

## Low Tuning Voltage/Low Rs Silicon Hyperabrupt Varactor Diode

**MA4ST1200 Series**  
**V4**

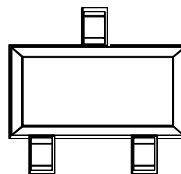
### Features

- Low Series Resistance at Low Tuning Voltages
- High Capacitance Ratio at Low Tuning Voltages
- Surface Mount Plastic Packages : SC-79, SOD-323, SC-70 ( 3L )
- SPC Process for Superior C vs V Repeatability
- Lead-Free (RoHs Compliant) equivalents available with 260°C reflow compatibility

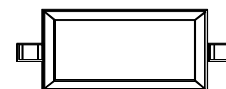
### Description

M/A-COM's MA4ST1200 series is a highly repeatable, UHCVD/ion-implanted, hyperabrupt silicon tuning varactor in a cost effective surface mount package. 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. The 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 Sn/Pb plating, as well as with 100% matte Sn plating on our RohS compliant equivalent devices.

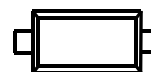
SC-70 (3 lead)



SOD-323



SC-79



### Absolute Maximum Ratings @ T<sub>A</sub>=+25 °C (Unless Otherwise Noted)<sup>1</sup>

| Parameter             | Absolute Maximum  |
|-----------------------|-------------------|
| Reverse Voltage       | 12 V              |
| Forward Current       | 50 mA             |
| Operating Temperature | -55 °C to +125 °C |
| Storage Temperature   | -55 °C to +125 °C |

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

| Part Number       | RoHs Compliant Part Number | Configuration  | Package    | Package Cp (pF) | Package Ls (nH) |
|-------------------|----------------------------|----------------|------------|-----------------|-----------------|
|                   | MAVR-001230-12790T         | Single         | SC-79      | 0.10            | 0.6             |
|                   | MAVR-001240-12790T         | Single         | SC-79      | 0.10            | 0.6             |
| MA4ST1230-1141T   | MA4ST1231-1141T            | Single         | SOD-323    | 0.11            | 1.2             |
| MA4ST1240-1141T   | MA4ST1241-1141T            | Single         | SOD-323    | 0.11            | 1.2             |
| MA4ST1230CK-1146T | MA4ST1231CK-1146T          | Common Cathode | SC-70 (3L) | 0.12            | 1.3             |
| MA4ST1240CK-1146T | MA4ST1241CK-1146T          | Common Cathode | SC-70 (3L) | 0.12            | 1.3             |

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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**

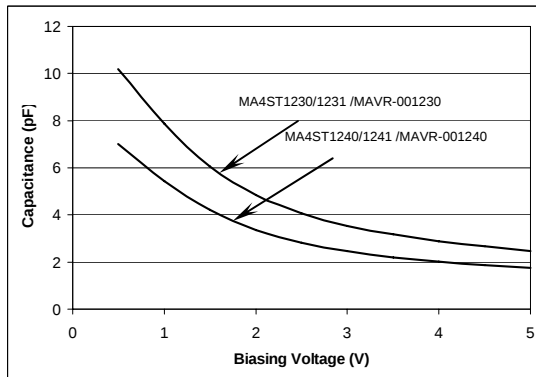
| Part Number<br>Base | RoHS Compliant<br>Part Number Base <sup>1</sup> | Ct<br>(pF) <sup>2</sup> |                     |      |      |      | Capacitance<br>Ratio | Rs <sup>3</sup><br>(Ohm) |      |
|---------------------|-------------------------------------------------|-------------------------|---------------------|------|------|------|----------------------|--------------------------|------|
|                     |                                                 | $V_R = 0.5\text{V}$     | $V_R = 2.0\text{V}$ |      |      |      | $C_{t0.5}/C_{t4.0}$  | $V_R = 2.0\text{ V}$     |      |
|                     |                                                 | Typ.                    | Min.                | Nom. | Max. | Typ. | Typ.                 | Typ.                     | Max. |
| MA4ST1230           | MA4ST1231<br>MAVR-001230-xxxxx                  | 10.1                    | 4.2                 | 4.7  | 5.2  | 2.75 | 3.67                 | 0.40                     | 0.70 |
| MA4ST1240           | MA4ST1241<br>MAVR-001240-xxxxx                  | 7.1                     | 3.0                 | 3.4  | 3.8  | 2.05 | 3.46                 | 0.40                     | 0.70 |

<sup>1</sup> The prefix defines package style, configuration and packaging information. Contact representative for complete part identification.

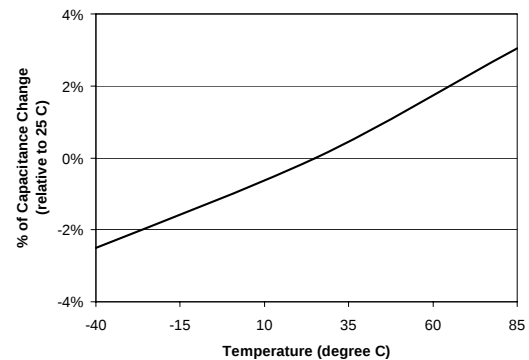
<sup>2</sup> Capacitance @ 1 MHz

<sup>3</sup> Series Resistance @ 100 MHz

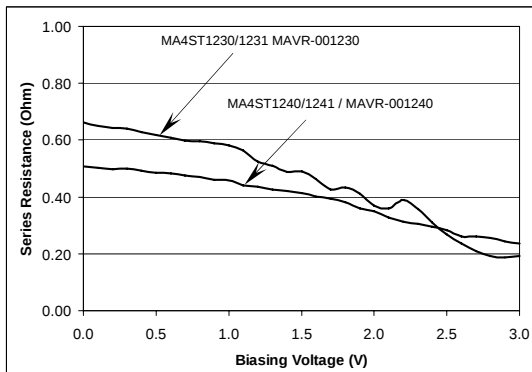
**Typical Capacitance vs. Biasing Voltage**



**Typical Capacitance Change vs. Temperature**



**Typical Rs vs Biasing Voltage<sup>3</sup>**



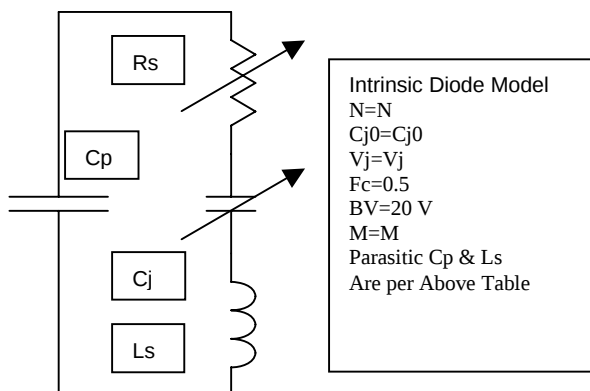
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**Typical Capacitance Values**

| $V_R$ (V) | MA4ST1230  | MA4ST1240  |
|-----------|------------|------------|
|           | $C_t$ (pF) | $C_t$ (pF) |
| 0.5       | 10.170     | 7.016      |
| 1.0       | 7.839      | 5.424      |
| 1.5       | 6.062      | 4.213      |
| 2.0       | 4.840      | 3.370      |
| 2.5       | 4.053      | 2.829      |
| 3.0       | 3.527      | 2.466      |
| 3.5       | 3.155      | 2.208      |
| 4.0       | 2.877      | 2.016      |
| 4.5       | 2.661      | 1.865      |
| 5.0       | 2.488      | 1.746      |

**Spice Model**



| Part Number | N   | CJO (pF) | Vj (V) | M   |
|-------------|-----|----------|--------|-----|
| MA4ST1230   | 1.1 | 12.7     | 3.136  | 2.6 |
| MA4ST1240   | 1.1 | 8.65     | 3.170  | 2.6 |

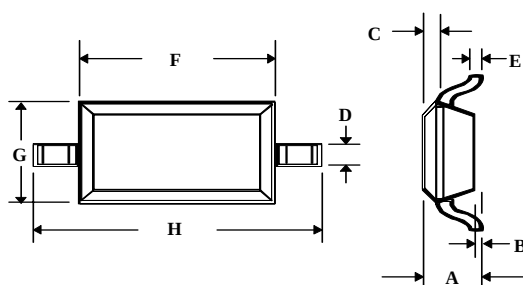
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## Case Styles

### SOD-323

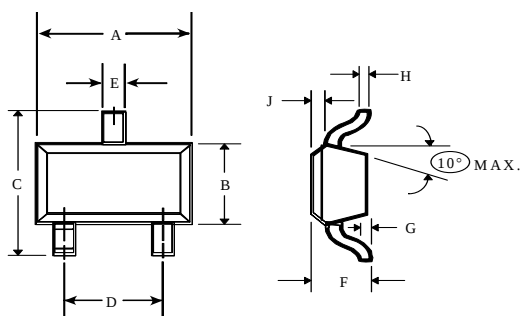
#### Case Style 1141



| DIM. | INCHES |       | MILLIMETERS |      |
|------|--------|-------|-------------|------|
|      | MIN.   | MAX.  | MIN.        | MAX. |
| A    | —      | 0.043 | —           | 1.1  |
| B    | —      | 0.004 | —           | 0.1  |
| C    | —      | 0.008 | —           | 0.2  |
| D    | 0.010  | 0.016 | 0.25        | 0.4  |
| E    | 0.003  | 0.006 | 0.08        | 0.15 |
| F    | 0.063  | 0.075 | 1.6         | 1.9  |
| G    | 0.045  | 0.057 | 1.15        | 1.45 |
| H    | 0.091  | 0.106 | 2.3         | 2.7  |

### SC-70, 3 Lead

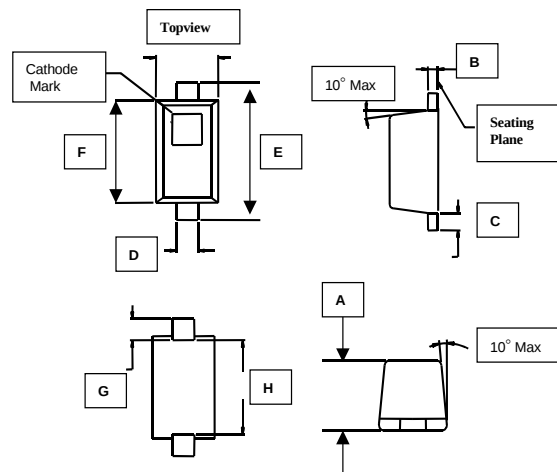
#### Case Style 1146



| DIM. | INCHES |       | MILLIMETERS |      |
|------|--------|-------|-------------|------|
|      | MIN.   | MAX.  | MIN.        | MAX. |
| A    | 0.071  | 0.087 | 1.80        | 2.20 |
| B    | 0.045  | 0.053 | 1.15        | 1.35 |
| C    | 0.071  | 0.094 | 1.80        | 2.40 |
| D    | 0.047  | 0.057 | 1.19        | 1.45 |
| E    | 0.010  | 0.016 | 0.25        | 0.41 |
| F    | 0.031  | 0.039 | 0.80        | 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    | 0.020         | 0.028 | 0.50        | 0.71 |
| B    | 0.003         | 0.008 | 0.08        | 0.20 |
| C    | 0.006         | 0.010 | 0.15        | 0.25 |
| D    | 0.010         | 0.014 | 0.25        | 0.36 |
| E    | 0.059         | 0.067 | 0.08        | 0.15 |
| F    | 0.043         | 0.051 | 1.50        | 1.30 |
| G    | 0.011         | 0.012 | 0.28        | 0.30 |
| H    | 0.037 typical | 0.043 | 0.94        | 1.09 |

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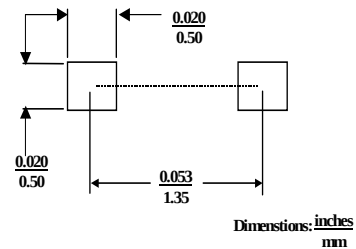
**Mounting Information**

The illustration indicates the recommended mounting pad configuration for the SC-79, SOT-323 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.

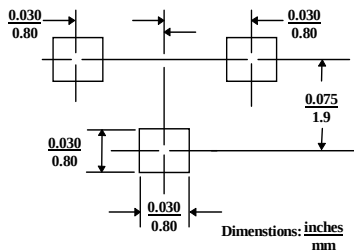
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

Please refer to Application Note M538 for surface mounting instructions.

**SC-79**



**SOT-323**



**SOD-323**

