

SDLS026

**SN5401, SN54LS01,
SN7401, SN74LS01****QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS**

APRIL 1985 — 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

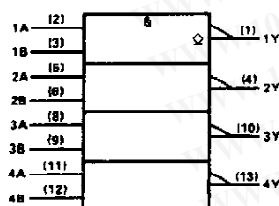
description

These devices contain four independent 2-input NAND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN5401 and SN54LS01 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7401 and SN74LS01 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

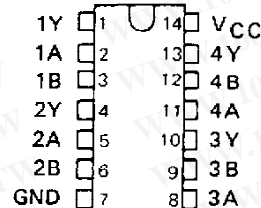
logic symbol†

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

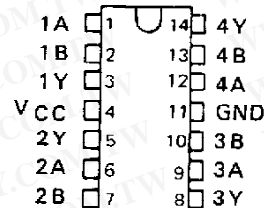
Pin numbers shown are for D, J, N, and W packages.

SN5401 . . . J PACKAGE
SN54LS01 . . . J OR W PACKAGE
SN7401 . . . N PACKAGE
SN74LS01 . . . D OR N PACKAGE

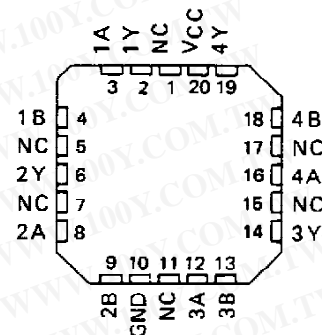
(TOP VIEW)



SN5401 . . . W PACKAGE
(TOP VIEW)



SN54LS01 . . . FK PACKAGE
(TOP VIEW)



NC — No internal connection

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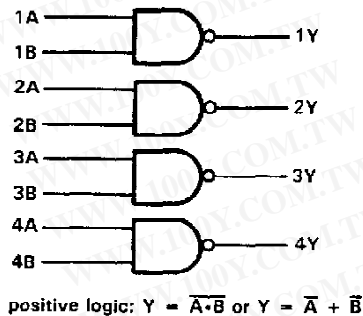
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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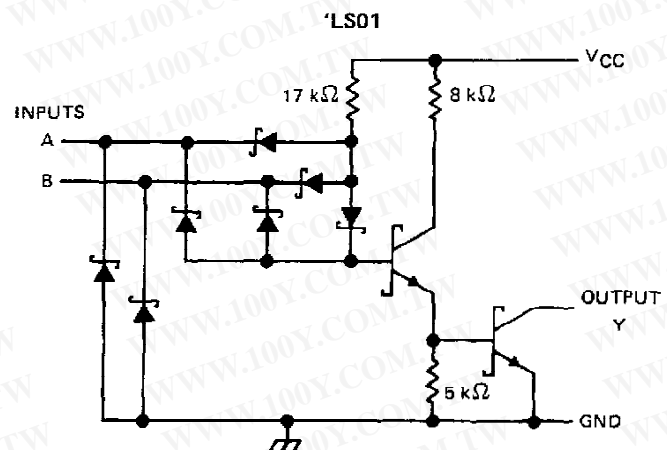
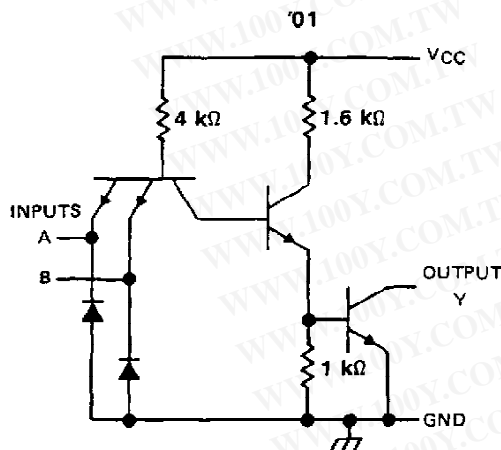
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**SN5401, SN54LS01,
SN7401, SN74LS01
QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS**

logic diagram (positive logic)



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): '01, 'LS01	7 V
Input voltage: '01	5.5 V
'LS01	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 terminals.

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SN5401, SN7401 QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN5401			SN7401			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
V _{OH} High-level output voltage			5.5			5.5	V
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†	SN5401			SN7401			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -12 mA		-1.5			-1.5		V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V					0.25		mA
	V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V		0.25					
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 _{CCH}	V _{CC} = MAX, V _I = 0	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.

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 = 15 pF		35	55	ns
t _{PHL}			R _L = 400 Ω, C _L = 15 pF		8	15	ns

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

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SN54LS01, SN74LS01**QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS****recommended operating conditions**

	SN54LS01			SN74LS01			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
V _{OH} High-level output voltage			5.5			5.5	V
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†	SN54LS01			SN74LS01			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = MAX, V _{OH} = 5.5 V			0.1			0.1	mA
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 _{CCH}	V _{CC} = MAX, V _I = 0	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.**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		17	32	ns
t _{PHL}						15	28	ns

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

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