

DATA SHEET

# SMV1702: Hyperabrupt Junction Tuning Varactors

## Features

- Designed for high-volume, low-cost battery applications
- Low series resistance
- High capacitance ratio
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020
- SOD-323 package
- Available in tape and reel packaging



## Description

The SMV1702 devices are silicon hyperabrupt junction varactor diodes specifically designed for battery operation. The specified high capacitance ratio and low  $R_S$  of these varactors make them appropriate for low noise VCOs used at frequencies in wireless systems. Applications include low-noise and wideband UHF and VHF VCOs.

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



## Absolute Maximum Ratings


Characteristic	Value
Forward current ( $I_F$ )	20 mA
Power dissipation ( $P_D$ )	250 mW
Storage temperature ( $T_{ST}$ )	-55 °C to +150 °C
Operating temperature ( $T_{OP}$ )	-55 °C to +125 °C
ESD human body model	Class 0


Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

**CAUTION:** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) 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 must be employed at all times.

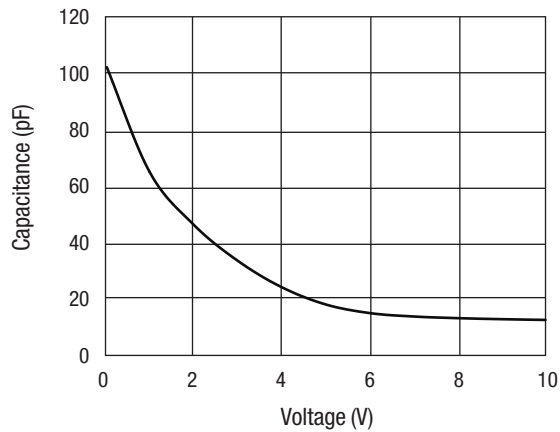
**Electrical Specifications at 25 °C**

Parameter	Condition	Min.	Typ.	Max.	Unit
Reverse Current ( $I_R$ )	$V_R = 8\text{ V}$		< 0.01	20	nA
Capacitance ( $C_T$ )	$V_R = 0.1\text{ V}, F = 1\text{ MHz}$	90	100	110	pF
Capacitance ( $C_T$ )	$V_R = 2\text{ V}, F = 1\text{ MHz}$	41	46	50	pF
Capacitance ( $C_T$ )	$V_R = 4\text{ V}, F = 1\text{ MHz}$	22	25	29	pF
Capacitance Ratio ( $C_{TR}$ )	$C_T(0.1\text{ V})/C_T(4\text{ V})$	3.6	4		
Series Resistance ( $R_S$ )	$V_R = 5\text{ V}, F = 470\text{ MHz}$		0.45	1.25	$\Omega$
Breakdown Voltage ( $V_{BR}$ )	$I_R = 10\ \mu\text{A}$	10			V


Single
SOD-323
<b>SMV1702-011</b>
Marking: CJ
<b>SMV1702-011LF</b>
Marking: HJ
$L_S = 1.5\text{ nH}$

 LF denotes lead (Pb)-free, RoHS-compliant packaging option as an alternative to our standard tin/lead (Sn/Pb) packaging.

**Typical Performance Data**



**Capacitance vs. Voltage**

**Capacitance vs. Voltage**

$V_R$ (V)	$C_T$ (pF)
0	103.3
1	65.1
2	46.38
3	33.57
4	24.2
5	18.08
6	15.01
7	13.8
8	13.21
9	12.84
10	12.58

**Recommended Solder Reflow Profiles**

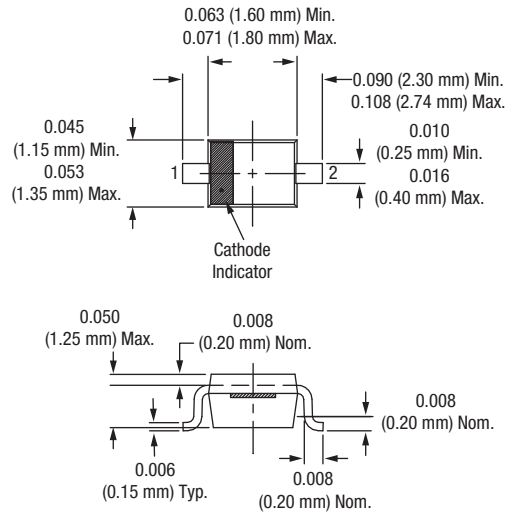
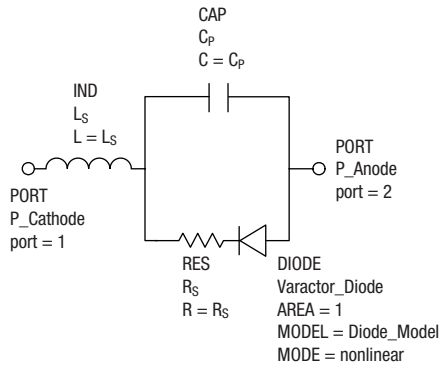
Refer to the [“Recommended Solder Reflow Profile”](#) Application Note.

**Tape and Reel Information**

Refer to the [“Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation”](#) Application Note.

**SPICE Model**

**SOD-323**



**SPICE Model Parameters**

Parameter	Description	Unit	Value	Default
IS	Saturation current (with N, determine the DC characteristics of the diode)	A		1e-14
R <sub>S</sub>	Series resistance		0.5	0
N	Emission coefficient (with IS, determines the DC characteristics of the diode)	-		1
TT	Transit time	s		0
C <sub>J0</sub>	Zero-bias junction capacitance (with V <sub>J</sub> and M define nonlinear junction capacitance of the diode)	F	120e-12	0
V <sub>J</sub>	Junction potential (with V <sub>J</sub> and M define nonlinear junction capacitance of the diode)	V	0.89	1
M	Grading coefficient (with V <sub>J</sub> and M define nonlinear junction capacitance of the diode)	-	0.925	0.5
E <sub>G</sub>	Energy gap (with XTI, helps define the dependence of IS on temperature)	eV		1.11
XTI	Saturation current temperature exponent (with E <sub>G</sub> , helps define the dependence of IS on temperature)	-		3
KF	Flicker noise coefficient	-		0
AF	Flicker noise exponent	-		1
FC	Forward-bias depletion capacitance coefficient	-		0.5
B <sub>V</sub>	Reverse breakdown voltage	V	18	
I <sub>BV</sub>	Current at reverse breakdown voltage	A	1e-5	1e-3
ISR	Recombination current parameter	A		0
NR	Emission coefficient for ISR	-		2
IKF	High-injection knee current	A		
NBV	Reverse breakdown ideality factor	-		1
IBVL	Low-level reverse breakdown knee current	A		0
NBVL	Low-level reverse breakdown ideality factor	-		1
TNOM	Nominal ambient temperature at which these model parameters were derived	°C		27
FFE	Flicker noise frequency exponent	-		1
Cpkg		pF	0.12	
LS		nH	1.5	

The table contains typical SPICE parameters for SMV1720-011. The default value should be used for any parameter for which the "value" column is blank.

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