DATA SHEET

SMVA1253-079LF: Hyperabrupt Junction Tuning Varactor

Automotive Applications

- Low tuning voltage VCOs
- Infotainment
- Navigation
- Telematics
- Garage door openers
- Wireless control systems

Features

- AEC-Q101 qualified
- ISO/TS16949 certified facility
- High capacitance ratio: $C_{0.3V}/C_{4.7V}$ = 12 typical
- 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 SMVA1253-079LF silicon hyperabrupt junction varactor diode is designed for use in voltage controlled oscillators (VCOs) with a low tuning voltage operation and is ideal for in-vehicle infotainment applications. This varactor is characterized for capacitance and resistance over temperature.

Table 1 describes the SMVA1253-079LF package and marking.

Table 1. Packageand Marking


Single
SC-79 Green™
SMVA1253-079LF Marking: Cathode
L_S = 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.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMVA1253-079LF varactor are provided in Table 2. Electrical specifications are provided in Table 3. Typical capacitance values are listed in Table 4. Typical performance characteristics of the SMVA1253-079LF varactor are illustrated in Figures 1 and 2.

The SPICE model for the SMVA1253-079LF varactor is shown in Figure 3, and the associated model parameters are provided in Table 5.

Table 2. SMVA1253-079LF Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V_R		15	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 1A			500	V
Machine Model (MM), Class A			<50	V

Note 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.

***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. SMVA1253-079LF Electrical Specifications (Note 1)
(T_{OP} = 25 °C, Unless Otherwise Noted)

C_T @ 0.3 V (pF)		C_T @ 4.7 V (pF)		C_T @ 1 V (pF)	C_T @ 3 V (pF)	$\frac{C_T \text{ @ 0.3 V}}{C_T \text{ @ 4.7 V}}$ (Ratio)		$\frac{C_T \text{ @ 1 V}}{C_T \text{ @ 3 V}}$ (Ratio)	R_S @ 3 V, 500 MHz (Ω)	Q @ 3 V, 50 MHz
Min.	Typical	Typical	Max.	Typical	Typical	Min.	Typical	Typical	Max.	Typical
48.0	53	4.3	4.80	37.0	7.80	11.0	12.3	4.7	1.4	350

Note 1: Performance is guaranteed only under the conditions listed in this table.
Reverse voltage V_R (I_R = 10 µA) = 15 V minimum
Reverse current I_R (V_R = 12 V) = 20 nA maximum

Table 4. Capacitance vs Reverse Voltage

V_R (V)	C_T (pF)
0	69.32
0.5	50.23
1.0	37.07
1.5	27.57
2.0	19.37
2.5	12.39
3.0	7.77
3.5	5.77
4.0	4.86
4.5	4.34
5.0	4.01
5.5	3.78
6.0	3.62
6.5	3.50
7.0	3.41
7.5	3.34
8.0	3.28

Typical Performance Characteristics

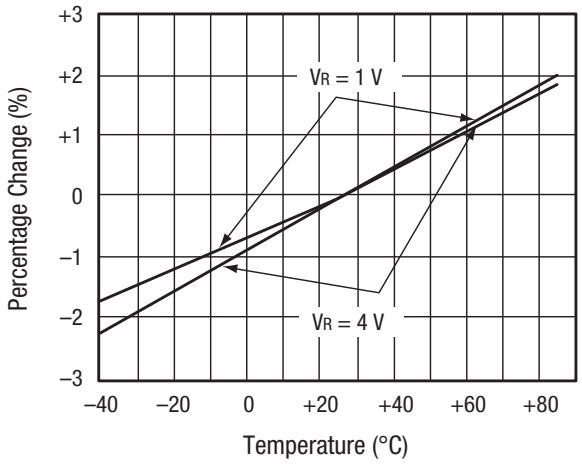


Figure 1. Relative Capacitance Change vs Temperature

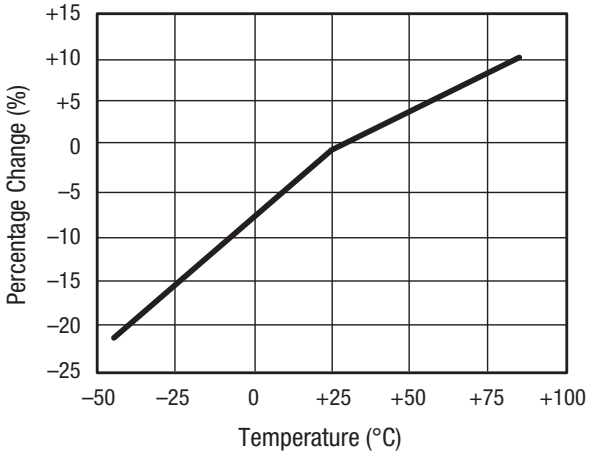


Figure 2. Relative Series Resistance Change vs Temperature @ 500 MHz

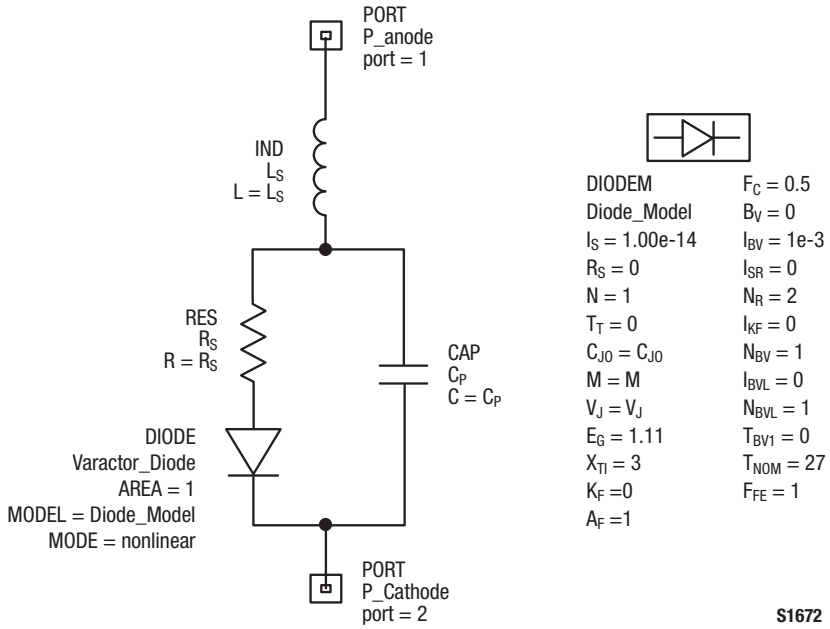


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

C_{J0} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)
68.30	100	71	2.00	1.1

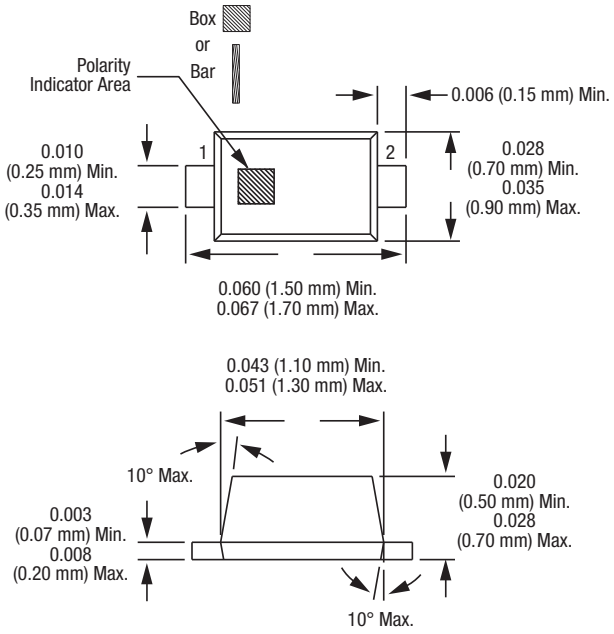
Package and Handling Information

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 SMVA1253-079LF 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.

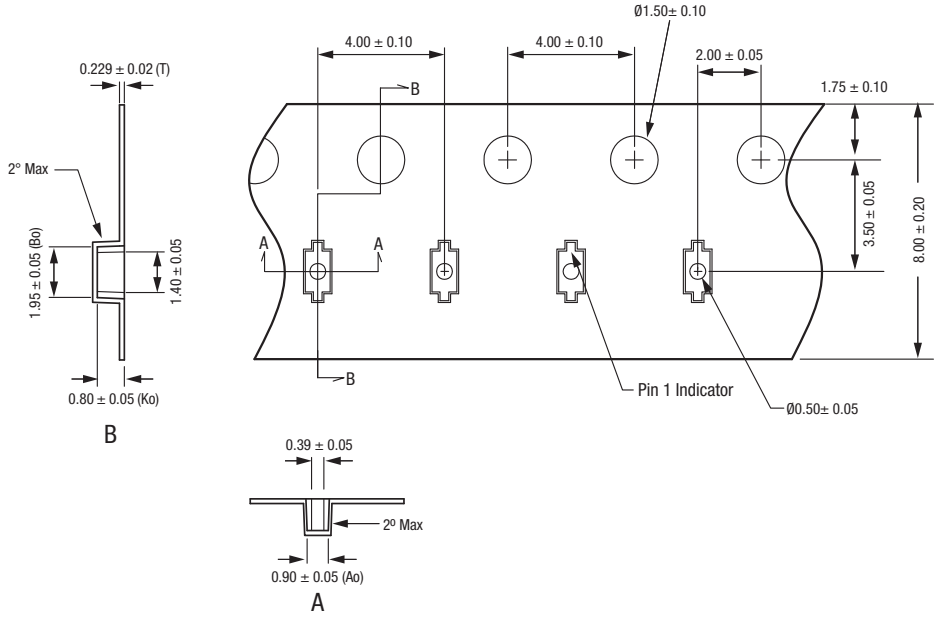
Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

Package dimensions are shown in Figure 4, and tape and reel dimensions are provided in Figure 5.



Dimensions are in inches (millimeters shown in parentheses) **S1652**

Figure 4. SC-79 Package Dimensions



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.*
4. *All measurements are in millimeters.*

S2929

Figure 5. SC-79 Tape and Reel Dimensions