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

Features

- Designed for high-performance wireless switch applications
- 0.9 Ω resistance, 0.3 pF capacitance
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020
- Available in tape and reel packaging

Description

The SMP1320 series of plastic packaged, surface mountable PIN diodes is designed for high-volume switch applications from 10 MHz to beyond 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. Available in a selection of plastic packages and in a variety of configurations including a low inductance (0.4 nH) SOT-23 (SMP1320-007), the small footprint SC-79 and the miniature SC-70.

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

Absolute Maximum Ratings

Characteristic	Value
Reverse voltage (V_R)	50 V
Power dissipation @ 25 °C lead temperature (P_D)	250 mW
Storage temperature (T_{ST})	-65 °C to +150 °C
Operating temperature (T_{OP})	-65 °C to +150 °C
ESD human body model	Class 1B

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

CAUTION: *Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) 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 must be employed at all times.*

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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	SMP1320-011 Marking: PL	SMP1320-017 Marking: PLF	◆SMP1320-079
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 our standard tin/lead (Sn/Pb) packaging.
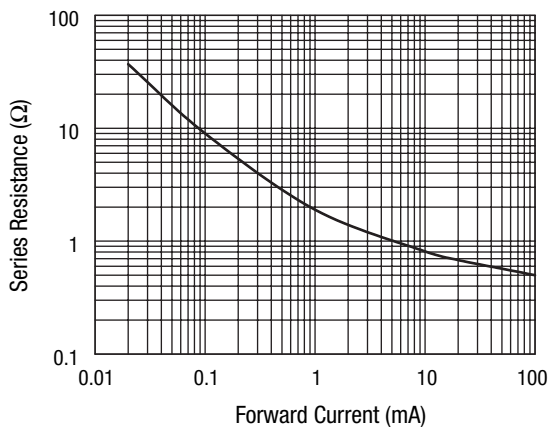
Innovation to Go™
Select Linear Products (indicated by ◆) now available for purchase online.
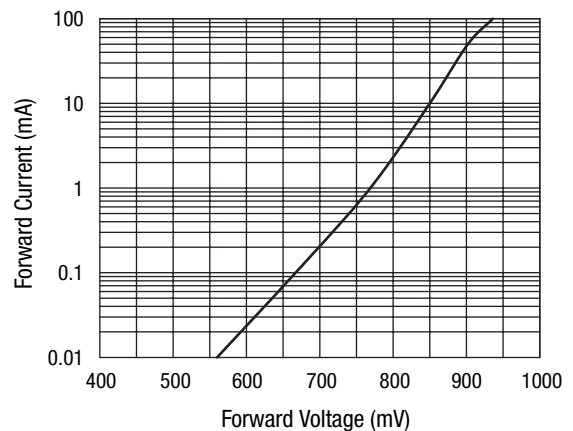
Electrical Specifications at 25 °C

Parameter	Condition	Typ.	Max.	Unit
Reverse current (I_R)	V_R = 50 V		10	µA
Capacitance (C_T)[1]	F = 1 MHz, V = 30 V		0.3	pF
Resistance (R_S)	F = 100 MHz, I = 1 mA	2		Ω
Resistance (R_S)	F = 100 MHz, I = 10 mA		0.9	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

1. 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.
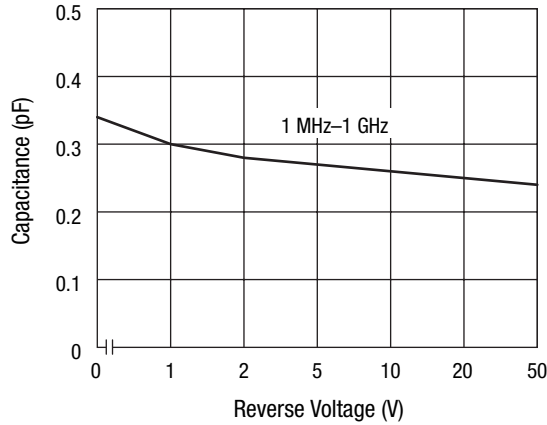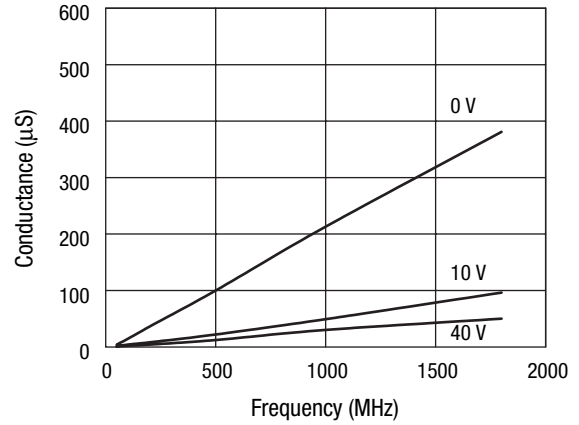
Typical Performance Data

Series Resistance vs. Current @ 100 MHz

DC Characteristic

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Capacitance vs. Reverse Voltage

**Conductance vs. Frequency
and Reverse Voltage**

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	32.7
0.1	7.2	7.7	8.3	8.8	8.8
0.3	3.4	3.6	3.8	4	4.1
0.5	2.5	2.7	2.8	2.9	3
1	1.7	1.8	1.9	2	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	0.4

Recommended Solder Reflow Profiles

Refer to the *"Recommended Solder Reflow Profile"* Application Note.

Tape and Reel Information

Refer to the *"Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation"* Application Note.
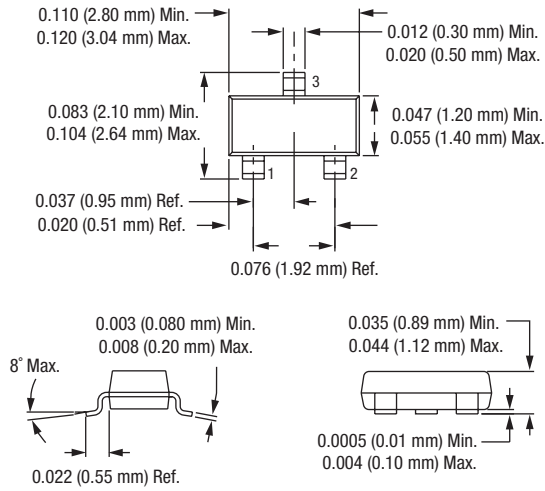
SMP1320-007

In the -007 configuration of the SOT-23 package, the package inductance is effectively reduced to 0.4 nH, in comparison to the 1.5 nH value of the standard configuration. This lower inductance will be particularly beneficial when the diodes are used as shunt connected switches at frequencies higher than 500 MHz, where inductance is the primary limitation on maximum switch isolation.
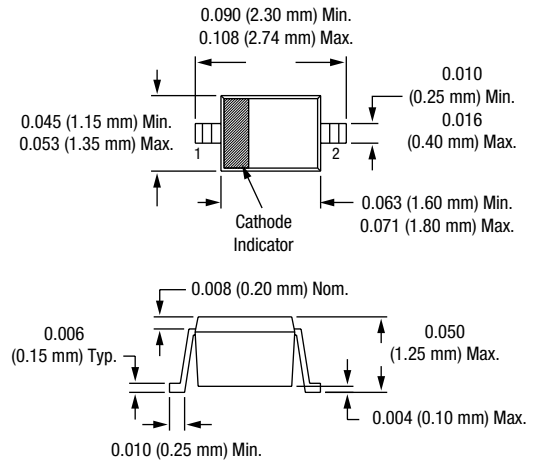
To achieve the effective 0.4 nH, the SOT-23 package must be inserted in the microstrip circuit board with a gap in the trace, as shown in the figure. Because of the polarity of the diode junction, this low inductance feature is realizable only with the cathode connected to ground.
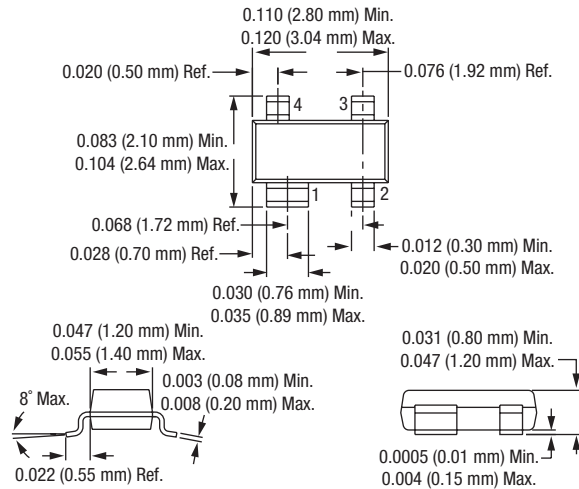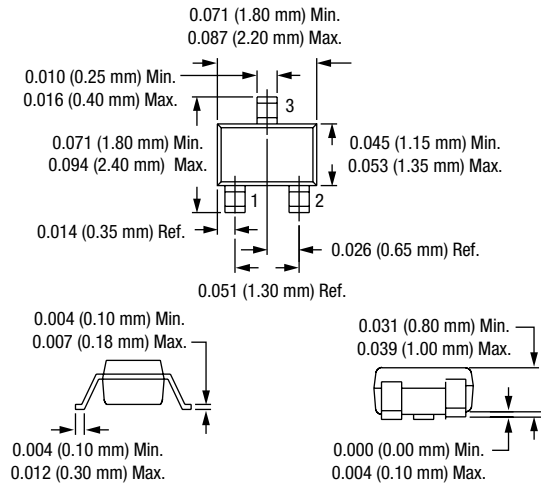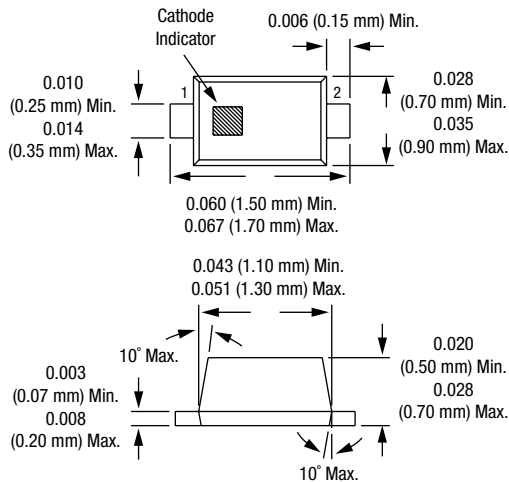
SOT-23

0.110 (2.80 mm) Min.
0.120 (3.04 mm) Max.

0.012 (0.30 mm) Min.
0.020 (0.50 mm) Max.

0.083 (2.10 mm) Min.
0.104 (2.64 mm) Max.

0.047 (1.20 mm) Min.
0.055 (1.40 mm) Max.

3

1   2

0.037 (0.95 mm) Ref.
0.020 (0.51 mm) Ref.

0.076 (1.92 mm) Ref.

0.003 (0.080 mm) Min.
0.008 (0.20 mm) Max.

0.035 (0.89 mm) Min.
0.044 (1.12 mm) Max.

8° Max.

0.022 (0.55 mm) Ref.

0.0005 (0.01 mm) Min.
0.004 (0.10 mm) Max.

SOD-323

0.090 (2.30 mm) Min.
0.108 (2.74 mm) Max.

0.010 (0.25 mm) Min.
0.016 (0.40 mm) Max.

0.045 (1.15 mm) Min.
0.053 (1.35 mm) Max.

1   2

Cathode Indicator

0.063 (1.60 mm) Min.
0.071 (1.80 mm) Max.

0.008 (0.20 mm) Nom.

0.006 (0.15 mm) Typ.

0.050 (1.25 mm) Max.

0.004 (0.10 mm) Max.

0.010 (0.25 mm) Min.

SOT-143

0.110 (2.80 mm) Min.
0.120 (3.04 mm) Max.

0.020 (0.50 mm) Ref.

0.076 (1.92 mm) Ref.

0.083 (2.10 mm) Min.
0.104 (2.64 mm) Max.

4   3

1   2

0.068 (1.72 mm) Ref.
0.028 (0.70 mm) Ref.

0.012 (0.30 mm) Min.
0.020 (0.50 mm) Max.

0.030 (0.76 mm) Min.
0.035 (0.89 mm) Max.

0.047 (1.20 mm) Min.
0.055 (1.40 mm) Max.

0.003 (0.08 mm) Min.
0.008 (0.20 mm) Max.

8° Max.

0.022 (0.55 mm) Ref.

0.031 (0.80 mm) Min.
0.047 (1.20 mm) Max.

0.0005 (0.01 mm) Min.
0.004 (0.15 mm) Max.

SC-70

0.071 (1.80 mm) Min.
0.087 (2.20 mm) Max.

0.010 (0.25 mm) Min.
0.016 (0.40 mm) Max.

0.071 (1.80 mm) Min.
0.094 (2.40 mm) Max.

3

1   2

0.045 (1.15 mm) Min.
0.053 (1.35 mm) Max.

0.014 (0.35 mm) Ref.

0.026 (0.65 mm) Ref.

0.051 (1.30 mm) Ref.

0.004 (0.10 mm) Min.
0.007 (0.18 mm) Max.

0.004 (0.10 mm) Min.
0.012 (0.30 mm) Max.

0.031 (0.80 mm) Min.
0.039 (1.00 mm) Max.

0.000 (0.00 mm) Min.
0.004 (0.10 mm) Max.

SC-79

Cathode Indicator

0.006 (0.15 mm) Min.

0.010 (0.25 mm) Min.
0.014 (0.35 mm) Max.

1   2

0.028 (0.70 mm) Min.
0.035 (0.90 mm) Max.

0.060 (1.50 mm) Min.
0.067 (1.70 mm) Max.

0.043 (1.10 mm) Min.
0.051 (1.30 mm) Max.

10° Max.

0.003 (0.07 mm) Min.
0.008 (0.20 mm) Max.

0.020 (0.50 mm) Min.
0.028 (0.70 mm) Max.

10° Max.

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