

# MC74LCX07

## Low-Voltage CMOS Hex Buffer with Open Drain Outputs

### With 5 V-Tolerant Inputs

The MC74LCX07 is a high performance hex buffer operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers. These LCX devices have open drain outputs which provide the ability to set output levels, or do active-HIGH AND or active-LOW OR functions. A  $V_I$  specification of 5.5 V allows MC74LCX07 inputs to be safely driven from 5.0 V devices.

#### Features

- Designed for 2.3 to 3.6 V  $V_{CC}$  Operation
- 5.0 V Tolerant Inputs/Outputs
- LVTTTL Compatible
- LVC MOS Compatible
- 24 mA Output Sink Capability
- Near Zero Static Supply Current (10  $\mu$ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- Wired-OR, Wired-AND
- Output Level Can Be Set Externally Without Affecting Speed of Device
- ESD Performance: Human Body Model >1500 V;  
Machine Model >200 V
- Pb-Free Packages are Available\*

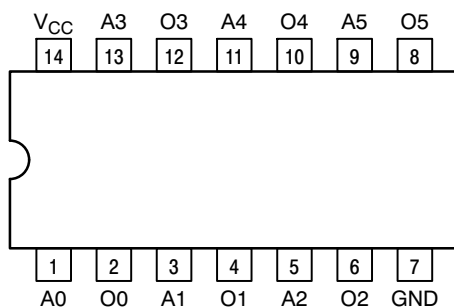


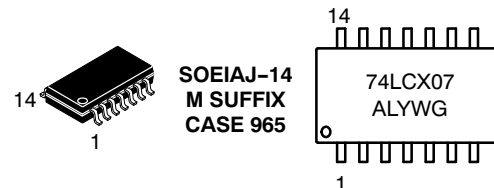
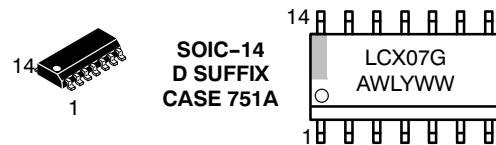
Figure 1. Pinout: 14-Lead (Top View)



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#### MARKING DIAGRAMS



- A = Assembly Location
  - L, WL = Wafer Lot
  - Y, YY = Year
  - W, WW = Work Week
  - G = Pb-Free Package
  - = Pb-Free Package
- (Note: Microdot may be in either location)

#### ORDERING INFORMATION

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

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

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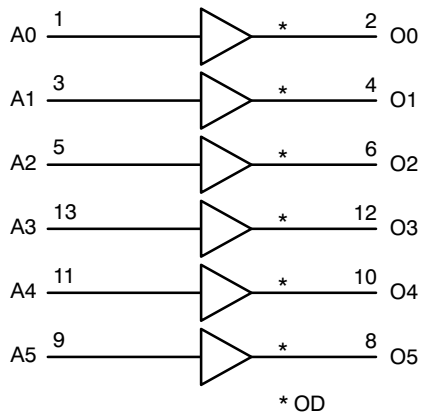


Figure 2. Logic Diagram

## PIN NAMES

| Pins | Function    |
|------|-------------|
| An   | Data Inputs |
| On   | Outputs     |

## TRUTH TABLE

| An | On |
|----|----|
| L  | L  |
| H  | Z  |

## MAXIMUM RATINGS

| Symbol    | Parameter                        | Value                     | Condition                            | Unit        |
|-----------|----------------------------------|---------------------------|--------------------------------------|-------------|
| $V_{CC}$  | DC Supply Voltage                | -0.5 to +7.0              |                                      | V           |
| $V_I$     | DC Input Voltage                 | $-0.5 \leq V_I \leq +7.0$ |                                      | V           |
| $V_O$     | DC Output Voltage                | $-0.5 \leq V_O \leq +7.0$ | Output in HIGH or LOW State (Note 1) | V           |
| $I_{IK}$  | DC Input Diode Current           | -50                       | $V_I < GND$                          | mA          |
| $I_{OK}$  | DC Output Diode Current          | -50                       | $V_O < GND$                          | mA          |
|           |                                  | +50                       | $V_O > V_{CC}$                       | mA          |
| $I_O$     | DC Output/Sink Current           | +50                       |                                      | mA          |
| $I_{CC}$  | DC Supply Current Per Supply Pin | $\pm 100$                 |                                      | mA          |
| $I_{GND}$ | DC Ground Current Per Ground Pin | $\pm 100$                 |                                      | mA          |
| $T_{STG}$ | Storage Temperature Range        | -65 to +150               |                                      | $^{\circ}C$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1.  $I_O$  absolute maximum rating must be observed.

## ORDERING INFORMATION

| Device         | Package                | Shipping <sup>†</sup> |
|----------------|------------------------|-----------------------|
| MC74LCX07D     | SOIC-14                | 55 Units / Rail       |
| MC74LCX07DG    | SOIC-14<br>(Pb-Free)   | 55 Units / Rail       |
| MC74LCX07DR2   | SOIC-14                | 2500 Tape & Reel      |
| MC74LCX07DR2G  | SOIC-14<br>(Pb-Free)   | 2500 Tape & Reel      |
| MC74LCX07DT    | TSSOP-14*              | 96 Units / Rail       |
| MC74LCX07DTG   | TSSOP-14*              | 96 Units / Rail       |
| MC74LCX07DTR2  | TSSOP-14*              | 2500 Tape & Reel      |
| MC74LCX07DTR2G | TSSOP-14*              | 2500 Tape & Reel      |
| MC74LCX07M     | SOEIAJ-14              | 50 Units / Rail       |
| MC74LCX07MG    | SOEIAJ-14<br>(Pb-Free) | 50 Units / Rail       |
| MC74LCX07MEL   | SOEIAJ-14              | 2000 Tape & Reel      |
| MC74LCX07MELG  | SOEIAJ-14<br>(Pb-Free) | 2000 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.

\*This package is inherently Pb-Free.

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## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter  | Min        | Typ        | Max              | Unit |
|-----------------|--|------------|------------|------------------|------|
| V <sub>CC</sub> | Supply Voltage<br>Operating<br>Data Retention Only   | 2.0<br>1.5 | 2.3 to 3.3 | 5.5<br>5.5       | V    |
| V <sub>I</sub>  | Input Voltage  | 0          |            | 5.5              | V    |
| V <sub>O</sub>  | Output Voltage<br>(HIGH or LOW State)  | 0          |            | 5.5              | V    |
| I <sub>OH</sub> | HIGH Level Output Current<br>V <sub>CC</sub> = 3.0 V-3.6 V<br>V <sub>CC</sub> = 2.7 V-3.0 V<br>V <sub>CC</sub> = 2.3 V-2.7 V |            |            | -24<br>-12<br>-8 | mA   |
| I <sub>OL</sub> | LOW Level Output Current<br>V <sub>CC</sub> = 3.0 V-3.6 V<br>V <sub>CC</sub> = 2.7 V-3.0 V<br>V <sub>CC</sub> = 2.3 V-2.7 V  |            |            | +24<br>+12<br>+8 | mA   |
| T <sub>A</sub>  | Operating Free-Air Temperature   | -40        |            | +85              | °C   |
| Δt/ΔV           | Input Transition Rise or Fall Rate, V <sub>IN</sub> from 0.8 V to 2.0 V, V <sub>CC</sub> = 3.0 V                             | 0          |            | 10               | ns/V |

## DC ELECTRICAL CHARACTERISTICS

| Symbol           | Characteristic                        | Condition   | T <sub>A</sub> = -40°C to +85°C |                  | Unit           |
|------------------|---------------------------------------|---|---------------------------------|------------------|----------------|
|                  |                                       |   | Min                             | Max              |                |
| V <sub>IH</sub>  | HIGH Level Input Voltage (Note 2)     | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V   | 1.7                             |                  | V              |
|                  |                                       | 2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V   | 2.0                             |                  |                |
|                  |                                       | 4.5 V ≤ V <sub>CC</sub> ≤ 5.25 V  | 3.125                           |                  |                |
| V <sub>IL</sub>  | LOW Level Input Voltage (Note 2)      | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V   |                                 | 0.7              | V              |
|                  |                                       | 2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V   |                                 | 0.8              |                |
|                  |                                       | 4.5 V ≤ V <sub>CC</sub> ≤ 5.25 V  |                                 | 0.8              |                |
| V <sub>OL</sub>  | LOW Level Output Voltage              | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100 μA   |                                 | 0.2              | V              |
|                  |                                       | V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 8 mA   |                                 | 0.3              |                |
|                  |                                       | V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12 mA  |                                 | 0.4              |                |
|                  |                                       | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA  |                                 | 0.4              |                |
|                  |                                       | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24 mA  |                                 | 0.55             |                |
| I <sub>I</sub>   | Maximum Input Leakage Current         | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, 0 V ≤ V <sub>I</sub> ≤ 5.5 V   |                                 | ±5               | μA             |
| I <sub>OFF</sub> | Power-Off Leakage Current             | V <sub>CC</sub> = 0V, V <sub>O</sub> or V <sub>I</sub> = 5.5V   |                                 | 10               | μA             |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current      | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, V <sub>I</sub> = V <sub>CC</sub> or GND<br>2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, 3.6 V ≤ V <sub>I</sub> ≤ 5.5 V<br>V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 3.125 V |                                 | 10<br>±10<br>60  | μA<br>μA<br>mA |
| ΔI <sub>CC</sub> | Increase in I <sub>CC</sub> per Input | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V<br>4.5 V ≤ V <sub>CC</sub> ≤ 5.5 V<br>V <sub>CC</sub> = 5.25 V, one input at 3.125 V, other inputs at V <sub>CC</sub> or GND                                      |                                 | 500<br>1.0<br>10 | μA<br>mA<br>mA |

2. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

## AC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter         | Limits                          |     |                         |     |                                 |     | Unit |
|------------------|-------------------|---------------------------------|-----|-------------------------|-----|---------------------------------|-----|------|
|                  |                   | T <sub>A</sub> = -40°C to +85°C |     |                         |     |                                 |     |      |
|                  |                   | V <sub>CC</sub> = 3.3 V ± 0.3 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 2.5 V ± 0.2 V |     |      |
|                  |                   | C <sub>L</sub> = 50 pF          |     | C <sub>L</sub> = 50 pF  |     | C <sub>L</sub> = 30 pF          |     |      |
|                  |                   | Min                             | Max | Min                     | Max | Min                             | Max |      |
| t <sub>PLZ</sub> | Propagation Delay | 0.5                             | 3.0 | 0.8                     | 3.7 | 0.8                             | 3.8 | ns   |
| t <sub>PZL</sub> | Input to Output   | 0.5                             | 3.0 | 0.8                     | 3.7 | 0.8                             | 3.8 | ns   |

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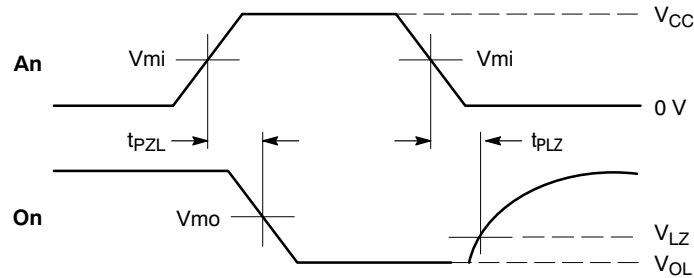
## DYNAMIC SWITCHING CHARACTERISTICS

| Symbol           | Characteristic                      | Condition  | T <sub>A</sub> = +25°C |              |     | Unit |
|------------------|-------------------------------------|--|------------------------|--------------|-----|------|
|                  |                                     |  | Min                    | Typ          | Max |      |
| V <sub>OLP</sub> | Dynamic LOW Peak Voltage (Note 3)   | V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V<br>V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V |                        | 0.9<br>0.7   |     | V    |
| V <sub>OLV</sub> | Dynamic LOW Valley Voltage (Note 3) | V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V<br>V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V |                        | -0.8<br>-0.6 |     | V    |

3. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

## CAPACITIVE CHARACTERISTICS

| Symbol           | Parameter                     | Condition  | Typical | Unit |
|------------------|-------------------------------|--|---------|------|
| C <sub>IN</sub>  | Input Capacitance             | V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>         | 7       | pF   |
| C <sub>OUT</sub> | Output Capacitance            | V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>         | 8       | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance | 10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 25      | pF   |

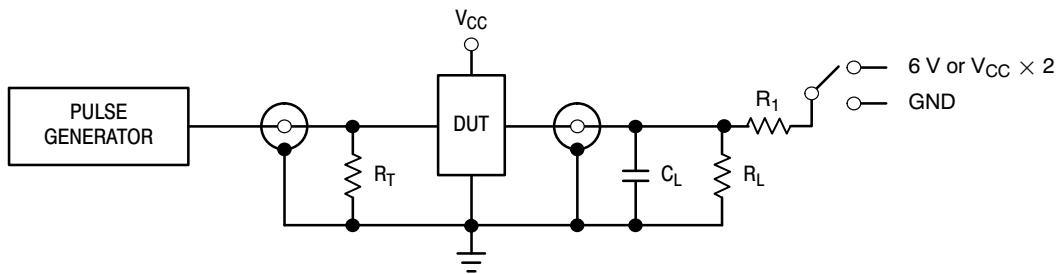


### PROPAGATION DELAYS

$$t_R = t_F = 2.5 \text{ ns, } 10\% \text{ to } 90\%; f = 1 \text{ MHz; } t_W = 500 \text{ ns}$$

| Symbol          | V <sub>CC</sub>         |                         |                          |
|-----------------|-------------------------|-------------------------|--------------------------|
|                 | 3.3 V ± 0.3 V           | 2.7 V                   | 2.5 V ± 0.2 V            |
| V <sub>mi</sub> | 1.5 V                   | 1.5 V                   | V <sub>CC</sub> /2       |
| V <sub>mo</sub> | 1.5 V                   | 1.5 V                   | V <sub>CC</sub> /2       |
| V <sub>LZ</sub> | V <sub>OL</sub> + 0.3 V | V <sub>OL</sub> + 0.3 V | V <sub>OL</sub> + 0.15 V |

Figure 3. AC Waveforms



| TEST   | SWITCH |
|--|--------|
| t <sub>PZL</sub> , t <sub>PLZ</sub>                        | 6 V    |
| Open Collector/Drain t <sub>PLH</sub> and t <sub>PHL</sub> | 6 V    |
| t <sub>PZH</sub> , t <sub>PHZ</sub>                        | GND    |

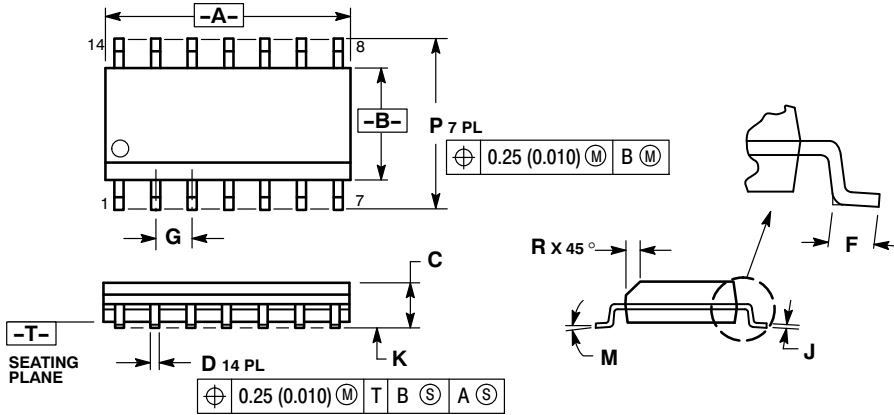
C<sub>L</sub> = 50 pF at V<sub>CC</sub> = 3.3 ± 0.3 V or equivalent (includes jig and probe capacitance)  
 C<sub>L</sub> = 30 pF at V<sub>CC</sub> = 2.5 ± 0.2 V or equivalent (includes jig and probe capacitance)  
 R<sub>L</sub> = R<sub>1</sub> = 500 Ω or equivalent  
 R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

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## PACKAGE DIMENSIONS

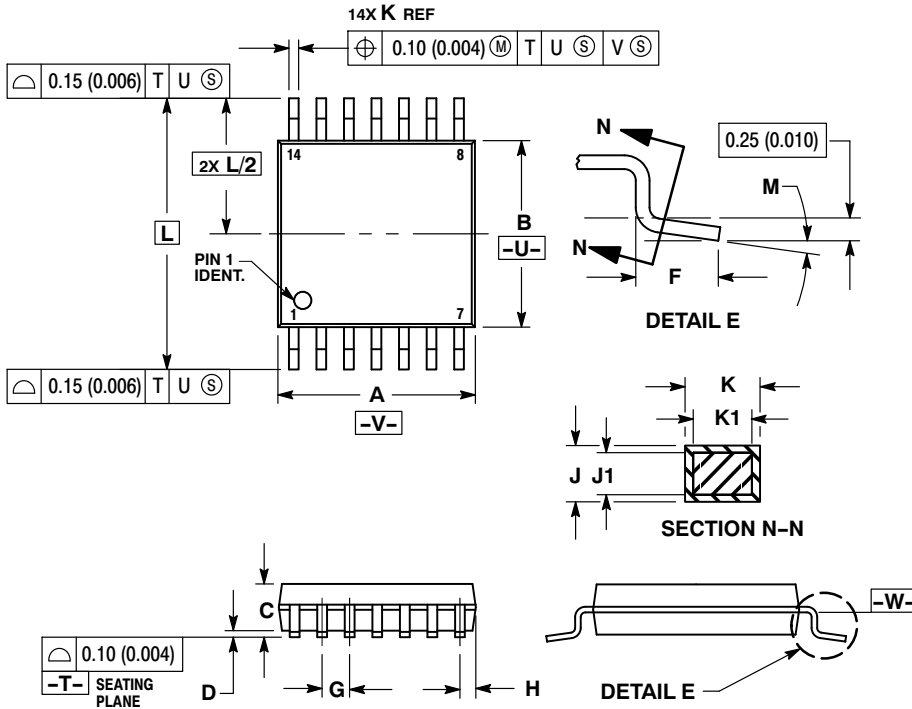
SOIC-14  
D SUFFIX  
CASE 751A-03  
ISSUE G



- 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   | 8.55        | 8.75 | 0.337     | 0.344 |
| 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 | 0.228     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |

TSSOP-14  
DT SUFFIX  
CASE 948G-01  
ISSUE A



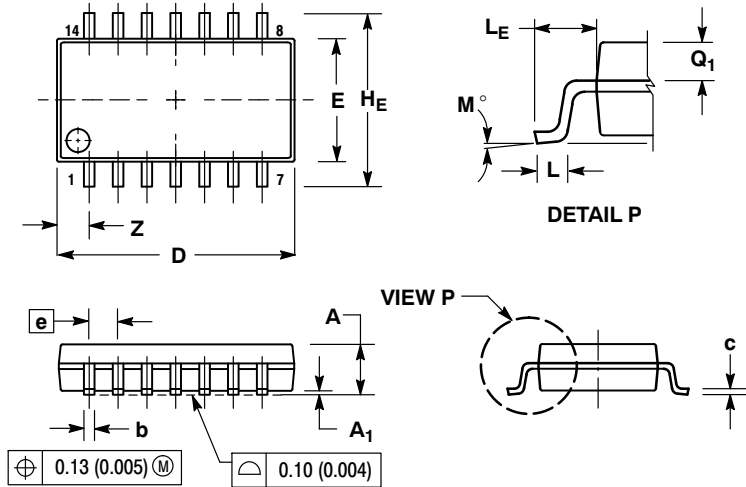
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.90        | 5.10 | 0.193     | 0.200 |
| B   | 4.30        | 4.50 | 0.169     | 0.177 |
| C   | ---         | 1.20 | ---       | 0.047 |
| D   | 0.05        | 0.15 | 0.002     | 0.006 |
| F   | 0.50        | 0.75 | 0.020     | 0.030 |
| G   | 0.65 BSC    |      | 0.026 BSC |       |
| H   | 0.50        | 0.60 | 0.020     | 0.024 |
| J   | 0.09        | 0.20 | 0.004     | 0.008 |
| J1  | 0.09        | 0.16 | 0.004     | 0.006 |
| K   | 0.19        | 0.30 | 0.007     | 0.012 |
| K1  | 0.19        | 0.25 | 0.007     | 0.010 |
| L   | 6.40 BSC    |      | 0.252 BSC |       |
| M   | 0°          | 8°   | 0°        | 8°    |

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## PACKAGE DIMENSIONS

SOEIAJ-14  
M SUFFIX  
CASE 965-01  
ISSUE O



### 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              | ---         | 1.42  | ---       | 0.056 |

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