

DATA SHEET

# Surface Mount Mixer and Detector Schottky Diodes

## Applications

- High-volume wireless applications
- RF and microwave mixers and detectors
- Low-noise receivers in high-sensitivity ID tags
- Radio designs

## Features

- Tight parameter distribution
- Available as singles, pairs, and dual pairs
- 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

These low-cost, surface mountable, plastic packaged silicon mixer Schottky diodes are designed for RF and microwave mixers and detectors. They include low barrier diodes and zero-bias detectors that combine Skyworks advanced semiconductor technology with low-cost packaging techniques. All diodes are 100 percent DC tested and deliver tight parameter distribution, which minimizes performance variability.

These diodes are available in SC-70, SC-79, SC-88, SOD-323, SOT-23, SOT-143, and LGA packages. Wiring configurations include singles, common cathode, series pairs, unconnected pairs, and dual series pairs. They may be used at frequencies up to 10 GHz.

Table 1 describes the various packages and marking of the mixer and detector Schottky diodes.

**Table 1. Schottky Diode Packaging and Marking**

Single	Single	Single	Common Cathode	Series Pair
SC-79 Green™	SOD-323 Green™	SOT-23	SOT-23	SOT-23
				<b>SMS1546-005</b> Marking: SG2
				<b>SMS1546-005LF</b> Green™ Marking: XG2
		<b>SMS7621-001</b> Marking: SH1		◆ <b>SMS7621-005</b> Marking: SH2
◆ <b>SMS7621-079LF</b> Marking: Cathode		<b>SMS7621-001LF</b> Green™ Marking: XH1		◆ <b>SMS7621-005LF</b> Green™ Marking: XH2
		<b>SMS7630-001</b> Marking: SD1		<b>SMS7630-005</b> Marking: SD2
◆ <b>SMS7630-079LF</b> Marking: Anode	<b>SMS7630-011LF</b> Marking: XD	<b>SMS7630-001LF</b> Green™ Marking: XD1		<b>SMS7630-005LF</b> Green™ Marking: XD2
$L_s = 0.7 \text{ nH}$	$L_s = 1.5 \text{ nH}$	$L_s = 1.5 \text{ nH}$		$L_s = 1.5 \text{ nH}$
			SC-70	SC-70
			<b>SMS7621-074</b> Marking: SH3	<b>SMS7621-075</b> Marking: SH2
			<b>SMS7621-074LF</b> Marking: XH3	<b>SMS7621-075LF</b> Marking: XH2
			$L_s = 1.4 \text{ nH}$	$L_s = 1.4 \text{ nH}$

Reverse Series Pair	Unconnected Pair	Reverse Unconnected Pair	Unconnected Pair	Dual Series Pair
SOT-23	SOT-143	SOT-143	LGA Green™	SC-88
◆ <b>SMS7621-006</b> Marking: SH8	<b>SMS7621-015</b> Marking: SH7		<b>SMS7621-517</b> Marking: H Pb-Free	
◆ <b>SMS7621-006LF</b> Marking: XH8	<b>SMS7621-015LF</b> Marking: XH7			<b>SMS7621-081LF</b> Marking: XHQ
◆ <b>SMS7630-006</b> Green™ Marking: SD8		◆ <b>SMS7630-020</b> Marking: SD0	<b>SMS7630-517</b> Marking: D Pb-Free	
◆ <b>SMS7630-006LF</b> Green™ Marking: XD8		◆ <b>SMS7630-020LF</b> Marking: XD0		
$L_s = 1.5 \text{ nH}$	$L_s = 1.5 \text{ nH}$	$L_s = 1.5 \text{ nH}$	$L_s = 0.6 \text{ nH}$	$L_s = 1.8 \text{ nH}$



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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## Electrical and Mechanical Specifications

The absolute maximum ratings of the mixer and detector Schottky diodes are provided in Table 2. Electrical specifications are provided in Tables 3 and 4. The associated SPICE model parameters are provided in Table 5. A typical detector schematic diagram is shown in Figure 1.

A pinout and equivalent circuit diagram for the dual series pair Schottky diode (SMS7621-081LF) is shown in Figure 2. Typical performance characteristics are illustrated in Figures 3 and 4. Package dimensions are shown in Figures 5 to 17 (even numbers), and tape and reel dimensions are provided in Figures 6 to 18 (odd numbers).

Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The mixer and detector Schottky diodes are rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C for 5 seconds. They 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. For packaging details, refer to the Skyworks Application Note *Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation*, document number 200083.

## Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed.

**Table 2. SMP1320 Series Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	$V_R$		Rated $V_B$	V
Forward current, steady state	$I_F$		50	mA
Power dissipation	$P_D$		75	mW
Storage temperature	$T_{STG}$	-65	+150	°C
Operating temperature	$T_A$	-65	+150	°C
Junction temperature	$T_J$		+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 mixer and detector Schottky diodes are Class 0 Human Body Model (HBM) and Class C4 Charged Device Model (CDM) ESD devices.

**Table 3. Low Barrier Mixer and Detectors Electrical Specifications (Note 1)**

( $T_A = +25$  °C Per Junction, Unless Otherwise Noted)

Part Number	Barrier	Minimum $V_B$ @ 10 $\mu$ A (V)	Typical $C_T$ @ 0 V (pF)	$V_F$ @ 1 mA (mV)	Maximum Pair Configuration $\Delta V_F$ @ 1 mA (mV)	Maximum $R_T$ (Note 2) ( $\Omega$ )
SMS1546 series	Low	2	0.50	200 to 270	10	8 @ 10 mA
SMS7621 series	Low	2	0.25	260 to 320	10	18 @ 5 mA

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

**Note 2:**  $R_T$  is the slope resistance.

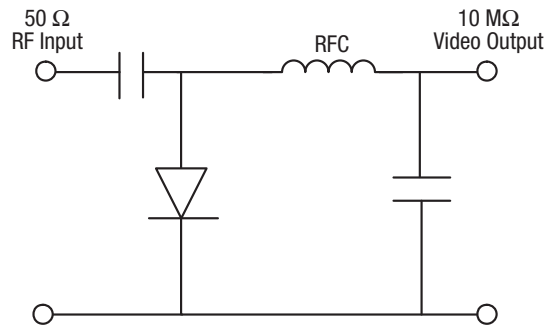
**Table 4. Zero Bias Detectors Electrical Specifications (Note 1)**  
 (TA = +25 °C Per Junction, Unless Otherwise Noted)

Part Number	Minimum V <sub>B</sub> @ 100 μA (V)	Typical C <sub>T</sub> @ 0.15 V (pF)	V <sub>F</sub> @ 0.1 mA (mV)	V <sub>F</sub> @ 1 mA (mV)	Maximum Pair Configuration ΔV <sub>F</sub> @ 1 mA (mV)	Typical R <sub>V</sub> (Ω)
SMS7630 series	1	0.3	60 to 120	135 to 240	10	5000

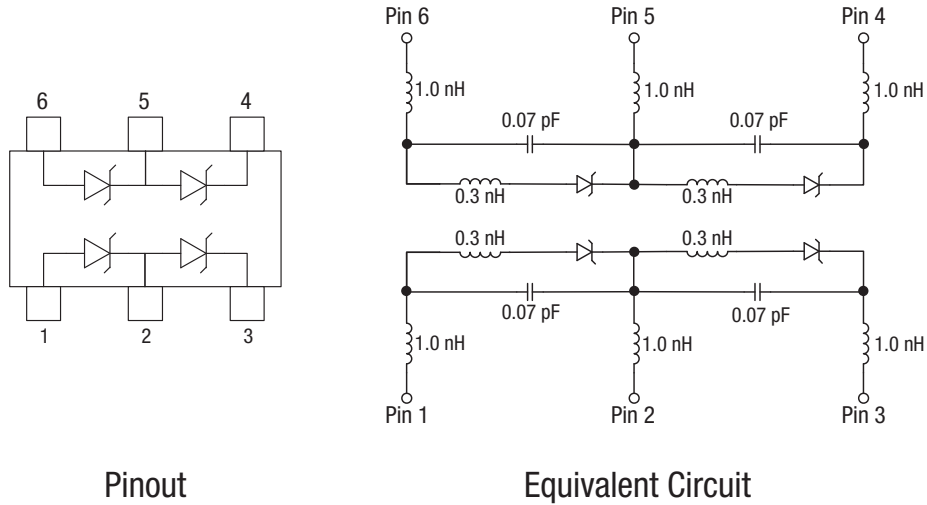
Note 1: Performance is guaranteed only under the conditions listed in this Table.

**Table 5. SPICE Model Parameters (Per Junction)**

Parameter	Units	SMS1546 Series	SMS7621 Series	SMS7630 Series
I <sub>S</sub>	A	3E-7	4E-8	5E-6
R <sub>S</sub>	Ω	4	12	20
N	–	1.04	1.05	1.05
T <sub>T</sub>	sec	1E-11	1E-11	1E-11
C <sub>JO</sub>	pF	0.38	0.1	0.14
M	–	0.36	0.35	0.40
E <sub>G</sub>	eV	0.69	0.69	0.69
X <sub>TI</sub>	–	2	2	2
F <sub>C</sub>	–	0.5	0.5	0.5
B <sub>V</sub>	V	3	3	2
I <sub>bv</sub>	A	1E-5	1E-5	1E-4
V <sub>J</sub>	V	0.51	0.51	0.34



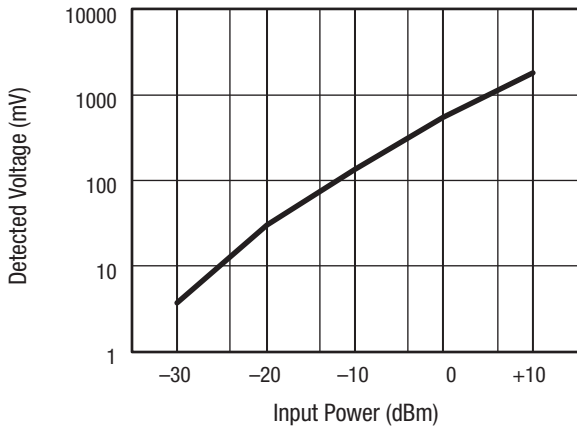
**Figure 1. Typical Detector Circuit**



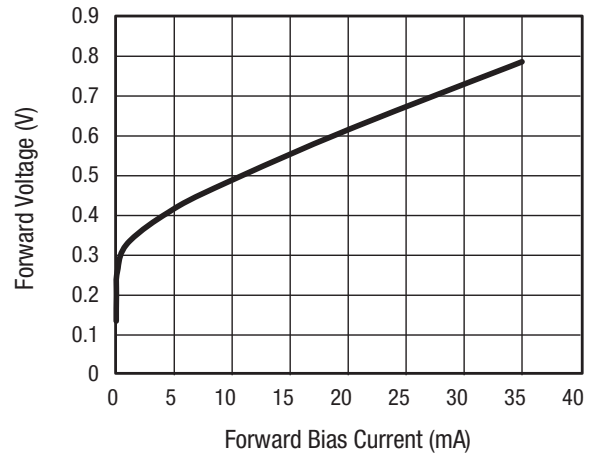
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**Figure 2. SMS7621-081LF Dual Series Pair Pinout and Equivalent Circuit**

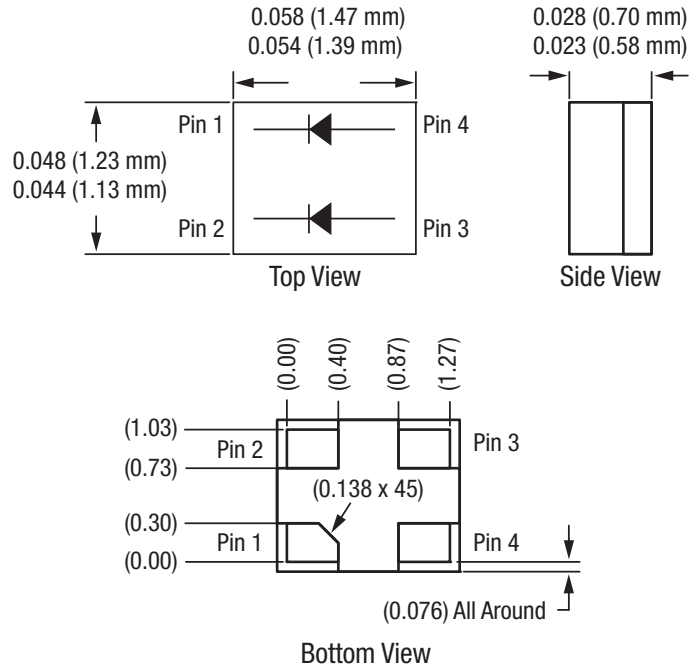
**Typical Performance Characteristics**



**Figure 3. Typical Detector Characteristics @ 1.8 GHz**



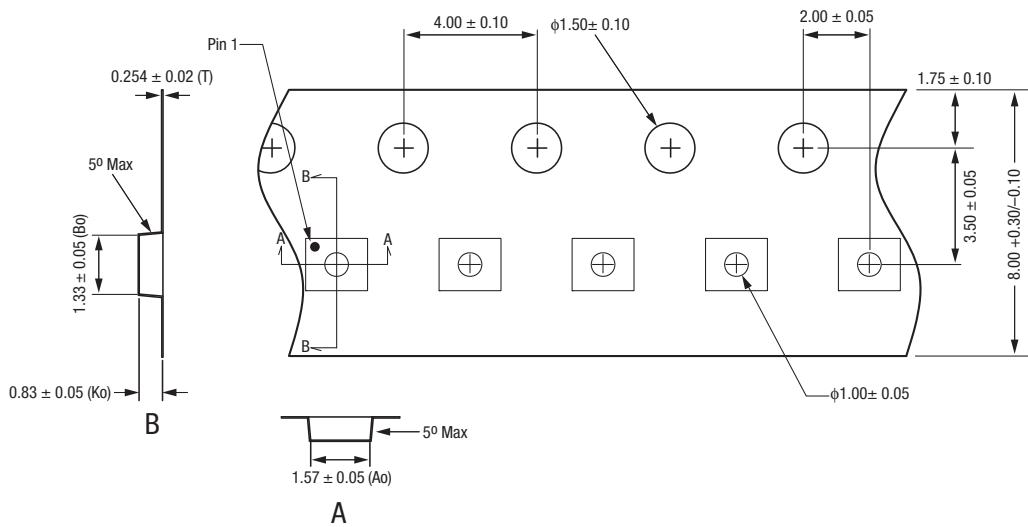
**Figure 4. SMS7621-081LF Forward Voltage vs Forward Bias Current**



Dimensions are in inches (millimeters shown in parentheses)

S1833

Figure 5. LGA 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 in 7 inches. Standard reel quantity is 3000 pcs.

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Figure 6. LGA Tape and Reel Dimensions

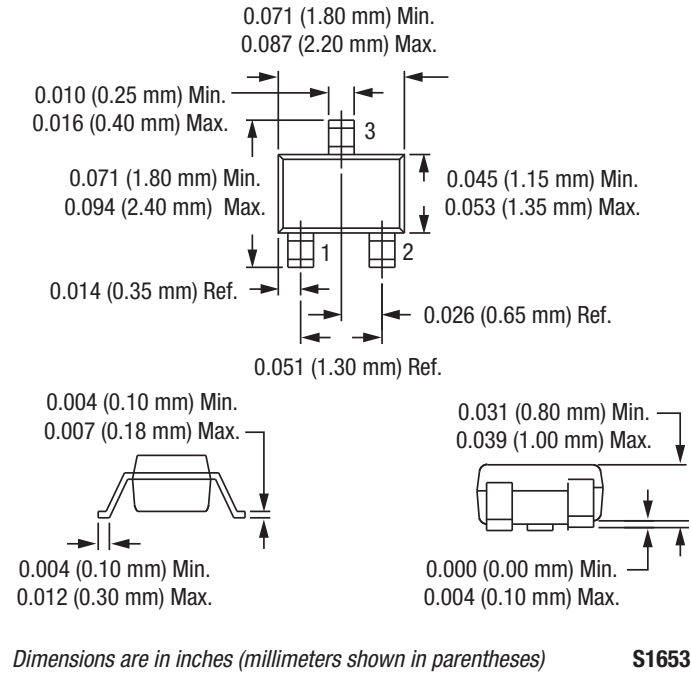


Figure 7. SC-70 Package Dimension Drawing

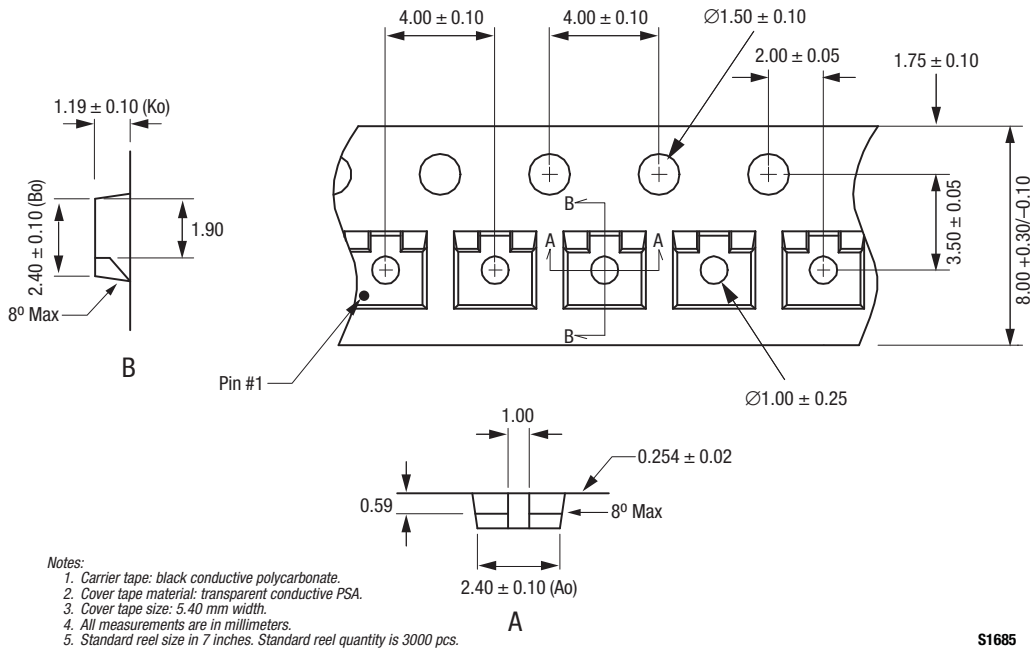
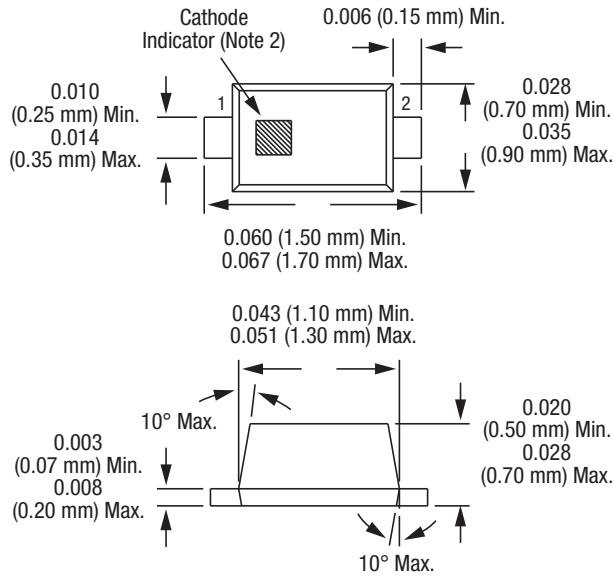


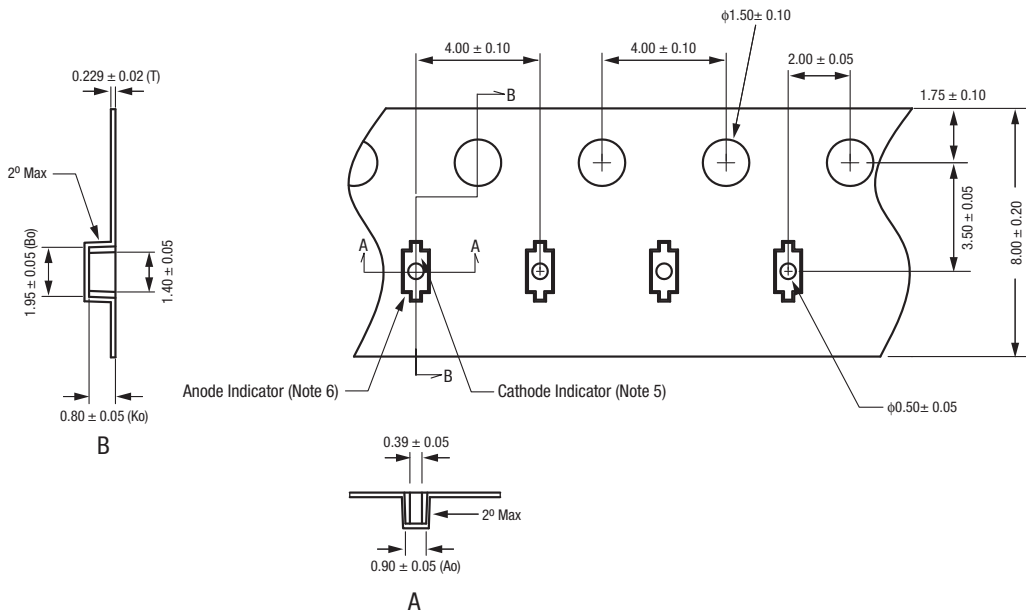
Figure 8. SC-70 Tape and Reel Dimensions



Notes:  
 1. Dimensions are in inches (millimeters shown in parentheses).  
 2. Cathode indicator for SMS7621-079LF  
 Anode indicator for SMS7630-079LF

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Figure 9. SC-79 Package Dimension Drawing



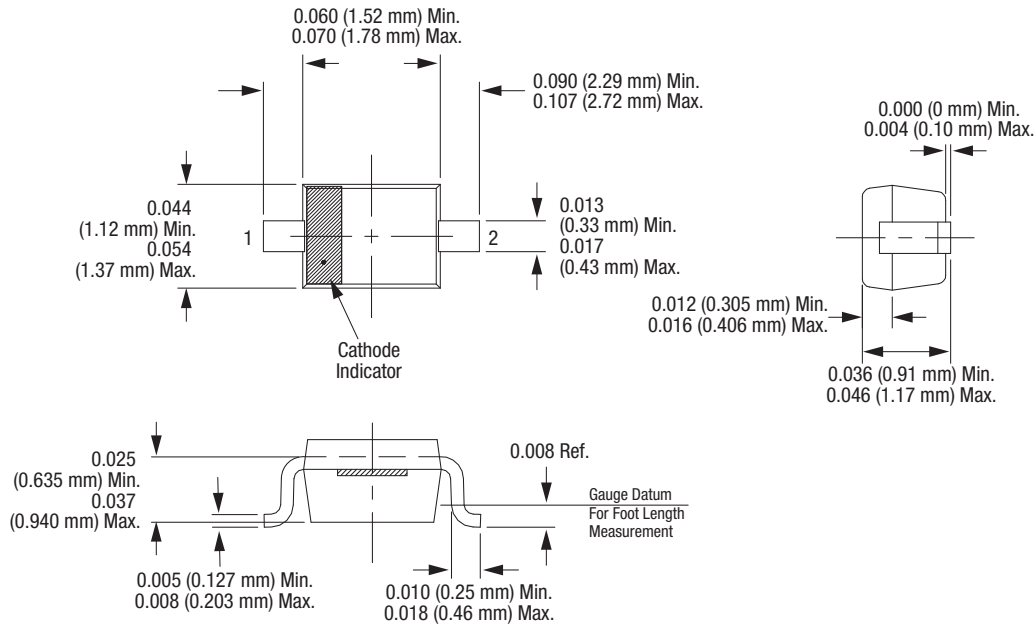
Notes:  
 1. Carrier tape: black conductive polycarbonate or polystyrene.  
 2. Cover tape material: transparent conductive PSA.  
 3. Cover tape size: 5.4 mm width.  
 4. All measurements are in millimeters.  
 5. Cathode indicator for SMS7621-079LF  
 6. Anode indicator for SMS7630-079LF  
 7. Standard reel size in 7 inches. Standard reel quantity is 3000 pcs.

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Figure 10. SC-79 Tape and Reel Dimensions



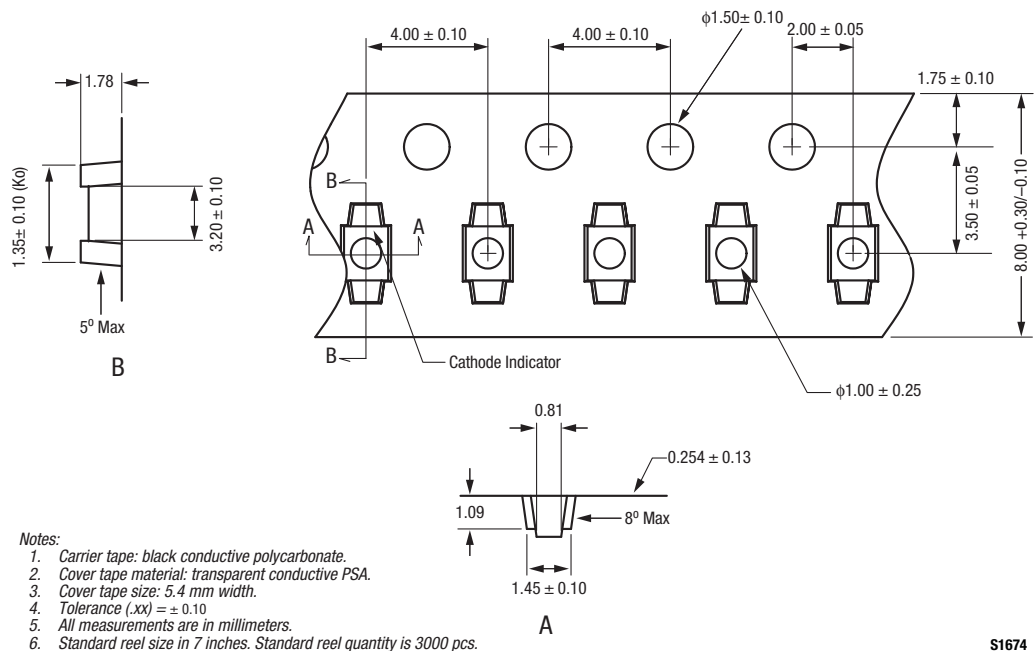




Dimensions are in inches (millimeters shown in parentheses)

S1619

Figure 13. SOD-323 Package Dimension Drawing



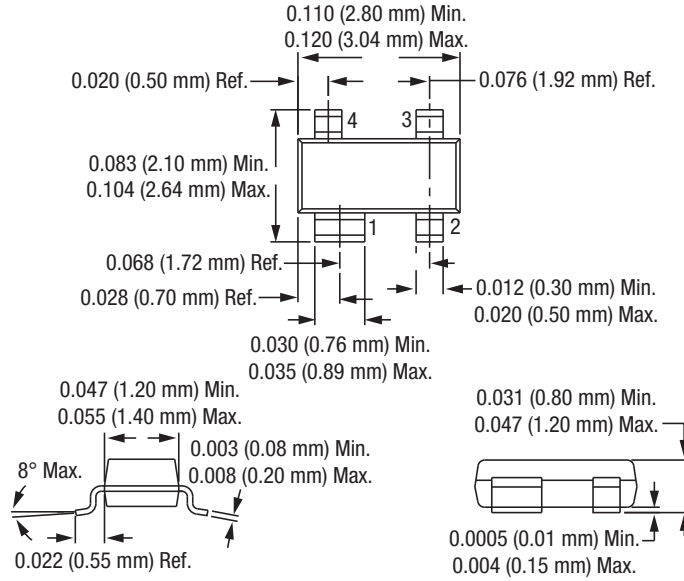
Notes:

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 in 7 inches. Standard reel quantity is 3000 pcs.

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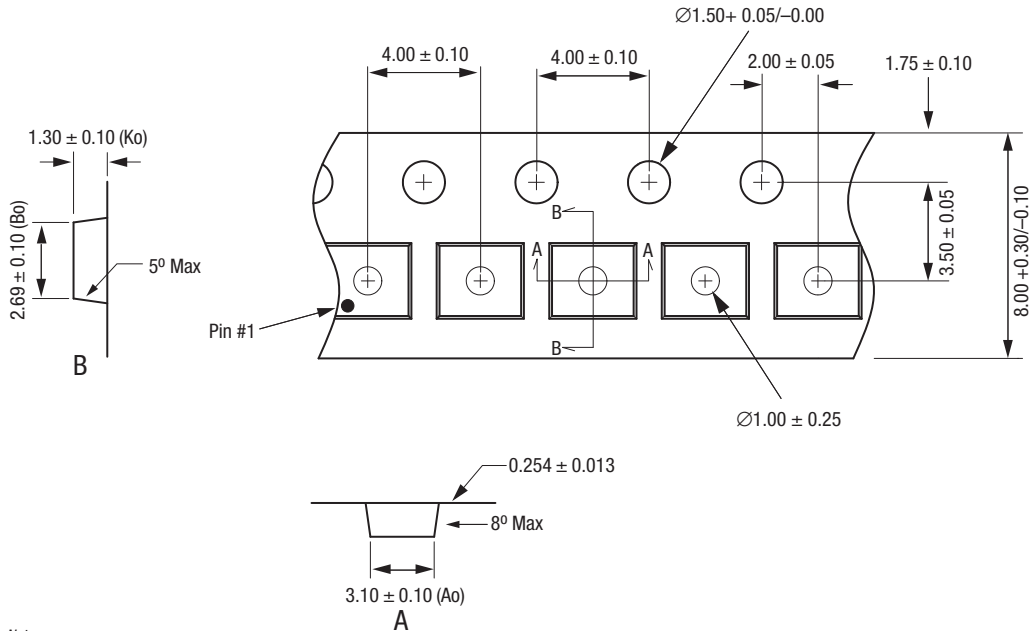
Figure 14. SOD-323 Tape and Reel Dimensions





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

**Figure 17. 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  $\pm 0.10$  mm.
  5. All measurements are in millimeters.
  6. Standard reel size in 7 inches. Standard reel quantity is 3000 pcs.

**S1683**

**Figure 18. SOT-143 Tape and Reel Dimensions**

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