

DATA SHEET

# SMV1247–SMV1255: Hyperabrupt Tuning Varactors

## Features

- Designed for high-volume commercial applications
- High capacitance ratio,  $C_{0.3V}/C_{4.7V} = 12$  typ.
- Multiple packages: SOT-23, SOD-323, SC-70 and SC-79
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020
- SPICE models are available
- Available in tape and reel packaging



## Description

The SMV1247–SMV1255 series of silicon hyperabrupt junction varactor diodes is designed for use in VCOs with low tuning voltage operation. This family of varactors is characterized for capacitance and resistance over temperature. SPICE models are provided.

**NEW** Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant packaging.



## Absolute Maximum Ratings

Characteristic	Value
Reverse voltage ( $V_R$ )	15 V
Forward current ( $I_F$ )	20 mA
Power dissipation ( $P_D$ )	250 mW
Storage temperature ( $T_{ST}$ )	-55 °C to +150 °C
Operating temperature ( $T_{OP}$ )	-55 °C to +125 °C
ESD human body model	Class 0

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

**CAUTION:** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. 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.

Single	Single	Single	Common Anode	Common Cathode	Common Cathode
SC-79	SOD-323	SOT-23	SOT-23	SOT-23	SC-70
◆SMV1247-079 Marking: Cathode	SMV1247-011 Marking: BF				◆SMV1247-074 Marking: BF3
◆SMV1247-079LF Marking: Cathode	SMV1247-011LF Marking: GF				◆SMV1247-074LF Marking: GF3
SMV1248-079LF Marking: Cathode		SMV1248-001 Marking: BG1			SMV1248-074 Marking: GG3
		SMV1248-001LF Marking: GG1			SMV1248-074LF Marking: GG3
◆SMV1249-079 Marking: Cathode	SMV1249-011 Marking: AF	SMV1249-001 Marking: AF1	SMV1249-003 Marking: AF9	SMV1249-004 Marking: AF3	SMV1249-074 Marking: AF3
◆SMV1249-079LF Marking: Cathode	SMV1249-011LF Marking: EF	SMV1249-001LF Marking: EF1	SMV1249-003LF Marking: EF9	SMV1249-004LF Marking: EF3	SMV1249-074LF Marking: EF3
SMV1251-079 Marking: Cathode	SMV1251-011 Marking: AH			SMV1251-004 Marking: AH3	SMV1251-074 Marking: AH3
SMV1251-079LF Marking: Cathode	SMV1251-011LF Marking: EH	SMV1251-001LF Marking: EH		SMV1251-004LF Marking: EH3	SMV1251-074LF Marking: EH3
SMV1253-079 Marking: Cathode				SMV1253-004 Marking: AJ3	
SMV1253-079LF Marking: Cathode				SMV1253-004LF Marking: EJ3	
◆SMV1255-079 Marking: Cathode	SMV1255-011 Marking: AK	SMV1255-001 Marking: AK1		SMV1255-004 Marking: AK3	
◆SMV1255-079LF Marking: Cathode	SMV1255-011LF Marking: EK	SMV1255-001LF Marking: EK1		SMV1255-004LF Marking: EK3	
$L_S = 0.7 \text{ nH}$	$L_S = 1.5 \text{ nH}$	$L_S = 1.5 \text{ nH}$		$L_S = 1.5 \text{ nH}$	

LF denotes lead (Pb)-free, RoHS-compliant packaging option as an alternative to our standard tin/lead (Sn/Pb) packaging.

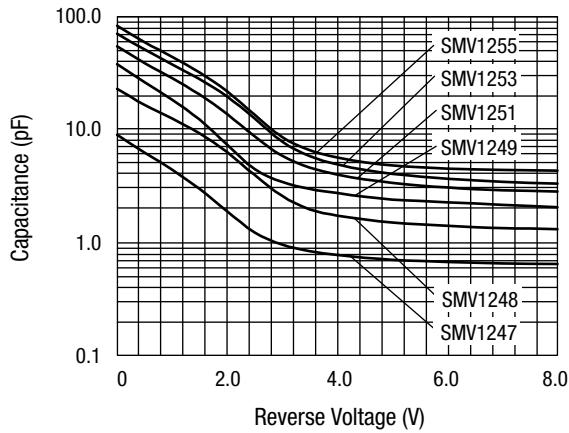
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### Electrical Specifications at 25 °C

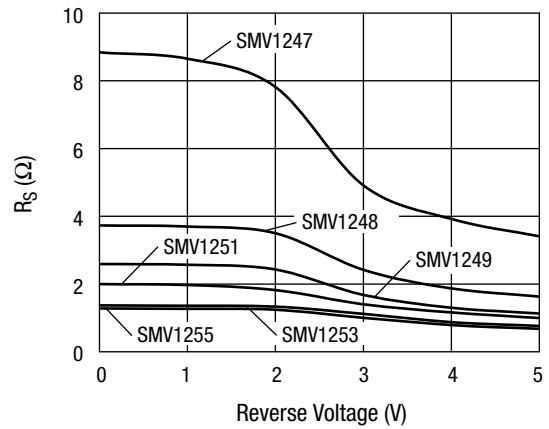
Part Number	$C_T$ @ 0.3 V (pF)		$C_T$ @ 4.7 V (pF)		$C_T$ @ 1 V (pF)	$C_T$ @ 3 V (pF)	$\frac{C_T @ 0.3 \text{ V}}{C_T @ 4.7 \text{ V}}$ (Ratio)		$\frac{C_T @ 1 \text{ V}}{C_T @ 3 \text{ V}}$ (Ratio)	$R_S @ 3 \text{ V}$ 500 MHz (Ω)	$Q @ 3 \text{ V}$ 50 MHz
	Min.	Typ.	Typ.	Max.	Typ.	Typ.	Min.	Typ.	Typ.	Max.	Typ.
SMV1247	6.5	7	0.7	0.78	4.4	0.95	9.5	10	4.6	6	1500
SMV1248	15	17	1.5	1.7	12.3	2.6	10.8	12	4.7	3.3	700
SMV1249	28	31	2.6	2.8	18.2	3.4	11	12.1	5.3	2.2	600
SMV1251	38	42	3.4	3.8	28.1	5.8	11	12.2	4.8	1.6	400
SMV1253	48	53	4.3	4.8	37	7.8	11	12.3	4.7	1.4	350
SMV1255	58	64	5.2	5.8	43.3	8.5	11	12.3	5.1	1.3	350

Reverse Voltage  $V_R$  ( $I_R = 10 \mu\text{A}$ ): 15 V minimum.  
Reverse Current  $I_R$  ( $V_R = 12 \text{ V}$ ): 20 nA maximum.

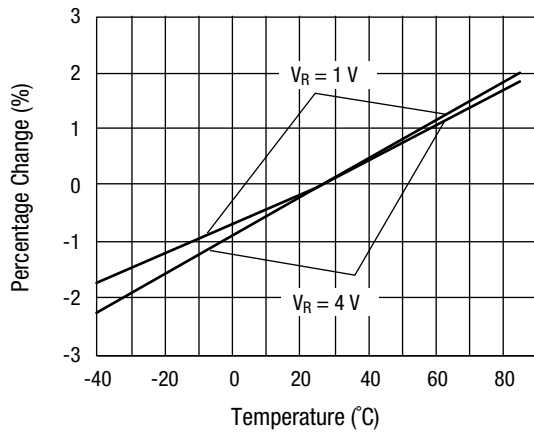
**Typical Performance Data**



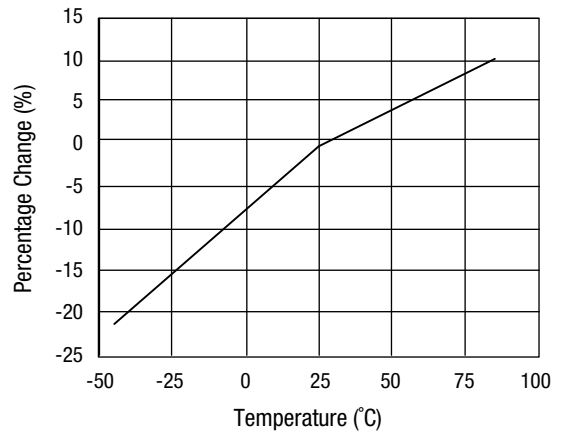
**Capacitance vs. Reverse Voltage**



**Series Resistance vs. Reverse Voltage @ 500 MHz**



**Relative Capacitance Change vs. Temperature**

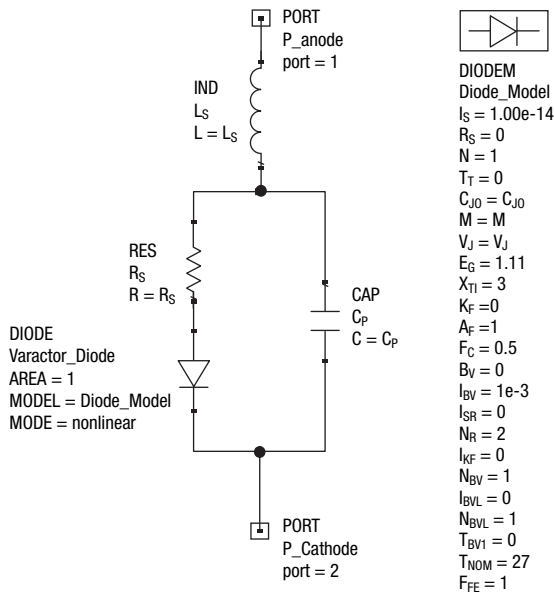


**Relative Series Resistance Change vs. Temperature @ 500 MHz**

### Typical Capacitance Values

V <sub>R</sub> (V)	SMV1247	SMV1248	SMV1249	SMV1251	SMV1253	SMV1255
	C <sub>T</sub> (pF)	C <sub>T</sub> (pF)	C <sub>T</sub> (pF)	C <sub>T</sub> (pF)	C <sub>T</sub> (pF)	C <sub>T</sub> (pF)
0	8.86	22.62	37.35	53.65	69.32	81.21
0.5	6.17	16.32	25.88	38.23	50.23	58.28
1	4.37	12.33	18.18	28.09	37.07	43.27
1.5	2.96	9.12	12.08	20.13	27.57	31.49
2	1.88	6.27	7.27	13.55	19.37	21.5
2.5	1.22	3.93	4.44	8.6	12.39	13.4
3	0.95	2.57	3.4	5.78	7.77	8.51
3.5	0.83	1.95	2.96	4.57	5.77	6.51
4	0.77	1.71	2.72	3.95	4.86	5.58
4.5	0.73	1.59	2.51	3.58	4.34	5.07
5	0.7	1.49	2.38	3.33	4.01	4.76
5.5	0.68	1.44	2.3	3.16	3.78	4.58
6	0.67	1.4	2.24	3.03	3.62	4.46
6.5	0.66	1.36	2.19	2.94	3.5	4.39
7	0.65	1.33	2.14	2.88	3.41	4.33
7.5	0.64	1.31	2.09	2.83	3.34	4.29
8	0.64	1.3	2.03	2.79	3.28	4.26

### SPICE Model



Part Number	C <sub>J0</sub> (pF)	V <sub>J</sub> (V)	M	C <sub>P</sub> (pF)	R <sub>S</sub> (Ω)
SMV1247	9.22	13	10.5	0	4.9
SMV1248	21.54	13	10.5	0	2.4
SMV1249	39	17	14	0	1.7
SMV1251	60	17	14	0	1.4
SMV1253	70	17	14	0	1.1
SMV1255	82	17	13	0	1

Model was designed to fit measured data in the range of up to 4 V.  
 For package inductance (L<sub>S</sub>) refer to package type.  
 For more details refer to the "Varactor SPICE Models for RF VCO Applications" Application Note.

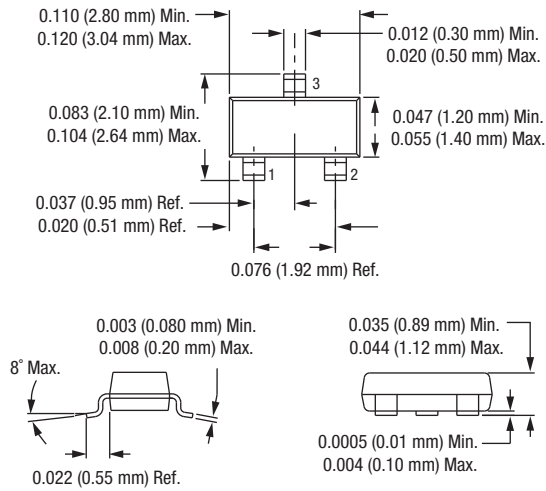
### Recommended Solder Reflow Profiles

Refer to the ["Recommended Solder Reflow Profile"](#) Application Note.

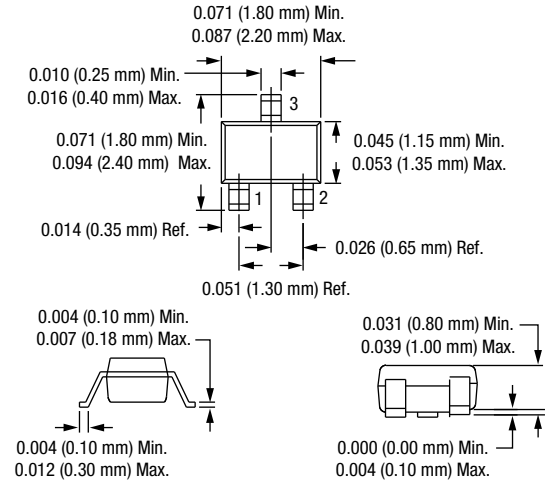
### Tape and Reel Information

Refer to the ["Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation"](#) Application Note.

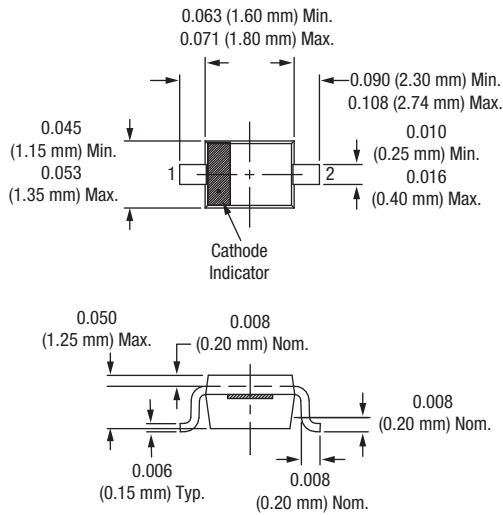
**SOT-23**



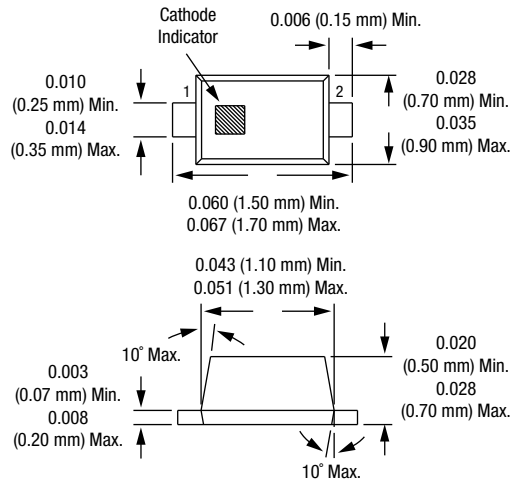
**SC-70**



**SOD-323**



**SC-79**



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