

# The RF Line

## NPN Silicon

### RF Power Transistor

... designed primarily for applications as a high-power linear amplifier from 2.0 to 30 MHz, in single sideband mobile, marine and base station equipment.

- Specified 28 Volt, 30 MHz Characteristics —
  - Output Power = 80 W (PEP)
  - Minimum Gain = 15 dB
  - Efficiency = 40%
  - Intermodulation Distortion = -32 dB (Max)

#### MATCHING PROCEDURE

In the push-pull circuit configuration it is preferred that the transistors are used as matched pairs to obtain optimum performance.

The matching procedure used by Motorola consists of measuring  $h_{FE}$  at the data sheet conditions and color coding the device to predetermined  $h_{FE}$  ranges within the normal  $h_{FE}$  limits. A color dot is added to the marking on top of the cap. Any two devices with the same color dot can be paired together to form a matched set of units.

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	35	Vdc
Collector-Base Voltage	$V_{CBO}$	65	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Continuous	$I_C$	10	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 1.4	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	$R_{\theta JC}$	0.7	$^\circ\text{C/W}$
Stud Torque (1)	—	8.5	In. Lb.

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

Characteristic	Symbol	Min	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	35	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 100\text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	65	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 1.0\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	Vdc
Collector Cutoff Current ( $V_{CE} = 28\text{ Vdc}$ , $V_{BE} = 0$ , $T_C = +55^\circ\text{C}$ )	$I_{CES}$	—	10	mAdc

#### ON CHARACTERISTICS

DC Current Gain ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	10	—	—
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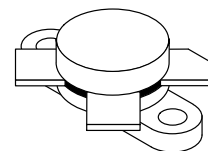
NOTE:

- Case 145A-10 — For Repeated Assembly Use 11 In. Lb.

(continued)

**MRF464**

**80 W (PEP), 30 MHz  
RF POWER  
TRANSISTOR  
NPN SILICON**



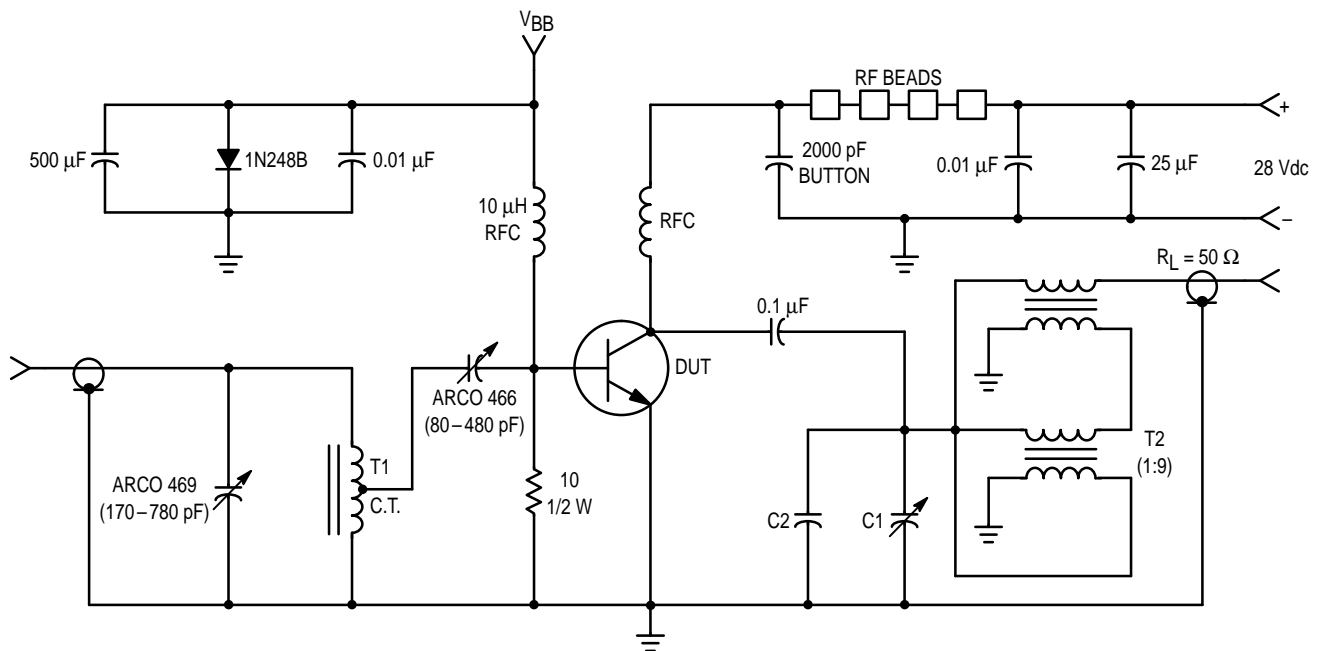
CASE 211-11, STYLE 1

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

Characteristic	Symbol	Min	Max	Unit
<b>DYNAMIC CHARACTERISTICS</b>				
Output Capacitance ( $V_{CB} = 28 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	200	pF
<b>FUNCTIONAL TESTS</b>				
Common-Emitter Amplifier Power Gain (Figure 1) ( $P_{out} = 80 \text{ W (PEP)}$ , $I_C = 3.6 \text{ Adc (Max)}$ , $V_{CC} = 28 \text{ Vdc}$ , $f_1 = 30 \text{ MHz}$ , $f_2 = 30.001 \text{ MHz}$ )	$G_{PE}$	15	—	dB
Intermodulation Distortion Ratio (Figure 1) (2) ( $P_{out} = 80 \text{ W (PEP)}$ , $I_C = 3.6 \text{ Adc (Max)}$ , $V_{CC} = 28 \text{ Vdc}$ , $f_1 = 30 \text{ MHz}$ , $f_2 = 30.001 \text{ MHz}$ )	IMD	—	-32	dB
Collector Efficiency ( $P_{out} = 80 \text{ W (PEP)}$ , $I_C = 3.6 \text{ Adc (Max)}$ , $V_{CC} = 28 \text{ Vdc}$ , $f_1 = 30 \text{ MHz}$ , $f_2 = 30.001 \text{ MHz}$ )	$\eta$	40	—	%

**NOTE:**

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



RFC — 20 Turns @ 12 AWG Enameled Wire Close Wound in 2 Layers, 1/4" I.D.

T1 — 20 Turns #24 AWG Wire Wound on Micro-Metals T37-7 Toroid Core Center Tapped.

T2 — 1:9 XFMR; 6 Turns of 2 Twisted Pairs of #28 AWG Enameled Wire. (8 Crests Per Inch) Bifilar Wound on Each of 2 Separate Balun Cores. (Stackpole #57-1503, No. 14 Material) Interconnected as shown

RF Beads — Ferroxcube #56-590-65/3B

$V_{BB}$  adjusted for  $I_{CQ} = 40 \text{ mA}$  ( $I_{CQ} = \text{Quiescent Collector Current}$ )

C1 — 170-180 pF ARCO 469 or Equivalent

C2 — 330 pF

**Figure 1. 30 MHz Test Circuit**

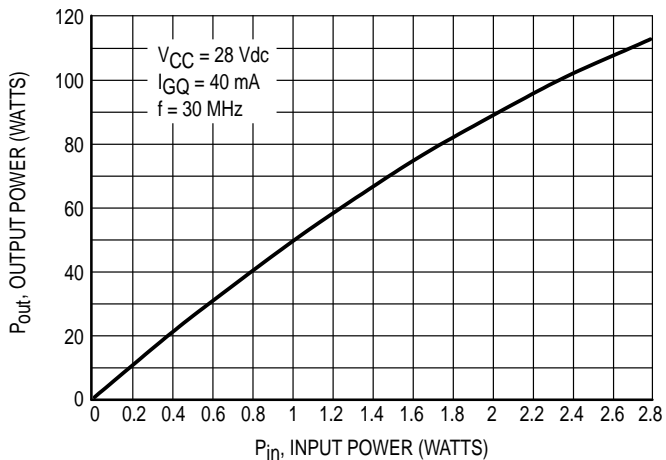


Figure 2. Output Power versus Input Power

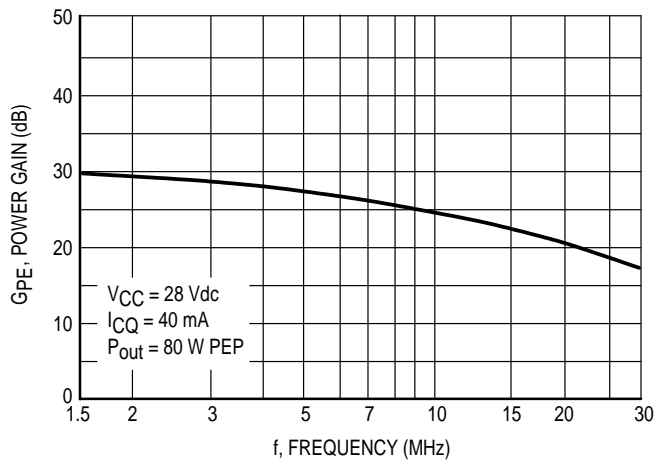


Figure 3. Power Gain versus Frequency

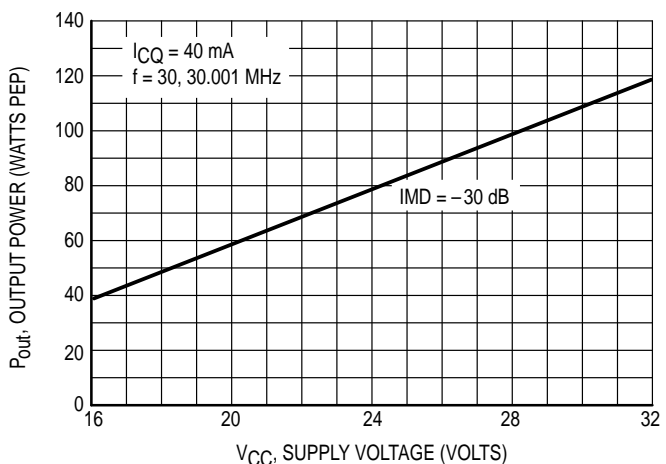


Figure 4. Output Power versus Supply Voltage

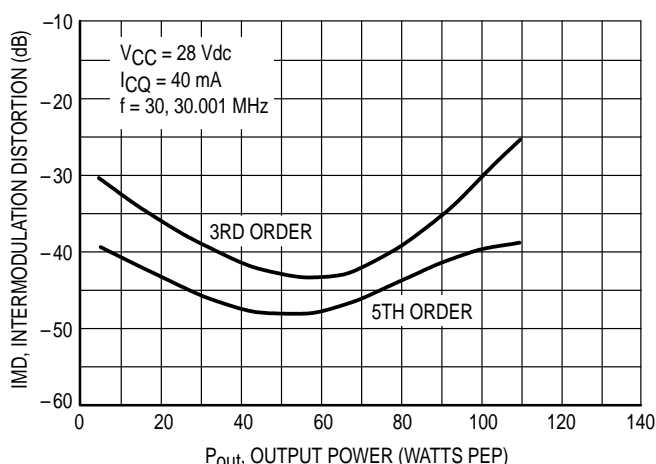


Figure 5. Intermodulation Distortion versus Output Power

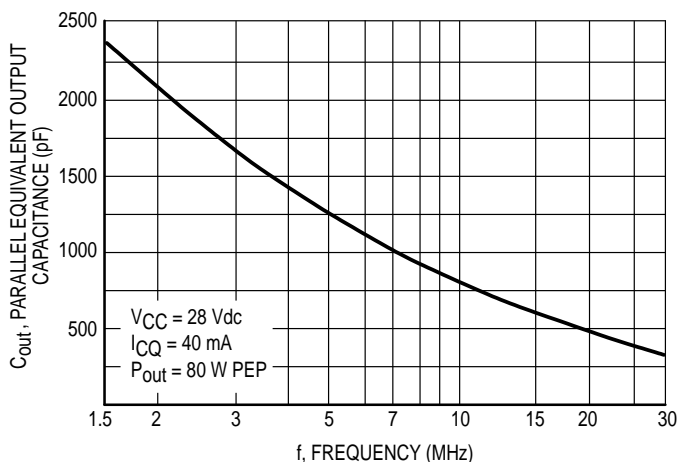


Figure 6. Output Capacitance versus Frequency

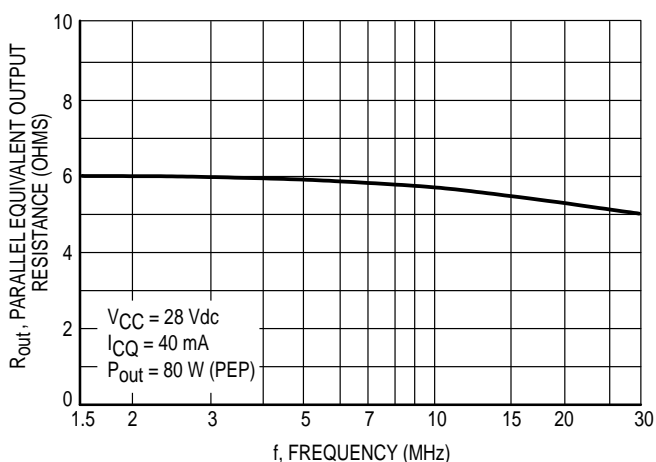


Figure 7. Output Resistance versus Frequency

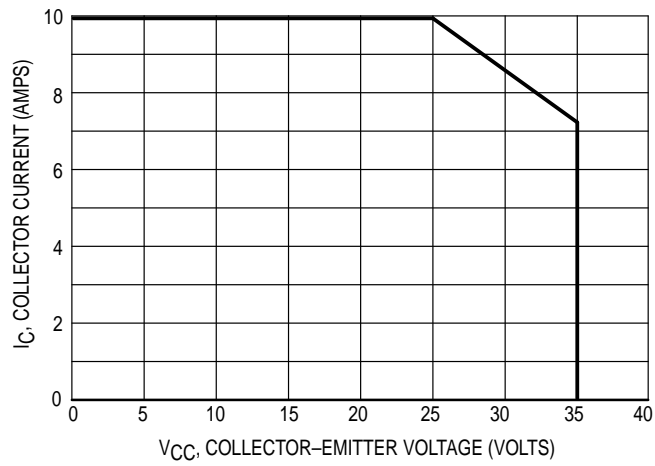


Figure 8. DC Safe Operating Area

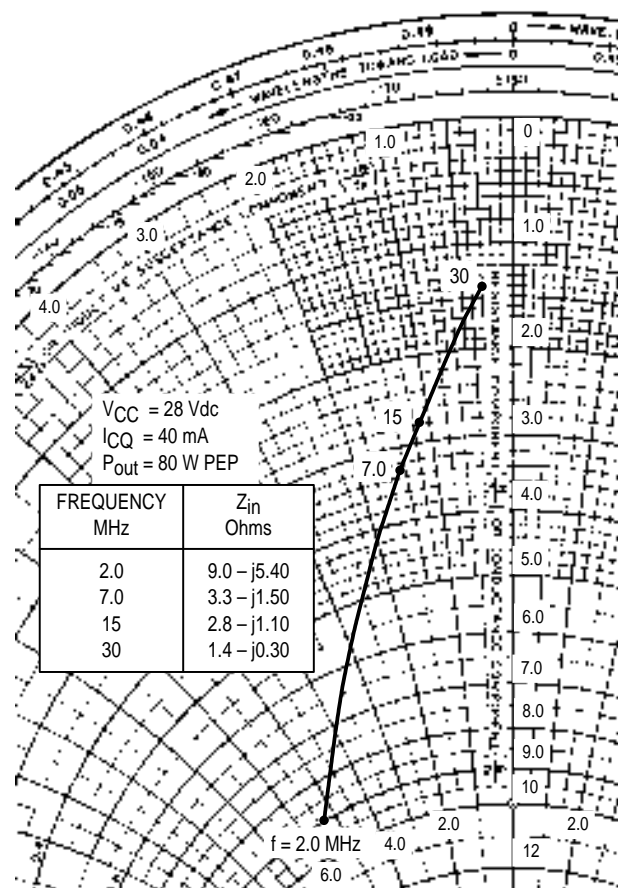
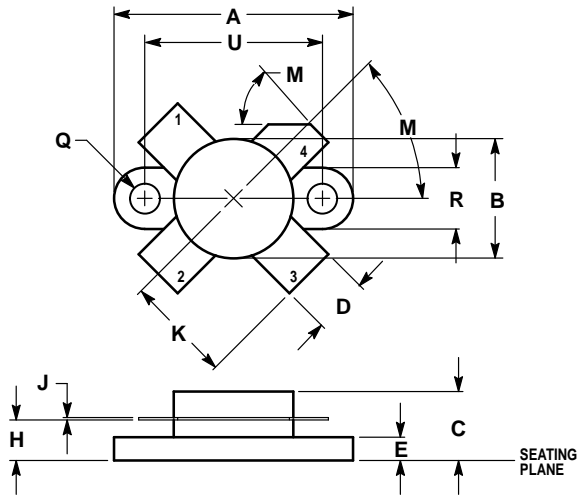


Figure 9. Series Input Impedance

## 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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MRF464/D

