

The RF Line

NPN Silicon

RF Power Transistors

Designed for 12.5 Vdc UHF large-signal, amplifier applications in industrial and commercial FM equipment operating to 512 MHz.

- Guaranteed 12.5 Volt, 512 MHz Characteristics
 - Output Power = 5.0 Watts
 - Minimum Gain = 10 dB
 - Efficiency = 65% (Typ)
- Typical Performance at 512 MHz, 12.5 V, 5.0 W Output = 6.0 dB
- Series Equivalent Large-Signal Characterization
- Gold Metallized, Emitter Ballasted for Long Life and Reliability
- Capable of 30:1 VSWR Load Mismatch at 15.5 V Supply Voltage
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

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	2.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	25 143	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	7.0	$^\circ\text{C/W}$

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 ($I_C = 25\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 25\text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	36	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 25\text{ mAdc}$, $I_E = 0$)	$V_{(BR)CBO}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5.0\text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 15\text{ Vdc}$, $V_{BE} = 0$)	I_{CES}	—	—	1.0	mAdc

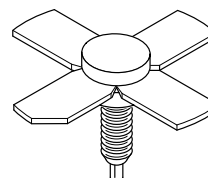
ON CHARACTERISTICS

DC Current Gain ($I_C = 200\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	10	—	150	—
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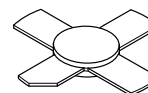
(continued)

MRF652
MRF652S

5.0 W, 512 MHz
RF POWER
TRANSISTORS
NPN SILICON



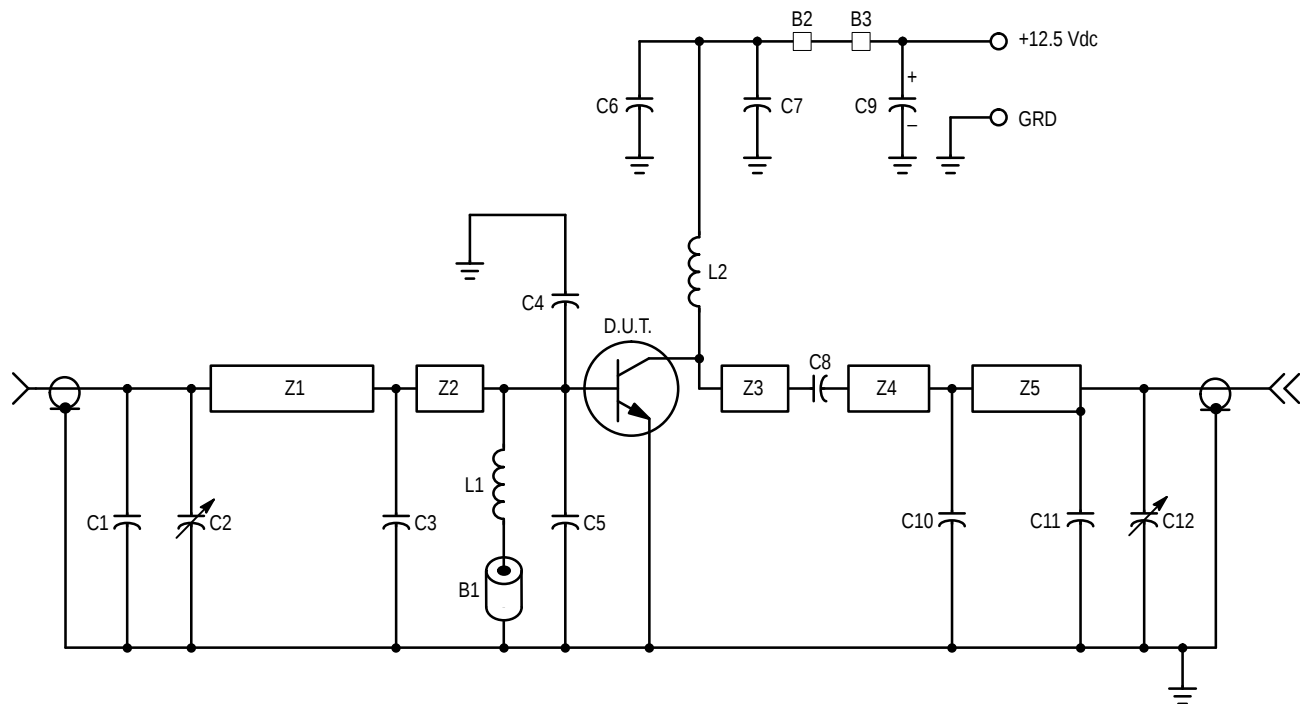
CASE 244-04, STYLE 1
MRF652



CASE 249-06, STYLE 1
MRF652S

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

Characteristic	Symbol	Min	Typ	Max	Unit	
DYNAMIC CHARACTERISTICS						
Output Capacitance (V _{CB} = 15 Vdc, I _E = 0, f = 1.0 MHz)	C _{ob}	—	9.5	15	pF	
FUNCTIONAL TESTS						
Common–Emitter Amplifier Power Gain (V _{CC} = 12.5 Vdc, P _{out} = 5.0 W)	f = 512 MHz f = 870 MHz	G _{pe}	10 —	11 6.0	— —	dB
Collector Efficiency (V _{CC} = 12.5 Vdc, P _{out} = 5.0 W, f = 512 MHz)		η	60	65	—	%
Load Mismatch (V _{CC} = 15.5 Vdc, P _{in} = 500 mW, f = 512 MHz, VSWR = 30:1, At All Phase Angles)		ψ	No Degradation in Output Power			



B1, B2, B3 — Ferrite Bead
 C1 — 7.0 pF Unelco Mica
 C2 — 1.0–6.0 pF Johanson Variable 5201
 C3 — 15 pF Unelco Mica
 C4 — 43 pF Mini-Underwood Mica
 C5 — 56 pF Mini-Underwood Mica
 C6 — 1000 pF Unelco Mica
 C7 — 0.1 μF Ceramic

C8 — 68 pF Mini-Underwood Mica
 C9 — 1.0 μF Electrolytic 25 V
 C10, C11 — 5.0 pF Unelco Mica
 C12 — 1.0–10 pF Johanson Variable 5501
 L1, L2 — 6 Turns, 20 AWG Wire 0.125" ID
 Z1, Z2 — 25 Ohm $\mu\text{Stripline}$
 Z3, Z4, Z5 — 50 Ohm $\mu\text{Stripline}$
 Board — 0.032" Glass-Teflon

Figure 1. 440–512 MHz Broadband Test Circuit

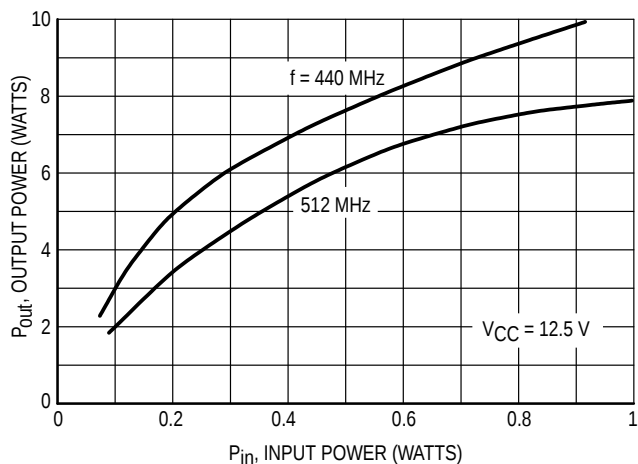


Figure 2. Output Power versus Input Power

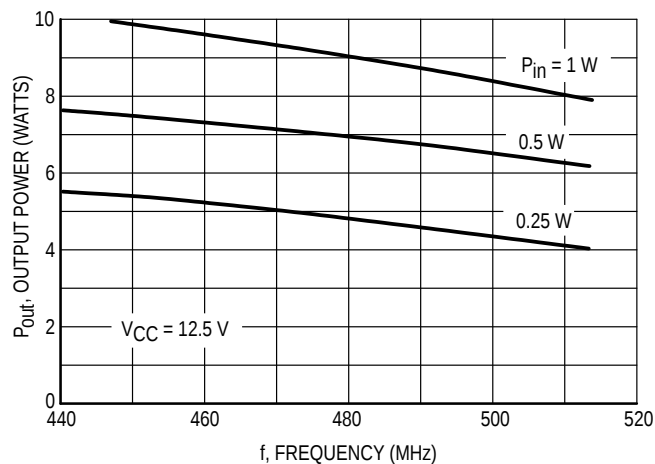


Figure 3. Output Power versus Frequency

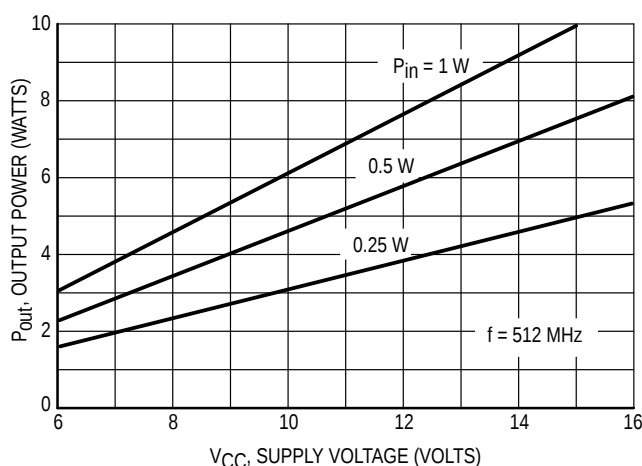


Figure 4. Output Power versus Supply Voltage

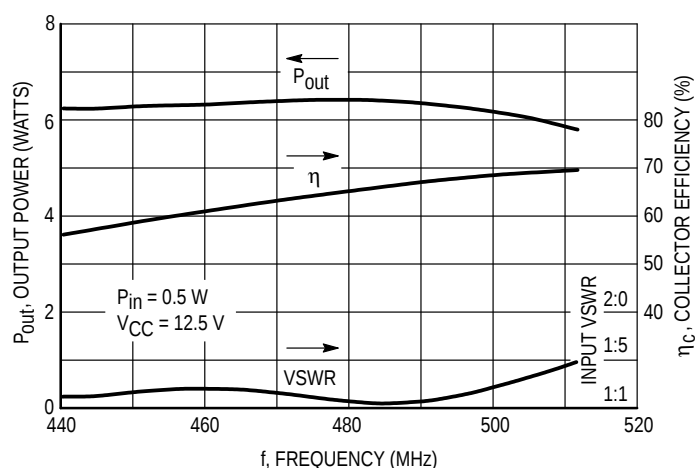
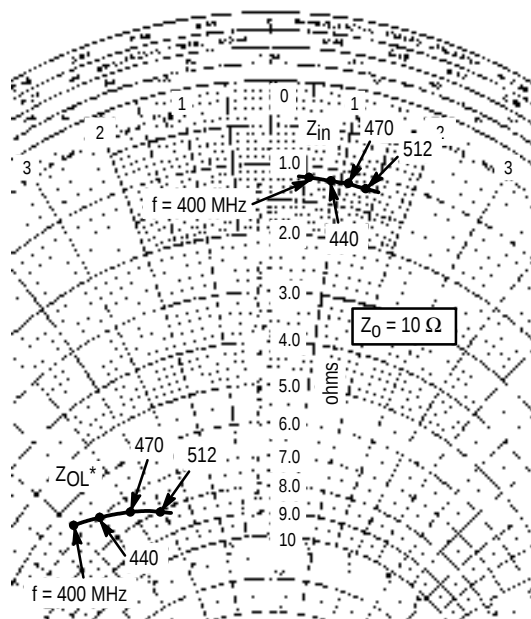


Figure 5. Typical Broadband Circuit Performance



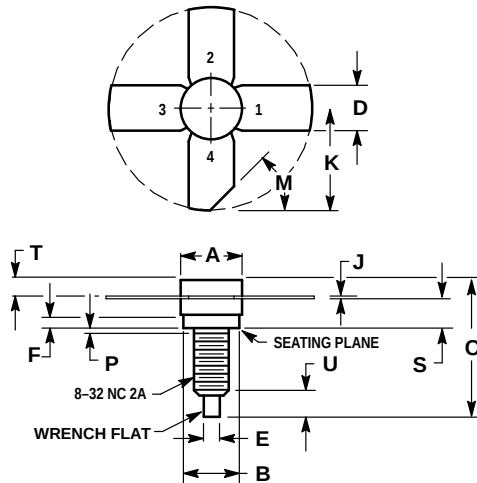
$V_{CC} = 12.5 \text{ Vdc}$
 $P_{out} = 5.0 \text{ W}$

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
400	$1.18 + j0.54$	$6.7 - j6.9$
440	$1.19 + j0.88$	$7.05 - j6.1$
470	$1.19 + j1.11$	$7.6 - j5.1$
512	$1.19 + j1.35$	$8.1 - j4.1$

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 Input/Output Impedance

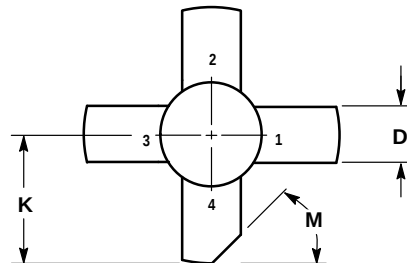
PACKAGE DIMENSIONS



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
MRF652**



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. SEATING PLANE = GROUND AND IS CONNECTED TO PIN 1 AND 3.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.271	0.286	6.88	7.26
C	0.112	0.136	2.84	3.45
D	0.215	0.235	5.46	5.97
H	0.055	0.065	1.40	1.65
J	0.003	0.007	0.08	0.18
K	0.435	—	11.05	—
M	45° REF		45° REF	

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

**CASE 249-06
ISSUE H
MRF652S**

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MRF652/D

