

# MC74LCX258

## Low-Voltage CMOS Quad 2-Input Multiplexer

### With 5 V-Tolerant Inputs and Outputs (3-State, Inverting)

The MC74LCX258 is a high performance, quad 2-input inverting multiplexer with 3-state outputs operating from a 2.3 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 MC74LCX258 inputs to be safely driven from 5 V devices.

Four bits of data from two sources can be selected using the Select input. The four outputs present the selected data in the inverted form. The outputs may be switched to a high impedance state by placing a logic HIGH on the Output Enable ( $\overline{OE}$ ) input. Current drive capability is 24 mA at the outputs.

#### Features

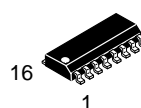
- Designed for 2.3 to 3.6 V  $V_{CC}$  Operation
- 5 V Tolerant – Interface Capability With 5 V TTL Logic
- Supports Live Insertion and Withdrawal
- $I_{OFF}$  Specification Guarantees High Impedance When  $V_{CC} = 0$  V
- TTL Compatible
- CMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in all Three Logic States (10  $\mu$ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance: Human Body Model >2000 V  
Machine Model >200 V
- Pb-Free Packages are Available\*



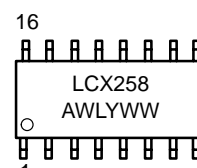
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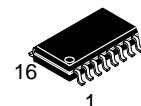
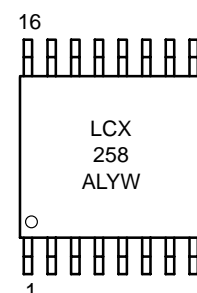
#### MARKING DIAGRAMS



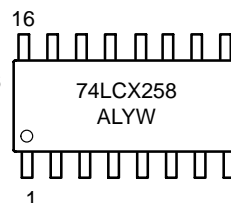
SOIC-16  
D SUFFIX  
CASE 751B



TSSOP-16  
DT SUFFIX  
CASE 948F



SOEIAJ-16  
M SUFFIX  
CASE 966



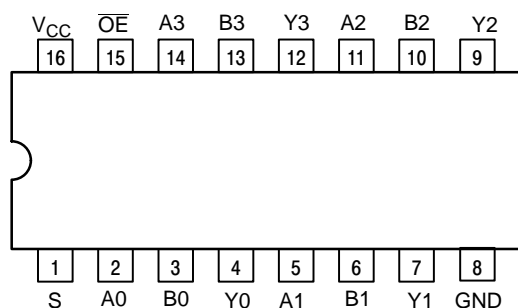
A = Assembly Location  
L, WL = Wafer Lot  
Y = Year  
W, WW = Work Week

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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

## MC74LCX258



### PIN NAMES

Pins	Function
An	Source 0 Data Inputs
Bn	Source B Data Inputs
$\overline{OE}$	Enable Input
S	Select Input
Yn	Outputs

Figure 1. Pinout: 16-Lead Plastic Package (Top View)

### TRUTH TABLE

Inputs		Outputs
Output Enable	Select	Y0–Y3
H	X	Z
L	L	A0–A3
L	H	B0–B3

X = Don't Care

A0–A3, B0–B3 = The levels of the respective Data-Word Inputs

### 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 LCX258.

##### 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 LCX258.

#### 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 LCX258. For the Output Enable input at a high level, the outputs are at a high level for the LCX258.

##### 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.

#### CONTROL 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 3-state off.

# MC74LCX258

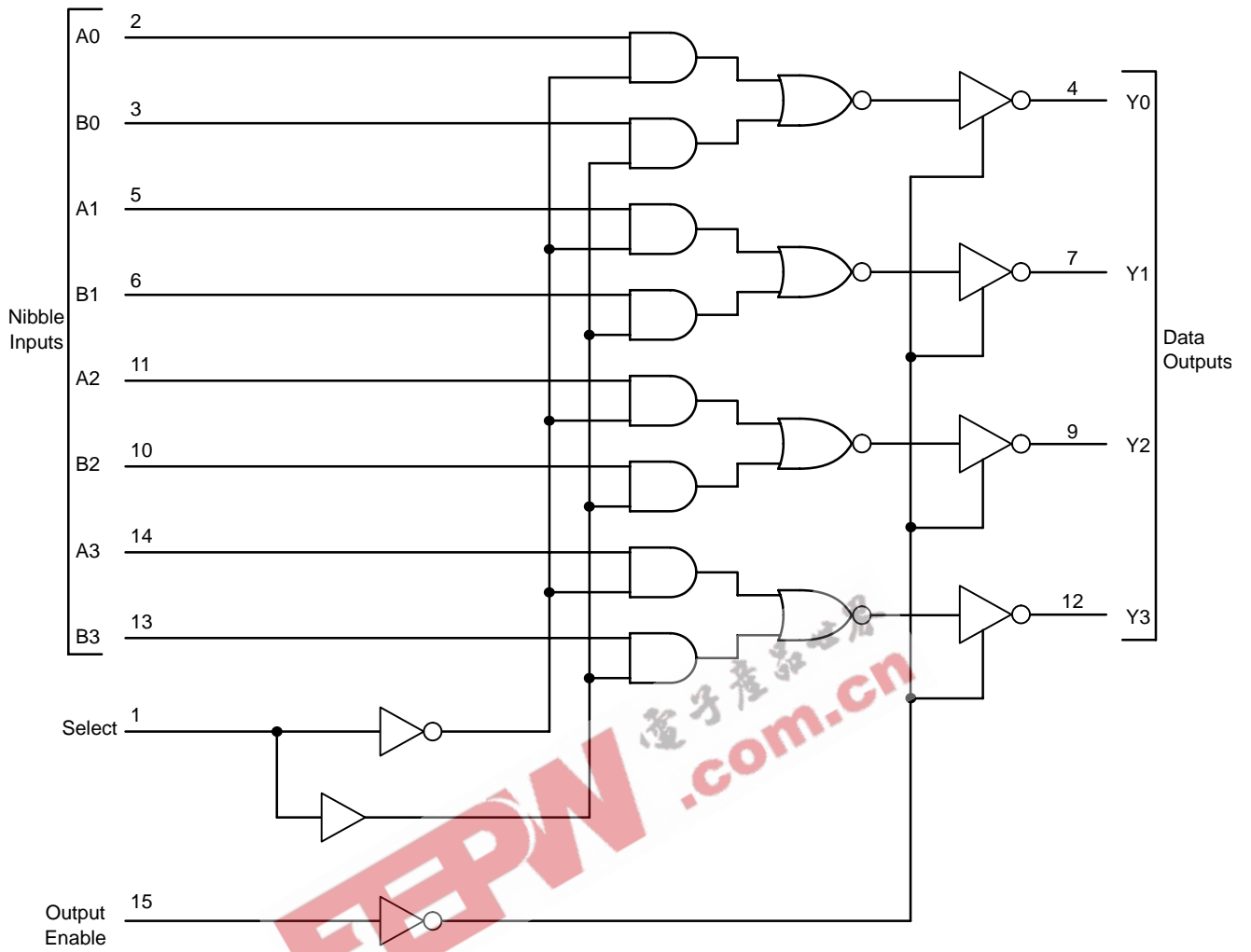


Figure 2. Expanded Logic Diagram

## MC74LCX258

### MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0		V
$V_I$	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$		V
$V_O$	DC Output Voltage	$-0.5 \leq V_O \leq V_{CC} + 0.5$	Note 1	V
$I_{IK}$	DC Input Diode Current	-50	$V_I < \text{GND}$	mA
$I_{OK}$	DC Output Diode Current	-50	$V_O < \text{GND}$	mA
		+50	$V_O > V_{CC}$	mA
$I_O$	DC Output Source/Sink Current	$\pm 50$		mA
$I_{CC}$	DC Supply Current Per Supply Pin	$\pm 100$		mA
$I_{GND}$	DC Ground Current Per Ground Pin	$\pm 100$		mA
$T_{STG}$	Storage Temperature Range	-65 to +150		$^{\circ}\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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	2.3 to 3.3	3.6
		Data Retention Only	1.5		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	$V_{CC} = 3.0\text{ V} - 3.6\text{ V}$		-24	mA
		$V_{CC} = 2.7\text{ V} - 3.0\text{ V}$		-12	
		$V_{CC} = 2.3\text{ V} - 2.7\text{ V}$		-8	
$I_{OL}$	LOW Level Output Current	$V_{CC} = 3.0\text{ V} - 3.6\text{ V}$		+24	mA
		$V_{CC} = 2.7\text{ V} - 3.0\text{ V}$		+12	
		$V_{CC} = 2.3\text{ V} - 2.7\text{ V}$		+8	
$T_A$	Operating Free-Air Temperature	-40		+85	$^{\circ}\text{C}$
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, $V_{IN}$ from 0.8 V to 2.0 V, $V_{CC} = 3.0\text{ V}$	0		10	ns/V

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC74LCX258D	SOIC-16	48 Units / Rail
MC74LCX258DG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74LCX258DR2	SOIC-16	2500 Tape & Reel
MC74LCX258DR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74LCX258DT	TSSOP-16*	96 Units / Rail
MC74LCX258DTR2	TSSOP-16*	2500 Tape & Reel
MC74LCX258M	SOEIAJ-16	48 Units / Rail
MC74LCX258MEL	SOEIAJ-16	2000 Tape & Reel

<sup>†</sup>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.

\*This package is inherently Pb-Free.

## MC74LCX258

### DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T <sub>A</sub> = -40°C to +85°C		Unit
			Min	Max	
V <sub>IH</sub>	Minimum HIGH Level Input Voltage (Note 2)	2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V 2.7 V ≤ V <sub>CC</sub> ≤ 3.0 V 3.0 V ≤ V <sub>CC</sub> ≤ 3.6 V	1.7 2.0 2.0		V
V <sub>IL</sub>	Maximum LOW Level Input Voltage (Note 2)	2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V 2.7 V ≤ V <sub>CC</sub> ≤ 3.0 V 3.0 V ≤ V <sub>CC</sub> ≤ 3.6 V		0.7 0.8 0.8	V
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OH</sub> = -100 μA V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -8 mA V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -12 mA V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -18 mA V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -24 mA	V <sub>CC</sub> - 0.2 1.7 2.2 2.4 2.2		V
V <sub>OL</sub>	Maximum LOW Level Output Voltage	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OH</sub> = 100 μA V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = 8 mA V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = 12 mA V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = 16 mA V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = 24 mA		0.2 0.7 0.4 0.4 0.55	V
I <sub>I</sub>	Input Leakage Current	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; 0 V ≤ V <sub>I</sub> ≤ 5.5 V		±5.0	μA
I <sub>CC</sub>	Quiescent Supply Current	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; 3.6 V ≤ V <sub>I</sub> ≤ 5.5 V		10 ±10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V		500	μA

2. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

### AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Limits						Unit
		T <sub>A</sub> = -40°C to +85°C						
		V <sub>CC</sub> = 3.0 V to 3.6 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 2.3 V to 2.7 V		
		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 30 pF		
		Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay A to B to Y	1.0	6.5	1.0	7.5	1.0	8.5	ns
t <sub>PHL</sub>		1.0	6.5	1.0	7.5	1.0	8.5	ns
t <sub>PLH</sub>	Propagation Delay S to Y	1.0	7.0	1.0	8.0	1.0	9.0	ns
t <sub>PHL</sub>		1.0	7.0	1.0	8.0	1.0	9.0	ns
t <sub>PZL</sub>	Propagation Delay OE to Y	1.0	7.0	1.0	8.0	1.0	9.0	ns
t <sub>PZH</sub>		1.0	7.0	1.0	8.0	1.0	9.0	ns
t <sub>PLZ</sub>	Propagation Delay OE to Y	1.0	6.0	1.0	7.0	1.0	8.0	ns
t <sub>PHZ</sub>		1.0	6.0	1.0	7.0	1.0	8.0	ns
t <sub>OSSL</sub>	Output-to-Output Skew		1.0					ns
t <sub>OSLH</sub>			1.0					ns

### DYNAMIC SWITCHING CHARACTERISTICS

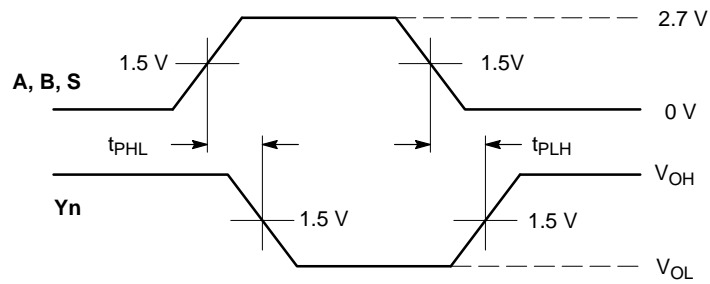
Symbol	Characteristic	Condition	T <sub>A</sub> = +25°C			Unit
			Min	Typ	Max	
V <sub>OLP</sub>	Dynamic LOW Peak Voltage (Note 3)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V		0.8		V
V <sub>OLV</sub>	Dynamic LOW Valley Voltage (Note 3)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V		0.8		V

3. 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

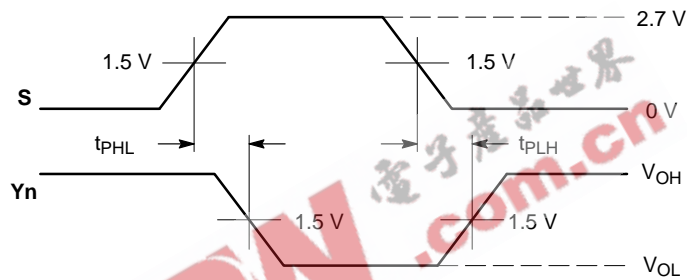
Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	7	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	25	pF

## MC74LCX258



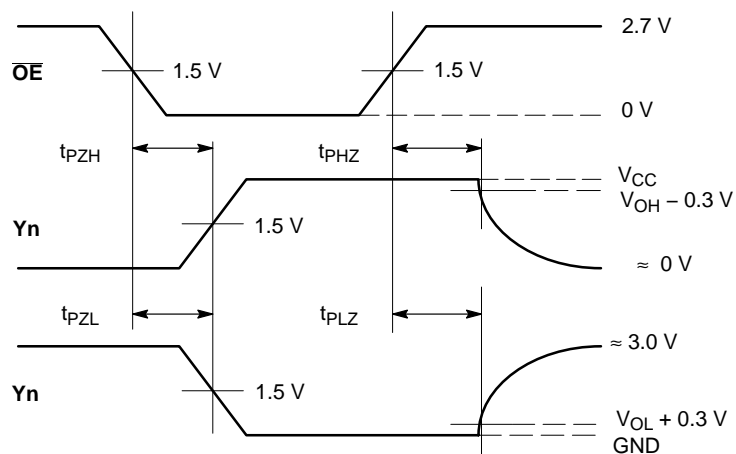
**WAVEFORM 1 – NONINVERTING PROPAGATION DELAYS**

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

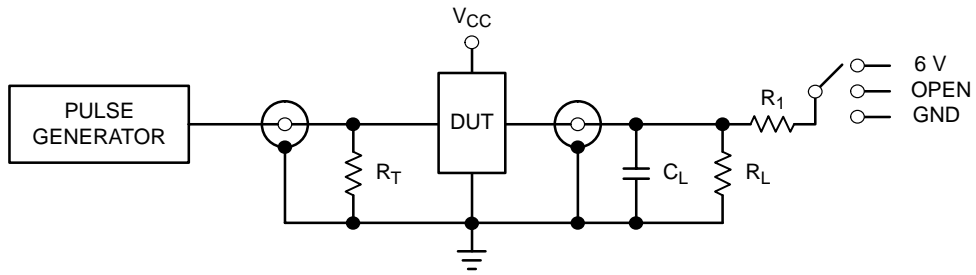


**WAVEFORM 3 – OUTPUT ENABLE AND DISABLE TIMES**

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

**Figure 3. AC Waveforms**

## MC74LCX258



Test	Switch
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	6 V
Open Collector/Drain $t_{PLH}$ and $t_{PHL}$	6 V
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L = 50$  pF or equivalent (Includes jig and probe capacitance)

$R_L = R_1 = 500 \Omega$  or equivalent

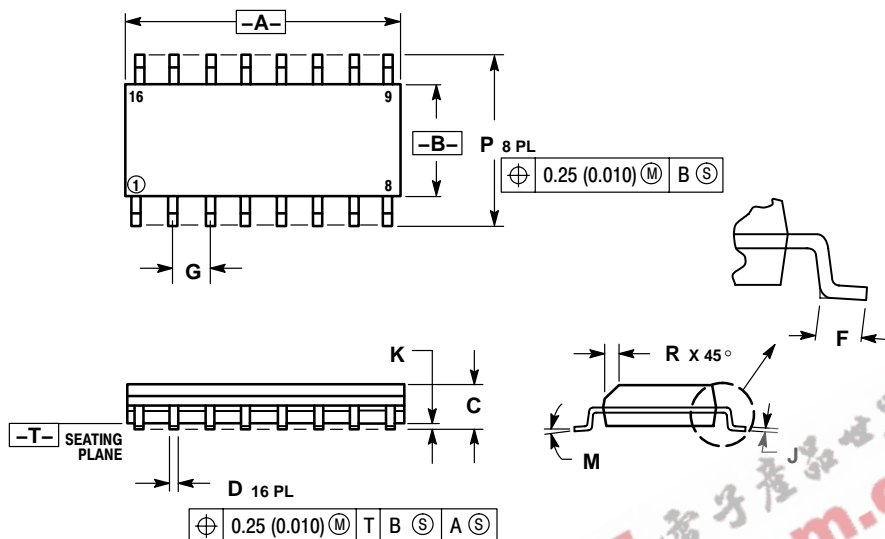
$R_T = Z_{OUT}$  of pulse generator (typically  $50 \Omega$ )

Figure 4. Test Circuit

# MC74LCX258

## PACKAGE DIMENSIONS

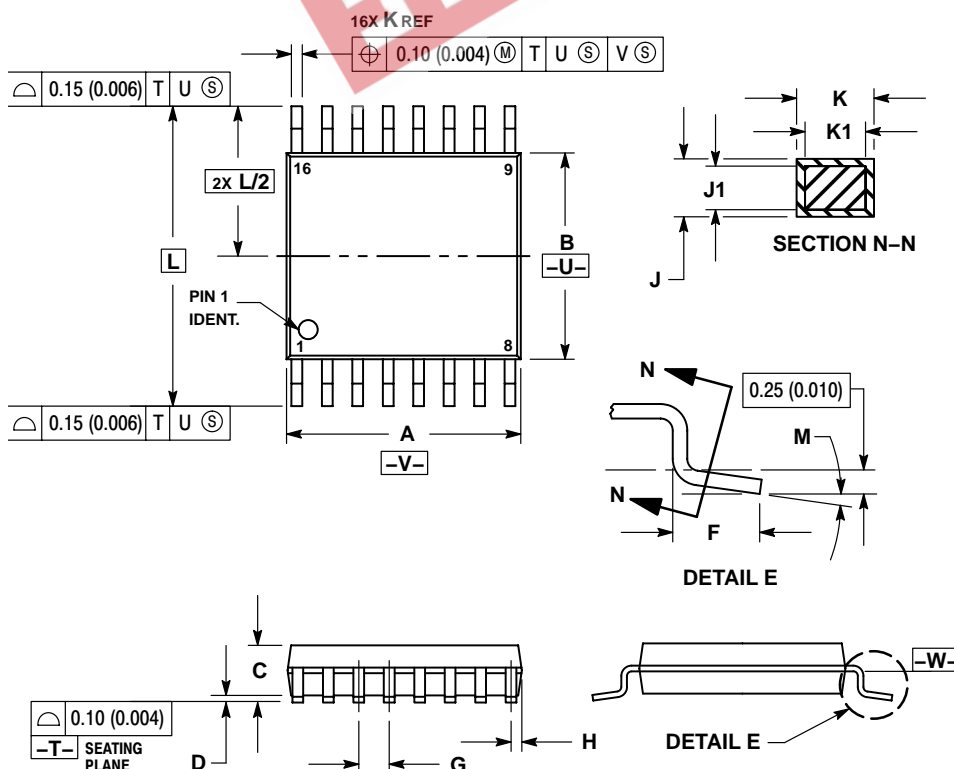
SOIC-16  
D SUFFIX  
CASE 751B-05  
ISSUE J



- 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

TSSOP-16  
DT SUFFIX  
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-.

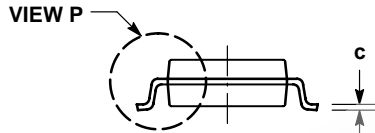
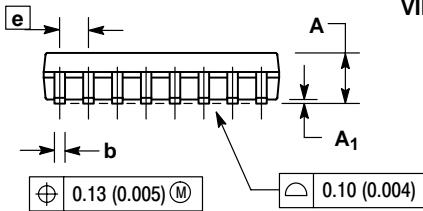
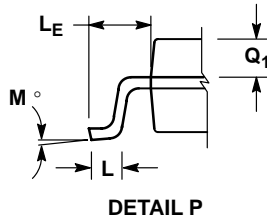
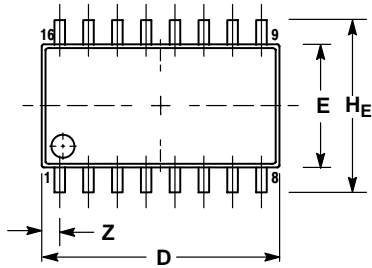
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°



# MC74LCX258

## PACKAGE DIMENSIONS

SOEIAJ-16  
M SUFFIX  
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 <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	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 <sub>E</sub>	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L <sub>E</sub>	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	---	0.78	---	0.031

# MC74LCX258

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