

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

T10054—D2957, JULY 1987—REVISED JANUARY 1990

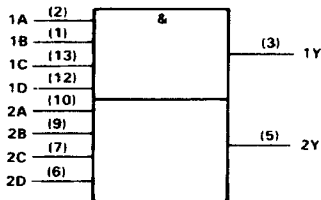
- Flow-Through Architecture to Optimize PCB Layout
- Center-Pin V_{CC} and GND Configurations to Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- μ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic "Small Outline" Packages, Ceramic 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 $Y = \overline{A + B + C + D}$ in positive logic.

The 54AC11021 is characterized for operation over the full military temperature range of -55°C to 125°C. The 74AC11021 is characterized for operation from -40°C to 85°C.

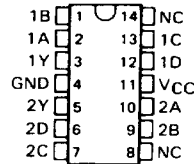
logic symbol†



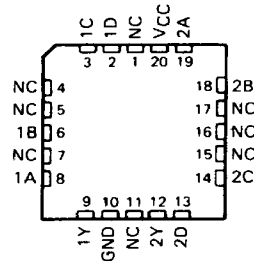
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

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

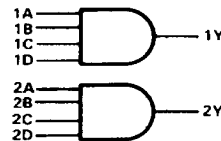


54AC11021 ... FK PACKAGE
(TOP VIEW)



NC—No internal connection

logic diagram (positive logic)



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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2-53

54AC11021, 74AC11021

DUAL 4-INPUT POSITIVE-AND GATES

D2957, JULY 1987—REVISED JANUARY 1990—T10054

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

			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	$V_{CC} = 3$ V	2.1			2.1			V
		$V_{CC} = 4.5$ V	3.15			3.15			
		$V_{CC} = 5.5$ V	3.85			3.85			
V_{IL}	Low-level input voltage	$V_{CC} = 3$ V			0.9			0.9	V
		$V_{CC} = 4.5$ V			1.35			1.35	
		$V_{CC} = 5.5$ V			1.65			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			−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		10	0		10	ns/V
T_A	Operating free-air temperature		−55		125	−40		85	°C

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T10054—D2957, JULY 1987—REVISED JANUARY 1990

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			54AC11021		74AC11021		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
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		
		5.5 V	4.94			4.7		4.8		
	I _{OH} = -50 mA† I _{OH} = -75 mA†	5.5 V				3.85				
		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	
		4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
	I _{OL} = 50 mA† I _{OL} = 75 mA†	5.5 V					1.65			
		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			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 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°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	

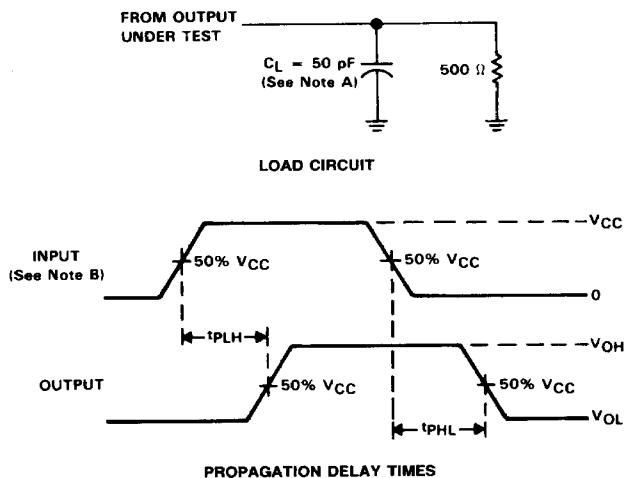
operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _p d Power dissipation capacitance per gate	C _L = 50 pF, f = 1 MHz	38	pF

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D2957, JULY 1987—REVISED JANUARY 1990—T10054

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