

74LCX27

Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs

General Description

The LCX27 contains three 3-input NOR gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX27 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 4.9 ns t_{PD} max ($V_{CC} = 3.3V$), 10 μA 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:

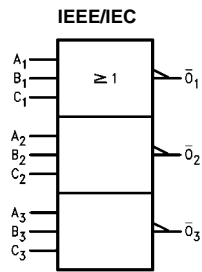
Order Number	Package Number	Package Description
74LCX27M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX27SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX27MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74LCX27MTCX_NL (Note 1)	MTC14	Pb-Free 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.
Pb-Free package per JEDEC J-STD-020B.

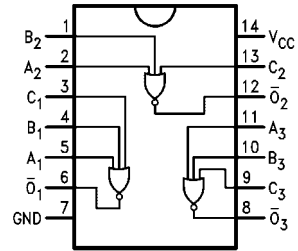
Note 1: "_NL" indicates Pb-Free package (per JEDEC J-STD-020B). Device available in Tape and Reel only.

74LCX27 Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
A_n, B_n, C_n	Inputs
\bar{O}_n	Outputs

Truth Table

$$\bar{O}_n = A_n + B_n + C_n$$

Inputs			Output
A_n	B_n	C_n	\bar{O}_n
H	X	X	L
X	H	X	L
X	X	H	L
L	L	L	H

H = HIGH Voltage Level L = LOW Voltage Level X = Immaterial

Absolute Maximum Ratings ^(Note 2)				
Symbol	Parameter	Value	Conditions	Units
V _{CC}	Supply Voltage	-0.5 to +7.0		V
V _I	DC Input Voltage	-0.5 to +7.0		V
V _O	DC Output Voltage	-0.5 to V _{CC} + 0.5	Output in HIGH or LOW State (Note 3)	V
I _{IK}	DC Input Diode Current	-50	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50 +50	V _O < GND 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	-65 to +150		°C

Recommended Operating Conditions ^(Note 4)					
Symbol	Parameter	Min	Max	Units	
V _{CC}	Supply Voltage				
		Operating	2.0	3.6	V
		Data Retention	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} /I _{OL}	Output Current				
		V _{CC} = 3.0V - 3.6V		±24	mA
		V _{CC} = 2.7V - 3.0V		±12	
		V _{CC} = 2.3V - 2.7V		±8	
T _A	Free-Air Operating Temperature	-40	85	°C	
Δt/ΔV	Input Edge Rate, V _{IN} = 0.8V-2.0V, V _{CC} = 3.0V	0	10	ns/V	

Note 2: 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 3: I_O Absolute Maximum Rating must be observed.

Note 4: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40°C to +85°C		Units	
				Min	Max		
V _{IH}	HIGH Level Input Voltage		2.3 - 2.7	1.7		V	
			2.7 - 3.6	2.0			
V _{IL}	LOW Level Input Voltage		2.3 - 2.7		0.7	V	
			2.7 - 3.6		0.8		
V _{OH}	HIGH Level Output Voltage	I _{OH} = -100 μA	2.3 - 3.6	V _{CC} - 0.2		V	
			I _{OH} = -8 mA	2.3	1.8		
			I _{OH} = -12 mA	2.7	2.2		
			I _{OH} = -18 mA	3.0	2.4		
			I _{OH} = -24 mA	3.0	2.2		
V _{OL}	LOW Level Output Voltage	I _{OL} = 100 μA	2.3 - 3.6		0.2	V	
			I _{OL} = 8 mA	2.3	0.6		
			I _{OL} = 12 mA	2.7	0.4		
			I _{OL} = 16 mA	3.0	0.4		
			I _{OL} = 24 mA	3.0	0.55		
I _I	Input Leakage Current	0 ≤ V _I ≤ 5.5V	2.3 - 3.6		±5.0	μA	
I _{OFF}	Power-Off Leakage Current	V _I or V _O = 5.5V	0		10	μA	
I _{CC}	Quiescent Supply Current	V _I = V _{CC} or GND	2.3 - 3.6		10	μA	
			3.6V ≤ V _I ≤ 5.5V	2.3 - 3.6			±10
ΔI _{CC}	Increase in I _{CC} per Input	V _{IH} = V _{CC} - 0.6V	2.3 - 3.6		500	μA	

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40^\circ\text{C to } +85^\circ\text{C}, R_L = 500\Omega$						Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		$V_{CC} = 2.5V \pm 0.2V$		
		$C_L = 50\text{pF}$		$C_L = 50\text{pF}$		$C_L = 30\text{pF}$		
		Min	Max	Min	Max	Min	Max	
t_{PHL}	Propagation Delay	1.5	4.9	1.5	5.8	1.5	5.9	ns
t_{PLH}		1.5	4.9	1.5	5.8	1.5	5.9	
t_{OSHL}	Output to Output Skew (Note 5)		1.0					ns
t_{OSLH}			1.0					

Note 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 any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

Dynamic Switching Characteristics

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

Capacitance

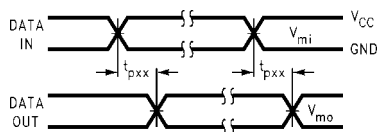
Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0V \text{ or } V_{CC}$	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V, V_I = 0V \text{ or } V_{CC}$	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V, V_I = 0V \text{ or } V_{CC}, f = 10\text{ MHz}$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

AC LOADING and WAVEFORMS Generic for LCX Family

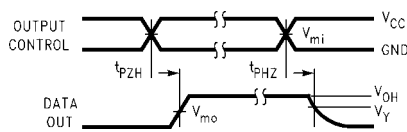


FIGURE 1. AC Test Circuit (C_L includes probe and jig capacitance)

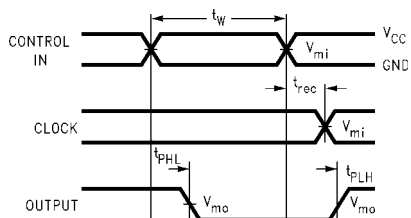
Test	Switch
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6V at $V_{CC} = 3.3 \pm 0.3V$ $V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2V$
t_{PZH}, t_{PHZ}	GND



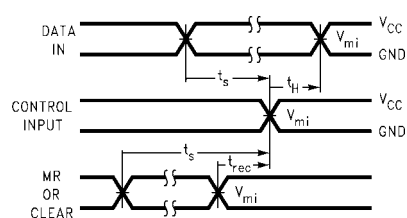
Waveform for Inverting and Non-Inverting Functions



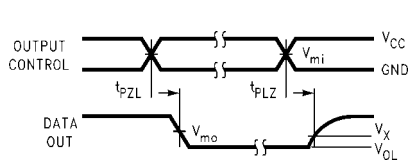
3-STATE Output High Enable and Disable Times for Logic



Propagation Delay, Pulse Width and t_{rec} Waveforms



Setup Time, Hold Time and Recovery Time for Logic



3-STATE Output Low Enable and Disable Times for Logic

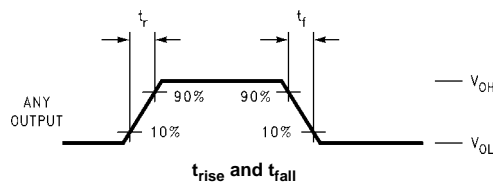


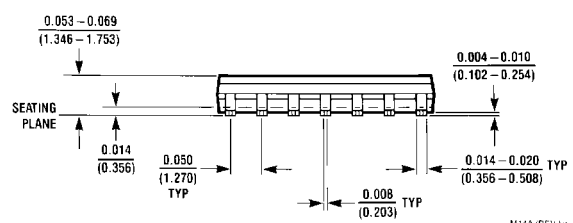
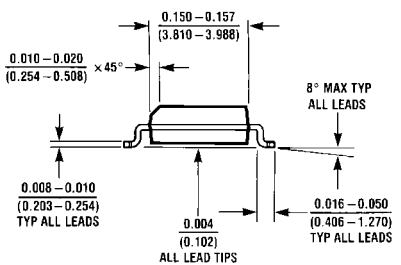
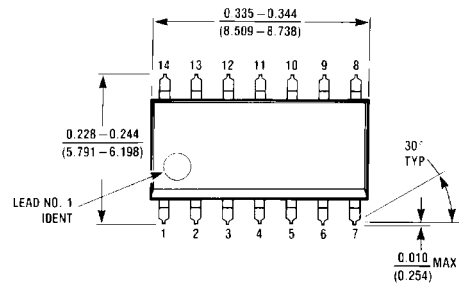
FIGURE 2. Waveforms (Input Characteristics; $f = 1MHz, t_r = t_f = 3ns$)

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

Schematic Diagram Generic for LCX Family



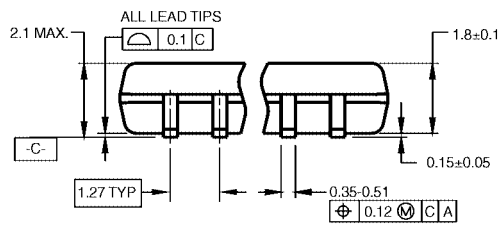
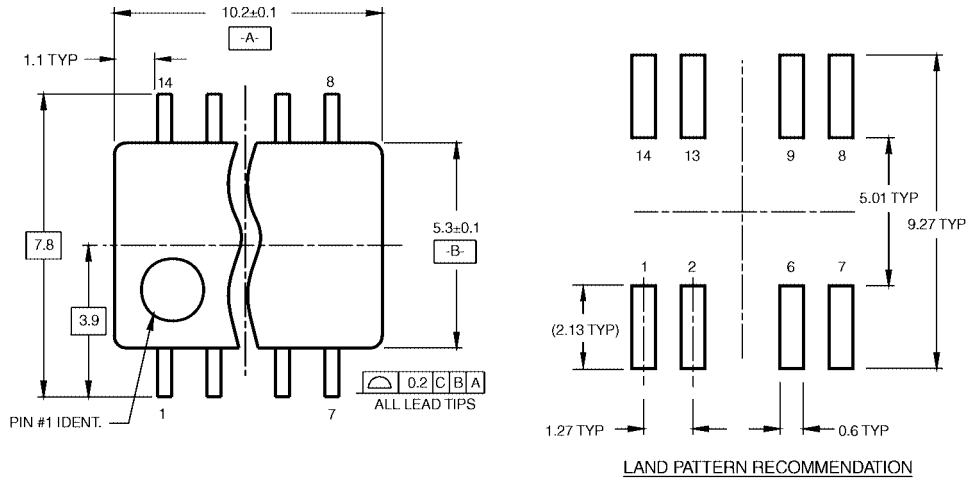
Physical Dimensions inches (millimeters) unless otherwise noted



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

M14A (REV. H)

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



DIMENSIONS ARE IN MILLIMETERS

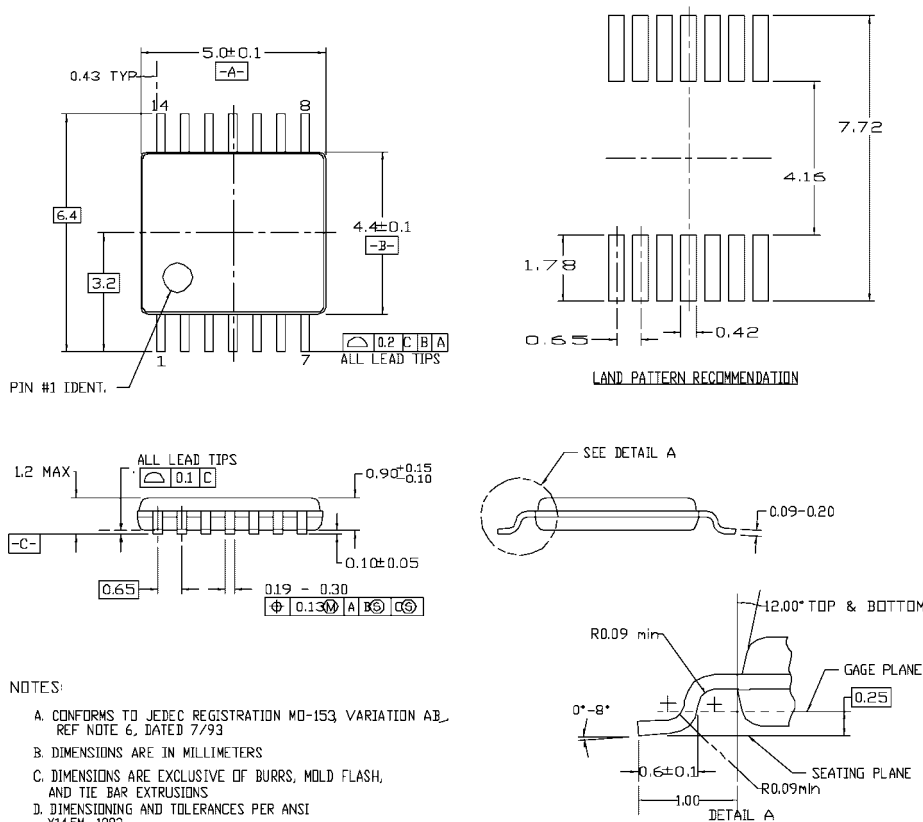
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 B. DIMENSIONS ARE IN MILLIMETERS.
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1



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

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



- NOTES:
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATED 7/93
 - B. DIMENSIONS ARE IN MILLIMETERS
 - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
 - D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

MTC14revD

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

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