

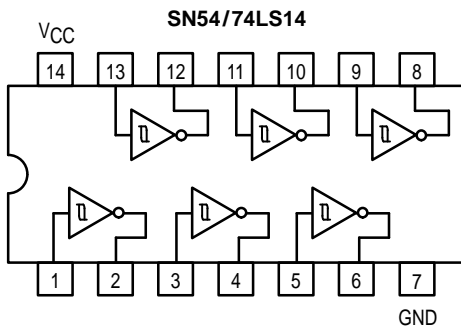
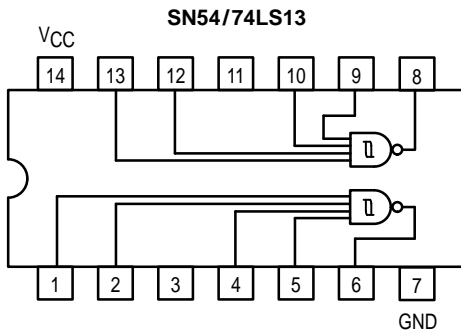


# SCHMITT TRIGGERS DUAL GATE/HEX INVERTER

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.

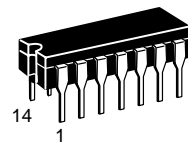
Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going 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

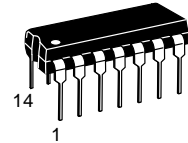


**SN54/74LS13  
SN54/74LS14**

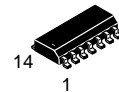
**SCHMITT TRIGGERS  
DUAL GATE/HEX INVERTER  
LOW POWER SCHOTTKY**



**J SUFFIX  
CERAMIC  
CASE 632-08**



**N SUFFIX  
PLASTIC  
CASE 646-06**



**D SUFFIX  
SOIC  
CASE 751A-02**

## ORDERING INFORMATION

SN54LSXXJ Ceramic  
SN74LSXXN Plastic  
SN74LSXXD SOIC

## GUARANTEED OPERATING RANGES

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

# 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	$V_{CC} = \text{MIN}, I_{OH} = -400\text{ }\mu\text{A}, V_{IN} = V_{IL}$	
		74	2.7	3.4	V		
$V_{OL}$	Output LOW Voltage	54, 74		0.25	0.4	V	$V_{CC} = \text{MIN}, I_{OL} = 4.0\text{ mA}, V_{IN} = 2.0\text{ V}$
		74		0.35	0.5	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	$\mu\text{A}$	$V_{CC} = \text{MAX}, V_{IN} = 2.7\text{ V}$	
				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					$V_{CC} = \text{MAX}$	
	Total, Output HIGH	LS13	2.9	6.0	mA		
		LS14	8.6	16			
	Total, Output LOW	LS13	4.1	7.0	mA		
	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	

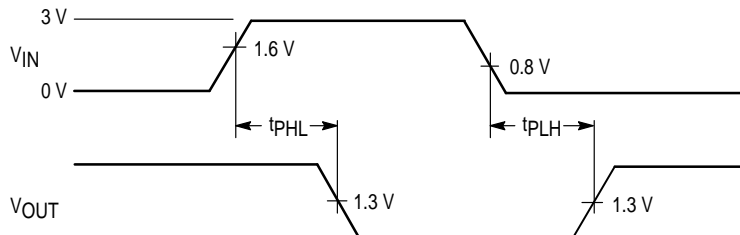


Figure 1. AC Waveforms

SN54/74LS13 • SN54/74LS14

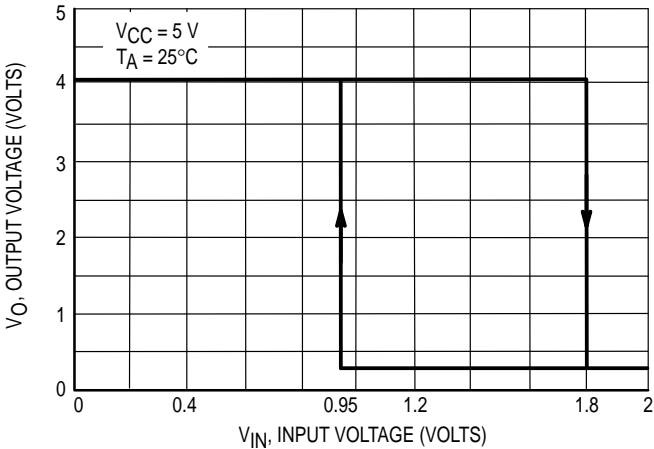


Figure 2.  $V_{IN}$  versus  $V_{OUT}$  Transfer Function

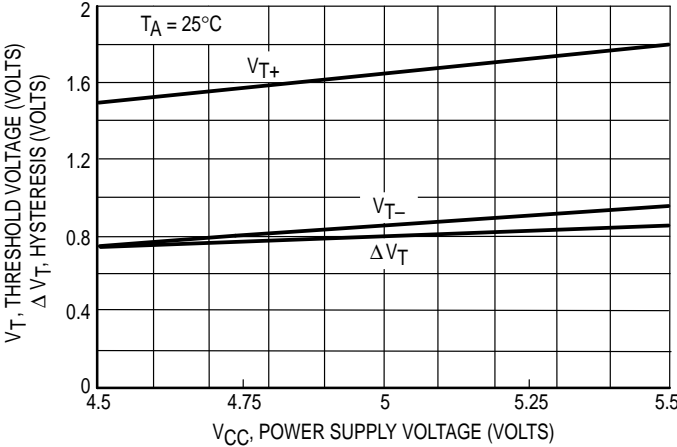


Figure 3. Threshold Voltage and Hysteresis versus Power Supply Voltage

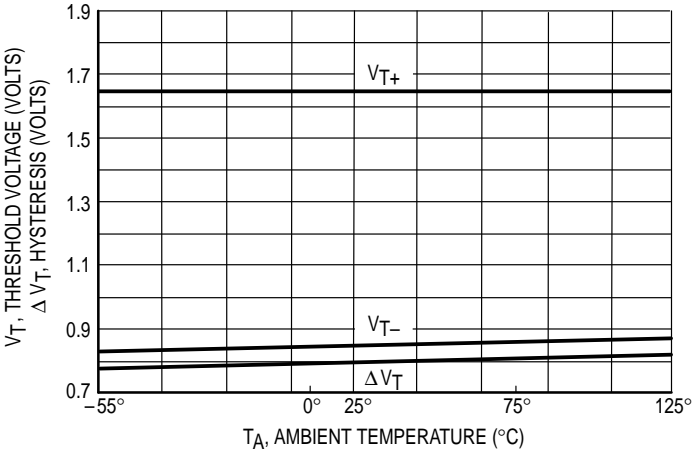


Figure 4. Threshold Voltage Hysteresis versus Temperature