

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.

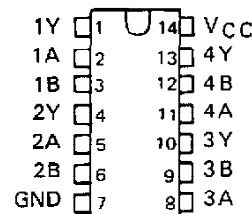
logic diagram (positive logic)



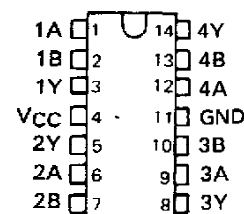
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SN5402 . . . J PACKAGE
SN54LS02, SN54S02 . . . J OR W PACKAGE
SN7402 . . . N PACKAGE
SN74LS02, SN74S02 . . . D OR N PACKAGE

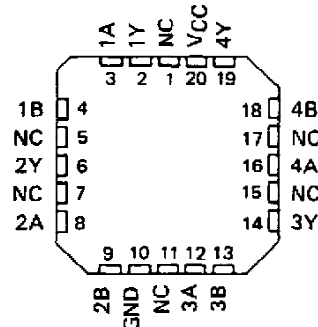
(TOP VIEW)



SN5402 . . . W PACKAGE
(TOP VIEW)



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



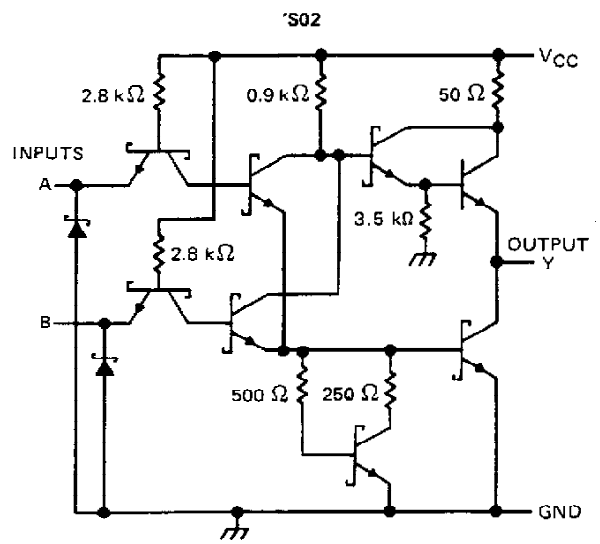
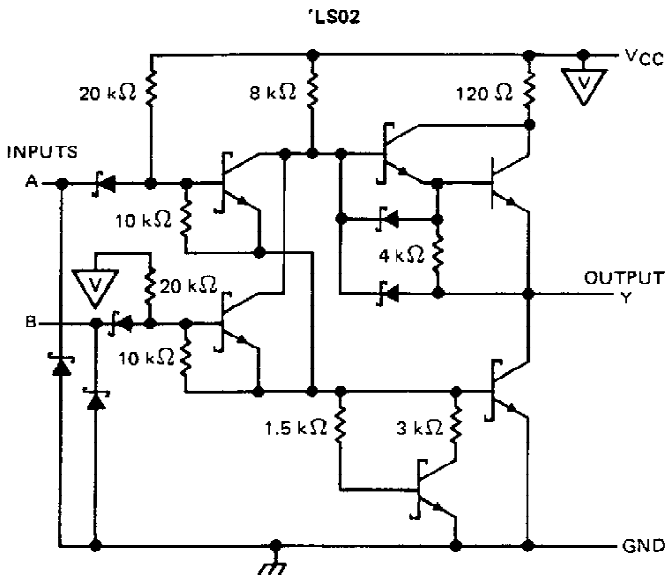
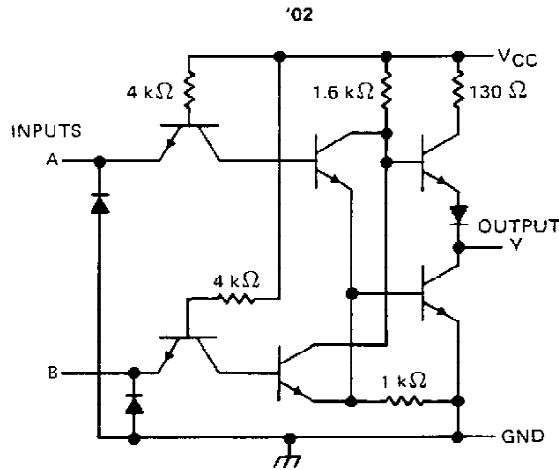
NC - No internal connection

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

schematics (each gate)



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.

SN5402, SN7402 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

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.


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SN54LS02, SN74LS02

QUADRUPLE 2-INPUT POSITIVE-NOR GATES

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}	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.5		-1.5	V	
V_{OH}	$V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $I_{OH} = -0.4 \text{ mA}$	2.5	3.4		2.7	3.4	V	
V_{OL}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 8 \text{ mA}$					0.35	0.5	
I_I	$V_{CC} = \text{MAX}$, $V_I = 7 \text{ V}$			0.1		0.1	mA	
I_{IH}	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$			20		20	μA	
I_{IL}	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-0.4		-0.4	mA	
$I_{OS} §$	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA
I_{CCH}	$V_{CC} = \text{MAX}$, $V_I = 0 \text{ V}$		1.6	3.2		1.6	3.2	mA
I_{CCL}	$V_{CC} = \text{MAX}$, 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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

§ 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, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 3)

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

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

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SN54S02, SN74S02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

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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SN54LS02, Quadruple 2-Input Positive-NOR Gates

DEVICE STATUS: ACTIVE

PARAMETER NAME	SN54LS02	SN74LS02
Voltage Nodes (V)	5	5
Vcc range (V)	4.5 to 5.5	4.75 to 5.25
Input Level	TTL	TTL
Output Level	TTL	TTL
Output Drive (mA)		-0.4/8
No. of Gates	4	4
Static Current		4.3
tpd(max) (ns)		15

FEATURES

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- 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

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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.

TECHNICAL DOCUMENTS

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DATASHEET

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Full datasheet in Acrobat PDF: [sdl027.pdf](#) (253 KB) (Updated: 03/01/1988)

Full datasheet in Zipped PostScript: [sdl027.psz](#) (279 KB)

APPLICATION NOTES

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- [Designing With Logic](#) (SDYA009C - Updated: 06/01/1997)
- [Designing with the SN54/74LS123](#) (SDLA006A - Updated: 03/01/1997)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)

RELATED DOCUMENTS

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- [Advanced Bus Interface Logic Selection Guide](#) (SCYT126, 448 KB - Updated: 01/09/2001)
- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 13 KB - Updated: 05/06/1999)
- [Logic Selection Guide First Half 2001](#) (SDYU0010, 4573 KB - Updated: 11/08/2000)

- [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)
- [Overview of IEEE Std 91-1984, Explanation of Logic Symbols Training Booklet](#) (SDYZ001A, 138 KB - Updated: 07/01/1996)

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
JM38510/30301B2A	FK	20	-55 TO 125	ACTIVE	6.91	1		Check stock or order
JM38510/30301BCA	J	14	-55 TO 125	ACTIVE	2.22	1		Check stock or order
JM38510/30301BDA	W	14	-55 TO 125	ACTIVE	6.39	150		Check stock or order
SN54LS02J	J	14	-55 TO 125	ACTIVE	0.77	1		Check stock or order
SNJ54LS02FK	FK	20	-55 TO 125	ACTIVE	6.18	1		Check stock or order
SNJ54LS02J	J	14	-55 TO 125	ACTIVE	1.07	1		Check stock or order
SNJ54LS02W	W	14	-55 TO 125	ACTIVE	5.72	1		Check stock or order

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Table Data Updated on: 7/15/2001