VHF amplifier module

BGY145C

T-74-09-01

DESCRIPTION

An RF amplifier module designed for use in transmitters of mobile communications equipment powered by a 12.5 V battery supply.

The module is a two stage transistor amplifier and consists of two RF npn transistors mounted on a ceramic substrate, together with surface mounted components that make up the matching and bias circuits.

The module will provide 27 W RF power into a 50 Ω load, when operated at nominal conditions within the frequency range of 174 to 200 MHz.

PINNING - SOT183A

PIN	DESCRIPTION
1	output
2	V_{S2}
3	V_{S1}
4	input
flange	ground

PIN CONGIGURATION

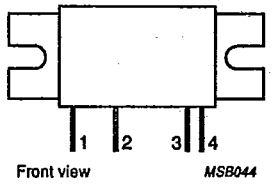


Fig.1 Simplified outline.

QUICK REFERENCE DATA

Mode of operation: continuous wave.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
f	frequency range		174	–	200	MHz
P_L	RF output power	P_D = 300 mW	27	–	–	W
G_p	RF power gain	P_L = 27 W	19.5	–	–	dB
η	efficiency	P_L = 27 W	35	–	–	%
V_{S1}, V_{S2}	DC supply voltage		–	12.5	–	V
Z_I	input impedance		–	50	–	Ω
Z_L	output load impedance		–	50	–	Ω

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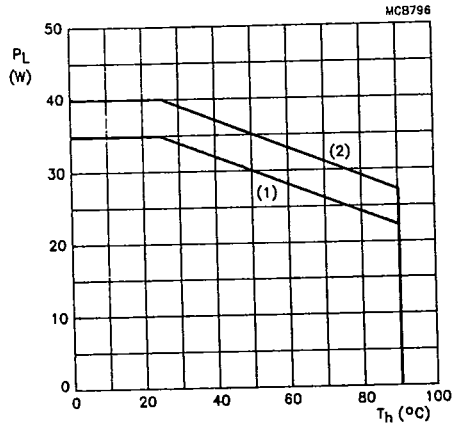
BGY145C

T-74-09-01

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{S1}, V_{S2}	DC supply voltage	–	15.5	V
$\pm V_i$	RF input terminal voltage	–	25	V
$\pm V_o$	RF output terminal voltage	–	25	V
P_D	RF input power	–	450	mW
P_L	RF output power (see Fig.2)	–	40	W
T_{stg}	storage temperature range	–30	100	°C
T_h	heatsink operating temperature	–	90	°C



(1) 3:1 mismatch.
(2) Matched.

Fig.2 Load power derating.

CHARACTERISTICS

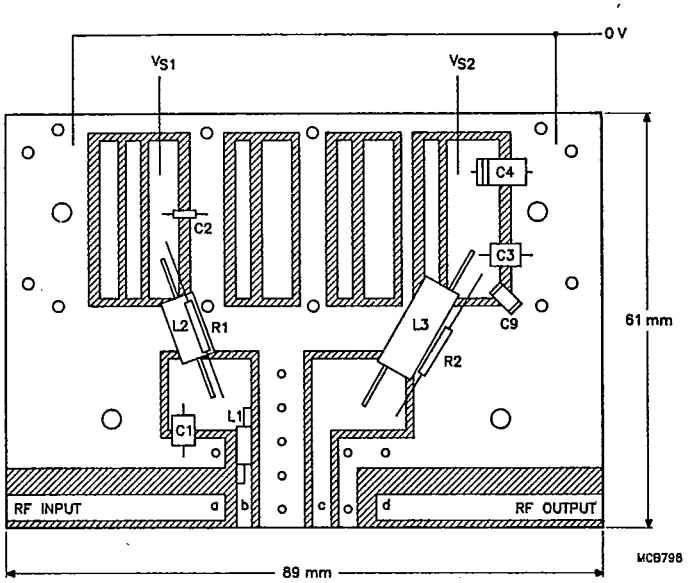
T_h = 25 °C; V_{S1} = V_{S2} = 12.5 V; R_S = R_L = 50 Ω; frequency range = 174 to 200 MHz.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{Q1}	quiescent current	P_D = 0	–	25	mA
I_{Q2}	quiescent current	P_D = 0	–	55	mA
P_L	RF output power	P_D = 300 mW	27	–	W
G_p	RF power gain	P_L = 27 W	19.5	–	dB
η	efficiency	P_L = 27 W	35	–	%
H_{R2}	2nd harmonic output	P_L = 27 W	–	–30	dBc
H_{R3}	3rd harmonic output	P_L = 27 W	–	–40	dBc
	input VSWR with respect to 50 Ω	P_L = 27 W	–	2:1	

VHF amplifier module BGY145C

T-74-09-01

APPLICATION INFORMATION



Epoxy fibre-glass board, 1/16 inch thick, $\varepsilon_r = 4.5$.
L2 to be 90 degrees to L3.
Track widths 'a' and 'd' (50 Ω) = 4 mm.
Track width 'b' = 2.5 mm.
Track width 'c' = 3 mm.
Circles indicate the positions of through rivets.

Fig.3 Test jig.

LIST OF COMPONENTS (Fig.3)

DESIGNATION	DESCRIPTION	VALUE	DIMENSIONS
C1, C3	63 V miniature polyester film capacitor	470 nF	
C2	35 V tantalum bead capacitor	4.7 µF	
C4	35 V tantalum capacitor	1 µF	
C9	50 V multilayer ceramic capacitor	47 nF	
L1	4 turns 0.45 mm diameter copper wire		int. dia. 2.5 mm
L2	4 turns 1 mm diameter copper wire		int. dia. 9 mm
L3	12 turns 1 mm diameter copper wire		int. dia. 9 mm
R1, R2	0.5 W resistor	12 Ω	

VHF amplifier module BGY145C

T-74-09-01

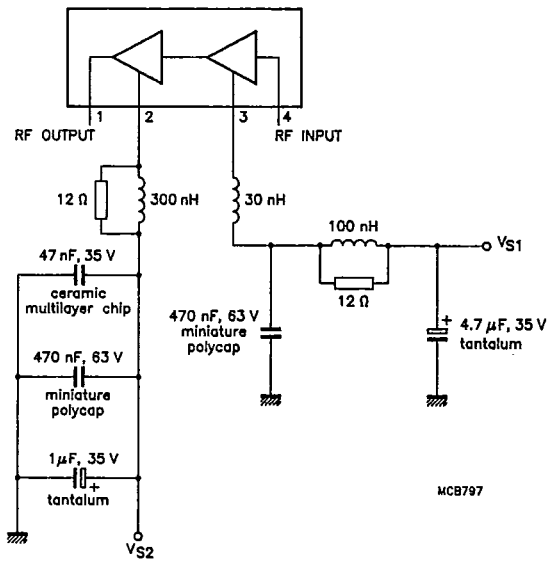


Fig.4 Decoupling arrangement.

STABILITY

The module is stable when operated with a load of up to 3:1 at all phases, providing the operating conditions are as follows:

P_D 15 to 450 mW; $P_L \geq 3$ to ≤ 40 W;
V_{S1} = 1.5 to 15.5 V;
V_{S2} = 10.5 to 15.5 V and $V_{S1} < V_{S2}$.

RUGGEDNESS

The output power of the module into a 50 Ω load will be unchanged after one minute of operation into a load mismatch of 20:1 (any phase), providing maximum ratings are not exceeded.

V_{S1}, $V_{S2} \leq 15.5$ V; $T_h \leq 90$ °C;
$P_L \leq 40$ W; $P_D < 450$ mW.

RF POWER CONTROL

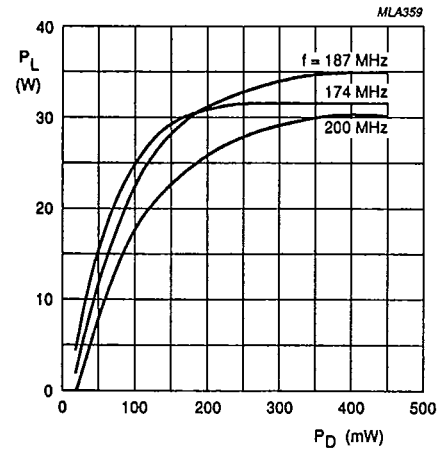
The module is designed to be operated over a power range up to 27 W, under nominal conditions. The output power may be controlled by adjusting the input power, P_D, or the first stage supply voltage, V_{S1}.

P_D = 15 to 450 mW;
V_{S1} = 1.5 V to V_{S2}.

VHF amplifier module

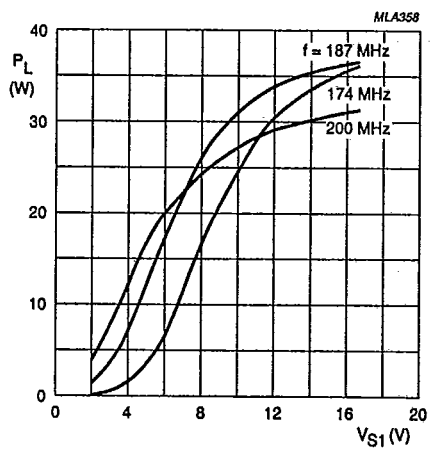
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T-74-09-01



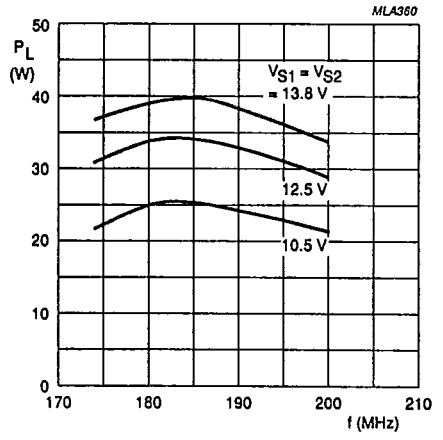
$V_{S1} = V_{S2} = 12.5$ V.

Fig.5 Load power as a function of drive power.



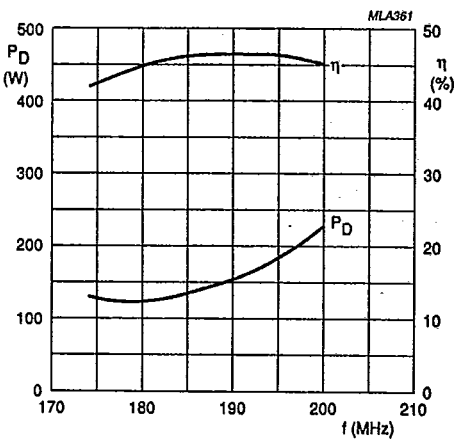
$P_D = 300$ mW; $V_{S2} = 12.5$ V.

Fig.6 Load power as a function of first stage supply voltage.



$P_D = 300$ mW.

Fig.7 Load power as a function of frequency.

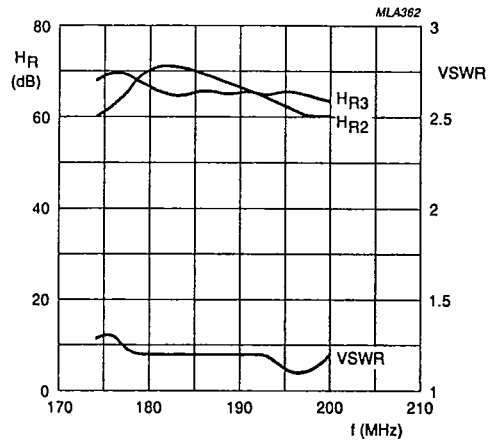


$P_L = 27$ W; $V_{S1} = V_{S2} = 12.5$ V.

Fig.8 Drive power as a function of frequency.

VHF amplifier module BGY145C

T-74-09-01



P_L = 27 W; V_{S1} = V_{S2} = 12.5 V.

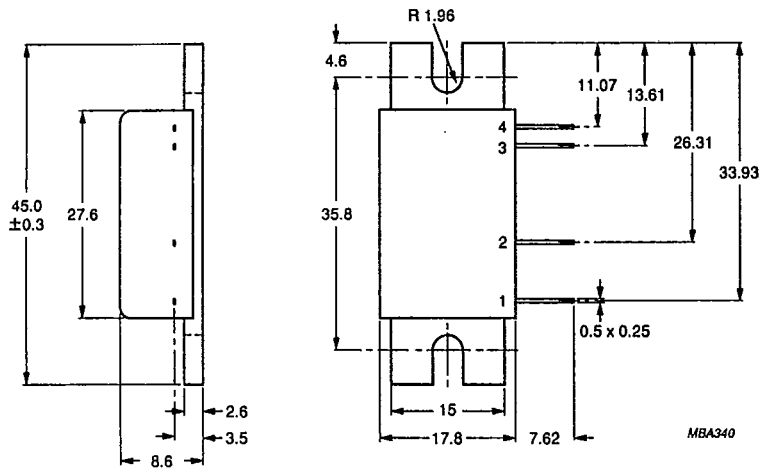
Fig.9 Harmonics as a function of frequency.

VHF amplifier module

BGY145C

T-74-09-01

PACKAGE OUTLINE



Dimensions in mm.

Fig.10 SOT183A.