

December 1992

Features

- High Voltage Type (20V Rating)
- High Output Sourcing Capability up to 25mA
- Input Latches for BCD Code Storage
- Lamp Test and Blanking Capability
- 7 Segment Outputs Blanked for BCD Input Codes > 1001
- 100% Tested for Quiescent Current at 20V
- 5V, 10V and 15V Parametric Ratings
- Maximum Input Current of 1 μ A at 18V Over Full Package Temperature Range; 100nA at 18V and +25°C

Applications

- Driving Common Cathode LED Displays
- Multiplexing with Common Cathode LED Displays
- Driving Incandescent Displays
- Driving Low Voltage Fluorescent Displays

Description

CD4511BMS is a BCD-to-7-Segment latch decoder drivers constructed with CMOS logic and n-p-n bipolar transistor output devices on a single monolithic structure. These devices combine the low quiescent power dissipation and high noise immunity features of Intersil CMOS with n-p-n bipolar output transistors capable of sourcing up to 25mA. This capability allows the CD4511BMS types to drive LED's and other displays directly.

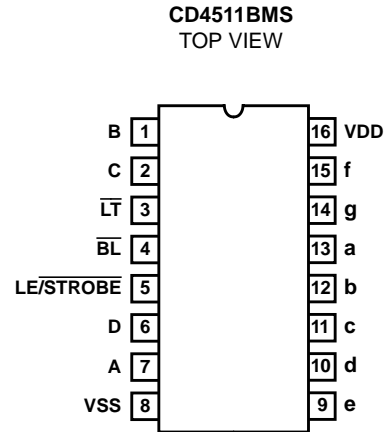
Lamp Test (\overline{LT}), Blanking (\overline{BL}), and Latch Enable or Strobe inputs are provided to test the display, shut off or intensity modulate it, and store or strobe a BCD code, respectively. Several different signals may be multiplexed and displayed when external multiplexing circuitry is used.

These devices are similar to the type MC14511.

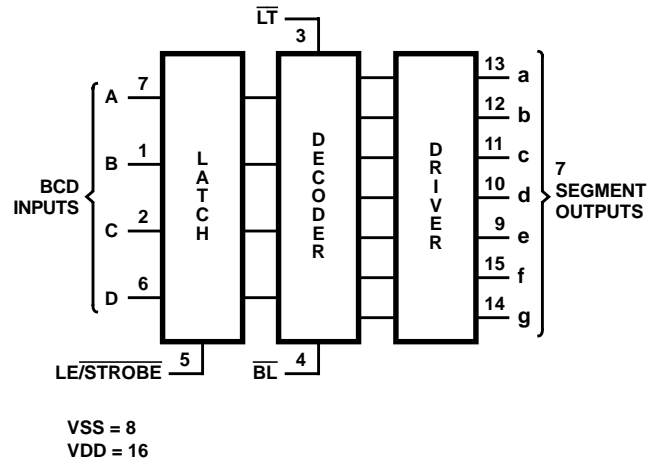
The CD4511BMS is supplied in these 16-lead outline packages:

| | |
|------------------|-----|
| Braze Seal DIP | H4W |
| Frit Seal DIP | H2R |
| Ceramic Flatpack | H6W |

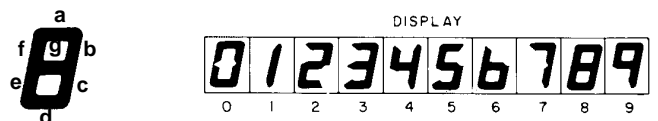
Pinout



Functional Diagram



7-Segment Display



Specifications CD4511BMS

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 | ±10mA |
| 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 ± 1/32 Inch (1.59mm ± 0.79mm) from case for 10s Maximum |

Reliability Information

| | | |
|---|---|---------------|
| Thermal Resistance | θ_{ja} | θ_{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 $+100^\circ\text{C}$ (Package Type D, F, K) | 500mW | |
| For $T_A = +100^\circ\text{C}$ to $+125^\circ\text{C}$ (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 SUBGROUPS | TEMPERATURE | LIMITS | | UNITS |
|-----------------------------|--------|------------------------------------|-----------|-------------------|----------------------|-------------|-------------|-------|
| | | | | | | MIN | MAX | |
| Supply Current | IDD | VDD = 20V, VIN = VDD or GND | | 1 | +25°C | - | 10 | μA |
| | | | | 2 | +125°C | - | 1000 | μA |
| | | VDD = 18V, VIN = VDD or GND | | 3 | -55°C | - | 10 | μA |
| Input Leakage Current | IIL | VIN = VDD or GND | VDD = 20 | 1 | +25°C | -100 | - | nA |
| | | | VDD = 18V | 2 | +125°C | -1000 | - | nA |
| | | | | 3 | -55°C | -100 | - | nA |
| Input Leakage Current | IIH | VIN = VDD or GND | VDD = 20 | 1 | +25°C | - | 100 | nA |
| | | | VDD = 18V | 2 | +125°C | - | 1000 | nA |
| | | | | 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 | +25°C | 14.1 | - | V |
| | | | | 2 | +125°C | 14.2 | - | V |
| | | | | 3 | -55°C | 14.0 | - | V |
| Output Current (Sink) | IOL5 | VDD = 5V, VOUT = 0.4V | | 1 | +25°C | 1 | - | mA |
| Output Current (Sink) | IOL10 | VDD = 10V, VOUT = 0.5V | | 1 | +25°C | 2.6 | - | mA |
| Output Current (Sink) | IOL15 | VDD = 15V, VOUT = 1.5V | | 1 | +25°C | 6.8 | - | mA |
| Output Drive Voltage | LVOH5 | VDD = 5V, IOH = -20mA | | 1 | +25°C | 3.4 | - | V |
| Output Drive Voltage | LVOH10 | VDD = 10V, IOH = -20mA | | 1 | +25°C | 8.6 | - | V |
| Output Drive Voltage | LVOH15 | VDD = 15V, IOH = -20mA | | 1 | +25°C | 13.7 | - | V |
| N Threshold Voltage | VNTH | VDD = 10V, ISS = -10μA | | 1 | +25°C | -2.8 | -0.7 | V |
| P Threshold Voltage | VPTH | VSS = 0V, IDD = 10μA | | 1 | +25°C | 0.7 | 2.8 | V |
| Functional | F | VDD = 2.8V, VIN = VDD or GND | | 7 | +25°C | VOH > VDD/2 | VOL < 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 (Note 2) | VIL | VDD = 5V, VOH > 3.6V, VOL < 0.5V | | 1, 2, 3 | +25°C, +125°C, -55°C | - | 1.5 | V |
| Input Voltage High (Note 2) | VIH | VDD = 5V, VOH > 3.6V, VOL < 0.5V | | 1, 2, 3 | +25°C, +125°C, -55°C | 3.5 | - | V |
| Input Voltage Low (Note 2) | VIL | VDD = 15V, VOH > 12.6V, VOL < 1.5V | | 1, 2, 3 | +25°C, +125°C, -55°C | - | 4 | V |
| Input Voltage High (Note 2) | VIH | VDD = 15V, VOH > 12.6V, VOL < 1.5V | | 1, 2, 3 | +25°C, +125°C, -55°C | 11 | - | V |

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

Specifications CD4511BMS

TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS

| PARAMETER | SYMBOL | CONDITIONS (NOTE 1, 2) | GROUP A SUBGROUPS | TEMPERATURE | LIMITS | | UNITS |
|-------------------------------------|--------|----------------------------|----------------------|---------------|--------|------|-------|
| | | | | | MIN | MAX | |
| Propagation Delay Data to Output | TPHL | VDD = 5V, VIN = VDD or GND | 9 | +25°C | - | 1040 | ns |
| | | | 10, 11 | +125°C, -55°C | - | 1404 | ns |
| Propagation Delay Data to Output | TPLH | VDD = 5V, VIN = VDD or GND | 9 | +25°C | - | 1320 | ns |
| | | | 10, 11 | +125°C, -55°C | - | 1782 | ns |
| Transition Time | TTHL | VDD = 5V, VIN = VDD or GND | 9 | +25°C | - | 310 | ns |
| | | | 10, 11 | +125°C, -55°C | - | 419 | ns |
| Transition Time | TTLH | VDD = 5V, VIN = VDD or GND | 9 | +25°C | - | 80 | ns |
| | | | 10, 11 | +125°C, -55°C | - | 108 | 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 | 4.1 | - | V |
| | | | 1, 2 | +125°C | 4.2 | - | V |
| | | | 1, 2 | -55°C | 4.0 | - | V |
| Output Voltage | VOH | VDD = 10V, No Load | 1, 2 | +25°C | 9.1 | - | V |
| | | | 1, 2 | +125°C | 9.2 | - | V |
| | | | 1, 2 | -55°C | 9.0 | - | 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 |
| Input Voltage Low | VIL | VDD = 10V, VOH > 9V, VOL < 1V | 1, 2 | +25°C, +125°C, -55°C | - | 3 | V |
| 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 | TPHL | VDD = 10V | 1, 2, 3 | +25°C | - | 420 | ns |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 300 | ns |

Specifications CD4511BMS

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS(Continued)

| PARAMETER | SYMBOL | CONDITIONS | NOTES | TEMPERATURE | LIMITS | | UNITS | |
|-------------------------------------|--------|------------------------|-----------------------|-------------|--------|-----|-------|---|
| | | | | | MIN | MAX | | |
| Propagation Delay Data to Output | TPLH | VDD = 10V | 1, 2, 3 | +25°C | - | 520 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 360 | ns | |
| Propagation Delay (BT) | TPHL | VDD = 5V | 1, 2, 3 | +25°C | - | 700 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 350 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 250 | ns | |
| Propagation Delay (BT) | TPLH | VDD = 5V | 1, 2, 3 | +25°C | - | 800 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 350 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 300 | ns | |
| Propagation Delay (LT) | TPHL | VDD = 5V | 1, 2, 3 | +25°C | - | 500 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 250 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 170 | ns | |
| Propagation Delay (LT) | TPLH | VDD = 5V | 1, 2, 3 | +25°C | - | 300 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 150 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 100 | ns | |
| Transition Time | TTHL | VDD = 10V | 1, 2, 3 | +25°C | - | 185 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 160 | ns | |
| Transition Time | TTLH | VDD = 10V | 1, 2, 3 | +25°C | - | 60 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 50 | ns | |
| Minimum Data Setup Time | TS | VDD = 5V | 1, 2, 3 | +25°C | - | 150 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 70 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 40 | ns | |
| Minimum Data Hold Time | TH | 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 | |
| Minimum Strobe Pulse Width | TW | VDD = 5V | 1, 2, 3 | +25°C | - | 400 | ns | |
| | | VDD = 10V | 1, 2, 3 | +25°C | - | 160 | ns | |
| | | VDD = 15V | 1, 2, 3 | +25°C | - | 100 | ns | |
| Output Drive Voltage | LVOH5 | VDD = 5V, IOH = -10mA | 1, 2 | +25°C | 3.9 | - | V | |
| | | | 1, 2 | +125°C | 3.9 | - | V | |
| | | | 1, 2 | -55°C | 3.8 | - | V | |
| | | VDD = 5V, IOH = -20mA | 1, 2 | -55°C | 3.55 | - | V | |
| | | | VDD = 5V, IOH = -25mA | 1, 2 | +25°C | 3.1 | - | V |
| | | | | 1, 2 | -55°C | 3.4 | - | V |
| Output Drive Voltage | LVOH10 | VDD = 10V, IOH = -10mA | 1, 2 | +25°C | 9.0 | - | V | |
| | | | 1, 2 | +125°C | 9.0 | - | V | |
| | | | 1, 2 | -55°C | 8.85 | - | V | |
| | | VDD = 10V, IOH = -20mA | 1, 2 | +125°C | 8.4 | - | V | |
| | | | 1, 2 | -55°C | 8.7 | - | V | |
| | | VDD = 10V, IOH = -25mA | 1, 2 | +25°C | 8.3 | - | V | |
| | | | 1, 2 | +25°C | 8.6 | - | V | |
| | | | | 1, 2 | -55°C | 8.6 | - | V |

Specifications CD4511BMS

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS(Continued)

| PARAMETER | SYMBOL | CONDITIONS | NOTES | TEMPERATURE | LIMITS | | UNITS |
|------------------------|--------|------------------------|-------|-------------|--------|-----|-------|
| | | | | | MIN | MAX | |
| Output Drive Voltage | LVOH15 | VDD = 15V, IOH = -10mA | 1, 2 | +25°C | 14.0 | - | V |
| | | | | | 14.0 | - | V |
| | | | | | 13.9 | - | V |
| | | VDD = 15V, IOH = -20mA | 1, 2 | +125°C | 13.5 | - | V |
| | | | | | 13.75 | - | V |
| | | | | | 13.5 | - | V |
| VDD = 15V, IOH = -25mA | 1, 2 | +25°C | 13.5 | - | V | | |
| | | | 13.65 | - | V | | |
| 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 | VDD = 5V | 1, 2, 3, 4 | +25°C | - | 1.35 x +25°C Limit | ns |
| | TPLH | | | | | | |

- NOTES: 1. All voltages referenced to device GND. 2. CL = 50pF, RL = 200K, Input TR, TF < 20ns. 3. See Table 2 for +25°C limit. 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 |
| Interim Test 2 (Post Burn-In) | 100% 5004 | 1, 7, 9 | IDD, IOL5, IOH5A |

Specifications CD4511BMS

TABLE 6. APPLICABLE SUBGROUPS (Continued)

| CONFORMANCE GROUP | | MIL-STD-883 METHOD | GROUP A SUBGROUPS | READ AND RECORD |
|-------------------------------|--------------|--------------------|---------------------------------------|------------------------------|
| 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 ± 0.5V | OSCILLATOR | |
|---------------------------|------|--------|----------|-----------|------------|-------|
| | | | | | 50kHz | 25kHz |
| Static Burn-In 1 (Note 1) | 9-15 | 1-8 | 16 | | | |
| Static Burn-In 2 (Note 1) | 9-15 | 8 | 1-7, 16 | | | |
| Dynamic Burn-In (Note 1) | 9-15 | 5, 8 | 3, 4, 16 | - | 1, 2, 7 | 6 |
| Irradiation (Note 2) | 9-15 | 8 | 1-7, 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, $VDD = 10V \pm 0.5V$

CD4511BMS

Logic Diagram

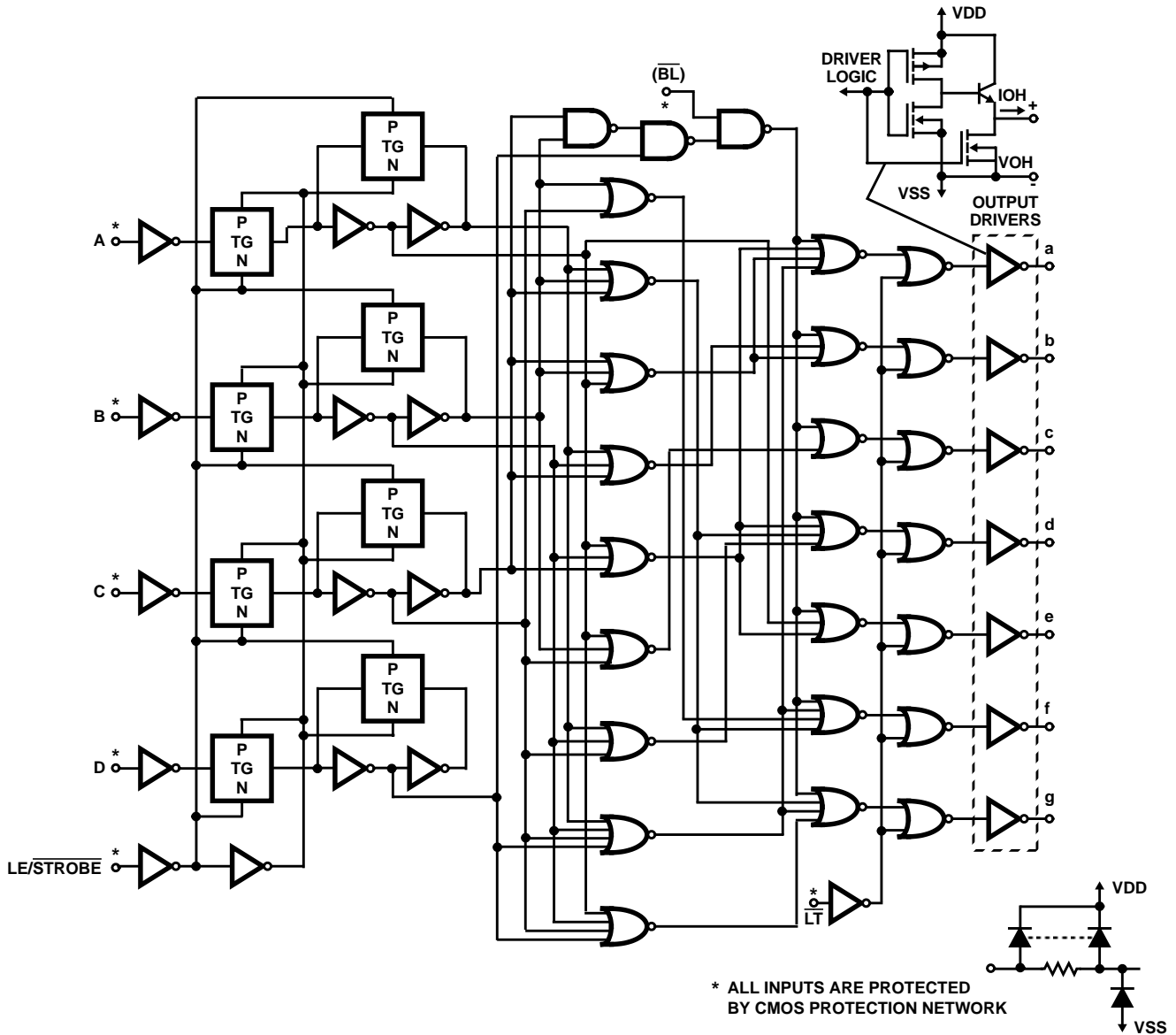


FIGURE 1.

TRUTH TABLE

| LE | \overline{B} | \overline{L} | D | C | B | A | a | b | c | d | e | f | g | DISPLAY |
|----|----------------|----------------|---|---|---|---|---|---|---|---|---|---|---|----------|
| X | X | 0 | X | X | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| X | 0 | 1 | X | X | X | X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 2 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 3 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 4 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 5 |

CD4511BMS

TRUTH TABLE (Continued)

| LE | \overline{BI} | \overline{LT} | D | C | B | A | a | b | c | d | e | f | g | DISPLAY |
|----|-----------------|-----------------|---|---|---|---|---|---|---|---|---|---|---|----------|
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | b |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 7 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 9 |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 1 | 1 | 1 | X | X | X | X | | | | * | | | | * |

X = Don't Care

* Depends on BCD code previously applied when LE = 0

NOTE: Display is blank for all illegal input codes (BCD > 1001).

Typical Performance Characteristics

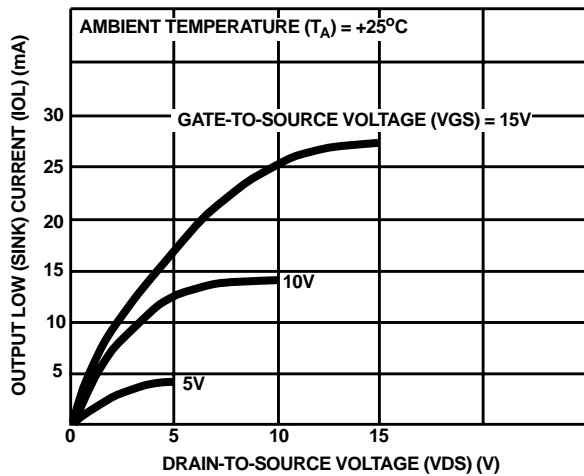


FIGURE 2. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

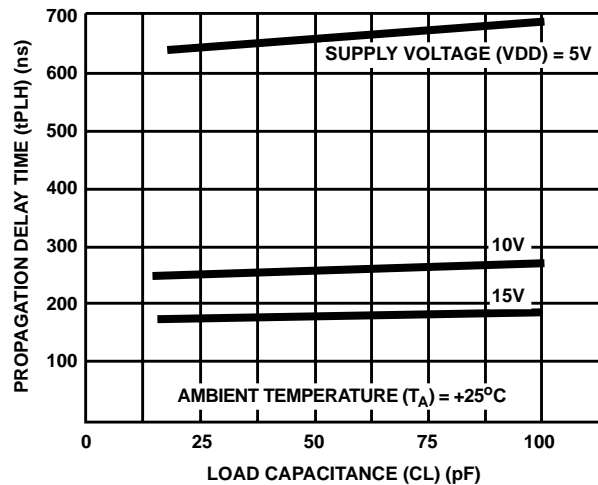


FIGURE 3. TYPICAL DATA-TO-OUTPUT, LOW-TO-HIGH-LEVEL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

Typical Performance Characteristics

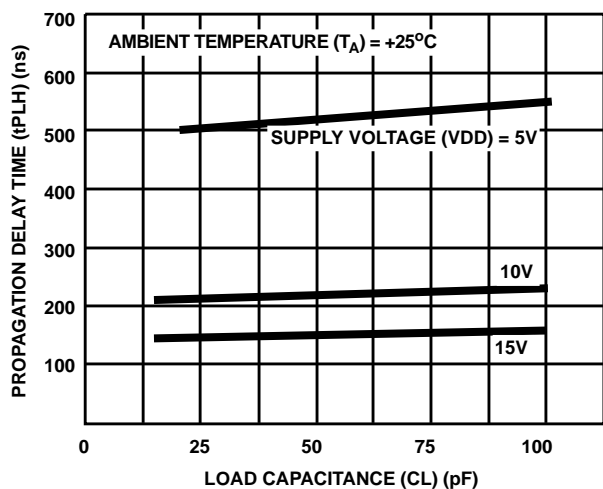


FIGURE 4. TYPICAL DATA-TO-OUTPUT, HIGH-TO-LOW-LEVEL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

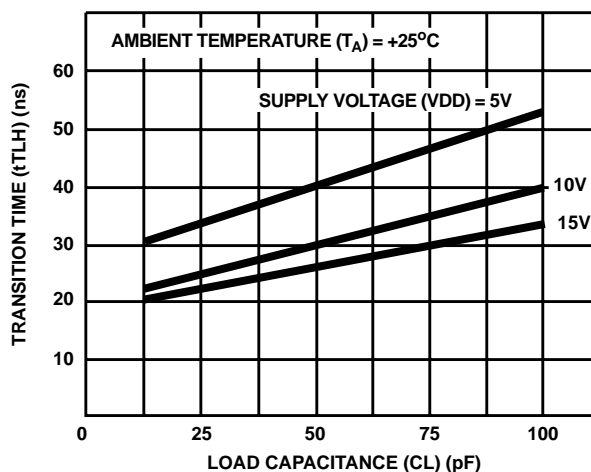


FIGURE 5. TYPICAL LOW-TO-HIGH-LEVEL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

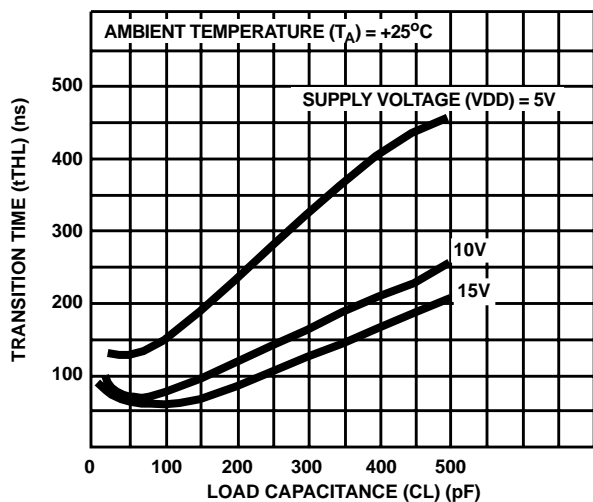


FIGURE 6. TYPICAL HIGH-TO-LOW TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

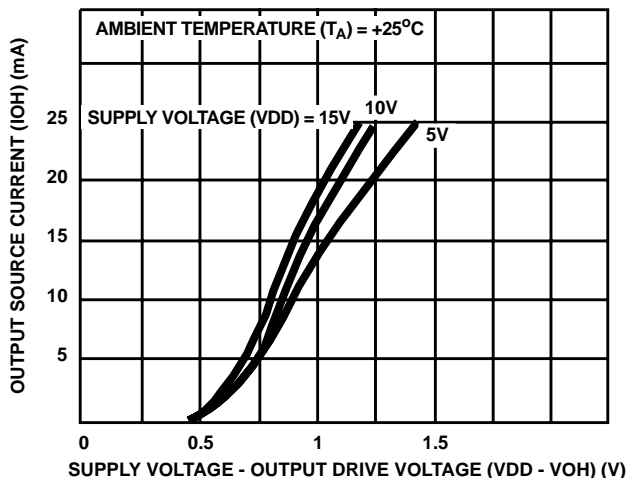


FIGURE 7. TYPICAL VOLTAGE DROP (VDD TO OUTPUT) vs OUTPUT SOURCE CURRENT AS A FUNCTION OF SUPPLY

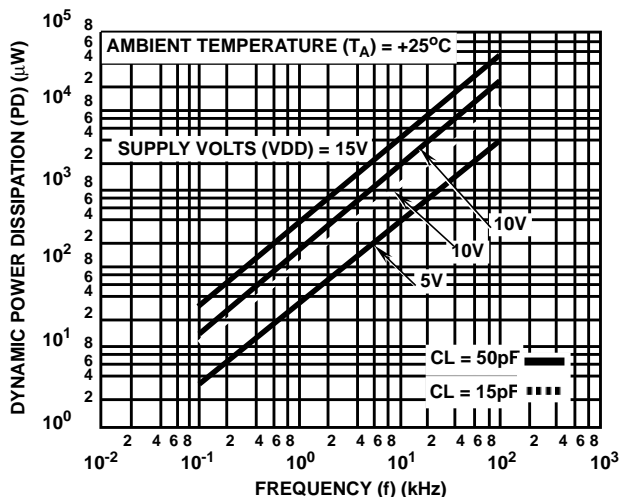
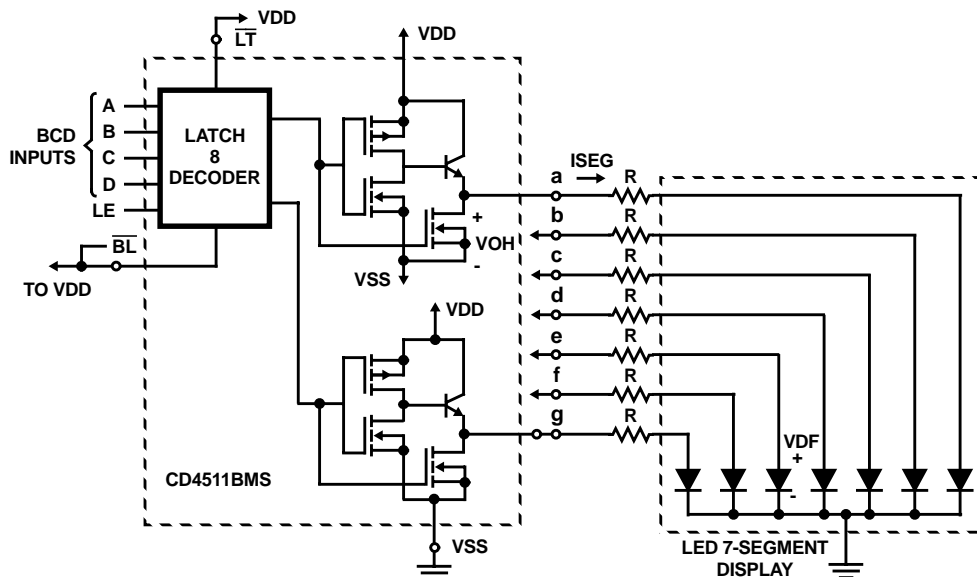


FIGURE 8. TYPICAL DYNAMIC POWER DISSIPATION CHARACTERISTICS

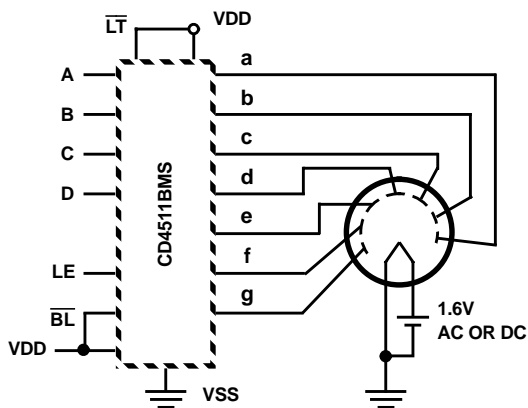
Applications Interfacing with Various Displays



DUTY CYCLE = 100%
 ISEG = IDIODEAVG. = 20mA AT LUMINOUS INTENSITY/SEGMENT = 250 μ cd

$$R = \frac{VOH - VDF}{ISEG}$$

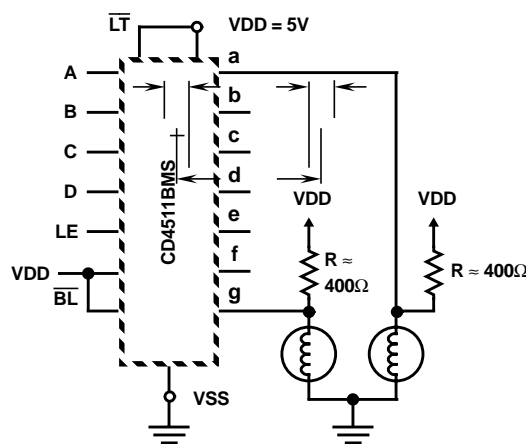
FIGURE 9. DRIVING COMMON CATHODE 7-SEGMENT LED DISPLAYS (EXAMPLE HEWLET-PACKARD 5082-7740)



A MEDIUM BRIGHTNESS INTENSITY DISPLAY CAN BE OBTAINED WITH LOW VOLTAGE FLUORESCENT DISPLAYS SUCH AS THE TUNG-SOL DIGIVAC S/G* SERIES

* Trademark Tung-Sol Division Wagner Electric Co.

FIGURE 10. DRIVING LOW VOLTAGE FLOURESCENT DISPLAYS



2 OF 7 SEGMENTS SHOWN CONNECTED
 RESISTORS R FROM VDD TO EACH 7-SEGMENT DRIVER OUTPUT ARE CHOSEN TO KEEP ALL NUMITRON SEGMENTS SLIGHTLY ON AND WARM

FIGURE 11. DRIVING INCANDESCENT DISPLAYS (RCA NUMITRON DR2000 SERIES DISPLAYS)

All Intersil semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

Intersil products are sold by description only. Intersil Corporation reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Intersil is believed to be accurate and reliable. However, no responsibility is assumed by Intersil or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Intersil or its subsidiaries.

For information regarding Intersil Corporation and its products, see web site <http://www.intersil.com>

CD4511BMS

Applications Interfacing with Various Displays (Continued)

MULTIPLEXING SCHEME SHOWING
2 OF 7 SEGMENTS CONNECTED

TRANSISTORS T1 - T4 (2N3053 OR 2N2102)
HAVE IC MAX. RATING > 7 x ISEG

DUTY CYCLE = 25%

$I_{SEG} = (I_{DIODEAVG}) \times 4$

$R = \frac{(V_{OH} - V_{DF} - V_{CE})}{I_{SEG}}$

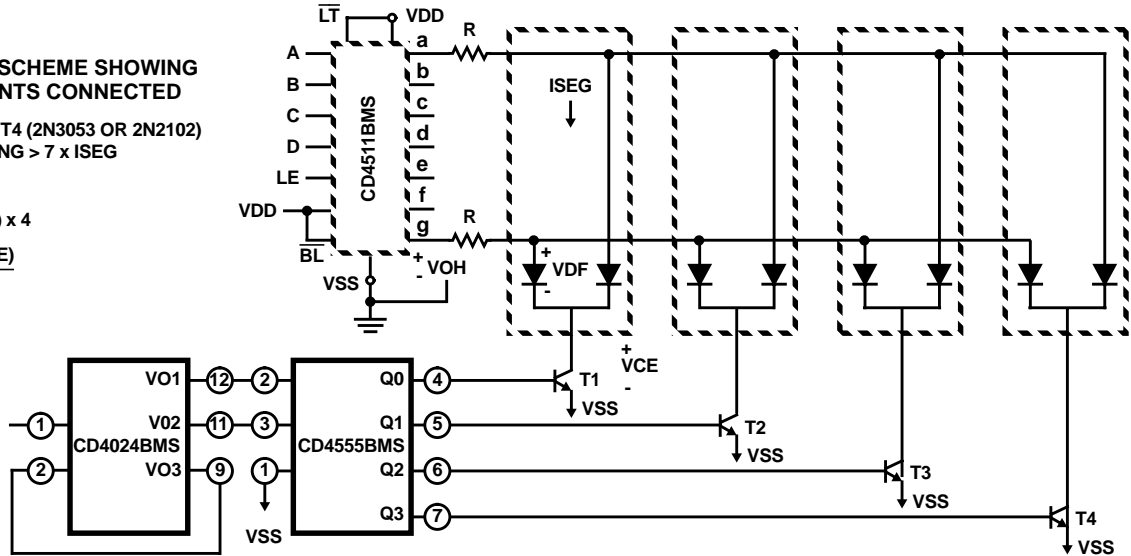


FIGURE 12. MULTIPLEXING WITH COMMON CATHODE 7-SEGMENT LED DISPLAYS (EXAMPLE HEWLET-PACKARD 5082-7404 4 CHARACTER DISPLAY OR 4 DISCRETE MONOSANTO MAN 3 DISPLAYS)

Waveforms

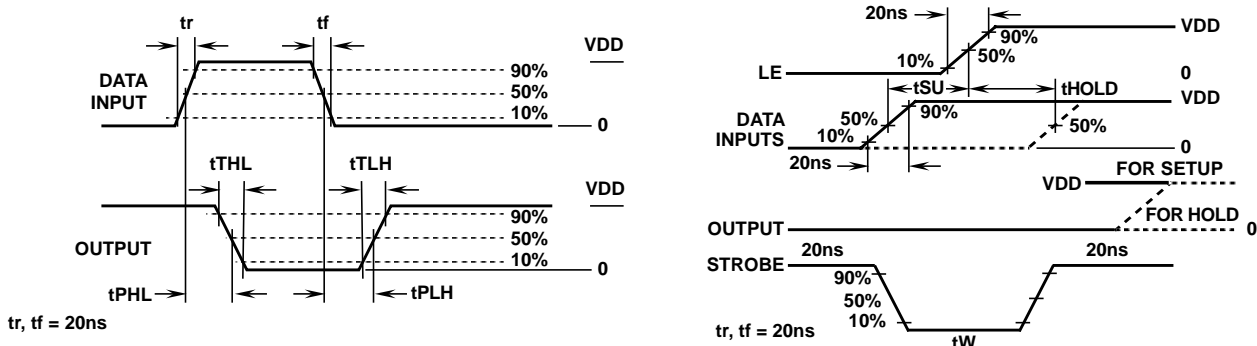
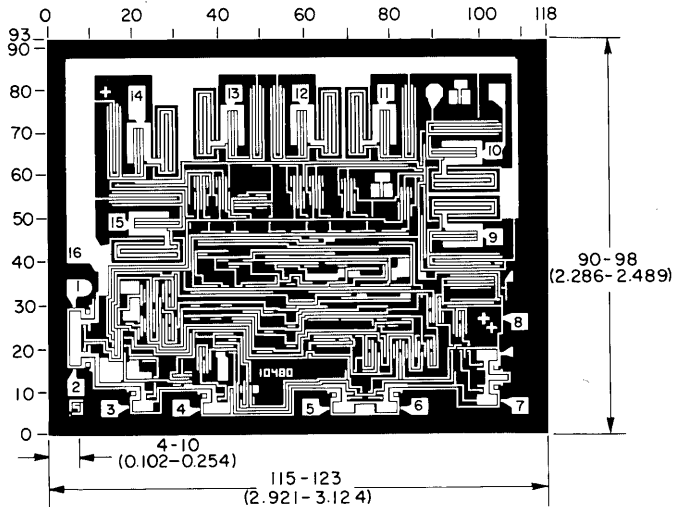


FIGURE 13. DYNAMIC WAVEFORMS

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