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- Operation From Very Slow Input Transitions
- Temperature-Compensated Threshold Levels
- High Noise Immunity
- Same Pinouts as 'HC08
- Package Options Include Plastic Small-Outline (D) and Ceramic Flat (W)
  Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J)
  300-mil DIPs

#### description

Each circuit functions as a quadruple AND gate. They perform the Boolean function  $Y = A \bullet B$  or  $Y = \overline{A} + \overline{B}$  in positive logic. Because of the Schmitt action, the inputs have different input threshold levels for positive-and negative-going signals.

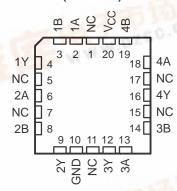
These circuits are temperature compensated and can be triggered from the slowest of input ramps and still give clean jitter-free output signals.

The SN54HC7001 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74HC7001 is characterized for operation from –40°C to 85°C.

SN54HC7001 ... J OR W PACKAGE SN74HC7001 ... D OR N PACKAGE (TOP VIEW)



### SN54HC7001 . . . FK PACKAGE (TOP VIEW)



NC – No internal connection

## FUNCTION TABLE (each gate)

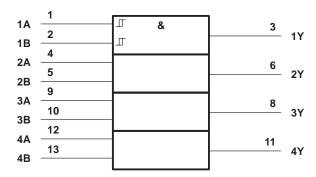
	(	
INP	UTS	OUTPUT
Α	В	Υ
Н	Н	Н
L	X	L
X	L	L

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### SN54HC7001, SN74HC7001 QUADRUPLE POSITIVE-AND GATES WITH SCHMITT-TRIGGER INPUTS

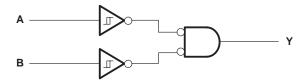
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#### logic symbol†



<sup>&</sup>lt;sup>†</sup> This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, N, and W packages.

#### logic diagram, each gate (positive logic)



#### absolute maximum ratings over operating free-air temperature range‡

Supply voltage range, V <sub>CC</sub>	$\dots$ -0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)	±20 mA
Output clamp current, I <sub>OK</sub> (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> ) (see Note 1)	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through V <sub>CC</sub> or GND	±50 mA
Package thermal impedance, θ <sub>JA</sub> (see Note 2): D package	127°C/W
N package	78°C/W
Storage temperature range, T <sub>stq</sub>	. $-65^{\circ}\text{C}$ to $150^{\circ}\text{C}$

<sup>‡</sup> 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
  - 2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.



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#### recommended operating conditions

			SN	SN54HC7001		SN74HC7001			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage		2	5	6	2	5	6	V
		V <sub>CC</sub> = 2 V	1.5	1.5					
VIH	High-level input voltage	$V_{CC} = 4.5 \text{ V}$	3.15		ςN	3.15			V
		V <sub>CC</sub> = 6 V	4.2	FL		4.2			
		V <sub>CC</sub> = 2 V	0	2	0.5	0		0.5	
VIL	Low-level input voltage	$V_{CC} = 4.5 \text{ V}$	0	0 0 1.35	0		1.35	V	
		VCC = 6 V	0.4	2	1.8	0		1.8	
VI	Input voltage		0	,	VCC	0		VCC	V
VO	Output voltage	·	0		VCC	0		VCC	V
TA	Operating free-air temperature		-55		125	-40		85	°C

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

PARAMETER	TEST CONDITIONS			T <sub>A</sub> = 25°C			SN54HC7001		SN74HC7001		UNIT
PARAMETER	lesi cc	SNOTTIONS	Vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNII
			2 V	1.9	1.998		1.9		1.9		
		$I_{OH} = -20  \mu A$	4.5 V	4.4	4.499		4.4		4.4		V
Voн	VI = VIH or VIL		6 V	5.9	5.999		5.9		5.9		
		I <sub>OH</sub> = -4 mA	4.5 V	3.98	4.3		3.7		3.84		
		$I_{OH} = -5.2 \text{ mA}$	6 V	5.48	5.8		5.2		5.34		
			2 V		0.002	0.1		0.1		0.1	
		I <sub>OL</sub> = 20 μA	4.5 V		0.001	0.1		0.1		0.1	V
V <sub>OL</sub>	$V_I = V_{IH}$ or $V_{IL}$		6 V		0.001	0.1		0.1		0.1	
		I <sub>OL</sub> = 4 mA	4.5 V		0.17	0.26		0.4		0.33	
		I <sub>OL</sub> = 5.2 mA	6 V		0.15	0.26		0.4		0.33	
			2 V	0.7	1.2	1.5	0.7	1.5	0.7	1.5	
V <sub>T+</sub>				1.55	2.5	3.15	1.55	3.15	1.55	3.15	V
			6 V	2.1	3.3	4.2	2.1	4.2	2.1	4.2	
			2 V	0.3	0.6	1	0.3	1	0.3	1	
V <sub>T</sub> _			4.5 V	0.9	1.6	2.45	0.9	2.45	0.9	2.45	V
			6 V	1.2	2	3.2	1.2	3.2	1.2	3.2	
			2 V	0.2	0.6	1.2	0.2	1.2	0.2	1.2	
$V_{T+} - V_{T-}$			4.5 V	0.4	0.9	2.1	0.4	2.1	0.4	2.1	V
			6 V	0.5	1.3	2.5	0.5	2.5	0.5	2.5	
II	$V_I = V_{CC}$ or 0		6 V		±0.1	±100		±1000		±1000	nA
Icc	$V_I = V_{CC}$ or 0,	I <sub>O</sub> = 0	6 V			2		40		20	μΑ
C <sub>i</sub>			2 V to 6 V		3	10		10		10	pF



#### SN54HC7001, SN74HC7001 QUADRUPLE POSITIVE-AND GATES WITH SCHMITT-TRIGGER INPUTS

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

DADAMETED	PARAMETER FROM TO VO		Vaa	T,	չ = 25°C	;	SN54H	C7001	SN74H	C7001	UNIT	
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
		2 V		60	130		195		163			
t <sub>pd</sub> A or B Y	Υ	4.5 V		18	26		//39		33	ns		
		Γ		6 V		14	22	1	33		28	
			2 V		28	75	35	110		95		
t <sub>t</sub> Any	4.5 V		8	15	90	22		19	ns			
	6	6 V		6	13	8	19		16			

#### operating characteristics, T<sub>A</sub> = 25°C

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance per gate	No load	20	pF

#### PARAMETER MEASUREMENT INFORMATION From Output Test Input 50% 50% **Under Test Point** $C_L = 50 pF$ - tPHL − tPLH → (see Note A) $V_{OH}$ In-Phase 90% 50% Output **LOAD CIRCUIT** 10% VOL tPHL - VCC 90% 90% Input 90% **Out-of-Phase** Output 10% $v_{OL}$ **VOLTAGE WAVEFORM VOLTAGE WAVEFORMS INPUT RISE AND FALL TIMES** PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

NOTES: A. C<sub>L</sub> includes probe and test-fixture capacitance.

- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_O = 50~\Omega$ ,  $t_f = 6$  ns,  $t_f = 6$  ns.
- C. The outputs are measured one at a time with one input transition per measurement.
- D. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms



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