

GRF5115

33 dBm Power-LNA 26 to 2700 MHz

FEATURES

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

Reference: 5 V / 300 mA / 1950 MHz

- Gain: 14.8 dB
- OP1dB: 33.2 dBm
- OIP3: 43 dBm
- Evaluation Board Noise Figure: 1.3 dB
- Drain Efficiency: 58%

APPLICATIONS

- Linear Driver
- Multi-stage LNA
- High Efficiency Power Amplifier

DESCRIPTION

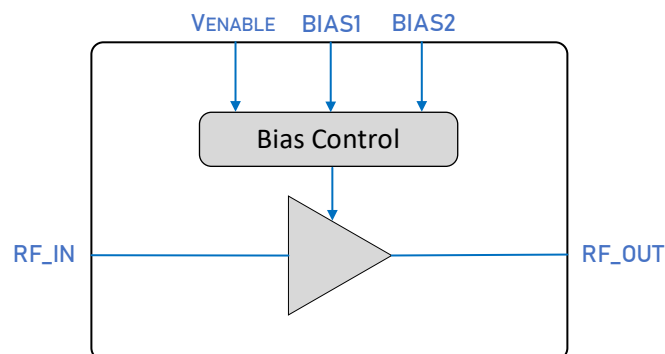
The GRF5115 is a high efficiency PA/Driver that delivers an OP1dB of 33 dBm with greater than 55% drain efficiency. The device is tunable from 26 to 2700 MHz with typical fractional bandwidths of 5 to 10%.

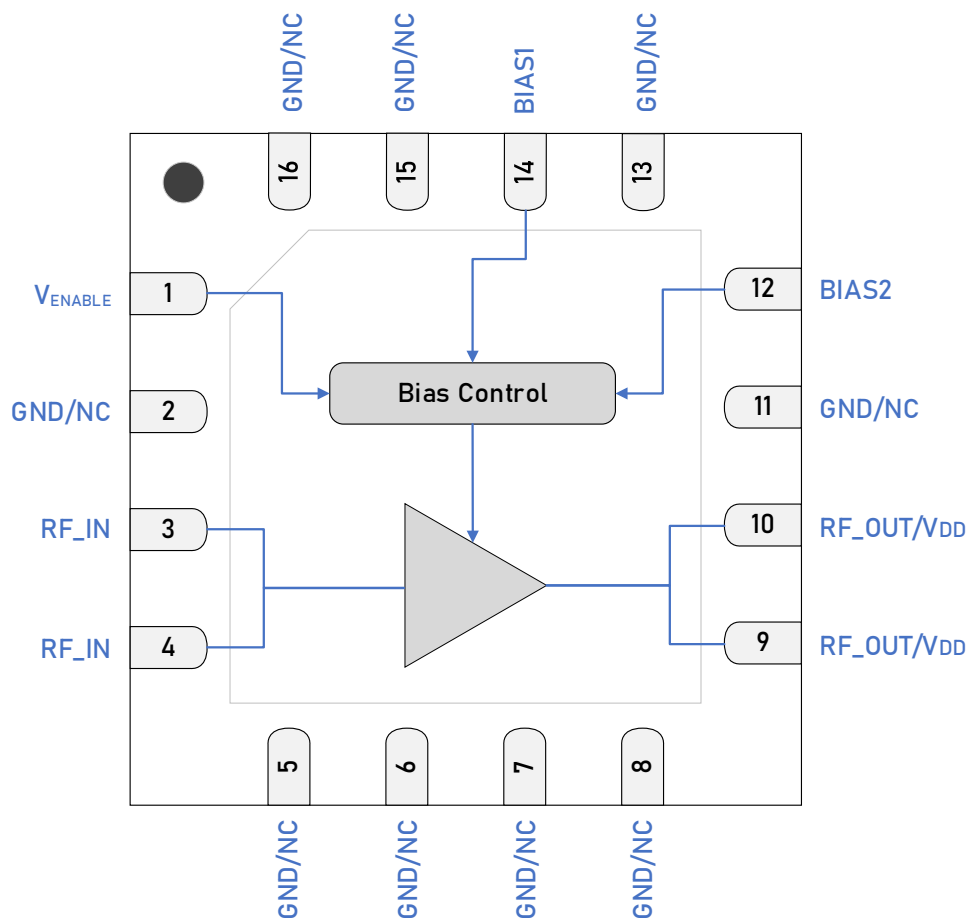
GRF5115 can be biased over a range of 2.7 to 5 volts (V_{DD}) and I_{DDQ} can be adjusted for optimal linearity and efficiency.

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 GRF5115 “Custom Tunes” product page: [GRF5115 Custom Tunes](#)

BLOCK DIAGRAM





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

Pin Assignments

Pin	Name	Description	Note
1	V _{ENABLE}	Enable Voltage Input	V _{ENABLE} and series resistor sets I _{DDQ} for the input stage. V _{ENABLE} ≤ 0.2 volts disables the device. On-die pull-down resistor will turn the part 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. R1 to ground is placed to limit self-biasing. The value of R1 also contributes to the device I _{DDQ} .
9, 10	RF_OUT/V _{DD}	RF Output	Pins 9 & 10 tied together on system board. Supply V _{DD} here.
12	Bias2	Bias Circuit Supply	Connect to V _{DD} through an external resistor.
14	Bias1	Bias Circuit Ground	Consult application schematic.
PKG BASE	GND	Ground	Provides DC and RF ground for the amplifier, as well as thermal heat sink. 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.

Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Drain Voltage	V_{DD}		5.5	V
Transient Average RF Input Power: Load VSWR < 2:1, Duration < 1 hour.	$P_{IN\ MAX}$		23	dBm
Operating Temperature (package base).	$T_{PKG\ BASE}$	-40	85	°C
Maximum Junction Temperature.	T_{MAX}		170	°C
Maximum Dissipated Power. DC only (no RF applied).	$P_{DISS\ MAX}$		2.25	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 — 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](#)

Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Voltage	V _{DD}	3.3	5	5.5	V	
RF Frequency Range	F _{RF}	26		2700	MHz	Notes 1 & 2.
Operating Temperature (package base)	T _{PKG BASE}	-40	25	85	°C	
RF_IN Port Impedance	Z _{RF_IN}		50		Ω	Single-ended.
RF_OUT Port Impedance	Z _{RF_OUT}		50		Ω	Single-ended.

Note 1: Operation outside of this range is supported by using different custom tunes. Examples of other optimized tunes can be found here: [GRF5115 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

The following conditions apply unless noted otherwise: typical application schematic. $V_{DD} = 5\text{ V}$, $I_{DD} = 300\text{ mA}$, $F_{TEST} = 1950\text{ MHz}$, $50\ \Omega$ system impedance, $T_{PKG\text{ BASE}} = 25\text{ }^{\circ}\text{C}$. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Current (Quiescent)	I_{DDQ}	200	300	400	mA	$V_{DD} = 5\text{ V}$, $V_{ENABLE} = 5\text{ V}$, $M1 = 22\text{ k}\Omega$, $M9 = 100\text{ k}\Omega$, $R1 = 15\text{ k}\Omega$.
Enable Current	I_{ENABLE}		0.5		mA	$V_{DD} = 5\text{ V}$.
Switching Rise Time	T_{RISE}		100		ns	Disabled mode to Gain mode (note 3).
Switching Fall Time	T_{FALL}		850		ns	Gain mode to Disabled mode (note 4).

Disabled Mode

Supply Current (leakage)	$I_{LEAKAGE}$		2.0		μA	$V_{DD} = 5\text{ V}$, $V_{ENABLE} = 0\text{ V}$.
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Thermal Data

Thermal Resistance (Infrared Scan)	Θ_{JC}		35		$^{\circ}\text{C}/\text{W}$	On standard evaluation board (note 5).
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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} .

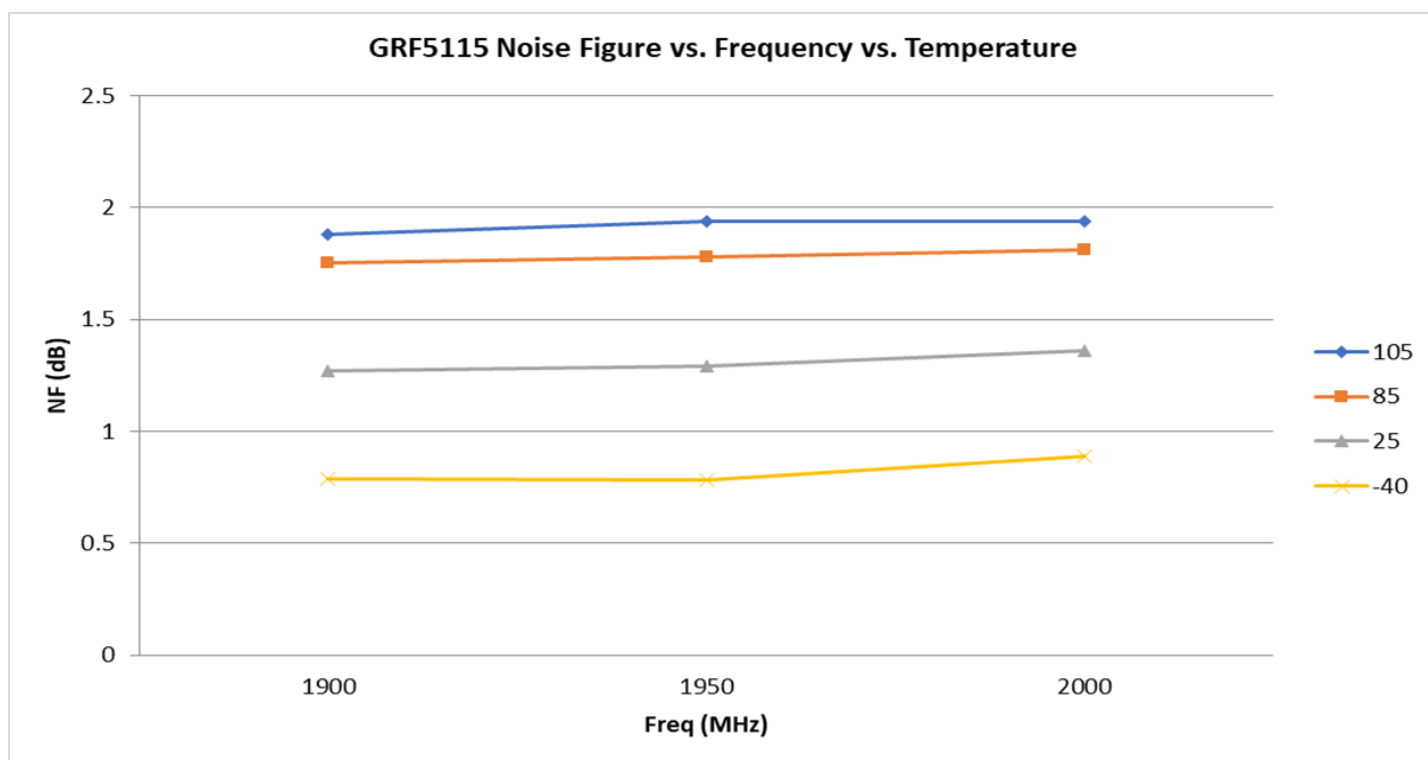
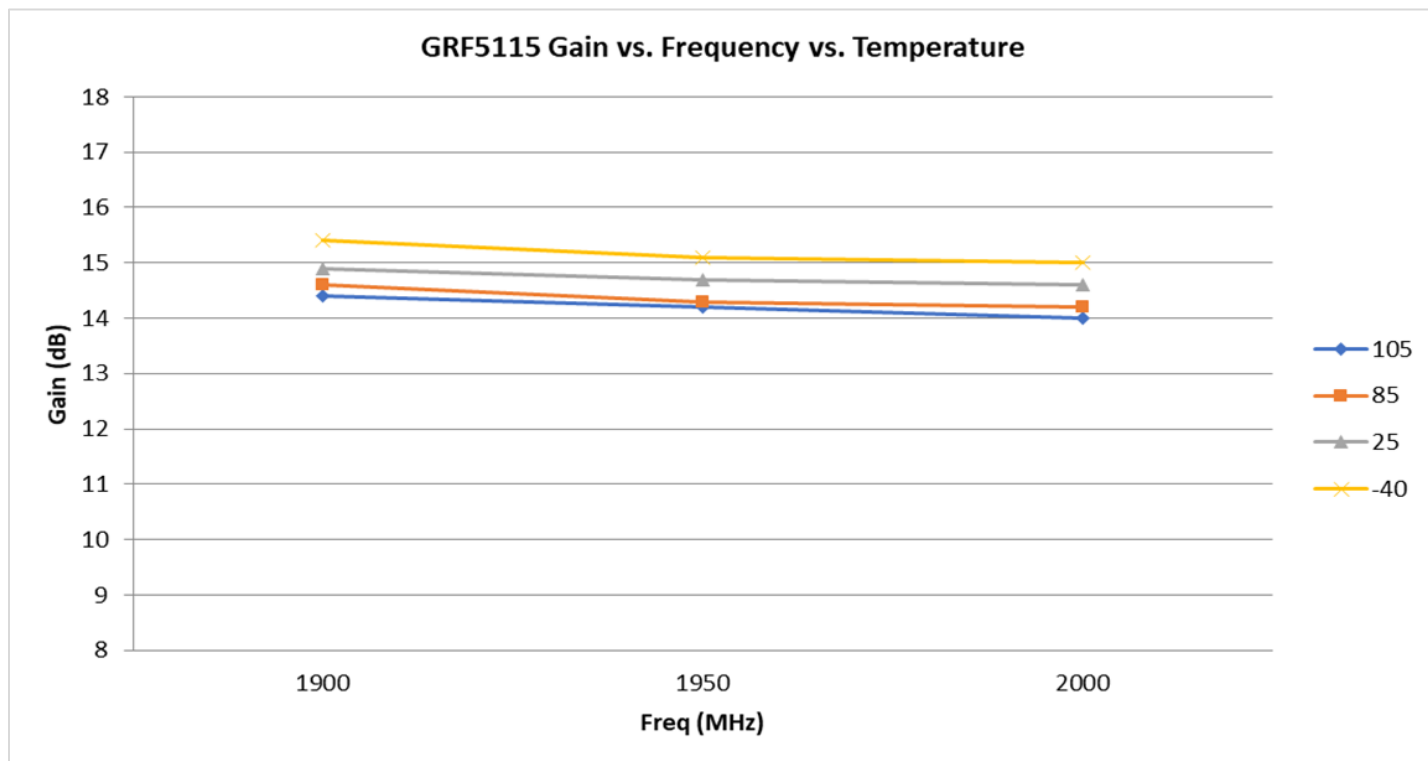
Note 5: MTTF > 10^6 hours for $T_j \leq 170\text{ }^{\circ}\text{C}$. Listed thermal resistance pertains to DC case. Thermal resistance is not constant vs. output power (see thermal resistance and junction temperature plots).

Nominal Operating Parameters – RF

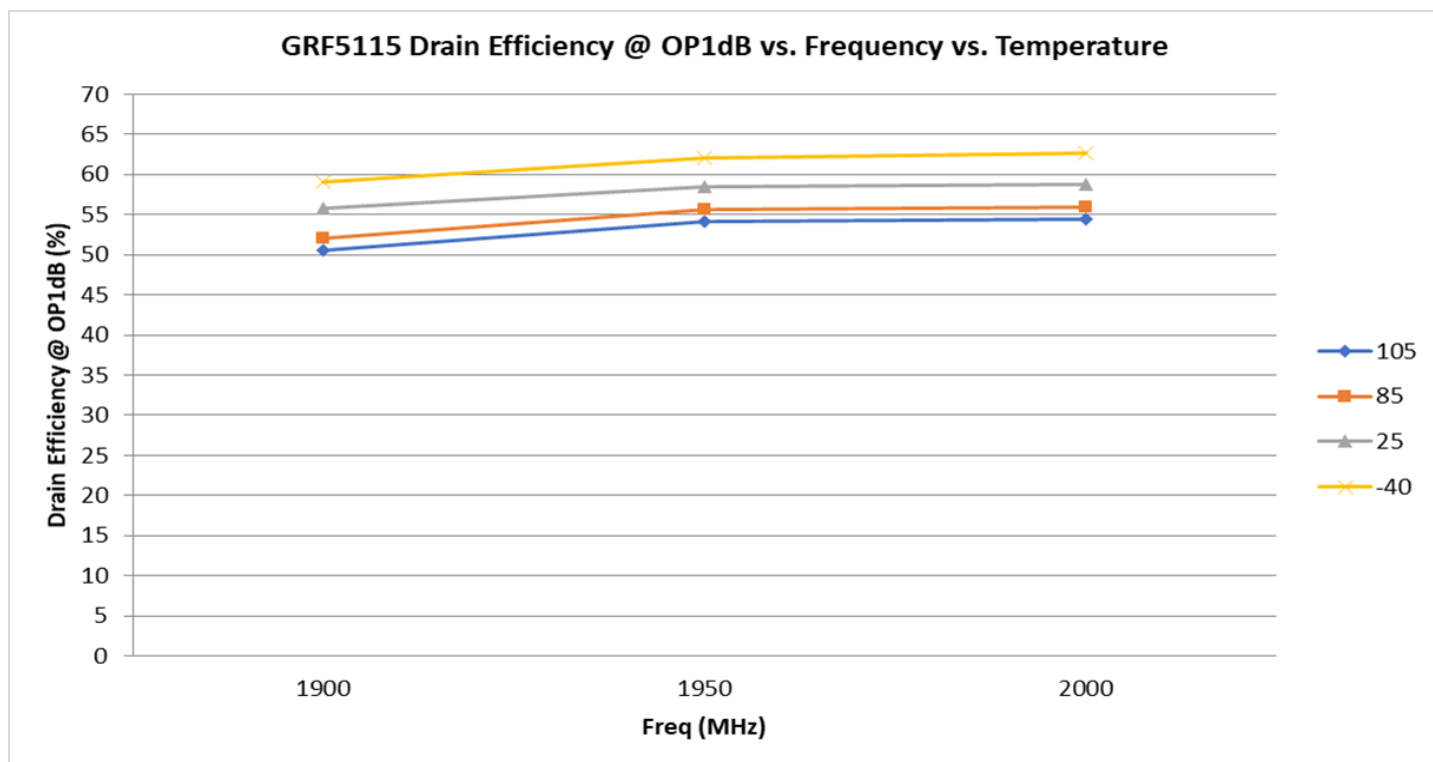
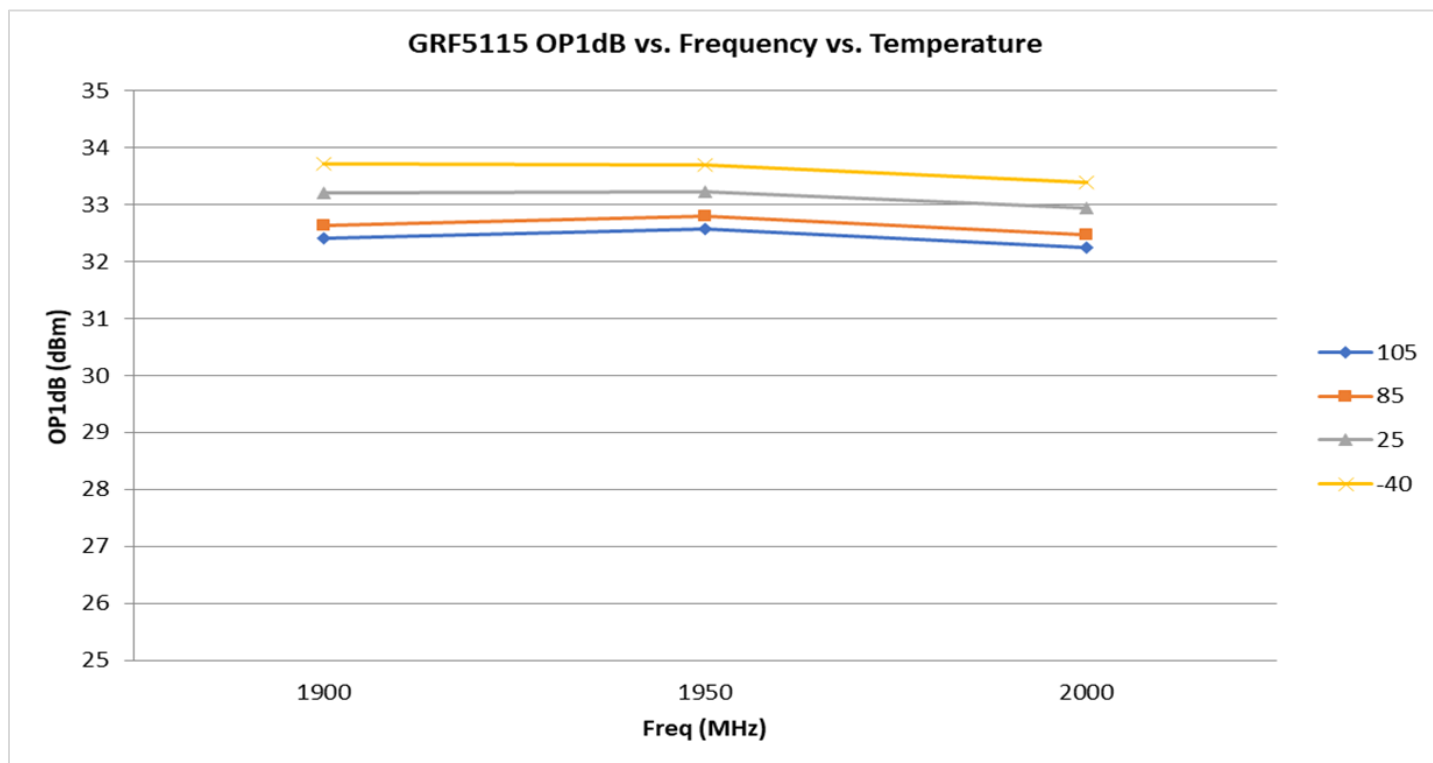
The following conditions apply unless noted otherwise: typical application schematic. $V_{DD} = 5\text{ V}$, $I_{DD} = 300\text{ mA}$, $F_{TEST} = 1950\text{ MHz}$, $50\ \Omega$ system impedance, $T_{PKG\text{ BASE}} = 25\text{ }^{\circ}\text{C}$. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain	S21	13.8	14.8		dB	$V_{DD} = 5\text{ V}$, $I_{DD} = 300\text{ mA}$.
Noise Figure	NF		1.3		dB	On standard evaluation board.
Output 1 dB Compression Power	OP1dB	31.5	33		dBm	
Output 3rd Order Intercept Point	OIP3		43		dBm	12 dBm P_{OUT} per tone at 2 MHz spacing (1949 and 1951 MHz).
Drain Efficiency at OP1dB	η		58		%	

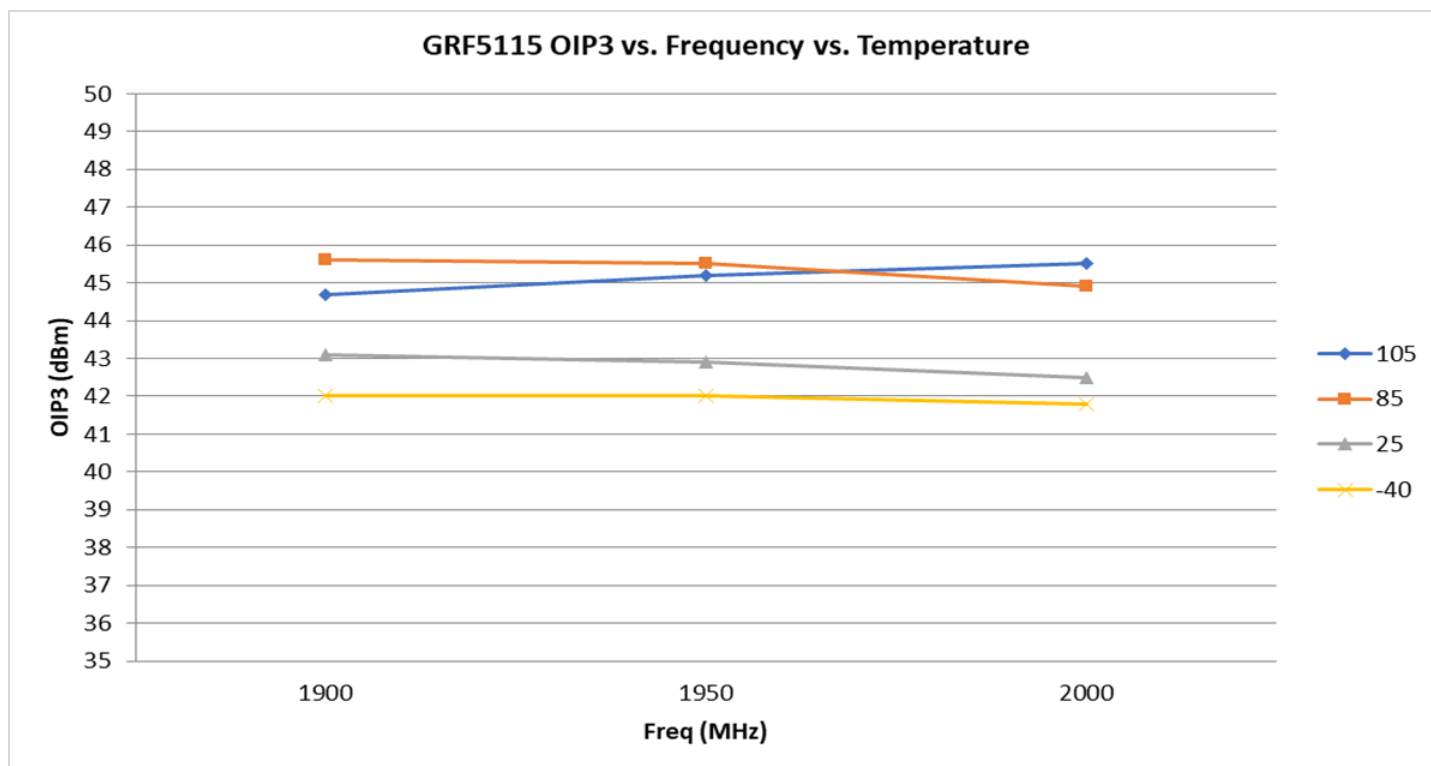
GRF5115 Typical Operating Curves: 1.9 to 2.0 GHz Tune



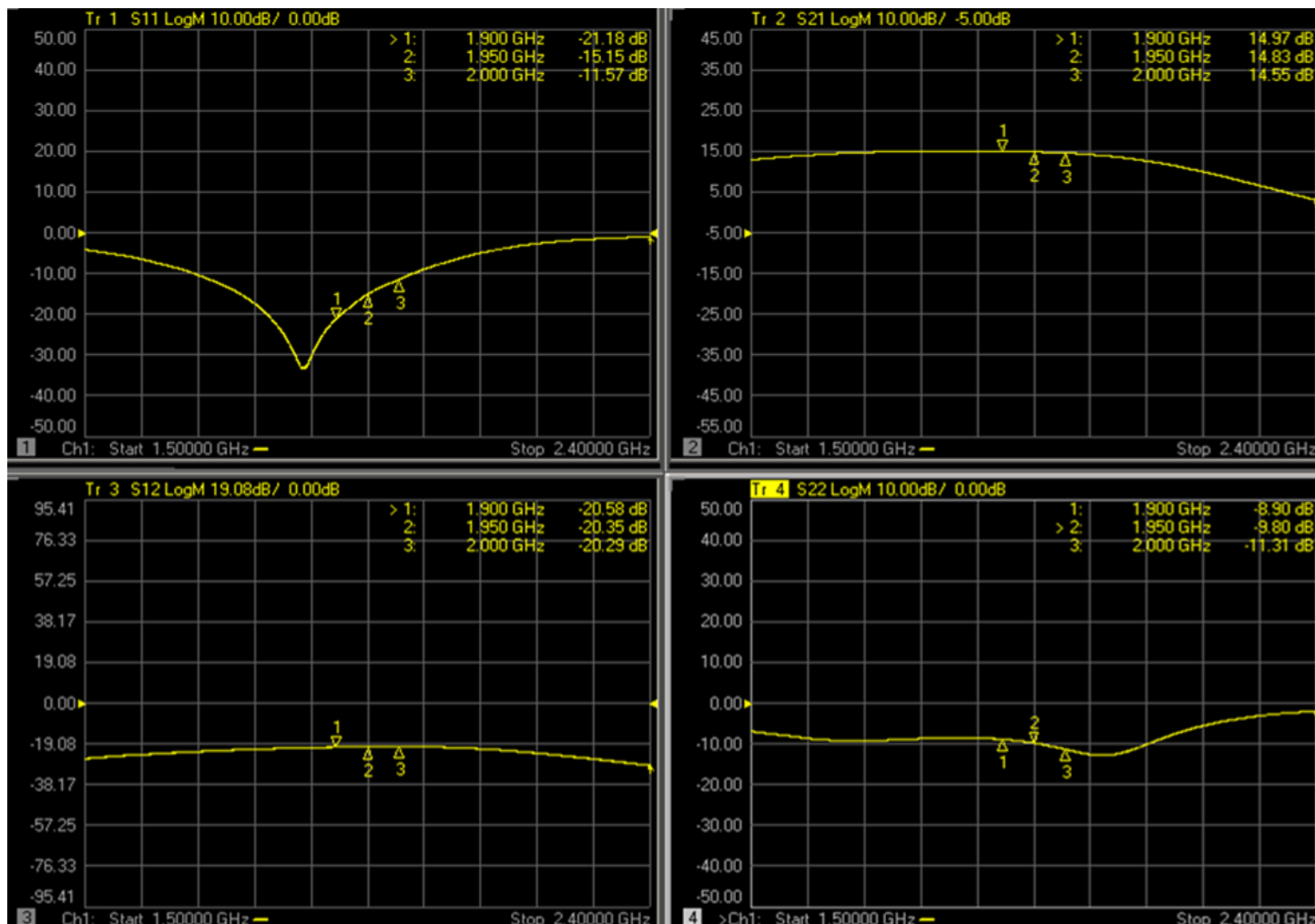
GRF5115 Typical Operating Curves: 1.9 to 2.0 GHz Tune



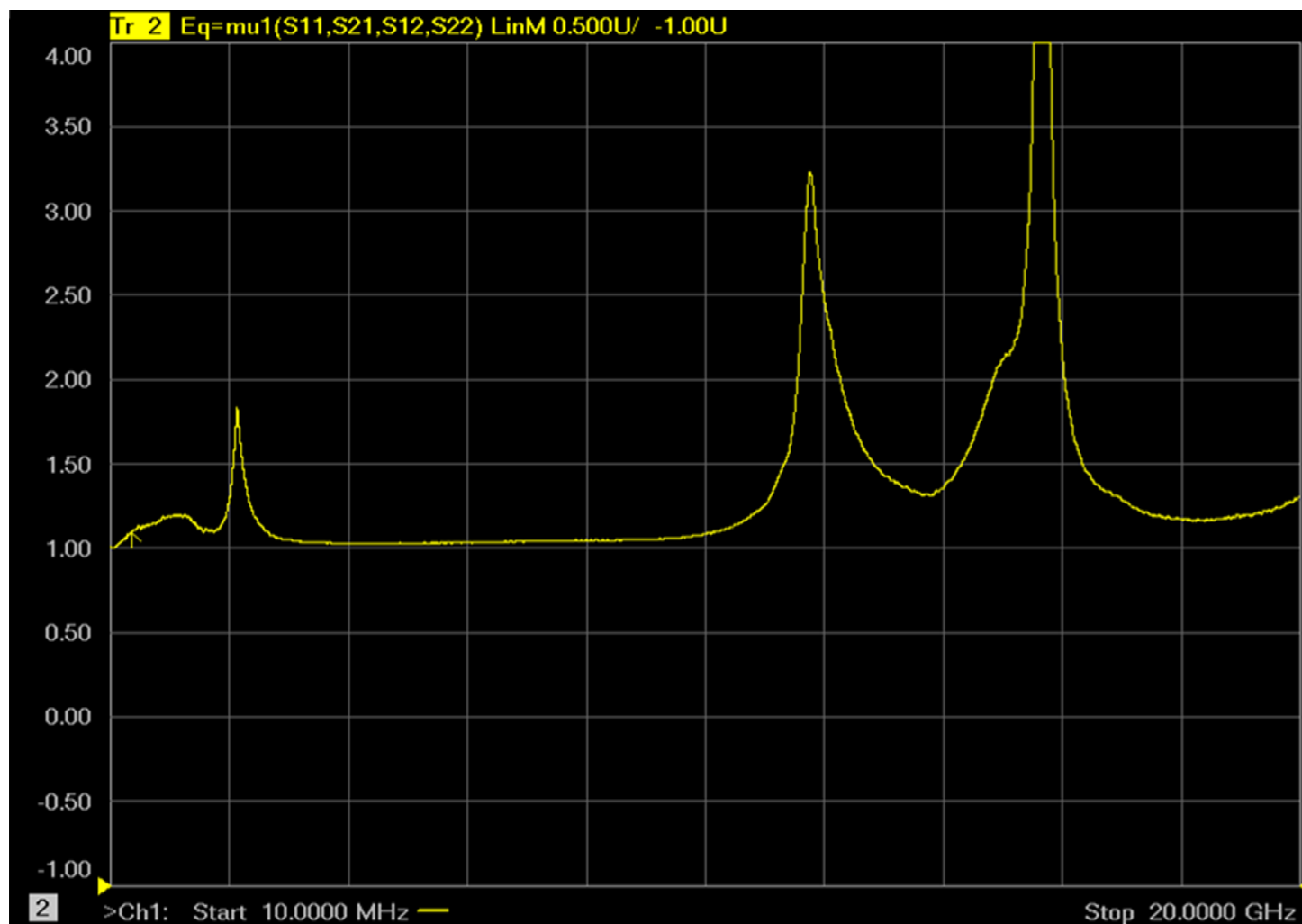
GRF5115 Typical Operating Curves: 1.9 to 2.0 GHz Tune



GRF5115 Typical Operating Curves: S-Parameters (1.9 to 2.0 GHz Tune)



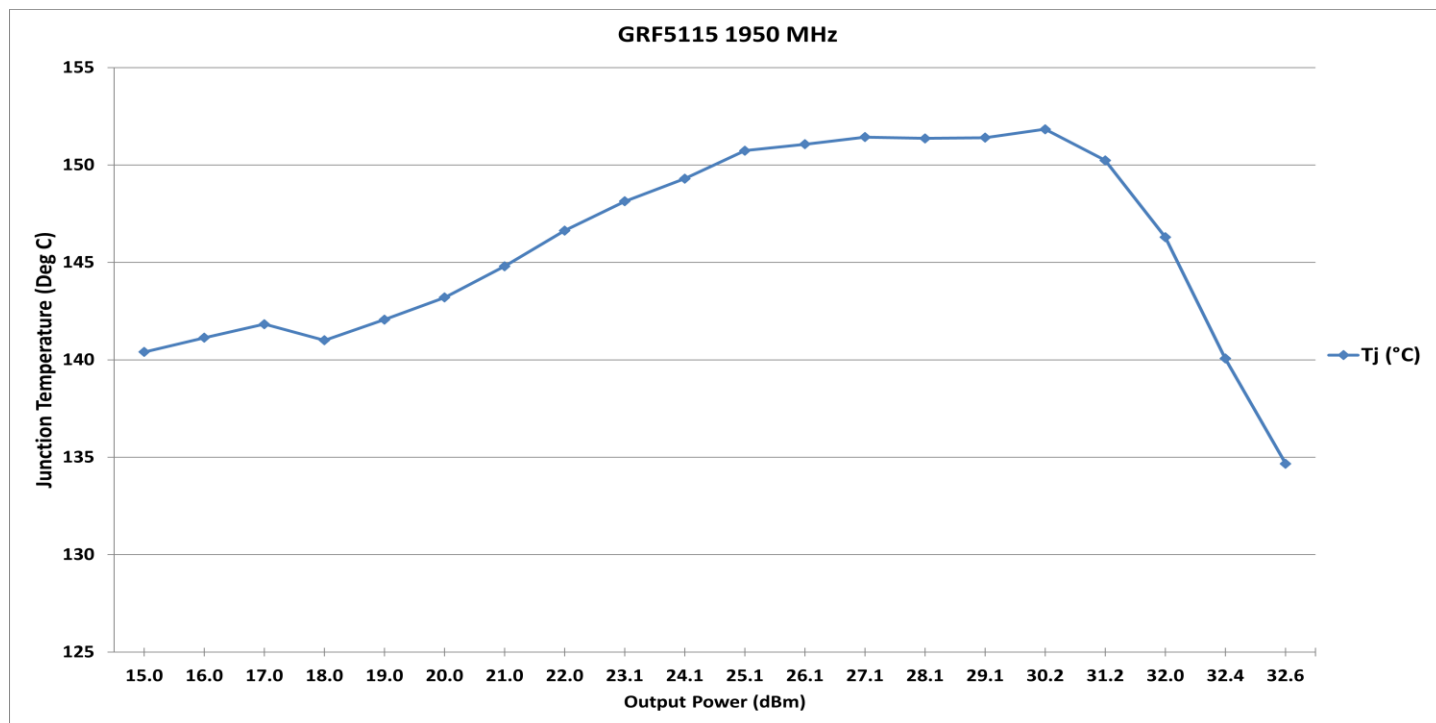
GRF5115 Typical Operating Curves: Stability Mu (10 MHz to 20 GHz)



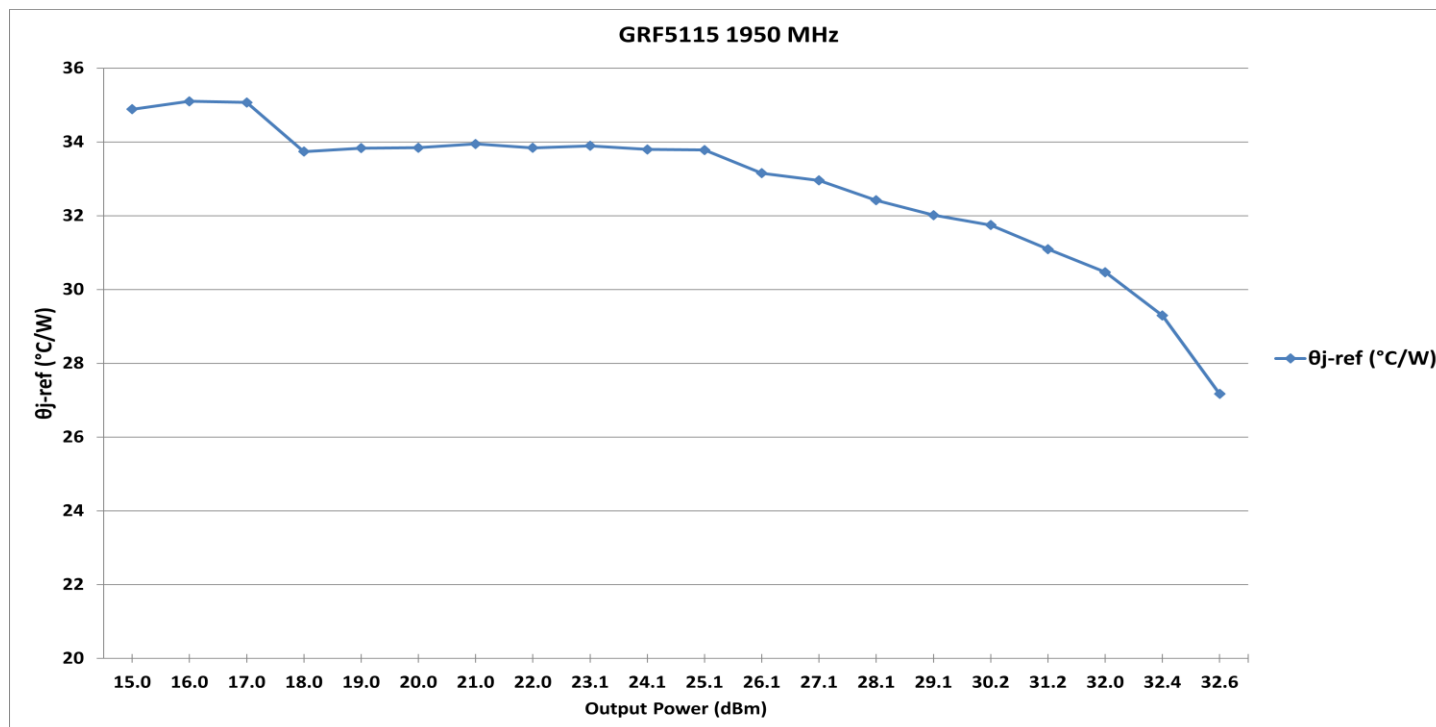
Note: Mu factor ≥ 1.0 implies unconditional stability.

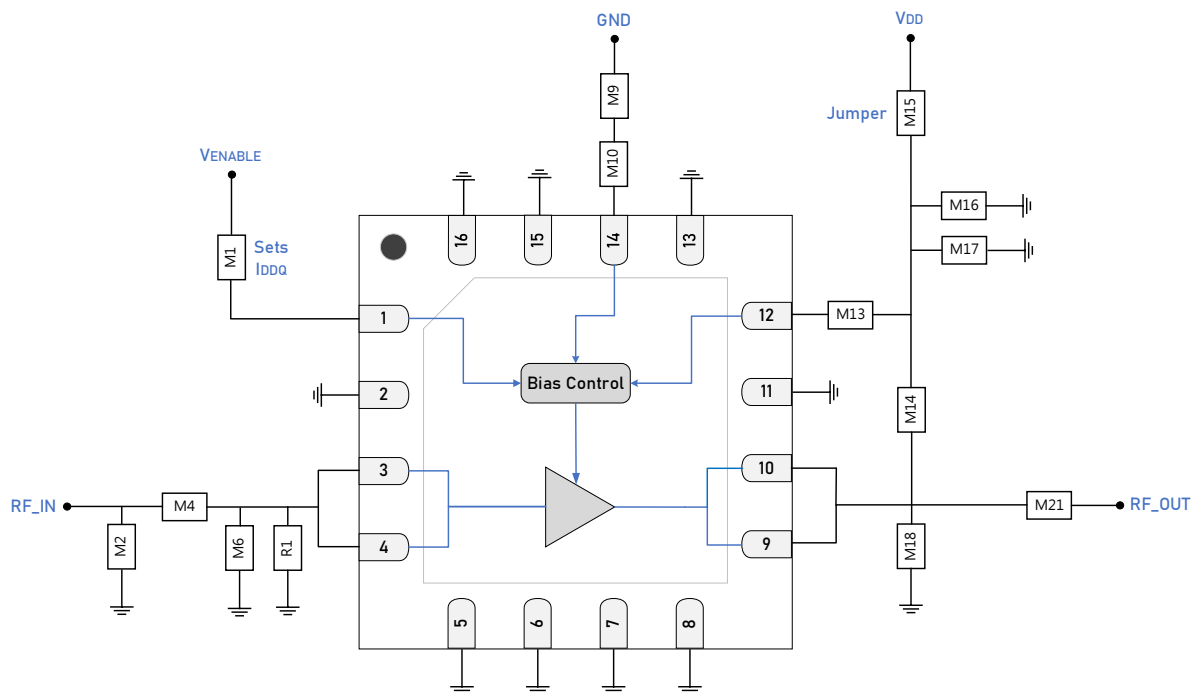
GRF5115 Typical Operating Curves: Per Application Schematic at 85 °C

Junction Temperature vs. Output Power

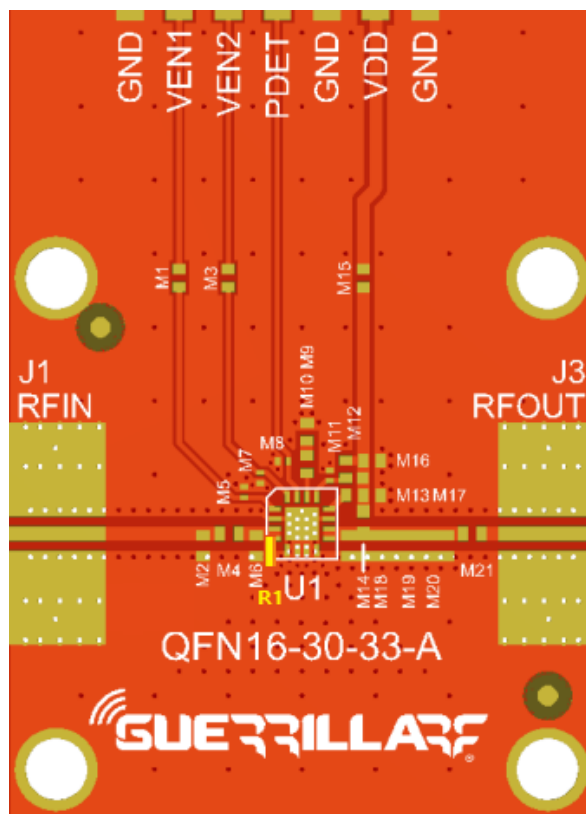


Thermal Resistance vs. Output Power





GRF5115 Standard Evaluation Board Schematic

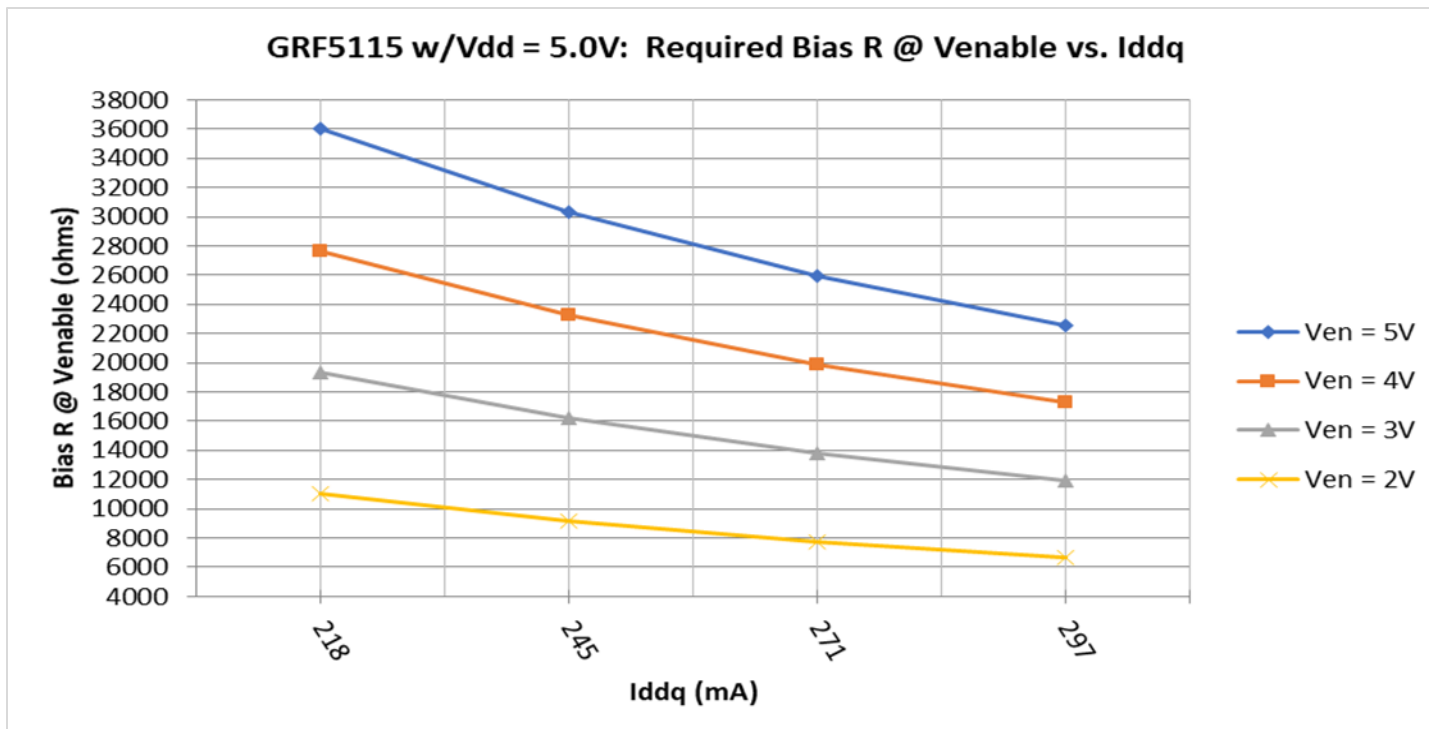
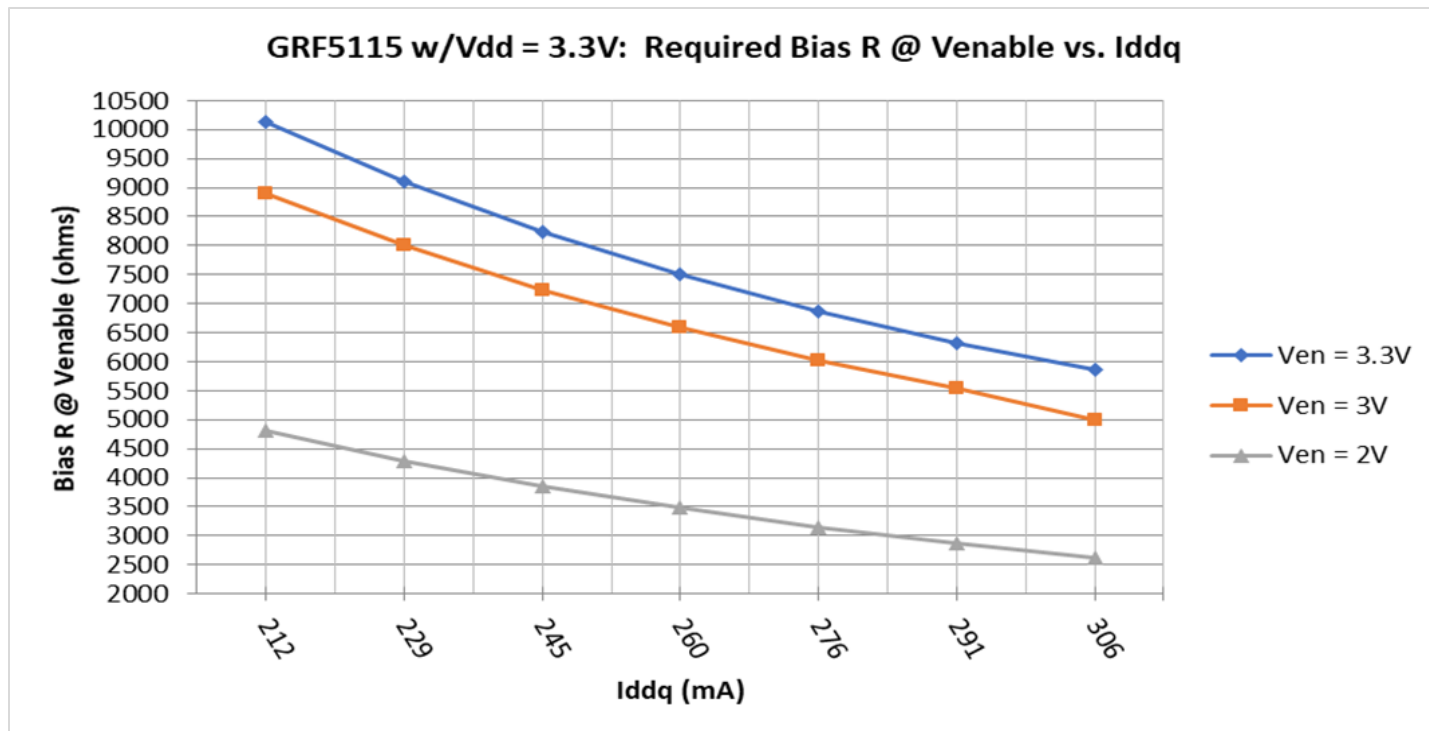


GRF5115 Evaluation Board Assembly Diagram

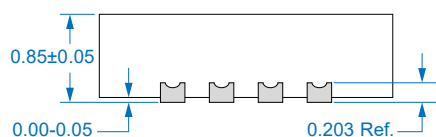
GRF5115 Evaluation Board Assembly Diagram Reference: 1.9 to 2.0 GHz Tune

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1 (sets I _{DDQ})	Resistor	Various	5%	See Curves	0402	ok
M2	Inductor	Murata	LQP	6.2 nH	0402	ok
M4	Capacitor	Murata	GJM	1.5 pF	0402	ok
M6	Capacitor	Murata	GJM	3.9 pF	0402	ok
R1	Resistor	Various	5%	15 kΩ	0402	ok
M9	Resistor	Various	5%	100 kΩ	0402	ok
M10	Resistor	Various	5%	0 Ω	0402	ok
M13	Resistor	Various	5%	150 Ω	0402	ok
M14	Inductor	Coilcraft	HP	8.2 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	100 pF	0402	ok
M18	Capacitor	Murata	GJM	3.9 pF	0402	ok
M21	Capacitor	Murata	GJM	15 pF	0402	ok
Evaluation Board	QFN16-30-33-A					

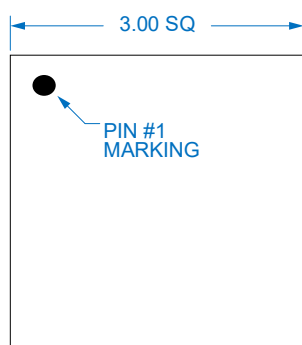
GRF 5115 Bias Resistor Selection Curves:



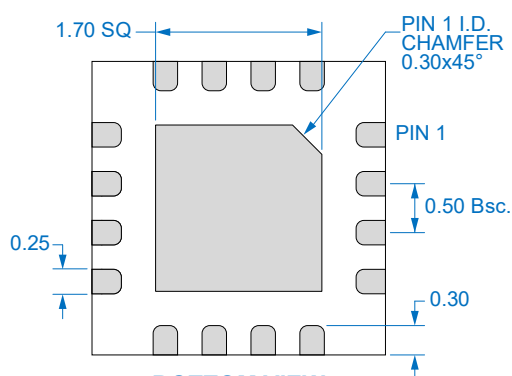
Package Outline Drawing



SIDE VIEW

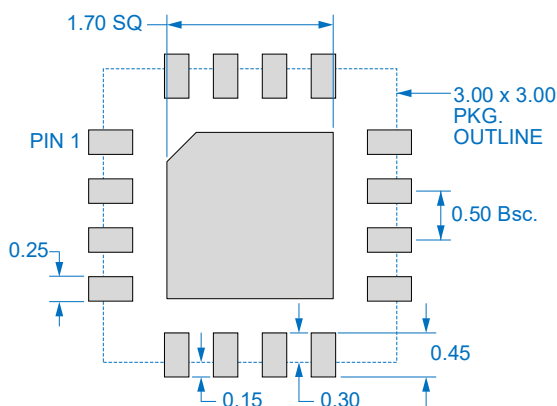


TOP VIEW



BOTTOM VIEW

Recommended PCB Footprint



TOP VIEW

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

Package Marking Diagram



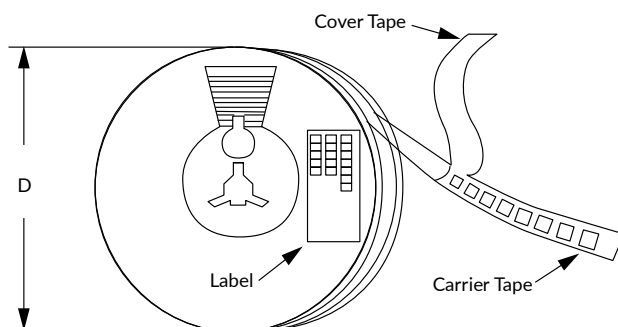
- Line 1: "YY" = YEAR. "WW" = WORK WEEK the device was assembled.
- Line 2: "GRF" = Guerrilla RF.
- Line 3: "XXXX" = Device PART NUMBER.

Tape and Reel Information

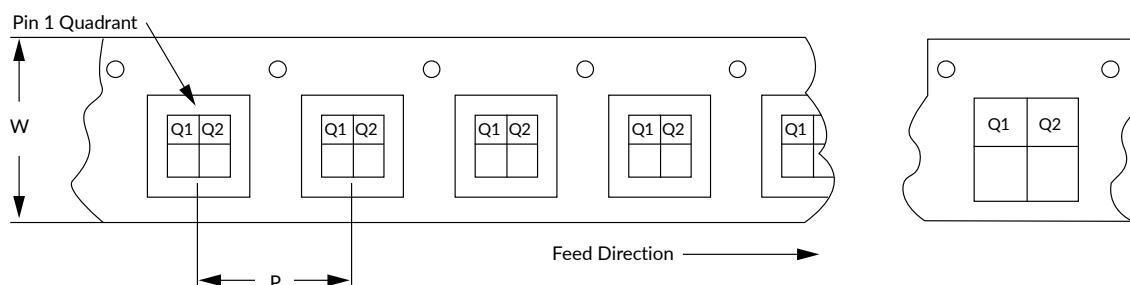
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table,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

Revision History

Revision Date	Description of Change
December 17, 2019	Release Ø Data Sheet.
July 17, 2024	Upgraded Data Sheet to new format. Added new evaluation board.
June 19, 2025	Extended lower frequency range from 100 MHz to 26 MHz.
October 21, 2025	Upgraded Data Sheet to new format only. No change to device or device specifications.
February 10, 2026	Updated $P_{DISS\ MAX}$ and thermal specifications. Added junction temp and thermal resistance plots. Removed Gain upper limit.



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 <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.

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