

# The RF Line

## NPN Silicon

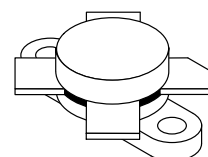
### RF Power Transistor

Designed primarily for application as a high-power linear amplifier from 2.0 to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics —  
Output Power = 100 W (PEP)  
Minimum Gain = 10 dB  
Efficiency = 40%
- Intermodulation Distortion @ 100 W (PEP) —  
IMD = -30 dB (Min)
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR

**MRF421**

**100 W (PEP), 30 MHz  
RF POWER  
TRANSISTORS  
NPN SILICON**



**CASE 211-11, STYLE 1**

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	20	Vdc
Collector-Base Voltage	$V_{CBO}$	45	Vdc
Emitter-Base Voltage	$V_{EBO}$	3.0	Vdc
Collector Current — Continuous	$I_C$	20	Adc
Withstand Current — 10 s	—	30	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ 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	$R_{\theta JC}$	0.6	$^\circ\text{C/W}$

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

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

#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	20	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 200 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	45	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 200 \text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	3.0	—	—	Vdc
Collector Cutoff Current ( $V_{CE} = 16 \text{ Vdc}$ , $V_{BE} = 0$ , $T_C = 25^\circ\text{C}$ )	$I_{CES}$	—	—	10	mAdc

(continued)

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

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

## **ON CHARACTERISTICS**

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

## **DYNAMIC CHARACTERISTICS**

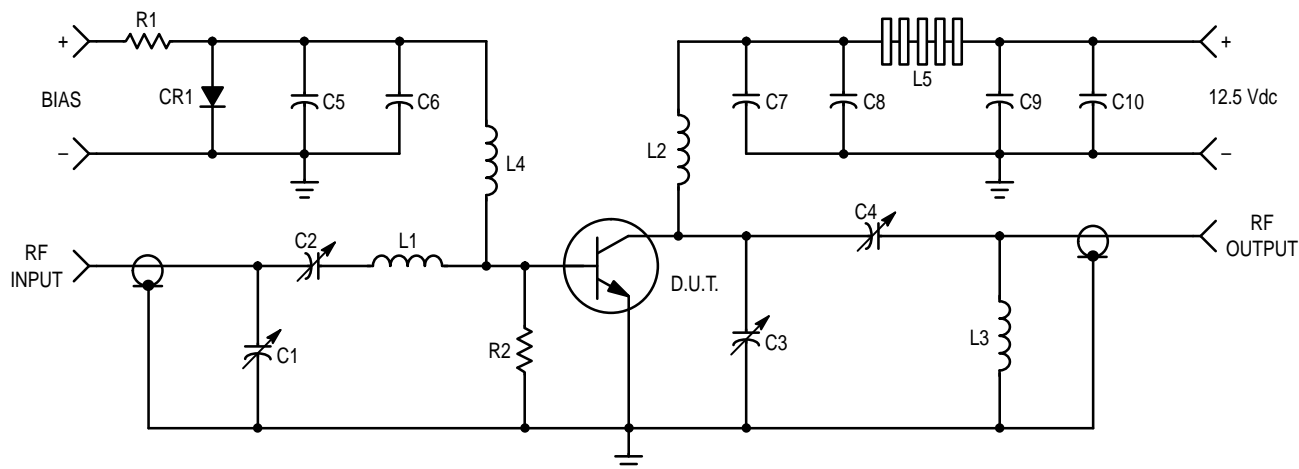
Output Capacitance ( $V_{CB} = 12.5 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	550	800	pF
---	----------	---	-----	-----	----

## **FUNCTIONAL TESTS**

Common-Emitter Amplifier Power Gain ( $V_{CC} = 12.5 \text{ Vdc}$ , $P_{out} = 100 \text{ W}$ , $I_{C(max)} = 10 \text{ Adc}$ , $I_{CQ} = 150 \text{ mA}$ , $f = 30, 30.001 \text{ MHz}$ )	$G_{PE}$	10	12	—	dB
Collector Efficiency ( $V_{CC} = 12.5 \text{ Vdc}$ , $P_{out} = 100 \text{ W}$ , $I_{C(max)} = 10 \text{ Adc}$ , $I_{CQ} = 150 \text{ mA}$ , $f = 30, 30.001 \text{ MHz}$ )	$\eta$	40	—	—	%
Intermodulation Distortion (1) ( $V_{CE} = 12.5 \text{ Vdc}$ , $P_{out} = 100 \text{ W}$ , $I_C = 10 \text{ Adc}$ , $I_{CQ} = 150 \text{ mA}$ , $f = 30, 30.001 \text{ MHz}$ )	IMD	—	-33	-30	dB

### NOTE:

1. To proposed EIA method of measurement. Reference peak envelope power.



C1, C2, C4 — 170–780 pF, ARCO 469  
 C3 — 80–480 pF, ARCO 466  
 C5, C7, C10 — ERIE 0.1  $\mu\text{F}$ , 100 V  
 C6 — MALLORY 500  $\mu\text{F}$  @ 15 V Electrolytic  
 C9 — 100  $\mu\text{F}$ , 15 V Electrolytic  
 C8 — 1000 pF, 350 V UNDERWOOD  
 R1 — 10  $\Omega$ , 25 Watt Wirewound

R2 — 10  $\Omega$ , 1.0 Watt Carbon  
 CR1 — 1N4997  
 L1 — 3 Turns, #16 Wire, 5/16" I.D., 5/16" Long  
 L2 — 12 Turns, #16 Enameled Wire Closewound, 1/4" I.D.  
 L3 — 1-3/4 Turns, 1/8" Tubing, 3/8" I.D., 3/8" Long  
 L4 — 10  $\mu\text{H}$  Molded Choke  
 L5 — 10 Ferrite Beads — FERROXCUBE #56–590–65/3B

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

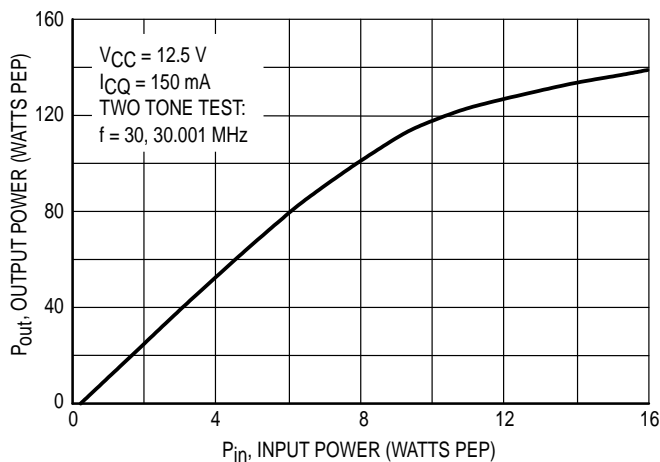


Figure 2. Output Power versus Input Power

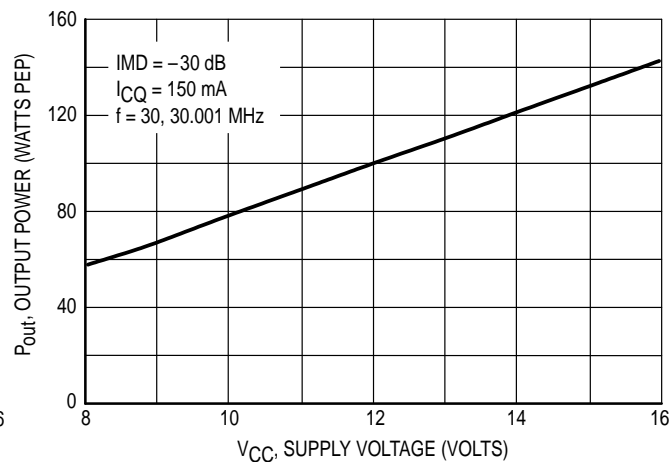


Figure 3. Output Power versus Supply Voltage

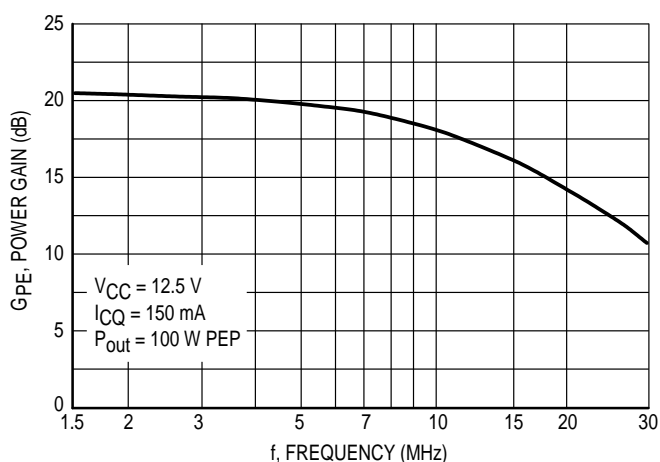


Figure 4. Power Gain versus Frequency

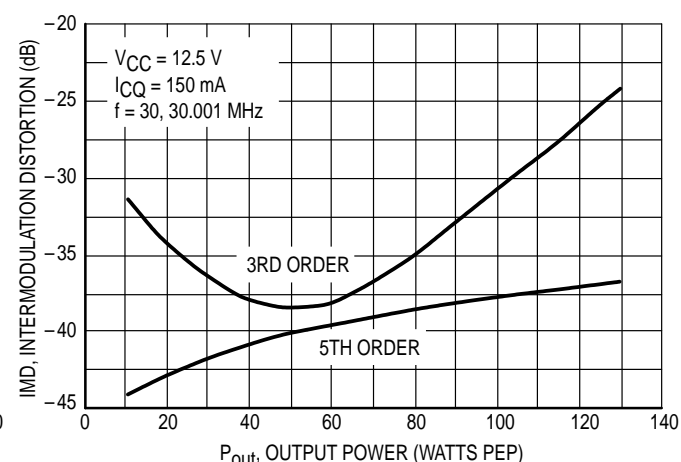


Figure 5. Intermodulation Distortion versus Output Power

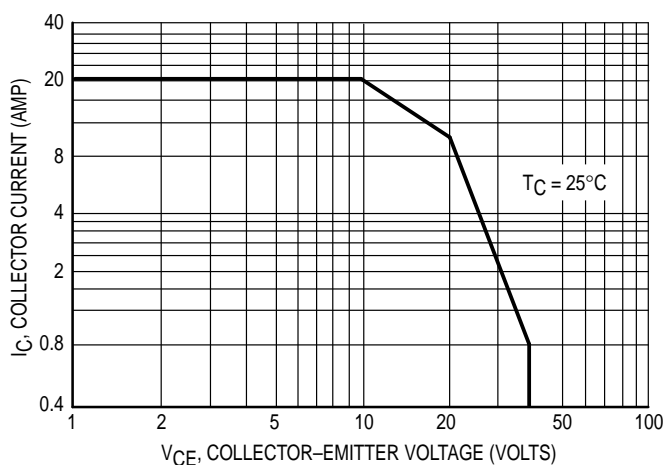


Figure 6. DC Safe Operating Area

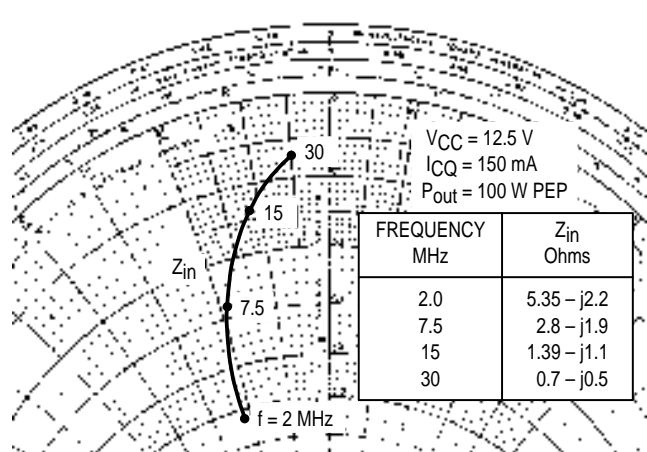


Figure 7. Series Equivalent Impedance

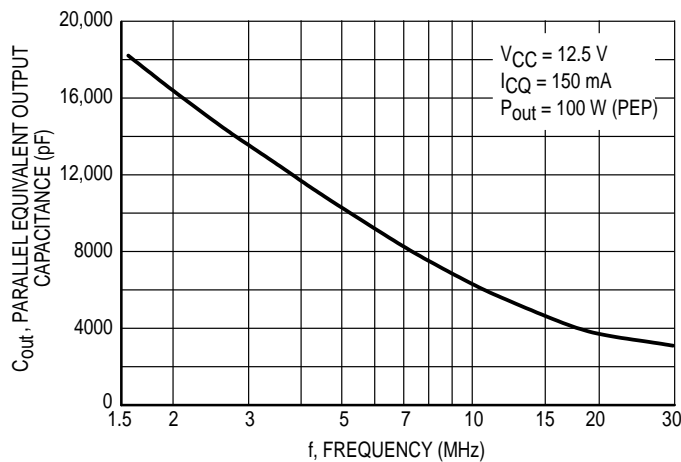


Figure 8. Output Capacitance versus Frequency

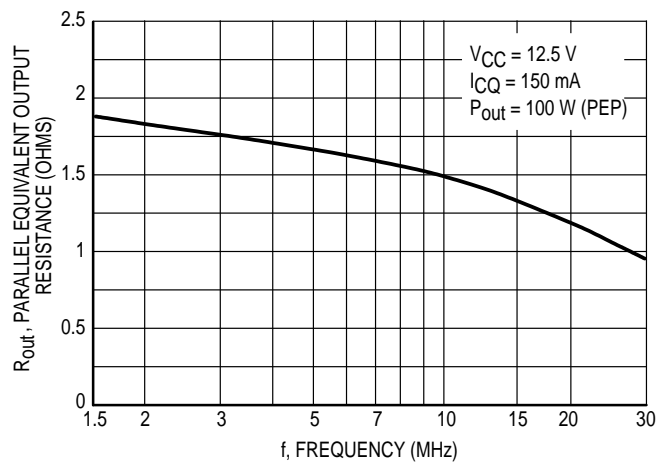
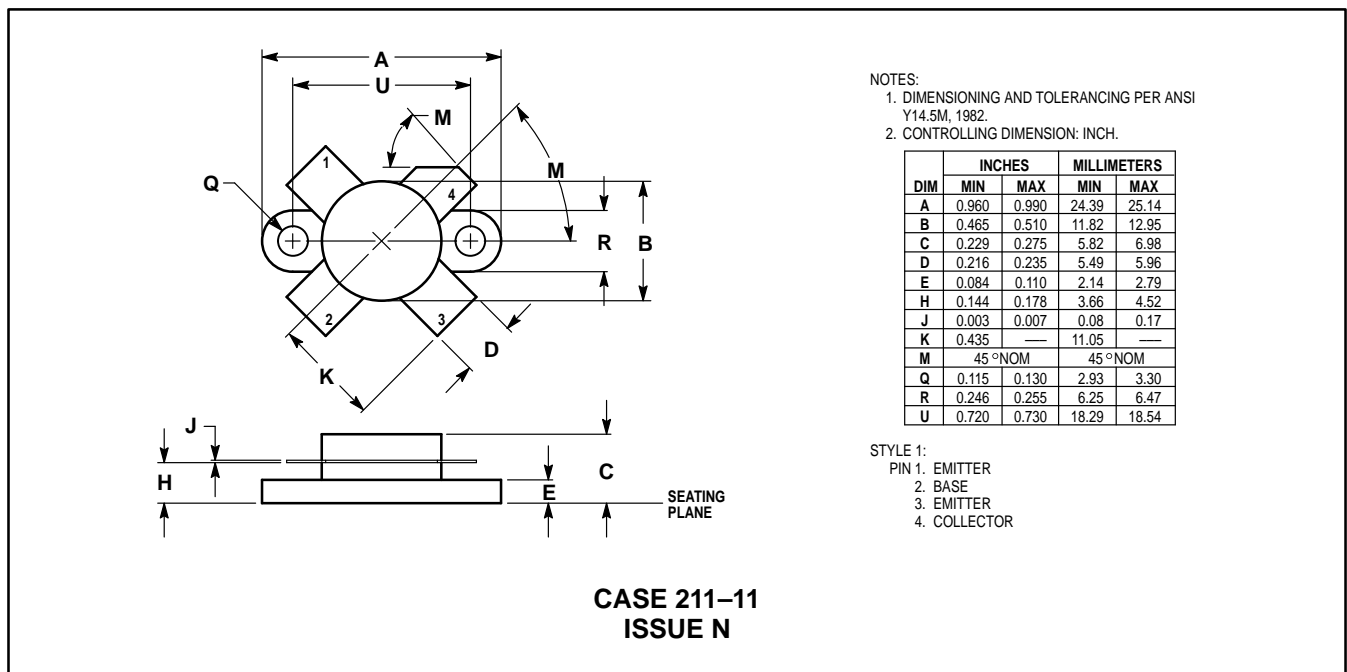


Figure 9. Output Resistance versus Frequency

## PACKAGE DIMENSIONS



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

### How to reach us:

**USA/EUROPE:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

**MFAX:** RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609  
**INTERNET:** <http://Design-NET.com>

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,  
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

**HONG KONG:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



MRF421/D

