DATA SHEET

SMP1331 Series: Low Capacitance, Plastic Packaged PIN Diodes

Applications

- High-performance wireless switches
- Low-distortion attenuators



Features

- Capacitance: 0.18 pF typical @ 30 V
- Series resistance: 1.7 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 SMP1331 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 (0.18 pF), combined with a low resistance (1.7 Ω typical at 10 mA), makes the SMP1331 series particularly suited to high isolation, series-connected PIN diode switches in battery operated circuits.

The SMP1331 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 SMP1331 series.

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Table 1. SMP1331 Series Packaging and Marking

			
Common Anode	Common Cathode	Single	Single
SOT-23	SOT-23	SC-79 Green™	SOD-882 Green™
SMP1331-003LF Green™ Marking: KE9	**♦SMP1331-004LF** Green™ Marking: KE3	**SMP1331-079LF** Marking: Cathode and KE	**SMP1331-040LF** Marking: KE1
L_S = 1.5 nH	L_S = 1.5 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.

Electrical and Mechanical Specifications

The part number and configuration for the SMP1331 series are provided in Table 1. The absolute maximum ratings of the SMP1331 series are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the SMP1331 series are illustrated in Figures 1 to 3.

Package Dimensions

Package dimensions are shown in Figures 4 to 8 (even numbers), and tape and reel dimensions are provided in Figures 5 to 9 (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 SMP1331 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.

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Table 2. SMP1331 Series Absolute Maximum Ratings (Per Junction) (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V_R		200	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. SMP1331 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 = 200 V			10	µA
Capacitance	C_T	F = 1 MHz, V = 30 V		0.18	0.35	pF
Resistance	R_S	F = 100 MHz: R_S @ 1.0 mA R_S @ 10.0 mA R_S @ 100.0 mA		 1.7 0.5	 14.5	 Ω Ω Ω
Forward voltage	V_F	I_F = 10 mA		0.80		V
Carrier lifetime	TI	I_F = 10 mA		0.6		µs
I region width				30		µm

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

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Typical Performance Characteristics (Per Junction)

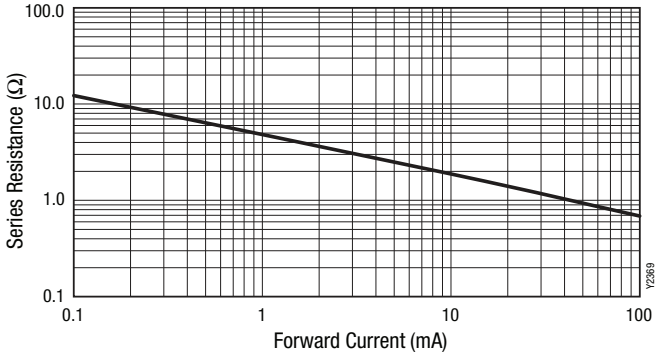


Figure 1. Series Resistance vs Current @ 100 MHz

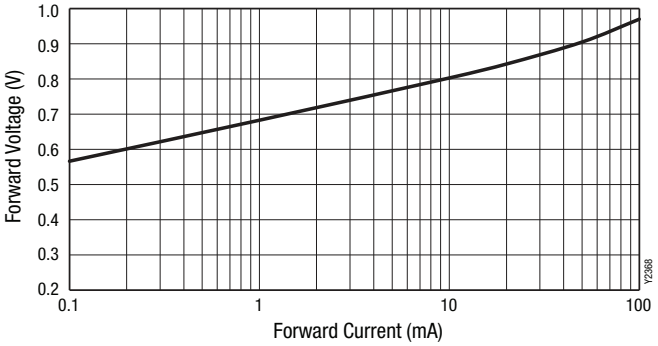


Figure 2. DC Characteristics

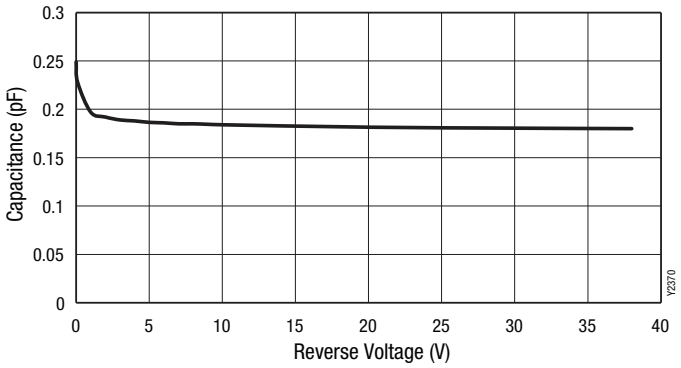
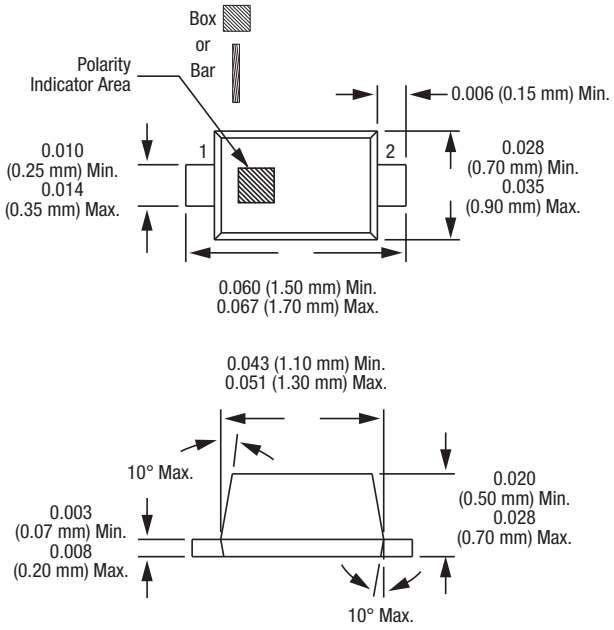


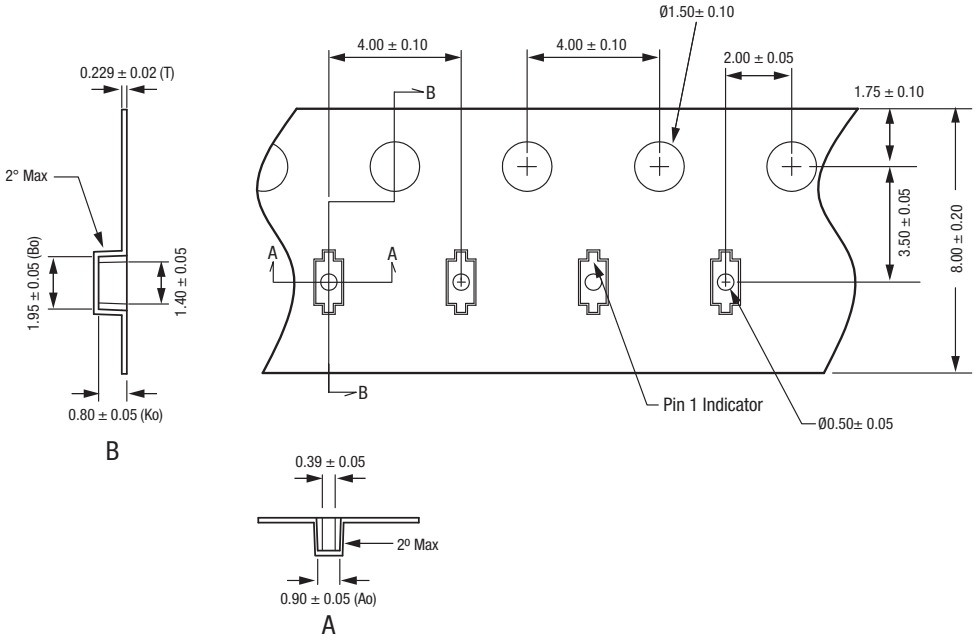
Figure 3. Capacitance vs Reverse Voltage @ 1 MHz

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

Figure 4. 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.*

S2929

Figure 5. SC-79 Tape and Reel Dimensions

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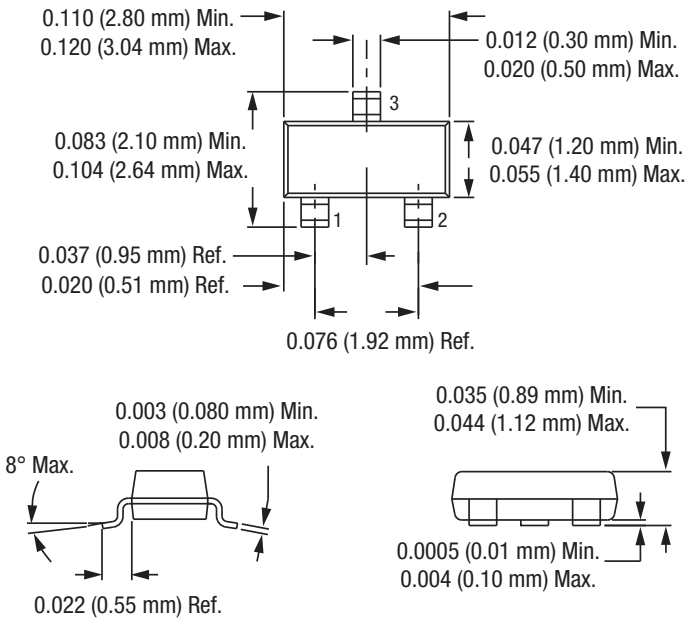
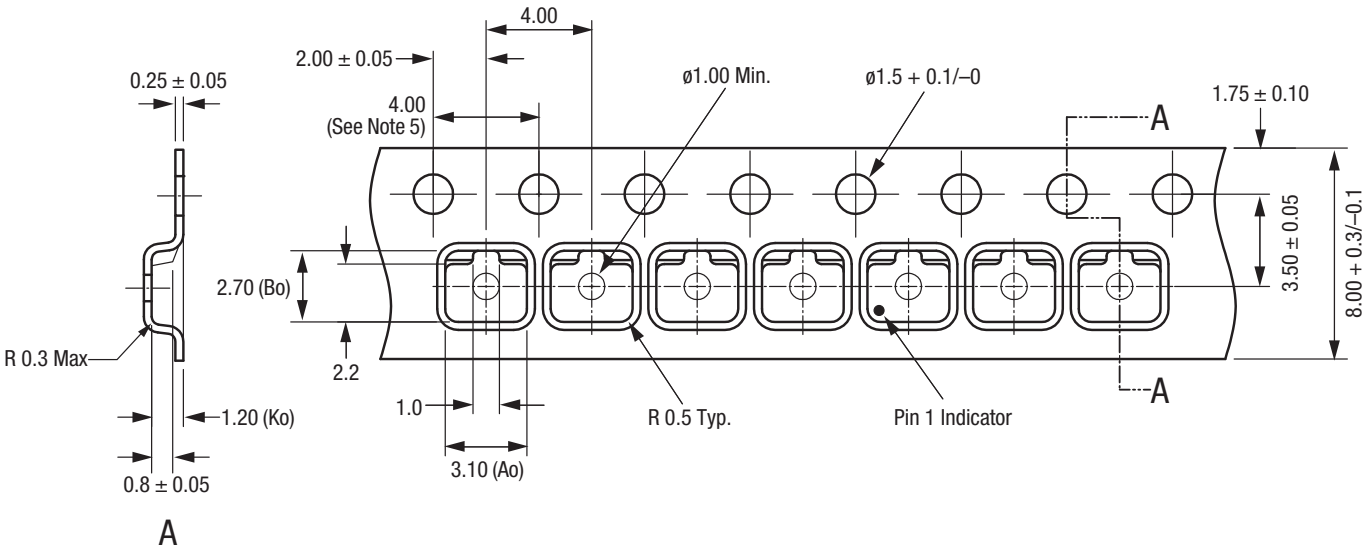


Figure 6. SOT-23 Package Dimension Drawing

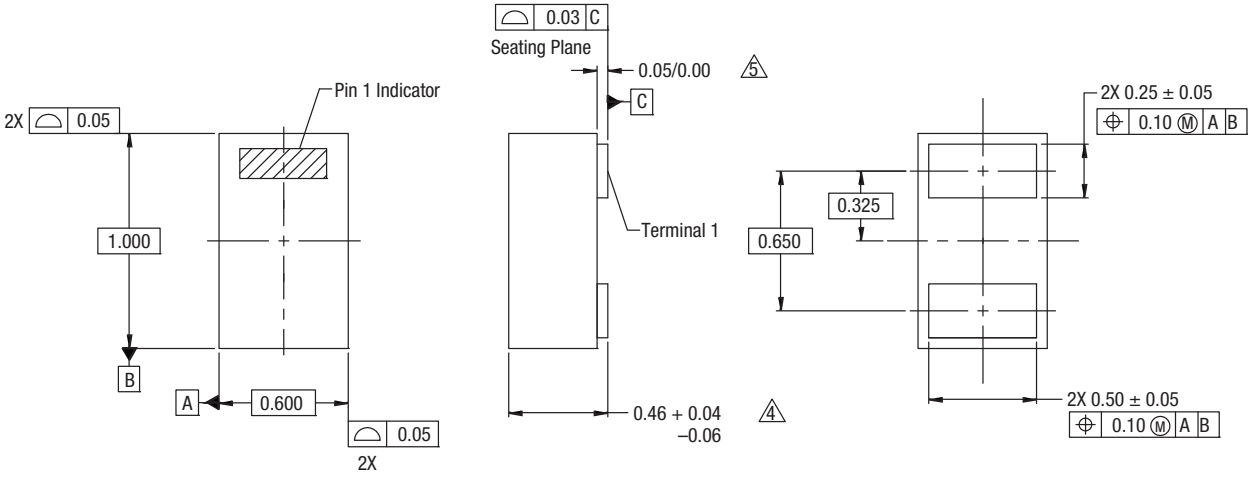


Notes:
1. *Carrier tape: black conductive polycarbonate.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Tolerance ±0.10 mm.*
5. *Ten sprocket hole pitch cumulative tolerance: ±0.2 mm.*
6. *All measurements are in millimeters.*
7. *Alternative carrier tape dimensions are:*
   Ao = 3.3
   Bo = 2.9
   Ko = 1.22

S1684b

Figure 7. SOT-23 Tape and Reel Dimensions

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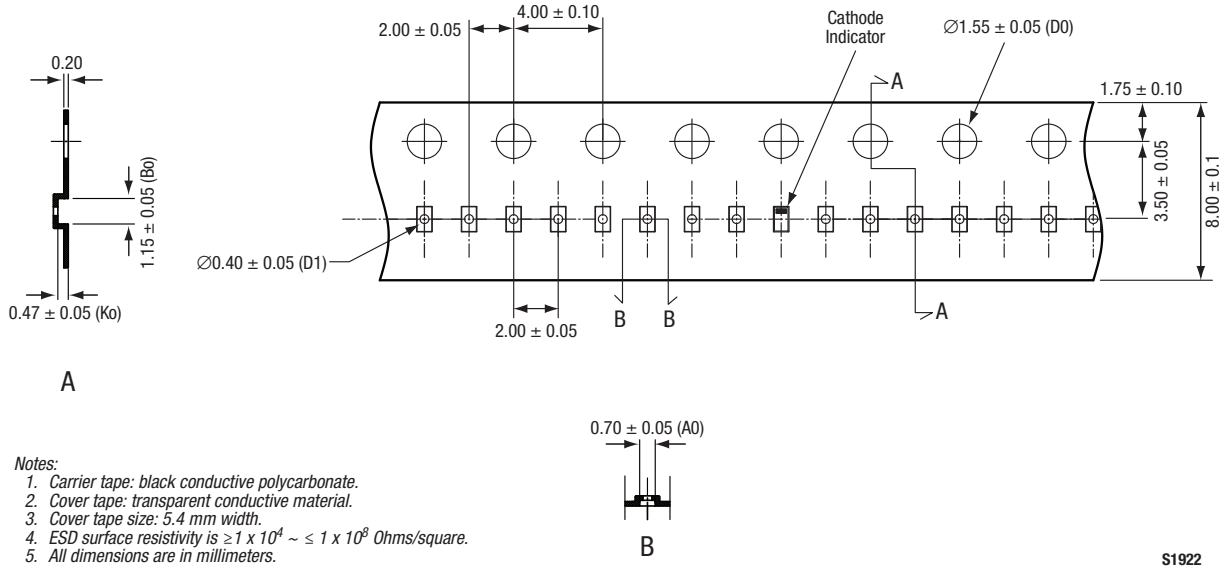


NOTES:

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 8. 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 ≥1 x 10^4 ~ ≤ 1 x 10^8 Ohms/square.*
5. *All dimensions are in millimeters.*

S1922

Figure 9. SOD-882 Tape and Reel Dimensions

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