

DATA SHEET

SMV114x Series: Hyperabrupt Junction Tuning Varactors

Applications

- High volume commercial systems

Features

- Frequency linear design
- Low series resistance
- Packages rated MSL1, 260 °C per JEDEC J-STD-020



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.



Description

The SMV114x series of silicon hyperabrupt junction varactor diodes is specifically designed with an increasing gamma versus voltage characteristic. This results in improved Voltage-Controlled Oscillator (VCO) frequency-voltage linearity compared to a conventional hyperabrupt junction varactor.

The SMV114x family of varactors is characterized for capacitance and resistance over temperature.

Table 1 describes the various packages and markings of the SMV114x varactors.

Table 1. Packaging and Marking

|  |  |
|--|---|
| Single | Single |
| SC-79 Green™ | SOD-323 Green™ |
| | SMV1142-011LF Marking: GU |
| | SMV-1143-011LF Marking: GV |
| | SMV-1144-011LF Marking: GW |
| SMV1145-079LF Marking: Cathode | SMV1145-011LF Marking: GA |
| SMV1147-079LF Marking: Cathode | SMV1147-011LF Marking: GY |
| | SMV1148-011LF Marking: GZ |
| Ls = 0.7 nH | Ls = 1.5 nH |



The Pb-free symbol or "LF" in the part number denotes a lead-free, RoHS-compliant package unless otherwise noted as Green™. Tin/lead (Sn/Pb) packaging is not recommended for new designs.

Table 2. SMV114x Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|-----------------------|-----------|---------|---------|---------|-------|
| Reverse voltage | V_R | | | 12 | V |
| Forward current | I_F | | | 20 | mA |
| Power dissipation | P_{DIS} | | | 250 | mW |
| Operating temperature | T_{OP} | -55 | | +125 | °C |
| Storage temperature | T_{STG} | -55 | | +150 | °C |

Note: 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.

CAUTION: 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. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times. The SMV114x varactors are Class 0 Human Body Model (HBM) ESD devices.

Table 3. SMV114x Electrical Specifications (Note 1) (Note 2)
($T_{OP} = 25\text{ °C}$, Unless Otherwise Noted)

| Part Number | $C_T @ 1\text{ V}$ (pF) | | $C_T @ 3\text{ V}$ (pF) | $C_T @ 6\text{ V}$ (pF) | $\frac{C_T @ 1\text{ V}}{C_T @ 3\text{ V}}$ Ratio (pF) | | $\frac{C_T @ 1\text{ V}}{C_T @ 6\text{ V}}$ Ratio (pF) | | $R_S @ 3\text{ V},$ 500 MHz (Ω) | $Q @ 3\text{ V},$ 50 MHz |
|-------------|----------------------------|-------|----------------------------|----------------------------|---|------|---|------|--|-----------------------------|
| | Min. | Max. | Typ. | Typ. | Min. | Max. | Min. | Max. | Max. | Typ. |
| SMV1142 | 8.20 | 10.0 | 5.80 | 3.50 | 1.50 | 1.65 | 2.43 | 2.93 | 0.70 | 800 |
| SMV1143 | 11.60 | 14.2 | 8.20 | 4.90 | 1.50 | 1.65 | 2.45 | 2.95 | 0.65 | 600 |
| SMV1144 | 14.65 | 17.95 | 10.4 | 6.10 | 1.50 | 1.65 | 2.46 | 2.96 | 0.65 | 500 |
| SMV1145 | 25.50 | 31.2 | 18.1 | 10.6 | 1.50 | 1.65 | 2.50 | 3.00 | 0.60 | 300 |
| SMV1147 | 54.60 | 66.7 | 38.6 | 22.6 | 1.50 | 1.65 | 2.50 | 3.00 | 0.55 | 150 |
| SMV1148 | 62.00 | 76.0 | 44.1 | 25.2 | 1.50 | 1.65 | 2.50 | 3.00 | 0.50 | 150 |

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Note 2: Reverse voltage, V_R ($I_R = 10\ \mu\text{A}$): 12 V minimum.
Reverse current, I_R ($V_R = 9.6\text{ V}$): 20 nA maximum.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV114x varactors are provided in Table 2. Electrical specifications are provided in Table 3. Typical performance characteristics for the SMV114x varactors are illustrated in Figures 1 through 4. Table 4 summarizes the capacitance of the SMV114x series for reverse voltages between 0 and 12 V.

The SPICE model for the SMV114x varactor series is shown in Figure 5 and the associated model parameters are provided in Table 5.

Package dimensions are provided in Figures 6 and 8. Tape and reel dimensions are provided in Figures 7 and 9.

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur

when the part is subjected to high temperature during solder assembly.

The SMV114x varactors are rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. They can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

Typical Performance Characteristics

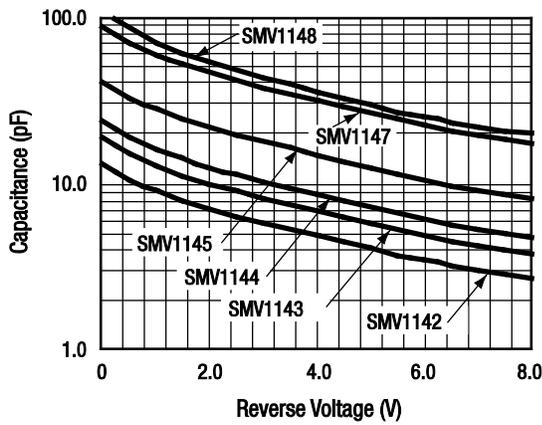


Figure 1. Capacitance vs Reverse Voltage

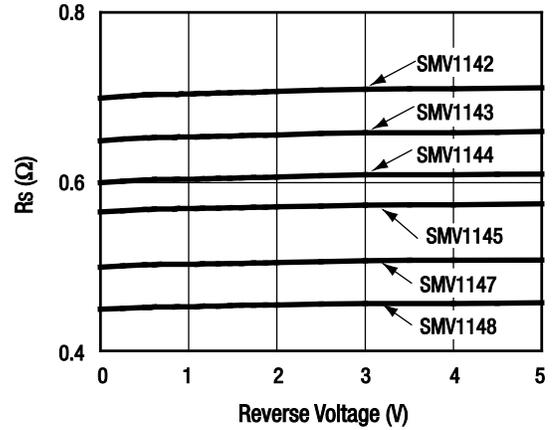


Figure 2. Series Resistance vs Reverse Voltage @ 500 MHz

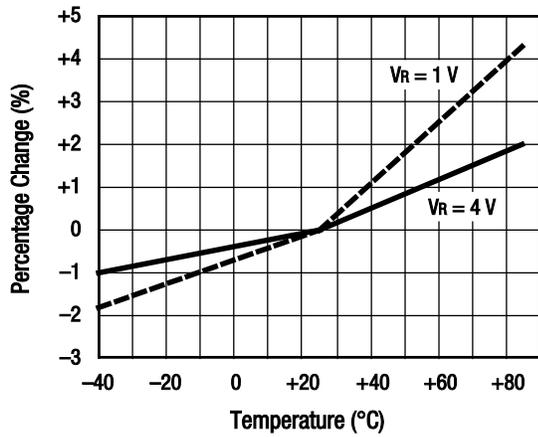


Figure 3. Relative Capacitance Change vs Temperature

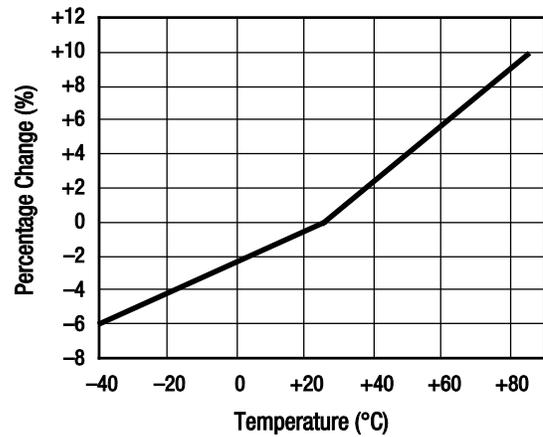


Figure 4. Relative Series Resistance Change vs Temperature

Table 4. Capacitance vs Reverse Voltage

| V _R (V) | C _T (pF) | | | | | |
|-----------------------|------------------------|---------|---------|---------|---------|---------|
| | SMV1142 | SMV1143 | SMV1144 | SMV1145 | SMV1147 | SMV1148 |
| 0 | 13.38 | 18.99 | 24.01 | 41.81 | 89.52 | 104.71 |
| 0.5 | 10.70 | 15.18 | 19.18 | 33.38 | 71.44 | 83.27 |
| 1.0 | 9.10 | 12.90 | 16.30 | 28.35 | 60.65 | 70.48 |
| 1.5 | 7.98 | 11.30 | 14.28 | 24.82 | 53.07 | 61.48 |
| 2.0 | 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 |
| 3.0 | 5.83 | 8.24 | 10.40 | 18.06 | 38.58 | 44.13 |
| 3.5 | 5.32 | 7.51 | 9.48 | 16.45 | 35.12 | 39.97 |
| 4.0 | 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 |
| 5.0 | 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 |
| 6.0 | 3.46 | 4.87 | 6.13 | 10.60 | 22.58 | 25.22 |
| 6.5 | 3.21 | 4.51 | 5.68 | 9.81 | 20.89 | 23.43 |
| 7.0 | 3.00 | 4.22 | 5.31 | 9.17 | 19.52 | 22.06 |
| 7.5 | 2.84 | 3.99 | 5.02 | 8.66 | 18.43 | 21.01 |
| 8.0 | 2.72 | 3.82 | 4.80 | 8.29 | 17.63 | 20.22 |
| 8.5 | 2.63 | 3.69 | 4.63 | 7.99 | 16.98 | 19.61 |
| 9.0 | 2.56 | 3.58 | 4.50 | 7.76 | 16.50 | 19.12 |
| 9.5 | 2.50 | 3.50 | 4.40 | 7.58 | 16.10 | 18.72 |
| 10.0 | 2.45 | 3.43 | 4.31 | 7.43 | 15.78 | 18.38 |
| 10.5 | 2.41 | 3.37 | 4.24 | 7.30 | 15.50 | 18.11 |
| 11.0 | 2.36 | 3.31 | 4.15 | 7.15 | 15.18 | 17.87 |
| 11.5 | 2.35 | 3.28 | 4.15 | 7.10 | 15.08 | 17.65 |
| 12.0 | 2.32 | 3.25 | 4.08 | 7.02 | 14.90 | 17.43 |

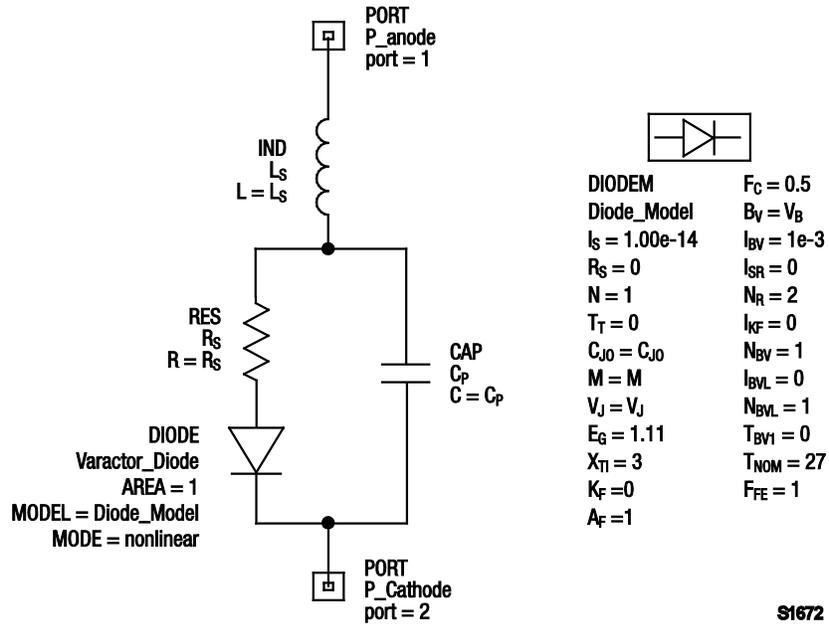
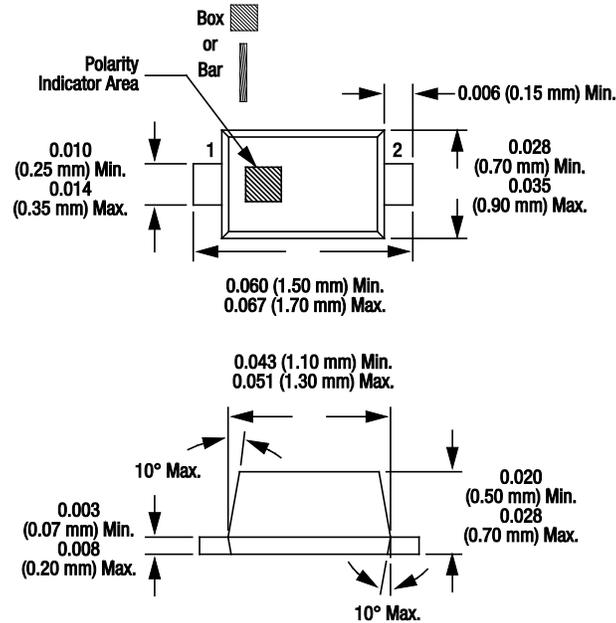


Figure 5. SPICE Model

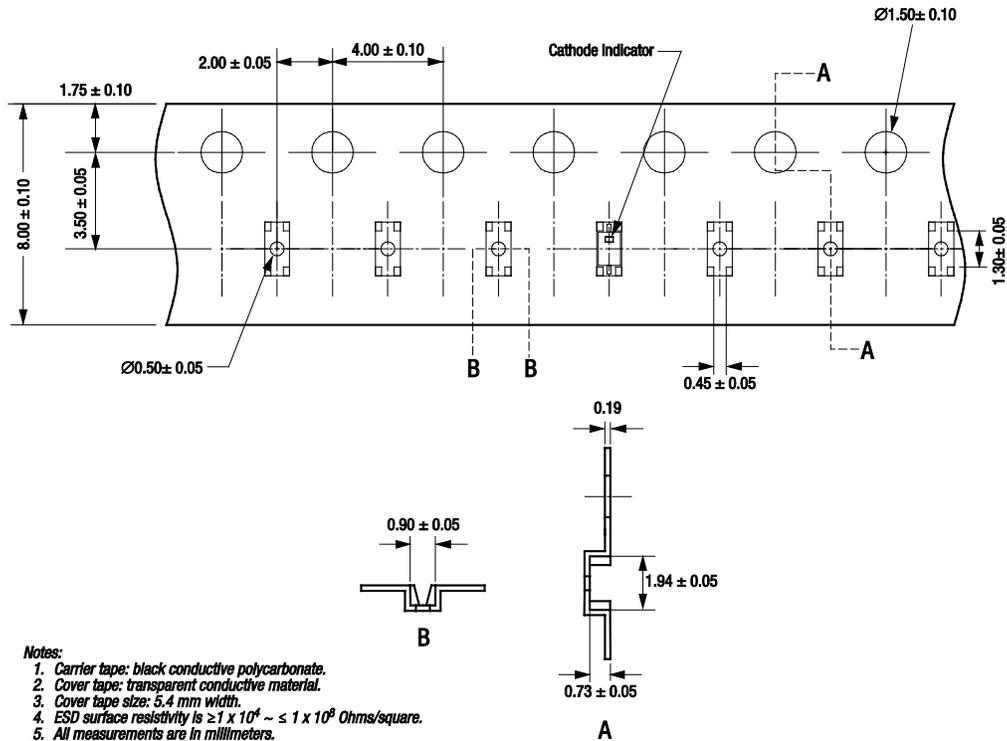
Table 5. SPICE Model Parameters

| Part Number | C _{J0} (pF) | V _J (V) | V _B (V) | M | C _P (pF) | R _S (Ω) |
|-------------|-------------------------|-----------------------|-----------------------|------|------------------------|-----------------------|
| SMV1142 | 13.38 | 2.20 | 12 | 1.00 | 0 | 0.70 |
| SMV1143 | 18.99 | 2.20 | 12 | 1.00 | 0 | 0.65 |
| SMV1144 | 24.01 | 2.20 | 12 | 1.00 | 0 | 0.65 |
| SMV1145 | 41.80 | 2.50 | 12 | 1.10 | 0 | 0.60 |
| SMV1147 | 89.52 | 2.50 | 12 | 1.10 | 0 | 0.55 |
| SMV1148 | 105.00 | 2.31 | 12 | 1.07 | 0 | 0.50 |



Dimensions are in inches (millimeters shown in parentheses) S1052

Figure 6. SC-79 Package Dimensions



- Notes:
1. Carrier tape: black conductive polycarbonate.
 2. Cover tape: transparent conductive material.
 3. Cover tape size: 5.4 mm width.
 4. ESD surface resistivity is $\geq 1 \times 10^4 \sim 1 \times 10^9$ Ohms/square.
 5. All measurements are in millimeters.
 6. Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.

S2108

Figure 7. SC-79 Tape and Reel Dimensions

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