



# MC54/74HC573A

## MAXIMUM RATINGS\*

| Symbol           | Parameter  | Value                          | Unit |
|------------------|--|--------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage (Referenced to GND)  | - 0.5 to + 7.0                 | V    |
| V <sub>in</sub>  | DC Input Voltage (Referenced to GND)   | - 0.5 to V <sub>CC</sub> + 0.5 | V    |
| V <sub>out</sub> | DC Output Voltage (Referenced to GND)  | - 0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>in</sub>  | DC Input Current, per Pin  | ± 20                           | mA   |
| I <sub>out</sub> | DC Output Current, per Pin   | ± 35                           | mA   |
| I <sub>CC</sub>  | DC Supply Current, V <sub>CC</sub> and GND Pins  | ± 75                           | mA   |
| P <sub>D</sub>   | Power Dissipation in Still Air, Plastic or Ceramic DIP†  | 750                            | mW   |
|                  | SOIC Package†  | 500                            |      |
|                  | TSSOP Package†   | 450                            |      |
| T <sub>stg</sub> | Storage Temperature  | - 65 to + 150                  | °C   |
| T <sub>L</sub>   | Lead Temperature, 1 mm from Case for 10 Seconds<br>(Plastic DIP, TSSOP or SOIC Package)<br>(Ceramic DIP) | 260                            | °C   |
|                  |  | 300                            |      |

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<sub>in</sub> and V<sub>out</sub> should be constrained to the range GND ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>CC</sub>. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

† Derating — Plastic DIP: - 10 mW/°C from 65° to 125°C  
 Ceramic DIP: - 10 mW/°C from 100° to 125°C  
 SOIC Package: - 7 mW/°C from 65° to 125°C  
 TSSOP Package: - 6.1 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

## RECOMMENDED OPERATING CONDITIONS

| Symbol                             | Parameter  | Min                     | Max             | Unit |    |
|------------------------------------|--|-------------------------|-----------------|------|----|
| V <sub>CC</sub>                    | DC Supply Voltage (Referenced to GND)                | 2.0                     | 6.0             | 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             | - 55                    | + 125           | °C   |    |
| t <sub>r</sub> , t <sub>f</sub>    | Input Rise and Fall Time<br>(Figure 1)               | V <sub>CC</sub> = 2.0 V | 0               | 1000 | ns |
|                                    |  | V <sub>CC</sub> = 4.5 V | 0               | 500  |    |
|                                    |  | V <sub>CC</sub> = 6.0 V | 0               | 400  |    |

## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

| Symbol          | Parameter                         | Test Conditions  | V <sub>CC</sub><br>V | Guaranteed Limit |        |         | Unit |
|-----------------|-----------------------------------|--|----------------------|------------------|--------|---------|------|
|                 |                                   |  |                      | - 55 to<br>25°C  | ≤ 85°C | ≤ 125°C |      |
| V <sub>IH</sub> | Minimum High-Level Input Voltage  | V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA   | 2.0                  | 1.5              | 1.5    | 1.5     | V    |
|                 |                                   |  | 3.0                  | 2.1              | 2.1    | 2.1     |      |
|                 |                                   |  | 4.5                  | 3.15             | 3.15   | 3.15    |      |
|                 |                                   |  | 6.0                  | 4.2              | 4.2    | 4.2     |      |
| V <sub>IL</sub> | Maximum Low-Level Input Voltage   | V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA   | 2.0                  | 0.5              | 0.5    | 0.5     | V    |
|                 |                                   |  | 3.0                  | 0.9              | 0.9    | 0.9     |      |
|                 |                                   |  | 4.5                  | 1.35             | 1.35   | 1.35    |      |
|                 |                                   |  | 6.0                  | 1.8              | 1.8    | 1.8     |      |
| V <sub>OH</sub> | Minimum High-Level Output Voltage | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 20 μA  | 2.0                  | 1.9              | 1.9    | 1.9     | V    |
|                 |                                   |  | 4.5                  | 4.4              | 4.4    | 4.4     |      |
|                 |                                   |  | 6.0                  | 5.9              | 5.9    | 5.9     |      |
|                 |                                   | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 2.4 mA<br> I <sub>out</sub>   ≤ 6.0 mA<br> I <sub>out</sub>   ≤ 7.8 mA | 3.0                  | 2.48             | 2.34   | 2.2     |      |
|                 |                                   |  | 4.5                  | 3.98             | 3.84   | 3.7     |      |
|                 |                                   |  | 6.0                  | 5.48             | 5.34   | 5.2     |      |

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

**DC ELECTRICAL CHARACTERISTICS** (Voltages Referenced to GND)

| Symbol          | Parameter                                      | Test Conditions   | V <sub>CC</sub><br>V | Guaranteed Limit |        |         | Unit |
|-----------------|--|---|----------------------|------------------|--------|---------|------|
|                 |  |   |                      | - 55 to<br>25°C  | ≤ 85°C | ≤ 125°C |      |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage               | V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 2.0                  | 0.1              | 0.1    | 0.1     | V    |
|                 |  |   | 4.5                  | 0.1              | 0.1    | 0.1     |      |
|                 |  |   | 6.0                  | 0.1              | 0.1    | 0.1     |      |
|                 |  | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 2.4 mA<br> I <sub>out</sub>   ≤ 6.0 mA<br> I <sub>out</sub>   ≤ 7.8 mA | 3.0                  | 0.26             | 0.33   | 0.4     |      |
|                 |  |   | 4.5                  | 0.26             | 0.33   | 0.4     |      |
|                 |  |   | 6.0                  | 0.26             | 0.33   | 0.4     |      |
| I <sub>in</sub> | Maximum Input Leakage Current                  | V <sub>in</sub> = V <sub>CC</sub> or GND  | 6.0                  | ± 0.1            | ± 1.0  | ± 1.0   | μA   |
| I <sub>OZ</sub> | Maximum Three-State Leakage Current            | Output in High-Impedance State<br>V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>out</sub> = V <sub>CC</sub> or GND               | 6.0                  | - 0.5            | - 5.0  | - 10    | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current (per Package) | V <sub>in</sub> = V <sub>CC</sub> or GND<br> I <sub>out</sub>   = 0 μA  | 6.0                  | 4.0              | 40     | 160     | μA   |

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

**AC ELECTRICAL CHARACTERISTICS** (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

| Symbol                                 | Parameter   | V <sub>CC</sub><br>V | Guaranteed Limit |        |         | Unit |
|--|---|----------------------|------------------|--------|---------|------|
|  |   |                      | - 55 to<br>25°C  | ≤ 85°C | ≤ 125°C |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input D to Q<br>(Figures 1 and 5)            | 2.0                  | 150              | 190    | 225     | ns   |
|  |   | 3.0                  | 100              | 140    | 180     |      |
|  |   | 4.5                  | 30               | 38     | 45      |      |
|  |   | 6.0                  | 26               | 33     | 38      |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Latch Enable to Q<br>(Figures 2 and 5)       | 2.0                  | 160              | 200    | 240     | ns   |
|  |   | 3.0                  | 105              | 145    | 190     |      |
|  |   | 4.5                  | 32               | 40     | 48      |      |
|  |   | 6.0                  | 27               | 34     | 41      |      |
| t <sub>PLZ</sub> ,<br>t <sub>PHZ</sub> | Maximum Propagation Delay, Output Enable to Q<br>(Figures 3 and 6)      | 2.0                  | 150              | 190    | 225     | ns   |
|  |   | 3.0                  | 100              | 125    | 150     |      |
|  |   | 4.5                  | 30               | 38     | 45      |      |
|  |   | 6.0                  | 26               | 33     | 38      |      |
| t <sub>PZL</sub> ,<br>t <sub>PZH</sub> | Maximum Propagation Delay, Output Enable to Q<br>(Figures 3 and 6)      | 2.0                  | 150              | 190    | 225     | ns   |
|  |   | 3.0                  | 100              | 125    | 150     |      |
|  |   | 4.5                  | 30               | 38     | 45      |      |
|  |   | 6.0                  | 26               | 33     | 38      |      |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output<br>(Figures 1 and 5)         | 2.0                  | 60               | 75     | 90      | ns   |
|  |   | 3.0                  | 27               | 32     | 36      |      |
|  |   | 4.5                  | 12               | 15     | 18      |      |
|  |   | 6.0                  | 10               | 13     | 15      |      |
| C <sub>in</sub>                        | Maximum Input Capacitance   |                      | 10               | 10     | 10      | pF   |
| C <sub>out</sub>                       | Maximum Three-State Output Capacitance (Output in High-Impedance State) |                      | 15               | 15     | 15      | pF   |

NOTE: For propagation delays with loads other than 50 pF, and information on typical parametric values, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

| C <sub>PD</sub> | Power Dissipation Capacitance (Per Enabled Output)* | Typical @ 25°C, V <sub>CC</sub> = 5.0 V |    |
|-----------------|---|---|----|
|                 |   |   | 23 |

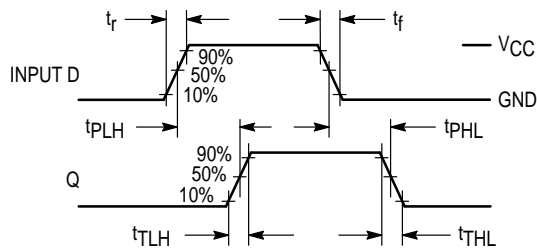
\* Used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> V<sub>CC</sub><sup>2</sup>f + I<sub>CC</sub> V<sub>CC</sub>. For load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

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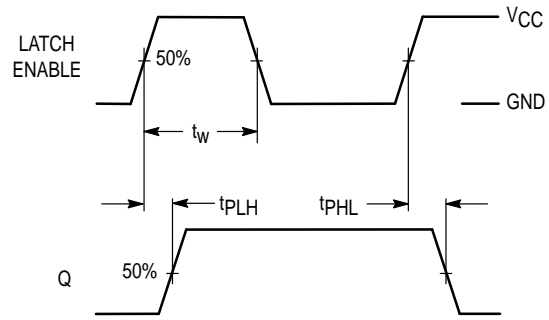
## TIMING REQUIREMENTS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

| Symbol                          | Parameter                                   | Fig. | V <sub>CC</sub><br>Volts | Guaranteed Limit |      |        |      |         |      | Unit |
|---------------------------------|---|------|--------------------------|------------------|------|--------|------|---------|------|------|
|                                 |   |      |                          | - 55 to 25°C     |      | ≤ 85°C |      | ≤ 125°C |      |      |
|                                 |   |      |                          | Min              | Max  | Min    | Max  | Min     | Max  |      |
| t <sub>su</sub>                 | Minimum Setup Time, Input D to Latch Enable | 4    | 2.0                      | 50               |      | 65     |      | 75      |      | ns   |
|                                 |   |      | 3.0                      | 40               |      | 50     |      | 60      |      |      |
|                                 |   |      | 4.5                      | 10               |      | 13     |      | 15      |      |      |
|                                 |   |      | 6.0                      | 9.0              |      | 11     |      | 13      |      |      |
| t <sub>h</sub>                  | Minimum Hold Time, Latch Enable to Input D  | 4    | 2.0                      | 5.0              |      | 5.0    |      | 5.0     |      | ns   |
|                                 |   |      | 3.0                      | 5.0              |      | 5.0    |      | 5.0     |      |      |
|                                 |   |      | 4.5                      | 5.0              |      | 5.0    |      | 5.0     |      |      |
|                                 |   |      | 6.0                      | 5.0              |      | 5.0    |      | 5.0     |      |      |
| t <sub>w</sub>                  | Minimum Pulse Width, Latch Enable           | 2    | 2.0                      | 75               |      | 95     |      | 110     |      | ns   |
|                                 |   |      | 3.0                      | 60               |      | 80     |      | 90      |      |      |
|                                 |   |      | 4.5                      | 15               |      | 19     |      | 22      |      |      |
|                                 |   |      | 6.0                      | 13               |      | 16     |      | 19      |      |      |
| t <sub>r</sub> , t <sub>f</sub> | Maximum Input Rise and Fall Times           | 1    | 2.0                      |                  | 1000 |        | 1000 |         | 1000 | ns   |
|                                 |   |      | 3.0                      |                  | 800  |        | 800  |         | 800  |      |
|                                 |   |      | 4.5                      |                  | 500  |        | 500  |         | 500  |      |
|                                 |   |      | 6.0                      |                  | 400  |        | 400  |         | 400  |      |

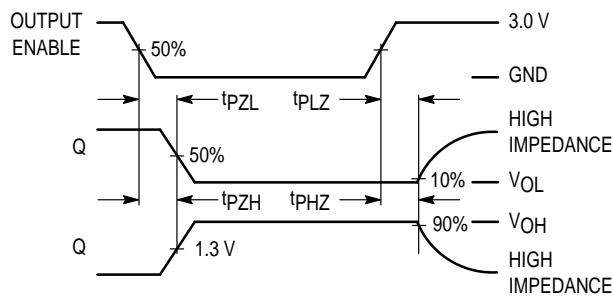
**SWITCHING WAVEFORMS**



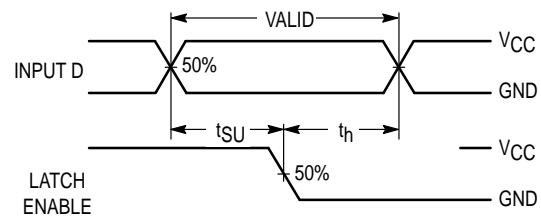
**Figure 1.**



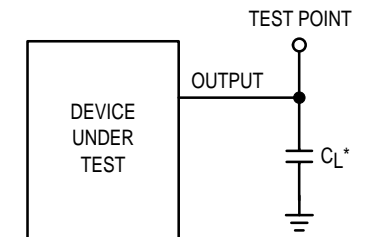
**Figure 2.**



**Figure 3.**

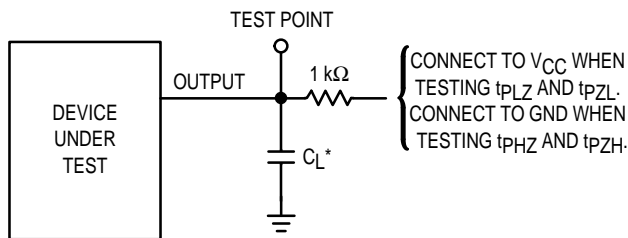


**Figure 4.**



\* Includes all probe and jig capacitance

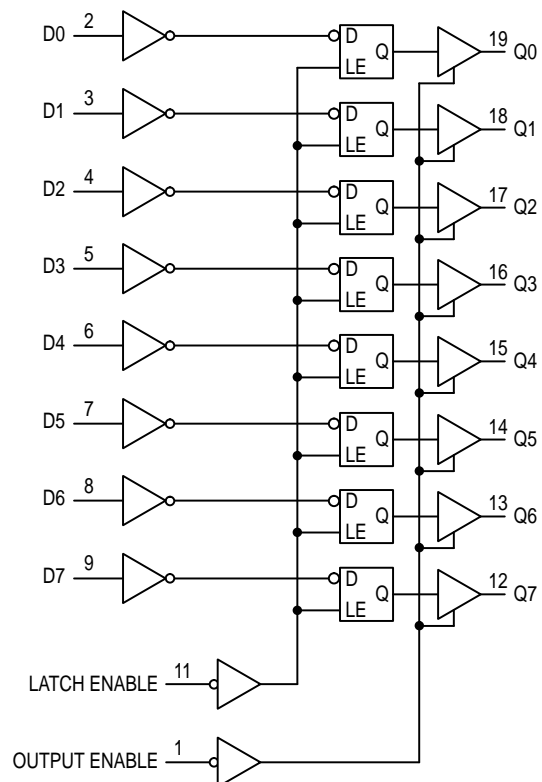
**Figure 5. Test Circuit**



\* Includes all probe and jig capacitance

**Figure 6. Test Circuit**

**EXPANDED LOGIC DIAGRAM**



OUTLINE DIMENSIONS

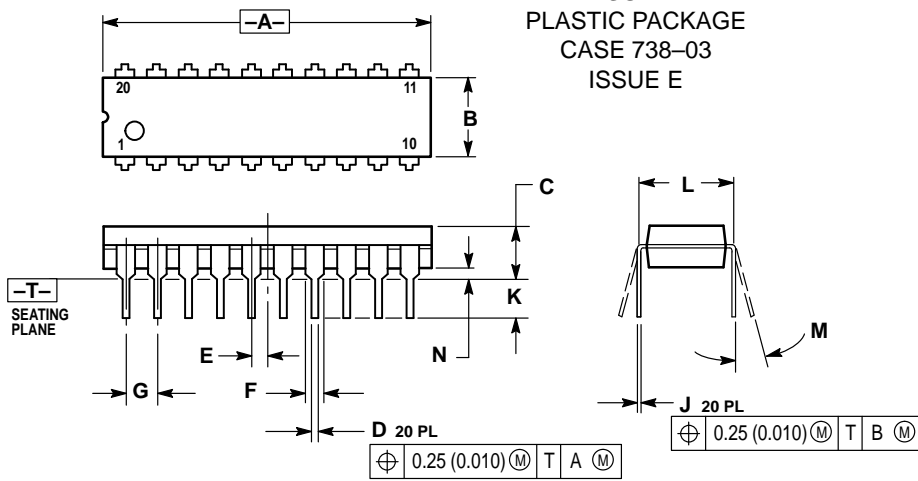
**J SUFFIX**  
**CERAMIC PACKAGE**  
**CASE 732-03**  
**ISSUE E**



- NOTES:
- LEADS WITHIN 0.25 (0.010) DIAMETER, TRUE POSITION AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
  - DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  - DIMENSIONS A AND B INCLUDE MENISCUS.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 23.88       | 25.15 | 0.940     | 0.990 |
| B   | 6.60        | 7.49  | 0.260     | 0.295 |
| C   | 3.81        | 5.08  | 0.150     | 0.200 |
| D   | 0.38        | 0.56  | 0.015     | 0.022 |
| F   | 1.40        | 1.65  | 0.055     | 0.065 |
| G   | 2.54 BSC    |       | 0.100 BSC |       |
| H   | 0.51        | 1.27  | 0.020     | 0.050 |
| J   | 0.20        | 0.30  | 0.008     | 0.012 |
| K   | 3.18        | 4.06  | 0.125     | 0.160 |
| L   | 7.62 BSC    |       | 0.300 BSC |       |
| M   | 0°          | 15°   | 0°        | 15°   |
| N   | 0.25        | 1.02  | 0.010     | 0.040 |

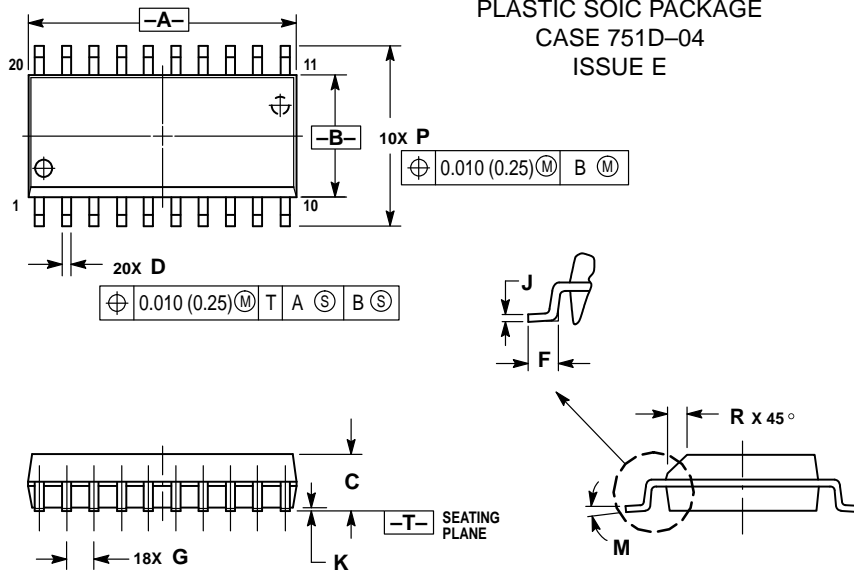
**N SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 738-03**  
**ISSUE E**



- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  - CONTROLLING DIMENSION: INCH.
  - DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  - 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  |

**DW SUFFIX**  
**PLASTIC SOIC PACKAGE**  
**CASE 751D-04**  
**ISSUE E**

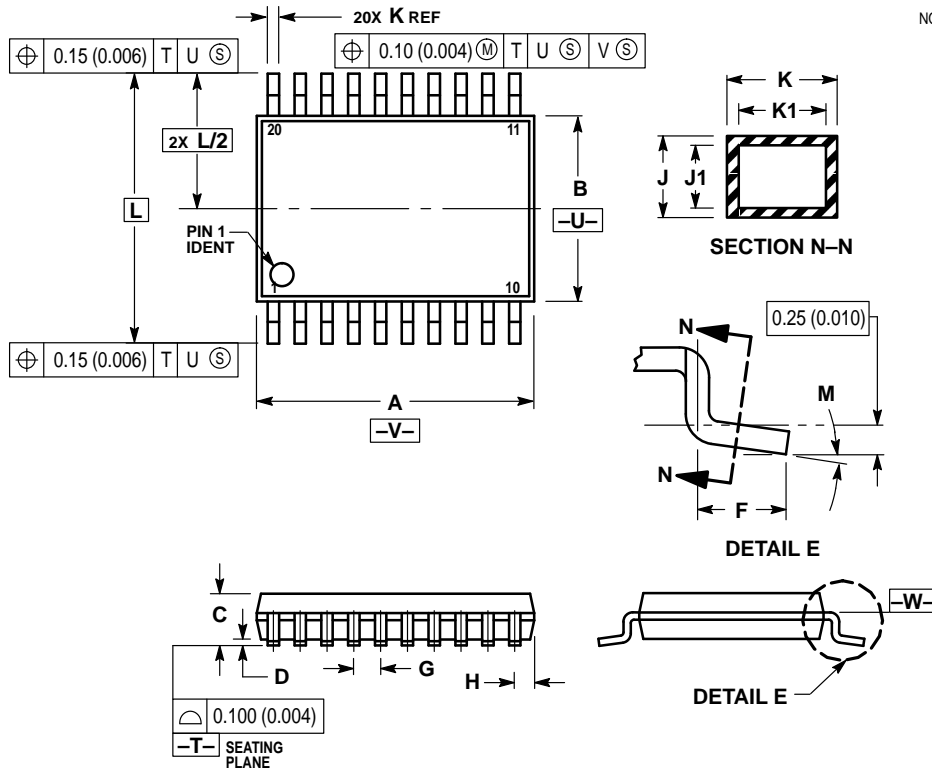


- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  - CONTROLLING DIMENSION: MILLIMETER.
  - DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
  - MAXIMUM MOLD PROTRUSION 0.150 (0.006) PER SIDE.
  - DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 12.65       | 12.95 | 0.499     | 0.510 |
| B   | 7.40        | 7.60  | 0.292     | 0.299 |
| C   | 2.35        | 2.65  | 0.093     | 0.104 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.50        | 0.90  | 0.020     | 0.035 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.25        | 0.32  | 0.010     | 0.012 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0°          | 7°    | 0°        | 7°    |
| P   | 10.05       | 10.55 | 0.395     | 0.415 |
| R   | 0.25        | 0.75  | 0.010     | 0.029 |

OUTLINE DIMENSIONS

DT SUFFIX  
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-.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | 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°    |

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