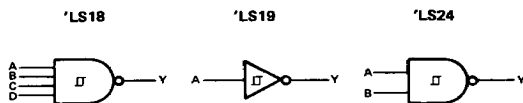- **Functionally and Mechanically Identical To 'LS13, 'LS14, and 'LS132, Respectively**
- **Improved Line-Receiving Characteristics**
- **P-N-P Inputs Reduce System Loading**
- **Excellent Noise Immunity With Typical Hysteresis of 0.7 V**
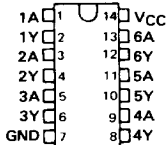
description

Each circuit functions as a NAND gate or inverter, but because of the Schmitt action, it has different input threshold levels for positive (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 900 millivolts.

These circuits are temperature-compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals.
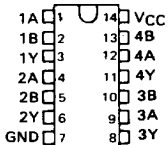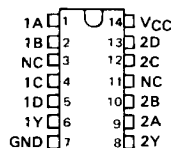
logic diagram (each gate or inverter)

'LS18 'LS19 'LS24

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SN74LS18 . . . D, J OR N PACKAGE
(TOP VIEW)

SN74LS18 . . . FN PACKAGE
(TOP VIEW)
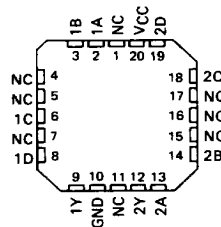
SN74LS19 . . . FN PACKAGE
(TOP VIEW)

SN74LS19 . . . D, J OR N PACKAGE
(TOP VIEW)

SN74LS24 . . . D, J OR N PACKAGE
(TOP VIEW)
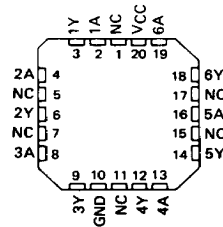
SN74LS24 . . . FN PACKAGE
(TOP VIEW)
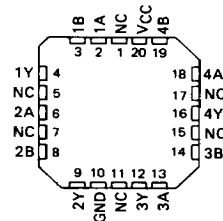
NC - No internal connection

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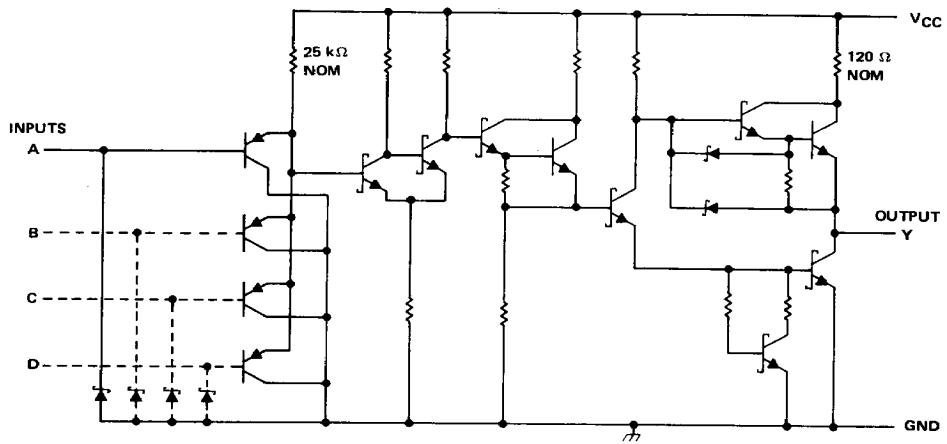
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) .... 7 V
Input voltage .... 7 V
Operating free-air temperature range: SN74LS' .... 0°C to 70°C
Storage temperature range .... −65°C to 150°C

recommended operating conditions

	SN74LS'			UNIT
	MIN	NOM	MAX	
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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TTL DEVICES

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

PARAMETER	TEST CONDITIONS[†]		SN74LS' MIN	SN74LS' TYP[‡]	SN74LS' MAX	UNIT
V_{T+}	$V_{CC} = 5$ V		1.65	1.9	2.15	V
V_{T-}	$V_{CC} = 5$ V		0.75	1.0	1.25	V
Hysteresis $(V_{T+} - V_{T-})$	$V_{CC} = 5$ V		0.4	0.9		V
V_{IK}	$V_{CC} = $ MIN, $\quad I_I = -18$ mA				−1.5	V
V_{OH}	$V_{CC} = $ MIN, $\quad V_I = V_T - $ min $\quad I_{OH} = -0.4$ mA		2.7	3.4		V
V_{OL}	$V_{CC} = $ MIN, $\quad V_I = V_T + $ max	$I_{OL} = 4$ mA		0.25	0.4	V
		$I_{OL} = 8$ mA		0.35	0.5	
I_{T+}	$V_{CC} = 5$ V, $\quad V_I = V_{T+}$			−2	−20	μA
I_{T-}	$V_{CC} = 5$ V, $\quad V_I = V_{T-}$			−5	−30	μA
I_I	$V_{CC} = $ MAX, $\quad V_I = 7$ V				0.1	mA
I_{IH}	$V_{CC} = $ MAX, $\quad V_I = 2.7$ V				20	μA
I_{IL}	$V_{CC} = $ MAX, $\quad V_I = 0.4$ V				−50	μA
I_{OS}[§]	$V_{CC} = $ MAX, $\quad V_I = V_O = 0$ V		−20		−100	mA
I_{CCH}	$V_{CC} = $ MAX, $\quad V_I = 0$ V	'LS18		3.3	6	mA
		'LS19		9.9	18	
		'LS24		6.6	12	
I_{CCL}	$V_{CC} = $ MAX, $\quad V_I = 4.5$ V	'LS18		5.7	10	mA
		'LS19		17	30	
		'LS24		11	20	

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡] All typical values are at $V_{CC} = 5$ 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 figure 1

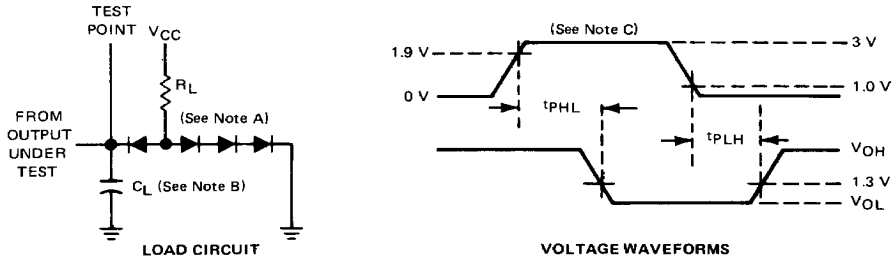| PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS18 MIN	'LS18 TYP	'LS18 MAX	'LS19 MIN	'LS19 TYP	'LS19 MAX	'LS24 MIN	'LS24 TYP	'LS24 MAX	UNIT
t_{PLH}	Any	Y	$R_L = 2$ kΩ, $C_L = 15$ pF		13	20		13	20		13	20	ns
t_{PHL}	Any	Y			37	55		18	30		25	40	ns

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

LOAD CIRCUIT

VOLTAGE WAVEFORMS

NOTES: A. All diodes are IN3064 or equivalent.
  B. C_L includes probe and circuit capacitance.
  C. The generator characteristics are; $P_{RR} = 1MHz$, $t_r = 15\ ns$,
    $t_p = 6\ ns$, $Z_{out} = 50\ \Omega$.

FIGURE 1

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