



Product Description

GRF2505 is a broadband, ultra-low noise, linear amplifier offering the highest levels of performance for demanding 802.11ac and wireless backhaul LNA and PA driver applications.

This amplifier exhibits outstanding broadband NF, linearity and return losses over 4.0 to 6.0 GHz with a single match and can easily be tuned down to 3.0 GHz as needed. It is operated from a single positive supply of 1.8V to 5.0 V with a selectable I_{ddq} range of 20 to 60 mA for optimal efficiency and linearity.

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

Features

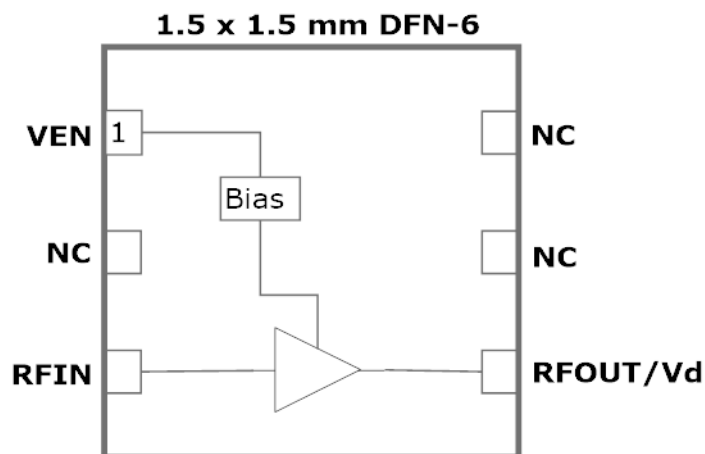
Reference: 5V/40mA/5.5 GHz

- EVB NF: 1.2 dB
- Gain: 12.5 dB
- OIP3: 30.0 dBm
- OP1dB: 19.0 dBm

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- PA Driver / Low Noise Amplifier for Wireless Backhaul and 802.11A/n/ac
- Vehicle Information Systems
- Automated Toll Reader
- C-band Amplifier





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Broadband LNA/Linear Driver
3.0 to 6.0 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}		17	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}		300	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 GRF2505 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	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.
2	NC	No Connect or Ground	No internal connection to die
3	RF _{In}	LNA RF input	An external DC blocking cap must be used.
4	RF _{Out}	LNA RF output	V _{DD} must be applied through a choke to this pin
5	NC	No Connect or Ground	No internal connection to die
6	NC	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.



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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}		5.5		GHz	
Gain	S_{21}	11.3	12.5		dB	
Evaluation Board Noise Figure	NF		1.2	1.4	dB	
Output 1dB Compression Power	OP1dB	17.0	19.0		dBm	
Output 3rd Order Intercept	OIP3		30.0		dBm	0.0 dBm P_{OUT} per tone (5499 and 5501 MHz)
Switching Rise Time	T_{RISE}		500		ns	
Switching Fall Time	T_{FALL}		500		ns	
Supply Current	I_{DD}		40.0		mA	
Enable Current	I_{ENABLE}		1.5		mA	
Disabled Mode						
Leakage Current	$I_{LEAKAGE}$		1	10	μA	$V_{DD}: 5.0\text{V}; V_{ENABLE}: 0.0\text{V}$
Thermal Data						
Thermal Resistance: (Infra-Red Scan)	Θ_{jc}		225		$^\circ\text{C}/\text{W}$	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	$T_{CHANNEL}$		141 (See note)		$^\circ\text{C}$	$V_{DD}: 5.0\text{ V}; I_{DDQ}: 40\text{ mA}; \text{No RF}; P_{DISS}: 200\text{ mW}$

Note: MTTF >10⁶ hours for $T_{CHANNEL} \leq 170$ degrees C.

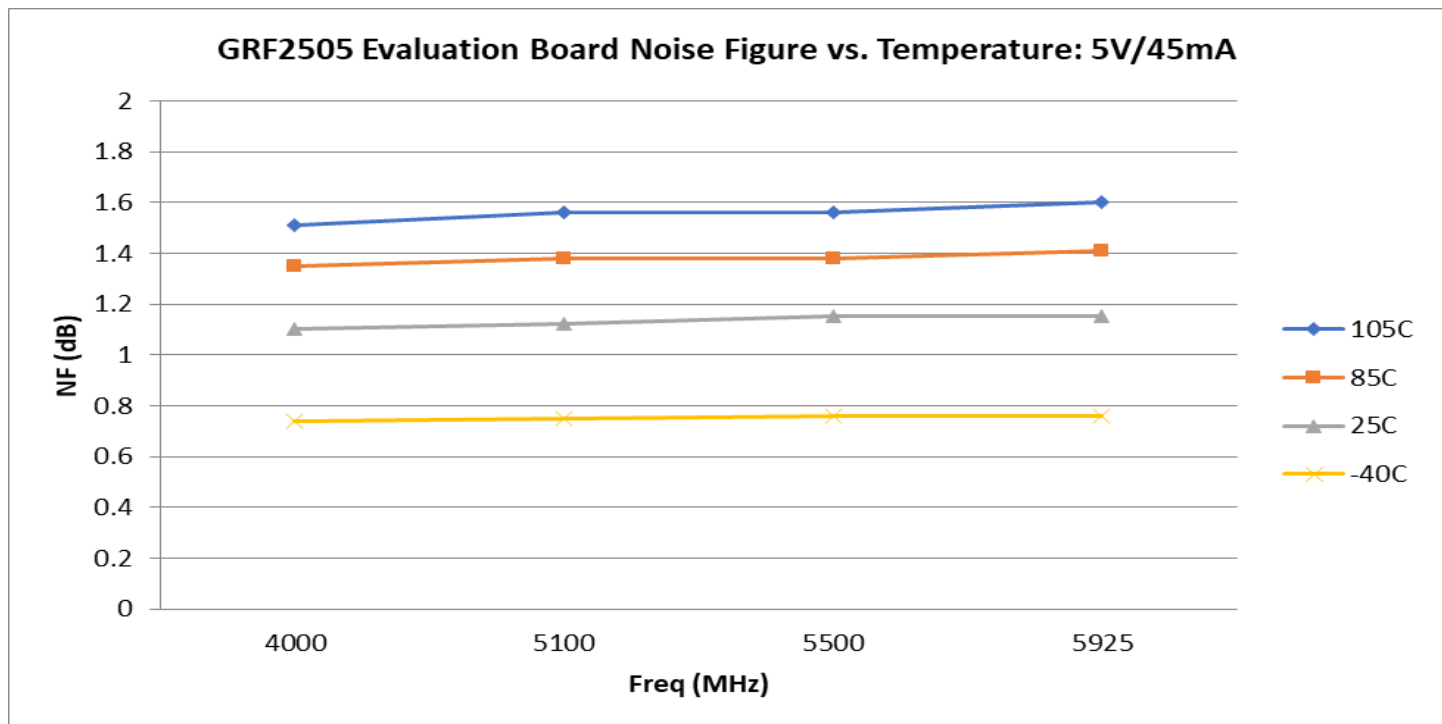
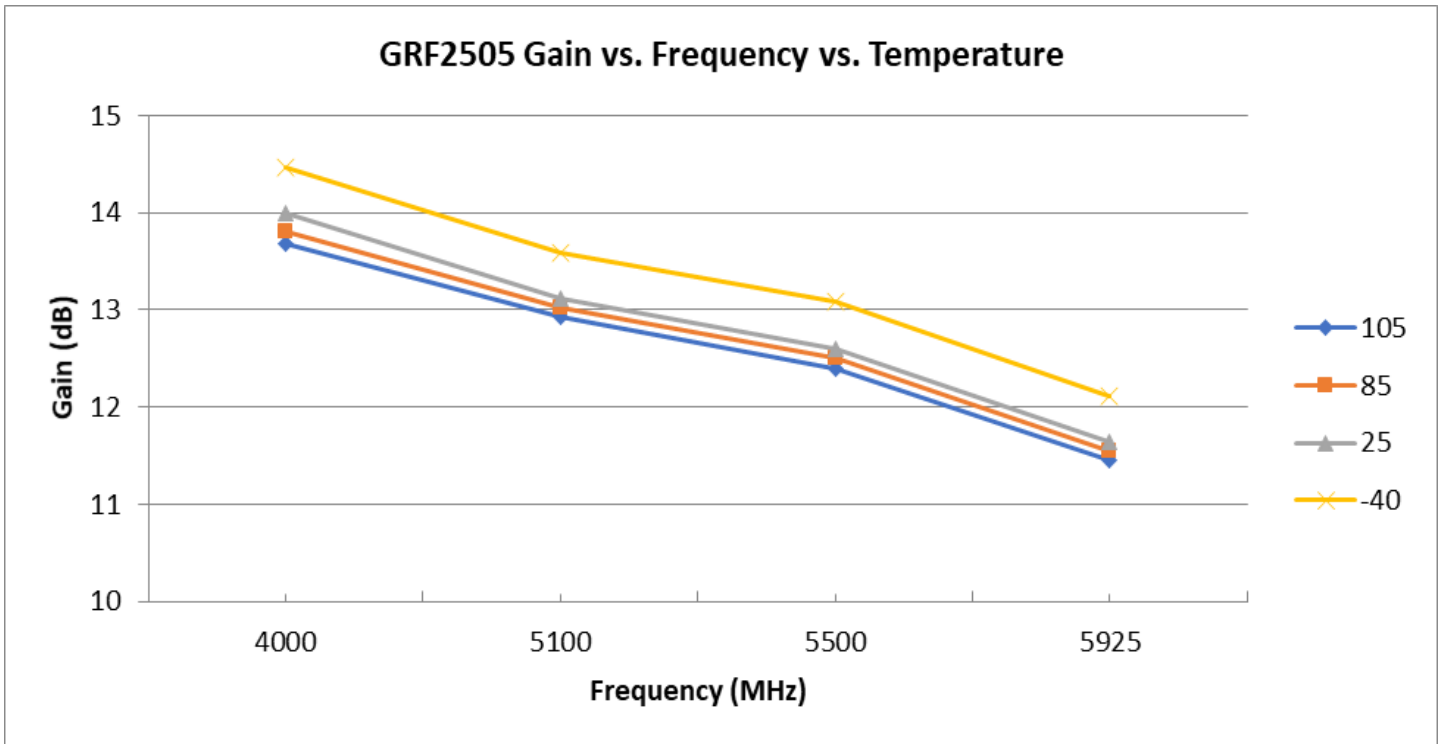


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GRF2505 Evaluation Board Measured Data:



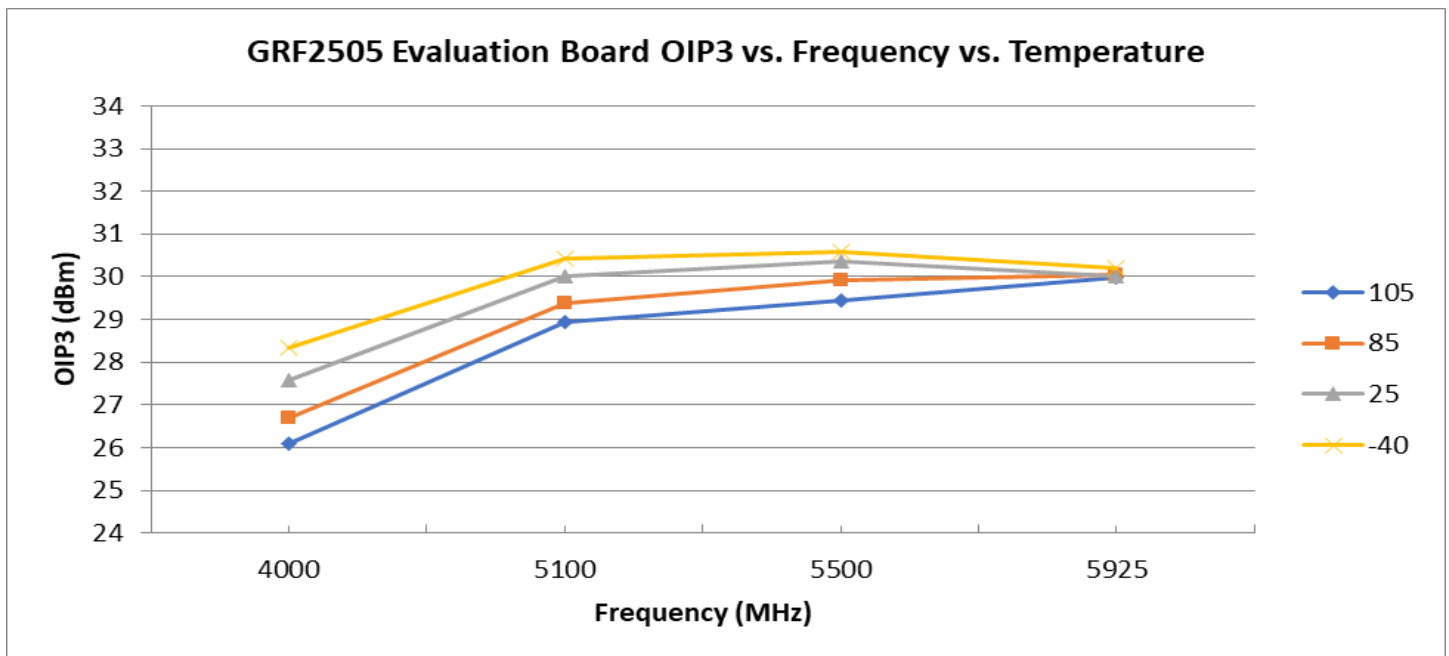
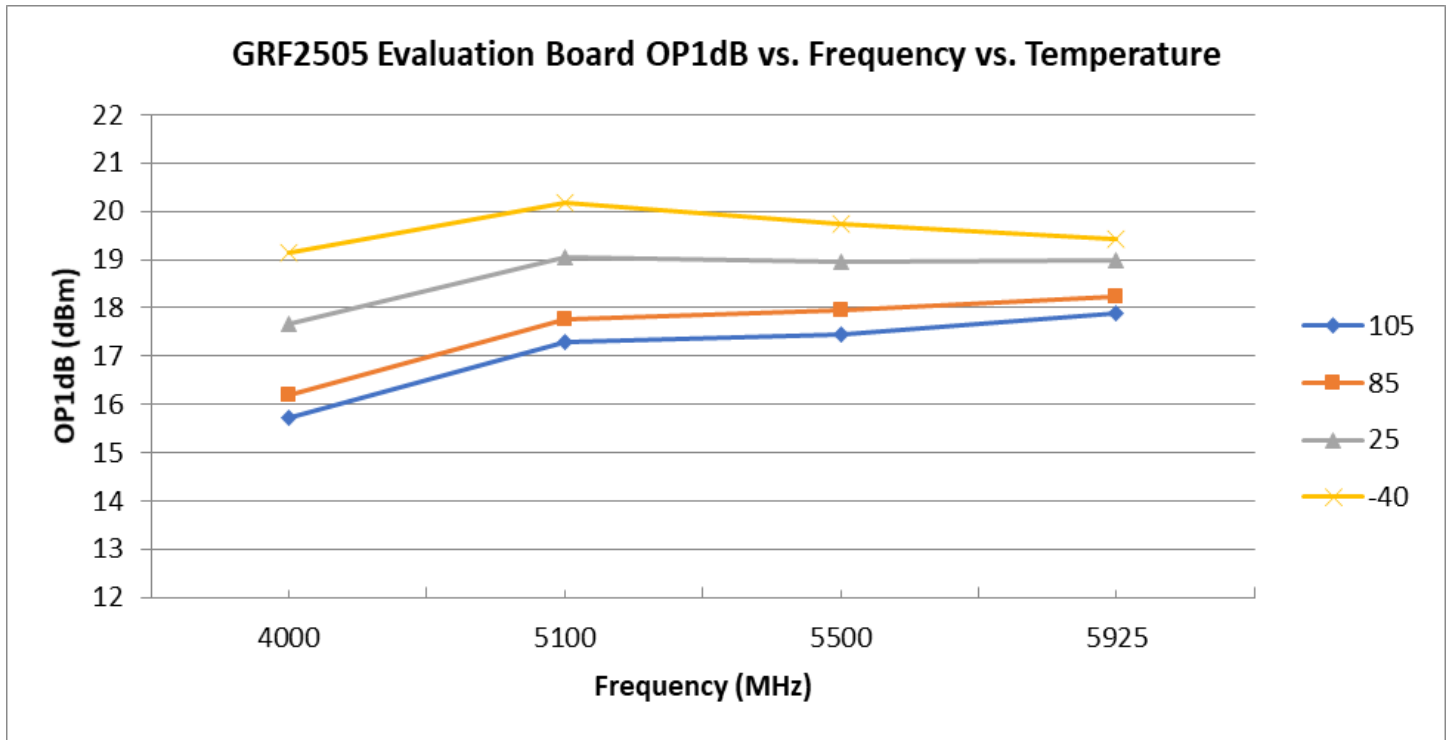


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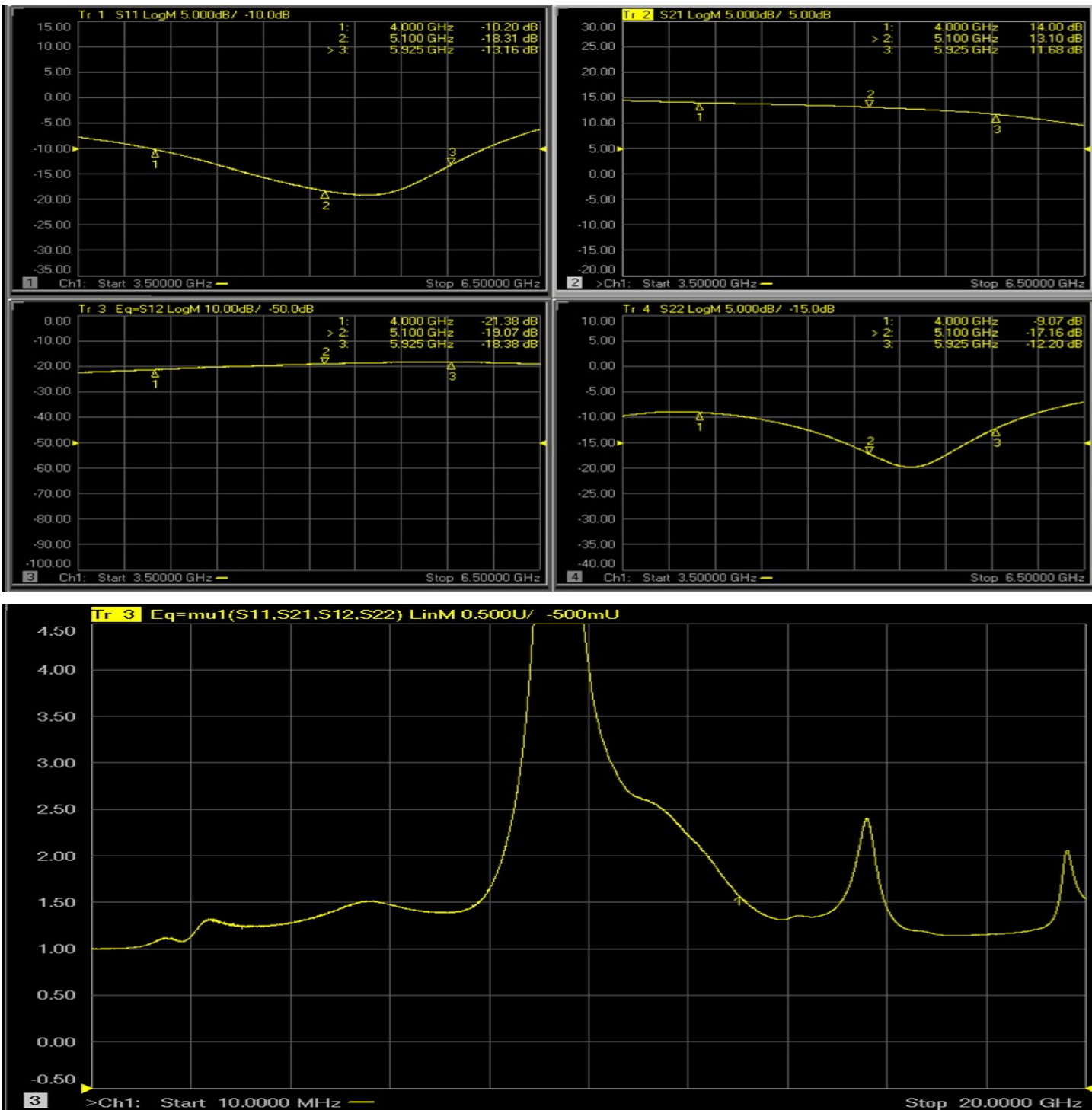
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3.0 to 6.0 GHz

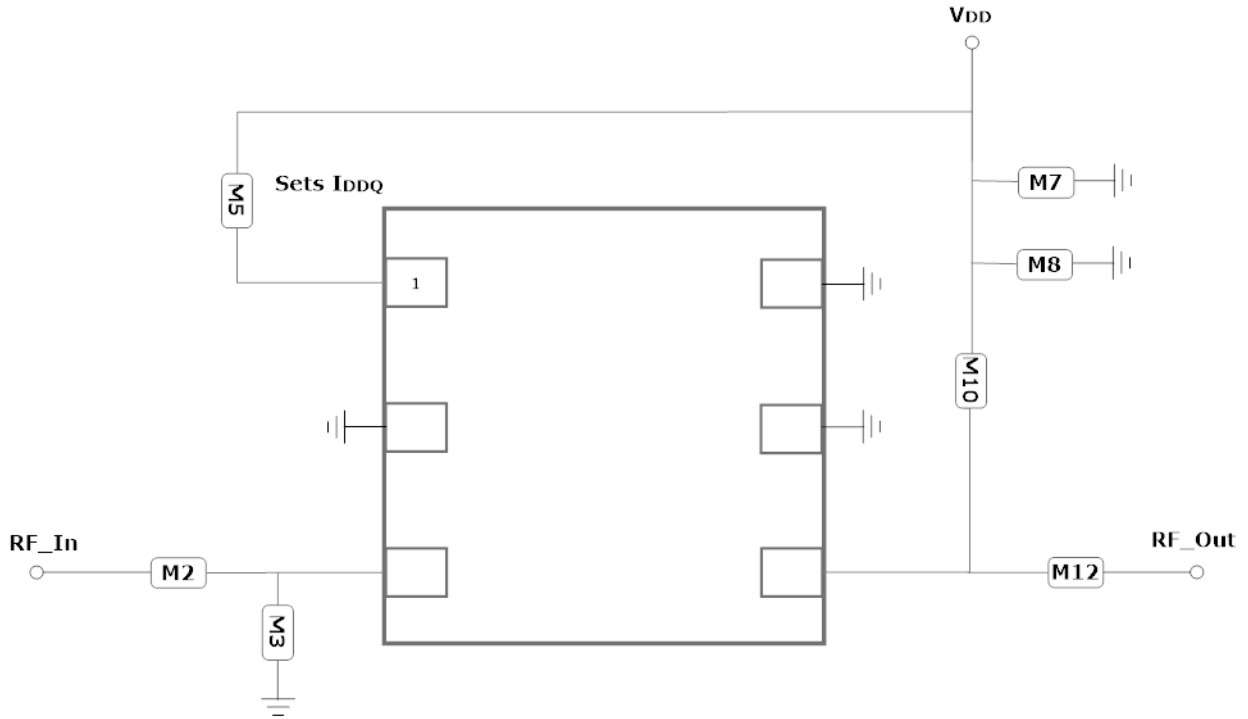
GRF2505 Evaluation Board Measured Data:



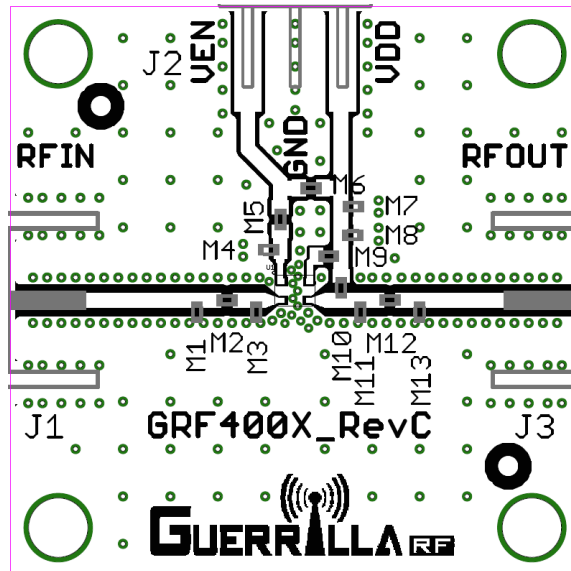
GRF2505 Evaluation Board S-Pars and Stability Mu Factor: (4.0— 6.0 GHz Match)



Note: Mu factor ≥ 1.0 implies unconditional stability.



GRF2505 Application Schematic



GRF2505 Evaluation Board Assembly Diagram



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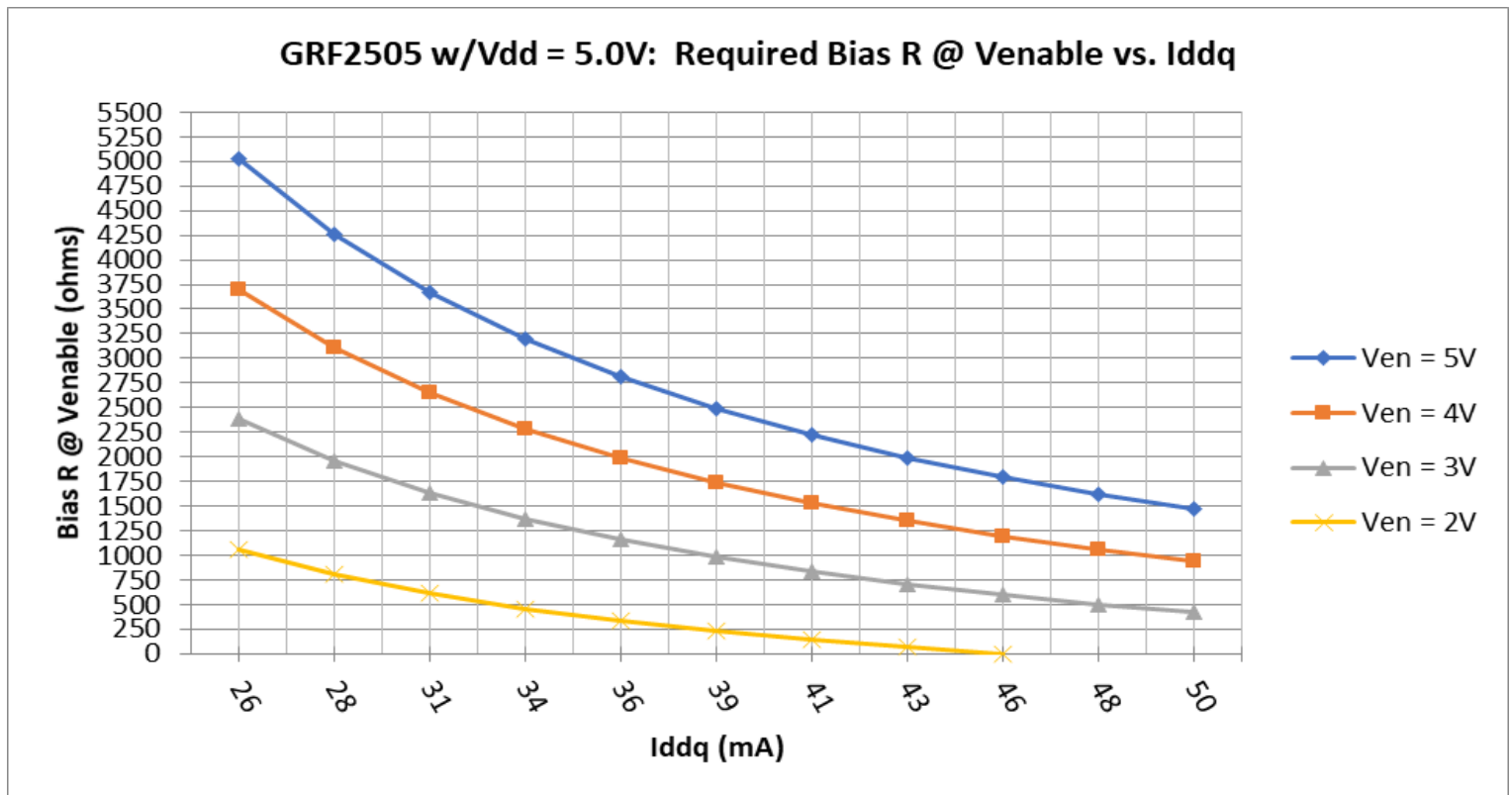
Broadband LNA/Linear Driver
3.0 to 6.0 GHz

GRF2505 Standard Evaluation Board BOM: (4.0 to 6.0 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M2	Capacitor	Murata	GJM	1.5 pF	0402	ok
M3	Capacitor	Murata	GJM	0.5 pF	0402	ok
M5 (See curves)	Resistor	Various	5%	Sets Iddq	0402	ok
M7	Capacitor	Murata	GRM	0.1 uF	0402	ok
M8	Capacitor	Murata	GJM	10 pF	0402	ok
M10	Inductor	Coilcraft	HPA	2.0 nH	0402	ok
M12	Capacitor	Murata	GJM	1.0 pF	0402	ok
Evaluation Board	GRF400X_RevC					

Note: Standard evaluation board bias: Vdd: 5.0V; Venable: 5.0V; M5:

GRF2505 Bias R vs. Iddq:





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Broadband LNA/Linear Driver 3.0 to 6.0 GHz

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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