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SCLS225C – JULY 1995 – REVISED FEBRUARY 2000

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

description

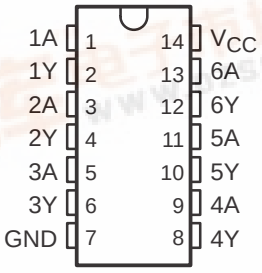
The ’HCT14 devices contain six independent inverters. The devices perform the Boolean function $Y = \overline{A}$ in positive logic.

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.

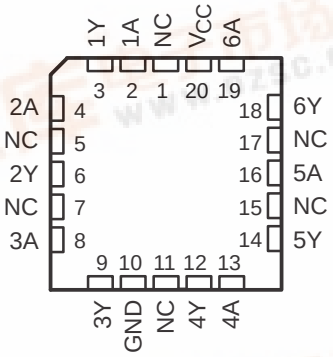
FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

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

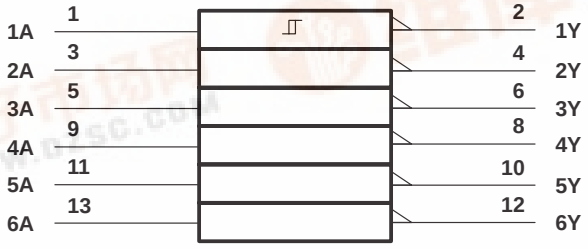


SN54HCT14 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

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, DGV, J, N, PW, and W packages.

logic diagram (positive logic)

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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
Package thermal impedance, θ_{JA} (see Note 2): D package . . . . . 86°C/W
DB package . . . . . 96°C/W
DGV package . . . . . 127°C/W
N package . . . . . 80°C/W
PW package . . . . . 113°C/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 package thermal impedance is calculated in accordance with JESD 51.

recommended operating conditions (see Note 3)

		SN54HCT14		SN74HCT14		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	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

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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}	I_{OH} = –20 μA	4.5 V	4.4	4.49		4.4		4.4		V
	I_{OH} = –4 mA	4.5 V	3.98	4.3		3.7		3.84		
V_{OL}	I_{OL} = 20 μA	4.5 V		0.001	0.1		0.1		0.1	V
	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	VI = 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}.

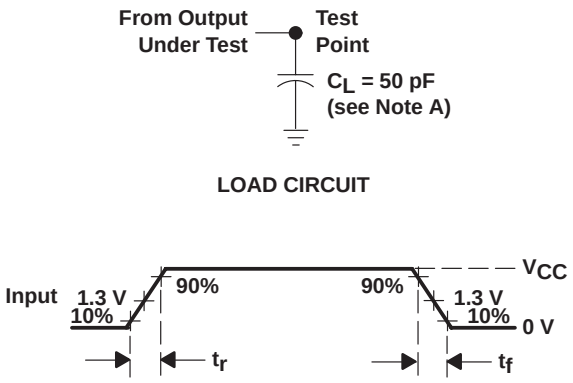
switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

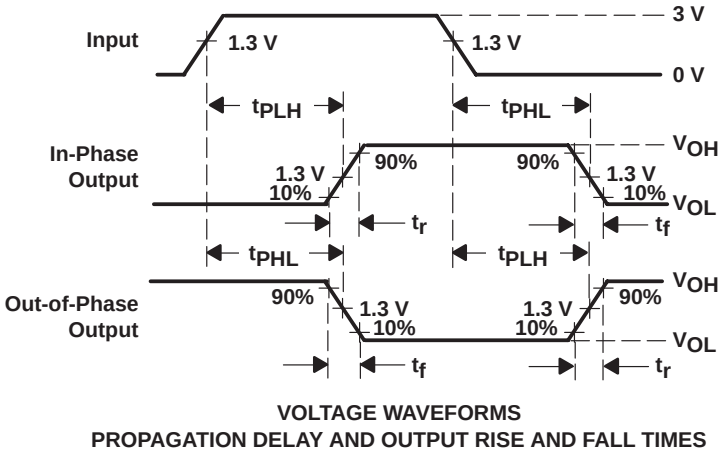
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HCT14		SN74HCT14		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	4.5 V		20	32		48		40	ns
			5.5 V		18	30		45		38	
t_t		Y	4.5 V		7	15		22		19	ns
			5.5 V		6	14		20		17	

operating characteristics, T_A = 25°C

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

PARAMETER MEASUREMENT INFORMATION



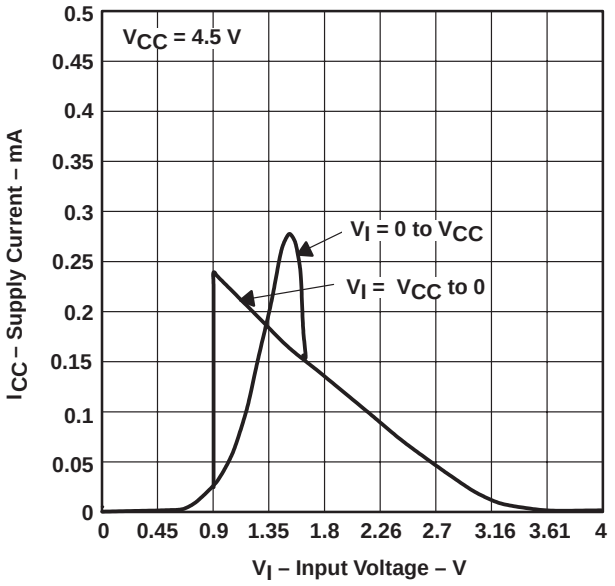


NOTES: A. C_L includes probe and test-fixture capacitance.
B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 6 ns, t_f = 6 ns.
C. The outputs are measured one at a time with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

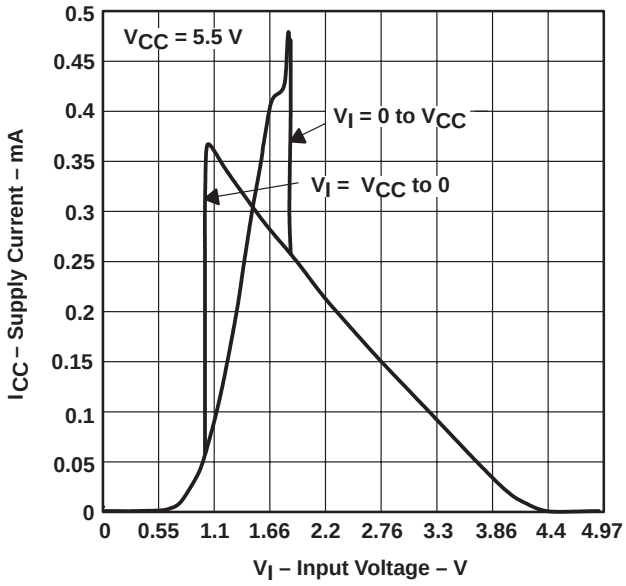
Figure 1. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

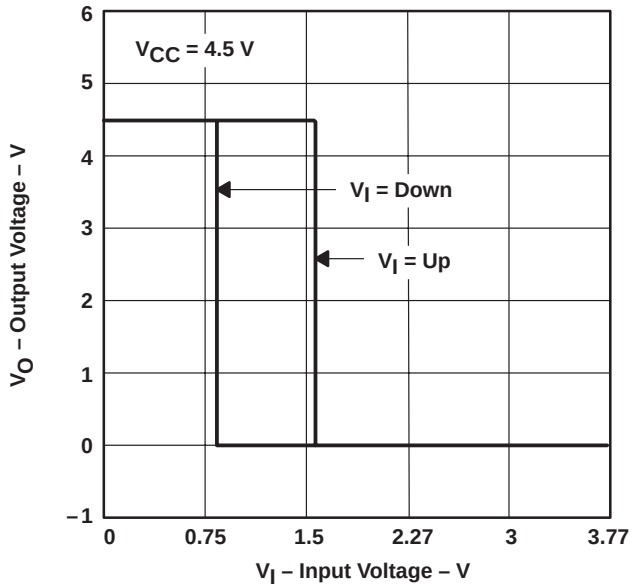
SUPPLY CURRENT vs INPUT VOLTAGE



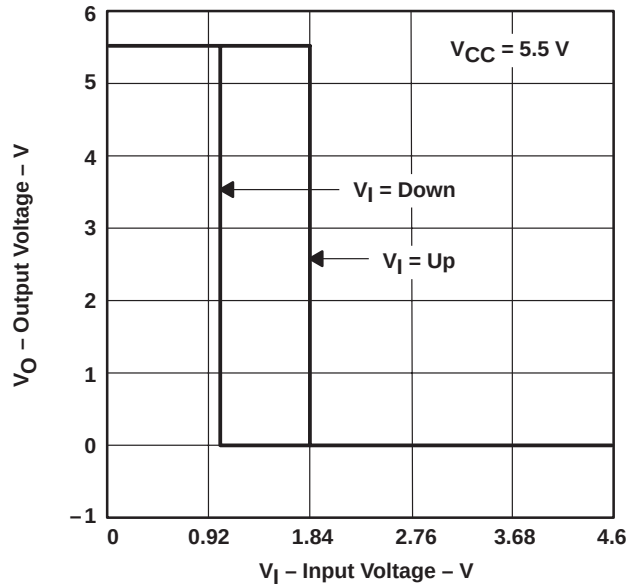
SUPPLY CURRENT vs INPUT VOLTAGE



OUTPUT VOLTAGE vs INPUT VOLTAGE



OUTPUT VOLTAGE vs INPUT VOLTAGE



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