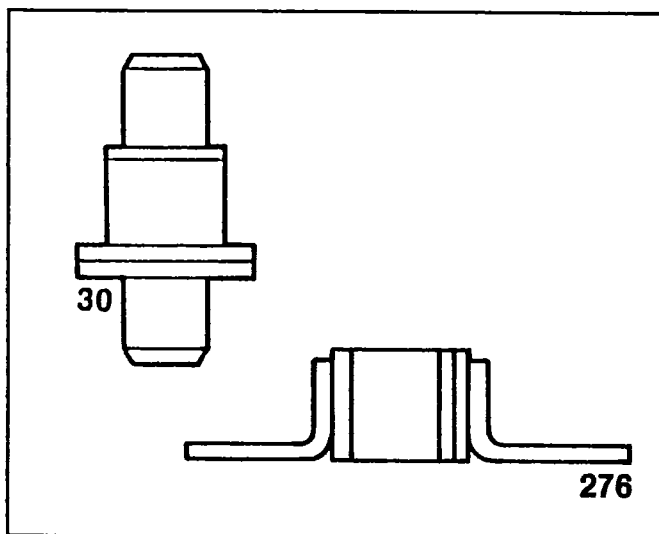




MA46600 Series

GaAs Tuning Varactors



Description

The MA46600 series of microwave tuning varactors is a family of abrupt junction gallium arsenide devices featuring "Q factors" in excess of 8000. This series is specifically designed for broadband high Q tuning performance (up to 8000 at -4 volts and 50 MHz) from L through Ka band. Characteristics such as high reliability, low leakage and close capacitance tracking between diodes are typical of these devices. Standard capacitance matching is $\pm 10\%$, but closer matching is available upon request. All diode types are available in a wide selection of ceramic packages as well as in chip form. The series is available in minimum breakdown voltage ranges of 30 volts and 45 volts.

Features

- HIGHEST Q
- LARGE CAPACITANCE VARIATION WITH VOLTAGE (ABRUPT JUNCTION)
- CUSTOM TAILORED DESIGNS AVAILABLE ON REQUEST

Applications

The MA46600 series of tuning varactors can be used for both broad and narrow band tuning through Ka-band. Typical applications include solid state tuning of VCOs using transistors, Gunns or IMPATTs, as well as voltage tunable filters and amplifier circuits. The GaAs abrupt junction tuning varactors offer the highest Q of any tuning varactors and are utilized in high frequency applications where Q is premium.

MA46800 Series — GaAs Tuning Varactors

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

Model Number	Voltage ⁷ Breakdown (Volts)	$C_{t4}^{1,3}$ ± 10% (pF)	Q@ -4 Volts ² Minimum	Ratio ^{1,3} $C_{t0}/C_{t4}V_B$ (pF) (Typical)
MA46800	30	0.3	8000	1.9
MA46801	30	0.4	7500	2.1
MA46802	30	0.5	7000	2.5
MA46803	30	0.6	6500	2.8
MA46804	30	0.8	6000	3.2
MA46805	30	1.0	5700	3.4
MA46806	30	1.2	5300	3.6
MA46807	30	1.5	5000	3.8
MA46808	30	1.8	4500	3.9
MA46809	30	2.2	4000	4.0
MA46810	45	0.5	6000	2.7
MA46811	45	0.6	5500	3.1
MA46812	45	0.8	5000	3.6
MA46813	45	1.0	4600	3.9
MA46814	45	1.2	4300	4.2
MA46815	45	1.5	4000	4.5
MA46816	45	1.8	3800	4.7
MA46817	45	2.2	3600	4.9
MA46818	45	2.7	3300	5.1
MA46819	45	3.3	3000	5.3

NOTES

1. Capacitance is measured at 1 MHz on a bridge which has been balanced with shielded test holders connected in place but open circuited.

2. Diode Q is measured by the DeLoach technique and extrapolated to -4 volts and 50 MHz.

3. All GaAs tuning varactors are available in any case style shown in this bulletin as well as in chip form. When ordering, specify the desired case by adding the case designation as a suffix to the type number. For example, a MA46801-30 specifies a 30 volt tuning diode in a case style 30 with a C_{t4} between .36 and .44 pF and a Q at -4 volts and 50 MHz ≥ 7500 . The capacitance values and capacitance ratios are for case style 30. Other case styles or chips will have slightly different values.

4. All junctions are abrupt i.e., $\gamma = 0.50 \pm .03$

where

$$C_j(V) = \frac{C_0}{(1 + \frac{V_R}{\phi})^\gamma}$$

5. Total capacitance ratios will vary with case choice due to differences in case capacitance (C_p). Figure 1 shows the ratio for the 30 case style.

6. Case parasitics (C_p and L_g) are given for most case styles.

7. Breakdown voltage (V_B) is measured at $-10 \mu\text{A}$.

MAXIMUM RATINGS

Temperature:

Operating -65°C to +200°C

Storage -65°C to +200°C

Voltage Breakdown Voltage

Power Dissipation $C_j = 1.0 \text{ pF max. @ } 50\text{mW}$

(derate linearly to zero at 200°C) $C_j = 1.0 \text{ pF min. @ } 100\text{mW}$

ENVIRONMENTAL RATINGS

Method Levels

Temperature, Storage	1031	See Maximum Ratings
Temperature, Operating	—	See Maximum Ratings
Temperature, Cycling	1051	5 cycles, -65 to +150 °C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Moisture Resistance	1021	10 days

Typical Performance Curve

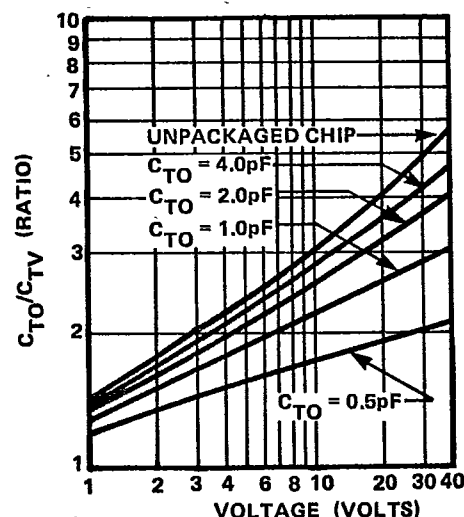
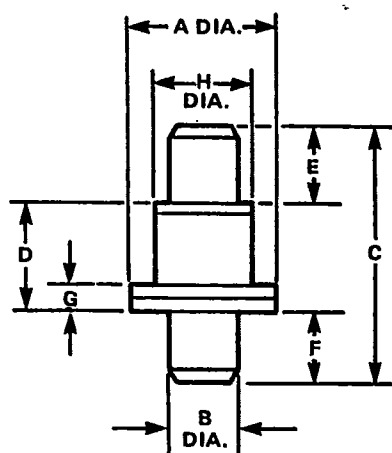


FIGURE 1. Capacitance Change Ratios for GaAs Tuning Varactors in Case Style 30

Case Styles

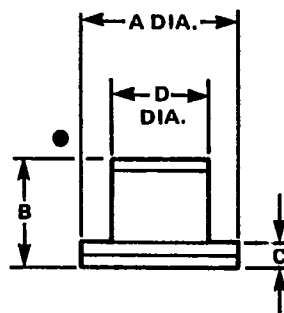
30



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.127	0.119	3,22	3,02
B	0.064	0.060	1,63	1,52
C	0.225	0.205	5,72	5,21
D	0.097	0.085	2,46	2,16
E	0.064	0.060	1,63	1,52
F	0.064	0.060	1,63	1,52
G	0.024	0.016	0,61	0,41
H	0.083	0.079	2,11	2,01

GaAs: $C_P = 0.18$ pF Typical
 $L_S = 0.60$ nH Typical

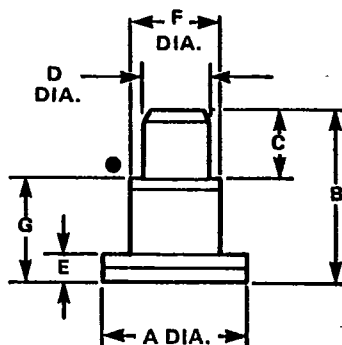
31



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3,02	3,23
B	0.085	0.097	2,16	2,46
C	0.016	0.024	0,41	0,61
D	0.077	0.083	1,96	2,11

$C_P = 0.18$ pF Typical
 $L_S = 0.60$ nH Typical

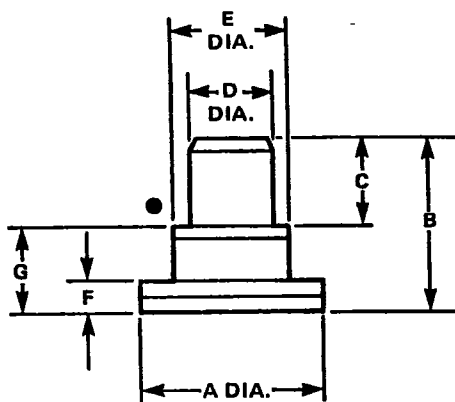
36



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.125	3,02	3,18
B	0.143	0.163	3,63	4,14
C	0.060	0.064	1,52	1,63
D	0.060	0.064	1,52	1,63
E	—	0.025	—	0,64
F	0.077	0.083	1,96	2,11
G	0.086	0.096	2,18	2,44

GaAs: $C_P = 0.18$ pF Typical
 $L_S = 0.60$ nH Typical

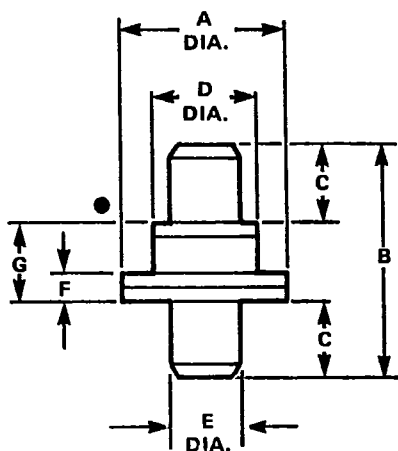
91



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3,02	3,23
B	0.115	0.129	2,92	3,28
C	0.060	0.064	1,52	1,63
D	0.060	0.062	1,52	1,57
E	0.077	0.083	1,96	2,11
F	0.016	0.024	0,41	0,61
G	0.055	0.065	1,40	1,65

$C_P = 0.30$ pF Typical
 $L_S = 0.40$ nH Typical

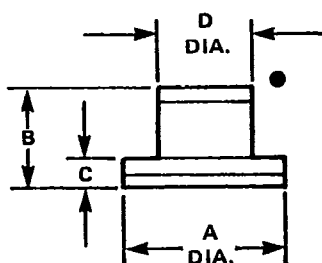
92



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.119	0.127	3,02	3,23
B	0.174	0.194	4,42	4,93
C	0.060	0.064	1,52	1,63
D	0.077	0.083	1,96	2,11
E	0.060	0.062	1,52	1,57
F	0.016	0.024	0,41	0,61
G	0.055	0.065	1,40	1,65

$C_P = 0.30$ pF Typical
 $L_S = 0.40$ nH Typical

94

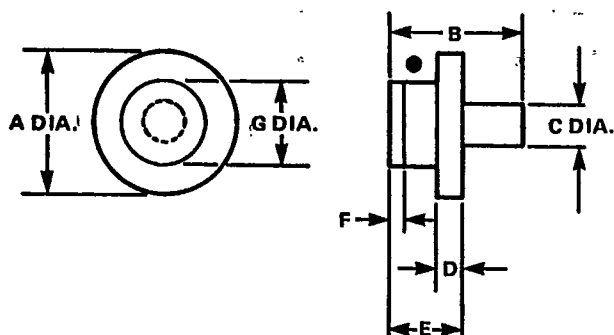


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.078	0.086	1,98	2,18
B	0.040	0.050	1,02	1,27
C	—	0.015	—	0,38
D	0.047	0.053	1,19	1,35

$C_P = 0.15$ pF Typical
 $L_S = 0.17$ nH Typical

Case Styles (Cont'd)

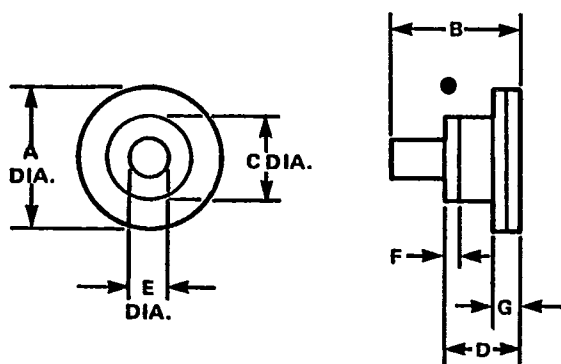
95



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.078	0.086	1,98	2,18
B	0.070	0.080	1,78	2,03
C	0.024	0.026	0,61	0,66
D	—	0.015	—	0,38
E	0.040	0.050	1,02	1,27
F	0.004	0.010	0,10	0,25
G	0.047	0.053	1,19	1,35

$C_p = 0.15$ pF Typical
 $L_s = 0.17$ nH Typical

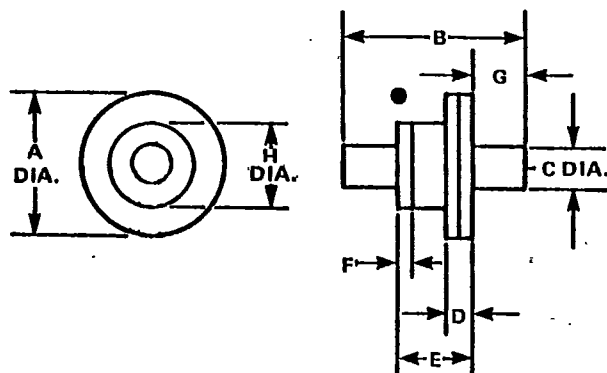
96



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.078	0.086	1,98	2,18
B	0.070	0.080	1,78	2,03
C	0.047	0.053	1,19	1,35
D	0.040	0.050	1,02	1,27
E	0.024	0.026	0,61	0,66
F	0.004	0.010	0,10	0,25
G	—	0.015	—	0,38

$C_p = 0.15$ pF Typical
 $L_s = 0.17$ nH Typical

97

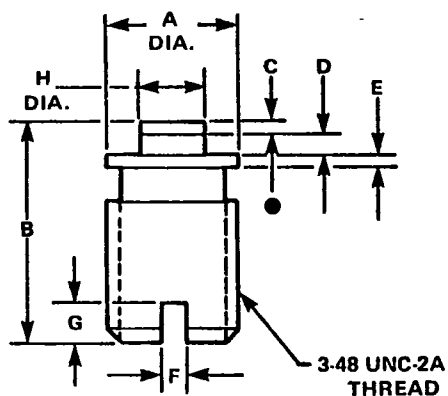


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.078	0.086	1,98	2,18
B	0.100	0.110	2,54	2,79
C	0.024	0.026	0,61	0,66
D	—	0.015	—	0,38
E	0.040	0.050	1,02	1,27
F	0.004	0.010	0,10	0,25
G	0.029	0.031	0,74	0,79
H	0.047	0.053	1,19	1,35

$C_p = 0.15$ pF Typical
 $L_s = 0.17$ nH Typical

Case Styles (Cont'd)

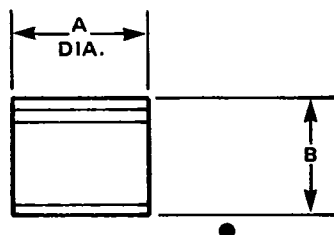
118



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.098	0.102	2,49	2,59
B	0.165	0.185	4,19	4,70
C	0.008	0.012	0,20	0,30
D	0.014	0.018	0,36	0,46
E	0.009	0.011	0,23	0,28
F	0.015	0.025	0,38	0,64
G	0.025	0.045	0,64	1,14
H	0.048	0.052	1,22	1,32

 $C_p = 0.22 \text{ pF Typical}$ $L_s = 0.16 \text{ nH Typical}$

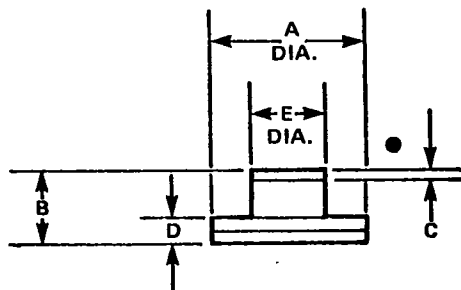
120



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.051	0.055	1,30	1,40
B	0.040	0.050	1,02	1,27

 $C_p = 0.13 \text{ pF Typical}$ $L_s = 0.40 \text{ nH Typical}$

126

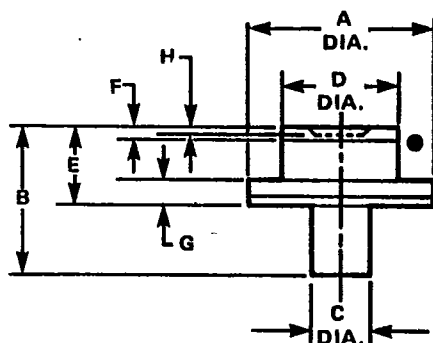


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.079	0.087	2,01	2,21
B	0.030	0.038	0,76	0,97
C	0.002	0.006	0,05	0,15
D	0.009	0.015	0,23	0,38
E	0.047	0.053	1,19	1,35

 $C_p = 0.23 \text{ pF Typical}$ $L_s = 0.20 \text{ nH Typical}$

Case Styles (Cont'd)

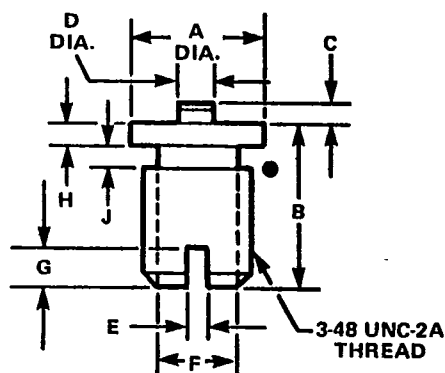
128



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.077	0.083	1,96	2,11
B	0.0545	0.0675	1,384	1,715
C	0.022	0.028	0,56	0,71
D	0.047	0.053	1,19	1,35
E	0.0295	0.0325	0,749	0,826
F	0.002	0.007	0,05	0,18
G	0.010	0.015	0,25	0,38
H	0.0015	0.0030	0,038	0,076

$C_p = 0.23$ pF Typical
 $L_s = 0.20$ nH Typical

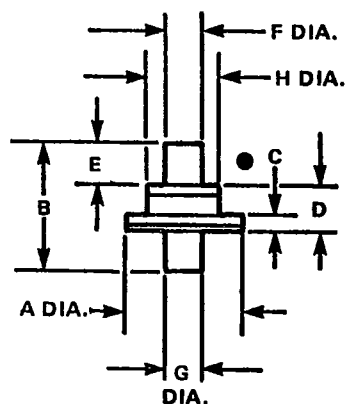
138



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.113	0.118	2,87	3,00
B	0.140	0.145	3,56	3,68
C	0.016	0.019	0,41	0,48
D	0.027	0.034	0,69	0,86
E	0.015	0.025	0,38	0,64
F	0.068	0.070	1,73	1,78
G	0.025	0.045	0,64	1,14
H	0.018	0.022	0,46	0,56
J	0.015	0.025	0,38	0,64

$C_p = 0.18$ pF Typical
 $L_s = 0.10$ nH Typical

168



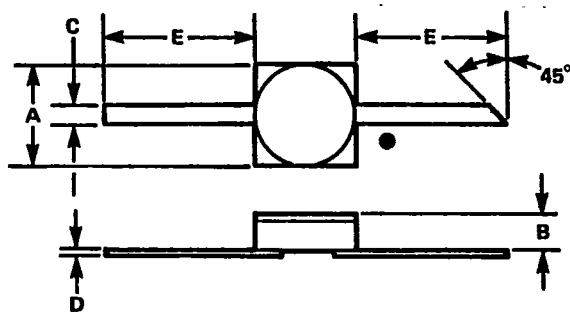
DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.079	0.081	2,01	2,06
B	0.084	0.096	2,13	2,49
C	0.008	0.010	0,20	0,25
D	0.028	0.032	0,71	0,81
E	0.028	0.032	0,71	0,81
F	0.024	0.026	0,61	0,66
G	0.024	0.026	0,61	0,66
H	0.049	0.051	1,24	1,30

$C_p = 0.23$ pF Typical
 $L_s = 0.20$ nH Typical

MA46600 Series — GaAs Tuning Varactors

Case Styles (Cont'd)

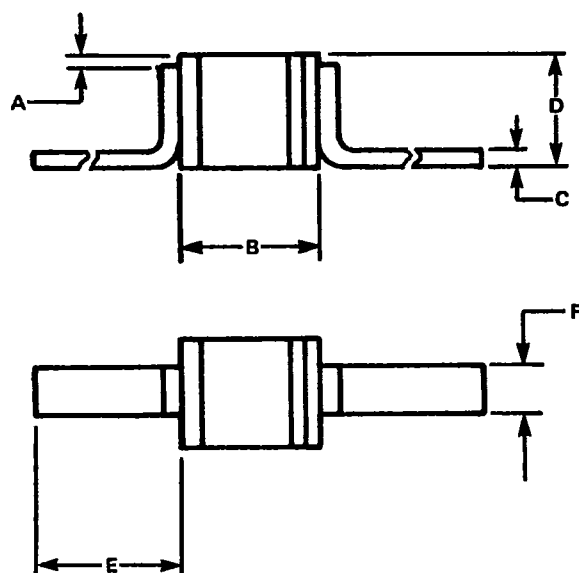
186



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.094	0.102	2,39	2,59
B	0.031	0.044	0,79	1,12
C	0.019	0.021	0,48	0,53
D	0.003	0.006	0,76	0,15
E	0.130	0.170	3,30	4,32

 $C_p \approx 0.15$ Typical $L_s \approx 0.40$ nH Typical

276

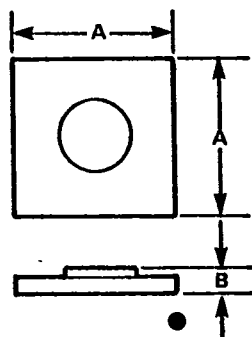


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.010	0.020	0,025	0,058
B	0.040	0.050	1,02	1,27
C	— —	0.005	— —	0,127
D	0.051	0.055	1,29	1,39
E	0.200	— —	5,08	— —
F	0.019	0.021	0,483	0,533

 $C_p = 0.13$ pF Typical $L_s = 0.40$ nH Typical

Chip Style

277



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.010	0.012	0,25	0,31
B	0.004	0.005	0,10	0,13