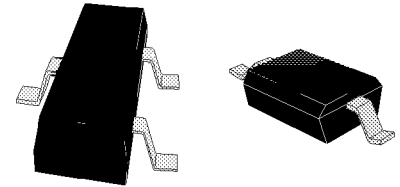


## Features

- Industry Standard Outlines: SOD-323 and SOT-23 Packages
- High “Q” Abrupt and Hyperabrupt Junction Designs
- Single, Common Anode and Common Cathode Configurations
- Available for 3 Volt Battery Operated Circuits
- Priced for High Volume Commercial Applications
- Available in Tape and Reel
- Also Available as Chips



## Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

Forward Current:	100 mA
Power Dissipation:	250 mW
Junction Temperature:	125°C
Storage Temperature:	-55 to 150°C
Operating Temperature:	-55 to 125°C

## Description

The surface mount plastic varactor diodes are designed for RF and Microwave applications in VCOs, electronically tunable filters and matching networks. Package offerings include the SOT-23 and the small footprint SOD-323 package. Alpha offers a comprehensive capability in capacitance values, package options and voltage ratings all aggressively priced for high volume commercial applications.

The SMV1247-001 to SMV1255-001 varactors were specifically designed for battery operated applications where 3 to 5 volts is available. These varactors have capacitance ratios of greater than 12 from 0.3 to 4.7 volts.

Alpha’s hyperabrupt varactors are available in a wide variety of tightly specified capacitance values and

high capacitance ratios. They are available as single junctions and common cathode configurations where they may be employed in a back-to-back orientation to reduce distortion.







Alpha’s abrupt junction varactors are noted for extremely high Q factor and are the preferred choice in applications that require low phase noise and high temperature stability.

The inductance of the SOT-23 package is typically 1.5 nH for each junction. Employing a common cathode SOT-23 with the varactor junctions connected in parallel reduces the inductance to approximately 0.9 nH. The inductance of a varactor in the SOD-323 package is approximately 1.5 nH.

## Electrical Characteristics (T<sub>A</sub> = 25°C)







### High Ratio Hyperabrupt Junction Varactors for Battery Operated Applications

Breakdown Voltage, V<sub>B</sub> (10 μA): 15V Min.  
 Reverse Current, I<sub>R</sub> (12V): 50 nA Max.

C <sub>T</sub> @ 0.3V (pF)		C <sub>T</sub> @ 4.7V (pF)		C <sub>T</sub> @ 0.3V / C <sub>T</sub> @ 4.7V (Ratio)		R <sub>S</sub> @ 3V 200 MHz (Ω)						
Min.	Typ.	Max.	Typ.	Min.	Typ.	Max.	SOD-323	SOT-23				SOT-143
Min.	Typ.	Max.	Typ.	Min.	Typ.	Max.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
6.5	7.0	.78	.7	9.5	10.0	2.0	SMV1247-011	SMV1247-001		SMV1247-004		
15	17	1.7	1.5	10.8	16.5	1.8	SMV1248-011	SMV1248-001		SMV1248-004		
28	31	2.8	2.6	11.0	12.1	1.5	SMV1249-011	SMV1249-001	SMV1249-003	SMV1249-004		
33	36	3.3	3.0	11.0	12.2	1.5	SMV1250-011	SMV1250-001		SMV1250-004		
38	42	3.8	3.4	11.0	12.2	1.3	SMV1251-011	SMV1251-001		SMV1251-004		
48	53	4.8	4.3	11.0	12.3	1.2	SMV1253-011	SMV1253-001		SMV1253-004		
58	64	5.8	5.2	11.0	12.3	1.0	SMV1255-011	SMV1255-001	SMV1255-003	SMV1255-004		







### 12 Volt Hyperabrupt Junction Varactors

Reverse Breakdown Voltage, V<sub>B</sub> (10 μA): 12V Min.  
 Reverse Current, I<sub>R</sub> (8V): 50 nA Max.

C <sub>T</sub> @ 1V (pF)		C <sub>T</sub> @ 2.5V (pF)		C <sub>T</sub> @ 4V (pF)		Q @ 4V 50 MHz						
Min.	Typ.	Min.	Max.	Typ.	Max.	Min.	SOD-323	SOT-23				SOT-143
Min.	Typ.	Min.	Max.	Typ.	Max.	Min.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
95	100	40	65	20	25	80		SMV1211-001				
42	50	18	27	9.0	12	150		SMV1212-001		SMV1212-004		
17	22	8.5	10.5	4.0	5.5	200	SMV1213-011	SMV1213-001		SMV1213-004		
14.5	16	6.5	7.8	3.0	4.8	300		SMV1214-001	SMV1214-003			
8.7	9.5	4.3	5.5	2.0	2.9	350	SMV1215-011	SMV1215-001				
85	-	-	-	15.0	30.0	500*		SMV1297-001				

\*Q @ 2V, F=1 MHz

Breakdown Voltage, V<sub>B</sub> (10 μA): 12V Min.  
 Reverse Current, I<sub>R</sub> (10V): 50 nA Max.







C <sub>T</sub> @ 0.2V (pF)		C <sub>T</sub> @ 2V (pF)		C <sub>T</sub> @ 6V (pF)		Q @ 2V 50 MHz						
Min.	Max.	Min.	Max.	Min.	Max.	Min.	SOD-323	SOT-23				SOT-143
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
11	14	4	6.5	1.2	1.9	250	SMV1299-011	SMV1299-001		SMV1299-004		SMV1299-015

► All plastic packaged varactors are available through distribution.

## 12 Volt Hyperabrupt Junction Varactors (cont.)

 Reverse Breakdown Voltage,  $V_B$  (10  $\mu$ A): 12V Min.







 Reverse Current,  $I_R$  (8V): 50 nA

$C_T$ @ 2.5V (pF)		$\frac{C_T @ 1V}{C_T @ 2.5V}$ (Ratio)		$\frac{C_T @ 2.5V}{C_T @ 4V}$ (Ratio)		$Q$ @ 4V 50 MHz						
Min.	Typ.	Min.	Max.	Min.	Max.	Min.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
18	27	1.5	2.0	1.5	2.0	150	SMV1222-011	SMV1222-001				
9	13	1.5	2.0	1.5	2.0	200	SMV1223-011	SMV1223-001				
6	8	1.5	2.0	1.5	2.0	300		SMV1224-001				
4.2	5.6	1.5	2.0	1.5	2.0	350		SMV1225-001				

## 15 Volt Hyperabrupt Junction Varactors

 Reverse Breakdown Voltage,  $V_B$  (10  $\mu$ A): 15V Min.







 Reverse Current,  $I_R$  (12V): 50 nA Max.

$C_T$ @ 1V (pF)		$\frac{C_T @ 1V}{C_T @ 3V}$ (Ratio)		$\frac{C_T @ 1V}{C_T @ 6V}$ (Ratio)		$R_S$ @ 3V 50 MHz ( $\Omega$ )	$Q$ @ 3V 50 MHz						
Min.	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
3.0	3.6	1.5	1.9	2.6	3.3	1.2	1200	SMV1233-011	SMV1233-001	SMV1233-003	SMV1233-004		
5.85	7.15	1.6	2.0	2.8	3.4	0.8	1000	SMV1234-011	SMV1234-001	SMV1234-003	SMV1234-004		
10.35	12.65	1.6	2.0	2.9	3.4	0.6	750	SMV1235-011	SMV1235-001		SMV1235-004		
15.50	18.50	1.6	2.0	3.0	3.5	0.5	700	SMV1236-011	SMV1236-001	SMV1236-003	SMV1236-004		
45.00	54.0	1.6	2.0	3.0	3.5	0.25	500		SMV1237-001		SMV1237-004		

## 22 Volt Hyperabrupt Junction Varactors

 Reverse Breakdown Voltage,  $V_B$  (10  $\mu$ A): 22V Min.

 Reverse Current,  $I_R$  (17.6 V): 50 nA Max.







$C_T$ @ $V_{R1}$ (pF)		$V_{R1}$ (V)	$C_T$ @ $V_{R2}$ (pF)		$V_{R2}$ (V)	$\frac{C_T1}{C_T2}$ (Ratio)	$Q$ @ $V_{R1}$ 50 MHz						
Min.	Max.		Min.	Max.		Min.	Min.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
10.5	12.5	3	2.1	2.5	20	4.6	400	SMV1206-011	SMV1206-001		SMV1206-004		
25	31	3	4.5	5.3	20	4.8	300		SMV1207-001		SMV1207-004		
2.5	3.3	4	0.6	0.85	20	3.0	500	SMV2022-011	SMV2022-001	SMV2022-003	SMV2022-004		
4.4	5.4	4	0.9	1.2	20	4.2	500	SMV2023-011	SMV2023-001	SMV2023-003	SMV2023-004		
18	22	4	3.1	3.9	20	4.6	300		SMV1227-001				
45	55	4	7.3	9.2	20	5.0	200		SMV1228-001				
100	120	4	16	20	20	5.2	125		SMV1229-001				

► All plastic packaged varactors are available through distribution.

### Low Series Resistance Abrupt Junction Varactors

Reverse Breakdown Voltage,  $V_{BR}$  (10  $\mu$ A): 12V Min.

Reverse Current,  $I_R$  (10V): 50 nA Max.







$C_T$ @ 1.0V (pF)		$C_T$ @ 4.0V (pF)		$R_s$ @ 3V 50 MHz ( $\Omega$ )						
					SOD-323	SOT-23				SOT-143
Min.	Max.	Min.	Max.	Max.	Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
17.4	20.0	10.0	12.1	0.25	SMV1493-011					
36.3	41.7	20.7	25.3	0.20	SMV1494-011					

► All plastic packaged varactors are available through distribution.

### 30 Volt Abrupt Junction Varactors

Reverse Breakdown Voltage,  $V_{BR}$  (10  $\mu$ A): 30V Min.

Reverse Current,  $I_R$  (24V): 50nA Max.

$C_T$ @ 4V (pF)		$\frac{C_{T0}}{C_{T30}}$ (Ratio)	$R_S$ @ 4V 50 MHz ( $\Omega$ )	$Q$ @ 4V 50 MHz						
Min.	Max.	Min.	Max.	Min.	SOD-323	SOT-23			SOT-143	
					Single	Single	Common Anode	Common Cathode	Low Inductance	Unconnected Pair
1.21	1.45	4.1	0.8	3200		SMV1405-001		SMV1405-004		
1.75	2.11	4.1	0.60	2900	SMV1408-011	SMV1408-001		SMV1408-004		
2.11	2.55	4.1	0.50	2800		SMV1409-001		SMV1409-004		
2.56	3.10	4.2	0.45	2600		SMV1410-001		SMV1410-004		
3.10	3.76	4.2	0.40	2500		SMV1411-001		SMV1411-004		
3.64	4.42	4.2	0.35	2400		SMV1413-001		SMV1413-004		
4.36	5.30	4.2	0.30	2200		SMV1414-001		SMV1414-004		
5.17	6.29	4.3	0.27	2100		SMV1415-001		SMV1415-004		
6.25	7.61	4.3	0.24	2000		SMV1416-001		SMV1416-004		
7.51	9.15	4.3	0.22	1800		SMV1417-001		SMV1417-004		
9.13	11.13	4.4	0.20	1600		SMV1419-001				
10.93	13.33	4.4	0.19	1400		SMV1420-001				
13.63	16.63	4.4	0.18	1200		SMV1421-001				
16.33	19.93	4.4	0.18	1000		SMV1422-001				
29.83	36.43	4.5	0.16	600		SMV1426-001				

► All plastic packaged varactors are available through distribution.

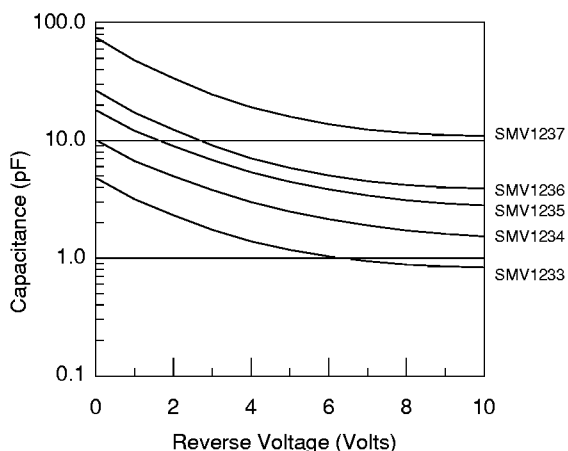
1. Capacitance measured at 1 MHz.
2. For multiple junction packages specifications apply to single junction.

Unpackaged chips are available for purchase by replacing the dash number with -000. For example, to purchase the chip from the SMV1408-001, the part number becomes SMV1408-000. The package capacitance of 0.13 pF should be subtracted from the  $C_T$  specifications to indicate junction capacitance.

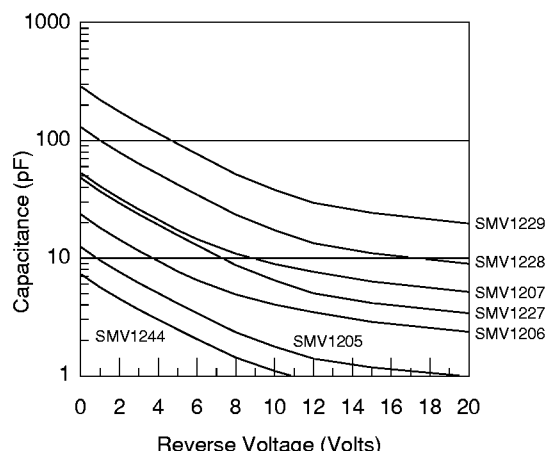
► Chips available through distribution:

SMV1212-000  
SMV1213-000  
SMV1214-000  
SMV1233-000  
SMV1236-000

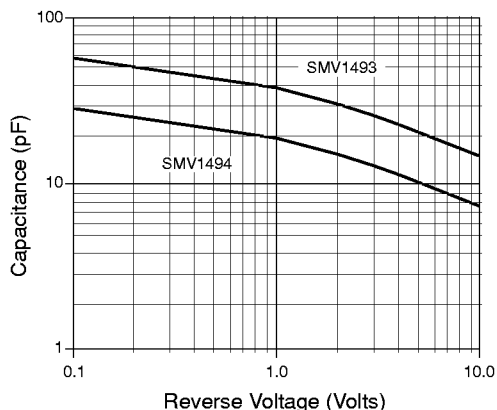
### Typical Capacitance Curves



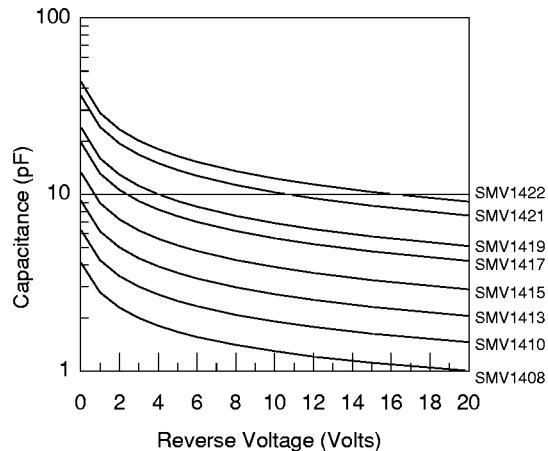
**Capacitance vs. Reverse Voltage**



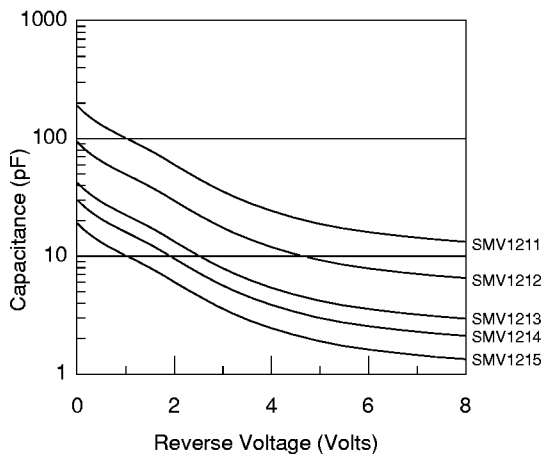
**Capacitance vs. Reverse Voltage**



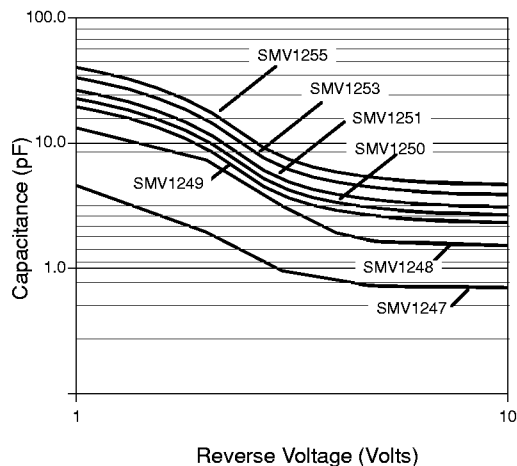
**Capacitance vs. Reverse Voltage**



**Capacitance vs. Reverse Voltage**



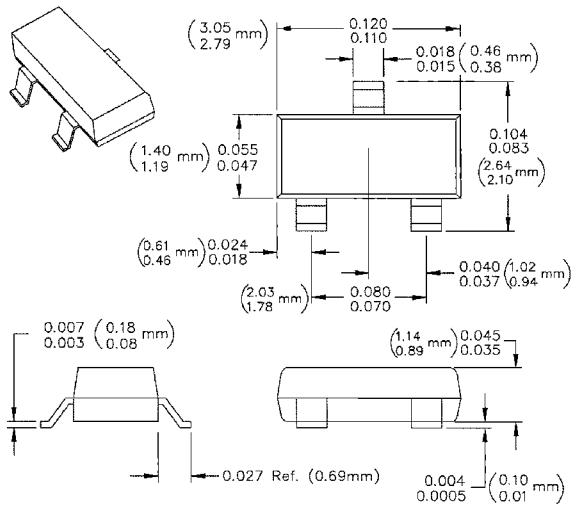
**Capacitance vs. Reverse Voltage**



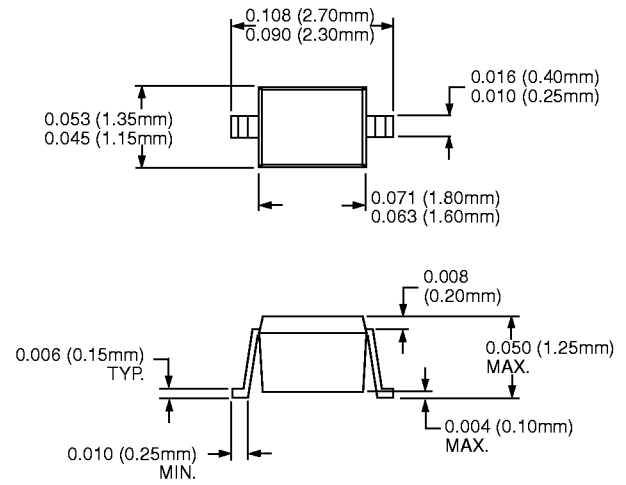
**Capacitance vs. Reverse Voltage**

## Outline Dimensions

### SOT-23



### SOD-323



### SOT-143

