

MC74VHC1GT66

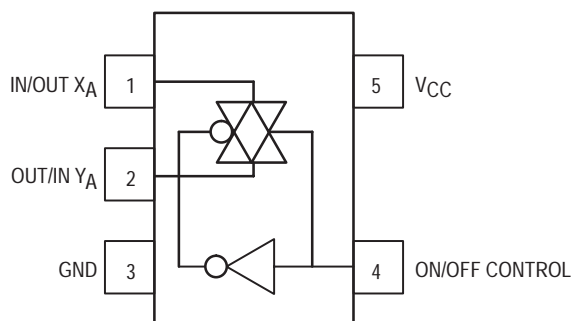
Advance Information Analog Switch

The MC74VHC1GT66 is an advanced high speed CMOS bilateral analog switch fabricated with silicon gate CMOS technology. It achieves high speed propagation delays and low ON resistances while maintaining CMOS low power dissipation. This bilateral switch controls analog and digital voltages that may vary across the full power-supply range (from V_{CC} to GND).

The MC74VHC1GT66 is compatible in function to a single gate of the very High Speed CMOS MC74VHCT4066. The device has been designed so that the ON resistances (R_{ON}) are much lower and more linear over input voltage than R_{ON} of the metal-gate CMOS or High Speed CMOS analog switches.

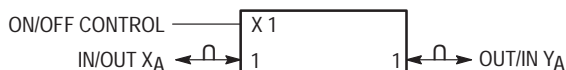
The ON/OFF Control input is compatible with TTL-type input thresholds allowing the device to be used as a logic-level translator from 3.0V CMOS logic to 5.0V CMOS logic or from 1.8V CMOS logic to 3.0V CMOS logic while operating at the high-voltage power supply. The input protection circuitry on this device allows overvoltage tolerance on the input, which provides protection when voltages of up to 7V are applied, regardless of the supply voltage. This allows the MC74VHC1GT66 to be used to interface 5V circuits to 3V circuits.

- Low Power Dissipation: $I_{CC} = 2 \mu A$ (Max) at $T_A = 25^\circ C$
- Diode Protection Provided on Inputs and Outputs
- Improved Linearity and Lower ON Resistance over Input Voltage
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; MM > 200 V, CDM > 1500 V



5-Lead SOT-353 Pinout (Top View)

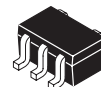
LOGIC SYMBOL



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

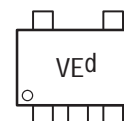


ON Semiconductor
Formerly a Division of Motorola
<http://onsemi.com>



SC-88A / SOT-353
DF SUFFIX
CASE 419A

MARKING DIAGRAM



Pin 1
d = Date Code

PIN ASSIGNMENT

Pin	Function
1	IN/OUT X_A
2	OUT/IN Y_A
3	GND
4	ON/OFF CONTROL
5	V_{CC}

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

FUNCTION TABLE

On/Off Control Input	State of Analog Switch
L	Off
H	On

MC74VHC1GT66

ABSOLUTE MAXIMUM RATINGS

Characteristics	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	-0.5 to +7.0	V
Digital Input Voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
Analog Output Voltage	V_{IS}	-0.5 to $V_{CC} + 0.5$	V
Digital Input Diode Current	I_{IK}	-20	mA
DC Supply Current, V_{CC} and GND	I_{CC}	+25	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

†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}	4.5	5.5	V
Digital Input Voltage	V_{IN}	GND	V_{CC}	V
Analog Input Voltage	V_{IS}	GND	V_{CC}	V
Static or Dynamic Voltage Across Switch	V_{IO}^*		1.2	V
Operating Temperature Range	T_A	-55	+85	°C
Input Rise and Fall Time ON/OFF Control Input	t_r, t_f	0 0	100 20	ns/V
		$V_{CC} = 3.3V \pm 0.3V$		
		$V_{CC} = 5.0V \pm 0.5V$		

* For voltage drops across the switch greater than 1.2V (switch on), excessive V_{CC} current may be drawn; i.e. the current out of the switch may contain both V_{CC} and switch input components. The reliability of the device will be unaffected unless the Maximum Ratings are exceeded.

MC74VHC1GT66

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25°C			T _A ≤ 85°C		T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	Minimum High-Level Input Voltage ON/OFF Control Input	R _{ON} = Per Spec	3.0 4.5 5.5	1.2 2.0 2.0			1.2 2.0 2.0		1.2 2.0 2.0	V	
V _{IL}	Maximum Low-Level Input Voltage ON/OFF Control Input	R _{ON} = Per Spec	3.0 4.5 5.5			0.53 0.8 0.8		0.53 0.8 0.8	0.53 0.8 0.8	V	
I _{IN}	Maximum Input Leakage Current ON/OFF Control Input	V _{IN} = V _{CC} 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 V _{IO} = 0V	5.5			2.0		20	40	μA	
I _{CCT}	Quiescent Supply Current	ON/OFF Control at 3.4V	5.5			1.35		1.5	1.65	mA	
R _{ON}	Maximum "ON" Resistance	V _{IN} = V _{IH} V _{IS} = V _{CC} or GND I _{IS} ≤ 10mA (Figure 1)	3.0 4.5 5.5		30 20 15	50 30 20		70 40 35	100 50 45	Ω	
		Endpoints V _{IN} = V _{IH} V _{IS} = V _{CC} or GND I _{IS} ≤ 10mA (Figure 1)	3.0 4.5 5.5		25 12 8	50 20 15		65 26 23	90 40 32	Ω	
I _{OFF}	Maximum Off-Channel Leakage Current	V _{IN} = V _{IL} V _{IS} = V _{CC} or GND Switch Off (Figure 2)	5.5			0.1		0.5	1.0	μA	
I _{ON}	Maximum On-Channel Leakage Current	V _{IN} = V _{IH} V _{IS} = V _{CC} or GND Switch On (Figure 3)	5.5			0.1		0.5	1.0	μA	

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

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25°C			T _A ≤ 85°C		T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input X to Y	Y _A = Open Figure 4	2.0 3.0 4.5 5.5		1 0 0 0	5 2 1 1		6 3 1 1	7 4 2 1	ns	
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, ON/OFF Control to Analog Output	R _L = 1000 Ω Figure 5	2.0 3.0 4.5 5.5		15 8 6 4	35 15 10 7		46 20 13 9	57 25 17 11	ns	
t _{PZL} , t _{PZH}	Maximum Propagation Delay, ON/OFF Control to Analog Output	R _L = 1000 Ω Figure 5	2.0 3.0 4.5 5.5		15 8 6 4	35 15 10 7		46 20 13 9	57 25 17 11	ns	
C _{IN}	Maximum Input Capacitance	ON/OFF Control Input	0.0		3	10		10	10	pF	
		Control Input = GND	5.0								
		Analog I/O Feedthrough			4 4	10 10		10 10	10 10		

C _{PD}	Power Dissipation Capacitance (Note NO TAG)	Typical @ 25°C, V_{CC} = 5.0V	pF
		18	

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} • 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}.

MC74VHC1GT66

ADDITIONAL APPLICATION CHARACTERISTICS (Voltages Referenced to GND Unless Noted)

Symbol	Parameter	Test Conditions	V _{CC}	Limit 25°C	Unit
BW	Maximum On-Channel Bandwidth or Minimum Frequency Response Figure 7	f _{in} = 1 MHz Sine Wave Adjust f _{in} voltage to obtain 0 dBm at V _{OS} Increase f _{in} = frequency until dB meter reads -3dB R _L = 50Ω, C _L = 10 pF	3.0	150	MHz
			4.5	175	
			5.5	200	
ISO _{off}	Off-Channel Feedthrough Isolation Figure 8	f _{in} = Sine Wave Adjust f _{in} voltage to obtain 0 dBm at V _{IS} f _{in} = 10 kHz, R _L = 600Ω, C _L = 50 pF f _{in} = 1.0 kHz, R _L = 50Ω, C _L = 10 pF	3.0	-50	dB
			4.5	-50	
			5.5	-50	
			3.0	-40	
			4.5	-40	
			5.5	-40	
NOISE _{feed}	Feedthrough Noise Control to Switch Figure 9	V _{in} ≤ 1 MHz Square Wave (t _r = t _f = 2ns) Adjust R _L at setup so that I _S = 0 A R _L = 600Ω, C _L = 50 pF R _L = 50Ω, C _L = 10 pF	3.0	45	mV _{pp}
			4.5	60	
			5.5	130	
			3.0	25	
			4.5	30	
			5.5	60	
THD	Total Harmonic Distortion Figure 10	f _{in} = 1 kHz, R _L = 10kΩ, C _L = 50 pF THD = THD _{Measured} - THD _{Source} V _{IS} = 3.0 V _{pp} sine wave V _{IS} = 4.0 V _{pp} sine wave V _{IS} = 5.0 V _{pp} sine wave	3.3	0.20	%
			4.5	0.10	
			5.5	0.06	

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} • 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}.

MC74VHC1GT66

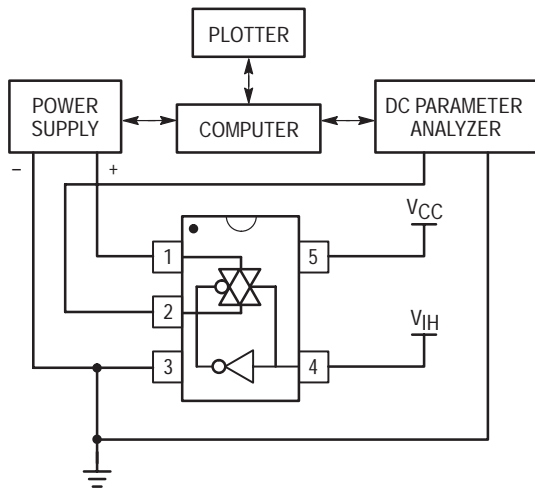


Figure 1. On Resistance Test Set-Up

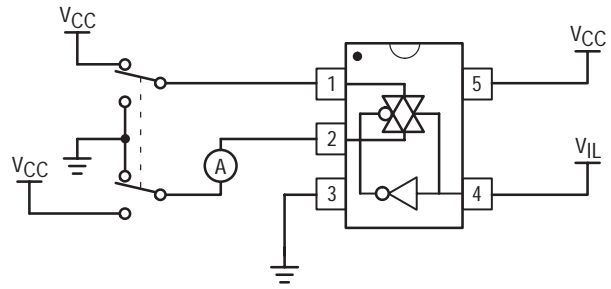


Figure 2. Maximum Off-Channel Leakage Current Test Set-Up

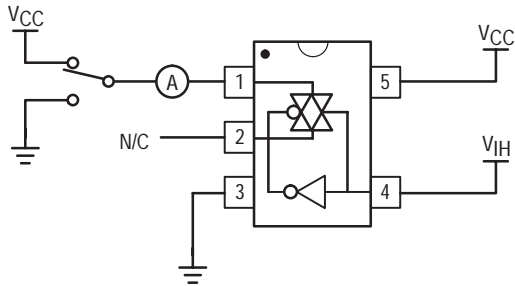


Figure 3. Maximum On-Channel Leakage Current Test Set-Up

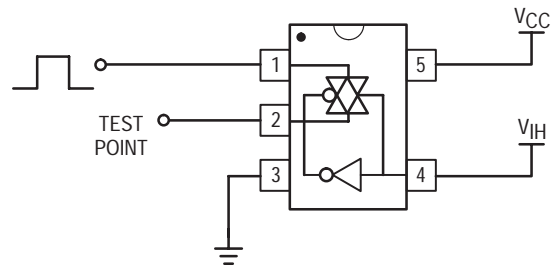


Figure 4. Propagation Delay Test Set-Up

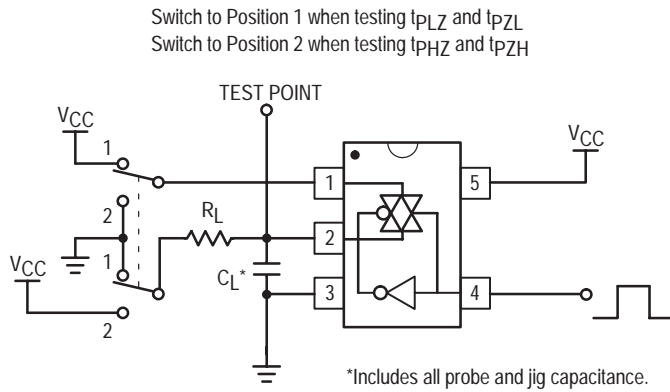


Figure 5. Propagation Delay Output Enable/Disable Test Set-Up

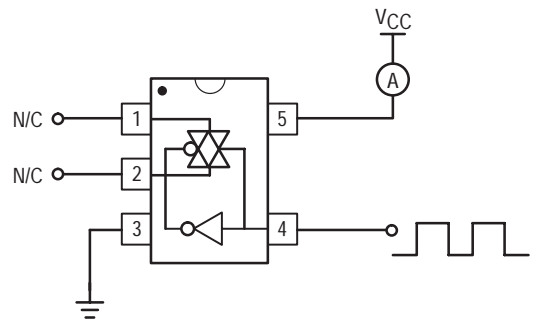


Figure 6. Power Dissipation Capacitance Test Set-Up

MC74VHC1GT66

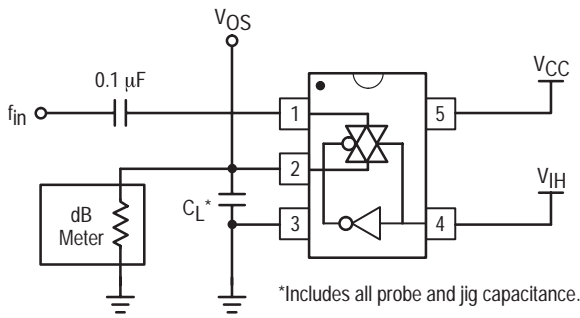


Figure 7. Maximum On-Channel Bandwidth Test Set-Up

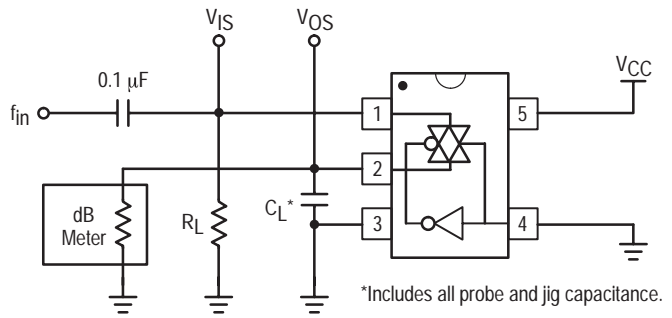


Figure 8. Off-Channel Feedthrough Isolation Test Set-Up

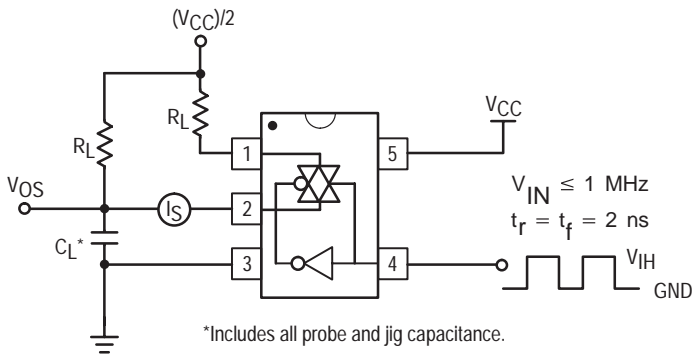


Figure 9. Feedthrough Noise, ON/OFF Control to Analog Out, Test Set-Up

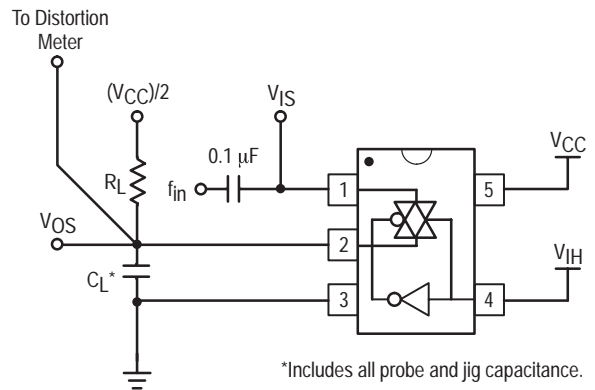


Figure 10. Total Harmonic Distortion Test Set-Up

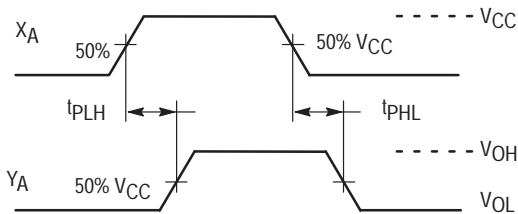


Figure 11. Propagation Delay, Analog In to Analog Out Waveforms

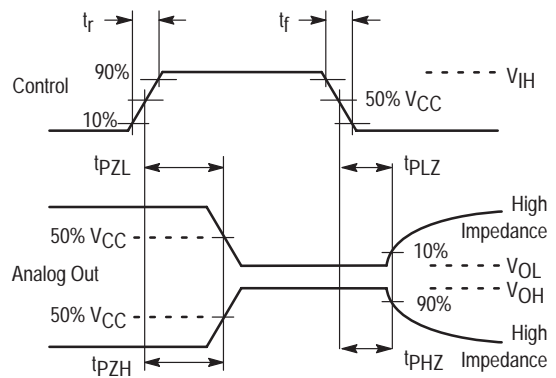


Figure 12. Propagation Delay, ON/OFF Control

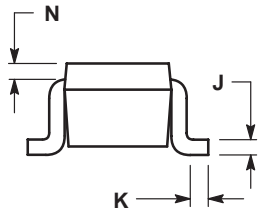
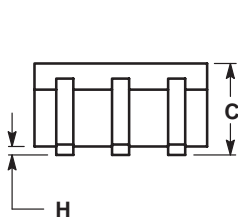
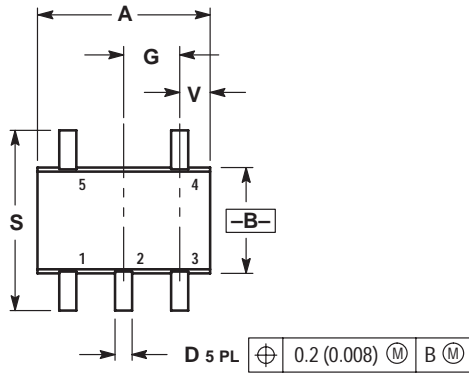
MC74VHC1GT66

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		
MC74VHC1GT66DFT1	MC	74	VHC1G	T66	DF	T1	SC-88A / SOT-353	7-Inch/3000 Unit

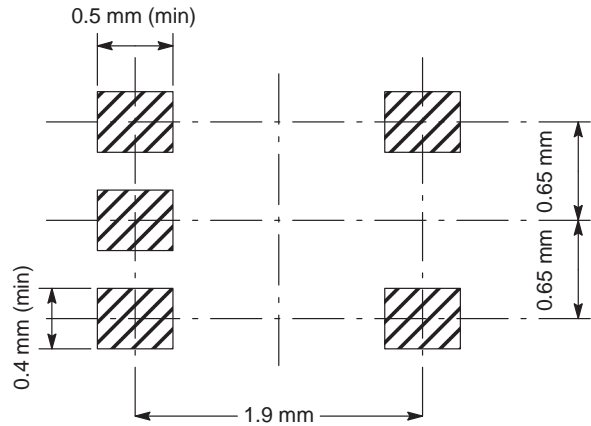
PACKAGE DIMENSIONS

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



MC74VHC1GT66

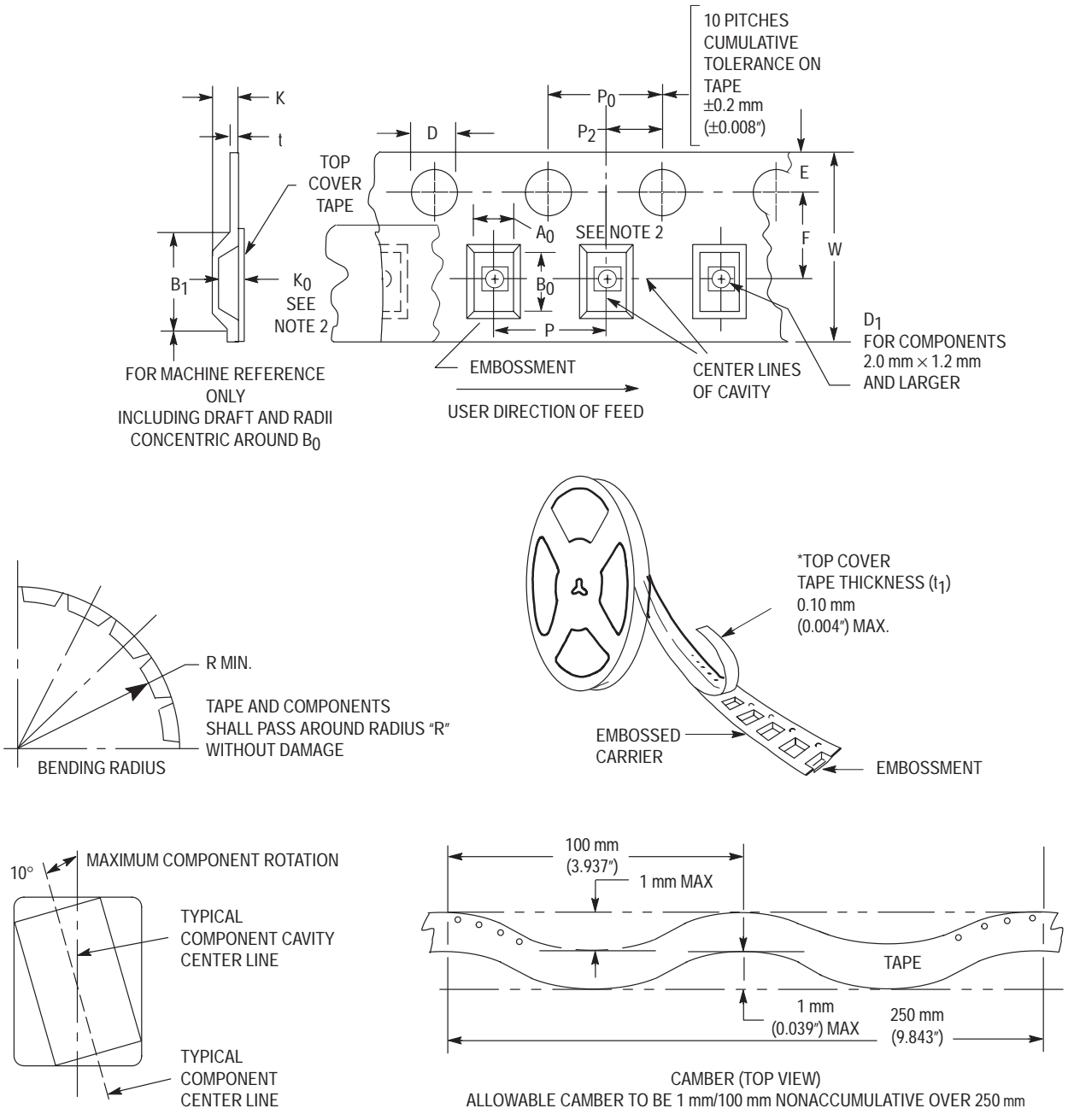


Figure 13. Carrier Tape Specifications

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. A₀, B₀, and K₀ 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

MC74VHC1GT66

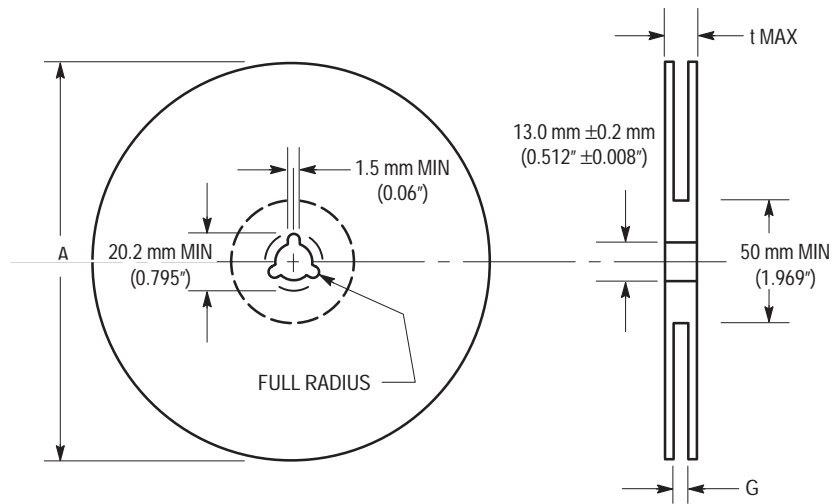


Figure 14. Reel Dimensions

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")

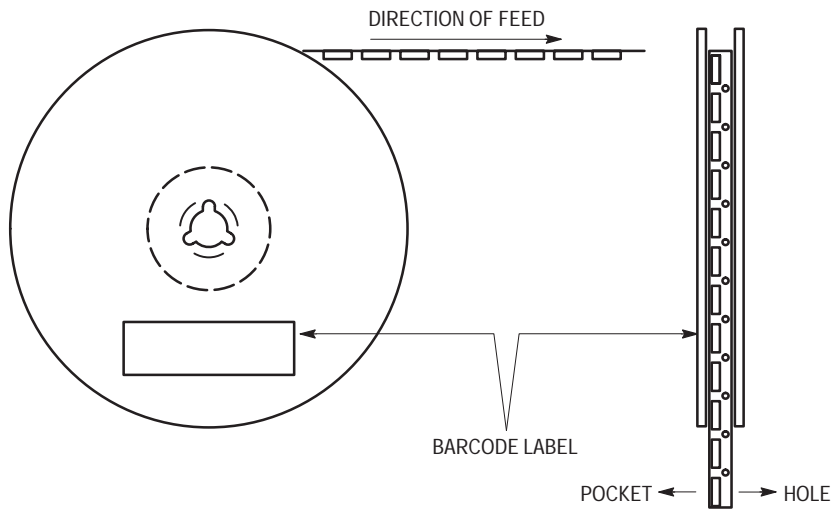


Figure 15. Reel Winding Direction

MC74VHC1GT66

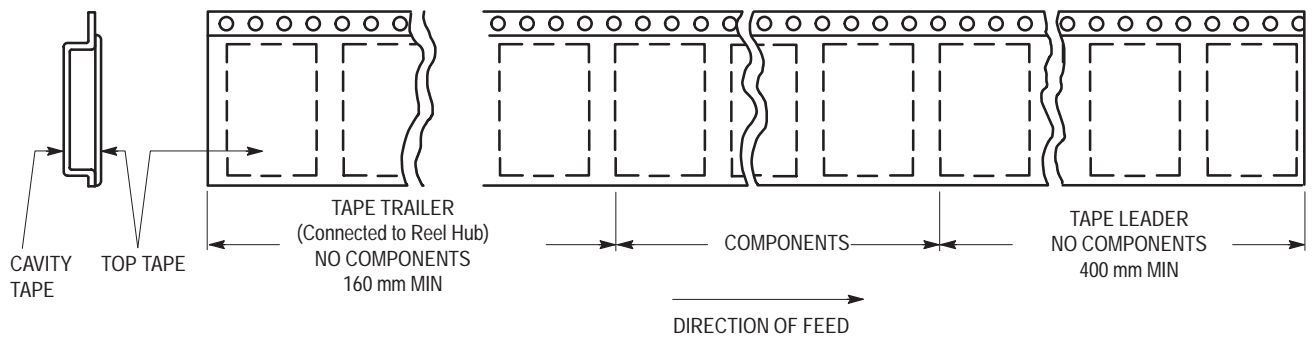


Figure 16. Tape Ends for Finished Goods

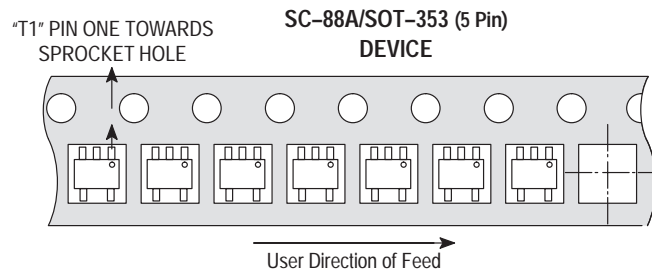



Figure 17. Reel Configuration

Notes

MC74VHC1GT66

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