



Preliminary

GRF2541

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



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 off-state 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 s-parameters.

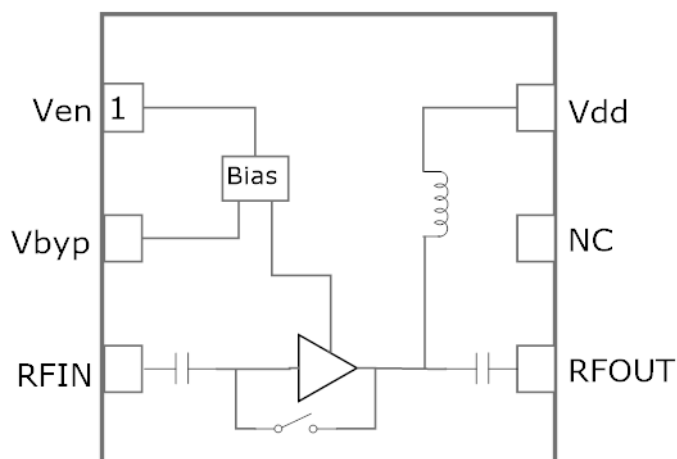
Features

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



1.5 x 1.5 mm DFN-6



Preliminary

GRF2541

High Gain, Ultra-LNA w/Bypass
802.11ac: 4.9–6.0 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}		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 GRF2541 landing page: **Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.**

[Link to manufacturing note](#)

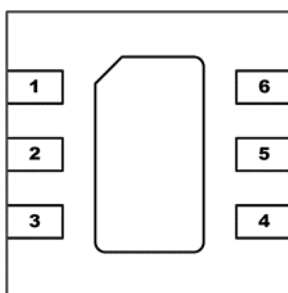


Preliminary

GRF2541

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

Pin Out (Top View)



Pin Assignments:

Pin	Name	Description	Note
1	V _{ENABLE}	LNA enable	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	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 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 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.

V_{ENABLE} Truth Table:

Mode	Description	V _{ENABLE}	V _{BYP}
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 V _{dd}	1.5V to V _{dd}



Preliminary

GRF2541

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

Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
High Gain Mode						$V_{DD} = 3.3\text{ V}$; 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						V_{DD} : 3.3 V; V_{EN} : 0.0 V; V_{BYP} : High
Gain	S(2,1)		-5.1		dB	
Input 1dB Compression Point	IP1dB		5.0		dBm	
Disabled Mode (Guerrilla Armor)						$V_{DD} = 3.3\text{ V}$, $V_{ENABLE}=V_{BYPASS}= 0.0\text{ V}$
Gain	S(2,1)		-32		dB	RF Input Power: +20 dBm
Supply Current (Leakage)	I_{DD}		500		μA	
Enable Current	I_{ENABLE}		0.01		μA	
Thermal Data						
Thermal Resistance (Infra-Red Scan)	Θ_{jc}		150		$^{\circ}\text{C}/\text{W}$	
Channel Temperature @ +85 C reference (Package heat sink)	$T_{CHANNEL}$		94		$^{\circ}\text{C}$	V_{DD} : 3.3 V; I_{DDQ} : 18 mA; No RF; Dissipated Power: 60 mW

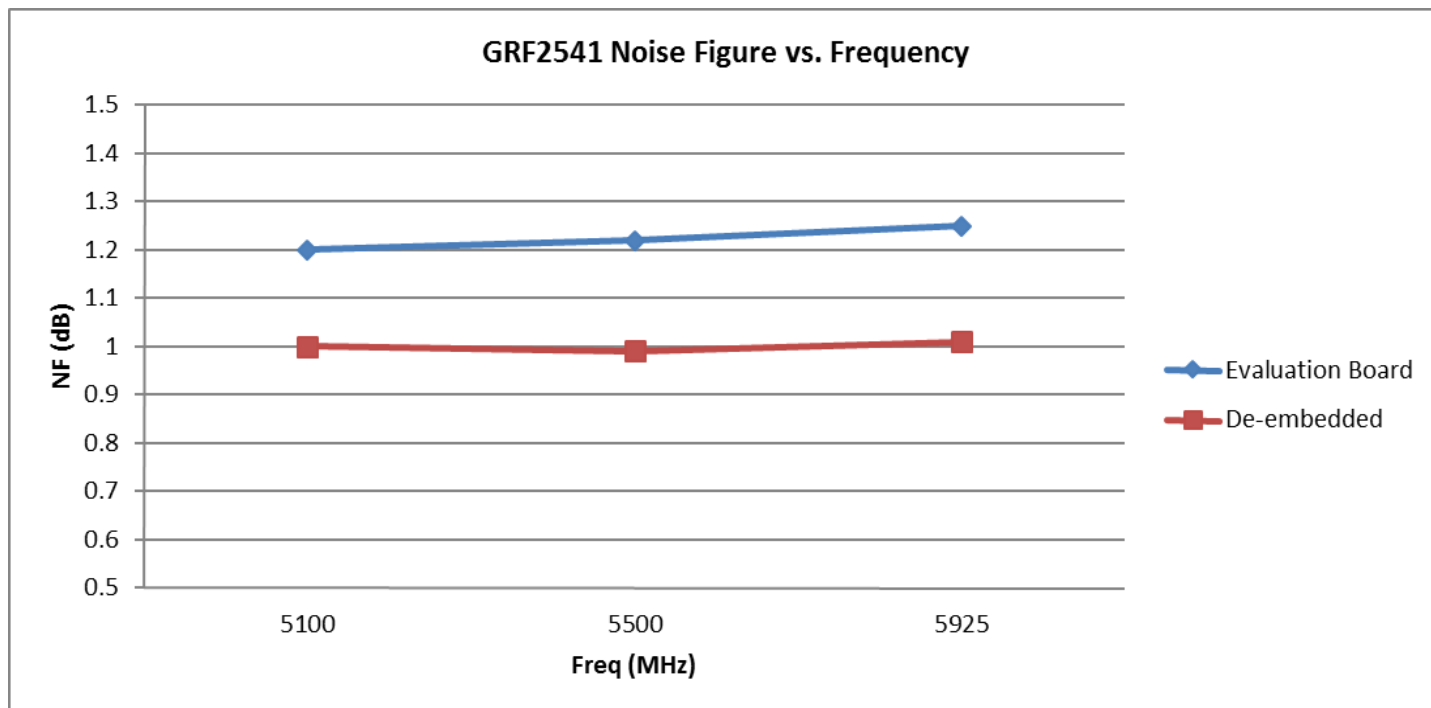


Preliminary

GRF2541

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

GRF2541 Evaluation Board Measured Data:



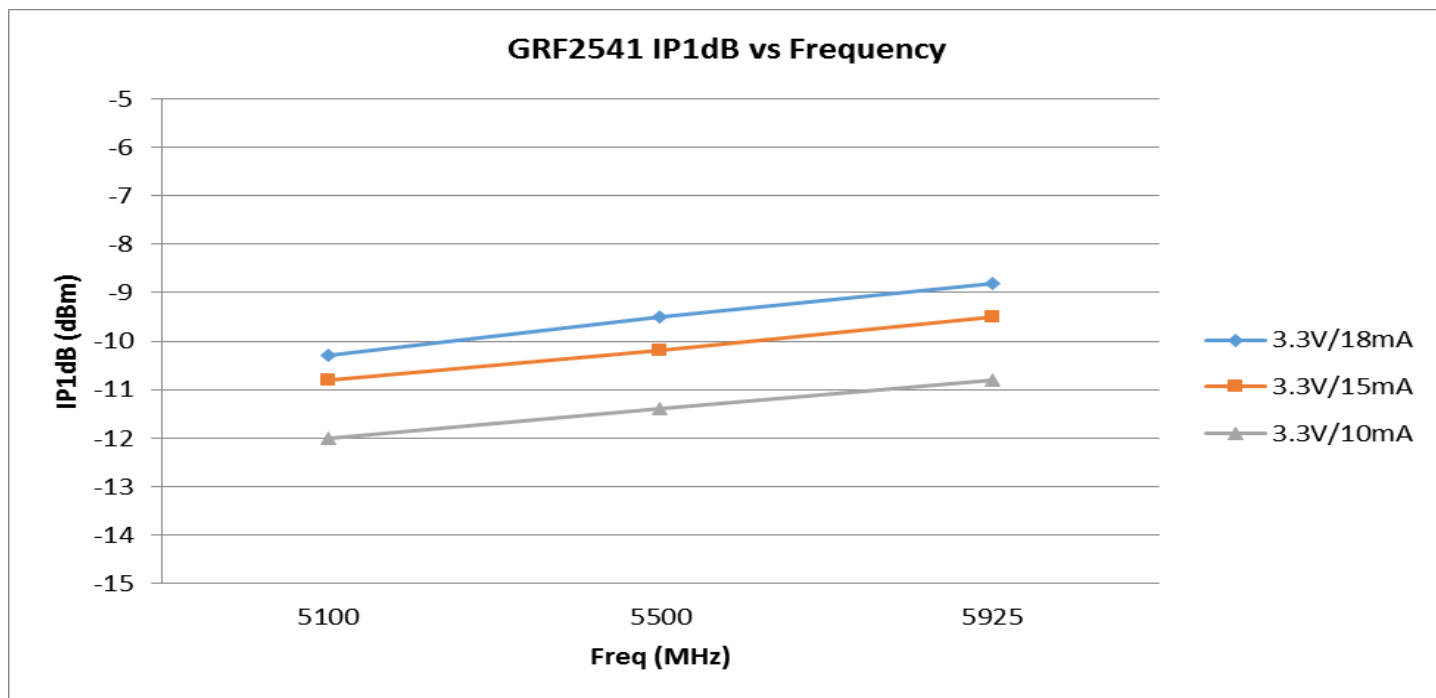


Preliminary

GRF2541

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

GRF2541 Evaluation Board Measured Data:



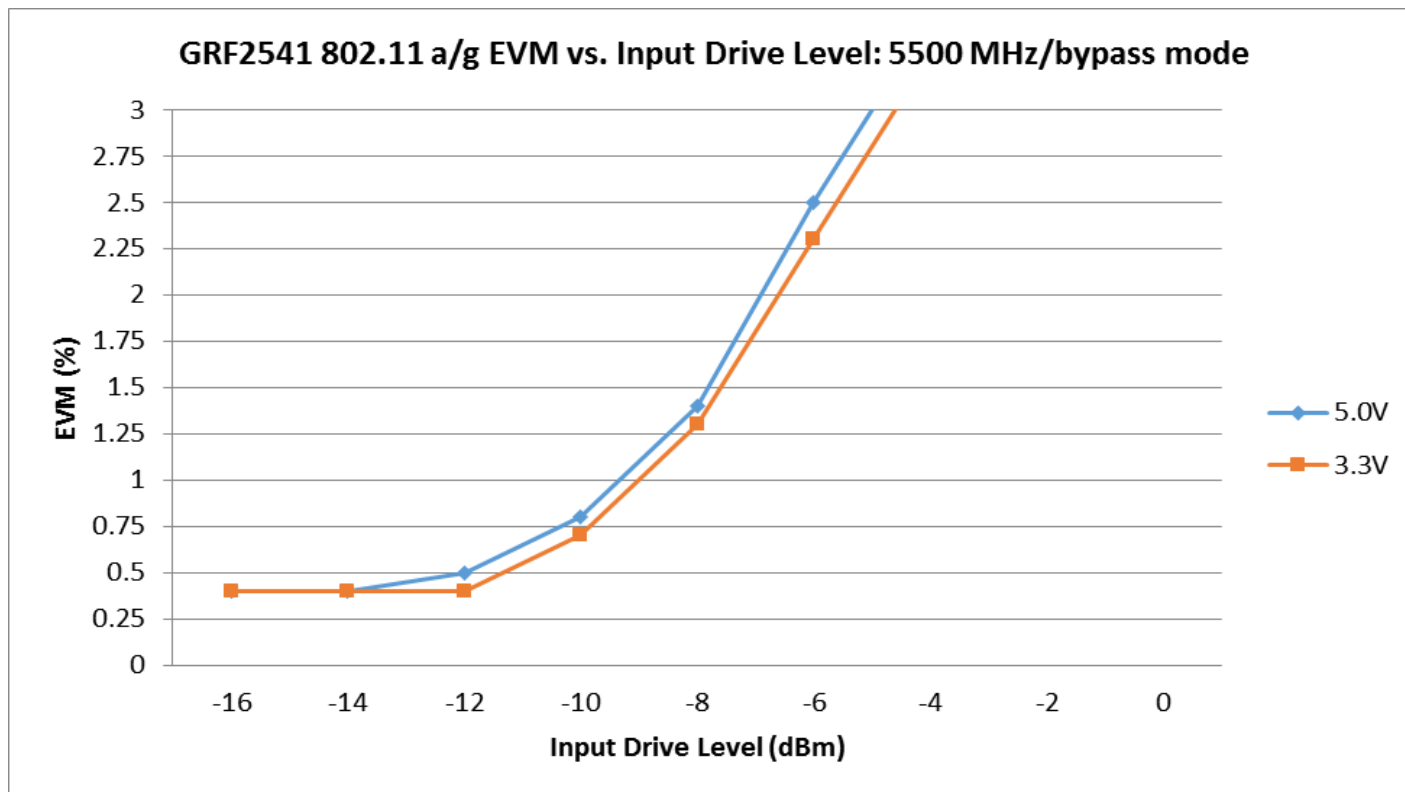
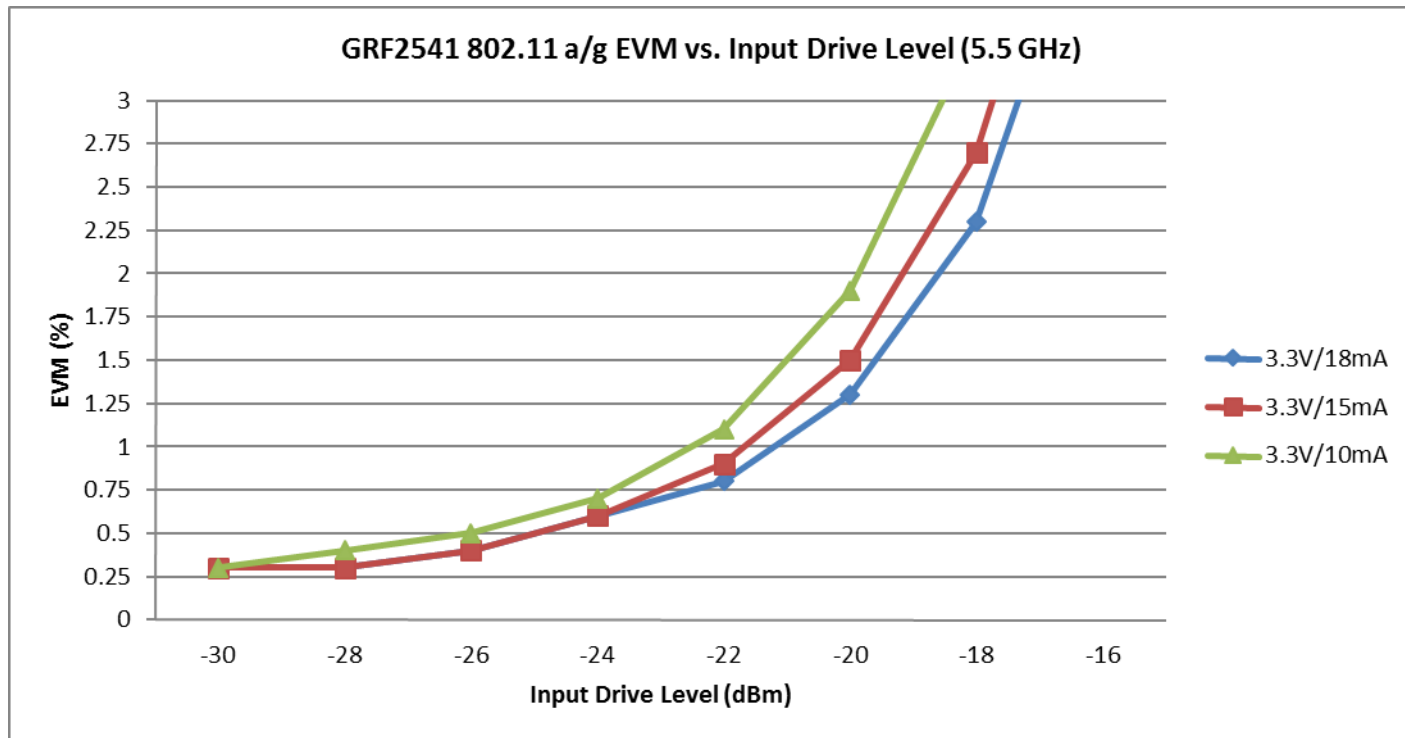


Preliminary

GRF2541

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

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



Guerrilla RF Proprietary Information. Guerrilla RF™ and the composite logo of Guerrilla RF™ are trademarks of Guerrilla RF, Inc. ©2014 Guerrilla RF, Inc. All rights reserved.

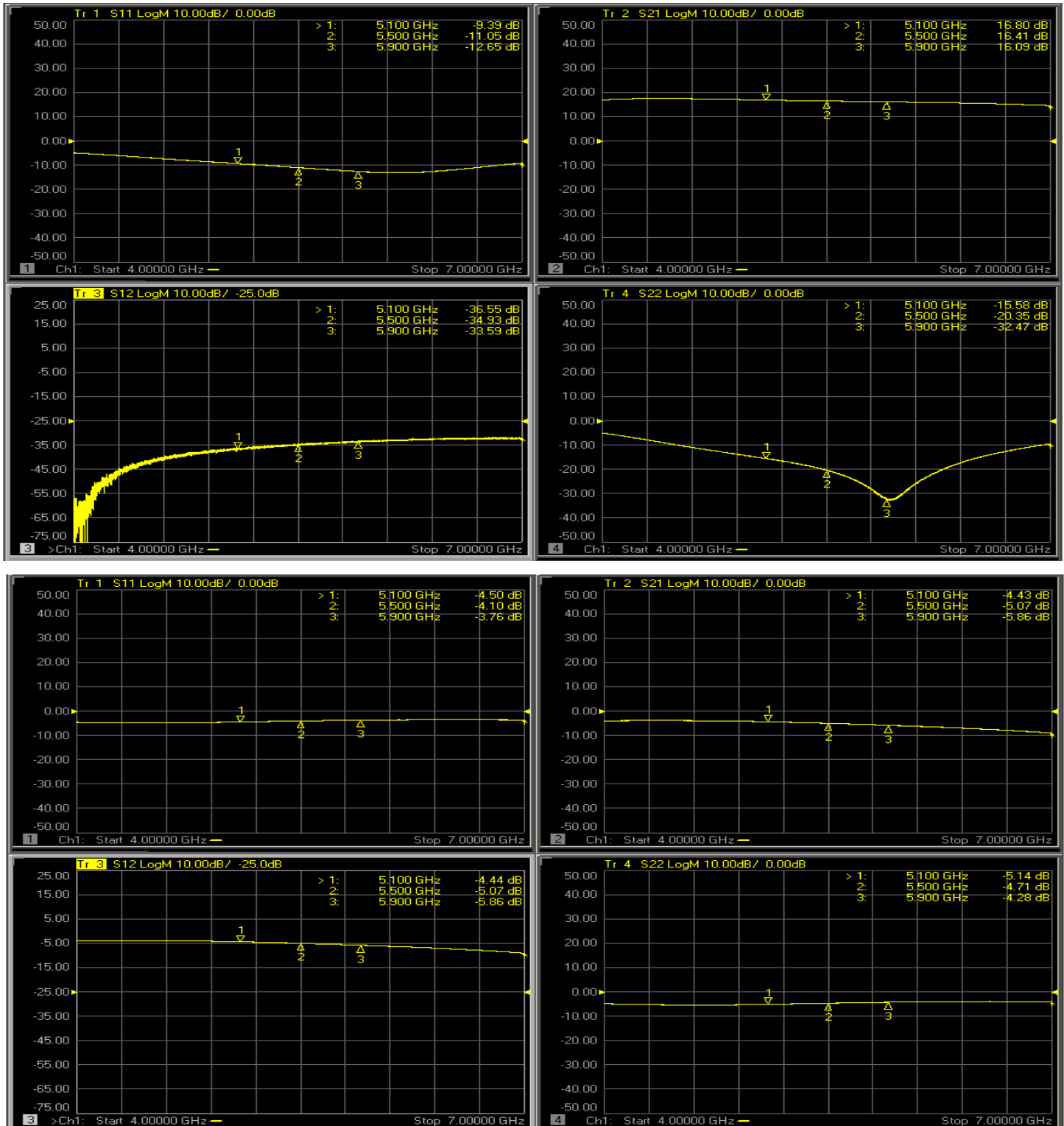


Preliminary

GRF2541

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

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



Guerrilla RF Proprietary Information. Guerrilla RF™ and the composite logo of Guerrilla RF™ are trademarks of Guerrilla RF, Inc. ©2014 Guerrilla RF, Inc. All rights reserved.

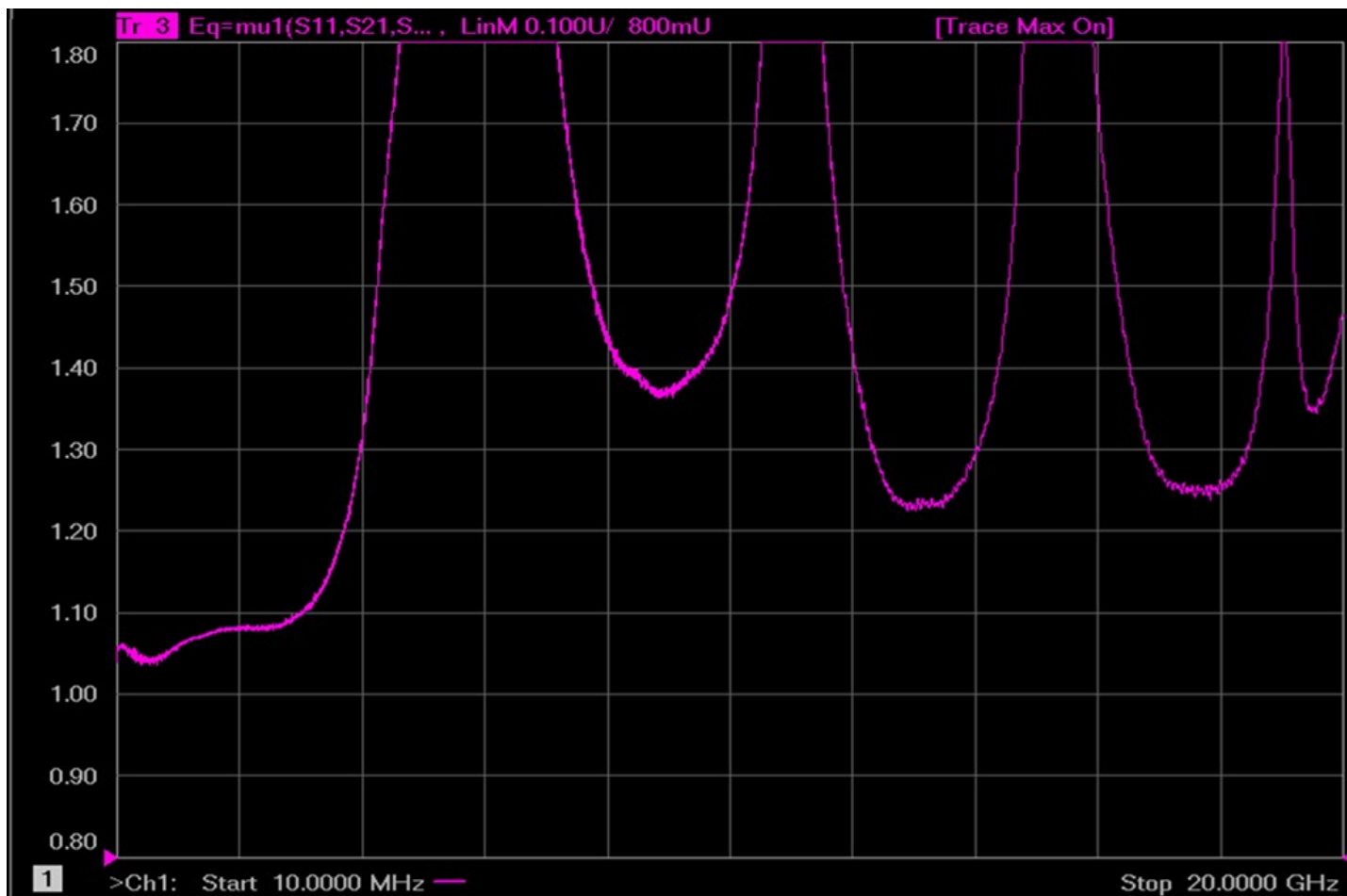


Preliminary

GRF2541

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

GRF2541 Evaluation Board Stability Mu Factor:



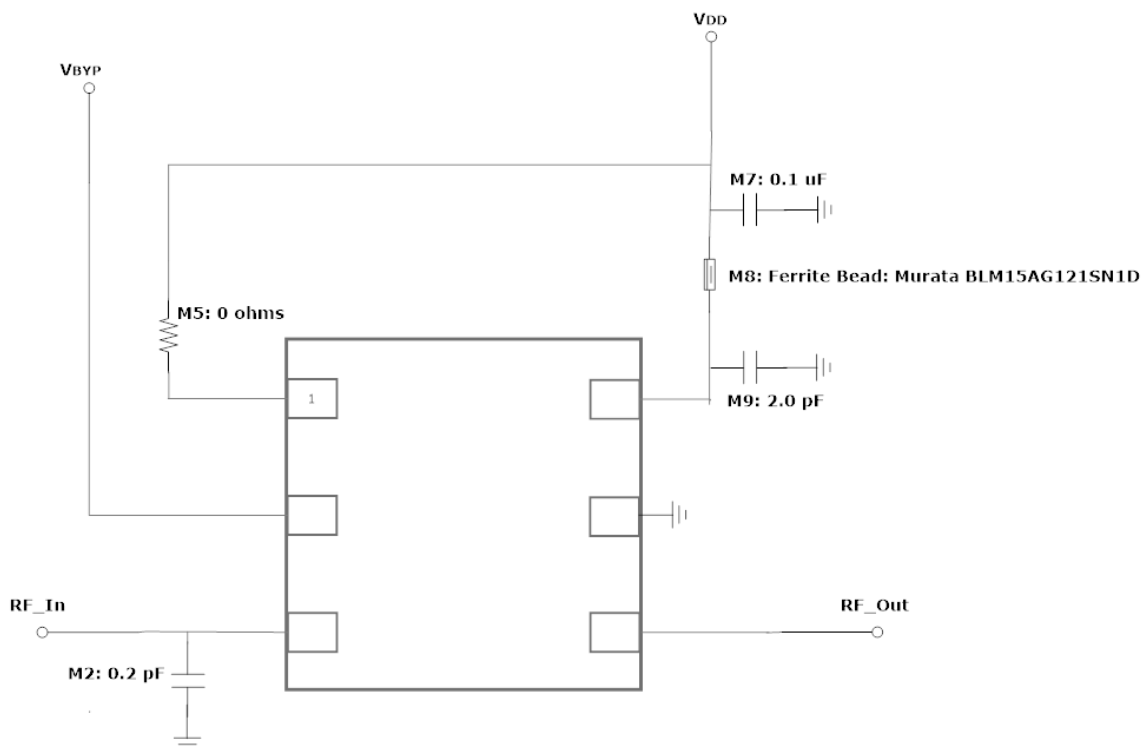
Note: Mu factor ≥ 1.0 implies unconditional stability.



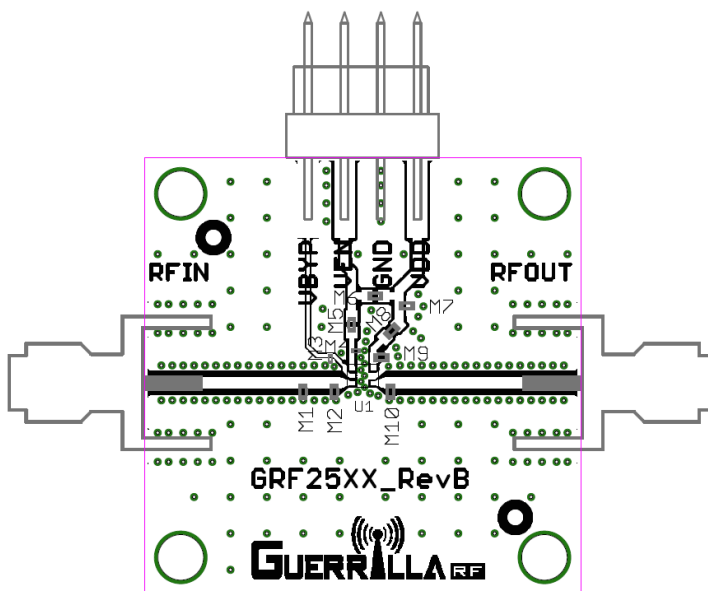
Preliminary

GRF2541

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



GRF2541 Application Schematic



GRF2541 Evaluation Board Assembly Diagram



Preliminary

GRF2541

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

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

Component	Type	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.



GRF2541

Preliminary High Gain, Ultra-LNA w/Bypass
802.11ac: 4.9–6.0 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.

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

This datasheet, including the information contained in it, is provided by Guerrilla RF as a service to its customers and may be used for informational purposes only by the customer. Guerrilla RF assumes no responsibility for errors or omissions on this datasheet or the information contained herein. Information provided is believed to be accurate and reliable, however, no responsibility is assumed by Guerrilla RF for its use, nor for any infringement of patents, or other rights of third parties, resulting from its use. Guerrilla RF assumes no liability for any datasheet, datasheet information, materials, products, product information, or other information provided hereunder, including the sale, distribution, reproduction or use of Guerrilla RF products, information or materials.

No license, whether express, implied, by estoppel, by implication or otherwise is granted by this datasheet for any intellectual property of Guerrilla RF, or any third party, including without limitation, patents, patent rights, copyrights, trademarks and trade secrets. All rights are reserved by Guerrilla RF.

All information herein, products, product information, datasheets, and datasheet information are subject to change and availability without notice. Guerrilla RF reserves the right to change component circuitry, recommended application circuitry and specifications at any time without prior notice. Guerrilla RF may further change its datasheet, product information, documentation, products, services, specifications or product descriptions at any time, without notice. Guerrilla RF makes no commitment to update any materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

GUERRILLA RF INFORMATION, PRODUCTS, PRODUCT INFORMATION, DATASHEETS AND DATASHEET INFORMATION ARE PROVIDED "AS IS" AND WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. GUERRILLA RF DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. GUERRILLA RF SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Customers are solely responsible for their use of Guerrilla RF products in the Customer's products and applications or in ways which deviate from Guerrilla RF's published specifications, either intentionally or as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Guerrilla RF assumes no liability or responsibility for applications assistance, customer product design, or damage to any equipment resulting from the use of Guerrilla RF products outside of stated published specifications or parameters.

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9