MC74VHC1G00

Advance Information

2-Input NAND Gate

The MC74VHC1G00 is an advanced high speed CMOS 2–input NAND gate 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 MC74VHC1G00 input structure provides protection when voltages up to 7V are applied, regardless of the supply voltage. This allows the MC74VHC1G00 to be used to interface 5V circuits to 3V circuits.

- High Speed: t_{PD} = 3.7ns (Typ) at V_{CC} = 5V
- Low Power Dissipation: I_{CC} = 2μA (Max) at T_A = 25°C
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; MM > 200V, CDM > 1500V
- Chip Complexity: 8 FETs or 2 Equivalent Gates

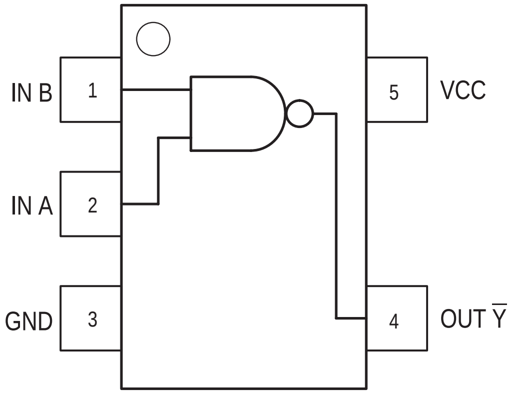

Figure 1. 5–Lead SOT–353 Pinout (Top View)

LOGIC SYMBOL

This document contains information on a new product. Specifications and information herein are subject to change without notice.

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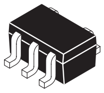
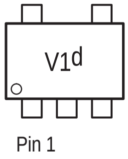


SC–88A / SOT–353
DF SUFFIX
CASE 419A

MARKING DIAGRAM



d = Date Code

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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

FUNCTION TABLE

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

MAXIMUM RATINGS*

Characteristics		Symbol	Value	Unit
DC Supply Voltage		V_{CC}	–0.5 to +7.0	V
DC Input Voltage		V_{IN}	–0.5 to +7.0	V
DC Output Voltage	$V_{CC} = 0$ High or Low State	V_{OUT}	–0.5 to 7.0 –0.5 to V_{CC} + 0.5	V
Input Diode Current		I_{IK}	–20	mA
Output Diode Current	(V_{OUT} < GND; V_{OUT} > V_{CC})	I_{OK}	+20	mA
DC Output Current, per Pin		I_{OUT}	+25	mA
DC Supply Current, V_{CC} and GND		I_{CC}	+50	mA
Power dissipation in still air, SC–88A †		P_D	200	mW
Lead temperature, 1 mm from case for 10 s		T_L	260	°C
Storage temperature		T_{stg}	–65 to +150	°C

* 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.

†Derating — SC–88A Package: –3 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Characteristics		Symbol	Min	Max	Unit
DC Supply Voltage		V_{CC}	2.0	5.5	V
DC Input Voltage		V_{IN}	0.0	5.5	V
DC Output Voltage		V_{OUT}	0.0	V_{CC}	V
Operating Temperature Range		T_A	–55	+85	°C
Input Rise and Fall Time	$V_{CC} = 3.3V \pm 0.3V$ $V_{CC} = 5.0V \pm 0.5V$	t_r , t_f	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	T_A ≤ 85°C Min	T_A ≤ 85°C Max	T_A ≤ 125°C Min	T_A ≤ 125°C Max	Unit
V_{IH}	Minimum High–Level Input Voltage		2.0 3.0 4.5 5.5	1.5 2.1 3.15 3.85			1.5 2.1 3.15 3.85		1.5 2.1 3.15 3.85		V
V_{IL}	Maximum Low–Level Input Voltage		2.0 3.0 4.5 5.5			0.5 0.9 1.35 1.65		0.5 0.9 1.35 1.65		0.5 0.9 1.35 1.65	V
V_{OH}	Minimum High–Level Output Voltage $V_{IN} = V_{IH}$ or V_{IL}	$V_{IN} = V_{IH}$ or V_{IL} I_{OH} = –50µA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 2.9 4.4		1.9 2.9 4.4		V
		$V_{IN} = V_{IH}$ or V_{IL} I_{OH} = –4mA I_{OH} = –8mA	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}	$V_{IN} = V_{IH}$ or V_{IL} I_{OL} = 50µA	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
		$V_{IN} = V_{IH}$ or V_{IL} I_{OL} = 4mA I_{OL} = 8mA	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} = 5.5V 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

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

Symbol	Parameter	Test Conditions	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	T_A ≤ 85°C Min	T_A ≤ 85°C Max	T_A ≤ 125°C Min	T_A ≤ 125°C Max	Unit
t_{PLH}, t_{PHL}	Maximum Propogation Delay, Input A or B to Y	V_{CC} = 3.0 ± 0.3V C_L = 15 pF C_L = 50 pF		5.5 8.0	7.9 11.4		9.5 13.0		11.0 15.5	ns
		V_{CC} = 5.0 ± 0.5V C_L = 15 pF C_L = 50 pF		3.7 5.2	5.5 7.5		6.5 8.5		8.0 10.0	
C_{IN}	Maximum Input Capacitance			4	10		10		10	pF

		Typical @ 25°C, V_{CC} = 5.0V	
C_{PD}	Power Dissipation Capacitance (Note 1.)	18	pF

1. 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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

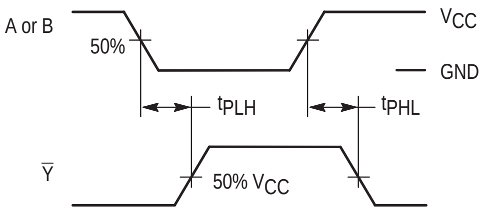
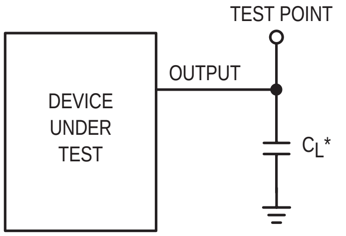


Figure 2. Switching Waveforms



*Includes all probe and jig capacitance

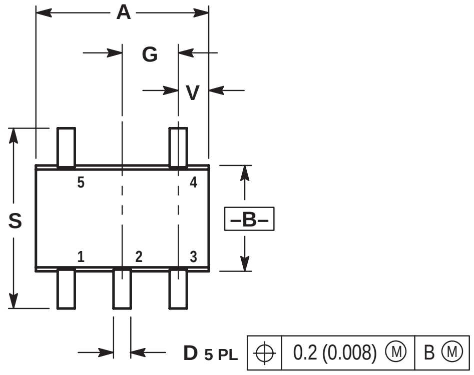
Figure 3. Test Circuit

DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature						Package Type	Tape and Reel Size
	Circuit Indicator	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape & Reel Suffix		
MC74VHC1G00DFT1	MC	74	VHC1G	00	DF	T1	SC–88A / SOT–353	7–Inch/3000 Unit

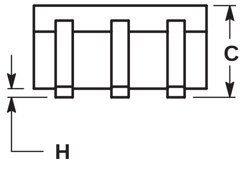
PACKAGE DIMENSIONS

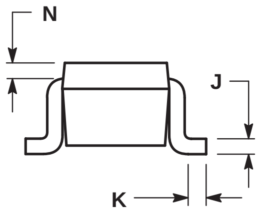
SC–88A / SOT–353
DF SUFFIX
5–LEAD PACKAGE
CASE 419A–01
ISSUE B

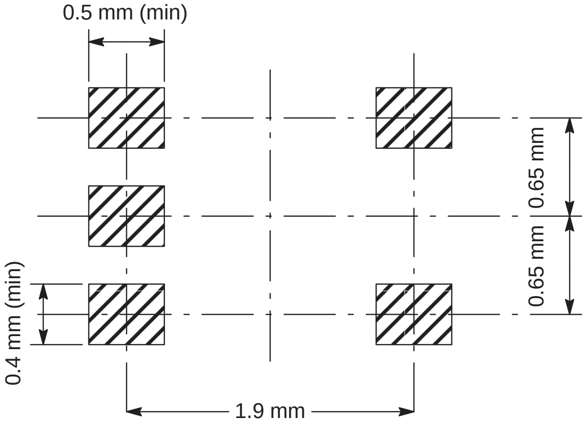


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MM.

DIM	INCHES		MILLIMETERS	
	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
V	0.012	0.016	0.30	0.40







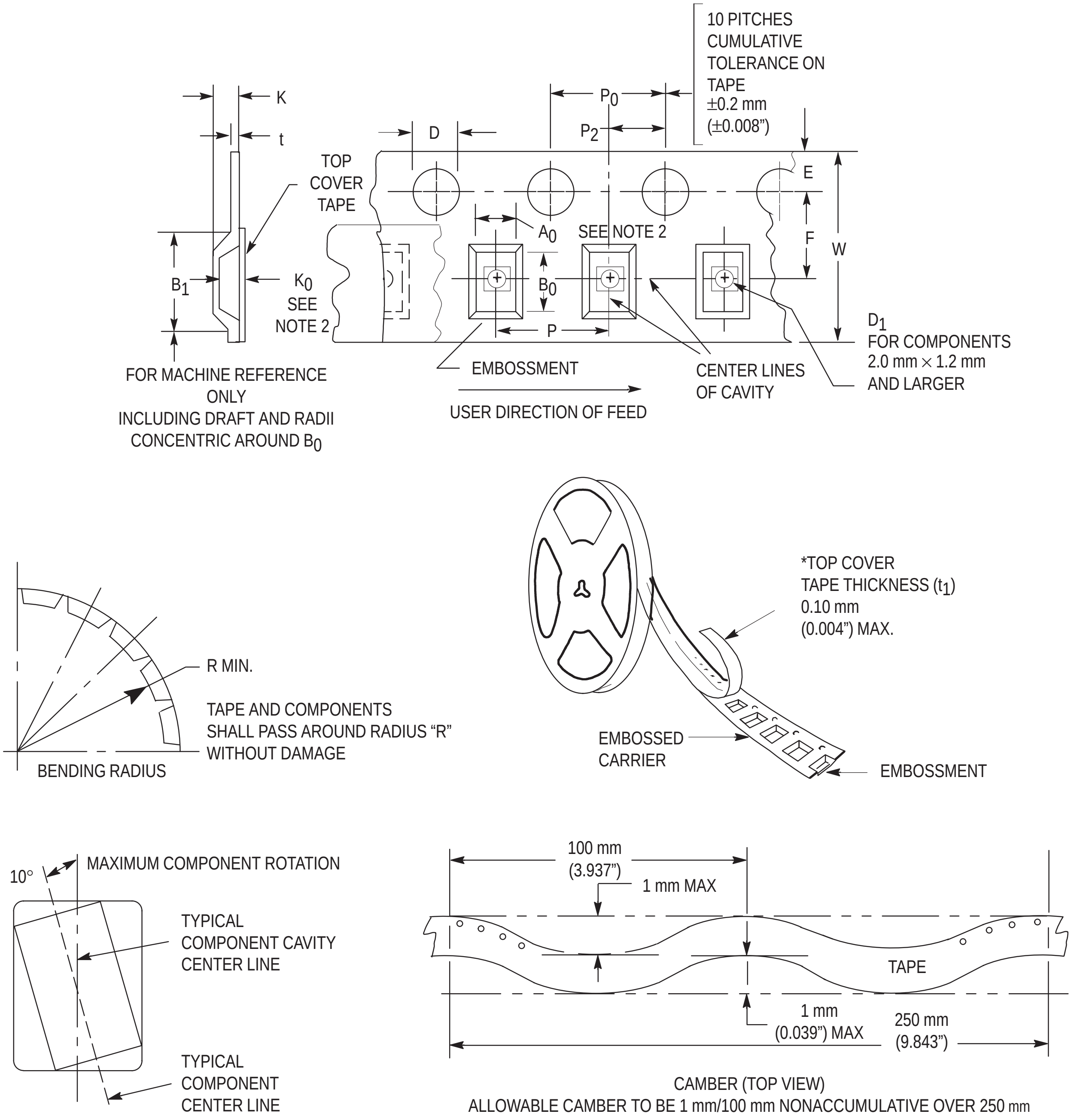


Figure 4. Carrier Tape Specifications

EMBOSSED CARRIER DIMENSIONS (See Notes 1 and 2)

Tape Size	B_1 Max	D	D_1	E	F	K	P	P_0	P_2	R	T	W
8 mm	4.35 mm (0.171")	1.5 +0.1/ –0.0 mm (0.059 +0.004/ –0.0")	1.0 mm Min (0.039")	1.75 ±0.1 mm (0.069 ±0.004")	3.5 ±0.5 mm (1.38 ±0.002")	2.4 mm (0.094")	4.0 ±0.10 mm (0.157 ±0.004")	4.0 ±0.1 mm (0.156 ±0.004")	2.0 ±0.1 mm (0.079 ±0.002")	25 mm (0.98")	0.3 ±0.05 mm (0.01 +0.0038/ –0.0002")	8.0 ±0.3 mm (0.315 ±0.012")

1. Metric Dimensions Govern–English are in parentheses for reference only.
2. A_0, B_0, and K_0 are determined by component size. The clearance between the components and the cavity must be within 0.05 mm min to 0.50 mm max. The component cannot rotate more than 10° within the determined cavity

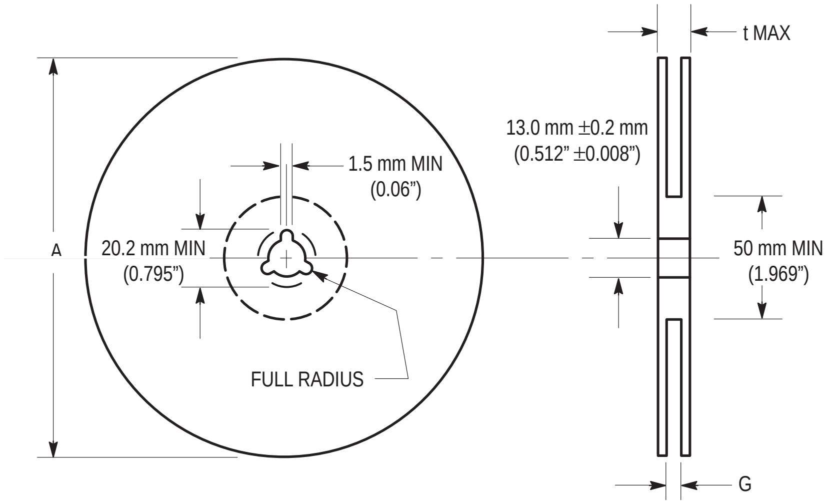


Figure 5. Reel Dimensions

REEL DIMENSIONS

Tape Size	A Max	G	t Max
8 mm	330 mm (13”)	8.400 mm, +1.5 mm, –0.0 (0.33”, +0.059”, –0.00)	14.4 mm (0.56”)

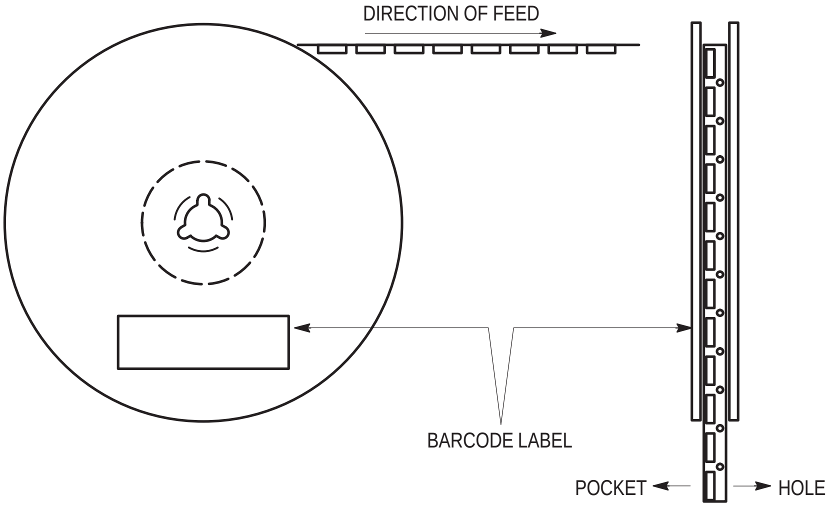


Figure 6. Reel Winding Direction

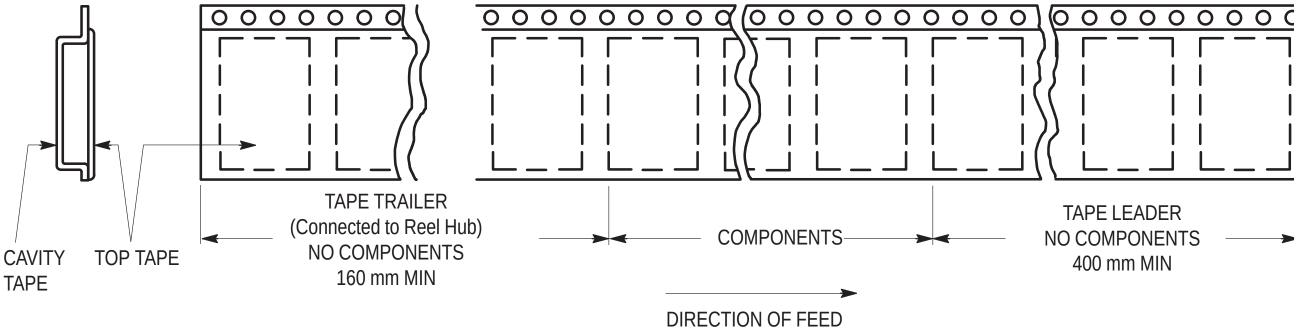


Figure 7. Tape Ends for Finished Goods

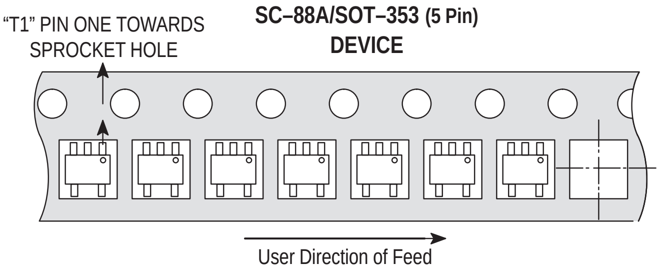


Figure 8. Reel Configuration

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