

**SN54132, SN54LS132, SN54S132,  
SN74132, SN74LS132, SN74S132**  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

DECEMBER 1983 — REVISED MARCH 1988

- Operation from Very Slow Edges
- Improved Line-Receiving Characteristics
- High Noise Immunity

SN54132, SN54LS132, SN54S132 . . . J OR W PACKAGE  
SN74132 . . . N PACKAGE  
SN74LS132, SN74S132 . . . D OR N PACKAGE

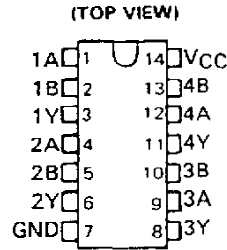
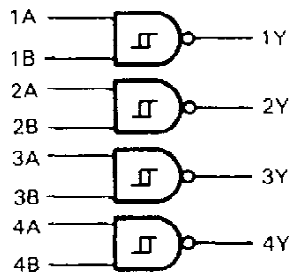
**description**

Each circuit functions as a 2-input NAND gate, but because of the Schmitt action, it has different input threshold levels for positive ( $V_{T+}$ ) and for negative going ( $V_{T-}$ ) signals.

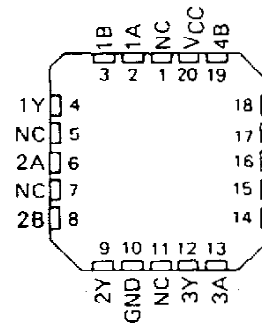
These circuits are temperature-compensated and can be triggered from the slowest of input ramps and still give clear, jitter-free output signals.

The SN54132, SN54LS132, and SN54S132 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74132, SN74LS132, and SN74S132 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

**logic diagram (positive logic)**

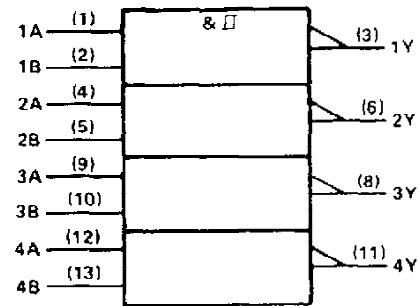


SN54LS132, SN54S132 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

**logic symbol†**



positive logic:  $Y = \overline{AB}$  or  $Y = \overline{A} + \overline{B}$

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

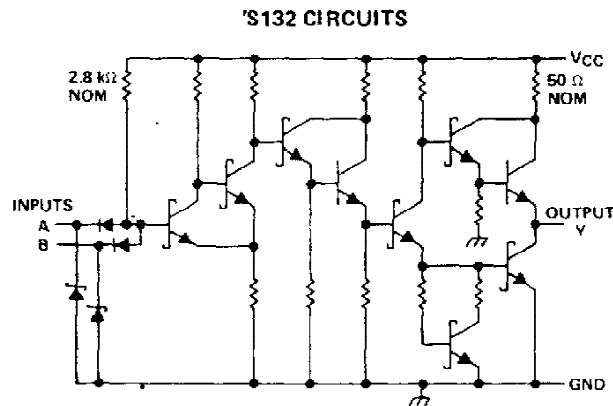
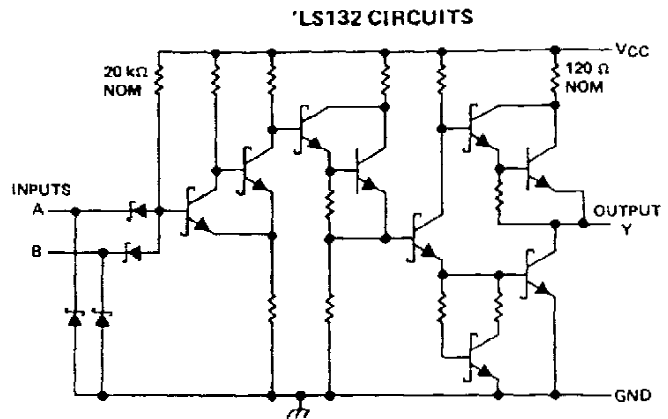
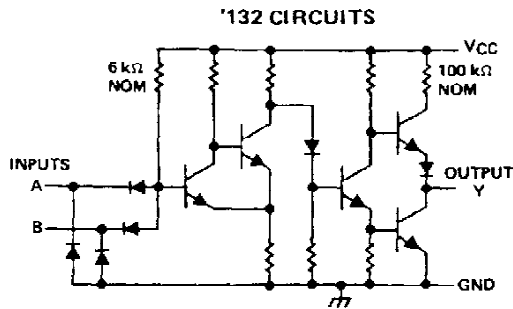
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**SN54132, SN54LS132, SN54S132,  
SN74132, SN74LS132, SN74S132  
QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

schematics



Resistor values shown are nominal.

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

Supply voltage, $V_{CC}$ (see Note 1).....	7 V
Input voltage: '132, 'S132.....	5.5 V
'LS132.....	7 V
Operating free-air temperature: SN54'.....	-55°C to 125°C
SN74'.....	0°C to 70°C
Storage temperature range.....	-65°C to 150°C

NOTE 1: Voltages values are with respect to network ground terminal.

**TEXAS  
INSTRUMENTS**

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SN54132, SN74132  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

**recommended operating conditions**

	SN54132			SN74132			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
I <sub>OH</sub> High-level output current			-0.8			-0.8	mA
I <sub>OL</sub> Low-level output current			16			16	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†	MIN	TYP‡	MAX	UNIT
V <sub>T+</sub>	V <sub>CC</sub> = 5 V	1.5	1.7	2	V
V <sub>T-</sub>	V <sub>CC</sub> = 5 V	0.6	0.9	1.1	V
V <sub>hys</sub> (V <sub>T+</sub> - V <sub>T-</sub> )	V <sub>CC</sub> = 5 V	0.4	0.8		V
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -12 mA			-1.5	V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>I</sub> = 0.6 V, I <sub>OH</sub> = -0.8 mA	2.4	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>I</sub> = 2 V, I <sub>OL</sub> = 16 mA		0.2	0.4	V
I <sub>T+</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T+</sub>		-0.43		mA
I <sub>T-</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T-</sub>		-0.56		mA
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V			1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V			40	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>IL</sub> = 0.4 V		-0.8	-1.2	mA
I <sub>OS</sub> §	V <sub>CC</sub> = MAX		-18	-55	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX		15	24	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX		26	40	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.

**switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 400 Ω, C <sub>L</sub> = 15 pF		15	22	ns
t <sub>PHL</sub>					15	22	ns



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# SN54LS132, SN74LS132 QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS

recommended operating conditions

	SN54LS132			SN74LS132			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
I <sub>OH</sub> High-level output current			-0.4			-0.4	mA
I <sub>OL</sub> Low-level output current			4			8	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†	SN54LS132			SN74LS132			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>T+</sub>	V <sub>CC</sub> = 5 V	1.4	1.6	1.9	1.4	1.6	1.9	V
V <sub>T-</sub>	V <sub>CC</sub> = 5 V	0.5	0.8	1	0.5	0.8	1	V
V <sub>hys</sub> (V <sub>T+</sub> - V <sub>T-</sub> )	V <sub>CC</sub> = 5 V	0.4	0.8		0.4	0.8		V
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.5			-1.5	V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>I</sub> = 0.5 V, I <sub>OH</sub> = -0.4 mA	2.5	3.4		2.7	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>I</sub> = 1.9 V, I <sub>OL</sub> = 4 mA, I <sub>OL</sub> = 8 mA		0.25	0.4		0.25	0.4	V
I <sub>T+</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T+</sub>		-0.14			-0.14		mA
I <sub>T-</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T-</sub>		-0.18			-0.18		mA
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V			0.1			0.1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V			20			20	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>IL</sub> = 0.4 V			-0.4			-0.4	mA
I <sub>OS</sub> §	V <sub>CC</sub> = MAX	-20		-100	-20		-100	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX		5.9	11		5.9	11	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX		8.2	14		8.2	14	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 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 figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 15 pF		15	22	ns
t <sub>PHL</sub>					15	22	ns

TEXAS  
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**SN54S132, SN74S132**  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

**recommended operating conditions**

		SN54S132			SN74S132			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.75	5	5.25	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†	SN54S132			SN74S132			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>T+</sub>	V <sub>CC</sub> = 5 V	1.6	1.77	1.9	1.6	1.77	1.9	V
V <sub>T-</sub>	V <sub>CC</sub> = 5 V	1.1	1.22	1.4	1.1	1.22	1.4	V
V <sub>hys</sub> (V <sub>T+</sub> - V <sub>T-</sub> )	V <sub>CC</sub> = 5 V	0.2	0.55		0.2	0.55		V
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>I</sub> = 1.1 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>I</sub> = 1.9 V, I <sub>OL</sub> = 20 mA			0.5			0.5	V
I <sub>T+</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T+</sub>		-0.9			-0.9		mA
I <sub>T-</sub>	V <sub>CC</sub> = 5 V, V <sub>I</sub> = V <sub>T-</sub>		-1.1			-1.1		mA
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		28	44		28	44	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX		44	68		44	68	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 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 figure 1)**

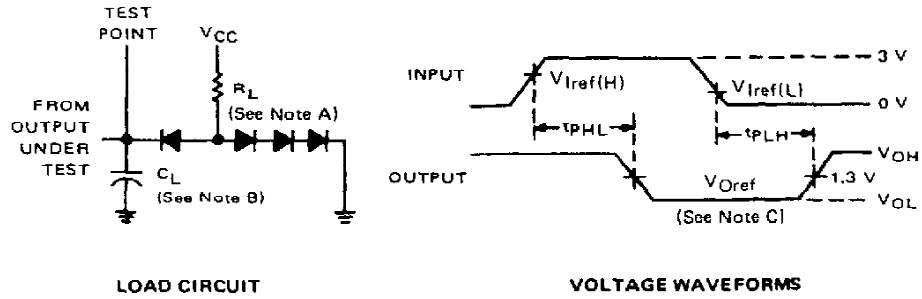
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	A or B	Y	R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 15 pF		7	10.5	ns
t <sub>PHL</sub>				8.5	13	ns	



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**SN54132, SN54LS132, SN54S132,  
SN74132, SN74LS132, SN74S132  
QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

**PARAMETER MEASUREMENT INFORMATION**



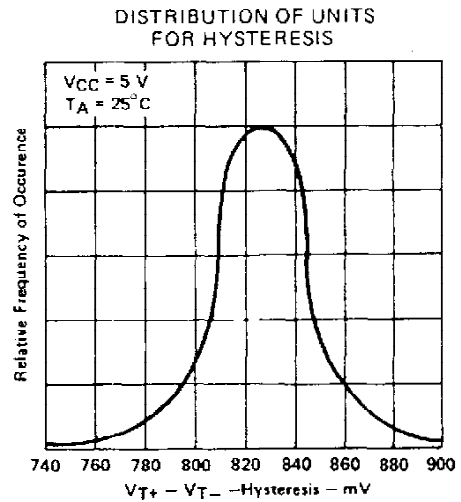
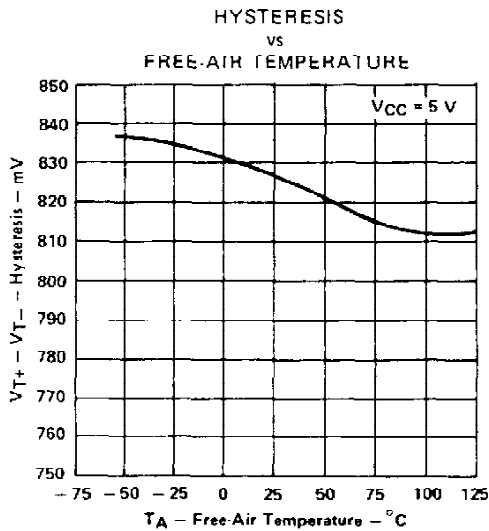
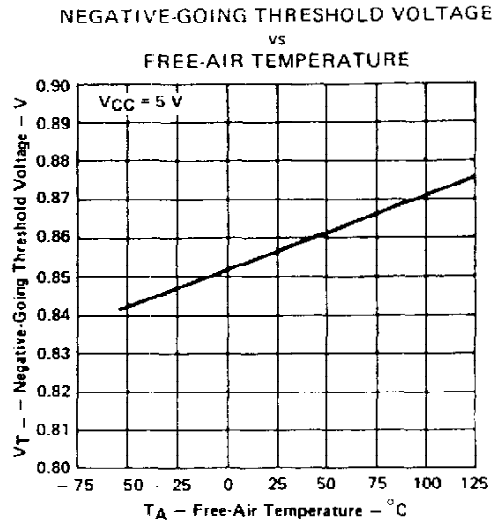
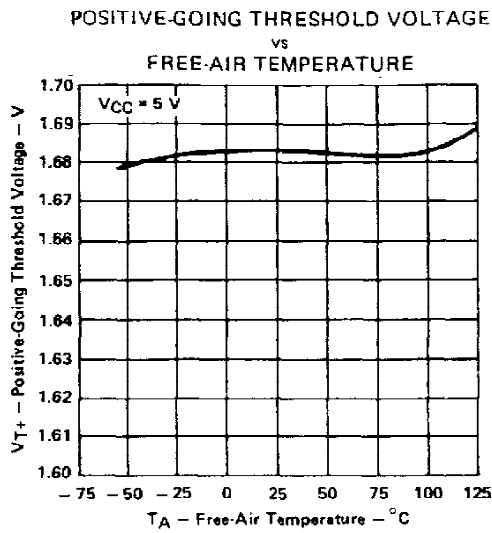
- NOTES: A. All diodes are 1N3064 or equivalent.  
B.  $C_L$  includes probe and jig capacitance.  
C. Generator characteristics and reference voltages are:

	Generator Characteristics				Reference Voltages		
	$Z_{out}$	PRR	$t_r$	$t_f$	$V_{1ref(H)}$	$V_{1ref(L)}$	$V_{Oref}$
SN54/SN74'	50	1 MHz	10 ns	10 ns	1.7 V	0.9 V	1.5 V
SN54LS/SN74LS'	50	1 MHz	15 ns	6 ns	1.6 V	0.8 V	1.3 V
'S132	50	1 MHz	2.5 ns	2.5 ns	1.8 V	1.2 V	1.5 V

FIGURE 1

SN54132, SN74132  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

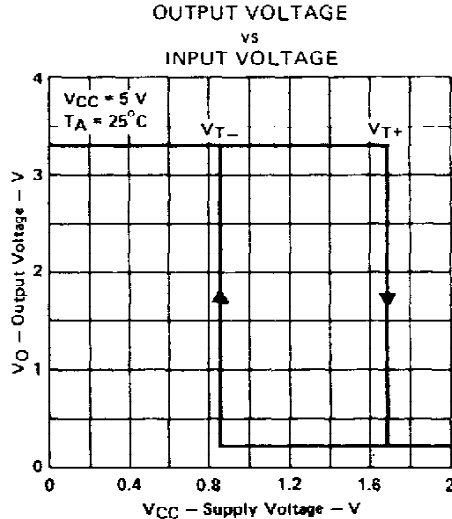
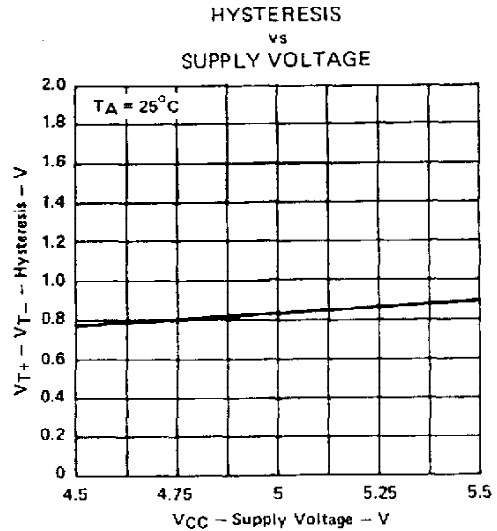
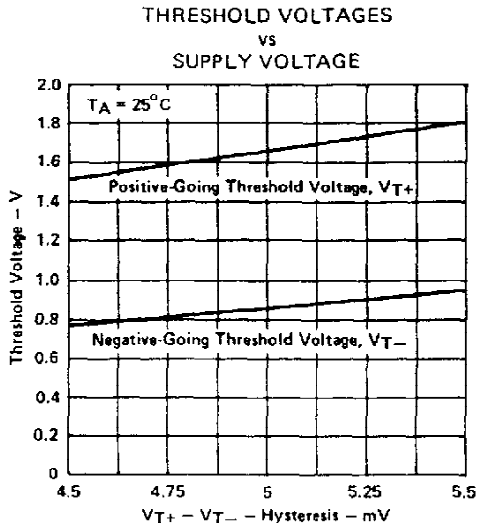
TYPICAL CHARACTERISTICS OF '132 CIRCUITS



† Data for temperatures below 0°C and 70°C and supply below 4.75 V and above 5.25 V are applicable for SN54132 only.

**SN54132, SN74132**  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

TYPICAL CHARACTERISTICS OF '132 CIRCUITS



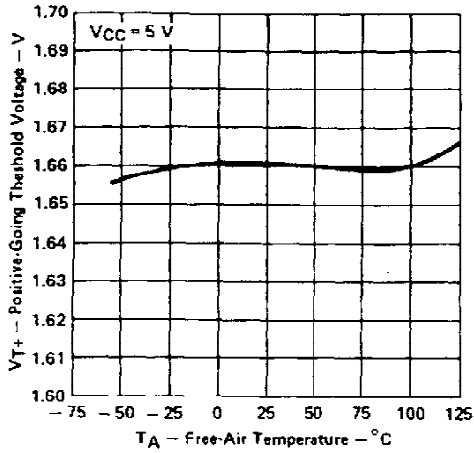
† Data for temperatures below 0°C and 70°C and supply below 4.75 V and above 5.25 V are applicable for SN54132 only.



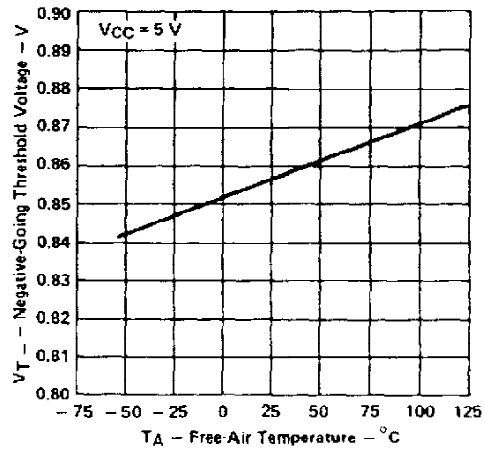
SN54LS132, SN74LS132  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

**TYPICAL CHARACTERISTICS OF 'LS132 CIRCUITS**

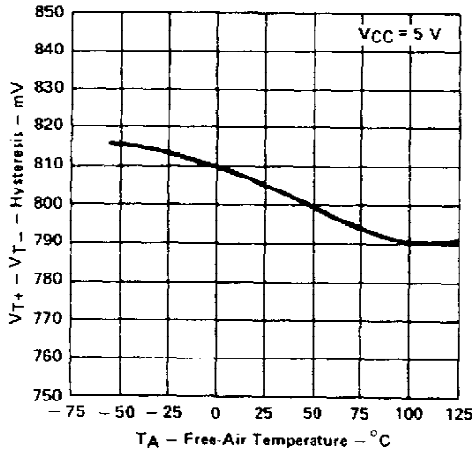
POSITIVE-GOING THRESHOLD VOLTAGE  
 vs  
 FREE-AIR TEMPERATURE



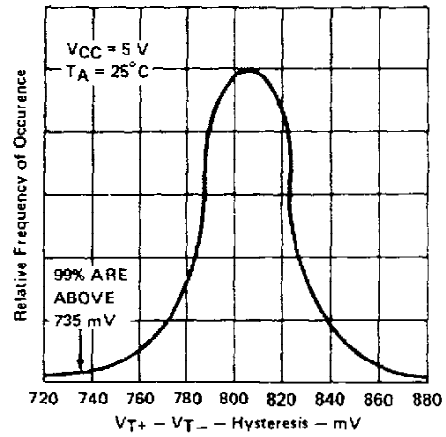
NEGATIVE-GOING THRESHOLD VOLTAGE  
 vs  
 FREE-AIR TEMPERATURE



HYSTERESIS  
 vs  
 FREE-AIR TEMPERATURE



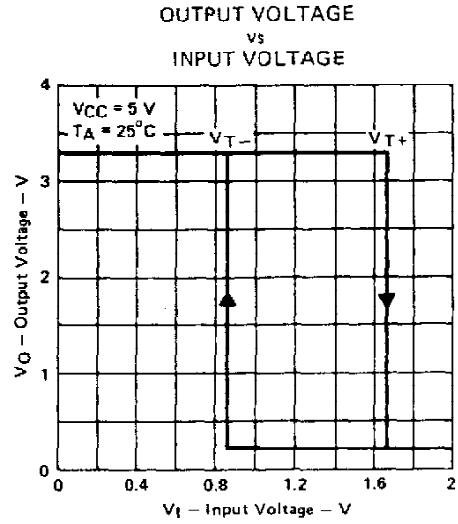
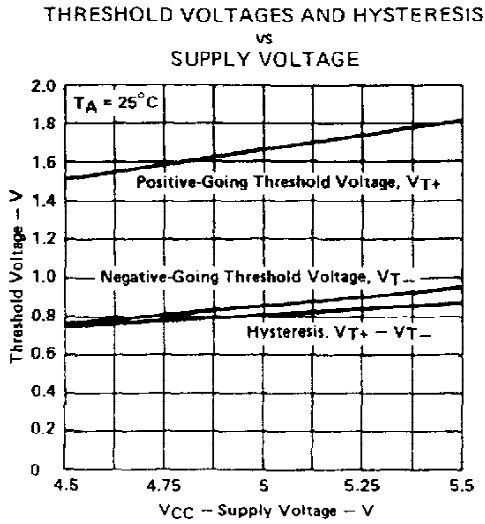
DISTRIBUTION OF UNITS  
 FOR HYSTERESIS



† Data for temperatures below 0°C and above 70°C and supply voltages below 4.75 V and above 5.25 V are applicable for SN54LS132 only.

**SN54LS132, SN74LS132**  
**QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS**

**TYPICAL CHARACTERISTICS OF 'LS132 CIRCUITS**



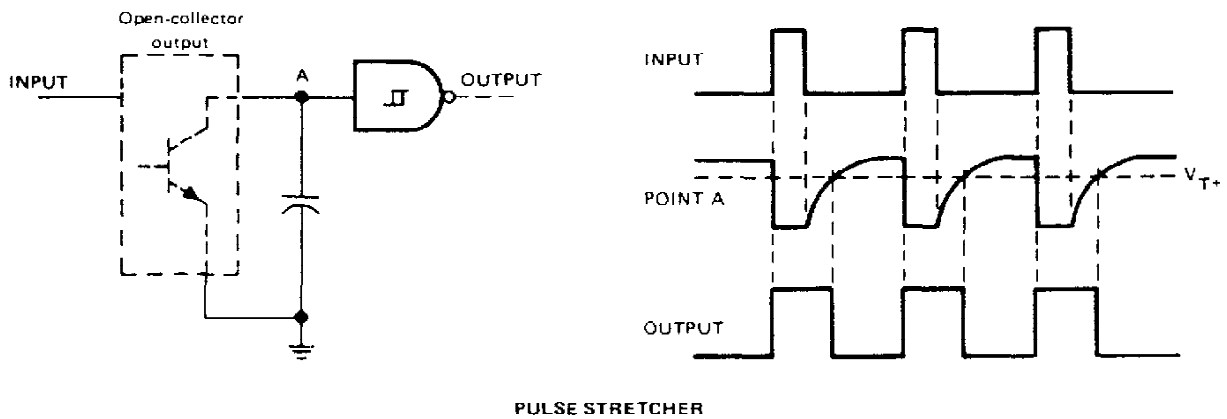
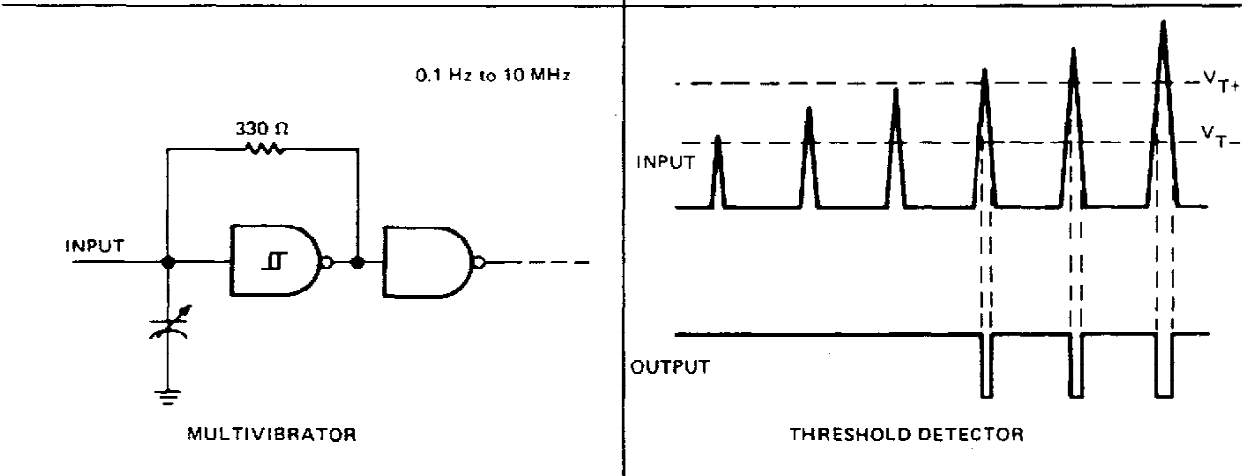
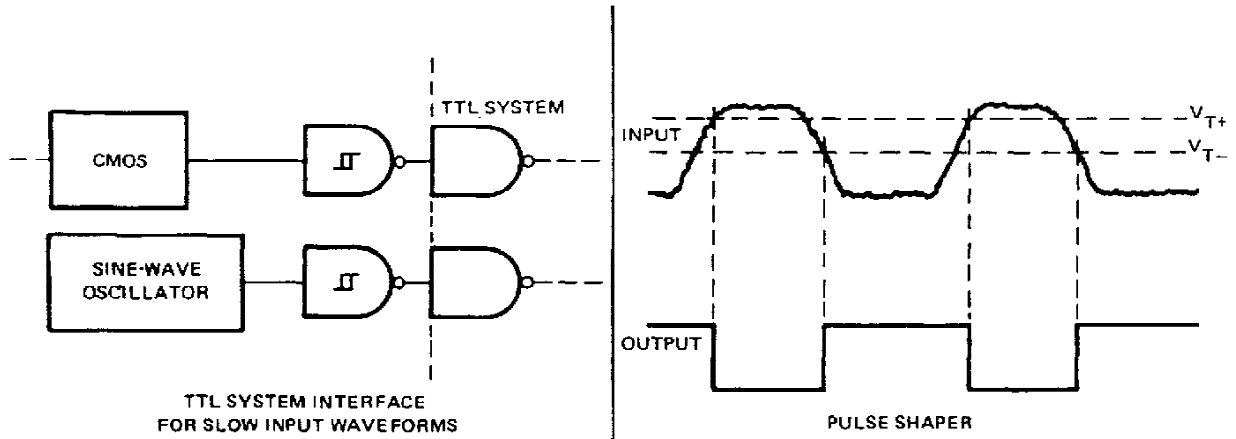
† Data for temperatures below  $0^\circ\text{C}$  and above  $70^\circ\text{C}$  and supply voltages below 4.75 V and above 5.25 V are applicable for SN54LS132 only.



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SN54132, SN54LS132, SN54S132,  
SN74132, SN74LS132, SN74S132  
QUADRUPLE 2-INPUT POSITIVE-NAND SCHMITT TRIGGERS

TYPICAL APPLICATION DATA



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