GRF2071

Preliminary

Ultra-Low Noise Amplifier
Tuning Range: 0.7 – 2.7 GHz



Features

Reference: 5V/60 mA at 1.9 GHz

- Gain: 19.0 dB
- Eval Board NF: 0.36 dB
- OP1dB: 21.0 dBm
- OIP3: 38.0 dBm
- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- First Stage LNA for Infrastructure
- Small Cells and Cellular Repeaters
- Distributed Antenna Systems
- Military Grade GPS

Product Description

The GRF2071 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.

GRF2071 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:

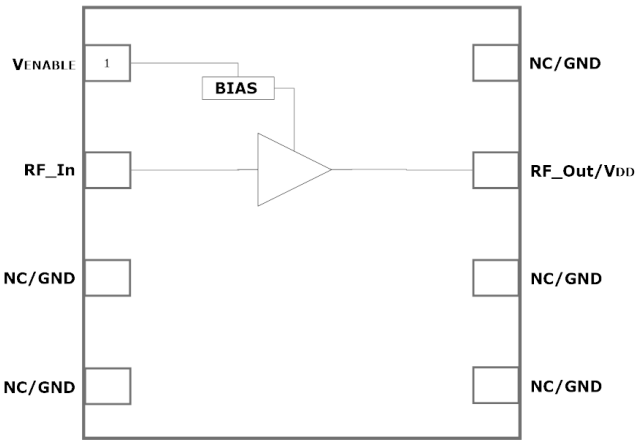
GRF2070: 0.4 to 1.5 GHz

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

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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)	$P_{IN\ MAX}$		20	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	250		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		1	--



Caution! ESD Sensitive Device



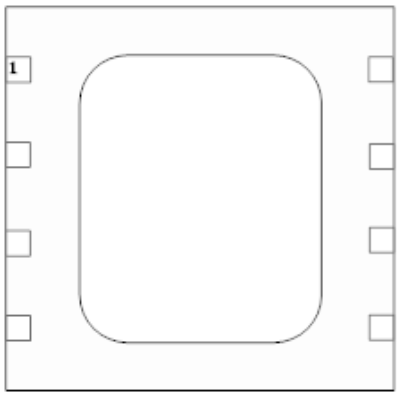
Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For package dimensions and manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF2071 landing page: Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

Link to manufacturing note

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Pin Out (Top View)



Pin Assignments:

Pin	Name	Description	Note
1	V_{EN}	Enable Voltage Input	V_{ENABLE} and series resistor set I_{DDQ}. V_{ENABLE} < 0.1 volts disables device.
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 Only	No internal connection to die
6	NC/GND	No Connect or Ground	No internal connection to die
7	RF_Out/V_{DD}	No Connect or Ground	Provide device V_{DD} via external bias inductor
8	NC/GND	No Connect or Ground	No internal connection to die
PKG	GND	Ground	Provides DC and RF ground for LNA, as well as thermal heat sink.

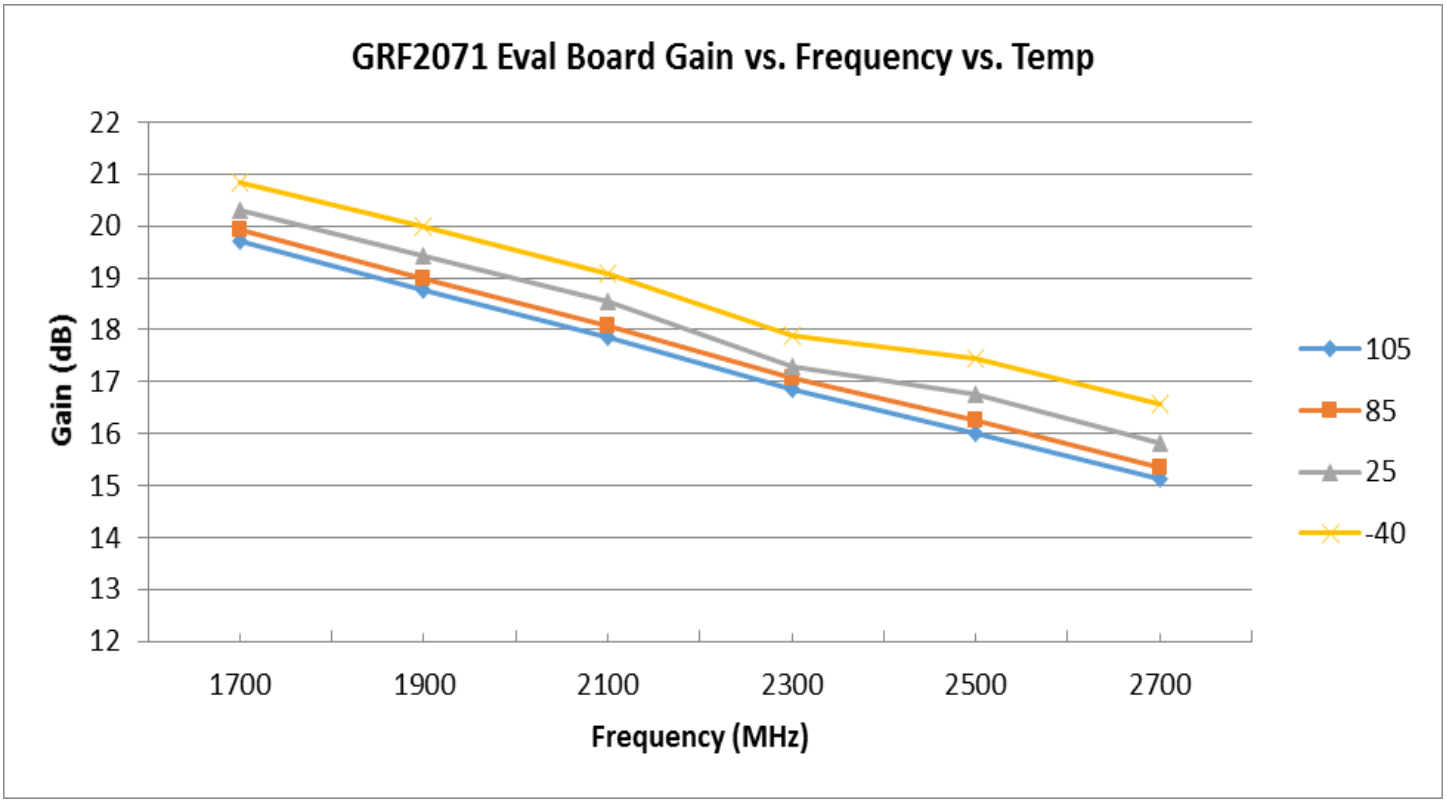
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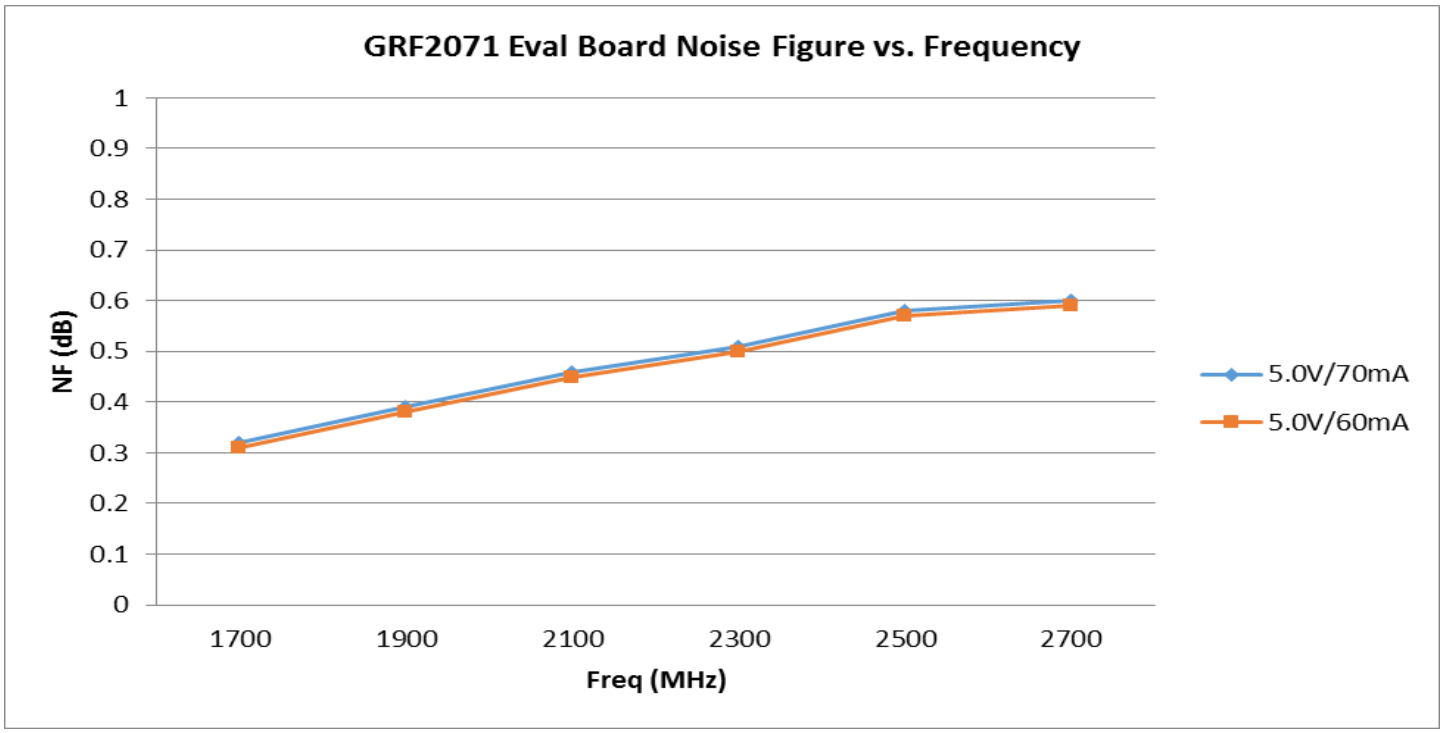
Nominal Operating Parameters:

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}		1.9		GHz	1.7 to 2.7 GHz Tune
Evaluation Board Gain	S21	18.0	19.0		dB	
Evaluation Board Noise Figure	NF		0.36		dB	Evaluation Board SMA to SMA
Output 3rd Order Intercept Point	OIP3		38.0		dBm	+3 dBm P_{OUT} per tone at 2 MHz Spacing (1899 and 1901 MHz)
Output 1dB Compression Point	OP1dB	19.5	21.0		dBm	
Switching Rise Time	T_{RISE}		300		ns	
Switching Fall Time	T_{FALL}		300		ns	
Supply Current	I_{DD}		60		mA	Adjustable for optimal IP3
Enable Current	I_{ENABLE}		3.0		mA	
Thermal Data						
Thermal Resistance (measured via IR scan)	Θjc		54		°C/W	On standard evaluation board
Channel Temperature @ +85 C Reference (Package Heat Sink)	$T_{CHANNEL}$		102		°C	V_{DD}: 5.0 V; I_{DDQ}: 60 mA; No RF; P_{DISS}: 300 mW

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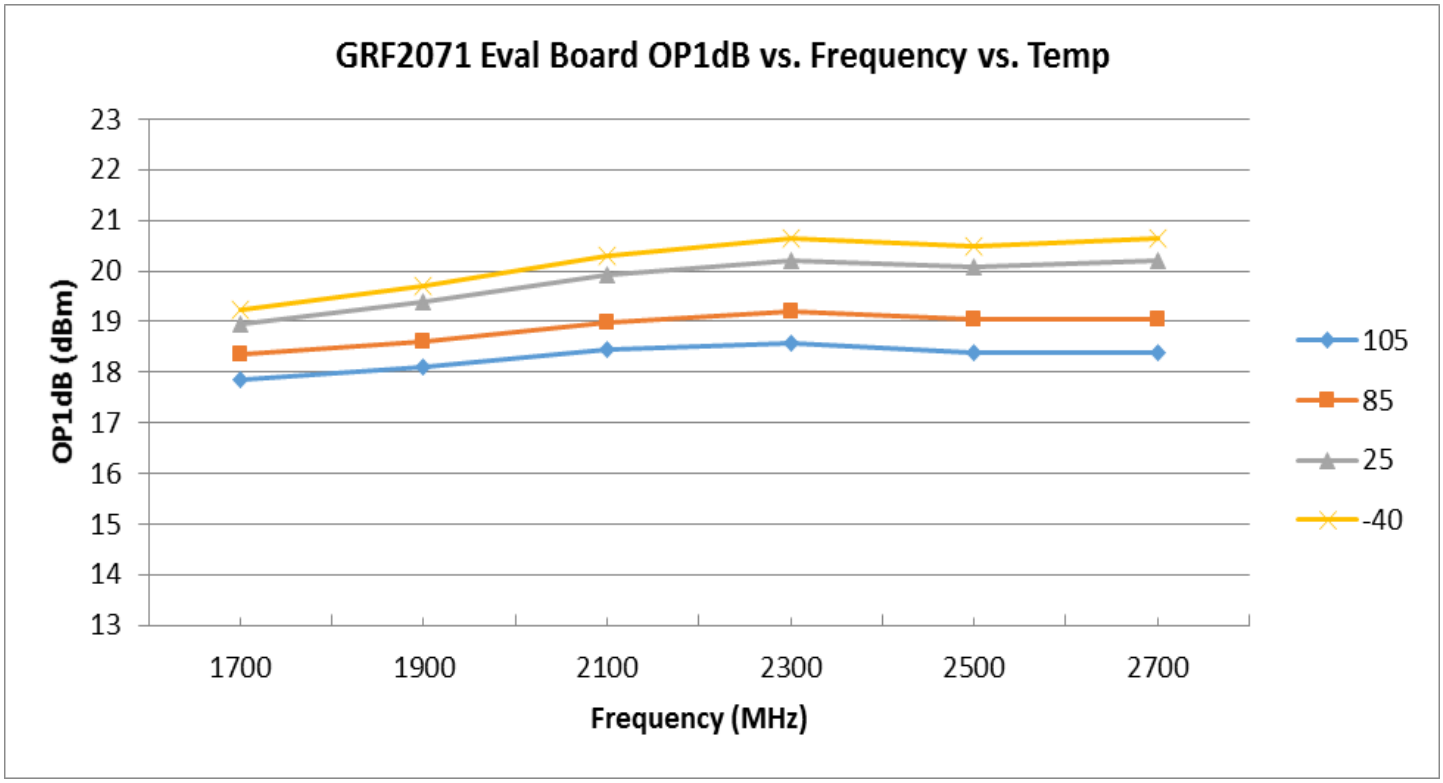
GRF2071 Evaluation Board Measured Data:

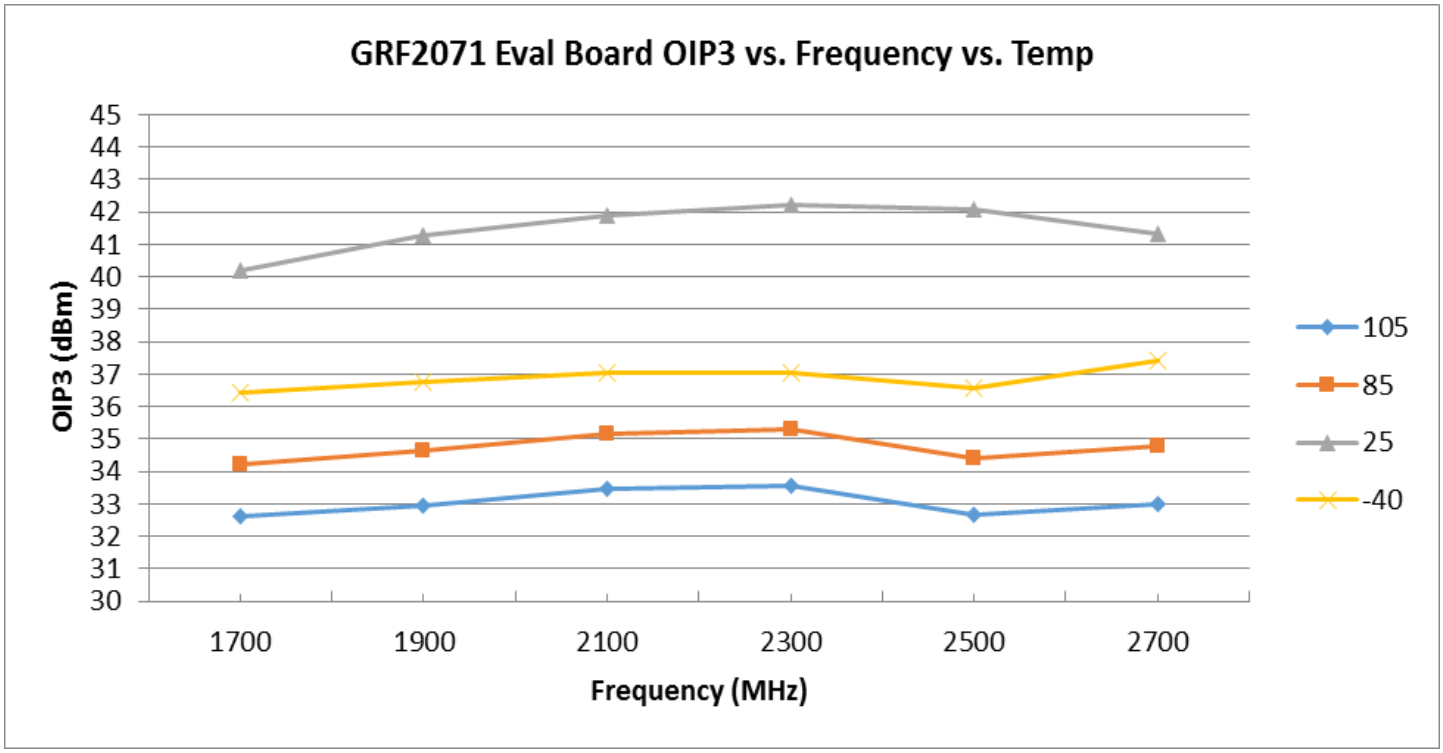




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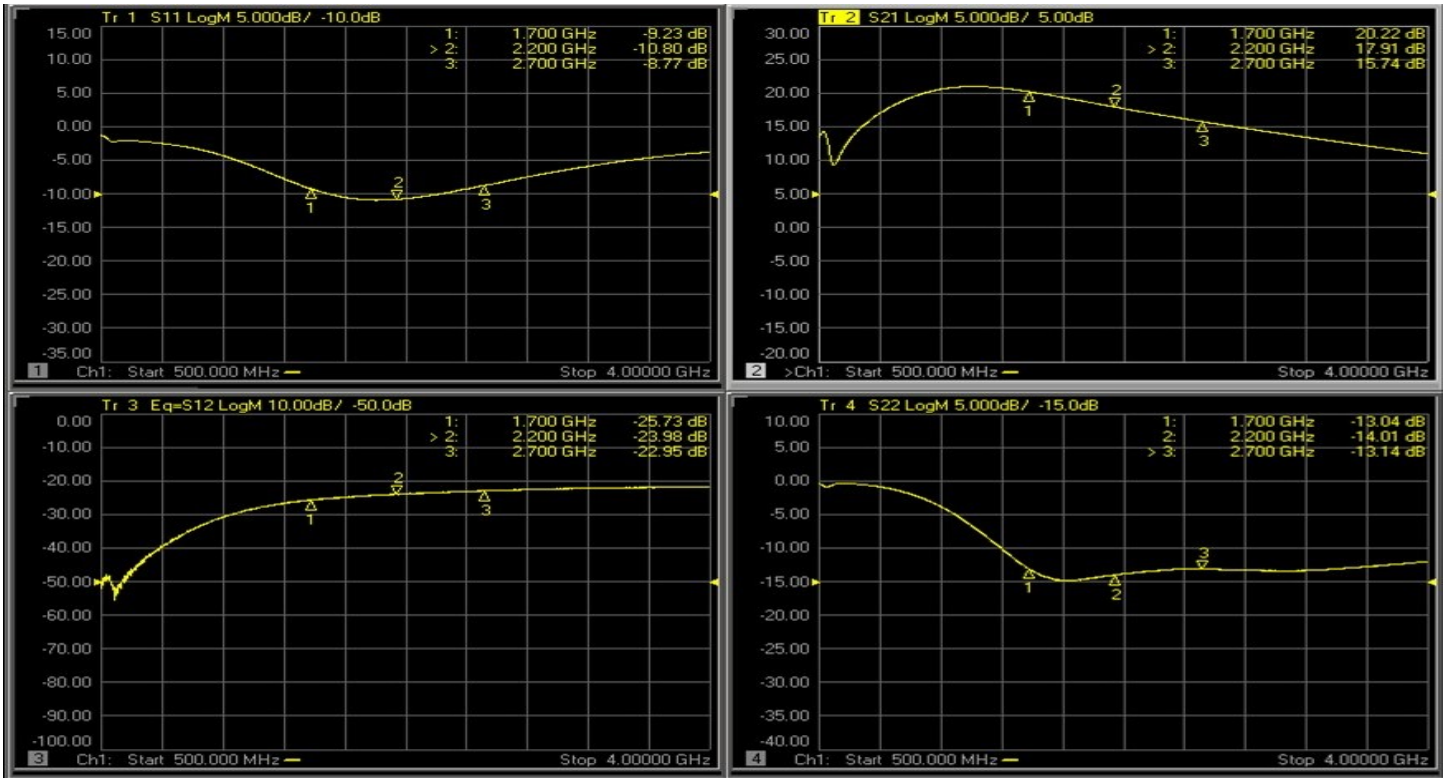
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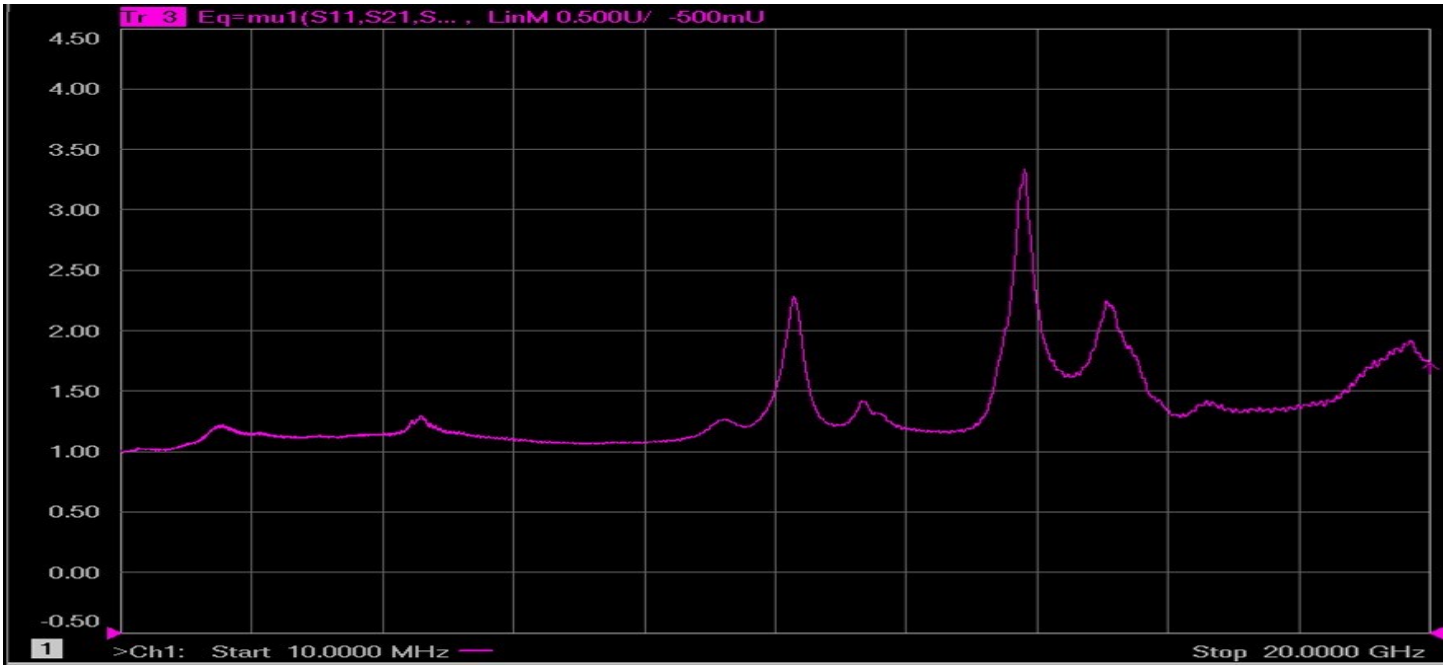




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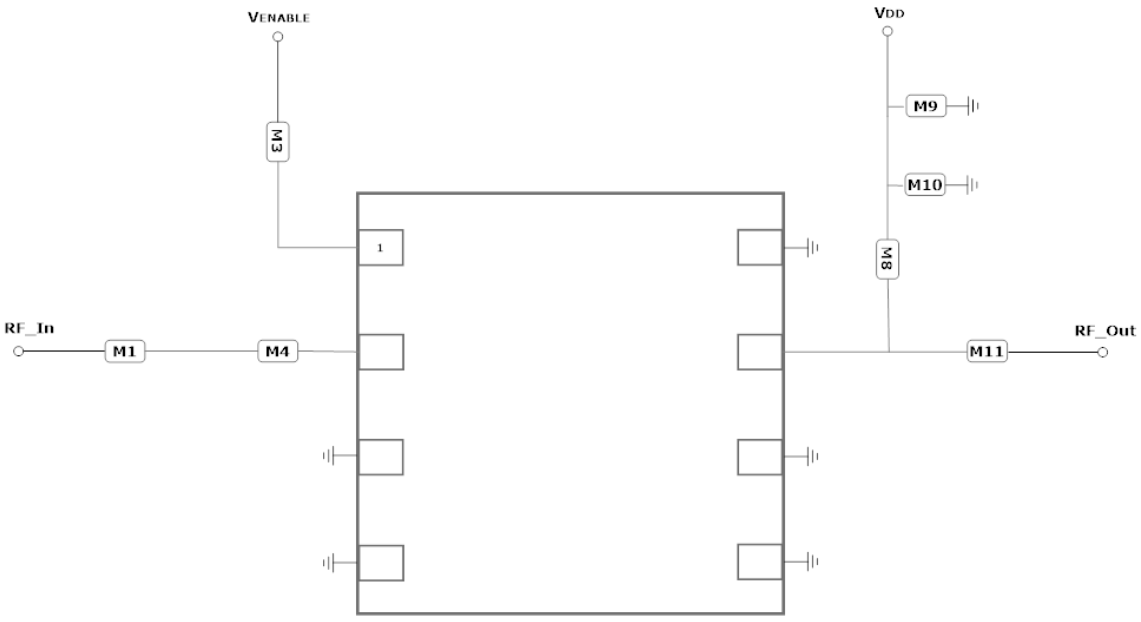
GRF2071 Evaluation Board S-Pars: (1.7 to 2.7 GHz Match)



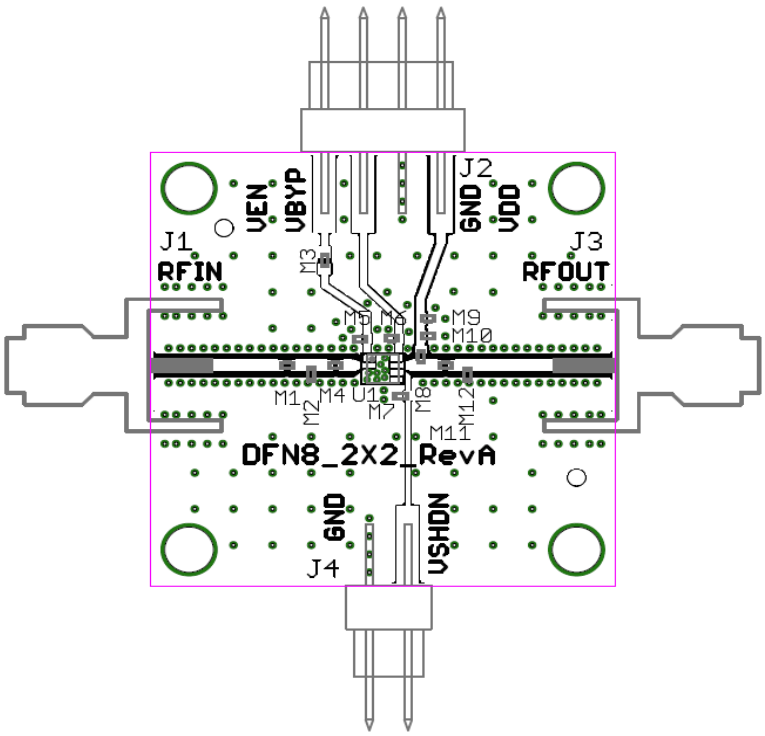


Note: Mu factor >= 1.0 implies unconditional stability.

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GRF2071 Application Schematic



GRF2071 EVB Assembly Drawing

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GRF2071 Standard Evaluation Board BOM: (1.7 to 2.7 GHz Tune)

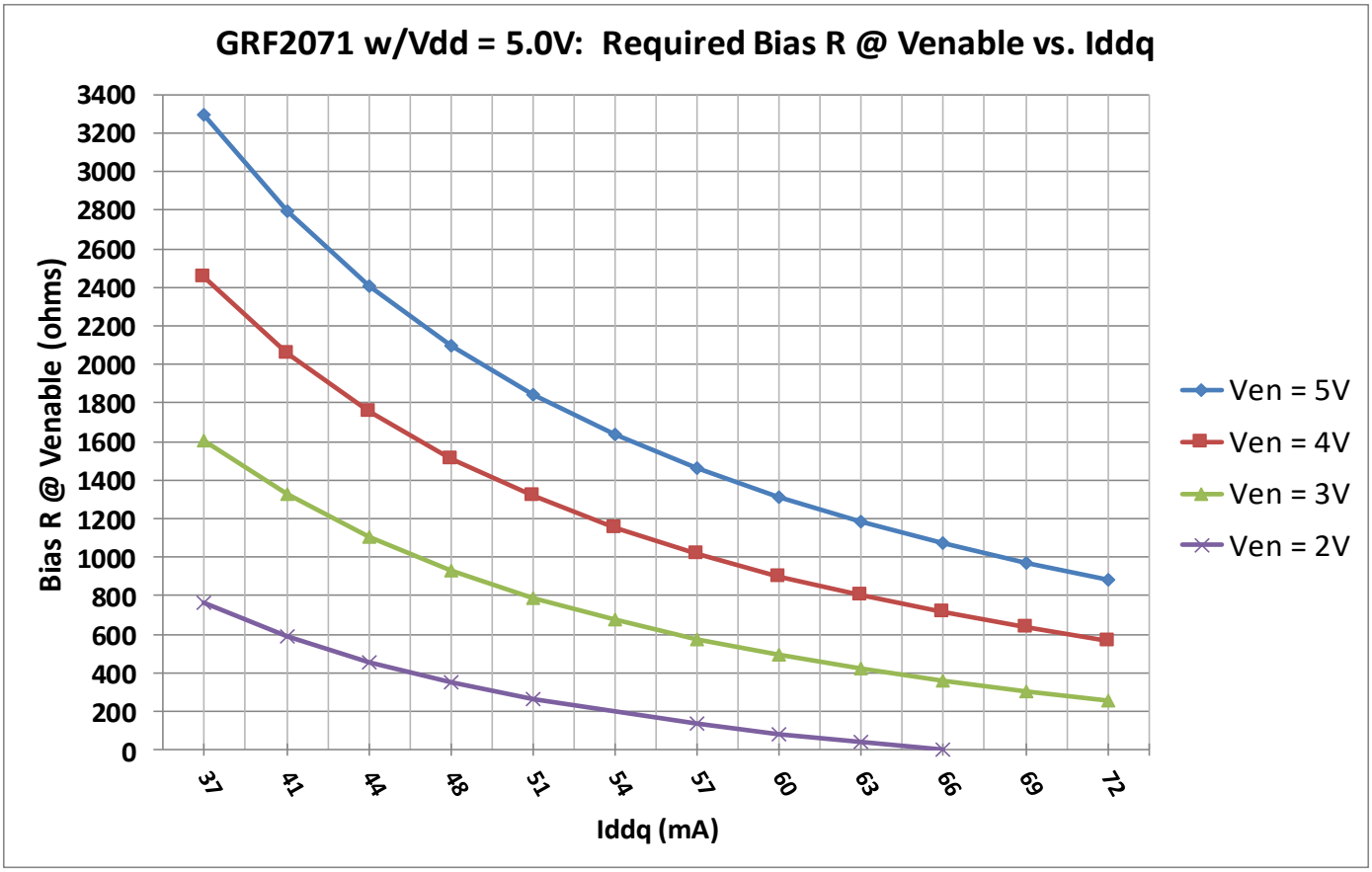
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Capacitor	Murata	GJM	12 pF	0402	ok
M3	Resistor	Various	5%	Sets Iddq	0402	ok
M4	Inductor	Coilcraft	HP	2.0 nH	0402	ok
M8	Inductor	Murata	LQG	3.3 nH	0402	ok
M9	Capacitor	Murata	GRM	0.1 uF	0402	ok
M10	Capacitor	Murata	GRM	100 pF	0402	ok
M11	Capacitor	Murata	GJM	2.7 pF	0402	ok

GRF2071 Evaluation Board BOM: (0.7 to 0.96 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Capacitor	Murata	GJM	22 pF	0402	ok
M3	Resistor	Various	5%	Sets Iddq	0402	ok
M4	Inductor	Coilcraft	HP	10.0 nH	0402	ok
M8	Inductor	Murata	LQG	15.0 nH	0402	ok
R1 (parallel with M8)	Resistor	Various	5%	80 ohms	0402	ok
M10	Capacitor	Murata	GRM	0.1 uF	0402	ok
M11	Capacitor	Murata	GJM	22 pF	0402	ok

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GRF2071 Bias Resistor 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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