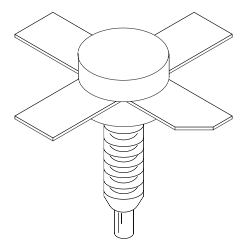
The RF Line
UHF Power Transistor

MRA1000-3.5L

Designed primarily for wideband, large–signal output and driver amplifier stages to 1000 MHz.

- Designed for Class A Linear Power Amplifiers
- Specified 19 Volt, 1000 MHz Characteristics:
  Output Power — 3.5 Watts
  Power Gain — 10 dB, Small–Signal
- Built–In Matching Network for Broadband Operation
- Gold Metallization for Improved Reliability
- Diffused Ballast Resistors

10 dB, 1000 MHz
3.5 W
BROADBAND
UHF POWER TRANSISTOR



CASE 145D–02, STYLE 1
(.380 SOE)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	28	Vdc
Collector–Base Voltage	V_{CBO}	50	Vdc
Emitter–Base Voltage	V_{EBO}	3.5	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	22 0.125	Watts W/°C
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	–65 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (T_C = 70°C)	$R_{\theta JC}$	8	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 10 mA, I_B = 0)	$V_{(BR)CEO}$	28	–	–	Vdc
Collector–Emitter Breakdown Voltage (I_C = 10 mA, V_{BE} = 0)	$V_{(BR)CES}$	50	–	–	Vdc
Collector–Base Breakdown Voltage (I_C = 10 mA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Emitter–Base Breakdown Voltage (I_E = 5 mA, I_C = 0)	$V_{(BR)EBO}$	3.5	–	–	Vdc
Collector Cutoff Current (V_{CB} = 30 V, I_E = 0)	I_{CBO}	–	–	10	mAdc

(continued)

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 250 mA, V_{CE} = 5 V)	h_{FE}	20	–	90	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 V, I_E = 0, f = 1 MHz)	C_{ob}	–	–	15	pF
FUNCTIONAL TESTS					
Common–Emitter Amplifier Small–Signal Gain (V_{CE} = 19 V, P_{in} = 1 mW, f = 1 GHz, I_C = 600 mA)	G_{SS}	10	–	–	dB
Load Mismatch (V_{CE} = 19 V, I_C = 600 mA, P_{out} = 3.5 W, f = 1 GHz, Load VSWR = ∞:1, All Phase Angles)	ψ	No Degradation in Output Power			
Overdrive (V_{CE} = 19 V, I_C = 600 mA, f = 1 GHz) (No degradation)	P_{inover}	–	–	1.75	W

TYPICAL CHARACTERISTICS

Table 1. Common Emitter S–Parameters

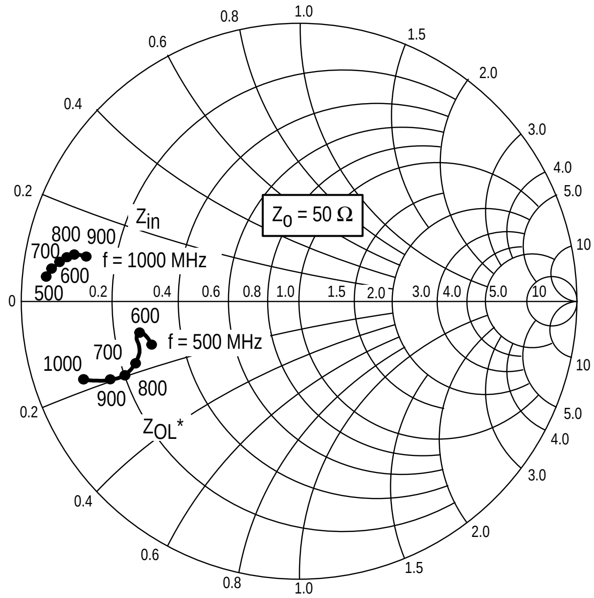
V_{CE} (Volts)	I_C (mA)	f (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			Mag	∠ ϕ	Mag	∠ ϕ	Mag	∠ ϕ	Mag	∠ ϕ
19	600	0.5	0.91	174	1.78	53	0.03	23	0.55	–164
		0.6	0.9	173	1.64	47	0.03	21	0.58	–170
		0.7	0.87	171	1.53	36	0.03	19	0.63	–159
		0.8	0.85	168	1.51	24	0.03	15	0.68	–157
		0.9	0.82	168	1.49	10	0.03	5	0.74	–158
		1	0.78	168	1.5	–7	0.03	–4	0.83	–160

Table 2. Z_{in} and Z_{OL}* versus Frequency

V_{CC} = 19 V, P_c = 3.5 W

Freq. (MHz)	Z_{OL}*		Z_{in} (Ohms)	
	Re	Im	Re	Im
500	14.6	–6.31	2.36	2.53
600	13.2	–4.07	2.74	3.18
700	11.7	–8.95	3.36	4.14
800	9.95	–9.65	4.12	5.13
900	7.72	–9.72	4.99	5.33
1000	4.67	–8.74	6.36	5.04

Z_{OL}* = Conjugate of the optimum lead impedance into which the device output operates at a given frequency, output power and voltage.



V_{CC} = 19 V, P_0 = 3.5 W, Z_0 = 50 Ω

Figure 1. Series Equivalent Input/Output Impedance

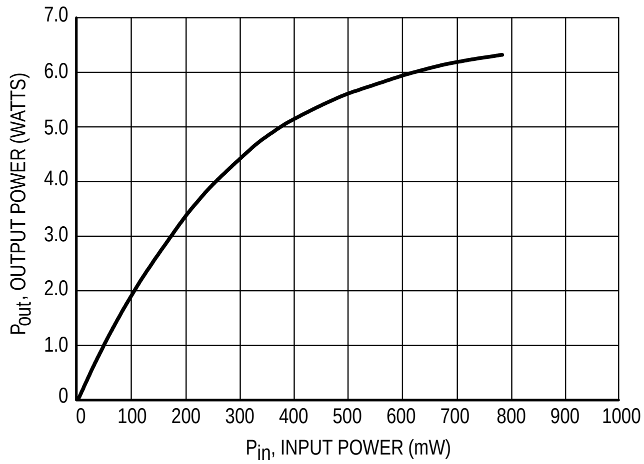
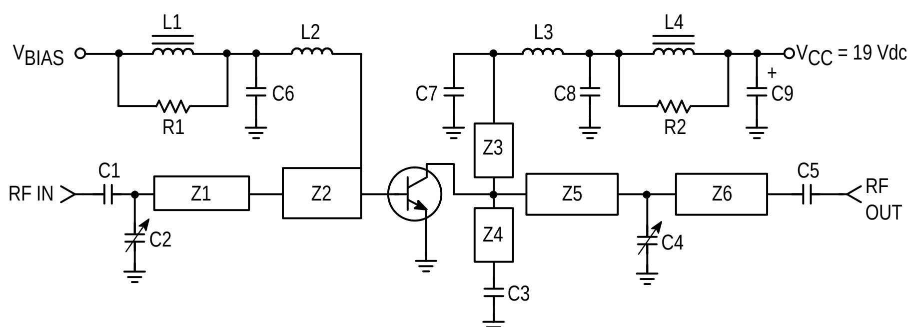


Figure 2. Power Input versus Power Output



C1, C3, C5, C6, C7	500 pF, ATC	L4	8T, 20 Gauge on 275 Mil Ferrite Toroid
C2, C4	0.8 – 10 pF, JFD	R1, R2	15 Ω, 1/4 Watt
C9	0.1 μF, 50 V, Ceramic	Z1	50 Ω, Microstripline, ℓ = 0.110 λ
L1	7T, 20 Gauge on 200 Mil Ferrite Toroid	Z2	10 Ω, Microstripline, ℓ = 0.162 λ
L2	8T, 20 Gauge, 100 Mil Dia.	Z3, Z4	50 Ω, Microstripline, ℓ = 0.052 λ
L3	11T, 20 Gauge, 100 Mil Dia.	Z5	24 Ω, Microstripline, ℓ = 0.080 λ
		Z6	50 Ω, Microstripline, ℓ = 0.125 λ

Figure 3. 1 GHz Test Circuit

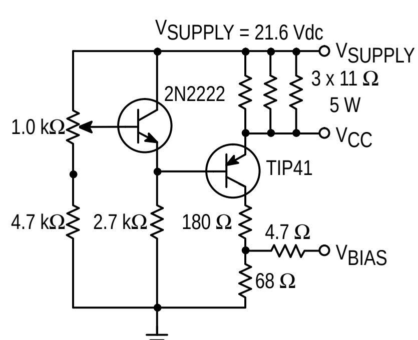
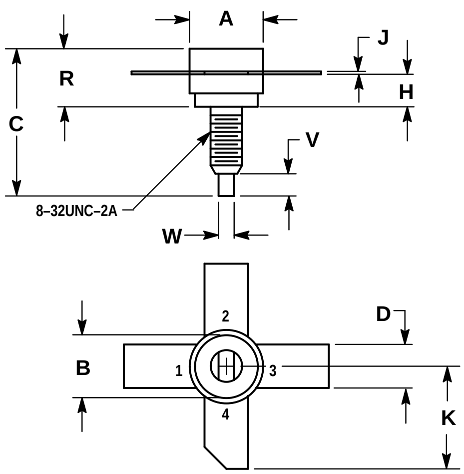


Figure 4. Bias Circuit

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.385	9.28	9.77
B	0.320	0.330	8.13	8.38
C	0.700	0.778	17.78	19.76
D	0.220	0.230	5.59	5.84
H	0.160	0.170	4.07	4.31
J	0.003	0.006	0.08	0.15
K	0.490	0.520	12.45	13.20
R	0.248	0.275	6.30	7.23
V	0.100	0.130	2.54	3.30
W	0.055	0.065	1.40	1.65

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 145D–02
ISSUE A

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