Power Amplifier

Frequency: 2.6GHz~4.2GHz

Gain: 22.7dB@3.1GHz

Psat: 44.3dBm@3.1GHz

PAE: 52.4%@3.1GHz

Operation Voltage: 28V, static current 160mA

Package: PH (metal package)

General Description

BR9701PHG is a 20W MMIC power amplifier covering the frequency range of 2.6GHz to 4.2GHz. It operates from a +28V drain supply voltage with a quiescent current of 160mA, delivering saturated output power in excess of 20W with power-added efficiency (PAE) greater than 47%. This product features high efficiency, high gain, and high reliability, making it widely applicable to transmitter systems in communication, radar, and other applications.

Applications

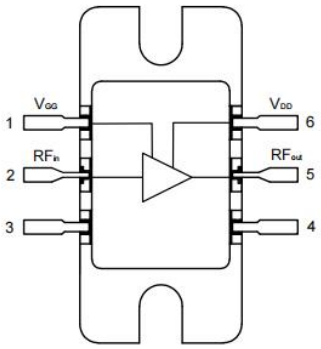
Communications

Data Link

Radar

Package Outline

Functional Block Diagram



Ordering Information

Part Number	Package	Description
BR9702PHG	PH	3.7GHz~6GHz 15WPower Amplifier

Absolute Maximum Ratings

Parameters	Value
Gate Drain Breakdown Voltage (BVDG)	120V
Gate Voltage Range (VGG)	-6~0V
Gate Current (IG)	9mA
Soldering Temperature	300℃, < 30s
Storage Temperature	-65℃~+150℃

Note: Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the deviceat these conditions is not implied. Please pay attention to good heat dissipation under high temperature operation.Please ensure proper heat dissipation when operating at high temperatures.

Impedance Mismatch

Markers	Parameters	Typ.
VSWR	Impedance Mismatch Ruggedness	10:1

Test Conditions: DEMO board test, TA =25℃, VDD =+28V, IDQ =160mA, Freq=3.3GHz, CW wave, Pout=43dBm.

Recommended Operating Conditions

Parameters	Value
Drain Voltage (V_{DD})	+28V (Typ)
Drain Static Current (I_{DQ})	160mA (Typ)
Gate Voltage (V_{GG})	-2.4V (Typ)
Channel Temperature (T_{CH})	< 225℃
Continuous Dissipated Power (25℃)	< 35W
Operating Temperature	-55℃~+85℃

Note: The electrical specifications of power amplifier tubes are tested under specified test conditions. Electrical performance is not guaranteed when the test specifications are exceeded.

Thermal Parameters

Parameters	Test Conditions	Value	Units
Thermal Resistance (θJC)	Static bias condition, tested at 85 ° C	6.5	℃/W

Note: θJC to measure the thermal resistance to the bottom of the tube housing.

ESD WARNING

ELECTROSTATIC SENSITIVE DEVICE

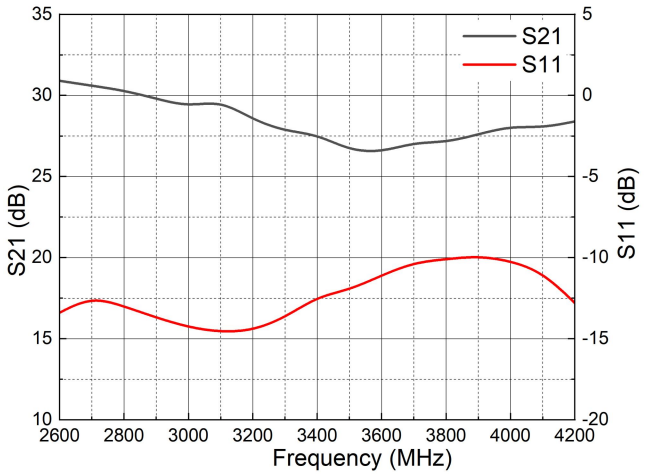
OBSERVE HANDLING PRECAUTIONS

Typical Performance: EVB test data (2.6GHz~4.2GHz)

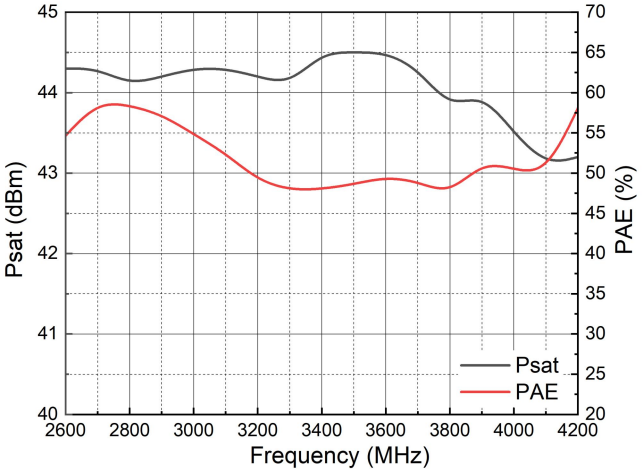
Parameters	Typ									Units
Frequency	**2.6**	**2.7**	**2.8**	**2.9**	**3**	**3.1**	**3.2**	**3.3**	**3.4**	**GHz**
Gain	30.9	30.6	30.3	29.8	29.3	29.7	28.5	27.8	27.6	dB
Input Return Loss	-13.4	-12.4	-13.0	-13.7	-14.3	-14.6	-14.5	-13.7	-12.4	dB
Pout@P_{sat}	44.3	44.3	44.1	44.2	44.3	44.3	44.2	44.1	44.5	dBm
Drain Current@P_{sat}	1744	1625	1564	1632	1744	1823	1902	1906	2089	mA
Power Gain @P_{sat}	20.7	23.3	23.46	23.2	23.1	22.7	22.35	22.4	24.5	dB
PAE@P_{sat}	54.6	58.9	58.4	57.3	54.8	52.4	49.1	47.9	48.0	%
Frequency	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**4**	**4.1**	**4.2**	**4.3**	**GHz**
Gain	26.6	26.5	27.1	27.1	27.6	28.1	28.0	28.4	28.7	dB
Input Return Loss	-12.0	-11.1	-10.3	-10.1	-9.9	-10.2	-10.9	-12.8	-18.1	dB
Pout@P_{sat}	44.5	44.5	44.3	43.8	44	43.5	43.1	43.2	41.8	dBm
Drain Current@P_{sat}	2056	2020	1949	1800	1735	1575	1456	1279	1173	mA
Power Gain @P_{sat}	21.6	22.03	21.4	21.88	22.64	23.05	22.73	23.82	23.6	dB
PAE@P_{sat}	48.6	49.5	49.0	47.3	51.4	50.5	49.8	58.1	45.9	%

Test Condition: Temp =+25°C, VDD=+28V, IDQ=300mA ,under continuous wave (CW) excitation.

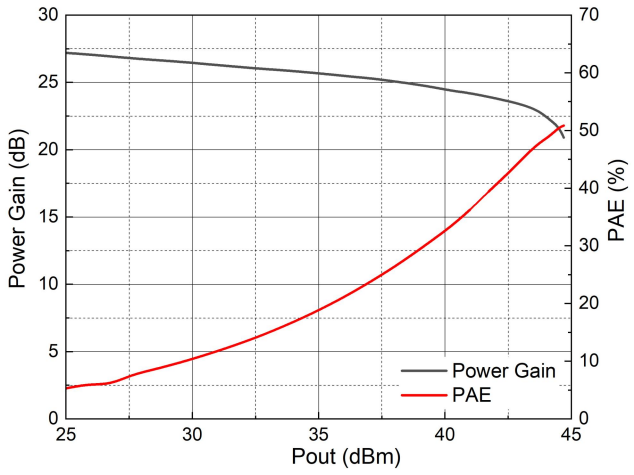
Note: Psat defined as the Psat output of the evaluation board.



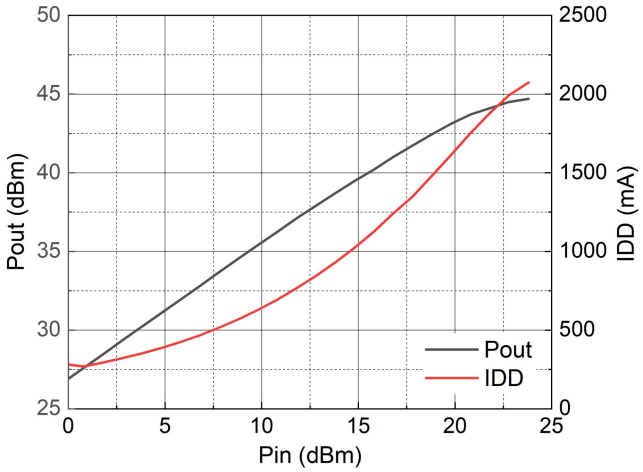
Gain, Input Return Loss vs. Freq



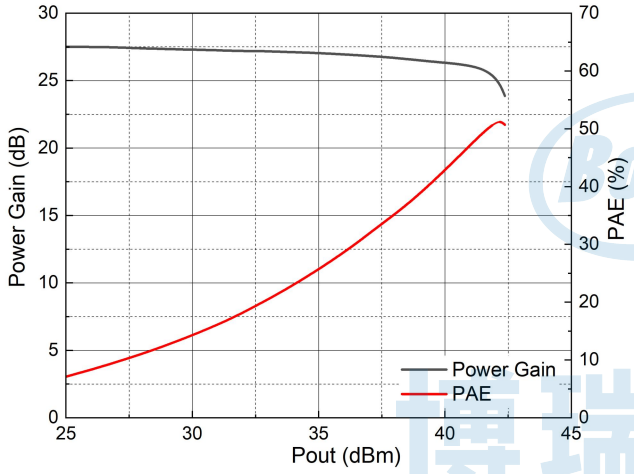
Psat, PEA vs. Freq



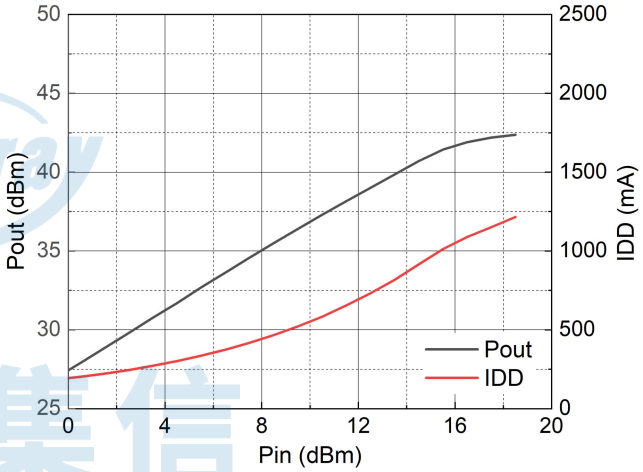
Gain, PEA vs. Pout@4.7GHz



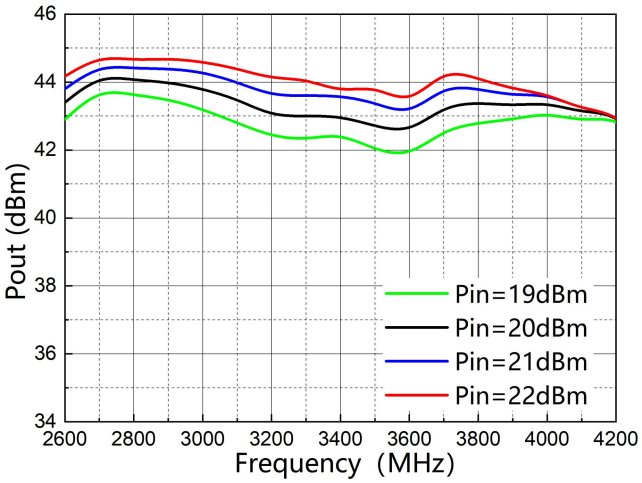
Pout, IDD vs. Pin@4.7GHz



Gain, PEA vs. Pout@5.7GHz

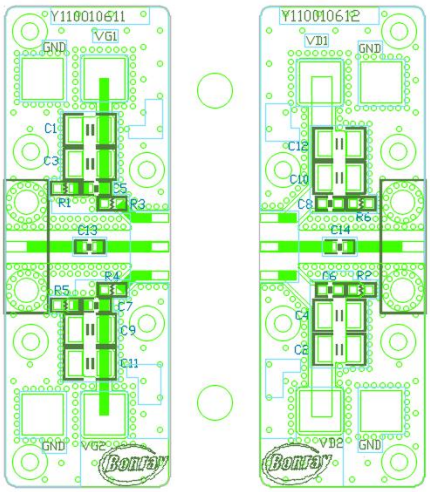


Pout, IDD vs. Pin@5.7GHz



Pout vs.Freq

Evaluation Board Outline Drawing



Evaluation Board Bill of Materials (BOM)

Designator	Package	Value	Part Number
C1,C10,C12	1210	10uF	GRM32EC72A106KE05#
C5,C8	0603	1000pF	GRM1885C1H102JA01D
R1、R3、R6	0603	15Ω	RC0603JR-0715RL
C13、C14	0603	0Ω	RC0603JR-070RL
Evaluation Board PCB			20mil Rogers 4350B

Installation Instructions

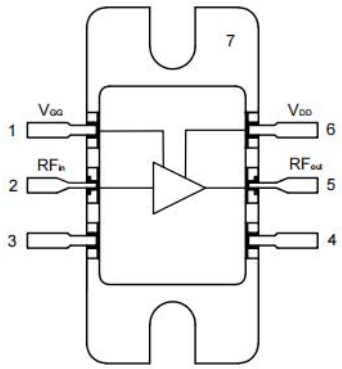
1.To ensure proper heat dissipation and grounding performance, it is recommended to solder the bottom of the device to the external heat dissipation structure for fixation.

2.If bottom soldering is not feasible, secure the device with screws and apply locking measures to prevent loosening. Additionally, indium foil shall be placed between the device bottom and the heat sink to ensure good grounding and heat dissipation.

3.The routing slots on the PCB and metal structure should be properly designed to ensure that the device leads are 0.1mm higher than the PCB surface.

4.The device shall be mounted centrally within the routing slot, with the distance between the input/output end faces and the edge of the PCB routing slot controlled within the range of 0.1mm to 0.15mm.。

Pin Configuration and Description



Pin Configuration

Pin Number	Pin Name	Description
1	V_{GG}	Gate voltage.
2	RFin	RF input pin: internally DC-blocked; external blocking capacitor is not required.
3,4	NC	Internally not connected, recommended to be grounded in application.
5	RFout	RF output pin: internally DC-blocked; external blocking capacitor is not required.
6	V_{DD}	Drain voltage.
7	Metal Package	Amplifier Source Grounding and Heat Dissipation

Power-on Sequence

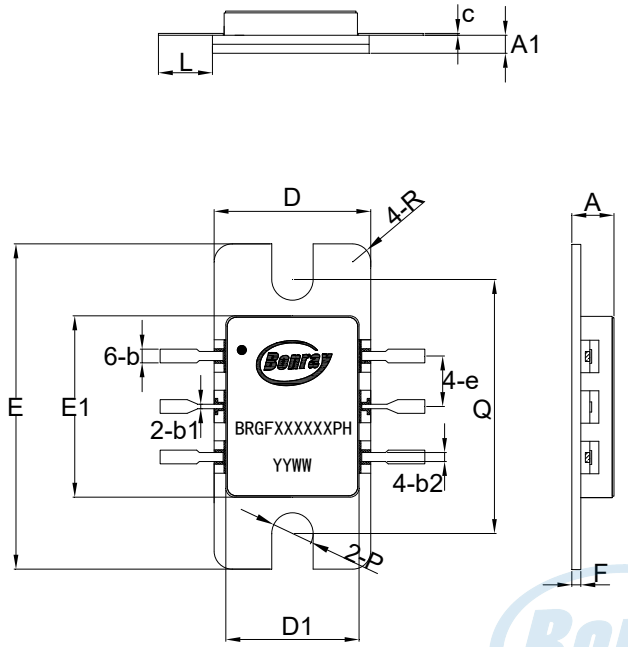
1. Set the grid voltage (VGG) to -5V,Turn on the gate voltage；
2. Set drain voltage (VDD) to +28V,Turn on the drain voltage；
3. Adjust the gate voltage (Vgg) to set the drain current to 300 mA；
4. Input RF signal；

Power-off Sequence

1. Turn off the RF signal；
2. Turn off the drain votage and wait for 5 seconds to allow the drain capacitors to fully discharge；
3. Turn off the gate voltage；

Note: In circuit design, bias voltage under-voltage protection is needed with timing protection circuits to ensure that VGG is fully powered up before VDD is applied, and that VDD is lowered to below 5V before VGG is powered down, especially in TDD applications. The gate driving decoupling capacitor needs to be carefully evaluated to meet the switching speed requirements.

Package Dimensions（Unit：mm）



Dimension	Units: mm		
	Min	Typ.	Max
A	2.2	2.4	2.6
A1	0.8	1	1.2
b	0.63	0.76	0.9
b1	-	0.25	-
b2	-	0.5	-
c	0.07	0.1	0.13
D	8.55	8.7	8.85
D1	7.25	7.4	7.55
E	17.83	18.03	18.23
E1	9.9	10.05	10.2
e	2.67	2.8	2.93
F	0.37	0.5	0.63
L	2.5	3	3.5
P	-	2.3	-
Q	13.88	14.08	14.28
R	-	1	-

Outline Drawing with Dimensions

Recommended Soldering Temperature Profile