

SN54HCT14, SN74HCT14 HEX SCHMITT-TRIGGER INVERTERS

SCLS225A - JULY 1995 - REVISED MARCH 1996

- Inputs Are TTL-Voltage Compatible
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

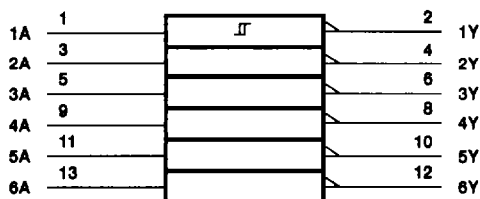
The 'HCT14 contain six independent inverters. The devices perform the Boolean function $Y = \overline{A}$ in positive logic.

The SN54HCT14 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT14 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

logic symbol†



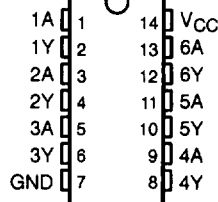
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the D, DB, J, N, PW, and W packages.

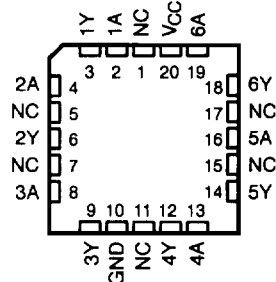
logic diagram (positive logic)



SN54HCT14 . . . J OR W PACKAGE
SN74HCT14 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)



SN54HCT14 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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absolute maximum ratings over operating free-air temperature range†

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	
D package	1.25 W
DB and PW packages	0.5 W
N package	1.1 W
Storage temperature range, T_{stg}	–65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions

		SN54HCT14		SN74HCT14		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 4.5$ V to 5.5 V		2.1	2.1	V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5$ V to 5.5 V		0.5	0.5	V
V_I	Input voltage	0	V_{CC}	0	V_{CC}	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
T_A	Operating free-air temperature	–55	125	–40	85	°C

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54HCT14		SN74HCT14		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{T+} Positive-going threshold		4.5 V	1.2	1.5	1.9	1.2	1.9	1.2	1.9	V
		5.5 V	1.4	1.7	2.1	1.4	2.1	1.4	2.1	
V _{T-} Negative-going threshold		4.5 V	0.5	0.9	1.2	0.5	1.2	0.5	1.2	V
		5.5 V	0.6	1	1.4	0.6	1.4	0.6	1.4	
ΔV _T Hysteresis (V _{T+} – V _{T-})		4.5 V	0.4	0.6	1.4	0.4	1.4	0.4	1.4	V
		5.5 V	0.4	0.65	1.5	0.4	1.5	0.4	1.5	
V _{OH}	V _I = V _{IH} or V _{IL} , I _{OH} = –20 μA	4.5 V	4.4	4.49		4.4		4.4	V	
	V _I = V _{IH} or V _{IL} , I _{OH} = –4 mA	4.5 V	3.98	4.3		3.7		3.84		
V _{OL}	V _I = V _{IH} or V _{IL} , I _{OL} = 20 μA	4.5 V		.001	0.1		0.1		V	
	V _I = V _{IH} or V _{IL} , I _{OL} = 4 mA	4.5 V		0.17	0.26		0.4			0.33
I _I	V _I = V _{CC} or GND	5.5 V			±0.1		±1		±1	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			2		40		20	μA
ΔI _{CC} †	One input at 0.5 V or 2.4 V, Other inputs at GND or V _{CC}	5.5 V		0.2	2.4		3		2.9	mA
C _i	V _I = V _{CC} or GND	5 V		3	10		10		10	pF

† This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V_{CC}.

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HCT14		SN74HCT14		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	4.5 V		20	32		48		40	ns
			5.5 V		18	30		45		38	
t _t		Y	4.5 V		7	15		22		19	ns
			5.5 V		6	14		20		17	

operating characteristics, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance	No load	10	pF

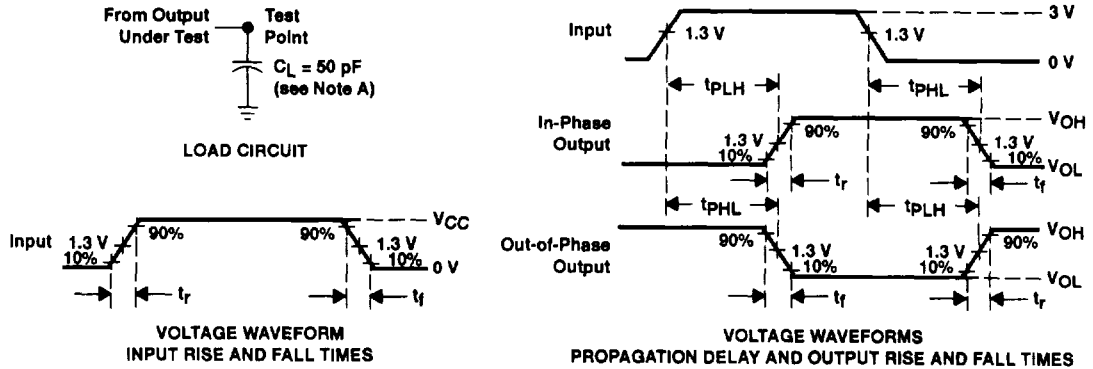


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PARAMETER MEASUREMENT INFORMATION

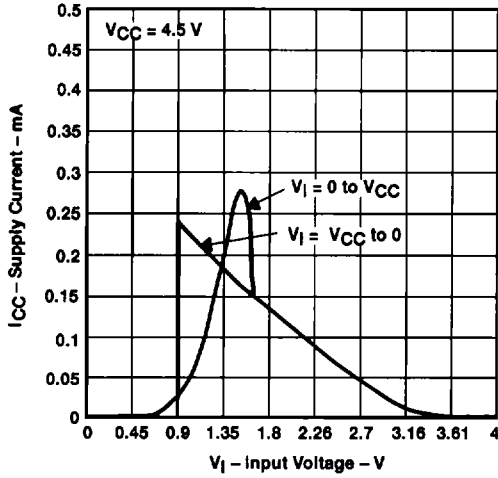


- NOTES: A. C_L includes probe and test-fixture capacitance.
 B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 C. The outputs are measured one at a time with one input transition per measurement.
 D. t_{PLH} and t_{PHL} are the same as t_{pd} .

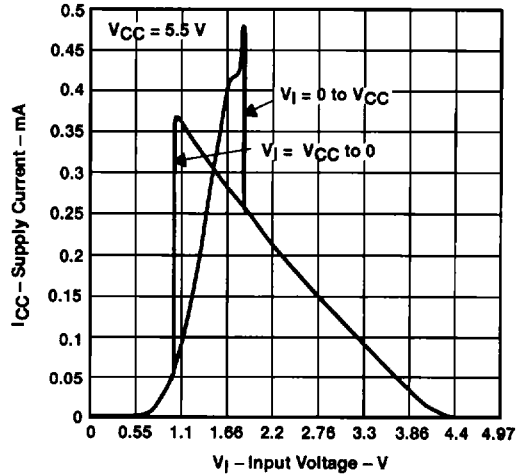
Figure 1. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

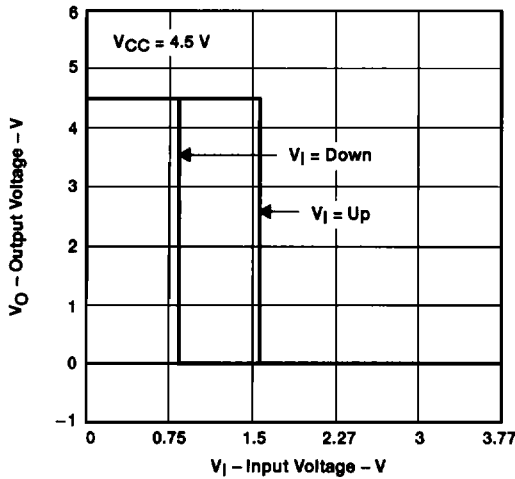
SUPPLY CURRENT
 vs
 INPUT VOLTAGE



SUPPLY CURRENT
 vs
 INPUT VOLTAGE



OUTPUT VOLTAGE
 vs
 INPUT VOLTAGE



OUTPUT VOLTAGE
 vs
 INPUT VOLTAGE

