

# Surface Mount Hyperabrupt Varactors

MA4ST400 Series  
V2

## 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

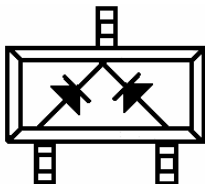
## Description

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.

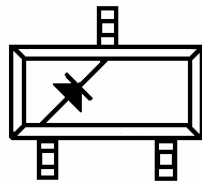
## Applications

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.

## Configurations



Common Cathode



Single

## Absolute Maximum Ratings @ $T_A = +25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)<sup>1</sup>

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

## RoHS Compliant Parts

Part Number	RoHS Compliant Part Number	Configuration
MA4ST401-287T	MAVR-000401-0287AT	Single
MA4ST402-287T	MAVR-000402-0287AT	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
MA4ST402CK-287T	MAVR-000402-0287FT	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

<sup>1</sup>Suffix refers to package style, configuration and packaging requirements. Other packages and configurations may be available upon request.

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

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	RoHs Compliant Part Number Base <sup>1</sup>	$C_T^2$			Capacitance Ratio	Q Factor
		(pF)				
		f=1 MHz, $V_R=4.0\text{V}$			CT2.0/CT20	f=50 MHz,
		Min.	Nom.	Max.	Typ.	Min.
MA4ST401-287T	MAVR-000401-0287AT	9.0	10.0	11.0	6	250
MA4ST402-287T	MAVR-000402-0287AT	10.8	12.0	13.2	6.5	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
MA4ST402CK-287T	MAVR-000402-0287FT	10.8	12.0	13.2	6.5	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

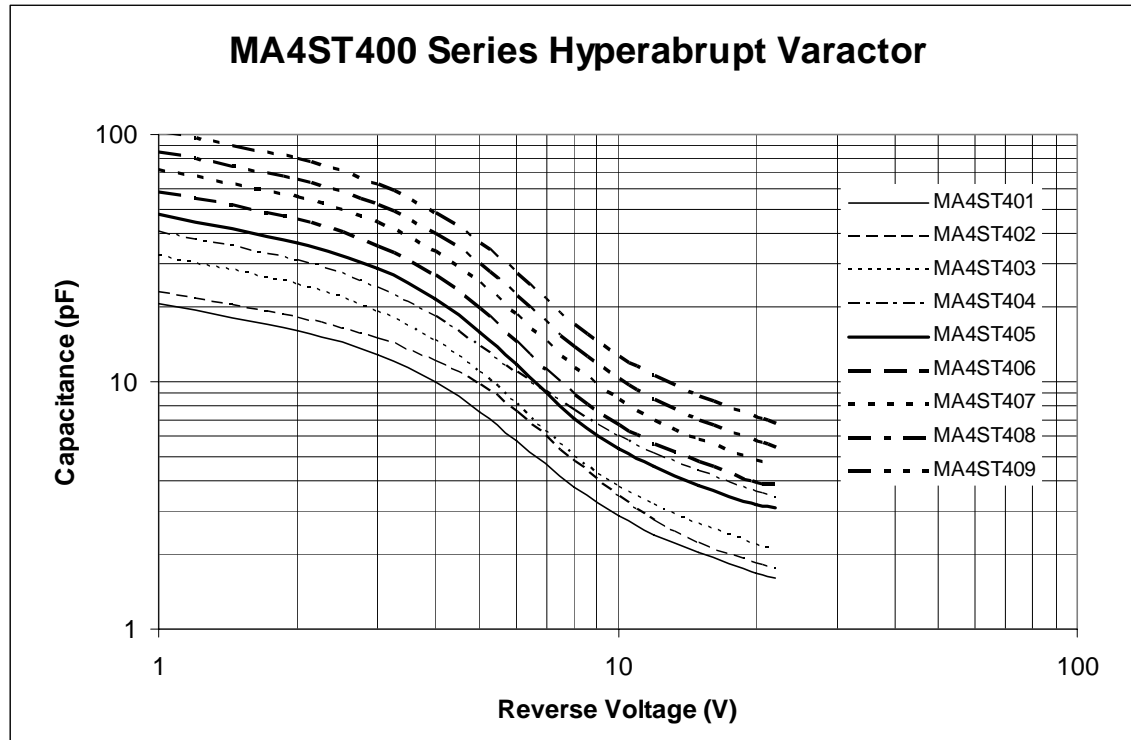
1 The suffix defines package style, configuration and packaging information. Contact representative for complete part identification.

2 Capacitance specification is per diode

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**Typical Performance Curves**



**Tabulated Capacitance Data**

Bias (V)	MA4ST401	MA4ST402	MA4ST403	MA4ST404	MA4ST405	MA4ST406	MA4ST407	MA4ST408	MA4ST409
0	30.37	33.12	47.05	59.64	69.45	86.29	105.60	124.52	150.59
1	20.86	23.02	32.12	40.43	47.47	58.98	72.34	85.20	103.10
2	16.19	18.20	24.72	30.89	36.55	45.41	55.93	65.82	79.70
3	12.83	14.87	19.33	24.00	28.57	35.50	44.02	51.83	62.79
4	9.99	12.14	14.74	18.35	21.73	27.00	33.85	39.95	48.45
5	7.59	9.69	10.90	13.95	15.95	19.82	25.13	29.86	36.27
6	5.80	7.56	8.08	10.94	11.73	14.57	18.64	22.36	27.26
8	3.76	4.79	4.96	7.61	7.11	8.83	11.37	13.80	17.11
10	2.86	3.41	3.76	6.00	5.37	6.67	8.45	10.23	12.73
12	2.41	2.74	3.17	5.12	4.53	5.63	7.05	8.50	10.58
15	2.03	2.23	2.66	4.33	3.81	4.73	5.87	7.05	8.79
20	1.68	1.83	2.21	3.60	3.18	3.95	4.81	5.76	7.17
22	1.60	1.77	2.09	3.39	3.11	3.86	4.53	5.42	6.75

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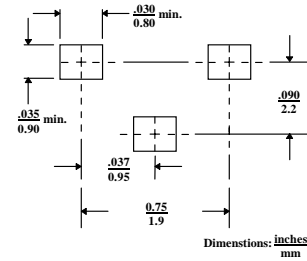
## Mounting Information

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.

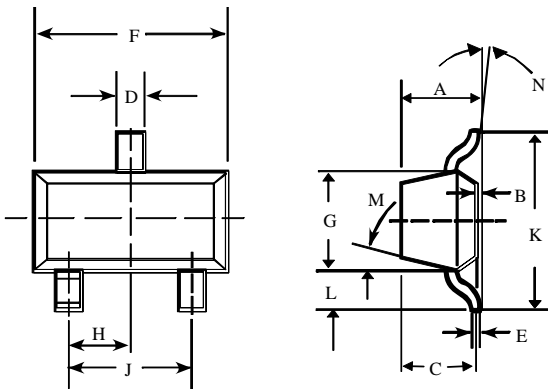
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

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
<b>DIM.</b>	<b>GRADIENT</b>			
M	10° max. <sup>1</sup>			
N	2° . . . 30°			