

# Low-Voltage / High Q Si Hyperabrupt Varactors

MA4ST200 Series  
V1

## Features

- Surface Mount Packages (SOT-23, SOT-323, SOD-323)
- High Q at Low Voltages
- High Capacitance Ratio at Low Voltages
- SPC Process for Superior C-V Repeatability
- Available as Single and Common Cathode Pairs Tape and Reel Packaging
- Designed for Commercial Wireless Applications
- Lead-Free (RoHs Compliant) equivalents available with 260°C reflow compatibility

## Description

M/A-COM's MA4ST200 series is a ion-implanted, hyperabrupt junction, silicon tuning varactors in SOT-23, SOT-323, and SOD-323 surface mount packages. This series of varactors is designed for high Q and low voltage operation. Each varactor type has a Q greater than 400 at -2 V. These diodes are offered with standard Sn/Pb plating, as well as 100% matte Sn plating on our RoHs compliant equivalent devices.

## Applications

The MA4ST200 series tuning varactors are useffil for wide band tuning and low phase noise applications where the supply voltage is limited to 5 volts or less. These varactors have been specifically designed for use in the wireless communications up to the 2.4 GHz band. Applications include VCOs and voltage tuned filters.

## RoHs Compliant parts

Part Number	RoHs Compliant Base Part Number
MA4ST230	MAVR-000230
MA4ST240	MAVR-000240
MA4ST250	MAVR-000250

## 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
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

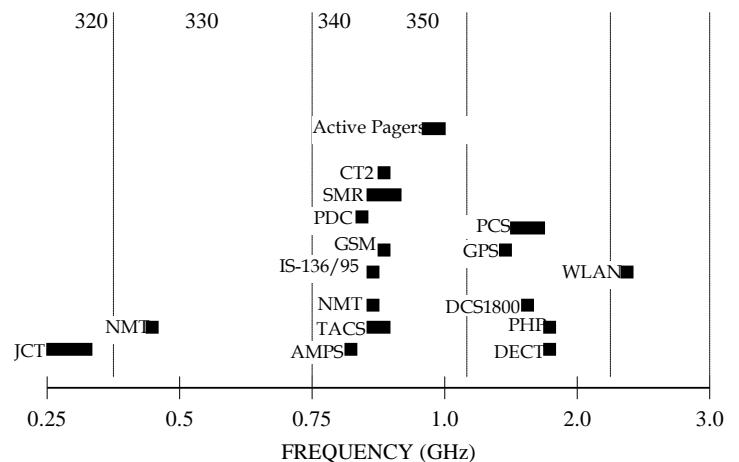


Fig. 1 Typical Device Selection by Frequency

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

Breakdown Voltage @  $I_R = 10\mu\text{A}$ ,  $V_b = 12\text{ V}$  Minimum

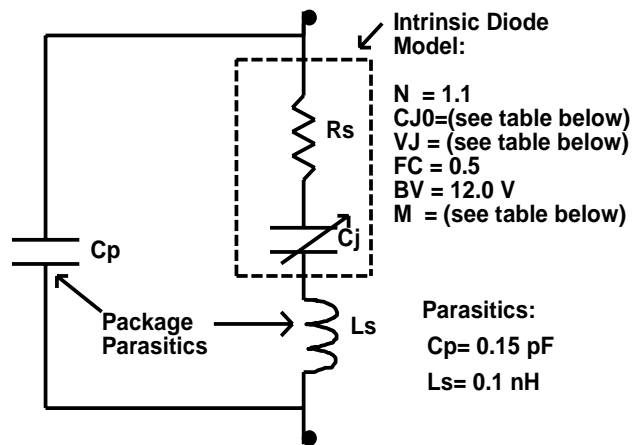
Reverse Leakage Current @  $V_R = 10\text{V}$ ,  $I_R = 100\text{ nA}$  Maximum

Part Number Base	RoHs Compliant Part Number Base <sup>1</sup>	$C_T^2$				Capacitance Ratio	Q Factor
		(pF)		(pF)			
		f=1 MHz, $V_R=2.0$		f=1MHz, $V_R=4.0\text{V}$		$C_{T0.5}/C_{T4.0}$	f=50 MHz, $V_R = 2.0\text{V}$
		Min.	Nom.	Max.	Max.	Typ.	Min.
MA4ST230	MAVR-000230-XXXXXX	4.5	5.0	6.0	3.1	3.5	400
MA4ST240	MAVR-000240-XXXXXX	3.0	3.5	4.2	2.3	3.5	450
MA4ST250	MAVR-000250-XXXXXX	2.3	2.7	3.5	1.8	3.5	450

<sup>1</sup> The suffix defines package style, configuration and packaging information. Contact representative for complete part identification. Example : The MA4ST250-1141T RoHs compliant version is MAVR-000250-11410T .

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

## Spice Model



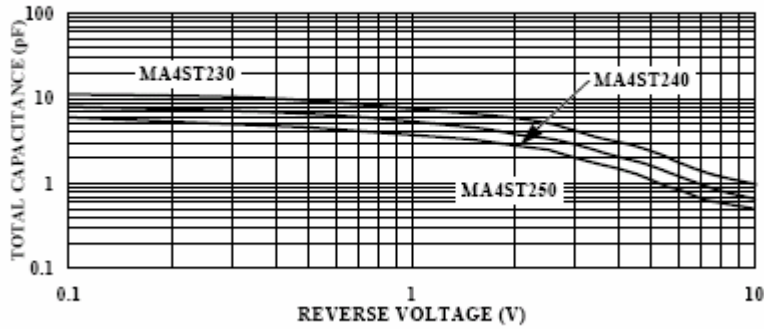
Part No.	RoHs Compliant Base Part No.	CJ0 (pF)	VJ (V)	M
MA4ST230	MAVR-000230	12.0	4.085	2.228
MA4ST240	MAVR-000240	8.16	4.930	2.520
MA4ST250	MAVR-000250	6.19	4.774	2.458

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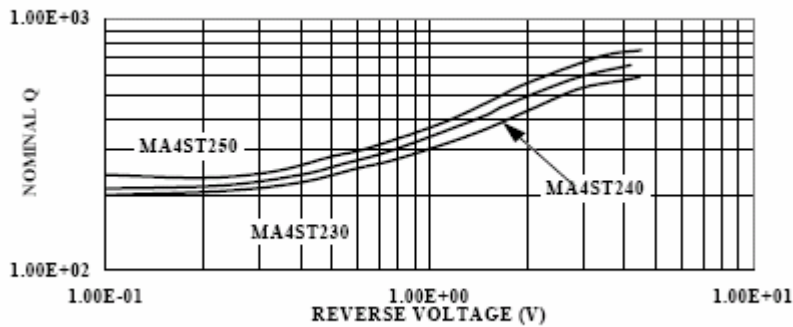
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**Typical Performance Curves**

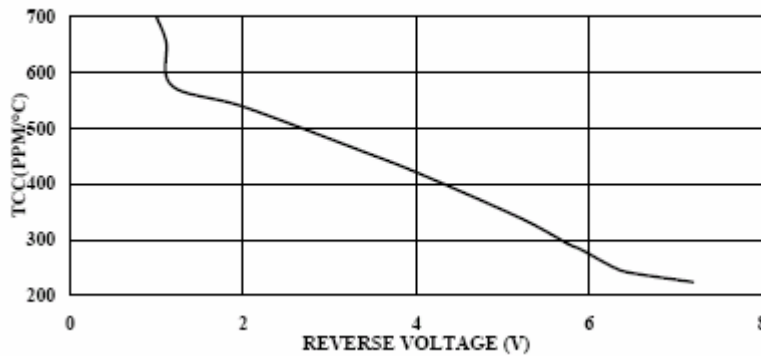
**TOTAL CAPACITANCE vs REVERSE VOLTAGE at 1 MHz**



**NOMINAL Q at 50 MHz vs REVERSE VOLTAGE**



**NOMINAL CHANGE in CAPACITANCE with TEMPERATURE**



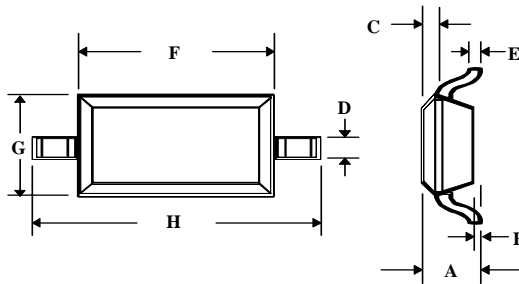
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**Case Styles**

**SOD-323**

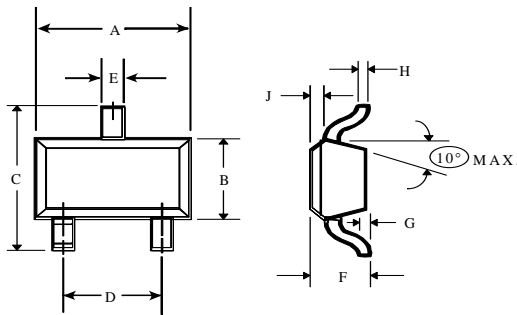
**Case Style 1141**



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**

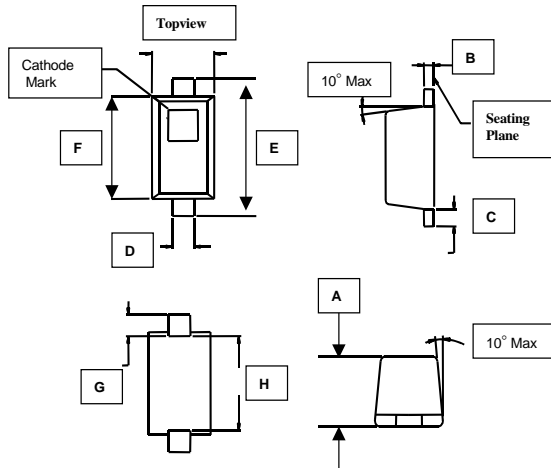
**Case Style 1146**



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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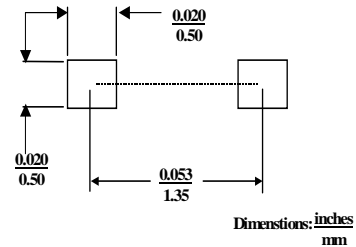
### Mounting Information

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.

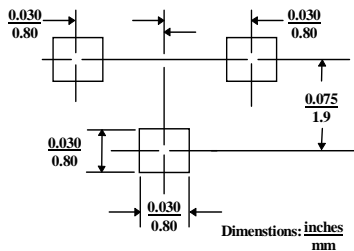
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

Please refer to Application Note M538 for surface mounting instructions.

### SC-79



### SOT-323



### SOD-323

