GRF2083

Preliminary

Ultra-LNA with Shutdown
Tuning Range: 3.0 to 6.0 GHz

Features

Reference: 5V/70 mA/3.6 GHz

- Gain: 17.8 dB
- Eval Board NF: 0.65 dB
- OP1dB: 19.5 dBm
- OIP3: 36.5 dBm

- High Isolation Shut Down State
- Flexible Bias Voltage
- Process: GaAs pHEMT

Applications

- Cellular Infrastructure
- Small Cells and Cellular Repeaters
- Distributed Antenna Systems
- TDD Systems
- 802.11ac

Product Description

GRF2083 is a broadband, linear, ultra-low noise amplifier designed for small cell, wireless infrastructure and other high performance RF applications requiring ultra-low NF, high gain and linearity.

The device features an integrated shut down function which places the device into a high-isolation shut down state.

GRF2083 is a member of a family of pin compatible, ultra low noise devices which cover a wide range of frequency bands with industry leading NF and gain:

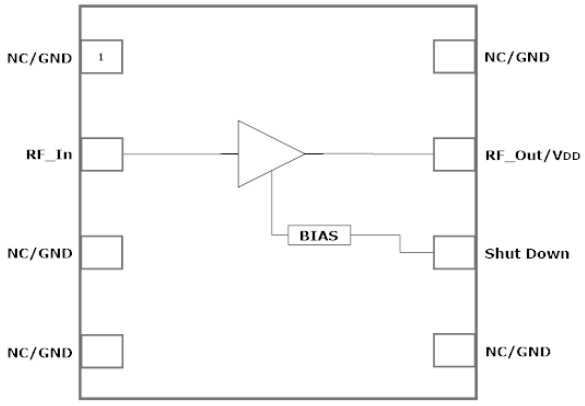
GRF2080: 0.4 to 1.5 GHz

GRF2081: 1.4 to 2.7 GHz

GRF2082: 1.9 to 3.8 GHz

GRF2083: 3.0 to 6.0 GHz

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



2.0 x 2.0 mm DFN-8

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)	$P_{IN\ MAX}$		23	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	$P_{DISS\ MAX}$		500	mW
Electrostatic Discharge:				
Charged Device Model:	CDM	1500		V
Human Body Model:	HBM	500		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		1	--

RoHS Compliant

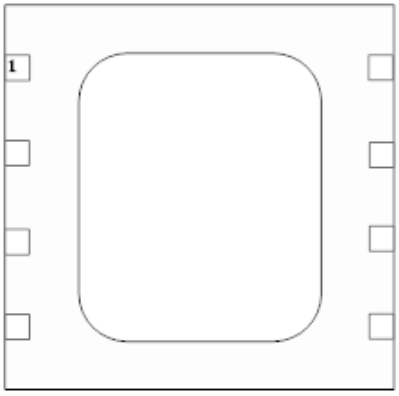
Caution! ESD Sensitive Device

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 GRF2083 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	NC/GND	No Connect or Ground	No internal connection to die
2	RF_In	RF Input	External match must provide DC block
3	NC/GND	No Connect or Ground	No internal connection to die
4	NC/GND	No Connect or Ground	No internal connection to die
5	NC/GND	No Connect or Ground	No internal connection to die
6	Shut Down	Selects Shut Down Mode	See control logic truth table
7	RF_Out/V_{DD}	RF Out	Provide device V_{DD} via external bias inductor
8	NC/GND	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.

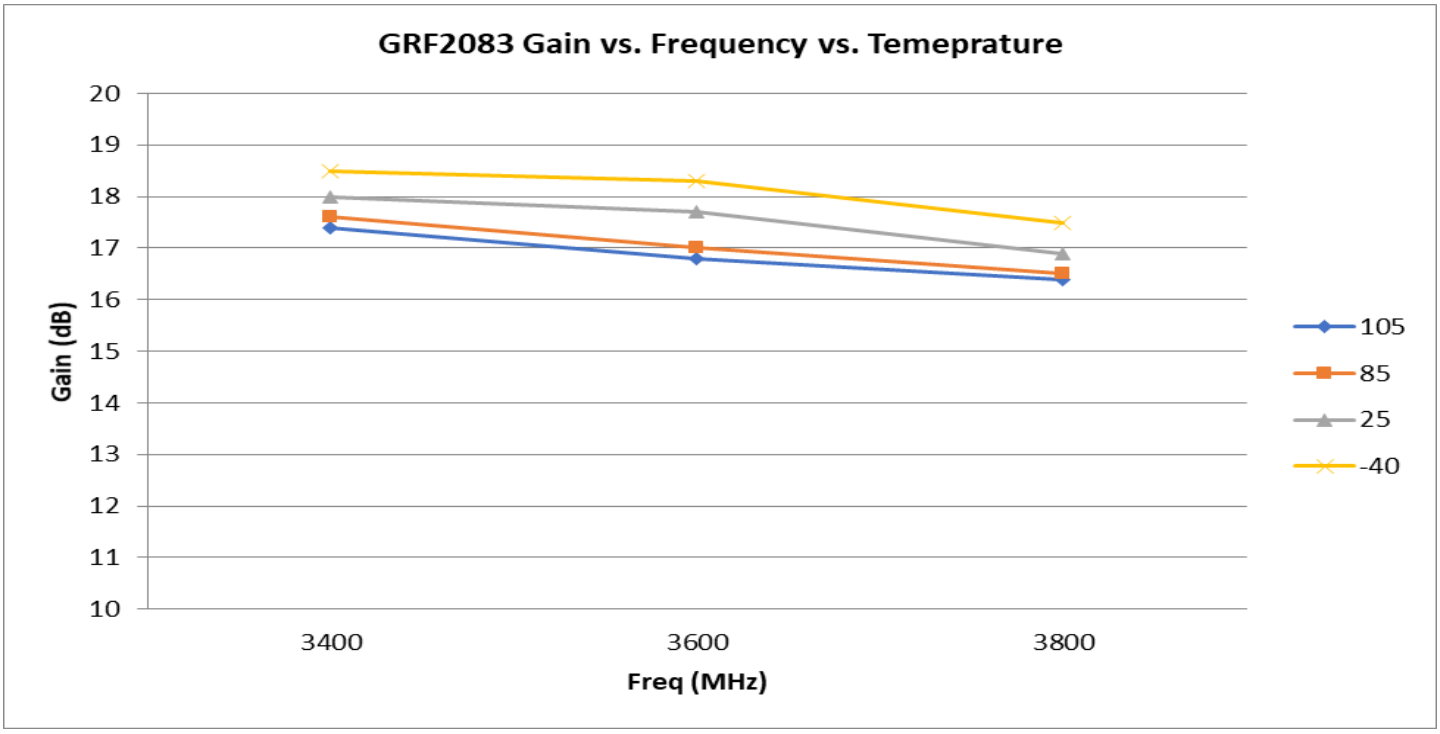
Control Logic Truth Table:

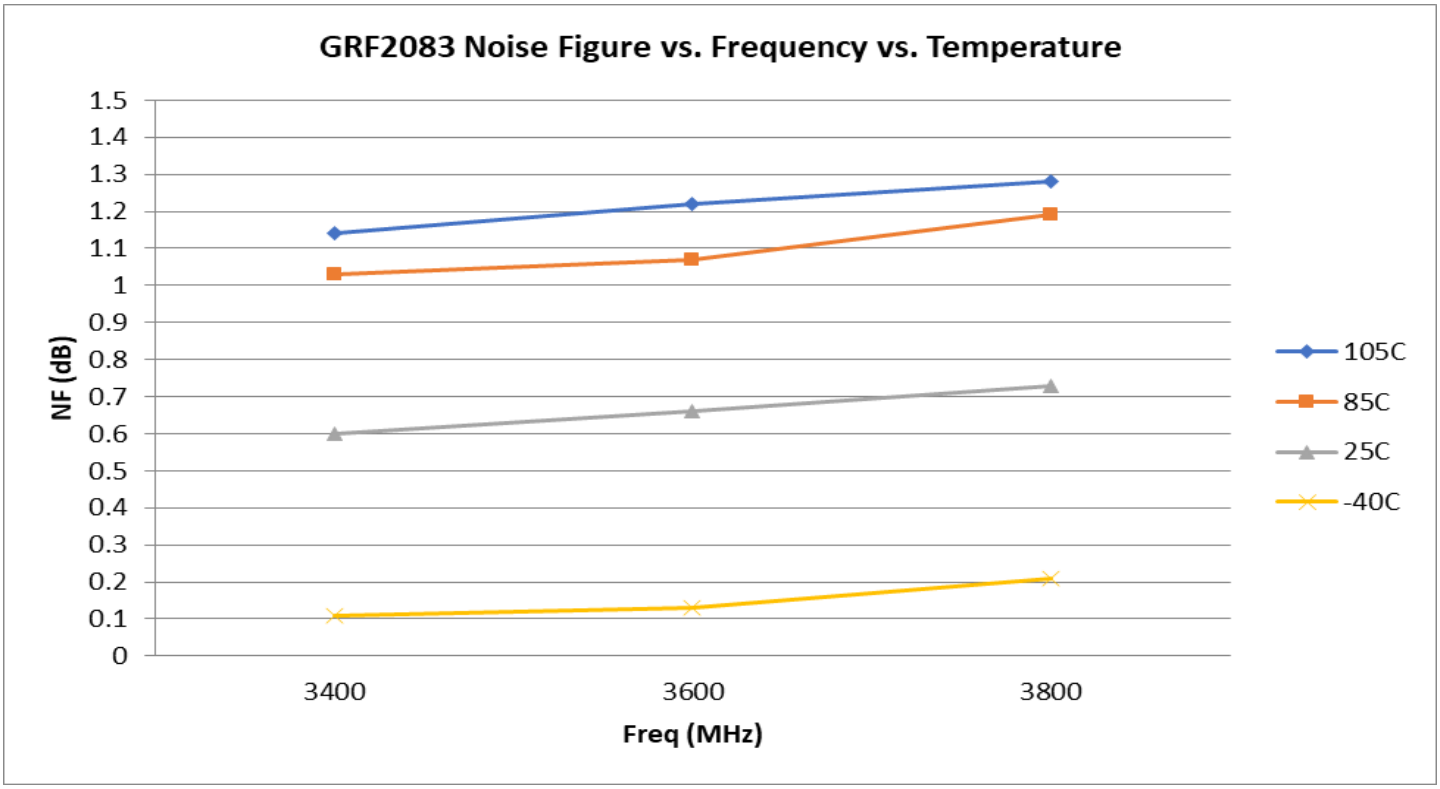
Mode	Description	V_{DD}	$V_{SHUTDOWN}$ (pin 6)
High Gain	High LNA Gain	High	Low
Shutdown	High Insertion Loss	High	High
Logic Level “0”	Logic Low	0.0V	0.0V to 0.2V
Logic Level “1”	Logic High	>= 2.7V	1.5V to V_{DD}

Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain Mode (Pin 6: < 0.2V)						V_{DD} = 5.0 V, T_A = 25 °C
Test Frequency	F_{TEST}		3600		MHz	3400 to 3800 MHz Tune
Evaluation Board Gain	S21		17.8		dB	
Evaluation Board Noise Figure	NF		0.65		dB	Evaluation Board SMA to SMA
Output 3rd Order Intercept Point	OIP3		36.5		dBm	4.0 dBm P_{OUT} per tone at 2 MHz Spacing (3599 and 3601 MHz)
Output 1dB Compression Point	OP1dB		19.5		dBm	
Switching Rise Time	T_{RISE}		100		ns	
Switching Fall Time	T_{FALL}		100		ns	
Supply Current	I_{DD}		70		mA	
Shutdown Mode (Pin 6: >1.5V)						
Shutdown Gain	S(2,1)		-18.5		dB	
Shutdown Current (Pin 6)	$I_{SHUTDOWN}$		40		uA	$V_{SHUTDOWN}$: 1.8 V
Leakage Current (Pin 7)	$I_{LEAKAGE}$		3.2		mA	$V_{SHUTDOWN}$: 1.8 V
Thermal Data						
Thermal Resistance (measured via IR scan)	Θ_{jc}		60		°C/W	On standard evaluation board
Channel Temperature @ +85 C Reference (Package Heat Sink)	$T_{CHANNEL}$		106		°C	V_{DD}: 5.0 V; I_{DDQ}: 70 mA; No RF; P_{DISS}: 350 mW

GRF2083 Evaluation Board Data over Temperature:





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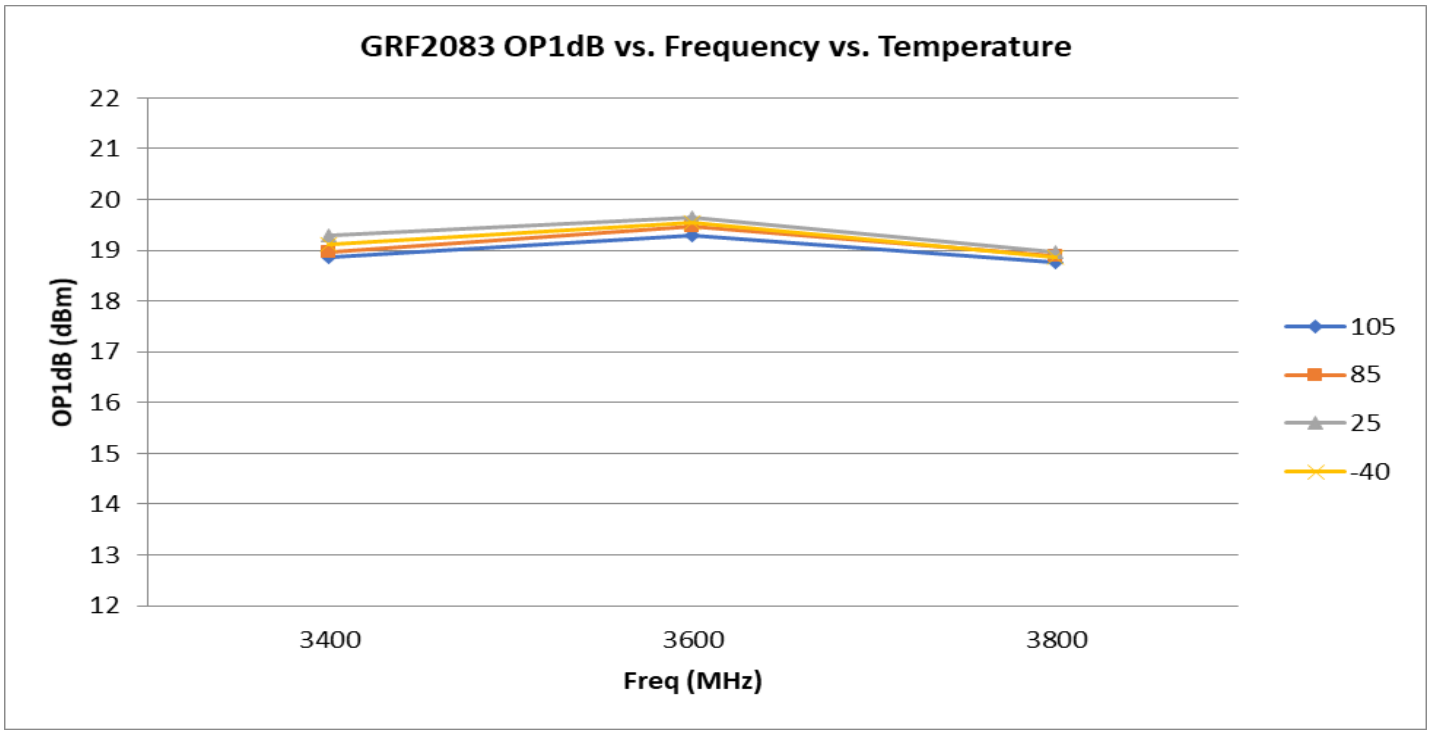
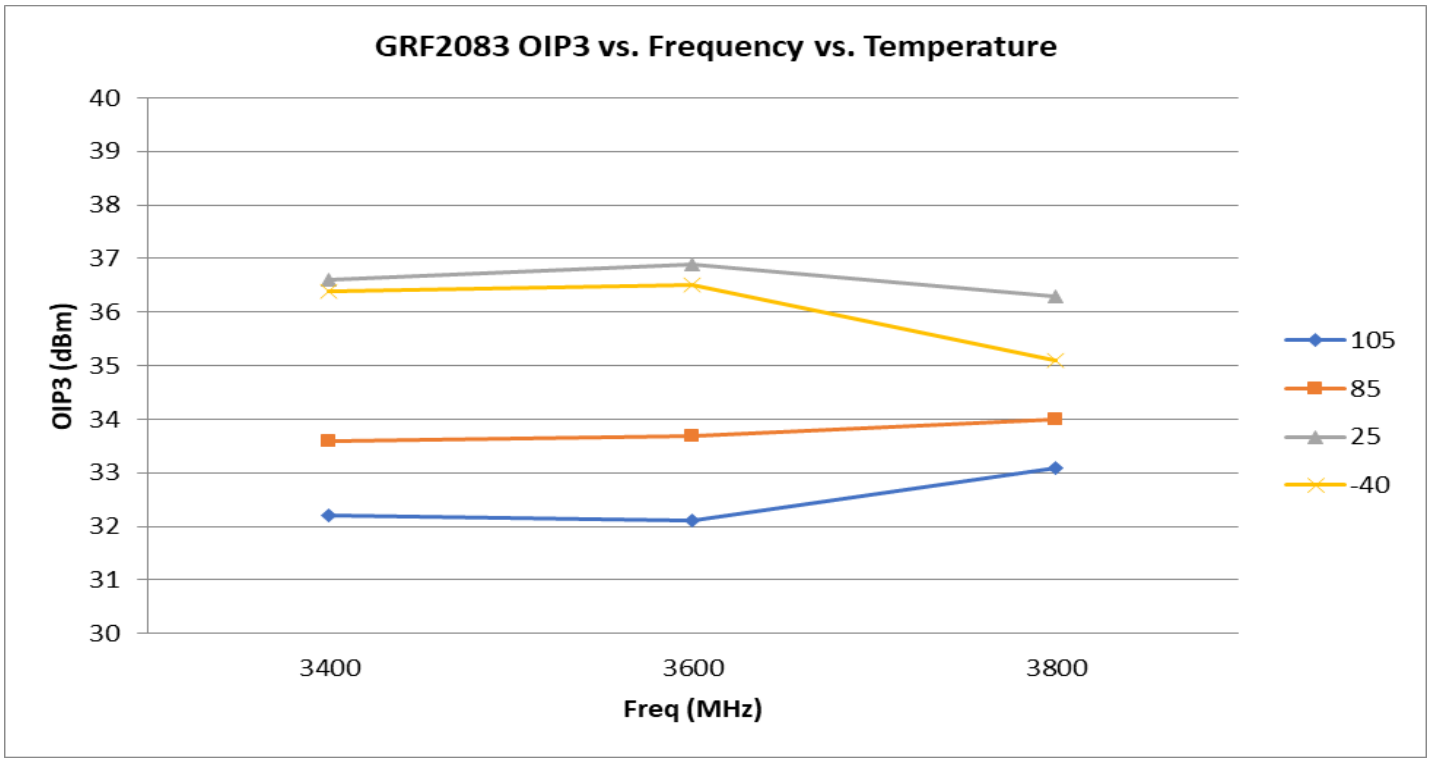
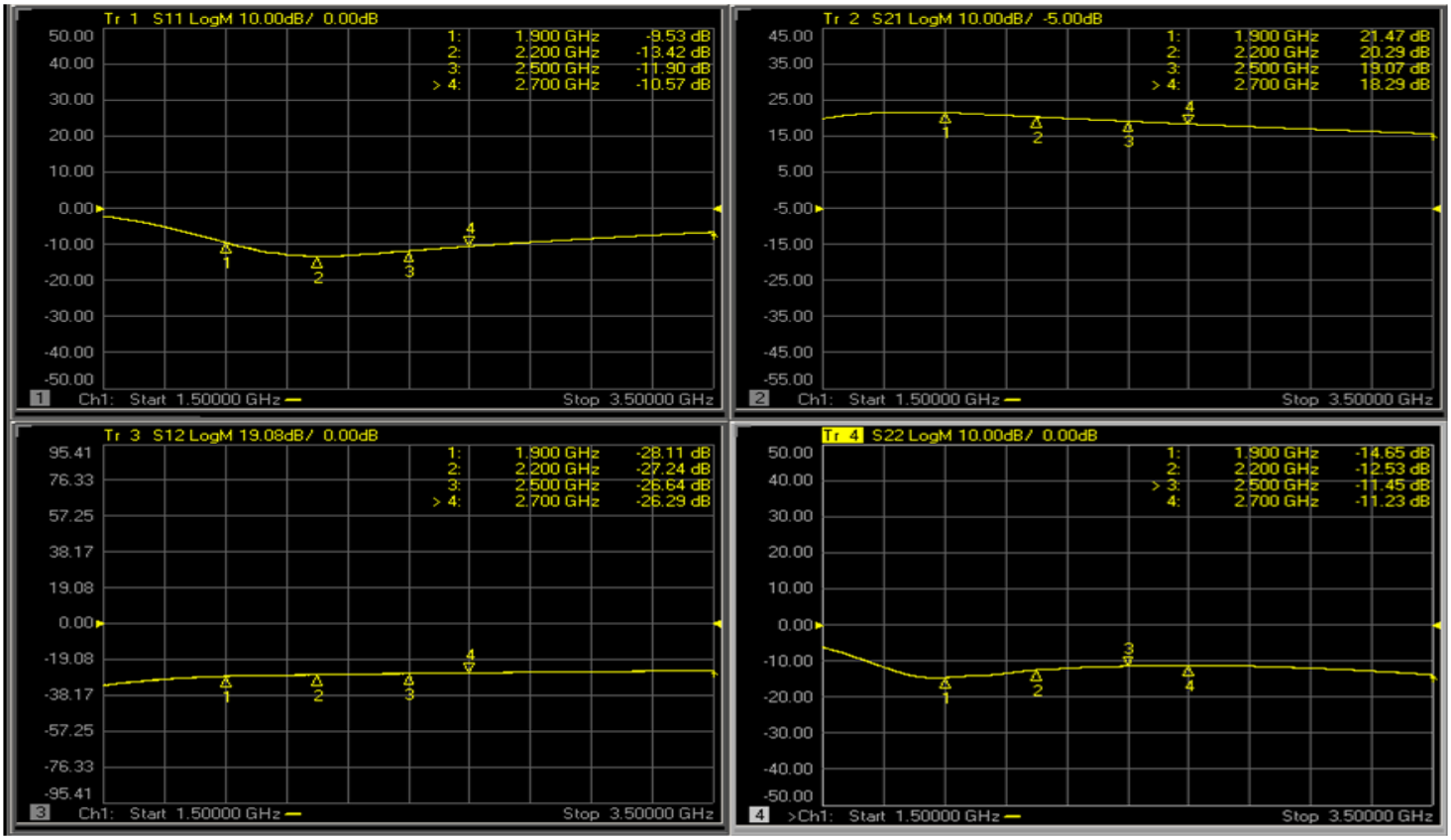
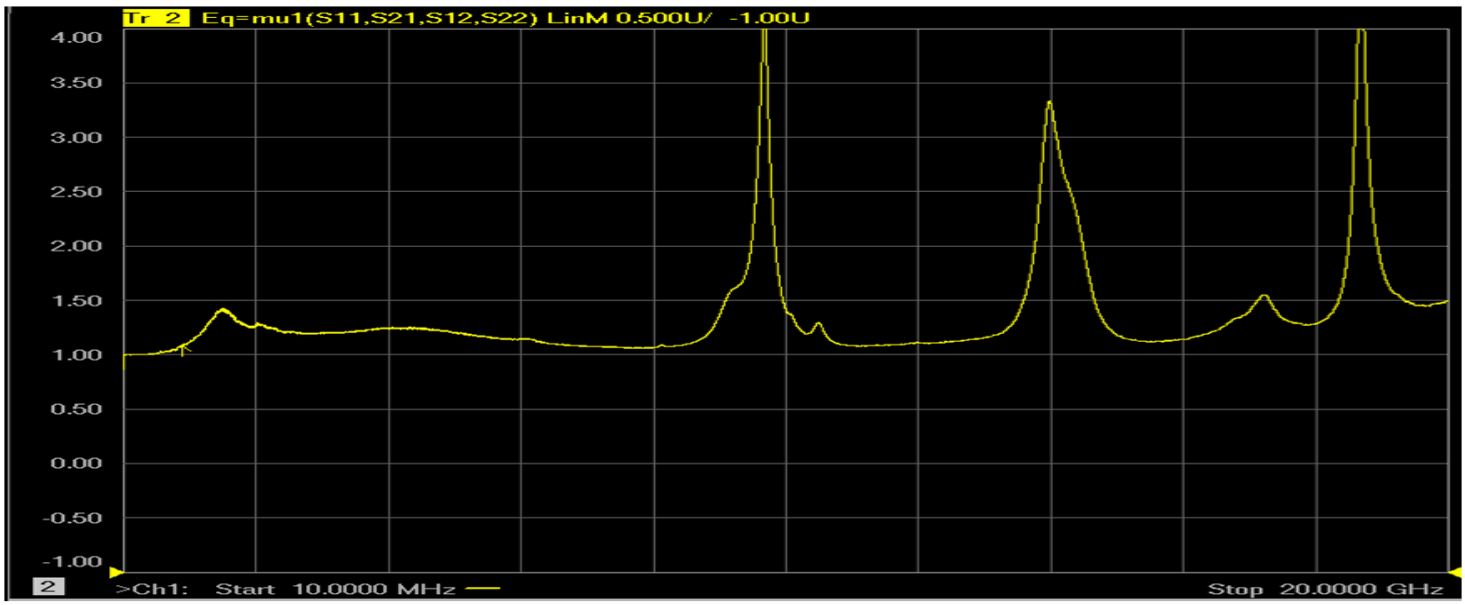


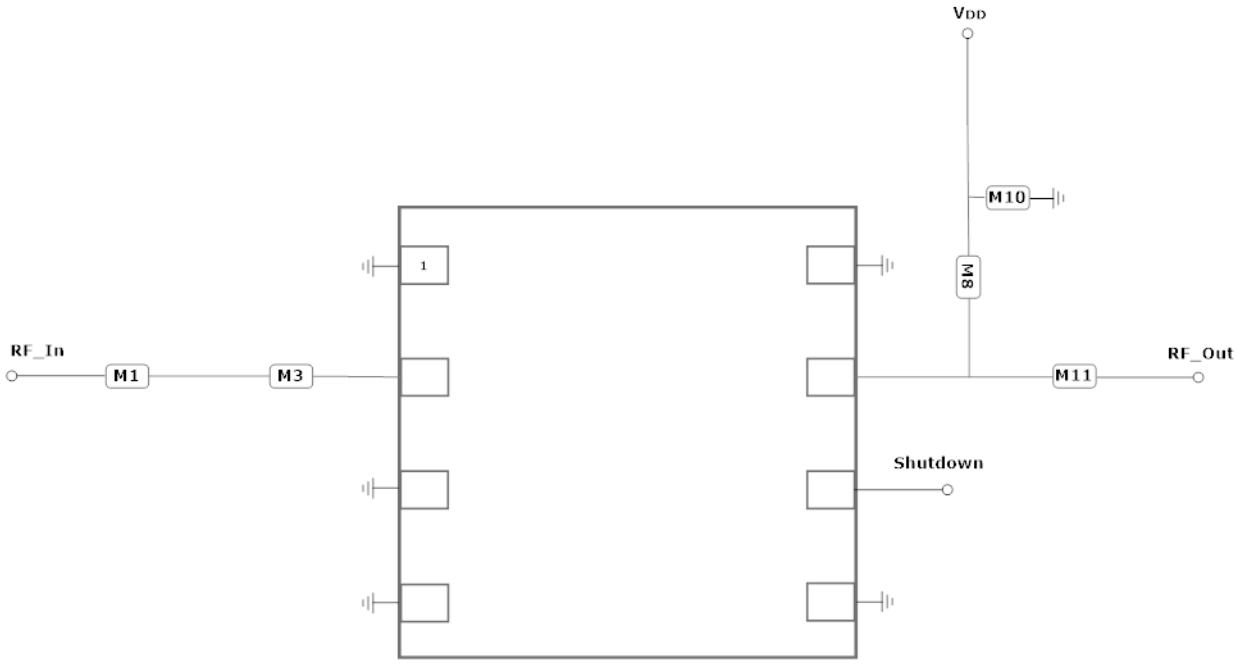


GRF2083 Gain Mode S-Pars: (3.4 to 3.8 GHz Match)

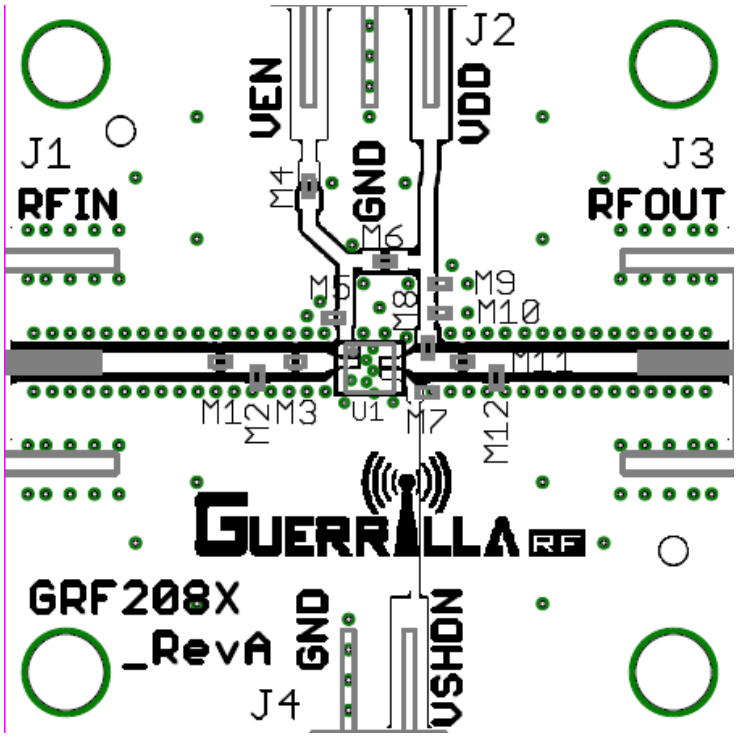




Note: Mu factor >= 1.0 implies unconditional stability.



GRF2083 Application Schematic



GRF2083 EVB Assembly Drawing

GRF2082 Standard Evaluation Board BOM: (3.4 to 3.8 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Capacitor	Murata	GJM	1.2 pF	0402	Ok (high Q)
M3	0 Ohm Jumper	—	—	—	0402	—
M8	Inductor	Murata	LQG	1.8 nH	0402	ok
M9	DNP	—	—	—	—	—
M10	Capacitor	Murata	GRM	0.1 uF	0402	ok
M11	Capacitor	Murata	GRM	5.1 pF	0402	ok
Evaluation Board	GRF208X_RevA	—	—	—	—	—

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.