RF Power Module

M57715

144-148MHz

12,5V / 13W

DATASHEET

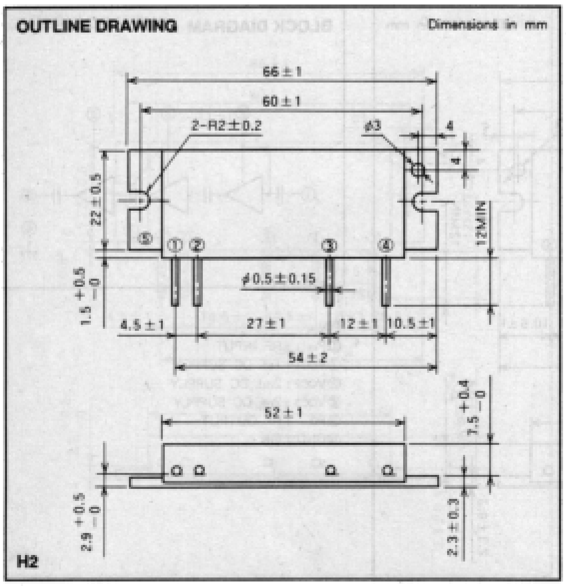
OEM –Mitsubishi

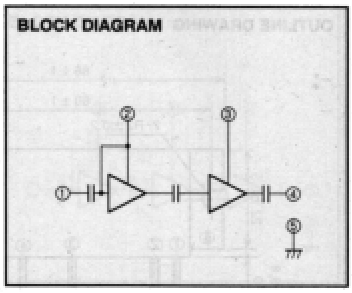
Source: Mitsubishi Databook 1995

MITSUBISHI RF POWER MODULE

M57715

144-148MHz, 12.5V, 13W, FM MOBILE RADIO





PIN :
①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		17	V
I_{CC}	Total current		5	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50\Omega$	0.4	W
$P_{O(max)}$	Output power	$Z_G = Z_L = 50\Omega$	20	W
$T_{C(OP)}$	Operation case temperature		−30 to 110	℃
T_{stg}	Storage temperature		−40 to 110	℃

Note. Above parameters are guaranteed independently.

ELECTRICAL CHARACTERISTICS (T_C = 25℃ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits Min	Limits Max	Unit
f	Frequency range	P_{in} = 0.2W, V_{CC} = 12.5V, $Z_G = Z_L = 50\Omega$	144	148	MHz
P_O	Output power		13		W
η_T	Total efficiency		48		%
2fo	2nd. harmonic			−25	dBc
3fo	3rd. harmonic			−30	dBc
ρ_{in}	Input VSWR			2.8	−
−	Load VSWR tolerance	V_{CC} = 15.2V, P_O = 14W (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50\Omega$	No degradation or destroy		−

Note. Above parameters, ratings, limits and conditions are subject to change.

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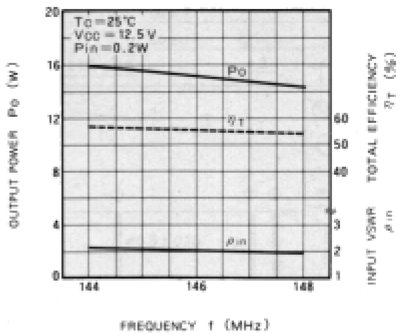
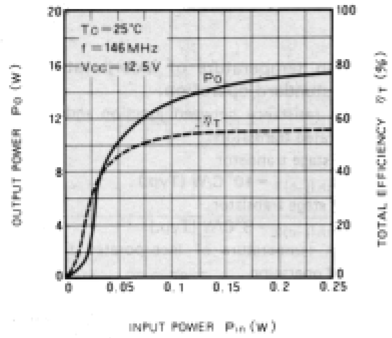
TYPICAL PERFORMANCE DATA

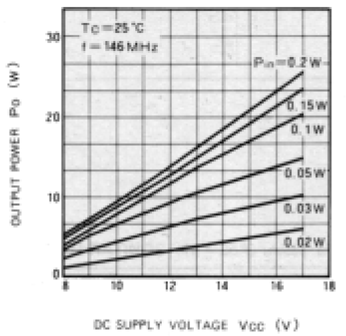
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY



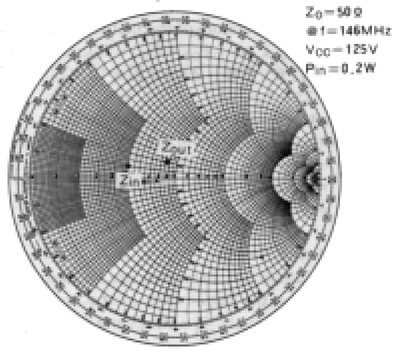
OUTPUT POWER, TOTAL EFFICIENCY, VS. INPUT POWER



OUTPUT POWER VS. DC SUPPLY VOLTAGE



INPUT IMPEDANCE, OUTPUT IMPEDANCE



DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

(1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$R_{th(j-c)1} = 10°C/W$ (Typ.)

b) Final stage transistor

$R_{th(j-c)2} = 3°C/W$ (Typ.)

(2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 13W$, $V_{CC} = 12.5V$, $P_{in} = 0.2W$, $\eta_T = 48\%$ (minimum rating), P_{o1} (Note 1) $= 2.5W$, $I_T = 2.2A$ (I_{T1} (2) $=$ 0.45A, I_{T2} (3) $= 1.75A$)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$T_{j1} = (V_{CC} \times I_{T1} - P_{o1} + P_{in}) \times R_{th(j-c)1} + T_c{}^{(4)}$$
$$= (12.5 \times 0.45 - 2.5 + 0.2) \times 10 + T_c$$
$$= 33 + T_c\ (°C)$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$T_{j2} = (V_{CC} \times I_{T2} - P_o + P_{o1}) \times R_{th(j-c)2} + T_c$$
$$= (12.5 \times 1.15 - 13 + 2.5) \times 3 + T_c$$
$$= 34 + T_c\ (°C)$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60°C$) and at the output power of 8W below 90°C.

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(13/0.48) - 13 + 0.2}$$
$$= 2.8\ (°C)$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$T_{j1} = 113°C$, $T_{j2} = 134°C$ at $T_a = 60°C$, $T_c = 90°C$.

In the annual average of ambient temperature is 33°C,

$T_{j1} = 103°C$, $T_{j2} = 104°C$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C, application under fully derated condition is ensure.