

# 54ACT11020, 74ACT11020 DUAL 4-INPUT POSITIVE-NAND GATES

SCAS016A – D2957, JUNE 1987 – REVISED APRIL 1993

- Inputs Are TTL-Voltage Compatible
- 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- $\mu$ 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

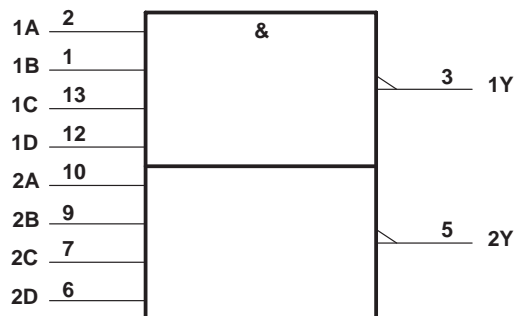
These devices contain two independent 4-input NAND gates. They perform the Boolean functions  $Y = \overline{A \cdot B \cdot C \cdot D}$  or  $Y = \overline{A + B + C + D}$  in positive logic.

The 54ACT11020 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The 74ACT11020 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE  
(each gate)

INPUTS				OUTPUT Y
A	B	C	D	
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

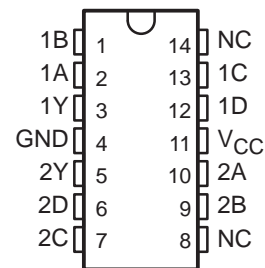
## logic symbol†



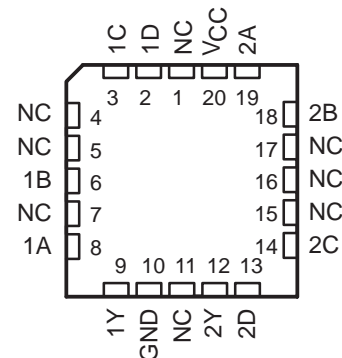
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

54ACT11020 . . . J PACKAGE  
74ACT11020 . . . D OR N PACKAGE  
(TOP VIEW)

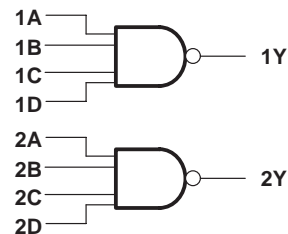


54ACT11020 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## logic diagram (positive logic)



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TEXAS  
INSTRUMENTS

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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 6 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	± 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

		54ACT11020		74ACT11020		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8	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		–24		–24	mA
$I_{OL}$	Low-level output current		24		24	mA
$\Delta t/\Delta v$	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	$V_{CC}$	$T_A = 25^\circ\text{C}$			54ACT11020		74ACT11020		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50 \mu\text{A}$	4.5 V	4.4		4.4		4.4		V	
		5.5 V	5.4		5.4		5.4			
	$I_{OH} = -24 \text{ mA}$	4.5 V	3.94		3.7		3.8			
		5.5 V	4.94		4.7		4.8			
	$I_{OH} = -50 \text{ mA}^\ddagger$	5.5 V			3.85					
$I_{OH} = -75 \text{ mA}^\ddagger$	5.5 V					3.85				
$V_{OL}$	$I_{OL} = 50 \mu\text{A}$	4.5 V			0.1		0.1		V	
		5.5 V			0.1		0.1			
	$I_{OL} = 24 \text{ mA}$	4.5 V			0.36		0.5	0.44		
		5.5 V			0.36		0.5	0.44		
	$I_{OL} = 50 \text{ mA}^\ddagger$	5.5 V					1.65			
$I_{OL} = 75 \text{ mA}^\ddagger$	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	
$\Delta I_{CC}^\S$	One input at 3.4 V, Other inputs at GND or $V_{CC}$	5.5 V			0.9		1	1	mA	
$C_i$	$V_I = V_{CC}$ 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.

§ This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or  $V_{CC}$ .



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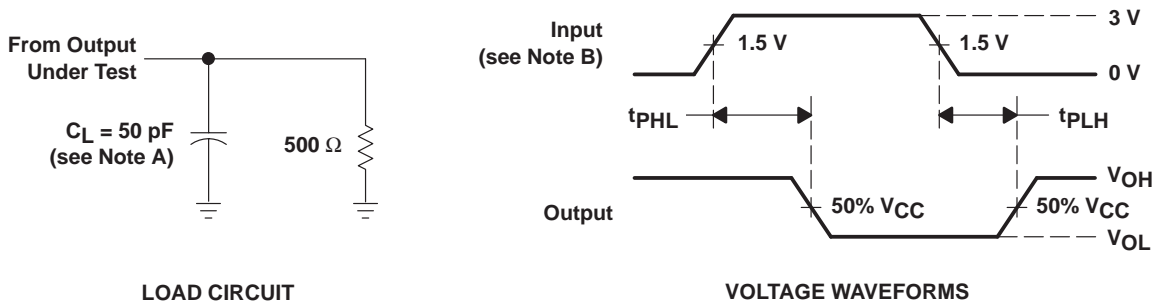
switching characteristics over recommended ranges of supply voltage and free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54ACT11020		74ACT11020		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	Any	Y	1.5	5.6	8.5	1.5	9.5	1.5	9.1	ns
$t_{PHL}$			1.5	6.1	8.4	1.5	9.8	1.5	9.2	

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	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r = 3\text{ ns}$ ,  $t_f = 3\text{ ns}$ .  
 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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