

The RF Line

NPN Silicon

RF Power Transistors

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 = 10 W
 - Gain = 8.0 dB (Typ)
 - Efficiency = 65% (Typ)
- Gold Metallized, Emitter Ballasted for Long Life and Reliability
- Capable of 20:1 VSWR Load Mismatch at 16 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}	16.5	Vdc
Collector-Base Voltage	V_{CBO}	38	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	2.75	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	44 0.25	Watts W/ $^\circ\text{C}$
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	$R_{\theta JC}$	4.0	$^\circ\text{C/W}$

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 ($I_C = 20\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	16.5	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 20\text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	38	—	—	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}	—	—	5.0	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	—	120	—
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DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 12.5\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	22	28	pF
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FUNCTIONAL TESTS

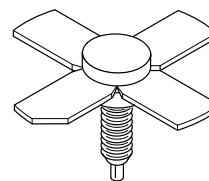
Common-Emitter Amplifier Power Gain ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 512\text{ MHz}$)	G_{pe}	7.0	8.0	—	dB
Collector Efficiency ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 512\text{ MHz}$)	η_c	55	65	—	%
Load Mismatch Stress ($V_{CC} = 16\text{ Vdc}$, $f = 512\text{ MHz}$, $P_{in}(1) = 2.6\text{ W}$, VSWR = 20:1, All Phase Angles)	ψ	No Degradation in Output Power			

NOTE:

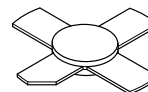
- $P_{in} = 2.0\text{ dB}$ over the typical input power required for 10 W output power @ 12.5 Vdc.

MRF653
MRF653S

10 W, 512 MHz
RF POWER
TRANSISTORS
NPN SILICON

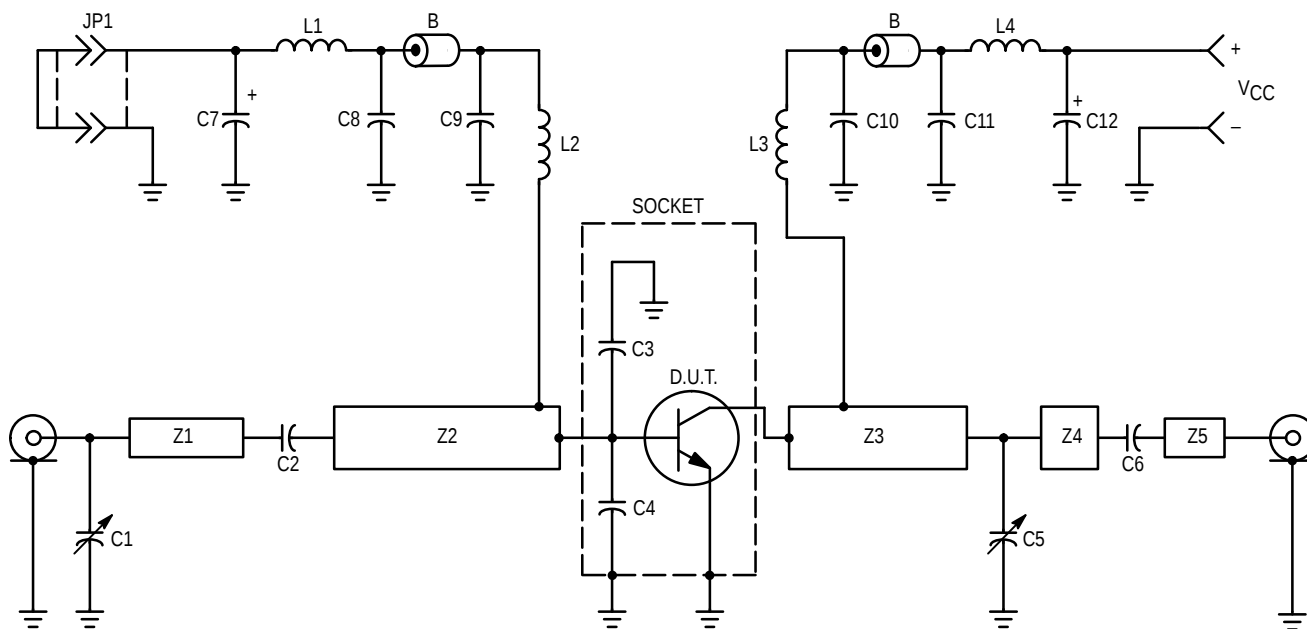


CASE 244-04, STYLE 1
MRF653



CASE 249-06, STYLE 1
MRF653S





C1, C5 — 1.0–20 pF, Johanson
 C2, C6 — 330 pF, 100 Mil ATC
 C3, C4 — 36 pF, Mini-Unelco
 C7, C12 — 10 μ F, 35 V, Tantalum
 C8, C11 — 0.1 μ F, Ceramic
 C9, C10 — 91 pF, Mini-Unelco

L1, L4 — 4–1/2 Turns, #18 AWG, 0.16" ID
 L2, L3 — 2 Turns, #18 AWG, 0.16" ID
 B — Ferrite Bead, Ferroxcube 56–590–65–3B
 Z1 — 51 x 630 mils
 Z2 — 162 x 1300 mils
 Z3 — 210 x 1350 mils
 Z4 — 210 x 280 mils
 Z5 — 51 x 300 mils
 Board Material — 0.032" epoxy glass G10, 1 oz., copper clad,
 double sided, $\epsilon_r = 5$
 JP1 — Jumper, #14 AWG w/Banana Plugs

Figure 1. Broadband Test Circuit Schematic

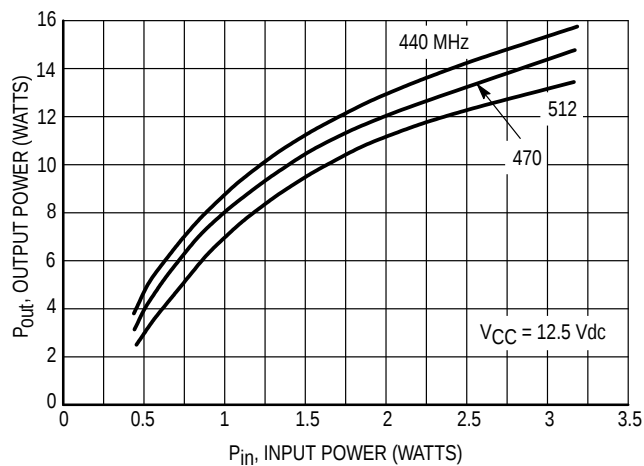


Figure 2. Output Power versus Input Power

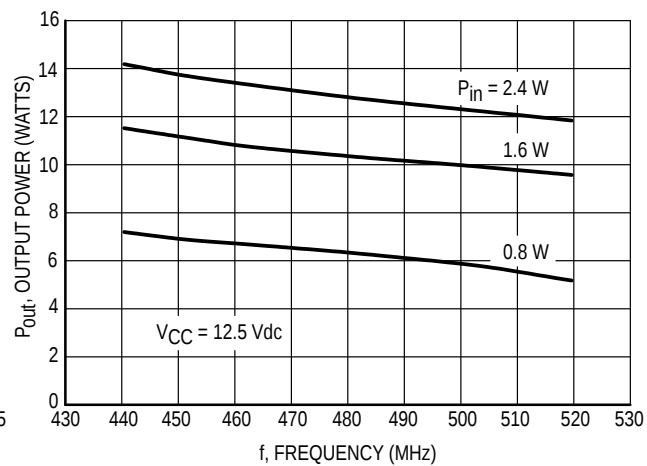


Figure 3. Output Power versus Frequency

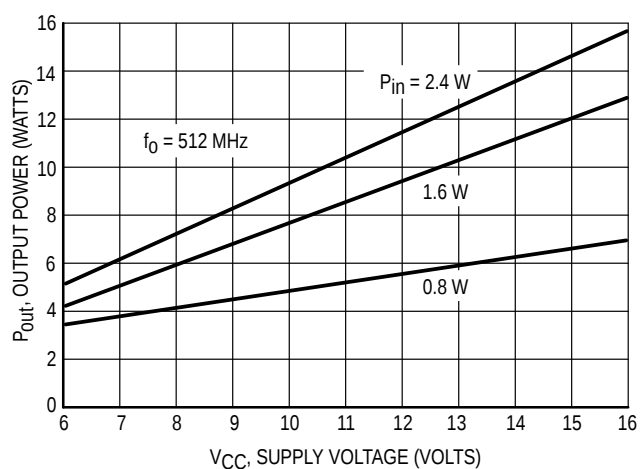


Figure 4. Output Power versus Supply Voltage

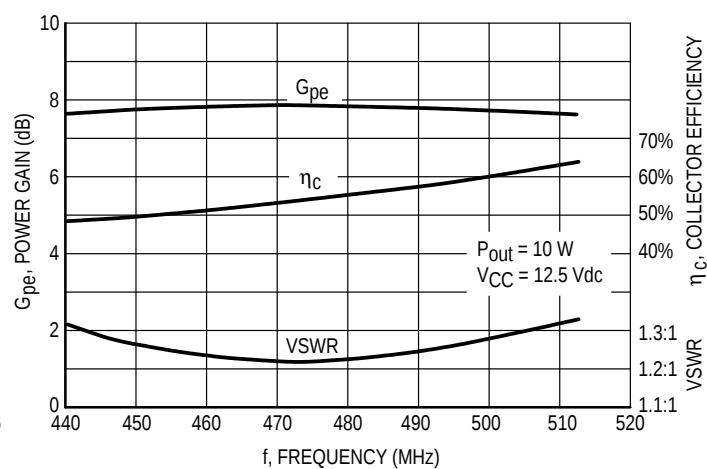


Figure 5. Typical Broadband Circuit Performance

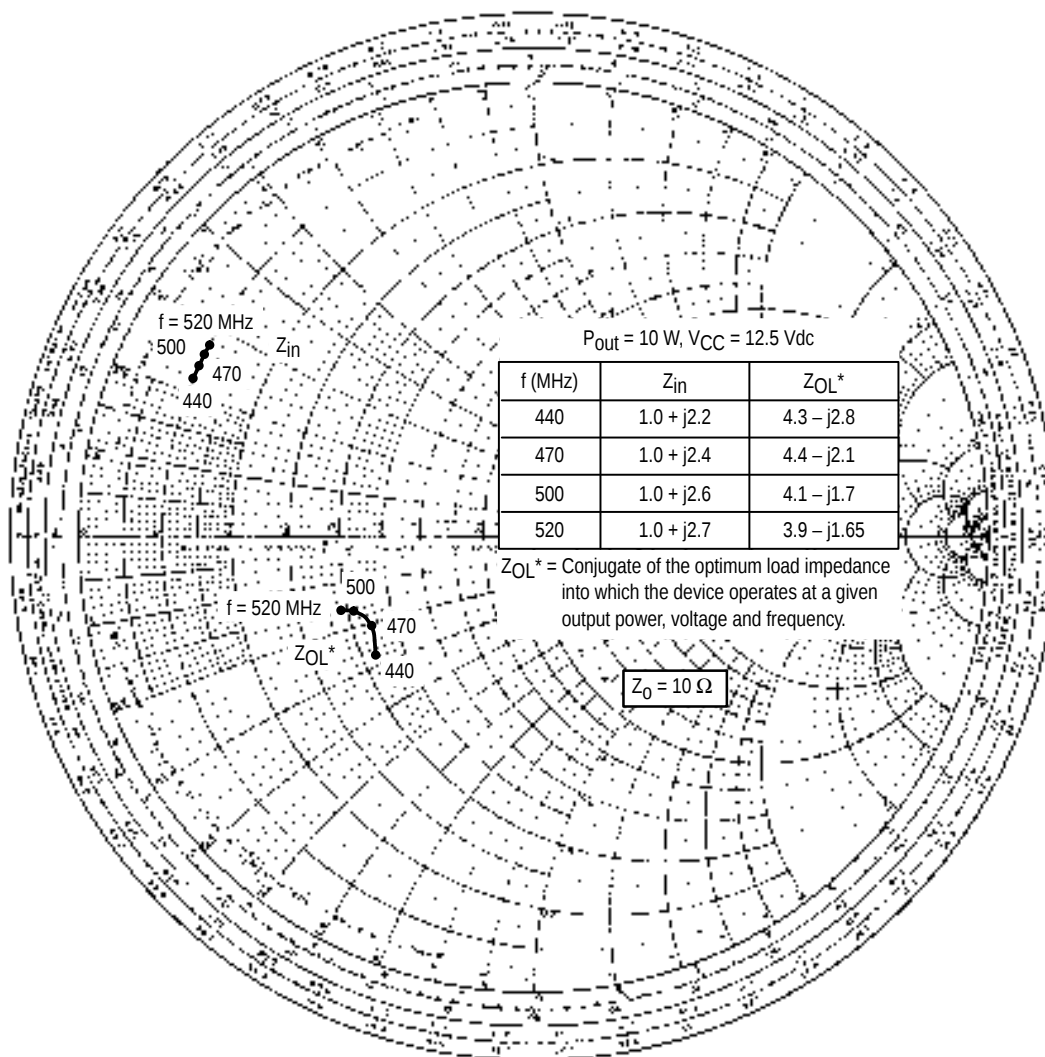
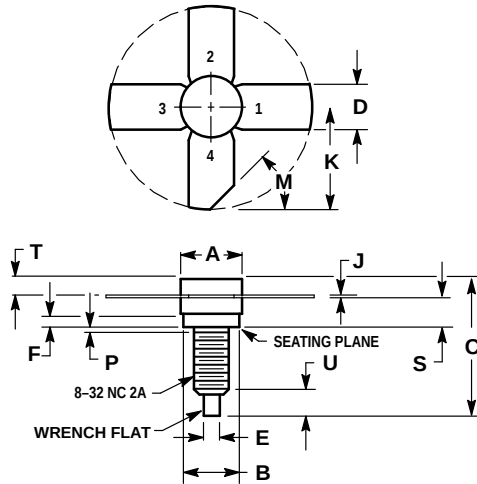


Figure 6. Series Equivalent Input and Output Impedance

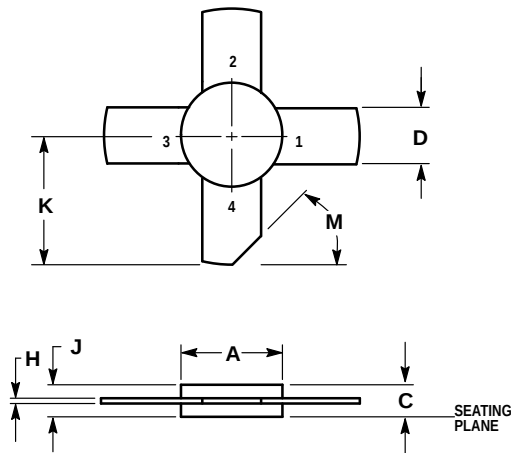
PACKAGE DIMENSIONS



**CASE 244-04
ISSUE J
MRF653**

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 249-06
ISSUE H
MRF653S**

NOTES:
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
3. CONTROLLING DIMENSION: INCH.
4. 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

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MOTOROLA



MRF653/D

