DATA SHEET

SMV1705 Series: Hyperabrupt Junction Tuning Varactors

Applications

- Low-noise and wideband UHF and VHF VCOs
- High volume, low-cost batteries

Features

- Low series resistance
- High capacitance ratio
- 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 SMV1705 group of silicon hyperabrupt junction varactor diodes is specifically designed for battery operation. The specified high capacitance ratio and low reverse voltage of these varactors make them appropriate for low-noise voltage controlled oscillators (VCOs) used at frequencies in wireless systems up to and above 10 GHz.

Table 1 describes the various packages and markings of the SMV1705 group of varactors.

Table 1. Packaging and Marking

		
Common Cathode	Single	Single
SOT-23	SC-79 Green™	SOD-882 Green™
SMV1705-004LF Green™ Marking: HY3	**SMV1705-079LF** Marking: Cathode and YE	**SMV1705-040LF** Marking: O
L_S = 1.4 nH	L_S = 0.7 nH	L_S = 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.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1705 group of varactors 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 SMV1705 varactors are illustrated in Figures 1 and 2.

The SPICE model for the SMV1705 varactors is shown in Figure 3 and the associated model parameters are provided in Table 5.

Package Dimensions

Package dimensions are shown in Figures 4 to 8 (even numbers), and tape and reel dimensions are provided in Figures 5 to 9 (odd numbers).

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 SMV1705 series of varactors 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 2. SMV1705 Series Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	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
Electrostatic discharge:	ESD			
Charged Device Model (CDM), Class 3			1000	V
Human Body Model (HBM), Class 1C			1000	V
Machine Model (MM), Class B			200	V

[1] 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.

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.*

Table 3. SMV1705 Series Electrical Specifications[1]
(T_{OP} = 25 °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Reverse current	I_R	V_R = 8 V		<0.01	20	nA
Capacitance	C_T	F = 1 MHz :				
		V_R = 1 V	17.3	18.3	19.3	pF
		V_R = 4 V	5.3	6.1	6.6	pF
Capacitance ratio	C_{TR}	C_T @ 1 V/ C_T @ 4 V	2.8	3.0		–
Series resistance	R_S	F = 470 MHz, V_R = 1 V		0.32		Ω
Breakdown voltage	V_{BR}	I_R = 10 µA	12			V

[1] Performance is guaranteed only under the conditions listed in this table.

Table 4. Capacitance vs Reverse Voltage

V_R (V)	C_T (pF)
0	31.5
0.5	23.5
1.0	18.3
1.5	14.3
2.0	11.9
2.5	9.7
3.0	8.3
3.5	7.1
4.0	6.1
4.5	5.5
5.0	5.2

Typical Performance Characteristics

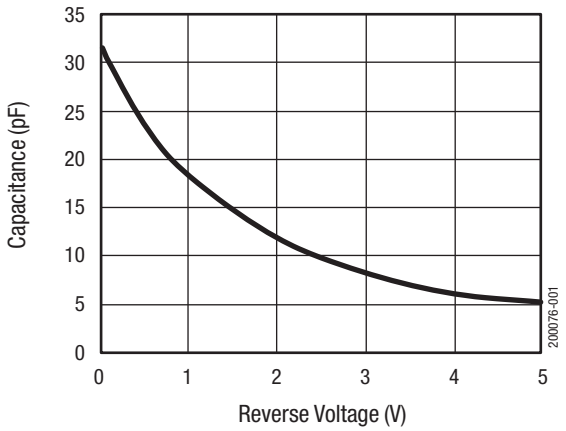


Figure 1. Capacitance vs Reverse Voltage

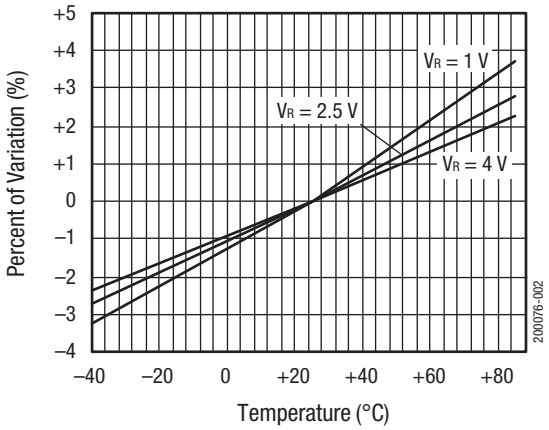


Figure 2. Relative Capacitance Change vs Temperature

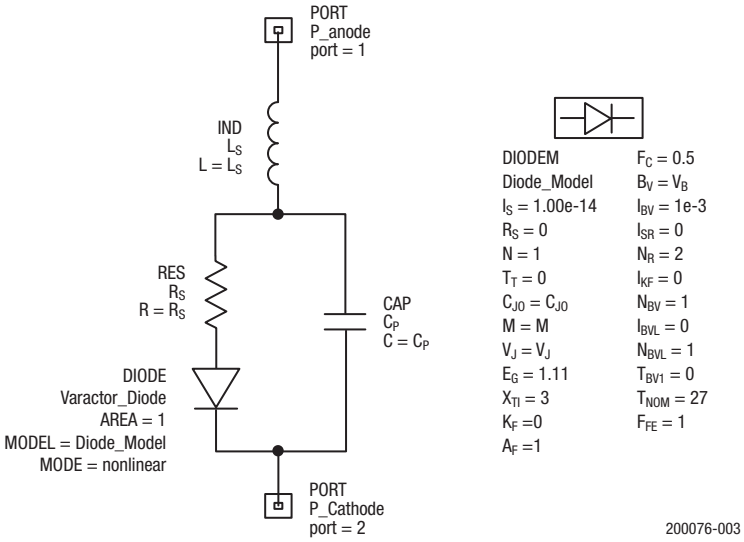
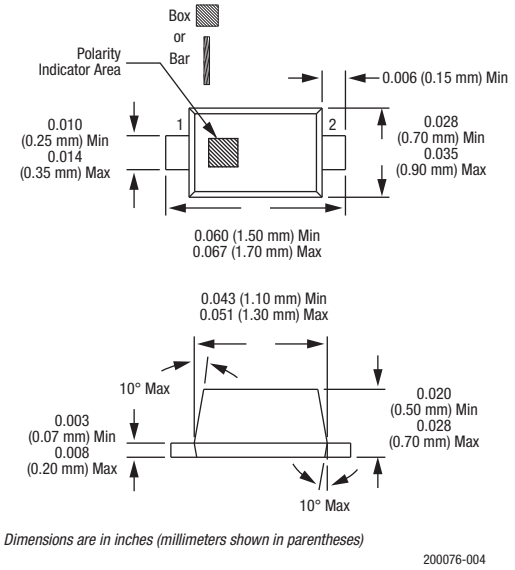


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

Part Number	C_{JO} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)	L_S (nH)
SMV1705	31	3	2	0.5	0.32	0.8



Dimensions are in inches (millimeters shown in parentheses)

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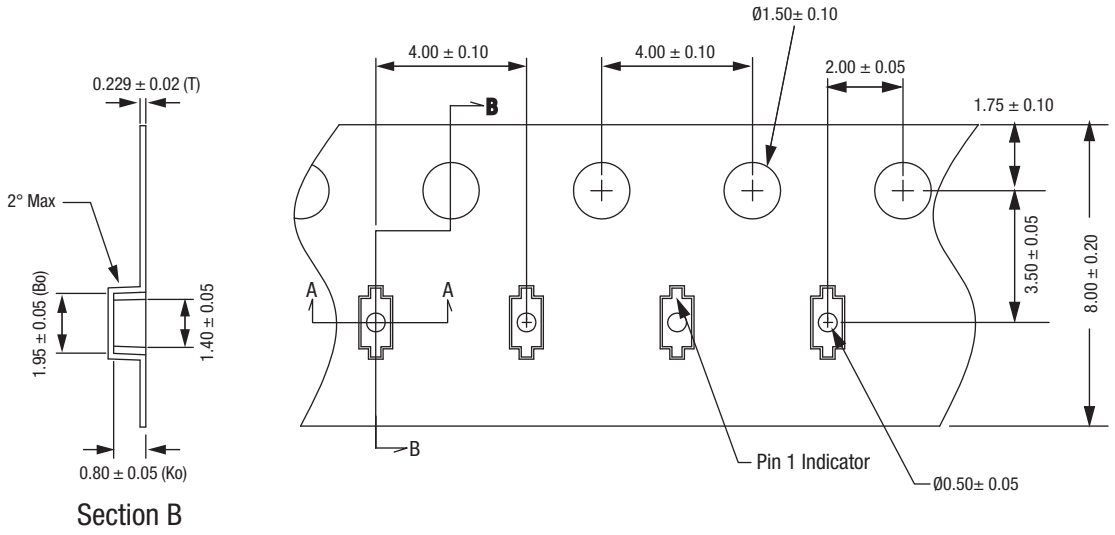
Figure 4. SC-79 Package Dimensions



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Notes:

1. *Carrier tape: black conductive polycarbonate or polystyrene.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.4 mm width.*
4. *ESD-surface resistivity is ≤1 x 10^8 Ohms/square per EIA, JEDEC TNR Specification.*
5. *All measurements are in millimeters.*

Figure 5. SC-79 Tape and Reel Dimensions

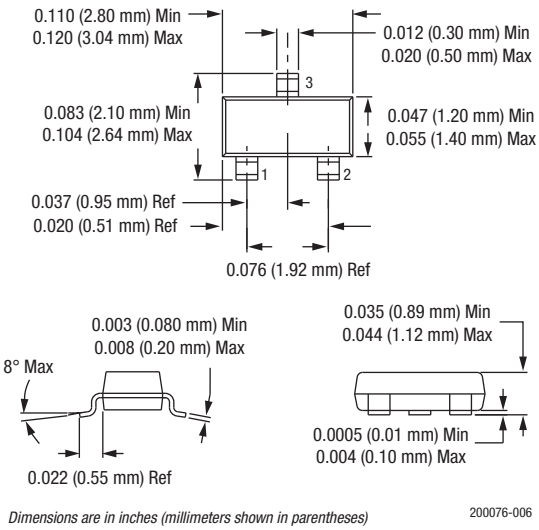
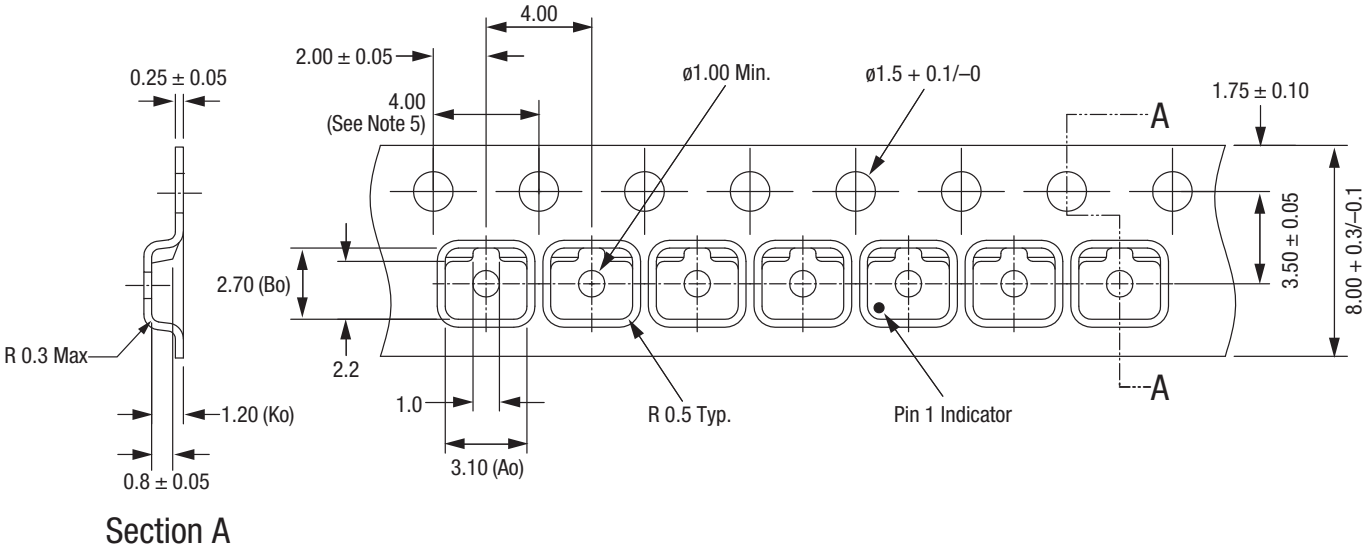


Figure 6. SOT-23 Package Dimensions



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

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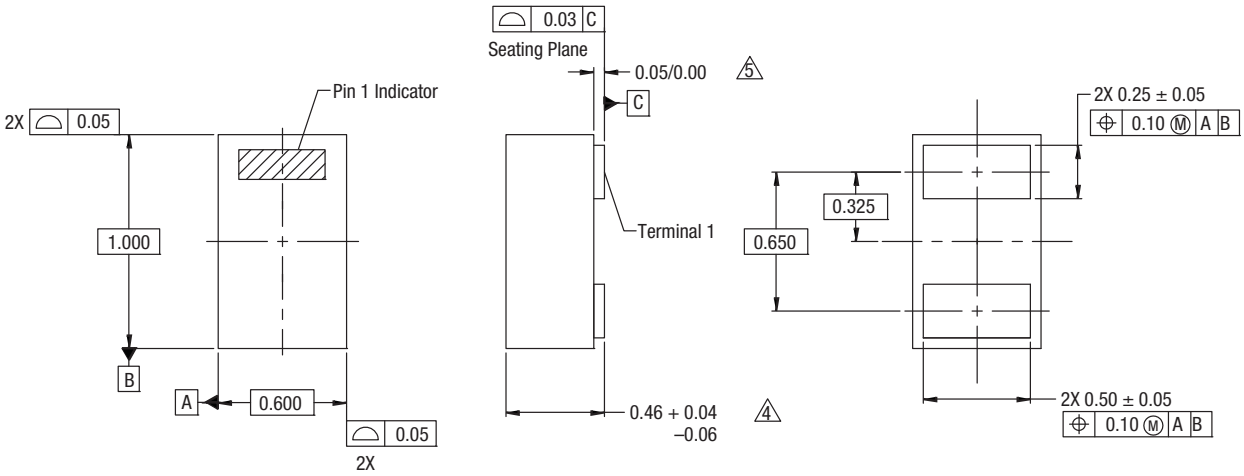
Figure 7. SOT-23 Tape and Reel Dimensions



Notes:

1. *All measurements are in millimeters.*
2. *Dimensions and tolerances according to ASME Y14.5M-1994.*
3. *These packages are used principally for discrete devices.*
4. *This dimension includes stand-off height and package body thickness, but does not include attached features, e.g., external heatsink or chip capacitors. An integral heatslug is not considered an attached feature.*
5. *This dimension is primarily terminal plating, but does not include small metal protrusion.*

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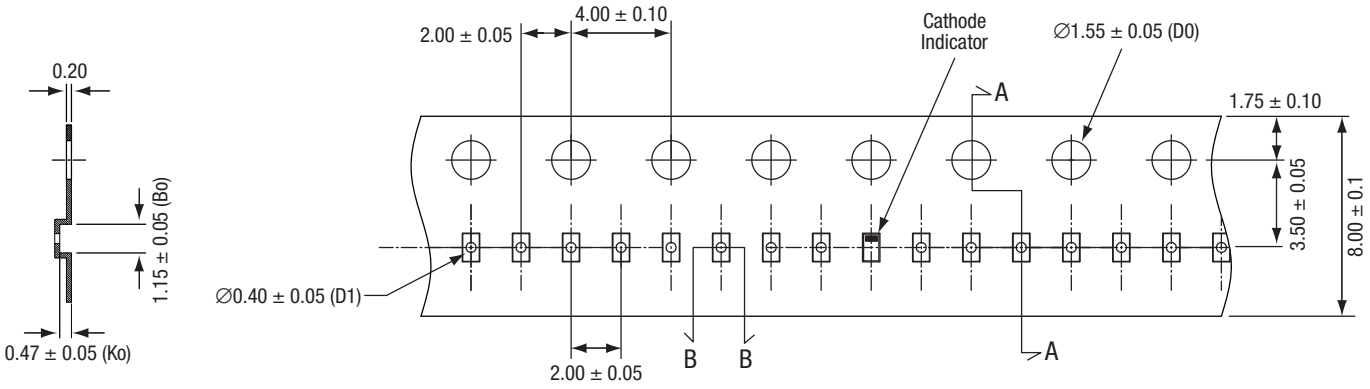
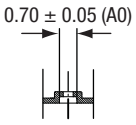
Figure 8. SOD-882 Package Dimensions



Section A



Section B

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.*

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Figure 9. SOD-882 Tape and Reel Dimensions