

MC74VHC1GT126

Product Preview

Noninverting Buffer / CMOS Logic Level Shifter with LSTTL-Compatible Inputs

The MC74VHC1GT126 is a single gate noninverting 3-state 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 MC74VHC1GT126 requires the 3-state control input ($\overline{OE}$) to be set Low to place the output into the high impedance state.

The device input is compatible with TTL-type input thresholds and the output has a full 5V CMOS level output swing. The input protection circuitry on this device allows overvoltage tolerance on the input, 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 MC74VHC1GT126 input structure provides protection when voltages up to 7V are applied, regardless of the supply voltage. This allows the MC74VHC1GT126 to be used to interface 5V circuits to 3V circuits. The output structures also provide protection when $V_{CC} = 0V$. These input and output structures help prevent device destruction caused by supply voltage – input/output voltage mismatch, battery backup, hot insertion, etc.

- High Speed: $t_{PD} = 3.5ns$ (Typ) at $V_{CC} = 5V$
- Low Power Dissipation: $I_{CC} = 2\mu A$ (Max) at $T_A = 25^\circ C$
- TTL-Compatible Inputs: $V_{IL} = 0.8V$; $V_{IH} = 2.0V$
- CMOS-Compatible Outputs: $V_{OH} > 0.8V_{CC}$; $V_{OL} < 0.1V_{CC}$ @Load
- Power Down Protection Provided on Inputs and Outputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 1500V; MM > 200V

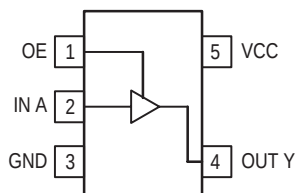
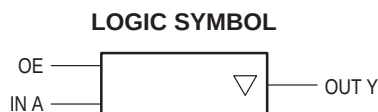


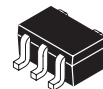
Figure 1. 5-Lead SOT-353 Pinout (Top View)



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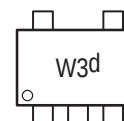
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SC-88A / SOT-353
DF SUFFIX
CASE 419A

MARKING DIAGRAM



Pin 1

d = Date Code

PIN ASSIGNMENT

	PIN ASSIGNMENT
1	OE
2	IN A
3	GND
4	OUT 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

A Input	OE Input	Y Output
L	H	L
H	H	H
X	L	Z

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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}	Input Diode Current	– 20	mA
I _{OK}	Output Diode Current	± 20	mA
I _{out}	DC Output Current, per Pin	± 25	mA
I _{CC}	DC Supply Current, V _{CC} and GND Pins	± 50	mA
P _D	Power Dissipation in Still Air, SOIC Packages† TSSOP Package†	500 450	mW
T _{stg}	Storage Temperature	– 65 to + 150	°C

* Absolute maximum continuous 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.

† Derating — SOIC Packages: – 7 mW/°C from 65° to 125°C
TSSOP Package: – 6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage	4.5	5.5	V
V _{in}	DC Input Voltage	0	5.5	V
V _{out}	DC Output Voltage	0	V _{CC}	V
T _A	Operating Temperature, All Package Types	– 40	+ 85	°C
t _r , t _f	Input Rise and Fall Time V _{CC} = 5.0V ± 0.5V	0	20	ns/V

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		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		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
V _{OH}	Minimum High–Level Output Voltage V _{IN} = V _{IH} or V _{IL}	V _{IN} = V _{IH} or V _{IL} I _{OH} = – 50μA	3.0 4.5	2.9 4.4	3.0 4.5		2.9 4.4		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 _{OL}	Maximum Low–Level Output Voltage V _{IN} = V _{IH} or V _{IL}	V _{IN} = V _{IH} or V _{IL} I _{OL} = 50μA	3.0 4.5		0.0 0.0	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	
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 _{CC} T	Quiescent Supply Current	Input: V _{IN} = 3.4V	5.5			1.35		1.50		1.65	mA
I _{OPD}	Output Leakage Current	V _{OUT} = 5.5V	0.0			0.5		5.0		10	μA

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AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0\text{ns}$)

Symbol	Parameter	Test Conditions	$T_A = 25^\circ\text{C}$			$T_A = -40 \text{ to } 85^\circ\text{C}$		$T_A \leq 125^\circ\text{C}$		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{PLH} , t_{PHL}	Maximum Propagation Delay, A to Y (Figure 2 and 4)	$V_{CC} = 3.3 \pm 0.3\text{V}$ $C_L = 15\text{pF}$		5.6	8.0	1.0	9.5		12.0	ns
		$C_L = 50\text{pF}$		8.1	11.5	1.0	13.0		16.0	
		$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$		3.8	5.5	1.0	6.5		8.5	
		$C_L = 50\text{pF}$		5.3	7.5	1.0	8.5		10.5	
t_{PZL} , t_{PZH}	Maximum Output Enable Time, $\overline{\text{OE}}$ to Y (Figure 3 and 5)	$V_{CC} = 3.3 \pm 0.3\text{V}$ $C_L = 15\text{pF}$		5.4	8.0	1.0	9.5		11.5	ns
		$R_L = 1\text{k}\Omega$ $C_L = 50\text{pF}$		7.9	11.5	1.0	13.0		15.0	
		$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$		3.6	5.1	1.0	6.0		7.5	
		$R_L = 1\text{k}\Omega$ $C_L = 50\text{pF}$		5.1	7.1	1.0	8.0		9.5	
t_{PLZ} , t_{PHZ}	Maximum Output Disable Time, $\overline{\text{OE}}$ to Y (Figure 3 and 5)	$V_{CC} = 3.3 \pm 0.3\text{V}$ $C_L = 15\text{pF}$		6.5	9.7	1.0	11.5		14.5	ns
		$R_L = 1\text{k}\Omega$ $C_L = 50\text{pF}$		8.0	13.2	1.0	15.0		18.0	
		$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$		4.8	6.8	1.0	8.0		10.0	
		$R_L = 1\text{k}\Omega$ $C_L = 50\text{pF}$		7.0	8.8	1.0	10.0		12.0	
C_{in}	Maximum Input Capacitance			4	10		10		10	pF
C_{out}	Maximum Three-State Output Capacitance (Output in High Impedance State)			6						pF

C _{PD}	Power Dissipation Capacitance (Note 1.)	Typical @ 25°C, V _{CC} = 5.0V	pF
		15	

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: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}/4$ (per buffer). C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

SWITCHING WAVEFORMS

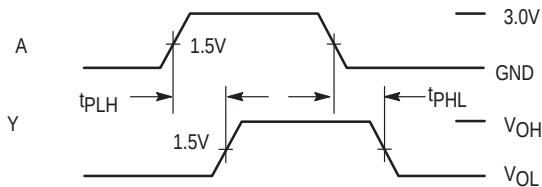


Figure 2.

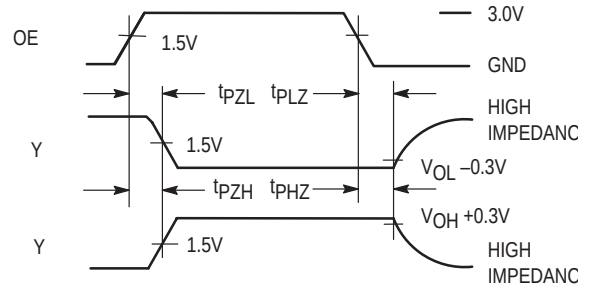
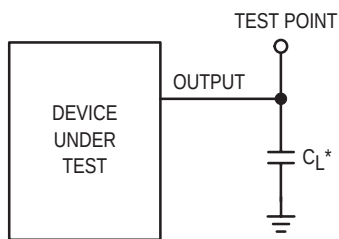
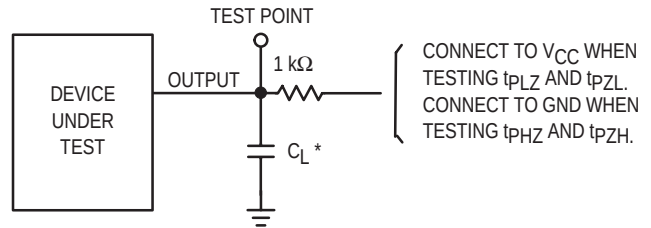


Figure 3.



*Includes all probe and jig capacitance

Figure 4. Test Circuit



*Includes all probe and jig capacitance

Figure 5. Test Circuit

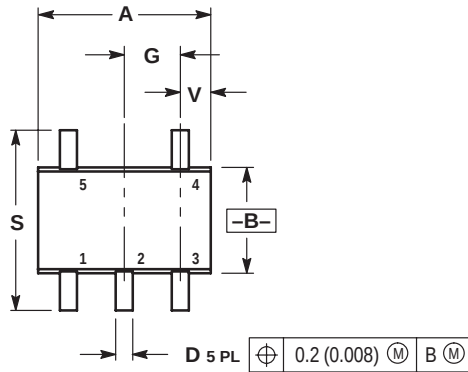
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DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type	Tape and Reel Size
	Circuit Indicator	Temp Range Identifier	Technology	Input Type	Device Function	Package Suffix	Tape & Reel Suffix		
MC74VHC1GT126DFT1	MC	74	VHC1G	T	126	DF	T1	SC-88A/ SOT-353	7-Inch/3000 Unit

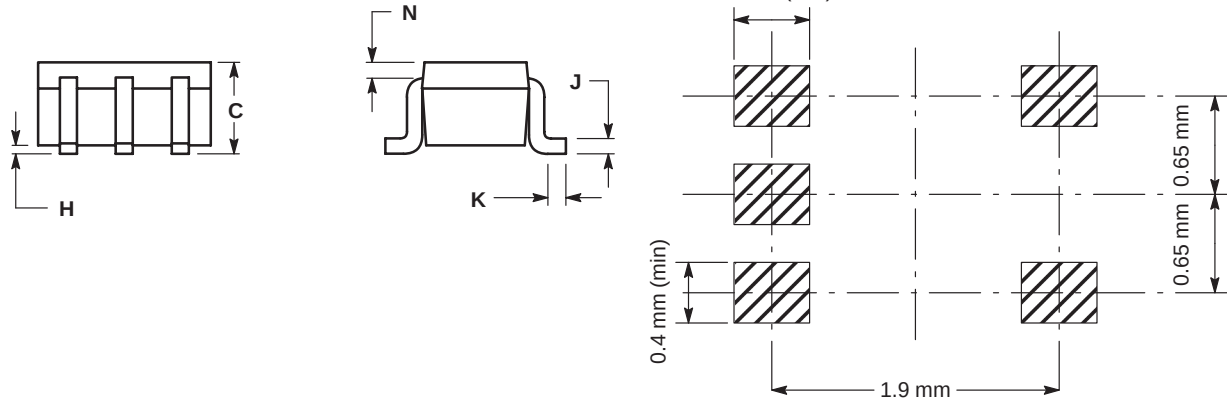
PACKAGE DIMENSIONS

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



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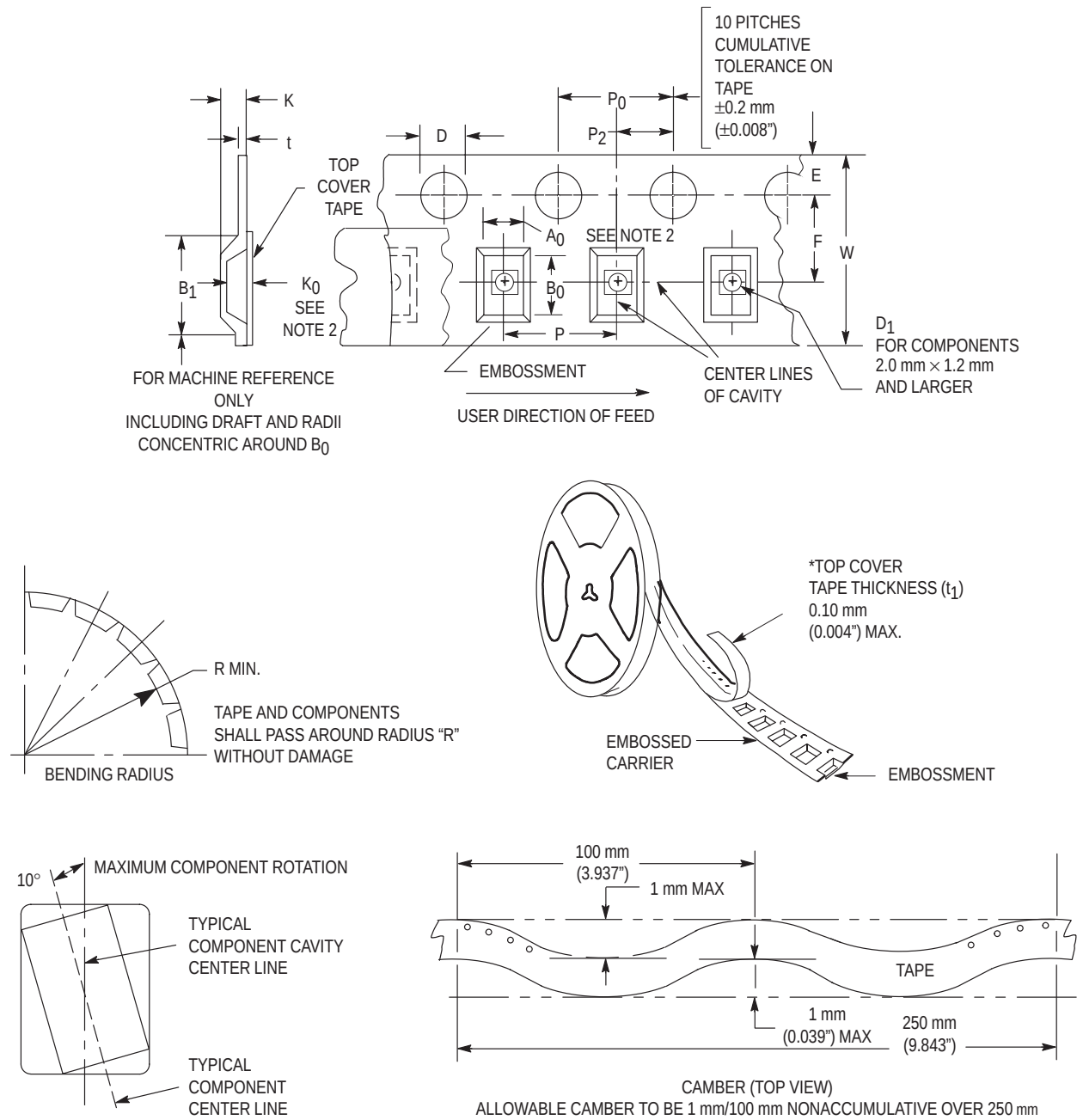


Figure 6. Carrier Tape Specifications

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

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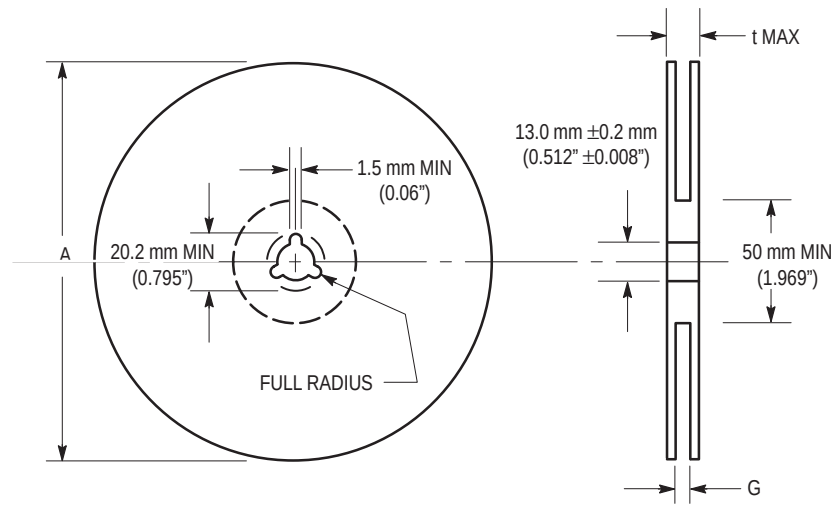


Figure 7. Reel Dimensions

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")

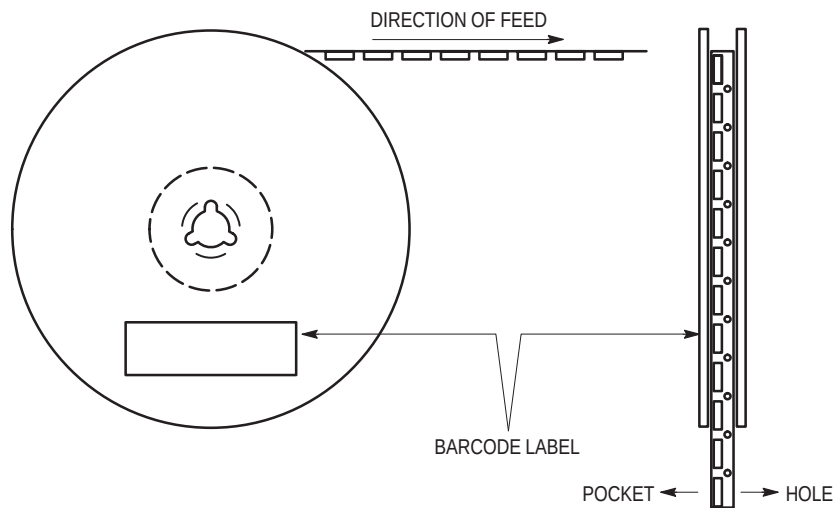


Figure 8. Reel Winding Direction

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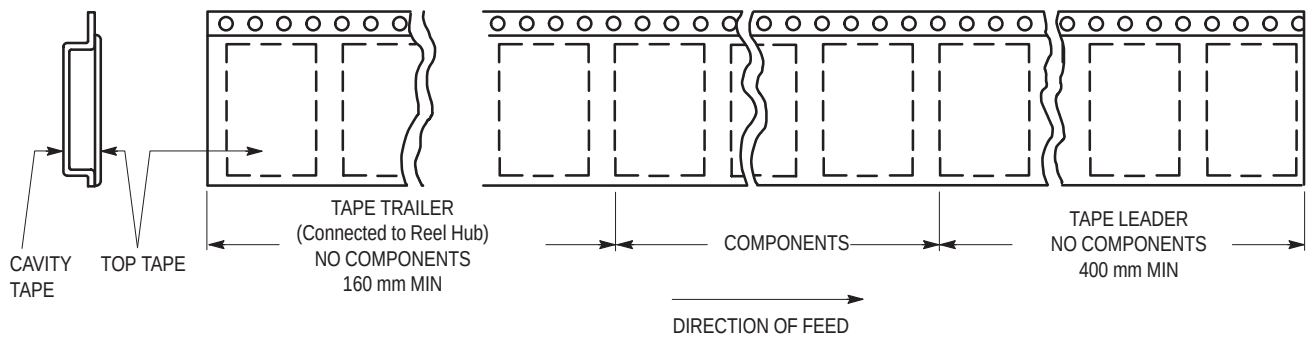


Figure 9. Tape Ends for Finished Goods

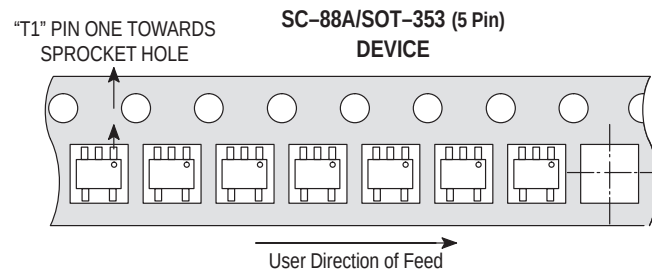


Figure 10. Reel Configuration

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