MA4ST1200 Series

Low Tuning Voltage / Low Rs Silicon Hyperabrupt Varactor Diode

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

Description
The 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 (3L). These diodes are offered with 100% matte Sn plating.

Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Configuration</th>
<th>Package</th>
<th>Package Cp (pF)</th>
<th>Package Ls (nH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAVR-001230-12790T</td>
<td>Single</td>
<td>SC-79</td>
<td>0.10</td>
<td>0.6</td>
</tr>
<tr>
<td>MAVR-001240-12790T</td>
<td>Single</td>
<td>SC-79</td>
<td>0.10</td>
<td>0.6</td>
</tr>
<tr>
<td>MA4ST1231-1141T</td>
<td>Single</td>
<td>SOD-323</td>
<td>0.11</td>
<td>1.2</td>
</tr>
<tr>
<td>MA4ST1241-1141T</td>
<td>Single</td>
<td>SOD-323</td>
<td>0.11</td>
<td>1.2</td>
</tr>
<tr>
<td>MA4ST1241CK-1146T</td>
<td>Common Cathode</td>
<td>SC-70 (3L)</td>
<td>0.12</td>
<td>1.3</td>
</tr>
</tbody>
</table>

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Electrical Specifications @ $T_A = +25^\circ$C

Breakdown Voltage @ $I_R = 10 \, \mu A$, $V_B = 12 \, V$ Minimum
Reverse Leakage Current @ $V_R = 10 \, V$, $I_R = 100 \, nA$ Maximum

<table>
<thead>
<tr>
<th>RoHS Compliant Part No.</th>
<th>$C_T$ (pF)</th>
<th>Capacitance Ratio</th>
<th>$R_s$ (Ohm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$V_R = 0.5 , V$</td>
<td>$V_R = 2.0 , V$</td>
<td>$V_R = 4.0 , V$</td>
</tr>
<tr>
<td>MA4ST1231 MAVR-001230</td>
<td>10.1</td>
<td>4.2</td>
<td>4.7</td>
</tr>
<tr>
<td>MA4ST1241 MAVR-001240</td>
<td>7.1</td>
<td>3.0</td>
<td>3.4</td>
</tr>
</tbody>
</table>

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. guaranteed by design.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Voltage</td>
<td>12 V</td>
</tr>
<tr>
<td>Forward Current</td>
<td>50 mA</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>$-55^\circ$C to $+125^\circ$C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$-55^\circ$C to $+125^\circ$C</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>$V_R$ (V)</th>
<th>$C_T$ (pF)</th>
<th>$C_T$ (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MA4ST1231</td>
<td>MA4ST1241</td>
</tr>
<tr>
<td>0.5</td>
<td>10.170</td>
<td>7.016</td>
</tr>
<tr>
<td>1.0</td>
<td>7.839</td>
<td>5.424</td>
</tr>
<tr>
<td>1.5</td>
<td>6.062</td>
<td>4.213</td>
</tr>
<tr>
<td>2.0</td>
<td>4.840</td>
<td>3.370</td>
</tr>
<tr>
<td>2.5</td>
<td>4.053</td>
<td>2.829</td>
</tr>
<tr>
<td>3.0</td>
<td>3.527</td>
<td>2.466</td>
</tr>
<tr>
<td>3.5</td>
<td>3.155</td>
<td>2.208</td>
</tr>
<tr>
<td>4.0</td>
<td>2.877</td>
<td>2.016</td>
</tr>
<tr>
<td>4.5</td>
<td>2.661</td>
<td>1.865</td>
</tr>
<tr>
<td>5.0</td>
<td>2.488</td>
<td>1.746</td>
</tr>
</tbody>
</table>

Spice Model

Intrinsic Diode Model
$N=N$
$Cj0=Cj0$
$Vj=Vj$
$Fc=0.5$
$BV=20 \, V$
$M=M$
Parasitic $Cp$ & $Ls$ Are per Above Table

RoHS Compliant
Part No. | $C_T$ (pF) | $Cj0$ (pF) | $Vj$ (V) | $M$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAVR-001230</td>
<td>1.1</td>
<td>12.7</td>
<td>3.136</td>
<td>2.6</td>
</tr>
<tr>
<td>MAVR-001240</td>
<td>1.1</td>
<td>8.65</td>
<td>3.170</td>
<td>2.6</td>
</tr>
</tbody>
</table>

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Typical Performance Curves

**Capacitance vs. Biasing Voltage**

![Capacitance vs. Biasing Voltage Graph]

**Series Resistance vs. Biasing Voltage**

![Series Resistance vs. Biasing Voltage Graph]

**Capacitance Change (relative to +25°C) vs. Temperature**

![Capacitance Change vs. Temperature Graph]
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Case Styles

SOD-323 (Case Style 1141)

<table>
<thead>
<tr>
<th>DIM.</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3/32</td>
<td>3/4</td>
</tr>
<tr>
<td>B</td>
<td>3/32</td>
<td>3/4</td>
</tr>
<tr>
<td>C</td>
<td>0.008</td>
<td>0.2</td>
</tr>
<tr>
<td>D</td>
<td>0.010</td>
<td>0.016</td>
</tr>
<tr>
<td>E</td>
<td>0.003</td>
<td>0.006</td>
</tr>
<tr>
<td>F</td>
<td>0.063</td>
<td>0.075</td>
</tr>
<tr>
<td>G</td>
<td>0.045</td>
<td>0.057</td>
</tr>
<tr>
<td>H</td>
<td>0.091</td>
<td>0.106</td>
</tr>
</tbody>
</table>

SC-70, 3 Lead (Case Style 1146)

<table>
<thead>
<tr>
<th>DIM.</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.071</td>
<td>1.80</td>
</tr>
<tr>
<td>B</td>
<td>0.045</td>
<td>1.14</td>
</tr>
<tr>
<td>C</td>
<td>0.071</td>
<td>1.80</td>
</tr>
<tr>
<td>D</td>
<td>0.047</td>
<td>1.19</td>
</tr>
<tr>
<td>E</td>
<td>0.010</td>
<td>0.25</td>
</tr>
<tr>
<td>F</td>
<td>0.031</td>
<td>0.79</td>
</tr>
<tr>
<td>G</td>
<td>0.000</td>
<td>0.00</td>
</tr>
<tr>
<td>H</td>
<td>0.004</td>
<td>0.10</td>
</tr>
<tr>
<td>J</td>
<td>0.004</td>
<td>0.10</td>
</tr>
</tbody>
</table>

SC-79 (Case Style 1279)

<table>
<thead>
<tr>
<th>DIM.</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.0197</td>
<td>0.50</td>
</tr>
<tr>
<td>B</td>
<td>0.003</td>
<td>0.07</td>
</tr>
<tr>
<td>C</td>
<td>0.006</td>
<td>0.15</td>
</tr>
<tr>
<td>D</td>
<td>0.010</td>
<td>0.25</td>
</tr>
<tr>
<td>E</td>
<td>0.059</td>
<td>1.50</td>
</tr>
<tr>
<td>F</td>
<td>0.043</td>
<td>1.09</td>
</tr>
<tr>
<td>G</td>
<td>0.098</td>
<td>0.250</td>
</tr>
<tr>
<td>H</td>
<td>.0433</td>
<td>1.10</td>
</tr>
<tr>
<td>I</td>
<td>.027</td>
<td>0.68</td>
</tr>
</tbody>
</table>

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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.