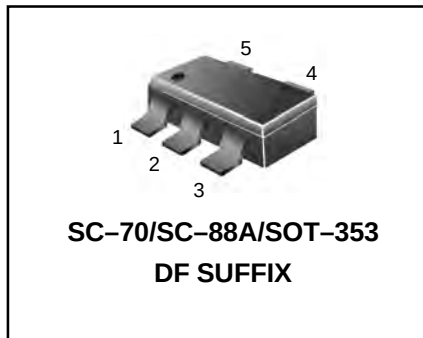


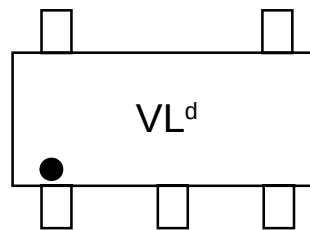
Noninverting Buffer / CMOS Logic Level Shifter

FC74VHC1G50 is a single gate noninverting buffer 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 FC74VHC1G50 input structure provides protection when voltages up to 7 V are applied, regardless of the supply voltage. This allows the 74VHC1G50 to be used to interface 5 V circuits to 3 V circuits.

- High Speed: $t_{PD} = 3.5 \text{ ns}$ (Typ) at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 2 \text{ uA}$ (Max) at $T_A = 25^\circ\text{C}$
- TTL-Compatible Inputs: $V_{IL} = 0.8 \text{ V}$; $V_{IH} = 2.0 \text{ V}$
- CMOS-Compatible Outputs: $V_{OH} > 0.8 V_{CC}$; $V_{OL} < 0.1 V_{CC}$ @Load
- Power Down Protection Provided on Inputs and Outputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 104; Equivalent Gates = 26



MARKING DIAGRAMS



Pin 1
d = Date Code

PIN ASSIGNMENT	
1	NC
2	IN A
3	GND
4	OUT Y
5	V_{CC}

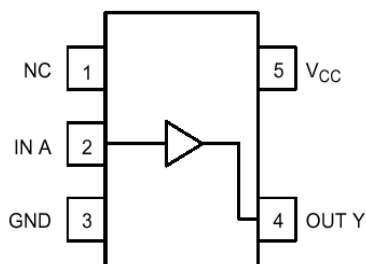


Figure 1. Pinout (Top View)

FUNCTION TABLE

Inputs	Output
A	Y
L	L
H	H

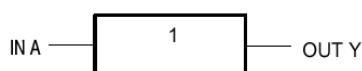


Figure 2. Logic Symbol



FC74VHC1G50

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	V _{CC} =0 High or Low State	− 0.5 to +7.0 −0.5 to V _{CC} + 0.5	V
I _{IK}	Input Diode Current	−20	mA	
I _{OK}	Output Diode Current	V _{OUT} < GND; V _{OUT} > V _{CC}	+20	mA
I _{OUT}	DC Output Current, per Pin	+ 25	mA	
I _{CC}	DC Supply Current, V _{CC} and GND	+50	mA	
P _D	Power dissipation in still air	200	mW	
θ _{JA}	Thermal resistance	333	°C/W	
T _L	Lead Temperature, 1 mm from Case for 10 s	260	°C	
T _J	Junction Temperature Under Bias	+ 150	°C	
T _{stg}	Storage temperature	−65 to +150	°C	
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 _{LATCH-UP}	Latch-Up Performance	Above V _{CC} and Below GND at 125°C (Note 5)	± 500	mA

1. Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.
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	3.0	5.5	V
V_{IN}	DC Input Voltage	0.0	5.5	V
V_{OUT}	DC Output Voltage	$V_{CC} = 0$ 0.0 High Low State 0.0	5.5 V_{CC}	V
T_A	Operating Temperature Range	- 55	+ 125	°C
t_r, t_f	Input Rise and Fall Time	$V_{CC} = 3.3 \pm 0.3$ V 0 $V_{CC} = 5.0 \pm 0.5$ V 0	100 20	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

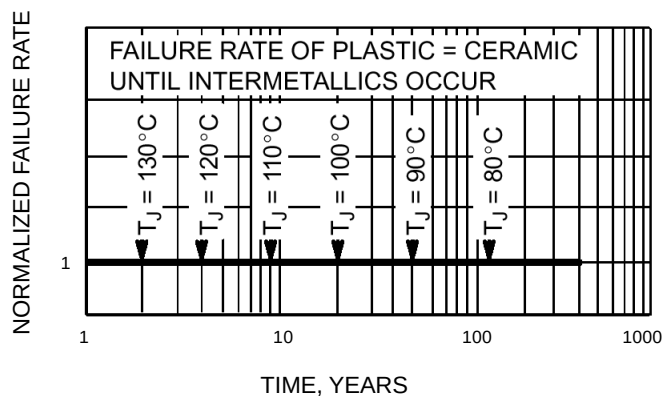


Figure 3. Failure Rate vs. Time Junction Temperature

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25°C			T _A ≤ 85°C		-55°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	Minimum High-Level Input Voltage		2.0	1.5			1.5		1.5		V
			3.0	2.1			2.1		2.1		
			4.5	3.15			3.15		3.15		
			5.5	3.85			3.85		3.85		
V _L	Maximum Low-Level Input Voltage		2.0			0.5		0.5		0.5	V
			3.0			0.9		0.9		0.9	
			4.5			1.35		1.35		1.35	
			5.5			1.65		1.65		1.65	
V _{OH}	Minimum High-Level Output Voltage V _N = V _{IH} or V _L	V _N = V _H or V _L I _{OH} = -50 μA	3.0	2.9	3.0		2.9		2.9		V
			4.5	4.4	4.5		4.4		4.4		
		V _N = V _H or V _L I _{OH} = -4 mA I _{OH} = -8 mA	3.0	2.58			2.48		2.34		
			4.5	3.94			3.80		3.66		
V _{OL}	Maximum Low-Level Output Voltage V _N = V _{IH} or V _L	V _N = V _H or V _L I _{OL} = 50 μA	3.0		0.0	0.1		0.1		0.1	V
			4.5		0.0	0.1		0.1		0.1	
		V _N = V _H or V _L I _{OL} = 4 mA I _{OL} = 8 mA	3.0			0.36		0.44		0.52	
			4.5			0.36		0.44		0.52	
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			2.0		20		40	μA
I _{CCT}	Quiescent Supply Current	Input: V _{IN} = 3.4 V	5.5			1.35		1.50		1.65	mA
I _{OPD}	Output Leakage Current	V _{OUT} = 5.5 V	0.0			0.5		5.0		10	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 ≤ 85°C		-55°C ≤ T _A ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A to Y	V _{CC} = 3.3 ± 0.3 V C _L = 15 pF		4.5	10.0		11.0		13.0	ns
				6.3	13.5		15.0		17.5	
		V _{CC} = 5.0 ± 0.5 V C _L = 15 pF		3.5	6.7		7.5		8.5	
				4.3	7.7		8.5		9.5	
C _N	Maximum Input Capacitance			5	10		10		10	pF
Typical @ 25°C, V _{CC} = 5.0 V										
C _{PD}	Power Dissipation Capacitance (Note 6)		12						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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

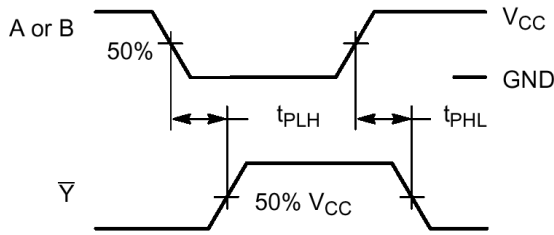
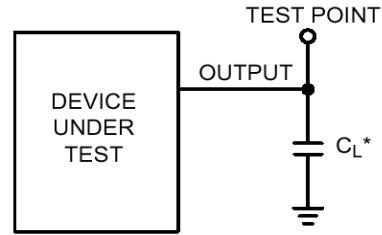


Figure 4. Switching Waveforms

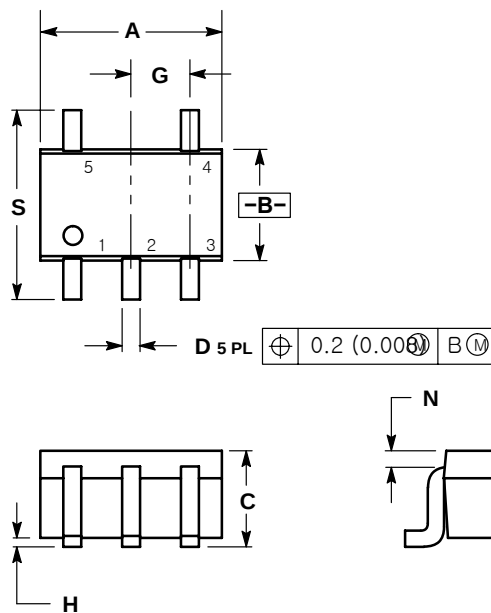


*Includes all probe and jig capacitance

Figure 5. Test Circuit

PACKAGE DIMENSIONS

SC70-5/SC-88A/SOT-353 DF SUFFIX



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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.070	0.087	1.80	2.20
B	0.040	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*

