

SN74LS19A, SN74LS24A SCHMITT-TRIGGER POSITIVE-NAND GATES AND INVERTERS WITH TOTEM-POLE OUTPUTS

JANUARY 1981 — REVISED MARCH 1988

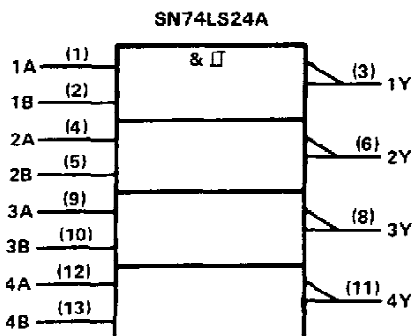
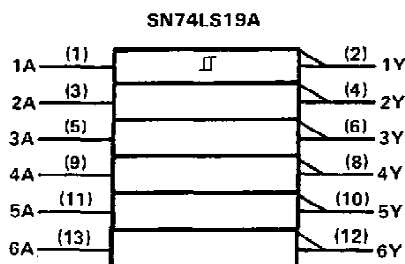
- Functionally and Mechanically Identical to 'LS13, 'LS14, and 'LS132, Respectively
- Improved Line-Receiving Characteristics
- P-N-P Inputs Reduce System Loading
- Excellent Noise Immunity with Typical Hysteresis of 0.8 V

description

Each circuit functions as a NAND gate or inverter, but because of the Schmitt action, it has different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals. The hysteresis or backlash, which is the difference between the two threshold levels ($V_{T+} - V_{T-}$), is typically 800 millivolts.

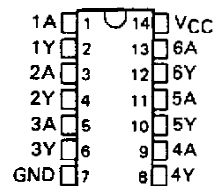
These circuits are temperature-compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals.

logic symbols†

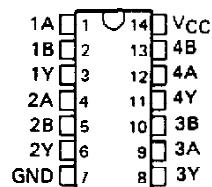


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

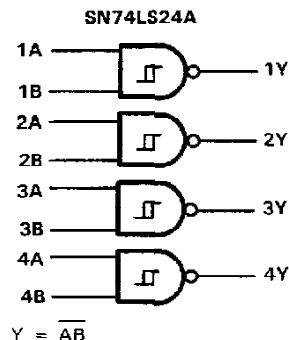
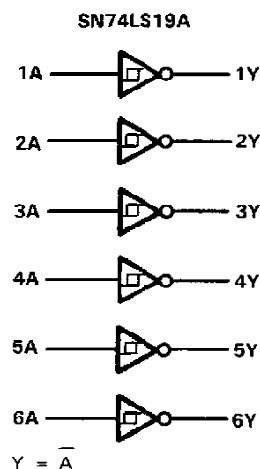
SN74LS19A . . . D, J, OR N PACKAGE (TOP VIEW)



SN74LS24A . . . D, J, OR N PACKAGE (TOP VIEW)



logic diagrams (positive logic)



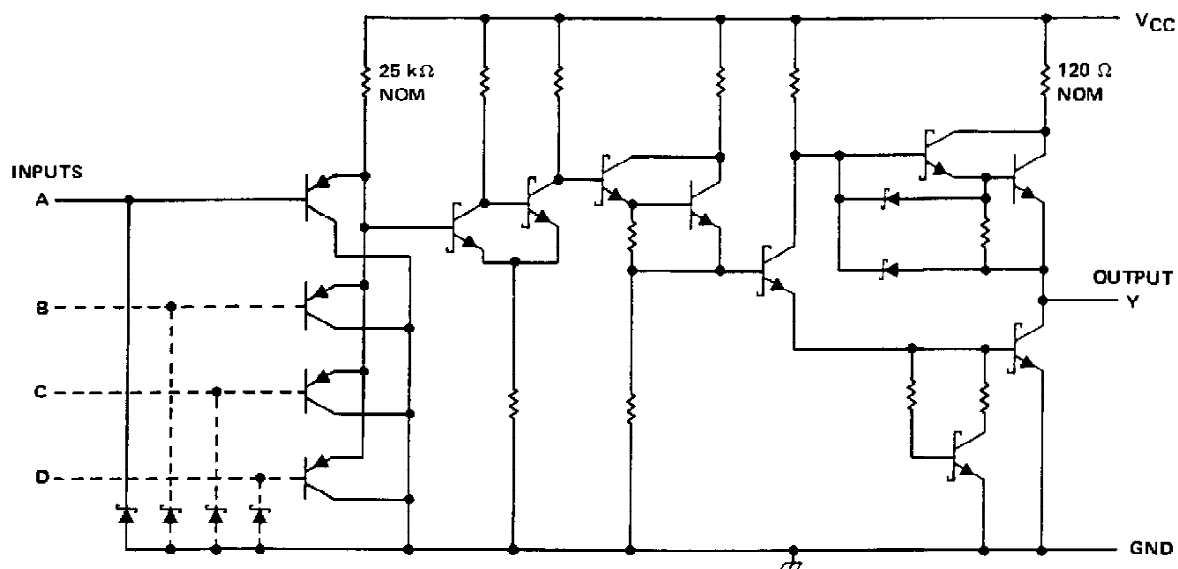
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INSTRUMENTS

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SN74LS19A, SN74LS24A **SCHMITT-TRIGGER POSITIVE-NAND GATES** **AND INVERTERS WITH TOTEM-POLE OUTPUTS**

schematic (each gate)



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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-400	μA
Low-level output current, I_{OL}			8	mA
Operating free-air temperature, T_A	0		70	°C

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

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
V_{T+}	$V_{CC} = 5\text{ V}$	1.65	1.9	2.15	V
V_{T-}	$V_{CC} = 5\text{ V}$	0.75	1.0	1.25	V
Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = 5\text{ V}$	0.4	0.9		V
V_{IK}	$V_{CC} = \text{MIN.}$ $I_I = -18\text{ mA}$		-1.5		V
V_{OH}	$V_{CC} = \text{MIN.}$ $V_I = V_{T-\text{min}}$ $I_{OH} = -0.4\text{ mA}$	2.7	3.4		V
V_{OL}	$V_{CC} = \text{MIN.}$ $V_I = V_{T+\text{max}}$	$I_{OL} = 4\text{ mA}$	0.25	0.4	V
		$I_{OL} = 8\text{ mA}$	0.35	0.5	
I_{T+}	$V_{CC} = 5\text{ V.}$ $V_I = V_{T+}$		-2	-20	μA
I_{T-}	$V_{CC} = 5\text{ V.}$ $V_I = V_{T-}$		-5	-30	μA
I_I	$V_{CC} = \text{MAX.}$ $V_I = 7\text{ V}$		0.1		mA
I_{IH}	$V_{CC} = \text{MAX.}$ $V_I = 2.7\text{ V}$			20	μA
I_{IL}	$V_{CC} = \text{MAX.}$ $V_I = 0.4\text{ V}$			-50	μA
I_{OS}^{\S}	$V_{CC} = \text{MAX.}$ $V_I = V_O = 0\text{ V}$	-20		-100	mA
I_{CCH}	$V_{CC} = \text{MAX.}$ $V_I = 0\text{ V}$	'LS19A	9.9	18	mA
		'LS24A	6.6	12	
I_{CCL}	$V_{CC} = \text{MAX.}$ $V_I = 4.5\text{ V}$	'LS19A	17	30	mA
		'LS24A	11	20	

† 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 Figure 1)

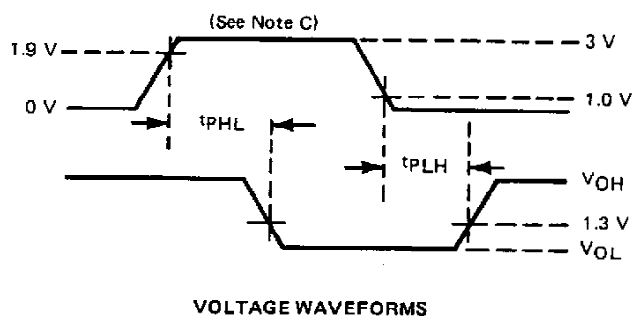
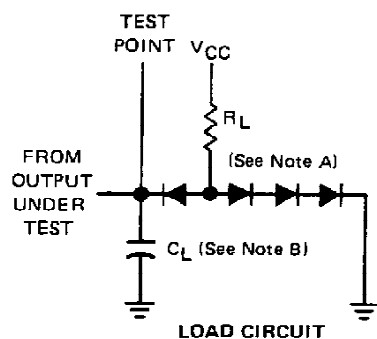
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	SN74LS19A			SN74LS24A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Any	Y	$R_L = 2\text{ k}\Omega$, $C_L = 15\text{ pF}$		13	20		13	20	ns
t_{PHL}	Any	Y			18	30		25	40	ns

t_{PLH} = Propagation delay time, low-to-high-level output

t_{PHL} = Propagation delay time, high-to-low-level output

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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. All diodes are IN3064 or equivalent.
 B. C_L includes probe and circuit capacitance.
 C. The generator characteristics are: PRR = 1 MHz, t_r = 15 ns, t_p = 6 ns, Z_o = 50 Ω.

FIGURE 1

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