

54AC11014, 74AC11014 HEX SCHMITT-TRIGGER INVERTERS

SCAS141A – AUGUST 1989 – REVISED AUGUST 1995

- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- μ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic (N) and Ceramic (J) DIPs

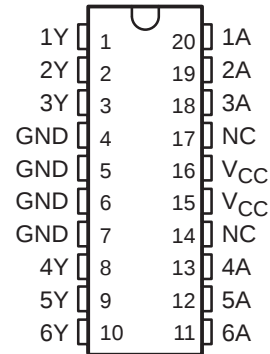
description

The 'AC11014 contains six independent inverters. They perform the Boolean function $Y = \bar{A}$. Because of the Schmitt action, the devices have different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals.

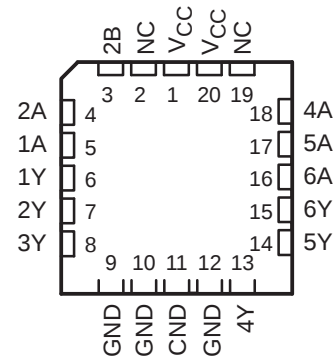
These circuits are temperature compensated. They can be triggered from the slowest of input ramps and still give clean, jitter-free output signals and greater noise margin than conventional inverters.

The 54AC11014 is characterized for operation over the full military temperature range of -55°C to 125°C. The 74AC11014 is characterized for operation from -40°C to 85°C.

54AC11014 . . . J OR W PACKAGE
74AC11014 . . . DW OR N PACKAGE
(TOP VIEW)



54AC11014 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H



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**TEXAS
INSTRUMENTS**

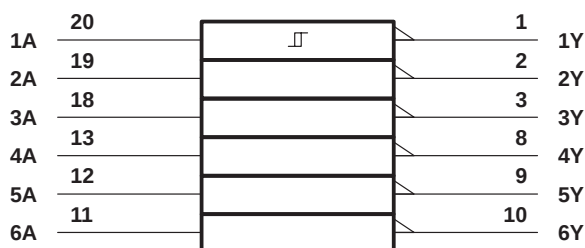
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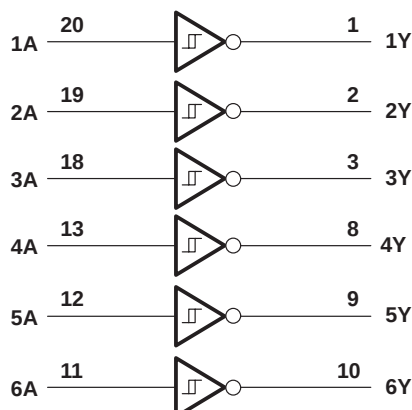
logic symbol†



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

Pin numbers shown are for the DW, J, N, 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 $V_{CC} + 0.5$ 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 $V_O > V_{CC}$)	± 50 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 50 mA
Continuous current through V_{CC} or GND	± 150 mA
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.

NOTE 1: The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

recommended operating conditions

		54AC11014			74AC11014			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	3	5	5.5	3	5	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 3$ V		2.1	$V_{CC} = 3$ V		2.1	V
		$V_{CC} = 4.5$ V		3.15	$V_{CC} = 4.5$ V		3.15	
		$V_{CC} = 5.5$ V		3.85	$V_{CC} = 5.5$ V		3.85	
V_{IL}	Low-level input voltage	$V_{CC} = 3$ V		0.9	$V_{CC} = 3$ V		0.9	V
		$V_{CC} = 4.5$ V		1.35	$V_{CC} = 4.5$ V		1.35	
		$V_{CC} = 5.5$ V		1.65	$V_{CC} = 5.5$ V		1.65	
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		–4	$V_{CC} = 3$ V		–4	mA
		$V_{CC} = 4.5$ V		–24	$V_{CC} = 4.5$ V		–24	
		$V_{CC} = 5.5$ V		–24	$V_{CC} = 5.5$ V		–24	
I_{OL}	Low-level output current	$V_{CC} = 3$ V		12	$V_{CC} = 3$ V		12	mA
		$V_{CC} = 4.5$ V		24	$V_{CC} = 4.5$ V		24	
		$V_{CC} = 5.5$ V		24	$V_{CC} = 5.5$ V		24	
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			54AC11014		74AC11014		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{T+} Positive-going threshold		3 V			2.2		2.2		2.2	V
		4.5 V			3.2		3.2		3.2	
		5.5 V			3.9		3.9		3.9	
V _{T-} Negative-going threshold		3 V	0.5			0.5		0.5		V
		4.5 V	0.9			0.9		0.9		
		5.5 V	1.1			1.1		1.1		
ΔV _T Hysteresis (V _{T+} – V _{T-})		3 V	0.3		1.2	0.3	1.2	0.3	1.2	V
		4.5 V	0.4		1.4	0.4	1.4	0.4	1.4	
		5.5 V	0.5		1.6	0.5	1.6	0.5	1.6	
V _{OH}	I _{OH} = – 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 _{OH} = – 4 mA	3 V	2.58			2.4		2.48		
		4.5 V	3.94			3.7		3.8		
	I _{OH} = – 24 mA	4.5 V	3.94			3.7		3.8		
		5.5 V	4.94			4.7		4.8		
V _{OL}	I _{OL} = 50 μA	3 V			0.1		0.1		0.1	V
		4.5 V			0.1		0.1		0.1	
		5.5 V			0.1		0.1		0.1	
	I _{OL} = 12 mA	3 V			0.36		0.5		0.44	
		4.5 V			0.36		0.5		0.44	
	I _{OL} = 24 mA	4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
I _I	V _I = V _{CC} or GND	5.5 V			±0.1		±1		±1	μA
		5.5 V			4		80		40	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		80		40	μA
C _i	V _I = V _{CC} or GND	5 V		3.5						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_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°C			54AC11014		74AC11014		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1.2	5.4	9.2	1.2	10.3	1.2	9.8	ns
t _{PHL}			1.7	6	8.5	1.7	9.9	1.7	9.3	



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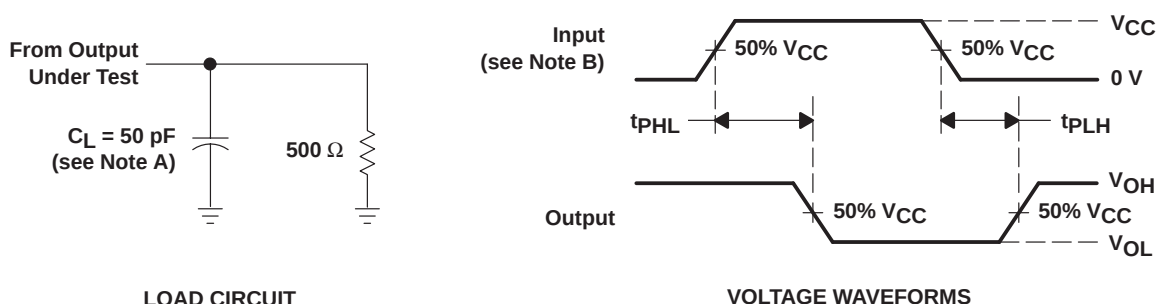
switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°C			54AC11014		74AC11014		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1.1	3.6	6.8	1.1	7.6	1.1	7.1	ns
t _{PHL}			1.5	4.1	6.7	1.5	7.6	1.5	7.4	

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 pF, f = 1 MHz	27	pF

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.
B. Input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ 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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