DATA SHEET

SMV1142–SMV1148: Hyperabrupt Junction Tuning Varactors

Features

- Frequency linear design
- Low series resistance
- Available in the SOD-323 and SC-79 packages
- Designed for high-volume commercial applications
- SPICE models are available
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

Description

The SMV1142–SMV1148 series of silicon hyperabrupt junction varactor diodes is specifically designed with an increasing gamma vs. voltage characteristic. This characteristic will result in improved VCO frequency-voltage linearity, in comparison to a conventional hyperabrupt junction varactor. 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)	12 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
SC-79	SOD-323
	SMV1142-011 Marking: BU
	SMV1142-011LF Marking: GU
	SMV1143-011 Marking: BV
	SMV1143-011LF Marking: GV
	SMV1144-011 Marking: BW
	SMV1144-011LF Marking: GW
SMV1145-079 Marking: Cathode	**SMV1145-011** Marking: BA
SMV1145-079LF Marking: Cathode	**SMV1145-011LF** Marking: GA
SMV1147-079 Marking: Cathode	**SMV1147-011** Marking: BY
SMV1147-079LF Marking: Cathode	**SMV1147-011LF** Marking: GY
	SMV1148-011 Marking: BZ
	SMV1148-011LF Marking: GZ
L_S = 0.7 nH	L_S = 1.5 nH

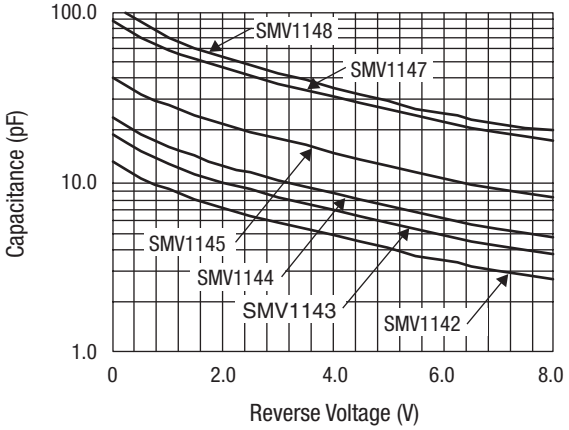
LF denotes lead (Pb)-free, RoHS-compliant packaging option as an alternative to our standard tin/lead (Sn/Pb) packaging.

Electrical Specifications at 25 °C

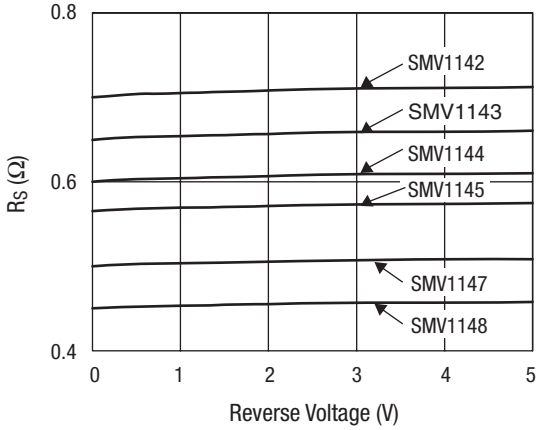
Part Number	C_T @ 1 V (pF)		C_T @ 3 V (pF)	C_T @ 6 V (pF)	$\frac{C_T \text{ @ 1 V}}{C_T \text{ @ 3 V}}$ (Ratio)		$\frac{C_T \text{ @ 1 V}}{C_T \text{ @ 6 V}}$ (Ratio)		R_S @ 3 V 500 MHz (Ω)	Q @ 3 V 50 MHz
	Min.	Max.	Typ.	Typ.	Min.	Max.	Min.	Max.	Max.	Typ.
SMV1142	8.2	10	5.8	3.5	1.5	1.65	2.43	2.93	0.7	800
SMV1143	11.60	14.20	8.2	4.9	1.5	1.65	2.45	2.95	0.65	600
SMV1144	14.65	17.95	10.4	6.1	1.5	1.65	2.46	2.96	0.65	500
SMV1145	25.5	31.2	18.1	10.6	1.5	1.65	2.5	3	0.6	300
SMV1147	54.6	66.7	38.6	22.6	1.5	1.65	2.5	3	0.55	150
SMV1148	62	76	44.1	25.2	1.5	1.65	2.5	3	0.5	150

Reverse Voltage V_R (I_R = 10 μA): 12 V minimum.
Reverse Current I_R (V_R = 9.6 V): 20 nA maximum.

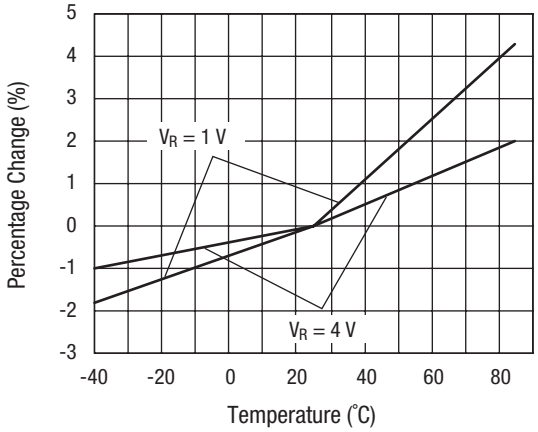
Typical Performance Data



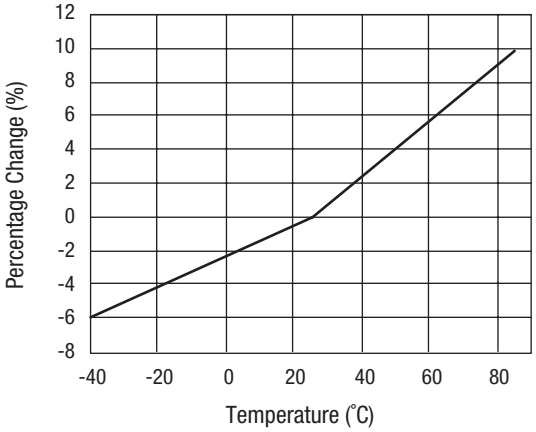
Capacitance vs. Reverse Voltage



Series Resistance vs. Reverse Voltage @ 500 MHz



Relative Capacitance Change vs. Temperature

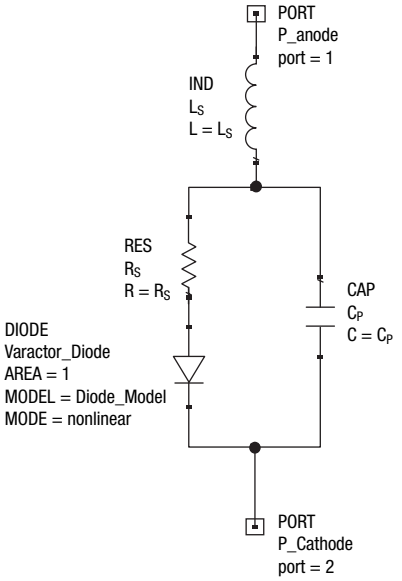


Relative Series Resistance Change vs. Temperature

Typical Capacitance Values

V_R (V)	SMV1142	SMV1143	SMV1144	SMV1145	SMV1147	SMV1148
	C_T (pF)	C_T (pF)	C_T (pF)	C_T (pF)	C_T (pF)	C_T (pF)
0	13.38	18.99	24.01	41.81	89.52	104.71
0.5	10.7	15.18	19.18	33.38	71.44	83.27
1	9.1	12.90	16.3	28.35	60.65	70.48
1.5	7.98	11.30	14.28	24.82	53.07	61.48
2	7.12	10.08	12.73	22.11	47.27	54.56
2.5	6.42	9.08	11.46	19.91	42.55	48.92
3	5.83	8.24	10.4	18.06	38.58	44.13
3.5	5.32	7.51	9.48	16.45	35.12	39.97
4	4.86	6.87	8.66	15.02	32.06	36.29
4.5	4.45	6.29	7.93	13.73	29.31	32.99
5	4.09	5.76	7.26	12.57	26.81	30.03
5.5	3.75	5.29	6.66	11.53	24.57	27.43
6	3.46	4.87	6.13	10.6	22.58	25.22
6.5	3.21	4.51	5.68	9.81	20.89	23.43
7	3	4.22	5.31	9.17	19.52	22.06
7.5	2.84	3.99	5.02	8.66	18.43	21.01
8	2.72	3.82	4.8	8.29	17.63	20.22
8.5	2.63	3.69	4.63	7.99	16.98	19.61
9	2.56	3.58	4.5	7.76	16.5	19.12
9.5	2.5	3.50	4.4	7.58	16.1	18.72
10	2.45	3.43	4.31	7.43	15.78	18.38
10.5	2.41	3.37	4.24	7.3	15.5	18.11
11	2.36	3.31	4.15	7.15	15.18	17.87
11.5	2.35	3.28	4.15	7.1	15.08	17.65
12	2.32	3.25	4.08	7.02	14.9	17.43

SPICE Model





DIODEM
Diode_Model
I_S = 1.00e-14
R_S = 0
N = 1
T_T = 0
C_{J0} = C_{J0}
M = M
V_J = V_J
E_G = 1.11
X_{TI} = 3
K_F =0
A_F =1
F_C = 0.5
B_V = 0
I_{BV} = 1e-3
I_{SR} = 0
N_R = 2
I_{KF} = 0
N_{BV} = 1
I_{BVL} = 0
N_{BVL} = 1
T_{BV1} = 0
T_{NOM} = 27
F_{FE} = 1

Part Number	C_{J0} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)
SMV1142	13.38	2.2	1	0	0.7
SMV1143	18.99	2.20	1.0	0	0.65
SMV1144	24.01	2.2	1	0	0.65
SMV1145	41.8	2.5	1.1	0	0.6
SMV1147	89.52	2.5	1.1	0	0.55
SMV1148	104.7	2.25	1.1	0	0.5

Values extracted from measured performance.
For package inductance (L_S) refer to package type.
For more details refer to the "Varactor SPICE Models for RF VCO Applications" Application Note.

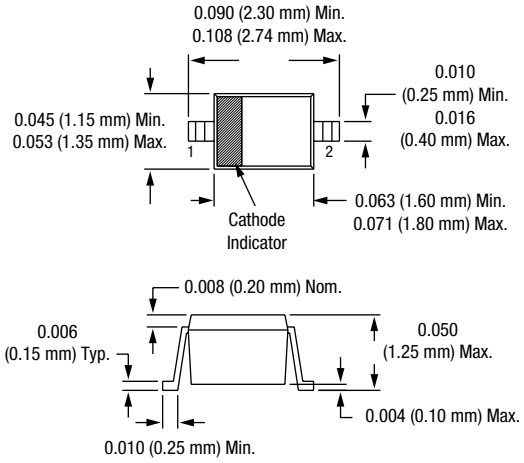
Recommended Solder Reflow Profiles

Refer to the *"Recommended Solder Reflow Profile"* Application Note.

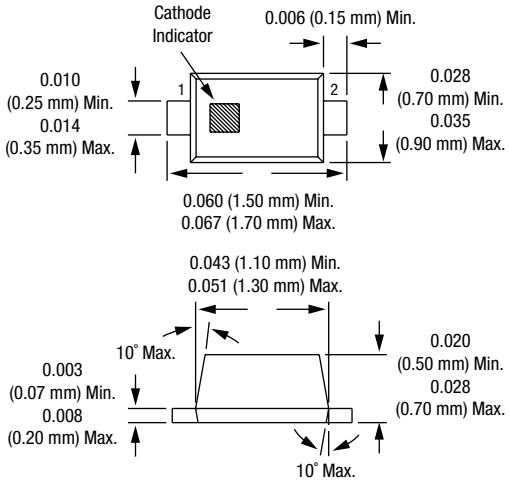
Tape and Reel Information

Refer to the *"Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation"* Application Note.

SOD-323


0.090 (2.30 mm) Min.
0.108 (2.74 mm) Max.
0.010
(0.25 mm) Min.
0.016
(0.40 mm) Max.
0.045 (1.15 mm) Min.
0.053 (1.35 mm) Max.
1
2
Cathode
Indicator
0.063 (1.60 mm) Min.
0.071 (1.80 mm) Max.
0.008 (0.20 mm) Nom.
0.006
(0.15 mm) Typ.
0.050
(1.25 mm) Max.
0.004 (0.10 mm) Max.
0.010 (0.25 mm) Min.

SC-79


Cathode
Indicator
0.006 (0.15 mm) Min.
0.010
(0.25 mm) Min.
0.014
(0.35 mm) Max.
1
2
0.028
(0.70 mm) Min.
0.035
(0.90 mm) Max.
0.060 (1.50 mm) Min.
0.067 (1.70 mm) Max.
0.043 (1.10 mm) Min.
0.051 (1.30 mm) Max.
10° Max.
0.020
(0.50 mm) Min.
0.003
(0.07 mm) Min.
0.028
(0.70 mm) Max.
0.008
(0.20 mm) Max.
10° Max.

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