

# MC14099B

## 8-Bit Addressable Latches

The MC14099B is an 8-bit addressable latch. Data is entered in serial form when the appropriate latch is addressed (via address pins A0, A1, A2) and write disable is in the low state. For the MC14099B the input is a unidirectional write only port.

The data is presented in parallel at the output of the eight latches independently of the state of Write Disable, Write/Read or Chip Enable.

A Master Reset capability is available on both parts.

- Serial Data Input
- Parallel Output
- Master Reset
- 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
- MC14099B pin for pin compatible with CD4099B

### 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   |

2. Maximum Ratings are those values beyond which damage to the device may occur.

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

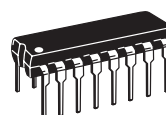
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



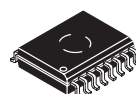
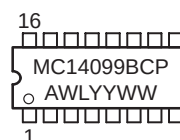
ON Semiconductor

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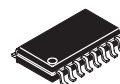
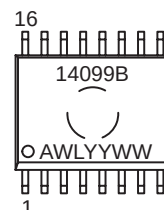
### MARKING DIAGRAMS



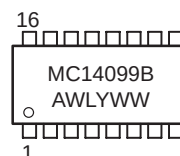
PDIP-16  
P SUFFIX  
CASE 648



SOIC-16  
DW SUFFIX  
CASE 751G



SOEIAJ-16  
F SUFFIX  
CASE 966



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

### ORDERING INFORMATION

| Device       | Package   | Shipping         |
|--------------|-----------|------------------|
| MC14099BCP   | PDIP-16   | 2000/Box         |
| MC14099BDW   | SOIC-16   | 2350/Box         |
| MC14099BDWR2 | SOIC-16   | 1000/Tape & Reel |
| MC14099BF    | SOEIAJ-16 | See Note 1.      |
| MC14099BFEL  | SOEIAJ-16 | See Note 1.      |

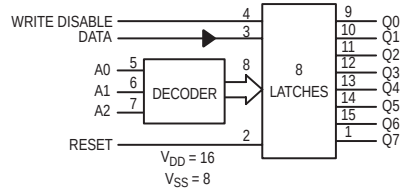
1. For ordering information on the EIAJ version of the SOIC packages, please contact your local ON Semiconductor representative.

# MC14099B

## PIN ASSIGNMENT

|                  |   |    |                 |
|------------------|---|----|-----------------|
| Q7               | 1 | 16 | V <sub>DD</sub> |
| RESET            | 2 | 15 | Q6              |
| DATA             | 3 | 14 | Q5              |
| WRITE<br>DISABLE | 4 | 13 | Q4              |
| A0               | 5 | 12 | Q3              |
| A1               | 6 | 11 | Q2              |
| A2               | 7 | 10 | Q1              |
| V <sub>SS</sub>  | 8 | 9  | Q0              |

## MC14099B



## 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 <sup>(4)</sup> | 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>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)                                       | “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)                   | 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   | —     |      |
| 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   |
| Input Capacitance<br>MC14599B — Data (pin 3)<br>(V <sub>in</sub> = 0)                                                                                               | C <sub>in</sub>              | —                      | —                                                                                                                                                           | —     | —     | 15                 | 22.5  | —     | —     | pF   |
| Quiescent Current<br>(Per Package)                                                                                                                                  | I <sub>DD</sub>              | 5.0                    | —                                                                                                                                                           | 5.0   | —     | 0.005              | 5.0   | —     | 150   | μAdc |
|                                                                                                                                                                     |                              | 10                     | —                                                                                                                                                           | 10    | —     | 0.010              | 10    | —     | 300   |      |
|                                                                                                                                                                     |                              | 15                     | —                                                                                                                                                           | 20    | —     | 0.015              | 20    | —     | 600   |      |
| Total Supply Current <sup>(5)</sup> <sup>(6)</sup><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> = (1.5 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (3.0 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (4.5 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 <sup>(7.)</sup> ( $C_L = 50 \text{ pF}$ , $T_A = 25^\circ\text{C}$ )

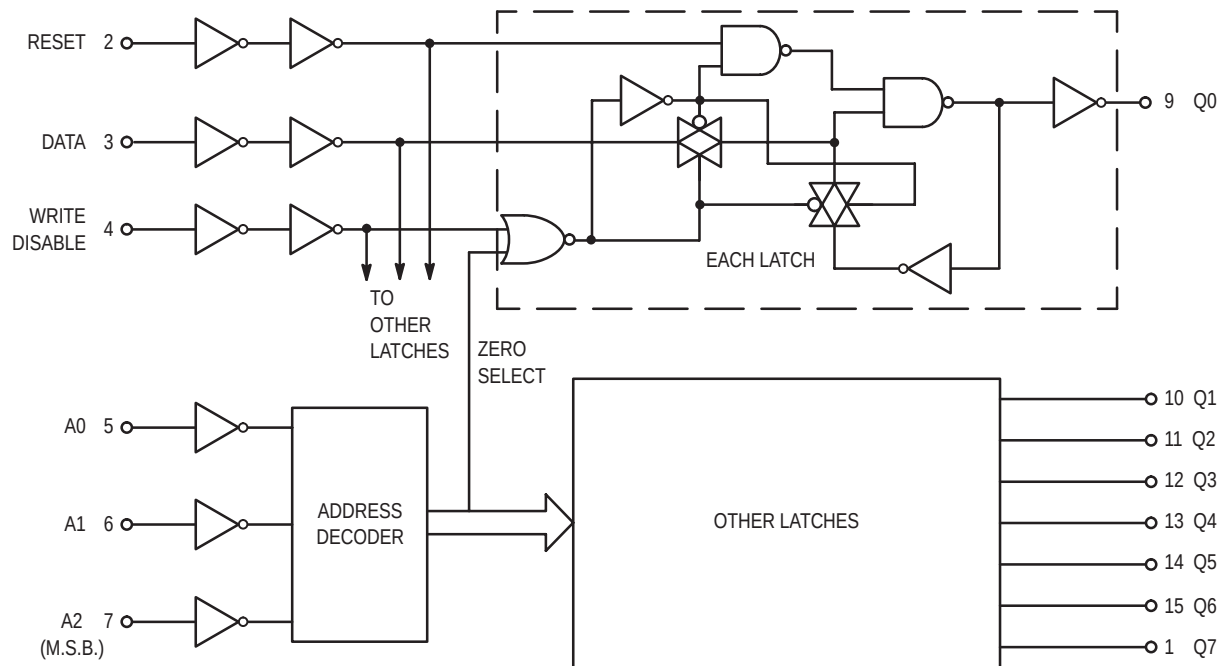
| Characteristic                                                                                                                                                                                                                      | Symbol                   | $V_{DD}$<br>Vdc | Min               | Typ <sup>(8.)</sup>  | Max               | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|-------------------|----------------------|-------------------|------|
| Output Rise and Fall Time<br>$t_{TLH}$ , $t_{THL} = (1.35 \text{ ns/pF}) C_L + 32 \text{ ns}$<br>$t_{TLH}$ , $t_{THL} = (0.6 \text{ ns/pF}) C_L + 20 \text{ ns}$<br>$t_{TLH}$ , $t_{THL} = (0.4 \text{ ns/pF}) C_L + 20 \text{ ns}$ | $t_{TLH}$ ,<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<br>Data to Output Q                                                                                                                                                                                          | $t_{PHL}$ ,<br>$t_{PLH}$ | 5.0<br>10<br>15 | —<br>—<br>—       | 200<br>75<br>50      | 400<br>150<br>100 | ns   |
| Write Disable to Output Q                                                                                                                                                                                                           |                          | 5.0<br>10<br>15 | —<br>—<br>—       | 200<br>80<br>60      | 400<br>160<br>120 | ns   |
| Reset to Output Q                                                                                                                                                                                                                   |                          | 5.0<br>10<br>15 | —<br>—<br>—       | 175<br>80<br>65      | 350<br>160<br>130 | ns   |
| CE to Output Q (MC14599B only)                                                                                                                                                                                                      |                          | 5.0<br>10<br>15 | —<br>—<br>—       | 225<br>100<br>75     | 450<br>200<br>150 | ns   |
| Propagation Delay Time, MC14599B only<br>Chip Enable, Write/Read to Data                                                                                                                                                            | $t_{PHL}$ ,<br>$t_{PLH}$ | 5.0<br>10<br>15 | —<br>—<br>—       | 200<br>80<br>65      | 400<br>160<br>130 | ns   |
| Address to Data                                                                                                                                                                                                                     |                          | 5.0<br>10<br>15 | —<br>—<br>—       | 200<br>90<br>75      | 400<br>180<br>150 | ns   |
| Pulse Widths<br>Reset                                                                                                                                                                                                               | $t_{W(H)}$<br>$t_{W(L)}$ | 5.0<br>10<br>15 | 150<br>75<br>50   | 75<br>40<br>25       | —<br>—<br>—       | ns   |
| Write Disable                                                                                                                                                                                                                       |                          | 5.0<br>10<br>15 | 320<br>160<br>120 | 160<br>80<br>60      | —<br>—<br>—       | ns   |
| Set Up Time<br>Data to Write Disable                                                                                                                                                                                                | $t_{SU}$                 | 5.0<br>10<br>15 | 100<br>50<br>35   | 50<br>25<br>20       | —<br>—<br>—       | ns   |
| Hold Time<br>Write Disable to Data                                                                                                                                                                                                  | $t_H$                    | 5.0<br>10<br>15 | 150<br>75<br>50   | 75<br>40<br>25       | —<br>—<br>—       | ns   |
| Set Up Time<br>Address to Write Disable                                                                                                                                                                                             | $t_{SU}$                 | 5.0<br>10<br>15 | 100<br>80<br>40   | 45<br>30<br>10       | —<br>—<br>—       | ns   |
| Removal Time<br>Write Disable to Address                                                                                                                                                                                            | $t_{REM}$                | 5.0<br>10<br>15 | 0<br>0<br>0       | – 80<br>– 40<br>– 40 | —<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.

# MC14099B

## MC14099B FUNCTION DIAGRAM



### TRUTH TABLE

| Write Disable | Reset | Addressed Latch | Unaddressed Latches |
|---------------|-------|-----------------|---------------------|
| 0             | 0     | Data            | $Q_n^*$             |
| 0             | 1     | Data            | Reset <sup>†</sup>  |
| 1             | 0     | $Q_n^*$         | $Q_n^*$             |
| 1             | 1     | Reset           | Reset               |

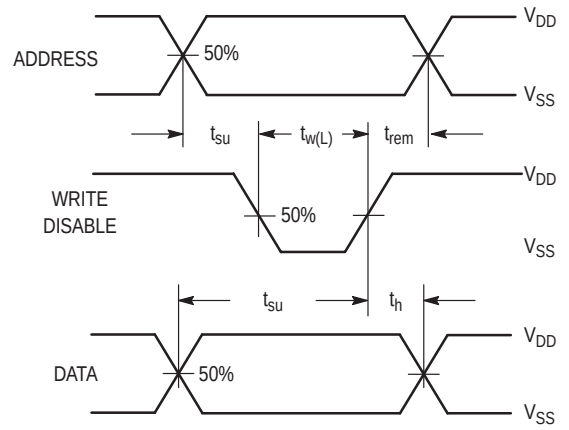
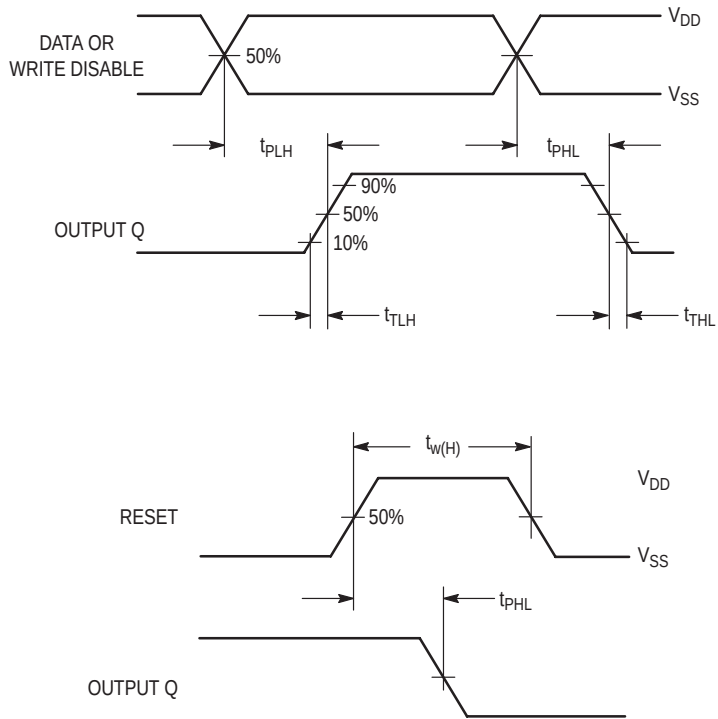
\* $Q_n$  is previous state of latch.

<sup>†</sup>Reset to zero state.

**CAUTION:** To avoid unintentional data changes in the latches, Write Disable must be active (high) during transitions on the address inputs A0, A1, and A2.

# MC14099B

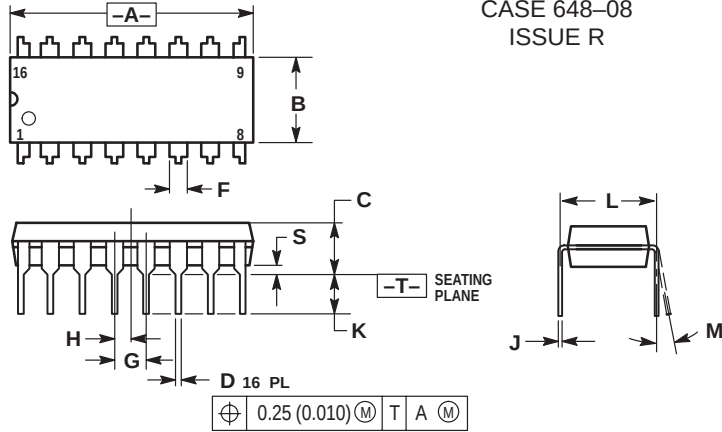
## SWITCHING WAVEFORMS



# MC14099B

## PACKAGE DIMENSIONS

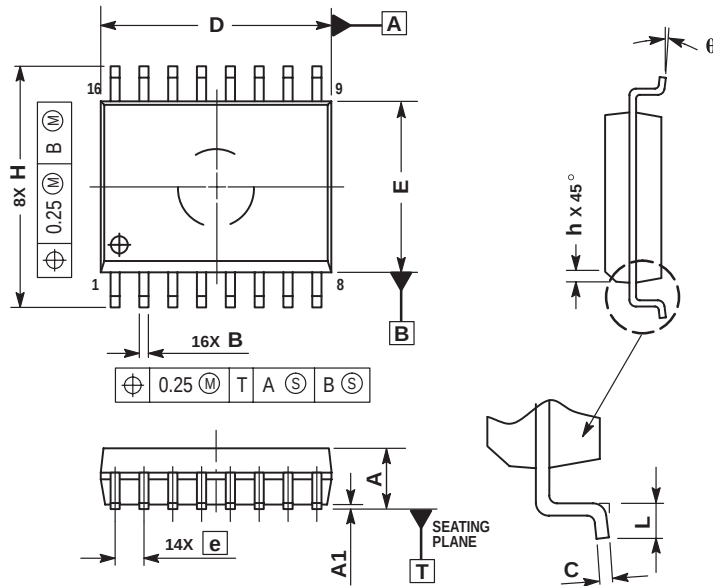
### PDIP-16 P SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R



#### 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.

### SOIC-16 DW SUFFIX PLASTIC SOIC PACKAGE CASE 751G-03 ISSUE B



#### NOTES:

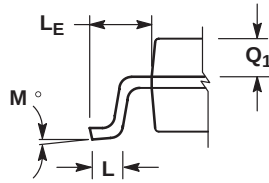
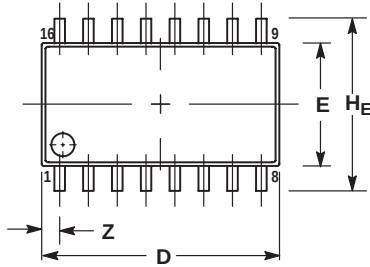
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MIN      | MAX   |
|-----|----------|-------|
| A   | 2.35     | 2.65  |
| A1  | 0.10     | 0.25  |
| B   | 0.35     | 0.49  |
| C   | 0.23     | 0.32  |
| D   | 10.15    | 10.45 |
| E   | 7.40     | 7.60  |
| e   | 1.27 BSC |       |
| H   | 10.05    | 10.55 |
| h   | 0.25     | 0.75  |
| L   | 0.50     | 0.90  |
| θ   | 0°       | 7°    |

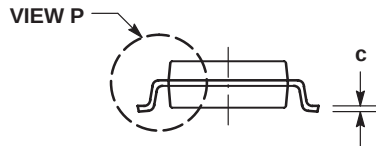
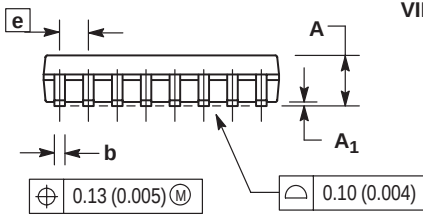
# MC14099B

## 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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