



## Product Description

The 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.

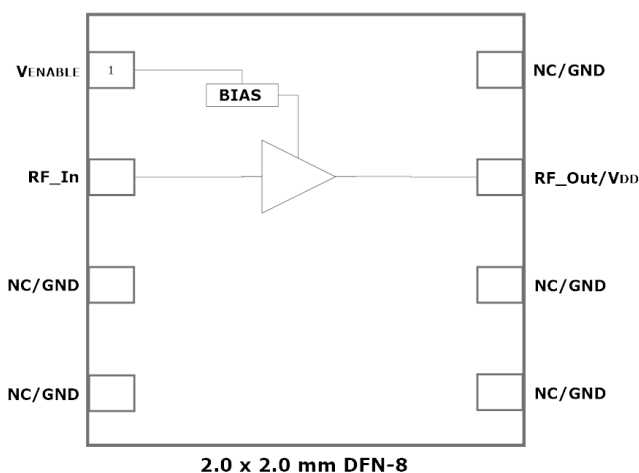
## Features

Reference: 5V/75 mA at 0.9 GHz

- Gain: 20.8 dB
- Eval Board NF: 0.34 dB
- OP1dB: 20.1 dBm
- OIP3: 39.7 dBm
- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

## Applications

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





*Preliminary*

# GRF2070

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

## Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V <sub>DD</sub>	0	6.0	V
RF Input Power: (Load VSWR < 2:1; V <sub>D</sub> : 5.0 volts)	P <sub>IN MAX</sub>		20	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>		500	mW
<b>Electrostatic Discharge:</b>				
Charged Device Model:	CDM	1500		V
Human Body Model:	HBM	250		V
<b>Storage:</b>				
Storage Temperature	T <sub>STG</sub>	-65	150	°C
Moisture Sensitivity Level	MSL		1	--



**Caution!** ESD Sensitive Device

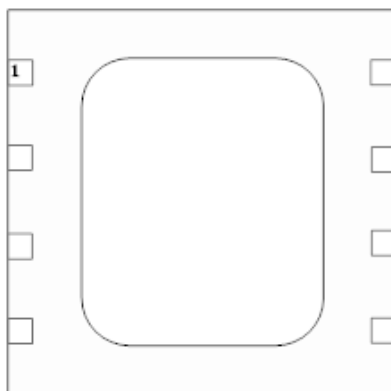


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

**Note:** For package dimensions and manufacturing information, see the [Guerrilla-RF.com](http://Guerrilla-RF.com) website for the following document located on the GRF2070 landing page: **Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.**

[Hyperlink to manufacturing note](#)

## Pin Out (Top View)



## Pin Assignments:

Pin	Name	Description	Note
1	VEN	Enable Voltage Input	VENABLE and series resistor set I <sub>DDQ</sub> . VENABLE < 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 <sub>DD</sub>	No Connect or Ground	Provide device V <sub>DD</sub> 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.



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## Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain Mode (Venable high)						$V_{DD} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$
Test Frequency	$F_{TEST}$		900		MHz	700 to 960 MHz Tune
Evaluation Board Gain	S21		20.8		dB	
Evaluation Board Noise Figure	NF		0.34		dB	Evaluation Board SMA to SMA
Output 3rd Order Intercept Point	OIP3		39.7		dBm	+3 dBm $P_{OUT}$ per tone at 2 MHz Spacing (899 and 901 MHz)
Output 1dB Compression Point	OP1dB		20.1		dBm	
Switching Rise Time	$T_{RISE}$		500		ns	
Switching Fall Time	$T_{FALL}$		500		ns	
Supply Current	$I_{DD}$		75		mA	Adjustable for optimal IP3
Enable Current	$I_{ENABLE}$		3.5		mA	
Thermal Data						
Thermal Resistance (measured via IR scan)	$\Theta_{jc}$		54		$^\circ\text{C/W}$	On standard evaluation board
Channel Temperature @ +85 C Reference (Package Heat Sink)	$T_{CHANNEL}$		106		$^\circ\text{C}$	$V_{DD}: 5.0\text{ V}$ ; $I_{DDQ}: 75\text{ mA}$ ; No RF; $P_{DISS}: 375\text{ mW}$

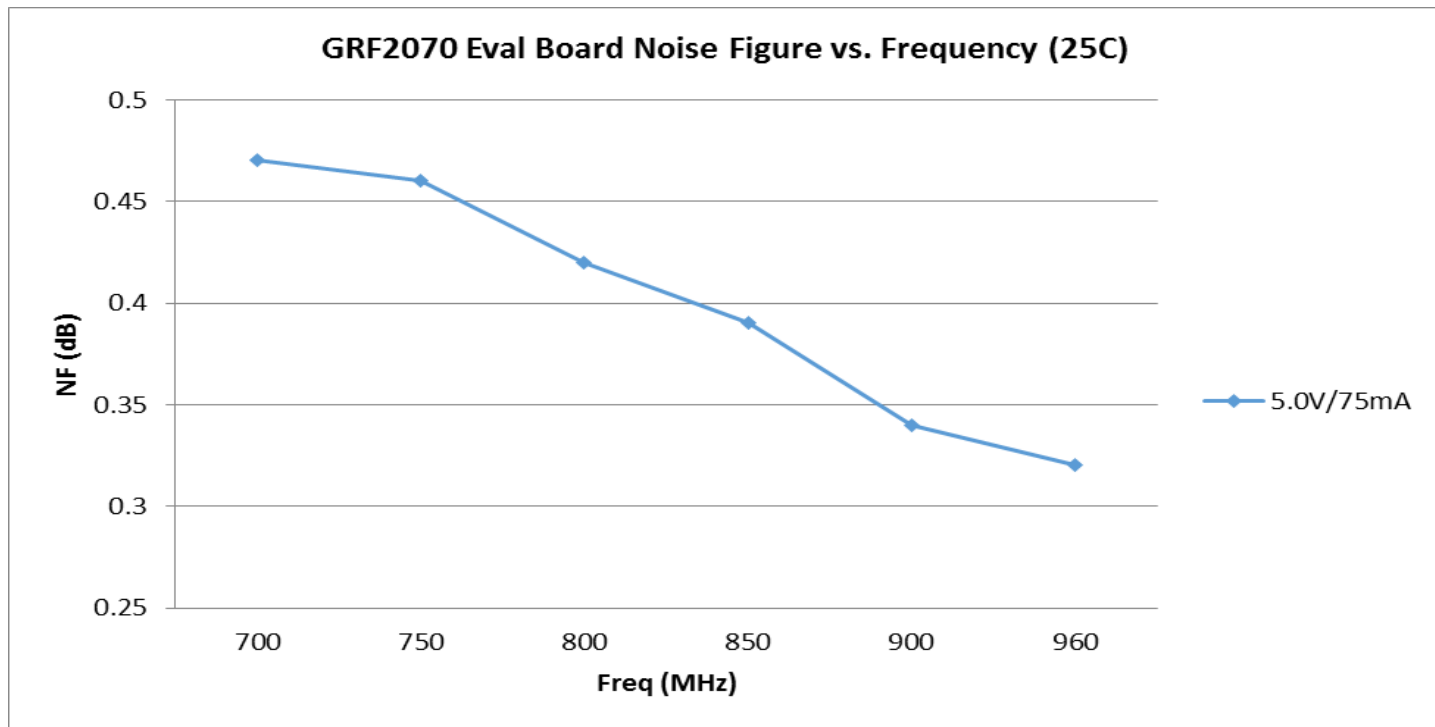
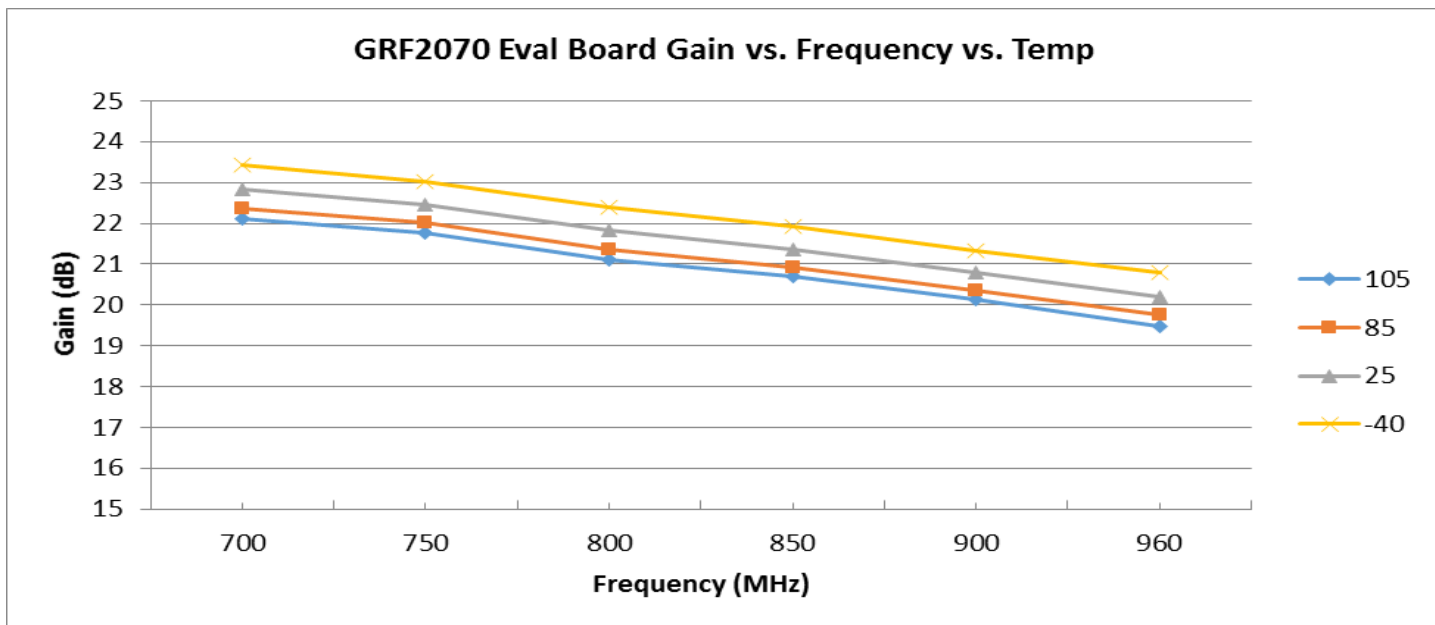


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# GRF2070

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

## GRF2070 Evaluation Board Measured Data:



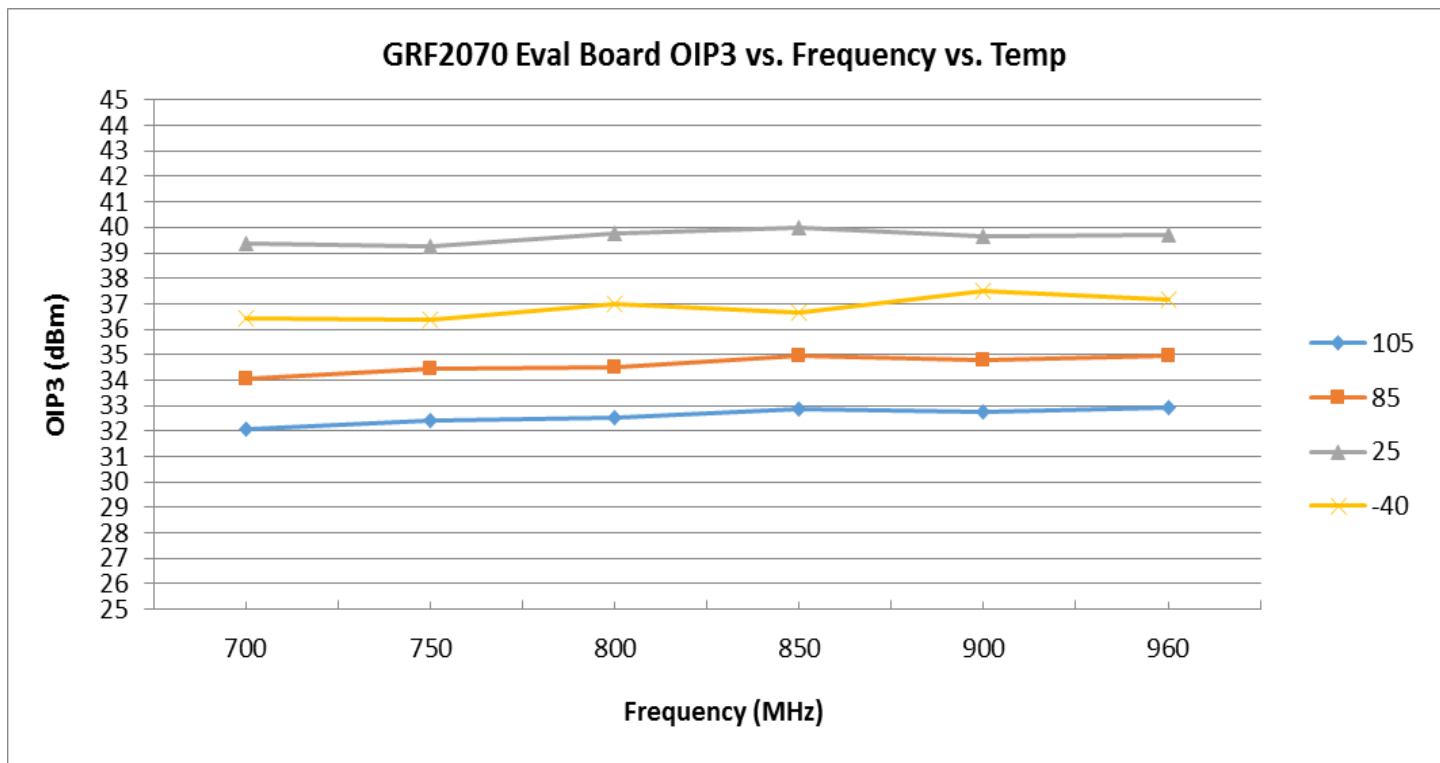
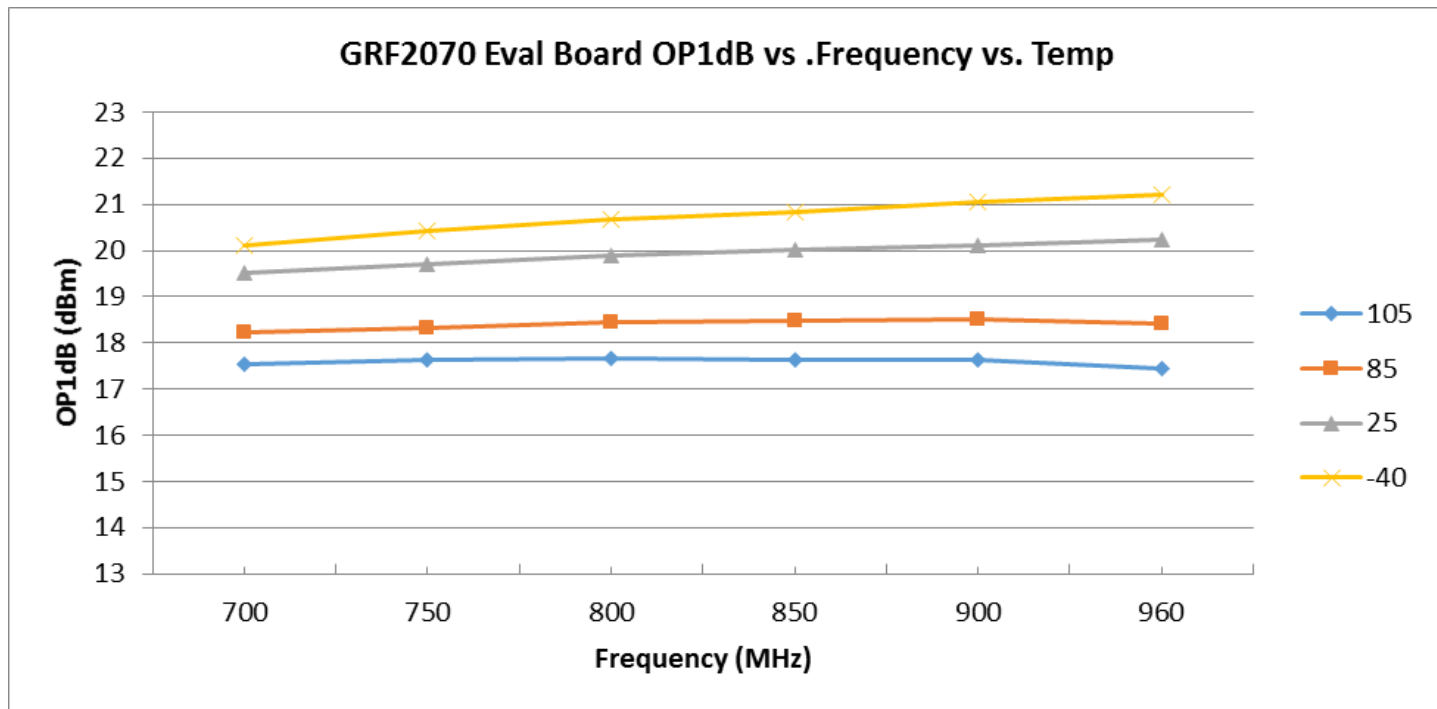


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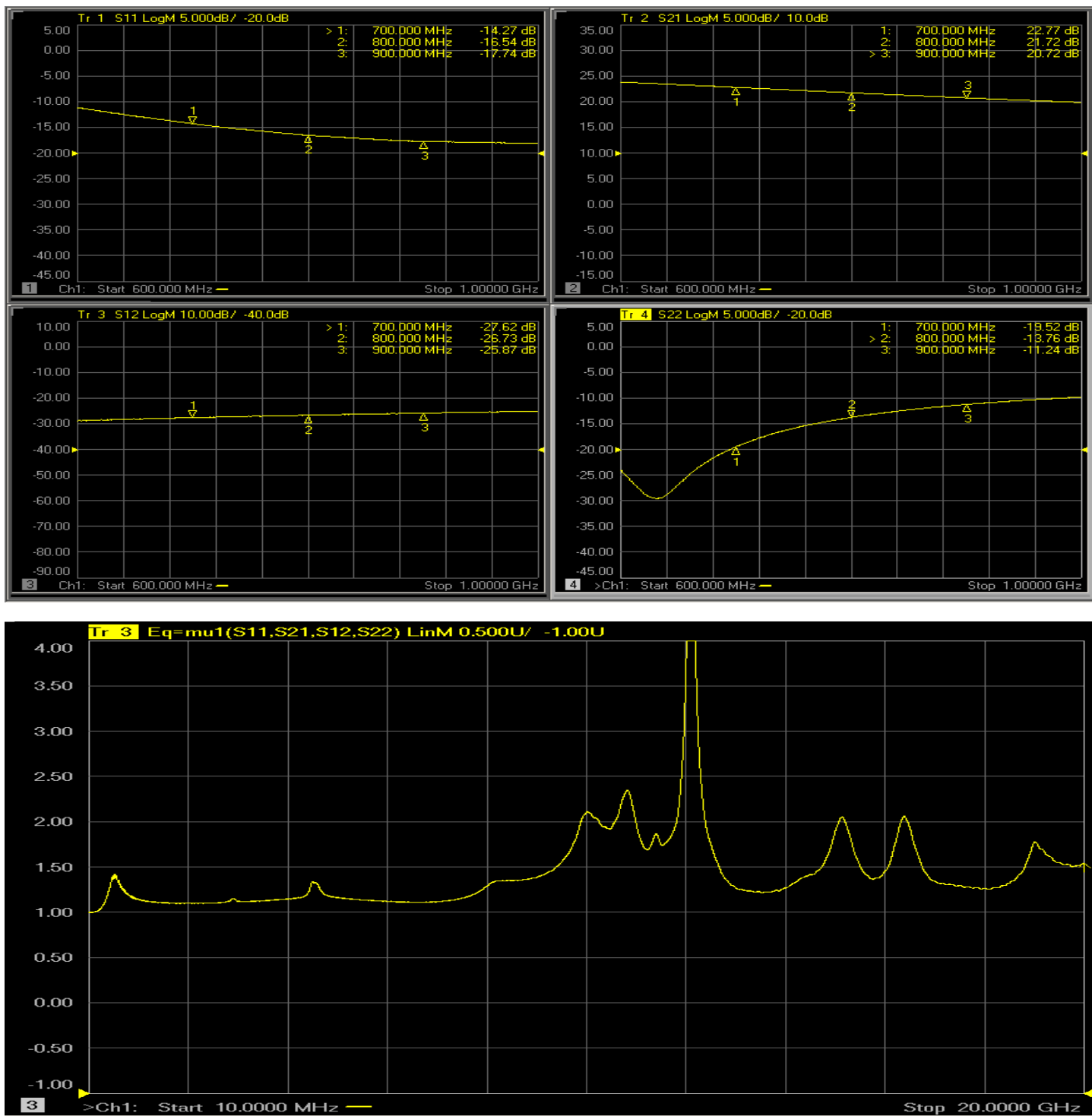


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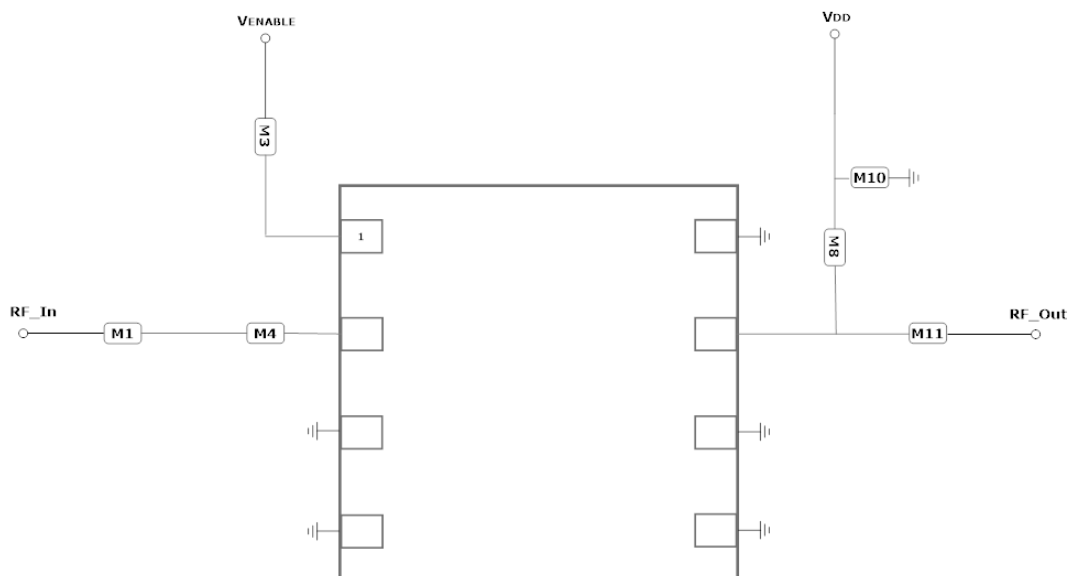
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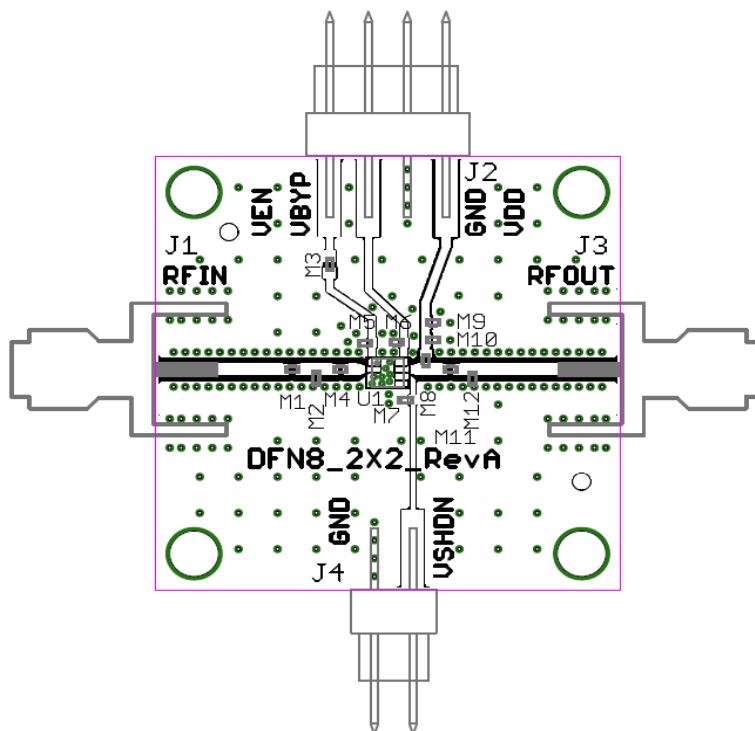
## GRF2070 Evaluation Board S-Pars: (0.7 to 0.96 GHz Match)



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



GRF2070 Application Schematic



GRF2070 EVB Assembly Drawing





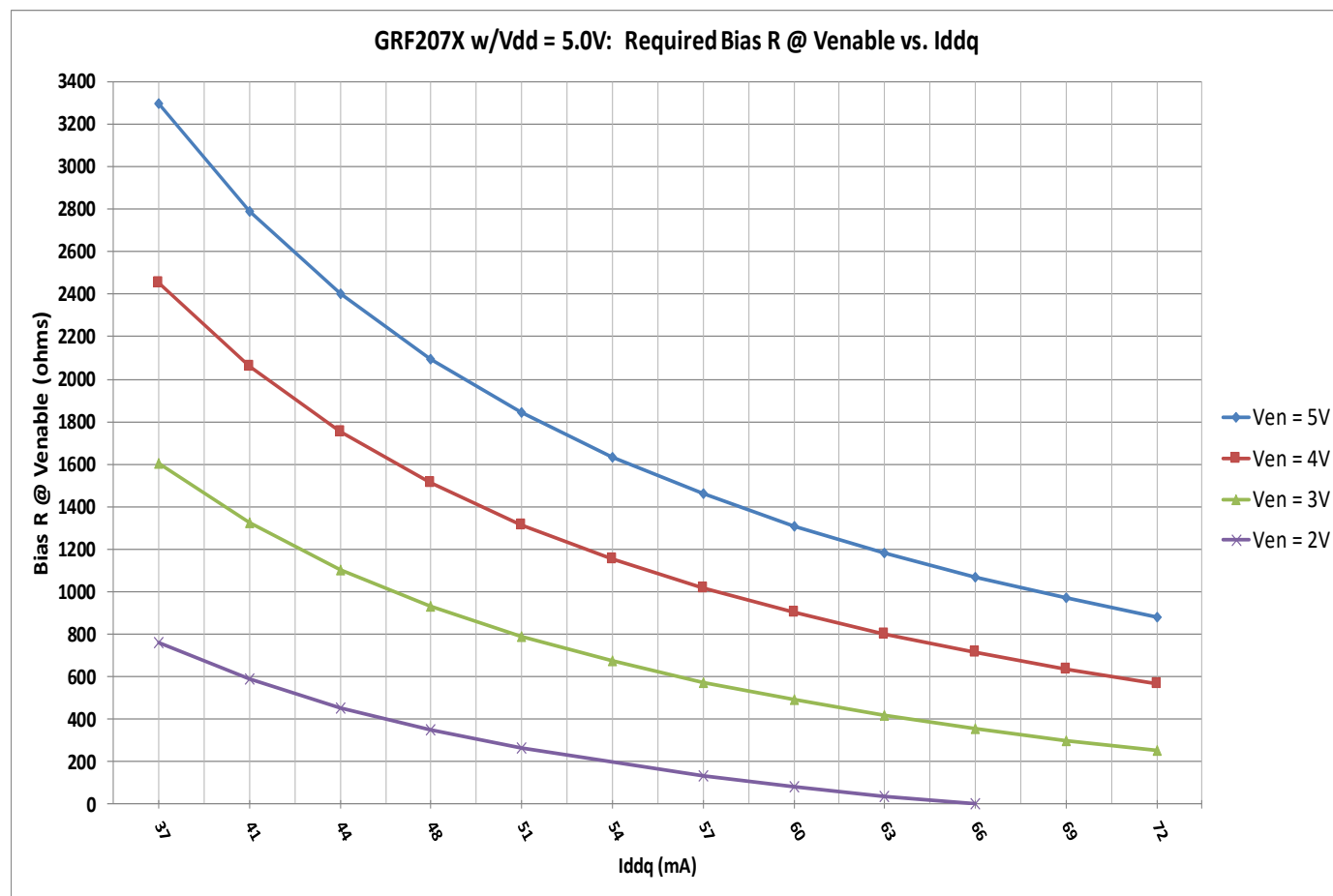
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Ultra-Low Noise Amplifier  
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## GRF2070 Standard Evaluation Board BOM: (0.7 to 0.96 GHz Tune)

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 (high Q)
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





*Preliminary*

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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.

Information in this datasheet is specific to the Guerrilla RF, Inc. ("Guerrilla RF") product identified.

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