GRF2171

Released

High Gain Ultra LNA
Tuning Range: 2.5 to 5.0 GHz

Features

Reference: 5V/75mA/3.6 GHz

- EVB NF: 0.80 dB
- Gain: 26.8 dB
- OP1dB: 18.7 dBm
- OIP3: 35.0 dBm

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

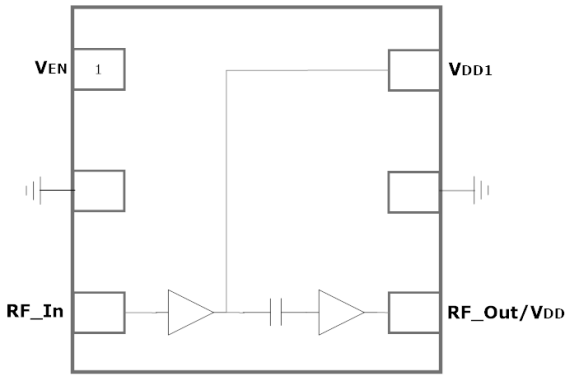
- Ultra High Gain LNA
- CBRS
- Microwave Backhaul

Product Description

GRF2171 is an ultra-high gain, ultra-low noise amplifier that can be tuned over a wide range of frequencies.

Flexible biasing allows the device to be configured for a wide range of Vdd and Iddq values for optimal efficiency and linearity.

Consult with the GRF applications engineering team for custom tuning/evaluation board data.



1.5 x 1.5 mm DFN-6

Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	0	6.0	V
RF Input Power CW : (Load VSWR < 2:1; V_D: 5.0 volts)	$P_{IN\ MAX}$		22	dBm
Operating Temperature (Package Heat Sink)	T_{AMB}	-40	105	°C
Maximum Channel Temperature (MTTF > 10^6 Hours)	T_{MAX}		170	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		600	mW
Electrostatic Discharge:				
Charged Device Model:	CDM	1000		V
Human Body Model:	HBM	250		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		1	--

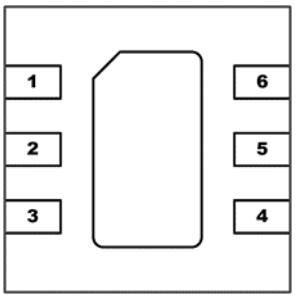
Caution! ESD Sensitive Device

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

Note: For manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF2171 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:

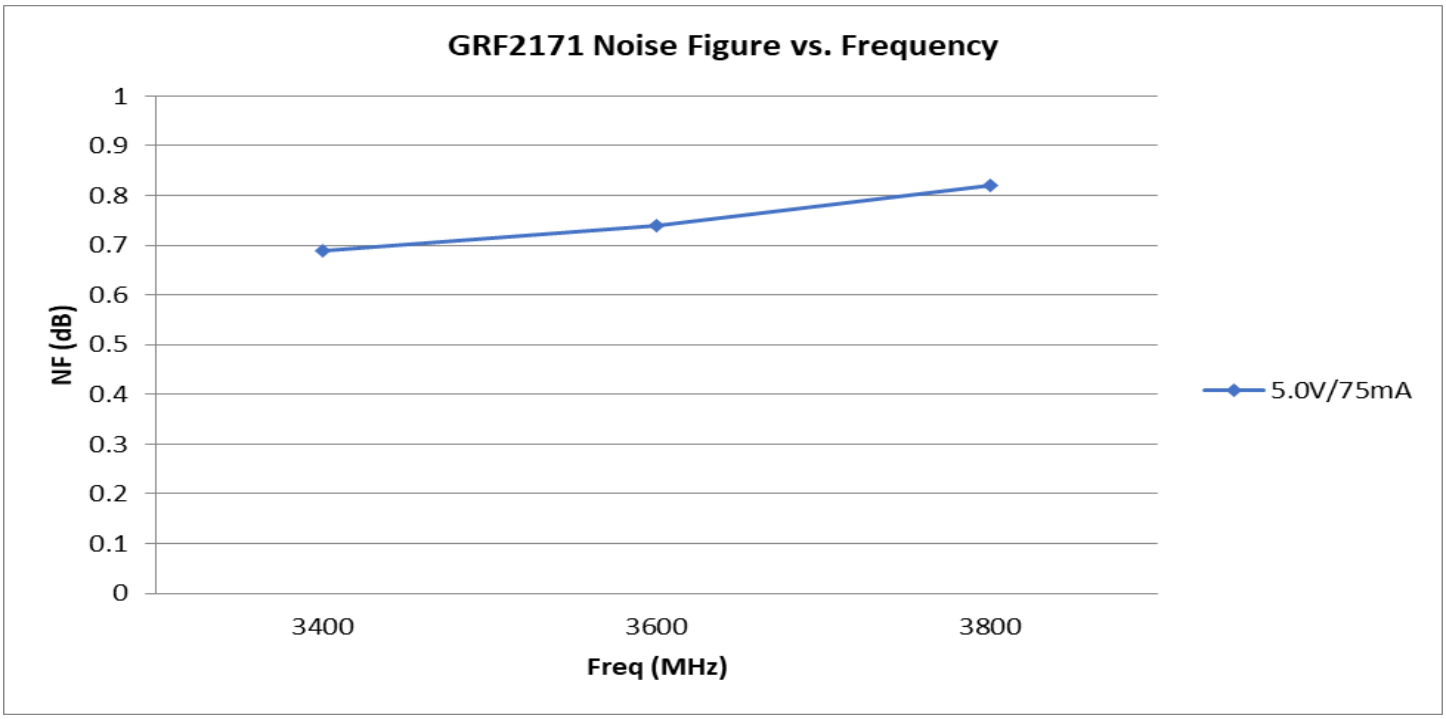
Pin	Name	Description	Note
1	V_{ENABLE}	Enable Voltage Input	V_{ENABLE} and series resistor set I_{DDQ}. V_{ENABLE} < =0.2 volts disables device. On -die pull-down resistor will turn the part off if this node is allowed to float.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	An external DC blocking cap must be used.
4	RF_Out	LNA RF output	V_{DD} must be applied through a choke to this pin.
5	NC	No Connect or Ground	No internal connection to die
6	V_{DD}	Stage 1 power supply	Connect to V_{DD} with inductor. Place de-coupling cap to ground on this node.
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.

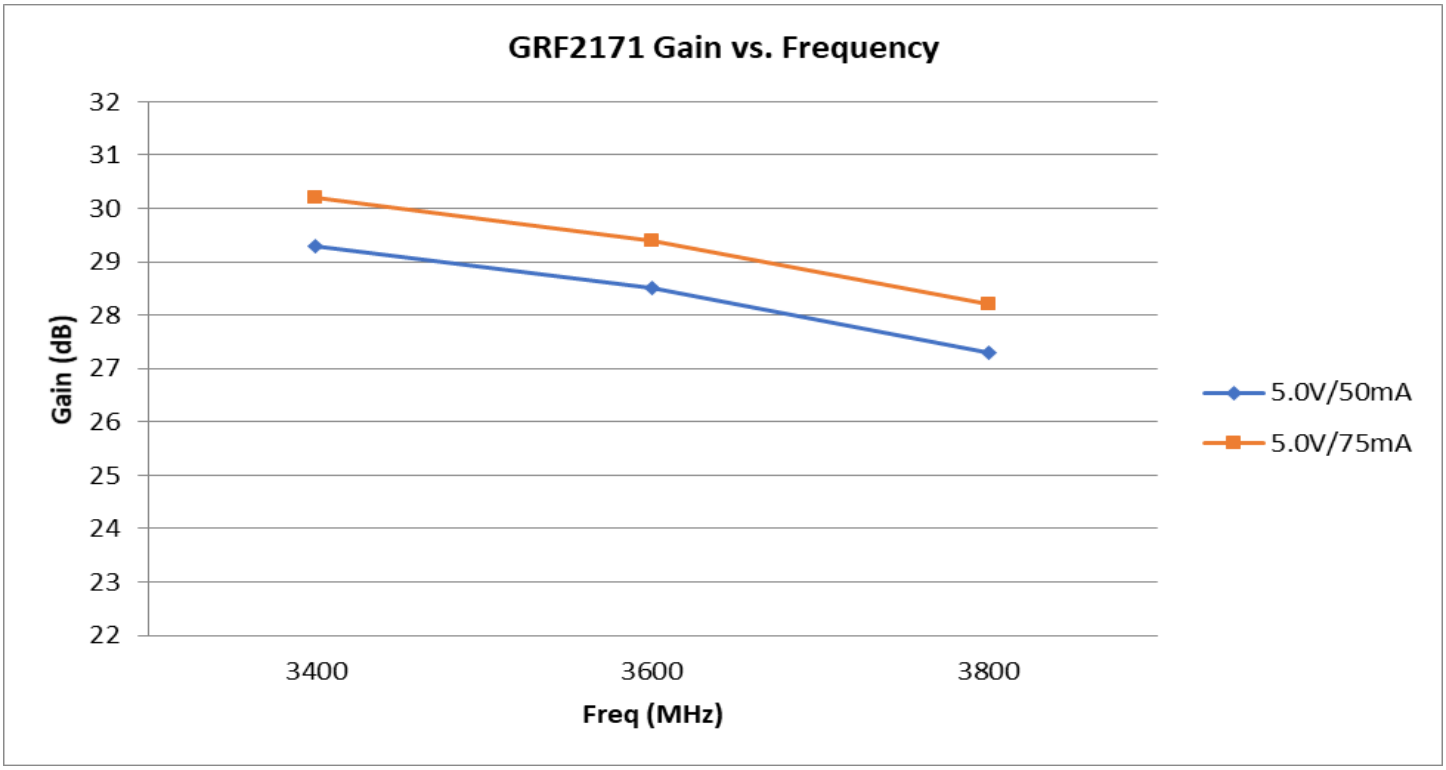
Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		3600		MHz	V_{DD} = 5.0 V, T_A = 25°C
Gain	S21	24.8	26.8		dB	
Evaluation Board Noise Figure	NF		0.80	1.0	dB	Incudes Board Losses
Output 1dB Compression Power	OP1dB	16.7	18.7		dBm	
Output 3rd Order Intercept	OIP3		35.0		dBm	4.0 dBm P_{OUT} per tone at 2 MHz Spacing (3599 and 3601 MHz)
Switching Rise Time	T_{RISE}		800		ns	
Switching Fall Time	T_{FALL}		900		ns	
Supply Current	I_{DD}	55	75	95	mA	V_{DD}=V_{ENABLE}=5.0 volts; R_{BIAS}:1.2k Ω
Enable Current	I_{ENABLE}		3.5	5	mA	
Leakage Current	$I_{LEAKAGE}$		325	1000	uA	V_{DD}: 5.0V; V_{ENABLE}: 0.0V
Thermal Data						
Thermal Resistance: (Infra-Red Scan)	Θjc		40		°C/W	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	$T_{CHANNEL}$		100 (See note)		°C	V_{DD}: 5.0 V; I_{DDQ}: 75 mA; No RF; P_{DISS}: 375 mW

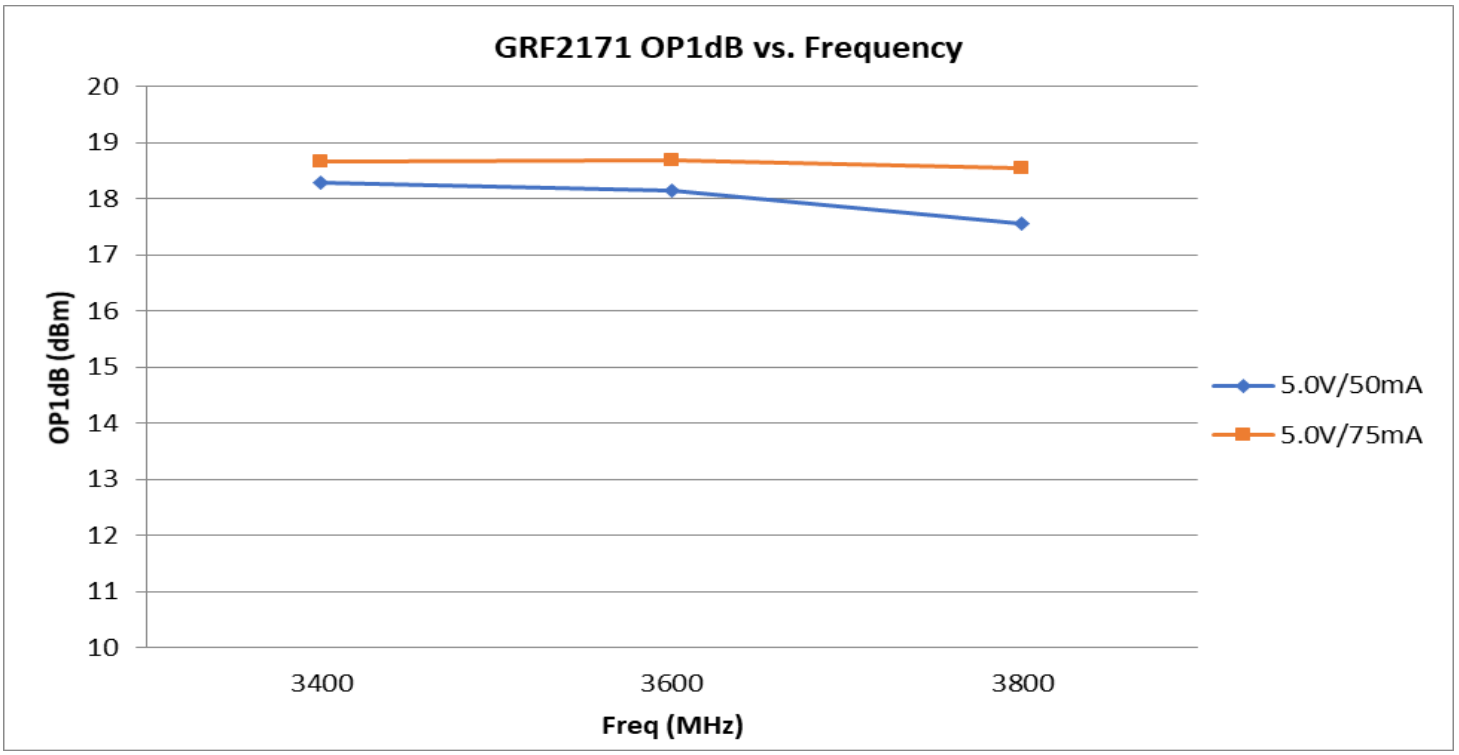
Note: MTTF >10^6 hours for $T_{CHANNEL}$ < =170 degrees C.

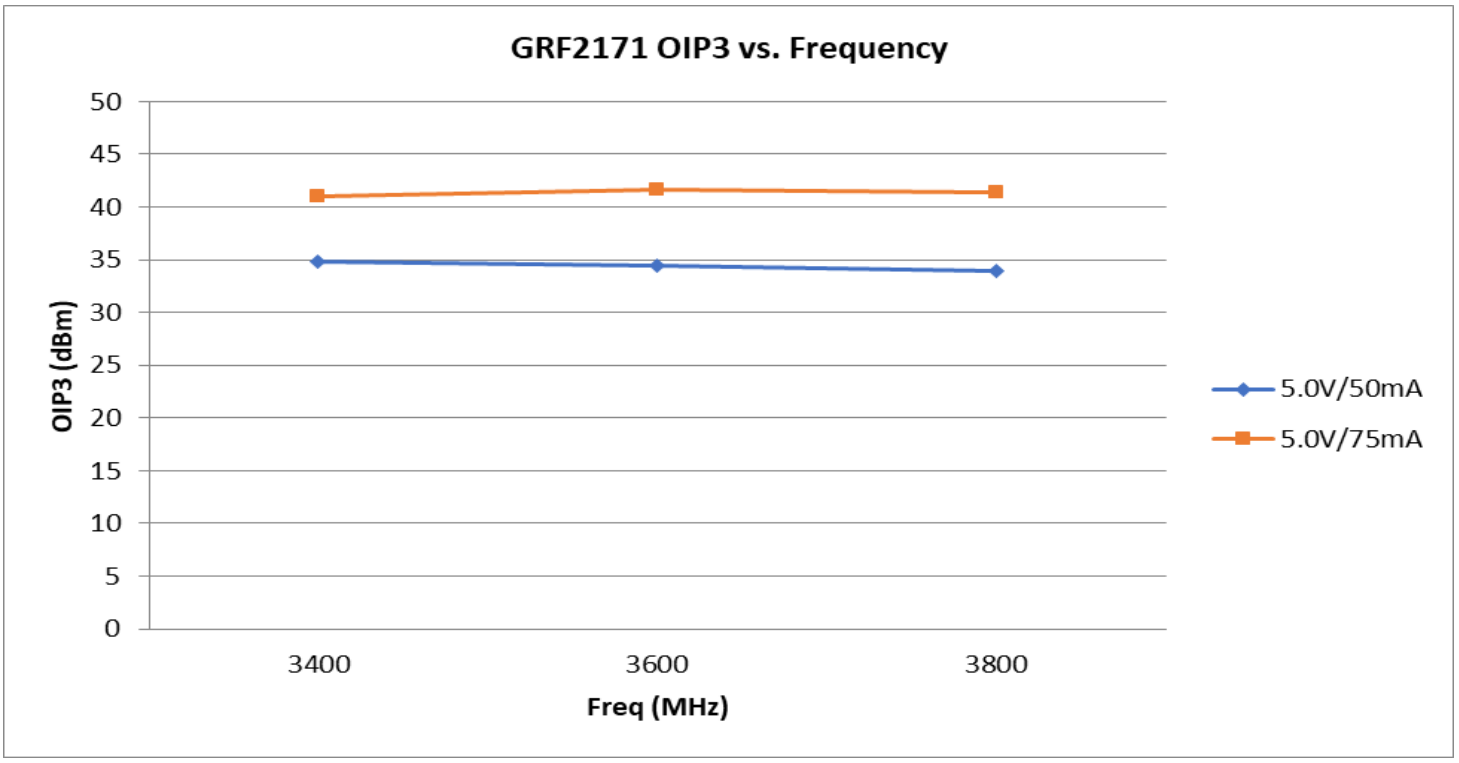
GRF2171 Evaluation Board Data:



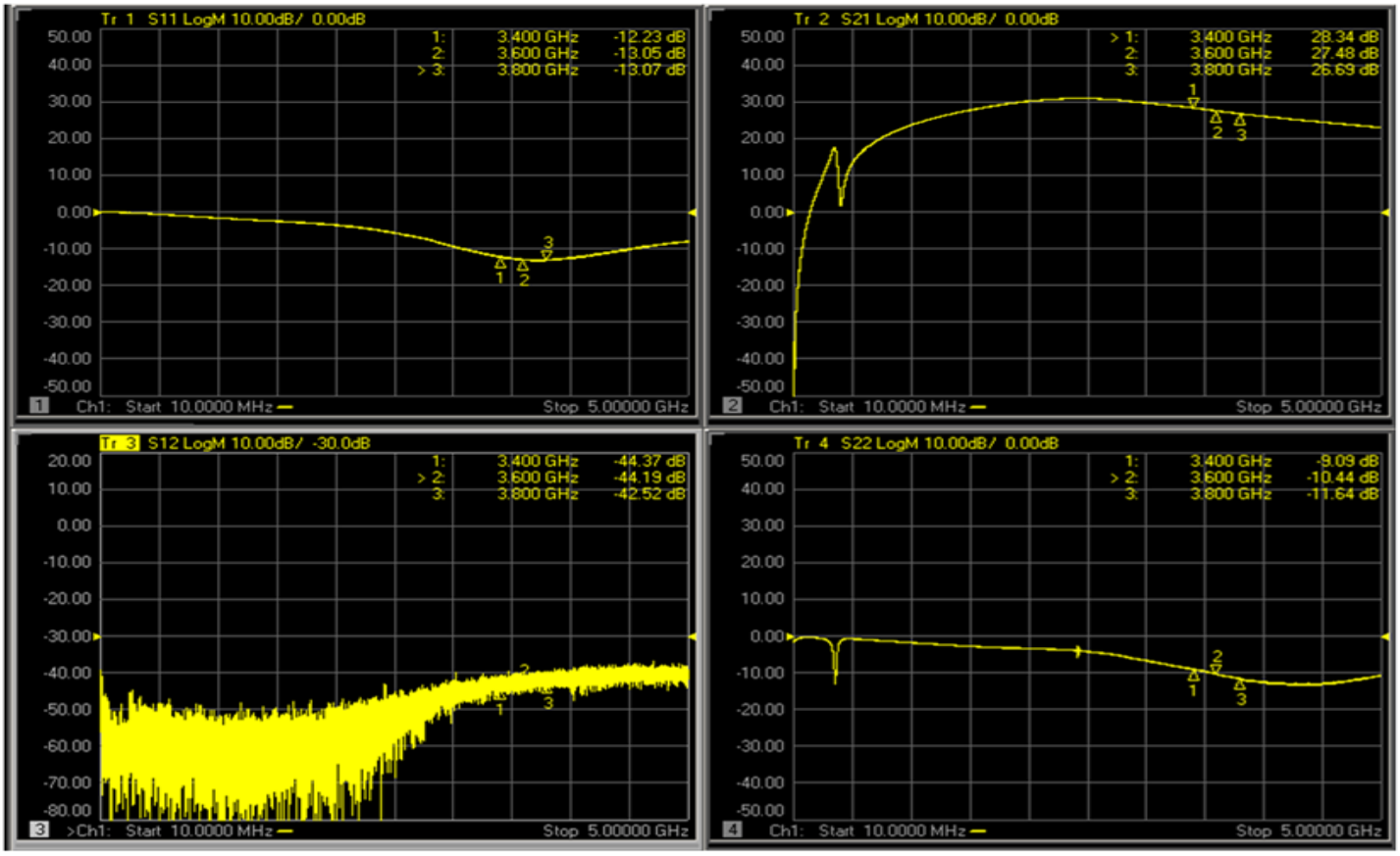


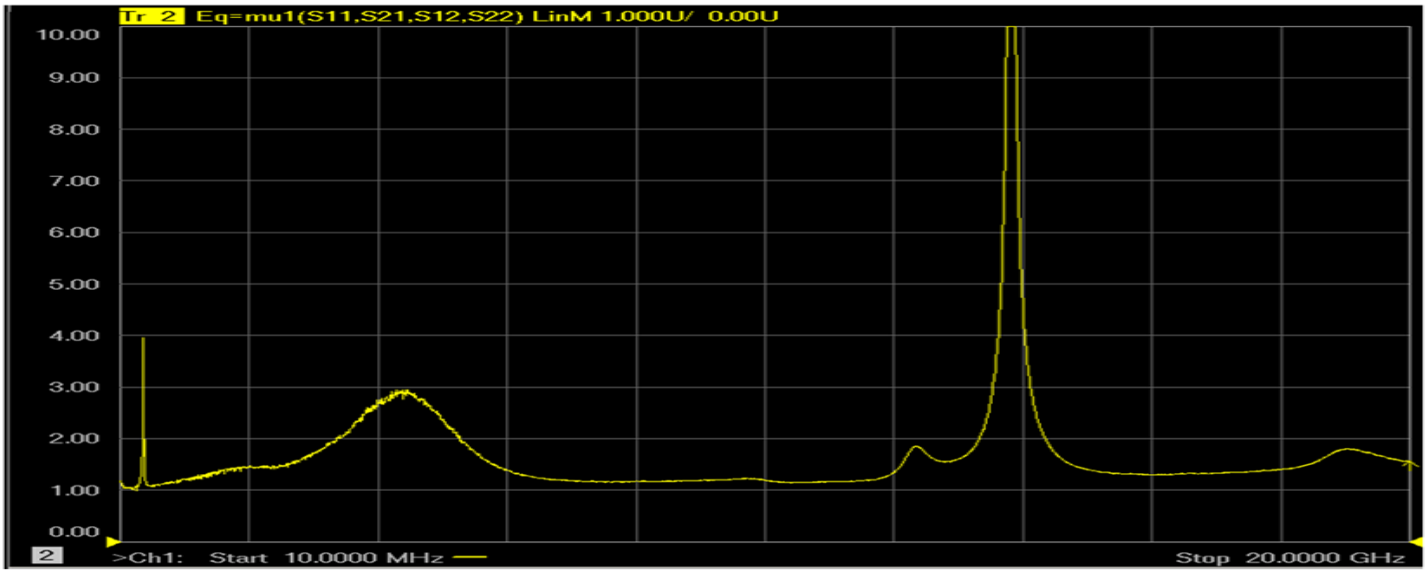
GRF2171 Evaluation Board Data:



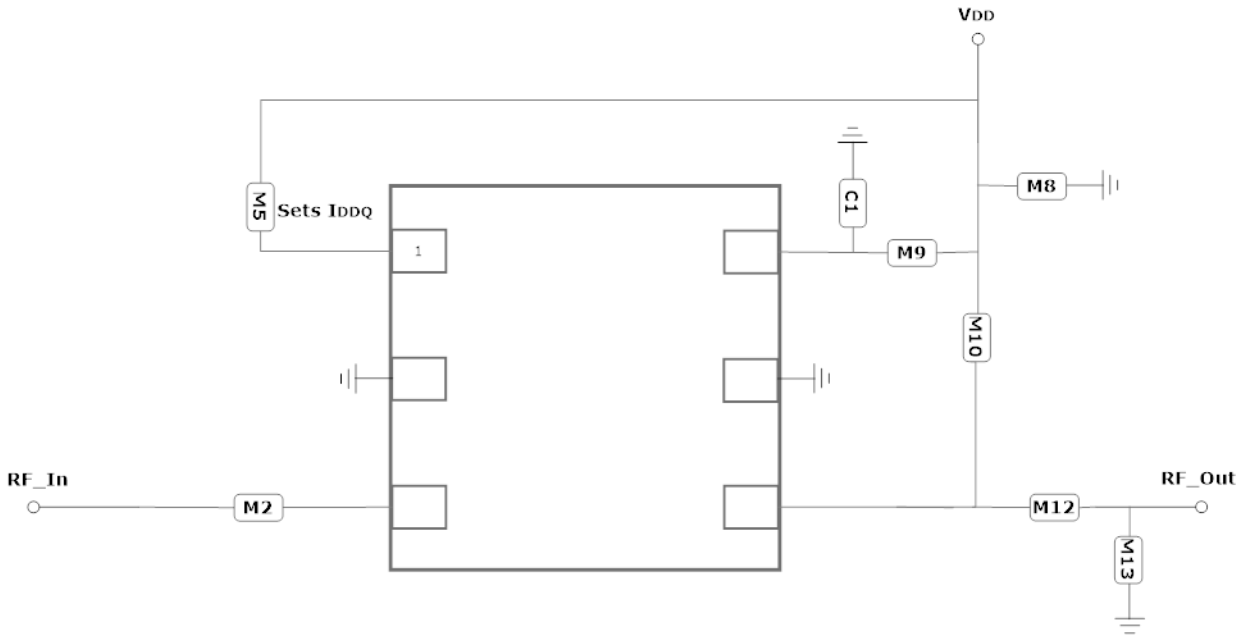


GRF2171 Evaluation Board S-Pars and Stability Mu Factor: (3.4 to 3.8 GHz Match)

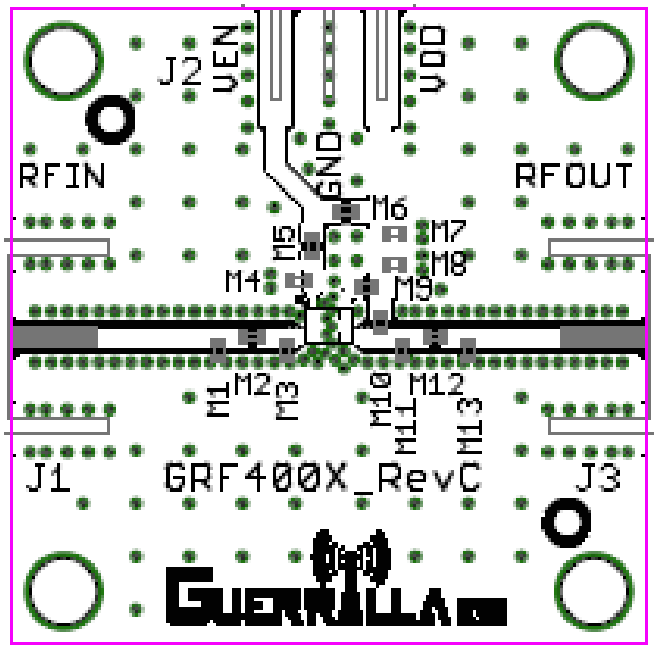




Note: Mu factor >= 1.0 implies unconditional stability.



GRF2171 Application Schematic

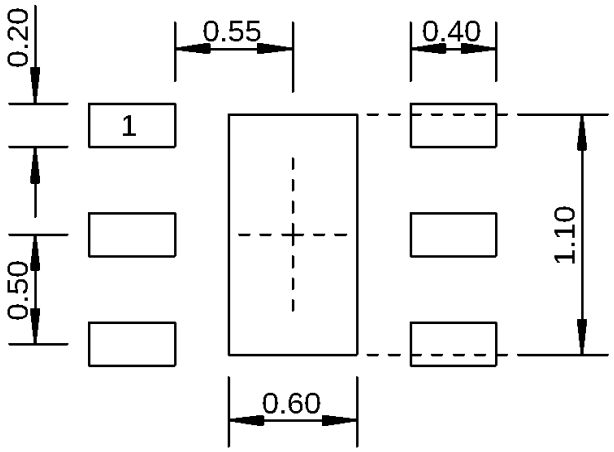


GRF2171 Evaluation Board Assembly Diagram

GRF2171 Standard Evaluation Board BOM: (3.4 to 3.8 GHz Tune)

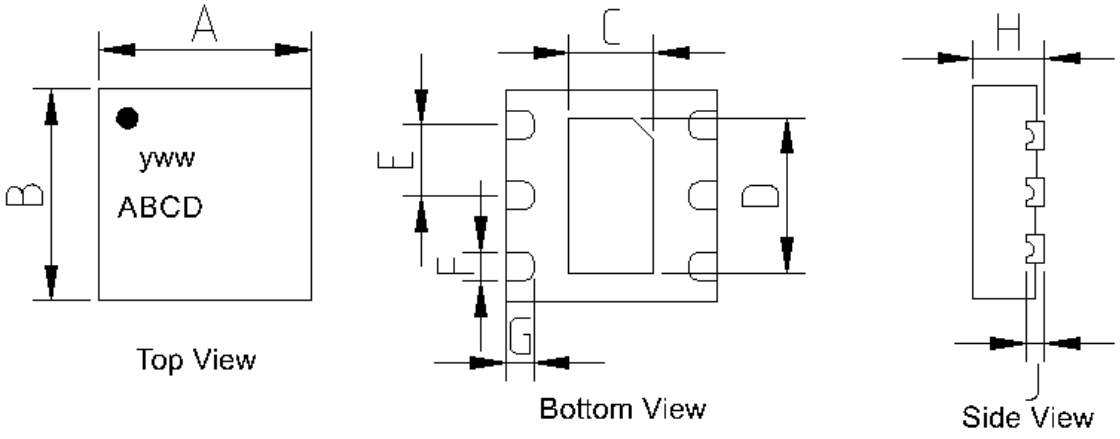
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M2	Capacitor	Murata	GJM	20 pF	0402	ok
M5 (See curves)	Resistor: 5%	Various	—	—	0402	ok
M8	Capacitor	Murata	GRM	0.1 uF	0402	ok
C1	Capacitor	Murata	GRM	0.1 uF	0402	ok
M9	Inductor	Murata	LQG	5.6 nH	0402	ok
M10	Inductor	Murata	LQG	2.4 nH	0402	ok
M12	Capacitor	Murata	GRM	1000 pF	0402	ok
M13	Resistor: 5%	Various	—	500 Ohm	0402	ok
Evaluation Board	GRF400X_RevC					

GRF2171 Bias Resistor Selection Curves: (TBD)



Dimensions in millimeters

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



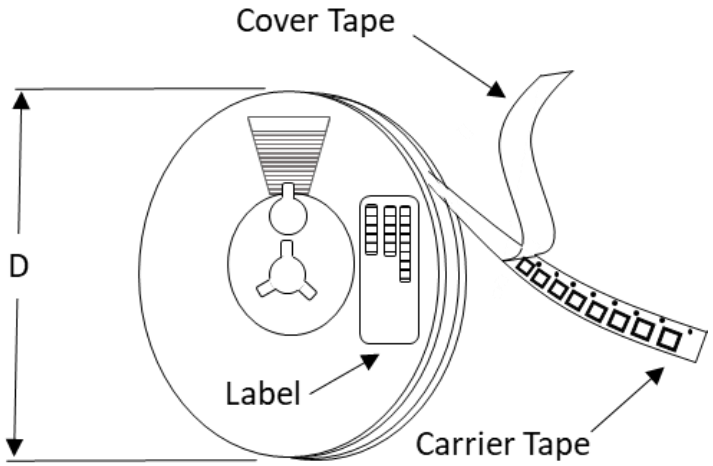
Dimensions (MM)	
A	1.5 +/- 0.050
B	1.5 +/- 0.050
C	.6 +/- 0.050
D	1.1 +/- 0.050
E	.5 Bsc
F	.2 +/- 0.050
G	.2 +/- 0.050
H	.45 +/- 0.050
J	.12 Ref.

1.5 mm DFN-6 Package Dimensions

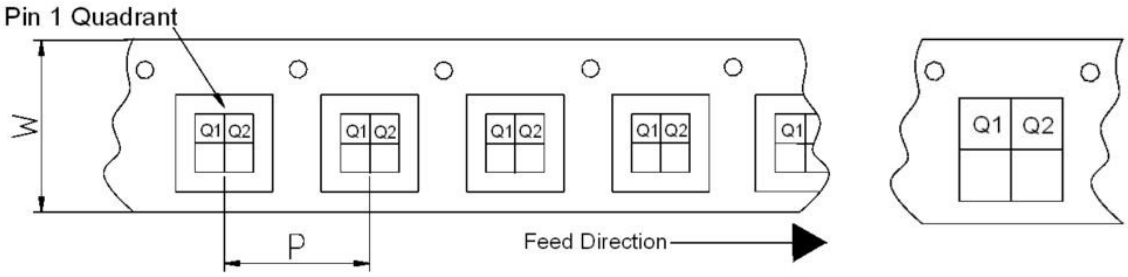
Tape and Reel Information:

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

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 Quad-rant	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

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.