

DATA SHEET

SMV2025-079LF: Surface Mount, Silicon Hyperabrupt Tuning Varactor Diode

Applications

- Wide bandwidth and low phase noise VCOs
- Wide range, voltage-tuned phase shifters and filters
- Miniature RF and microwave tuners



Features

- Low series resistance and leakage current for low phase noise VCOs
- High capacitance ratio: $C_T(2\text{ V})/C_T(10\text{ V}) = 2.2$ minimum
- Broad 18 V tuning range
- Competitive cross to Toshiba 1SV280 varactor diode
- Ultra-small SC-79 packages (MSL1, 260 °C per JEDEC J-STD-020)

NEW



Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant packaging.

Description

The SMV2025-079LF is a silicon surface mount, hyperabrupt tuning varactor diode excellent for use as a high-Q tuning element in an RF Voltage Controlled Oscillator (VCO), voltage-controlled phase shifter, or tunable bandpass filter.

The minimum capacitance ratio from 2 V to 10 V is 2.2, which makes the SMV2025-079LF suitable for wide bandwidth VCOs and wide phase range phase shifters.

The SMV2025-079LF is manufactured in an ultra-small, surface mount industry-standard SC-79 package that offers very low parasitic inductance and capacitance.

Table 1. SMV2025-079LF Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Maximum | Units |
|------------------------------|------------------|---------|---------|-------|
| Forward current | I _F | | 100 | mA |
| Reverse voltage | V _R | | 20 | V |
| Dissipated power @ 25 °C | P _D | | 250 | mW |
| Storage temperature | T _{STG} | -55 | +200 | °C |
| Junction temperature | T _J | -55 | +175 | °C |
| Solder interface temperature | T _S | -40 | +85 | °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 2. SMV2025-079LF Electrical Specifications (Note 1)
(T_s = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

| Parameter | Symbol | Test Condition | Min | Typical | Max | Units |
|-------------------|-----------------|--|------|---------|------|-------|
| Reverse current | I _R | V _R = 19 V | | | 20 | nA |
| Capacitance | C _T | f = 1 MHz | | | | |
| | | V _R = 2 V | 4.20 | | 5.10 | pF |
| | | V _R = 10 V | 1.60 | | 2.00 | pF |
| | | V _R = 18 V | 1.00 | | 1.25 | pF |
| Capacitance ratio | C _{TR} | C _T @ 2 V/C _T @ 10 V | 2.2 | | | - |
| Series resistance | R _S | f = 470 MHz, V _R = 1 V | | 0.8 | | Ω |
| Breakdown voltage | V _{BR} | I _R = 10 μA | 20 | | | V |

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

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV2025-079LF are provided in Table 1. Electrical specifications are provided in Table 2. Table 3 summarizes the typical capacitance for reverse voltages between 0 and 20 V.

Typical performance characteristics of the SMV2025-079LF are illustrated in Figures 1 and 2.

The SPICE model for the SMV2025-079LF varactor diode is shown in Figure 3 and the associated model parameters are provided in Table 4.

Package Dimensions

Package dimensions for the SMV2025-079LF are provided in Figure 4. Tape and reel dimensions are provided in Figure 5. For the PCB layout footprint, refer to the Skyworks Application Note, *Suggested PCB Land Pattern Designs for Leaded and Leadless Packages, and Detailed Surface Mount Guidelines for Leadless Packages*, document number 200123.

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 SMV2025-079LF 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.

Table 3. Reverse Voltage vs Typical Capacitance

| V _R (V) | C _T (pF) |
|--------------------|---------------------|
| 0 | 8.81 |
| 0.5 | 6.93 |
| 1.0 | 5.88 |
| 1.5 | 5.18 |
| 2.0 | 4.67 |
| 2.5 | 4.27 |
| 3.0 | 3.94 |
| 3.5 | 3.67 |
| 4.0 | 3.44 |
| 4.5 | 3.23 |
| 5.0 | 3.05 |
| 6.0 | 2.74 |
| 7.0 | 2.47 |
| 8.0 | 2.24 |
| 9.0 | 2.03 |
| 10.0 | 1.83 |
| 11.0 | 1.65 |
| 12.0 | 1.50 |
| 13.0 | 1.38 |
| 14.0 | 1.30 |
| 15.0 | 1.24 |
| 16.0 | 1.21 |
| 17.0 | 1.19 |
| 18.0 | 1.17 |
| 19.0 | 1.16 |
| 20.0 | 1.15 |

Typical Performance Characteristics

(TA = 25 °C, Unless Otherwise Noted)

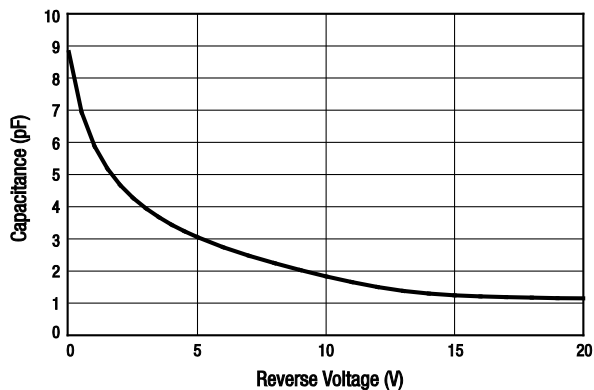


Figure 1. Capacitance vs Reverse Voltage

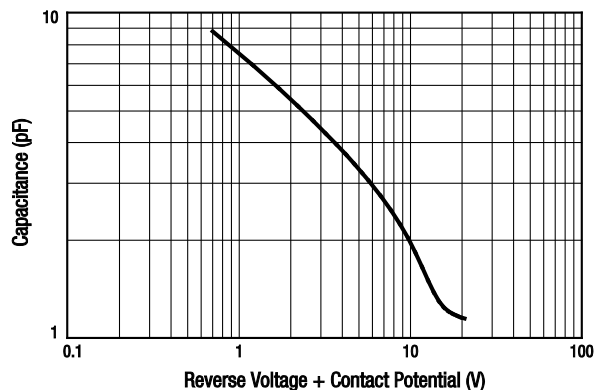


Figure 2. Capacitance vs Reverse Voltage (Logarithmic Plot)

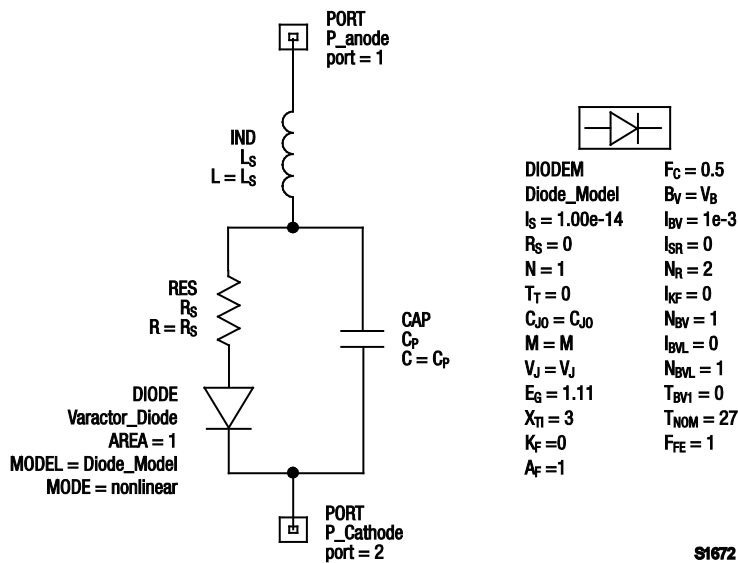
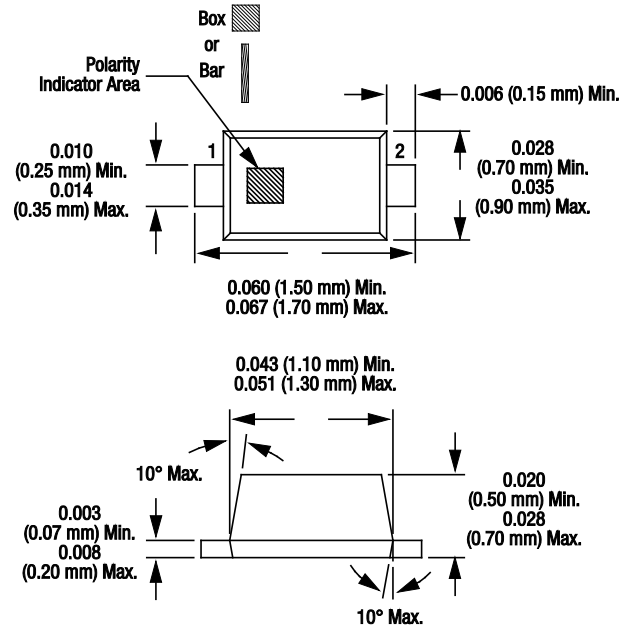


Figure 3. SPICE Model

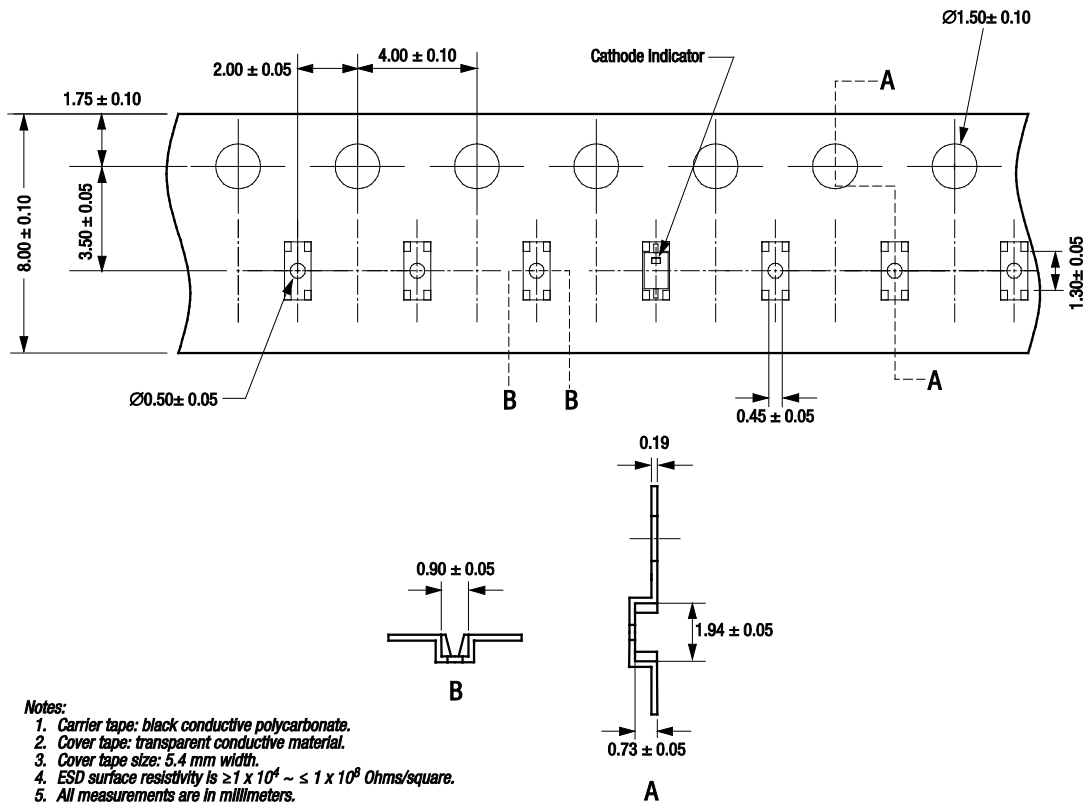
Table 4. SPICE Model Parameters

| Part Number | CJ0 (pF) | VJ (V) | M | CP (pF) | RS (Ω) | LS (nH) |
|---------------|----------|--------|-----|---------|--------|---------|
| SMV2025-079LF | 8.8 | 1.05 | 0.7 | 0.07 | 0.8 | 0.7 |



Dimensions are in inches (millimeters shown in parentheses) S1052

Figure 4. SMV2025-079LF 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. SMV2025-079LF Tape and Reel Dimensions

Ordering Information

| Model Name | Manufacturing Part Number |
|---|---------------------------|
| SMV2025-079LF Surface Mount Hyperabrupt Tuning Varactor Diode | SMV2025-079LF |

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