## Product Features

Frequency: 10MHz ~ 1GHz

Gain : 20.8dB@500MHz

Psat: 40.3dBm@500MHz

PAE: 59.9%(500MHz)

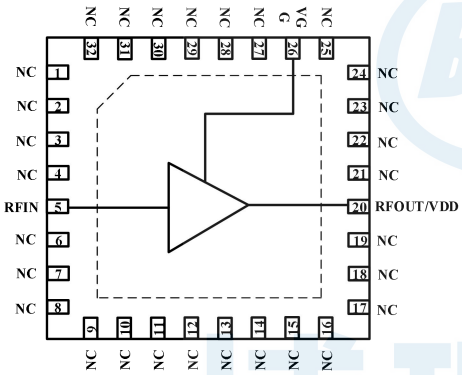
Supply Voltage: 28V, $I_{DQ}$ 70mA

Package: QFN32 (5mm×5mm)

## General Description

The BRGF010010FLJ is a gallium nitride (GaN) Internal Matched power amplifier that achieves 10W (40dBm) output with a power PAE of 59.9% (Pout=40.3dBm, 500MHz) over an instantaneous bandwidth of 10MHz to 1GHz. The product is ideal for pulsed or continuous wave Application, such as radar, public mobile radio communications, and general-purpose amplification technologies.

## Functional Block Diagram




## Ordering Information

| Part Number | Package | Description |
|---|---|---|
| BRGF010010FLJ | QFN32 | 10 MHZ to 1GHz<br>10W Internal Matched PA |

## Absolute Maximum Ratings

| Parameters | Values |
|---|---|
| Gate Drain Breakdown Voltage ($BV_{DG}$) | 100V |
| Gate Voltage Range ($V_{GG}$) | -6 to 0V |
| Drain Current ($I_D$) | 1.3 A |
| Gate Current ($I_G$) | 5mA |
| Continuous Dissipated Power ($P_D$) | 20.3 W. |
| Channel Temperature ($T_{CH}$) | 275 ℃ |
| Mounting Temperature (30 seconds) | 245 ℃ |

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 device at these conditions is not implied. Please pay attention to good heat dissipation under high temperature operation.

## Recommended Operating Conditions

| Parameters | Values |
|---|---|
| Drain Voltage ($V_{DD}$) | +28V (Typ) |
| Drain Static Current ($I_{DQ}$) | 70mA (Typ) |
| Gate Voltage ($V_{GG}$) | -2.4V (Typ) |
| Storage Temperature | -65℃ ~ +150℃ |
| 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.

## Impedance Mismatch

| Markers | Parameters | Typ. |
|---|---|---|
| VSWR | Impedance Mismatch Ruggedness | 5:1 |

Test Conditions: EVB test, $T_A$=25℃, $V_{DD}$=+28V, $I_{DQ}$=70mA, Fre=1GHz, CW wave, $P_{out}$=10W .

## Thermal Parameters

| Parameters | Test Conditions | Value | Units |
|---|---|---|---|
| Thermal Resistance ($\theta_{JC}$) | DC at 85 ° C case | 12.3 | ℃/W |
| Channel Temperature ($T_{ch}$) | | 225 | ℃ |

Note: $\theta_{JC}$ to measure the thermal resistance to the bottom of the package

## ESD WARNING

**ELECTROSTATIC SENSITIVE DEVICE**

**OBSERVE HANDLING PRECAUTIONS**

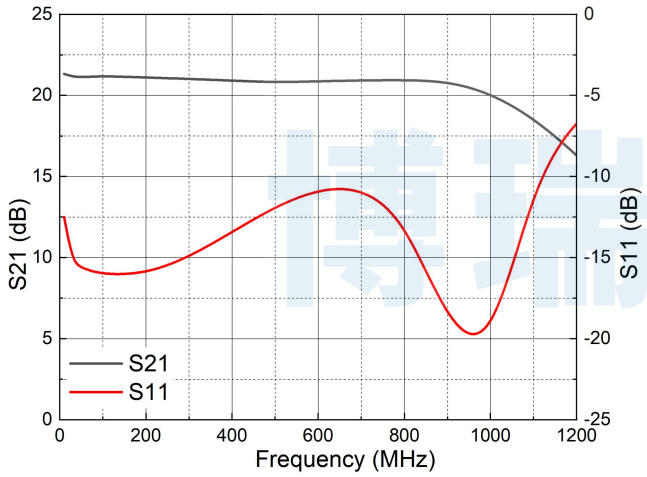
## Typical Performanc (EVB test data,0.01GHz ~ 1GHz)

| Parameters | Typ. | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 10 | 30 | 100 | 300 | 400 | 500 | 600 | 800 | 1000 | MHz |
| Gain | 21.32 | 21.16 | 21.20 | 21.02 | 20.92 | 20.80 | 20.87 | 20.95 | 20.15 | dB |
| Input Return Loss | -12.50 | -15.27 | -16.06 | -14.97 | -13.43 | -11.85 | -10.77 | -12.58 | -20.97 | dB |
| Output Return Loss | -14.95 | -20.95 | -21.23 | -17.49 | -16.40 | -15.56 | -14.71 | -15.61 | -10.35 | dB |
| Drain Current @$P_{sat}$ | 546 | 457 | 472 | 521 | 544 | 616 | 712 | 778 | 590 | mA |
| Pout ( dBm ) @$P_{sat}$ | 39.60 | 39.42 | 39.66 | 39.94 | 40.15 | 40.26 | 40.94 | 41.81 | 40.47 | dBm |
| PAE@$P_{sat}$ | 57.01 | 65.61 | 67.58 | 65.35 | 65.99 | 59.85 | 60.00 | 67.54 | 65.33 | % |
| Power Gain@$P_{sat}$ | 13.53 | 13.92 | 14.66 | 14.76 | 15.38 | 15.58 | 14.37 | 15.21 | 15.02 | dB |

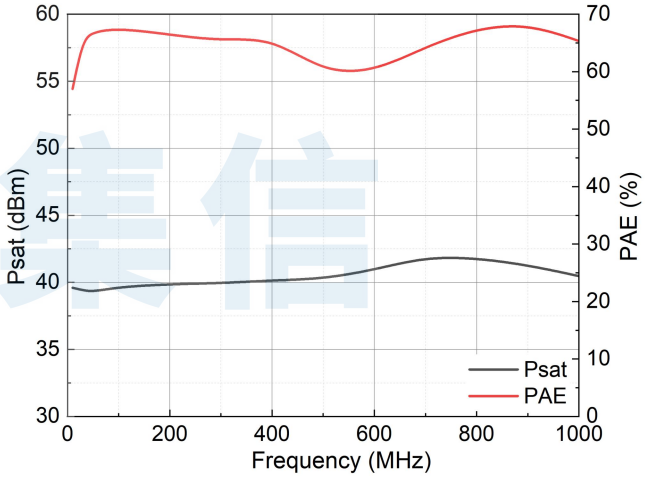
Test Condition: Temp =+25 ° C, $V_{DD}$=+28V, $I_{DQ}$=70mA

Note: $P_{sat}$ defined as the saturation power output of the evaluation board;

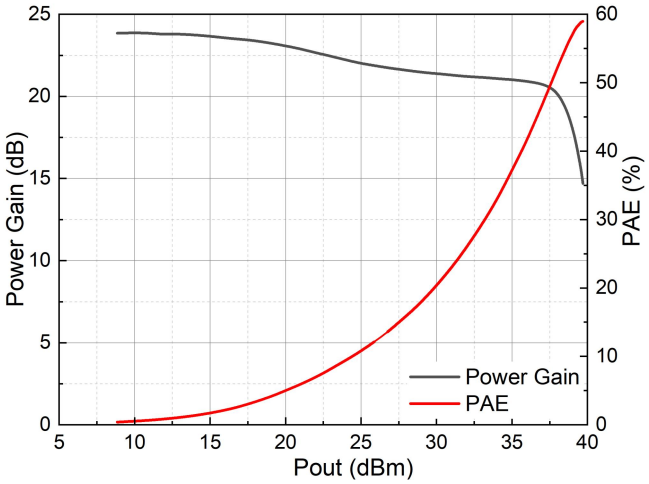
## Typical Performanc (EVB test results)



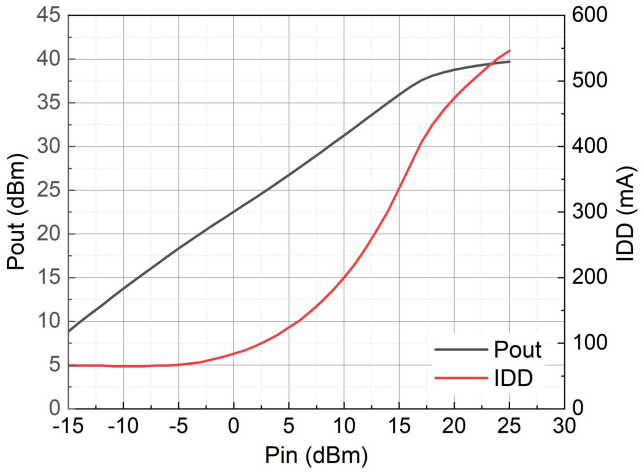

Gain , Input Return Loss vs. Freq



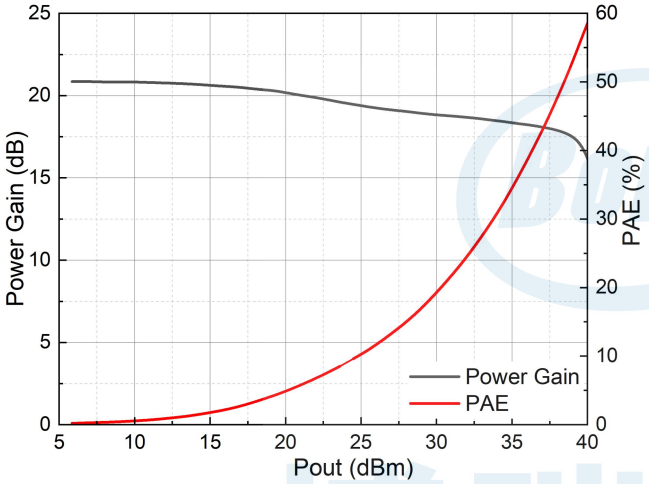

Psat, PAE vs. Freq



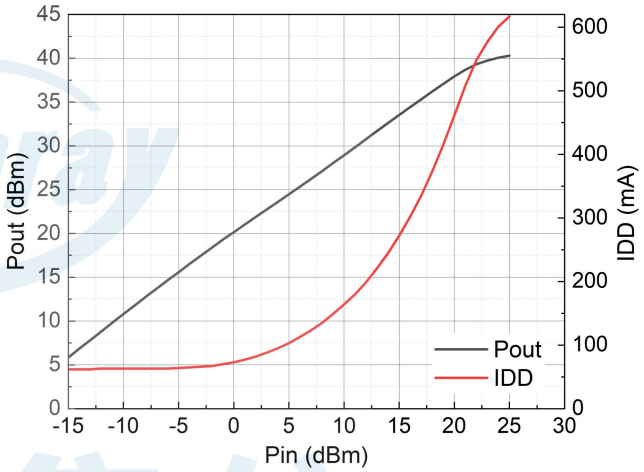

Gain , PAE vs. $P_{out}$ @10MHz



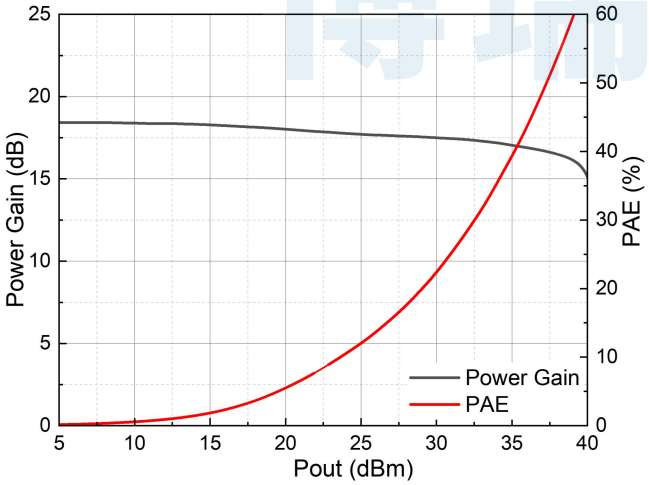

$P_{out}$, IDD vs $P_{in}$ @10MHz



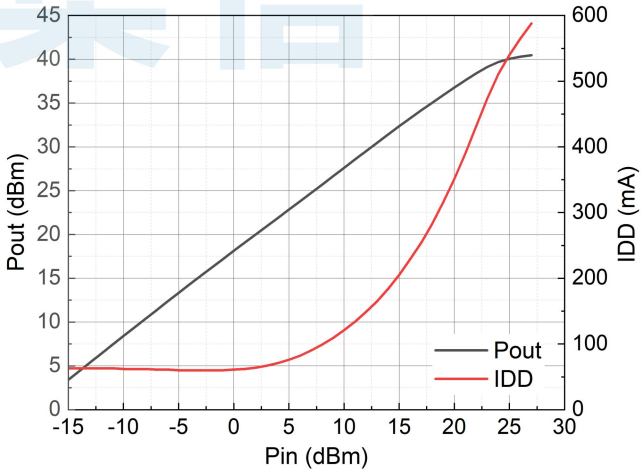

Gain , PAE vs. $P_{out}$ @500MHz




$P_{out}$, IDD vs $P_{in}$@500MHz

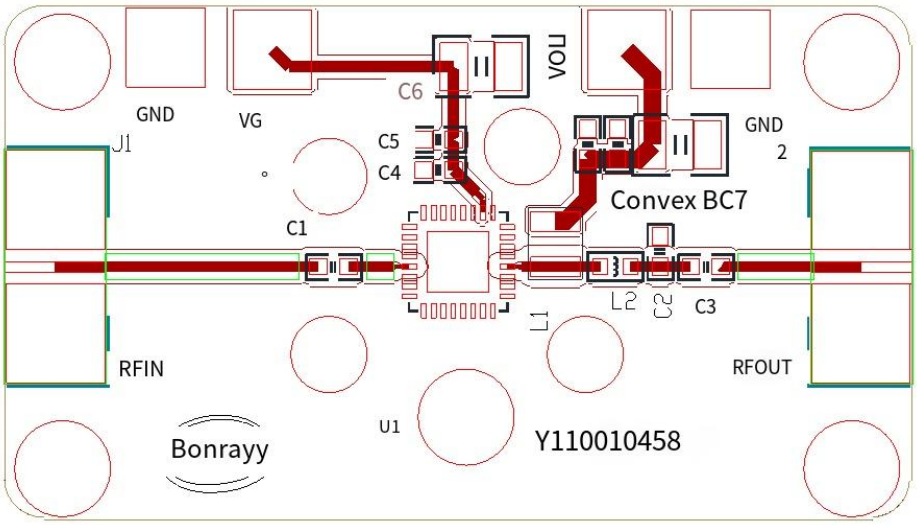



Gain , PAE vs. $P_{out}$ @1GHz

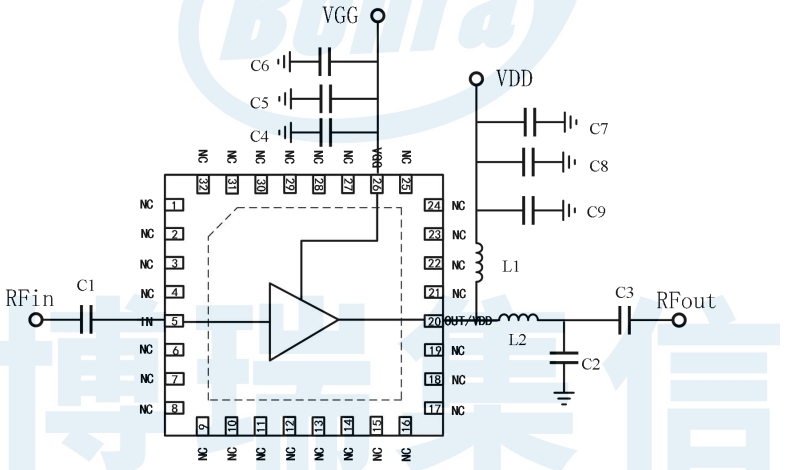



$P_{out}$, IDD vs $P_{in}$ @1GHz

**PCB Evaluation Board**



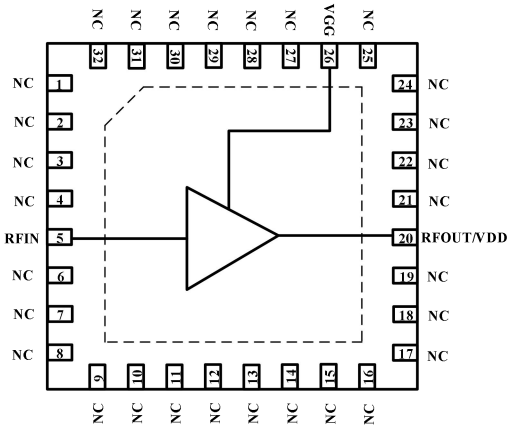

## Typical Application Schematic




**Bill of Material**

| Designator | Description | Part Number |
|---|---|---|
| L1 | 1.1 uH | 1008AF-112XJRB |
| L2 | 6.2 nH | LQG18HH6N2S00D |
| C6, C7 | 10uF | GRM32ER71H106KA12L |
| C5, C8 | 100nF | GRM155R71H104KE14D |
| C4, C9 | 1nF | GRM188R71H102KA93D |
| C1, C3 | 2.2 nF | GRM1885C1H222JA01D |
| C2 | 2.4 PF | GQM1875C2E2R4BB12# |

## Pin Configuration and Description




| Pin Number | Pin Name | Description |
|---|---|---|
| 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32 | NC | No internal connection, but connected to RF/DC ground when testing and using. |
| 5 | RFIN | RF input pins. |
| 20 | RFOUT/$V_{DD}$ | RF output and drain Supply Voltage voltage pins. |
| 26 | $V_G$ | Gate Supply Voltage voltage |

### Power-on sequence

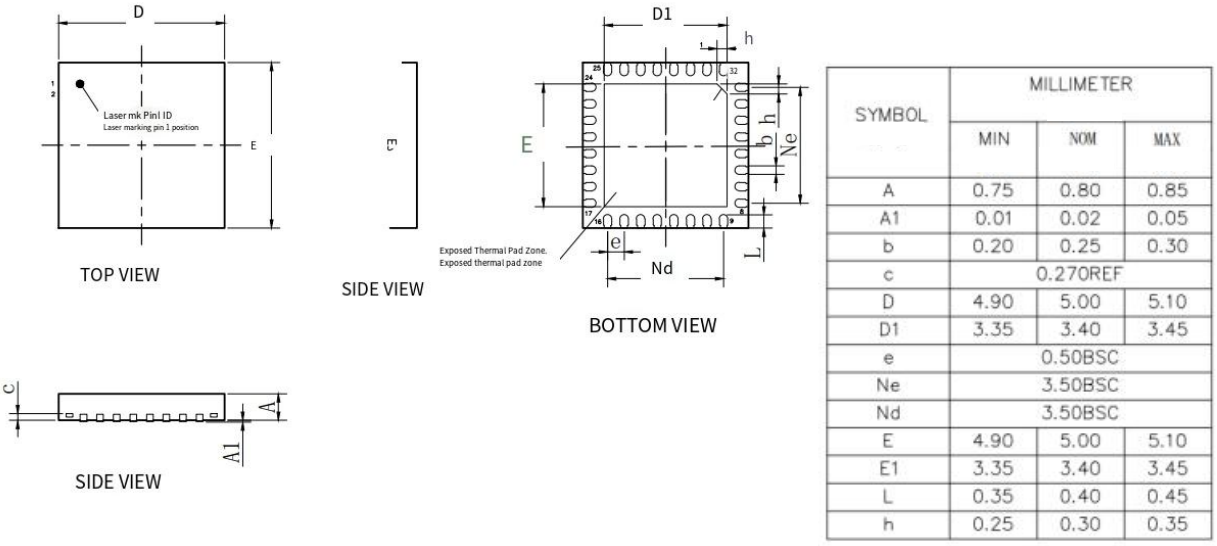
1. Set the gate voltage ($V_{GG}$) to -5V
2. Set drain voltage ( $V_{DD}$) to +28V, current limit 500mA;
3. Open the gate voltage;
4. Turn on drain voltage;
5. Increase the gate voltage ( $V_{GG}$ ) so that the drain current is 70mA;
6. Input RF signal;

### Power-off sequence

1. Turn off the RF signal;
2. Reduce the gate voltage ($V_{GG}$) to -5V;
3. Turn off the drain Supply Voltage voltage;
4. Turn off the gate Supply Voltage voltage;

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

## Package Dimensions (mm)




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.75 | 0.80 | 0.85 |
| A1 | 0.01 | 0.02 | 0.05 |
| b | 0.20 | 0.25 | 0.30 |
| c | | 0.270REF | |
| D | 4.90 | 5.00 | 5.10 |
| D1 | 3.35 | 3.40 | 3.45 |
| e | | 0.50BSC | |
| Ne | | 3.50BSC | |
| Nd | | 3.50BSC | |
| E | 4.90 | 5.00 | 5.10 |
| E1 | 3.35 | 3.40 | 3.45 |
| L | 0.35 | 0.40 | 0.45 |
| h | 0.25 | 0.30 | 0.35 |

## Recommended Soldering Temperature Profile