

**MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA**

Order this data sheet
by MC54HCT14A/D

**Hex Schmitt-Trigger Inverter with
LSTTL Compatible Inputs
High-Performance Silicon-Gate CMOS**

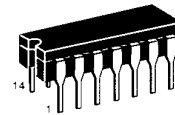
The MC54/74HCT14A may be used as a level converter for interfacing TTL or NMOS outputs to high-speed CMOS inputs.

The HCT14A is identical in pinout to the LS14.

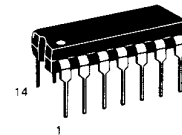
The HCT14A is useful to "square up" slow input rise and fall times. Due to the hysteresis voltage of the Schmitt trigger, the HCT14A finds applications in noisy environments.

- Output Drive Capability: 10 LSTTL Loads
- TTL/NMOS-Compatible Input Levels
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1.0 μ A
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 72 FETs or 18 Equivalent Gates

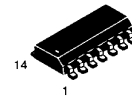
MC54/74HCT14A



**J SUFFIX
CERAMIC
CASE 632-08**



**N SUFFIX
PLASTIC
CASE 646-06**

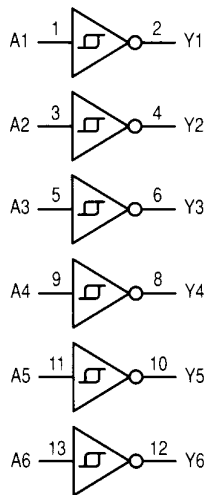


**D SUFFIX
SOIC
CASE 751A-02**

ORDERING INFORMATION

MC74HCTXXXAN Plastic
MC54HCTXXXAJ Ceramic
MC74HCTXXXAD SOIC

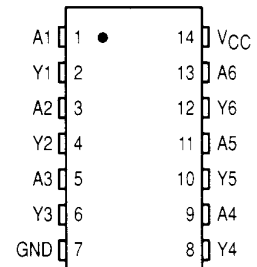
LOGIC DIAGRAM



$Y = \bar{A}$

PIN 14 = V_{CC}
PIN 7 = GND

PIN ASSIGNMENT



FUNCTION TABLE

Input	Output
A	Y
L	H
H	L



MAXIMUM RATINGS*			
Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V _{in}	DC Input Voltage (Referenced to GND)	-1.5 to V _{CC} +1.5	V
V _{out}	DC Output Voltage (Referenced to GND)	-0.5 to V _{CC} +0.5	V
I _{in}	DC Input Current, per Pin	±20	mA
I _{out}	DC Output Current, per Pin	±25	mA
I _{CC}	DC Supply Current, V _{CC} and GND Pins	±50	mA
P _D	Power Dissipation in Still Air, Plastic or Ceramic DIP SOIC Package	750 500	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package) (Ceramic DIP)	260 300	°C °C

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this hi-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS				
Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	4.5	5.5	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V _{CC}	V
T _A	Operating Temperature, All Package Types	-55	+125	°C
t _r , t _f	Input Rise and Fall Time (Figure 1)	—	*	ns

* No Limit when V_{in} = 50% V_{CC}, I_{CC} > 1.0 mA.

DC CHARACTERISTICS FOR THE MC74/54HCT14A										
Symbol	Parameter	Test Conditions	V _{CC} Volts	Temperature Limits						Unit
				25°C to -55°C		≤ 85°C		≤ 125°C		
				Min	Max	Min	Max	Min	Max	
VT+max	Maximum Positive-Going Input Threshold Voltage	V _{OUT} = 0.1 V or V _{CC} -0.1 V [I _{OUT}] ≤ 20 μA	4.5 5.5		1.9 2.1		1.9 2.1		1.9 2.1	V
VT+min	Minimum Positive-Going Input Threshold Voltage	V _{OUT} = 0.1 V or V _{CC} -0.1 V [I _{OUT}] ≤ 20 μA	4.5 5.5	1.2 1.4		1.2 1.4		1.2 1.4		V
VT-max	Maximum Negative-Going Input Threshold Voltage	V _{out} = 0.1 V or V _{CC} -0.1 V [I _{out}] < 20 μA	4.5 5.5		1.2 1.4		1.2 1.4		1.2 1.4	
VT-min	Minimum Negative-Going Input Threshold Voltage	V _{out} = 0.1 V or V _{CC} -0.1 V [I _{out}] < 20 μA	4.5 5.5	0.5 0.6		0.5 0.6		0.5 0.6		
V _H max	Maximum Hysteresis Voltage	V _{out} = 0.1 V or V _{CC} -0.1 V [I _{out}] < 20 μA	4.5 5.5		1.4 1.5		1.4 1.5		1.4 1.5	
V _H min	Minimum Hysteresis Voltage	V _{out} = 0.1 V or V _{CC} -0.1 V [I _{out}] < 20 μA	4.5 5.5	0.4 0.4		0.4 0.4		0.4 0.4		
V _{OH}	Minimum High-Level Output Voltage	V _{IN} < VT-min [I _{OUT}] ≤ 20 μA	4.5 5.5	4.4 5.4		4.4 5.4		4.4 5.4		V
		V _{IN} < VT-min [I _{OUT}] ≤ 4.0 mA	4.5	3.98		3.84		3.7		
V _{OL}	Maximum Low-Level Output Voltage	V _{IN} < VT-min [I _{OUT}] ≤ 20 μA	4.5 5.5		0.1 0.1		0.1 0.1		0.1 0.1	V
		V _{IN} < VT-min [I _{OUT}] ≤ 4.0 mA	4.5		0.26		0.33		0.4	

(continued)

DC CHARACTERISTICS FOR THE MC74/54HCT14A — continued										
Symbol	Parameter	Test Conditions	V _{CC} Volts	Temperature Limits						Unit
				25°C to -55°C		≤ 85°C		≤ 125°C		
				Min	Max	Min	Max	Min	Max	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	5.5		±0.1		±1.0		±1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per package)	V _{in} = V _{CC} or GND I _{OUT} = 0 μA	5.5		1.0		10		40	μA
ΔI _{CC}	Additional Quiescent Supply Current	V _{in} = 2.4 V, Any One Input V _{in} = V _{CC} or GND, Other Inputs I _{out} = 0 μA	5.5		≥ -55°C		25°C to 125°C			mA
					2.9		2.4			

AC CHARACTERISTICS FOR THE MC74/54HCT14A										
Symbol	Parameter	Test Conditions	Fig.	Temperature Limits						Unit
				25°C to -55°C		≤ 85°C		≤ 125°C		
				Min	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A to Output Y (L to H)	V _{CC} = 5.0 V ±10% C _L = 50 pF, Input t _r = t _f = 6.0 ns	Fig. 1 & 2		32		40		48	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output	V _{CC} = 5.0 V ±10% C _L = 50 pF, Input t _r = t _f = 6.0 ns	Fig. 1 & 2		15		19		22	ns

Symbol	Parameter	Typical @ 25°C, V _{CC} = 5.0 V		Unit
		Min	Max	
C _{PD}	Power Dissipation Capacitance (Per Inverter) Used to determine the no-load dynamic power consumption: P _D = C _{PD} V _{CC} ² f + I _{CC} V _{CC}	32		pF

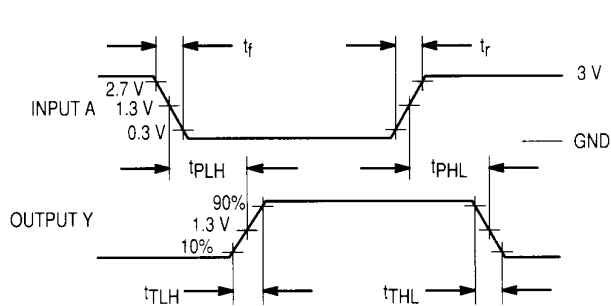
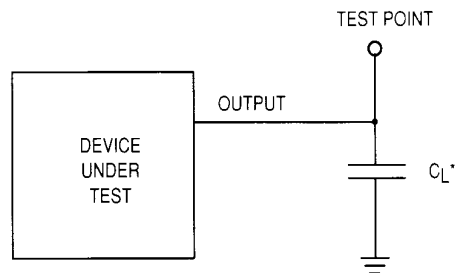



Figure 1. Switching Waveforms

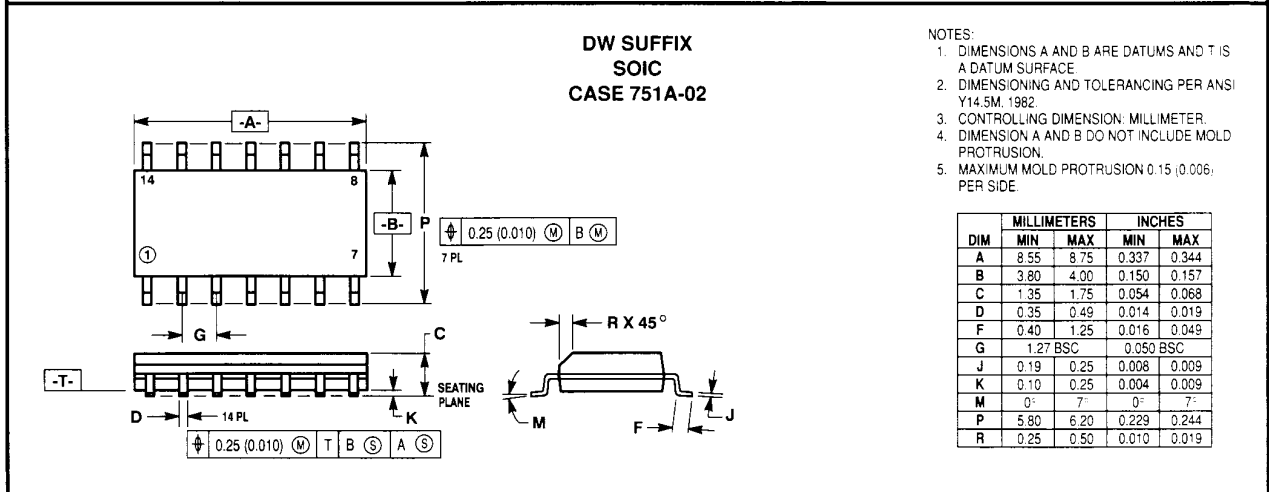
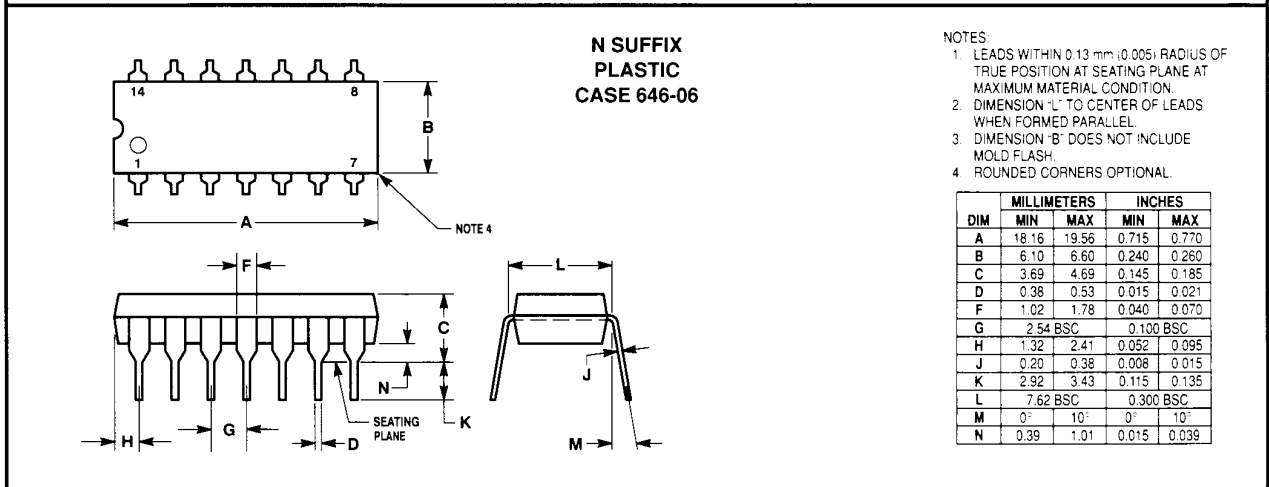
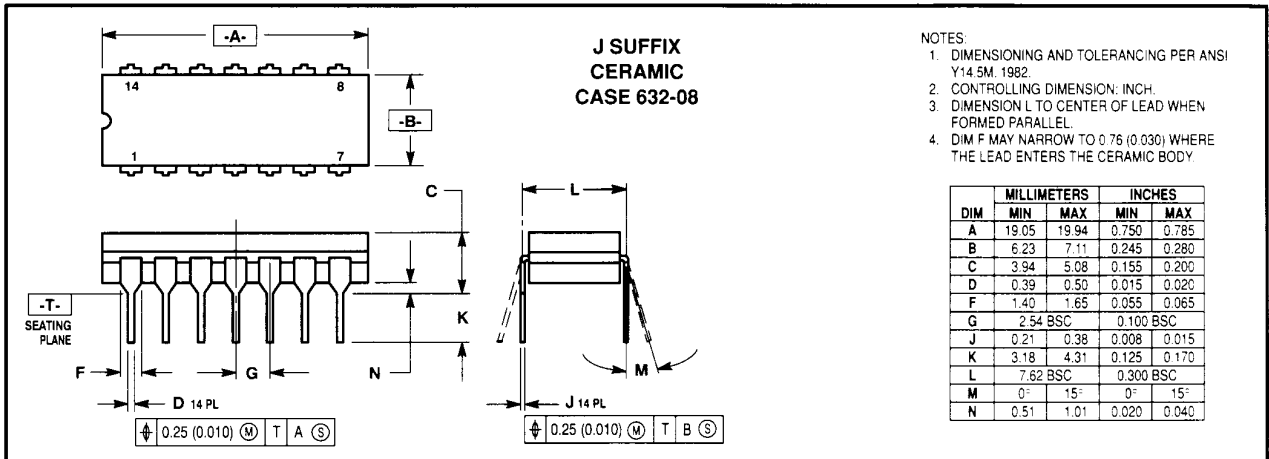


*Includes all probe and jig capacitance

Figure 2. Test Circuit

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