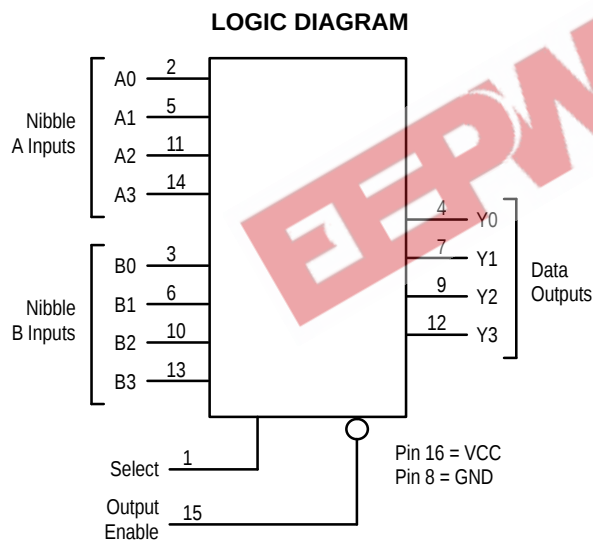


Quad 2-Input Data  
Selector/Multiplexer  
High-Performance Silicon-Gate CMOS

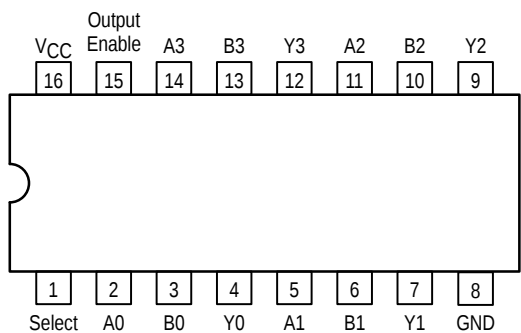
The MC74HC158A is identical in pinout to the LS158. The device inputs are compatible with Standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

These devices route 2 nibbles (A or B) to a single port (Y) as determined by the Select input. The data is presented at the outputs in inverted form for the HC158A. A high level on the Output Enable input sets all four Y outputs to a high level for the HC158A.

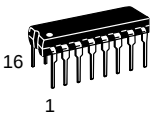
- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2 to 6V
- Low Input Current: 1μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 74 FETs or 18.5 Equivalent Gates



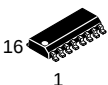
Pinout: 16-Lead Plastic Package (Top View)



MC74HC158A



N SUFFIX  
PLASTIC PACKAGE  
CASE 648-08



D SUFFIX  
SOIC PACKAGE  
CASE 751B-05



DT SUFFIX  
TSSOP PACKAGE  
CASE 948F-01

ORDERING INFORMATION

|              |         |
|--------------|---------|
| MC74HCXXXAN  | Plastic |
| MC74HCXXXAD  | SOIC    |
| MC74HCXXXADT | TSSOP   |

FUNCTION TABLE

| Inputs        |        | Outputs |
|---------------|--------|---------|
| Output Enable | Select | Y0-Y3   |
| H             | X      | H       |
| L             | L      | A0-A3   |
| L             | H      | B0-B3   |

X = Don't Care  
A0-A3, B0-B3 = the levels of the respective Data-Word inputs.



# MC74HC158A

## MAXIMUM RATINGS\*

| Symbol    | Parameter                                                                               | Value                   | Unit |
|-----------|-----------------------------------------------------------------------------------------|-------------------------|------|
| $V_{CC}$  | DC Supply Voltage (Referenced to GND)                                                   | – 0.5 to + 7.0          | V    |
| $V_{in}$  | DC Input Voltage (Referenced to GND)                                                    | – 0.5 to $V_{CC} + 0.5$ | V    |
| $V_{out}$ | DC Output Voltage (Referenced to GND)                                                   | – 0.5 to $V_{CC} + 0.5$ | V    |
| $I_{in}$  | DC Input Current, per Pin                                                               | $\pm 20$                | mA   |
| $I_{out}$ | DC Output Current, per Pin                                                              | $\pm 25$                | mA   |
| $I_{CC}$  | DC Supply Current, $V_{CC}$ and GND Pins                                                | $\pm 50$                | mA   |
| $P_D$     | Power Dissipation in Still Air, Plastic DIP†<br>SOIC Package†<br>TSSOP Package†         | 750<br>500<br>450       | mW   |
| $T_{stg}$ | Storage Temperature                                                                     | – 65 to + 150           | °C   |
| $T_L$     | Lead Temperature, 1 mm from Case for 10 Seconds<br>(Plastic DIP, SOIC or TSSOP Package) | 260                     | °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  $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$ .

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). 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

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 2)               | V <sub>CC</sub> = 2.0 V<br>V <sub>CC</sub> = 3.0 V<br>V <sub>CC</sub> = 4.5 V<br>V <sub>CC</sub> = 6.0 V | 0<br>0<br>0<br>0 | 1000<br>600<br>500<br>400 | ns |

## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

| Symbol   | Parameter                         | Test Conditions                                                                         | $V_{CC}$<br>V            | Guaranteed Limit          |                           |                           | Unit |
|----------|-----------------------------------|-----------------------------------------------------------------------------------------|--------------------------|---------------------------|---------------------------|---------------------------|------|
|          |                                   |                                                                                         |                          | –55°C to<br>25°C          | ≤ 85°C                    | ≤ 125°C                   |      |
| $V_{IH}$ | Minimum High-Level Input Voltage  | $V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$<br>$ I_{out}  \leq 20 \mu\text{A}$ | 2.0<br>3.0<br>4.5<br>6.0 | 1.5<br>2.1<br>3.15<br>4.2 | 1.5<br>2.1<br>3.15<br>4.2 | 1.5<br>2.1<br>3.15<br>4.2 | V    |
| $V_{IL}$ | Maximum Low-Level Input Voltage   | $V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$<br>$ I_{out}  \leq 20 \mu\text{A}$ | 2.0<br>3.0<br>4.5<br>6.0 | 0.5<br>0.9<br>1.35<br>1.8 | 0.5<br>0.9<br>1.35<br>1.8 | 0.5<br>0.9<br>1.35<br>1.8 | V    |
| $V_{OH}$ | Minimum High-Level Output Voltage | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$ I_{out}  \leq 20 \mu\text{A}$                 | 2.0<br>4.5<br>6.0        | 1.9<br>4.4<br>5.9         | 1.9<br>4.4<br>5.9         | 1.9<br>4.4<br>5.9         | V    |
|          |                                   | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$ I_{out}  \leq 2.4 \text{ mA}$                 | 3.0                      | 2.48                      | 2.34                      | 2.20                      |      |
|          |                                   | $ I_{out}  \leq 4.0 \text{ mA}$                                                         | 4.5                      | 3.98                      | 3.84                      | 3.70                      |      |
|          |                                   | $ I_{out}  \leq 5.2 \text{ mA}$                                                         | 6.0                      | 5.48                      | 5.34                      | 5.20                      |      |

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

| Symbol          | Parameter                                      | Test Conditions                                                                                                                                      | V <sub>CC</sub><br>V | Guaranteed Limit |        |         | Unit |
|-----------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|--------|---------|------|
|                 |                                                |                                                                                                                                                      |                      | –55°C to<br>25°C | ≤ 85°C | ≤ 125°C |      |
| V <sub>OL</sub> | Maximum Low-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                  | 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><br> I <sub>out</sub>   ≤ 2.4 mA<br> I <sub>out</sub>   ≤ 4.0 mA<br> I <sub>out</sub>   ≤ 5.2 mA | 3.0                  | 0.26             | 0.33   | 0.40    |      |
|                 |                                                |                                                                                                                                                      | 4.5                  | 0.26             | 0.33   | 0.40    |      |
|                 |                                                |                                                                                                                                                      | 6.0                  | 0.26             | 0.33   | 0.40    |      |
| 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>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                | 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°C to<br>25°C | ≤ 85°C | ≤ 125°C |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input A or B to Output Y<br>(Figures 1 and 4)  | 2.0                  | 100              | 140    | 160     | ns   |
|                                        |                                                                           | 3.0                  | 85               | 95     | 110     |      |
|                                        |                                                                           | 4.5                  | 25               | 31     | 38      |      |
|                                        |                                                                           | 6.0                  | 21               | 26     | 32      |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Select to Output Y<br>(Figures 2 and 4)        | 2.0                  | 100              | 140    | 160     | ns   |
|                                        |                                                                           | 3.0                  | 85               | 95     | 110     |      |
|                                        |                                                                           | 4.5                  | 25               | 31     | 38      |      |
|                                        |                                                                           | 6.0                  | 21               | 26     | 32      |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Output Enable to Output Y<br>(Figures 3 and 4) | 2.0                  | 115              | 145    | 175     | ns   |
|                                        |                                                                           | 3.0                  | 80               | 90     | 100     |      |
|                                        |                                                                           | 4.5                  | 23               | 29     | 35      |      |
|                                        |                                                                           | 6.0                  | 20               | 25     | 30      |      |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output<br>(Figures 2 and 4)           | 2.0                  | 75               | 95     | 110     | ns   |
|                                        |                                                                           | 3.0                  | 27               | 32     | 36      |      |
|                                        |                                                                           | 4.5                  | 15               | 19     | 22      |      |
|                                        |                                                                           | 6.0                  | 13               | 16     | 19      |      |
| C <sub>in</sub>                        | Maximum Input Capacitance                                                 | —                    | 10               | 10     | 10      | 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 Package)* | Typical @ 25°C, V <sub>CC</sub> = 5.0 V | pF |
|-----------------|----------------------------------------------|-----------------------------------------|----|
|                 |                                              | 35                                      |    |

\* 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).

SWITCHING WAVEFORMS

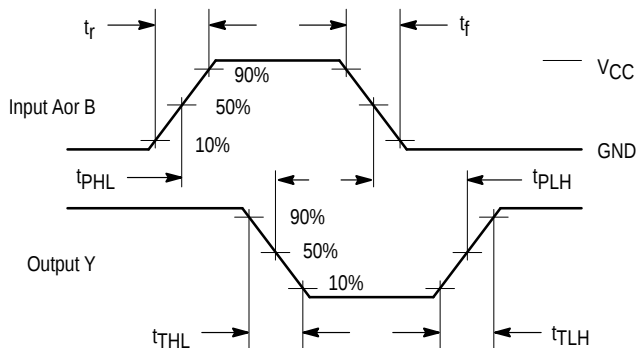


Figure 1.

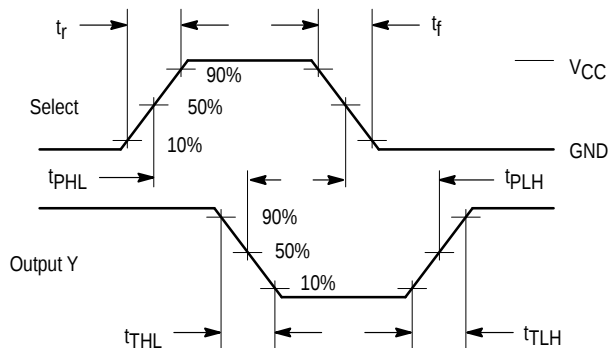


Figure 2. Y versus Select, Inverted

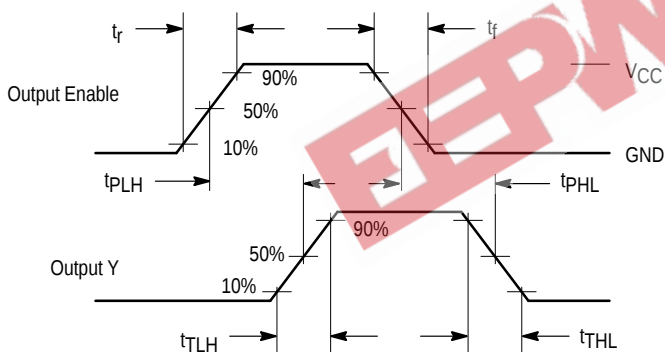
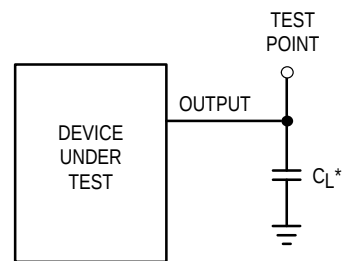


Figure 3.



\*Includes all probe and jig capacitance

Figure 4. Test Circuit

## PIN DESCRIPTIONS

## INPUTS

**A0–A3 (Pins 2,5,11,14)**

Nibble A inputs. The data present on these pins is transferred to the outputs when the Select input is at a low level and the Output Enable input is at a low level. The data is presented to the outputs in inverted form for the HC158A.

**B0–B3 (Pins 3,6,10,13)**

Nibble B inputs. The data present on these pins is transferred to the outputs when the Select input is at a high level and the Output Enable input is at a low level. The data is presented to the outputs in inverted form for the HC158A.

## OUTPUTS

**Y0–Y3 (Pins 4,7,9,12)**

Data outputs. The selected input nibble is presented at these outputs when the Output Enable input is at a low level.

The data present on these pins is in its inverted form for the HC158A. For the Output Enable input at a high level, the outputs are at a high level for the HC158A.

## CONTROL INPUTS

**Select (Pin 1)**

Nibble select. This input determines the data word to be transferred to the outputs. A low level on this input selects the A inputs and a high level selects the B inputs.

**Output Enable (Pin 15)**

Output Enable input. A low level on this input allows the selected data to be presented at the outputs. A high level on this input sets all of the outputs to a high level for the HC158A.

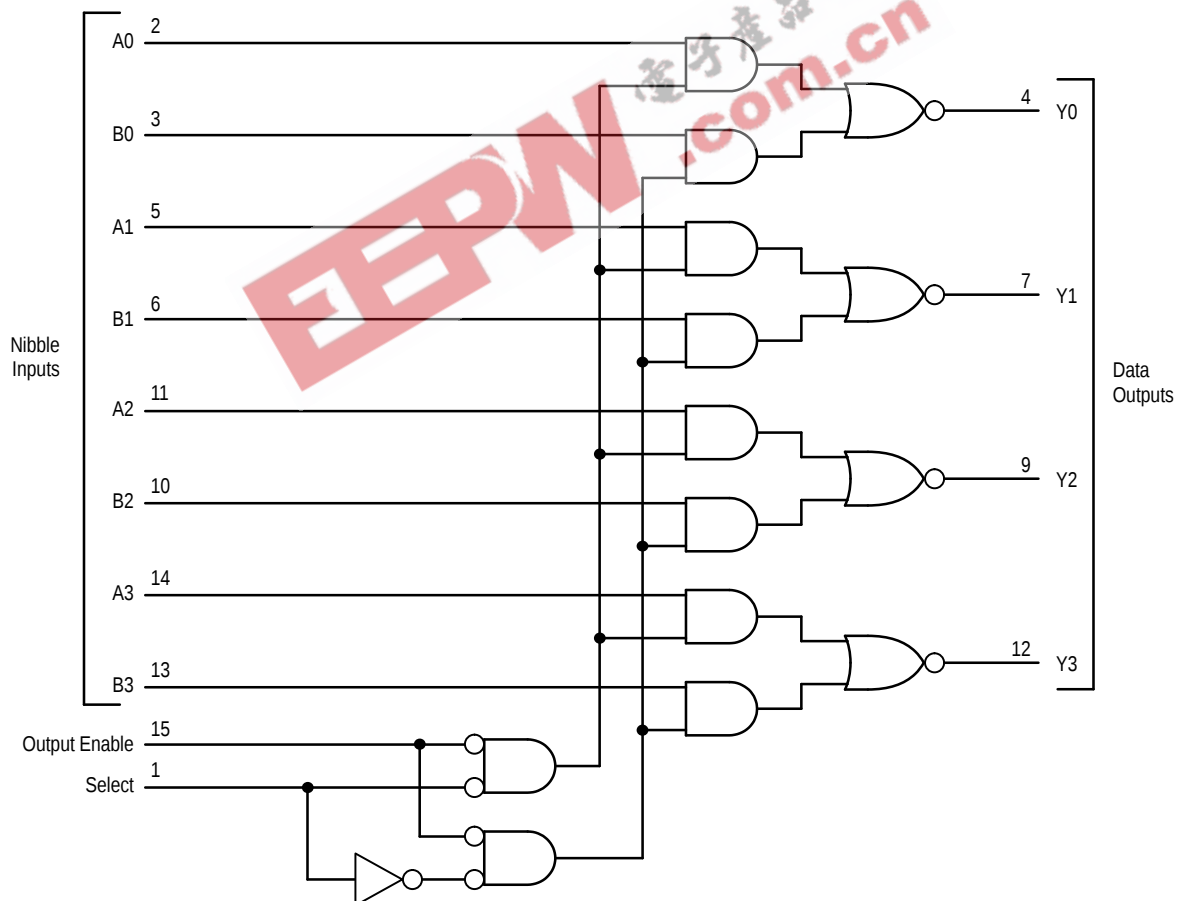
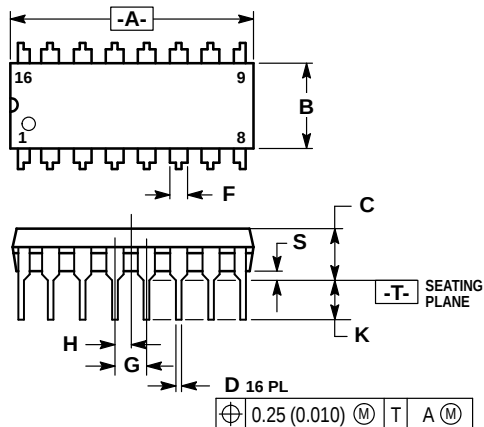


Figure 5. Expanded Logic Diagram

## OUTLINE DIMENSIONS

**N SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 648-08**  
**ISSUE R**

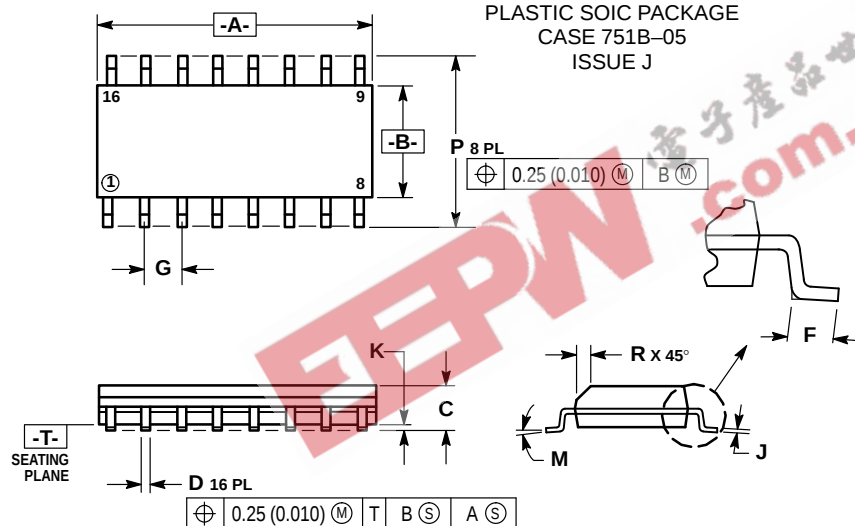


## NOTES:

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

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.070 | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0°        | 10°   | 0°          | 10°   |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

**D SUFFIX**  
**PLASTIC SOIC PACKAGE**  
**CASE 751B-05**  
**ISSUE J**

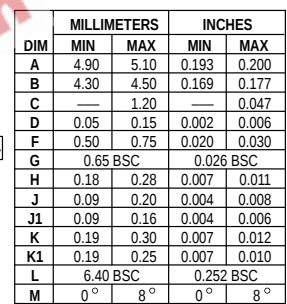


## NOTES:

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 |

**DT SUFFIX**  
PLASTIC TSSOP PACKAGE  
CASE 948F-01  
ISSUE 0



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**INTERNET:** <http://www.mot.com/SPS/>

