

**MRF648**

**The RF Line**

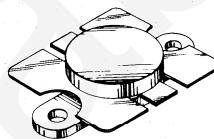
**NPN SILICON RF POWER TRANSISTOR**

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

- Specified 12.5 Volt, 470 MHz Characteristics --  
 Output Power = 60 Watts  
 Minimum Gain = 4.4 dB  
 Efficiency = 55%
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Built-In Matching Network for Broadband Operation
- Tested for Load Mismatch Stress at all Phase Angles with 20:1 VSWR @ 16-Volt High Line and 20% Overdrive

60 W – 470 MHz

**CONTROLLED Q**  
**RF POWER**  
**TRANSISTOR**  
**NPN SILICON**



Island Labs

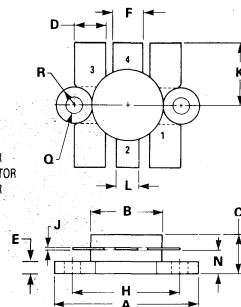
**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	16	Vdc
Collector-Base Voltage	V <sub>CB0</sub>	36	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	4.0	Vdc
Collector Current — Continuous	I <sub>C</sub>	11.0	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	175 1.0	Watts W/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C

**THERMAL CHARACTERISTICS**

Thermal Resistance, Junction to Case	R <sub>θJC</sub>	1.0	°C/W
--------------------------------------	------------------	-----	------

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



NOTE:  
 FLANGE IS ISOLATED IN ALL STYLES.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	24.38	25.14	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.58	0.210	0.220
E	2.16	3.04	0.085	0.120
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	11.17	0.405	0.440
L	3.81	4.06	0.150	0.160
N	3.81	4.31	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130
U	11.94	12.57	0.470	0.495

**CASE 316-01**

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> = 50 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	16	—	—	Vdc
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 50 mAdc, V <sub>BE</sub> = 0)	V <sub>(BR)CES</sub>	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 5.0 mAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	4.0	—	—	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 15 Vdc, V <sub>BE</sub> = 0, T <sub>C</sub> = 25°C)	I <sub>CES</sub>	—	—	15	mAdc
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 6.0 Adc, V <sub>CE</sub> = 5.0 Vdc)	h <sub>FE</sub>	20	70	150	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance (V <sub>CB</sub> = 12.5 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	—	130	150	pF
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain (V <sub>CC</sub> = 12.5 Vdc, P <sub>out</sub> = 60 W, f = 470 MHz)	G <sub>pe</sub>	4.4	5.0	—	dB
Input Power (V <sub>CC</sub> = 12.5 Vdc, P <sub>out</sub> = 60 W, f = 470 MHz)	P <sub>in</sub>	—	19	22	Watts
Collector Efficiency (V <sub>CC</sub> = 12.5 Vdc, P <sub>out</sub> = 60 W, f = 470 MHz)	η	55	65	—	%
Output Mismatch Stress (V <sub>CC</sub> = 16 Vdc, P <sub>in</sub> = 26 W, f = 470 MHz, VSWR = 20:1, All Phase Angles)	ψ*	No Degradation in Output Power			

Notes:

\* ψ = Mismatch stress factor—the electrical criterion established to verify the device resistance to load mismatch failure. The mismatch stress test is accomplished in the standard test fixture (Figure 1) terminated in a 20:1 minimum load mismatch at all phase angles.

FIGURE 1 – TEST CIRCUIT SCHEMATIC

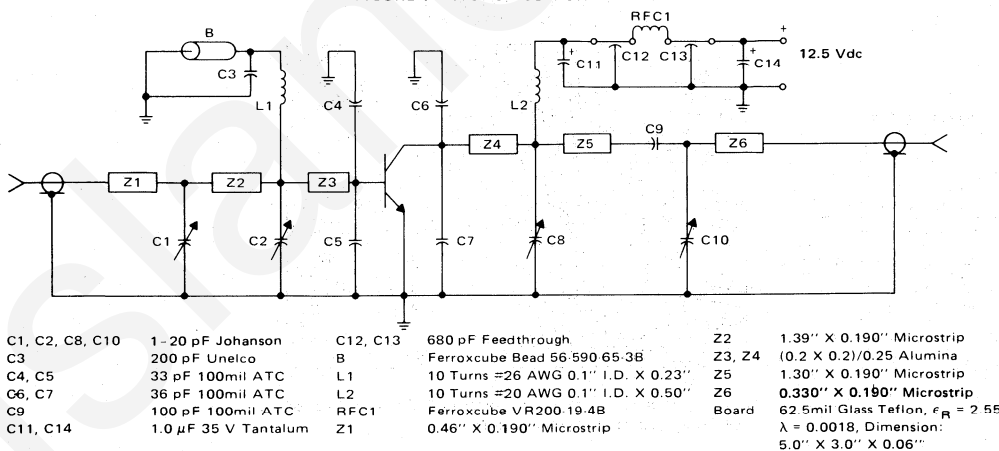


FIGURE 2 – POWER OUTPUT versus POWER INPUT

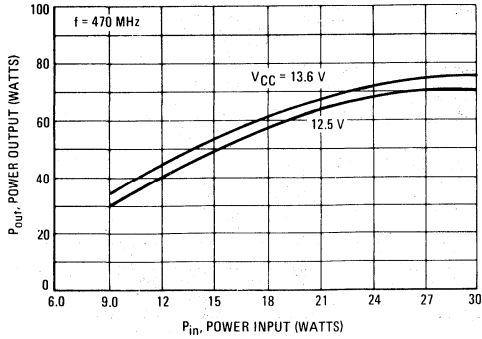


FIGURE 3 – POWER OUTPUT versus FREQUENCY

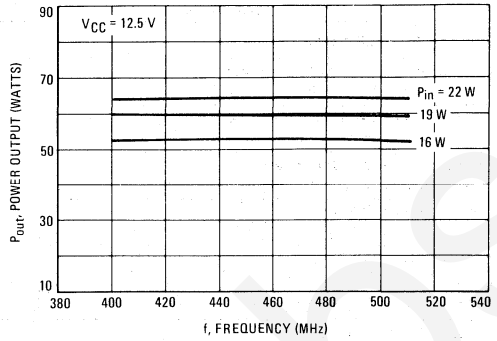


FIGURE 4 – POWER OUTPUT versus SUPPLY VOLTAGE

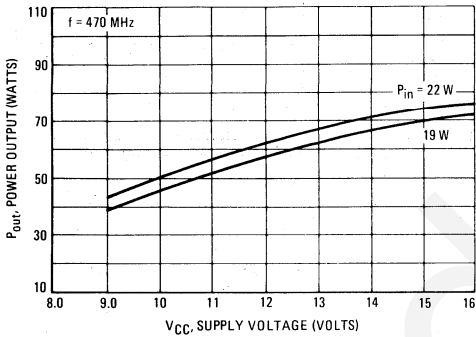


FIGURE 5 – POWER SATURATION PROFILE

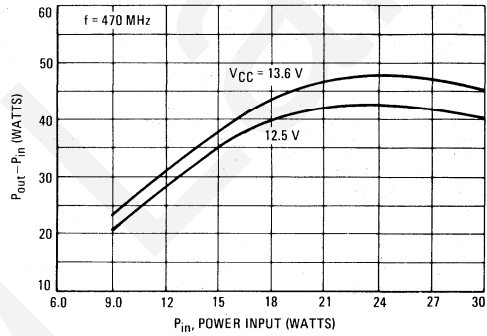
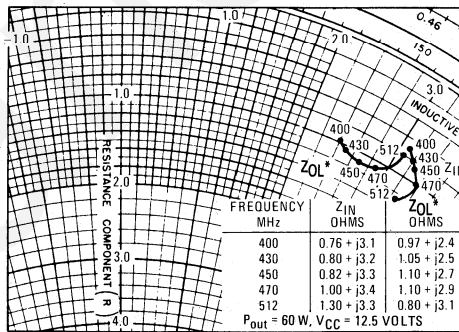
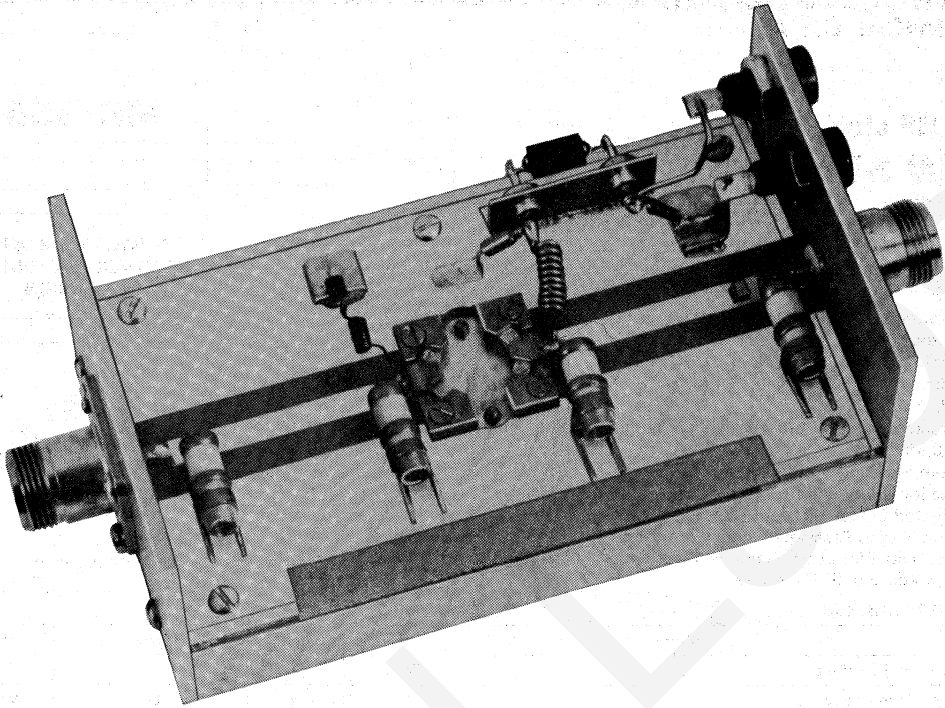


FIGURE 6 – SERIES EQUIVALENT INPUT-OUTPUT IMPEDANCE

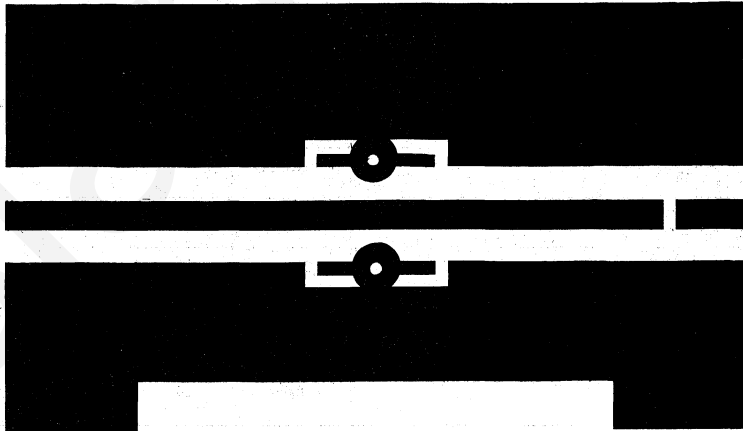


Z<sub>OL</sub>\* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

2



TEST CIRCUIT TEST FIXTURE



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