FAIRCHILD SEMICONDUCTOR™

May 1993
Revised March 1999

74LVX02
Low Voltage Quad 2-Input NOR Gate

General Description

The LVX02 contains four 2-input NOR gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

Features

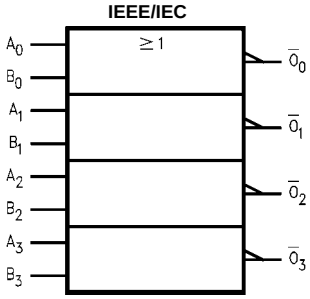
- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

Ordering Code

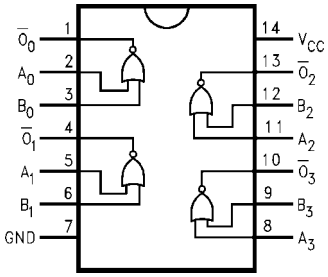
Order Number	Package Number	Package Description
74LVX02M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow
74LVX02SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVX02MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

Logic Symbol



Connection Diagram



Pin Descriptions

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

Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
DC Input Voltage (V_I)	−0.5V to 7V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source	
or Sink Current (I_O)	±25 mA
DC V_{CC} or Ground Current	
(I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Power Dissipation	180 mW

Recommended Operating Conditions (Note 2)

Supply Voltage (V_{CC})	2.0V to 3.6V
Input Voltage (V_I)	0V to 5.5V
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Input Rise and Fall Time (Δt/ΔV)	0 ns/V to 100 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: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	T_A = +25°C			T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Input	2.0	1.5			1.5				
	Voltage	3.0	2.0			2.0		V		
		3.6	2.4			2.4				
V_{IL}	LOW Level Input	2.0			0.5		0.5			
	Voltage	3.0			0.8		0.8	V		
		3.6			0.8		0.8			
V_{OH}	HIGH Level Output	2.0	1.9	2.0		1.9			V_{IN} = V_{IL} or V_{IH}	I_{OH} = −50 μA
	Voltage	3.0	2.9	3.0		2.9		V		I_{OH} = −50 μA
		3.0	2.58			2.48				I_{OH} = −4 mA
V_{OL}	LOW Level Output	2.0		0.0	0.1		0.1		V_{IN} = V_{IL} or V_{IH}	I_{OL} = 50 μA
	Voltage	3.0		0.0	0.1		0.1	V		I_{OL} = 50 μA
		3.0			0.36		0.44			I_{OL} = 4 mA
I_{IN}	Input Leakage Current	3.6			±0.1		±1.0	μA	V_{IN} = 5.5V or GND	
I_{CC}	Quiescent Supply Current	3.6			2.0		20.0	μA	V_{IN} = V_{CC} or GND	

Noise Characteristics (Note 3)

Symbol	Parameter	V_{CC} (V)	T_A = 25°C		Units	Conditions C_L (pF)
			Typ	Limit		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3	0.3	0.5	V	50
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3	−0.3	−0.5	V	50
V_{IHD}	Minimum HIGH Level Dynamic Input Voltage	3.3		2.0	V	50
V_{ILD}	Maximum LOW Level Dynamic Input Voltage	3.3		0.8	V	50

Note 3: Input t_r = t_f = 3ns

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$			$T_A = -40°C$ to $+85°C$		Units	C_L (pF)
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay Time	2.7		5.9	10.7	1.0	13.5	ns	15
t_{PHL}				8.4	14.2	1.0	17.0		50
		3.3 ± 0.3		4.5	6.6	1.0	8.0		15
				7.0	10.1	1.0	11.5		50
t_{OSLH}	Output to Output Skew	2.7			1.5		1.5	ns	50
t_{OSHL}	(Note 4)	3.3			1.5		1.5		

Note 4: Parameter guaranteed by design. $t_{OSLH} = |t_{PLHm} t_{PLHm}|$, $t_{OSHL} = |t_{PHLm} - t_{PHLm}|$

Capacitance

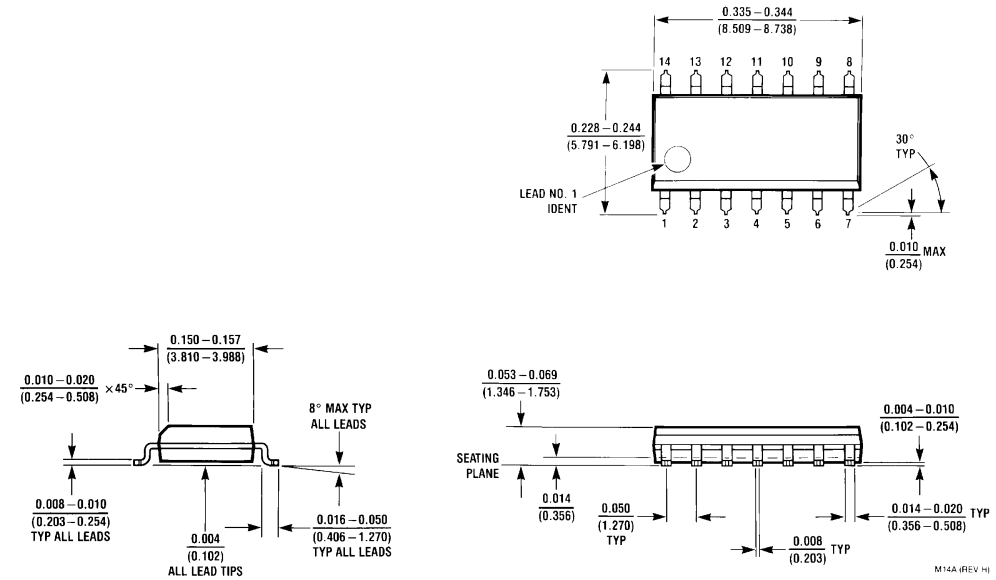
Symbol	Parameter	$T_A = +25°C$			$T_A = -40°C$ to $+85°C$		Units
		Min	Typ	Max	Min	Max	
C_{IN}	Input Capacitance		4	10		10	pF
C_{PD}	Power Dissipation Capacitance (Note 5)		15				pF

Note 5: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

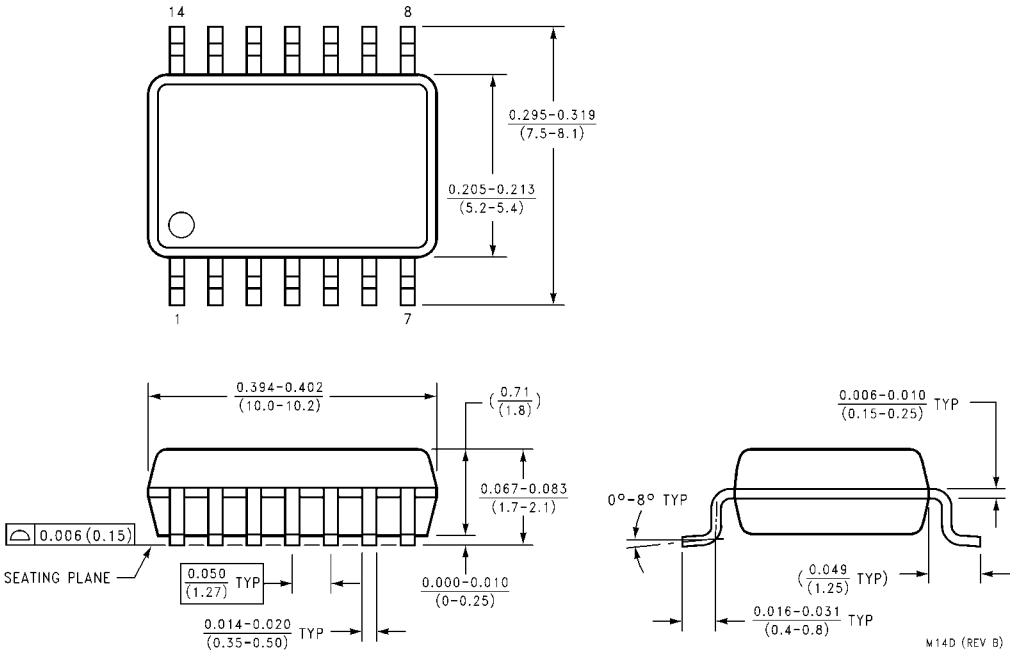
Average operating current can be obtained by the equation:

$$\text{Average operating current can be obtained by the equation: } I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{4 \text{ (per Gate)}}$$

Physical Dimensions inches (millimeters) unless otherwise noted

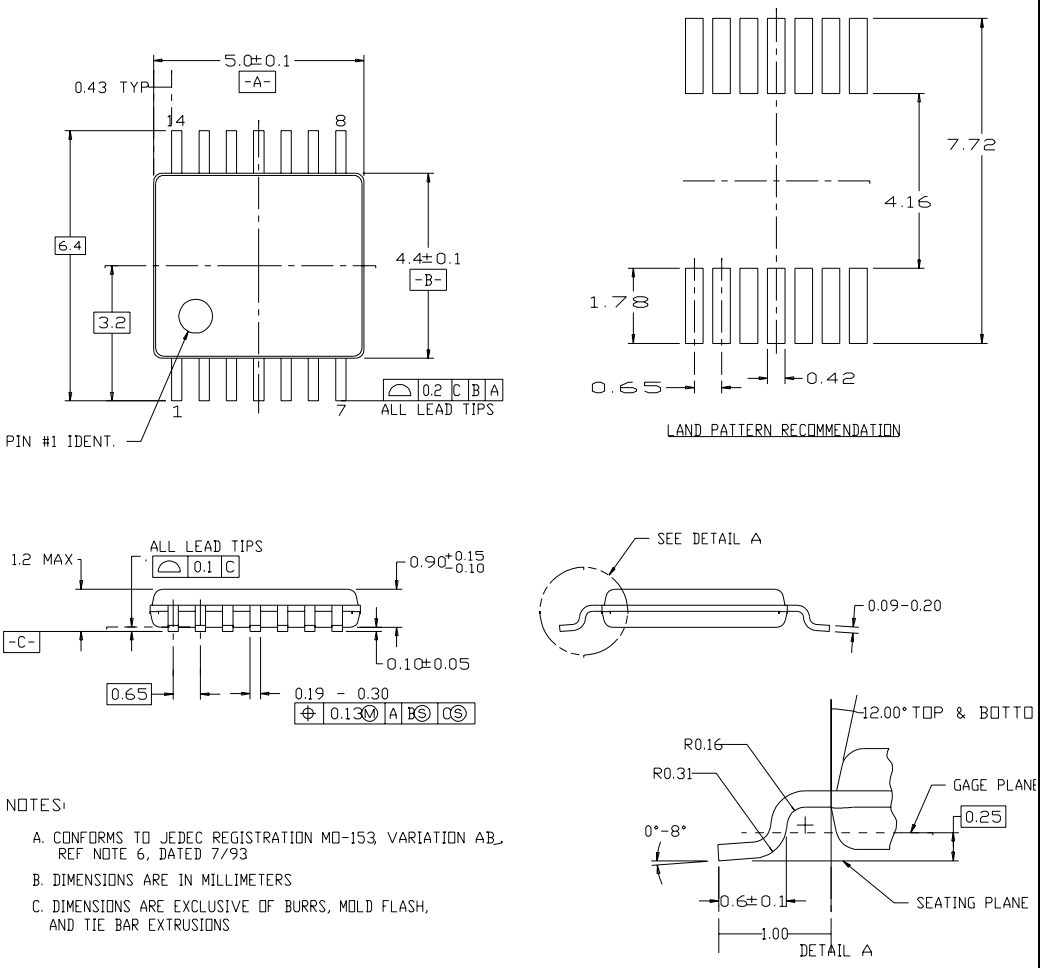


14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120A, 0.150" Narrow
Package Number M14A



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

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