

Features

- Surface Mount Packages
- High Quality Factor
- Capacitance Ratio to 9.5:1
- Tape and Reel Packaging Available
- SPC Monitored Ion Implantation for Excellent
- C-V Repeatability
- Singles and Common Cathode Pairs
- Lead-Free (RoHS Compliant) Equivalents
Available with 260 °C Reflow Compatibility

Description

M/A-COM's MA4ST400 series are ion-implanted, hyperabrupt junction, silicon tuning varactors in the SOT-23 surface mount package. These thermal oxide passivated diodes feature high capacitance ratio and quality factor. They are well suited for octave bandwidth tuning in the HF to UHF frequency bands. The standard capacitance tolerance is $\pm 10\%$, with tighter tolerances available. Capacitance matching at one or more bias voltages is also available. These diodes are offered with standard Sn/Pb plating, as well as with 100% matte Sn plating on our RoHS compliant devices.

Applications

The MA4ST400 series tuning varactors are useful for octave bandwidth tuning applications in the HF through UHF ranges. Applications include VCOs and voltage tuned filters in radios, cable TV tuners and test instruments where low cost and excellent lot-to-lot repeatability are critical. Linear tuning performance is available from 3 to 8 volts.

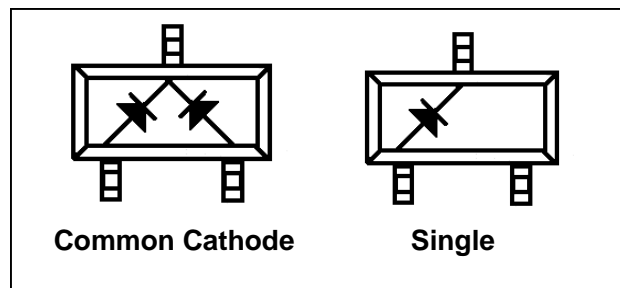
Absolute Maximum Ratings^{1,2}

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

| Parameter | Absolute Maximum |
|-------------------------|-------------------|
| Reverse Voltage | 22V |
| Forward Current | 50 mA |
| Total Power Dissipation | 250 mW |
| 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

Configurations



RoHS Compliant Parts³

| Part Number | RoHS Compliant Part Number | Configuration |
|-----------------|----------------------------|----------------|
| MA4ST401-287T | MAVR-000401-0287AT | Single |
| MA4ST403-287T | MAVR-000403-0287AT | Single |
| MA4ST404-287T | MAVR-000404-0287AT | Single |
| MA4ST405-287T | MAVR-000405-0287AT | Single |
| MA4ST406-287T | MAVR-000406-0287AT | Single |
| MA4ST407-287T | MAVR-000407-0287AT | Single |
| MA4ST408-287T | MAVR-000408-0287AT | Single |
| MA4ST409-287T | MAVR-000409-0287AT | Single |
| MA4ST401CK-287T | MAVR-000401-0287FT | Common Cathode |
| MA4ST403CK-287T | MAVR-000403-0287FT | Common Cathode |
| MA4ST404CK-287T | MAVR-000404-0287FT | Common Cathode |
| MA4ST405CK-287T | MAVR-000405-0287FT | Common Cathode |
| MA4ST406CK-287T | MAVR-000406-0287FT | Common Cathode |
| MA4ST407CK-287T | MAVR-000407-0287FT | Common Cathode |
| MA4ST408CK-287T | MAVR-000408-0287FT | Common Cathode |
| MA4ST409CK-287T | MAVR-000409-0287FT | Common Cathode |

3. Suffix refers to package style, configuration and packaging requirements. Other packages and configurations may be available upon request.

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MA4ST400 Series



Surface Mount Hyperabrupt Varactors

MA-COM Products
Rev. V4

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

Breakdown Voltage @ $I_R = 10\mu\text{A}$, $V_b = 22\text{ V}$ Minimum

Reverse Leakage Current @ $V_R = 20\text{V}$, $I_R = 100\text{ nA}$ Maximum

| Part Number Base ¹ | RoHS Compliant Part No. Base ¹ | C _T ² | | | Capacitance Ratio | Q Factor |
|----------------------------------|--|-----------------------------------|------|------|----------------------|--------------------------------------|
| | | (pF) | | | | |
| | | f = 1 MHz, V _R = 4.0 V | | | CT2.0/CT20 | f = 50 MHz V _R = 4.0 V |
| | | Min. | Nom. | Max. | Typ. | Min. |
| MA4ST401-287T | MAVR-000401-0287AT | 9.0 | 10.0 | 11.0 | 6 | 250 |
| MA4ST403-287T | MAVR-000403-0287AT | 13.5 | 15.0 | 16.5 | 7 | 250 |
| MA4ST404-287T | MAVR-000404-0287AT | 16.2 | 18.0 | 19.8 | 7 | 175 |
| MA4ST405-287T | MAVR-000405-0287AT | 19.8 | 22.0 | 24.2 | 7.5 | 175 |
| MA4ST406-287T | MAVR-000406-0287AT | 24.3 | 27.0 | 29.7 | 8 | 150 |
| MA4ST407-287T | MAVR-000407-0287AT | 29.7 | 33.0 | 36.3 | 9 | 150 |
| MA4ST408-287T | MAVR-000408-0287AT | 35.1 | 39.0 | 42.9 | 9.5 | 150 |
| MA4ST409-287T | MAVR-000409-0287AT | 42.3 | 47.0 | 51.7 | 9.5 | 150 |
| MA4ST401CK-287T | MAVR-000401-0287FT | 9.0 | 10.0 | 11.0 | 6 | 250 |
| MA4ST403CK-287T | MAVR-000403-0287FT | 13.5 | 15.0 | 16.5 | 7 | 250 |
| MA4ST404CK-287T | MAVR-000404-0287FT | 16.2 | 18.0 | 19.8 | 7 | 175 |
| MA4ST405CK-287T | MAVR-000405-0287FT | 19.8 | 22.0 | 24.2 | 7.5 | 175 |
| MA4ST406CK-287T | MAVR-000406-0287FT | 24.3 | 27.0 | 29.7 | 8 | 150 |
| MA4ST407CK-287T | MAVR-000407-0287FT | 29.7 | 33.0 | 36.3 | 9 | 150 |
| MA4ST408CK-287T | MAVR-000408-0287FT | 35.1 | 39.0 | 42.9 | 9.5 | 150 |
| MA4ST409CK-287T | MAVR-000409-0287FT | 42.3 | 47.0 | 51.7 | 9.5 | 150 |

1. The suffix defines package style, configuration and packaging information. Contact representative for complete part identification.
2. Capacitance specification is per diode

Specifications are subject to change without prior notification

2

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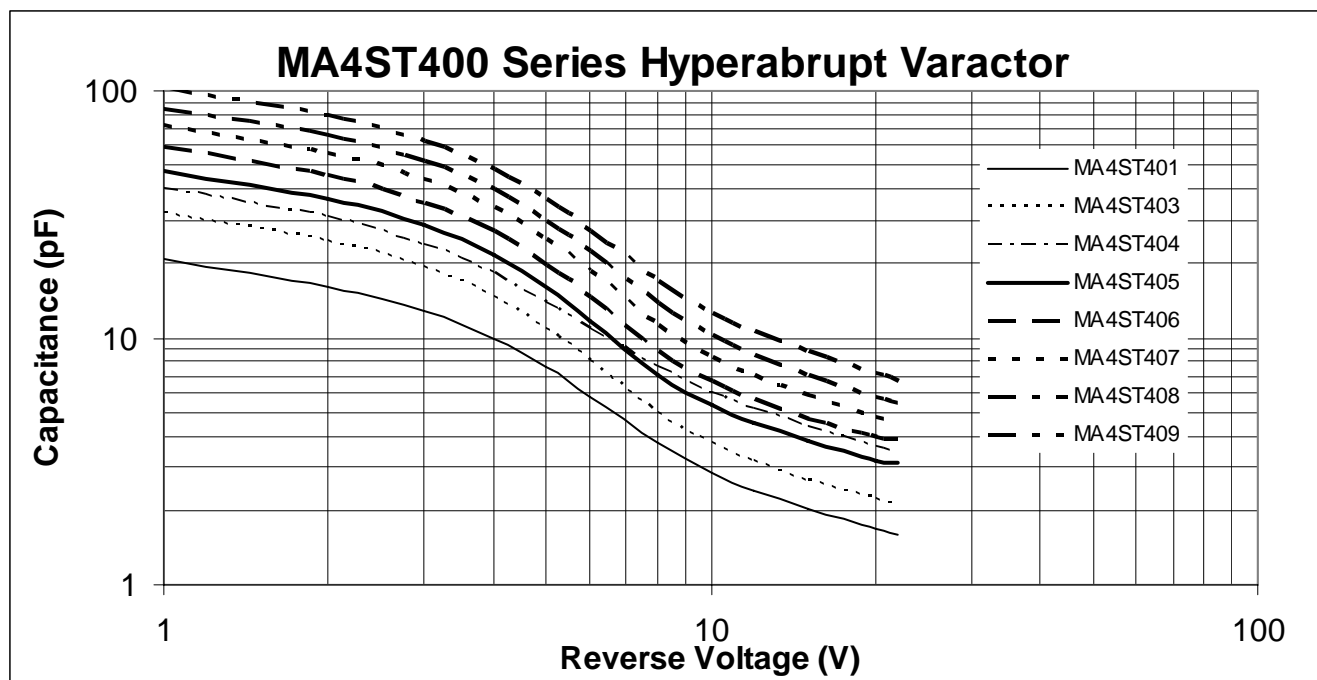
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Typical Performance Curves



Tabulated Capacitance Data

| Bias (V) | MA4ST401 | MA4ST403 | MA4ST404 | MA4ST405 | MA4ST406 | MA4ST407 | MA4ST408 | MA4ST409 |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | 30.37 | 47.05 | 59.64 | 69.45 | 86.29 | 105.60 | 124.52 | 150.59 |
| 1 | 20.86 | 32.12 | 40.43 | 47.47 | 58.98 | 72.34 | 85.20 | 103.10 |
| 2 | 16.19 | 24.72 | 30.89 | 36.55 | 45.41 | 55.93 | 65.82 | 79.70 |
| 3 | 12.83 | 19.33 | 24.00 | 28.57 | 35.50 | 44.02 | 51.83 | 62.79 |
| 4 | 9.99 | 14.74 | 18.35 | 21.73 | 27.00 | 33.85 | 39.95 | 48.45 |
| 5 | 7.59 | 10.90 | 13.95 | 15.95 | 19.82 | 25.13 | 29.86 | 36.27 |
| 6 | 5.80 | 8.08 | 10.94 | 11.73 | 14.57 | 18.64 | 22.36 | 27.26 |
| 8 | 3.76 | 4.96 | 7.61 | 7.11 | 8.83 | 11.37 | 13.80 | 17.11 |
| 10 | 2.86 | 3.76 | 6.00 | 5.37 | 6.67 | 8.45 | 10.23 | 12.73 |
| 12 | 2.41 | 3.17 | 5.12 | 4.53 | 5.63 | 7.05 | 8.50 | 10.58 |
| 15 | 2.03 | 2.66 | 4.33 | 3.81 | 4.73 | 5.87 | 7.05 | 8.79 |
| 20 | 1.68 | 2.21 | 3.60 | 3.18 | 3.95 | 4.81 | 5.76 | 7.17 |
| 22 | 1.60 | 2.09 | 3.39 | 3.11 | 3.86 | 4.53 | 5.42 | 6.75 |

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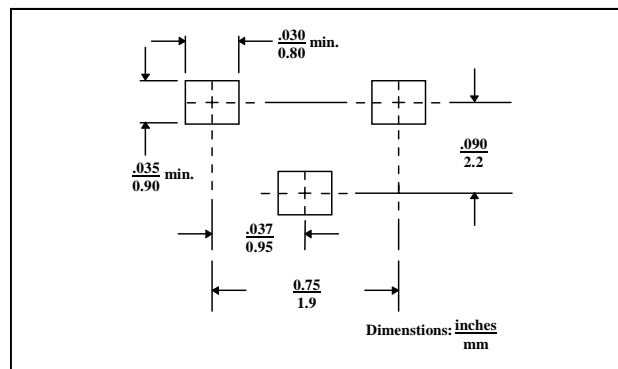
Mounting Information

The illustration indicates the recommended mounting pad configuration for the SOT-23 package. 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.

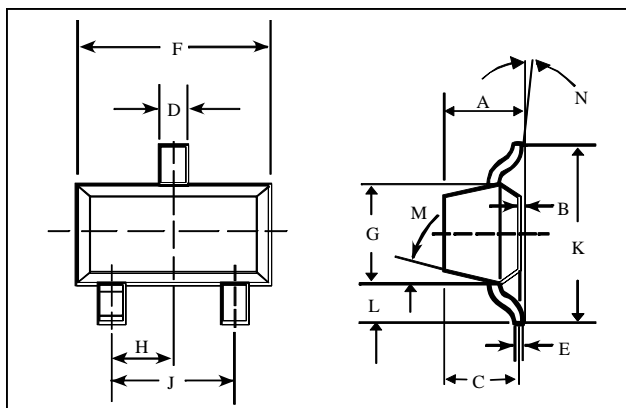
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

Please refer to Application Note M538 for surface mounting instructions.

SOT-23



SOT-23 (Case Style 287)



SOT-23 (Case Style 287)

| DIM. | INCHES | | MILLIMETERS | |
|------|---------------|-------|--------------|------|
| | MIN. | MAX. | MIN. | MAX. |
| A | — | 0.048 | — | 1.22 |
| B | — | 0.008 | — | 0.20 |
| C | — | 0.040 | — | 1.00 |
| D | 0.013 | 0.020 | 0.35 | 0.50 |
| E | 0.003 | 0.006 | 0.08 | 0.15 |
| F | 0.110 | 0.119 | 2.80 | 3.00 |
| G | 0.047 | 0.056 | 1.20 | 1.40 |
| H | 0.037 typical | | 0.95 typical | |
| J | 0.075 typical | | 1.90 typical | |
| K | — | 0.103 | — | 2.60 |
| L | — | 0.024 | — | 0.60 |
| DIM. | GRADIENT | | | |
| M | 10° max. | | | |
| N | 2° . . .30° | | | |

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