

# 54AC11021, 74AC11021 DUAL 4-INPUT POSITIVE-AND GATES

SCAS005B – JULY 1987 – REVISED APRIL 1993

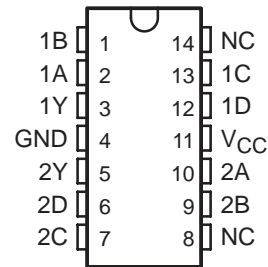
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

## description

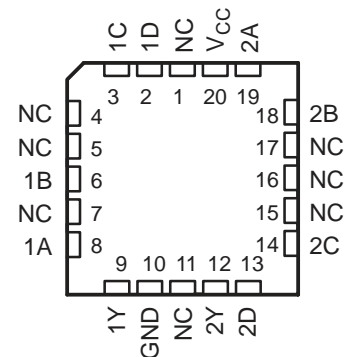
These devices contain two independent 4-input AND gates. They perform the Boolean functions  $Y = A \cdot B \cdot C \cdot D$  or  $Y = \bar{A} + \bar{B} + \bar{C} + \bar{D}$  in positive logic.

The 54AC11021 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The 74AC11021 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

54AC11021 . . . J PACKAGE  
74AC11021 . . . D OR N PACKAGE  
(TOP VIEW)



54AC11021 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE  
(each gate)

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

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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.



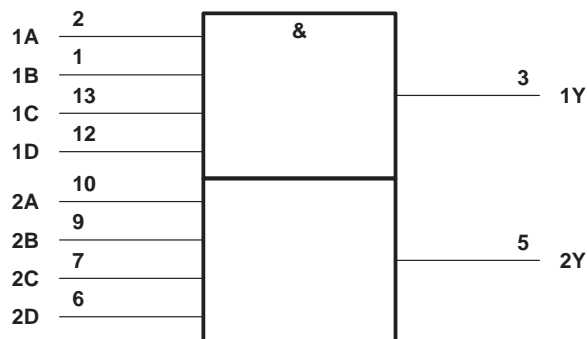
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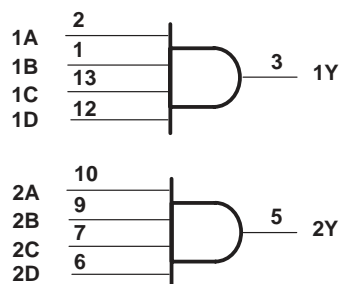
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## logic symbol†



## logic diagram (positive logic)



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

Pin numbers shown are for the 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 $V_I > V_{CC}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 100$ 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 clamp-current ratings are observed.

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## recommended operating conditions

		54AC11021			74AC11021			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	$V_{CC} = 3\text{ V}$	2.1		2.1			V
		$V_{CC} = 4.5\text{ V}$	3.15		3.15			
		$V_{CC} = 5.5\text{ V}$	3.85		3.85			
$V_{IL}$	Low-level input voltage	$V_{CC} = 3\text{ V}$			0.9			V
		$V_{CC} = 4.5\text{ V}$			1.35			
		$V_{CC} = 5.5\text{ V}$			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	$V_{CC} = 3\text{ V}$			-4			mA
		$V_{CC} = 4.5\text{ V}$			-24			
		$V_{CC} = 5.5\text{ V}$			-24			
$I_{OL}$	Low-level output current	$V_{CC} = 3\text{ V}$			12			mA
		$V_{CC} = 4.5\text{ V}$			24			
		$V_{CC} = 5.5\text{ V}$			24			
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	0		10	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	$V_{CC}$	$T_A = 25^\circ\text{C}$			54AC11021		74AC11021		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50\ \mu\text{A}$	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		
	$I_{OH} = -4\ \text{mA}$	3 V	2.58			2.4		2.48		
		4.5 V	3.94			3.7		3.8		
		5.5 V	4.94			4.7		4.8		
		5.5 V				3.85				
$I_{OH} = -50\ \text{mA}^\dagger$	5.5 V				3.85					
$I_{OH} = -75\ \text{mA}^\dagger$	5.5 V						3.85			
$V_{OL}$	$I_{OL} = 50\ \mu\text{A}$	3 V				0.1		0.1	V	
		4.5 V				0.1		0.1		
		5.5 V				0.1		0.1		
	$I_{OL} = 12\ \text{mA}$	3 V			0.36		0.5	0.44		
		4.5 V			0.36		0.5	0.44		
		5.5 V			0.36		0.5	0.44		
		5.5 V					1.65			
$I_{OL} = 50\ \text{mA}^\dagger$	5.5 V					1.65				
$I_{OL} = 75\ \text{mA}^\dagger$	5.5 V						1.65			
$I_I$	$V_I = V_{CC}$ or GND	5.5 V			$\pm 0.1$		$\pm 1$	$\pm 1$	$\mu\text{A}$	
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			4		80	40	$\mu\text{A}$	
$C_i$	$V_I = V_{CC}$ or GND	5 V			3.5				pF	

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



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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54AC11021		74AC11021		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	Any	Y	1.5	8.2	11.4	1.5	13.9	1.5	13	ns
$t_{PHL}$			1.5	6.4	8.7	1.5	9.9	1.5	9.3	

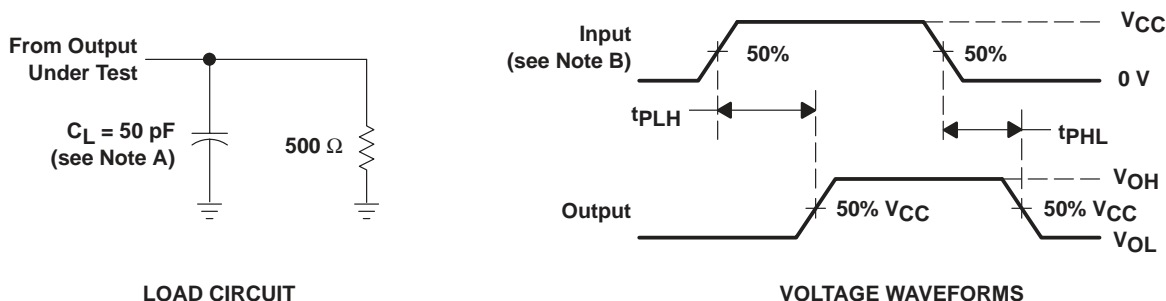
switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54AC11021		74AC11021		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	Any	Y	1.5	5.6	7.8	1.5	9.4	1.5	8.8	ns
$t_{PHL}$			1.5	4.6	6.5	1.5	7.4	1.5	6.9	

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per gate	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	38	pF

## PARAMETER MEASUREMENT INFORMATION



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