The RF Line

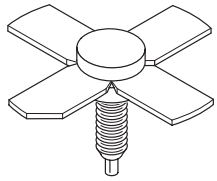
NPN Silicon RF Power Transistor

. . . designed for 12.5 Volt UHF large–signal amplifier applications in industrial and commercial FM equipment operating to 512 MHz.

- Specified 12.5 Volt, 512 MHz Characteristics
  Output Power = 15 W
  Minimum Gain = 7.8 dB
  Efficiency = 55%
- Built–In Matching Network for Broadband Operation
- Gold Metallized, Emitter Ballasted for Long Life and Reliability
- Capable of 20:1 VSWR Load Mismatch at 15.5 V Supply Voltage
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MRF654

**15 W, 470 MHz
RF POWER
TRANSISTOR
NPN SILICON**



CASE 244–04, STYLE 1

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	16	Vdc
Collector–Base Voltage	V_{CBO}	36	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	4.0	Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	44 0.25	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.0	°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 = 25 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 25 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector–Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0)	I_{CES}	—	—	2.0	mAdc

(continued)

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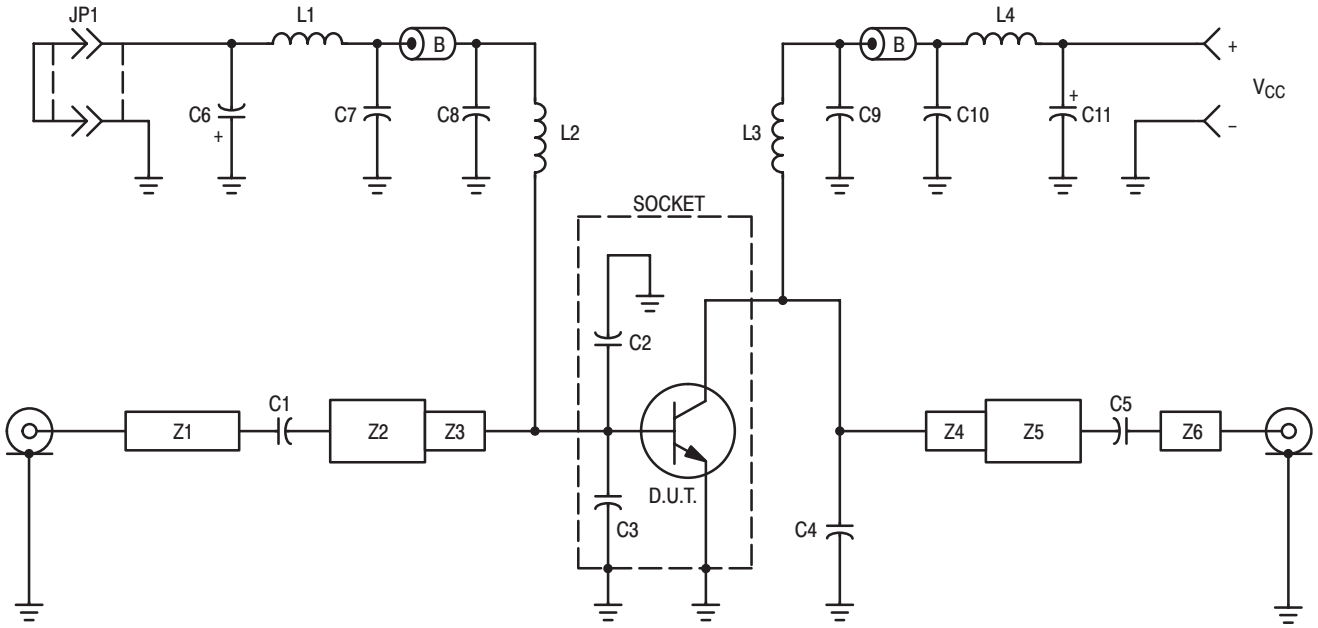
ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	20	—	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	31	45	pF
FUNCTIONAL TESTS					
Common–Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 15 W, f = 512 MHz)	G_{pe}	7.8	8.8	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 15 W, f = 512 MHz)	η	55	63	—	%
Load Mismatch Stress (V_{CC} = 15.5 Vdc, f = 512 MHz, P_{in} = 3.0 W, VSWR = 20:1, All Phase Angles)	ψ	No Degradation in Output Power			



C1, C5 — 68 pF Mini–Unelco
C2, C3 — 33 pF, Mini–Unelco
C4 — 47 pF, Mini–Unelco
C6, C11 — 10 μF, 25 V Tantalum
C7, C10 — 0.1 μF, Ceramic
C8, C9 — 91 pF, Mini–Unelco
L1, L4 — 4–1/2 Turns, #18 AWG, Enamel Covered, 0.16″ ID
L2, L3 — 2 Turns, #18 AWG Enamel Covered, 0.16″ ID
B — Ferrite Bead, Ferroxcube 56–590–65–3B
Z1–Z6 — See PCB Artwork
PCB — 1/32″ G–10, ε_r = 4.5 @ UHF
Socket — See Socket Drawings
JP1 — Jumper, #14 AWG w/Banana Plugs

Figure 1. 440–512 MHz Broadband Test Circuit

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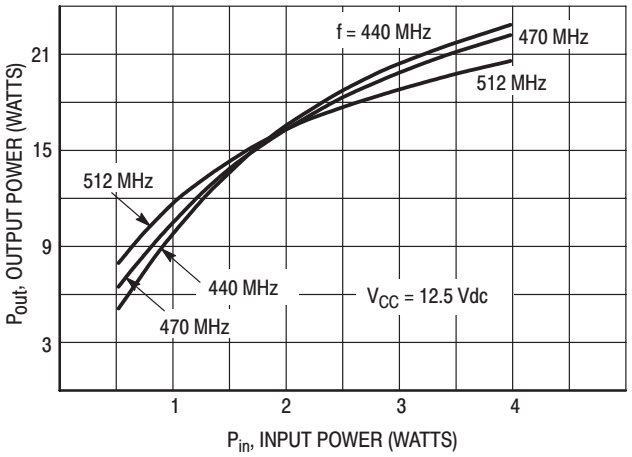


Figure 2. Output Power versus Input Power

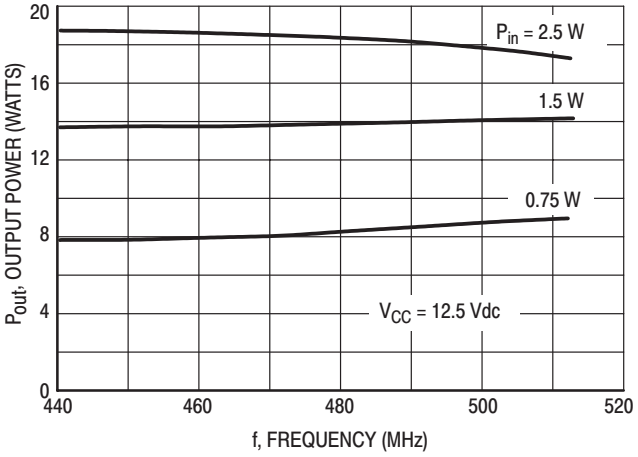


Figure 3. Output Power versus Frequency

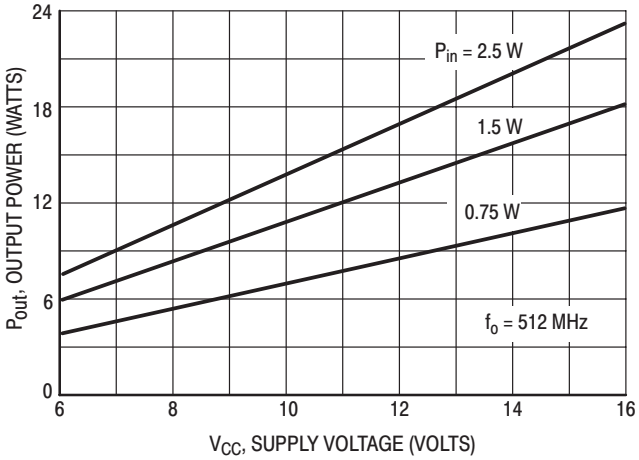


Figure 4. Power Output versus Supply Voltage

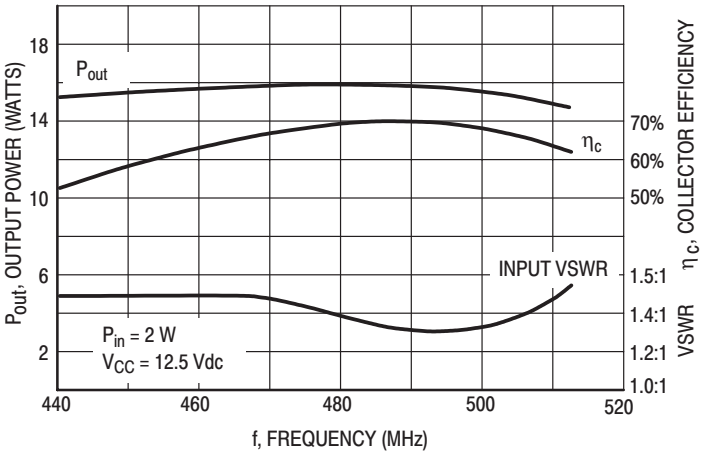
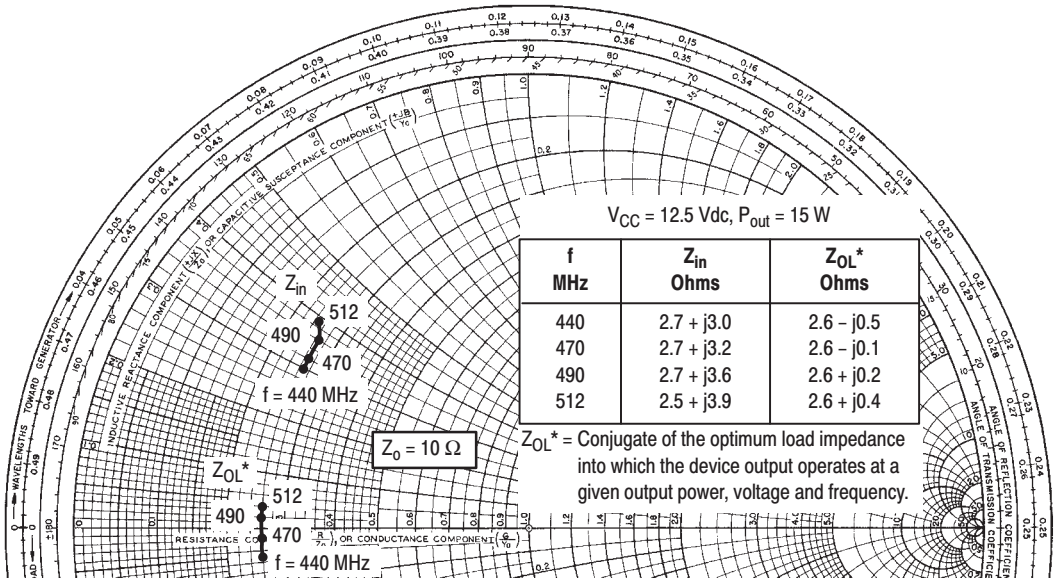


Figure 5. Typical Broadband Circuit Performance



f MHz	Z_{in} Ohms	Z_{OL}* Ohms
440	2.7 + j3.0	2.6 – j0.5
470	2.7 + j3.2	2.6 – j0.1
490	2.7 + j3.6	2.6 + j0.2
512	2.5 + j3.9	2.6 + j0.4

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 Input and Output Impedance

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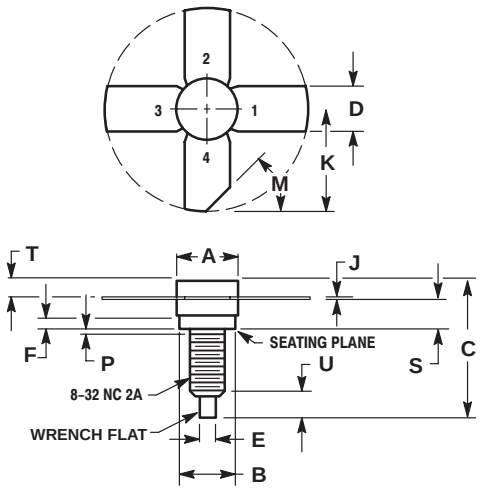
PACKAGE DIMENSIONS



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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