

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

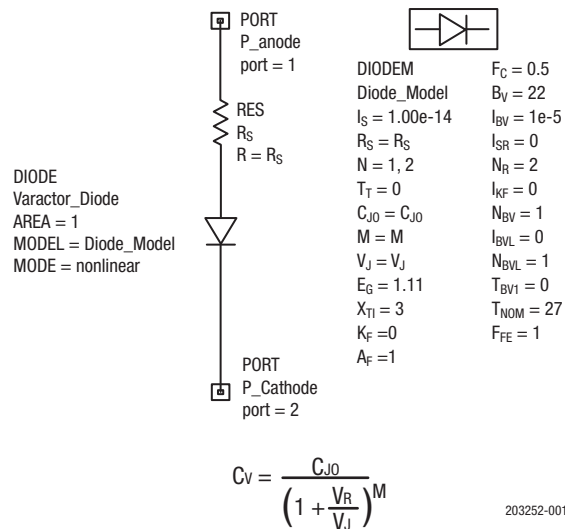


Figure 1. SPICE Model

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

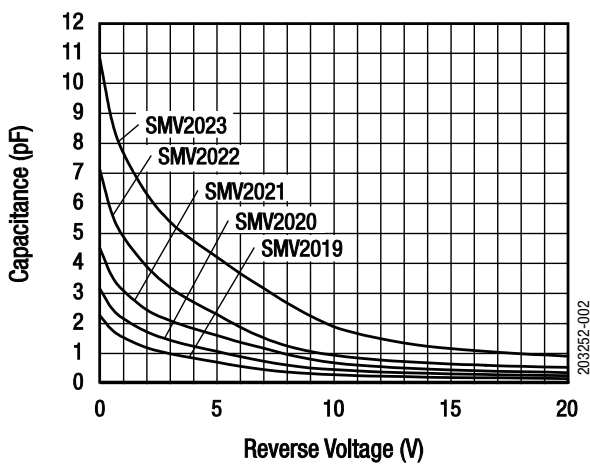


Figure 2. Capacitance vs Reverse Voltage

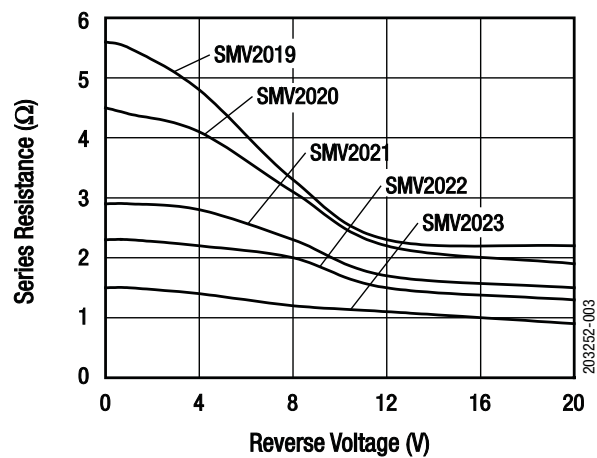
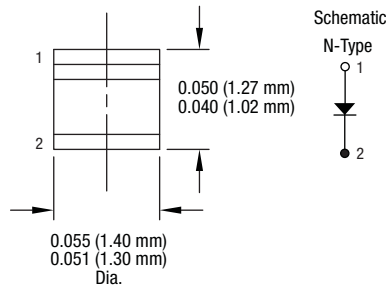


Figure 3. Series Resistance vs Voltage @ 1 GHz

Package Outline Drawings

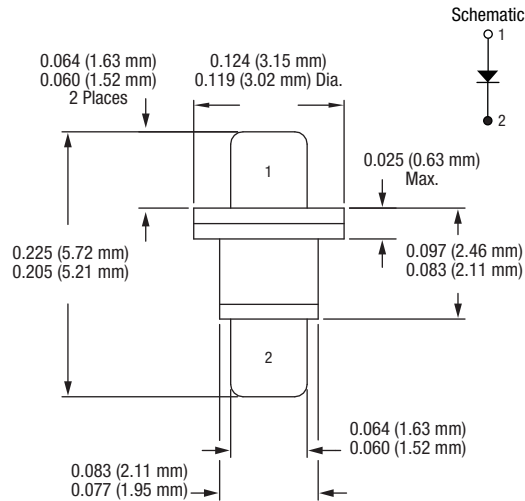
The package outline drawings for the SMV23019 to SMV2023 varactors are shown in Figures 4 through 7.



Dimensions are in inches (millimeters shown in parentheses)

203252-004

Figure 4. -203 Package

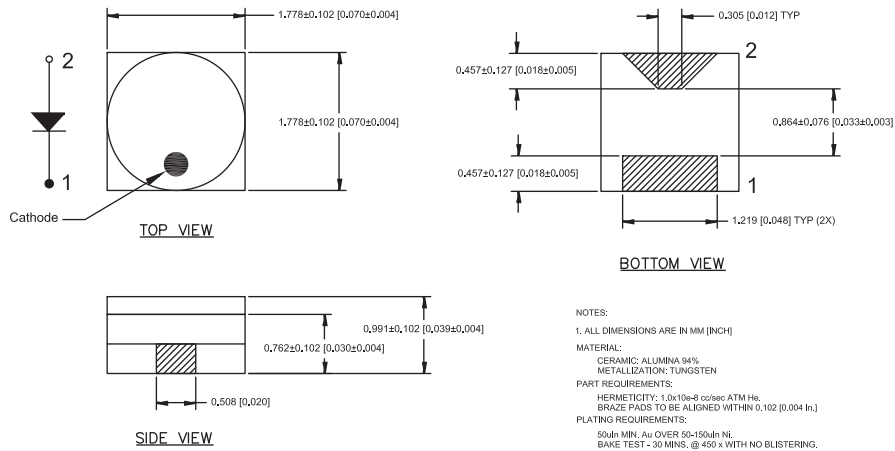


Dimensions are in inches (millimeters shown in parentheses)

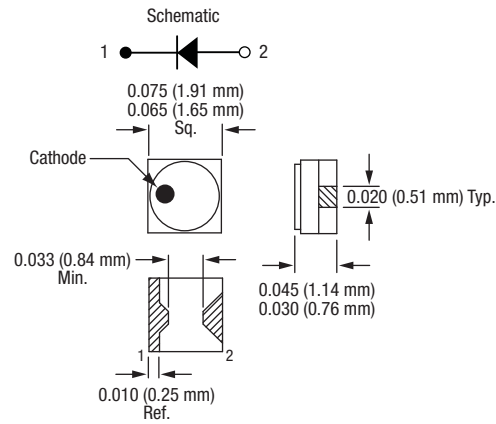
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Figure 5. -210 Package

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Version A



Dimensions are in inches (millimeters shown in parentheses)

Version B

203252-006

Figure 6. -219 Package

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