

The RF Line

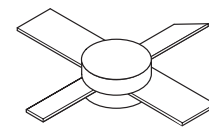
Microwave Pulse Power Transistor

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

- Guaranteed Performance @ 1090 MHz, 50 Vdc
Output Power = 90 Watts Peak
Minimum Gain = 8.4 dB
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Industry Standard Package
- Nitride Passivated
- Gold Metallized for Long Life and Resistance to Metal Migration
- Internal Input Matching for Broadband Operation

MRF1090MB

**90 W PEAK, 960–1215 MHz
MICROWAVE POWER
TRANSISTOR
NPN SILICON**



CASE 332A-03, STYLE 1

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------|-------------|------------------------------|
| Collector–Base Voltage | V_{CBO} | 70 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 4.0 | Vdc |
| Collector–Current — Peak (1) | I_C | 6.0 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) (2) Derate above 25°C | P_D | 290 1.66 | Watts W/ $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -65 to +150 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-----|---------------------------|
| Thermal Resistance, Junction to Case (3) | $R_{\theta JC}$ | 0.6 | $^\circ\text{C}/\text{W}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|-----|---|-----|------|
| Collector–Emitter Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $V_{BE} = 0$) | $V_{(BR)CES}$ | 70 | — | — | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $I_E = 0$) | $V_{(BR)CBO}$ | 70 | — | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 5.0 \text{ mAdc}$, $I_C = 0$) | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB} = 50 \text{ Vdc}$, $I_E = 0$) | I_{CBO} | — | — | 5.0 | mAdc |

ON CHARACTERISTICS

| | | | | | |
|---|----------|----|----|---|---|
| DC Current Gain (4) ($I_C = 2.5 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$) | h_{FE} | 10 | 30 | — | — |
|---|----------|----|----|---|---|

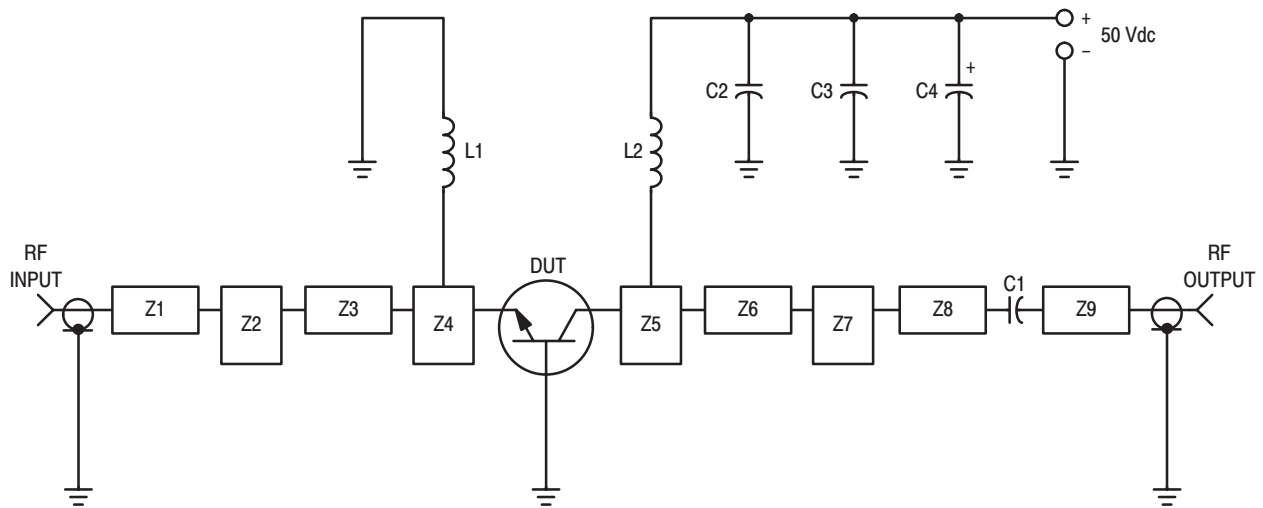
NOTES:

1. Pulse Width = 10 μs , Duty Cycle = 1%.
2. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.
4. 80 μs Pulse on Tektronix 576 or equivalent.

(continued)

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------|--------------------------------|------|-----|------|
| DYNAMIC CHARACTERISTICS | | | | | |
| Output Capacitance ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{ob} | — | 12 | 16 | pF |
| FUNCTIONAL TESTS (Pulse Width = $10\ \mu\text{s}$, Duty Cycle = 1.0%) | | | | | |
| Common-Base Amplifier Power Gain ($V_{CC} = 50\text{ Vdc}$, $P_{out} = 90\text{ W pk}$, $f = 1090\text{ MHz}$) | G_{PB} | 8.4 | 10.8 | — | dB |
| Collector Efficiency ($V_{CC} = 50\text{ Vdc}$, $P_{out} = 90\text{ W pk}$, $f = 1090\text{ MHz}$) | η | 35 | 40 | — | % |
| Load Mismatch ($V_{CC} = 50\text{ Vdc}$, $P_{out} = 90\text{ W pk}$, $f = 1090\text{ MHz}$, $VSWR = 10:1$ All Phase Angles) | ψ | No Degradation in Power Output | | | |



C1, C2 — 220 pF Chip Capacitor, 100-mil ATC
 C3 — 0.1 μF
 C4 — 47 $\mu\text{F}/75\text{ V}$
 L1, L2 — 3 Turns #18 AWG, 1/8" ID
 Z1-Z9 — Distributed Microstrip Elements,
 See Photomaster
 Board Material — 0.031" Thick Glass Teflon, $\epsilon_r = 2.5$

Figure 1. 1090 MHz Test Circuit

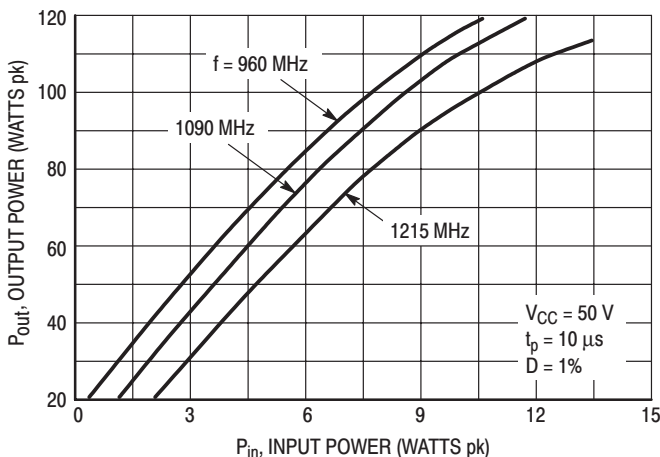


Figure 2. Output Power versus Input Power

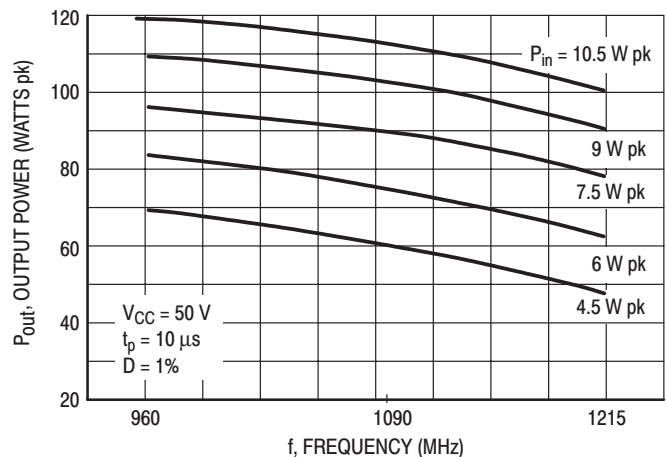


Figure 3. Output Power versus Frequency

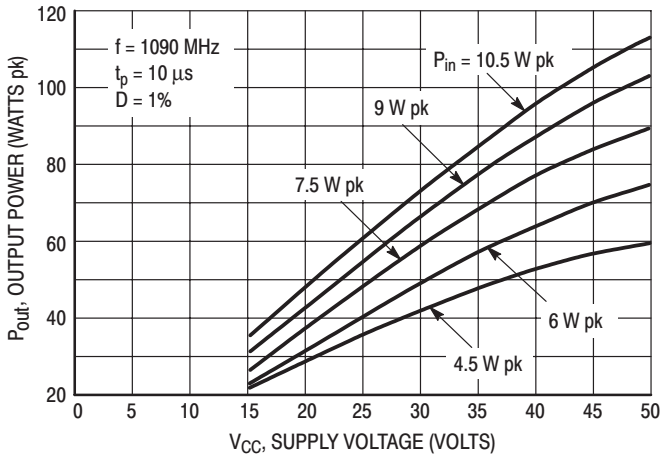


Figure 4. Output Power versus Supply Voltage

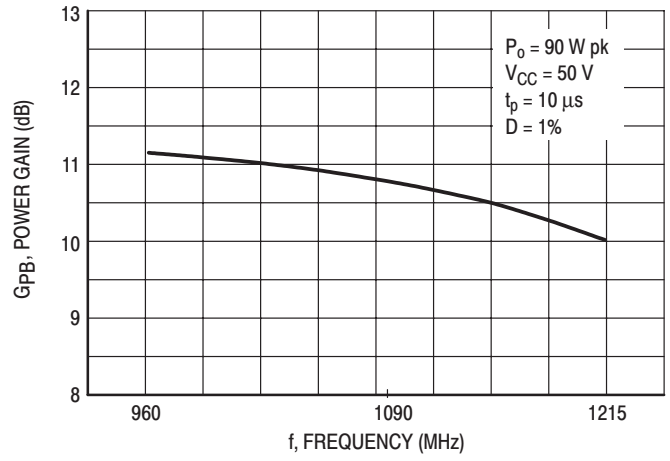
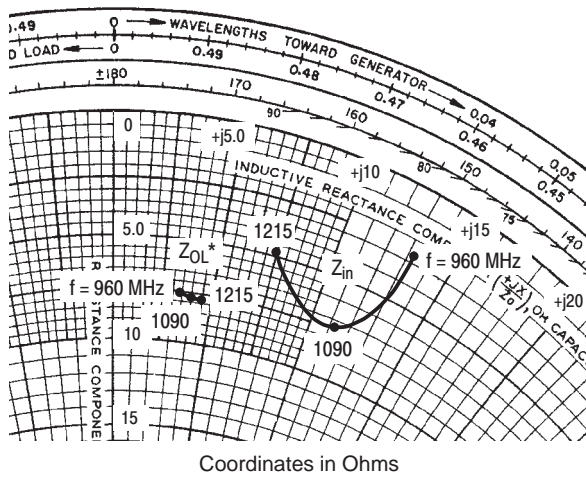


Figure 5. Power Gain versus Frequency



$P_{out} = 90 \text{ W pk}$ $V_{CC} = 50 \text{ V}$
 $t_p = 10 \mu\text{s}$ $D = 1\%$

| f MHz | Z_{in} Ohms | Z_{OL}^* Ohms |
|----------|------------------|--------------------|
| 960 | $2.8 + j13.2$ | $7.6 + j3.5$ |
| 1090 | $7.4 + j11.4$ | $7.6 + j4.0$ |
| 1215 | $4.7 + j7.5$ | $7.7 + j4.5$ |

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

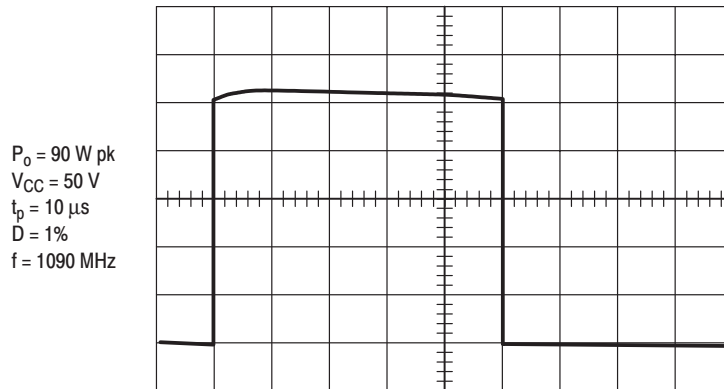
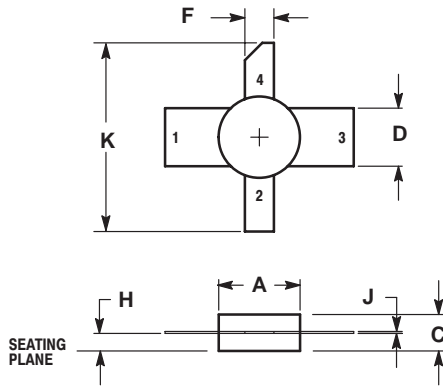


Figure 7. Typical Pulse Performance

PACKAGE DIMENSIONS



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

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.270 | 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**

Specifications subject to change without notice.

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