DATA SHEET

SMP1320 Series: Low Resistance, Low Capacitance, Plastic Packaged PIN Diodes

Applications

- High-volume wireless applications

Features

- Resistance: 0.9 Ω
- Capacitance: 0.3 pF
- Packages rated MSL1, 260 °C per JEDEC J-STD-020)

NEW

Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances) compliant packaging.

Description

The SMP1320 series of plastic packaged, surface mountable PIN diodes is designed for use in high volume switch applications from 10 MHz to more than 2 GHz. The low current performance of these diodes (0.9 Ω maximum at 10 mA and 2 Ω typical at 1 mA) makes the SMP1320 series particularly suited to battery operated circuits.

The SMP1320 series is available in a selection of plastic packages and a variety of configurations that include a low inductance SOT-23 (0.4 nH), a small footprint SC-79, and a miniature SC-70. Table 1 describes the various packages and marking of the SMP1320 series.

Table 1. SMP1320 Series Packaging and Marking

							
Single	Common Anode	Common Cathode	Series Pair	Low Inductance	Single	Ultra-Low Inductance	Single
SOT-23	SOT-23	SOT-23	SOT-23	SOT-23	SOD-323	SOT-143	SC-79
SMP1320-001 Marking: PL1	**SMP1320-003** Marking: PL9	**SMP1320-004** Marking: PL3	**SMP1320-005** Marking: PL2	**SMP1320-007** Marking: PLB		**SMP1320-017** Marking: PLF	
SMP1320-001LF Marking: RL1	**SMP1320-003LF** Marking: RL9	**SMP1320-004LF** Marking: RL3	**SMP1320-005LF** Marking: RL2	**SMP1320-007LF** Marking: RLB	**SMP1320-011LF** Marking: RL	**SMP1320-017LF** Marking: RLF	♦**SMP1320-079LF**
L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH	L_S = 0.4 nH	L_S = 1.5 nH	L_S = 0.2 nH	L_S = 0.7 nH
		SC-70	SC-70	SC-70			
		SMP1320-074	**SMP1320-075**	**SMP1320-077**			
		SMP1320-074LF Marking: RL3	**SMP1320-075LF** Marking: RL2	**SMP1320-077LF** Marking: RLB			
		L_S = 1.4 nH	L_S = 1.4 nH	L_S = 0.4 nH			

LF denotes lead (Pb)-free, RoHS-compliant packaging option as an alternative to the standard Skyworks tin/lead (Sn/Pb) packaging.

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SMP1320-007

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.

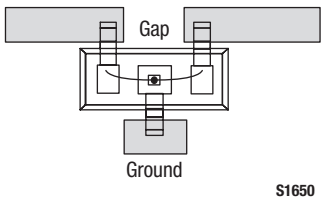


Figure 1. SOT-23 Package Trace Gap

Electrical and Mechanical Specifications

The part number and configuration for the SMP1320 series are provided in Table 1. The absolute maximum ratings of the SMP1320 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 SMP1320 series are illustrated in Figures 2 to 5. Package dimensions are shown in Figures 6 to 10.

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 SMP1320 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. For packaging details, refer to the Skyworks Application Note *Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation*, document number 200083.

Table 2. SMP1320 Series Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V_R		50	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 SMP1320 series PIN diodes are Class 1B ESD devices.*

Table 3. SMP1320 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 = 50 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		 2	 0.9	 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				8		µm

Note 1: Performance is guaranteed only under the conditions listed in this Table and is not guaranteed over the full operating or storage temperature ranges. Operation at elevated temperatures may reduce reliability of the device.

Note 2: C_T @ 30 V is 0.45 pF maximum for the SMP1320-007, SMP1320-007LF, and SMP1320-077.
C_T @ 30 V is 0.5 pF maximum for the SMP1320-017.

Table 4. Resistance vs Temperature @ 500 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	29.6	29.2	30.8	32.0	32.7
0.10	7.2	7.7	8.3	8.8	8.8
0.3	3.4	3.6	3.8	4.0	4.1
0.5	2.5	2.7	2.8	2.9	3.0
1.0	1.7	1.8	1.9	2.0	1.9
10	0.84	0.85	0.76	0.76	0.67
20	0.73	0.73	0.64	0.64	0.56
100	0.59	0.57	0.47	0.48	0.40

Typical Performance Characteristics

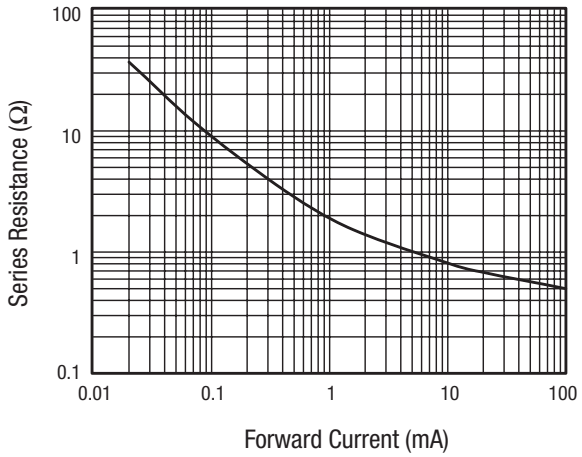


Figure 2. Series Resistance vs Current @ 100 MHz

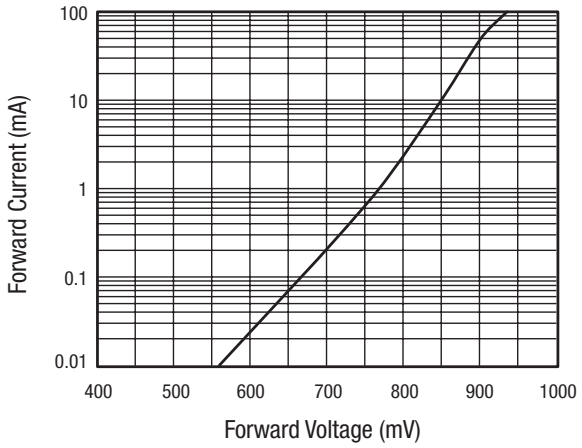


Figure 3. DC Characteristics

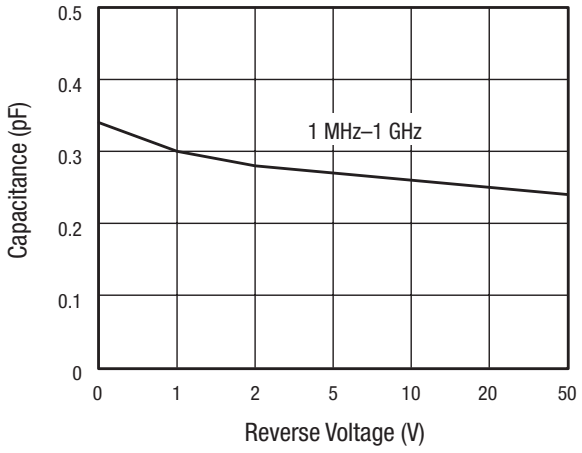


Figure 4. Capacitance vs Reverse Voltage

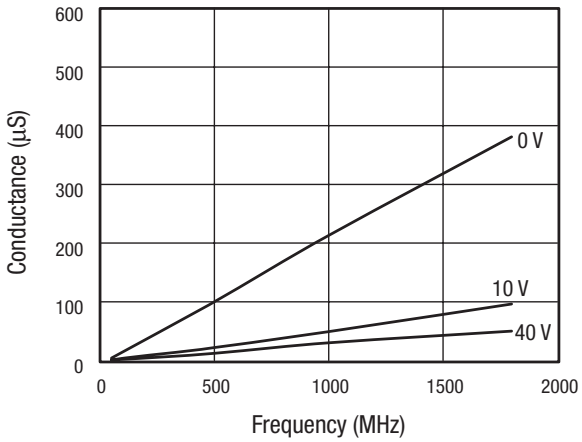
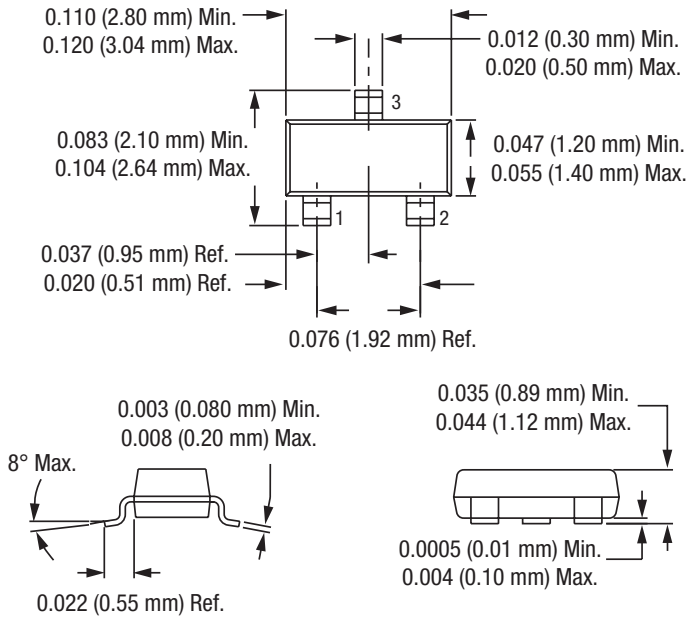
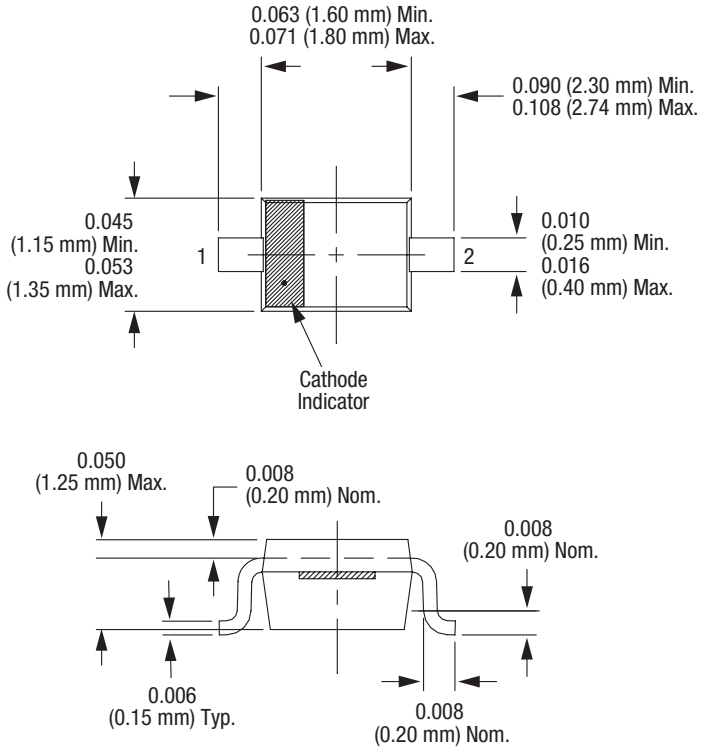


Figure 5. Conductance vs Frequency and Reverse Voltage



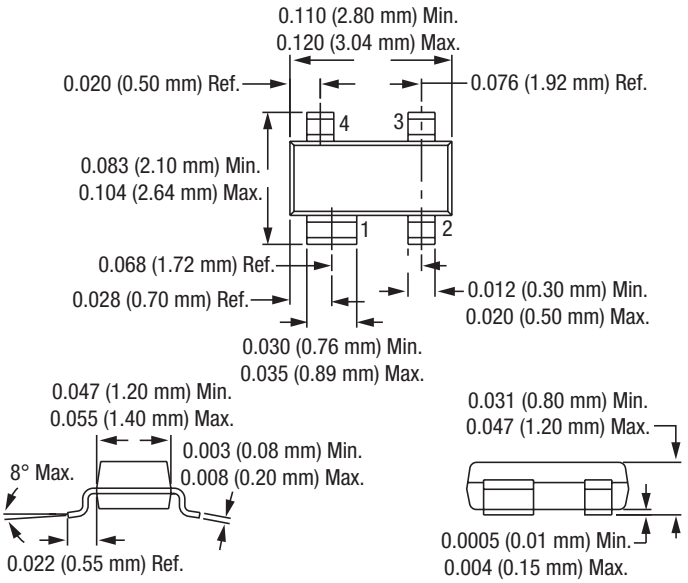
Dimensions are in inches (millimeters shown in parentheses) **S1389**

Figure 6. SOT-23 Package Dimension Drawing



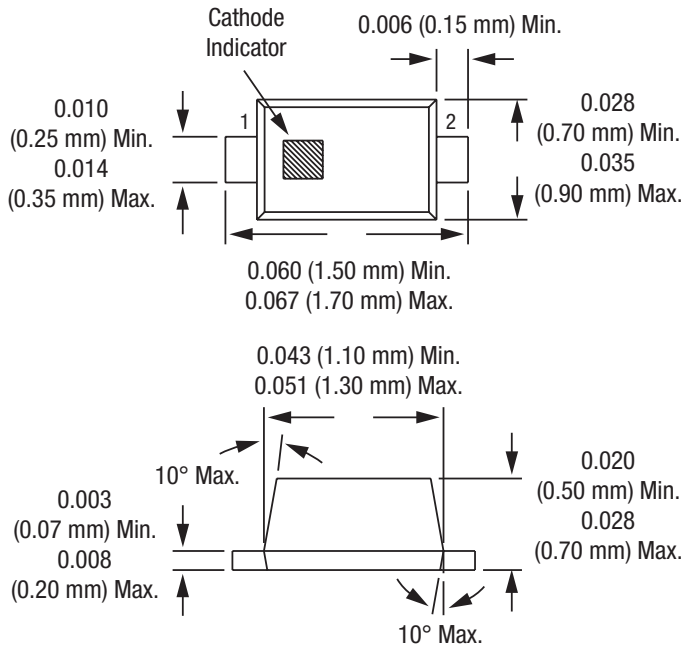
Dimensions are in inches (millimeters shown in parentheses) **S1619**

Figure 7. SOD-323 Package Dimension Drawing



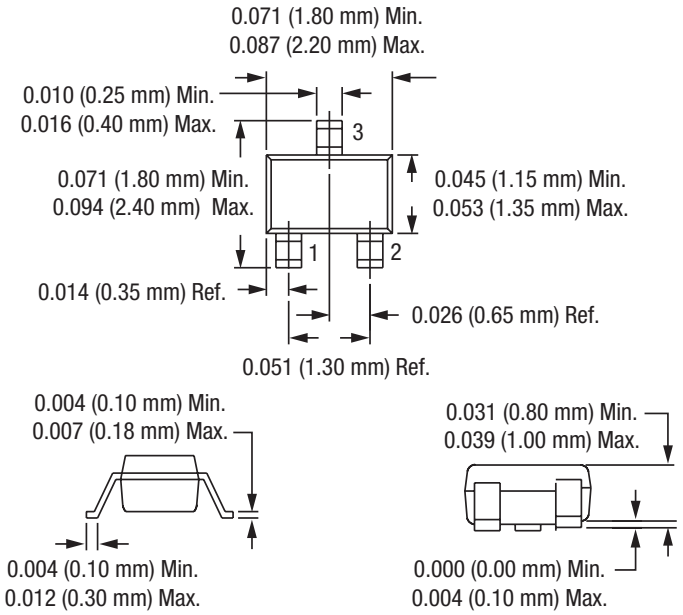
Dimensions are in inches (millimeters shown in parentheses) **S1651**

Figure 8. SOT-143 Package Dimension Drawing



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

Figure 9. SC-79 Package Dimension Drawing



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

Figure 10. SC-70 Package Dimension Drawing