

## 74LCX07

### Low Voltage Hex Buffer with Open Drain Outputs

#### General Description

The LCX07 contains six buffers. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The outputs of the LCX07 are open drain and can be connected to other open drain outputs to implement active HIGH wire AND or active LOW wire OR functions.

The 74LCX07 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

#### Features

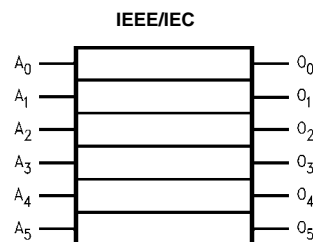
- 5V tolerant inputs
- 2.3V–5.5V  $V_{CC}$  specifications provided
- 2.9 ns  $t_{PD}$  max ( $V_{CC} = 3.3V$ ), 10  $\mu A$   $I_{CC}$  max
- Power down high impedance inputs and outputs
- +24 mA output drive ( $V_{CC} = 3.0V$ )
- Implements patented noise/EMI reduction circuitry
- Latch-up performance exceeds 500 mA
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

#### Ordering Code:

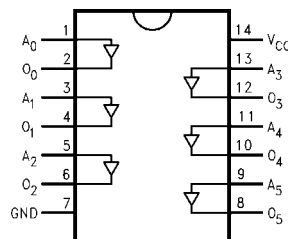
Order Number	Package Number	Package Description
74LCX07M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX07SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX07MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Logic Symbol



#### Connection Diagram



#### Pin Descriptions

Pin Names	Description
$A_n$	Inputs
$O_n$	Outputs

74LCX07 Low Voltage Hex Buffer with Open Drain Outputs

**Absolute Maximum Ratings** (Note 1)

Symbol	Parameter	Value	Conditions	Units
V <sub>CC</sub>	Supply Voltage	−0.5 to +7.0		V
V <sub>I</sub>	DC Input Voltage	−0.5 to +7.0		V
V <sub>O</sub>	DC Output Voltage	−0.5 to +7.0	Output in HIGH or LOW State (Note 2)	V
I <sub>IK</sub>	DC Input Diode Current	−50	V <sub>I</sub> < GND	mA
I <sub>OK</sub>	DC Output Diode Current	−50 +50	V <sub>O</sub> < GND V <sub>O</sub> > V <sub>CC</sub>	mA
I <sub>O</sub>	DC Output Current	±50		mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	±100		mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±100		mA
T <sub>STG</sub>	Storage Temperature	−65 to +150		°C

**Recommended Operating Conditions** (Note 3)

Symbol	Parameter	Min	Max	Units
V <sub>CC</sub>	Supply Voltage <div>Operating Data Retention</div>	2.0 1.5	5.5 5.5	V
V <sub>I</sub>	Input Voltage	0	5.5	V
V <sub>O</sub>	Output Voltage	0	5.5	V
I <sub>OL</sub>	Output Current <div>V<sub>CC</sub> = 4.5 – 5.5V V<sub>CC</sub> = 3.0V – 3.6V V<sub>CC</sub> = 2.7V – 3.0V V<sub>CC</sub> = 2.3V – 2.7V</div>	<div>+32 +24 +12 +8</div>	<div>+32 +24 +12 +8</div>	mA
T <sub>A</sub>	Free-Air Operating Temperature	−40	85	°C
Δt/ΔV	Input Edge Rate, V <sub>IN</sub> = 0.8V–2.0V, V <sub>CC</sub> = 3.0V	0	10	ns/V

**Note 1:** The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The Recommended Operating Conditions table will define the conditions for actual device operation.

**Note 2:** I<sub>O</sub> Absolute Maximum Rating must be observed.

**Note 3:** Unused inputs must be held HIGH or LOW. They may not float.

**DC Electrical Characteristics**

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = −40°C to +85°C		Units
				Min	Max	
V <sub>IH</sub>	HIGH Level Input Voltage		2.3 – 2.7	1.7		V
			2.7 – 3.6	2.0		
			4.5 – 5.5	0.7 x V <sub>CC</sub>		
V <sub>IL</sub>	LOW Level Input Voltage		2.3 – 2.7		0.7	V
			2.7 – 3.6		0.8	
			4.5 - 5.5		0.3 x V <sub>CC</sub>	
V <sub>OL</sub>	LOW Level Output Voltage	I <sub>OL</sub> = 100 μA	2.3 – 5.5		0.2	V
		I <sub>OL</sub> = 8 mA	2.3		0.6	
		I <sub>OL</sub> = 12 mA	2.7		0.4	
		I <sub>OL</sub> = 16 mA	3.0		0.4	
		I <sub>OL</sub> = 24 mA	3.0		0.55	
		I <sub>OL</sub> = 32 mA	4.5		0.55	
I <sub>I</sub>	Input Leakage Current	0 ≤ V <sub>I</sub> ≤ 5.5V	2.3 – 5.5		±5.0	μA
I <sub>OFF</sub>	Power-Off Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 5.5V	0		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>I</sub> = V <sub>CC</sub> or GND	2.3 – 5.5		10	μA
		3.6V ≤ V <sub>I</sub> ≤ 5.5V	2.3 – 5.5		±10	
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	V <sub>IH</sub> = V <sub>CC</sub> -0.6V	2.3 – 3.6		500	μA
			4.5 – 5.5		1	mA
I <sub>OHZ</sub>	Off State Current	V <sub>O</sub> = 5.5	2 - 5.5		10	μA

## AC Electrical Characteristics

Symbol	Parameter	T <sub>A</sub> = -40°C to +85°C, R <sub>L</sub> = 500Ω								Units
		V <sub>CC</sub> = 5.0V ± 0.5V		V <sub>CC</sub> = 3.3V ± 0.3V		V <sub>CC</sub> = 2.7V		V <sub>CC</sub> = 2.5V ± 0.2V		
		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 30 pF		
		Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PZL</sub>	Propagation Delay Time	0.5	3.0	0.8	3.7	1.0	4.4	0.8	3.8	ns
t <sub>PLZ</sub>		0.5	3.0	0.8	3.7	1.0	4.4	0.8	3.8	

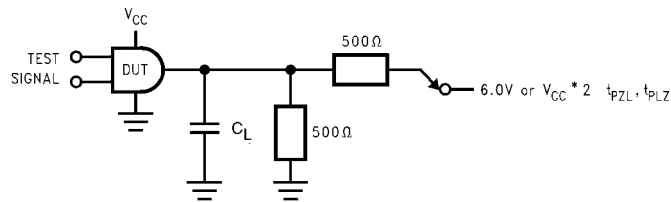
## Dynamic Switching Characteristics

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
$V_{OLP}$	Quiet Output Dynamic Peak $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$ $C_L = 30\text{ pF}, V_{IH} = 2.5\text{V}, V_{IL} = 0\text{V}$	3.3 2.5	0.9 0.7	V
$V_{OLV}$	Quiet Output Dynamic Valley $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$ $C_L = 30\text{ pF}, V_{IH} = 2.5\text{V}, V_{IL} = 0\text{V}$	3.3 2.5	-0.8 -0.6	V

## Capacitance

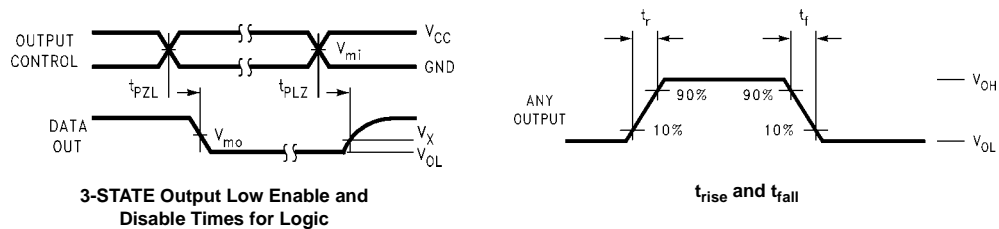
Symbol	Parameter	Conditions	Typical	Units
$C_{IN}$	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0\text{V or } V_{CC}$	7	pF
$C_{OUT}$	Output Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}$	8	pF
$C_{PD}$	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}, f = 10\text{ MHz}$	25	pF

## AC Loading and Waveforms



**FIGURE 1. AC Test Circuit**  
( $C_L$  includes probe and jig capacitance)

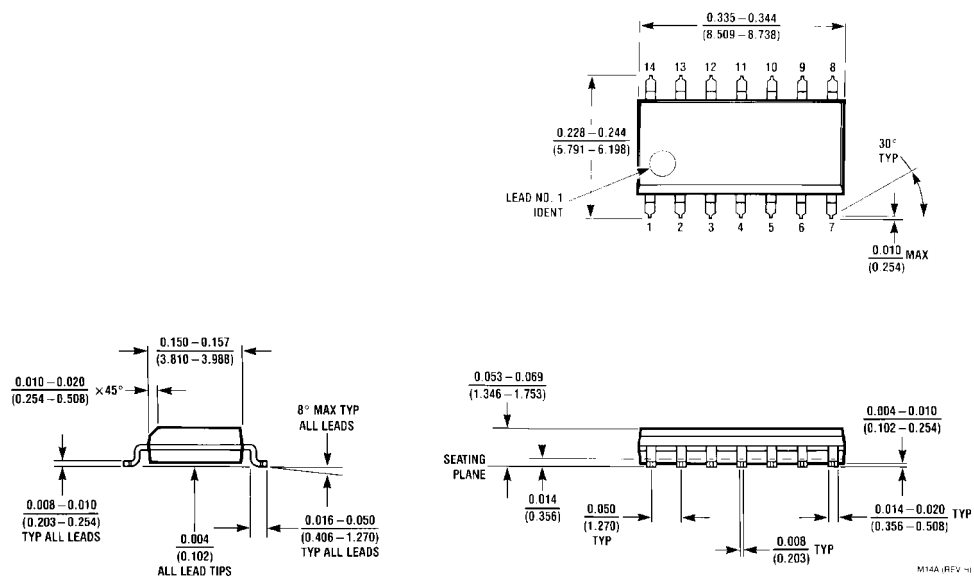
Test	Switch
$t_{PZL}, t_{PLZ}$	$V_{CC} \times 2$ at $V_{CC} = 5.0 \pm 0.5V$ 6V at $V_{CC} = 3.3 \pm 0.3V$ $V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2V$



**FIGURE 2. Waveforms**  
(Input Pulse Characteristics;  $f = 1MHz$ ,  $t_r = t_f = 3ns$ )

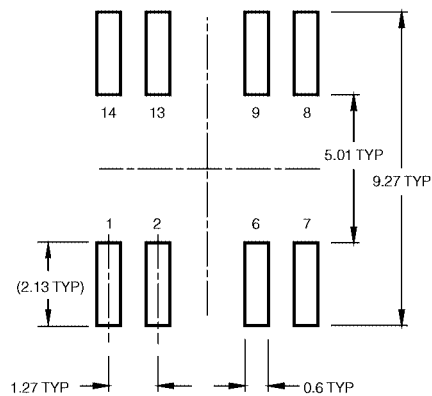
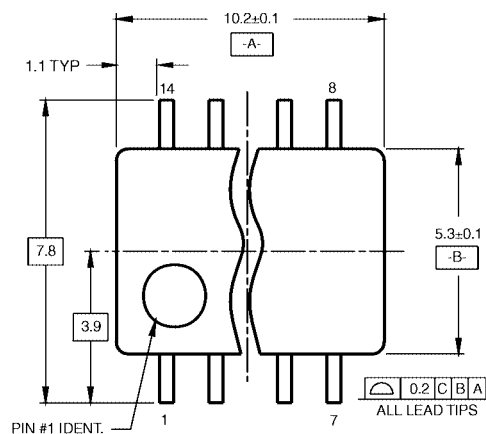
Symbol	$V_{CC}$			
	$5.0V \pm 0.5V$	$3.3V \pm 0.3V$	$2.7V$	$2.5V \pm 0.2V$
$V_{mi}$	$V_{CC}/2$	1.5V	1.5V	$V_{CC}/2$
$V_{mo}$	$V_{CC}/2$	1.5V	1.5V	$V_{CC}/2$
$V_x$	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
$V_y$	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

# Physical Dimensions inches (millimeters) unless otherwise noted

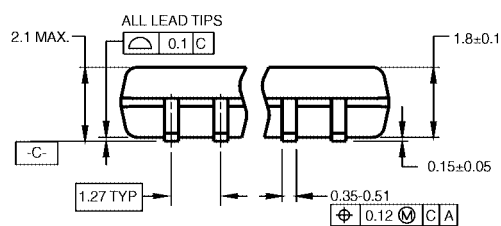


**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow  
Package Number M14A**

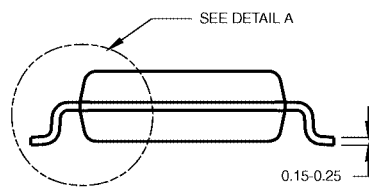
# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



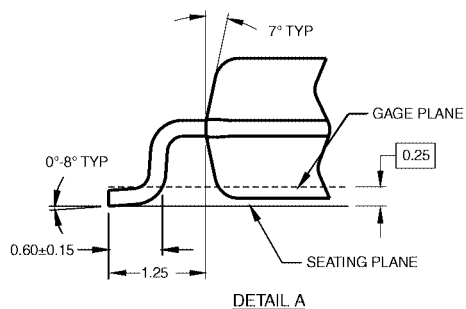
DIMENSIONS ARE IN MILLIMETERS



## NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

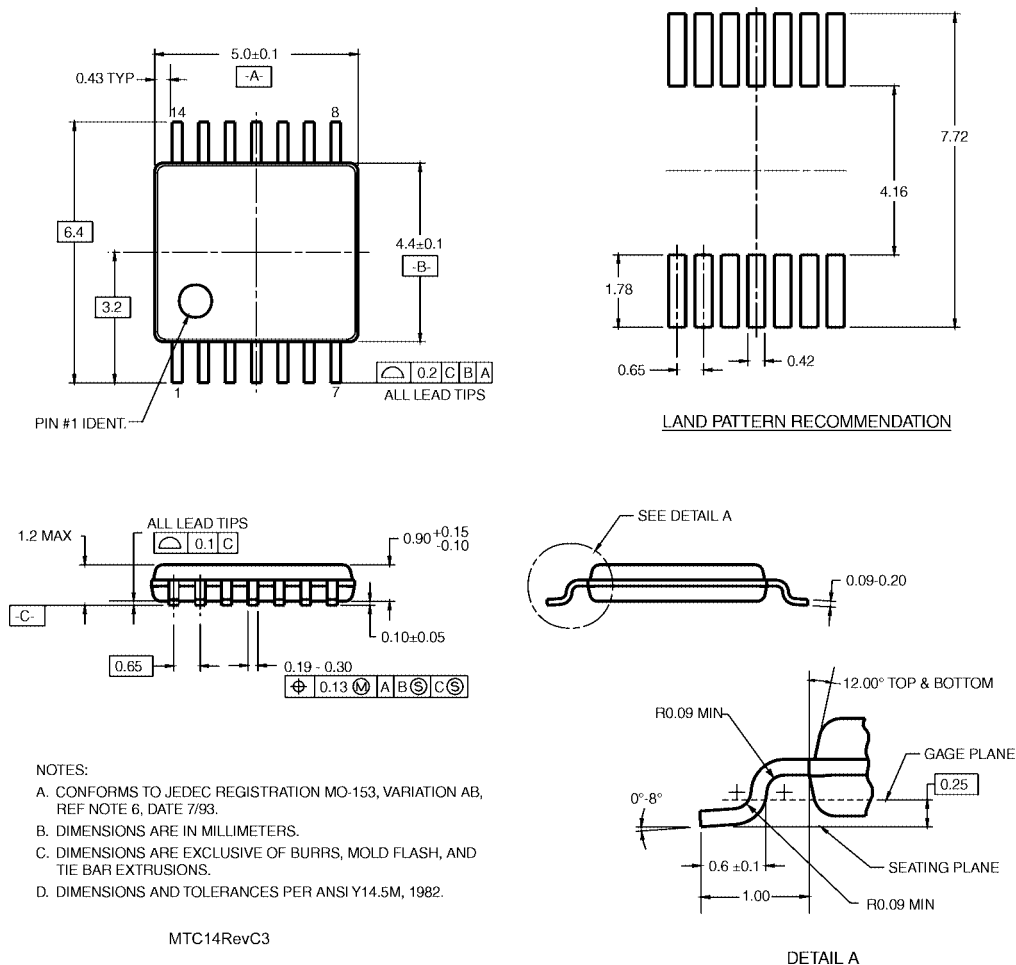
M14DRevB1



DETAIL A

**14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M14D**

# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



**14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC14**

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- A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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