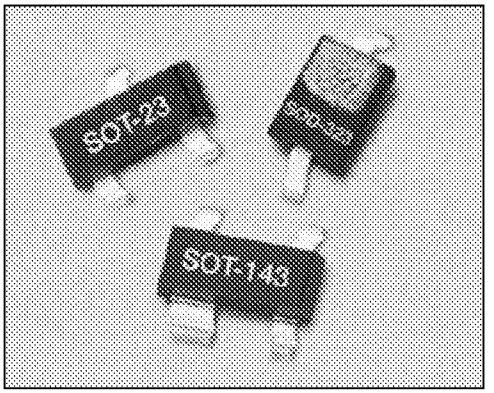
Low Distortion Attenuator Plastic Packaged PIN Diodes

Alpha

SMP1304 Series

Features

- Low Distortion Design
- Frequency Range from HF to > 2 GHz
- Designed for Base Station Applications
- Configured for PI and TEE Attenuators

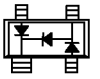


Description

The SMP1304 series of plastic packaged, surface mountable, low capacitance (0.3 pF) silicon PIN diodes are designed for use in attenuator applications from 5 MHz to beyond 2 GHz. The thick 100 µm I region of these PIN diodes makes them very attractive for use in low distortion PI and TEE attenuators commonly used in TV distribution applications. The 1 µS typical carrier lifetime of these diodes results in resistance of 20 Ω maximum at 1 mA and 7 Ω maximum at 10 mA. Available in a selection of plastic packages: as a single diode in the small footprint SOD-323 package and in a variety of configurations in the SOT-23 package, including a low inductance (0.4 nH) SMP1304-007 package. Also available in the SOT-143 package are three diode junctions designed for insertion in TEE attenuators (SMP1304-018) and PI attenuators (SMP1304-019).

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

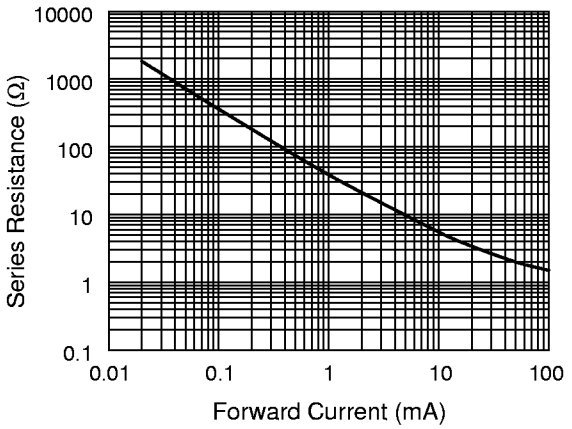
						
Single	Common Cathode	Series Pair	Low Inductance	Single	TEE	PI
Marking: PG1	Marking: PG3	Marking: PG2	Marking: PGB		Marking: PGK	PGJ
SOT-23	SOT-23	SOT-23	SOT-23	SOD-323	SOT-143	SOT-143
♦ **SMP1304-001**	♦ **SMP1304-004**	♦ **SMP1304-005**	♦ **SMP1304-007**	♦ **SMP1304-011**	♦ **SMP1304-018**	♦ **SMP1304-019**
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		

♦ Available through distribution.

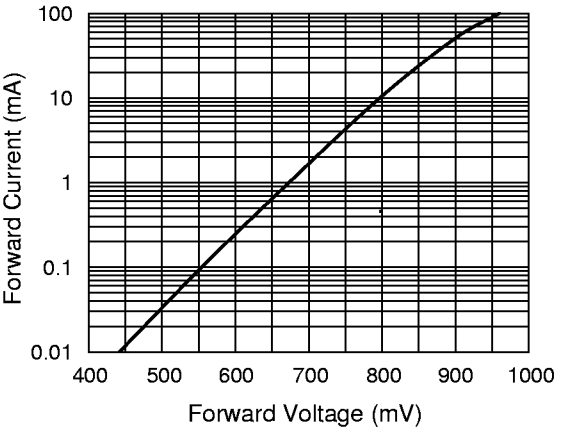
Electrical Specifications at 25°C

Parameter	Condition	Typ.	Max.	Unit
Reverse Current (I_R)	V_R = 200 V		10	µA
Capacitance (C_T)	F = 1 MHz, V = 30 V		0.30	pF
Capacitance (C_T)	F = 1 MHz, V = 30 V (SMP1304-018 & SMP1304-019)		0.45	pF
Resistance (R_S)	F = 100 MHz, I = 1 mA	40	50	Ω
Resistance (R_S)	F = 100 MHz, I = 10 mA		7.0	Ω
Resistance (R_S)	F = 100 MHz, I = 100 mA		2.0	Ω
Forward Voltage (V_F)	IF = 10 mA	0.8		V
Carrier Lifetime (TI)	IF = 10 mA	1.0		µS
I Region Width		100		µm

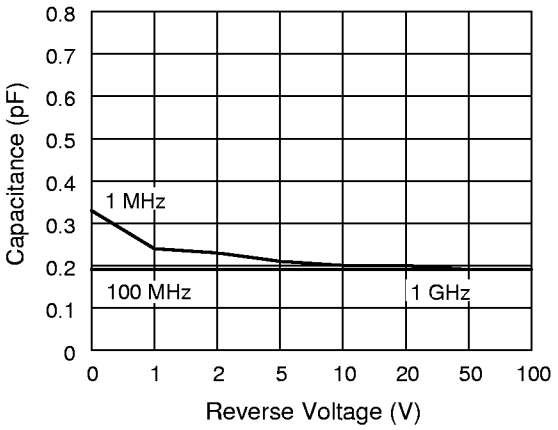
Typical Performance Data



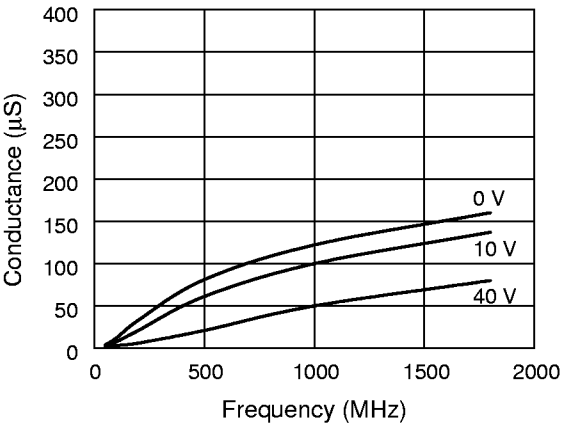
Series Resistance vs. Current @ 100 MHz



DC Characteristic



Capacitance vs. Reverse Voltage



Conductance vs. Frequency

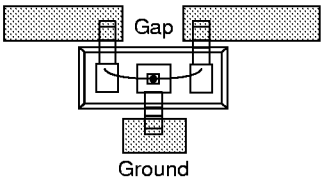
Resistance vs. Temperature @ 100 MHz

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	1590.0	1660.0	1752.0	1770.0	1760.0
0.10	315.0	340.0	367.0	396.0	409.0
0.30	108.0	118.0	128.0	141.0	147.0
1.00	34.5	37.9	41.6	46.3	48.8
10.00	4.8	5.3	5.8	6.6	7.0
20.00	3.0	3.3	3.6	4.1	4.3
100.00	1.3	1.4	1.5	1.7	1.8

SMP1304-007

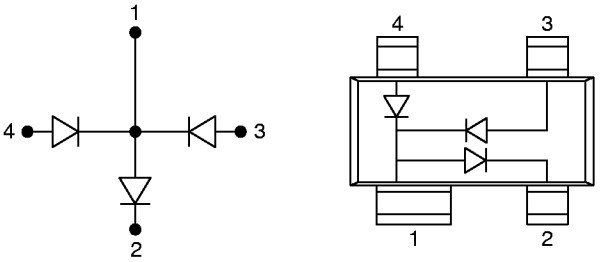
In the -007 configuration of the SOT-23 package, the package inductance is effectively reduced to 0.4 nH, in comparison to the 1.5 nH value of the standard configuration. This lower inductance will be particularly beneficial when the diodes are used as shunt connected switches at frequencies higher than 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 only realizable with the cathode connected to ground.

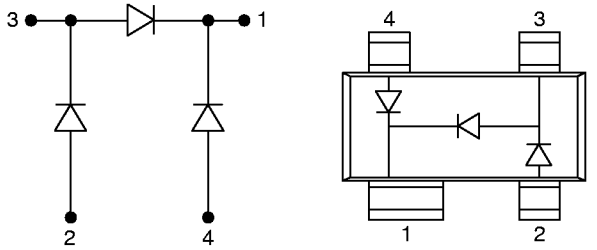


SMP1304-018, SMP1304-019 TEE and PI Attenuator PIN Diodes

Both the SMP1304-018 and the SMP1304-019 employ three PIN diode junctions in a SOT-143 package. They are configured for ease of insertion in PI and TEE attenuator circuits commonly used from 10 MHz to beyond 1 GHz. The SMP1304 PIN diode junction was designed for low capacitance, wide resistance dynamic range and low distortion performance.

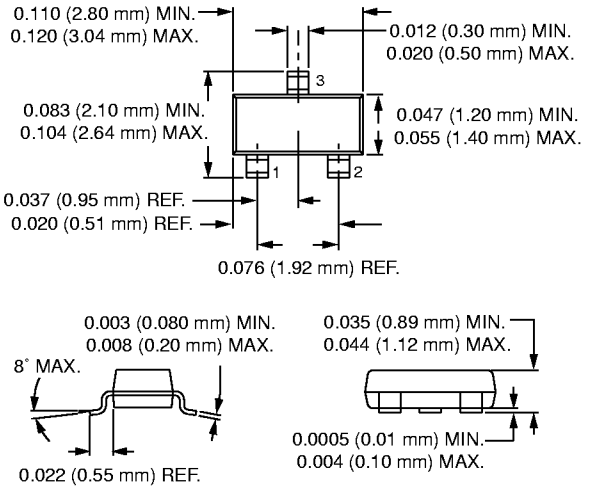


SMP1304-018 (TEE)

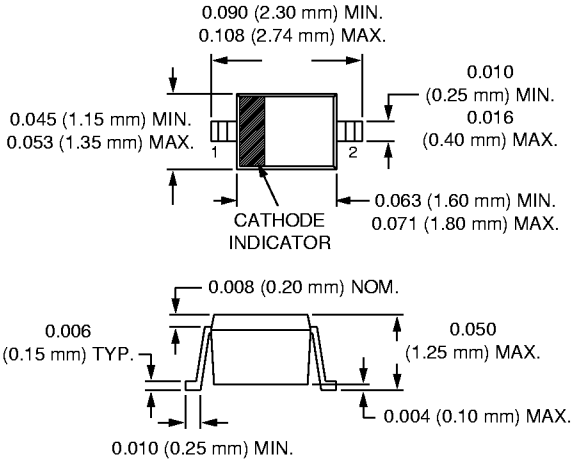


SMP1304-019 (PI)

SOT-23



SOD-323



SOT-143