SKYWORKS®

DATA SHEET

SMV2022–SMV2023: Hyperabrupt Junction Tuning Varactors

Features

- Low series resistance
- High capacitance ratio at low reverse voltage
- Designed for high volume, low cost battery applications
- Available in tape and reel packaging



Description

The SMV2022 and SMV2023 devices are silicon hyperabrupt junction varactor diodes. The specified high capacitance ratio and low RS of these varactors make them attractive for low phase noise VCOs in wireless systems.

Absolute Maximum Ratings

Characteristic	Value
Reverse voltage (V_R)	22 V
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, 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 must be employed at all times.*

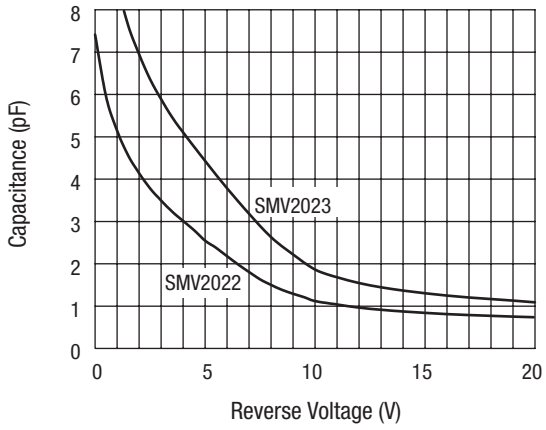
Electrical Specifications at 25 °C

Part Number	C_T @ 4 V (pF)		C_T @ 20 V (pF)		$\frac{C_T \text{ @ 4 V}}{C_T \text{ @ 20 V}}$ (Ratio)	Q @ 4 V
	Min.	Max.	Min.	Max.	Min.	50 MHz
SMV2022	2.5	3.3	0.6	0.85	3.0	500
SMV2023	4.4	5.4	0.9	1.20	4.2	500

Reverse current I_R (V_R = 16 nA): 50 nA.
Performance is guaranteed only under the conditions listed in the Electrical Specifications table.

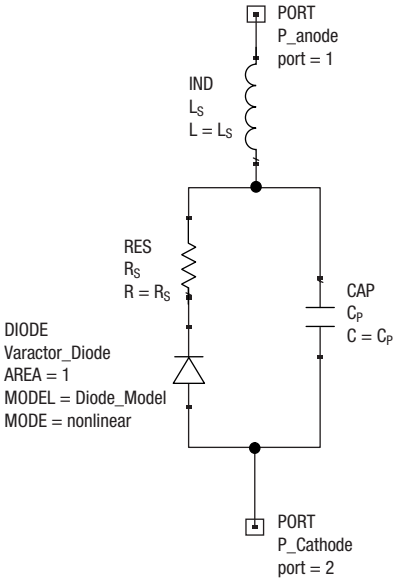
		
Single	Common Cathode	Single
SOT-23	SOT-23	SOD-323
SMV2022-001 Marking: VJ1	**SMV2022-004** Marking: VJ3	
SMV2023-001 Marking: VK1	**SMV2023-004** Marking: VK3	**SMV2023-011** Marking: VK
L_S = 1.5 nH	L_S = 1.5 nH	L_S = 1.5 nH

Typical Performance Data



Capacitance vs. Voltage

SPICE Model

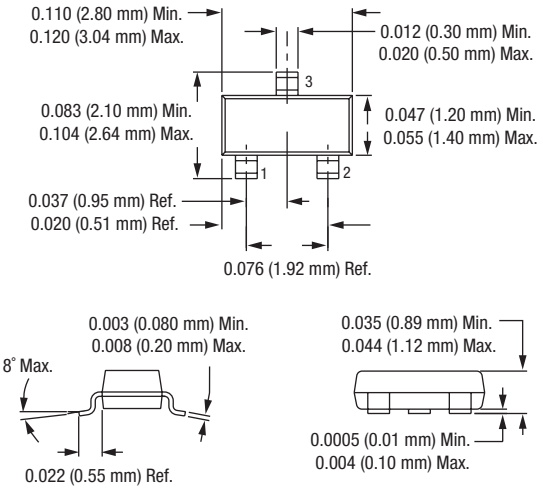




DIODEM
Diode_Model
I_S = 1.00e-14
R_S = 0
N = 1
T_T = 0
C_{J0} = C_{J0}
M = M
V_J = V_J
E_G = 1.11
X_{TI} = 3
K_F =0
A_F =1
F_C = 0.5
B_V = 0
I_{BV} = 1e-3
I_{SR} = 0
N_R = 2
I_{KF} = 0
N_{BV} = 1
I_{BVL} = 0
N_{BVL} = 1
T_{BV1} = 0
T_{NOM} = 27
F_{FE} = 1

Part Number	C_{J0} (pF)	V_J (V)	M	C_P (pF)	R_S (Ω)	L_S (nH)
SMV2022	7.30	4.0	1.4	0	2.2	1.5
SMV2023	12.23	4.0	1.4	0	1.6	1.5

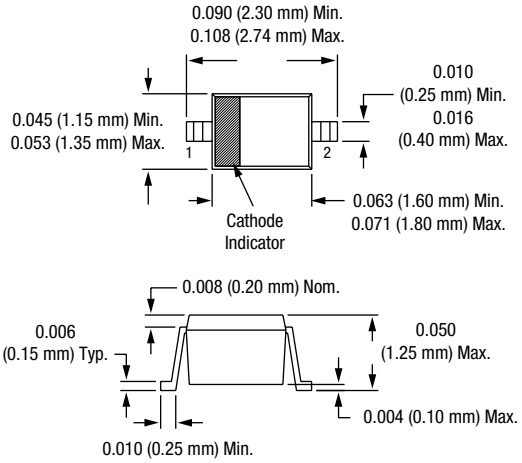
SOT-23



Capacitance vs. Voltage

V_R (V)	SMV2022 C_T (pF)	SMV2023 C_T (pF)
0.0	7.41	12.33
0.5	5.94	9.90
1.0	5.14	8.60
1.5	4.56	7.62
2.0	4.14	6.94
2.5	3.78	6.34
3.0	3.49	5.88
3.5	3.23	5.45
4.0	3.01	5.09
5.0	2.54	4.42
6.0	2.18	3.77
7.0	1.8	3.18
8.0	1.5	2.63
9.0	1.29	2.21
10.0	1.11	1.86
11.0	1.03	1.68
12.0	0.96	1.54
13.0	0.91	1.44
14.0	0.87	1.37
15.0	0.83	1.30
16.0	0.81	1.25
17.0	0.78	1.20
18.0	0.76	1.16
19.0	0.75	1.13
20.0	0.73	1.09

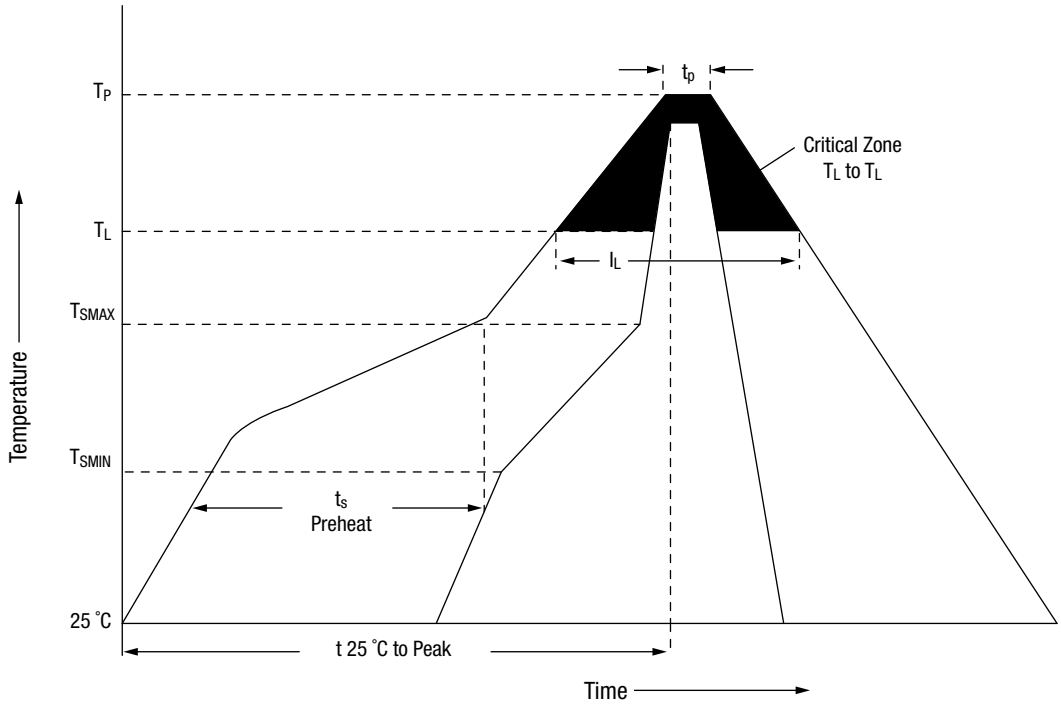
SOD-323



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-020C.



Reference JEDEC J-STD-020

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