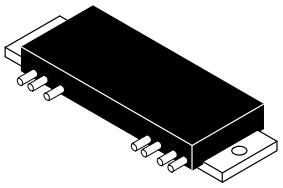
The RF Line
UHF Power Amplifiers

Capable of wide power range control as encountered in UHF cellular telephone applications.

- MHW720A1 400–440 MHz
- MHW720A2 440–470 MHz
- Specified 12.5 Volt, UHF Characteristics —
  Output Power = 20 Watts
  Minimum Gain = 21 dB
  Harmonics = –40 dB (Max)
- 50 Ω Input/Output Impedance
- Guaranteed Stability and Ruggedness
- Epoxy Glass PCB Construction Gives Consistent Performance and Reliability
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MHW720A1
MHW720A2

20 W, 400 to 470 MHz
RF POWER
AMPLIFIERS



CASE 700–04, STYLE 2

MAXIMUM RATINGS (Flange Temperature = 25°C)

Rating		Symbol	Value	Unit
DC Supply Voltages		V_{s1}, V_{s2}	15.5	Vdc
RF Input Power		P_{in}	250	mW
RF Output Power (@ $V_{s1} = V_{s2} = 12.5$ V)		P_{out}	25	W
Operating Case Temperature Range		T_C	–30 to +100	°C
Storage Temperature Range	MHW720A1, MHW720A2	T_{stg}	–40 to +100	°C

ELECTRICAL CHARACTERISTICS (V_{s1} and V_{s2} set at 12.5 Vdc, T_C = 25°C, 50 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
Frequency Range	MHW720A1 MHW720A2	—	400 440	440 470	MHz
Input Power (P_{out} = 20 W)		P_{in}	—	150	mW
Power Gain (P_{out} = 20 W)		G_p	21	—	dB
Efficiency (P_{out} = 20 W)	MHW720A1, MHW720A2	η	35	—	%
Harmonics (P_{out} = 20 W, Reference)		—	—	–40	dB
Input Impedance (P_{out} = 20 W, 50 Ω Reference)		Z_{in}	—	2:1	VSWR
Gain Degradation (1) (P_{out} = 20 W, Reference Gain @ T_C = + 25°C)	 T_C = –30°C T_C = +80°C	—	 — —	 –0.7 –0.7	dB
Load Mismatch (VSWR = 30:1, $V_{s1} = V_{s2}$ = 15.5 Vdc, P_{out} = 30 W)		—	No degradation in P_{out}		
Stability (P_{in} = 0 to 250 mW, $V_{s1} = V_{s2}$ = 10 to 15.5 Vdc) MHW720A1, MHW720A2 1. Load VSWR = 4:1, 50 Ω Reference 2. Source VSWR = 2:1, 50 Ω Refernece		—	All spurious outputs more than 60 dB below desired signal		
Quiescent Current (I_{s1} No RF Drive Applied)	MHW720A1, MHW720A2	I_{s1} (q)	—	200	mA

NOTE:
1. See Figure 5, Input Power versus Case Temperature

APPLICATIONS INFORMATION

Nominal Operation

All electrical specifications are based on the nominal conditions of Vs_1 (Pin 5) and V_{S2} (Pin 3) equal to 12.5 Vdc and with output power equaling 20 watts. With these conditions, maximum current density on any device is 1.5 x 10^5 A/cm^2 and maximum die temperature with 100° base plate temperature is 165°. 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

This module is designed for wide range P_{out} level control. The recommended method of power output control, as shown in Figure 3, is to fix V_{S1} and V_{S2} at 12.5 Vdc and vary the input RF drive level at Pin 7.

In all applications, the module output power should be limited to 20 watts.

Decoupling

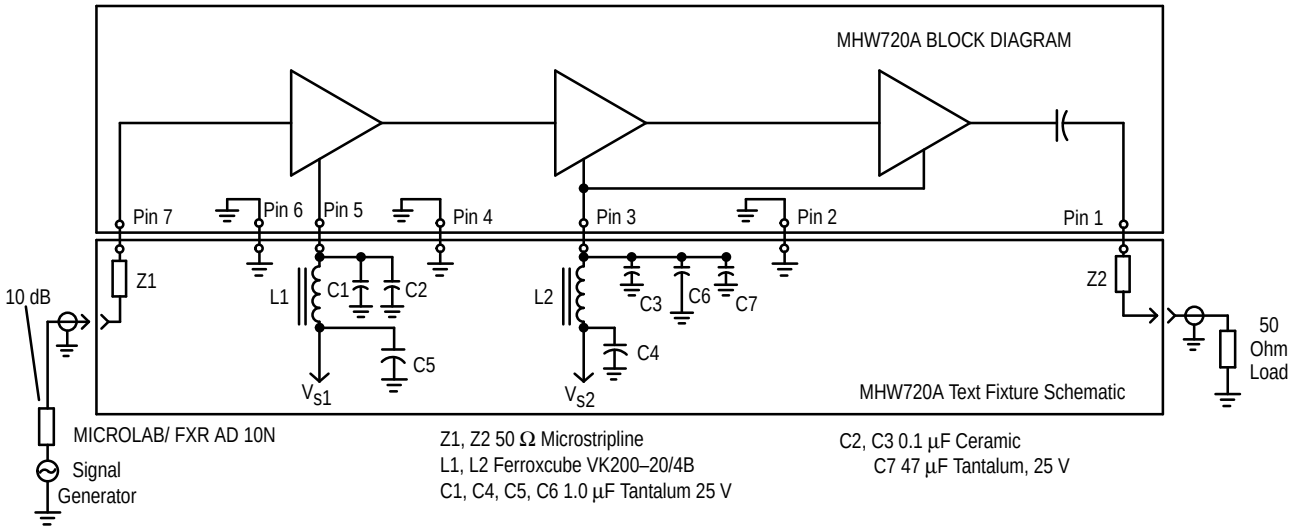
Due to the high gain of the three stages and the module size limitation, the external decoupling network requires careful consideration. Both Pins 3 and 5 are internally bypassed with a 0.018 μF chip capacitor effective for frequencies from 5 through 470 MHz. For bypassing frequencies below 5 MHz, networks equivalent to that shown in the test fixture schematic are recommended. Inadequate decoupling will result in spurious outputs at certain operating frequencies and certain phase angles of input and output VSWR less than 4:1.

Load Mismatch

During final test, each module is load mismatch tested in a fixture having the identical decoupling network described in Figure 1. Electrical conditions are V_{S1} and V_{S2} equal 15.5 V, load VSWR infinite, and output power equal to 30 watts.

Mounting Considerations

To insure optimum heat transfer from the flange to heatsink, use standard 6–32 mounting screws and an adequate quantity of silicon thermal compound (e.g., Dow Corning 340). With both mounting screws finger tight, alternately torque down the screws to 4–6 inch pounds. The heatsink mounting surface directly beneath the module flange should be flat to within 0.005 inch to prevent fracturing of ceramic substrate material. For more information on module mounting, see EB–107.



NOTE: No Internal D.C. blocking on input pin.

Figure 1. UHF Power Amplifier Test Setup

TYPICAL CHARACTERISTICS
MHW720A1, MHW720A2

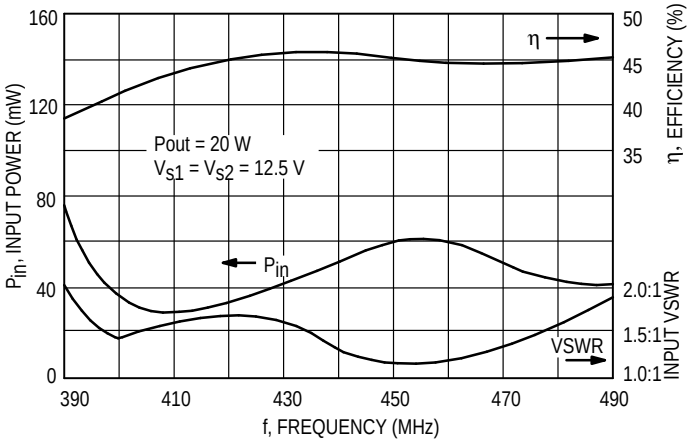


Figure 2. Input Power, Efficiency, and VSWR versus Frequency

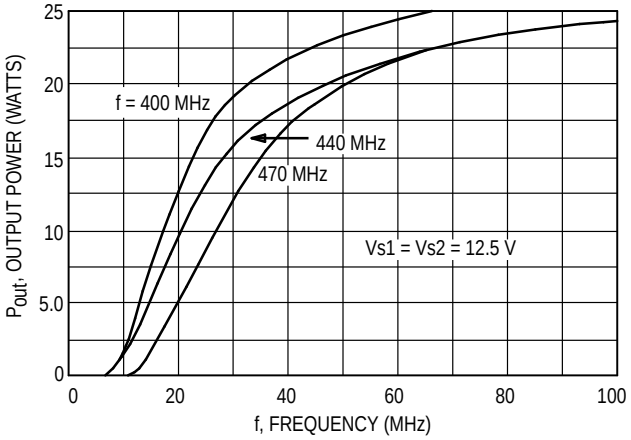


Figure 3. Output Power versus Input Power

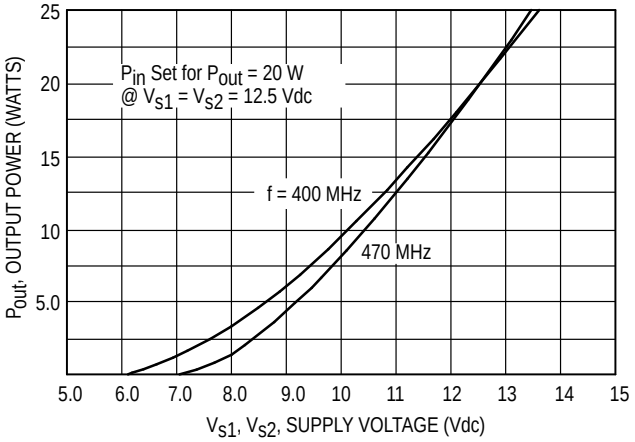


Figure 4. Output Power versus Voltage

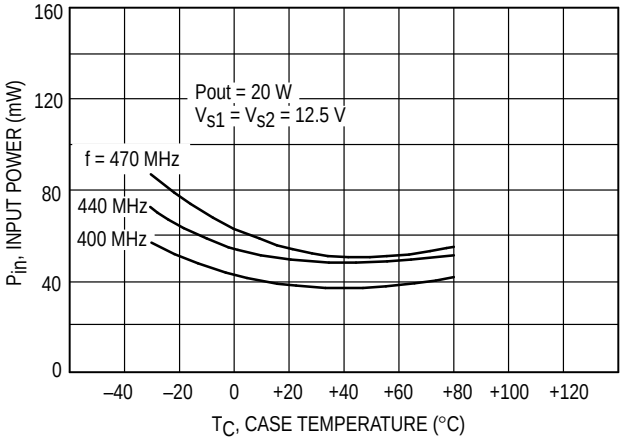


Figure 5. Input Power versus Case Temperature

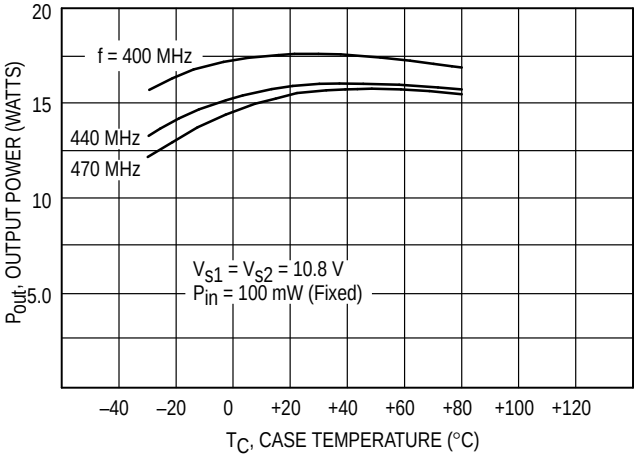
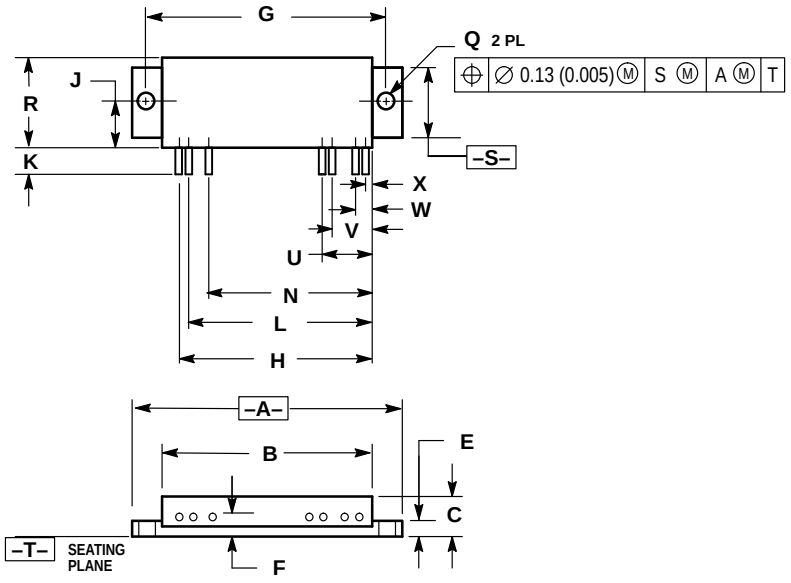


Figure 6. Output Power versus Case Temperature @ 10.8 V Supply

PACKAGE DIMENSIONS



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	2.640	2.660	67.06	67.56
B	2.040	2.085	51.82	52.95
C	0.335	0.360	8.51	9.14
E	0.100	0.115	2.54	2.92
F	0.085	0.115	2.16	2.92
G	2.405 BSC		61.09 BSC	
H	1.885	1.915	47.88	48.64
J	0.400	0.440	10.16	11.18
K	0.230	0.300	5.85	7.62
L	1.785	1.815	45.34	46.10
N	1.585	1.615	40.26	41.02
Q	0.136	0.146	3.46	3.70
R	0.800	0.820	20.32	20.82
S	0.670	0.690	17.02	17.52
U	0.485	0.515	12.32	13.08
V	0.385	0.415	9.78	10.54
W	0.185	0.215	4.70	5.46
X	0.085	0.115	2.16	2.92

STYLE 2:
PIN 1. RF OUTPUT
2. GROUND
3. Vs2
4. GROUND
5. Vs1
6. GROUND
7. RF INPUT

CASE 700–04
ISSUE F

How to reach us:
USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1–800–441–2447

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244–6609
INTERNET: http://Design–NET.com

JAPAN: Nippon Motorola Ltd.; Tatsumi–SPD–JLDC, Toshikatsu Otsuki,
6F Seibu–Butsuryu–Center, 3–14–2 Tatsumi Koto–Ku, Tokyo 135, Japan. 03–3521–8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298