Low-Voltage CMOS Unbuffered Hex Inverter

With 5 V-Tolerant Inputs

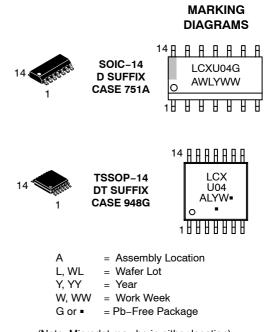
The MC74LCXU04 is a high performance unbuffered hex inverter operating from a 2.3 to 3.6 V supply. (High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance.) A V_I specification of 5.5 V allows MC74LCXU04 inputs to be safely driven from 5 V devices.

Features

- Designed for 2.3 to 3.6 V V_{CC} Operation
- 5 V Tolerant Inputs Interface Capability With 5 V TTL Logic
- LVTTL Compatible
- LVCMOS Compatible
- Near Zero Static Supply Current (10 μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance:
 - Human Body Model >2000 V
 - Machine Model >200 V
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



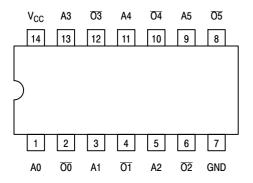
http://onsemi.com



(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.



PIN NAMES

Pins	Function
An	Data Inputs
On	Outputs

TRUTH TABLE

An	On
L	Н
Н	L

Figure 1. Pinout: 14-Lead (Top View)

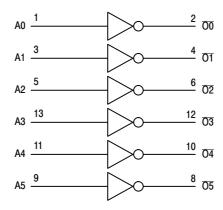


Figure 2. Logic Diagram

MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Units
V _{CC}	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \leq V_{l} \leq +7.0$		V
Vo	DC Output Voltage	$-0.5 \le V_{O} \le V_{CC} + 0.5$	Output in HIGH or LOW State. (Note 1)	V
I _{IK}	DC Input Diode Current	-50	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50	V _O < GND	mA
		+50	V _O > V _{CC}	mA
Ι _Ο	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 Range	-65 to +150		°C
MSL	Moisture Sensitivity		Level 1	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Тур	Max	Units
V _{CC}	Supply Voltage Operating Data Retention Only	2.0 1.5	2.5, 3.3 2.5, 3.3	3.6 3.6	V
VI	Input Voltage	0		5.5	V
Vo	Output Voltage (HIGH or LOW State)	0		V _{CC}	V
I _{OH}				-18 -12 -8	mA
I _{OL}	$ LOW Level Output Current \\ V_{CC} = 3.0 V - 3.6 V \\ V_{CC} = 2.7 V - 3.0 V \\ V_{CC} = 2.3 V - 2.7 V $			+16 +12 +8	mA
T _A	Operating Free-Air Temperature	-40		+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, V _{IN} from 0.8 V to 2.0 V, V _{CC} = 3.0 V	0		10	ns/V

DC ELECTRICAL CHARACTERISTICS

			T _A = −40°C	to +85°C	
Symbol	Characteristic	Condition	Min	Max	Units
VIH	HIGH Level Input Voltage (Note 2)	V _{CC} = 2.3 V	1.7		V
		V _{CC} = 2.7 V	2.1		
		V _{CC} = 3.0 V	2.2		
		V _{CC} = 3.6 V	2.7		
V_{IL}	LOW Level Input Voltage (Note 2)	V _{CC} = 2.3 V		0.55	V
		V _{CC} = 2.7 V		0.55	
		V _{CC} = 3.0 V		0.55	-
		V _{CC} = 3.6 V		0.55	
V _{OH} H	HIGH Level Output Voltage	$2.3~V \leq V_{CC} \leq 3.6~V;~I_{OL} = 100~\mu A$	V _{CC} – 0.2		V
		V_{CC} = 2.3 V; I_{OH} = -8 mA	1.8		
		$V_{CC} = 2.7 \text{ V}; I_{OH} = -12 \text{ mA}$	2.2		
		$V_{CC} = 3.0 \text{ V}; \text{ I}_{OH} = -18 \text{ mA}$	2.4		
V _{OL}	LOW Level Output Voltage	2.3 V \leq V_{CC} \leq 3.6 V; I_{OL} = 100 μA		0.2	V
		V _{CC} = 2.3 V; I _{OL} = 8 mA		0.6	
		$V_{CC} = 2.7 \text{ V}; \text{ I}_{OL} = 12 \text{ mA}$		0.4	
		V_{CC} = 3.0 V; I_{OL} = 16 mA		0.5	
I _{OFF}	Power Off Leakage Current	V_{CC} = 0, V_{IN} = 5.5 V or V_{OUT} = 5.5 V		10	μΑ
I _{IN}	Input Leakage Current	V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND		±5	μA
I _{CC}	Quiescent Supply Current	V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND		10	μA
ΔI_{CC}	Increase in I _{CC} per Input	$2.3 \le V_{CC} \le 3.6 \text{ V}; \text{ V}_{IH} = V_{CC} - 0.6 \text{ V}$		500	μA

2. These values of V_I are used to test DC electrical characteristics only.

AC CHARACTERISTICS ($t_R = t_F = 2.5 \text{ ns}; R_L = 500 \Omega$) (Note 3)

				Limits					
				T _A = −40°C to +85°C					
			V _{CC} = 3.3	3 V \pm 0.3 V	V _{CC} =	2.7 V	V _{CC} = 2.5	V \pm 0.2 V	
			C _L =	50 pF	C _L =	50 pF	C _L =	30 pF	
Symbol	Parameter	Waveform	Min	Max	Min	Max	Min	Max	Units
t _{PLH} t _{PHL}	Propagation Delay Input to Output	1	1.0 1.0	3.6 3.6	1.0 1.0	4.5 4.5	1.0 1.0	4.3 4.3	ns
t _{OSHL} t _{OSLH}	Output-to-Output Skew (Note 4)			1.0 1.0					ns

3. These AC parameters are preliminary and may be modified.

 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}); parameter guaranteed by design.

DYNAMIC SWITCHING CHARACTERISTICS

			Т	A = +25°0	C	
Symbol	Characteristic	Condition	Min	Тур	Max	Units
V _{OLP}	Dynamic LOW Peak Voltage (Note 5)			0.8 0.6		V
V _{OLV}	Dynamic LOW Valley Voltage (Note 5)	$ \begin{array}{l} V_{CC} = 3.3 \text{ V}, \ C_L = 50 \text{ pF}, \ V_{IH} = 3.3 \text{ V}, \ V_{IL} = 0 \text{ V} \\ V_{CC} = 2.5 \text{ V}, \ C_L = 30 \text{ pF}, \ V_{IH} = 2.5 \text{ V}, \ V_{IL} = 0 \text{ V} \end{array} $		-0.8 -0.6		V

5. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

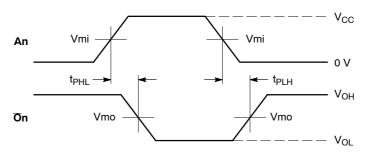
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
C _{IN}	Input Capacitance	V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC}	7	pF
C _{OUT}	Output Capacitance	V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	10 MHz, V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC}	25	pF

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCXU04DG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74LCXU04DR2G	SOIC-14 (Pb-Free)	2500 Tape & Reel
MC74LCXU04DTG	TSSOP-14 (Pb-Free)	96 Units / Rail
MC74LCXU04DTR2G	TSSOP-14 (Pb-Free)	2500 Tape & Reel

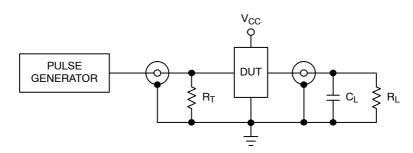
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



PROPAGATION DELAYS $t_{R} = t_{F} = 2.5$ ns, 10% to 90%; f = 1 MHz; $t_{W} = 500$ ns

	V _{CC}				
Symbol	3.3 V \pm 0.3 V	2.7 V	$\textbf{2.5 V} \pm \textbf{0.2 V}$		
Vmi	1.5 V	1.5 V	V _{CC} /2		
Vmo	1.5 V	1.5 V	V _{CC} /2		

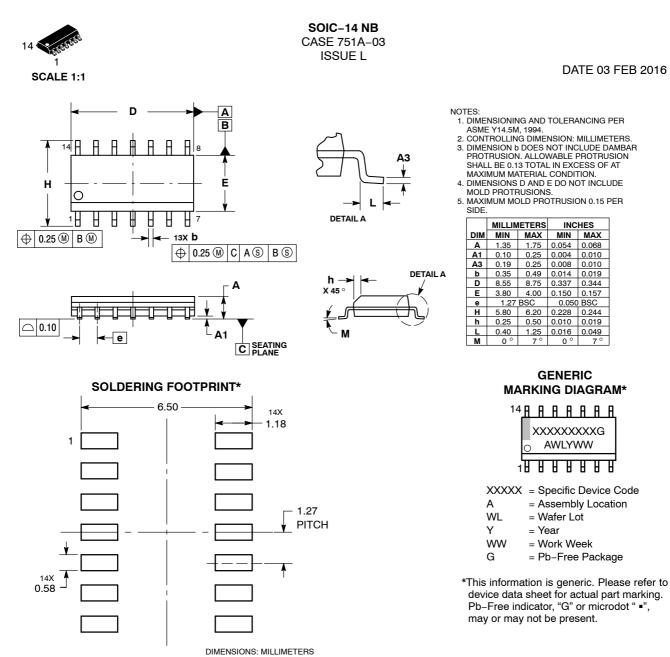




 C_L = 50 pF at V_{CC} = 3.3 \pm 0.3 V or equivalent (includes jig and probe capacitance) C_L = 30 pF at V_{CC} = 2.5 \pm 0.2 V or equivalent (includes jig and probe capacitance) R_L = R_1 = 500 Ω or equivalent R_T = Z_{OUT} of pulse generator (typically 50 Ω)

Figure 4. Test Circuit





*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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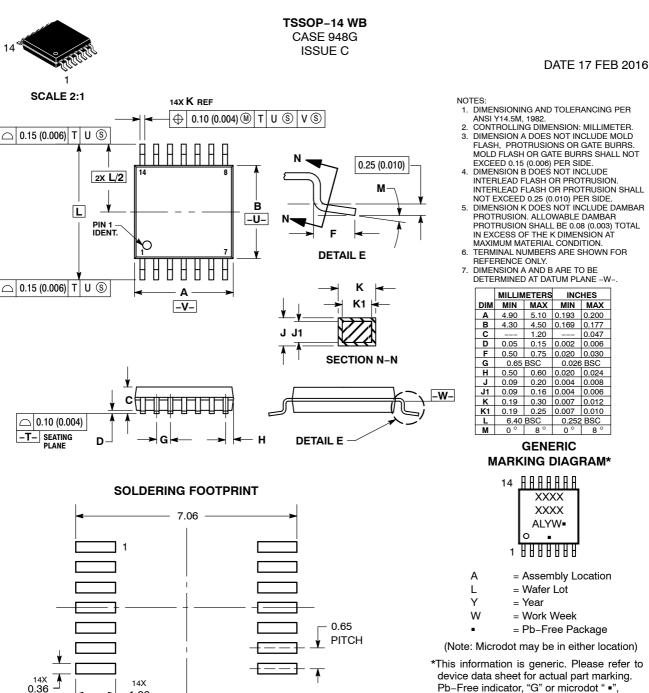
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