MHW401-1
MHW401-2
MHW401-3

MOTOROLA

The RF Line

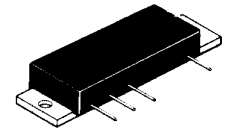
1.5 W — 512 MHz

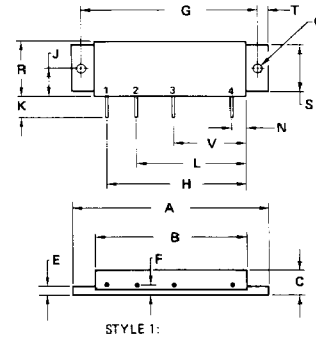
RF POWER AMPLIFIER MODULE

UHF POWER AMPLIFIER MODULE

. . . designed for 7.5 volt UHF power amplifier applications in portable FM equipment operating to 512 MHz.

- Specified 7.5 Volt, UHF Characteristics –
  Output Power = 1.5 Watts
  Minimum Gain = 15 dB
  Harmonics = -45 dB
- Frequency Range – 400 to 512 MHz
- Gain Control Pin for Constant Output Power Level





STYLE 1:
PIN 1. RF INPUT
2. DC GAIN
3. DC TERM.
4. RF OUTPUT
CASE. GROUND

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	48.13	48.39	1.895	1.905
B	33.15	33.40	1.305	1.315
C	5.84	6.86	0.230	0.270
E	1.32	1.83	0.052	0.072
F	2.21	2.84	0.087	0.112
G	41.15	41.40	1.620	1.630
H	30.35	30.61	1.195	1.205
J	7.49	7.75	0.295	0.305
K	5.84	7.62	0.230	0.300
L	22.73	22.98	0.895	0.905
N	2.41	2.67	0.095	0.105
Q	2.92	3.18	0.115	0.125
R	17.14	17.40	0.675	0.685
S	15.11	15.37	0.595	0.605
T	3.35	3.61	0.132	0.142
V	15.11	15.37	0.595	0.605

CASE 301-01

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Frequency Range MHW401-1 MHW401-2 MHW401-3	—	400 440 470	440 470 512	MHz
Output Power (1) (50-Ohm Load) (P_{in} = 50 mW, V_s = 7.5 Vdc)	P_{out}	1.5	2.0	Watts
Power Gain	G_p	15	—	dB
Efficiency (1) (P_{out} = 1.5 W, V_s = 7.5 Vdc)	η	40	—	%
Harmonics (1) (P_{out} = 1.5 W, Reference)	—	—	-45	dB
Input Impedance (1) (P_{out} = 1.5 W, 50 Ohm Reference)	Z_{in}	—	2.1	VSWR
Power Degradation (1) (P_{out} = 1.5 W, T_C = 25°C) (T_C = 0°C to 60°C)	—	—	0.3	dB
Power Degradation (1) (P_{out} = 1.5 W, T_C = 25°C) (T_C = 0°C to 80°C)	—	—	0.7	dB
Load Mismatch (VSWR = ∞, V_s = 11 Vdc, V_{sc} set for P_{out} = 2.0 W)	—	No degradation in P_{out}		
Stability (P_{in} = 25 to 75 mW, Load Mismatch 10:1 50 ohm reference, V_s = 4.0 to 11 Vdc, V_{sc} adjusted for P_{out} = 0.5 to 2.0 W)	—	All spurious outputs more than 60 dB below desired signal		

(1) P_{in} = 50 mW, V_{sc} Adjusted for 1.5 W Output

5.1

APPLICATIONS INFORMATION

Nominal Operation

All electrical specifications are based on the nominal conditions: Pin 2 voltage (control pin – V_{SC}) and Pin 3 voltage (main supply or V_S) equal to 7.5 Vdc and with output power equaling to 1.5 watts. With these conditions, maximum current density on any device is 1.5×10^5 A/cm^2 and maximum die temperature with 100°C base plate temperature is 165°C. While the modules are designed to have excess gain margin with ruggedness, operation of these units outside the limits of published specifications is not recommended unless prior communications regarding intended use has been made with the factory representative.

Gain Control

The input stage in this module is designed to have good input VSWR with varying drive and voltage conditions. This is accomplished by running the stage essentially Class A.

Maximum module DC to RF conversion efficiency is obtained by applying full input drive, output power set to 1.5 Watts by reducing the voltage on Pin 2 (V_{SC}). This can be done with a variable resistor or through a series pass transistor such as in an AGC loop. Input VSWR even under heavy AGC application or overdrive to 80 mW will generally remain under 2:1.

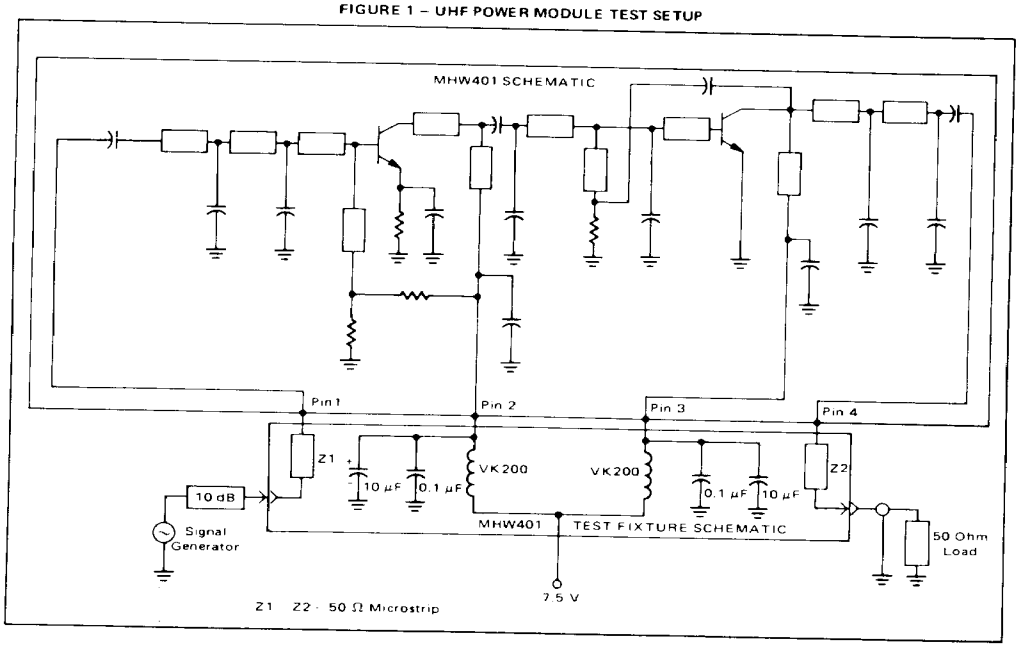
Decoupling

The high gain of the two stages and the module size limitations, external decoupling network requires careful consideration. Both Pins 2 and 3 are internally bypassed with a 0.018 μF chip capacitor effective for frequencies from 5 through 1000 MHz. For bypassing frequencies below 5 MHz, networks equivalent to that shown in the test figure schematic are recommended. Inadequate decoupling will result in spurious outputs at certain operating frequencies and certain phase angles of input and output VSWR greater than 3:1.

Load Pull

During final test, each module is "load pull" tested in a fixture having the identical decoupling network described in Figure 1. Electrical conditions are V_S and V_{SC} equal 11 V, output VSWR infinite, output power obtained with 80 mW drive – lowest frequency in the band.

FIGURE 1 – UHF POWER MODULE TEST SETUP



TYPICAL PERFORMANCE CURVES

FIGURE 2 – INPUT POWER, EFFICIENCY, AND VSWR versus FREQUENCY

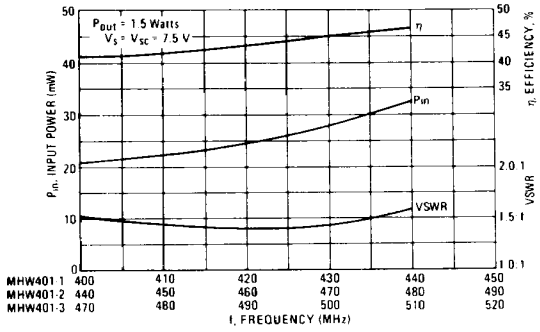


FIGURE 3 – OUTPUT POWER versus INPUT POWER

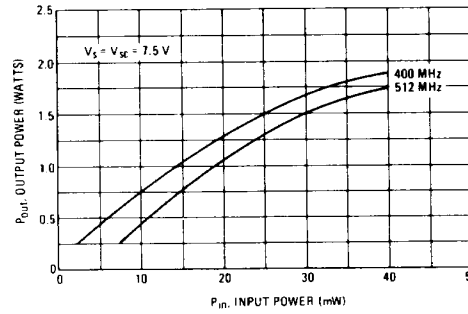
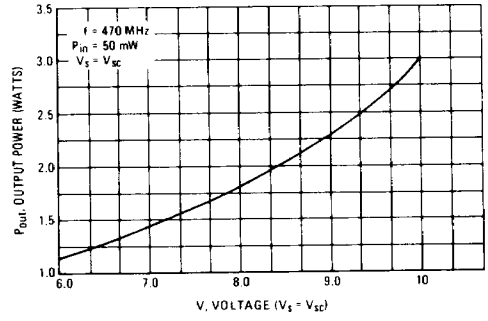


FIGURE 4 – OUTPUT POWER versus VOLTAGE



5.1

FIGURE 5 – TEST CIRCUIT

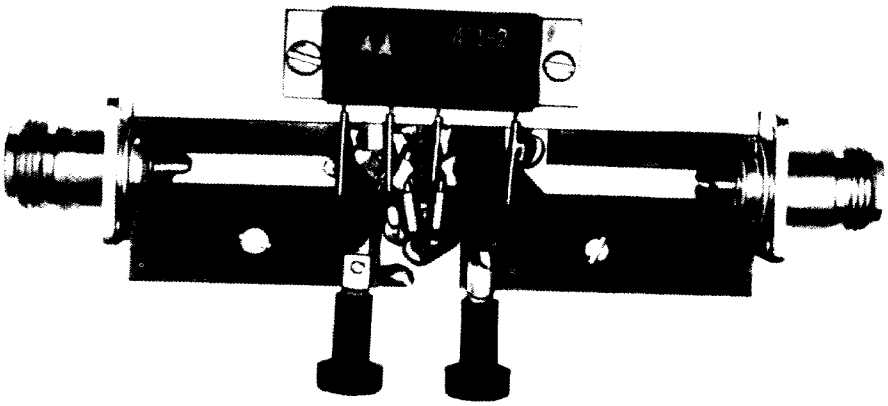


FIGURE 6 – UHF POWER MODULE TEXT FIXTURE
PRINTED CIRCUIT BOARD