DATA SHEET

SMP1321 Series: Low Capacitance, Plastic Packaged PIN Diodes

Applications

- High-performance wireless switches

Features

- Capacitance: 0.18 pF typical @ 30 V
- Series resistance: 1.05 Ω typical @ 10 mA
- 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

The SMP1321 series of plastic packaged, surface mountable PIN diodes is designed for use in high volume switch applications from 10 MHz to more than 10 GHz. The low capacitance of these diodes (0.25 pF), combined with a low resistance (2.0 Ω maximum at 10 mA), makes the SMP1321 series particularly suited to high isolation, series-connected PIN diode switches in battery operated circuits.

The SMP1321 series is available in a selection of plastic packages and a variety of configurations that include a small footprint SC-79, a low inductance SOT-23, and a miniature SOD-882.

Table 1 describes the various packages and marking of the SMP1321 series.

Table 1. SMP1321 Series Packaging and Marking

				
Common Anode	Series Pair	Low Inductance	Single	Single
SOT-23	SOT-23	SOT-23	SC-79 Green™	SOD-882 Green™
SMP1321-003 Marking: PM9	♦**SMP1321-005** Marking: PM2	**SMP1321-007** Marking: PMB		
SMP1321-003LF Green™ Marking: RM9	♦**SMP1321-005LF** Green™ Marking: RM2	**SMP1321-007LF** Green™ Marking: RMB	**SMP1321-079LF** Marking: Cathode and C6	**SMP1321-040LF** Marking: C
L_S = 1.5 nH	L_S = 1.5 nH	L_S = 0.4 nH	L_S = 0.7 nH	L_S = 0.45 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.

SMP1321-007

For the -007 configuration of the SOT-23 package, the package inductance is effectively reduced to 0.4 nH compared to the 1.5 nH value of the standard configuration. This lower inductance is particularly beneficial when the diodes are used as shunt connected switches at frequencies higher than 500 MHz in which inductance is the primary limitation on maximum switch isolation.

To achieve the effective 0.4 nH, the SOT-23 package must be inserted in the microstrip circuit board with a gap in the trace, as shown in Figure 1. Because of the polarity of the diode junction, this low inductance feature is realizable only with the cathode connected to ground.

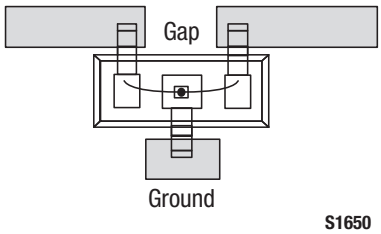


Figure 1. SOT-23 Package Trace Gap

Electrical and Mechanical Specifications

The part number and configuration for the SMP1321 series are provided in Table 1. The absolute maximum ratings of the SMP1321 series are provided in Table 2. Electrical specifications are provided in Table 3. Resistance versus temperature measurements are provided in Table 4.

Typical performance characteristics of the SMP1321 series are illustrated in Figures 2 to 5.

Package Dimensions

Package dimensions are shown in Figures 6 to 10 (even numbers), and tape and reel dimensions are provided in Figures 7 to 11 (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 SMP1321 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 2. SMP1321 Series Absolute Maximum Ratings (Per Junction) (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V_R		100	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
Electrostatic discharge: Human Body Model (HBM), Class 1A	ESD		 500	 V

Note 1: 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.*

Table 3. SMP1321 Series Electrical Specifications (Per Junction) (Note 1)
(T_A = +25 °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	I_R	V_R = 100 V			10	µA
Capacitance (Note 2)	C_T	F = 1 MHz, V = 30 V		0.18	0.25	pF
Resistance	R_S	F = 100 MHz I = 1 mA I = 10 mA		 3.00 1.05	 2.00	 Ω Ω
Forward voltage	V_F	I_F = 10 mA		0.85		V
Carrier lifetime	TI	I_F = 10 mA		0.4		µs
I region width				15		µm

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

Note 2: C_T is 0.4 pF maximum for the SMP1321-007.

Table 4. Resistance vs Temperature @ 500 MHz (Per Junction)

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	47.4	50.0	56.3	61.5	65.1
0.10	12.0	12.6	13.9	15.4	16.4
0.3	5.2	5.4	5.8	6.4	6.9
0.5	3.6	3.8	4.1	4.5	4.8
1.0	2.4	2.5	2.6	2.8	3.1
10	1.03	1.04	1.04	1.07	1.15
20	0.871	0.888	0.873	0.889	0.956
100	0.669	0.659	0.642	0.645	0.695

Typical Performance Characteristics (Per Junction)

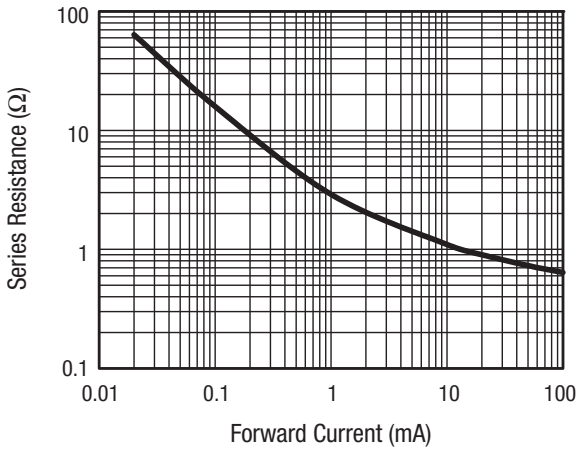


Figure 2. Series Resistance vs Current @ 100 MHz

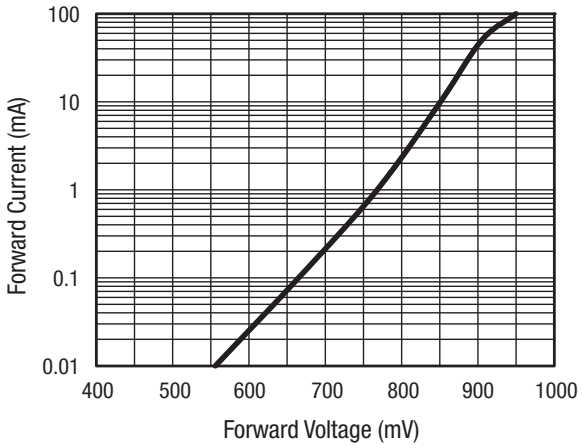


Figure 3. DC Characteristics

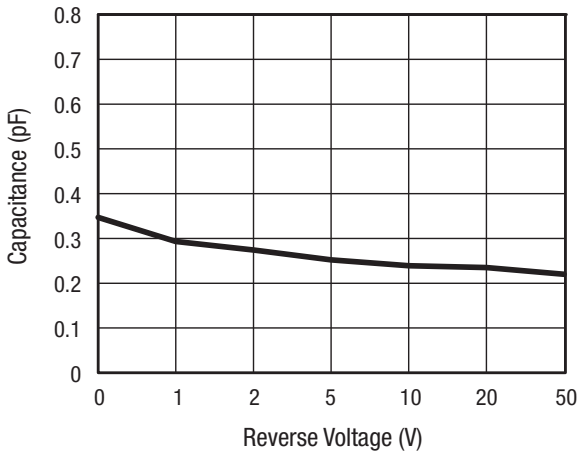


Figure 4. Capacitance vs Reverse Voltage (1 MHz to 1 GHz)

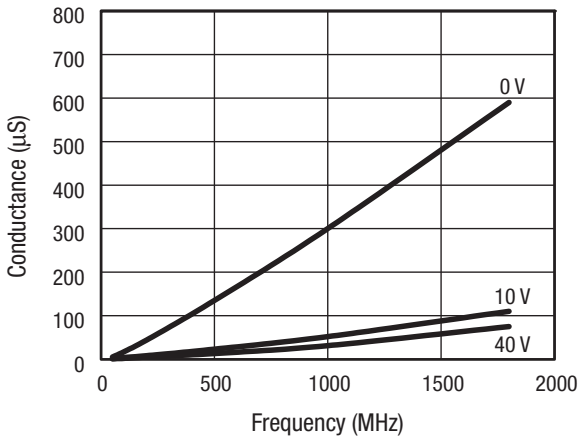
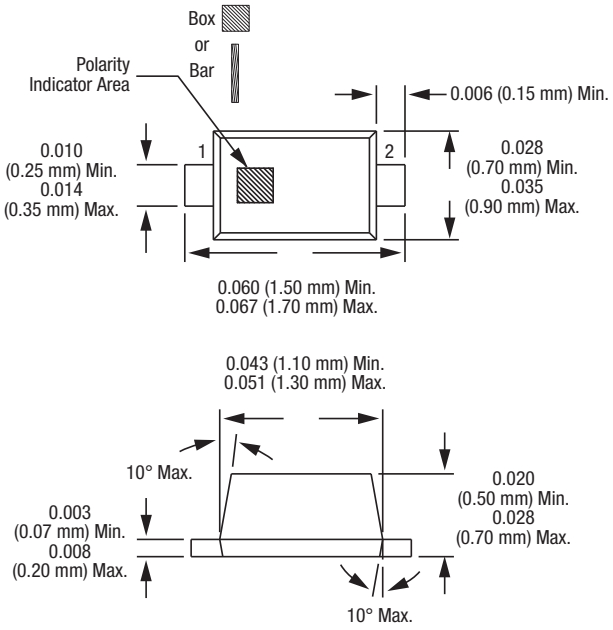
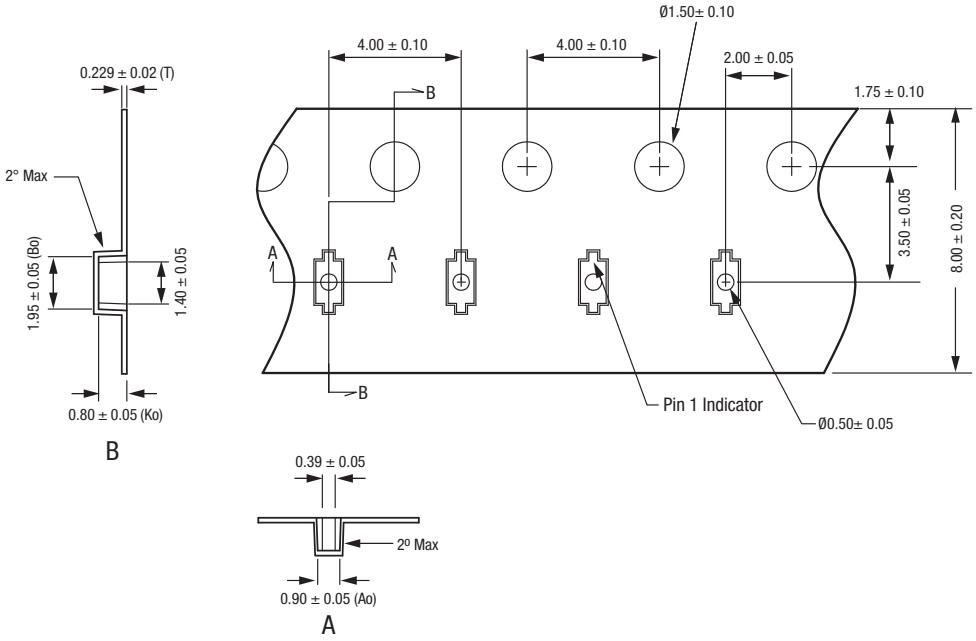


Figure 5. Conductance vs Frequency and Reverse Voltage



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

Figure 6. 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. *ESD-surface resistivity is ≤1 x 10^8 Ohms/square per EIA, JEDEC TNR Specification.*
5. *All measurements are in millimeters.*

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Figure 7. SC-79 Tape and Reel Dimensions

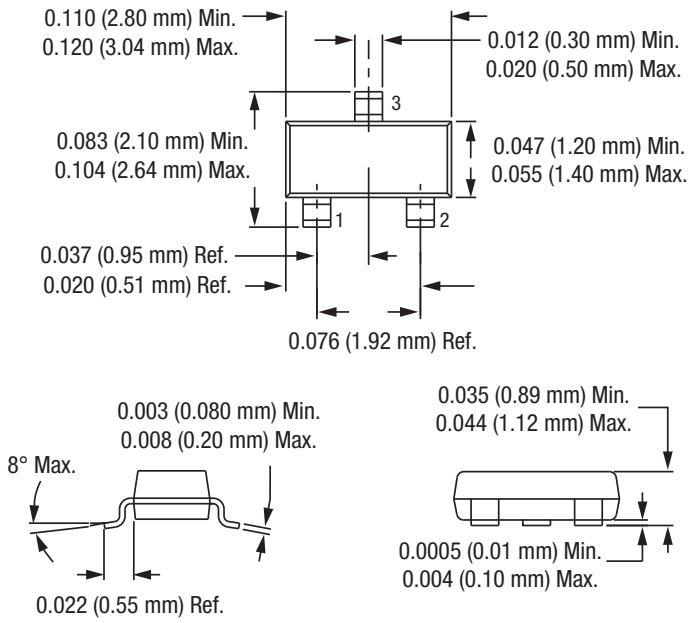
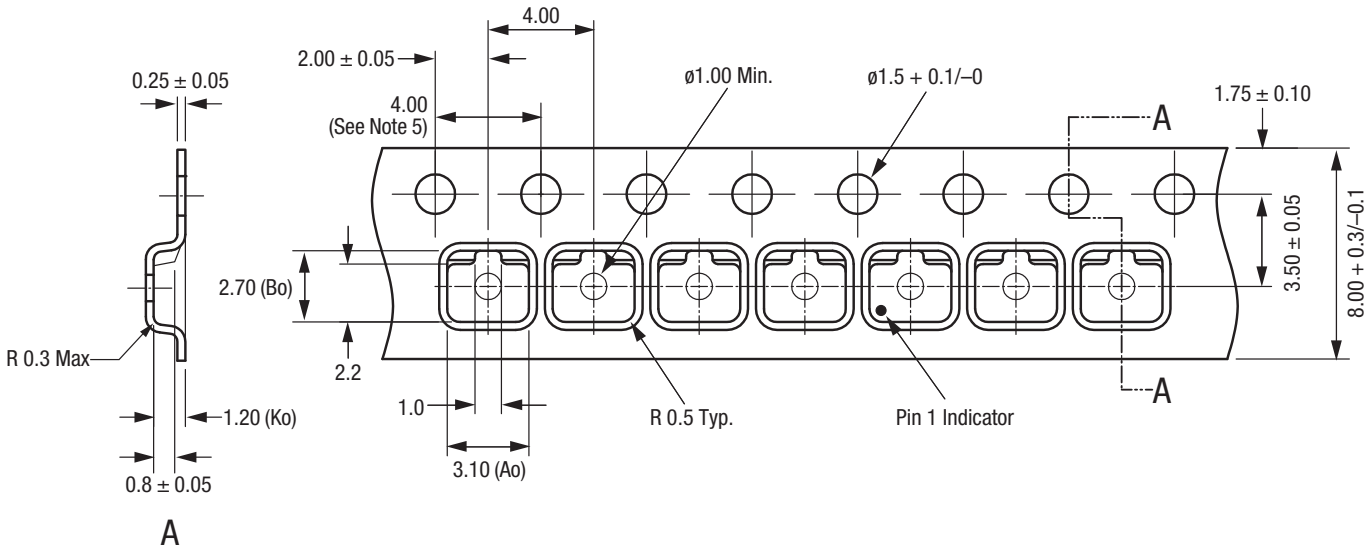


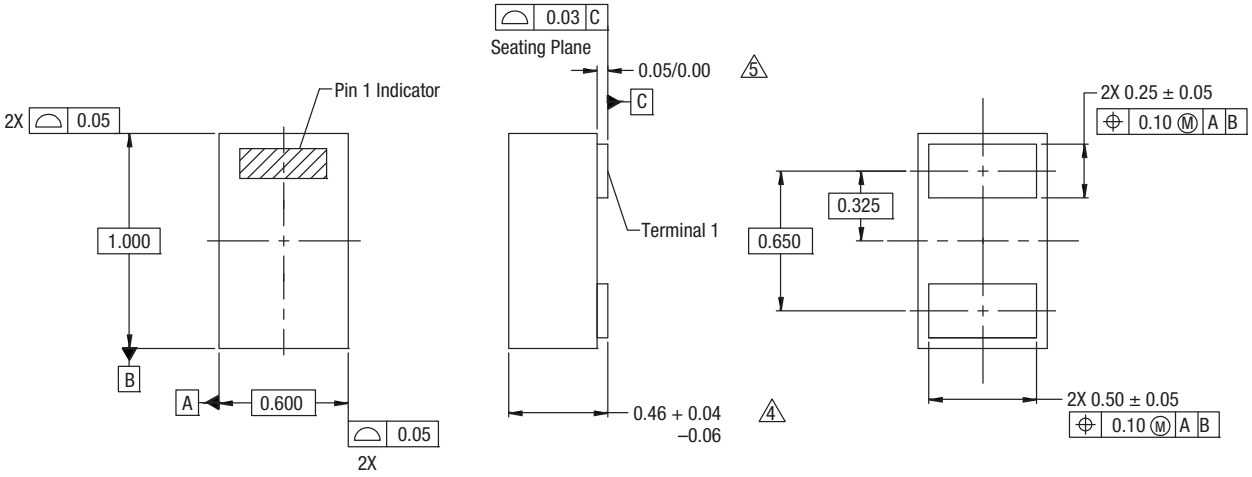
Figure 8. SOT-23 Package Dimension Drawing



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. *Ten sprocket hole pitch cumulative tolerance: ±0.2 mm.*
6. *All measurements are in millimeters.*
7. *Alternative carrier tape dimensions are:*
   Ao = 3.3
   Bo = 2.9
   Ko = 1.22

S1684b

Figure 9. SOT-23 Tape and Reel Dimensions

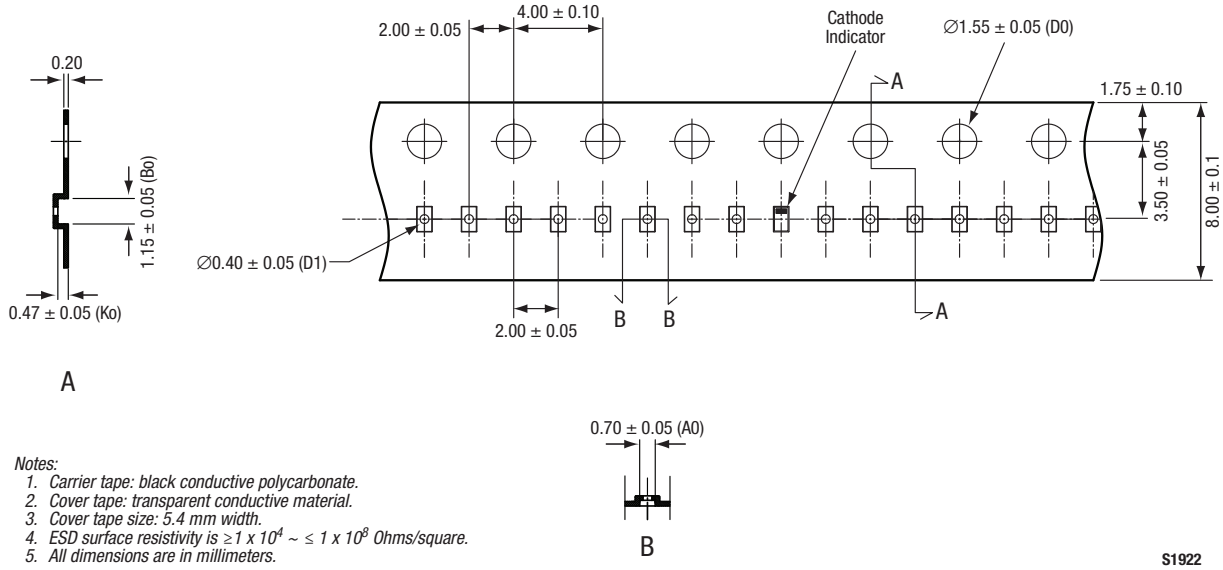


NOTES:

1. *All measurements are in millimeters.*
2. *Dimensions and tolerances according to ASME Y14.5M-1994.*
3. *These packages are used principally for discrete devices.*
4. *This dimension includes stand-off height and package body thickness, but does not include attached features, e.g., external heatsink or chip capacitors. An integral heatslug is not considered an attached feature.*
5. *This dimension is primarily terminal plating, but does not include small metal protrusion.*

Y1410

Figure 10. SOD-882 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 $\geq 1 \times 10^4 \sim \leq 1 \times 10^8$ Ohms/square.*
5. *All dimensions are in millimeters.*

S1922

Figure 11. SOD-882 Tape and Reel Dimensions

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