

# MC14555B, MC14556B

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

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
- These Devices are Pb-Free and are 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 $V_{DD}$ + 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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Temperature Derating: Plastic “P and 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,  $V_{in}$  and  $V_{out}$  should be constrained to the range  $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$ .

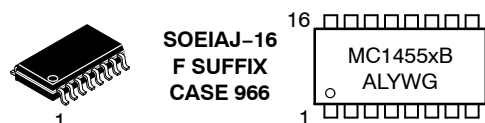
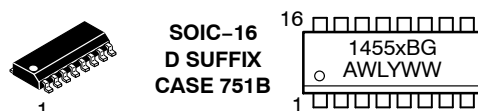
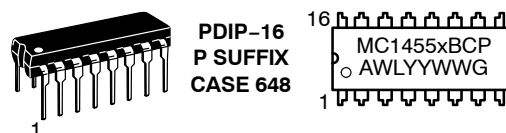
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



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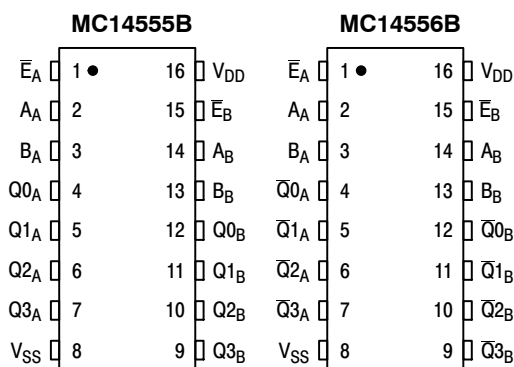
<http://onsemi.com>

### MARKING DIAGRAMS



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

### PIN ASSIGNMENTS



### ORDERING INFORMATION

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

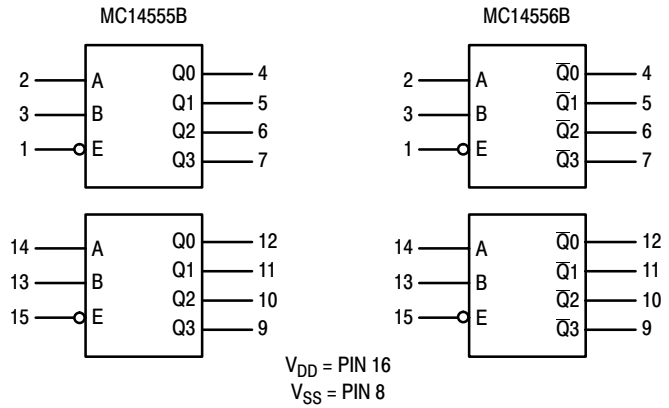
# MC14555B, MC14556B

TRUTH TABLE

| Inputs    |        |   | Outputs  |    |    |    |            |            |            |            |
|-----------|--------|---|----------|----|----|----|------------|------------|------------|------------|
| Enable    | Select |   | MC14555B |    |    |    | MC14556B   |            |            |            |
| $\bar{E}$ | B      | A | Q3       | Q2 | Q1 | Q0 | $\bar{Q}3$ | $\bar{Q}2$ | $\bar{Q}1$ | $\bar{Q}0$ |
| 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  $V_{SS}$ )

| Characteristic                                                                                                                             | Symbol   | $V_{DD}$<br>Vdc | - 55°C                                                                                                                              |           | 25°C  |                 |           | 125°C |           | Unit            |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|-----------------|-----------|-------|-----------|-----------------|
|                                                                                                                                            |          |                 | Min                                                                                                                                 | Max       | Min   | Typ<br>(Note 2) | Max       | Min   | Max       |                 |
| Output Voltage<br>$V_{in} = V_{DD}$ or 0                                                                                                   | $V_{OL}$ | 5.0             | –                                                                                                                                   | 0.05      | –     | 0               | 0.05      | –     | 0.05      | Vdc             |
|                                                                                                                                            |          | 10              | –                                                                                                                                   | 0.05      | –     | 0               | 0.05      | –     | 0.05      |                 |
| $V_{in} = 0$ or $V_{DD}$                                                                                                                   | $V_{OH}$ | 5.0             | 4.95                                                                                                                                | –         | 4.95  | 5.0             | –         | 4.95  | –         | Vdc             |
|                                                                                                                                            |          | 10              | 9.95                                                                                                                                | –         | 9.95  | 10              | –         | 9.95  | –         |                 |
| Input Voltage<br>( $V_O = 4.5$ or $0.5$ Vdc)<br>( $V_O = 9.0$ or $1.0$ Vdc)<br>( $V_O = 13.5$ or $1.5$ Vdc)                                | $V_{IL}$ | 5.0             | –                                                                                                                                   | 1.5       | –     | 2.25            | 1.5       | –     | 1.5       | Vdc             |
|                                                                                                                                            |          | 10              | –                                                                                                                                   | 3.0       | –     | 4.50            | 3.0       | –     | 3.0       |                 |
| $V_{in} = 0$ or $V_{DD}$                                                                                                                   | $V_{IH}$ | 5.0             | 3.5                                                                                                                                 | –         | 3.5   | 2.75            | –         | 3.5   | –         | Vdc             |
|                                                                                                                                            |          | 10              | 7.0                                                                                                                                 | –         | 7.0   | 5.50            | –         | 7.0   | –         |                 |
| Output Drive Current<br>( $V_{OH} = 2.5$ Vdc)<br>( $V_{OH} = 4.6$ Vdc)<br>( $V_{OH} = 9.5$ Vdc)<br>( $V_{OH} = 13.5$ Vdc)                  | $I_{OH}$ | 5.0             | –3.0                                                                                                                                | –         | –2.4  | –4.2            | –         | –1.7  | –         | mAdc            |
|                                                                                                                                            |          | 10              | –0.64                                                                                                                               | –         | –0.51 | –0.88           | –         | –0.36 | –         |                 |
| $V_{OL} = 0.4$ Vdc<br>( $V_{OL} = 0.5$ Vdc)<br>( $V_{OL} = 1.5$ Vdc)                                                                       | $I_{OL}$ | 5.0             | 0.64                                                                                                                                | –         | 0.51  | 0.88            | –         | 0.36  | –         | mAdc            |
|                                                                                                                                            |          | 10              | 1.6                                                                                                                                 | –         | 1.3   | 2.25            | –         | 0.9   | –         |                 |
| Input Current                                                                                                                              | $I_{in}$ | 15              | –                                                                                                                                   | $\pm 0.1$ | –     | $\pm 0.00001$   | $\pm 0.1$ | –     | $\pm 1.0$ | $\mu\text{Adc}$ |
| Input Capacitance, ( $V_{in} = 0$ )                                                                                                        | $C_{in}$ | –               | –                                                                                                                                   | –         | –     | 5.0             | 7.5       | –     | –         | pF              |
| Quiescent Current (Per Package)                                                                                                            | $I_{DD}$ | 5.0             | –                                                                                                                                   | 5.0       | –     | 0.005           | 5.0       | –     | 150       | $\mu\text{Adc}$ |
|                                                                                                                                            |          | 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>( $C_L = 50$ pF on all outputs, all<br>buffers switching) | $I_T$    | 5.0             | $I_T = (0.85 \mu\text{A/kHz}) f + I_{DD}$<br>$I_T = (1.70 \mu\text{A/kHz}) f + I_{DD}$<br>$I_T = (2.60 \mu\text{A/kHz}) f + I_{DD}$ |           |       |                 |           |       |           | $\mu\text{Adc}$ |

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:  $I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) V f k$  where:  $I_T$  is in  $\mu\text{A}$  (per package),  $C_L$  in pF,  $V = (V_{DD} - V_{SS})$  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>$t_{TLH}, t_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$            | $t_{TLH},$<br>$t_{THL}$ | 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>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 45 \text{ ns}$ | $t_{PLH},$<br>$t_{PHL}$ | 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>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 40 \text{ ns}$    | $t_{PLH},$<br>$t_{PHL}$ | 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.

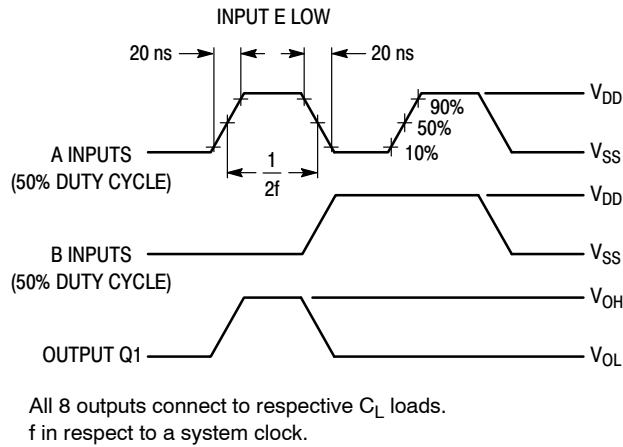


Figure 1. Dynamic Power Dissipation Signal Waveforms

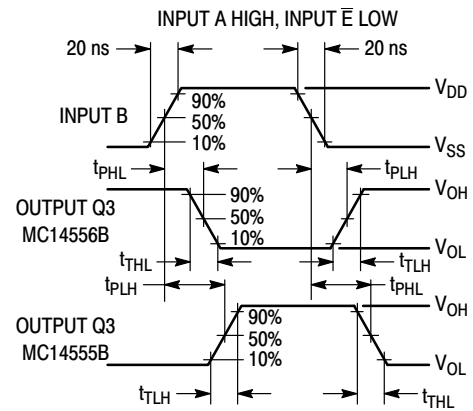
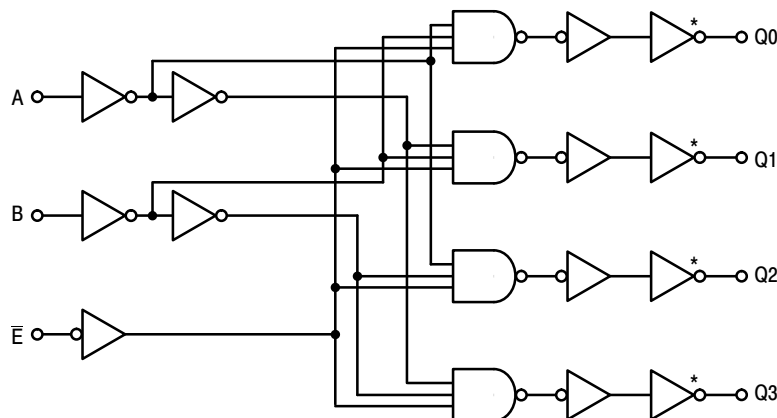


Figure 2. Dynamic Signal Waveforms

## LOGIC DIAGRAM (1/2 of Dual)



\*Eliminated for MC14555B

## MC14555B, MC14556B

### ORDERING INFORMATION

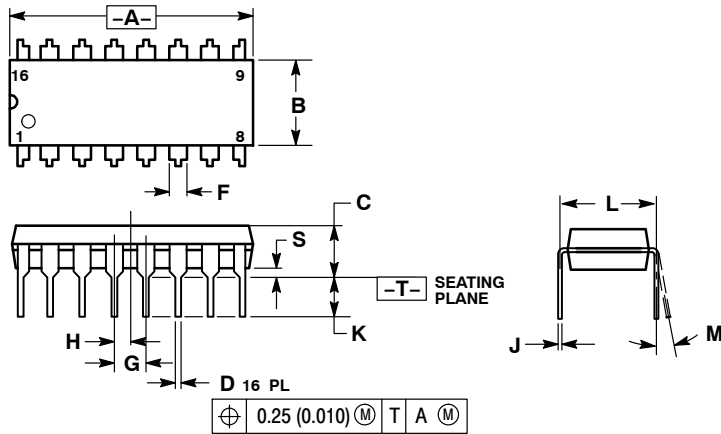
| Device       | Package                | Shipping†          |
|--------------|------------------------|--------------------|
| MC14555BCPG  | PDIP-16<br>(Pb-Free)   | 500 Units / Rail   |
| MC14555BDG   | SOIC-16<br>(Pb-Free)   | 48 Units / Rail    |
| MC14555BDR2G | SOIC-16<br>(Pb-Free)   | 2500 / Tape & Reel |
| MC14555BFELG | SOEIAJ-16<br>(Pb-Free) | 2000 / Tape & Reel |
| MC14556BCPG  | PDIP-16<br>(Pb-Free)   | 500 Units / Rail   |
| MC14556BDR2G | SOIC-16<br>(Pb-Free)   | 2500 / Tape & Reel |
| MC14556BFELG | SOEIAJ-16<br>(Pb-Free) | 2000 / Tape & Reel |

†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.

# MC14555B, MC14556B

## PACKAGE DIMENSIONS

### PDIP-16 CASE 648-08 ISSUE T

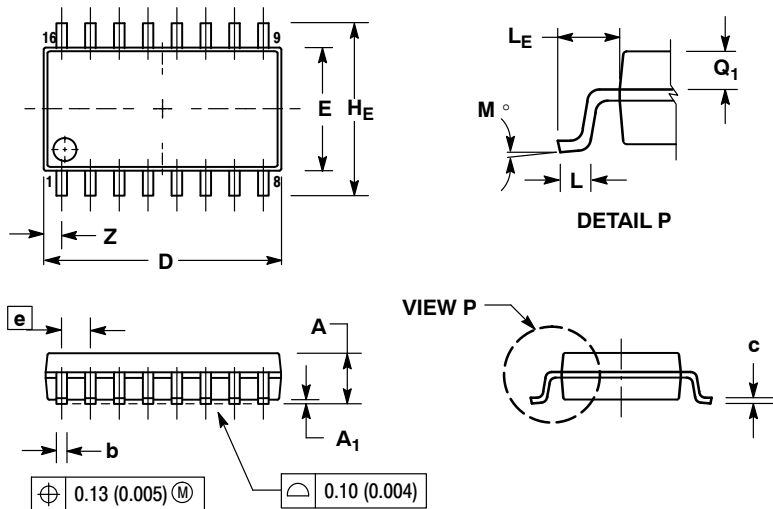


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.70  | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0°        | 10°   | 0°          | 10°   |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

### SOEIAJ-16 CASE 966-01 ISSUE A



#### NOTES:

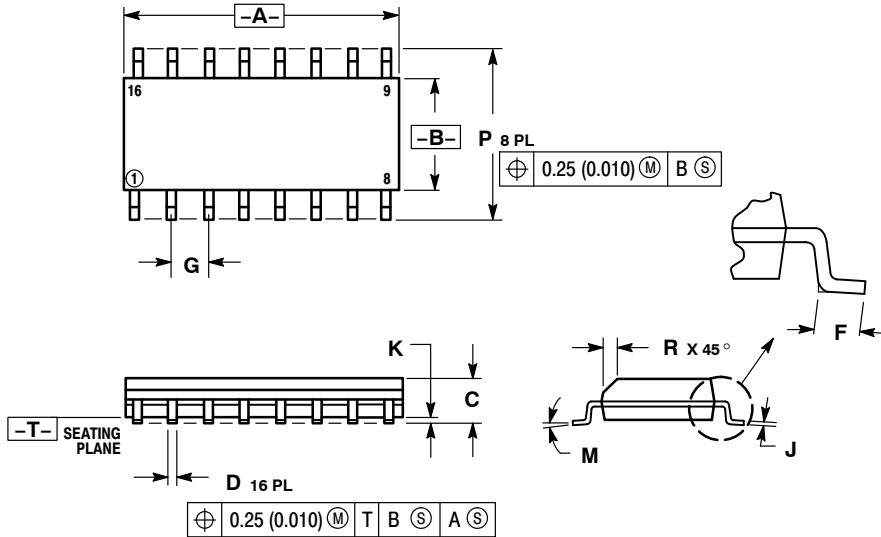
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | MIN         | MAX   | MIN       | MAX   |
| A              | ---         | 2.05  | ---       | 0.081 |
| A <sub>1</sub> | 0.05        | 0.20  | 0.002     | 0.008 |
| b              | 0.35        | 0.50  | 0.014     | 0.020 |
| c              | 0.10        | 0.20  | 0.007     | 0.011 |
| D              | 9.90        | 10.50 | 0.390     | 0.413 |
| E              | 5.10        | 5.45  | 0.201     | 0.215 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H <sub>E</sub> | 7.40        | 8.20  | 0.291     | 0.323 |
| L              | 0.50        | 0.85  | 0.020     | 0.033 |
| L <sub>E</sub> | 1.10        | 1.50  | 0.043     | 0.059 |
| M              | 0°          | 10°   | 0°        | 10°   |
| Q <sub>1</sub> | 0.70        | 0.90  | 0.028     | 0.035 |
| Z              | ---         | 0.78  | ---       | 0.031 |

# MC14555B, MC14556B

## PACKAGE DIMENSIONS

SOIC-16  
CASE 751B-05  
ISSUE K

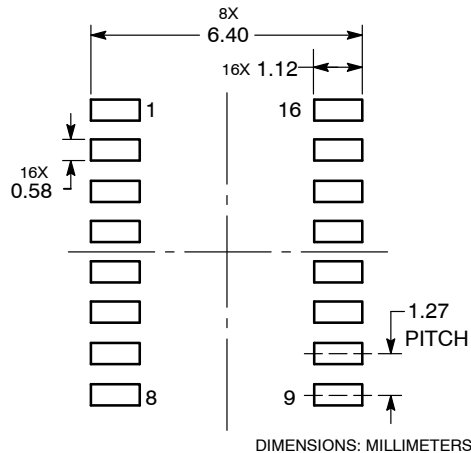


### NOTES:

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 |

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