

Low-Voltage CMOS Quad 2-Input Multiplexer With 5V-Tolerant Inputs (Non-Inverting)

The MC74LCX157 is a high performance, quad 2-input multiplexer operating from a 2.7 to 3.6V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5V allows MC74LCX157 inputs to be safely driven from 5V devices.

Four bits of data from two sources can be selected using the Select and Enable inputs. The four outputs present the selected data in the true (non-inverted) form. The MC74LCX157 can also be used as a function generator. Current drive capability is 24mA at the outputs.

- Designed for 2.7 to 3.6V V_{CC} Operation
- 5V Tolerant Inputs — Interface Capability With 5V TTL Logic
- LVTTTL Compatible
- LVCMOS Compatible
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10 μ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500mA
- ESD Performance: Human Body Model >2000V; Machine Model >200V

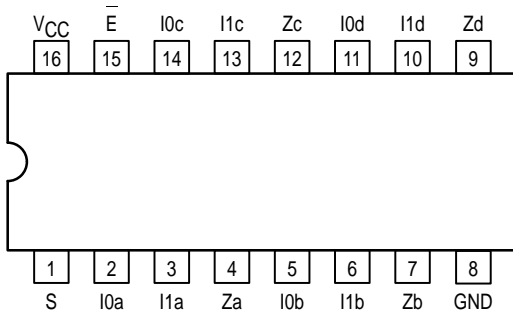
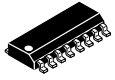


Figure 1. 16-Lead Pinout (Top View)

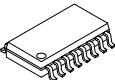
MC74LCX157

LCX


LOW-VOLTAGE CMOS QUAD 2-INPUT MULTIPLEXER




D SUFFIX
16-LEAD PLASTIC SOIC PACKAGE
CASE 751B-05



M SUFFIX
16-LEAD PLASTIC SOIC EIAJ PACKAGE
CASE 966-01



SD SUFFIX
16-LEAD PLASTIC SSOP PACKAGE
CASE 940B-03



DT SUFFIX
16-LEAD PLASTIC TSSOP PACKAGE
CASE 948F-01

PIN NAMES

| Pins | Function |
|-----------------|----------------------|
| I _{0n} | Source 0 Data Inputs |
| I _{1n} | Source 1 Data Inputs |
| E | Enable Input |
| S | Select Input |
| Z _n | Outputs |



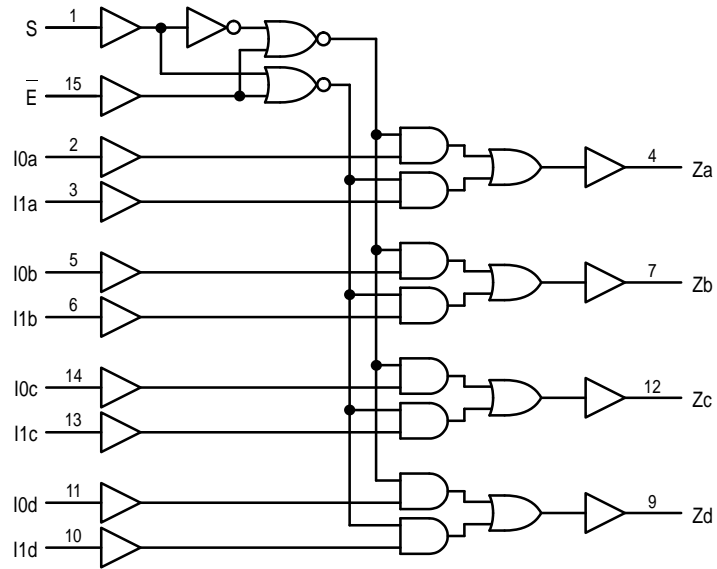


Figure 2. Logic Diagram

TRUTH TABLE

| Inputs | | | | Outputs |
|-----------|---|-----|-----|---------|
| \bar{E} | S | I0n | I1n | Zn |
| H | X | X | X | L |
| L | H | X | L | L |
| L | H | X | H | H |
| L | L | L | X | L |
| L | L | H | X | H |

H = High Voltage Level; L = Low Voltage Level; X = High or Low Voltage Level; For I_{CC} Reasons DO NOT FLOAT Inputs

ABSOLUTE 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 ≤ V _I ≤ +7.0 | | V |
| V _O | DC Output Voltage | -0.5 ≤ V _O ≤ V _{CC} + 0.5 | 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 Source/Sink Current | ±50 | | mA |
| I _{CC} | DC Supply Current Per Supply Pin | ±100 | | mA |
| I _{GND} | DC Ground Current Per Ground Pin | ±100 | | mA |
| T _{STG} | Storage Temperature Range | -65 to +150 | | °C |

* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

1. Output in HIGH or LOW State. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

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

DC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic | Condition | T _A = -40°C to +85°C | | Unit |
|-----------------|------------------------------------|---|---------------------------------|------|------|
| | | | Min | Max | |
| V _{IH} | HIGH Level Input Voltage (Note 2.) | 2.7V ≤ V _{CC} ≤ 3.6V | 2.0 | | V |
| V _{IL} | LOW Level Input Voltage (Note 2.) | 2.7V ≤ V _{CC} ≤ 3.6V | | 0.8 | V |
| V _{OH} | HIGH Level Output Voltage | 2.7V ≤ V _{CC} ≤ 3.6V; I _{OH} = -100μA | V _{CC} - 0.2 | | V |
| | | V _{CC} = 2.7V; I _{OH} = -12mA | 2.2 | | |
| | | V _{CC} = 3.0V; I _{OH} = -18mA | 2.4 | | |
| | | V _{CC} = 3.0V; I _{OH} = -24mA | 2.2 | | |
| V _{OL} | LOW Level Output Voltage | 2.7V ≤ V _{CC} ≤ 3.6V; I _{OL} = 100μA | | 0.2 | V |
| | | V _{CC} = 2.7V; I _{OL} = 12mA | | 0.4 | |
| | | V _{CC} = 3.0V; I _{OL} = 16mA | | 0.4 | |
| | | V _{CC} = 3.0V; I _{OL} = 24mA | | 0.55 | |

2. These values of V_I are used to test DC electrical characteristics only.

MC74LCX157

DC ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Characteristic | Condition | T _A = -40°C to +85°C | | Unit |
|------------------|---------------------------------------|--|---------------------------------|------|------|
| | | | Min | Max | |
| I _I | Input Leakage Current | 2.7V ≤ V _{CC} ≤ 3.6V; 0V ≤ V _I ≤ 5.5V | | ±5.0 | μA |
| I _{CC} | Quiescent Supply Current | 2.7 ≤ V _{CC} ≤ 3.6V; V _I = GND or V _{CC} | | 10 | μA |
| | | 2.7 ≤ V _{CC} ≤ 3.6V; 3.6 ≤ V _I ≤ 5.5V | | ±10 | μA |
| ΔI _{CC} | Increase in I _{CC} per Input | 2.7 ≤ V _{CC} ≤ 3.6V; V _{IH} = V _{CC} - 0.6V | | 500 | μA |

AC CHARACTERISTICS (t_R = t_F = 2.5ns; C_L = 50pF; R_L = 500Ω)

| Symbol | Parameter | Waveform | Limits | | | Unit |
|--|------------------------------------|----------|---------------------------------|------------|------------------------|------|
| | | | T _A = -40°C to +85°C | | | |
| | | | V _{CC} = 3.0V to 3.6V | | V _{CC} = 2.7V | |
| | | | Min | Max | Max | |
| t _{PLH} t _{PHL} | Propagation Delay In to Zn | 1 | 1.5 1.5 | 5.8 5.8 | 6.3 6.3 | ns |
| t _{PLH} t _{PHL} | Propagation Delay S to Zn | 1,2 | 1.5 1.5 | 7.0 7.0 | 8.0 8.0 | ns |
| t _{PLH} t _{PHL} | Propagation Delay E to Zn | 2 | 1.5 1.5 | 7.0 7.0 | 8.0 8.0 | ns |
| t _{OSHL} t _{OSLH} | Output-to-Output Skew (Note 3.) | | | 1.0 1.0 | | ns |

3. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

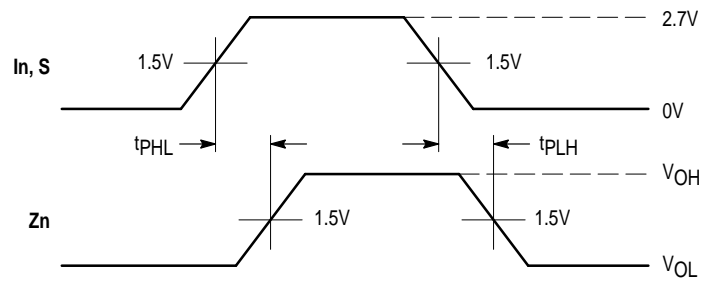
DYNAMIC SWITCHING CHARACTERISTICS

| Symbol | Characteristic | Condition | T _A = +25°C | | | Unit |
|------------------|--------------------------------------|---|------------------------|-----|-----|------|
| | | | Min | Typ | Max | |
| V _{OLP} | Dynamic LOW Peak Voltage (Note 4.) | V _{CC} = 3.3V, C _L = 50pF, V _{IH} = 3.3V, V _{IL} = 0V | | 0.8 | | V |
| V _{OLV} | Dynamic LOW Valley Voltage (Note 4.) | V _{CC} = 3.3V, C _L = 50pF, V _{IH} = 3.3V, V _{IL} = 0V | | 0.8 | | V |

4. 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.

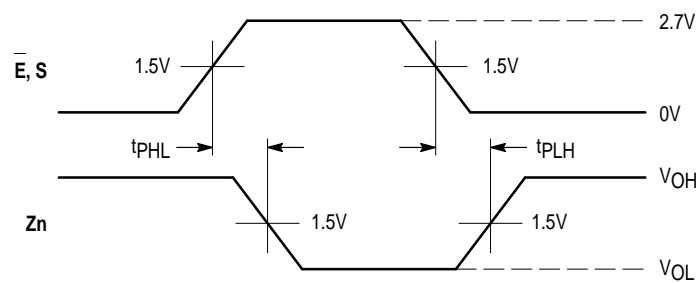
CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|-------------------------------|---|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 3.3V, V _I = 0V or V _{CC} | 7 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 3.3V, V _I = 0V or V _{CC} | 8 | pF |
| C _{PD} | Power Dissipation Capacitance | 10MHz, V _{CC} = 3.3V, V _I = 0V or V _{CC} | 25 | pF |



WAVEFORM 1 – NON-INVERTING PROPAGATION DELAYS

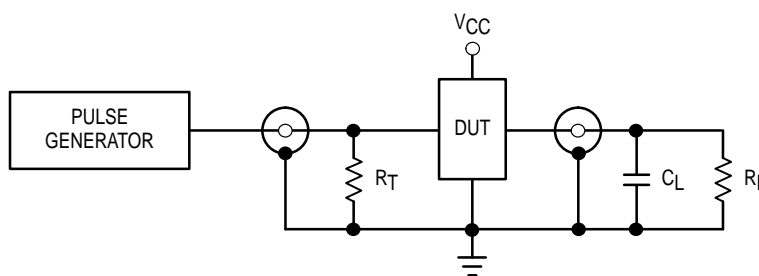
$t_R = t_F = 2.5\text{ns}$, 10% to 90%; $f = 1\text{MHz}$; $t_W = 500\text{ns}$



WAVEFORM 2 – INVERTING PROPAGATION DELAYS

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

Figure 3. AC Waveforms



$C_L = 50\text{pF}$ or equivalent (Includes jig and probe capacitance)

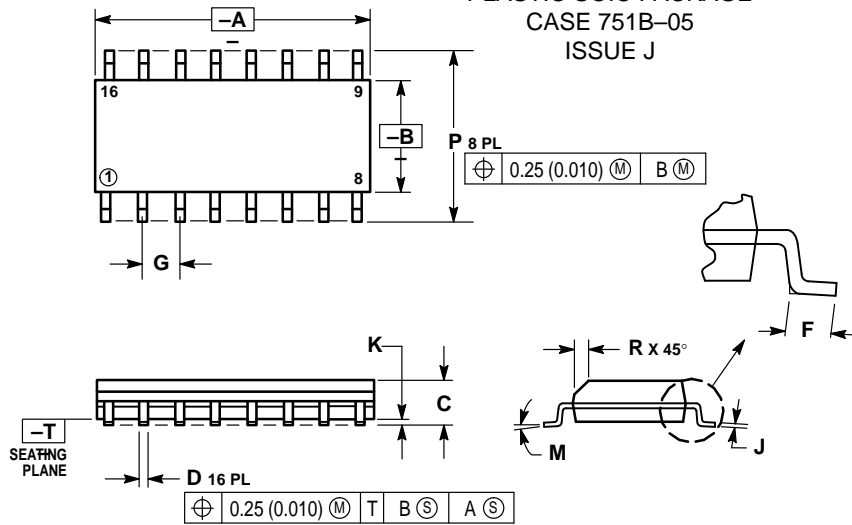
$R_L = R_1 = 500\Omega$ or equivalent

$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 4. Test Circuit

OUTLINE DIMENSIONS

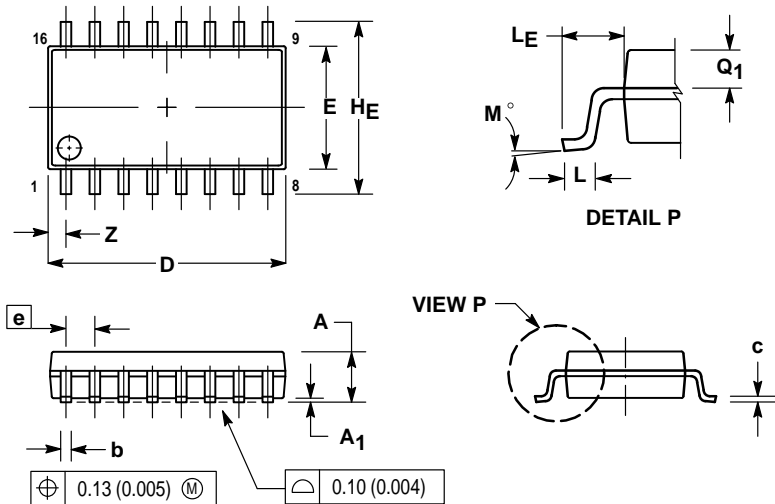
D SUFFIX
 PLASTIC SOIC PACKAGE
 CASE 751B-05
 ISSUE J



- 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 |

M SUFFIX
 PLASTIC SOIC EIAJ PACKAGE
 CASE 966-01
 ISSUE O

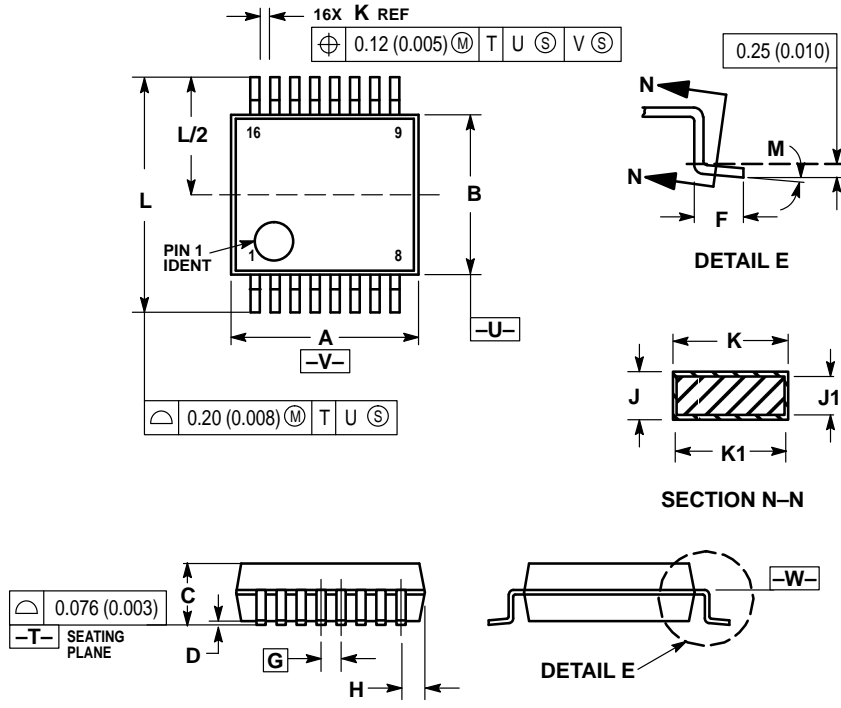


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. TERMINAL NUMBERS ARE SHOWN 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 ₁ | 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 _E | 7.40 | 8.20 | 0.291 | 0.323 |
| L | 0.50 | 0.85 | 0.020 | 0.033 |
| L _E | 1.10 | 1.50 | 0.043 | 0.059 |
| M | 0° | 10° | 0° | 10° |
| Q ₁ | 0.70 | 0.90 | 0.028 | 0.035 |
| Z | --- | 0.78 | --- | 0.031 |

OUTLINE DIMENSIONS

SD SUFFIX
 PLASTIC SSOP PACKAGE
 CASE 940B-03
 ISSUE B

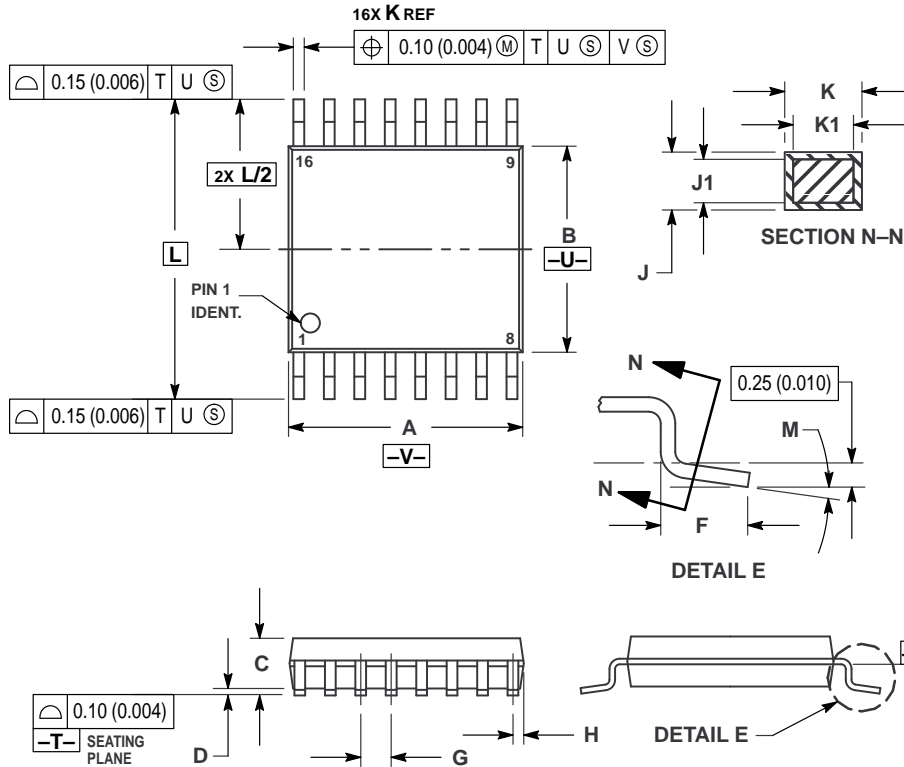


- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: MILLIMETER.
 - DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 - DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 - DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF K DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION K BY MORE THAN 0.07 (0.002) AT LEAST MATERIAL CONDITION.
 - TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 - DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 6.07 | 6.33 | 0.238 | 0.249 |
| B | 5.20 | 5.38 | 0.205 | 0.212 |
| C | 1.73 | 1.99 | 0.068 | 0.078 |
| D | 0.05 | 0.21 | 0.002 | 0.008 |
| F | 0.63 | 0.95 | 0.024 | 0.037 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.73 | 0.90 | 0.028 | 0.035 |
| J | 0.09 | 0.20 | 0.003 | 0.008 |
| J1 | 0.09 | 0.16 | 0.003 | 0.006 |
| K | 0.25 | 0.38 | 0.010 | 0.015 |
| K1 | 0.25 | 0.33 | 0.010 | 0.013 |
| L | 7.65 | 7.90 | 0.301 | 0.311 |
| M | 0° | 8° | 0° | 8° |

OUTLINE DIMENSIONS

DT SUFFIX
 PLASTIC TSSOP PACKAGE
 CASE 948F-01
 ISSUE O



- 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 | 0.85 BSC | — | 0.026 BSC | — |
| H | 0.18 | 0.28 | 0.007 | 0.011 |
| 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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