

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 compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.




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™
SMV1770-079LF 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	Ω
Breakdown voltage	V_{BR}	$I_R = 10\ \mu\text{A}$	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

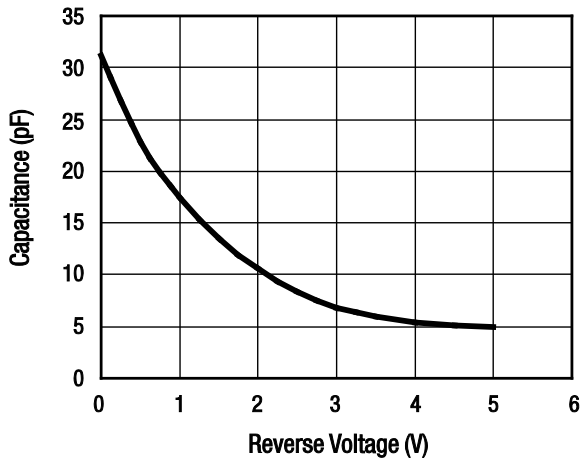


Figure 1. Capacitance vs Voltage

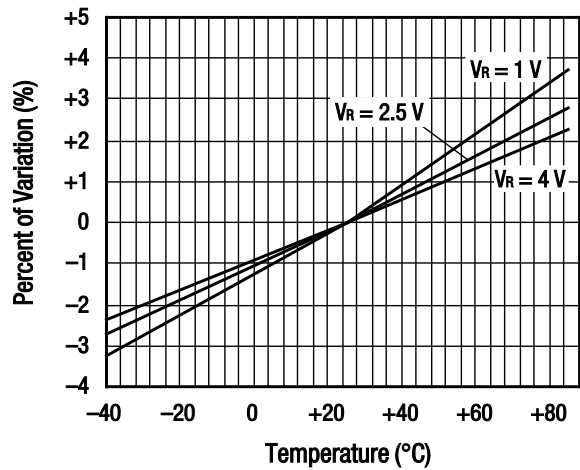


Figure 2. Relative Capacitance Change vs Temperature

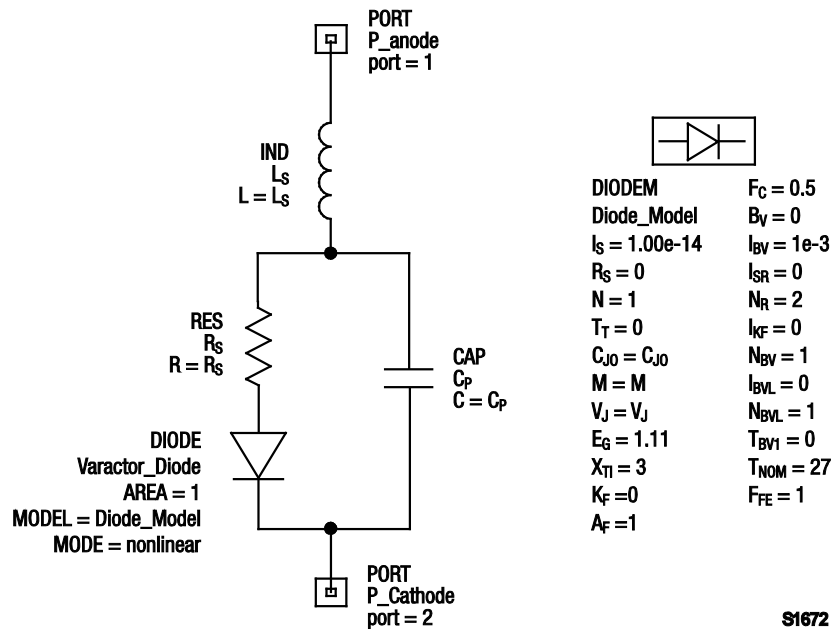
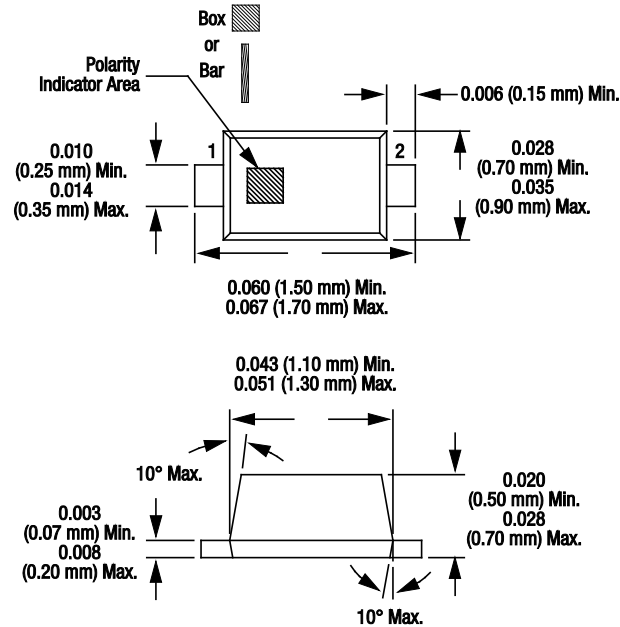


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

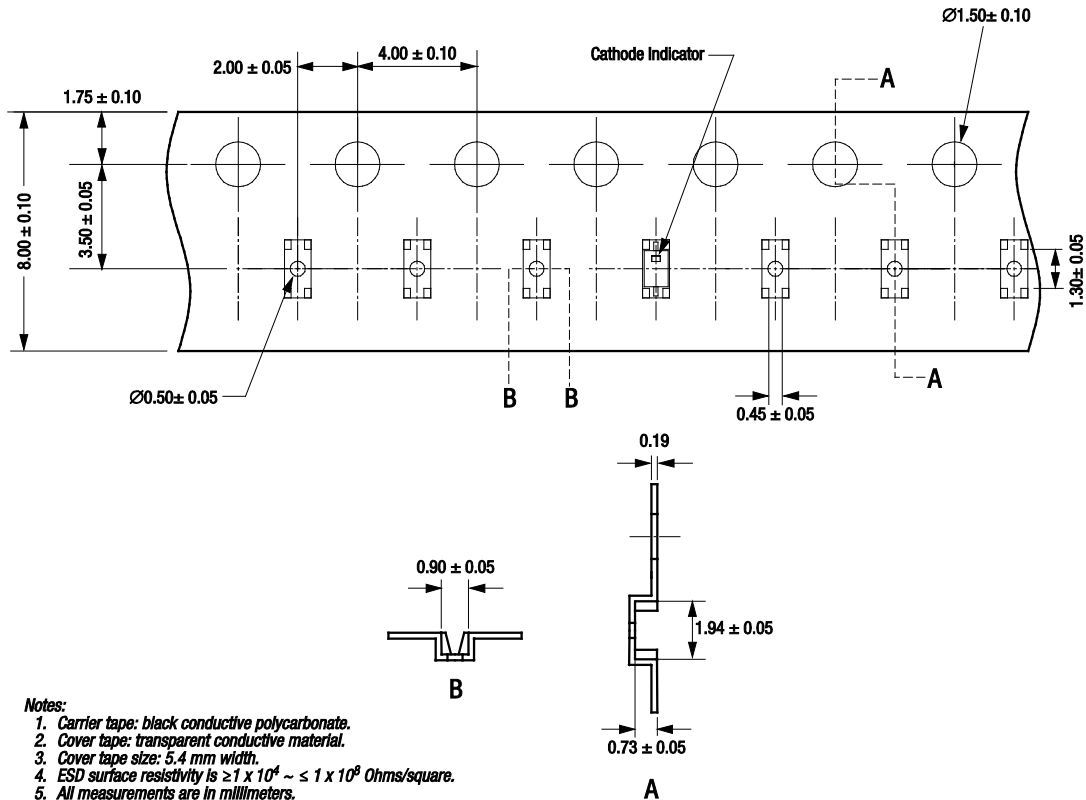
Part Number	C _{J0} (pF)	V _J (V)	M	C _P (pF)	R _S (Ω)	L _S (nH)
SMV1770-079LF	27.88	43.4	30	3.54	0.4	0.8

Note: Values extracted from measured performance.



Dimensions are in inches (millimeters shown in parentheses) S1052

Figure 4. SC-79 Package Dimensions



S2186

Figure 5. SC-79 Tape and Reel Dimensions

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