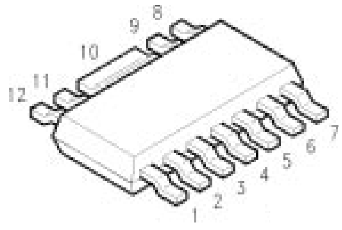
Datasheet

*****Power amplifier for GSM or AMPS application
*****Fully integrated 2 stage amplifier
*****Operating voltage range: 2.7 to 6 V
*****Overall power added efficiency 45 %
*****Input matched to 50 ohms, simple output match



ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Marking	Ordering code (taped)	Package 1)
CGY 92	CGY 92	Q68000-A8884	MW 12

Maximum ratings

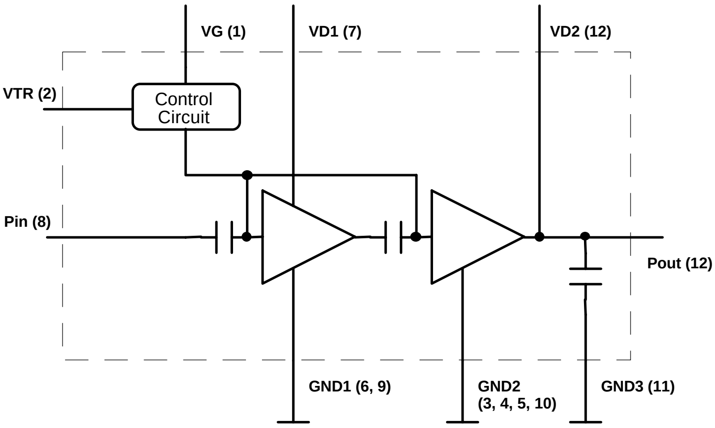
Characteristics	Symbol	max. Value	Unit
Positive supply voltage	V_D	9	V
Negative supply voltage	V_G	-6	V
Supply current	I_D	2	A
Channel temperature	T_{Ch}	150	°C
Storage temperature	T_{stg}	-55...+150	°C
RF input power	P_{in}	25	dBm
Pulse peak power dissipation *duty cycle 12.5%, ton=0.577ms*	P_{Pulse}	9	W
Total power dissipation *(CW, Ts ≤ 81°C)* *Ts: Temperature at soldering point*	P_{tot}	5	W

Thermal Resistance

Channel-soldering point	R_{thChS}	≤14	K/W

1) Plastic body identical to SOT 223, dimensions see page 14

Functional block diagramm:



Control circuit:

The drain current ID of the CGY 92 is adjusted by the internal control circuit. Therefore a negativ voltage (-4V...-6V) has to be supplied at VG. For transmit operation VTR must be set to 0V. During receive operation VTR should be disconnected (shut off mode).

Pin #		Configuration
1	**VG**	Negative voltage at control circuit (-4V...-6V)
2	**VTR**	Control voltage for transmit mode (0V) or receive mode (open)
3,4,5,10	**GND 2**	RF and DC ground of the 2nd stage
6,9	**GND 1**	RF and DC ground of the 1st stage
7	**VD1**	Positive drain voltage of the 1st stage
8	**RFin**	RF input power
11	**GND 3**	Ground for internal output matching
12	**VD2, RFout**	Positive drain voltage of the 2nd stage, RF output power

DC characteristics

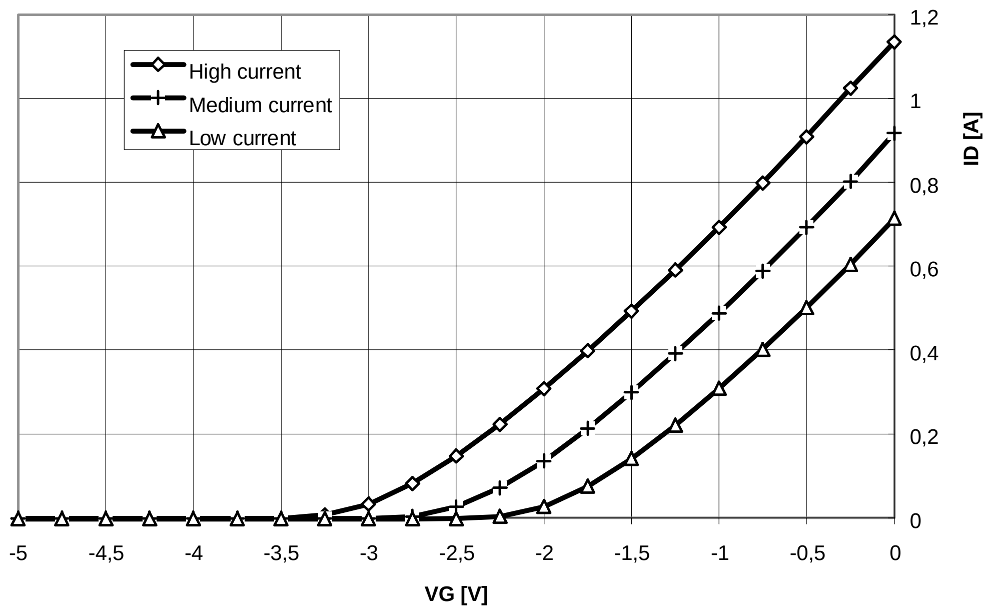
Characteristics	Symbol	Conditions	min	typ	max	Unit
Drain current stage 1	*IDSS1*	VD=3V, VG=0V, VTR n.c.	0.6	0.9	1.2	A
stage 2	*IDSS2*		2.4	3.5	4.8	A
Drain current with active current control	*ID*	VD=3V, VG=-4V, VTR=0V	-	1.0	-	A
Transconductance	*gfs1*	VD=3V, ID=350mA	0.28	0.32	-	S
(stage 1 and 2)	*gfs2*	VD=3V, ID=700mA	1.1	1.3	-	S
Pinch off voltage	*Vp*	VD=3V, ID<500µA (all stages)	-3.8	-2.8	-1.8	V

Electrical characteristics

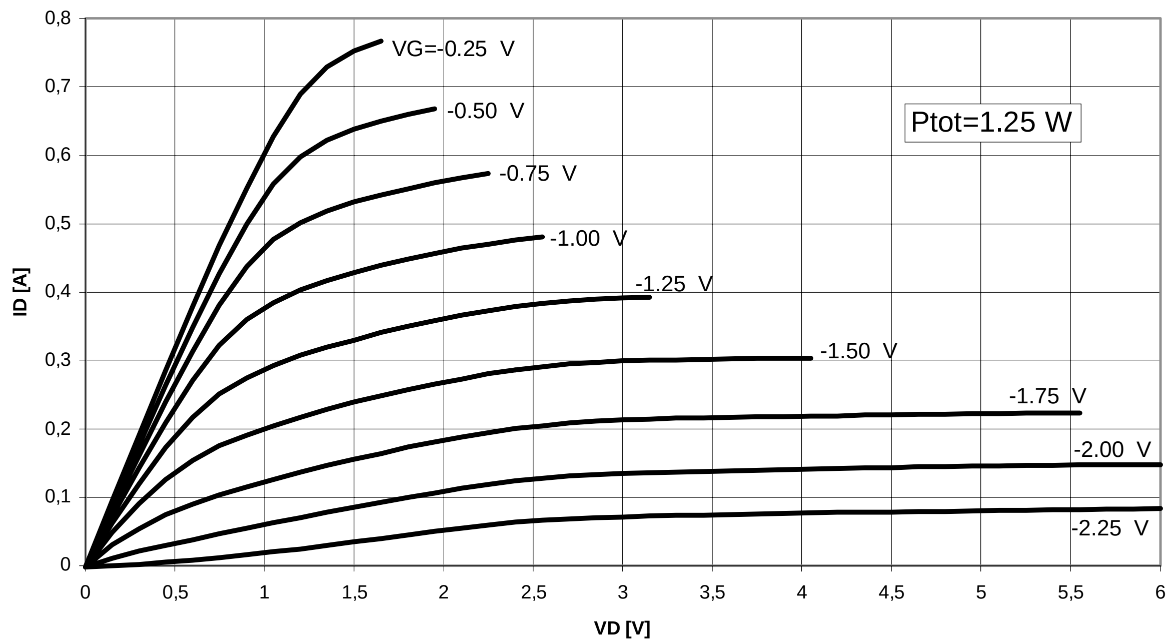
(T_A = 25°C , f=0.9 GHz, Z_S=Z_L=50 Ohm, VD=3.0V, VG=-4V, VTR pin connected to ground, unless otherwise specified, pulsed with a duty cycle of 10%, t_{on}=0.33ms)

Characteristics	Symbol	min	typ	max	Unit
Supply current *Pin=10dBm*	I_{DD}	-	1.05	-	A
Negative supply current *(normal operation)*	I_G	-	2	-	mA
Shut-off current *VTR n.c.*	I_D	-	400	-	µA
Negative supply current *(shut off mode, VTR pin n.c.)*	I_G	-	10	-	µA
Small signal gain *P_{in} = -5dBm*	*G*	27.0	29.0	-	dB
Power gain *VD=3V; P_{in}=10dBm*	*G*	21.0	21.8	-	dB
Output Power *VD=3V; P_{in}=10dBm*	P_o	31.0	31.8	-	dBm
Output Power *VD=3.6V; P_{in}=10dBm*	P_o	32.3	33.1	-	dBm
Output Power *VD=5V; P_{in}=10dBm*	P_o	34.0	35.0	-	dBm
Overall Power added Efficiency *VD=3V; P_{in}=10dBm*	η	43	48	-	%
Overall Power added Efficiency *VD=3.6V; P_{in}=10dBm*	η	41	46	-	%
Overall Power added Efficiency *VD=5V; P_{in} =10dBm*	η	40	45	-	%
Harmonics *(P_{in}=10dBm)* $2f_0$ *VD=3V; (P_{out}=32dBm)* $3f_0$	- -	- -	-46 -37	- -	dBc dBc
Harmonics *(P_{in}=10dBm)* $2f_0$ *VD=5V; (P_{out}=35dBm)* $3f_0$	- -	- -	-48 -38	- -	dBc dBc
Input VSWR *VD=3.0V;*	-	-	1.7 : 1	2.0 : 1	-
Third order intercept point *VD=3V; pulsed with a duty cycle of 10%; f_1=900.00MHz; f_2=900.20MHz;*	IP_3	-	40	-	dBm
Third order intercept point *VD=4.8V; pulsed with a duty cycle of 10%; f_1=900.00MHz; f_2=900.20MHz;*	IP_3	-	45	-	dBm

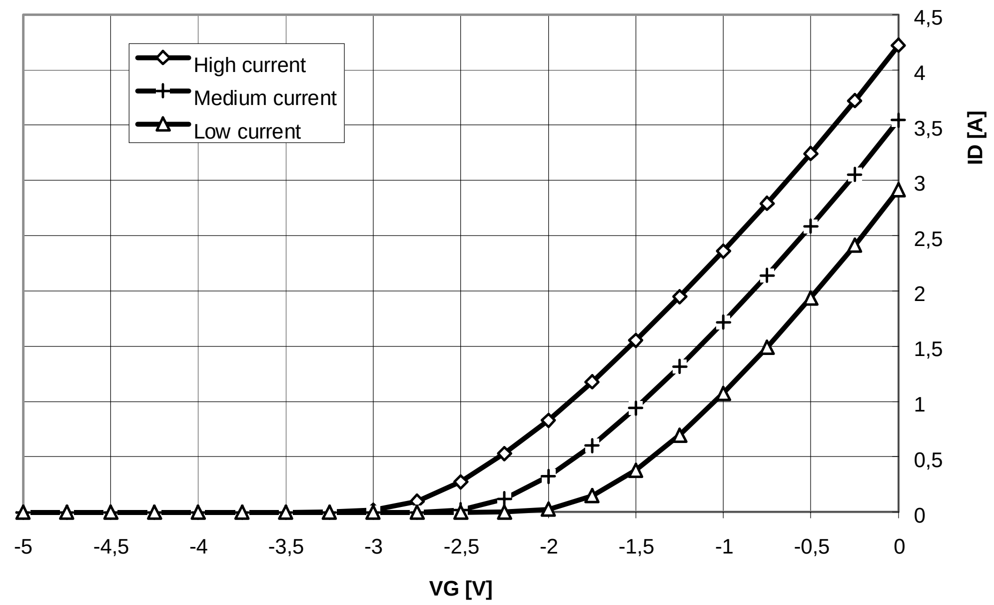
DC-ID(VG) characteristics - typical values of stage 1, VD=3V



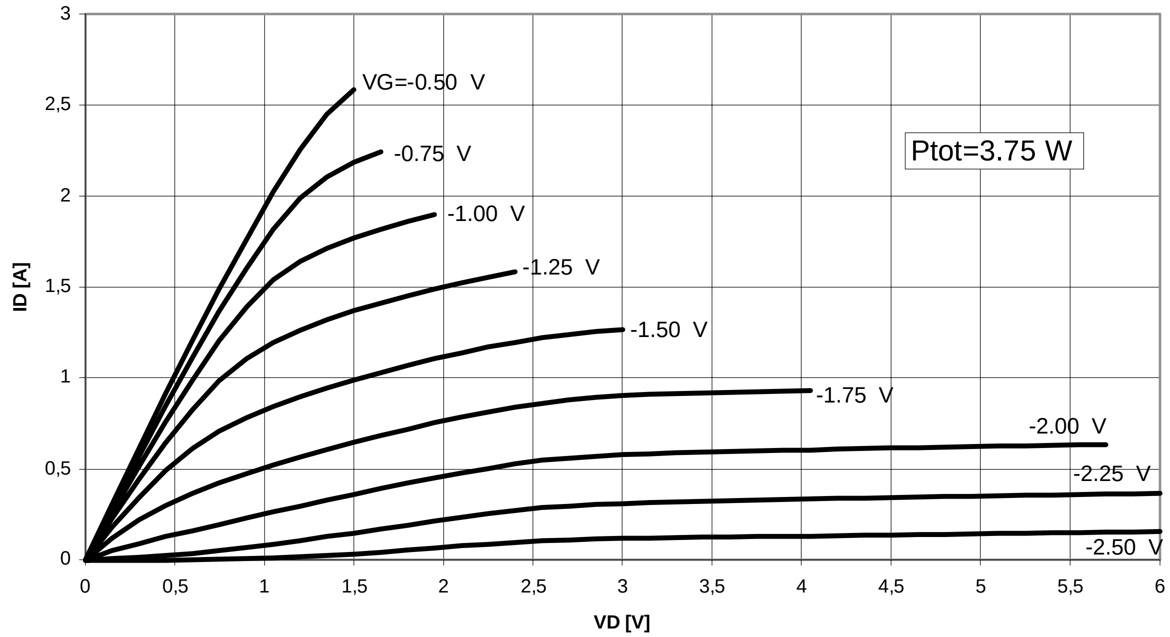
DC-Output characteristics - typical values of stage 1



DC-ID(VG) characteristics - typical values of stage 2, VD=3V

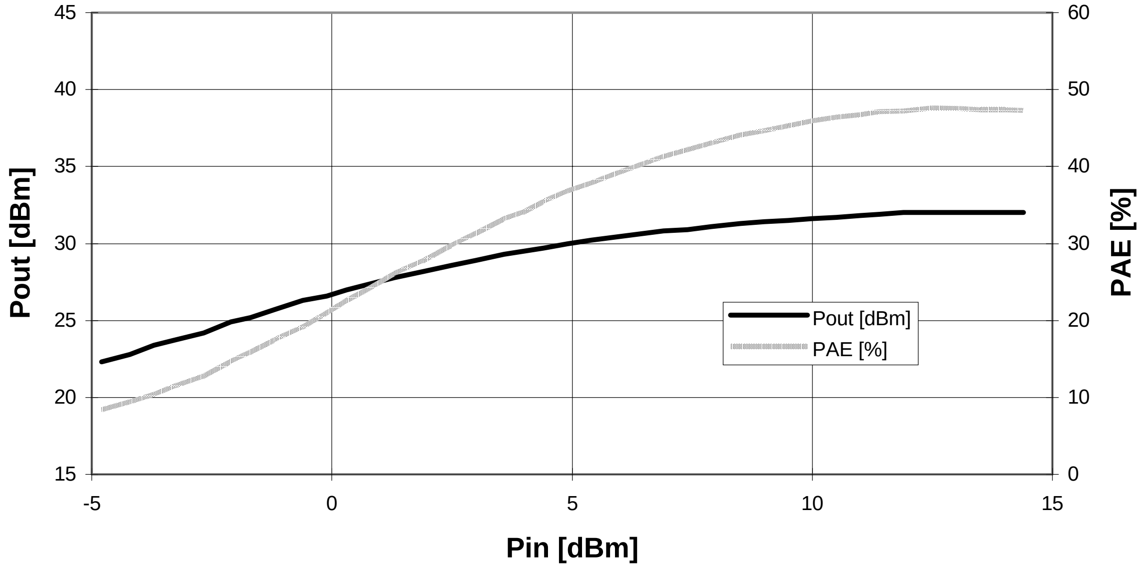


DC-Output characteristics - typical values of stage 2



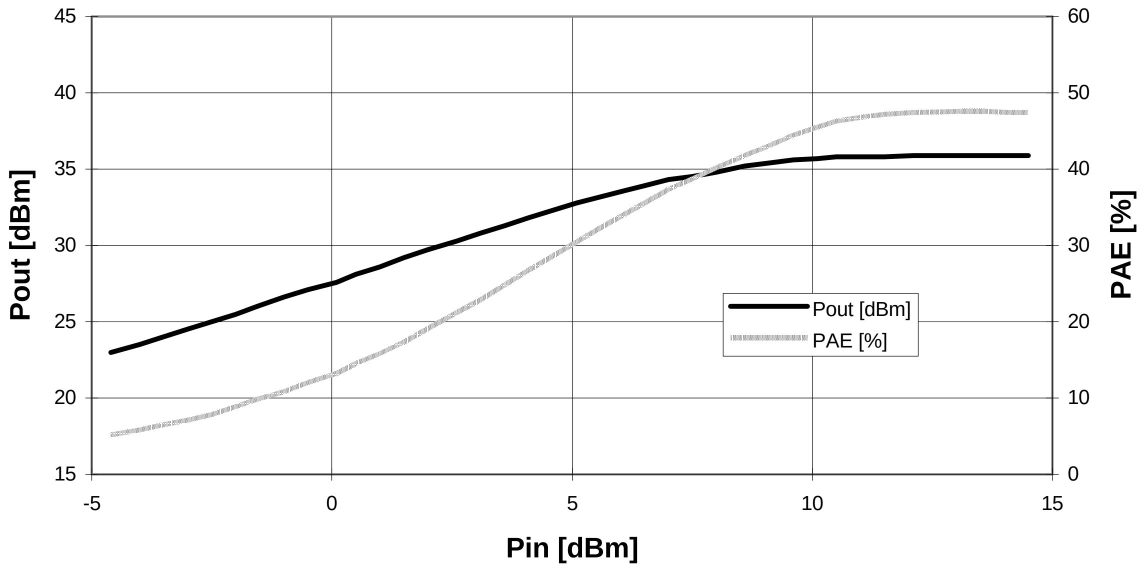
Pout and PAE vs. Pin

(VD=3V, VG=-4V, VTR=0V, f=900MHz, pulsed with a duty cycle of 10%, ton=0.33ms)

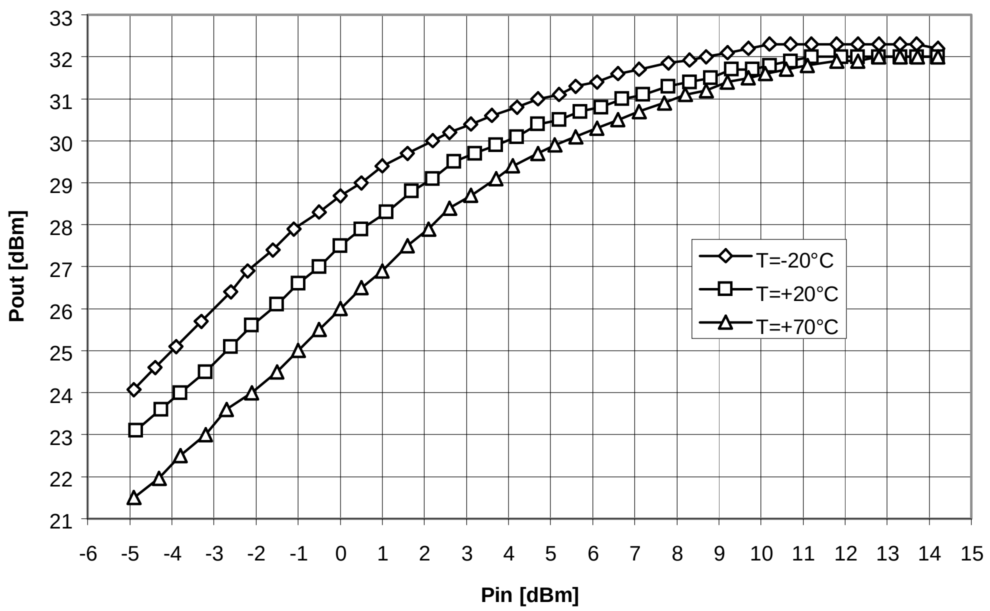


Pout and PAE vs. Pin

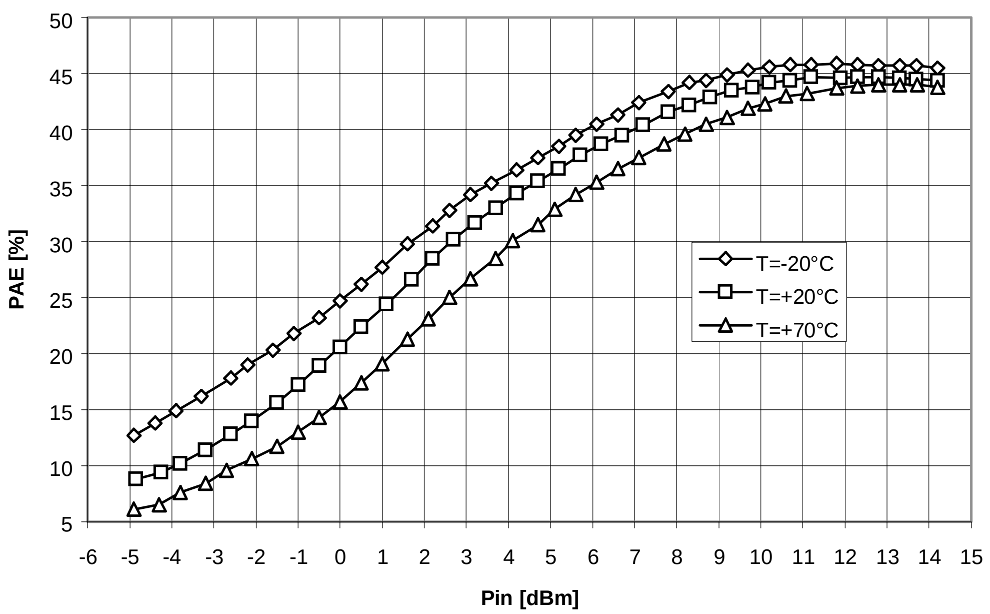
(VD=5V, VG=-4V, VTR=0V, f=900MHz, pulsed with a duty cycle of 10%, ton=0.33ms)



Output power at different temperatures
(VD=3V, VG=-4V, VTR=0V, f=900MHz, pulsed with a duty cycle of 10%, ton=0.33ms)

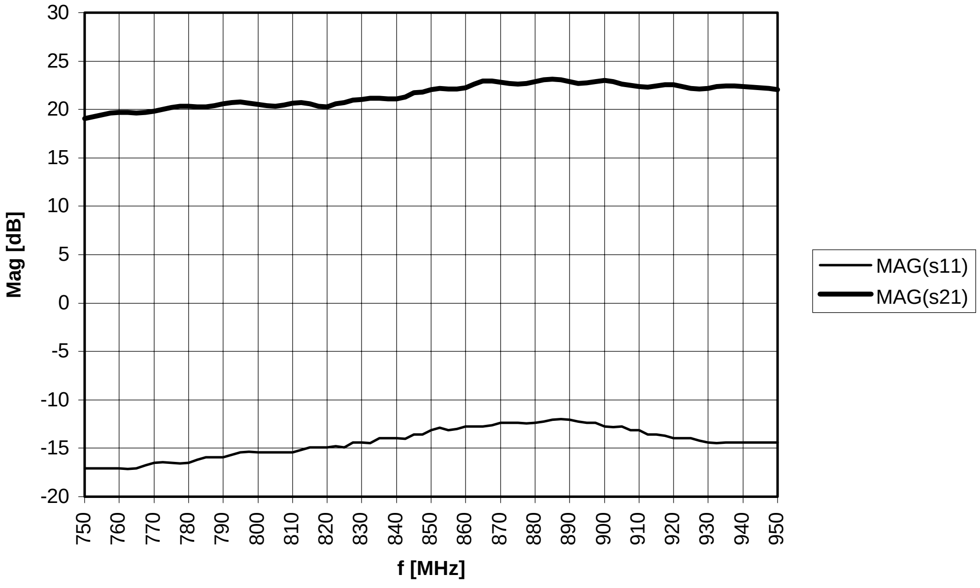


Power added efficiency at different temperatures
(VD=3V, VG=-4V, VTR=0V, f=900MHz, pulsed with a duty cycle of 10%, ton=0.33ms)



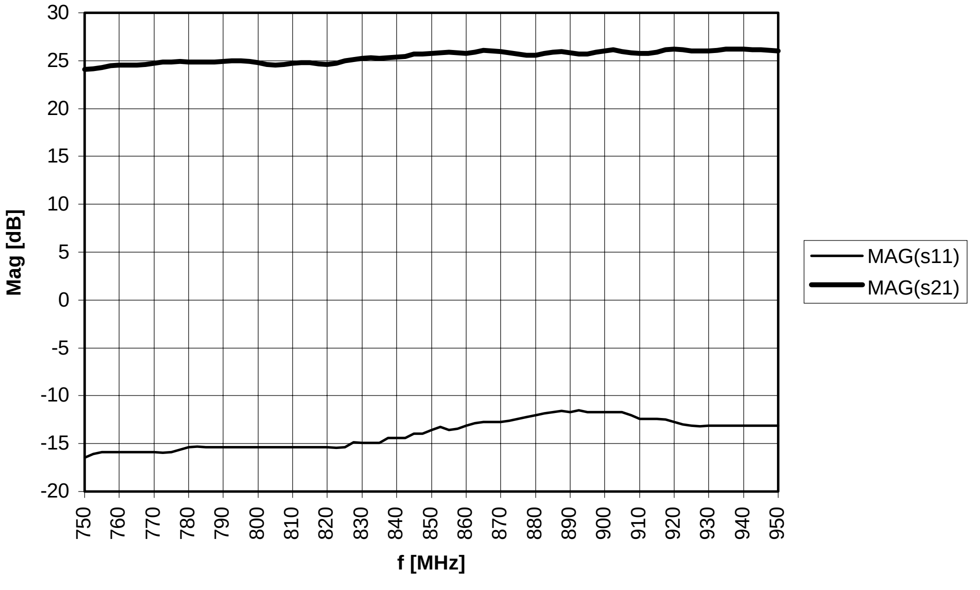
Measured S-parameter at VD=3V and Pin=9dBm

(VG=-4V, VTR=0V, pulsed with a duty cycle of 10%, ton=0.33ms)



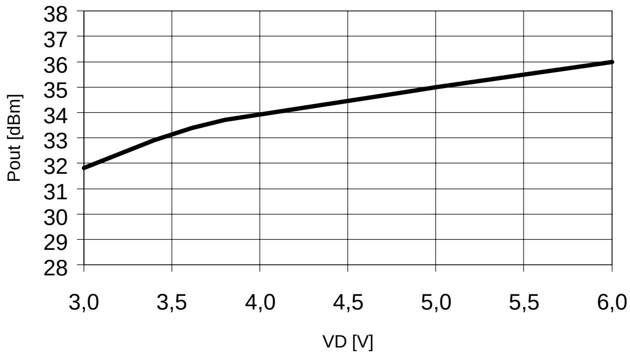
Measured S-parameter at VD=5V and Pin=9dBm

(VG=-4V, VTR=0V, pulsed with a duty cycle of 10%, ton=0.33ms)



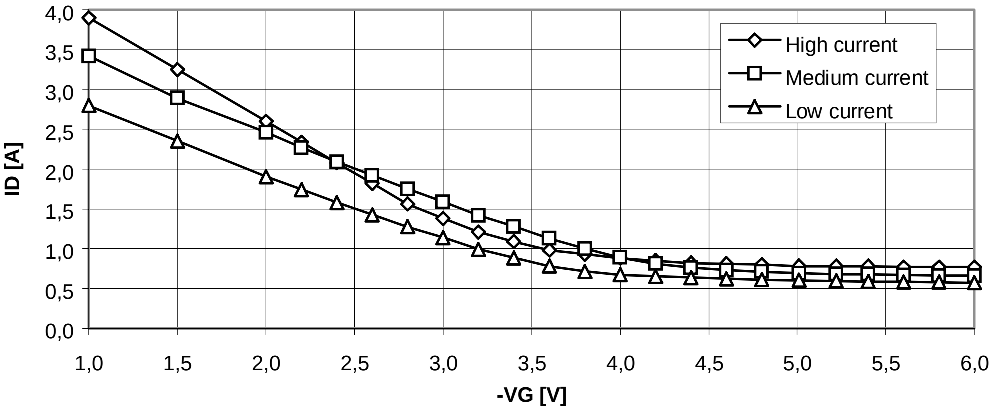
Output power vs. drain voltage

(Pin=10dBm, VG=-4V, VTR=0V, f=900MHz, pulsed with a duty cycle of 10%, ton=0.33ms)



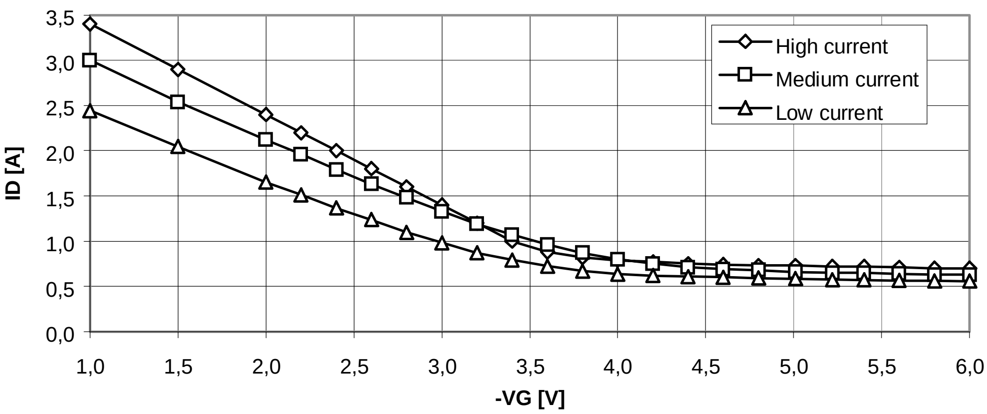
Performance of internal bias control circuit @VD=3V

(VTR=0V, pulsed with a duty cycle of 10%, ton=0.33ms)

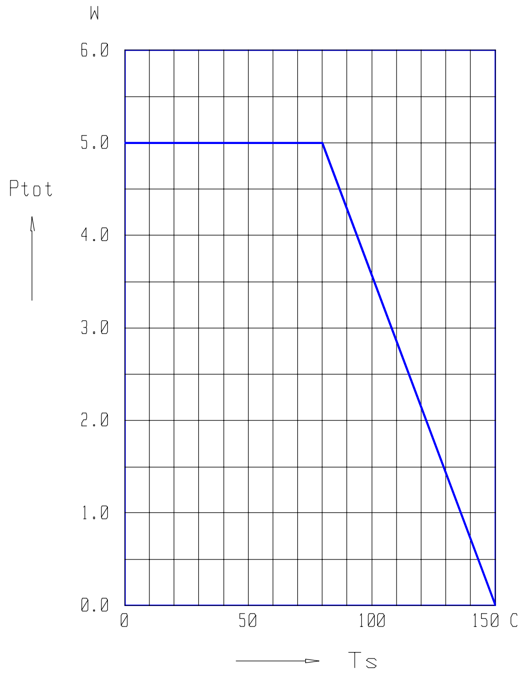


Performance of internal bias control circuit @VD=5V

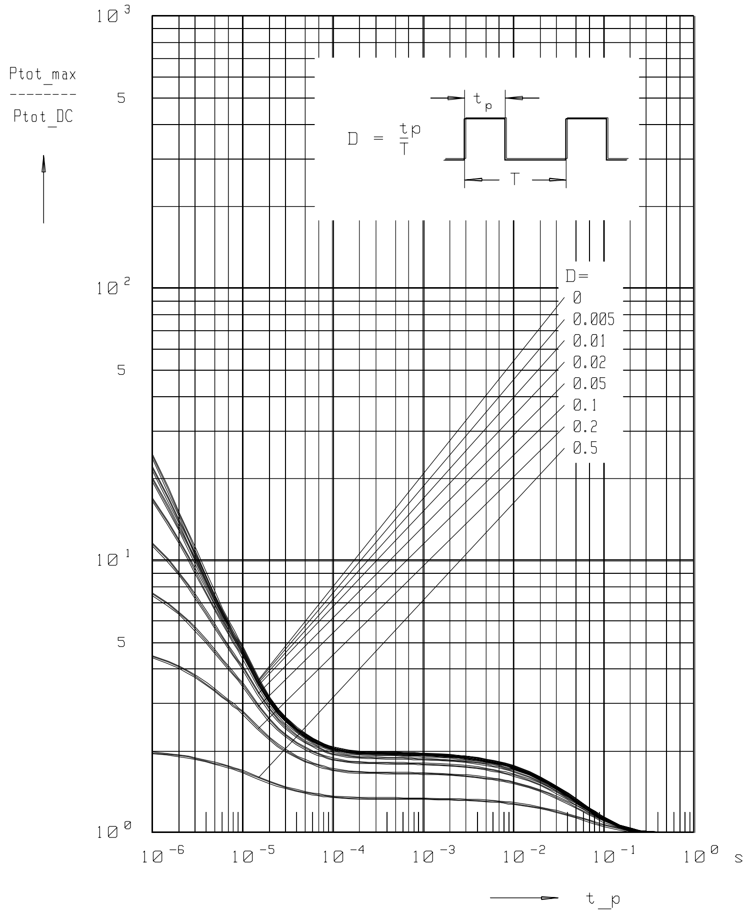
(VTR=0V, pulsed with a duty cycle of 10%, ton=0.33ms)



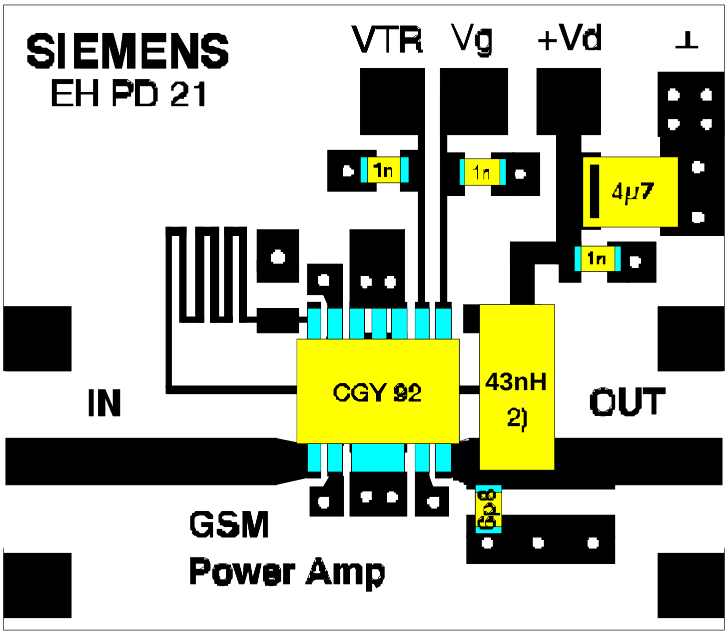
Total Power Dissipation Ptot=f(T_S)



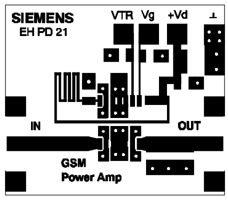
Permissible pulse load P_{tot_max}/P_{tot_DC} = f(t_p)



Test circuit board:



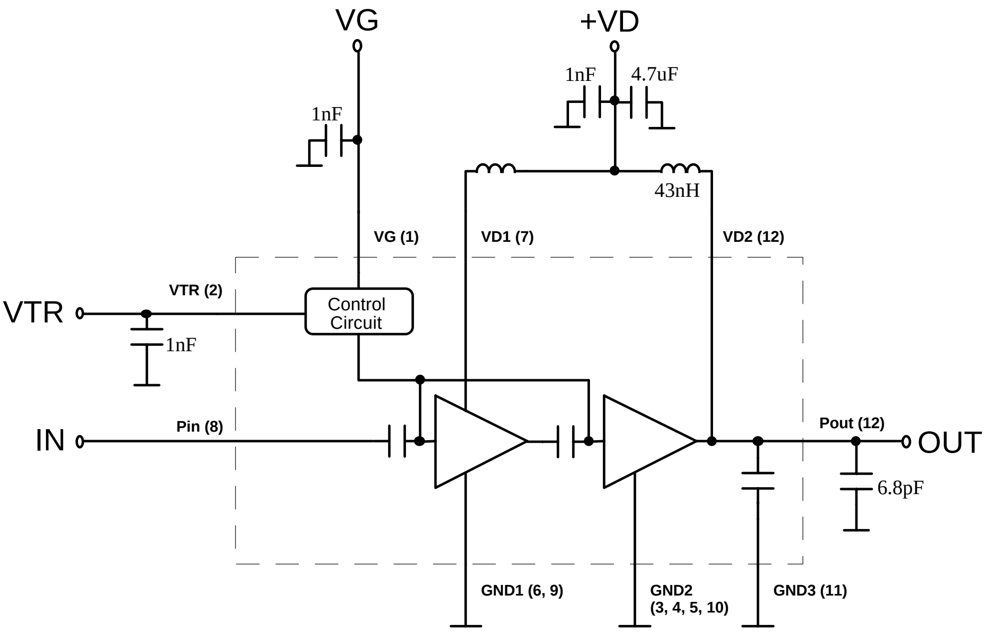
size: 30 x 26 mm



Note:

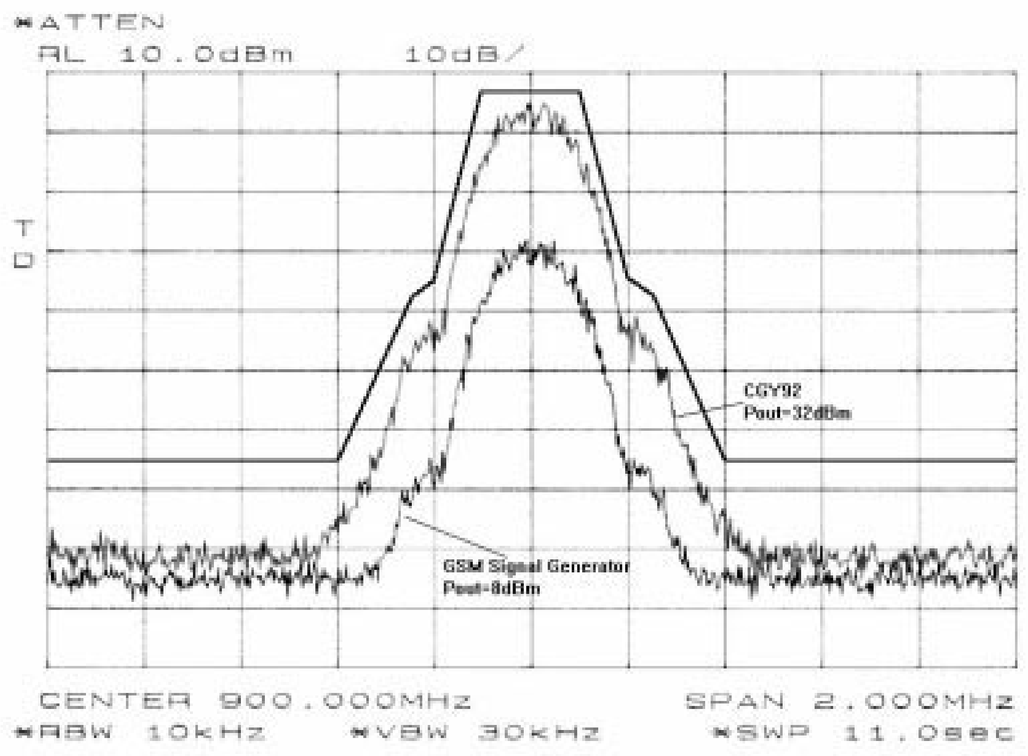
By changing the position of the 6.8 pF capacitor at pin # 12 it is possible to tune the board for max. Pout or max. PAE. To achieve the maximum output power place the capacitor close to the CGY92. For a better PAE increase the distance between the capacitor and the CGY92 device (2-5mm).

Principal circuit:

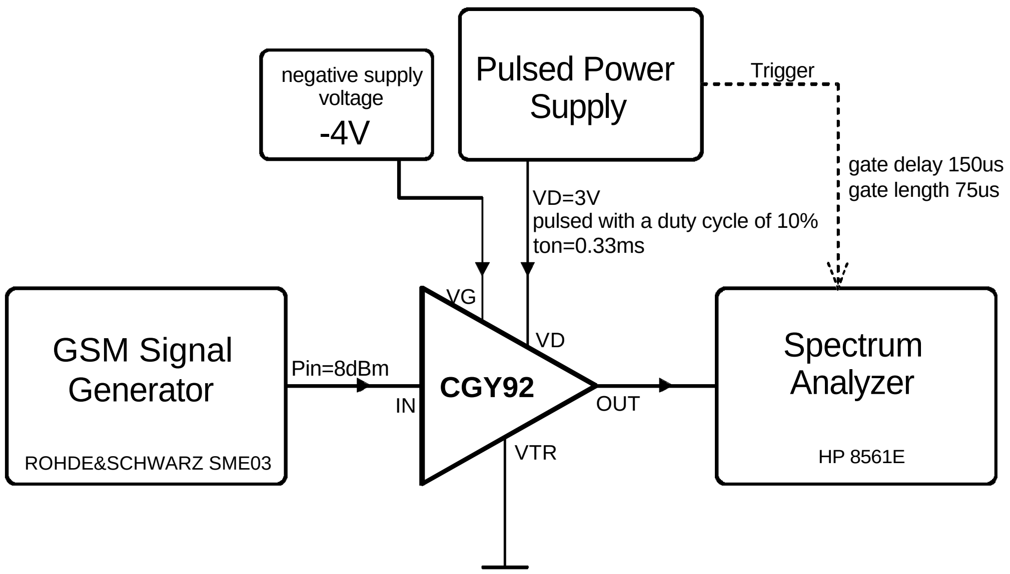


2) Coilcraft SMD Spring Inductor
distribution by Ginsbury Electronic GmbH, Am Moosfeld 85 D-81829 München, Tel. 089/45170-223

Emissions due to GMSK modulation:



Measurement was done with the following equipment:



APPLICATION - HINTS

1. CW - capability of the CGY92

Proving the possibility of CW - operation there must be known the total power dissipation of the device. This value can be found as a function of the temperature in the datasheet (page 10). The CGY92 has a maximum total power dissipation of P_{tot} = 5 W.
As an example we take the operating point with a drain voltage V_D = 3 V and a typical drain current of I_D=1.0 A. So the maximum DC - power can be calculated to:

$$P_{DC} = V_D \cdot I_D = 3W$$

This value is smaller than 5 W and CW - operation is possible.

By decoupling RF power out of the CGY92 the power dissipation of the device can be further reduced. Assuming a power added efficiency (PAE) of 40 % the total power dissipation P_{tot} can be calculated using the following formula:

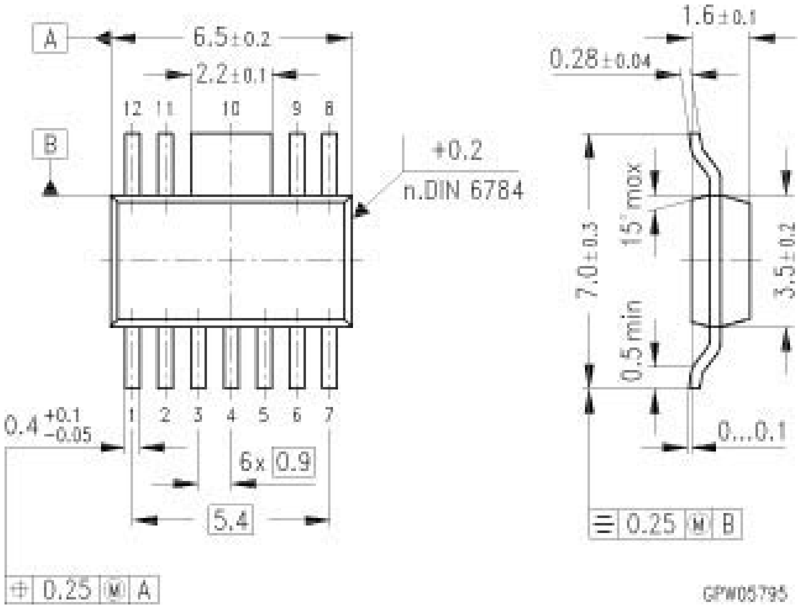
$$P_{tot} = P_{DC}(1 - PAE) = 3W(1 - 0.40) = 1.8W$$

2. Operation without using the internal current control

If you don' t want to use the internal current control, it is recommended to connect the negative supply voltage at pin 1 (V_{TR}) instead of pin 2 (V_G). In that case V_G is not connected.

3. Biasing and use considerations

Biasing should be timed such that gate voltage (V_G) is always applied before the drain voltage (V_D), and when returning to the standby mode, gate voltage should only be removed once the drain voltage have been removed.



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