

MC74HCT14A

Hex Schmitt-Trigger Inverter with LSTTL Compatible Inputs

High-Performance Silicon-Gate CMOS

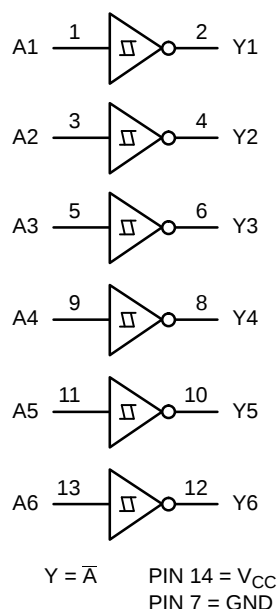
The MC74HCT14A may be used as a level converter for interfacing TTL or NMOS outputs to high-speed CMOS inputs.

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.

Features

- 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 JEDEC Standard No. 7.0 A Requirements
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

LOGIC DIAGRAM



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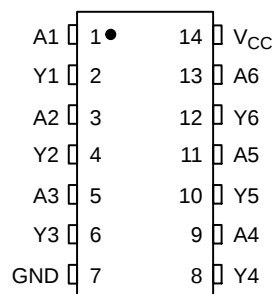


SOIC-14 NB
D SUFFIX
CASE 751A

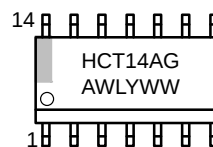


TSSOP-14
DT SUFFIX
CASE 948G

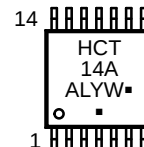
PIN ASSIGNMENT



MARKING DIAGRAMS



SOIC-14 NB



TSSOP-14

A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

Input A	Output Y
L	H
H	L

ORDERING INFORMATION

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

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MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V_I	DC Input Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
V_O	DC Output Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 25	mA
I_O	DC Output Sink Current	± 25	mA
I_{CC}	DC Supply Current per Supply Pin	± 50	mA
I_{GND}	DC Ground Current per Ground Pin	± 50	mA
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T_J	Junction Temperature under Bias	+150	°C
θ_{JA}	Thermal Resistance SOIC TSSOP	125 170	°C/W
P_D	Power Dissipation in Still Air at 85°C SOIC TSSOP	500 450	mW
MSL	Moisture Sensitivity	Level 1	
F_R	Flammability Rating Oxygen Index: 30% – 35%	UL 94 V-0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage Human Body Model (Note 1) Machine Model (Note 2) Charged Device Model (Note 3)	> 4000 > 300 > 1000	V
$I_{Latchup}$	Latchup Performance Above V_{CC} and Below GND at 85°C (Note 4)	± 300	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	4.5	5.5	V
V_I, V_O	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)	-	(Note 5)	ns

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

5. No Limit when $V_I \approx 50\% V_{CC}$, $I_{CC} > 1$ mA.
6. Unused inputs may not be left open. All inputs must be tied to a high-logic voltage level or a low-logic input voltage level.

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DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} Volts	Temperature Limit						Unit
				–55°C to 25°C		≤85°C		≤125°C		
				Min	Max	Min	Max	Min	Max	
V _{T+} max	Maximum Positive-Going Input Threshold Voltage	V _O = 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	 1.9 2.1	 1.9 2.1	V	
V _{T+} min	Minimum Positive-Going Input Threshold Voltage	V _O = 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	1.2 1.4	 1.2 1.4	V	
V _{T–} max	Maximum Negative-Going Input Threshold Voltage	V _O = 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	 1.2 1.4	1.2 1.4		
V _{T–} min	Minimum Negative-Going Input Threshold Voltage	V _O = 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	0.5 0.6	 0.5 0.6		
V _H max	Maximum Hysteresis Voltage	V _O = 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	 1.4 1.5	1.4 1.5		
V _H min	Minimum Hysteresis Voltage	V _O = 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	0.4 0.4	 0.4 0.4		
V _{OH}	Minimum High-Level Output Voltage	V _I < V _{T–} min I _{out} ≤ 20 μA	4.5 5.5	4.4 5.4	 4.4 5.4	 4.4 5.4	4.4 5.4	 4.4 5.4	V	
		V _I < V _{T–} min I _{out} ≤ 4.0 mA	4.5	3.98	 3.84	 3.7	 3.7			
V _{OL}	Maximum Low-Level Output Voltage	V _I ≥ V _{T+} max I _{out} ≤ 20 μA	4.5 5.5	 0.1 0.1	 0.1 0.1	 0.1 0.1	 0.1 0.1	0.1 0.1	V	
		V _I ≥ V _{T+} max I _{out} ≤ 4.0 mA	4.5	 0.26	 0.33	 0.4	 0.4			
I _{IK}	Maximum Input Leakage Current	V _I = V _{CC} or GND	5.5	 ±0.1	 ±1.0	 ±1.0	 ±1.0	μA		
I _{CC}	Maximum Quiescent Supply Current (per package)	V _I = V _{CC} or GND I _{out} = 0 μA	5.5	 1.0	 10	 40	 40	μA		
ΔI _{CC}	Additional Quiescent Supply Current	V _I = 2.4 V, Any One Input V _I = V _{CC} or GND, Other Inputs I _{out} = 0 μA	5.5	≥ –55°C		25°C to 125°C		mA		
				2.9		2.4				

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC CHARACTERISTICS (C_L = 50 pF; Input t_r = t_f = 6.0 ns)

Symbol	Parameter	Test Conditions	Figures	Guaranteed Limit						Unit
				− 55°C to 25°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	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	1 & 2		15		19		22	ns

C _{PD}	Power Dissipation Capacitance, per Inverter (Note 7)	Typical @ 25°C, V _{CC} = 5.0 V	pF
		32	

7. Used to determine the no-load dynamic power consumption: P_D = C_{PD} V_{CC}²f + I_{CC} V_{CC}.

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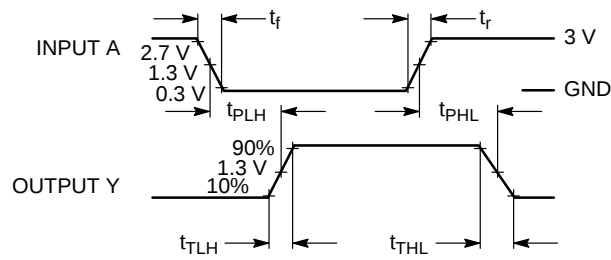
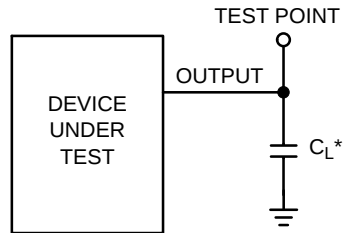


Figure 1. Switching Waveforms



*Includes all probe and jig capacitance.

Figure 2. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HCT14ADG	SOIC-14 NB (Pb-Free)	55 Units / Rail
NLV74HCT14ADG*		
MC74HCT14ADR2G	SOIC-14 NB (Pb-Free)	2500 / Tape & Reel
NLV74HCT14ADR2G*		
MC74HCT14ADTR2G	TSSOP-14 (Pb-Free)	2500 / Tape & Reel
NLV74HCT14ADTR2G*		

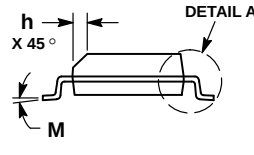
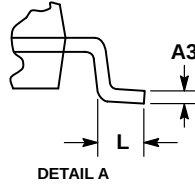
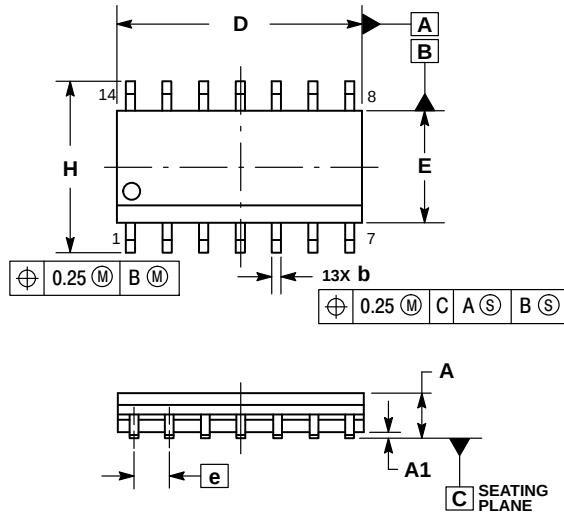
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

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PACKAGE DIMENSIONS

SOIC-14 NB
CASE 751A-03
ISSUE K

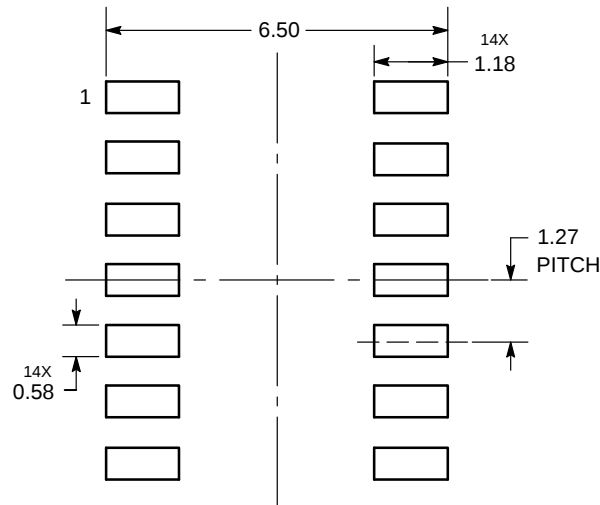


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION, ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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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