

## 74132, LS132 Schmitt Triggers

Quad 2-Input NAND Schmitt Trigger  
Product Specification

### Logic Products

The '132 contains four 2-input NAND gates which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have greater noise margin than conventional NAND gates.

Each circuit contains a 2-input Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem-pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transition, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input threshold (typically 800mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations. As long as one input remains at a more positive voltage than  $V_{T+MAX}$ , the gate will respond to the transitions of the other input as shown in Waveform 1.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74132	15ns	21mA
74LS132	15ns	7mA

### ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$ ; $T_A = 0^{\circ}C$ to $+70^{\circ}C$
Plastic DIP	N74132N, N74LS132N

### NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74	74LS
A, B	Inputs	1ul	1LSul
Y	Output	10ul	10LSul

### NOTE:

Where a 74 unit load (ul) is understood to be  $40\mu A I_{IH}$  and  $-1.6mA I_{IL}$ , and a 74LS unit load (LSul) is  $20\mu A I_{IH}$  and  $-0.4mA I_{IL}$ .

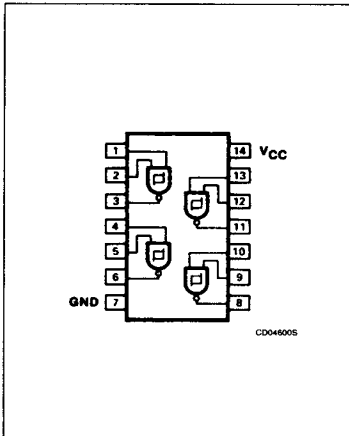
### FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH voltage level

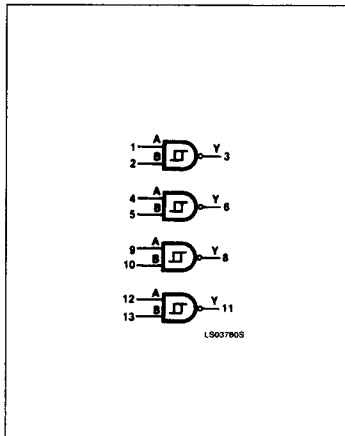
L = LOW voltage level

### PIN CONFIGURATION



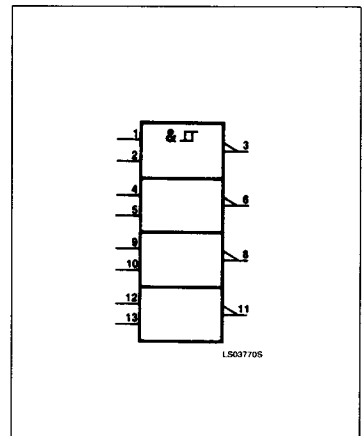
December 4, 1985

### LOGIC SYMBOL



5-212

### LOGIC SYMBOL (IEEE/IEC)



853-0517 81502

# Schmitt Triggers

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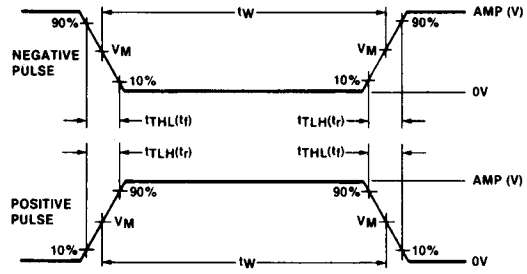
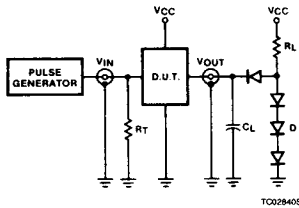
### ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74	74LS	UNIT
V <sub>CC</sub>	Supply voltage	7.0	7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +5.5	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	-30 to +1	mA
V <sub>OUT</sub>	Voltage applied to output in HIGH output state	-0.5 to +V <sub>CC</sub>	-0.5 to +V <sub>CC</sub>	V
T <sub>A</sub>	Operating free-air temperature range	0 to 70		°C

### RECOMMENDED OPERATING CONDITIONS

PARAMETER	74			74LS			UNIT
	Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	4.75	5.0	5.25	4.75	5.0	5.25	V
I <sub>IK</sub>			-12			-18	mA
I <sub>OH</sub>			-800			-400	μA
I <sub>OL</sub>			16			8	mA
T <sub>A</sub>	0		70	0		70	°C

### TEST CIRCUITS AND WAVEFORMS



V<sub>M</sub> = 1.3V for 74LS; V<sub>M</sub> = 1.5V for all other TTL families.

#### Input Pulse Definition

#### DEFINITIONS

R<sub>L</sub> = Load resistor to V<sub>CC</sub>; see AC CHARACTERISTICS for value.

C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

t<sub>TLH</sub>, t<sub>THL</sub> Values should be less than or equal to the table entries.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t <sub>TLH</sub>	t <sub>THL</sub>
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

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## Schmitt Triggers

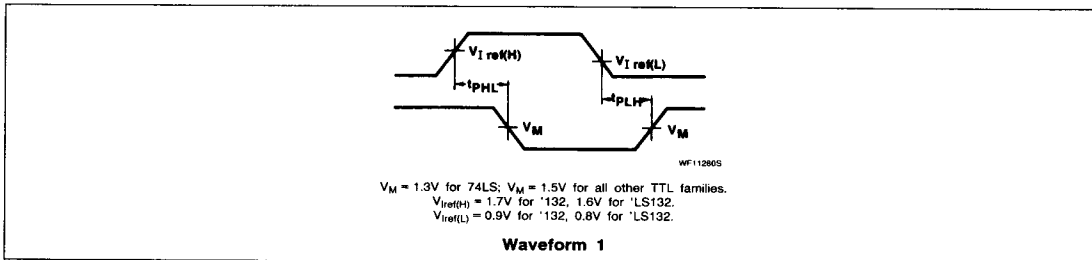
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**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating free-air temperature range unless otherwise noted.)

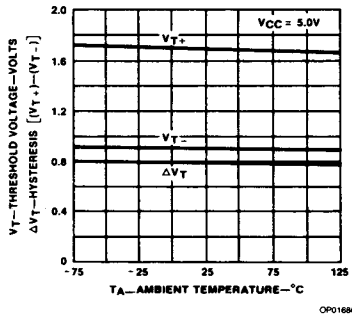
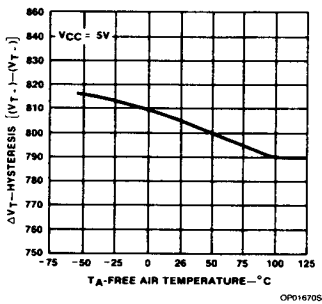
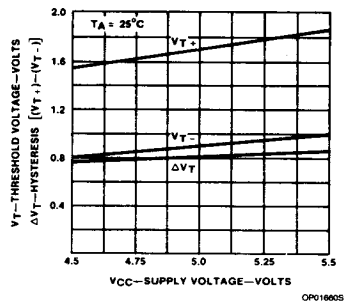
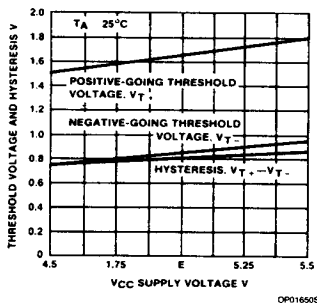
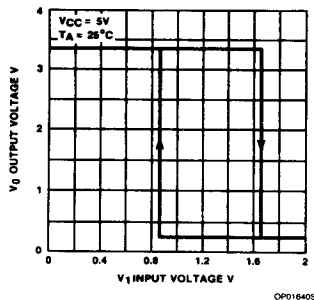
PARAMETER	TEST CONDITIONS <sup>1</sup>	74132			74LS132			UNIT	
		Min	Typ <sup>2</sup>	Max	Min	Typ <sup>2</sup>	Max		
$V_{T+}$ Positive-going threshold	$V_{CC} = 5.0V$	1.5	1.7	2.0	1.4	1.6	1.9	V	
$V_{T-}$ Negative-going threshold	$V_{CC} = 5.0V$	0.6	0.9	1.1	0.5	0.8	1.0	V	
$\Delta V_T$ Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{CC} = 5.0V$	0.4	0.8		0.4	0.8		V	
$V_{OH}$ HIGH-level output voltage	$V_{CC} = \text{MIN}, V_I = V_{T-} - \text{MIN}, I_{OH} = \text{MAX}$	2.4	3.4		2.7	3.4		V	
$V_{OL}$ LOW-level output voltage	$V_{CC} = \text{MIN}, V_I = V_{T+} + \text{MAX}$	$I_{OL} = \text{MAX}$		0.2	0.4		0.35	0.5	V
		$I_{OL} = 4\text{mA} (74\text{LS})$					0.25	0.4	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$			-1.5			-1.5	V	
$I_{T+}$ Input current at positive-going threshold	$V_{CC} = 5.0V, V_I = V_{T+}$		-0.43			-0.14		mA	
$I_{T-}$ Input current at negative-going threshold	$V_{CC} = 5.0V, V_I = V_{T-}$		-0.56			-0.18		mA	
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}$	$V_I = 5.5V$		1.0				mA	
		$V_I = 7.0V$					0.1	mA	
$I_{IH}$ HIGH-level input current	$V_{CC} = \text{MAX}$	$V_I = 2.4V$		40				$\mu\text{A}$	
		$V_I = 2.7V$					20	$\mu\text{A}$	
$I_{IL}$ LOW-level input current	$V_{CC} = \text{MAX}, V_I = 0.4V$			-1.2			-0.4	mA	
$I_{OS}$ Short-circuit output current <sup>3</sup>	$V_{CC} = \text{MAX}$	-18		-55	-20		-100	mA	
$I_{CC}$ Supply current (total)	$V_{CC} = \text{MAX}$	$I_{CCH}$ Outputs HIGH		15	24		5.9	11	mA
		$I_{CCL}$ Outputs LOW		26	40		8.2	14	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5V, T_A = 25^\circ\text{C}$ .
- $I_{OS}$  is tested with  $V_{OUT} = +0.5V$  and  $V_{CC} = V_{CC} \text{ MAX} + 0.5V$ . Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

**AC WAVEFORM**

TYPICAL CHARACTERISTICS



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**AC ELECTRICAL CHARACTERISTICS**  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ 

PARAMETER	TEST CONDITIONS	74		74LS		UNIT
		$C_L = 15\text{pF}$ , $R_L = 400\Omega$		$C_L = 15\text{pF}$ , $R_L = 2\text{k}\Omega$		
		Min	Max	Min	Max	
$t_{PLH}$ $t_{PHL}$ Propagation delay	Waveform 1		22 22		22 22	ns