

# MC14512B

## 8-Channel Data Selector

The MC14512B is an 8-channel data selector constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. This data selector finds primary application in signal multiplexing functions. It may also be used for data routing, digital signal switching, signal gating, and number sequence generation.

### Features

- Diode Protection on All Inputs
- Single Supply Operation
- 3-State Output (Logic “1”, Logic “0”, High Impedance)
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- This Device is Pb-Free and is RoHS Compliant

### MAXIMUM RATINGS (Voltages Referenced to $V_{SS}$ )

| Parameter   | Symbol            | Value                     | Unit |
|---|-------------------|---------------------------|------|
| DC Supply Voltage Range                           | $V_{DD}$          | -0.5 to +18.0             | V    |
| Input or Output Voltage Range (DC or Transient)   | $V_{in}, V_{out}$ | -0.5 to $V_{DD}$<br>+ 0.5 | V    |
| Input or Output Current (DC or Transient) per Pin | $I_{in}, I_{out}$ | $\pm 10$                  | mA   |
| Power Dissipation, Per Package (Note 1)           | $P_D$             | 500                       | mW   |
| Ambient Temperature Range                         | $T_A$             | -55 to +125               | °C   |
| Storage Temperature Range                         | $T_{stg}$         | -65 to +150               | °C   |
| Lead Temperature (8-Second Soldering)             | $T_L$             | 260                       | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Temperature Derating: “D/DW” Package: -7.0 mW/°C From 65°C To 125°C

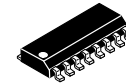
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{in}$  and  $V_{out}$  should be constrained to the range  $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$ .

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



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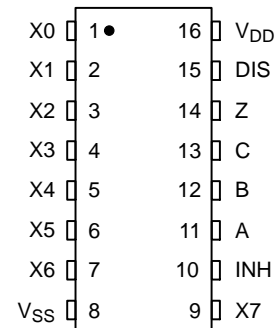
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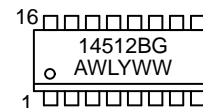
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SOIC-16  
D SUFFIX  
CASE 751B

### PIN ASSIGNMENT



### MARKING DIAGRAM



A = Assembly Location  
WL = Wafer Lot  
YY, Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

# MC14512B

## TRUTH TABLE

| C | B | A | Inhibit | Disable | Z              |
|---|---|---|---------|---------|----------------|
| 0 | 0 | 0 | 0       | 0       | X0             |
| 0 | 0 | 1 | 0       | 0       | X1             |
| 0 | 1 | 0 | 0       | 0       | X2             |
| 0 | 1 | 1 | 0       | 0       | X3             |
| 1 | 0 | 0 | 0       | 0       | X4             |
| 1 | 0 | 1 | 0       | 0       | X5             |
| 1 | 1 | 0 | 0       | 0       | X6             |
| 1 | 1 | 1 | 0       | 0       | X7             |
| X | X | X | 1       | 0       | 0              |
| X | X | X | X       | 1       | High Impedance |

NOTE: X = Don't Care

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to V<sub>SS</sub>)

| Characteristic  | Symbol                       | V <sub>DD</sub><br>Vdc | - 55°C  |      | 25°C  |                 |      | 125°C |      | Unit     |
|---|------------------------------|------------------------|---|------|-------|-----------------|------|-------|------|----------|
|   |                              |                        | Min   | Max  | Min   | Typ<br>(Note 2) | Max  | Min   | Max  |          |
| Output Voltage<br>V <sub>in</sub> = V <sub>DD</sub> or 0  | "0" Level<br>V <sub>OL</sub> | 5.0                    | -   | 0.05 | -     | 0               | 0.05 | -     | 0.05 | Vdc      |
|   |                              | 10                     | -   | 0.05 | -     | 0               | 0.05 | -     | 0.05 |          |
| V <sub>in</sub> = 0 or V <sub>DD</sub>  | "1" Level<br>V <sub>OH</sub> | 5.0                    | 4.95  | -    | 4.95  | 5.0             | -    | 4.95  | -    | Vdc      |
|   |                              | 10                     | 9.95  | -    | 9.95  | 10              | -    | 9.95  | -    |          |
| Input Voltage<br>(V <sub>O</sub> = 4.5 or 0.5 Vdc)<br>(V <sub>O</sub> = 9.0 or 1.0 Vdc)<br>(V <sub>O</sub> = 13.5 or 1.5 Vdc)                           | "0" Level<br>V <sub>IL</sub> | 5.0                    | -   | 1.5  | -     | 2.25            | 1.5  | -     | 1.5  | Vdc      |
|   |                              | 10                     | -   | 3.0  | -     | 4.50            | 3.0  | -     | 3.0  |          |
| (V <sub>O</sub> = 0.5 or 4.5 Vdc)<br>(V <sub>O</sub> = 1.0 or 9.0 Vdc)<br>(V <sub>O</sub> = 1.5 or 13.5 Vdc)  | "1" Level<br>V <sub>IH</sub> | 5.0                    | 3.5   | -    | 3.5   | 2.75            | -    | 3.5   | -    | Vdc      |
|   |                              | 10                     | 7.0   | -    | 7.0   | 5.50            | -    | 7.0   | -    |          |
| Output Drive Current<br>(V <sub>OH</sub> = 2.5 Vdc)<br>(V <sub>OH</sub> = 4.6 Vdc)<br>(V <sub>OH</sub> = 9.5 Vdc)<br>(V <sub>OH</sub> = 13.5 Vdc)       | Source<br>I <sub>OH</sub>    | 5.0                    | -3.0  | -    | -2.4  | -4.2            | -    | -1.7  | -    | mAd<br>c |
|   |                              | 5.0                    | -0.64   | -    | -0.51 | -0.88           | -    | -0.36 | -    |          |
| (V <sub>OL</sub> = 0.4 Vdc)<br>(V <sub>OL</sub> = 0.5 Vdc)<br>(V <sub>OL</sub> = 1.5 Vdc)   | Sink<br>I <sub>OL</sub>      | 5.0                    | 0.64  | -    | 0.51  | 0.88            | -    | 0.36  | -    | mAd<br>c |
|   |                              | 10                     | 1.6   | -    | 1.3   | 2.25            | -    | 0.9   | -    |          |
| 15  | 4.2                          | -                      | 3.4   | 8.8  | -     | 2.4             | -    | -     |      |          |
| Input Current   | I <sub>in</sub>              | 15                     | -   | ±0.1 | -     | ±0.00001        | ±0.1 | -     | ±1.0 | µAdc     |
| Input Capacitance (V <sub>in</sub> = 0)   | C <sub>in</sub>              | -                      | -   | -    | -     | 5.0             | 7.5  | -     | -    | pF       |
| Quiescent Current<br>(Per Package)  | I <sub>DD</sub>              | 5.0                    | -   | 5.0  | -     | 0.005           | 5.0  | -     | 150  | µAdc     |
|   |                              | 10                     | -   | 10   | -     | 0.010           | 10   | -     | 300  |          |
|   |                              | 15                     | -   | 20   | -     | 0.015           | 20   | -     | 600  |          |
| Total Supply Current (Note 3) (Note 4)<br>(Dynamic plus Quiescent,<br>Per Package)<br>(C <sub>L</sub> = 50 pF on all outputs, all<br>buffers switching) | I <sub>T</sub>               | 5.0                    | I <sub>T</sub> = (0.8 µA/kHz) f + I <sub>DD</sub> |      |       |                 |      |       | µAdc |          |
|   |                              | 10                     | I <sub>T</sub> = (1.6 µA/kHz) f + I <sub>DD</sub> |      |       |                 |      |       |      |          |
|   |                              | 15                     | I <sub>T</sub> = (2.4 µA/kHz) f + I <sub>DD</sub> |      |       |                 |      |       |      |          |
| 3-State Leakage Current   | I <sub>TL</sub>              | 15                     | -   | ±0.1 | -     | ±0.0001         | ±0.1 | -     | ±3.0 | µAdc     |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF: I<sub>T</sub>(C<sub>L</sub>) = I<sub>T</sub>(50 pF) + (C<sub>L</sub> - 50) Vfk where: I<sub>T</sub> is in µA (per package), C<sub>L</sub> in pF, V = (V<sub>DD</sub> - V<sub>SS</sub>) in volts, f in kHz is input frequency, and k = 0.001.

# MC14512B

## SWITCHING CHARACTERISTICS (Note 5) ( $C_L = 50$ pF, $T_A = 25^\circ\text{C}$ , See Figure 1)

| Characteristic   | Symbol                                    | $V_{DD}$        | All Types        |                   | Unit |
|--|---|-----------------|------------------|-------------------|------|
|  |   |                 | Typ (Note 6)     | Max               |      |
| Output Rise and Fall Time<br>$t_{TLH}, t_{THL} = (1.5 \text{ ns/pF}) C_L + 25 \text{ ns}$<br>$t_{TLH}, t_{THL} = (0.75 \text{ ns/pF}) C_L + 12.5 \text{ ns}$<br>$t_{TLH}, t_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$ | $t_{TLH},$<br>$t_{THL}$                   | 5.0<br>10<br>15 | 100<br>50<br>40  | 200<br>100<br>80  | ns   |
| Propagation Delay Time (Figure 2)<br>Inhibit, Control, or Data to Z  | $t_{PLH}$                                 | 5.0<br>10<br>15 | 330<br>125<br>85 | 650<br>250<br>170 | ns   |
| Propagation Delay Time (Figure 2)<br>Inhibit, Control, or Data to Z  | $t_{PHL}$                                 | 5.0<br>10<br>15 | 330<br>125<br>85 | 650<br>250<br>170 | ns   |
| 3-State Output Delay Times (Figure 3)<br>"1" or "0" to High Z, and<br>High Z to "1" or "0"   | $t_{PHZ}, t_{PLZ},$<br>$t_{PZH}, t_{PZL}$ | 5.0<br>10<br>15 | 60<br>35<br>30   | 150<br>100<br>75  | ns   |

5. The formulas given are for the typical characteristics only at  $25^\circ\text{C}$ .

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

## ORDERING INFORMATION

| Device         | Package              | Shipping <sup>†</sup> |
|----------------|----------------------|-----------------------|
| MC14512BDG     | SOIC-16<br>(Pb-Free) | 48 Units / Rail       |
| NLV14512BDG*   | SOIC-16<br>(Pb-Free) | 48 Units / Rail       |
| MC14512BDR2G   | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |
| NLV14512BDR2G* | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

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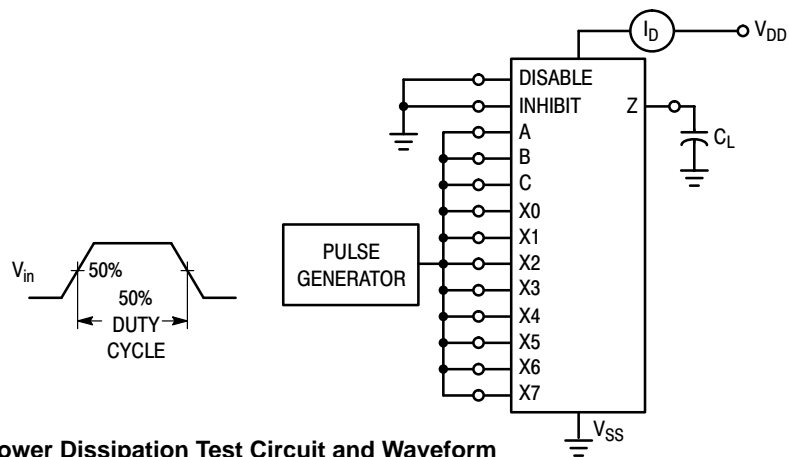


Figure 1. Power Dissipation Test Circuit and Waveform

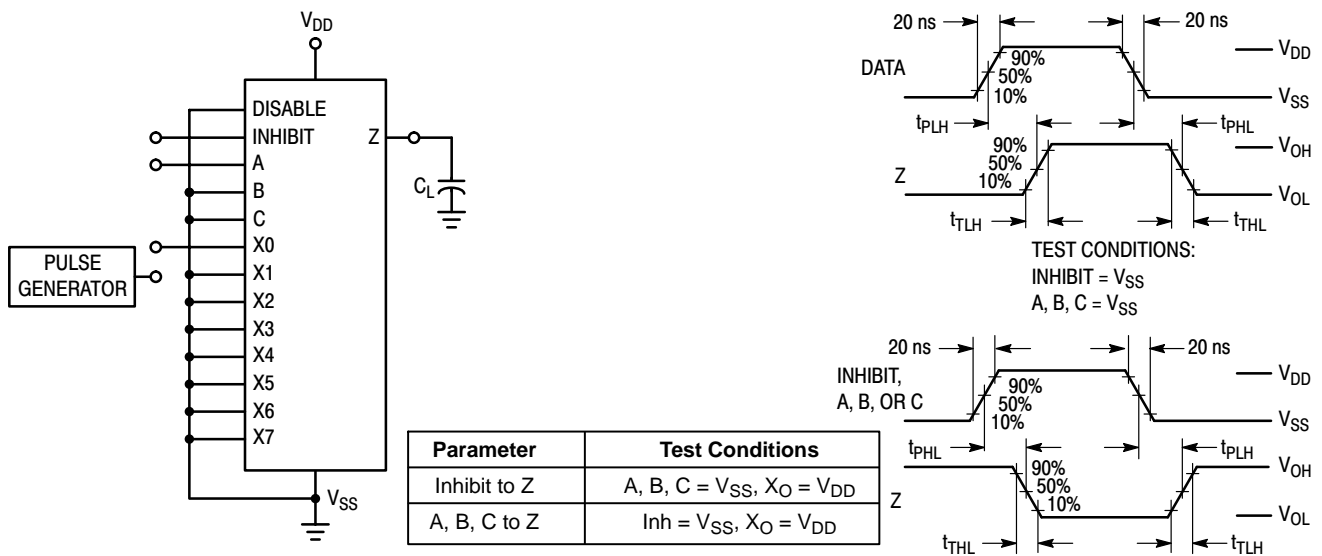


Figure 2. AC Test Circuit and Waveforms

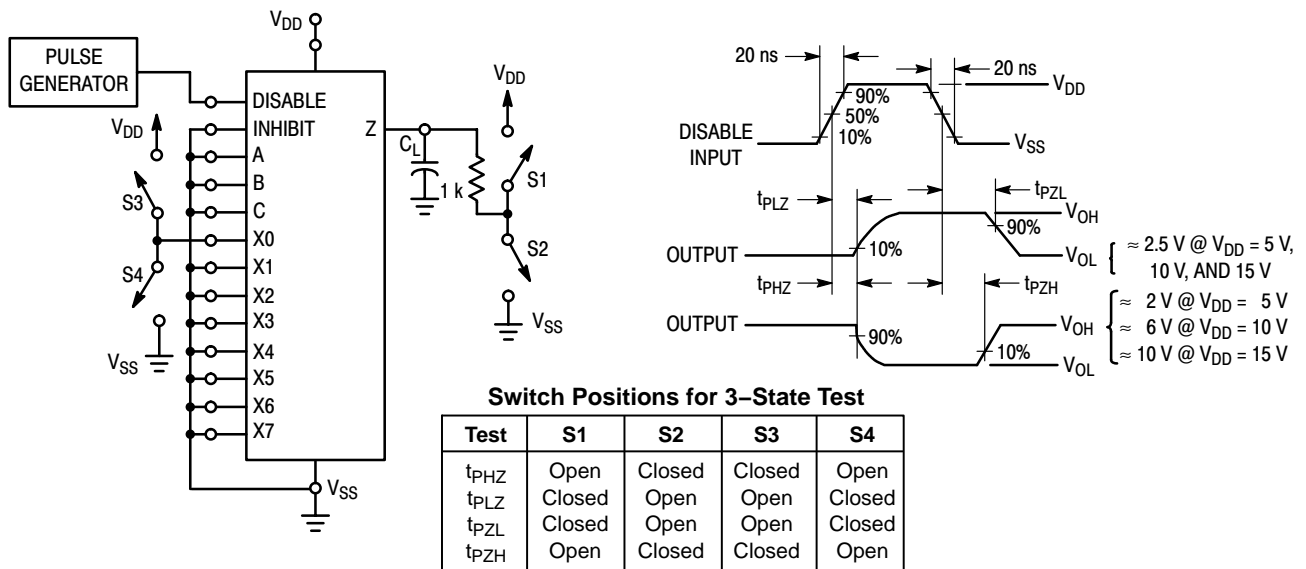
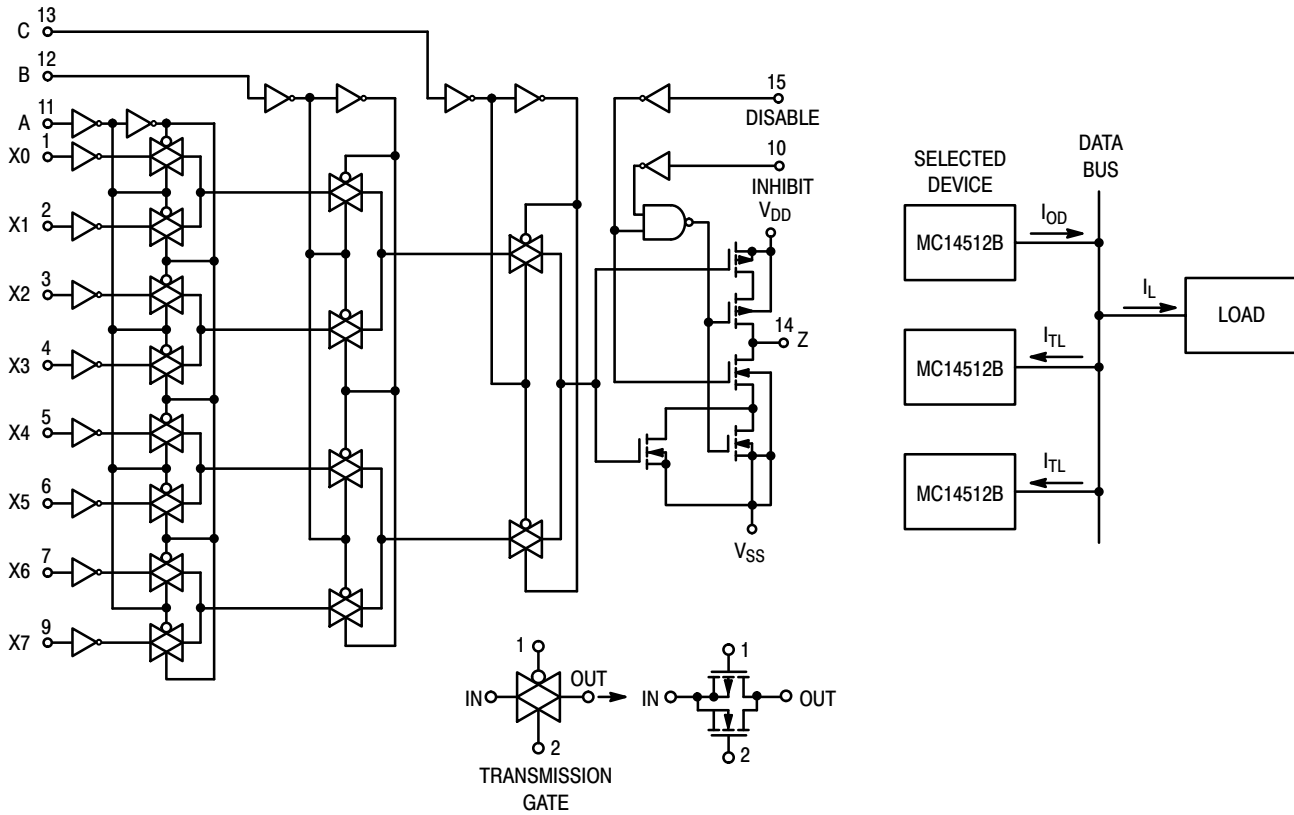


Figure 3. 3-State AC Test Circuit and Waveform

# MC14512B

## LOGIC DIAGRAM



### 3-STATE MODE OF OPERATION

Output terminals of several MC14512B 8-Bit Data Selectors can be connected to a single data bus as shown. One MC14512B is selected by the 3-state control, and the remaining devices are disabled into a high-impedance "off" state. The number of 8-bit data selectors,  $N$ , that may be connected to a bus line is determined from the output drive current,  $I_{OD}$ , 3-state or disable output leakage current,  $I_{TL}$ , and the load current,  $I_L$ , required to drive the bus line

(including fanout to other device inputs), and can be calculated by:

$$N = \frac{I_{OD} - I_L}{I_{TL}} + 1$$

$N$  must be calculated for both high and low logic state of the bus line.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1

## SOIC-16 CASE 751B-05 ISSUE K

DATE 29 DEC 2006



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| B   | 3.80        | 4.00  | 0.150     | 0.157 |
| C   | 1.35        | 1.75  | 0.054     | 0.068 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.40        | 1.25  | 0.016     | 0.049 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.19        | 0.25  | 0.008     | 0.009 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0°          | 7°    | 0°        | 7°    |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

- |  |  |  |  |
|--|--|--|--|
| <p>STYLE 1:</p> <p>PIN 1. COLLECTOR</p> <p>2. BASE</p> <p>3. EMITTER</p> <p>4. NO CONNECTION</p> <p>5. EMITTER</p> <p>6. BASE</p> <p>7. COLLECTOR</p> <p>8. COLLECTOR</p> <p>9. BASE</p> <p>10. EMITTER</p> <p>11. NO CONNECTION</p> <p>12. EMITTER</p> <p>13. BASE</p> <p>14. COLLECTOR</p> <p>15. EMITTER</p> <p>16. COLLECTOR</p>                           | <p>STYLE 2:</p> <p>PIN 1. CATHODE</p> <p>2. ANODE</p> <p>3. NO CONNECTION</p> <p>4. CATHODE</p> <p>5. CATHODE</p> <p>6. NO CONNECTION</p> <p>7. ANODE</p> <p>8. CATHODE</p> <p>9. CATHODE</p> <p>10. ANODE</p> <p>11. NO CONNECTION</p> <p>12. CATHODE</p> <p>13. CATHODE</p> <p>14. NO CONNECTION</p> <p>15. ANODE</p> <p>16. CATHODE</p> | <p>STYLE 3:</p> <p>PIN 1. COLLECTOR, DYE #1</p> <p>2. BASE, #1</p> <p>3. EMITTER, #1</p> <p>4. COLLECTOR, #1</p> <p>5. COLLECTOR, #2</p> <p>6. BASE, #2</p> <p>7. EMITTER, #2</p> <p>8. COLLECTOR, #2</p> <p>9. COLLECTOR, #3</p> <p>10. BASE, #3</p> <p>11. EMITTER, #3</p> <p>12. COLLECTOR, #3</p> <p>13. COLLECTOR, #4</p> <p>14. BASE, #4</p> <p>15. EMITTER, #4</p> <p>16. COLLECTOR, #4</p>   | <p>STYLE 4:</p> <p>PIN 1. COLLECTOR, DYE #1</p> <p>2. COLLECTOR, #1</p> <p>3. COLLECTOR, #2</p> <p>4. COLLECTOR, #2</p> <p>5. COLLECTOR, #3</p> <p>6. COLLECTOR, #3</p> <p>7. COLLECTOR, #4</p> <p>8. COLLECTOR, #4</p> <p>9. BASE, #4</p> <p>10. EMITTER, #4</p> <p>11. BASE, #3</p> <p>12. EMITTER, #3</p> <p>13. BASE, #2</p> <p>14. EMITTER, #2</p> <p>15. BASE, #1</p> <p>16. EMITTER, #1</p> |
| <p>STYLE 5:</p> <p>PIN 1. DRAIN, DYE #1</p> <p>2. DRAIN, #1</p> <p>3. DRAIN, #2</p> <p>4. DRAIN, #2</p> <p>5. DRAIN, #3</p> <p>6. DRAIN, #3</p> <p>7. DRAIN, #4</p> <p>8. DRAIN, #4</p> <p>9. GATE, #4</p> <p>10. SOURCE, #4</p> <p>11. GATE, #3</p> <p>12. SOURCE, #3</p> <p>13. GATE, #2</p> <p>14. SOURCE, #2</p> <p>15. GATE, #1</p> <p>16. SOURCE, #1</p> | <p>STYLE 6:</p> <p>PIN 1. CATHODE</p> <p>2. CATHODE</p> <p>3. CATHODE</p> <p>4. CATHODE</p> <p>5. CATHODE</p> <p>6. CATHODE</p> <p>7. CATHODE</p> <p>8. CATHODE</p> <p>9. ANODE</p> <p>10. ANODE</p> <p>11. ANODE</p> <p>12. ANODE</p> <p>13. ANODE</p> <p>14. ANODE</p> <p>15. ANODE</p> <p>16. ANODE</p>                                 | <p>STYLE 7:</p> <p>PIN 1. SOURCE N-CH</p> <p>2. COMMON DRAIN (OUTPUT)</p> <p>3. COMMON DRAIN (OUTPUT)</p> <p>4. GATE P-CH</p> <p>5. COMMON DRAIN (OUTPUT)</p> <p>6. COMMON DRAIN (OUTPUT)</p> <p>7. COMMON DRAIN (OUTPUT)</p> <p>8. SOURCE P-CH</p> <p>9. SOURCE P-CH</p> <p>10. COMMON DRAIN (OUTPUT)</p> <p>11. COMMON DRAIN (OUTPUT)</p> <p>12. COMMON DRAIN (OUTPUT)</p> <p>13. GATE N-CH</p> <p>14. COMMON DRAIN (OUTPUT)</p> <p>15. COMMON DRAIN (OUTPUT)</p> <p>16. SOURCE N-CH</p> |  |

### SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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