

74LCX02

Low Voltage Quad 2-Input NOR Gate with 5V Tolerant Inputs

Features

- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 5.2ns t_{PD} max. ($V_{CC} = 3.3V$), 10 μ A I_{CC} max.
- Power down high impedance inputs and outputs
- $\pm 24mA$ output drive ($V_{CC} = 3.0V$)
- Implements patented noise/EMI reduction circuitry
- Latch-up performance exceeds 500mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

General Description

The LCX02 contains four 2-input NOR gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX02 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

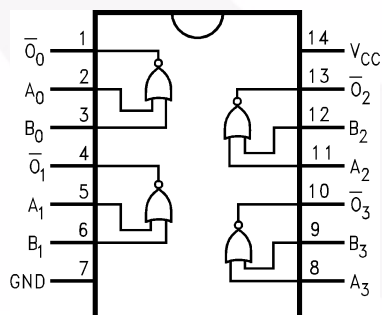
Ordering Information

Order Number	Package Number	Package Description
74LCX02M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX02SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX02MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

 All packages are lead free per JEDEC: J-STD-020B standard.

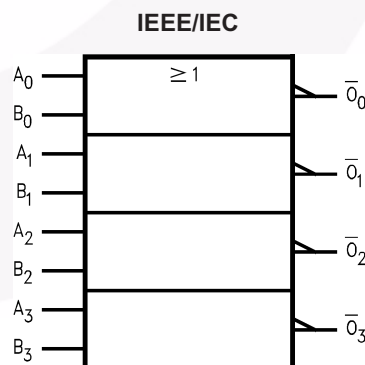
Connection Diagram



Pin Description

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

Logic Symbol



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	−0.5V to +7.0V
V_I	DC Input Voltage	−0.5V to +7.0V
V_O	DC Output Voltage, Output in HIGH or LOW State ⁽¹⁾	−0.5V to $V_{CC} + 0.5V$
I_{IK}	DC Input Diode Current, $V_I < GND$	−50mA
I_{OK}	DC Output Diode Current $V_O < GND$	−50mA
	$V_O > V_{CC}$	+50mA
I_O	DC Output Source/Sink Current	±50mA
I_{CC}	DC Supply Current per Supply Pin	±100mA
I_{GND}	DC Ground Current per Ground Pin	±100mA
T_{STG}	Storage Temperature	−65°C to +150°C

Note:

1. I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions⁽²⁾

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

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
$\Delta t / \Delta V$	Input Edge Rate, $V_{IN} = 0.8V-2.0V$, $V_{CC} = 3.0V$	0	10	ns/V

Note:

2. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	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	2.3–3.6	I _{OH} = -100μA	V _{CC} - 0.2		V
		2.3	I _{OH} = -8mA	1.8		
		2.7	I _{OH} = -12mA	2.2		
		3.0	I _{OH} = -18mA	2.4		
			I _{OH} = -24mA	2.2		
V _{OL}	LOW Level Output Voltage	2.3–3.6	I _{OL} = 100μA		0.2	V
		2.3	I _{OL} = 8mA		0.6	
		2.7	I _{OL} = 12mA		0.4	
		3.0	I _{OL} = 16mA		0.4	
			I _{OL} = 24mA		0.55	
I _I	Input Leakage Current	2.3–3.6	0 ≤ V _I ≤ 5.5V		±5.0	μA
I _{OFF}	Power-Off Leakage Current	0	V _I or V _O = 5.5V		10	μA
I _{CC}	Quiescent Supply Current	2.3–3.6	V _I = V _{CC} or GND		10	μA
			3.6V ≤ V _I ≤ 5.5V		±10	
ΔI _{CC}	Increase in I _{CC} per Input	2.3–3.6	V _{IH} = V _{CC} - 0.6V		500	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = −40°C to +85°C, R _L = 500Ω						Units
		V _{CC} = 3.3V ± 0.3V, C _L = 50pF		V _{CC} = 2.7V, C _L = 50pF		V _{CC} = 2.5V ± 0.2V, C _L = 30pF		
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{PHL} , t _{PLH}	Propagation Delay	1.5	5.2	1.5	6.0	1.5	6.2	ns
t _{OSHL} , t _{OSLH}	Output to Output Skew ⁽³⁾		1.0					ns

Note:

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

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 (Generic for LCX Family)

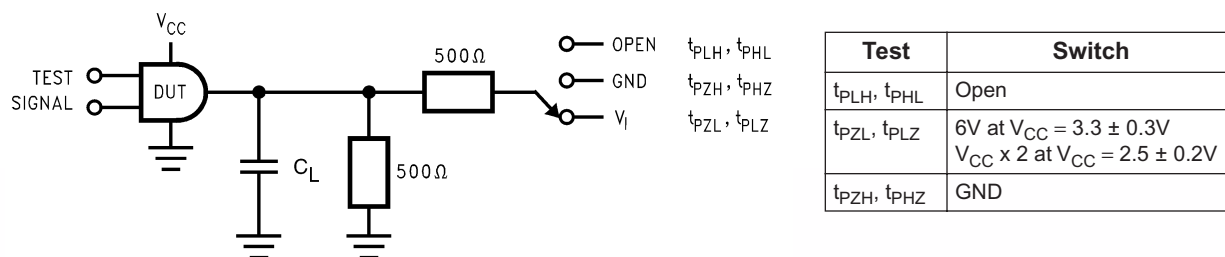
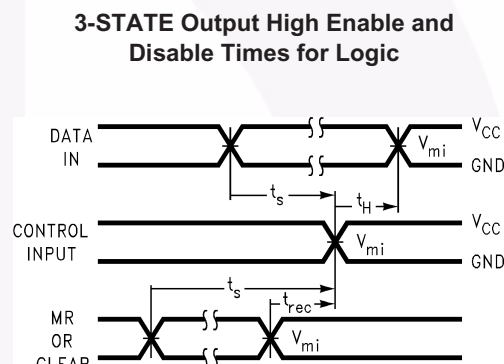
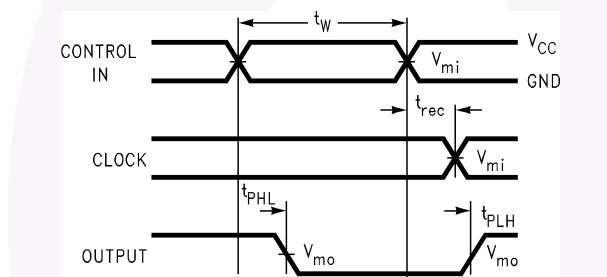
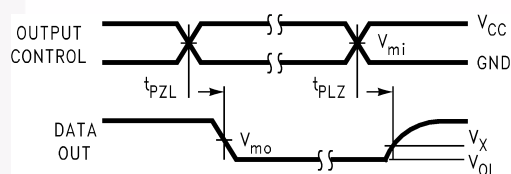
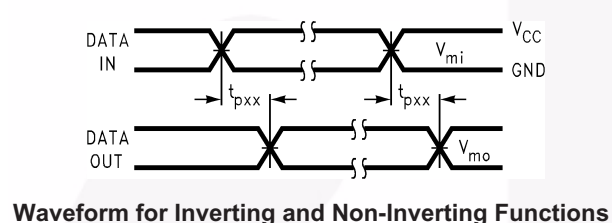
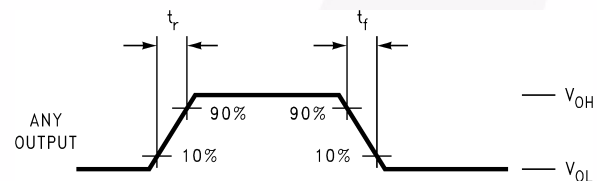
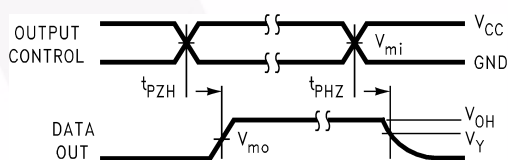


Figure 1. AC Test Circuit (C_L includes probe and jig capacitance)



Propagation Delay, Pulse Width and t_{rec} Waveforms

Setup Time, Hold Time and Recovery Time for Logic



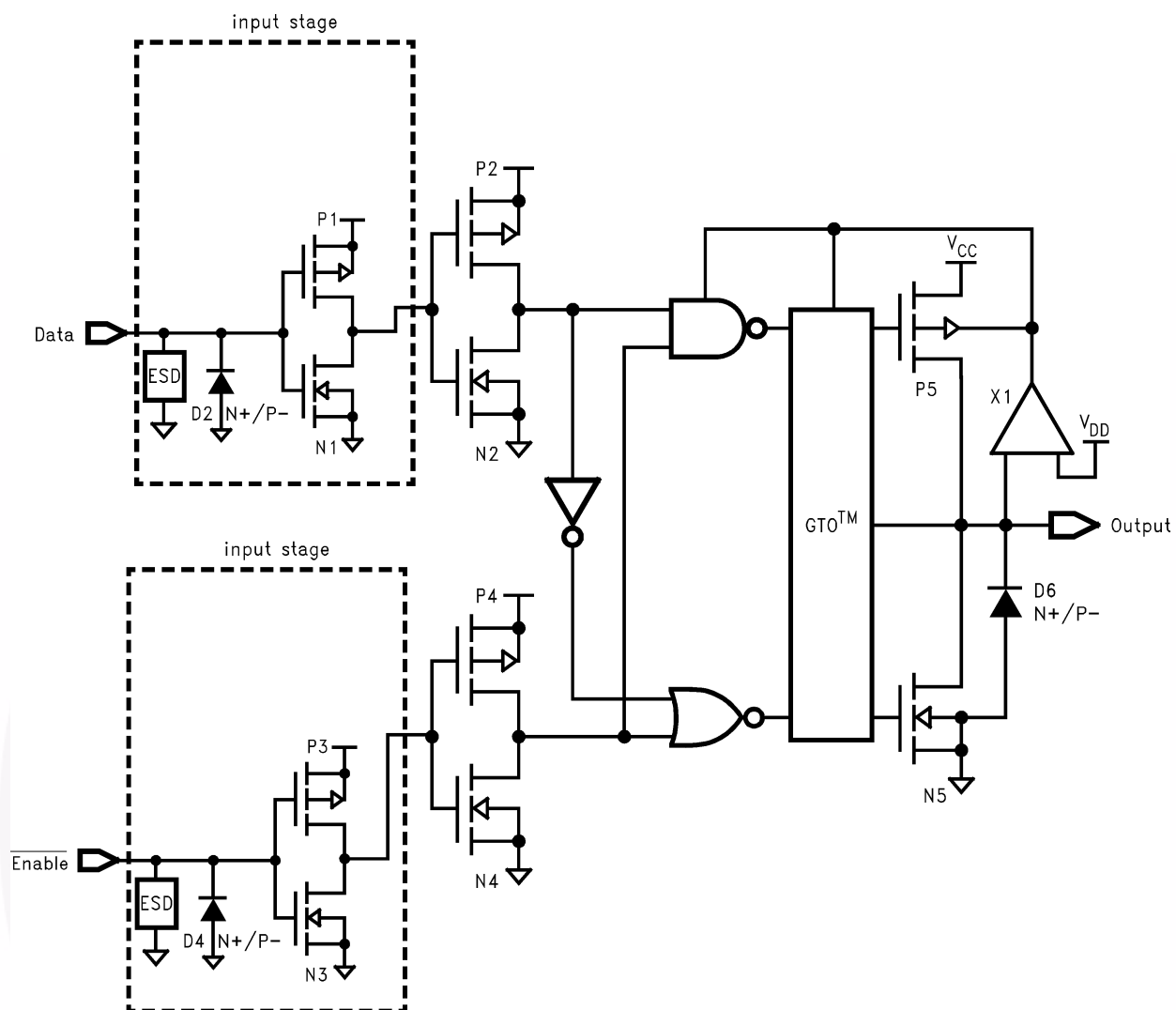
3-STATE Output Low Enable and Disable Times for Logic

t_{rise} and t_{fall}

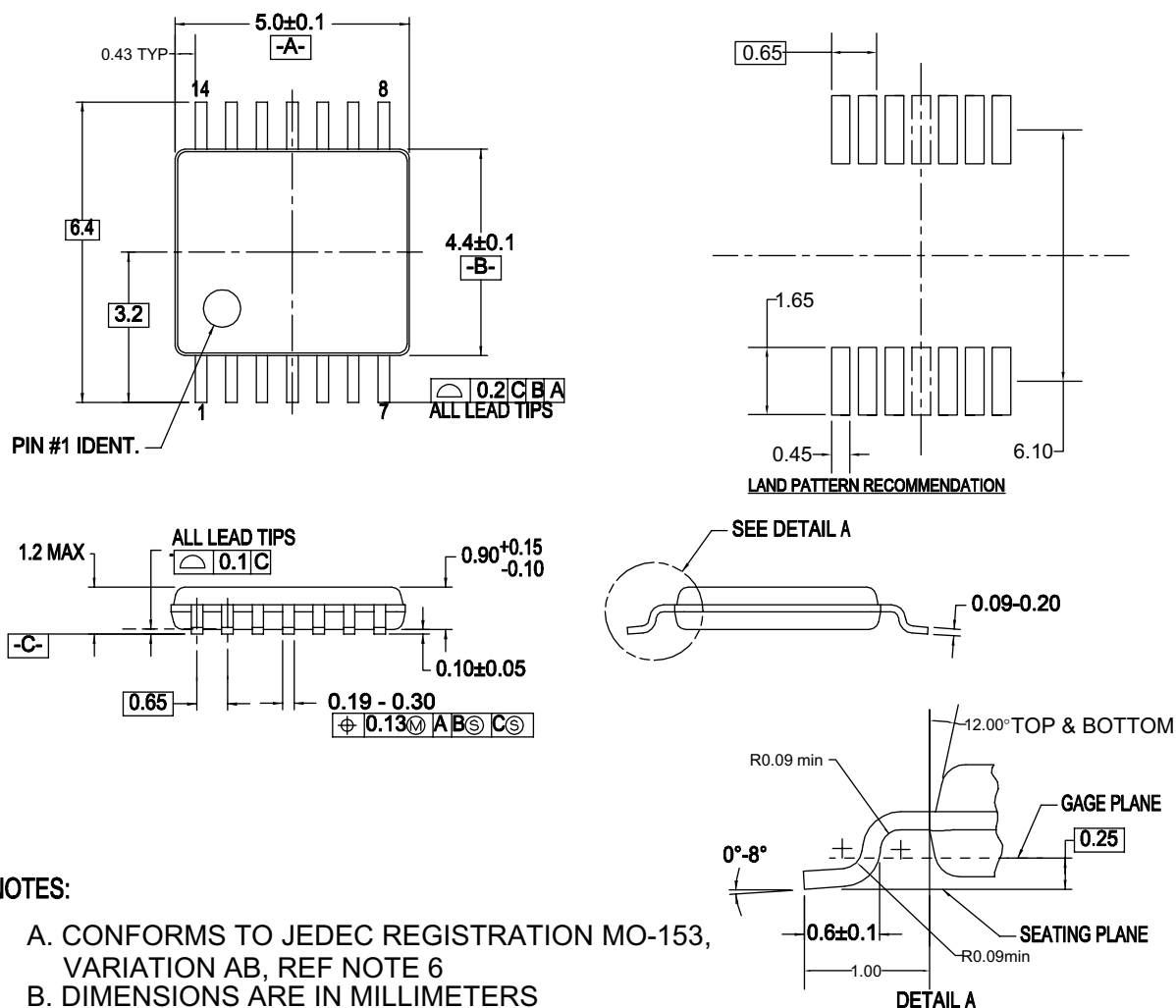
Symbol	V_{CC}		
	$3.3V \pm 0.3V$	$2.7V$	$2.5V \pm 0.2V$
V_{mi}	1.5V	1.5V	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$
V_x	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
V_y	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

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

Schematic Diagram (Generic for LCX Family)



Physical Dimensions (Continued)



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- 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
- E. LANDPATTERN STANDARD: SOP65P640X110-14M
- F. DRAWING FILE NAME: MTC14REV6

Figure 5. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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Rev. I33