

December 1992

## CMOS 9-Bit Parity Generator/Checker

### Features

- High Voltage Type (20V Rating)
- 100% Tested for Quiescent Current at 20V
- 5V, 10V and 15V Parametric Ratings
- Maximum Input Current of 1 $\mu$ A at 18V Over Full Package Temperature Range; 100nA at 18V and +25°C
- Noise Margin (Over Full Package/Temperature Range)
  - 1V at VDD = 5V
  - 2V at VDD = 10V
  - 2.5V at VDD = 15V
- Standardized Symmetrical Output Characteristics
- Meets All Requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

### Description

The CD40101BMS is a 9-bit (8 data bits plus 1 parity bit) parity generator/checker. It may be used to detect errors in data transmission or data retrieval. Odd and even outputs facilitate odd or even parity generation and checking.

When used as a parity generator, a parity bit is supplied along with the data to generate an even or odd parity output.

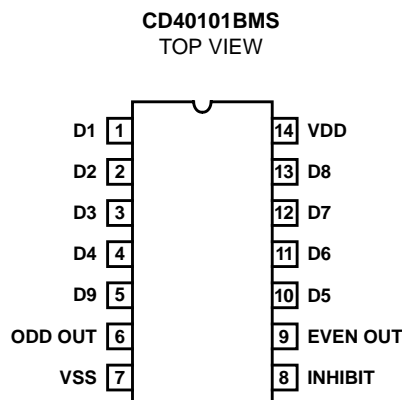
When used as a parity checker, the received data bits and parity bits are compared for correct parity. The even or odd outputs are used to indicate an error in the received data.

Word length capability is expandable by cascading. The CD40101BMS is also provided with an inhibit control. If the inhibit control is set at logical "1", the even and odd outputs go to a logical "0".

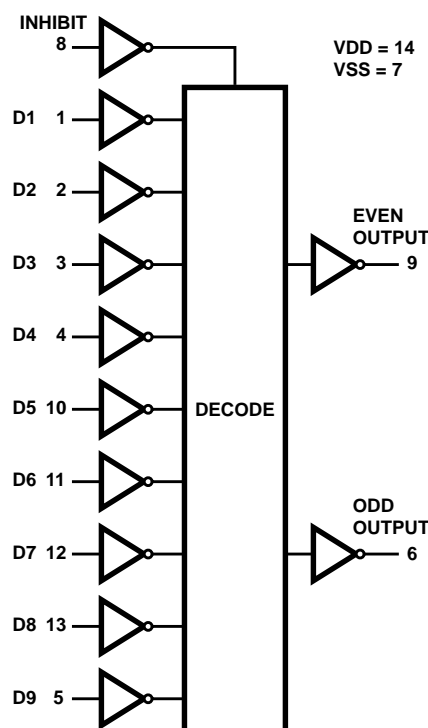
The CD40101BMS is supplied in these 14 lead outline packages:

Braze Seal DIP	H4H
Frit Seal DIP	H1B
Ceramic Flatpack	H3W

### Pinout



### Functional Diagram



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## Absolute Maximum Ratings

DC Supply Voltage Range, (VDD) ..... -0.5V to +20V  
 (Voltage Referenced to VSS Terminals)  
 Input Voltage Range, All Inputs ..... -0.5V to VDD +0.5V  
 DC Input Current, Any One Input .....  $\pm 10\text{mA}$   
 Operating Temperature Range .....  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$   
 Package Types D, F, K, H  
 Storage Temperature Range (TSTG) .....  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$   
 Lead Temperature (During Soldering) .....  $+265^{\circ}\text{C}$   
 At Distance  $1/16 \pm 1/32$  Inch ( $1.59\text{mm} \pm 0.79\text{mm}$ ) from case for  
 10s Maximum

## Reliability Information

Thermal Resistance .....  $\theta_{ja}$   $\theta_{jc}$   
 Ceramic DIP and FRIT Package .....  $80^{\circ}\text{C/W}$   $20^{\circ}\text{C/W}$   
 Flatpack Package .....  $70^{\circ}\text{C/W}$   $20^{\circ}\text{C/W}$   
 Maximum Package Power Dissipation (PD) at  $+125^{\circ}\text{C}$   
 For  $T_A = -55^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  (Package Type D, F, K) .....  $500\text{mW}$   
 For  $T_A = +100^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  (Package Type D, F, K) ..... Derate  
 Linearity at  $12\text{mW}/^{\circ}\text{C}$  to  $200\text{mW}$   
 Device Dissipation per Output Transistor .....  $100\text{mW}$   
 For  $T_A = \text{Full Package Temperature Range (All Package Types)}$   
 Junction Temperature .....  $+175^{\circ}\text{C}$

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITIONS (NOTE 1)		GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
						MIN	MAX	
Supply Current	IDD	VDD = 20V, VIN = VDD or GND		1	$+25^{\circ}\text{C}$	-	10	$\mu\text{A}$
				2	$+125^{\circ}\text{C}$	-	1000	$\mu\text{A}$
		VDD = 18V, VIN = VDD or GND		3	$-55^{\circ}\text{C}$	-	10	$\mu\text{A}$
Input Leakage Current	IIL	VIN = VDD or GND	VDD = 20	1	$+25^{\circ}\text{C}$	-100	-	nA
				2	$+125^{\circ}\text{C}$	-1000	-	nA
			VDD = 18V	3	$-55^{\circ}\text{C}$	-100	-	nA
Input Leakage Current	IIH	VIN = VDD or GND	VDD = 20	1	$+25^{\circ}\text{C}$	-	100	nA
				2	$+125^{\circ}\text{C}$	-	1000	nA
			VDD = 18V	3	$-55^{\circ}\text{C}$	-	100	nA
Output Voltage	VOL15	VDD = 15V, No Load		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	-	50	mV
Output Voltage	VOH15	VDD = 15V, No Load (Note 3)		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	14.95	-	V
Output Current (Sink)	IOL5	VDD = 5V, VOUT = 0.4V		1	$+25^{\circ}\text{C}$	0.53	-	mA
Output Current (Sink)	IOL10	VDD = 10V, VOUT = 0.5V		1	$+25^{\circ}\text{C}$	1.4	-	mA
Output Current (Sink)	IOL15	VDD = 15V, VOUT = 1.5V		1	$+25^{\circ}\text{C}$	3.5	-	mA
Output Current (Source)	IOH5A	VDD = 5V, VOUT = 4.6V		1	$+25^{\circ}\text{C}$	-	-0.53	mA
Output Current (Source)	IOH5B	VDD = 5V, VOUT = 2.5V		1	$+25^{\circ}\text{C}$	-	-1.8	mA
Output Current (Source)	IOH10	VDD = 10V, VOUT = 9.5V		1	$+25^{\circ}\text{C}$	-	-1.4	mA
Output Current (Source)	IOH15	VDD = 15V, VOUT = 13.5V		1	$+25^{\circ}\text{C}$	-	-3.5	mA
N Threshold Voltage	VNTH	VDD = 10V, ISS = $-10\mu\text{A}$		1	$+25^{\circ}\text{C}$	-2.8	-0.7	V
P Threshold Voltage	VPTH	VSS = 0V, IDD = $10\mu\text{A}$		1	$+25^{\circ}\text{C}$	0.7	2.8	V
Functional	F	VDD = 2.8V, VIN = VDD or GND		7	$+25^{\circ}\text{C}$	$\text{VOH} > \text{VDD}/2$	$\text{VOL} < \text{VDD}/2$	V
		VDD = 20V, VIN = VDD or GND		7	$+25^{\circ}\text{C}$			
		VDD = 18V, VIN = VDD or GND		8A	$+125^{\circ}\text{C}$			
		VDD = 3V, VIN = VDD or GND		8B	$-55^{\circ}\text{C}$			
Input Voltage Low (Note 2)	VIL	VDD = 5V, VOH > 4.5V, VOL < 0.5V		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	-	1.5	V
Input Voltage High (Note 2)	VIH	VDD = 5V, VOH > 4.5V, VOL < 0.5V		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	3.5	-	V
Input Voltage Low (Note 2)	VIL	VDD = 15V, VOH > 13.5V, VOL < 1.5V		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	-	4	V
Input Voltage High (Note 2)	VIH	VDD = 15V, VOH > 13.5V, VOL < 1.5V		1, 2, 3	$+25^{\circ}\text{C}, +125^{\circ}\text{C}, -55^{\circ}\text{C}$	11	-	V

NOTES: 1. All voltages referenced to device GND, 100% testing being implemented. 3. For accuracy, voltage is measured differentially to VDD. Limit is 0.050V max.  
 2. Go/No Go test with limits applied to inputs.

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**TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITIONS (NOTE 1, 2)	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Propagation Delay Data-In To Output	TPHL1 TPLH1	VDD = 5V, VIN = VDD or GND	9	+25°C	-	700	ns
			10, 11	+125°C, -55°C	-	945	ns
Propagation Delay Inhibit-In to Output	TPHL2 TPLH2	VDD = 5V, VIN = VDD or GND	9	+25°C	-	280	ns
			10, 11	+125°C, -55°C	-	378	ns
Transition Time	TTHL TTLH	VDD = 5V, VIN = VDD or GND	9	+25°C	-	200	ns
			10, 11	+125°C, -55°C	-	270	ns

NOTES:

1. CL = 50pF, RL = 200K, Input TR, TF < 20ns.
2. -55°C and +125°C limits guaranteed, 100% testing being implemented.

**TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Supply Current	IDD	VDD = 5V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	5	μA
				+125°C	-	150	μA
		VDD = 10V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	10	μA
				+125°C	-	300	μA
		VDD = 15V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	10	μA
				+125°C	-	600	μA
Output Voltage	VOL	VDD = 5V, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOL	VDD = 10V, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOH	VDD = 5V, No Load	1, 2	+25°C, +125°C, -55°C	4.95	-	V
Output Voltage	VOH	VDD = 10V, No Load	1, 2	+25°C, +125°C, -55°C	9.95	-	V
Output Current (Sink)	IOL5	VDD = 5V, VOUT = 0.4V	1, 2	+125°C	0.36	-	mA
				-55°C	0.64	-	mA
Output Current (Sink)	IOL10	VDD = 10V, VOUT = 0.5V	1, 2	+125°C	0.9	-	mA
				-55°C	1.6	-	mA
Output Current (Sink)	IOL15	VDD = 15V, VOUT = 1.5V	1, 2	+125°C	2.4	-	mA
				-55°C	4.2	-	mA
Output Current (Source)	IOH5A	VDD = 5V, VOUT = 4.6V	1, 2	+125°C	-	-0.36	mA
				-55°C	-	-0.64	mA
Output Current (Source)	IOH5B	VDD = 5V, VOUT = 2.5V	1, 2	+125°C	-	-1.15	mA
				-55°C	-	-2.0	mA
Output Current (Source)	IOH10	VDD = 10V, VOUT = 9.5V	1, 2	+125°C	-	-0.9	mA
				-55°C	-	-1.6	mA
Output Current (Source)	IOH15	VDD = 15V, VOUT = 13.5V	1, 2	+125°C	-	-2.4	mA
				-55°C	-	-4.2	mA
Input Voltage Low	VIL	VDD = 10V, VOH > 9V, VOL < 1V	1, 2	+25°C, +125°C, -55°C	-	3	V

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**TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)**

PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Input Voltage High	VIH	VDD = 10V, VOH > 9V, VOL < 1V	1, 2	+25°C, +125°C, -55°C	7	-	V
Propagation Delay Data to Output	TPHL1 TPLH1	VDD = 10V	1, 2, 3	+25°C	-	300	ns
		VDD = 15V	1, 2, 3	+25°C	-	200	ns
Propagation Delay Inhibit to Output	TPHL2 TPLH2	VDD = 10V	1, 2, 3	+25°C	-	140	ns
		VDD = 15V	1, 2, 3	+25°C	-	100	ns
Transition Time	TTLH TTHL	VDD = 10V	1, 2, 3	+25°C	-	100	ns
		VDD = 15V	1, 2, 3	+25°C	-	80	ns
Input Capacitance	CIN	Any Input	1, 2	+25°C	-	7.5	pF

**NOTES:**

1. All voltages referenced to device GND.
2. The parameters listed on Table 3 are controlled via design or process and are not directly tested. These parameters are characterized on initial design release and upon design changes which would affect these characteristics.
3. CL = 50pF, RL = 200K, Input TR, TF < 20ns.

**TABLE 4. POST IRRADIATION ELECTRICAL PERFORMANCE CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Supply Current	IDD	VDD = 20V, VIN = VDD or GND	1, 4	+25°C	-	25	μA
N Threshold Voltage	VNTH	VDD = 10V, ISS = -10μA	1, 4	+25°C	-2.8	-0.2	V
N Threshold Voltage Delta	ΔVTN	VDD = 10V, ISS = -10μA	1, 4	+25°C	-	±1	V
P Threshold Voltage	VTP	VSS = 0V, IDD = 10μA	1, 4	+25°C	0.2	2.8	V
P Threshold Voltage Delta	ΔVTP	VSS = 0V, IDD = 10μA	1, 4	+25°C	-	±1	V
Functional	F	VDD = 18V, VIN = VDD or GND	1	+25°C	VOH > VDD/2	VOL < VDD/2	V
		VDD = 3V, VIN = VDD or GND					
Propagation Delay Time	TPHL TPLH	VDD = 5V	1, 2, 3, 4	+25°C	-	1.35 x +25°C Limit	ns

- NOTES: 1. All voltages referenced to device GND. 3. See Table 2 for +25°C limit.  
2. CL = 50pF, RL = 200K, Input TR, TF < 20ns. 4. Read and Record

**TABLE 5. BURN-IN AND LIFE TEST DELTA PARAMETERS +25°C**

PARAMETER	SYMBOL	DELTA LIMIT
Supply Current - MSI-2	IDD	± 1.0μA
Output Current (Sink)	IOL5	± 20% x Pre-Test Reading
Output Current (Source)	IOH5A	± 20% x Pre-Test Reading

**TABLE 6. APPLICABLE SUBGROUPS**

CONFORMANCE GROUP	MIL-STD-883 METHOD	GROUP A SUBGROUPS	READ AND RECORD
Initial Test (Pre Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A
Interim Test 1 (Post Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A

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**TABLE 6. APPLICABLE SUBGROUPS**

CONFORMANCE GROUP		MIL-STD-883 METHOD	GROUP A SUBGROUPS	READ AND RECORD
Interim Test 2 (Post Burn-In)		100% 5004	1, 7, 9	IDD, IOL5, IOH5A
PDA (Note 1)		100% 5004	1, 7, 9, Deltas	
Interim Test 3 (Post Burn-In)		100% 5004	1, 7, 9	IDD, IOL5, IOH5A
PDA (Note 1)		100% 5004	1, 7, 9, Deltas	
Final Test		100% 5004	2, 3, 8A, 8B, 10, 11	
Group A		Sample 5005	1, 2, 3, 7, 8A, 8B, 9, 10, 11	
Group B	Subgroup B-5	Sample 5005	1, 2, 3, 7, 8A, 8B, 9, 10, 11, Deltas	Subgroups 1, 2, 3, 9, 10, 11
	Subgroup B-6	Sample 5005	1, 7, 9	
Group D		Sample 5005	1, 2, 3, 8A, 8B, 9	Subgroups 1, 2 3

NOTE: 1. 5% Parametric, 3% Functional; Cumulative for Static 1 and 2.

**TABLE 7. TOTAL DOSE IRRADIATION**

CONFORMANCE GROUPS	MIL-STD-883 METHOD	TEST		READ AND RECORD	
		PRE-IRRAD	POST-IRRAD	PRE-IRRAD	POST-IRRAD
Group E Subgroup 2	5005	1, 7, 9	Table 4	1, 9	Table 4

**TABLE 8. BURN-IN AND IRRADIATION TEST CONNECTIONS**

FUNCTION	OPEN	GROUND	VDD	9V $\pm$ -0.5V	OSCILLATOR	
					50kHz	25kHz
Static Burn-In 1 Note 1	6, 9	1-5, 7, 8, 10-13	14			
Static Burn-In 2 Note 1	6, 9	7	1-5, 8, 10-14			
Dynamic Burn-In Note 1	-	4, 7	12, 14	6, 9	2, 3, 5, 8, 10	1, 11, 13
Irradiation Note 2	6, 9	7	1-5, 8, 10-14			

NOTES:

- Each pin except VDD and GND will have a series resistor of  $10K \pm 5\%$ ,  $VDD = 18V \pm 0.5V$
- Each pin except VDD and GND will have a series resistor of  $47K \pm 5\%$ ; Group E, Subgroup 2, sample size is 4 dice/wafer, 0 failures,  $VDD = 10V \pm 0.5V$

## Logic Diagram

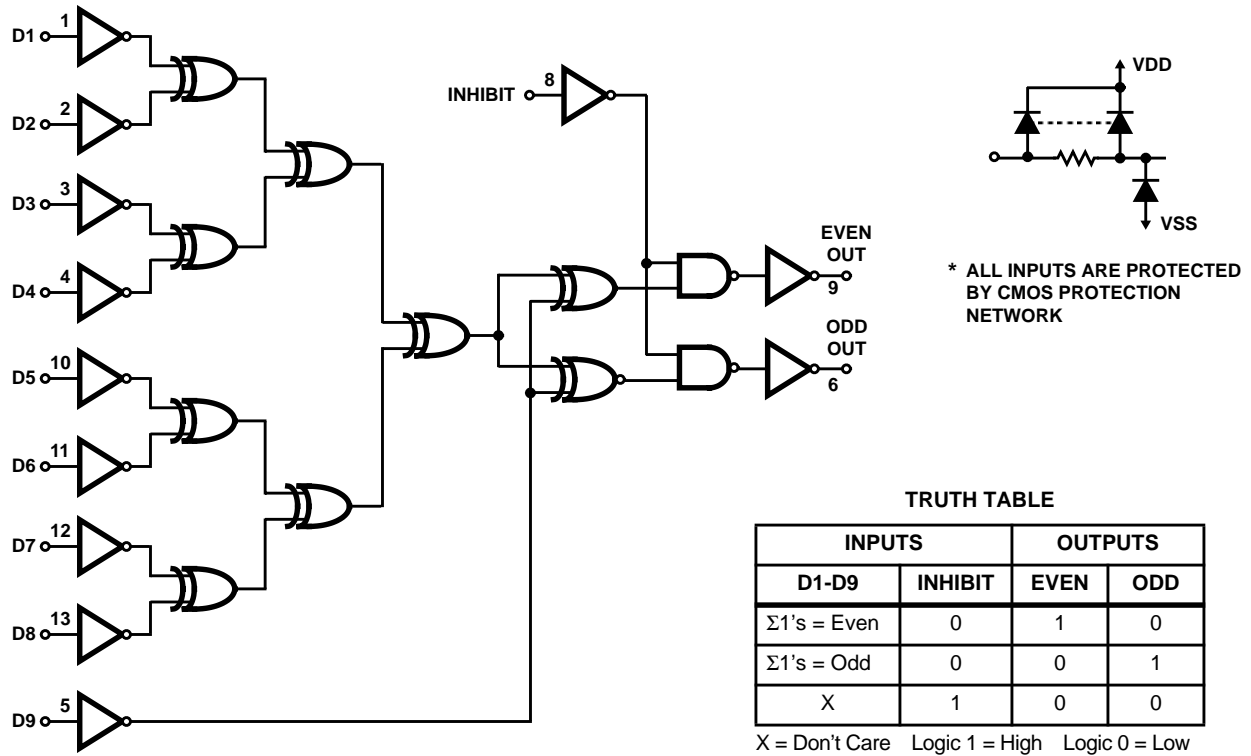


FIGURE 1.

## Typical Performance Characteristics

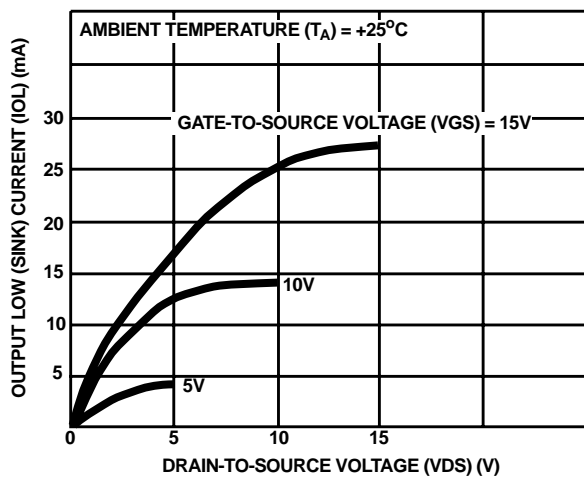


FIGURE 2. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

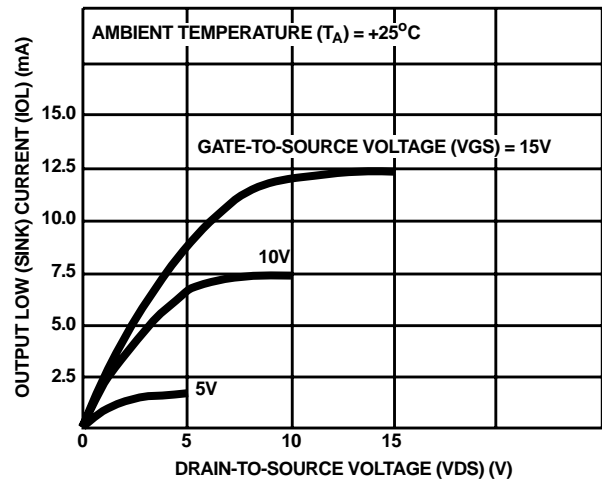


FIGURE 3. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

# Typical Performance Characteristics (Continued)

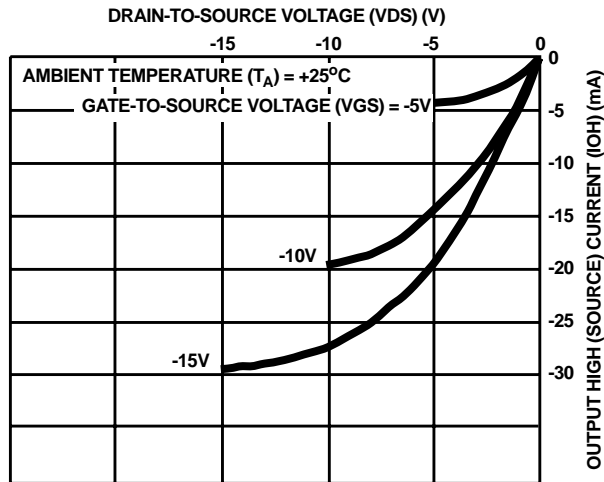


FIGURE 4. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

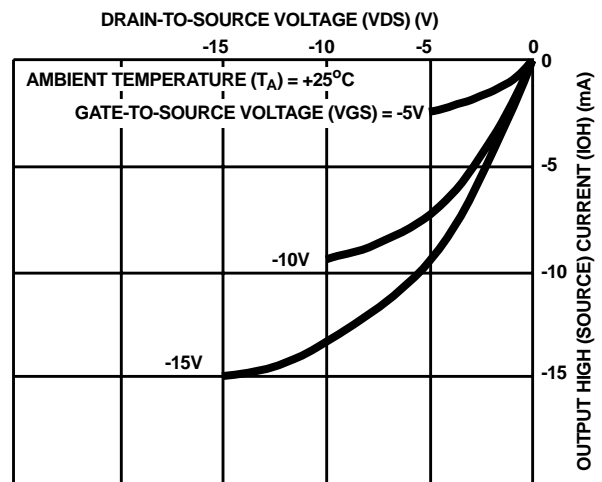


FIGURE 5. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

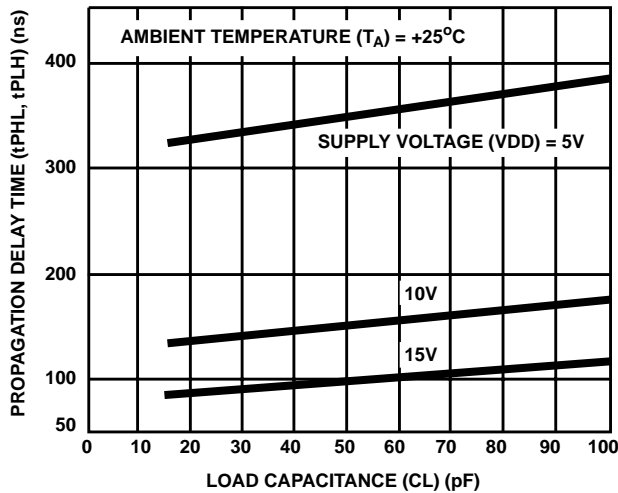


FIGURE 6. TYPICAL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

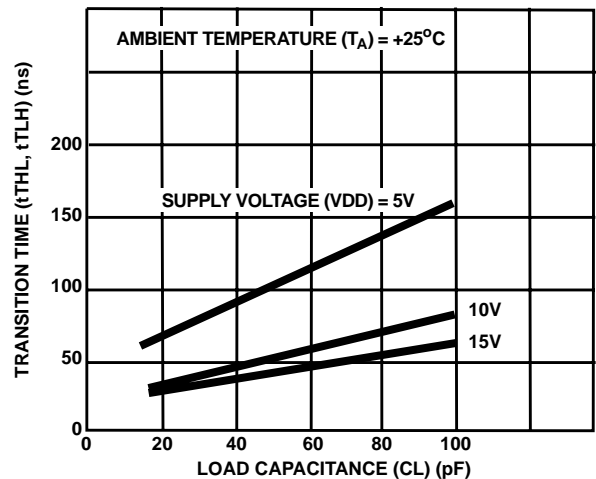


FIGURE 7. TYPICAL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

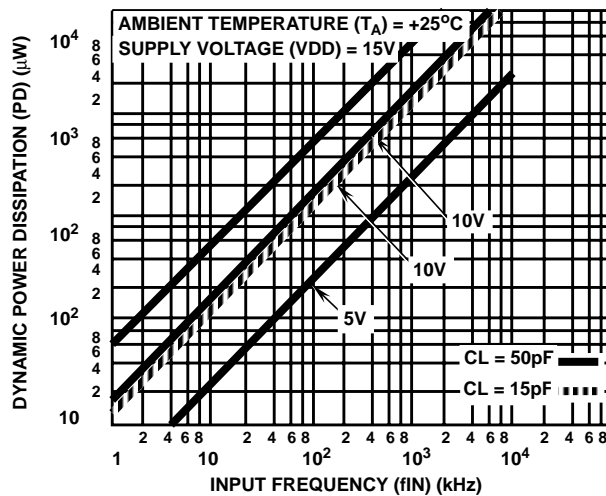
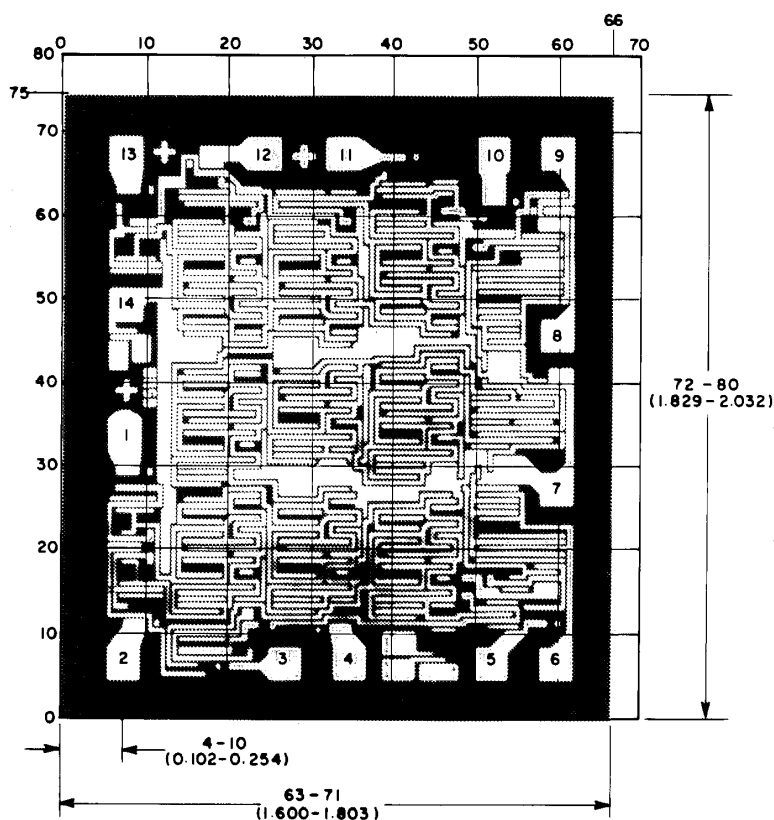


FIGURE 8. TYPICAL DYNAMIC POWER DISSIPATION AS A FUNCTION OF INPUT FREQUENCY

**Chip Dimensions and Pad Layout**

Dimensions in parenthesis are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

**METALLIZATION:** Thickness:  $11\text{k}\text{\AA} - 14\text{k}\text{\AA}$ , AL.

**PASSIVATION:**  $10.4\text{k}\text{\AA} - 15.6\text{k}\text{\AA}$ , Silane

**BOND PADS:** 0.004 inches X 0.004 inches MIN

**DIE THICKNESS:** 0.0198 inches - 0.0218 inches

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