

74LVX04 Low Voltage Hex Inverter

General Description

The LVX04 contains six inverters. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

Features

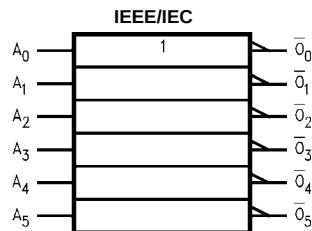
- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

Ordering Code

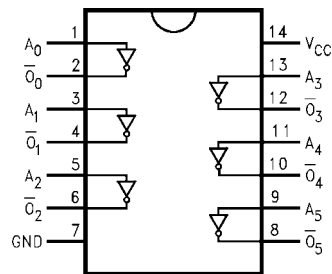
Order Number	Package Number	Package Description
74LVX04M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LVX04SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVX04MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm 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	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 ($\Delta t/\Delta V$)	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}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			Min	Typ	Max	Min	Max		
V_{IH}	HIGH Level Input Voltage	2.0	1.5			1.5		V	
		3.0	2.0			2.0			
		3.6	2.4			2.4			
V_{IL}	LOW Level Input Voltage	2.0			0.5		0.5	V	
		3.0			0.8		0.8		
		3.6			0.8		0.8		
V_{OH}	HIGH Level Output Voltage	2.0	1.9	2.0		1.9		V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -4 \text{ mA}$
		3.0	2.9	3.0		2.9			
		3.0	2.58			2.48			
V_{OL}	LOW Level Output Voltage	2.0		0.0	0.1		0.1	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 4 \text{ mA}$
		3.0		0.0	0.1		0.1		
		3.0			0.36		0.44		
I_{IN}	Input Leakage Current	3.6			± 0.1		± 1.0	μA	$V_{IN} = 5.5V \text{ or GND}$
I_{CC}	Quiescent Supply Current	3.6			2.0		20.0	μA	$V_{IN} = V_{CC} \text{ or GND}$

Noise Characteristics (Note 3)

Symbol	Parameter	V_{CC} (V)	$T_A = 25^\circ\text{C}$		Units	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 $t_r = t_f = 3\text{ns}$

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		5.4	10.1	1.0	12.5	ns	15
t _{PHL}				7.9	13.6	1.0	16.0		50
		3.3 ± 0.3		4.1	6.2	1.0	7.5		15
				6.6	9.7	1.0	11.0		50
t _{OSLH}	Output to Output Skew (Note 4)	2.7			1.5		1.5	ns	50
t _{OSHL}		3.3			1.5		1.5		

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

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)		18				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.

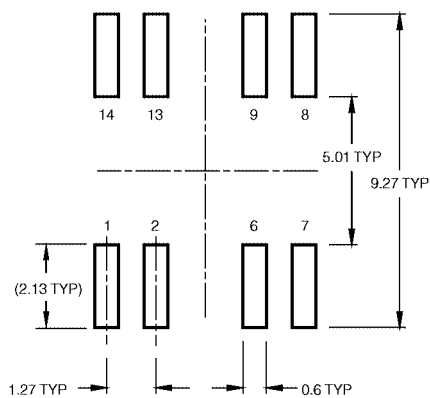
Average operating current can be obtained by the equation: $I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{6}$ (per Gate)

Physical Dimensions inches (millimeters) unless otherwise noted

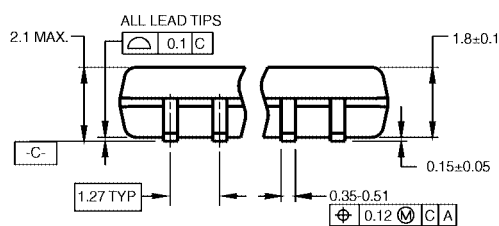


14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M14A

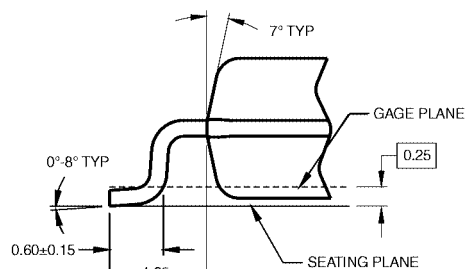
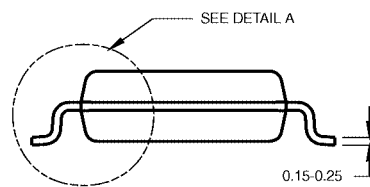
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



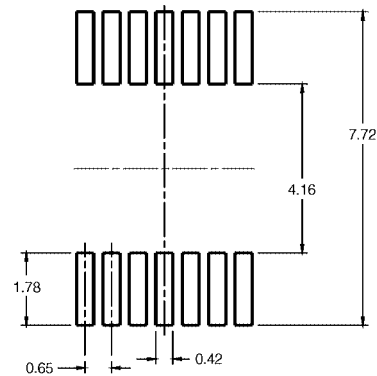
DETAIL A

NOTES:

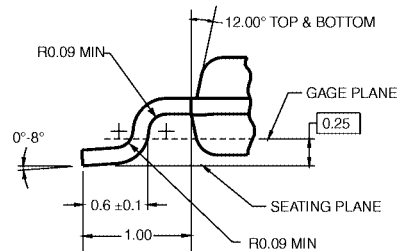
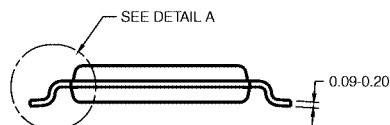
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

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



LAND PATTERN RECOMMENDATION



DETAIL A

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATE 7/93.

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.

MTC14RevC3

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

LIFE SUPPORT POLICY

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. 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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