National Semiconductor

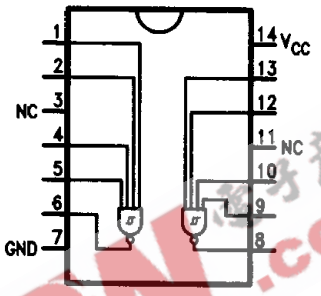
54LS13/DM74LS13
Dual 4-Input Schmitt Trigger

General Description

This device contains two independent gates each of which perform the logic NAND function. Each input has hysteresis which increases the noise immunity and transforms a slowly changing input signal to a fast changing jitter free output.

Connection Diagram

Dual-In-Line Package



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Order Number 54LS13DMQB, 54LS13FMQB, 54LS13LMQB, DM74LS13M or DM74LS13N
See NS Package Number E20A, J14A, M14A, N14A or W14B

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter	54LS13			DM74LS13			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.7			0.8	V
I_{OH}	High Level Output Current			−0.4			−0.4	mA
I_{OL}	Low Level Output Current			4			8	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max	54LS	2.5			V
			DM74	2.7			
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IH} = Min	54LS			0.4	V
			DM74			0.5	
		I_{OL} = 4 mA, V_{CC} = Min	DM74			0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 10V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−0.4	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	54LS	−20		−100	mA
			DM74	−20		−100	
I_{CCH}	Supply Current with Outputs High	V_{CC} = Max, V_{IN} = GND				6.0	mA
I_{CCL}	Supply Current with Outputs Low	V_{CC} = Max, V_{IN} = OPEN				7.0	mA
V_{T+}	Positive-Going Threshold Voltage	V_{CC} = +5.0V		1.5		2.0	V
V_{T-}	Negative-Going Threshold Voltage	V_{CC} = +5.0V		0.6		1.1	V
$V_{T+} - V_{T-}$	Hysteresis Voltage	V_{CC} = +5.0V		0.4			V
I_{T+}	Input Current at Positive-Going Threshold	V_{CC} = +5.0V, V_{IN} = V_{T+}		−0.14*			mA
I_{T-}	Input Current at Negative-Going Threshold	V_{CC} = +5.0V, V_{IN} = V_{T-}		−0.18*			mA

*Typical Value

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics

V_{CC} = +5.0V, T_A = +25°C (See Section 1 for test waveforms and output load)

Symbol	Parameter	R_L = 2 kΩ, C_L = 15 pF				Units
		54LS		DM74		
		Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output		22		25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		27		30	ns