SKYWORKS™

DATA SHEET

SMV1702 Series: Hyperabrupt Junction Tuning Varactor

Features

- Designed for high volume, low cost battery applications
- Low series resistance
- High capacitance ratio
- Available lead (Pb)-free MSL-1 @ 240°C per JEDEC J-STD-020
- SOD-323 package
- Available in tape and reel packaging

Description

The SMV1702 series 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 Lead (Pb)-Free "environmentally friendly" packaging available: Skyworks offers the SMV1702-011LF lead (Pb)-free package that is RoHS compliant (European Parliament for the Restriction of Hazardous Substances).

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

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.

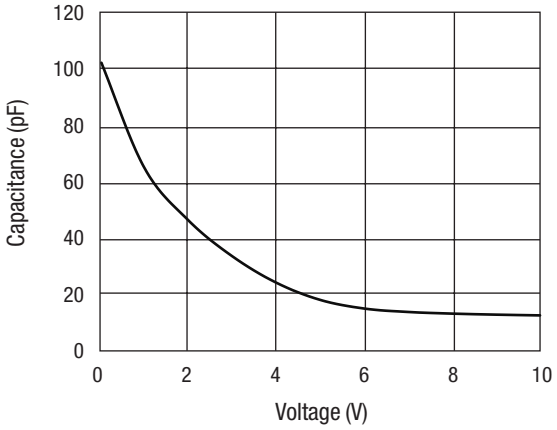
Single
Marking: CJ
SOD-323
SMV1702-011
SMV1702-011LF
L_S = 1.5 nH

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

Electrical Specifications at 25°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Reverse Current (I_R)	V_R = 8 V		< 0.01	20.00	nA
Capacitance (C_T)	V_R = 0.1 V, F = 1 MHz	90.0	100.00	110.00	pF
Capacitance (C_T)	V_R = 2.0 V, F = 1 MHz	41.0	46.00	50.00	pF
Capacitance (C_T)	V_R = 4.0 V, F = 1 MHz	22.0	25.00	29.00	pF
Capacitance Ratio (C_{TR})	C_T (0.1 V)/C_T (4 V)	3.6	4.00		
Series Resistance (R_S)	V_R = 5 V, F = 470 MHz		0.45	1.25	Ω
Breakdown Voltage (V_{BR})	I_R = 10 µA	10.0			V

Typical Performance Data

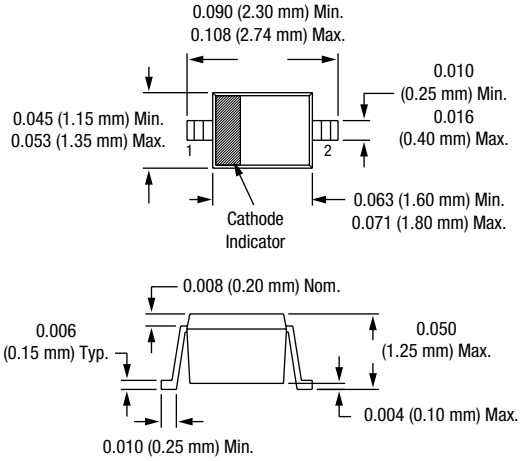


Capacitance vs. Voltage

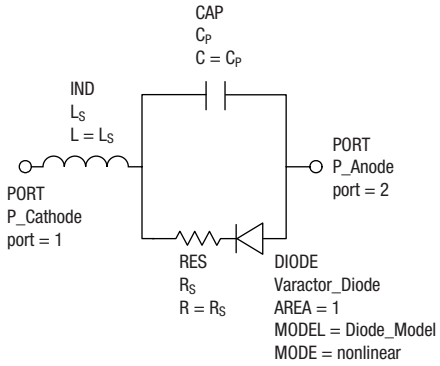
Capacitance vs. Voltage

V_R (V)	C_T (pF)
0	103.30
1	65.10
2	46.38
3	33.57
4	24.20
5	18.08
6	15.01
7	13.80
8	13.21
9	12.84
10	12.58

SOD-323



SPICE Model



SPICE Model Parameters

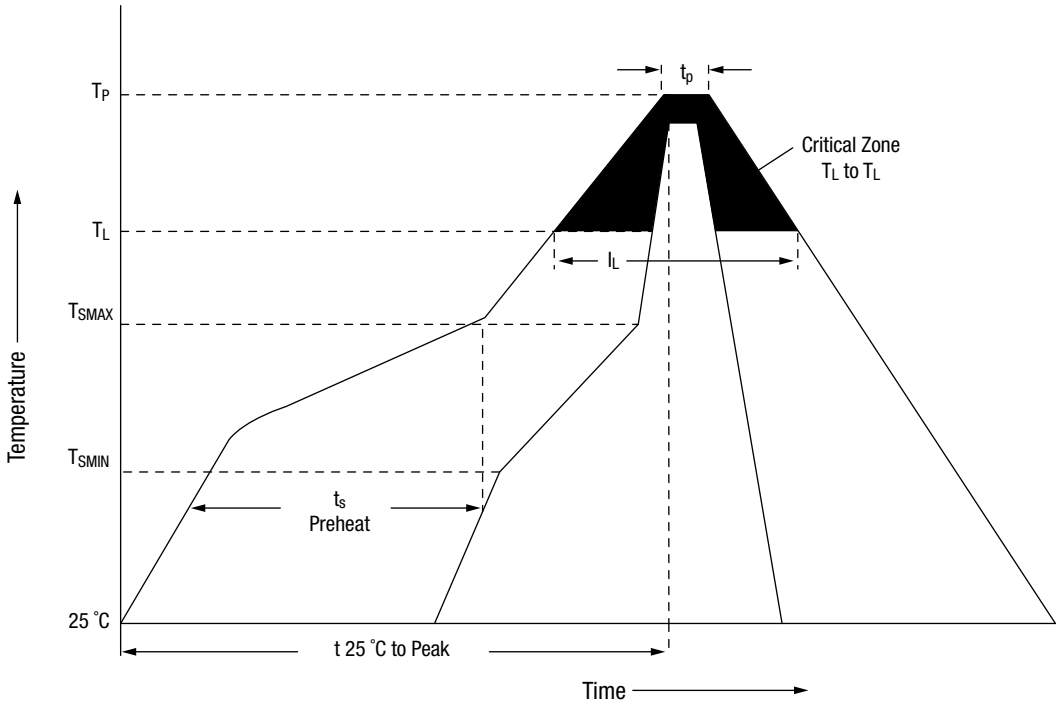
Parameter	Description	Unit	Value	Default
IS	Saturation current (with N, determine the DC characteristics of the diode)	A		1e-14
R_S	Series resistance		0.50	0
N	Emission coefficient (with IS, determines the DC characteristics of the diode)	-		1
TT	Transit time	s		0
C_{JO}	Zero-bias junction capacitance (with V_J and M define nonlinear junction capacitance of the diode)	F	120e-12	0
V_J	Junction potential (with V_J and M define nonlinear junction capacitance of the diode)	V	0.890	1
M	Grading coefficient (with V_J and M define nonlinear junction capacitance of the diode)	-	0.925	0.5
E_G	Energy gap (with XTI, helps define the dependence of IS on temperature)	eV		1.11
XTI	Saturation current temperature exponent (with E_G, 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_V	Reverse breakdown voltage	V	18	
I_{BV}	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	1.50	

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.

Recommended Solder Reflow Profiles

Profile Feature	SnPb Eutectic Assembly	Lead (Pb)-Free Assembly 100% Sn
Average ramp-up rate (T_L to T_P)	3 °C/second max.	3 °C/second max.
Preheat Temperature min. (T_{SMIN}) Temperature max. (T_{SMAX}) Time (min. to max.) (ts)	 100 °C 150 °C 60–120 seconds	 150 °C 200 °C 60–80 seconds
T_{SMAX} to T_L Ramp-up rate	 —	 3 °C/second max.
Time maintained above: Temperature (T_L) Time (t_L)	 183 °C 60–150 seconds	 217 °C 60–150 seconds
Peak temperature (T_P)	240 +0/-5 °C	250 +0/-5 °C
Time within 5 °C of actual peak temperature (tp)	10–30 seconds	20–40 seconds
Ramp-down rate	6 °C/second max.	6 °C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to the topside of the package, measured on the package body surface.
Reference JEDEC J-STD-020B.



Reference JEDEC J-STD-020