DATA SHEET

SMV1470-004 and SMV1470-004LF: Hyperabrupt Junction Tuning Varactors

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 SMV1470-004/004LF are dual silicon, hyperabrupt junction varactor diodes in a common cathode configuration. The specified high capacitance ratio and low series resistance make these varactors 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 packages and markings of the SMV1470-004/004LF varactors.

Table 1. Part Number and Configuration


Common Cathode
SOT-23
SMV1470-004 Marking: AT3
SMV1470-004LF Green™ Marking: ET3
L_S = 1.4 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. SMV1470-004/004LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Forward current	I_F		20	mA
Power dissipation	P_D		250	mW
Storage temperature	T_{STG}	–55	+150	°C
Operating temperature	T_A	–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. The SMV1470-004/004LF Varactors are Human Body Model (HBM) Class 0 ESD devices.*

Table 3. SMV1470-004/004LF Electrical Specifications (T_A = +25 °C Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	I_R	V_R = 10 V			20	nA
Capacitance	C_T	V_R = 1 V, F = 1 MHz	65.8	70.0	74.2	pF
		V_R = 4.5 V, F = 1 MHz	12.0	13.4	14.8	pF
Capacitance ratio	C_{TR}	C_T (1 V)/C_T (5 V)	5	6		–
Series resistance	R_S	V_R = 1.5 V, F = 900 MHz		0.5	0.8	Ω
Breakdown voltage	V_B	I_R = 10 μA	10			V

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

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1470-004/004LF varactors 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 SMV1470-004/004LF varactors are illustrated in Figures 1 and 2.

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

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 SMP1330 series is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. These diodes 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 4. Capacitance vs Reverse Voltage

V_R (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

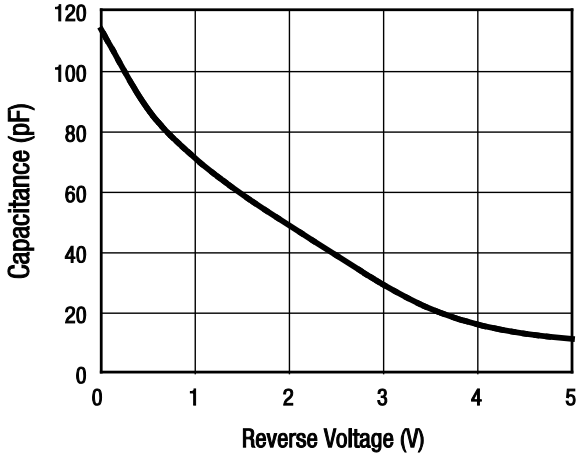

Figure 1. Capacitance vs Voltage

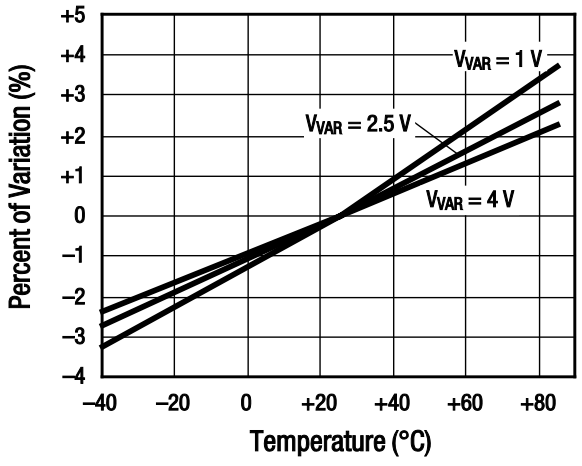

Figure 2. Relative Capacitance Change vs Temperature

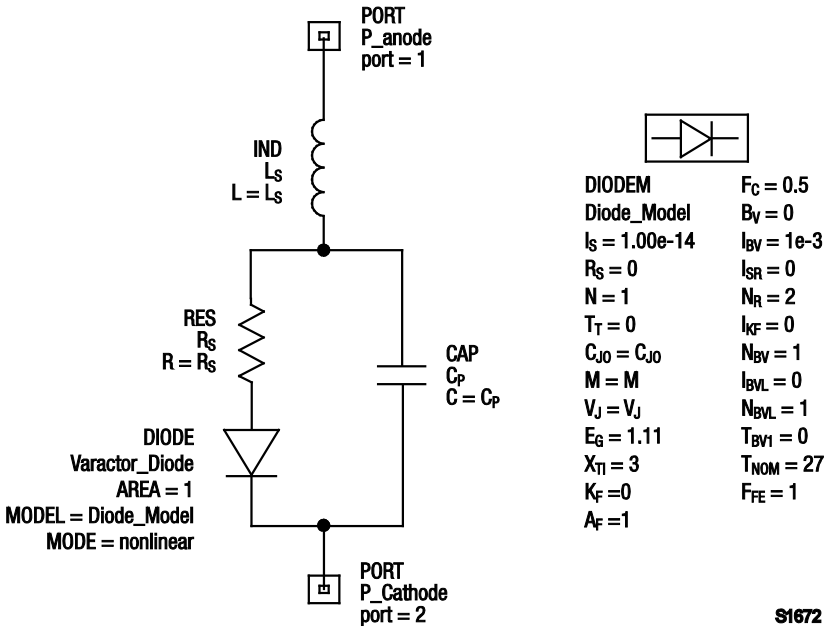

Figure 3. SPICE Model

Table 5. SPICE Model Parameters

Part Number	C_{JO} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)	L_S (nH)
SMV1470-004/004LF	110	80	39.7	3.94	0.5	1.4

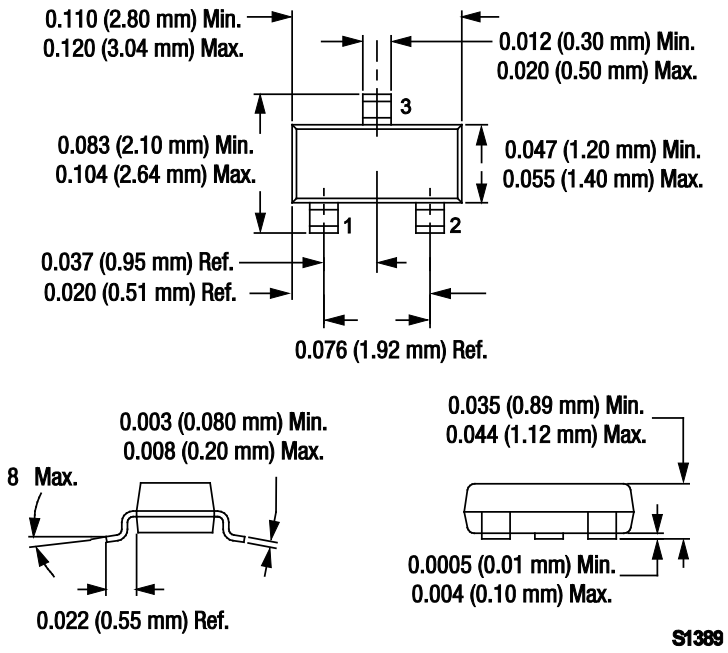

Figure 4. SOT-23 Package Dimension Drawing

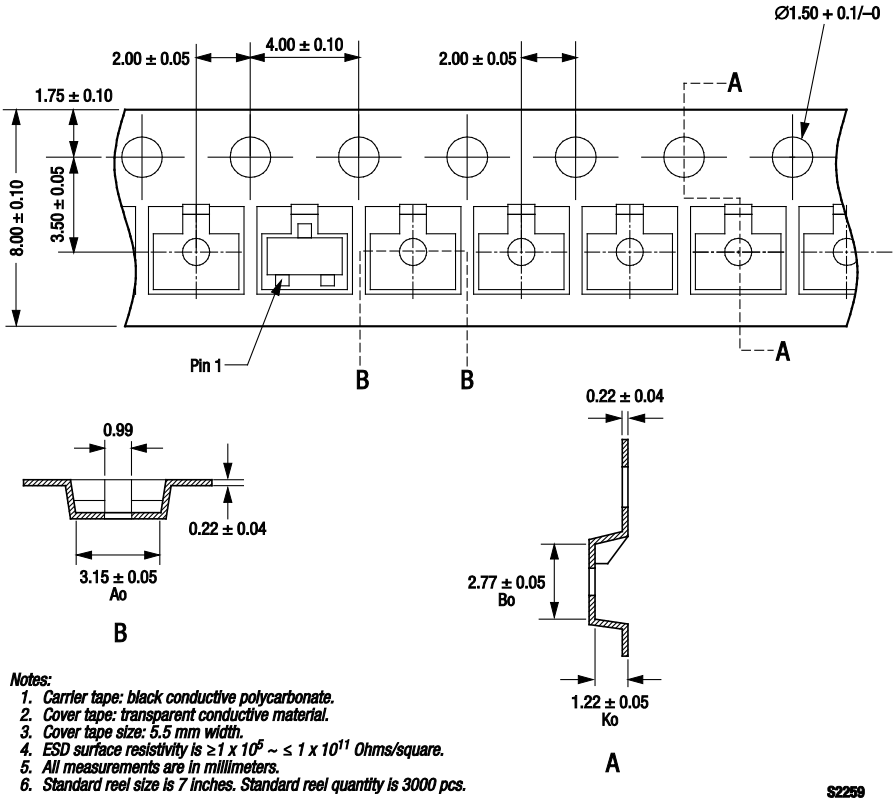

Figure 5. SOT-23 Tape and Reel Dimensions