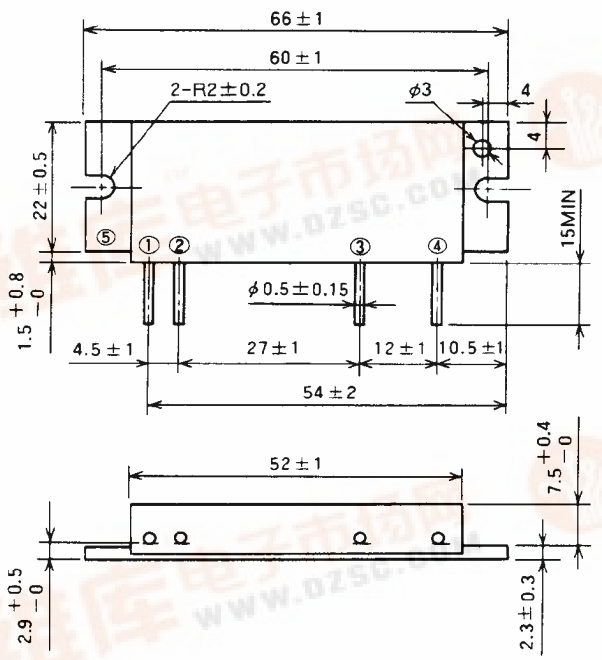
M57774

220-225MHz, 12.5V, 30W, FM MOBILE RADIO

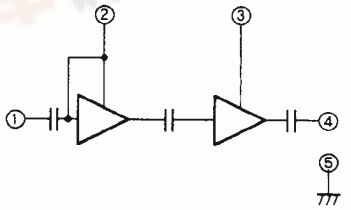
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



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

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

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		7	A
Pin(max)	Input power	ZG = ZL = 50 Ω	0.6	W
Po(max)	Output power	ZG = ZL = 50 Ω	40	W
Tc(OP)	Operation case temperature		− 30 to 110	℃
Tstg	Storage temperature		− 40 to 110	℃

Note. Above parameters are guaranteed independently.

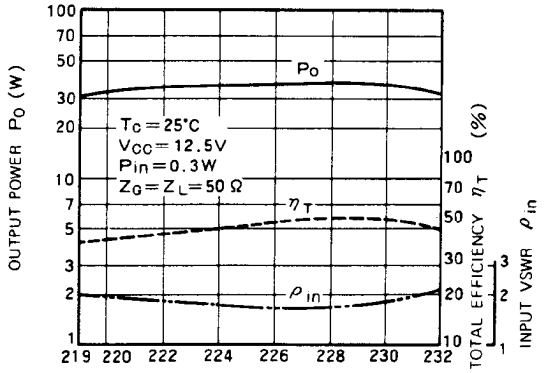
ELECTRICAL CHARACTERISTICS (Tc = 25℃ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Pin = 0.3W Vcc = 12.5V ZG = ZL = 50 Ω	220	225	MHz
Po	Output power		30		W
ηT	Total efficiency		43		%
2fo	2nd. harmonic			− 30	dBc
3fo	3rd. harmonic			− 35	dBc
ρin	Input VSWR			2.8	−
−	Load VSWR tolerance	Vcc = 15.2V, Po = 30W (Pin : controlled) Load VSWR=20:1 (All phase), 5sec. ZG = 50Ω	No degradation or destroy		−

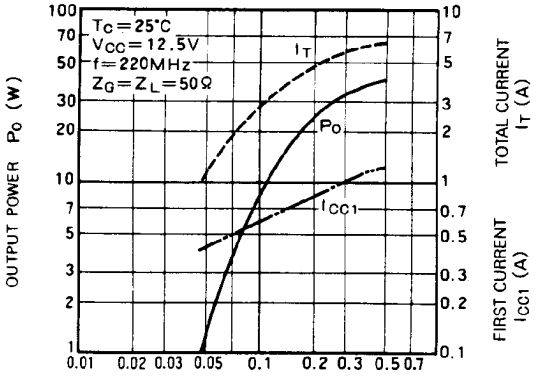
Note. Above parameters, ratings, limits and conditions are subject to change.

TYPICAL CHARACTERISTICS

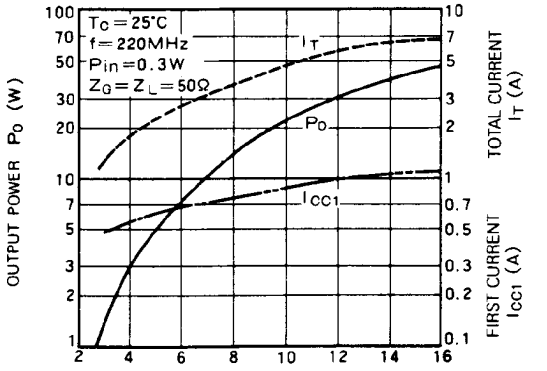
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY



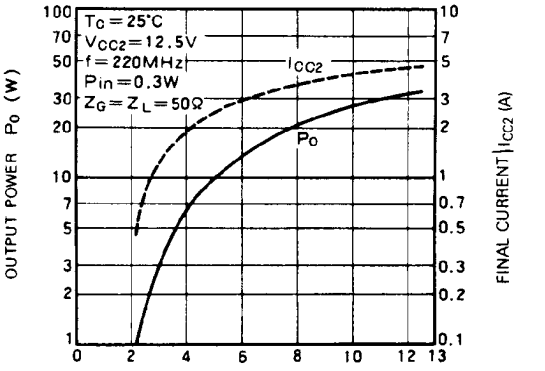
OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. INPUT POWER



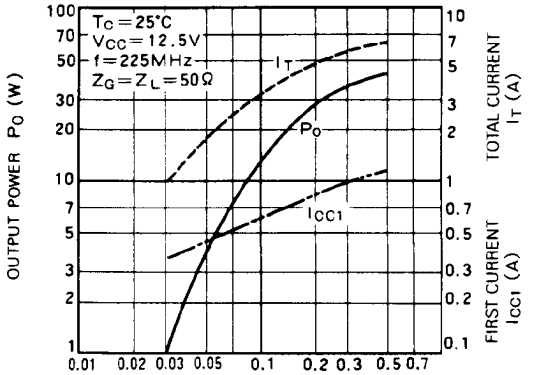
OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. SUPPLY VOLTAGE



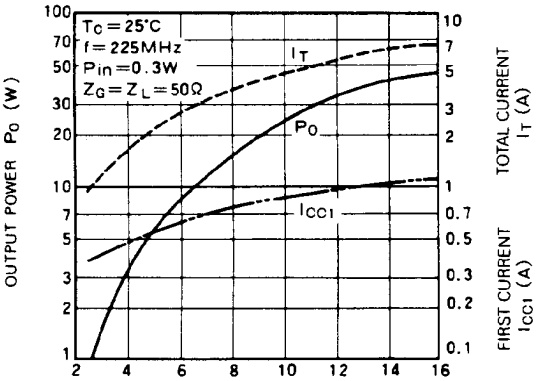
OUTPUT POWER, FINAL CURRENT, VS. FIRST VOLTAGE



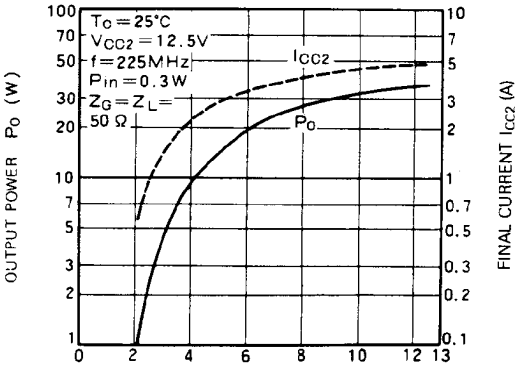
OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. INPUT POWER



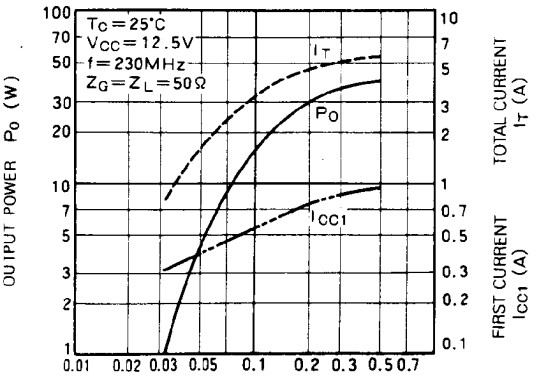
OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. SUPPLY VOLTAGE



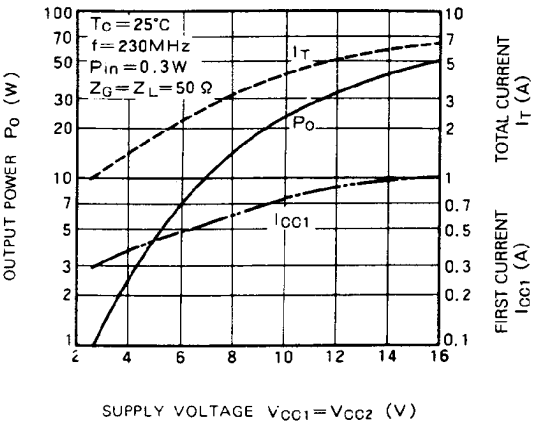
OUTPUT POWER, FINAL CURRENT, VS. FIRST VOLTAGE



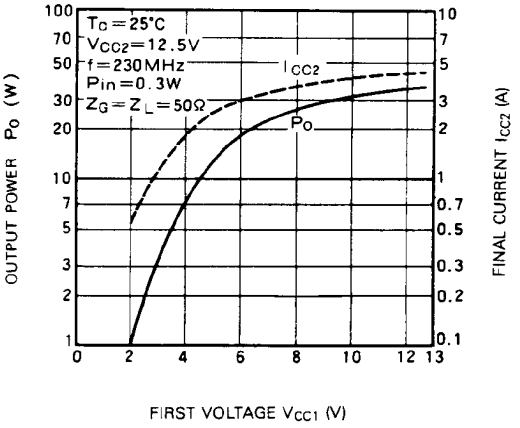
OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. SUPPLY VOLTAGE



OUTPUT POWER, TOTAL CURRENT, FIRST CURRENT VS. SUPPLY VOLTAGE



OUTPUT POWER, FINAL CURRENT, VS. FIRST VOLTAGE



DESIGN CONSIDERATION OF HEAT RADIATION

Note the following when designing a heat sink:

1. Junction temperature of built-in transistor at standard operation

(1) Thermal resistance between junction of built-in transistors and case

Thermal resistance between junction of 1st stage transistor and case

$R_{th(j-c)1}$ = 8°C/W (typ.)

Thermal resistance between junction of final stage transistor and case

$R_{th(j-c)2}$ = 2°C/W

(2) Junction temperature of built-in transistor at standard operation

- Standard operating conditions

P_O = 30W, V_{CC} = 12.5V, P_{in} = 0.3W, η_T = 43% (rated minimum), P_{O1} = 5W(Note 1), I_T = 5.6A (I_{T1}(Note 2) = 0.9A, I_{T2}(Note 3) = 4.7A)

Note 1: Output power of 1st stage transistor

Note 2: Current loss of 1st stage transistor

Note 3: Current loss of final stage transistor

- Junction temperature of 1st stage transistor

$T_{j1} = (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_C$(Note 4)

$= (12.5 \times 0.9 - 5 + 0.3) \times 8 + T_C$

$= 52 + T_C$ (°C)

Note 4: Case temperature of device

- Junction temperature of final stage transistor

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

$= 912.5 \times 4.7 - 30 + 5) \times 2 + T_C$

$= 68 + T_C$ (°C)

2. Heat sink design

To design the thermal characteristics of a heat sink, keep the case temperature below 90°C when output power P_O is 28W and the upper limit of ambient temperature T_a is 60°C.

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

$$R_{th(c-a)} = \frac{T_C - T_a}{\frac{P_O}{\eta_T} - P_O + P_{in}} = \frac{90 - 60}{\frac{30}{0.43} - 30 + 0.3}$$

$$= 0.75\ (°C/W)$$

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

Mounting the device on the heat sink with the above thermal resistance, junction temperatures of each transistor module becomes as follows:

T_{j1} = 142°C, T_{j2} = 158°C at T_a = 60°C, T_C = 90°C, Since the annual average of ambient temperature is 30°C, junction temperature of each transistor becomes as follows: T_{j1} = 112°C and T_{j2} = 17°C.

Use of these built-in transistors in temperatures below the maximum junction temperature T_{jmax} 175°C is guaranteed.