

# MC74ACT640

## Octal 3-State Inverting Transceiver<sup>1</sup>

The MC74ACT640 octal bus transceiver is designed for asynchronous two-way communication between data buses. The device transmits data from bus  $\bar{A}$  to bus B when  $T/\bar{R}$  = HIGH, or from bus  $\bar{B}$  to bus A when  $T/\bar{R}$  = LOW. The enable input can be used to disable the device so the buses are effectively isolated.

- Bidirectional Data Path
- A and B Outputs Sink 24 mA/Source -24 mA
- TTL Compatible Inputs

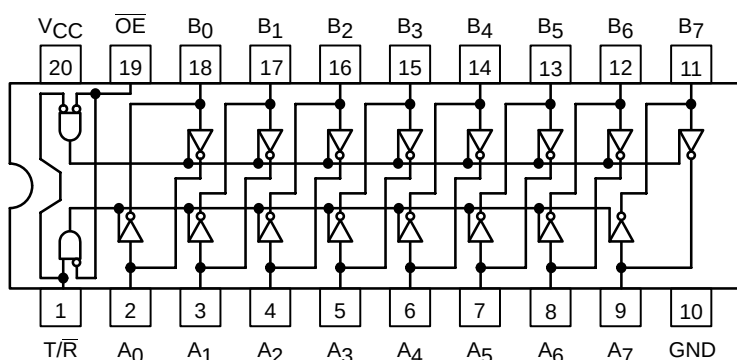


Figure 1. Pinout: 20-Lead Packages Conductors  
(Top View)

### PIN ASSIGNMENT

| PIN                            | FUNCTION                         |
|--------------------------------|----------------------------------|
| A <sub>0</sub> –A <sub>7</sub> | Side A Inputs or 3-State Outputs |
| $\overline{OE}$                | Output Enable Input              |
| T/ $\bar{R}$                   | Transmit/Receive Input           |
| B <sub>0</sub> –B <sub>7</sub> | Side B Inputs or 3-State Outputs |

### TRUTH TABLE

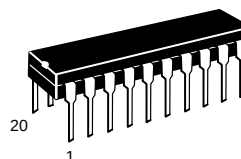
| $\overline{OE}$ | T/ $\bar{R}$ | Applied Inputs | Valid Direction I/P→O/P | Output |
|-----------------|--------------|----------------|-------------------------|--------|
| H               | X            | X              | X                       | X      |
| L               | H            | H              | $\bar{A}$ to B          | L      |
| L               | H            | L              | $\bar{A}$ to B          | H      |
| L               | L            | H              | $\bar{B}$ to A          | L      |
| L               | L            | L              | $\bar{B}$ to A          | H      |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

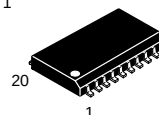


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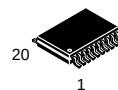
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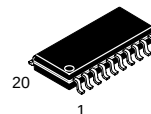
PDIP-20  
N SUFFIX  
CASE 738



SO-20  
DW SUFFIX  
CASE 751



TSSOP-20  
DT SUFFIX  
CASE 948E



EIAJ-20  
M SUFFIX  
CASE 967

### ORDERING INFORMATION

| Device         | Package  | Shipping         |
|----------------|----------|------------------|
| MC74ACT640N    | PDIP-20  | 18 Units/Rail    |
| MC74ACT640DW   | SOIC-20  | 38 Units/Rail    |
| MC74AC640DWR2  | SOIC-20  | 1000 Tape & Reel |
| MC74AC640DT    | TSSOP-20 | 75 Units/Rail    |
| MC74ACT640DTR2 | TSSOP-20 | 2500 Tape & Reel |
| MC74ACT640M    | EIAJ-20  | 40 Units/Rail    |
| MC74AC640MEL   | EIAJ-20  | 2000 Tape & Reel |

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 5 of this data sheet.

# MC74ACT640

## MAXIMUM RATINGS (Note 1)

| Symbol                | Parameter                                                                                                     | Value                                          | Unit |
|-----------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------|------|
| V <sub>CC</sub>       | DC Supply Voltage                                                                                             | − 0.5 to + 7.0                                 | V    |
| V <sub>I</sub>        | DC Input Voltage                                                                                              | − 0.5 ≤ V <sub>I</sub> ≤ V <sub>CC</sub> + 0.5 | V    |
| V <sub>O</sub>        | DC Output Voltage (Note 2)                                                                                    | − 0.5 ≤ V <sub>O</sub> ≤ V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>       | DC Input Diode Current                                                                                        | ± 20                                           | mA   |
| I <sub>OK</sub>       | DC Output Diode Current                                                                                       | ± 50                                           | mA   |
| I <sub>O</sub>        | DC Output Sink/Source Current                                                                                 | ± 50                                           | mA   |
| I <sub>CC</sub>       | DC Supply Current per Output Pin                                                                              | ± 50                                           | mA   |
| I <sub>GND</sub>      | DC Ground Current per Output Pin                                                                              | ± 50                                           | mA   |
| T <sub>STG</sub>      | Storage Temperature Range                                                                                     | − 65 to + 150                                  | °C   |
| T <sub>L</sub>        | Lead temperature, 1 mm from Case for 10 Seconds                                                               | 260                                            | °C   |
| T <sub>J</sub>        | Junction temperature under Bias                                                                               | + 150                                          | °C   |
| θ <sub>JA</sub>       | Thermal resistance<br>PDIP<br>SOIC<br>TSSOP                                                                   | 67<br>96<br>128                                | °C/W |
| P <sub>D</sub>        | Power Dissipation in Still Air at 85°C<br>PDIP<br>SOIC<br>TSSOP                                               | 750<br>500<br>450                              | mW   |
| MSL                   | Moisture Sensitivity                                                                                          | Level 1                                        |      |
| F <sub>R</sub>        | Flammability Rating<br>Oxygen Index: 30% – 35%                                                                | UL 94 V-0 @ 0.125 in                           |      |
| V <sub>ESD</sub>      | ESD Withstand Voltage<br>Human Body Model (Note 3)<br>Machine Model (Note 4)<br>Charged Device Model (Note 5) | > 2000<br>> 200<br>> 1000                      | V    |
| I <sub>Latch-Up</sub> | Latch-Up Performance<br>Above V <sub>CC</sub> and Below GND at 85°C (Note 6)                                  | ± 100                                          | mA   |

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Extended exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied.
2. I<sub>O</sub> absolute maximum rating must be observed.
3. Tested to EIA/JESD22-A114-A.
4. Tested to EIA/JESD22-A115-A.
5. Tested to JESD22-C101-A.
6. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                             | Parameter                                                                               | Min    | Typ       | Max             | Unit |
|------------------------------------|-----------------------------------------------------------------------------------------|--------|-----------|-----------------|------|
| V <sub>CC</sub>                    | DC Input Voltage (Referenced to GND)                                                    | 4.5    |           | 5.5             | V    |
| V <sub>in</sub> , V <sub>out</sub> | DC Input Voltage, Output Voltage (Referenced to GND)                                    | 0      |           | V <sub>CC</sub> | V    |
| T <sub>A</sub>                     | Operating Temperature, All Package Types                                                | −40    | 25        | +85             | °C   |
| t <sub>r</sub> , t <sub>f</sub>    | Input Rise and Fall Time (Note 8)<br>V <sub>CC</sub> = 4.5 V<br>V <sub>CC</sub> = 5.5 V | 0<br>0 | 10<br>8.0 | 10<br>8.0       | ns/V |
| T <sub>J</sub>                     | Junction Temperature (PDIP)                                                             |        |           | 140             | °C   |
| I <sub>OH</sub>                    | Output Current – High                                                                   |        |           | −24             | mA   |
| I <sub>OL</sub>                    | Output Current – Low                                                                    |        |           | 24              | mA   |

7. Unused Inputs may not be left open. All inputs must be tied to a high voltage level or low logic voltage level.
8. V<sub>in</sub> from 0.8 V to 2.0 V; refer to individual Data Sheets for devices that differ from the typical input rise and fall times.

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## DC CHARACTERISTICS

| Symbol                               | Parameter                              | V <sub>CC</sub> (V) | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = -40°C to +85°C | Unit     | Conditions                                                                                                                                  |
|--------------------------------------|----------------------------------------|---------------------|------------------------|-------------------|---------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                                      |                                        |                     | Typ                    | Guaranteed Limits |                                 |          |                                                                                                                                             |
| V <sub>IH</sub>                      | Minimum High Level Input Voltage       | 4.5<br>5.5          | 1.5<br>1.5             | 2.0<br>2.0        | 2.0<br>2.0                      | V<br>V   | V <sub>OUT</sub> = 0.1 V<br>or<br>V <sub>CC</sub> - 0.1 V                                                                                   |
| V <sub>IL</sub>                      | Maximum Low Level Input Voltage        | 4.5<br>5.5          | 1.5<br>1.5             | 0.8<br>0.8        | 0.8<br>0.8                      | V<br>V   | V <sub>OUT</sub> = 0.1 V<br>or<br>V <sub>CC</sub> - 0.1 V                                                                                   |
| V <sub>OH</sub>                      | Minimum High Level Output Voltage      | 4.5<br>5.5          | 4.49<br>5.49           | 4.4<br>5.4        | 4.4<br>5.4                      | V<br>V   | I <sub>OUT</sub> = -50 μA                                                                                                                   |
|                                      |                                        | 4.5<br>5.5          |                        | 3.86<br>4.86      | 3.76<br>4.76                    | V<br>V   | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -24 mA<br>I <sub>OH</sub> -24 mA                                                      |
| V <sub>OL</sub>                      | Maximum Low Level Output Voltage       | 4.5<br>5.5          | 0.001<br>0.001         | 0.1<br>0.1        | 0.1<br>0.1                      | V<br>V   | I <sub>OUT</sub> = 50 μA                                                                                                                    |
|                                      |                                        | 4.5<br>5.5          |                        | 0.36<br>0.36      | 0.44<br>0.44                    | V<br>V   | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -24 mA<br>I <sub>OH</sub> -24 mA                                                      |
| I <sub>IN</sub>                      | Maximum Input Leakage Current          | 5.5                 |                        | ±0.1              | ±1.0                            | μA       | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                                                      |
| ΔI <sub>CCT</sub>                    | Additional Max. I <sub>CC</sub> /Input | 5.5                 | 0.6                    |                   | 1.5                             | mA       | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V                                                                                                    |
| I <sub>OZ</sub>                      | Maximum 3-State Current                | 5.5                 |                        | ±0.5              | ±5.0                            | μA       | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub><br>V <sub>I</sub> = V <sub>CC</sub> , GND<br>V <sub>O</sub> = V <sub>CC</sub> , GND |
| I <sub>OLD</sub><br>I <sub>OHD</sub> | †Minimum Dynamic Output Current        | 5.5<br>5.5          |                        |                   | 75<br>-75                       | mA<br>mA | V <sub>OLD</sub> = 1.65 V Max                                                                                                               |
| I <sub>CC</sub>                      | Maximum Quiescent Supply Current       | 5.5                 |                        | 8.0               | 80                              | μA       | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                    |

\*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

## AC CHARACTERISTICS t<sub>r</sub> = t<sub>f</sub> = 3.0 ns (For Figures and Waveforms, See Figures 2 and 3.)

| Symbol           | Parameter                                                            | V <sub>CC</sub> * (V) | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      | Unit |
|------------------|----------------------------------------------------------------------|-----------------------|--------------------------------------------------|------|-----------------------------------------------------------|------|------|
|                  |                                                                      |                       | Min                                              | Max  | Min                                                       | Max  |      |
| t <sub>PLH</sub> | Propagation Delay An to Bn or Bn to An                               | 5.0                   | 1.5                                              | 8.0  | 1.0                                                       | 8.5  | ns   |
| t <sub>PHL</sub> | Propagation Delay An to Bn or Bn to An                               | 5.0                   | 1.5                                              | 8.0  | 1.0                                                       | 9.0  | ns   |
| t <sub>PZH</sub> | Output Enable Time $\overline{OE}$ to An or Bn                       | 5.0                   | 1.5                                              | 10.0 | 1.0                                                       | 11.0 | ns   |
| t <sub>PZL</sub> | Output Enable Time $\overline{OE}$ to An or Bn                       | 5.0                   | 1.5                                              | 10.0 | 1.0                                                       | 11.0 | ns   |
| t <sub>PHZ</sub> | Output Disable Time T/ $\overline{R}$ or $\overline{OE}$ to An or Bn | 5.0                   | 1.5                                              | 10.0 | 1.0                                                       | 11.0 | ns   |
| t <sub>PLZ</sub> | Output Disable Time T/ $\overline{R}$ or $\overline{OE}$ to An or Bn | 5.0                   | 1.5                                              | 10.0 | 1.0                                                       | 11.0 | ns   |

\*Voltage Range 5.0 V is 5.0 V ±0.5 V

## CAPACITANCE

| Symbol           | Parameter                     | Value<br>Typ | Unit | Test Conditions         |
|------------------|-------------------------------|--------------|------|-------------------------|
| C <sub>IN</sub>  | Input Capacitance             | 4.5          | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>I/O</sub> | Input/Output Capacitance      | 15           | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>PD</sub>  | Power Dissipation Capacitance | 45           | pF   | V <sub>CC</sub> = 5.0 V |

SWITCHING WAVEFORMS

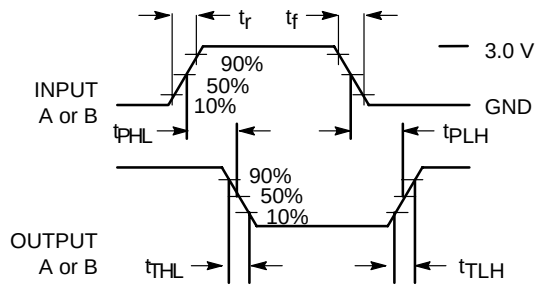


Figure 2.

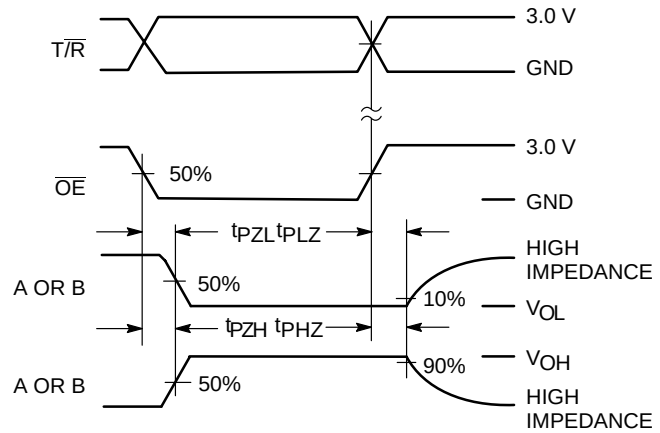
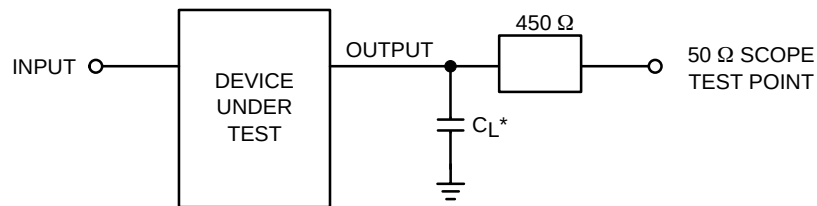


Figure 3.

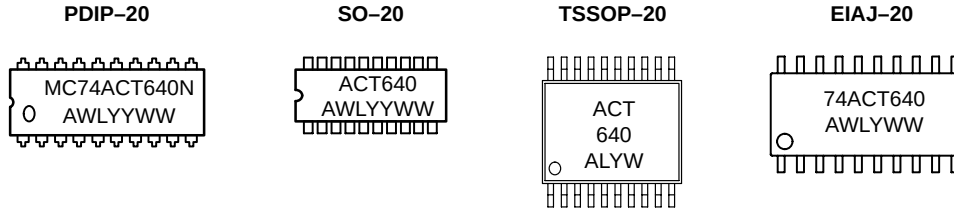


\*Includes all probe and jig capacitance

Figure 4. Test Circuit

# MC74ACT640

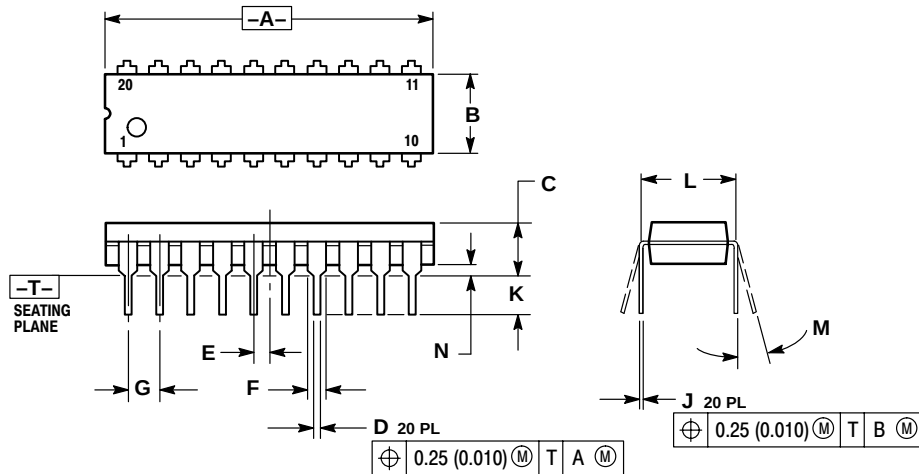
## MARKING DIAGRAMS23



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

## PACKAGE DIMENSIONS

**PDIP-20**  
**N SUFFIX**  
 20 PIN PLASTIC DIP PACKAGE  
 CASE 738-03  
 ISSUE E



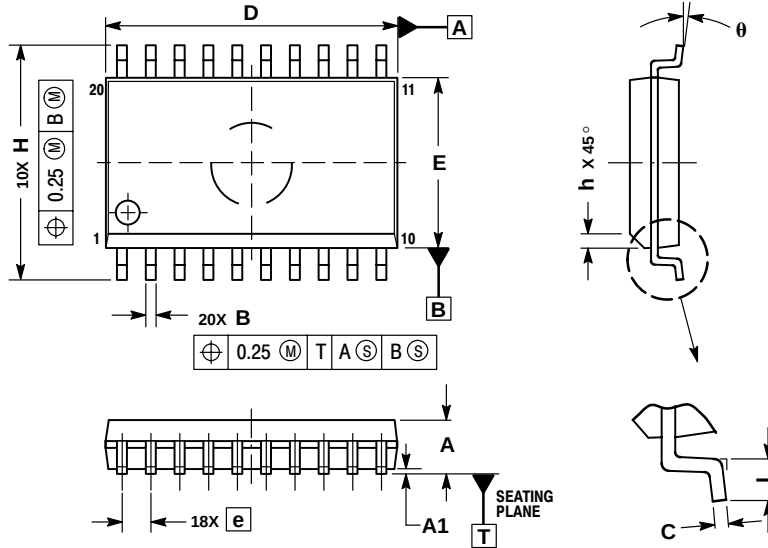
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL
  4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 1.010     | 1.070 | 25.66       | 27.17 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.150     | 0.180 | 3.81        | 4.57  |
| D   | 0.015     | 0.022 | 0.39        | 0.55  |
| E   | 0.050 BSC |       | 1.27 BSC    |       |
| F   | 0.050     | 0.070 | 1.27        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.140 | 2.80        | 3.55  |
| L   | 0.300 BSC |       | 7.62 BSC    |       |
| M   | 0°        | 15°   | 0°          | 15°   |
| N   | 0.020     | 0.040 | 0.51        | 1.01  |

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## PACKAGE DIMENSIONS

### SO-20 DW SUFFIX 20 PIN PLASTIC SOIC PACKAGE CASE 751D-05 ISSUE F

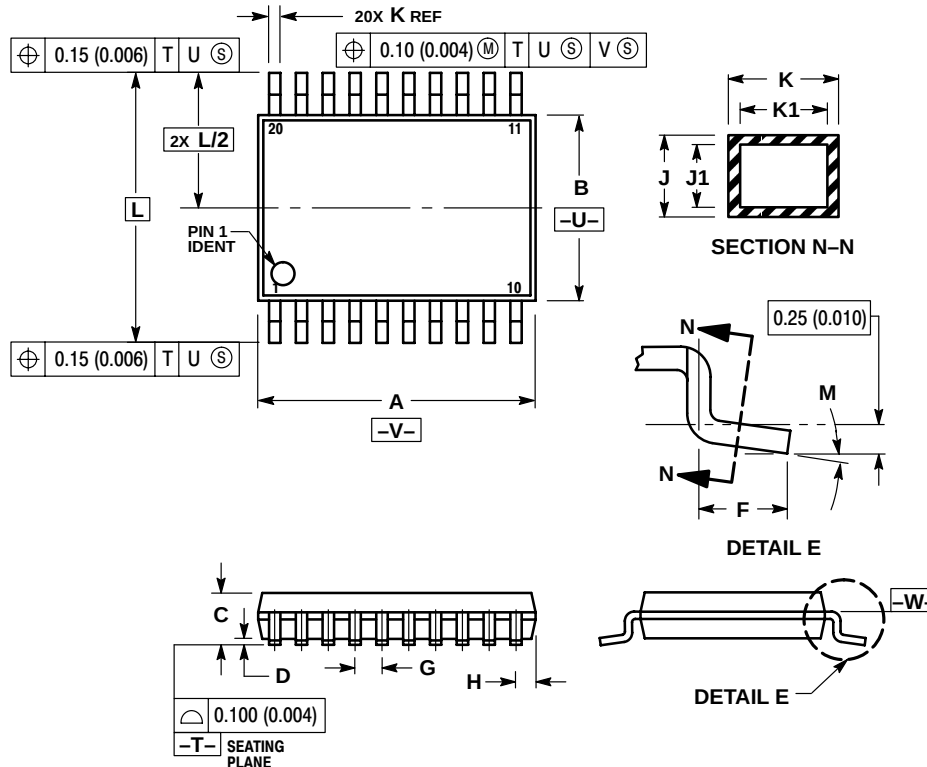


#### NOTES:

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 PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| MILLIMETERS |          |       |
|-------------|----------|-------|
| DIM         | MIN      | MAX   |
| A           | 2.35     | 2.65  |
| A1          | 0.10     | 0.25  |
| B           | 0.35     | 0.49  |
| C           | 0.23     | 0.32  |
| D           | 12.65    | 12.95 |
| 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°    |

### TSSOP-20 DT SUFFIX 20 PIN PLASTIC TSSOP PACKAGE CASE 948E-02 ISSUE A



#### NOTES:

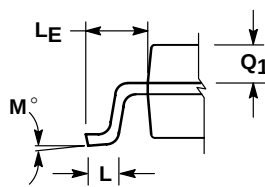
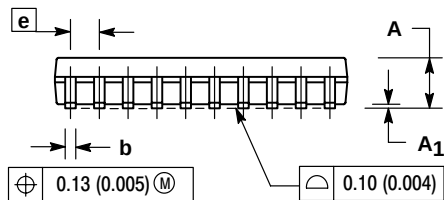
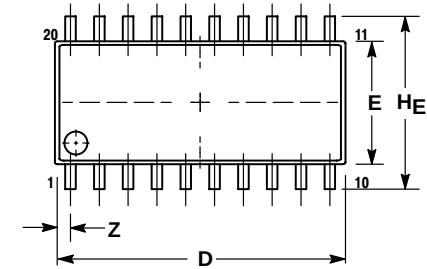
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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-.

|     |  | MILLIMETERS |      | INCHES    |       |
|-----|--|-------------|------|-----------|-------|
| DIM |  | MIN         | MAX  | MIN       | MAX   |
| A   |  | 6.40        | 6.60 | 0.252     | 0.260 |
| 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   |  | 0.27        | 0.37 | 0.011     | 0.015 |
| 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°    |

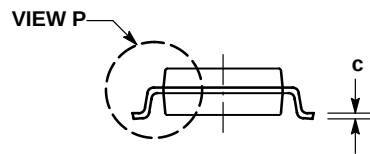
# MC74ACT640

## PACKAGE DIMENSIONS

EIAJ-20  
M SUFFIX  
20 PIN PLASTIC EIAJ PACKAGE  
CASE 967-01  
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              | 12.35       | 12.80 | 0.486     | 0.504 |
| E              | 5.10        | 5.45  | 0.201     | 0.215 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| HE             | 7.40        | 8.20  | 0.291     | 0.323 |
| L              | 0.50        | 0.85  | 0.020     | 0.033 |
| LE             | 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              | ---         | 0.81  | ---       | 0.032 |

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