

Ultra High Ratio Si Hyperabrupt Varactor Diode

**MA4ST2000 Series
V4**

Features

- Ultra High Capacitance Ratio, $C(0.1V)/C(4.7V) = 18:1$, $C(0.1V)/C(2.7V) = 12:1$
- Surface Mount Plastic Packages : SOD-323, SC-70, 3 Lead
- SPC Process for Superior C vs V and Q vs V Repeatability

Description and Applications

M/A-COM's MA4ST2000 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 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. Varactors in this series have a typical 18:1 capacitance ratio between 0.1 V and 4.7 V and a 12:1 ratio between 0.1 V and 2.7 V. The varactors are offered as singles in SOD-323 configurations with common cathode version offered in a SC-70, 3 Lead.

Absolute Maximum Ratings @ $T_A = +25^\circ\text{C}$ (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.

Ordering Information

Part Number	Configuration	Package
MA4ST2XXX-1141T	Single	SOD-323
MA4ST2XXX-1146T	Common Cathode	SC-70 (3 L)

Technical Parasitic Information

Package Type	Package Cp (pF)	Package Ls (nH)
SOD-323	0.11	1.2
SC-70, 3 Lead	0.12	1.3

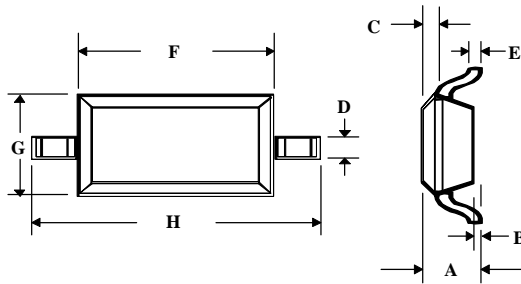
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Case Styles

SOD-323

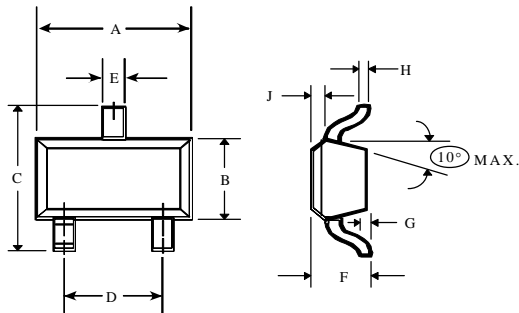
Case Style 1141



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

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

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

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

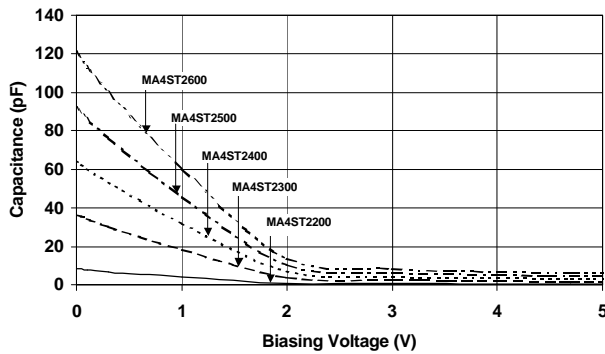
Part Number	Ct* (pF)						Capacitance Ratio		Rs** (Ohm)	
	$V_R = 0.1\text{ V}$	$V_R = 1.0\text{ V}$			$V_R = 2.7\text{ V}$	$V_R = 4.7\text{ V}$	$C_{t0.1}/C_{t4.7}$	$C_{t0.1}/C_{t2.7}$	$V_R = 4.0\text{ V}$	
	Typ.	Min.	Nom.	Max.	Typ.	Typ.	Typ.	Typ.	Typ.	Max.
MA4ST2200	7.68	3.66	4.07	4.48	0.70	0.47	16.3	11.0	3.84	4.6
MA4ST2300	34.2	16.2	18.0	19.8	2.67	1.85	18.5	12.8	0.95	1.2
MA4ST2400	60.3	28.6	31.8	34.9	4.98	3.27	18.4	12.1	0.67	0.9
MA4ST2500	86.4	41.4	46.0	50.6	6.68	4.64	18.6	12.9	0.61	0.8
MA4ST2600	113.3	54.3	60.3	66.4	9.14	6.27	18.1	12.4	0.54	0.7

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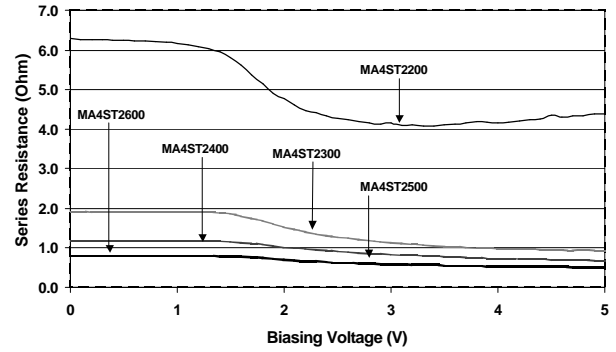
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* Capacitance @ 1 MHz
** Series Resistance @ 470 MHz

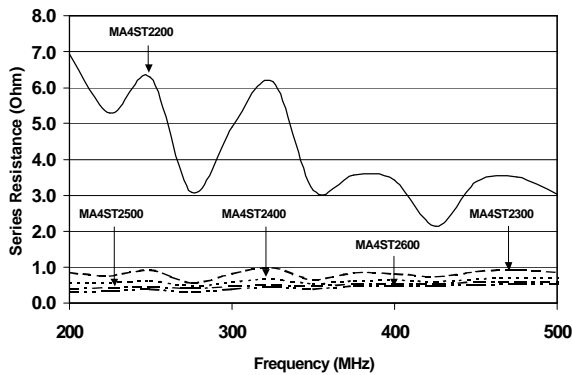
Typical Capacitance vs. Biasing Voltage



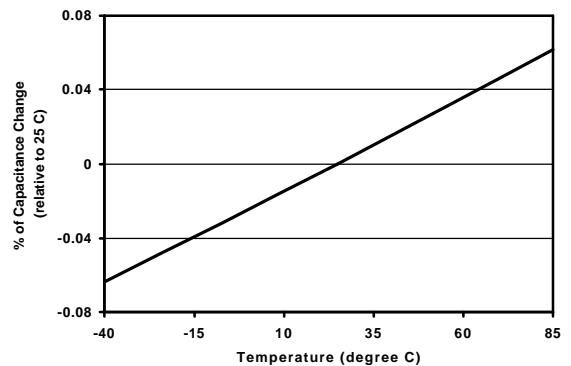
Typical Series Resistance vs. Biasing Voltage



Typical Series Resistance vs. Frequency



Typical Capacitance Change vs. Temperature



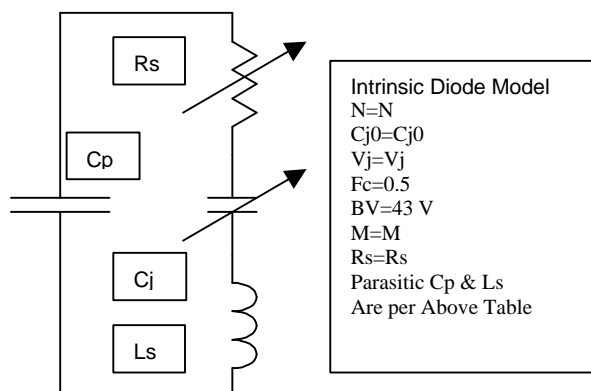
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Typical Capacitance Values

V_R (V)	MA4ST2200	MA4ST2300	MA4ST2400	MA4ST2500	MA4ST2600
	Ct (pF)	Ct (pF)	Ct (pF)	Ct (pF)	Ct (pF)
0.1	7.643	34.06	60.26	86.48	113.09
0.3	6.746	30.07	53.12	76.34	99.80
0.5	5.948	26.56	46.81	67.36	88.07
1.0	4.006	18.00	31.75	46.09	60.31
1.5	1.895	8.313	15.52	22.83	30.21
2.0	0.985	3.941	7.470	10.05	13.94
2.5	0.744	2.889	5.407	7.112	9.952
3.0	0.638	2.429	4.512	5.918	8.274
3.5	0.579	2.166	4.000	5.275	7.332
4.0	0.543	1.993	3.663	4.895	6.749
4.5	0.517	1.845	3.370	4.691	6.317
5.0	0.469	1.771	3.200	4.557	6.086

Spice Model



Part Number	N	CJO (pF)	Vj (V)	M	Rs (W)
MA4ST2200	1.261	10.2	12.62	18.60	1.114
MA4ST2300	1.210	46.8	2.450	4.268	1.085
MA4ST2400	1.158	84.6	1.322	2.632	0.903
MA4ST2500	1.204	100	1.616	2.700	0.842
MA4ST2600	1.196	159	1.169	2.270	0.910