

DATA SHEET

SMV1770 Series: Hyperabrupt Junction Tuning Varactors

Applications

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

Features

- Low series resistance
- High capacitance ratio
- SC-79 and ultra-small SOD-882 packages (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 series are silicon hyperabrupt junction varactor diodes specifically designed for battery operation. The specified high capacitance ratio and low reverse voltage make these varactors 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 packages and markings of the SMV1770 varactor series.

Table 1. Packaging and Marking

	
Single	Single
SC-79 Green™	SOD-882 Green™
SMV1770-079LF Marking: Cathode	SMV1770-040LF Marking: ED1
Ls = 0.7 nH	Ls = 0.45 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 Series 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.

Table 3. SMV1770 Series 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	$f = 900\text{ MHz}$, $V_R = 1\text{ V}$		0.4	0.5	Ω
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 varactor series 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 varactors are illustrated in Figures 1 and 2.

The SPICE model for the SMV1770 varactors is shown in Figure 3 and the associated model parameters are provided in Table 5.

Package dimensions are shown in Figures 4 and 6, and tape and reel dimensions are provided in Figures 5 and 7.

Package and Handling Information

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

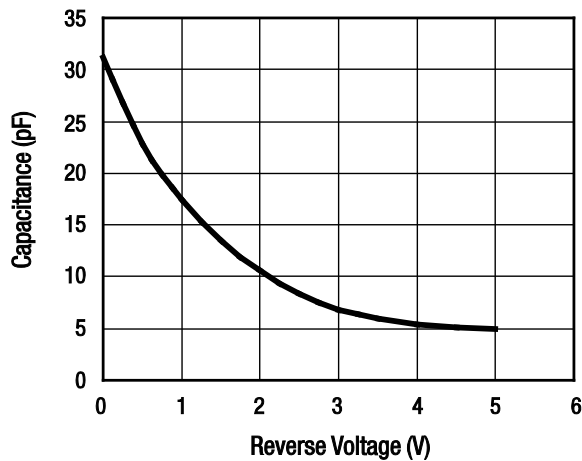
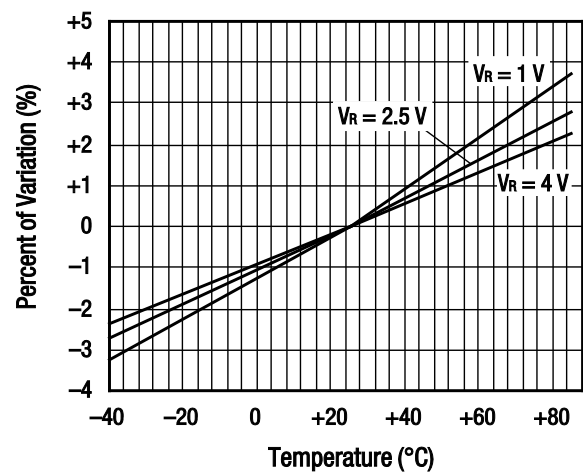
Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SMV1770 varactor series are rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. They 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	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**

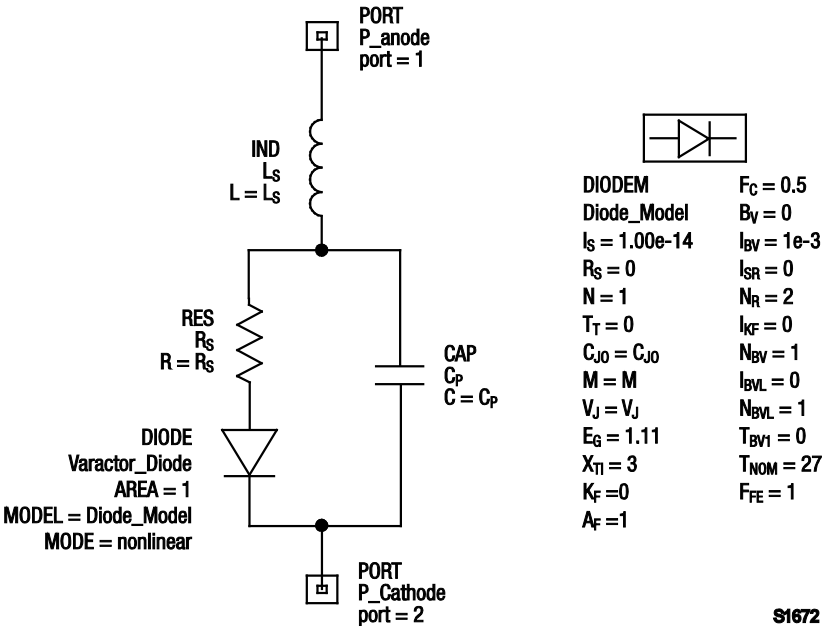


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

Part Number	Cj0 (pF)	Vj (V)	M	Cp (pF)	Rs (Ω)	Ls (nH)
SMV1770-079LF	27.88	43.4	30	3.54	0.4	0.80
SMV1770-040LF	33.07	43.4	30	3.54	0.4	0.45

Note: Values extracted from measured performance.

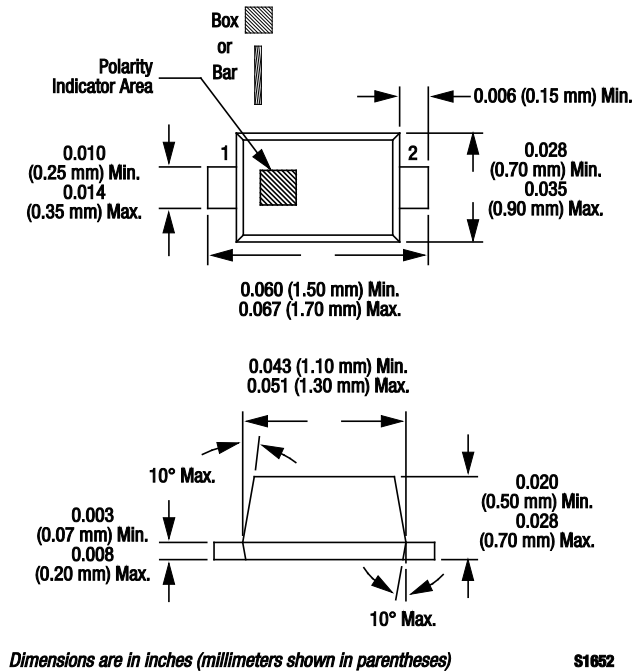


Figure 4. SC-79 Package Dimensions

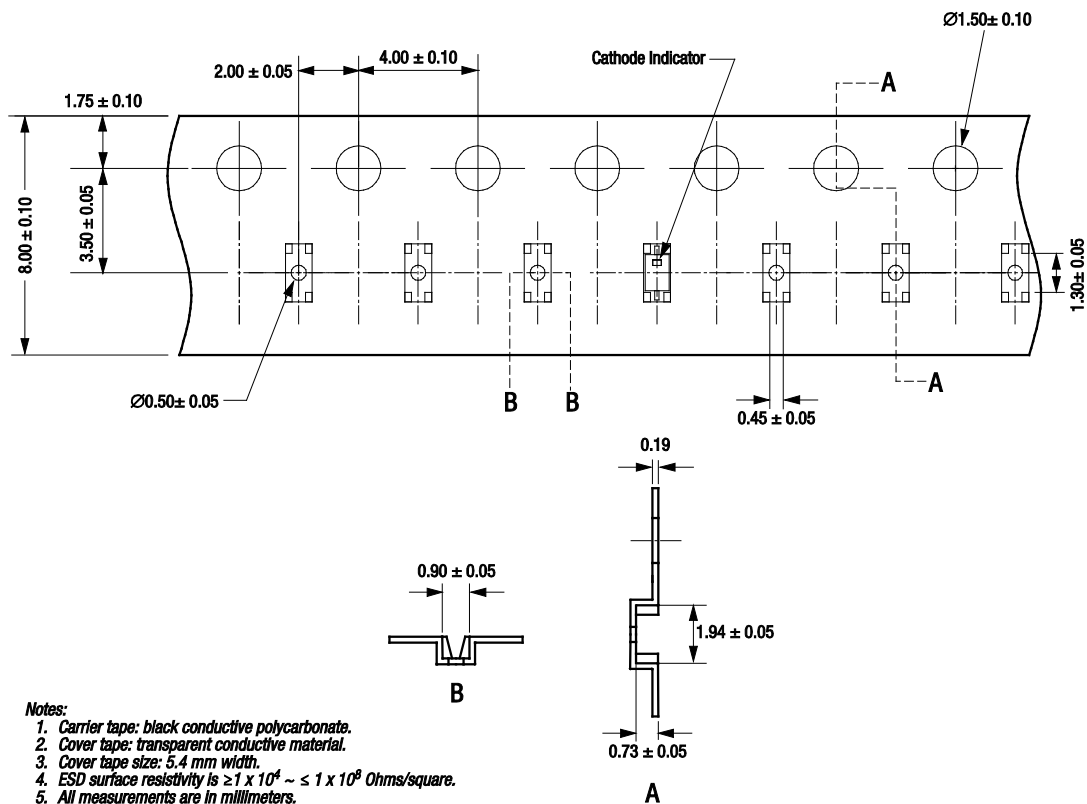
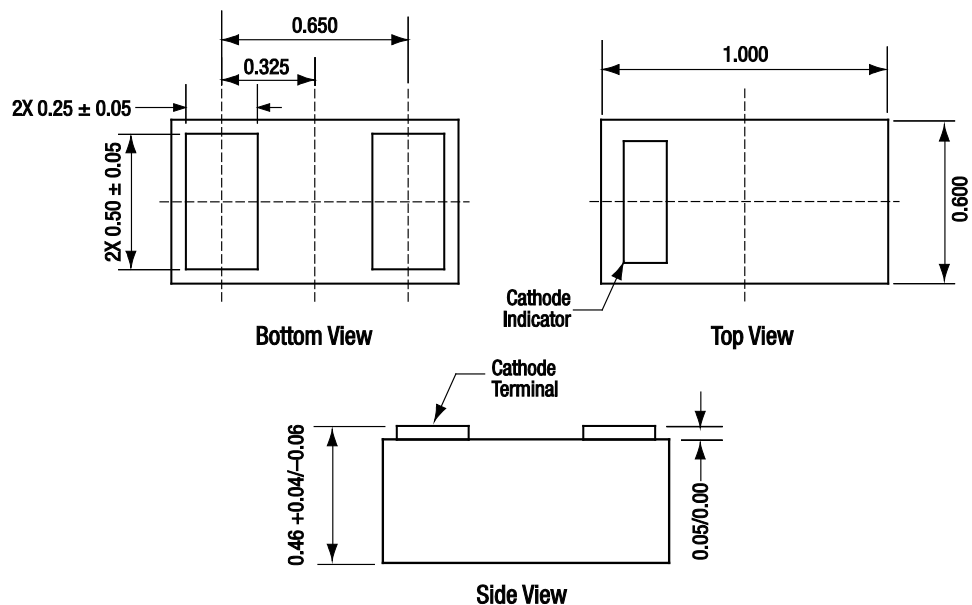


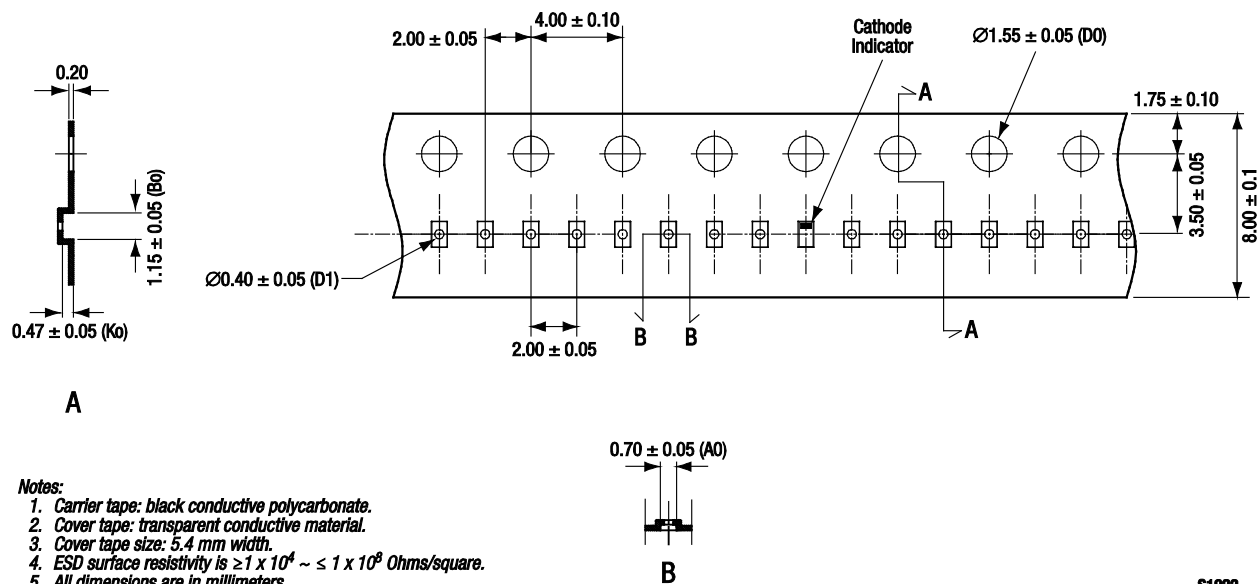
Figure 5. SC-79 Tape and Reel Dimensions



All dimensions in millimeters

S1892

Figure 6. SOD-882 Package Dimensions



S1922

Figure 7. SOD-882 Tape and Reel Dimensions

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