VHF AMPLIFIER MODULE

A broadband VHF amplifier module primarily designed for use in portable transmitters operating from 9.6 V electrical battery supply.

The module is a two-stage RF amplifier consisting of n-channel FETs, with lumped-element matching and bias circuits.

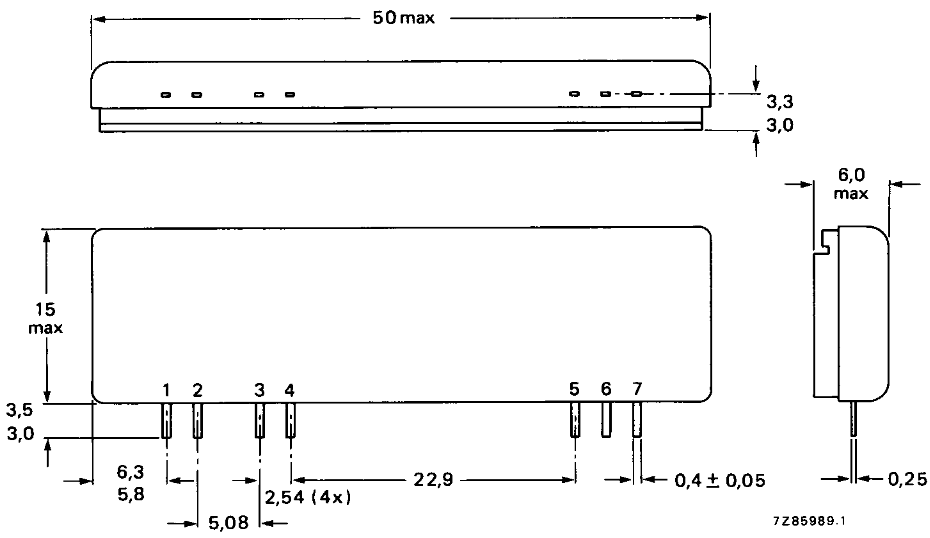
The module will produce a minimum of 5 W into a 50 Ω load over the frequency range of 148 to 174 MHz.

QUICK REFERENCE DATA

Mode of operation			CW
Frequency range			148 to 174 MHz
DC supply voltages	V_{S1}, V_{S2}	nom.	9.6 V
Drive power	P_D	max.	35 mW
Load power	P_L	>	5.0 W
Input, output impedance	z_i, z_L	nom.	50 Ω

MECHANICAL DATA

Dimensions in mm



Lead reference

1 = RF input
2 = Earth
3 = V_{S1} and second stage bias
4 = Earth
5 = V_{S2}
6 = Earth
7 = RF output
Flange = Earth

Fig. 1 SOT-182.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

DC supply terminal voltages*	V_{S1}, V_{S2}	max.	13.5	V
RF input terminal voltage*	$\pm V_i$	max.	25	V
RF output terminal voltage*	$\pm V_o$	max.	25	V
Load power (see Fig. 2)	P_L	max.	9.0	W
Drive power	P_D	max.	70	mW
Storage temperature range	T_{stg}		−40 to + 100	°C
Operating heatsink temperature	T_h	max.	90	°C

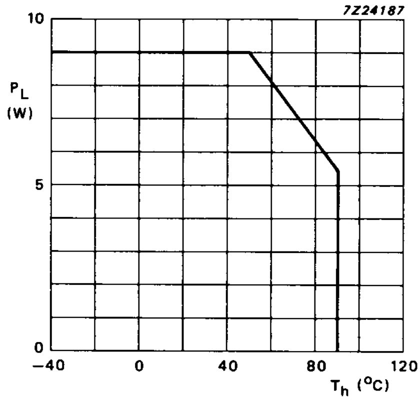


Fig. 2 Load power derating; VSWR = 1 : 1.

* With respect to earth.

CHARACTERISTICS

T_h = 25 °C unless otherwise stated
$V_{S1} = V_{S2}$ = 9.6 V; $R_S = R_L$ = 50 Ω; f = 148 to 174 MHz.

Quiescent currents			
first stage current			
$P_D = 0$	I_{Q1}	typ.	125 mA
second stage current with first stage open circuit			
$P_D = 0$; $I_{S1} = 0$	I_{Q2}	<	0.5 mA
RF drive power			
P_L = 5.0 W	P_D	<	35 mW
Efficiency			
P_L = 5.0 W	η	>	40 %
		typ.	46 %
Harmonic output	any harmonic (relative to carrier)	<	−35 dB
Input VSWR			
with respect to 50 Ω	VSWR	max.	2 : 1

Stability

The module is stable with load VSWR up to 8 (all phases) when operated within the following conditions:

$V_{S1} \leqslant V_{S2}$ = 4 to 11.2 V; f = 148 to 174 MHz; P_D = 17 to 70 mW; P_L < 9 W (matched).

Ruggedness

The module will withstand a load VSWR of 50 for short period overload conditions, with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched RF output power derating curve being exceeded (T_h < 90 °C).

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface and heat-conducting compound applied between module and heatsink. The module is designed to be pressed against the heatsink by a sheet spring applying up to 50 N to the top surface of the module encapsulation. The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 s at a distance of at least 1 mm from the plastic.

Power rating

In general it is recommended that the output power from the module under nominal conditions should not exceed 7 W in order to provide an adequate safety margin under fault conditions.

Gain control

The module is designed to be operated at a constant output power of 5 W. The module is adjusted to produce nominal output power by reducing the first stage supply voltage (V_{S1}). If the module is to be used over a range of output power levels below 5 W the first stage supply voltage should not be reduced below 4 V. If further reductions in power are needed this may be achieved by varying the drive power (P_D), however for stable operation care must be taken to avoid operating the module outside the published stability conditions.

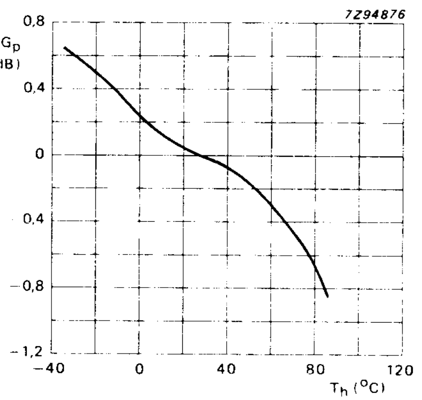


Fig. 3 Power gain as a function of temperature; $V_{S1} = V_{S2} = 9.6$ V; $P_D = 35$ mW; f = 161 MHz.

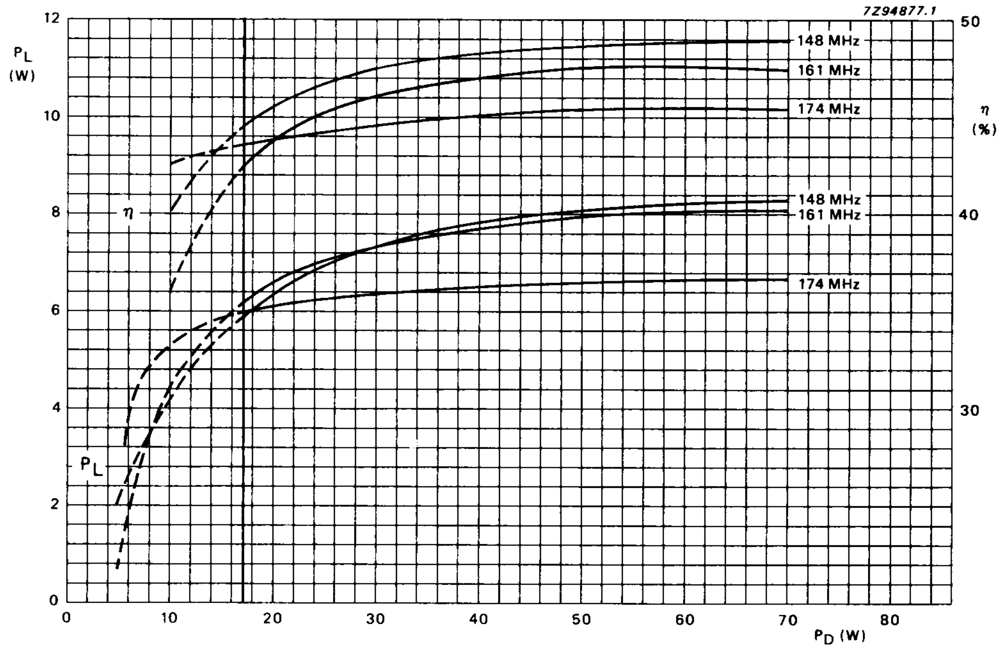


Fig. 4 Load power and efficiency as functions of drive power;
$V_{S1} = V_{S2} = 9.6$ V; typical values.

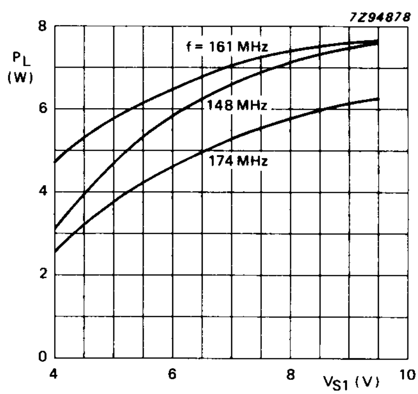


Fig. 5 Load power as a function of supply voltage V_{S1};
P_D = 35 mW; $V_{S2} = 9.6$ V; typical values.

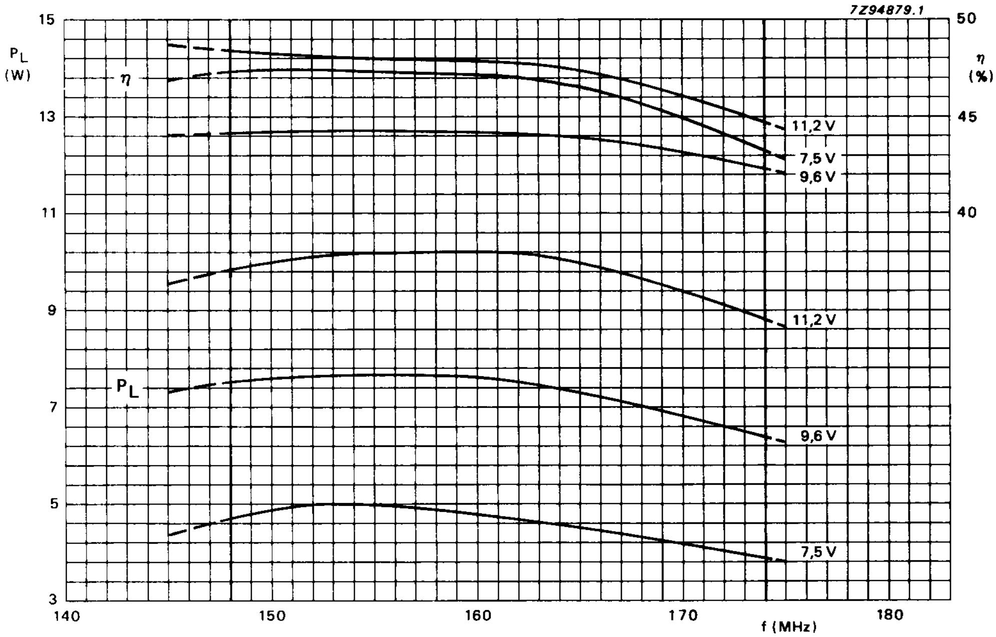


Fig. 6 Load power and efficiency as functions of frequency;
$V_{S1} = V_{S2}$; P_D = 35 mW; typical values.

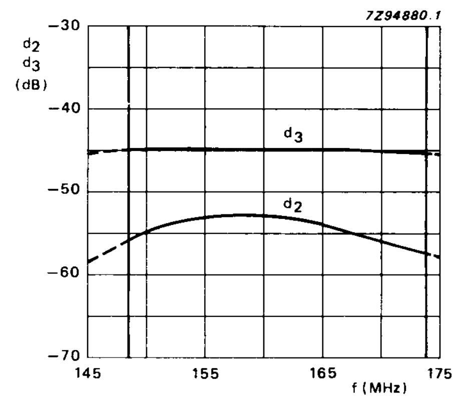


Fig. 7 Second and third harmonic distortion as a function of frequency;
$V_{S1} = V_{S2}$ = 9.6 V; P_D = 35 mW; typical values.