UHF Amplifier Module

BGY205

3.5W UHF Amplifier

DATASHEET

OEM – Philips

Source: Philips Data Handbook SC09

RF Power Modules and Transistors for Mobile Phones 1996

Datasheet Rev. 2.0 – 09/19– data without warranty / liability

UHF amplifier module BGY205

FEATURES

- 6 V nominal supply voltage
- 3.5 W pulsed output power
- Easy control of output power by DC voltage.

APPLICATIONS

- Digital cellular radio systems with Time Division Multiple Access (TDMA) operation (GSM systems) in the 880 to 915 MHz frequency range.

DESCRIPTION

The BGY205 is a four-stage UHF amplifier module in a SOT321B package. The module consists of four NPN silicon planar transistor dies mounted together with matching and bias circuit components on a metallized ceramic substrate.

PINNING - SOT321B

PIN	DESCRIPTION
1	RF input
2	V_C
3	V_S
4	RF output
Flange	ground

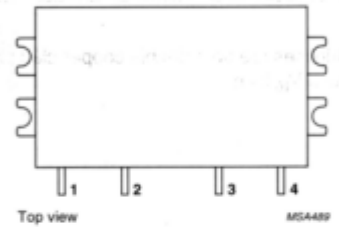


Fig.1 Simplified outline.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C.

MODE OF OPERATION	f (MHz)	V_S (V)	V_C (V)	P_L (W)	G_p (dB)	η (%)	Z_S; Z_L (Ω)
Pulsed; δ = 1 : 8	880 to 915	6	≤4	3.5	≥32.5	≥40	50

LIMITING VALUES

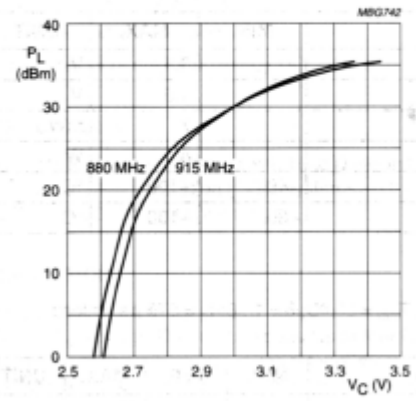
In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_S	DC supply voltage	–	8.5	V
V_C	DC control voltage	–	4.5	V
P_D	input drive power	–	7	mW
P_L	load power	–	4	W
T_{stg}	storage temperature	–40	+100	°C
T_{mb}	operating mounting base temperature	–30	+100	°C

CHARACTERISTICS

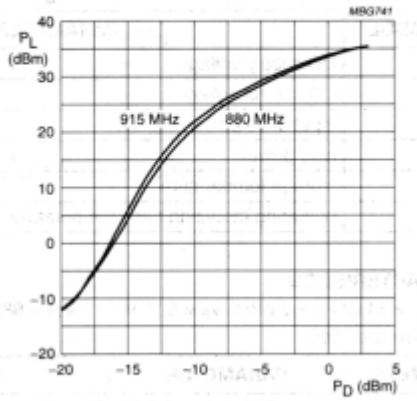
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V; $V_C \leq 4$ V; f = 880 to 915 MHz; $T_{mb} = 25$ °C; $\delta = 1 : 8$; $t_p = 575\ \mu s$; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_Q	leakage current	$V_C = 0.5$ V	–	–	100	µA
I_C	control current	adjust V_C for $P_L = 3.5$ W	–	–	500	µA
P_L	load power	$V_C = 4$ V	3.5	–	–	W
G_p	power gain	adjust V_C for $P_L = 3.5$ W	32.5	–	–	dB
η	efficiency	adjust V_C for $P_L = 3.5$ W	40	45	–	%
H_2	second harmonic	adjust V_C for $P_L = 3.5$ W	–	–	–40	dBc
H_3	third harmonic	adjust V_C for $P_L = 3.5$ W	–	–	–40	dBc
$VSWR_{in}$	input VSWR	adjust V_C for $P_L = 3.5$ W	–	–	2 : 1	
	stability	$P_D = 0$ to 6 dBm; $V_S = 5$ to 8.5 V; $V_C = 0$ to 4 V; $P_L \leq 3.5$ W; VSWR ≤ 6 : 1 through all phases	–	–	–60	dBc
	isolation	$V_C = 0.5$ V	–	–	–36	dBm
	control bandwidth	R1 = 0; C1 = 0; see Fig.16	1	–	–	MHz
	AM-AM conversion	P_D with 3% AM; f = 100 kHz; $P_L = 3.5$ mW to 3.5 W	–	–	12	%
P_n	noise power	$P_L = 3.5$ W; bandwidth = 30 kHz; 20 MHz above transmitter band	–	–	–85	dBm
	ruggedness	$V_S = 8.5$ V; adjust V_C for $P_L = 3.5$ W; VSWR ≤ 10 : 1 through all phases	no degradation			



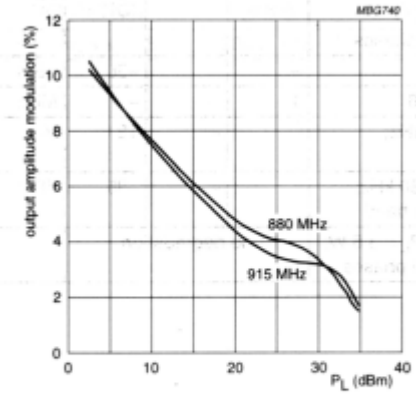
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.2 Load power as a function of control voltage; typical values.



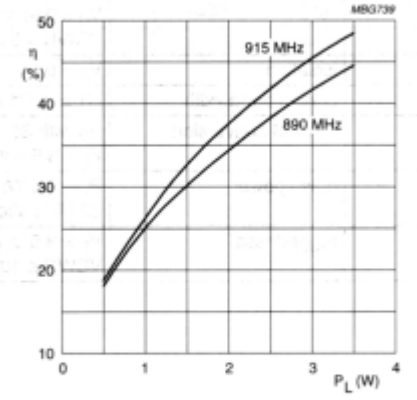
$Z_S = Z_L = 50\ \Omega$; $V_S = 6$ V; $P_L = 3.5$ mW;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.3 Load power as a function of drive power; typical values.



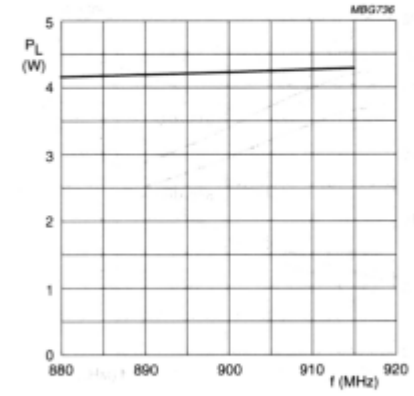
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V; $T_{mb} = 25$ °C;
$\delta = 1:8$; $t_p = 575\ \mu s$; input amplitude modulation = 3%.

Fig.4 Output amplitude modulation as a function of load power; typical values.



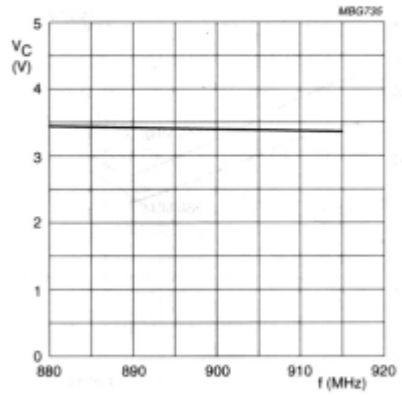
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.5 Efficiency as a function of load power; typical values.



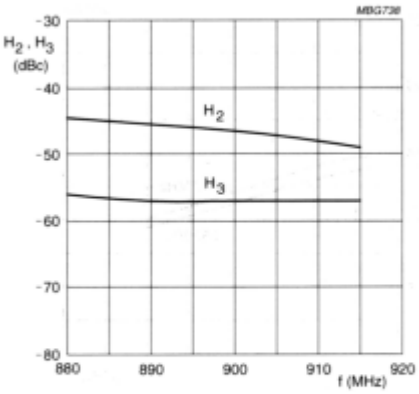
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$V_C = 4$ V; $T_{mb} = 25$ °C; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.6 Load power as a function of frequency; typical values.



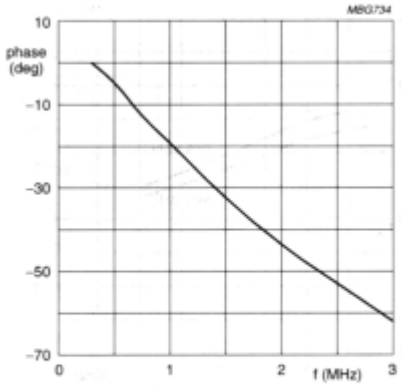
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$P_L = 3.5$ W; $T_{mb} = 25$ °C; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.7 Control voltage as a function of frequency; typical values.



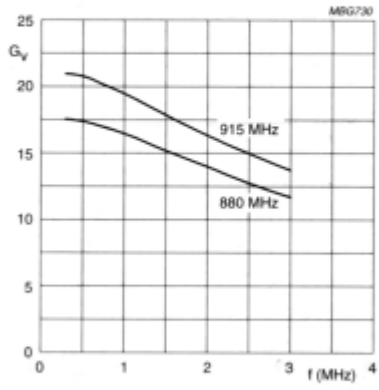
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$P_L = 3.5$ W; $T_{mb} = 25$ °C; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.8 Harmonics as a function of frequency; typical values.



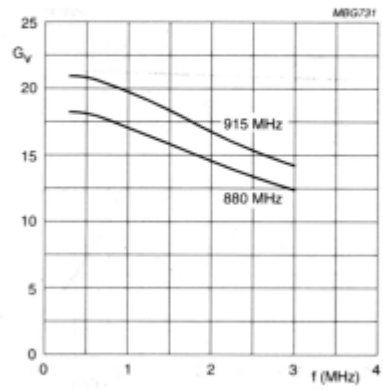
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V; $P_L = 15$ to 35.4 dBm;
f = 880 to 915 MHz; $T_{mb} = 25$ °C; $\delta = 1 : 8$; $t_p = 575\ \mu s$; R1 = 0; C1 = 0.

Fig.9 Control loop phase as a function of frequency on the control pin; typical values.



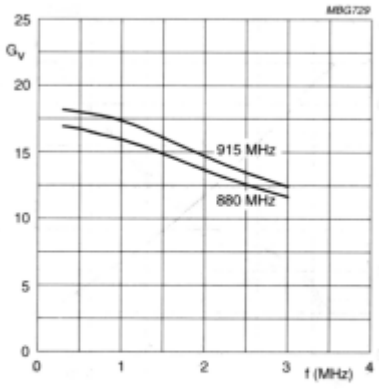
P_L = 30 dBm.
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$; R1 = 0; C1 = 0.

Fig.10 Control loop voltage gain as a function of frequency on the control pin; typical values.



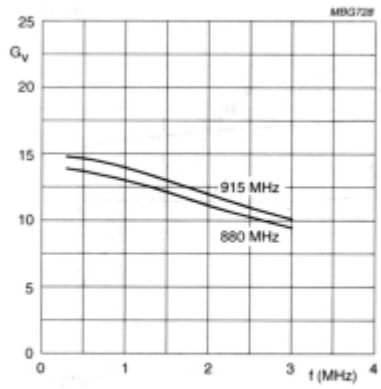
P_L = 25 dBm.
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$; R1 = 0; C1 = 0.

Fig.11 Control loop voltage gain as a function of frequency on the control pin; typical values.



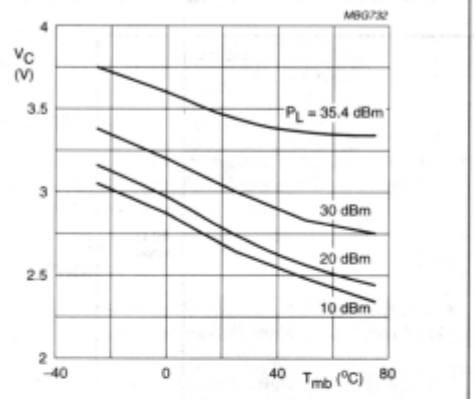
P_L = 20 dBm.
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$; R1 = 0; C1 = 0.

Fig.12 Control loop voltage gain as a function of frequency on the control pin; typical values.



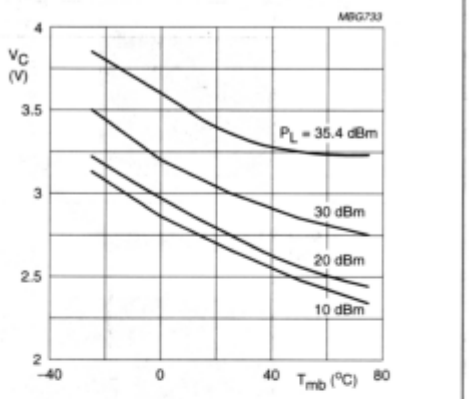
P_L = 15 dBm.
$Z_S = Z_L = 50\ \Omega$; $P_D = 3$ dBm; $V_S = 6$ V;
$T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$; R1 = 0; C1 = 0.

Fig.13 Control loop voltage gain as a function of frequency on the control pin; typical values.



f = 880 MHz.
$Z_S = Z_L = 50\ \Omega$; P_D = 3 dBm; V_S = 6 V; δ = 1 : 8; t_p = 575 µs.

Fig.14 Control voltage as a function of mounting base temperature; typical values.



f = 915 MHz.
$Z_S = Z_L = 50\ \Omega$; P_D = 3 dBm; V_S = 6 V; δ = 1 : 8; t_p = 575 µs.

Fig.15 Control voltage as a function of mounting base temperature; typical values.

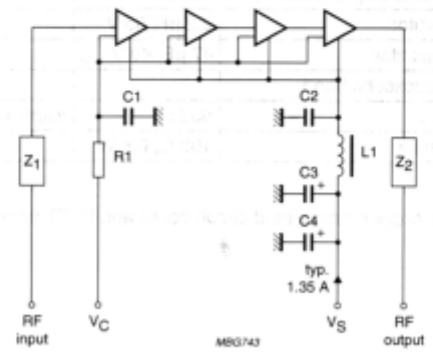
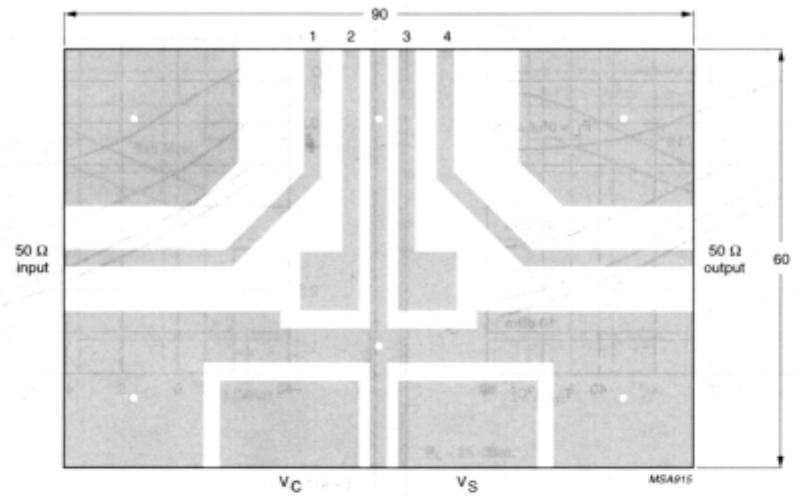


Fig.16 Test circuit.



Dimensions in mm.

Fig.17 Printed-circuit board layout.

List of components (see Fig.16)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor	680 pF		2222 851 11681
C3	tantalum capacitor	2.2 μF; 35 V		–
C4	electrolytic capacitor	47 μF; 40 V		2222 030 37479
L1	Grade 4S2 Ferroxcube bead			4330 030 36300
Z_1, Z_2	stripline; note 1	50 Ω	width = 2.33 mm	–
R1	metal film resistor	100 Ω; 0.6 W		2322 156 11001

Note

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibreglass dielectric (ε_r = 2.2); thickness $\frac{1}{32}$ inch.