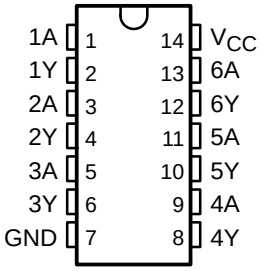
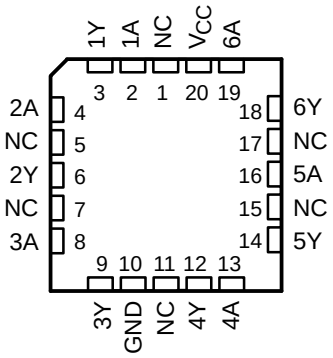
SCLS246D – OCTOBER 1995 – REVISED NOVEMBER 1996

- **Inputs Are TTL-Voltage Compatible**
- ***EPIC***™ **(Enhanced-Performance Implanted CMOS) Process**
- **High Latch-Up Immunity Exceeds 250 mA Per JEDEC Standard JESD-17**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **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**

SN54AHCT14 . . . J OR W PACKAGE
SN74AHCT14 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)



SN54AHCT14 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The ’AHCT14 contain six independent inverters. These devices perform the Boolean function $Y = \overline{A}$.

Each circuit functions as an independent inverter, but because of the Schmitt action, the inverters have different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals.

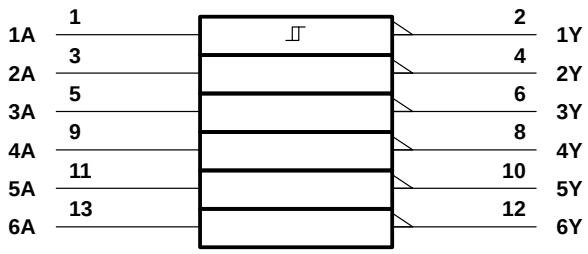
The SN54AHCT14 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74AHCT14 is characterized for operation from –40°C to 85°C.

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

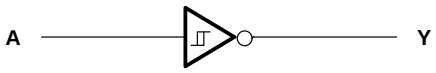
ADVANCE INFORMATION

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)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to 7 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°C (in still air) (see Note 2): D package . . . . . 1.25 W
DB or PW package . . . . . 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 (see Note 3)

		SN54AHCT14		SN74AHCT14		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	2.1		2.1		V
V_{IL}	Low-level input voltage		0.5		0.5	V
V_I	Input voltage	0	5.5	0	5.5	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current		–8		–8	mA
I_{OL}	Low-level output current		8		8	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		20		20	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

ADVANCE INFORMATION

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

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			SN54AHCT14		SN74AHCT14		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{T+} Positive-going input threshold voltage		4.5 V			3.15		3.15		3.15	V
		5.5 V			3.85		3.85		3.85	
V_{T-} Negative-going input threshold voltage		4.5 V	1.35			1.35		1.35		V
		5.5 V	1.65			1.65		1.65		
ΔV_T Hysteresis ($V_{T+} - V_{T-}$)		4.5 V	0.4		1.4	0.4	1.4	0.4	1.4	V
		5.5 V	0.5		1.6	0.5	1.6	0.5	1.6	
V_{OH}	I_{OH} = –50 μA	4.5 V	4.4	4.5		4.4		4.4		V
	I_{OH} = –8 mA	4.5 V	3.94			3.8		3.8		
V_{OL}	I_{OL} = 50 μA	4.5 V			0.1		0.1		0.1	V
	I_{OL} = 8 mA	4.5 V			0.36		0.44		0.44	
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		20		20	μA
C_i	$V_I = V_{CC}$ or GND	5 V		2	10				10	pF

switching characteristics over recommended operating free-air temperature range V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHCT14				UNIT
				T_A = 25°C			MIN	MAX
				MIN	TYP	MAX		
t_{PLH}*	A	Y	C_L = 15 pF		4	7	1	8	ns
t_{PHL}*					4	7	1	8	
t_{PLH}	A	Y	C_L = 50 pF		5.5	8	1	9	ns
t_{PHL}					5.5	8	1	9	

* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

switching characteristics over recommended operating free-air temperature range V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHCT14				UNIT
				T_A = 25°C			MIN	MAX
				MIN	TYP	MAX		
t_{PLH}	A	Y	C_L = 15 pF		4	7	1	8	ns
t_{PHL}					4	7	1	8	
t_{PLH}	A	Y	C_L = 50 pF		5.5	8	1	9	ns
t_{PHL}					5.5	8	1	9	

ADVANCE INFORMATION

noise characteristics, V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C (see Note 4)

PARAMETER		SN74AHCT14			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.9		V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		–0.7		V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		4.3		V
$V_{IH(D)}$	High-level dynamic input voltage	2.1			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.5	V

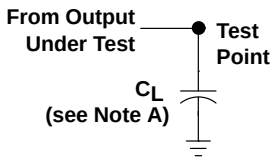
NOTE 4: Characteristics are determined during product characterization and ensured by design for surface-mount packages only.

operating characteristics, V_{CC} = 5 V, T_A = 25°C

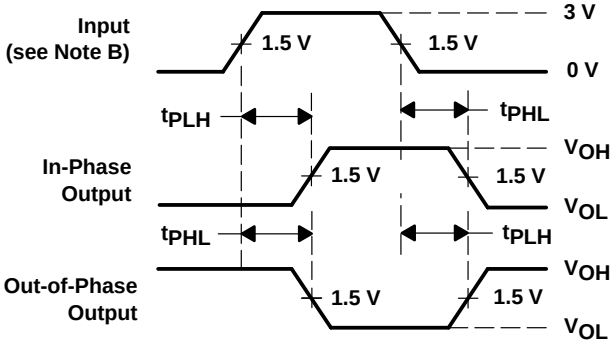
PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	No load,	f = 1 MHz	12	pF

ADVANCE INFORMATION

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT



VOLTAGE WAVEFORMS
DELAY TIMES

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 3 ns, t_f = 3 ns.
C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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