



Product Description

GRF2052 is an ultra-low noise amplifier designed for wireless infrastructure and other high performance RF applications requiring the absolute lowest possible NF, high gain and outstanding linearity. Broadband external matches deliver outstanding RF performance over 1.5 to 4.5 GHz.

Configured as a first stage LNA, linear driver or cascaded gain block, the GRF2052 flexible biasing capability offers high levels of reuse both within a design and across platforms. For lower gain applications from 0.7 GHz up to 3.8 GHz, the pin compatible GRF2051 should be used.

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

Features

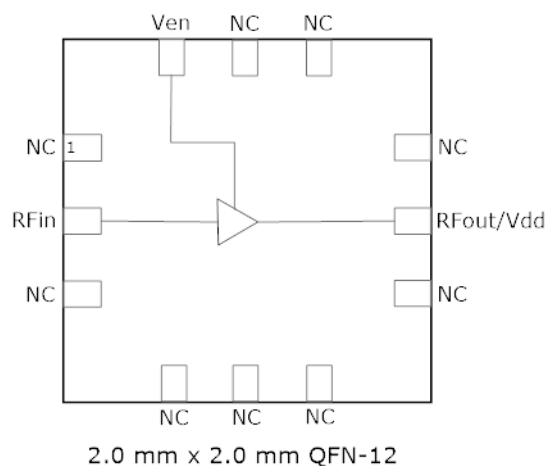
Reference: 5V/70mA /2.5 GHz

- Gain: 19.2 dB
- Eval Board NF: 0.50 dB
- OP1dB: 21.0 dBm
- OIP3: 38.0 dBm

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

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





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GRF2052

Ultra-Low Noise Amplifier
Tuning Range: 1.7 – 4.5 GHz

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

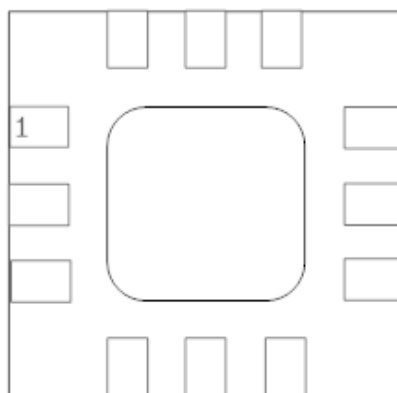


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF2052 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	No Connect or Ground	No internal connection to die
2	RF_In	RF Input	External match must provide DC block
3	NC	No Connect or Ground	No internal connection to die
4	NC	No Connect or Ground	No internal connection to die
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	RF_Out/V _{DD}	RF Output	Provide device V _{DD} via external bias inductor
9	NC	No Connect or Ground	No internal connection to die
10	NC	No Connect or Ground	No internal connection to die
11	NC	No Connect or Ground	No internal connection to die
12	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.
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.



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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}		2500		MHz	
Evaluation Board Gain	S ₂₁	18.0	19.0		dB	
Evaluation Board Noise Figure	NF		0.50	0.70	dB	Evaluation Board SMA to SMA
Output 3rd Order Intercept Point	OIP ₃		38.2		dBm	3 dBm P _{OUT} per tone at 2 MHz Spacing (2499 and 2501 MHz)
Output 1dB Compression Point	OP _{1dB}	19.5	21.0		dBm	
Switching Rise Time	T _{RISE}		400		ns	
Switching Fall Time	T _{FALL}		400		ns	
Supply Current	I _{DD}		70		mA	
Enable Current	I _{ENABLE}		4	8	mA	
Disabled Mode						
	I _{LEAKAGE}		10	150	uA	
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 (See note)		°C	V _{DD} : 5.0 V; I _{DDQ} : 70 mA; No RF; P _{DISS} : 350 mW

Note: MTTF >10⁶ hours for T_{CHANNEL} < =170 degrees C.

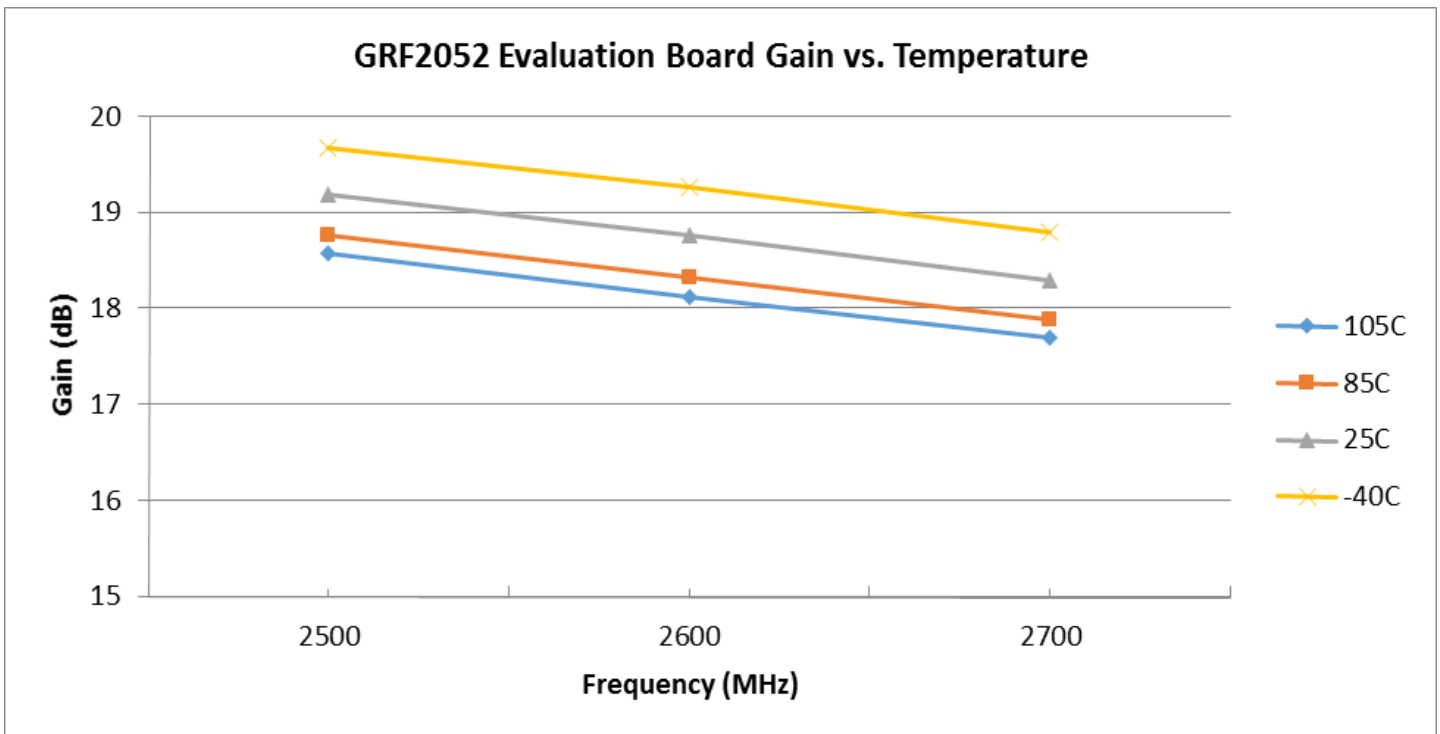
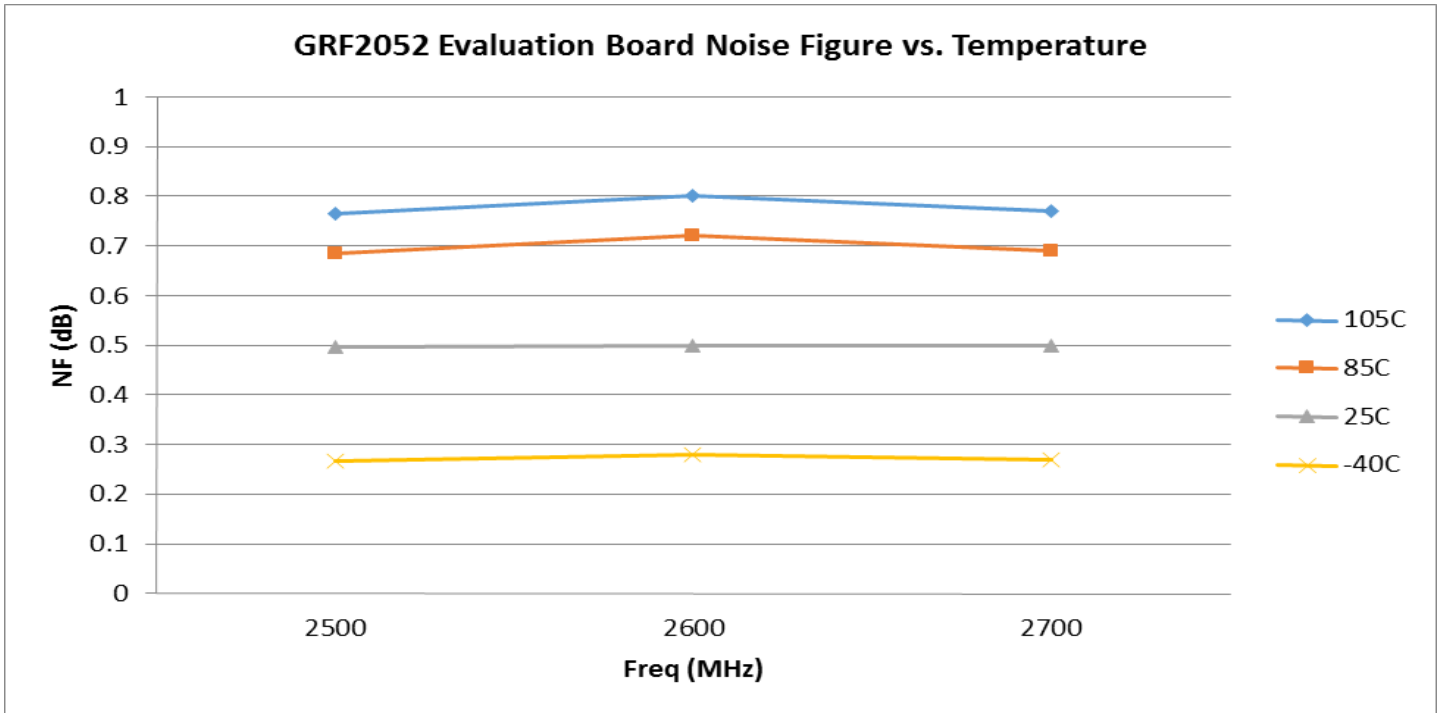


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Tuning Range: 1.7 – 4.5 GHz

GRF2052 Evaluation Board Measured Data over Temperature: (2.5 to 2.7 GHz Tune)



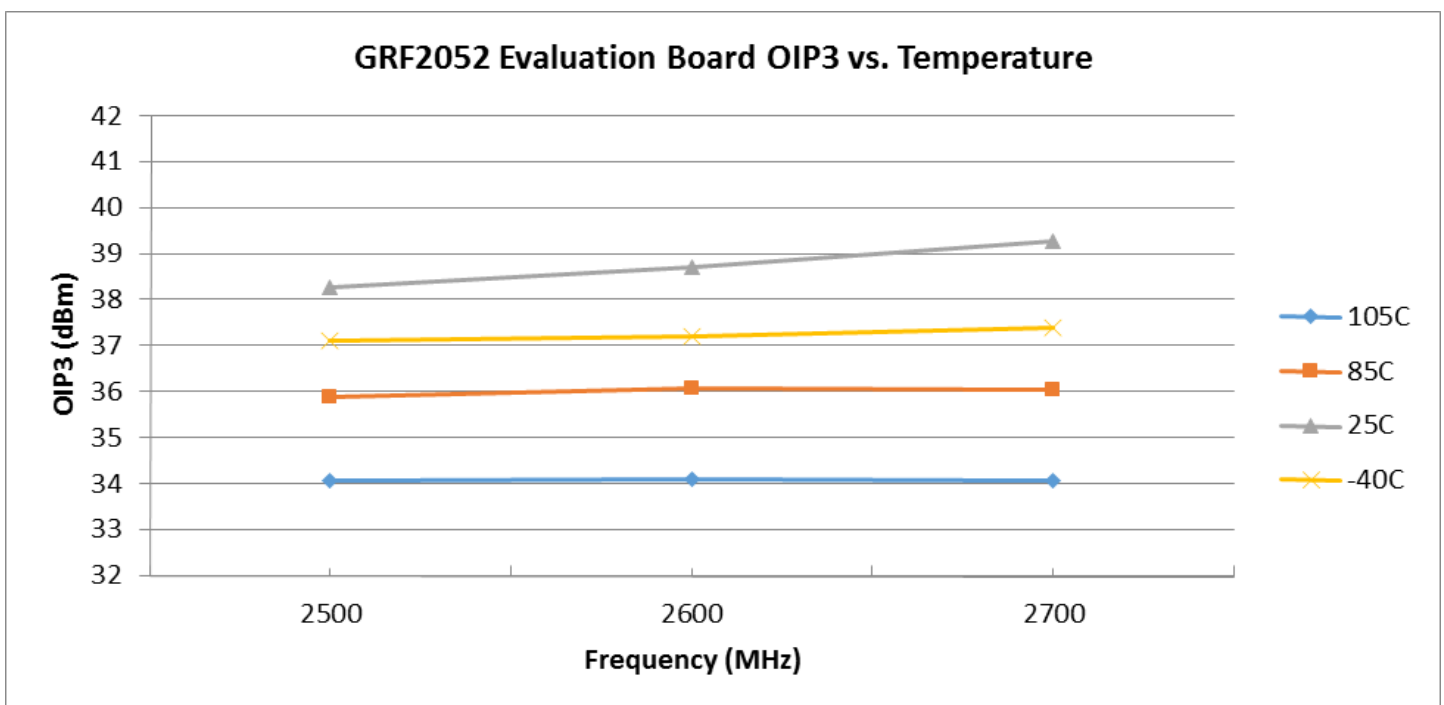
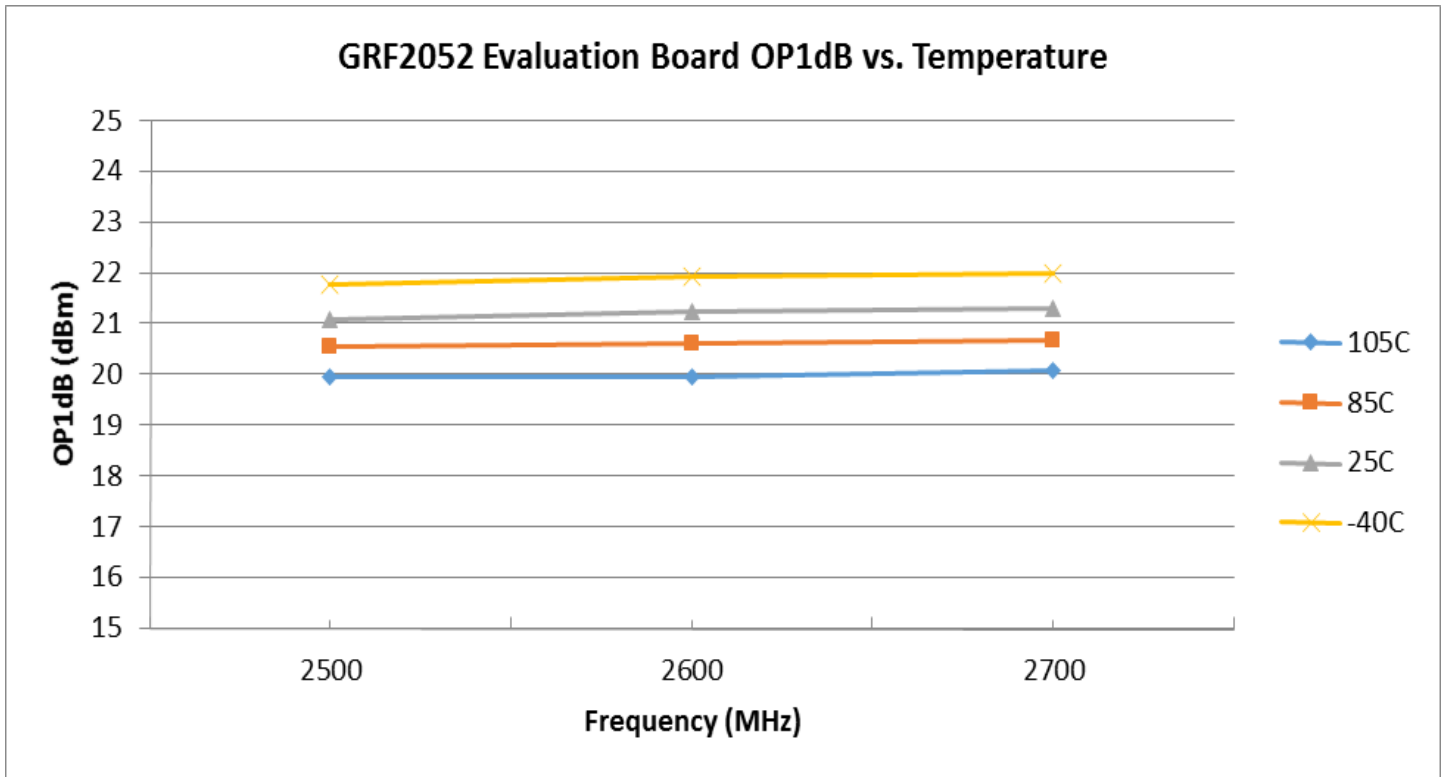


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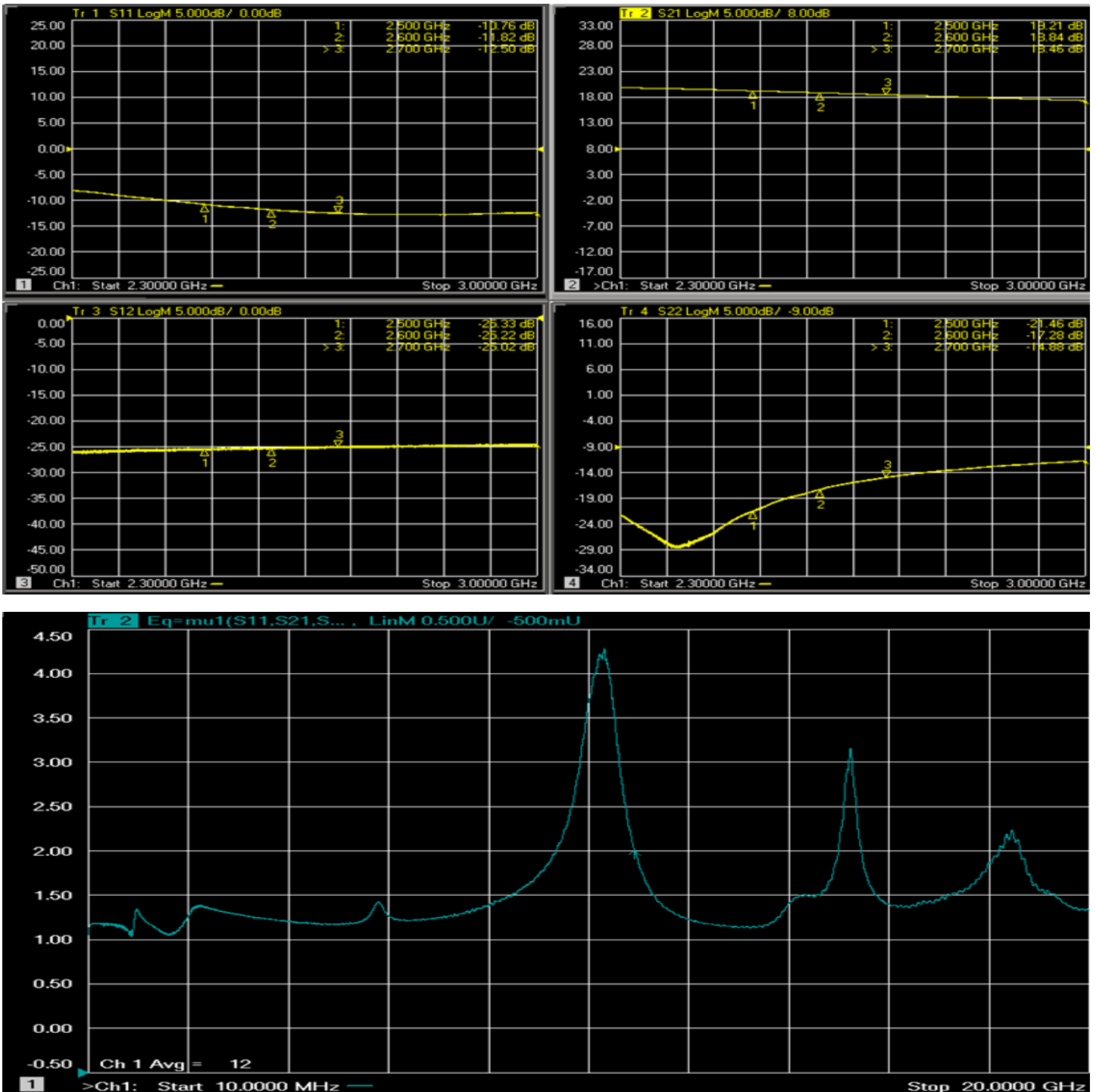


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Ultra-Low Noise Amplifier
Tuning Range: 1.7 – 4.5 GHz

GRF2052 Evaluation Board S-Pars and Stability Mu Factor: (2.5 to 2.7 GHz Tune)



Note: Mu factor ≥ 1.0 implies unconditional stability.

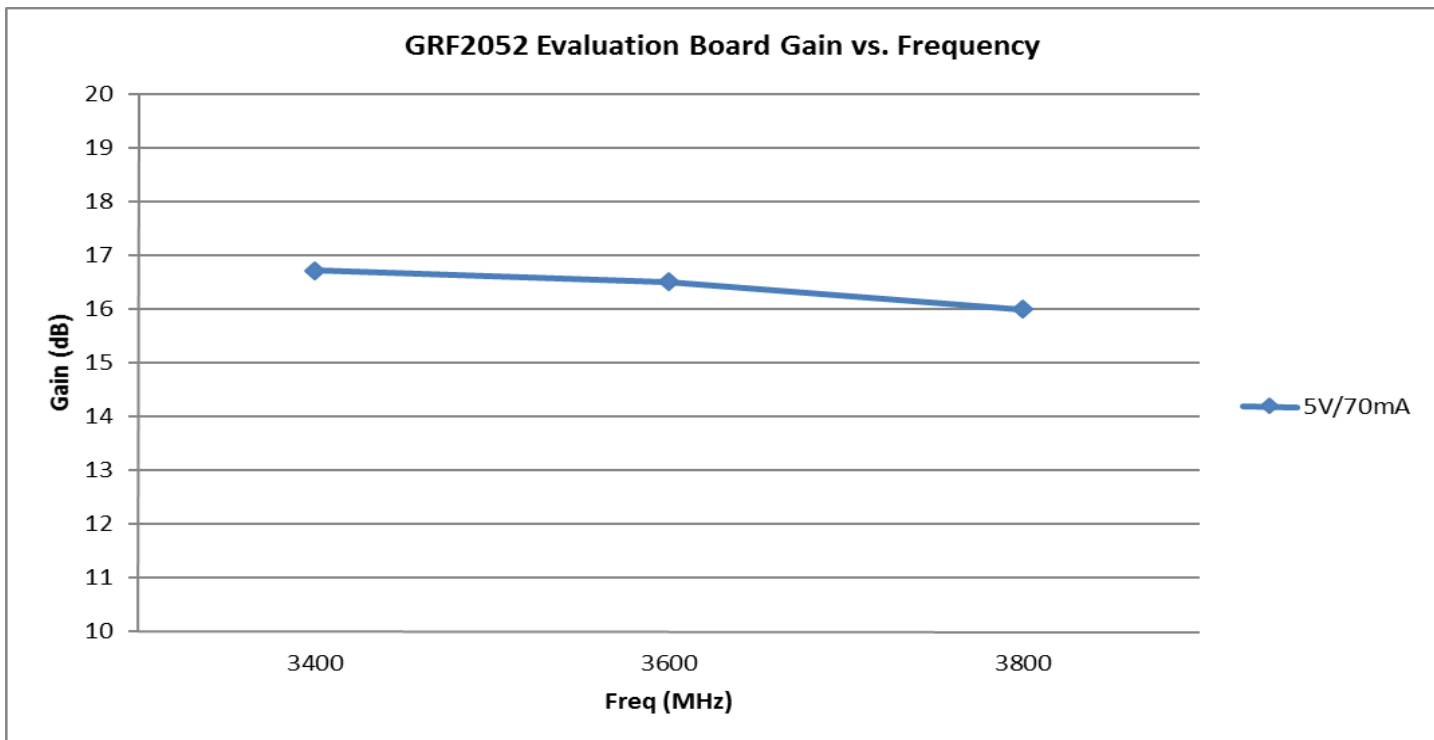
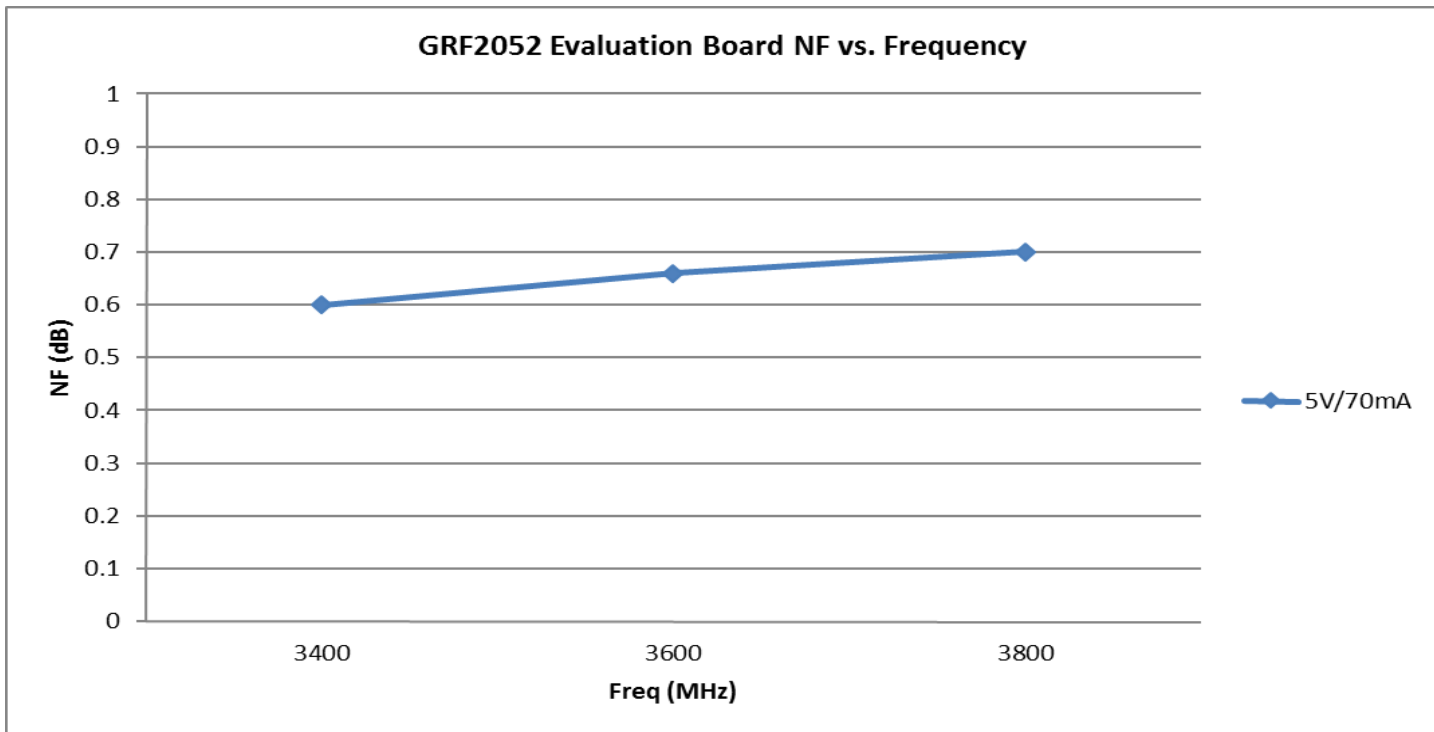


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Ultra-Low Noise Amplifier
Tuning Range: 1.7 – 4.5 GHz

GRF2052 Evaluation Board Measured Data: (3.4 to 3.8 GHz Tune)



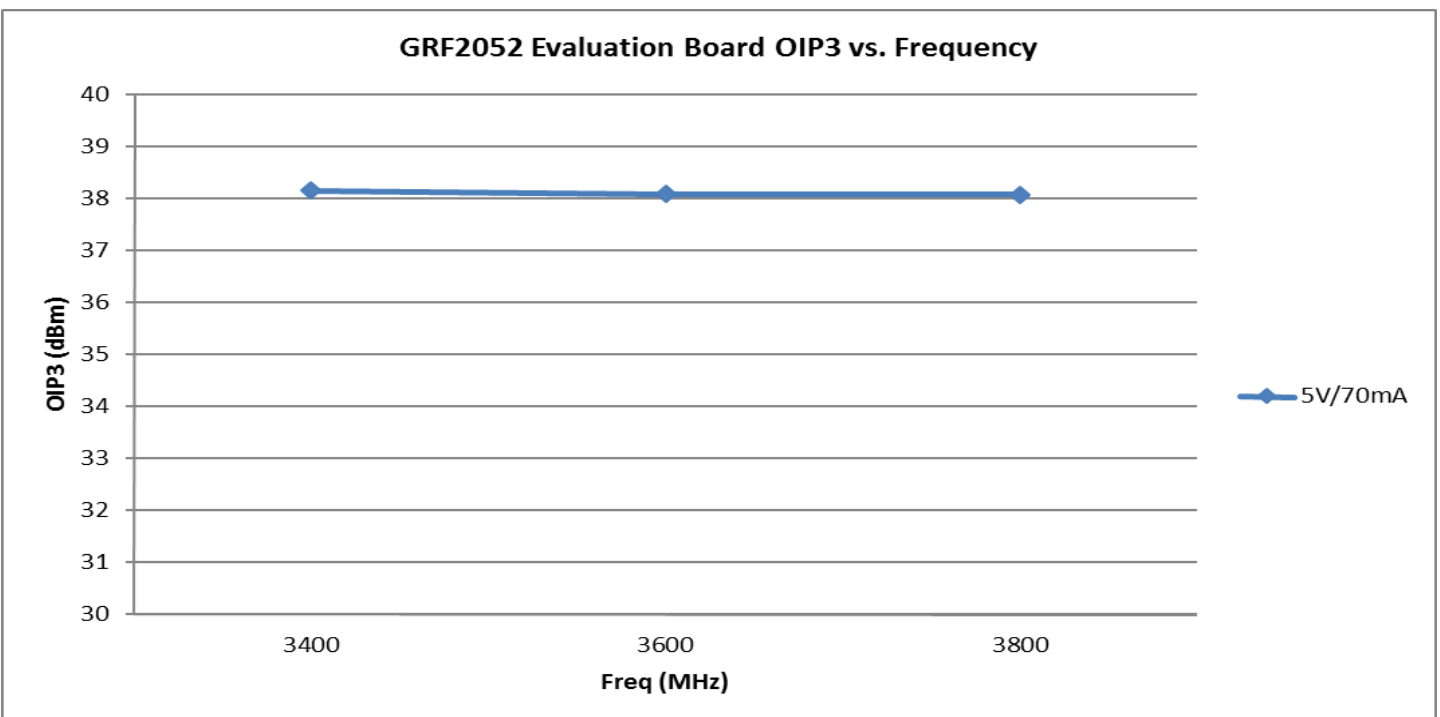
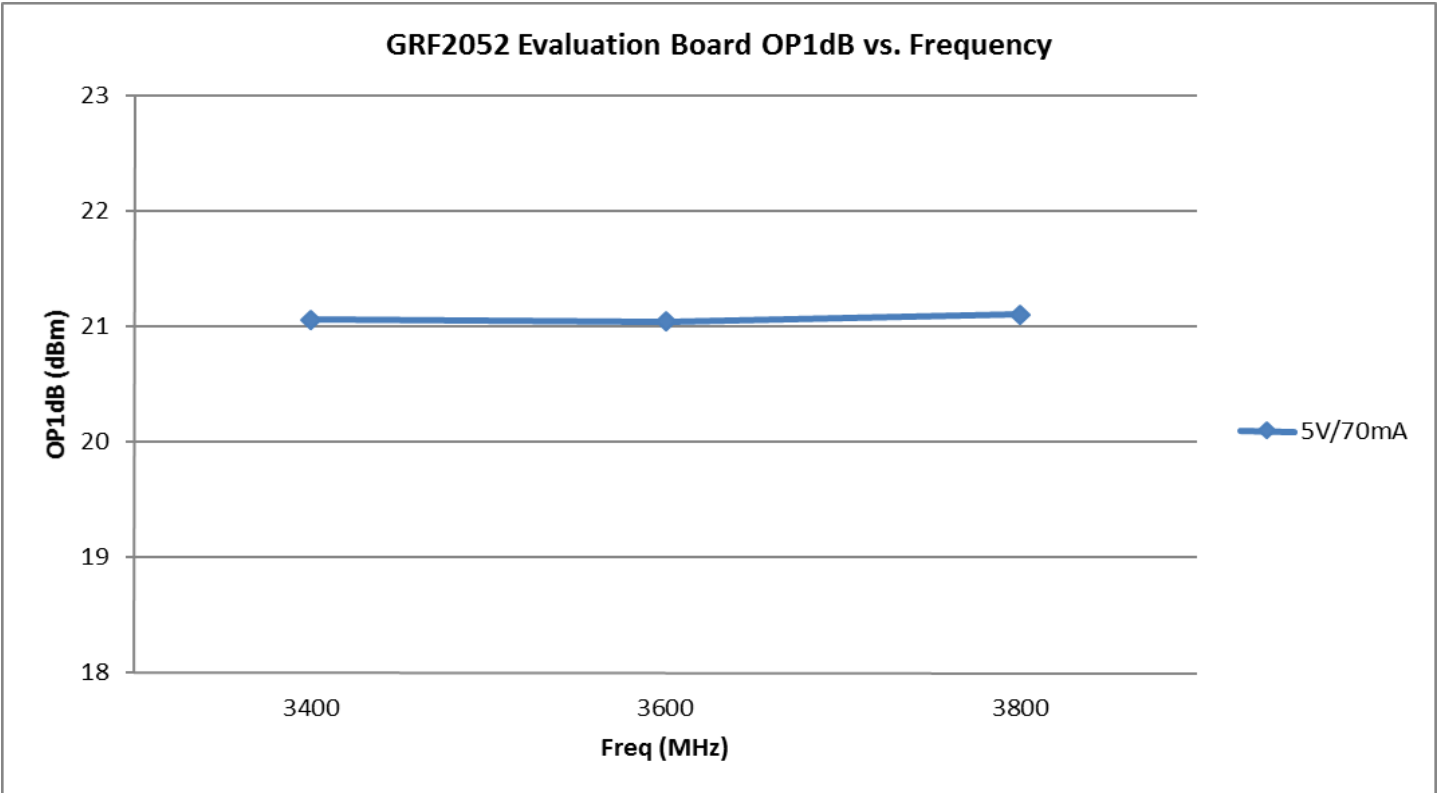


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GRF2052 Evaluation Board Measured Data: (3.4 to 3.8 GHz Tune)



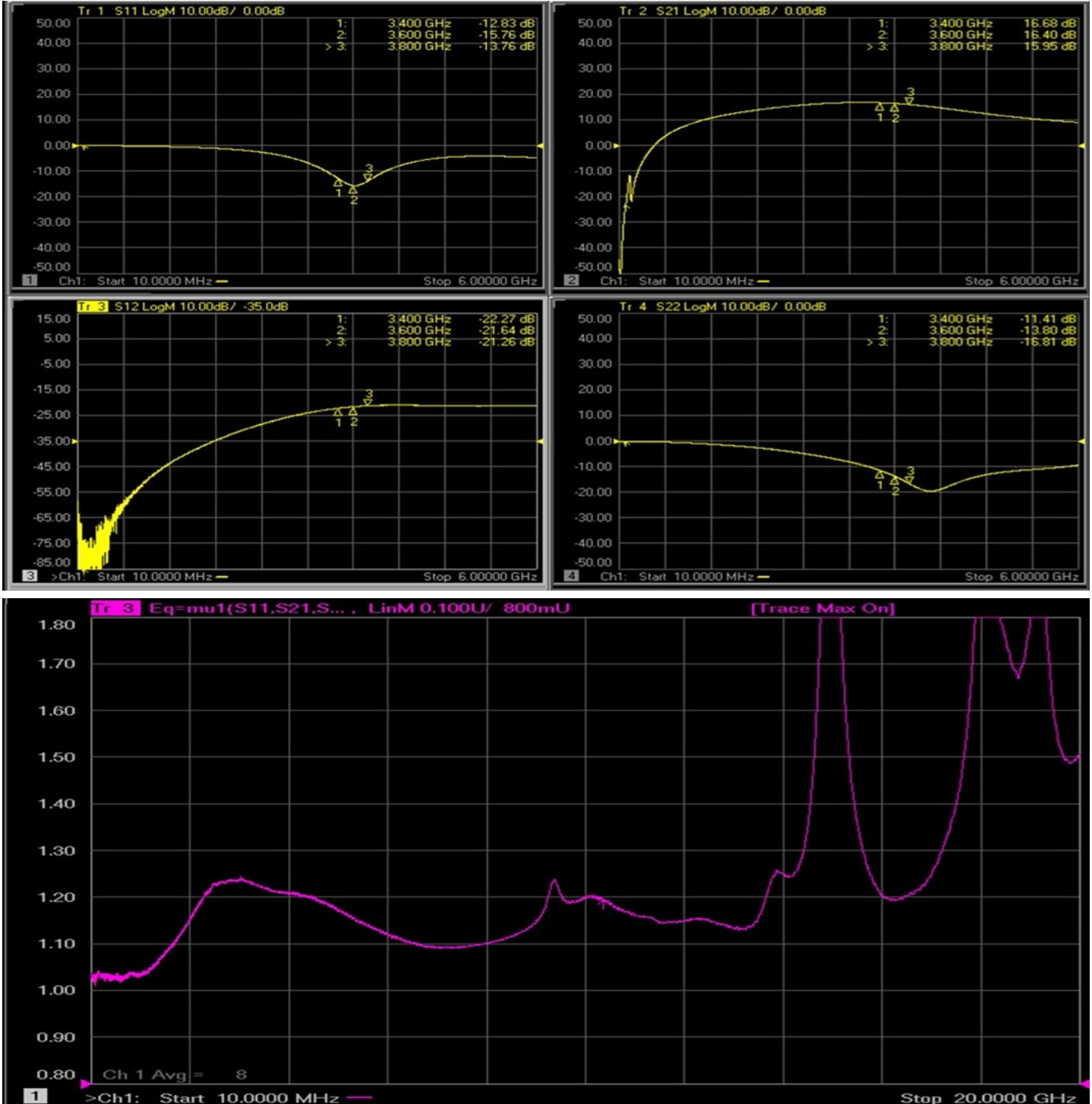


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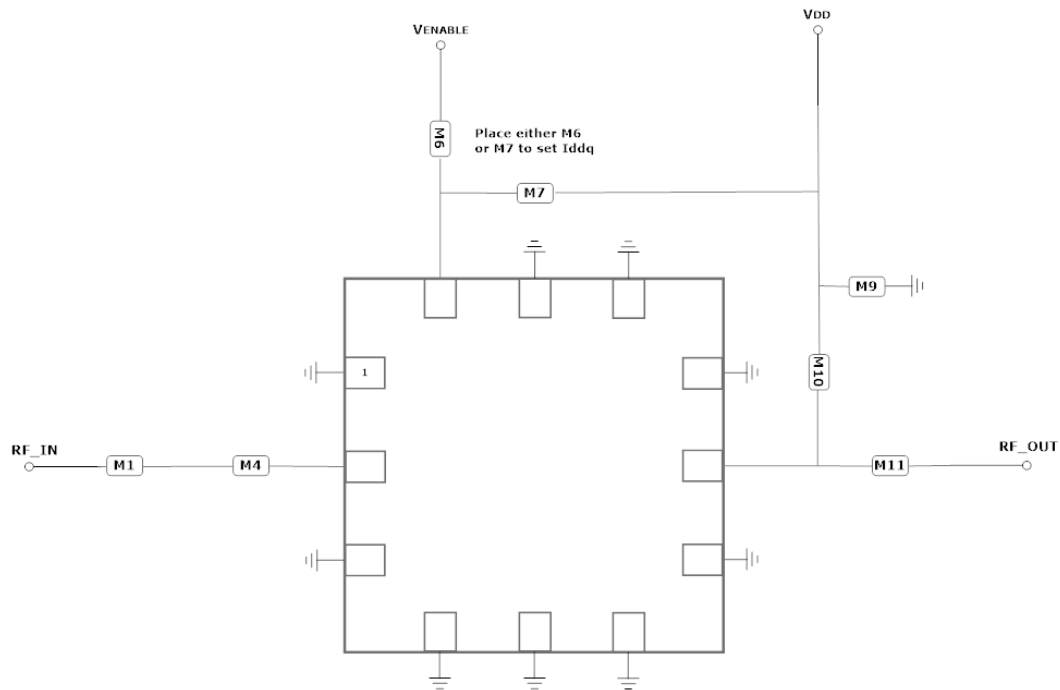
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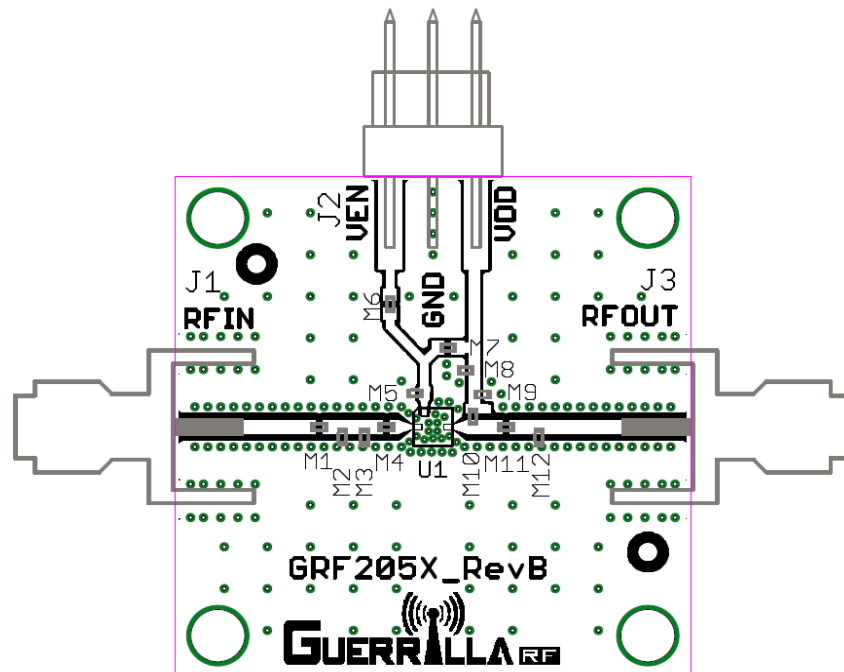
GRF2052 Evaluation Board S-Pars and Stability Mu Factor: (3.4 to 3.8 GHz Tune)



Note: Mu factor ≥ 1.0 implies unconditional stability.



GRF2052 Application Schematic



GRF2052 Eval Board Assembly Drawing



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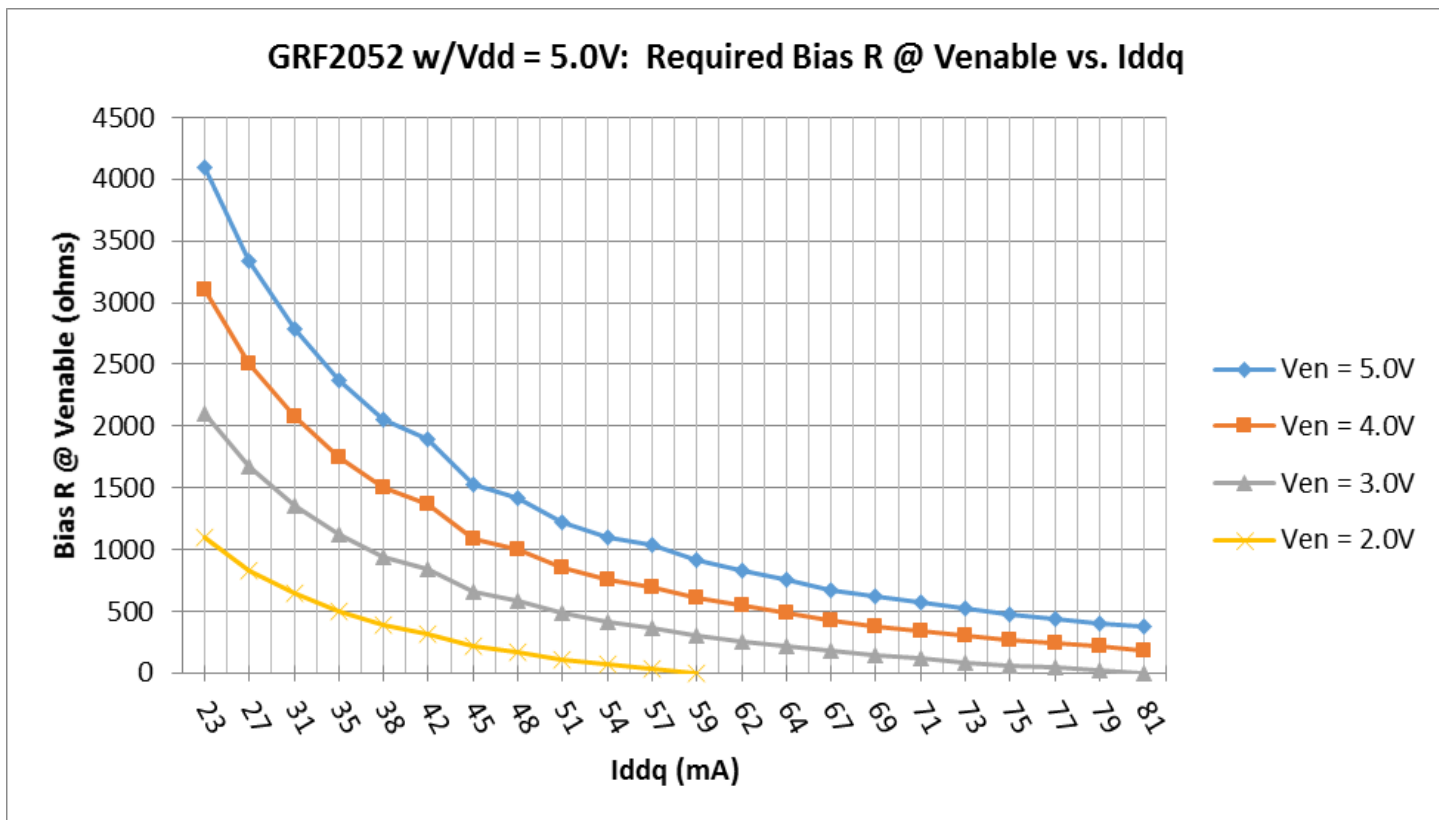
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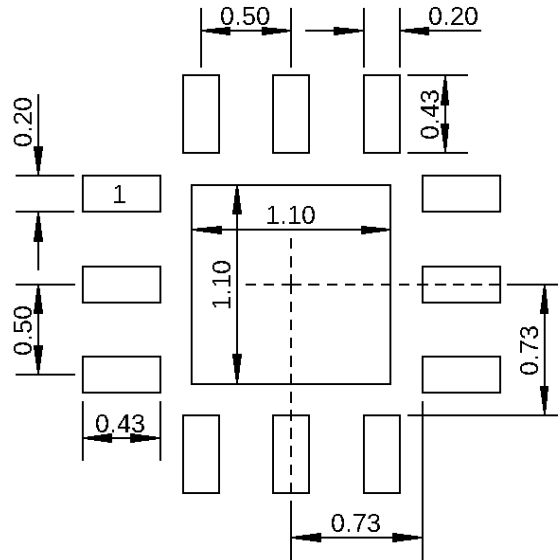
Ultra-Low Noise Amplifier
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GRF2052 Evaluation Board BOM (2.5 to 2.7 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package	Substitu-	Comment
M1	Capacitor: High Q	Murata	GJM	2.4 pF	0402	ok	
M4	Inductor	Murata	LQG	1.0 nH	0402	ok	
M6/7	Resistor: 5%	Various	—	—	0402	ok	Place M6 or M7
M9	Capacitor	Murata	GRM	0.1 uF	0402	ok	
M10	Inductor	Various	MLC	2.7 nH	0402	ok	
M11	Capacitor	Murata	GJM	2.4 pF	0402	ok	
Evaluation Board	GRF205X_RevB						

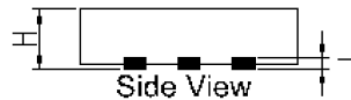
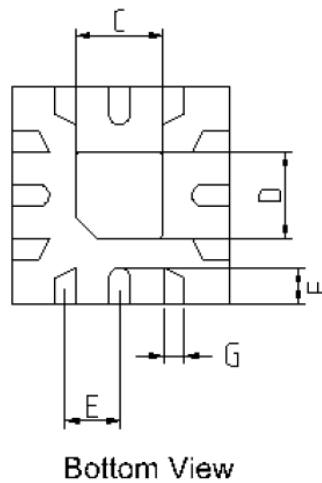
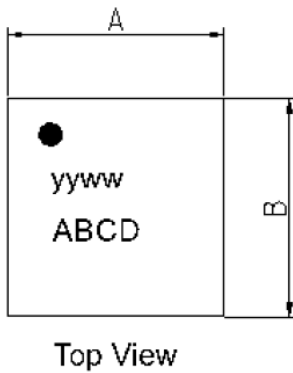
Note: Standard evaluation board bias: Vdd: 5.0V; Venable: 5.0V; M6/M7:





Dimensions in millimeters

2.0 mm QFN-12 Suggested PCB Footprint (Top View)



Dimensions (MM)	
A	2.00 Bsc
B	2.00 Bsc
C	.80 +/- .10
D	.80 +/- .10
E	.50 Bsc
F	.30 +/- .05
G	.20 +/- .05
H	.50 +/- .05
J	.12 Ref

2.0 mm QFN-12 Package Dimensions