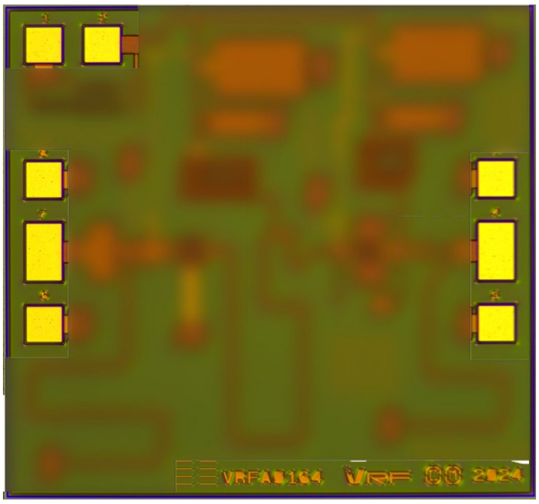
VRFA0164-BD

7GHz—11GHz MMIC Low-Noise Amplifier

Product Datasheet V1.2



Features

- Frequency Range: 7GHz to 11GHz
- 24dB Small signal gain
- 1.1dB Noise-Figure
- Self-Biased, Vd=3.0V, Id=130mA typical
- 50Ω matched RF ports
- Die size = 1.5mm x 1.4mm

Description

The VRFA0164-BD is a GaAs low-noise amplifier MMIC which operates over the frequency range of 7GHz to 11GHz. The amplifier typically delivers a small signal gain of +24dB with a typical noise-figure of 1.1dB. The LNA is self-biased with a typical drain voltage supply of 3V DC resulting in a typical quiescent current of 130mA. The RF ports are DC blocked and matched to 50Ω.

Applications

- General Purpose
- Radars
- Telecommunications
- Test Equipment

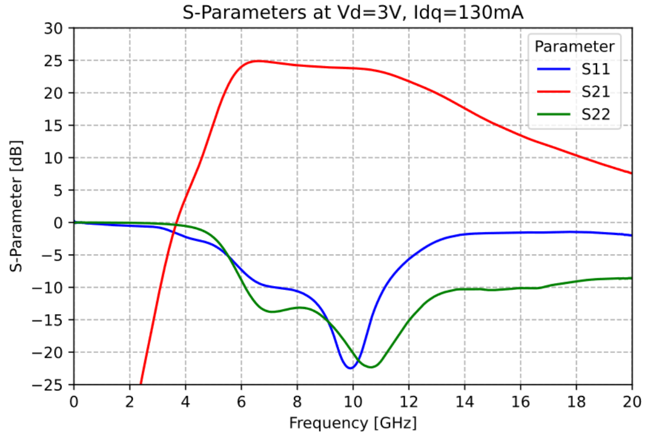
Electrical Specifications

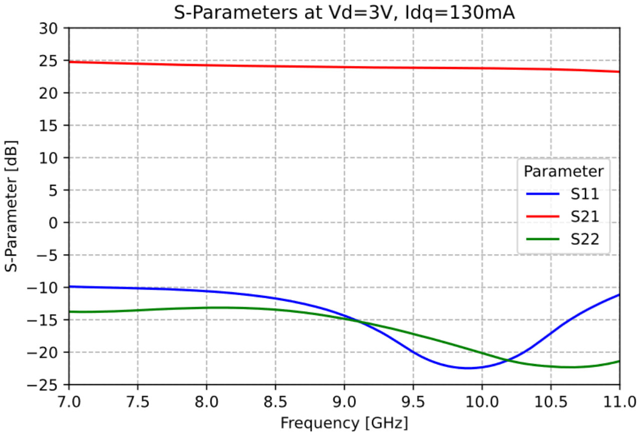
T=+25°C, V_{DD} = +3.0V, I_{DD} = 130mA

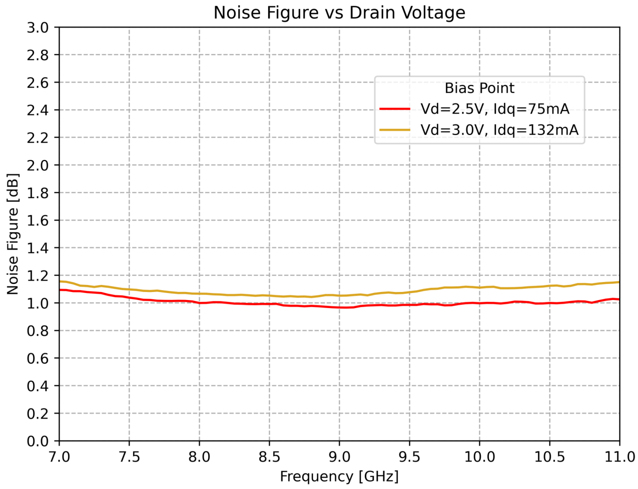
Parameter	Test Condition	Specification			Unit
		Min.	Typ.	Max.	
Frequency Bandwidth	-	7	-	11	GHz
Small-Signal Gain	-30dBm Input Power	-	24	-	dB
I/P Return Loss	-30dBm Input Power	-	11	-	dB
O/P Return Loss	-30dBm Input Power	-	12.5	-	dB
Noise-Figure	-45dBm Input Power	-	1.1	-	dB
P1dB	-	-	16	-	dBm
Psat	-	-	18	-	dBm
Output IP3	-25dBm Input Power	-	29	-	dBm
Current Consumption	-	-	130	-	mA

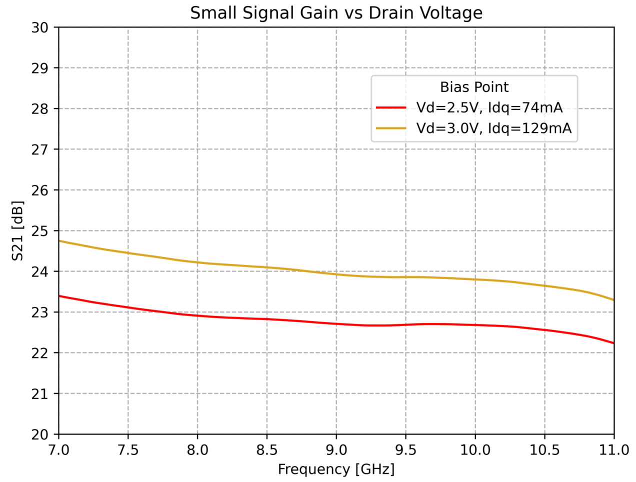
Measured Performance

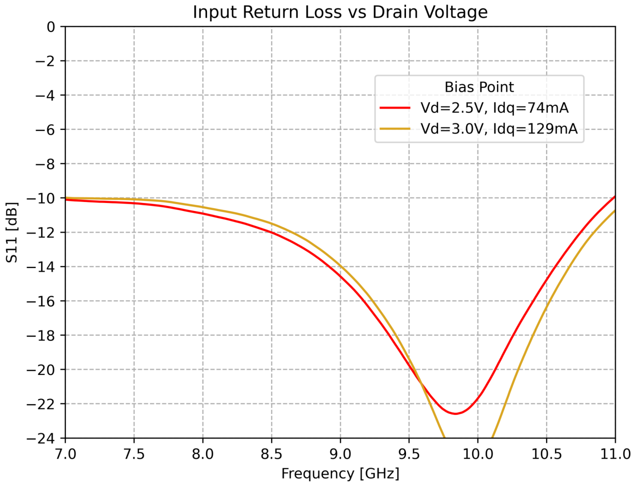
T=+25°C , V_{DD} = +3.0V, I_{DD}= 130mA (Reference Plane: RF including bondwires)

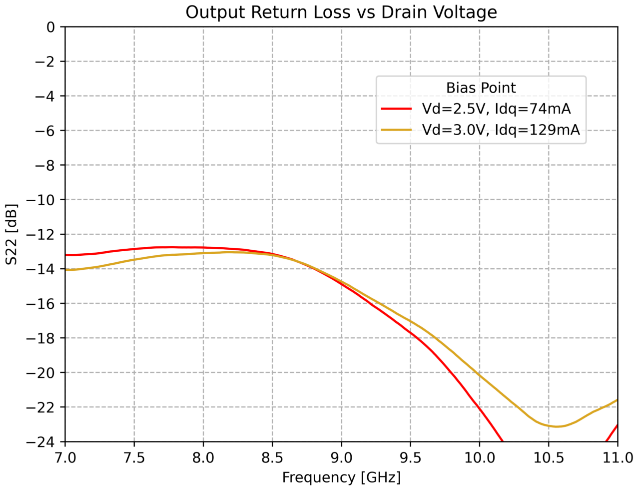


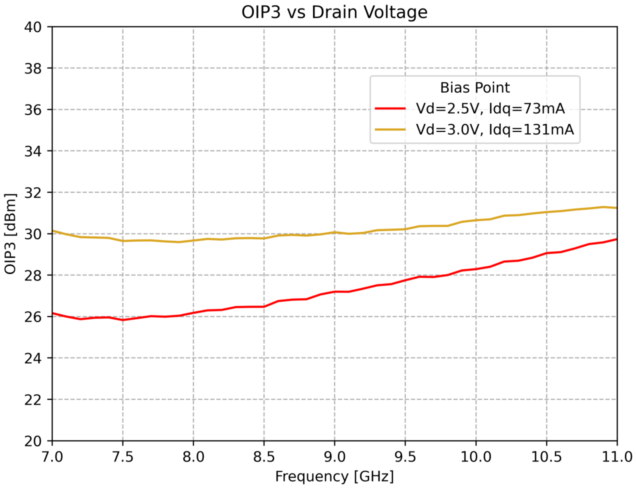




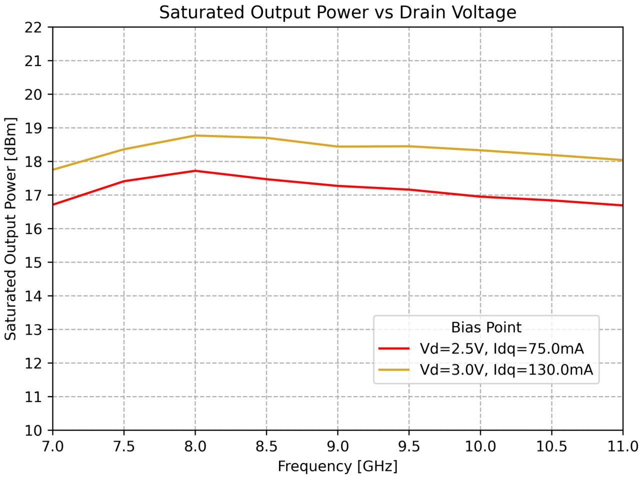




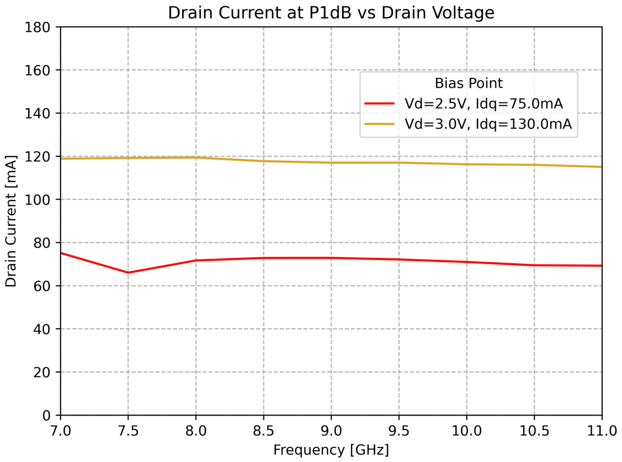




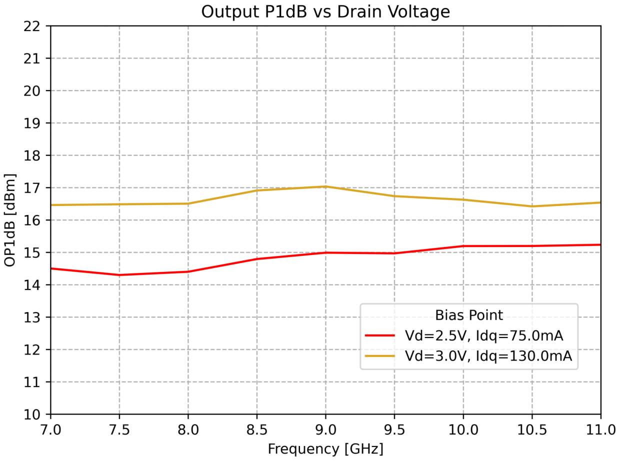
OIP3 vs Drain Voltage
OIP3 [dBm]
Frequency [GHz]
Bias Point
Vd=2.5V, Idq=73mA
Vd=3.0V, Idq=131mA
20
22
24
26
28
30
32
34
36
38
40
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0



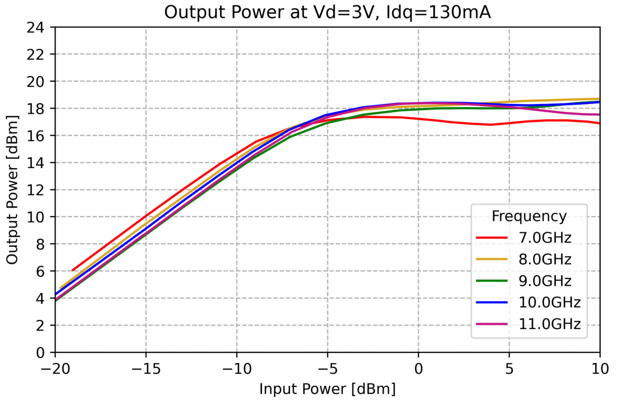
Saturated Output Power vs Drain Voltage
Saturated Output Power [dBm]
Frequency [GHz]
Bias Point
Vd=2.5V, Idq=75.0mA
Vd=3.0V, Idq=130.0mA
10
11
12
13
14
15
16
17
18
19
20
21
22
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0



Drain Current at P1dB vs Drain Voltage
Drain Current [mA]
Frequency [GHz]
Bias Point
Vd=2.5V, Idq=75.0mA
Vd=3.0V, Idq=130.0mA
0
20
40
60
80
100
120
140
160
180
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0



Output P1dB vs Drain Voltage
OP1dB [dBm]
Frequency [GHz]
Bias Point
Vd=2.5V, Idq=75.0mA
Vd=3.0V, Idq=130.0mA
10
11
12
13
14
15
16
17
18
19
20
21
22
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0



Output Power at Vd=3V, Idq=130mA
Output Power [dBm]
Input Power [dBm]
Frequency
7.0GHz
8.0GHz
9.0GHz
10.0GHz
11.0GHz
0
2
4
6
8
10
12
14
16
18
20
22
24
−20
−15
−10
−5
0
5
10

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Absolute Maximum Ratings [1][2]

Parameter	Value
Drain Voltage	+4V
Input Power	15dBm
Junction Temperature	175°C
Thermal Resistance	99°C/W
Operating Temperature	-40 to 85°C
Storage temperature	-55 to 150°C

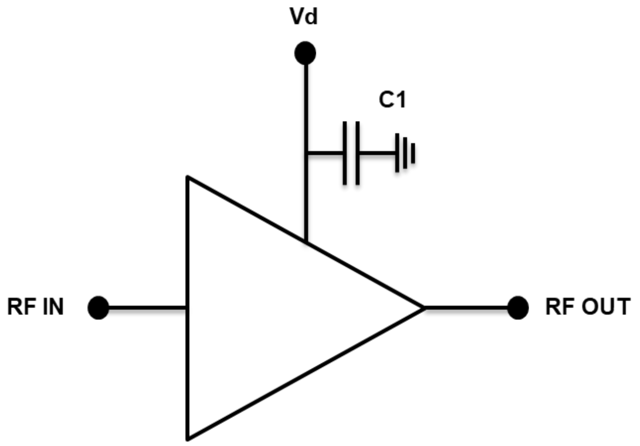
[1] *Operation outside these conditions may cause permanent damage to the device.*

[2] *Combination of maximum rating conditions may reduce the values. Device performance at these ratings is not implied.*

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Drain Voltage	2.5	3.0	4.0	V
Drain Current	-	130	-	mA

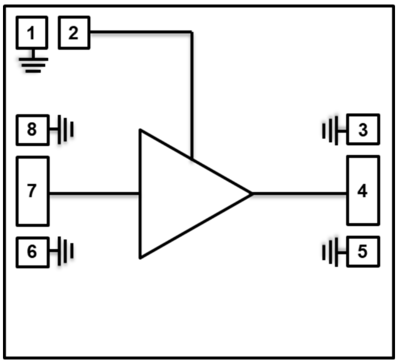
Applications Circuit



Designator	Value	Example Part #	Case
C1	0.01 uF	KYOCERA AVX — 04025C103K4T2A	0402

Pin Configuration

Pin #	Function	Description
1	GND	Ground
2	VD	Drain Voltage
3, 5, 6, 8	RF GND	RF Ground
4	RF OUT	Output RF
7	RF IN	Input RF



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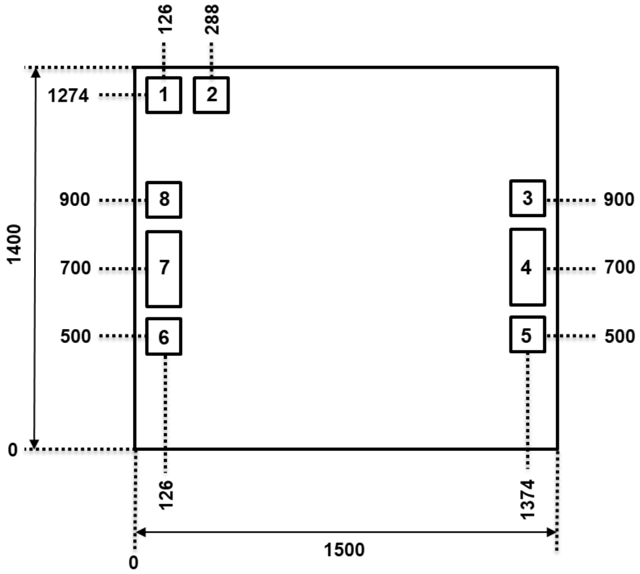
Assembly Diagram

All units are in um

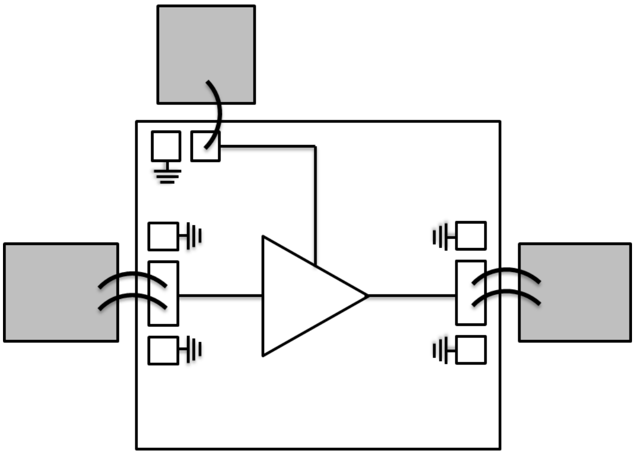
Pad #	Location[3] (x,y)
1	126um x 1274um
2	288um x 1274um
3	1374um x 900um
4	1374um x 700um
5	1374um x 500um
6	126um x 500um
7	126um x 700um
8	126um x 900um

[3] From origin to centre of pad



Bonding Diagram

Parameter	Value
GND bond pad opening	100um x 100um
Drain bond pad opening	100um x 100um
RF bond pad opening	100um x 160um
RF bond wire length	500um
Die size	1.5mm x 1.4mm
Die thickness	100um



Order Information

Part Number	Details
VRFA0164	Die in Gel Pack

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