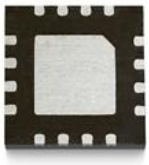
DATA SHEET

RELEASE Ø DATA SHEET





GRF5511

High Frequency Power-LNA 0.4 to 8 GHz

FEATURES

- Flexible Bias Voltage and Current
- 5 V Supply Voltage
- Compact 3 x 3 mm QFN-16 Package
- Process: GaAs pHEMT

Reference: 5 V / 130 mA / 2.5 GHz

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

Reference: 5 V / 100 mA / 5.5 GHz

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

APPLICATIONS

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

DESCRIPTION

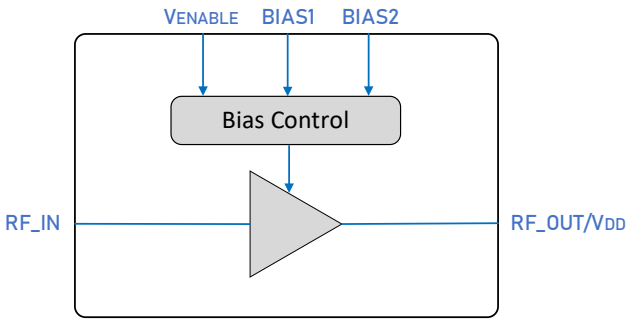
The GRF5511 is a high linearity PA-Linear Driver with low noise figure (NF). It delivers excellent OP1dB, OIP3 and NF over a wide range of frequencies with fractional bandwidths > 15% and is well suited to demanding 802.11ac 5 GHz PA/Driver applications.

The device offers flexible biasing to achieve optimal linearity and efficiency and 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



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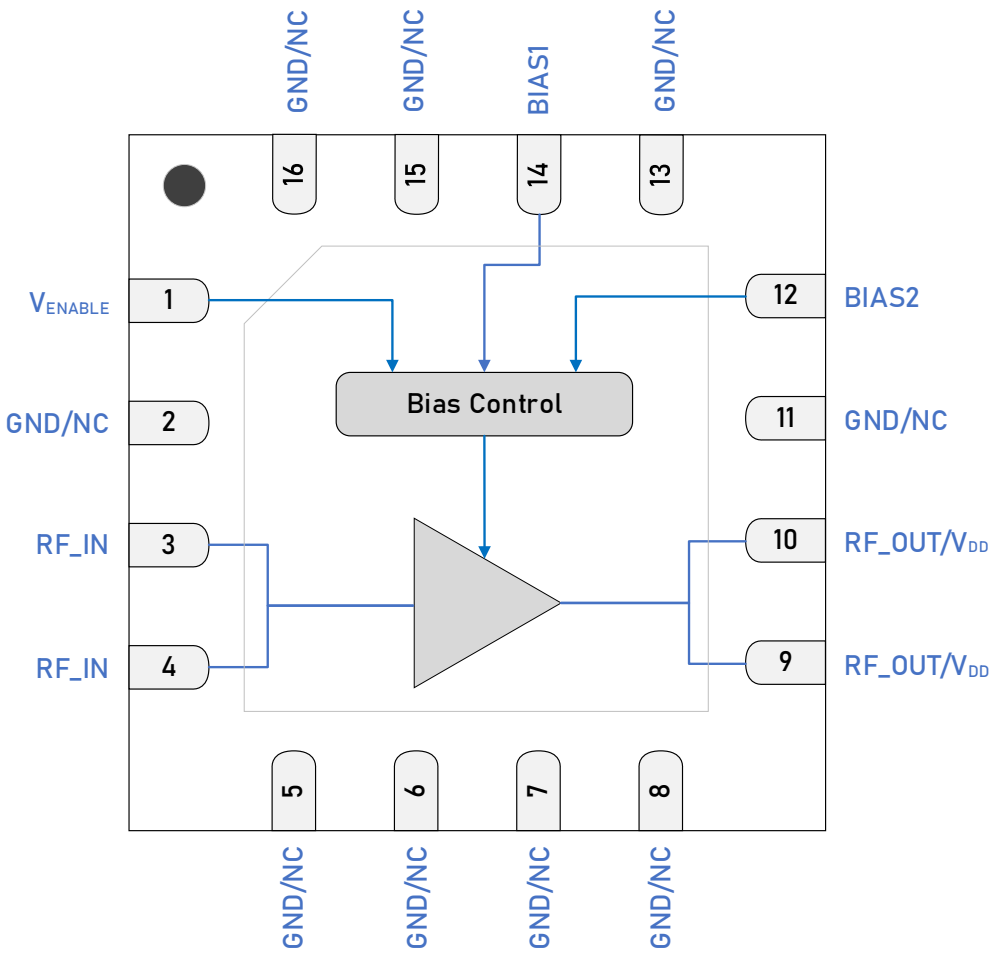

3 x 3 mm QFN-16 Pin Out (Top View)

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Pin Assignments

Pin	Name	Description	Note
1	V_{ENABLE}	Enable Voltage Input	V_{ENABLE} and series resistor set I_{DDQ}. $V_{ENABLE} \leq 0.2$ 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. We recommend connecting these pins to ground.
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 an external resistor.
14	Bias1	Bias Circuit Ground	Refer to application schematic.
PKG BASE	GND	Ground	Provides DC and RF ground for amplifier as well as thermal heat sink. In order to match the device's rated performance, it is strongly recommended to use 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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Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply 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 to the device.

Note: For additional information, please refer to *Manufacturing Note MN-001 — Package and Manufacturing Information*.

All Guerrilla RF products are provided in RoHS compliant lead (Pb)-free packaging requiring no exemptions. Additional information for this topic can be found at this link - *Environmental and Restricted Substance Statement Library*

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Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	3.3	5	9	V	
RF Frequency Range	F_{RF}	0.4		8	GHz	**Notes 1 & 2**.
Operating Temperature Range	$T_{PKG\ BASE}$	-40		105	°C	
RF_IN Port Impedance	Z_{RF_IN}		50		Ω	Single-ended with 4 element match.
RF_OUT Port Impedance	Z_{RF_OUT}		50		Ω	Single-ended with 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.

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Nominal Operating Parameters – General

2.3 to 2.7 GHz Tune: Bias = 5 V, 130 mA unless otherwise noted ($T_{PKG\ BASE}$ = 25 °C).

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		2.5		GHz	
Supply Current (quiescent)	I_{DDQ}	105	130	165	mA	V_{DD} = 5 V, V_{EN} = 5 V. R_{BIAS} = 715 Ω.
Enable Current	I_{ENABLE}		4		mA	V_{DD} = 5 V, V_{EN} = 5 V.
Switching Rise Time	T_{RISE}		30		ns	Disabled mode to Gain mode **(note 3)**.
Switching Fall Time	T_{FALL}		30		ns	Gain mode to Disabled mode **(note 4)**.

5.1 to 5.9 GHz Tune: Bias = 5 V, 100 mA unless otherwise noted ($T_{PKG\ BASE}$ = 25 °C).

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		5.5		GHz	
Supply Current (quiescent)	I_{DDQ}		100		mA	V_{DD} = 5 V, V_{EN} = 5 V.
Enable Current	I_{ENABLE}		3		mA	V_{DD} = 5 V, V_{EN} = 5 V.
Switching Rise Time	T_{RISE}		30		ns	Disabled mode to Gain mode **(note 3)**.
Switching Fall Time	T_{FALL}		30		ns	Gain mode to Disabled mode **(note 4)**.

Disabled Mode

Supply Current (leakage)	$I_{LEAKAGE}$		600	1000	µA	V_{DD} = 5 V, V_{EN} = 0 V.

Thermal Data

Thermal Resistance (Infrared Scan)	Θ_{JC}		44		°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 $T_j \leq 170$ °C.

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Nominal Operating Parameters – RF

The following conditions apply unless noted otherwise: typical application schematic. V_{DD} = 5 V, V_{EN} = 5 V, I_{DD} = 130 mA, F_{TEST} = 2.5 GHz, 50 Ω system impedance, $T_{PKG\ BASE}$ = 25 °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 V, V_{EN} = 5 V.
Noise Figure	NF		1.5		dB	On standard evaluation board.
Output 1 dB Compression Power	OP1dB	24.5	26		dBm	
Output 3rd Order Intercept Point	OIP3		39.5		dBm	8 dBm P_{OUT} per tone at 2 MHz (2499 and 2501 MHz).

The following conditions apply unless noted otherwise: typical application schematic. V_{DD} = 5 V, V_{EN} = 5 V, I_{DD} = 100 mA, F_{TEST} = 5.5 GHz, 50 Ω system impedance, $T_{PKG\ BASE}$ = 25 °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 V, V_{EN} = 5 V.
Noise Figure	NF		1.7		dB	On standard evaluation board.
Output 1 dB Compression Power	OP1dB		25.8		dBm	
Output 3rd Order Intercept Point	OIP3		44		dBm	8 dBm P_{OUT} per tone at 2 MHz (5499 and 5501 MHz).

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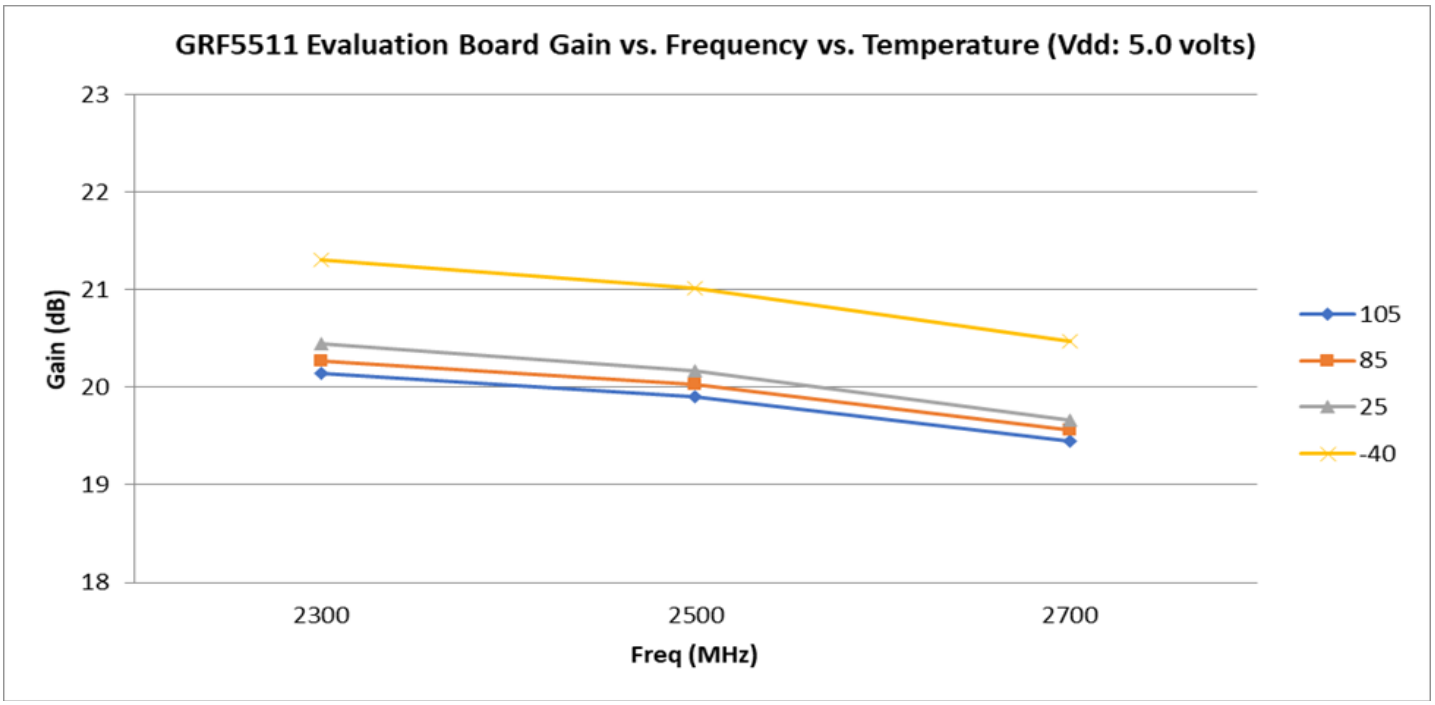
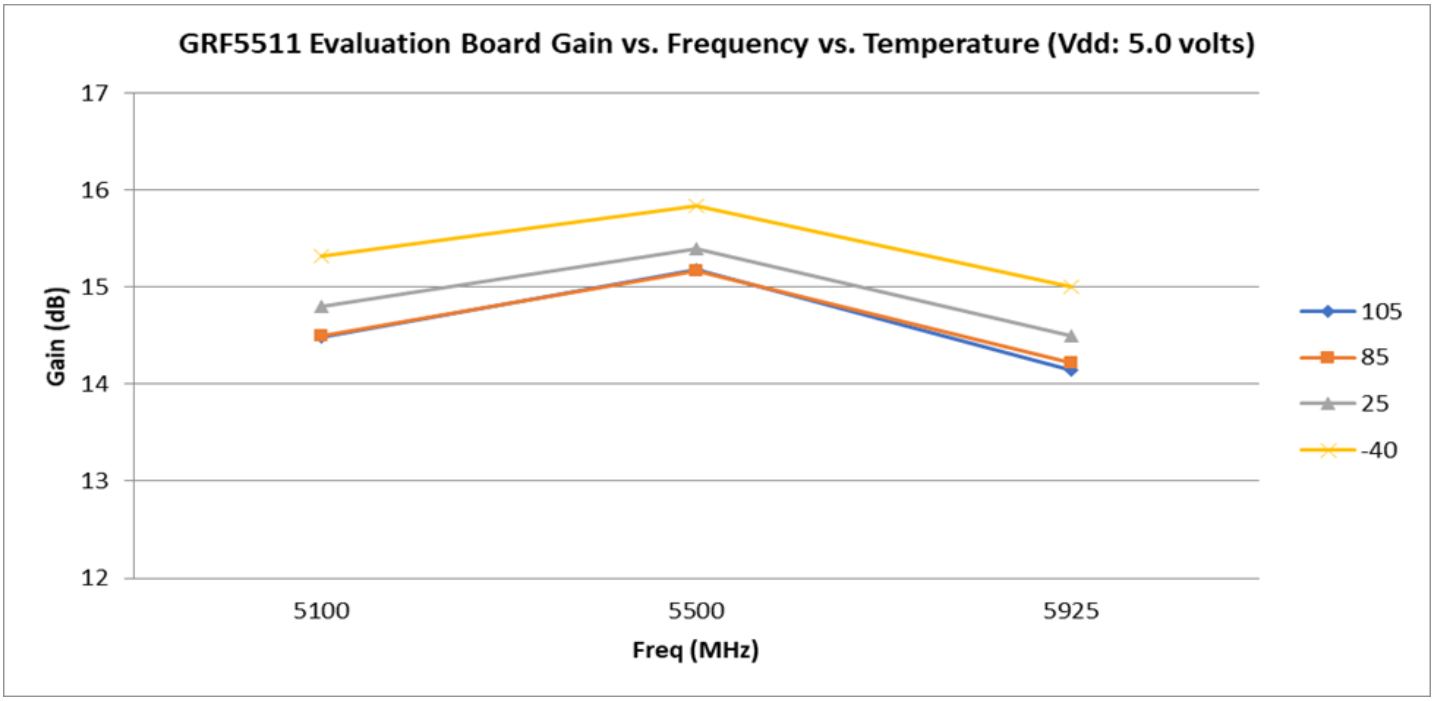
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune)



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



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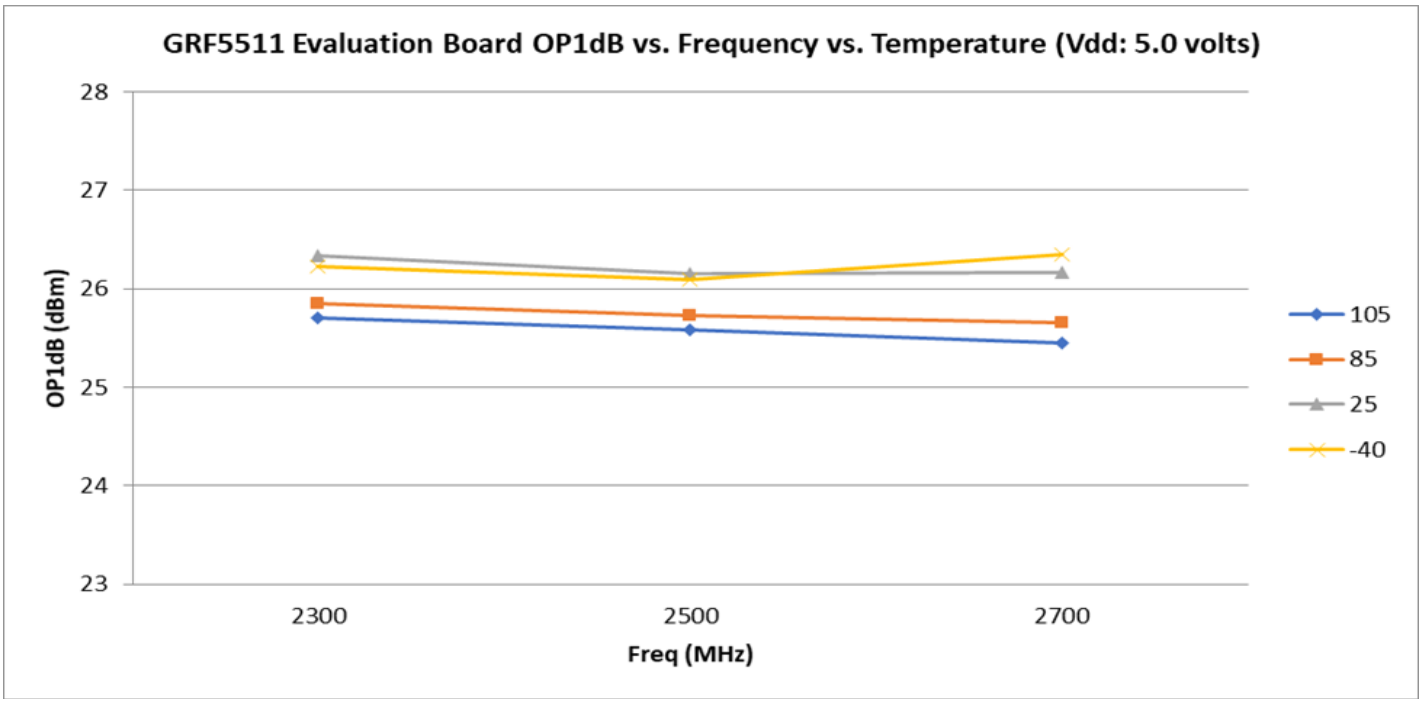
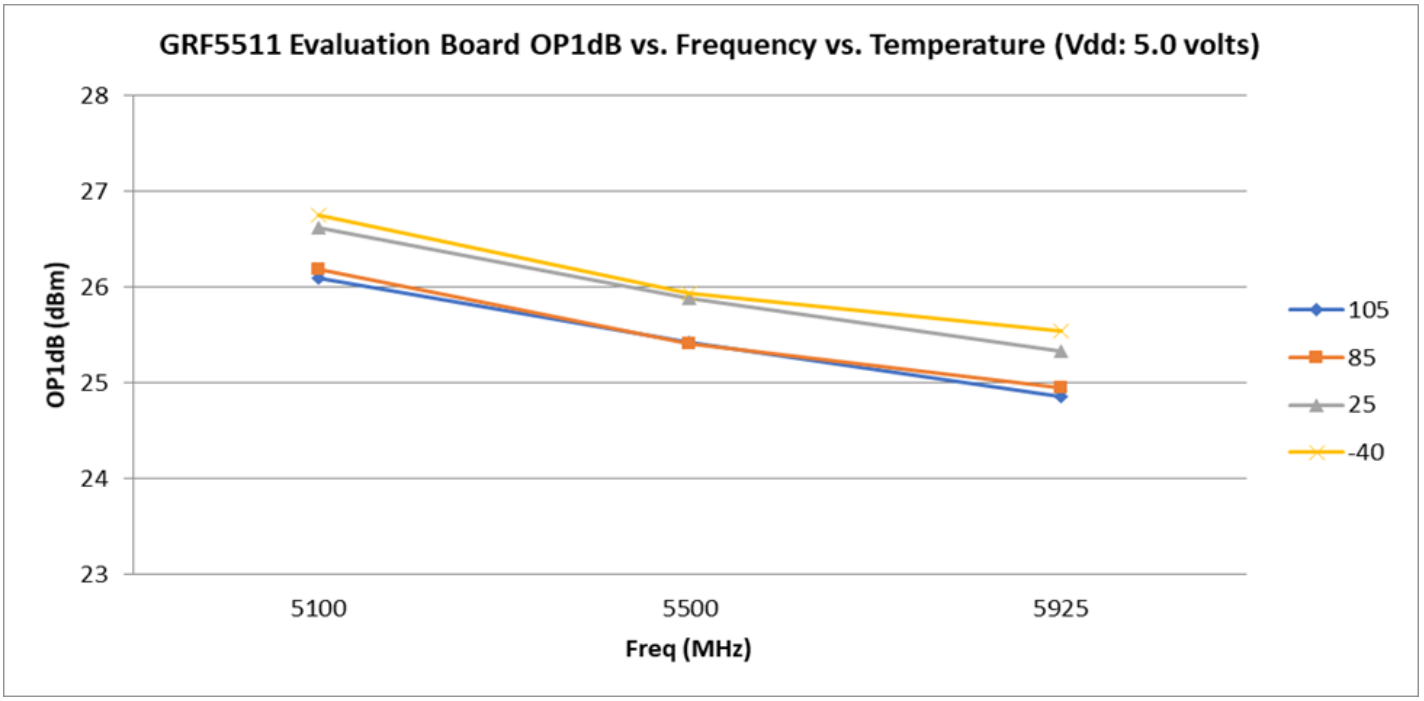
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune)



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



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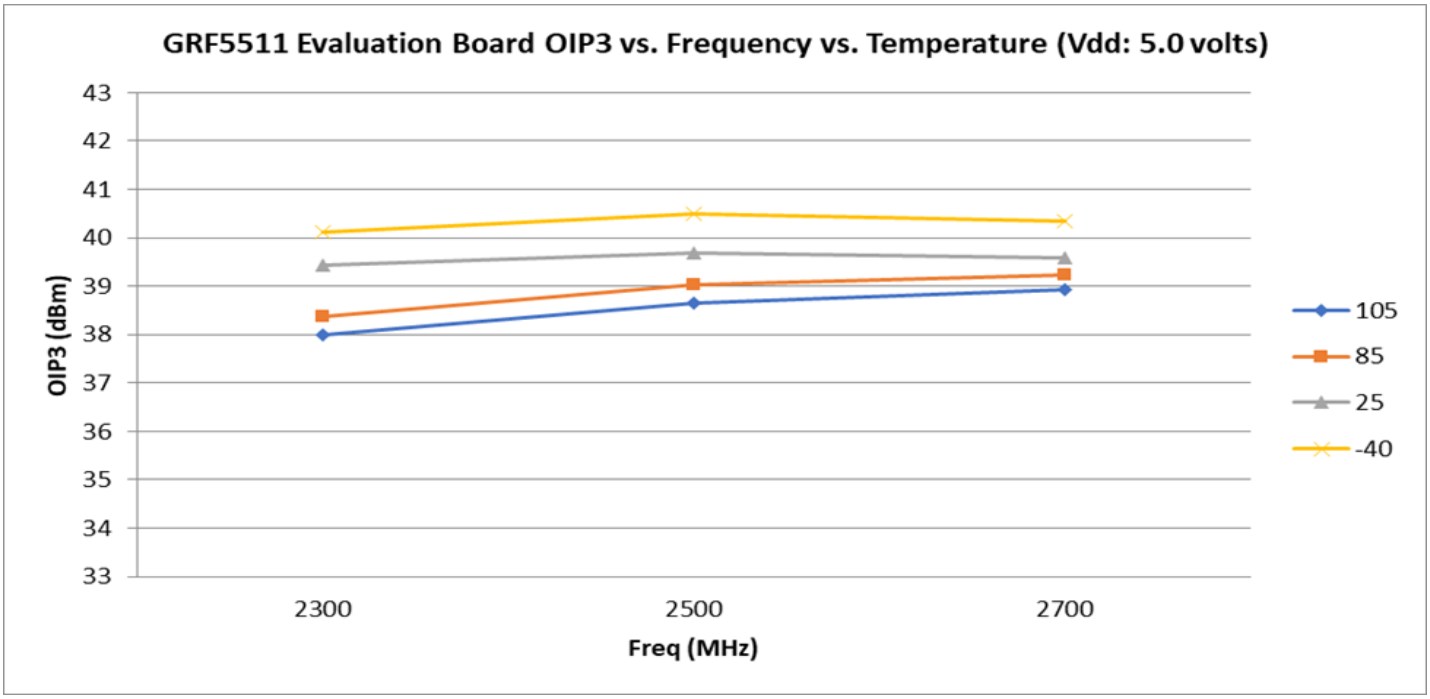
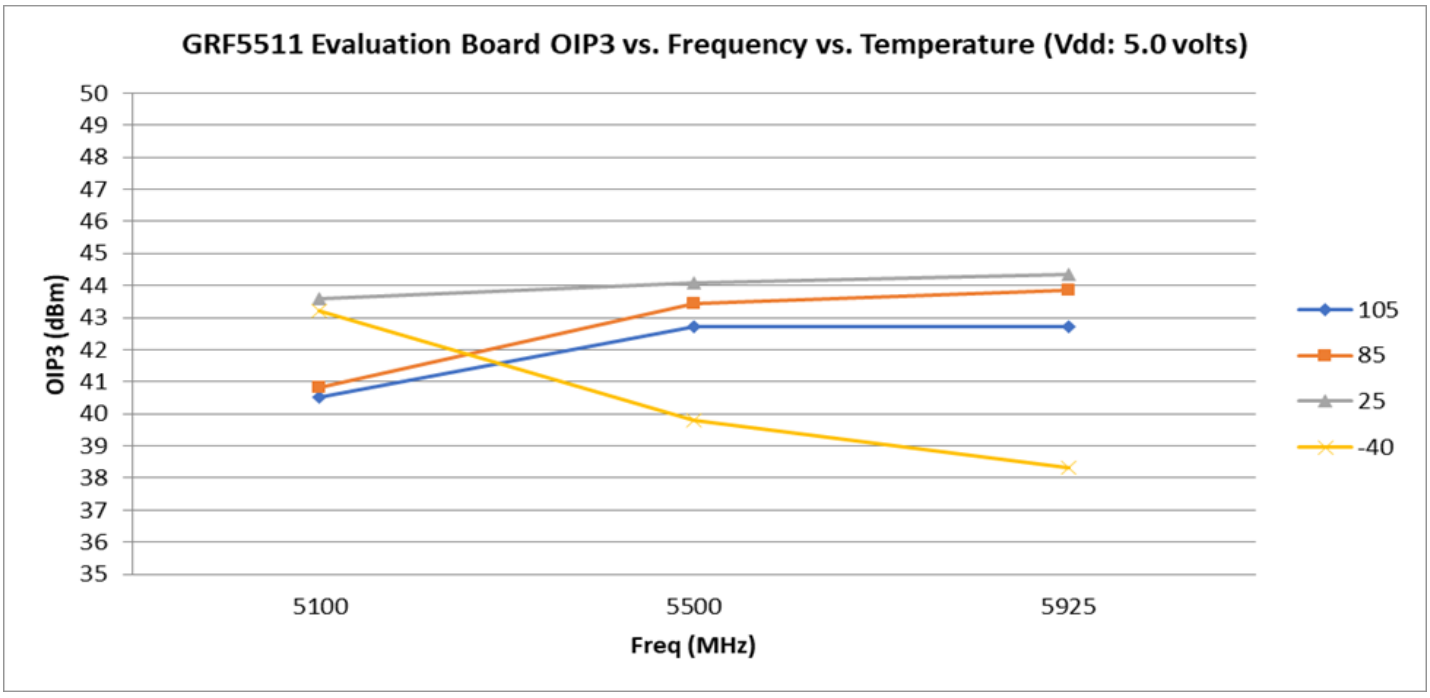
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune)



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



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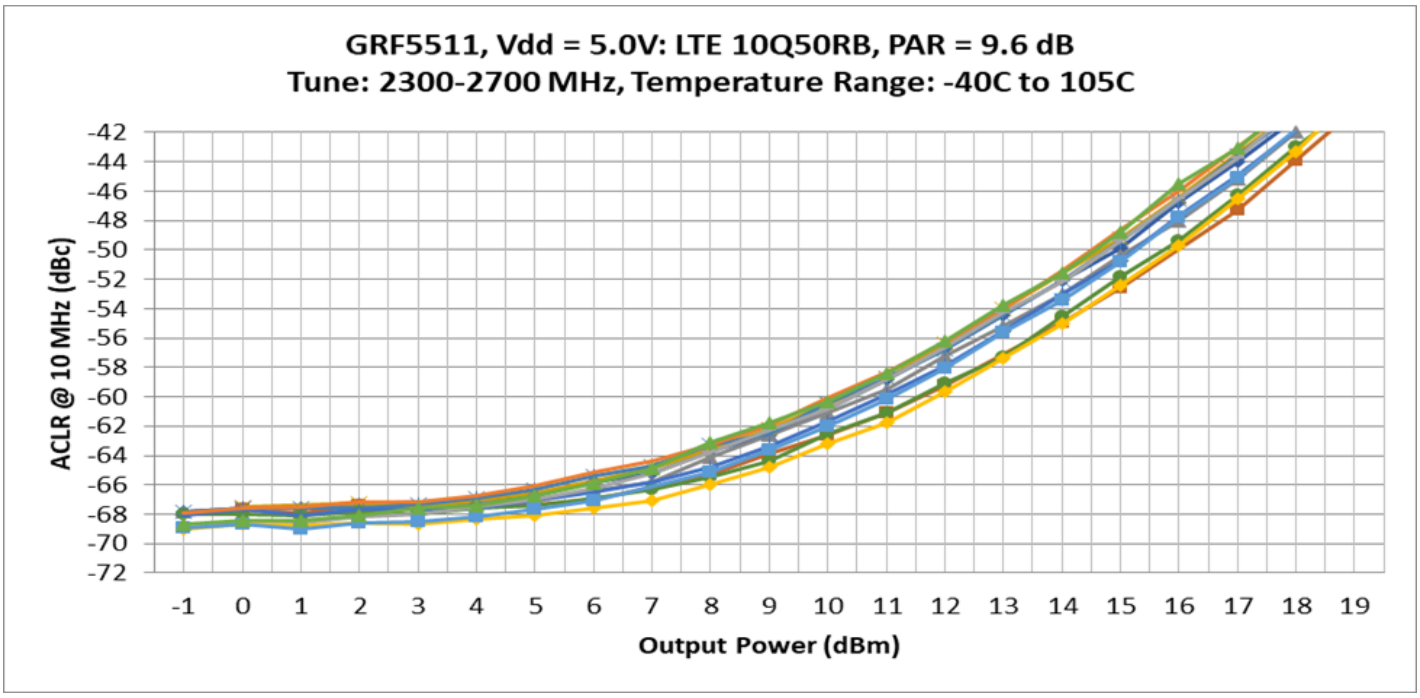
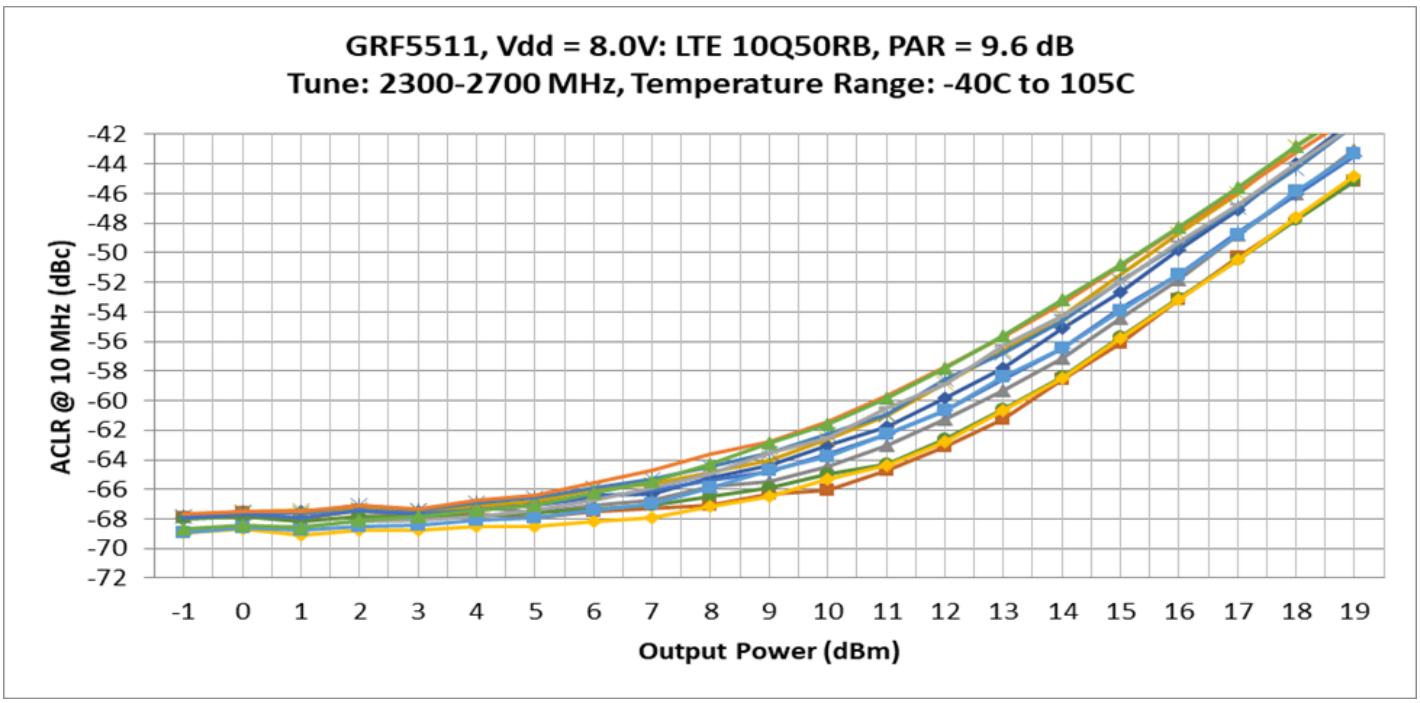
GRF5511 Typical Operating Curves: 5 V, 130 mA (2.3 to 2.7 GHz Tune)



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



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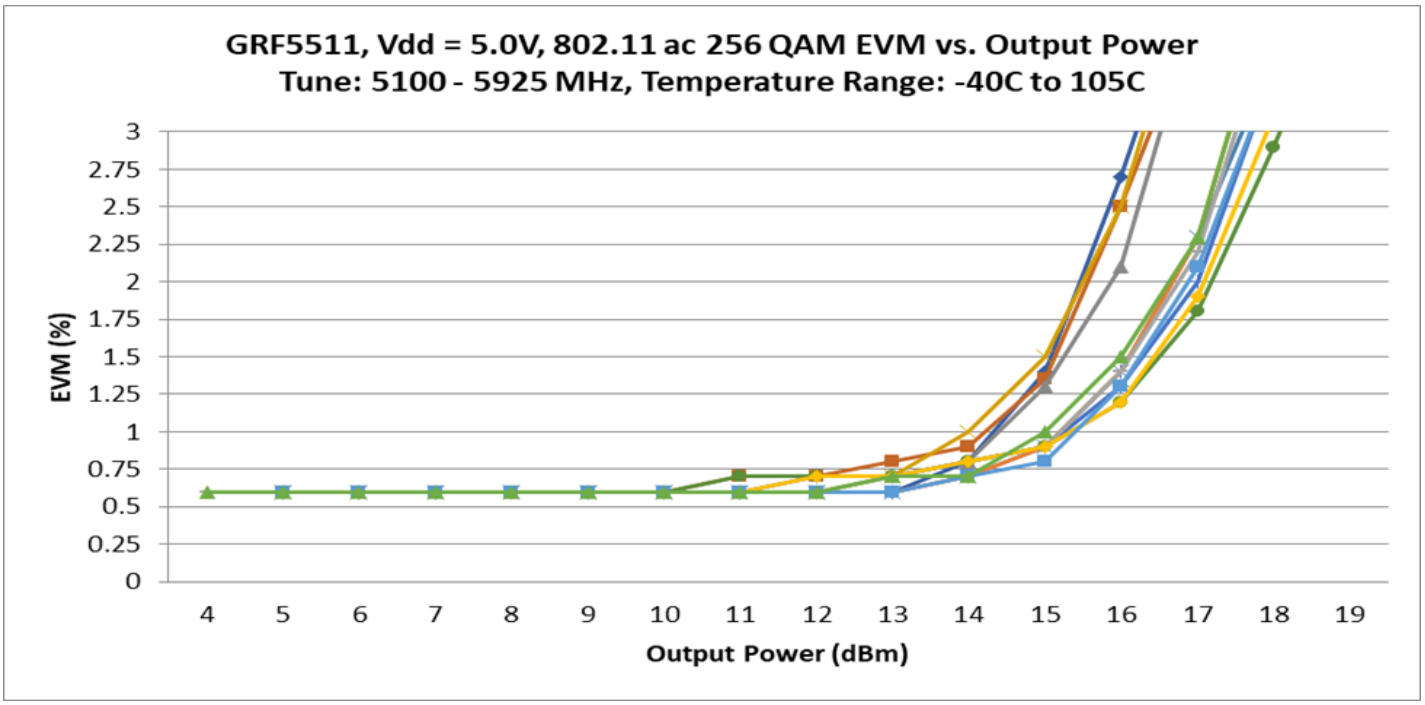
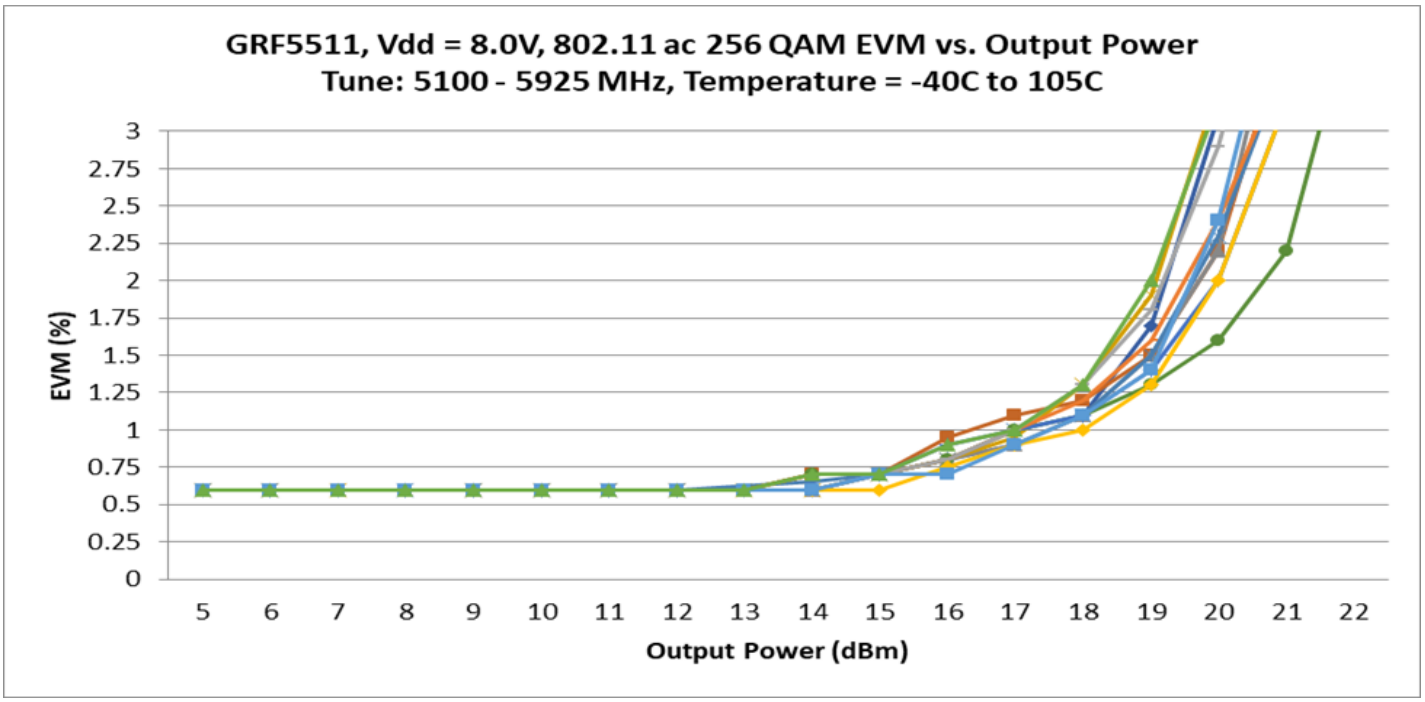
GRF5511 Typical Operating Curves: 5 V, 100 mA, 5.1 to 5.9 GHz Tune



Typical Operating Curves: 8 V, 150 mA, 5.1 to 5.9 GHz Tune



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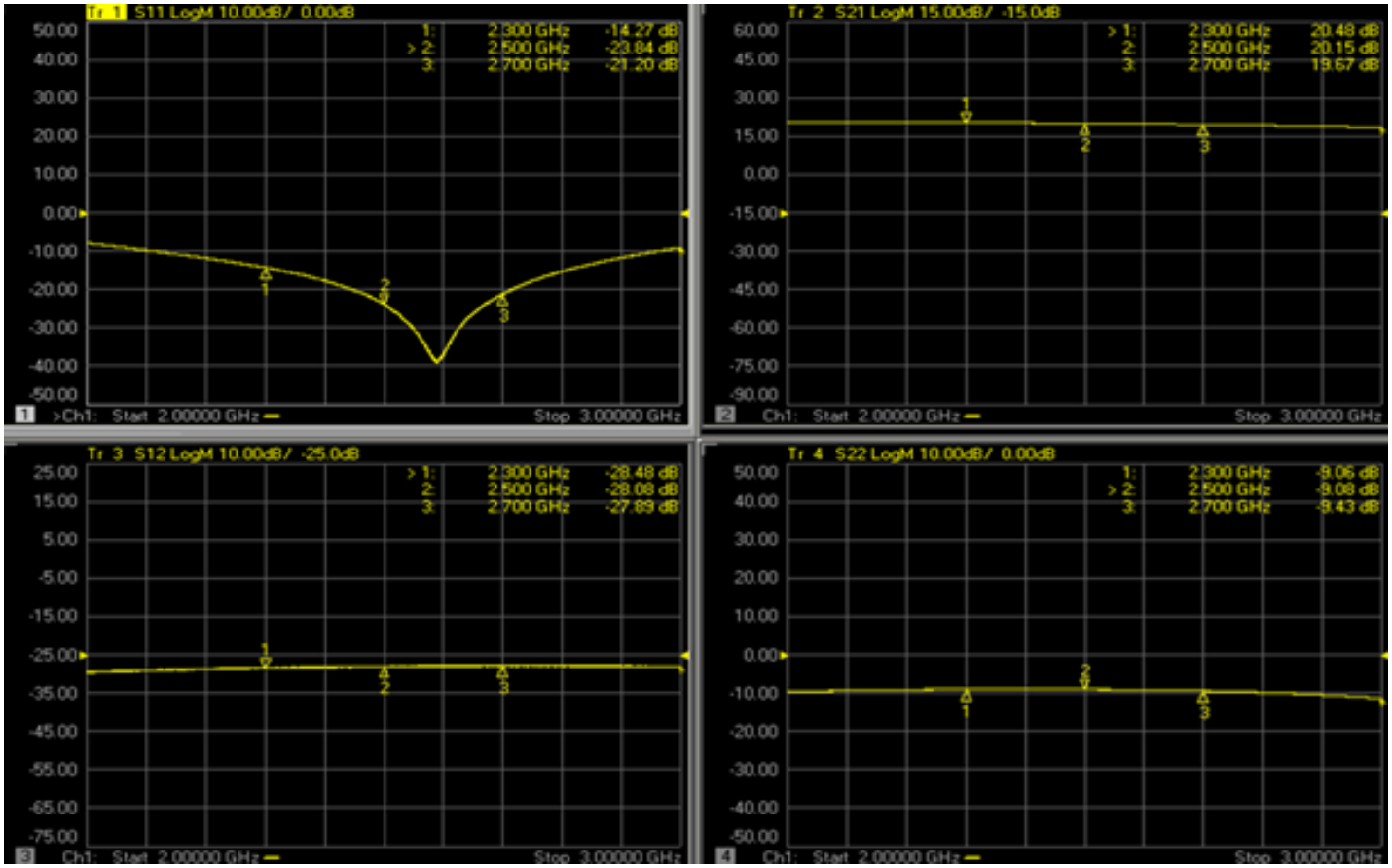
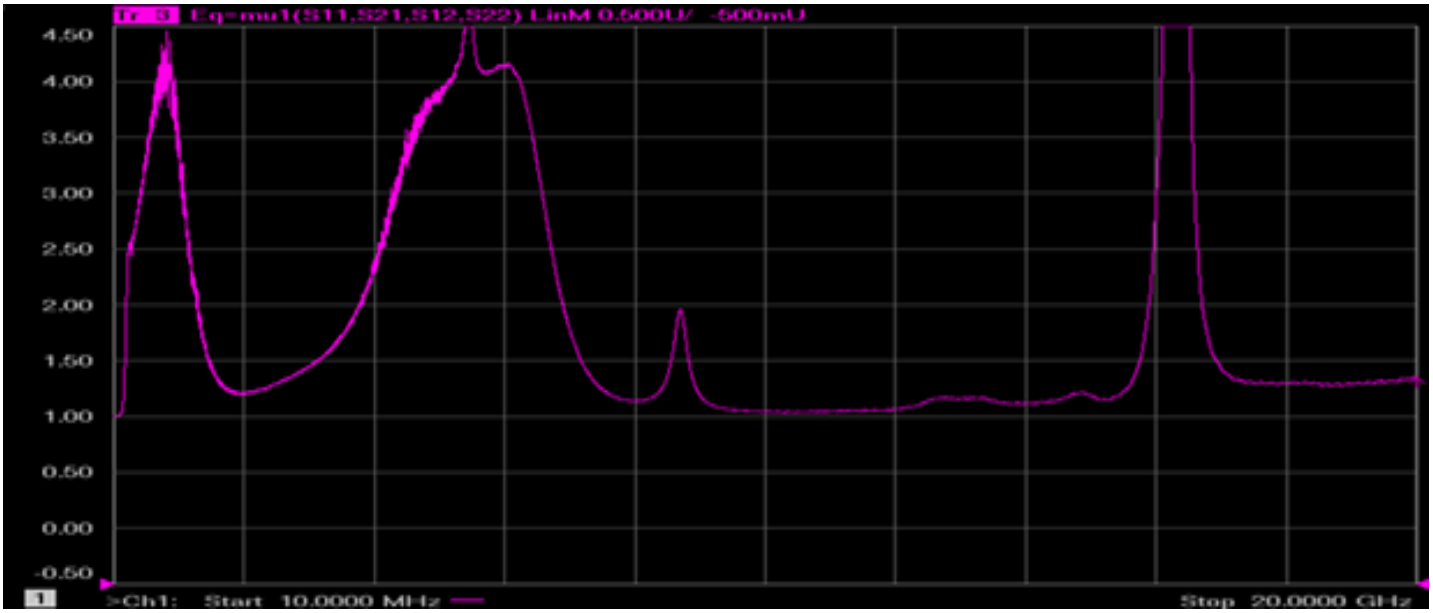
GRF5511 Typical Operating Curves: S-Parameters (5 V, 130 mA, 2.3 to 2.7 GHz Tune)



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



Note: Mu factor ≥ 1.0 implies unconditional stability

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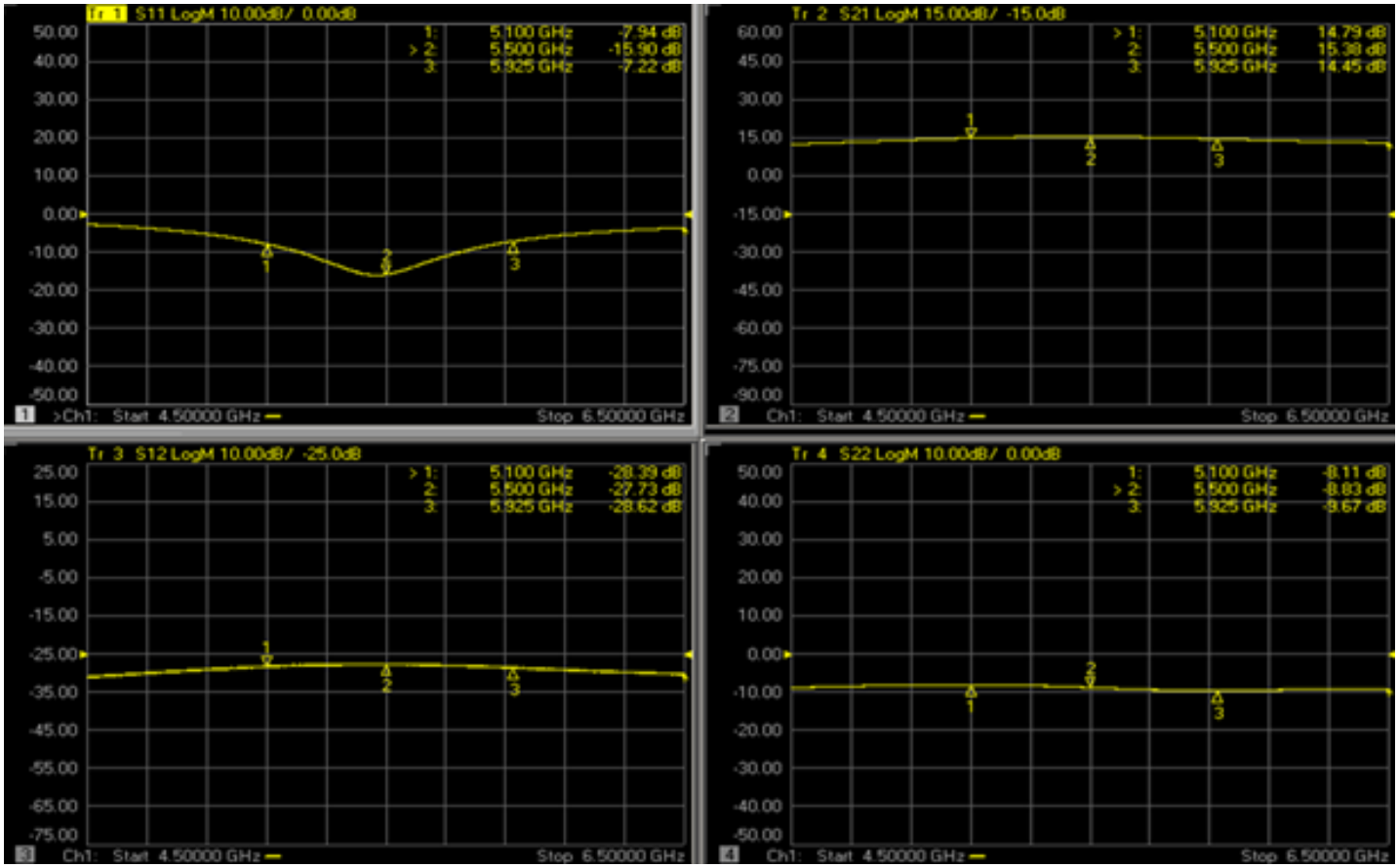
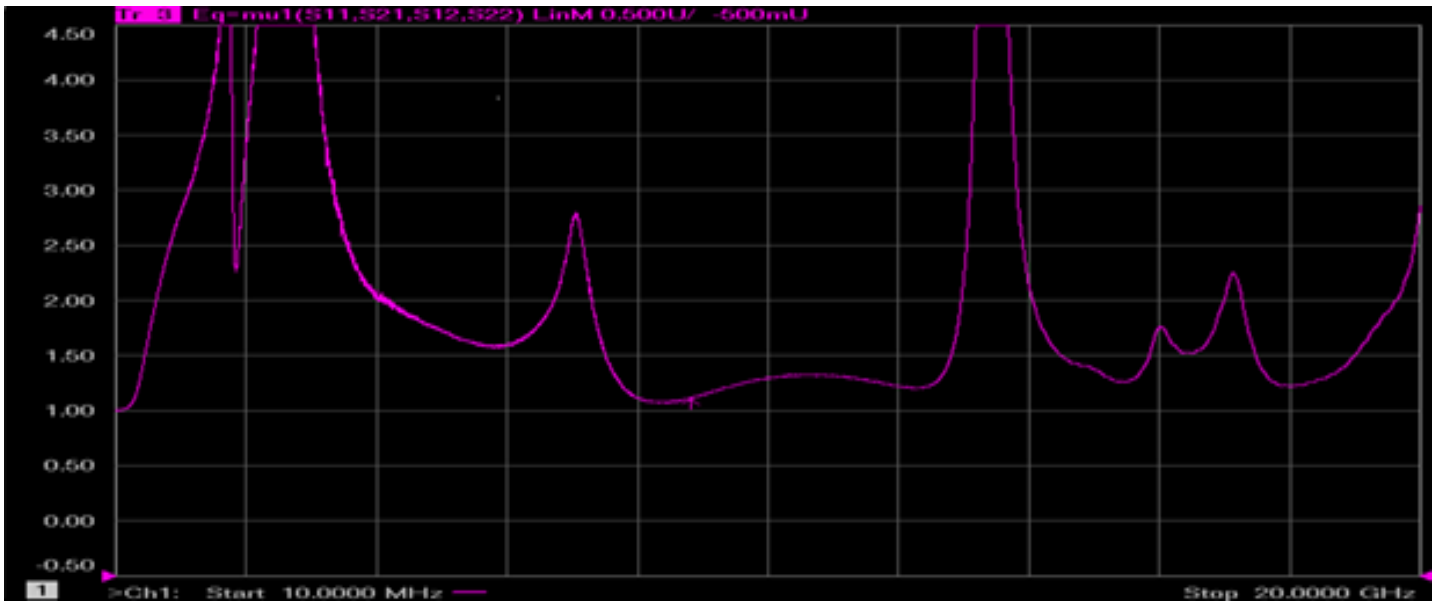
GRF5511 Typical Operating Curves: S-Parameters (5 V, 100 mA, 5.1 to 5.9 GHz Tune)



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



Note: Mu factor ≥ 1.0 implies unconditional stability

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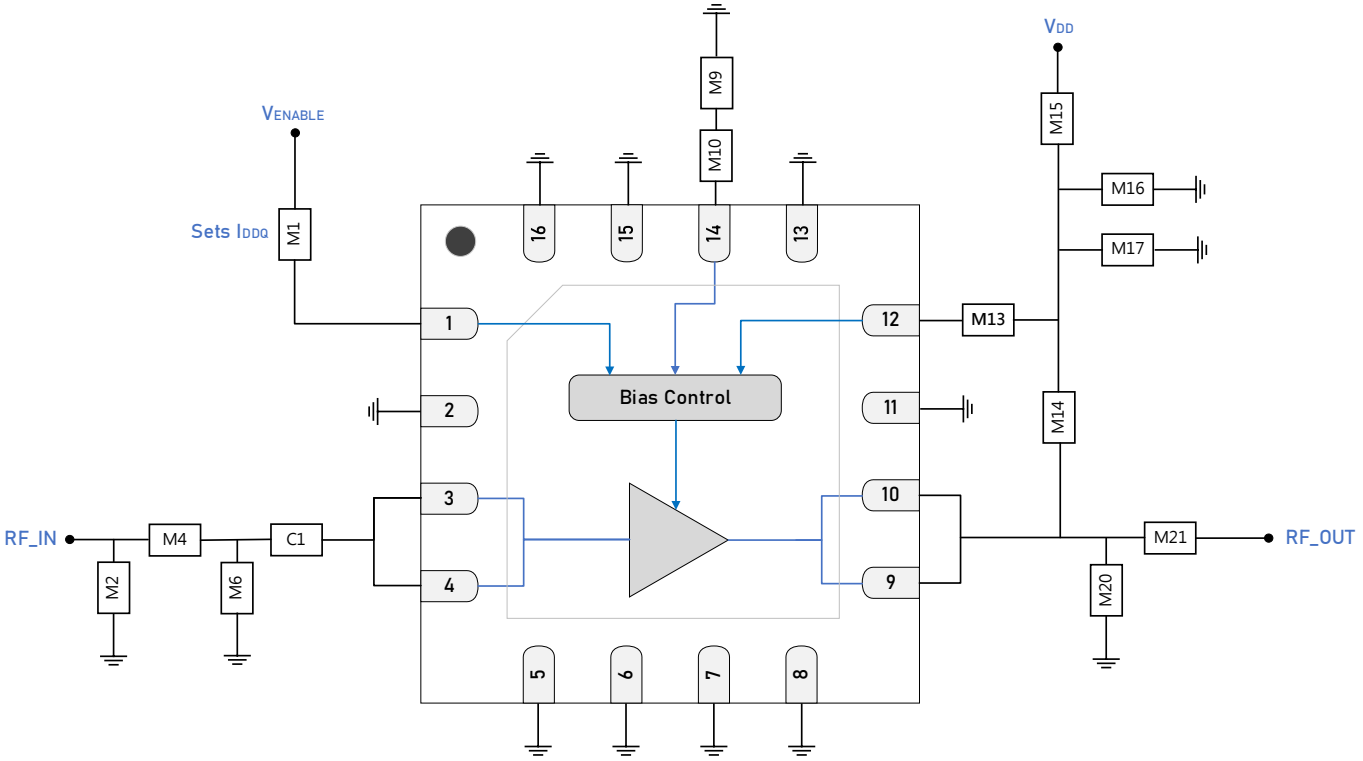
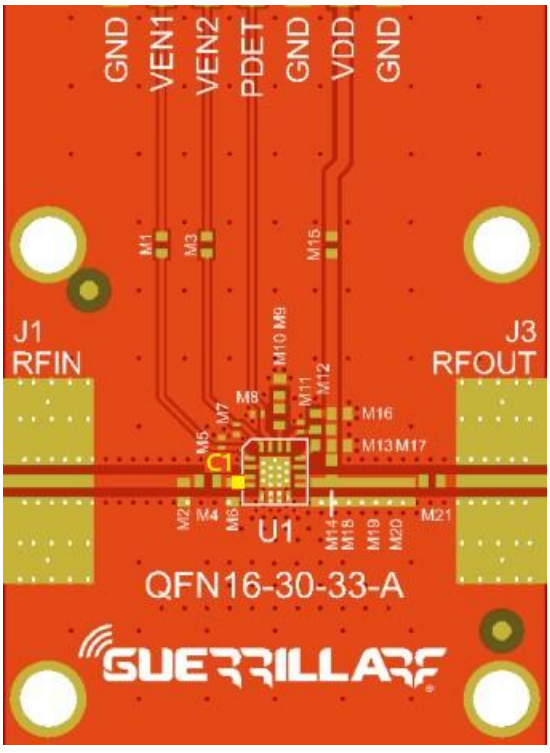


GRF5511 Standard Evaluation Board Schematic



GRF5511 Evaluation Board Assembly Diagram

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

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (sets I_{DDQ})	Resistor	Various	5%	See Curves	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	5%	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 (sets I_{DDQ})	Resistor	Various	5%	See Curves	0402	ok
M4	Capacitor	Murata	GJM	2 pF	0402	ok
M6	Inductor	Murata	LQP	2 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	5%	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					

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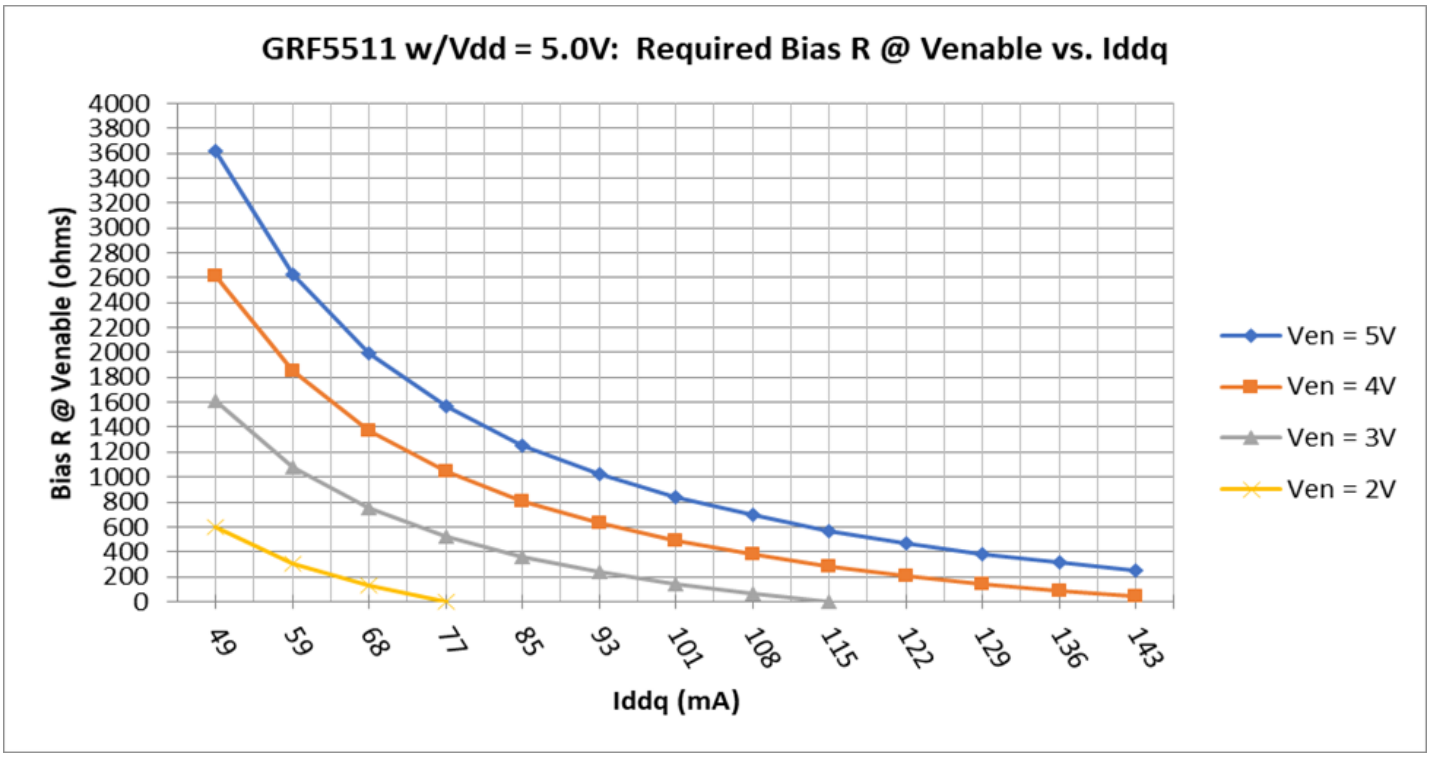
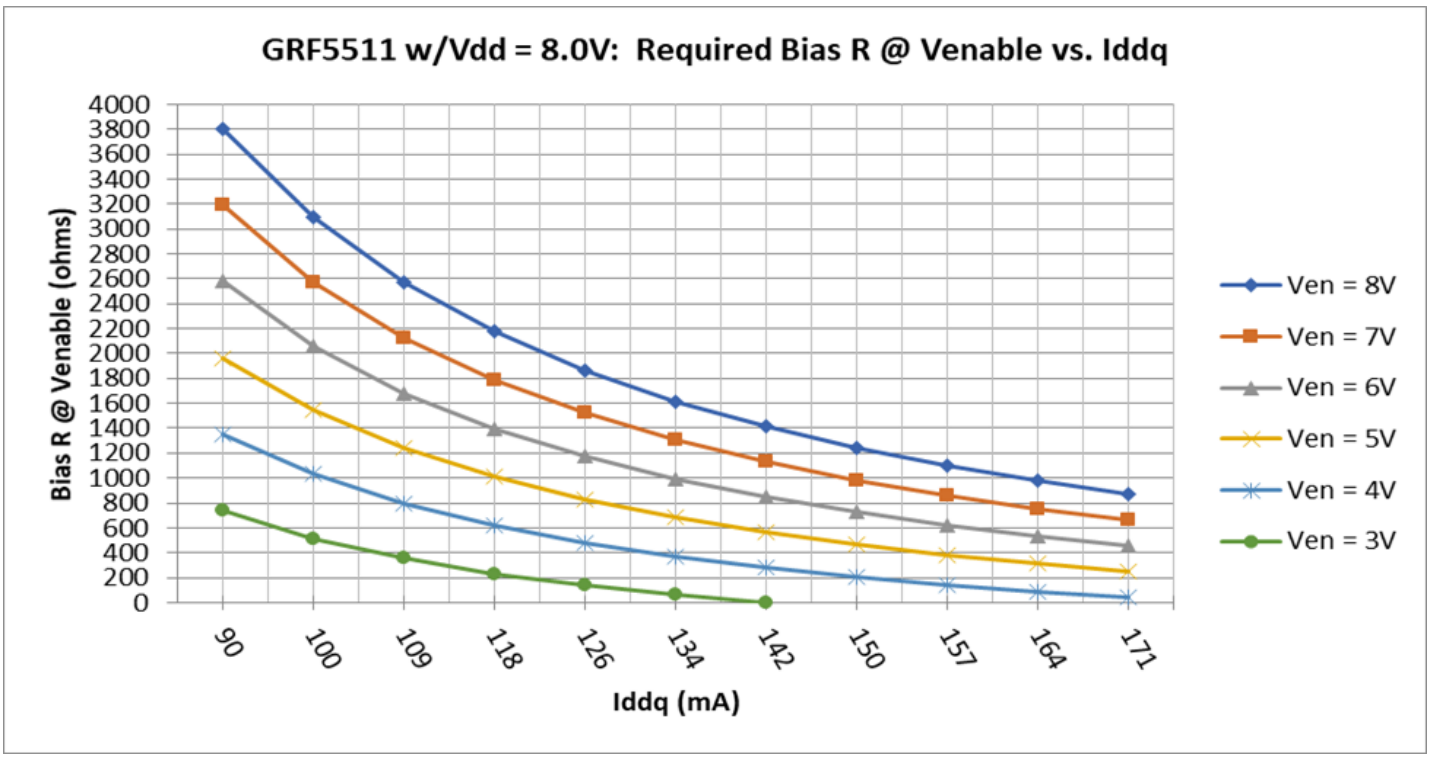
GRF5511 Bias Resistor Selection Curves:





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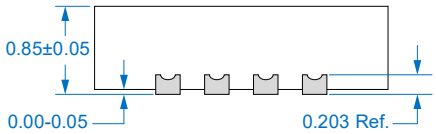
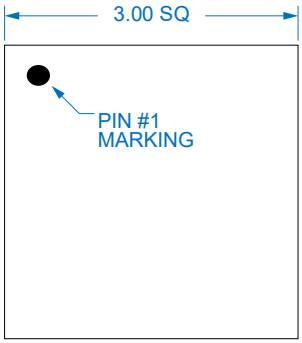
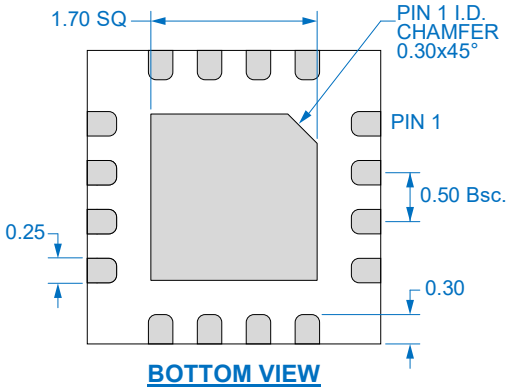
Package Outline Drawing



SIDE VIEW

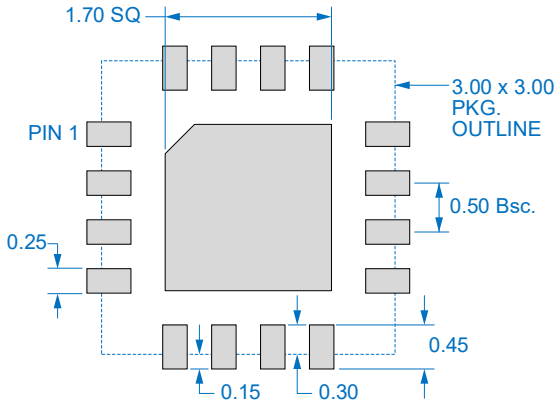


TOP VIEW



BOTTOM VIEW

Recommended PCB Footprint



TOP VIEW

QFN-16 3 x 3 Package Dimensions and Suggested PCB Footprint (Top View)

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Package Marking Diagram



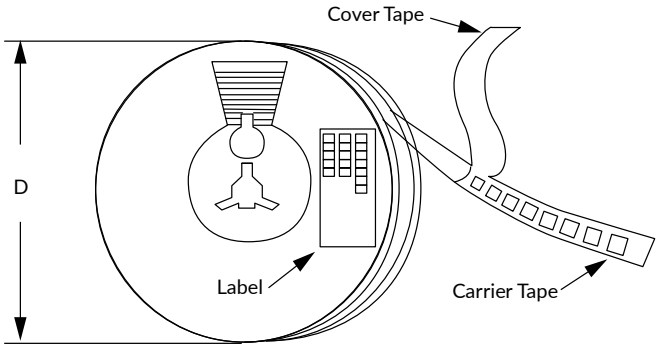
- Line 1: "YY" = YEAR. "WW" = WORK WEEK the device was assembled.
- Line 2: "GRF" = Guerrilla RF.
- Line 3: "XXXX" = Device PART NUMBER.

Tape and Reel Information

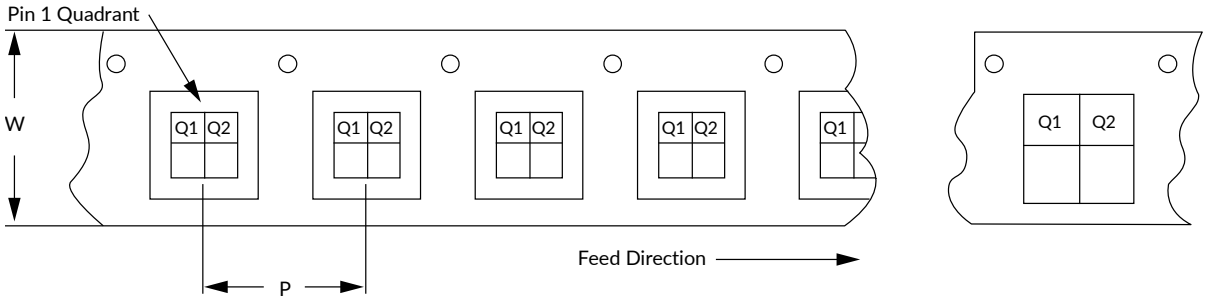
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table, which includes units per reel.

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 Tape and Reel Reference Table, please refer to: *https://www.guerrilla-rf.com/prodFiles/Manufacturing/MN001.pdf*



Tape and Reel Packaging with Reel Diameter Noted (D)



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

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Revision History

Revision Date	Description of Change
March 29, 2018	Release Ø Data Sheet.
March 25, 2023	Upgraded Data Sheet to new format only. No change to device or device specifications.
May 15, 2025	Extended lower frequency range from 700 MHz to 400 MHz.
November 11, 2025	Upgraded Data Sheet to new format only. No change to device or device specifications.
February 18, 2026	Updated Switching Times.

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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 limited evaluation board measurements taken within the Guerrilla RF Applications Lab. All parametric values are subject to change pending the collection of additional data.
Release Ø	All data based on measurements taken with *production-released* material. TYP values are based on a combination of ATE and bench-level measurements, with MIN/MAX limits defined using *modelled estimates* 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 *derived from multiple lots which have been fabricated over an extended period of time*. MIN/MAX limits may be refined over previous releases as more statistically significant data is collected to account for process spreads.

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