

# MC14042B

## Quad Transparent Latch

The MC14042B Quad Transparent Latch is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. Each latch has a separate data input, but all four latches share a common clock. The clock polarity (high or low) used to strobe data through the latches can be reversed using the polarity input. Information present at the data input is transferred to outputs Q and  $\bar{Q}$  during the clock level which is determined by the polarity input. When the polarity input is in the logic "0" state, data is transferred during the low clock level, and when the polarity input is in the logic "1" state the transfer occurs during the high clock level.

### Features

- Buffered Data Inputs
- Common Clock
- Clock Polarity Control
- Q and  $\bar{Q}$  Outputs
- Double Diode Input Protection
- 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
- These Devices are Pb-Free and are RoHS Compliant

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

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

#### 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  $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$ .

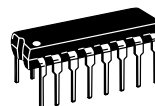
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



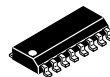
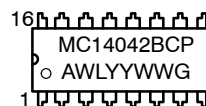
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### MARKING DIAGRAMS



PDIP-16  
P SUFFIX  
CASE 648



SOIC-16  
D SUFFIX  
CASE 751B



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

### ORDERING INFORMATION

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

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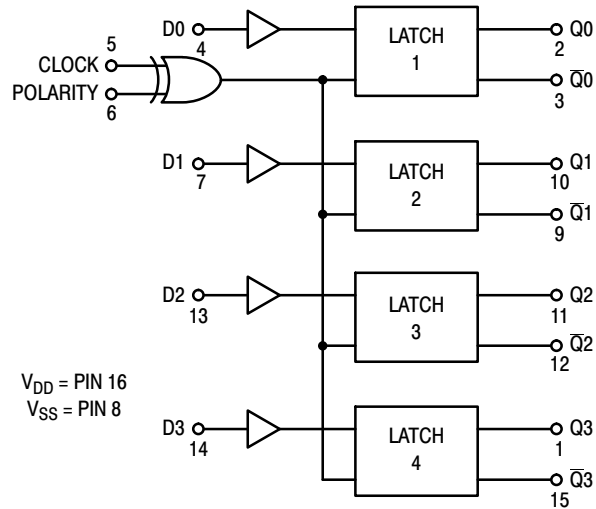
## PIN ASSIGNMENT

|                 |     |    |                 |
|-----------------|-----|----|-----------------|
| Q3              | 1 • | 16 | V <sub>DD</sub> |
| Q0              | 2   | 15 | $\bar{Q}3$      |
| $\bar{Q}0$      | 3   | 14 | D3              |
| D0              | 4   | 13 | D2              |
| CLOCK           | 5   | 12 | $\bar{Q}2$      |
| POLARITY        | 6   | 11 | Q2              |
| D1              | 7   | 10 | Q1              |
| V <sub>SS</sub> | 8   | 9  | $\bar{Q}1$      |

## TRUTH TABLE

| Clock | Polarity | Q     |
|-------|----------|-------|
| 0     | 0        | Data  |
| 1     | 0        | Latch |
| 1     | 1        | Data  |
| 0     | 1        | Latch |

## LOGIC DIAGRAM



# MC14042B

## 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<br><br>V <sub>in</sub> = 0 or V <sub>DD</sub>                                                                                                                                             | “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 |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | –                                                                                                                                                           | 0.05 | –      | 0               | 0.05 | –      | 0.05 |      |
|                                                                                                                                                                                                                                                    | “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   | –    |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | 14.95                                                                                                                                                       | –    | 14.95  | 15              | –    | 14.95  | –    |      |
| 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)<br><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)  | “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  |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | –                                                                                                                                                           | 4.0  | –      | 6.75            | 4.0  | –      | 4.0  |      |
|                                                                                                                                                                                                                                                    | “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    | –    |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | 11                                                                                                                                                          | –    | 11     | 8.25            | –    | 11     | –    |      |
| 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)<br><br>(V <sub>OL</sub> = 0.4 Vdc)<br>(V <sub>OL</sub> = 0.5 Vdc)<br>(V <sub>OL</sub> = 1.5 Vdc) | Source<br>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  | –    |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | – 4.2                                                                                                                                                       | –    | – 3.4  | – 8.8           | –    | – 2.4  | –    |      |
|                                                                                                                                                                                                                                                    | Sink<br>I <sub>OL</sub>      | 5.0                    | 0.64                                                                                                                                                        | –    | 0.51   | 0.88            | –    | 0.36   | –    | mAdc |
|                                                                                                                                                                                                                                                    |                              | 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<br>(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                    | –                                                                                                                                                           | 1.0  | –      | 0.002           | 1.0  | –      | 30   | μAdc |
|                                                                                                                                                                                                                                                    |                              | 10                     | –                                                                                                                                                           | 2.0  | –      | 0.004           | 2.0  | –      | 60   |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | –                                                                                                                                                           | 4.0  | –      | 0.006           | 4.0  | –      | 120  |      |
| 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> = (1.0 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (2.0 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (3.0 μA/kHz) f + I <sub>DD</sub> |      |        |                 |      |        |      | μAdc |

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:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) Vfk$$

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 = 0.004.

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## 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, D to Q, $\bar{Q}$<br>$t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 135 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 57 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 35 \text{ ns}$     | $t_{PLH},$<br>$t_{PHL}$ | 5.0<br>10<br>15 | –<br>–<br>–      | 220<br>90<br>60 | 440<br>180<br>120 | ns            |
| Propagation Delay Time, Clock to Q, $\bar{Q}$<br>$t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 135 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 57 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 35 \text{ ns}$ | $t_{PLH},$<br>$t_{PHL}$ | 5.0<br>10<br>15 | –<br>–<br>–      | 220<br>90<br>60 | 440<br>180<br>120 | ns            |
| Clock Pulse Width                                                                                                                                                                                                                               | $t_{WH}$                | 5.0<br>10<br>15 | 300<br>100<br>80 | 150<br>50<br>40 | –<br>–<br>–       | ns            |
| Clock Pulse Rise and Fall Time                                                                                                                                                                                                                  | $t_{TLH},$<br>$t_{THL}$ | 5.0<br>10<br>15 | –<br>–<br>–      | –<br>–<br>–     | 15<br>5.0<br>4.0  | $\mu\text{s}$ |
| Hold Time                                                                                                                                                                                                                                       | $t_h$                   | 5.0<br>10<br>15 | 100<br>50<br>40  | 50<br>25<br>20  | –<br>–<br>–       | ns            |
| Setup Time                                                                                                                                                                                                                                      | $t_{su}$                | 5.0<br>10<br>15 | 50<br>30<br>25   | 0<br>0<br>0     | –<br>–<br>–       | ns            |

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

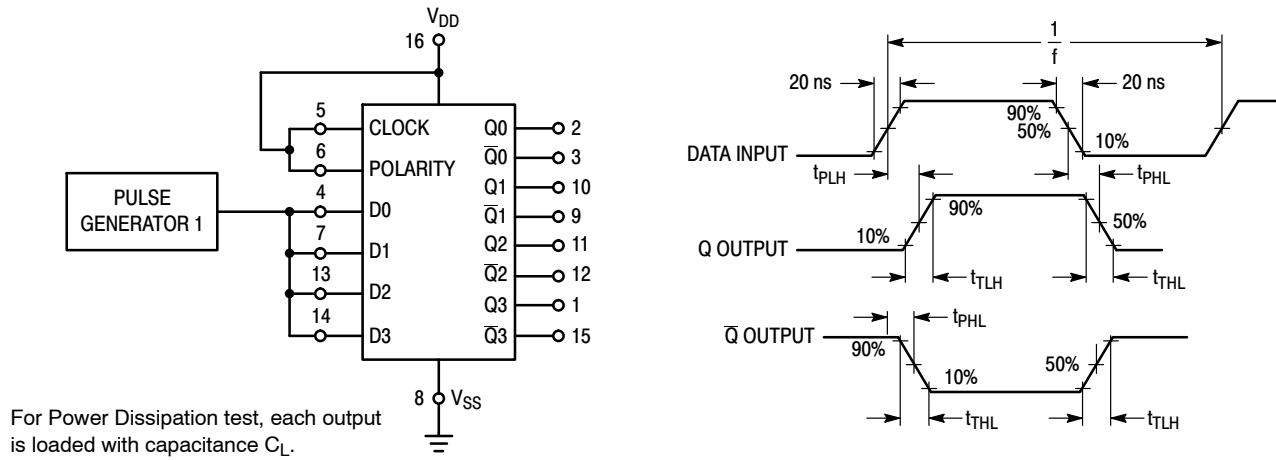
6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

## ORDERING INFORMATION

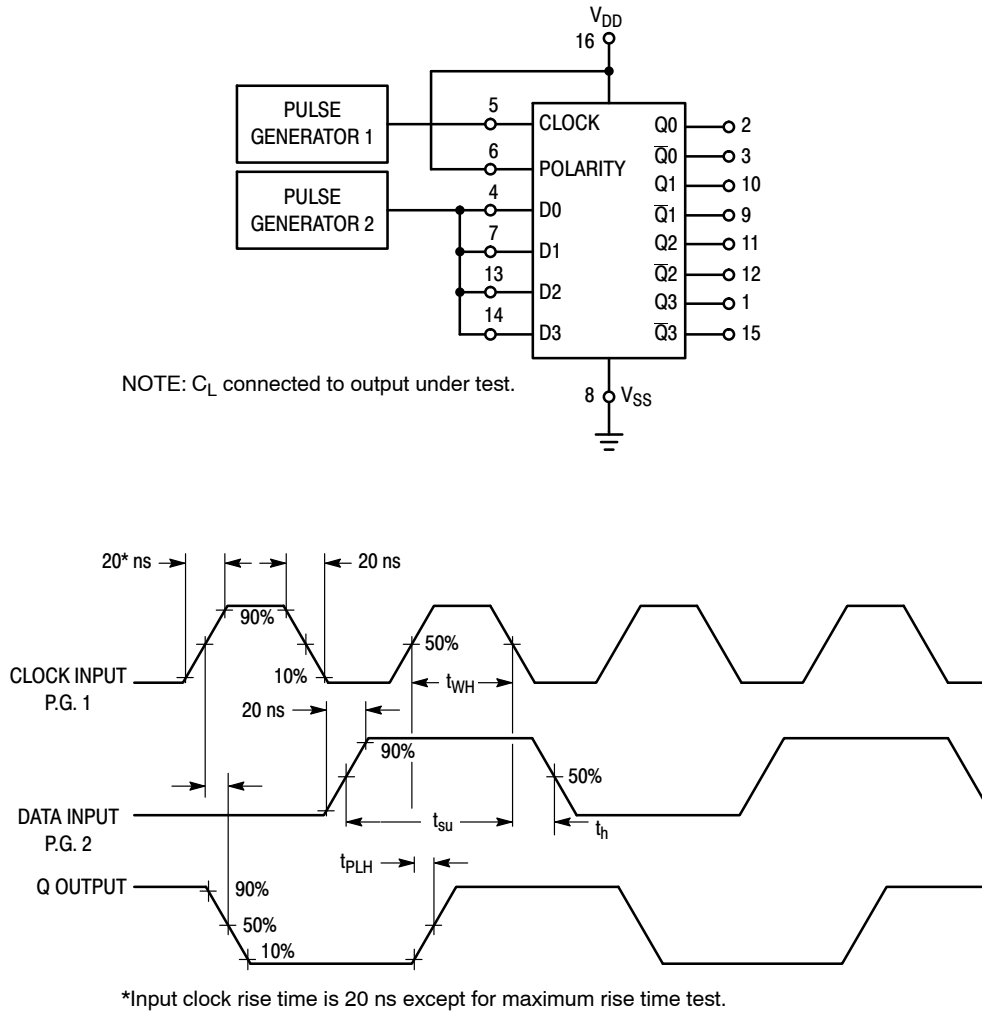
| Device       | Package              | Shipping <sup>†</sup>    |
|--------------|----------------------|--------------------------|
| MC14042BCPG  | PDIP–16<br>(Pb–Free) | 500 Units / Rail         |
| MC14042BDG   | SOIC–16<br>(Pb–Free) | 48 Units / Rail          |
| MC14042BDR2G | SOIC–16<br>(Pb–Free) | 2500 Units / 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.

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**Figure 1. AC and Power Dissipation Test Circuit and Timing Diagram (Data to Output)**

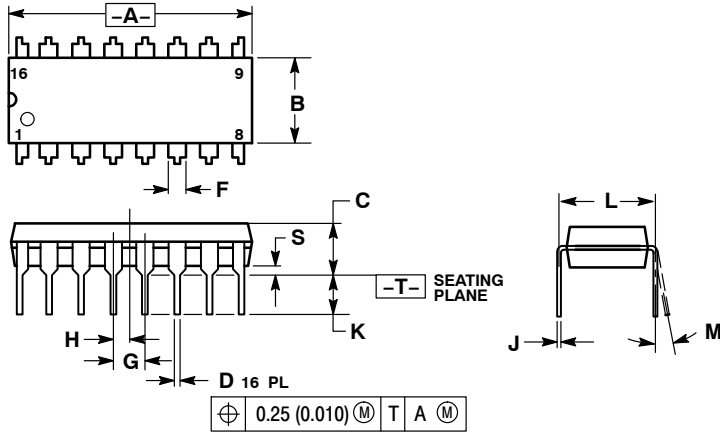


**Figure 2. AC Test Circuit and Timing Diagram (Clock to Output)**

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## PACKAGE DIMENSIONS

PDIP-16  
P SUFFIX  
PLASTIC DIP PACKAGE  
CASE 648-08  
ISSUE T



### NOTES:

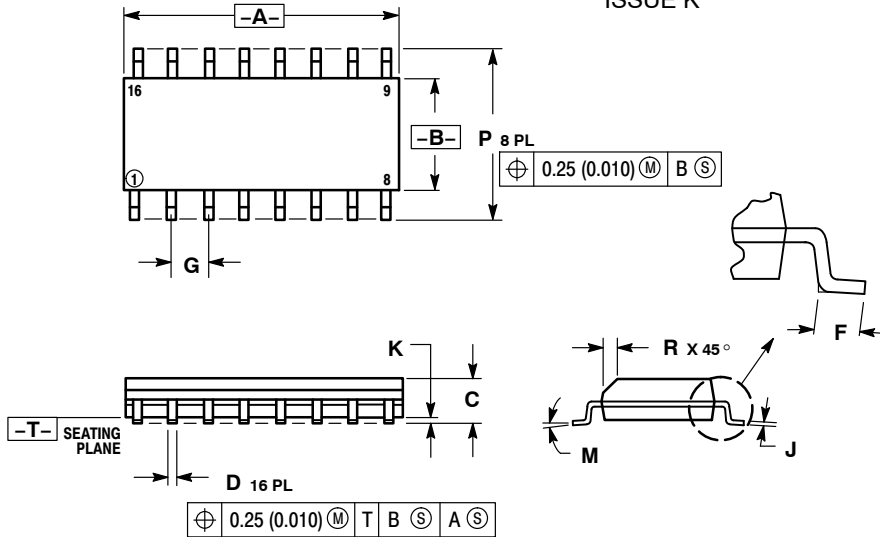
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| 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  |

# MC14042B

## PACKAGE DIMENSIONS

### SOIC-16 D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE K

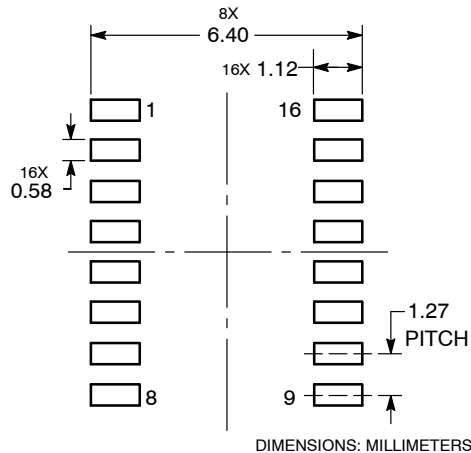


#### NOTES:

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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