DATA SHEET

SMP1307 Series: Very Low Distortion Attenuator Plastic Packaged PIN Diodes

Features

- Low-distortion design
- Frequency range from HF to > 2 GHz
- Designed for CATV AGC applications
- Designed for high-volume wireless applications
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C[1] per JEDEC J-STD-020

Description

The SMP1307 series of plastic packaged, surface mountable, low capacitance (0.3 pF) silicon PIN diodes is designed for use in attenuator applications from 5 MHz to beyond 2 GHz. The thick 175 µm I region of these PIN diodes makes them very attractive for use in very low distortion PI and TEE attenuators commonly used in TV distribution applications. The 1.5 µs typical carrier lifetime of these diodes results in resistance of 100 Ω maximum at 1 mA and 10 Ω maximum at 10 mA. Available in a selection of plastic packages, as a single diode in the small footprint SOD-323, and in a variety of configurations in the SOT-23. Also available in a SOT-5 (SMP1307-027) package as a four-diode array designed for insertion in the commonly used four-diode PI attenuator circuit.

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

Absolute Maximum Ratings

Characteristic	Value
Reverse voltage (V_R)	200 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 1C

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.*

1. SOT-5 (-027) MSL to be defined.

						
Single	Common Anode	Common Cathode	Series Pair	Reverse Series Pair	Single	PI
SOT-23	SOT-23	SOT-23	SOT-23	SOT-23	SOD-323	SOT-5
♦**SMP1307-001** Marking: PJ1		**SMP1307-004** Marking: PJ3	**SMP1307-005** Marking: PJ2		**SMP1307-011** Marking: PJ	**SMP1307-027** Marking: PJM
♦**SMP1307-001LF** Marking: RJ1	**SMP1307-003LF** Marking: RJ9	**SMP1307-004LF** Marking: RJ3	**SMP1307-005LF** Marking: RJ2	**SMP1307-006LF** Marking: RJ8	**SMP1307-011LF** Marking: RJ	**SMP1307-027LF** Marking: RJM
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	

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

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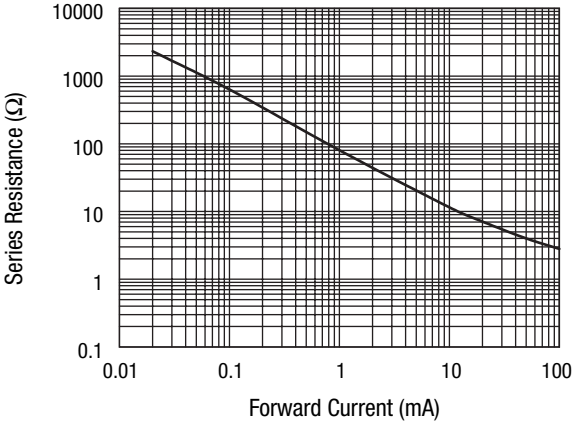
Electrical Specifications at 25 °C

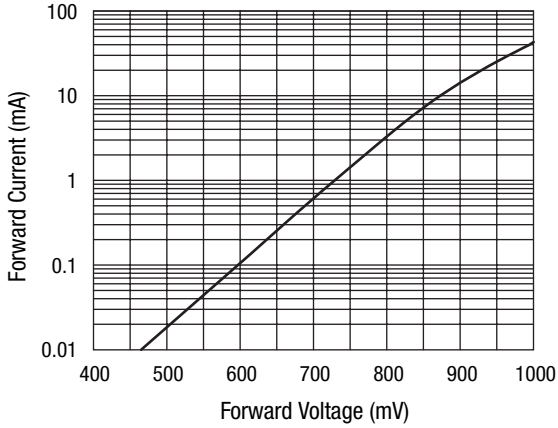
Parameter	Condition	Typ.	Max.	Unit
Reverse current (I_R)	V_R = 200 V		10	µA
Capacitance (C_T)(1)	F = 1 MHz, V = 30 V		0.3	pF
Resistance (R_S)	F = 100 MHz, I = 1 mA	75	100	Ω
Resistance (R_S)	F = 100 MHz, I = 10 mA		15	Ω
Resistance (R_S)	F = 100 MHz, I = 100 mA		3	Ω
Forward voltage (V_F)	I_F = 10 mA	0.85		V
Carrier lifetime (TI)	I_F = 10 mA	1.5		µs
I region width		175		µm

1. The SMP1307-027 maximum capacitance is 0.45 pF.

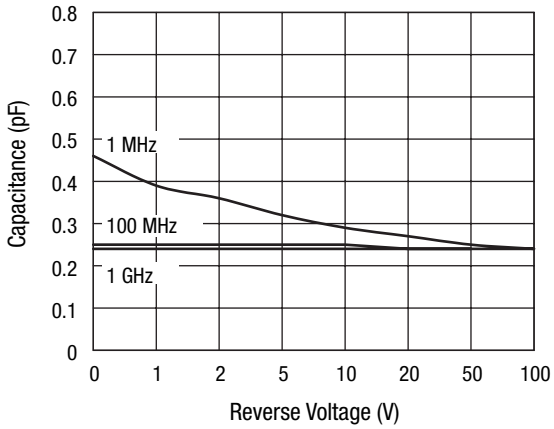
Typical Performance Data



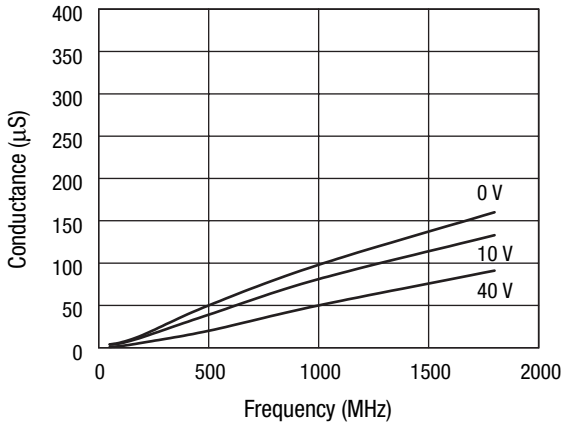
Series Resistance vs. Current @ 100 MHz



DC Characteristic



Capacitance vs. Reverse Voltage



Conductance vs. Frequency and Reverse Voltage

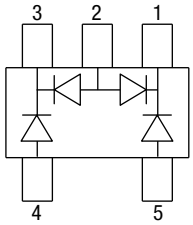
Typical Resistance vs. Temperature @ 100 MHz

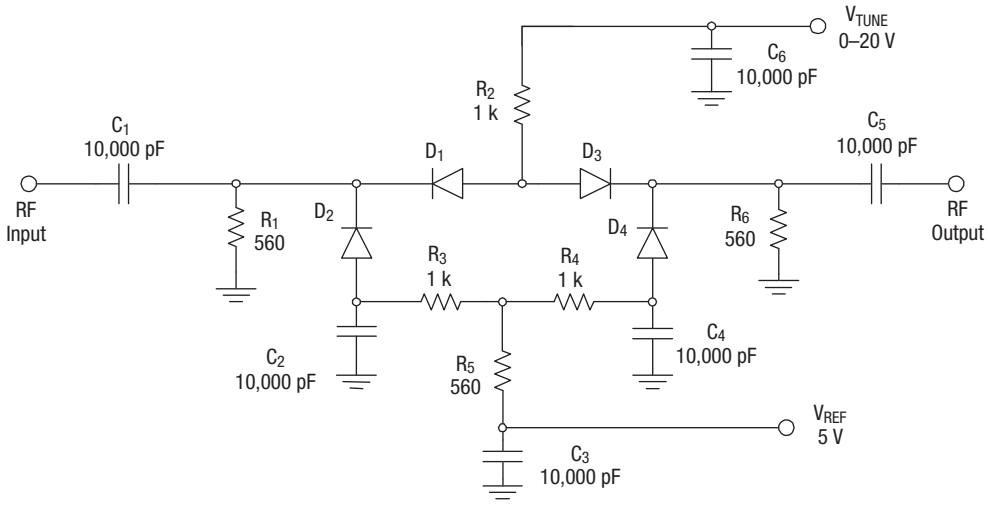
I_F (mA)	R -55 °C (Ω)	R -15 °C (Ω)	R 25 °C (Ω)	R 65 °C (Ω)	R 100 °C (Ω)
0.02	2386	2360	2546	2520	2440
0.1	560	598	632	633	639
0.3	203	219	236	239	242
1	66.1	71.2	79.3	83.6	85.4
10	9.1	10	10.9	12.2	12.9
20	5.6	6	6.6	7.4	7.8
100	2.2	2.4	2.6	3	3.2

SMP1307-027 Four-Diode PI Attenuator

The SMP1307-027 employs four PIN diode junctions in a 5-lead SOT package. It is configured for ease of insertion in the PI attenuator circuit commonly used for broadband TV distribution systems, covering a frequency range from 5 MHz to beyond 1 GHz.

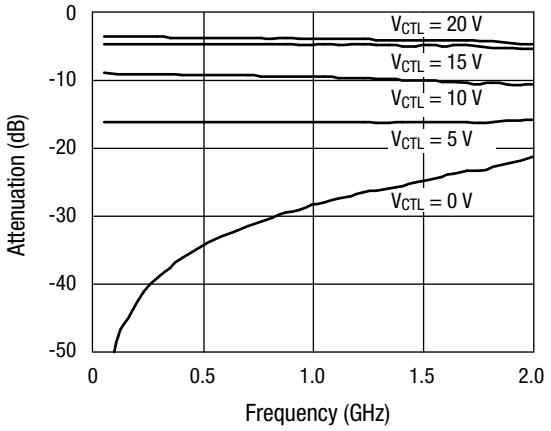
A broadband attenuator was designed using the SMP1307-027 showing good performance to 2 GHz. The attenuator was evaluated with a 50 Ω source and load impedance. The following figure shows the circuit diagram and measured performance.





D_1–D_4 SMP1307-027

A 4-diode PI attenuator utilizing individual SMP1307-011 PIN diodes is described in the "A Wideband General Purpose PIN Diode Attenuator" Application Note.



SMP1307-027 Attenuation vs. Frequency

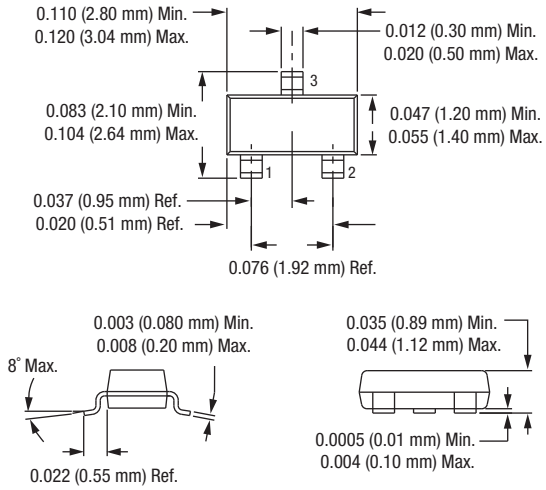
Recommended Solder Reflow Profiles

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

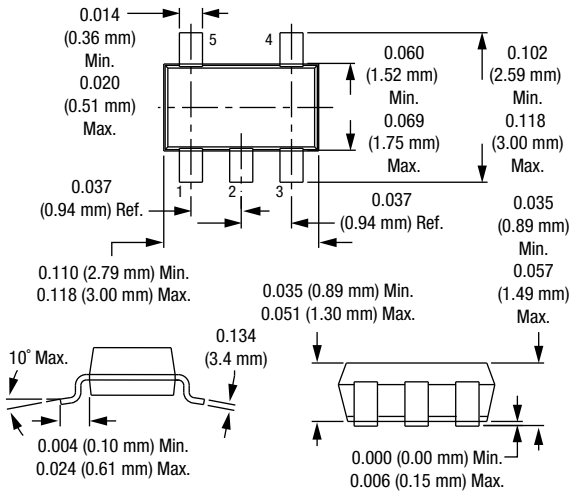
Tape and Reel Information

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

SOT-23



SOT-5



SOD-323