



## Product Description

GRF2106 is a low cost, high gain LNA designed for a wide range of applications up to 4.2 GHz.

The device is operated from a supply voltage ( $V_{dd}$ ) range of 2.7 to 5.0 V with  $I_{ddq}$  set from 10 mA to 30 mA for optimal efficiency and linearity.

The device is housed in a 1.5 x 1.5 x 0.5 mm 6-pin plastic DFN package. Consult with the GRF applications engineering team for custom tuning/evaluation board data and device s-parameters.

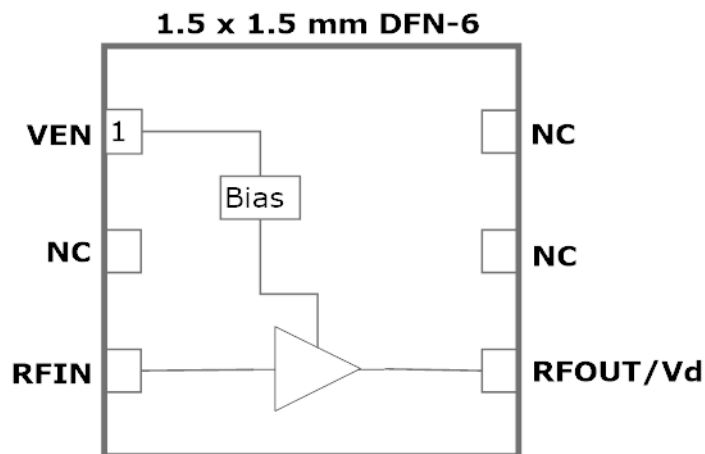
## Features

Reference: 3.3V/15mA/2.45 GHz

- Gain: 21.5 dB
- Evaluation Board NF: 0.80 dB
- OP1dB: 11.0 dBm
- OIP3: 21.0 dBm
- Flexible bias voltage and Current
- Minimal External Components
- Process: GaAs pHEMT

## Applications

- ISM
- GPS
- Cellular Booster
- Compensator
- VHF/UHF





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# GRF2106

High Gain, Low Current LNA  
Tuning Range: 0.1 to 4.2 GHz

## Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V <sub>DD</sub>	0	6.0	V
RF Input Power CW: (Load VSWR < 2:1; V <sub>D</sub> : <=5.0 volts)	P <sub>IN MAX</sub>		17	dBm
Operating Temperature (Package Heat Sink)	T <sub>AMB</sub>	-40	105	°C
Maximum Channel Temperature (MTTF > 10 <sup>6</sup> Hours)	T <sub>MAX</sub>		170	°C
Maximum Dissipated Power	P <sub>DISS MAX</sub>		150	mW
<b>Electrostatic Discharge:</b>				
Charged Device Model:	CDM	1500		V
Human Body Model:	HBM	250		V
<b>Storage:</b>				
Storage Temperature	T <sub>STG</sub>	-65	150	°C
Moisture Sensitivity Level	MSL		1	--



**Caution!** ESD Sensitive Device

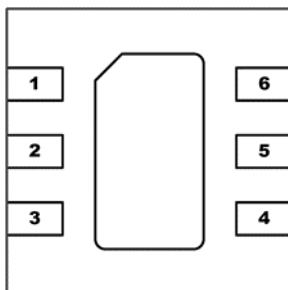


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

**Note:** For manufacturing information, see the [Guerrilla-RF.com](http://Guerrilla-RF.com) website for the following document located on the GRF2106 landing page: Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

[Link to manufacturing note](#)

## Pin Out (Top View)



## Pin Assignments:

Pin	Name	Description	Note
1	V <sub>ENABLE</sub>	Enable Voltage Input	V <sub>ENABLE</sub> and series resistor set I <sub>DDQ</sub> . V <sub>ENABLE</sub> < 0.2 volts disables device. On-die pull-down resistor will turn the part off if this node is allowed to float.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	An external DC blocking cap must be used.
4	RF_Out	LNA RF output/V <sub>dd</sub>	V <sub>DD</sub> must be applied through a choke to this pin
5	NC	No Connect or Ground	No internal connection to die
6	NC	No Connect or Ground	No internal connection to die
PKG BASE	GND	Ground	Provides DC and RF ground for LNA, as well as thermal heat sink. Recommend multiple 8 mil vias beneath the package for optimal RF and thermal performance. Refer to evaluation board top layer graphic on schematic page.



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## Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F <sub>TEST</sub>		2.45		GHz	V <sub>DD</sub> = 3.3V, T <sub>A</sub> = 25 °C
Gain	S <sub>21</sub>	19.5	21.5		dB	
Noise Figure (Evaluation Board)	NF		0.80	1.0	dB	
Output 1dB Compression Power	OP1dB	7.3	11.0		dBm	
Output 3rd Order Intercept	OIP3		21.0		dBm	-5.0 dBm P <sub>OUT</sub> per tone (2449 and 2451 MHz)
Switching Rise Time	T <sub>RISE</sub>		1000		ns	
Switching Fall Time	T <sub>FALL</sub>		100		ns	
Supply Current	I <sub>DD</sub>		15		mA	V <sub>ENABLE</sub> =3.3V; R <sub>BIAS</sub> =5.0k Ω
Enable Current	I <sub>ENABLE</sub>		0.5	1.0	mA	
<b>Disabled Mode</b>						
Leakage Current	I <sub>LEAKAGE</sub>		250	500	uA	V <sub>DD</sub> : 3.3V; V <sub>ENABLE</sub> : 0.0V
<b>Thermal Data</b>						
Thermal Resistance: (Infra-Red Scan)	Q <sub>JC</sub>		100		°C/W	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	T <sub>CHANNEL</sub>		90		°C	V <sub>DD</sub> : 3.3 V; I <sub>DDQ</sub> : 15 mA; No RF P <sub>DISS</sub> : 50 mW

Note: MTTF >10<sup>6</sup> hours for T<sub>CHANNEL</sub> < =170 degrees C.

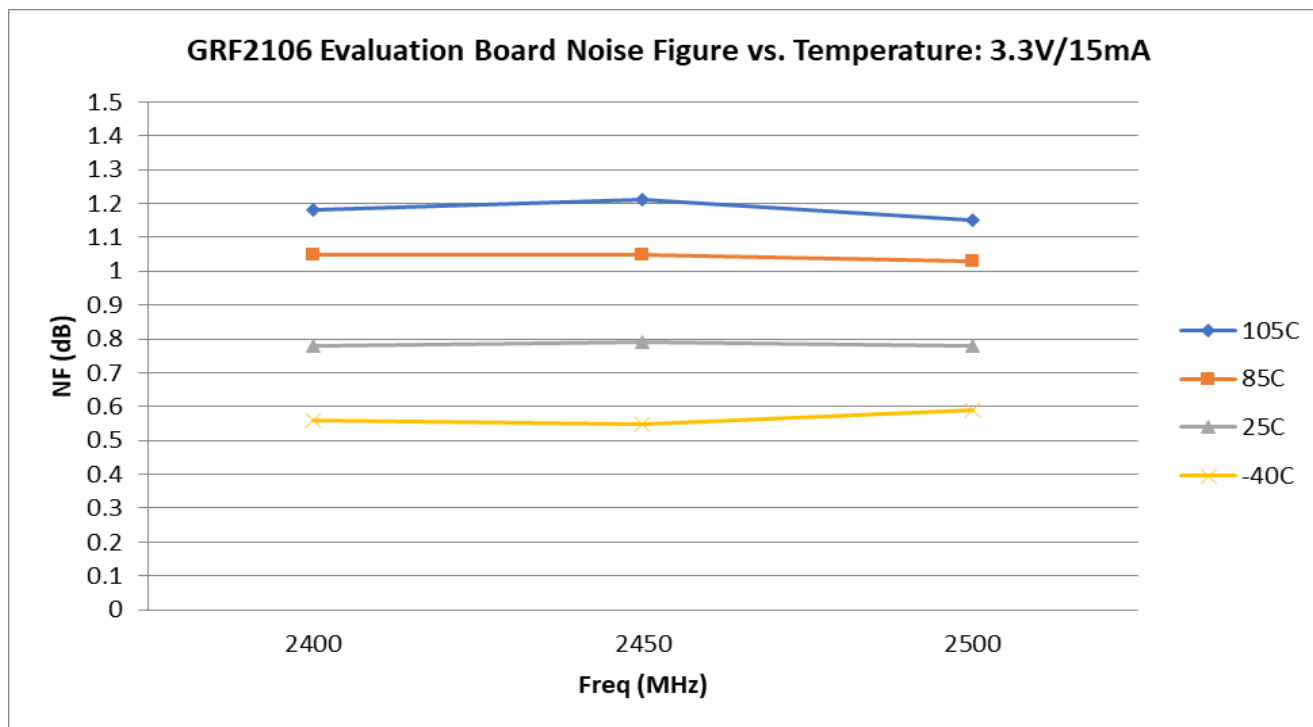
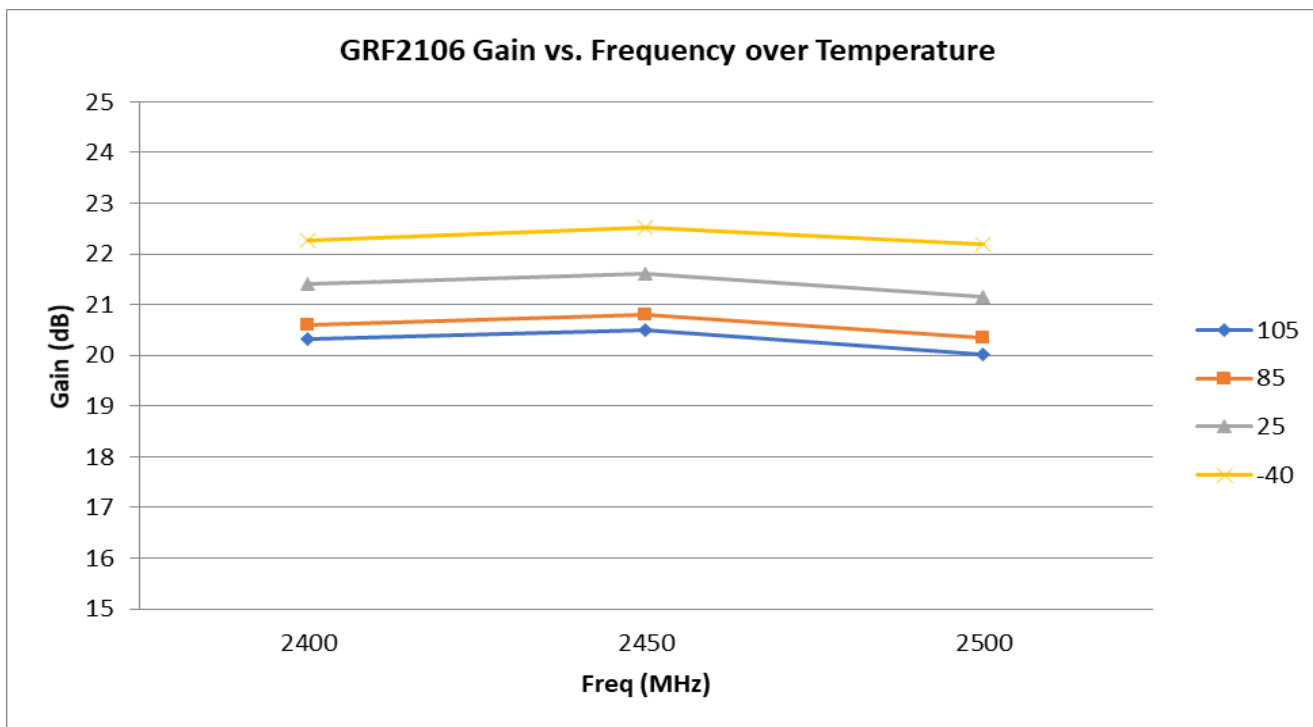


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## GRF2106 Evaluation Board Data:



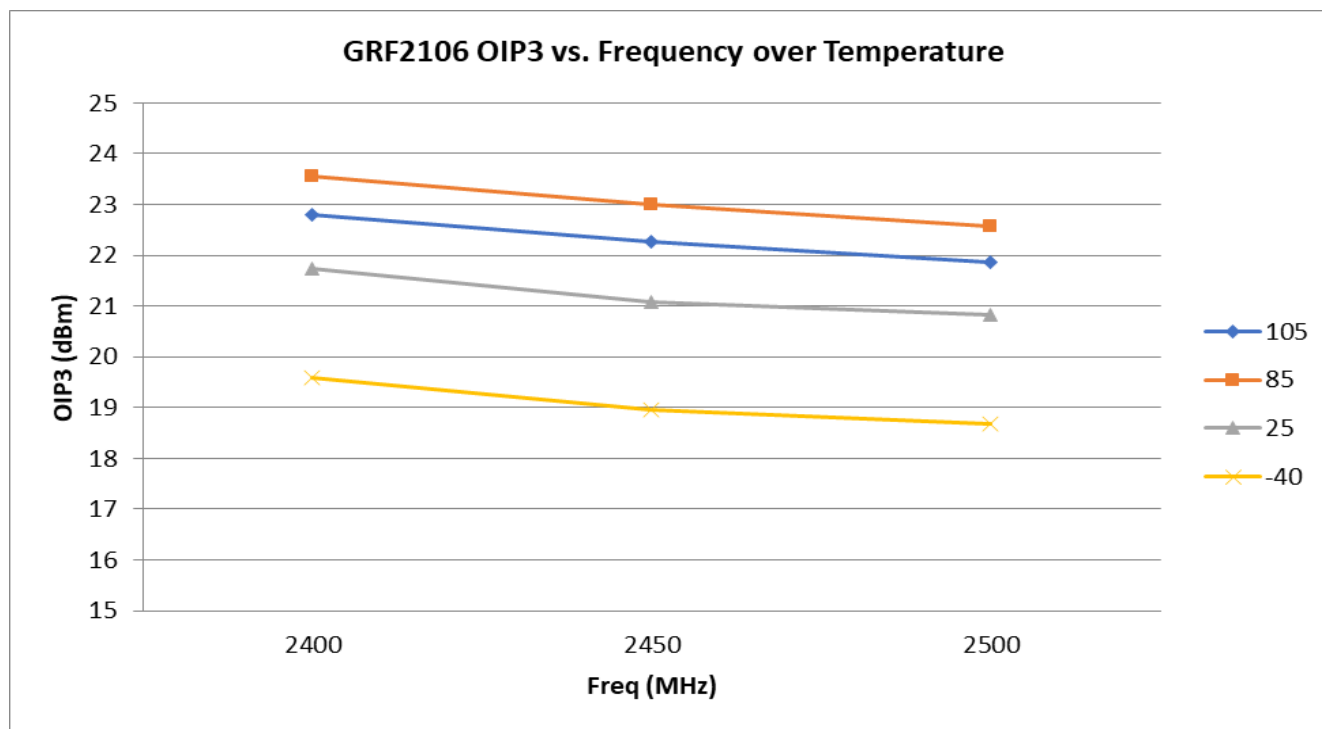
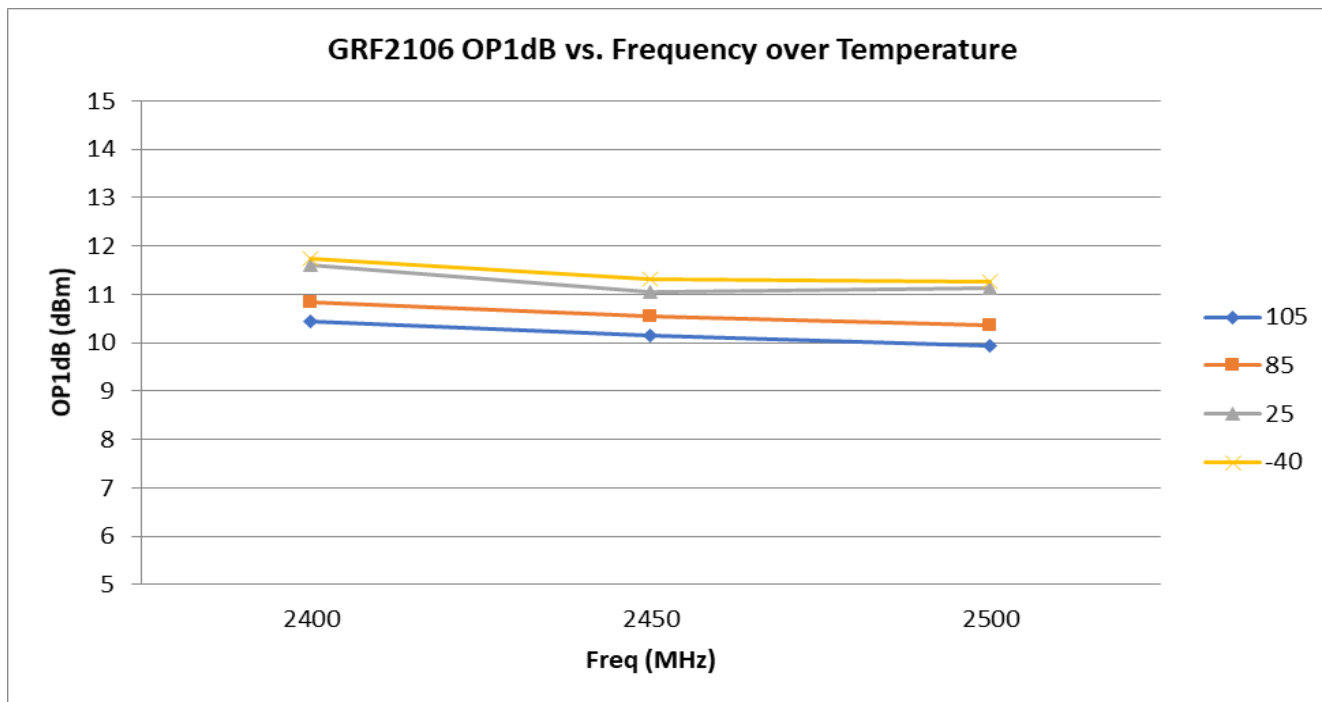


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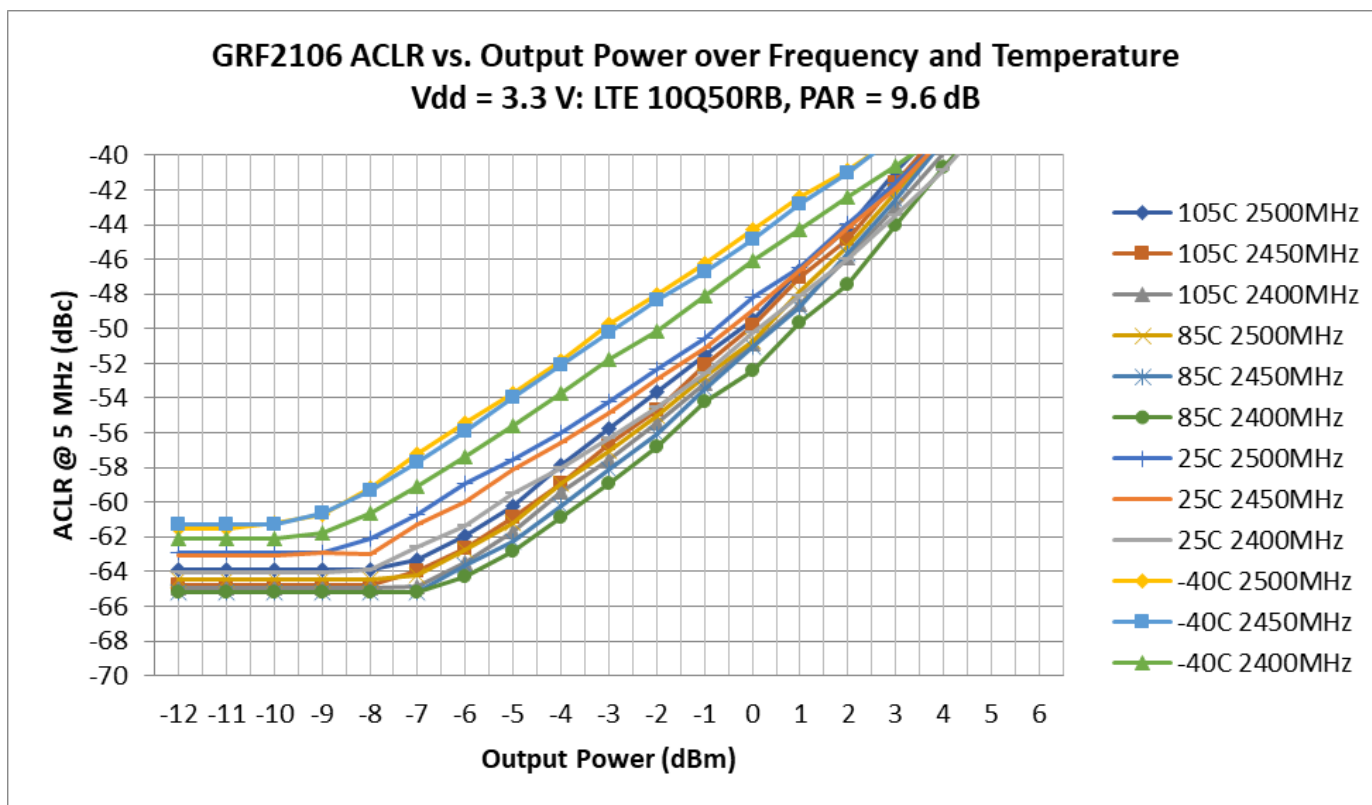
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Tuning Range: 0.1 to 4.2 GHz

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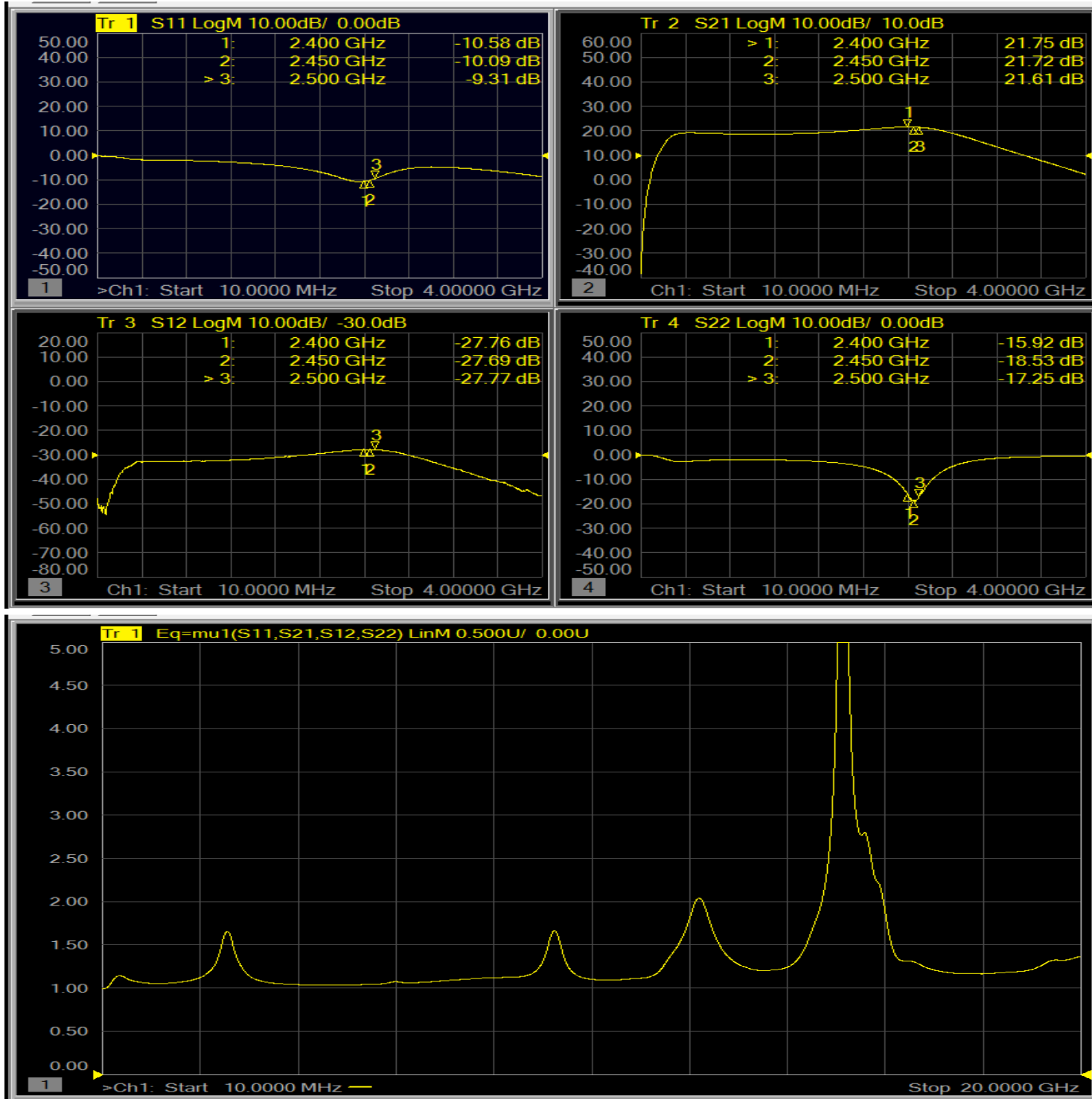


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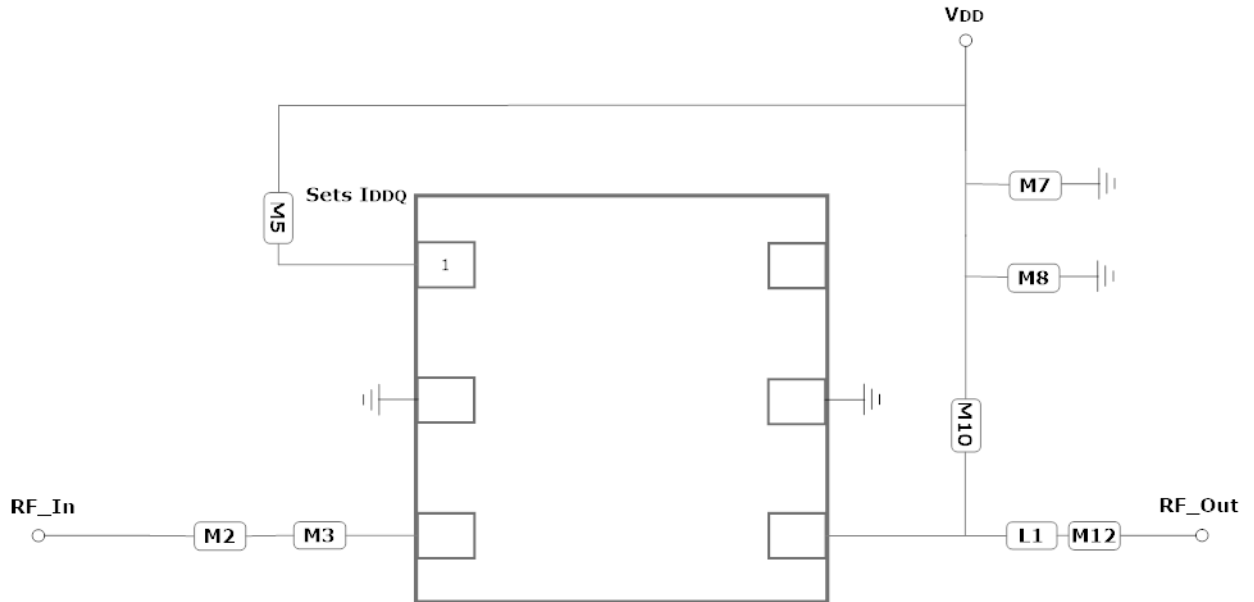
High Gain, Low Current LNA  
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## GRF2106 Evaluation Board S-pars:

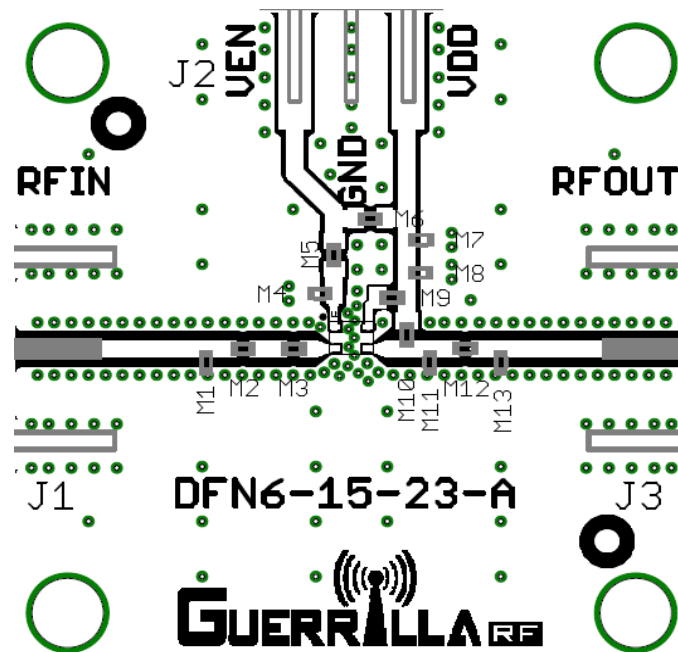


Note:  $\mu \geq 1.0$  implies unconditional stability





GRF2106 Application Schematic (2.4 to 2.5 GHz Tune)



GRF2106 Evaluation Board Assembly Drawing



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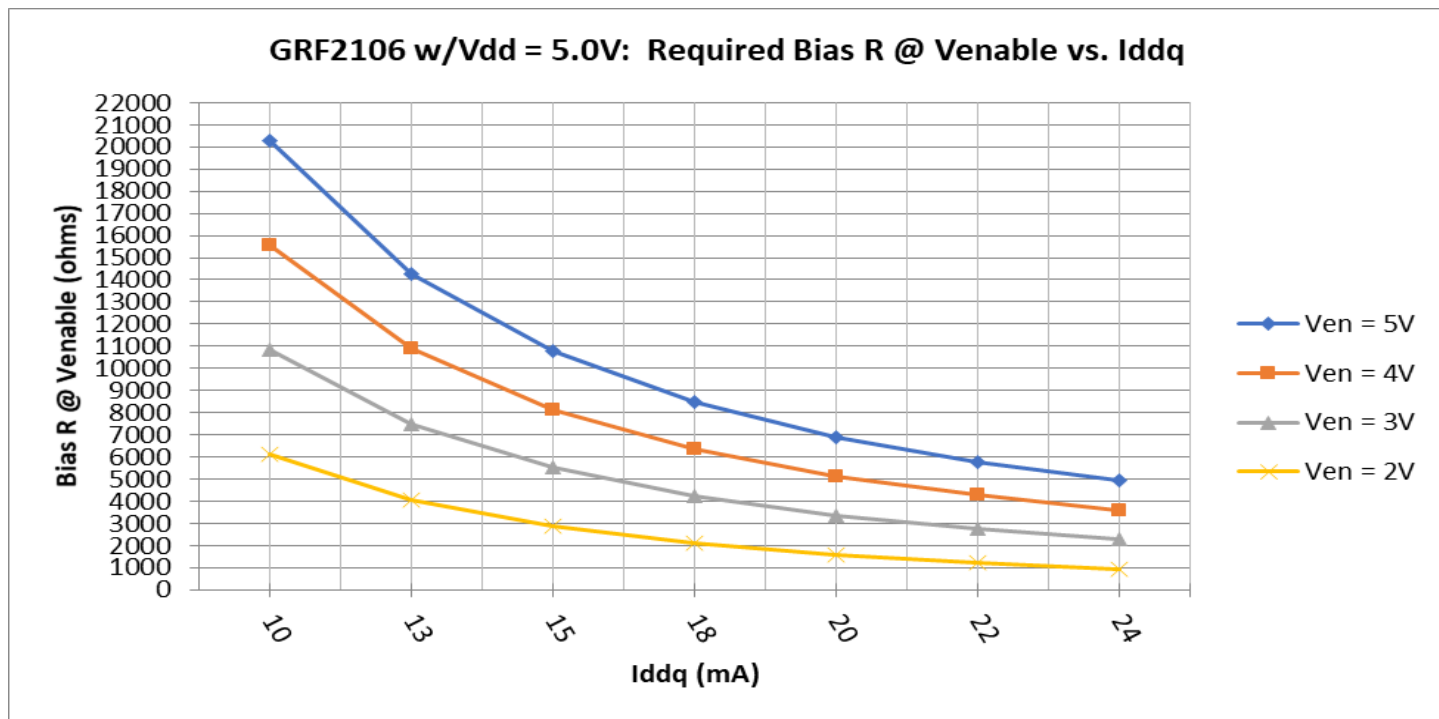
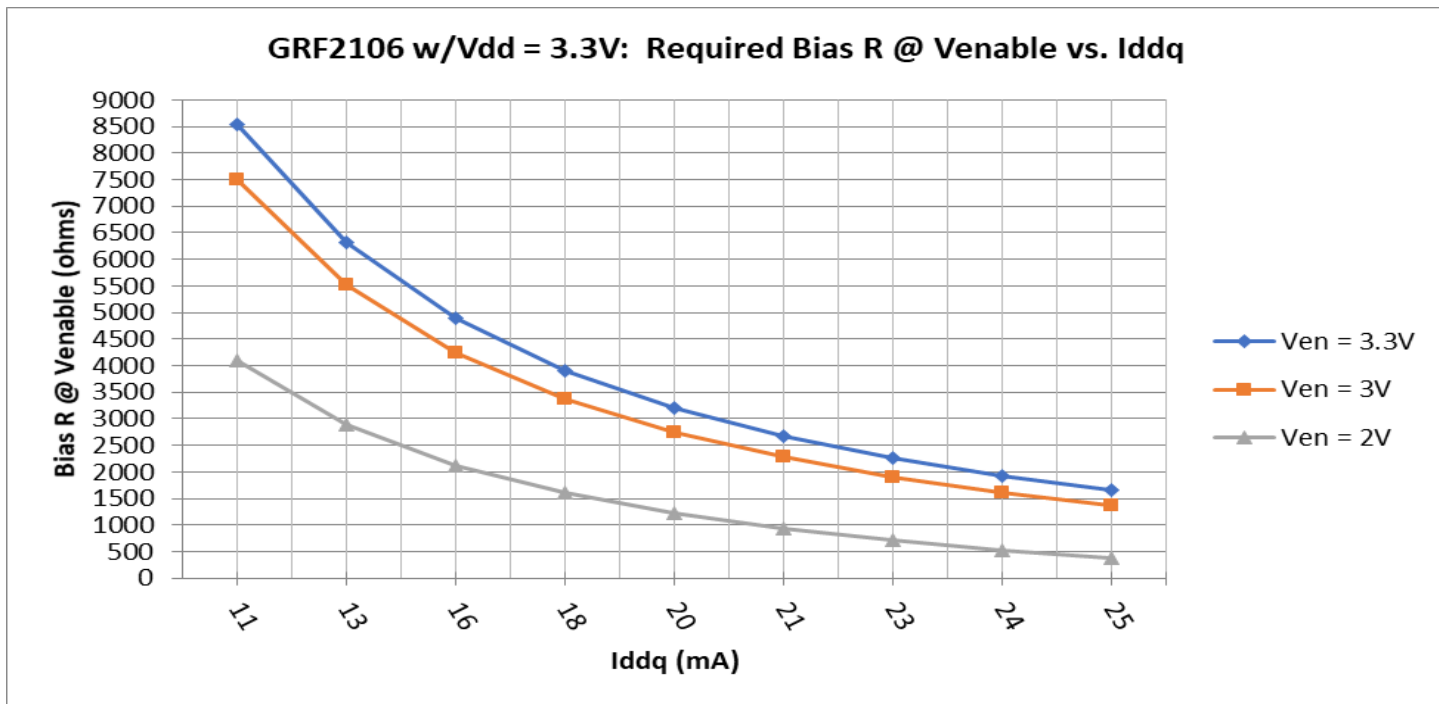
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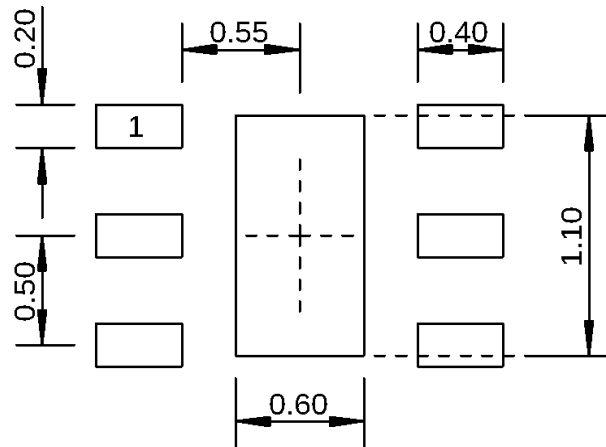
**High Gain, Low Current LNA**  
**Tuning Range: 0.1 to 4.2 GHz**

## GRF2106 Standard Evaluation Board BOM: (2.4 to 2.5 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M2	Capacitor	Murata	GJM	8.2 pF	0402	ok
M3	Resistor	Various	5%	0 Ohm	0402	ok
M5 (sets Iddq)	Resistor	Various	5%	—	0402	ok
M7	Capacitor	Murata	GRM	0.1 uF	0402	ok
M8	Capacitor	Murata	GRM	1000 pF	0402	ok
M10	Inductor	Murata	22 nH	LQG	0402	ok
L1 (Adj. to M12)	Inductor	Murata	5.6 nH	LQG	0402	ok
M12	Capacitor	Murata	GJM	12 pF	0402	ok

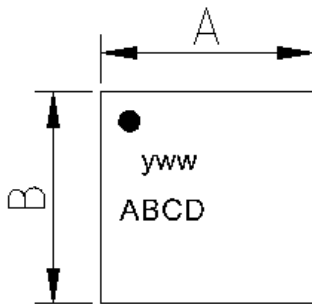
## Rbias Selection Curves:



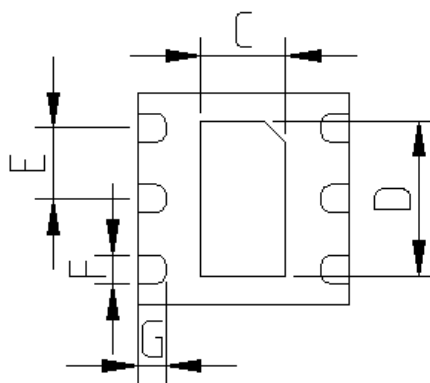


Dimensions in millimeters

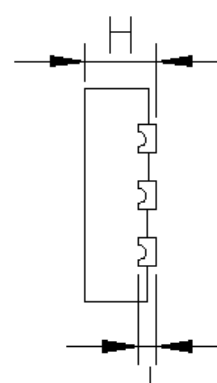
## 1.5 mm DFN-6 Suggested PCB Footprint (Top View)



Top View



Bottom View



Side View

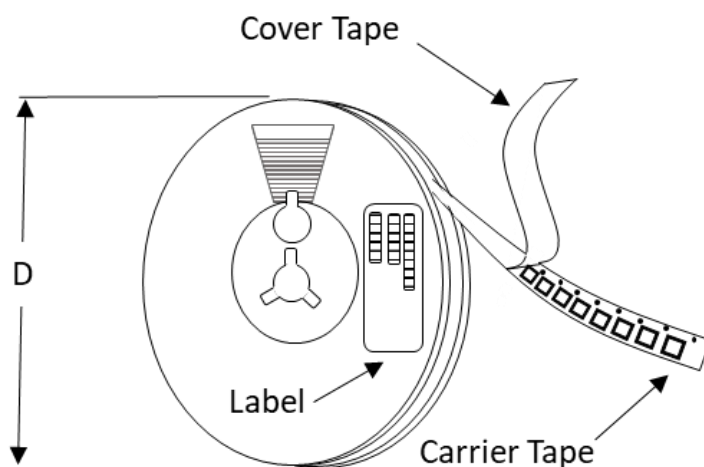
Dimensions (MM)	
A	1.5 +/- 0.050
B	1.5 +/- 0.050
C	.6 +/- 0.050
D	1.1 +/- 0.050
E	.5 Bsc
F	.2 +/- 0.050
G	.2 +/- 0.050
H	.45 +/- 0.050
J	.12 Ref.

## 1.5 mm DFN-6 Package Dimensions

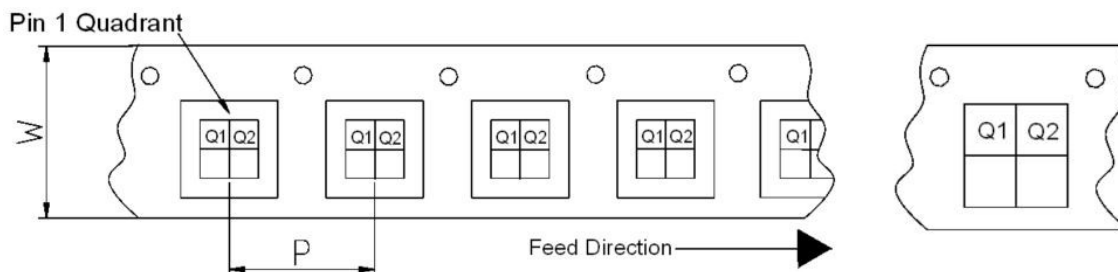
## Tape and Reel Information:

Guerrilla RF's Tape and Reel specification complies with the Electronics Industries Association (EIA) standards for 'Embossed Carrier Tape of Surface Mount Components for Automatic Handling'. Reference EIA-481. See the table on the following page for Tape and Reel specifications along with units per reel.

Devices are loaded with pins down into the carrier pocket with protective cover tape, wound into a plastic reel. Each reel will be packaged in a cardboard box. There will be product labels on the reel, the protective ESD bag and the outside surface of the box.



Tape and Reel Packaging with Reel Diameter Noted (D)



Carrier Tape Width (W), Pitch (P), Feed Direction and Pin 1 Quadrant Information



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# GRF2106

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**Tape and Reel Specification and Device Package Information Table**

Package				Carrier Tape			Reel	
Type	Dimensions (mm)	Leads	Weight (mg)	Width (W) (mm)	Pocket Pitch (P) (mm)	Pin 1 Quadrant	Diameter (D) (inches)	Units per Reel
QFN	2.0 x 2.0 x 0.50	12	7	8	4	Q1	7	2500
QFN	3.0 x 3.0 x 0.85	16	24	12	8	Q1	7	1500
DFN	1.5 x 1.5 x 0.45	6	4	8	4	Q1	7	2500
DFN	2.0 x 2.0 x 0.75	8	12	8	4	Q1	7	2500
LFM	3.5 x 3.5 x 0.75	See note	TBD	12	8	Q2	7	1500
LFM	4.0 x 4.0 x 0.75	See note	TBD	12	8	Q2	7	1500

**Note:** Lead count may vary. Reference applicable product data sheet



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Data Sheet Release Status:	Notes
Advance	S-parameter and NF data based on EM simulations for the fully packaged device using foundry supplied transistor s-parameters. Linearity estimates based on device size, bias condition and experience with related devices.
Preliminary	All data based on evaluation board measurements in the Guerrilla RF Applications Lab.
Released	All data based on device qualification data. Typically, this data is nearly identical to the data found in the preliminary version. Max and min values for key RF parameters are included.

Information in this datasheet is specific to the Guerrilla RF, Inc. ("Guerrilla RF") product identified.

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