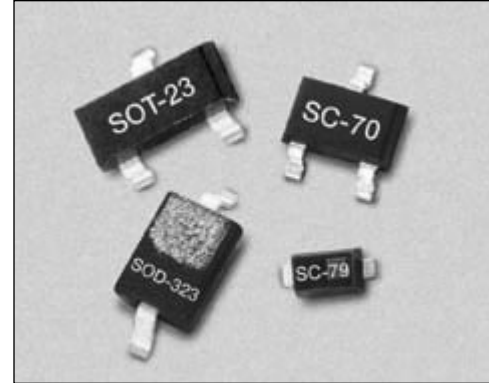


### Features

- High Capacitance Ratio,  
 $C_{1V}/C_{3V} = 1.8$ ,  $C_{1V}/C_{6V} = 3.1$
- Low Series Resistance for Low  
Phase Noise
- Multiple Packages SOT-23, SOD-323,  
SC-70 and SC-79
- Designed for High Volume Commercial  
Applications
- Full Characterization with SPICE Models



### Description

The SMV1232–SMV1237 series of silicon hyperabrupt junction varactor diodes are designed for use in VCOs with low tuning voltage operation. The low resistance of these varactors makes them appropriate for high Q resonators in wireless system VCOs to frequencies beyond 2.5 GHz. The SMV1232–SMV1237 series is fully characterized for capacitance and resistance over temperature. SPICE model is provided.

### 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 1B        |

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |  |  |  |  |
| Single                                                                              | Single                                                                              | Single                                                                              | Common Anode                                                                        | Common Cathode                                                                       | Common Anode                                                                          | Common Cathode                                                                        |
| SC-79                                                                               | SOD-323                                                                             | SOT-23                                                                              | SOT-23                                                                              | SOT-23                                                                               | SC-70                                                                                 | SC-70                                                                                 |
| † SMV1232-079                                                                       | † SMV1232-011                                                                       |                                                                                     |                                                                                     |                                                                                      |                                                                                       | † SMV1232-074                                                                         |
| † SMV1233-079                                                                       | † SMV1233-011                                                                       | † SMV1233-001                                                                       | † SMV1233-003                                                                       | † SMV1233-004                                                                        | † SMV1233-073                                                                         | † SMV1233-074                                                                         |
| † SMV1234-079                                                                       | † SMV1234-011                                                                       | † SMV1234-001                                                                       | † SMV1234-003                                                                       | † SMV1234-004                                                                        | † SMV1234-073                                                                         | † SMV1234-074                                                                         |
| † SMV1235-079                                                                       | † SMV1235-011                                                                       | † SMV1235-001                                                                       |                                                                                     | † SMV1235-004                                                                        |                                                                                       | † SMV1235-074                                                                         |
| † SMV1236-079                                                                       | † SMV1236-011                                                                       | † SMV1236-001                                                                       |                                                                                     | † SMV1236-004                                                                        |                                                                                       | † SMV1236-074                                                                         |
|                                                                                     |                                                                                     | † SMV1237-001                                                                       |                                                                                     | † SMV1237-004                                                                        |                                                                                       |                                                                                       |
| $L_S = 0.7$ nH                                                                      | $L_S = 1.5$ nH                                                                      | $L_S = 1.5$ nH                                                                      | $L_S = 1.5$ nH                                                                      | $L_S = 1.5$ nH                                                                       | $L_S = 1.4$ nH                                                                        | $L_S = 1.4$ nH                                                                        |

† Available through distribution.

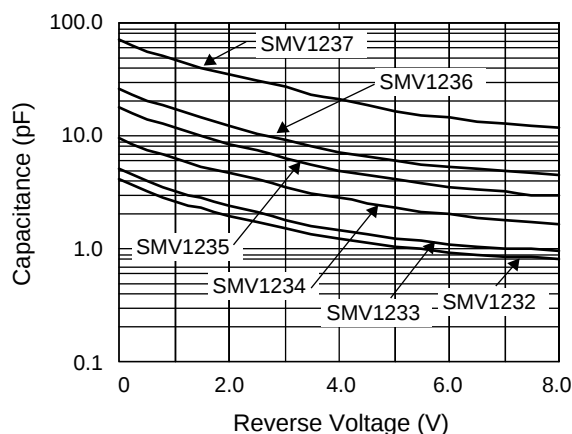
For other packages or configurations, please contact the factory.

## Electrical Specifications at 25°C

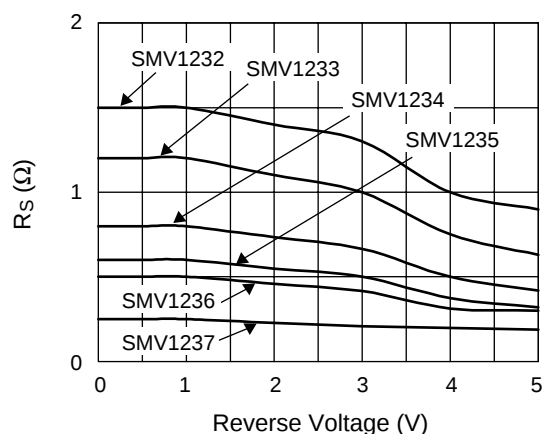
| Part Number | $C_T$ @ 1 V (pF) |       | $C_T$ @ 3 V (pF) | $C_T$ @ 6 V (pF) | $\frac{C_T @ 1 V}{C_T @ 3 V}$ (Ratio) |      | $\frac{C_T @ 1 V}{C_T @ 6 V}$ (Ratio) |      | $R_S$ @ 3 V 500 MHz ( $\Omega$ ) | $Q$ @ 3 V 50 MHz |
|-------------|------------------|-------|------------------|------------------|---------------------------------------|------|---------------------------------------|------|----------------------------------|------------------|
|             | Min.             | Max.  | Typ.             | Typ.             | Min.                                  | Max. | Min.                                  | Max. | Max.                             | Typ.             |
| SMV1232     | 2.34             | 2.86  | 1.5              | 0.94             | 1.5                                   | 1.9  | 2.6                                   | 3.3  | 1.50                             | 1400             |
| SMV1233     | 3.00             | 3.60  | 1.8              | 1.10             | 1.5                                   | 1.9  | 2.6                                   | 3.3  | 1.20                             | 1200             |
| SMV1234     | 5.85             | 7.15  | 3.6              | 2.00             | 1.6                                   | 2.0  | 2.8                                   | 3.4  | 0.80                             | 1000             |
| SMV1235     | 10.35            | 12.65 | 6.4              | 3.60             | 1.6                                   | 2.0  | 2.9                                   | 3.4  | 0.60                             | 750              |
| SMV1236     | 15.50            | 18.50 | 9.2              | 5.30             | 1.6                                   | 2.0  | 3.0                                   | 3.5  | 0.50                             | 700              |
| SMV1237     | 45.00            | 54.00 | 26.9             | 14.40            | 1.6                                   | 2.0  | 3.0                                   | 3.5  | 0.25                             | 500              |

Reverse Voltage  $V_R$  ( $I_R = 10 \mu A$ ): 15 VReverse Current  $I_R$  ( $V_R = 12 V$ ): 20 nA

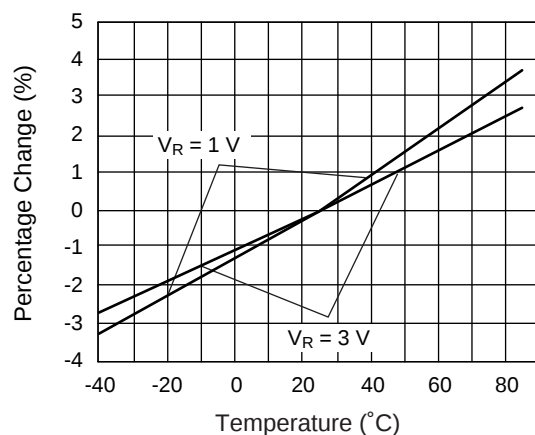
## Typical Performance Data



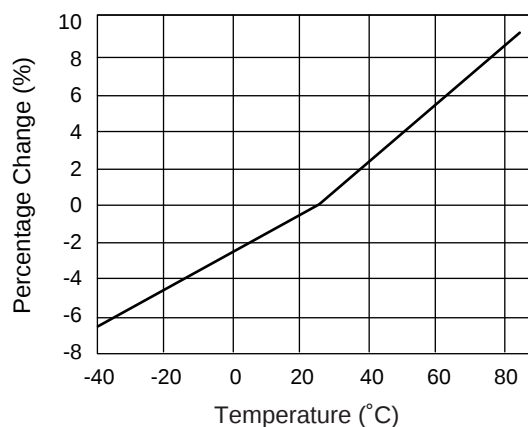
Capacitance vs. Reverse Voltage



Series Resistance vs. Reverse Voltage @ 500 MHz



Relative Capacitance Change vs. Temperature

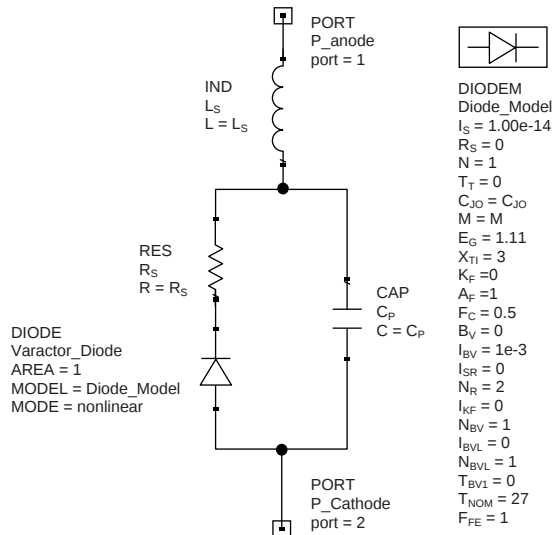


Relative Series Resistance Change vs. Temperature @ 500 MHz

## Typical Capacitance Values

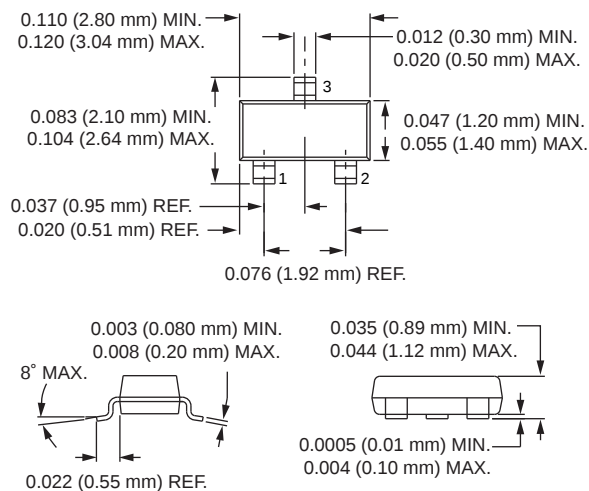
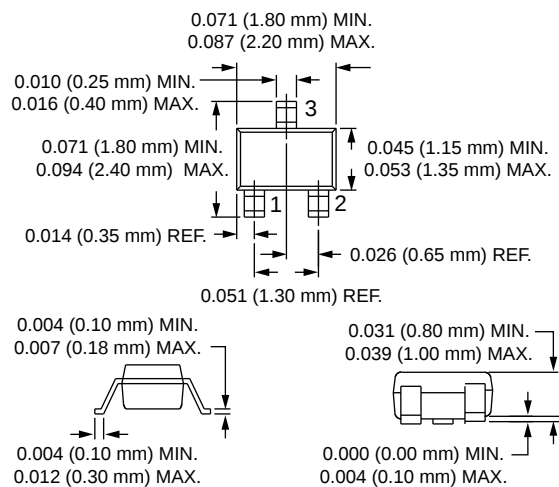
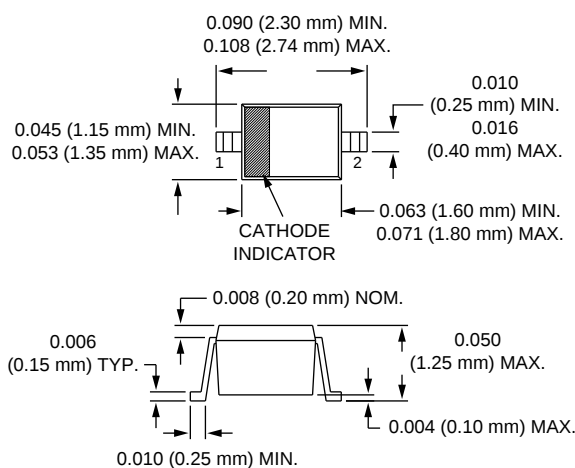
| $V_R$ (V) | SMV1232    | SMV1233    | SMV1234    | SMV1235    | SMV1236    | SMV1237    |
|-----------|------------|------------|------------|------------|------------|------------|
|           | $C_T$ (pF) | $C_T$ (pF) | $C_T$ (pF) | $C_T$ (pF) | $C_T$ (pF) | $C_T$ (pF) |
| 0.0       | 4.15       | 5.08       | 9.63       | 18.22      | 26.75      | 71.82      |
| 0.5       | 3.22       | 3.95       | 7.53       | 14.12      | 20.61      | 56.10      |
| 1.0       | 2.67       | 3.28       | 6.28       | 11.67      | 17.02      | 46.89      |
| 1.5       | 2.28       | 2.80       | 5.39       | 9.91       | 14.38      | 40.33      |
| 2.0       | 1.97       | 2.41       | 4.68       | 8.52       | 12.29      | 35.13      |
| 2.5       | 1.72       | 2.09       | 4.09       | 7.36       | 10.56      | 30.71      |
| 3.0       | 1.51       | 1.82       | 3.58       | 6.40       | 9.16       | 26.87      |
| 3.5       | 1.35       | 1.62       | 3.15       | 5.62       | 8.04       | 23.57      |
| 4.0       | 1.22       | 1.45       | 2.81       | 4.99       | 7.19       | 20.83      |
| 4.5       | 1.13       | 1.33       | 2.54       | 4.50       | 6.53       | 18.62      |
| 5.0       | 1.05       | 1.24       | 2.32       | 4.11       | 6.01       | 16.87      |
| 5.5       | 0.99       | 1.16       | 2.15       | 3.80       | 5.61       | 15.48      |
| 6.0       | 0.94       | 1.10       | 2.02       | 3.55       | 5.28       | 14.36      |
| 6.5       | 0.90       | 1.05       | 1.90       | 3.34       | 5.02       | 13.46      |
| 7.0       | 0.86       | 1.01       | 1.80       | 3.17       | 4.81       | 12.72      |
| 7.5       | 0.84       | 0.98       | 1.72       | 3.03       | 4.64       | 12.11      |
| 8.0       | 0.81       | 0.96       | 1.65       | 2.91       | 4.49       | 11.61      |
| 9.0       | 0.78       | 0.92       | 1.55       | 2.73       | 4.28       | 10.87      |
| 10.0      | 0.76       | 0.90       | 1.47       | 2.61       | 4.13       | 10.38      |
| 11.0      | 0.75       | 0.88       | 1.42       | 2.53       | 4.02       | 10.06      |
| 12.0      | 0.74       | 0.87       | 1.38       | 2.47       | 3.95       | 9.84       |
| 13.0      | 0.73       | 0.86       | 1.35       | 2.43       | 3.89       | 9.68       |
| 14.0      | 0.73       | 0.85       | 1.33       | 2.40       | 3.84       | 9.56       |
| 15.0      | 0.72       | 0.84       | 1.32       | 2.38       | 3.80       | 9.47       |

## SPICE Model



| Part Number | $C_{JO}$ (pF) | $V_J$ (V) | M   | $C_P$ (pF) | $R_S$ ( $\Omega$ ) |
|-------------|---------------|-----------|-----|------------|--------------------|
| SMV1232     | 4.20          | 1.7       | 0.9 | 0.0        | 1.50               |
| SMV1233     | 4.12          | 1.7       | 0.9 | 0.7        | 1.20               |
| SMV1234     | 8.75          | 2.3       | 1.1 | 1.2        | 0.80               |
| SMV1235     | 16.13         | 8.0       | 4.0 | 2.0        | 0.60               |
| SMV1236     | 21.63         | 8.0       | 4.2 | 3.2        | 0.50               |
| SMV1237     | 66.16         | 10.0      | 5.3 | 9.0        | 0.25               |

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

**SOT-23****SC-70****SOD-323****SC-79**