

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)



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.



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
				SMS1546-005 Marking: SG2
				SMS1546-005LF Green™ Marking: XG2
		SMS7621-001 Marking: SH1		◆ SMS7621-005 Marking: SH2
◆ SMS7621-079LF Marking: Cathode		SMS7621-001LF Green™ Marking: XH1		◆ SMS7621-005LF Green™ Marking: XH2
		SMS7630-001 Marking: SD1		SMS7630-005 Marking: SD2
◆ SMS7630-079LF Marking: Anode	SMS7630-011LF Marking: XD	SMS7630-001LF Green™ Marking: XD1		SMS7630-005LF 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
			SMS7621-074 Marking: SH3	SMS7621-075 Marking: SH2
			SMS7621-074LF Green™ Marking: XH3	SMS7621-075LF Green™ 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 Green™
◆ SMS7621-006 Marking: SH8	SMS7621-015 Marking: SH7		SMS7621-517 Marking: H Pb-Free	
◆ SMS7621-006LF Green™ Marking: XH8	SMS7621-015LF Marking: XH7			SMS7621-081LF Marking: XHQ
◆ SMS7630-006 Marking: SD8		◆ SMS7630-020 Marking: SD0	SMS7630-517 Marking: D Pb-Free	
◆ SMS7630-006LF Green™ Marking: XD8		◆ SMS7630-020LF 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.

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. Surface Mount Mixer and Detector Diodes 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. Surface Mount Mixer and Detector Diodes Electrical Specifications (Note 1)
($T_A = +25$ °C Per Junction, Unless Otherwise Noted)

Part Number	Barrier	Minimum V_B @ 10 μA (V)	Typical C_T @ 0 V (pF)	V_F @ 1 mA (mV)	Maximum Pair Configuration ΔV_F @ 1 mA (mV)	Maximum R_T (Note 2) (Ω)
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. Surface Mount Mixer and Detector Diodes Electrical Specifications (Note 1)
 (TA = +25 °C Per Junction, Unless Otherwise Noted)

Part Number	Minimum V _B @ 100 μ A (V)	Typical C _T @ 0.15 V (pF)	V _F @ 0.1 mA (mV)	V _F @ 1 mA (mV)	Maximum Pair Configuration Δ V _F @ 1 mA (mV)	Typical R _v (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 _s	A	3E-7	4E-8	5E-6
R _s	Ω	4	12	20
N	–	1.04	1.05	1.05
T _T	sec	1E-11	1E-11	1E-11
C _{J0}	pF	0.38	0.1	0.14
M	–	0.36	0.35	0.40
E _g	eV	0.69	0.69	0.69
X _{TI}	–	2	2	2
F _c	–	0.5	0.5	0.5
B _v	V	3	3	2
I _{bv}	A	1E-5	1E-5	1E-4
V _J	V	0.51	0.51	0.34

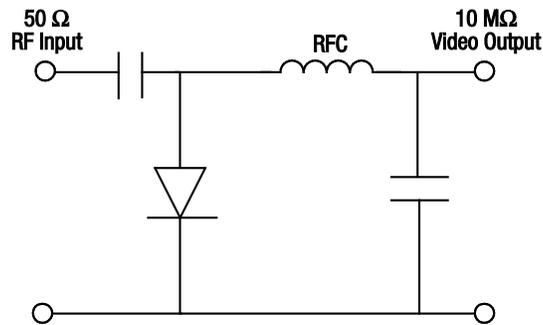


Figure 1. Typical Detector Circuit

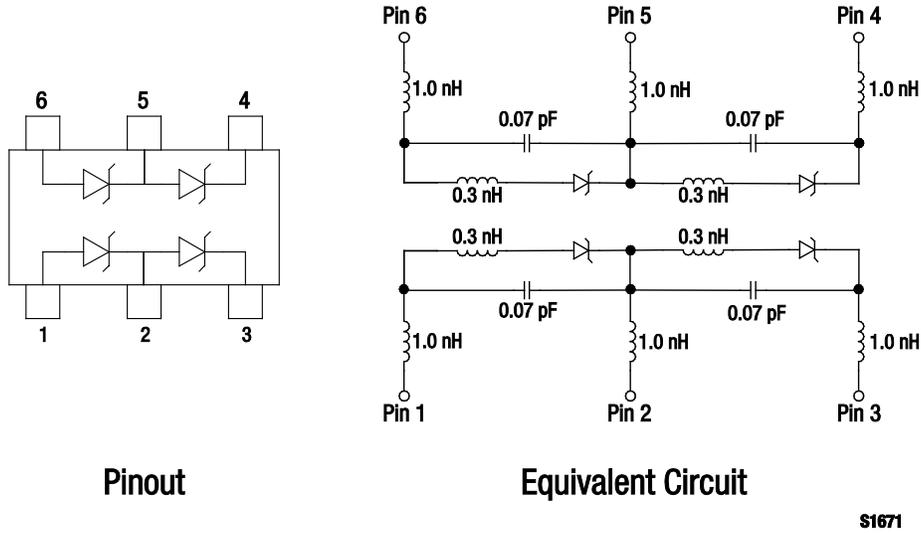


Figure 2. SMS7621-081LF Dual Series Pair Pinout and Equivalent Circuit

Typical Performance Characteristics

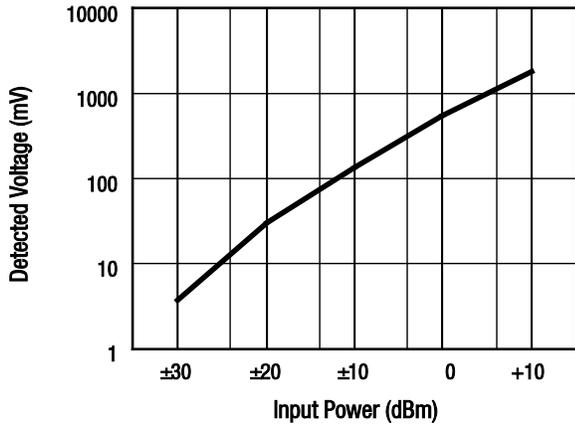


Figure 3. Typical Detector Characteristics @ 1.8 GHz

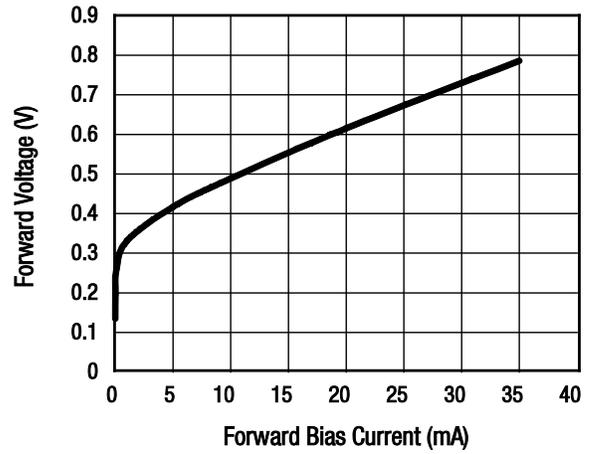
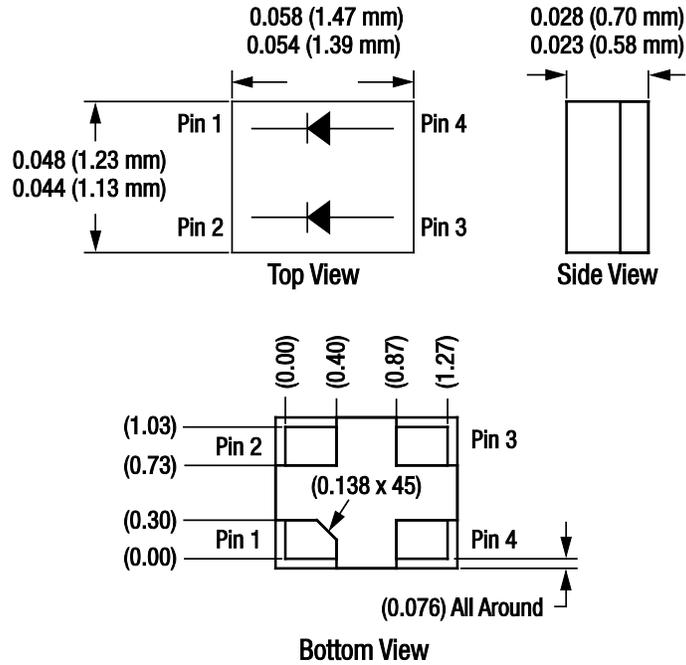


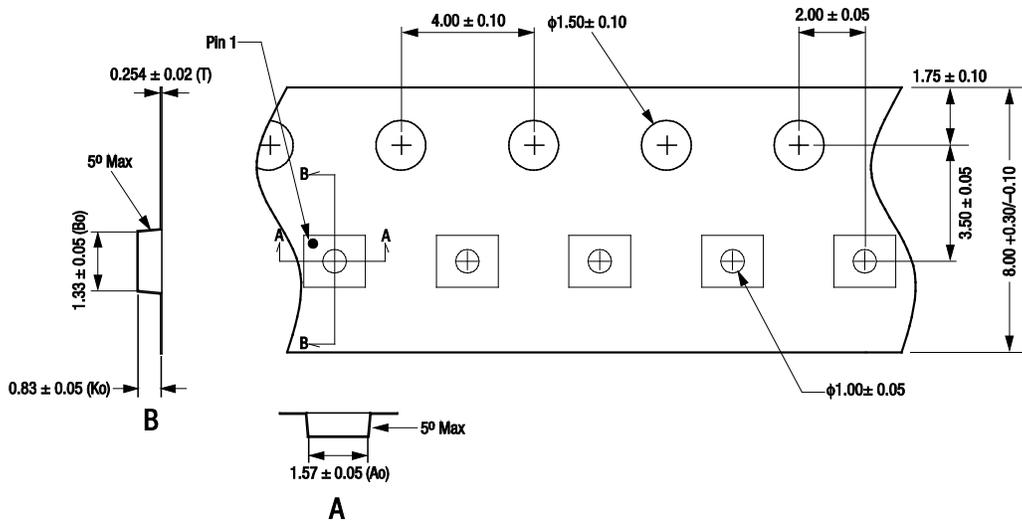
Figure 4. SMS7621-081LF Forward Voltage vs Forward Bias Current



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.

S1882

Figure 6. LGA Tape and Reel Dimensions

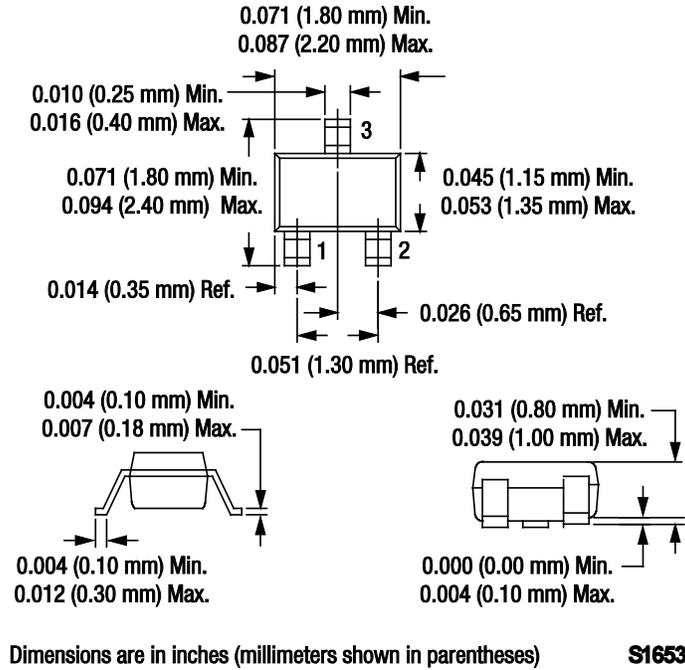
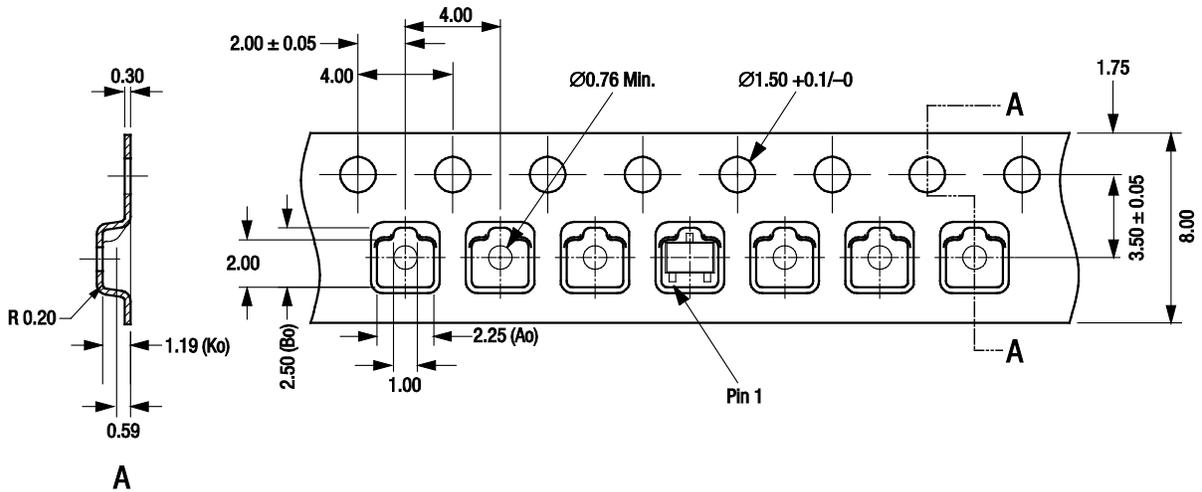


Figure 7. SC-70 Package Dimension Drawing

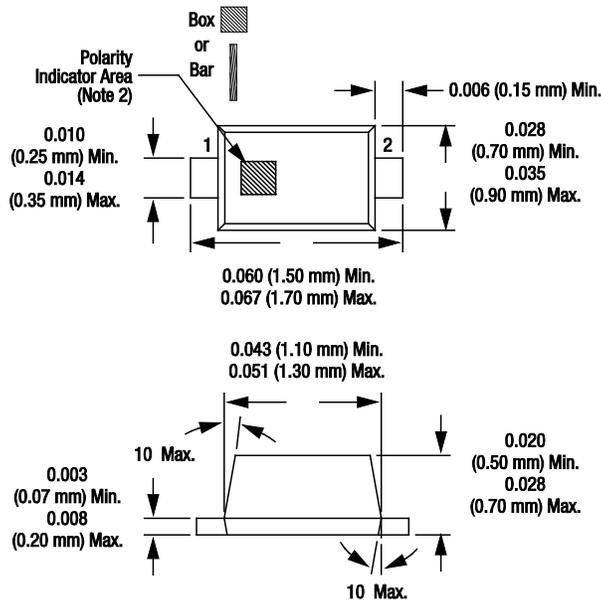


Notes:

1. Carrier tape: black conductive polystyrene bakeable material at 125 °C.
2. Cover tape material: transparent conductive PSA.
3. Cover tape size: 5.40 mm width.
4. ESD surface resistivity is $\geq 1 \times 10^4$ and approx. $\leq 1 \times 10^9$ Ohms/square per EIA, JEDEC TNR Specification.
5. All measurements are in millimeters.

S1685b

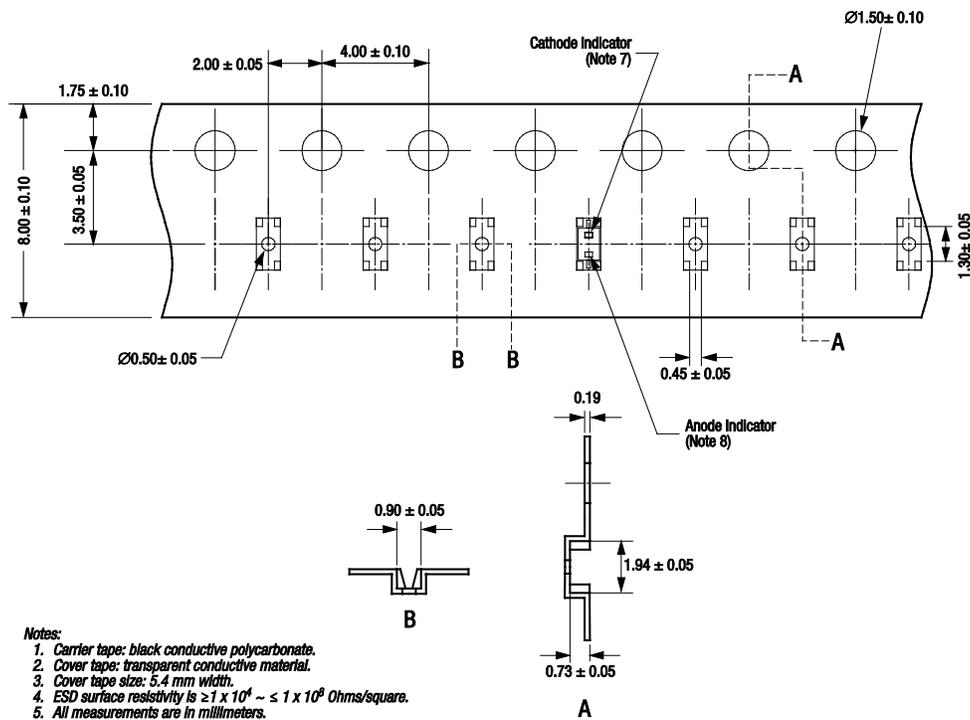
Figure 8. SC-70 Tape and Reel Dimensions



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

S1652a

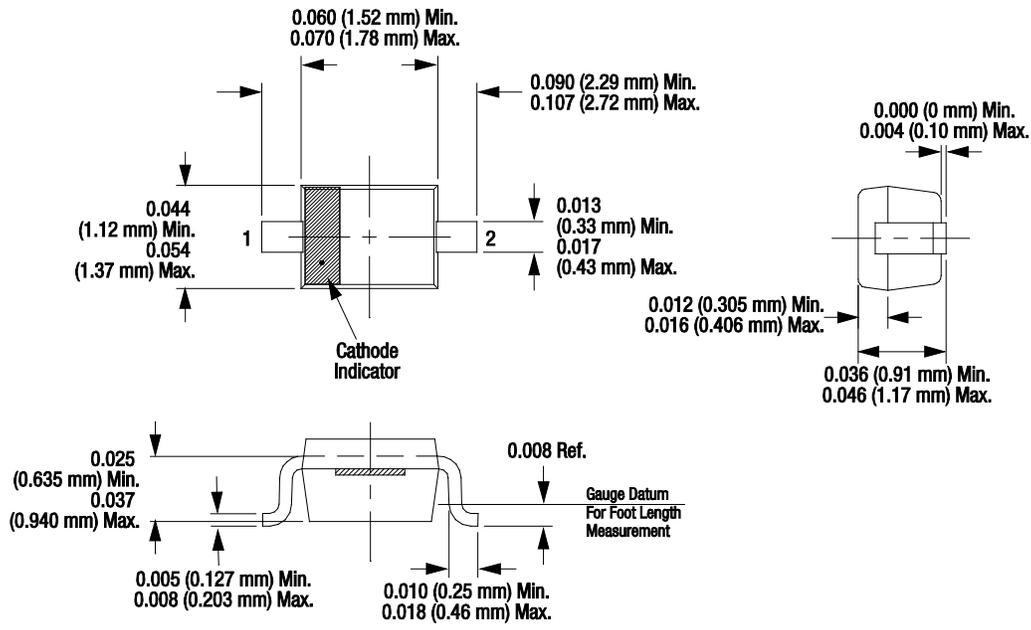
Figure 9. SC-79 Package Dimension Drawing



- Notes:
 1. Carrier tape: black conductive polycarbonate.
 2. Cover tape: transparent conductive material.
 3. Cover tape size: 5.4 mm width.
 4. ESD surface resistivity is $\approx 1 \times 10^4 \sim 1 \times 10^8$ Ohms/square.
 5. All measurements are in millimeters.
 6. Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.
 7. Cathode Indicator for SMS7621-079LF.
 8. Anode Indicator for SMS7630-079LF.

S2188a

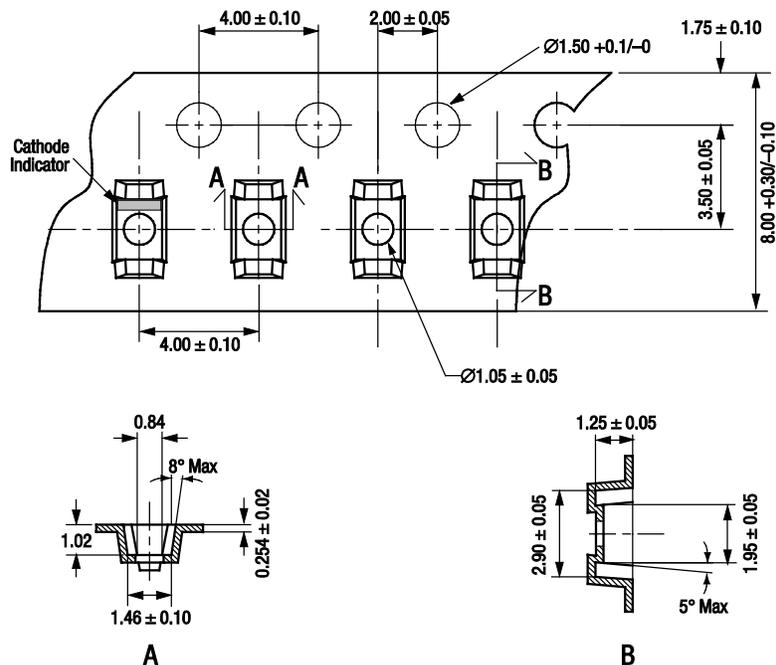
Figure 10. SC-79 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses)

S1619

Figure 13. SOD-323 Package Dimension Drawing



Notes:

1. Carrier tape: black conductive polycarbonate or polystyrene.
2. Cover tape: transparent conductive material.
3. Cover tape size: 5.5 mm width.
4. ESD surface resistivity is $\geq 1 \times 10^5 \sim \leq 1 \times 10^{11}$ Ohms/square.
5. 10 sprocket hole pitch cumulative tolerance: ± 0.20 mm.
6. A_0 and B_0 measured on plane 0.30 mm above bottom of the pocket.
7. All measurements are in millimeters.
8. Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.

S2061

Figure 14. SOD-323 Tape and Reel Dimensions

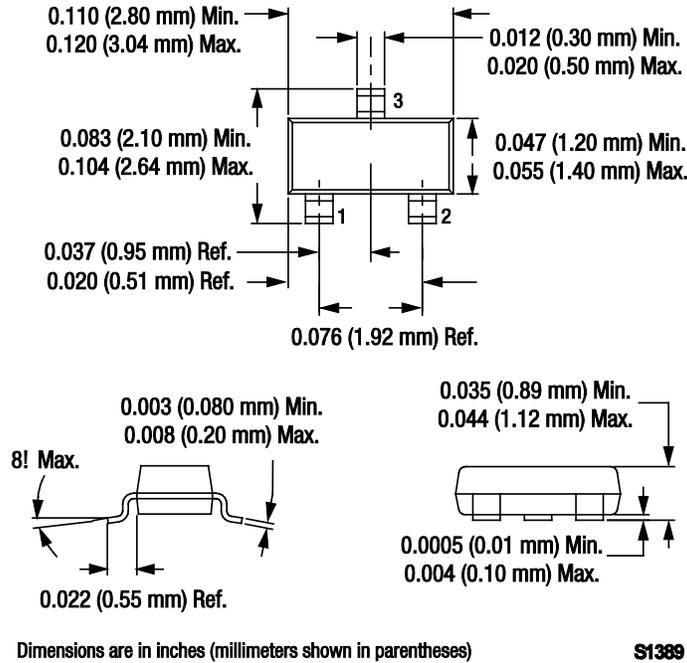


Figure 15. SOT-23 Package Dimension Drawing

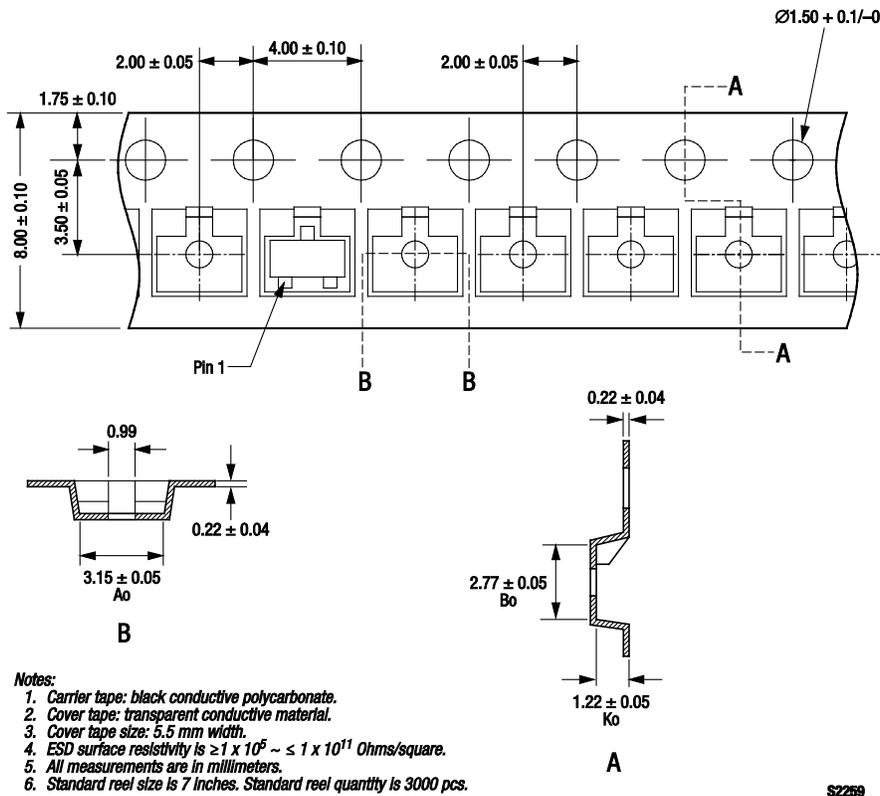
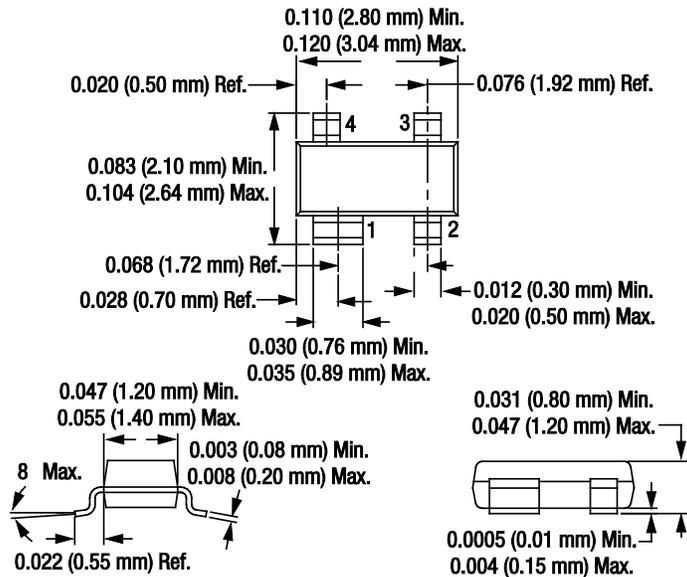
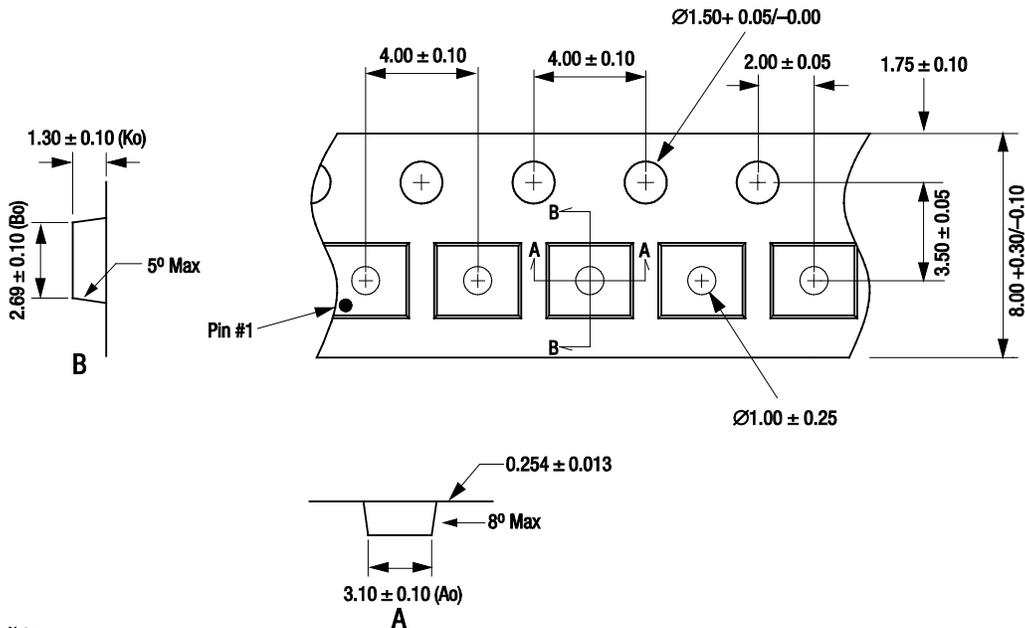


Figure 16. SOT-23 Tape and Reel Dimensions



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 ± 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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