- **Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

description

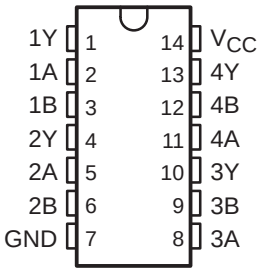
These devices contain four independent 2-input NOR gates. They perform the Boolean function $Y = \overline{A + B}$ or $Y = \overline{A} \bullet \overline{B}$ in positive logic.

The SN54HC02 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74HC02 is characterized for operation from –40°C to 85°C.

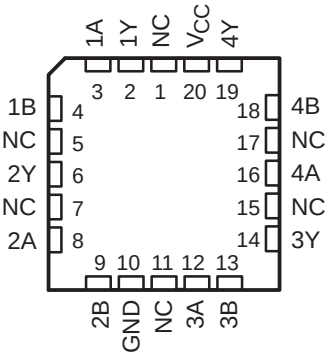
FUNCTION TABLE
(each gate)

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

SN54HC02 . . . J OR W PACKAGE
SN74HC02 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)

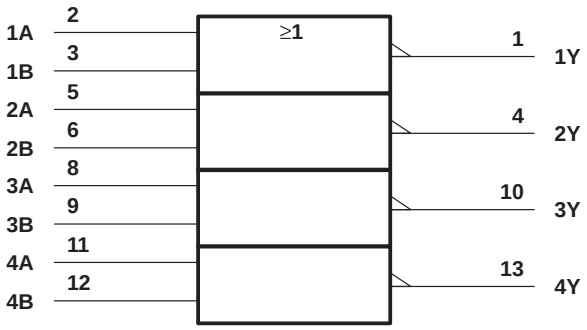


SN54HC02 . . . FK PACKAGE
(TOP VIEW)



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, DB, J, N, PW, and W packages.

logic diagram (positive logic)

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
Package thermal impedance, θ_{JA} (see Note 2): D package . . . . . 127°C/W
DB package . . . . . 158°C/W
N package . . . . . 78°C/W
PW package . . . . . 170°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, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

			SN54HC02			SN74HC02			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		0.5	0		0.5	V
		V_{CC} = 4.5 V	0		1.35	0		1.35	
		V_{CC} = 6 V	0		1.8	0		1.8	
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	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 range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		V_{CC}	T_A = 25°C			SN54HC02		SN74HC02		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	V_I = V_{IH} or V_{IL}	I_{OH} = –20 μA	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		
		I_{OH} = –4 mA	4.5 V	3.98	4.3		3.7		3.84		
		I_{OH} = –5.2 mA	6 V	5.48	5.8		5.2		5.34		
V_{OL}	V_I = V_{IH} or V_{IL}	I_{OL} = 20 μA	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	
		I_{OL} = 4 mA	4.5 V		0.17	0.26		0.4		0.33	
		I_{OL} = 5.2 mA	6 V		0.15	0.26		0.4		0.33	
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		20	μA
C_i			2 V to 6 V		3	10		10		10	pF

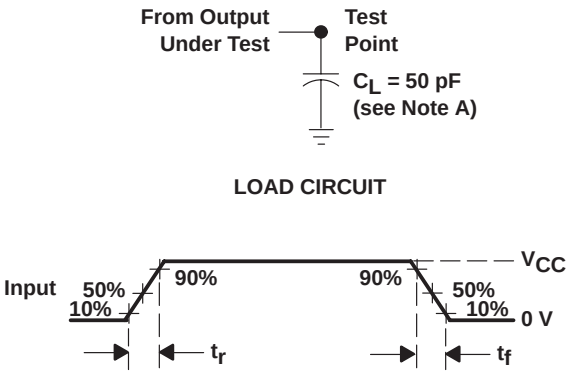
switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

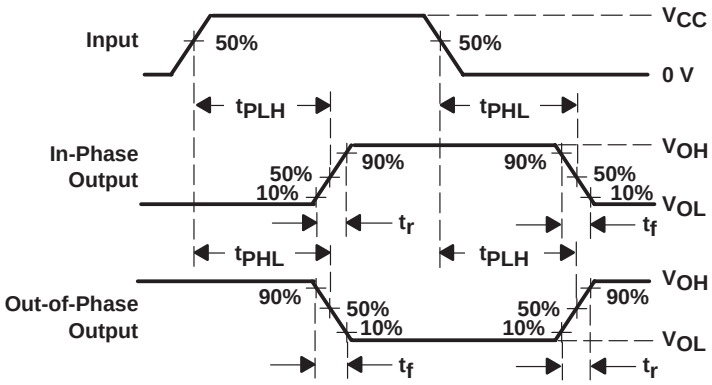
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC02		SN74HC02		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	2 V		45	90		135		115	ns
			4.5 V		9	18		27		23	
			6 V		8	15		23		20	
t_t		Y	2 V		38	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

operating characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per gate	No load	22	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 ≤ 1 MHz, Z_O = 50 Ω, 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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SN54HC02, Quadruple 2-Input Positive-NOR Gates

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN54HC02
Voltage Nodes (V)	6, 5, 2
Vcc range (V)	2.0 to 6.0
Input Level	CMOS
Output Level	CMOS
No. of Gates	4

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- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

DESCRIPTION

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

The SN54HC02 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74HC02 is characterized for operation from -40°C to 85°C.

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DATASHEET

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Full datasheet in Acrobat PDF: scls076b.pdf (76 KB) (Updated: 05/01/1997)
Full datasheet in Zipped PostScript: scls076b.psz (76 KB)

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- CMOS Power Consumption And CPD Calculation (SCAA035B - Updated: 06/01/1997)
- Designing With Logic (SDYA009C - Updated: 06/01/1997)
- HCMOS Design Considerations (SCLA007 - Updated: 04/01/1996)
- Implications of Slow or Floating CMOS Inputs (SCBA004C - Updated: 02/01/1998)
- Input and Output Characteristics of Digital Integrated Circuits (SDYA010 - Updated: 10/01/1996)
- Live Insertion (SDYA012 - Updated: 10/01/1996)
- SN54/74HCT CMOS Logic Family Applications And Restrictions (SCLA011 - Updated: 05/01/1996)
- Using High Speed CMOS And Advanced CMOS In Systems With Multiple Vcc (SCLA008 - Updated: 04/01/1996)

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- Documentation Rules (SAP) And Ordering Information (SZZU001B, 4 KB - Updated: 05/06/1999)
- Logic Selection Guide Second Half 2000 (SDYU001N, 5035 KB - Updated: 04/17/2000)
- MicroStar Junior BGA Design Summary (SCET004, 167 KB - Updated: 07/28/2000)
- More Power In Less Space - Technical Article (SCAU001A, 850 KB - Updated: 03/01/1996)

PRICING/AVAILABILITY

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ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	BUDGETARY PRICE US$/UNIT QTY=1000+	PACK QTY	DSCC NUMBER	PRICING/AVAILABILITY
84041012A	FK	20	-55 TO 125	ACTIVE	6.71	1		Check stock or order
JM38510/65101B2A	FK	20	-55 TO 125	ACTIVE	7.65	1		Check stock or order
JM38510/65101BCA	J	14	-55 TO 125	ACTIVE	3.93	1		Check stock or order
JM38510/65101BDA	W	14	-55 TO 125	ACTIVE	11.23	1		Check stock or order
SN54HC02J	J	14	-55 TO 125	ACTIVE	0.87	1		Check stock or order
SNJ54HC02FK	FK	20	-55 TO 125	ACTIVE	6.71	1	84041012A	Check stock or order

SNJ54HC02J	J	14	-55 TO 125	ACTIVE	1.03	1		Check stock or order
SNJ54HC02W	W	14	-55 TO 125	ACTIVE	8.29	150	8404101DA	Check stock or order

Table Data Updated on: 11/10/2000

PRODUCT FOLDER | PRODUCT INFO: FEATURES | DESCRIPTION | DATASHEETS | PRICING/AVAILABILITY | APPLICATION NOTES | RELATED DOCUMENTS

PRODUCT SUPPORT: TRAINING

SN74HC02, Quadruple 2-Input Positive-NOR Gates

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN74HC02
Voltage Nodes (V)	6, 5, 2
Vcc range (V)	2.0 to 6.0
Input Level	CMOS
Output Level	CMOS
Output Drive (mA)	-4/4
No. of Gates	4
Static Current	0.02
tpd(max) (ns)	20

FEATURES

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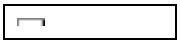
These devices contain four independent 2-input NOR gates. They perform the Boolean function $Y = \overline{A + B}$ or  in positive logic.

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PRICING/AVAILABILITY

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ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	BUDGETARY PRICE US$/UNIT QTY=1000+	PACK QTY	PRICING/AVAILABILITY
SN74HC02D	D	14	-40 TO 85	ACTIVE	0.25	50	Check stock or order
SN74HC02DBLE	DB	14	-40 TO 85	OBSOLETE			
SN74HC02DBR	DB	14	-40 TO 85	ACTIVE	0.25	2000	Check stock or order
SN74HC02DR	D	14	-40 TO 85	ACTIVE	0.28	2500	Check stock or order
SN74HC02N	N	14	-40 TO 85	ACTIVE	0.23	25	Check stock or order
SN74HC02N3	N	14	-40 TO 85	OBSOLETE			
SN74HC02NSR	NS	14	-40 TO	ACTIVE	0.33	2000	Check stock or order

			85				
SN74HC02PWLE	PW	14	-40 TO 85	OBSOLETE			
SN74HC02PWR	PW	14	-40 TO 85	ACTIVE	0.25	2000	Check stock or order

Table Data Updated on: 11/15/2000