

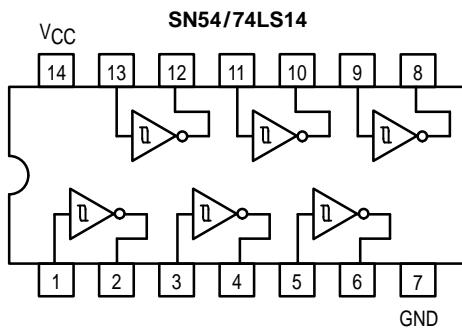
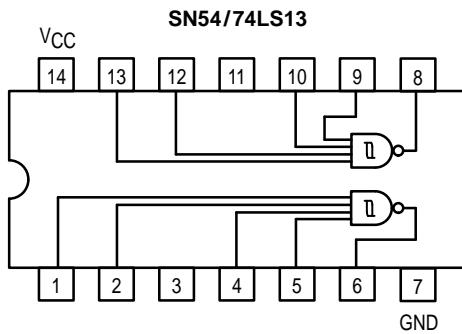


SCHMITT TRIGGERS DUAL GATE/HEX INVERTER

The SN54LS/74LS13 and SN54LS/74LS14 contain logic gates/inverters 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. Additionally, they have greater noise margin than conventional inverters.

Each circuit contains a 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 transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

LOGIC AND CONNECTION DIAGRAMS

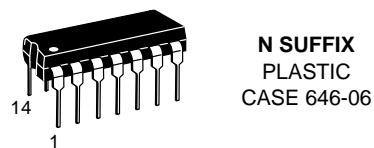
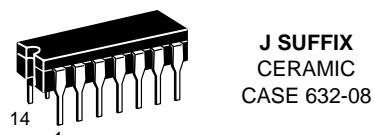


GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V _{CC}	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T _A	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
I _{OH}	Output Current — High	54, 74			-0.4	mA
I _{OL}	Output Current — Low	54 74			4.0 8.0	mA

SN54/74LS13 SN54/74LS14

SCHMITT TRIGGERS DUAL GATE/HEX INVERTER LOW POWER SCHOTTKY



ORDERING INFORMATION

SN54LSXXJ Ceramic
 SN74LSXXN Plastic
 SN74LSXXD SOIC

SN54/74LS13 • SN54/74LS14

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
V_{T+}	Positive-Going Threshold Voltage	1.5		2.0	V	$V_{CC} = 5.0 \text{ V}$
V_{T-}	Negative-Going Threshold Voltage	0.6		1.1	V	$V_{CC} = 5.0 \text{ V}$
$V_{T+}-V_{T-}$	Hysteresis	0.4	0.8		V	$V_{CC} = 5.0 \text{ V}$
V_{IK}	Input Clamp Diode Voltage		-0.65	-1.5	V	$V_{CC} = \text{MIN}, I_{IN} = -18 \text{ mA}$
V_{OH}	Output HIGH Voltage	54	2.5	3.4	V	$V_{CC} = \text{MIN}, I_{OH} = -400 \mu\text{A}, V_{IN} = V_{IL}$
		74	2.7	3.4	V	
V_{OL}	Output LOW Voltage	54, 74		0.25	V	$V_{CC} = \text{MIN}, I_{OL} = 4.0 \text{ mA}, V_{IN} = 2.0 \text{ V}$
		74		0.35	V	$V_{CC} = \text{MIN}, I_{OL} = 8.0 \text{ mA}, V_{IN} = 2.0 \text{ V}$
I_{T+}	Input Current at Positive-Going Threshold		-0.14		mA	$V_{CC} = 5.0 \text{ V}, V_{IN} = V_{T+}$
I_{T-}	Input Current at Negative-Going Threshold		-0.18		mA	$V_{CC} = 5.0 \text{ V}, V_{IN} = V_{T-}$
I_{IH}	Input HIGH Current		1.0	20	μA	$V_{CC} = \text{MAX}, V_{IN} = 2.7 \text{ V}$
				0.1	mA	$V_{CC} = \text{MAX}, V_{IN} = 7.0 \text{ V}$
I_{IL}	Input LOW Current			-0.4	mA	$V_{CC} = \text{MAX}, V_{IN} = 0.4 \text{ V}$
I_{OS}	Short Circuit Current (Note 1)	-20		-100	mA	$V_{CC} = \text{MAX}, V_{OUT} = 0 \text{ V}$
I_{CC}	Power Supply Current	LS13		2.9	6.0	$V_{CC} = \text{MAX}$
	Total, Output HIGH	LS14		8.6	16	
	Total, Output LOW	LS13		4.1	7.0	
		LS14		12	21	

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

Symbol	Parameter	Max		Unit	Test Conditions
		LS13	LS14		
t_{PLH}	Propagation Delay, Input to Output	22	22	ns	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$
t_{PHL}	Propagation Delay, Input to Output	27	22	ns	

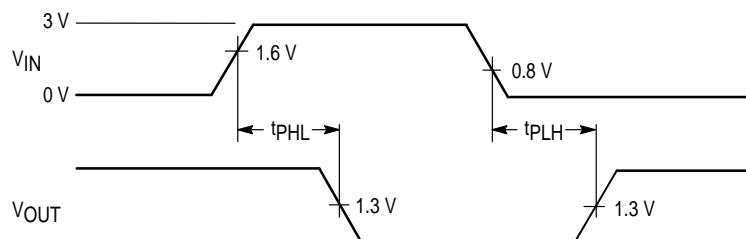


Figure 1. AC Waveforms

SN54/74LS13 • SN54/74LS14

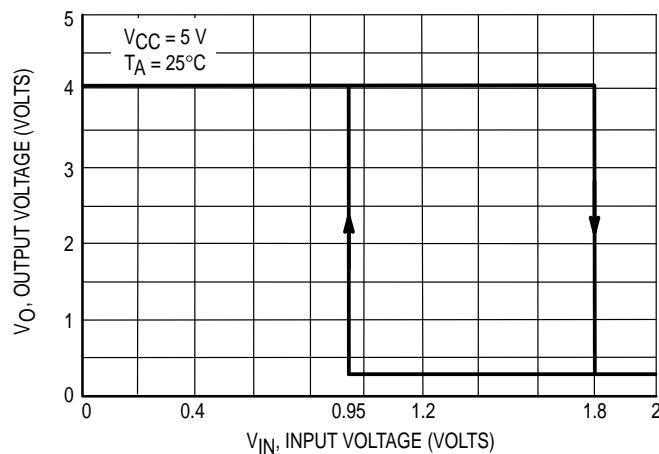


Figure 2. V_{IN} versus V_{OUT} Transfer Function

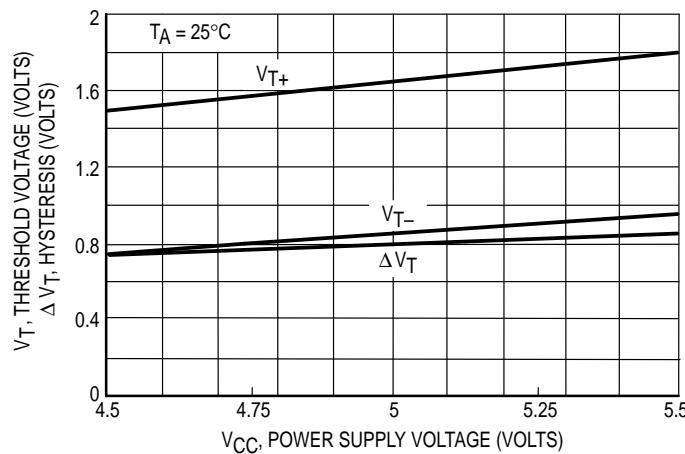


Figure 3. Threshold Voltage and Hysteresis versus Power Supply Voltage

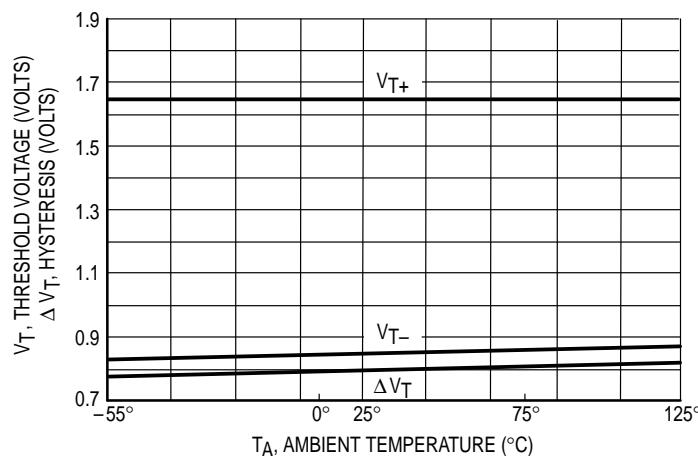


Figure 4. Threshold Voltage Hysteresis versus Temperature