

## Silicon Hyperabrupt Varactor Diode Low Voltage / Low Series Resistance

Rev. V9

### Features

- Low Series Resistance @ Low Tuning Voltages
- High Capacitance Ratio @ Low Tuning Voltages
- Surface Mount Plastic Packages:  
SC-79 , SOD-323, SC-70 (3L) (other packages & configurations available)
- SPC Process for Superior C vs. V Repeatability
- Lead-Free Packages
- RoHS\* Compliant

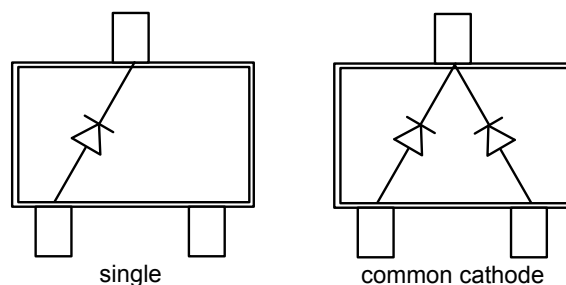
### Description and Applications

The MAVR-0013xx series is a highly repeatable, UHCVD / ion-implanted, hyperabrupt silicon tuning varactor. This series of varactors is designed for high capacitance ratio, and high Q for low battery voltage operation. It is efficient for wide band tuning and low phase noise application where the supply voltage is limited to 5 volts or less.

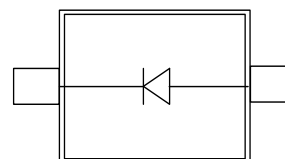
These cost effective surface mount packaged varactors are offered as singles in SC-79 and SOD-323 along with a common cathode version offered in the SC-70, 3 Lead. These diodes are offered with standard 100% matte Sn plating.

### Configurations

#### Top View (SOT-23, SC70 3LD)



#### Top View (SOD-323, SC-79)



### Ordering Information

Part #	Configuration	Package	Package Cp (pF)	Package Ls (nH)
MAVR-001320-12790T	Single	SC-79	0.10	0.6
MAVR-001330-12790T	Single	SC-79	0.10	0.6
MAVR-001340-12790T	Single	SC-79	0.10	0.6
MAVR-001350-12790T	Single	SC-79	0.10	0.6
MAVR-001320-11410T	Single	SOD-323	0.11	1.2
MAVR-001330-11410T	Single	SOD-323	0.11	1.2
MAVR-001340-11410T	Single	SOD-323	0.11	1.2
MAVR-001350-11410T	Single	SOD-323	0.11	1.2
MAVR-001320-1146FT	Common Cathode	SC-70 (3L)	0.12	1.3
MAVR-001330-1146FT	Common Cathode	SC-70 (3L)	0.12	1.3
MAVR-001340-1146FT	Common Cathode	SC-70 (3L)	0.12	1.3
MAVR-001350-1146FT	Common Cathode	SC-70 (3L)	0.12	1.3

\* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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### Electrical Specifications @ $T_A = +25^\circ\text{C}$

Breakdown Voltage @  $I_R = 10 \mu\text{A}$ ,  $V_b = 12 \text{ V}$  Minimum

Reverse Leakage Current @  $V_R = 10 \text{ V}$ ,  $I_R = 100 \text{ nA}$  Maximum

Part No. <sup>1</sup>	$C_T$ (pF)				Capacitance Ratio	$R_S$ ( $\Omega$ )	
	$V_R = 0.5 \text{ V}$			$V_R = 4.0 \text{ V}$	$C_{T0.5} / C_{T3.0}$	$V_R = 2.0 \text{ V}$	
	Min.	Nom.	Max.	Typ.	Typ.	Typ.	Max.
MAVR-001320-xxxxxx	48.0	55.0	63.0	17.0	3.37	0.32	0.50
MAVR-001330-xxxxxx	22.0	25.0	30.0	7.80	3.31	0.45	0.70
MAVR-001340-xxxxxx	15.0	18.0	21.0	5.20	3.40	0.57	0.85
MAVR-001350-xxxxxx	9.5	11.0	13.5	3.60	3.20	0.78	1.00

1. The prefix defines package style, configuration and packaging information. Contact representative for complete part identification.
2. Capacitance @ 1 MHz
3. Series Resistance @ 100 MHz

### Absolute Maximum Ratings<sup>4,5</sup>

@  $T_A = +25^\circ\text{C}$  (Unless Otherwise Noted)

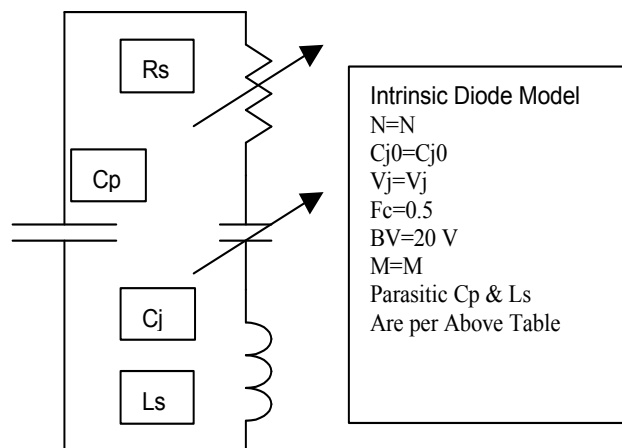
Parameter	Absolute Maximum
Reverse Voltage	12 V
Forward Current	50 mA
Operating Temperature	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
Storage Temperature	$-55^\circ\text{C}$ to $+125^\circ\text{C}$

4. Operation of this device above any one of these parameters may cause permanent damage.
5. Please refer to application note M538 for surface mounting instructions.

## Typical Capacitance Values

$V_R$ (V)	MAVR-001320	MAVR-001330	MAVR-001340	MAVR-001350
	$C_T$ (pF)	$C_T$ (pF)	$C_T$ (pF)	$C_T$ (pF)
0.5	55.45	25.4	17.7	11.4
1.0	45.0	20.7	14.4	9.3
1.5	36.3	16.8	11.7	7.6
2.0	28.3	13.2	9.2	5.9
2.5	21.2	10.1	7.0	4.5
3.0	16.4	7.9	5.4	3.4
3.5	13.3	6.4	4.4	2.9
4.0	11.4	5.5	3.8	2.5
4.5	10.0	4.8	3.3	2.2
5.0	9.1	4.4	3.0	2.0

## Spice Model



Part Number	N	$C_{J_0}$ (pF)	$V_J$ (V)	M
MAVR-001320	1.1	71.5	20.35	13.21
MAVR-001330	1.1	32.8	20.91	13.72
MAVR-001340	1.1	22.7	22.32	14.72
MAVR-001350	1.1	14.3	25.52	15.87

# MAVR-0013xx Series

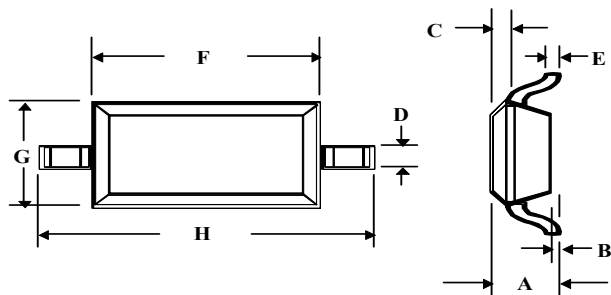


**Silicon Hyperabrupt Varactor Diode**  
**Low Voltage / Low Series Resistance**

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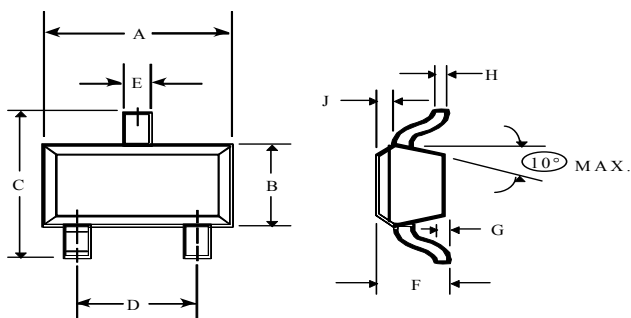
## Case Styles

### SOD-323 (Case Style 1141)



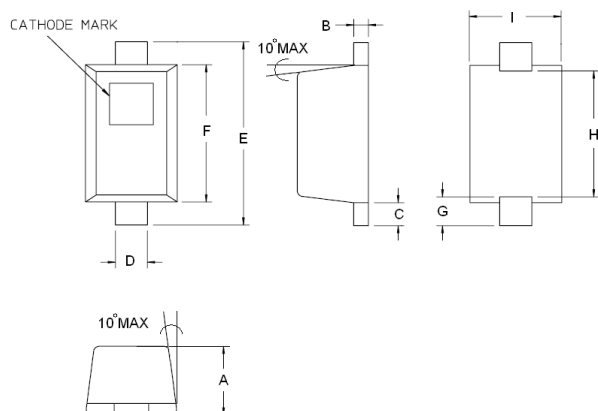
Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	—	0.043	—	1.10
B	—	0.004	—	0.10
C	—	0.008	—	0.20
D	0.010	0.016	0.25	0.41
E	0.003	0.006	0.07	0.15
F	0.063	0.075	1.60	1.90
G	0.045	0.057	1.14	1.45
H	0.091	0.106	2.30	2.70

### SC-70, 3 lead (Case Style 1146)



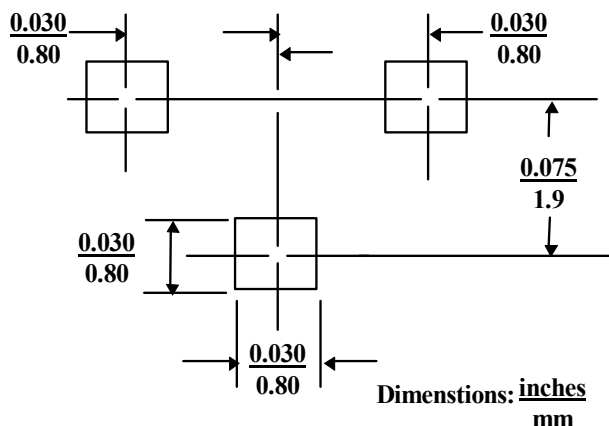
Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.071	0.087	1.80	2.21
B	0.045	0.053	1.14	1.35
C	0.071	0.094	1.80	2.39
D	0.047	0.057	1.19	1.45
E	0.010	0.016	0.25	0.41
F	0.031	0.039	0.79	1.00
G	0.000	0.004	0.00	0.10
H	0.004	0.007	0.10	0.18
J	0.004	0.010	0.10	0.25

### SC-79 (Case Style 1279)

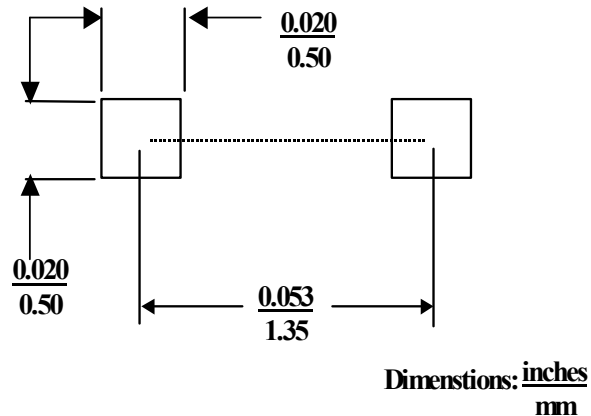


Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.0197	0.0276	0.50	0.70
B	0.003	0.008	0.07	0.20
C	0.006	0.010	0.15	0.25
D	0.010	0.014	0.25	0.35
E	0.059	0.067	1.50	1.70
F	0.043	0.051	1.09	1.30
G	0.0098 nominal		0.250 nominal	
H	0.0433 nominal		1.10 nominal	
I	0.027	0.035	0.68	0.89

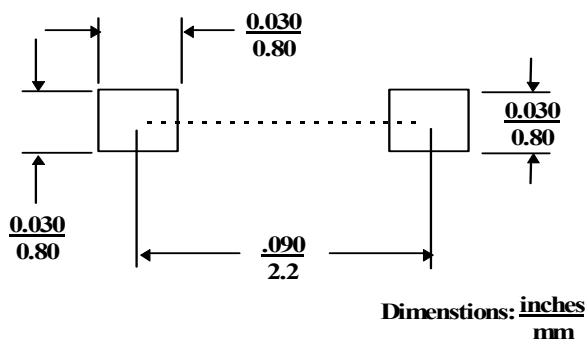
## SC-70, 3 Lead (Case Style 1146)



## SC-79 (Case Style 1279)



## SOD-323 (Case Style 1141)



## Mounting Information

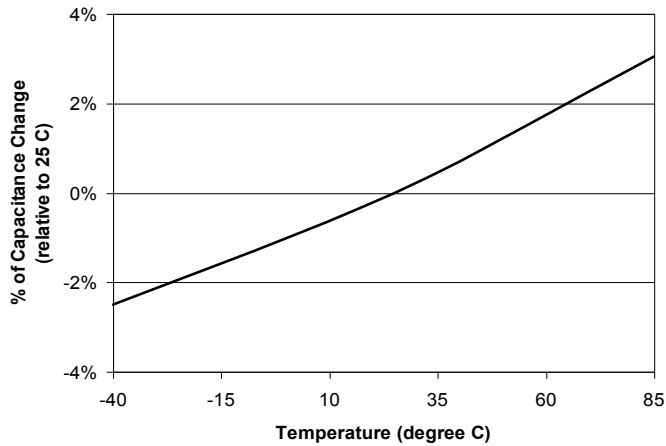
The illustration indicates the recommended mounting pad configuration for the SC-79, SC-70 and SOD-323 packages. Solder paste containing flux should be screened onto the pads to a thickness of 0.005- 0.007 inches. The plastic package is placed in position, firmly adhering to the solder paste.

Permanent attachment is performed by a reflow soldering procedure during which the body temperature does not exceed +260°C.

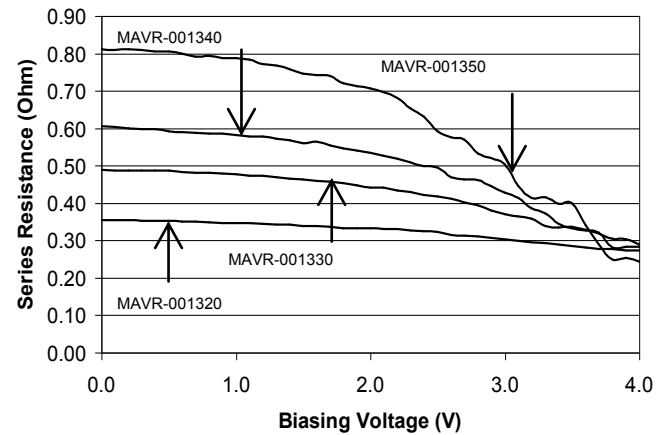
Please refer to Application Note M538 for surface mounting instructions.

## Typical Performance Curves

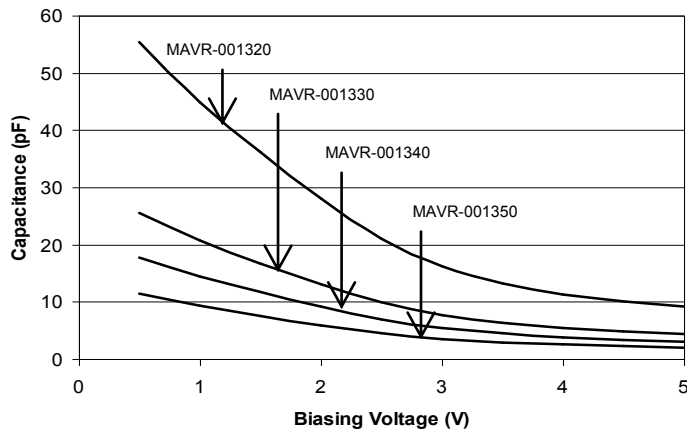
**Typical Capacitance Change vs. Temperature**



**Series Resistance vs Biasing Voltage\***



**Typical Capacitance vs. Biasing Voltage**



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