

# The RF Line

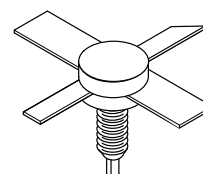
## Microwave Pulse Power Transistors

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 = 150 Watts Peak  
Minimum Gain = 7.8 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.

# MRF1150MA

**150 W PEAK, 960–1215 MHz  
MICROWAVE POWER  
TRANSISTORS  
NPN SILICON**



**CASE 332-04, STYLE 1**

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Base Voltage	$V_{CB0}$	70	Vdc
Emitter–Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Peak (1)	$I_C$	12	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) (2) Derate above $25^\circ\text{C}$	$P_D$	583 3.33	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)	$R_{\theta JC}$	0.3	$^\circ\text{C/W}$

### 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 ( $I_C = 50\text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	70	—	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = 50\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	70	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 5.0\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	10	mAdc

### ON CHARACTERISTICS

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

(continued)

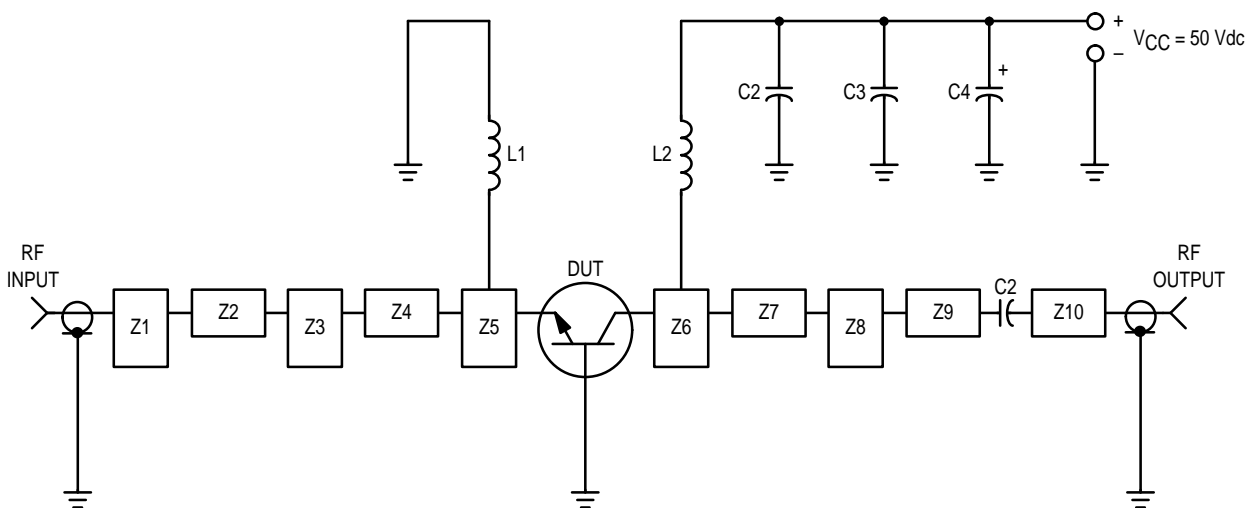
- Pulse Width = 10  $\mu\text{s}$ , Duty Cycle = 1%.
- These devices are designed for RF operation. The total device dissipation rating applies only when the device is operated as RF amplifiers.
- Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.
- 80  $\mu\text{s}$  Pulse on Tektronix 576 or equivalent.

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	—	25	32	pF

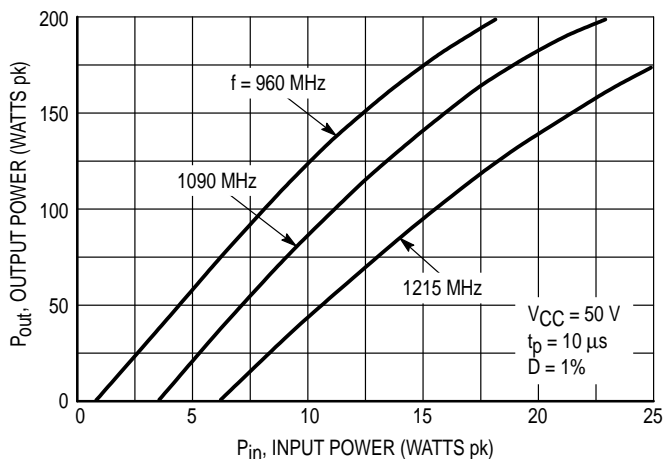
## **FUNCTIONAL TESTS** (Pulse Width = $10\text{ }\mu\text{s}$ , Duty Cycle = 1.0%)

Common-Base Amplifier Power Gain ( $V_{CC} = 50\text{ Vdc}$ , $P_{out} = 150\text{ W pk}$ , $f = 1090\text{ MHz}$ )	GPB	7.8	9.8	—	dB
Collector Efficiency ( $V_{CC} = 50\text{ Vdc}$ , $P_{out} = 150\text{ W pk}$ , $f = 1090\text{ MHz}$ )	$\eta$	35	40	—	%
Load Mismatch ( $V_{CC} = 50\text{ Vdc}$ , $P_{out} = 150\text{ W pk}$ , $f = 1090\text{ MHz}$ , VSWR = 10:1 All Phase Angles)	$\psi$	No Degradation in Power Output			

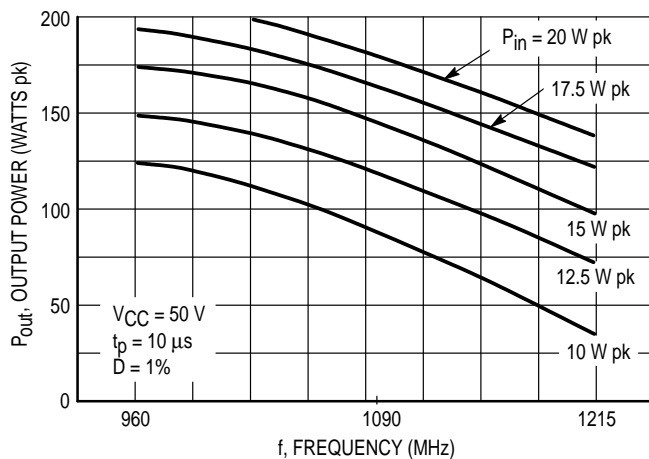


$C1, C2$  — 220 pF Chip Capacitor, 100-mil ATC  
 $C3$  —  $0.1\text{ }\mu\text{F}/100\text{ V}$   
 $C4$  —  $47\text{ }\mu\text{F}/75\text{ V}$  Electrolytic  
 $L1, L2$  — 3 Turns #18 AWG,  $1/8''$  ID  
 $Z1-Z10$  — Distributed Microstrip Elements — See Photomaster  
 Board Material —  $0.031''$  Thick Teflon-Fiberglass,  $\epsilon_r = 2.5$

**Figure 1. 1090 MHz Test Circuit**



**Figure 2. Output Power versus Input Power**



**Figure 3. Output Power versus Frequency**

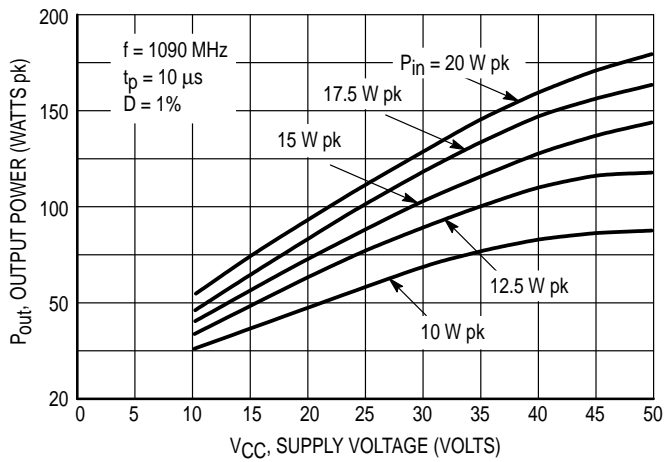


Figure 4. Output Power versus Supply Voltage

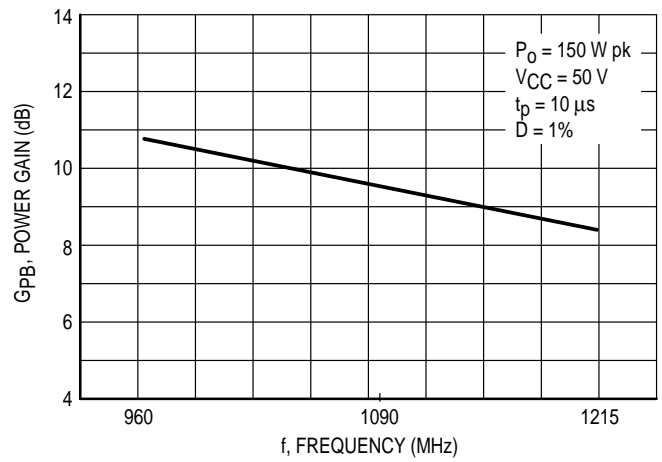
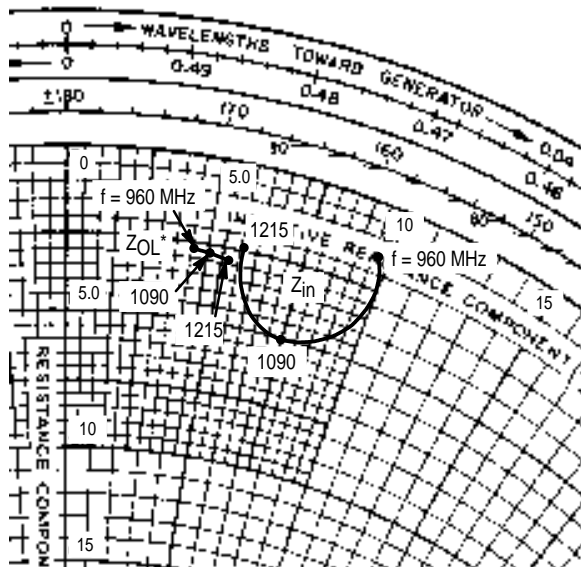


Figure 5. Power Gain versus Frequency



$P_{out} = 150 \text{ W pk}$   $V_{CC} = 50 \text{ V}$   
 $t_p = 10 \mu\text{s}$   $D = 1\%$

f MHz	$Z_{in}$ Ohms	$Z_{OL}^*$ Ohms
960	$1.5 + j9.6$	$2.6 + j4.1$
1090	$5.0 + j7.5$	$2.7 + j4.6$
1215	$2.4 + j5.6$	$2.8 + j5.3$

$Z_{OL}^*$  = 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

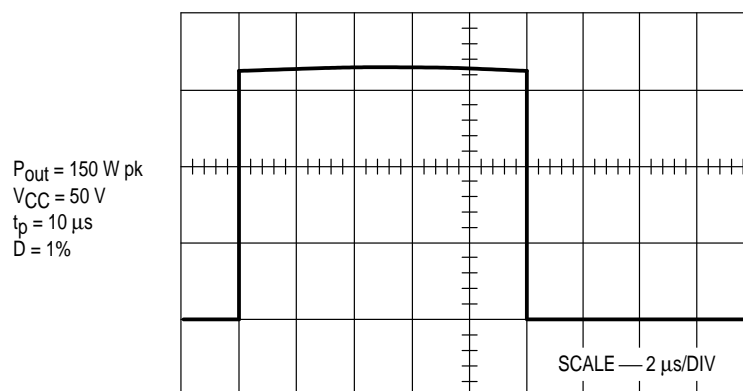
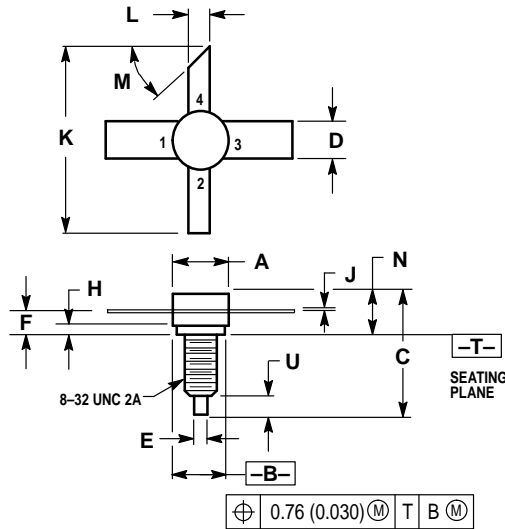


Figure 7. Typical Pulse Performance

## PACKAGE DIMENSIONS



### NOTES:


1. 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

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