

# SN54HC51, SN74HC51 AND-OR-INVERT 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

The 'HC51 provides 2-wide, 2-input, and 2-wide, 3-input AND-OR-INVERT gates. The device performs the following Boolean functions:

$$1Y = (1A \cdot 1B \cdot 1C) + (1D \cdot 1E \cdot 1F)$$

$$2Y = (2A \cdot 2B) + (2C \cdot 2D)$$

The SN54HC51 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC51 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

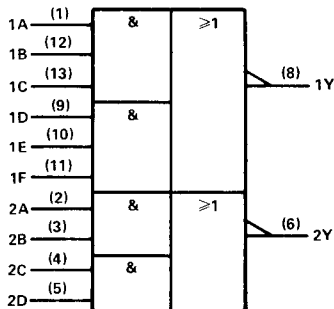
## FUNCTION TABLES

INPUTS						OUTPUT
1A	1B	1C	1D	1E	1F	1Y
H	H	H	X	X	X	L
X	X	X	H	H	H	L
Any other combination						H

INPUTS				OUTPUT
2A	2B	2C	2D	2Y
H	H	X	X	L
X	X	H	H	L
Any other combination				H

H = high level, L = low level, X = irrelevant

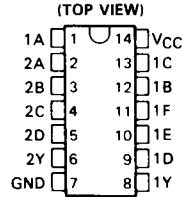
## logic symbol†



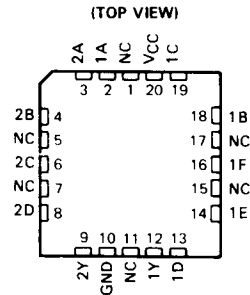
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

## SN54HC51 . . . J PACKAGE SN74HC51 . . . D OR N PACKAGE

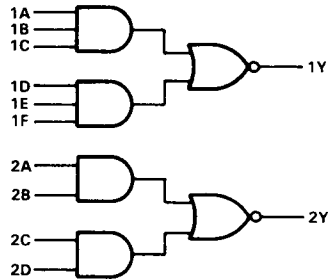


## SN54HC51 . . . FK PACKAGE



NC—No internal connection

## logic diagram (positive logic)



# SN54HC51, SN74HC51 AND-OR-INVERT GATES

2

HC MOS Devices

## absolute maximum ratings over operating free-air temperature†

Supply voltage, $V_{CC}$ .....	-0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 25$ mA
Continuous current through $V_{CC}$ or GND pins .....	$\pm 50$ 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

		SN54HC51			SN74HC51			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$ Supply voltage		2	5	6	2	5	6	V
$V_{IH}$ High-level input voltage	$V_{CC} = 2$ V	1.5			1.5			V
	$V_{CC} = 4.5$ V	3.15			3.15			
	$V_{CC} = 6$ V	4.2			4.2			
$V_{IL}$ Low-level input voltage	$V_{CC} = 2$ V	0	0.3	0	0	0.3	V	
	$V_{CC} = 4.5$ V	0	0.9	0	0	0.9		
	$V_{CC} = 6$ V	0	1.2	0	0	1.2		
$V_I$ 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	$V_{CC} = 2$ V	0	1000	0	1000		ns	
	$V_{CC} = 4.5$ V	0	500	0	500			
	$V_{CC} = 6$ V	0	400	0	400			
$T_A$ Operating free-air temperature		-55	125	-40	85		°C	

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC51		SN74HC51		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$V_I = V_{IH}$ 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				
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -5.2 \text{ mA}$	6 V	5.48	5.80		5.2	5.34			
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 20 \mu\text{A}$	2 V		0.002	0.1		0.1	V		
		4.5 V		0.001	0.1		0.1			
		6 V		0.001	0.1		0.1			
	4.5 V		0.17	0.26		0.4	0.33			
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 5.2 \text{ mA}$	6 V		0.15	0.26		0.4	0.33		
$I_I$	$V_I = V_{CC}$ or 0	6 V		$\pm 0.1$	$\pm 100$		$\pm 1000$		nA	
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$	6 V		2		40		20	$\mu\text{A}$	
$C_i$		2 to 6 V		3	10		10		pF	

**SN54HC51, SN74HC51  
AND-OR-INVERT GATES**

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC51		SN74HC51		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	Any	Y	2 V		54	140		210		175	ns
			4.5 V		15	28		42		35	
			6 V		12	24		36		30	
$t_t$		Y	2 V		28	75		110		95	ns
			4.5 V		9	15		22		19	
			6 V		8	13		19		16	

$C_{pd}$	Power dissipation capacitance per AOI 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.

**2**

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