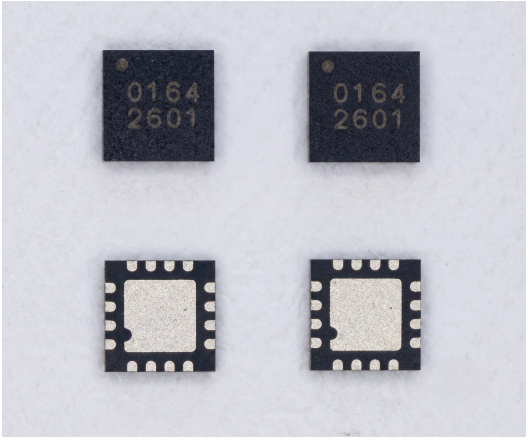
VRFA0164-QFN

7 GHz-11 GHz MMIC Low Noise Amplifier

Datasheet

Features

- Frequency Range: 7 to 11 GHz
- 24 dB Small Signal Gain
- 1.1 dB Noise Figure
- Self-Biased, Vd=3.0V, Id=130mA typical
- 50 Ohm Matched RF Ports
- QFN Packaged 3 mm x 3 mm x 0.55 mm
- OIP3 29 dBm typical at 3.0 V, 130 mA



Applications

- General Purpose
- Radars
- Telecommunications
- Test Equipment

Description

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

Electrical Specifications

Test conditions: T = +25°C, Vd = +3.0 V, Idd = 130 mA

Parameter	Symbol	Min	Typ	Max	Unit
Frequency Bandwidth	BW	7		11	GHz
Small-Signal Gain (-30dBm Input Power)	S21		24		dB
I/P Return Loss (-30dBm Input Power)	S11		12		dB
O/P Return Loss (-30dBm Input Power)	S22		12.5		dB
Noise Figure (-45dBm Input Power)	NF		1.1		dB
1dB compression point	P1dB		16		dBm
Saturated Output Power	Psat		18		dBm
Output IP3 (-25dBm Input Power)	OIP3		29		dBm
Current Consumption	Idd		130		mA

[1] control applied on VG pad

Absolute Maximum Ratings

Parameter	Symbol	Value
Drain Voltage	Vd	+4 V
Input Power	RFin	+15 dBm
Junction Temperature	Tj	+175°C
Thermal Resistance	R_th	99°C/W
Operating Temperature	TA	-40 to +85°C
Storage Temperature	Tstg	-55 to +150°C

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.

Recommended Operating Conditions

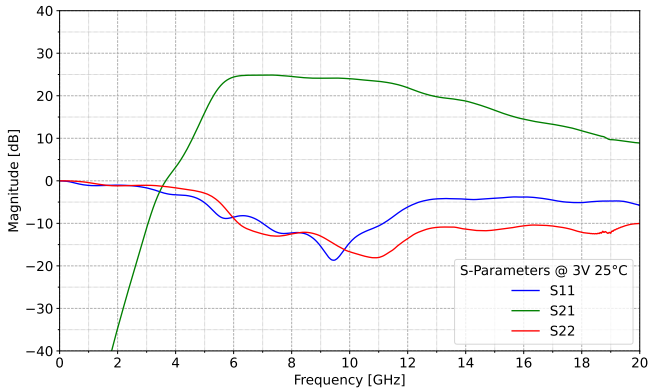
Parameter	Symbol	Min	Typ	Max	Unit
Drain Voltage	Vd	2.5	3	4	V
Drain Current	Idd		130		mA

S-Parameters

Measured on the evaluation board; reference plane at the QFN package.

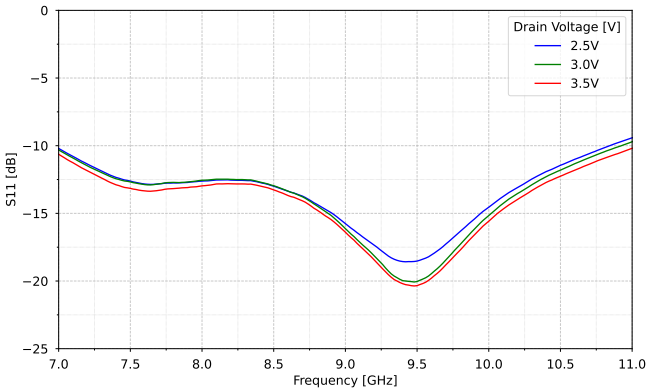
Wide Band S-Parameters

T = +25°C, Vd = 3 V, Idq = 130 mA, reference plane: QFN Package



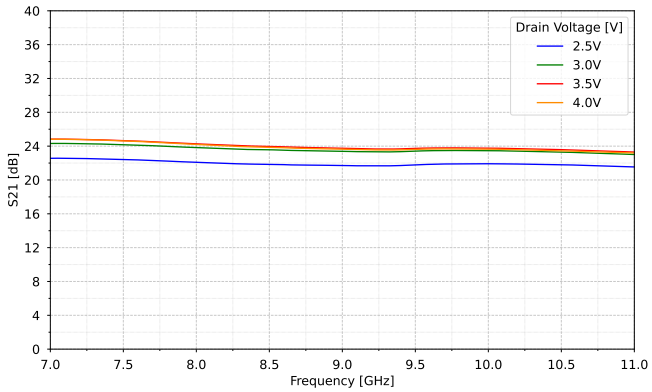
Input Losses over Bias Voltage

T = +25°C, reference plane: QFN Package



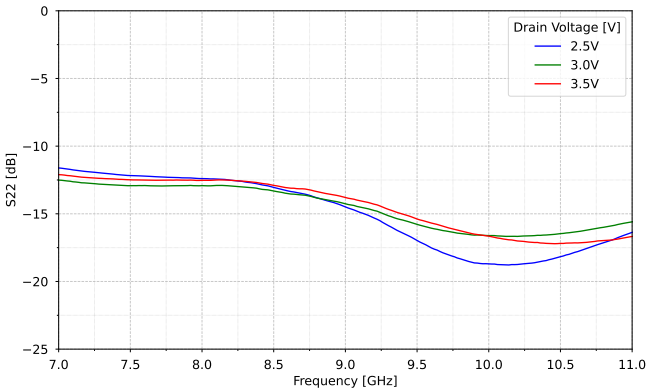
Small Signal Gain over Bias Voltage

T = +25°C, reference plane: QFN Package



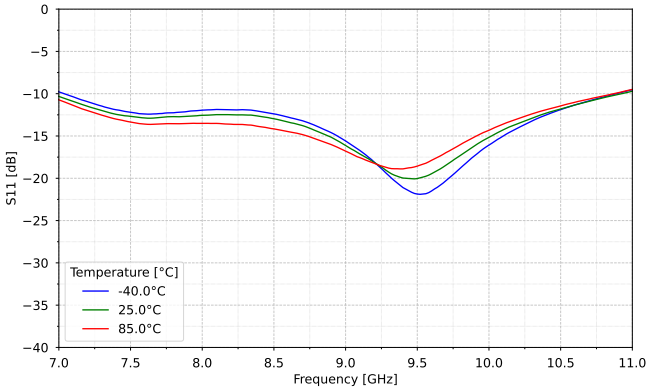
Output Losses over Bias Voltage

T = +25°C, reference plane: QFN Package



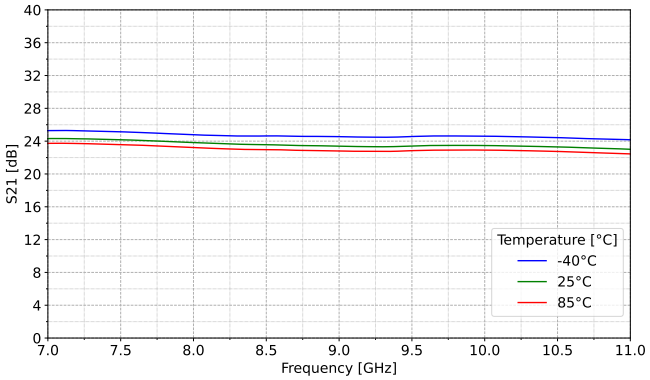
Input Losses over Temperature

Vd = 3 V, Idq = 130 mA, reference plane: QFN Package



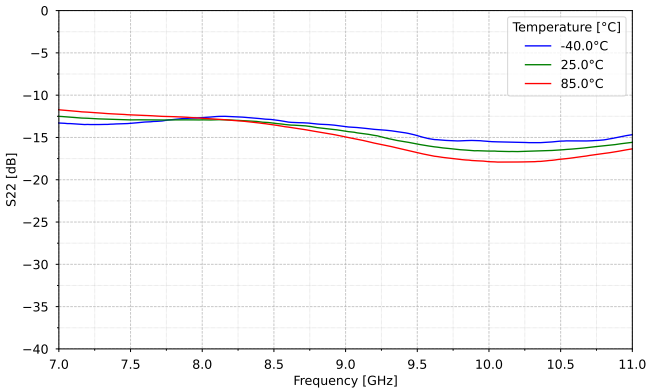
Small Signal Gain over Temperature

Vd = 3 V, Idq = 130 mA, reference plane: QFN Package



Output Losses over Temperature

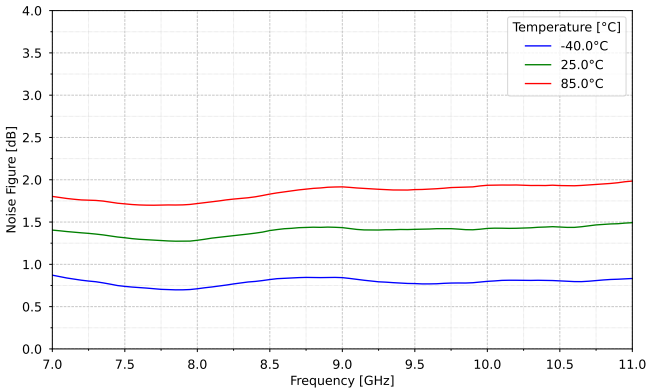
Vd = 3 V, Idq = 130 mA, reference plane: QFN Package



Noise Figure

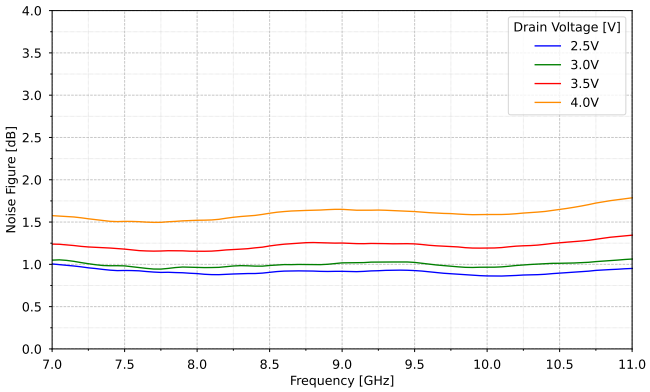
Noise Figure over Temperature

Vd = 3.0 V, Idq = 132 mA, reference plane: QFN Package



Noise Figure over Bias Voltage

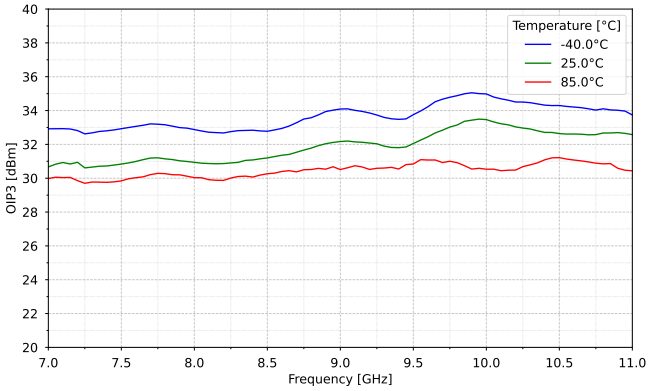
T = +25°C, reference plane: QFN Package



Large-Signal Performance

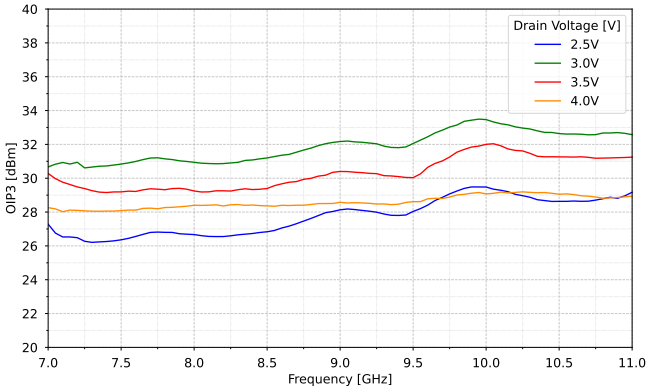
OIP3 over Temperature

Vd = 3.0 V, Idq = 131 mA, reference plane: QFN Package



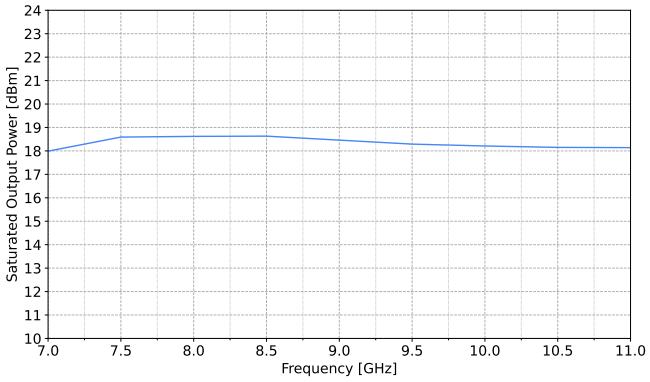
OIP3 over Bias Voltage

T = +25°C, reference plane: QFN Package



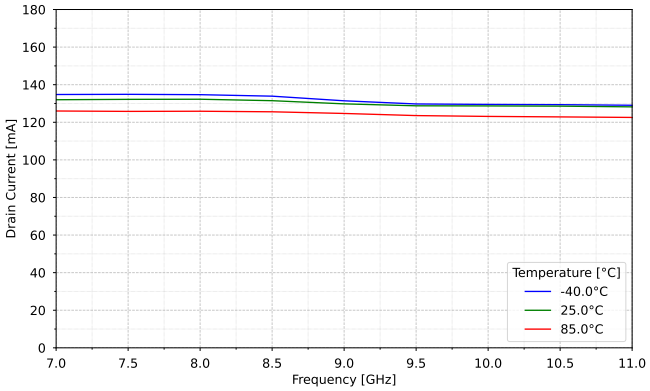
Saturated Output Power

T = +25°C, Vd = 3.0 V, Idq = 131 mA, reference plane: QFN Package



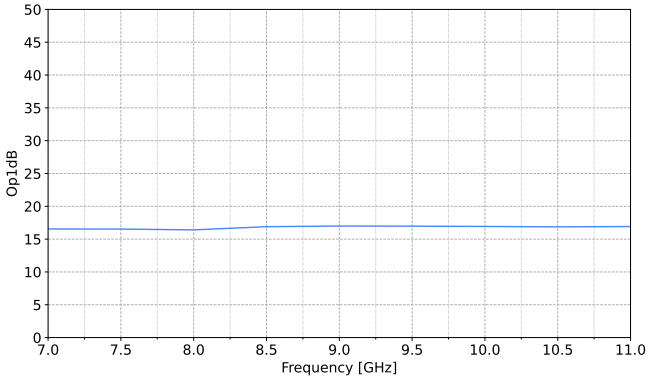
Drain Current at P1dB over Temperature

T = +25°C, Vd = 3.0 V, Idq = 131 mA, reference plane: QFN Package



Output P1dB

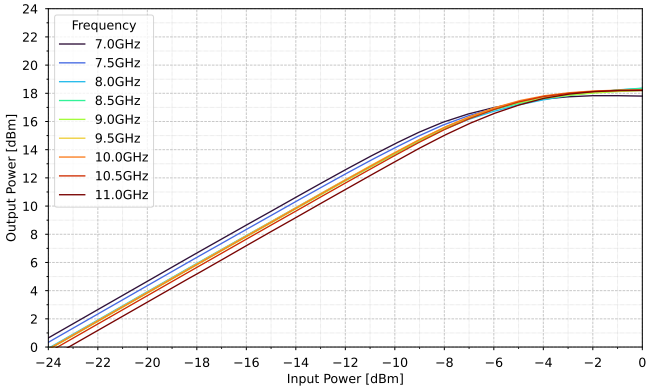
T = +25°C, Vd = 3.0 V, Idq = 131 mA, reference plane: QFN Package



Power Sweep

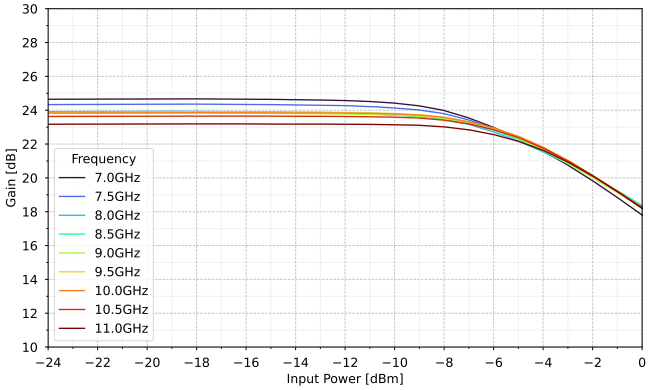
Output Power vs Input Power at 25°C

T = +25°C, Vd = 3 V, reference plane: QFN Package



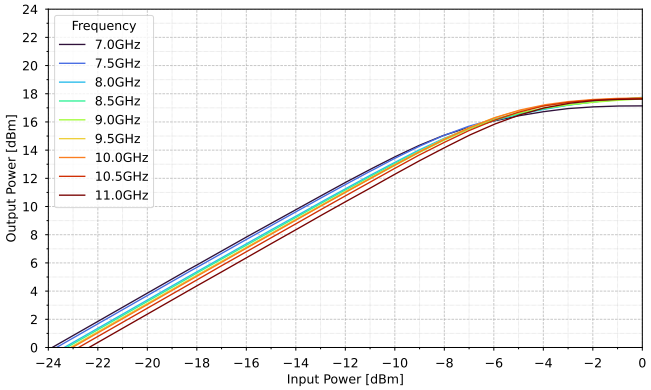
Gain vs Input Power at 25°C

T = +25°C, Vd = 3 V, reference plane: QFN Package



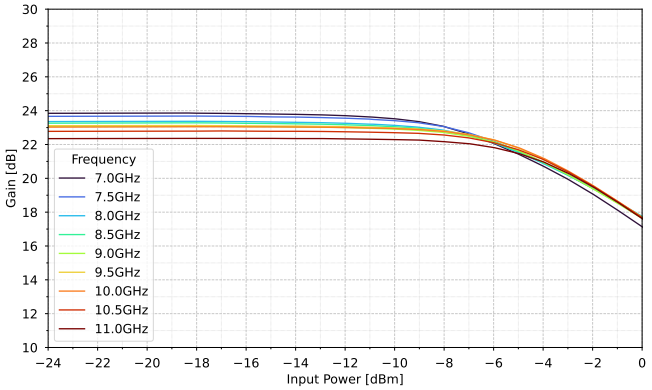
Output Power vs Input Power at 85°C

T = +85°C, Vd = 3 V, reference plane: QFN Package



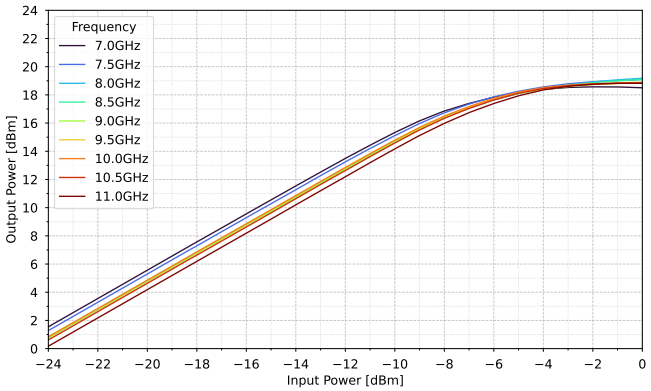
Gain vs Input Power at 85°C

T = +85°C, Vd = 3 V, reference plane: QFN Package



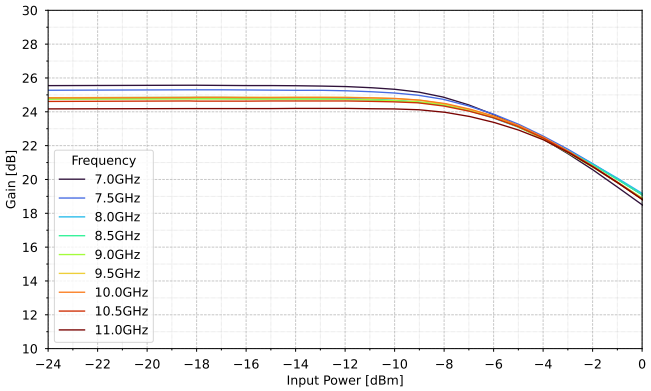
Output Power vs Input Power at -40°C

T = -40°C, Vd = 3 V, reference plane: QFN Package



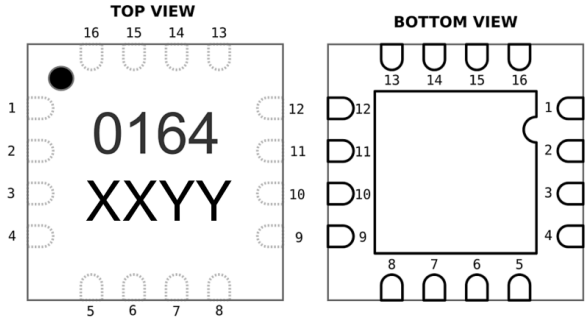
Gain vs Input Power at -40°C

T = -40°C, Vd = 3 V, reference plane: QFN Package

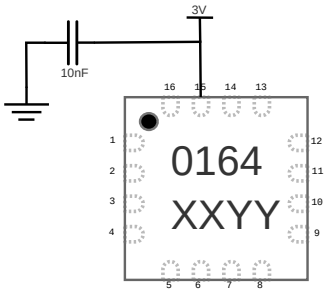


Pin Configuration

Pin	Function	DC Voltage	Description
16	GND	0 V	Ground
15	VD	+3.0 V	Drain Voltage
2, 4, 9, 11	RF GND	0 V	RF Ground
10	RF OUT	DC Blocked	Output RF
3	RF IN	DC Blocked	Input RF
1, 5, 6, 7, 8, 12, 13, 14	NC	-	No Connect



Application Circuit

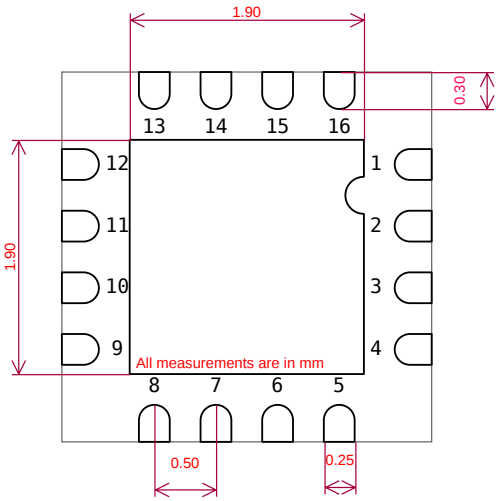


* XXYY = batch date

Ref Des	Value	Case
C1	0.01 uF	0402

Package Information

Package type	QFN
Dimensions	3 x 3 x 0.55 mm



Handling and ESD

ESD-sensitive device (GaAs). Observe full precautions during storage, handling, assembly and testing.

Ordering Information

Part Number	Details
VRFA0164-QFN	QFN in Tape and Reel

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