

# The RF Line

## NPN Silicon

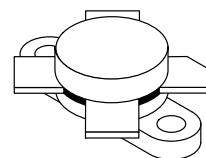
### RF Power Transistor

Designed primarily for high-voltage applications as a high-power linear amplifier from 2.0 to 30 MHz. Ideal for marine and base station equipment.

- Specified 50 Volt, 30 MHz Characteristics
  - Output Power = 250 W
  - Minimum Gain = 12 dB
  - Efficiency = 45%
- Intermodulation Distortion @ 250 W (PEP) —
  - IMD = -30 dB (Max)
- 100% Tested for Load Mismatch at all Phase Angles with 3:1 VSWR

**MRF448**

**250 W, 30 MHz  
RF POWER  
TRANSISTOR  
NPN SILICON**



CASE 211-11, STYLE 1

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector-Base Voltage	$V_{CBO}$	100	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Continuous	$I_C$	16	Adc
Withstand Current — 10 s	—	20	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	290 1.67	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	$R_{\theta JC}$	0.6	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 200 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 100 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	100	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100 \text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	100	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc

NOTE:

- $P_D$  is a measurement reflecting short term maximum condition. See SOAR curve for operating conditions.

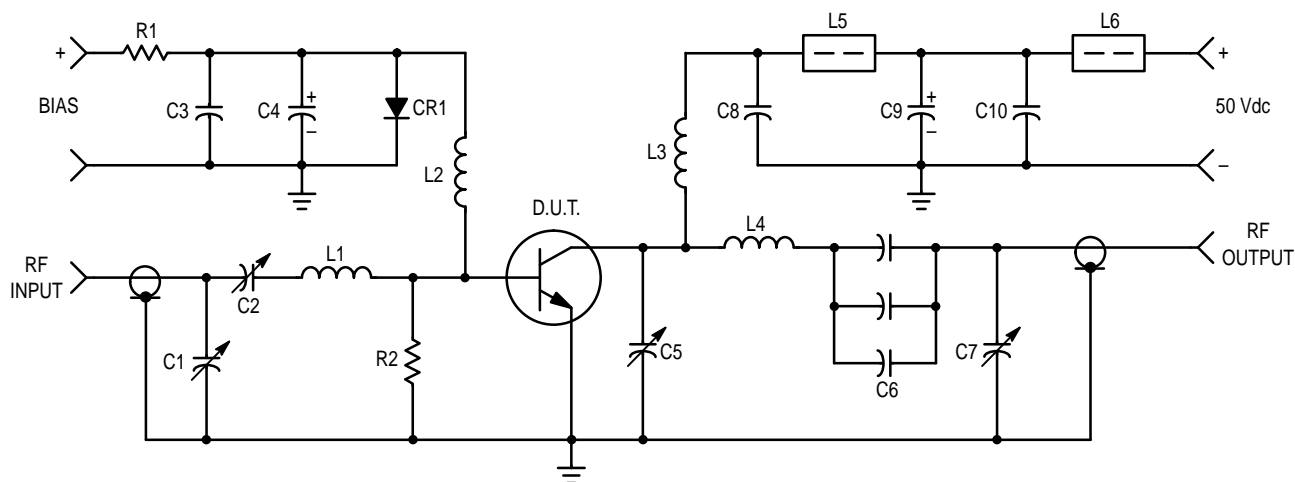
(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 5.0 \text{ Adc}$ , $V_{CE} = 10 \text{ Vdc}$ )	$h_{FE}$	10	30	—	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 50 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	350	450	pF
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 50 \text{ Vdc}$ , $P_{out} = 250 \text{ W CW}$ , $f = 30 \text{ MHz}$ , $I_{CQ} = 250 \text{ mA}$ )	$G_{PE}$	12	14	—	dB
Collector Efficiency ( $V_{CC} = 50 \text{ Vdc}$ , $P_{out} = 250 \text{ W}$ , $f = 30 \text{ MHz}$ , $I_{CQ} = 250 \text{ mA}$ )	$\eta$	—	45 65	—	% (PEP) % (CW)
Intermodulation Distortion (2) ( $V_{CE} = 50 \text{ Vdc}$ , $P_{out} = 250 \text{ W (PEP)}$ , $I_{CQ} = 250 \text{ mA}$ , $f = 30 \text{ MHz}$ )	IMD	—	-33	-30	dB
Electrical Ruggedness ( $V_{CC} = 50 \text{ Vdc}$ , $P_{out} = 250 \text{ W CW}$ , $f = 30 \text{ MHz}$ , VSWR 3:1 at all Phase Angles)	$\psi$	No Degradation in Output Power			

**NOTE:**

2. To Mil-Std-1311 Version A, Test Method 2204, Two Tone, Reference each Tone.



C1, C2, C5, C7 — 170–780 pF, Arco 469  
 C3, C8, C9 — 0.1  $\mu\text{F}$ , 100 V Erie  
 C4 — 500  $\mu\text{F}$  @ 6.0 V  
 C6 — 360 pF, 3 x 120 pF 3.0 kV in parallel  
 C10 — 10  $\mu\text{F}$ , 100 V  
 R1 — 10  $\Omega$ , 10 Watt  
 R2 — 10  $\Omega$ , 1.0 Watt

CR1 — 1N4997 or equivalent  
 L1 — 3 Turns, #16 Wire, 0.4" I.D., 0.3" Long  
 L2 — 0.8  $\mu\text{H}$ , Ohmite Z-235 or equivalent  
 L3 — 12 Turns, #16 Enameled Wire Closewound 0.25" I.D.  
 L4 — 4 Turns, 1/8" Copper Tubing, 0.6" I.D., 1.0" Long  
 L5, L6 — 2.0  $\mu\text{H}$ , Fair-Rite 2643021801 Ferrite bead each or equivalent

**Figure 1. 30 MHz Test Circuit Schematic**

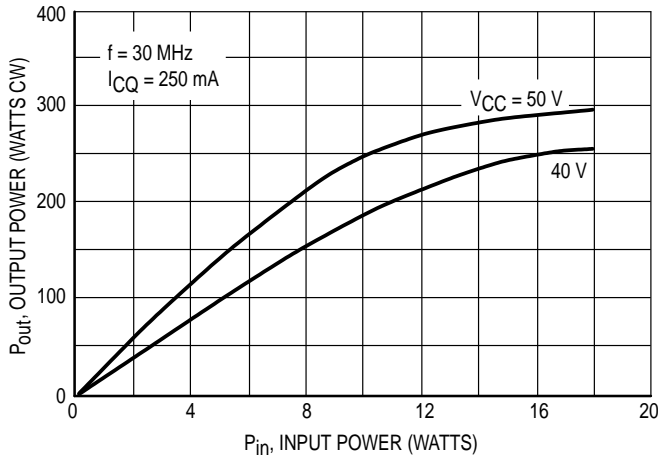


Figure 2. Output Power versus Input Power

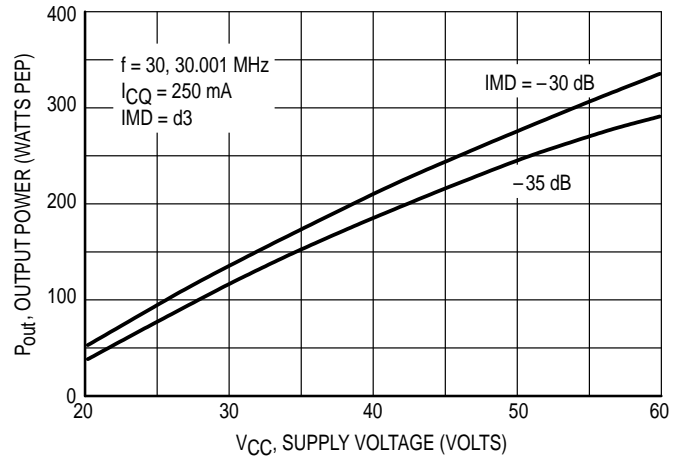


Figure 3. Output Power versus Supply Voltage

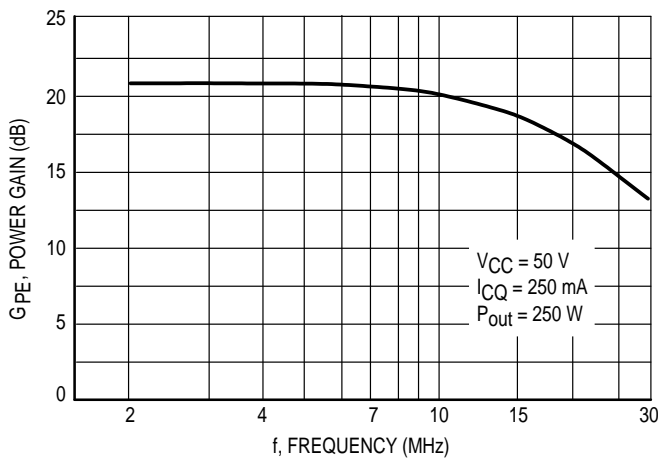


Figure 4. Power Gain versus Frequency

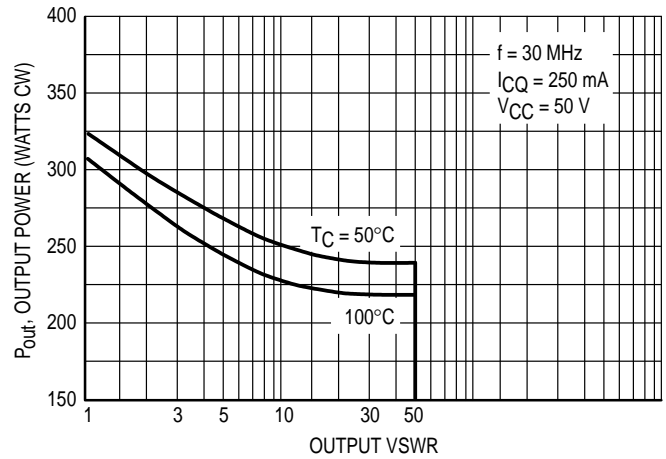


Figure 5. RF SOAR (Class AB)  $P_{out}$  versus Output VSWR

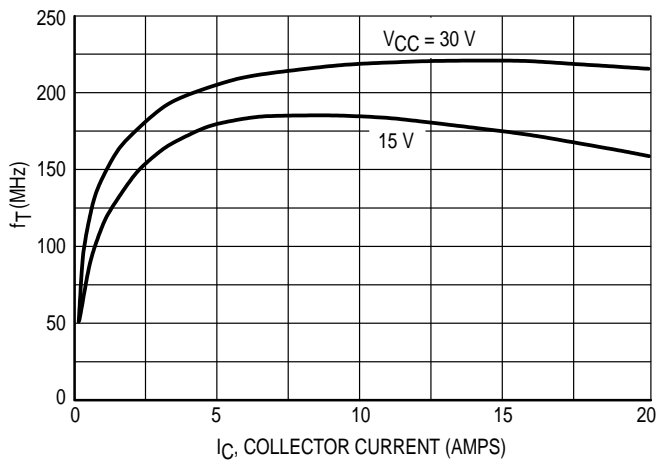


Figure 6.  $f_T$  versus Collector Current

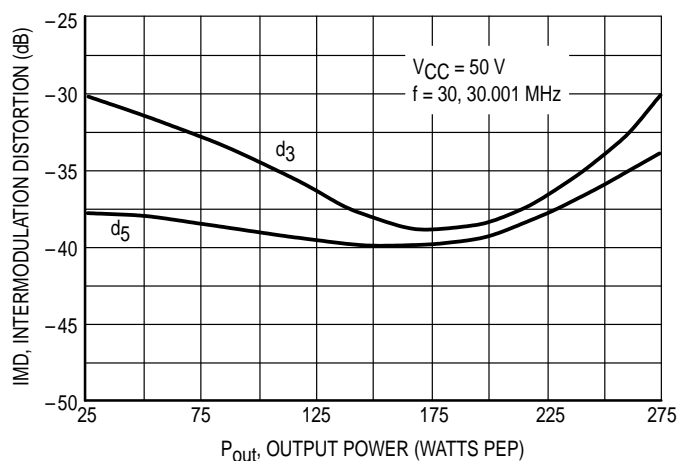
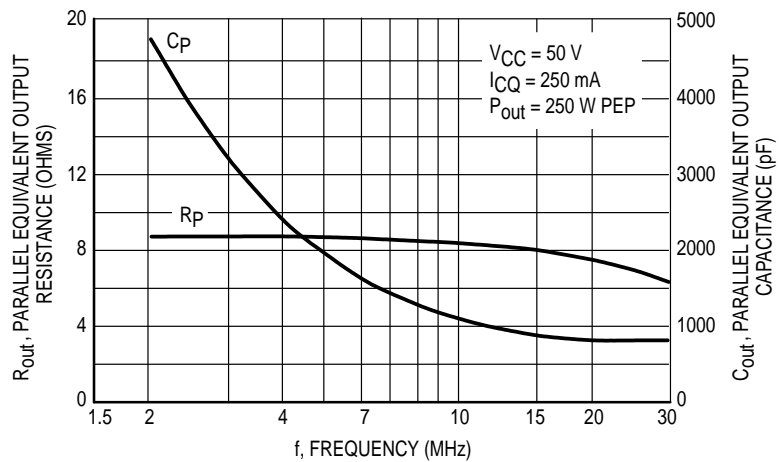
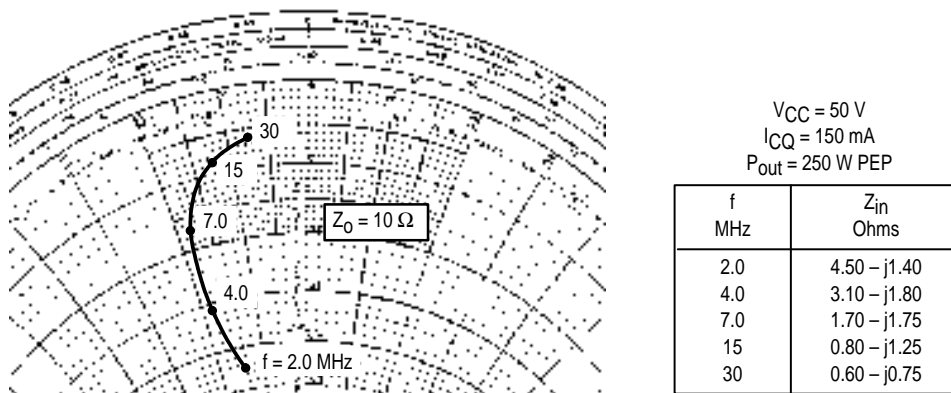


Figure 7. IMD versus  $P_{out}$

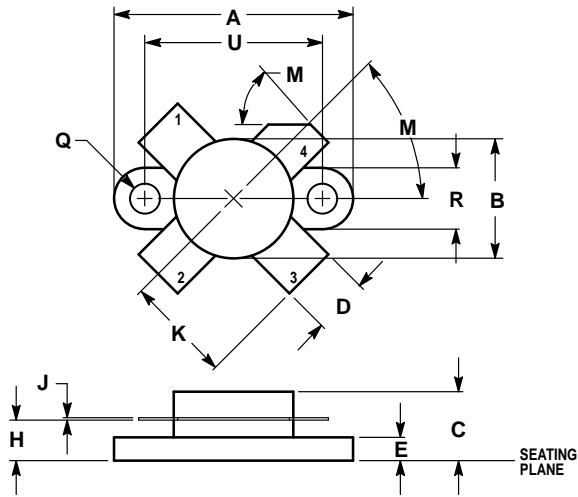


**Figure 8. Output Resistance and Capacitance versus Frequency**



**Figure 9. Series Equivalent Impedance**

## PACKAGE DIMENSIONS




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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.960	0.990	24.39	25.14
B	0.465	0.510	11.82	12.95
C	0.229	0.275	5.82	6.98
D	0.216	0.235	5.49	5.96
E	0.084	0.110	2.14	2.79
H	0.144	0.178	3.66	4.52
J	0.003	0.007	0.08	0.17
K	0.435	—	11.05	—
M	45°NOM		45°NOM	
Q	0.115	0.130	2.93	3.30
R	0.246	0.255	6.25	6.47
U	0.720	0.730	18.29	18.54

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

**CASE 211-11  
 ISSUE N**

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MRF448/D



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