

**SN5410, SN54LS10, SN54S10,  
SN7410, SN74LS10, SN74S10**  
**TRIPLE 3-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**

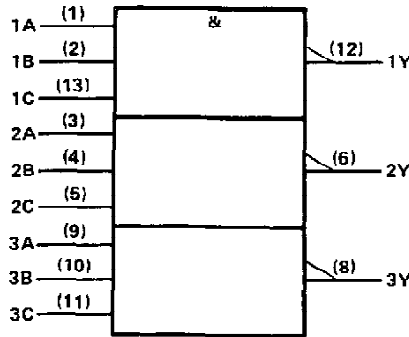
These devices contain three independent 3-input NAND gates.

The SN5410, SN54LS10, and SN54S10 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7410, 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 symbol†**

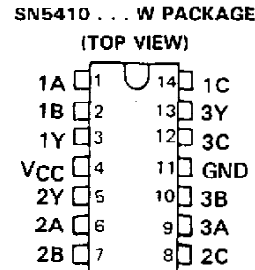
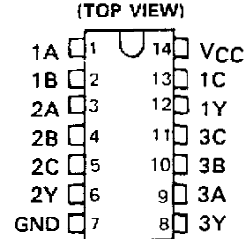


†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, and N packages.

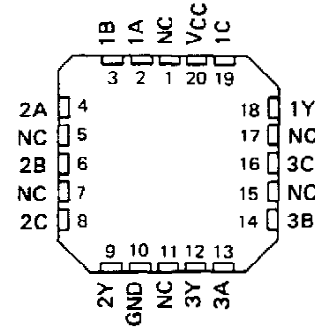
**positive logic**

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

- SN5410 . . . J PACKAGE
- SN54LS10, SN54S10 . . . J OR W PACKAGE
- SN7410 . . . N PACKAGE
- SN74LS10, SN74S10 . . . D OR N PACKAGE

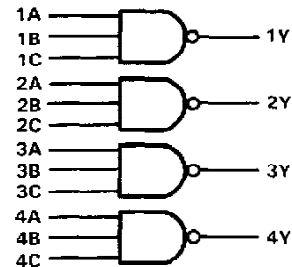


- SN54LS10, SN54S10 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

**logic diagram (positive logic)**

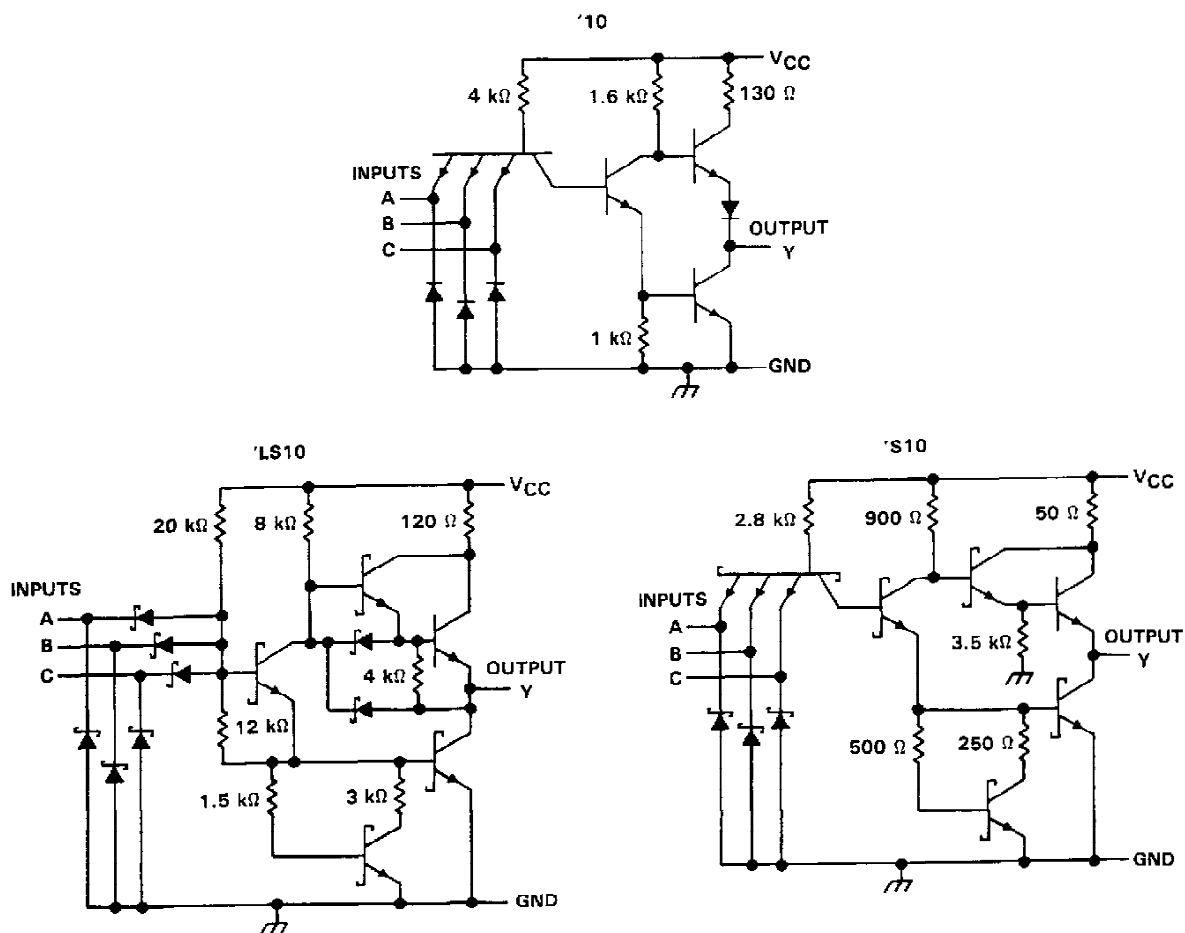


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**SN5410, SN54LS10, SN54S10,  
SN7410, SN74LS10, SN74S10  
TRIPLE 3-INPUT POSITIVE-NAND GATES**

schematics (each gate)



Resistor values shown are nominal.

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

Supply voltage, VCC (see Note 1) .....	7 V
Input voltage: '10, '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.



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**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	
$V_{IK}$	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-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
$I_{CCH}$	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$	3 6			3 6			mA
$I_{CCL}$	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$	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  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

§ 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, B or C	Y	$R_L = 400 \Omega,$	$C_L = 15 \text{ pF}$		11	22	ns
$t_{PHL}$						7	15	ns

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



# 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			0.7			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 †	SN54LS10		SN74LS10		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$			-1.5		-1.5	V	
$V_{OH}$	$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $I_{OH} = -0.4 \text{ mA}$	2.5	3.4		2.7	3.4	V	
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $I_{OL} = 4 \text{ mA}$		0.25	0.4		0.4	V	
	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $I_{OL} = 8 \text{ mA}$				0.25	0.5		
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 7 \text{ V}$			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	
$I_{OS}§$	$V_{CC} = \text{MAX}$	-20		-100	-20	-100	mA	
$I_{CCH}$	$V_{CC} = \text{MAX}$ , $V_I = 0 \text{ V}$		0.6	1.2		0.6	1.2	mA
$I_{CCL}$	$V_{CC} = \text{MAX}$ , $V_I = 4.5 \text{ V}$		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  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

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

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

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

TEXAS  
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**SN54S10, SN74S10**  
**TRIPLE 3-INPUT POSITIVE-NAND GATES**

**recommended operating conditions**

	SN54S10			SN74S10			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.8			0.8	V
I <sub>OH</sub> High-level output current			-1			-1	mA
I <sub>OL</sub> Low-level output current			20			20	mA
T <sub>A</sub> 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	TYP‡	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.2			-1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -1 mA	2.5	3.4		2.7	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 20 mA			0.5			0.5	V
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V			1			1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V			50			50	µA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5 V			-2			-2	mA
I <sub>OS</sub> §	V <sub>CC</sub> = MAX	-40		-100	-40		-100	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V		7.5	12		7.5	12	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	A, B or C	Y	R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 15 pF		3	4.5	ns
t <sub>PHL</sub>					3	5	ns
t <sub>PLH</sub>			R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 50 pF		4.5		ns
t <sub>PHL</sub>					5		ns

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



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