SN5400, SN54LS00, SN54S00, SN7400, SN74LS00, SN74S00 QUADRUPLE 2-INPUT POSITIVE-NAND 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

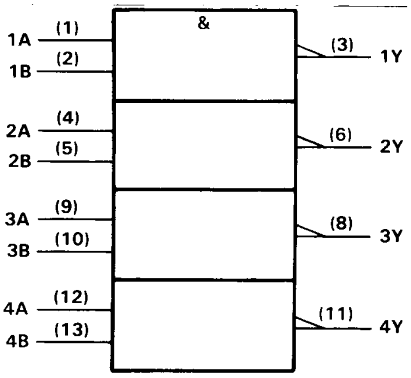
These devices contain four independent 2-input-NAND gates.

The SN5400, SN54LS00, and SN54S00 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN7400, SN74LS00, and SN74S00 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE (each gate)

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

logic symbol†



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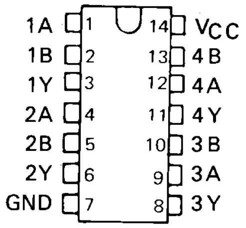
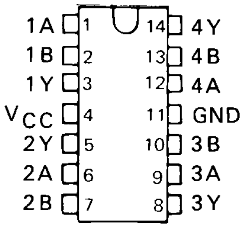
† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

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

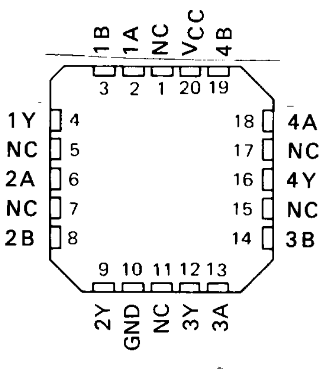
SN5400 . . . J PACKAGE
SN54LS00, SN54S00 . . . J OR W PACKAGE
SN7400 . . . N PACKAGE
SN74LS00, SN74S00 . . . D OR N PACKAGE
(TOP VIEW)



SN5400 . . . W PACKAGE
(TOP VIEW)

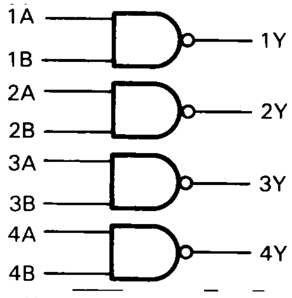


SN54LS00, SN54S00 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram (positive logic)

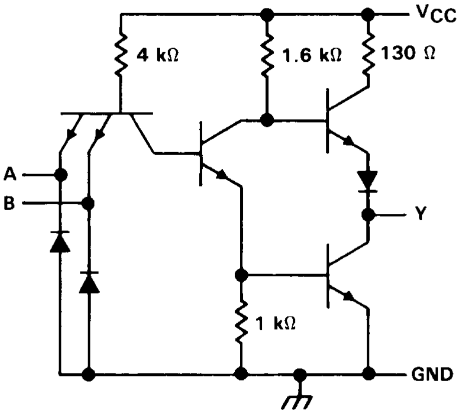


$Y = \overline{A \cdot B}$ or $Y = \overline{A} + \overline{B}$

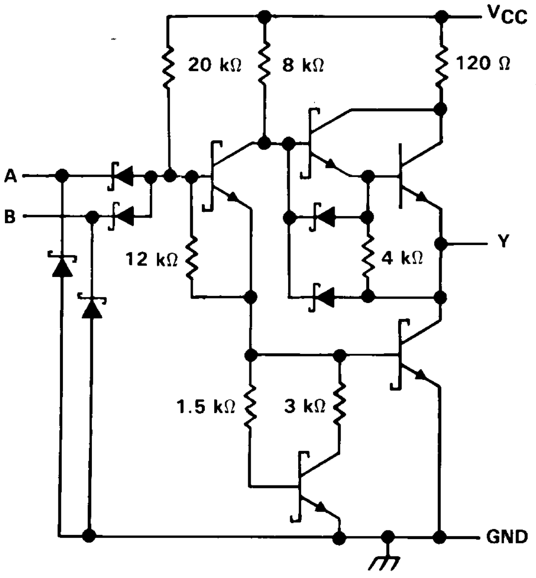
SN5400, SN54LS00, SN54S00, SN7400, SN74LS00, SN74S00 QUADRUPLE 2-INPUT POSITIVE-NAND GATES

schematics (each gate)

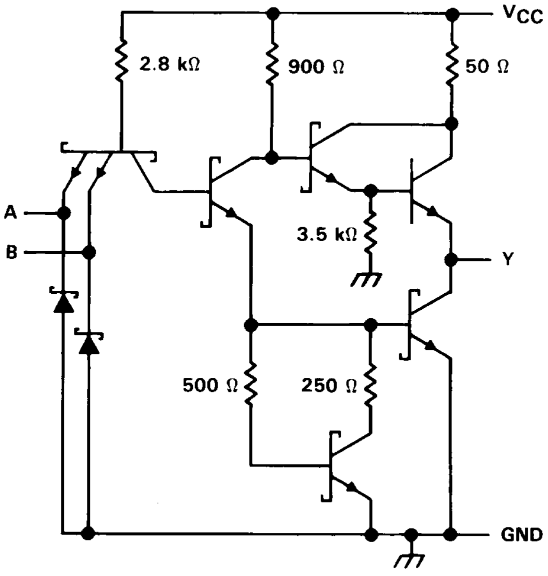
'00



'LS00



'S00



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: '00, 'S00	5.5 V
'LS00	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

		SN5400			SN7400			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†			SN5400			SN7400			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			4	8		4	8	mA
I_{CCL}	V_{CC} = MAX,	V_I = 4.5 V			12	22		12	22	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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

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		11	22	ns
t_{PHL}						7	15	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

SN54LS00, SN74LS00
QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

		SN54LS00 MIN	SN54LS00 NOM	SN54LS00 MAX	SN74LS00 MIN	SN74LS00 NOM	SN74LS00 MAX	UNIT
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 †	SN54LS00 MIN	SN54LS00 TYP‡	SN54LS00 MAX	SN74LS00 MIN	SN74LS00 TYP‡	SN74LS00 MAX	UNIT
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		0.8	1.6		0.8	1.6	mA
I_{CCL}	V_{CC} = MAX, V_I = 4.5 V		2.4	4.4		2.4	4.4	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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	$R_L = 2\ k\Omega$, C_L = 15 pF		9	15	ns
t_{PHL}					10	15	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

recommended operating conditions

		SN54S00			SN74S00			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 †	SN54S00			SN74S00			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		10	16		10	16	mA
I_{CCL}	V_{CC} = MAX, V_I = 4.5 V		20	36		20	36	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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

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	4.5	ns
t_{PHL}					3	5	ns
t_{PLH}			R_L = 280 Ω, C_L = 50 pF		4.5		ns
t_{PHL}					5		ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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