MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

T-33-05

MRF660

The RF Line

2

NPN SILICON RF POWER TRANSISTOR

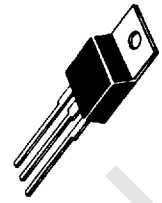
. . . designed for 12.5 volt UHF large signal power amplifier applications in commercial and industrial FM equipment.

- 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



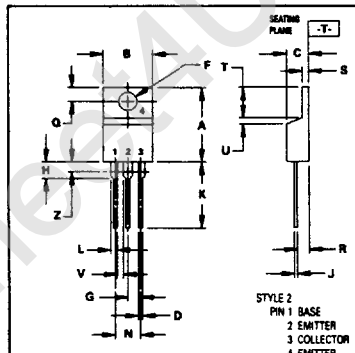
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	36	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	2.4	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	25 143	Watts mW/°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	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

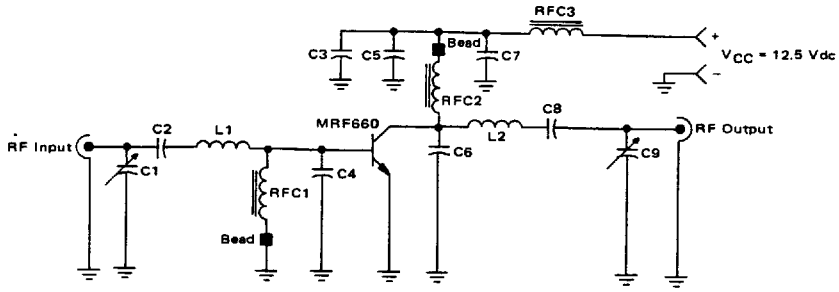
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.48	15.75	0.570	0.620
B	9.66	10.28	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.93	0.110	0.155
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	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_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)	$V_{(BR)CEO}$	16	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 20 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, T_C = 25°C)	I_{CES}	–	–	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 250 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	20	90	160	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	17	25	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 7.0 W, f = 470 MHz)	G_{PE}	5.4	6.0	–	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 7.0 W, f = 470 Mhz)	η	60	–	–	%

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

NOTE.

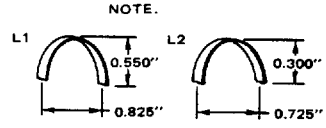


FIGURE 2 – OUTPUT POWER versus INPUT POWER

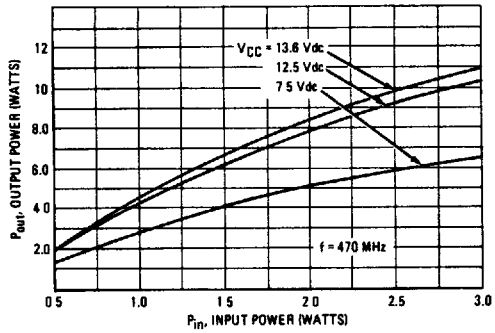


FIGURE 3 – OUTPUT POWER versus FREQUENCY

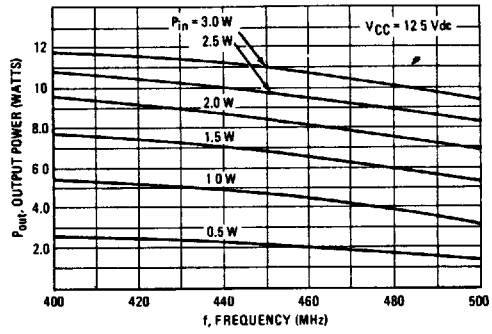


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FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

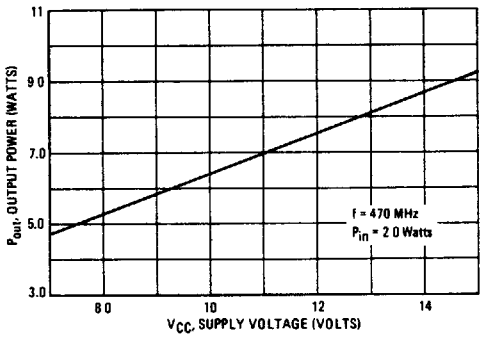
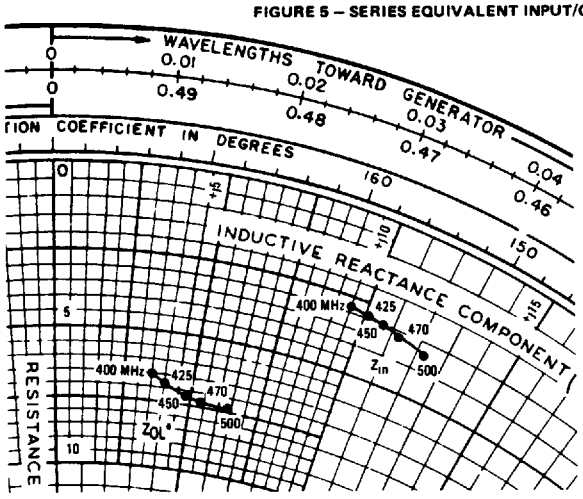


FIGURE 5 – SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCES



P_{in} = 2.0 W, V_{CC} = 12.5 V

f MHz	Z_{in} Ohms	Z_{OL}^* 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_{OL}^* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage, and frequency.

FIGURE 6 – UHF TEST AMPLIFIER

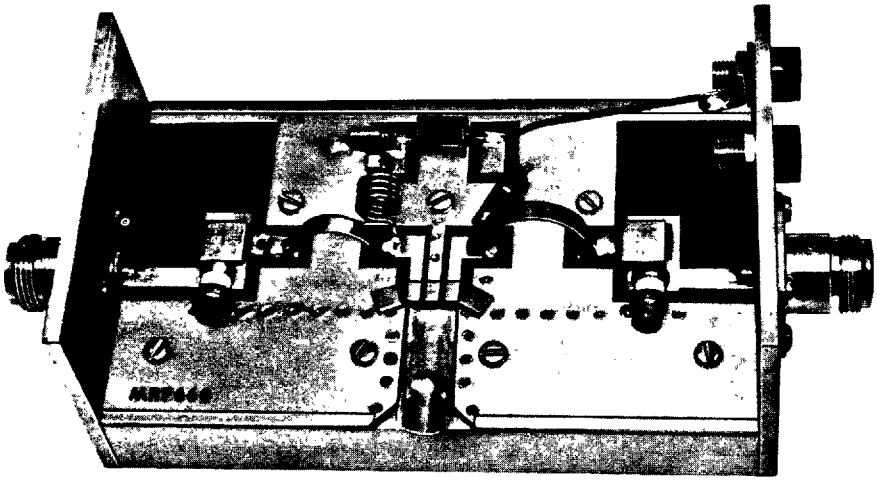


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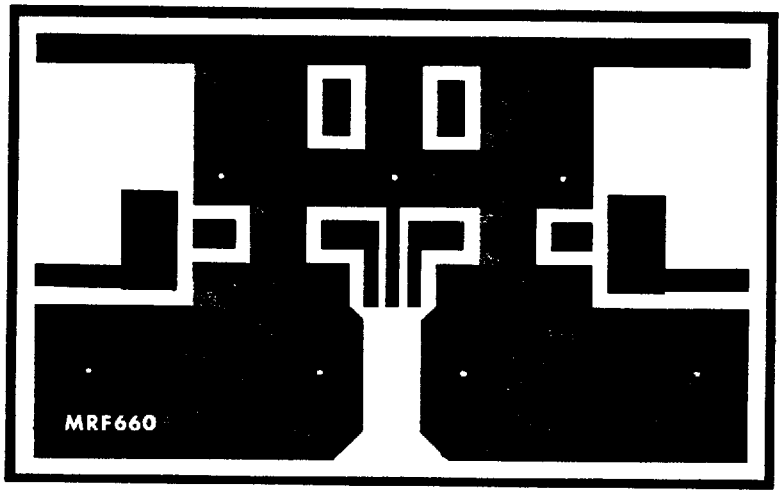
FIGURE 7 – PRINTED CIRCUIT BOARD



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