

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

T-33-05  
**MRF660**

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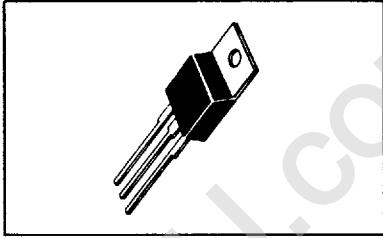
**The RF Line**

**NPN SILICON RF POWER TRANSISTOR**

... designed for 12.5 volt UHF large signal power amplifier applications in commercial and industrial FM equipment.

- Low Cost Common Emitter TO-220AB Package
- Specified 12.5 V, 470 MHz Performance  
Output Power = 7.0 W  
Power Gain = 5.4 dB Min  
Efficiency — 60% Min
- Load Mismatch Capability at High Line and RF Input Overdrive

7.0 W 470 MHz  
**RF POWER TRANSISTOR**  
NPN SILICON



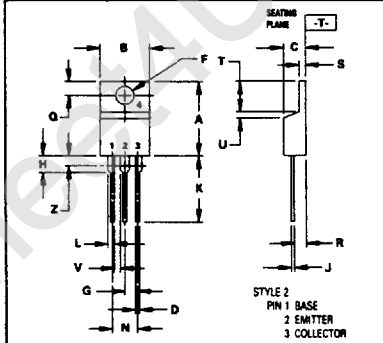
**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	16	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	36	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	4.0	Vdc
Collector-Current — Continuous	I <sub>C</sub>	2.4	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C (1) Derate above 25°C	P <sub>D</sub>	25 143	Watts mW/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	7.0	°C/W

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



NOTES  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M 1982  
2. CONTROLLING DIMENSION INCH  
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.75	0.570	0.620
B	9.68	10.28	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.94	0.98	0.035	0.039
F	3.81	3.73	0.142	0.147
G	2.42	2.65	0.095	0.105
H	2.80	3.93	0.110	0.155
J	0.38	0.55	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.75	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

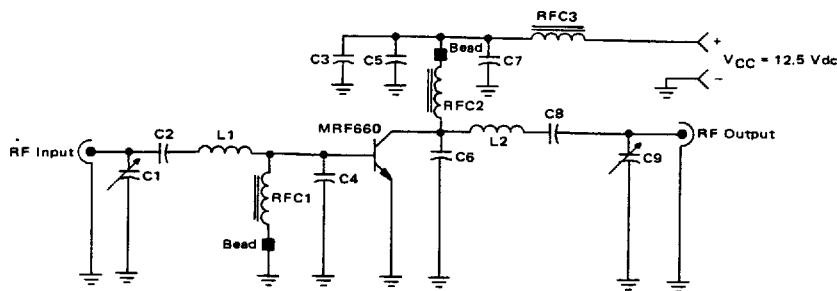
CASE 221A-04  
TO-220AB

ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

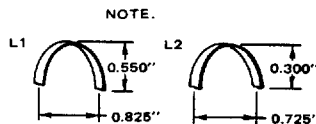
Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 20 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	18	-	-	V <sub>dc</sub>
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 20 mA, V <sub>BE</sub> = 0)	V <sub>(BR)CES</sub>	36	-	-	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 5.0 mA, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	4.0	-	-	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 15 V, V <sub>BE</sub> = 0, T <sub>C</sub> = 25°C)	I <sub>CES</sub>	-	-	5.0	mA
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 250 mA, V <sub>CE</sub> = 5.0 V)	h <sub>FE</sub>	20	90	160	-
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance (V <sub>CB</sub> = 12.5 V, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	-	17	25	pF
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain (V <sub>CC</sub> = 12.5 V, P <sub>out</sub> = 7.0 W, f = 470 MHz)	G <sub>PE</sub>	5.4	6.0	-	dB
Collector Efficiency (V <sub>CC</sub> = 12.5 V, P <sub>out</sub> = 7.0 W, f = 470 MHz)	η	60	-	-	%

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FIGURE 1 - TEST CIRCUIT



- C1, C9 - 1 - 10 pF Johanson
- C2, C8 - 15 pF Underwood Elect. Co. Type J101
- C3 - 270 pF, ATC Chip Capacitor Case B
- C4, C6 - 24 pF ELMENCO MCN01/010
- C5 - 0.1 μF Ceramic, Erie
- C7 - 1.0 μF, 35 V, Tantalum
- L1 - 27 nH Copper Strap 0.150" X 0.025" X 1.5" (See Note)
- L2 - 16 nH Copper Strap 0.150" X 0.025" X 1.0" (See Note)
- RFC1 - 0.68 μH Molded Choke, Cambion
- RFC2 - 4 Turns #20 AWG, 0.312" ID X 0.25" Long
- RFC3 - Ferrite Choke, Ferroxcube #VK200-20/4B
- Bead - Ferrite Bead, Ferroxcube #56-590-65-3B
- Printed Circuit Board Material - 3M #K6098-22062, Teflon Fiberglass or equivalent



MRF660

MOTOROLA SC (XSTRS/R F)

46E D

6367254 0094852 0 MOT6

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FIGURE 2 - OUTPUT POWER versus INPUT POWER

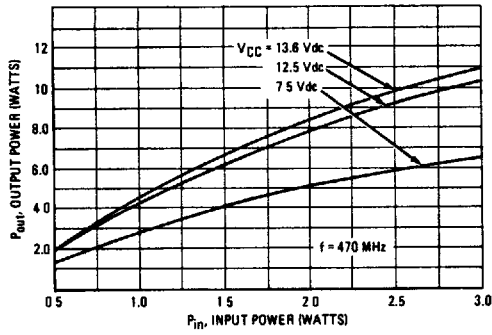


FIGURE 3 - OUTPUT POWER versus FREQUENCY

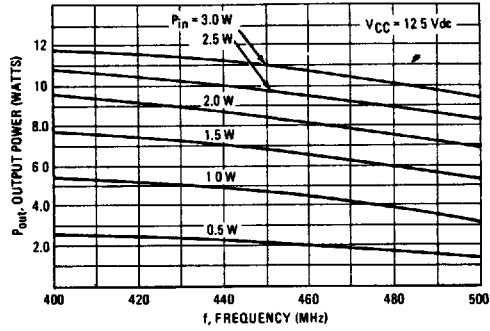
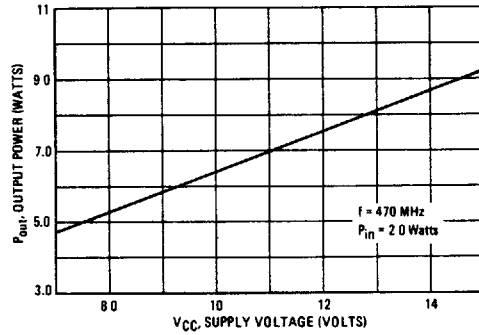
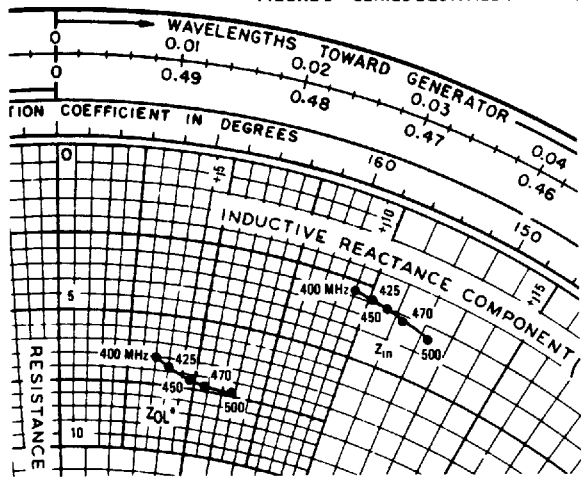


FIGURE 4 - OUTPUT POWER versus SUPPLY VOLTAGE



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FIGURE 5 - SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



P<sub>in</sub> = 2.0 W, V<sub>CC</sub> = 12.5 V

f MHz	Z <sub>in</sub> Ohms	Z <sub>OL</sub> <sup>*</sup> Ohms
400	2.8 + j9.0	6.5 + j3.5
425	2.9 + j10.1	6.8 + j4.0
450	3.0 + j10.5	7.2 + j4.8
470	3.1 + j11.2	7.3 + j5.4
500	3.4 + j12.2	7.3 + j6.4

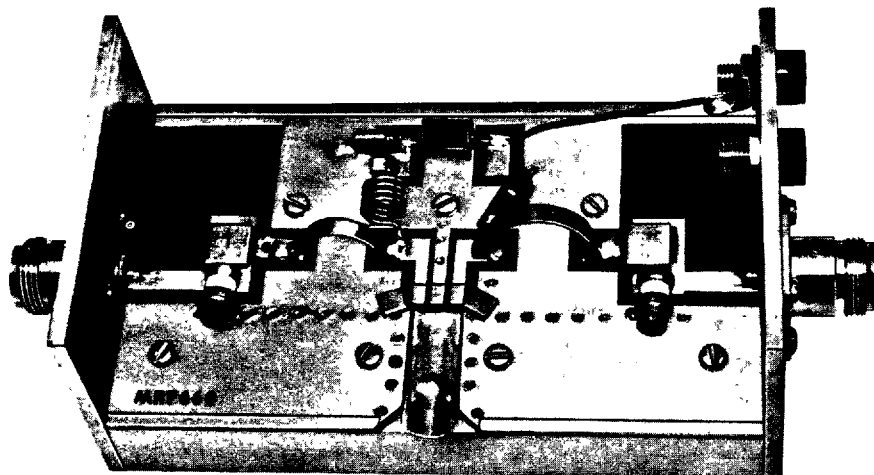
Z<sub>OL</sub><sup>\*</sup> = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage, and frequency.

MRF660

MOTOROLA SC (XSTRS/R F) 46E D ■ 6367254 0094853 2 ■ M0T6

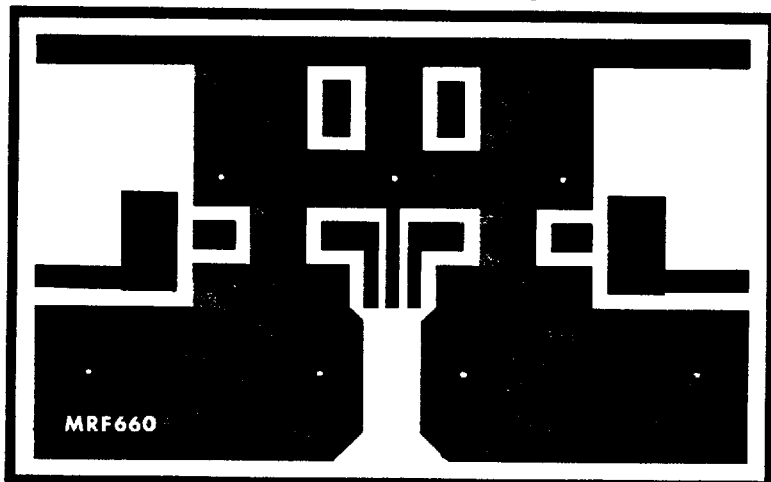
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FIGURE 6 - UHF TEST AMPLIFIER



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FIGURE 7 - PRINTED CIRCUIT BOARD



NOTE: The Printed Circuit Board shown is 75% of the original.