

## 81-86GHz GaAs MMIC Low Noise Amplifier

Preliminary Datasheet v1

### Features

- Frequency Range: 81 to 86 GHz
- Drain Voltage 2.5V
- 4.2dB Noise Figure Typical
- 28dB small signal gain
- 50Ω matched RF ports
- Die size: 4.5 mm x 1.5 mm x 0.07 mm



### Description

The VRFA0146V2-BD is a 5-stage low noise amplifier MMIC which operates over the frequency range of 81GHz to 86GHz. The device demonstrates a typical noise figure of 4.5dB with small signal gain of 28dB across the frequency band. Each stage of the VRFA0146V2-BD is biased from a +2.5V DC supply. Total current drawn is 85mA. The RF ports are matched to 50Ω. Typical applications for the VRFA0146V2-BD include high frequency point to point radios and test & instrumentation.

### Electrical Specifications

$T = 25^{\circ}\text{C}$  baseplate,  $V_{g1,2,3,4,5} = -0.02\text{V}$ ,  $V_{d1,2,3,4,5} = 2.5\text{V}$ ,  $I_d = 85\text{mA}$

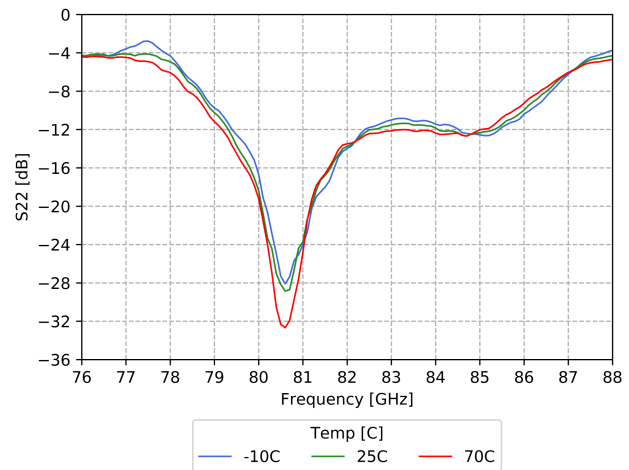
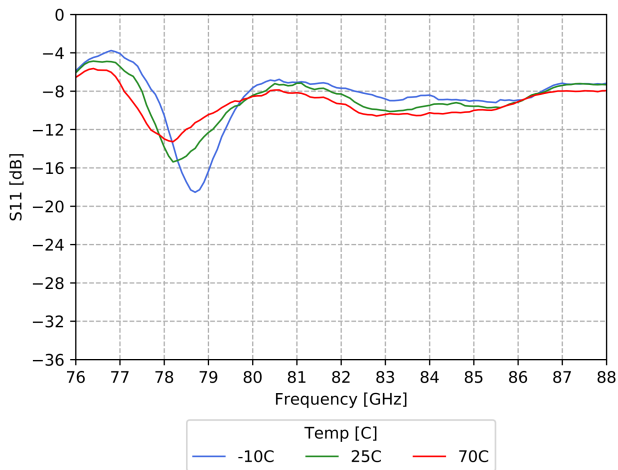
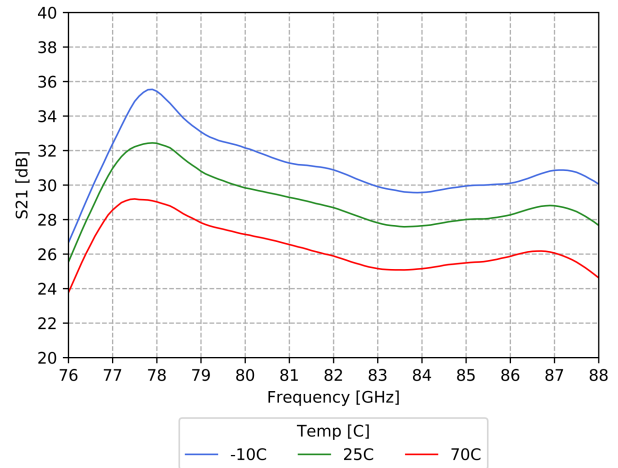
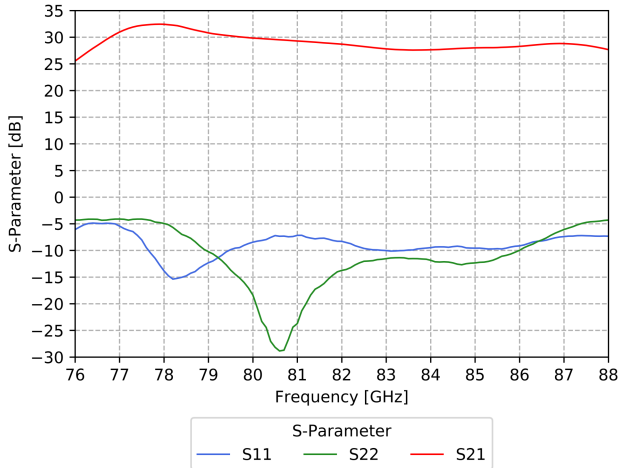
Parameter	Specification			Unit
	Min.	Typ.	Max.	
Frequency Bandwidth	81		86	GHz
Small Signal Gain	28	26@86GHz	28	dB
Noise Figure		4.5	5	dB
I/P Return Loss		-10@86GHz	-8	dB
O/P Return Loss		-28@85GHz	-10	dB
OIP3		18		dBm

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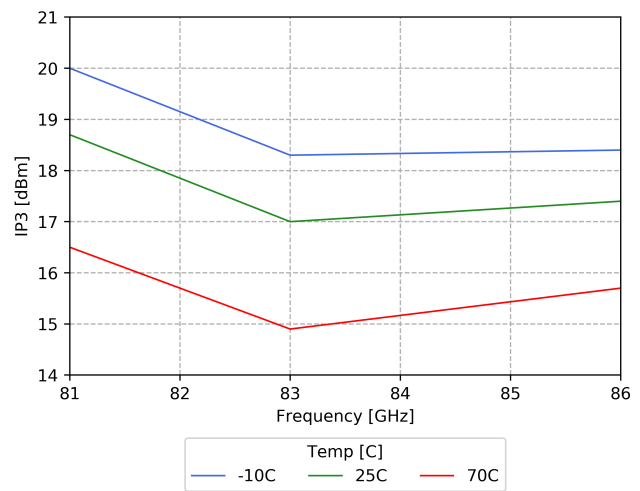
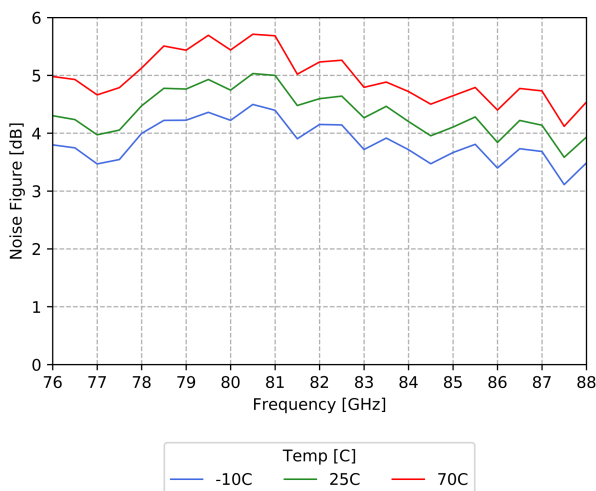
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### Measured Die Performance

$V_{g1,2,3,4,5} = -0.02V$ ,  $V_{d1,2,3,4,5} = 2.5V$ , Total  $I_d = 85mA$



Typical measured S-Parameters over Temperature



Typical measured Noise Figure over Temperature

Typical measured IP3 over Temperature

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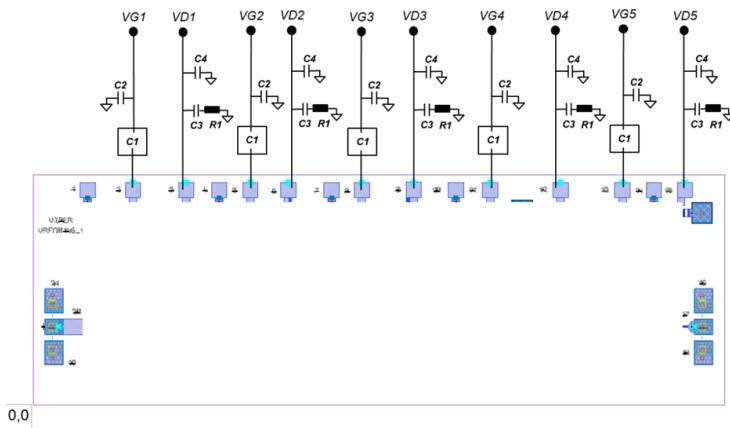
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### Recommended Absolute Maximum Ratings <sup>[1]</sup>

Parameter	Symbol	Value	Notes
Drain bias voltage	Vd	3.5V	
Gate bias voltage	Vg	-2V	
Gate Current	Ig	2mA	
RF input power	RFin	0dBm	
Junction Temperature	T <sub>j</sub>	160°C/230°C	160°C for space applications/230°C for non-space applications
Storage Temperature	T <sub>storage</sub>	-55 to 150°C	

<sup>[1]</sup> Operation outside these conditions may cause permanent damage to the device. Combination of maximum rating conditions may reduce the values. Device performance at these ratings is not implied.

### Assembly & Bonding Diagram



	Value	Max Voltage / Power Rating	Type
C1	100pF	16V	Single Layer chip capacitor
C2, C3	1uF	10V	0402
C4	10uF	10V	0402
R1	10ohm	200mW	0402

ID	PAD	Voltage	Current
20	RF IN		
2,5,8,11,13	Gate	Vg = -0.1V typical	Negligible
3,6,9,12,15	Drain	Vd = 2.5V typical	85mA
17	RF OUT		
Die Bottom	GND		

Die Size	4.5 mm x 1.5 mm
Die Thickness	70µm
Minimum Bondpad opening	100µm x 100µm

**1. Ribbon Bond (Length: <0.15mm and diameter:0.05mm) is recommended**

GaAs and GaN devices are ESD sensitive and precautions should be observed during storage, handling, assembly and testing.



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### **Amplifier Bias on Procedure:**

- Set VG1, VG2, VG3, VG4 and VG5 to -1V
- Increase VD1, VD2, VD3, VD4 and VD5 to 2.5V
- Reduce VG1, VG2, VG3, VG4 and VG5 to approximately 0V to set the right drain current
- Turn RF ON

### **Amplifier Bias off Procedure:**

- Turn RF OFF
- Set VG1, VG2, VG3, VG4 and VG5 to -1V
- Set VD1, VD2, VD3, VD4 and VD5 to 0V