

The RF Line

Microwave Pulse Power Transistors

... designed for Class A and AB common emitter amplifier applications in the low-power stages of IFF, DME, TACAN, radar transmitters, and CW systems.

- Guaranteed Performance @ 1090 MHz, 18 Vdc — Class A
Output Power = 0.2 Watt
Minimum Gain = 10 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Internal Input Matching for Broadband Operation
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	20	Vdc
Collector-Base Voltage	V_{CBO}	50	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector Current — Continuous	I_C	200	mAdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	7.0 40	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	25	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 5.0$ mAdc, $I_B = 0$)	$V_{(BR)CEO}$	20	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 5.0$ mAdc, $V_{BE} = 0$)	$V_{(BR)CES}$	50	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 5.0$ mAdc, $I_E = 0$)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 1.0$ mAdc, $I_C = 0$)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 20$ Vdc, $I_E = 0$)	I_{CBO}	—	—	0.5	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 100$ mAdc, $V_{CE} = 5.0$ Vdc)	h_{FE}	10	—	100	—
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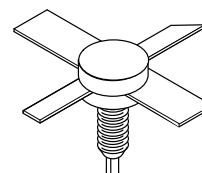
NOTES:

1. These devices are designed for RF operation. The total device dissipation rating applies only when the device is operated as RF amplifiers.
2. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

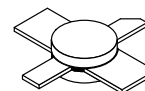
(continued)

MRF1000MA
MRF1000MB

0.7 W, 960 – 1215 MHz
CLASS A/AB
MICROWAVE POWER
TRANSISTORS
NPN SILICON



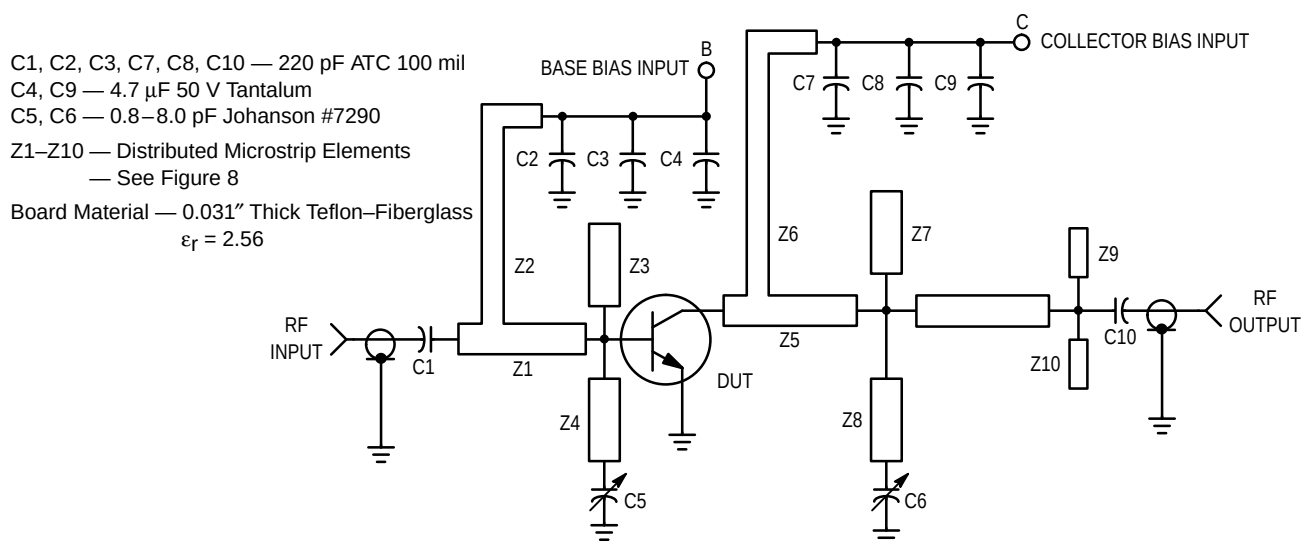
CASE 332-04, STYLE 2
MRF1000MA



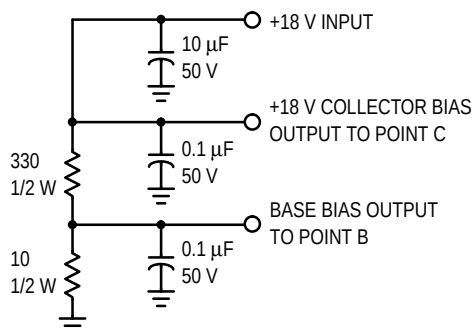
CASE 332A-03, STYLE 2
MRF1000MB

ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 28\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	2.0	5.0	pF
FUNCTIONAL TESTS					
Common-Emitter Power Gain — Class A ($V_{CE} = 18\text{ Vdc}$, $I_C = 100\text{ mAdc}$, $f = 1090\text{ MHz}$, $P_{out} = 200\text{ mW}$)	G_{PE}	10	12	—	dB
Common-Emitter Power Gain — Class AB ($V_{CE} = 18\text{ Vdc}$, $I_{CQ} = 10\text{ mAdc}$, $f = 1090\text{ MHz}$, $P_{out} = 0.7\text{ W}$)	G_{PE}	—	10.7	—	dB
Load Mismatch — Class A ($V_{CE} = 18\text{ Vdc}$, $I_C = 100\text{ mAdc}$, $f = 1090\text{ MHz}$, $P_{out} = 200\text{ mW}$, $VSWR = 10:1$ All Phase Angles)	ψ	No Degradation in Power Output			



Class AB Bias Control Circuit
18 V Output I_{CQ} 10 mA Nominal



Class A Constant Current Bias Control Circuit
 $I_C = 100\text{ mA}$, $V_{CE} = 18\text{ V}$

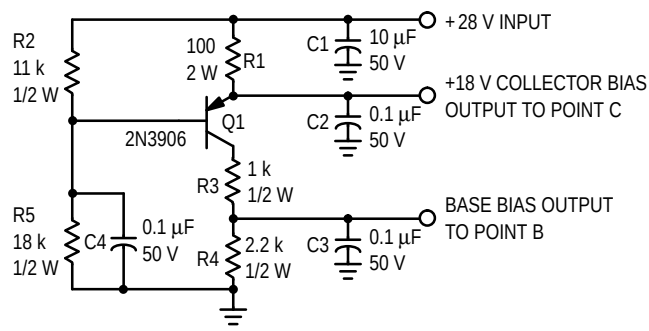


Figure 1. 1090 MHz Test Circuit

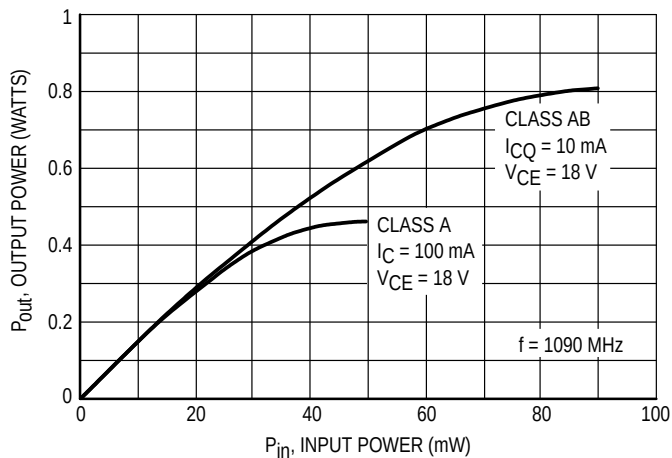


Figure 2. Output Power versus Input Power

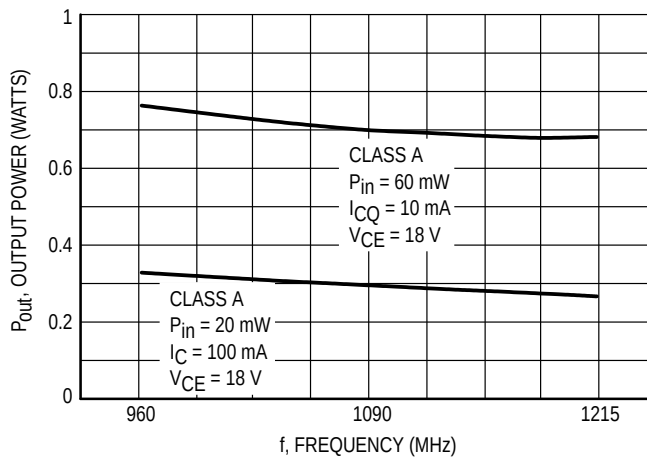


Figure 3. Output Power versus Frequency

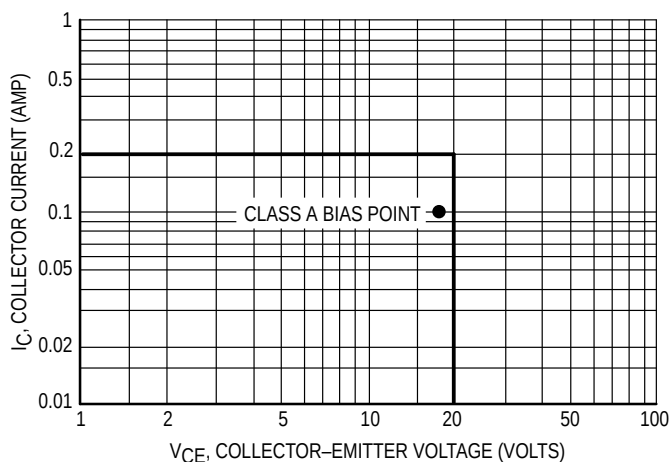


Figure 4. DC Safe Operating Area

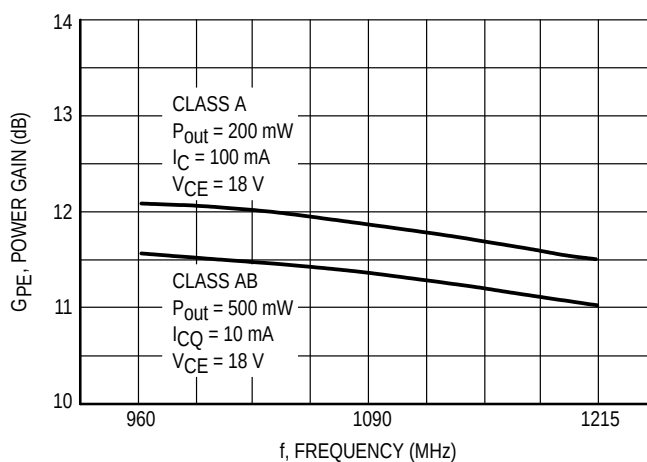
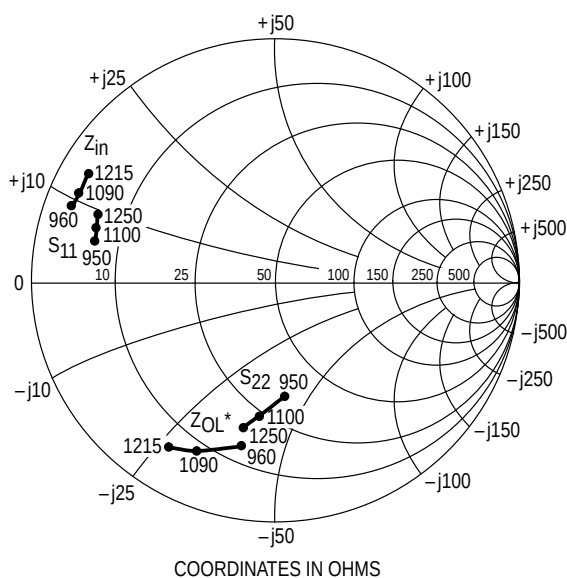


Figure 5. Power Gain versus Frequency



SERIES EQUIVALENT IMPEDANCES
 $P_{out} = 0.5 \text{ W}$, $V_{CE} = 18 \text{ Vdc}$,
 $I_{CQ} = 10 \text{ mAdc}$, Class AB

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
960	$3.0 + j9.0$	$16 - j40$
1090	$3.2 + j10$	$8.5 - j31$
1215	$2.8 + j12$	$7.0 - j26$

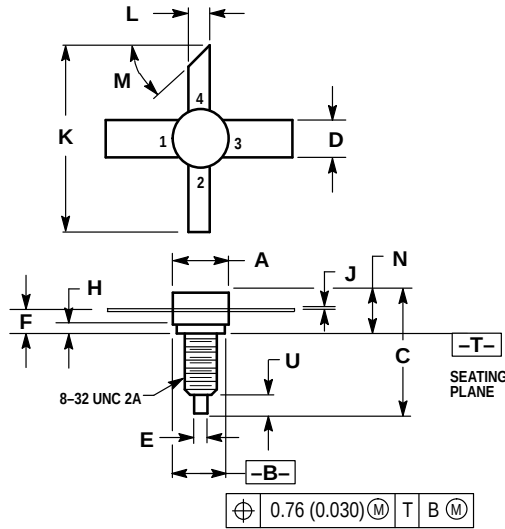
Z_{OL}^* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage, and frequency.

S-PARAMETERS — $V_{CE} = 18 \text{ Vdc}$, $I_C = 100 \text{ mAdc}$, Class A

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	S ₁₁	φ	S ₂₁	φ	S ₁₂	φ	S ₂₂	φ
950	0.77	166	2.42	40	0.016	42	0.48	-87
1000	0.78	165	2.36	38	0.016	48	0.50	-90
1050	0.77	163	2.31	33	0.016	46	0.51	-94
1100	0.77	162	2.31	28	0.016	46	0.54	-97
1150	0.78	161	2.20	23	0.015	46	0.57	-100
1200	0.78	159	2.20	19	0.016	47	0.59	-103
1250	0.78	158	2.12	12	0.016	42	0.61	-106

Figure 6. Common-Emitter S-Parameters and Series Equivalent Input/Output Impedances

PACKAGE DIMENSIONS



NOTES:

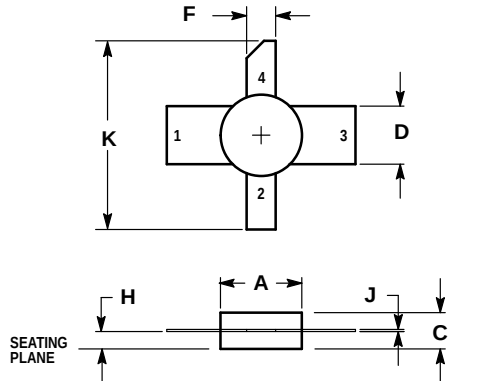
1. DIMENSION K APPLIES TWO PLACES.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1973.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.86	7.62	0.270	0.300
B	6.10	6.60	0.240	0.260
C	16.26	16.76	0.640	0.660
D	4.95	5.21	0.195	0.205
E	1.40	1.65	0.055	0.065
F	2.67	4.32	0.105	0.170
H	1.40	1.65	0.055	0.065
J	0.08	0.18	0.003	0.007
K	15.24	—	0.600	—
L	2.41	2.67	0.095	0.105
M	45°NOM	—	45°NOM	—
N	4.97	6.22	0.180	0.245
U	2.92	3.68	0.115	0.145

STYLE 2:

1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

**CASE 332-04
ISSUE D
MRF1000MA**



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.270	0.290	6.86	7.36
C	0.115	0.135	2.93	3.42
D	0.195	0.205	4.96	5.20
F	0.095	0.105	2.42	2.66
H	0.050	0.070	1.27	1.77
J	0.003	0.007	0.08	0.17
K	0.600	—	15.24	—

STYLE 2:

1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

**CASE 332A-03
ISSUE D
MRF1000MB**

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MRF1000MA/D

