

DATA SHEET

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.

| | | | | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|----------------|
| | | | | | | | |
| 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.

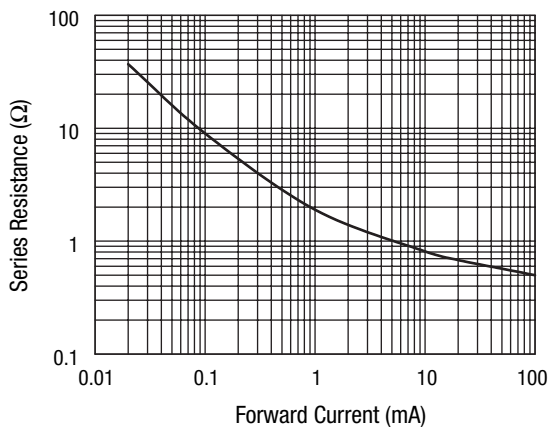
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Electrical Specifications at 25 °C

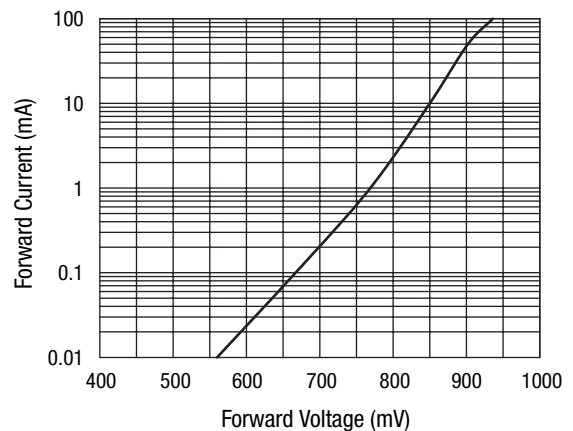
| Parameter | Condition | Typ. | Max. | Unit |
|--------------------------------------|----------------------------|------|------|----------|
| Reverse current (I_R) | $V_R = 50$ V | | 10 | μ A |
| Capacitance (C_T) ⁽¹⁾ | $F = 1$ MHz, $V = 30$ V | | 0.3 | pF |
| Resistance (R_S) | $F = 100$ MHz, $I = 1$ 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 (τ) | $I_F = 10$ mA | 0.4 | | μ s |
| I region width | | 8 | | μ m |

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.

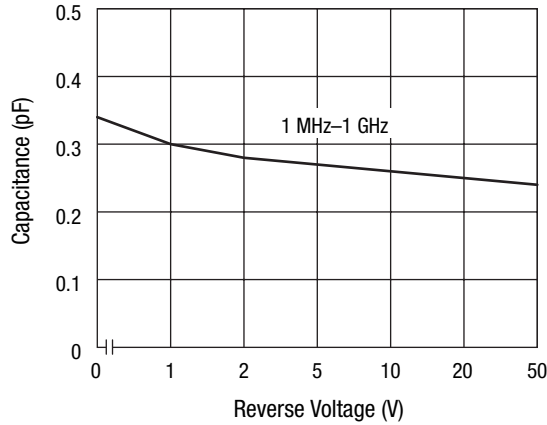
Typical Performance Data



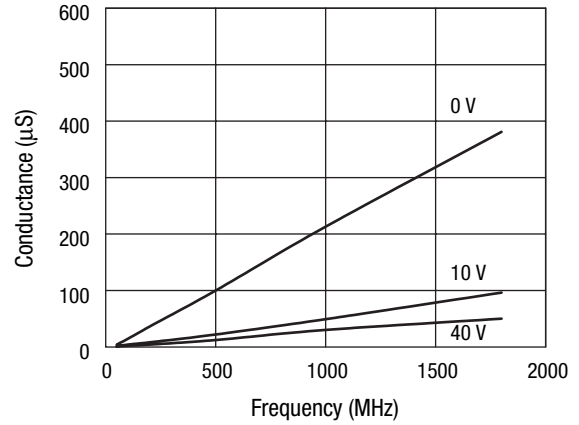
Series Resistance vs. Current @ 100 MHz



DC Characteristic



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.

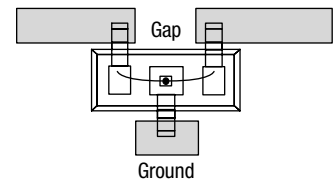
Tape and Reel Information

Refer to the [“Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation”](#) Application Note.

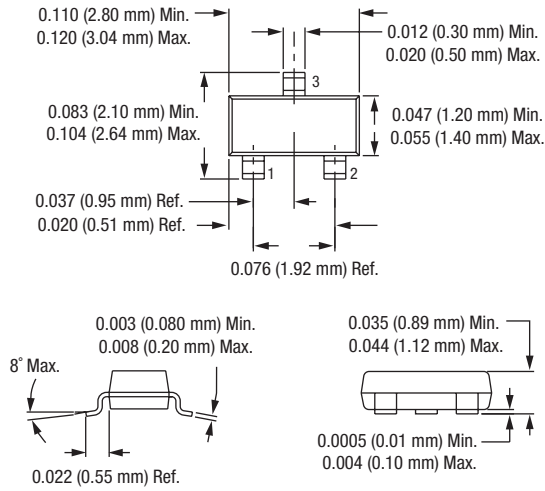
SMP1320-007

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.

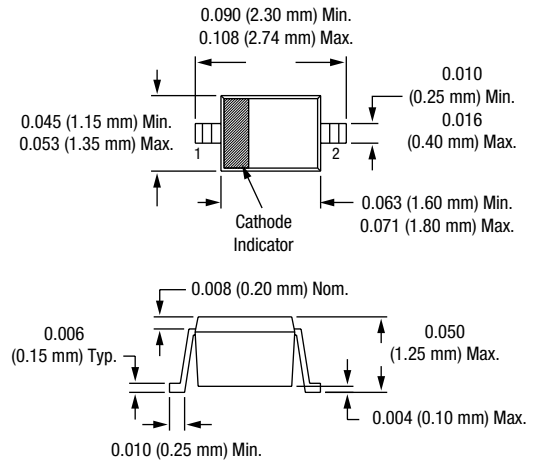
To achieve the effective 0.4 nH, the SOT-23 package must be inserted in the microstrip circuit board with a gap in the trace, as shown in the figure. Because of the polarity of the diode junction, this low inductance feature is realizable only with the cathode connected to ground.



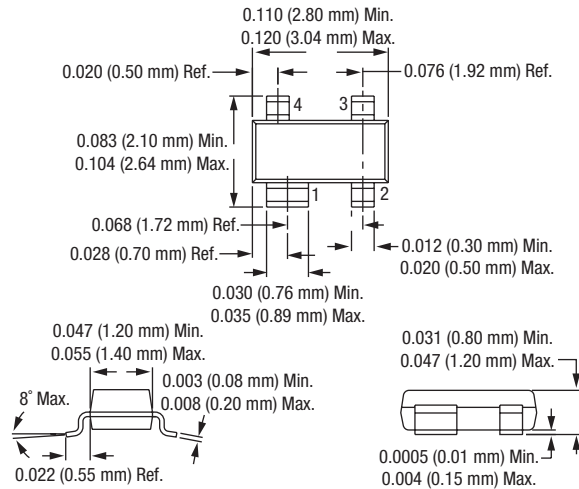
SOT-23



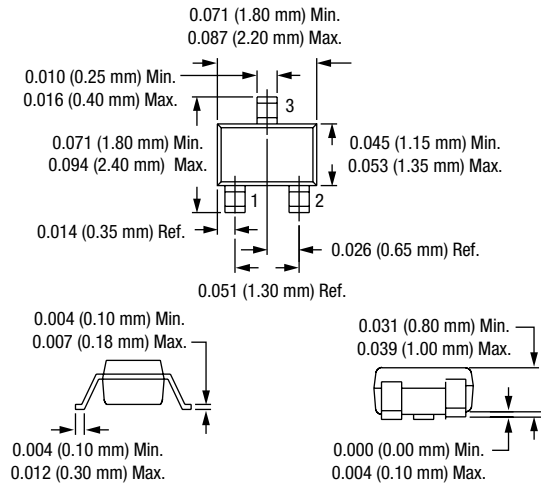
SOD-323



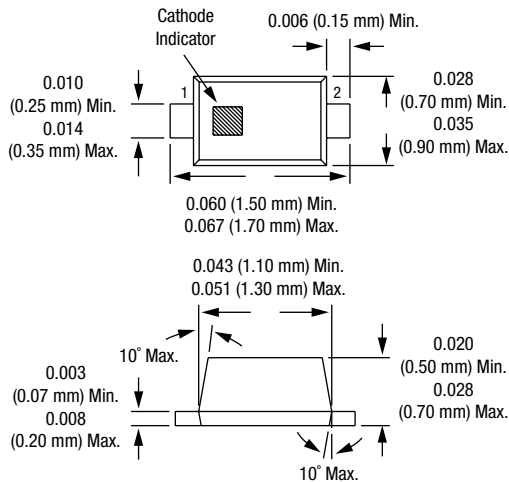
SOT-143



SC-70



SC-79



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