

42 TUNING VARACTORS

CERAMIC PACKAGED SILICON ABRUPT JUNCTION MICROWAVE TUNING VARACTORS

The MA-45200 series of silicon abrupt junction microwave 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.

This series is ideally suited for frequency tuning applications through K-Band. These devices are designed for use in solid state electronic tuning of transistor, Gunn and IMPATT oscillators. They may also be used in tunable filters, phase shifters, up and down converters and low order multipliers.

MODEL NUMBER ¹	MIN. BREAK-DOWN VOLT., V_B^2 (VOLTS)	TOTAL CAP., C_T^3 (pF)	MIN. CAP. RATIO ⁴ C_{T0}/C_{TVB}	MINIMUM Q^5	SUGGESTED FREQ. RANGE (GHz)
MA-45225	30	0.5	2.7	5500	10-12
MA-45226	30	0.6	2.9	5500	9-11
MA-45227	30	0.8	2.9	5000	8-10
MA-45228	30	1.0	3.0	4800	7-9
MA-45229	30	1.2	3.2	4800	6-8
MA-45230	30	1.5	3.3	4500	6-8
MA-45231	30	1.8	3.5	4000	5-7
MA-45232	30	2.2	3.6	4000	5-7
MA-45233	30	2.7	3.7	4000	4-6
MA-45234	30	3.3	3.7	3500	4-6
MA-45235	30	3.9	3.8	3500	3-5
MA-45236	30	4.7	3.8	3000	3-5
MA-45237	30	5.6	3.9	3000	2-4
MA-45238	30	6.8	3.9	3000	2-4
MA-45245	45	0.5	3.3	4000	9-11
MA-45246	45	0.6	3.7	4000	8-10
MA-45247	45	0.8	3.9	3800	5-7
MA-45248	45	1.0	4.0	3500	5-7
MA-45249	45	1.2	4.2	3500	4-6
MA-45250	45	1.5	4.4	3300	4-6
MA-45251	45	1.8	4.6	3000	3-5
MA-45252	45	2.2	4.8	2700	3-5
MA-45253	45	2.7	5.0	2700	2-3
MA-45254	45	3.3	5.2	2400	2-3
MA-45255	45	3.9	5.3	2200	1.5-2.5
MA-45256	45	4.7	5.4	2000	1-1.5
MA-45257	45	5.6	5.4	2800	1-1.5
MA-45258	45	6.8	5.4	1800	1-1.5
MA-45259	45	8.2	5.5	1700	1-1.5
MA-45260	60	0.6	7.5	2500	4-6
MA-45261	60	0.8	4.5	2300	4-6
MA-45262	60	1.0	4.8	2200	4-6
MA-45263	60	1.2	5.2	2000	2-4
MA-45264	60	1.5	5.6	1800	2-4
MA-45265	60	1.8	5.9	1800	2-4

CERAMIC PACKAGED SILICON ABRUPT JUNCTION MICROWAVE TUNING VARACTORS (CONT'D)

MODEL NUMBER ¹	MIN. BREAK-DOWN VOLT., V_B ² (VOLTS)	TOTAL CAP., C_T ³ (pF)	MIN. CAP. RATIO ⁴ C_{T0}/C_{TVB}	MINIMUM Q ⁵	SUGGESTED FREQ. RANGE (GHz)
MA-45266	60	2.2	6.0	1700	1.5—3.0
MA-45267	60	2.7	6.2	1700	1.5—3.0
MA-45268	60	3.3	6.3	1600	1.5—3.0
MA-45269	60	3.9	6.4	1500	1—2
MA-45270	60	4.7	6.5	1400	1—2
MA-45271	60	5.6	6.5	1400	1—2
MA-45272	60	6.8	6.5	1200	0.5—1.0
MA-45273	60	8.2	6.8	1200	0.5—1.0
MA-45274	60	10.0	7.0	1000	0.5—1.0
MA-45275	60	12.0	7.0	1000	0.5—1.0
MA-45276	60	15.0	7.2	1000	0.25—0.5
MA-45277	60	18.0	7.2	900	0.25—0.5
MA-45278	60	22.0	7.4	900	0.25—0.5
MA-45279	60	27.0	7.4	800	0.1—0.25
MA-45280	60	33.0	7.4	800	0.1—0.25
MA-45290	90	1.0	6.0	1500	2—4
MA-45291	90	1.2	6.5	1200	2—4
MA-45292	90	1.5	7.0	1100	2—4
MA-45293	90	1.8	7.3	1000	1.5—3.0
MA-45294	90	2.2	7.5	900	1.5—3.0
MA-45295	90	2.7	7.8	900	1.5—3.0
MA-45296	90	3.3	8.0	800	1—2
MA-45297	90	3.9	8.2	800	1—2
MA-45298	90	4.7	8.5	700	1—2
MA-45299	90	6.6	8.8	600	0.5—1.0

NOTES:

1. Case style 30 (ceramic enclosure with axial metal prongs) is the standard enclosure for this series. On special order, these devices are available in other styles including styles 31, 94, 96 and 108. For chip devices, see page 46.
2. Breakdown voltage (V_B) is measured at 10 μ A of reverse bias current.
3. Total capacitance is measured at 1 MHz and -4 volts. The standard capacitance tolerance is $\pm 10\%$. A tighter tolerance ($\pm 5\%$) may be obtained by adding the suffix "A" to the basic model number.

4. The total capacitance ratio is specified for case style 30 but will vary with other packages due to differences in package parasitics.
5. Diode Q is calculated at -4 volts and 50 MHz using values of R_S measured at 1.0 GHz and $C_{J.4}$ measured at 1 MHz.

$$Q_{.4} = \frac{1}{2\pi C_{J.4} R_S}$$

44 TUNING VARACTORS

GLASS PACKAGED SILICON PLANAR MICROWAVE TUNING VARACTORS

The MA-45300 series of silicon planar abrupt junction microwave tuning varactors has been designed to obtain the highest Q possible at the lowest cost. All devices in this series have a high density silicon dioxide passivation which results in exceptionally low leakage currents and low post tuning drift. Each device is available in a choice of axial lead glass packages 4 or 54.

These varactors are specially designed for low leakage microwave applications through X-Band in stripline, microstrip, waveguide, coaxial or lumped circuits environments. Specific applications include electronic tuning of transistor, Gunn and IMPATT oscillators as well as tuned filters, phase shifters and preselectors.

MODEL NUMBER ¹	MIN. BREAK-DOWN VOLT., V_B^2 (VOLTS)	TOTAL CAP., C_T @ -4 VOLTS ³ (pF)	MIN. CAP. RATIO ⁴ C_{T0}/C_{TVB}	MIN. Q @ -4 VOLTS ⁵
MA-45330	30	4.7	4.5	1800
MA-45331	30	5.6	4.5	1700
MA-45332	30	6.8	4.5	1600
MA-45333	30	8.2	4.5	1500
MA-45334	30	10.0	4.6	1300
MA-45335	30	12.0	4.6	1200
MA-45336	30	15.0	4.6	1300
MA-45337	30	18.0	4.6	1100
MA-45338	30	22.0	4.6	1000
MA-45339	30	27.0	4.7	900
MA-45340	30	33.0	4.7	750
MA-45341	30	39.0	4.7	500
MA-45342	30	47.0	4.7	400
MA-45343	30	56.0	4.7	300
MA-45345	45	4.7	5.6	1500
MA-45346	45	5.6	5.7	1400
MA-45347	45	6.8	5.8	1300
MA-45348	45	8.2	5.8	1200
MA-45349	45	10.0	5.9	1000
MA-45350	45	12.0	5.9	1000
MA-45351	45	15.0	5.9	800
MA-45352	45	18.0	5.9	800
MA-45353	45	22.0	5.9	600
MA-45354	45	27.0	6.0	600
MA-45355	45	33.0	6.0	400
MA-45356	45	39.0	6.0	400
MA-45357	45	47.0	6.0	300
MA-45358	45	56.0	6.0	250
MA-45360	60	4.7	7.2	1000
MA-45361	60	5.6	7.2	900
MA-45362	60	6.8	7.2	800
MA-45363	60	8.2	7.2	750
MA-45364	60	10.0	7.3	700

GLASS PACKAGED SILICON PLANAR MICROWAVE TUNING VARACTORS (CONT'D.)

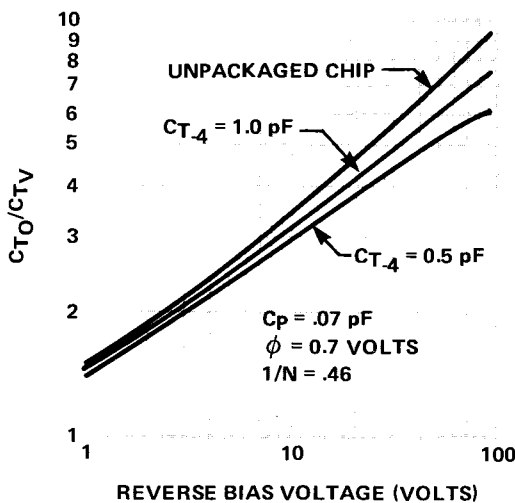
MODEL NUMBER ¹	MIN. BREAK-DOWN VOLT., V_B^2 (VOLTS)	TOTAL CAP., C_T @ -4 VOLTS ³ (pF)	MIN. CAP. RATIO ⁴ C_{T0}/C_{TVB}	MIN. Q @ -4 VOLTS ⁵
MA-45365	60	12.0	7.3	650
MA-45366	60	15.0	7.3	600
MA-45367	60	18.0	7.3	500
MA-45368	60	22.0	7.3	400
MA-45369	60	27.0	7.4	350
MA-45370	60	33.0	7.4	300
MA-45371	60	39.0	7.4	250
MA-45372	60	47.0	7.4	250

NOTES:

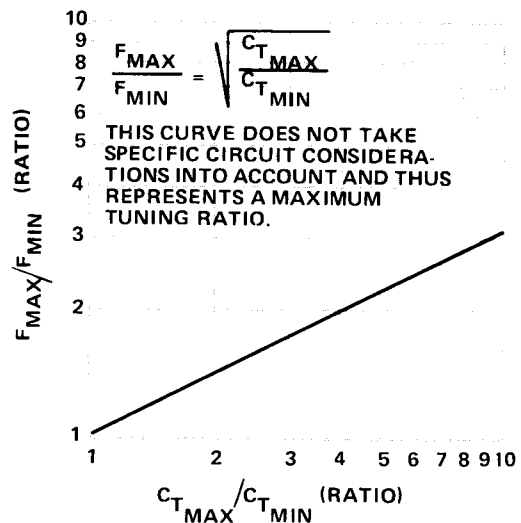
1. All silicon planar varactors in this series are available as standard products in the axial lead glass case style 4 or glass case style 54. Ceramic styles are available on request (the maximum C_{T-4} , available with case style 54, is 27 pF). Case selection is designated by use of a suffix with the diode model number (i.e. an MA-45347-4 is a silicon tuning diode with a typical $C_{T-4} = 6.8$ pF, a minimum capacitance change $C_{T0}/C_{T-45} = 5.8$, a minimum Q of 1,300 and a minimum breakdown voltage of 45 volts. The device is housed in a case style 4 hermetic glass enclosure.
2. Breakdown voltage is measured at 10 μ A of reverse bias current.
3. Standard capacitance tolerances are $\pm 10\%$ of this value. A tighter tolerance ($\pm 5\%$) may be obtained by adding the suffix "A" to the basic model number.
4. See performance curves for typical capacitance ratios at other reverse diode voltages of case styles 4 and 54 respectively.
5. Diode Q is calculated at -4 volts and 50 MHz using values of R_s measured at 500 MHz and values of junction capacitance measured at 1 MHz.

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

TYPICAL PERFORMANCE MA-45300 SERIES



TYPICAL CAPACITANCE CHANGE RATIOS FOR SILICON TUNING VARACTORS IN CASE STYLE 4



FREQUENCY TUNING RATIO AS A FUNCTION OF TOTAL CAPACITANCE CHANGE RATIO

CONTROL DIODES