DATA SHEET

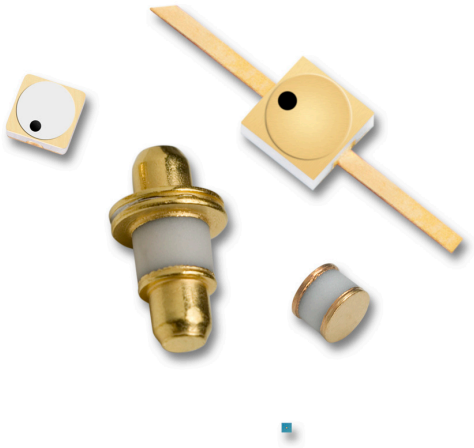
SMV2019 to SMV2023: Silicon Hyperabrupt Junction Varactors, Packaged and Bondable Planar Chips

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

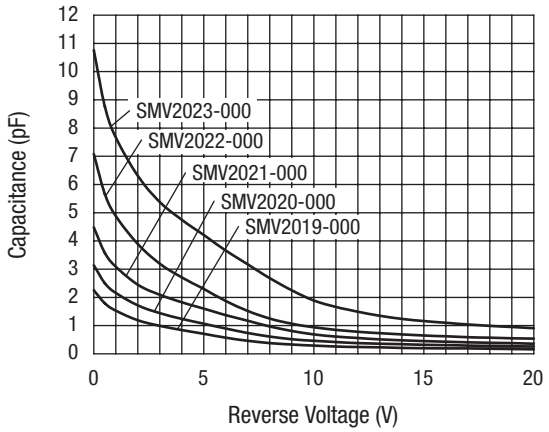
Part Number	C_J @ 0 V (pF)[1]	C_J @ 4 V (pF)		C_J @ 20 V (pF)		Q @ 4 V 50 MHz[2]	1 GHz R_S @ 4 V (Ω)	I_R @17.6 V (nA)[3]	Contact Diam. (mils)[4]
	Typ.	Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Nom.
SMV2019-000	2.3	0.68	0.88	0.13	0.23	500	4.8	50	2
SMV2020-000	3.1	1.13	1.43	0.23	0.33	500	4.1	50	2.5
SMV2021-000	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_S and 1 MHz C_J.
3. V_B at 10 μA specified at 22 V Min.
4. Outline drawing 149-801.

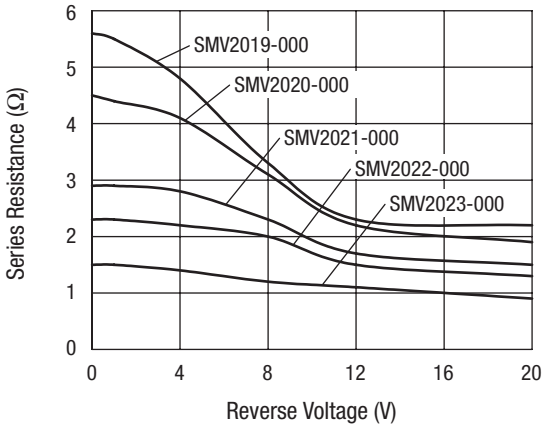
Hermetic Packaged Varactor Diodes

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_R (V)	SMV2019 C_J (pF)	SMV2020 C_J (pF)	SMV2021 C_J (pF)	SMV2022 C_J (pF)	SMV2023 C_J (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

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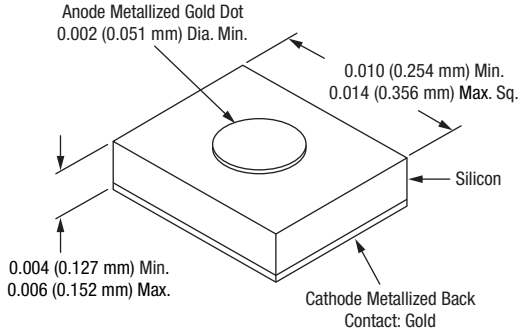
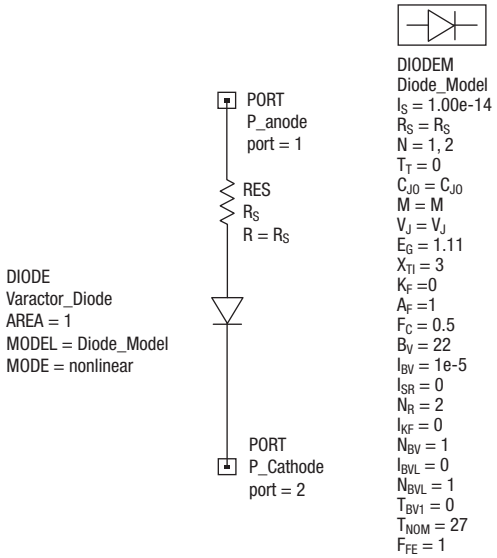


SPICE Model



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

Part Number	C_{J0} (pF)	V_J (V)	M	R_S (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.

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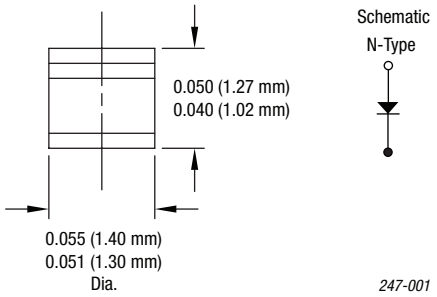

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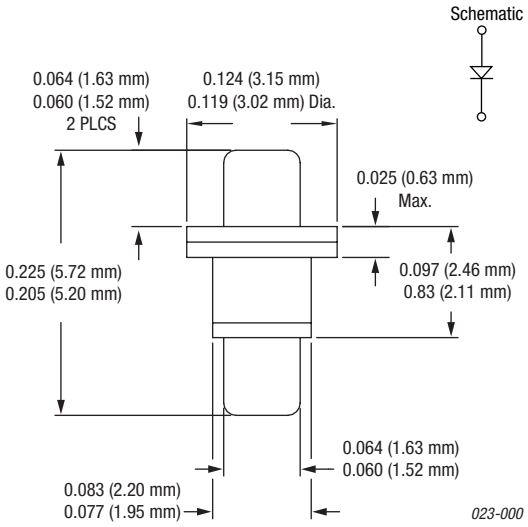

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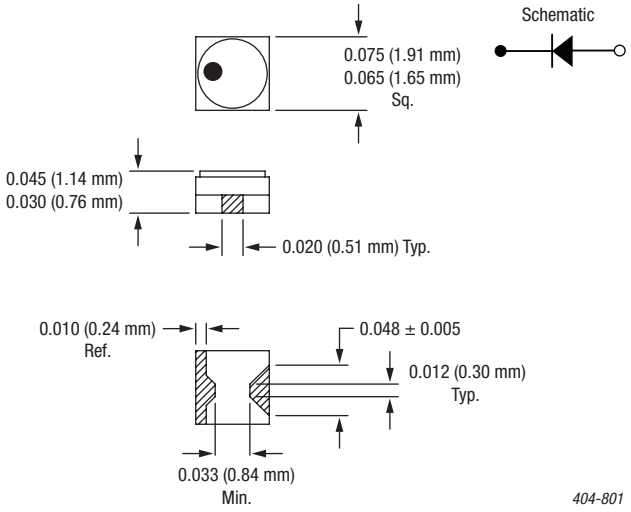

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