

DATA SHEET

SMVA1705-004LF: Hyperabrupt Junction Tuning Varactor

Automotive Applications

- Infotainment
- Navigation
- Telematics
- Garage door openers
- Wireless control systems

Features

- AEC-Q101 qualified
- Low series resistance
- High capacitance ratio
- SOT-23 package (MSL1, 260 °C per JEDEC J-STD-020)



Description


The SMVA1705-004LF silicon hyperabrupt junction varactor diode is specifically designed for in-vehicle infotainment applications.

Table 1 describes the SMVA1705-004LF package and marking.



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.

Table 1. Packaging and Marking

| |
|---|
|  |
| Common Cathode |
| SOT-23 |
| SMVA1705-004LF Green™ Marking: HY3 |
| L _s = 1.4 nH |



The Pb-free symbol or "LF" in the part number denotes a lead-free, RoHS-compliant package unless otherwise noted as Green™.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SMVA1705-004LF 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 SMVA1705-004LF varactor are illustrated in Figures 1 and 2.

The SPICE model for the SMVA1705-004LF varactor is shown in Figure 3, and the associated model parameters are provided in Table 5.

Table 2. SMVA1705-004LF Absolute Maximum Ratings¹

| 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 A | | | 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. SMVA1705-004LF Electrical Specifications¹
(T_{OP} = 25 °C, Unless Otherwise Noted)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Units |
|-------------------|-----------------|---|-------------|-------------|-------------|----------|
| Reverse current | I _R | V _R = 8 V | | <0.01 | 20 | nA |
| Capacitance | C _T | F = 1 MHz V _R = 1 V V _R = 4 V | 17.3 5.3 | 18.3 6.1 | 19.3 6.6 | pF 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

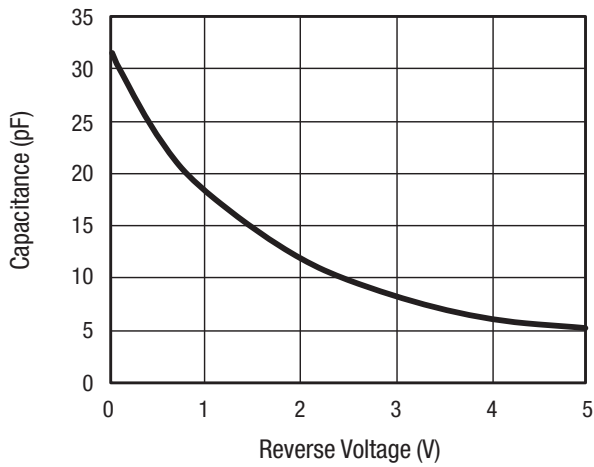


Figure 1. Capacitance vs Reverse Voltage

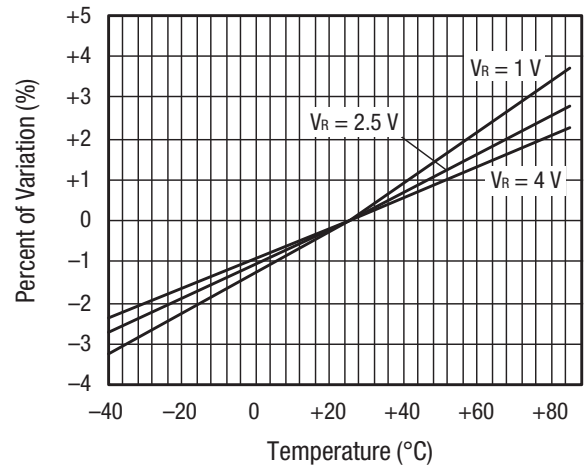


Figure 2. Relative Capacitance Change vs Temperature

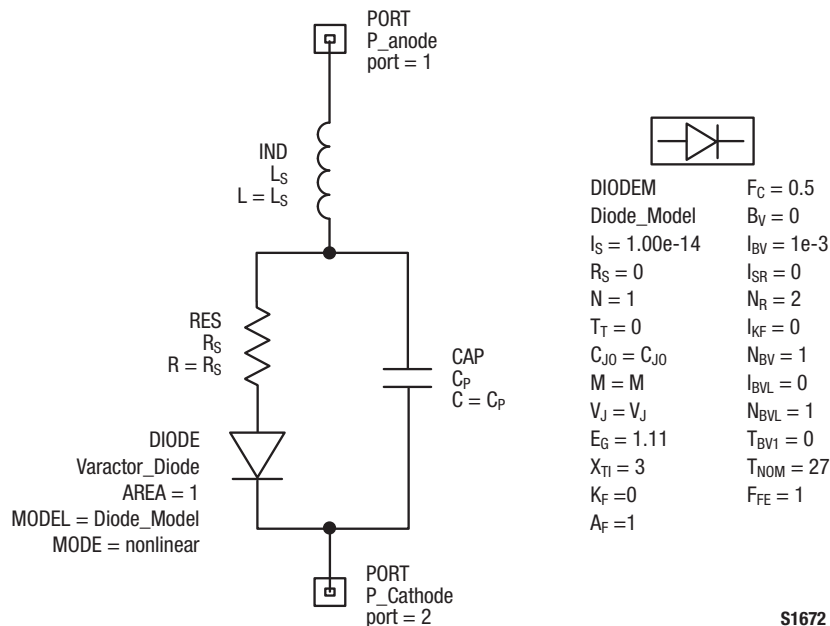


Figure 3. SPICE Model

Table 5. SPICE Model Parameters

| Cj0 (pF) | Vj (V) | M | Cp (pF) | Rs (Ω) | Ls (nH) |
|-------------|-----------|---|------------|-----------|------------|
| 31 | 3 | 2 | 0.5 | 0.32 | 0.8 |

Package Dimensions

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 SMVA1705-004LF 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.

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