GRF2501

Released

High Gain, Ultra-LNA
802.11ac: 4.9—6.0 GHz

Features

Reference: 3.3V/15mA/5.5 GHz

- De-embedded NF: 0.8 dB
- Gain: 16.0 dB
- IP1dB: -8.0 dBm
- Flexible Bias Voltage and Current
- Internally Matched to 50 Ω
- Process: GaAs pHEMT

Applications

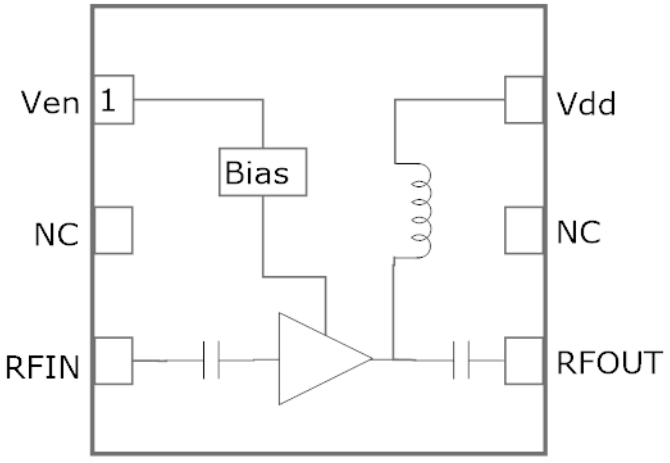
- WiFi Access Points
- Mobile WiFi Devices
- 802.11p Vehicle Communications
- Microwave Backhaul

Product Description

The GRF2501 is an ultra-low noise amplifier (LNA) designed for IEEE 802.11a/n/ac/p applications (5.1 GHz to 5.925 GHz). Over this band, the device exhibits outstanding de-embedded noise figure (NF) of 0.80 dB along with excellent gain flatness. The high gain, superior NF and directivity of its design allows designers to create receiver architectures with outstanding cascaded NF and unconditional stability.

The LNA is operated from a single positive supply of 2.8 to 5.0 V with a typical bias condition of 3.3 V and 15 mA. GRF2501 is internally matched to 50 Ω at the input and output ports.

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



1.5 x 1.5 mm DFN-6

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)	$P_{IN\ MAX}$		15	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	$P_{DISS\ MAX}$		200	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	--

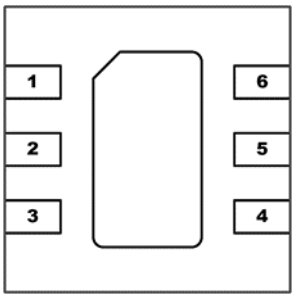
Caution! ESD Sensitive Device

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 GRF2501 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}	LNA Enable Input	V_{ENABLE} and series resistor M5 set the device Iddq. V_{ENABLE} < 0.1 volts disables the device.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	Internally matched to 50 Ω. These ports may be DC connected to ground externally but no DC > 0.2 volts should be applied to these ports.
4	RF_Out	LNA RF output	
5	NC	No Connect or Ground	No internal connection to die
6	V_{DD}	Supply Voltage for the LNA	Requires bypass capacitance as close as possible to pin on PCB
PKG BASE	GND	Ground	Provides DC and RF ground for LNA, as well as thermal heat sink. Please see evaluation board assembly diagram for reference.

V_{ENABLE} Truth Table:

V_{DD}	V_{ENABLE}	Mode
High	>=1.8 V	LNA On
High	<0.1 V	LNA Off

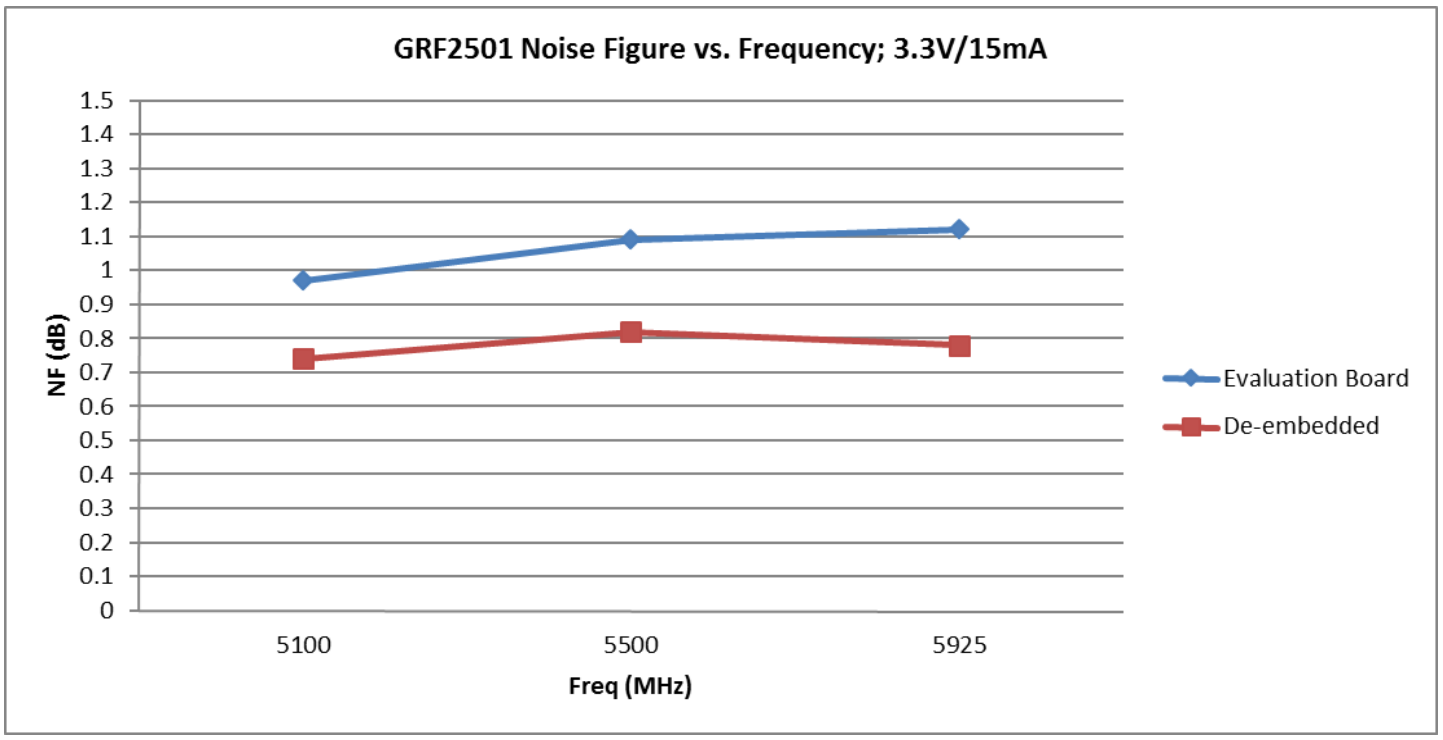
Nominal Operating Parameters:

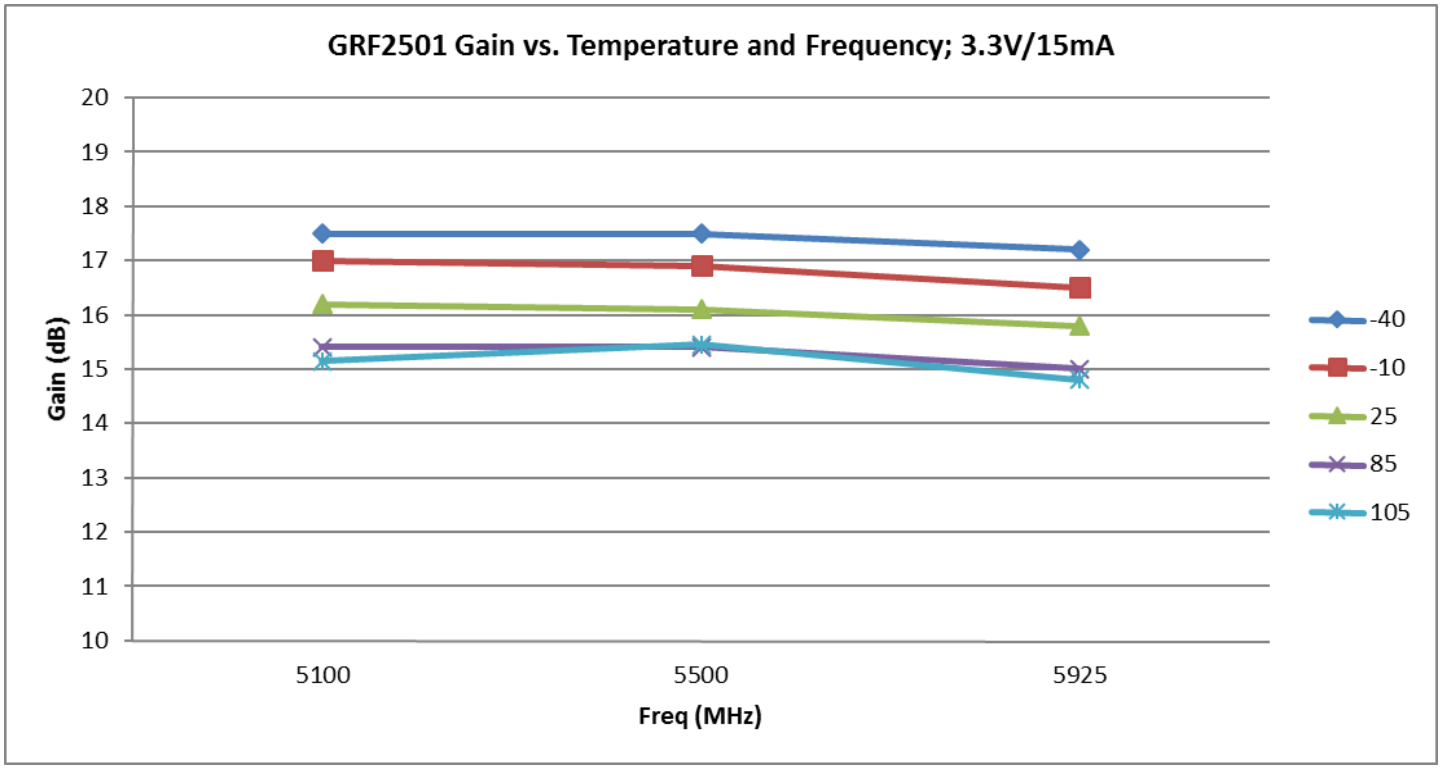
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
High Gain Mode						V_{DD} = 3.3 V, V_{ENABLE} = 3.3 V, T_A = 25°C
Test Frequency	F_{TEST}		5500		MHz	
Gain	S21	15.0	16.0		dB	
Gain Flatness	ΔS21		+/- 0.5		dB	Across 5.1 to 5.825 GHz
Evaluation Board Noise Figure	NF		1.1	1.3	dB	
Input Power at 1% EVM	EVM		-19.0		dBm	802.11a modulation
Input 1dB Compression	IP1dB	-10.0	-8.0		dBm	
Supply Current (Quiescent)	I_{DD}	12.0	15.0	28.0	mA	
Enable Current	I_{ENABLE}		1.5	3.0	mA	
Disabled Mode						V_{DD} = 3.3 V, V_{ENABLE} = 0.0V
Supply Current (Leakage)	I_{DD}		200	500	µA	
Thermal Data						
Thermal Resistance (Infra-Red Scan)	Θ_{jc}		150		°C/W	
Channel Temperature @ +85 C reference (Package heat sink)	$T_{CHANNEL}$		99		°C	V_{DD}: 3.3V; I_{DDQ}: 28 mA; No RF P_{DISS}: 92 mW

GRF2501 Evaluation Board Performance Summary Table:

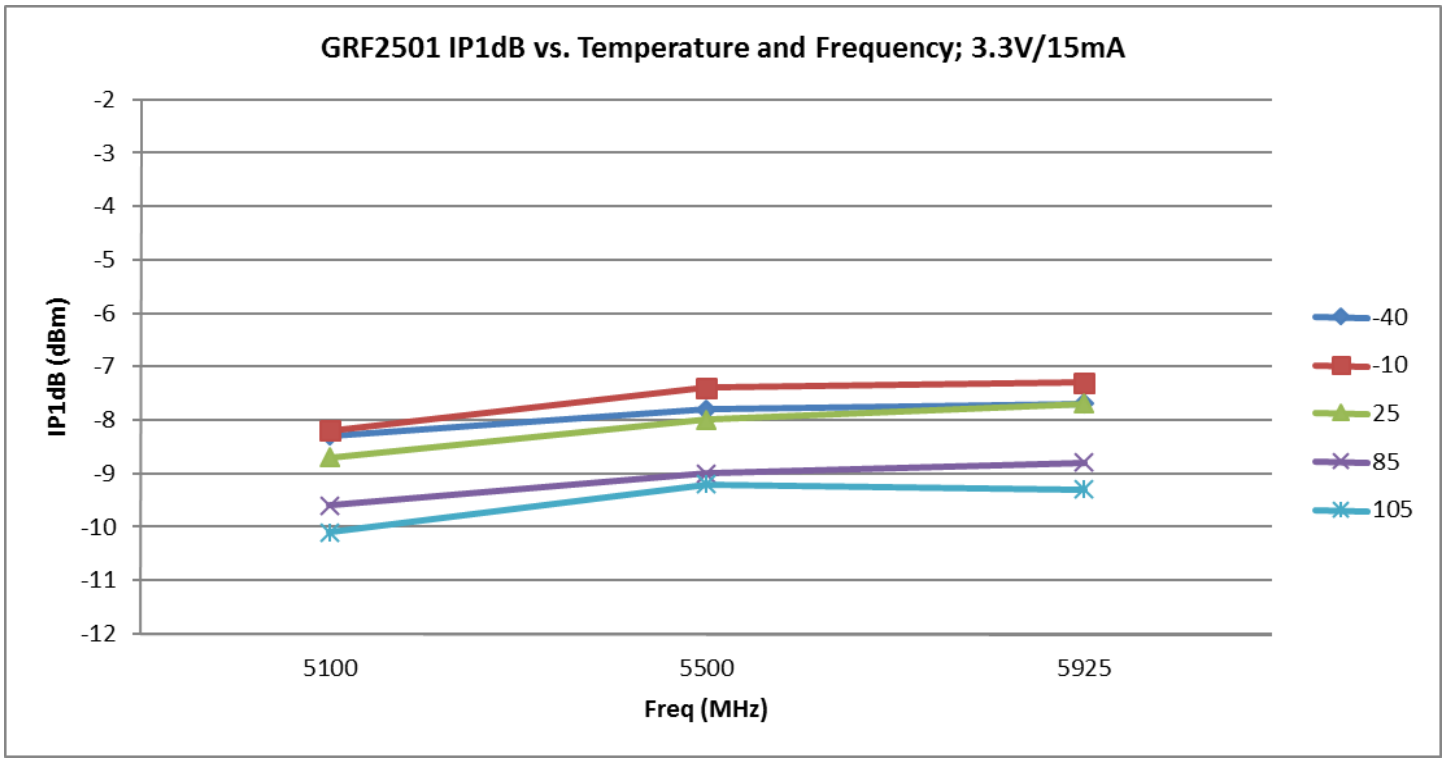
Tune (GHz)	Reference Freq. (GHz)	Gain (dB)	NF (dB) (de-embedded)	IP1dB (dBm)	Input Power for 1% EVM (dBm)	Bias Condition (V/mA)
4.9 to 6.0	5.1	16.2	0.75	-8.7	-20.0	3.3/15
4.9 to 6.0	5.5	16.0	0.80	-8.0	-19.0	3.3/15
4.9 to 6.0	5.9	15.8	0.80	-7.7	-19.0	3.3/15

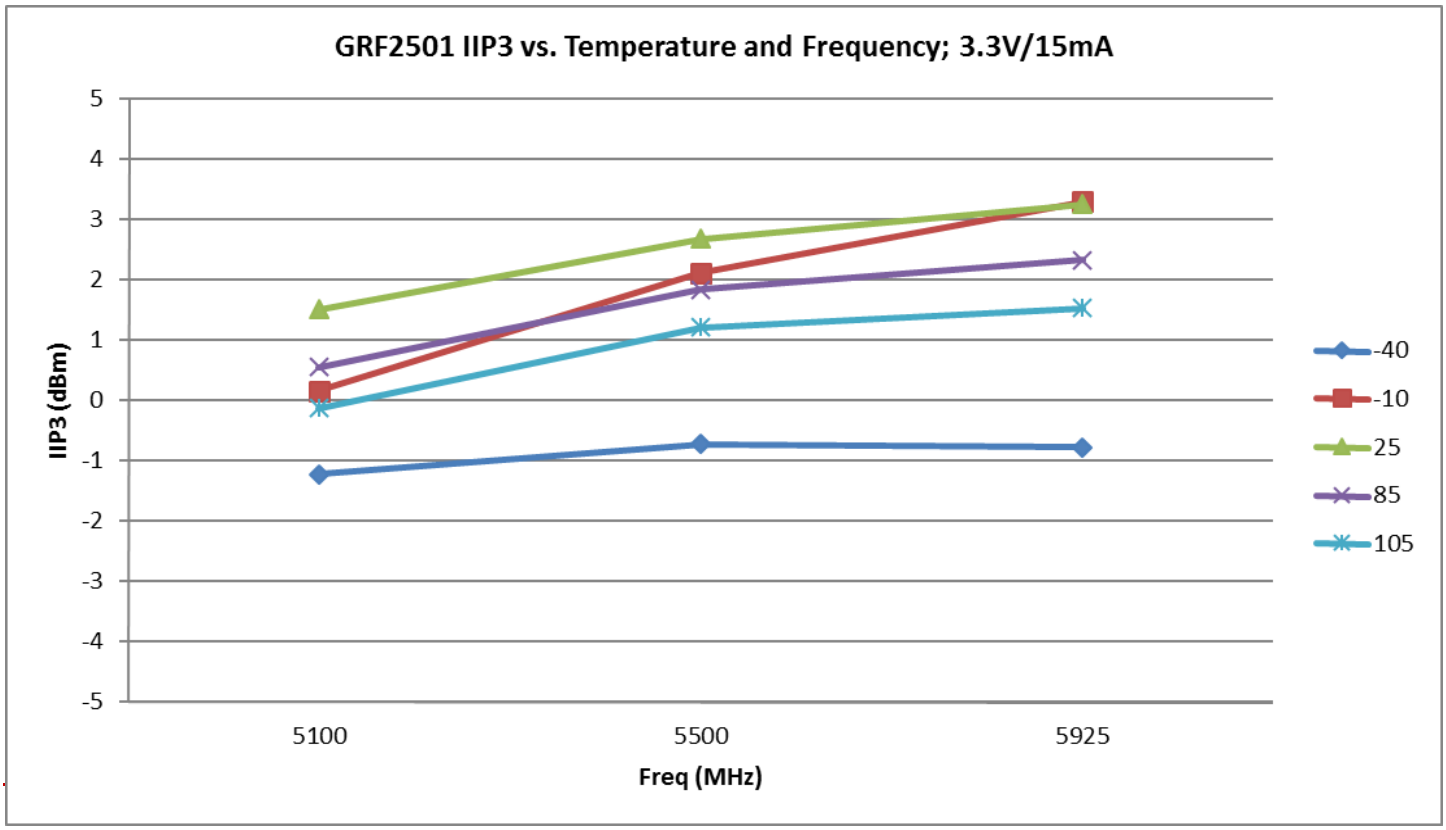
GRF2501 Evaluation Board Measured Data:





GRF2501 Evaluation Board Measured Data:





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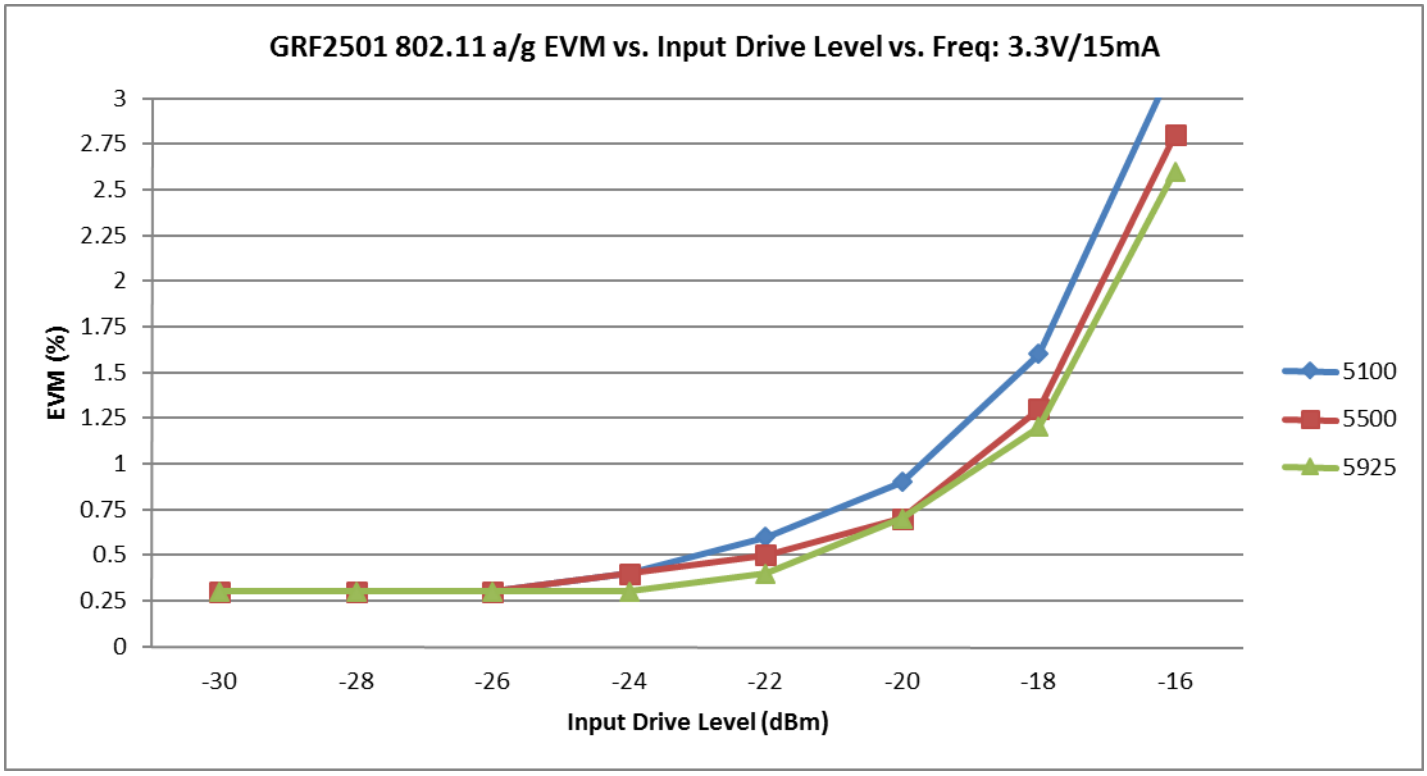
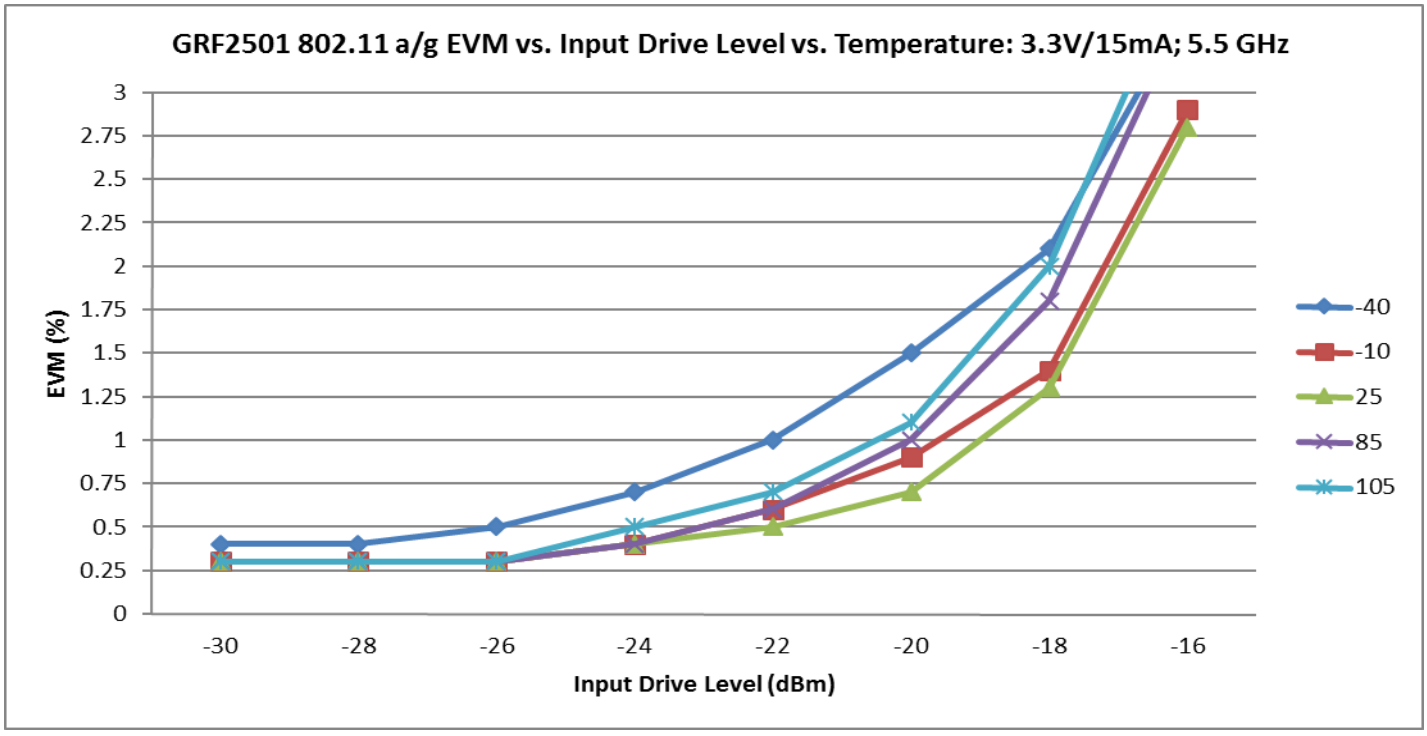
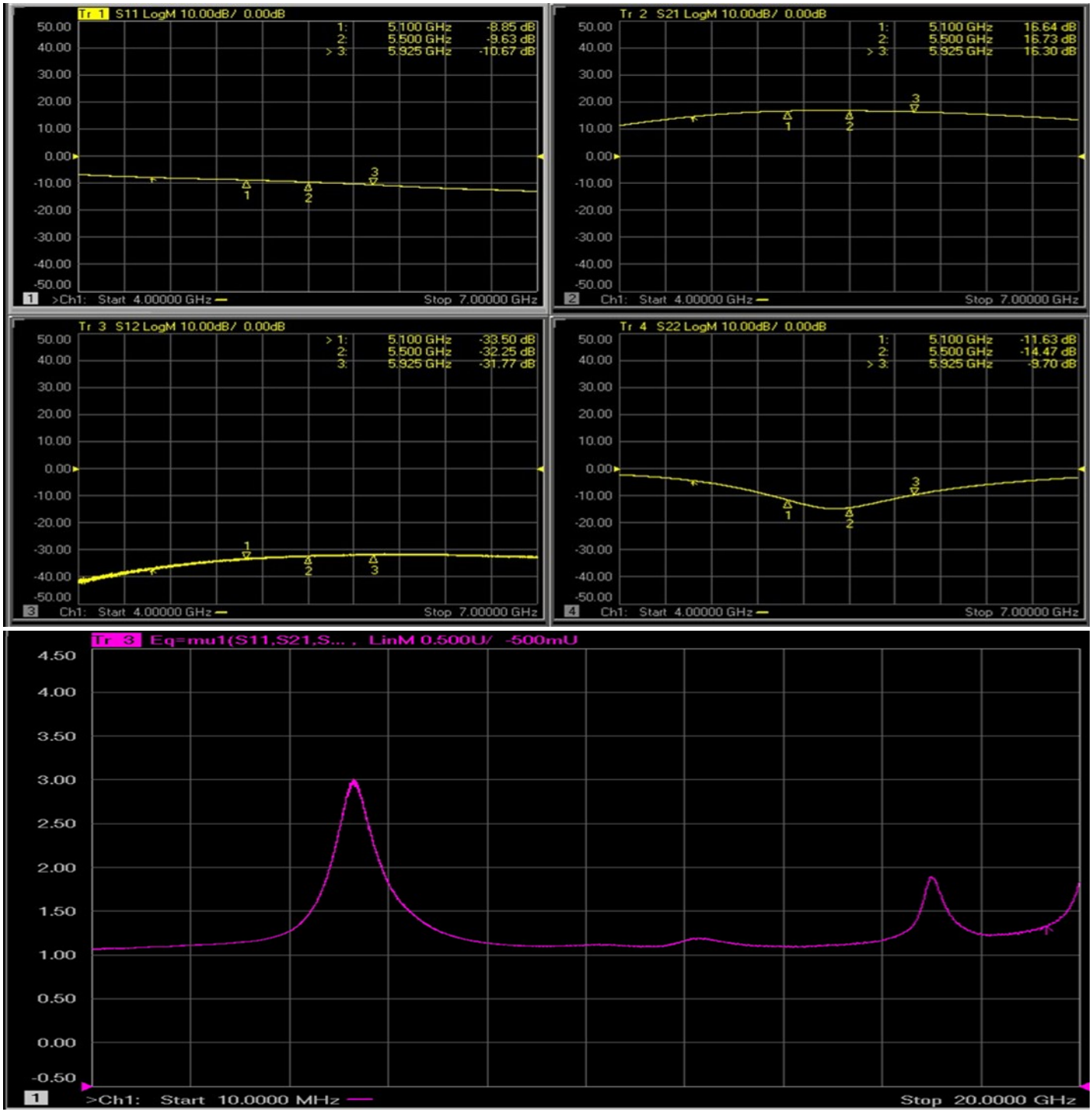
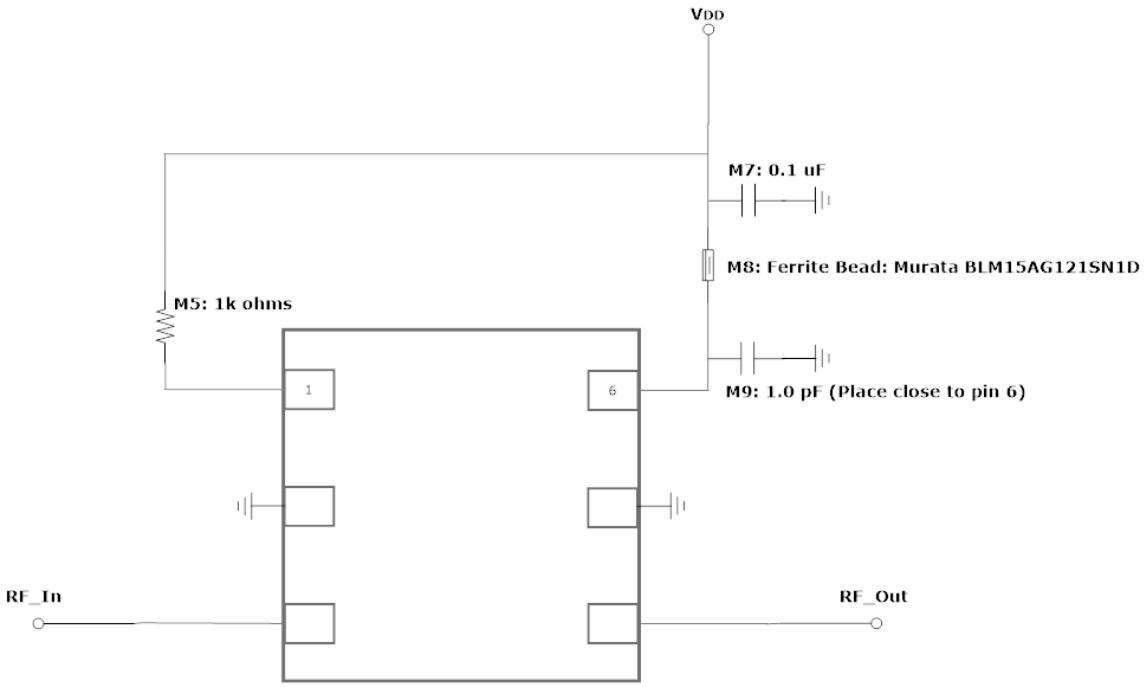




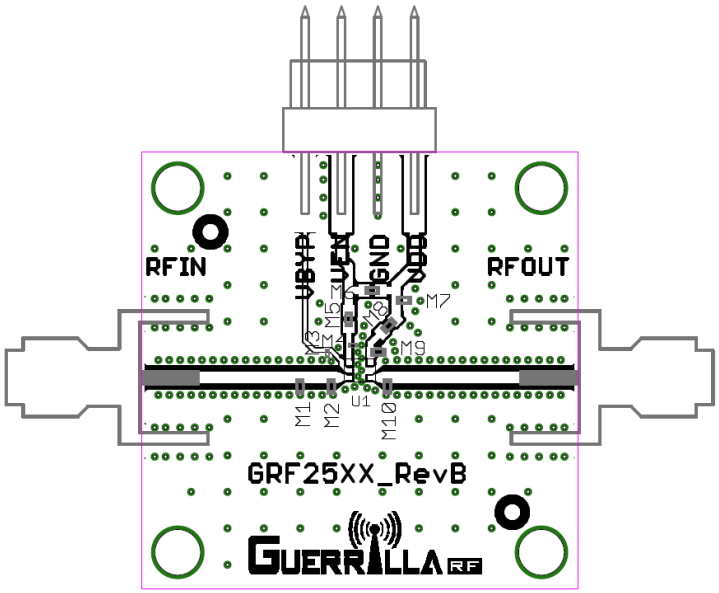
GRF2501 Evaluation Board S-Pars:



Note: Mu >= 1.0 implies unconditional stability



GRF2501 Application Schematic



GRF2501 Evaluation Board Assembly Diagram

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.