MOTOROLA

SCHMITT TRIGGERS
DUAL GATE/HEX INVERTER

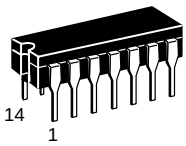
SN54/74LS13
SN54/74LS14

SCHMITT TRIGGERS
DUAL GATE/HEX INVERTER

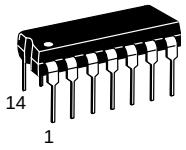
LOW POWER SCHOTTKY

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.

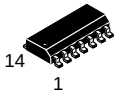
Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going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



J SUFFIX
CERAMIC
CASE 632-08



N SUFFIX
PLASTIC
CASE 646-06



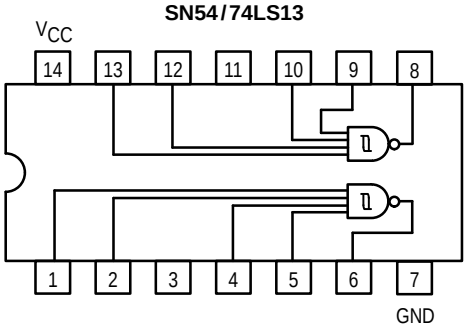
D SUFFIX
SOIC
CASE 751A-02

ORDERING INFORMATION

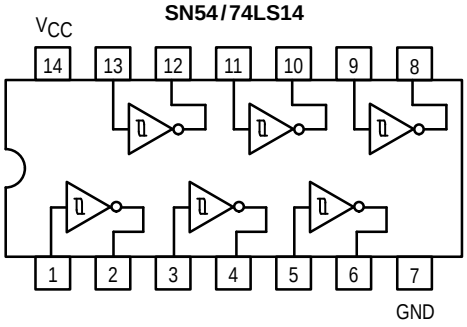
SN54LSXXJ	Ceramic
SN74LSXXN	Plastic
SN74LSXXD	SOIC

LOGIC AND CONNECTION DIAGRAMS

SN54/74LS13



SN54/74LS14



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

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits Min	Limits Typ	Limits Max	Unit	Test Conditions
V_{T+}	Positive-Going Threshold Voltage		1.5		2.0	V	V_{CC} = 5.0 V
V_{T-}	Negative-Going Threshold Voltage		0.6		1.1	V	V_{CC} = 5.0 V
$V_{T+}-V_{T-}$	Hysteresis		0.4	0.8		V	V_{CC} = 5.0 V
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54	2.5	3.4		V	V_{CC} = MIN, I_{OH} = −400 μA, V_{IN} = V_{IL}
		74	2.7	3.4		V	
V_{OL}	Output LOW Voltage	54, 74		0.25	0.4	V	V_{CC} = MIN, I_{OL} = 4.0 mA, V_{IN} = 2.0 V
		74		0.35	0.5	V	V_{CC} = MIN, I_{OL} = 8.0 mA, V_{IN} = 2.0 V
I_{T+}	Input Current at Positive-Going Threshold			−0.14		mA	V_{CC} = 5.0 V, V_{IN} = V_{T+}
I_{T-}	Input Current at Negative-Going Threshold			−0.18		mA	V_{CC} = 5.0 V, V_{IN} = V_{T-}
I_{IH}	Input HIGH Current			1.0	20	μA	V_{CC} = MAX, V_{IN} = 2.7 V
					0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V
I_{IL}	Input LOW Current				−0.4	mA	V_{CC} = MAX, V_{IN} = 0.4 V
I_{OS}	Short Circuit Current (Note 1)		−20		−100	mA	V_{CC} = MAX, V_{OUT} = 0 V
I_{CC}	Power Supply Current Total, Output HIGH	LS13		2.9	6.0	mA	V_{CC} = MAX
		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°C)

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

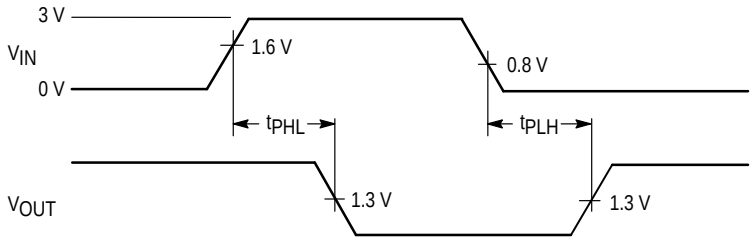


Figure 1. AC Waveforms

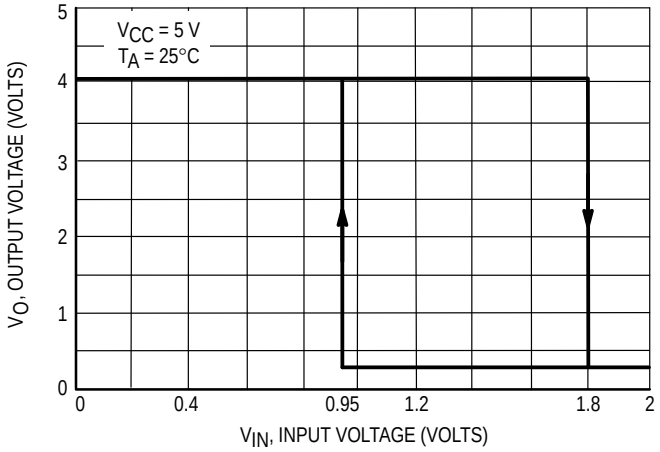


Figure 2. V_{IN} versus V_{OUT} Transfer Function

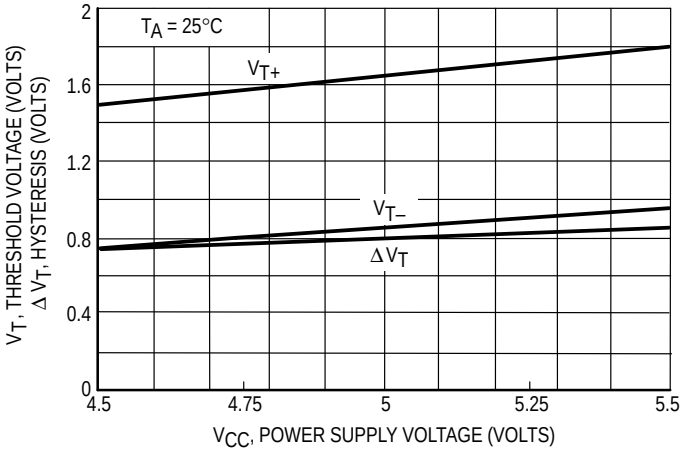


Figure 3. Threshold Voltage and Hysteresis versus Power Supply Voltage

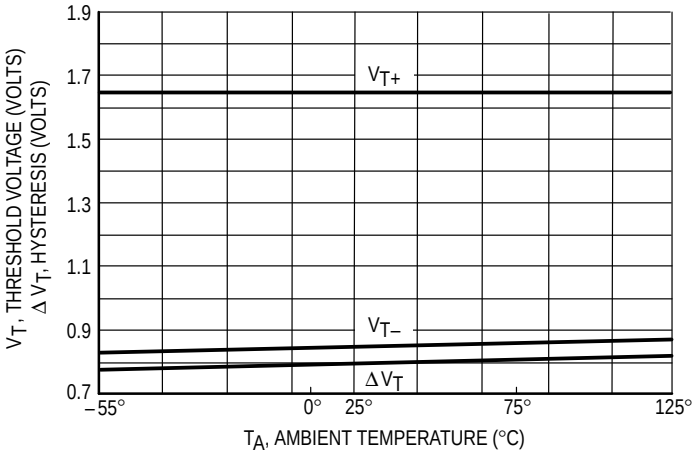


Figure 4. Threshold Voltage Hysteresis versus Temperature