

1. General Description

The ARF2204 is Power Amplifier at 2300MHz-2400MHz, power supply +5V operation, at 120mA working current, can provide 35dB Small signal gain, Past 36.4dBm, PAE typical value of 35.5%.The ARF2204 port impedance is 50 Ω.

2. Features

- 2.3GHz to 2.4GHz operation
- 16 Pin 5X5 mm LGA Package
- 35.5% High Efficiency
- High Linearity:ACPR <-50dBc
- Past 36.4 dBm
- 35dB Small signal Gain
- ESD Protection

3. Applications

- FDD and TDD 2G/3G/4G LTE systems
- 3GPP bands 3 and 9 small-cell base stations
- Driver amplifier for micro-base and macro-base stations
- Active antenna array and massive MIMO

4. Functional Block Diagram

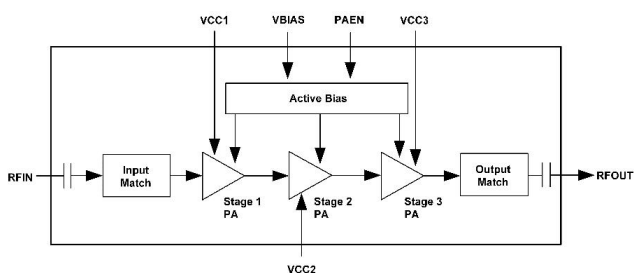


Figure1.

5. Order product model

ARF2204

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6. Specifications

6.1. Electrical Specifications

Test Conditions: 50 Ω system, VCC1 = VCC2 = VCC3 = VBIAS = 5 V, PAEN = 2.0 V, Temp=+25°C, (de-embedded data);

Table1. Electrical Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Frequency Range			2.3		2.4	GHz
Test Frequency				2.35		GHz
Input Return Loss	S11	PIN = -30 dBm		-13		dB
Output Return Loss	S22	PIN = -30 dBm		-7		dB
Small signal gain		PIN = -30 dBm		35		dB
Gain		Pout = +28 dBm		36		dB
Past		100 μ s/1 ms, 10% duty cycle		36.4		dBm
PAE		Pout = +28 dBm		35.5		%
ACPR(Uncorrected)		LTE, 20 MHz E-UTRA Test Model 1.1 or 3.1, PAR = 8.5 dB, Pout = +28 dBm		-27		dBc
ACPR(Uncorrected)		LTE, 20 MHz x 3 E-UTRA Test Model 1.1 or 3.1, PAR = 8.5 dB, Pout = +28 dBm		-25		dBc
ACPR(Corrected)		LTE, 20 MHz E-UTRA Test Model 1.1 or 3.1, PAR = 8.5 dB, Pout = +28 dBm		-50		dBc
Quiescent current		No RF signal		120		mA
2nd harmonic		CW, Pout = +28 dBm		-30		dBc
3rd harmonic		CW, Pout = +28 dBm		-50		dBc

6.2. Handling Ratings

Table2. Handling Ratings

Symbol	Parameter	Min	Typ	Max	Units
T _{STG}	Storage temperature range	-55		+125	°C
V _{ESD}	Human body model (HBM)	1000			V
	Charged device model (CDM)	500			V

6.3. Timing Requirements

Table3. Timing Requirements

Parameter	Conditions	Min	Typ	Max	Units
Switching Time OFF			1		μ s
Switching Time ON			1		μ s

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.

Table4. Absolute Maximum Ratings

Parameter	Min	Typ	Max	Units
Supply voltage(VCC1, VCC2, VCC3, VBIAS)	4.75	5	5.5	V
PA enable (PAEN)		2	3	V
RF Input Power (Pin), CW, 50ohms, T=25°C			10	dBm
Junction temperature		150		°C
Operating Temperature	-40	25	85	°C

8. Pin Assignments and Description

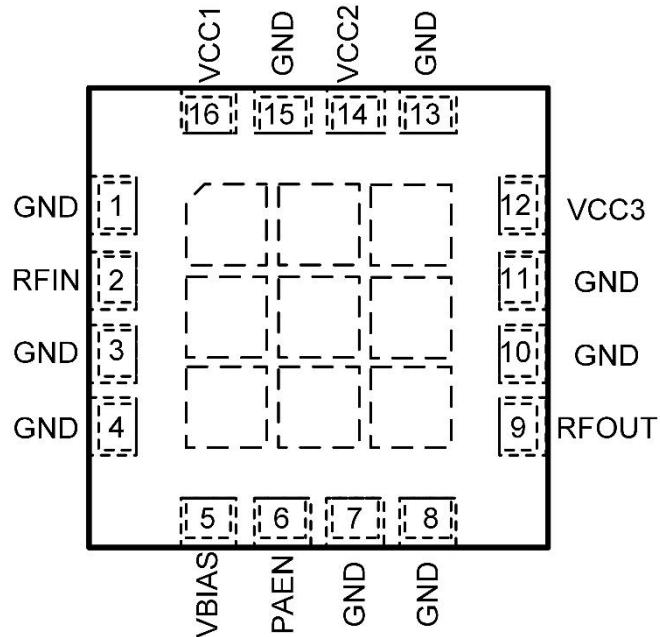


Figure2. Pin Assignments

Table5. Description

Pin No.	Mnemonic	Description
1	GND	Ground
2	RFIN	RF input port
3	GND	Ground
4	GND	Ground
5	VBIAS	Bias voltage
6	PAEN	PA enable
7	GND	Ground
8	GND	Ground
9	RFOUT	RF output port
10	GND	Ground
11	GND	Ground
12	VCC3	Stage 3 collector voltage
13	GND	Ground
14	VCC2	Stage 2 collector voltage
15	GND	Ground
16	VCC1	Stage 1 collector voltage

9. Typical Performance Characteristic

Test Conditions: 50 Ω system, VCC1 = VCC2 = VCC3 = VBIAS = 5 V, PAEN = 2.0 V ,Temp=+25°C, (de-embedded data);

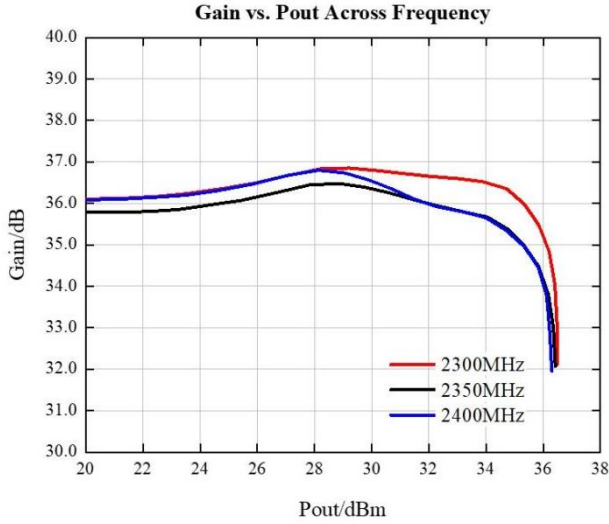


Figure3.

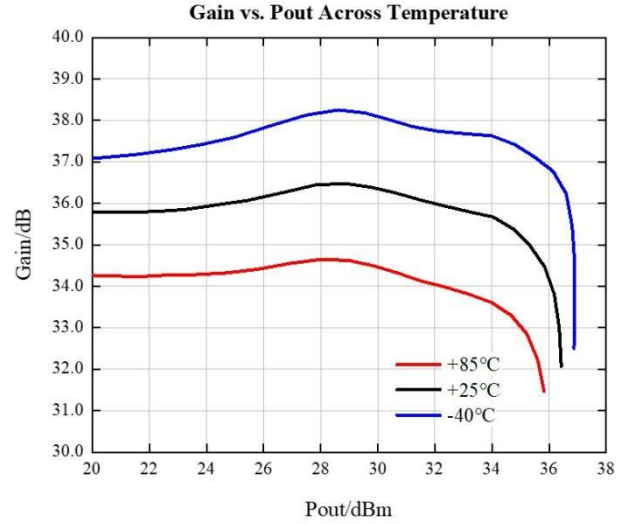


Figure4.

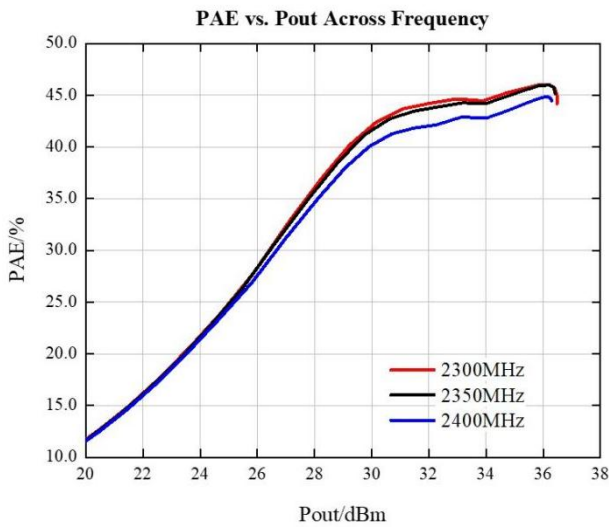


Figure5.

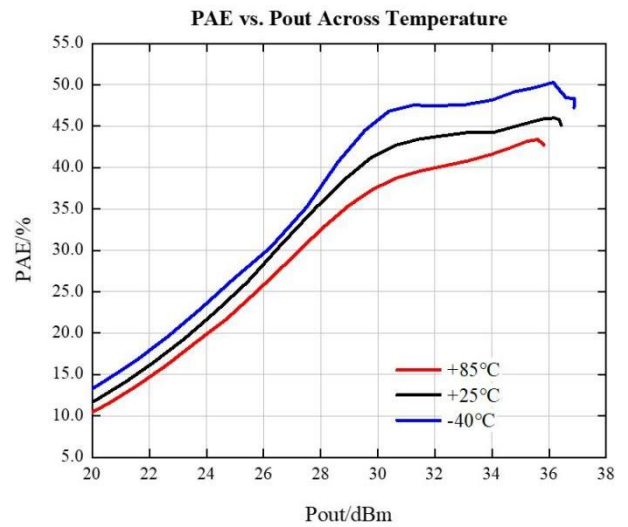


Figure6.

Typical Performance Characteristic

Test Conditions: 50 Ω system, VCC1 = VCC2 = VCC3 = VBIAS = 5 V, PAEN = 2.0 V, Temp=+25°C, (de-embedded data);

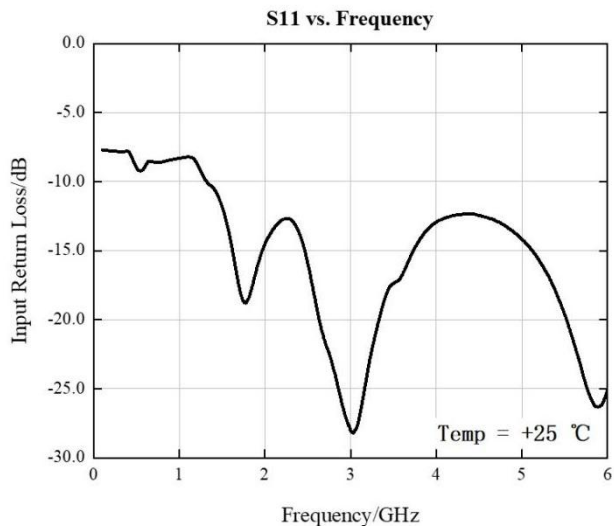


Figure7.

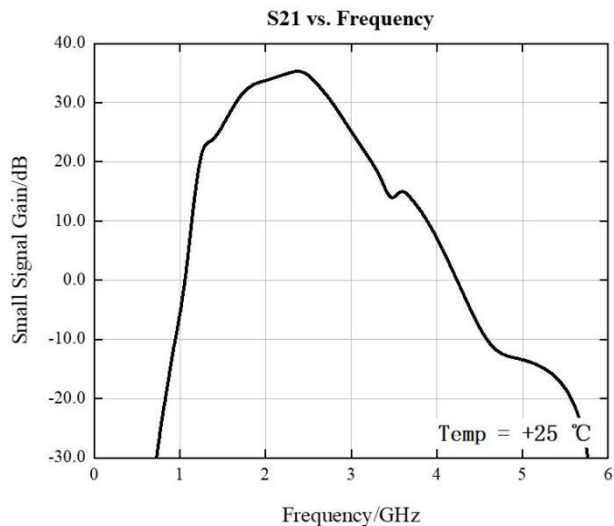


Figure8.

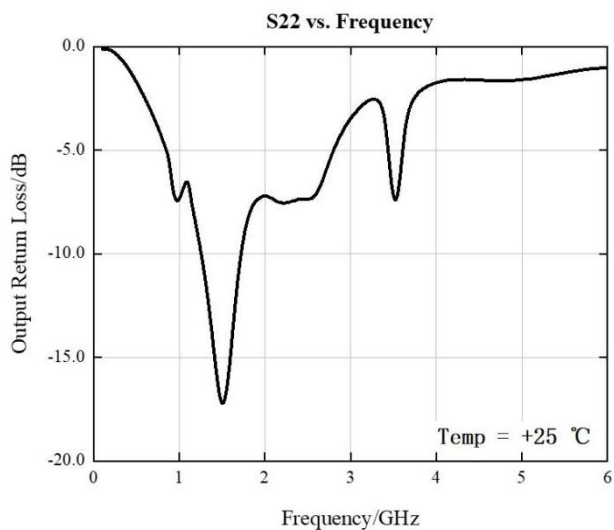


Figure9.

10. Application

10.1. PCB Evaluation Board

The ARF2204 device is typically placed in a system like the one shown below Figure10.

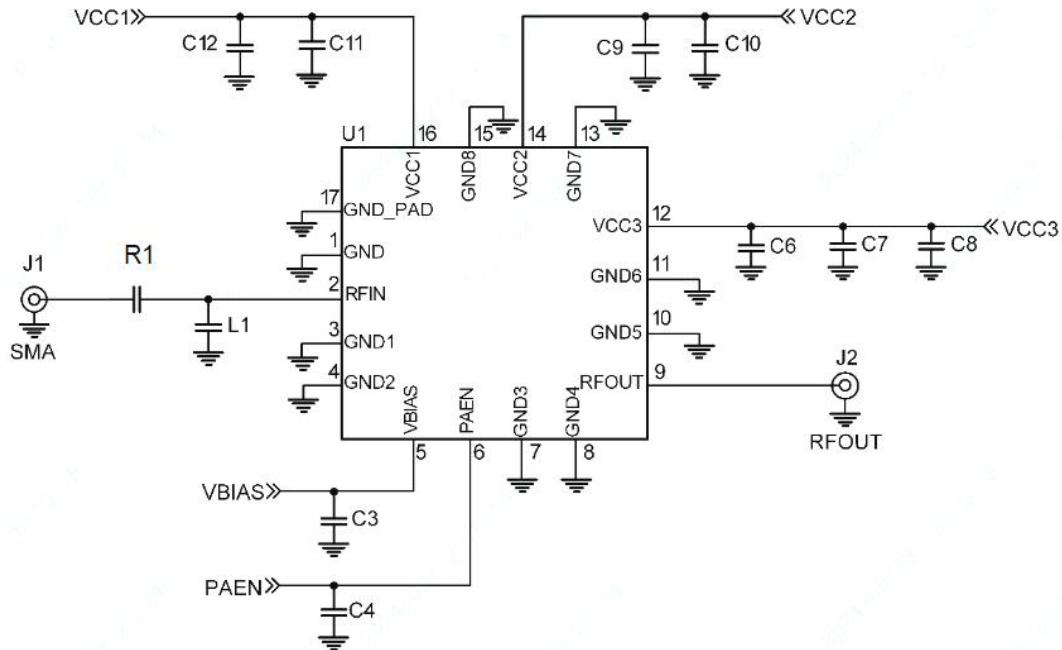


Figure10.

10.2. Evaluation Board BOM

Table6. Bill of Materials for Evaluation PCB

Item	Value	Manuf.	Part Num.
PCB	N/A	ARF	ARF2204-EVB
Q1	N/A	ARF	ARF2204
R1	0 Ω	Murata	0402
C3, C6	1 μ F	Murata	0402
C4, C7	3300 pF	Murata	0402
C9	470 nF	Murata	0402
C11	100 nF	Murata	0402
C8, C10, C12	10 μ F	Murata	1206

11. Package Marking and Outline Dimensions

- 1) All dimensions are in millimeters.
- 2) LGA 16 pin 5x5x0.85mm Package.
- 3) Marking: Part number - 2204
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.

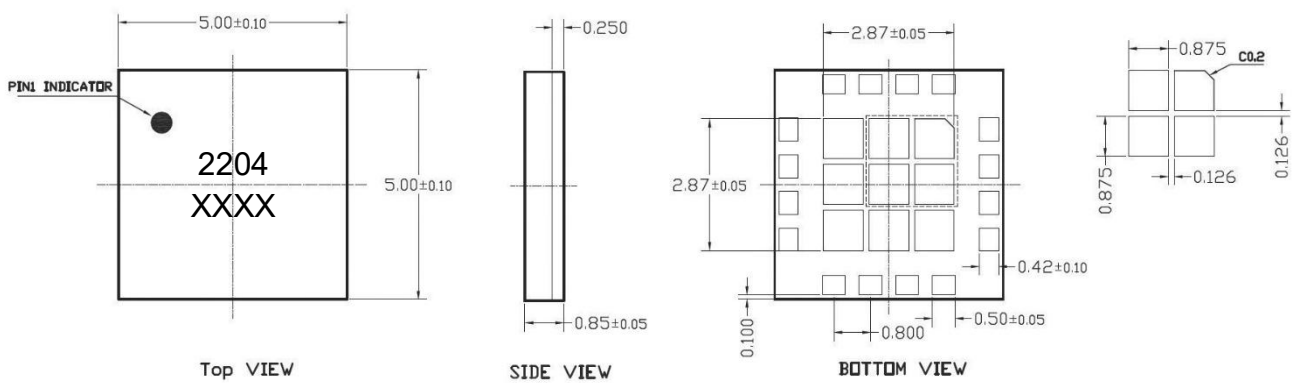


Figure11. Package Marking and Outline Dimensions

12. PCB Mounting Pattern

- 1) All dimensions are in millimeters.
- 2) Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation.

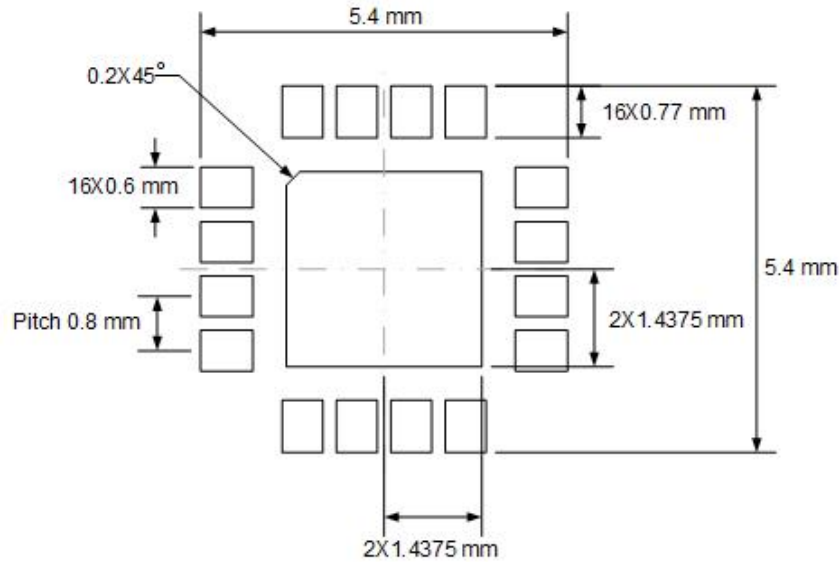


Figure12.PCB Layout Footprint (Top View)

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

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Website: www.arf-semi.com

Address: 3E Gambas Crescent Singapore 757033

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