

DATA SHEET

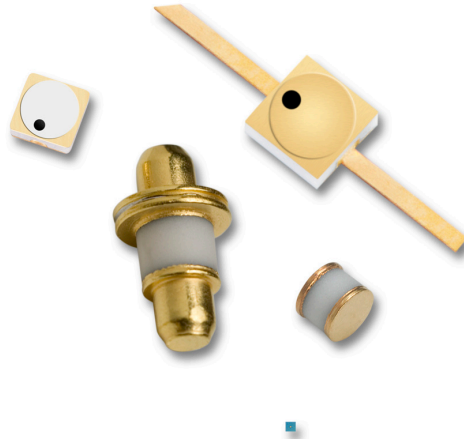
# SMV2019 to SMV2023: Silicon Hyperabrupt Junction Varactors, Packaged and Bondable Planar Chips

## Applications

- Voltage controlled oscillators

## Features

- High Q for low loss resonators
- Low leakage current
- High tuning ratio for wideband VCOs
- SPICE model parameters
- Small footprint chip design
- Lead (Pb)-free, RoHS-compliant, and Green™



## Description

Skyworks silicon hyperabrupt junction varactor diodes are processed using established ion-implantation technology resulting in low  $R_S$  wide tuning ratio devices with high Q values. These diodes are available as chips or in ceramic packages. These planar chips have a small outline size (12 x 12 mils nominal) and are fully passivated, resulting in low leakage current and high reliability. These varactor chips are intended for assembly in hybrid integrated circuit resonators used in VCOs and analog tuned filters.

**NEW** 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.



## Absolute Maximum Ratings

Characteristic	Value
Reverse Voltage ( $V_R$ )	22 V
Forward Current ( $I_F$ )	100 mA
Power Dissipation at 25 °C ( $P_D$ )	250 mW
Operating Temperature ( $T_{OP}$ )	-55 °C to +150 °C
Storage Temperature ( $T_{ST}$ )	-65 °C to +200 °C

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 Ratings. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

**CAUTION:** Although these devices are designed to be robust, ESD (Electrostatic Discharge) can cause permanent damage. 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.

### Electrical Specifications at 25 °C

Part Number	C <sub>J</sub> @ 0 V (pF) <sup>(1)</sup>	C <sub>J</sub> @ 4 V (pF)		C <sub>J</sub> @ 20 V (pF)		Q @ 4 V 50 MHz <sup>(2)</sup>	1 GHz R <sub>S</sub> @ 4 V (Ω)	I <sub>R</sub> @17.6 V (nA) <sup>(3)</sup>	Contact Diam. (mils) <sup>(4)</sup>
	Typ.	Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Nom.
SMV2019-000	2.3	0.68	0.88	0.13	0.23	500	4.8	50	2
SMV2020-000	3.1	1.13	1.43	0.23	0.33	500	4.1	50	2.5
SMV2021-000	4.5	1.58	1.98	0.32	0.44	500	2.8	50	3
SMV2022-000	7.1	2.48	3.08	0.48	0.68	400	2.2	50	3.75
SMV2023-000	10.8	4.28	5.28	0.78	1.08	400	1.4	50	5

1. All capacitance values specified at 1 MHz.

2. 50 MHz Q calculated from 1 GHz R<sub>S</sub> and 1 MHz C<sub>J</sub>.

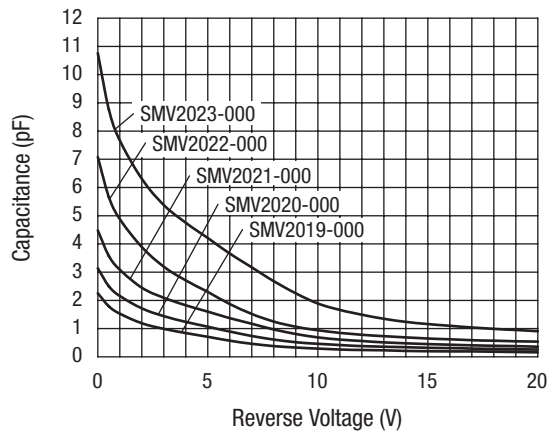
3. V<sub>B</sub> at 10 μA specified at 22 V Min.

4. Outline drawing 149-801.

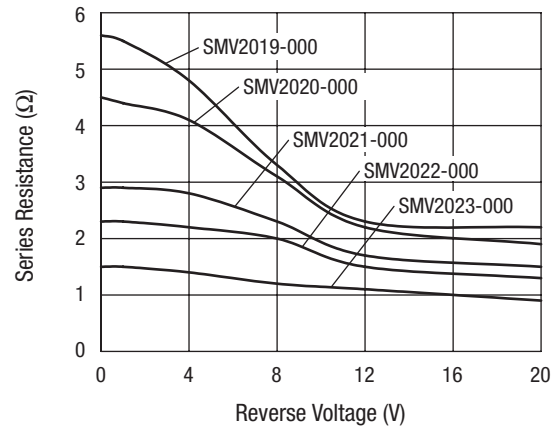
### Hermetic Packaged Varactor Diodes

Stripline 240	Hermetic Pill 203	Stripline 219	Coaxial 210
SMV2019-240	SMV2019-203	SMV2019-219	SMV2019-210
SMV2020-240	SMV2020-203	SMV2020-219	SMV2020-210
SMV2021-240	SMV2021-203	SMV2021-219	SMV2021-210
SMV2022-240	SMV2022-203	SMV2022-219	SMV2022-210
SMV2023-240	SMV2023-203	SMV2023-219	SMV2023-210

### Typical Performance Data



Capacitance vs. Reverse Voltage

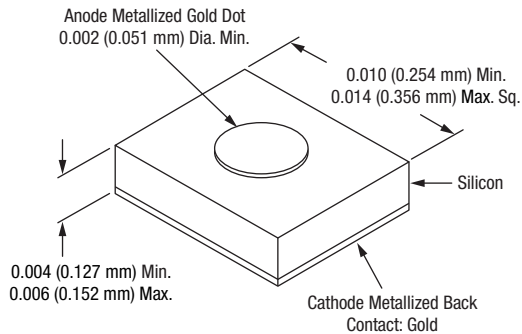


Series Resistance vs. Voltage @ 1 GHz

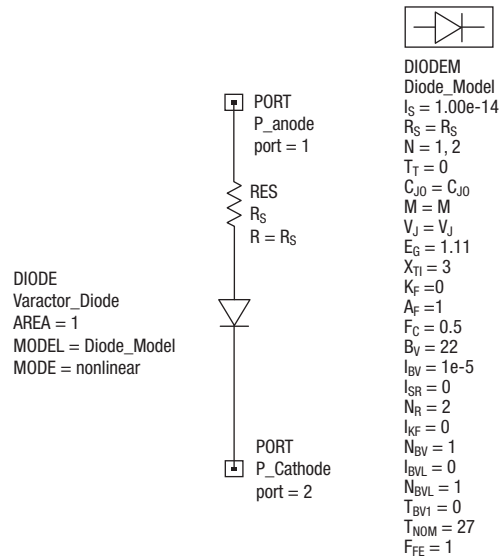
### Typical Capacitance Values

V <sub>R</sub> (V)	SMV2019 C <sub>J</sub> (pF)	SMV2020 C <sub>J</sub> (pF)	SMV2021 C <sub>J</sub> (pF)	SMV2022 C <sub>J</sub> (pF)	SMV2023 C <sub>J</sub> (pF)
0	2.25	3.14	4.48	7.08	10.76
0.5	1.79	2.5	3.57	5.66	8.76
1	1.53	2.16	3.09	4.88	7.67
2	1.19	1.72	2.45	3.89	6.31
3	0.99	1.44	2.09	3.19	5.38
4	0.84	1.24	1.83	2.71	4.75
5	0.71	1.07	1.6	2.3	4.21
6	0.57	0.9	1.37	1.87	3.66
7	0.46	0.74	1.17	1.52	3.17
8	0.38	0.61	0.97	1.25	2.68
9	0.33	0.52	0.81	1.07	2.25
10	0.29	0.46	0.69	0.94	1.89
11	0.26	0.42	0.61	0.85	1.66
12	0.24	0.38	0.56	0.78	1.49
13	0.23	0.36	0.51	0.73	1.35
14	0.21	0.34	0.48	0.69	1.24
15	0.2	0.32	0.45	0.65	1.16
16	0.19	0.31	0.43	0.62	1.1
17	0.19	0.29	0.41	0.59	1.04
18	0.18	0.28	0.39	0.57	0.99
19	0.17	0.27	0.38	0.55	0.95
20	0.16	0.26	0.36	0.54	0.91

### 149-801



### SPICE Model



```

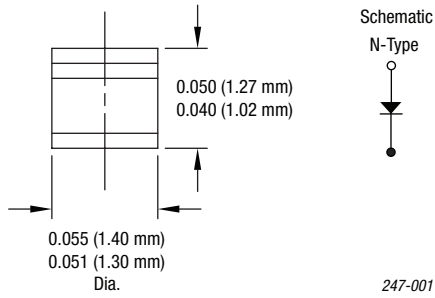
DIODEM
Diode_Model
I_S = 1.00e-14
R_S = R_S
N = 1, 2
T_T = 0
C_J0 = C_J0
M = M
V_J = V_J
E_G = 1.11
X_T1 = 3
K_F = 0
A_F = 1
F_C = 0.5
B_V = 22
I_BV = 1e-5
I_SR = 0
N_R = 2
I_KF = 0
N_BV = 1
I_BVL = 0
N_BVL = 1
T_BV1 = 0
T_NOM = 27
F_FE = 1
    
```

$$C_V = \frac{C_{J0}}{\left(1 + \frac{V_R}{V_J}\right)^M}$$

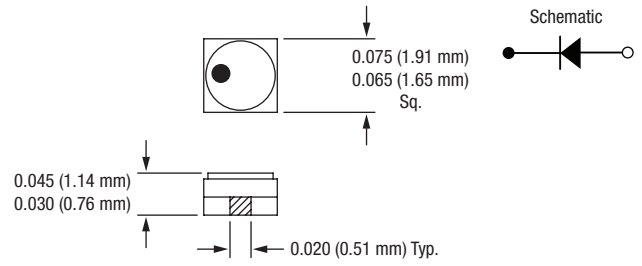
Part Number	C <sub>J0</sub> (pF)	V <sub>J</sub> (V)	M	R <sub>S</sub> (Ω)
SMV2019	2.3	3.5	1.4	4.8
SMV2020	3.3	3.6	1.3	4.1
SMV2021	4.5	3.9	1.34	2.8
SMV2022	7.1	4	1.4	2.2
SMV2023	10.8	4.6	1.45	1.4

SPICE model parameters extracted from measured characteristics may not reflect exact physical or electronic properties. See application note APN1004.

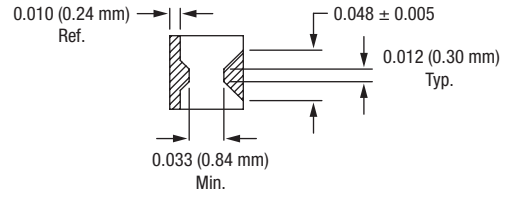
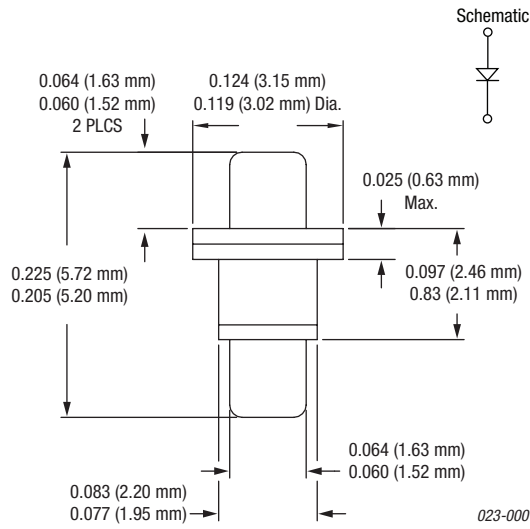
**-203**



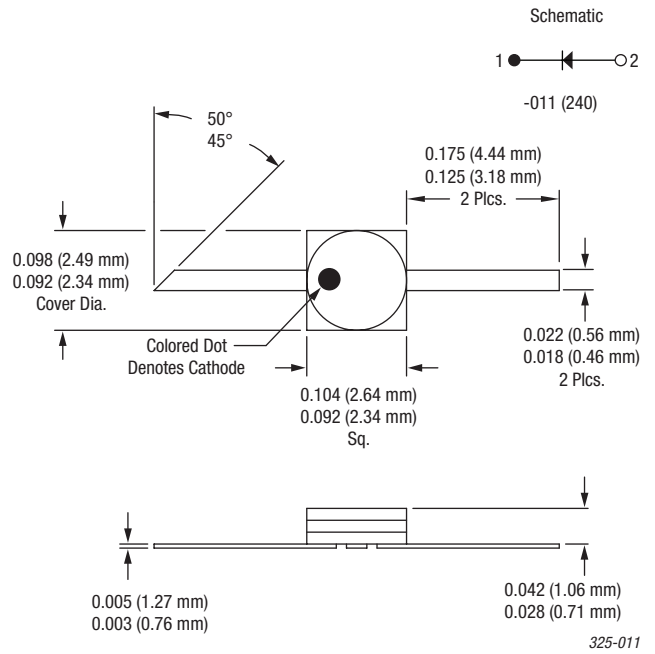
**-219**



**-210**



**-240**



Copyright © 2002, 2003, 2004, 2005, 2006, 2007, 2008, 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.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.