

# SMV1770-079LF: Hyperabrupt Junction Tuning Varactor

## Applications

- Low-noise and wideband UHF and VHF VCOs
- High-volume, low-cost battery-powered tuning circuits

## Features

- Low series resistance
- High capacitance ratio
- Ultra-small SC-79 package (MSL1, 260 °C per JEDEC J-STD-020)




Skyworks Green™ products are RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain <1,000 ppm antimony trioxide in polymeric materials.

## Description

The SMV1770-079LF is a silicon hyperabrupt junction varactor diode specifically designed for battery operation. 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.

Table 1 describes the package and marking of the SMV1770-079LF varactor.

**Table 1. Packaging and Marking**


Single
SC-79 Green™
<b>SMV1770-079LF</b> Marking: Cathode
Ls = 0.7 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. SMV1770-079LF Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Typical	Maximum	Units
Reverse voltage	$V_R$			12	V
Forward current	$I_F$			20	mA
Power dissipation	$P_{DIS}$			250	mW
Operating temperature	$T_{OP}$	-55		+125	°C
Storage temperature	$T_{STG}$	-55		+150	°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. The SMV1770-079LF varactor is a Class 0 Human Body Model (HBM) ESD device.

**Table 3. SMV1770-079LF Electrical Specifications (Note 1)**  
( $T_{OP} = 25\text{ °C}$ , Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	$I_R$	$V_R = 8\text{ V}$			20	nA
Capacitance	$C_T$	$F = 1\text{ MHz}$				
		$V_R = 0.5\text{ V}$ $V_R = 2.5\text{ V}$	22.1 7.7	23.6 8.6	25.1 9.8	pF pF
Capacitance ratio	$C_{TR}$	$C_T @ 0.5\text{ V}/C_T @ 2.5\text{ V}$	2.3	2.7		-
Series resistance	$R_S$	$F = 470\text{ MHz}, V_R = 1\text{ V}$		0.4	0.5	$\Omega$
Breakdown voltage	$V_{BR}$	$I_R = 10\text{ }\mu\text{A}$	12			V

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

### Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1770-079LF varactor are provided in Table 2. Electrical specifications are provided in Table 3. Typical capacitance values are listed in Table 4. Typical performance characteristics for the SMV1770-079LF varactor are illustrated in Figures 1 and 2.

The SPICE model for the SMV1770-079LF varactor 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.

Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SMV1770-079LF 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.

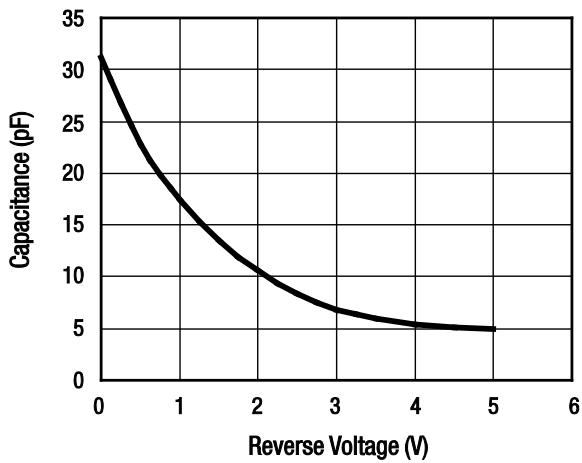
### Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed.

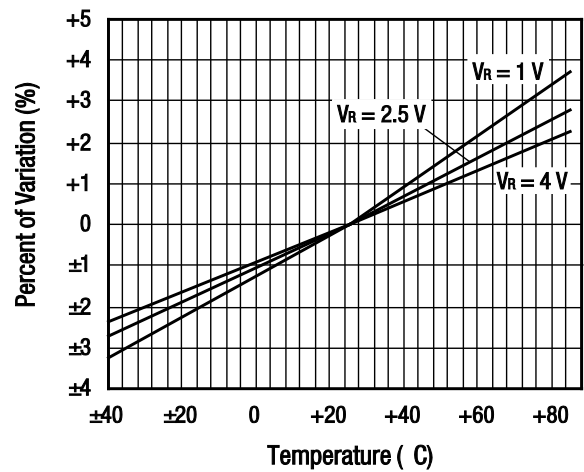
**Table 4. Capacitance vs Reverse Voltage**

$V_R$ (V)	$C_T$ (pF)
0	31.2
0.5	23.6
1.0	17.8
1.5	13.7
2.0	10.7
2.5	8.6
3.0	7.0
3.5	5.9
4.0	5.5
4.5	5.2
5.0	5.0

**Typical Performance Characteristics**



**Figure 1. Capacitance vs Voltage**



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

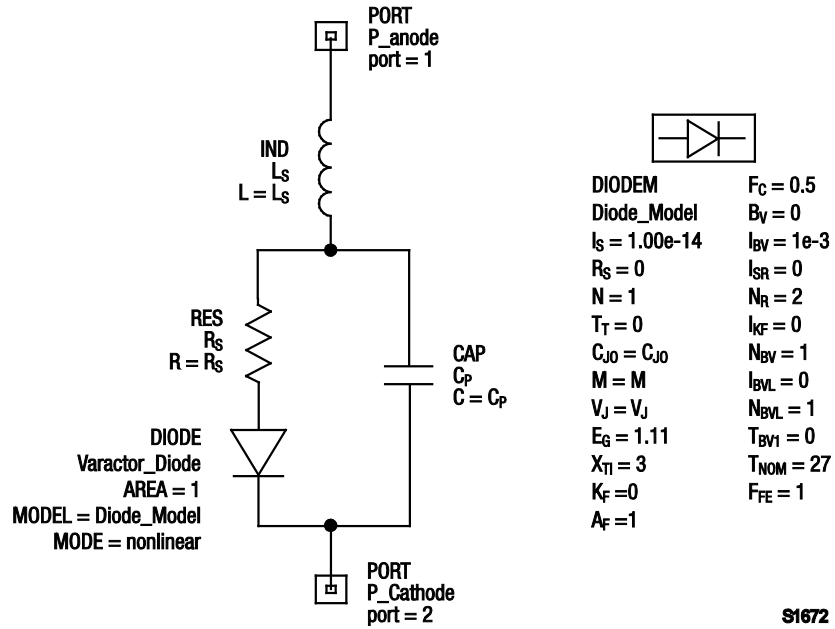
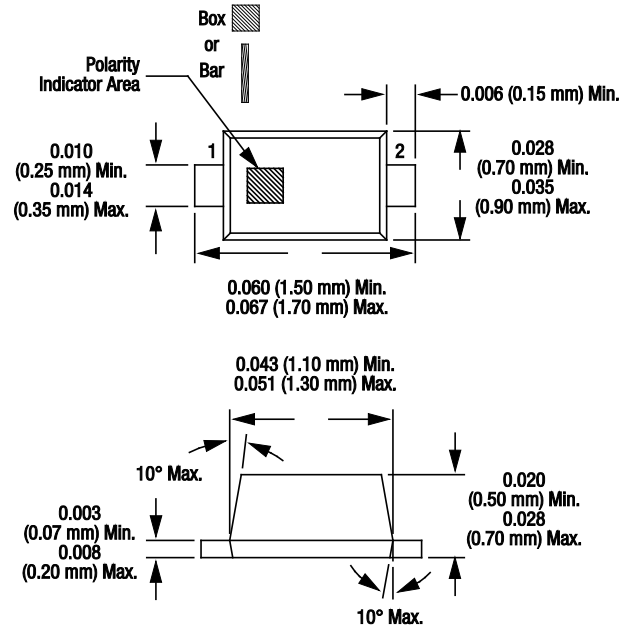


Figure 3. SPICE Model

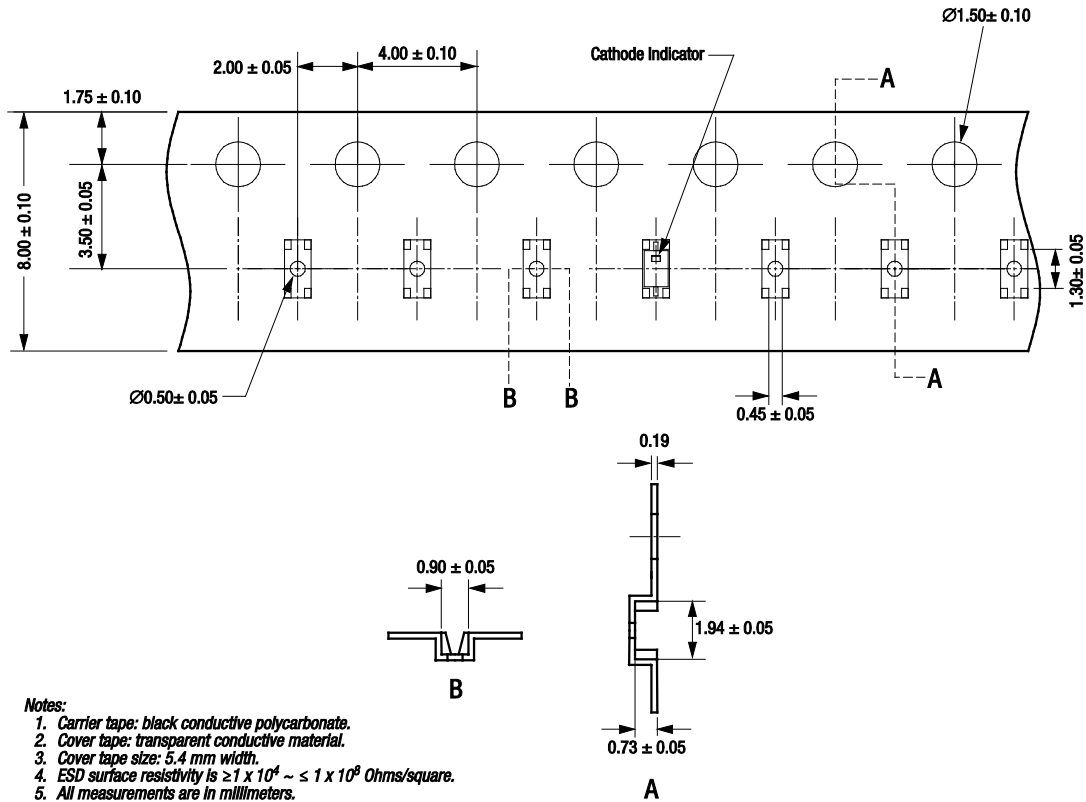
Table 5. SPICE Model Parameters

Part Number	CJO (pF)	VJ (V)	M	CP (pF)	RS (Ω)	LS (nH)
SMV1770-079LF	31	12	8	2	0.4	0.8



Dimensions are in inches (millimeters shown in parentheses) S1052

Figure 4. SC-79 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  $\geq 1 \times 10^4 \sim \leq 1 \times 10^9$  Ohms/square.
  5. All measurements are in millimeters.
  6. Standard reel size is 7 inches. Standard reel quantity is 3000 pcs.

S2106

Figure 5. SC-79 Tape and Reel Dimensions

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