UHF, VHF Hyperabrupt Tuning Varactors

MA4ST520, MA4ST530 Series

V3.00

Features

- A Superior Ion Implantation Process Results in More Repeatable C-V Characteristics Within Specified Capacitance Tolerances
- High Q
- Usable Capacitance Change Ratios as High as 8:1. (MA4ST520 Series)

Description

M/A-COM's silicon hyperabrupt tuning varactors combine advantages of a repeatable ion-implant process with excellent passivation and low series resistance. The resulting diodes exhibit a C-V characteristic that is consistent from lot to lot and stable within close tolerances, over time and temperature.

Applications

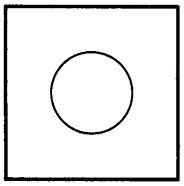
The MA4ST520 series was developed for VCO tuning in the VHF through UHF ranges. Applications are high volume fixed tuned and frequency hopping military radios where low cost and lot-to-lot C-V repeatability are critical. The MA4ST530 family has a faster change of capacitance with voltage.

Ordering Information

When ordering diodes, use the appropriate M/A-COM model number and add case style suffix where appropriate. (For example, MA4ST520B is an 18-22 pF (@ 4V) varactor in the standard glass package (case style 4). The MA4ST520B-132 is the unpackaged chip version.

Case Style (See appendix for complete dimensions)

4



132

Absolute Maximum Ratings at 25°C

Parameter	Absolute Maximum
Temperature Range	
Operating	-65°C to +125°C
Storage	-65°C to +150°C
Power Dissipation (Max.)	(derate linearly to zero at 150°C) 250 mW (Case Style 4)
Max. Reverse Voltage	Same as V_B
Forward Current	50 mAdc
Max. Leakage Current	@ 80% V_B = 100 nA max. @ +25°C

High Tuning Ratio
Electrical Specifications at 25°C

Min. Reverse Voltage V_R 22 V @ 10 µA Max. Reverse Leakage Current I_R @ 18 V = 100 nAmps

Parameter	Diode Capacitance[1] (pF)				Tuning Ratio		Figure of Merit	
Test Conditions	F = 1 MHz				F = 1 MHz		F = 50 MHz	
	V_R = 2.5 Vdc	V_R = 4.0 Vdc	V_R = 8.0 Vdc	V_R = 20 Vdc	C (4V)/C (8V)	C (4V)/C (20V)	V_R = 4 Vdc	
Part Number	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Typ.	Chip Style[2]
MA4ST520	25/29	18/22	—	—	—	—	150	132
MA4ST520B	—	18/22	7.5/10.5	3.1/3.9	—	4.6/7.1	300	132
MA4ST520D	—	19/21	7.8/9.2	3.1/3.9	2.0/2.7	4.8/6.8	300	132
MA4ST522	62/72	45/55	—	—	—	—	100	132
MA4ST522C	—	47.5/52.5	18.4/21.6	—	2.2/2.8	—	200	132
MA4ST522D	—	47.5/52.5	18.4/21.6	7.3/9.2	2.2/2.8	5.2/6.9	200	132
MA4ST523	135/160	100/120	—	—	—	—	65	200
MA4ST523C	—	104.5/115.5	41.4/48.6	—	2.15/2.8	—	125	200
MA4ST523D	—	104.5/115.5	41.4/48.6	16/20	2.15/2.8	5.2/7.3	125	200
MA4ST524	195/225	140/170	—	—	—	—	50	200
MA4ST524C	—	147/163	59.8/70.2	—	2.1/2.8	—	100	200
MA4ST524D	147/163	147/163	59.8/70.2	22.5/28	2.1/2.8	5.2/7.2	100	200

Note:
1. The capacitance values and tuning ratios are given for diodes in case style 4. Chip diodes may have slightly different values.

Electrical Specifications at 25°C

Parameter	Reverse Breakdown Volage (Vdc)	Diode Capacitance[1] (pF)				Tuning Ratio		Figure of Merit
Test Conditions		F = 1 MHz				F = 1 MHz		F = 50 MHz
	@ 10 µAdc	V_R = 1.25 Vdc	V_R = 3.0 Vdc	V_R = 8.0 Vdc	V_R = 20 Vdc	C (3V)/C (8V)	C (3V)/C (20V)	V_R = 3 Vdc
Part Number	MIn.	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Min./Max.	Typ.
MA4ST533	15	14/17.5	10.5/12.5	—	—	—	—	200
MA4ST533B	22	_	10.5/12.5	4.3/4.7	2.0/2.4	—	4.4/6.3	300
MA4ST533C	22	—	10.5/12.5	4.3/4.7	2.0/2.3	—	4.6/6.3	450
MA4ST534B	22	—	25/31	10/13.5	4.5/5.3	—	4.7/6.9	200
MA4ST534C	22	—	25/31	10/13.5	4.5/5.1	—	4.9/6.9	300

Notes:
1. For all model numbers listed above the reverse leakage current at 80% of related V_B Max. is 100 nAmps Max.
2. All model numbers listed above are available in axial lead Case Style 4 and Chip Style 132. To order chip style 132, add the case style suffix to the part number, ie: MA4ST533-132.

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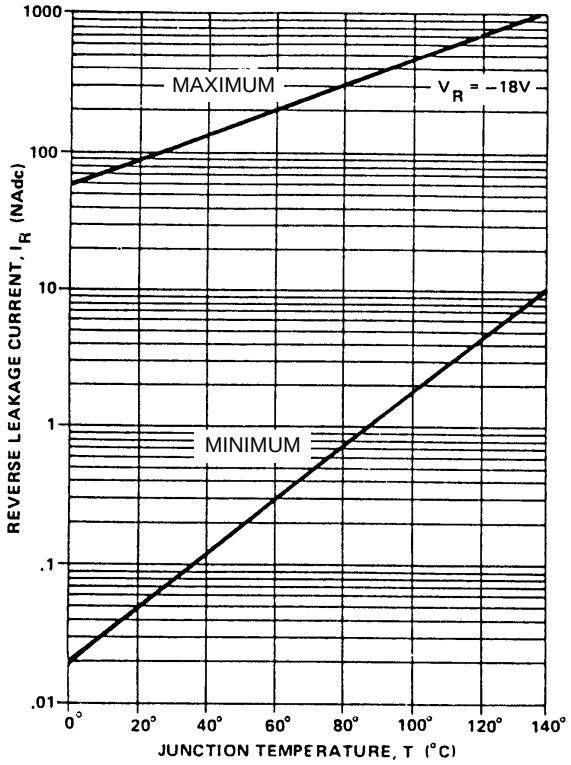
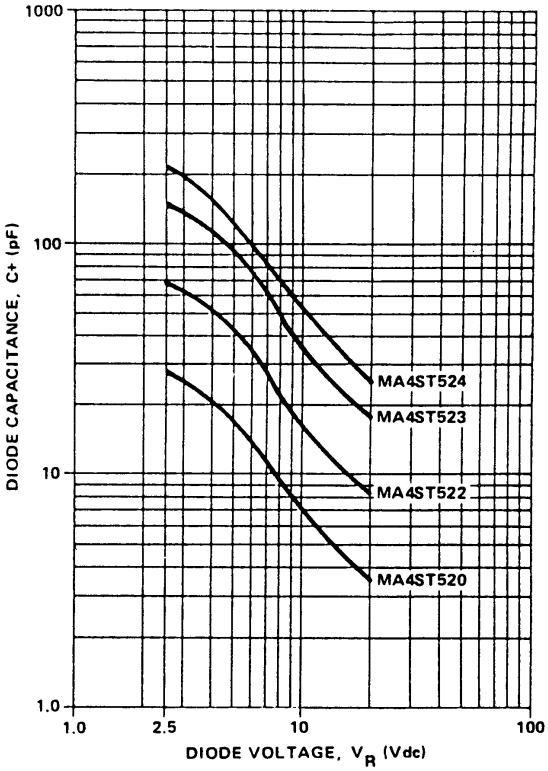
Typical Performance Curves MA4ST520 Series

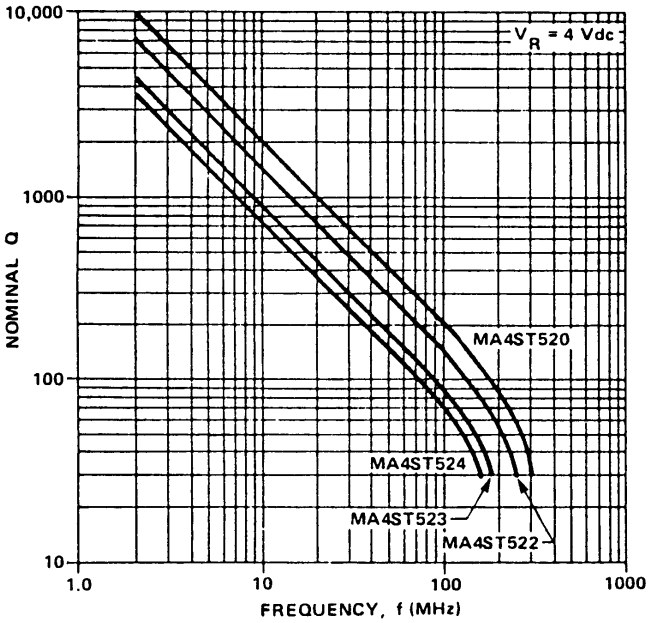
REVERSE LEAKAGE CURRENT @ - 18V vs JUNCTION TEMPERATURE



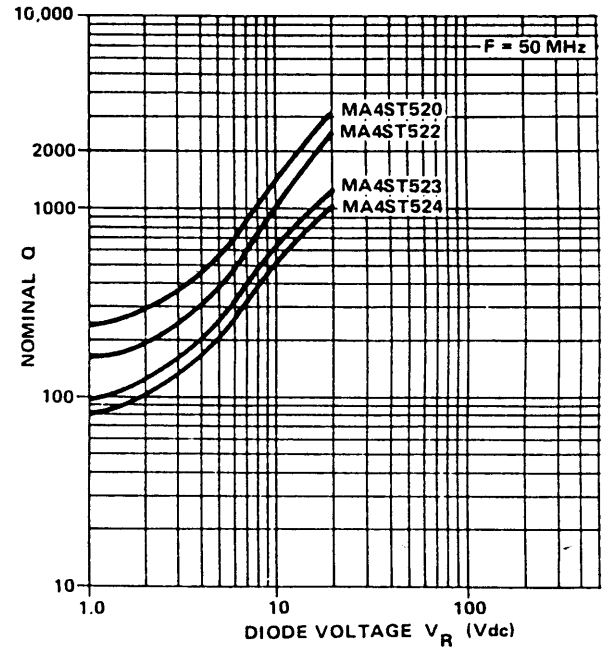
NOMINAL CAPACITANCE vs TUNING VOLTAGE T_A = +25°C



NOMINAL Q vs FREQUENCY

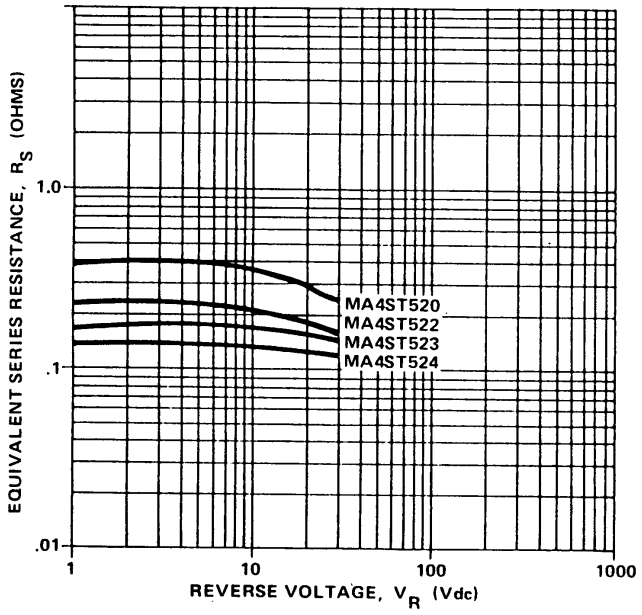


NOMINAL Q vs TUNING VOLTAGE

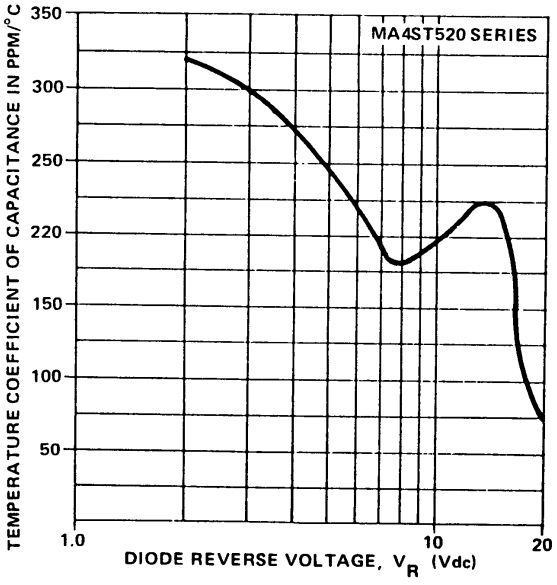


Typical Performance Curves MA4ST520 Series (Cont'd)

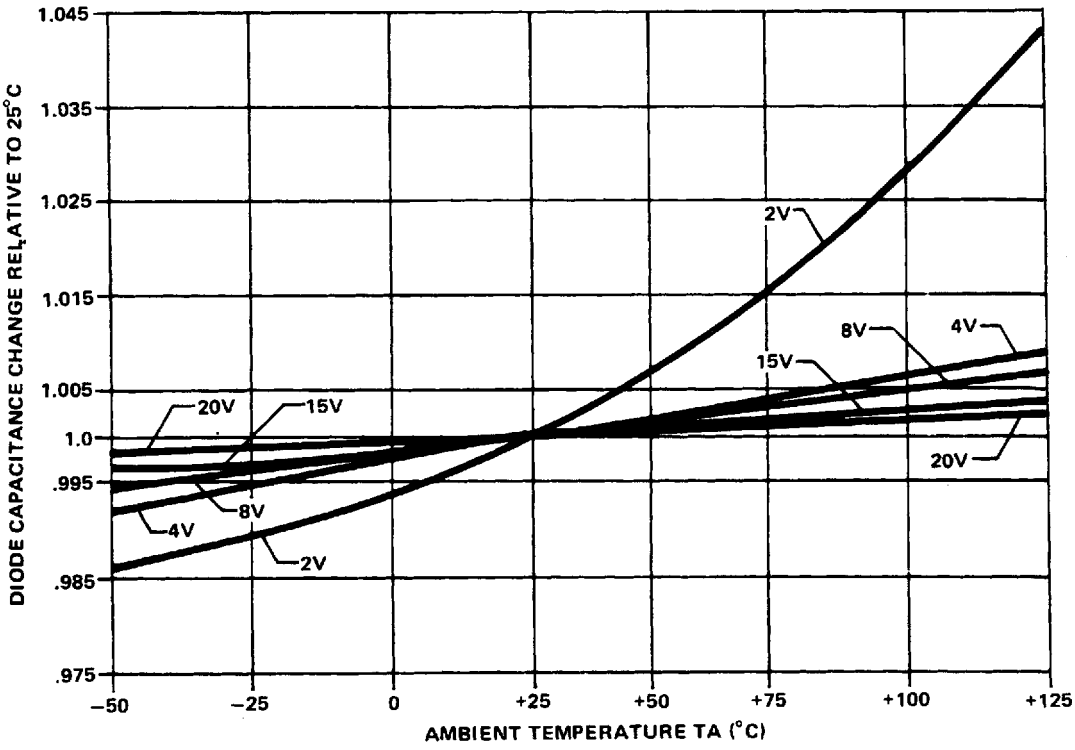
EQUIVALENT SERIES RESISTANCE vs VARACTOR VOLTAGE (T_A = +25°C)



TEMPERATURE COEFFICIENT OF CAPACITANCE IN PPM/°C vs TUNING VOLTAGE



CAPACITANCE CHANGE vs AMBIENT TEMPERATURE



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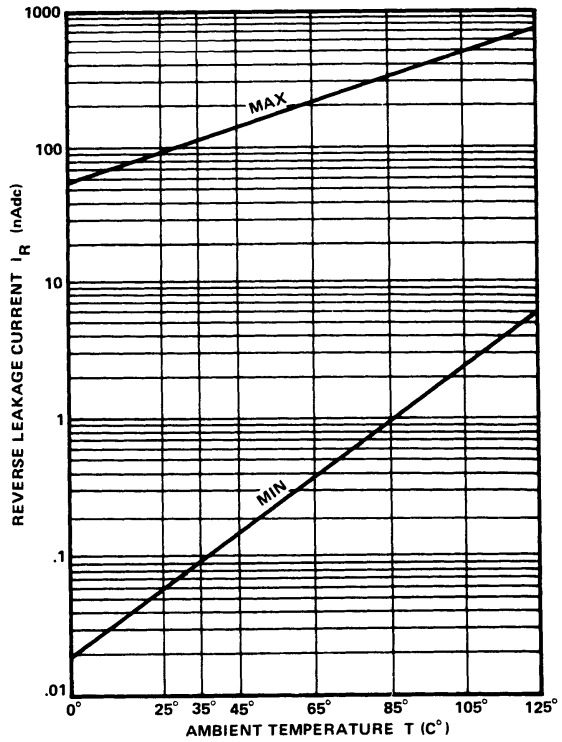
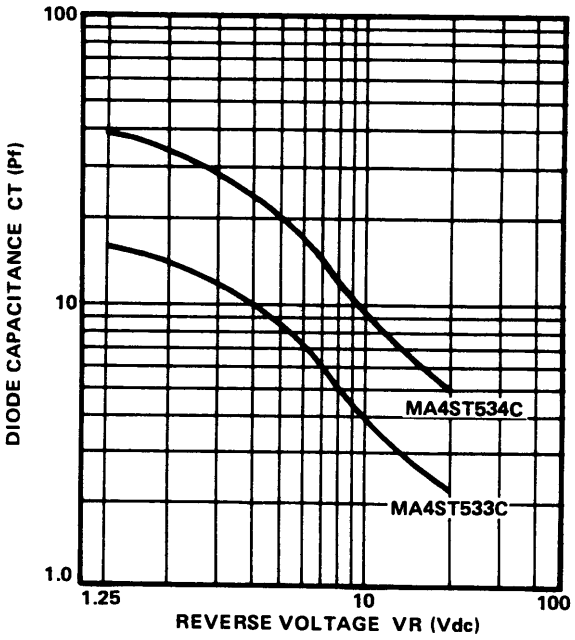
Typical Performance Curves MA4ST530 Series

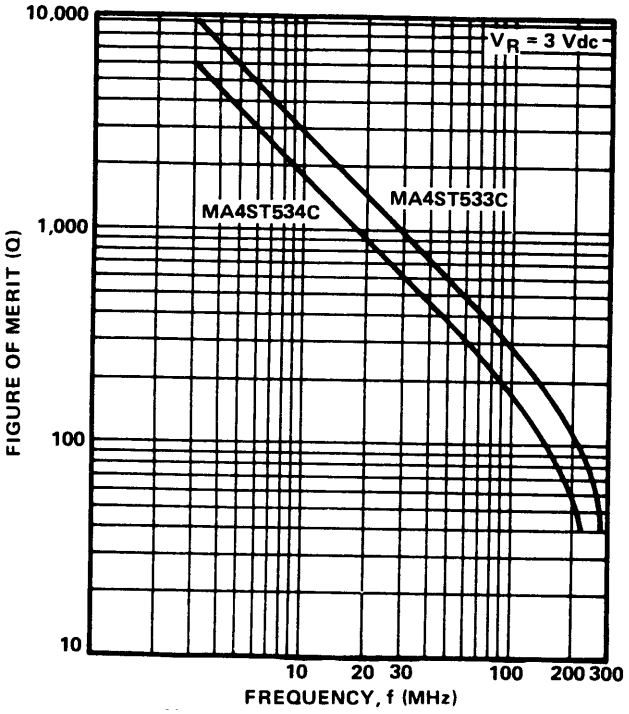
REVERSE LEAKAGE CURRENT @ 80% V_B vs AMBIENT TEMPERATURE



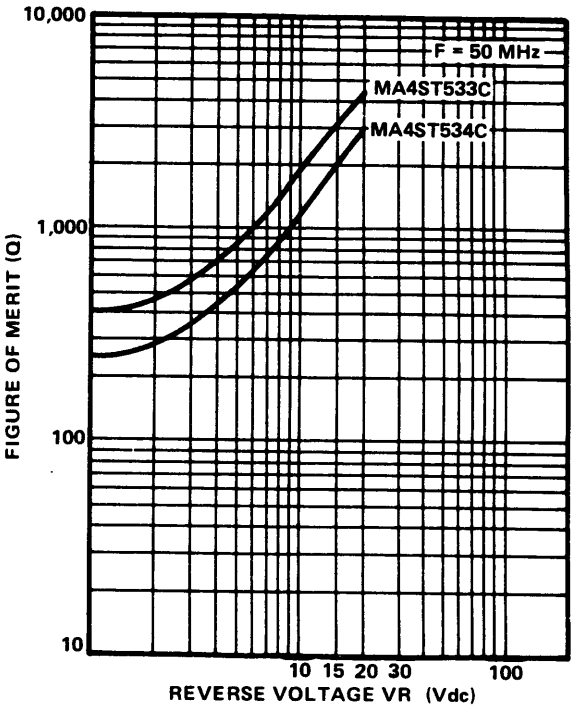
NOMINAL CAPACITANCE vs TUNING VOLTAGE T_A = +25°C



NOMINAL Q vs FREQUENCY

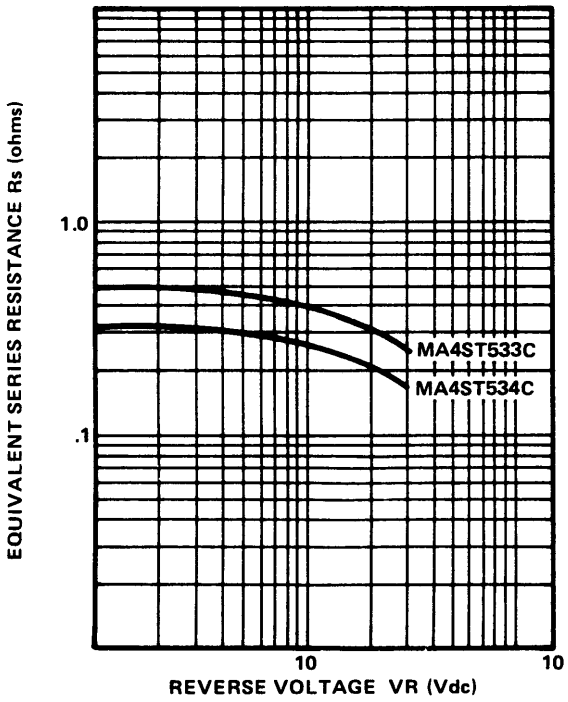


NOMINAL Q vs TUNING VOLTAGE

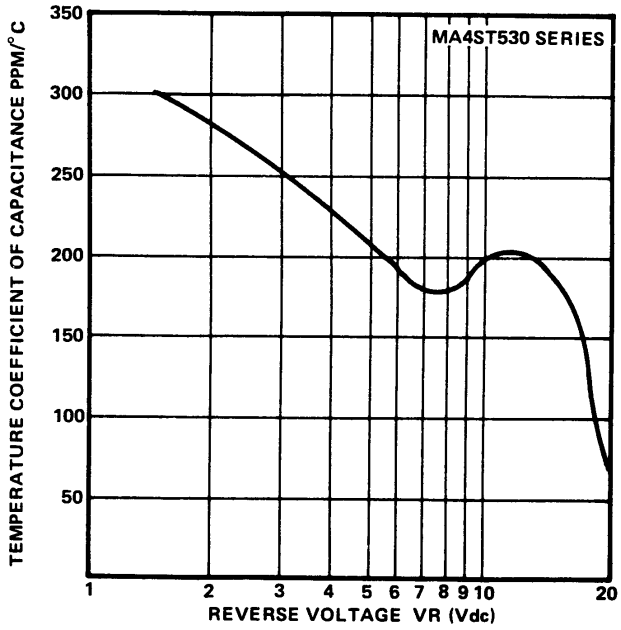


Typical Performance Curves MA4ST530 Series (Cont'd)

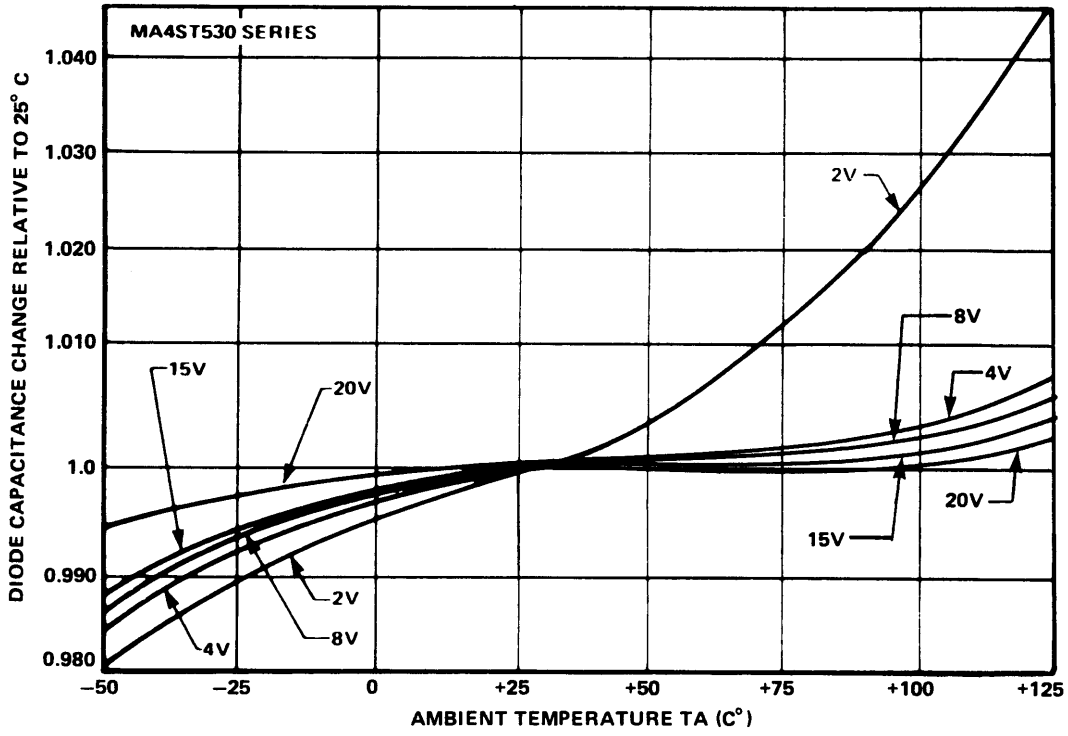
EQUIVALENT SERIES RESISTANCE vs VARACTOR VOLTAGE (T_A = 25°C)



TEMPERATURE COEFFICIENT OF CAPACITANCE IN PPM/°C vs TUNING VOLTAGE



CAPACITANCE CHANGE vs AMBIENT TEMPERATURE



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