

MA44300

310

Multiplier Varactors

**SNAP, POWERPACK, CIRCUIT TESTED
AND DUALMODE**

DESCRIPTION

Microwave Associates manufactures four distinct families of multiplier varactor diodes. Each series has an advantage in a particular type of circuit. The four series include:

- The MA-44100 Series – SNAP™ Varactor
- The MA-44200 Series – DUALMODE™ Varactor
- The MA-43000 Series – RF Circuit Tested SNAP™ Varactor
- The MA-44000 Series – POWERPACK™ Stacked Multiplier Varactor

All of the varactors in these series are manufactured with our "oxide passivated metalized mesa" process. This process results in a device with extremely low leakage currents and excellent reliability. This reliability has been demonstrated on many high reliability programs. (See Section for High Reliability Screening, page 3).

The diffusion profile of each family is carefully controlled to assure closely matched impedances and stored charge characteristics. Control of these characteristics is assured by tight double-ended specifications for lifetime, capacitance and breakdown voltage. All of the varactors are eutectically bonded to assure the minimum thermal resistance.

APPLICATIONS

These varactors are intended for use in high power frequency multiplier circuits, harmonic generators, signal sources, and other signal processing applications.

All specifications are subject to change without notice.

Bulletin 4400A



**Microwave
Associates, Inc.**

Burlington

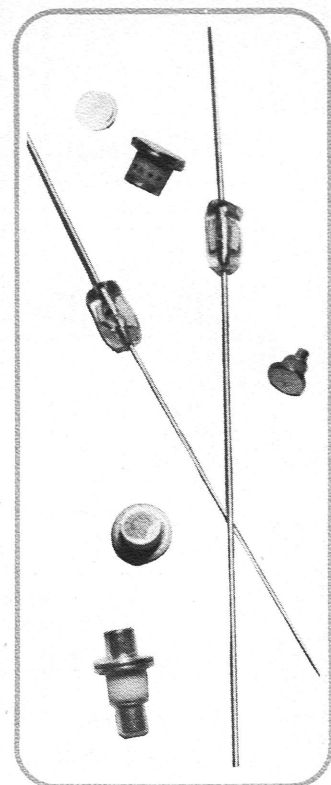
Massachusetts

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ABSOLUTE MAXIMUM RATINGS (ALL DEVICES)

Temperature Range:

Operating (T_{OPR})

-65 to +200°C

Storage (T_{STG})

-65 to +200°C

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS¹ @ $T_A = 25^\circ\text{C}$

SNAP VARACTORS

MA-44100 Series

Type Number	Case Style	Breakdown Voltage		Junction Capac. ¹		Capac. Ratio Max.	Minority Carrier Lifetime		Snap-time Max.	Series Resist. Max.	Cut-off Freq. Min.	Thermal ² Resist. Max.
		Min.	Max.	Min.	Max.		Min.	Max.				
MA-44100	43	150	250	16.0	30.0	1.4	1000	3000	3000	0.45	-	5
MA-44110	43	100	150	8.0	16.0	1.4	350	1050	750	1.0	-	10
MA-44120	43	75	100	3.0	8.0	1.4	150	450	500	-	50	15
MA-44130	30	45	75	1.0	3.5	1.5	60	200	200	-	100	25
MA-44140	30	25	45	0.5	1.5	1.5	10	30	100	-	170	70
MA-44150	30	15	40	0.2	0.6	1.5	8	30	90	-	200	100
MA-44300	26	50	-	3.0	5.0	-	100	300	225	-	-	300
MA-44310	26	35	-	1.0	3.0	-	30	90	200	-	-	300
MA-44320	54	15	-	0.5	1.0	-	10	30	90	-	-	600
Symbol		V_{BR}		C_j		β	T_L		T_s	R_s	f_{c-6}	θ_{JC}
Units		Volt		pF		-	ns		ps	ohms	MHz	C/W
Test Condition		$I_R = 10 \mu\text{A}$		$V_R = 6\text{V}$ $f = 1.0 \text{ MHz}$		C_{j0}/C_{j6}	$I_F = 1.7 I_R$		$I_F \approx 10 \text{ mA}$	$V_R = 6\text{V}$ $f = 0.5 \text{ GHz}$	$V_R = 6\text{V}$ $f = 3.3 \text{ GHz}$	-

CIRCUIT TESTED SNAP VARACTORS

MA-43000 Series

Type Number	Case Style	Output Power	Output Freq.	Input Freq.	Input Power	Breakdown Voltage		Junction Capacitance ¹		Minority Carrier Lifetime		Snap-time	Thermal ² Resist.
		Min.	-	-	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.	Max.
MA-4B300	43	8.0	2.0	0.4	30	100	145	5.0 ³	8.0 ³	300	900	750	7
MA-43000	103	4.0	2.0	0.333	15	85	105	3.0	4.5	250	500	600	12
MA-43002	91	1.5	6.0	2.0	5	45	70	1.6	2.4	75	225	250	25
MA-43004	91	0.30	13.3	3.3	2	30	45	0.45	0.85	20	50	150	45
Symbol		P_{OUT}	F_{OUT}	F_{IN}	P_{IN}	V_{BR}		C_j		T_L		T_s	θ_{JC}
Units		Watt	GHz	GHz	Watt	Volt		pF		ns		ps	C/W
Test Condition		-	-	-	-	$I_R = 10 \mu\text{A}$		$V_R = 6\text{V}$ $f = 1.0 \text{ MHz}$		$I_F = 1.7 I_F \approx 10 \text{ mA}$		$I_F \approx 10 \text{ mA}$	-

POWERPACK STACKED JUNCTION VARACTORS

MA-44000 Series

Type Number	Case Style	Breakdown Voltage		Junction ¹ Capacitance		Minority Carrier Lifetime		Snap-off Time	Cutoff Freq.	Thermal ² Resist.
		Min.	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.
MA-44010	122	120	-	1.6	2.5	100	400	200	110	7
MA-44020	122	100	-	1.2	1.6	80	300	150	130	10
MA-44030	122	80	-	0.7	1.2	30	95	120	150	15
MA-44040	122	60	-	0.3	0.7	10	40	90	200	20
Symbol		V_{BR}		C_j		T_L		T_s	f_{c-6}	θ_{JC}
Units		Volt		pF		ns		ps	MHz	C/W
Test Condition		$I_R = 10 \mu\text{A}$		$V_R = -12\text{V}$ $f = 1.0 \text{ MHz}$		$I_F = 1.7 I_R$		$I_F \approx 10 \text{ mA}$	$V_R = 6\text{V}$ $f = 3.3 \text{ GHz}$	-

NOTES: 1. In any shipment capacitance is controlled to within $\pm 10\%$. Tighter tolerances on capacitance and other parameters are available upon request. Contact Microwave Associates or its representatives listed on the last page.

2. $P_{Diss} = \frac{200^\circ\text{C} - T_{Case}}{\theta_{JC}}$

3. MA-48300 $C_{VR} @ V_R = 60 \text{ V}$

4. SNAPTM, DUALMODETM, POWERPACKTM are registered trademarks of Microwave Associates.

ELECTRICAL SPECIFICATIONS¹ (Continued)

DUALMODE VARACTORS MA-44200 Series

Type Number	Case Style	Breakdown Voltage		Junction Capac. ¹		Capac. Ratio	Minority Carrier Lifetime		Snap-time	Series Resist.	Cut-off Freq.	Thermal ² Resist.
		Min.	Max.	Min.	Max.	Min.	Min.	Max.	Max.	Max.	Min.	Max.
MA-44200	43	150	250	16.0	30.0	1.4	300	1000	3000	0.45	—	5
MA-44210	43	100	150	8.0	16.0	1.4	100	300	750	1.0	—	10
MA-44220	43	75	100	3.0	8.0	1.4	50	150	500	—	50	15
MA-44230	30	45	75	1.0	3.5	1.4	20	60	200	—	100	25
MA-44240	30	25	45	0.5	1.5	1.4	10	30	100	—	170	70
MA-44250	30	15	40	0.2	0.6	1.4	8	30	90	—	200	100
Symbol		V _{BR}		C _j		β	T _L		T _s	R _s	f _{c6}	θ _{JC}
Units		Volt		pF		—	ns		ps	ohms	MHz	°C/W
Test Condition		I _R = 10 μA		V _R = 6V f = 1.0 MHz		C _{j0} /C _{j6}	I _F = 1.7 I _R		I _F ≈ 10mA	V _R = 6V f = 0.5 MHz	V _R = 6V f = 3.3 GHz	—

NOTE:

1. Tighter specifications and special packages are available on request. Contact Microwave Associates or its representatives listed on the last page.

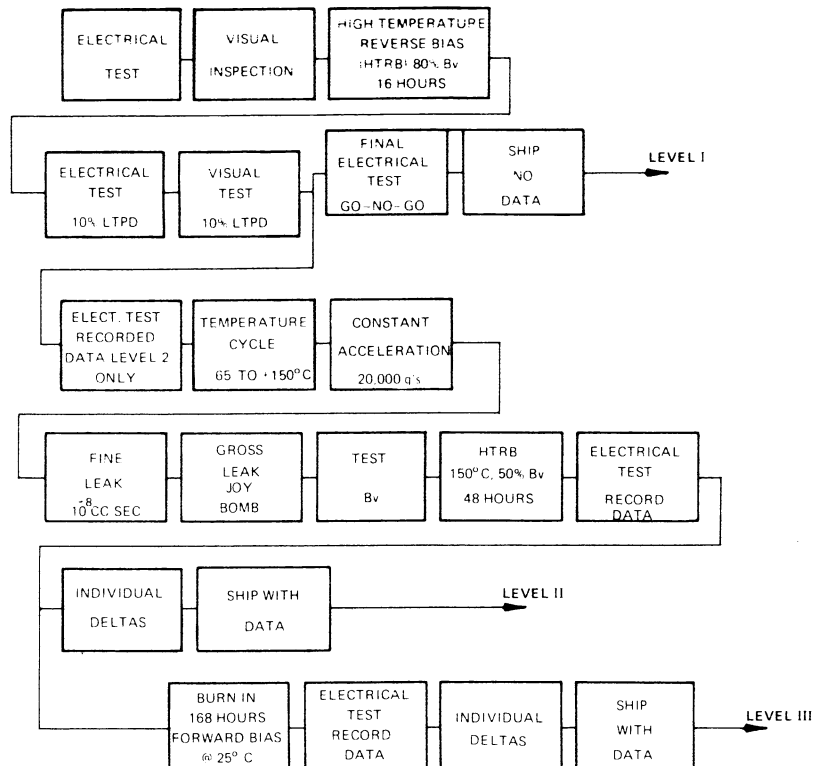
$$2. P_{Diss} = \frac{200^{\circ}C}{\theta_{JC}} T_{Case}$$

ENVIRONMENTAL RATINGS

Manufacturing processing and screening can be controlled so that the product is capable of meeting the following MIL-STD-750 environments:

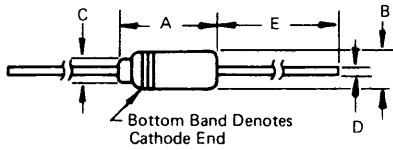
Temperature:				Vibration Fatigue	2046	32 Hours,
Storage	1031	-65 to +200°C				(X, Y, Z @ 20 g's, Min.)
Operating	—	-65 to +200°C		Vibration, Variable Frequency	2056	4 Four-Min. cycles
Cycling	1051	5 cycles				(X, Y, Z @ 20 g's Min., 100-2000 Hz)
Solderability	2026	230°C as Applicable		Constant Acceleration	2006	X, Y, Z @ 20,000 g's
Thermal Shock	1056	5 cycles, 0-100°C		Terminal Strength	2036	Package Dependent
Moisture Resistance	1021	10 Days, 90-98% RH		Salt Atmosphere	1041	35°C for 24 Hours
Shock	2016	5 Blows,				
		(X, Y, Z @ 1500 g's)				

SUGGESTED SCREENING OF VARACTOR DIODES FOR HIGHER RELIABILITY



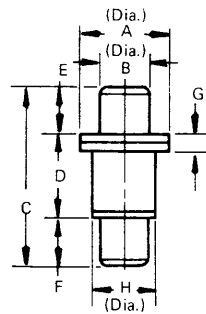
CASE STYLES

26



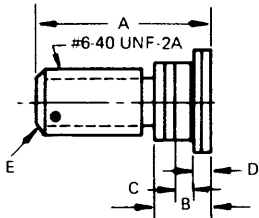
DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	—	0.300	—	7.62
B	—	0.105	—	2.67
C	0.040	REF.	1.016	REF.
D	0.018	0.022	0.457	0.559
E	1.000	—	25.4	—

30



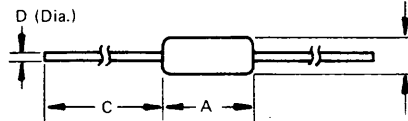
DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3.02	3.22
B	0.060	0.064	1.52	1.63
C	0.205	0.225	5.21	5.72
D	0.085	0.097	2.16	2.46
E	0.060	0.064	1.52	1.63
F	0.060	0.064	1.52	1.63
G	0.016	0.024	0.41	0.61
H	0.079	0.083	2.01	2.11

43



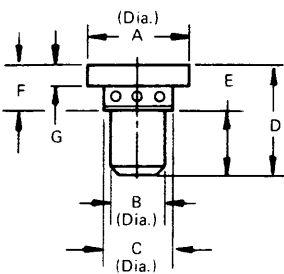
DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.440	0.460	11.18	11.70
B	0.119	0.131	3.03	3.302
C	0.050	REF.	1.27	REF.
D	0.025	0.035	0.635	0.900
E	.020x45°	REF.	.508x45°	REF.

54



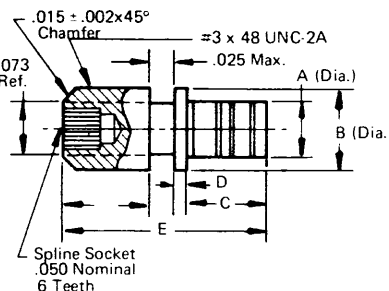
DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.145	0.165	3.70	4.20
B	0.068	0.075	1.727	1.905
C	1.000	1.500	25.4	38.1
D	0.014	0.016	0.356	0.406

91



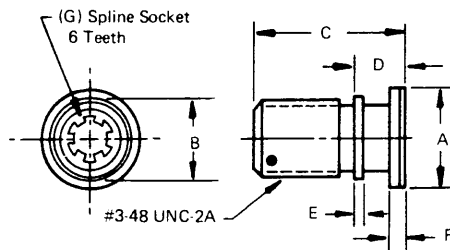
DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3.02	3.22
B	0.060	0.062	1.52	1.57
C	0.077	0.083	1.96	2.11
D	0.115	0.129	2.92	3.28
E	0.060	0.064	1.52	1.63
F	0.055	0.065	1.40	1.65
G	0.016	0.024	0.41	0.61

122



DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.075	0.085	1.90	2.16
B	0.095	0.105	2.41	2.68
C	0.096	0.128	2.44	3.25
D	0.008	0.012	0.202	0.304
E	0.241	0.281	6.12	7.14

103



DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3.03	3.25
B	0.098	0.102	2.50	2.60
C	0.188	0.208	4.80	5.30
D	0.058	0.071	1.50	1.80
E	0.009	0.011	0.25	0.28
F	0.016	0.024	0.40	0.60
G	0.050	NOM.	1.27	NOM.

Case Style 26 is a hermetically sealed glass package with .040 dumet studs through the glass to decrease the thermal resistance. The leads are gold plated. Capacitance is typically .17 pF and inductance is 2.0 nH.

Case Style 30 is a metal ceramic hermetically sealed package. It features a gold plated copper cathode and gold plated kovar anode. The package capacity is typically .18 pF and the inductance .42 pF.

Case Style 43 is a metal ceramic hermetically sealed package. It features a gold plated copper cathode stud and a gold plated kovar anode flange. Package capacitance is typically 0.75 pF; inductance is typically 0.6 nH.

Case Style 54 is a miniature hermetically sealed lead glass package with gold plated dumet leads. Capacitance is typically .1 pF; inductance typically 1.5 nH.

Case Style 91 is a metal ceramic hermetically sealed package. The cathode end is gold plated copper. The anode flange is gold plated kovar. Package capacitance is typically 0.27 pF; inductance typically 0.30 nH.

Case Style 103 is a metal ceramic hermetically sealed package. The cathode (threaded end) is gold plated copper. The anode is gold plated kovar. Package capacitance is typically 0.27 pF; inductance typically 0.30 nH.

Case Style 122 is a metal ceramic hermetically sealed package. The cathode (threaded end) is gold plated copper. The anode is gold plated kovar. Package capacitance is typically 0.4 pF; inductance typically 0.4 nH.