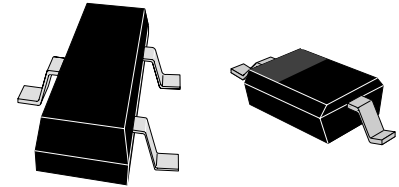


## Features

- 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 ( $T_A = 25^\circ\text{C}$ )







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

Breakdown Voltage,  $V_B$  (10  $\mu\text{A}$ ): 15V Min.  
 Reverse Current,  $I_R$  (12V): 50 nA Max.

$C_T$ @ 0.3V (pF)		$C_T$ @ 4.7V (pF)		$\frac{C_T @ 0.3V}{C_T @ 4.7V}$ (Ratio)		$R_s$ @ 3V 200 MHz ( $\Omega$ )						
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,  $V_B$  (10  $\mu\text{A}$ ): 12V Min.  
 Reverse Current,  $I_R$  (8V): 50 nA Max.

$C_T$ @ 1V (pF)		$C_T$ @ 2.5V (pF)		$C_T$ @ 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,  $V_B$  (10  $\mu\text{A}$ ): 12V Min.  
 Reverse Current,  $I_R$  (10V): 50 nA Max.







$C_T$ @ 0.2V (pF)		$C_T$ @ 2V (pF)		$C_T$ @ 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.	SOD-323	SOT-23			SOT-143	
							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.	SOD-323	SOT-23			SOT-143	
								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.	SOD-323	SOT-23			SOT-143	
								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 ( $\Omega$ )						
Min.	Max.	Min.	Max.		Max.	SOD-323	SOT-23			SOT-143
					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)		$C_T0$ $C_T30$ (Ratio)		$R_s$ @ 4V 50 MHz ( $\Omega$ )	$Q$ @ 4V 50 MHz						
						SOD-323	SOT-23				SOT-143
Min.	Max.	Min.	Max.	Min.	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.

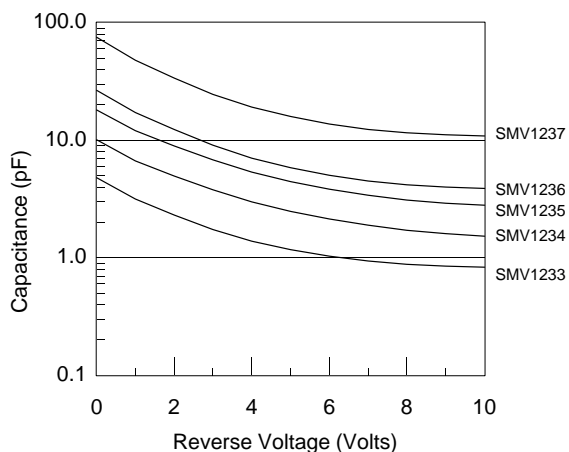
1. Capacitance measured at 1 MHz.
2. For multiple junction packages specifications apply to single junction.

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.

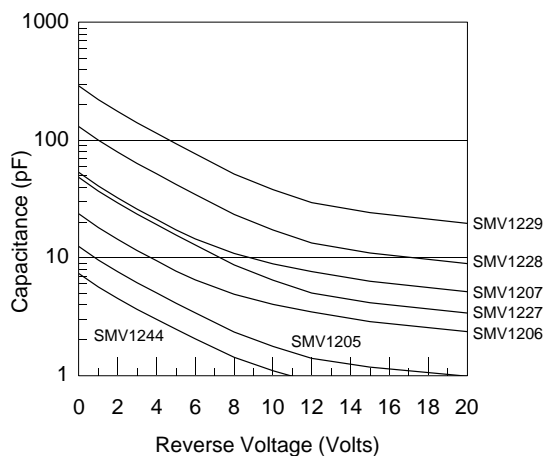
► Chips available through distribution:

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

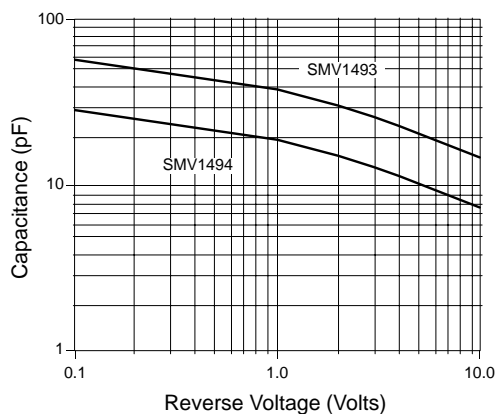
### Typical Capacitance Curves



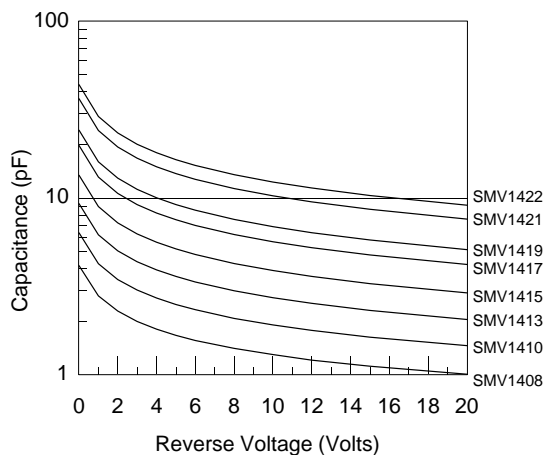
**Capacitance vs. Reverse Voltage**



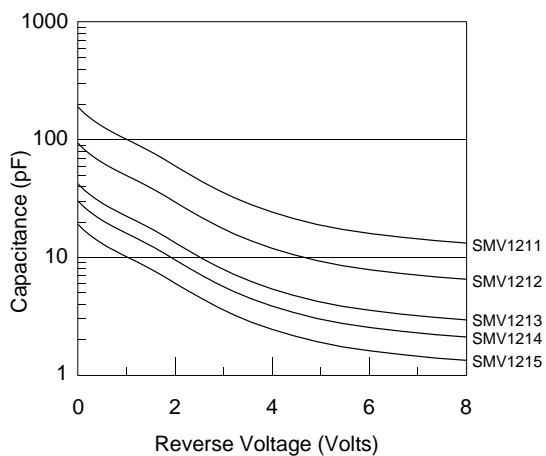
**Capacitance vs. Reverse Voltage**



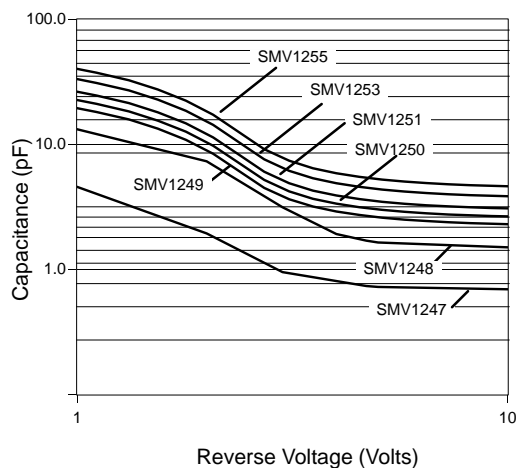
**Capacitance vs. Reverse Voltage**



**Capacitance vs. Reverse Voltage**



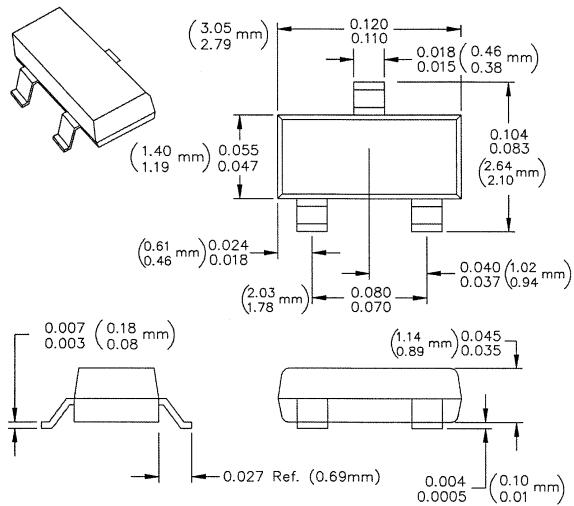
**Capacitance vs. Reverse Voltage**



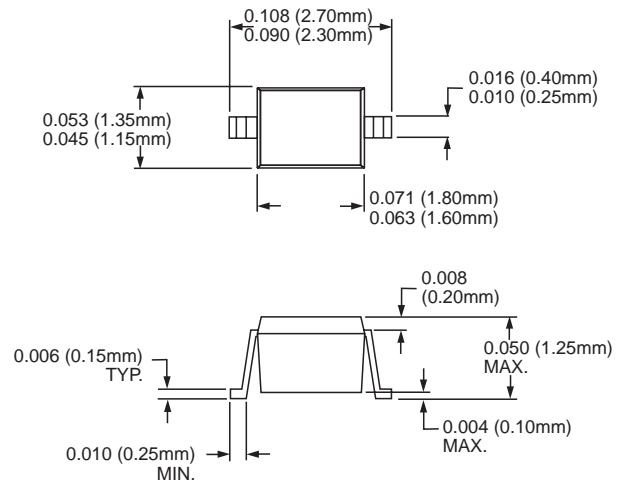
**Capacitance vs. Reverse Voltage**

## Outline Dimensions

### SOT-23



### SOD-323



### SOT-143

