

Preliminary

GRF2541

High Gain, Ultra-LNA w/Bypass 802.11ac: 4.9-6.0 GHz



Features

Reference: 3.3V/18mA/5.5 GHz

EVB NF: 1.2 dB

Gain: 16.4 dB

IP1dB: -10.2 dBm

Flexible Bias Voltage and Current

• Internally Matched to 50 Ω

Process: GaAs pHEMT

Applications

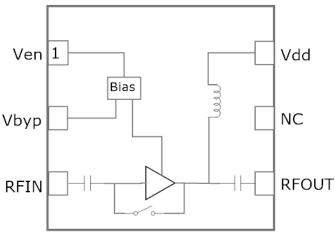
- WiFi Access Points
- Mobile WiFi Devices
- 802.11p Vehicle Communications
- Microwave Backhaul

Product Description

GRF2541 is an ultra-low noise amplifier (LNA) with bypass designed for IEEE 802.11a/n/ac/p applications in the 5GHz band (5.1 GHz to 5.925 GHz). The device exhibits outstanding de-embedded noise figure (NF) of 1.0 dB along with a high gain of approximately 16.4 dB

Guerrilla Armor™ technology provides exceptional offstate isolation in the presence of high RF input signal levels in LNA disabled mode. The LNA is operated from a single positive supply of 2.7 to 5.0 V with typical bias condition of 3.3 volts and 18 mA.

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



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)	Т _{АМВ}	-40	105	°C
Maximum Channel Temperature (MTTF > 10^6 Hours)	Тмах		170	°C
Maximum Dissipated Power	P _{DISS MAX}		200	mW
Electrostatic Discharge:				
Charged Device Model:	CDM	1500		V
Human Body Model:	НВМ	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.

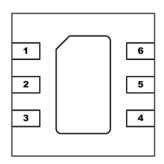
Note: For package dimensions and manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF2541 landing page: Manufacturing Note-MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

Link to manufacturing note





Pin Out (Top View)



Pin Assignments:

Pin	Name	Description	Note			
1	VENABLE	LNA enable	Venable and series resistor set IDDQ. Venable < 0.2 volts disables device. On-die pull-down resistor will turn the part off if this node is allowed to float.			
2	V_{BYP}	Bypass function enable	Logic high invokes the LNA bypass mode.			
3	RF_In	LNA RF input	Internally matched to 50 Ω . These ports may be DC connected to gro			
4	RF_Out	LNA RF output	externally but no DC > 0.2 volts should be applied to these ports.			
5	NC	No Connect or Ground	No internal connections to die			
6	VDD	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. Recommend multiple 8 mil vias beneath the package for optimal RF and thermal performance. Refer to evaluation board top layer graphic on schematic page.			

VENABLE Truth Table:

Mode	Description	VENABLE	VBYP
High Gain	High LNA Gain	1	0
Bypass	High Linearity Bypass	0	1
Disabled	LNA Powered Down	0	0
Logic Level "0"	Logic Low	0.0V to 0.1V	0.0V to 0.1V
Logic Level "1"	Logic High	1.5V to Vdd	1.5V to Vdd





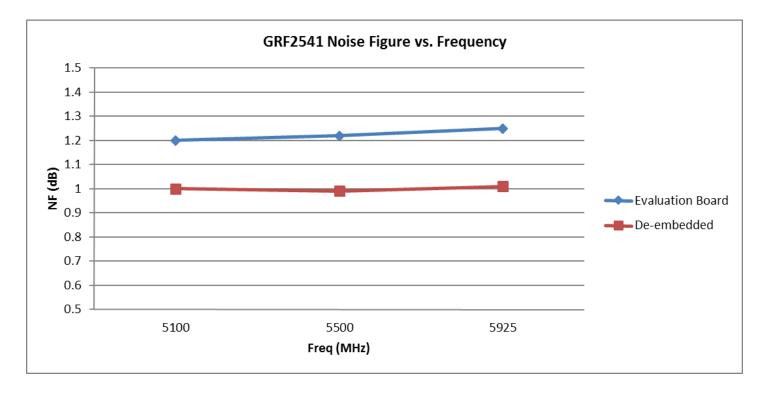
Nominal Operating Parameters:

Parameter	Symbol	S	pecificatio	n	Unit	Condition	
rafameter	Symbol	Min.	Тур.	Max.	Unit	Condition	
High Gain Mode						V _{DD} = 3.3 V; V _{ENABLE} : High; V _{BYPASS} : 0.0 V	
Test Frequency	F _{TEST}		5.5		GHz		
Gain	S21		16.4		dB		
Noise Figure (Evaluation Board)	NF		1.2		dB		
Input Power for 1.0% EVM (Gain Mode)	IP1%		-22.0		dBm	Waveform: 802.11a/g; PAR: 11.6 dB	
Input Power for 1.0% EVM (Bypass Mode)	IP1%		-9.0		dBm	Waveform: 802.11a/g; PAR: 11.6 dB	
Input 1dB Compression Point	IP1dB		-10.2		dBm		
Supply Current	I _{DD}		18		mA		
Enable Current	I _{ENABLE}		1.0		mA		
Bypass Mode						VDD: 3.3 V; Ven: 0.0 V; VBYP: High	
Gain	S(2,1)		-5.1		dB		
Input 1dB Compression Point	IP1dB		5.0		dBm		
Disabled Mode (Guerrilla Armor)						V _{DD} = 3.3V, V _{ENABLE} =V _{BYPASS} = 0.0 V	
Gain	S(2,1)		-32		dB	RF Input Power: +20 dBm	
Supply Current (Leakage)	I _{DD}		500		μΑ		
Enable Current	I _{ENABLE}		0.01		μΑ		
Thermal Data							
Thermal Resistance (Infra-Red Scan)	Θјс		150		°C/W		
Channel Temperature @ +85 C reference (Package heat sink)	TCHANNEL		94		°C	V _{DD} : 3.3 V; I _{DDQ} : 18 mA; No RF; Dissi- pated Power: 60 mW	





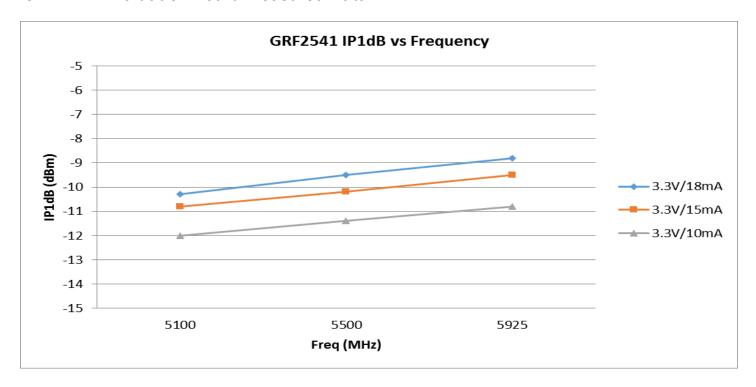
GRF2541 Evaluation Board Measured Data:







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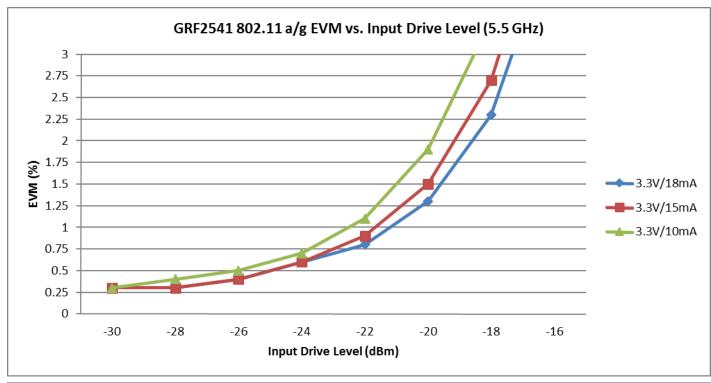


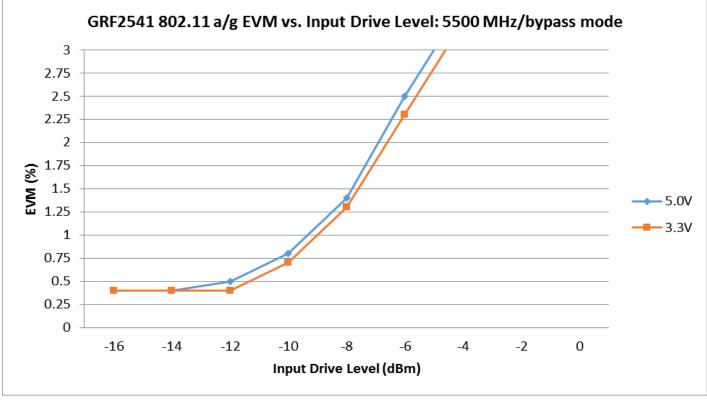




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GRF2541 Evaluation Board Measured EVM Data: (Gain and Bypass Modes)





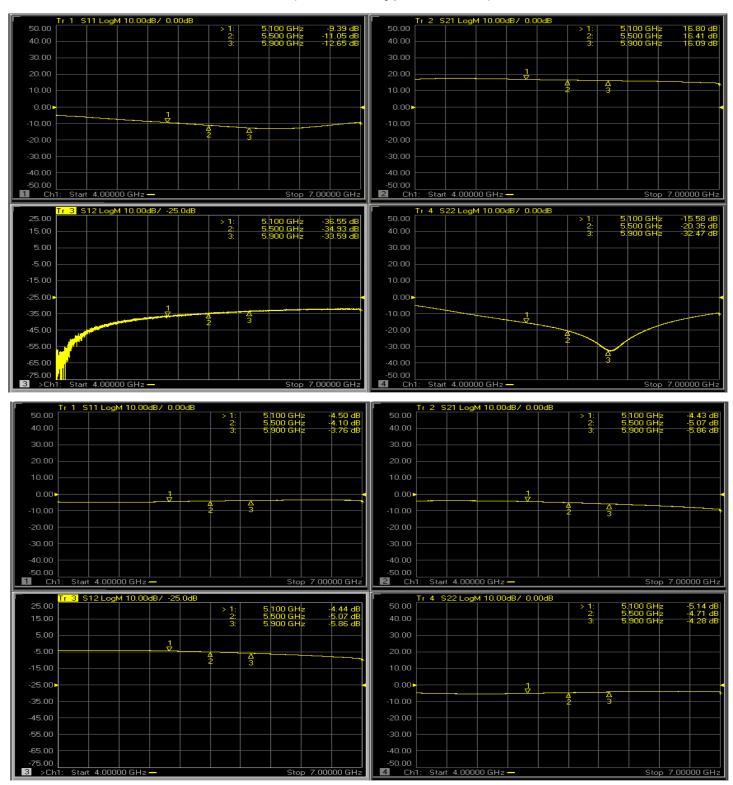




Revision Date: 02/28/18

802.11ac: 4.9-6.0 GHz

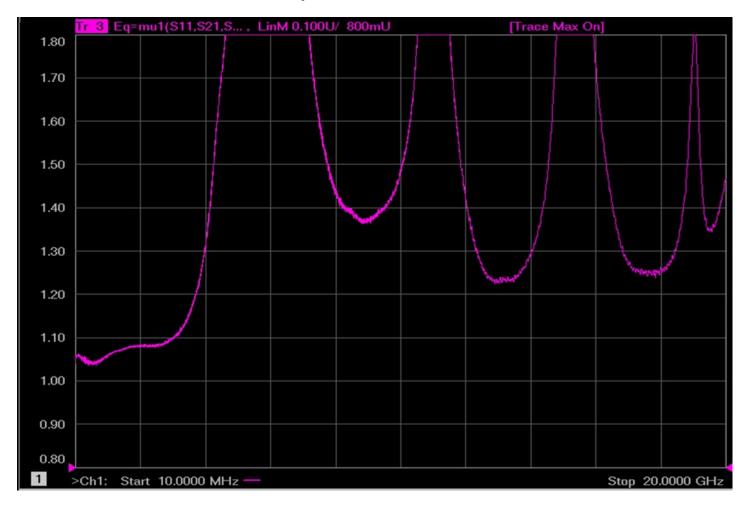
GRF2541 Evaluation Board S-Pars (Gain and Bypass Modes):







GRF2541 Evaluation Board Stability Mu Factor:



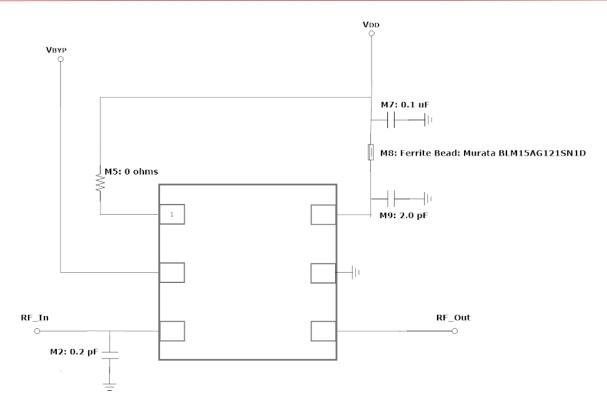
Note: Mu factor >= 1.0 implies unconditional stability.



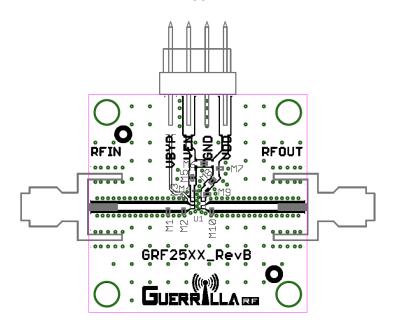


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802.11ac: 4.9-6.0 GHz



GRF2541 Application Schematic



GRF2541 Evaluation Board Assembly Diagram





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802.11ac: 4.9-6.0 GHz

GRF2541 Standard Evaluation Board BOM: 5.1 to 5.9 GHz Tune)

Component	Туре	Manufacturer	Family	Value	Package Size	Substitution
M2	Capacitor	Murata	GJM	0.2 pF	0402	ok
M5	Resistor: 5%	Various	_	Sets Iddq	0402	ok
M7	Capacitor	Murata	GRM	0.1 uF	0402	ok
M8	Ferrite Bead	Murata	BLM15AG121SN1D	_	0402	ok
M8 (See Note)	Resistor	Various	_	15 Ohm	0402	ok
M9	Capacitor	Murata	GJM	2.0 pF	0402	ok
Evaluation Board:	GRF25XX_RevB					

Note: 15 Ohm resistor can be used instead of ferrite bead at position M8. Ferrite bead will provide better gain suppression below 2 GHz.



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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.

Revision Date: 02/28/18

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