

GRF5511

High Frequency Power-LNA

0.4 to 8.0 GHz

RELEASE Ø DATA SHEET

FEATURES

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Reference: 5 V / 130 mA / 2.5 GHz

- Gain: 20.1 dB
- OP1dB: 26 dBm
- OIP3: 39.5 dBm
- Evaluation Board NF: 1.5 dB

Reference: 5 V / 100 mA / 5.5 GHz

- Gain: 15.4 dB
- OP1dB: 25.8 dBm
- OIP3: 44 dBm
- Evaluation Board NF: 1.7 dB

APPLICATIONS

- PA/Driver for 802.11ac
- Linear Driver Amplifier for High PAR Waveforms
- Multi-stage LNA
- Microwave Backhaul

ORDERING INFORMATION

Buy it Now

DESCRIPTION

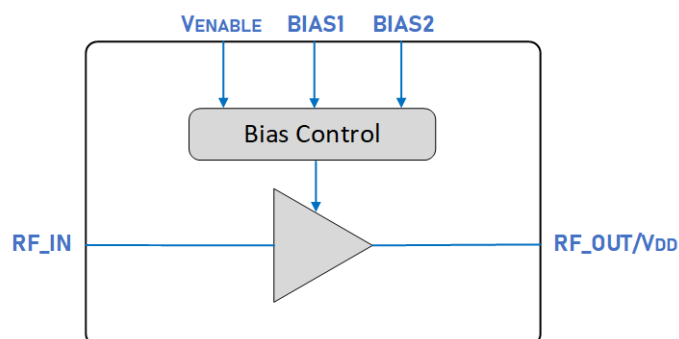
The GRF5511 is a high linearity PA/Linear Driver with low noise figure (NF). It delivers excellent OP1dB, OIP3 and NF over a wide range of frequencies with fractional bandwidths >15% and is well suited to demanding 802.11ac 5 GHz PA/Driver applications.

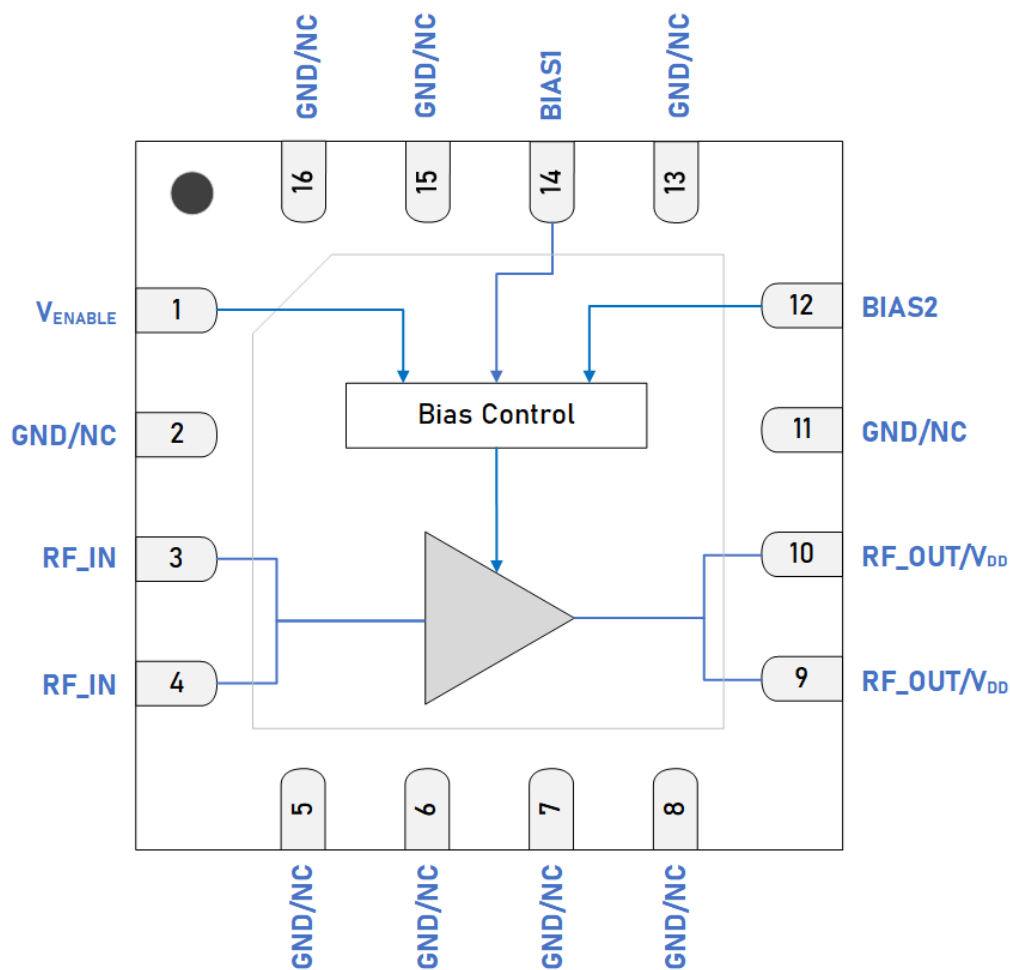
The device offers flexible biasing to achieve optimal linearity and efficiency and it can be tuned over a wide range of frequencies from 400 MHz up to 8 GHz.

Please consult with the GRF applications engineering team for custom tuning/evaluation board data and device S-parameters.

Additional tunes can be found on the GRF5511 "Custom Tunes" product page: [GRF5511 Custom Tunes](#)

BLOCK DIAGRAM





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 the device. On-die pull-down resistor turns the device off if this node is allowed to float.
2, 5, 6, 7, 8, 11, 13, 15, 16	GND/NC	Ground or No Connect	No internal connection to die.
3, 4	RF_IN	RF Input	Pins 3 & 4 tied together on system board.
9, 10	RF_OUT/V _{DD}	RF Output	Pins 9 & 10 tied together on system board.
12	Bias2	Bias Circuit Supply	Connect to V _{DD} through external resistor.
14	Bias1	Bias Circuit Ground	Consult application schematic.
PKG BASE	GND	Ground	Provides DC and RF ground for amplifiers, as well as thermal heat sink. In order to match the device's rated performance, it is strongly recommended to use multiple 8mil vias beneath the package for optimal RF and thermal performance. Refer to evaluation board top layer graphic on schematic page.

Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Drain Voltage	V_{DD}		9	V
RF Input Power	$P_{IN\ MAX}$		22	dBm
Operating Temperature	T_{AMB}	-40	105	°C
Maximum Junction Temperature	T_{MAX}		170	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		1.8	W

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.

Note: For additional information, please refer to [Manufacturing Note MN-001 - Packaging and Manufacturing Information](#).



All Guerrilla RF products are provided in RoHS compliant lead (Pb)-free packaging. For additional information, please refer to the [Certificate of RoHS Compliance](#).

Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	3.3	5	9	V	
Operating Temperature	$T_{PKG\ BASE}$	-40	25	105	°C	
RF Frequency Range	F_{RF}	0.4		8.0	GHz	Note 1 & 2.
RF_IN Port Impedance	Z_{RF_IN}		50		Ω	Single-ended. 4 element match.
RF_OUT Port Impedance	Z_{RF_OUT}		50		Ω	Single-ended. 2 element match.

Note 1: Operation outside of this range is supported by using different custom tunes. Examples of other optimized tunes can be found here: [GRF5511 Custom Tunes](#)

Note 2: Contact the Guerrilla RF Applications team for guidance on optimizing the tuning of the device for alternative bands.

Nominal Operating Parameters - General

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Tune: 2.3 to 2.7 GHz						Bias: 5 V, 130 mA unless otherwise noted (+25°C).
Test Frequency	F_{TEST}		2.5		GHz	
Switching Rise Time	T_{RISE}		200		ns	Disabled mode to Gain mode (note 3) .
Switching Fall Time	T_{FALL}		200		ns	Gain mode to Disabled mode (note 4) .
Quiescent Supply Current	I_{DDQ}	105	130	165	mA	$V_{ENABLE} = 5\text{ V}$, $R_{BIAS} = 715\ \Omega$.
Enable Current	I_{ENABLE}		4		mA	

Tune: 5.1 to 5.9 GHz						Bias: 5 V, 100 mA unless otherwise noted (+25°C).
Test Frequency	F_{TEST}		5.5		GHz	
Switching Rise Time	T_{RISE}		200		ns	
Switching Fall Time	T_{FALL}		200		ns	
Quiescent Supply Current	I_{DDQ}		100		mA	
Enable Current	I_{ENABLE}		3		mA	

Disabled Mode

Supply Current (Leakage)	I_{DDQ}		600	1000	μA	$V_{DD} = 5\text{ V}$, $V_{ENABLE} = 0\text{ V}$.
--------------------------	-----------	--	-----	------	---------------	---

Thermal Data

Thermal Resistance (Infrared Scan)	Θ_{JC}		44		$^{\circ}\text{C/W}$	On standard evaluation board (note 5) .
------------------------------------	---------------	--	----	--	----------------------	--

Note 3: Switching Time: 50% of V_{ENABLE} to 90% of P_{OUT} .

Note 4: Switching Time: 50% of V_{ENABLE} to 10% of P_{OUT} .

Note 5: MTTF > 10^6 hours for $T_j \leq 170\ ^{\circ}\text{C}$

Nominal Operating Parameters - RF

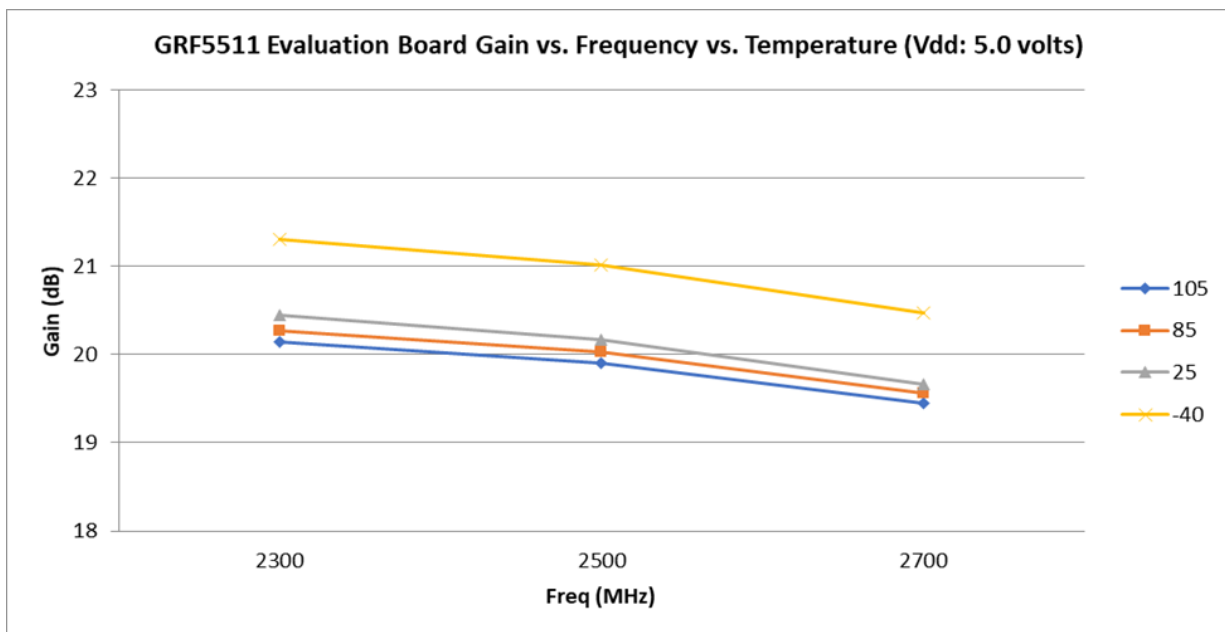
The following conditions apply unless noted otherwise; Typical Application Schematic, $V_{DD} = 5\text{ V}$, $I_{DD} = 130\text{ mA}$, $F_{TEST} = 2.5\text{ GHz}$, $50\ \Omega$ system impedance, $T_{PKG\ BASE} = 25\text{ }^{\circ}\text{C}$. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Small Signal Gain	S21	19	20.1		dB	$V_{DD} = 5\text{ V}$, $I_{DD} = 130\text{ mA}$.
Output 1 dB Compression Power	OP1dB	24.5	26		dBm	
Output 3rd Order Intercept Point	OIP3		39.5		dBm	8 dBm Pout per tone. 2 MHz spacing (2499 and 2501 MHz).
Noise Figure	NF		1.5		dB	On standard evaluation board.

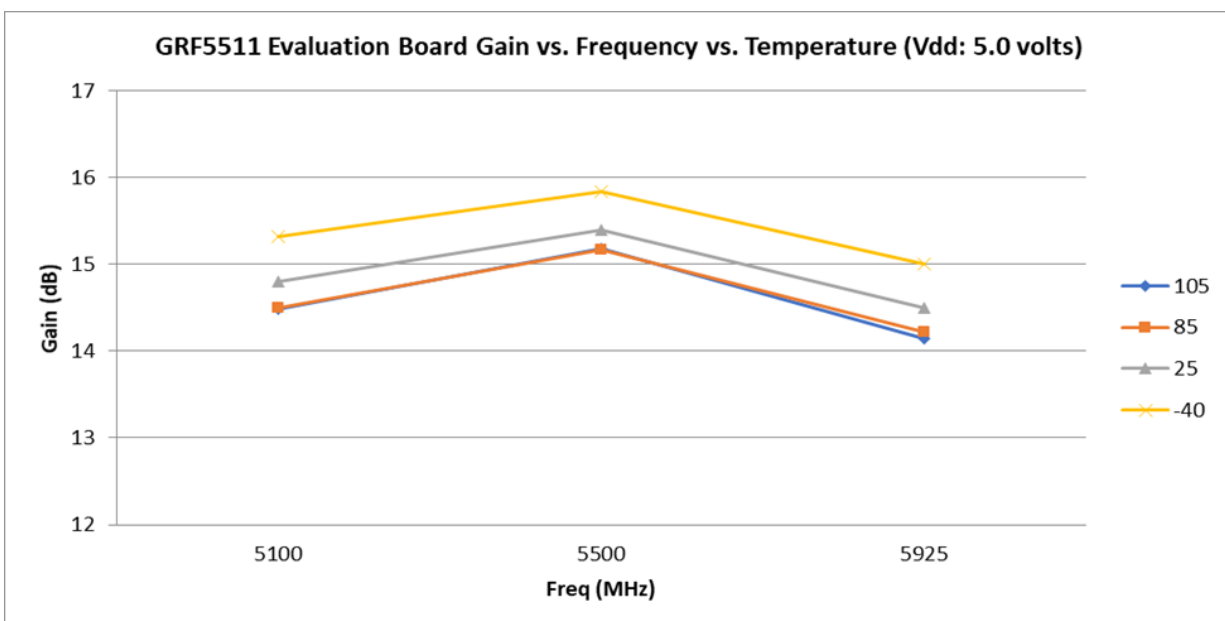
The following conditions apply unless noted otherwise; Typical Application Schematic, $V_{DD} = 5\text{ V}$, $I_{DD} = 100\text{ mA}$, $F_{TEST} = 5.5\text{ GHz}$, $50\ \Omega$ system impedance, $T_{PKG\ BASE} = 25\text{ }^{\circ}\text{C}$. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Small Signal Gain	S21		15.4		dB	$V_{DD} = 5\text{ V}$, $I_{DD} = 100\text{ mA}$.
Output 1 dB Compression Power	OP1dB		25.8		dBm	
Output 3rd Order Intercept Point	OIP3		44		dBm	8 dBm Pout per tone. 2 MHz spacing (2499 and 2501 MHz).
Noise Figure	NF		1.7		dB	On standard evaluation board.

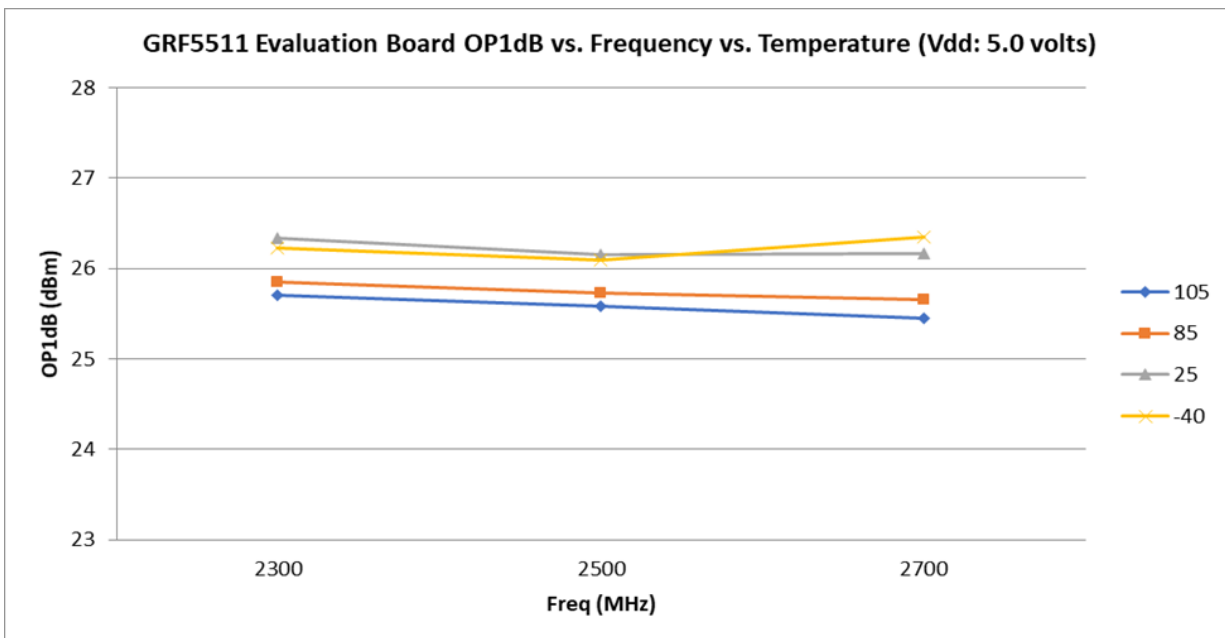
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune).



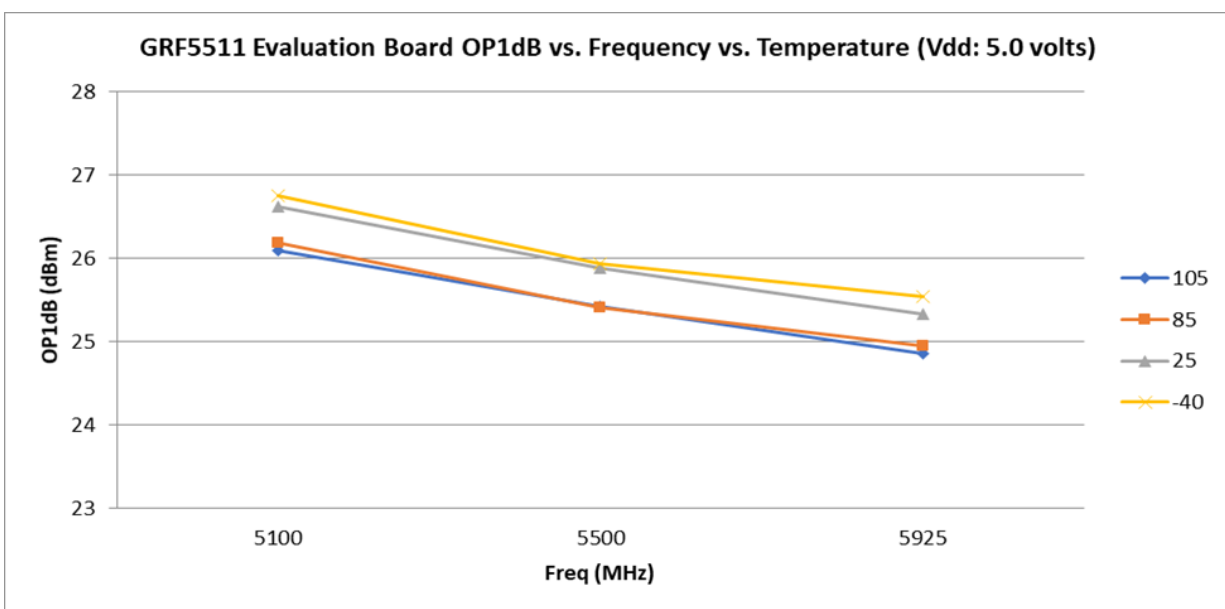
GRF5511 Typical Operating Curves: 5 V, 100 mA (5.1 to 5.9 GHz Tune).



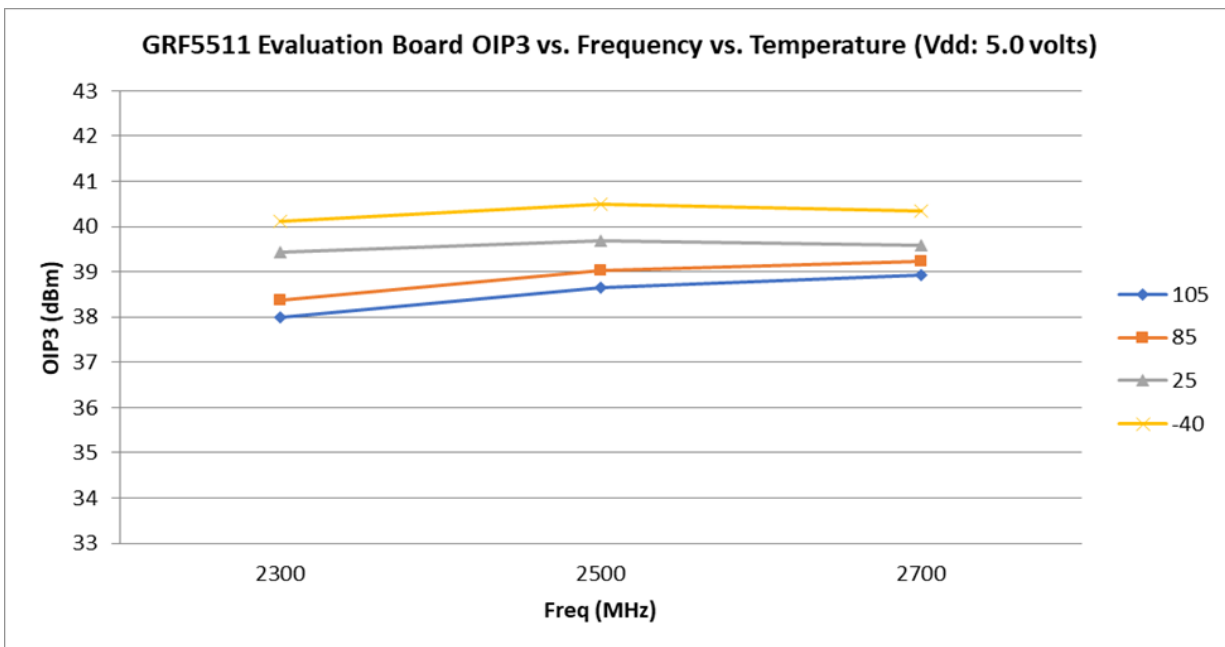
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune).



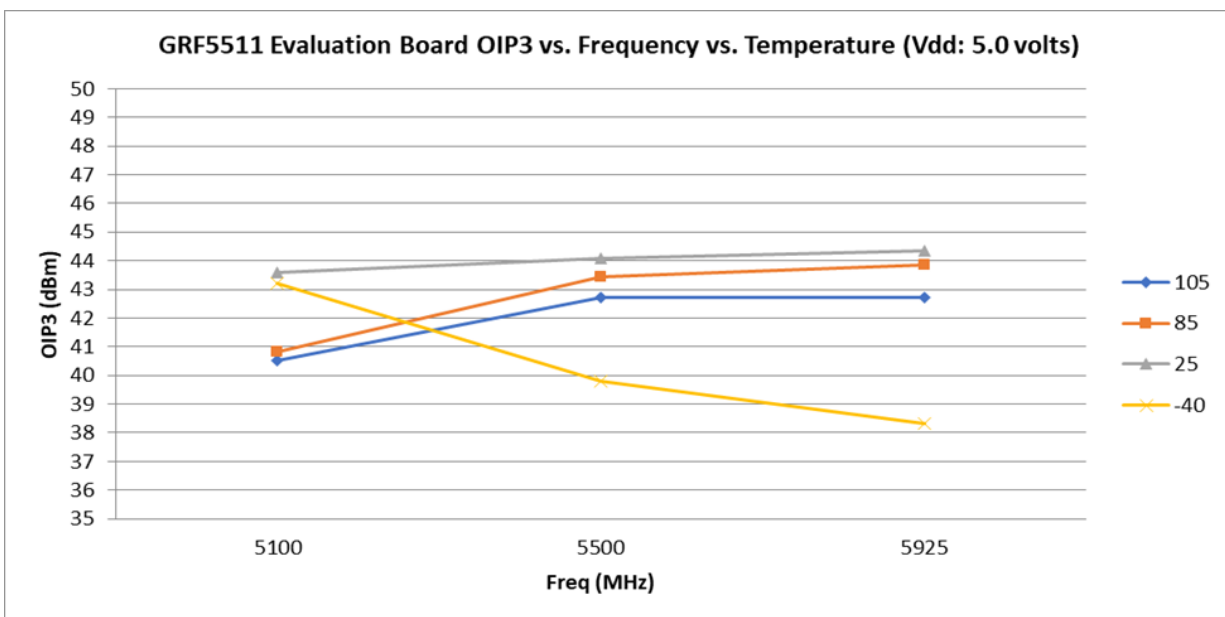
GRF5511 Typical Operating Curves: 5 V, 100 mA (5.1 to 5.9 GHz Tune).



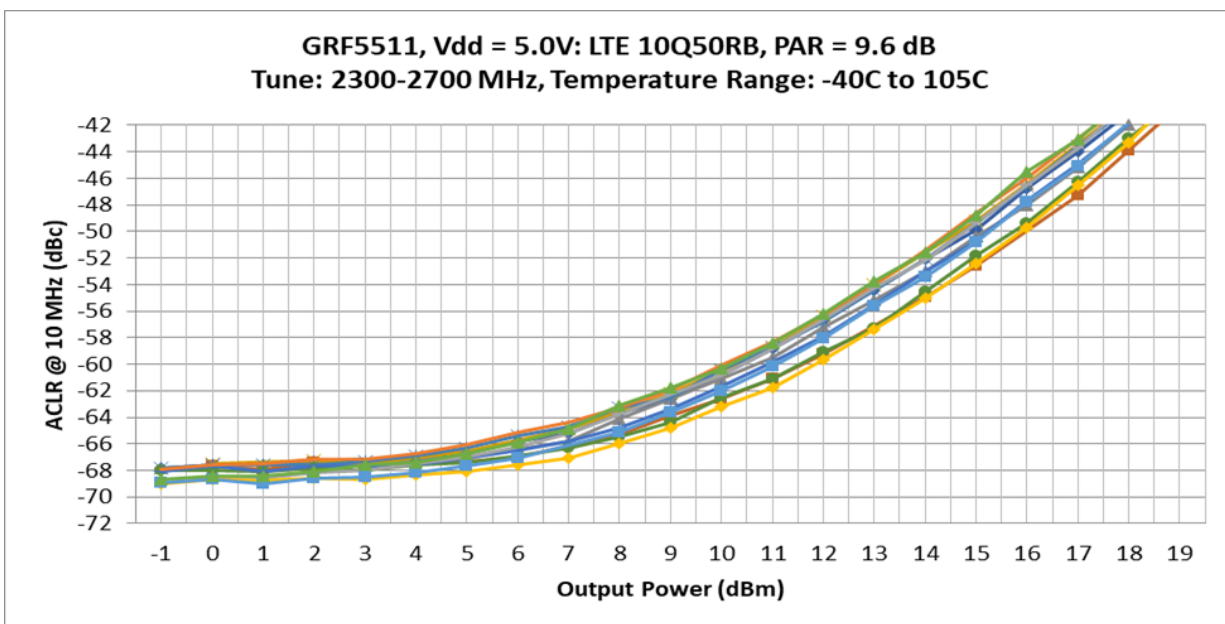
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune).



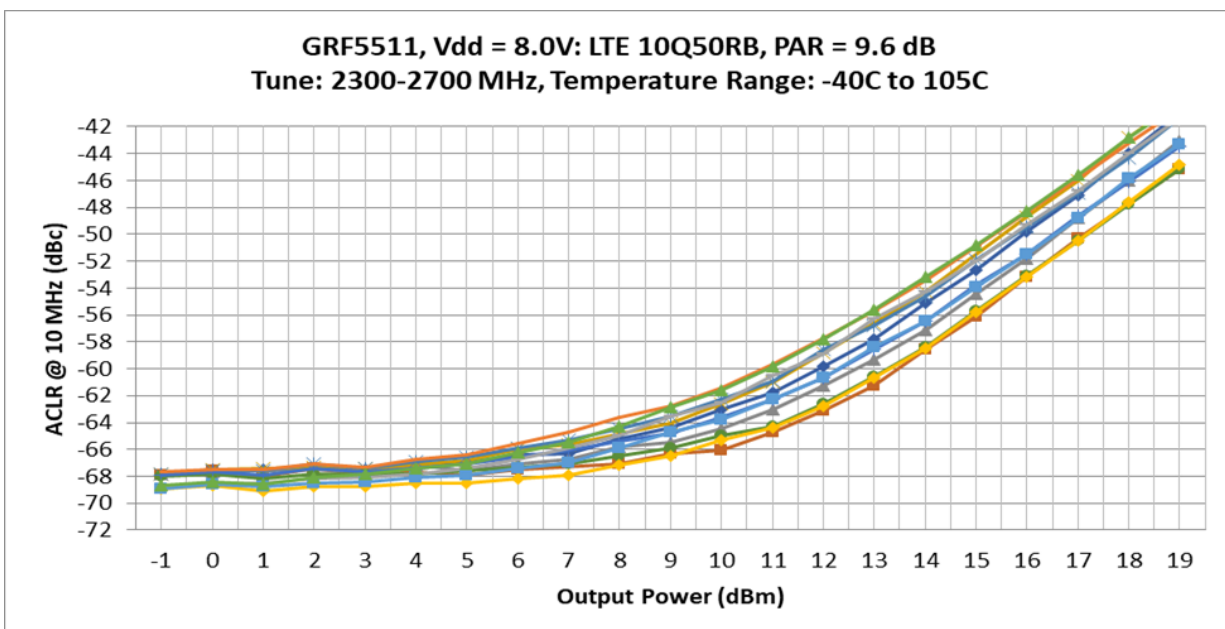
GRF5511 Typical Operating Curves: 5 V, 100 mA (5.1 to 5.9 GHz Tune).



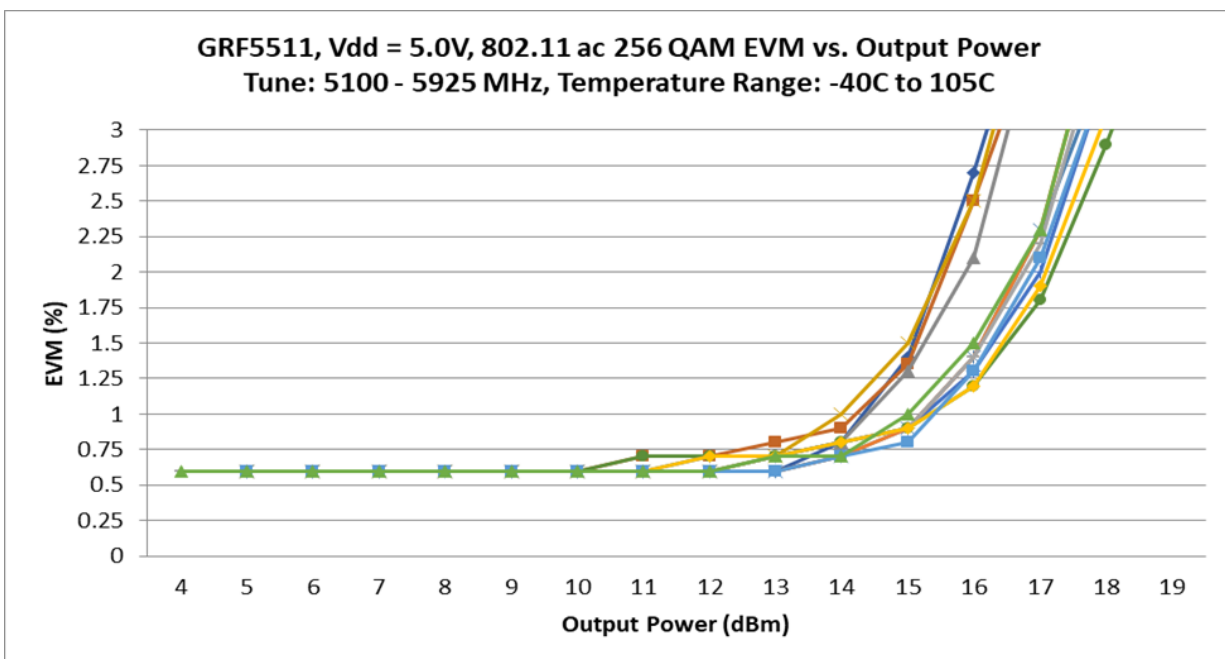
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune).



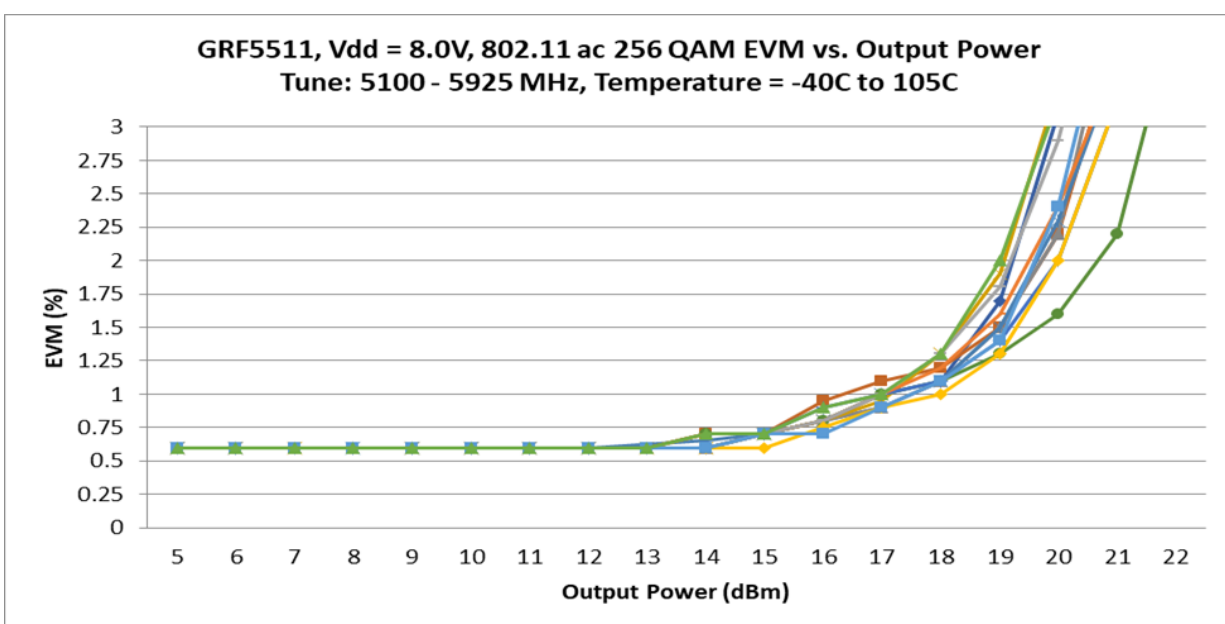
GRF5511 Typical Operating Curves: 8 V, 160 mA (2.3 to 2.7 GHz Tune).



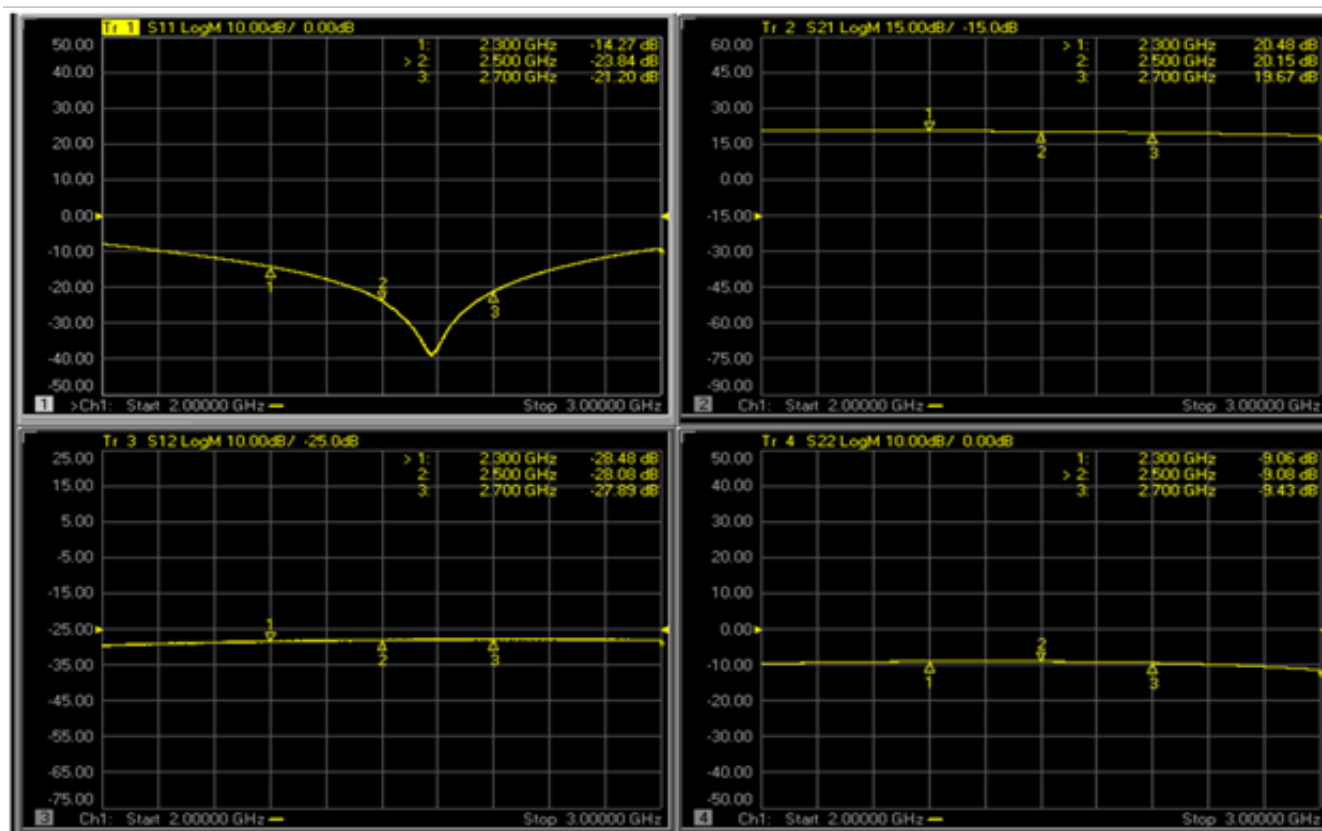
GRF5511 Typical Operating Curves: 5 V, 100 mA (5.1 to 5.9 GHz Tune).



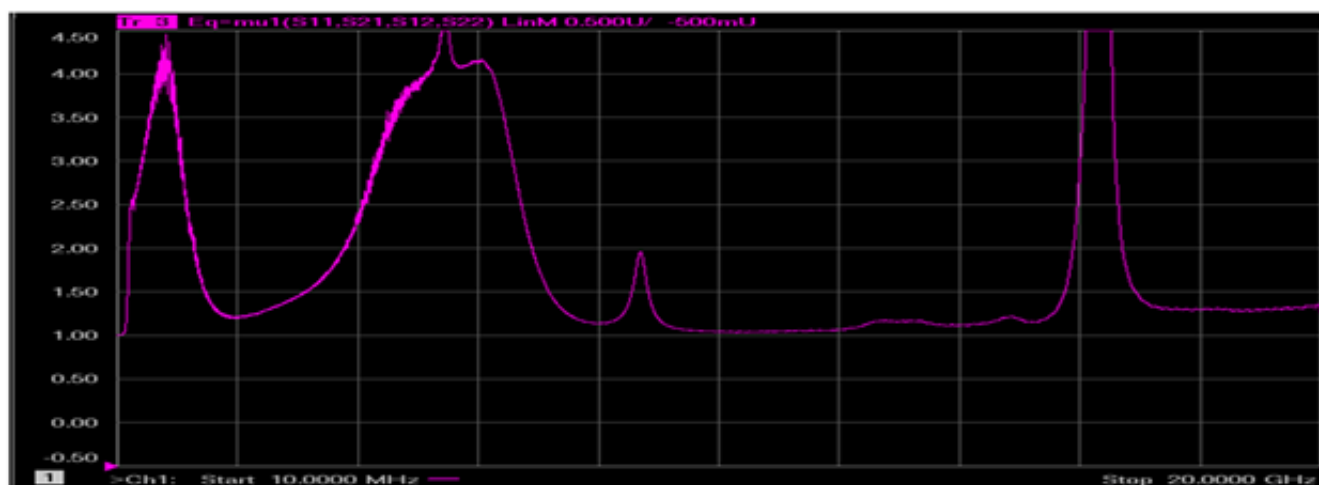
GRF5511 Typical Operating Curves: 8 V, 150 mA (5.1 to 5.9 GHz Tune).



GRF5511 Typical Operating Curves: S-Parameters (5 V, 130 mA, 2.3 to 2.7 GHz Tune).

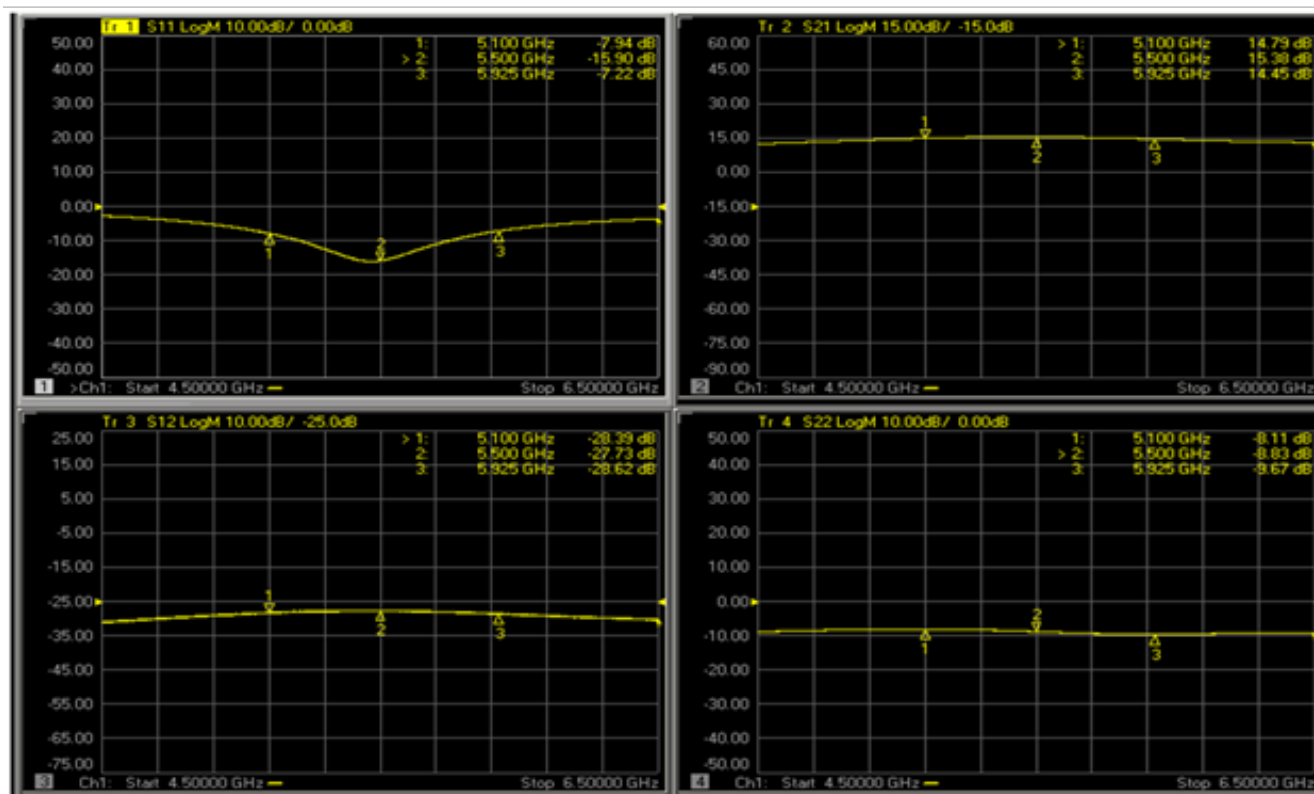


GRF5511: Mu Factor (5 V, 130 mA, 2.3 to 2.7 GHz Tune).

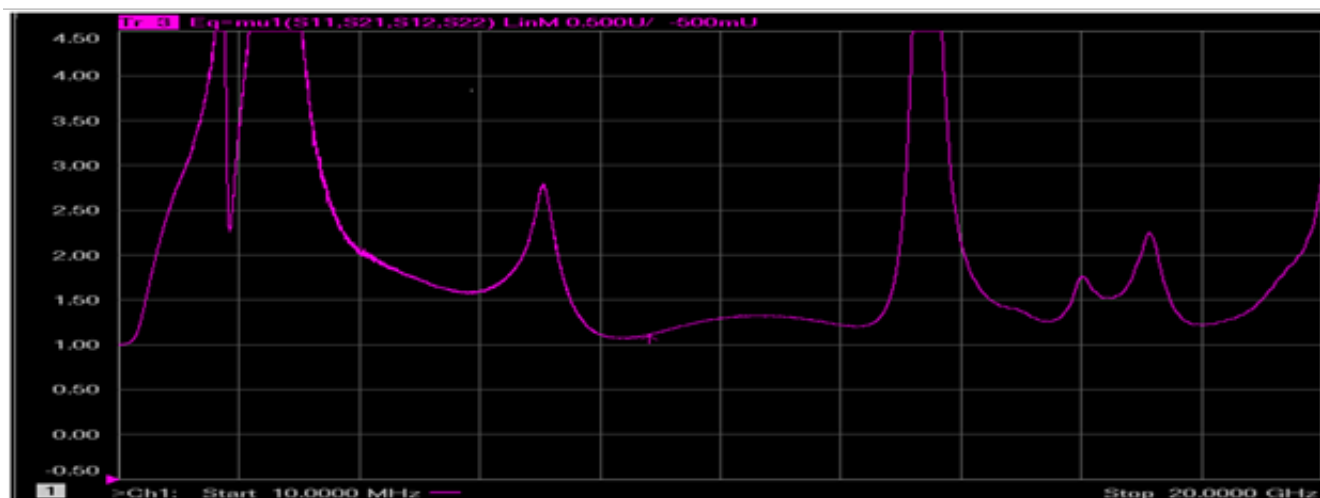


Note: Mu Factor ≥ 1.0 implies unconditional stability.

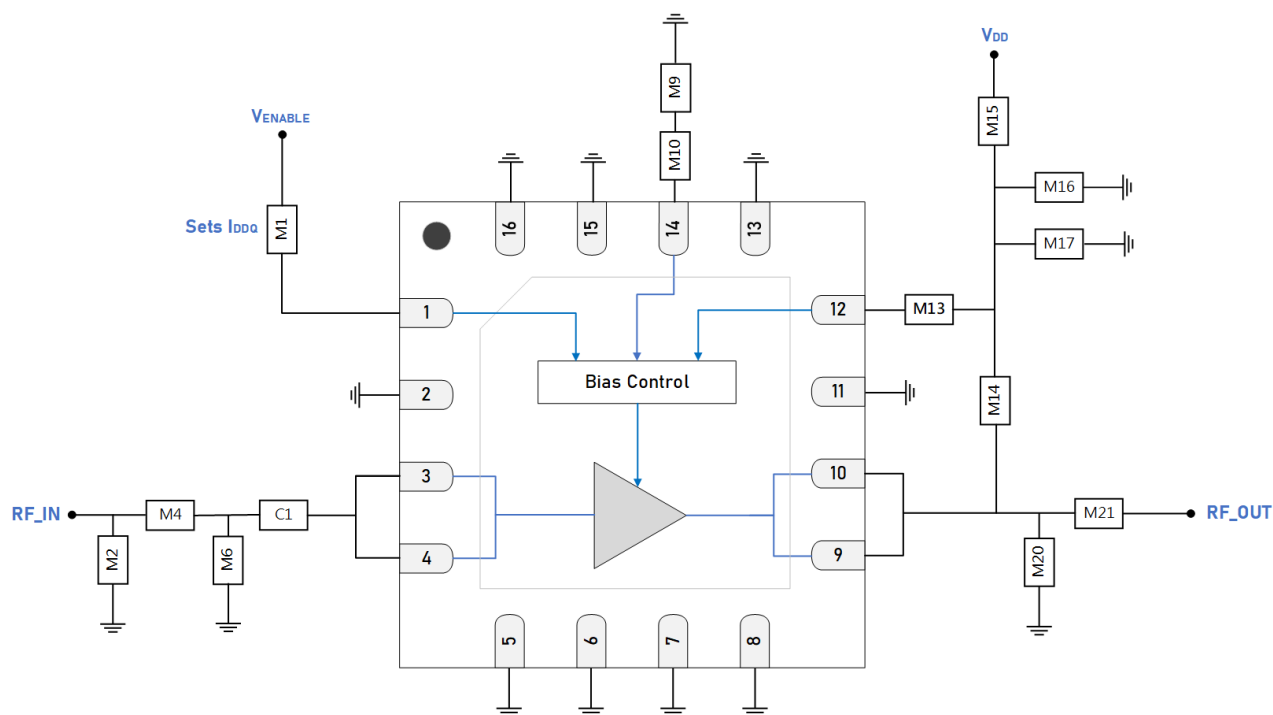
GRF5511 Typical Operating Curves: S-Parameters (5 V, 100 mA, 5.1 to 5.9 GHz Tune).



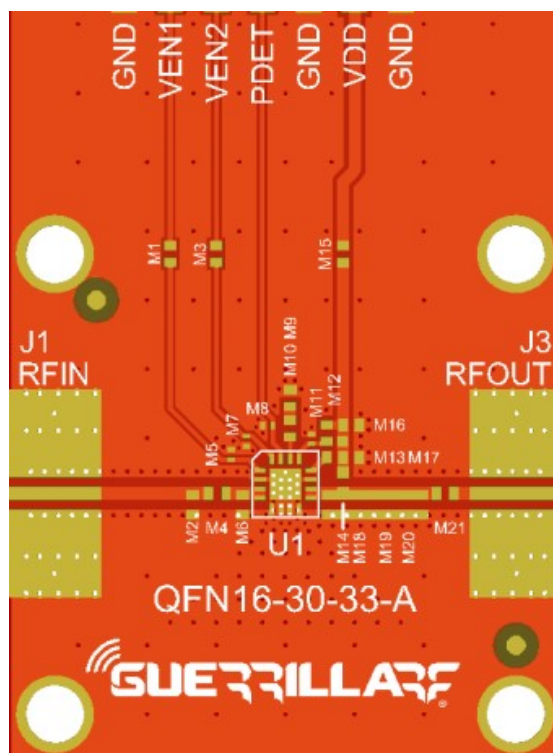
GRF5511: Mu Factor (5 V, 100 mA, 5.1 to 5.9 GHz Tune).



Note: Mu Factor ≥ 1.0 implies unconditional stability.



GRF5511 Standard Evaluation Board Schematic



GRF5511 Evaluation Board Assembly Drawing

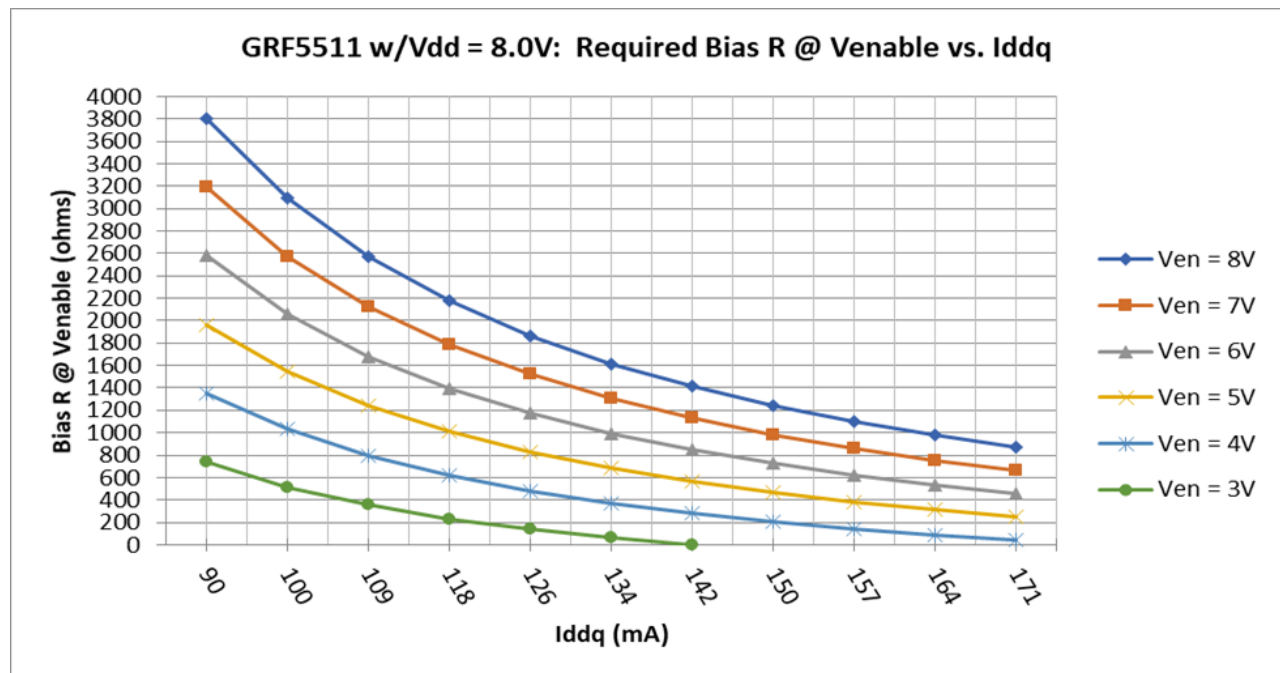
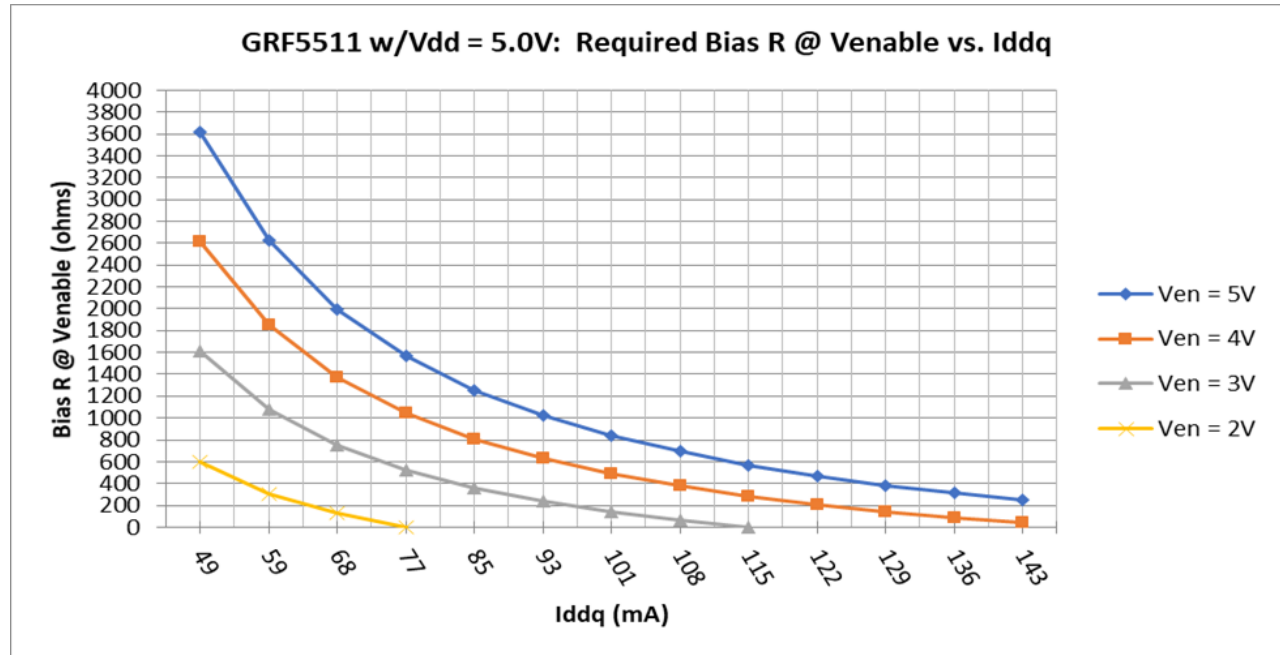
GRF5511 Evaluation Board Assembly Diagram Reference: 2.3 to 2.7 GHz Tune

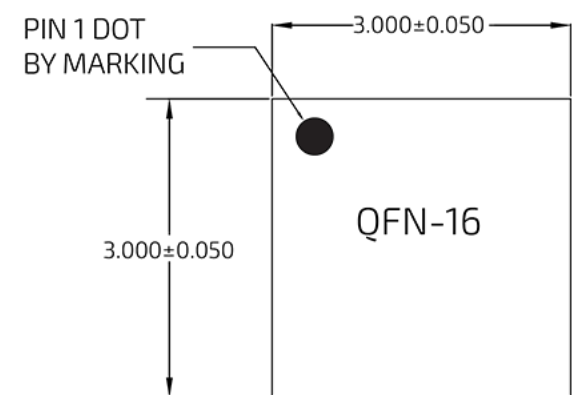
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (see curves)	Resistor	Various	5%	Sets I _{DDQ}	0402	ok
M2	Inductor	Murata	LQP	4.3 nH	0402	ok
M4	Capacitor	Murata	GJM	1.2 pF	0402	ok
M6	Capacitor	Murata	GJM	1.8 pF	0402	ok
M9	Resistor	Various	5%	50 Ω	0402	ok
M10	Resistor	Various	--	0 Ω	0402	ok
M13	Resistor	Various	5%	500 Ω	0402	ok
M14	Inductor	Coilcraft	HP	15 nH	0402	ok
M15	Resistor (jumper)	Various	5%	0 Ω	0402	ok
M16	Capacitor	Murata	GRM	0.1 μF	0402	ok
M17	Capacitor	Murata	GJM	15 pF	0402	ok
M20	Capacitor	Murata	GJM	0.5 pF	0402	ok
M21	Capacitor	Murata	GJM	15 pF	0402	ok
Evaluation Board	QFN16-30-33-A					

GRF5511 Evaluation Board Assembly Diagram Reference: 5.1 to 5.9 GHz Tune

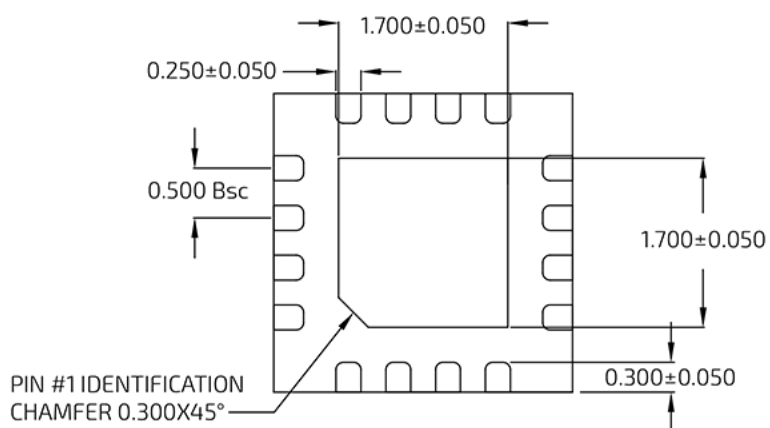
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (see curves)	Resistor	Various	5%	Sets I _{DDQ}	0402	ok
M4	Capacitor	Murata	GJM	2.0 pF	0402	ok
M6	Inductor	Murata	LQP	2.0 nH	0402	ok
C1 (spliced into EVB)	Capacitor	Murata	GJM	0.3 pF	0402	ok
M9	Inductor	Murata	LQP	1.5 nH	0402	ok
M10	Resistor	Various	--	0 Ω	0402	ok
M13	Resistor	Various	5%	500 Ω	0402	ok
M14	Inductor	Coilcraft	HP	4.7 nH	0402	ok
M15	Resistor (jumper)	Various	5%	0 Ω	0402	ok
M16	Capacitor	Murata	GRM	0.1 μF	0402	ok
M17	Capacitor	Murata	GJM	8.2 pF	0402	ok
M19	Capacitor	Murata	GJM	0.6 pF	0402	ok
M21	Capacitor	Murata	GJM	6.8 pF	0402	ok
Evaluation Board	QFN16-30-33-A					

GRF5511 Bias Resistor Selection Curves:

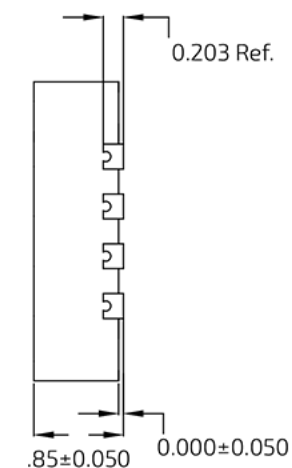




TOP VIEW

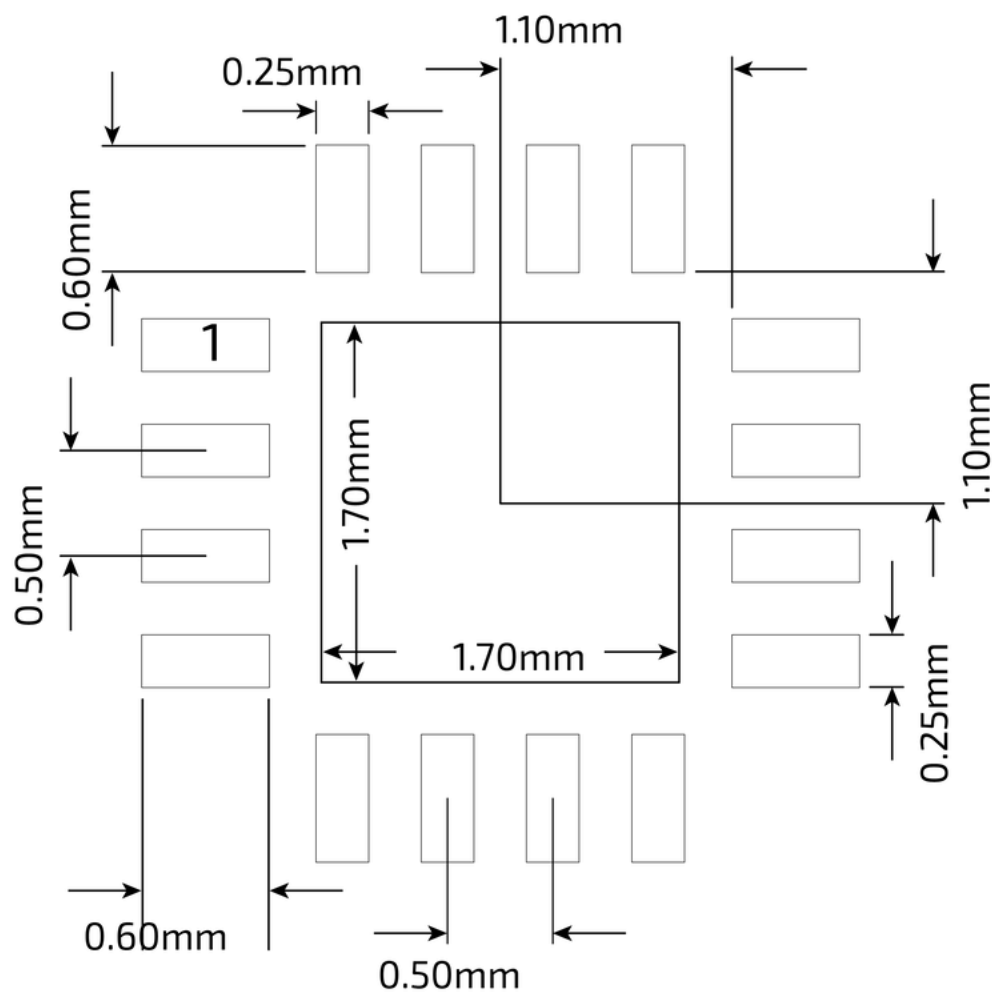


BOTTOM VIEW



SIDE VIEW

QFN 16 3x3mm Package Dimensions



QFN 16 3x3mm Suggested PCB Footprint (Top View)

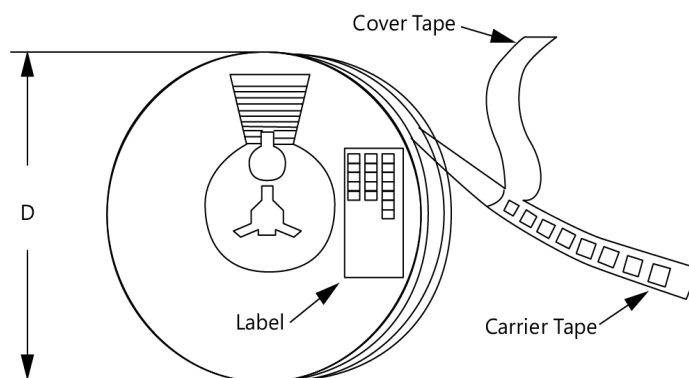
Package Marking Diagram



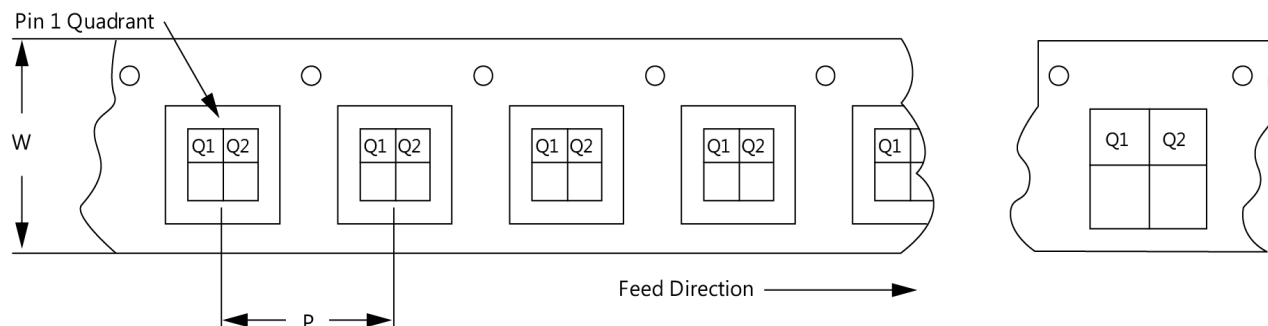
Line 1: "YY" = Year. "WW" = WORK WEEK the Device was assembled.
 Line 2: "GRF" = Guerrilla RF
 Line 3: "XXXX" = Device Part Number.

Tape and Reel Information

Guerrilla RF's tape and reel specification complies with Electronics Industries Association (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). Devices are loaded with pins down into the carrier pocket with protective cover tape and reeled onto a plastic reel. Each reel is packaged in a cardboard box. There are product labels on the reel, the protective ESD bag, and the outside surface of the box. For the latest reel specifications and package information (including units/reel), please visit [Package Manufacturing Information](#) | [Guerrilla RF](#) (guerrilla-rf.com).



Tape and Reel Packaging with Reel Diameter Noted (D)



Carrier Tape Width (W), Pitch (P), Feed Direction and Pin 1 Quadrant Information



Revision History

Revision Date	Description of Change
March 29, 2018	Release Ø Data Sheet.
March 25, 2023	Upgraded Data Sheet to new format only.
May 15, 2025	Extended lower frequency range from 700 MHz to 400 MHz.



Data Sheet Classifications

Data Sheet 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 taken within the Guerrilla RF Applications Lab. Any MIN/MAX limits represented within the data sheet are based solely on <i>estimated</i> part-to-part variations and process spreads. All parametric values are subject to change pending the collection of additional data.
Release Ø	All data based on measurements taken with <i>production-released</i> material. TYP values are based on a combination of ATE and bench-level measurements, with MIN/MAX limits defined using <i>modelled estimates</i> that account for part-to-part variations and expected process spreads. Although unlikely, future refinements to the TYP/MIN/MAX values may be in order as multiple lots are processed through the factory.
Release A-Z	All data based on measurements taken with production-released material <i>derived from multiple lots which have been fabricated over an extended period of time</i> . MIN/MAX limits may be refined over previous releases as more statistically significant data is collected to account for process spreads.

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

This data sheet, 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 data sheet 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 data sheet, data sheet 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 granted by this data sheet 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, data sheets, and data sheet 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 data sheet, 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, DATA SHEETS AND DATA SHEET 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.