National Semiconductor

PRELIMINARY
January 1988

MM54HC132/MM74HC132 Quad 2-Input NAND Schmitt Trigger

General Description

The MM54HC132/MM74HC132 utilizes advanced silicon-gate CMOS technology to achieve the low power dissipation and high noise immunity of standard CMOS, as well as the capability to drive 10 LS-TTL loads.

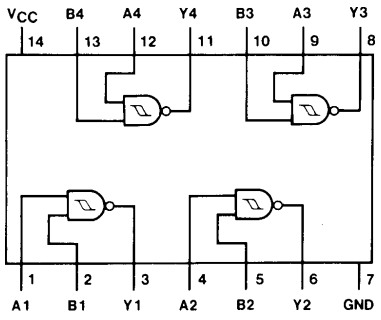
The 54HC/74HC logic family is functionally and pinout compatible with the standard 54LS/74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

Features

- Typical propagation delay: 12 ns
- Wide power supply range: 2V–6V
- Low quiescent current: 20 μA maximum (74HC Series)
- Low input current: 1 μA maximum
- Fanout of 10 LS-TTL loads
- Typical hysteresis voltage: 0.9V at $V_{CC}=4.5V$

Connection and Logic Diagrams

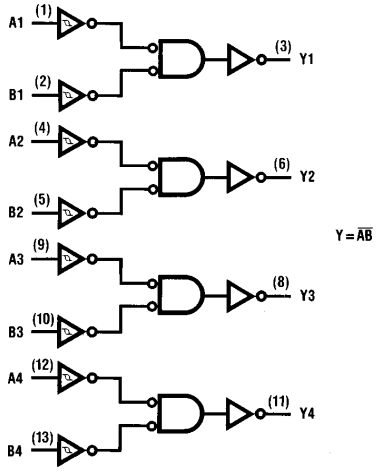
Dual-In-Line Package



TL/F/5309–1

Top View

Order Number MM54HC132 or MM74HC132



TL/F/5309–2

  RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Notes 1 & 2)

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

Supply Voltage (V_{CC})	−0.5 to +7.0V
DC Input Voltage (V_{IN})	−1.5 to V_{CC} +1.5V
DC Output Voltage (V_{OUT})	−0.5 to V_{CC} +0.5V
Clamp Diode Current (I_{IK}, I_{OK})	±20 mA
DC Output Current, per pin (I_{OUT})	±25 mA
DC V_{CC} or GND Current, per pin (I_{CC})	±50 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C
Power Dissipation (P_D)	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature (T_L)	
(Soldering 10 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	2	6	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temp. Range (T_A)			
MM74HC	−40	+85	°C
MM54HC	−55	+125	°C

DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions		V_{CC}	T_A = 25°C	74HC T_A = −40 to 85°C	54HC T_A = −55 to 125°C	Units
					Typ	Guaranteed Limits		
V_{T+}	Positive Going Threshold Voltage		Min	2.0V		1.0	1.0	V
				4.5V		2.0	2.0	V
				6.0V		3.0	3.0	V
			Max	2.0V		1.5	1.5	V
				4.5V		3.15	3.15	V
				6.0V		4.2	4.2	V
V_{T-}	Negative Going Threshold Voltage		Min	2.0V		0.3	0.3	V
				4.5V		0.9	0.9	V
				6.0V		1.2	1.2	V
			Max	2.0V		1.0	1.0	V
				4.5V		2.2	2.2	V
				6.0V		3.0	3.0	V
V_H	Hysteresis Voltage		Min	2.0V		0.2	0.2	V
				4.5V		0.4	0.4	V
				6.0V		0.5	0.5	V
			Max	2.0V		1.0	1.0	V
				4.5V		1.4	1.4	V
				6.0V		1.5	1.5	V
V_{OH}	Minimum High Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 20\ \mu A$		2.0V	2.0	1.9	1.9	V
				4.5V	4.5	4.4	4.4	V
				6.0V	6.0	5.9	5.9	V
		V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 4.0$ mA		4.5V	4.2	3.98	3.84	V
		$\|I_{OUT}\| \leq 5.2$ mA		6.0V	5.7	5.48	5.34	V
V_{OL}	Maximum Low Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 20\ \mu A$		2.0V	0	0.1	0.1	V
				4.5V	0	0.1	0.1	V
				6.0V	0	0.1	0.1	V
		V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 4.0$ mA		4.5V	0.2	0.26	0.33	V
		$\|I_{OUT}\| \leq 5.2$ mA		6.0V	0.2	0.26	0.33	V
I_{IN}	Maximum Input Current	V_{IN} = V_{CC} or GND		6.0V		±0.1	±1.0	±1.0	μA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND I_{OUT} = 0 μA		6.0V		2.0	20	40	μA

Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

Note 2: Unless otherwise specified all voltages are referenced to ground.

Note 3: Power Dissipation temperature derating — plastic "N" package: −12 mW/°C from 65°C to 85°C; ceramic "J" package: −12 mW/°C from 100°C to 125°C.

Note 4: For a power supply of 5V ±10% the worst case output voltages (V_{OH}, and V_{OL}) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at V_{CC} = 5.5V and 4.5V respectively. (The V_{IH} value at 5.5V is 3.85V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0V values should be used.

AC Electrical Characteristics $V_{CC} = 5V$, $T_A = 25°C$, $C_L = 15$ pF, $t_r = t_f = 6$ ns

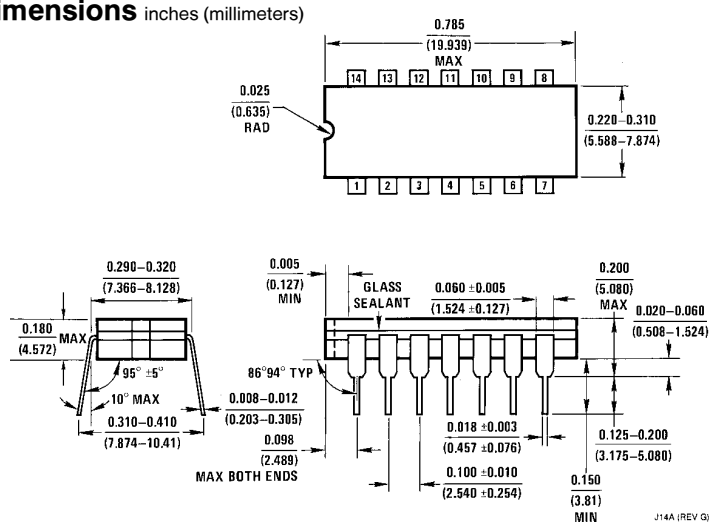
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay		12	20	ns

AC Electrical Characteristics $V_{CC} = 2.0V$ to $6.0V$, $C_L = 50$ pF, $t_r = t_f = 6$ ns (unless otherwise specified)

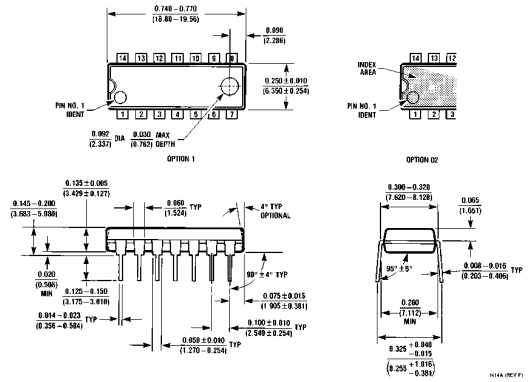
Symbol	Parameter	Conditions	V_{CC}	$T_A = 25°C$	74HC $T_A = -40$ to $85°C$	54HC $T_A = -55$ to $125°C$	Units
				Typ	Guaranteed Limits		
t_{PHL}, t_{PLH}	Maximum Propagation Delay		2.0V	63	125	158	186	ns
			4.5V	13	25	32	37	ns
			6.0V	11	21	27	32	ns
t_{TLH}, t_{THL}	Maximum Output Rise and Fall Time		2.0V	30	75	95	110	ns
			4.5V	8	15	19	22	ns
			6.0V	7	13	16	19	ns
C_{PD}	Power Dissipation Capacitance (Note 5)	(per gate)		130				pF
C_{IN}	Maximum Input Capacitance				5	10	10	pF

Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Physical Dimensions inches (millimeters)



Dual-In-Line Package (J)
Order Number MM54HC132J or MM74HC132J
NS Package J14A



Dual-In-Line Package (N)
Order Number MM74HC132N
NS Package N14A

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National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408