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Low-Voltage CMOS Quad 2-Input Multiplexer

With 5 V-Tolerant Inputs
(Non-Inverting)

MC74LCX157A

The MC74LCX157A is a high performance, quad 2-input multiplexer operating from a 1.65 to 3.6 V 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 5.5 V allows MC74LCX157A inputs to be safely driven from 5 V 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 MC74LCX157A can also be used as a function generator. Current drive capability is 24 mA at the outputs.

Features

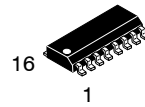
- Designed for 1.65 to 3.6 V V_{CC} Operation
- 5 V Tolerant Inputs – Interface Capability With 5 V TTL Logic
- LVTTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10 μ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 100 mA
- ESD Performance:
 - ◆ Human Body Model >2000 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



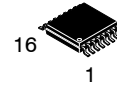
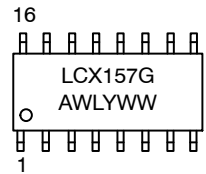
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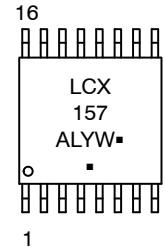
MARKING DIAGRAMS



SOIC-16
D SUFFIX
CASE 751B



TSSOP-16
DT SUFFIX
CASE 948F



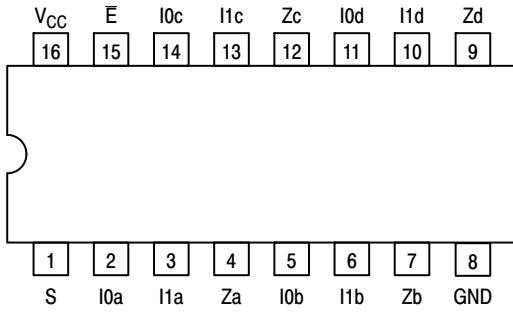
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week
G or ■ = Pb-Free Package

(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.

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PIN NAMES

Pins	Function
I0n	Source 0 Data Inputs
I1n	Source 1 Data Inputs
E	Enable Input
S	Select Input
Zn	Outputs

Figure 1. 16-Lead Pinout (Top View)

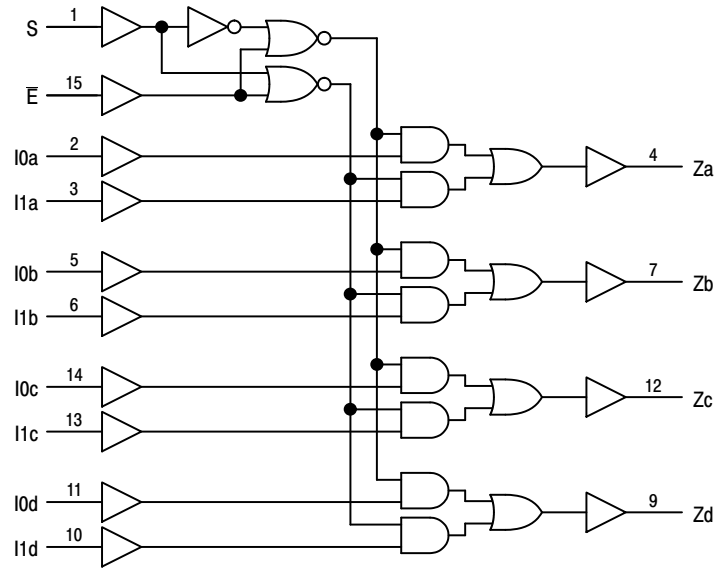


Figure 2. Logic Diagram

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

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX157ADR2G (Contact ON Semiconductor)	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74LCX157ADTR2G	TSSOP-16 (Pb-Free)	2500 Tape & Reel

[†]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.

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Table 1. MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	-0.5 to +6.5	V
V_I	DC Input Voltage (Note 1)	-0.5 to +6.5	V
V_O	DC Output Voltage (Note 1) Active-Mode (High or Low State) Tri-State Mode Power-Down Mode ($V_{CC} = 0$ V)	-0.5 to $V_{CC} + 0.5$ -0.5 to +6.5 -0.5 to +6.5	V
I_{IK}	DC Input Diode Current $V_{IN} < GND$	-50	mA
I_{OK}	DC Output Diode Current $V_{OUT} < GND$	-50	mA
I_O	DC Output Source/Sink Current	± 50	mA
I_{CC}	DC Supply Current Per Supply Pin	± 100	mA
I_{GND}	DC Supply Current Per Ground Pin	± 100	mA
T_{STG}	Storage Temperature Range	-65 to +150	$^{\circ}C$
MSL	Moisture Sensitivity	Level 1	
F_R	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage (Note 2) Human Body Model Charged Device Model	> 2000 N/A	V
$I_{LATCHUP}$	Latchup Performance (Note 3)	± 100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- I_O absolute maximum rating must be observed.
- HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
- Tested to EIA/JESD78 Class II.

Table 2. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage Operating	1.65	3.3	3.6	V
	Data Retention Only	1.5	3.3	3.6	
V_I	Digital Input Voltage	0	-	5.5	V
V_O	Output Voltage Active Mode (High or Low State)	0	-	V_{CC}	V
	Tri-State Mode	0	-	5.5	
	Power Down Mode ($V_{CC} = 0$ V)	0	-	5.5	
T_A	Operating Free-Air Temperature	-40	-	+125	$^{\circ}C$
t_r, t_f	Input Transition Rise or Fall Rate $V_I =$ from 0.8 V to 2.0 V, $V_{CC} = 3.0$ V	0	-	10	nS/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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Table 3. DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40°C to +85°C		T _A = -40°C to +125°C		Unit
				Min	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95	0.65 x V _{CC}	-	0.65 x V _{CC}	-	V
			2.3 to 2.7	1.7	-	1.7	-	
			2.7 to 3.6	2.0	-	2.0	-	
V _{IL}	Low-Level Input Voltage		1.65 to 1.95	-	0.35 x V _{CC}	-	0.35 x V _{CC}	V
			2.3 to 2.7	-	0.7	-	0.7	
			2.7 to 3.6	-	0.8	-	0.8	
V _{OH}	High-Level Output Voltage	V _I = V _{IH} or V _{IL}	1.65 to 3.6	V _{CC} - 0.2	-	V _{CC} - 0.2	-	V
		I _{OH} = -100 μA	1.65	1.2	-	1.2	-	
		I _{OH} = -4 mA	2.3	1.8	-	1.8	-	
		I _{OH} = -8 mA	2.7	2.2	-	2.2	-	
		I _{OH} = -12 mA	3.0	2.4	-	2.4	-	
		I _{OH} = -16 mA	3.0	2.2	-	2.2	-	
V _{OL}	Low-Level Output Voltage	V _I = V _{IH} or V _{IL}	1.65 to 3.6	-	0.2	-	0.2	V
		I _{OL} = 100 μA	1.65	-	0.45	-	0.45	
		I _{OL} = 4 mA	2.3	-	0.6	-	0.6	
		I _{OL} = 8 mA	2.7	-	0.4	-	0.4	
		I _{OL} = 12 mA	3.0	-	0.4	-	0.4	
		I _{OL} = 16 mA	3.0	-	0.55	-	0.6	
I _I	Input Leakage Current	V _I = 0 to 5.5 V	3.6	-	±5.0	-	±5.0	μA
I _{OFF}	Power Off Leakage Current	V _I = 5.5 V or V _O = 5.5 V	0	-	10	-	20	μA
I _{CC}	Quiescent Supply Current	V _I = 5.5 V or GND	3.6	-	10	-	10	μA
ΔI _{CC}	Increase in I _{CC} per Input	V _{IH} = V _{CC} - 0.6 V	2.3 to 3.6	-	500	-	500	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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Table 4. AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V _{CC} (V)	T _A = -40°C to +85°C		T _A = -40°C to +125°C		Unit
				Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay, In to Zn	See Figures 3 and 4	1.65 to 1.95	-	11.4	-	11.4	ns
			2.3 to 2.7	-	8.7	-	8.7	
			2.7	-	6.3	-	6.3	
			3.0 to 3.6	-	5.8	-	5.8	
t _{PLH} , t _{PHL}	Propagation Delay, S to Zn	See Figures 3 and 4	1.65 to 1.95	-	13.0	-	13.0	ns
			2.3 to 2.7	-	9.0	-	9.0	
			2.7	-	8.0	-	8.0	
			3.0 to 3.6	-	7.0	-	7.0	
t _{PLH} , t _{PHL}	Propagation Delay, to Zn	See Figures 3 and 4	1.65 to 1.95	-	13.0	-	13.0	ns
			2.3 to 2.7	-	9.0	-	9.0	
			2.7	-	8.0	-	8.0	
			3.0 to 3.6	-	7.0	-	7.0	

Table 5. DYNAMIC SWITCHING CHARACTERISTICS

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

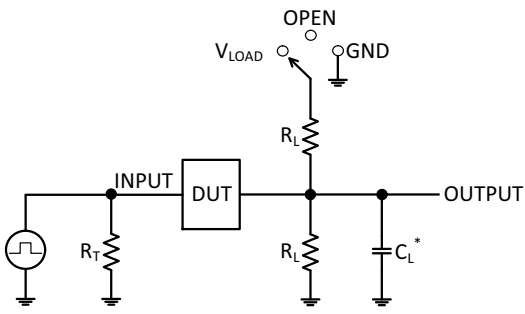
4. Number of outputs defined as “n”. Measured with “n-1” outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

Table 6. CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical (T _A = 25°C)	Unit
C _{IN}	Input Capacitance	V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	7	pF
C _{OUT}	Output Capacitance	V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	8	
C _{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC}	25	

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I_{CC(OPR)} = C_{PD} × V_{CC} × f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption: P_D = C_{PD} × V_{CC}² × f_{in} + I_{CC} × V_{CC}.

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C_L includes probe and jig capacitance
 R_T is Z_{OUT} of pulse generator (typically 50 Ω)
 $f = 1$ MHz

Figure 3. Test Circuit

Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	V_{LOAD}
t_{PHZ} / t_{PZH}	GND

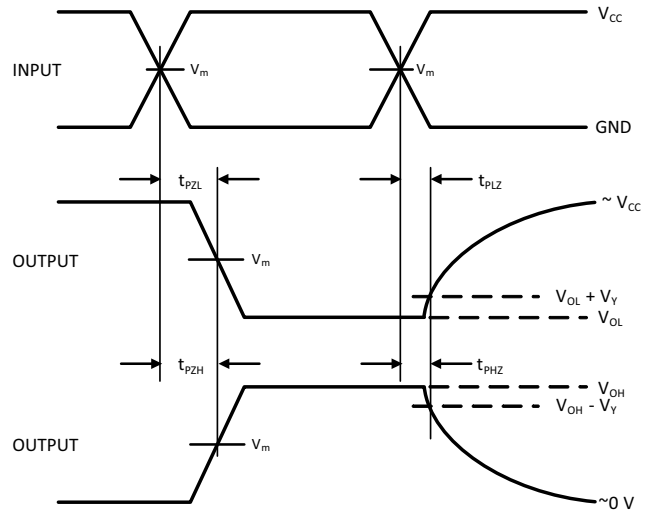
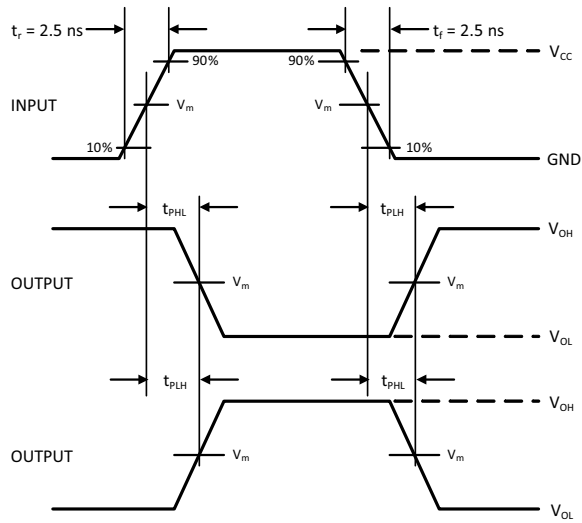


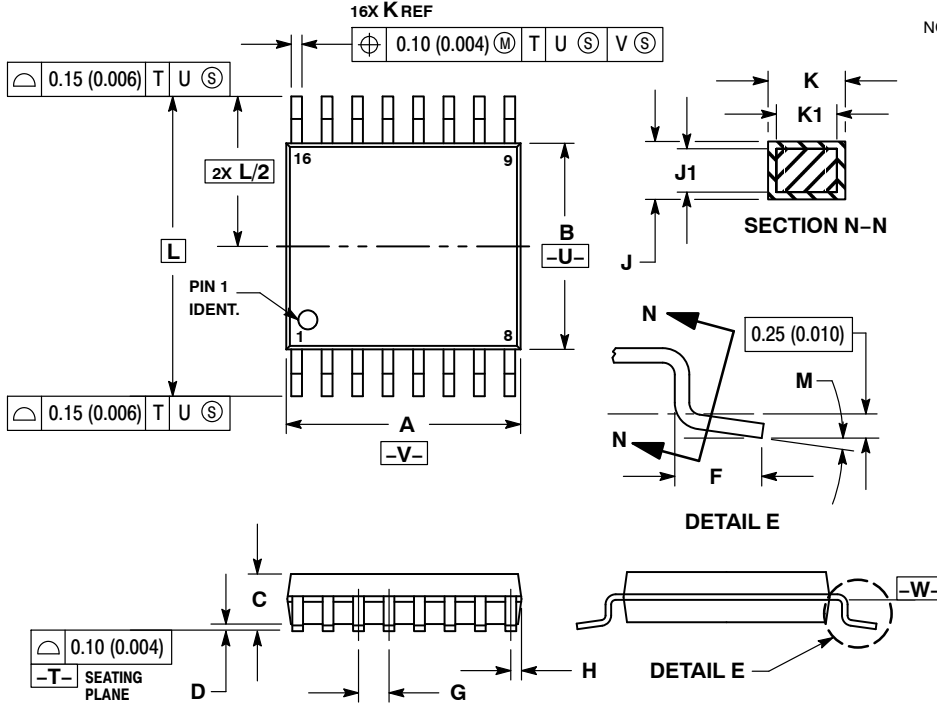
Figure 4. Switching Waveforms

V_{CC}, V	R_L, Ω	C_L, pF	V_{LOAD}	V_m, V	V_Y, V
1.65 to 1.95	500	30	$2 \times V_{CC}$	$V_{CC}/2$	0.15
2.3 to 2.7	500	30	$2 \times V_{CC}$	$V_{CC}/2$	0.15
2.7	500	50	6 V	1.5	0.3
3.0 to 3.6	500	50	6 V	1.5	0.3

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PACKAGE DIMENSIONS

TSSOP-16
DT SUFFIX
CASE 948F
ISSUE B

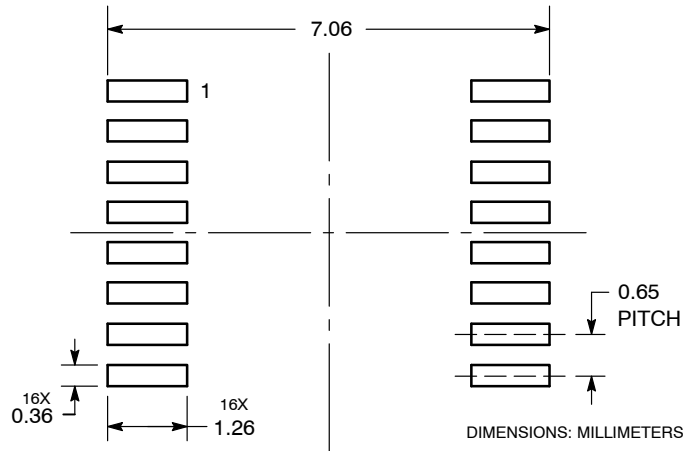


NOTES:

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	0.18	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°

SOLDERING FOOTPRINT*

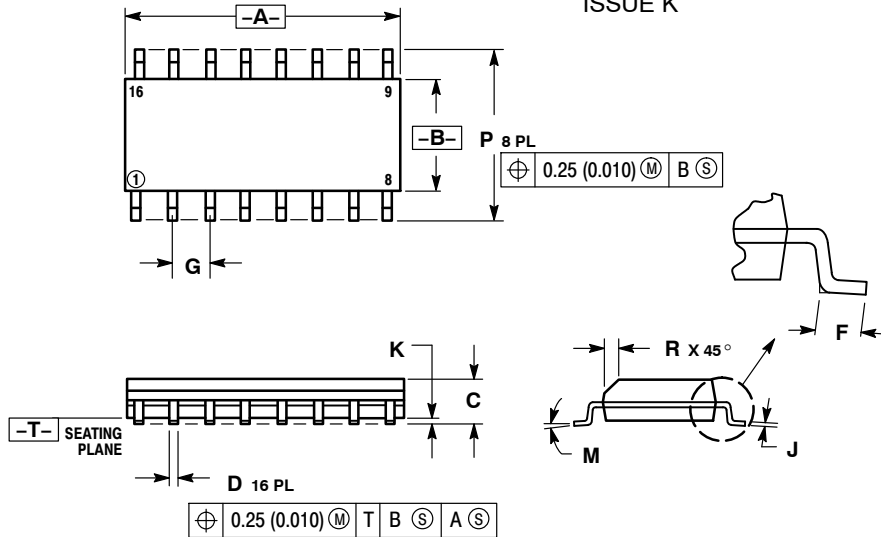


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC74LCX157A

PACKAGE DIMENSIONS

SOIC-16
D SUFFIX
CASE 751B-05
ISSUE K

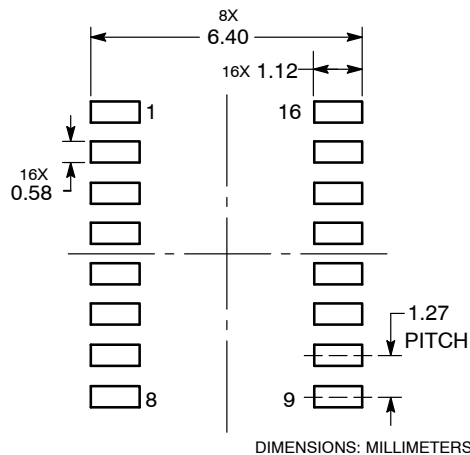


NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- 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

SOLDERING FOOTPRINT*



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