

TYPES SN5414, SN54LS14, SN7414, SN74LS14 HEX SCHMITT-TRIGGER INVERTERS

REVISED DECEMBER 1983

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

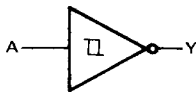
description

Each circuit functions as an inverter, 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 clean, jitter-free output signals.

The SN5414 and SN54LS14 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7414 and the SN74LS14 are characterized for operation from 0°C to 70°C .

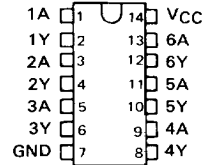
logic diagram



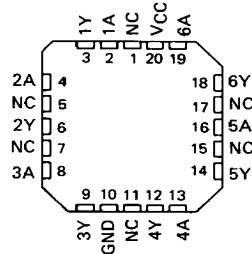
positive logic

$$Y = \overline{A}$$

SN5414, SN54LS14 ... J OR W PACKAGE
SN7414 ... J OR N PACKAGE
SN74LS14 ... D, J OR N PACKAGE
(TOP VIEW)



SN54LS14 ... FK PACKAGE
SN74LS14 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection

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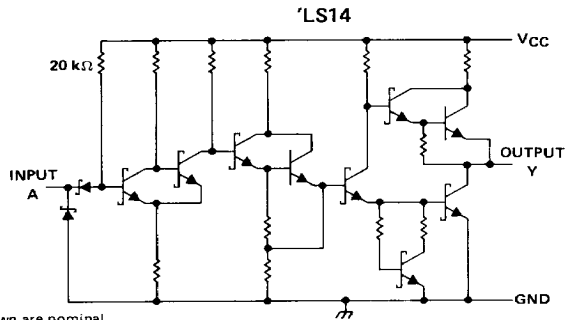
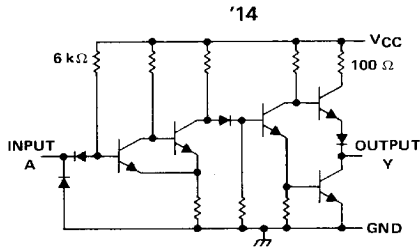
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TYPES SN5414, SN54LS14, SN7414, SN74LS14
HEX SCHMITT-TRIGGER INVERTERS

schematics



Resistor values shown are nominal.

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

Supply voltage, VCC (see Note 1)	7 V
Input voltage: '14	5.5 V
'LS14	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: Voltage values are with respect to network ground terminal.

TYPES SN5414, SN7414
HEX SCHMITT-TRIGGER INVERTERS

recommended operating conditions

	SN5414			SN7414			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
I _{OH} High-level output current			- 0.8			- 0.8	mA
I _{OL} Low-level output current			16			16	mA
T _A 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 _{T+}	V _{CC} = 5 V	1.5	1.7	2	V
V _{T-}	V _{CC} = 5 V	0.6	0.9	1.1	V
Hysteresis (V _{T+} - V _{T-})	V _{CC} = 5 V	0.4	0.8		V
V _{IK}	V _{CC} = MIN, I _I = - 12 mA			- 1.5	V
V _{OH}	V _{CC} = MIN, V _I = 0.6 V, I _{OH} = - 0.8 mA	2.4	3.4		V
V _{OL}	V _{CC} = MIN, V _I = 2 V, I _{OL} = 16 mA		0.2	0.4	V
I _{T+}	V _{CC} = 5 V, V _I = V _{T+}		- 0.43		mA
I _{T-}	V _{CC} = 5 V, V _I = V _{T-}		- 0.56		mA
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _{IH} = 2.4 V			40	µA
I _{IL}	V _{CC} = MAX, V _{IL} = 0.4 V		- 0.8	- 1.2	mA
I _{OS} §	V _{CC} = MAX	- 18		- 55	mA
I _{CCH}	V _{CC} = MAX		22	36	mA
I _{CCL}	V _{CC} = MAX		39	60	mA

† 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.

switching characteristics, V_{CC} = 5 V, T_A = 25° C

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 400 Ω, C _L = 15 pF		15	22	ns
t _{PHL}					15	22	ns

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TYPES SN54LS14, SN74LS14 HEX SCHMITT-TRIGGER INVERTERS

recommended operating conditions

	SN54LS14			SN74LS14			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
I _{OH} High-level output current			-0.4			-0.4	mA
I _{OL} Low-level output current			4			8	mA
T _A Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†	SN54LS14			SN74LS14			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{T+}	V _{CC} = 5 V	1.4	1.6	1.9	1.4	1.6	1.9	V
V _{T-}	V _{CC} = 5 V	0.5	0.8	1	0.5	0.8	1	V
Hysteresis (V _{T+} - V _{T-})	V _{CC} = 5 V	0.4	0.8		0.4	0.8		V
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5			-1.5	V
V _{OH}	V _{CC} = MIN, V _I = 0.5 V, I _{OH} = -0.4 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _I = 1.9 V, I _{OL} = 4 mA I _{OL} = 8 mA		0.25	0.4		0.25	0.4	V
I _{T+}	V _{CC} = 5 V, V _I = V _{T+}	-0.14			-0.14			mA
I _{T-}	V _{CC} = 5 V, V _I = V _{T-}	-0.18			-0.18			mA
I _I	V _{CC} = MAX, V _I = 7 V		0.1			0.1		mA
I _{IH}	V _{CC} = MAX, V _{IH} = 2.7 V		20			20		µA
I _{IL}	V _{CC} = MAX, V _{IL} = 0.4 V		-0.4			-0.4		mA
I _{OS} §	V _{CC} = MAX	-20		-100	-20		-100	mA
I _{CCH}	V _{CC} = MAX		8.6	16		8.6	16	mA
I _{CCL}	V _{CC} = MAX		12	21		12	21	mA

† 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 duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

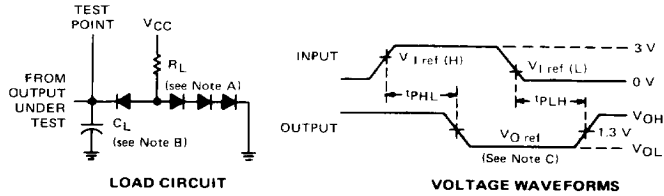
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 2 kΩ, C _L = 15 pF	15	22		ns
t _{PHL}				15	22		ns

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TYPES SN5414, SN54LS14, SN7414, SN74LS14 HEX SCHMITT-TRIGGER INVERTERS

PARAMETER MEASUREMENT INFORMATION

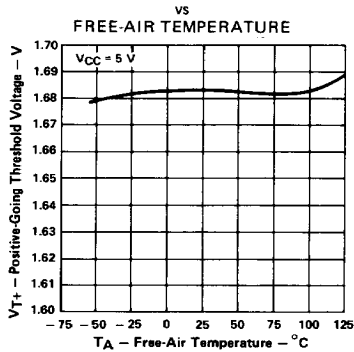


NOTES: A. All diodes are 1N3064 or equivalent.
B. C_L includes probe and jig capacitance.
C. Generator characteristics and reference voltage are:

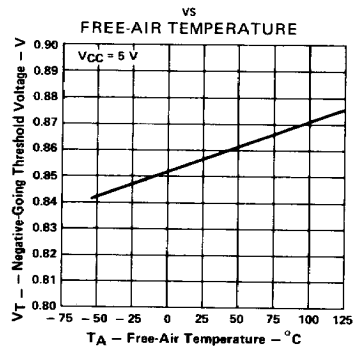
	Generator Characteristics				Reference Voltages		
	Z_{out}	PRR	t_r	t_f	$V_{I\ ref(H)}$	$V_{I\ ref(L)}$	$V_{O\ ref}$
SN54'/SN74'	50 Ω	1 MHz	10 ns	10 ns	1.7 V	0.9 V	1.5 V
SN54LS'/SN74LS'	50 Ω	1 MHz	15 ns	6 ns	1.6 V	0.8 V	1.3 V

TYPICAL CHARACTERISTICS OF '14 CIRCUITS

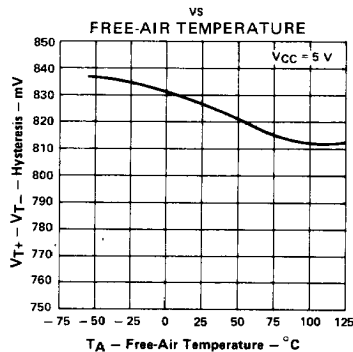
POSITIVE-GOING THRESHOLD VOLTAGE



NEGATIVE-GOING THRESHOLD VOLTAGE



HYSTERESIS



Data for temperatures below 0°C and 70°C and supply voltages below 4.75V and above 5.25 V are applicable for SN5414 only.

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TYPES SN5414, SN7414 HEX SCHMITT-TRIGGER INVERTERS

TYPICAL CHARACTERISTICS OF '14 CIRCUITS

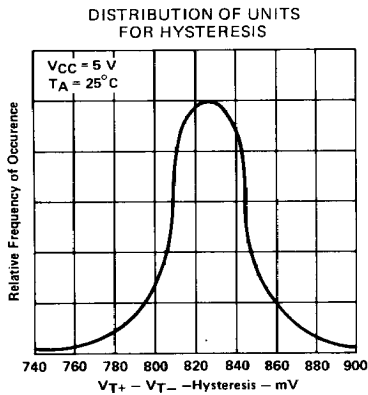


FIGURE 4

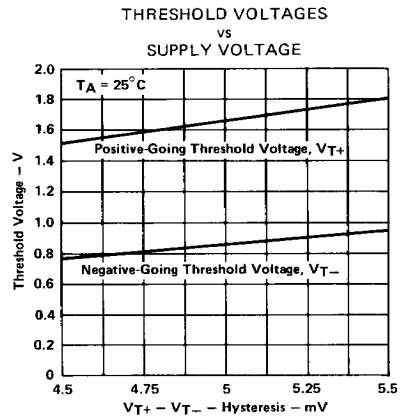


FIGURE 5

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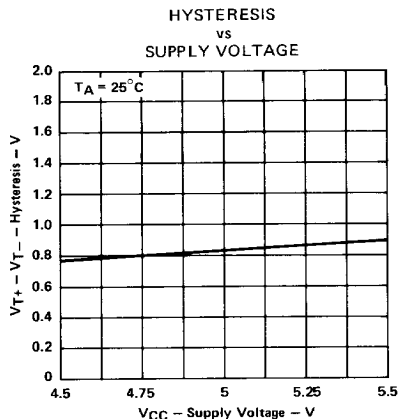


FIGURE 6

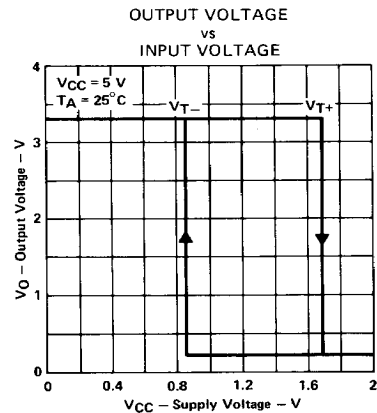


FIGURE 7

Data for temperatures below 0°C and 70°C and supply voltages below 4.75 V and above 5.25 V are applicable for SN5414 only.

TYPICAL CHARACTERISTICS OF 'LS14 CIRCUITS

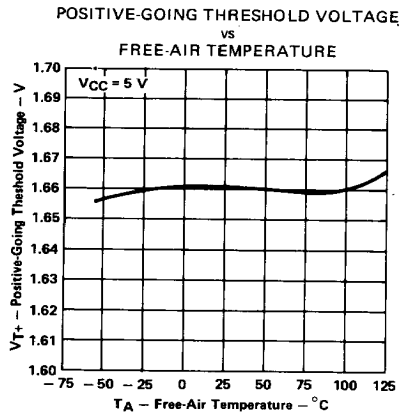


FIGURE 8

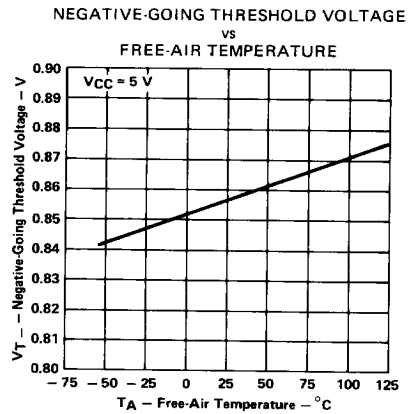


FIGURE 9

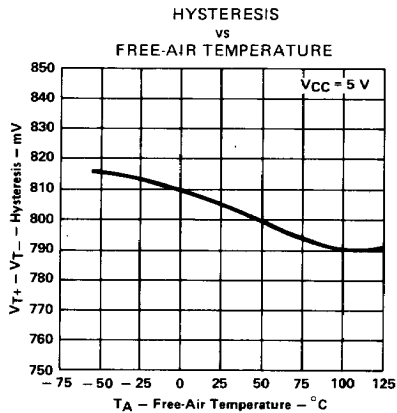


FIGURE 10

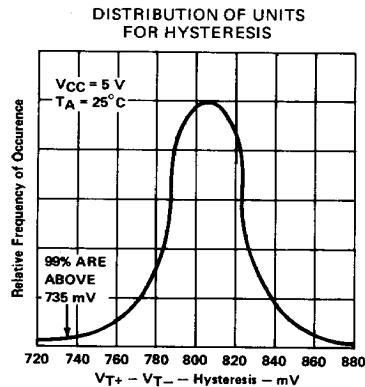


FIGURE 11

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 SN54LS14 only.

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TYPICAL CHARACTERISTICS OF 'LS14 CIRCUITS

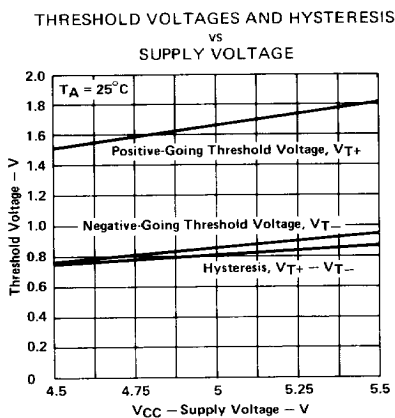


FIGURE 12

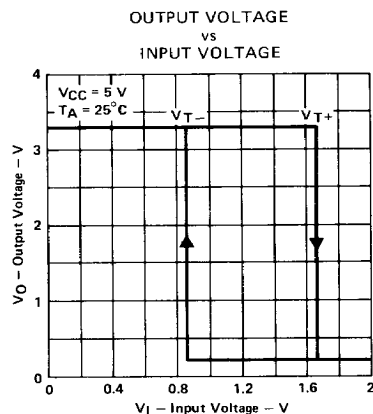


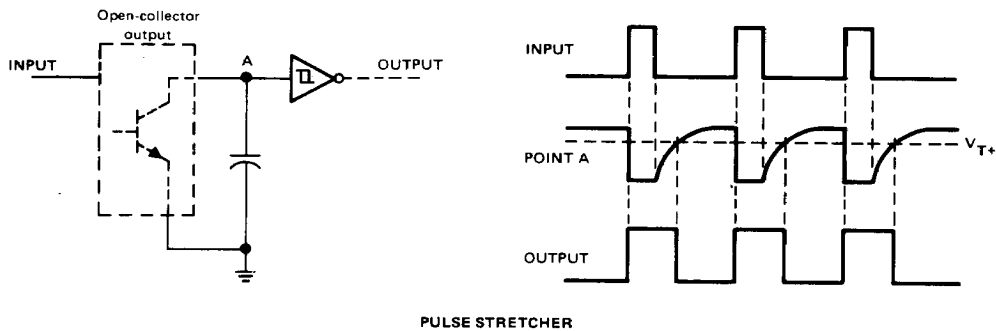
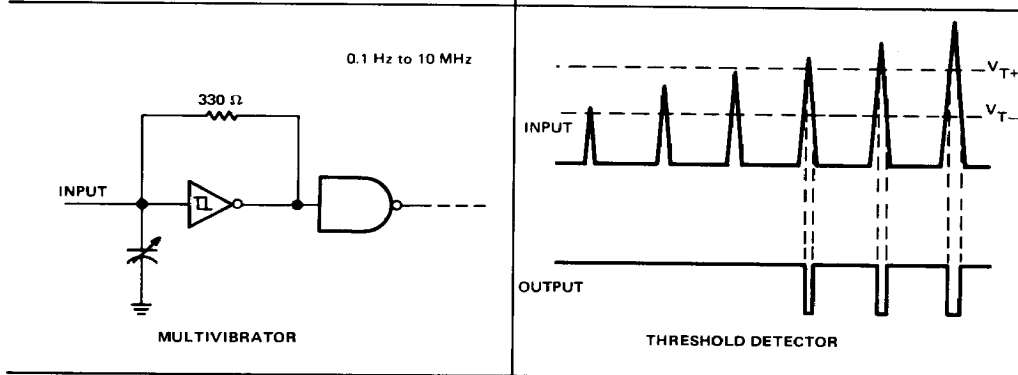
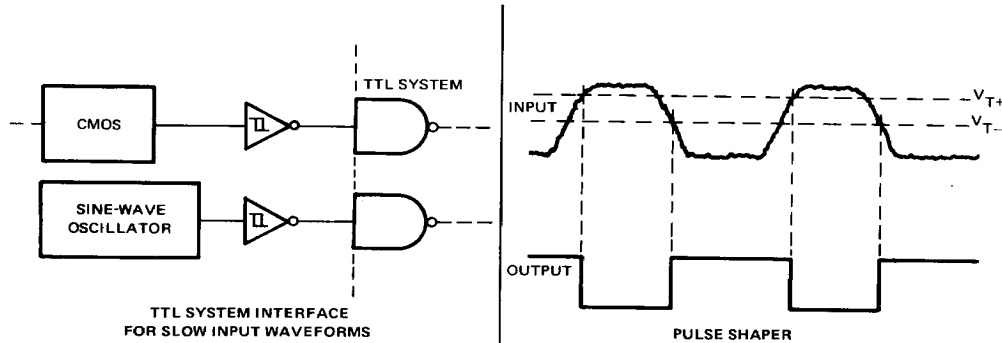
FIGURE 13

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 SN54LS14 only.

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TYPICAL APPLICATION DATA



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