MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

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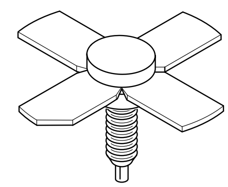
The RF Line
NPN Silicon RF Power Transistor

MRF323

20 W, 400 MHz
RF POWER
TRANSISTOR
NPN SILICON

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

- Guaranteed Performance at 400 MHz, 28 V
  - Output Power = 20 Watts
  - Power Gain = 10 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



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	2.2 3.0	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	55 310	Watts mW/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.2	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 20 mAdc, I_B = 0)	$V_{(BR)CEO}$	33	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 20 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	—	—	Vdc
Collector–Base Breakdown Voltage (I_C = 20 mAdc, I_E = 0)	$V_{(BR)CBO}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 2.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	—	—	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	20	—	80	—

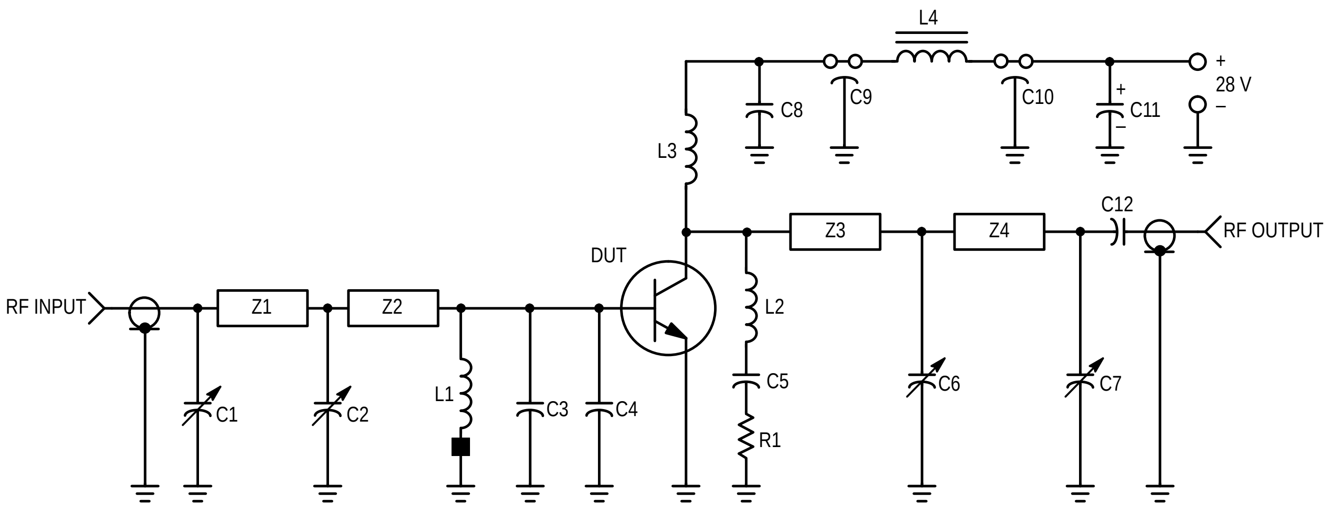
NOTE:
1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

(continued)

MOTOROLA

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	20	24	pF
FUNCTIONAL TESTS (Figure 1)					
Common–Emitter Amplifier Power Gain (V_{CC} = 28 Vdc, P_{out} = 20 W, f = 400 MHz)	G_{PE}	10	11	—	dB
Collector Efficiency (V_{CC} = 28 Vdc, P_{out} = 20 W, f = 400 MHz)	η	50	60	—	%
Load Mismatch (V_{CC} = 28 Vdc, P_{out} = 20 W, f = 400 MHz, VSWR = 30:1 all phase angles)	ψ	No Degradation in Output Power			



C1, C2, C6 — 1.0–20 pF Johanson Trimmer (JMC 5501)
C3, C4 — 47 pF ATC Chip Capacitor
C5, C8 — 0.1 µF Erie Redcap
C7 — 0.5–10 pF Johanson Trimmer (JMC 5201)
C9, C10 — 680 pF Feedthru
C11 — 1.0 µF 50 Volt Tantalum
C12 — 0.018 µF Vitramon Chip Capacitor
L1 — 0.33 µH Molded Choke with Ferroxcube Bead (Ferroxcube 56–590–65/4B) on Ground End
L2 — 6 Turns #20 Enamel, 1/4″ ID, Closewound
L3 — 4 Turns #20 Enamel, 1/8″ ID, Closewound
L4 — Ferroxcube VK200–19/4B
R1 — 5.1 Ω 1/4 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 ε_r = 2.56, t = 0.062″
Input/Output Connectors — Type N

Figure 1. 400 MHz Test Circuit Schematic

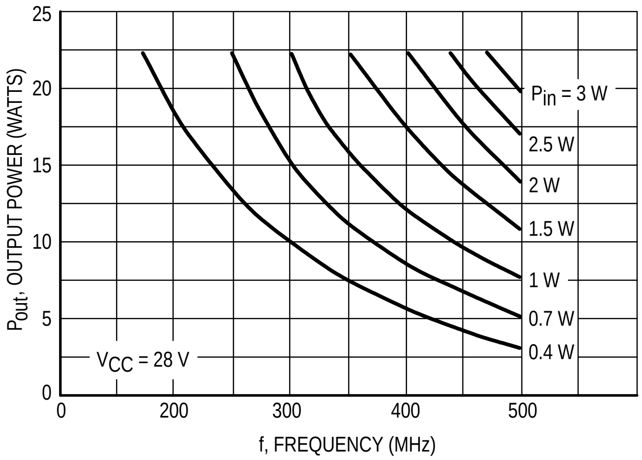


Figure 2. Output Power versus Frequency

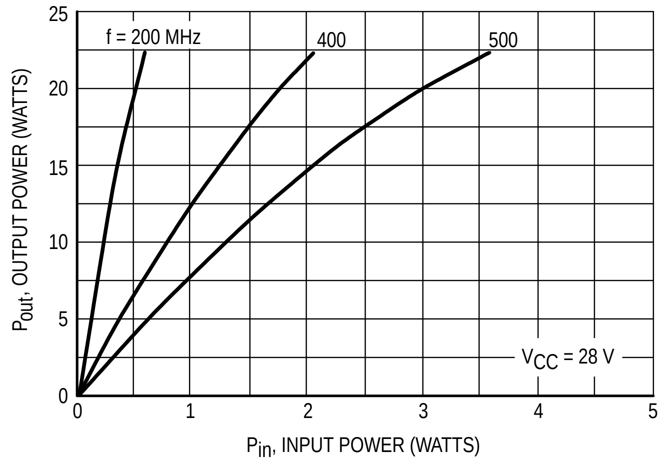


Figure 3. Output Power versus Input Power

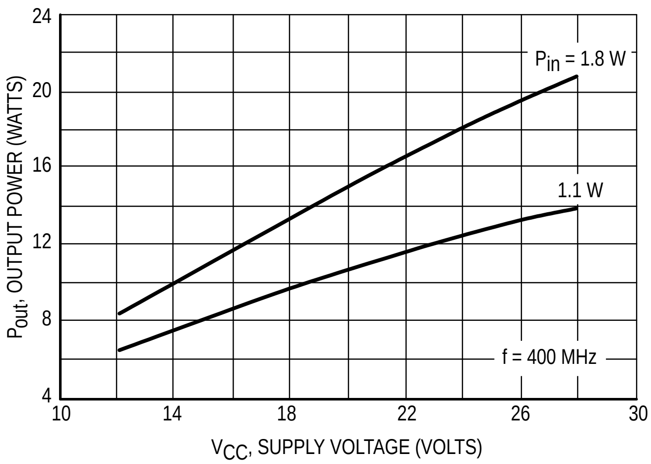


Figure 4. Output Power versus Supply Voltage

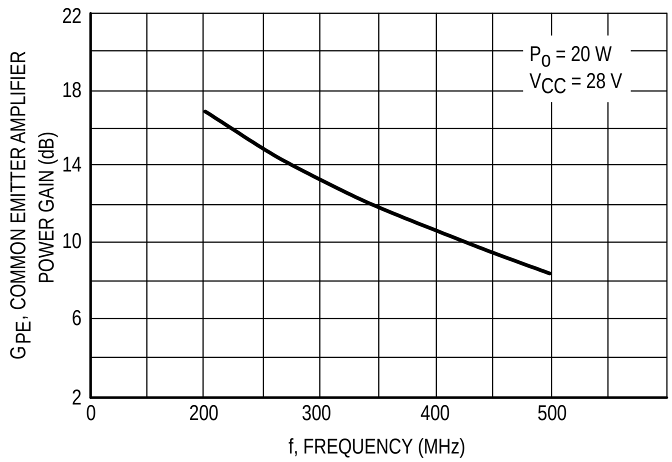
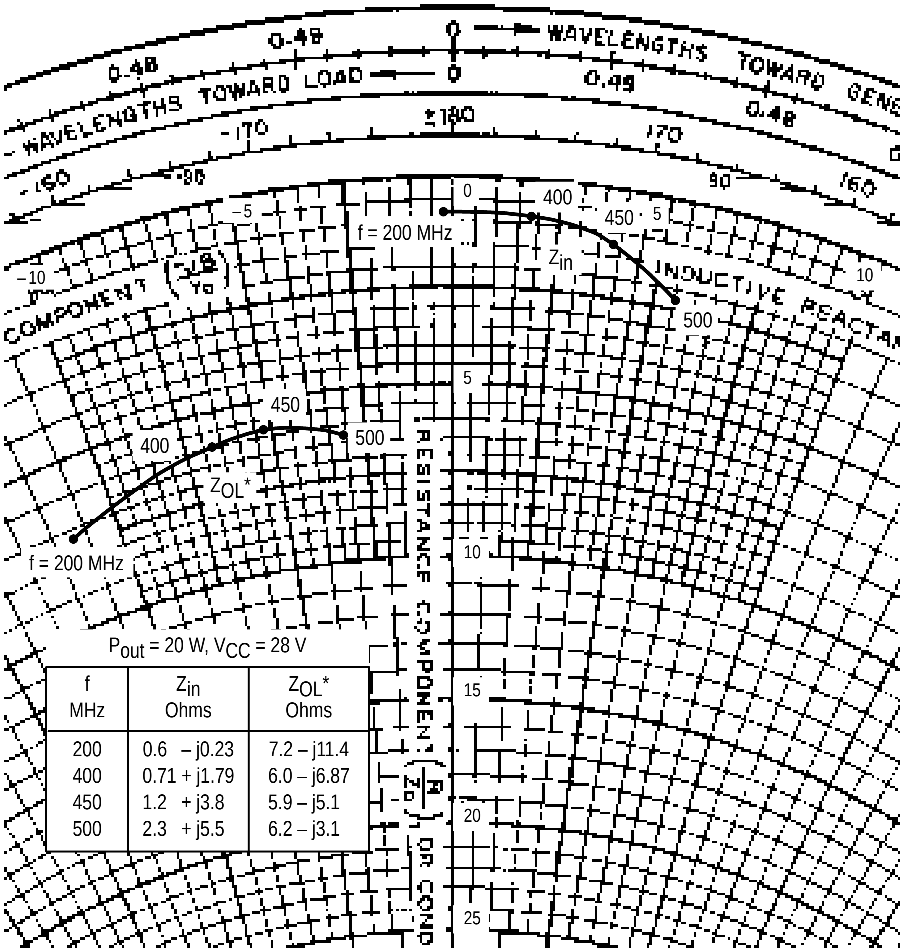


Figure 5. Power Gain versus Frequency



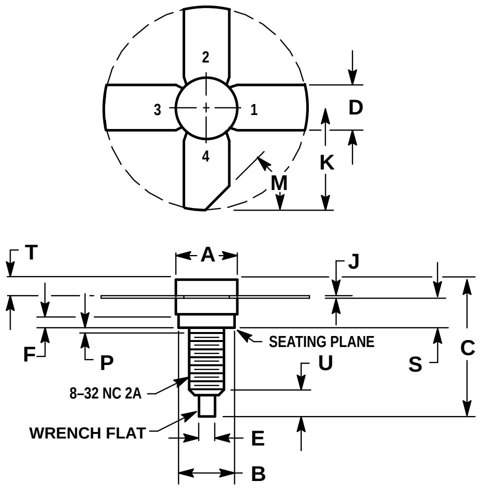
P_{out} = 20 W, V_{CC} = 28 V

f MHz	Z_{in} Ohms	Z_{OL}* Ohms
200	0.6 – j0.23	7.2 – j11.4
400	0.71 + j1.79	6.0 – j6.87
450	1.2 + j3.8	5.9 – j5.1
500	2.3 + j5.5	6.2 – j3.1

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 MIN	MILLIMETERS MAX	INCHES MIN	INCHES 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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