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

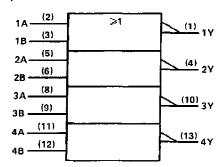
These devices contain four independent 2-input-NOR gates.

The SN5402, SN54LS02, and SN54S02 are characterized for operation over the full military temperature range of $-55\,^{\circ}\text{C}$ to 125 $\,^{\circ}\text{C}$. The SN7402, SN74LS02, and SN74S02 are characterized for operation from 0 $\,^{\circ}\text{C}$ to 70 $\,^{\circ}\text{C}$.

FUNCTION TABLE (each gate)

INF	UTS	OUTPUT
Α	В	Y
Н	Х	L
X	Н	L
L	L	н

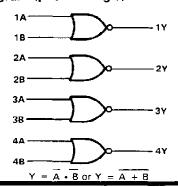
logic symbol[†]



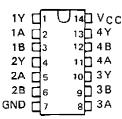
[†]This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

logic diagram (positive logic)



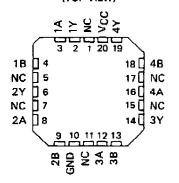
SN5402...J PACKAGE
SN54LS02, SN54S02...J OR W PACKAGE
SN7402...N PACKAGE
SN74LS02, SN74S02...D OR N PACKAGE
(TOP VIEW)



SN5402 . . . W PACKAGE (TOP VIEW)

1A 🗆	ī	U 14	4Y
18 🗆	2	13	4B
1Y 🗀	3	12	₽ 4A
V¢¢ □	4	- 11	B GND
2Y 🗀	5	10	∐ 3B
2A 🗀	6	9] 3A
2B 🗆	7	8	<u> </u> 3Υ

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

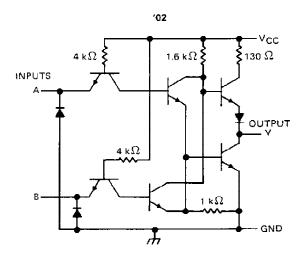


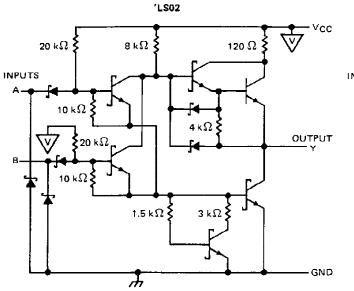
NC - No internal connection

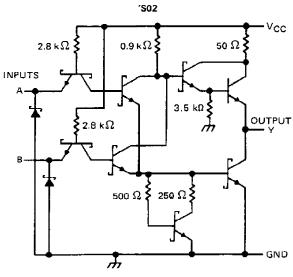
PRODUCTION DATA documents contain information current as of publication dats. Preducts conform to specifications per the terms of Tuxas Instruments standard warranty. Production processing does not necessarily include tasting of all parameters.



schematics (each gate)







Resistor values shown are nominal.

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

Supply voltage, VCC (see Note 1)	
	5.5 V
'LS02	, , ,
Off-state output voltage	,
Operating free-air temperature range:	SN54'55°C to 125°C
	SN74'
Storage temperature range	, -65°C to 150°C

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



recommended operating conditions

	:	SN5402		SN7402			
	MIN	МОМ	MAX	MIN	NOM	MAX	UNIT
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	ν
V _{IH} High-level input voltage	2			2			٧
VIL Low-level input voltage			8.0			8.0	V
OH High-level output current			- 0.4			- 0.4	mΔ
OL Low-level output current			16			16	mA
TA Operating free-air temperature	55		125	٥		70	°c

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

5450445755	T-0	TEST CONDITIONS †		SN5402			SN7402		
PARAMETER	163			TYP ‡	MAX	MIN	TYP‡	MAX	UNIT
٧ıĸ	V _{CC} = MIN, 1 ₁ =	— 12 mA			- 1.5			- 1.5	V
Voн	V _{CC} = MIN, V _{IL}	= 0.8 V, I _{OH} = − 0.4 mA	2.4	3.4		2.4	3.4		٧
VOL	V _{CC} = MIN, V _{IH}	= 2 V, I _{OL} = 16 mA		0.2	0.4		0.2	0.4	V
Ц	VCC = MAX, VI =	5.5 V			1			1	mA
Ιн	V _{CC} = MAX, V _I =	2.4 V			40			40	μΑ
h _L	V _{CC} = MAX, V _I =	0.4 V			- 1.6			- 1.6	mΑ
IOS §	V _{CC} = MAX		- 20		- 55	- 18		- 55	mA
¹ ССН	V _{CC} - MAX, V _I -	0 V	_	8	16		8	16	mΑ
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.

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 CON	TEST CONDITIONS			MAX	UNIT
t _{PLH}		V	_			12	22	ns
tPHL	A or B	Υ	R _L = 400 Ω,	C _L = 15 pF		8	15	ns

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

[‡] 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.

SN54LS02, SN74LS02 QUADRUPLE 2 INPUT POSITIVE NOR GATES

recommended operating conditions

		SN54LS02			UNIT		
	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
V _{CC} Supply voltage	4.5	5	5 .5	4.75	5	5.25	٧
V _{IH} High-level input voltage	2			2			٧
VIL Law-level input voltage			0.7		-	8.0	٧
IOH High-level output current			- 0.4			- 0.4	mΑ
IOL Low-level output current			4			8	mA
TA Operating free-air temperature	- 55		125	0		70	°C

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

		TEST CONDITIONS †			SN54LS	502		SN74L	S 02	
PARAMÉTER				MIN	TYP‡	MAX	MIN	TYP\$	MAX	UNIT
VIΚ	VCC = MIN,	I _j = 18 mA				— 1.5			– 1.5	٧
Voн	V _{CC} = MIN,	VIL = MAX,	1 _{OH} = -0.4 mA	2.5	3.4		2.7	3.4		٧
\/-·	V _{CC} - MIN,	V _{1H} = 2 V,	I _{OL} = 4 mA		0.25	0.4		0.25	0.4	V
VOL	VCC = MIN,	V _{IH} = 2 V,	IOL = 8 mA					0.35	0.5	*
t _i	V _{CC} = MAX,	V _I = 7 V	.			0.1			0.1	mΑ
l _{IH}	V _{CC} = MAX,	V ₁ = 2.7 V				20			20	μА
HL	V _{CC} = MAX,	V) = 0.4 V				- 0.4			- 0.4	mΑ
los§	V _{CC} = MAX			- 20		- 100	- 20		- 100	mΑ
Іссн	V _{CC} = MAX,	V _I = 0 V			1.6	3.2		1.6	3.2	mA
^I CCL	VCC = MAX,	See Note 2			2.8	5.4		2.8	5.4	mΑ

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CON	DITIONS	MIN TYP	MAX	UNIT
₹PLH	A or B	V	D. = 2k0	C 15 pc	10	15	nş
ФНL	χ 0	3 Y	RL = 2 kΩ,	C _L = 15 pF	10	15	ns

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

[†] All typical values are at $V_{\rm CC}$ = 5 V, $T_{\rm A}$ = 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.

recommended operating conditions

			SN54S02		SN74S02			UNIT
		MIN	NOM	MAX	MIN	мом	MAX	UNIT
Vcc	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
ViH	High-level input voltage	2			2			٧
٧IL	Low-level input voltage			8.0			0.8	٧
юн	High-level output current			– 1			– 1	mΑ
loL	Low-level output current			20			20	mΑ
TA	Operating free-air temperature	55		125	0		70	°C

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

DADAMETED	TEST CONDITIONS †	SN54S02	SN74S02	UNIT
PARAMETER	TEST CONDITIONS I	MIN TYP# MAX	MIN TYP# MAX	
VIK	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	٧
VOL	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA	0.5	0.5	٧
Ц	V _{CC} = MAX, V _I = 5.5 V	1	1	mA
ЧН	V _{CC} = MAX, V ₁ = 2.7 V	50	50	μА
կը	V _{CC} = MAX, V _I = 0.5 V	-2	-2	mA
l _{OS} §	V _{CC} = MAX	-40 -100	_40 _100	mA
^I ссн	V _{CC} = MAX, V _I = 0 V	17 29	17 29	mA
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.

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
tPLH			$R_1 = 280 \Omega$, $C_1 = 15 pF$	3.5	5,5	ns
tPHL	A D	v	R _L = 280 Ω, C _L = 15 pF	3.5	5,5	ns
tPLH	A or B		$R_1 = 280 \Omega$, $C_L = 50 pF$	5		ns
tPHL			$R_{\perp} = 280 \Omega$, $C_{\perp} = 50 pF$	5		ns

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

[‡] All typical values are at $V_{CC} = 5 \text{ V}$, $T_{\Delta} = 25^{\circ}\text{C}$. § Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

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