

DATA SHEET

SMV1770-040LF: 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 SOD-882 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 SMV1770-040LF 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 SMV1770-040LF.

Table 1. Packaging and Marking

| |
|---|
|  |
| Single |
| SOD-882 Green™ |
| SMV1770-040LF Marking: ED1 |
| 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.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMV1770-040LF 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 SMV1770-040LF are illustrated in Figures 1 and 2.

The SPICE model for the SMV1770-040LF 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.

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 SMV1770-040LF 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 2. SMV1770-040LF Absolute Maximum Ratings (Note 1)

| 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 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. SMV1770-040LF Electrical Specifications (Note 1)
(T_{OP} = 25 °C, Unless Otherwise Noted)

| Parameter | Symbol | Test Condition | Min | Typical | Max | Units |
|-------------------|-----------------|---|------|---------|------|-------|
| Reverse current | I _R | V _R = 8 V | | | 20 | nA |
| Capacitance | C _T | f = 1 MHz : | | | | |
| | | V _R = 0.5 V | 22.1 | 23.6 | 25.1 | pF |
| | | V _R = 2.5 V | 7.7 | 8.6 | 9.8 | pF |
| Capacitance ratio | C _{TR} | C _T @ 0.5 V/C _T @ 2.5 V | 2.3 | 2.7 | | - |
| Series resistance | R _S | f = 900 MHz, V _R = 1 V | | 0.4 | 0.5 | Ω |
| Breakdown voltage | V _{BR} | I _R = 10 μA | 12 | | | V |

Note 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 | 31.2 |
| 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

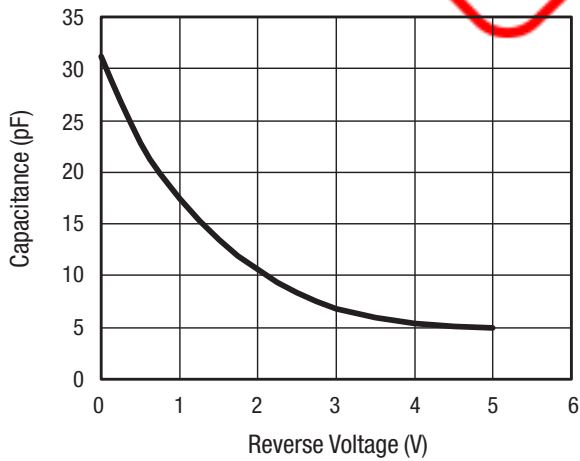


Figure 1. Capacitance vs Voltage

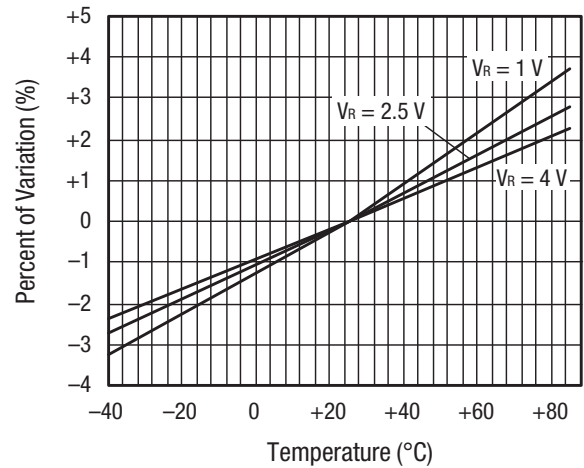


Figure 2. Relative Capacitance Change vs Temperature

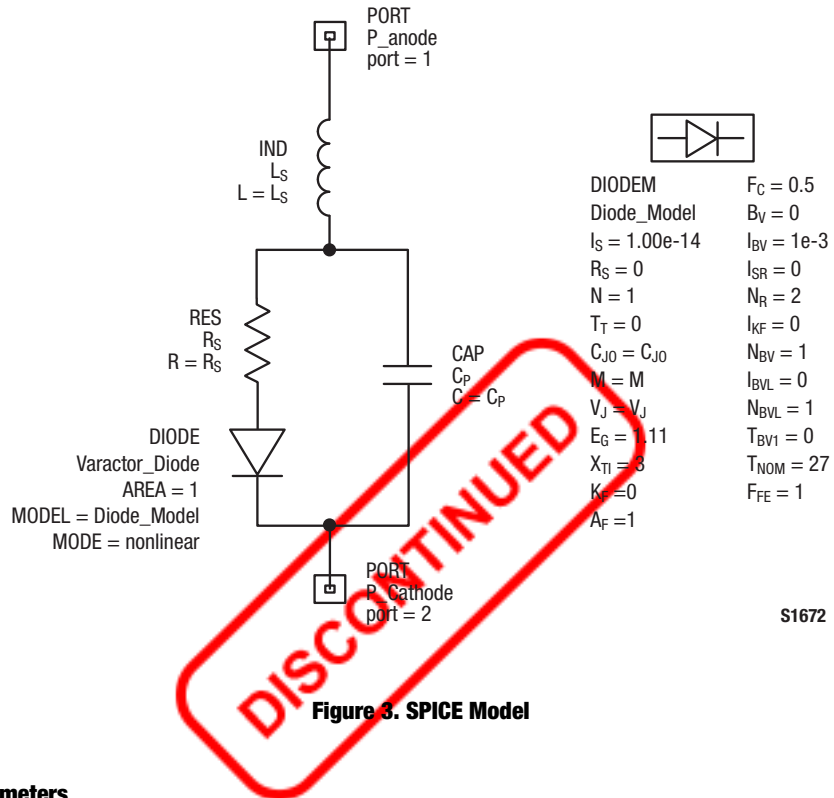
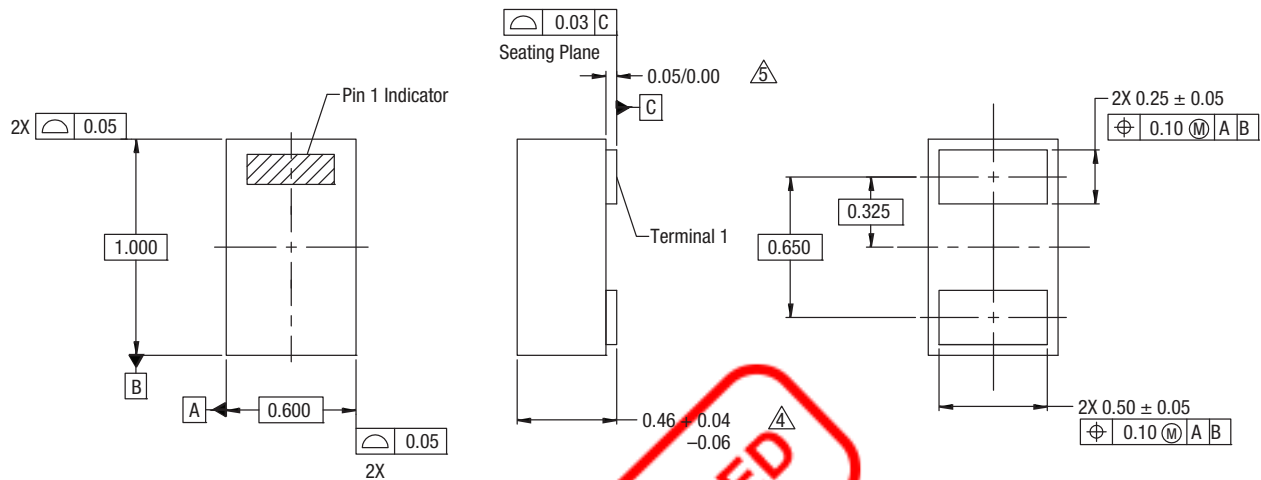


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

| Part Number | CJO (pF) | VJ (V) | M | Cp (pF) | Rs (Ω) | Ls (nH) |
|---------------|----------|--------|----|---------|--------|---------|
| SMV1770-040LF | 33.07 | 43.4 | 30 | 3.54 | 0.4 | 0.45 |

Note: Values extracted from measured performance.

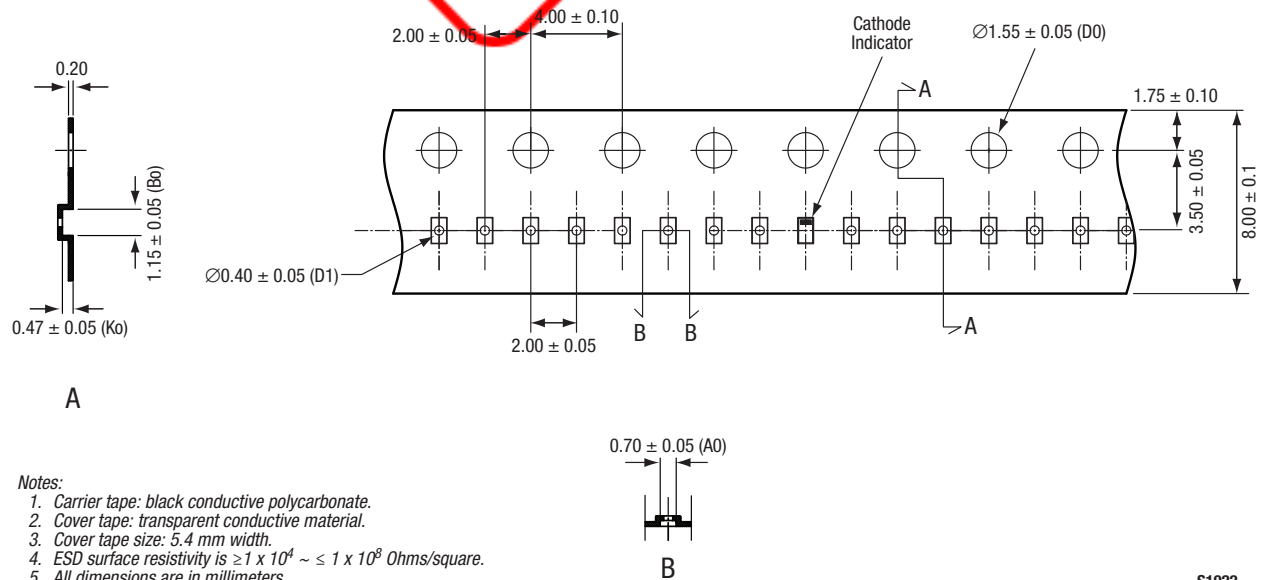


NOTES:

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.

Y1410

Figure 4. SOD-882 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 dimensions are in millimeters.

S1922

Figure 5. SOD-882 Tape and Reel Dimensions



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