



Preliminary

# GRF5115

33.0 dBm Power-LNA™  
Tuning Range: 0.1 – 2.7 GHz



## Product Description

GRF5115 is a high efficiency PA/Driver that delivers an OP1dB of 33 dBm with greater than 55% drain efficiency. It is tunable from 100 MHz up to 2.7 GHz with typical fractional bandwidths of 5 to 10%

The device can be biased with Vdd over a range from 2.7 to 5.0 volts and Iddq can be adjusted for optimal linearity and efficiency.

Consult with the GRF applications engineering team for custom tuning/evaluation board data and device s-parameters.

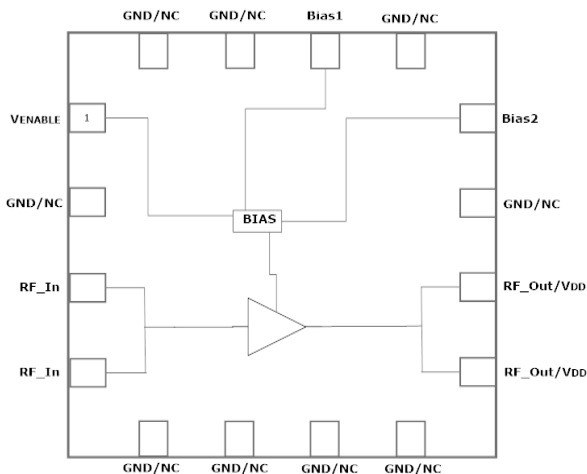
## Features

Reference: 5V/250mA/1.95GHz

- Gain: 14.8 dB
- OP1dB: 33.2 dBm
- Drain Efficiency: 58%
- OIP3: 43.0 dBm
- Eval Board NF: 1.3 dB
  
- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

## Applications

- High Efficiency Power Amplifier
- Multi-stage LNA



3.0 x 3.0 mm QFN-16



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## Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Drain Voltage	V <sub>DD</sub>		5.5	V
Transient Average RF Input Power: (Load VSWR < 2:1; Duration: <1 hour)	P <sub>IN MAX</sub>		23.0	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>		1.6	W
Electrostatic Discharge:				
Charged Device Model: (TBD)	CDM	1500		V
Human Body Model: (TBD)	HBM	250		V
Storage:				
Storage Temperature	T <sub>STG</sub>	-65	150	°C
Moisture Sensitivity Level	MSL		1	–



Caution! ESD Sensitive Device

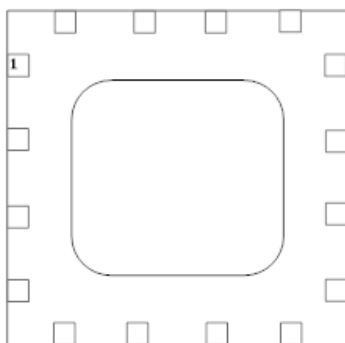


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

**Note:** For package dimensions and manufacturing information, see the [Guerrilla-RF.com](http://Guerrilla-RF.com) website for the following document located on the GRF5115 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	RF Input	Pins 3-4 tied together on system board
4	RF_In	RF Input	Pins 3-4 tied together on system board
5	NC	No Connect or Ground	No internal connection to die
6	NC	No Connect or Ground	No internal connection to die
7	NC	No Connect or Ground	No internal connection to die
8	NC	No Connect or Ground	No internal connection to die
9	RF_Out/V <sub>DD</sub>	PA Output/Bias	Pins 9-10 tied together on system board. Supply V <sub>DD</sub> here.
10	RF_Out/V <sub>DD</sub>	PA Output/Bias	Pins 9-10 tied together on system board. Supply V <sub>DD</sub> here.
11	NC	No Connect or Ground	No internal connection to die
12	Bias2	Bias Circuit Supply	Connect to V <sub>DD</sub> through external resistor
13	NC	No Connect or Ground	No internal connection to die
14	Bias1	Bias Circuit Ground	Consult application schematic
15	NC	No Connect or Ground	No internal connection to die
16	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.		
<b>Target Performance (1.9 to 2.0 GHz Tune)</b>						<b>Bias: 5.0 V and 250 mA unless otherwise noted. (+25C)</b>
Test Frequency	$F_{TEST}$		1.95		GHz	
Gain	$S(2,1)$		14.8		dB	
Noise Figure (Evaluation Board)	NF		1.3		dB	
Output 1dB Compression Point	OP1dB		33.2		dBm	
Drain Efficiency @ OP1dB	$\eta$		58.0		%	
Output Third Order Intercept Point	OIP3		43.0		dBm	12.0 dBm $P_{OUT}$ per tone (1949 and 1951 MHz)
Switching Rise Time	$T_{RISE}$		100		ns	
Switching Fall Time	$T_{FALL}$		850		ns	
Quiescent Supply Current	$I_{DDQ}$		250		mA	
Enable Current	$I_{ENABLE}$		0.5		mA	
<b>Disabled Mode</b>						
Supply Current (Leakage)	$I_{DD}$		2.0		$\mu$ A	
<b>Thermal Data</b>						
Thermal Resistance: (IR Scan Method)	$\Theta_{jc}$		34		$^{\circ}$ C/W	
Channel Temperature @ +85C Reference (package heat sink)	$T_{CHANNEL}$		128		$^{\circ}$ C	$V_{DD}$ : 5.0 volts; $I_{DDQ}$ : 250 mA $P_{DISS}$ : 1.25 W; No RF

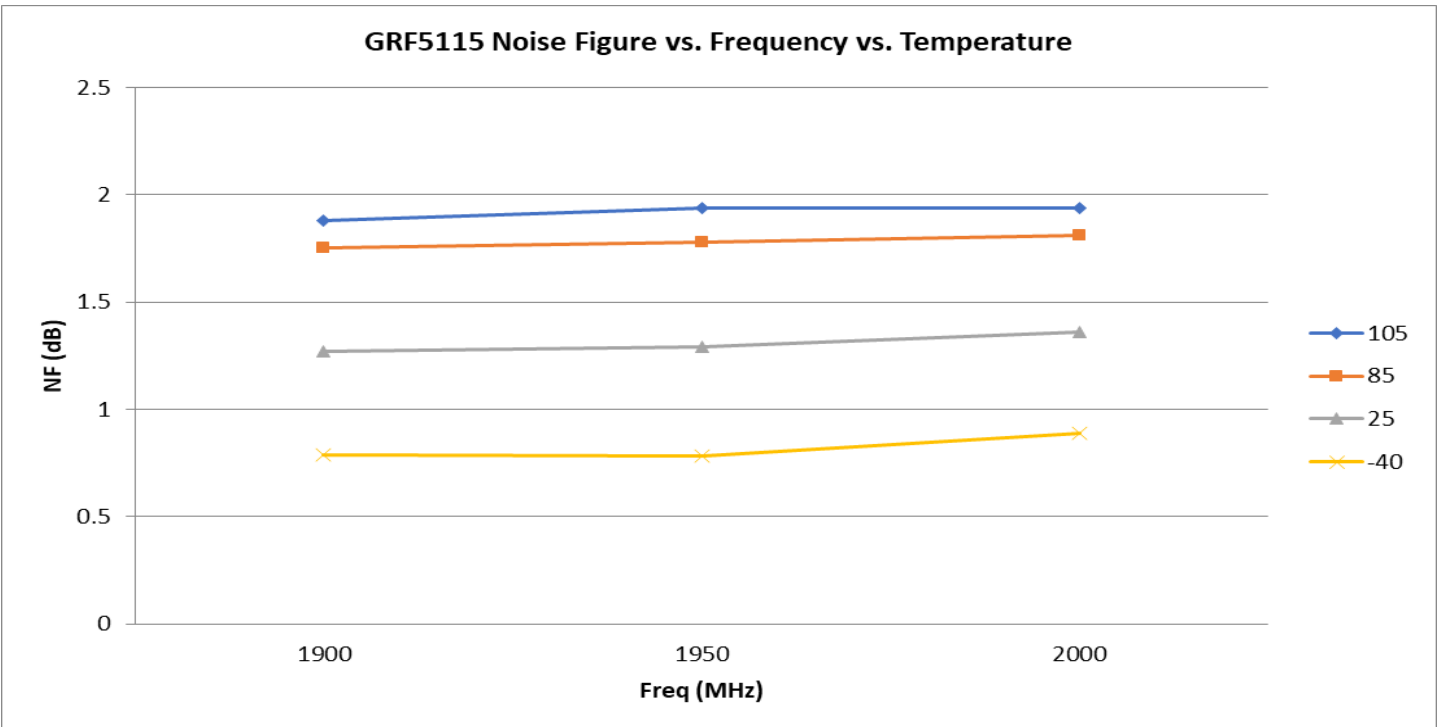
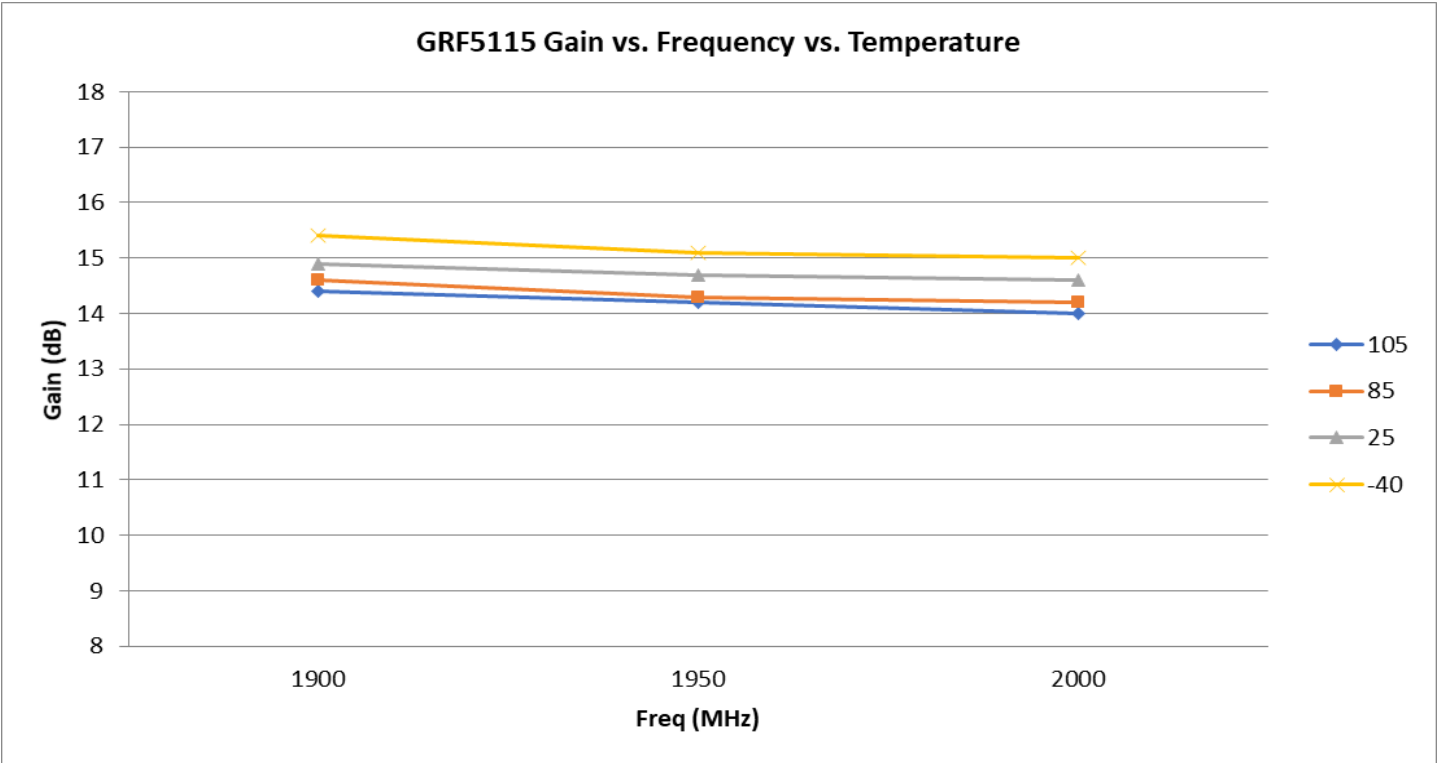


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## GRF5115 Evaluation Board Data: (1.9 to 2.0 GHz Tune)



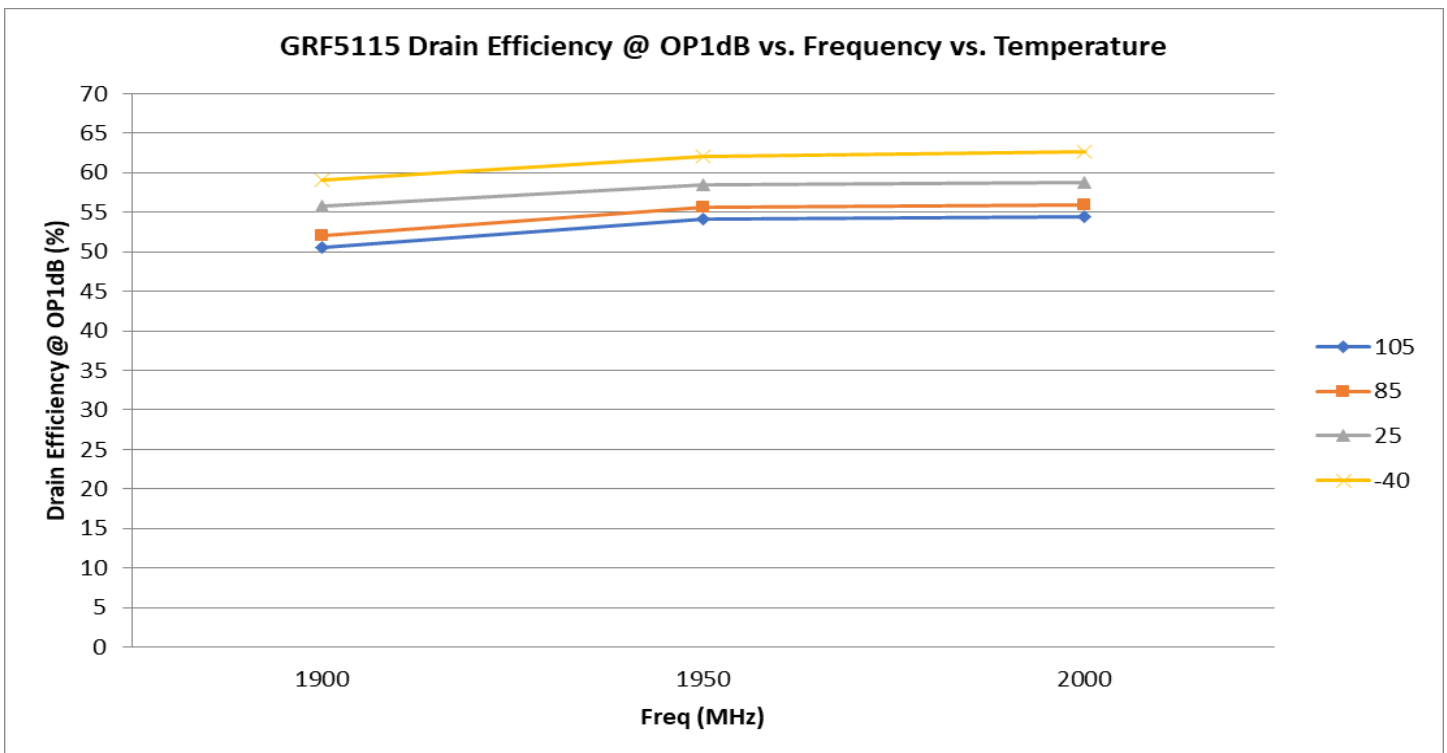
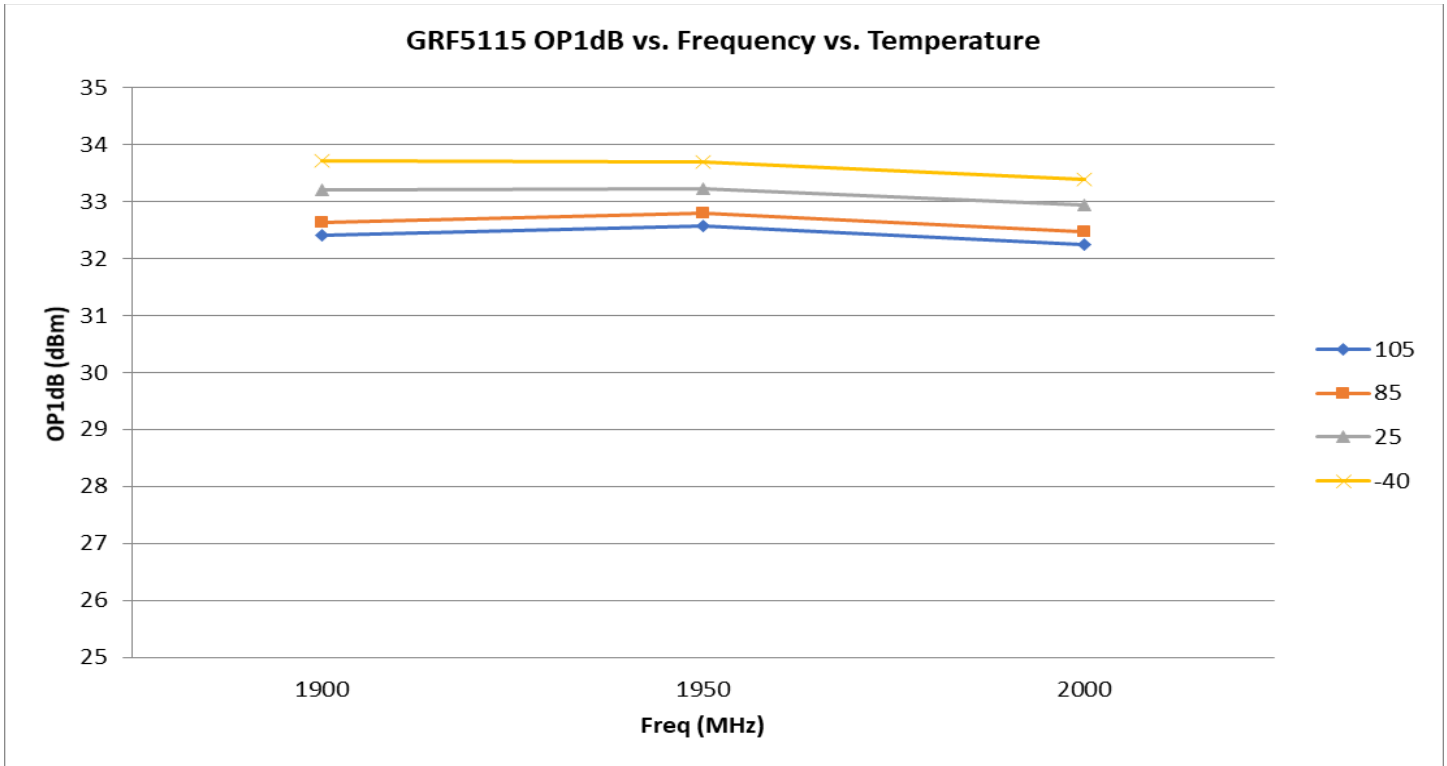


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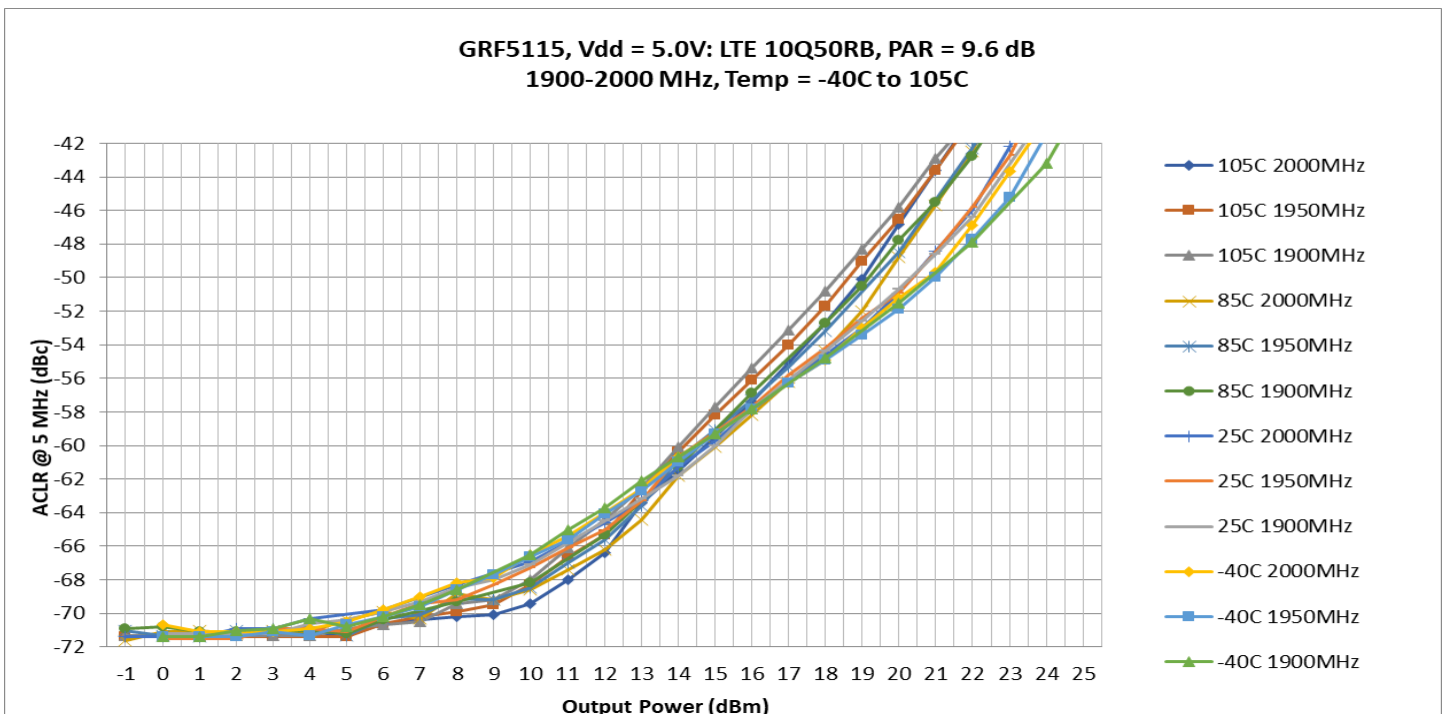
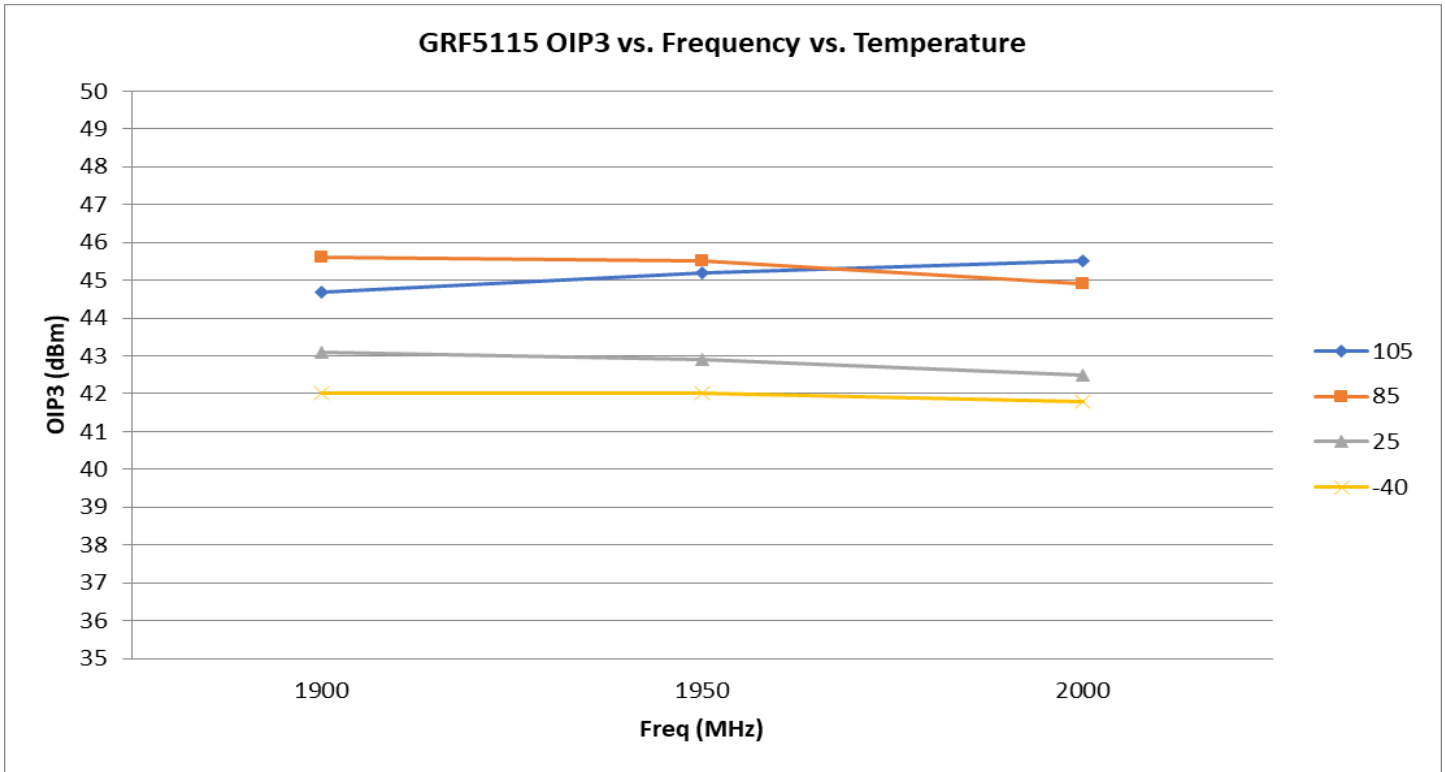


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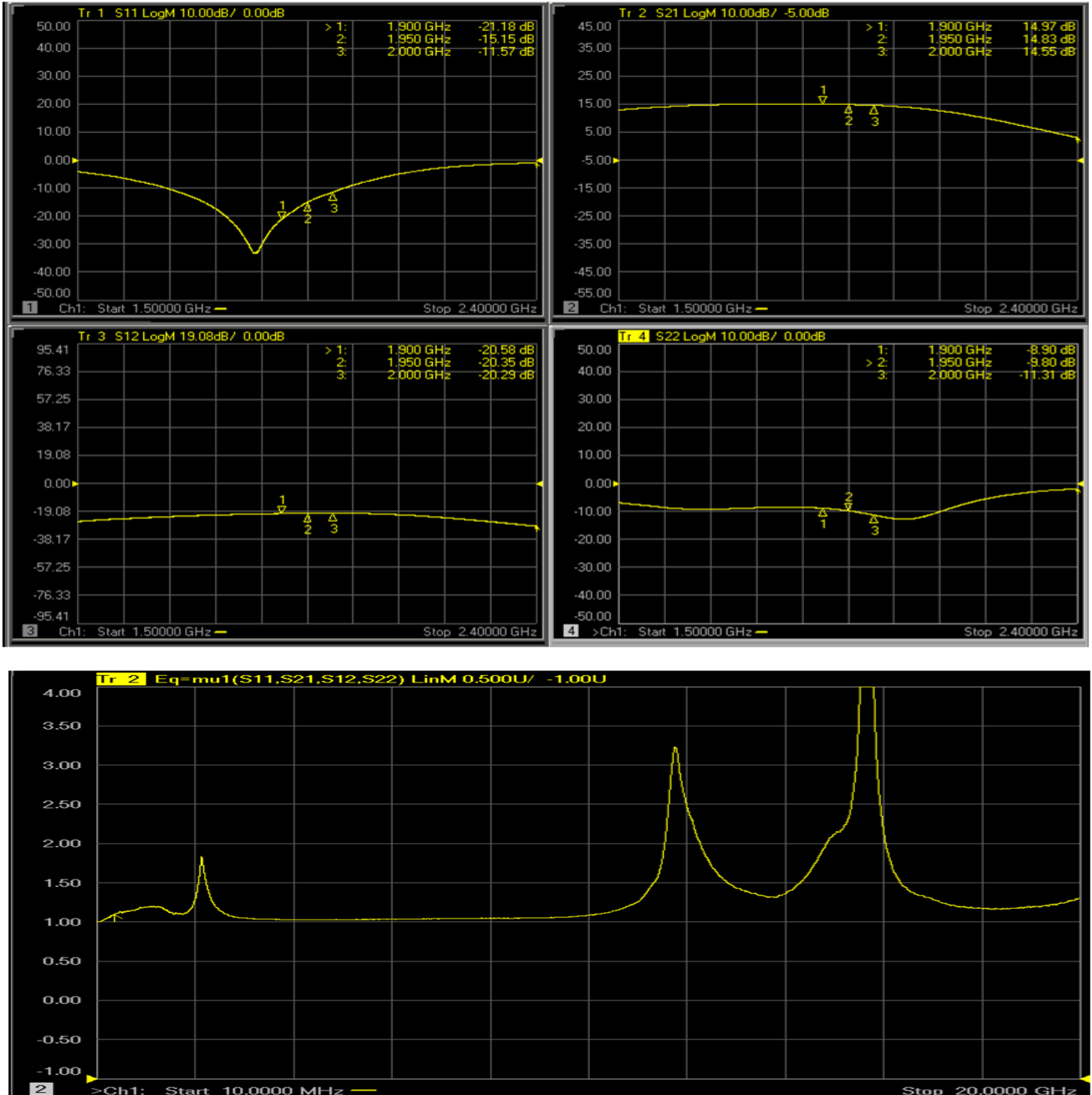


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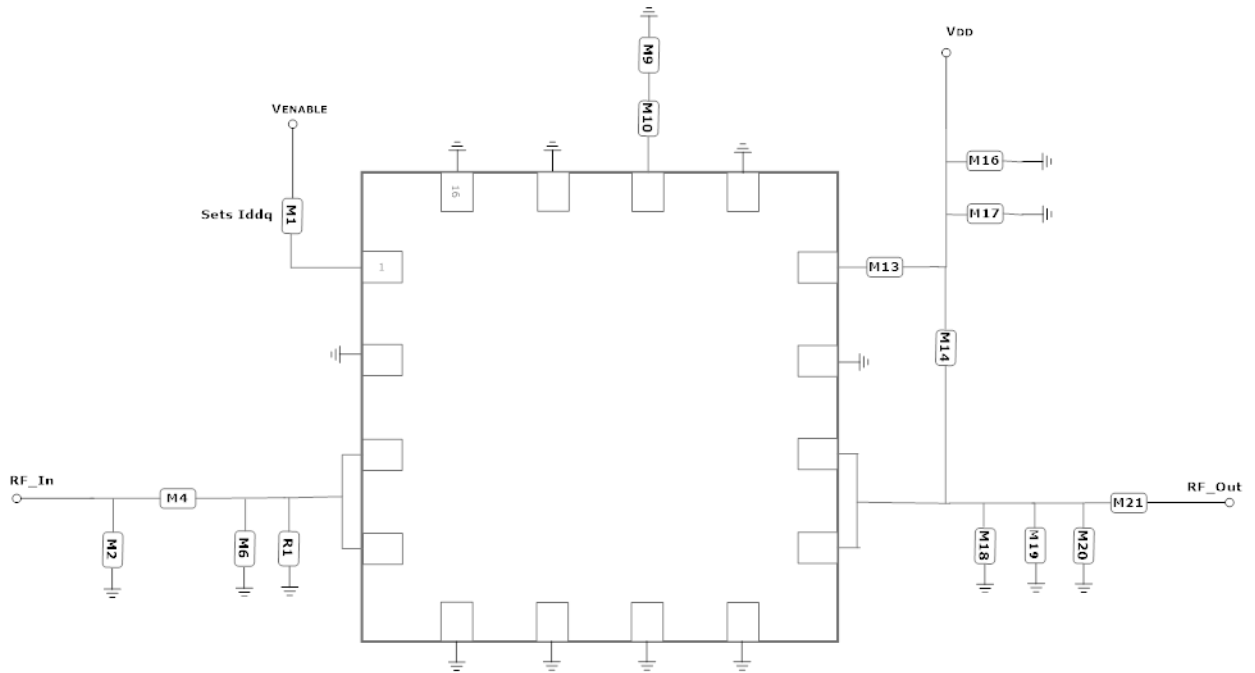
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## GRF5115 Evaluation Board S-Pars: (1.9 to 2.0 GHz Tune)

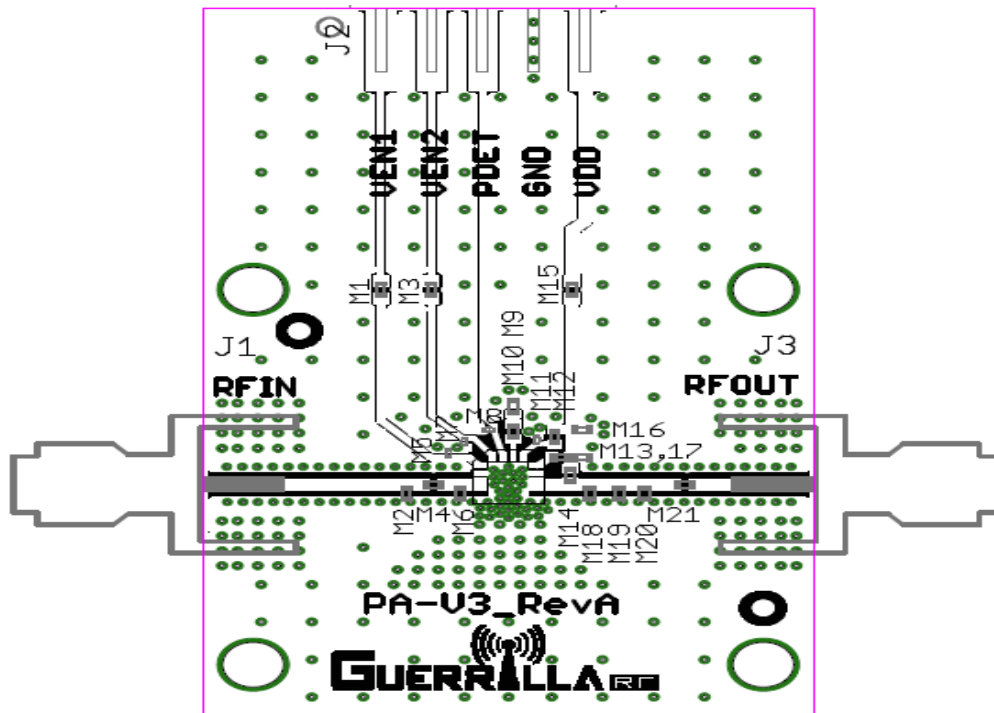


Note: Mu factor  $\geq 1.0$  implies unconditional stability.





GRF5115 Application Schematic



GRF5115 Evaluation Board Assembly Drawing



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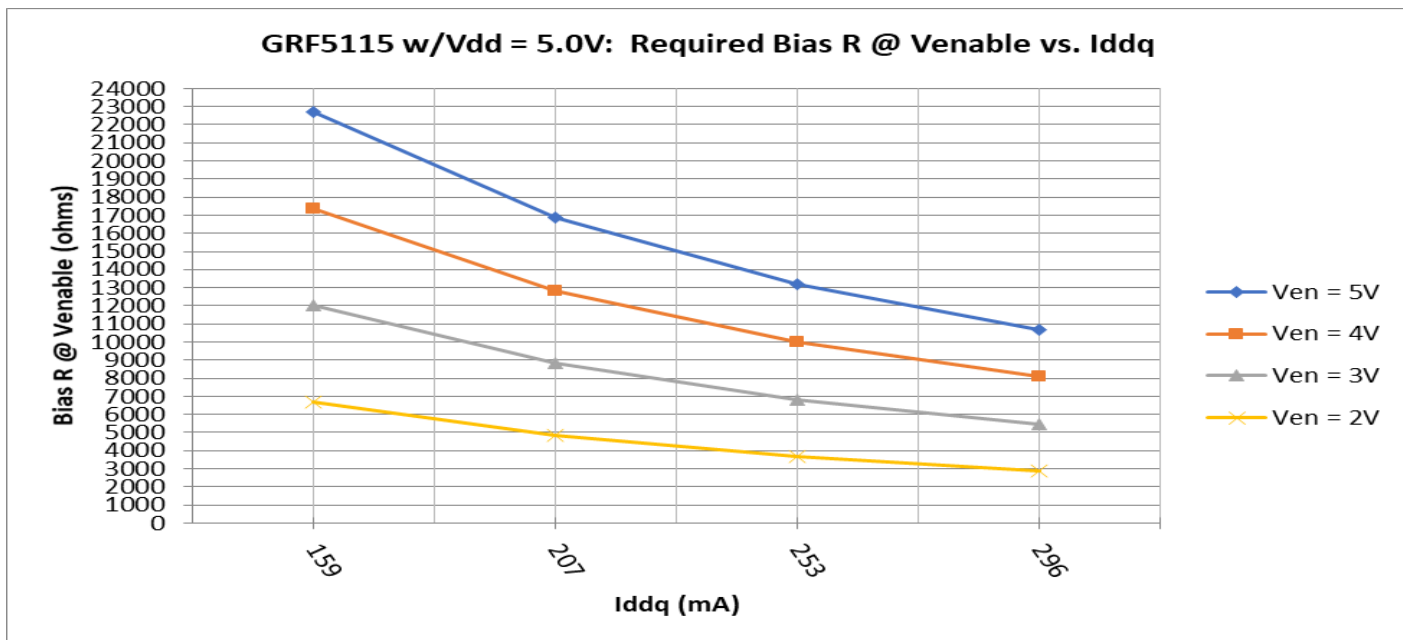
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## GRF5115 Evaluation Board BOM: (1.9 to 2.0 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (See curves)	Resistor	Various	5%	Sets Iddq	0402	ok
M2	Inductor	Murata	LQP	6.2 nH	0402	ok
M4	Capacitor	Murata	GJM	1.5 pF	0402	ok
M6	Capacitor	Murata	GJM	3.9 pF	0402	ok
R1 (Adjacent M6)	Resistor	Various	—	5.0k Ohm	0402	ok
M9	Resistor	Various	—	100k Ohm	0402	ok
M10	Inductor	Murata	LQG	0 Ohm	0402	ok
M13	Resistor	Various	5%	150 Ohm	0402	ok
M14	Inductor	Coilcraft	HP	8.2 nH	0402	ok
M16	Capacitor	Murata	GRM	0.1 uF	0402	ok
M17	Capacitor	Murata	GRM	100 pF	0402	ok
M18	Capacitor	Murata	GJM	3.9 pF	0402	ok
M21	Capacitor	Murata	GJM	15 pF	0402	ok
Evaluation board	PA-V3_RevA					

## GRF5115 Bias Resistor M1 Selection Curves





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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.

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