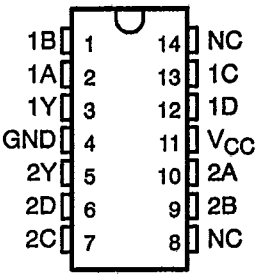
54AC11013, 74AC11013
DUAL 4-INPUT POSITIVE-NAND SCHMITT-TRIGGERS

SCAS112 – D3481, MARCH 1990

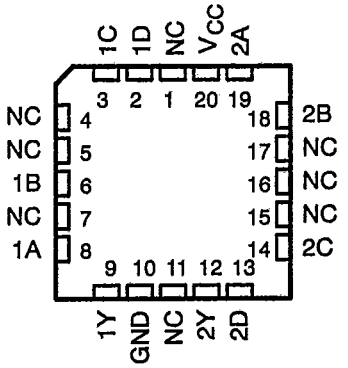
T-43-21

- **Operation From Very Slow Edges**
- **Improved Line-Receiving Characteristics**
- **High Noise Immunity**
- **Flow-Through Architecture to Optimize PCB Layout**
- **Center-Pin V_{CC} and GND Configurations to Minimize High-Speed Switching Noise**
- **EPIC™ (Enhanced-Performance Implanted CMOS) 1-μm Process**
- **500-mA Typical Latch-Up Immunity at 125°C**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**

54AC11013 . . . J PACKAGE
74AC11013 . . . D OR N PACKAGE
(TOP VIEW)



54AC11013 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

Each circuit functions as a 4-input NAND gate, but because of the Schmitt action, it has different input threshold levels for positive (V_{T+}) and for negative going (V_{T-}) signals.

The 54AC11013 is characterized for operation over the full military temperature range of – 55°C to 125°C. The 74AC11013 is characterized for operation from – 40°C to 85°C.

FUNCTION TABLE

INPUTS				OUTPUT
A	B	C	D	Y
H	H	H	H	L
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H

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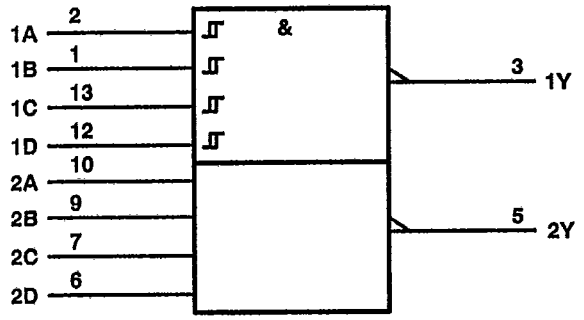
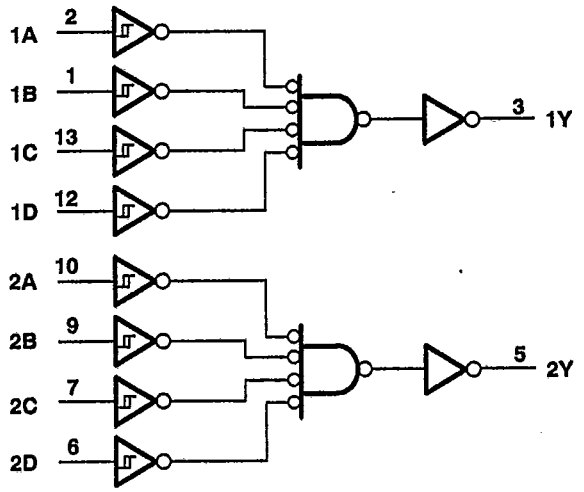
D3481, MARCH 1990 – SCAS112

logic symbol†



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

logic diagram (positive logic)



Pin numbers shown are for D, J, and N packages.

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 pins ..... ± 100 mA
Storage temperature range ..... – 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 voltage ratings may be exceeded if the input and output current ratings are observed.

recommended operating conditions

T-43-21

			54AC11013			74AC11013			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	2.2			2.2			V
		V_{CC} = 4.5 V	3.2			3.2			
		V_{CC} = 5.5 V	3.9			3.9			
V_{IL}	Low-level input voltage	V_{CC} = 3 V			0.5			0.5	V
		V_{CC} = 4.5 V			0.9			0.9	
		V_{CC} = 5.5 V			1.1			1.1	
V_I	Input voltage		0		V_{CC}	0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	0		V_{CC}	
I_{OH}	High-level output current	V_{CC} = 3 V			– 4			– 4	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	
$\Delta t/\Delta v$	Input transition rise or fall rate		0		100	0		100	ns/V
T_A	Operating free-air temperature		– 55		125	– 40		85	°C

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

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			54AC11013		74AC11013		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{T+}		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-}		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		
V_{hys}	$V_{hys} = V_{T+} - V_{T-}$	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		
	I_{OH} = – 24 mA	4.5 V	3.94			3.7		3.8		
		5.5 V	4.94					4.8		
	I_{OH} = – 50 mA†	5.5 V				3.85				
	I_{OH} = – 75 mA†	5.5 V						3.85		
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	
	I_{OL} = 24 mA	4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
	I_{OL} = 50 mA†	5.5 V					1.65			
	I_{OL} = 75 mA†	5.5 V							1.65	
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			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			54AC11013		74AC11013		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A, B C, D	Y	2.5	6.4	8.7	2.5	10.4	2.5	9.7	ns
t_{PHL}			2.3	6.5	8.7	2.3	10.6	2.3	9.9	

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

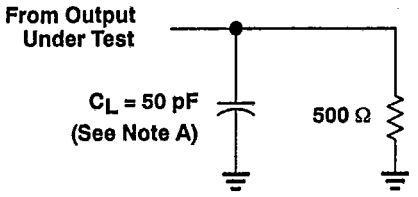
PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			54AC11013		74AC11013		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A, B, C, D	Y	2	4.2	6.4	2	7.6	2	7.1	ns
t_{PHL}			2	4.4	6.9	2	8.3	2	7.8	

PRODUCT PREVIEW

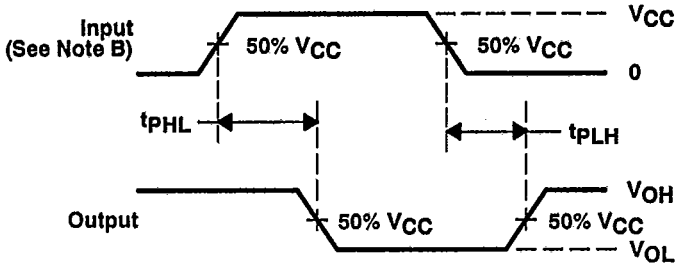
operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	C_L = 50 pF, f = 1 MHz	29	pF

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

NOTES: A. C_L includes probe and jig capacitance.
B. Input pulses are supplied by generators having the following characteristics: PRR ≤ 10 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