DATA SHEET

SMP1302 Series: Switch and Attenuator Plastic Packaged PIN Diodes

Applications

- TV distribution and cellular base stations
- High volume switch and attenuators

Features

- Designed for base station and handset applications
- Low-distortion design
- Available in tape and reel packaging
- Packages rated MSL1 @ 260 °C per JEDEC J-STD-020

NEW

Skyworks Green™ products are RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain <1,000 ppm antimony trioxide in polymeric materials.

Description

The SMP1302 series of plastic packaged, surface mountable, low capacitance (0.3 pF) silicon PIN diodes is designed for high-volume switch and attenuator applications from 10 MHz to beyond 2 GHz.

These diodes are designed for use in low-distortion PI and TEE attenuators with low drive current (maximum resistance at 1 mA is 10 Ω) commonly used in TV distribution and cellular base station applications. The nominal 50 µm I region width, combined with a maximum resistance of 3 Ω at 10 mA, makes these diodes useful in large signal switch applications.

The SMP1302 series provides single, dual, and quad diodes in a selection of plastic packages including SOT-23, SOD-323, small footprint SC-79, an ultralow inductance (0.2 nH) SOT-143 (SMP1302-017), a miniature SC-70, and an SC-88.

A four-diode array is available in an SOT-5 package (SMP1302-027) designed for insertion in the commonly used four-diode PI attenuator circuits.

Table 1 describes the various packages and marking of the SMP1302 series.

Table 1. SMP1302 Series Packaging and Marking

									
Single	Common Anode	Common Cathode	Series Pair	Reverse Series Pair	Single	Ultralow Inductance	PI	Single	Quad Common Cathode
SOT-23	SOT-23	SOT-23	SOT-23	SOT-23	SOD-323 Green™	SOT-143	SOT-5	SC-79 Green™	SC-88
SMP1302-001 Marking: PF1	**SMP1302-003** Marking: PF9	**SMP1302-004** Marking: PF3	**SMP1302-005** Marking: PFS			**SMP1302-017** Marking: PFF	**SMP1302-027** Marking: PFM		**SMP1302-078LF** Marking: RFR
SMP1302-001LF Green™ Marking: RF1	**SMP1302-003LF** Green™ Marking:RF9	**SMP1302-004LF** Green™ Marking: RF3	**SMP1302-005LF** Green™ Marking: RF2	**SMP1302-006LF** Green™ Marking: RF8	**SMP1302-011LF** Marking: RF	**SMP1302-017LF** Marking: RFF	**SMP1302-027LF** Marking: RFM	♦**SMP1302-079LF**	
L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 0.2 nH		L_S = 0.7 nH	L_S = 1.4 nH
		SC-70	SC-70						
		SMP1302-074 Marking: PF3							
		SMP1302-074LF Green™ Marking: RF3	**SMP1302-075LF** Green™ Marking: RF2						
		L_S = 1.4 nH	L_S = 1.4 nH						

The Pb-free symbol or "LF" in the part number denotes a lead-free, RoHS-compliant package unless otherwise noted as Green™. Tin/lead (Sn/Pb) packaging is not recommended for new designs.

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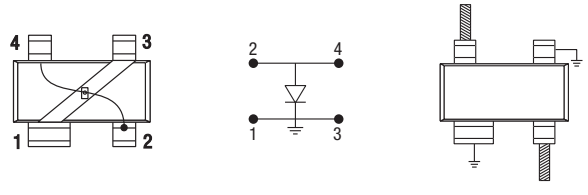
Table 2. SMP1302-078LF Pin Signals

Pin #	Name	Pin #	Name
1	Anode 1	4	Anode 3
2	Common cathode	5	Common cathode
3	Anode 2	6	Anode 4

SMP1302-017: Low Inductance PIN Diode in SOT-143 Package

The SMP1302-017 uses the SMP1302 PIN diode in a customized SOT-143 plastic package designed for high performance in high-frequency applications. Its effective inductance, based on the 3 GHz isolation, is <0.2 nH. The SOT-143 package is diagrammed in Figure 1.



Lead Configuration **Schematic** **Switch Connection**

Figure 1. SOT-143 Package

SMP1302-078LF Pinout

Table 2 provides the signal pin assignments for the 6-pin SC-88 quad common cathode package.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMP1302 series are provided in Table 3. Electrical specifications are provided in Table 4. Resistance versus temperature measurements are provided in Table 5.

Typical performance characteristics of the SMP1302 series are illustrated in Figures 2 to 5. Package dimensions are shown in Figures 6 to 18 (even numbers), and tape and reel dimensions are provided in Figures 7 to 19 (odd numbers).

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SMP1302 series is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

Table 3. SMP1302 Series Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V_R		200	V
Power dissipation @ 25 °C lead temperature	P_D		250	mW
Storage temperature	T_{STG}	–65	+150	°C
Operating temperature	T_A	–65	+150	°C

Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

***CAUTION**: Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times. The SMP1302 series PIN diodes are Class 1C ESD devices.*

Table 4. SMP1302 Series Electrical Specifications (Note 1)
(T_A = +25 °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	I_R	V_R = 200 V			10	µA
Capacitance (Note 2)	C_T	f = 1 MHz, V = 30 V			0.3	pF
Resistance	R_S	f = 100 MHz I = 1 mA I = 10 mA I = 100 mA		 15	 20 3 1.5	 Ω Ω Ω
Forward voltage	V_F	I_F = 10 mA		0.8		V
Carrier lifetime	Tl	I_F = 10 mA		0.7		µs
I region width				50		µm

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Note 2: The SMP1302-017 and SMP1302-027 maximum capacitance is 0.45 pF.

Table 5. Resistance vs Temperature @ 100 MHz

I_F (mA)	R_S @ –55 °C (Ω)	R_S @ –15 °C (Ω)	R_S @ +25 °C (Ω)	R_S @ +65 °C (Ω)	R_S @ +100 °C (Ω)
0.02	599	653	692	715	722
0.10	123	135	143	154	161
0.3	42.2	46.6	49.7	54.3	56.8
1.0	13.5	15.0	16.2	17.9	18.8
10	2.0	2.3	2.6	2.9	3.0
20	1.34	1.50	1.70	2.00	2.00
100	0.60	0.74	1.00	1.10	1.10

Typical Performance Characteristics

(TA = +25 °C, Unless Otherwise Noted)

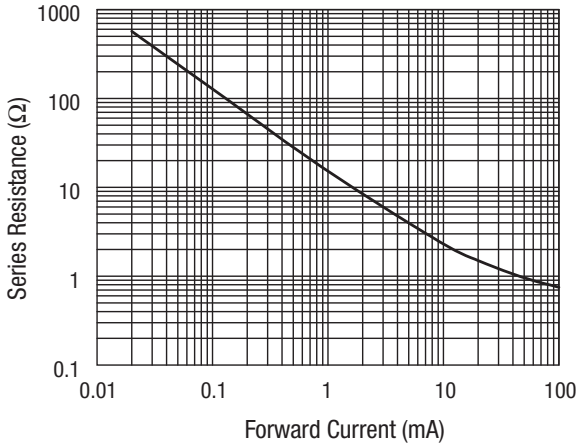


Figure 2. Series Resistance vs Current @ 100 MHz

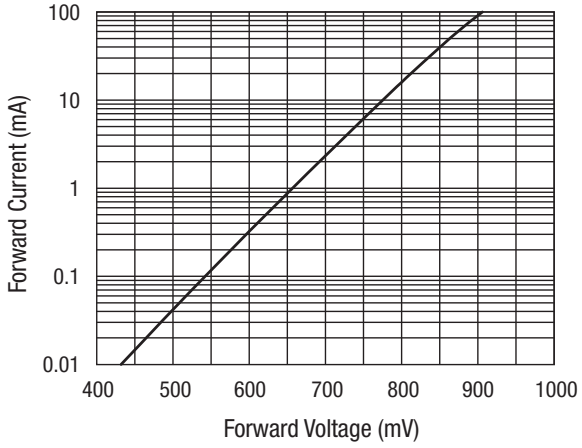


Figure 3. DC Characteristic

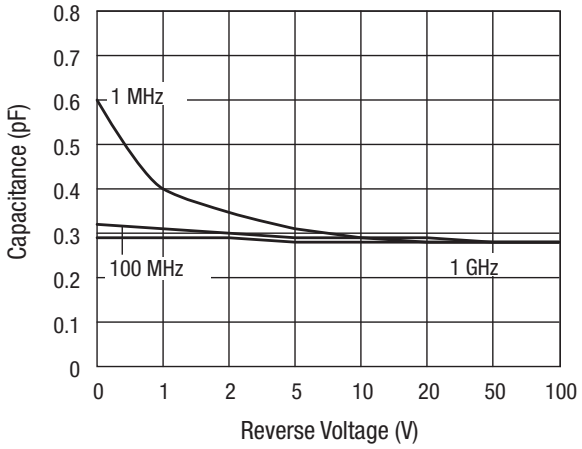


Figure 4. Capacitance vs Reverse Voltage

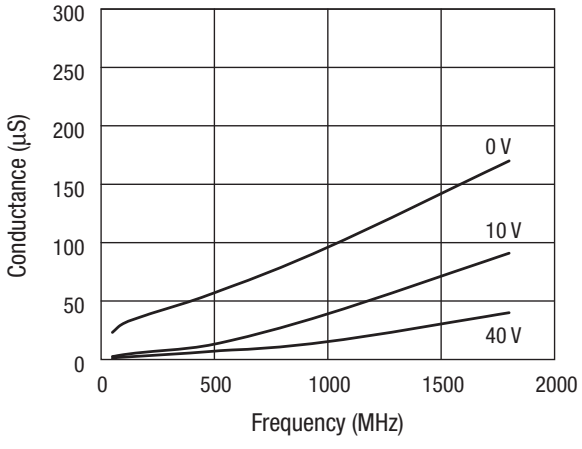
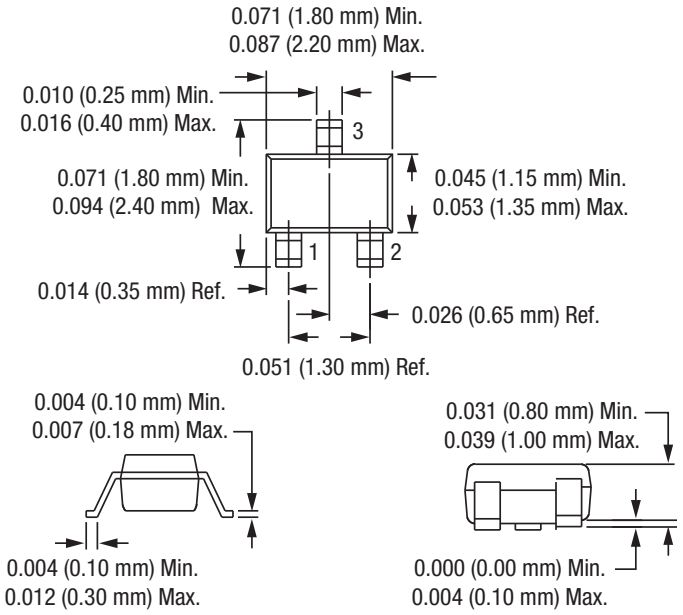
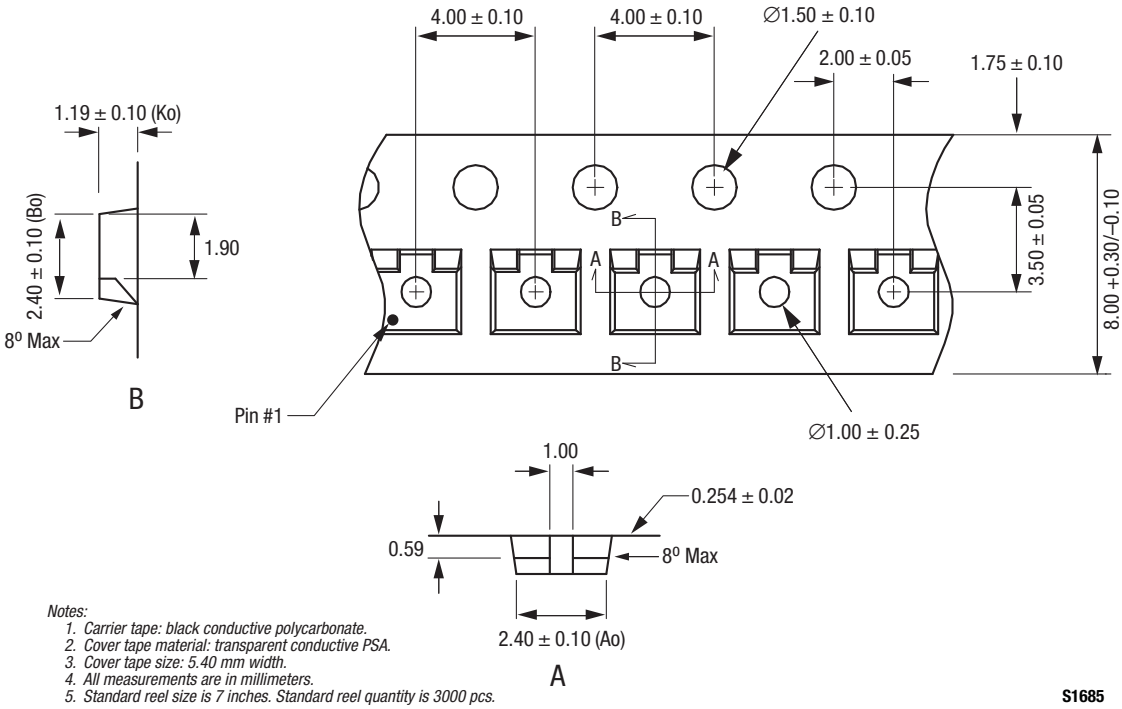


Figure 5. Conductance vs Frequency and Reverse Voltage



Dimensions are in inches (millimeters shown in parentheses) **S1653**

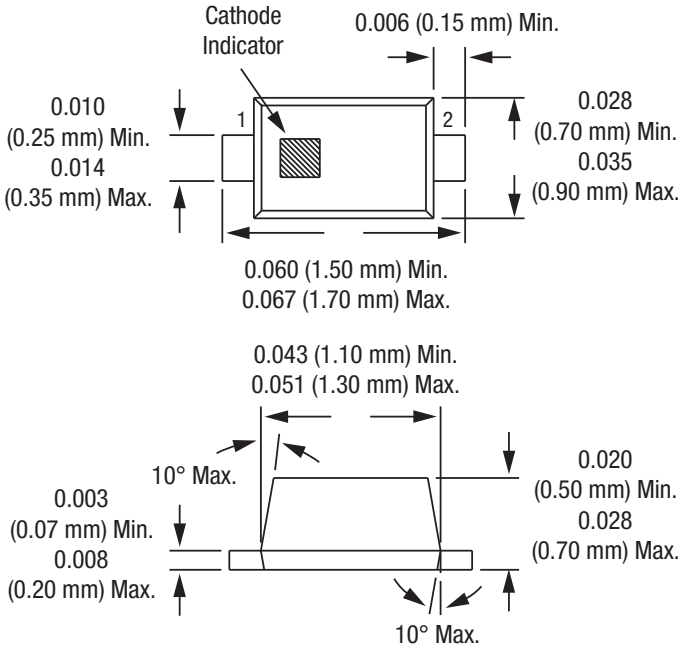
Figure 6. SC-70 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polycarbonate.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.40 mm width.*
4. *All measurements are in millimeters.*
5. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

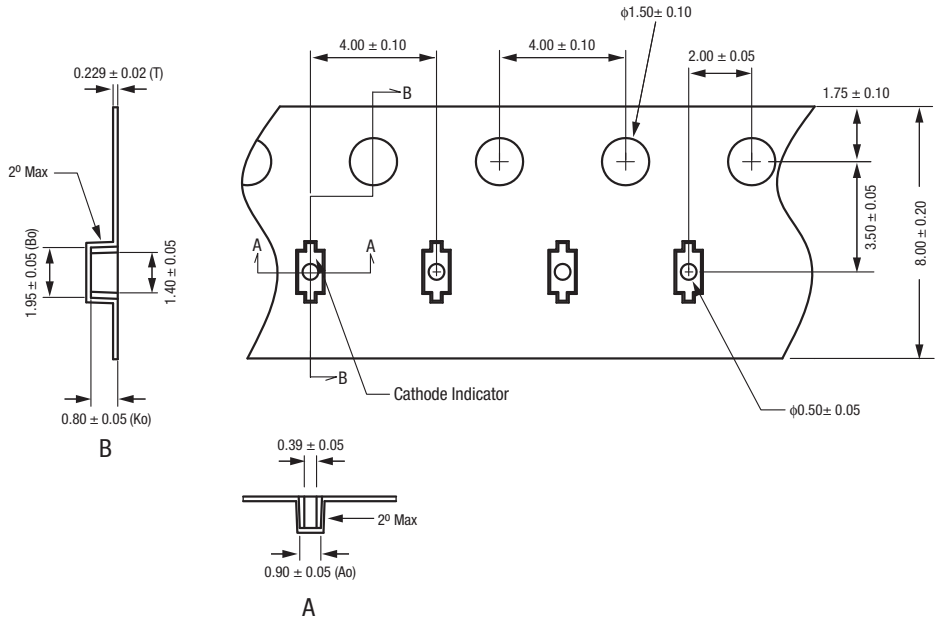
S1685

Figure 7. SC-70 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses) **S1652**

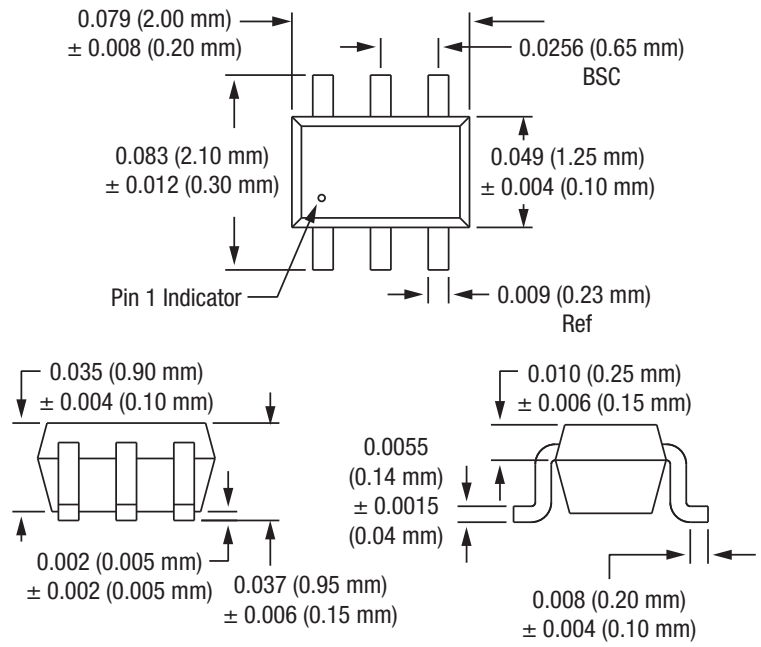
Figure 8. SC-79 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polycarbonate or polystyrene.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.4 mm width.*
4. *All measurements are in millimeters.*
5. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

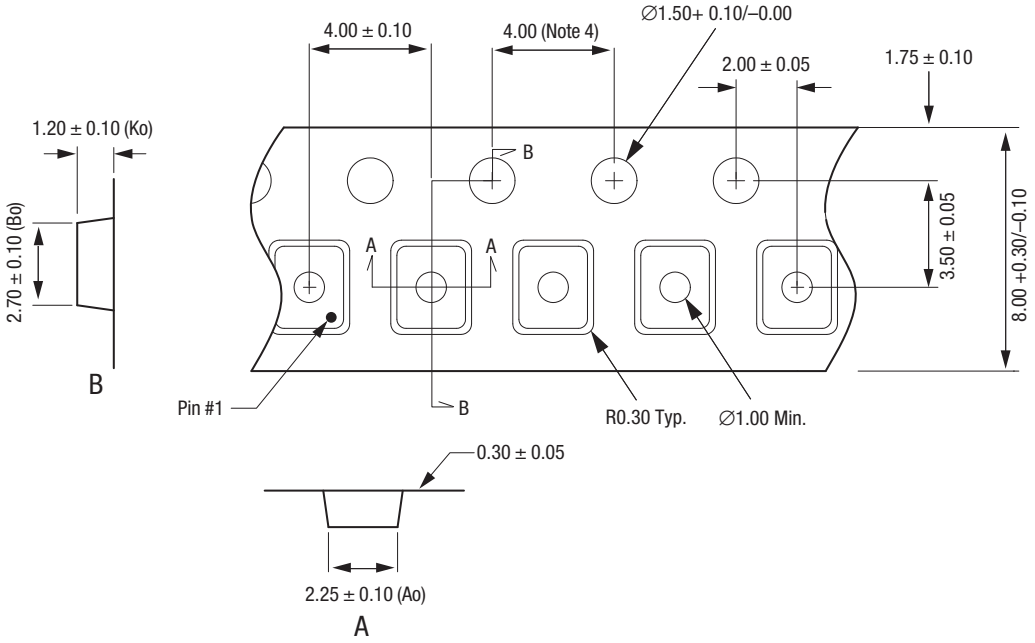
S1673

Figure 9. SC-79 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses) **S1670**

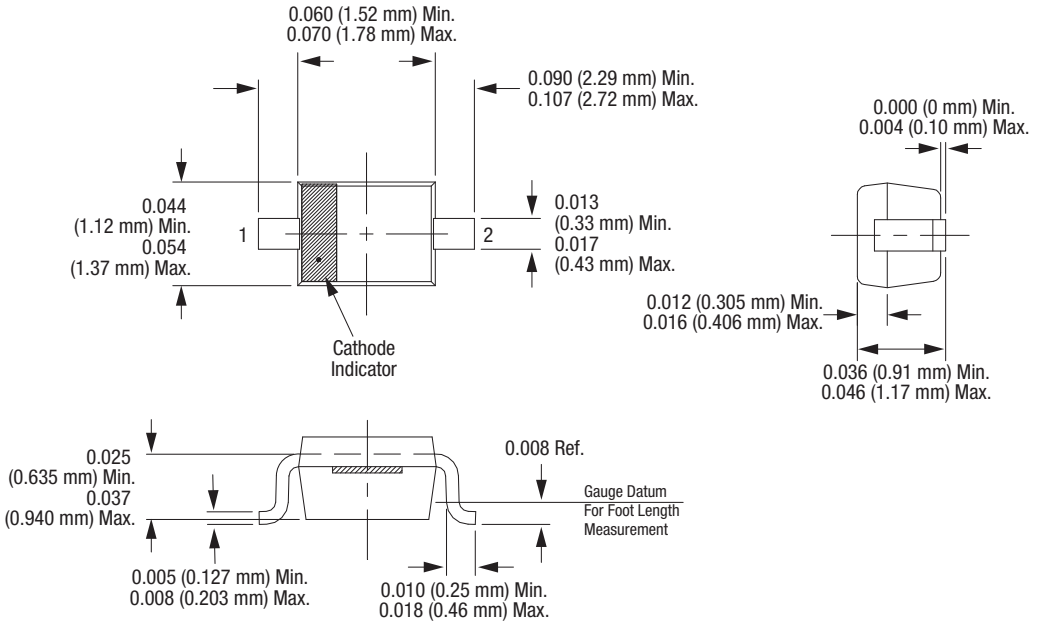
Figure 10. SC-88 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polystyrene.*
2. *Cover tape material: transparent conductive HSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Ten sprocket hole pitch cumulative tolerance ±0.20 mm.*
5. *All measurements are in millimeters.*
6. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

S1620

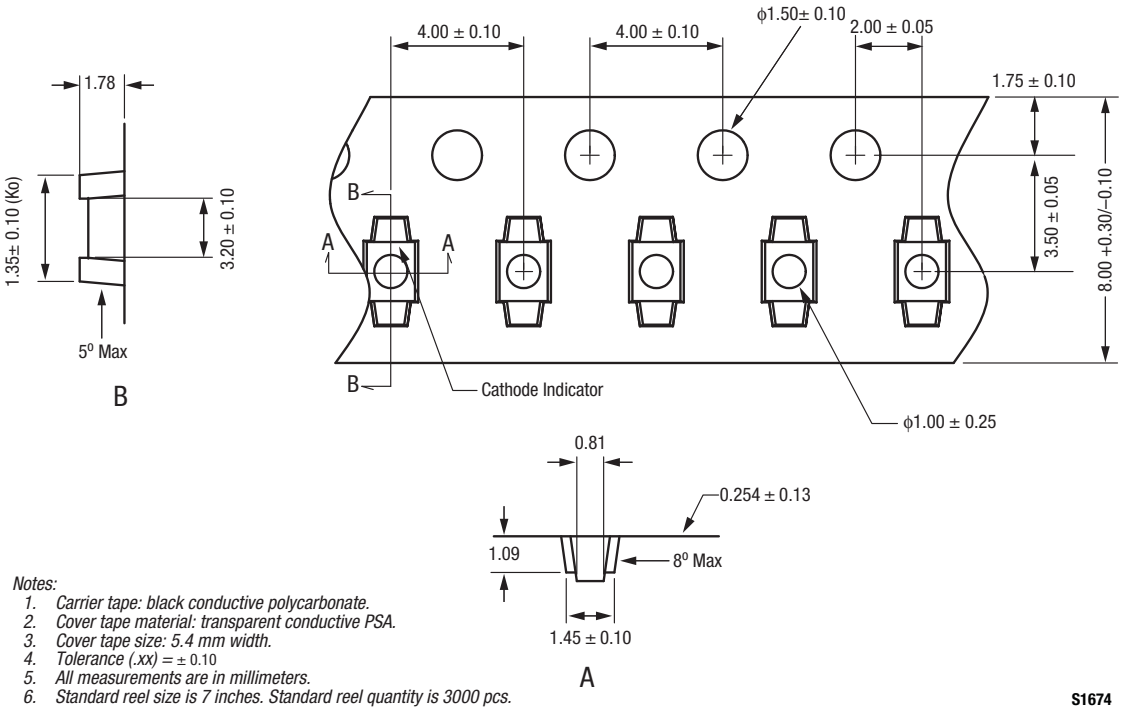
Figure 11. SC-88 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses)

S1619

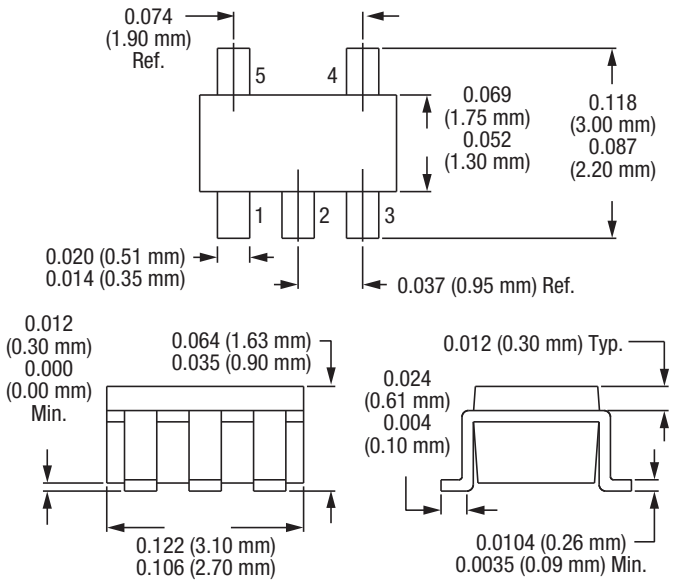
Figure 12. SOD-323 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polycarbonate.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.4 mm width.*
4. *Tolerance (.xx) = ± 0.10*
5. *All measurements are in millimeters.*
6. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

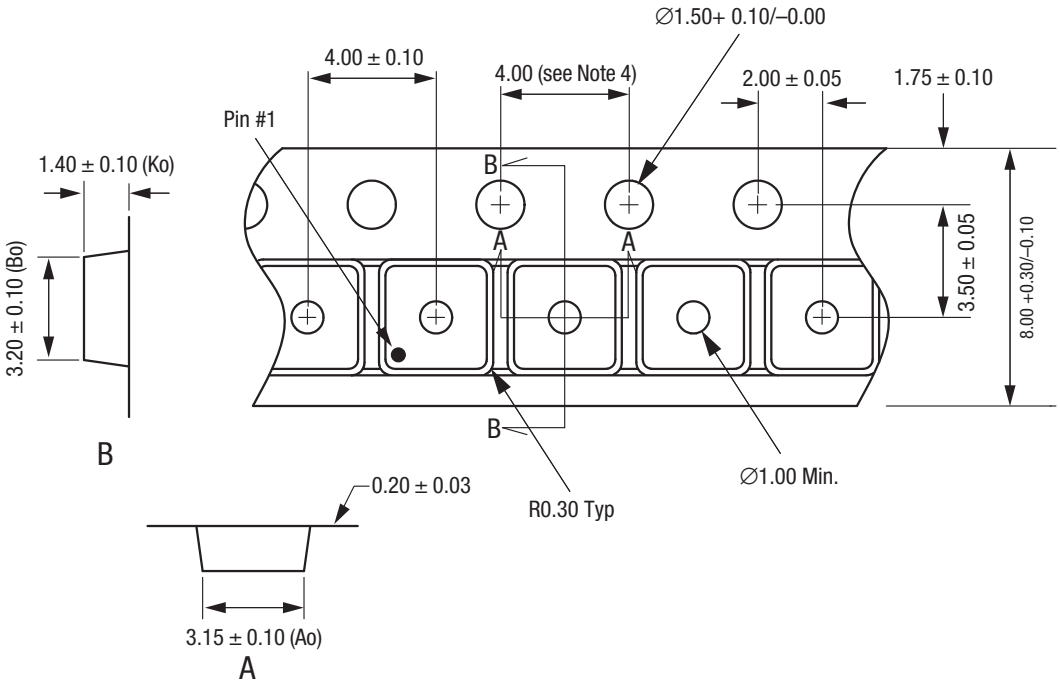
S1674

Figure 13. SOD-323 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses) **S1657**

Figure 14. SOT-5 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polystyrene.*
2. *Cover tape material: transparent conductive HSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Ten sprocket hole pitch cumulative tolerance = ±0.20 mm.*
5. *All measurements are in millimeters.*
6. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

S1681

Figure 15. SOT-5 Tape and Reel Dimensions

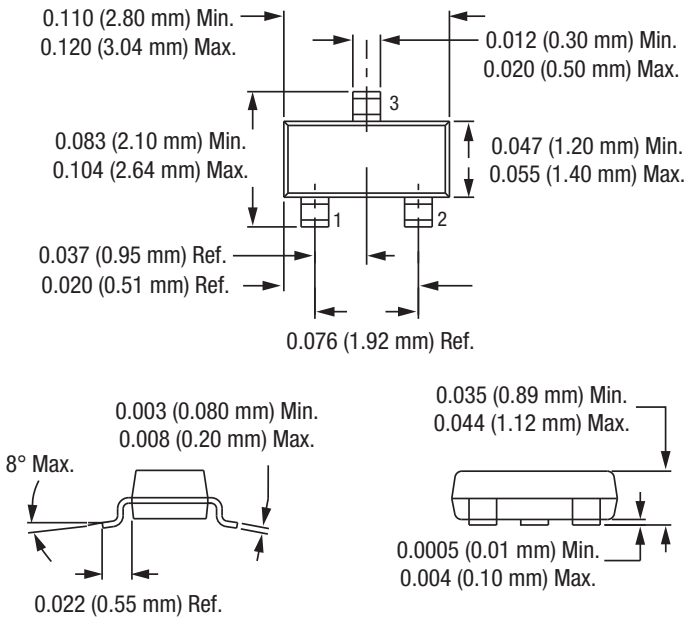
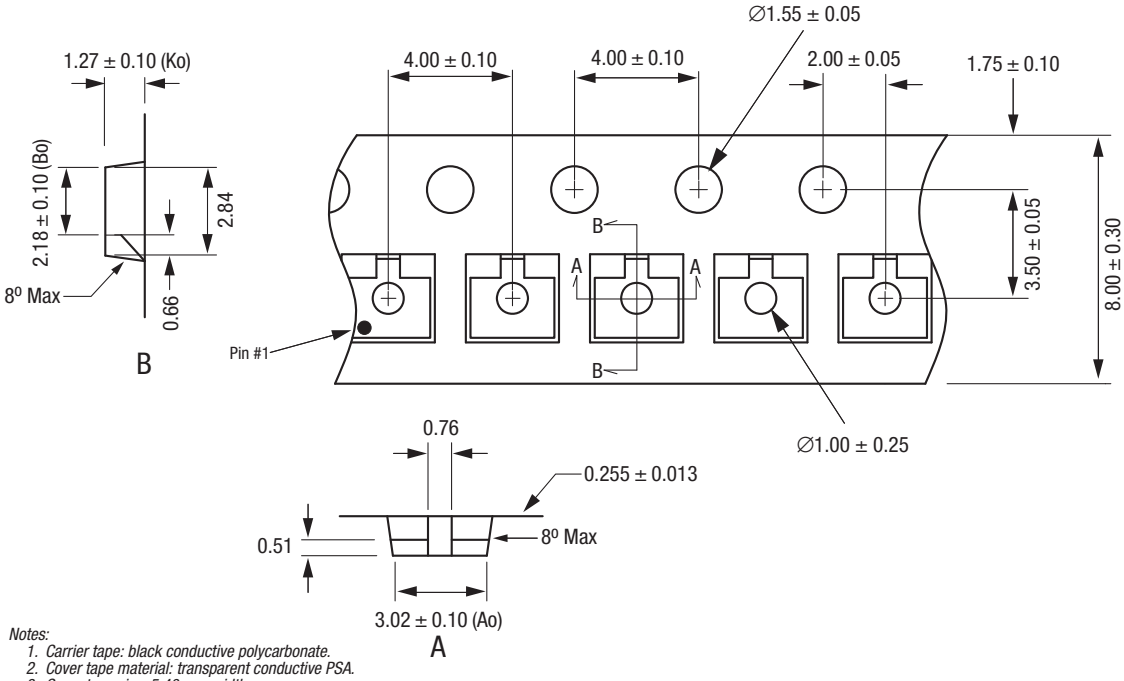


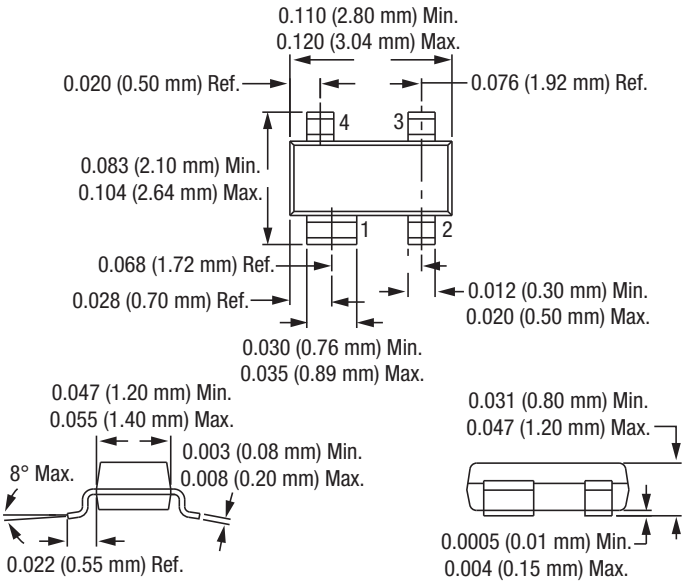
Figure 16. SOT-23 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polycarbonate.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Tolerance ±0.10 mm.*
5. *All measurements are in millimeters.*
6. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

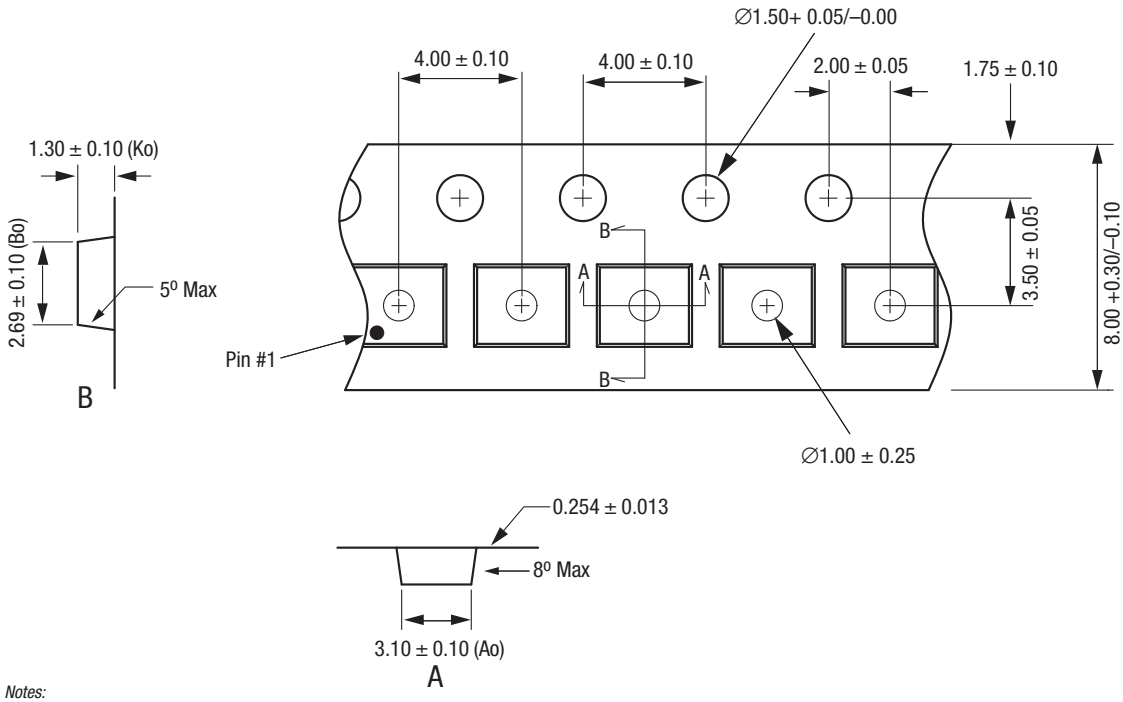
S1684

Figure 17. SOT-23 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses) **S1651**

Figure 18. SOT-143 Package Dimension Drawing



Notes:
1. *Carrier tape: black conductive polycarbonate.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Tolerance ±0.10 mm.*
5. *All measurements are in millimeters.*
6. *Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.*

S1683

Figure 19. SOT-143 Tape and Reel Dimensions