1. General Description

The ARF1001 is a GaN - on - SiC Power Amplifier operating at DC - 6GHz, power supply +50V operation, can provide 21.8dB Small Signal Gain, 39dBm P3dB.

2. Features

21.8 dB Small Signal Gain

39 dBm P3dB

55% Darin Efficiency@P3dB

50V Operating Voltage

6 Pin DFN Package

3. Applications

Base station

Microwave oven

Military radar

Civilian radar

Test instrumentation

Wideband or narrowband amplifiers

Jammers

4. Functional Block Diagram

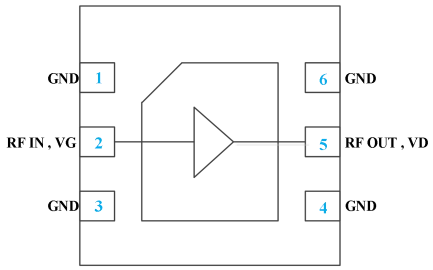

Figure 1.

5. Order product model

ARF1001

Directory

6. Specifications

6.1. Electrical Characteristics

Table1. Electrical Characteristics

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
Breakdown Voltage	VGS = –8 V, ID = 1.04 mA	BVDG	V	150	-	-
Gate Threshold Voltage	VDS = 10 V, ID = 1.04 mA	VGs(th)	V	-3.4	-2.9	-2.4
Gate Quiescent Voltage	VDS = 48 V, ID = 10 mA	VGs(Q)	V	-	-2.7	-
Gate-Source Leakage Current	VGS = –5 V, VDS = 10 V	IGss	uA	-	-	-1.04

6.2. Handling Ratings

Table2. Handling Ratings

Symbol	Parameter	Min	Typ	Max	Units
T_{STG}	Storage temperature range	-65		+150	℃
V_{ESD}	Human body model (HBM)	250			V
	Charged device model (CDM)	500			V

6.3. Loadpull Performance

Test conditions unless otherwise noted: VD= +50 V, IDQ= 10 mA, Pulse Width = 100 us, Duty Cycle = 10% ,Temp = +25 °C.

Table3. Efficiency Tuned

Frequency (MHz)	Source Impedance (Ω)	Load Impedance (Ω)	P3dB (dBm)	Drain Efficiency (%)	Linear Gain (dB)
2600	3.8+j3.4	25.9+j66.1	39.8	72.5	22.9
3400	3.4-j6.6	16.1+j44.3	39.3	74.0	22.3
3500	4.0-j9.0	17.0+j41.7	39.5	73.4	21.6
3600	3.7-j11.6	18.8+j38.5	40.2	73.3	21.2

Table4. Power Tuned

Frequency (MHz)	Source Impedance (Ω)	Load Impedance (Ω)	P3dB (dBm)	Drain Efficiency (%)	Linear Gain (dB)
2600	3.2+j6.1	37.7+j48.6	40.6	63.7	23.2
3400	4.3-j2.1	34.3+j32.4	40.8	62.4	20.5
3500	3.7-j6.8	26.9+j26.0	40.7	63.4	20.7
3600	3.8-j10.2	27.6+j26.0	40.7	62.2	20.3

6.4. Loadpull Smith Charts

Test conditions unless otherwise noted: VD= +50 V, IDQ= 10 mA, Pulse Width = 100 us, Duty Cycle = 10% ,Temp = +25 °C.

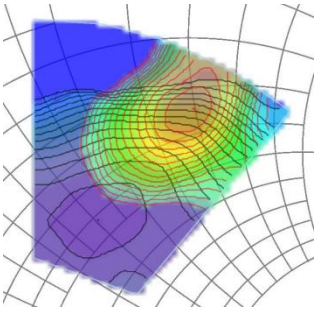

Figure 2. 2600MHz

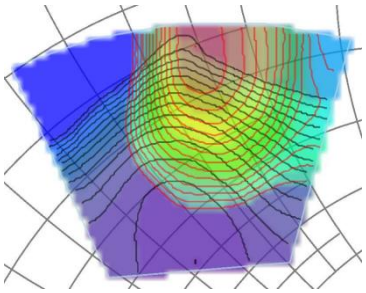

Figure 3. 3400MHz

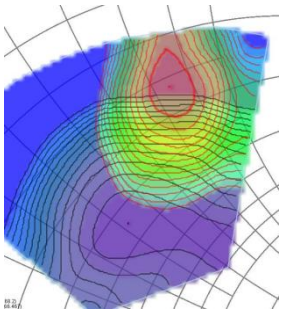

Figure 4. 3500MHz

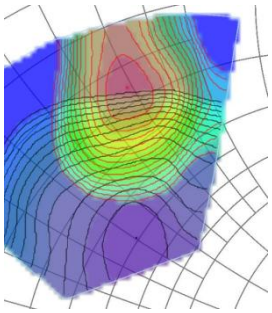

Figure 5. 3600MHz

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.

Table 5. Absolute Maximum Ratings

Parameter	Min	Typ	Max	Units
Gate Voltage Range	-10		1.3	V
Operating Drain Voltage Rang	25		55	V
Max Drain Current		0.65		A
Operating Environment Temp Range	-40		85	℃
Case Operating Temperature		130		℃
Operating Junction Temperature		225		℃

8. Pin Assignments and Description

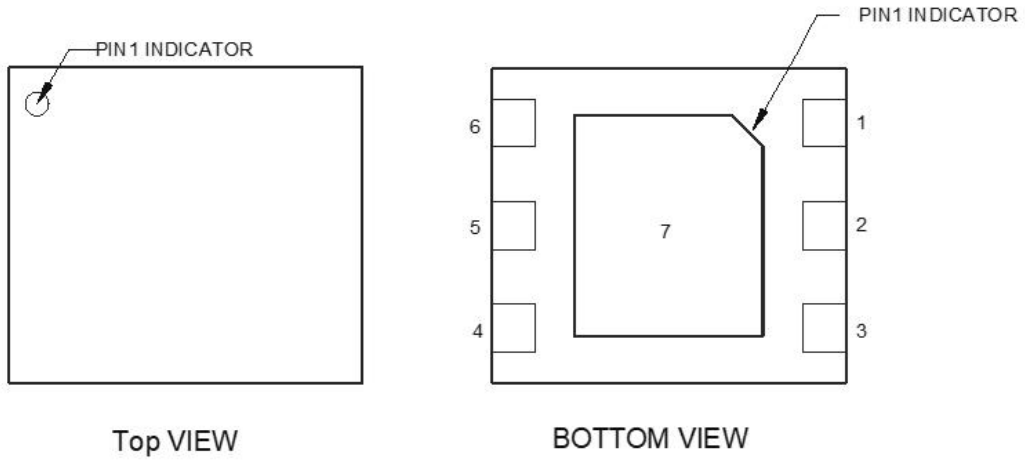

Figure 6. Pin Assignments

Table 6. Description

Pin No.	Mnemonic	Description
1	NC	NC
2	RF IN, Vg	RF Input, Gate Bias
3	NC	NC
4	NC	NC
5	RF Out, Vd	RF Output, Drain Bias
6	NC	NC
7(Back Paddle)	GND	RF and DC Ground

9. Typical Performance Characteristic

Test conditions unless otherwise noted: VD= +50 V, IDQ= 15 mA, Pulse Width = 100 us, Duty Cycle = 10% ,Temp = +25 °C.

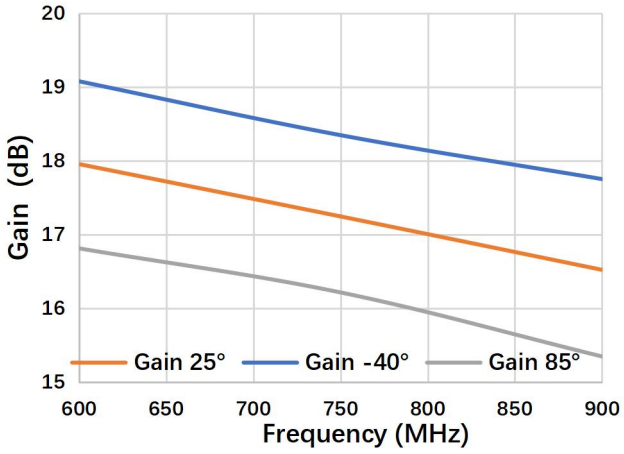

Figure 7. Gain vs Frequency as a Function of Temperature(Fixed Gate Voltage)

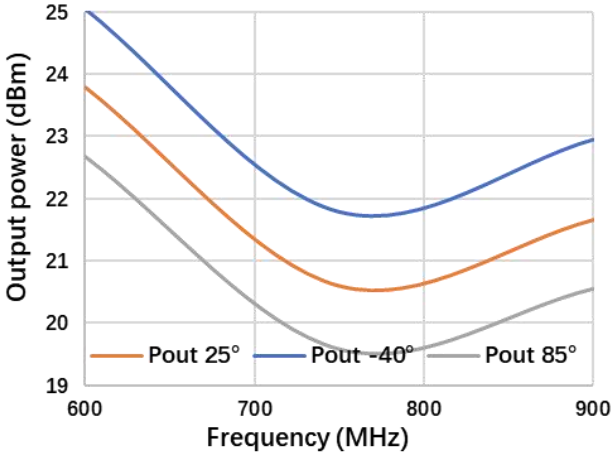

Figure 8. Output power vs Frequency as a Function of Temperature(Fixed Gate Voltage)

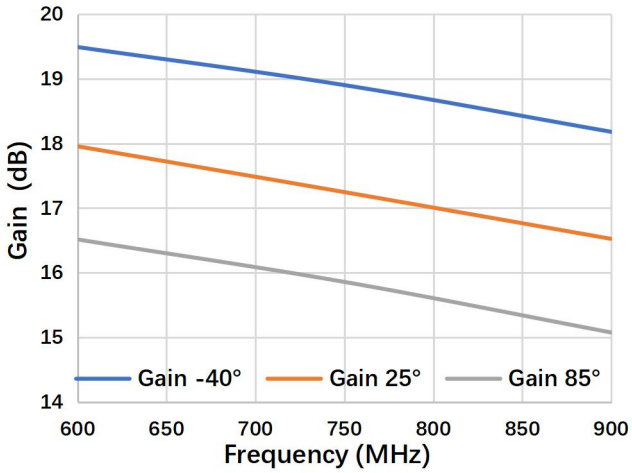

Figure 9. Gain vs Frequency as a Function of Temperature(Fixed Bias Current)

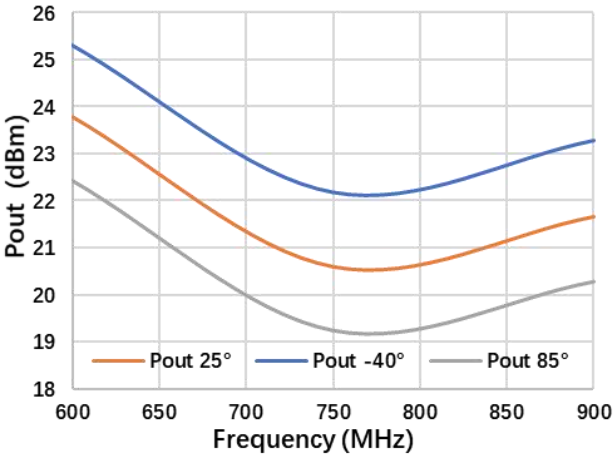

Figure 10. Output power vs Frequency as a Function of Temperature(Fixed Bias Current)

Typical Performance Characteristic

Test conditions unless otherwise noted: VD= +50 V, IDQ= 80 mA, Pulse Width = 100 us, Duty Cycle = 10% ,Temp = +25 °C.

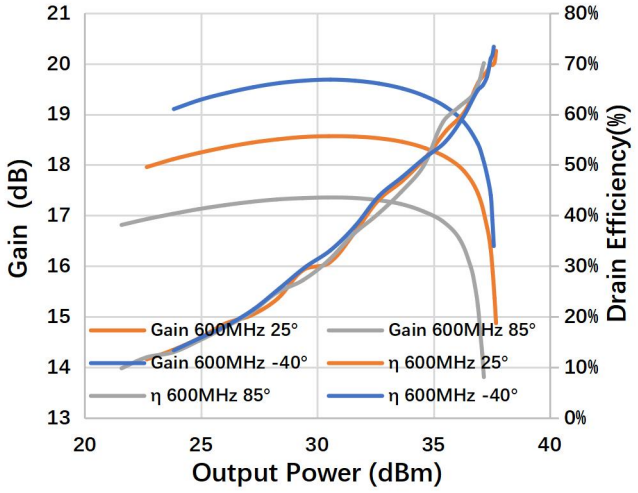

Figure 11. Gain & Drain Efficiency vs Output Power (600MHz & Vgs=-2.92V)

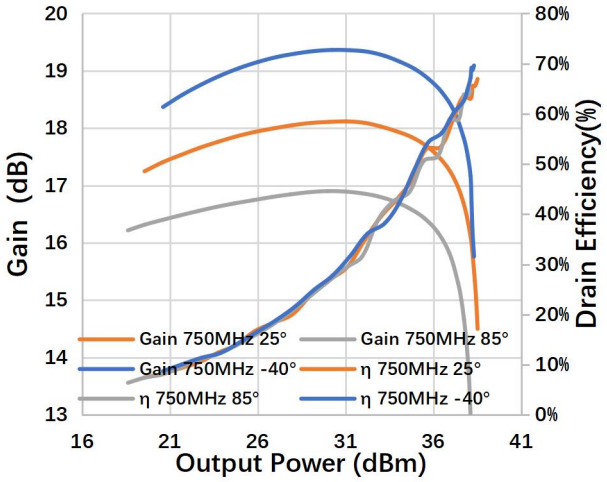

Figure 12. Gain & Drain Efficiency vs Output Power (750MHz & Vgs=-2.92V)

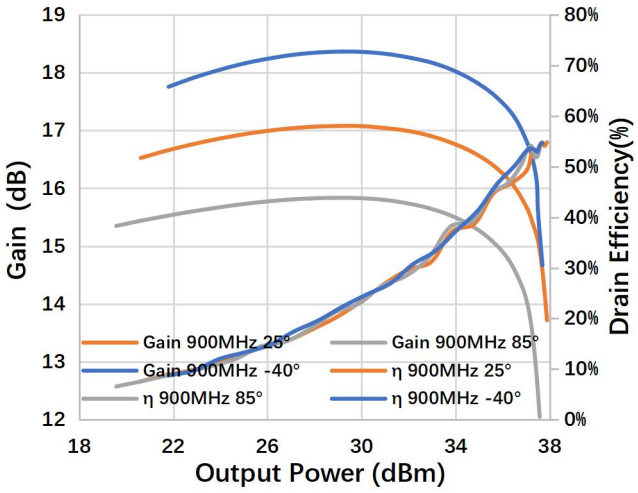

Figure 13. Gain & Drain Efficiency vs Output Power (900MHz & Vgs=-2.92V)

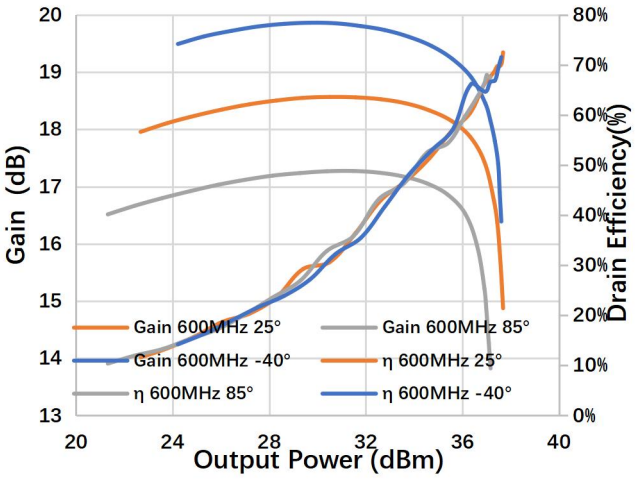

Figure 14. Gain & Drain Efficiency VS Output Power (600MHz & Idq=80mA)

Typical Performance Characteristic

Test conditions unless otherwise noted: VD= +50 V, IDQ= 80 mA, Pulse Width = 100 us, Duty Cycle = 10% ,Temp = +25 °C.

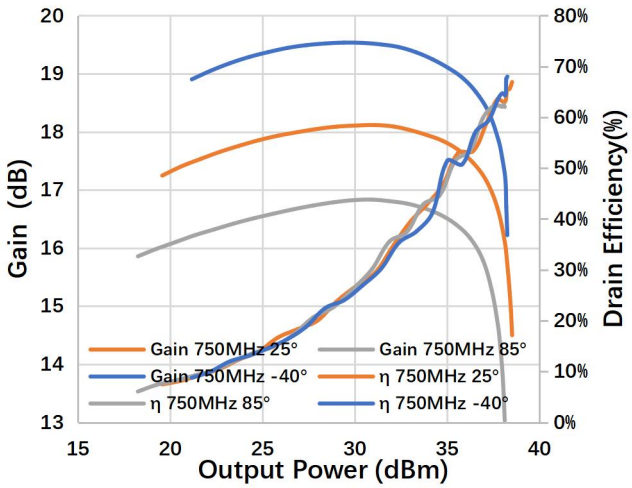

Figure 15. Gain & Drain Efficiency VS Output Power (750MHz & Idq=80mA)

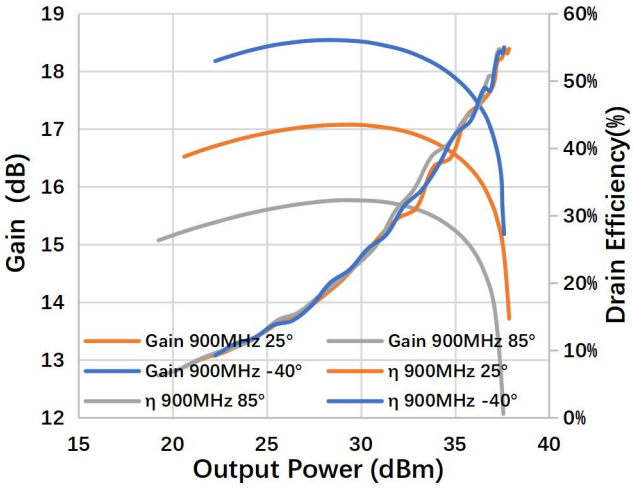

Figure 16. Gain & Drain Efficiency VS Output Power (900MHz & Idq=80mA)

10. Package Marking and Outline Dimensions

1) All dimensions are in millimeters.
2) 6 Pin DFN Package.
3) Marking: Part number -1001
   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.

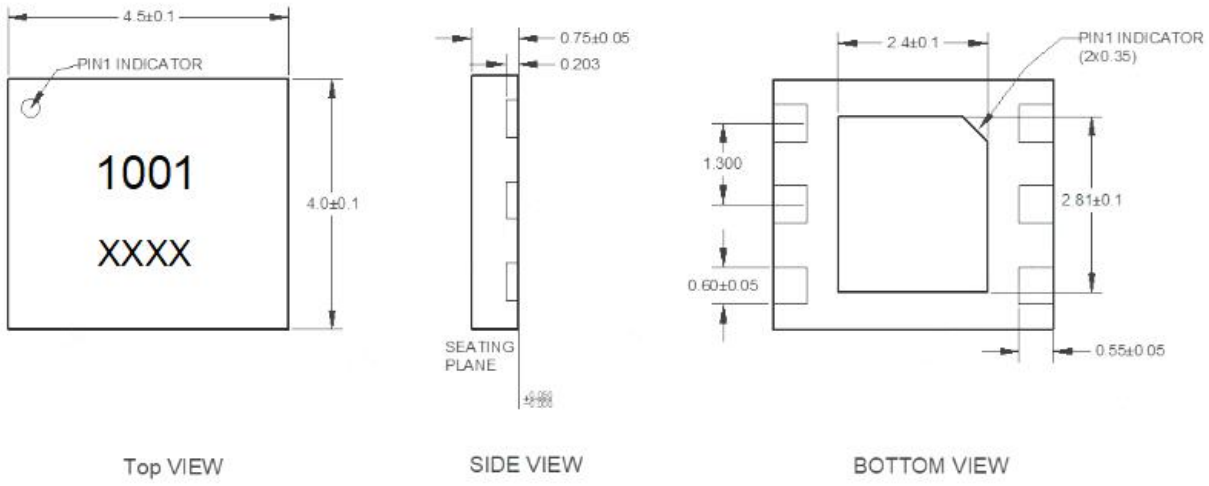

Figure 17. Package Marking and Outline Dimensions

11. Notice

11.1. 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.

11.2. 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.

11.3. Solderability

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

11.4. RoHS Compliance

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

11.5. Contact Information

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Website：www.arf-semi.com
Address：3E Gambas Crescent Singapore 757033

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