

# Dual Binary to 1-of-4 Decoder/Demultiplexer

## MC14555B, MC14556B

The MC14555B and MC14556B are constructed with complementary MOS (CMOS) enhancement mode devices. Each Decoder/Demultiplexer has two select inputs (A and B), an active low Enable input (E), and four mutually exclusive outputs (Q0, Q1, Q2, Q3). The MC14555B has the selected output go to the “high” state, and the MC14556B has the selected output go to the “low” state. Expanded decoding such as binary-to-hexadecimal (1-of-16), etc., can be achieved by using other MC14555B or MC14556B devices.

Applications include code conversion, address decoding, memory selection control, and demultiplexing (using the Enable input as a data input) in digital data transmission systems.

### Features

- Diode Protection on All Inputs
- Active High or Active Low Outputs
- Expandable
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- All Outputs Buffered
- 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
- These Devices are Pb-Free and are RoHS Compliant

### MAXIMUM RATINGS (Voltages Referenced to V<sub>SS</sub>)

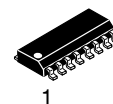
| Parameter                                         | Symbol                             | Value                         | Unit |
|---------------------------------------------------|------------------------------------|-------------------------------|------|
| DC Supply Voltage Range                           | V <sub>DD</sub>                    | −0.5 to +18.0                 | V    |
| Input or Output Voltage Range (DC or Transient)   | V <sub>in</sub> , V <sub>out</sub> | −0.5 to V <sub>DD</sub> + 0.5 | V    |
| Input or Output Current (DC or Transient) per Pin | I <sub>in</sub> , I <sub>out</sub> | ±10                           | mA   |
| Power Dissipation, per Package (Note 1)           | P <sub>D</sub>                     | 500                           | mW   |
| Ambient Temperature Range                         | T <sub>A</sub>                     | −55 to +125                   | °C   |
| Storage Temperature Range                         | T <sub>stg</sub>                   | −65 to +150                   | °C   |
| Lead Temperature (8-Second Soldering)             | T <sub>L</sub>                     | 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” Packages: −7.0 mW/°C From 65°C To 125°C

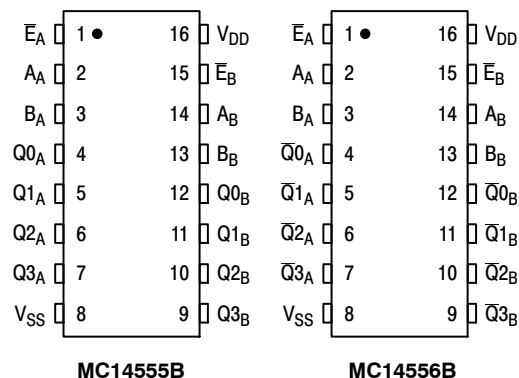
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V<sub>in</sub> and V<sub>out</sub> should be constrained to the range V<sub>SS</sub> ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>DD</sub>.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V<sub>SS</sub> or V<sub>DD</sub>). Unused outputs must be left open.

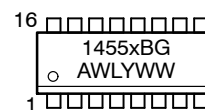


SOIC-16  
D SUFFIX  
CASE 751B

### PIN ASSIGNMENTS



### MARKING DIAGRAMS



SOIC-16

- x = 5 or 6
- A = Assembly Location
- WL, L = Wafer Lot
- YY, Y = Year
- WW, W = Work Week
- G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

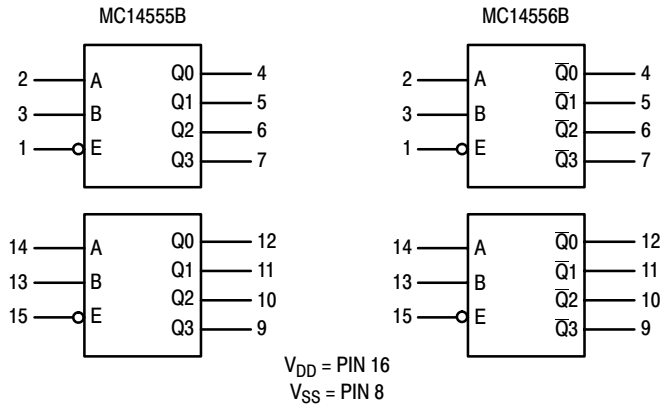
# MC14555B, MC14556B

TRUTH TABLE

| Inputs |        |   | Outputs  |    |    |    |          |    |    |    |
|--------|--------|---|----------|----|----|----|----------|----|----|----|
| Enable | Select |   | MC14555B |    |    |    | MC14556B |    |    |    |
| E      | B      | A | Q3       | Q2 | Q1 | Q0 | Q3       | Q2 | Q1 | Q0 |
| 0      | 0      | 0 | 0        | 0  | 0  | 1  | 1        | 1  | 1  | 0  |
| 0      | 0      | 1 | 0        | 0  | 1  | 0  | 1        | 1  | 0  | 1  |
| 0      | 1      | 0 | 0        | 1  | 0  | 0  | 1        | 0  | 1  | 1  |
| 0      | 1      | 1 | 1        | 0  | 0  | 0  | 0        | 1  | 1  | 1  |
| 1      | X      | X | 0        | 0  | 0  | 0  | 1        | 1  | 1  | 1  |

X = Don't Care

BLOCK DIAGRAM



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                                                                                           | V <sub>OL</sub> | 5.0                    | –                                                                                                                                                              | 0.05 | –     | 0               | 0.05 | –     | 0.05 | Vdc  |
|                                                                                                                                                    |                 | 10                     | –                                                                                                                                                              | 0.05 | –     | 0               | 0.05 | –     | 0.05 |      |
|                                                                                                                                                    |                 | 15                     | –                                                                                                                                                              | 0.05 | –     | 0               | 0.05 | –     | 0.05 |      |
|                                                                                                                                                    | V <sub>OH</sub> | 5.0                    | 4.95                                                                                                                                                           | –    | 4.95  | 5.0             | –    | 4.95  | –    | Vdc  |
| 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)                      |                 | 10                     | 9.95                                                                                                                                                           | –    | 9.95  | 10              | –    | 9.95  | –    |      |
|                                                                                                                                                    |                 | 15                     | 14.95                                                                                                                                                          | –    | 14.95 | 15              | –    | 14.95 | –    |      |
| “1” Level<br>(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)                          | V <sub>IL</sub> | 5.0                    | –                                                                                                                                                              | 1.5  | –     | 2.25            | 1.5  | –     | 1.5  | Vdc  |
|                                                                                                                                                    |                 | 10                     | –                                                                                                                                                              | 3.0  | –     | 4.50            | 3.0  | –     | 3.0  |      |
|                                                                                                                                                    |                 | 15                     | –                                                                                                                                                              | 4.0  | –     | 6.75            | 4.0  | –     | 4.0  |      |
|                                                                                                                                                    | V <sub>IH</sub> | 5.0                    | 3.5                                                                                                                                                            | –    | 3.5   | 2.75            | –    | 3.5   | –    | Vdc  |
| 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)  |                 | 10                     | 7.0                                                                                                                                                            | –    | 7.0   | 5.50            | –    | 7.0   | –    |      |
|                                                                                                                                                    |                 | 15                     | 11                                                                                                                                                             | –    | 11    | 8.25            | –    | 11    | –    |      |
| Source                                                                                                                                             | I <sub>OH</sub> | 5.0                    | –3.0                                                                                                                                                           | –    | –2.4  | –4.2            | –    | –1.7  | –    | mAdc |
|                                                                                                                                                    |                 | 5.0                    | –0.64                                                                                                                                                          | –    | –0.51 | –0.88           | –    | –0.36 | –    |      |
|                                                                                                                                                    |                 | 10                     | –1.6                                                                                                                                                           | –    | –1.3  | –2.25           | –    | –0.9  | –    |      |
|                                                                                                                                                    | I <sub>OL</sub> | 15                     | –4.2                                                                                                                                                           | –    | –3.4  | –8.8            | –    | –2.4  | –    | mAdc |
| Sink                                                                                                                                               | I <sub>OL</sub> | 5.0                    | 0.64                                                                                                                                                           | –    | 0.51  | 0.88            | –    | 0.36  | –    |      |
|                                                                                                                                                    |                 | 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 (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 (Notes 3, 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<br>10<br>15        | I <sub>T</sub> = (0.85 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (1.70 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (2.60 μA/kHz) f + I <sub>DD</sub> |      |       |                 |      |       |      | 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 = 0.002.

# MC14555B, MC14556B

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

| Characteristic                                                                                                                                                                                                                            | Symbol             | $V_{DD}$        | Min         | Typ<br>(Note 6) | Max               | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|-------------|-----------------|-------------------|------|
| 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>$t_{TLH}, t_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$            | $t_{TLH}, t_{THL}$ | 5.0<br>10<br>15 | —<br>—<br>— | 100<br>50<br>40 | 200<br>100<br>80  | ns   |
| Propagation Delay Time – A, B to Output<br>$t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 135 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 62 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 45 \text{ ns}$ | $t_{PLH}, t_{PHL}$ | 5.0<br>10<br>15 | —<br>—<br>— | 220<br>95<br>70 | 440<br>190<br>140 | ns   |
| Propagation Delay Time – E to Output<br>$t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 115 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 52 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 40 \text{ ns}$    | $t_{PLH}, t_{PHL}$ | 5.0<br>10<br>15 | —<br>—<br>— | 200<br>85<br>65 | 400<br>170<br>130 | 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.

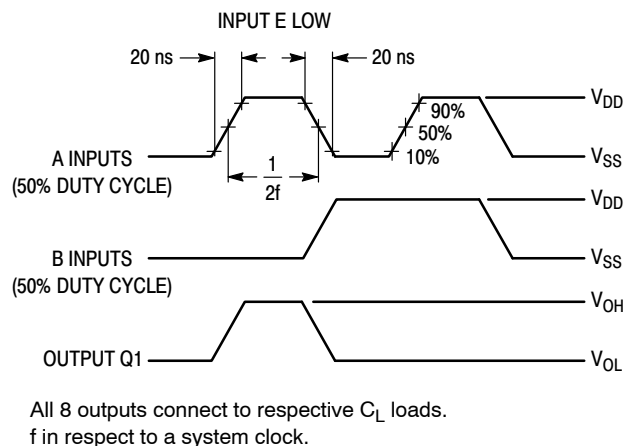


Figure 1. Dynamic Power Dissipation Signal Waveforms

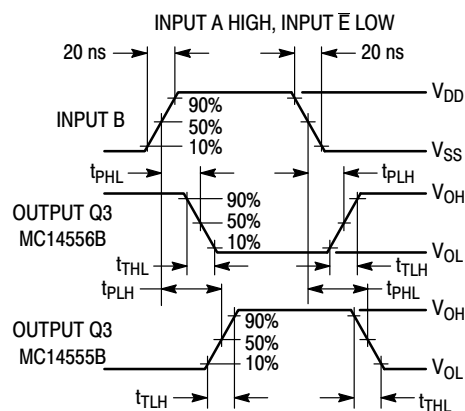
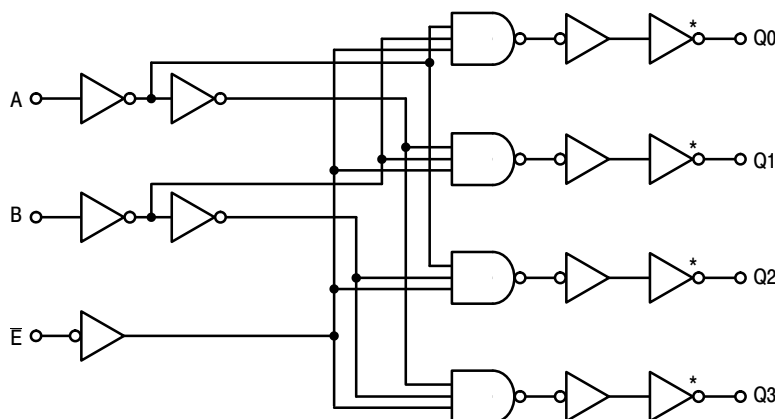


Figure 2. Dynamic Signal Waveforms

## LOGIC DIAGRAM (1/2 of Dual)



\*Eliminated for MC14555B

## MC14555B, MC14556B

### ORDERING INFORMATION

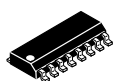
| Device         | Package              | Shipping <sup>†</sup> |
|----------------|----------------------|-----------------------|
| MC14555BDG     | SOIC-16<br>(Pb-Free) | 48 Units / Rail       |
| MC14555BDR2G   | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |
| NLV14555BDR2G* | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |
| MC14556BDR2G   | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |
| NLV14556BDR2G* | 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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



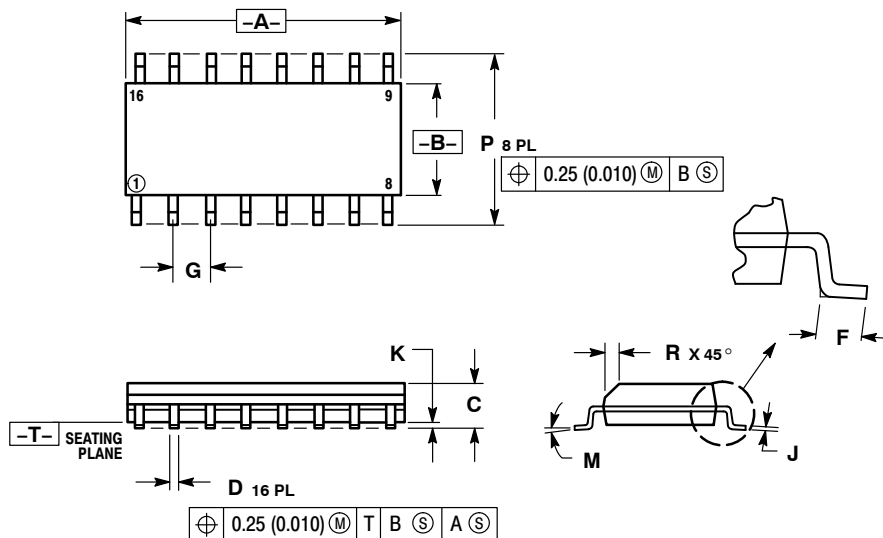
SCALE 1:1

### SOIC-16

#### CASE 751B-05

#### ISSUE K

DATE 29 DEC 2006



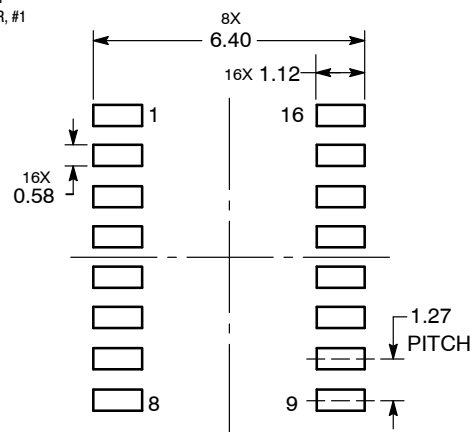
#### NOTES:

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 |

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

#### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                  |             |                                                                                                                                                                                     |
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