

SN54HC20, SN74HC20 DUAL 4-INPUT POSITIVE-NAND GATES

D2684, DECEMBER 1982 — REVISED SEPTEMBER 1987

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

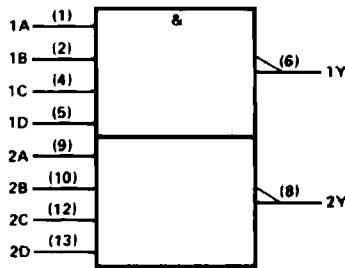
These devices contain two independent 4-input NAND gates. They perform the Boolean functions $Y = \overline{A \cdot B \cdot C \cdot D}$ or $Y = \overline{A + B + C + D}$ in positive logic.

The SN54HC20 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC20 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE (each gate)

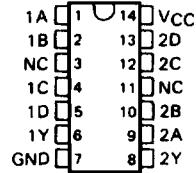
INPUTS				OUTPUT Y
A	B	C	D	
H	H	H	H	L
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H

logic symbol†

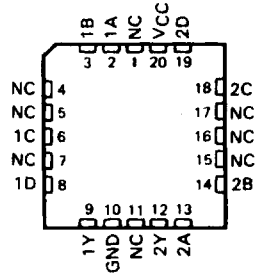


†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, and N packages.

SN54HC20 . . . J PACKAGE
SN74HC20 . . . D OR N PACKAGE
(TOP VIEW)

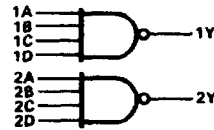


SN54HC20 . . . FK PACKAGE
(TOP VIEW)



NC — No internal connection

logic diagram (positive logic)



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PRODUCTION DATA documents contain information 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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SN54HC20, SN74HC20

DUAL 4-INPUT POSITIVE-NAND GATES

absolute maximum ratings over operating free-air temperature†

Supply voltage, V_{CC}	-0.5 V to 7 V
Input clamp current, $I_{IK}(V_I < 0 \text{ or } V_I > V_{CC})$	± 20 mA
Output clamp current, $I_{OK}(V_O < 0 \text{ or } V_O > V_{CC})$	± 20 mA
Continuous output current, $I_O (V_O = 0 \text{ to } V_{CC})$	± 25 mA
Continuous current through V_{CC} or GND pins	± 50 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package	300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: D or N package	260°C
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.

recommended operating conditions

		SN54HC20			SN74HC20			UNIT		
		MIN	NOM	MAX	MIN	NOM	MAX			
V_{CC}	Supply voltage	2	5	6	2	5	6	V		
V_{IH}	High-level input voltage	$V_{CC} = 2 \text{ V}$		1.5	$V_{CC} = 2 \text{ V}$		1.5	V		
		$V_{CC} = 4.5 \text{ V}$		3.15	$V_{CC} = 4.5 \text{ V}$		3.15			
		$V_{CC} = 6 \text{ V}$		4.2	$V_{CC} = 6 \text{ V}$		4.2			
V_{IL}	Low-level input voltage	$V_{CC} = 2 \text{ V}$		0	0.3	$V_{CC} = 2 \text{ V}$		0	V	
		$V_{CC} = 4.5 \text{ V}$		0	0.9	$V_{CC} = 4.5 \text{ V}$		0		
		$V_{CC} = 6 \text{ V}$		0	1.2	$V_{CC} = 6 \text{ V}$		0		
V_I	Input voltage	0			V_{CC}	0			V_{CC}	V
V_O	Output voltage	0			V_{CC}	0			V_{CC}	V
t_t	Input transition (rise and fall) times	$V_{CC} = 2 \text{ V}$		0	1000	$V_{CC} = 2 \text{ V}$		0	1000	ns
		$V_{CC} = 4.5 \text{ V}$		0	500	$V_{CC} = 4.5 \text{ V}$		0	500	
		$V_{CC} = 6 \text{ V}$		0	400	$V_{CC} = 6 \text{ V}$		0	400	
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}	$T_A = 25^\circ\text{C}$		SN54HC20		SN74HC20		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	
V_{OH}	$V_I = V_{IH} \text{ or } V_{IL}, I_{OH} = -20 \mu\text{A}$	2 V	1.9	1.998	1.9	1.9	V		
		4.5 V	4.4	4.499	4.4	4.4			
		6 V	5.9	5.999	5.9	5.9			
	4.5 V	3.98	4.30	3.7	3.84				
	$V_I = V_{IH} \text{ or } V_{IL}, I_{OH} = -5.2 \text{ mA}$	6 V	5.48	5.80	5.2	5.34			
V_{OL}	$V_I = V_{IH} \text{ or } V_{IL}, I_{OL} = 20 \mu\text{A}$	2 V	0.002	0.1	0.1	0.1	V		
		4.5 V	0.001	0.1	0.1	0.1			
		6 V	0.001	0.1	0.1	0.1			
	4.5 V	0.17	0.26	0.4	0.33				
	$V_I = V_{IH} \text{ or } V_{IL}, I_{OL} = 5.2 \text{ mA}$	6 V	0.15	0.26	0.4	0.33			
I_I	$V_I = V_{CC} \text{ or } 0$	6 V	± 0.1	± 100	± 1000	± 1000	nA		
I_{CC}	$V_I = V_{CC} \text{ or } 0, I_O = 0$	6 V	2		40	20	μA		
C_i		2 to 6 V	3	10	10	10	pF		

SN54HC20, SN74HC20
TRIPLE 3-INPUT POSITIVE-NAND GATES

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L = 50$ pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC20		SN74HC20		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A, B, C, or D	Y	2 V	45	110	165	140	ns			
			4.5 V	14	22	33	28				
			6 V	11	19	28	24				
t_t		Y	2 V	27	75	110	95	ns			
			4.5 V	9	15	22	19				
			6 V	7	13	19	16				

C_{pd}	Power dissipation capacitance per gate	No load, $T_A = 25^\circ\text{C}$	25 pF typ
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NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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