

**DATA SHEET**

# SMV1470-004LF: Hyperabrupt Junction Tuning Varactor

## Applications

- Low-noise VCOs and VCXOs in wireless systems

## Features

- High-capacitance ratio
- Designed for high volume
- SOT-23 package (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 SMV1470-004LF is a dual silicon, hyperabrupt junction varactor diode in a common cathode configuration. The specified high-capacitance ratio and low series resistance make this varactor appropriate for low-noise voltage controlled oscillators (VCOs) and voltage-controlled crystal oscillators (VCXOs) in wireless systems. Applications include low-noise and wideband VCOs and VCXOs for GSM, PCS, CDMA, and analog phones.

Table 1 describes the package and markings of the SMV1470-004LF varactor.

**Table 1. Part Number and Configuration**

|   |
|---|
|  |
| Common Cathode  |
| SOT-23  |
| <b>SMV1470-004LF</b><br>Green™<br>Marking: ET3  |
| $L_S = 1.4 \text{ nH}$  |



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.

### Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1470-004LF varactor are provided in Table 2. Electrical specifications are provided in Table 3. Typical capacitance values are listed in Table 4.

Typical performance characteristics of the SMV1470-004LF varactor are illustrated in Figures 1 and 2.

The SPICE model for the SMV1470-004LF varactor is shown in Figure 3 and the associated model parameters are provided in Table 5.

### Package Dimensions

Package dimensions are shown in Figure 4, and tape and reel dimensions are provided in Figure 5.

### 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 SMV1470-004LF varactor is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It 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.

**Table 2. SMV1470-004LF Absolute Maximum Ratings**

| Parameter             | Symbol           | Minimum | Maximum | Units |
|-----------------------|------------------|---------|---------|-------|
| Forward current       | I <sub>F</sub>   |         | 20      | mA    |
| Power dissipation     | P <sub>D</sub>   |         | 250     | mW    |
| Storage temperature   | T <sub>STG</sub> | -55     | +150    | °C    |
| Operating temperature | T <sub>A</sub>   | -55     | +125    | °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.

**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.

**Table 3. SMV1470-004LF Electrical Specifications (T<sub>A</sub> = +25 °C Unless Otherwise Noted)**

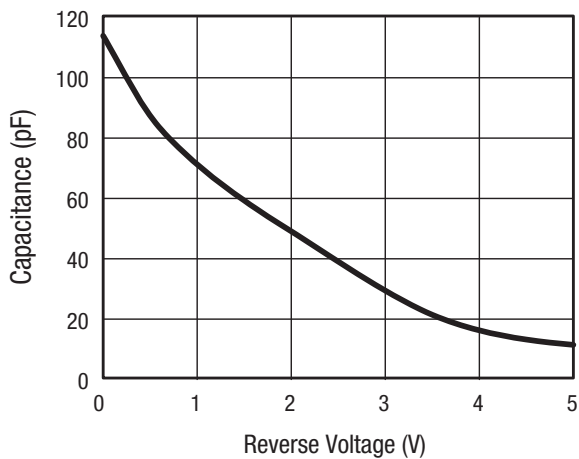
| Parameter         | Symbol          | Test Condition                            | Min  | Typical | Max  | Units |
|-------------------|-----------------|---|------|---------|------|-------|
| Reverse current   | I <sub>R</sub>  | V <sub>R</sub> = 10 V                     |      |         | 20   | nA    |
| Capacitance       | C <sub>T</sub>  | V <sub>R</sub> = 1 V, F = 1 MHz           | 65.8 | 70.0    | 74.2 | pF    |
|                   |                 | V <sub>R</sub> = 4.5 V, F = 1 MHz         | 12.0 | 13.4    | 14.8 | pF    |
| Capacitance ratio | C <sub>TR</sub> | C <sub>T</sub> (1 V)/C <sub>T</sub> (5 V) | 5    | 6       |      | –     |
| Series resistance | R <sub>S</sub>  | V <sub>R</sub> = 1.5 V, F = 900 MHz       |      | 0.5     | 0.8  | Ω     |
| Breakdown voltage | V <sub>B</sub>  | I <sub>R</sub> = 10 μA                    | 10   |         |      | V     |

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

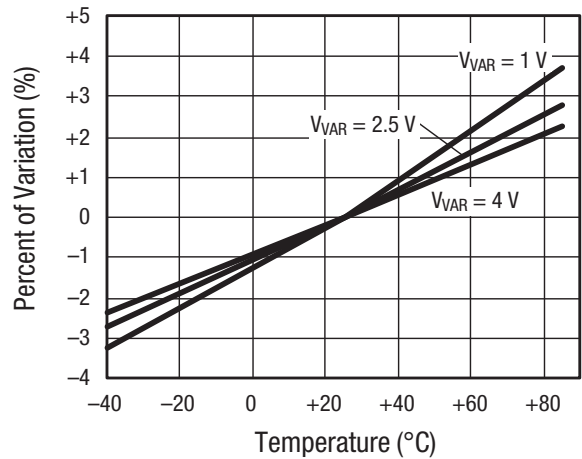
**Table 4. Capacitance vs Reverse Voltage**

| $V_R$<br>(V) | $C_T$ (pF) |
|--------------|------------|
| 0            | 113.9      |
| 0.5          | 87.4       |
| 1.0          | 71.3       |
| 1.5          | 59.3       |
| 2.0          | 49.0       |
| 2.5          | 39.1       |
| 3.0          | 29.4       |
| 3.5          | 21.4       |
| 4.0          | 16.3       |
| 4.5          | 13.3       |
| 5.0          | 11.5       |
| 5.5          | 10.3       |
| 6.0          | 9.5        |
| 6.5          | 8.9        |
| 7.0          | 8.5        |
| 7.5          | 8.1        |
| 8.0          | 7.9        |
| 8.5          | 7.7        |
| 9.0          | 7.6        |
| 9.5          | 7.5        |
| 10.0         | 7.5        |

**Typical Performance Characteristics**



**Figure 1. Capacitance vs Voltage**



**Figure 2. Relative Capacitance Change vs Temperature**

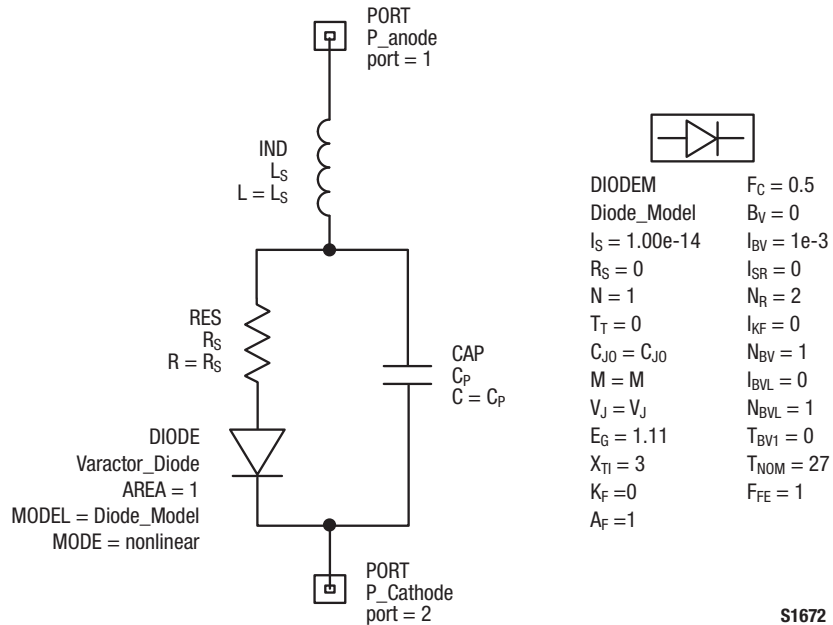


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

| Part Number   | C <sub>J0</sub> (pF) | V <sub>J</sub> (V) | M    | C <sub>P</sub> (pF) | R <sub>S</sub> (Ω) | L <sub>S</sub> (nH) |
|---------------|----------------------|--------------------|------|---------------------|--------------------|---------------------|
| SMV1470-004LF | 110                  | 80                 | 39.7 | 3.94                | 0.5                | 1.4                 |



## DATA SHEET • SMV1470-004LF: HYPERABRUPT JUNCTION TUNING VARACTOR

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