

# MC14094B

## 8-Stage Shift/Store Register with Three-State Outputs

The MC14094B combines an 8-stage shift register with a data latch for each stage and a 3-state output from each latch.

Data is shifted on the positive clock transition and is shifted from the seventh stage to two serial outputs. The  $Q_5$  output data is for use in high-speed cascaded systems. The  $Q_5$  output data is shifted on the following negative clock transition for use in low-speed cascaded systems.

Data from each stage of the shift register is latched on the negative transition of the strobe input. Data propagates through the latch while strobe is high.

Outputs of the eight data latches are controlled by 3-state buffers which are placed in the high-impedance state by a logic Low on Output Enable.

### Features

- 3-State Outputs
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Input Diode Protection
- Data Latch
- Dual Outputs for Data Out on Both Positive and Negative Clock Transitions
- Useful for Serial-to-Parallel Data Conversion
- Pin-for-Pin Compatible with CD4094B
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

| 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   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Temperature Derating: "D/DW" Packages: -7.0 mW/°C From 65°C To 125°C

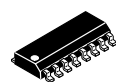
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{in}$  and  $V_{out}$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

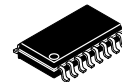


ON Semiconductor®

<http://onsemi.com>



SOIC-16  
D SUFFIX  
CASE 751B

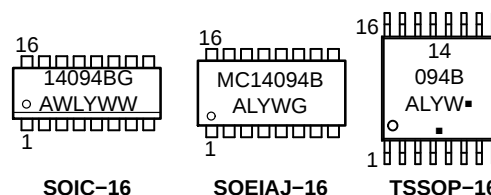


SOEIAJ-16  
F SUFFIX  
CASE 966



TSSOP-16  
DT SUFFIX  
CASE 948F

### MARKING DIAGRAMS



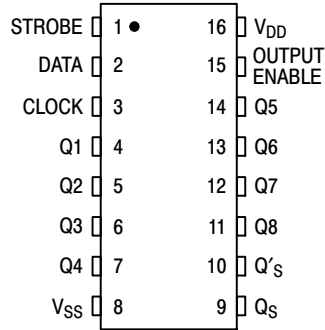
A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week  
G or ■ = Pb-Free Indicator

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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## PIN ASSIGNMENT



## TRUTH TABLE

| Clock | Output Enable | Strobe | Data | Parallel Outputs |                   | Serial Outputs   |                 |
|-------|---------------|--------|------|------------------|-------------------|------------------|-----------------|
|       |               |        |      | Q1               | Q <sub>N</sub>    | Q <sub>S</sub> * | Q' <sub>S</sub> |
|       | 0             | X      | X    | Z                | Z                 | Q7               | No Chg.         |
|       | 0             | X      | X    | Z                | Z                 | No Chg.          | Q7              |
|       | 1             | 0      | X    | No Chg.          | No Chg.           | Q7               | No Chg.         |
|       | 1             | 1      | 0    | 0                | Q <sub>N</sub> -1 | Q7               | No Chg.         |
|       | 1             | 1      | 1    | 1                | Q <sub>N</sub> -1 | Q7               | No Chg.         |
|       | 1             | 1      | 1    | No Chg.          | No Chg.           | No Chg.          | Q7              |

Z = High Impedance X = Don't Care

\* At the positive clock edge, information in the 7th shift register stage is transferred to Q8 and Q<sub>S</sub>.

## ORDERING INFORMATION

| Device          | Package             | Shipping <sup>†</sup>    |
|-----------------|---------------------|--------------------------|
| MC14094BDG      | SOIC-16 (Pb-Free)   | 48 Units / Rail          |
| MC14094BDR2G    | SOIC-16 (Pb-Free)   | 2500 Units / Tape & Reel |
| NLV14094BDR2G*  | SOIC-16 (Pb-Free)   | 2500 Units / Tape & Reel |
| MC14094BDTR2G   | TSSOP-16 (Pb-Free)  | 2500 Units / Tape & Reel |
| NLV14094BDTR2G* | TSSOP-16 (Pb-Free)  | 2500 Units / Tape & Reel |
| MC14094BFELG    | SOEIAJ-16 (Pb-Free) | 2000 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.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

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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<br>(Note 2) | 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)<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                    | –                                                                                                                                                          | 5.0  | –     | 0.005           | 5.0  | –     | 150  | μAdc |
|                                                                                                                                                                                                                                                    |                              | 10                     | –                                                                                                                                                          | 10   | –     | 0.010           | 10   | –     | 300  |      |
|                                                                                                                                                                                                                                                    |                              | 15                     | –                                                                                                                                                          | 20   | –     | 0.015           | 20   | –     | 600  |      |
| Total Supply Current (Notes 3 & 4)<br>(Dynamic plus Quiescent,<br>Per Package)<br>(C <sub>L</sub> = 50 pF on all outputs, all<br>buffers switching)                                                                                                | I <sub>T</sub>               | 5.0<br>10<br>15        | I <sub>T</sub> = (4.1 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (14 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (140 μA/kHz) f + I <sub>DD</sub> |      |       |                 |      |       |      | μAdc |
| 3-State Output Leakage Current                                                                                                                                                                                                                     | I <sub>TL</sub>              | 15                     | –                                                                                                                                                          | ±0.1 | –     | ±0.0001         | ±0.1 | –     | ±3.0 | μA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

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

4. To calculate total supply current at loads other than 50 pF:

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

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 = 0.001.

# MC14094B

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

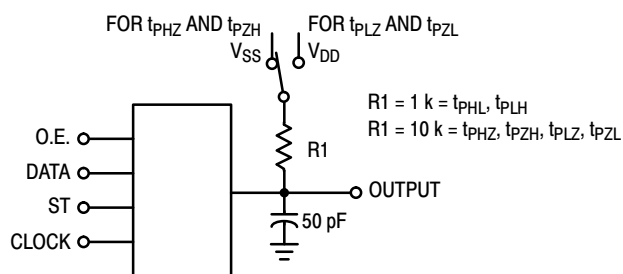
| Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Symbol                     | $V_{DD}$<br>Vdc                                                                      | Min                                                                  | Typ<br>(Note 6)                                                                            | Max                                                                                          | Unit          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------|
| Output Rise and Fall Time<br>$t_{TLH}, t_{THL} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$<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 (Figure 1)<br>Clock to Serial out QS<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 305 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 107 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 82 \text{ ns}$<br><br>Clock to Serial out Q'S<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 350 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 149 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 62 \text{ ns}$<br><br>Clock to Parallel out<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 375 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.35 \text{ ns/pF}) C_L + 177 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 122 \text{ ns}$<br><br>Strobe to Parallel out<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 245 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 127 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 87 \text{ ns}$ | $t_{PLH},$<br>$t_{PHL}$    | 5.0<br>10<br>15<br><br>5.0<br>10<br>15<br><br>5.0<br>10<br>15<br><br>5.0<br>10<br>15 | –<br>–<br>–<br><br>–<br>–<br>–<br><br>–<br>–<br>–<br><br>–<br>–<br>– | 350<br>125<br>95<br><br>230<br>110<br>75<br><br>420<br>195<br>135<br><br>290<br>145<br>100 | 600<br>250<br>190<br><br>460<br>220<br>150<br><br>840<br>390<br>270<br><br>580<br>290<br>200 | ns            |
| Output Enable to Output<br>$t_{PHZ}, t_{PZL} = (0.90 \text{ ns/pF}) C_L + 95 \text{ ns}$<br>$t_{PHZ}, t_{PZL} = (0.36 \text{ ns/pF}) C_L + 57 \text{ ns}$<br>$t_{PHZ}, t_{PZL} = (0.26 \text{ ns/pF}) C_L + 42 \text{ ns}$<br><br>$t_{PLZ}, t_{PZH} = (0.90 \text{ ns/pF}) C_L + 180 \text{ ns}$<br>$t_{PLZ}, t_{PZH} = (0.36 \text{ ns/pF}) C_L + 77 \text{ ns}$<br>$t_{PLZ}, t_{PZH} = (0.26 \text{ ns/pF}) C_L + 57 \text{ ns}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $t_{PHZ},$<br>$t_{PZL}$    | 5.0<br>10<br>15                                                                      | –<br>–<br>–                                                          | 140<br>75<br>55                                                                            | 280<br>150<br>110                                                                            | ns            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $t_{PLZ},$<br>$t_{PZH}$    | 5.0<br>10<br>15                                                                      | –<br>–<br>–                                                          | 225<br>95<br>70                                                                            | 450<br>190<br>140                                                                            |               |
| Setup Time<br>Data in to Clock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | $t_{su}$                   | 5.0<br>10<br>15                                                                      | 125<br>55<br>35                                                      | 60<br>30<br>20                                                                             | –<br>–<br>–                                                                                  | ns            |
| Hold Time<br>Clock to Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | $t_h$                      | 5.0<br>10<br>15                                                                      | 0<br>20<br>20                                                        | – 40<br>– 10<br>0                                                                          | –<br>–<br>–                                                                                  | ns            |
| Clock Pulse Width, High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $t_{WH}$                   | 5.0<br>10<br>15                                                                      | 200<br>100<br>83                                                     | 100<br>50<br>40                                                                            | –<br>–<br>–                                                                                  | ns            |
| Clock Rise and Fall Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $t_{r(cl)}$<br>$t_{f(cl)}$ | 5<br>10<br>15                                                                        | –<br>–<br>–                                                          | –<br>–<br>–                                                                                | 15<br>5.0<br>4.0                                                                             | $\mu\text{s}$ |
| Clock Pulse Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $f_{cl}$                   | 5.0<br>10<br>15                                                                      | –<br>–<br>–                                                          | 2.5<br>5.0<br>6.0                                                                          | 1.25<br>2.5<br>3.0                                                                           | MHz           |
| Strobe Pulse Width                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $t_{WL}$                   | 5.0<br>10<br>15                                                                      | 200<br>80<br>70                                                      | 100<br>40<br>35                                                                            | –<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.

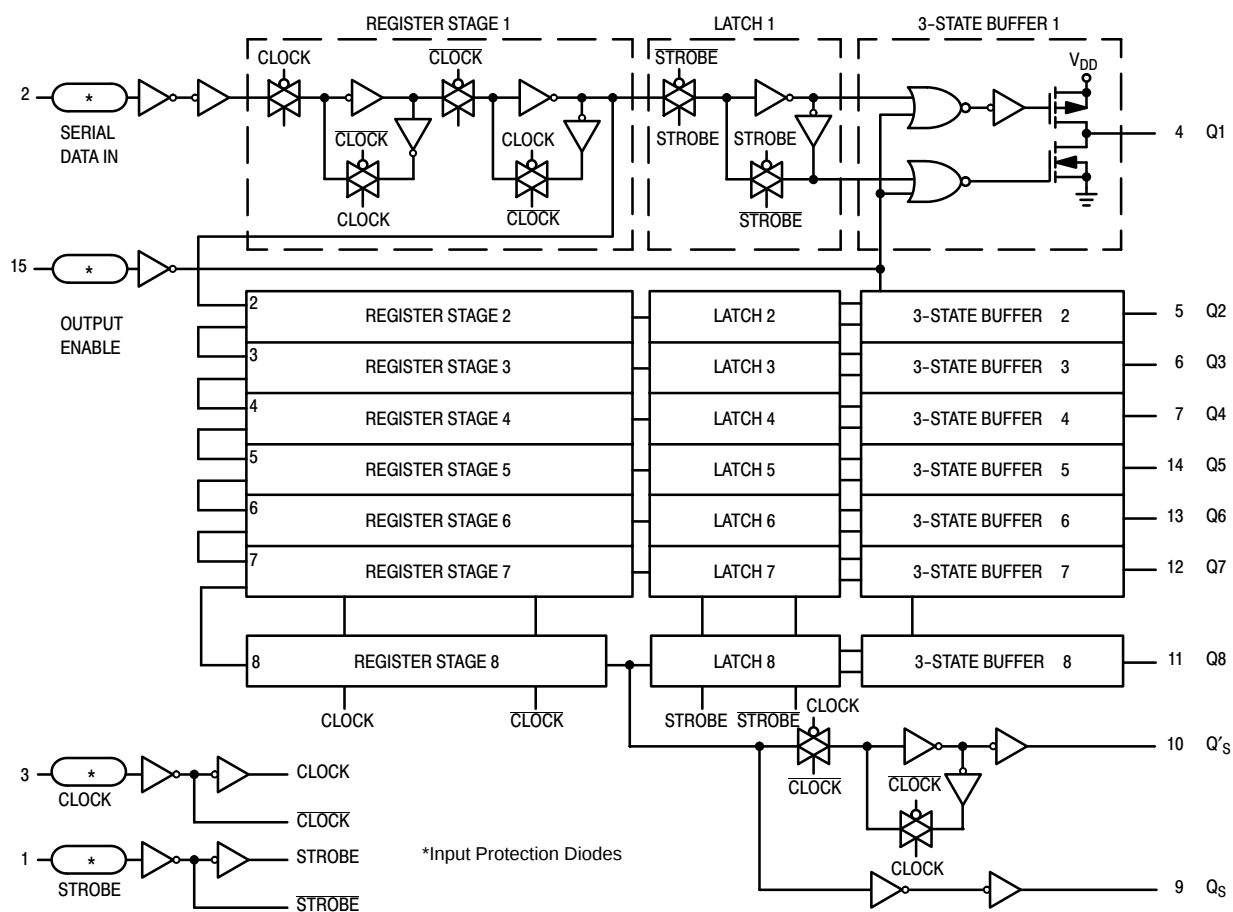
## MC14094B

### 3-STATE TEST CIRCUIT



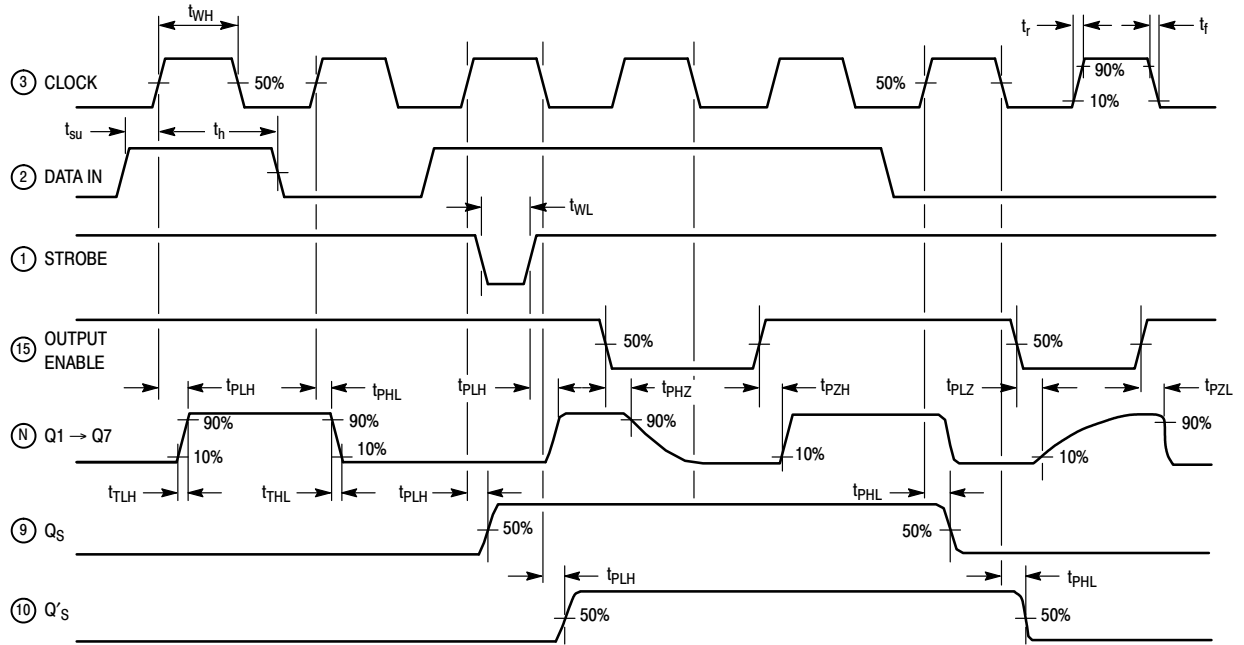
**Figure 1.**

### BLOCK DIAGRAM



# MC14094B

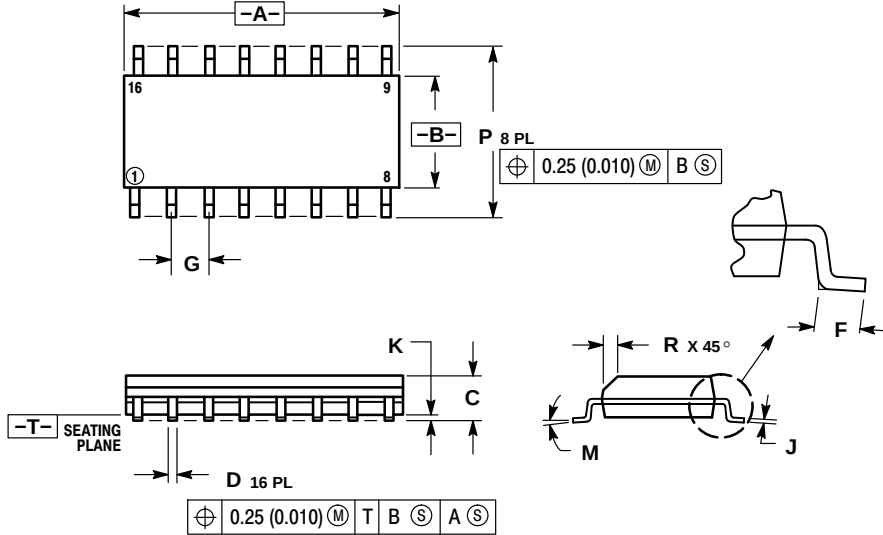
## DYNAMIC TIMING DIAGRAM



# MC14094B

## PACKAGE DIMENSIONS

SOIC-16  
D SUFFIX  
CASE 751B-05  
ISSUE K

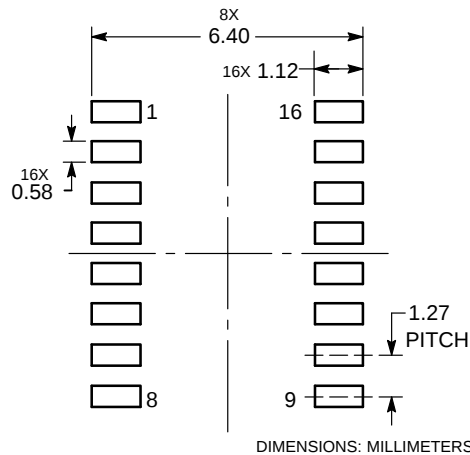


### NOTES:

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 |

## SOLDERING FOOTPRINT\*



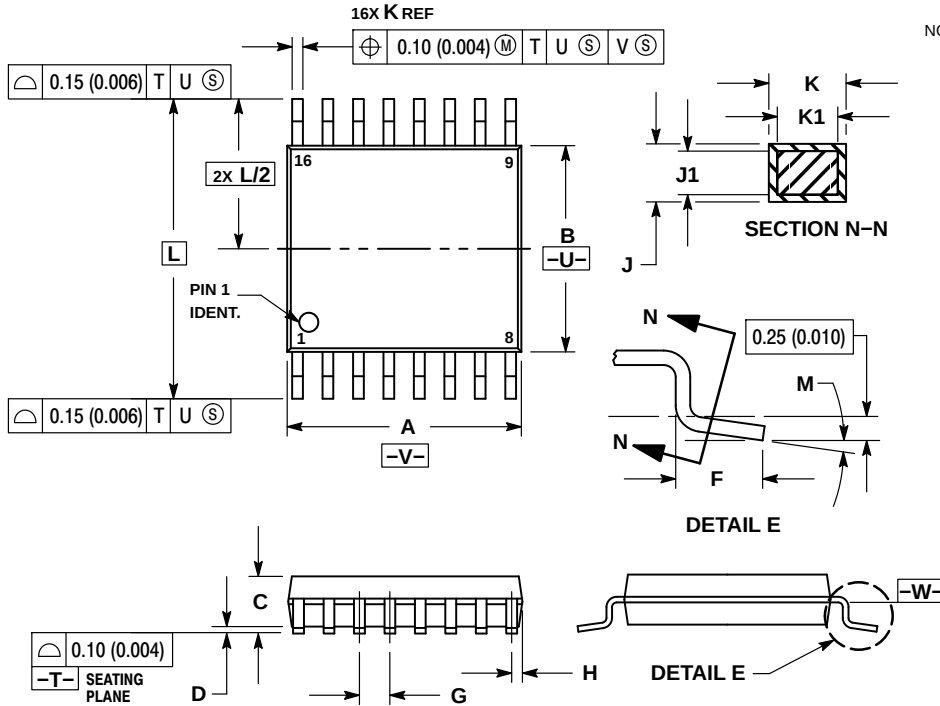
DIMENSIONS: MILLIMETERS

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

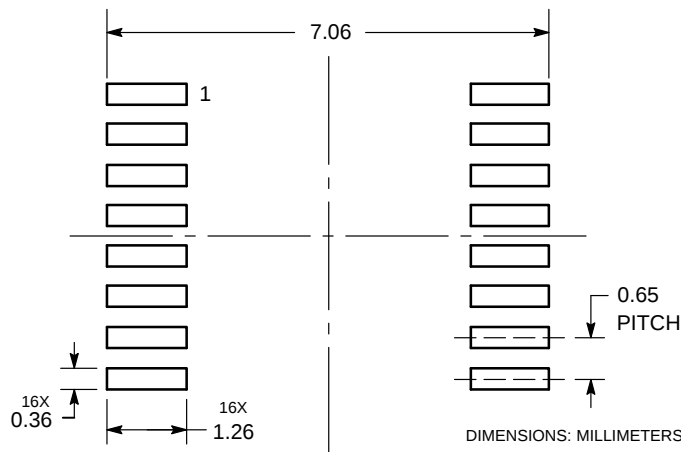
# MC14094B

## PACKAGE DIMENSIONS

TSSOP-16  
DT SUFFIX  
CASE 948F  
ISSUE B



## SOLDERING FOOTPRINT\*

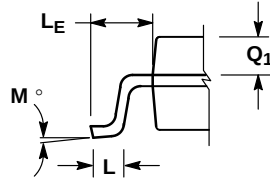
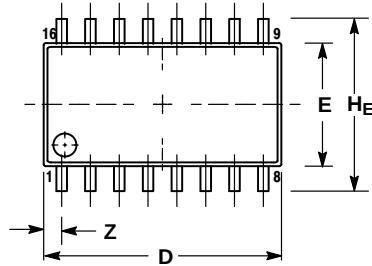


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

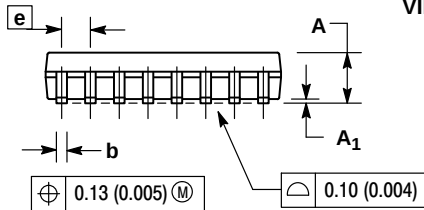
# MC14094B

## PACKAGE DIMENSIONS

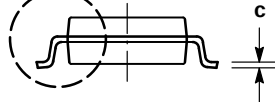
SOEIAJ-16  
F SUFFIX  
CASE 966  
ISSUE A



DETAIL P



VIEW 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              | 0.10        | 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 |

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