

DATA SHEET

SMV1493, SMV1494: Silicon Abrupt Junction Tuning Varactors, Hermetic Ceramic Packaged Devices

Applications

- RF and UHF VCOs
- Voltage tuned filters
- Voltage variable phase shifters

Features

- Supports high frequencies beyond 20 GHz
- Low series resistance for low phase noise
- Packages rated MSL1, 260 °C per JEDEC J-STD-020

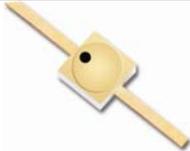


Description

The SMV1493 and SMV1494 hermetic packaged silicon abrupt junction varactor diodes are designed for use in Voltage Controlled Oscillators (VCOs) requiring tight capacitance tolerances. The low resistance of these varactors makes them appropriate for high-Q resonators in wireless system VCOs from RF to to frequencies beyond 20 GHz.

Table 1 lists the various packages and part numbers for the SMV1493 and SMV1494 varactors.

Table 1. Hermetic Packaged Abrupt Junction Tuning Varactor Devices

			
Hermetic Stripline 240	Hermetic Pill 203	Stripline 219	Coaxial 210
SMV1493-240	SMV1493-203	SMV1493-219	SMV1493-210
SMV1494-240	SMV1494-203	SMV1494-219	SMV1494-210
Ls = 0.55 nH	Ls = 0.40 nH	Ls = 0.50 nH	Ls = 0.45 nH

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1493 and SMV1494 varactors are provided in Table 2. Electrical specifications are provided in Table 3. Typical capacitance values are listed in Table 4. The typical capacitance versus reverse voltage performance of the SMV1493 and SMV1494 varactors is illustrated in Figure 1.

The SPICE model for the SMV1493 and SMV1494 varactors is shown in Figure 2 and the associated model parameters are provided in Table 5.

Package dimensions are shown in Figures 3 to 6. The SMV1493 and SMV1494 varactors are not delivered on carrier tapes.

Table 2. SMV1493 and SMV1494 Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Maximum	Units
Forward current	I _F		20	mA
Power dissipation	P _D		250	mW
Operating temperature	T _{OP}	-55	+125	°C
Storage temperature	T _{STG}	-55	+150	°C
Electrostatic discharge: Human Body Model (HBM), Class 0	ESD		< 250	V

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. Exceeding any of the limits listed here may result in permanent damage to the device.

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 3. SMV1493 and SMV1494 Electrical Specifications¹
(T_{OP} = 25 °C, Unless Otherwise Noted)

Part Number	Voltage Breakdown @ 10 mA (V)	Total Capacitance (CT) @ 1 V (pF)		Total Capacitance (CT) @ 4 V (pF)		Series Resistance (RS) @ 1 V, f = 500 MHz (Ω)
	Minimum	Minimum	Maximum	Minimum	Maximum	Maximum
SMV1493-203	12	17.48	20.08	10.08	12.18	0.5
SMV1493-210	12	17.48	20.08	10.08	12.18	0.5
SMV1493-219	12	17.48	20.08	10.08	12.18	0.5
SMV1493-240	12	17.48	20.08	10.08	12.18	0.5
SMV1494-203	12	36.35	41.85	20.67	25.35	0.45
SMV1494-210	12	36.35	41.85	20.67	25.35	0.45
SMV1494-219	12	36.35	41.85	20.67	25.35	0.45
SMV1494-240	12	36.35	41.85	20.67	25.35	0.45

¹ Performance is guaranteed only under the conditions listed in this table.

Table 4. Capacitance vs Reverse Voltage

V _R (V)	C _T (pF)	
	SMV1493	SMV1494
0	28.7	57.8
0.2	25.6	51.5
0.4	23.3	46.9
0.6	21.5	43.4
0.8	20.1	40.5
1.0	19.0	38.4
1.2	17.9	36.3
1.4	17.0	34.6
1.6	16.2	33.0
1.8	15.5	31.6
2.0	15.0	30.6
2.2	14.4	29.5
2.4	13.9	28.5
2.6	13.5	27.6
2.8	13.1	26.7
3.0	12.7	26.1
3.2	12.4	25.3
3.4	12.0	24.7
3.6	11.7	24.1
3.8	11.4	23.5
4.0	11.2	23.1
4.2	10.9	22.6
4.4	10.7	22.1
4.6	10.5	21.7
4.8	10.3	21.3
5.0	10.1	20.9
6.0	9.2	19.2
7.0	8.5	17.9
8.0	8.0	16.7
9.0	7.6	15.7
10.0	7.1	14.7

Typical Performance Characteristics

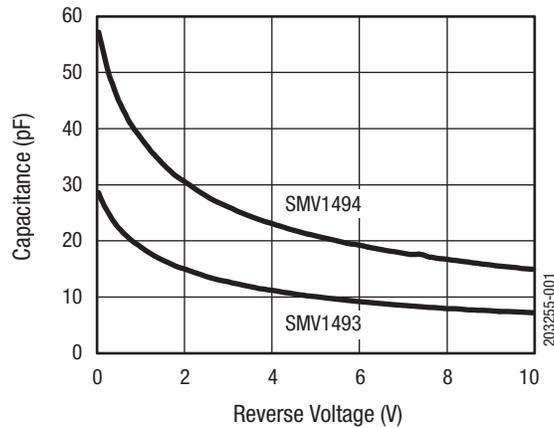


Figure 1. Capacitance vs Reverse Voltage

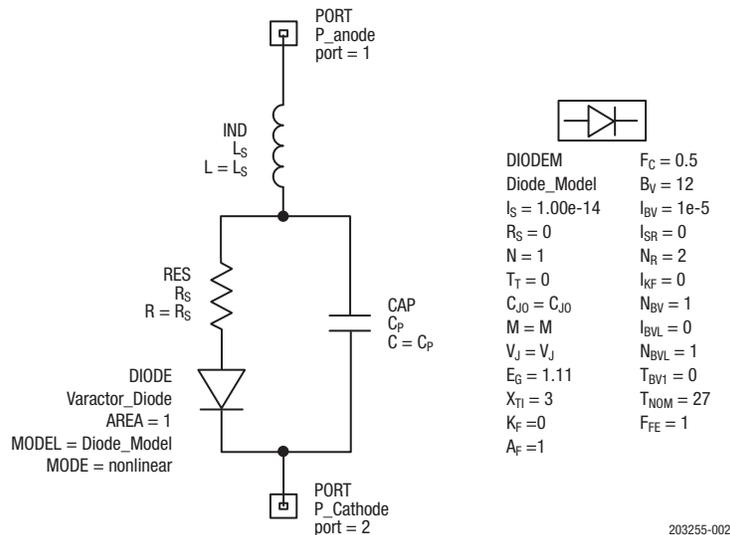


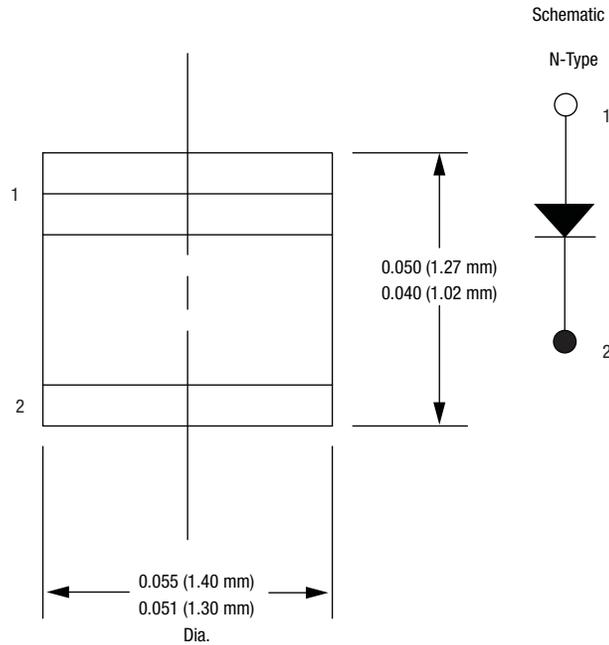
Figure 2. SPICE Model

Table 5. SPICE Model Parameters

Part Number	CJO (pF)	VJ (V)	M	Cp (pF)	Rs (Ω)
SMV1493	28.66	0.88	0.55	0	0.50
SMV1494	57.70	0.83	0.52	0	0.45

Values extracted from measured performance.

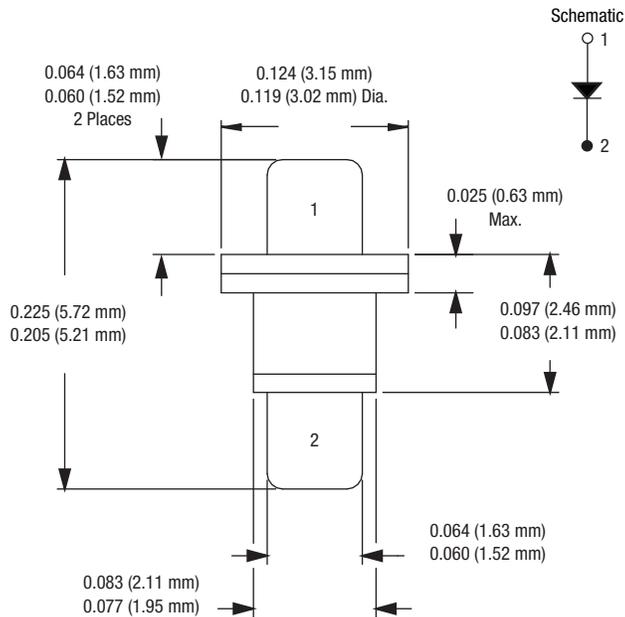
For more details, refer to the Skyworks Application Note, *Varactor SPICE Model for Approved RF VCO Applications*, document number 200315.



Dimensions are in inches (millimeters shown in parentheses)

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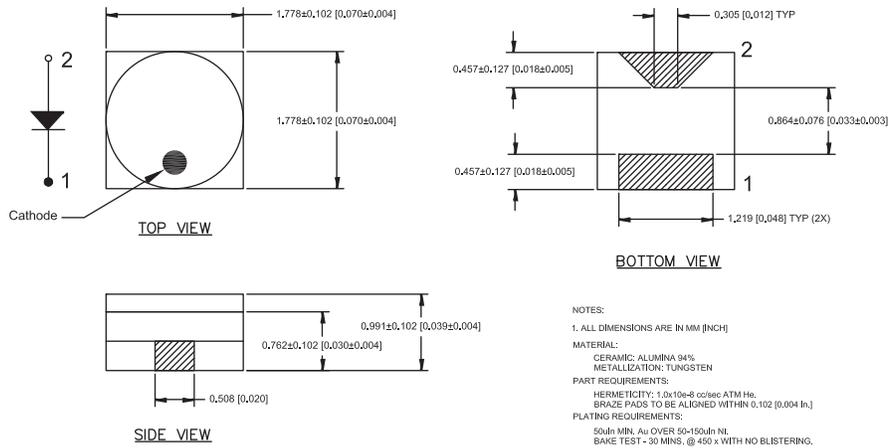
Figure 3. -203 Package Dimensions



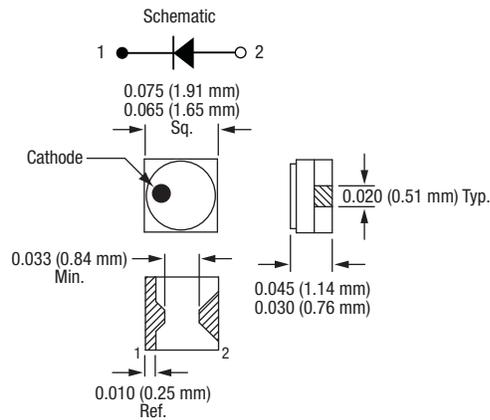
Dimensions are in inches (millimeters shown in parentheses)

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Figure 4. -210 Package Dimensions



Version A

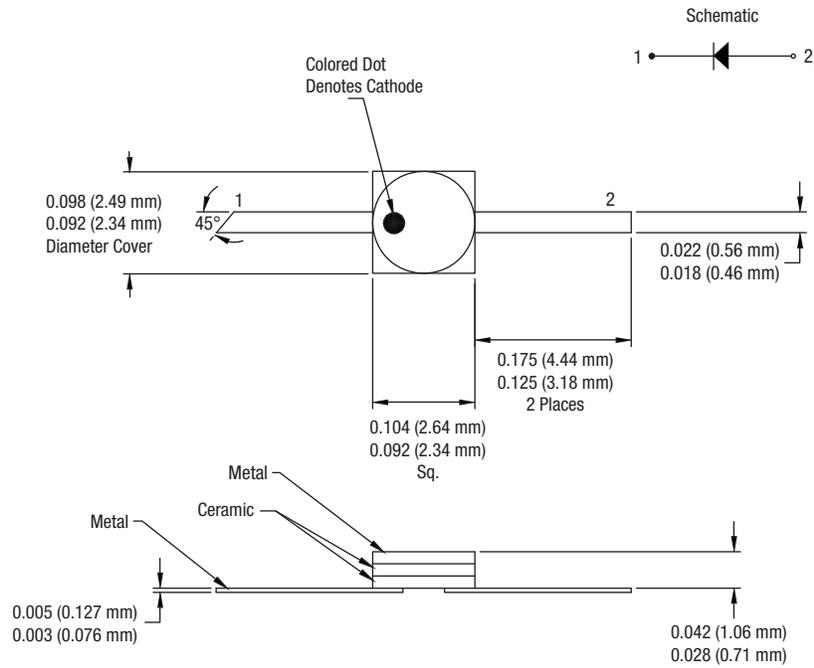


Dimensions are in inches (millimeters shown in parentheses)

Version B

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Figure 5. -219 Package Dimensions



Dimensions are in inches (millimeters shown in parentheses)

203255-006

Figure 6. -240 Package Dimensions

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