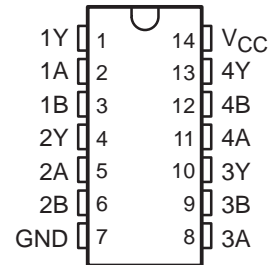


- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- ESD Protection Exceeds 1500 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 20-μA Max I_{CC}
- Typical t_{pd} = 8 ns
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 μA Max

† Contact factory for details. Q100 qualification data available on request.

D OR PW PACKAGE
 (TOP VIEW)



description/ordering information

The 'HC02 device contains four independent 2-input NOR gates. They perform the Boolean function $Y = A + B$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic.

ORDERING INFORMATION

T _A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	SOIC – D	Tape and reel	SN74HC02QDRQ1	HC02QQ1
	TSSOP – PW	Tape and reel	SN74HC02QPWRQ1	HC02QQ1

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE
 (each gate)

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

logic diagram (positive logic)



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SN74HC02-Q1

QUADRUPLE 2-INPUT POSITIVE-NOR GATE

SCLS530 – AUGUST 2003

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

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
Package thermal impedance, θ_{JA} (see Note 2): D package	86°C/W
PW package	113°C/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 package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	2	5	6	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5		V
		$V_{CC} = 4.5$ V	3.15		
		$V_{CC} = 6$ V	4.2		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5	V
		$V_{CC} = 4.5$ V		1.35	
		$V_{CC} = 6$ V		1.8	
V_I	Input voltage	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	V
$\Delta t/\Delta v$	Input transition rise/fall time	$V_{CC} = 2$ V		1000	ns
		$V_{CC} = 4.5$ V		500	
		$V_{CC} = 6$ V		400	
T_A	Operating free-air temperature	–40		125	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



SN74HC02-Q1 QUADRUPLE 2-INPUT POSITIVE-NOR GATE

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	2 V	1.9	1.998	1.9	V	
			4.5 V	4.4	4.499	4.4		
			6 V	5.9	5.999	5.9		
		I _{OH} = -4 mA	4.5 V	3.98	4.3	3.7		
		I _{OH} = -5.2 mA	6 V	5.48	5.8	5.2		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	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		
		I _{OL} = 4 mA	4.5 V	0.17	0.26	0.4		
		I _{OL} = 5.2 mA	6 V	0.15	0.26	0.4		
I _I	V _I = V _{CC} or 0	6 V	±0.1	±100	±1000	nA		
I _{CC}	V _I = V _{CC} or 0, I _O = 0	6 V		2	40	μA		
C _i		2 V to 6 V		3	10	10	pF	

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°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{pd}	A or B	Y	2 V	45	90	135	ns		
			4.5 V	9	18	27			
			6 V	8	15	23			
t _t		Y	2 V	38	75	110	ns		
			4.5 V	8	15	22			
			6 V	6	13	19			

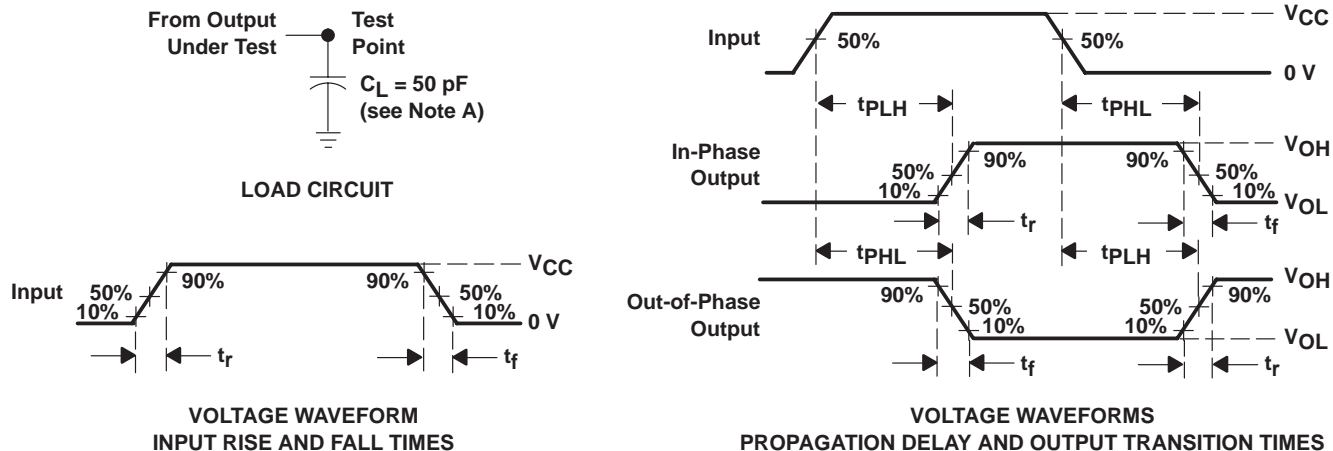
operating characteristics, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance per gate	No load	22	pF

SN74HC02-Q1 QUADRUPLE 2-INPUT POSITIVE-NOR GATE

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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

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-012 variation AB.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

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