SDLS035 - 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

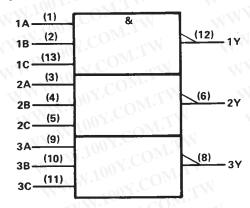
These devices contain three independent 3-input NAND gates.

The SN5410, SN54LS10, and SN54S10 are characterized for operation over the full military temperature range of  $-55\,^{\circ}\text{C}$  to  $125\,^{\circ}\text{C}$ . The SN7410, SN74LS10, and SN74S10 are characterized for operation from  $0\,^{\circ}\text{C}$  to  $70\,^{\circ}\text{C}$ .

**FUNCTION TABLE (each gate)** 

A	VPUT	s	OUTPUT
A	В	С	Y
н	⊣н√	√н	tww
L	X	x	Н
X	VLT.	X	н
X	X	O	H 📢

## logic symbol<sup>†</sup>



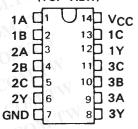
<sup>†</sup>This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

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

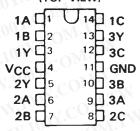
#### positive logic

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

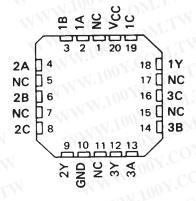
SN5410 . . . J PACKAGE
SN54LS10, SN54S10 . . . J OR W PACKAGE
SN7410 . . . N PACKAGE
SN74LS10, SN74S10 . . . D OR N PACKAGE
(TOP VIEW)



SN5410 . . . W PACKAGE (TOP VIEW)

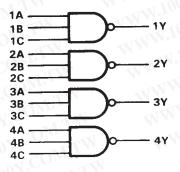


SN54LS10, SN54S10 . . . FK PACKAGE (TOP VIEW)



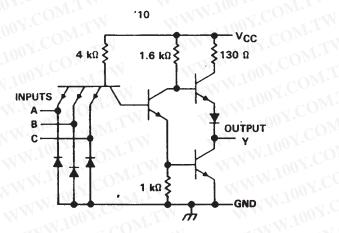
NC - No internal connection

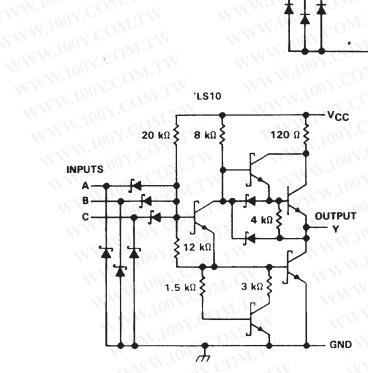
## logic diagram (positive logic)

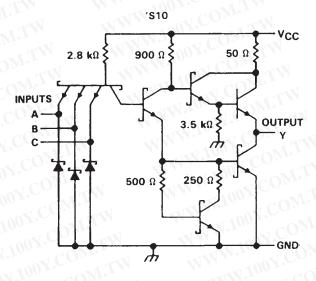


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#### schematics (each gate)







Resistor values shown are nominal.

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

state maximum ratings over operating mode an temperature range (amous exist	
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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# recommended operating conditions

		SN5410		SN7410				
	TAMM'ION COM. TAM MAM.	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	C5	5.5	4.75	5	5.25	V
VIH	High-level input voltage	2	V C	OMr.,	~ 2			V
VIL	Low-level input voltage	11.10	- <b>- - - - - - -</b>	0.8	-33		0.8	V
ЮН	High-level output current	. W.1	003	- 0.4		1	- 0.4	mA
loL	Low-level output current	-TXN	100,	16	V.L	· .	16	mA
TA	Operating free-air temperature	- 55	1 100	125	0	1	70	°c

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

PARAMETER		TEST CONDIT	IONS TON	W	SN5410		$C_{\mathbf{O}_{\hat{\mathbf{L}}}}$	SN741	0	
M COM	7.	VEGT GOILD	COM	MIN	TYP#	MAX	MIN	TYP‡	MAX	TINU
VIK	VCC = MIN,	I <sub>I</sub> = - 12 mA	Ton . COW.		TWV	- 1.5	s7 C	Mir	- 1.5	V
Vон	V <sub>CC</sub> = MIN,	VIL = 0.8 V,	I <sub>OH</sub> = - 0.4 mA	2.4	3.4	W.109	2.4	3.4	1	V
Vol	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 16 mA		0.2	0.4	01.	0.2	0.4	V
N. II ON C	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 5.5 V	1100Y.Com.T	N .	W	1	001	~ 01	1	mA
TH	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 2.4 V	W. TOOX.Co	W	W	40	100	C	40	μА
VIL.	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0.4 V	MM. TONY.COM	TVI		- 1.6	100	V.C	- 1.6	mA
los§	V <sub>CC</sub> = MAX	N X	MAN-TO ON COM	- 20		- 55	- 18	ov.C	- 55	mA
Іссн 1	V <sub>CC</sub> = MAX,	V1 = 0 V	AINAN TOO	VI-3	3	6	M.F	3	6	mA
ICCL 10	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 4.5 V	M. 100 - CC	M	9	16.5	NN.	9	16.5	mA

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

# 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
<sup>t</sup> PLH	MMiles	CONTAN	MMM, 100X CO TUTM	11 22	ns
<sup>t</sup> PHL	A, B or C	$R_L = 400 \Omega$ , $C_L = 15 pF$	7 15	ns	

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

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

<sup>§</sup> Not more than one output should be shorted at a time.

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## recommended operating conditions

		SN54LS10				SN74LS10			
$M_{\odot}$	IN M. 1001.	MIN	NOM	MAX	MIN	NOM	MAX	UNIT	
Vcc	Supply voltage	4.5	5	5.5	4.75	5	5.25	V	
VIH	High-level input voltage	2	1001		2			V	
VIL	Low-level input voltage		100	0.7	$\Lambda T$	N	8.0	٧	
Іон	High-level output current	W	10	- 0.4	317	W	- 0.4	mA	
lor	Low-level output current	NW	14.5	4	) P	W	8	mA	
TA	Operating free-air temperature	- 55	111.7	125	0	-CVN	70	°C	

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

PARAMETER	MIIM	TEST CONDITIONS †			SN54LS10			SN74LS10		
FARAMETER	TEST CONDITIONS TO THE			MIN	TYP‡	MAX	MIN	TYP‡	MAX	רואט
VIK	VCC = MIN, I <sub>I</sub> = - 18 mA			N	- 1		51 007		- 1.5	V
Voн	V <sub>CC</sub> = MIN,	VIL = MAX,	I <sub>OH</sub> = - 0.4 mA	2.5	3,4	M A.	2.7	3.4	VIIV	V
WW. Income	VCC = MIN,	V <sub>1H</sub> = 2 V,	I <sub>OL</sub> = 4 mA	TV	0.25	0.4	100	Y.CU	0.4	QN <sub>v</sub>
VOL	VCC = MIN,	V <sub>1H</sub> = 2 V,	IOL = 8 mA	TW		WWV	1.3	0.25	0.5	W
1 1 10 10 10 10 10 10 10 10 10 10 10 10	VCC = MAX,	V1 = 7 V	TMM:In CO	VI.		0.1	W.r.	oov.	0.1	mA
ЧН	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 2.7 V	M. Tan T. C.C.	M.		20	M.)	00 03/	20	μА
կլ	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 0.4 V	M. 100	$O_{M,J,J}$	:1	- 0.4	NW.	100	- 0.4	mA
los§	V <sub>CC</sub> = MAX	1.TW	1111001	- 20	<b>V</b>	- 100	- 20	V.100	- 100	mA
Іссн	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0 V	WW 100Y	TIM	0.6	1.2	V	0.6	1.2	mΑ
ICCL	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 4.5 V	4/// 1002	C	1.8	3.3	MAA	1.8	3.3	mA

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

## switching characteristics, VCC = 5 V, TA = 25°C (see note 2)

ARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN TYP	MAX	UNIT
tPLH	A, B or C	OY. VINIT	B = 210 2 W 100 2 - 20 EV. 1	WWW P	15	ns
tPHL	A, B 01 C	ONY.CO	$R_L = 2 k\Omega$ , $C_L = 15 pF$	10	15	ns

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

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

<sup>§</sup> Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

## recommended operating conditions

		SN54S10		0	SN74S10			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	UNIII
V <sub>CC</sub> Si	upply voltage	4.5	5	5.5	4.75	5	5.25	٧
V <sub>IH</sub> H	ligh-level input voltage	2	Y.C	Time	N 2			V
VIL L	ow-level input voltage	1.0	oy.C'	0.8	W		0.8	٧
юн н	ligh-level output current	W.r.	any.		TW		- 1	mA
IOL L	ow-level output current	MV.	OV.	20	TV.	Ń	20	mA
T <sub>A</sub> O	perating free-air temperature	- 55	700.	125	0	- <b>%</b> T	70	°c

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

COM		TEST CONDITIONS †			SN54S1	0 7.0	Dr.	SN74S	10	UNIT
PARAMETER	TEST CONDITIONS 1			MIN	TYP‡	MAX	MIN	TYP‡	MAX	UNIT
V <sub>IK</sub>	V <sub>CC</sub> = MIN,	I <sub>I</sub> = -18 mA	ON.		WW.	-1.2	$CO_J$	1. 1	1.2	٧
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	1700.	2.7	3.4	· -31	V
V <sub>OL</sub>	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 20 mA		N V	0.5	7.0	$O_{M',j}$	0.5	V
1007.00	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 5.5 V	31 100 Y. OM.T	W	MAL	W 10	17.0	Mor	1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 2.7 V	1007.CO		W	50	10.XY		50	μА
WIL ON	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0.5 V	M. TOON.CO.	W	W	-2	1003	Co	-2	mA
los§	V <sub>CC</sub> = MAX	V V	MM. TO OX. COM	-40	V	-100	-40	A'Ch	-100	mA
Іссн	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0 V	MAN. TOO	W. W	7.5	12	.10	7.5	12	mA
ICCL (1)	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 4.5 V	TANN IN T CC	WI.	15	27	W.In	15	27	mA

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

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CON	MIN TYP	MAX	UNIT	
<sup>t</sup> PLH	W.100	OM:	R <sub>L</sub> = 280 Ω,	C <sub>L</sub> = 15 pF	3.	4.5	ns
tPHL .	1 N 100 x .	COMIL	ME = 200 12,	CO TOPI	3	5	ns
<sup>t</sup> PLH	A, B or C	A, B or C	$R_1 = 280 \Omega_s$	C <sub>L</sub> = 50 pF	4.5	N.Inc	ns
<sup>t</sup> PHL		WI.MO	n[ - 200 sz,		5	W.16	ns

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

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<sup>‡</sup> 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.

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