

Low Voltage/Low Rs Silicon Hyperabrupt
Varactor Diode

MA4ST1300 Series
V3

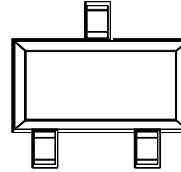
Features

- 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) (other packages & configurations available)
- SPC Process for Superior C vs V Repeatability
- Lead-Free (RoHs Compliant) equivalents available with 260°C reflow compatibility.

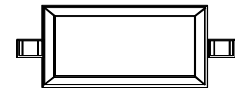
Description and Applications

M/A-COM's MA4ST1300 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 100% matte Sn plating on our RoHs compliant equivalent devices.

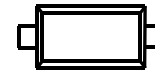
SC-70 (3 lead)



SOD-323



SC-79



**Absolute Maximum Ratings @ T_A=+25 °C
(Unless Otherwise Noted)¹**

| 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-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 |
| MA4ST1320-1141T | MAVR-001320-11410T | Single | SOD-323 | 0.11 | 1.2 |
| MA4ST1330-1141T | MAVR-001330-11410T | Single | SOD-323 | 0.11 | 1.2 |
| MA4ST1340-1141T | MAVR-001340-11410T | Single | SOD-323 | 0.11 | 1.2 |
| MA4ST1350-1141T | MAVR-001350-11410T | Single | SOD-323 | 0.11 | 1.2 |
| MA4ST1320CK-1146T | MAVR-001320-1146FT | Common Cathode | SC-70 (3L) | 0.12 | 1.3 |
| MA4ST1330CK-1146T | MAVR-001330-1146FT | Common Cathode | SC-70 (3L) | 0.12 | 1.3 |
| MA4ST1340CK-1146T | MAVR-001340-1146FT | Common Cathode | SC-70 (3L) | 0.12 | 1.3 |
| MA4ST1350CK-1146T | MAVR-001350-1146FT | Common Cathode | SC-70 (3L) | 0.12 | 1.3 |

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Visit www.macom.com for additional data sheets and product information.

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Electrical Specifications @ T_A = +25 °C

Breakdown Voltage @ I_R = 10µA, V_b = 12 V Minimum
Reverse Leakage Current @ V_R = 10V, I_R = 100 nA Maximum

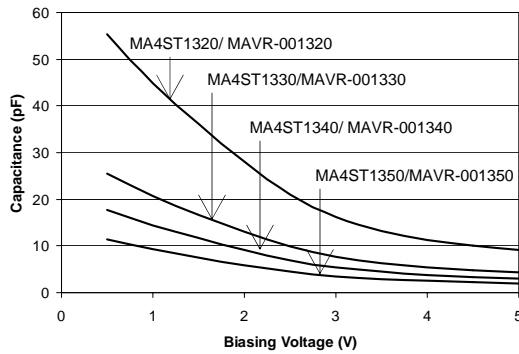
| Part Number Base | RoHS Compliant Part Number Base ¹ | C _t (pF) ² | | | | Capacitance Ratio | R _s ³ (Ohm) | |
|------------------|--|----------------------------------|------|------|-----------------------|--------------------------------------|-----------------------------------|------|
| | | V _R = 0.5V | | | V _R = 4.0V | C _{t0.5} /C _{t3.0} | V _R = 2.0 V | |
| | | Min. | Nom. | Max. | Typ. | Typ. | Typ. | Max. |
| MA4ST1320 | MAVR-001320-XXXXXX | 48.0 | 55.0 | 63.0 | 17.0 | 3.37 | 0.32 | 0.5 |
| MA4ST1330 | MAVR-001330-XXXXXX | 22.0 | 25.0 | 30.0 | 7.8 | 3.31 | 0.45 | 0.7 |
| MA4ST1340 | MAVR-001340-XXXXXX | 15.0 | 18.0 | 21.0 | 5.2 | 3.4 | 0.57 | 0.85 |
| MA4ST1350 | MAVR-001350-XXXXXX | 9.5 | 11.0 | 13.5 | 3.6 | 3.2 | 0.78 | 1.0 |

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

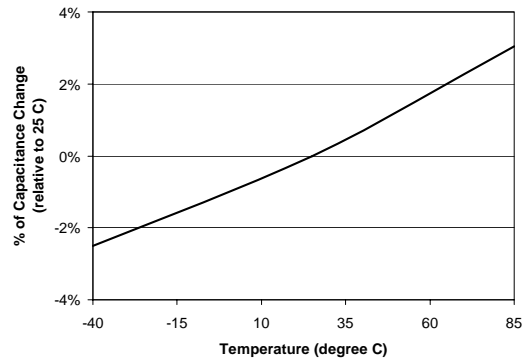
² Capacitance @ 1 MHz

³ Series Resistance @ 100 MHz

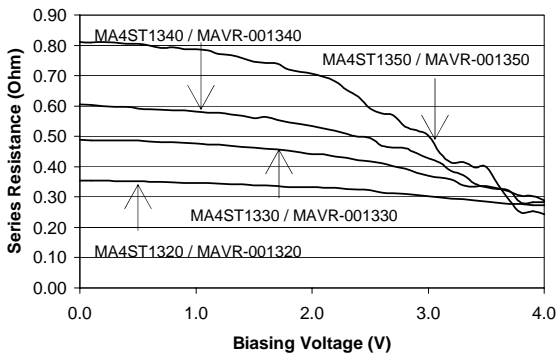
Typical Capacitance vs. Biasing Voltage



Typical Capacitance Change vs. Temperature



Series Resistance vs. Biasing Voltage*



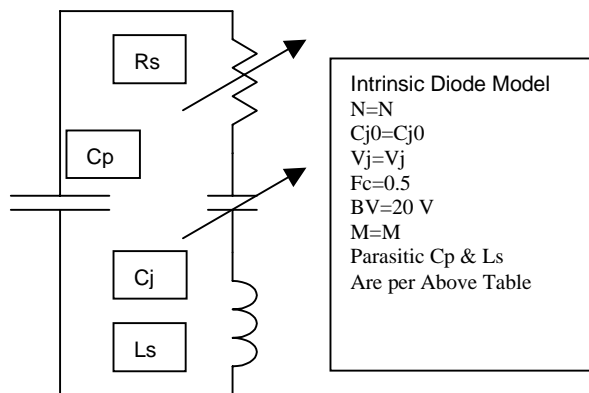
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Typical Capacitance Values

| V _R (V) | MA4ST1320 MAVR-001320 | MA4ST1330 MAVR-001330 | MA4ST1340 MAVR-001340 | MA4ST1350 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 | CJO (pF) | Vj (V) | M |
|--------------------------|-----|----------|--------|-------|
| MA4ST1320 MAVR-001320 | 1.1 | 71.5 | 20.35 | 13.21 |
| MA4ST1330 MAVR-001330 | 1.1 | 32.8 | 20.91 | 13.72 |
| MA4ST1340 MAVR-001340 | 1.1 | 22.7 | 22.32 | 14.72 |
| MA4ST1350 MAVR-001350 | 1.1 | 14.3 | 25.52 | 15.87 |

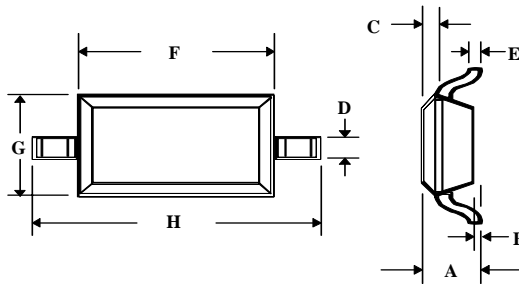
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Case Styles

SOD-323

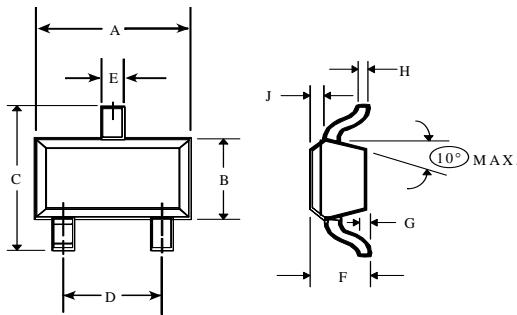
Case Style 1141



| 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

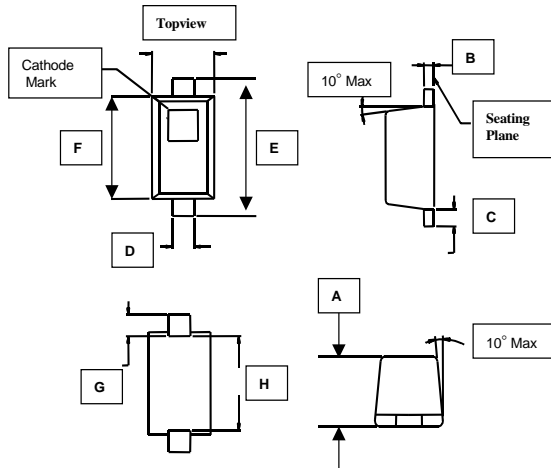
Case Style 1146



| 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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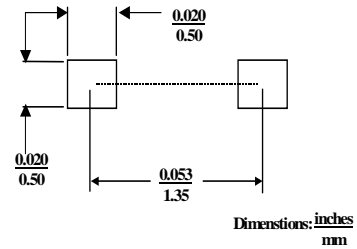
Mounting Information

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.

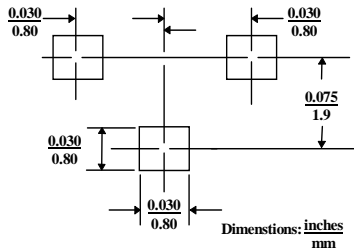
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

Please refer to Application Note M538 for surface mounting instructions.

SC-79



SOT-323



SOD-323

