

DATA SHEET

# SMP1330 Series: Plastic Packaged Limiter Diodes

## Applications

- WLAN, WiMAX
- Cellular infrastructure
- RFID readers
- Test instruments



## Features

- Low-distortion design
- Limiter performance to 2 GHz and higher
- Low insertion loss
- Low-cost plastic package
- SOT-23 Pb-free (MSL1, 260 °C per JEDEC J-STD-020) package



Skyworks Green™ products are RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain <1,000 ppm antimony trioxide in polymeric materials.

## Description

The SMP1330 series of limiter diodes is designed for use as passive receiver protectors in wireless and other RF systems covering frequencies up to 2 GHz and higher. These diodes use Skyworks limiter diode technology to produce gold-doped, thin base limiters for low-loss, low-distortion performance and good limiter action.

The SMP1330 series of diodes has been characterized in limiter circuits and tightly specified to ensure consistent performance.

The absolute maximum ratings of the SMP1330 series are provided in Table 1.

**Table 1. SMP1330 Series Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	$V_R$		20	V
Forward current	$I_F$		100	mA
CW incident power @ 25 °C lead temperature			1	W
Peak incident power @ 1% duty factor, 1 $\mu$ s pulse			100	W
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.

**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 SMP1330 series of limiter diodes are Class 2 ESD devices.

### Configurations

As illustrated in Figure 1, the SMP1330 series is available in two wiring configurations, each using an industry standard SOT-23 package.

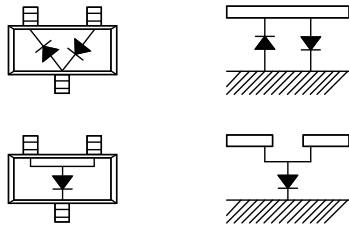


Figure 1. SMP1330 Series SOT-23 Configurations

### Electrical and Mechanical Specifications

The part numbers and configurations for the SMP1330 series are provided in Table 2. Electrical specifications are provided in Table 3. Typical 1 GHz limiter performance measurements are provided in Table 4.

Input power vs output power performance for the SMP1330 series is illustrated in Figure 2. Package dimensions for the SOT-23 are

shown in Figure 3, and tape and reel dimensions are provided in Figure 4.



### 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 SMP1330 series is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. These diodes 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.

Table 2. Part Number and Configuration

	
Series Pair	Low Inductance
SOT-23	SOT-23
<b>SMP1330-005</b> Marking: PQ2	<b>SMP1330-007</b> Marking: PQB
<b>SMP1330-005LF</b> Green™ Marking: RQ2	<b>SMP1330-007LF</b> Green™ Marking: RQB
L <sub>s</sub> = 1.5 nH	L <sub>s</sub> = 0.4 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.

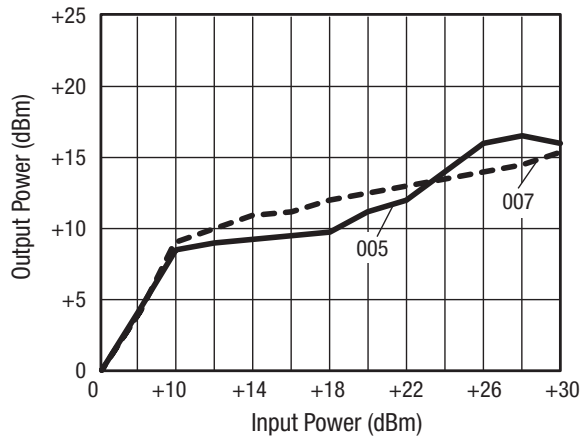
**Table 3. SMP1330 Series Electrical Specifications**  
( $T_A = +25\text{ }^\circ\text{C}$  Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Series resistance	$R_s$	$F = 100\text{ MHz}$ , $I_f = 10\text{ mA}$		1.2	1.5	$\Omega$
Capacitance	$C_T$	0 V $F = 1\text{ MHz}$ $F = 1\text{ GHz}$		0.7 0.7	1.0	pF pF
Conductance	$G$	0 V, $F = 1\text{ GHz}$		50		$\mu\text{s}$
Carrier lifetime	$T_I$	$I_f = 10\text{ mA}$		4		ns
I region width				3		$\mu\text{m}$
Breakdown voltage	$V_B$	$I_R = 10\text{ }\mu\text{A}$	20	35	50	V

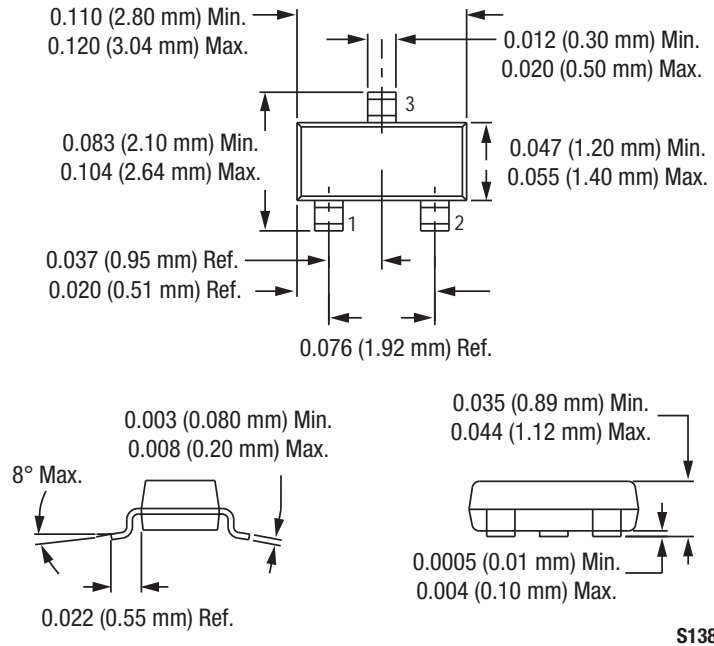
**Note 1:** Performance is guaranteed only under the conditions listed in this Table.

**Table 4. Typical 1 GHz Limiter Performance**

Parameter	SMP1330-005	Condition
Connection	Parallel	
Insertion loss	0.3 dB	Input power = -20 dBm
IP3	+30 dBm	Input power = < 0 dBm
1 dB compression	+10 dBm	
Attenuation @ +20 dBm	8.8 dB	
Attenuation @ +30 dBm	14 dB	

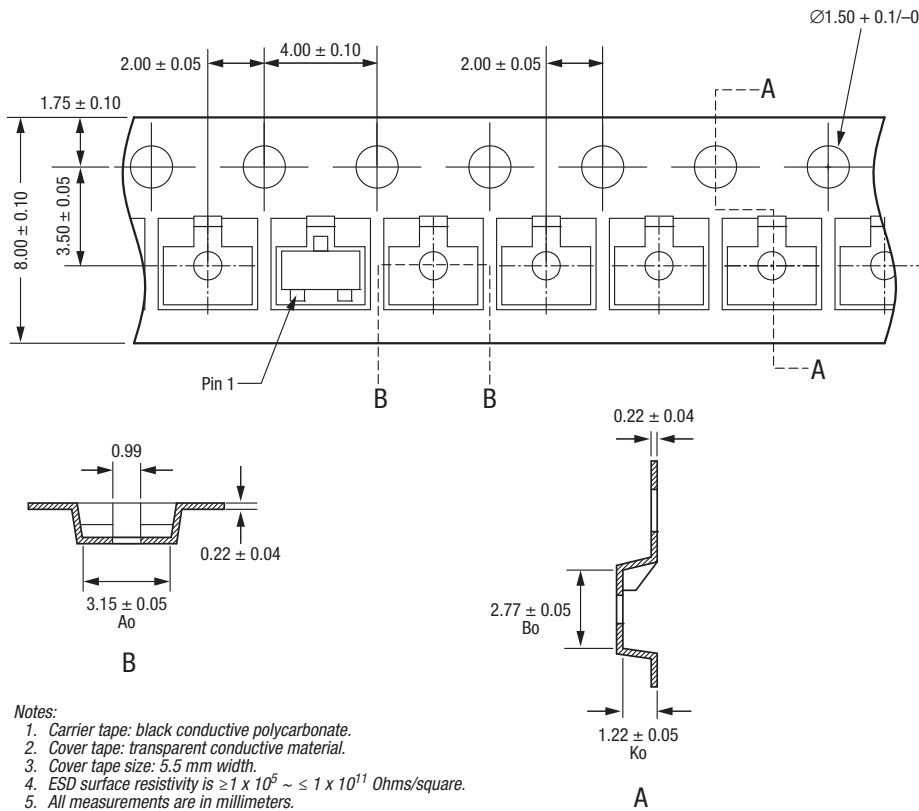


**Figure 2. Typical 1 GHz Limiter Performance**



S1389

Figure 3. SOT-23 Package Dimension Drawing



S2259

Figure 4. SOT-23 Tape and Reel Dimensions

- Notes:
1. Carrier tape: black conductive polycarbonate.
  2. Cover tape: transparent conductive material.
  3. Cover tape size: 5.5 mm width.
  4. ESD surface resistivity is  $\geq 1 \times 10^5 \sim \leq 1 \times 10^{11}$  Ohms/square.
  5. All measurements are in millimeters.
  6. Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.

Copyright © 2009, 2010 Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of stated published specifications or parameters.

Skyworks, the Skyworks symbol, and "Breakthrough Simplicity" are trademarks or registered trademarks of Skyworks Solutions, Inc., in the United States and other countries. Third-party brands and names are for identification purposes only, and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at [www.skyworksinc.com](http://www.skyworksinc.com), are incorporated by reference.