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DATA SHEET

# SMP1302 Series: Switch and Attenuator Plastic Packaged PIN Diodes

## Applications

- TV distribution and cellular base stations
- High volume switch and attenuators

## Features

- Designed for base station and handset applications
- Low-distortion design
- Available in tape and reel packaging
- 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 SMP1302 series of plastic packaged, surface mountable, low capacitance (0.3 pF) silicon PIN diodes is designed for high-volume switch and attenuator applications from 10 MHz to beyond 2 GHz.

These diodes are designed for use in low- distortion PI and TEE attenuators with low drive current (maximum resistance at 1 mA is 10  $\Omega$ ) commonly used in TV distribution and cellular base station applications. The nominal 50  $\mu\text{m}$  I region width, combined with a maximum resistance of 3  $\Omega$  at 10 mA, makes these diodes useful in large signal switch applications.

The SMP1302 series provides single and dual diodes in a selection of plastic packages including SOT-23, SOD-323, small footprint SC-79, an ultralow inductance (0.2 nH) SOT-143 (SMP1302-017), and miniature SC-70.

A four-diode array is available in an SOT-5 package (SMP1302-027) designed for insertion in the commonly used four-diode PI attenuator circuits.

Table 1 describes the various packages and marking of the SMP1302 series.

**Table 1. SMP1302 Series Packaging and Marking**

Single	Common Anode	Common Cathode	Series Pair	Reverse Series Pair	Single	Ultralow Inductance	PI	Single
SOT-23	SOT-23	SOT-23	SOT-23	SOT-23	SOD-323	SOT-143	SOT-5	SC-79
SMP1302-001 Marking: PF1	SMP1302-003 Marking: PF9	SMP1302-004 Marking: PF3	SMP1302-005 Marking: PFS			SMP1302-017 Marking: PFF	SMP1302-027 Marking: PFM	
SMP1302-001LF Marking: RF1	SMP1302-003LF Marking: RF9	SMP1302-004LF Marking: RF3	SMP1302-005LF Marking: RF2	SMP1302-006LF Marking: RF8	SMP1302-011LF Marking: RF	SMP1302-017LF Marking: RFF	SMP1302-027LF Marking: RFM	◆ SMP1302-079LF
$L_S = 1.5$ nH	$L_S = 1.5$ nH	$L_S = 1.5$ nH	$L_S = 1.5$ nH	$L_S = 1.5$ nH	$L_S = 1.5$ nH	$L_S = 0.2$ nH		$L_S = 0.7$ nH
		SC-70	SC-70					
		SMP1302-074 Marking: PF3						
		SMP1302-074LF Marking: RF3	SMP1302-075LF Marking: RF2					
		$L_S = 1.4$ nH	$L_S = 1.4$ nH					



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

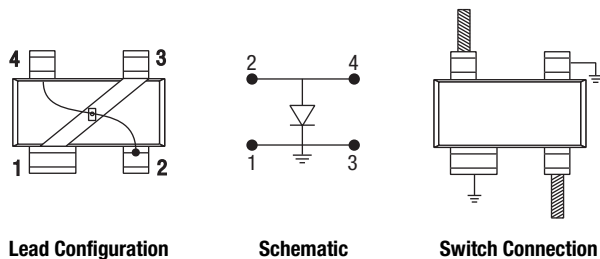


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### SMP1302-017: Low Inductance PIN Diode in SOT-143 Package

The SMP1302-017 uses the SMP1302 PIN diode in a customized SOT-143 plastic package designed for high performance in high-frequency applications. Its effective inductance, based on the 3 GHz isolation, is <math><0.2\text{ nH}</math>. The SOT-143 package is diagrammed in Figure 1.



**Figure 1. SOT-143 Package**

### Electrical and Mechanical Specifications

The absolute maximum ratings of the SMP1302 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 SMP1302 series are illustrated in Figures 2 to 5. Package dimensions are shown in Figures 6 to 11.

### 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 SMP1302 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. SMP1302 Series Absolute Maximum Ratings**

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

**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 SMP1302 series PIN diodes are Class 1C ESD devices.

**Table 3. SMP1302 Series Electrical Specifications (Note 1)****( $T_A = +25\text{ °C}$ , Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	$I_R$	$V_R = 200\text{ V}$			10	$\mu\text{A}$
Capacitance (Note 2)	$C_T$	$f = 1\text{ MHz}, V = 30\text{ V}$			0.3	pF
Resistance	$R_S$	$f = 100\text{ MHz}$ $I = 1\text{ mA}$ $I = 10\text{ mA}$ $I = 100\text{ mA}$		15	20 3 1.5	$\Omega$ $\Omega$ $\Omega$
Forward voltage	$V_F$	$I_F = 10\text{ mA}$		0.8		V
Carrier lifetime	$\tau_I$	$I_F = 10\text{ mA}$		0.7		$\mu\text{s}$
I region width				50		$\mu\text{m}$

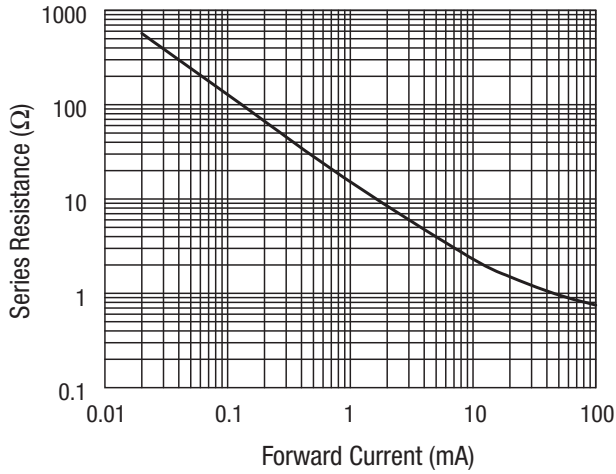
**Note 1:** Performance is guaranteed only under the conditions listed in this Table and is not guaranteed over the full operating or storage temperature ranges. Operation at elevated temperatures may reduce reliability of the device.

**Note 2:** The SMP1302-017 and SMP1302-027 maximum capacitance is 0.45 pF.

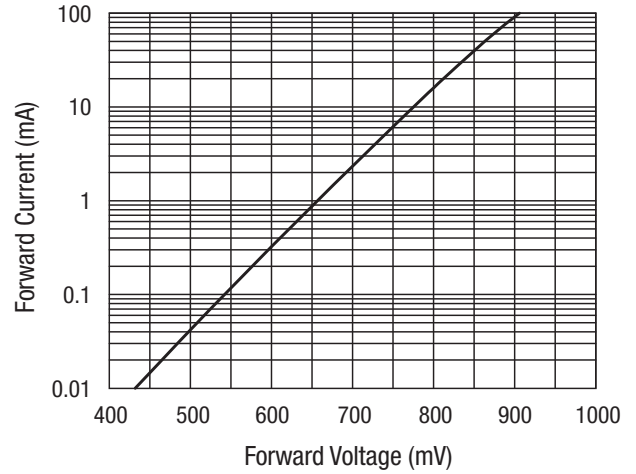
**Table 4. Resistance vs Temperature @ 100 MHz**

$I_F$ (mA)	$R_S @ -55\text{ °C}$ ( $\Omega$ )	$R_S @ -15\text{ °C}$ ( $\Omega$ )	$R_S @ +25\text{ °C}$ ( $\Omega$ )	$R_S @ +65\text{ °C}$ ( $\Omega$ )	$R_S @ +100\text{ °C}$ ( $\Omega$ )
0.02	599	653	692	715	722
0.10	123	135	143	154	161
0.3	42.2	46.6	49.7	54.3	56.8
1.0	13.5	15.0	16.2	17.9	18.8
10	2.0	2.3	2.6	2.9	3.0
20	1.34	1.50	1.70	2.00	2.00
100	0.60	0.74	1.00	1.10	1.10

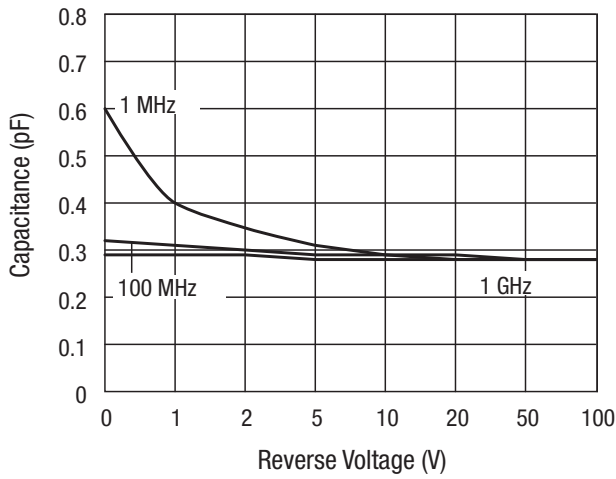
**Typical Performance Data**



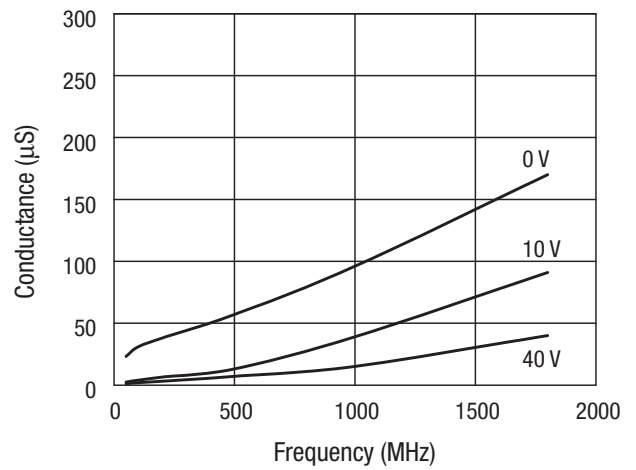
**Figure 2. Series Resistance vs Current @ 100 MHz**



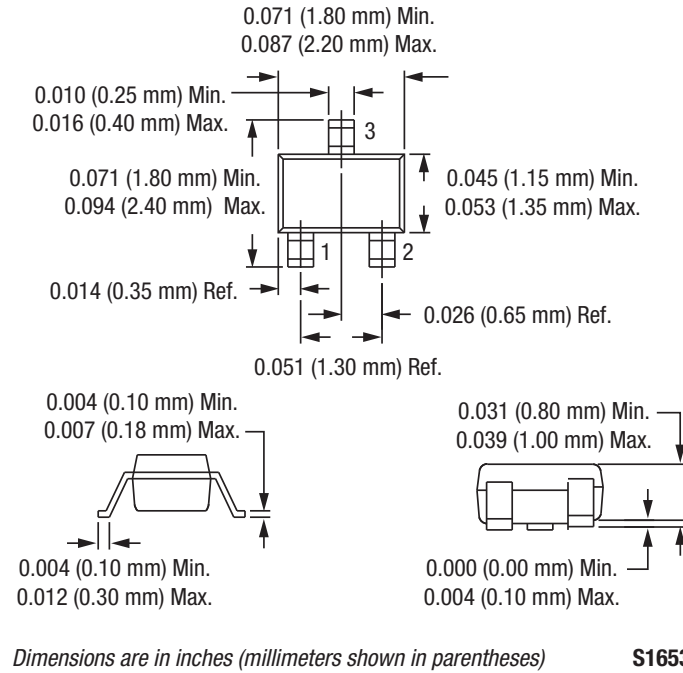
**Figure 3. DC Characteristic**



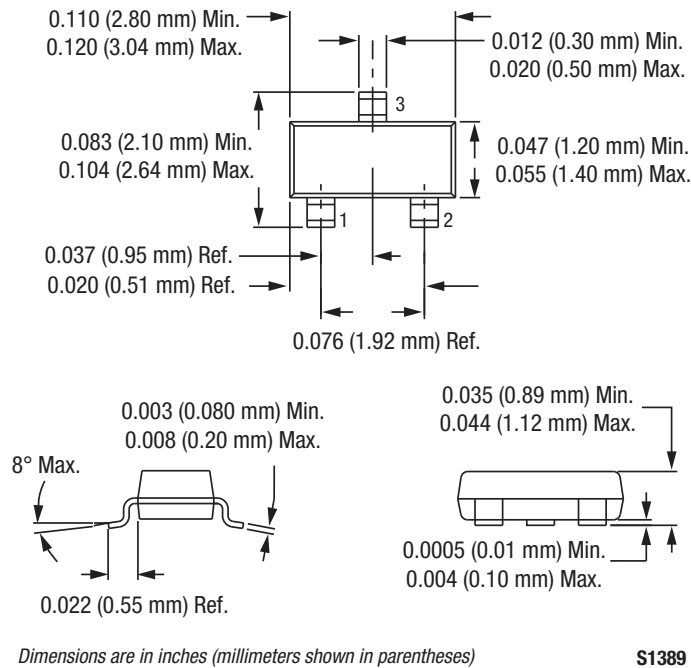
**Figure 4. Capacitance vs Reverse Voltage**



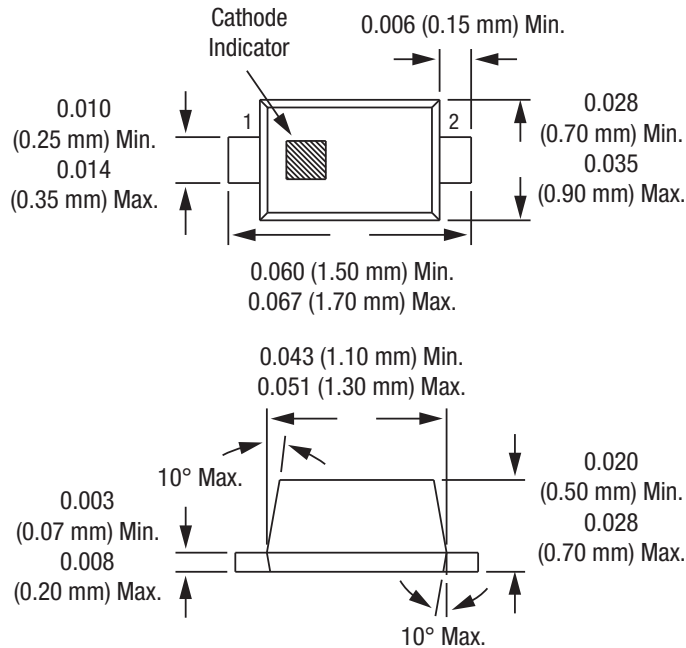
**Figure 5. Conductance vs Frequency and Reverse Voltage**



**Figure 6. SC-70 Package Dimension Drawing**

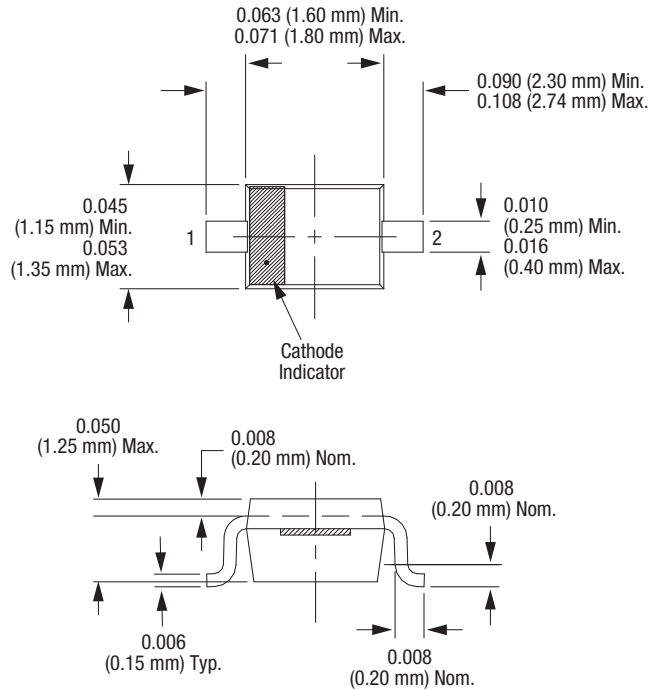


**Figure 7. SOT-23 Package Dimension Drawing**



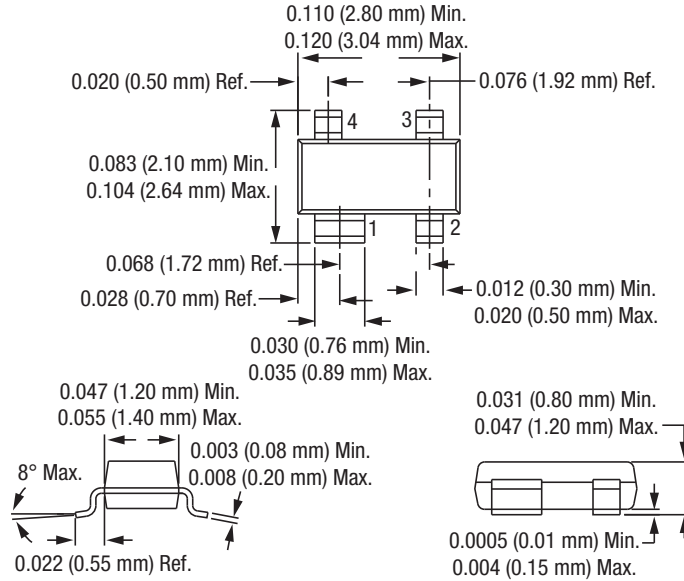
Dimensions are in inches (millimeters shown in parentheses) **S1652**

**Figure 8. SC-79 Package Dimension Drawing**



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

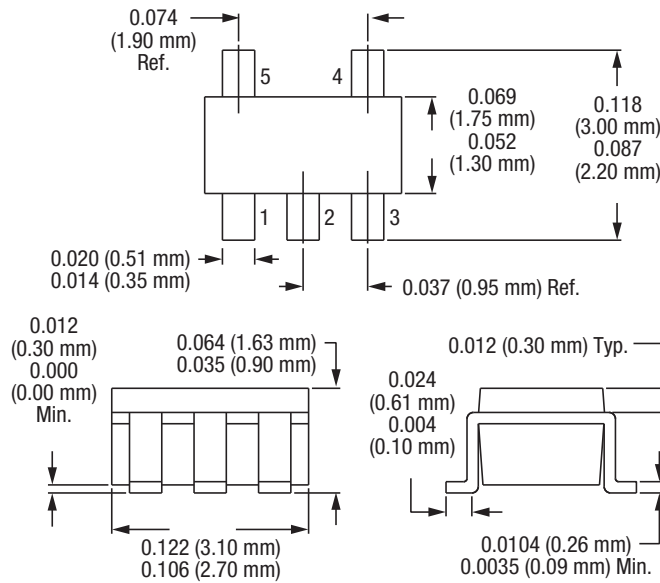
**Figure 9. SOD-323 Package Dimension Drawing**



Dimensions are in inches (millimeters shown in parentheses)

S1651

Figure 10. SOT-143 Package Dimension Drawing



Dimensions are in inches (millimeters shown in parentheses)

S1657

Figure 11. SOT-5 Package Dimension Drawing



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