

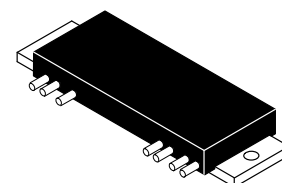
## The RF Line UHF Power Amplifiers

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	$T_{stg}$	–40 to +100	°C

### ELECTRICAL CHARACTERISTICS ( $V_{S1}$ and $V_{S2}$ set at 12.5 Vdc, $T_C = 25^\circ\text{C}$ , 50 Ω system unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Frequency Range				
MHW720A1	—	400	440	MHz
MHW720A2		440	470	
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)	$\eta$	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 @ $T_C = +25^\circ\text{C}$ )	—	—	–0.7	dB
$T_C = -30^\circ\text{C}$ $T_C = +80^\circ\text{C}$		—	–0.7	
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 Reference	—	All spurious outputs more than 60 dB below desired signal		
Quiescent Current ( $I_{S1}$ No RF Drive Applied)	$I_{S1} (q)$	—	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  $V_{S1}$  (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  $1.5 \times 10^5$  A/cm<sup>2</sup> 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 by-

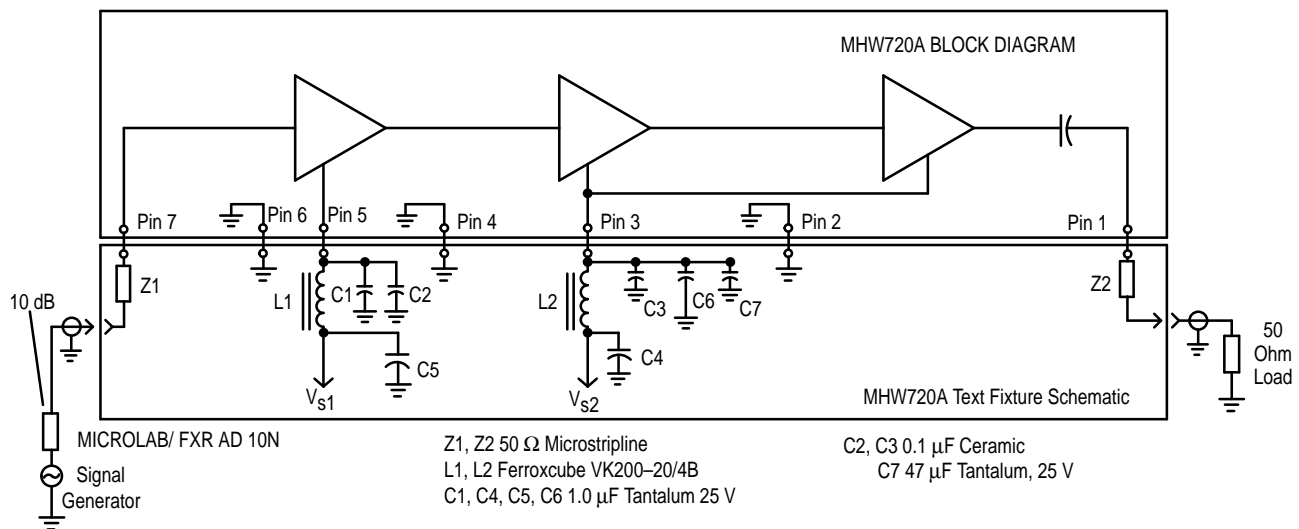
passed with a 0.018  $\mu$ F chip capacitor effective for frequencies from 5 through 470 MHz. For bypassing frequencies below 5 MHz, networks equivalent to that shown in the test fixture schematic are recommended. Inadequate decoupling will result in spurious outputs at certain operating frequencies 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

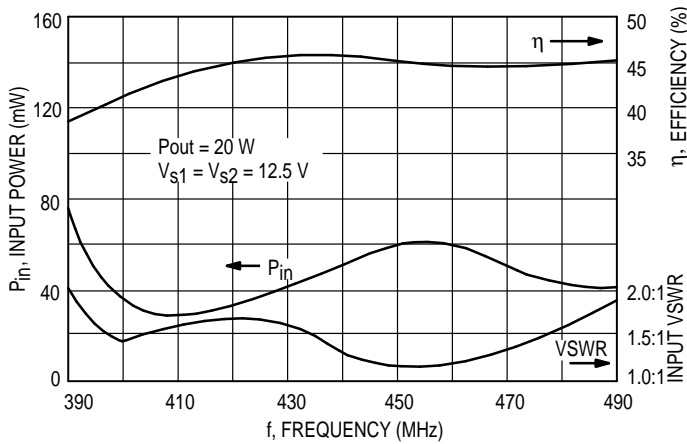
To insure optimum heat transfer from the flange to heat-sink, use standard 6–32 mounting screws and an adequate quantity of silicon thermal compound (e.g., Dow Corning 340). With both mounting screws finger tight, alternately torque down the screws to 4–6 inch pounds. The heatsink mounting surface directly 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.



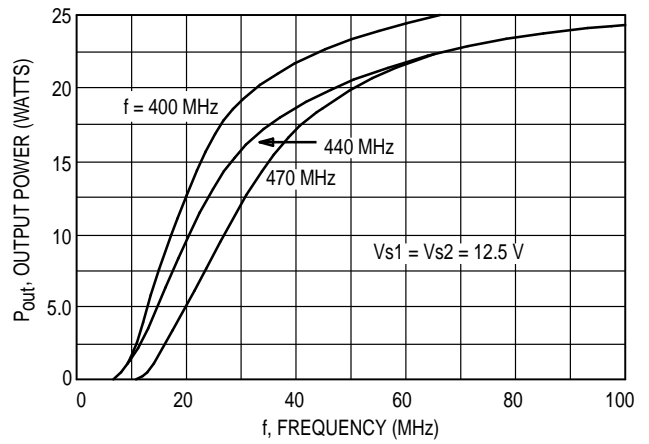
NOTE: No Internal D.C. blocking on input pin.

Figure 1. UHF Power Amplifier Test Setup

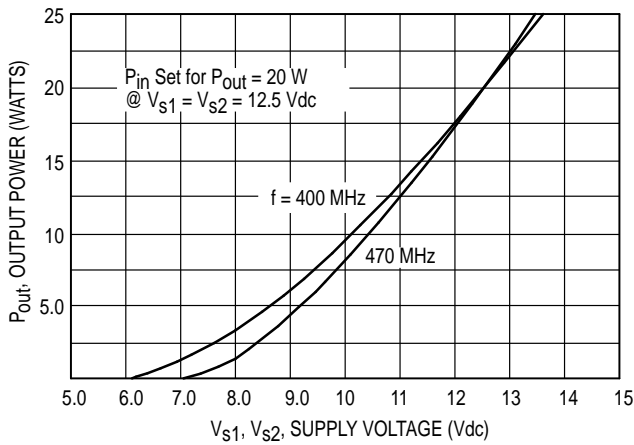
## TYPICAL CHARACTERISTICS MHW720A1, MHW720A2



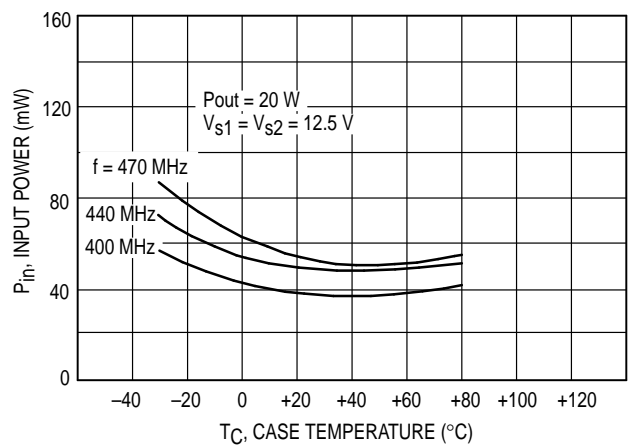
**Figure 2. Input Power, Efficiency, and VSWR versus Frequency**



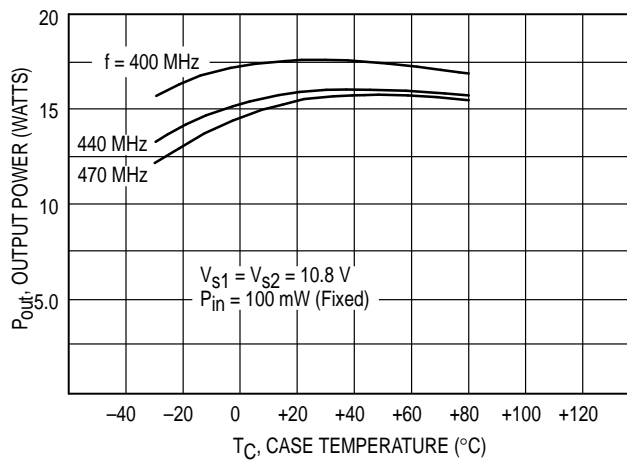
**Figure 3. Output Power versus Input Power**



**Figure 4. Output Power versus Voltage**

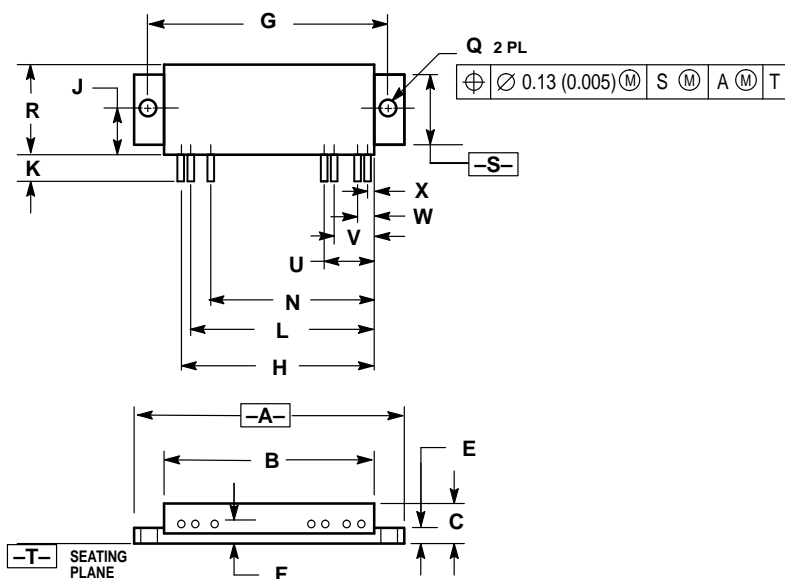


**Figure 5. Input Power versus Case Temperature**



**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.

DIM	INCHES		MILLIMETERS	
	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:**
1. RF OUTPUT
  2. GROUND
  3. Vs2
  4. GROUND
  5. Vs1
  6. GROUND
  7. RF INPUT

**CASE 700-04  
ISSUE F**

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**How to reach us:**

**USA/EUROPE:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

**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

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

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



MHW720A1/D

