

## 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

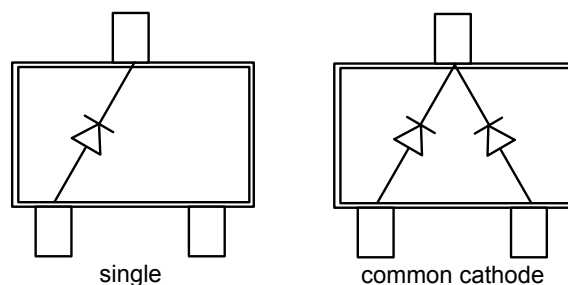
### Description and Applications

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.

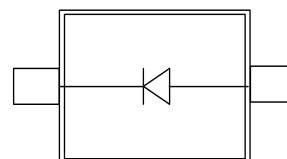
These cost effective surface mount packaged varactors are offered as singles in SC-79 and SOD-323 along with a common cathode version offered in the SC-70, 3 Lead. These diodes are offered with standard 100% matte Sn plating.

### 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.

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

Rev. V9

### 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)

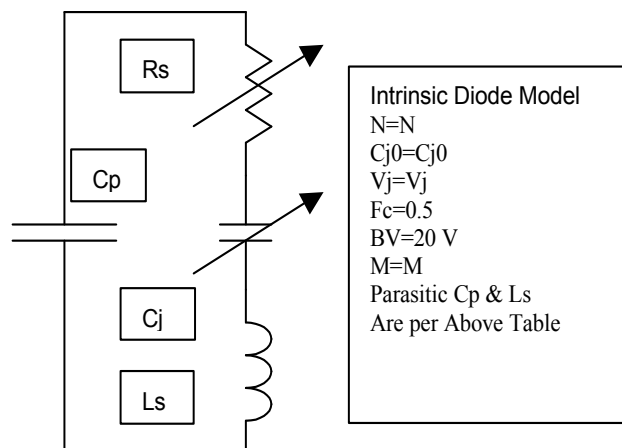
Parameter	Absolute Maximum
Reverse Voltage	12 V
Forward Current	50 mA
Operating Temperature	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
Storage Temperature	$-55^\circ\text{C}$ to $+125^\circ\text{C}$

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	$C_{J0}$ (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

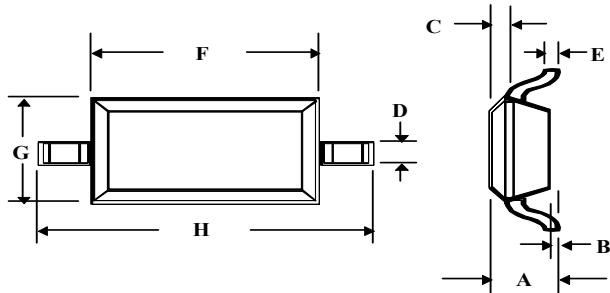


**Silicon Hyperabrupt Varactor Diode**  
**Low Voltage / Low Series Resistance**

Rev. V9

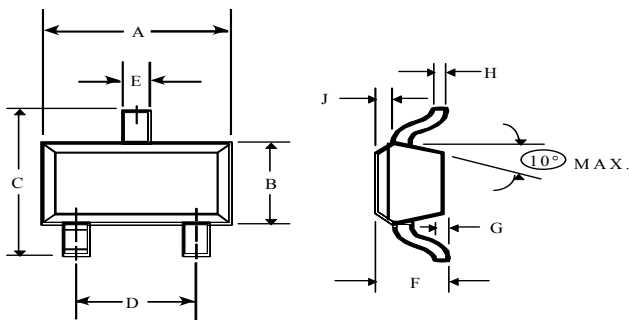
## Case Styles

### SOD-323 (Case Style 1141)



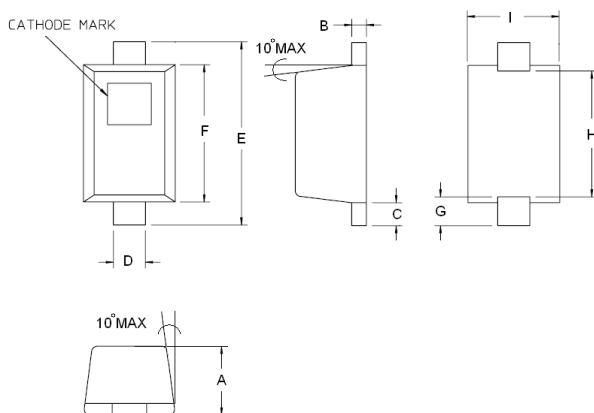
Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	—	0.043	—	1.10
B	—	0.004	—	0.10
C	—	0.008	—	0.20
D	0.010	0.016	0.25	0.41
E	0.003	0.006	0.07	0.15
F	0.063	0.075	1.60	1.90
G	0.045	0.057	1.14	1.45
H	0.091	0.106	2.30	2.70

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



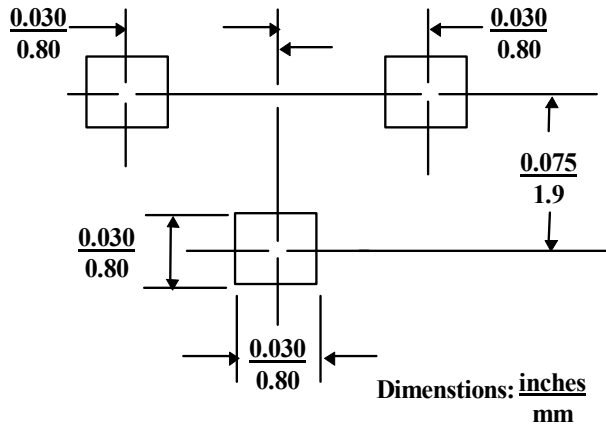
Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.071	0.087	1.80	2.21
B	0.045	0.053	1.14	1.35
C	0.071	0.094	1.80	2.39
D	0.047	0.057	1.19	1.45
E	0.010	0.016	0.25	0.41
F	0.031	0.039	0.79	1.00
G	0.000	0.004	0.00	0.10
H	0.004	0.007	0.10	0.18
J	0.004	0.010	0.10	0.25

### SC-79 (Case Style 1279)

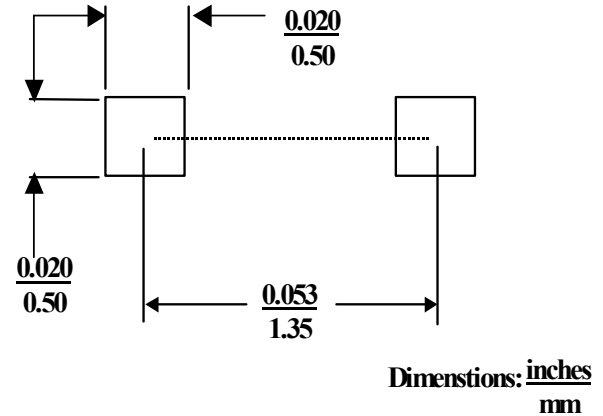


Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.0197	0.0276	0.50	0.70
B	0.003	0.008	0.07	0.20
C	0.006	0.010	0.15	0.25
D	0.010	0.014	0.25	0.35
E	0.059	0.067	1.50	1.70
F	0.043	0.051	1.09	1.30
G	0.0098 nominal		0.250 nominal	
H	0.0433 nominal		1.10 nominal	
I	0.027	0.035	0.68	0.89

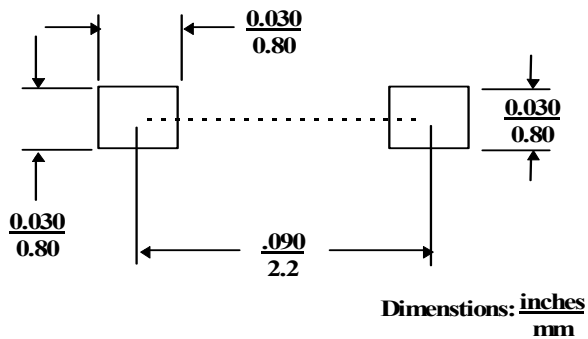
### SC-70, 3 Lead (Case Style 1146)



### SC-79 (Case Style 1279)



### SOD-323 (Case Style 1141)



### Mounting Information

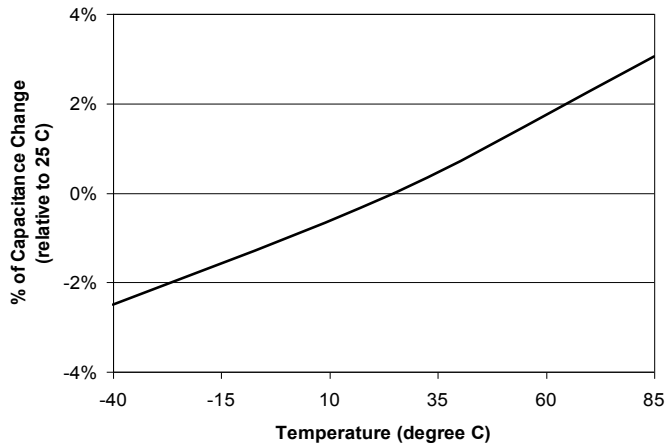
The illustration indicates the recommended mounting pad configuration for the SC-79, SC-70 and SOD-323 packages. Solder paste containing flux should be screened onto the pads to a thickness of 0.005- 0.007 inches. The plastic package is placed in position, firmly adhering to the solder paste.

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

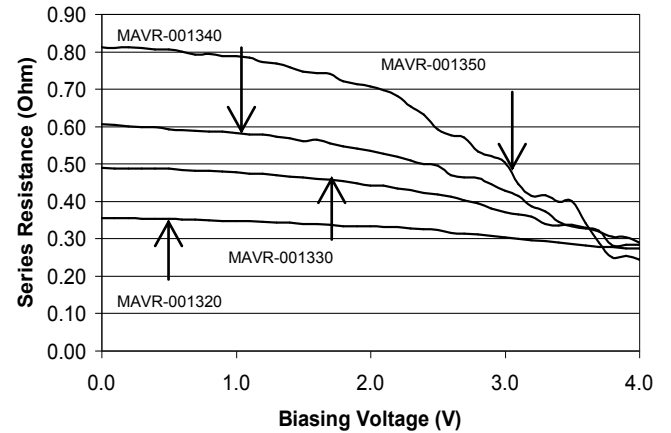
Please refer to Application Note M538 for surface mounting instructions.

## Typical Performance Curves

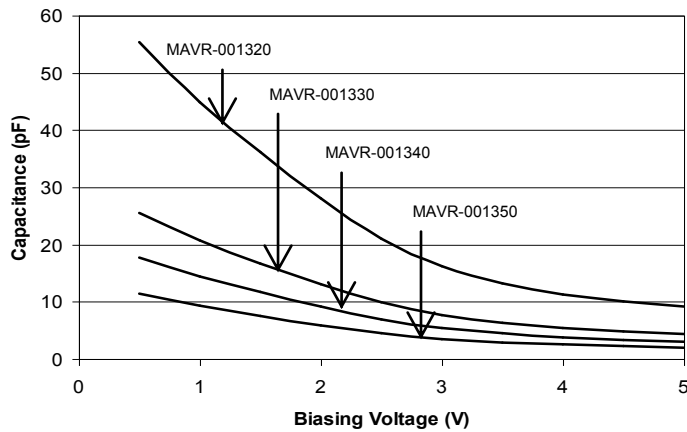
**Typical Capacitance Change vs. Temperature**



**Series Resistance vs Biasing Voltage\***



**Typical Capacitance vs. Biasing Voltage**



M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.