

## 1. General Description

The ARF2109 is a GaAs pHEMT MMIC power Amplifier operating at 5GHz-20GHz, power supply +5V operation, at 127 mA working current, can provide 21dB Small Signal Gain, 21dBm P1dB. The ARF2109 port impedance is 50 Ω.

## 2. Features

- 21 dB Small Signal Gain
- 21 dBm P1dB
- 22 dBm PSAT
- 28 dBm Third Order Intercept Point (OIP3) @ Pout=+10 dBm SCL ,f=10MHz
- Bias 127 mA @ 5 V
- 6 Pin 3X3 mm QFN Package
- RoHS\* Compliant

## 3. Applications

- Point-To-Point radio for cellular backhaul applications
- Radar
- General Purpose Wireless
- Fiber Optics
- Test Equipment & Sensors

## 4. Functional Block Diagram

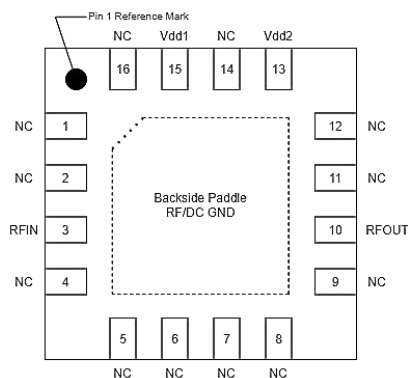


Figure1.

## 5. Order product model

ARF2109

## Directory

1. General Description .....	1
2. Features .....	1
3. Applications .....	1
4. Functional Block Diagram .....	1
5. Order product model .....	1
6. Specifications .....	3
6.1. Electrical Specifications .....	3
6.2. Handling Ratings .....	3
6.3. Timing Requirements .....	错误! 未定义书签。
7. Absolute Maximum Ratings .....	4
8. Pin Assignments and Description .....	4
9. Typical Performance .....	5
10. Performance Plots .....	5
11. Application .....	8
11.1. PCB Evaluation Board .....	8
11.2. Evaluation Board BOM .....	8
12. Package Marking and Outline Dimensions .....	9
13. Notice .....	10
13.1. Operating protection condition .....	10
13.2. Operate attention .....	10
13.3. Solderability .....	10
13.4. RoHS Compliance .....	10
13.5. Contact Information .....	10
Important Notices and disclaimers .....	11

## 6. Specifications

### 6.1. Electrical Specifications

Test Conditions: Vdd1=5V,Vdd2=5V, Idq=127mA, TA=+25°C, (de-embedded data);

Table1. Electrical Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Frequency Range			5		20	GHz
Input Return Loss	S11			10		dB
Output Return Loss	S22			10		dB
Gain	S21			21		dB
P1dB				21		dBm
OIP3		+10 dBm SCL,f=10MHz		28		dBm
Noise Figure	NF			5		dB

### 6.2. Handling Ratings

Table2. Handling Ratings

Symbol	Parameter	Min	Typ	Max	Units
T <sub>STG</sub>	Storage temperature range	-65		+150	°C
V <sub>ESD</sub>	Human body model (HBM)		500		V
	Charged device model (CDM)		500		V

Table4.Absolute Maximum Ratings

### 7. Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Parameter	Min	Typ	Max	Units
DC Supply Voltage (Vdd1,Vdd2)	4.5	5	5.5	V
Operational Frequency Range	5		20	GHz
RF Input Power (Pin), CW, 50ohms, TA=25°C			20	dBm
Operating Temperature	-55		+85	°C

### 8. Pin Assignments and Description

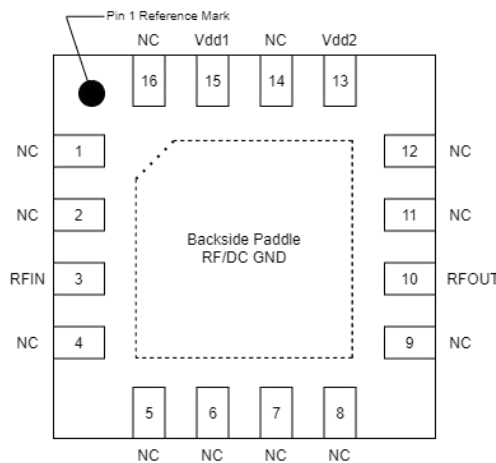


Figure2. Pin Assignments

Table5. Description

Pin No.	Mnemonic	Description
1,2,4,5,6,7,8,9,11,12,14,16	NC	No Connection
13,15	Vdd1,Vdd2	DC power supply
3	RFIN	RF input port
10	RFOUT	RF output port
Backside Paddle	GND	RF Ground and DC power supply Ground

## 9. Typical Performance

Test Conditions: Vdd1=5V,Vdd2=5V, Idq=127mA, TA=+25°C, (de-embedded data);

Table6. Typical Performance

Parameter	Conditions	Units	Typical							
Freq		GHz	6	8	10	12	14	16	18	20
Small Signal Gain		dB	22	21.5	21.5	21.5	20.5	21	21	18
Input Return Loss		dB	20	20	18	13	16	15	7	15
Output Return Loss		dB	20	30	25	20	17	26	22	10
P1dB		dBm	21.5	21.5	21	21	21.5	21.5	21.5	20
PSAT		dBm	22	22	21.5	21.5	22	22.5	22.5	21
OIP3	@10 dBm SCL,f=10MHz	dBm	28	31	30	28	28	28	28	27
Noise Figure		dB	7.5	6.5	5.5	5	4.5	4	4	4

## 10. Performance Plots

Test Conditions: Vdd1=5V,Vdd2=5V, Idq=127mA, TA=+25°C, (de-embedded data);

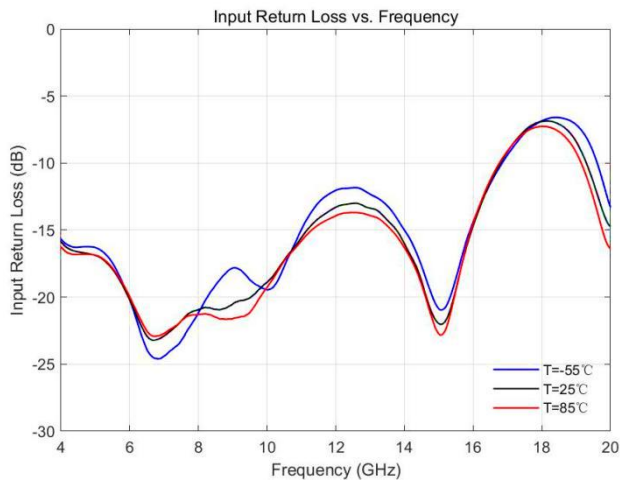


Figure3.

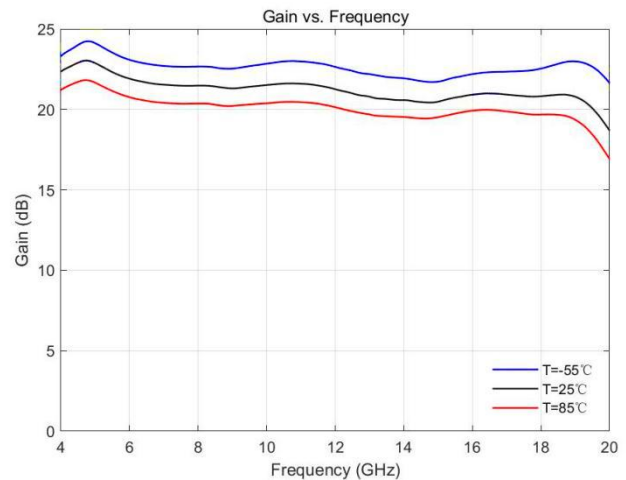


Figure4.

### Performance Plots (Cont.)

Test Conditions: Vdd1=5V, Vdd2=5V, Idq=127mA, TA=+25°C, (de-embedded data);

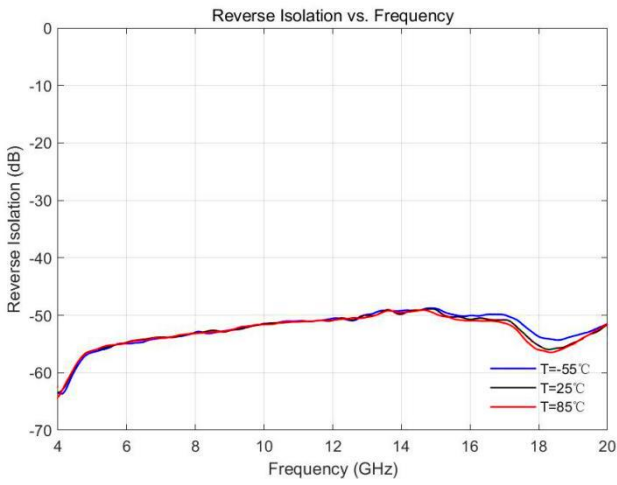


Figure5.

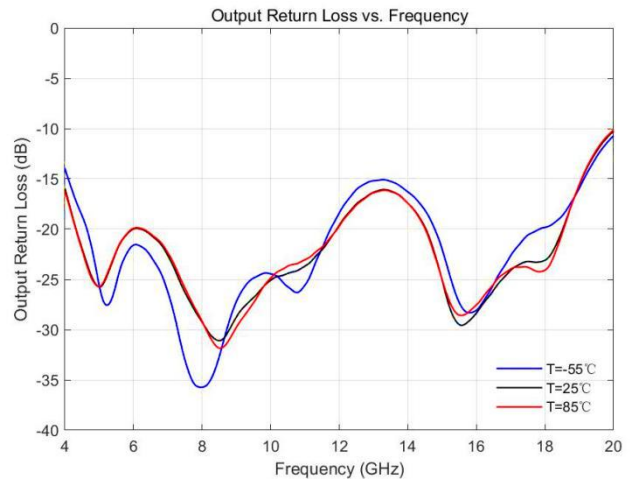


Figure6.

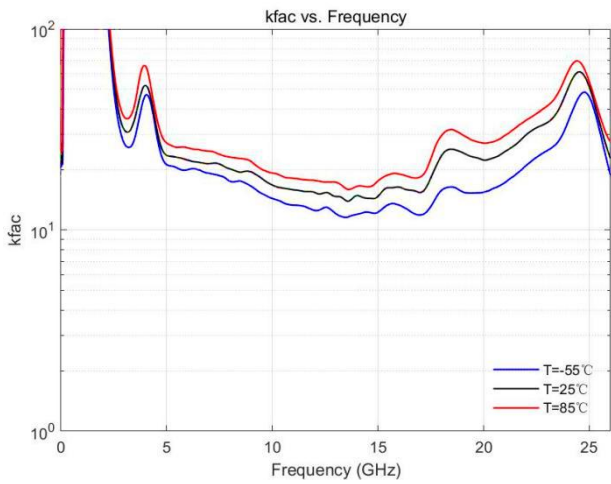


Figure7.

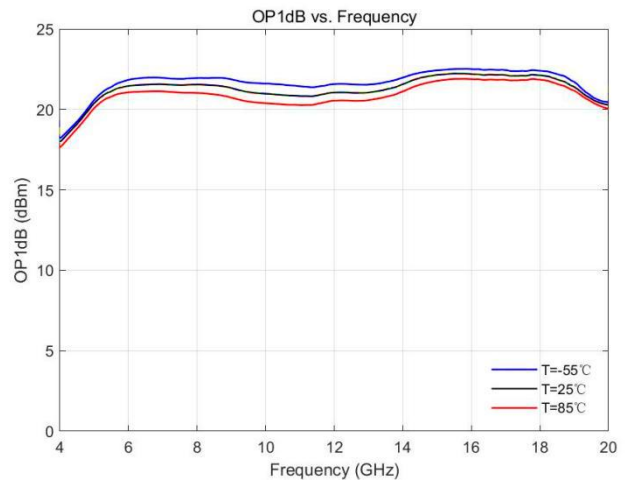


Figure8.

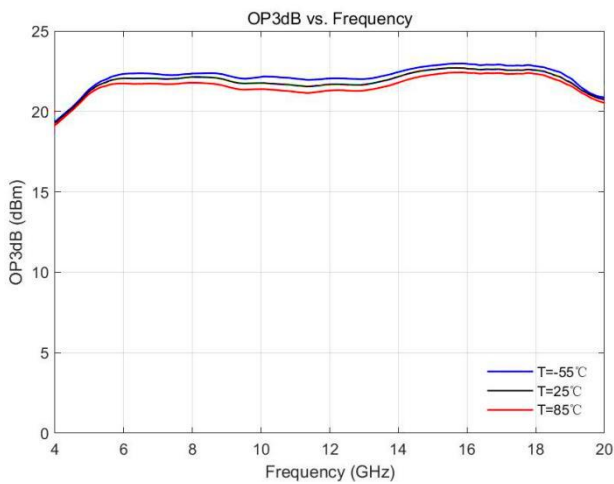


Figure9.

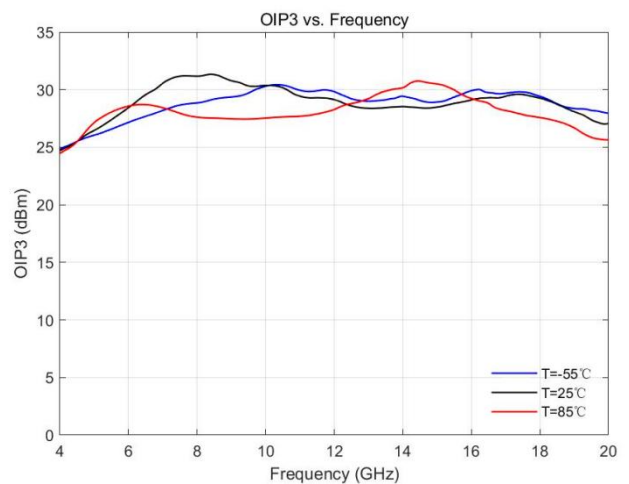


Figure10.

### Performance Plots (Cont.)

Test Conditions:  $V_{dd1}=5V, V_{dd2}=5V, I_{dq}=127mA, T_A=+25^{\circ}C$ , (de-embedded data);

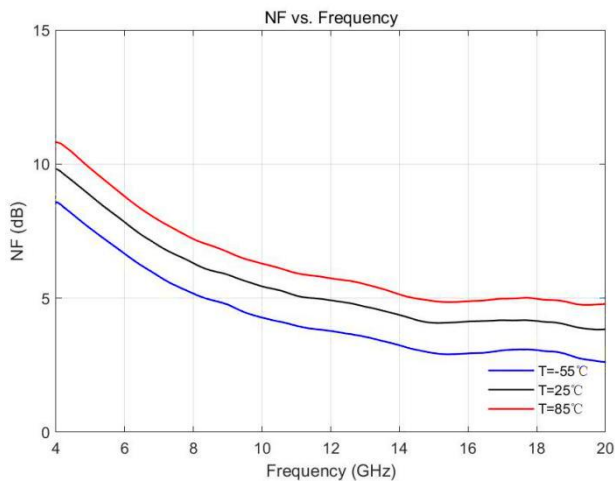


Figure11.

## 11. Application

### 11.1. PCB Evaluation Board

The ARF2109 device is typically placed in a system like the one shown below Figure12.

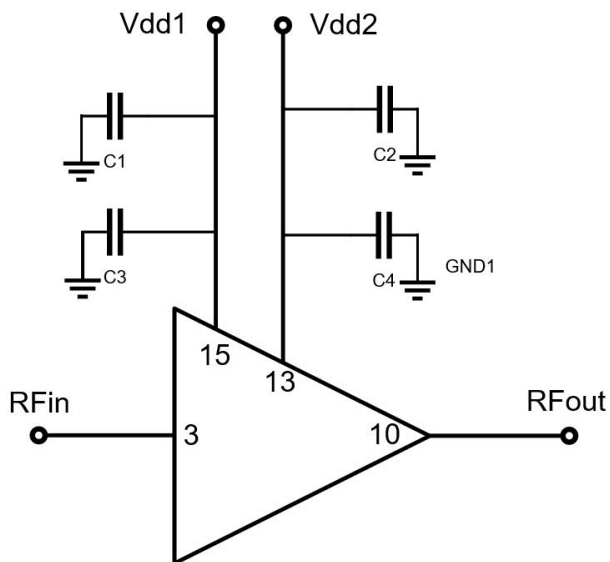


Figure12.

### 11.2. Evaluation Board BOM

Table7. Bill of Materials for Evaluation PCB

Item	Conditions	Value	Manuf.	Part Num.
PCB	N/A	N/A	ARF	ARF2109-EVB
C1, C2	N/A	1000PF	N/A	0402
C3, C4	N/A	100PF	N/A	0402



## 12. Package Marking and Outline Dimensions

- 1) All dimensions are in millimeters.
- 2) QFN 16 pin 3x3x0.85mm Package.
- 3) Marking: Part number - 2109  
Lot code - XXXX
- 4) Coplanarity applies to the exposed heat sink slug as well as the terminals.
- 5) The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

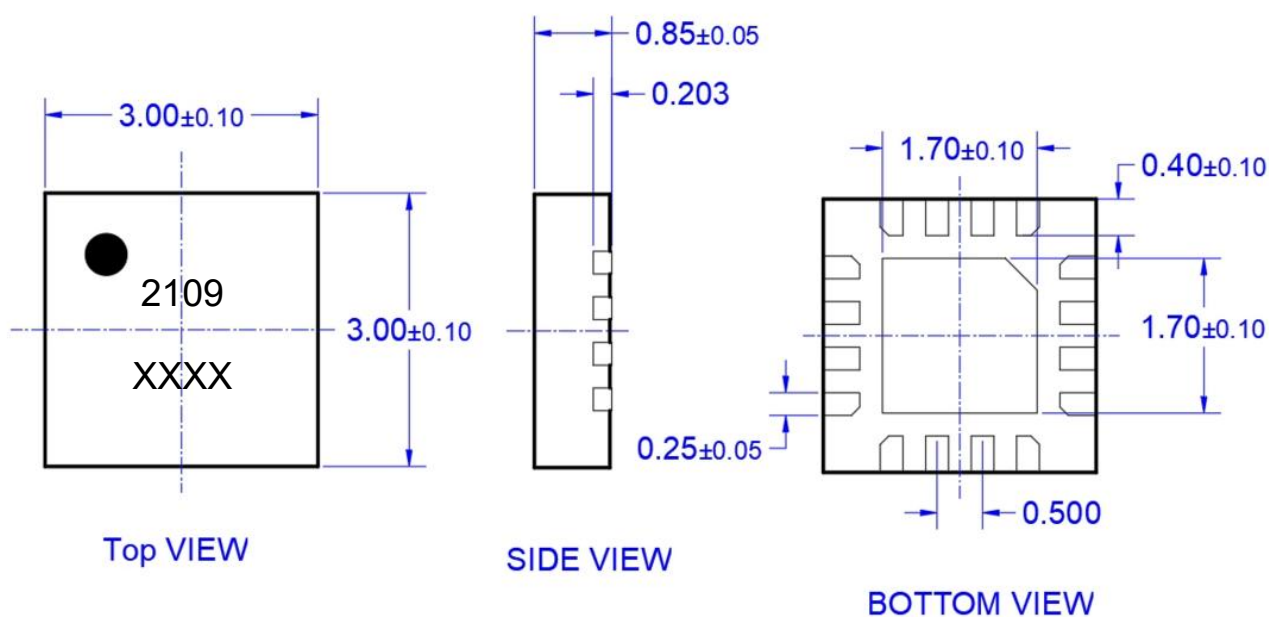


Figure13. Package Marking and Outline Dimensions

## **13. Notice**

### **13.1. Operating protection condition**



Devices and circuit boards may be undetected. Although this product has an ESD protection circuit, the device may be damaged when encountering high energy ESD. Therefore, appropriate ESD prevention measures should be taken to avoid deterioration of device performance or loss of function.

### **13.2. Operate attention**

1. Must be placed in a container with electrostatic protection function, dry environment, conditions permit the best storage nitrogen environment.
2. Please strictly comply with the ESD protection requirements to avoid electrostatic damage.
3. Use vacuum clamps or tweezers to avoid tools or fingers touching the product surface.

### **13.3. Solderability**

Compatible with lead-free (260 °C maximum reflow temperature) soldering processes.

### **13.4. RoHS Compliance**

This product is compliant with the EU RoHs2.0, EU Directive 2015/863.

### **13.5. Contact Information**

Telephone: 65-31580333 / 65-80673575

Email: [sales@arf-semi.com](mailto:sales@arf-semi.com)

Website: [www.arf-semi.com](http://www.arf-semi.com)

Address: 3E Gambas Crescent Singapore 757033

## **Important Notices and disclaimers**

The information provided in this document is intended as a guide only and shall not in any event be regarded as a guarantee of conditions, characteristics or performance. ARF does not assume any liability arising out of the application or use of any product described herein, including but not limited to any personal injury, death, or property or environmental damage. No licenses, patent rights, or any other intellectual property rights is granted or conveyed. ARF reserves the right to modify without notice. All rights reserved.