

1. General Description

The ARF9001 is a GaAs MMIC Power Amplifier operating at 12GHz-16GHz, power supply +6V operation, at 1380 mA working current, can provide 27 dB Small Signal Gain, OP1dB 32 dBm. The ARF9001 port impedance is 50 Ω.

2. Features

- 27 dB Small Signal Gain
- 32 dBm OP1dB
- 33 dBm PSAT
- Bias 1380 mA @ 6 V
- 24 Pin 5X5 mm QFN Package
- Integrated Power Detector
- RoHS* Compliant

3. Applications

- Point-To-Point radio for cellular backhaul applications
- Radar
- General Purpose Wireless

4. Functional Block Diagram

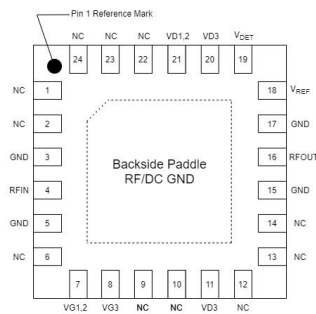


Figure1.

5. Order product model

ARF9001

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6. Specifications

6.1. Electrical Specifications

Test Conditions: VD=6V, Idq=1380mA, TA=+25°C, (de-embedded data);

Table1. Electrical Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Frequency Range			12		16	GHz
Input Return Loss	S11			-10		dB
Output Return Loss	S22			-10		dB
Gain	S21			26		dB
P1dB				32		dBm
Past				33		dBm
IMD3		+20 dBm SCL, Δf=10MHz		-50		dBc
Noise Figure	NF			3.5		dB

6.2. Handling Ratings

Table2. Handling Ratings

Symbol	Parameter	Min	Typ	Max	Units
T _{STG}	Storage temperature range	-65		+150	°C
V _{ESD}	Human body model (HBM)		250		V
	Charged device model (CDM)		250		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 (V_D)	0		7	V
Gate Voltage (V_G)	-2		0	V
Detector Voltage (V_{DET})			7	V
Detector Reference Voltage (V_{REF})			7	V
Operational Frequency Range	12		16	GHz
RF Input Power (P_{in}), CW, 50ohms, $T_A=25^\circ\text{C}$			20	dBm
Operating Temperature	-40		+85	$^\circ\text{C}$
MSL		3		

8. Pin Assignments and Description

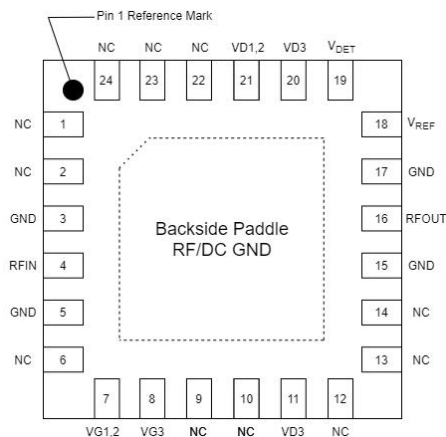


Figure2. Pin Assignments

Table5. Description

Pin No.	Mnemonic	Description
1,2,6,9,10,12,13, 14,22,23,24	NC	No Connection
3,5,15,17	GND	Ground
4	RFIN	RF Input
7	VG1,2	Gates 1,2 Bias
8	VG3	Gate 3 Bias
11	VD3	Drain 3 Bias
16	RFOUT	RF Output
18	VREF	Pwr Det Ref
19	VDET	Pwr Det
20	VD3	Drain 3 Bias
21	VD1,2	Drains 1,2 Bias
Backside Paddle	GND	RF/DC ground connection.

9. Typical Performance

Test Conditions: VD=6V, Idq=1380mA, TA=+25°C, (de-embedded data);

Table6. Typical Performance

Parameter	Conditions	Units	Typical					
Freq	-	GHz	12.7	13.3	13.9	14.5	15.1	15.4
Small Signal Gain	-	dB	24.9	25.2	26.0	27.2	27.9	27.6
Input Return Loss	-	dB	-20	-15	-15	-12	-9	-7
Output Return Loss	-	dB	-12	-11	-11	-13	-15	-15
P1dB	-	dBm	32.2	31.9	31.4	31.8	32.7	32.2
Psat	-	dBm	33.3	33.0	32.4	32.7	33.5	33.0
IMD3	+20 dBm SCL, ΔF=10MHz	dBc	-53	-53	-52	-52	-52	-52
IMD3	+23 dBm SCL, ΔF=10MHz	dBc	-38	-38	-38	-37	-36	-36
IMD3	+26 dBm SCL, ΔF=10MHz	dBc	-32	-31	-28	-30	-34	-33
Noise Figure	-	dB	3.8	3.5	3.5	3.2	3.2	3.2

10. Performance Plots

Test Conditions: VD=6V, Idq=1380mA, TA=+25°C, (de-embedded data);

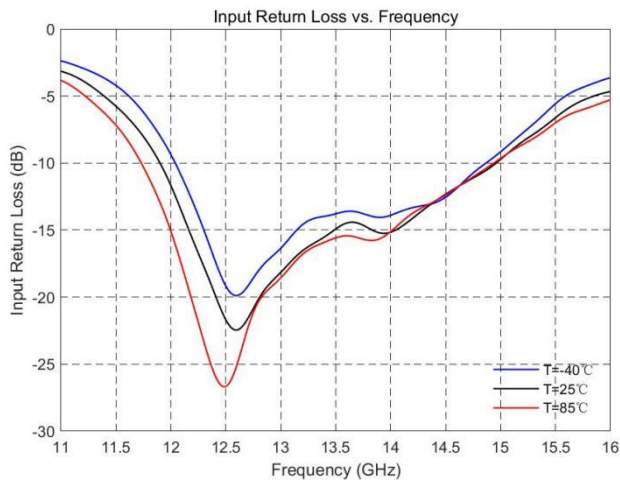


Figure3.

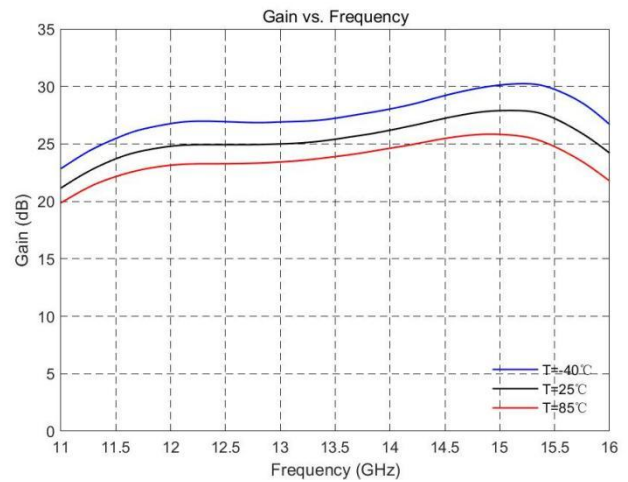


Figure4.

Performance Plots (Cont.)

Test Conditions: $V_D=6V$, $I_{dq}=1380mA$, $T_A=+25^\circ C$, (de-embedded data)

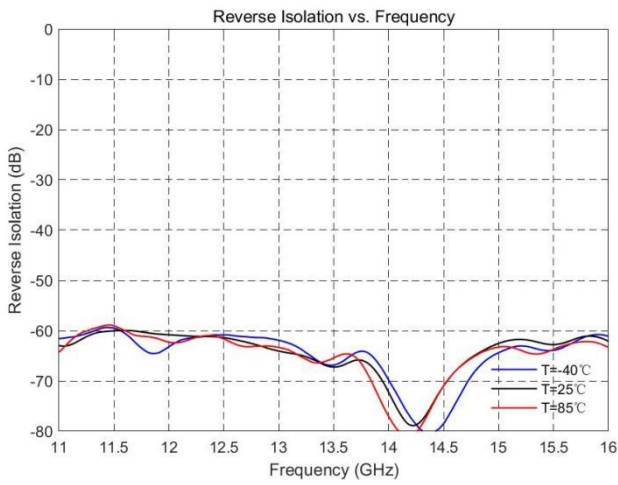


Figure5.

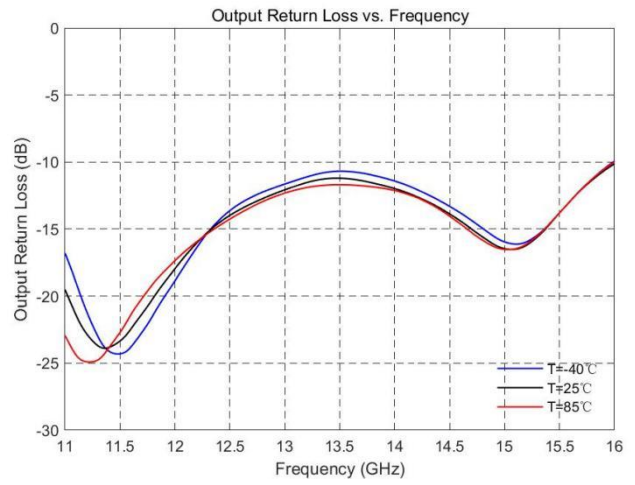


Figure6.

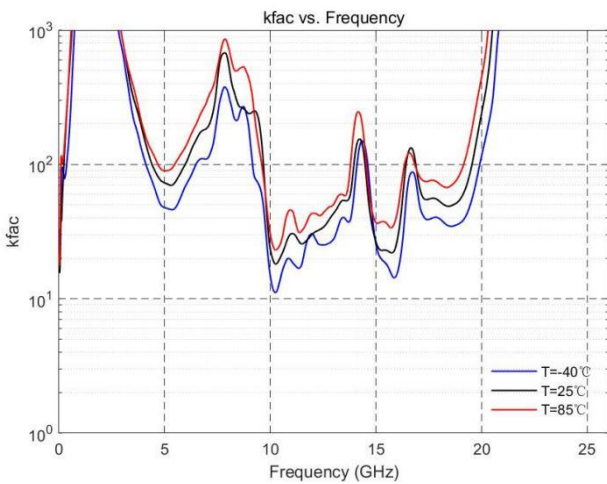


Figure7.

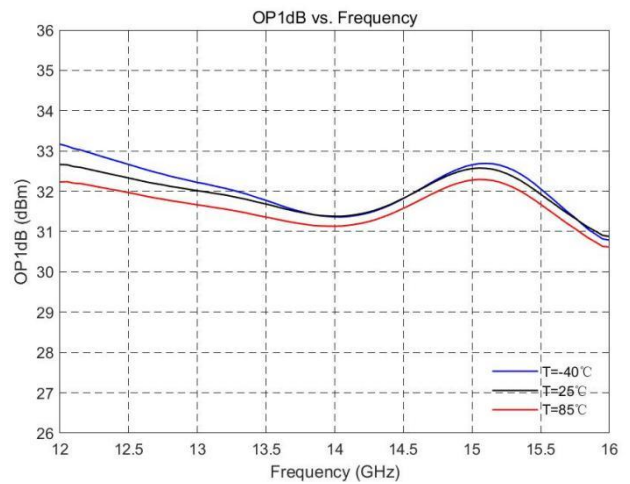


Figure8.

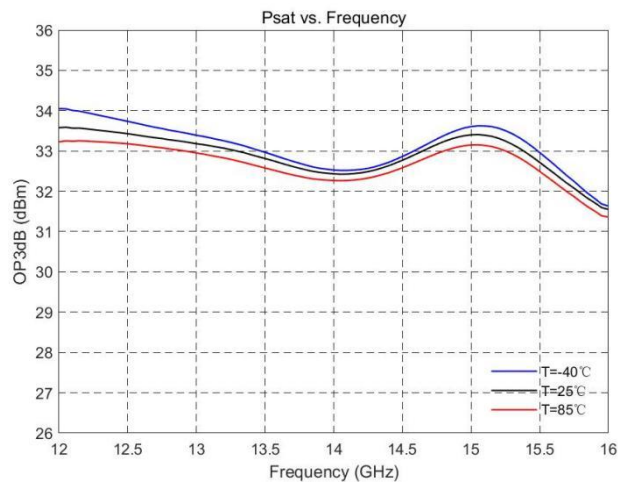


Figure9.

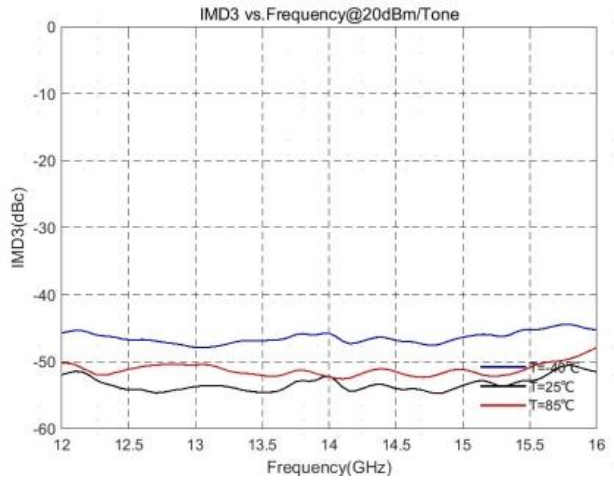


Figure10.

Performance Plots (Cont.)

Test Conditions: VD=6V, Idq=1380mA, TA=+25°C, (de-embedded data)

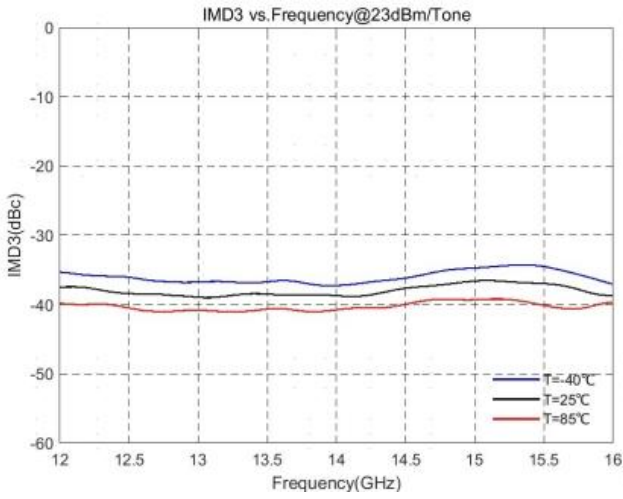


Figure11.

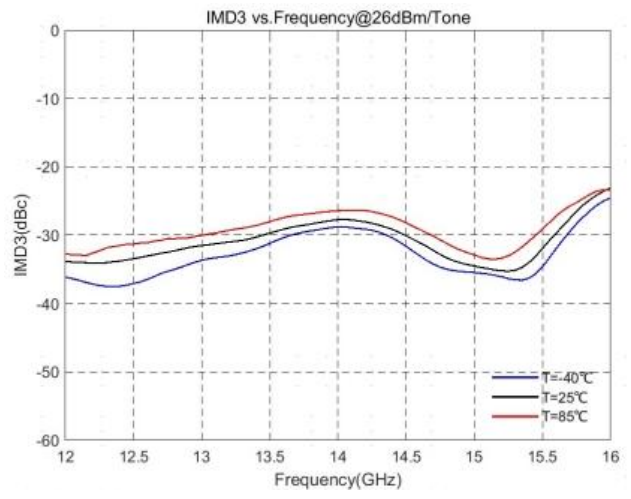


Figure12.

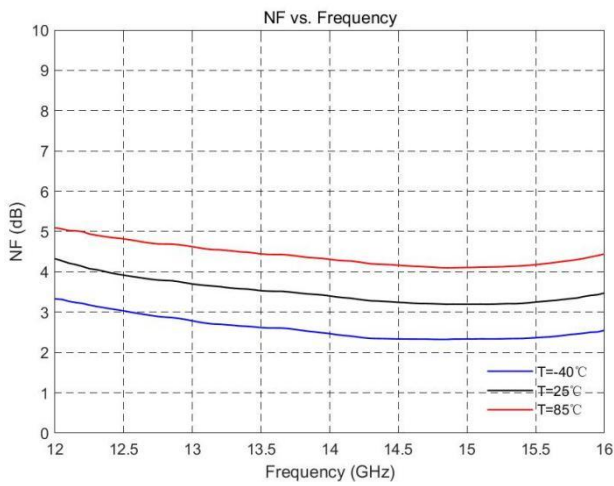


Figure13.

11. Application

11.1 Detector Application Schematic

As shown in the schematic below, the power detector is implemented by providing 5 V bias and measuring the difference in output voltage. This measure can be achieved by mean of either standard op-amp in a differential mode configuration or analog-to-digital converters.

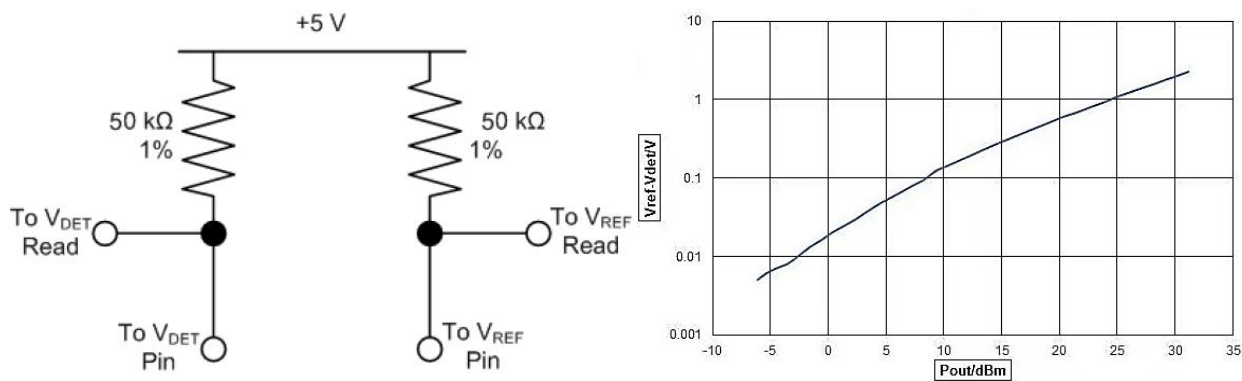


Figure14.

12. Package Marking and Outline Dimensions

- 1) All dimensions are in millimeters.
- 2) QFN 24 pin 5x5x0.85mm Package.
- 3) Marking: Part number – 9001
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.

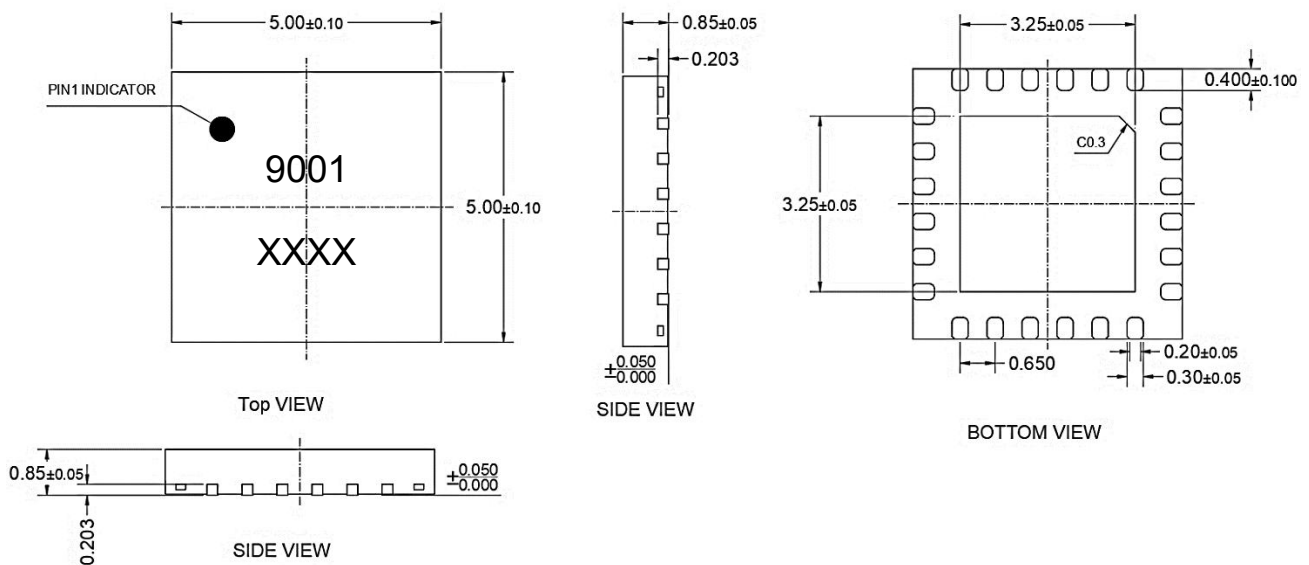


Figure15. Package Marking and Outline Dimensions

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

Website: www.arf-semi.com

Address: 3E Gambas Crescent Singapore 757033

Important Notices and disclaimers

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