

TYPES SN5400, SN54H00, SN54L00, SN54LS00, SN54S00, SN7400, SN74H00, SN74LS00, SN74S00 QUADRUPLE 2-INPUT POSITIVE-NAND GATES

REVISED DECEMBER 1983

- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

These devices contain four independent 2-input NAND gates.

The SN5400, SN54H00, SN54L00, and SN54LS00, and SN54S00 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7400, SN74H00, 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 diagram (each gate)

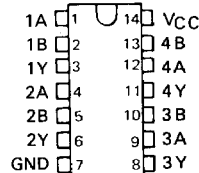


positive logic

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

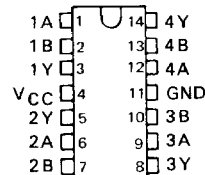
SN5400, SN54H00, SN54L00 ... J PACKAGE
SN54LS00, SN54S00 ... J OR W PACKAGE
SN7400, SN74H00 ... J OR N PACKAGE
SN74LS00, SN74S00 ... D, J OR N PACKAGE

(TOP VIEW)



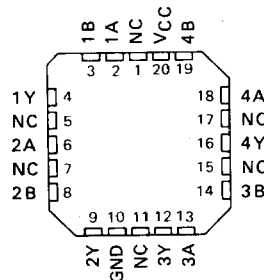
SN5400, SN54H00 ... W PACKAGE

(TOP VIEW)



SN54LS00, SN54S00 ... FK PACKAGE
SN74LS00, SN74S00 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection

3

TTL DEVICES

PRODUCTION DATA

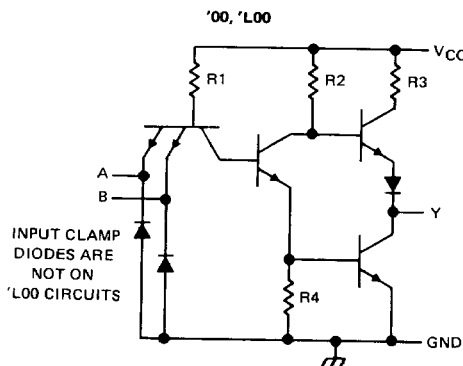
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

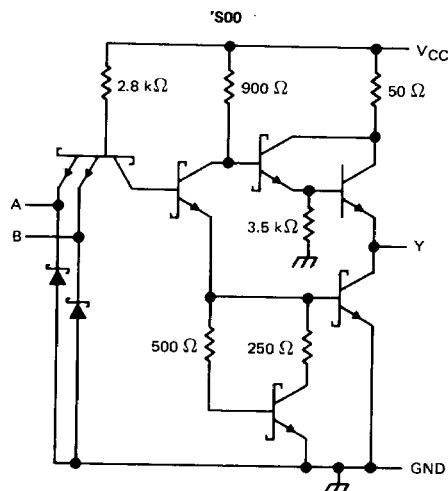
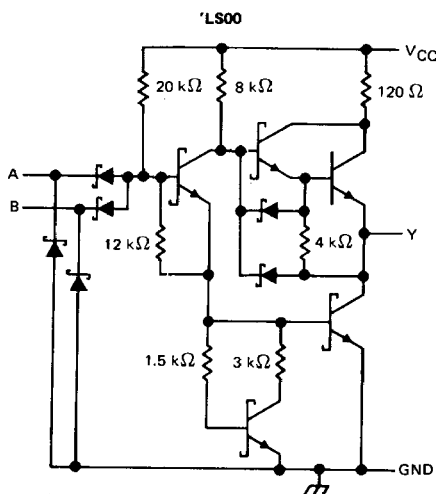
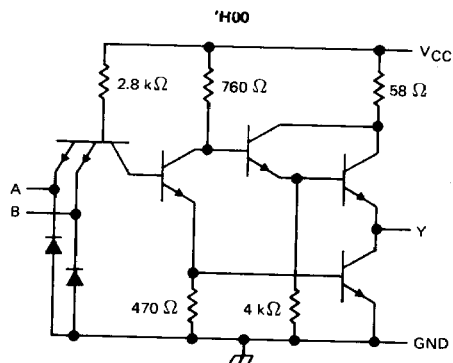
POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

TYPES SN5400, SN54H00, SN54L00, SN54LS00, SN54S00, SN7400, SN74H00, SN74LS00, SN74S00 QUADRUPLE 2-INPUT POSITIVE-NAND GATES

schematics (each gate)



CIRCUIT	R1	R2	R3	R4
'00	4 k Ω	1.6 k Ω	130 Ω	1 k Ω
'L00	40 k Ω	20 k Ω	500 Ω	12 k Ω



Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1) '00, 'H00, 'LS00, 'S00	7 V
'L00	8 V
Input voltage: '00, 'H00, 'L00, '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.

3

TTL DEVICES

TYPES SN5400, SN7400

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

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}	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5			-1.5	V
V_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, I_{OH} = -0.4 \text{ mA}$	2.4	3.4		2.4	3.4		V
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	µA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
$I_{OS}§$	$V_{CC} = \text{MAX}$	-20		-55	-18		-55	mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		4	8		4	8	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

§ Not more than one output should be shorted at a time.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	$R_L = 400 \Omega, C_L = 15 \text{ pF}$		11	22	ns
t_{PHL}					7	15	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPES SN54H00, SN74H00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54H00			SN74H00			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			-0.5			-0.5	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 †	MIN	TYP ‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = -8 mA		-1.5		V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.5 mA	2.4	3.5		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			50	µA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-2	mA
I _{OS} §	V _{CC} = MAX	-40		-100	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		10	16.8	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		26	40	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 = 25 pF		5.9	10	ns
t _{PHL}					6.2	10	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPE SN54L00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54L00			UNIT
	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	V
V _{IH} High-level input voltage	2			V
V _{IL} Low-level input voltage			0.7	V
I _{OH} High-level output current		-0.1		mA
I _{OL} Low-level output current		2		mA
T _A Operating free-air temperature	-55		125	°C

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

PARAMETER	TEST CONDITIONS †	SN54L00			UNIT
		MIN	TYP ‡	MAX	
V _{OH}	V _{CC} = MIN, V _{IL} = 0.7 V, I _{OH} = -0.1 mA	2.4	3.3		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 2 mA		0.15	0.3	V
I _I	V _{CC} = MAX, V _I = 5.5 V			0.1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			10	μA
I _{IL}	V _{CC} = MAX, V _I = 0.3 V			-0.18	mA
I _{OS} §	V _{CC} = MAX	-3		-15	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		0.44	0.8	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		1.16	2.04	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 = 4 kΩ, C _L = 50 pF		35	60	ns
t _{PHL}					31	60	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPES SN54LS00, SN74LS00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54LS00			SN74LS00			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 †	SN54LS00			SN74LS00			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		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 kΩ, C _L = 15 pF		9	15	ns
t _{PHL}					10	15	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

3
TTL DEVICES

TYPES SN54S00, SN74S00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

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: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES