

The RF Line

NPN Silicon

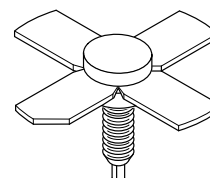
RF Power Transistor

... designed primarily for wideband large-signal driver and predriver amplifier stages in 200–500 MHz frequency range.

- Guaranteed Performance at 400 MHz, 28 Vdc
Output Power = 10 Watts
Power Gain = 12 dB Min
Efficiency = 50% Min
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR
- Gold Metallization System for High Reliability
- Computer-Controlled Wirebonding Gives Consistent Input Impedance

MRF321

**10 W, 400 MHz
RF POWER
TRANSISTOR
NPN SILICON**



CASE 244-04, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	33	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous — Peak	I_C	1.1 1.5	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	27 160	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	–65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.4	$^\circ\text{C/W}$

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 ($I_C = 20\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	33	—	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 20\text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	60	—	—	Vdc
Collector–Base Breakdown Voltage ($I_C = 20\text{ mAdc}$, $I_E = 0$)	$V_{(BR)CBO}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 2.0\text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	1.0	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 500\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	—	80	—
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NOTE:

- This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

(continued)



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

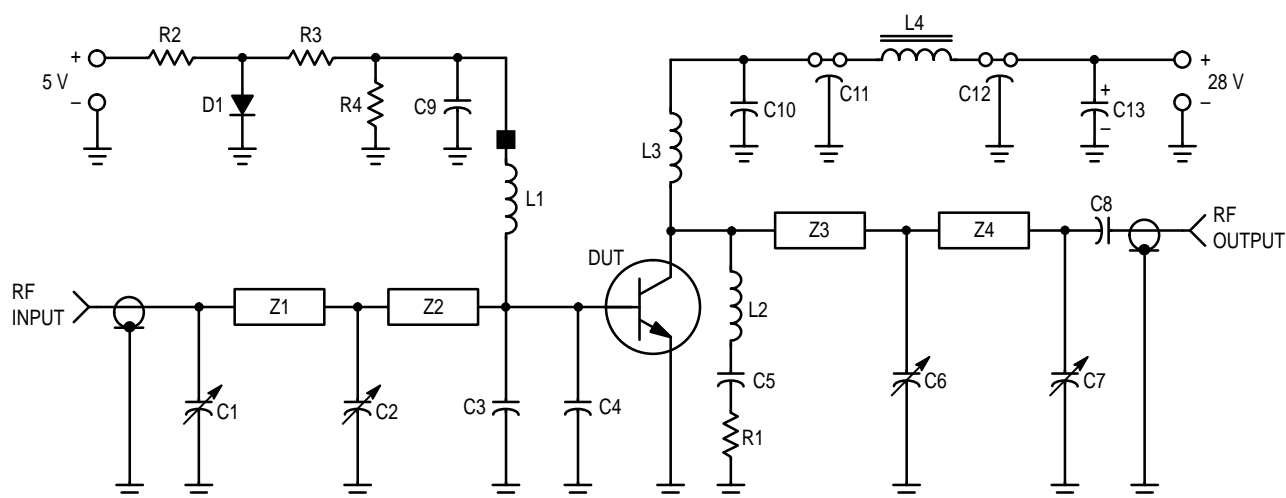
Characteristic	Symbol	Min	Typ	Max	Unit
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DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 28\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	10	12	pF
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FUNCTIONAL TESTS (Figure 1)

Common-Emitter Amplifier Power Gain ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$)	G_{PE}	12	13	—	dB
Collector Efficiency ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$)	η	50	60	—	%
Load Mismatch ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$, VSWR = 30:1 all phase angles)	ψ	No Degradation in Output Power			



C1, C2, C3 — 1.0–20 pF Johanson Trimmer (JMC 5501)
 C3, C4 — 47 pF ATC Chip Capacitor
 C5, C10 — 0.1 μF Erie Redcap
 C7 — 0.5–10 pF Johanson Trimmer (JMC 5201)
 C8 — 0.018 μF Vitramon Chip Capacitor
 C9 — 200 pF UNELCO Capacitor
 C11, C12 — 680 pF Feedthru
 C13 — 1.0 μF , 50 Volt Tantalum Capacitor
 D1 — 1N4001
 L1 — 0.33 μH Molded Choke with Ferroxcube Bead
 (Ferroxcube 56–590–65/4B) on Ground End of Coil
 L2 — 4 Turns #20 Enamel, 1/8" ID

L3 — 6 Turns #20 Enamel, 1/4" ID
 L4 — Ferroxcube VK200–19/4B
 R1 — 5.1 Ω , 1/4 Watt
 R2 — 120 Ω , 1.0 Watt
 R3 — 20 Ω , 1/2 Watt
 R4 — 47 Ω , 1/2 Watt
 Z1 — Microstrip 0.1" W x 1.35" L
 Z2 — Microstrip 0.1" W x 0.55" L
 Z3 — Microstrip 0.1" W x 0.8" L
 Z4 — Microstrip 0.1" W x 1.75" L
 Board — Glass Teflon, $\epsilon_R = 2.56$, $t = 0.062$ "
 Input/Output Connectors — Type N

Figure 1. 400 MHz Test Circuit Schematic

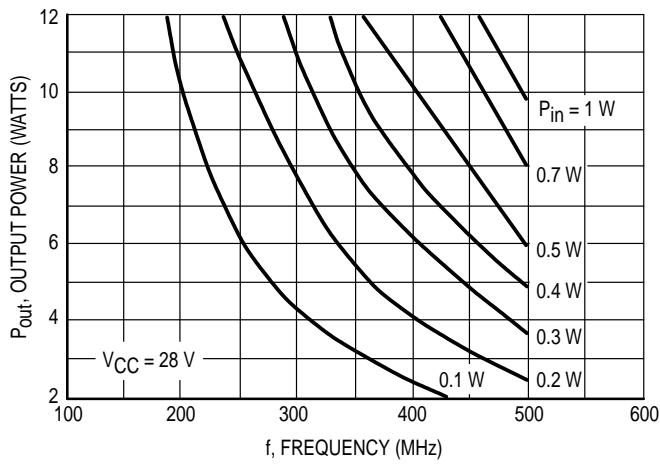


Figure 2. Output Power versus Frequency

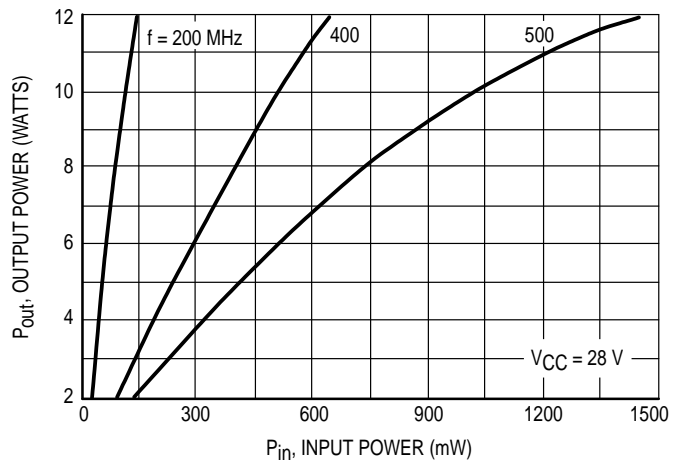


Figure 3. Output Power versus Input Power

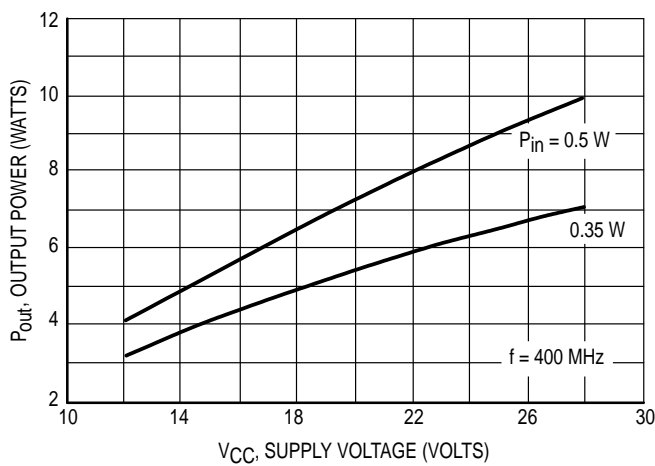


Figure 4. Output Power versus Supply Voltage

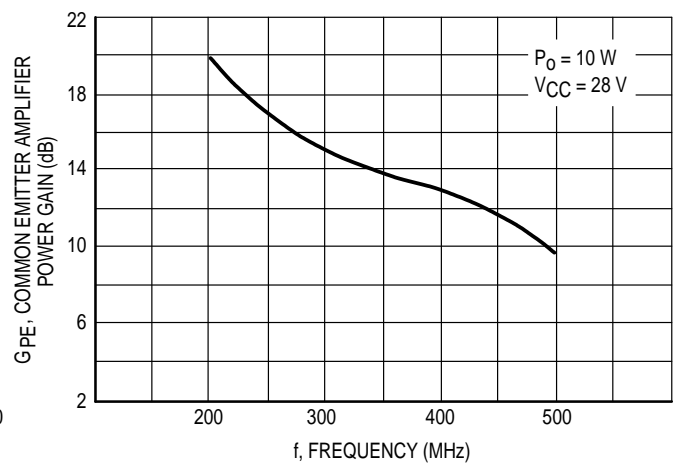
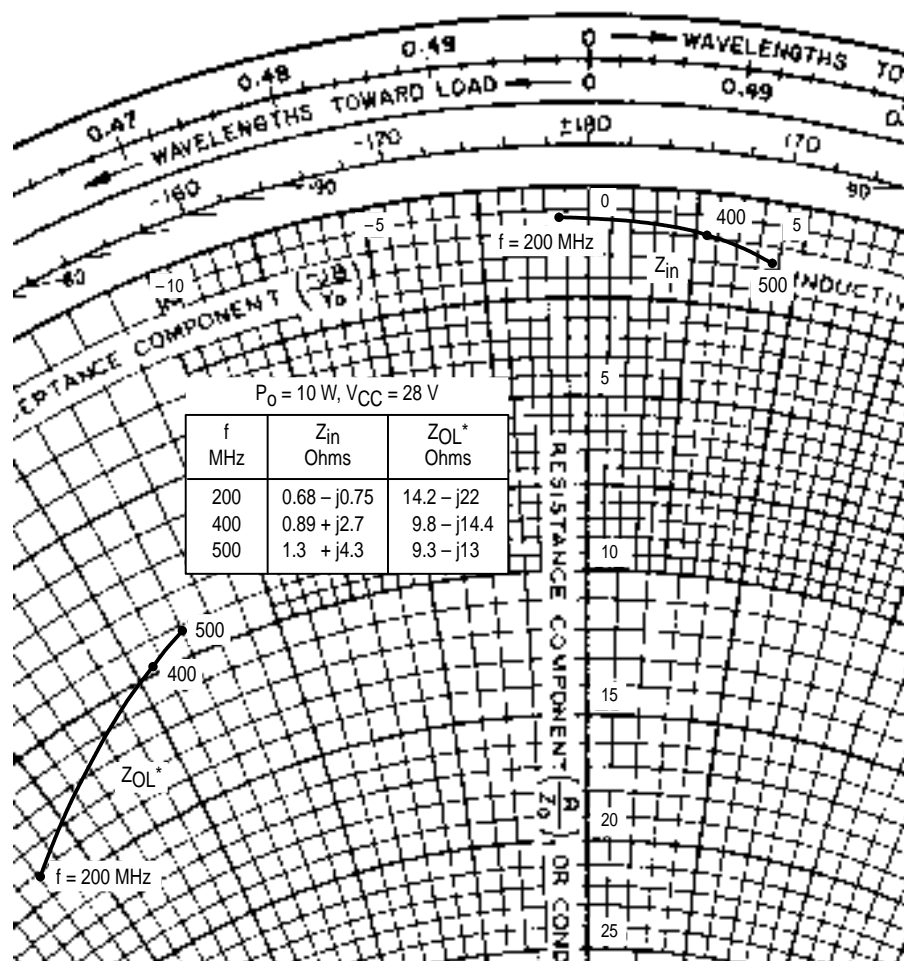


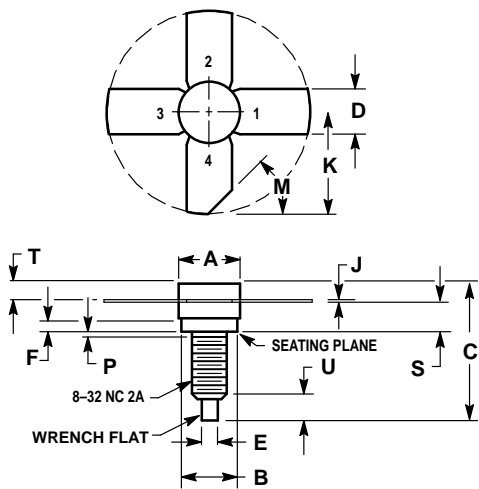
Figure 5. Power Gain versus Frequency



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 Impedance


PACKAGE DIMENSIONS



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.96	0.215	0.235
E	1.40	1.65	0.055	0.065
G	1.52	—	0.060	—
J	0.08	0.17	0.003	0.007
K	11.05	—	0.435	—
M	45°	NOM	45°	NOM
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.77	0.055	0.070
U	2.92	3.68	0.115	0.145

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

CASE 244-04
ISSUE J

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