

74LCX04

Low Voltage Hex Inverter with 5V Tolerant Inputs

General Description

The LCX04 contains six inverters. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX04 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

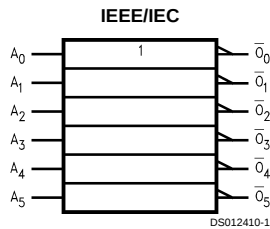
- 5V tolerant inputs
- 5.2 ns t_{PD} max, 10 μ A I_{CCQ} max
- Power down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V V_{CC} supply operation
- ± 24 mA output drive
- Implements patentend noise/EMI reduction circuitry
- Functionally compatible with 74 series 04
- Latch-up performance exceeds 500 mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

Ordering Code:

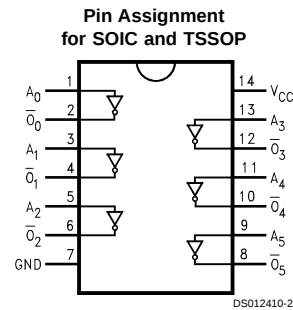
Order Number	Package Number	Package Description
74LCX04M	M14A	14-Lead Small Outline Package, SOIC, JEDEC
74LCX04SJ	M14D	14-Lead Small Outline Package, SOIC, EIAJ
74LCX04MTC	MTC14	14-Lead Thin Shrink Small Outline Package, TSSOP

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
$\overline{O}_n$	Outputs

Absolute Maximum Ratings (Note 1)

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 2)	V
I_{IK}	DC Input Diode Current	-50	$V_I < \text{GND}$	mA
I_{OK}	DC Output Diode Current	-50 +50	$V_O < \text{GND}$ $V_O > V_{CC}$	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 3)

Symbol	Parameter	Min	Max	Units
V_{CC}	Supply Voltage			V
	Operating	2.0	3.6	
	Data Retention	1.5	3.6	
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	0	V_{CC}	V
I_{OH}/I_{OL}	Output Current			mA
	$V_{CC} = 3.0\text{V}-3.6\text{V}$		±24	
	$V_{CC} = 2.7\text{V}$		±12	
T_A	Free-Air Operating Temperature	-40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8\text{V}-2.0\text{V}$, $V_{CC} = 3.0\text{V}$	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_O 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_{CC} (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units
				Min	Max	
V_{IH}	HIGH Level Input Voltage		2.7-3.6	2.0		V
V_{IL}	LOW Level Input Voltage		2.7-3.6		0.8	V
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100\ \mu\text{A}$	2.7-3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -12\ \text{mA}$	2.7	2.2		V
		$I_{OH} = -18\ \text{mA}$	3.0	2.4		V
		$I_{OH} = -24\ \text{mA}$	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100\ \mu\text{A}$	2.7-3.6		0.2	V
		$I_{OL} = 12\ \text{mA}$	2.7		0.4	V
		$I_{OL} = 16\ \text{mA}$	3.0		0.4	V
		$I_{OL} = 24\ \text{mA}$	3.0		0.55	V
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5\text{V}$	2.7-3.6		±5.0	μA
I_{OFF}	Power-Off Leakage Current	V_I or $V_O = 5.5\text{V}$	0		10	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.7-3.6		10	μA
		$3.6\text{V} \leq V_I \leq 5.5\text{V}$	2.7-3.6		±10	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6\text{V}$	2.7-3.6		500	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = -40°C to +85°C, C _L = 50pF, R _L = 500Ω				Units
		V _{CC} = 3.3V ±0.3V		V _{CC} = 2.7V		
		Min	Max	Min	Max	
t _{PHL}	Propagation Delay Time	1.5	5.2	1.5	6.0	ns
t _{PLH}		1.5	5.2	1.5	6.0	
t _{OSHL}	Output to Output Skew		1.0			ns
t _{OSLH}	(Note 4)		1.0			

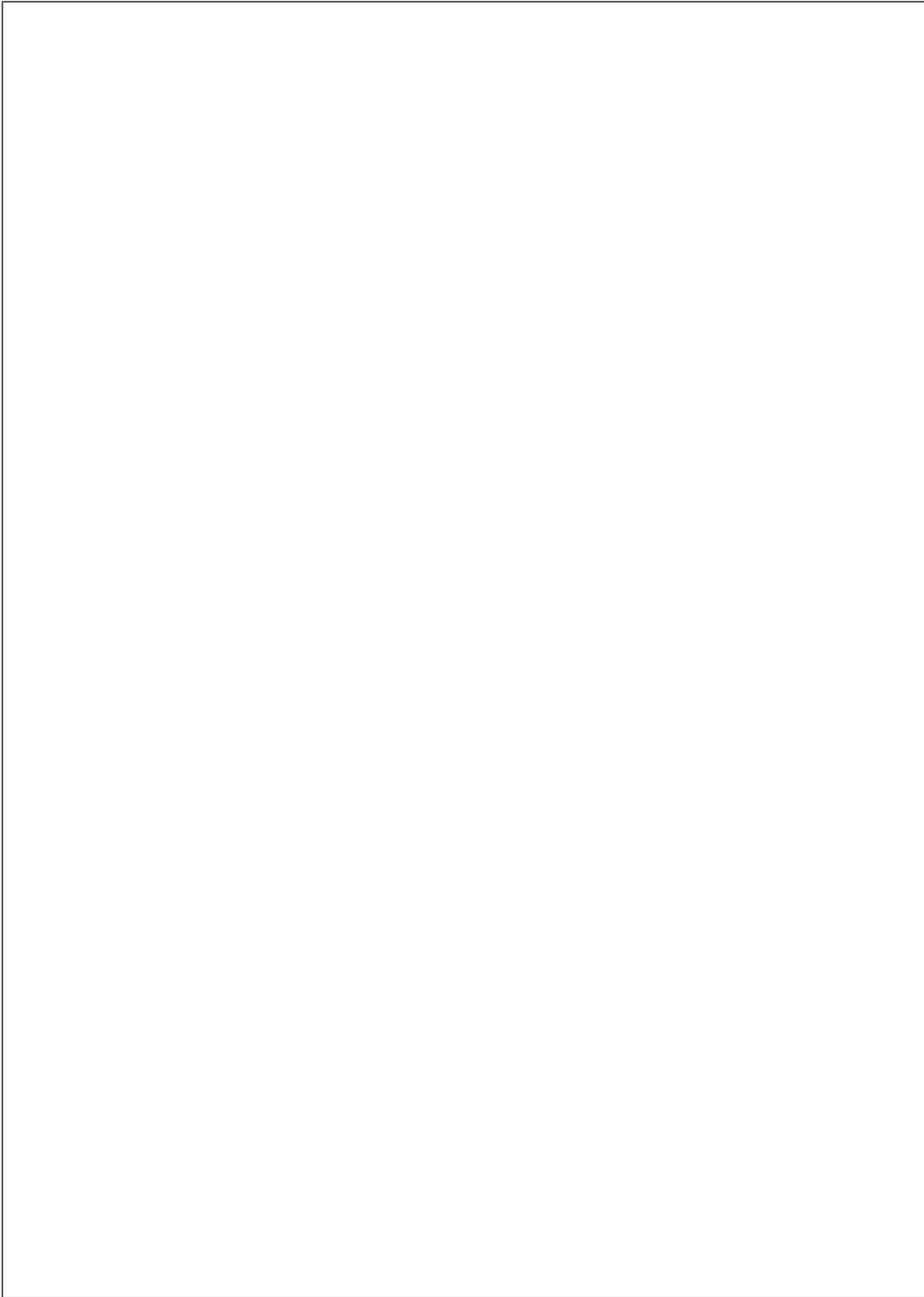
Note 4: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}).

Dynamic Switching Characteristics

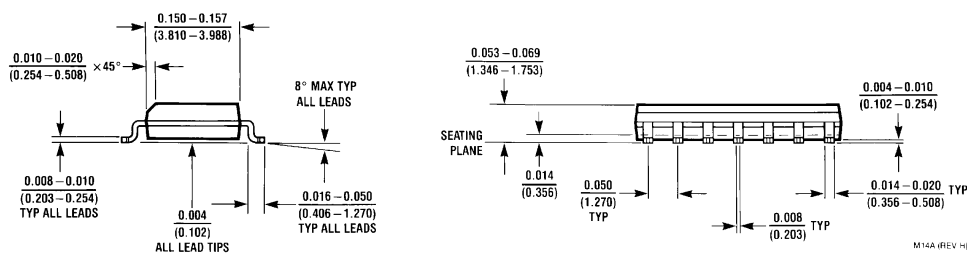
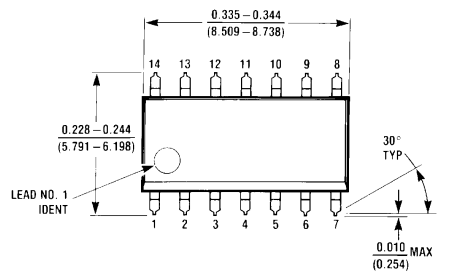
Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$	3.3	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$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

Capacitance

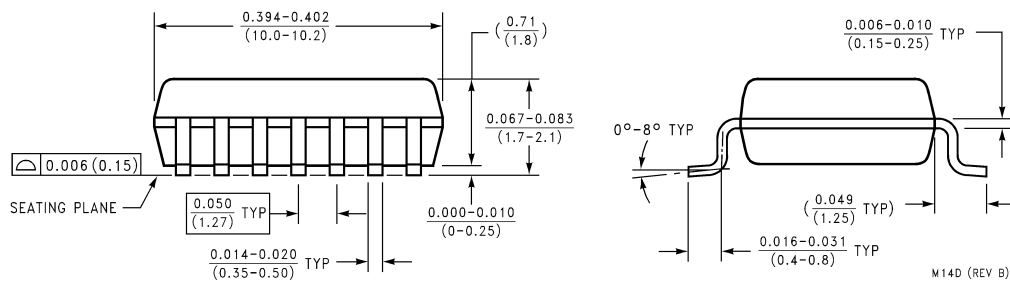
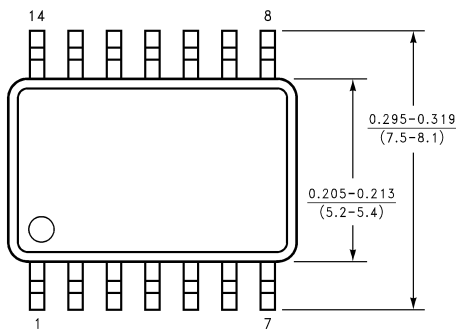
Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0\text{V or } V_{CC}$	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3\text{V}, V_O = 0\text{V or } V_{CC}$	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}, f = 10\text{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



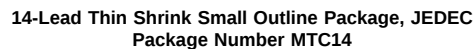
Physical Dimensions inches (millimeters) unless otherwise noted



14-Lead Small Outline Package SOIC JEDEC (M)
Package Number M14A



14-Lead Small Outline Package SOIC EIAJ (SJ)
Package Number M14D



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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