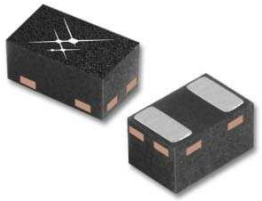
DATA SHEET

SMV1234-040LF: Surface Mount, 0402 Silicon Hyperabrupt Tuning Varactor Diode

Applications

- Wide bandwidth VCOs
- Wide range voltage-tuned phase shifters and filters



Features

- Low series resistance: 0.8 Ω typical
- High capacitance ratio at low reverse voltage: CT1/CT3 = 1.8 typical
- Industry-standard 0402 footprint
- 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 SMV1234-040LF is a silicon hyperabrupt junction varactor diode specifically designed for 3 V platforms. The specified high capacitance ratio and low reverse voltage make this varactor appropriate for low phase noise Voltage Controlled Oscillators (VCOs) used at frequencies in wireless systems up to and above 2.5 GHz.

The SMV1234-040LF is compatible with the industry-standard 0402 PCB footprint.

Table 1. SMV1234-040LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Forward current	I_F		20	mA
Reverse voltage	V_R		15	V
Dissipated power @ 25 °C	P_D		750	mW
Storage temperature	T_{STG}	–55	+200	°C
Junction temperature	T_J	–55	+175	°C
Solder interface temperature	T_S	–40	+85	°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.*

Table 2. SMV1234-040LF Electrical Specifications (Note 1)
(Ts = +25 °C, Characteristic Impedance [Z0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	I_R	V_R = 12 V			20	nA
Capacitance	C_T	f = 1 MHz, V_R = 1 V	5.85		7.15	pF
Capacitance ratio	C_{TR}	C_T @ 1 V/C_T @ 3 V C_T @ 1 V/C_T @ 6 V	1.6 2.8		2.0 3.4	– –
Series resistance	R_S	f = 500 MHz, V_R = 3 V			1.2	Ω
Series inductance	L_S			0.45		nH
Breakdown voltage	V_{BR}	I_R = 10 μA	15			V

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

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1234-040LF are provided in Table 1. Electrical specifications are provided in Table 2. Table 3 summarizes the capacitance for reverse voltages between 0 and 20 V.

Typical performance characteristics of the SMV1234-040LF are illustrated in Figures 1 and 2.

The SPICE model for the SMV1234-040LF varactor is shown in Figure 3 and the associated model parameters are provided in Table 4.

Package Dimensions

The PCB layout footprint for the SMV1234-040LF is provided in Figure 4. Typical case markings are shown in Figure 5. Package dimensions for the SMV1234-040LF are provided in Figure 6. Tape and reel dimensions are provided in Figure 7.

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 SMV1234-040LF 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 3. Capacitance vs Reverse Voltage

V_R (V)	C_T (pF)
0	10.28
1	6.57
2	4.81
3	3.64
4	2.87
5	2.40
6	2.09
7	1.88
8	1.75
9	1.67
10	1.62
12	1.57
14	1.53
16	1.51
18	1.49
20	1.48

Typical Performance Characteristics

(T_A = 25 °C, Unless Otherwise Noted)

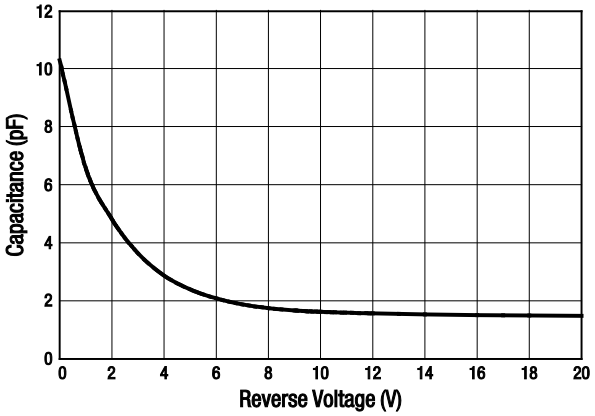


Figure 1. Capacitance vs Reverse Voltage

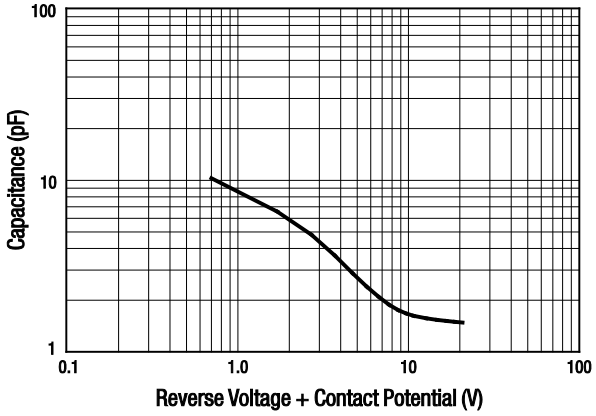


Figure 2. Capacitance vs Reverse Voltage + Contact Potential

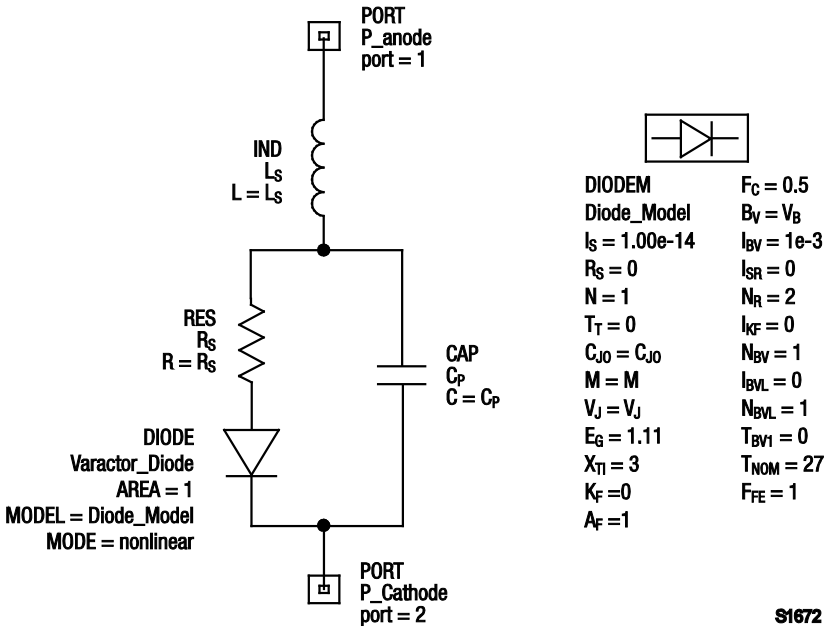


Figure 3. SPICE Model

Table 4. SPICE Model Parameters

Part Number	C_{J0} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)	L_S (nH)
SMV1234-040LF	8.80	11.01	5.91	1.45	0.8	0.45

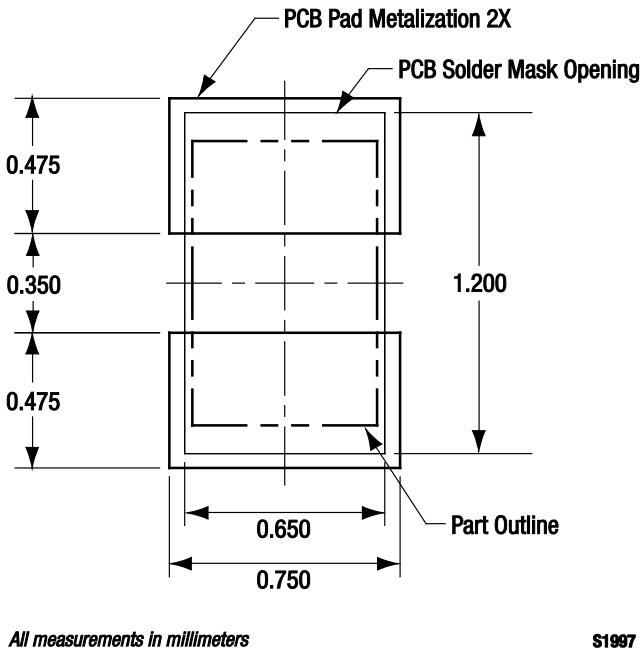


Figure 4. SMV1234-040LF PCB Layout Footprint

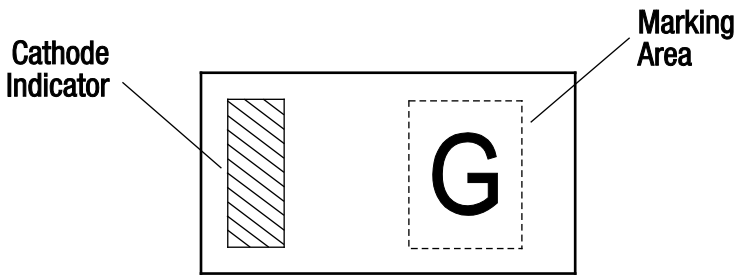


Figure 5. Typical Case Markings (Top View)

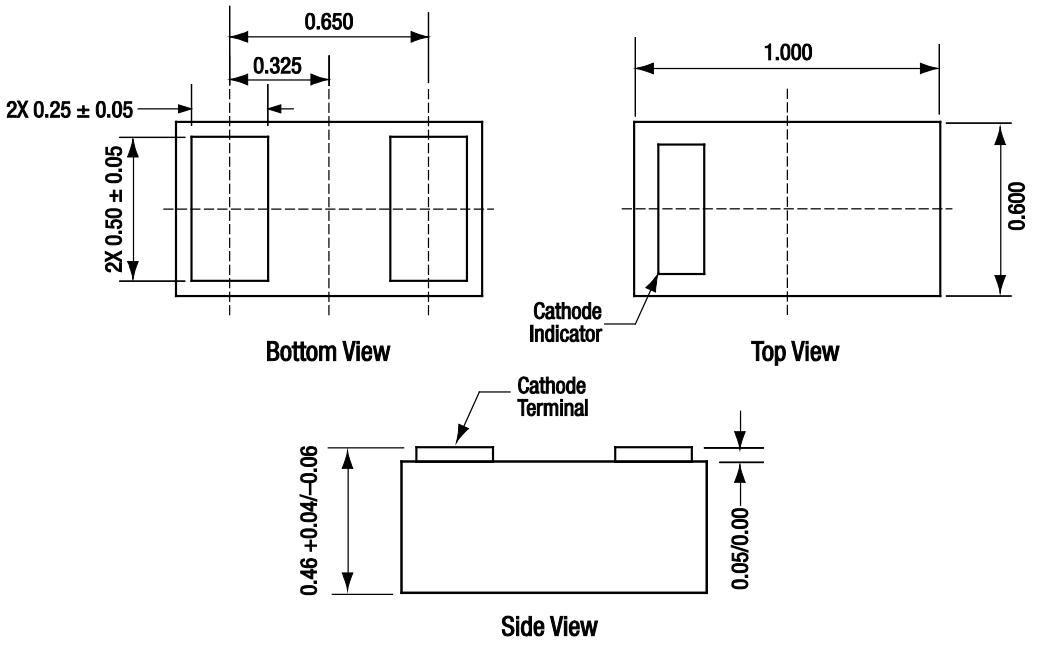
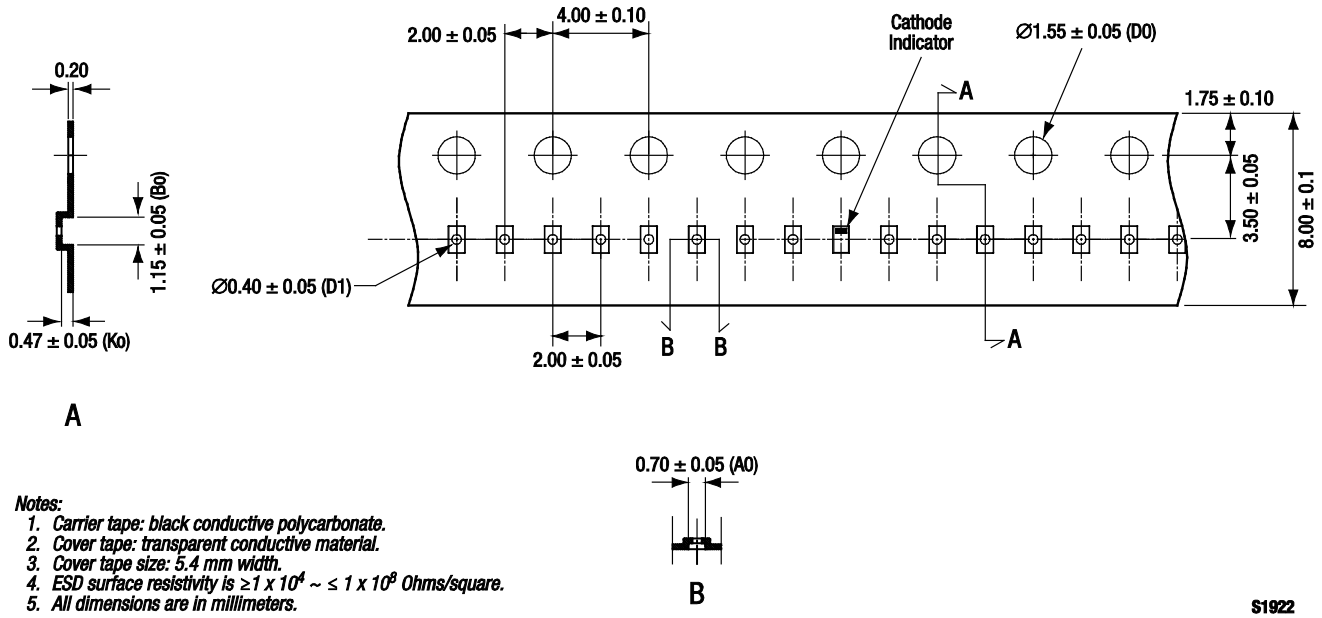


Figure 6. SMV1234-040LF Package Dimensions



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 ≥1 x 10^4 ~ ≤ 1 x 10^8 Ohms/square.*
5. *All dimensions are in millimeters.*

Figure 7. SMV1234-040LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number
SMV1234-040LF Surface Mount Hyperabrupt Tuning Varactor Diode	SMV1234-040LF