

DATA SHEET

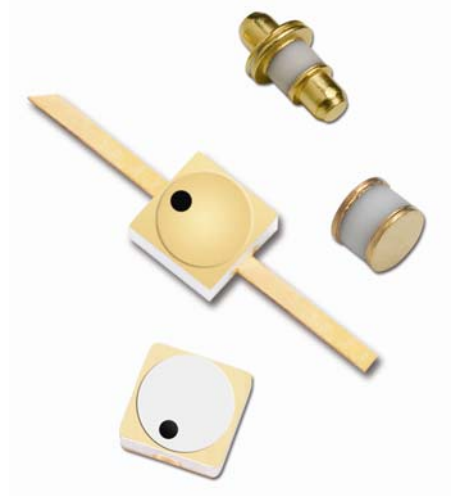
SMV2019 to SMV2023 Series: Hermetic Ceramic Packaged Silicon Hyperabrupt Junction Varactors

Applications

- VCOs

Features

- High Q for low-loss resonators
- Low leakage current
- High tuning ratio for wideband VCOs
- SPICE model parameters



Description

The Isolink silicon hyperabrupt junction varactor diodes are processed using established ion-implantation technology resulting in low series resistance, wide tuning ratio devices with high Q values. These diodes are available in ceramic packages. The planar devices are fully passivated, which results in low leakage current and high reliability.

The absolute maximum ratings of the SMV2019 to SMV2023 varactors are provided in Table 1. Electrical specifications are specified in Table 2. Typical capacitance values are listed in Table 3.

The SPICE model is shown in Figure 1. SPICE parameters are listed in Table 4. Typical performance characteristics are provided in Figures 2 and 3.

Table 1. SMV2019 to SMV2023 Absolute Maximum Ratings¹

Parameter	Symbol	Min	Typ	Max	Units
Power dissipation	P _{DIS}			250	mW
Reverse voltage	V _R			22	V
Forward current	I _F			100	mA
Operating temperature	T _{OP}	-55		+150	°C
Storage temperature	T _{STG}	-65		+200	°C

¹ 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.

ESD HANDLING: 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 when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

Table 2. SMV2019 to SMV2023 Electrical Specifications¹
(T_{OP} = +25 °C, C_J Measured at 1 MHz, Unless Otherwise Noted)

Part Number	Total Capacitance (C _T) @ 0 V (pF)	Total Capacitance (C _T) @ 4 V (pF)		Total Capacitance (C _T) @ 20 V (pF)		Q @ 4 V, (500 MHz) ²	Series Resistance (R _s) @ 4 V, f = 1 GHz (Ω)	Reverse Voltage @ 17.6 V (nA) ³
	Typical	Minimum	Maximum	Minimum	Maximum	Minimum	Typical	Maximum
SMV2019-203	2.25	0.81	1.03	0.26	0.38	500	4.8	50
SMV2019-210	2.25	0.89	1.11	0.34	0.46	500	4.8	50
SMV2019-219	2.25	0.77	1.00	0.22	0.35	500	4.8	50
SMV2019-240	2.25	0.82	1.04	0.27	0.39	500	4.8	50
SMV2020-203	3.14	1.26	1.58	0.36	0.48	500	4.1	50
SMV2020-210	3.14	1.34	1.66	0.44	0.56	500	4.1	50
SMV2020-219	3.14	1.22	1.55	0.32	0.45	500	4.1	50
SMV2020-240	3.14	1.27	1.59	0.37	0.49	500	4.1	50
SMV2021-203	4.48	1.71	2.13	0.45	0.59	500	2.8	50
SMV2021-210	4.48	1.79	2.21	0.53	0.67	500	2.8	50
SMV2021-219	4.48	1.67	2.10	0.41	0.56	500	2.8	50
SMV2021-240	4.48	1.72	2.14	0.46	0.60	500	2.8	50
SMV2022-203	7.08	2.61	3.23	0.61	0.83	400	2.2	50
SMV2022-210	7.08	2.69	3.31	0.69	0.91	400	2.2	50
SMV2022-219	7.08	2.57	3.20	0.57	0.80	400	2.2	50
SMV2022-240	7.08	2.62	3.24	0.62	0.84	400	2.2	50
SMV2023-203	10.76	4.41	5.43	0.91	1.23	400	1.4	50
SMV2023-210	10.76	4.49	5.51	0.99	1.31	400	1.4	50
SMV2023-219	10.76	4.38	5.43	0.88	1.23	400	1.4	50
SMV2023-240	10.76	4.42	5.44	0.92	1.24	400	1.4	50

¹ Performance is guaranteed only under the conditions listed in this table and is not guaranteed over the full operating or storage temperature ranges. Exceeding any of the conditions listed here may result in permanent damage to the device. Operation at elevated temperatures may reduce reliability of the device.

² 50 MHz Q calculated from 1 GHz R_s and 1 MHz C_J.

³ V_B at 10 μA specified at 22 V, minimum.

Table 3. Typical Capacitance Values

Reverse Voltage, V_R (V)	Junction Capacitance, C_j (pF)				
	SMV2019	SMV2020	SMV2021	SMV2022	SMV2023
0	2.25	3.14	4.48	7.08	10.76
0.5	1.79	2.50	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	0.89	1.24	1.83	2.71	4.75
5	0.71	1.07	1.60	2.30	4.21
6	0.57	0.90	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	0.20	0.32	0.45	0.65	1.16
16	0.19	0.31	0.43	0.62	1.10
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

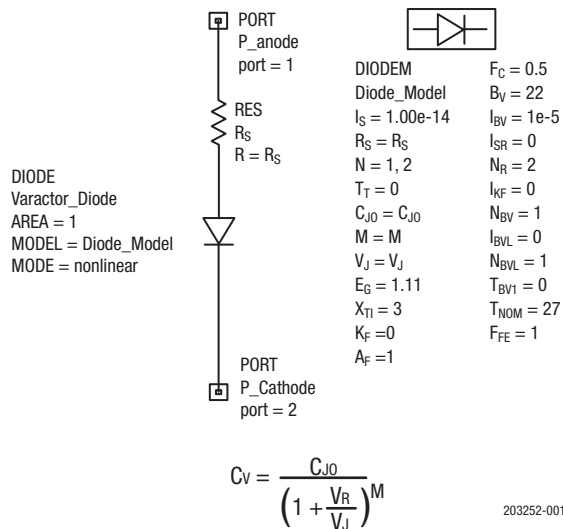


Figure 1. SPICE Model

Table 4. SPICE Model Parameters

Part Number	C _{J0} (pF)	V _J (V)	M	R _s (Ω)
SMV2019	2.3	3.5	1.40	4.80
SMV2020	3.05	4.46	1.51	4.10
SMV2021	4.3	5.09	1.59	2.80
SMV2022	6.9	4.92	1.69	2.20
SMV2023	10.26	7.61	1.93	1.40

Typical Performance Characteristics at 25 °C

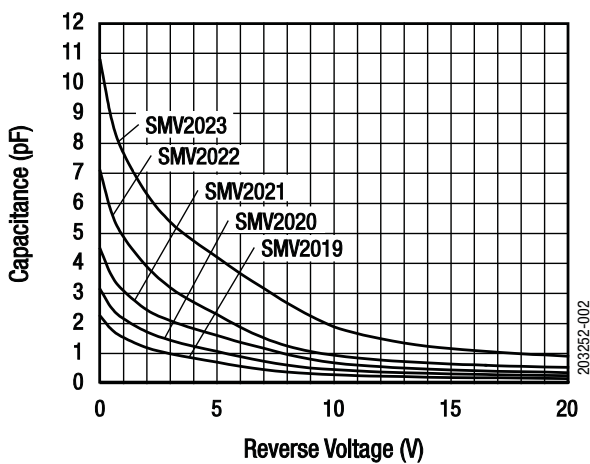


Figure 2. Capacitance vs Reverse Voltage

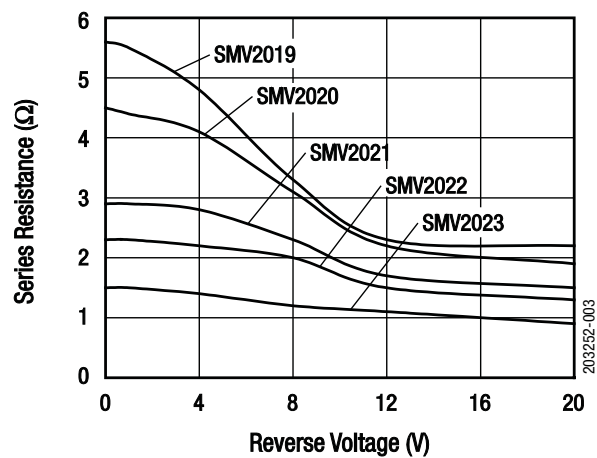
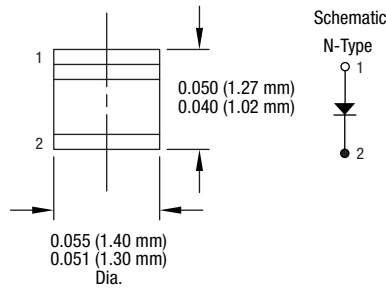


Figure 3. Series Resistance vs Voltage @ 1 GHz

Package Outline Drawings

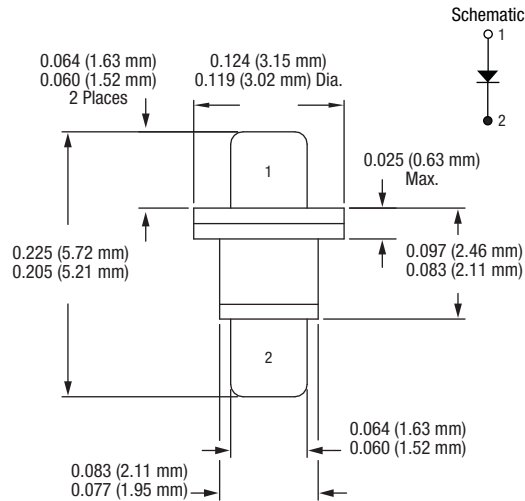
The package outline drawings for the SMV23019 to SMV2023 varactors are shown in Figures 4 through 7.



Dimensions are in inches (millimeters shown in parentheses)

203252-004

Figure 4. -203 Package

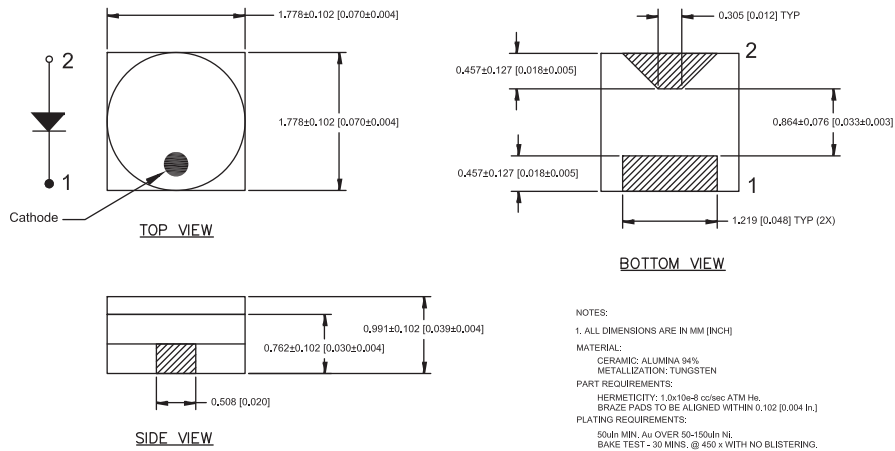


Dimensions are in inches (millimeters shown in parentheses)

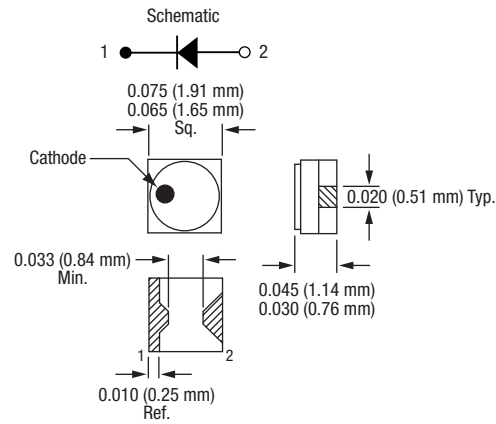
203252-005

Figure 5. -210 Package

DATA SHEET • SMV2019 TO SMV2023 SERIES: HERMETIC CERAMIC PACKAGED SILICON HYPERABRUPT JUNCTION VARACTORS



Version A



Dimensions are in inches (millimeters shown in parentheses)

Version B

203252-006

Figure 6. -219 Package

Copyright © 2014, 2017 Isolink, Inc. All Rights Reserved.

Information in this document is provided in connection with Isolink, Inc. ("Isolink"), a wholly-owned subsidiary of Skyworks Solutions, Inc. These materials, including the information contained herein, are provided by Isolink as a service to its customers and may be used for informational purposes only by the customer. Isolink assumes no responsibility for errors or omissions in these materials or the information contained herein. Isolink may change its documentation, products, services, specifications or product descriptions at any time, without notice. Isolink 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. Isolink assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Isolink products, information or materials, except as may be provided in Isolink 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. ISOLINK DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. ISOLINK 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.

Customers are responsible for their products and applications using Isolink 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. Isolink assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Isolink products outside of stated published specifications or parameters.

Isolink is a trademark of Isolink Inc. in the United States and other countries. Skyworks and the Skyworks symbol 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.