SN5402, SN54LS02, SN54S02, SN7402, SN74LS02, SN74S02
QUADRUPLE 2-INPUT POSITIVE-NOR GATES

DECEMBER 1983—REVISED MARCH 1988

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

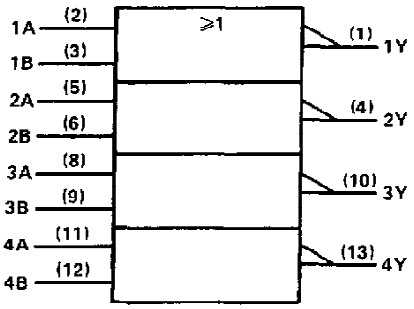
These devices contain four independent 2-input NOR gates.

The SN5402, SN54LS02, and SN54S02 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN7402, SN74LS02, and SN74S02 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE (each gate)

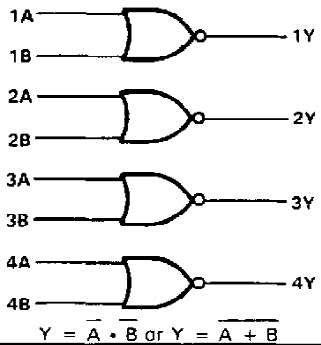
INPUTS		OUTPUT
A	B	Y
H	X	L
X	H	L
L	L	H

logic symbol†



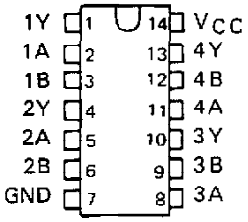
†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, and N packages.

logic diagram (positive logic)

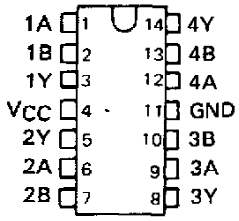


$Y = \overline{A} \cdot \overline{B}$ or $Y = \overline{A + B}$

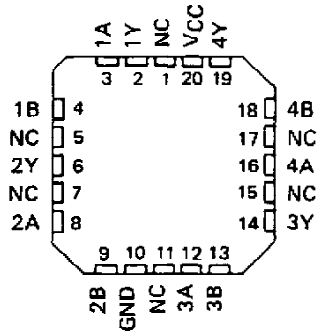
SN5402 . . . J PACKAGE
SN54LS02, SN54S02 . . . J OR W PACKAGE
SN7402 . . . N PACKAGE
SN74LS02, SN74S02 . . . D OR N PACKAGE
(TOP VIEW)



SN5402 . . . W PACKAGE
(TOP VIEW)



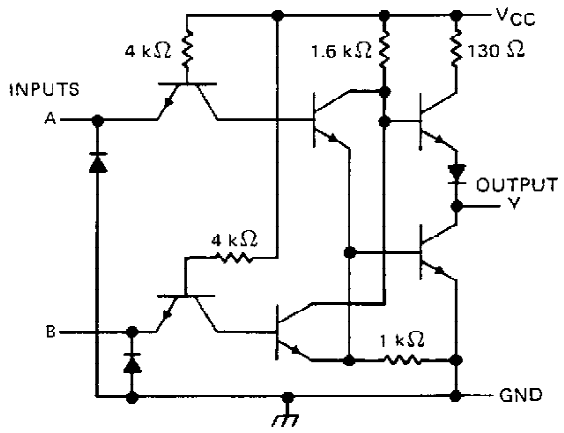
SN54LS02, SN54S02 . . . FK PACKAGE
(TOP VIEW)



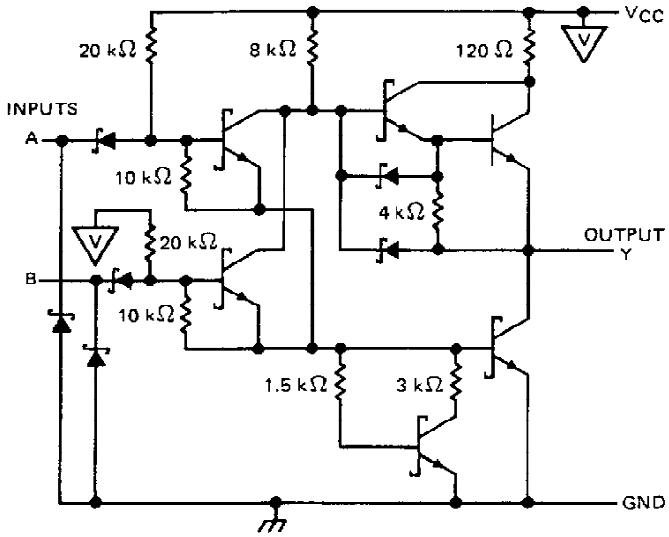
NC – No internal connection

schematics (each gate)

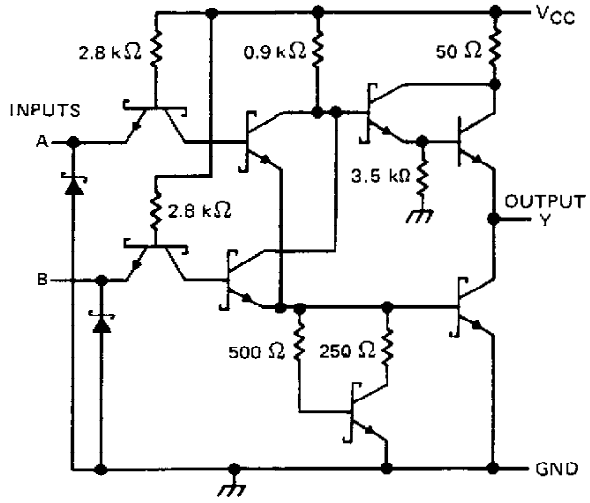
'02



'LS02



'S02



Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: '02, 'S02	5.5 V
'LS02	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	−55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	−65°C to 150°C

NOTE 1. Voltage values are with respect to network ground terminal.

recommended operating conditions

		SN5402			SN7402			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−0.4			−0.4	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS †	SN5402			SN7402			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN, I_I = −12 mA			−1.5			−1.5	V
V_{OH}	V_{CC} = MIN, V_{IL} = 0.8 V, I_{OH} = −0.4 mA	2.4	3.4		2.4	3.4		V
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.4 V			40			40	μA
I_{IL}	V_{CC} = MAX, V_I = 0.4 V			−1.6			−1.6	mA
I_{OS}§	V_{CC} = MAX	−20		−55	−18		−55	mA
I_{CCH}	V_{CC} = MAX, V_I = 0 V		8	16		8	16	mA
I_{CCL}	V_{CC} = MAX, See Note 2		14	27		14	27	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ Not more than one output should be shorted at a time.
NOTE 2: One input at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 400 Ω, C_L = 15 pF		12	22	ns
t_{PHL}					8	15	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

recommended operating conditions

		SN54LS02			SN74LS02			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.7			0.8	V
I_{OH}	High-level output current			−0.4			−0.4	mA
I_{OL}	Low-level output current			4			8	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS †			SN54LS02			SN74LS02			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA				−1.5			−1.5	V
V_{OH}	V_{CC} = MIN,	V_{IL} = MAX,	I_{OH} = −0.4 mA	2.5	3.4		2.7	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 8 mA					0.35	0.5	
I_I	V_{CC} = MAX,	V_I = 7 V				0.1			0.1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V				20			20	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.4 V				−0.4			−0.4	mA
I_{OS}§	V_{CC} = MAX			−20		−100	−20		−100	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			1.6	3.2		1.6	3.2	mA
I_{CCL}	V_{CC} = MAX,	See Note 2			2.8	5.4		2.8	5.4	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C
§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.
NOTE 2: One input at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 2 kΩ,	C_L = 15 pF		10	15	ns
t_{PHL}						10	15	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

recommended operating conditions

		SN54S02			SN74S02			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−1			−1	mA
I_{OL}	Low-level output current			20			20	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS †			SN54S02			SN74S02			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA				−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	V_{IL} = 0.8 V,	I_{OH} = −1 mA	2.5	3.4		2.7	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 20 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V				1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V				50			50	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V				−2			−2	mA
I_{OS}§	V_{CC} = MAX			−40		−100	−40		−100	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			17	29		17	29	mA
I_{CCL}	V_{CC} = MAX,	See Note 2			26	45		26	45	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.
NOTE 2: One input at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 280 Ω,	C_L = 15 pF		3.5	5.5	ns
t_{PHL}						3.5	5.5	ns
t_{PLH}			R_L = 280 Ω,	C_L = 50 pF		5		ns
t_{PHL}						5		ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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