MR	asynchronous reset input
PL	asynchronous preset input
T	transfer input
S <sub>A</sub> , S <sub>B</sub> , S <sub>C</sub>	digit select inputs
EO	output enable input
O <sub>0</sub> to O <sub>3</sub>	BCD outputs
CO <sub>2</sub> to CO <sub>5</sub>	carry outputs

## QUADRUPLE STATIC DECADE COUNTERS

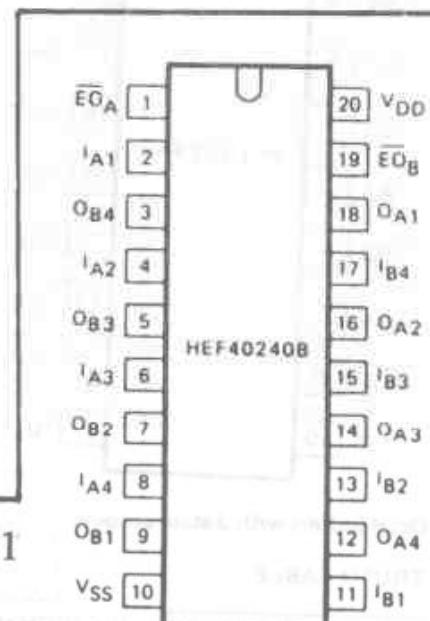
H.159



### LIST OF USED ABBREVIATIONS

A1 to A5	address	SGNS	source generate state
ACDS	acceptor data state	SIDS	source idle state
APRS	affirmative poll response state	SIWS	source idle wait state
ATN	attention	sp	serial poll
AVD	address valid	SPAS	serial poll active state
ats	controller active or transfer state	SPD	serial poll disable
clr	device clear	SPE	serial poll enable
CVD	command valid	sr	shift register
DAC	data accepted	SRO	service request
DAV	data valid	SRQS	request service state
DCAS	device clear active state	SWNS	source wait for new cycle state
dcr	don't change data	ts	talker active
DCL	device clear	tct	talk control
DIO	data input output	ton	talk only
DTAS	device trigger active state	trg	trigger
dvd	data valid device	UNL	unlisten
EQI	end of output/identify		
GTL	go to local		
IDY	identify		
IFC	interface clear		
ist	individual status		
LEO	local lock out		
loc	local		
LOCS	local state		
lnn	listen only		
H	decides whether the device can only be listener/talker or listener and talker simultaneously		
LWLS	local with lock out state		
MLA	my listen address		
MTA	my talk address		
nba	new byte available		
NRFD	not ready for data		
NDAC	not data accepted		
OTA	other talk address		
P1 to P3	parallel response messages		
PCA	parallel poll configuration accepted		
pon	power on		
PP	parallel poll message enable		
PPC	parallel poll configure		
PPD	parallel poll disable		
PPE	parallel poll enable		
PPU	parallel poll unconfigure		
rdy	ready for next message		
rd	ready for next shift cycle		
REN	remote enable		
RFD	ready for data		
ROS	requested service		
rv	request for service		
rfl	return to local		
SDC	selected device clear		

H.160

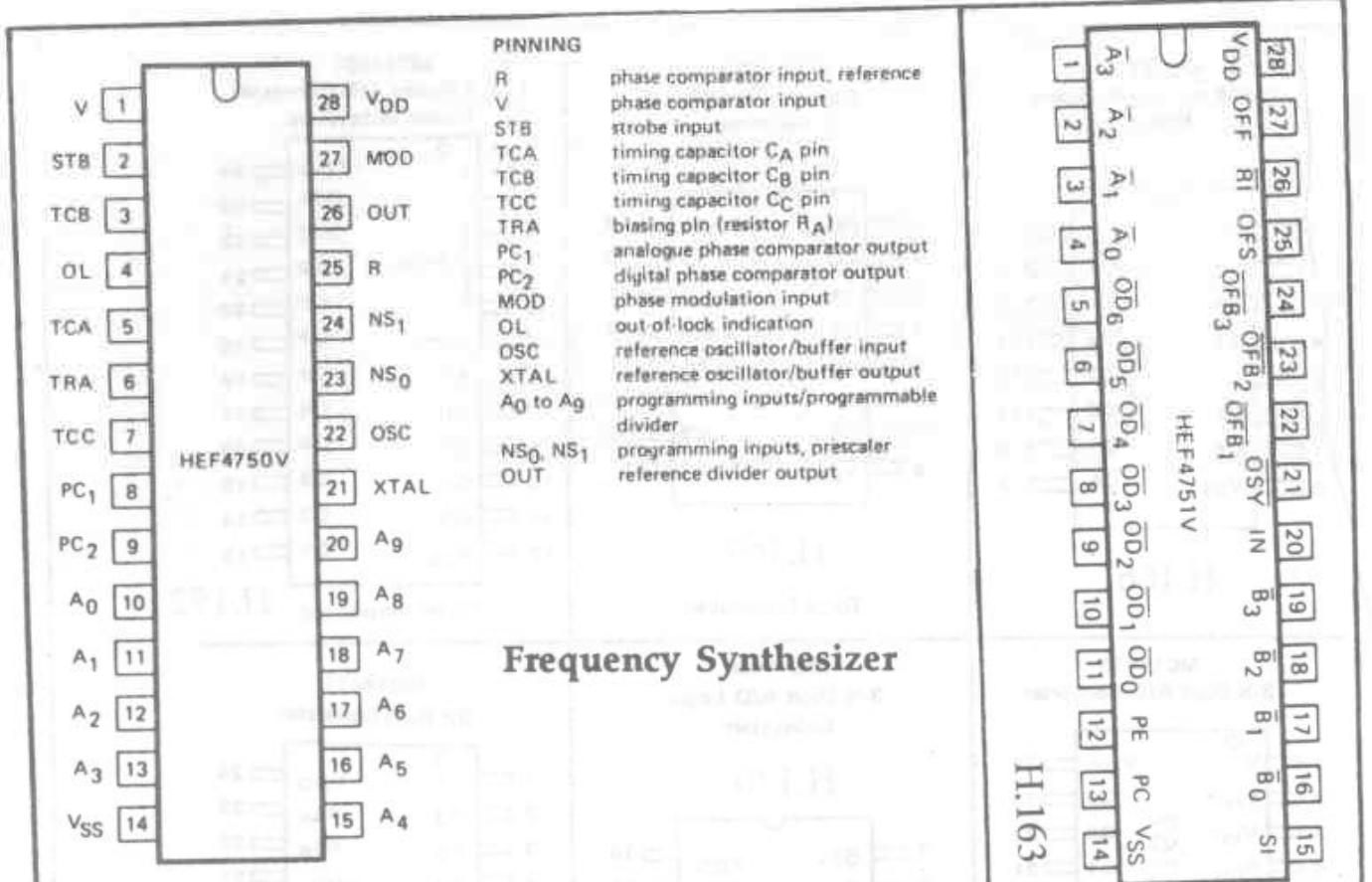


### TRUTH TABLE

inputs	output
I <sub>n</sub> E <sub>O</sub>	O <sub>n</sub>
H L	L
L L	H
X H	Z

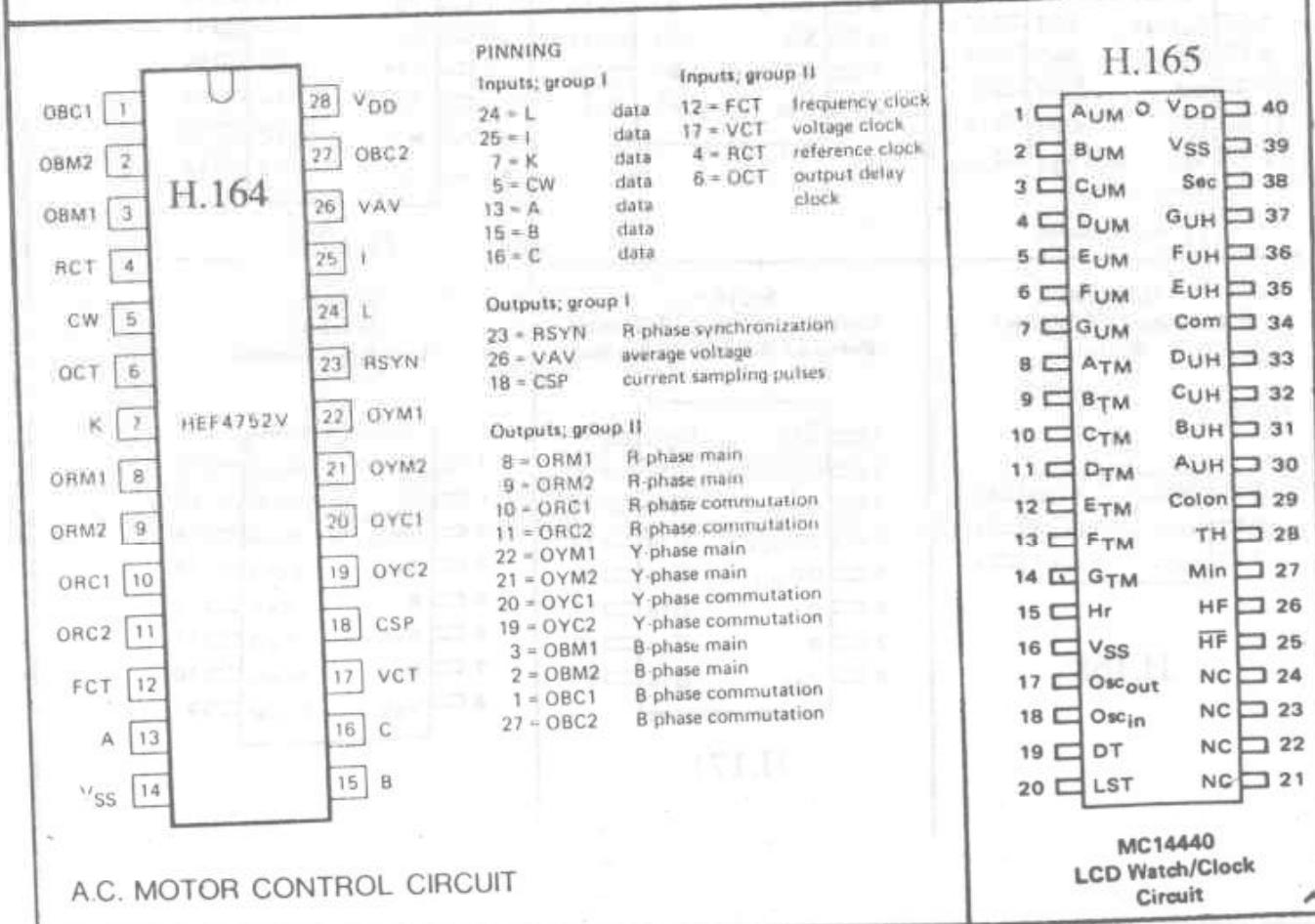
H.161

## OCTAL BUFFERS WITH 3-STATE OUTPUTS



H.162

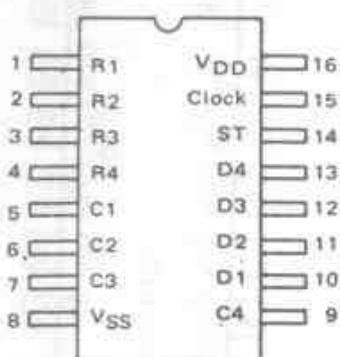
## Frequency Synthesizer



## A.C. MOTOR CONTROL CIRCUIT

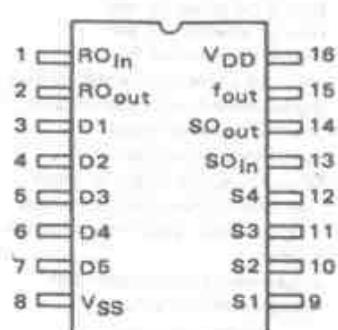
MC14440  
LCD Watch/Clock  
Circuit

**MC14419**  
2-of-8 Keypad-to-Binary  
Encoder



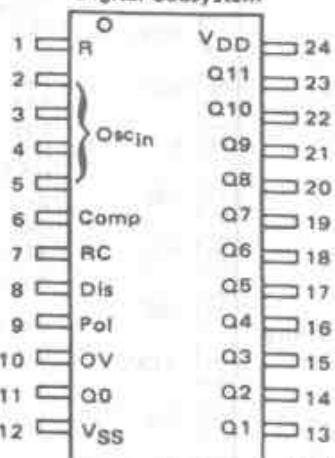
H.166

**MC14422**  
Remote Control  
Transmitter



H.169

**MC14431**  
12-Bit Binary A/D Converter  
Digital Subsystem



H.172

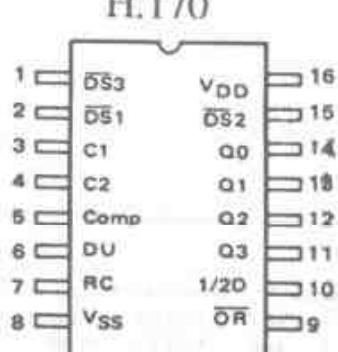
To be introduced

**MC14433**  
3-½ Digit A/D Converter



To be introduced

**MC14435**  
3-½ Digit A/D Logic  
Subsystem



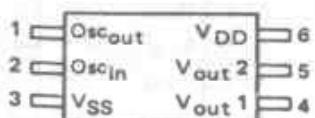
H.170

**MC14411**  
Bit Rate Generator



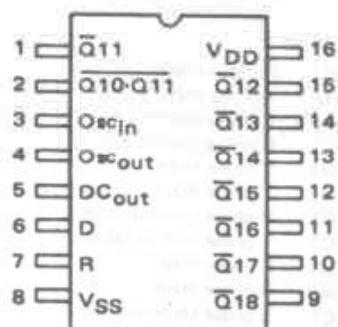
H.173

**MC14450**  
Oscillator/2<sup>16</sup> Divider/  
Buffer



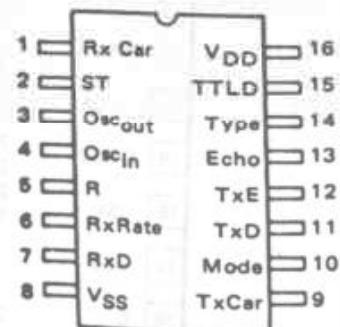
H.168

**MC14451**  
Oscillator/2<sup>11</sup> to 2<sup>19</sup> Divider/  
Buffered Duty Cycle Control

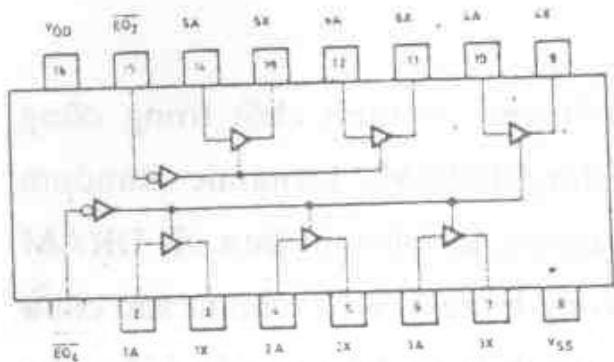


H.171

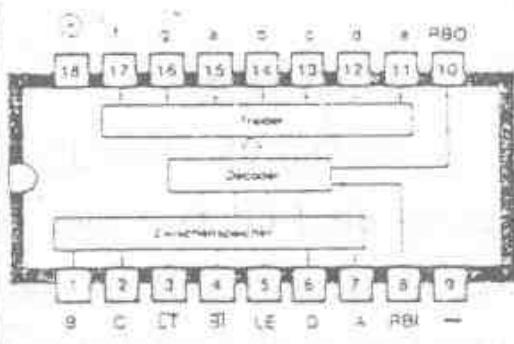
**MC14412**  
Universal  
Low Speed Modem



**40097B** 3-State Hex Non-Inverting Buffer

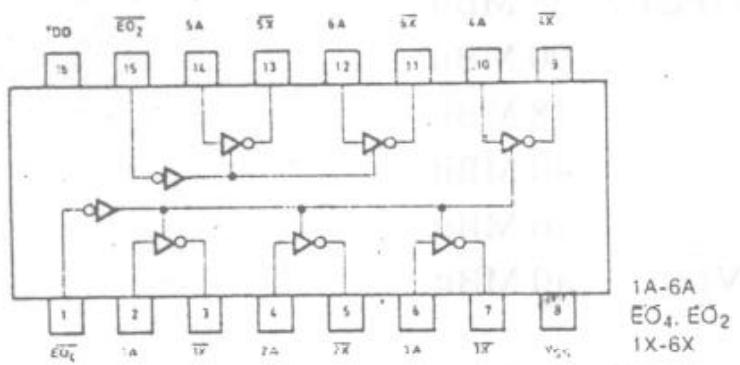


**4513**



BCD-zu-7-Segm.-Speicher-Dek.

**40098B** 3-State Hex Inverting Buffer



Buffer Inputs  
Enable Inputs (Active LOW)  
Buffer Outputs (Active HIGH)

## 4. CÁC BỘ NHỚ BÁN DẪN

### 4.1 ĐẠI CƯƠNG

Các bộ nhớ bán dẫn đóng một vai trò then chốt trong công nghiệp điện tử. Đặc biệt bộ nhớ động/DRAM (Dynamic Random Access Memories) là bộ nhớ chính trong các thiết bị điện tử. DRAM được phát minh cách đây 25 năm. Trong bảng T.4.1.1 cho ta sức chứa cần thiết của bộ nhớ bán dẫn trong các thiết bị điện tử tiêu biểu vào năm 1995.

Máy tính cá nhân (PC)	36 MBit
Workstation	90 MBit
Máy in Laser	18 MBit
Máy photocopy	40 MBit
Máy Fax	16 MBit
Tivi rõ nét (HDTV)	40 MBit

T.4.1.1

Loại DRAM 4 MBit đã được dùng rộng rãi hiện nay trong công nghiệp, sau đó là 16 và 64 MBit. Các bộ nhớ lớn này được thực hiện nhờ những tiến bộ trong kỹ thuật bán dẫn:

- Diện tích của 1 chip to hơn
- Cấu trúc của bộ nhớ bé hơn
- IC được cấu tạo bởi nhiều lớp
- Độ phức tạp của quá trình chế tạo tăng

Mỗi đơn vị của DRAM được cấu tạo bởi 1 tụ điện và 1 Transistor cổng. Cấu trúc của mỗi đơn vị loại 4 MBit DRAM bé hơn 1μm. Sau 16ms một mạch logic của bộ nhớ sẽ kiểm soát lại điện dung

của các tụ điện và nạp điện lại nếu cần thiết (refresh). Điện dung của mỗi tụ điện trong 4 MBit DRAM khoảng 35 Femto Farad.

Với những mạch điện phức tạp từ vài trăm nghìn đến vài triệu đơn vị người ta chỉ có thể chế tạo nó với sự giúp đỡ của công cụ CAE (Computer-Aided-Engineering-Systems). Dù với các Vectorprocessor hiện đại có vận tốc tính nhanh, sự mô phỏng các bộ nhớ cần rất nhiều thời gian và sai số so với kết quả đo đạc từ 10% đến 20%. Dù vật liệu Gallium-Arsenid đã được nghiên cứu rất nhiều, silic vẫn là nguyên vật liệu chính trong kỹ thuật VLSI. Từ cát thạch anh người ta tinh luyện những thỏi silic siêu sạch và đơn tinh thể rồi cắt ra từng phiến mỏng. Từ những phiến mỏng silic này đến khi một chip với bộ nhớ 4 MBit thành hình người ta cần khoảng 400 công đoạn gia công nữa. Với bộ nhớ 16 MBit-chip cần 450 công đoạn gia công. Kỹ thuật CVD (Chemical Vapor Deposition) và Ion-Implantation được sử dụng để chế tạo IC nhiều lớp. Với cấu trúc cực nhỏ cho IC có độ tổ hợp cao, trong các công đoạn quang khắc người ta phải dùng ánh sáng có độ dài sóng ngắn dần: Với ánh sáng đèn thủy ngân 2 vạch g (436nm) và I (365nm) được sử dụng, với ánh sáng cực tím (200 – 250nm) hay với tia Roentgen (1nm). Trong kỹ thuật ăn mòn, ngoài k/t ăn mòn ướt, cho cấu trúc < 1  $\mu$ m người ta sử dụng k/t ăn mòn plasma. Tất cả các công đoạn trên được thực hiện trong các phòng siêu sạch có mật độ dơ bẩn là một đầu kim trên một sân đá banh.

Hiện nay cứ sau 3 – 3,5 năm người ta có 1 thế hệ mới của bộ nhớ bán dẫn. Một xưởng chế tạo bộ nhớ 16-MBit-DRAM với công suất 10 triệu bộ nhớ trong một tháng, người ta cần đầu tư khoảng 1,3 tỷ Dollar Mỹ. Dù tốn kém nhưng để cạnh tranh buôn bán hàng hóa người ta vẫn phải đầu tư.

## 4.2 BẢNG SO SÁNH CÁC BỘ NHỚ BÁN DẪN

	HITACHI	MITSUBISHI	FUJITSU	MOTOROLA	SAMSUNG	TI	TOSHIBA	SGS	THOMSON	NEC	OKI
2114-200-16			MIN 2114-200	MCW 2114-20		TMS 2114-20	TMM 2114			UPU 2114-13	MSW 2114-1
4116-150-05	HM 4116 A2	MEK 4116 P2	MB 0116 H	MCW 4116-15		TMS 4116-15	TMM 4116 P2			ET 4116 N2	UPU 4116 C3
4116-200-05	HM 4116 A3	MEK 4116 P3	MB 0116 F	MCW 4116-20		TMS 4116-20	TMM 4116 P3			ET 4116 N3	UPU 4116 C2
4164-15	HM 4864 A715	MEK 4164 P715	MB 0264 A15	MCW 6555-015	EM 4164 A9	TMS 4164-15	TMM 4164-15			UPU 4164 C3	MSW 3164
4164-15	HM 4865 A715	MEK 4865 P715	MB 0265 A15	MCW 6556-015						UPU 4265 C15	
41256-15	HM 50256-15	MEK 4256 P15	MB 01256-15		KM 41256-15	TMS 4256-15	TMM 41256-015			UPU 41256 C15	MSW 41256
41257-15	HM 50257-15	MEK 4257 P15	MB 01257-15	MCW 65257-15	KM 41257-15		TMM 41257-015			UPU 41257 C15	MSW 41257
41464-15	HM 50464-15	MEK 4464 P15	MB 01464-15			TMS 4464-15	TMM 41464-015			UPU 41464 C15	
6116-016-173	MEW 5116	MB 0216	MCW 6116		KM 6816-15		TC 5517 A115				MSW 5128
6264-1P-15	HM 62264-1P15	MEW 5165	MB 0454	MCW 6164	KM 6264-1		TC 5565 A115				MSW 5165
2116-450	ME 462716	MSL 2716 X	MB 0516	MCW 2716		TMS 2516-15	TMM 323 D	Y 2716F1	ET 2716G	UPU 2716 D	MSW 2716 A
2116-350								Y 2716-1F1	ET 2716G-1		
2152-1-250	HM 452732425	MSL 2732 X2	MB 27324250		TMS 2732 A	TMM 2732 D		W 2732 F1		UPU 2732 D	MSW 2732 A
2152-1-450		MSL 2732 X	MB 2732		TMS 2732 A4			W 2732-4F1			
2154-250	HM 482734 6	MSL 2734 X	MB 2734 25		TMS 2734	TMM 2734 D		W 2734 F1	ET 2734 G	UPU 2734 D	MSW 2164
2164-450	HM 492734 63	MSL 2734 X3	MB 2734-45					W 2734H-4F1	ET 2734H-4	UPU 2734 H4	
21126-250	HM 4927126-25	MSL 27126 X	MB 27126-25		TMS 27126	TMM 27126		W 27126 F1	ET 27126Q	UPU 27126 Q	MSW 27126
21735-250	HM 27256	MSL 27256 X	MB 27256		TMS 27256	TMM 27256		W 27256 F1	UPU 27256 Q	MSW 27256	
21016-450									ET 2718Q		
21016-450									ETU 2712Q		
21064-250	HM 27084								TS 27084 Q	UPU 27084 Q	
215256-250	HM 27256	MSL 27256			TMS 27256	TC 57256			UPU 27256 Q		

### 4.3 SRAM (RAM TĨNH) VÀ DRAM (RAM ĐỘNG) LOẠI CMOS

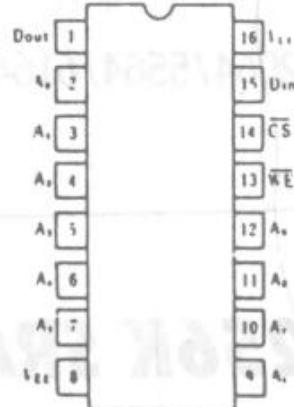
#### 1KX1BIT-RAM STATIC

2112

Input			Output	Mode
CS	WE	Din		
H	x	x	L	Not Selected
L	L	L	L	Write "0"
L	L	H	L	Write "1"
L	H	x	Dout*	Read

\* : Irrelevant

\* : Read out noninverted



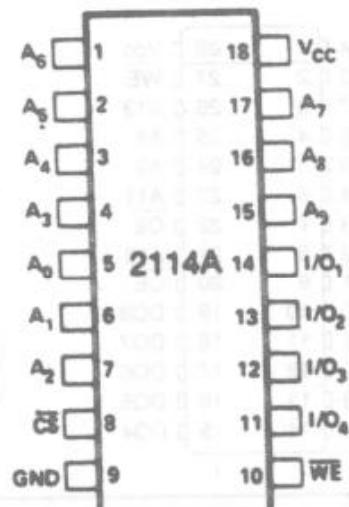
(Top View)

#### 1024 X 4 BIT STATIC RAM

2114/2148/2149/6148

CS	WE	DIN	DOUT
H	*	*	High Impedance
L	H	*	Data Output
L	L	H/L	Data Input

\* L or H



#### 16K SRAM

2016/2116/5516/6116

2048X8 BIT

E	G	W	MODE	SUPPLY CURRENT	IO PIN
H	X	X	Not Selected	I <sub>SB</sub>	High-Z
L	H	H	D <sub>OUT</sub> Disable	I <sub>CC</sub>	High-Z
L	L	H	Read	I <sub>CC</sub>	D <sub>OUT</sub>
L	X	L	Write	I <sub>CC</sub>	D <sub>IN</sub>



# **64K SRAM**

**8K x 8**  
**MT5C6408**  
**28 PIN SOJ**

**2064/5564/6164/6264/8464**

NC	1	28	Vcc
A12	2	27	WE
A7	3	26	CE2
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ8
DQ1	11	18	DQ7
DQ2	12	17	DQ6
DQ3	13	16	DQ5
Vss	14	15	DQ4

# **256K SRAM**

**32K x 8**  
**MT5C2568**  
**28 PIN SOJ**

**256K x 1**  
**MT5C2561**  
**24 PIN SOJ**

A14	1	28	Vcc
A12	2	27	WE
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ8
DQ1	11	18	DQ7
DQ2	12	17	DQ6
DQ3	13	16	DQ5
Vss	14	15	DQ4

A0	1	24	Vcc
A1	2	23	A17
A2	3	22	A16
A3	4	21	A15
A4	5	20	A14
A5	6	19	A13
A6	7	18	A12
A7	8	17	A11
A8	9	16	A10
Q	10	15	A9
WE	11	14	D
Vss	12	13	CE

# **1 MEG SRAM**

**1 MEG x 1**  
**MT5C1001**  
**28 PIN SOJ**

**256K x 4**  
**28 PIN SOJ**

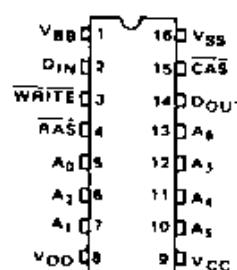
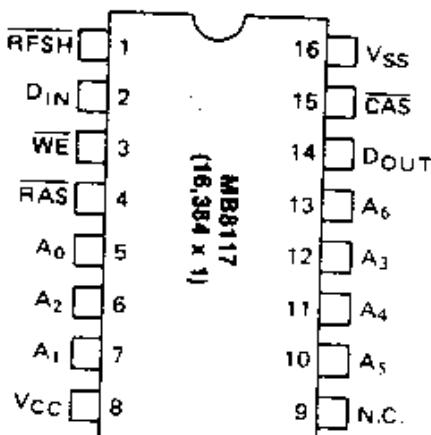
**128K x 8**  
**32 PIN SOJ**

A10	1	28	Vcc
A11	2	27	A9
A12	3	26	A8
A13	4	25	A7
A14	5	24	A6
A15	6	23	A5
NC	7	22	A4
A16	8	21	NC
A17	9	20	A3
A18	10	19	A2
A19	11	18	A1
Q	12	17	A0
WE	13	16	D
Vss	14	15	OE

A7	1	28	Vcc
A8	2	27	A6
A9	3	26	A5
A10	4	25	A4
A11	5	24	A3
A12	6	23	A2
A13	7	22	A1
A14	8	21	A0
A15	9	20	NC
A16	10	19	DQ4
A17	11	18	DQ3
CE	12	17	DQ2
OE	13	16	DQ1
Vss	14	15	WE

NC	1	32	Vcc
A16	2	31	A15
A14	3	30	CE2
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE1
A0	12	21	DQ8
DQ1	13	20	DQ7
DQ2	14	19	DQ6
DQ3	15	18	DQ5
Vss	16	17	DQ4

**DYNAMIC RAM**  
**16K x 1 Bit DRAM**

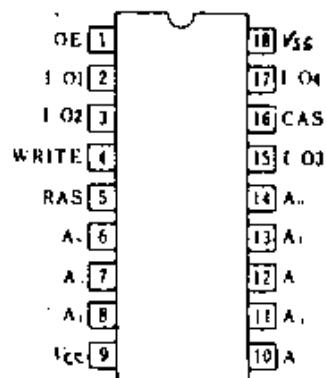


A <sub>0</sub> -A <sub>6</sub>	Address Inputs
CAS	Column Address Strobe
DIN	Data In
DOUT	Data Out
RAS	Row Address Strobe
WRITE	Read/Write Input
VBB	Power (-5V)
VCC	Power (+5V)
VDD	Power (+12V)
VSS	Ground

**I6384 x 4-bit-d RAM**

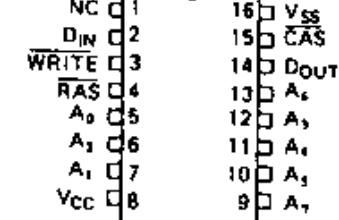
A0~A7	Address Inputs
ČAS	Column Address Strobe
I/O1~I/O4	Data In/Data Out
OE	Output Enable
RAS	Row Address Strobe
WRITE	Read/Write Input
VCC	Power (+5V)
VSS	Ground

2620/4416/41416/48416



**64K DRAM**

**65536 x 1-bit d RAM**



3764/4164/4564

A <sub>0</sub> ~A <sub>7</sub>	Address Inputs
CAS	Column Address Strobe
DIN	Data In
NC	No-Connection
DOUT	Data Out
RAS	Row Address Strobe
WRITE	Read/Write Input
VCC	Power (+5V)
VSS	Ground

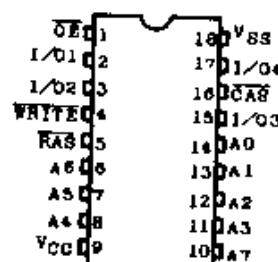
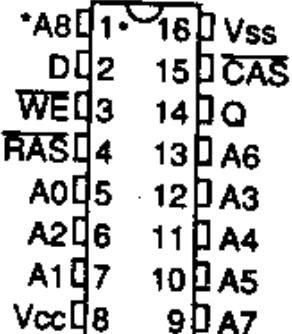
# 256K DRAM

65536 x 4-bit dRAM

256K x 1  
41256/41257

81256/81257

MT 1259

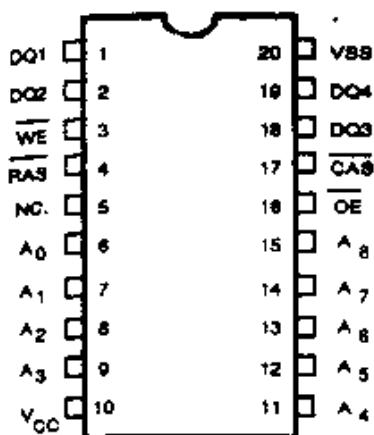


A <sub>0</sub> ~A <sub>7</sub>	Address Inputs
CAS	Column Address Strobe
I/O <sub>1</sub> ~I/O <sub>4</sub>	Data Input/Output
RAS	Row Address Strobe
WRITE	Read/Write Input
OE	Output Enable
VCC	Power (+5V)
VSS	Ground

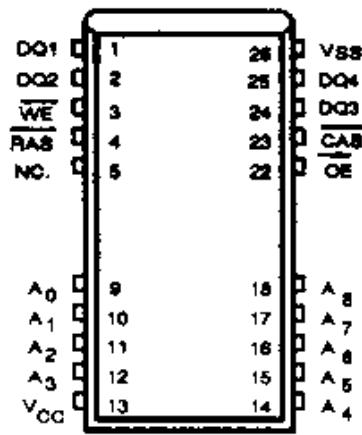
# 1 MEG DRAM

256K x 4

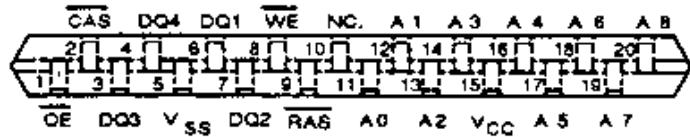
16-Pin DIP:  
(TOP VIEW)



26-Pin SOJ:  
(TOP VIEW)



20-Pin ZIP:  
(TOP VIEW)



**1 MEG x 1**

**TMM411000**

**MT4C1024/26**

**18 PIN DIP**

D	1	18	Vss
WE	2	17	Q
RAS	3	16	CAS
NC	4	15	A9
A0	5	14	A8
A1	6	13	A7
A2	7	12	A6
A3	8	11	A5
Vcc	9	10	A4

**1 MEG x 1**

**MT4C1024/26**

**20 PIN SOJ**

D	1	26	Vss
WE	2	25	Q
RAS	3	24	CAS
NC	4	23	NC
A0	5	22	A9
A1	6	9	A8
A2	7	10	A7
A3	8	11	A6
Vcc	9	12	A5
	10	13	A4
	11	14	A3
	12	15	A2
	13	16	A1
	14	17	A0
	15	18	A9
	16	19	A8
	17	20	A7
	18	21	A6
	19	22	A5
	20	23	A4
	21	24	A3
	22	25	A2
	23	26	A1

**1 MEG x 1**

**MT4C1024/26**

**20 PIN ZIP**

A9	1	2	CAS
Q	2	3	Vss
D	5	4	WE
RAS	7	6	NC
NC	9	8	NC
A0	11	10	NC
A2	13	12	A1
Vcc	15	14	A3
A5	17	16	A4
A7	19	18	A6
	20	21	A8
	21	22	A7
	22	23	A6
	23	24	A5
	24	25	A4
	25	26	A3

## **4 MEG DRAM**

**4 MEG x 1**

**MT4C1004**

**18 PIN DIP**

D	1	18	Vss
WE	2	17	Q
RAS	3	16	CAS
A10	4	15	A9
A0	5	14	A8
A1	6	13	A7
A2	7	12	A6
A3	8	11	A5
Vcc	9	10	A4

**4 MEG x 1**

**MT4C1004**

**20 PIN SOJ**

D	1	26	Vss
WE	2	25	Q
RAS	3	24	CAS
NC	4	23	NC
A10	5	22	A9
A0	9	18	A8
A1	10	17	A7
A2	11	16	A6
A3	12	15	A5
Vcc	13	14	A4

**4 MEG x 1**

**MT4C1004**

**20 PIN ZIP**

A9	1	2	CAS
Q	3	4	Vss
D	5	6	WE
RAS	7	8	A10
NC	9	10	NC
A0	11	12	A1
A2	13	14	A3
Vcc	15	16	A4
A5	17	18	A6
A7	19	20	A8

**1 MEG x 4**

**MT4C4001**

**20 PIN DIP**

DQ1	1	20	Vss
DQ2	2	19	DQ4
WE	3	18	DQ3
RAS	4	17	CAS
A9	5	16	OE
A0	6	15	A8
A1	7	14	A7
A2	8	13	A6
A3	9	12	A5
Vcc	10	11	A4

**1 MEG x 4**

**MT4C4001**

**20 PIN SOJ**

DQ1	1	28	Vss
DQ2	2	25	DQ4
WE	3	24	DQ3
RAS	4	23	CAS
A9	5	22	OE
A0	9	18	A8
A1	10	17	A7
A2	11	16	A6
A3	12	15	A5
Vcc	13	14	A4

**1 MEG x 4**

**MT4C4001**

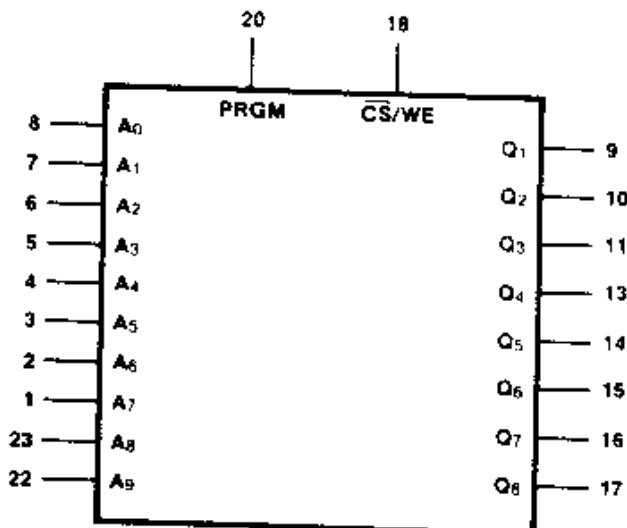
**20 PIN ZIP**

OE	1	2	CAS
DQ3	3	4	DQ4
Vss	5	6	DQ1
DQ2	7	8	WE
RAS	9	10	A9
A0	11	12	A1
A2	13	14	A3
Vcc	15	16	A4
A5	17	18	A6
A7	19	20	A8

## 4.4 EPROM

2708

1KX8



V<sub>DD</sub> = Pin 19

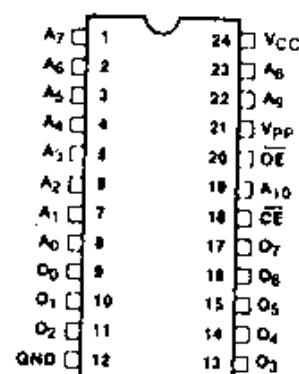
V<sub>SS</sub> = Pin 12

V<sub>CC</sub> = Pin 24

V<sub>BB</sub> = Pin 21

2KX8

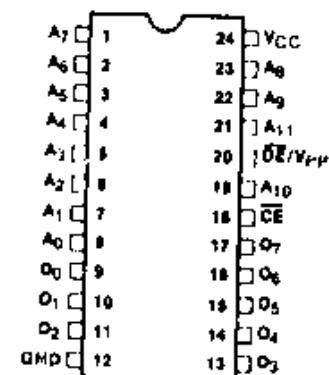
2716



4KX8

2732A

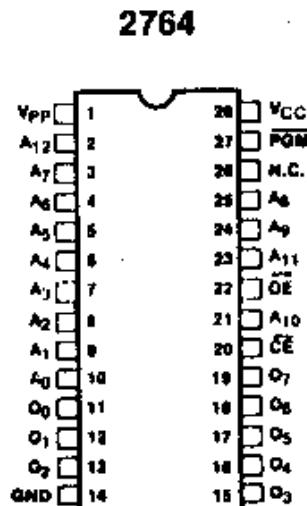
MODE	Pins	CE (18)	OE/V <sub>PP</sub> (20)	V <sub>CC</sub> (24)	Outputs (9 ~ 11, 13 ~ 17)
Read	V <sub>IL</sub>	V <sub>IL</sub>	+5	D <sub>out</sub>	
Stand by	V <sub>IH</sub>	Don't Care	+5	High Z	
Program	V <sub>IL</sub>	V <sub>PP</sub>	+5	D <sub>in</sub>	
Program Verify	V <sub>IL</sub>	V <sub>IL</sub>	+5	D <sub>out</sub>	
Program Inhibit	V <sub>IH</sub>	V <sub>PP</sub>	+5	High Z	



Mode	Pins	$\bar{CE}$ (20)	$\bar{OE}$ (22)	$\bar{PGM}$ (27)	$V_{PP}$ (1)	$V_{CC}$ (28)	Outputs (11~13, 15~19)
Read		$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{CC}$	$V_{CC}$	Dout
Stand by		$V_{IH}$	x	x	$V_{CC}$	$V_{CC}$	High Z
Program		$V_{IL}$	x	$V_{IL}$	$V_{PP}$	$V_{CC}$	Din
Program Verify		$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{PP}$	$V_{CC}$	Dout
Program Inhibit		$V_{IH}$	x	x	$V_{PP}$	$V_{CC}$	High Z

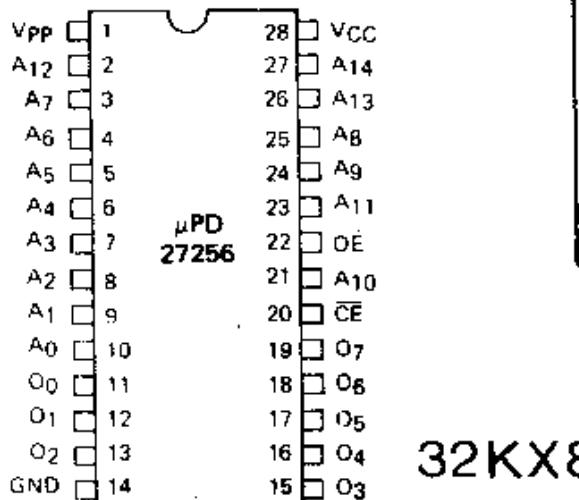
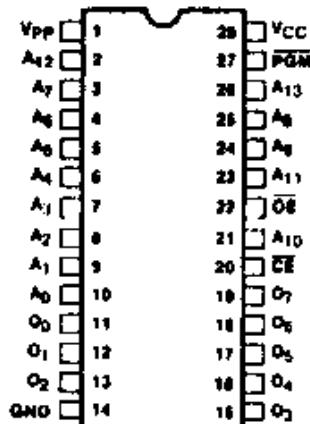
x - don't care

8KX8



MODE	Pins	$\bar{CE}$ (20)	$\bar{OE}$ (22)	$\bar{PGM}$ (27)	$V_{PP}$ (1)	$V_{CC}$ (28)	Outputs (11~13, 15~19)
Read		$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{CC}$	$V_{CC}$	Dout
Stand by		$V_{IH}$	x	x	$V_{CC}$	$V_{CC}$	High Z
Program		$V_{IL}$	x	$V_{IL}$	$V_{PP}$	$V_{CC}$	Din
Program Verify		$V_{IL}$	$V_{IL}$	$V_{IH}$	$V_{PP}$	$V_{CC}$	Dout
Program Inhibit		$V_{IH}$	x	x	$V_{PP}$	$V_{CC}$	High Z

27128



32KX8

Mode	Pins	$\bar{CE}$ (20)	$\bar{OE}$ (22)	$V_{PP}$ (1)	$V_{CC}$ (28)	Outputs (11~13, 15~19)
Read		$V_{IL}$	$V_{IL}$	$V_{CC}$	$V_{CC}$	Dout
Output Disable		$V_{IL}$	$V_{IH}$	$V_{CC}$	$V_{CC}$	High Z
Standby		$V_{IH}$	x	$V_{CC}$	$V_{CC}$	High Z
High Performance Program		$V_{IL}$	$V_{IH}$	$V_{PP}$	$V_{CC}$	Din
Program Verify		$V_{IH}$	$V_{IL}$	$V_{PP}$	$V_{CC}$	Dout
Optional Verify		$V_{IL}$	$V_{IL}$	$V_{PP}$	$V_{CC}$	Dout
Program Inhibit		$V_{IH}$	$V_{IH}$	$V_{PP}$	$V_{CC}$	High Z

PINS	CE (20)	OE/ V <sub>PP</sub> (22)	A <sub>9</sub> (24)	V <sub>CC</sub> (28)	OUTPUTS (11-13, 15-19)
Read	V <sub>IL</sub>	V <sub>IL</sub>	X	V <sub>CC</sub>	D <sub>OUT</sub>
Output Disable	V <sub>IL</sub>	V <sub>HF</sub>	X	V <sub>CC</sub>	High Z
Standby	V <sub>IH</sub>	X	X	V <sub>CC</sub>	High Z
Intelligent Programming	V <sub>IL</sub>	V <sub>PP</sub>	X	V <sub>CC</sub>	D <sub>IN</sub>
Program Inhibit	V <sub>IH</sub>	V <sub>PP</sub>	X	V <sub>CC</sub>	High Z
Intelligent Identifier	V <sub>IL</sub>	V <sub>IL</sub>	V <sub>H</sub>	V <sub>CC</sub>	Code

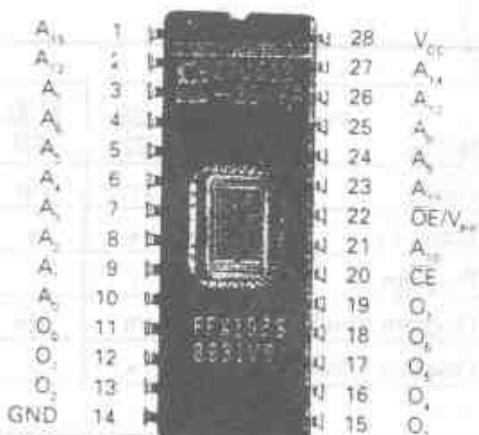
NOTES:

1. X can be V<sub>IH</sub> or V<sub>IL</sub>  
 2. V<sub>H</sub> = 12.0V ± 0.5V

A <sub>0</sub> -A <sub>15</sub>	ADDRESSES
CE	CHIP ENABLE
OE/V <sub>PP</sub>	OUTPUT ENABLE/V <sub>PP</sub>
O <sub>0</sub> -O <sub>7</sub>	OUTPUTS

512 K

64 K x 8



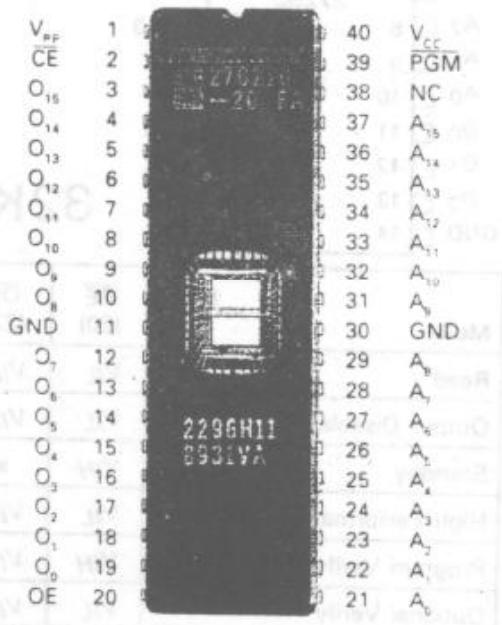
1024 K

64 K x 16

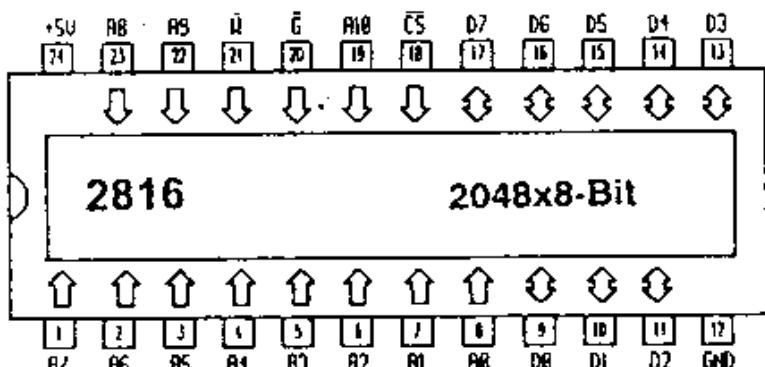
1	DU	16	O <sub>5</sub>	31	A <sub>7</sub>
2	V <sub>PP</sub>	17	O <sub>4</sub>	32	A <sub>6</sub>
3	CE	18	O <sub>3</sub>	33	NC
4	O <sub>15</sub>	19	O <sub>2</sub>	34	GND
5	O <sub>14</sub>	20	O <sub>1</sub>	35	A <sub>9</sub>
6	O <sub>13</sub>	21	O <sub>0</sub>	36	A <sub>10</sub>
7	O <sub>12</sub>	22	OE	37	A <sub>11</sub>



8	O <sub>11</sub>	23	DU	38	A <sub>12</sub>
9	O <sub>10</sub>	24	A <sub>0</sub>	39	A <sub>13</sub>
10	O <sub>9</sub>	25	A <sub>1</sub>	40	A <sub>14</sub>
11	O <sub>8</sub>	26	A <sub>2</sub>	41	A <sub>15</sub>
12	GND	27	A <sub>3</sub>	42	NC
13	NC	28	A <sub>4</sub>	43	PGM
14	O <sub>7</sub>	29	A <sub>5</sub>	44	V <sub>CC</sub>
15	O <sub>6</sub>	30	A <sub>6</sub>		

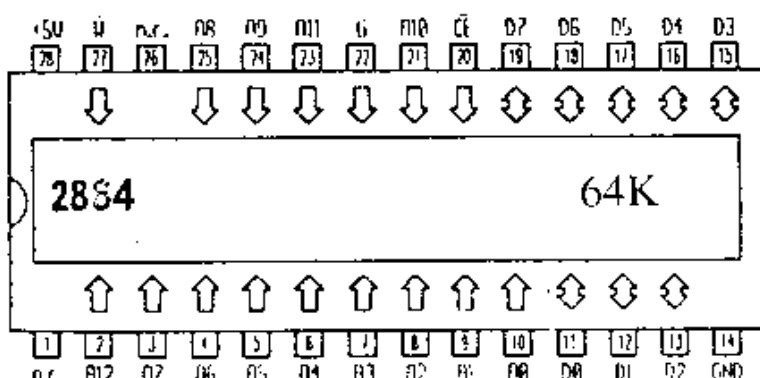


## 4.5 EEPROM



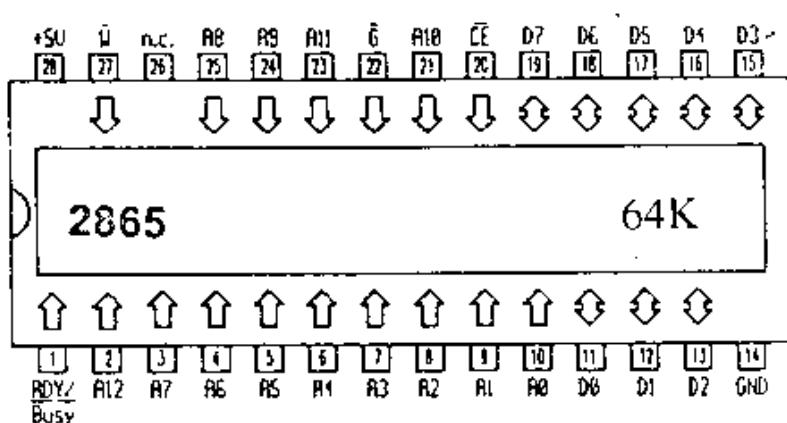
Mode		Power		
		read		
		write		
CS		standby + write inhibit		
		write inhibit		
		write inhibit		

KM 2816-A-35  
XLM 2816 AC-300



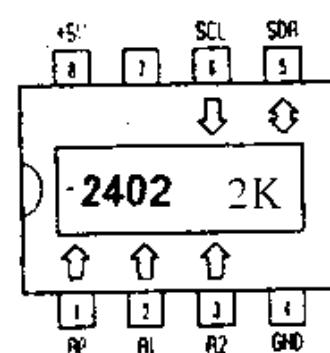
Mode		Power		
		standby		
CS		output disable		
		read		
		write		

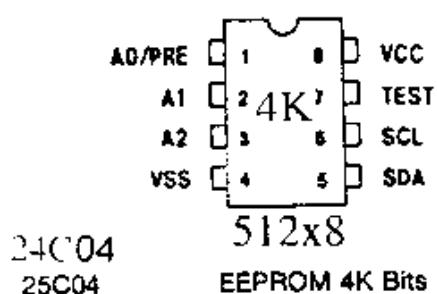
XLM2864



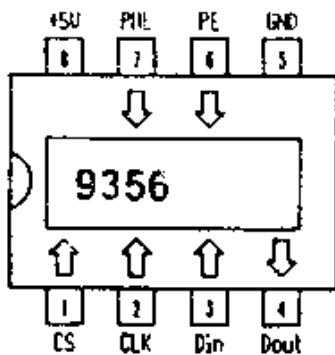
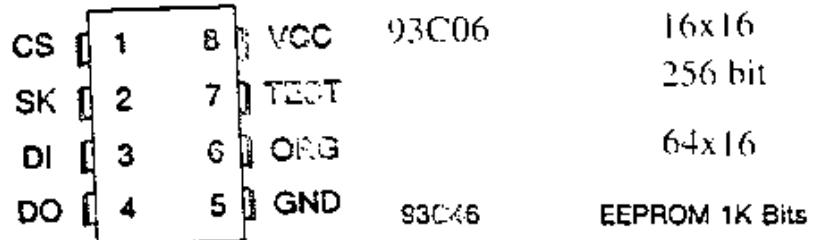
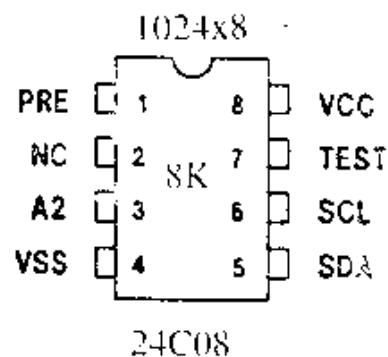
RDY/Busy = device ready/busy (open-drain output)

CE	G	W	A9	Dn	Mode
L	L	H	X	data out	read
L	X	L	X	data in	write
L	H	H	X	Hi-Z	output disable
H	X	X	X	Hi-Z	standby
L	+12V	L	X	Dn = X	chip erase
L	L	H	+12V	data out	electronic signature





24C04  
25C04



2048x1-Bit serial EEPROM

## 5. BẢNG SO SÁNH IC CỦA SNG VỚI CÁC NƯỚC KHÁC

Аналоги ИС производства СНГ					
Тип ИС	Аналог	1005XA1	AN6341	1102АП12	SN75462N
1001ИК1	-	1005XA2	AN6350	1102АП13	SN75463N
1002KP1	CD40105BE	1005XA3	AN6677	1102АП14	SN75464N
1002ХЛ1	TR1602	1005XA4	AN6910	1102АП15	F9636A
1002ХЛ1	-	1005XA5	AN6932	1102АП16	F9638RS
1003KH1	SAS580	1005XA6	AN6960	1102АП17	SN75470N
1003KH2	SAS590	1005XA7	AN6962	1102BA1	8T37
1003ПЛ1	UAA180	1005XA8	XR-200	1102ПЛ1	9637A
1003ПЛ2	UAA170	1005XA8Б	XR-S200	1102ПЛ1	N8T20N
1004ИП2-4	-	1005XA9	AN6406	1104KH1	NAR333P
1004ХЛ5-4	N200F	1006ВИ1	LM555CN-8	1104KH1-2	NAR333P
1004ХЛ6-4	TS8208	1008ВИ1	AY5-9151A	1106KT1-4	SAS560
1004ХЛ7-4	-	1008ВИ10	KS5851	1107PB1	TDC1014J
1004ХЛ8-4	5729	1008ВИ2	SS262	1107PB2	TDC1007J
1004ХЛ9-4	-	1008ВИ3	SAA6002	1107PB4A	TDC1025J
1004ХЛ10-4	AMCC1270	1008ВИ4	S2561	1107PB4B	TDC1025J
1004ХЛ11-4	AMCC1270	1008ВИ5	-	1107PB8	HADC77100
1004ХЛ12-4	-	1010KT1	SN75494	1107PB1A	TDC1014J
1004ХЛ13-4	-	1011ВГ1	-	1109KH2	TDC1007J
1004ХЛ15	WIC3121	1012ИК1	-	1108PA1	H11-562
1004ХЛ20	E3121	1012ИК2	MN5824	1108PB1	TDC1013J
1004ХЛ21	3121	1012ИК3	-	1108PB2	AM6112
1004ХЛ22	3121	1012ИК4	TDA1008	1108ПЛ2	ICL8068A
1004ХЛ28	KS5199A	1012ИК5	-	1109KH1	DI510
1004ХЛ6	TC8208AF9K	1012ИД1	-	1109KH2	DI510
1004ХЛ7	7910	1013BE1	MCOM-43	1109KH3	-
1004ХП14-4	-	1013BK1-2	-	1109KH4	DI512
1004ХП16-4	-	1013BK4-2	-	1109KH5	-
1004ХП17-4	-	1014KT1	VN2410	1109KH6A	MB491
1004ХП19-4	-	1015ХК2A	MPD2819C	1109KT1	D1210
1005BE1	MN1405	1015ХК3A	MPD2819C	1109KT2	ULN2001A
1005BX1	MN1435	1015ХК3Б	MPD2819C	1109KT3	ULN2074B
1005ПС1	AN6371	1016БР1	MN3011	1109KT4	UDN2841B
1005ПС2	AN6342	1016ВИ1	MN1435	1109KT21	ULN2002A
1005ПЦ1	M54819L	1016ПУ1	-	1109KT22	ULN2003A
1005ПЦ2	AN6342	1016ХЛ1	-	1109KT23	ULN2004A
1005ПЦ3-1	-	1102АП1	-	1109KT24	ULN2005A
1005ПЦ4	AN6345	1102АП2	SN75113N	1109KT61	ULN2801A
1005ПЦ5	AN6346	1102АП3	DS8831	1109KT62	ULN2802A
1005УД1	AN6551	1102АП4	SN75454N	1109KT63	ULN2803A
1005УЛ1	AN6320	1102АП5	SN75430N	1109KT64	ULN2804A
1005УЛ1A	AN6320	1102АП6	SN75431N	1109KT65	ULN2805A
1005УЛ1Б	AN6320H	1102АП7	SN75432N	1113PB1	AD571
1005УН1A	AN270	1102АП8	SN75433N	1118PA1	MC10318
1005УН1Б	AN270	1102АП9	SN75434N	1118PA2	-
1005УН1В	AN262	1102АП10	SN75460N	1118PA3	SP9768
1005УР1	AN262	1102АП11	SN75461N	1119ПУ1	-
1005УР1A	AN304			1121CA1	-
1005УР1Б	AN304				

		Тип ИС	Аналог	134ИИ4	-
1124АД1	-			134ИИ5	SN74L183N
1124АИ2	-			134ИИ2	SN74L180N
1124ЛУ1	-			134ИП3	SN74L181N
1128КН1	L292	133ИР13	SN74198	134ИИ2	SN74L182N
1128КТ1	L298	133ИР17	-	134ИП4	SN74L95W
1128КТ2	L298	133КП2	SN74153	134ИР1	SN74L91N
1200ЦЛ1	CCD131	133КП5	SN74152	134ИР2	SN74L98N
1200ЦЛ2	F1204	133КП7	SN74151	134ИР5	SN74L164N
1200ЦЛ3	-	133ЛА1	SN7420	134ИР8	-
1200ЦЛ6	-	133ЛА11	SN7426	134КП10	-
1200ЦМ1	CCD211	133ЛА12	SN7437	134КП8	-
1200ЦМ2	-	133ЛА15	-	134КП9	SN74L153N
1200ЦМ7	SID-51232	133ЛА2	SN7430	134ЛА2	SN74L30N
1200ЦМ8	CCD211	133ЛА3	SN7400	134ЛА8	SN74L01N
1200ЦМ9-3	719CCD	133ЛА4	SN7410	134ЛБ1	-
1200ЦМ10-3	719CCD	133ЛА6	SN7440	134ЛБ2	-
127ГФ1	-	133ЛА7	SN7422	134ЛП3	-
132РУ1	AM9102BDM	133ЛА8	SN7401	134ЛР1	-
132РУ12А	IMS1420-55	133ЛД1	SN7460	134ЛР2	SN74L54
132РУ12Б	IMS1420-55	133ЛД3	-	134ЛР4	SN74L55N
132РУ13А	TMM2018D-55	133ЛЕ1	SN7402	134РУ6	-
132РУ16А	I2147	133ЛЕ3	SN7425	134РМ1	SN54L77
132РУ16Б	I1247	133ЛЕ5	SN7428	134СП1	SN74L85N
132РУ2	-	133ЛЕ6	SN74128	134TB1	SN74L72N
132РУ3	I2125	133ЛН1	SN7408	134TB14	SN74L78N
132РУ4	I2125AL	133ЛН1	SN7432	134TM1	-
132РУ5	MK2147	133ЛН2	SN7405	134TM2	SN74L74N
132РУ6	IMS1400P45	133ЛН3	SN7406	134ХЛ2	-
132РУ7	-	133ЛН5	SN7416	134ХЛ3	-
132РУ8	I2148H	133ЛП5	SN7486	1401CA1	LM339
132РУ9	I2149H	133ЛП7	DS55451	1401CA2	LM2901
133АГ1	SN74121	133ЛП8	SN74125	1401CA3	AN1393
133АГ3	SN74123	133ЛП9	SN7407	1401УД1	LM3900
133ЖВ1	SN74148	133ЛР1	SN7450	1401УД2	LM324
133ИД1	SN74141	133ЛР3	SN7453	1401УД2A	LM324N
133ИД10	SN74145	133ЛР4	SN7455	1401УД2B	LM1240
133ИД16	-	133ЛП4	SN7449	1401УД3	TDB0146DP
133ИД15	-	133РП2	8220	1401УД6	LM392
133ИД20	-	133РП3	8220	145АП1	-
133ИД21	-	133РУ1	SN7481	145АП2	S5668
133ИД3	SN74154	133РУ2	-	145ИП16	SR-50
133ИД4	SN74155	133РУ5	93410DC	145ИП2	-
133ИЕ14	SN74196	133РУ7	93425FM	145ИР1	-
133ИЕ2	SN7490	133TB1	SN7472	145KT2	-
133ИЕ4	SN7492	133TB15	SN74109	145ПН1	-
133ИЕ5	SN7493	133TL1	SN7413	145ИИ1	-
133ИЕ6	SN74192	133TL2	SN14	145РЕ2	-
133ИЕ7	SN74193	133TL3	SN54132	145ХК1	-
133ИЕ8	SN7497	133TM2	SN7474	145ХК2	-
133ИМ1	SN7480	133TM5	SN7477	145ХК3	-
133ИМ2	SN7482	133TM7	SN7475	145ХК4	-
133ИМ3	SN7483	134ИД3	SN74L154N	146KT1	MPA35C
133ИП3	SN74181	134ИД6	SN74L42	1500BA123	F100123
133ИП4	SN74182	134НЕ2	SN74L90N	1500MB165	-
133ИР1	SN7495	134НЕ5	SN74L93	1500ИД170	F100170
				1500ИЕ136	F100136

1500ME160	F100160	1531MM6	74F283	1533MP24	SN74ALS299N
1500MM180	F100180	1531MP11	74F194	1533MP26	SN74LS670N
1500MP156	F100156	1531MP22	74F373	1533MP27	SN74LS377N
1500MP158	-	1531MP23	74F374	1533MP29	SN74ALS323N
1500MP179	F100179	1531MP40	74F533	1533MP30	SN74ALS259N
1500MP181	-	1531MP41	74F534	1533MP31	-
1500KP194	F100194	1531KP16	74F157	1533MP32	SN74LS170N
1500MP141	F100141	1531LA1	SN74F20N	1533MP33	SN74ALS573N
1500MP150	F100150	1531LA3	SN74FOON	1533MP35	SN74ALS273N
1500MP151	F100151	1531LA4	SN74F10N	1533MP37	SN74ALS574N
1500KP155	F100155	1531LE1	SN74FO2N	1533MP38	SN74ALS874N
1500KP163	F100163	1531LK1	SN74FO8N	1533MP39	-
1500KP164	F100164	1531LN3	SN74F11N	1533MP8	SN74ALS164N
1500KP171	F100171	1531LN1	SN74F32N	1533MP9	SN74ALS165N
1500MA104	-	1531LN1	SN74FO4N	1533KL11	SN74ALS257N
1500LK117	F100117	1531LP5	74F86	1533KL12	SN74ALS253N
1500JK118	F100118	1531JP9	74F64	1533KP13	SN74LS298N
1500JM102	F100102	1531TM8	SN74F175N	1533KP14	SN74ALS258N
1500JM107	F100107	1531TM9	SN74F174N	1533KP15	SN74ALS251N
1500JM112	F100112	1533AG3	SN74LS123N	1533KP16	SN74ALS157N
1500JM114	F100114	1533AP14	SN74ALS465N	1533KP17	SN74ALS353N
1500JM122	F100122	1533AP15	SN74ALS466N	1533KP18	SN74ALS158N
1500JU124	F100124	1533AP16	SN74ALS643N	1533KP19	SN74ALS352N
1500JU125	F100125	1533AP3	SN74ALS240N	1533KJ12	SN74ALS153N
1500PT416	F100416	1533AP4	SN74ALS241N	1533KJ17	SN74ALS151N
1500PY073	CX8100473	1533AP5	SN74ALS244N	1533JA1	SN74ALS20N
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1500PY480	MBM100480	1533JU17	SN74ALS274N	1533JA22	SN74ALS1020N
1500CP166	F100166	1533JU3	SN74LS154N	1533JA23	SN74ALS1003N
1500TM130	F100130	1533JU4	SN74LS155N	1533JA24	SN74ALS1010N
1500TM131	F100131	1533JU7	SN74ALS138N	1533JA3	SN74ALS00N
1507KE1	MPG552C	1533HE10	SN74ALS161N	1533JA4	SN74ALS10N
1508XJ1	CX775	1533HE11	SN74ALS162N	1533JA7	SN74ALS22N
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1508XJ3	-	1533HE13	SN74ALS191N	1533JA9	SN74ALS03N
1508XJ5	-	1533HE18	SN74ALS163N	1533LE1	SN74ALS02N
1509KP1	NTT	1533HE2	SN74LS90N	1533LE10	SN74ALS1002N
1515XM1	-	1533HE5	SN74LS93N	1533LE11	SN74ALS33N
1517KP1	-	1533HE6	SN74ALS192N	1533LE4	SN74ALS27N
1518BM1	TDC1010J	1533HE7	SN74ALS193N	1533JL1	SN74ALS08N
1520XM1	F100	1533HE9	SN74ALS160N	1533JL10	SN74ALS1011N
1521XM1	F100	1533JU3	SN74LS161N	1533JL2	SN74ALS09N
1520XM2	MCA1200ECL	1533MP4	SN74S182N	1533JL3	SN74ALS11N
1520XM3	FGE1500	1533MP5	SN74LS280N	1533JL4	SN74ALS15N
1520XM5	SH100/LS124	1533MP6	SN74ALS242N	1533JL6	SN74ALS21N
1527XM1	-	1533MP7	SN74ALS243N	1533JW8	SN74ALS1008N
1530MA20	SN74AS804N	1533MP10	SN74ALS166N	1533JL1	SN74ALS32N
1530LE8	SN54AS805	1533MP13	SN74ALS198N	1533JL4	SN74ALS1032N
1531AP3	SN74F240N	1533MP15	SN74LS173N	1533JL1	SN74ALS04N
1531AP4	SN74F241N	1533MP16	SN74LS295N	1533JL10	SN74ALS1005N
1531KD7	SN74F138N	1533MP22	SN74ALS373N	1533JH2	SN74ALS05N
1531MD14	SN74F139N	1533MP23	SN74ALS374N	1533JH7	SN74ALS368N
				1533JH8	SN74ALS1004N

1533ЛП12	SN74ALS136N	1554MP47	HC4006	155MM3	SN7483N
1533ЛН16	SN74ALS1034N	1554MP51	HC4035	155МД2	SN74180N
1533ЛП17	SN74ALS1035N	1554MP8	74AC164	155ХП3	SN74181N
1533ЛП3	-	1554MP5	74AC280	155МД4	SN74182N
1533ЛП5	SN74ALS86N	1554КП11	74AC257	155ХР1	SN7495N
1533ЛП8	SN74LS125N	1554КП12	74AC253	155MP13	SN74198N
1533ЛР11	SN74LS51N	1554КП14	74AC258	155MP15	SN74173N
1533ЛР13	SN74LS54N	1554КП16	74AC157	155MP17	AN2504
1533ЛР4	SN74LS55N	1554КП18	74AC158	155MP32	SN74170N
1533СЛ1	SN74LS85N	1554KR2	74AC153	155КИ1	SN74150N
1533TB1	-	1554ЛА1	74AC20	155КИ2	SN74153N
1533TB10	SN74ALS113N	1554ЛА3	74AC00	155КИ5	SN74152N
1533TB11	SN74ALS114N	1554ЛА4	74AC10	155КИ7	SN74151N
1533TB15	SN74ALS109N	1554ЛЕ1	74AC02	155ЛА1	SN7420N
1533TB6	SN74LS107N	1554ЛЕ4	74AC27	155ЛА10	SN7412N
1533TB9	SN74ALS112N	1554ЛН1	74AC08	155ЛА11	SN7426N
1533ТЛ2	SN74LS14N	1554ЛН6	74AC21	155ЛА12	SN7437N
1533TM2	SN74ALS74N	1554ЛН9	74AC34	155ЛА13	SN7438N
1533TM7	SN74LS75N	1554ЛН1	74AC32	155ЛА18	SN7452N
1533TM8	SN74ALS175N	1554ЛН1	74AC04	155ЛА2	SN7430N
1533TM9	SN74ALS174N	1554ЛП5	74AC86	155ЛА3	SN7400N
1533TP2	-	1554TB9	74AC112	155ЛА4	SN7410N
1534НЕ1	-	1554TB15	74AC109	155ЛА6	SN7440N
1534НП1	-	1554TM2	74AC74	155ЛА7	SN7422N
1534НП2	-	1554TM8	74AC175	155ЛА8	SN7401N
153ЛН1	-	1554TM9	74AC174	155ЛД1	SN7460N
153ЛН3	-	1554TM9	-	155ЛД3	-
153УД1	MA709	1556ХЛ8	PAL16L8	155НЕ1	SN7402N
153УД2	AD201AH	1556ХП4	PAL16R4C	155НЕ2	SN7423N
153УД3	MA709A	1556ХП6	PAL16R6C	155НЕ3	SN7425N
153УД4	LW4250	1556ХР8	PAL16R8C	155НЕ4	SN7427N
153УД5	LH0044C	1558RT1	85C060	155НЕ5	SN7428N
153УД5А	AD504S	155АГ1	SN74121N	155НЕ6	SN74128N
153УД5Б	AD504S	155АГ3	SN74123N	155ЛН1	SN7408N
153УД6	AD101AF	155АП1	-	155ЛН5	SN75451N
1548ХМ1	-	155АП2	-	155ЛН1	SN7432N
1554АП10	74AC640	155НВ1	SN74148N	155ЛН2	SN75453N
1554АП17	74AC652	155НД1	SN74141N	155ЛН1	SN7404N
1554АП20	74AC646	155НД10	SN74145N	155ЛН2	SN7405N
1554АП3	74AC240	155НД11	-	155ЛН3	SN7406N
1554АП4	74AC241	155НД13	-	155ЛН5	SN7416N
1554АП5	74AC244	155НД15	-	155ЛН6	SN74366N
1554АП6	74AC245	155НД3	SN74154N	155ЛН10	SN74365N
1554АП14	74AC139	155НД4	SN74155N	155ЛП11	SN74367N
1554НЕ10	74AC161	155НД8	-	155ЛН4	SN7417N
1554НЕ18	74AC163	155НД9	-	155ЛН5	SN7486N
1554НЕ23	HC4520	155НЕ1	-	155ЛН7	SN75450N
1554НЕ6	74AC193	155НЕ14	SN74196N	155ЛН8	SN74125N
1554НЕ7	74AC193	155НЕ2	SN7490N	155ЛН9	SN7407N
1554ИР22	74AC373	155НЕ4	SN7492N	155ЛР1	SN7450N
1554ИР23	74AC374	155НЕ5	SN7493N	155ЛР3	SN7453N
1554ИР24	74AC299	155НЕ6	SN74192N	155ЛР4	SN7455N
1554ИР29	74AC323	155НЕ7	SN74193N	155ЛН4	-
1554ИР35	74AC273	155НЕ8	SN7497N	155ИР6	SN74184N
1554ИР40	74AC533	155НЕ9	SN74160N	155ИР7	SN74185N
1554ИР41	74AC534	155ХМ1	SN7480N	155Е21	SN74187N
1554ИР46	HC4015	155ХМ2	SN7482N	155Е24	SN74187N

155РЕ3	Н8223Н	1602РЦ2	-	176КТ1	CD4016E
155РП1	SN74170N	1602РЦ3	-	176ЛА7	-
155РП3	SN74172N	1603РЕ1	SCM5316	176ЛА7	-
155РУ1	SN7481N	1603РУ1	HMI-6501	176ЛА8	-
155РУ2	SN7489N	1605РЦ1	-	176ЛА9	-
155РУ3	SN7484N	1605РЦ2A	7110	176ЛЕ10	-
155РУ5	F93410C	1607РФ1	-	176ЛЕ5	-
155РУ7	F93425APC	1607РФ1	-	176ЛЕ6	-
155TB1	SN7472N	1608РТ1	AM29751A	176ЛН1	-
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155TL1	SN7413N	1609РР1	12816	176ЛН11	-
155TL2	SN7414N	1609РР11	-	176ЛН12	-
155TL3	SN74132N	1609РР12	-	176ЛН2	-
155TM2	SN7474N	1609РР2	12B64A	176ЛН4	CD4000E
155TM5	SN7477N	1609РР3A	X2864	176ЛС1	-
155TM7	SN7475N	1610РЕ1-0100	-	176ЛУ1	-
155TM8	SN74175N	1610РЕ1-0107	-	176ЛУ2	CD4009E
155ХЛ1	-	1611РР1	-	176ЛУ3	CD4010E
1561АГ1	CD4098BE	1656РЕ2	6275	176ЛУ5	-
1561ГГ1	MCY74046N	1656РЕ3	6249	176PM1	CD4005E
1561ИД6	MC14555BP	1656РЕ4	NB7144	176РУ2	-
1561ИД7	MC14556BP	1657Ф2	-	176TB1	-
1561НЕ10	CD4520BE	1657Ф3	-	176TM1	CD4003E
1561НЕ20	MC14040BP	170AA1	-	176TM2	-
1561НЕ21	MC14194BP	170AA3	SN75325N	1800BA4	MC10804
1561НР14	MC14076BP	170AA4	-	1800BA7	MC10807
1561НР15	MC14194BP	:	:	1800ББ2	MC10802
1561КП1	CD4052BE	170AA7	-	1800BB2	MC10802
1561КП2	CD4051BE	170АП1	SN75110N	1800БМ5	MC10905
1561КП3	MC14512BP	170АП2	SN75150N	1800BP1	MC10901
1561КП4	MC14519BP	170АП3	NMHO026	1800BP8	MC10808
1561КТ3	CD4066BE	170АП4	I3245	1800BC1	MC10800
1561ЛА10	CD40107B	170УЛ1	-	1800BT3	MC10803
1561ЛА9	CD4023BE	170УЛ11	-	1800BV1	MC10801
1561ЛЕ5	CD4001BE	170УП1	SN75107N	1800РП6	MC10806
1561ЛЕ6	CD4002BE	170УП2	SN75154N	1801BE1	-
1561ЛЕ10	CD4025BE	176ИД1	-	1802BB1	NB2S112
1561ЛН2	CD4081BE	176ИД2	-	1802BB2	-
1561ЛП14	CD4070B	176ИД3	-	1802BB3	-
1561НР1	CD4094BE	176НЕ1	CD4024E	1802BP1	AM25510
1561РУ4	CD4050BE	176НЕ12	-	1802BP2	SN745508
1561TB1	CD4027BE	176НЕ13	-	1802BP3	MPY8H
1561TL1	CD4093BE	176НЕ17	-	1802BP4	MPY12IIJ
1561ХЛ1	HAL16L8A	176НЕ18	-	1802BP5	MPY16HJ
1561ХЛ2	HAL20L8A	176НЕ2	TA5971	1802BP6	MPY008H-1
1572XM1	-	176НЕ3	-	1802BP7	MPY008H
1601PP1	ER2401	176НЕ4	CD4026E	1802BC1	6702
1601PP11	-	176НЕ5	CD4033E	1802ИМ1	-
1601PP12	-	176НЕ8	-	1802ИД4	-
1601PP2	-	176ИМ1	-	1802НР1	AM29705
1601PP3	HN48016	176ИМ10	CD4006E	1804BA2	AM2908DC
1601PP31	-	176ИМ2	-	1804BA3	AM2916ADC
1601PP32	-	176ИМ3	CD40115E	1804BK1	AM2960DC
1601PP33	-	176ИМ4	CD4031E	1804BK2	AM2961
1608PP38	-	176ИМ6	-	1804BK3	AM2962

1804ВН1	AM2914DC	1818BB1	WD1100-01	193НЕ2	SP8685A
1804ВР1	AM2902DC	1818BB5	WD1100-05	193НЕ3	SP8690A
1804ВР2	AM2904DC	1818BB61	SCN2661B	193НЕ4	SP8655A
1804ВР3	AM2913DC	1818БГ01	MP07201	193НЕ5	-
1804ВС1	AM2901DC	1818БГ93	FDC1793	193НЕ6	SP8772B
1804ВС2	AM2903DC	1818БМ1	F9401	193НЕ7	SP8611M
1804ВТ1	AM2964B	1818БМ19	F9401C	193НЕ8	SP8786A
1804ВТ2	AM2965	1818БМ3	WD1100-01	193НЕ9	SP86611A
1804ВТ3	AM2966	1818БМ01	N8X3001	193ПЦ1	-
1804ВУ1	AM2909DC	1818БН19	AM9519APC	193ПЦ2	SP8612B
1804ВУ2	AM2911DC	1818БТ1	DC301	500ГГ1	MC1658L
1804ВУ3	-	1818БТ4	WD1100-04	500ИВ165	MC10165
1804ВУ4	AM2910DC	1818БЧ12	WD1100-12	500ИД161	MC10161
1804ВУ5	AM2930DC	1818ПЦ1	DC301	500ИД162	MC10162
1804ВУ7	AM2924DC	1818ПЦ2	COM8046	500ИД164	MC10164
1804ГТ1	AM2925DC	1818ПЦ3	COM8116T	500НЕ136	MC10136
1804НР1	AM2918DC	1818ПЧ4	COM8046	500НЕ137	MC10137
1804НР2	-	1820BE1	COP402	500НЕ160	MC10160
1804НР3	AM2950DC	1820BE2	COP420	500ИМ180	MC10180
1804НР4	AM2970S	1820BE3	COP424	500ИП179	MC10179
1809БГ1	MPD765	1820BE6	COP444	500ИП181	MC10181
1809БГ3	MPD765	1820БМ1	COP498	500MP141	MC10141
1809БГ3	TMS9918A	1820ИД1	NCC24370	500КП174	MC10174
1809БГ4	MPD7220	1821БМ85	-	500ЛЕ106	MC10106
1809БГ5	MC68652	1823АГ1	-	500ЛЕ111	MC10111
1809РЕ1	-	1823БВ1	-	500ЛЕ123	MC10123
1809РУ1	-	1823БУ1	-	500ЛЕ211	MC10211
1810ББ89	I8289	1823НЕ1	-	500ЛК117	MC10117
1810БГ88	I8288	1823НЕ2	-	500ЛК121	MC10121
1810БГ72	I8272	1823РЕ1	RCB2S290M	500ЛЛ110	MC10110
1810БМ86	I8086	1827БЕ1	TMS9940	500ЛЛ210	MC10210
1810БМ87	I8087	1827БЕ2	I2920	500ЛМ101	MC10101
1810БМ88	I8088	1828БМ1	-	500ЛМ102	MC10102
1810БМ89	I8089	1828БМ2	-	500ЛМ105	MC10105
1810БН59	I8259A	1829БМ1	-	500ЛМ106	-
1810БТ3	I8203	1829БМ2	MPD7500	500ЛМ109	MC10109
1810БТ37	I823A	1830БЕ31	-	500ЛМ107	-
1810ГФ84	I8284	1830БЕ35	-	500ЛП114	MC10114
1811БМ1	-	1830БЕ48	-	500ЛП115	MC10115
1811БТ1	DEC304E	1830БЕ5	80C51	500ЛП116	MC10116
1811БY1 - 1811БY3 -	-	1830БЕ51	-	500ЛП128	MC10128
1813БЕ1	I2920-16	185РУ1	-	500ЛП129	MC10129
1814БЕ2	-	185РУ10	-	500ЛП216	MC10216
1814БЕ3	TMS1099	185РУ2	-	500ЛС118	MC10118
1814БЕ4	-	185РУ3	-	500ЛС119	MC10119
1814БЕ5	TMS1200MLL	185РУ4	-	500LP400	-
1814БЕ7	TMS1200MLL	185РУ5	-	500LP124	MC10124
1814БЕ8	TMS1200MLL	185РУ7	F93422DC	500LP125	MC10125
1815БЧ1	-	185РУ8	NBX350F	500PE149	MC10149
1816БЕ31	I8031	188PE1	-	500PT416	F10416C
1816БЕ35	I8035	188PM1	-	500PY145	MC10145
1816БЕ39	I8039	188PY1	-	500PY148	MC10148
1816БЕ48	I8048	188PY2	CD4061AE	500PY401	F10142
1816БЕ49	I8049	188PY3	-	500PY410	F95410
1816БЕ51	I8051	190KT1	MEN2009	500PY412	-
1816БЕ75	I8751B	190KT2	ML160	500PY415	F95415
1818БА19	DC319AP	193НЕ1	SP8602A	500PY470	F10470

		531АП2	18216/18226	531ЛН3	SN74S11N
500ТВ135	MC10135	531АП3	SN74S240N	531ЛН4	-
500ТМ130	MC10130	531ВА1	SN74S226N	531ЛН1	SN74S32N
500ТМ131	MC10131	531ВГ1	SN74S482N	531ЛН2	SN74S04N
500ТМ133	MC10133	531ГГ1	SN74S124N	531ЛН5	SN74S05N
500ТМ134	MC10134	531ИД14	SN74S139N	531ЛР9	SN74S86N
500ТМ173	MC10173	531ИД7	SN74S138N	531ЛР10	SN74S65N
500ТМ231	MC10231	531ИЕ10	SN74S161N	531ЛР11	SN74S51N
502КР1	TMS5700	531ИЕ11	SN74S162N	531РУ8	SN74S189N
502КР1	TMS3016	531ИЕ14	SN74S196N	531РУ9	SN74S289N
502MC1	TMS5700	531ИЕ15	SN74S197N	531РУ10	SN74S225N
505MP2-505MP6	-	531ИЕ16	SN74S168N	531РУ11	DM85S68
505PE1	-	531ИЕ17	SN74S169N	531СН1	SN74S85N
505PE3	-	531ИЕ18	SN74S163N	531TB9	SN74S112N
505PE4	-	531ИЕ7	-	531TB10	SN74S113N
505PY5	MN5260	531ИК1	AM25S05	531TB11	SN74S114N
505PY6	-	531ИК2	SN74S381N	531TA3	SN74S132N
507PY1	-	531ИЛ3	SN74S181N	531TM2	SN74S74N
511ИД1	H158	531ИП4	SN74S182N	531TM8	SN74S175N
511ИЕ1	H157	531ИП5	SN74S280M	531TM9	SN74S174N
511ЛА1	H102	531ИП10	AM93S48	531ХЛ1	-
511ЛА2	H103	531ИР11	SN74S194N	533АГ3	SN54LS123
511ЛА3	H124	531ИР12	SN74S195N	533АГ4	SN54LS221
511ЛА4	H104	531ИР18	AM25S07	533АЛ3	SNS4LS240
511ЛА5	H122	531ИР19	AM25S08	533АЛ4	SN54LS241
511ЛН1	H109	531ИР20	AM25S09	533АЛ5	SN54LS244
511ЛН1	H113	531ИР21	AM25S10	533АЛ6	SN54LS245
511ЛУ2	H114	531ИР22	SN74S373N	533БМ1	SN54LS630
511TB1	H110	531ИР23	SN74S374N	533БВ1	SN54LS148
512BM1	MC14818	531ИР24	SN74S299N	533БВ2	SN54LS348
512ЛС10	-	531ИП11	SN74S257N	533БВ3	SN54LS147
512ЛС12	ICW7227	531ИП12	SN74S253N	533БЛ3	SN54LS154
512ЛС2	-	531ИП14	SN74S258N	533БМ4	SN54LS155
512ЛС3	-	531ИП15	SN74S251N	533ИД5	SN54LS156
512ЛС5	-	531ИП16	SN74S157N	533ИД6	SN54LS42
512ЛС6	-	531ИП18	SN74S158N	533ИД7	SN54LS138
512ЛС7	TC42820	531ИП2	SN74S153N	533ИД10	SN54LS145
512ЛС8	-	531ИП7	SN74S151N	533ИД18	-
512ЛС9	-	531ЛА1	SN74S20N	533ИД19	SN54LS159
514АП1	-	531ЛА12	SN74S37J	533НЕ10	SN54LS161
514ИД1	MSD047	531ЛА13	SN74S38N	533НЕ13	SN54LS191
514НВ2	MSD101	531ЛА16	SN74S140N	533НЕ19	SN54LS393
514ИД3	MA-17	531ЛА17	-	533НЕ5	SN54LS93
514ИД4	N8T51	531ЛА19	SN74S134N	533НЕ6	SN54LS192
514ИД5	-	531ЛА2	SN74S30N	533НЕ7	SN54LS193
514ИК1	DS8872N	531ЛА3	SN74SOON	533НЕ9	SN54LS160
514ИР2	HDSP-2000	531ЛА4	SN74S10N	533ИМ5	SN54LS280
521CA1	MA711	531ЛА7	SN74S22N	533ИМ6	SN54LS283
521CA2	LN106	531ЛА9	SN74S03N	533ИД3	SN54LS181
521CA3	CA111	531ЛЕ1	SN74S02N	533ИД5	SN54LS280
521CA4	NE527N	531ЛЕ7	SN74S260N	533ИП6	SN54LS283
521CA5	TL810	531ЛИ1	SN74SOBJ	533ИП8	SN54LS261
521CA6	MAL319	531ЛН2	-	533ИП9	SN54LS384

533MP11	SN54LS194A	533TP2	DM54LS279	555HE18	SN74LS163N
533MP15	SN54LS173A	533YU2	LM301N	555HE19	SN74LS393N
533MP16	SN54LS295A	533YU3	MA709A	555HE2	SN74LS90N
533MP20	SN74LS322A	536MP2	3341AMO	555HE20	SN74LS390N
533MP22	S4LS373	537PY1	MCM146508-1	555HE5	SN74LS93N
533MP23	SN54LS74	537PY10	-	555HE6	SN74LS192N
533MP25	DM54LS395	537PY11	-	555HE7	SN74LS193N
533MP26	SN54LS670	537PY13	HM6514	555HE9	SN74LS160AJ
533MP28	SN54LS322	537PY14	TC5504AD	555HM5	SN74LS183N
533MP29	SN74LS323	537PY16	HM6264-15	555HM6	SN74LS283N
533MP30	SN54LS259	537PY17	HM65642	555HM7	SN74LS385N
533MP35	S4LS273	537PY25	HM65161-5	555HP3	SN74LS181N
533MP8	S4LS164	537PY2	HM6504	555HP4	SN74LS182N
533KP11	SN54LS257	537PY3	NMC6504	555HP5	SN74LS280N
533KP12	DM54LS253	537PY4	HM6504	555HP6	SN74LS242N
533KP13	S4LS298	537PY5	-	555HP7	SN74LS243N
533KP14	DM54LS258	537PY6	-	555HP8	SN74LS261N
533KP15	S4LS251	537PY8	HM6516	555HP9	SN74LS384N
533KP16	S4LS157	537PY9	-	555HP1	-
533KP2	DM54LS153	541PE1	I3601	555HP10	SN74LS166N
533KP7	DM54LS151	541PT1	-	555HP11	SN74LS194J
533JA1	SNS4LS20	541PT2	M3636	555WP15	SN74LS173N
533JA10	DM54LS12	541PY1	SN74S401N	555WP16	SN74LS295N
533JA12	SN54LS37	541PY2	-	555WP22	SN74LS373N
533JA2	DM54LS30	541PY3	-	555WP23	SN74LS374N
533JA3	SN74ZS00	541PY31 - PY34	-	555WP26	SN74LS670N
533JA4	DM54LS10	554CA1	mA711C	555WP27	SN74LS377N
533JA6	SN54LS40	554CA2	mA710	555WP28	-
533JA7	DM54LS22	554CA3	LW211N	555WP30	SN74LS259N
533JA9	DM54LS03	554CA4	SE527	555WP32	SN74LS170N
533JE1	SN54LS02	555AF3	SN74LS123N	555WP35	SN74LS273N
533JE4	SN54LS27	555AF4	SN74LS221N	555WP8	SN74LS164J
533JH1	DM54LS08	555AJ3	SN74LS240N	555WP9	SN74LS165N
533JH2	SN54LS09	555AJ4	SN74LS241N	555KJ11	SN74LS257N
533JH3	DM54LS11	555AJ5	SN74LS244N	555KJ12	SN74LS253N
533JM6	DM54LS21	555AJ6	SN74LS245N	555KJ13	SN74LS298N
533JL1	DM54LS32	555AJ9	SN74LS640-1	555KJ14	SN74LS258N
533JLH1	DM54LS04	555BK1	SN74LS630N	555KJ15	SN74LS251N
533JH2	DM54LS05	555FT2	SN74LS626	555KJ16	SN74LS157N
533JH5	SN74LS86	555WB1	SN74LS148N	555KJ17	SN74LS353N
533JL5	DM54LS86	555WB3	SN74LS147N	555KJ2	SN74LS153N
533JL8	SN54LS125	555WD10	SN74LS145N	555KJ7	SN74LS151N
533JP11	DM54LS51	555HD14	-	555JA1	SN74LS20N
533JP11	SN74LS51	555HD18	SN74LS247N	555JA10	SN74LS12N
533JP13	SN54LS54	555KD3	SN74LS154N	555JA11	SN74LS26N
533JP4	SN54LS55	555KD4	SN74LS155N	555JA12	SN74LS37N
533CP1	DM54LS85	555WD5	SN74LS156N	555JA13	SN74LS38N
533TB6	DM54LS107	555WD6	SN74LS42J	555JA2	SN74LS30N
533TB9	DM54LS112	555WD7	SN74LS138N	555JA3	SN74LS00N
533TL2	SN54LS14	555HE10	SN74LS161N	555JA4	SN74LS10N
533TN2	SN54LS74	555HE13	SN74LS191N	555JA6	SN74LS40N
533TM7	SN54LS75	555HE14	SN74LS196N	555JA7	SN74LS22N
533TM8	SN74LS175	555HE15	SN74LS197N	555JA9	SN74LS03N
533TM9	SN74LS174	555HE17	SN74LS169AN	555HE1	SN74LS02N

555Л4	SN74LS27N		561РУ2	CD4061AE
555Л1	SN74LS08N		561CA1	MC14531AP
555Л2	SN74LS09N	559И11	561TB1	CD4027AE
555Л3	SN74LS11N	559И12	561TM1	CD4093AE
555Л4	SN74LS15N	559И13	561TM2	CD4013AE
555Л6	SN74LS21N	559И14	561TM3	CD4042AE
555Л1	SN74LS32N	559И15	561TP2	CD4043AE
555Л1	SN74LS04N	559И19	563PE2	-
555Л2	SN74LS05N	559И2	565РУ1	I2107A
555Л3	-	559И3	565РУ2	-
555Л5	SN74LS86N	559И4	565РУ3	-
555Л8	SN74LS125N	559И5	565РУ5	TMS4164
555Л12	SN74LS136J	559И6	565РУ5Д1	-
555ЛР4	SN74LS55N	559И7	565РУ5Д2	-
555ЛР11	SN74LS51N	559И8	565РУ5Д3	-
555ЛР13	SN74LS54N	559CK1	565РУ5Д4	-
555РЕ4	6275-1	559CK2	565РУ6	I2118
555CH1	SN74LS85N	561ИД1	565РУ7	-
555TB6	SN74LS107N	561ИЕ10	565РУ8	MC1488
555TB9	SN74LS112N	561ИЕ11	565РУ9	KM81256-10
555ТЛ2	SN74LS14N	561ИЕ14	568PE1-0001	-
555TM2	SN74LS74N	561ИЕ15	568PE1-0011	I4316
555TM7	SN74LS75N	561ИЕ16	568PE1-0301	-
555TM8	SN74LS175N	561ИЕ19	568PE1-0308	I4316
555TM9	SN74LS174N	561ИЕ8	568PE1-0310	I4316
555TP2	SN74LS279N	561ИЕ9	568PE2	MN52164
556PT1	N82S101	561ИК1	568PE2-0001	MN52164
556PT11 - PT15	-	561ИМ1	568PE3	TMS0351
556PT16	HM76641	561ИМ2	568PE3-000	TMS0351
556PT17	-	561ИМ5	568PE4	-
556PT18	HM76161	561ИР11	570TN1	-
556PT20	AM27S35C	561ИР12	571ХЛ1	3226
556PT2	N82S100	561ИР2	571ХМ4	SN74LS368AN
556PT22	PLS106	561ИР6	571ХМ5	SN74LS367AN
556PT4	I3601	561ИР9	572ЛА1	AD7520
556PT5	I3604	561ИР1	572ЛА2	AD7522
556PT6	N82S190	561ИР2	572ЛА3	-
556PT7	N82S191	561ИТ3	572ЛВ1	AD7570
556PT9	N82HS1281	561ЛА7	572ЛВ2	ICL7107
558PP1	BOPAN6000	561ЛА8	572ЛВ3	AD7574AD
558PP11	-	561ЛА9	572ЛВ4	AD7581
558PP2	HN48016	561ЛА10	572ЛВ5	-
558PP21 - PP24	-	561ЛЕ5	572ЛН2	I2764
558PP3	-	561ЛЕ6	573PE6	I2764
558PP4	IMS3630	561ЛН1	573PP2	I2816
558ХП1	MN9106	561ЛН2	573PP21	-
558ХП2	SAA1095	561ЛН3	573PP22	-
559BB1	-	561ЛН2	573PT5	I2716
559BB2	-	561ЛН13	573РФ1	I2708
559BH1	DC003	561ЛС2	573РФ11-РФ14	I2704
559BH2	DC013	561РУ1	573РФ2	I2716
559BT1	DC004	561РУ4	573РФ21-РФ24	I2758
559ИЕ1	-	561РУ7	573РФ3	-
559Л1	DS8640	561РУ8	573РФ31-РФ34	-
559ИП10	DS7641W	561РЕ1-0309	573РФ4	I2764

		588BA1	CP82C86
573РФ41-РФ44	-	5888Р2	CDP1855
573Р05	I2716	588BC1	-
573Р06	I2764	588BC2	-
573РФ61-РФ64	-	588BT2	-
573Р7	I27256	588BY1	-
573ХМ330	85С090	588BY2	-
580BA86	8286	588MP1	CP82CB2
580BA87	8287	588MP2	-
580BA91	-	588PE1	SMM2364
580BA92	-	589АП16	I8216
580BA93	8293	589АП26	I8226
580ББ89	18289	589ИК01	I8201
580ББ51	18251	589ИК02	I8202
580ББ53	18053	589ИК03	I8203
580ББ55	18255	589ИК14	I8214
580ББ79	18279	589ИР12	I8212
580ВГ18	I8218	589РА04	I3104
580ВГ75	I8287	589РУ01	I3101
580ВГ76	I8276	589ХЛ4	-
580ВГ88	I8288	590KP1	Н1-6-8572
580ВГ89	-	590KH1	F3705
580ВГ92	I8292	590KH2	Н13-1800A-5
580BK28	I8228	590KH3	Н13-0509-5
580BK38	I8238	590KH4	Н13-5043-5
580BN80	I8080	590KH5	Н13-0201-5
580BH59	I8259	590KH6	Н13-0508-5
580BH91	-	590KH7	Н13-5046A-5
580BP43	I8243	590KH8	SD5000
580BT42	I8242	590KH9	Н13-200-5
580BT57	I8257	590KT1	AD7519
580BP43	I8243	591KH1	Н1-6-8752
580ГФ24	I8224	591KH2	Н11-0507-5
580ГФ84	I8284	591KH3	Н11-0506-5
580HK51	I8251	594ЛА1	AD562
580HK55	AM6255A	596PE1	MKB36000Р84
580HK80	8080	596PE2	mPD73100
580MP82	I8282	597CA1	AM685M
580MP83	I8283	597CA2	AM686M
581BA1	TR1602A	597CA3	ICB8001C
581BE1	-	599ЛД1	-
581HK1	CP1611	599ЛК1	-
581HK2	CP1621	599ЛК3	-
581РУ1-РУ3	CP1631	599ЛК4	-
581РУ4	HM4116-2	599ЛК5	-
581РУ5	HM6116	599ЛК6	-
582АП26	-	599ЛР1	-
582HK03	-	6500НЕ2	HMД41016-1
582HK1	-	6500НЕ3	-
582HK2	SPB0400	6500MP1	-
583PA1	TMS4000	6500LP1	HMД11016
583ХЛ1	-	6500LP2	HMД11016-1
584BB1	-	6500TP2	-
584ВГ1	-	6500TT1	HMД11016-1
584BM1	SPB0400	6500РУ1	I2G011

## 6. TRANSISTOR

### 6.1 ĐẠI CƯƠNG

Transistor được phát minh vào năm 1948. Trong lúc nghiên cứu lớp tiếp giáp pn của diốt, John Bardeen và H. Brattain đã đặt một kim đo trên lớp n của diốt và ngẫu nhiên tạo ra các lớp pnp. Với các phép đo hai ông đã nhận thấy rằng sự thay đổi điện trở của một lớp tiếp giáp cũng làm cho điện trở của lớp tiếp giáp thứ hai thay đổi theo. Như thế nguyên tắc cơ bản của 1 transistor loại bipolar đã được tìm thấy. Vì rằng sự thay đổi điện trở của một lớp tiếp giáp cũng làm cho điện trở của lớp tiếp giáp thứ hai thay đổi theo, người ta gọi đây là "transfer resistor" gọi tắt "Transistor". Và vì lần nguyên thủy một transistor được hình thành với một lớp tiếp giáp pn và một kim đo, người ta chọn dấu hiệu một transistor là có hình mũi tên chỉ vào cho transistor loại pnp hay chỉ ra cho transistor loại npn. Sau khi William Shockley giải thích được cơ chế bên trong transistor, cả ba nhà khoa học nhận giải Nobel vào năm 1956 về vật lý. Phát minh này đã ảnh hưởng đồi sống của từng người một trên quả đất từ 50 năm nay.

### 6.2 HỆ THỐNG KÝ HIỆU CHO BÁN DẪN RỜI

Ký hiệu cho những linh kiện bán dẫn cơ bản gồm hai chữ cái và các mã số tiếp theo.

*Chữ cái đầu tiên:*

- A Germani
- B Silic
- C Gallium – Arsenic
- D Những chất bán dẫn khác, v.d. Cadmium sulfic

*Chữ cái thứ hai : cho biết nhiệm vụ chính*

- A Diôt tín hiệu, công suất bé
- B Diôt với điện dung thay đổi
- C Transistor công suất bé, âm tần

D	Transistor công suất, âm tần
E	Tunneldiode, Diốt đường hầm
F	Transistor công suất bé, cao tần
G	Linh tinh, v.d. dao động
H	Diốt làm việc khi có từ trường
L	Transistor công suất, cao tần
N	Bộ ghép quang (Opto-Coupler)
P	Linh kiện cảm quang (Phototransistor, tế bào quang điện)
Q	Linh kiện phát quang (LED, Laser)
R	Linh kiện điều khiển, đóng mở
S	Transistor công suất nhỏ, đóng mở
T	Điều khiển, đóng mở (Thyristor, Triac ...)
U	Transistor đóng mở công suất
W	Linh kiện sóng bề mặt
X	Diốt, bộ nhân, Varactor, step recovery
Y	Diốt, chỉnh lưu, Booster
Z	Zener Diode, diốt điều chỉnh điện áp; diốt hạn chế điện áp (với chữ cái thứ ba là W)

Các ký hiệu tiếp theo :

- 3 số (100 đến 999) cho linh kiện trong vô tuyến truyền thanh, truyền hình ...
- 1 chữ cái và 2 số (Y10 đến A99) cho I/k trong các thiết bị chuyên môn.

Ví dụ:

BD232: Silic, công suất, transistor âm tần, loại thương mại

CQY17: GaAs, diốt phát quang, loại công nghiệp

RPY 84: CdS, điện trở quang, loại công nghiệp

Những ký hiệu phụ: Cho ta biết thêm một ít đặc trưng kỹ thuật, ví dụ :

Z-Diốt, chữ cái cho biết thêm dung sai của điện áp Zener A 1%; B 2%; C 3%; D 10%; E 20%.

Con số cho biết điện áp Zener theo dòng định mức, v.d: BZY74 C6V3.

### 6.3 ĐẶC TRUNG KỸ THUẬT TRANSISTOR 2N3055

ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ ) = 25°C Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS						LIMITS		
	VOLTAGE		CURRENT						
	V <sub>CE</sub>	V <sub>BE</sub>	I <sub>C</sub>	I <sub>E</sub>	I <sub>B</sub>	Min.	Typ.	Max.	
I <sub>CEO</sub>	100	-1.5				—	—	5	
I <sub>CEO</sub> , T <sub>C</sub> = 150°C	100	-1.5				—	—	30	
I <sub>CEO</sub>	30				0	—	—	0.7	
I <sub>CEO</sub>	7		0			—	—	5	
V <sub>CEO(sus)</sub> **				0.2		70	—	—	
R <sub>ce</sub> , 100Ω				0.2		60	—	—	
V <sub>CEO(sus)††</sub>			4	4		20	—	70	
			4	10		5	—	—	
V <sub>BE</sub>		4	4			—	—	1.8	
V <sub>CE(sat)</sub>			4	0.4		—	—	7.1	
			10	3.3		—	—	8	
I <sub>FB</sub> , f = 10 kHz	4		1			20	—	—	
I <sub>FB</sub>  , f = 1 MHz	4		1			0.8	—	—	
I <sub>BS</sub> , I = 1.5 (non-repetitive)	60					1.95	—	—	

\*In accordance with JEDEC registration data.

\*\*The sustaining voltages V<sub>CE(sus)</sub> and V<sub>CE(sus)</sub> MUST NOT be measured on a curve tracer.

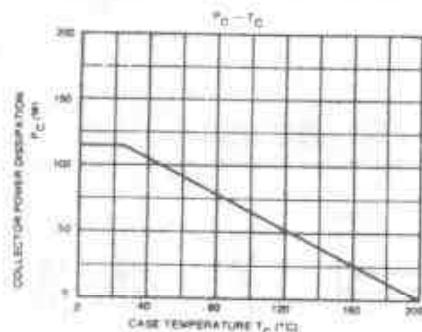


Fig. 1 - Power dissipation vs. temperature derating curve for 2N3055.

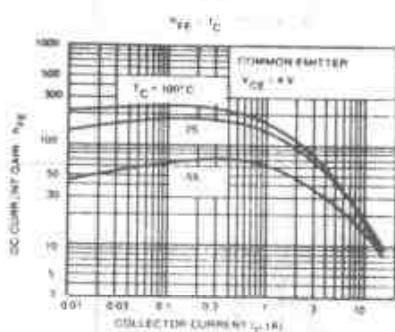


Fig. 2 - Typical dc-beta characteristics for 2N3055.

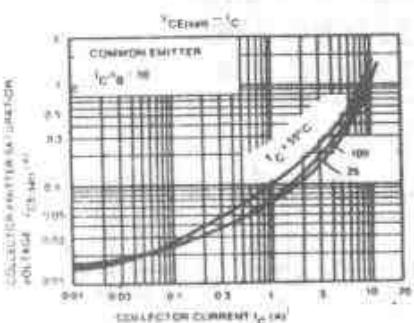


Fig. 3 - Typical collector-to-emitter saturation voltage characteristics for type 2N3055.

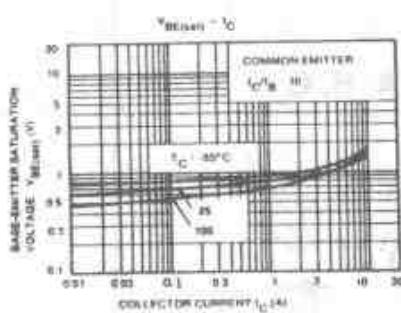


Fig. 4 - Typical base-to-emitter saturation voltage as a function of collector current for type 2N3055.

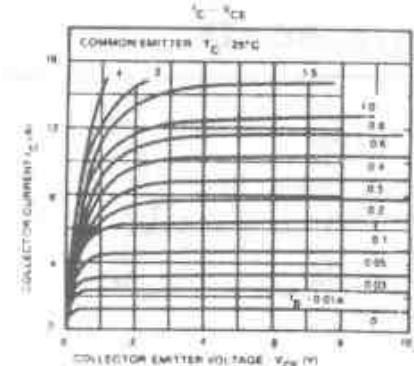


Fig. 5 - Typical output characteristics for 2N3055.

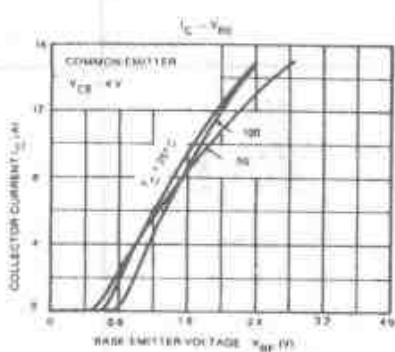


Fig. 6 - Typical transfer characteristics for 2N3055.

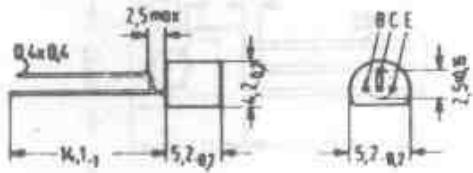
TERMINAL DESIGNATIONS



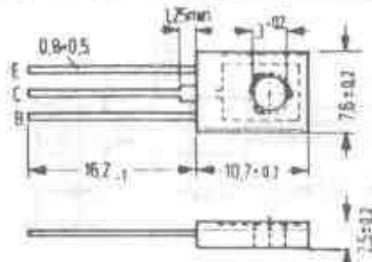
## 6.4 SƠ ĐỒ CHÂN MỘT SỐ TRANSISTOR THÔNG DỤNG

<p><b>AC 121; AC 151; AC 152 ASY 48; ASY 70</b></p>	<p><b>BC 182; BC 183; BC 212; BC 237...BC 239</b></p>
<p><b>BC 140; BC 160 BC 141; BC 161</b></p>	<p><b>BC 257...BC 259</b></p>
<p><b>BC 107...BC 109 A, B, C</b></p>	<p><b>BC 307...BC 309; BC 327; BC 328; BC 337; BC 338</b></p>
<p><b>BC 167...BC 169</b></p>	<p><b>BC 177...BC 179</b></p>
<p><b>BC 368; BC 369</b></p>	<p><b>BC 413...BC 416; BC 516; BC 517; BC 546...BC 560</b></p>

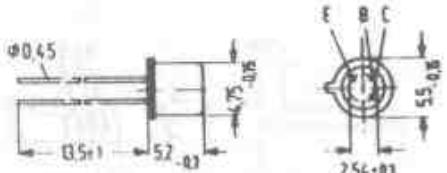
## SƠ ĐỒ CHÂN MỘT SỐ TRANSISTOR THÔNG DỤNG



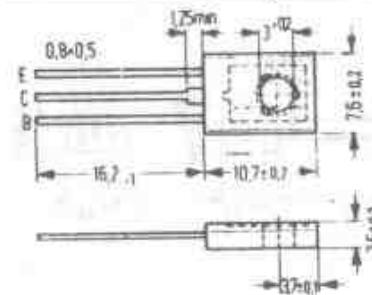
**BC 635...BC 640  
BC 875...BC 880**



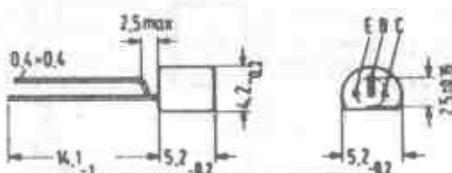
**BD 135...BD 140; BD 287;  
BD 288; BD 433...BD 436**



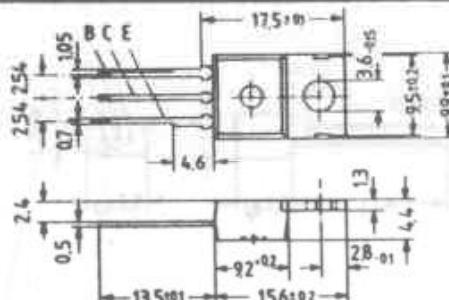
**BCX 22...BCX 24;  
BCX 39**



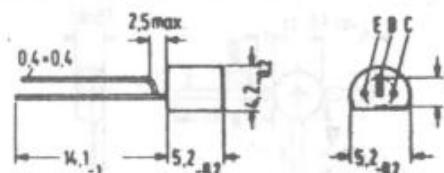
**BD 437...BD 442; BD 675...BD 680**



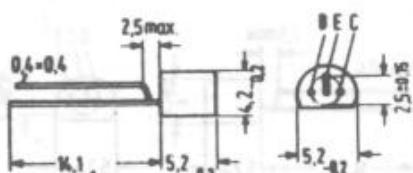
**BCX 58; BCX 59**



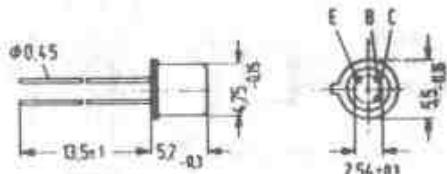
**BD 533...BD 538; BD 645...BD 650**



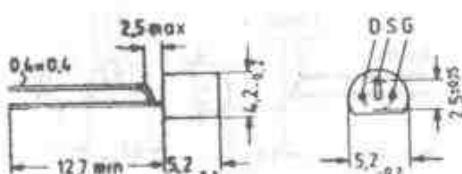
**BCX 73...BCX 76  
BCX 78; BCX 79**



**BF 199; BF 240; BF 241;  
BF 254; BF 255**

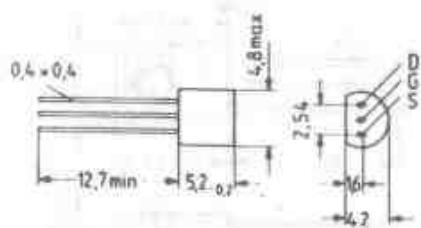


**BCY 58; BCY 59; BCY 65; BCY 67;  
BCY 77; BCY 78; BCY 79**

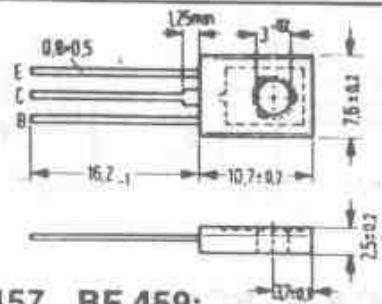


**BF 245 A, 245 B, 245 C;  
BF 256 A, 256 B, 256 C;  
BF 410 A, 410 B, 410 C, 410 D**

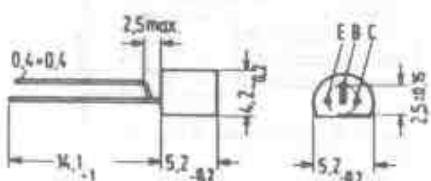
# SƠ ĐỒ CHÂN MỘT SỐ TRANSISTOR THÔNG DỤNG



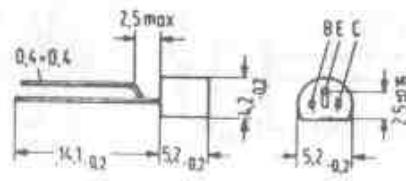
**BF 246 A, 246 B, 246 C**



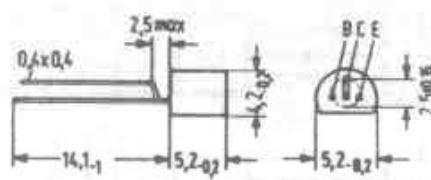
**BF 457...BF 459;  
BF 469...BF 472**



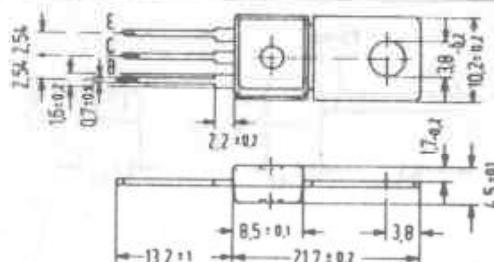
**BF 324**



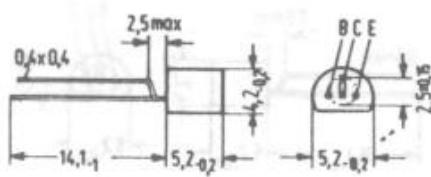
**BF 606 A;  
BF 926; BF 959**



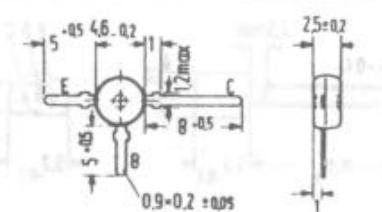
**BF 420; BF 421**



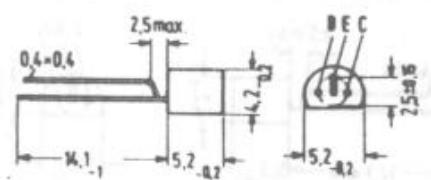
**BF 857.. BF 859;  
BF 869...BF 872**



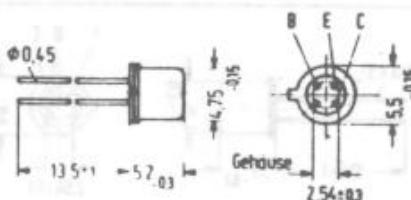
**BF 422; BF 423**



**BF 967; BF 968; BF 970;  
BF 979 S**

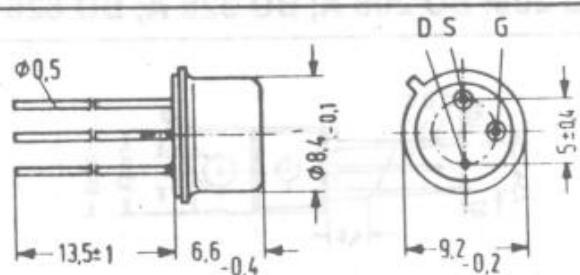
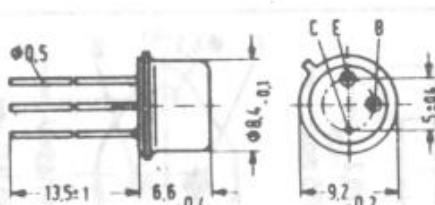
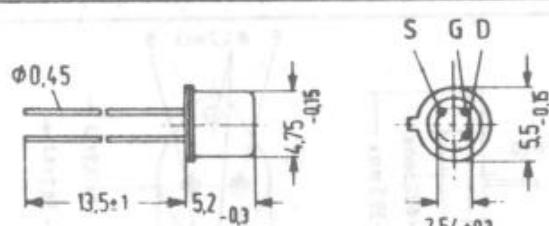
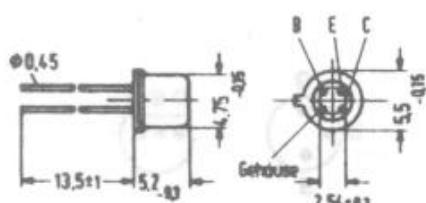
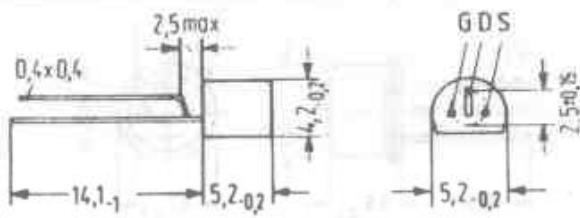
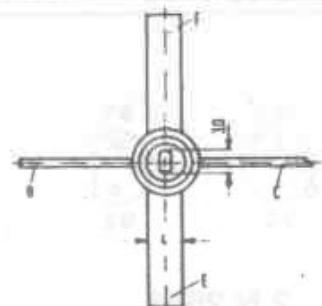
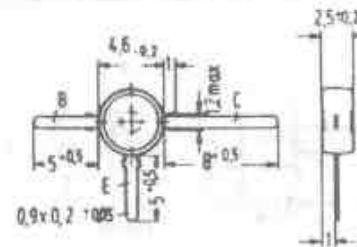
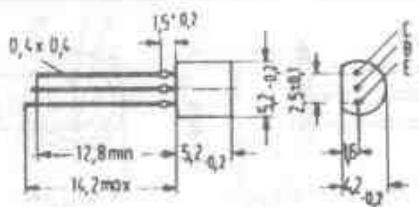
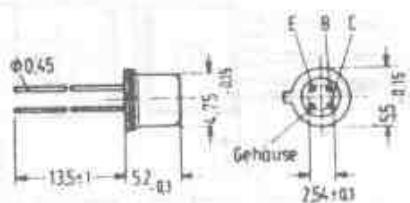
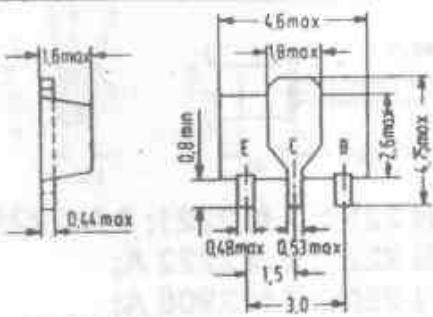


**BF 450; BF 451**

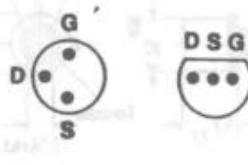
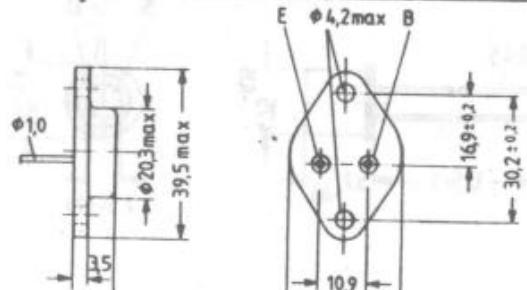
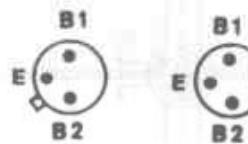
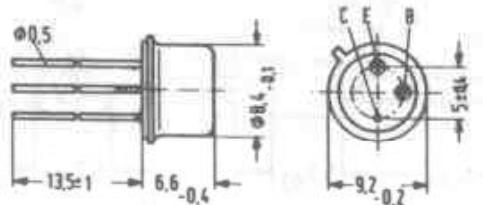
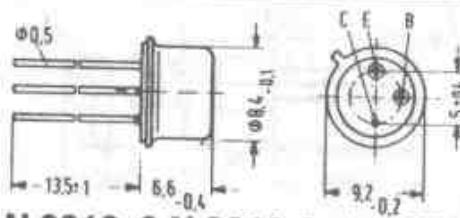
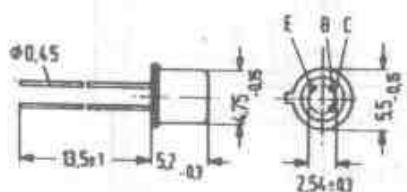
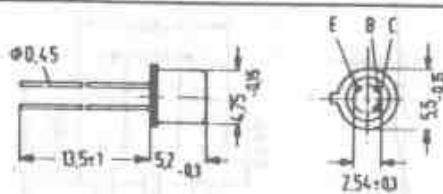
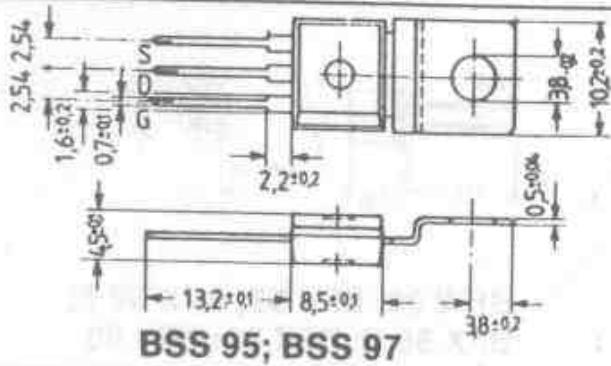


**BFR 15 A; BFS 55 A**

## SƠ ĐỒ CHÂN MỘT SỐ TRANSISTOR THÔNG DỤNG

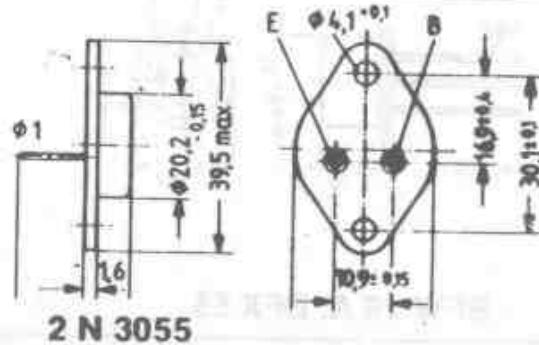
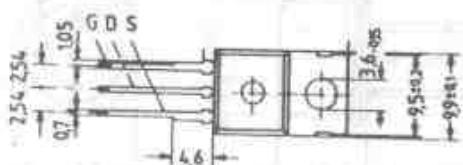


# SƠ ĐỒ CHÂN MỘT SỐ TRANSISTOR THÔNG DỤNG



E 300 und J 300 sind gegeneinander austauschbar (technisch gleich)

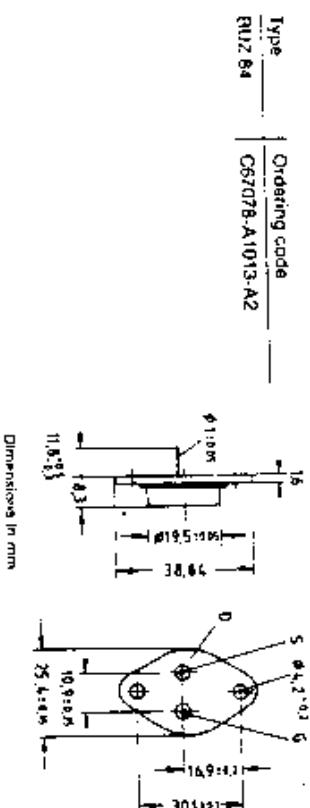
**BU 205; BU 208 A; BU 326 A; BU 626 A**



# 6.5 ĐẶC TRUNG KỸ THUẬT TRANSISTOR MOSFET

## BUZ 84

**Description** SiPMOS<sup>®</sup> FET power transistor, N-channel enhancement mode  
**Case** Metal case, weight approx. 12 g  
**Standard designation** Conforms to JEDEC outlines TO-204 AA (10-3)



### Electrical Characteristics

at  $T_c = 25^\circ\text{C}$  (unless otherwise specified)

Description	Symbol	Value	Unit	Conditions
		min.	typ.	max.
Absolute maximum ratings				
Drain-source voltage	$V_{DS}$	800V		
Drain-gate voltage, $R_{DS} = 20 \text{ k}\Omega$	$V_{GS}$	800V		
Continuous drain current, $T_c = 25^\circ\text{C}$	$I_D$	5.3A		
Pulsed drain current, $T_c = 25^\circ\text{C}$	$I_{D(\text{pulse})}$	15A		
Gate-source voltage	$V_{GS}$	$\pm 20\text{V}$		
Max. power dissipation	$P_D$	125W		
Operating and storage temperature range	$T_{J\text{ to } S}$	-55°C...+150°C		
Thermal resistance	$R_{Th\text{JA}}$	1.0K/W		
	$R_{Th\text{JC}}$	35K/W		

### Dynamic ratings

Forward transconductance	$G_F$	1.8	3.0	-	$S$	$V_{GS} = 25\text{V}$
Input capacitance	$C_{in}$	-	3600	-	pF	$I_D = 3\text{A}$
Output capacitance	$C_{out}$	-	200	-	$V_{GS} = 0\text{V}$	$V_{GS} = 25\text{V}$
Reverse transfer capacitance	$C_{tr}$	-	100	-	$V_{GS} = 1\text{MHz}$	$V_{GS} = 1\text{MHz}$
Turn-on delay time: <sup>1)</sup>	$t_{on}$	-	60	-	$V_{GS} = 30\text{V}$	$I_D = 2.5\text{A}$
$t_{on} = t_{on\text{sat}} + t_i$	$t_i$	-	100	-	$V_{GS} = 10\text{V}$	$I_D = 1\text{A}$
Turn-off delay time: <sup>1)</sup>	$t_{off}$	-	500	-	$R_{DS(on)} = 10\Omega$	
$t_{off} = t_{off\text{sat}} + t_o$	$t_o$	-	100	-		

### Reverse diode

Continuous reverse drain current	$I_{DM}$	-	-	5.3	A	-
Pulsed reverse drain current	$I_{D(\text{pulse})}$	-	-	15		
Diode forward voltage	$V_{SD}$	-	1.0	1.45	V	$I_F = 2 \times I_{DM}$ $V_{DS} = 0\text{V}, T_c = 25^\circ\text{C}$
Reverse recovery time	$t_r$	-	1800	-	$T_c = 25^\circ\text{C}$	$t_r = 2 \times t_{off}$
Reverse recovery charge	$Q_r$	-	25	-	$\mu\text{C}$	$Q_{r,m} = 100\mu\text{A}/\mu\text{s}$

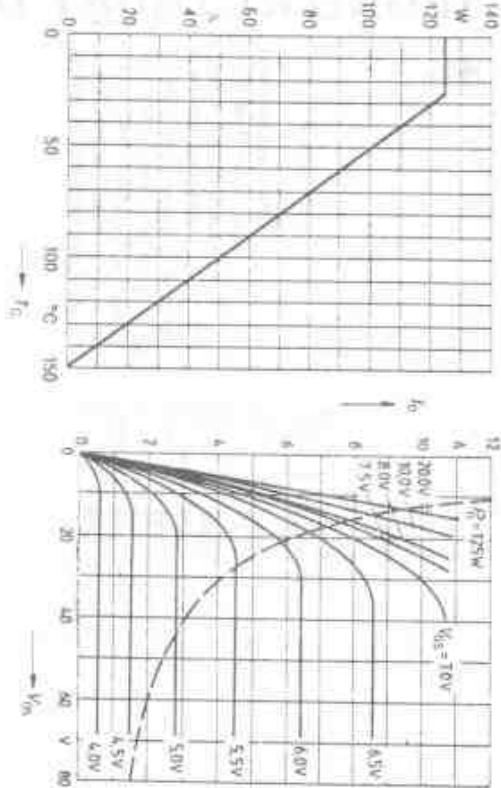
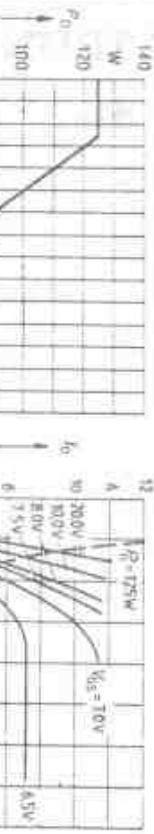
<sup>1)</sup>SiPMOS switching times are substantially independent of operating temperature.

Verhältnisstellung  $f_{T_1} = f(T_1)$

Typ-Ausgangsschwellenstrom  $I_{OSS} = f(V_{GS})$   
Parameter:  $V_{DS} = 25V$ ,  $T_1 = 25^\circ C$

Typ-Emissionswiderstand  $R_{DCE,typ} = f(T_1)$   
Parameter:  $V_{GS} = 25V$ ,  $T_1 = 25^\circ C$

Emissionswiderstand  $R_{DCE,real} = f(T_1)$   
Parameter:  $I_D = 3A$ ,  $V_{DS} = 10V$   
(Strombereich)

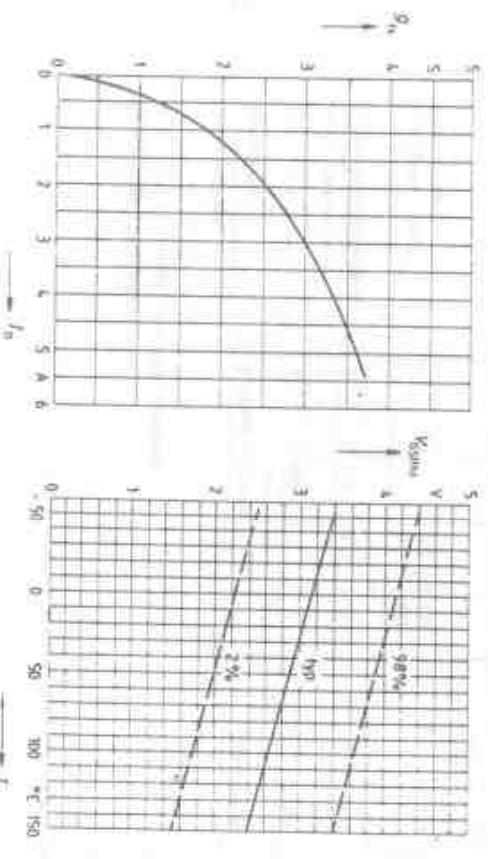
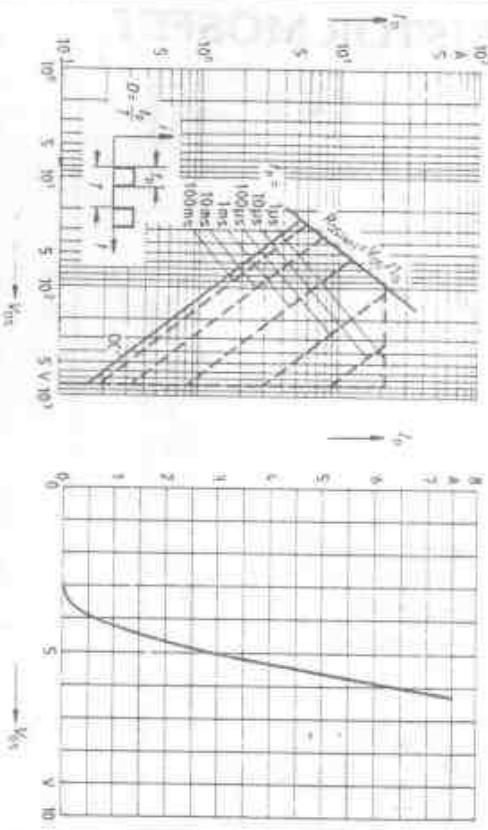


Zur Differenztemperatur  $\delta T = T_1 - 25^\circ C$   
Parameter:  $D = 0.01$ ;  $T_C = 25^\circ C$

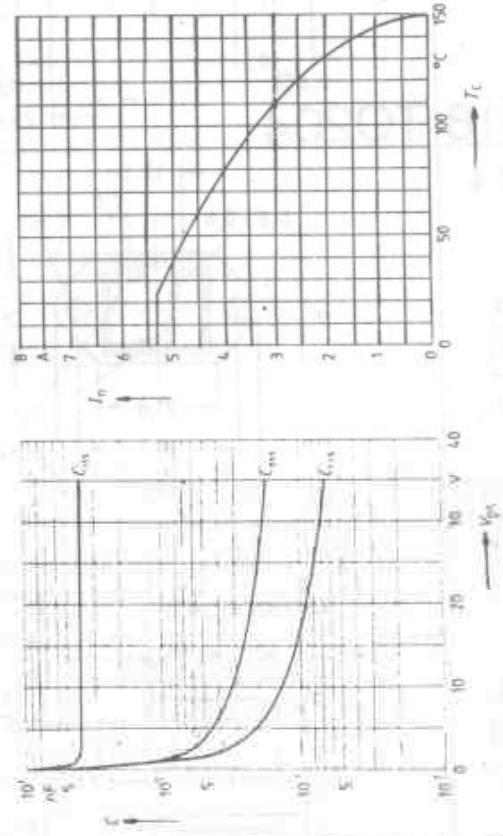
Typ-Durchlassspannungscharakteristik  $I_D = f(V_{GS})$   
Parameter:  $V_{DS} = 25V$ ,  $T_1 = 25^\circ C$

Typ-Obertragungsgeschwindigkeit  $I_{DSS} = f(f_T)$   
Parameter:  $V_{DS} = 25V$ ,  $T_1 = 25^\circ C$

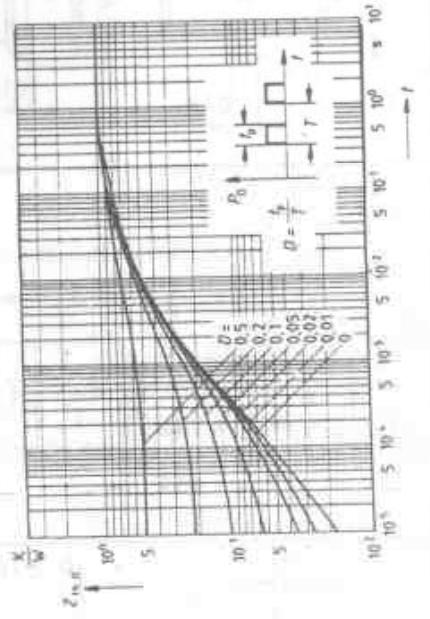
Gute Schwellenspannung  $V_{GS,th} = f(f_T)$   
Parameter:  $V_{DS} = V_{GS}$ ,  $I_D = 1mA$   
(Strombereich)



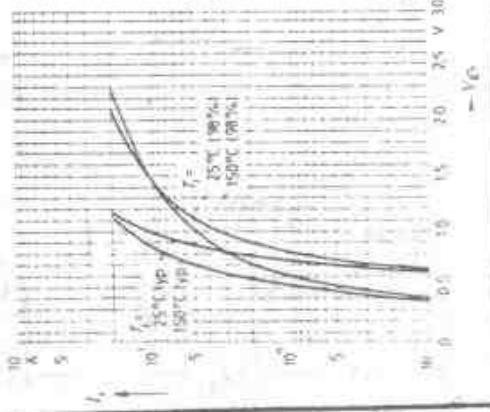
Typ-Kapazität  $C = r/(V_{GS})$   
Parameter:  $V_{GS} = 0, f = 100\text{Hz}$



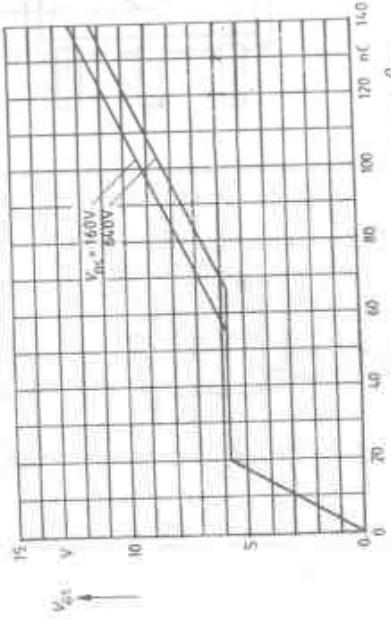
Drainstrom  $I_D = r(T_C)$   
Parameter:  $V_{GS} \geq 0, f = 100\text{Hz}$



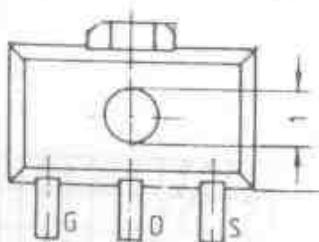
Durchflusskennlinie Transistoriode  $I_F = r(V_{DS})$   
Parameter:  $T_C, I_F = 100 \mu\text{A}$   
(Struktur:  $\text{Si}-\text{N}_x-\text{Si}$ )



Typ-Gateleitung  $V_{GS} = r(25^\circ\text{K})$   
Parameter:  $I_D = 9\text{A}$

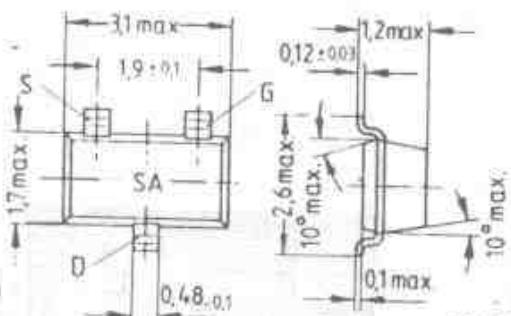


## 6.6 SƠ ĐỒ CHÂN TRANSISTOR MOSFET



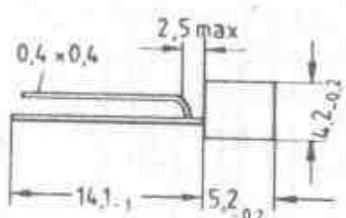
H.1

SOT89



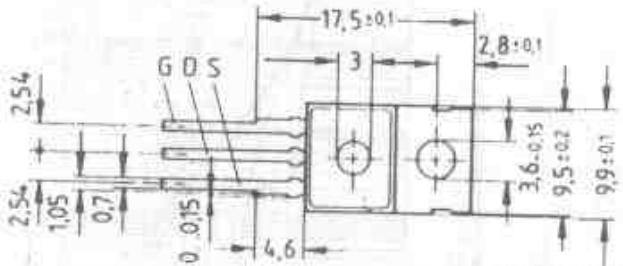
H.6

SOT23

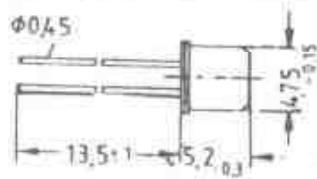


GDS  
2.5:0.15  
5.2-0.2

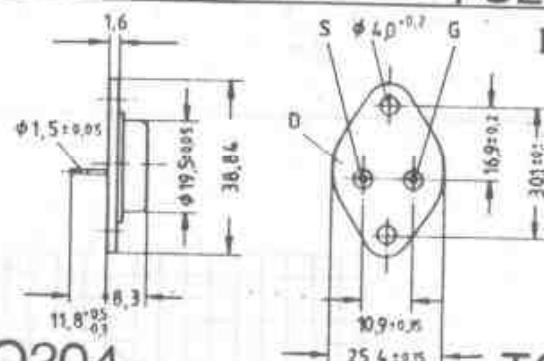
H.2



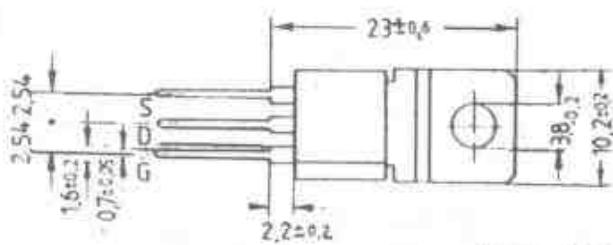
H.7



H.3

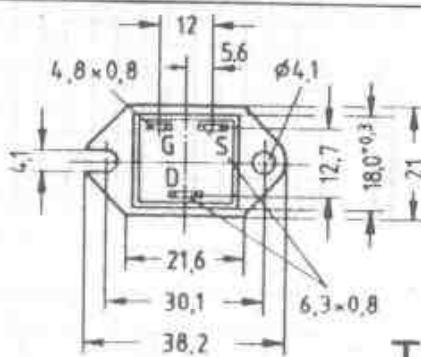


H.8



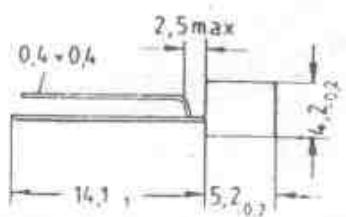
TO 202

H.5

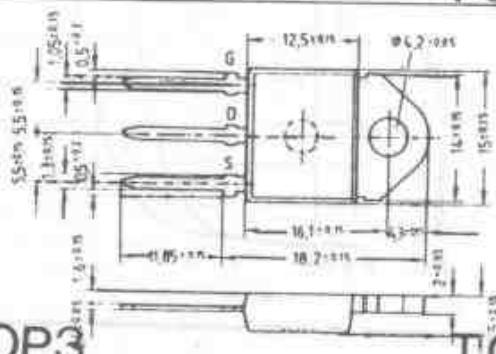


H.9

TO238



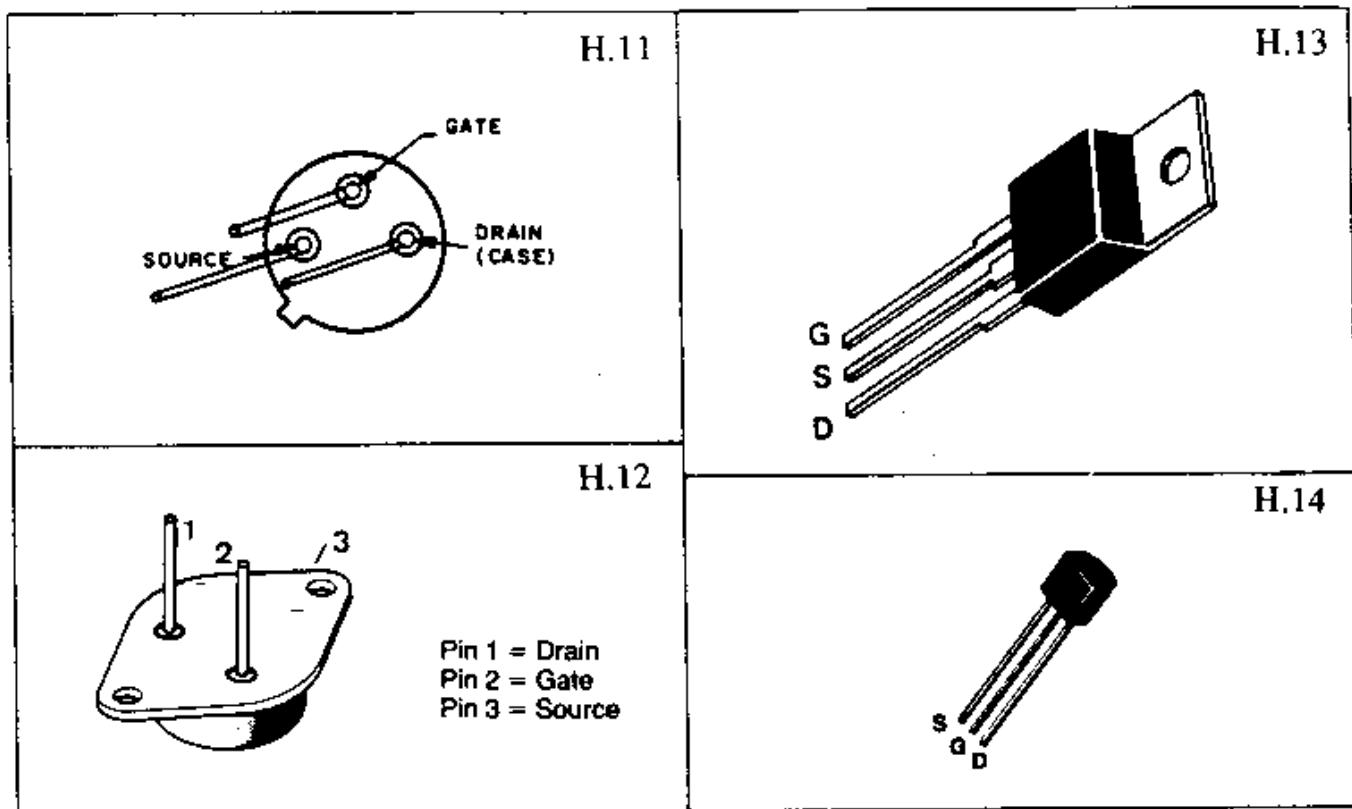
1.5



H.10

T092 TOP3

## SƠ ĐỒ CHÂN MOSFET



### Transistor trường công suất

Transistor trường công suất (PMOSFET) là loại transistor trường tự ngắt. Điện áp giữa Gate và Source điều khiển điện trở kênh giữa Drain và Source. Đa số PMOSFET là loại kênh N. Với sự di động  $\mu_N$  của hạt điện tử lớn hơn  $\mu_P$  của lỗ trống, kênh N có điện trở bé hơn.

- Điều khiển bằng điện áp.
- Thời gian đóng mở nhanh (nanosecond).
- Công suất ra trên tải lớn (dòng điện có thể lên đến 150A, công suất đóng mở tới 5KW).
  - Công suất điều khiển bé.
  - Để gia tăng công suất trên tải, MOSFET có thể mắc song song với nhau.
  - Công suất điều khiển không tùy thuộc vào công suất trên tải. Cho nên có thể dùng cùng một mạch điều khiển cho công suất 10W hay 1000W.
  - Điện trở vào lúc transistor dẫn rất lớn.
  - Điện trở  $R_{DS(on)}$  của MOSFET rất bé (vài phần trăm của ohm).
  - Nhờ sự cấu tạo đặc biệt của transistor và hệ thống của  $R_{DS(on)}$  MOSFET không có hiệu ứng đánh thủng cấp hai trong toàn dài các trị số kỹ thuật cực đại.
  - Sự giao tiếp với IC đơn giản.
  - Không có thời gian trích trữ (Storage time).
  - Tuyến tính .

## 6.7 ĐẶC TRUNG KỸ THẬT RÚT GỌN TRANSISTOR MOSFET BUZ

Typ	Kanal	$V_{DS}$	$I_D$	$R_{DS(on)}$	
BSS 84	P	-50	-130	10.0	SOT 23
BSS 110	P	-50	-170	10.0	TO 92
BSS 92	P	-200	-150	20.0	TO 92
BSS 138	N	50	200	3.5	SOT 23
BSS 98	N	50	300	3.5	TO 92
BSS 123	N	100	170	6.0	SOT 23
BSS 100	N	100	250	6.0	TO 92
BSS 101	N	200	160	12.0	TO 92
BSS 87	N	200	280	6.0	SOT 89
BSS 89	N	200	300	6.0	TO 92
BSS 91	N	200	350	6.0	TO 18
BSS 95	N	200	800	6.0	TO 202
BSS 97	N	200	1500	2.0	TO 202
BSS 129 <sup>2)</sup>	N	230	150	20.0	TO 92
BSS 68	N	230	250	8.0	TO 92
BSS 131	N	240	100	16.0	SOT 23
BSS 125	N	600	100	40.0	TO 92

Typ	Kanal	$V_{DS}$	$I_D$	$R_{DS(on)}$	

$V_{DS} = 50 \text{ V}$

BUZ 171	P	-50	-7	0.4	TO 220
BUZ 71A	N	50	13	0.12	TO 220
BUZ 71	N	50	14	0.1	TO 220
BUZ 71L	N	50	14	0.1	TO 220
BUZ 10	N	50	20	0.08	TO 220
BUZ 11A	N	50	25	0.06	TO 220
BUZ 11	N	50	30	0.04	TO 220
BUZ 11S2	N	50	30	0.04	TO 220
BUZ 17	N	50	32	0.04	TO 238
BUZ 18	N	50	37	0.03	TO 238
BUZ 14	N	50	39	0.04	TO 3
BUZ 348	N	50	39	0.04	TO 218
BUZ 347	N	50	40	0.03	TO 218
BUZ 15	N	50	45	0.03	TO 3

Typ	Kanal	$V_{DS}$	$I_D$	$R_{DS(on)}$	

$V_{DS} = 100 \text{ V}$

BUZ 172	P	-100	-5	0.8	TO 220
BUZ 72A	N	100	9.0	0.25	TO 220
BUZ 23	N	100	10	0.2	TO 3
BUZ 72	N	100	10	0.2	TO 220
BUZ 20	N	100	12	0.2	TO 220
BUZ 28	N	100	18	0.1	TO 238
BUZ 21	N	100	19	0.1	TO 220
BUZ 25	N	100	19	0.1	TO 3
BUZ 27	N	100	26	0.06	TO 238
BUZ 349	N	100	32	0.06	TO 218
BUZ 24	N	100	32	0.06	TO 3

$V_{DS} = 200 \text{ V}$					
BUZ 173	P	-200	-3	2.0	TO 220
BUZ 73A	N	200	5.8	0.6	TO 220
BUZ 73	N	200	7.0	0.4	TO 220
BUZ 32	N	200	9.5	0.4	TO 220
BUZ 35	N	200	9.9	0.4	TO 3
BUZ 31	N	200	12.5	0.2	TO 220
BUZ 37	N	200	13	0.2	TO 238
BUZ 34	N	200	14	0.2	TO 3
BUZ 36	N	200	22	0.12	TO 3
BUZ 38	N	200	18	0.12	TO 238
BUZ 350	N	200	22	0.12	TO 218

$V_{DS} = 400 \text{ V}$					
BUZ 76A	N	400	2.6	2.5	TO 220
BUZ 76	N	400	3.0	1.8	TO 220
BUZ 60B	N	400	4.5	1.5	TO 220
BUZ 206 <sup>1)</sup>	N	400	5.0	1.5	TO 220
BUZ 60	N	400	5.5	1.0	TO 220
BUZ 63	N	400	5.9	1.0	TO 3
BUZ 205 <sup>1)</sup>	N	400	6.0	1.0	TO 220
BUZ 67	N	400	9.6	0.4	TO 238
BUZ 326	N	400	10.5	0.5	TO 218
BUZ 64	N	400	11.5	0.4	TO 3
BUZ 202 <sup>1)</sup>	N	400	11.5	0.5	TO 3
BUZ 351	N	400	11.5	0.4	TO 218
BUZ 383 <sup>1)</sup>	N	400	11.5	0.5	TO 218
BUZ 201 <sup>1)</sup>	N	400	12.5	0.4	TO 3
BUZ 382 <sup>1)</sup>	N	400	12.5	0.4	TO 218

Typ	Kanal	$V_{DS}$	$I_D$	$R_{DS(on)}$	

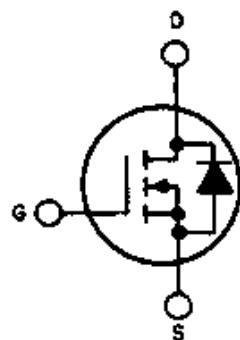
$V_{DS} = 500 \text{ V}$					
BUZ 74A	N	500	2.0	4.0	TO 220
BUZ 74	N	500	2.4	3.0	TO 220
BUZ 47A	N	500	2.0	3.9	TO 238
BUZ 42	N	500	4.0	2.0	TO 220
BUZ 216 <sup>1)</sup>	N	500	4.4	2.0	TO 220
BUZ 41A	N	500	4.5	1.5	TO 220
BUZ 44A	N	500	4.8	1.5	TO 3
BUZ 215 <sup>1)</sup>	N	500	5.0	1.5	TO 220
BUZ 48A	N	500	6.8	0.8	TO 238
BUZ 214 <sup>1)</sup>	N	500	7.0	0.8	TO 238
BUZ 48	N	500	7.8	0.6	TO 238
BUZ 331	N	500	8.0	0.8	TO 218
BUZ 354	N	500	8.0	0.8	TO 218
BUZ 45A	N	500	8.3	0.8	TO 3
BUZ 213 <sup>1)</sup>	N	500	8.5	0.6	TO 238
BUZ 211 <sup>1)</sup>	N	500	9.0	0.8	TO 3
BUZ 385 <sup>1)</sup>	N	500	9.0	0.8	TO 218
BUZ 330	N	500	9.5	0.6	TO 218
BUZ 353	N	500	9.5	0.6	TO 218
BUZ 45	N	500	9.5	0.6	TO 3
BUZ 45B	N	500	10	0.5	TO 3
BUZ 210 <sup>1)</sup>	N	500	10.5	0.6	TO 3
BUZ 384 <sup>1)</sup>	N	500	10.5	0.6	TO 218

$V_{DS} = 600 \text{ V}$					
BUZ 90A	N	600	3,5	2,5	TO 220
BUZ 90	N	600	4,0	2,0	TO 220
BUZ 94	N	600	7,8	0,9	TO 3

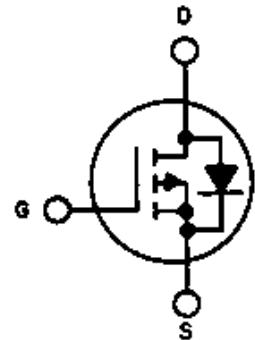
$V_{DS} = 800 \text{ V}$					
BUZ 78	N	800	1,5	8,0	TO 220
BUZ 80	N	800	2,6	4,0	TO 220
BUZ 308	N	800	2,6	4,0	TO 218
BUZ 83	N	800	2,9	4,0	TO 3
BUZ 361')	N	800	2,9	4,5	TO 218
BUZ 80A	N	800	3,0	3,0	TO 220
BUZ 307	N	800	3,0	3,0	TO 218
BUZ 83A	N	800	3,4	3,0	TO 3
BUZ 360')	N	800	3,6	3,0	TO 218
BUZ 88	N	800	4,3	2,0	TO 238
BUZ 88A	N	800	5,0	1,5	TO 238
BUZ 356	N	800	5,0	2,0	TO 218
BUZ 84	N	800	5,3	2,0	TO 3
BUZ 221')	N	800	5,5	2,0	TO 3
BUZ 84A	N	800	6,0	1,5	TO 3
BUZ 355	N	800	6,0	1,5	TO 218
BUZ 220	N	800	6,5	1,5	TO 3

Typ	Kanal	$V_{DS}$ V	$I_D$ A	$R_{DS(on)}$ $\Omega$	t °C
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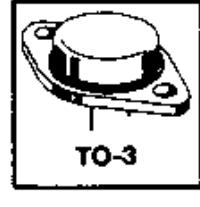
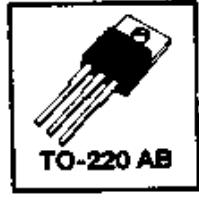
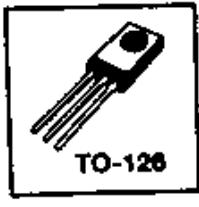
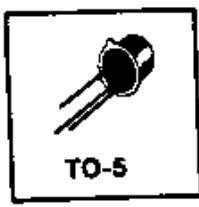
$V_{DS} = 1000 \text{ V}$					
BUZ 50B	N	1000	2,0	8,0	TO 220
BUZ 50C	N	1000	2,3	6,0	TO 220
BUZ 53C	N	1000	2,3	6,0	TO 3
BUZ 311	N	1000	2,3	6,0	TO 218
BUZ 50A	N	1000	2,5	5,0	TO 220
BUZ 310	N	1000	2,5	5,0	TO 218
BUZ 53A	N	1000	2,6	5,0	TO 3
BUZ 58A	N	1000	3,6	2,6	TO 238
BUZ 58	N	1000	4,2	2,0	TO 238
BUZ 54A	N	1000	4,5	2,6	TO 3
BUZ 358	N	1000	4,5	2,6	TO 218
BUZ 231')	N	1000	4,9	2,6	TO 3
BUZ 381')	N	1000	4,9	2,6	TO 218
BUZ 357	N	1000	5,0	2,0	TO 218
BUZ 54	N	1000	5,1	2,0	TO 3
BUZ 230')	N	1000	5,5	2,0	TO 3
BUZ 380')	N	1000	5,5	2,0	TO 218



Mosfet kênh N



Mosfet kênh P



## 6.8 BẢNG SO SÁNH MOSFET THEO MẪU TỰ

Cột số cho biết hình Mosfet (trang 297-298)

BS 107	BS 107	5	BUZ 45 A	MTM 7 N 50, IRF 452, RFK 10 N 50	8
BS 170		5	BUZ 45 B	MTM 15 N 50, RFK 10 N 50	8
BSS 87			BUZ 46	MTM 4 N 50, RRF 6 N 50, IRF 432, RRF 432	8
BSS 89	(MPF 89)	2	BUZ 50	(MTP 1 N 100), (IRF 820 N)	7
BSS 91	(MFE 9200)	3	BUZ 50 A	(MTP 1 N 100)	7
BSS 92		1	BUZ 50 B	(MTP 1 N 100)	7
BSS 93	(MFE 9200) JRFF 212		BUZ 53 A	MTM 4 N 100, (IRF 422)	8
BSS 95	(BS 107)	4	BUZ 60	MTP 5 N 40, RRF 7 N 40, IRF 730, RRF 730	7
BSS 97	(BS 107)	4	BUZ 60 B	MTP 5 N 40, RRF 7 N 40, IRF 732, RRF 730	7
BSS 100		5	BUZ 63	MTM 5 N 40, IRF 330, RRF 330	8
BSS 101		5	BUZ 63 B	MTM 5 N 40, IRF 330, RRF 330	8
BUZ 10	RFP 15 NOS, MTP 15 N 05, IRF 541	7	BUZ 64	MTM 15 N 40, IRF 352	8
BUZ 10 A	IRF 533, IRF 543	7	BUZ 71	RFP 15 N 05, IRF 541, (RFP 25 N 06)	7
BUZ 11	IRF 230, BUK 455	7	BUZ 71 A	BUZ 71, RFP 15 N 05, IRF 543, (RFP 25 N 06)	7
BUZ 11 A	MTP 25 N 05, IRF 543	7	BUZ 72	MTP 10 N 10, RFP 10 N 12, IRF 532, RRF 532, RFP 12 N 10	7
BUZ 14	MTM 35 N 05, RFK 45 N 05, VN 0400 A	8	BUZ 72 A	BUZ 72, MTP 10 N 10, RFP 10 N 12	7
BUZ 14 A	IRF 151		BUZ 73 A	MTP 7 N 20, (RFP 8 N 18), IRF 632, RRF 632, RFP 8 N 20	7
BUZ 15		8	BUZ 74	(MTP 2 N 50), RFP 2 N 50, IRF 820, RRF 820	7
BUZ 17		9	BUZ 74 A	MTP 2 N 50, BUZ 74, RFP 3 N 50, IRF 822, RRF 822	7
BUZ 18		9	BUZ 76	IRF 732, RRF 732, RFP 3 N 45, IRF 720, RRF 720	7
BUZ 20	(MTP 12 N 10), IRF 530, RFP 12 N 10	7	BUZ 76 A	IRF 732, BUZ 76, RRF 732, RFP 3 N 45, IRF 722, RRF 722 (IRF 822)	7
BUZ 21	(MTP 20 N 10), IRF 540, RFP 18 N 10	7	BUZ 80		7
BUZ 23	(MTM 12 N 10), IRF 130, RFM 12 N 10, RRF 130	8	BUZ 80 A		7
BUZ 24	(MTM 25 N 10), RFK 30 N 12, IRF 150, RFK 35 N 10	8	BUZ 83	MTM 4 N 85, (IRF 422)	8
BUZ 25	MTM 25 N 10, IRF 140, RFM 18 N 10	8	BUZ 83 A	MTM 5 N 85, (IRF 420)	8
BUZ 27		9	BUZ 84	MTM 5 N 85, (IRF 432)	8
BUZ 28		9	BUZ 201		8
BUZ 30	MTP 7 N 20, IRF 632, RFP 8 N 20, RRF 632		BUZ 307		8
BUZ 31	IRF 640, RFP 12 N 20	7	BUZ 308		8
BUZ 32	(MTP 8 N 20), RFP 12 N 20	7	BUZ 351		10
BUZ 32 A	RFK 10 N 15, IRF 631	7	BUZ 353		10
BUZ 33	MTM 7 N 20, IRF 232, RRF 232, RFM 8 N 20		BUZ 354		10
BUZ 33 A	IRF 232	8	BUZ 382		10
BUZ 34	(MTM 15 N 20)	8	BUZ 385		10
BUZ 35	MTM 8 N 20, RFM 12 N 20, IRF 230, RRF 230, (RFM 8 N 20)		D 84 CK 1	RFP 15 N 05	7
BUZ 35 A	IRF 231, RFM 10 N 15	8	D 84 CK 2	RFP 15 N 06	7
BUZ 36	(MTM 15 N 20), IRF 252, RFK 25 N 20	8	D 84 CL 1	RFP 12 N 08	7
BUZ 37		9	D 84 CL 2	RFP 12 N 10	7
BUZ 38		9	D 84 CM 1	RFP 8 N 18	7
BUZ 40	MTP 2 N 50, IRF 822, RRF 822, RFP 3 N 50		D 84 CM 2	RFP 8 N 18	7
BUZ 41 A	MTP 4 N 50, IRF 830, RRF 830, (RFP 6 N 50)	7	IRF 120	RFM 10 N 12, RRF 120, BUZ 23	8
BUZ 42	MTP 4 N 50, IRF 832, RRF 832 (RFP 6 N 50)	7	IRF 121	RFM 10 N 12, RRF 121, BUZ 23	8
BUZ 43	(MTM 2 N 50), IRF 422, RRF 422, RFM 3 N 50	8	IRF 122	RFM 10 N 12, RRF 122, BUZ 23	8
BUZ 44 A	(MTM 4 N 50), IRF 430, RFM 6 N 50, RRF 430	8	IRF 123	RFM 10 N 10, RRF 123, BUZ 23	8
BUZ 45	(MTM 7 N 50), IRF 452, RFK 10 N 50	8			

IRF 130	RFM 15 N 12, RRF 130, MTM 12 N 10, RFM 12 N 10, BUZ 25	8	IRF 422	MTM 2 N 50, RFM 3 N 50, RRF 422	8
IRF 131	RFM 15 N 12, RRF 131, BUZ 25	8	IRF 423	MTM 2 N 45, RFM 3 N 45, RRF 423	8
IRF 132	RFM 12 N 10, RRF 132, BUZ 23	8	IRF 430	RFM 6 N 50, RRF 430, BUZ 44 A	8
IRF 133	RFM 12 N 08, RRF 133, BUZ 23	8	IRF 431	RFM 6 N 45, RRF 431, BUZ 44 A	8
IRF 140	BUZ 24		IRF 432	RFM 6 N 50, RRF 432, BUZ 46	8
IRF 142	RFK 35 N 10, RFM 18 N 10, BUZ 25	8	IRF 433	RFM 6 N 45, RRF 433, BUZ 46	8
IRF 143	RFM 18 N 08, RRF 25 N 06, BUZ 25	8	IRF 440	MTM 7 N 50, RFK 10 N 50, RFM 10 N 50, BUZ 45 A	
IRF 150	RFK 35 N 10, BUZ 24	8	IRF 441	RFK 10 N 45, MTM 7 N 45, RFM 10 N 45, BUZ 45 A	
IRF 151	RFK 45 N 06, BUZ 14	8	IRF 442	MTM 7 N 50, RFK 10 N 50, RFM 6 N 50, BUZ 45 A	
IRF 152	RFK 35 N 10, BUZ 24	8	IRF 443	MTM 7 N 45, RFK 10 N 45, RFM 6 N 45, BUZ 45 A	
IRF 153	RFK 45 N 06, BUZ 14	8	IRF 450	MTM 15 N 50, BUZ 45 B	8
IRF 220	RFM 8 N 20, RRF 220	8	IRF 451	MTM 15 N 45, BUZ 45 B	8
IRF 221	RFM 10 N 15, RRF 221	8	IRF 452	MTM 15 N 50, BUZ 45 B	8
IRF 222	RFM 8 N 20, RRF 222	8	IRF 453	MTM 15 N 45, BUZ 45 B	8
IRF 223	RFM 10 N 15, RRF 223	8	IRF 510	RFP 10 N 12, RRF 510	7
IRF 230	RFM 12 N 20, RRF 230, BUZ 35	8	IRF 511	RFP 10 N 12, RRF 511	7
IRF 231	RFM 12 N 20, RFM 10 N 15, RRF 231, BUZ 35	8	IRF 512	RFP 10 N 12, RRF 512	7
IRF 232	RFM 8 N 20, RRF 232	8	IRF 513	RFP 10 N 12, RRF 513	7
IRF 233	RFM 10 N 15, RRF 233	8	IRF 520	RFP 10 N 12, RRF 520, BUZ 72 A	7
IRF 240	RFM 12 N 20, RFK 25 N 20, BUZ 36	8	IRF 521	RFP 10 N 12, RRF 521, BUZ 72 A	7
IRF 241	RFM 15 N 15, RRF 241, BUZ 36	8	IRF 522	RFP 10 N 12, RRF 222, BUZ 72 A	7
IRF 242	RFM 12 N 20, BUZ 34	8	IRF 523	BUZ 72 A	7
IRF 243	RFM 15 N 15, RRF 243, MTM 1034, BUZ 34	8	IRF 530	RFP 15 N 12, RRF 530, MTP 12 N 10, RFP 12 N 10, BUZ 20	7
IRF 250	RFK 25 N 20	8	IRF 531	RFP 15 N 12, RRF 531, BUZ 10 A	7
IRF 251	IRF 250, RRF 251	8	IRF 532	RFP 12 N 10, RRF 532, BUZ 20	7
IRF 252	RFK 25 N 20	8	IRF 533	RFP 12 N 08, RRF 533, BUZ 10 A	7
IRF 253	RRF 253	8	IRF 540	RFP 18 N 10, BUZ 21	7
IRF 320	MTM 5 N 40, RFM 7 N 40, RRF 320, BUZ 63 B	8	IRF 541	RFP 25 N 06, RFP 18 N 08, BUZ 11	7
IRF 321	RFM 7 N 35, MTM 5 N 35, RRF 321, BUZ 63 B	8	IRF 542	RFP 18 N 10, BUZ 21	7
IRF 322	RFM 3 N 45, RFM 7 N 40, RRF 322, MTM 3 N 40, BUZ 63 B	8	IRF 543	RFP 18 N 06, RFP 25 N 06, BUZ 11 A	7
IRF 323	RFM 7 N 35, RFM 3 N 45, RRF 323, MTM 5 N 35, BUZ 63 B	8	IRF 610	RFP 8 N 20, RRF 610	7
IRF 330	RFM 7 N 40, RRF 330, BUZ 63	8	IRF 611	RFP 10 N 15, RRF 611	7
IRF 331	RFM 7 N 35, RRF 331, BUZ 63	8	IRF 612	RFP 8 N 20, RRF 612	7
IRF 332	RFM 7 N 40, RRF 332, BUZ 63 B	8	IRF 613	RFP 10 N 15, RRF 613	7
IRF 333	RFM 7 N 35, RRF 333, BUZ 63 B	8	IRF 620	RFP 8 N 20, RRF 620, BUZ 73 A	7
IRF 340	RFK 12 N 40, RFM 12 N 40, MTM 8 N 40, BUZ 64		IRF 621	RFP 10 N 15, RRF 621, RFP 8 N 18, BUZ 73 A	7
IRF 341	MTM 8 N 35, RFM 12 N 35, BUZ 64		IRF 622	RFP 8 N 20, RRF 622, BUZ 73 A	7
IRF 342	MTM 8 N 40, RFK 12 N 40, RFM 7 N 40		IRF 623	RFP 10 N 15, RFP 8 N 18, RRF 623, BUZ 73 A	7
IRF 343	MTM 8 N 35, RRF 12 N 35, RFM 7 N 35		IRF 630	RFP 8 N 20, RRF 630, BUZ 32	7
IRF 350	MTM 15 N 40, BUZ 64	8	IRF 631	RFP 10 N 15, RRF 631, BUZ 32	7
IRF 351	MTM 15 N 35, BUZ 64	8	IRF 632	RFP 8 N 20, RRF 632, BUZ 32	7
IRF 352	MTM 15 N 40, BUZ 64	8	IRF 633	RFP 10 N 15, RRF 633, BUZ 32	7
IRF 353	MTM 15 N 35, BUZ 64	8	IRF 640	RFP 12 N 20, BUZ 31	7
IRF 420	MTM 2 N 50, RFM 3 N 50, RRF 420, BUZ 46	8	IRF 641	RFP 15 N 15, RRF 641, BUZ 31	7
IRF 421	MTM 2 N 45, RFM 3 N 45, RRF 421, BUZ 46	8	IRF 642	RFP 12 N 20, BUZ 31	7
			IRF 643	RFP 15 N 15, RRF 643, BUZ 31	7

IRF 710	MTP 3 N 40, RFP 3 N 45, RFP 4 N 40, BUZ 76 A	7		
IRF 711	RFP 3 N 45, RFP 4 N 35, MTP 3 N 35, BUZ 76 A	7		
IRF 712	RFP 3 N 45, RFP 4 N 40, MTP 2 N 40, BUZ 76 A	7		
IRF 713	MTP 2 N 35, RFP 3 N 45, RFP 4 N 35, BUZ 76 A	7		
IRF 720	MTP 5 N 40, RRF 720, BUZ 76	7		
IRF 721	MTP 5 N 35, RRF 721, BUZ 76	7		
IRF 722	MTP 5 N 40, RFP 3 N 45, RFP 4 N 40, RRF 722, BUZ 76 A	7		
IRF 723	MTP 5 N 35, RFP 4 N 35, RFP 3 N 45, RRF 723, BUZ 76 A	7		
IRF 730	RFP 7 N 40, RRF 730, BUZ 60	7		
IRF 731	RFP 7 N 35, RRF 731, BUZ 60	7		
IRF 732	RFP 7 N 40, RRF 732, BUZ 60 B	7		
IRF 733	RFP 7 N 35, RRF 733, BUZ 60 B	7		
IRF 740	BUZ 64			
IRF 741	BUZ 64			
IRF 742	BUZ 60			
IRF 743	BUZ 60			
IRF 820	RFP 3 N 50, MTP 4 N 50, RRF 820, BUZ 74	7		
IRF 821	RFP 3 N 45, MTP 4 N 45, RRF 821, BUZ 74	7		
IRF 822	RFP 3 N 50, MTP 2 N 50, RRF 822, BUZ 74 A	7		
IRF 823	RFP 3 N 45, MTP 2 N 45, RRF 823, BUZ 74 A	7		
IRF 830	RRF 830, RFP 6 N 50, BUZ 41 A	7		
IRF 831	RRF 831, RFP 6 N 45, BUZ 41 A	7		
IRF 832	RFP 6 N 50, PRF 832, BUZ 42	7		
IRF 833	RFP 6 N 45, PRF 833, BUZ 42	7		
IRF 9130	RFM 12 P 10, MTM 8 P 10	8		
IRF 9131	RFM 12 P 08, MTM 8 P 08	8		
IRF 9132	RFM 8 P 10, MTM 8 P 10	8		
IRF 9133	RFM 8 P 08, MTM 8 P 08	8		
IRF 9510	RFP 5 P 12	7		
IRF 9511	RFP 5 P 12	7		
IRF 9512	RFP 5 P 12	7		
IRF 9513	RFP 5 P 12	7		
IRF 9520	RFP 6 P 10, MTP 8 P 10	7		
IRF 9521	RFP 6 P 08, MTP 8 P 08, RFP 5 P 12	7		
IRF 9522	RFP 6 P 10, MTP 8 P 10, RFP 5 P 12	7		
IRF 9523	RFP 5 P 12, RFP 6 P 08, MTP 8 P 08	7		
IRF 9530	RFP 12 P 10, MTP 8 P 10	7		
IRF 9531	RFP 12 P 08, MTP 8 P 08	7		
IRF 9532	RFP 8 P 10, MTP 8 P 10	7		
IRF 9533	MTP 8 P 08, RFP 8 P 08	7		
IRF 9611	RFP 5 P 15	7		
IRF 9613	RFP 5 P 15	7		
IRF 9621	RFP 5 P 15	7		
IRF 9623	RFP 5 P 15	7		
IRF 9631	RFP 10 P 15	7		
IRF 9633	RFP 5 P 15	7		
IRFF 111	RFL 4 N 12, (MFE 960)	11		
IRFF 112	RFL 4 N 12	11		
IRFF 113	RFL 4 N 12	11		
IRFF 120	RFL 4 N 12	11		
IRFF 121	RFL 4 N 12		11	
IRFF 122	RFL 4 N 12		11	
IRFF 123	RFL 4 N 12		11	
IRFF 130	MTM 12 N 10, RFM 12 N 10, BUZ 23		11	
IRFF 150	RFK 35 N 10, BUZ 24			
IRFF 530	MTM 12 N 10, RFP 12 N 10, BUZ 20			
IRFF 532	RRF 532			
IRFZ 22	MTP 15 N 05, RFP 15 N 05, BUZ 71 A			
IRFZ 30	BUZ 11		7	
MFE 910	VN 10 KM		3	
MPF 910	MTM 10 N 05		14	
	RFM 15 N 05, IRF 133		8	
	MTM 10 N 06		8	
	RFM 15 N 06, IRF 133		8	
	MTM 10 N 08		8	
	RFM 12 N 08, IRF 120		8	
	MTM 10 N 10		8	
	RFM 12 N 10, IRF 120		8	
	MTM 10 N 12		8	
	RFM 10 N 12, IRF 243		8	
	MTM 10 N 15		8	
	RFM 10 N 15, IRF 243		8	
	MTM 12 N 05		8	
	RFM 15 N 05, IRF 133		8	
	MTM 12 N 06		8	
	RFM 15 N 06, IRF 131		8	
	MTM 12 N 08		8	
	RFM 12 N 08, IRF 130		8	
	MTM 12 N 10		8	
	RFM 12 N 10, IRF 130		8	
	IRF 243		8	
	MTM 12 N 12		8	
	RFM 12 N 18, IRF 242		8	
	MTM 12 N 20		8	
	RFM 12 N 20, IRF 242		8	
	MTM 15 N 05		8	
	RFM 15 N 05, IRF 143		8	
	MTM 15 N 06		8	
	RFM 15 N 06, IRF 143		8	
	MTM 15 N 12		8	
	RFM 15 N 12, IRF 243		8	
	MTM 15 N 15		8	
	RFM 15 N 15, IRF 243		8	
	MTM 15 N 18		8	
	IRF 252		8	
	MTM 15 N 35		8	
	(RFK 12 N 35), IRF 353		8	
	MTM 15 N 40		8	
	(RFK 12 N 40), IRF 352		8	
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	RFM 6 N 45, IRF 431		8	
	MTM 4 N 50		8	
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	MTM 5 N 18		8	
	RFM 8 N 18, IRF 220		8	
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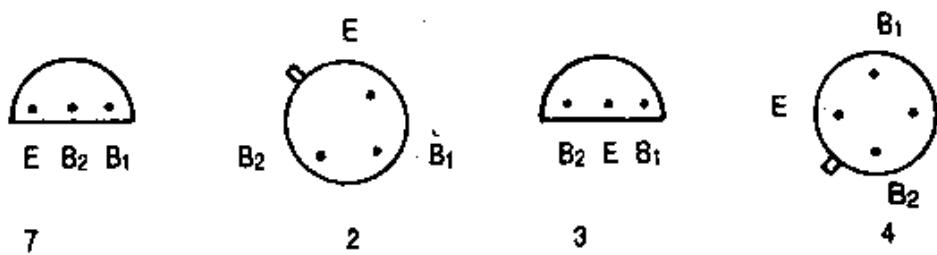
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MTM 7 N 15	RFM 8 N 18, IRF 233	8	MTP 1224	MTP 12 N 08, IRF 132, MTM 1224, BUZ 20	7
MTM 7 N 18	RFM 8 N 18, IRF 232	8	MTP 1225	MTP 12 N 10, IRF 132, MTM 1225, BUZ 20	7
MTM 7 N 20	(RFM 8 N 18), IRF 232	8	MTP 15 N 05	IRF 543	7
MTM 7 N 45	IRF 453, BUZ 45 A	8	MTP 15 N 06	IRF 543	7
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MTM 8 N 20	RFM 8 N 20, IRF 230	8	RCA 9193	BUZ 46	
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MTP 15 N 50	RFP 3 N 50	7	RCA 9195 B	BUZ 34	
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MTP 10 N 06	RFP 15 N 06, IRF 533	7	RCA 9213 B	BSS 97	
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MTP 7 N 15	RFP 8 N 18	7	RFM 4 N 40	IRF 320	8
MTP 7 N 18	RFP 8 N 18	7	RFM 5 P 12	IRF 9231	8
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MTP 564	MTP 5 N 35, IRF 333, BUZ 60 B	7	RFM 8 P 08	IRF 9132	8
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RFM 15 N 05	IRF 143	8	UFN 140	BUZ 24, IRF 140
RFM 15 N 06	IRF 143	8	UFN 141	BUZ 14, IRF 141
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RFM 15 N 15	IRF 253	8	UFN 143	BUZ 25, IRF 143
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RFM 18 N 10	IRF 142, MTM 25 N 10	8	UFN 151	BUZ 14, IRF 151
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RFM 25 N 06	IRF 141	8	UFN 153	BUZ 14, IRF 153
RFP 1 N 35	IRF 713	7	UFN 230	BUZ 35, IRF 230
RFP 1 N 40	IRF 712	7	UFN 231	BUZ 35, IRF 231
RFP 2 N 08	IRF 512, MTP 4 N 08	7	UFN 240	BUZ 36, IRF 240
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RFP 2 N 12	IRF 611, MTP 3 N 12	7	UFN 242	BUZ 34, IRF 242
RFP 2 N 15	IRF 611, MTP 3 N 15	7	UFN 243	BUZ 34, IRF 243
RFP 2 N 18	IRF 612, MTP 2 N 18	7	UFN 320	BUZ 63 B, IRF 320
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RFP 3 N 35	IRF 821	7	UFN 330	BUZ 63, IRF 330
RFP 3 N 50	IRF 820, IRF 832	7	UFN 331	BUZ 63, IRF 331
RFP 4 N 05	IRF 513	7	UFN 332	BUZ 63 B, IRF 332
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RFP 4 N 35	IRF 721	7	UFN 340	BUZ 64, IRF 340
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RFP 7 N 50	IRF 830	7	UFN 421	BUZ 46, IRF 421
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RFP 12 N 20	IRF 642	7	UFN 451	BUZ 45 B, IRF 451
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TA 9112 B	MTP 7 N 15		UFN 532	BUZ 20, IRF 532
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TA 9193	MTM 4 N 45, RCA 9193, BUZ 46		UFN 541	BUZ 21, IRF 541
TA 9195 B	MTM 15 N 15, RCA 9195 B, BUZ 34		UFN 542	BUZ 21, IRF 542
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UFN 643	BUZ 31, IRF 643		VN 0800 D	BUZ 21, MTP 12 N 08, IRF 530	
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UFN 711	BUZ 76 A, IRF 711		VN 0801 D	BUZ 21, IRF 532	
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UFN 741	BUZ 64, IRF 741		VN 4001 D	BUZ 60, IRF 732	
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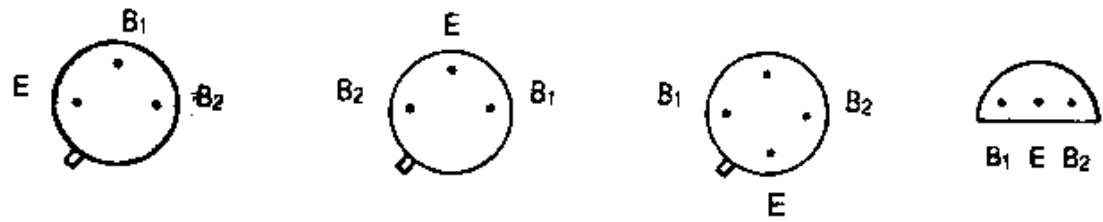
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2 SK 411				
2 SK 422				
2 SK 428	IRF 543, BUZ 72		7	
2 SK 440	IRF 630		7	
2 SK 441	IRFF 422			

## 6.9 UNIJUNCTION-TRANSISTOR



Tên	Ghi chú	Hình	V <sub>B2</sub> - V <sub>B1</sub> [V]	I <sub>E</sub> [mA]	I <sub>E peak</sub> [A]	P <sub>r</sub> [mW]
2N489 đến 2N494	Si-P	4/5	60	70	2	450
2N1671A/B/C 2N2160	Si-P :2N1671	4/5	35	50	2	450
2N2417 đến 2N2421	:2N489	4				
2N2646/2647	Si-P	2	35V	50	2	300
2N2840	Si-P	4	30	50	2	300
2N3479 đến 2N3484	Si-P	4	35	50	2	400
2N3980	Si-P	2	35	50	1	360
2N4851 đến 2N4853	Si-P	2	35	50	1,5	300
2N4870/4871	Si-P	3	35	50	1,5	300
2N4891 đến 2N4894	Si-P	3	30	50	1	300
2N4947 đến 2N4949	Si-P	2	35	50	1	360
2N5431	Si-P	2	35	50	1,5	300
2N6114/6115	Si-P	2	30	150	2	300
2SH11 đến 2SH15	Si-P	6	35	50	2	450
2SH16/17	Si-P	7	30	50	1	200
2SH23/24	Si-P	6	30	100	2	450

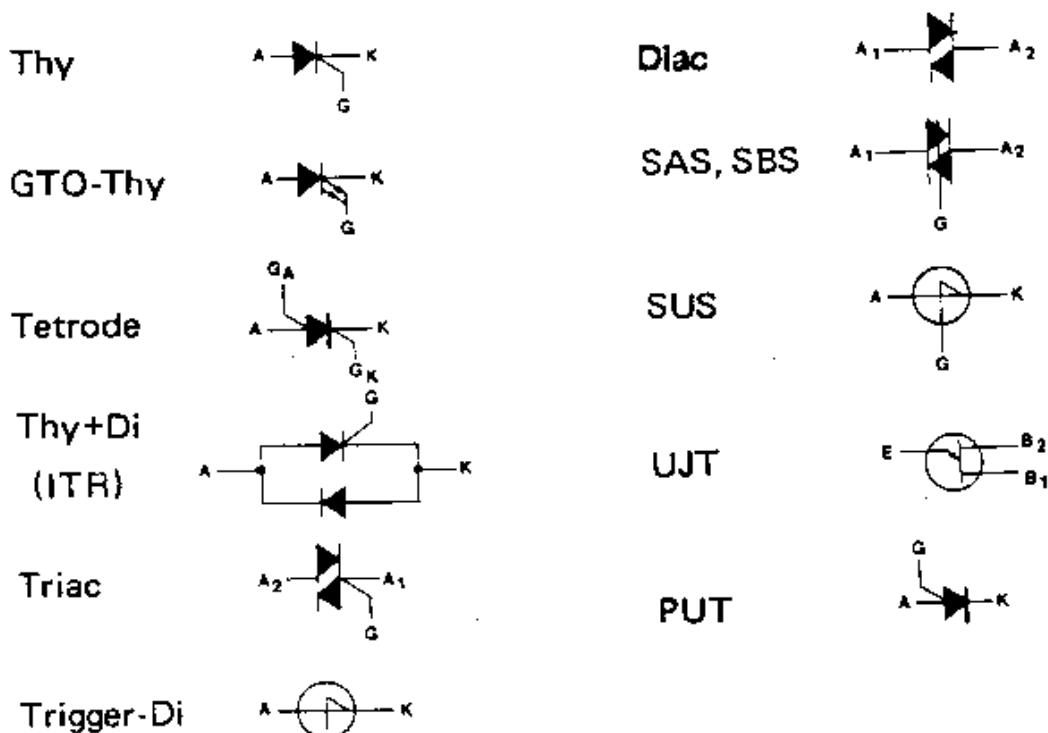
## UNIJUNCTION-TRANSISTOR



Tên	Ghi chú	Hình	$V_{B2} - V_{B1}$ [V]	$I_E$ [mA]	$I_{E\ peak}$ [A]	$P_T$ [mW]
2SH20/21/22	Si-P	6	55	50	1	250
2SH25	Si-P	3	30	75	1	300
BB3/4	Si-P	8	35		2	360
B85	Si-P	8	60		2	360
BB11	Si-P	8	15	10	2	300
BB12/14	Si-P	8	30	10	2	300
BB18	Si-P	8	20		1,5	250
BSV56	Si-P	8	35		2	400
BSV57	Si-P	9	35		2	400
D5E29	Si-P	8				
D5E35 đến D5E37	Si-P	8	35	50	2	300
D5E43/44/45	Si-P	8	35	50	2	300
D5K1	Si-N	8	30	150	2	300
D5K2	Si-N	8	20	150	2	200
MU10	Si-P	3	35	50	1	300
MU20	Si-P	8	35	50	1	300

## 7. THYRISTOR-TRIAC-DIAC

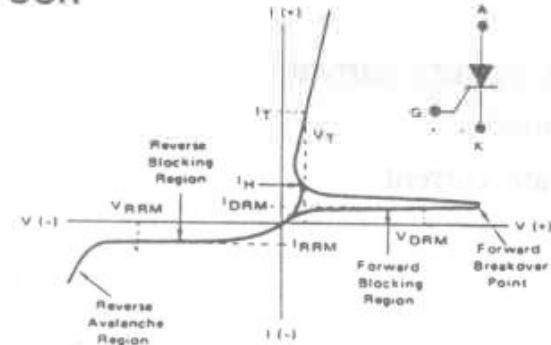
- U<sub>drm</sub>** : maximum permissible repetitive peak forward off-state voltage  
**U<sub>dsm</sub>** : maximum permissible non-repetitive peak forward off-state voltage  
**I<sub>tRSM</sub>** : maximum permissible RMS on-state current  
**I<sub>fAV</sub>** : on-state current (average value)  
**I<sub>tSM</sub>** : maximum rated surge on-state current  
**U<sub>gt</sub>** : gate trigger voltage  
**I<sub>gt</sub>** : gate trigger current  
**I<sub>h</sub>** : holding current  
**t<sub>q</sub>** : circuit commutated turn-off time  
**PUT** : Programmable Unijunction Transistor  
**SAS, SBS** : Silicon Bidirectional Switch  
**GTO** : Gate Turn-off Thyristor



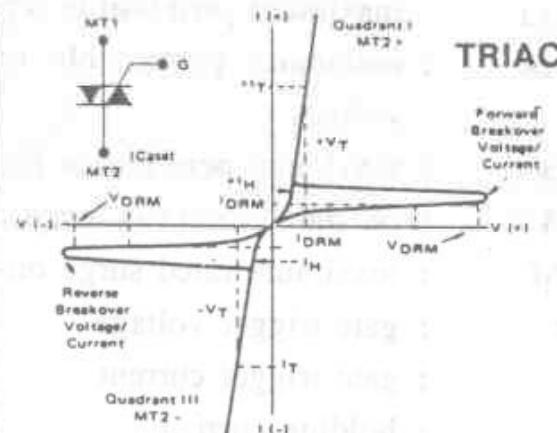
## 7.1 CÁC ĐẶC TUYỀN CỦA SCR, TRIAC, UJT, DIAC, PUT, SBS SIDAC VÀ Opt. COUPLED TRIAC DRIVER

### CHARACTERISTIC CURVES

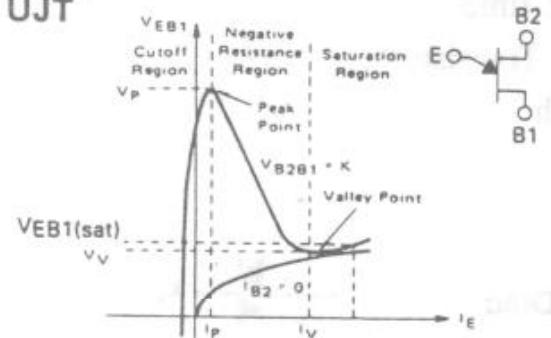
#### SCR



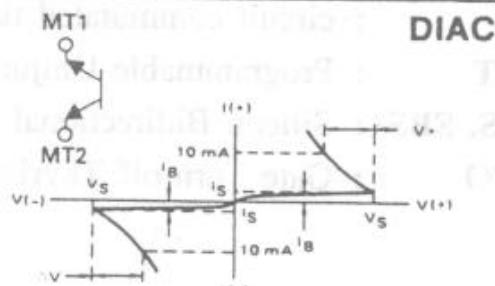
#### TRIAC



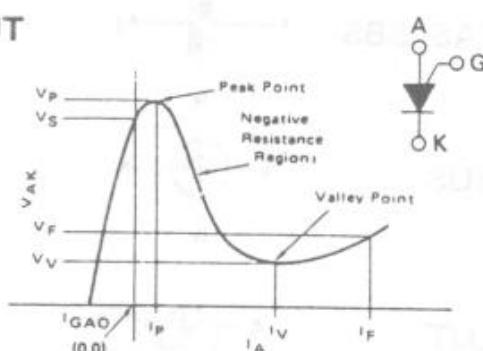
#### UJT



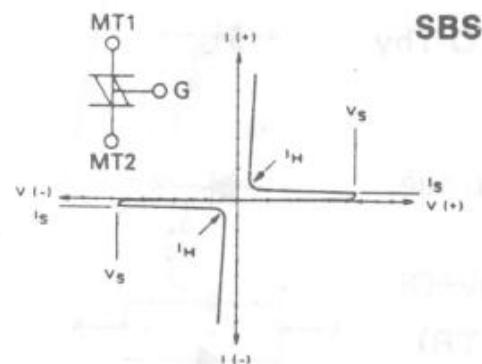
#### DIAC



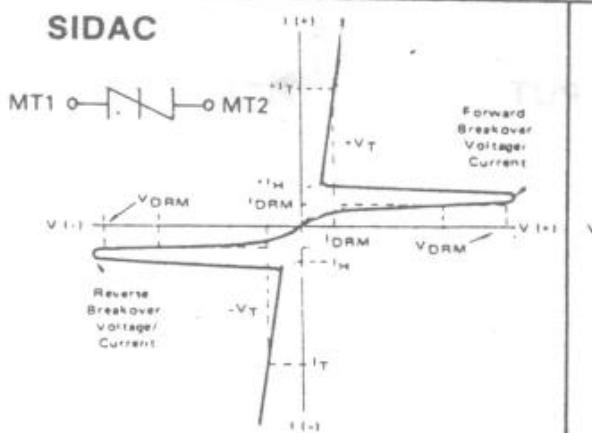
#### PUT



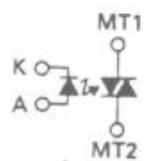
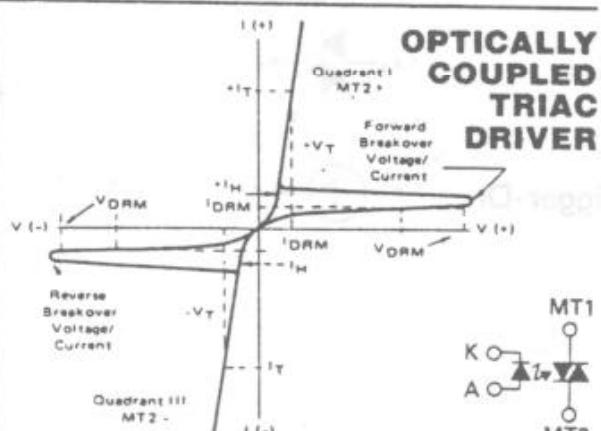
#### SBS



#### SIDAC



#### OPTICALLY COUPLED TRIAC DRIVER



## 7.2 THYRISTOR XẾP THỨ TỰ THEO ĐIỆN ÁP

### Thyristors - Voltage

EL0 data code	S.	Type	Udgm (V)	Udsn (V)	IrRMS (A)	IfAV (A)	ItSM (A)	by t (ns)	I2t (A2s)	Vgt (V)	Igt (A)	lh (A)	tq (ns)	O	Case No.
33-01-18421	2	2N 1842 A	25.	35.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048 348
33-12-00200	4	BRY 20	40.	.	5.0	0.5	.	.	.	0.4	0.00005	.	5000.	S	T012
33-03-00005	5	3P 05M	50.	.	5.0	.	80.	10000.	.	1.5	0.010	0.010	80000.	S	T0220AB 354
33-01-18431	2	2N 1843 A	50.	75.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048 348
33-01-06820	2	2N 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-56-06820	2	JAN 2N 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-81-00606	1	JAG 06-60	60.	.	0.800	0.500	6.	10000.	.	0.0002	0.005	.	S	T018 380	
33-01-50610	2	2N 5061	60.	.	0.800	0.500	6.	8300.	0.15	0.8	0.0002	0.005	10000.	S	T092 352
33-12-00390	2	BRY 39	70.	.	.	0.250	3.	.	.	0.5	0.001	.	250.	S	T072 357
33-74-28001	1	S 2800 A	100.	125.	10.	.	85.	10000.	40.	0.9	0.008	0.010	10000.	S	T0220AB 354
33-01-64010	2	2N 6401	100.	125.	16.	.	135.	10000.	100.	0.7	0.008	0.010	35000.	S	T0220AB 354
33-01-18441	2	2N 1844 A	100.	150.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048 348
33-01-50640	2	2N 5064	200.	.	0.800	0.500	6.	8300.	0.15	0.8	0.0002	0.005	30000.	S	T092 352
33-40-01222	2	C 122 B1	200.	250.	8.	.	85.	10000.	40.	0.9	0.010	0.020	10000.	S	T0220AB 354
33-01-06850	2	2N 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-56-06850	2	JAN 2N 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-56-06860	2	JAN 2N 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-01-06860	2	2N 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048 348
33-80-06300	1	1N 300 P0B	300.	.	7.6	.	100.	10000.	.	2.0	0.020	0.600	.	S	R0102 379
33-74-58003	1	S 5800 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	6000.	S	T0220AB 354
33-74-58023	1	S 5802 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	15000.	S	T0220AB 354
33-01-36520	2	2N 3652	300.	400.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048 348
33-68-01024	2	P 0102 0A	400.	.	0.800	0.500	6.	10000.	0.32	0.8	0.0002	0.005	500.	S	T092 352
33-37-01804	2	BTX 1B-400	400.	.	1.6	1.0	10.	10000.	.	2.0	0.005	.	35000.	S	T05 364
33-12-00554	2	BRY 55-400	400.	.	2.	0.8	8.	10000.	.	0.0002	.	.	8000.	S	T092 352
33-83-01064	2	TIC 106 D	400.	.	5.	3.2	30.	10000.	.	0.6	0.0006	0.008	7700.	S	T0220AB 354
33-44-01004	2	CS 1-04 go3	400.	.	7.	2.0	70.	10000.	25.	2.0	0.015	0.040	60000.	S	CSI 369
33-92-07094	2	X 0709 06	400.	.	7.	4.5	80.	10000.	36.1	0.8	0.010	0.015	2000.	S	T05 364
33-81-60540	2	TAG 605-400	400.	.	7.	4.5	80.	10000.	36.1	0.8	0.010	0.015	2000.	S	T05 364
33-81-01540	2	TAG 15-400	400.	.	15.	9.5	150.	10000.	110.	1.0	0.015	0.015	8000.	S	T048 348
33-81-02040	2	TAG 20-400	400.	.	20.	12.6	175.	10000.	150.	1.0	0.015	0.015	8000.	S	T048 348
33-01-65070	2	2N 6507	400.	.	25.	.	300.	8300.	.	1.5	0.040	.	.	S	T0220AB 354
33-40-00354	2	C 35 D	400.	.	35.	.	225.	8300.	.	3.0	0.040	.	.	S	267-D1 365
33-40-01064	2	C 106 D	400.	500.	3.5	2.2	18.5	10000.	1.77	0.5	0.00003	0.0017	30000.	S	T0220AB 366
33-74-01064	2	S 106 D	400.	500.	4.0	2.5	17.	10000.	1.7	0.5	0.00003	0.0017	30000.	S	T0202 361

# THYRISTOR XẾP THỨ TỰ THEO BIỆN ÁP

## Thyristors - Voltage

E10 Data code	S.	Type	Udrm (V)	Udsm (V)	Irms (A)	ITAV (A)	ITSM (A)	by t (ns)	I2t (A2s)	Ugt (V)	Igt (A)	Ih (A)	tq (ns)	D	Case	No.	
33-01-18491		2N 1849 A	400	500	16	10	115	10000	68	0.25	0.150	0.008	-	S	T048	348	
33-74-62204		S 6220 D	400	500	20	-	170	10000	170	1.1	0.008	0.009	20000	S	ISO-T048	373	
33-74-62104		S 6210 D	400	500	20	-	170	10000	170	1.1	0.008	0.009	20000	S	T048	348	
33-74-62304		S 6230 D	400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-STUD	374	
33-74-62504		S 6250 D	400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-FLAN	375	
33-74-62404		S 6240 D	400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-PRES	376	
33-01-06880		2N 688	400	500	25	16	140	10000	100	0.25	0.080	0.015	-	S	T048	348	
33-56-06880		JAN 2N 688	400	500	25	16	140	10000	100	0.25	0.080	0.015	-	S	T048	348	
33-01-36530		2M 3653	400	500	35	25	180	5000	165	1.5	0.080	0.075	15000	S	T048	348	
33-74-86234		S 8623 D	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	ISO-STUD	378	
33-74-86224		S 8622 D	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	ISO-STUD	378	
33-74-86134		S 8613 D	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	SRIO	377	
33-74-86114		S 8611 D	400	500	100	63	850	10000	4400	1.5	0.100	0.100	15000	S	SRIO	377	
33-74-86214		S 8621 D	400	500	100	63	850	10000	4400	1.5	0.100	0.100	15000	S	ISO-STUD	378	
33-74-86204		S 8620 D	400	500	100	63	850	10000	4400	1.5	0.100	0.100	15000	S	ISO-STUD	378	
33-74-64404		S 6440 D	400	660	35	22	300	10000	300	1.5	0.046	0.030	20000	S	ISO-PRES	376	
33-74-64504		S 6450 D	400	660	35	22	300	10000	300	1.5	0.046	0.030	20000	S	ISO-FLAN	375	
33-74-64204		S 6420 D	400	660	35	22	300	10000	300	1.5	0.046	0.030	20000	S	ISO-T048	373	
33-01-38720		2N 3872	400	660	35	22	300	10000	300	1.5	0.046	0.030	20000	S	T0203AA	349	
33-33-10905	*	BT 109-500 R	500	-	10	-	50	10000	-	2.0	0.010	0.050	-	S	T0127		
33-33-10105	*	BT 101-500 R	500	-	15	-	55	8300	-	2.0	0.010	-	-	S	T064	167	
33-R1-02050		TAG 20-500	500	-	20	12.6	175	10000	150	1.0	0.015	0.015	8000	S	T048	348	
33-74-73105		S 7310 F	500	-	40	25	370	10000	700	1.0	0.050	0.035	2800	S	T048	348	
33-74-61005		S 6100 E	500	550	16	-	135	10000	100	0.7	0.008	0.010	35000	S	T0220AB	354	
33-74-01225		S 122 E	500	600	8	-	85	10000	40	0.9	0.018	0.020	10000	S	T0220AB	354	
33-90-06010	*	VRC 601	600	-	1.5	-	-	-	-	-	-	-	-	S	DIL4P		
33-54-00640	*	HS 64 S	600	-	4.0	-	40	8300	-	0.8	0.0002	0.0005	-	S	T05	354	
33-44-00606	*	CS 0.6-06 go2	600	-	5	1.5	60	10000	18	2.0	0.010	0.020	60000	S	CS06	368	
33-81-00660	*	TAG 6-600 F	600	-	7.5	4.8	100	10000	50	0.8	0.005	0.005	-	S	T066	350	
33-81-02060		TAC 20-600 R	600	-	20	12.6	175	10000	150	1.0	0.015	0.015	8000	S	T048	348	
33-74-73106		S 7310 N	600	-	40	25	370	10000	700	1.0	0.050	0.035	2800	S	T048	348	
33-01-62410		2N 6241	600	650	4.0	2.6	35	8300	-	2.6	1.0	0.0002	0.005	2000	S	T0126	353
33-74-58006	*	S 5800 M	600	650	5	3.2	75	10000	28	1.2	0.050	0.020	6000	S	T0220AB	354	
33-01-63980		2M 6398	600	650	12	-	105	10000	65	0.7	0.008	0.010	35000	S	T0220AB	354	
33-74-24006	*	S 2400 M	600	700	4.5	3.3	170	10000	150	1.1	0.008	0.009	20000	S	T08	372	
33-01-41010	*	2N 4101	600	700	5.0	3.2	50	10000	15	1.2	0.008	0.010	15000	S	T066	350	

# THYRISTOR XẾP THỨ TỰ THEO ĐIỆN ÁP

## Thyristors - Voltage

FRdata code	Type	Udrm (V)	Udsm (V)	ItRMS (A)	ITAV (A)	ItSN (A)	by t (ns)	t2L (AZs)	Ugt (V)	Igt (A)	Ph (A)	tq (ns)	ID	Case	No.
33-74-26006	S 2600 M	600	700	7.0	4.5	85	10000	40	0.65	0.006	0.009	15000	S	T05	364
33-01-41030	2W 4103	600	700	12.5	8	120	10000	170	1.5	0.020	0.025	15000	S	T03	351
33-74-62406	S 6240 M	600	700	20	12.5	120	10000	170	1.1	0.008	0.009	20000	S	ISO-PRES	376
33-74-64936	S 6493 M	600	700	35	-	900	10000	2000	1.1	0.025	0.020	20000	V	TR48	340
33-74-64206	S 6420 M	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	ISO-1048	373
33-74-64116	S 6411 M	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T048	348
33-01-38990	2W 3899	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T048	348
33-74-64406	S 6440 M	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	ISO-PRES	376
33-74-74306	S 7430 M	600	700	35	25	180	5000	165	1.5	0.080	0.075	15000	S	T048	348
33-74-86136	S 8613 M	600	700	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	STUD	377
33-74-86116	S 8611 M	600	700	100	53	850	10000	4400	1.5	0.100	0.100	15000	S	STUD	377
33-74-64316	S 6431 M	600	720	35	-	900	10000	-	1.1	0.025	0.020	-	S	T048	348
33-06-40216	40216	600	720	35	-	900	10000	-	1.1	0.025	0.020	-	S	T048	348
33-06-40735	40735	600	720	35	25	180	5000	165	1.5	0.080	0.075	15000	S	T048	348
33-16-10467	BStC 1046 M	700	-	9.4	6.0	95	10000	45	2.0	0.025	0.080	50000	S	T0220AB	354
33-18-10467	BStD 1046 M	700	-	16	10	150	10000	130	2.0	0.025	0.080	50000	S	T0220AB	354
33-74-37037	S 3703 SF	750	800	5.0	3.2	65	10000	20	1.8	0.015	-	2400	S	T066	350
33-74-39007	S 3900 SF	750	800	8.0	5.0	70	10000	30	1.8	0.015	-	2400	SD	T0220AB	367
33-83-01068	TIC 106 M	800	-	5	3.2	30	10000	-	0.6	0.00006	0.008	7700	S	T0220AB	354
33-74-08028	S DB02 MH	800	-	6	5.1	80	10000	32	2.0	0.002	0.010	100000	S	T0220AB	354
33-16-10537	BStC 1053 M	800	-	9.4	6	95	10000	45	2.0	0.025	0.080	50000	S	T0220AB	354
33-83-01268	TIC 126 M	800	-	12	7.5	100	10000	-	0.8	0.005	0.040	11000	S	T0220AB	354
33-74-16128	S 1612 MH	800	-	16	10	160	10000	128	2.0	0.025	0.100	-	S	T0220AB	354
33-01-65090	2W 6509	800	-	25	-	300	8300	-	1.5	0.040	-	-	S	T0220AB	354
33-40-00358	C 35 N	800	-	35	-	225	8300	-	3.0	0.040	-	-	S	263-03	365
33-74-64008	S 6400 M	800	900	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T0203AB	349
33-18-16801	BStD 1680 M	1200	-	12	7.5	130	10000	85	2.0	0.020	0.080	50000	S	T0220AB	354
33-44-08012	CS 8-12 io2	1200	-	25	16	250	10000	310	2.5	0.030	0.040	60000	S	S100-M5	370
33-44-23016	CS 23-15 io2	1600	-	50	25	400	10000	800	2.5	0.050	0.100	60000	S	STUD-M7	371
33-20-35110	BStF 35110	1650	-	50	32	600	10000	1800	1.5	0.200	0.200	150000	S	DIN41892	358
33-22-35110	BStM 35110	1650	-	135	85	1700	10000	11250	1.5	0.200	0.250	150000	S	DIN41892	359
33-24-35110	BStL 35110	1650	-	235	150	2900	10000	42000	1.5	0.250	0.250	200000	S	DIN41893	360
33-26-35110	BStM 35110	1650	-	440	260	6160	10000	190000	1.5	0.250	0.250	200000	S	DIN41893	361
33-27-35110	BStP 35110	1650	-	550	350	10950	10000	600000	1.5	0.250	0.250	1200000	S	DIN41893	361

### 7.3 THYRISTOR XẾP THỨ TỰ THEO DÒNG ĐIỆN

**Thyristors - Current**

Identif. Code	Type	Udrc (V)	Udsm (V)	IRMS (A)	IFAV (A)	ItSM (A)	by t (ns)	12t (A%)	Ugt (V)	Igt (A)	14 (A)	tq (mAF)	Lage	No.	
33-12-00390	BRY 39	20.	-	-	0.250	3.	-	-	0.5	0.001	-	250.	S	T022	157
33-81-00606	TAG 06-60	60.	-	0.800	0.500	6.	10000.	-	-	0.0002	0.005	-	S	T018	380
33-01-50610	2N 5061	60.	-	0.800	0.500	6.	8300.	0.15	0.8	0.0002	0.005	10000.	S	T092	352
33-01-50610	2N 5064	200.	-	0.800	0.500	6.	8300.	0.15	0.8	0.0002	0.005	30000.	S	T092	352
33-68-01024	P 0102 DA	400.	-	0.800	0.500	8.	10000.	0.32	0.8	0.0002	0.005	400.	S	T092	152
33-90-06010	WCR 601	600.	-	1.5	-	-	-	-	-	-	-	-	S	DET 4P	
33-37-01804	BTX 18-400	400.	-	1.6	1.0	10.	10000.	-	2.0	0.005	-	35000.	S	T05	364
33-12-00554	BRY 55-400	400.	-	2.	0.8	8.	10000.	-	-	0.0002	-	8000.	S	T092	352
33-40-01064	C 106 D	400.	500.	3.5	2.2	16.5	10000.	1.77	0.5	0.00003	0.0017	30000.	S	T0202AB	366
33-54-00640	HS 64 S	600.	-	4.0	-	40.	8300.	-	0.8	0.0002	0.0005	-	S	T05	364
33-74-01064	S 106 D	400.	500.	4.0	2.5	17.	10000.	1.7	0.5	0.00003	0.0017	30000.	S	T0202	366
33-01-62410	2N 6241	600.	650.	4.0	2.6	35.	8300.	2.6	1.0	0.0002	0.005	2000.	S	T0126	353
33-74-24006	S 2400 N	600.	700.	4.5	3.3	170.	10000.	150.	1.1	0.008	0.009	20000.	S	T08	372
33-03-00005	5P 05M	50.	-	5.0	-	80.	10000.	-	1.5	0.010	0.010	80000.	S	T0220AB	354
33-12-00200	BRY 20	40.	-	5.0	0.5	-	-	-	0.4	0.00005	-	5000.	S	T012	
33-44-00606	CS 0.6-06 go2	600.	-	5.	1.5	60.	10000.	18.	2.0	0.010	0.020	60000.	S	C506	366
33-81-01064	TIC 106 D	400.	-	5.	3.2	30.	10000.	-	0.6	0.00006	0.008	2700.	S	T0220AB	354
33-81-01068	TIC 106 N	800.	-	5.	3.2	30.	10000.	-	0.6	0.00006	0.008	2700.	S	T0220AB	354
33-01-41010	2N 4101	600.	700.	5.0	3.2	50.	10000.	15.	1.2	0.008	0.010	15000.	S	T066	350
33-74-17037	S 3703 SF	750.	800.	5.0	3.2	65.	10000.	20.	1.8	0.015	-	2400.	S	T066	350
33-74-58003	S 5800 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	6000.	S	T0220AB	364
33-74-58023	S 5802 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	15000.	S	T0220AB	354
33-74-58006	S 5800 N	600.	650.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	6000.	S	T0220AB	354
33-44-01004	CS 1-04 go3	400.	-	7.	2.0	70.	10000.	25.	2.0	0.015	0.040	60000.	S	CSL	369
33-81-60540	TAG 605-400	400.	-	7.	4.5	80.	10000.	36.1	0.8	0.010	0.015	2000.	S	T05	364
33-92-07094	X 0/09 DG	400.	-	7.	4.5	80.	10000.	36.1	0.8	0.010	0.015	2000.	S	T05	364
33-74-26006	S 2600 N	600.	700.	7.0	4.5	85.	10000.	40.	0.65	0.006	0.009	15000.	S	T05	364
33-81-00660	TAG 6-600 F	600.	-	7.5	4.8	100.	10000.	50.	0.8	0.005	0.005	-	S	T066	350
33-80-06300	1N 300 P0B	300.	-	7.6	-	100.	10000.	-	2.0	0.020	0.600	-	S	RD102	379
33-40-01222	C 122 B1	200.	250.	8.	-	85.	10000.	40.	0.9	0.018	0.020	10000.	S	T0220AB	354
33-74-01225	S 122 E	500.	600.	8.	-	85.	10000.	40.	0.9	0.018	0.020	10000.	S	T0220AB	354
33-74-39007	S 3900 SF	750.	800.	8.0	5.0	70.	10000.	30.	1.8	0.015	-	2400.	S	T0220AB	367
33-74-08028	S 0802 NM	800.	-	8.	5.1	80.	10000.	32.	2.0	0.002	0.010	100000.	S	T0220AB	354
33-16-10467	BSCT 1046 N	700.	-	9.4	6.0	95.	10000.	45.	2.0	0.025	0.080	50000.	S	T0220AB	354
33-16-10537	BSYC 1053 N	800.	-	9.4	6.	95.	10000.	45.	2.0	0.025	0.080	50000.	S	T0220AB	354

# THYRISTOR XẾP THỨ TỰ THEO ĐÓNG BIỆN

## Thyristors - Current

EIData code	S	Type	Udrem (V)	Udsm (V)	ItRMS (A)	IfAV (A)	ItSM (A)	by t (ns)	I2t (A2s)	Ugt (V)	Igt (A)	Ih (A)	tq (ns)	D	Case	No.
33-33-10905	*	BT 109-500 R	500.	-	10.	-	50.	10000.	-	2.0	0.010	0.050	-	S	T0127	
33-74-28001	*	S 2800 A	100.	125.	10.	-	85.	10000.	40.	0.9	0.008	0.010	10000.	S	T0220AB	354
33-01-63980		2N 6398	600.	650.	12.	-	105.	10000.	65.	0.7	0.008	0.010	35000.	S	T0220AB	354
33-83-01268		TIC 126 M	800.	-	12.	7.5	100.	10000.	-	0.8	0.005	0.040	11000.	S	T072DA8	354
33-18-16801		BSI0 1680 N	1200.	-	12.	7.5	130.	10000.	85.	2.0	0.020	0.080	50000.	S	T0220AB	354
33-01-41030	*	2N 4103	600.	700.	12.5	8.	170.	10000.	170.	1.5	0.020	0.025	-	S	T03	351
33-33-10105	*	BT 101-500 R	500.	-	15.	-	55.	8300.	-	2.0	0.010	-	-	S	T064	362
33-81-01540		TAG 15-400	400.	-	15.	9.5	150.	10000.	110.	1.0	0.015	0.015	8000.	S	T048	348
33-01-64010		2N 6401	100.	125.	15.	-	135.	10000.	100.	0.7	0.008	0.010	35000.	S	T0220AB	354
33-74-61005	S	6100 E	500.	550.	15.	-	135.	10000.	100.	0.7	0.008	0.010	35000.	S	T0220AB	354
33-01-18421		2N 1842 A	25.	35.	15.	10.	115.	10000.	68.	0.25	0.150	0.008	-	S	T048	348
33-01-18431		2N 1843 A	50.	75.	15.	10.	115.	10000.	68.	0.25	0.150	0.008	-	S	T048	348
33-01-18441		2N 1844 A	100.	150.	15.	10.	115.	10000.	68.	0.25	0.150	0.008	-	S	T048	348
33-01-18491		2N 1849 A	400.	500.	15.	10.	115.	10000.	68.	0.25	0.150	0.008	-	S	T048	348
33-18-10467		BSI0 1046 M	700.	-	15.	10.	150.	10000.	130.	2.0	0.025	0.080	50000.	S	T0220AB	354
33-74-16128	S	1612 MM	800.	-	15.	10.	160.	10000.	120.	2.0	0.025	0.100	-	S	T0220AB	354
33-74-62104	S	6210 D	400.	500.	20.	-	170.	10000.	170.	1.1	0.008	0.009	20000.	S	T048	348
33-74-62204	S	6220 D	400.	500.	20.	-	170.	10000.	170.	1.1	0.008	0.009	20000.	S	ISO-TD48	373
33-74-62304	S	6230 D	400.	500.	20.	12.5	170.	10000.	170.	1.1	0.008	0.009	20000.	S	ISO-STUD	374
33-74-62504	S	6250 D	400.	500.	20.	12.5	170.	10000.	170.	1.1	0.008	0.009	20000.	S	ISO-FLAM	375
33-74-62404	S	6240 D	400.	500.	20.	12.5	170.	10000.	170.	1.1	0.008	0.009	20000.	S	ISO-PRES	376
33-74-62406	S	6240 M	600.	700.	20.	12.5	170.	10000.	170.	1.1	0.008	0.009	20000.	S	ISO-PRES	376
33-81-02040		TAG 20-400	400.	-	20.	12.6	175.	10000.	150.	1.0	0.015	0.015	8000.	S	T048	348
33-81-02050		TAG 20-500	500.	-	20.	12.6	175.	10000.	150.	1.0	0.015	0.015	8000.	S	T048	348
33-81-02060		TAG 20-600 R	600.	-	20.	12.6	175.	10000.	150.	1.0	0.015	0.015	8000.	S	T048	348
33-01-65070		2N 6507	400.	-	25.	-	300.	8300.	-	1.5	0.040	-	-	S	T0220AB	354
33-01-65090		2N 6509	800.	-	25.	-	300.	8300.	-	1.5	0.040	-	-	S	T0220AB	354
33-56-06820	JAN	2N 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-01-06820		2N 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-01-06850		2N 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-56-06850	JAN	2N 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-01-06860		2N 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-56-06860	JAN	2N 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-56-06880	JAN	2N 688	400.	500.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-01-06880		2N 688	400.	500.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	-	S	T048	348
33-44-08012	C5	8-12 1e2	1200.	-	25.	16.	250.	10000.	310.	2.5	0.030	0.040	60000.	S	STUD-HS	370

# THYRISTOR XẾP THỨ TỰ THEO DÒNG ĐIỆN

## Thyristors - Current

E10 Data code	Type	Udrm (V)	Udsm (V)	ITRMS (A)	ITAV (A)	ITSM (A)	Dy t (ns)	I2t (A2s)	Ugt (V)	Int (A)	In (A)	tq (ns)	D	Case No.
33-40-00354	C 35 D	400.	-	35.	-	225.	6300.	-	3.0	0.040	-	-	S	263-03 365
33-40-00358	C 35 N	800.	-	35.	-	225.	6300.	-	3.0	0.040	-	-	S	263-03 365
33-74-64936	S 6493 N	600.	700.	35.	-	900.	10000.	2000.	1.1	0.025	0.020	20000.	S	T048 348
33-06-40216	40216	600.	720.	35.	-	900.	10000.	-	1.1	0.025	0.020	-	S	T048 348
33-74-64316	S 6431 N	600.	720.	35.	-	900.	10000.	-	1.1	0.025	0.020	-	S	T048 348
33-74-64404	S 6440 D	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	ISO-PRES 376
33-74-64204	S 6420 D	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	ISO-T048 373
33-74-64504	S 6450 D	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	ISO-FLAM 375
33-01-38720	ZN 3872	400.	560.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	T0203AA 349
33-74-64406	S 6440 N	600.	700.	35.	22.	300.	10000.	300.	1.1	0.025	0.030	20000.	S	ISO-PRES 376
33-01-38990	ZN 3899	600.	700.	35.	22.	300.	10000.	300.	1.1	0.025	0.030	20000.	S	T048 348
33-74-64206	S 6420 N	600.	700.	35.	22.	300.	10000.	300.	1.1	0.025	0.030	20000.	S	ISO-T048 373
33-74-64116	S 6411 N	600.	700.	35.	22.	300.	10000.	300.	1.1	0.025	0.030	20000.	S	T048 348
33-74-64008	S 6400 N	800.	900.	35.	22.	300.	10000.	300.	1.1	0.025	0.030	20000.	S	T0203AA 349
33-01-36520	ZN 3652	300.	400.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048 348
33-01-36530	ZN 3653	400.	500.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048 348
33-74-74306	S 7430 N	600.	700.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048 348
33-06-40735	40735	600.	720.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048 348
33-74-73105	S 7310 E	500.	-	40.	25.	370.	10000.	700.	1.0	0.050	0.035	2800.	S	T048 348
33-74-73106	S 7310 W	600.	-	40.	25.	370.	10000.	700.	1.0	0.050	0.035	2800.	S	T048 348
33-44-23016	CS 23-16 102	1600.	-	50.	25.	400.	10000.	800.	2.5	0.050	0.100	50000.	S	STUD-M7 371
33-20-35110	BSF 35110	1650.	-	50.	32.	600.	10000.	1800.	1.5	0.200	0.200	150000.	S	DIN41892-358
33-74-86224	S 8622 D	400.	500.	75.	47.	640.	10000.	2450.	1.5	0.035	0.100	15000.	S	ISO-STUD 378
33-74-86234	S 8623 D	400.	500.	75.	47.	640.	10000.	2450.	1.5	0.035	0.100	15000.	S	ISO-STUD 378
33-74-86134	S 8613 D	400.	500.	75.	47.	640.	10000.	2450.	1.5	0.035	0.100	15000.	S	STUD 377
33-74-86136	S 8613 N	600.	700.	75.	47.	640.	10000.	2450.	1.5	0.035	0.100	15000.	S	STUD 377
33-74-86210	S 8621 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	ISO-STUD 378
33-74-86114	S 8611 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	STUD 377
33-74-86204	S 8620 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	ISO-STUD 378
33-74-86116	S 8611 N	600.	700.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	STUD 377
33-22-35110	BSF 35110	1650.	-	135.	85.	1700.	10000.	11250.	1.5	0.200	0.250	150000.	S	DIN41892-359
33-74-35110	BSFL 35110	1650.	-	235.	150.	2900.	10000.	42000.	1.5	0.250	0.250	200000.	S	DIN41893 360
33-26-35110	BSFN 35110	1650.	-	440.	280.	6150.	10000.	190000.	1.5	0.250	0.250	200000.	S	DIN41893 361
33-27-35110	BSFP 35110	1650.	-	550.	350.	10950.	10000.	600000.	1.5	0.250	0.250	200000.	S	DIN41893 361

## 7.4 THYSISTOR XẾP THỨ TỰ THEO DÒNG ĐIỆN KÍCH

Thyristors - Gate Current

ELData code	S	Type	Udrm (V)	Udsm (V)	ITRMS (A)	ITAV (A)	IesM (A)	by t (ns)	I2t (A2s)	Ugt (V)	Igt (A)	Ih (A)	t <sub>tr</sub> (ns)	ID	Case No.
33-90-06010		VRC 601	600	-	1.5	-	-	-	-	-	-	-	-	S	0114P
33-40-01064	C	106 D	400	500	3.5	2.2	18.5	10000	1.77	0.5	0.00003	0.0017	30000	S	T0202AB 366
33-74-01064	S	106 D	400	500	4.0	2.5	17	10000	1.7	0.5	0.00003	0.0017	30000	S	T0202 366
33-12-00200	BRY 20		40	-	5.0	0.5	-	-	-	0.4	0.00005	-	5000	S	T012
33-83-01064	TIC 106 D		400	-	5	3.2	30	10000	-	0.6	0.00006	0.008	7700	S	T0220AB 354
33-83-01068	TIC 106 N		800	-	5	3.2	30	10000	-	0.6	0.00006	0.008	7700	S	T0220AB 354
33-81-00606	TAG 06-60		60	-	0.800	0.500	6	10000	-	0.0002	0.005	-	-	S	T018
33-12-00554	BRY 55-400		400	-	2	0.8	8	10000	-	0.0002	-	8000	S	T092 352	
33-01-50610	ZW 5061		60	-	0.800	0.500	6	8300	0.15	0.8	0.0002	0.005	10000	S	T092 352
33-01-50640	ZW 5064		200	-	0.800	0.500	6	8300	0.15	0.8	0.0002	0.005	30000	S	T092 352
33-68-01024	P 0102 DA		400	-	0.800	0.500	8	10000	0.32	0.8	0.0002	0.005	500	S	T097 352
33-54-00640	HS 64 S		600	-	4.0	-	40	8300	-	0.8	0.0002	0.005	-	T05	364
33-01-62410	ZW 6241		600	650	4.0	2.6	35	8300	2.6	1.0	0.0002	0.005	2000	S	T0126 353
33-74-00028	S 0802 MH		800	-	8	5.1	80	10000	32	2.0	0.0002	0.010	100000	S	T0220AB 354
33-12-00390	BRY 39		70	-	-	0.250	3	-	-	0.5	0.001	-	250	S	T072 357
33-81-00660	TAG 6-600 F		600	-	7.5	4.8	100	10000	50	0.8	0.005	0.005	-	S	T066 350
33-83-01268	TIC 126 M		800	-	12	7.5	100	10000	-	0.8	0.005	0.040	11000	S	T0220AB 354
33-37-01804	BTX 18-400		400	-	1.6	1.0	10	10000	-	2.0	0.005	-	35000	S	T05 364
33-74-26006	S 2600 M		600	700	7.0	4.5	85	10000	40	0.65	0.006	0.009	15000	S	T05 364
33-01-64010	ZW 6401		100	125	16	-	135	10000	100	0.7	0.008	0.010	35000	S	T0220AB 354
33-74-61005	S 6100 E		500	550	16	-	135	10000	100	0.7	0.008	0.010	35000	S	T0220AB 354
33-01-63980	ZW 6398		600	650	17	-	105	10000	65	0.7	0.008	0.010	35000	S	T0220AB 354
33-74-28001	S 2800 A		100	125	10	-	85	10000	40	0.9	0.008	0.010	10000	S	T0220AB 354
33-74-62104	S 6210 D		400	500	20	-	170	10000	170	1.1	0.008	0.009	20000	S	T048 348
33-74-62204	S 6220 D		400	500	20	-	170	10000	170	1.1	0.008	0.009	20000	S	ISO-1048 373
33-74-62504	S 6250 D		400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-FLAN 375
33-74-62404	S 6240 D		400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-PRES 376
33-74-62304	S 6230 D		400	500	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-STUD 374
33-74-24006	S 2400 M		600	700	4.5	3.3	170	10000	150	1.1	0.008	0.009	20000	S	T08 372
33-74-62406	S 6240 M		500	700	20	12.5	170	10000	170	1.1	0.008	0.009	20000	S	ISO-PRES 376
33-01-41010	ZW 4101		600	700	5.0	3.2	50	10000	15	1.2	0.008	0.010	15000	S	T066 350
33-81-60540	TAG 605-400		400	-	7	4.5	80	10000	36.1	0.8	0.010	0.015	2000	S	T05 364
33-92-07094	X 0709 OG		400	-	7	4.5	80	10000	36.1	0.8	0.010	0.015	2000	S	T05 364
33-03-00005	SP 05M		50	-	5.0	-	80	10000	-	1.5	0.010	0.010	80000	S	T0220AB 354
33-33-10905	BT 109-500 R		500	-	10	-	50	10000	-	2.0	0.010	0.050	-	S	T0127

# THYRISTOR XẾP THỨ TỰ THEO ĐÓNG ĐIỆN KÍCH

## Thyristors - Gate Current

ELData code	S type	Udrm (V)	Udsm (V)	ItrMS (A)	IEAV (A)	ItSM (A)	bv t (ms)	12t (A2s)	Vgt (V)	Igt (A)	In (A)	t <sub>d</sub> (ns)	D	Case	No.
33-33-10105	BT 101-500 R	500	-	15	-	55	8300	-	2.0	0.010	-	-	S	1064	362
33-44-00606	CS 0.6-06 go2	600	-	5	1.5	60	10000	18	2.0	0.010	0.020	60000	S	C506	368
33-81-01540	TAG 15-400	400	-	15	9.5	150	10000	110	1.0	0.015	0.015	8000	S	T048	348
33-81-02040	TAG 20-400	400	-	20	12.6	175	10000	150	1.0	0.015	0.015	8000	S	T048	348
33-81-02050	TAG 20-500	500	-	20	12.6	175	10000	150	1.0	0.015	0.015	8000	S	T048	348
33-81-02060	TAG 20-600 R	600	-	20	12.6	175	10000	150	1.0	0.015	0.015	8000	S	T048	348
33-74-37037	S 3703 SF	750	800	5.0	3.2	65	10000	20	1.8	0.015	-	2400	S	1066	350
33-74-39007	S 3900 SF	750	800	8.0	5.0	70	10000	30	1.8	0.015	-	2400	SD	T0220AB	367
33-44-01004	CS 1-04 go3	400	-	7	2.0	70	10000	25	2.0	0.015	0.040	60000	S	C51	369
33-40-01222	C 122 81	200	250	8	-	85	10000	40	0.9	0.018	0.020	10000	S	T0220AB	354
33-74-01225	S 122 L	500	600	8	-	85	10000	40	0.9	0.018	0.020	10000	S	T0220AB	354
33-01-41030	2N 4103	600	700	12.5	8	170	10000	170	1.5	0.020	0.025	-	S	T03	351
33-80-06300	T 6N 300 P08	300	-	7.6	-	100	10000	-	2.0	0.020	0.600	-	S	AD102	379
33-18-16001	B5TD 1680 N	1200	-	12	7.5	130	10000	85	2.0	0.020	0.600	50000	S	T0220AB	354
33-74-64936	S 6493 N	600	700	35	-	900	10000	2000	1.1	0.025	0.020	20000	S	1048	348
33-74-64406	S 6440 N	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	ISO-PRES	376
33-74-64116	S 6411 N	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T048	348
33-01-38890	2N 3899	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T048	348
33-74-64206	S 6420 N	600	700	35	22	300	10000	300	1.1	0.025	0.030	20000	S	ISO-T048	378
33-74-64316	S 6431 N	600	720	35	-	900	10000	-	1.1	0.025	0.020	-	S	T048	348
33-06-40216	40216	600	720	35	-	900	10000	-	1.1	0.025	0.020	-	S	T048	348
33-74-64008	S 6400 N	800	900	35	22	300	10000	300	1.1	0.025	0.030	20000	S	T0203AA	349
33-16-10467	B5TC 1046 N	700	-	9.4	6.0	95	10000	45	2.0	0.025	0.080	50000	S	T0220AB	354
33-18-10467	B5TD 1046 N	700	-	16	10	150	10000	130	2.0	0.025	0.080	50000	S	T0220AB	354
33-16-10537	B5TC 1053 N	800	-	9.4	6	95	10000	45	2.0	0.025	0.080	50000	S	T0220AB	354
33-74-16128	S 1612 NH	800	-	16	10	160	10000	128	2.0	0.025	0.100	-	S	T0220AB	354
33-44-08012	CS 8-12 go2	1700	-	25	16	250	10000	310	2.5	0.030	0.040	60000	S	STUD-MS	370
33-74-86134	S 8613 C	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	STUD	377
33-74-86224	S 8622 D	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	ISO-STUD	378
33-74-86234	S 8623 D	400	500	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	ISO-STUD	378
33-74-86136	S 8613 M	600	700	75	47	640	10000	2450	1.5	0.035	0.100	15000	S	STUD	377
33-01-65010	2N 6507	400	-	25	-	300	8300	-	1.5	0.040	-	-	S	T0220AB	354
33-01-65009	2N 6509	800	-	25	-	300	8300	-	1.5	0.040	-	-	S	T0220AB	354
33-40-00154	C 35 D	400	-	35	-	225	8300	-	3.0	0.040	-	-	S	263-03	365
33-74-86404	S 6440 D	400	660	35	22	300	10000	300	1.5	0.046	0.030	20000	S	ISO-PRES	376

# THYSISTOR XẾP THỨ TỰ THEO DÒNG ĐIỆN KÍCH

## Thyristors - Gate Current

EI Data code	S	Type	Udwm (V)	Udsm (V)	ITRM5 (A)	ITAV (A)	ItSM (A)	by t (ns)	I2t (A2s)	Vgt (V)	Igt (A)	Ih (A)	tq (ns)	D	Case	No.
33-01-38729		ZN 3872	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	T0203AB	349
33-74-64204	S	6420 D	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	ISO-T048	373
33-74-64504	S	6450 D	400.	660.	35.	22.	300.	10000.	300.	1.5	0.046	0.030	20000.	S	ISO-FLAM	375
33-74-73105	S	7310 E	500.	.	40.	25.	370.	10000.	700.	1.0	0.050	0.035	2800.	S	T048	348
33-74-73106	S	7310 M	600.	.	40.	25.	370.	10000.	700.	1.0	0.050	0.035	2800.	S	T048	348
33-74-58023	S	5802 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	15000.	S	T0220AB	354
33-74-58003	S	5800 C	300.	350.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	6000.	S	T0220AB	354
33-74-58006	S	5800 M	600.	650.	5.	3.2	75.	10000.	28.	1.2	0.050	0.020	6000.	S	T0220AB	354
33-44-23016		CS 23-16 102	1600.	.	50.	25.	400.	10000.	800.	2.5	0.050	0.100	60000.	S	STUD-M7	371
33-01-06820		ZN 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-56-06820	JAR	ZN 682	50.	75.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-56-06850	JAR	ZN 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-01-06850		ZN 685	200.	300.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-01-06860		ZN 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-56-06860	JAR	ZN 686	250.	350.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-56-06880	JAR	ZN 688	400.	500.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-01-06880		ZN 688	400.	500.	25.	16.	140.	10000.	100.	0.25	0.080	0.015	.	S	T048	348
33-01-36520		ZN 3652	300.	400.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048	348
33-01-36530		ZN 3653	400.	500.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048	348
33-74-74306	S	7430 M	600.	700.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048	348
33-06-40735	*	40735	600.	720.	35.	25.	180.	5000.	165.	1.5	0.080	0.075	15000.	S	T048	348
33-74-86204	S	8620 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	ISO-STUD	378
33-74-86114	S	8611 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	STUD	377
33-74-86214	S	8621 D	400.	500.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	ISO-STUD	378
33-74-86116	S	8611 M	500.	700.	100.	63.	850.	10000.	4400.	1.5	0.100	0.100	15000.	S	STUD	377
33-01-18421		ZN 1842 A	25.	35.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048	348
33-01-18431		ZN 1843 A	50.	75.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048	348
33-01-18441		ZN 1844 A	100.	150.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048	348
33-01-18491		ZN 1849 A	400.	500.	16.	10.	115.	10000.	68.	0.25	0.150	0.008	.	S	T048	348
33-20-35110		B5tF 35110	1650.	.	50.	32.	600.	10000.	1600.	1.5	0.200	0.200	150000.	S	01N41892	358
33-22-35110		B5tH 35110	1650.	.	135.	85.	1700.	10000.	11250.	1.5	0.200	0.250	150000.	S	01N41892	359
33-24-35110		B5tL 35110	1650.	.	235.	150.	2900.	10000.	42000.	1.5	0.250	0.250	200000.	S	01N41893	360
33-26-35110		B5tN 35110	1650.	.	440.	280.	6160.	10000.	190000.	1.5	0.250	0.250	200000.	S	01N41893	361
33-27-35110		B5tP 35110	1650.	.	550.	350.	10950.	10000.	600000.	1.5	0.250	0.250	200000.	S	01N41893	361

## 7.5 TRIAC XẾP THỨ TỰ THEO ĐIỆN ÁP

Triacs - Voltage

E1 Data code	Type	V <sub>DRW</sub> (V)	I <sub>FRMS</sub> (A)	I <sub>ESM</sub> (A)	t <sub>by t</sub> (ns)	t <sub>2t</sub> (ns)	U <sub>GT</sub> (V)	I <sub>GT</sub> (A)	I <sub>h</sub> (A)	t <sub>Q</sub> (ns)	D	Case	No.
34-78-23021	T 2302 A	100.	2.5	24.	10000.	4.3	1.0	0.0035	0.007	1800.	T	T05	401
34-78-23221	T 2322 A	100.	2.5	23.5	10000.	3.4	1.0	0.010	0.015	1800.	T	T0202AB	405
34-01-63460	2N 6346	200.	12.	113.	10000.	54.	0.9	0.006	0.006	1500.	T	T0220AB	402
34-78-64012	T 6401 B	200.	30.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-64262	T 6426 B	200.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T2	ISO-T048	405
34-78-64142	T 6414 B	200.	40.	600.	1250.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-78-84112	* T 8411 B	200.	60.	600.	10000.	2700.	1.35	0.020	0.040	1200.	T	STUD	411
34-78-84502	* T 8450 B	200.	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-94-01054	Z 0105 DA	400.	1.0	8.	10000.	0.32	2.0	0.005	0.010	2500.	T	T092	415
34-78-23004	T 2300 D	400.	2.5	21.	10000.	4.3	1.0	0.001	0.007	1800.	T	T05	401
34-01-57560	2N 5756	400.	2.5	21.	10000.	4.3	0.9	0.005	0.006	1800.	T	T05	401
34-78-23064	T 2306 D	400.	2.5	21.	10000.	4.3	1.5	0.045	0.015	1800.	T2	T05	401
34-78-23204	T 2320 D	400.	2.8	23.5	10000.	3.4	1.0	0.003	0.015	1800.	T	T0202AB	406
34-78-28064	T 2806 D	400.	8.	85.	10000.	55.	1.5	0.045	0.015	1600.	T2	T0220AB	402
34-78-28564	T 2856 D	400.	8.	85.	10000.	55.	1.5	0.045	0.015	1600.	T2	ISO-T0220AB	403
34-64-41214	MT 4121 D non-iso	400.	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	T048	404
34-78-41214	T 4121 D	400.	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	ISO-T048	405
34-78-41174	T 4117 D	400.	10.	85.	10000.	55.	1.5	0.045	0.015	1600.	T2	T048	404
34-78-02454	SC 245 D 2	400.	10.	90.	10000.	55.	2.5	0.050	0.050	.	T	ISO-T048	405
34-88-99400	TXD 99 A 40	400.	10.	90.	10000.	40.	2.5	0.050	0.050	.	T	STUD-N8	413
34-78-47004	T 4700 D	400.	15.	85.	10000.	50.	1.0	0.015	0.015	1600.	T	T056	409
34-78-47064	* T 4706 D	400.	15.	85.	10000.	50.	1.5	0.045	0.015	1600.	T2	T066	409
34-78-02504	SC 250 D	400.	15.	90.	10000.	.	2.5	0.050	0.050	.	T	T048	404
34-88-98400	TXD 98 A 40	400.	15.	90.	10000.	40.	2.5	0.050	0.050	.	T	STUD-N8	413
34-78-64154	T 6415 D	400.	25.	600.	1250.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-89-99400	TXE 99 A 40	400.	25.	230.	10000.	265.	2.5	0.050	0.025	1700.	T	ISO-STUD	414
34-78-64304	* T 6430 D	400.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-STUD	408
34-78-64504	* T 6450 D	400.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-FLANGE	410
34-78-64144	T 6414 D	400.	40.	600.	1250.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-78-64064	T 6406 D	400.	40.	600.	1250.	270.	1.5	0.045	0.045	1600.	T2	T0203AA	400
34-78-64164	T 6416 D	400.	40.	265.	10000.	500.	1.5	0.045	0.025	1700.	T2	T048	404
34-78-84404	* T 8440 D	400.	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-78-84164	* T 8410 D	400.	80.	725.	10000.	4000.	1.35	0.020	0.040	1200.	T	STUD	411
34-13-16204	BT 162-400	400.	17.	110.	10000.	40.	1.5	0.040	0.030	.	T2	T0220AB	407
34-07-60765	BT 160765	480.	26.	200.	10000.	.	1.5	0.040	.	.	T	T048	404

# TRIAC XẾP THỨ TỰ THEO ĐIỆN ÁP

## Triacs - Voltage

IData code	Type	Udrm (V)	ItRMS (A)	ItSM (A)	by t (ns)	12t (A2s)	Ugt (V)	Igt (A)	lh (A)	tq (ms)	Ø	Case	No.
34-88-99500	TXD 99 A 50	500	10	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-88-98500	TXD 98 A 50	500	15	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-78-64075	T 6407 E	500	30	265	10000	500	1.5	0.045	0.025	1700	TZ	T0203AA	400
34-01-57570	2N 5757	600	2.5	21	10000	4.3	0.9	0.005	0.006	1800	T	T05	401
34-87-18606	TXC 18 E 60 H	600	6	35	10000	10	2.0	0.005	0.020	-	T	T0220AB	402
34-78-41216	T 4121 M	600	10	85	10000	55	1.0	0.010	0.015	1600	T	ISO-T048	405
34-78-41316	* T 4131 M	600	10	85	10000	55	1.0	0.010	0.015	1600	T	ISO-STUD	406
34-78-10106	T 1010 MJ	600	10	100	10000	50	2.5	0.025	0.050	-	T	ISO-T0220AB	403
34-81-45706	TAG 457-600	600	10	100	10000	50	2.5	0.025	0.050	-	T	T0220AB	402
34-01-63481	2N 6348 A	600	12	113	10000	64	0.9	0.006	0.006	1500	T	T0220AB	402
34-78-41166	T 4116 M	600	15	85	10000	50	1.5	0.045	0.020	1600	TZ	T048	404
34-88-10606	TXD 10 K 60 R	600	15	125	10000	60	2.0	0.050	0.050	-	T	T0220AB	402
34-81-28106	TAG 281-600	600	16	150	10000	112	2.5	0.050	0.100	-	T	T0220AB	402
34-81-28006	TAG 280-600	600	16	150	10000	112	2.5	0.050	0.150	-	T	T0220AB	402
34-33-13906	BT 139-600	600	16	115	10000	65	1.5	0.035	0.030	-	T	T0220AB	402
34-78-64116	T 6411 M	600	30	265	10000	500	1.35	0.015	0.025	1700	T	T048	404
34-78-64506	* T 6450 M	600	40	265	10000	500	1.35	0.015	0.025	1700	T	ISO-FLANGE	410
34-78-64106	T 6410 M	600	40	265	10000	500	1.35	0.015	0.025	1700	T	T048	404
34-01-54430	2N 5443	600	40	265	10000	500	1.35	0.015	0.025	1700	T	T0203AA	400
34-78-64306	* T 6430 M	600	40	265	10000	500	1.35	0.015	0.025	1700	T	ISO-STUD	408
34-78-64166	T 6416 M	600	40	265	10000	500	1.5	0.045	0.025	1700	TZ	T048	404
34-78-84216	* T 8421 M	600	50	800	10000	2700	1.35	0.020	0.040	1200	T	ISO-STUD	412
34-78-84206	* T 8420 M	600	80	725	10000	4000	1.35	0.020	0.040	1200	T	ISO-STUD	412
34-33-16206	BT 162-600	600	12	110	10000	40	1.5	0.040	0.030	-	TZ	T0220AB	402
34-83-02068	TIC 206-N	800	4	30	10000	-	0.7	0.0005	0.002	-	T	T0220AB	402
34-83-02258	TIC 225-N	800	8	80	10000	-	0.7	0.0000	0.003	-	T	T0220AB	402
34-83-02268	TIC 226-N	800	8	80	10000	-	0.7	0.002	0.005	-	T	T0220AB	402
34-78-12126	T 1212 MJ	800	12	150	10000	112	2.5	0.050	0.150	-	T	ISO-T0220AB	403
34-78-15136	T 1513 MJ	800	15	200	10000	200	2.5	0.050	0.150	-	T	ISO-T0220AB	403
34-83-02468	TIC 246-N	800	16	125	10000	-	0.7	0.005	0.012	-	T	T0220AB	402
34-78-16126	T 1612 MJ	800	16	150	10000	112	2.5	0.050	0.150	-	T	T0220AB	402
34-78-16136	T 1613 MJ	800	16	150	10000	112	2.5	0.050	0.160	-	T	T0220AB	402
34-78-64008	T 6400 N	800	40	265	10000	500	1.35	0.015	0.025	1700	T	T0203AA	400
34-78-40138	T 4013 NK	800	40	300	10000	450	2.5	0.050	0.150	-	T	ISO-RD101	407
34-36-04312	BTW 43-1200	1200	15	120	10000	72	2.5	0.100	0.100	-	T	T064	416

## 7.6 TRIAC XẾP THỨ TỰ THEO DÒNG ĐIỆN

### Triacs - Current

E10data code	Type	Udrm (V)	IrRMS (A)	ItSM (A)	t <sub>on</sub> (ns)	I <sub>2t</sub> (A2s)	U <sub>ce</sub> (V)	I <sub>gt</sub> (A)	I <sub>th</sub> (A)	t <sub>q</sub> (ns)	D	Case	No.
34-94-01054	Z 0105 DA	400	1.0	8	10000	0.32	2.0	0.005	0.010	2500	T	T092	415
34-78-23021	T 2302 A	100	2.5	21	10000	4.3	1.0	0.0035	0.007	1800	T	T05	401
34-78-23004	T 2300 D	400	2.5	21	10000	4.3	1.0	0.001	0.007	1800	T	T05	401
34-01-57560	2N 5756	400	2.5	21	10000	4.3	0.9	0.005	0.006	1800	T	T05	401
34-78-23064	T 2306 D	400	2.5	21	10000	4.3	1.5	0.045	0.015	1800	TZ	T05	401
34-01-57570	2N 5757	600	2.5	21	10000	4.3	0.9	0.005	0.006	1800	T	T05	401
34-78-23221	T 2322 A	100	2.5	23.5	10000	3.4	1.0	0.010	0.015	1800	T	T0202AB	406
34-78-23204	T 2320 D	400	2.8	23.5	10000	3.4	1.0	0.003	0.015	1800	T	T0202AB	406
34-83-02068	TIC 206 N	600	4	30	10000	-	0.7	0.0005	0.002	-	T	T0220AB	402
34-87-18606	TIC 18 E 60 N	600	6	35	10000	10	2.0	0.005	0.020	-	T	T0220AB	402
34-83-02258	TIC 225 N	800	8	80	10000	-	0.7	0.0008	0.003	-	T	T0220AB	402
34-83-02268	TIC 226 N	800	8	80	10000	-	0.7	0.002	0.005	-	T	T0220AB	402
34-78-28064	T 2806 D	400	8	85	10000	55	1.5	0.045	0.015	1600	TZ	T0220AB	402
34-78-28564	T 2856 D	400	8	85	10000	55	1.5	0.045	0.015	1600	TZ	ISO-T0220AB	403
34-78-10106	T 1010 NJ	600	10	100	10000	50	2.5	0.025	0.050	-	T	ISO-T0220AB	403
34-81-45706	TAG 457-600	600	10	100	10000	50	2.5	0.025	0.050	-	T	T0220AB	402
34-64-41214	MT 4121 D non-iso	400	10	85	10000	55	1.0	0.010	0.015	1600	T	T048	404
34-78-41214	T 4121 D	400	10	85	10000	55	1.0	0.010	0.015	1600	T	ISO-T048	405
34-78-41174	T 4117 D	400	10	85	10000	55	1.5	0.045	0.015	1600	TZ	T048	404
34-78-41216	T 4121 N	600	10	85	10000	55	1.0	0.010	0.015	1600	T	ISO-T048	405
34-78-41316	* T 4131 N	600	10	85	10000	55	1.0	0.010	0.015	1600	T	ISO-STUD	408
34-76-02454	SC 245 D 2	400	10	90	10000	55	2.5	0.050	0.050	-	T	ISO-T048	405
34-88-99400	TXD 99 A 40	400	10	90	10000	40	2.5	0.050	0.050	-	T	STUD-NB	413
34-88-99500	TXD 99 A 50	500	10	90	10000	40	2.5	0.050	0.050	-	T	STUD-NB	413
34-33-16204	BT 162-400	400	12	110	10000	40	1.5	0.040	0.030	-	TZ	T0220AB	402
34-33-16206	BT 162-600	600	12	110	10000	40	1.5	0.040	0.030	-	TZ	T0220AB	402
34-01-63460	2N 6346	200	12	113	10000	64	0.9	0.006	0.006	1500	T	T0220AB	402
34-01-63481	2N 6348 A	600	12	113	10000	64	0.9	0.006	0.006	1500	T	T0220AB	402
34-78-12128	T 1212 NJ	800	12	150	10000	112	2.5	0.050	0.150	-	T	ISO-T0220AB	403
34-88-10606	TXD 1D K 50 R	600	15	125	10000	60	2.0	0.050	0.050	-	T	T0220AB	402
34-78-15138	T 1513 NJ	800	15	200	10000	200	2.5	0.050	0.150	-	T	ISO-T0220AB	403
34-78-47004	T 4700 D	400	15	85	10000	50	1.0	0.015	0.015	1600	T	T066	409
34-78-47064	* T 4706 D	400	15	85	10000	50	1.5	0.045	0.015	1600	TZ	T066	409
34-78-41166	T 4116 N	600	15	85	10000	50	1.5	0.045	0.020	1600	TZ	T048	404
34-76-02504	SC 250 D	400	15	90	10000	-	2.5	0.050	0.050	-	T	T048	404

# TRIAC XẾP THỨ TỰ THEO ĐÒNG BIỆN

## Triacs - Current

Data code	Type	Udren (V)	I(RMS) (A)	tSM (A)	by t (ns)	t2t (A2s)	Ugt (V)	Igt (A)	Ih (A)	td (ns)	Case	No.	
34-88-98400	IXD 98 A 40	400.	15.	90.	10000.	40.	2.5	0.050	0.050	.	T	STUD-MB	413
34-88-98500	IXD 98 A 50	500.	15.	90.	10000.	40.	2.5	0.050	0.050	.	T	STUD-MB	413
34-36-04312	ATW 43-1200	1200.	15.	120.	10000.	72.	2.5	0.100	0.100	.	T	1064	415
34-83-02468	TIC 246 H	800.	16.	125.	10000.	.	0.7	0.005	0.012	.	T	T0220AB	402
34-81-28006	TAC 280-600	600.	16.	150.	10000.	112.	2.5	0.050	0.150	.	T	T0220AB	402
34-81-28106	TAC 281-600	600.	16.	150.	10000.	112.	2.5	0.050	0.100	.	T	T0220AB	402
34-78-16136	T 1613 MJ	800.	16.	150.	10000.	112.	2.5	0.050	0.100	.	T	T0220AB	402
34-78-16125	T 1612 MJ	800.	16.	150.	10000.	112.	2.5	0.050	0.150	.	T	T0220AB	402
34-33-13906	B1 139-600	600.	16.	115.	10000.	65.	1.5	0.035	0.030	.	T	T0220AB	402
34-89-99400	TXE 99 A 40	400.	25.	230.	10000.	265.	2.5	0.050	0.075	.	T	STUD-MB	414
34-78-64154	T 6415 D	400.	25.	600.	1750.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-07-60765	60765	480.	26.	200.	10000.	.	1.5	0.040	.	.	T	T048	404
34-78-64012	T 6401 B	200.	30.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-64075	T 6407 F	500.	30.	265.	10000.	500.	1.5	0.045	0.025	1700.	T	T0203AA	400
34-78-64116	T 6411 M	600.	30.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T048	404
34-78-64262	T 6426 B	200.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	150-T048	405
34-78-64304	T 6430 D	400.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	150-STUD	408
34-78-64504	T 6450 D	400.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-FLANGE	410
34-78-64164	T 6416 D	400.	40.	265.	10000.	500.	1.5	0.045	0.025	1700.	T	T048	404
34-78-64106	T 6410 M	600.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T048	404
34-78-64506	T 6450 M	600.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-FLANGE	410
34-78-64306	T 6430 M	600.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	150-STUD	408
34-01-54430	ZN 5443	600.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-64166	T 6416 M	600.	40.	265.	10000.	500.	1.5	0.045	0.025	1700.	T	T048	404
34-78-64008	T 6400 N	800.	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-40138	T 4013 NK	800.	40.	300.	10000.	450.	2.5	0.050	0.150	.	T	150-RD101	407
34-78-64142	T 6414 B	200.	40.	600.	1250.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-78-64144	T 6414 D	400.	40.	600.	1250.	270.	2.0	0.020	0.030	1600.	T	T048	404
34-78-64064	T 6406 D	400.	40.	600.	1250.	270.	1.5	0.045	0.045	1600.	T	T0203AA	400
34-78-84112	T 8411 B	200.	60.	600.	10000.	2700.	1.35	0.020	0.040	1200.	T	STUD	411
34-78-84216	T 8421 M	600.	60.	600.	10000.	2700.	1.35	0.020	0.040	1200.	T	ISO-STUD	412
34-78-84502	T 8450 B	200.	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-78-84404	T 8440 D	400.	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-78-84104	T 8410 D	400.	80.	725.	10000.	4000.	1.35	0.020	0.040	1200.	T	STUD	411
34-78-84206	T 8420 M	600.	80.	725.	10000.	4000.	1.35	0.020	0.040	1200.	T	ISO-STUD	412

## 7.7 TRIAC XẾP THỨ TỰ THEO DÒNG ĐIỆN KÍCH

Triacs - Gate Current

Triac code	Type	V <sub>DRW</sub> (V)	I <sub>TRMS</sub> (A)	I <sub>SM</sub> (A)	t <sub>by</sub> t (ns)	I <sub>2st</sub> (A25)	V <sub>G</sub> (V)	I <sub>G</sub> (A)	I <sub>th</sub> (A)	t <sub>th</sub> (ns)	D	Case	No.
34-83-02068	TIC 206 N	800	4.	30.	10000.	.	0.7	0.0005	0.002	.	F	T0220AB	402
34-83-02268	TIC 225 N	800	8.	90.	10000.	.	0.7	0.0008	0.003	.	T	T0220AB	402
34-78-23004	T 2300 D	400	2.5	21.	10000.	4.3	1.0	0.001	0.007	1800.	T	T05	401
34-83-02268	TIC 225 N	800	8.	80.	10000.	.	0.7	0.002	0.005	.	T	T0220AB	402
34-78-23204	T 2320 D	400	2.8	23.5	10000.	3.4	1.0	0.003	0.015	1800.	T	T0202AB	406
34-78-23021	T 2302 A	100	2.5	21.	10000.	4.3	1.0	0.0035	0.007	1800.	T	T05	401
34-83-02468	TIC 246 N	800	16.	125.	10000.	.	0.7	0.005	0.012	.	T	T0220AB	402
34-01-57560	2N 5756	400	2.5	21.	10000.	4.3	0.9	0.005	0.006	1800.	T	T05	401
34-01-57570	2N 5757	600	2.5	21.	10000.	4.3	0.9	0.005	0.006	1800.	T	T05	401
34-94-01054	Z 0105 DA	400	1.0	8.	10000.	0.32	2.0	0.005	0.010	2500.	T	T092	415
34-87-1B606	TXC 18 E 60 H	600	6.	35.	10000.	10.	2.0	0.005	0.020	.	T	T0220AB	402
34-01-63460	2N 6346	200	12.	113.	10000.	64.	0.9	0.006	0.006	1500.	T	T0220AB	402
34-01-63481	2N 6348 A	600	12.	113.	10000.	64.	0.9	0.006	0.006	1500.	T	T0220AB	402
34-78-23221	T 2322 A	100	2.5	23.5	10000.	3.4	1.0	0.010	0.015	1800.	T	T0202AB	406
34-64-41214	MT 4121 D non-iso	400	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	T048	404
34-78-41214	T 4121 D	400	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	ISO-T048	405
34-78-41216	T 4121 M	500	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	ISO-T048	405
34-78-41316	* T 4131 M	600	10.	85.	10000.	55.	1.0	0.010	0.015	1600.	T	ISO-STUD	408
34-78-47009	T 4700 D	400	15.	85.	10000.	50.	1.0	0.015	0.015	1600.	T	T066	409
34-78-64012	T 6401 B	200	30.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-64262	T 6426 B	200	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-T048	405
34-78-64304	* T 6430 D	400	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-STUD	408
34-78-64504	* T 6450 D	400	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-FLANGE	410
34-78-64116	T 6411 M	600	30.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T048	404
34-78-64306	* T 6431 M	600	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-STUD	408
34-78-64506	* T 6450 M	600	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	ISO-FLANGE	410
34-78-64106	1 6410 M	600	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T048	404
34-01-54430	2N 5443	600	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	
34-78-64008	T 6400 N	800	40.	265.	10000.	500.	1.35	0.015	0.025	1700.	T	T0203AA	400
34-78-84112	* T 8411 B	200	60.	600.	10000.	2700.	1.35	0.020	0.040	1200.	T	STUD	411
34-78-84502	* T 8450 B	200	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-78-84104	* T 8410 D	400	80.	725.	10000.	4000.	1.35	0.020	0.040	1200.	T	STUD	411
34-78-84404	* T 8440 D	400	80.	720.	10000.	3600.	1.35	0.020	0.020	1200.	T	ISO-STUD	412
34-78-84216	* T 8421 N	600	60.	600.	10000.	2700.	1.35	0.020	0.040	1200.	T	ISO-STUD	412
34-78-84206	* T 8420 N	600	80.	725.	10000.	4000.	1.35	0.020	0.040	1200.	T	ISO-STUD	412

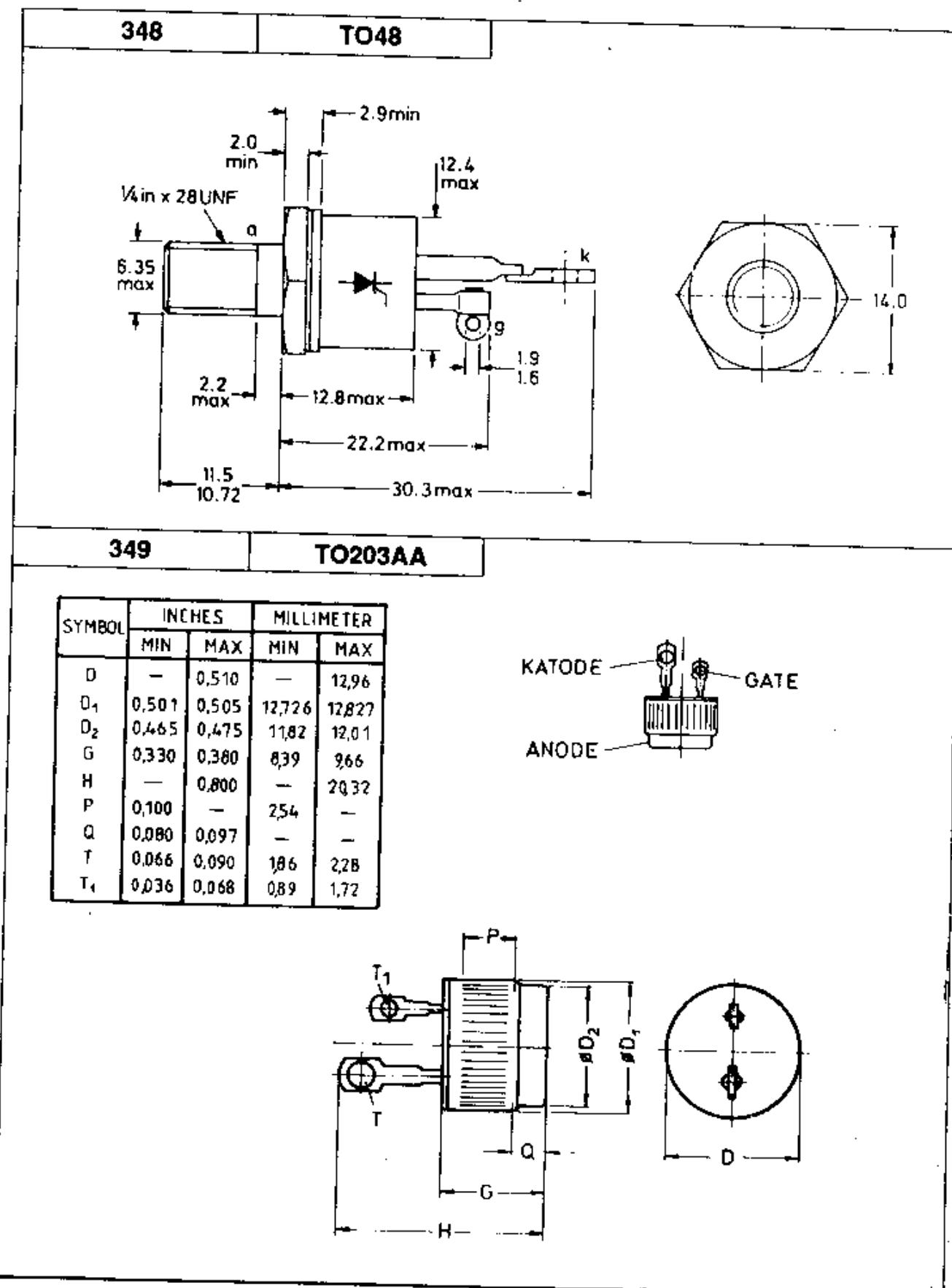
## TRIAC XẾP THỨ TỰ THEO ĐÓNG BIỆN KÍCH

### Triacs - Gate Current

E1 Data code	S	Type	Udrm (V)	ItRMS (A)	ItSM (A)	t <sub>on</sub> (ns)	I <sub>2t</sub> (A/ns)	Ugt (V)	Igt (A)	Ih (A)	tq (ns)	Case	No.	
34-78-64142		T 6414 B	200	40	600	1250	270	2.0	0.020	0.030	1600	T	TO48	404
34-78-64154		T 6415 D	400	25	600	1250	270	2.0	0.020	0.030	1600	T	TO48	404
34-78-64144		T 6414 D	400	40	600	1250	270	2.0	0.020	0.030	1600	T	TO48	404
34-78-45706		TAG 457-600	600	10	100	10000	50	2.5	0.025	0.050	-	T	TO220AB	402
34-78-10106		T 1010 MJ	600	10	100	10000	50	2.5	0.025	0.050	-	T	ISO-TO220AB	403
34-33-13906		BT 139-600	600	16	115	10000	65	1.5	0.035	0.030	-	T	TO220AB	402
34-33-16204		BT 162-400	400	12	110	10000	40	1.5	0.040	0.030	-	TZ	TO220AB	402
34-33-16206		BT 162-600	600	12	110	10000	40	1.5	0.040	0.030	-	TZ	TO220AB	402
34-07-60765		60765	480	25	200	10000	-	1.5	0.040	-	-	T	TO48	404
34-78-23064		T 2306 D	400	2.5	21	10000	4.3	1.5	0.045	0.015	1800	TZ	T05	401
34-78-28064		T 2806 D	400	8	85	10000	55	1.5	0.045	0.015	1600	TZ	TO220AB	402
34-78-28564		T 2856 D	400	8	85	10000	55	1.5	0.045	0.015	1600	TZ	ISO-TO220AB	403
34-78-41174		T 4117 D	400	10	85	10000	55	1.5	0.045	0.015	1600	TZ	TO48	404
34-78-47064		T 4706 D	400	15	85	10000	50	1.5	0.045	0.015	1600	TZ	T066	409
34-78-64064		T 6406 D	400	40	600	1250	270	1.5	0.045	0.045	1600	TZ	TO203AA	400
34-78-64164		T 6416 D	400	40	265	10000	500	1.5	0.045	0.025	1700	TZ	TO48	404
34-78-64075		T 6407 E	500	30	265	10000	500	1.5	0.045	0.025	1700	TZ	TO203AA	400
34-78-41166		T 4116 M	600	15	85	10000	50	1.5	0.045	0.020	1600	TZ	TO48	404
34-78-64166		T 6416 M	600	40	265	10000	500	1.5	0.045	0.025	1700	TZ	TO48	404
34-88-10606		TXD 10 K 60 R	600	15	125	10000	60	2.0	0.050	0.050	-	T	TO220AB	402
34-88-99400		TXD 99 A 40	400	10	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-76-02454		SC 245 D 2	400	10	90	10000	55	2.5	0.050	0.050	-	T	ISO-TO48	405
34-76-02504		SC 250 D	400	15	90	10000	-	2.5	0.050	0.050	-	T	TO48	404
34-88-98400		TXD 98 A 40	400	15	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-88-99400		TXD 99 A 40	400	25	230	10000	265	2.5	0.050	0.075	-	T	STUD-M8	414
34-88-99500		TXD 99 A 50	500	10	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-88-98500		TXD 98 A 50	500	15	90	10000	40	2.5	0.050	0.050	-	T	STUD-M8	413
34-81-28106		TAG 281-600	600	16	150	10000	112	2.5	0.050	0.100	-	T	TO220AB	402
34-81-28006		TAG 280-600	600	16	150	10000	112	2.5	0.050	0.150	-	T	TO220AB	402
34-78-12128		T 1212 MJ	800	12	150	10000	112	2.5	0.050	0.150	-	T	ISO-TO220AB	403
34-78-15138		T 1513 MJ	800	15	200	10000	200	2.5	0.050	0.150	-	T	TO220AB	402
34-78-16136		T 1613 MJ	800	16	150	10000	112	2.5	0.050	0.100	-	T	TO220AB	402
34-78-16126		T 1612 MJ	800	16	150	10000	112	2.5	0.050	0.150	-	T	TO220AB	402
34-78-40138		T 4013 NK	800	40	300	10000	450	2.5	0.050	0.150	-	T	ISO-RD101	407
34-36-04312		BTW 43-1200	1200	15	120	10000	72	2.5	0.100	0.100	-	T	T064	416

## 7.8 SO ĐỒ CHÂN THYRISTOR

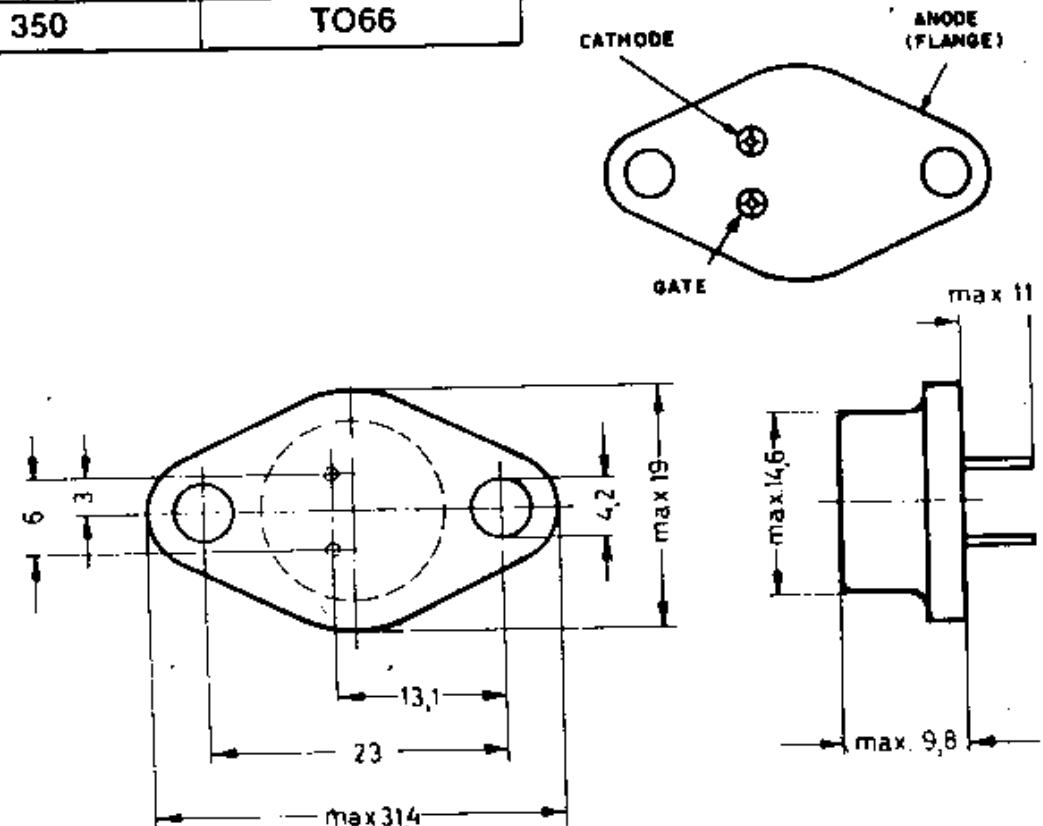
## Thyristors



## Thyristors

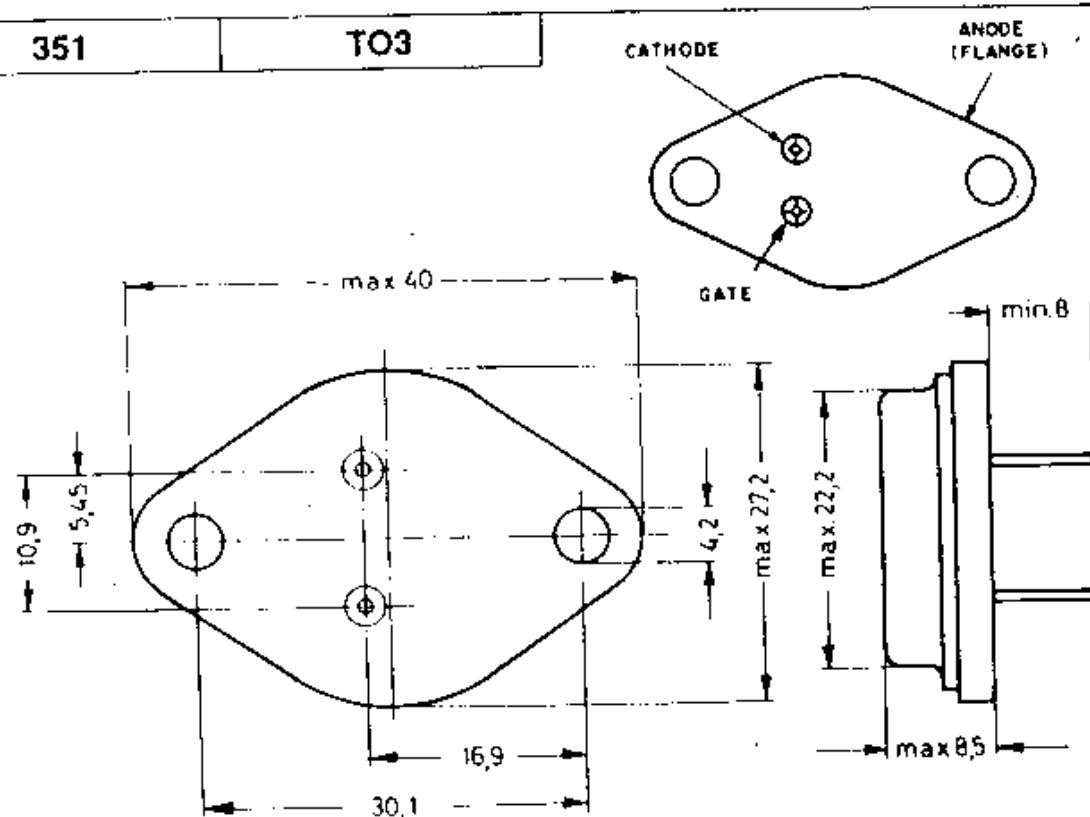
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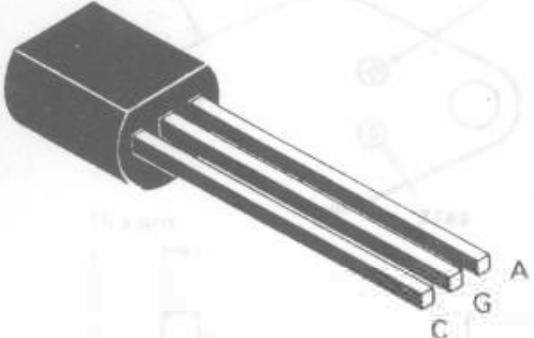
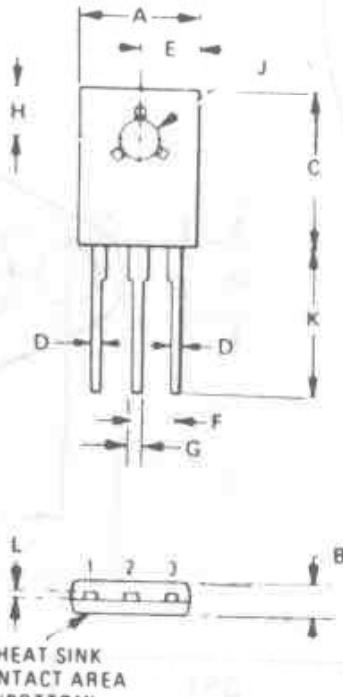
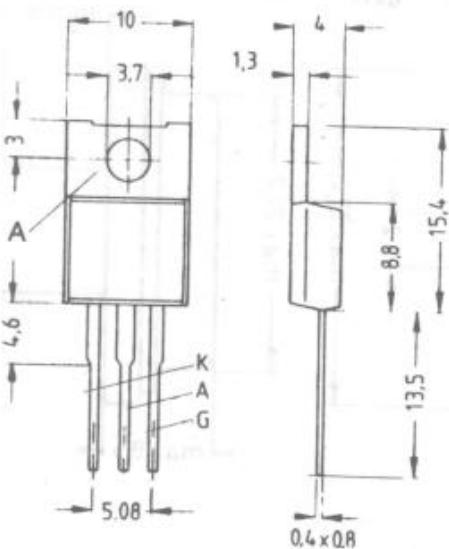
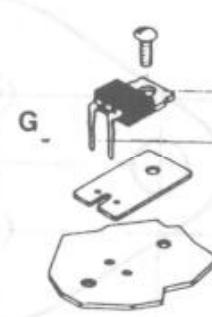
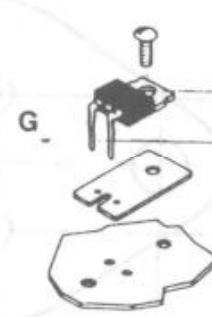
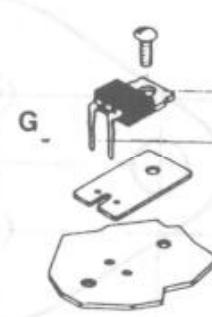


**351**

**TO3**



## Thyristors

<b>352</b> 	<b>-TO92</b> 																																																																	
<b>353</b> 	<b>TO126</b> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; width: fit-content;"> <thead> <tr> <th style="text-align: left; padding: 2px;">DIM</th> <th colspan="2" style="text-align: left; padding: 2px;">INCHES</th> <th colspan="2" style="text-align: left; padding: 2px;">MILLIMETERS</th> </tr> <tr> <th style="text-align: left; padding: 2px;">A</th> <th style="text-align: left; padding: 2px;">MIN</th> <th style="text-align: left; padding: 2px;">MAX</th> <th style="text-align: left; padding: 2px;">MIN</th> <th style="text-align: left; padding: 2px;">MAX</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">A</td><td style="padding: 2px;">0.270</td><td style="padding: 2px;">0.330</td><td style="padding: 2px;">6.860</td><td style="padding: 2px;">8.380</td></tr> <tr> <td style="padding: 2px;">B</td><td style="padding: 2px;">0.070</td><td style="padding: 2px;">0.130</td><td style="padding: 2px;">1.770</td><td style="padding: 2px;">3.300</td></tr> <tr> <td style="padding: 2px;">C</td><td style="padding: 2px;">0.390</td><td style="padding: 2px;">0.450</td><td style="padding: 2px;">9.910</td><td style="padding: 2px;">11.430</td></tr> <tr> <td style="padding: 2px;">D</td><td style="padding: 2px;">0.020</td><td style="padding: 2px;">0.026</td><td style="padding: 2px;">0.508</td><td style="padding: 2px;">0.660</td></tr> <tr> <td style="padding: 2px;">E</td><td style="padding: 2px;">0.150</td><td style="padding: 2px;">NOM</td><td style="padding: 2px;">3.810</td><td style="padding: 2px;">NOM</td></tr> <tr> <td style="padding: 2px;">F</td><td style="padding: 2px;">0.090</td><td style="padding: 2px;">TP</td><td style="padding: 2px;">2.290</td><td style="padding: 2px;">TP</td></tr> <tr> <td style="padding: 2px;">G</td><td style="padding: 2px;">0.025</td><td style="padding: 2px;">0.035</td><td style="padding: 2px;">0.635</td><td style="padding: 2px;">0.889</td></tr> <tr> <td style="padding: 2px;">H</td><td style="padding: 2px;">0.130</td><td style="padding: 2px;">0.175</td><td style="padding: 2px;">3.300</td><td style="padding: 2px;">4.450</td></tr> <tr> <td style="padding: 2px;">J</td><td style="padding: 2px;">0.115</td><td style="padding: 2px;">0.118</td><td style="padding: 2px;">2.910</td><td style="padding: 2px;">3.000</td></tr> <tr> <td style="padding: 2px;">K</td><td style="padding: 2px;">0.595</td><td style="padding: 2px;">0.655</td><td style="padding: 2px;">15.110</td><td style="padding: 2px;">16.650</td></tr> <tr> <td style="padding: 2px;">L</td><td style="padding: 2px;">0.015</td><td style="padding: 2px;">0.025</td><td style="padding: 2px;">0.381</td><td style="padding: 2px;">0.635</td></tr> </tbody> </table>	DIM	INCHES		MILLIMETERS		A	MIN	MAX	MIN	MAX	A	0.270	0.330	6.860	8.380	B	0.070	0.130	1.770	3.300	C	0.390	0.450	9.910	11.430	D	0.020	0.026	0.508	0.660	E	0.150	NOM	3.810	NOM	F	0.090	TP	2.290	TP	G	0.025	0.035	0.635	0.889	H	0.130	0.175	3.300	4.450	J	0.115	0.118	2.910	3.000	K	0.595	0.655	15.110	16.650	L	0.015	0.025	0.381	0.635
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<b>355</b> 	<b>TO220AA</b> 																																																																	

## Thyristors

<b>357</b>	<b>TO72</b>	<p>The diagram shows the TO72 package with three pins: anode (a), cathode (k), and cathodegate (kg). The top view indicates lead spacing of 2.54 mm and lead thickness of 0.48 mm. The side view shows lead length of 12.7 mm, lead thickness of 5.3 mm, and overall height of 4.8 mm.</p>	
<b>358</b>	<b>DIN41892</b>	<b>359</b>	<b>DIN41892</b>
<p>Diagram of DIN41892 assembly showing leads K and G. Lead K has a diameter of <math>\phi 6.5</math> and a thickness of 1.0. Lead G has a diameter of <math>\phi 4.1</math> and a thickness of 0.8. Total lead length is 180 <math>\pm</math> 5 mm.</p>	<p>Diagram of DIN41892 assembly showing leads K, G, HK, and A. Lead K has a diameter of <math>\phi 8.4</math> and a thickness of 1.2. Lead G has a diameter of <math>\phi 4.1</math> and a thickness of 0.8. Lead HK has a diameter of <math>\phi 10</math> and a thickness of 4.5. Lead A has a diameter of <math>\phi 10</math> and a thickness of 14. Total lead length is 180 <math>\pm</math> 5 mm.</p>		

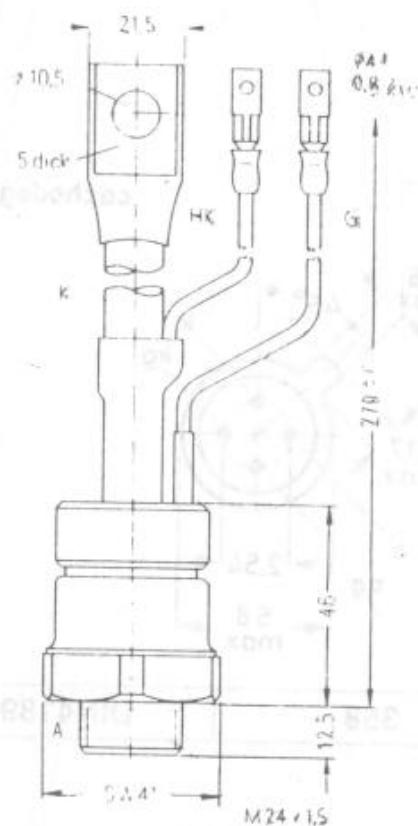
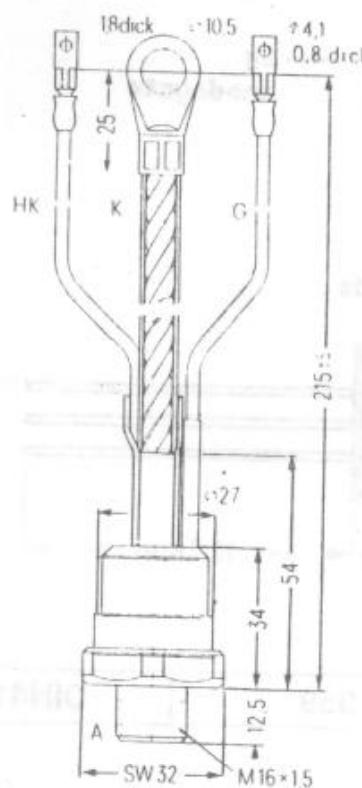
# Thyristors

360

DIN41893

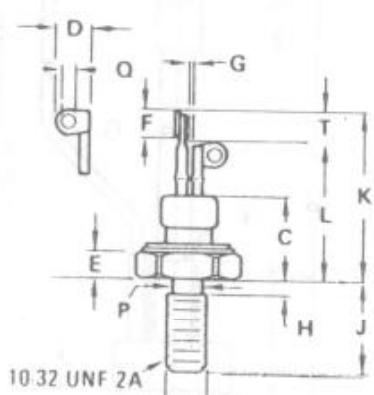
361

DIN41893



362

TO64



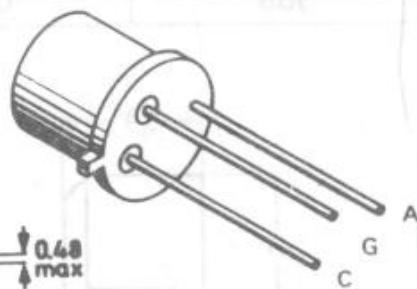
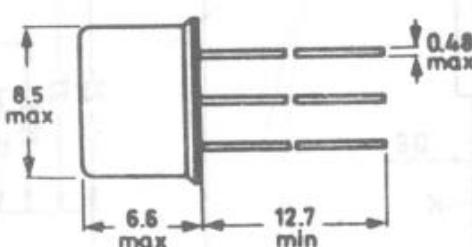
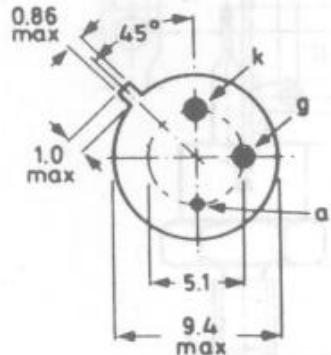
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	MIN	MAX	MIN	MAX
A	12.57	12.83	0.495	0.505
B	10.77	11.10	0.424	0.437
C	-	10.80	-	0.425
D	3.94	4.70	0.155	0.185
E	-	3.56	-	0.140
J	10.16	11.51	0.400	0.453
K	-	21.72	-	0.855
L	-	17.78	-	0.700
N	-	7.11	-	0.280
O	1.02	1.91	0.040	0.075

PIN 1 CATHODE  
2 GATE  
STUD ANODE

## Thyristors

364

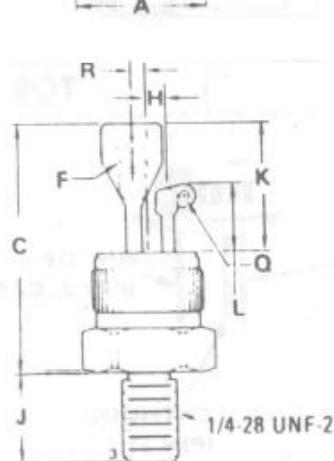
TO5



365

263-03

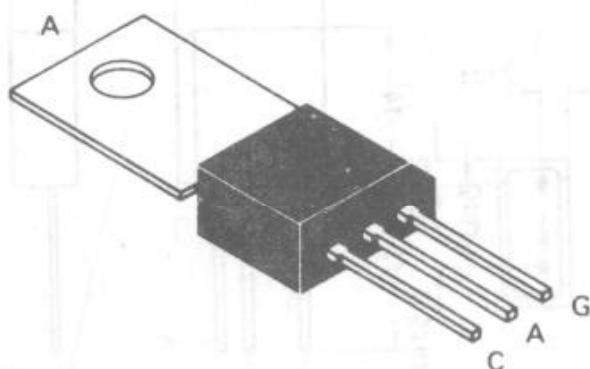
PIN 1. CATHODE  
2. GATE  
3. ANODE



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.34	15.60	0.604	0.614
B	14.00	14.20	0.551	0.559
C	26.67	30.23	1.050	1.190
F	3.43	4.06	0.135	0.160
H	2.29	REF	0.090	REF
J	10.67	11.56	0.420	0.455
K	15.75	17.02	0.620	0.670
L	7.62	8.89	0.300	0.350
O	1.40	2.16	0.055	0.085
R	1.65	REF	0.065	REF
T	12.73	12.83	0.501	0.505

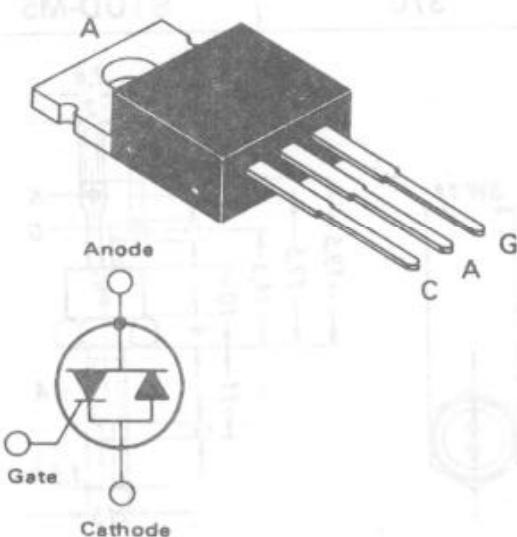
366

TO202



367

TO220AB



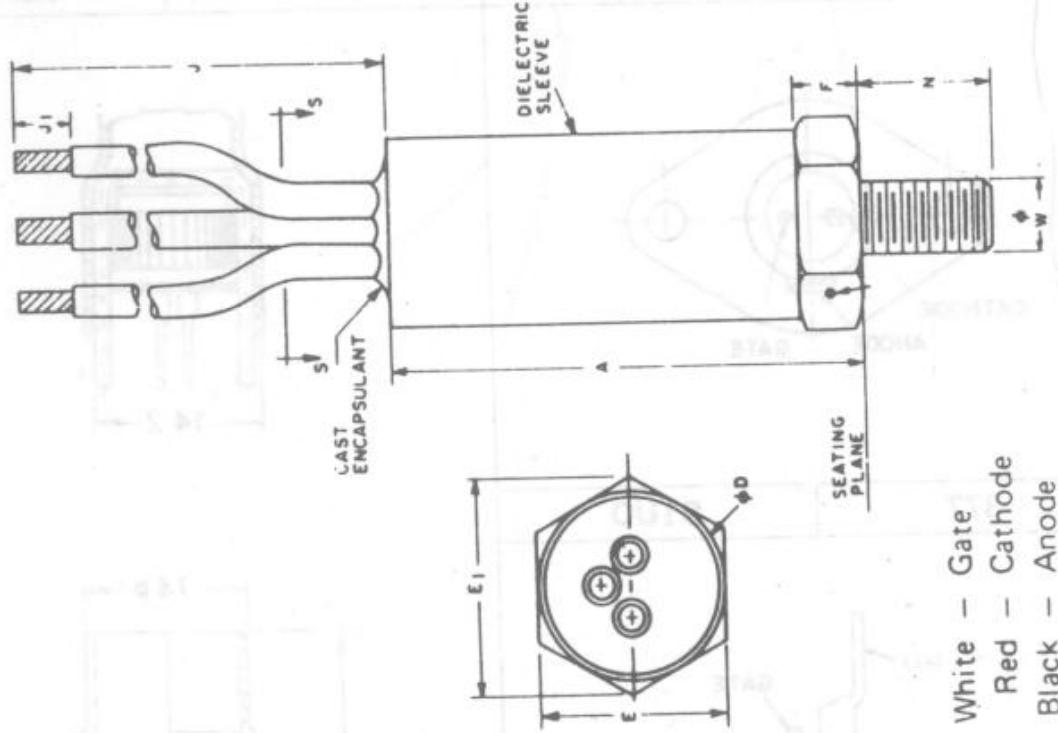
# Thyristors

368	CS06	371	STUD-M7
369	CS1		
370	STUD-M5	372	TO8
		373	ISO-TO48

# Thyristors

374

**ISO-STUD**

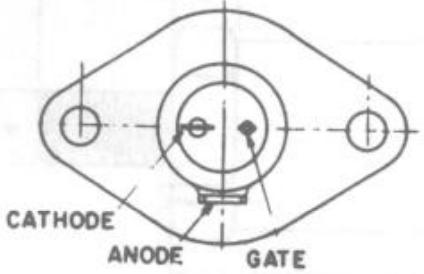
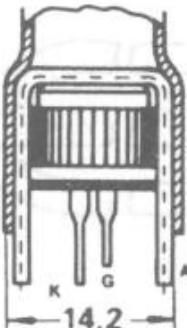
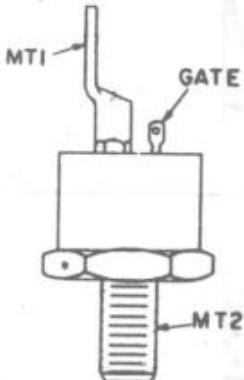
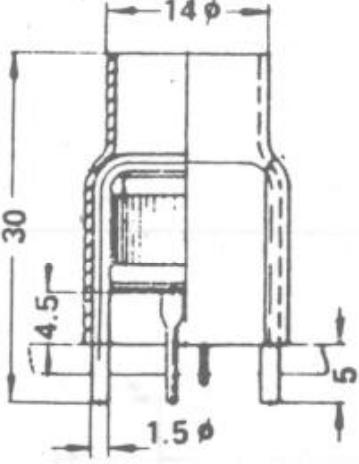
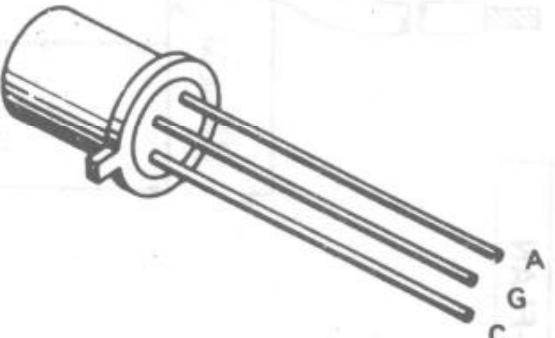
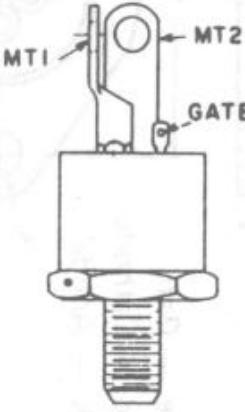
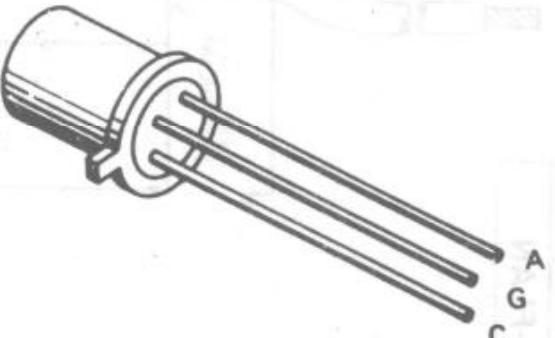


375

**ISO-FLAN**



## Thyristors

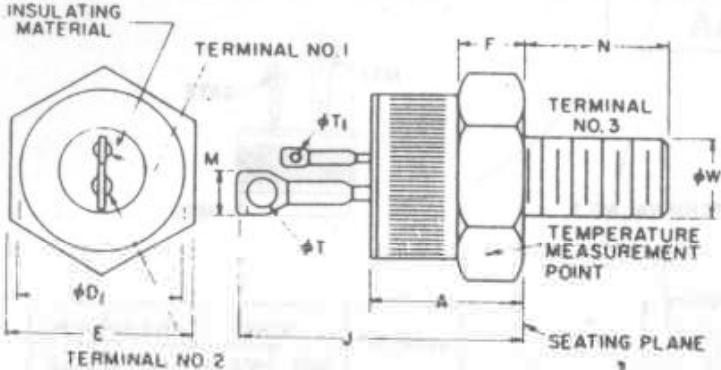
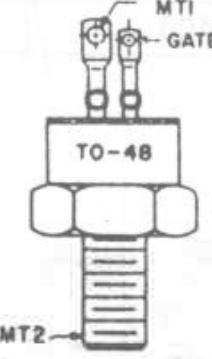
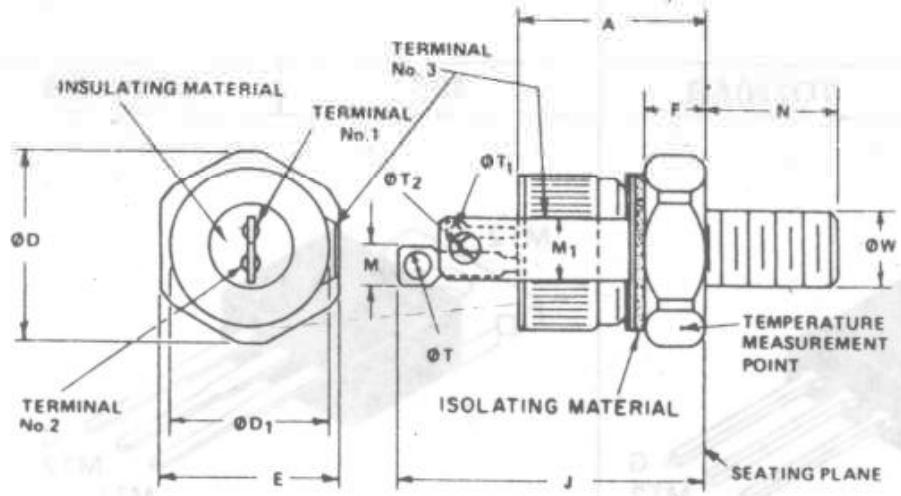
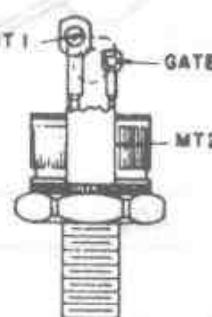
376	ISO-PRES	379	RD102
 <p>CATHODE ANODE GATE</p>			 <p>K G 14.2</p>
377	STUD		
 <p>MT1 GATE MT2</p>		 <p>14φ 30 4.5 1.5φ</p>	 <p>A G C</p>
378	ISO-STUD	380	TO18
 <p>MT1 MT2 GATE</p>		 <p>A G C</p>	

## 7.9 SƠ ĐỒ CHÂN TRIAC

### Triacs / Triacs

<b>400</b> 	<b>TO203AA</b> 	<table border="1"> <thead> <tr> <th rowspan="2">SYMBOL</th> <th colspan="2">INCHES</th> <th colspan="2">MILLIMETERS</th> </tr> <tr> <th>MIN.</th> <th>MAX.</th> <th>MIN.</th> <th>MAX.</th> </tr> </thead> <tbody> <tr> <td>G</td> <td>—</td> <td>0.380</td> <td>—</td> <td>9.65</td> </tr> <tr> <td><math>\phi D</math></td> <td>0.501</td> <td>0.510</td> <td>12.73</td> <td>12.95</td> </tr> <tr> <td><math>\phi D_1</math></td> <td>—</td> <td>0.505</td> <td>—</td> <td>12.83</td> </tr> <tr> <td><math>\phi D_2</math></td> <td>0.465</td> <td>0.475</td> <td>11.81</td> <td>12.07</td> </tr> <tr> <td>H</td> <td>0.825</td> <td>1.000</td> <td>20.95</td> <td>25.40</td> </tr> <tr> <td>M</td> <td>0.215</td> <td>0.225</td> <td>5.46</td> <td>5.71</td> </tr> <tr> <td><math>\phi T_1</math></td> <td>0.058</td> <td>0.068</td> <td>1.47</td> <td>1.73</td> </tr> <tr> <td><math>\phi T</math></td> <td>0.138</td> <td>0.148</td> <td>3.51</td> <td>3.75</td> </tr> </tbody> </table>	SYMBOL	INCHES		MILLIMETERS		MIN.	MAX.	MIN.	MAX.	G	—	0.380	—	9.65	$\phi D$	0.501	0.510	12.73	12.95	$\phi D_1$	—	0.505	—	12.83	$\phi D_2$	0.465	0.475	11.81	12.07	H	0.825	1.000	20.95	25.40	M	0.215	0.225	5.46	5.71	$\phi T_1$	0.058	0.068	1.47	1.73	$\phi T$	0.138	0.148	3.51	3.75
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<b>402</b> 	<b>TO220AB</b> 	<b>406</b> 	<b>TO202AB</b> 																																																

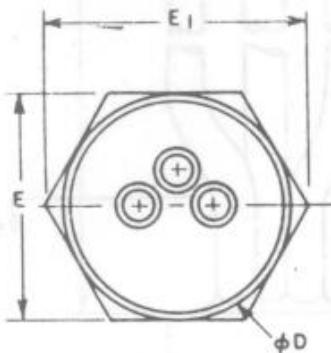
## Triacs / Triacs

404	TO48																																																																																																																																						
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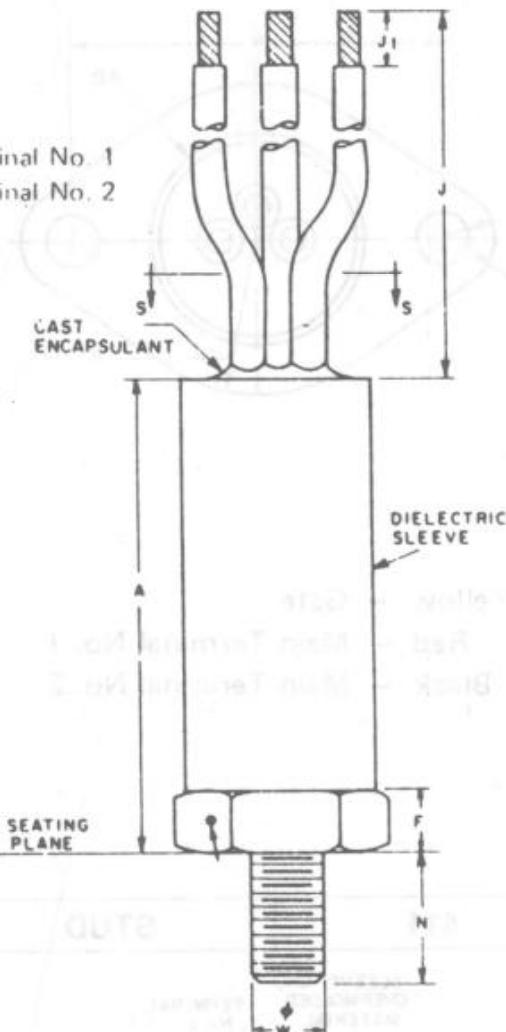
## Triacs / Triacs

**408**

**ISO-STUD**



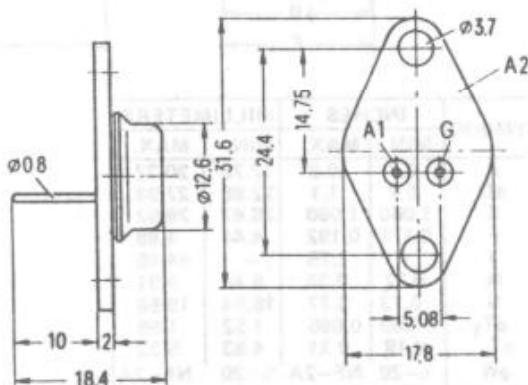
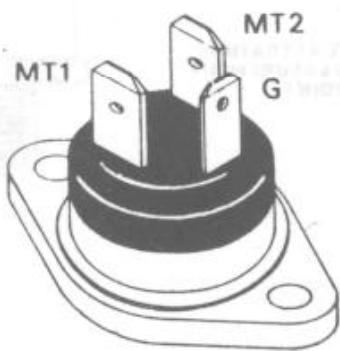
Yellow - Gate  
 Red - Main Terminal No. 1  
 Black - Main Terminal No. 2



Symbol	INCHES		MILLIMETERS	
	Min.	Max.	Min.	Max.
A	1.498	1.622	38.05	41.20
$\phi D$	0.619	0.629	15.72	15.98
E	0.677	0.683	17.20	17.35
$E_1$	0.745	0.755	18.92	19.17
F	0.117	0.123	2.97	3.12
J	-	6.500	-	165.10
$J_1$	0.125	0.500	3.17	12.70
N	0.430	0.450	10.92	11.43
$\phi W$	1/4-28	UNF-2A	1/4-28	UNF-2A

**407**

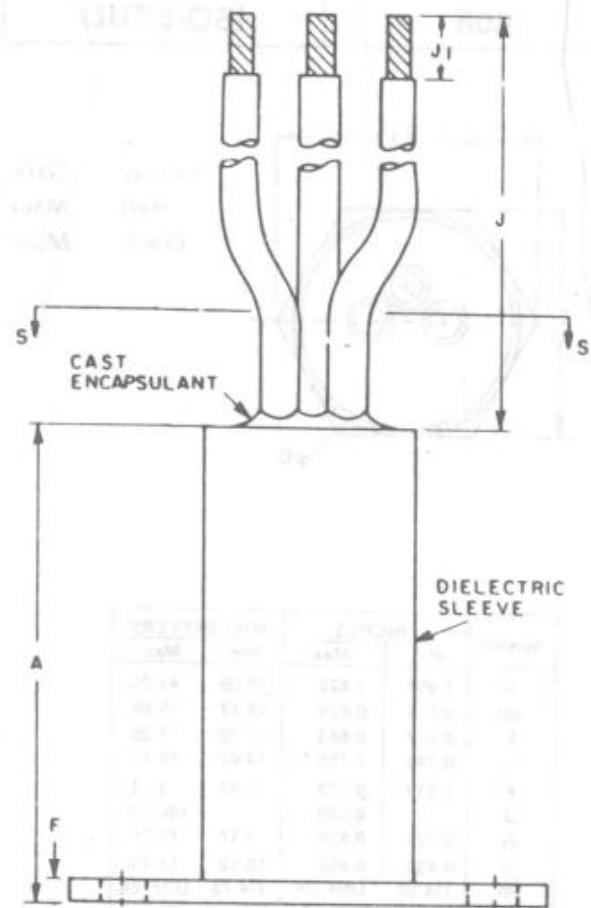
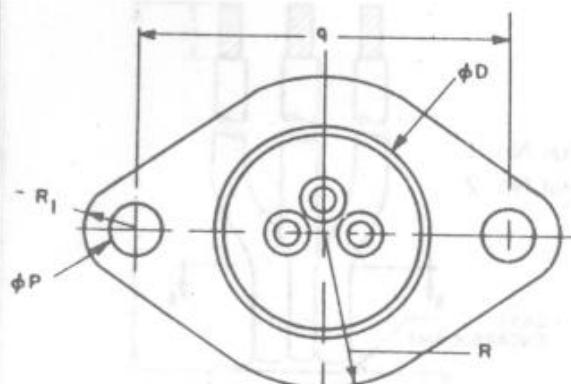
**ISO-RD101**



## Triacs / Triacs

**410**

**ISO-FLANG**



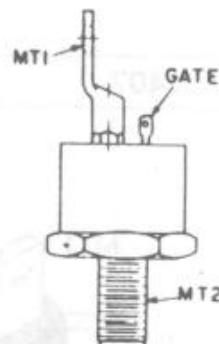
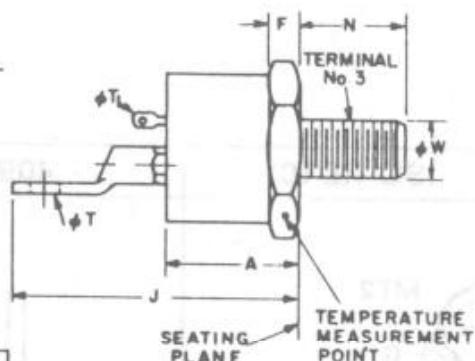
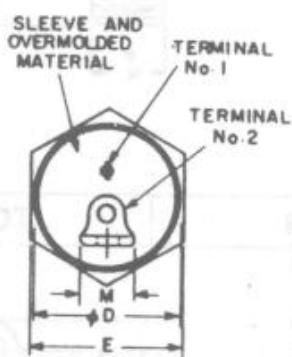
Yellow — Gate

Red — Main Terminal No. 1

Black — Main Terminal No. 2

**411**

**STUD**

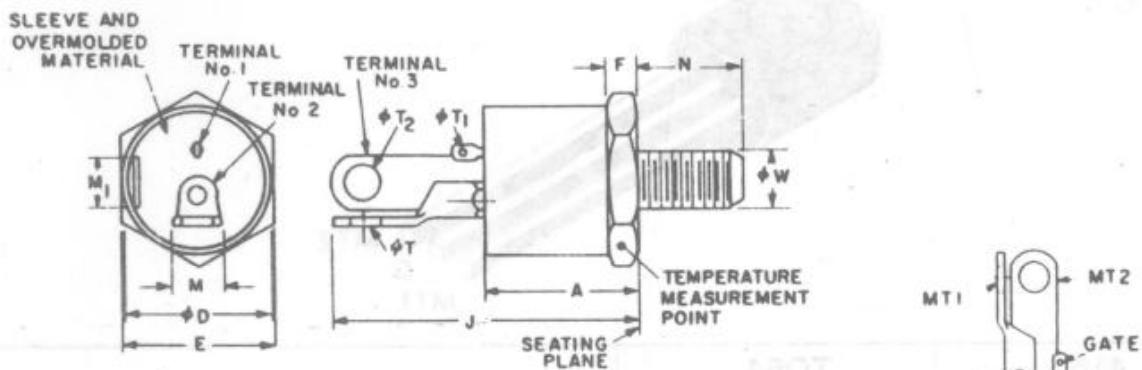


SYMBOL	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.7	0.8	17.78	20.32
$\phi D$	0.9	1.1	22.86	27.94
E	1.050	1.060	26.67	26.92
F	0.175	0.192	4.44	4.88
J	—	1.75	—	44.45
M	0.37	0.39	9.40	9.91
N	0.73	0.77	18.54	19.56
$\phi T_1$	0.060	0.065	1.52	1.65
$\phi T_2$	0.19	0.21	4.83	5.33
$\phi W$	1/20	NF-2A	1/20	NF-2A

# Triacs / Triacs

**412**

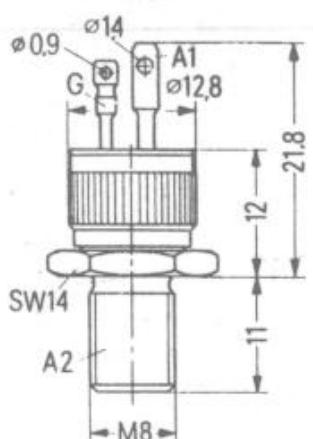
**ISO-STUD**



SYMBOL	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.8	1.0	20.32	25.4
$\phi D$	0.9	1.1	22.86	27.94
E	1.050	1.060	26.67	26.92
F	0.175	0.192	4.44	4.88
J	—	1.9	—	48.26
M	0.37	0.39	9.40	9.91
M <sub>1</sub>	0.37	0.39	9.40	9.91
N	0.73	0.77	18.54	19.56
$\phi T_1$	0.060	0.065	1.52	1.65
$\phi T$	0.19	0.21	4.83	5.33
$\phi T_2$	0.19	0.21	4.83	5.33
$\phi W$	½-20	NF-2A	½-20	NF-2A

**413**

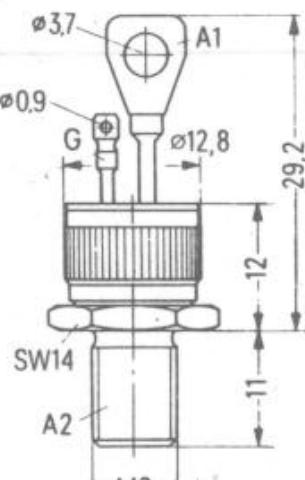
**STUD-M8**



A1 Anode 1  
 A2 Anode 2 (Gehäuse)  
 G Steueranschluß

**414**

**STUD-M8**

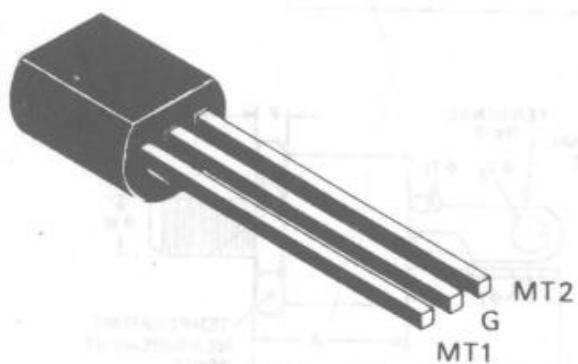


A1 Anode 1  
 A2 Anode 2 (Gehäuse)  
 G Steueranschluß

## Triacs / Triacs

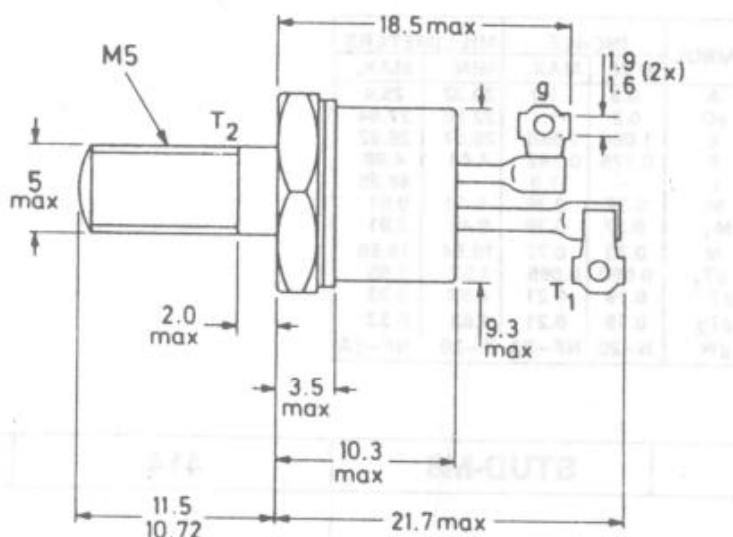
415

TO92



416

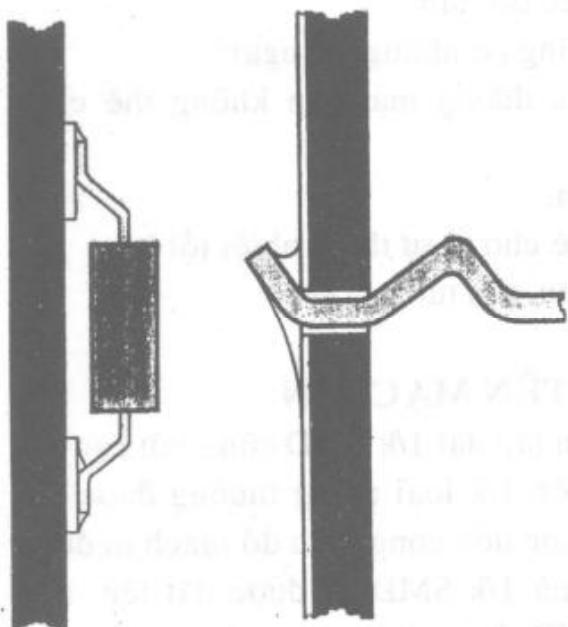
TO64



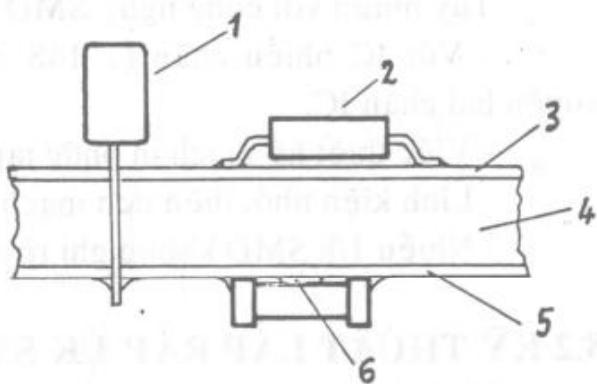
## 8. KỸ THUẬT LẮP ĐẶT BỀ MẶT SMD

### 8.1 ĐẠI CƯƠNG

Với kỹ thuật lắp đặt bề mặt (SMD-Surface-Mounted-Devices), điện trở, tụ điện, diốt, transistor, ICs ... được lắp đặt trực tiếp trên mạch in, chân linh kiện không cần đâm xuyên qua lỗ mạch in và hàn với mạch in ở mặt bên kia như các loại linh kiện trước đây (H.8.1.2). Mạch in phải dày khoảng từ 0,8 đến 1mm. Kỹ thuật SMD ban đầu được sử dụng trong kỹ thuật cao cấp với mạch lai trên những tấm gỗ từ những năm 70. Người ta tính trong năm 1990 50% 1/k được sử dụng là linh kiện (1/k) SMD.



H.8.1.1



H.8.1.2

1. Linh kiện thông thường

2. SMD

3. Đường mạch In

4. Tấm mạch In

5. Đường mạch In

6. Keo

Kỹ thuật SMD có những ưu điểm:

- Mạch điện trên mạch in nhỏ hơn (có thể tới 70%) và thiết bị điện tử cũng nhỏ hơn.

- Bỏ qua các công đoạn như với 1/k thông thường khi lắp ráp như cắt chân, uốn chân 1/k.

- Bỏ chân nối 1/k sức bền cơ học được gia tăng (chống lại sự rung ...)

- Giá tiền chuyên chở và cất giữ 1/k ít hơn.

- Trong công đoạn làm mạch in: Hầu hết không cần phải khoan lỗ.

- Lúc sản xuất hàng loạt xác xuất hư hỏng lúc lắp ráp 1/k bé hơn (v.d. với 1/k thông thường chân IC không đâm trúng vào lỗ mạch in, bị cong...) Hiện nay có những máy lắp ráp SMD tự động với vận tốc từ khoảng 30.000 đến 360.000 SMD trong 1 giờ. Giá tiền lắp ráp linh kiện giảm còn  $\frac{1}{2}$  đến 1/5.

- Với đường mạch in ngắn và linh kiện không có chân hay chân rất ngắn ta có nhiều ưu điểm hơn trong lĩnh vực cao tần.

Tuy nhiên với công nghệ SMD ta cũng có những trở ngại:

- Với IC nhiều chân (... 148 chân), đường mạch in không thể chạy xuyên hai chân IC.

- Việc thiết kế mạch in phức tạp hơn.

- Linh kiện nhỏ, diện tích mạch in bé cho ta sự thoát nhiệt tồi hơn.

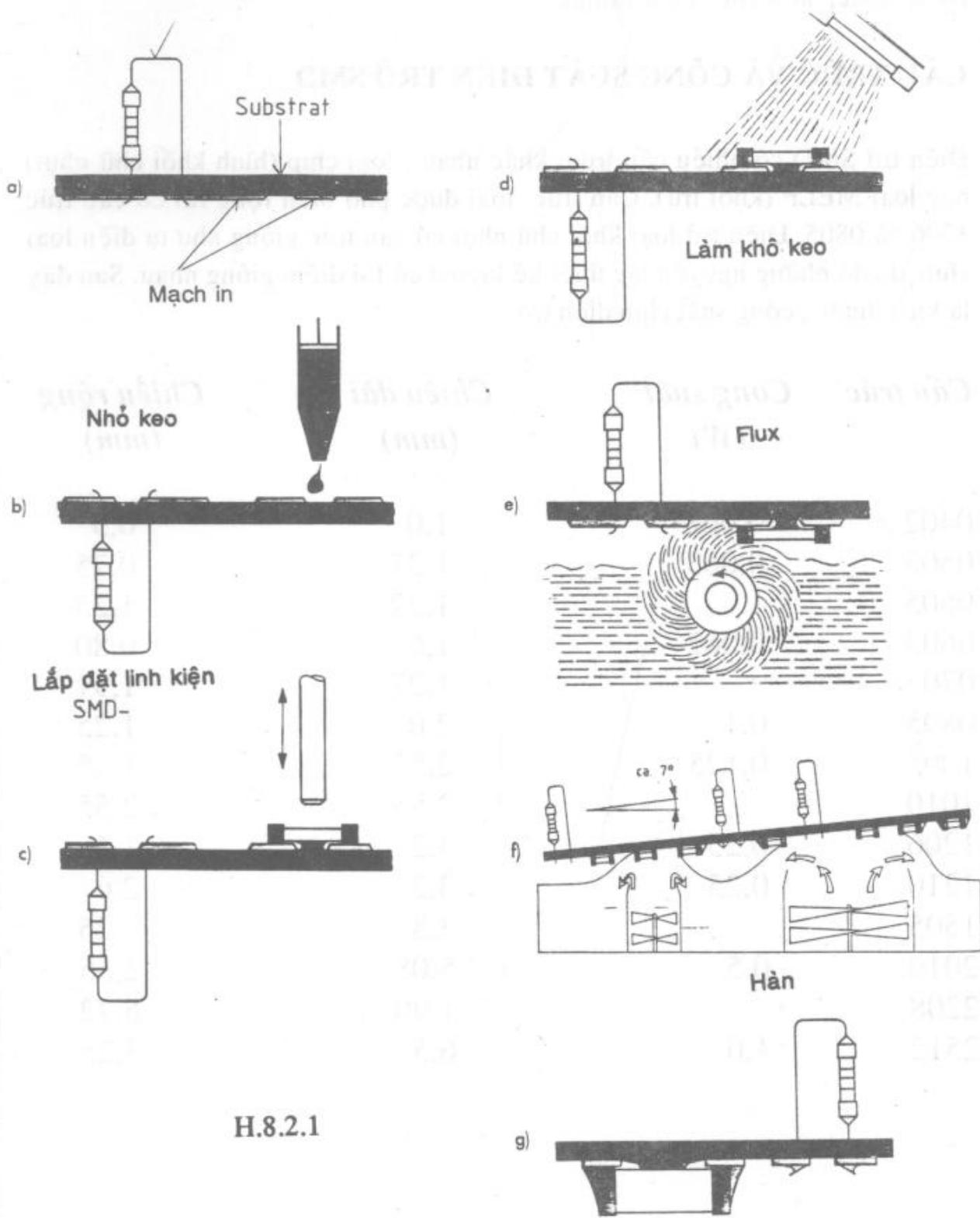
- Nhiều 1/k SMD không ghi rõ số liệu, tên tuổi.

## 8.2 KỸ THUẬT LẮP RÁP 1/K SMD TÊN MẠCH IN

Hình 8.2.1 cho ta thấy các công đoạn lắp đặt 1/k SMD cùng với các 1/k thông thường trên cùng 1 mạch in. Đầu tiên 1/k loại thông thường được lắp tay hay tự động. Khúc cuối của chân 1/k được uốn cong. Sau đó mạch in được lật lại, keo được nhỏ giọt vào các vị trí mà 1/k SMD sẽ được đặt lên, keo được làm khô với sức nóng. Linh kiện SMD được dán cứng với mạch in để sau đó qua quá trình hàn với bể hàn sóng.

Trong kỹ thuật Reflow, trước hết với kỹ thuật in lưới hay nhỏ giọt người ta cho một loại kem có thiếc hàn trên vị trí mạch in cần hàn. Các hạt thiếc hàn trong kem có đường kính khoảng  $70\mu\text{m}$ . Sau đó trong giai đoạn hàn, ta đưa nhiệt độ lên khoảng  $215^\circ\text{C}$ , luồng khí nóng bằng không khí hay nitơ ...

Nếu ta tự lắp đặt linh kiện SMD từng cái, trước hết ta chấm một ít thiếc vào vị trí muốn hàn trên mạch in. Dùng một cái gấp thông thường hay ống hút chân không đặt linh kiện lên và hàn tiếp (H.8.2.2). Mỏ hàn phải có



H.8.2.1

công suất > 15W. Thiếc hàn có đường kính khoảng 0,5mm và loại Sn60PbCu<sub>2</sub> (60% thiếc, 38% chì và 2% đồng).

## CẤU TRÚC VÀ CÔNG SUẤT ĐIỆN TRỞ SMD

Điện trở SMD có nhiều cấu trúc khác nhau : loại chip (hình khối chữ nhật) hay loại MELF (khối trụ). Cấu trúc loại được phổ biến rộng rãi có cấu trúc 1206 và 0805. Điện trở loại khối chữ nhật có cấu trúc giống như tụ điện loại chip, do đó những nguyên tắc thiết kế layout có lợi điểm giống nhau. Sau đây là kích thước , công suất chip điện trở

<i>Cấu trúc</i>	<i>Công suất</i> (W)	<i>Chiều dài</i> (mm)	<i>Chiều rộng</i> (mm)
0402	0,063	1,0	0,5
0503	0,063	1,27	0,75
0505		1,27	1,25
0603	0,062	1,6	0,80
0705		1,27	1,91
0805	0,1	2,0	1,25
1005	0,125	2,55	1,25
1010		2,55	2,55
1206	0,25	3,2	1,6
1210	0,25	3,2	2,6
1505		3,8	1,25
2010	0,5	5,08	2,55
2208		4,90	5,72
2512	1,0	6,5	3,25

## 8.3 LINH KIỆN SMD

### ĐIỆN TRỞ

- Loại 5% và 2%

R	Ký hiệu
0	000
1,0 ... 9,1	XRX
10 ... 91	XXR
100 ... 10M	XXX

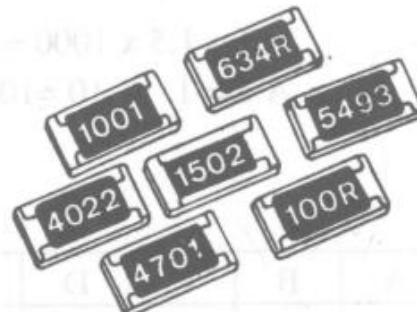
Số thứ ba là số con số không

$$\text{V.D } 474 = 470 \Omega$$



- Loại 1%

R	Ký hiệu
100 Ω ... 988 Ω	XXXR
1 kΩ ... 1MΩ	XXX
Số thứ tư là số con số không	
V.D 1004 = 1MΩ	



- Loại MELF

Loại điện trở có vỏ MELF được ghi trị số theo các vạch màu như điện trở thông thường.



### TỤ ĐIỆN:

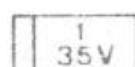
Tụ gốm : Tụ gốm SMD có trị số từ 0,47pF đến  $\mu\text{F}$ . Trị số không được ghi trên linh kiện.

Tụ Tantal : Trị số điện dung từ 0,1 $\mu\text{F}$  ....

68 $\mu\text{F}$ . Ký hiệu : XXX

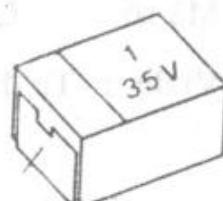
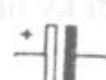
Số thứ ba là số con số không.

$$\text{V.D : } 224 = 220000\text{pF} = 0,22\mu\text{F}$$



SMD-Tantal-Elko

Một vạch trắng hay chữ M cho biết điện cực + .



### 8.3 LINH KIỆN SMD

Ngoài ra cho điện trở và tụ điện, người ta còn dùng cách mã hóa bằng hai dấu hiệu gồm một mẫu tự và một con số. Mẫu tự cho ta trị số hiện dụng và con số cho số con số không đứng sau số hiệu dụng. Trị số xác định số pF cho tụ điện và  $\Omega$  cho điện trở. Sau đây là hai bảng cho ta trị số của mẫu tự và con số đứng sau nó:

Ví dụ :

$$E \ 3 = 1,5 \times 1000 = 1500 \text{ pF} \text{ hay là } 1500 \Omega$$

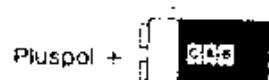
$$A \ 1 = 1 \times 10 = 10 \text{ pF} \text{ hay là } 10 \Omega$$

A	B	C	D	E	F	G	H	J	K	L
I	1,1	1,2	1,3	1,5	1,6	1,8	2	2,2	2,4	2,7
M	N	P	Q	R	S	T	U	V	W	X
3	3,3	3,6	3,9	4,3	4,7	5,1	5,6	6,2	6,8	7,5
Y	Z	a	b	d	e	f	m	n	t	y
8,2	9,1	2,5	3,5	4	4,5	5	6	7	8	9

0	1	2	3	4	5	6	7	8	9
$10^0$	$10^1$	$10^2$	$10^3$	$10^4$	$10^5$	$10^6$	$10^7$	$10^8$	$10^{-1}$

Đối với tụ điện , mẫu tự đầu tiên cho ta trị số điện thế.

Volt	4	6,3	10	16	20	25	35
Mã số	G	J	A	C	D	E	V



Ví dụ : Tụ điện với ký hiệu CA6 có điện dung 1,0  $\mu\text{F}$  - 16 V

## KÝ HIỆU MÃ SMD DIÓT VÀ TRANSISTOR

A	BAT 14-098	SOD 123	68	A2	CFY 30	SOT 143	112
A	MFR 947	SOT 323		A2	SMBD 2836	SOT 23	80
AA	BCW 60 A	SOT 23		A3	SMBD 2835	SOT 23	80
AA	BCX 51	SOT 89		A4	BB 404 A	TO 236	72
AAR	2SA 1415R	SOT 89		A4	SMBD 2838	SOT 23	79
AB	BCX 51-6	SOT 89		A5	SMBD 2837	SOT 23	79
AB	BCW 60 B	SOT 23		A6	BAS 16	SOT 23	
ABR	2SA 1461R	SOT 89		A7	BAV 99	SOT 23	
AC	BCW 60 C	SOT 23		A8	BAS 19	SOT 23	
AC	BCX 51-10	SOT 89		A51	BRY 62	SOT 143	
ACR	2 SA 1471R	SOT 89		A61	BAS 28	SOT 143	
ACS	2 SA 1471 S	SOT 89		A81	BAS 20	SOT 23	
AD	BCX 51-16	SOT 89		A82	BAS 21	SOT 23	
AD	BCX 51-60	SOT 89		A91	BAS 17	SOT 23	
AD	BCW 60 D	SOT 23		AR1	BSP 40	SOT 223	
ADR	2 SA 1418 R	SOT 89		AR1	BSR 40	SOT 89	
AE	BCX 52	SOT 89		AR2	BSR 41	SOT 89	
AE	BCP 52	SOT 89		AR3	BSR 42	SOT 89	
AER	2 SA 1419R	SOT 89		AR4	BSR 43	SOT 89	
AF	BCX 52-6	SOT 89		AS1	BSP 50	SOT 223	
AF	BCW 60 FF	SOT 23		AS1	BST 50	SOT 89	
AG	BCX 52-10	SOT 89		AS2	BSP 51	SOT 223	
AG	BCX 70 G	SOT 23		AS3	BSP 52	SOT 223	
AH	BCP 53	SOT 223		AS3	BST 52	SOT 89	
AH	BCX 53	SOT 89		AT1	BST 39	SOT 89	
AH	BCX 70 H	SOT 23		AT2	BST 40	SOT 89	
AJ	BCX 53-6	SOT 89		B	BAT 15-098	SOD 123	68
AJ	BCX 70 J	SOT 23		B	2 SK 1068	SOT 23	
AK	BCX 53-10	SOT 89		B	MFR 957	SOT 23	
AK	BCX 70 K	SOT 23		B2	BSV 52	SOT 23	
AL	BCP 53-16	SOT 223		B26	BF 570	SOT 23	88
AL	BCX 53-16	SOT 89		B4	BB 404 B	TO 236	72
AM	BCP 52-16	SOT 89		B4	BSV 52 R	SOT 23	
AM	BCX 52-16	SOT 89		B5	BSR 12	SOT 23	
AM	BSS 64	SOT 23		B81	BSR 12 R	SOT 23	
AN	BCW 60 FN	SOT 23		BA	BCW 61 A	SOT 23	
AO	BCW 60 AR	SOT 23		BA	BCX 54	SOT 89	
AP	BCW 60 BR	SOT 23		BB	BCW 61 B	SOT 23	
AR	BCW 60 CR	SOT 23		BB	BCX 54-6	SOT 89	
AS	BCW 60 DR	SOT 23		BC	BCW 61 C	SOT 23	
AS	BAT 18-05	SOT 23	79	BC	BCX 54-10	SOT 89	
AT	BAT 18-06	SOT 23	80	BCP 28	BCP 28	SOT 223	85
AU	BAT 18-04	SOT 23	78	BCP 29	BCP 29	SOT 223	85
AU	BCX 70 GR	SOT 23		BCP 48	BCP 48	SOT 223	85
AW	BCX 70HR	SOT 23		BCP 49	BCP 49	SOT 223	86
AX	BCX 70 JR	SOT 23		BCP 68	BCP 68	SOT 223	87
AY	BCX 70 KR	SOT 23		BCP 69	BCP 69	SOT 223	87
A1	BAW 56	SOT 23		BD	BCW 54-16	SOT 89	
A1	BAW 56 W	SOT 323		BD	BCW 61 D	SOT 23	
A2	BAT 18	SOT 23		BE	BCW 55	SOT 89	
A3	BAT 17	SOT 23		BE	BCX 55	SOT 89	
A4	BAV 70	SOT 23		BF	BCX 55-6	SOT 89	
A5	BRY 61	SOT 23		BF	BCW 61 FF	SOT 23	
A6	BAS 16 W	SOT 323		BF 720	BF 720	SOT 223	87
A1	CFY 19-18		65/110	BF 721	BF 721	SOT 223	87
A2	CFY 19-22		65/110				

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

BF 722	BF 722	SOT 223	87	C7	CFY	25-23	66/111
BF 723	BF 723	SOT 223	87	C7	BCF 29	SOT 23	
BN 36	BN 36	SOT 223	87	C77	BCF 29 R	SOT 23	
BN 37	BN 37	SOT 223	87	C8	BCF 30	SOT 23	
BN 38	BN 38	SOT 223	87	C9	BCF 30 R	SOT 23	
BN 39	BN 39	SOT 223	87	C91	BCV 62	SOT 143	
BG	BCX 55-10	SOT 89		C92	BCV 62 A	SOT 143	
BG	BCX 71 G	SOT 23		C93	BCV 62 B	SOT 143	
BH	BCX 56	SOT 89		C94	BCV 62 C	SOT 143	
BD	BCW 61 D	SOT 23		CA	BCX 68	SOT 89	
BH	BCX 71 H	SOT 23		CA	BB 510	TO 236	73
BJ	BCX 56-6	SOT 89		CAC	BCX 868	SOT 89	
BJ	BCX 71 J	SOT 23		C8	BCX 68-10	SOT 89	
BK	BCP 56-10	SOT 223		CC	BCX 68-16	SOT 89	
BK	BCX 56-10	SOT 89		CC	BF 554	SOT 23	
BK	BCX 71 K	SOT 23		CD	BCX 68-25	SOT 89	
BL	BCX 55-16	SOT 89		CD	BSS 81 B	SOT 23	
BM	BCX 56-16	SOT 89		CE	BCX 69	SOT 23	
BM	BSS 63	SOT 23		CE	BSS 79 B	SOT 23	
BN	BCW 61 FN	SOT 23		CEC BC	869	SOT 89	
BO	BCW 61 AR	SOT 23		CF	BCX 69-10	SOT 89	
BP	BCW 61 BR	SOT 23		CF	BSS 79 C	SOT 23	
BR	BCW 61 CR	SOT 23		CG	BCX 69-16	SOT 89	
BS	BCW 61 DR	SOT 23		CG	BSS 81 C	SOT 23	
BSP 50	BSP 52	SOT 223	87	CH	BCX 81 C	SOT 23	
BSP	BSP 51	SOT 223	87	CH	BSS 80 B	SOT 23	
BSP 50	BSP 50	SOT 223	87	CJ	BSS 80 C	SOT 23	
BSP 60	BSP 60	SOT 223	87	CL	BSS 82 B	SOT 23	
BSP 61	BSP 61	SOT 223	87	CM	BSS 82 C	SOT 23	
BSP 62	BSP 62	SOT 223	87	D1	BCW 31	SOT 23	
BU	BCX 71 GR	SOT 23		D2	BCW 32	SOT 23	
BW	BCX 71 HR	SOT 23		D3	BCW 33	SOT 23	
BX	BCX 71 JR	SOT 23		D4	BCW 31 R	SOT 23	
BY	BCX 71 KR	SOT 23		D4	BB 404 D	TO 236	72
BR1	BSP 30	SOT 223		D5	BCW 32 R	SOT 23	
BR1	BSR 30	SOT 89		D6	BCW 33 R	SOT 23	
BR2	BSP 31	SOT 223		D7	BCF 32	SOT 23	
BR2	BSR 31	SOT 89		D77	BCF 32 B	SOT 23	
BR3	BSR 32	SOT 89		D8	BCF 33	SOT 23	
BR4	BSR 33	SOT 89		D81	BCF 33 R	SOT 23	
BS1	BSP 60	SOT 223		D91	BCV 61	SOT 143	
BS1	BST 60	SOT 89		D92	BCV 61 A	SOT 143	
BS2	BSP 61	SOT 223		D93	BCV 61 B	SOT 23	
BS2	BST 61	SOT 89		D94	BCV 61 C	SOT 143	
BS3	BSP 62	SOT 223		DA	BF 622	SOT 89	
BS3	BST	SOT 89		DA	BCW 67 A	SOT 23	
BT1	BST 15	SOT 89		DB	BCW 67 B	SOT 23	
BT2	BST 16	SOT 89		DB	BF 623	SOT 89	
C1	BCW 29	SOT 23		DC	BCW 67 C	SOT 23	
C2	BCW 30	SOT 23		DC	BF 620	SOT 89	
C3	SMBT 4126	SOT 23	88	DC	BFN 20	SOT 89	
C4	BB404 C	TO 236	72	DD	BFN 16	SOT 89	
C4	BCW 29 R	SOT 23		DE	BFN 18	SOT 89	
C5	BCW 30 R	SOT 23		DF	BCW 68 F	SOT 23	
C5	CFY 25-17			DF	BF 621	SOT 89	
C6	CFY 25-20			DF	BFN 21	SOT 89	

# KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

DG	BCW 68 G	SOT 23		FK	BFN 25	SOT 23		
DG	BFN 17	SOT 89		FL	BFN 27	SOT 23		
DH	BCW 68 H	SOT 23		G	BAR 63-03 W	SOD 323		
DH	BFN 19	SOT 89		G1	BFS 20	SOT 23		
DK	BCX 42	SOT 23		G2	BF 55	SOT 23		
DT	BCW 67 AR	SOT 23		G2	CGY 50	SOT 143		
DU	BCW 67 BR	SOT 23		G3	BF 536	SOT 23		
DW	BCW 67 CR	SOT 23		G4	BFS 20 B	SOT 23		
DX	BCW 68 FR	SOT 23		G5	BF 550 R	SOT 23		
DZ	BCW 68 GR	SOT 23		G6	BF 569	SOT 23		
E	BAT 66	SOT 223		G61	BF 569 R	SOT 23		
E1	BFS 17	SOT 23		G7	BF 579	SOT 23		
E2	BFS 17 A	SOT 23		G8	BF 660	SOT 23		
E4	BFS 17 R	SOT 23		G81	BF 660 R	SOT 23		
E4	BB 404 E	TO 236	72	G9	BF 767	SOT 23		
E5	BFS 17 AR	SOT 23		GA	BAW 78 A	SOT 89		
EA	BCW 65 A	SOT 23		GB	BAW 78 B	SOT 89		
EB	BCW 65 B	SOT 23		GC	BAW 78 C	SOT 89		
EC	BCW 65 C	SOT 23		GD	BAW 78 D	SOT 89		
ED	BCV 28	SOT 89		GE	BAW 79 A	SOT 89		
EE	BCV 48	SOT 89		GE	BFR 35 AP	SOT 23		
EF	BCV 209	SOT 89		GF	BAW 79 B	SOT 89		
EF	BCW 66 F	SOT 23		GF	BFR 92 P	SOT 23		
EG	BCV 49	SOT 89		GG	BAW 79 C	SOT 89		
EG	bcw 66 g	SOT 23		GG	BFR 93 P	SOT 23		
EH	BCW 66 H	SOT 23		GH	BAW 79 D	SOT 23		
EK	BCX 41	SOT 23		grün	BB 240	SOD 80	97	
ET	BCW 65 AR	SOT 23		H	BBY 51-0,3 W	SOT 3223	69	
EU	BCW 65 BR	SOT 23		H1	BCW 69	SOT 23		
EW	BCW 65 CR	SOT 23		H2	BCW 70	SOT 23		
EX	BCW 66 FR	SOT 23		H3	BCW 89	SOT 23		
EY	BCW 66 GR	SOT 23		H31	BCW 89 R	SOT 23		
EZ	BCW 66 HR	SOT 23		H4	BCW 69 R	SOT 23		
F2	BFS 19	SOT 23		H5	BCW 70 R	SOT 23		
F3	BF 840	SOT 23		H7	BCF 70	SOT 23		
F31	BF 841	SOT 23		H71	BCF 70 R	SOT 23		
F5	BFS 19 R	SOT 23		HA	CFY 65-12	Micro-X	111	
F6	BGQ 19 S	SOT 89		HB	CFY 75-13	MW-4	107	
F8	BF 824	SOT 23		HB	BFN 22	SOT 23		
FA	BFP 81	SOT 143		HC	BFN 23	SOT 23		
FA	BFQ 17	SOT 89		HC	VFY 75-15	MW-4	107	
FB	BFP 17	SOT 143		I	BBY 52-03 W	SOT 323	69	
FB	BFQ 19	SOT 89		JA	BAT 74	SOT 23	95	
FC	BFP 29	SOT 143		JA	BAV 74	SOT 23		
FC	BFQ 64	SOT 89		JB	BAR 74	SOT 23		
FD	BFP 35 A	SOT 143		JB	BAR 74	SOT 23		77
FD	BFQ 17 P	SOT 89		JC	BAL 74	SOT 23		
FD	BCV 26	SOT 23		JO	BAW 56	SOT 23		
FE	BFP 93 A	SOT 143		JE	BAV 99	SOT 23		
FE	BFQ 19 P	SOT 89		JF	BAL 99	SOT 23		
FE	BCV 46	SOT 23		JG	BAR 99	SOT 23		
FF	BCV 27	SOT 23		JG	BAR 99	SOT 23		
FF	BFQ 18 A	SOT 89		JJ	BAV 70	SOT 23		71
FG	BCV 47	SOT 23		JP	BAW 101	SOT 143	74	
FH	BFN 24	SOT 23		JP	BAS 19	SOT 23		
FJ	BFN 26	SOT 23		JR	BAS 20	SOT 23		

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

JS	BAS 21	SOT 23		LS	BF 770 A	SOT 23		
JS	BAW 100	SOT 143	83	M1	BFR 30	SOT 23		
JT	BAS 28	SOT 143		M2	BFR 31	SOT 23		
JV	BAS 116	SOT 23	77	M3	BFR 46	SOT 23		
JX	BAV 170	SOT 23	79	M31	BSD 20	SOT143		
JY	BAV 199	SOT 23	78	M32	BSD 22	SOT143		
JZ	BAW 156	SOT 23	80	M4	BSR 56	SOT 23		
J 01	SO 2906 R			M5	BSR 57	SOT 23		
J 03	SO 2907 AR			M6	BSR 58	SOT 23		
J 05	SO 2907 R			M26	BF 908	SOT 143		
J 12	SO 2906 AR			M27	BF 908R	SOT 143R		
J 32	SO 5400 R			M28	BF 909	SOT 143		
J 33	SO 5401 R			M29	BF909R	SOT 143R		
J 39	SO 692 R			M33	BF864A	SOT 23		
K1	BCW 71	SOT 23		M34	BF 861B	SOT 23		
K2	BCW 72	SOT 23		M35	BF 861C	SOT 23		
K3	BCW 81	SOT 23		M52	BF992R	SOT 143R		
K31	BCW 81 R	SOT 23		M56	BF1100	SOT 143		
K4	BCW 71 R	SOT 23		M57	BF1100R	SOT 143R		
K5	BCW 72 R	SOT 23		M62	PMBF 4391			
K7	BCV 71	SOT 23		M63	PMBF 4392			
K8	BCV 72	SOT 23		M64	PMBF			
K9	BCF 81	SOT 23		M65	BF545A	SOT 23		
K91	BCF 81 R	SOT 23		M66	BF545B	SOT 23		
K	BAT 68-03 W	SOD 323		M67	BF 545C	SOT 23		
KA	BSS 87	SOT 89		M74	BSS 83	SOT 143		
KB	BSS 192	SOT 89		M84	BF 556A	SOT 23		
KC	BFQ 29 P	SOT 23		M85	BF 556B	SOT 23		
KM	BST 80	SOT 89		M85	BF 990 AR	SOT 143R		
KN	BST 84	SOT 89		M86	BF 556C	SOT 23		
KO	BST 86	SOT 89		M87	BF 990 A	SOT 143		
L	BAT 62-03 W	SOD 323	69	M2p	BFR 31	SOT 23		35
L6	BAR 17	SOT 23		M8P	BSN	SOT 23		19
L7	BAR 14-1	SOT 23		M89	BF 989	SOT 143		
L8	BAR 15-1	SOT 23		M90	BF 990	SOT 143		
L9	BAR 16-1	SOT 23		M91	BF 991	SOT 143		
L20	BAS 29	SOT 23		M92	BF 992	SOT 143		
L21	BAS 31	SOT 23		M93	BF 994 S	SOT 143		
L22	BAS 32	SOD 80		M94	BF 994	SOT 143		
L22	BAS	SOT 23		M95	BF 996 S	SOT 143		
L30	BAV 23	SOT 143	81	M96	BF 996	SOT 143		
L4	BAT 54	SOT 23	92	M97	BFR 101 A	SOT 143		
L42	BAT 54 A	SOT 23	93	M98	BFR 101 B	SOT 143		
L43	BAT 54 C	SOT 23	94	MA	BF 989	SOT 143		
L44	BAT 54 S	SOT 23	95	MB	BF 995	SOT 143		
L51	BAS 56	SOT143	90	MC	BFS 17 P	SOT 23		
LA	BF 550	SOT 23		MC	BF904WR	SOT 343R		
LB	BF 999	SOT 23	105	MC	ZVN 3306 F	SOT 23		67
LE	BF 660	SOT 23		MCs	BFS 17 w	SOT 323		70
JH	BF 569	SOT 23		MD	BF 908WR	SOT 343R		
LJ	BF 579	SOT 23		MD	BF 996	SOT 143		
LK	BF 799	SOT 23		ME	BF 993	SOT 143		
LM	BST 120	SOT 89		MF	NVN 3310 F	SOT 23		67
LN	BST 122	SOT 89		MG	BF 994 S	SOT 143		
LO	BF 775	SOT 23		MH	BF 996 S	SOT 143		
LR	BF 517	SOT 23		MIs	BF 930	SOT 143		70

## KÝ HIỆU MÃ SMD DIOT VÀ TRANSISTOR

MK	BF 997	SOT 143		O12	SO 2221 R		
ML	ZVP 3306 F	SOT 23	67	O13	SO 2222 R		
MO	BF 998	SOT 143	35	O20	SO 2222 AR		
MR	ZVP 3310 F	SOT 23	67	O27	SO 1893 R		
MS	CF 739	SOT 143	108	O54	SO 2221 AR		
MU	ZVN 3320 F	SOT 23	67	P01	SO 2906		
MX	CF 750	SOT 143	109	P03	SO 2907 A		
MY	VN 10 LF	SOT 23	67	P05	SO 2907		
MYs	BF 1012	SOT 143	70	P06	SO 2894		
MZ	ZVN 4106 F	SOT 23	67	P1	BFR 92	SOT 23	
MZ	ZVP 1320 F	SOT 23	67	P1s	BFR 92 W	SOT 323	
MZs	BF 1005	SOT 143	70	P2	BFR 92 A	SOT 23	
N05	SO 2484			P4	BFR 92 R	SOT 23	
N08	SO 930			P5	BFR 92 AR	SOT 23	
N1	BFR 53	SOT 23		P8	BFG 92 A	SOT 23	
N2	BFM 520	SOT 363		P12	SO 2906 A		
N2	BFS520	SOT 363		P25	SO 3906		
N4	BFG 520W/X	SOT 343		P26	SO 3905		
N4	BFR 53 R	SOT 23		P32	SO 5400		
N4	BFS 540	SOT 323		P33	SO 5401		
N5	BFG 520W/XR	SOT343R		P39	SO 692		
N11	SO 2369			PA	BA 885	SOT 23	
N12	SO 2221			PC	BA 886	SOT 23	
N13	SO 2222			PMs	BAR 66	SOT 23	
N18	SO 1711			POs	BAR 64	SOT 23	
N20	SO 2222 A			PPs	BAR 64-04	SOT 23	
N27	SO 1893			PRs	BAR 64-05	SOT 23	
N28	BFR 520	SOT 23		PSs	BAR 64-06	SOT 23	
N29	BFR 540	SOT 23		PTs	BAR 64-07	SOT 143	70
N30	BFR 505	SOT 23		PZTA13	PZTA 13	SOT 223	87
N33	BFG 505	SOT 143		PZTA14	PZTA 14	SOT 223	87
N36	BFG 520			PZTA42	PZTA 42	SOT 223	87
N37	BFG 540	SOT 143		PZTA43	PZTA 43	SOT 223	87
N38	BFG 590	SOT 143		PZTA63	PZTA 63	SOT 223	87
N39	BFG 505/X	SOT 143		PZTA64	PZTA 64	SOT 223	87
N42	BFG 520/X	SOT 143		PZTA92	PZTA 92	SOT 223	87
N43	BFG 540/X	SOT 143		PZTA93	PZTA 93	SOT 223	87
N44	BFG 590/X	SOT 143		R1	BFR 93	SOT 23	
N45	BFG 505/XR	SOT 143R		R2	BFR 93 A	SOT 23	
N48	BFG 520/XR	SOT 143R		R4	BFR 93 R	SOT 23	
N49	BFG 540/XR	SOT 143R		R5	BFR 93 AR	SOT 23	
N54	SO 2221 A			R7	BFR 106	SOT 23	
N71	SO 3904			R8	BFG 93 A	SOT 23	
N72	SO 3904			RA	BF 772	SOT 143	
N79	SO 5550			RA	BFQ 81	SOT 23	
N80	SO 5551			RB	BFQ 771	SOT 23	
N81	SO 2369 A			RC	BFP 193	SOT 143	70
N91	SO 642			RC	BFQ 193	SOT 89	89
N94	SO 517			RC	BFR 193	SOT 23	88
N	BAT 63-03 W	SOD 323		RD	BFP 180	SOT 143	70
NA	CFY 35-20	MW-4	107	RD	BFR 180	SOT 23	88
NB	BF 599	SOT 23		RDs	BFR 180 W	SOT 323	
NB	CFY 35-23	MW-4	107	RE	BFP 280	SOT 143	70
NC	BF 840	SOT 23	88	RE	BFP 280	SOT 23	88
ND	BF 841	SOT 23	88	RF	BFP 181	SOT 143	70
O1	BST 82	SOT 23		RF	BFR 181	SOT 23	88

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

RFs	BFR 181 W	SOT 323		SF	SP 0610 T	SOT 23	75
RG	BFP 182	SOT 143	70	SH	BSS 119	SOT 23	67
RG	BFR 182	SOT 23	88	SH	BB 814	SOT 23	
RGs	BFR 182 W	SOT 323		SP	BSS 84	SOT 23	
RH	BFP 183	SOT 143	70	SR	BSS 131	SOT 23	67
RH	BFR 183	SOT 23	88	SS	BSS 138	SOT 23	67
RHs	BFR 183 W	SOT 3223		ST	BSS 139	SOT 23	67
RI	BFP 196	SOT 143	70	T1	BCX 17	SOT 23	
RK	BFP 194	SOT 143	70	T2	BCX 18	SOT 23	
RK	BFR 194	SOT 23	88	T3	BSS 63	SOT 23	
RMs	BFE 182	SOT 143	70	T36	BSR 20	SOT 23	
RNs	BFE 183	SOT 143	70	T36	BSR 20 A	SOT 23	
ROs	BFE 193	SOT 143	70	T4	BCX 17 R	SOT 23	
RPs	BFE 196	SOT 143	70	T5	BCX 18 R	SOT 23	
S1	BBY 31	SOT 23		T6	BSS 63 R	SOT 23	
S1A	SMBT 3904	SOT 23		T7	BSR 15	SOT 23	
S1B	SMBT 2222	SOT 23		T71	BSR 15 R	SOT 23	
S1C	SMBTA 20	SOT 23		T8	BSR 16	SOT 23	
S1D	SMBTA 42	SOT 23		T81	BSR 16 R	SOT 23	
S1E	SMBTA 43	SOT 23		T9	BSR 18	SOT 23	
S1G	SMBTA 06	SOT 23		T91	BSR 18 R	SOT 23	
S1H	SMBTA 05	SOT 23		T92	BSR 18 A	SOT 23	
S1M	SMBTA 13	SOT 23		T93	BSR 18 AR	SOT 23	
S1N	SMBTA 14	SOT 23		TA	KTY 13 A	SOT 23	
S1P	SMBTA 2222 A	SOT 23		TB	KTY 13 B	SOT 23	
S2	BBY 40	SOT 23		TC	KTY 13 C	SOT 23	
S2A	SMBTA 3906	SOT 23		TD	KTY 13 D	SOT 23	
S2B	SMBT 2907	SOT 23		U	VV 525	SOD 123	68
S2D	SMBTA 92	SOT 23		U	BB 545	SOD 323	69
S2E	SMBTA 93	SOT 23		U1	BGX 50 A	SOT 143	
S2F	SMBT 2907 A	SOT 23		U1	BCX 19	SOT 23	
S2G	SMBTA 56	SOT 23		U1	BGX 50 A	SOT 143	
S2H	SMBTA 55	SOT 23		U2	BCX 20	SOT 23	
S2U	SMBTA 63	SOT 23		U3	BSS 64	SOT 23	
S2V	SMBTA 64	SOT 23		U35	BSR 19	SOT 23	
S3	BBY 51	SOT 23		U36	BSR 19 A	SOT 23	
S4	BBY 62	SOT 143	99	U4	BCX 19 R	SOT 23	
S5	BAT 15.099	SOT 143	99	U5	BCX 20 R	SOT 23	
S5	BBY 52	SOT 23		U6	BSS 64 R	SOT 23	
S5D	SMBD 914	SOT 23		U7	BSR 13	SOT 23	
S6	BF 510	SOT 23		U71	BSR 13 R	SOT 23	
S6	BAT 15-099 R	SOT 143	102	U8	BSR 14	SOT 23	
S7	BF 511	SOT 23		U81	BSR 14 R	SOT 23	
S7s	BAT 114-099	SOT 143	70	U9	BSR 17	SOT 23	
S8	BAT 14-099 R	SOT 143	70	U91	BSR 17	SOT 23	
S8	BF 512	SOT 23		U92	BSR 17 A	SOT 23	
S9	BF 513	SOT 23		U93	BSR 17 A	SOT 23	
S9	BAT 14-099	SOT 143	70	UF	BB 801	SOT 23	
S12	BBY 39	SOT 23		V1	BFG25AW	SOT 343	
S13	KSY 13	SOT 143		V1	BFT 25	SOT 23	
S13	BBY 42	SOT 23	98	V2	BFG 67	SOT 23	
SA	BSS 123	SOT 23		V3	BFG 67	SOT 23	
SA	BSS 123	SOT 23	67	V4	BFT 25 R	SOT 23	
SB	BSS 145	SOT 23	67	V10	BFT 25A	SOT 23	
schwarz	BB 249	SOD 80	97	V12	BFG 67/X	SOT 143	
SF	BB 804	SOT 23		V13	BFG 197/X	SOT 143	

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

V14	BFG 92A/X	SOT 143		Z6	BZX 84-C7V5	SOT 23		
V15	BFG 93A/X	SOT 143		Z7	BZX 84-C8V2	SOT 23		
V26	BFG 67/XR	SOT 143R		Z8	BZX 84-C9V1	SOT 23		
V29	BFG29A/XR	SOT 143R		Z9	BZX 84-C10	SOT 23		
V1p	BFT 25	SOT 23		Z11	BZX 84-C2V4	SOT 23		
W1	BFT 92	SOT 23		Z12	BZX 84-C2V7	SOT 23		
W3	BZX 84 2V4	SOT 23		Z13	BZX 84-C3V0	SOT 23		
W4	BFT 92 B	SOT 23		Z14	BZX 84-C3V3	SOT 23		
W4	BZX 84 2V7	SOT 23		Z15	BZX 84-C3V6	SOT 23		
W5	BZX 84 3VO	SOT 23		Z16	BZX 84-C3V9	SOT 23		
W6	BZX 84 3V3	SOT 23		Z17	BZX 84-C4V3	SOT 23		
W7	BZX 84 3V6	SOT 23		ZC	SMBT 4124	SOT 23	88	
W8	BZX 84 3V9	SOT 23		ZDD	SM5Z 3V3A	SOD 15		
W9	BZX 84 4V3	SOT 23		ZT2222	PZT 2222	SOT 223	87	
WCs	BCR 133	SOT 23		ZT2222A	PZT 2222 A	SOT 223	87	
WDs	BCR 141	SOT 23		ZT2907	PZT 2907	SOT 223	87	
WEs	BCR 148	SOT 23		ZT2907 A	PZT 2907 A	SOT 223	87	
WFs	BCR 112	SOT 23		ZT3904	PZT 3904	SOT 223	87	
WHs	BCR 108	SOT 23		ZT3906	PZT 3906	SOT 223	87	
WJs	BCR 135	SOT 23		ZDD	SM5Z 3V3 A	SOD6/SOD15	87	
WKs	BCR 119	SOT 23		ZDE	SM5Z 3V6 A			
WLs	BCR 146	SOT 23		ZDF	SM5Z 3V9 A			
WMs	BCR 183	SOT 23		ZDG	SM5Z 4V3 A			
WNs	BCR 185	SOT 23		ZDH	SM5Z 4V7 A			
WOs	BCR 191	SOT 23		ZDK	SM5Z 5V1 A			
WPs	BCR 192	SOT 23		ZDL	SM5Z 5V6 A			
WRs	BCR 198	SOT 23		ZDM	SM5Z 6V0 A			
WZs	BCR 142	SOT 23		ZDN	SM5Z 6V2 A			
X1	BFT 93	SOT 23		ZDP	SM5Z 6V8 A			
X4	BFT 93 R	SOT 23		ZDO	SM5Z 7V5 A			
Y1	BZX 24-C11	SOT 23		ZDR	SM5Z 8V2 A			
Y3	BZX 84-C13	SOT 23		ZDS	SM5Z 8V7 A			
Y4	BZX 84-C15	SOT 23		ZDT	SM5Z 9V1 A			
Y5	BZX 84-C16	SOT 23		ZVU	SM5Z 10 A			
Y6	BZX 84-C18	SOT 23		ZDV	SM5Z 11 A			
Y7	BZX 84-C20	SOT 23		ZDW	SM5Z 12 A			
Y8	BZX 84-C22	SOT 23		ZDX	SM5Z 13 A			
Y9	BZX 84-C24	SOT 23		ZDY	SM5Z 14 A			
Y10	BZX 84-C27	SOT 23		ZDZ	SM5Z 15 A			
Y11	BZX 84-C30	SOT 23		ZED	SM5Z 16 A			
Y12	BZX 84-C33	SOT 23		ZEE	SM5Z 17 A			
Y13	BZX 84-C36	SOT 23		ZEF	SM5Z 18 A			
Y14	BZX 84-C39	SOT 23		ZEG	SM5Z 19 A			
Y15	BZX 84-C43	SOT 23		ZEH	SM5Z 20 A			
Y16	BZX 84-C47	SOT 23		ZEK	SM5Z 22 A			
Y17	BZX 84-C51	SOT 23		ZEL	SM5Z 24 A			
Y18	BZX 84-C56	SOT 23		ZEM	SM5Z 25 A			
Y19	BZX 84-C62	SOT 23		ZEN	SM5Z 27 A			
7Y2	BZX 84-C12	SOT 23		ZEP	SM5Z 28 A			
Y20	BZX 84-C68	SOT 23		ZEQ	SM5Z 30 A			
Y21	BZX 84-C75	SOT 23		ZER	SM5Z 33 A			
Z1	BZX 84-C4V7	SOT 23		ZES	SM5Z 36 A			
Z2	BZX 84-C5V1	SOT 23		ZET	SM5Z 39 A			
Z3	BZX 84-C5V6	SOT 23		ZEU	SM5Z 43 A			
Z4	BZX 84-C6V2	SOT 23		ZEV	SM5Z 47 A			
Z5	BZX 84-C6V8	SOT 23		ZEW	SM5Z 51 A			

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

ZEX	SMSZ 55 A			1K	BCV 61 B	SOT 143	103
011	SO 2369 R			1K	SMBT 6428	SOT 23	88
081	SO 2369 AR			1Kp	BC848B	SOT 23	
13	BAS 125	SOT 23		1Kp	BCV61B	SOT 143 B	
14	BAS 125-04	SOT 23		1KR	BC 848 BR	SOT 23	
14s	BAS 114-099 R	SOT 143	70	1L	BC 848 C	SOT 23	88
15	BAS 125-05	SOT 23		1L	BCV 61 V	SOT 143	103
16	BAS 125-06	SOT 23		1L	SMBT 6429	SOT 23	88
17	BAS 125-07	SOT 143	70	1Lp	BCV 61C	SOT 143B	
181	BFQ 181		65/106	1LR	BC 848 CR	SOT 23	
182	BFQ 182		65/106	1LT	BC848CW	SOT 323	
194	BFQ 194		65/106	1M	SMBTA 13	SOT 23	88
196	BFQ 196		65/106	1Mt	BC848W	SOT 323	
1A	BC 846 A	SOT 23	88	1N	SMBTA 14	SOT 23	88
1A	SMBT 3904	SOT 23	88	1P	SMBT 2222 A	SOT 23	88
1A	SXT 3904	SOT 89	89	1V	SMBT 6427	SOT 23	88
1AR	BC 846 AR	SOT 23		1V	BF 820	SOT 23	
1B	BC 847 B	SOT 23		1W	BF 821	SOT 23	
1B	BC 846 B	SOT 23	88	1X	BF 822	SOT 23	
1B	SMBT 2222	SOT 23	88	1Y	BF 823	SOT 23	
1Bp	BC846B	SOT 23		27	BXY 42 BA-7		
1Bt	BC846BW	SOT 323		2A	SMBT 3906	SOT 23	88
1BR	BC 846 BR	SOT 23		2A	SXT 3906	SOT 89	89
1C	SMBTA 20	SOT 23	88	2B	BC 849 C	SOT 23	88
1D	SMBTA 42	SOT 23	88	2B	SMBT 2907	SOT 23	88
1D	SXTA 42	SOT 89	89	2B	BC 849 B	SOT 23	
1Dp	BC 846	SOT 23		2BR	BC 849 BR	SOT 23	
1Dt	BC 846W	SOT 323		2C	BC 849 C	SOT 23	88
1E	BC 847AT	SOT 416		2C	SMBTA 70	SOT 23	88
1E	BC 847 A	SOT 23	88	2CR	BC 849 CR	SOT 23	
1E	SMBTA 43	SOT 23	88	2D	SMBTA 92	SOT 23	88
1E	SXTA 43	SOT 89	89	2D	SXTA 92	SOT 89	89
1Ep	BC 847A	SOT 23		2E	SMBTA 93	SOT 23	88
1Et	BC 847AW	SOT 323		2E	SXTA 93	SOT 23	89
1ER	BC 847 AR	SOT 23		2F	SMBT 2907 A	SOT 23	88
1F	BC 847 B	SOT 23	88	2F	SXT 2907 A	SOT 23	89
1Fp	BC 847B	SOT 23		2F	BD 850 B	SOT 23	
1FR	BC 847 BR	SOT 23		2FR	BD 850 BR	SOT 23	
1Fr	BC 847BW	SOT 323		2G	BD 850 C	SOT 23	
1G	BC 847 C	SOT 23	88	2G	SMBTA 56	SOT 23	88
1G	SMBTA 06	SOT 23	88	2GR	BD 850 CR	SOT 23	
1Gp	BC 847C	SOT 23		2GT	SOA 56	SOT 23	
1GR	BC 847 CR	SOT 23		2H	SMBTA 55	SOT 23	88
1GT	SOA 06	SOT 23		2HT	SOA 55	SOT 23	
1Gt	BC 847 CW	SOT 323		2P	SMBT 5086	SOT 23	88
1H	SNBTA 05	SOT 23	88	2P	SXT 2222 A	SOT 89	89
1Hp	BC 847	SOT 23		2Q	SMBT 5087	SOT 23	88
1HT	SOA 05	SOT 23		2U	SMBTA 63	SOT 23	88
1Ht	BC 847W	SOT 323		2V	SMBTA 64		88
1J	BC 848 A	SOT 23	88	2X	SO 4401		
1J	BCV 61 A	SOT 143	103	2Y4	BZV 49-C2V4	SOT 89	
1Jp	BC848A	SOT 23		2Y7	BZ7 49-C2V7	SOT 89	
1Jp	BCV61A	SOT 143B		32	BAT 32		65
1JR	BC 848 AR	SOT 23		3A	BC 856 A	SOT 23	
1Jt	BC848AW	SOT 323		3AR	BC 856 AR	SOT 23	
1K	BC 848 B	SOT 23	88	3B	BC 856 B	SOT 23	

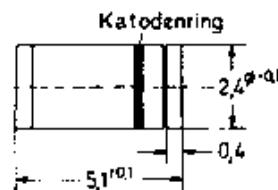
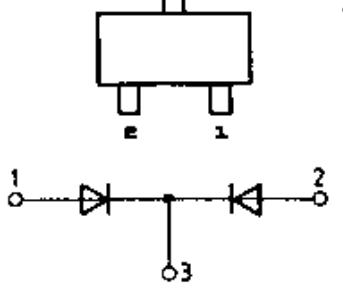
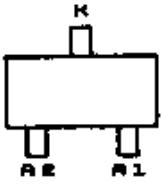
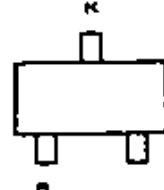
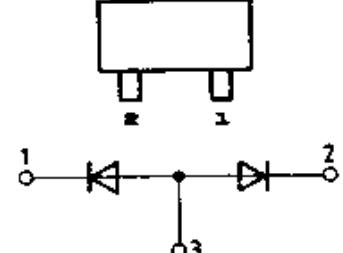
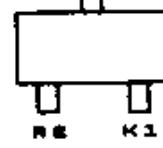
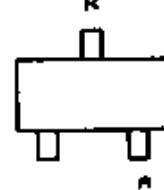
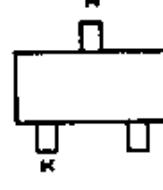
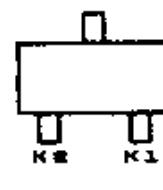
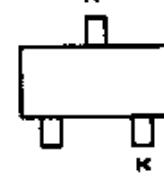
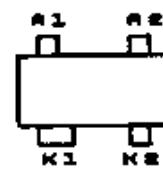
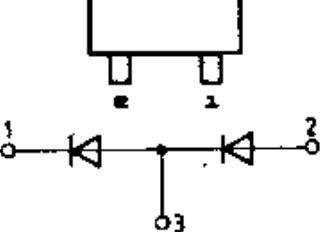
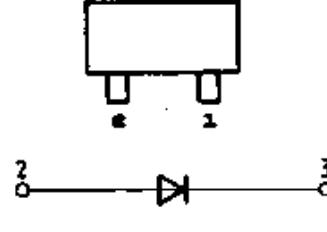
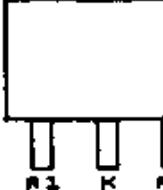
## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

3BR	BC 856 BR	SOT 23		55	BAT 15-055 S		65
3E	BC 857 A	SOT 23		55D	BAT 15-055 D		66
3ER	BC 857 AR	SOT 23		57	BAT 17-07	SOT 17-07	74
3F	BC 857 B	SOT 23		59	BAT 15-095 R		101
3FR	BC 857 BR	SOT 23		59	BAT 15-095 S		65
3G	BC 857 C	SOT 23		59D	BAT 15-095 D		66
3 GR	BC 857 CR	SOT 23		5A	SMBD 6050	SOT 23	77
3J	BC 858 A	SOT 23		5A	BC 807-16	SOT 23	
3J	BCV 62 A	SOT 143	104	5AR	BC 807-16R	SOT 23	
3JR	BC 858 AR	SOT 23		5B	BC 807-25	SOT 23	
3K	BC 858 B	SOT 23		5B	SMBD 6100	SOT 23	79
3K	BCV 62 B	SOT 143	104	5BR	BC 807-25R	SOT 23	
3KR	BC 858 BR	SOT 23		5C	BC 807-40	SOT 23	
3L	BC 858 C	SOT 23		5C	SMBD 7000	SOT 23	78
3L	BCV 62 C	SOT 143	104	5CR	BC 807-40R	SOT 23	
3LR	BC 858 CR	SOT 23		5D	SMBD 914	SOT 23	
3Y0	BZV 49-C3V0	SOT 89		5E	BC 808-16	SOT 23	
3Y3	BZV 49-C3V3	SOT 89		5ER	BC 808-16R	SOT 23	
3Y6	BZV 49-C3V6	SOT 89		5F	BC 808-16/25	SOT 23	
3Y9	BZV 49-C3V9	SOT 89		5FR	BC 808-25R	SOT 23	
11PH	BCD27-C11	SOD 7		5G	BC 808-25/40	SOT 23	
40	CGY 40	Cerex-X	110	5GR	BC 808-40R	SOT 23	
41	BAT 14-115 R		101	5H	BC 808-40	SOT 23	
41	BAT 14-115 S		65	5Y1	BZV 49-C5V1	SOT 89	
41D	BAT 14-115 D		66	5Y6	BZV 49-C5V6	SOT 89	
42	BAT 14-025 R		101	60	BAR 60	SOT 143	70
42	BAT 14-025 S		65	61	BAR 61	SOT 143	70
42D	BAT 14-025 D		66	62	BAR 62	SOT 143	70
45	BAT 14-055 R		101	63	BAR 63	SOT 143	70
45	BAT 14-055 S		65	63	BAR 64	SOT 23	77
45D	BAT 14-055 D		66	64	BAR 64-04	SOT 23	78
47	BAS 40-07	SOT 143	70	645	BFQ 645		65/106
49	BAT 14-095 R		101	65	BAT 64-05	SOT 23	79
49	BAT 14-09 S		65	66	BAT 64-06	SOT 23	80
49D	BAT 14-095 D		66	67	BAT 64-07	SOT 143	81
4A	BC 859 A	SOT 23		6A	BC 817-16	SOT 23	
4AR	BC 859 AR	SOT 23		6AR	BC 817-16R	SOT 23	
4B	BC 859 B	SOT 23		6B	BC 817-25	SOT 23	
4BR	BC 859 BR	SOT 23		6BR	BC 817-25R	SOT 23	
4C	BC 859 C	SOT 23		6C	BC 817-40	SOT 23	
4CR	BC 859 CR	SOT 23		6CR	BC 817-40R	SOT 23	
4E	BC 860 A	SOT 23		6E	BC 818-16	SOT 23	
4F	BC 860 B	SOT 23		6ER	BC 818-16R	SOT 23	
4ER	BC 860 AR	SOT 23		6F	BC 818-16/25	SOT 23	
4FR	BC 860 BR	SOT 23		6FR	BC 818-25R	SOT 23	
4G	BC 860 C	SOT 23		6G	BC 818-25/40	SOT 23	
4GR	BC 860 CR	SOT 23		6GR	BC 818-40R	SOT 23	
4Y3	BZV 49-C4V3	SOT 89		6H	BC 818-40	SOT 23	
4Y7	BZV 49-C4V7	SOT 89		6Y2	BZV 49-C6V2	SOT 89	
51	BAT 14-115 R		101	6Y8	BZV 49-C6V8	SOT 89	
51	BAT 15-115 S		65	73S	BFQ 73S		65/106
51D	BAT 15-115 D		66	75	BAS 70-05	SOT 23	
52	BAT 15-025 R		101	77	BAS 70-07	SOT 143	70
52	BAT 15-025 S		65	7Y5	BZV 49-C7V5	SOT 89	
52D	BAT 15-125 D		66	82	BFQ 82		65/106
55	BAT 15-055 R		101	83	BAT 68	SOT 23	77

## KÝ HIỆU MÃ SMD DIÔT VÀ TRANSISTOR

84	BAT 68-04	SOT 23	78	56Y	BZV 49-C56	SOT 59	
85	BAT 68-05	SOT 23	79	43	BAS 40	SOT 23	
86	BAT 68-06	SOT 23	80	44	BAS 40-04	SOT 23	
87	BAT 68-07	SOT 143	74	45	BAS 40-05	SOT 23	
8A	BZ 5225 B	SOT 23		46	BAS 40-06	SOT 23	
8B	BZ 5227 B	SOT 23		49	BAT 14-095S		65
8C	BZ 5228 B	SOT 23		49D	BAT 14-095D		65
8D	BZ 5229 B	SOT 23		49D	BAT 14-025D		65
8E	BZ 5230 B	SOT 23		52	BAT 15-025B		65
8F	BZ 5231 B	SOT 23		53	BAT 17	SOT 23	
8G	BZ 5232 B	SOT 23		54	BAT 17-04	SOT 23	
8H	BZ 5233 B	SOT 23		55	BAT 17-05	SOT 23	
8J	BZ 5234 B	SOT 23		56	BAT 17-06	SOT 23	
8K	BZ 5235 B	SOT 23		59	BAT 15-095S		65
8L	BZ 5236 B	SOT 23		62Y	BZV 49-C62	SOT 89	
8M	BZ 5237 B	SOT 23		68Y	BZY49-C68	SOT 89	
8N	BZ 5238 B	SOT 23		70	BFQ 70		65
8P	BZ 5239 B	SOT 23		71	BFQ 71		65
8Q	BZ 5240 B	SOT 23		73S	BFQ 73S		65
8R	BZ 5241 B	SOT 23		72	BFQ 72		65
8S	BZ 5242 B	SOT 23		73	BFQ 73		65
8T	BZ 5243 B	SOT 23		73	BAS 70	SOT 23	
8U	BZ 5244 B	SOT 23		74	BAS 70-04	SOT 23	
8V	BZ 5245 B	SOT 23		74	BFQ 74		65
8W	BZ 5264 B	SOT 23		75	BFQ 75		65
8X	BZ 5247 B	SOT 23		75Y	BZV 49-C75	SOT 89	
8Y	BZ 5248 B	SOT 23		76	BAS 70-06	SOT 23	
8Z	BZ 5249 B	SOT 23		76	BFQ 76		65
8Y2	BZV 49-C8V2	SOT 23		77	BFQ 77	SOT 143	
9Y1	BZV 49-C9V1	SOT 89		81A	BZ 5250 B	SOT 23	
10Y	BZV 49-C10	SOT 89		81B	BZ 5251 B	SOT 23	
11Y	BZV 49-C11	SOT 89		81C	BZ 5252 B	SOT 23	
12Y	BZV 49-C12	SOT 89		81D	BZ 5253 B	SOT 23	
13Y	BZV 49-C13	SOT 89		81E	BZ 5254 B	SOT 23	
15Y	BZV 49-C15	SOT 89		81F	BZ 5255 B	SOT 23	
16Y	BZV 49-C16	SOT 89		81G	BZ 5256 B	SOT 23	
18Y	BZV 49-C18	SOT 89		81H	BZ 5257 B	SOT 23	
20Y	BZV 49-C20	SOT 89			BAV 101	SOD 80	
22Y	BZV 49-C22	SOT 89			BAV 103	SOD 80	
24Y	BZV 49-C24	SOT 89			BAV 102	SOD 80	
27	BXY 42				BAV 100	SOD 80	
27Y	BZV 49-C27	SOT 89			BA 682	SOD 80	
30Y	BZV 49-C10	SOT 89			BA 683	SOD 80	
32	BAT 32		65		BA 219	SOD 80	
33Y	BZV 49-C33	SOT 89			Bb 215	SOD 80	
36Y	BZV 49-C36	SOT 89					
39Y	BZV 49-C10	SOT 89					
41	BAT 14-115S		65				
41D	BAT 14-115D		65				
42	BAT 14-025S		65				
43	BAS 40	SOT 23					
43Y	BZV 49-C43	SOT 89					
45	BAS 40-05		65				
45D	BAT 14-95D		65				
47Y	BZV 49-C47	SOT 89					
51Y	BZV 49-C51	SOT 89					

## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

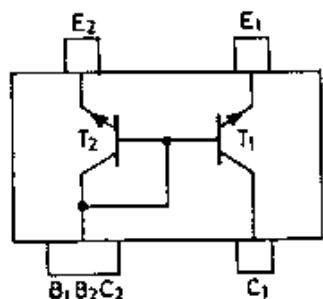
 <p><b>MELF</b></p>		
		
		
		
		

## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

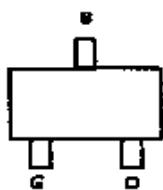
16	21	25
	A circuit diagram showing a bridge rectifier configuration. Four diodes are connected in a bridge, with their outputs connected to a central node. This node is connected to ground through a resistor and to the output terminal labeled '3'. The input terminals are labeled '1' and '4'. Terminals '1' and '4' are also connected to ground through resistors.	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left. Below the chip, the text reads: '1, 4 Điện thế Hall' and '3+, 2- : Dòng điện'.
17	26	
	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left. Below the chip, the text reads: '1, 2 công tắc' and '3 nền của chip'.	
18	22	27
	A circuit diagram for a Hall effect sensor. It shows a Hall element (represented by a rectangle with a diagonal line) connected between terminals '1' and '2'. A zener diode is connected between terminal '1' and ground. A resistor is connected between terminal '2' and ground. The output is taken from terminal '3'. The text above the diagram specifies pin assignments: 'Pin: 2+3 xanh lá cây' and '1+3 đỏ'.	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left.
19	23	28
	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left.	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left.
20	24	28 A
	A circuit diagram for a Hall effect sensor. It shows a Hall element (represented by a rectangle with a diagonal line) connected between terminals '1' and '2'. A zener diode is connected between terminal '1' and ground. The output is taken from terminal '3'. The text above the diagram is 'A -> K.'.	A top-down view of a rectangular chip with four pins. The pins are labeled '1', '2', '3', and '4' in a clockwise direction starting from the top-left. Below the chip, the text reads: '1 -> K.' and '3'.

# SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

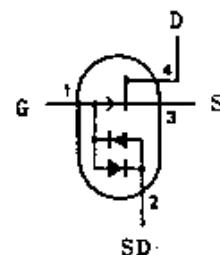
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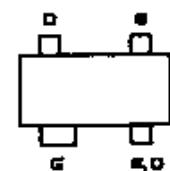
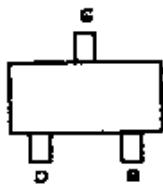
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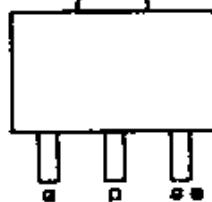
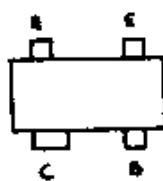
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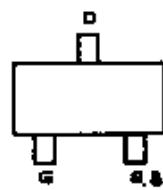
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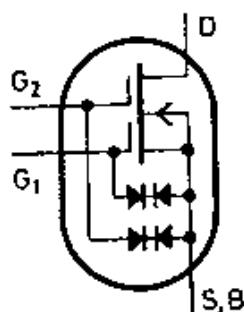
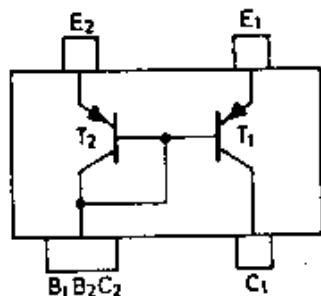
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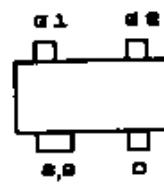
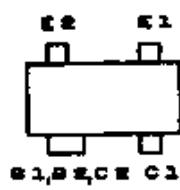
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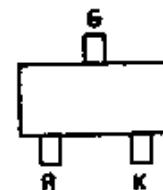
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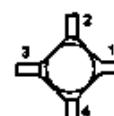
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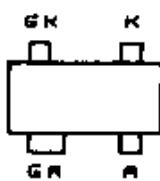
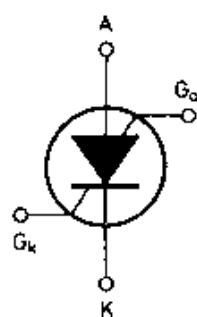
38 A



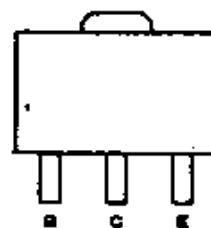
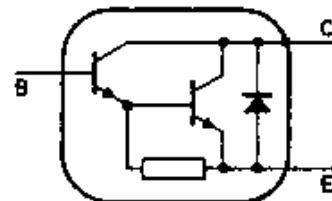
PIN	
1	B (Base)
2	E (Emitter)
3	C (Collector)
4	E (Emitter)

## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

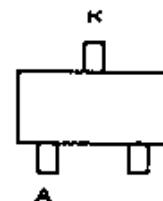
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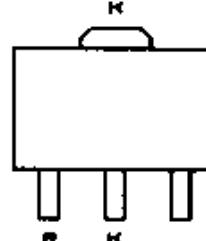
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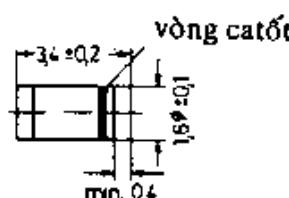
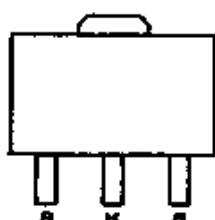
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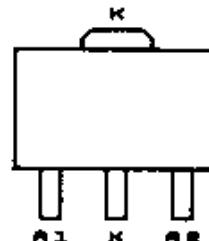


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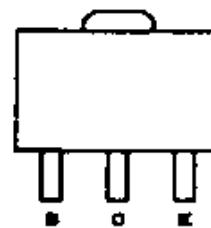
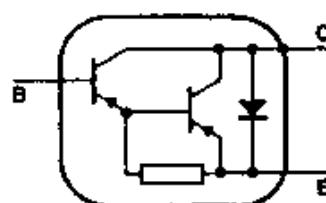
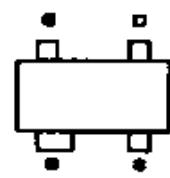
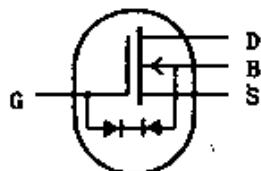
MiniMELF

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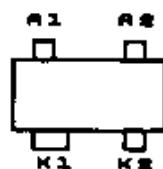


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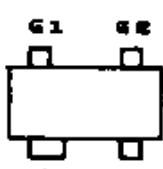
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44



48



49

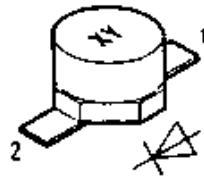
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40	43	47
	MiniMELF	
41	44	48
		49

# SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

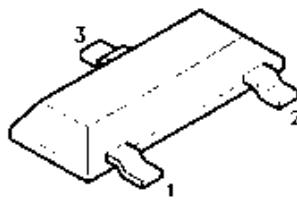
<p>50 LM 78L00</p>	<p>55 LM 136-2.5, 236-2.5, 336-2.5</p>	<p>59</p>
<p>51 LM 79L00</p>	<p>56 BYM 12-50-BYM 12-400 Vách 1 = Xanh lá cây Vách 2 = Điện thế xám=50V cam=200V đỏ=100V nâu=300V tim=150V vàng=400V</p>	<p>60</p>
<p>52 LM 317</p>	<p>57 SOD 15      SOD 6</p>	<p>61</p>
<p>53 LM 185-1.2, 285-1.2, 385-1.2</p>	<p>57 A</p>	<p>62</p>
<p>54 LM 134, 234, 334</p>	<p>58 6.5</p>	<p>63</p>
	<p>58 A</p>	<p>64</p>

# SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

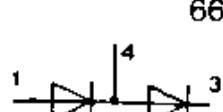
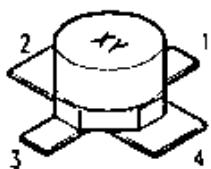
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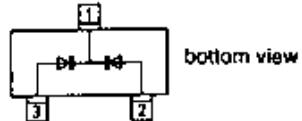
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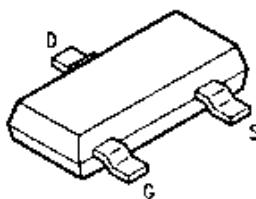
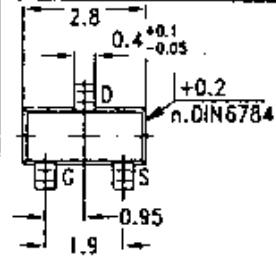
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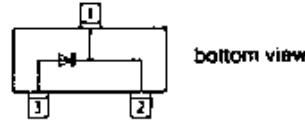
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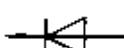
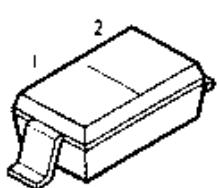
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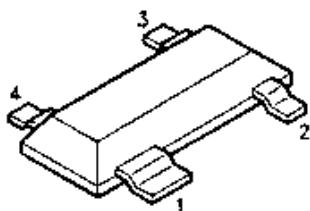
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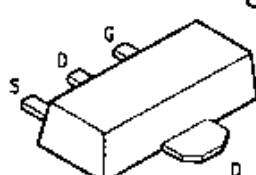
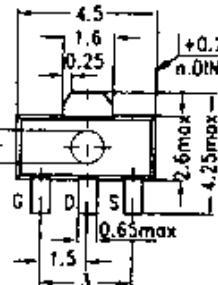
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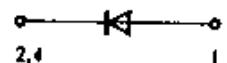
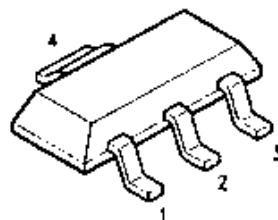
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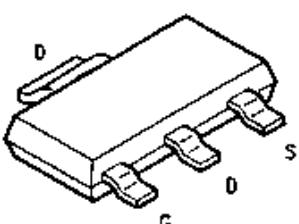
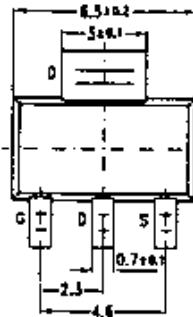
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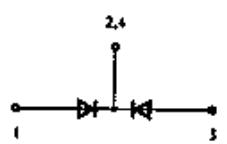
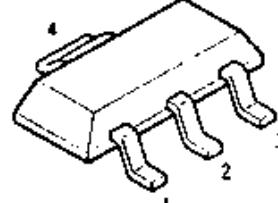
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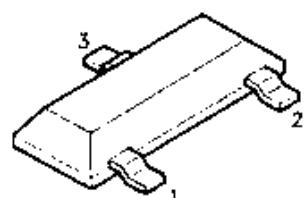
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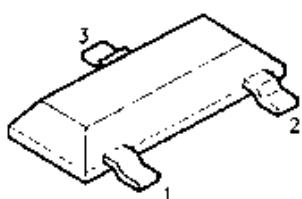
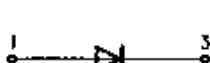
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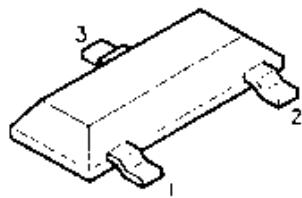
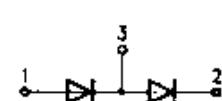
## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD



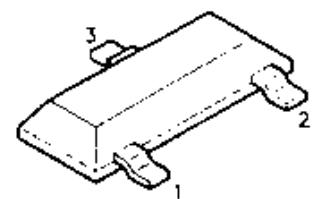
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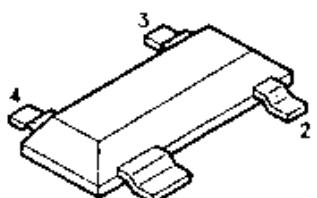
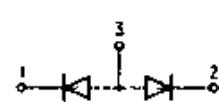
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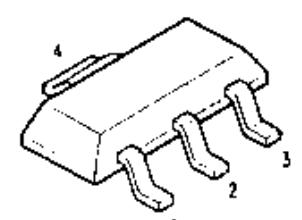
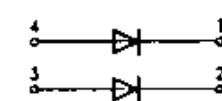
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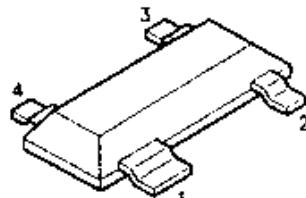
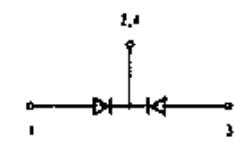
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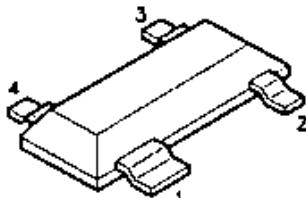
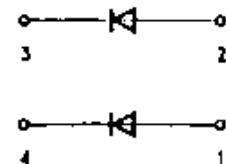
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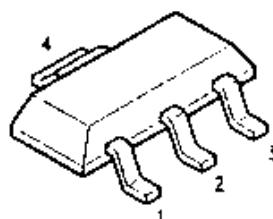
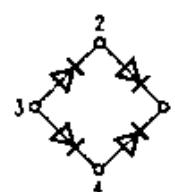
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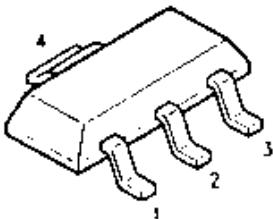
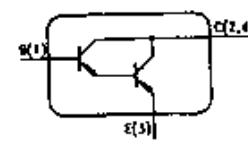
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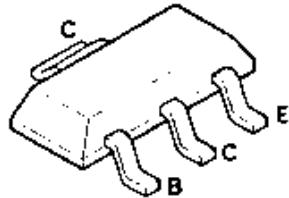
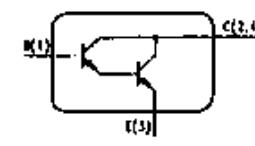
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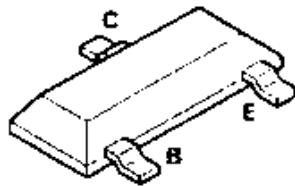
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86



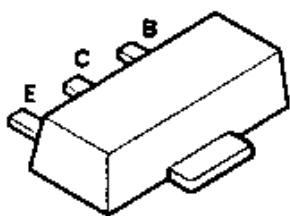
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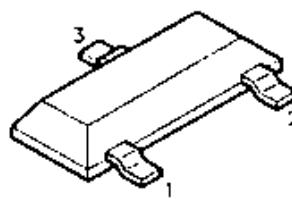
88

## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

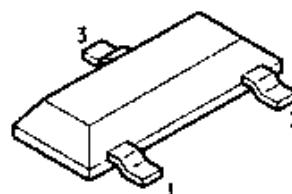
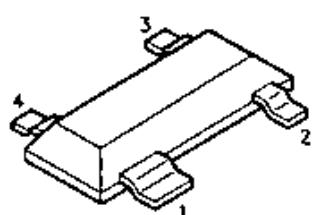
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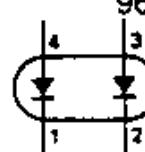
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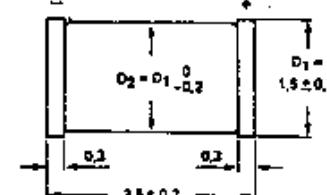
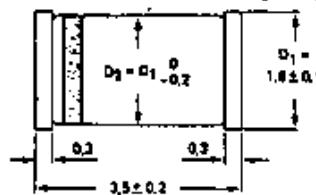
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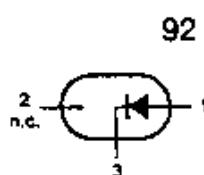
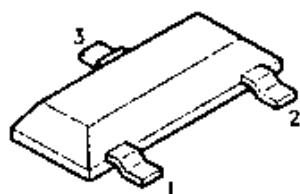
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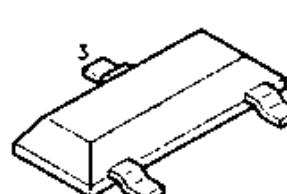
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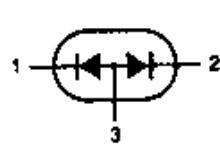
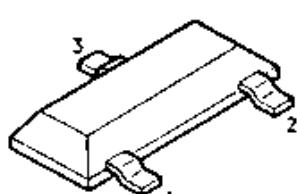
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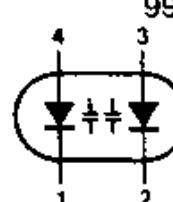
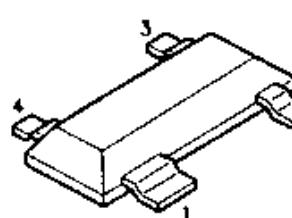
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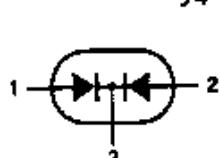
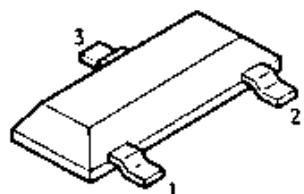
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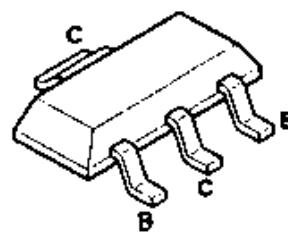
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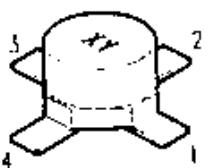
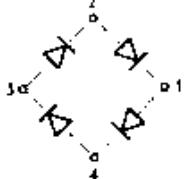
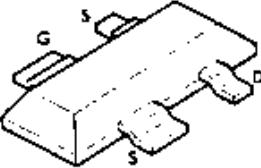
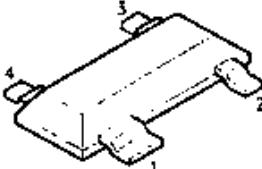
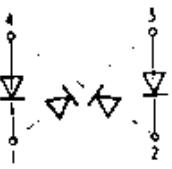
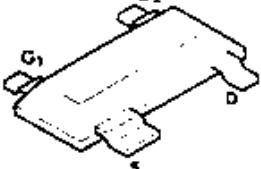
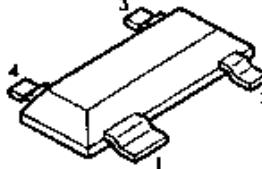
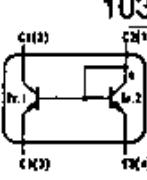
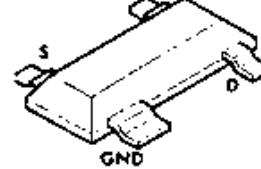
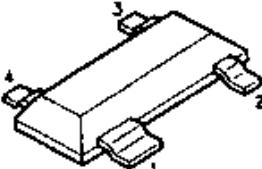
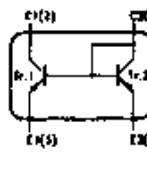
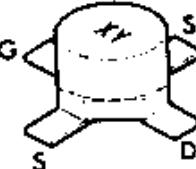
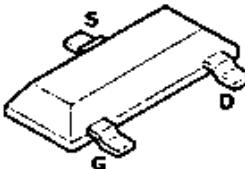
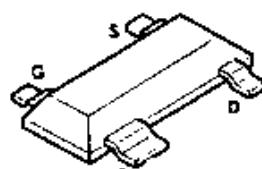
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## SƠ ĐỒ CHÂN TRANSISTOR / DIÔT SMD

  <p>101</p>	 <p>107</p>
  <p>102</p>	 <p>108</p>
  <p>103</p>	 <p>109</p>
  <p>104</p>	 <p>110</p>
 <p>105</p>	 <p>111</p>
 <p>106</p>	 <p>112</p>

**BÀNG SO SÁNH LINHKIỆN SMD/LINH KIỆN THÔNG THƯỜNG (LKTT)**

SMD	LKTT	SMD	LKTT	SMD	LKTT
BA 621	32 V Tuner-Diode	BAW 78 A		BC 850 CR	BC 550 C
BA 629	32 V Tuner-Diode	BAW 78 B		BC 856 A	BC 556 A
BA 679		BAW 78 C		BC 856 AR	BC 556 A
BA 682	BA 482	BAW 78 D		BC 856 B	BC 556 B
BA 683	BA 483	BAW 79 A		BC 856 BR	BC 556 B
BA 885		BAW 79 B		BC 857 A	BC 557 A
BAL 74		BAW 79 C		BC 857 AR	BC 557 A
BAL 99		BAW 79 D		BC 857 B	BC 557 B
BAQ 33		BAW 101		BC 857 BR	BC 557 B
BAQ 34		BAY 85		BC 857 C	BC 557 C
BAQ 35		BB 215	BB 405 B	BC 857 CR	BC 557 C
BAR 14-1		BB 219	BB 909	BC 858 A	BC 558 A
BAR 15-1		BB 801		BC 858 AR	BC 558 A
BAR 16-1		BB 804		BC 858 B	BC 558 B
BAR 26	Schottky	BBY 31	BB 405 G	BC 858 BR	BC 558 B
BAR 74		BBY 39		BC 858 C	BC 558 C
BAR 99		BBY 40	BB 409	BC 858 CR	BC 558 C
BAS 16	BAW 62	BC 807-16	BC 327-16	BC 859 A	BC 559 A
BAS 17	BA 314	BC 807-25	BC 327-25	BC 859 AR	BC 559 A
BAS 19	BAV 19	BC 807-40	BC 327-40	BC 859 B	BC 559 B
BAS 20	BAV 20	BC 808-16	BC 328-16	BC 859 BR	BC 559 B
BAS 21	BAV 21	BC 808-25	BC 328-25	BC 859 C	BC 559 C
BAS 28	BAW 62 (2X)	BC 808-40	BC 328-40	BC 859 CR	BC 559 C
BAS 29	BAX 12 A	BC 817-16	BC 337-16	BC 860 A	BC 560 A
BAS 31	BAX 12 A (2X)	BC 817-25	BC 337-25	BC 860 AR	BC 560 A
BAS 32	BAW 62	BC 817-40	BC 337-40	BC 860 B	BC 560 B
BAS 35	BAX 12 A (2X)	BC 818-16	BC 338-16	BC 860 BR	BC 560 B
BAS 40		BC 818-25	BC 338-25	BC 860 C	BC 560 C
BAS 40-04		BC 818-25	BC 337-40	BC 860 CR	BC 560 C
BAS 40-05		BC 846 A	BC 546 A	BC 868	BC 368
BAS 40-06		BC 846 AR	BC 546 A	BC 869	BC 369
BAS 56	BAV 12	BC 846 B	BC 546 B	BCF 29	BC 559 A
BAS 70		BC 846 BR	BC 536 B	BCF 29 R	BC 559 A
BAS 70-04		BC 847 A	BC 547 A	BCF 30	BC 559 B
BAS 70-05		BC 847 AR	BC 547 A	BCF 30 R	BC 559 B
BAS 70-06		BC 847 B	BC 547 B	BCF 32	BC 549 B
BAT 17	BA 481	BC 847 BR	BC 547 B	BCF 32 R	BC 549 B
BAT 17-04		BC 847 C	BC 547 C	BCF 33	BC 549 C
BAT 17-05		BC 847 BR	BC 547 C	BCF 33 R	BC 549 C
BAT 17-06		BC 848 A	BC 548 A	BCF 70	BC 560 B
BAT 18	BA 482	BC 848 AR	BC 548 A	BCF 70 R	BC 560 B
BAV 70	BAW 62 (2X)	BC 848 B	BC 548 B	BCF 81	BC 550 C
BAV 74		BC 848 BR	BC 548 B	BCF 81 R	BC 550 C
BAV 99	BAW 62 (2X)	BC 848 C	BC 548 C	BCV 26	BC 516
BAV 100	BAV 18	BC 848 CR	BC 548 C	BCV 27	BC 517
BAV 101	BAV 19	BC 849 B	BC 549 B	BCV 28	
BAV 102	BAV 20	BC 849 BR	BC 549 B	BCV 29	
BAV 103	BAV 21	BC 849 C	BC 549 C	BCV 29	
BAW 56	BAW 62 (2X)	BC 849 CR	BC 549 C	BCV 46	
		BC 850 B	BC 550 B	BCV 47	
		BC 850 BR	BC 550 B	BCV 46	
		BC 850 C	BC 550 C	BCV 61	BC 547

SMD	LKTT	SMD	LKTT	SMD	LKTT
BCV 62	BC 557	BCW 67 CR		BCX 54-16	
BCV 71	BC 546 A	BCW 68 F		BCX 55	BC 637
BCV 71 R	BC 546 A	BCW 68 FR		BCX 55-6	
BCV 72	BC 546 B	BCW 68 G		BCX 55-10	
BCV 72 R	BC 546 B	BCW 68 GR		BCX 55-16	
BCW 29	BC 558 A	BCW 68 H		BCX 56	BC 639
BCW 29 R	BC 558 A	BCW 68 HR		BCX 56-6	
BCW 30	BC 558 B	BCW 69	BC 557 A	BCX 56-10	
BCW 30 R	BC 558 B	BCW 69 R	BC 557 A	BCX 56-16	
BCW 31	BC 548 A	BCW 70	BC 557 B	BCX 68	BC 368
BCW 31 R	BC 548 A	BCX 70 GR		BCX 68-10	
BCW 32	BC 548 B	BCX 70 HR		BCX 68-16	
BCW 32 R	BC 548 B	BCX 70 JR		BCX 68-25	
BCW 33	BC 548 C	BCX 70 KR		BCX 69	BC 369
BCW 33 R	BC 548 C	BCW 70 R	BC 557 B	BCX 69-16	
BCW 60 A	BC 548 A	BCW 71	BC 547 A	BCX 69-25	
BCW 60 AR		BCX 71 GR		BCX 70 G	BC 547 A
BCW 60 B	BC 548 B	BCX 71 HR		BCX 70 H	BC 547 B
BCW 60 BR		BCX 71 JB		BCX 70 J	BC 547 B
BCW 60 C	BC 548 B	BCX 71 KR		BCX 70 K	BC 547 C
BCW 60 CR		BCW 71 R	BC 547 A	BCX 71 G	BC 557 A
BCW 60 D	BC 546 O	BCW 72	BC 547 B	BCX 71 H	BC 557 B
BCW 60 D		BCW 72 R	BC 547 B	BCX 71 J	BC 557 B
BCW 60 FF		BCW 81	BC 547 C	BCX 71 K	BC 557 C
BCW 60 FN		BCW 81 R	BC 547 C	BF 510	BF 410 A
BCW 61 A	BC 568 A	BCW 89	BC 558 A	BF 511	BF 410 B
BCW 61 AR		BCW 89 R	BC 556 A	BF 512	BF 410 C
BCW 61 B	BC 558 B	BCX 17	BC 327	BF 513	BF 410 D
BCW 61 BR		BCX 17 R	BC 327	BF 517	
BCW 61 C	BC 558 B	BCX 18	BC 326	BF 536	BF 936
BCW 61 CR		BCX 18 R	BC 326	BF 550	BF 450
BCW 61 D	BC 558 C	BCX 19	BC 337	BF 550 R	BF 450
BCW 61 DR		BCX 19 R	BC 337	BF 564	
BCW 61 FF		BCX 20	BC 338	BF 569	BF 970
BCW 61 FN		BCX 20 R	BC 338	BF 569 R	BF 970
BCW 65 A		BCX 41		BF 579	BF 970
BCW 65 AR		BCX 42		BF 599	
BCW 65 B		BCX 51	BC 636	BF 620	BF 420
BCW 65 BR		BCX 51-6		BF 621	BF 421
BCW 65 C		BCX 51-10		BF 622	BF 422
BCW 65 CR		BCX 51-16		BF 623	BF 423
BCW 66 F		BCX 52	BC 638	BF 660	BF 606 A
BCW 66 FR		BCX 52-6		BF 767	BF 967
BCW 66 G		BCX 52-10		BF 770 A	
BCW 66 GR		BCX 52-16		BF 775	
BCW 66 H		BCX 53	BC 640	BF 799	
BCW 66 HR		BCX 53-6		BF 820	BF 420
BCW 67 A		BCX 53-10		BF 821	BF 421
BCW 67 AR		BCX 53-16		BF 822	BF 422
BCW 67 B		BCX 54	BC 635	BF 823	BF 423
BCW 67 BR		BCX 54-6		BF 824	BF 324
BCW 67 C		BCX 54-10		BF 840	BF 340

SMD	LKTT	SMD	LKTT	SMD	LKTT
BF 841	BF 241	BFS 17	BFW 92	BSS 82 B	
BF 989	BF 960	BFS 17 A	BFW 92 A	BSS 82 C	
BF 990	BF 980	BFS 20	BF 199	BSS 83	
BF 991	BF 981	BFT 25	BFT 24	BSS 84	
BF 992	BF 982	BFT 46	BFW 13	BSS 87	
BF 993		BFT 92	BFQ 51	BSS 123	
BF 994	BF 964	BFT 93	BFQ 23	BSS 131	
BF 994 S	BF 964 S	BGX 50 A		BSS 138	
BF 995		BRY 61	BRY 56	BST 15	2N 5415
BF 996	BF 966	BRY 62	BRY 39	BST 16	2N 5416
BF 996 S	BF 966 S	BSD 20		BST 39	
BF 997		BSD 22		BST 40	
BFD 19	BF 494	BSR 12	2N 2894 A	BST 50	BSR 50
BFG 67	BFG 65	BSR 12 R	2N 2894 A	BST 51	BSR 51
BFG 92 A	BFR 90 A	BSR 13	2N 2222	BST 52	BSR 52
BFG 93 A	BFR 91 A	BSR 13 R	2N 2222	BST 60	BSR 60
BFN 16		BSR 14	2N 2222 A	BST 61	BSR 61
BFN 18		BSR 15	2N 2907	BST 62	BSR 62
BFN 20		BSR 15 R	2N 2907	BST 80	BSR 70 A
BFN 21		BSR 16	2N 2907 A	BST 82	BSR 72 A
BFN 22		BSR 16 R	2N 2907 A	BST 84	BSR 74 A
BFN 23		BSR 17	2N 3903	BST 86	BSR 76 A
BFN 24		BSR 17 R	2N 3903	BST 120	
BFN 25		BSR 17 A	2N 3904	BST 122	
BFN 26		BSR 17 AR	2N 3904	BSV 52	BSX 20
BFN 27		BSR 18	2N 3905	BSV 52 R	BSX 20
BFQ 17	BFW 16 A	BSR 18 A	2N 3906	BYM 12-50	50 V/1A
BFQ 18 A	BFQ 34	BSR 18 AR	2N 3906	BYM 12-100	100 V/1A
BFQ 19	BFR 96	BSR 18 R	2N 3905	BYM 12-150	150 V/1A
BFQ 19 S		BSR 19	2N 5550	BYM 12-200	200 V/1A
BFQ 29 P		BSR 19 A	2N 5551		
BFO 64		BSR 20	2N 5400	BYM 12-300	300 V/1A
BFQ 67	BFQ 65	BSR 20 A	2N 5401	BYM 12-400	400 V/1A
BFQ 81		BSR 30	2N 4030	CSB 05	50 V/1A
BFR 17 P		BSR 31	2N 4031	CSB 2	200 V/1A
BFR 30	BFW 11	BSR 32	2N 4032	CSB 4	400 V/1A
BFR 31	BFW 12	BSR 33	2N 4033	CSB 6	600 V/1A
BFR 35 AP		BSR 40	BSX 46-10	CSB 8	800 V/1A
BFR 53	BFW 93	BSR 41	BSX 46-16	IRFS 120	MOSFET
BFR 53 R	BFW 93	BSR 42	2N 3020	IRFS 123	MOSFET
BFR 92	BFR 90	BSR 43	2N 3019	KSY 13	
BFR 92 A	BFR 90	BSR 56	2N 4856	KTY 13 A	
BFR 92 AR	BFR 90	BSR 57	2N 4857	KTY 13 B	
BFR 92 P		BSR 58	2N 4858	KTY 13 C	
BFR 92 R	BFR 90	BSS 63	BSS 68	KTY 13 D	
BFR 93	BFR 91	BSS 64	BSS 38	LG S250-DO	
BFR 93 A	BFR 91	BSS 79 B		LG S259-BO	
BFR 93 AR	BFR 91	BSS 79 C		LL 101 A	60 V Schottky
BFR 93 P		BSS 80 B		LL 101 B	50 V Schottky
BFR 93 R	BFR 91	BSS 80 C		LL 101 C	40 V Schottky
BFR 101		BSS 81 B		LL 103 A	40 V Schottky
BFR 101 B		BSS 81 C		LL 103 B	30 V Schottky

LL 103 C	20 V Schottky
LL 104 A	10V Schottky
LL 104 B	5 V Schottky
LL 104 C	10 V Schottky
LL 104 D	5 V Schottky
LL 104 E	10 V Schottky
LL 104 F	5 V Schottky
LL 4148	1N 4148
LL 4149	
LL 4150	
LL 4151	
LL 4152	
LL 4153	
LL 4154	
LL 4446	
LL 4447	
LL 4448	
LL 4449	
LL 4450	
LL 4451	
LL 4153	
LL 4454	
LM 78 LXXA	78Lxx, uA78Lxx
LM 134 M	LM 134
LM 136-2,5	LM 136
LM 185-1,2	LM 185
LM 234 M	LM 234
LM 236	LM 236
LM 285-1,2	LM 285
LM 317 LM	LM 317, TL 317
LM 334	LM 334
LM 336-2,5	LM 336
LM 385-1,2	LM 385
LR S250-CO	
LS S250-DO	
LS S259-BO	
LU S250-DO	
LY S250-DO	
LY S259-BO	
RM 4001 G	1N 4001
RM 4002 G	1N 4002
RM 4003 G	1N 4003
RM 4004 G	1N 4003
MMBC 1622 D6	
MMBC 1622 D7	
MMBC 1622 D8	
MMBC 1623 L3	
MMBC 1623 L4	
MMBC 1623 L5	
MMBC 1623 L6	

## ĐIỂM NÓNG CHÀY CỦA CÁC LOẠI THIẾC HÀN MỀM

Hợp kim	Thành phần	Điểm nóng chảy
InBi	67/33	72°C
BiSnIn	57/17/26	79°C
BiPbSn	52,5/32/15,5	96°C
InSnZn	52,2/46/1,8	110-115°C
BiIn	67/33	112°C
InSn	52/48	117°C
BiSn	57/43	139°C
InPbAg	80/15/5	148-155°C
In	100	156°C
InPb	75/25	156-165°C
SnPbAg	62/36/2	179°C
SnPb	60/40	183-188°C
PbSn	60/40	183-238°C
PbIn	50/50	193-215°C
SnAg	96,5/3,5	221°C
SnCu	99/1	227°C
Sn	100	232°C
SnSb	95/5	236-240°C
PbIn	75/25	250-264°C
PbSb	90/10	252-260°C
PbIn	81/19	270-276°C
PbAgSn	92,5/2,5/5	280°C
AuSn	80/20	280°C
PbSn	92/8	285-305°C
PbSnAg	90/5/5	292°C
PbAg	97,5/2,5	304°C
PbAgSn	97,5/1,5/1	309°C

## 9. Tài liệu tham khảo

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## 10. PHỤ LỤC

### 10.1 LỊCH SỬ PHÁT TRIỂN KỸ THUẬT BÁN DẪN

#### GIAI ĐOẠN THỰC HIỆN BAN ĐẦU

1821	SEEBECK:	Tính chất nhiệt điện của PbS và ZnSb
1873	SMITH, SALE:	Tính quang dẫn của Selen
1874	F.BRAUN:	Detector đầu tiên bằng PbS
1879	E.H.HALL:	Hiệu ứng Hall
1906	PICKARD:	Detector đầu tiên bằng silicon
1915	BENEDICKS:	Detector đầu tiên bằng Germani
1930-1945		Ứng dụng Detector bằng silic trong kỹ thuật Radar

#### LÝ THUYẾT CƠ BẢN

1900	M.PLANCK:	Vật lý lượng tử, tìm ra hằng số lượng tử $\hbar$
1920	HEISENBERG, SCHRÖDINGER:	Cơ học lượng tử
1920-1930	BLOCH, HEISENBERG, SCHRÖDINGER:	Ứng dụng cơ học lượng tử vào chất rắn
1939	SCHOTTKY, SPENKE:	Lý thuyết về lớp chuyển tiếp cho sự tiếp xúc của bán dẫn và kim loại
1950-60	SHOCKLEY, et al.	Lý thuyết cho Junction-Transistor, cơ chế đánh thủng của lớp chuyển tiếp PN Lý thuyết về Transistor trường

#### TRANSISTOR và VI ĐIỆN TỬ

1948	BARDEEN, BRATTAIN:	Transistor tiếp xúc điểm đầu tiên
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1949	SHOCKLEY	Junction-Transistor bằng Germani đầu tiên
1955		Phát triển tiếp tục kỹ thuật Germani chế tạo Ge-MESA-Transistor.
		Ứng dụng kỹ thuật khuếch tán
1959	HOERNI:	Kỹ thuật Si-planar
1960	KAHNG, ATALLA:	Chứng minh hiệu ứng trường chất silic. MOS-transistor

### SỰ PHÁT TRIỂN CỦA KỸ THUẬT VI ĐIỆN TỬ

1958	KILBY:	Mạch tổ hợp với chất germani
1959	NOYCE:	Mạch tổ hợp đầu tiên với kỹ thuật Bipolar-Planar
1962		Những họ mạch số, TTL (Transistor-Transistor-logic)
1965		Bắt đầu kỹ thuật MOS (PMOS-Al-Gate)
1967		Kỹ thuật NMOS
1970		Kỹ thuật CMOS
1972		Bộ nhớ động 1-Transistor với NMOS-Si-Gate
1974	SHIMA et al.:	Bộ vi xử lý trên một mạch tổ hợp (Microprocessor)
1976	AHLQUIST et al.:	Bộ nhớ 16-KBit đầu tiên
1989		Bộ nhớ lớn hơn 1 Megabit
2010		Bộ nhớ 1-GigaBit

## 10.2 TRANG INTERNET CÁC HÃNG CHẾ TẠO VÀ PHÂN PHỐI LINH KIỆN BÁN DẪN.

- Agilent Technologies, [WWW.semiconductor.agilent.com](http://WWW.semiconductor.agilent.com)
- Allegro Microsystems Inc., [WWW.allegromicro.com](http://WWW.allegromicro.com)
- AMI Semiconductor , [WWW.amis..com](http://WWW.amis..com)
- AMD, [WWW.amd.com](http://WWW.amd.com)
- Analog Devices , [WWW.analog.com](http://WWW.analog.com)
- Atmel, [WWW.atmel.com](http://WWW.atmel.com)
- Buerklin , [WWW.buerklin.de](http://WWW.buerklin.de)
- Burr-Brown Corp. x. Texas Instrument
- Dallas Semiconductor, x. Maxim
- Epson, [WWW.epson-electronics.de](http://WWW.epson-electronics.de)
- Everlight, [WWW.everlight.com](http://WWW.everlight.com)
- Eurodis Enatechnik, [WWW.eurodis.com](http://WWW.eurodis.com)
- Exar Corp. , [WWW.exar.com](http://WWW.exar.com)
- Fairchild Semiconductor, [WWW.fairchildsemi.com](http://WWW.fairchildsemi.com)
- Fujitsu microelectronics , [WWW.fujitsu-fme.com](http://WWW.fujitsu-fme.com)
- Hamamatsu Photonics , [WWW.hamamatsu.com](http://WWW.hamamatsu.com)
- Hewlett Packard , [WWW.hp.com/go/components/](http://WWW.hp.com/go/components/)
- Infineon Technologies (SiemensAG),  
[WWW.infineon.com](http://WWW.infineon.com)
- Intel, [WWW.intel.com](http://WWW.intel.com)
- International Rectifier, [WWW.irf.com](http://WWW.irf.com)
- Intersil, [WWW.intersil.com](http://WWW.intersil.com)
- IXYS, [WWW.ixys.com](http://WWW.ixys.com)
- Lattice Semiconductor, [WWW.latticesemi.com](http://WWW.latticesemi.com)
- Linear Technology Corp. , [WWW.linear-tech.com](http://WWW.linear-tech.com)

- LiteOn Optoelectronics, [WWW.liteon.com.tw](http://WWW.liteon.com.tw)
- LiteOn Semiconductor, [WWW.liteon-semi.com](http://WWW.liteon-semi.com)
- Maxim Integrated Products, Inc., [WWW.maxim-ic.com](http://WWW.maxim-ic.com)
- MIC, [WWW.cnmic.com](http://WWW.cnmic.com)
- Microchip Technology Inc., [WWW.microchip.com](http://WWW.microchip.com)
- Mitsubishi electric Semiconductor, [WWW.mitsubishichips.com](http://WWW.mitsubishichips.com)
- Motorola Inc., [WWW.motorola.com](http://WWW.motorola.com)
- National Semiconductor, [WWW.national.com](http://WWW.national.com)
- NEC electronics , [WWW.ee.nec.de](http://WWW.ee.nec.de)
- Newark electronics (USA), [WWW.newark.com](http://WWW.newark.com)
- OKI, [WWW.oki-europe.de](http://WWW.oki-europe.de)
- ON Semiconductor, [WWW.onsemi.com](http://WWW.onsemi.com)
- Opto Devices, [WWW.optodevices.de](http://WWW.optodevices.de)
- Philips Semiconductors & Philips Electronics North America Corp., [WWW.semiconductors.philips.com](http://WWW.semiconductors.philips.com)
- RS Components GmbH, [bestellung@rs-components.com](mailto:bestellung@rs-components.com)
- Samsung Semiconductor , [WWW.samsungsemi.com](http://WWW.samsungsemi.com)
- Sharp Electronics, [WWW.sharp-world.com](http://WWW.sharp-world.com)
- Spoerle Electronic, [WWW.spoerle.com](http://WWW.spoerle.com)
- ST Microelectronics , [WWW.st.com](http://WWW.st.com)
- Taiwan Semiconductor, [WWW.tsceu.com](http://WWW.tsceu.com)
- TEMIC Semiconductors , [WWW.emic.de](http://WWW.emic.de)
- Texas Instruments Inc. , [WWW.ti.com](http://WWW.ti.com)
- Toshiba , [WWW.semicon.toshiba.co.jp/eng](http://WWW.semicon.toshiba.co.jp/eng)
- Vishay, [WWW.vishay.com](http://WWW.vishay.com)
- Xilinx, [WWW.xilinx.com](http://WWW.xilinx.com)
- Zilog , [WWW.zilog.com](http://WWW.zilog.com)

### 10.3 Một số chữ viết tắt và từ chuyên môn

<b>A-D Converter</b>	: <i>Analog-Digital Converter</i> , bộ biến đổi tín hiệu tương tự thành tín hiệu số.
<b>ALU</b>	: <i>Arithmetic and Logic Unit</i> , bộ số học và logic của bộ vi xử lý.
<b>AGC</b>	: <i>Automatic Gain Control</i> , hiệu chỉnh độ khuyếch đại tự động
<b>Asynchronous</b>	: Không đồng bộ.
<b>Baud</b>	: Viết tắt Bd . Đơn vị của kỹ thuật truyền tin được đặt theo tên của một kỹ sư Pháp Jean Baudot ( 1845 - 1903 ) . Nếu tín hiệu nhị phân được truyền đi chỉ với một dây truyền tin thì 1 Bd = 1 bps. Công suất truyền tin được tính với 200 , 600 , 1200 , 2400 , 4800... 2 Mio Bd .
<b>BCD</b>	: <i>Binary Code Decimal</i> , cách ghi số thập phân bằng cách diễn tả mỗi số thập phân bằng từng nhóm số nhị phân theo mã hóa 8 - 4 - 2 - 1.
<b>Bit</b>	: <i>Binary Digit</i> , con số trong hệ thống nhị phân , số 0 hay 1. Đơn vị dữ liệu trong tin học .
<b>Bias</b>	: Điện áp một chiều trên một cực của linh kiện (v.d. transistor) để linh kiện này có điểm làm việc ổn định.
<b>Bidirectional</b>	: Hai chiều .
<b>BNC</b>	: <i>Bayonet nut connector</i>
<b>Booster</b>	: Bộ khuyếch đại phụ
<b>Bootstrap</b>	: Lần nạp ( dữ liệu ... ) đầu tiên .
<b>Bus</b>	: Bus , hệ thống đường truyền dữ liệu .
<b>Buffer</b>	: Tầng đệm , bộ đệm , bộ nhớ dữ liệu trong thời gian ngắn
<b>CMOS</b>	: <i>Complementary Metal Oxid Semiconductor</i>
<b>CPU</b>	: <i>Central Processing Unit</i> .
<b>Clear</b>	: Xung xóa .
<b>Clock</b>	: Xung nhịp
<b>Code</b>	: Mã số .
<b>COM</b>	: <i>COMmunication Port</i> , giao diện loại nối tiếp (v.d.: cho con chuột, modem...)
<b>Comparator</b>	: Bộ so sánh .
<b>Counter ( up / down )</b>	: Bộ đếm ( xuôi / ngược ) .
<b>Decade</b>	: Từng nhóm 10 .
<b>Decade Counter</b>	: Bộ đếm từ 0 đến 9
<b>Decode , to</b>	: Giải mã .

<b>Delay</b>	: Sự trễ , thời gian trễ .
<b>Demultiplexer</b>	: Mạch tách các dữ liệu đã được truyền đi lần lượt .
<b>Divider</b>	: Bộ chia .
<b>DMOS</b>	: <i>Double-Diffused Metal-Oxide-Semiconductor</i> . Một MOSFET công suất có thể được chế tạo với công nghệ DMOS. Trên 1 cm <sup>2</sup> hàng trăm nghìn tế bào gate silic được tổ hợp để phân bố đều dòng điện và nhiệt . Source được nối song song chung với nhau và có chung một cực Drain. DMOS là thành phần công suất của Smart Power ICs .
<b>Dual</b>	: Đôi .
<b>Enable</b>	: Tạo điều kiện .
<b>Encode, to</b>	: Mã hóa .
<b>EPROM</b>	: <i>Erasable Programmable Read Only Memory</i> Bộ nhớ dữ liệu , chỉ đọc không thể nạp thêm dữ liệu lúc máy tính hoạt động . Dữ liệu không bị mất khi ngắt điện , chỉ bị xóa khi bị chiếu bằng tia cực tím .
<b>Expander</b>	: Bộ giãn , mở rộng ( để cho thêm nhiều ngõ ra ... )
<b>Exclusive OR</b>	: Loại logic Boole chỉ cho H khi chỉ có một trong hai biến số là H .
<b>Failure rate</b>	: Tỉ số hư hỏng .
<b>Feedback</b>	: Phản hồi .
<b>Function table</b>	: Bảng sự thật (BST).
<b>Gate</b>	: Cổng , mạch điện có một ngõ ra và gồm nhiều ngõ vào . Ngõ ra chỉ được tác động khi và chỉ khi ở những ngõ vào hội đủ một số điều kiện nhất định .
<b>Hex</b>	: Sáu
<b>IGBT</b>	: <i>Insulated Gate Bipolar Transistor</i>
<b>Interface</b>	: Mạch giao tiếp , giao diện.
<b>IP</b>	: <i>Internet Protocol</i> , hệ thống số xác định và mạng lưới trong internet xác lập sự liên lạc giữa các địa chỉ. Dữ liệu được IP đóng gói trong các " bao thư" với địa chỉ nơi gửi và nơi nhận được ghi rõ ràng rồi gửi lên mạng.
<b>IP</b>	: <i>Intellectual Property</i> , mạch bán dẫn có thể được dùng lại để chế tạo IC khác nhau. IP nằm trong IC loại AMS-SoC (Analog Mixed-Signal / Systems on Chip). IP đáp ứng nhu cầu ứng dụng ngày càng cao SoC. các công ty thiết kế nhưng không chế tạo IC (fabless), việc sở hữu bản quyền thiết kế cho việc sử dụng kế tiếp và thời gian đưa sản phẩm vào thị trường ( Time to Market) ngày càng ngắn cho việc sản xuất hàng loạt.

<b>LAN</b>	: <i>Local Area Network</i> , trong một mạng LAN nhiều máy tính được nối với nhau. Mỗi máy tính làm việc riêng lẻ với processor của chính mình, tuy nhiên có một máy tính trong mạng được gọi là master, host hay server đảm nhận vai trò quản lý toàn bộ dữ liệu. Các máy tính khác trong mạng được gọi là Workstations.
<b>Latch</b>	: Bộ nhớ trung gian để nhớ các kết quả trong thời gian ngắn. Các công tắc điện tử ghi các trạng thái, thường được cấu tạo bằng các D-Flipflop.
<b>LCD</b>	: <i>Liquid Crystal Display</i> , mặt hiện số tinh thể lỏng.
<b>LED</b>	: <i>Ligh Emitting Diode</i> , diốt phát sáng.
<b>LF / LP</b>	: <i>Low Frequency / Low - pass</i>
<b>LPT</b>	: <i>Line Printer</i> , giao diện song song thường với chuẩn Centronics có 25 chân, dữ liệu 8 bit được truyền đi cùng một lúc đạt được vận tốc rất cao. Tuy nhiên vì sự nhiễu điện từ có thể làm sai lệch các tín hiệu trong 256 tín hiệu được mã hóa khác nhau cho 8 bit được truyền đi trên dây điện thoại, loại giao diện song song không được ứng dụng rộng rãi, thường chỉ được dùng cho máy in với khoảng cách ngắn.
<b>Lock-In-Amplifier</b>	: Máy khuỷu đại các tín hiệu có cùng tần số và cùng pha với sóng chuẩn của máy khuỷu đại. Máy có thể tách các tín hiệu xoay chiều cần khuỷu đại ra khỏi sóng nhiễu, dù các tín hiệu nhiễu có biên độ lớn gấp hàng nghìn lần tín hiệu cần đo.
<b>MIDI</b>	: <i>Musical Instrument Digital Interface</i> , giao diện kết nối các dụng cụ âm nhạc với máy tính để các dụng cụ âm nhạc này được điều khiển bằng kỹ thuật số.
<b>MIPS</b>	: <i>Million Instructions per Second</i>
<b>Multiplexer</b>	: Bộ chuyển kênh tự động, truyền tín hiệu từ những nơi phát có tốc độ làm việc chậm đến một nơi nhận có tốc độ làm việc nhanh. Mục đích giảm số lượng dây truyền tin giữa hệ thống phát và nhận. Tín hiệu được truyền đi nối tiếp.
<b>Multiplier</b>	: Bộ nhân
<b>MELF</b>	: <i>Metal Electrode Face Bonding</i> .
<b>Optocoupler</b>	: Bộ ghép quang gồm có diốt phát sáng và transistor, thyristor, triac quang.
<b>OPA</b>	: <i>Operational Amplifier</i> / Khuyếu đại thuật toán
<b>Oscillator</b>	: Mạch dao động.

<b>Octal</b>	: Tám .
<b>O . C / Open Collector</b>	: Cực gác của transistor ở ngõ ra một cổng còn để trống .
<b>OTA</b>	: <i>Operational - Transconductance - Amplifier</i>
<b>PLL</b>	: <i>Phase - locked loop</i>
<b>Preset</b>	: Chọn trước , chỉnh trước . Thành lập trạng thái ban đầu .
<b>Preamplifier</b>	: Tiền khuếch đại .
<b>Protocol</b>	: Protocol trong mạng internet được hiểu là sự xác định rất chuẩn xác các quy tắc , theo đó các Host ( Host được hiểu là các thiết bị được nối vào mạng như máy tính, router, printserver...) trong mạng trao đổi dữ liệu với nhau.
<b>PWM</b>	: <i>Pulse – Width - Modulation</i>
<b>Quad</b>	: bốn .
<b>Rail-to-Rail</b>	: Loại khuếch đại thuật toán cho phép tín hiệu ở ngõ vào (và/ hay ở ngõ ra) đạt đến biên độ của điện áp cấp trên và dưới.
<b>Operational Amplifier</b>	: Loại khuếch đại thuần túy cho phép tín hiệu ở ngõ vào (và/ hay ở ngõ ra) đạt đến biên độ của điện áp cấp trên và dưới.
<b>Register</b>	: Thanh ghi, bộ nhớ trung gian nhỏ và nhanh
<b>RAM</b>	: <i>Random Access Memory</i> , bộ nhớ dữ liệu lúc máy tính làm việc , dữ liệu bị mất khi ngắt điện .
<b>Ripple Blanking</b>	: Sự xóa các số không đứng bên trái .
<b>RS-232</b>	: Recommended Standard 232, giao diện nối tiếp theo chuẩn công nghiệp quốc tế với ổ cắm 9 chân hay 25 chân.
<b>Shift Register</b>	: Bộ ghi và dịch chuyển .
<b>Sample and hold circuit</b>	: Mạch ghi giữ tín hiệu nhanh .
<b>Schmitt trigger</b>	: Mạch làm sạch xung vuông bị nhiễu hoặc biến đổi điện áp hình sin thành các xung vuông .
<b>Sensor</b>	: Sensor , đầu đo , cảm biến .
<b>Stack [ Register ]</b>	: Bộ nhớ sắp lớp từng chồng, dữ liệu nào được nhận sau cùng được đưa ra đầu tiên.
<b>Step motor</b>	: Động cơ bước .
<b>Synchronous</b>	: Đồng bộ .
<b>TCP</b>	: <i>Transmission Control Protocol</i> , TCP quản lý sự liên lạc giữa nơi gọi (client) và nơi nhận (server) trong internet, đảm bảo dữ liệu không bị mất mát, lặp lại sự truyền đạt nếu thấy cần thiết. TCP cũng ngăn chặn sự truyền đạt các gói dữ liệu lớn hơn 1500 ký tự có thể làm nghẽn mạng bằng cách phân chia làm nhiều gói nhỏ, đánh số và gói gọn trong các "bao thư IP", khi đến nơi TCP ghép các gói nhỏ thành gói dữ liệu như cũ.
<b>Timer</b>	: Mạch thời gian chuẩn .
<b>Transceiver</b>	: Transmitter / Receiver , mạch phát và thu .

<b>Transducer</b>	: Đầu đo biến đổi đại lượng không điện hay điện thành đại lượng điện có thể đo được .
<b>Transistor</b>	: Transistor , linh kiện bán dẫn không tuyến tính có khả năng khuỷch đại tín hiệu , điều chỉnh đóng mở dòng điện .
<b>Trigger</b>	: Mạch kích , khởi động bằng xung .
<b>Tri State Output</b>	: Cổng có ba trạng thái H, L và tổng trở cao ở ngõ ra .
<b>Triple</b>	: ba
<b>TTL</b>	: <i>Transistor Transistor Logic</i> .
<b>UART</b>	: <i>Universal Asyncron Receiver Transmitter</i> , bộ biến đổi từng byte bên trong máy tính thành 8 bit để được truyền sang thiết bị khác qua cổng có giao diện nối tiếp. Và ngược lại các chip UART ở cổng có giao diện nối tiếp nhận từng bit và kết hợp thành từng byte
<b>Varactor</b>	: Diốt có điện dung thay đổi .
<b>Varistor :</b>	Điện trở có trị số thay đổi tùy theo điện áp
<b>VCA</b>	: <i>Voltage Controlled Amplifier</i> . Mạch có hệ số khuỷch đại thay đổi theo điện áp 1 chiều bên ngoài (-30 ..+ 28dB) và với dải thông rộng ( 0...300 MHz ) . Gồm 1 Analogmultiplier và 1 Transimpedance - Amplifier .
<b>Vcc</b>	: Điện áp dương (bipolar)
<b>Vee</b>	: Điện áp âm (bipolar)
<b>Vdd</b>	: Điện áp dương (MOS)
<b>Vss</b>	: Điện áp âm (MOS)

## 10.4 HỆ THỐNG TRỊ SỐ ĐIỆN TRỞ TỪ E6 ĐẾN E192 DIN/IEC

E 6	E 12	E 24		E 6	E 12	E 24
1 0	1 0	1 0		3 3	3 3	3 3
		1 1				3 6
		1 2	1 2		3 9	3 9
			1 3			4 3
1 5	1 5	1 5		4 7	4 7	4 7
		1 6				5 1
		1 8	1 8		5 6	5 6
			2 0			6 2
2 2	2 2	2 2		6 8	6 8	6 8
		2 4				7 5
		2 7	2 7		8 2	8 2
			3 0			9 1

E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192
100	100	100	162	162	162	261	261	261	422	422	422
	101			164		264			427		690
102	102		165	165		267	267		432	432	698
	104			167		271			437		706
105	105	105	169	169	169	274	274	274	442	442	715
	106			172		277			448		723
107	107		174	174		280	280		453	453	732
	109			176		284			459		741
110	110	110	178	178	178	287	287	287	464	464	750
	111			180		291			470		759
113	113		182	182		294	294		475	475	768
	114			184		298			481		777
115	115	115	187	187	187	301	301	301	487	487	787
	117			189		305			493		796
118	118		191	191		309	309		499	499	806
	120			193		312			505		816
121	121	121	196	196	196	316	316	316	511	511	825
	123			198		320			517		835
124	124		200	200		324	324		523	523	845
	126			203		328			530		856
127	127	127	205	205	205	332	332	332	536	536	866
	129			208		336			542		876
130	130		210	210		340	340		549	549	887
	132			213		344			556		898
133	133	133	215	215	215	348	348	348	562	562	909
	135			218		352			569		920
137	137		221	221		357	357		576	576	931
	138			223		361			583		942
140	140	140	226	226	226	365	365	365	590	590	953
	142			229		370			597		965
143	143		232	232		374	374		604	604	976
	145			234		379			612		988
147	147	147	237	237	237	383	383	383	619	619	619
	149			240		388			626		
150	150		243	243		392	392		634	634	
	152			246		397			642		
154	154	154	249	249	249	402	402	402	649	649	649
	156			252		407			657		
158	158		255	255		412	412		665	665	
	160			258		417			673		

DƯƠNG MINH TRÍ

**SƠ ĐỒ CHÂN  
LINH KIỆN BÁN DẪN**

(In lần thứ 6 có sửa chữa)

<i>Chịu trách nhiệm xuất bản</i>	: GS. TS. TÔ ĐĂNG HẢI
<i>Biên tập</i>	: QUANG TRUNG
<i>Sửa bài</i>	: DƯƠNG MINH TRÍ
<i>Bìa</i>	: NGUYỄN KHOA

**NHÀ XUẤT BẢN KHOA HỌC VÀ KỸ THUẬT**

70 Trần Hưng Đạo, Hà Nội

**CHI NHÁNH NHÀ XUẤT BẢN KHOA HỌC VÀ KỸ THUẬT**

28 Đồng Khởi và 12 Hồ Huân Nghiệp, Q.1, TP. Hồ Chí Minh

ĐT : 8225062 - 8296628

Mã số 6.T.0.3  
KHKT-2005 1288 - 150 - 2005

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In 800 bản, khổ 14,5 x 20,5 cm, tại Xí nghiệp in II – Công ty in Ba Đình.  
Số 258 Nguyễn Trãi – Quận 1 – TP. HCM. Số xuất bản : 1288-150 cấp ngày 09/8/2005.  
In xong và nộp lưu chiểu tháng 9 năm 2005.

CÙNG TÁC GIẢ :

# LINH KIỆN QUANG ĐIỆN TỬ

(LCD, LED, IRLED, PHOTOTRANSISTOR,

BỘ GHÉP QUANG, QUANG TRỞ, LASER BÁN DẪN,  
CÔNG NGHỆ QUANG DẪN...)

205225



NXB KHOA HỌC VÀ KỸ THUẬT. IN LẦN THỨ HAI

## CẨM BIẾN VÀ ỨNG DỤNG

(NHIỆT ĐỘ, TRỊ SỐ pH, ĐỘ DẪN ĐIỆN,  
ĐỘ ẨM, ÁP SUẤT, CẨM BIẾN LỰC VÀ GIA TỐC  
LƯU LƯỢNG, VỊ TRÍ, TỪ TRƯỜNG, NỒNG ĐỘ  
VÀ PHÂN TÍCH KHÍ, MỨC CHẤT LỎNG VÀ MỨC  
CHẤT RẮN, MẠCH KHUYẾCH ĐẠI ĐO, NHIỄU  
ĐIỆN TỬ...)

### MÃ MÀU ĐIỆN TRỞ



E-12  
E-24

	Đen	Nâu	Đỏ	Cam	Vàng	Xanh lá cây	Xanh da trời	Tím	Xám	Trắng	Nhũ vàng	Nhũ bạc	Không màu
số thứ nhất	0	1	2	3	4	5	6	7	8	9	-	-	số thứ nhất
số thứ hai	0	1	2	3	4	5	6	7	8	9	-	-	số thứ hai
	0	1	2	3	4	5	6	7	8	9	-	-	số thứ ba
số nhân	$10^0$	$10^1$	$10^2$	$10^3$	$10^4$	$10^5$	$10^6$	$10^7$	$10^8$	$10^9$	$10^{-1}$	$10^{-2}$	số nhân
sai số											$I = \pm 5\%$	$K = \pm 10\%$	sai số

E-96



Giá : 56.000đ