UHF POWER AMPLIFIER MODULE

A broadband UHF amplifier module primarily designed for mobile communications equipment, operating directly from 7.5 V or 9.6 V electrical systems. The module will produce a minimum output of 2.0 W or 3.2 W into a 50 Ω load over the frequency range 400 to 470 MHz.

The module consists of a two-stage RF amplifier, using npn transistor chips with lumped-element matching components in a plastic stripline encapsulation (SOT181). The negative supply is internally connected to the flange.

QUICK REFERENCE DATA

Mode of operation			CW	
Frequency range			400 to 470	MHz
DC supply voltage (terminal 3)	V_{S1}		7.5 or 9.6	V
DC supply voltage (terminal 4)	V_{S2}		7.5 or 9.6	V
RF drive power	P_D	max.	50	mW
RF load power	P_L	min.	2.0 or 3.2	W
Efficiency	η	typ.	44	%

MECHANICAL DATA

Dimensions in mm

Lead reference

1 = RF input
2 = Earth
3 = V_{S1}
4 = V_{S2}
5 = Earth
6 = RF output
Flange = earth

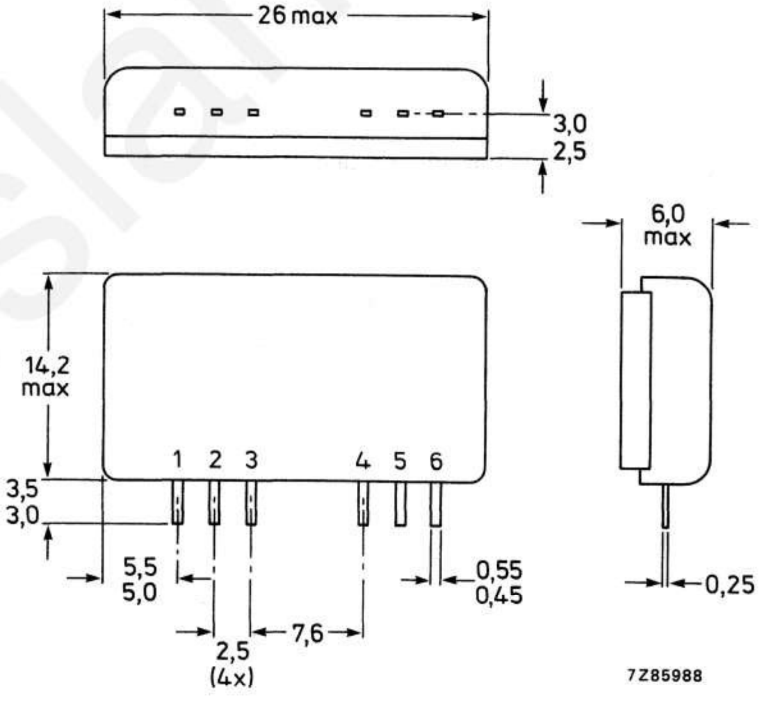

Fig.1 SOT181.

RATINGS

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

DC supply terminal voltages*	V_{S1}, V_{S2}	max.	12	V
RF input terminal voltage*	$\pm V_i$	max.	25	V
RF output terminal voltage*	$\pm V_o$	max.	25	V
Load power	P_L	max.	5.0	W
Drive power	P_D	max.	90	mW
Storage temperature range	T_{stg}		−40 to 100	°C
Operating heatsink temperature	T_h	max.	90	°C

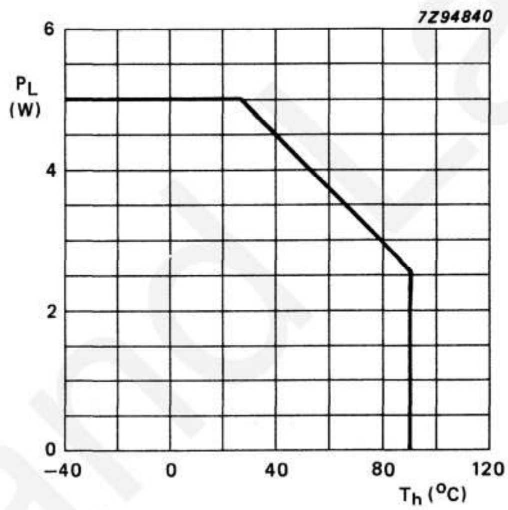

Fig.2 Load power derating; VSWR = 1 : 1.

* With respect to the earth pins.

CHARACTERISTICS

$Z_S = Z_L = 50\ \Omega$; frequency range = 400 to 470 MHz; $T_h = 25\ ^oC$ unless otherwise specified.

Quiescent currents				
$V_{S1} = V_{S2} = 7.5$ V or 9.6 V;	I_{Q1}	max.	7.0	mA
$P_D = 0$	I_{Q2}	max.	0.1	mA
Efficiency				
$P_L = 2.0$ W or $P_L = 3.2$ W	η	min.	40	%
	η	typ.	44	%
RF drive power				
$P_L = 2.0$ W; $V_{S1} = V_{S2} = 7.5$ V	P_D	max.	50	mW
$P_L = 3.2$ W; $V_{S1} = V_{S2} = 9.6$ V	P_D	max.	50	mW
Harmonic output	any harmonic	min.	−30	dB
		typ.	−40	dB
Input VSWR				
with respect to 50 Ω	VSWR	max.	2:1	

Stability

The module is stable with a load VSWR up to 5:1 (all phases) when operated within the following conditions:

$V_{S1} \leqslant V_{S2} = 5.0$ V to 11.2 V; $P_D = 25$ to 90 mW; f = 400 to 470 MHz; $P_L < 5.0$ W (matched)

Ruggedness

The module will withstand a load mismatch VSWR of 50:1 (all phases) for short period overload conditions, with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not cause the matched RF output power rating to be exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound applied between module and heatsink. The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 ^oC for not more than 10 seconds at a distance of a 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 **4 W** in order to provide an adequate safety margin under fault conditions.

Output power control

The module is not designed to be operated over a large range of output power levels. The aim of the output power control is to set the nominal output power level. The preferred method of output power control is by varying the drive power between 25 and 50 mW. The next option is by varying V_{S1} between 5.0 and 9.6 V.

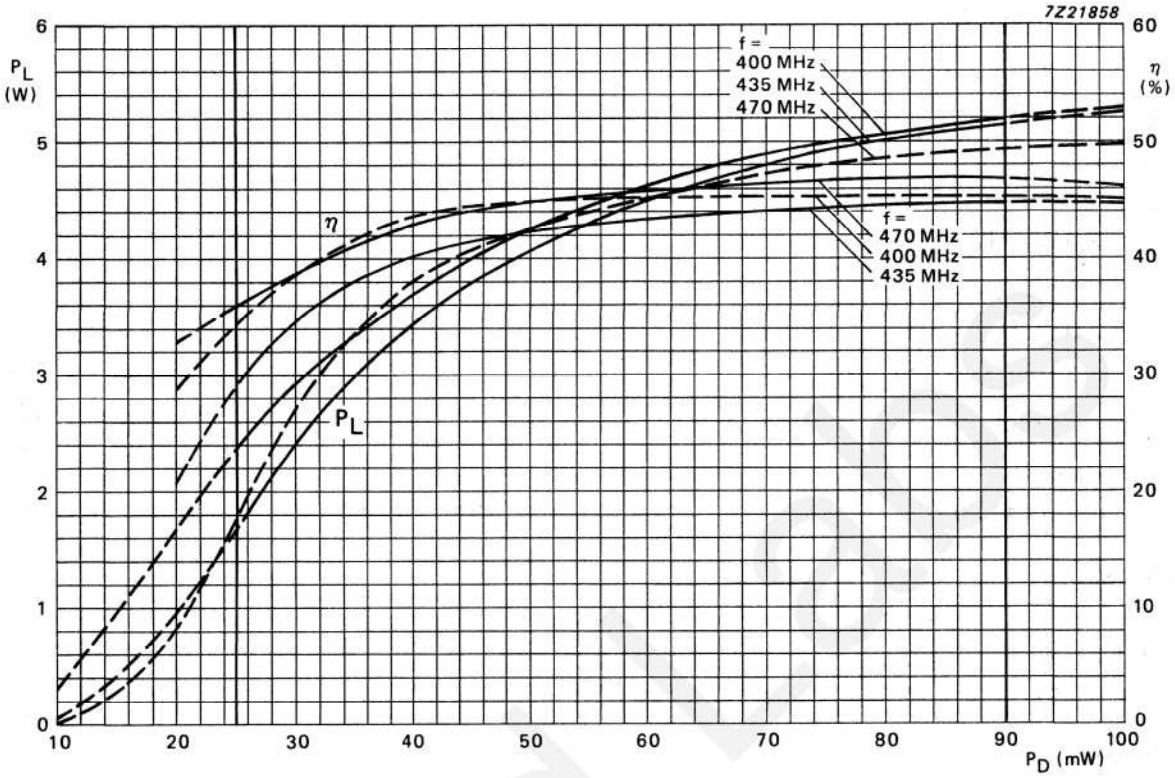

Fig.3 Load power and efficiency as functions of drive power; $V_{S1} = V_{S2} = 9.6$ V; typical values.

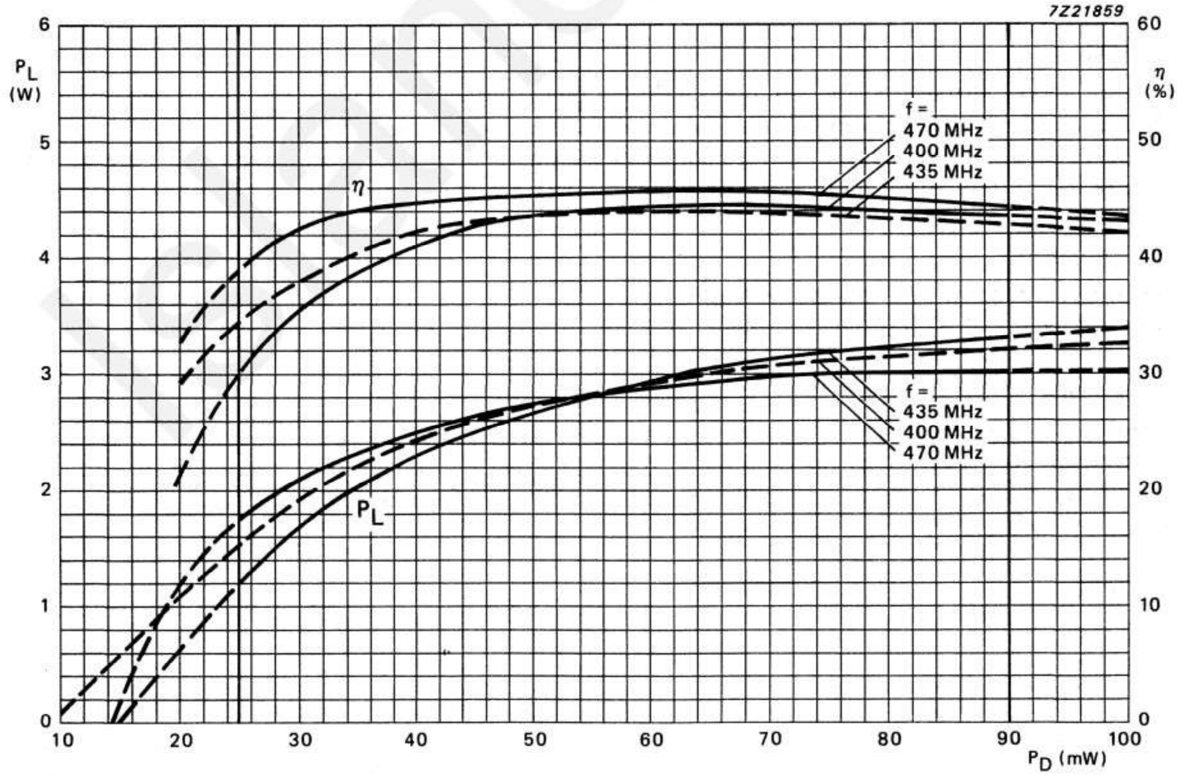

Fig.4 Load power and efficiency as functions of drive power; $V_{S1} = V_{S2} = 7.5$ V; typical values.

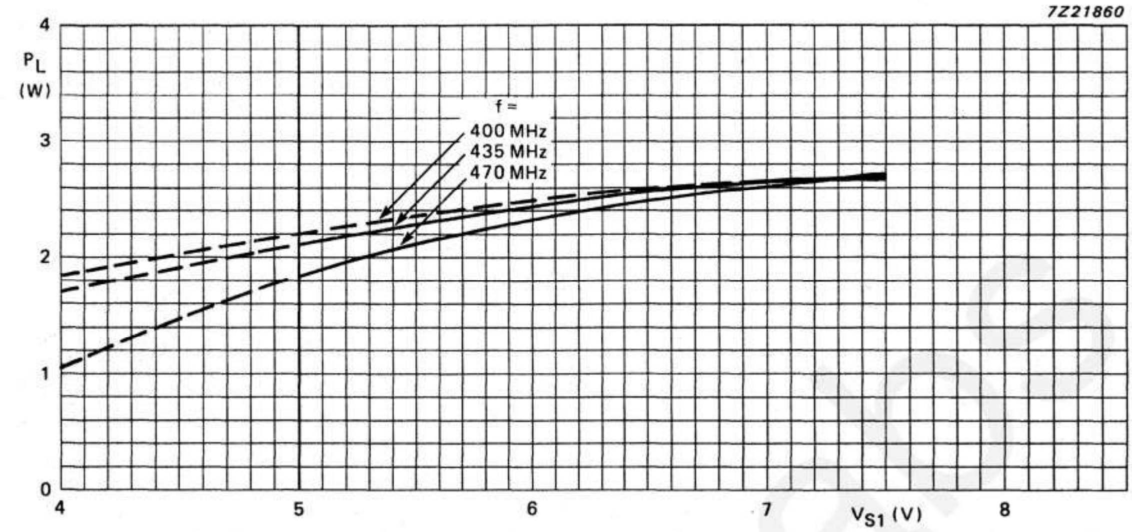

Fig.5 Load power as a function of V_{S1}; V_{S2} = 7.5 V; P_D = 50 mW; typical values.

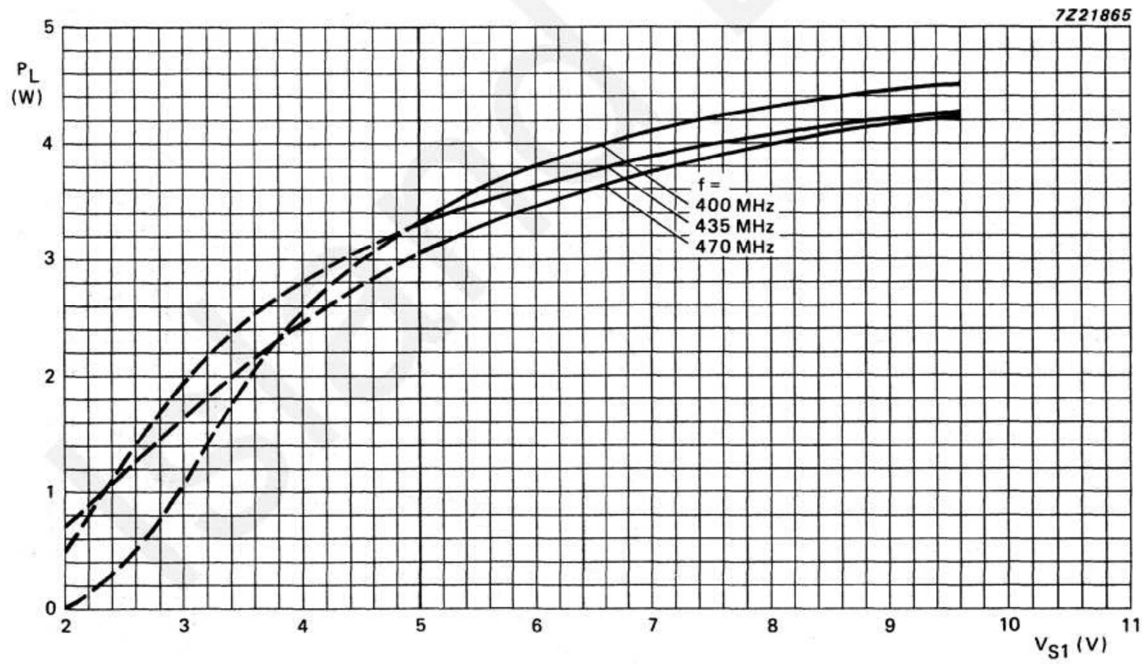

Fig.6 Load power as a function of V_{S1}; V_{S2} = 9.6 V; P_D = 50 mW; typical values.

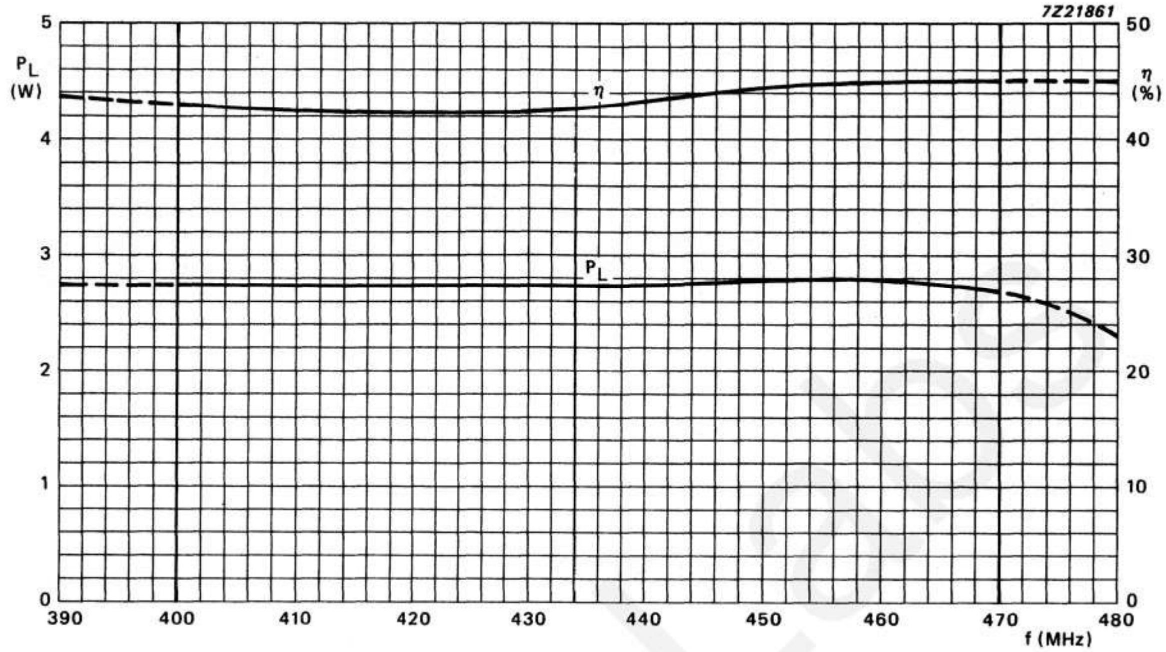

Fig.7 Load power and efficiency as functions of frequency; $V_{S1} = V_{S2} = 7.5$ V; $P_D = 50$ mW; typical values.

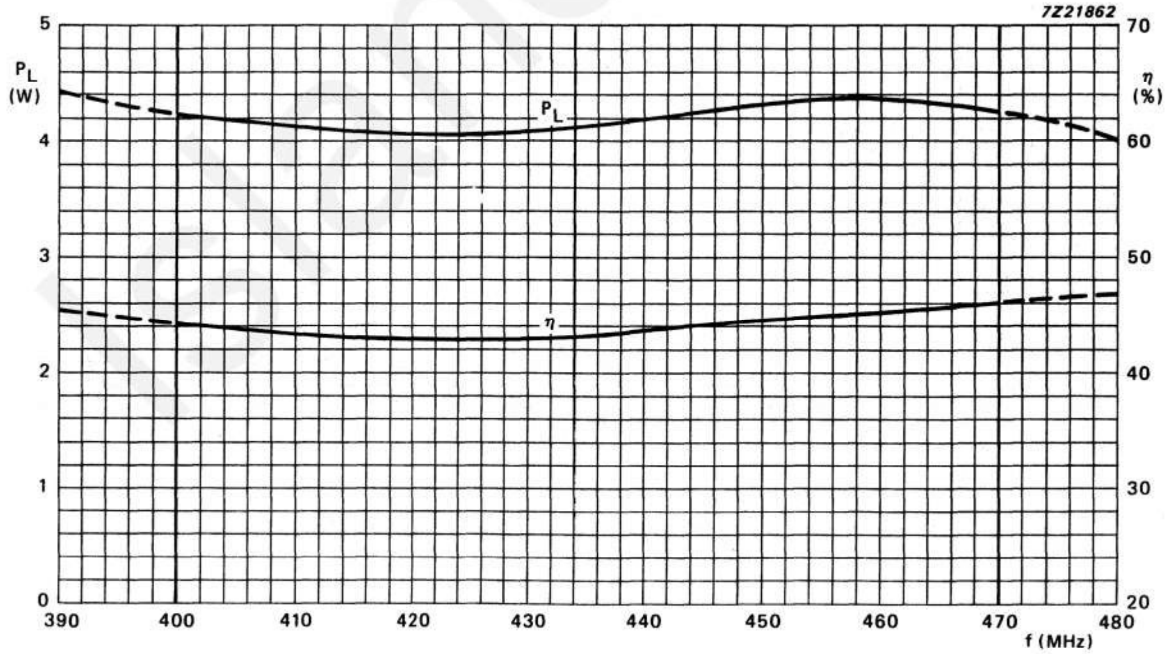

Fig.8 Load power and efficiency as functions of frequency; $V_{S1} = V_{S2} = 9.6$ V; $P_D = 50$ mW; typical values.

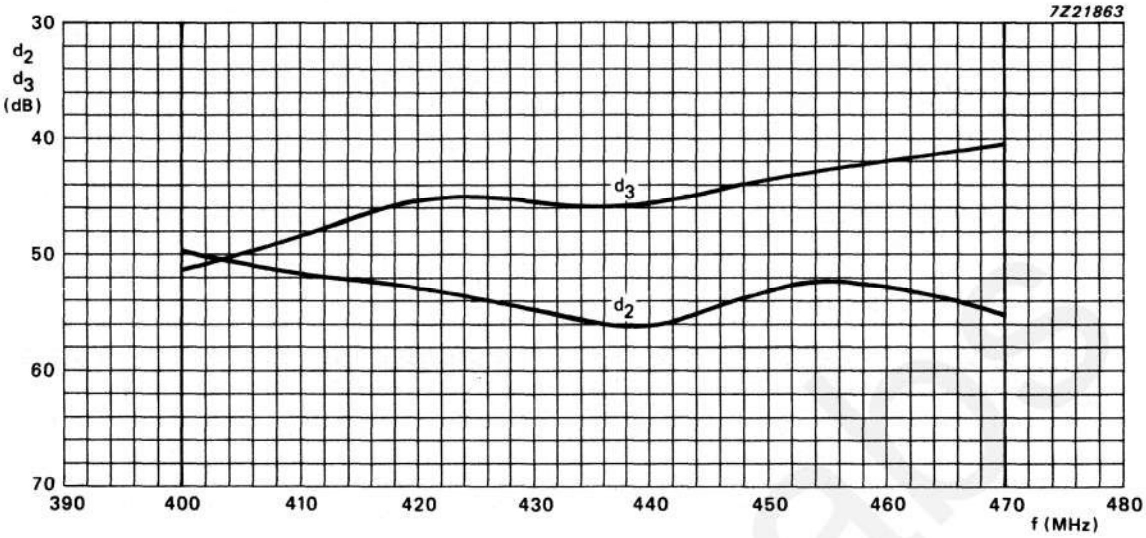

Fig.9 Second and third harmonic distortions as functions of frequency; $V_{S1} = V_{S2} = 7.5$ V; $P_D = 50$ mW; typical values.

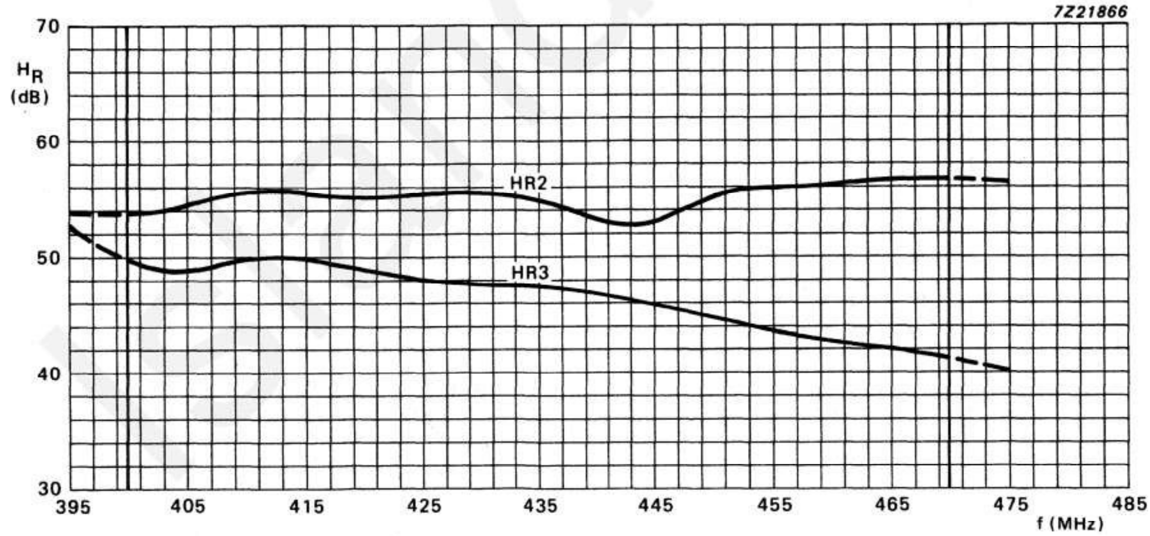

Fig.10 Second and third harmonic distortions as functions of frequency; $V_{S1} = V_{S2} = 9.6$ V; $P_D = 50$ mW; typical values.

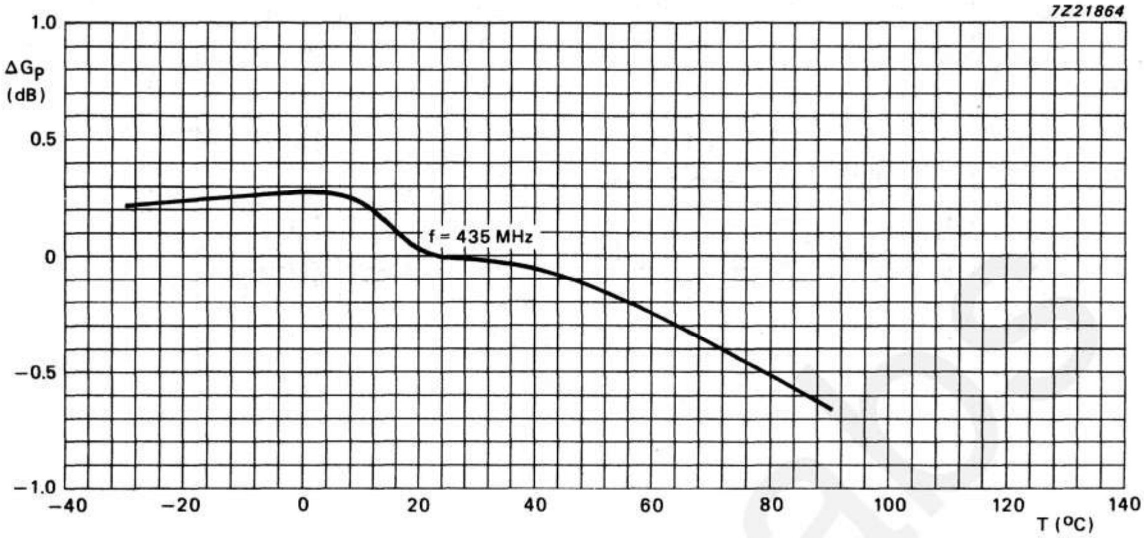

Fig.11 Power gain as a function of temperature; P_D = 50 mW; V_{S1} = V_{S2} = 7.5 V; typical values.

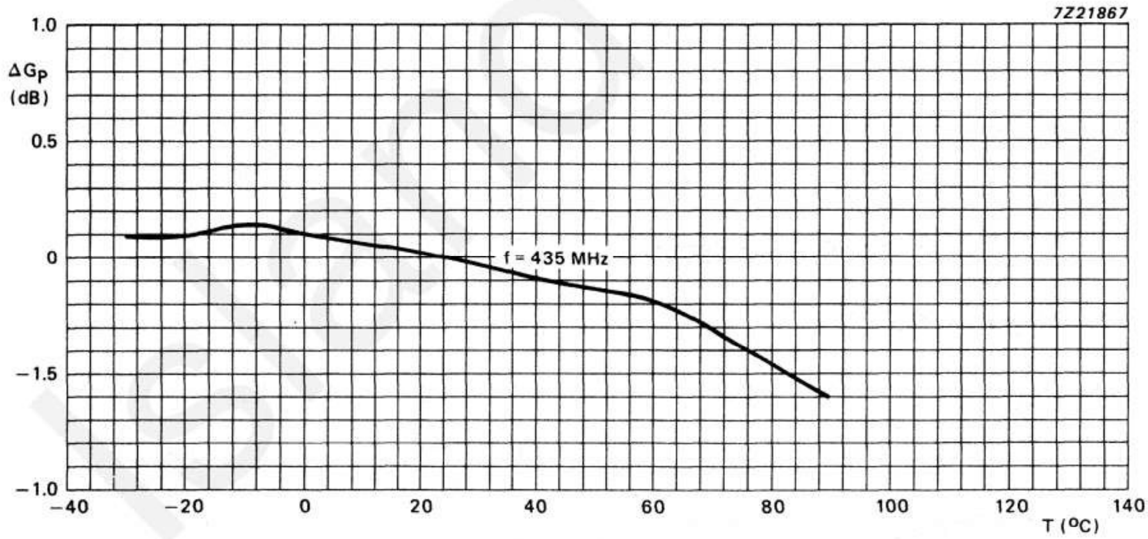

Fig.12 Power gain as a function of temperature; P_D = 50 mW; V_{S1} = V_{S2} = 9.6 V; typical values.