

# The RF Line

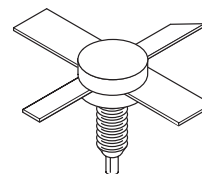
## Microwave Pulse Power Transistor

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

**MRF1090MA**

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



CASE 332-04, 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 $25^\circ\text{C}$	$P_D$	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	$^\circ\text{C/W}$

### 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 ( $I_C = 25 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	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	—	—
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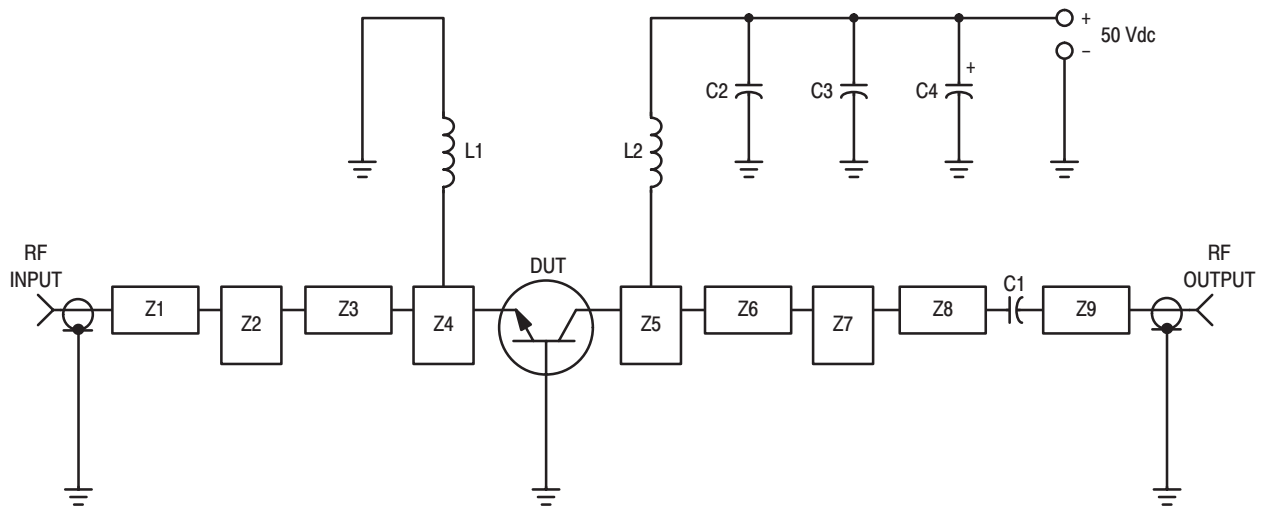
#### NOTES:

1. Pulse Width = 10  $\mu\text{s}$ , 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  $\mu\text{s}$  Pulse on Tektronix 576 or equivalent.

(continued)

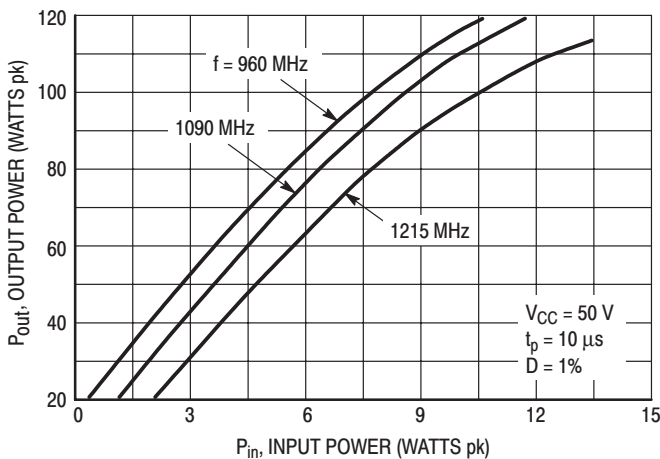
**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	—	12	16	pF
<b>FUNCTIONAL TESTS</b> (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 ( $V_{CC} = 50\text{ Vdc}$ , $P_{out} = 90\text{ W pk}$ , $f = 1090\text{ MHz}$ )	$\eta$	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)	$\psi$	No Degradation in Power Output			

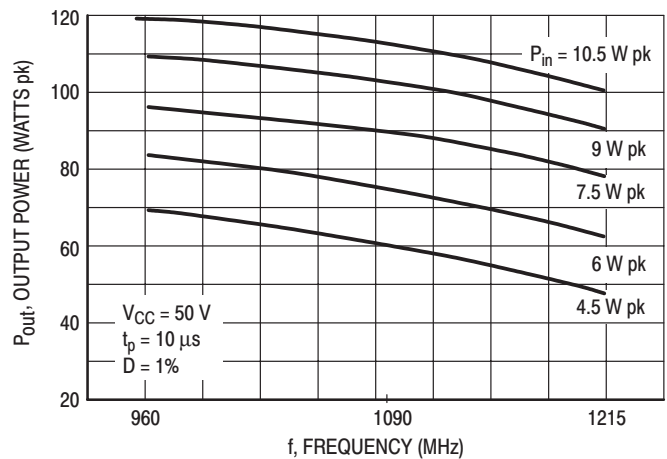


C1, C2 — 220 pF Chip Capacitor, 100-mil ATC  
 C3 — 0.1  $\mu\text{F}$   
 C4 — 47  $\mu\text{F}/75\text{ V}$   
 L1, L2 — 3 Turns #18 AWG, 1/8" ID  
 Z1-Z9 — Distributed Microstrip Elements,  
 See Photomaster  
 Board Material — 0.031" Thick Glass Teflon,  $\epsilon_r = 2.5$

**Figure 1. 1090 MHz Test Circuit**



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



**Figure 3. Output Power versus Frequency**

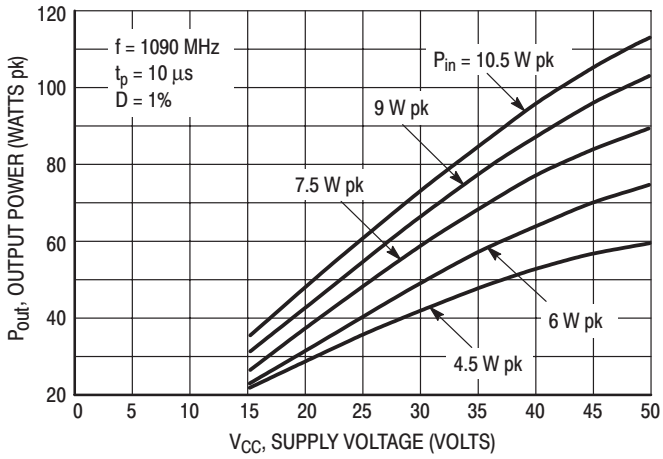


Figure 4. Output Power versus Supply Voltage

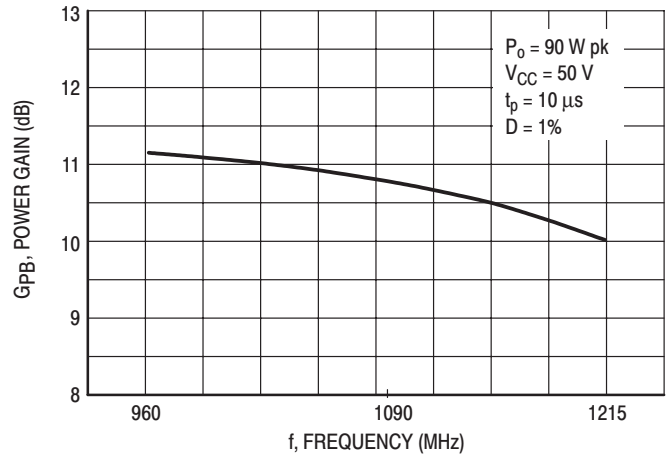
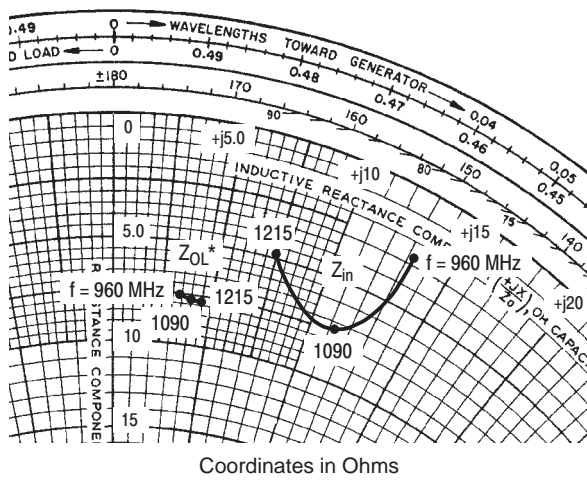


Figure 5. Power Gain versus Frequency



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

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

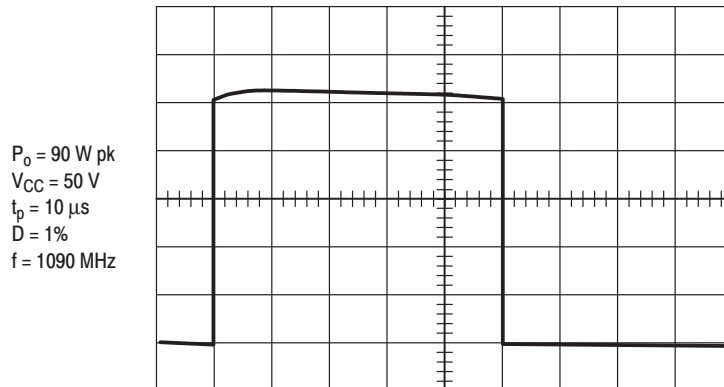
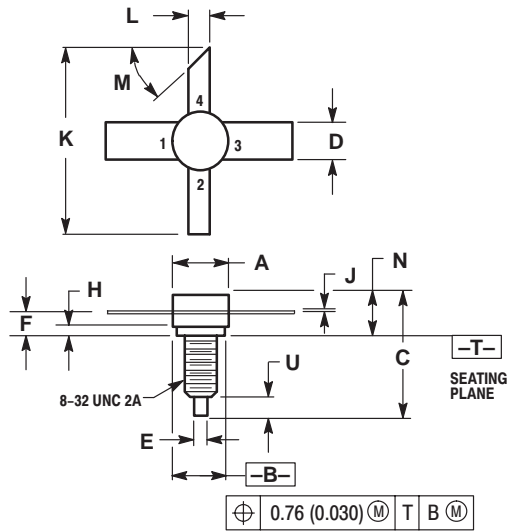


Figure 7. Typical Pulse Performance

## PACKAGE DIMENSIONS



- NOTES:  
 1. 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**

*Specifications subject to change without notice.*

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