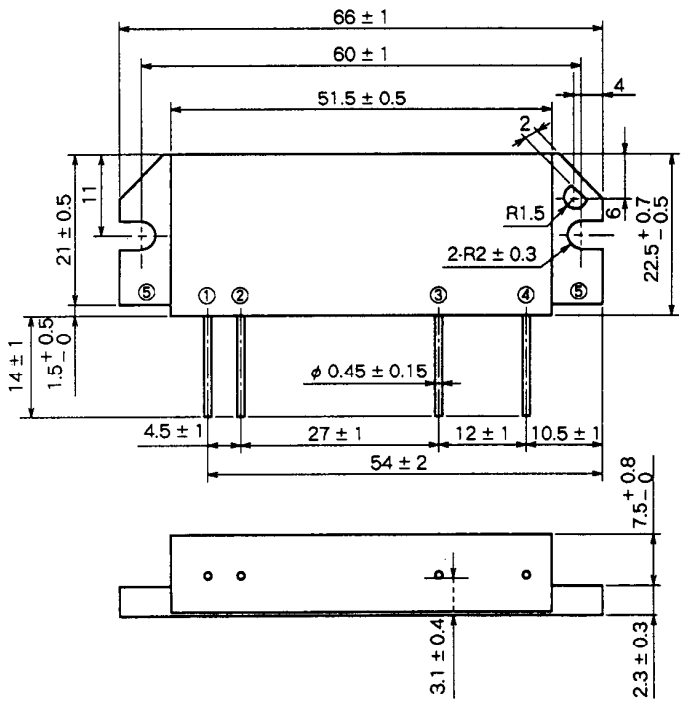
MITSUBISHI RF POWER MODULE

M57710-A

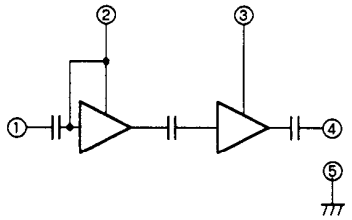
156-160MHz, 12.5V, 30W, FM MOBILE RADIO

OUTLINE DRAWING Dimensions in mm



H3

BLOCK DIAGRAM



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		7	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50\ \Omega$	0.4	W
$P_{o(max)}$	Output power	$Z_G = Z_L = 50\ \Omega$	40	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)

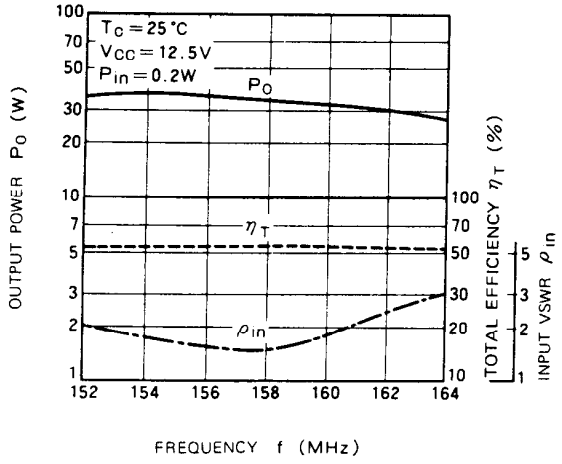
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P_{in} = 0.2W V_{CC} = 12.5V $Z_G = Z_L = 50\ \Omega$	156	160	MHz
P_o	Output power		30		W
η_T	Total efficiency		45		%
2fo	2nd. harmonic			− 25	dBc
3fo	3rd. harmonic			− 30	dBc
ρ_{in}	Input VSWR			2.8	−
−	Load VSWR tolerance	V_{CC} = 15.2V, P_o = 35W (P_{in} : controlled) Load VSWR=20:1(All phase), 5sec. Z_G = 50Ω	No degradation or destroy		−

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

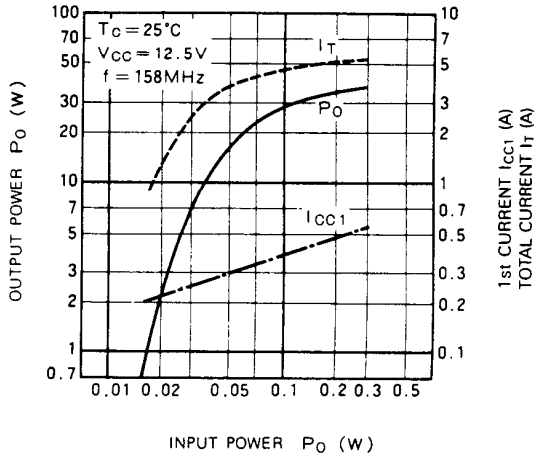
MITSUBISHI ELECTRIC

TYPICAL PERFORMANCE DATA

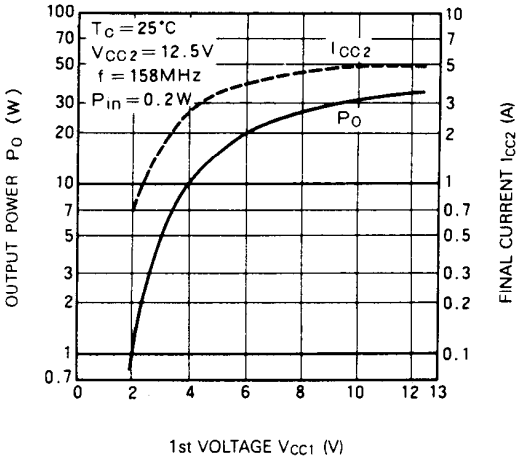
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY



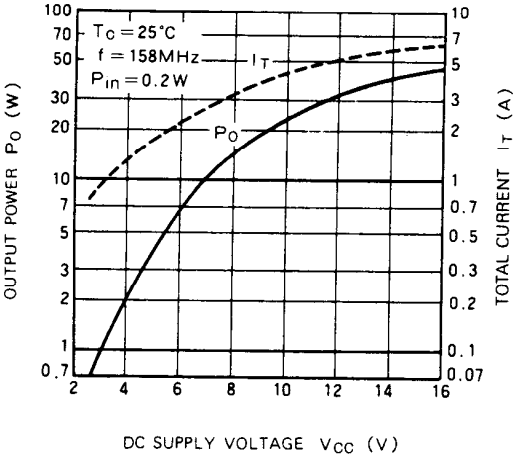
OUTPUT POWER, TOTAL CURRENT, 1st CURRENT VS. INPUT POWER



OUTPUT POWER, FINAL CURRENT VS. 1st VOLTAGE



OUTPUT POWER, TOTAL CURRENT VS. DC SUPPLY VOLTAGE



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

$R_{th(j-c)1}$ = 8°C/W (Typ.)

b) Final stage transistor

$R_{th(j-c)2}$ = 2°C/W (Typ.);

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

- Conditions for standard operation.

  P_O = 28W, V_{CC} = 12.5V, P_{in} = 0.2W, η_T = 45% (minimum rating), P_{O1} (Note 1) = 5W, I_T = 5.0A (I_{T1} (2) = 0.9A, I_{T2} (3) = 4.1A)

  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)

  $= (12.5 \times 0.9 - 5 + 0.2) \times 8 + T_C$

  $= 52 + T_C$ (°C)

  Note 4: Package temperature of device

- Junction temperature of the final stage transistor

  $T_{j2} = (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_C$

  $= (12.5 \times 4.1 - 28 + 5) \times 2 + T_C$

  $= 57 + T_C$ (°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:

$$R_{th(c-a)} = \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(28/0.45) - 28 + 0.2}$$

$$= 0.87\ (°C/W)$$

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} = 142°C, T_{j2} = 147°C at T_a = 60°C, T_C = 90°C.

In the annual average of ambient temperature is 30°C,

T_{j1} = 112°C, T_{j2} = 117°C

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