GRF2070

Preliminary

Ultra-Low Noise Amplifier
Tuning Range: 0.4 – 1.5 GHz

Features

Reference: 5V/75mA/0.9 GHz

- Gain: 21.2 dB
- Eval Board NF: 0.38 dB
- OP1dB: 20.4 dBm
- OIP3: 38.8 dBm

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- Cellular Infrastructure
- Small Cells and Cellular Repeaters
- Distributed Antenna Systems

Product Description

GRF2070 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.

Configured as a first stage LNA, linear driver or cascaded gain block, it offers high levels of reuse both within a design and across platforms.

GRF2070 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:

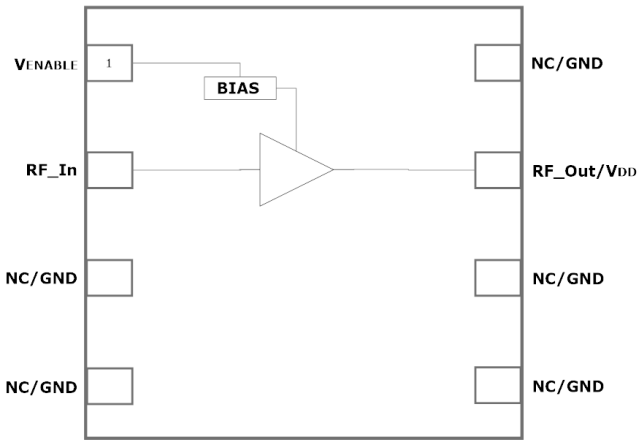
GRF2070: 0.4 to 1.5 GHz

GRF2071: 0.7 to 2.7 GHz

GRF2072: 2.3 to 3.8 GHz

GRF2073: 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: (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	--

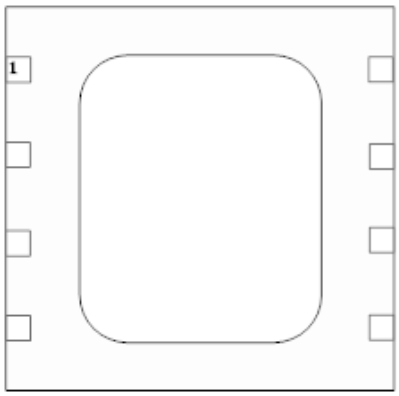
Caution! ESD Sensitive Device

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 GRF2070 landing page: Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

Link to manufacturing note

Pin Out (Top View)



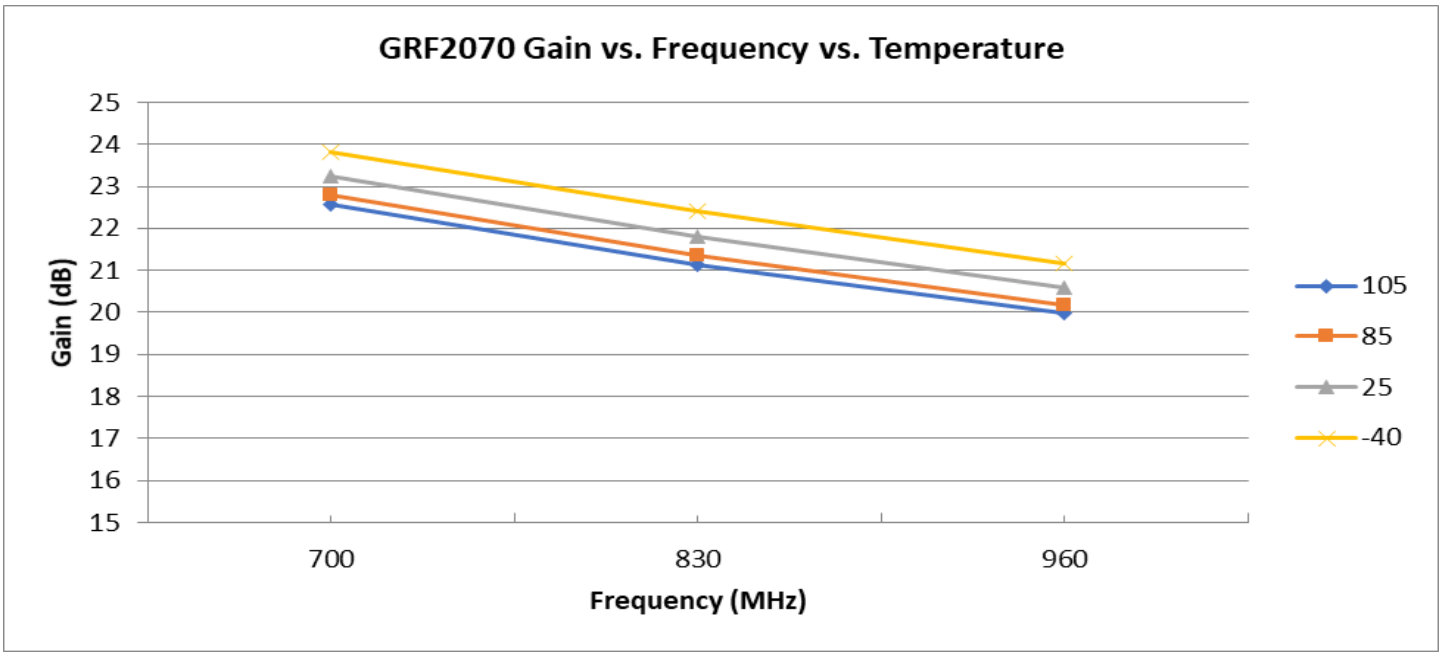
Pin Assignments:

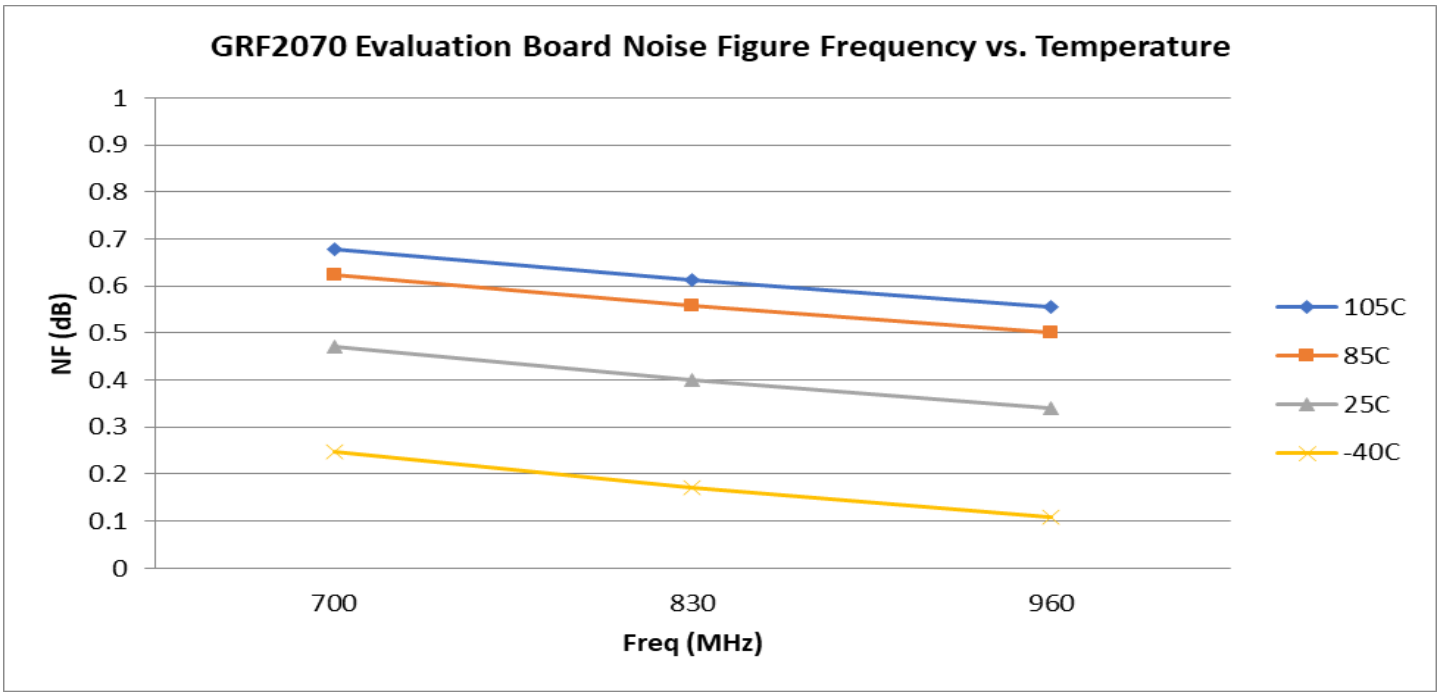
Pin	Name	Description	Note
1	VENABLE	Enable Voltage Input	VENABLE and series resistor set IDDQ. VENABLE < =0.2 volts disables device. On -die pull-down resistor will turn the part off if this node is allowed to float.
2	RF_In	RF Input	External match must provide DC block
3	NC/GND	No Connect or Ground	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	NC/GND	No Connect or Ground	No internal connection to die
7	RF_Out/VDD	RF Output	Provide device VDD 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.

Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain Mode (Venable high)						V_{DD} = 5.0 V, T_A = 25 °C
Test Frequency	F_{TEST}		900		MHz	700 to 960 MHz Tune
Evaluation Board Gain	S21		21.2		dB	
Evaluation Board Noise Figure	NF		0.38		dB	Evaluation Board SMA to SMA
Output 3rd Order Intercept Point	OIP3		38.8		dBm	+4.0 dBm P_{OUT} per tone at 2 MHz Spacing (899 and 901 MHz)
Output 1dB Compression Point	OP1dB		20.4		dBm	
Switching Rise Time	T_{RISE}		1800		ns	
Switching Fall Time	T_{FALL}		900		ns	
Supply Current	I_{DD}		70		mA	Adjustable for optimal IP3
Enable Current	I_{ENABLE}		3.5		mA	
Thermal Data						
Thermal Resistance (measured via IR scan)	Θ_{jc}		54		°C/W	On standard evaluation board
Channel Temperature @ +85 C Reference (Package Heat Sink)	$T_{CHANNEL}$		104		°C	V_{DD}: 5.0 V; I_{DDQ}: 70 mA; No RF; P_{DISS}: 350 mW

GRF2070 Evaluation Board Measured Data:





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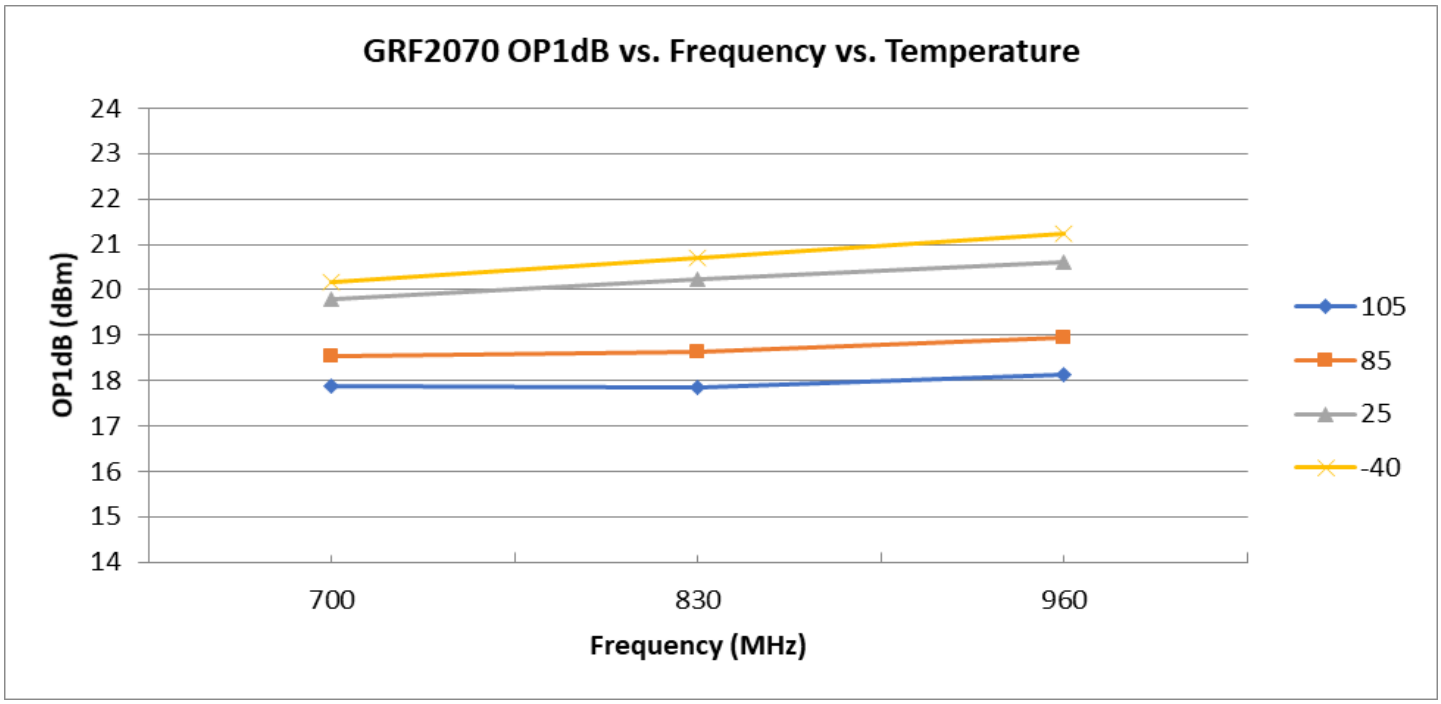
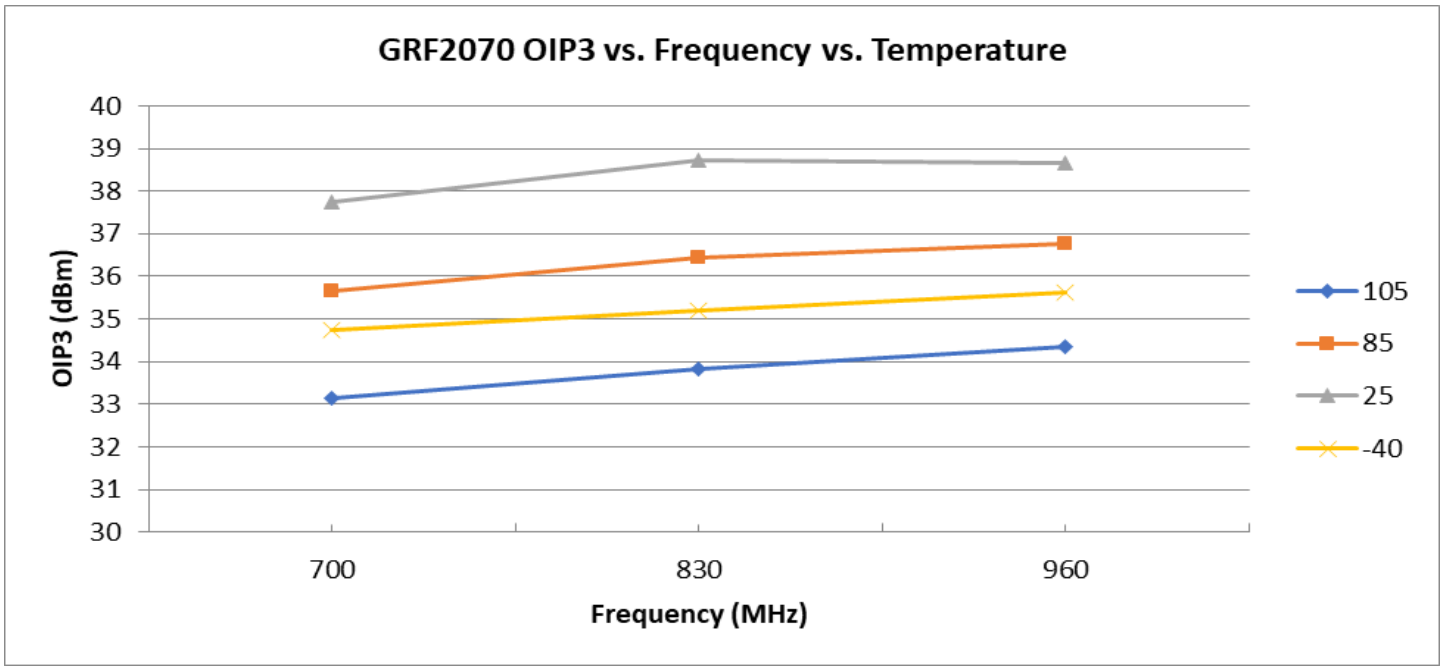
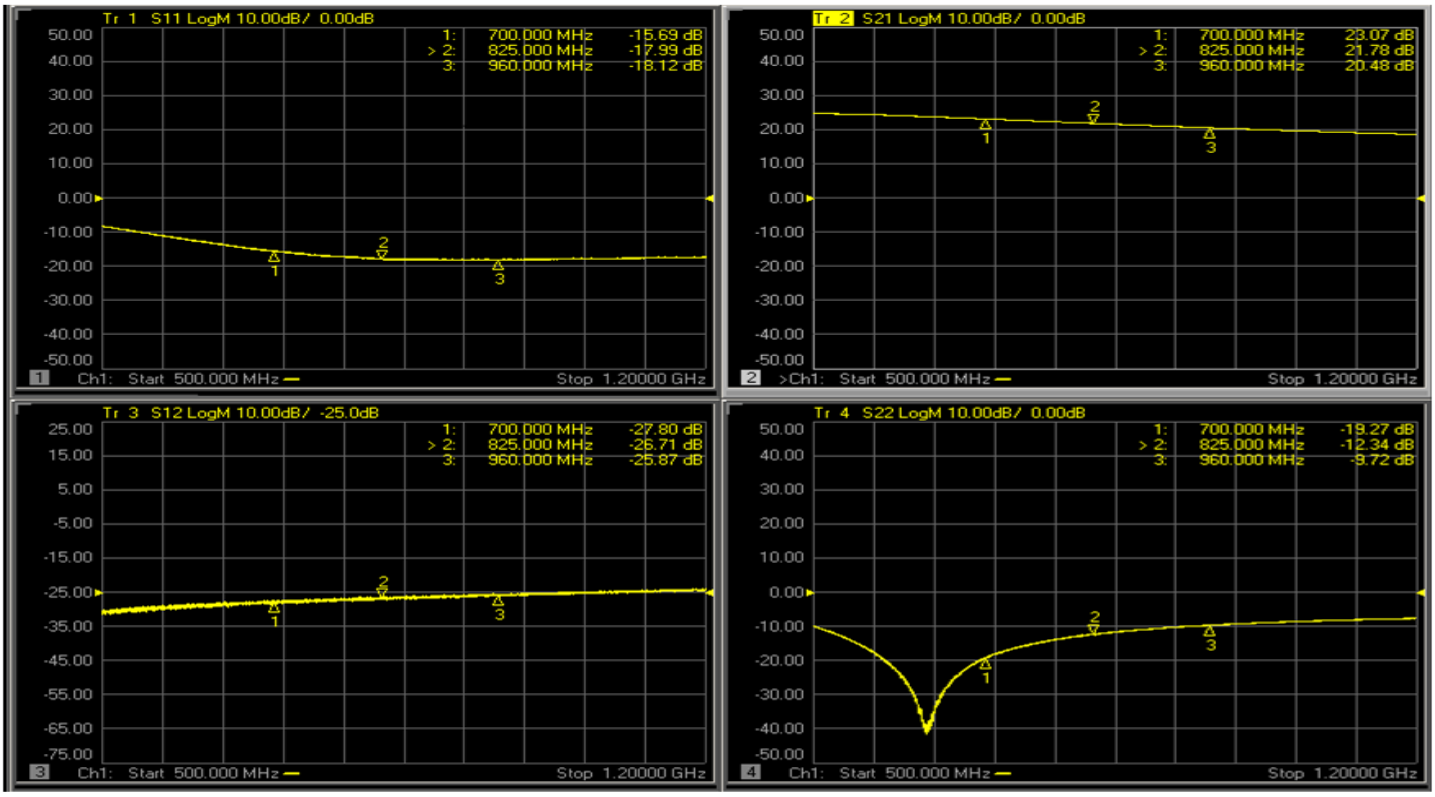
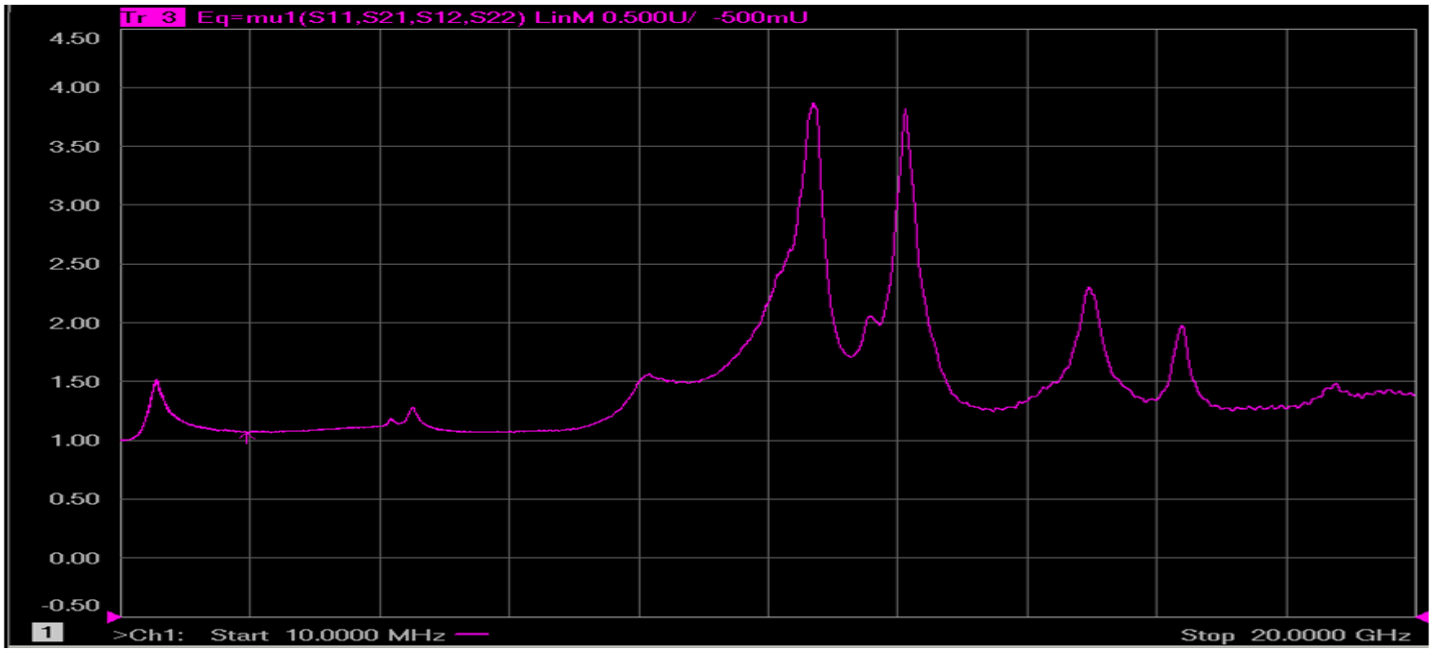


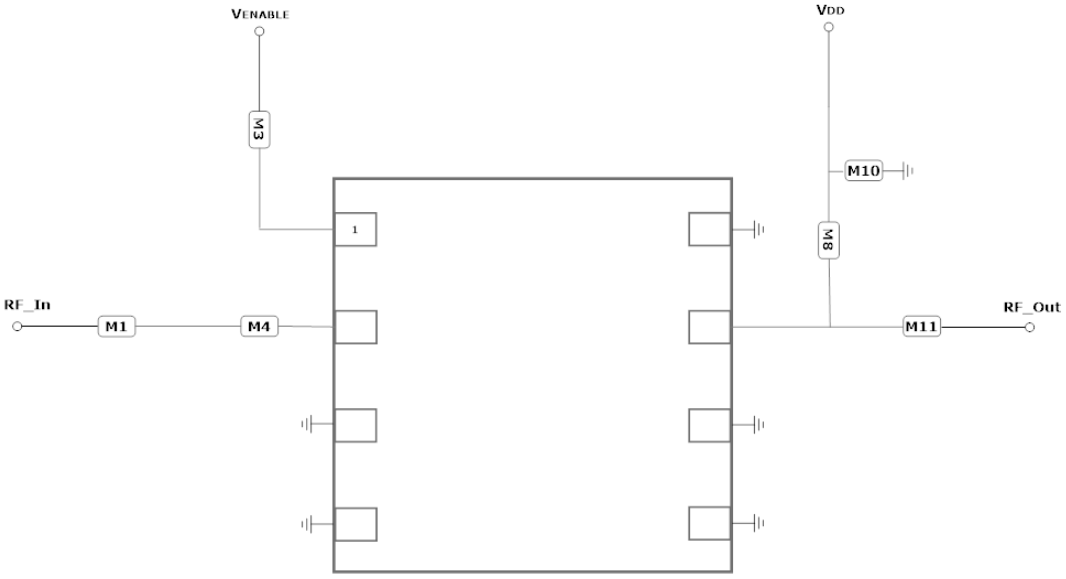


GRF2070 Evaluation Board S-Pars: (0.7 to 0.96 GHz Match)

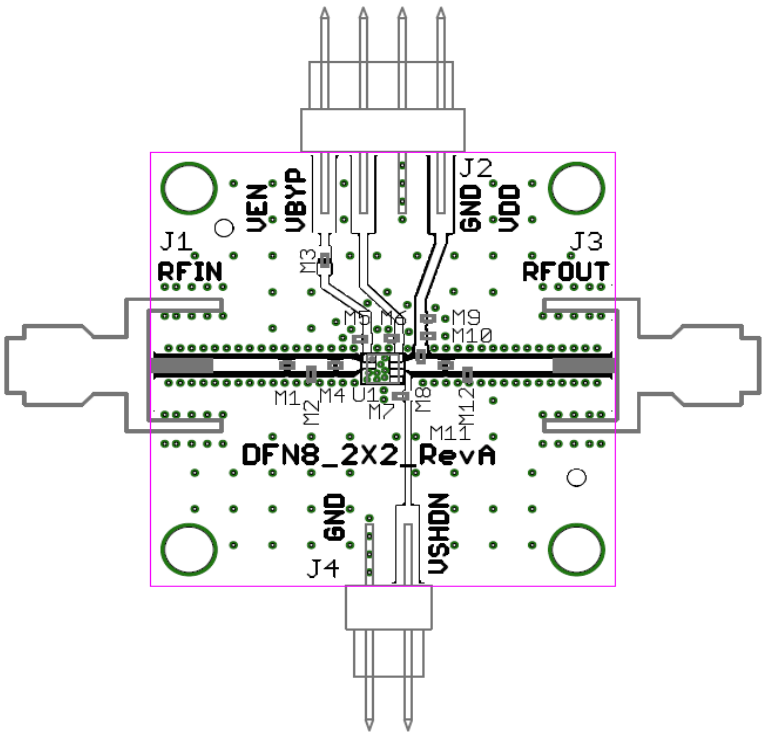




Note: Mu factor >= 1.0 implies unconditional stability.



GRF2070 Application Schematic

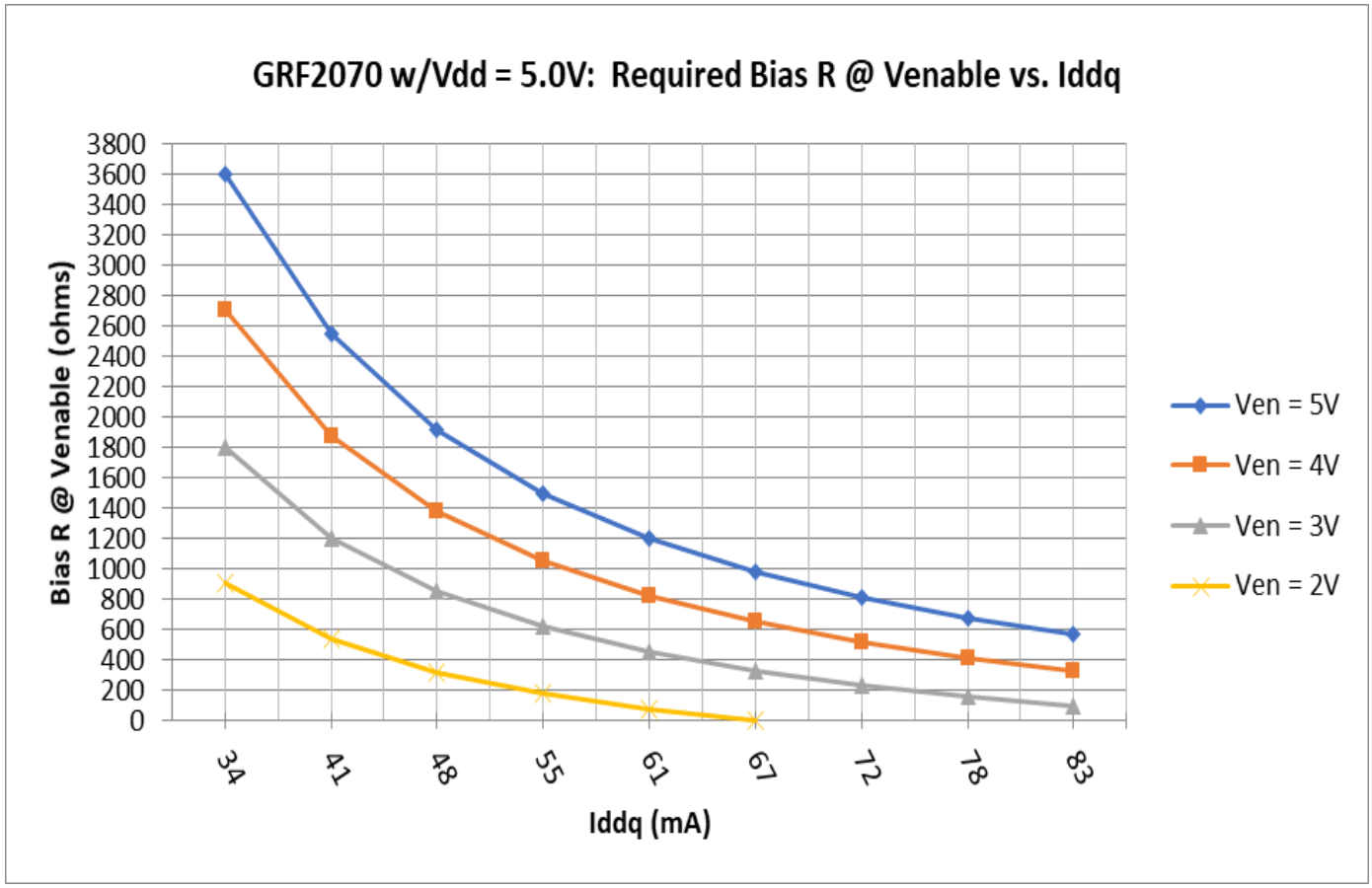


GRF2070 EVB Assembly Drawing

GRF2070 Standard Evaluation Board BOM: (0.7 to 0.96 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Resistor (jumper)	Various	—	0 Ohm	0402	ok
M3	Resistor	Various	5%	Sets Iddq	0402	ok
M4	Capacitor	Murata	GJM	47 pF	0402	ok
M8	Inductor	Murata	LQW	22 nH	0402	ok
M10	Capacitor	Murata	GRM	0.1 uF	0402	ok
M11	Capacitor	Murata	GRM	4.7 pF	0402	ok
Evaluation Board	DFN8_2x2_RevA	—	—	—	—	—

GRF2070 Bias Resistor 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.