

TYPES SN5410, SN54H10, SN54L10, SN54LS10, SN54S10, SN7410, SN74H10, SN74LS10, SN74S10 TRIPLE 3-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 three independent 3-input NAND gates.

The SN5410, SN54H10, SN54L10, SN54LS10 and SN54S10 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7410, SN74H10, SN74LS10 and SN74S10 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

logic diagram (each gate)

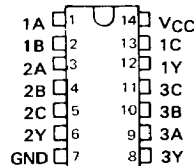


positive logic

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

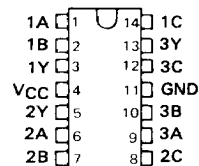
SN5410, SN54H10, SN54L10 ... J PACKAGE
SN54LS10, SN54S10 ... J OR W PACKAGE
SN7410, SN74H10 ... J OR N PACKAGE
SN74LS10, SN74S10 ... D, J OR N PACKAGE

(TOP VIEW)



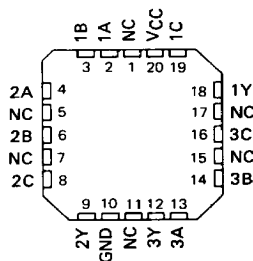
SN5410, SN54H10 ... W PACKAGE

(TOP VIEW)



SN54LS10, SN54S10 ... FK PACKAGE
SN74LS10, SN74S10 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection

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PRODUCTION DATA

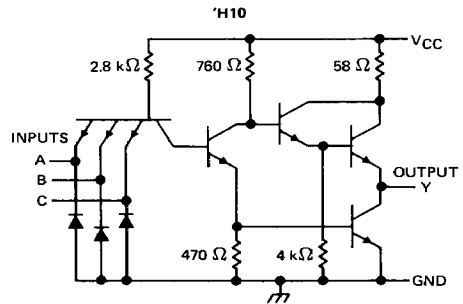
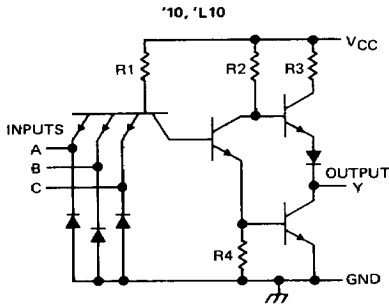
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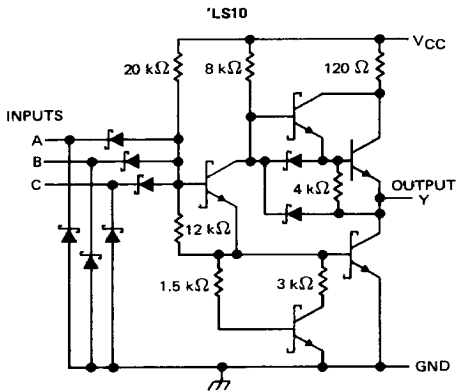
**TYPES SN5410, SN54H10, SN54L10, SN54LS10,
SN54S10, SN7410, SN74H10, SN74LS10, SN74S10
TRIPLE 3-INPUT POSITIVE-NAND GATES**

schematics (each gate)

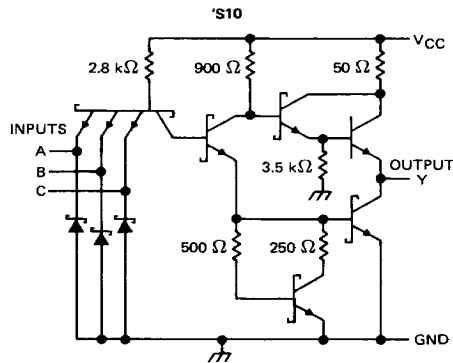


CIRCUIT	R1	R2	R3	R4
'10	4 kΩ	1.6 kΩ	130 Ω	1 kΩ
'L10	40 kΩ	20 kΩ	500 Ω	12 kΩ

Input clamp diodes not on SN54L10 circuit.



Resistor values shown are nominal.



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

Supply voltage, V_{CC} (see Note 1) '10, 'H10, 'LS10, 'S10	7 V
'L10	8 V
Input voltage: '10, 'H10, 'L10, 'S10	5.5 V
'LS10	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 SN5410, SN7410
TRIPLE 3-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN5410			SN7410			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 †	SN5410			SN7410			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		3	6		3	6	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		9	16.5		9	16.5	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, B or C	Y	R _L = 400 Ω,	C _L = 15 pF		11	22	ns
t _{PHL}						7	15	ns

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

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TYPES SN54H10, SN74H10 TRIPLE 3-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54H10			SN74H10			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			V
I _{OH} High-level output current				-0.5			mA
I _{OL} Low-level output current				20			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 †	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		7.5	12.6	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		19.5	30	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, B or C	Y	R _L = 280 Ω, C _L = 25 pF		5.9	10	ns
t _{PHL}					6.3	10	ns

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

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TYPE SN54L10
TRIPLE 3-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54L10			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 †	SN54L10		UNIT
		MIN	TYP ‡	
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	0.33	0.6	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	0.87	1.53	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, B or C	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.

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TYPE SN54LS10, SN74LS10 TRIPLE 3-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54LS10			SN74LS10			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			V
I _{OH} High-level output current				-0.4			mA
I _{OL} Low-level output current				8			mA
T _A Operating free-air temperature	-55			70			°C

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

PARAMETER	TEST CONDITIONS †	SN54LS10			SN74LS10			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				0.4	V
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA				0.25	0.5		
I _I	V _{CC} = MAX, V _I = 7 V	0.1			0.1			μA
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	0.6	1.2		0.6	1.2		mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	1.8	3.3		1.8	3.3		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, B or C	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.

TYPES SN54S10, SN74S10 TRIPLE 3-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54S10			SN74S10			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 †	SN54S10		SN74S10		UNIT
		MIN	TYP ‡	MAX	MIN	
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	7.5	12	7.5	12	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	15	27	15	27	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, B or C	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.

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