GRF5110

Released

28.8 dBm Power-LNA™
Tuning Range: 1.5 – 3.8 GHz

Features

Reference: 5V/160mA/1.9GHz

- Gain: 15.0 dB
- OP1dB: 28.8 dBm
- OIP3: 46.0 dBm
- Eval Board NF:0.9 dB

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

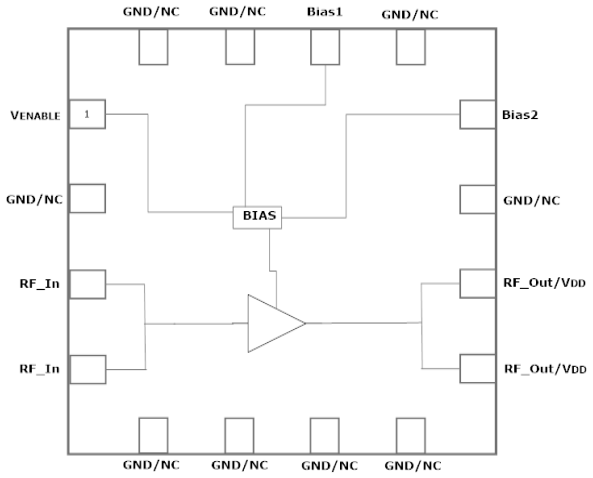
- Power Amplifier
- Linear Driver Amplifier for High PAR Waveforms
- Multi-stage LNA

Product Description

GRF5110 is a high linearity PA /Linear Driver with low noise figure (NF). It delivers excellent P1dB, IP3 and NF over a wide range of frequencies with fractional bandwidths of roughly 5 to 10%.

The device can be tuned over a wide range of frequencies from around 1.5 GHz to 3.8 GHz.

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



3.0 x 3.0 mm QFN-16

Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Drain Voltage	V_{DD}		6.0	V
Transient Average RF Input Power: (Load VSWR < 2:1; Duration: <1 hour)	$P_{IN\ MAX}$		24.0	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	$P_{DISS\ MAX}$		1.0	W
Electrostatic Discharge:				
Charged Device Model: (TBD)	CDM	1500		V
Human Body Model:	HBM	250		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		1	--

RoHS Compliant

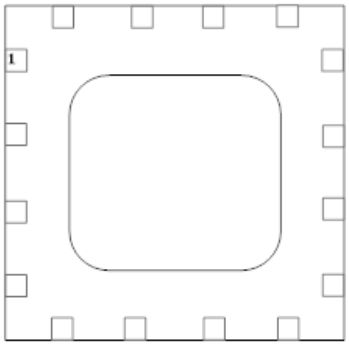
Caution! ESD Sensitive Device

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

Note: For package dimensions and manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF5110 landing page: Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

Link to manufacturing note

Pin Out (Top View)



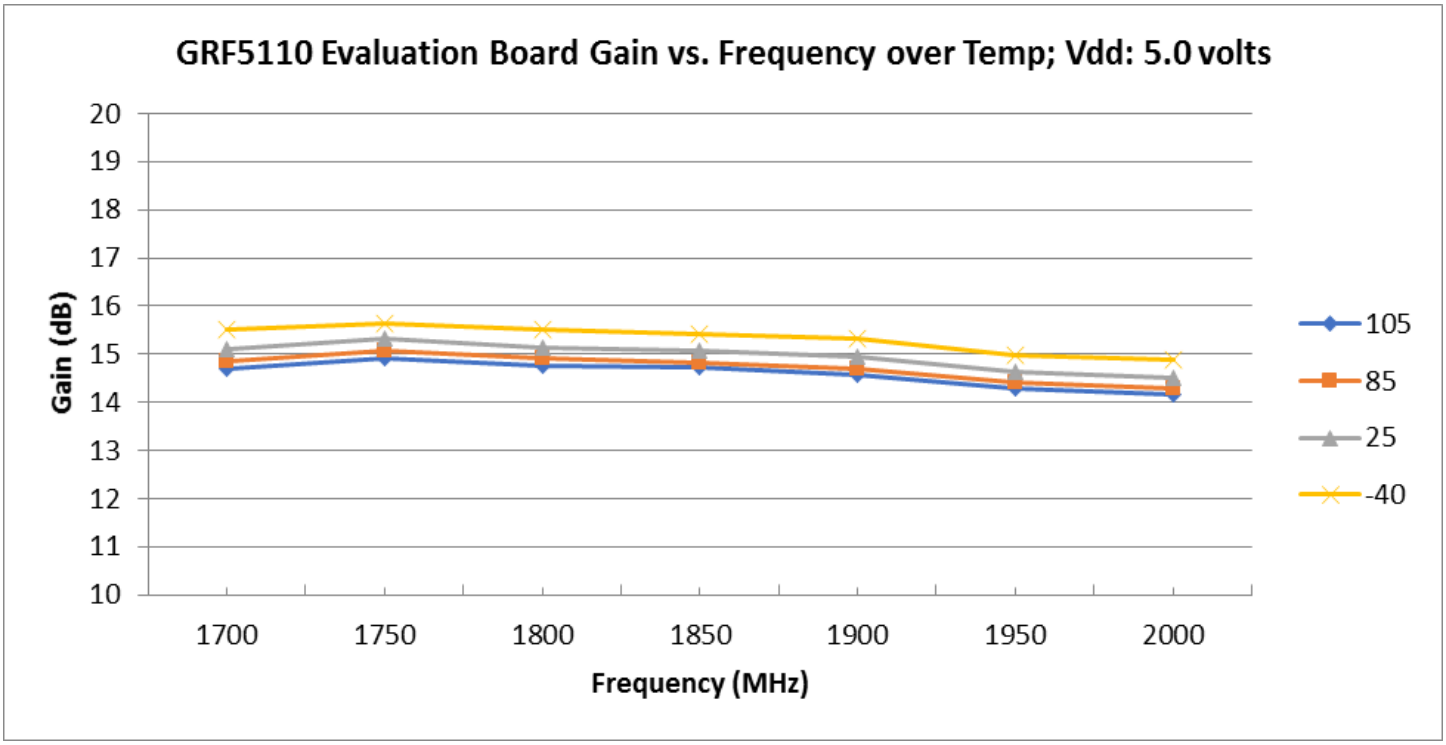
Pin Assignments:

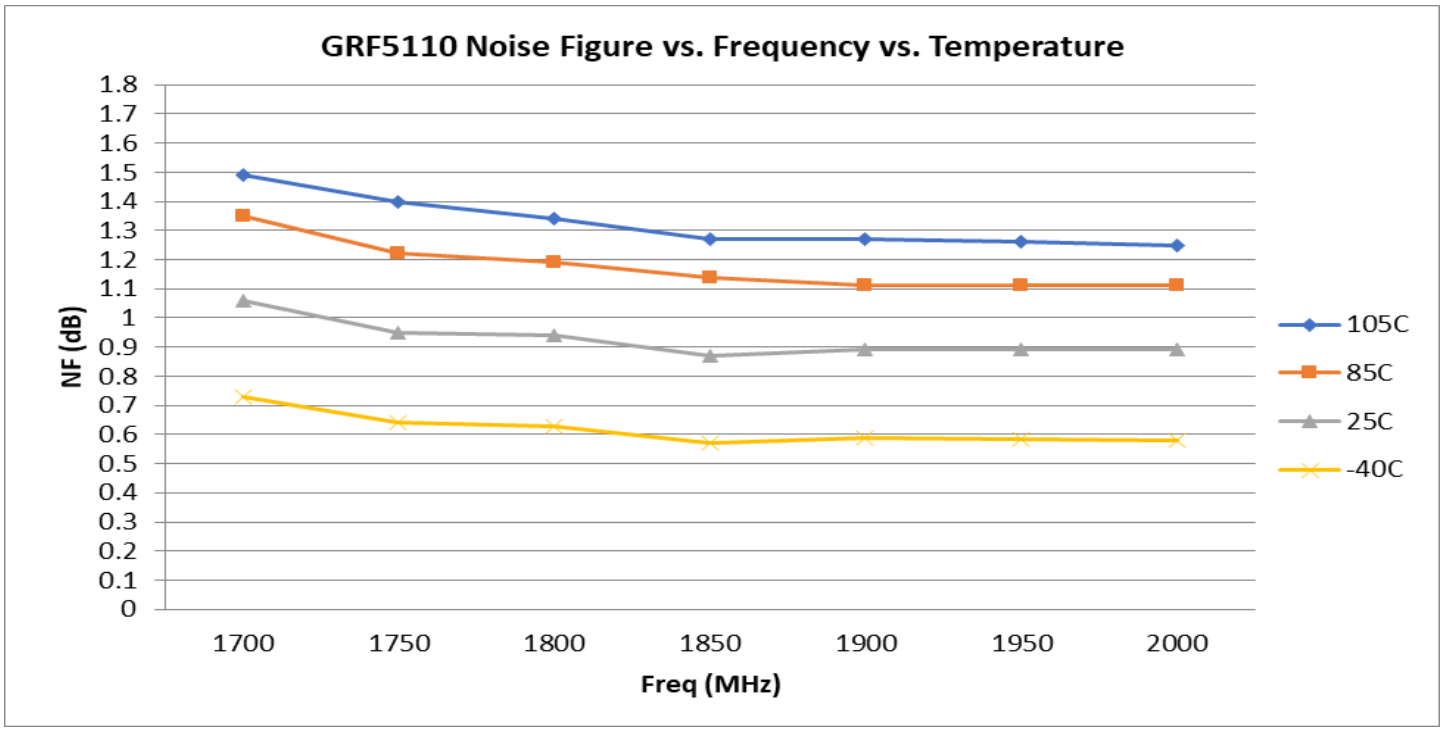
Pin	Name	Description	Note
1	V_{ENABLE}	Enable Voltage Input	V_{ENABLE} and series resistor set I_{DDQ}. V_{ENABLE} < =0.2 volts disables device. On-die pull-down resistor will turn the part off if this node is allowed to float.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	RF Input	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_{DD}	PA Output/Bias	Pins 9-10 tied together on system board. Supply Vdd here.
10	RF_Out/V_{DD}	PA Output/Bias	Pins 9-10 tied together on system board. Supply Vdd here.
11	NC	No Connect or Ground	No internal connection to die
12	Bias2	Bias Circuit Supply	Connect to V_{DD} 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.

Nominal Operating Parameters:

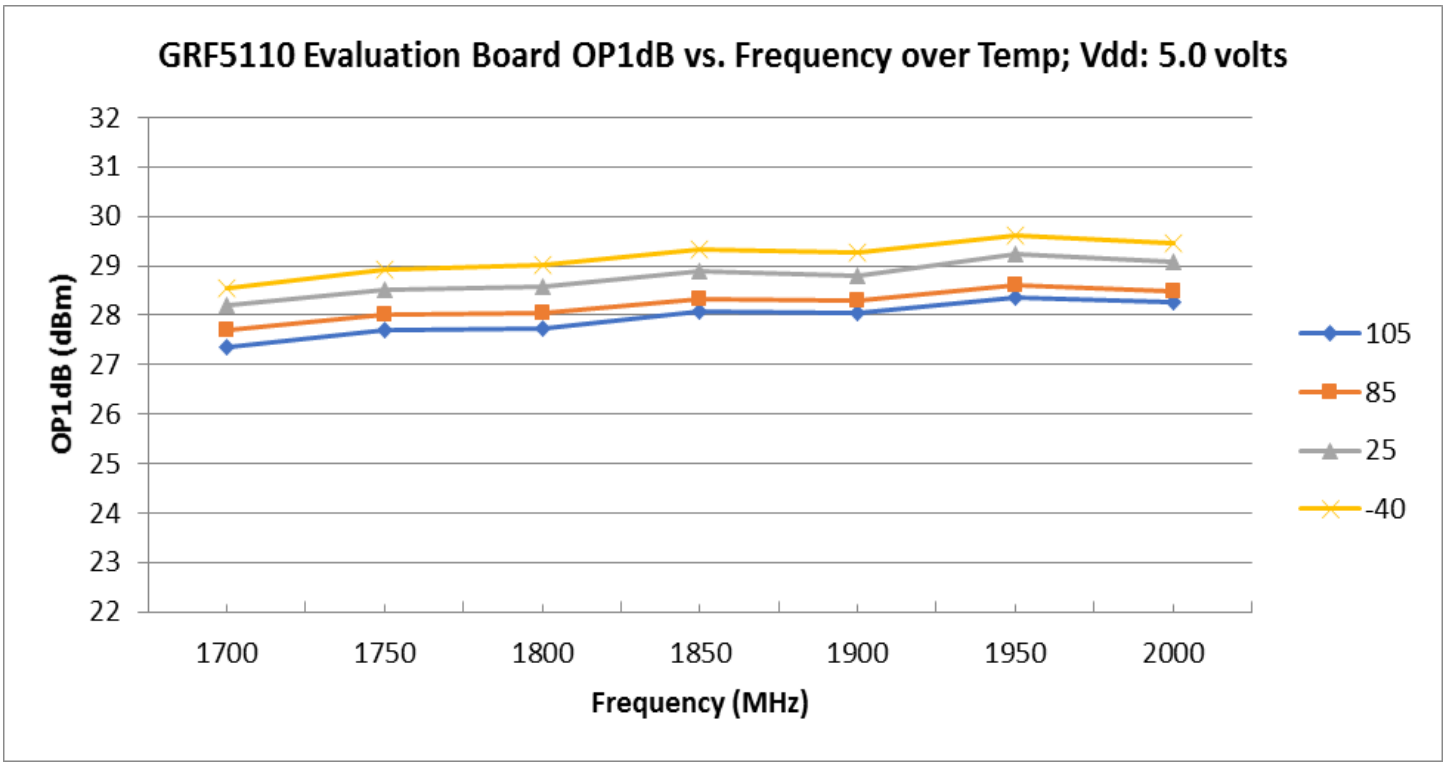
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Target Performance (1.7 to 2.2 GHz Tune)						**Bias: 5.0 V and 160 mA unless otherwise noted. (+25C)**
Test Frequency	F_{TEST}		1.9		GHz	
Gain	S(2,1)	14.0	15.0		dB	
Noise Figure (Evaluation Board)	NF		0.9		dB	
Output 1dB Compression Point	OP1dB	27.3	28.8		dBm	
Output Third Order Intercept Point	OIP3		46.0		dBm	
Switching Rise Time	T_{RISE}		100		ns	
Switching Fall Time	T_{FALL}		800		ns	
Quiescent Supply Current	I_{DDQ}		160	190	mA	Vdd=Venable=5.0volts Rbias: 5k ohms
Enable Current	I_{ENABLE}		2.0		mA	
Disabled Mode						
Supply Current (Leakage)	I_{DD}		30		uA	
Thermal Data						
Thermal Resistance: (IR Scan Method)	Θjc		80		°C/W	
Channel Temperature @ +85C Reference (package heat sink)	$T_{CHANNEL}$		149		°C	V_{DD}: 5.0 volts; I_{DDQ}: 160 mA P_{DISS}: 800 mW; No RF

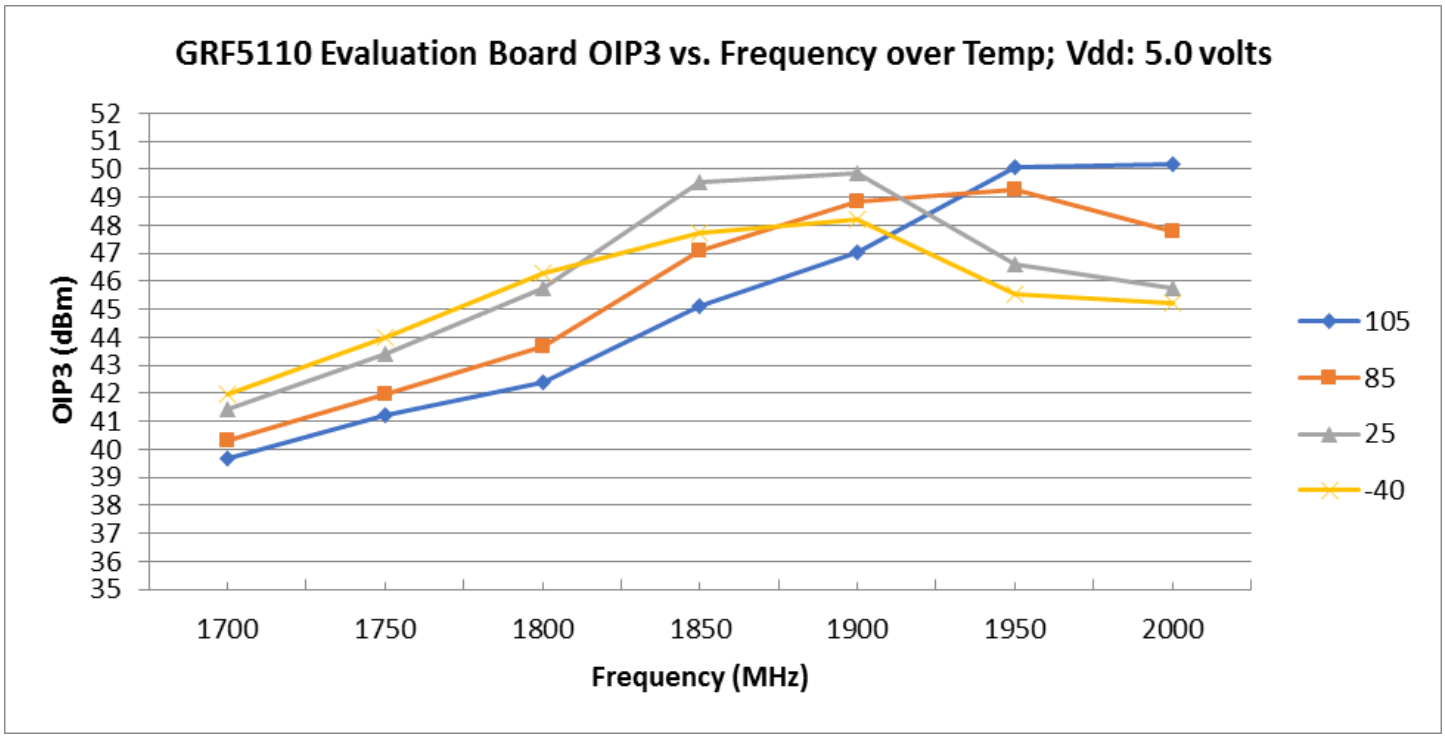
GRF5110 Evaluation Board Measured Data: (1.7 to 2.0 GHz Tune)



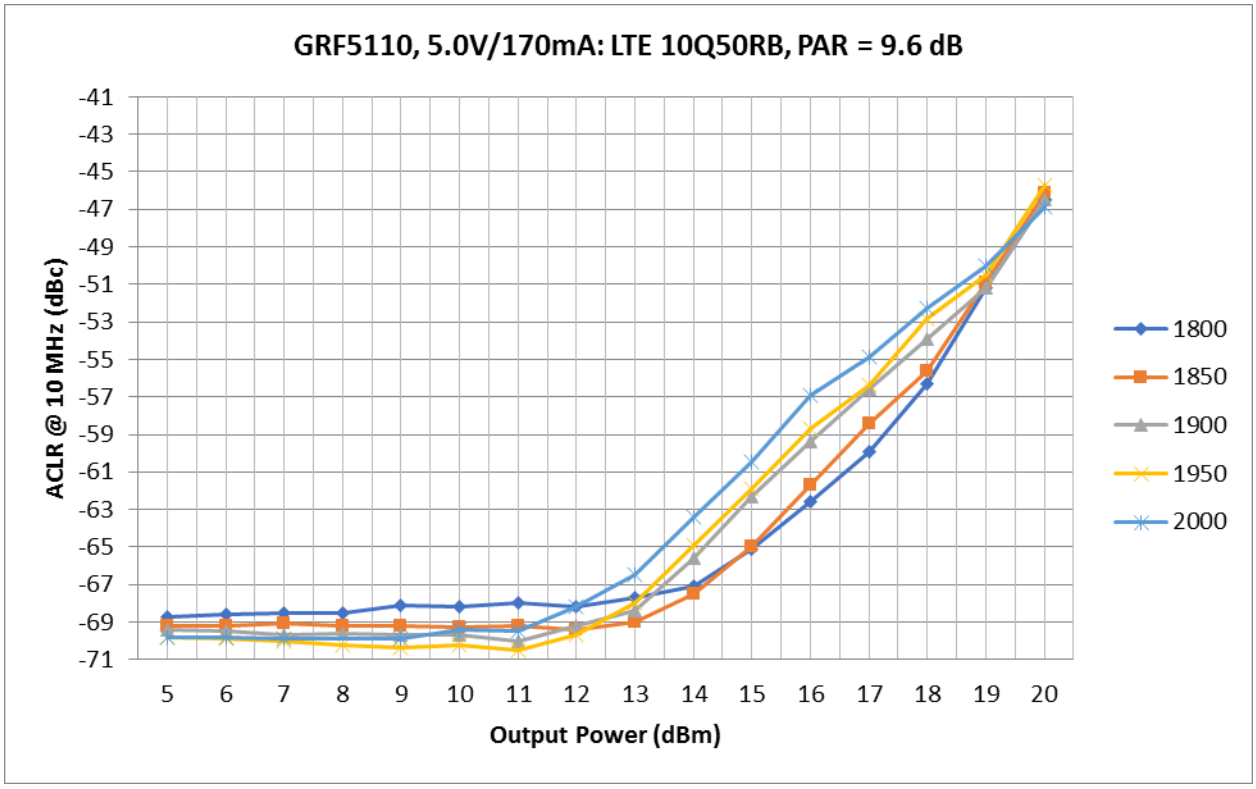


GRF5110 Evaluation Board Measured Data: (1.7 to 2.0 GHz Tune)

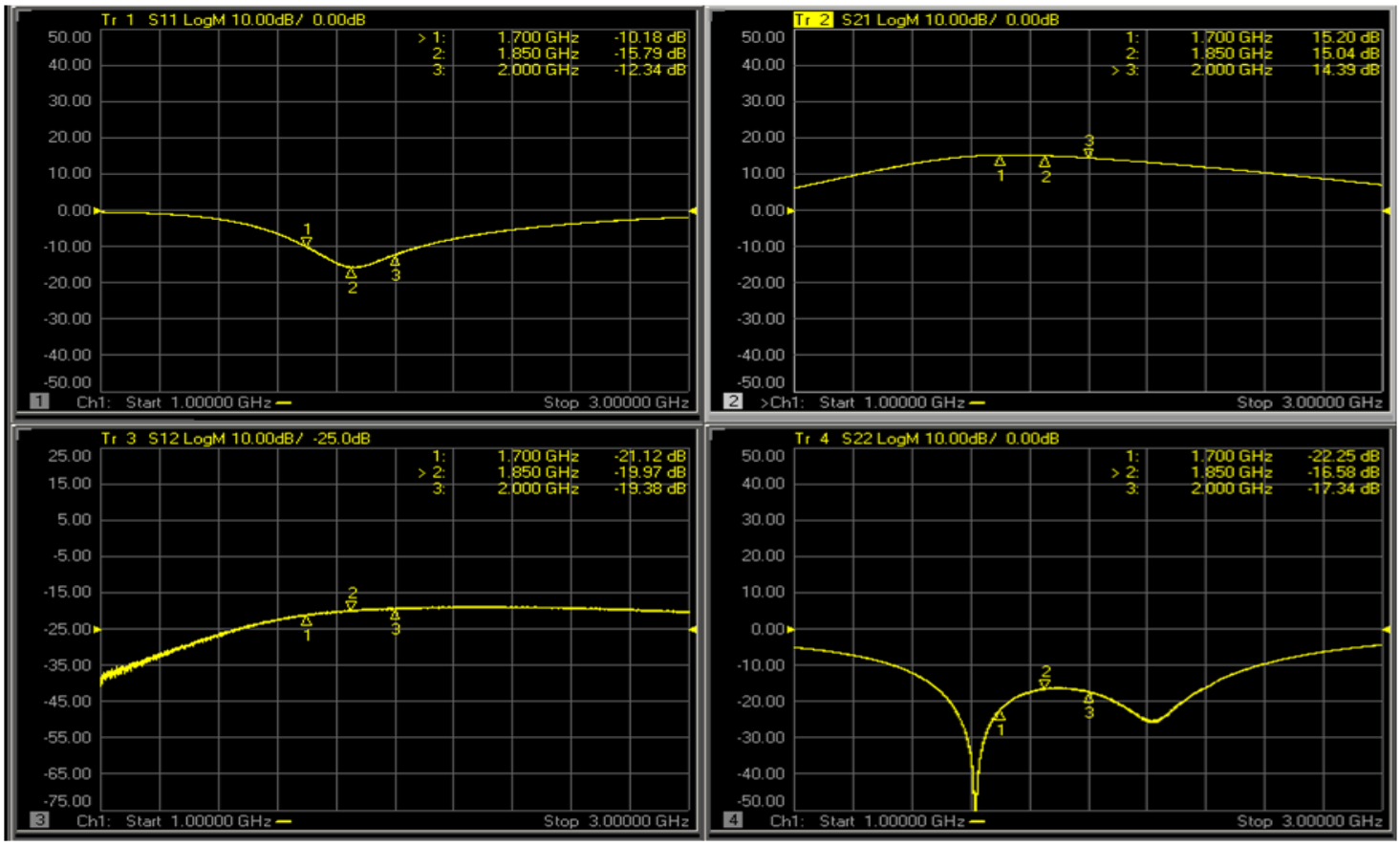


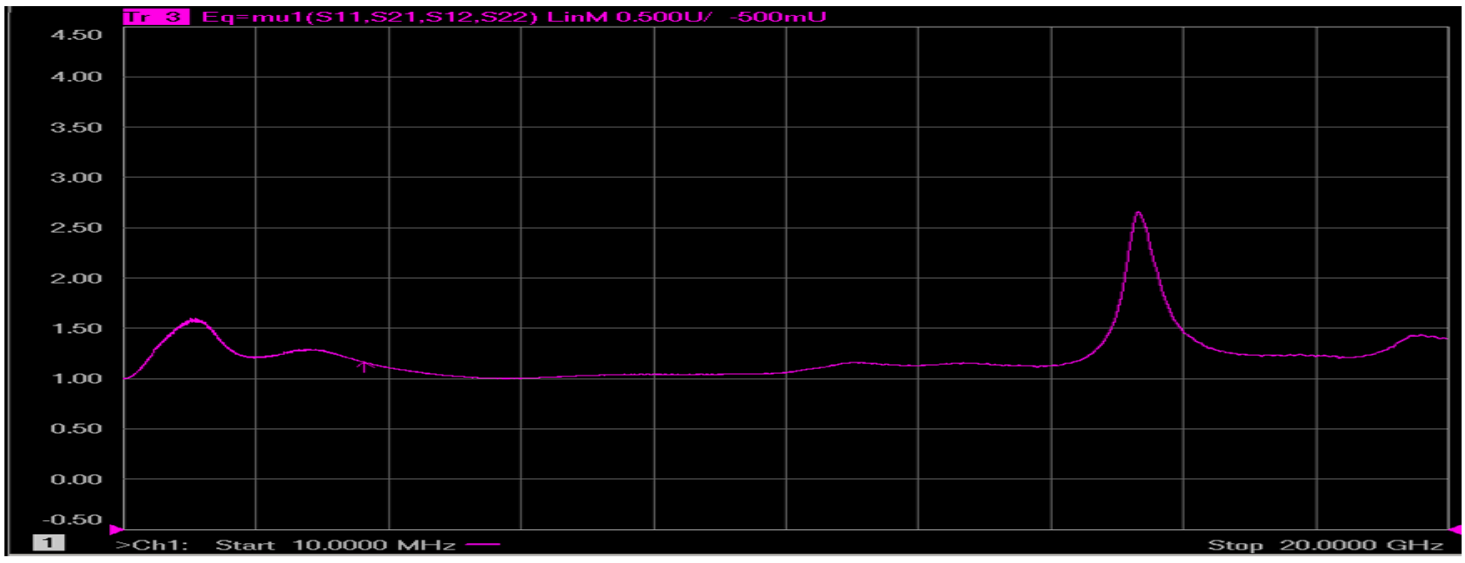


GRF5110 Evaluation Board Measured Data: (1.7 to 2.0 GHz Tune)

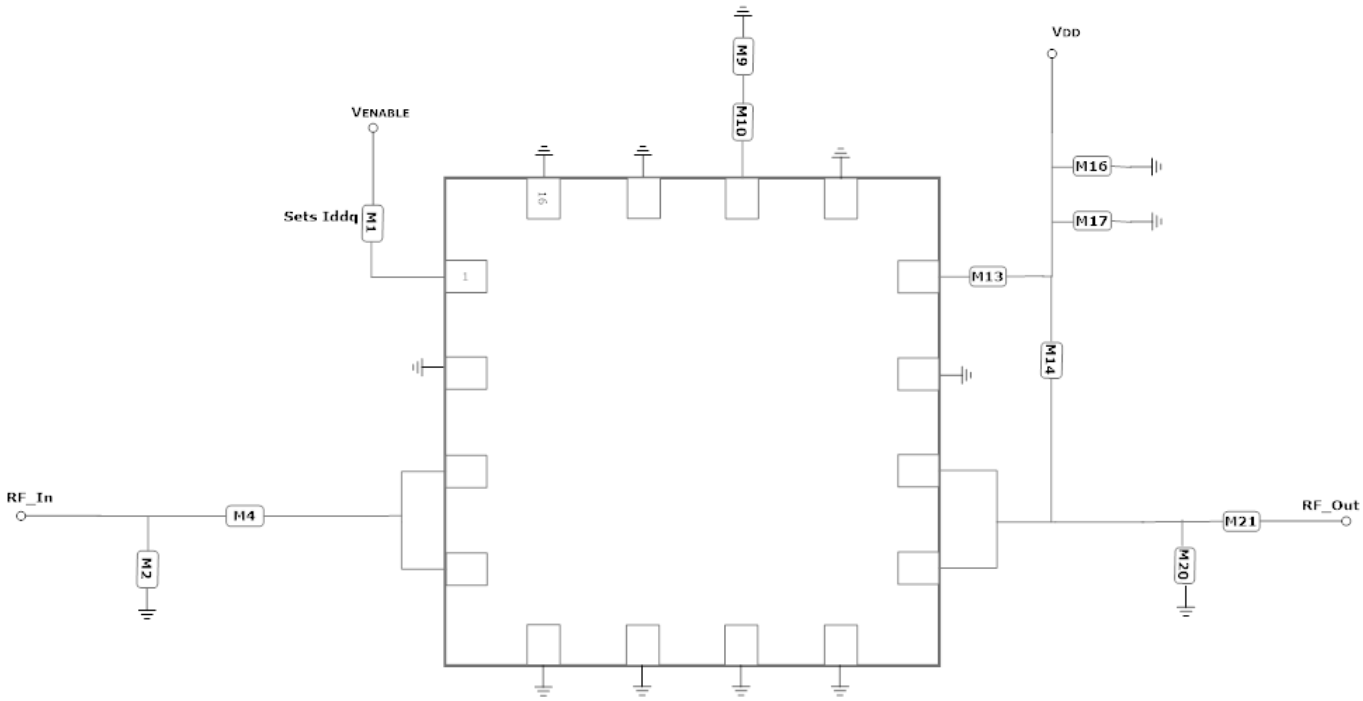


GRF5110 Evaluation Board S-Pars: (1.7 to 2.0 GHz Tune)

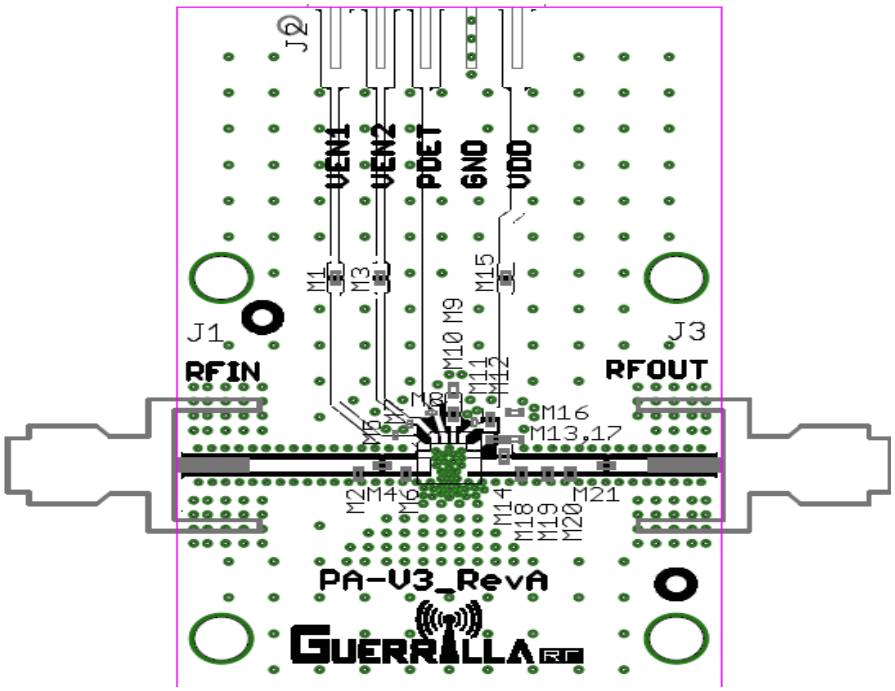




Note: Mu factor >= 1.0 implies unconditional stability.



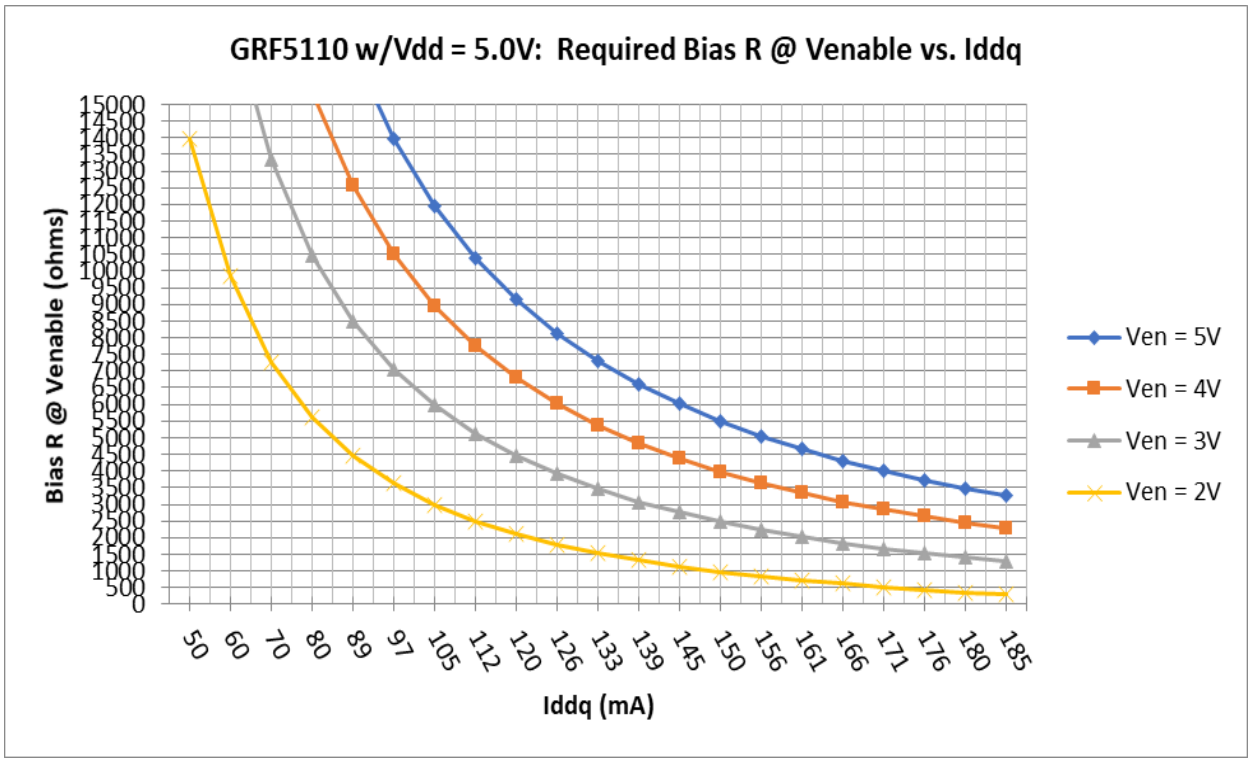
GRF5110 Application Schematic: (1.7 to 2.0 GHz)



GRF5110 Evaluation Board Assembly Drawing

GRF5110 Evaluation Board BOM: (1.7—2.0 GHz)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (See curves)	Resistor	Various	5%	Sets Iddq	0402	ok
M2	Inductor: High Q	Coilcraft	HP	2.7 nH	0402	ok
M4	Capacitor: High Q	Murata	GJM	2.0 pF	0402	ok
M9	Resistor	Various	5%	0 Ohm	0402	ok
M10	Inductor	Murata	LQP/LQG	12 nH	0402	ok
M13	Resistor	Various	5%	0 Ohm	0402	ok
M14	Inductor: High Q	Coilcraft	HP	18 nH	0402	ok
M16	Capacitor	Murata	GRM	0.1 uF	0402	ok
M17	Capacitor	Murata	GRM	100 pF	0402	ok
M20	Capacitor	Murata	GJM	1.5 pF	0402	ok
M21	Capacitor	Murata	GJM	10 pF	0402	ok



GRF5110 Bias Resistor (M1) Selection Curves

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.