2-Input NAND Schmitt Trigger

L74VHC1G132

The L74VHC1G132 is a single gate CMOS Schmitt NAND trigger fabricated with silicon gate CMOS technology.It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

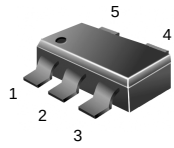
The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output.

The L74VHC1G132 input structure provides protection when voltages up to 7.0 V are applied, regardless of the supply voltage. This allows the L74VHC1G132 to be used to interface 5.0 V circuits to 3.0 V circuits.

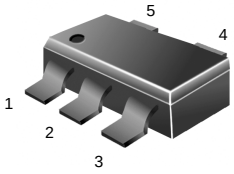
The L74VHC1G132 can be used to enhance noise immunity or to square up slowly changing waveforms.

Features

- High Speed: t_{PD} = 3.6 ns (Typ) at V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 1.0 μA (Max) at T_A = 25°C
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 68; Equivalent Gates = 16
- Pb−Free Packages are Available

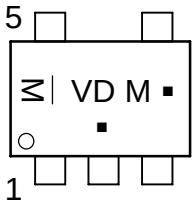


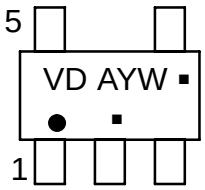
SC−88A/SOT−353/SC−70
DF SUFFIX



TSOP−5/SOT−23/SC−59
DT SUFFIX

MARKING DIAGRAMS





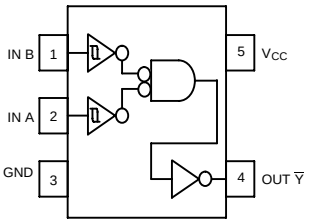


Figure 1. Pinout (Top View)

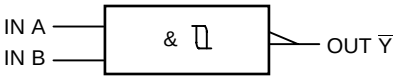


Figure 2. Logic Symbol

PIN ASSIGNMENT	
1	IN B
2	IN A
3	GND
4	OUT $\overline{Y}$
5	V_{CC}

FUNCTION TABLE

Inputs		Output
A	**B**	**$\overline{Y}$**
L	L	H
L	H	H
H	L	H
H	H	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_{IN}	DC Input Voltage		−0.5 to +7.0	V
V_{OUT}	DC Output Voltage		−0.5 to V_{CC} +0.5	V
I_{IK}	DC Input Diode Current		−20	mA
I_{OK}	DC Output Diode Current		±20	mA
I_{OUT}	DC Output Sink Current		±12.5	mA
I_{CC}	DC Supply Current per Supply Pin		±25	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance	SC70−5/SC−88A (Note 1) TSOP−5	350 230	°C/W
P_D	Power Dissipation in Still Air at 85°C	SC70−5/SC−88A TSOP−5	150 200	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	>2000 >200 N/A	V
$I_{LATCHUP}$	Latchup Performance	Above V_{CC} and Below GND at 125°C (Note 5)	±500	mA

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2−ounce copper trace with no air flow.
2. Tested to EIA/JESD22−A114−A.
3. Tested to EIA/JESD22−A115−A.
4. Tested to JESD22−C101−A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		2.0	5.5	V
V_{IN}	DC Input Voltage		0.0	5.5	V
V_{OUT}	DC Output Voltage		0.0	V_{CC}	V
T_A	Operating Temperature Range		−55	+125	°C
t_r , t_f	Input Rise and Fall Time	V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 V	− −	No Limit No Limit	ns/V

Device Junction Temperature versus Time to 0.1% Bond Failures

Junction Temperature °C	Time, Hours	Time, Years
80	1,032,200	117.8
90	419,300	47.9
100	178,700	20.4
110	79,600	9.4
120	37,000	4.2
130	17,800	2.0
140	8,900	1.0

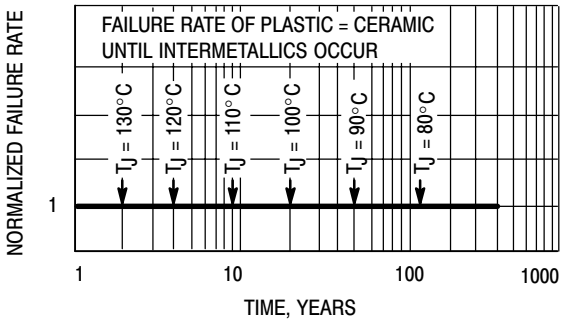


Figure 3. Failure Rate vs. Time Junction Temperature

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = 25°C			$T_A \le 85°C$		$-55 \le T_A \le 125°C$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{T+}	Positive Threshold Voltage		3.0 4.5 5.5	1.50 2.35 2.80	1.88 2.66 3.21	2.25 3.10 3.70	1.50 2.35 2.80	2.25 3.10 3.70	1.50 2.35 2.80	2.25 3.10 3.70	V
V_{T-}	Negative Threshold Voltage		3.0 4.5 5.5	0.65 1.10 1.45	1.03 1.62 2.02	1.40 2.10 2.60	0.65 1.10 1.45	1.40 2.10 2.60	0.65 1.10 1.45	1.40 2.10 2.60	V
V_H	Hysteresis Voltage		3.0 4.5 5.5	0.30 0.40 0.50	0.85 1.05 1.20	1.60 2.00 2.25	0.30 0.40 0.50	1.60 2.00 2.25	0.30 0.40 0.50	1.60 2.00 2.25	V
V_{OH}	Minimum High−Level Output Voltage I_{OH} = −50μA	V_{IN} = V_{CC} or GND	2.0	1.9	2.0		1.9		1.9		V
		V_{IN} = V_{IH} or V_{IL} I_{OH} = −50 μA	3.0 4.5	2.9 4.4	3.0 4.5		2.9 4.4		2.9 4.5		
		I_{OH} = −4 mA I_{OH} = −8 mA	3.0 4.5	2.58 3.94			2.48 3.80		2.34 3.66		V
V_{OL}	Maximum Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OL} = 50 μA	2.0 3.0 4.5		0.0 0.0 0.0	0.1 0.1 0.1		0.1 0.1 0.1		0.1 0.1 0.1	V
		I_{OL} = 4 mA I_{OL} = 8 mA	3.0 4.5			0.36 0.36		0.44 0.44		0.52 0.52	V
I_{IN}	Maximum Input Leakage Current	V_{IN} = 5.5 V or GND	0 to 5.5			±0.1		±1.0		±1.0	μA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND	5.5			1.0		20		40	μA

AC ELECTRICAL CHARACTERISTICS C_{load} = 50 pF, Input t_r/t_f = 3.0 ns

Symbol	Parameter	Test Conditions		T_A = 25°C			$T_A \le 85°C$		$-55 \le T_A \le 125°C$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, A or B to $\overline{Y}$	V_{CC} = 3.3 ± 0.3 V	C_L = 15 pF C_L = 50 pF		4.6 6.1	11.9 15.4	1.0 1.0	14.0 17.5	1.0 1.0	16.1 19.6	ns
		V_{CC} = 5.0 ± 0.5 V	C_L = 15 pF C_L = 50 pF		3.6 4.3	7.7 9.7	1.0 1.0	9.0 11.0	1.0 1.0	10.3 12.3	
C_{IN}	Maximum Input Capacitance				5.5	10		10		10	pF

		Typical @ 25°C, V_{CC} = 5.0 V	
C_{PD}	Power Dissipation Capacitance (Note 6)	11	pF

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

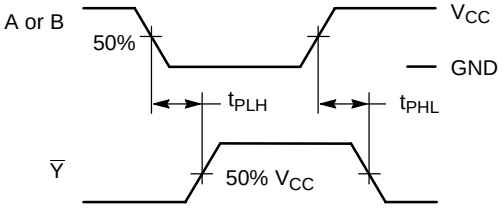
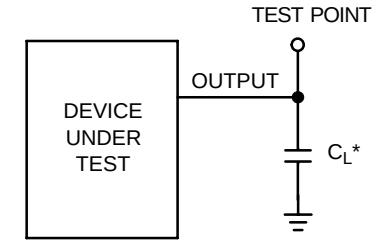


Figure 4. Switching Waveforms



*Includes all probe and jig capacitance

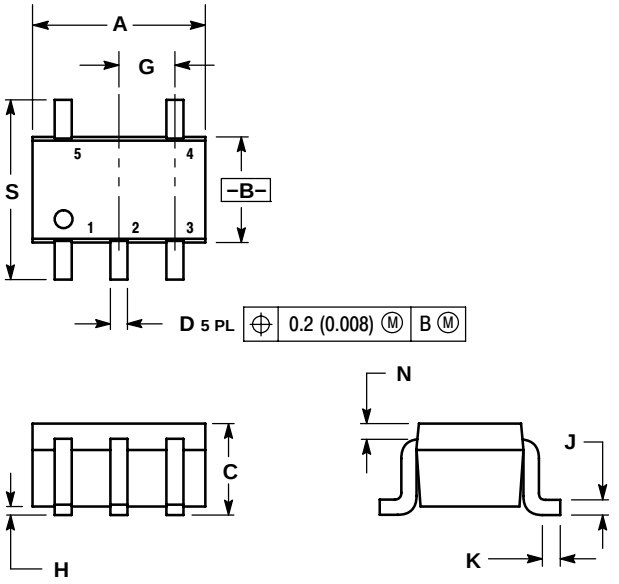
Figure 5. Test Circuit

DEVICE ORDERING INFORMATION

Device Nomenclature								
Device Order Number	**Logic Circuit Indicator**	**Temp Range Identifier**	**Technology**	**Device Function**	**Package Suffix**	**Tape and Reel Suffix**	**Package Type** (Name/SOT#/ Common Name)	**Tape and Reel Size**
L74VHC1G132DFT1	L	74	VHC1G	132	DF	T1	SC–70/SC–88A/ SOT–353	178 mm (7 in) 3000 Unit
L74VHC1G132DFT2	L	74	VHC1G	132	DF	T2	SC–70/SC–88A/ SOT–353	178 mm (7 in) 3000 Unit
L74VHC1G132DFT4	L	74	VHC1G	132	DF	T4	SC–70/SC–88A/ SOT–353	330 mm (13 in) 10,000 Unit
L74VHC1G132DTT1	L	74	VHC1G	132	DT	T1	SOT–23/TSOPS/ SC–59	178 mm (7 in) 3000 Unit
L74VHC1G132DTT3	L	74	VHC1G	132	DT	T3	SOT–23/TSOPS/ SC–59	330 mm (13 in) 10,000 Unit

PACKAGE DIMENSIONS

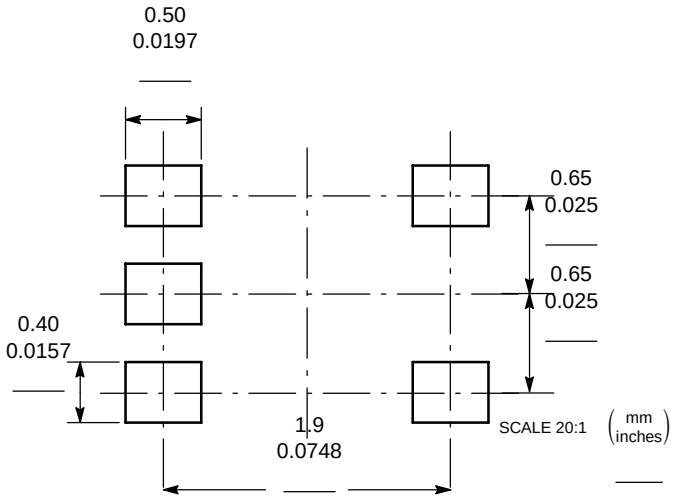
SC−88A / SOT−353 / SC70



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

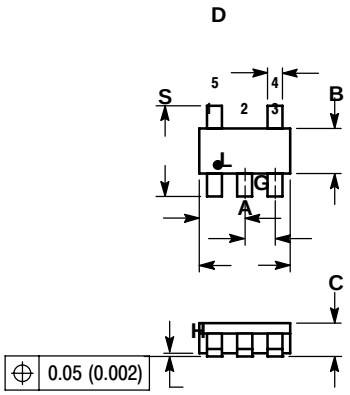
SOLDERING FOOTPRINT*



L74VHC1G132

PACKAGE DIMENSIONS

TSOP−5 / SOT23−5 / SC59−5
DT SUFFIX



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. A AND B DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0 °	10 °	0 °	10 °
S	2.50	3.00	0.0985	0.1181

SOLDERING FOOTPRINT*