

TYPES SN5401, SN54H01, SN54LS01, SN7401, SN74H01, SN74LS01 QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

REVISED APRIL 1985

- 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 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, SN54H01, and SN54LS01 are characterized for operation over the full military temperature ranges of -55°C to 125°C . The SN7401, SN74H01, 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 diagram (each gate)

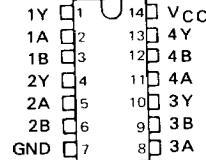


positive logic

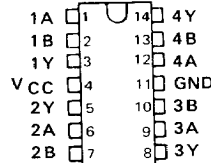
$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A} + \overline{B}$$

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

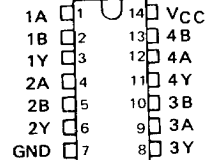
(TOP VIEW)



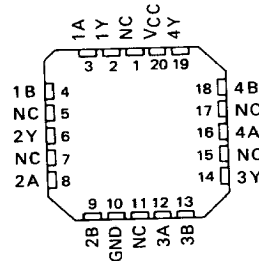
SN5401, SN54H01 ... W PACKAGE
(TOP VIEW)



SN54H01 ... J PACKAGE
SN74H01 ... J OR N PACKAGE
(TOP VIEW)



SN54LS01 ... FK PACKAGE
SN74LS01 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection

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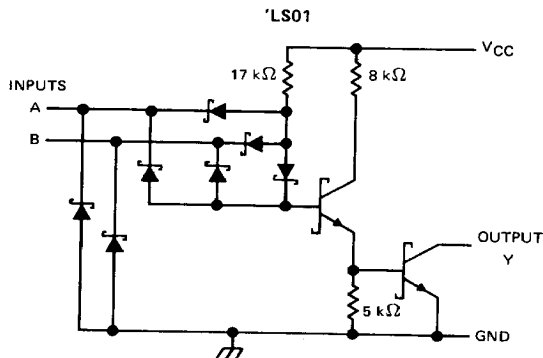
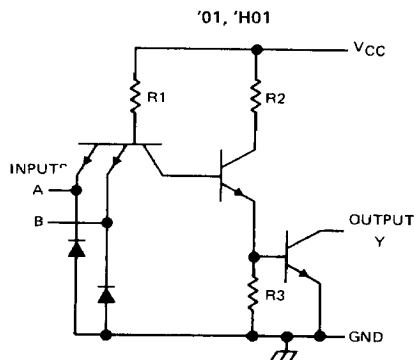
PRODUCTION DATA
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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TYPES SN5401, SN54H01, SN54LS01, SN7401, SN74H01, SN74LS01 **QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS**

schematics (each gate)



CIRCUITS	R1	R2	R3
'01	4 kΩ	1.6 kΩ	1 kΩ
'H01	2.8 kΩ	760 Ω	470 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): '01, 'H01, 'LS01	7 V
Input voltage: '01, 'H01	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 terminal.

TYPES 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†	MIN	TYP‡	MAX	UNIT
V_{IK}	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$		-1.5		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$		0.25		mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$	0.2	0.4		V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		40		μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-1.6		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		4	8	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		12	22	mA

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

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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	$R_L = 4 \text{ k}\Omega, C_L = 15 \text{ pF}$		35	55	ns
t_{PHL}			$R_L = 400 \Omega, C_L = 15 \text{ pF}$		8	15	ns

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

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TYPES SN54H01, SN74H01

QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54H01			SN74H01			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			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}	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$			-1.5	V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$			0.25	mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$		0.2	0.4	V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			50	µA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-2	mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		10	16.8	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		26	40	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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	$R_L = 280 \Omega, C_L = 25 \text{ pF}$	10		15	ns
t_{PHL}				7.5		12	ns

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

TYPES 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}	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{OH} = 5.5 \text{ V}$			0.1			0.1	mA
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	V
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_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$	0.8		1.6	0.8		1.6	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$	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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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	$R_L = 2 \text{ k}\Omega, C_L = 15 \text{ pF}$		17	32	ns
t_{PHL}					15	28	ns

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

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