

DATA SHEET

# SMVA1470-004LF: Hyperabrupt Junction Tuning Varactor

## Automotive Applications

- Low-noise VCOs and VCXOs in wireless systems
- Infotainment
- Navigation
- Telematics
- Garage door openers
- Wireless control systems

## Features

- AEC-Q101 qualified
- High capacitance ratio
- SOT-23 package (MSL1, 260 °C per JEDEC J-STD-020)



## Description


The SMVA1470-004LF 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 for in-vehicle infotainment applications.

Table 1 describes the SMVA1470-004LF package and marking.



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.

**Table 1. Package and Marking**


Common Cathode
SOT-23
<b>SMVA1470-004LF</b> Green™ 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™.

### Electrical and Mechanical Specifications

The absolute maximum ratings of the SMVA1470-004LF 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 SMVA1470-004LF varactor are illustrated in Figures 1 and 2.

The SPICE model for the SMVA1470-004LF varactor is shown in Figure 3 and the associated model parameters are provided in Table 5.

**Table 2. SMVA1470-004LF Absolute Maximum Ratings<sup>1</sup>**

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
Electrostatic discharge:	ESD			
Charged Device Model (CDM), Class 3			1000	V
Human Body Model (HBM), Class 1A			500	V
Machine Model (MM), Class A			50	V

<sup>1</sup> 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.

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**ESD HANDLING:** 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 when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

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**Table 3. SMVA1470-004LF Electrical Specifications<sup>1</sup>**  
**(T<sub>A</sub> = +25 °C Unless Otherwise Noted)**

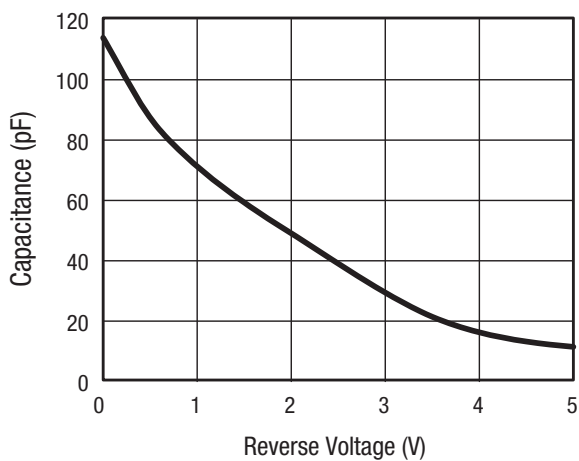
Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 10 V			20	nA
Capacitance	C <sub>T</sub>	V <sub>R</sub> = 1 V, F = 1 MHz	65.8	70.0	74.2	pF
		V <sub>R</sub> = 4.5 V, F = 1 MHz	12.0	13.4	14.8	pF
Capacitance ratio	C <sub>TR</sub>	C <sub>T</sub> (1 V)/C <sub>T</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

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.

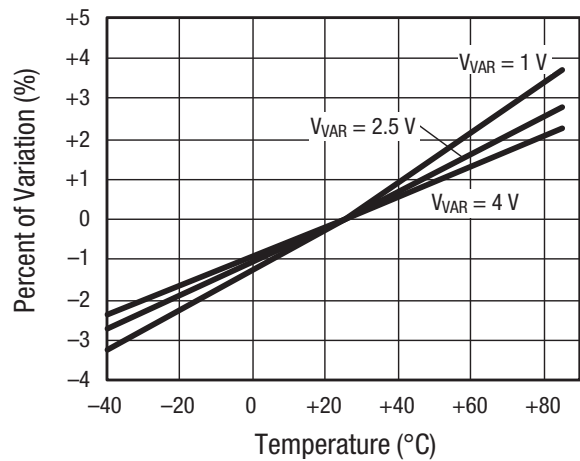
**Table 4. Capacitance vs Reverse Voltage**

$V_R$ (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**

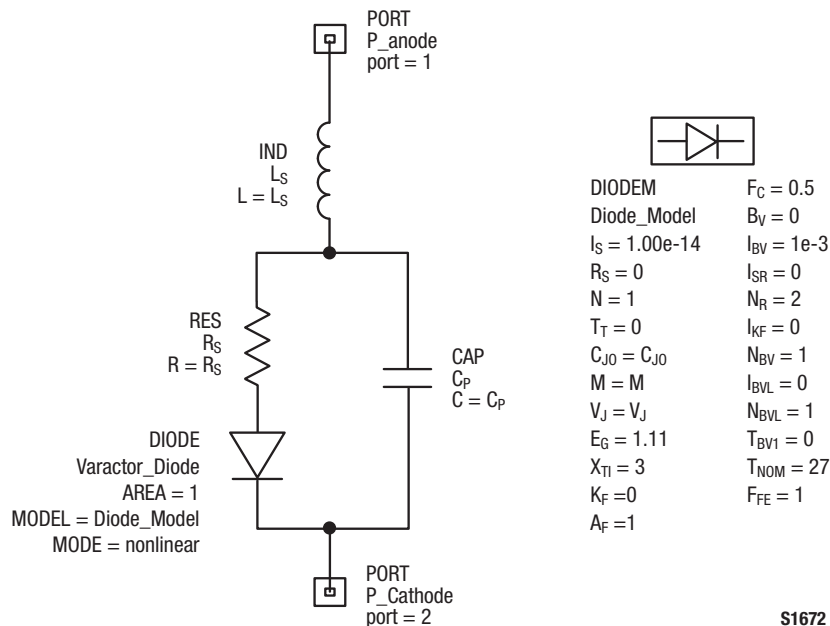


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

CJO (pF)	VJ (V)	M	CP (pF)	RS (Ω)	LS (nH)
110	80	39.7	3.94	0.5	1.4

### 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 SMVA1470-004LF 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.

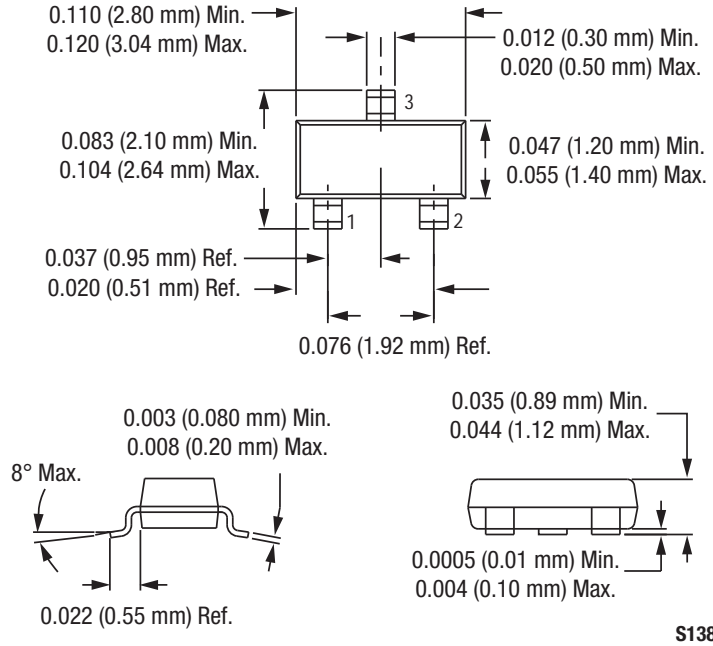
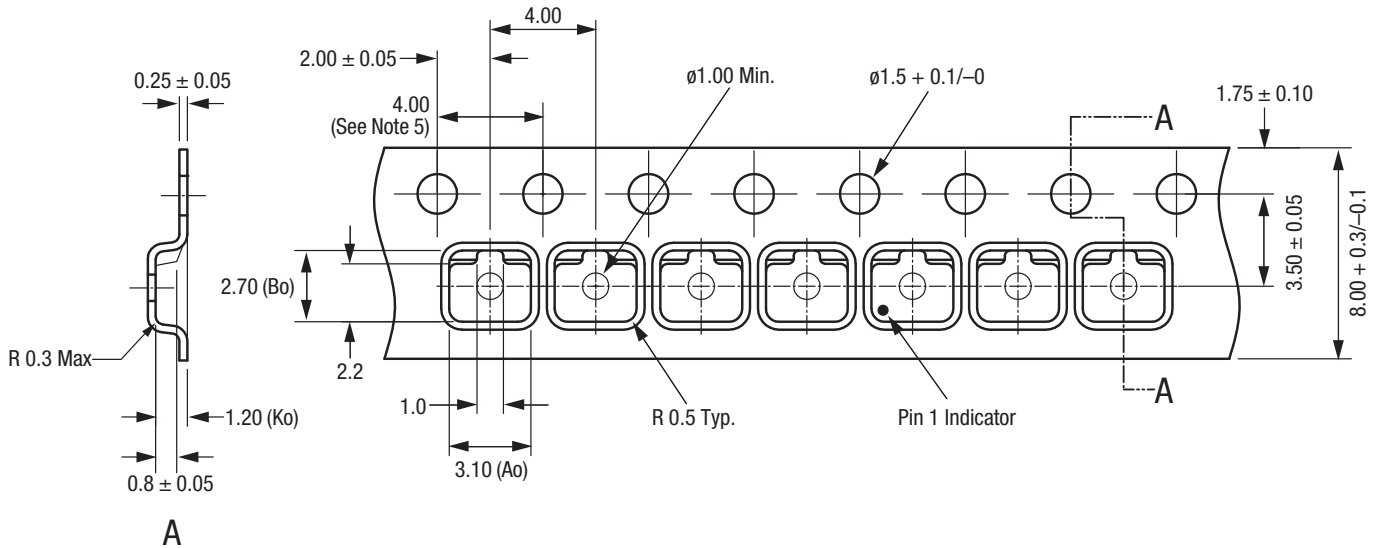


Figure 4. SOT-23 Package Dimension Drawing



Notes:

1. Carrier tape: black conductive polycarbonate.
2. Cover tape material: transparent conductive PSA.
3. Cover tape size: 5.40 mm width.
4. Tolerance: ±0.10 mm.
5. Ten sprocket hole pitch cumulative tolerance: ±0.2 mm.
6. All measurements are in millimeters.
7. Alternative carrier tape dimensions are:  
 Ao = 3.3  
 Bo = 2.9  
 Ko = 1.22

S1684b

Figure 5. SOT-23 Tape and Reel Dimensions

**DATA SHEET • SMVA1470-004LF: HYPERABRUPT JUNCTION TUNING VARACTOR**

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