

# SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

SCAS522D – AUGUST 1995 – REVISED FEBRUARY 1998

- **EPIC™ (Enhanced-Performance Implanted CMOS) Submicron Process**
- **Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic (N) and Ceramic (J) DIPS**

## description

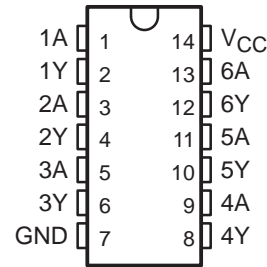
The 'AC14 devices contain six independent inverters. The devices perform the Boolean function  $Y = \bar{A}$ .

The SN54AC14 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AC14 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

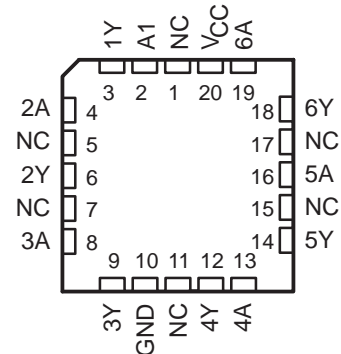
**FUNCTION TABLE**  
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

SN54AC14 ... J OR W PACKAGE  
SN74AC14 ... D, DB, N, OR PW PACKAGE  
(TOP VIEW)

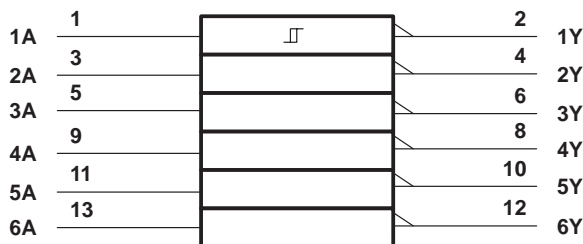


SN54AC14 ... FK PACKAGE  
(TOP VIEW)



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, J, N, PW, or W packages.

## logic diagram, each inverter (positive logic)



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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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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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## 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 $V_{CC} + 0.5$ 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 $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 200$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): D package .....	127°C/W
DB package .....	158°C/W
N package .....	78°C/W
PW package .....	170°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, except for through-hole packages, which use a trace length of zero

## recommended operating conditions (see Note 3)

		SN54AC14		SN74AC14		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	2	6	2	6	V
$V_I$	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
$V_O$	Output voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 3$ V		-12	-12	mA
		$V_{CC} = 4.5$ V		-24	-24	
		$V_{CC} = 5.5$ V		-24	-24	
$I_{OL}$	Low-level output current	$V_{CC} = 3$ V		12	12	mA
		$V_{CC} = 4.5$ V		24	24	
		$V_{CC} = 5.5$ V		24	24	
$T_A$	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.



# SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AC14		SN74AC14		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>T+</sub> Positive-going threshold		3 V	0.8	1.8	2.2	0.8	2.2	0.8	2.2	V
		4.5 V	1.5	2.6	3.2	1.5	3.2	1.5	3.2	
		5.5 V	1.6	3.2	3.9	1.6	3.9	1.6	3.9	
V <sub>T-</sub> Negative-going threshold		3 V	0.5	0.8	1	0.5	1	0.5	1	V
		4.5 V	0.9	1.4	1.8	0.9	1.8	0.9	1.8	
		5.5 V	1.1	1.8	2.3	1.1	2.3	1.1	2.3	
ΔV <sub>T</sub> Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )		3 V	0.3	1	1.2	0.3	1.2	0.3	1.2	V
		4.5 V	0.4	1.2	1.4	0.4	1.4	0.4	1.4	
		5.5 V	0.5	1.4	1.6	0.5	1.6	0.5	1.6	
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	3 V	2.9			2.9		2.9		V
		4.5 V	4.4			4.4		4.4		
		5.5 V	5.4			5.4		5.4		
	I <sub>OH</sub> = -12 mA	3 V	2.56			2.4		2.48		
		4.5 V	3.86			3.7		3.8		
	I <sub>OH</sub> = -24 mA	4.5 V	4.86			4.7		4.8		
		5.5 V				3.85				
I <sub>OH</sub> = -50 mA†	5.5 V				3.85					
	5.5 V						3.85			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	3 V	0.002		0.1	0.1		0.1		V
		4.5 V	0.001		0.1	0.1		0.1		
		5.5 V	0.001		0.1	0.1		0.1		
	I <sub>OL</sub> = 12 mA	3 V			0.36	0.5		0.44		
		4.5 V			0.36	0.5		0.44		
	I <sub>OL</sub> = 24 mA	4.5 V			0.36	0.5		0.44		
		5.5 V			0.36	0.5		0.44		
I <sub>OL</sub> = 50 mA†	5.5 V				1.65					
I <sub>OL</sub> = 75 mA†	5.5 V						1.65			
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V	±0.1			±1		±1		μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V	2			40		20		μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	4.5							pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

**switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			SN54AC14		SN74AC14		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1.5	6	13.5	1	16	1.5	15	ns
t <sub>PHL</sub>			1.5	6	11.5	1	14	1.5	13	



# SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

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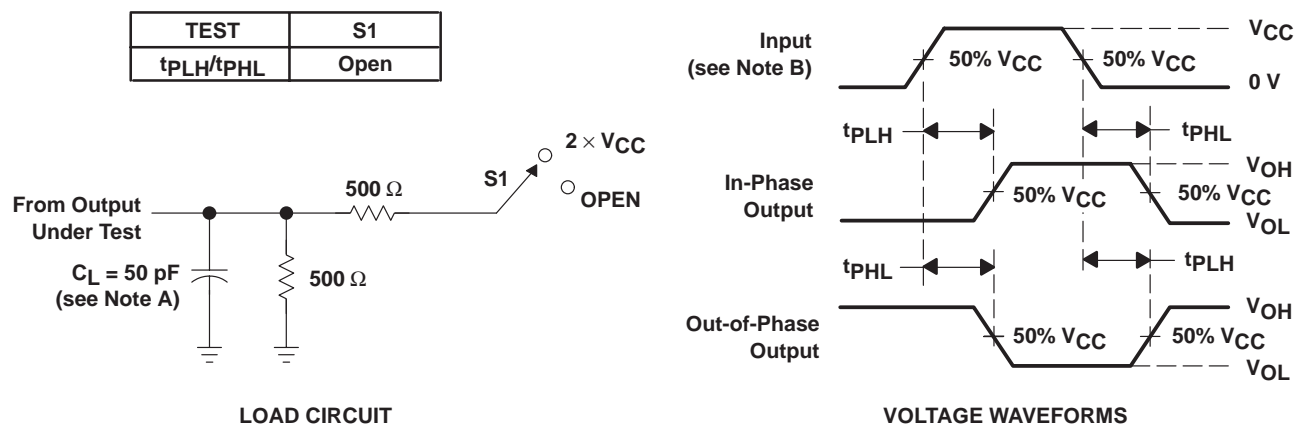
switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			SN54AC14		SN74AC14		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	1.5	5	10	1.5	12	1.5	11	ns
$t_{PHL}$			1.5	5	8.5	1.5	10	1.5	9.5	

operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	25	pF

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 2.5\text{ ns}$ ,  $t_f \leq 2.5\text{ ns}$ .  
 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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## SN74AC14, Hex Schmitt-Trigger Inverters

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN74AC14
Voltage Nodes (V)	5, 3.3
Vcc range (V)	2.0 to 6.0
Input Level	CMOS
Output Level	CMOS
Output Drive (mA)	-24/24
No. of Gates	6
Static Current	0.02
tpd(max) (ns)	11

### FEATURES

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- *EPIC*<sup>™</sup> (Enhanced-Performance Implanted CMOS) Submicron Process
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### DESCRIPTION

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The 'AC14 devices contain six independent inverters. The devices perform the Boolean function  $Y = A\bar{A}$ .

The SN54AC14 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74AC14 is characterized for operation from -40°C to 85°C.

### TECHNICAL DOCUMENTS

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**DATASHEET**[▲ Back to Top](#)Full datasheet in Acrobat PDF: [scas522d.pdf](#) (81 KB) (Updated: 02/01/1998)Full datasheet in Zipped PostScript: [scas522d.psz](#) (82 KB)**APPLICATION NOTES**[▲ Back to Top](#)View Application Reports for [Digital Logic](#)

- [CMOS Power Consumption And CPD Calculation](#) (SCAA035B - Updated: 06/01/1997)
- [Designing With Logic](#) (SDYA009C - Updated: 06/01/1997)
- [Implications of Slow or Floating CMOS Inputs](#) (SCBA004C - Updated: 02/01/1998)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)
- [Using High Speed CMOS And Advanced CMOS In Systems With Multiple Vcc](#) (SCLA008 - Updated: 04/01/1996)

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- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 4 KB - Updated: 05/06/1999)
- [Logic Selection Guide Second Half 2000](#) (SDYU001N, 5035 KB - Updated: 04/17/2000)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [More Power In Less Space - Technical Article](#) (SCAU001A, 850 KB - Updated: 03/01/1996)

**SAMPLES**[▲ Back to Top](#)

<u>ORDERABLE DEVICE</u>	<u>PACKAGE</u>	<u>PINS</u>	<u>TEMP (°C)</u>	<u>STATUS</u>	<u>SAMPLES</u>
SN74AC14D	<u>D</u>	14	-40 TO 85	ACTIVE	<a href="#">Request Samples</a>
SN74AC14PWLE	<u>PW</u>	14	-40 TO 85	OBSOLETE	

**PRICING/AVAILABILITY**[▲ Back to Top](#)

<u>ORDERABLE DEVICE</u>	<u>PACKAGE</u>	<u>PINS</u>	<u>TEMP (°C)</u>	<u>STATUS</u>	<u>BUDGETARY PRICE US\$/UNIT QTY=1000+</u>	<u>PACK QTY</u>	<u>PRICING/AVAILABILITY</u>
SN74AC14D	<u>D</u>	14	-40 TO 85	ACTIVE	0.27	50	<a href="#">Check stock or order</a>
SN74AC14DBLE	<u>DB</u>	14	-40 TO 85	OBSOLETE			
SN74AC14DBR	<u>DB</u>	14	-40 TO 85	ACTIVE	0.27	2000	<a href="#">Check stock or order</a>
SN74AC14DR	<u>D</u>	14	-40 TO 85	ACTIVE	0.30	2500	<a href="#">Check stock or order</a>
SN74AC14N	<u>N</u>	14	-40 TO 85	ACTIVE	0.27	25	<a href="#">Check stock or order</a>
SN74AC14PWLE	<u>PW</u>	14	-40 TO 85	OBSOLETE			
SN74AC14PWR	<u>PW</u>	14	-40 TO 85	ACTIVE	0.27	2000	<a href="#">Check stock or order</a>

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