

DATA SHEET

SMP1322 Series: Low Resistance Plastic Packaged PIN Diodes

Features

- Designed for high performance wireless switch applications
- R_S @ 1 mA 0.8 Ω typical
- Available lead (Pb)-free MSL-1 @ 250 °C per JEDEC J-STD-020
- Available in tape and reel packaging

Description

The SMP1322 series of plastic packaged, surface mountable PIN diodes are designed for high volume switch applications from 10 MHz to beyond 2 GHz. The ultra low resistance of these diodes (1.5 Ω maximum at 1 mA and 0.5 Ω typical at 10 mA) make the SMP1322 series particularly suited to low loss PIN diode switches in battery operated circuits. Available in a selection of plastic packages and in a variety of configurations including an ultra low inductance (0.2 nH) SOT-143 (SMP1322-017), the small footprint SC-79 and the miniature SC-70. In addition, the SMP1322-016 consists of 2 diodes in a SOT-143 package configured to enable insertion in a quarter-wave T/R switch with no crossover connections.

NEW



Skyworks offers lead (Pb)-free “environmentally friendly” packaging that is RoHS compliant (European Parliament for the Restriction of Hazardous Substances).









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, 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 must be employed at all times.*

				
Single	Common Anode	Common Cathode	Series Pair	Low Inductance
SOT-23	SOT-23	SOT-23	SOT-23	SOT-23
SMP1322-001	SMP1322-003	SMP1322-004	SMP1322-005	SMP1322-007
Marking: PN1	Marking: PN9	Marking: PN3	Marking: PN2	Marking: PNB
SMP1322-001LF	SMP1322-003LF			
Marking: RN1	Marking: RN9			
$L_S = 1.5 \text{ nH}$	$L_S = 1.5 \text{ nH}$	$L_S = 1.5 \text{ nH}$	$L_S = 1.5 \text{ nH}$	$L_S = 0.4 \text{ nH}$
		SC-70	SC-70	
		SMP1322-074	SMP1322-075	
		Marking: PN3	Marking: PN2	
		SMP1322-074LF		
		Marking: RN3		
		$L_S = 1.4 \text{ nH}$	$L_S = 1.4 \text{ nH}$	

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

			
Single	T/R Switch	Ultra Low Inductance	Single
SOD-323	SOT-143	SOT-143	SC-79
SMP1322-011	SMP1322-016	SMP1322-017	SMP1322-079
Marking: PN	Marking: PN6	Marking: PNF	
		SMP1322-017LF	SMP1322-079LF
		Marking: RNF	
$L_S = 1.5 \text{ nH}$	$L_S = 1.5 \text{ nH}$	$L_S = 0.2 \text{ nH}$	$L_S = 0.7 \text{ nH}$

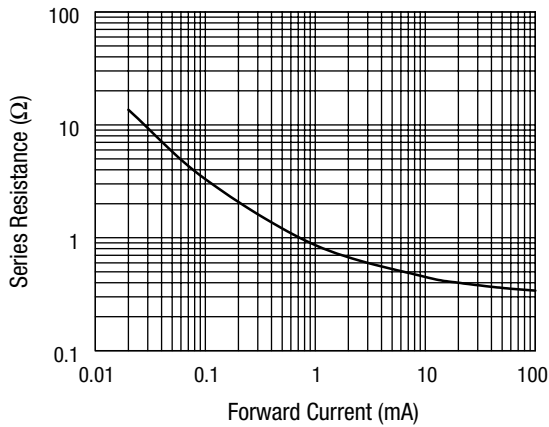
 LF denotes lead (Pb)-free packaging option as an alternative to our standard tin/lead (Sn/Pb) packaging.

Electrical Specifications at 25 °C

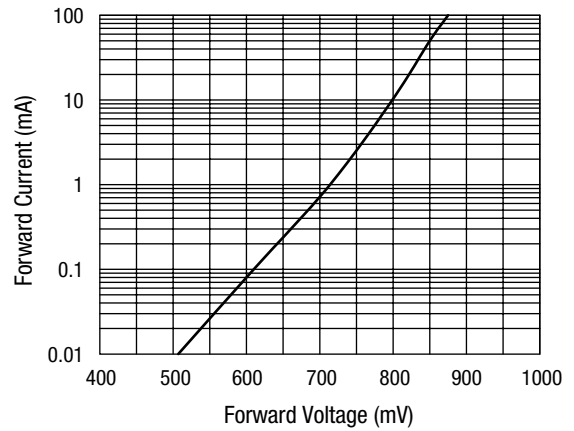
Parameter	Condition	Typ.	Max.	Unit
Reverse current (I_R)	$V_R = 50 \text{ V}$		10	μA
Capacitance (C_T) ⁽¹⁾	$F = 1 \text{ MHz}, V = 30 \text{ V}$		1.0	pF
Resistance (R_S)	$F = 100 \text{ MHz}, I = 1 \text{ mA}$		1.5	Ω
Resistance (R_S)	$F = 100 \text{ MHz}, I = 10 \text{ mA}$	0.50		Ω
Forward voltage (V_F)	$I_F = 10 \text{ mA}$	0.85		V
Carrier lifetime (TI)	$I_F = 10 \text{ mA}$	0.40		μs
I region width		8.00		μm

1. The SMP1322-016, SMP1322-017 and SMP1322-017LF maximum capacitance is 1.15 pF.

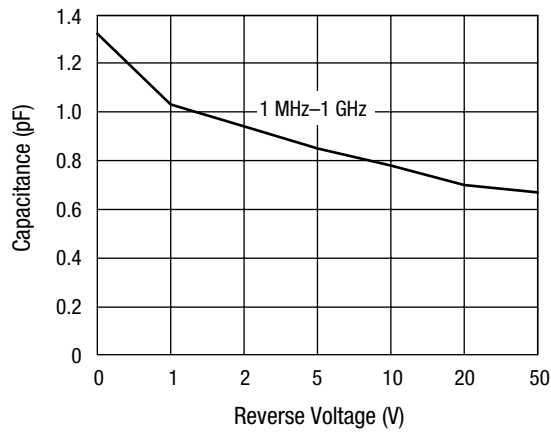
Typical Performance Data



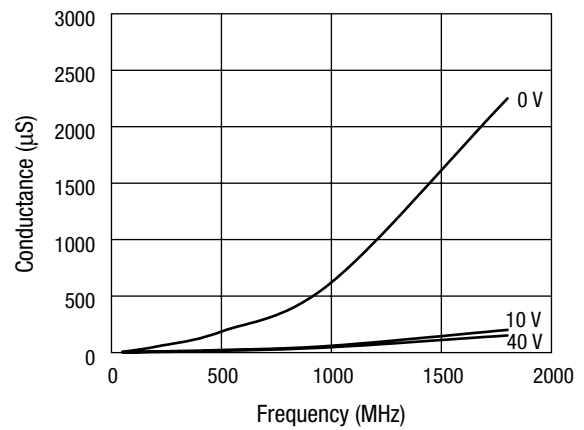
Series Resistance vs. Current @ 100 MHz



DC Characteristic



Capacitance vs. Reverse Voltage



Conductance vs. Frequency and Reverse Voltage

Resistance vs. Temperature @ 500 MHz

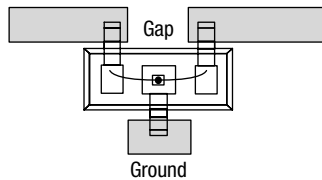
I_F (mA)	R -55 °C (Ω)	R -15 °C (Ω)	R +25 °C (Ω)	R +65 °C (Ω)	R +100 °C (Ω)
0.02	9.500	9.400	9.900	10.500	10.900
0.10	3.000	3.000	3.000	3.300	3.500
0.30	1.500	1.500	1.500	1.600	1.800
0.50	1.100	1.100	1.200	1.200	1.400
1.00	0.922	0.914	0.902	0.963	1.100
10.00	0.568	0.559	0.533	0.563	0.655
20.00	0.532	0.520	0.494	0.521	0.610
100.00	0.483	0.469	0.440	0.464	0.565

SMP1322-007

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.

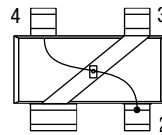
To achieve the effective 0.4 nH, the SOT-23 package must be inserted in the microstrip circuit board with a gap in the trace, as shown in the figure. Because of the polarity of the

diode junction, this low inductance feature is only realizable with the cathode connected to ground.

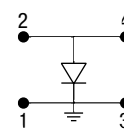


SMP1322-017 SOT-143 Low Inductance PIN Diode

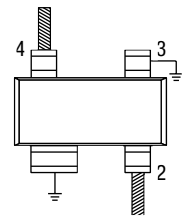
The SMP1322-017 utilizes the SMP1322 PIN diode chip in a customized SOT-143 plastic package designed for high isolation performance in a shunt connected switch. Its effective inductance, based on the 3 GHz isolation, is less than 0.2 nH. This diode is designed to work effectively as a shunt element in SPDT switches, covering the wireless frequencies from 900 MHz to beyond 2 GHz. Excellent performance is achievable when used in a quarter-wave T/R switch with the SMP1322-001 (SOT-23) or SMP1322-011 (SOD-323) PIN diode as the series connected diode.



Lead Configuration



Schematic

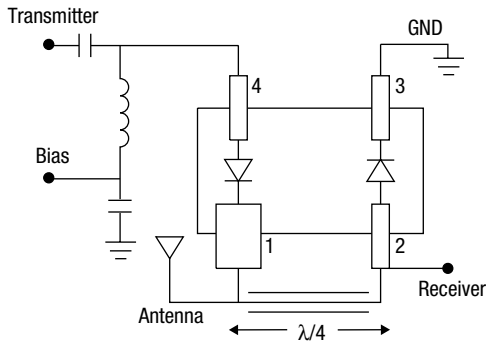


Switch Connection

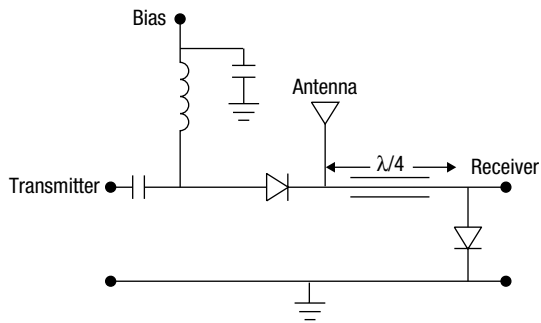
SMP1322-016 SOT-143 T/R Switch

The SMP1322-016 is a low cost PIN diode unconnected pair specifically designed for low current drain antenna T/R switches in hand held wireless suits. In the specifically configured SOT-143 package, the PIN diodes are oriented to enable connection as a $\lambda/4$ switch with no external crossover connections.

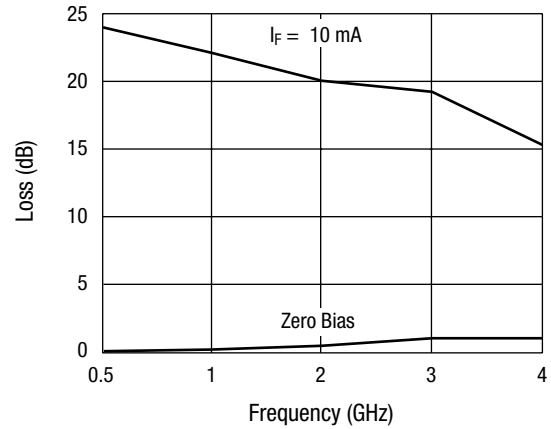
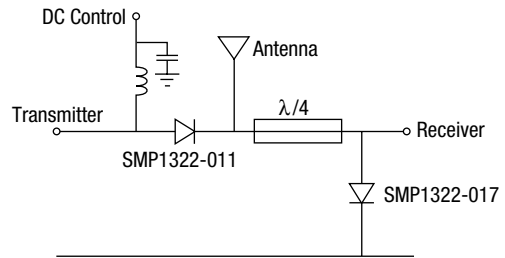
SMP1322-016 in $\lambda/4$ T/R Switch



$\lambda/4$ T/R Switch



T/R Switch Design

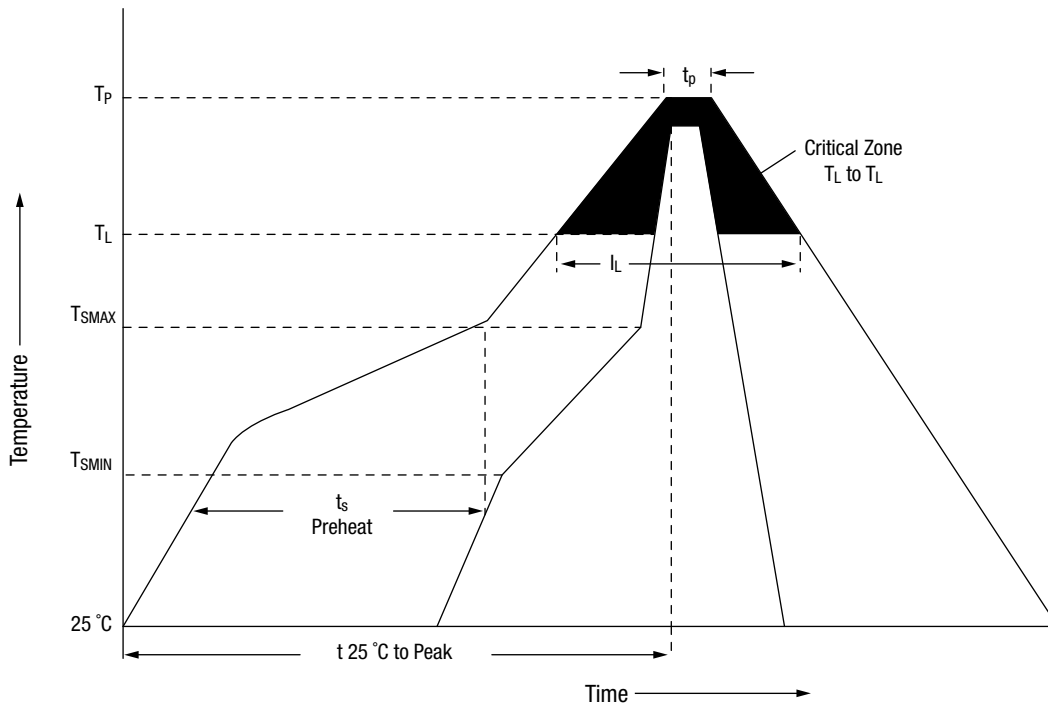


SMP1322-017 Typical SPST Switch Performance

Recommended Solder Reflow Profiles

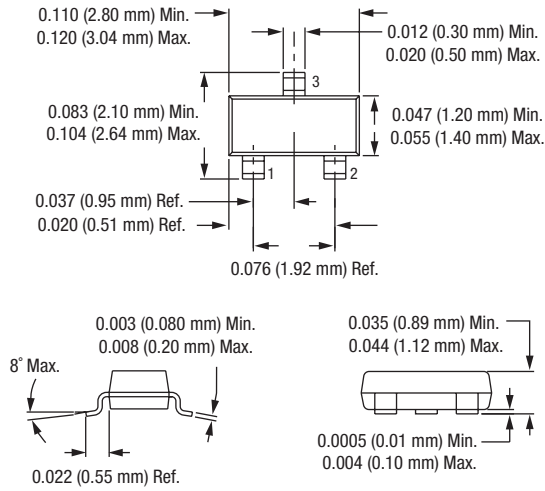
Profile Feature	SnPb Eutectic Assembly	Lead (Pb)-Free Assembly 100% Sn
Average ramp-up rate (T_L to T_P)	3 °C/second max.	3 °C/second max.
Preheat		
Temperature min. (T_{SMIN})	100 °C	150 °C
Temperature max. (T_{SMAX})	150 °C	200 °C
Time (min. to max.) (t_s)	60–120 seconds	60–80 seconds
T_{SMAX} to T_L Ramp-up rate	—	3 °C/second max.
Time maintained above:		
Temperature (T_L)	183 °C	217 °C
Time (t_L)	60–150 seconds	60–150 seconds
Peak temperature (T_P)	240 +0/-5 °C	250 +0/-5 °C
Time within 5 °C of actual peak temperature (t_p)	10–30 seconds	20–40 seconds
Ramp-down rate	6 °C/second max.	6 °C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to the top side of the package, measured on the package body surface.
Reference JEDEC J-STD-020B.

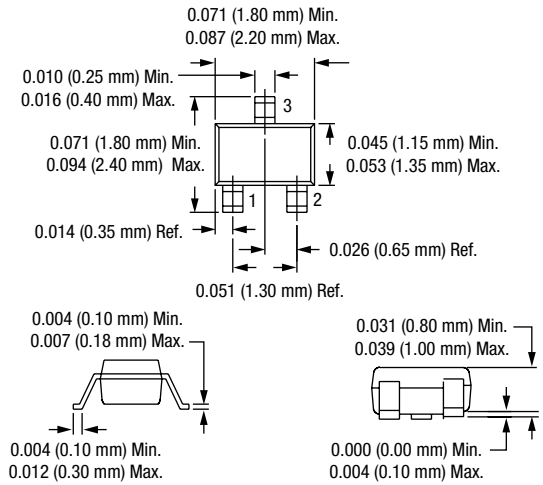


Reference JEDEC J-STD-020

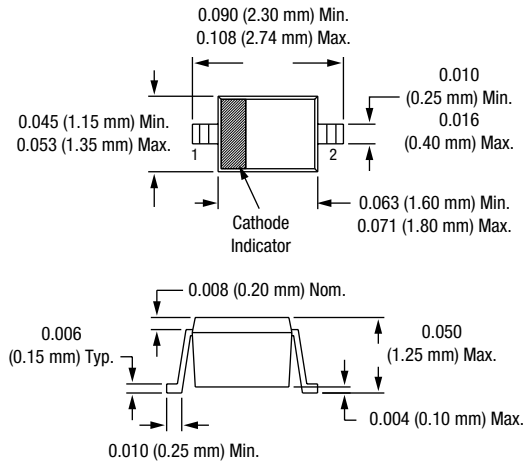
SOT-23



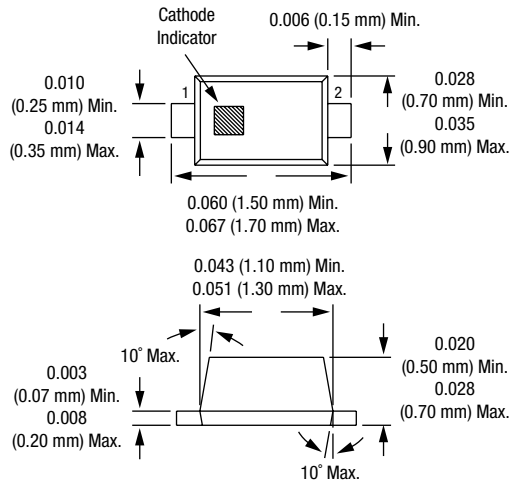
SC-70



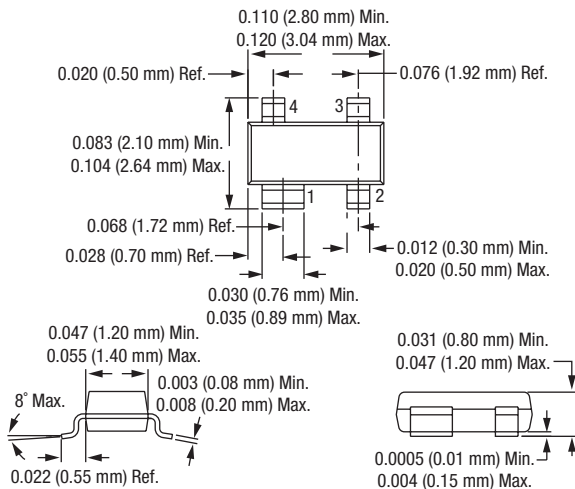
SOD-323



SC-79



SOT-143



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