

December 1992

### Features

- High-Voltage Types (20-Volt Rating)
- Low Quiescent Current - 10nA/pkg (Typ.) at VDD = 5V
- Clock Frequency 12MHz (Typ.) at VDD = 10V
- Schmitt Trigger Clock Inputs Allow Operation with Very Slow Clock Rise and Fall Times
- Capable of Driving Two Low-power TTL Loads, One Low-power Schottky TTL Load, or Two HTL Loads
- 3-State Outputs
- 100% Tested for Quiescent Current at 20V
- Standardized, Symmetrical Output Characteristics
- 5V, 10V, and 15V Parametric Ratings
- Meets all Requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

### Applications

- Time-delay Circuits
- Scratch-pad Memories
- General-purpose Serial Shift-register Applications

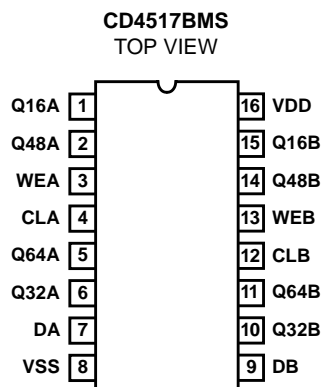
### Description

CD4517BMS dual 64-stage static shift register consists of two independent registers each having a clock, data, and write enable input and outputs accessible at taps following the 16th, 32nd, 48th, and 64th stages. These taps also serve as input points allowing data to be inputted at the 17th, 33rd, and 49th stages when the write enable input is a logic 1 and the clock goes through a low-to-high transition. The truth table indicates how the clock and write enable inputs control the operation of the CD4517BMS. Inputs at the intermediate taps allow entry of 64 bits into the register with 16 clock pulses. The 3-state outputs permit connection of this device to an external bus.

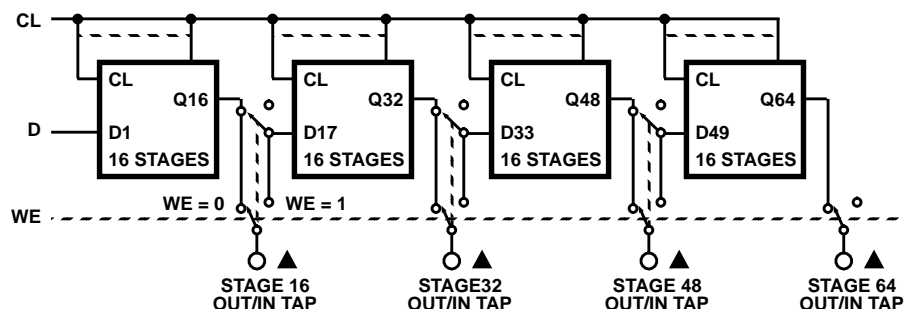
The CD4517BMS is supplied in these 16 lead outline packages:

|                  |     |
|------------------|-----|
| Braze Seal DIP   | H4X |
| Frit Seal DIP    | H1F |
| Ceramic Flatpack | H6P |

### Pinout



### Functional Diagram



# Specifications CD4517BMS

## 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°C to +125°C  
 Package Types D, F, K, H  
 Storage Temperature Range (TSTG) ..... -65°C to +150°C  
 Lead Temperature (During Soldering) ..... +265°C  
 At Distance 1/16  $\pm$  1/32 Inch (1.59mm  $\pm$  0.79mm) from case for  
 10s Maximum

## Reliability Information

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

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS**

| PARAMETER                      | SYMBOL | CONDITIONS (NOTE 1)                   |           | GROUP A<br>SUBGROUPS | TEMPERATURE          | LIMITS         |                | UNITS         |
|--------------------------------|--------|---------------------------------------|-----------|----------------------|----------------------|----------------|----------------|---------------|
|                                |        |                                       |           |                      |                      | MIN            | MAX            |               |
| Supply Current                 | IDD    | VDD = 20V, VIN = VDD or GND           |           | 1                    | +25°C                | -              | 10             | $\mu\text{A}$ |
|                                |        |                                       |           | 2                    | +125°C               | -              | 1000           | $\mu\text{A}$ |
|                                |        | VDD = 18V, VIN = VDD or GND           |           | 3                    | -55°C                | -              | 10             | $\mu\text{A}$ |
| Input Leakage Current          | IIL    | VIN = VDD or GND                      | VDD = 20  | 1                    | +25°C                | -100           | -              | nA            |
|                                |        |                                       |           | 2                    | +125°C               | -1000          | -              | nA            |
|                                |        |                                       | VDD = 18V | 3                    | -55°C                | -100           | -              | nA            |
| Input Leakage Current          | IIH    | VIN = VDD or GND                      | VDD = 20  | 1                    | +25°C                | -              | 100            | nA            |
|                                |        |                                       |           | 2                    | +125°C               | -              | 1000           | nA            |
|                                |        |                                       | VDD = 18V | 3                    | -55°C                | -              | 100            | nA            |
| Output Voltage                 | VOL15  | VDD = 15V, No Load                    |           | 1, 2, 3              | +25°C, +125°C, -55°C | -              | 50             | mV            |
| Output Voltage                 | VOH15  | VDD = 15V, No Load (Note 3)           |           | 1, 2, 3              | +25°C, +125°C, -55°C | 14.95          | -              | V             |
| Output Current (Sink)          | IOL5   | VDD = 5V, VOUT = 0.4V                 |           | 1                    | +25°C                | 0.53           | -              | mA            |
| Output Current (Sink)          | IOL10  | VDD = 10V, VOUT = 0.5V                |           | 1                    | +25°C                | 1.4            | -              | mA            |
| Output Current (Sink)          | IOL15  | VDD = 15V, VOUT = 1.5V                |           | 1                    | +25°C                | 3.5            | -              | mA            |
| Output Current (Source)        | IOH5A  | VDD = 5V, VOUT = 4.6V                 |           | 1                    | +25°C                | -              | -0.53          | mA            |
| Output Current (Source)        | IOH5B  | VDD = 5V, VOUT = 2.5V                 |           | 1                    | +25°C                | -              | -1.8           | mA            |
| Output Current (Source)        | IOH10  | VDD = 10V, VOUT = 9.5V                |           | 1                    | +25°C                | -              | -1.4           | mA            |
| Output Current (Source)        | IOH15  | VDD = 15V, VOUT = 13.5V               |           | 1                    | +25°C                | -              | -3.5           | mA            |
| N Threshold Voltage            | VNTH   | VDD = 10V, ISS = -10 $\mu\text{A}$    |           | 1                    | +25°C                | -2.8           | -0.7           | V             |
| P Threshold Voltage            | VPTH   | VSS = 0V, IDD = 10 $\mu\text{A}$      |           | 1                    | +25°C                | 0.7            | 2.8            | V             |
| Functional                     | F      | VDD = 2.8V, VIN = VDD or GND          |           | 7                    | +25°C                | VOH ><br>VDD/2 | VOL <<br>VDD/2 | V             |
|                                |        | VDD = 20V, VIN = VDD or GND           |           | 7                    | +25°C                |                |                |               |
|                                |        | VDD = 18V, VIN = VDD or GND           |           | 8A                   | +125°C               |                |                |               |
|                                |        | VDD = 3V, VIN = VDD or GND            |           | 8B                   | -55°C                |                |                |               |
| Input Voltage Low<br>(Note 2)  | VIL    | VDD = 5V, VOH > 4.5V, VOL < 0.5V      |           | 1, 2, 3              | +25°C, +125°C, -55°C | -              | 1.5            | V             |
| Input Voltage High<br>(Note 2) | VIH    | VDD = 5V, VOH > 4.5V, VOL < 0.5V      |           | 1, 2, 3              | +25°C, +125°C, -55°C | 3.5            | -              | V             |
| Input Voltage Low<br>(Note 2)  | VIL    | VDD = 15V, VOH > 13.5V,<br>VOL < 1.5V |           | 1, 2, 3              | +25°C, +125°C, -55°C | -              | 4              | V             |
| Input Voltage High<br>(Note 2) | VIH    | VDD = 15V, VOH > 13.5V,<br>VOL < 1.5V |           | 1, 2, 3              | +25°C, +125°C, -55°C | 11             | -              | V             |
| Tri-State Output<br>Leakage    | IOZL   | VIN = VDD or GND<br>VOUT = 0V         | VDD = 20V | 1                    | +25°C                | -0.4           | -              | $\mu\text{A}$ |
|                                |        |                                       |           | 2                    | +125°C               | -12            | -              | $\mu\text{A}$ |
|                                |        |                                       | VDD = 18V | 3                    | -55°C                | -0.4           | -              | $\mu\text{A}$ |
| Tri-State Output<br>Leakage    | IOZH   | VIN = VDD or GND<br>VOUT = VDD        | VDD = 20V | 1                    | +25°C                | -              | 0.4            | $\mu\text{A}$ |
|                                |        |                                       |           | 2                    | +125°C               | -              | 12             | $\mu\text{A}$ |
|                                |        |                                       | VDD = 18V | 3                    | -55°C                | -              | 0.4            | $\mu\text{A}$ |

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<br>SUBGROUPS | TEMPERATURE   | LIMITS |     | UNITS |
|----------------------------------|--------------|----------------------------|----------------------|---------------|--------|-----|-------|
|                                  |              |                            |                      |               | MIN    | MAX |       |
| Propagation Delay<br>Clock to 16 | TPHL<br>TPLH | VDD = 5V, VIN = VDD or GND | 9                    | +25°C         | -      | 400 | ns    |
|                                  |              |                            | 10, 11               | +125°C, -55°C | -      | 540 | ns    |
| Transition Time                  | TTHL<br>TTLH | VDD = 5V, VIN = VDD or GND | 9                    | +25°C         | -      | 200 | ns    |
|                                  |              |                            | 10, 11               | +125°C, -55°C | -      | 270 | ns    |
| Maximum Clock Input<br>Frequency | FCL          | VDD = 5V, VIN = VDD or GND | 9                    | +25°C         | 3      | -   | MHz   |
|                                  |              |                            | 10, 11               | +125°C, -55°C | 2.22   | -   | MHz   |

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,<br>-55°C | -      | 50    | mV    |
| Output Voltage          | VOL    | VDD = 10V, No Load            | 1, 2  | +25°C, +125°C,<br>-55°C | -      | 50    | mV    |
| Output Voltage          | VOH    | VDD = 5V, No Load             | 1, 2  | +25°C, +125°C,<br>-55°C | 4.95   | -     | V     |
| Output Voltage          | VOH    | VDD = 10V, No Load            | 1, 2  | +25°C, +125°C,<br>-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,<br>-55°C | -      | 3     | V     |
| Input Voltage High      | VIH    | VDD = 10V, VOH > 9V, VOL < 1V | 1, 2  | +25°C, +125°C,<br>-55°C | +7     | -     | V     |

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

| PARAMETER                                       | SYMBOL               | CONDITIONS | NOTES      | TEMPERATURE | LIMITS |     | UNITS |
|---|----------------------|------------|------------|-------------|--------|-----|-------|
|   |                      |            |            |             | MIN    | MAX |       |
| Propagation Delay<br>Clock to Q16               | TPHL<br>TPLH         | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 220 | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 180 | ns    |
| Propagation Delay<br>3-State WE to Q16          | TPHZ, ZH<br>TPLZ, ZL | VDD = 5V   | 1, 2, 5    | +25°C       | -      | 150 | ns    |
|   |                      | VDD = 10V  | 1, 2, 4    | +25°C       | -      | 80  | ns    |
|   |                      | VDD = 15V  | 1, 2, 4    | +25°C       | -      | 60  | ns    |
| Transition Time                                 | TTHL<br>TTLH         | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 100 | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 80  | ns    |
| Maximum Clock Input<br>Frequency                | FCL                  | VDD = 10V  | 1, 2       | +25°C       | 6      | -   | MHz   |
|   |                      | VDD = 15V  | 1, 2       | +25°C       | 8      | -   | MHz   |
| Minimum Data to Clock<br>Setup Time             | TS                   | VDD = 5V   | 1, 2, 3    | +25°C       | -      | 20  | ns    |
|   |                      | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 10  | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 10  | ns    |
| Minimum Data to Clock<br>Hold Time              | TH                   | VDD = 5V   | 1, 2, 3    | +25°C       | -      | 200 | ns    |
|   |                      | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 100 | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 50  | ns    |
| Minimum Clock Pulse<br>Width                    | TW                   | VDD = 5V   | 1, 2, 3    | +25°C       | -      | 180 | ns    |
|   |                      | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 80  | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 50  | ns    |
| Minimum Write Enable -<br>to-Clock Release Time | TR                   | VDD = 5V   | 1, 2, 3    | +25°C       | -      | 100 | ns    |
|   |                      | VDD = 10V  | 1, 2, 3    | +25°C       | -      | 50  | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | -      | 40  | ns    |
| Write Enable-to-Clock<br>Setup Time             | TS                   | VDD = 5V   | 1, 2, 3    | +25°C       | 0      | -   | ns    |
|   |                      | VDD = 10V  | 1, 2, 3    | +25°C       | 0      | -   | ns    |
|   |                      | VDD = 15V  | 1, 2, 3    | +25°C       | 0      | -   | ns    |
| Maximum Clock Input<br>Rise and Fall Time       | TRCL<br>TFCL         | VDD = 5V   | 1, 2, 3, 5 | +25°C       | -      | 15  | μs    |
|   |                      | VDD = 10V  | 1, 2, 3, 5 | +25°C       | -      | 5   | μs    |
|   |                      | VDD = 15V  | 1, 2, 3, 5 | +25°C       | -      | 5   | μs    |
| 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.
4. Measured at the point of 10% change in output with an output load 50pF, RL = 1KΩ to VDD for TPZL and TPLZ and RL = 1KΩ to VSS for TPZH and TPHZ
5. If more than one unit is cascaded, TRCL should be made less than or equal to the sum of the transition time and the fixed propagation delay of the output of the driving stage for the estimated capacitive load.

**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<br>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     |

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**TABLE 4. POST IRRADIATION ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)**

| PARAMETER                 | SYMBOL          | CONDITIONS                  | NOTES      | TEMPERATURE | LIMITS      |                    | UNITS |
|---------------------------|-----------------|-----------------------------|------------|-------------|-------------|--------------------|-------|
|                           |                 |                             |            |             | MIN         | MAX                |       |
| P Threshold Voltage Delta | $\Delta V_{TP}$ | VSS = 0V, IDD = 10 $\mu$ A  | 1, 4       | +25°C       | -           | $\pm 1$            | 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<br>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    | $\pm 1.0\mu$ A                |
| Output Current (Sink)   | IOL5   | $\pm 20\%$ x Pre-Test Reading |
| Output Current (Source) | IOH5A  | $\pm 20\%$ 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             |
| 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) | 1, 2, 5, 6, 10, 11, 14, 15 | 3, 4, 7-9, 12, 13 | 16                     |                            |            |       |
| Static Burn-In 2 (Note 1) | 1, 2, 5, 6, 10, 11, 14, 15 | 8                 | 3, 4, 7, 9, 12, 13, 16 |                            |            |       |
| Dynamic Burn-In (Note 1)  | -                          | 3, 8, 13          | 16                     | 1, 2, 5, 6, 10, 11, 14, 15 | 4, 12      | 7, 9  |

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TABLE 8. BURN-IN AND IRRADIATION TEST CONNECTIONS (Continued)

| FUNCTION                | OPEN                          | GROUND | VDD                       | 9V $\pm$ -0.5V | OSCILLATOR |       |
|-------------------------|-------------------------------|--------|---------------------------|----------------|------------|-------|
|                         |                               |        |                           |                | 50kHz      | 25kHz |
| Irradiation<br>(Note 2) | 1, 2, 5, 6, 10, 11,<br>14, 15 | 8      | 3, 4, 7, 9, 12, 13,<br>16 |                |            |       |

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

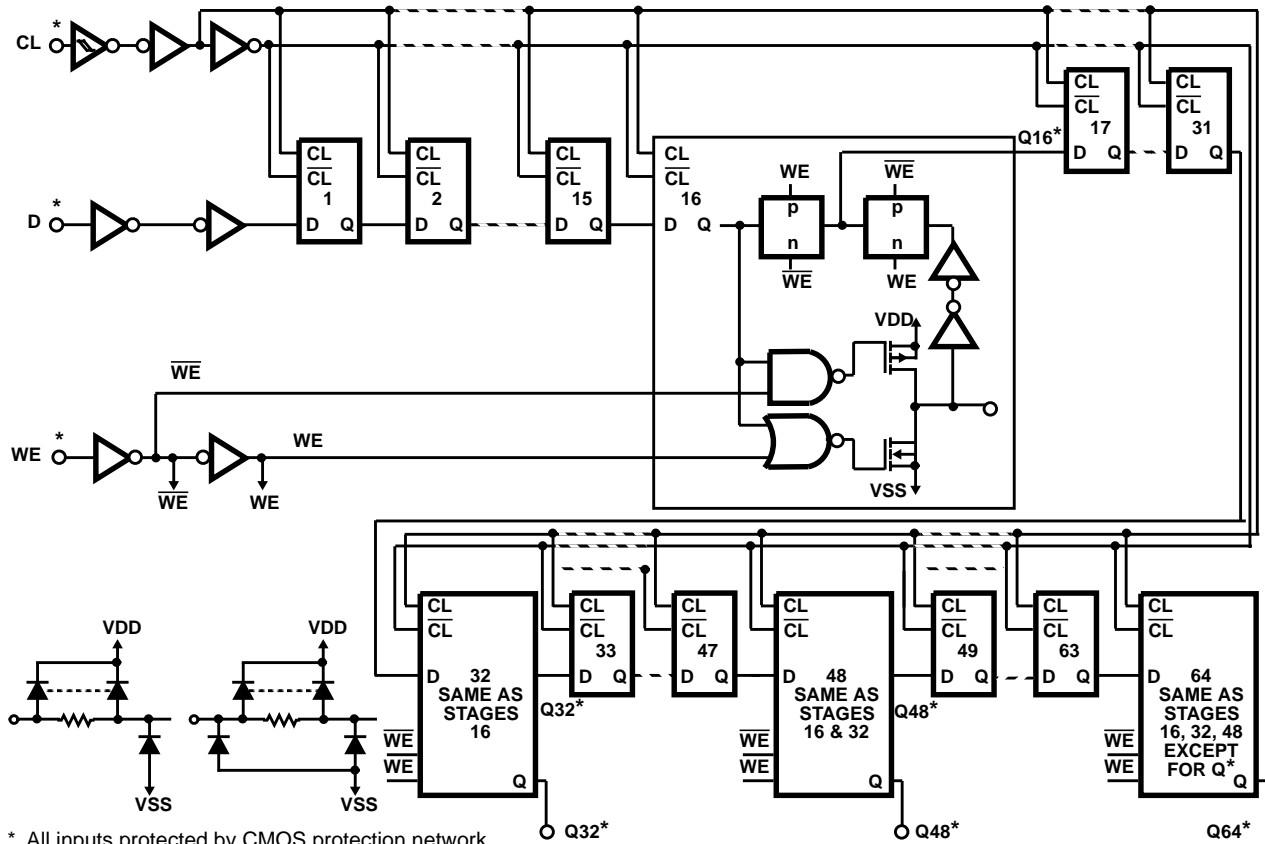


FIGURE 1. LOGIC BLOCK DIAGRAM

TRUTH TABLE

| 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            | X     | Z            | Z            | Z            | Z            |
| 1     | 0            | X     | Q16          | Q32          | Q48          | Q64          |
| 1     | 1            | X     | 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            |

1 = HIGH LEVEL  
0 = LOW LEVEL

X = DON'T CARE  
Z = HIGH IMPEDANCE

## Typical Performance Characteristics

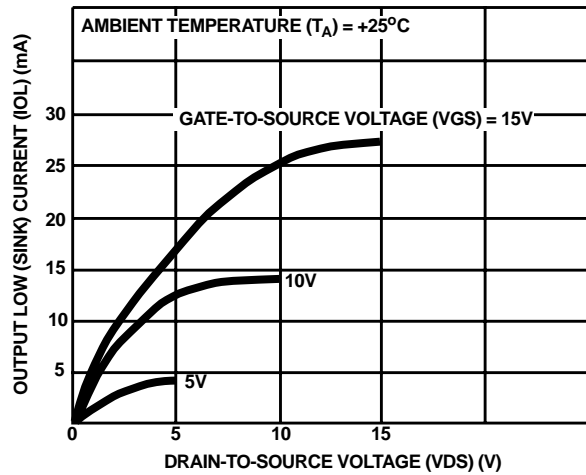


FIGURE 2. TYPICAL N-CHANNEL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

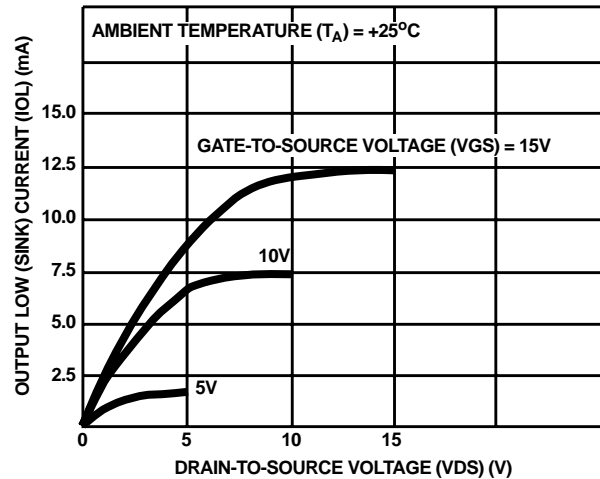


FIGURE 3. MINIMUM N-CHANNEL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

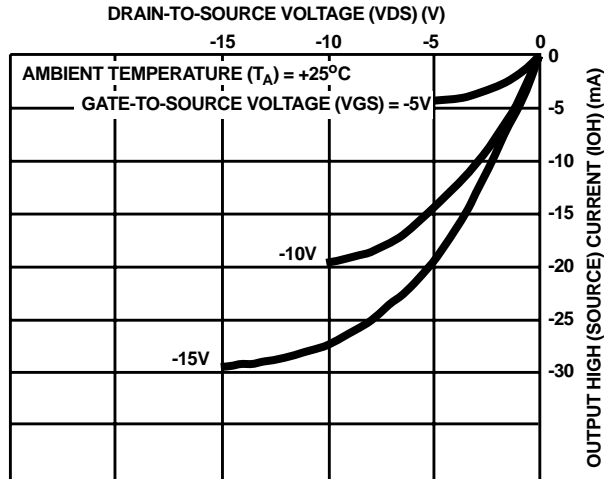


FIGURE 4. TYPICAL P-CHANNEL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

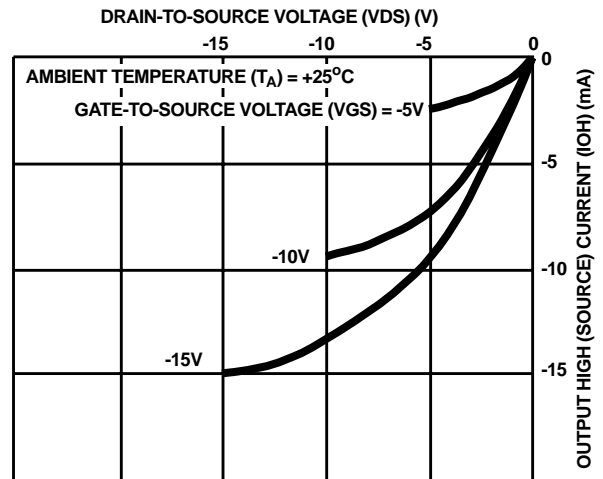


FIGURE 5. MINIMUM P-CHANNEL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

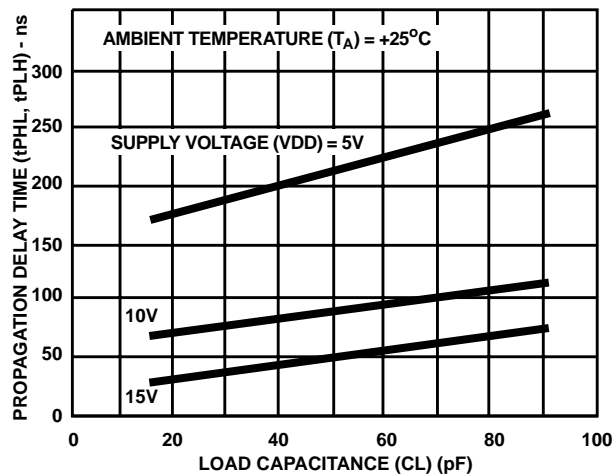


FIGURE 6. TYPICAL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

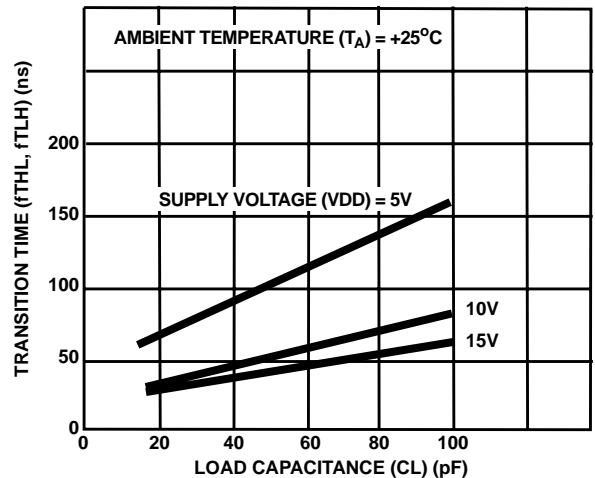


FIGURE 7. TYPICAL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

**Typical Performance Characteristics** (Continued)

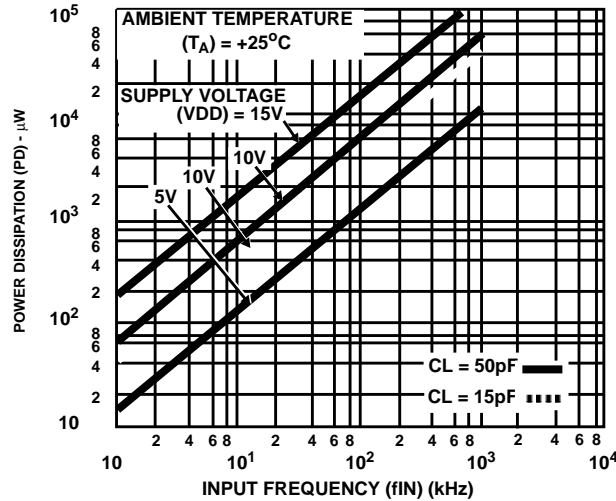


FIGURE 8. TYPICAL POWER DISSIPATION AS A FUNCTION OF FREQUENCY

**Waveforms and Test Circuits**

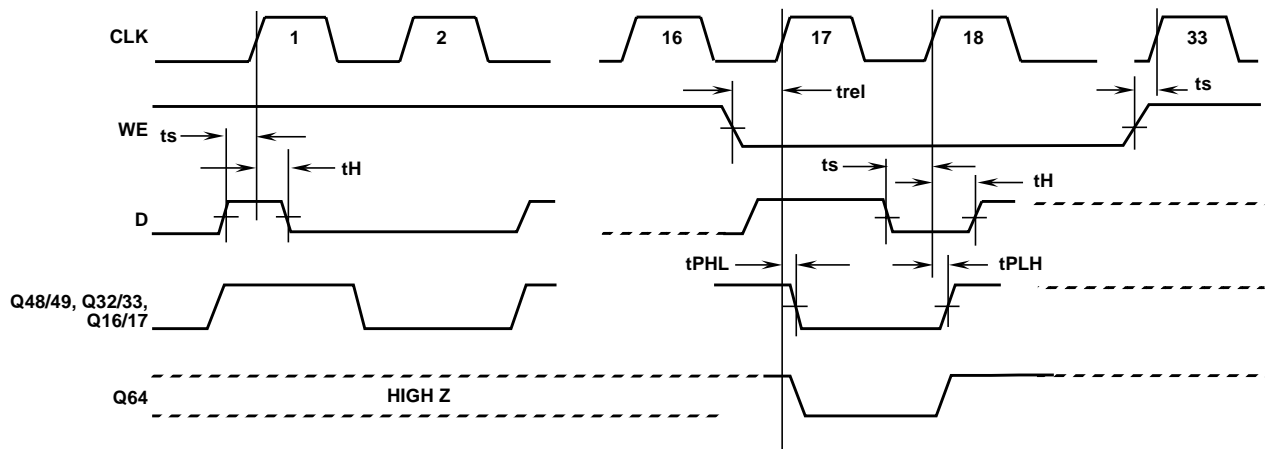


FIGURE 9. DYNAMIC TEST WAVEFORMS

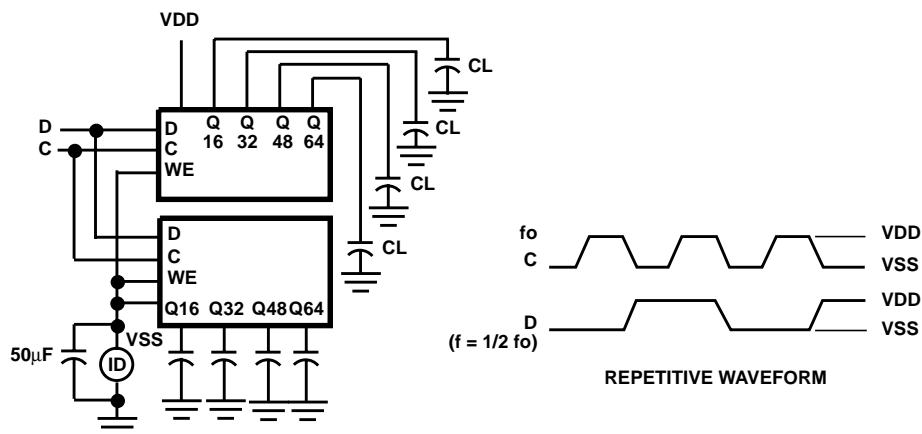
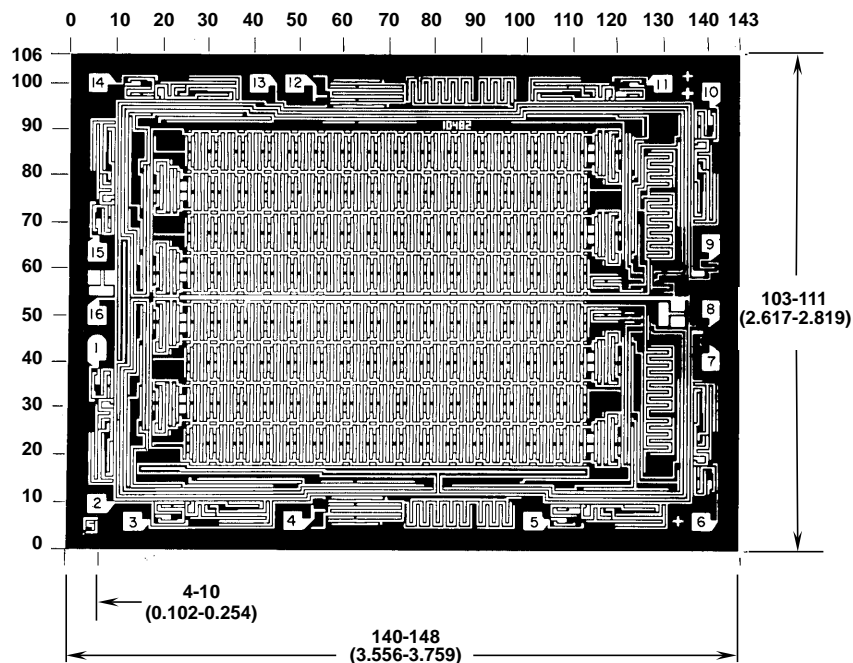


FIGURE 10. DYNAMIC POWER DISSIPATION TEST CIRCUIT AND WAVEFORMS



**Chip Dimensions and Pad Layouts**

Dimensions in parentheses 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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