

# Low-Voltage 16-Bit Buffer/Line Driver with 5 V Tolerant Inputs and Outputs

## 74LCX16244

### General Description

The LCX16244 contains sixteen non-inverting buffers with 3-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver. The device is nibble controlled. Each nibble has separate 3-STATE control inputs which can be shorted together for full 16-bit operation.

The LCX16244 is designed for low voltage (2.5 or 3.3 V)  $V_{CC}$  applications with capability of interfacing to a 5 V signal environment.

The LCX16244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

### Features

- 5 V Tolerant Inputs and Outputs
- 1.65 V to 5.5 V  $V_{CC}$  Specifications Provided
- 4.5 ns  $t_{PD}$  max ( $V_{CC} = 3.3$  V)
- 10  $\mu$ A  $I_{CCQ}$  max
- Power Down High Impedance Inputs and Outputs
- Supports Live Insertion and Withdrawal\*
- $\pm 24$  mA Output Drive ( $V_{CC} = 3.0$  V)
- Uses Patented Noise/EMI Reduction Circuitry
- Latch-up Performance Exceeds 100 mA
- ESD Performance:
  - ♦ Human Body Model >2000 V
- This Device is Halide Free and Pb-Free

\*To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

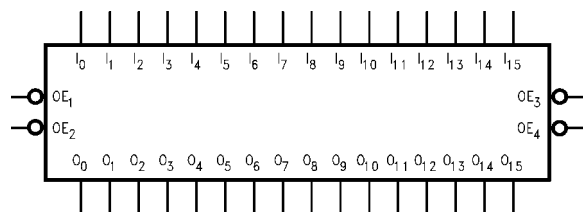
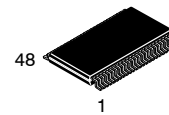
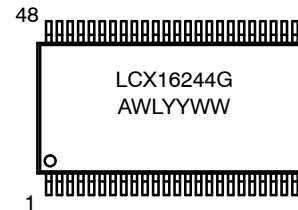


Figure 1. Logic Symbol



TSSOP48 12.5x6.1  
CASE 948BQ

### MARKING DIAGRAM



LCX16244 = Specific Device Code  
 A = Assembly Location  
 WL = Wafer Lot  
 YY = Year  
 WW = Work Week

### PIN DESCRIPTION

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active LOW)
$I_0-I_{15}$	Inputs
$O_0-O_{15}$	Outputs
NC	No Connect

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

# Connection Diagram

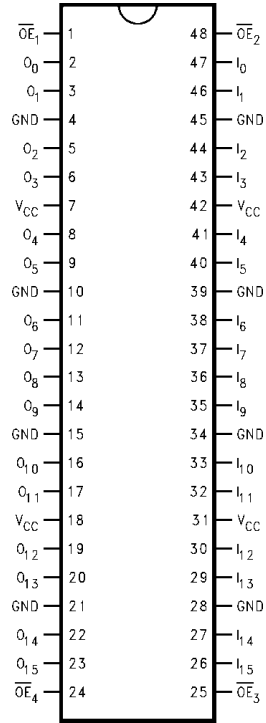


Figure 2. Pin Assignment

# TRUTH TABLE

Inputs		Outputs
$\overline{OE}_1$	$I_0-I_3$	$O_0-O_3$
L	L	L
L	H	H
H	X	Z

$\overline{OE}_2$	$I_4-I_7$	$O_4-O_7$
L	L	L
L	H	H
H	X	Z

$\overline{OE}_3$	$I_8-I_{11}$	$O_8-O_{11}$
L	L	L
L	H	H
H	X	Z

$\overline{OE}_4$	$I_{12}-I_{15}$	$O_{12}-O_{15}$
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial (HIGH or LOW, inputs may not float)

Z = High Impedance

# Functional Description

The LCX16244 contains sixteen non-inverting buffers with 3-STATE standard outputs. The device is nibble (4 bits) controlled with each nibble functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation. The 3-STATE outputs are controlled by an Output Enable ( $\overline{OE}_n$ ) input for each nibble. When  $\overline{OE}_n$  is LOW, the outputs are in 2-state mode. When  $\overline{OE}_n$  is HIGH, the outputs are in the high impedance mode, but this does not interfere with entering new data into the inputs.

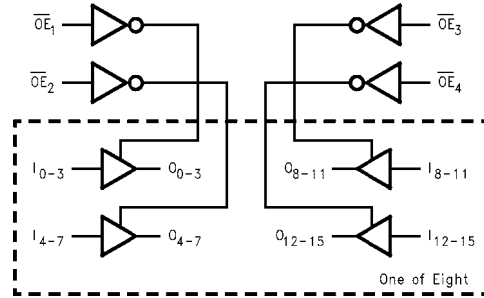


Figure 3. Logic Diagram

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage	−0.5 to +6.5	V
$V_{IN}$	DC Input Voltage (Note 1)	−0.5 to +6.5	V
$V_{OUT}$	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	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 secs	260	°C
$T_J$	Junction Temperature Under Bias	+150	°C
$\theta_{JA}$	Thermal Resistance (Note 2)	71	°C/W
$P_D$	Power Dissipation in Still Air	1765	mW
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 3) Human Body Model Charged Device Model	>2000 N/A	V

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.

1.  $I_O$  absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
3. 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.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
$V_{CC}$	Supply Voltage Operating Data Retention Only	1.65 1.5	3.3 3.3	5.5 5.5	V
$V_{IN}$	Digital Input Voltage	0	–	5.5	V
$V_{OUT}$	Output Voltage Active Mode (High or Low State) Tri-State Mode Power Down Mode ( $V_{CC} = 0$ V)	0 0 0	– – –	$V_{CC}$ 5.5 5.5	V
$T_A$	Operating Free-Air Temperature	−55	–	+125	°C
$t_r, t_f$	Input Rise or Fall Rate $V_{CC} = 1.65$ V to 1.95 V $V_{CC} = 2.3$ V to 2.7 V $V_{IN}$ from 0.8 V to 2.0 V, $V_{CC} = 3.0$ V $V_{CC} = 4.5$ V to 5.5 V	0 0 0 0	– – – –	20 20 10 5	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.

4. 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.

# 74LCX16244

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 °C to +85 °C		T <sub>A</sub> = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 to 1.95	0.65 x V <sub>CC</sub>	–	0.65 x V <sub>CC</sub>	–	V
			2.3 to 2.7	1.7	–	1.7	–	
			2.7 to 3.6	2.0	–	2.0	–	
			4.5 to 5.5	0.7 x V <sub>CC</sub>	–	0.7 x V <sub>CC</sub>	–	
V <sub>IL</sub>	Low-Level Input Voltage		1.65 to 1.95	–	0.35 x V <sub>CC</sub>	–	0.35 x V <sub>CC</sub>	V
			2.3 to 2.7	–	0.7	–	0.7	
			2.7 to 3.6	–	0.8	–	0.8	
			4.5 to 5.5	–	0.3 x V <sub>CC</sub>	–	0.3 x V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	V <sub>CC</sub> – 0.1	–	V <sub>CC</sub> – 0.1	–	V
		I <sub>OH</sub> = –100 µA	1.65	1.2	–	1.2	–	
		I <sub>OH</sub> = –4 mA	2.3	1.8	–	1.8	–	
		I <sub>OH</sub> = –8 mA	2.7	2.2	–	2.2	–	
		I <sub>OH</sub> = –12 mA	3.0	2.4	–	2.4	–	
		I <sub>OH</sub> = –16 mA	3.0	2.2	–	2.2	–	
		I <sub>OH</sub> = –32 mA	4.5	3.8	–	3.8	–	
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	–	0.1	–	0.1	V
		I <sub>OH</sub> = –100 µA	1.65	–	0.45	–	0.45	
		I <sub>OH</sub> = –4 mA	2.3	–	0.6	–	0.6	
		I <sub>OH</sub> = –8 mA	2.7	–	0.4	–	0.4	
		I <sub>OH</sub> = –12 mA	3.0	–	0.4	–	0.4	
		I <sub>OH</sub> = –16 mA	3.0	–	0.55	–	0.55	
		I <sub>OH</sub> = –32 mA	4.5	–	0.6	–	0.6	
I <sub>I</sub>	Input Leakage Current	V <sub>I</sub> = 0 to 5.5 V	3.6	–	±5.0	–	±5.0	µA
I <sub>OZ</sub>	3-State Output Leakage Current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>O</sub> = 0 V to 5.5 V	3.6	–	±5.0	–	±5.0	µA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>I</sub> = 5.5 V or V <sub>O</sub> = 5.5 V	0	–	10	–	10	µA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>I</sub> = 5.5 V or GND	3.6	–	10	–	10	µA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	V <sub>IH</sub> = V <sub>CC</sub> – 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.

## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 °C to +85 °C		T <sub>A</sub> = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, I to O	See Figures 4 and 5	1.65 to 1.95	–	TBD	–	TBD	ns
			2.3 to 2.7	–	5.4	–	5.4	
			2.7	–	5.2	–	5.2	
			3.0 to 3.6	–	4.5	–	4.5	
			4.5 to 5.5	–	TBD	–	TBD	
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time, OE to O	See Figures 4 and 5	1.65 to 1.95	–	TBD	–	TBD	ns
			2.3 to 2.7	–	7.2	–	7.2	
			2.7	–	6.3	–	6.3	
			3.0 to 3.6	–	5.5	–	5.5	
			4.5 to 5.5	–	TBD	–	TBD	
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Disable Time, OE to O	See Figures 4 and 5	1.65 to 1.95	–	TBD	–	TBD	ns
			2.3 to 2.7	–	6.5	–	6.5	
			2.7	–	5.7	–	5.7	
			3.0 to 3.6	–	5.4	–	5.4	
			4.5 to 5.5	–	TBD	–	TBD	
t <sub>OSHL</sub> , t <sub>OSLH</sub>	Output to Output Skew, (Note 5)		1.65 to 1.95	–	–	–	–	ns
			2.3 to 2.7	–	–	–	–	
			2.7	–	–	–	–	
			3.0 to 3.6	–	1.0	–	1.0	
			4.5 to 5.5	–	–	–	–	

5. 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 outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSHL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>).

## DYNAMIC SWITCHING CHARACTERISTICS (Note 6)

Symbol	Characteristic	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = +25 °C, Typical	Units
V <sub>OLP</sub>	Quiet Output Dynamic Peak V <sub>OL</sub>	C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V	3.3 2.5	0.8 0.6	V
V <sub>OLV</sub>	Quiet Output Dynamic Valley V <sub>OL</sub>	C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V	3.3 2.5	–0.8 –0.6	V

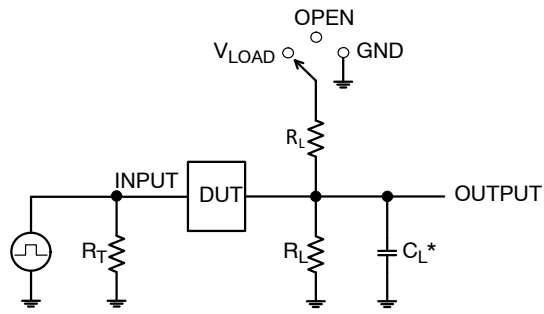
6. Number of outputs defined as “n”. Measured with “n–1” outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

## CAPACITANCE

Symbol	Parameter	Condition	Typical	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = Open, 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 (Note 7)	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> , f = 10 MHz	20	V

7. C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is 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<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

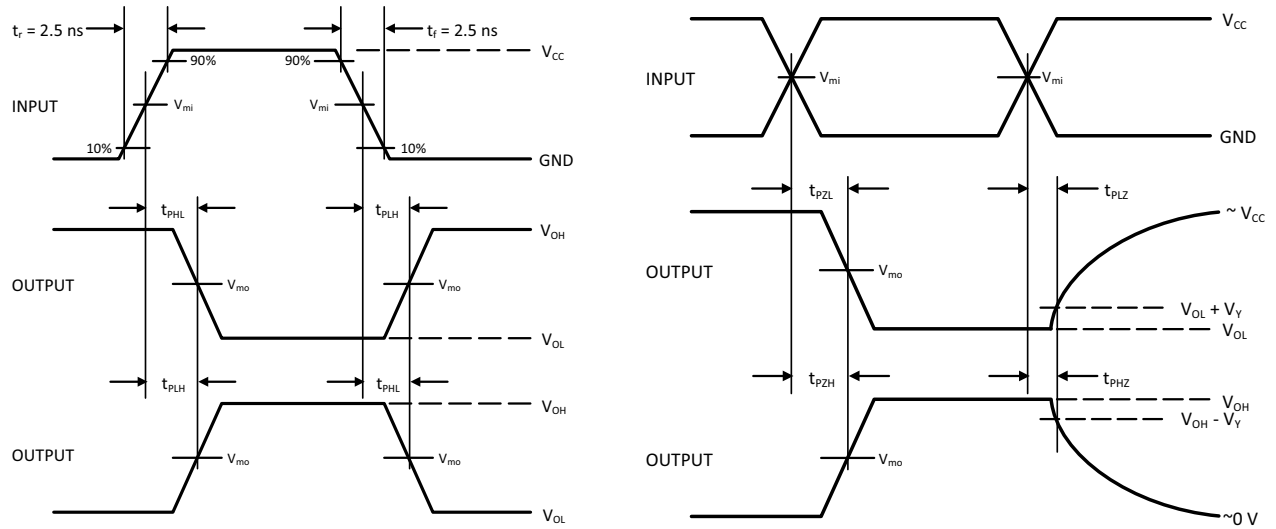
## 74LCX16244



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

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

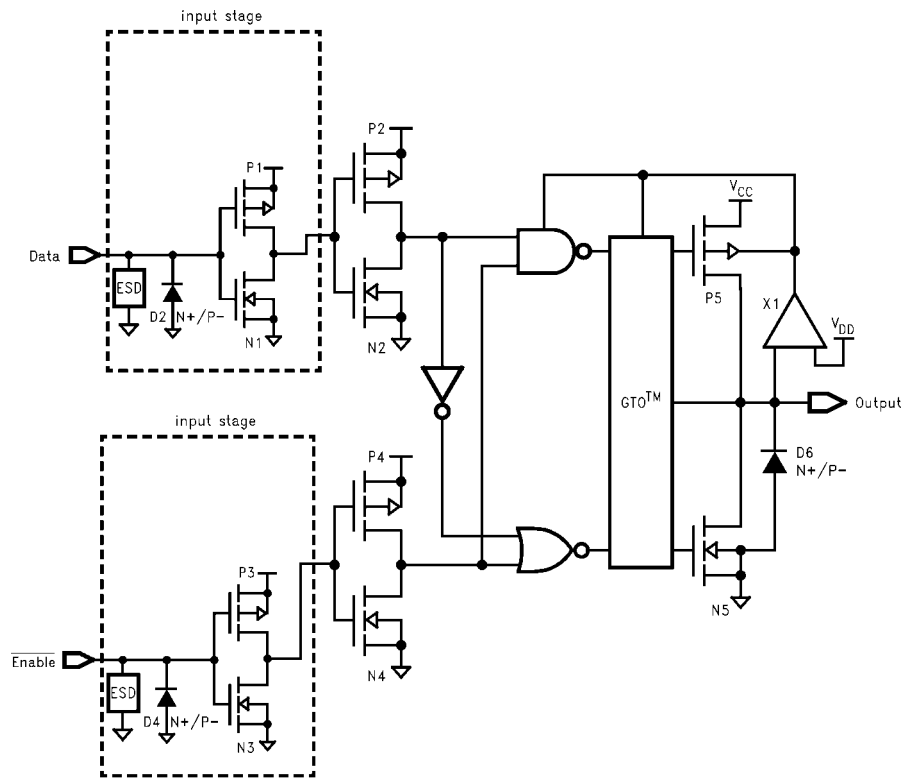
Figure 4. Test Circuit



$V_{CC}$ , V	$R_L$ , $\Omega$	$C_L$ , pF	$V_{LOAD}$	$V_{mi}$ , V	$V_{mo}$ , V	$V_Y$ , V
1.65 to 1.95	500	30	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	500	30	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.7	500	50	6 V	1.5	1.5	0.3
3.0 to 3.6	500	50	6 V	1.5	1.5	0.3
4.5 to 4.5	500	50	$2 \times V_{CC}$	$V_{CC}/2$	$V_{CC}/2$	0.3

Figure 5. Switching Waveforms

# 74LCX16244



**Figure 6. Schematic Diagram**

## ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
74LCX16244MTDX	LCX16244G	TSSOP-48	1000 Units / 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.

## 74LCX16244

### REVISION HISTORY

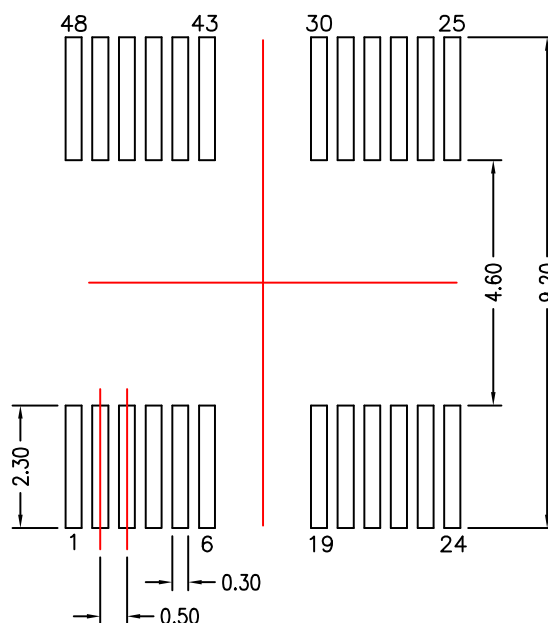
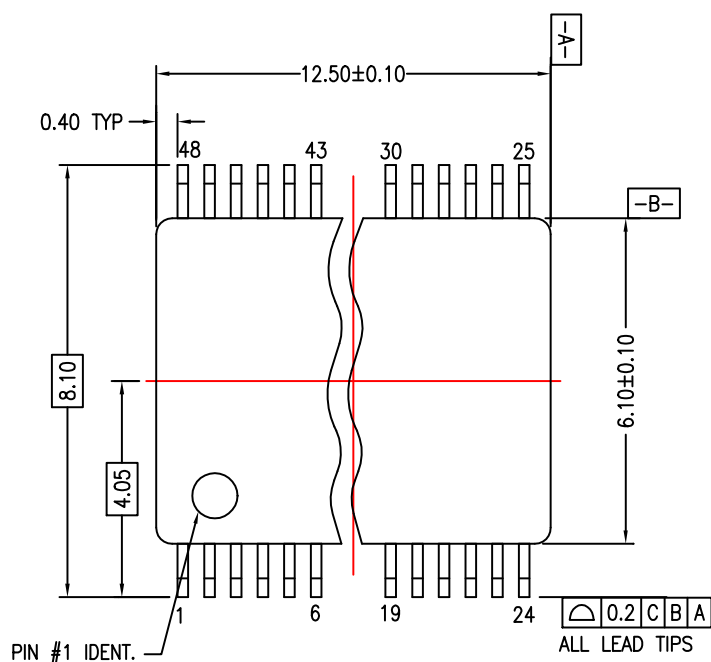
Revision	Description of Changes	Date
1	Converted the Data Sheet to <b>onsemi</b> format with the updates in Ordering Information Table, Recommended Operating Table, Maximum Rating Table and Figure 4 and 5 from the data sheet MC74LCX16244/D.	9/29/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

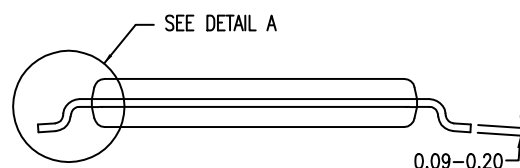
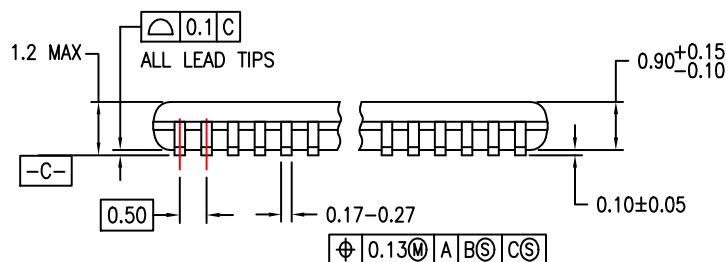


**TSSOP48 12.5x6.1**  
CASE 948BQ  
ISSUE O

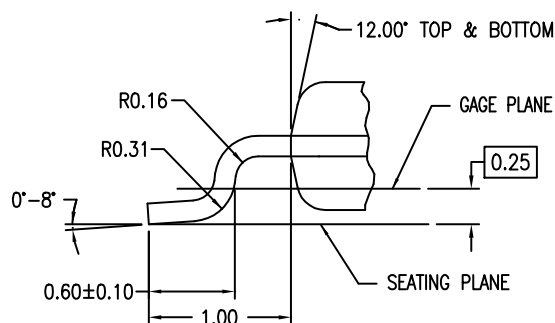
DATE 30 SEP 2016



## LAND PATTERN RECOMMENDATION



→ 12.00° TOP & BOTTOM



DETAIL A

DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION ED,  
DATE 4/97.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH,  
AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

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