

# SN54HCT02, SN74HCT02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

SCLS065A – NOVEMBER 1988 – REVISED JANUARY 1996

- Inputs Are TTL-Voltage Compatible
- 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

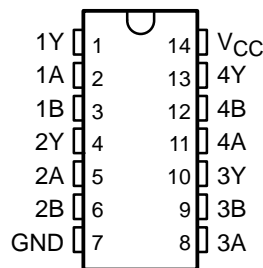
These devices contain four independent 2-input NOR gates. They perform the Boolean function  $Y = \overline{A} \cdot \overline{B}$  or  $Y = \overline{A + B}$  in positive logic.

The SN54HCT02 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HCT02 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

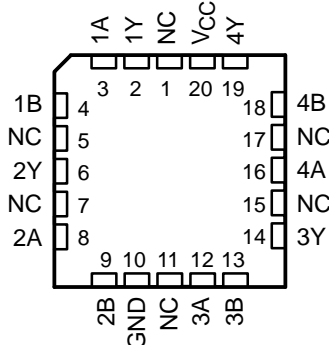
FUNCTION TABLE  
(each gate)

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

SN54HCT02 . . . J OR W PACKAGE  
SN74HCT02 . . . D OR N PACKAGE  
(TOP VIEW)

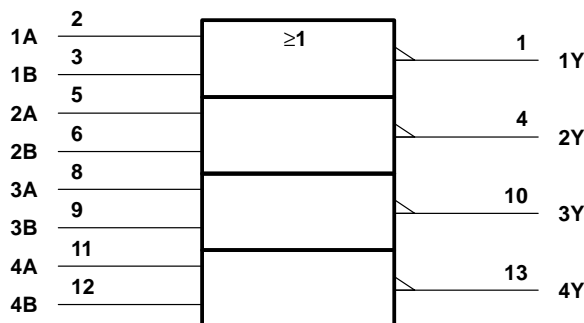


SN54HCT02 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## 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, N, and W packages.

## logic diagram (positive logic)



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**TEXAS  
INSTRUMENTS**

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# SN54HCT02, SN74HCT02

## QUADRUPLE 2-INPUT POSITIVE-NOR GATES

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

Supply voltage range, $V_{CC}$	–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, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through $V_{CC}$ or GND	±50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): D package	1.25 W
N package	1.1 W
Storage temperature range, $T_{stg}$	–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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

### recommended operating conditions

			SN54HCT02			SN74HCT02			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	2			2			V
$V_{IL}$	Low-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	0		0.8	0		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
$t_t$	Input transition (rise and fall) time		0		500	0		500	ns
$T_A$	Operating free-air temperature		–55		125	–40		85	°C

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

PARAMETER	TEST CONDITIONS		$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HCT02		SN74HCT02		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\text{ }\mu\text{A}$	4.5 V	4.4	4.499		4.4		4.4		V
		$I_{OH} = -4\text{ mA}$		3.98	4.3		3.7		3.84		
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\text{ }\mu\text{A}$	4.5 V		0.001	0.1		0.1		0.1	V
		$I_{OL} = 4\text{ mA}$			0.17	0.26		0.4		0.33	
$I_I$	$V_I = V_{CC}$ or 0		5.5 V	±0.1	±100		±1000		±1000		nA
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$		5.5 V			2	40		20		μA
$\Delta I_{CC}^\ddagger$	One input at 0.5 V or 2.4 V, Other inputs at 0 or $V_{CC}$		5.5 V		1.4	2.4	3		2.9		mA
$C_i$			4.5 V to 5.5 V		3	10	10		10		pF

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

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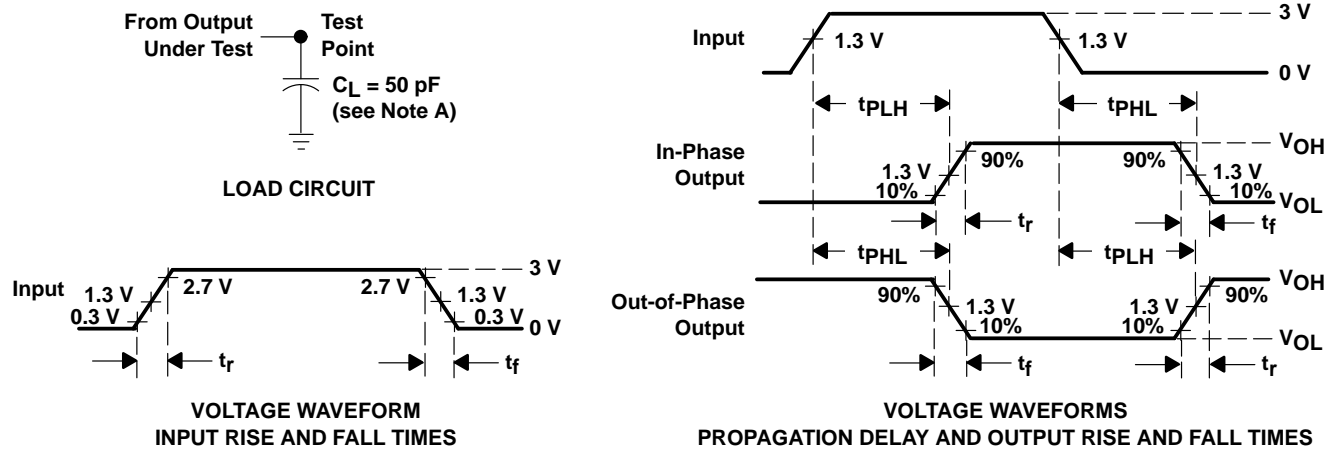
switching characteristics over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HCT02		SN74HCT02		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	4.5 V		11	20		30		25	ns
			5.5 V		10	18		27		22	
$t_t$		Y	4.5 V		9	15		22		19	ns
			5.5 V		8	14		20		17	

operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per gate	No load	20	pF

## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A.  $C_L$  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,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - C. The outputs are measured one at a time with one input transition per measurement.
  - D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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