

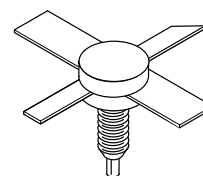
The RF Line Microwave Pulse Power Transistors

... designed for Class B and C common base amplifier applications in short and long pulse TACAN, IFF, DME, and radar transmitters.

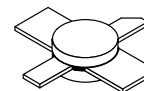
- Guaranteed Performance @ 1090 MHz, 35 Vdc
Output Power = 2.0 Watts Peak
Minimum Gain = 10 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Internal Input Matching for Broadband Operation
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MRF1002MA
MRF1002MB

2.0 W (PEAK), 960–1215 MHz
MICROWAVE POWER
TRANSISTORS
NPN SILICON



CASE 332-04, STYLE 1
MRF1002MA



CASE 332A-03, STYLE 1
MRF1002MB

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	250	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	$^\circ\text{C}/\text{W}$

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 ($V_{CB} = 35$ 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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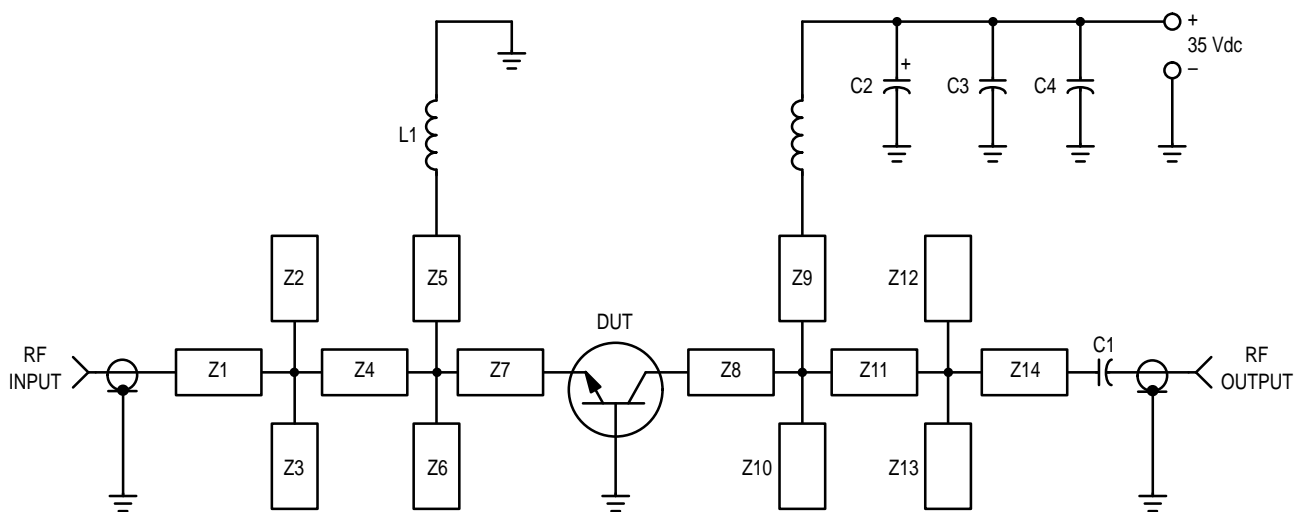
NOTES:

(continued)

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.

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

Characteristic	Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 35\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	2.5	5.0	pF
FUNCTIONAL TESTS (Pulse Width = 10 μs , Duty Cycle = 1.0%)					
Common-Base Amplifier Power Gain ($V_{CC} = 35\text{ Vdc}$, $P_{out} = 2.0\text{ W pk}$, $f = 1090\text{ MHz}$)	G_{PB}	10	12	—	dB
Collector Efficiency ($V_{CC} = 35\text{ Vdc}$, $P_{out} = 2.0\text{ W pk}$, $f = 1090\text{ MHz}$)	η	40	45	—	dB
Load Mismatch ($V_{CC} = 35\text{ Vdc}$, $P_{out} = 2.0\text{ W}$, $f = 1090\text{ MHz}$, $V_{SWR} = 10:1$ All Phase Angles)	ψ	No Degradation in Power Output			



- C1, C3 — 220 pF Chip Capacitor, 100 mil ATC
- C2 — 20 $\mu\text{F}/50\text{ Vdc}$ Electrolytic
- C4 — 0.1 μF Erie Redcap
- L1, L2 — 2 Turns #18 AWG, 1/8" ID
- Z1–Z14 — Distributed Microstrip Elements, See Photomaster
- Board Material — 0.031" Thick Teflon–Fiberglass,
 $\epsilon_r = 2.56$

Figure 1. 1090 MHz Test Circuit

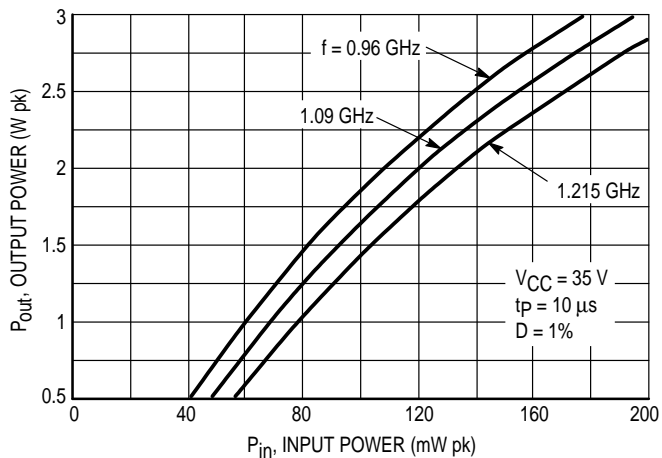


Figure 2. Output Power versus Input Power

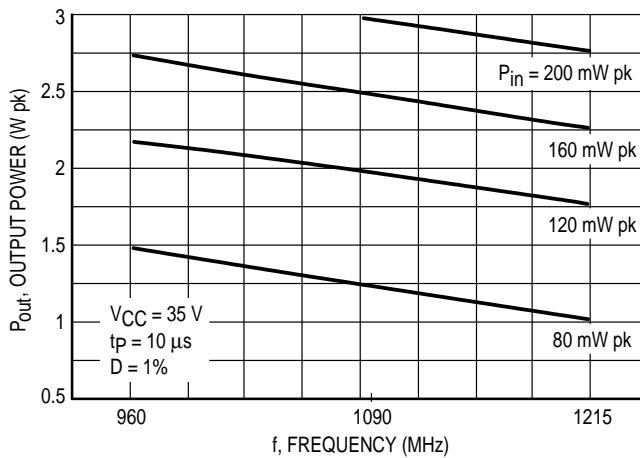


Figure 3. Output Power versus Frequency

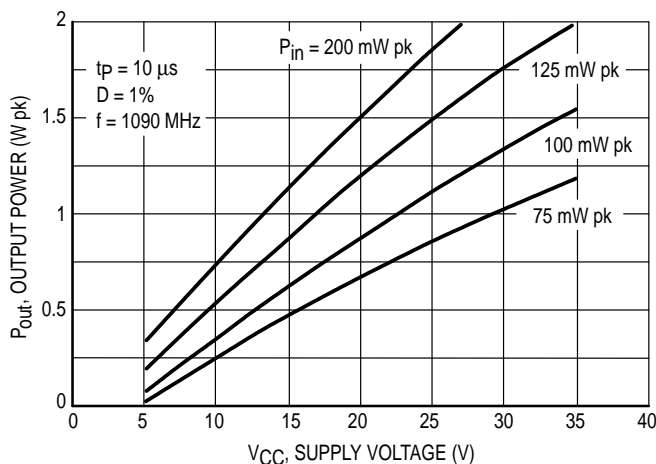


Figure 4. Output Power versus Supply Voltage

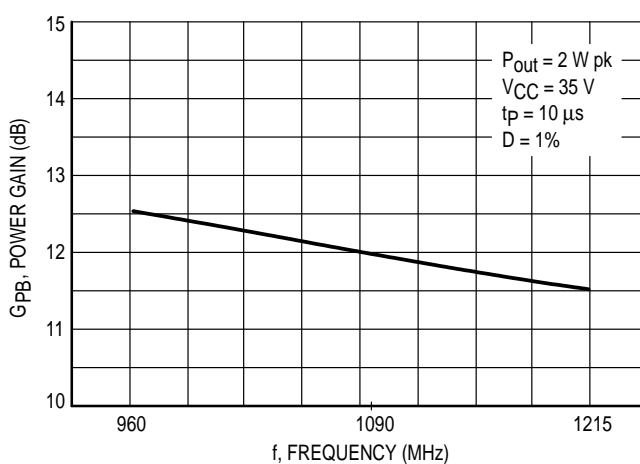
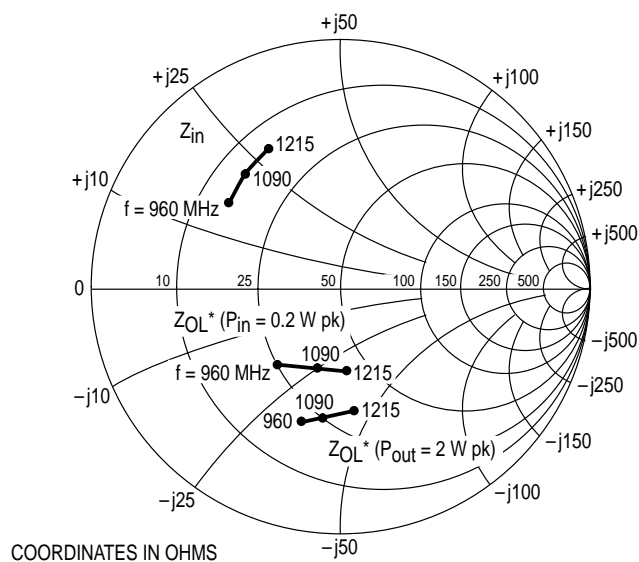


Figure 5. Power Gain versus Frequency



$V_{CC} = 35 \text{ Vdc}$,
 $t_p = 10 \mu\text{s}$, $D = 1.0\%$

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms $P_{out} = 2.0 \text{ W pk}$	Z_{OL}^* Ohms $P_{in} = 0.2 \text{ W pk}$
960	$15.5 + j16.5$	$20 + j32.5$	$25 + j21$
1090	$15 + j20$	$25 + j34$	$31 + j26$
1215	$14 + j27$	$33.5 + j42.5$	$37 + j32.5$

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

Figure 6. Series Equivalent Input/Output Impedance

$P_{out} = 2\text{ W pk}$
 $V_{CC} = 35\text{ V}$
 $t_p = 1\text{ ms}$
 $D = 10\%$
 $f = 1090\text{ MHz}$

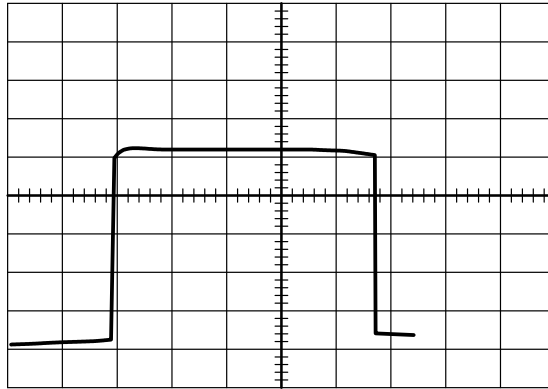
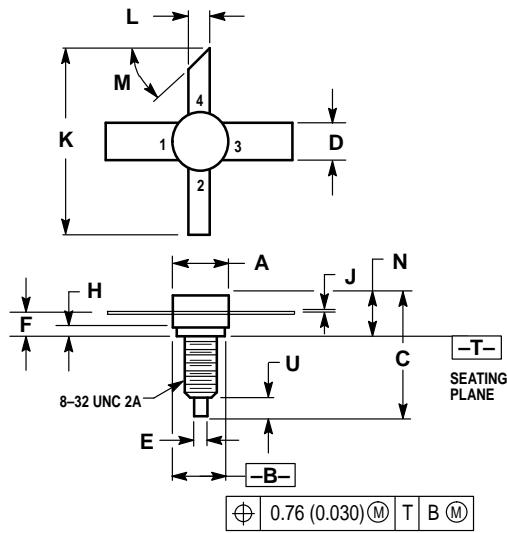


Figure 7. Typical Long Pulse Performance

PACKAGE DIMENSIONS

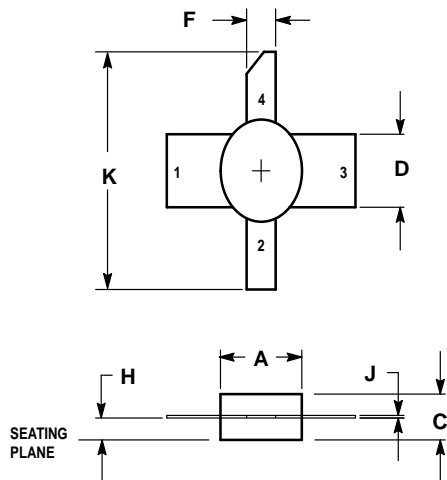


- NOTES:
 1. DIMENSION K APPLIES TWO PLACES.
 2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1973.

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

**CASE 332-04
 ISSUE D
 MRF1002MA**




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

**CASE 332A-03
 ISSUE D
 MRF1002MB**

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