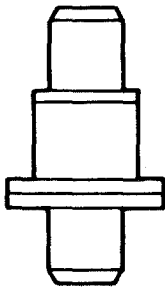


MA45200 Series

Silicon Abrupt Junction Tuning Varactors

30



Features

- HIGH Q
- LOW LEAKAGE
- AVAILABLE IN CHIP FORM
- AVAILABLE IN CERAMIC PACKAGES
- CUSTOM DESIGNS AVAILABLE
- LOW POST TUNING DRIFT
- FREQUENCY RANGE VHF — Ku-BAND
- CAN BE SCREENED TO TX, TXV SPECIFICATIONS

Description

The MA45200 series of silicon abrupt junction tuning varactors has been designed to obtain the highest Q possible. Each device in this series has a high density silicon dioxide passivation which results in exceptionally low leakage currents and low post tuning drift. These silicon abrupt junction tuning varactors, which have a high Q, also exhibit large capacitance changes with bias voltages. The capacitance change is approximately equal to the square root of the voltage. The MA45200 series diodes are available in a number of ceramic packages as well as in chip form.

Applications

The MA45200 series of silicon tuning diodes is ideally suited for frequency tuning applications through Ku band. These devices are designed for use in solid state electronic tuning of transistor, Gunn and IMPATT oscillators.

Model ¹ Number	Minimum ⁶ V _b (Volts)	Total ^{2,7} Capacitance (pF)	Minimum ^{3,7} Capacitance Ratio C _{t0} /C _{tVb}	Minimum ⁴ "Q"	Frequency Range (GHz)	Available ^{1,7} Case Style (Chip)
MA45225	30	0.5	2.7	5500	10-12	132
MA45226	30	0.6	2.9	5500	9-11	132
MA45227	30	0.8	2.9	5000	8-10	132
MA45228	30	1.0	3.0	4800	7-9	132
MA45229	30	1.2	3.2	4800	6-8	132
MA45230	30	1.5	3.3	4500	6-8	132
MA45231	30	1.8	3.5	4000	5-7	132
MA45232	30	2.2	3.6	4000	5-7	132
MA45233	30	2.7	3.7	4000	4-6	132
MA45234	30	3.3	3.7	3500	4-6	132
MA45235	30	3.9	3.8	3500	3-5	132
MA45236	30	4.7	3.8	3000	2-4	132
MA45237	30	5.6	3.9	3000	2-4	132
MA45238	30	6.8	3.9	3000	2-4	132
MA45239	30	8.2	3.9	2700	1-2	132
MA45240	30	10.0	4.0	2500	1-2	132
MA45241	30	12.0	4.0	2200	.5-1.0	132
MA45242	30	15.0	4.0	2000	.5-1.0	132

45 Volt Silicon Abrupt Junction Tuning Varactors

Nominal Characteristics

Model ¹ Number	Minimum ⁶ V _b (Volts)	Total ^{2,7} Capacitance (pF)	Minimum ^{3,7} Capacitance Ratio C _{t0} /C _{tVb}	Minimum ⁴ "Q"	Frequency Range (GHz)	Available ^{1,7} Case Style (Chip)
MA45245	45	0.5	3.3	4000	9-11	132
MA45246	45	0.6	3.7	4000	8-10	132
MA45247	45	0.8	3.9	3800	5-7	132
MA45248	45	1.0	4.0	3500	5-7	132
MA45249	45	1.2	4.2	3500	4-6	132
MA45250	45	1.5	4.4	3300	4-6	132
MA45251	45	1.8	4.6	3000	3-5	132
MA45252	45	2.2	4.8	2700	3-5	132
MA45253	45	2.7	5.5	2700	2-3	132
MA45254	45	3.3	5.2	2400	2-3	132
MA45255	45	3.9	5.3	2200	1.5-2.5	132
MA45256	45	4.7	5.4	2000	1.0-1.5	132
MA45257	45	5.6	5.4	2000	1.0-1.5	132
MA45258	45	6.8	5.4	1800	1.0-1.5	132
MA45259	45	8.2	5.4	1700	1.0-1.5	132

NOTES

- Case style 30 is the standard enclosure for this series. On special order, these devices are also available in other case styles including 31, 94, 96, 108, and in chip form. To order the MA45200 series in chip form or other case styles, add the designated available case number as a suffix to the model number, i.e., MA45229-132 is a chip or MA45229-96 is in the 96 case style.
- Total capacitance is measured at 1 MHz and -4 volts. The standard capacitance is $\pm 10\%$. A tighter tolerance $\pm 5\%$ may be obtained, at an additional cost, by adding the suffix "A" to the basic model number.
- The total capacitance ratio will vary with different packages due to differences in package parasitic capacitance.

- Diode Q at -4 volts is determined at 1.0 GHz and extrapolated to 50 MHz by:

$$Q_{-4} = \frac{1}{2\pi f C_{j-4} R_s}$$

- Reverse leakage current is measured at 80% of the minimum breakdown voltage and will be 20 nanoamperes maximum.
- Reverse leakage is 10 microamperes maximum at minimum breakdown voltage.
- The total capacitance and capacitance ratios shown are for diodes housed in case style 30. Other cases and chip styles will result in slightly different values.

Specifications @ $T_A = 25^\circ\text{C}$ (Cont'd)**60 Volt Silicon Abrupt Junction Tuning Varactors****Nominal Characteristics**

Model ¹ Number	Minimum ⁶ V_b (Volts)	Total ^{2,7} Capacitance (pF)	Minimum ^{3,7} Capacitance Ratio C_{t0}/C_{tvb}	Minimum ⁴ "Q"	Frequency Range (GHz)	Available ^{1,7} Case Style (Chip)
MA45260	60	0.6	4.5	2500	4-6	132
MA45261	60	0.8	4.5	2300	4-6	132
MA45262	60	1.0	4.8	2200	4-6	132
MA45263	60	1.2	5.2	2000	2-4	132
MA45264	60	1.5	5.6	1800	2-4	132
MA45265	60	1.8	5.9	1800	2-4	132
MA45266	60	2.2	6.0	1700	1.5-2.0	132
MA45267	60	2.7	6.2	1700	1.5-3.0	132
MA45268	60	3.3	6.3	1600	1.5-3.0	132
MA45269	60	3.9	6.4	1500	1.0-2.0	132
MA45270	60	4.7	6.5	1400	1.0-2.0	132
MA45271	60	5.6	6.5	1400	1.0-2.0	132
MA45272	60	6.8	6.5	1200	0.5-1.0	132
MA45273	60	8.2	6.8	1200	0.5-1.0	132
MA45274	60	10.0	7.0	1000	0.5-1.0	132
MA45275	60	12.0	7.0	1000	0.5-1.0	131
MA45276	60	15.0	7.2	900	0.25-0.50	131
MA45277	60	18.0	7.2	900	0.25-0.50	131
MA45278	60	22.0	7.4	800	0.25-0.50	131
MA45279	60	27.0	7.4	800	0.10-0.25	131
MA45280	60	33.0	7.4	700	0.10-0.25	131

90 Volt Silicon Abrupt Junction Tuning Varactors**Nominal Characteristics**

Model ¹ Number	Minimum ⁶ V_b (Volts)	Total ^{2,7} Capacitance (pF)	Minimum ^{3,7} Capacitance Ratio C_{t0}/C_{tvb}	Minimum ⁴ "Q"	Frequency Range (GHz)	Available ^{1,7} Case Style (Chip)
MA45290	90	1.0	6.0	1500	2.0-4.0	132
MA45291	90	1.2	6.5	1200	2.0-4.0	132
MA45292	90	1.5	7.0	1100	2.0-4.0	132
MA45293	90	1.8	7.3	1000	2.0-4.0	132
MA45294	90	2.2	7.5	900	1.5-3.0	132
MA45295	90	2.7	7.8	900	1.5-3.0	132
MA45296	90	3.3	8.0	800	1.0-2.0	132
MA45297	90	3.9	8.3	800	1.0-2.0	132
MA45298	90	4.7	8.5	700	1.0-2.0	132
MA45299	90	5.6	8.8	600	0.5-1.0	132

See notes on previous page.

MAXIMUM RATINGS

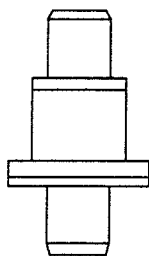
Reverse Voltage	Same as rated breakdown V_b
Operating Temperature	-65°C to + 150°C
Storage Temperature	-65°C to + 200°C
Temperature Coefficient	300 ppm/°C at + - 4 Volts
Power Dissipation	-65°C to + 200°C
Storage Temperature	$C_j < 1.0$ pF @ 100mW
(derate linearly to zero at 150°C)	$C_j > 1.0$ pF @ 200mW

ENVIRONMENTAL PERFORMANCE

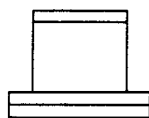
All tuning varactors in the MA45200 series are capable of meeting the performance tests dictated by the methods and procedures of the latest revisions of MIL-S-19500, MIL-STD-202 and MIL-STD-750 which specify mechanical, electrical, thermal and other environmental tests common to semiconductor products.

HIGH RELIABILITY PARTS

All diodes in the MA45200 series may be screened to TX, TXV specification.



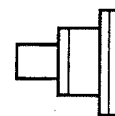
30



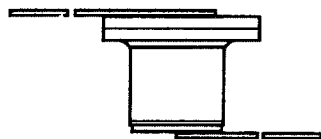
31



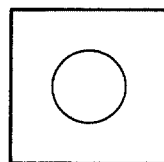
94



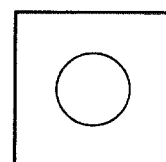
96



108



131



132



Typical Performance Curves

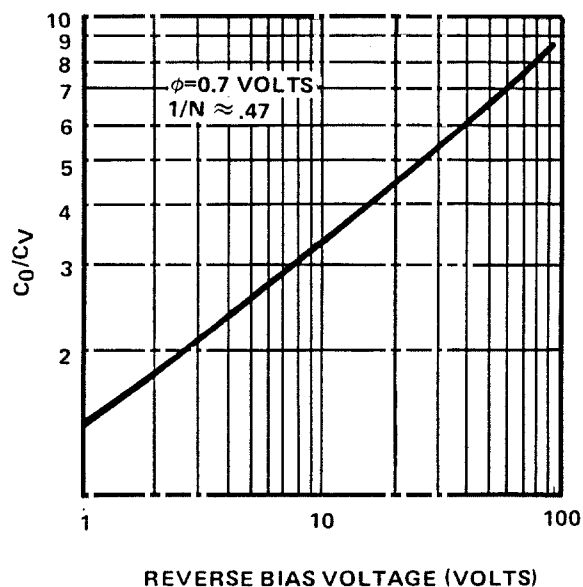


FIGURE 1. Typical Capacitance Change Ratios for Silicon Tuning Varactor Chips

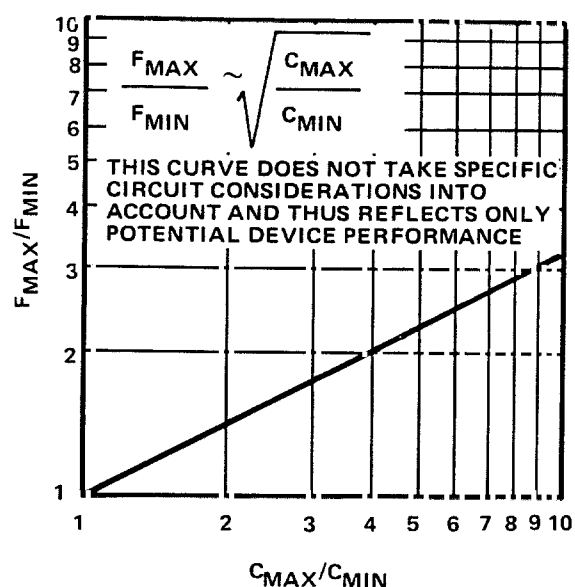


FIGURE 2. Frequency Tuning Ratio as a Function of Capacitance Change Ratio

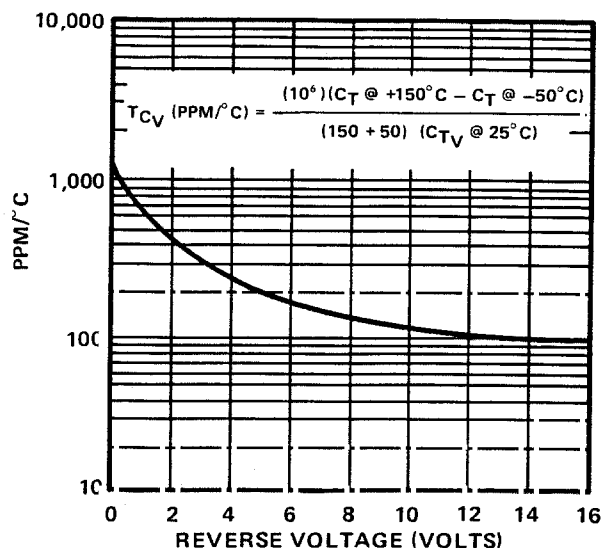


FIGURE 3. Typical Temperature Coefficient of Silicon Varactors

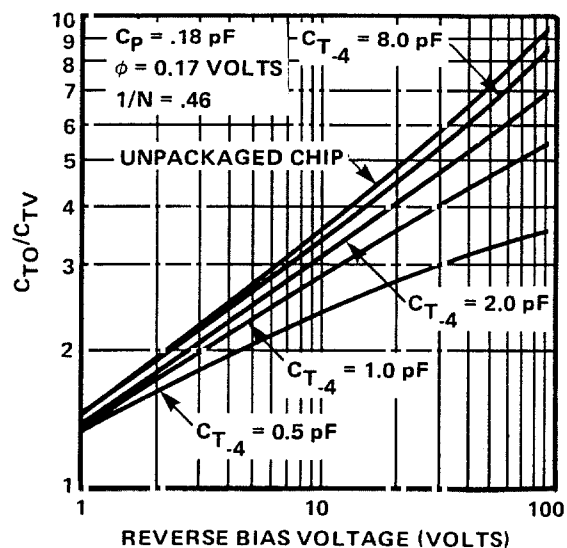


FIGURE 4. Typical Capacitance Change Ratios for Silicon Tuning Varactors in Case Styles 30, 31 & 108

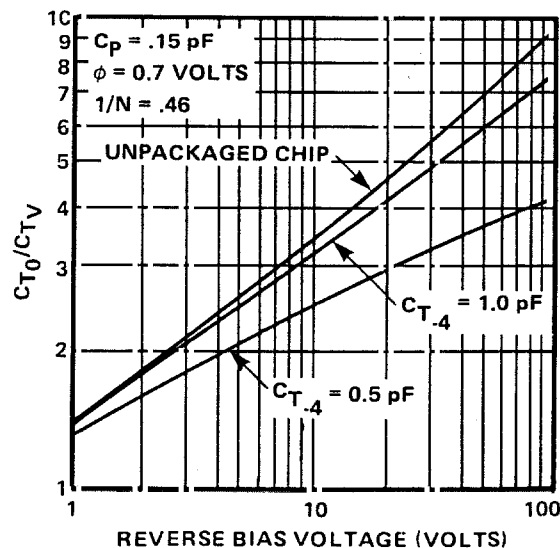


FIGURE 5. Typical Capacitance Change Ratios for Silicon Tuning Varactors in Case Styles 94 and 96