

# 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.

- 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

### MAXIMUM RATINGS (Voltages Referenced to $V_{SS}$ ) (Note 2.)

| 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 3.)          | 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 damage to the device may occur.
- Temperature Derating:  
Plastic "P and D/DW" Packages: - 7.0 mW/°C From 65°C To 125°C

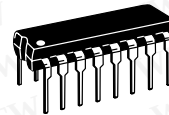
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{in}$  and  $V_{out}$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

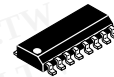
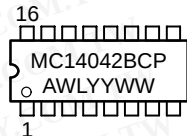


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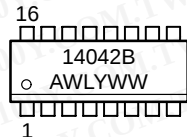
### MARKING DIAGRAMS



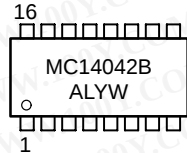
PDIP-16  
P SUFFIX  
CASE 648



SOIC-16  
D SUFFIX  
CASE 751B



SOEIAJ-16  
F SUFFIX  
CASE 966



A = Assembly Location  
 WL, L = Wafer Lot  
 YY, Y = Year  
 WW, W = Work Week

### ORDERING INFORMATION

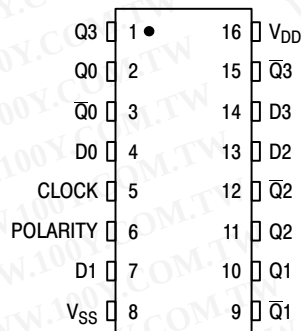
| Device      | Package   | Shipping         |
|-------------|-----------|------------------|
| MC14042BCP  | PDIP-16   | 2000/Box         |
| MC14042BD   | SOIC-16   | 2400/Box         |
| MC14042BDR2 | SOIC-16   | 2500/Tape & Reel |
| MC14042BF   | SOEIAJ-16 | See Note 1.      |
| MC14042BFEL | SOEIAJ-16 | See Note 1.      |
| MC14042BFR1 | SOEIAJ-16 | See Note 1.      |
| MC14042BFR2 | SOEIAJ-16 | See Note 1.      |

- For ordering information on the EIAJ version of the SOIC packages, please contact your local ON Semiconductor representative.

# MC14042B

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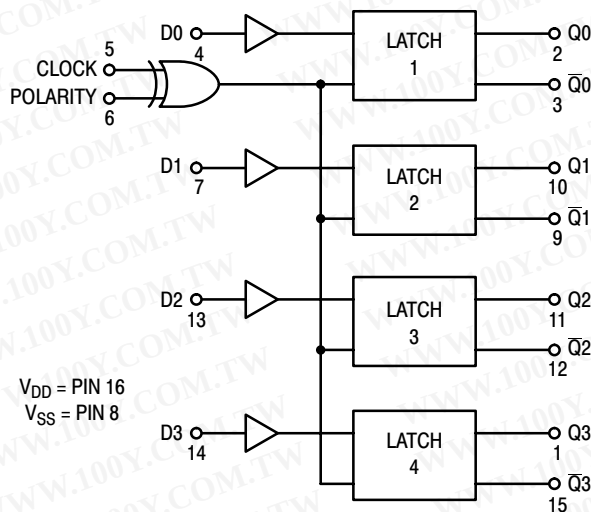
## PIN ASSIGNMENT



## TRUTH TABLE

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

## LOGIC DIAGRAM



# MC14042B

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## 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 (4)  | 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  |      |
|                                                                                                                                                   |                                                                                                                           | 15                     | —                                                                                                                                                           | 0.05  | —      | 0        | 0.05  | —      | 0.05  |      |
|                                                                                                                                                   | “1” Level<br>V <sub>in</sub> = 0 or V <sub>DD</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)                     | “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>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) | 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) | 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 (5.) (6.)<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 |

4. Data labelled “Typ” is not to be used for design purposes but is intended as an indication of the IC’s potential performance.

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

6. 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 (7.) ( $C_L = 50 \text{ pF}$ , $T_A = 25^\circ\text{C}$ )

| Characteristic                                                                                                                                                                                                                                  | Symbol             | $V_{DD}$        | Min              | Typ (8.)        | 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, 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>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 35 \text{ ns}$     | $t_{PLH}, t_{PHL}$ | 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>$t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 35 \text{ ns}$ | $t_{PLH}, t_{PHL}$ | 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                                                                                                                                                                                                                  | $t_{TLH}, t_{THL}$ | 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            |

7. The formulas given are for the typical characteristics only at  $25^\circ\text{C}$ .  
 8. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

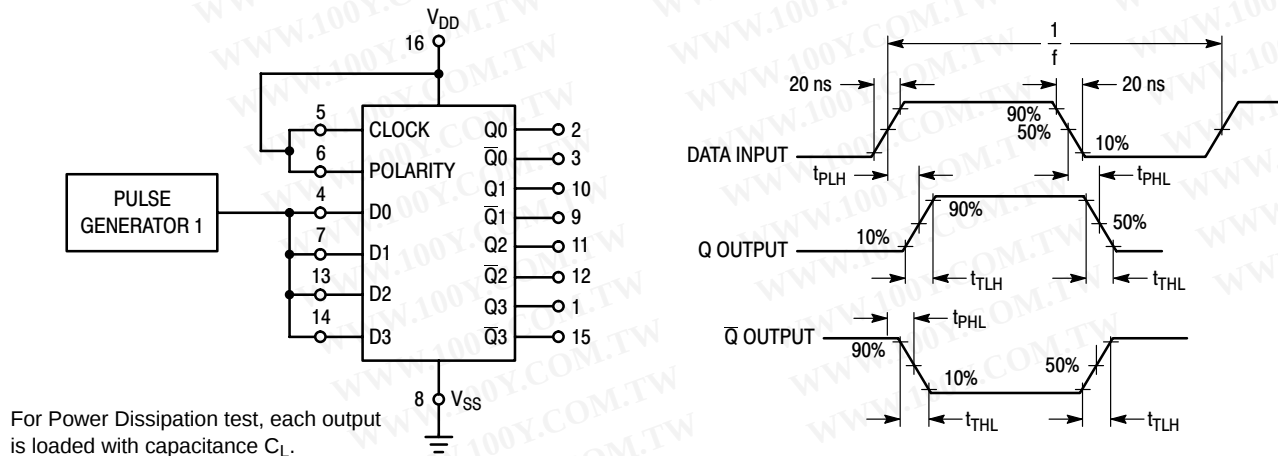
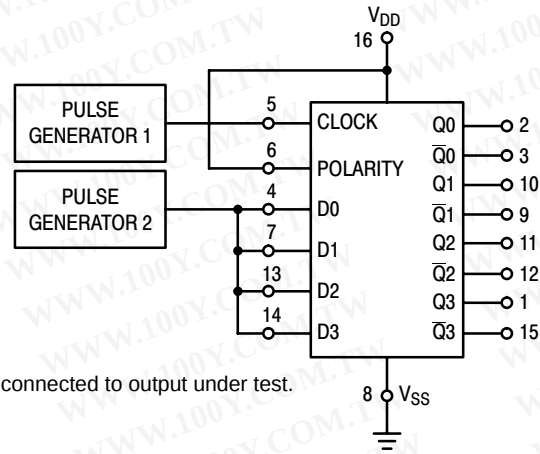


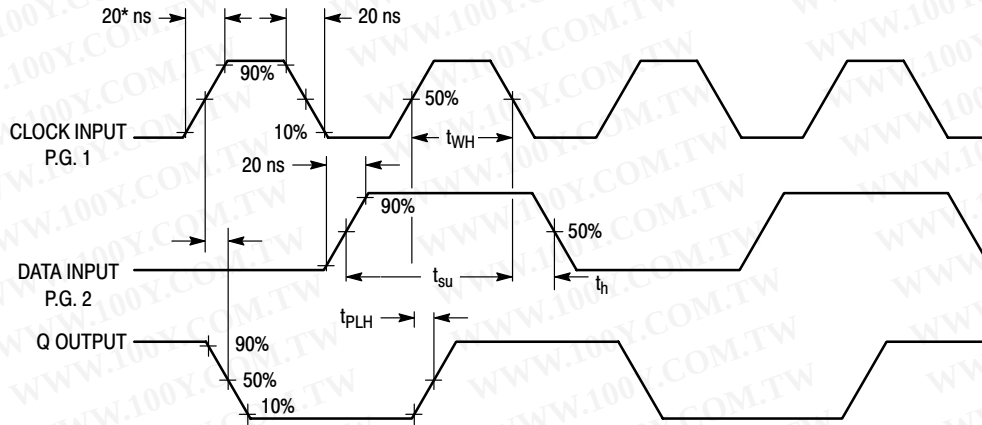
Figure 1. AC and Power Dissipation Test Circuit and Timing Diagram (Data to Output)

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NOTE:  $C_L$  connected to output under test.



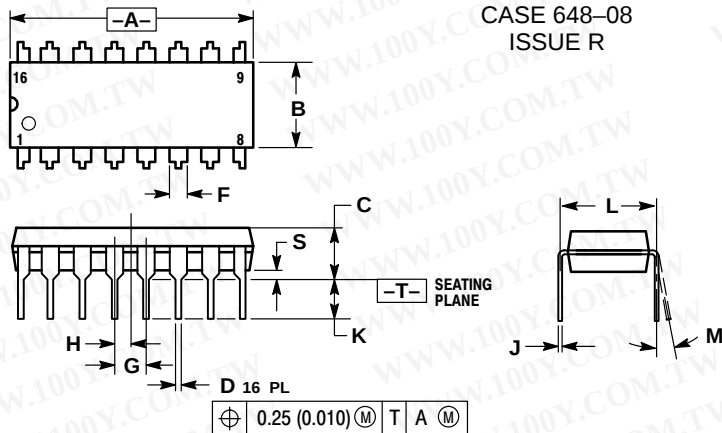
\*Input clock rise time is 20 ns except for maximum rise time test.

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

# MC14042B

## PACKAGE DIMENSIONS

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

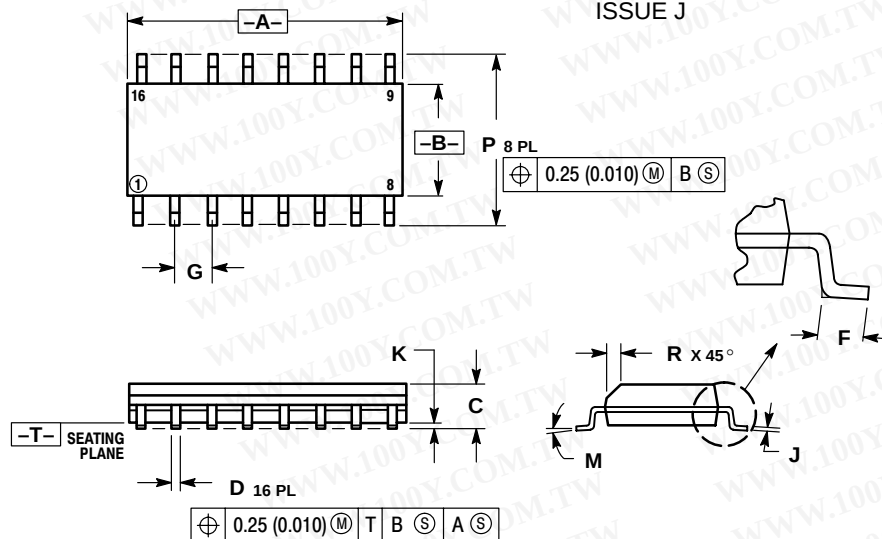


### NOTES:

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  |

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



### 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 |

# MC14042B

## PACKAGE DIMENSIONS

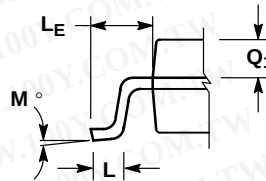
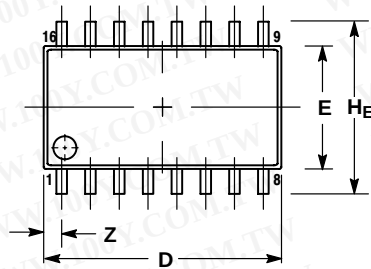
### SOEIAJ-16

#### F SUFFIX

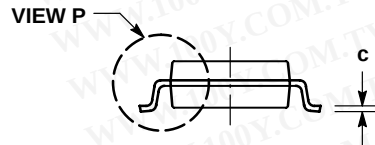
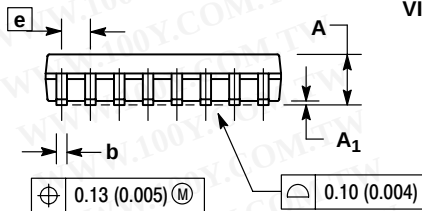
#### PLASTIC EIAJ SOIC PACKAGE

#### CASE 966-01

#### ISSUE O



DETAIL P



#### 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              | 0.18        | 0.27  | 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 |

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