



GRF2113

Broadband Gain Block 0.03 to 6 GHz

FEATURES

- Flexible Bias: 3 to 6 Volts
- High Gain
- Positive Gain Slope to 2.5 GHz
- Outstanding Linearity
- Compact 2.0 x 2.0 mm DFN-8 Package
- Process: GaAs pHEMT

Reference: 5 V / 108 mA / 2.5 GHz

- Gain: 21.8 dB
- OP1dB: 22.1 dBm
- OIP3: 35.7 dBm
- Evaluation Board Noise Figure: 1.6 dB

APPLICATIONS

- Cellular Infrastructure
- ISM
- SATV
- VHF/UHF
- Small Cells and Cellular Repeaters

DESCRIPTION

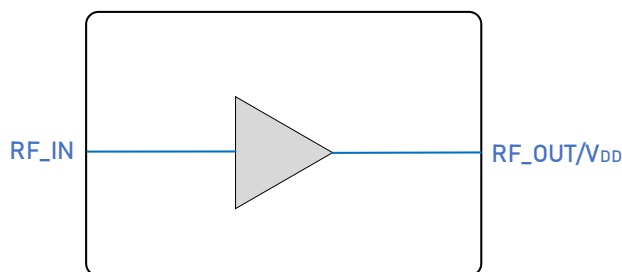
The GRF2113 is a broadband, linear gain block featuring low noise and a slightly positive gain slope to 2.5 GHz. The device is targeted at high linearity applications from 30 MHz to 6 GHz.

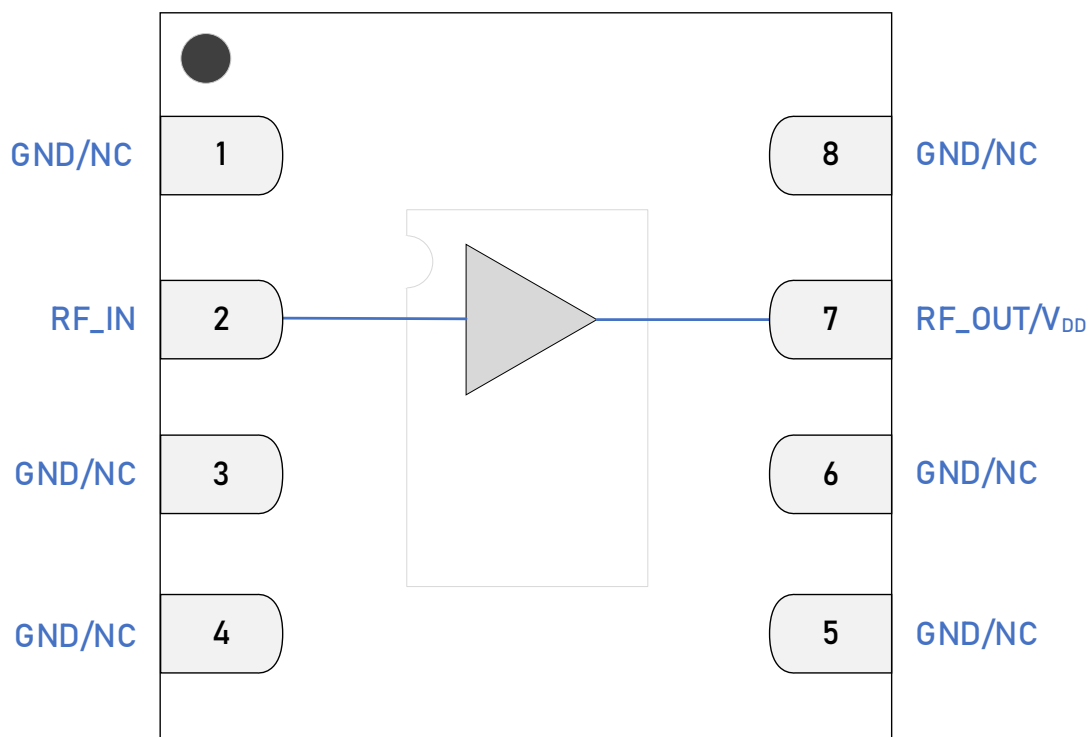
The device can be used over a range of V_{DD} values from 3 to 6 volts with I_{DDQ} directly proportional to V_{DD} .

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

Additional tunes can be found on the GRF2113 "Custom Tunes" product page: [GRF2113 Custom Tunes](#)

BLOCK DIAGRAM





DFN-8 2.0 x 2.0 mm Pin Out (Top View)



Pin Assignments

Pin	Name	Description	Note
2	RF_IN	RF Input	External match must provide DC block.
1, 3, 4, 5, 6, 8	GND/NC	Ground or No Connect	No internal connection to die. We recommend connecting these pins to ground.
7	RF_OUT/V _{DD}	RF Output	Provides device V _{DD} via external bias inductor or ferrite bead.
PKG BASE	GND	Ground	Provides DC and RF ground 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.

Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	3	6	V
RF Input Power: CW, Load VSWR < 2:1, $V_{DD} = 5$ V.	$P_{IN\ MAX}$		17	dBm
Operating Temperature (package base).	$T_{PKG\ BASE}$	-40	115	°C
Maximum Channel Temperature (MTTF > 10 ⁶ hours).	T_{MAX}		170	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		840	mW

Electrostatic Discharge

Charged Device Model	CDM	750		V
Human Body Model	HBM	500		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	5	6	V	
RF Frequency Range	F _{RF}	0.03	2.5	6	GHz	Typical application schematic with external matching components (notes 1 & 2).
Operating Temperature Range	T _{PKG BASE}	-40		115	°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: [GRF2113 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. $V_{DD} = 5\text{ V}$, $F_{TEST} = 2.5\text{ GHz}$, $50\ \Omega$ 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.		
Supply Current	I_{DD}		108		mA	$V_{DD} = 5\text{ V}$.

Thermal Data

Thermal Resistance: (Infrared Scan)	Θ_{JC}		73		$^{\circ}\text{C}$	On standard evaluation board (note 3).
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Note 3: MTTF > 10^6 hours for $T_j \leq 170\text{ }^{\circ}\text{C}$.

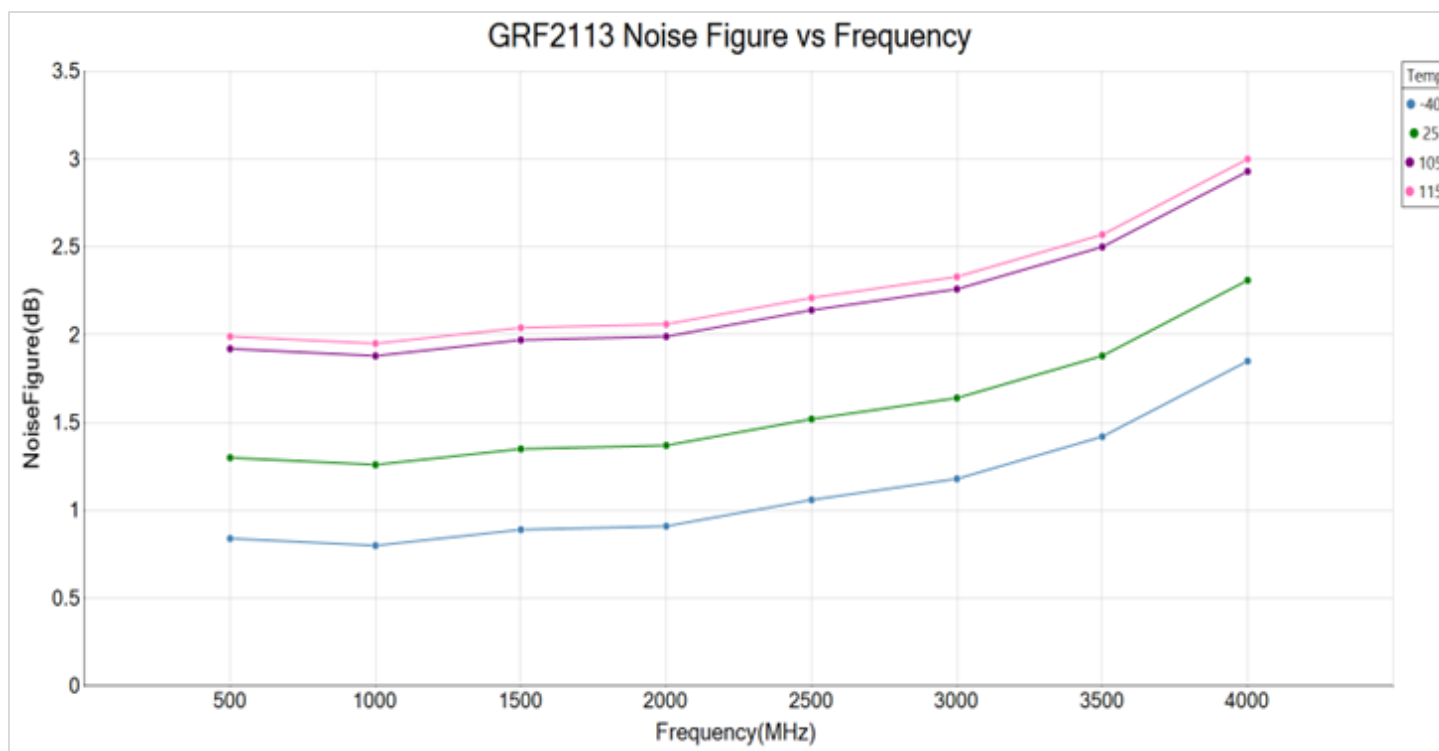
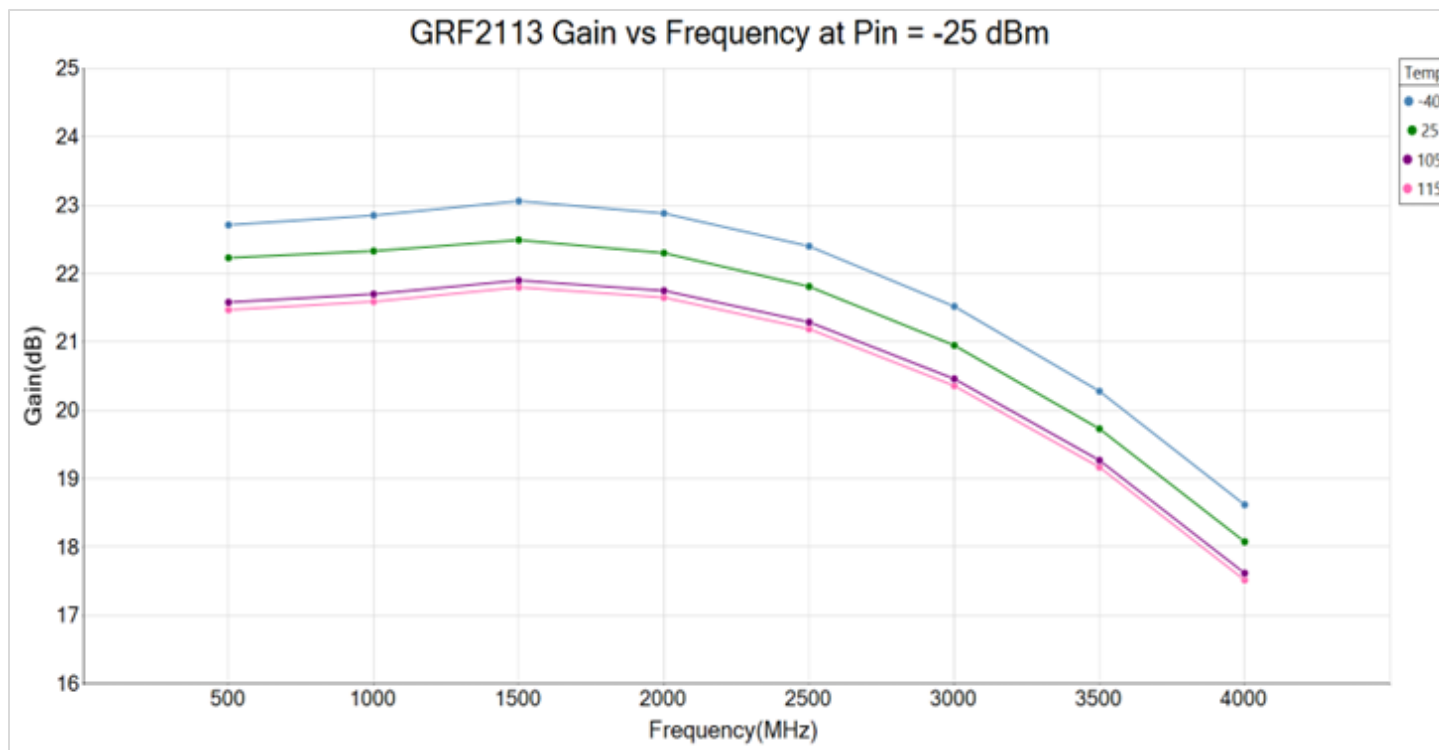


Nominal Operating Parameters – RF

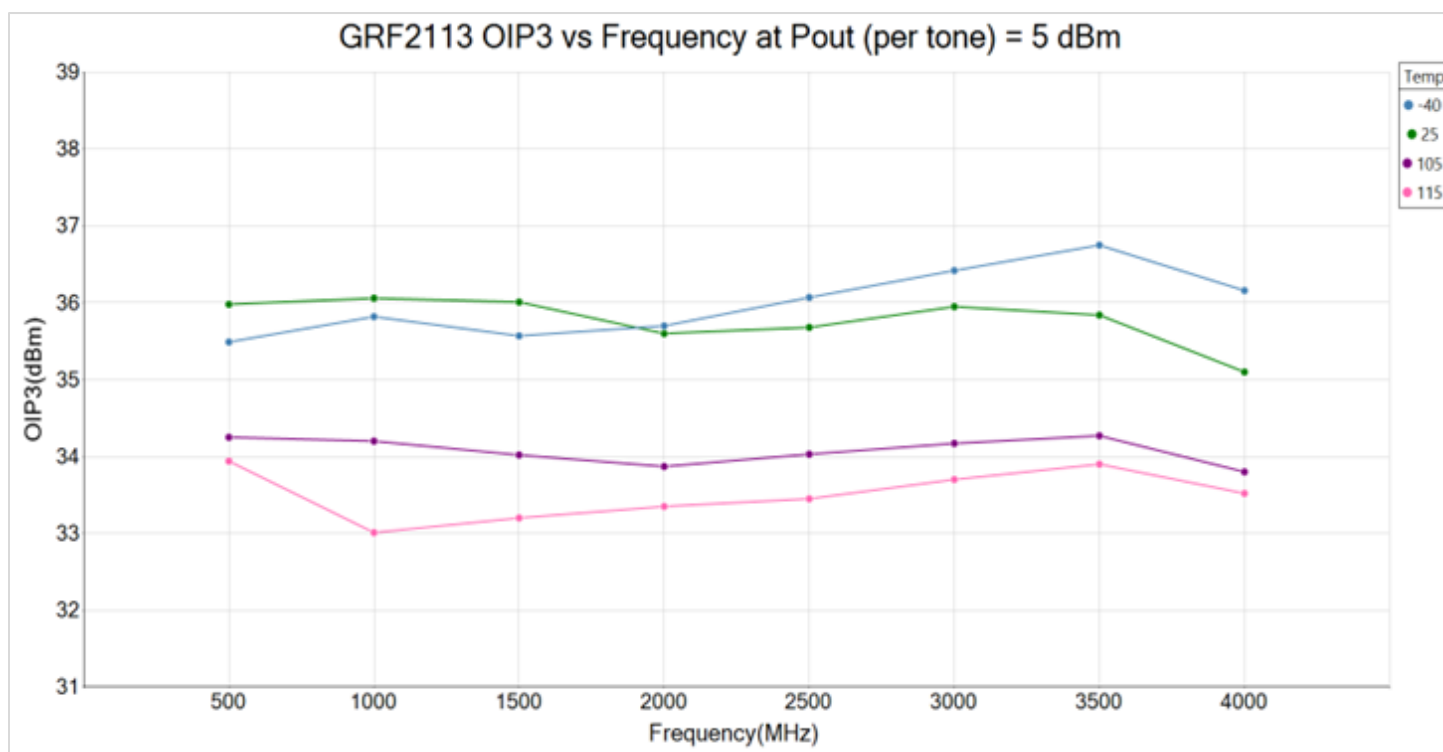
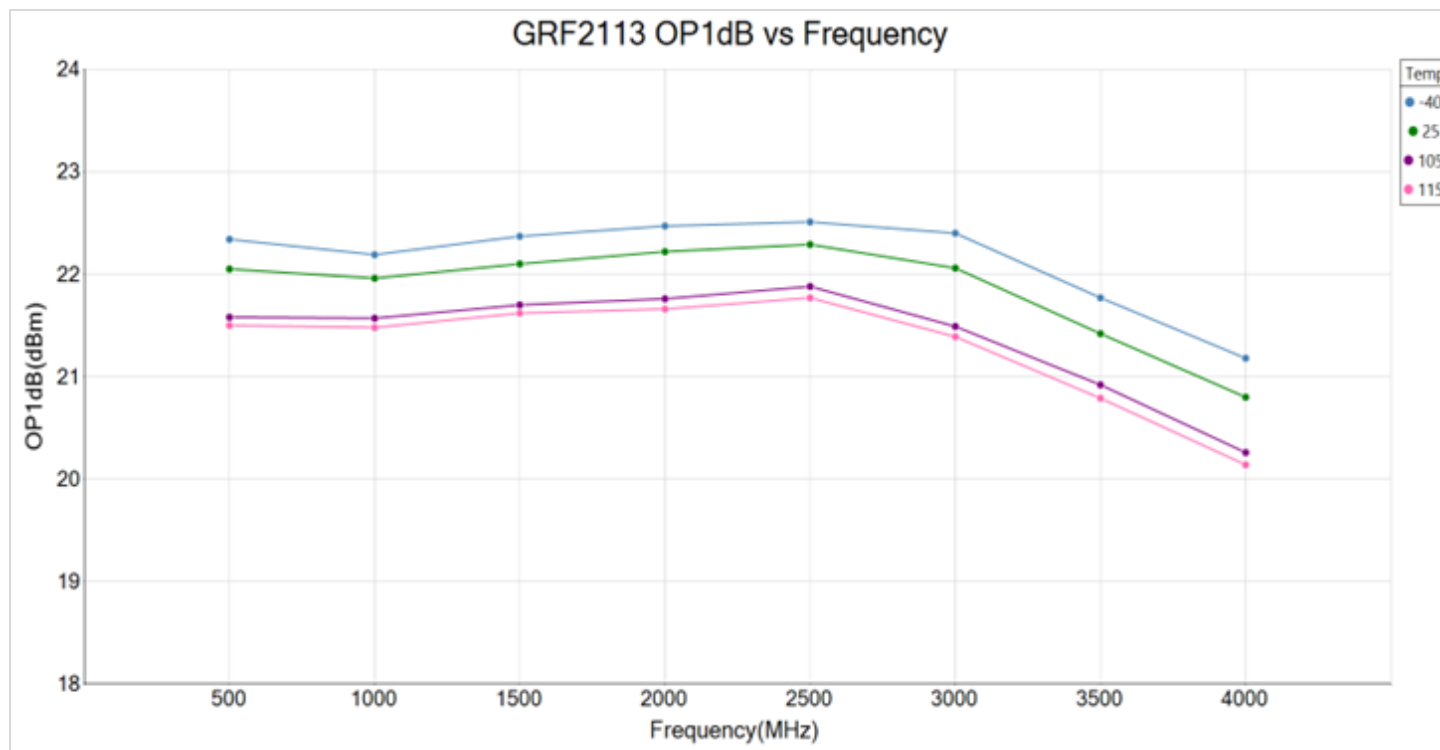
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Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain	S21		21.8		dB	
Reverse Isolation	S12		< -22		dB	
Noise Figure	NF		1.6		dB	On standard evaluation board (SMA to SMA).
Output 1 dB Compression Power	OP1dB		22.1		dBm	
Output 3 rd Order Intercept Point	OIP3		35.7		dBm	+5 dBm P_{OUT} per tone at 2 MHz spacing (2499 and 2501 MHz).

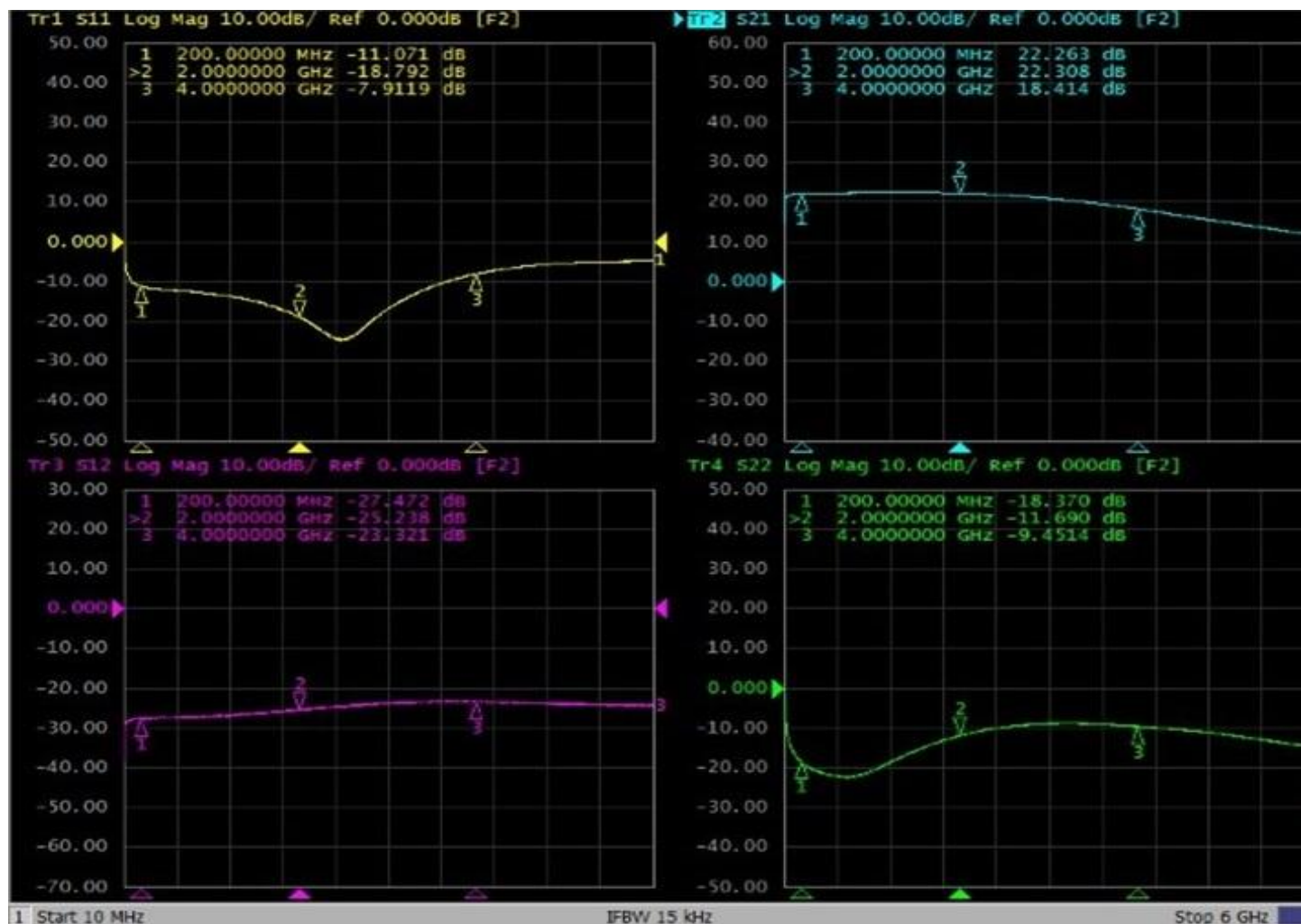
GRF2113 Typical Operating Curves: 5 V, 0.5 to 4 GHz Tune



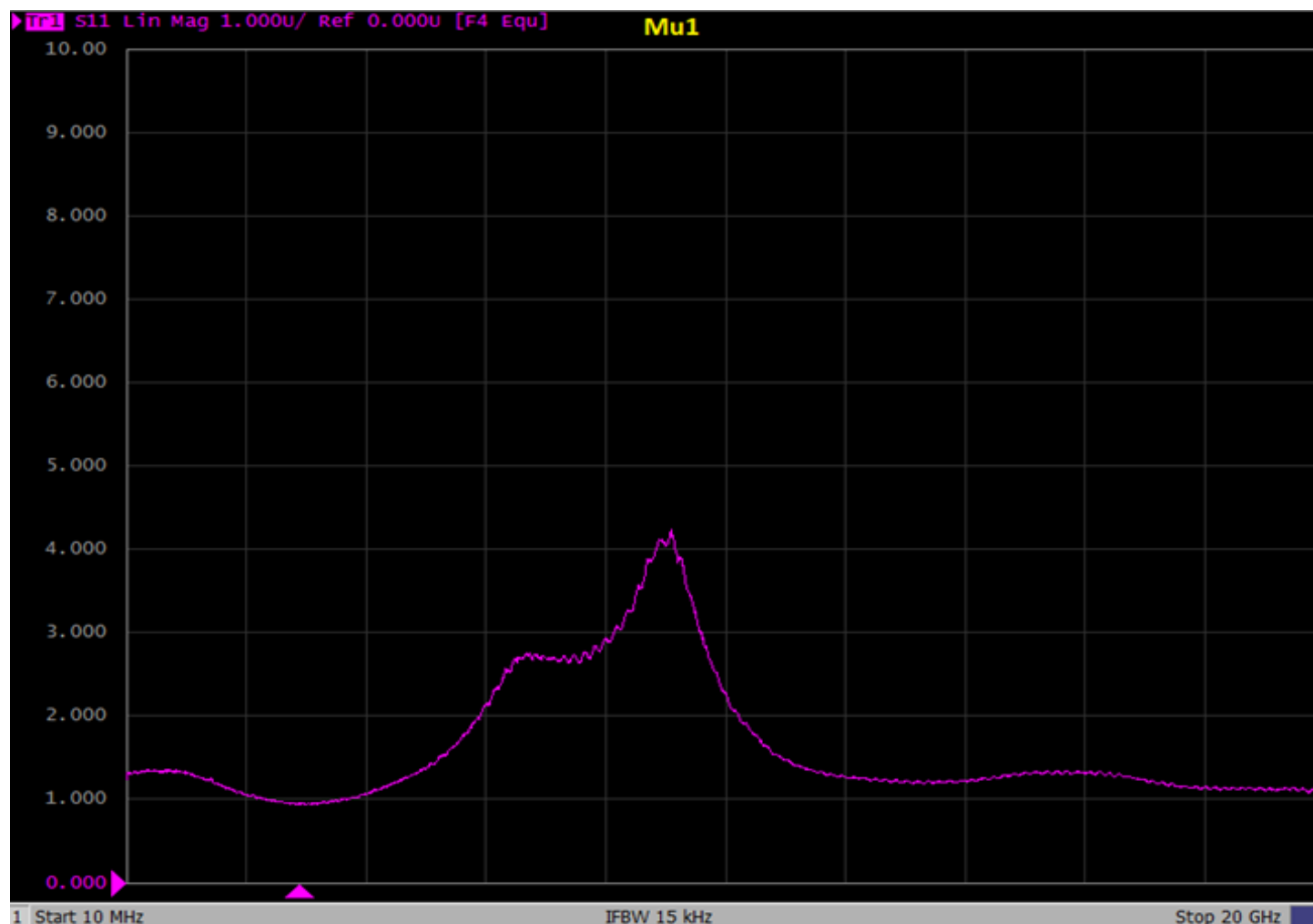
GRF2113 Typical Operating Curves: 5 V, 0.5 to 4 GHz Tune



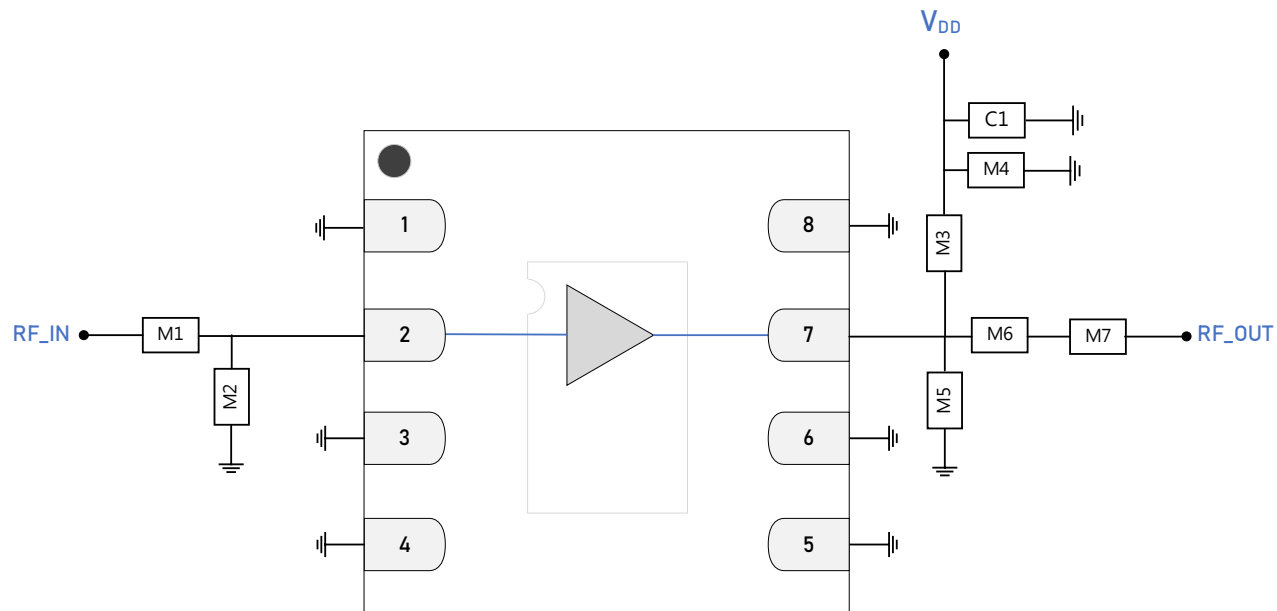
GRF2113 Typical Operating Curves: S-Parameters (0.2 to 4 GHz)



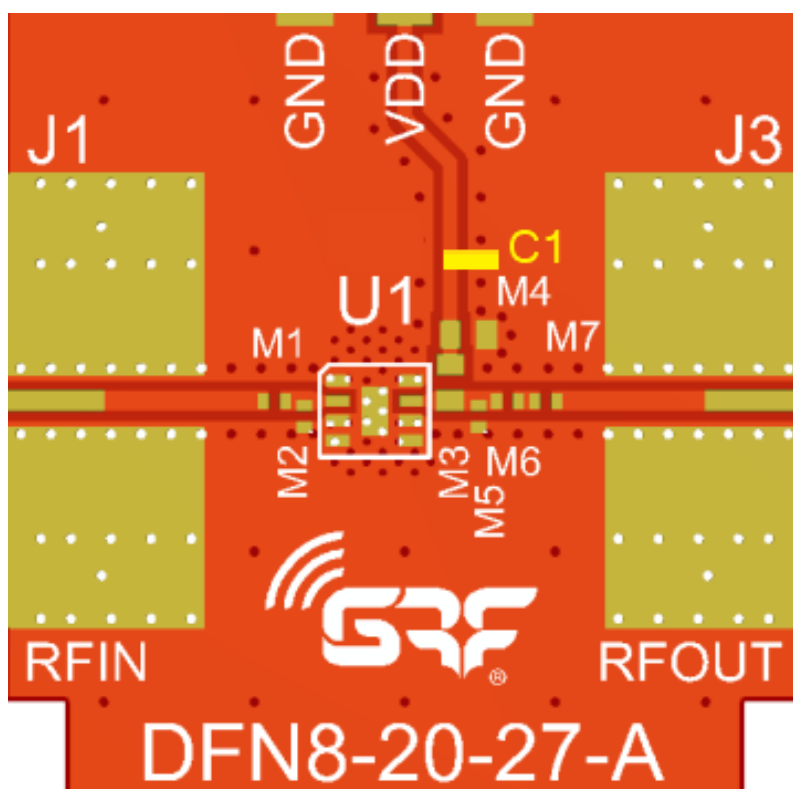
GRF2113 Typical Operating Curves: Stability Mu Factor (10 MHz to 20 GHz)



Note: Mu Factor ≥ 1.0 implies unconditional stability.



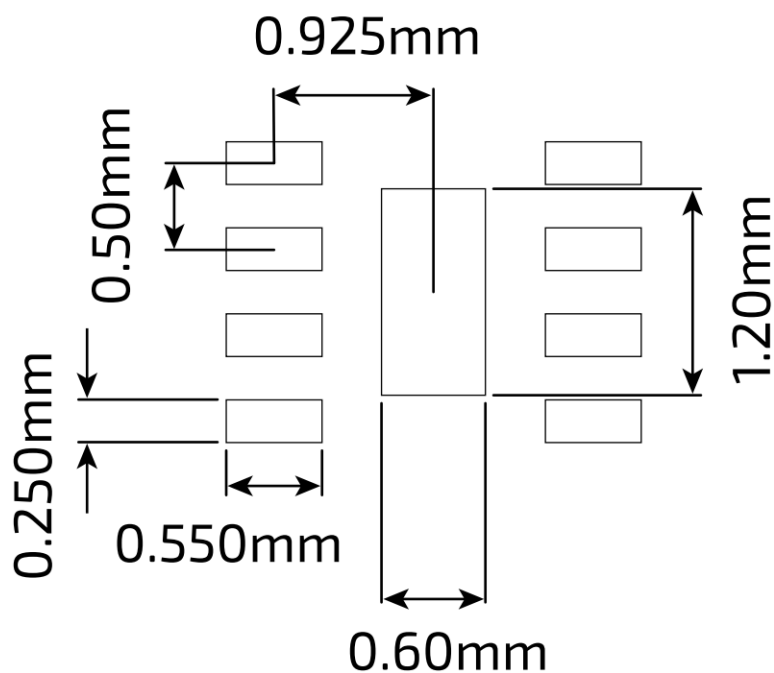
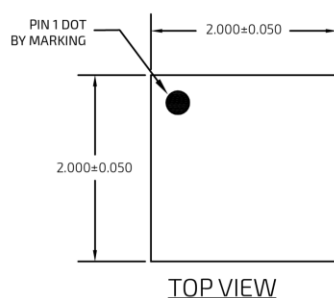
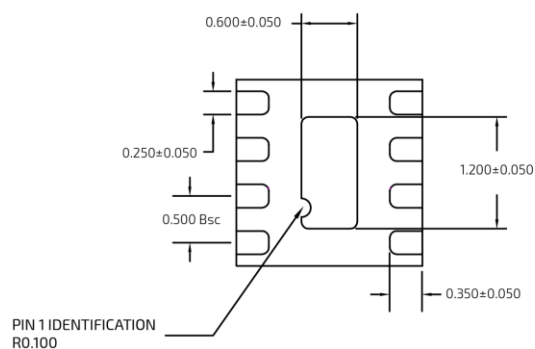
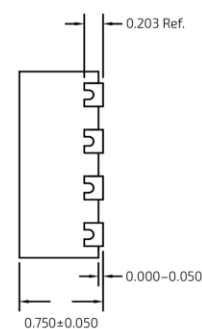
GRF2113 Standard Evaluation Board Schematic



GRF2113 Evaluation Board Assembly Diagram

**GRF2113 Evaluation Board Assembly Diagram Reference (0.5 to 4 GHz Tune)**

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
C1, M1, M7	Capacitor	Murata	GRM	1000 pF	0201	ok
M2	DNP					
M3	Ferrite Bead	Murata	BLM15HG102BH1	1 k Ω	0402	ok
M4	Capacitor	Murata	GRM	1000 pF	0402	ok
M5	Capacitor	Murata	GJM	0.3 pF	0201	ok
M6	Resistor	Various	5%	3.4 Ω	0201	ok
Evaluation Board	DFN8-20-27-A					


DFN-8 2.0 x 2.0 mm Suggested PCB Footprint (Top View)

TOP VIEW

BOTTOM VIEW

SIDE VIEW
DFN-8 2.0 x 2.0 mm Package Dimensions

Package Marking Diagram



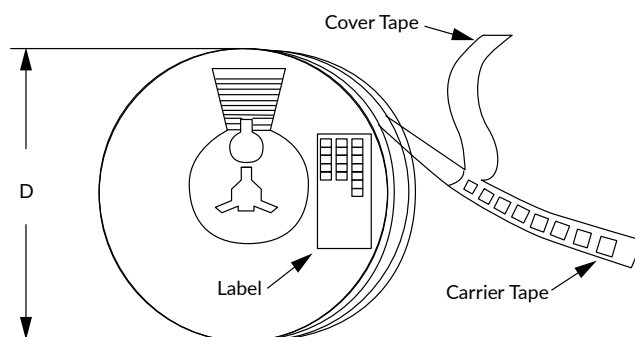
- Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK the device was assembled.
- Line 2: "XXXX" = Device PART NUMBER.

Tape and Reel Information

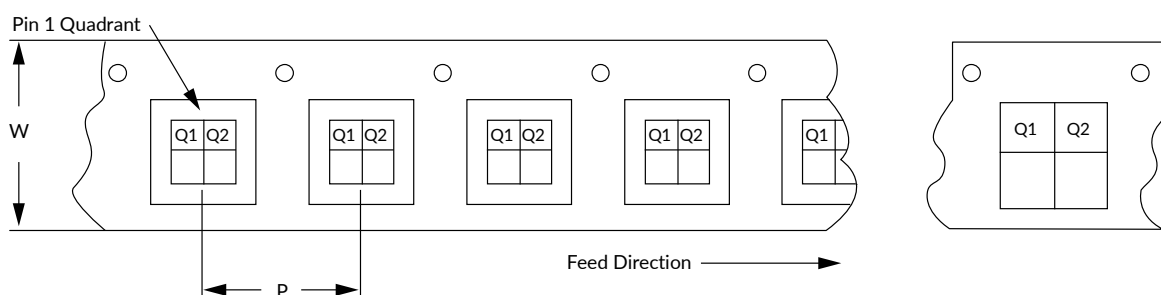
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table, 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: [Package Manufacturing Information | Guerrilla RF \(guerrilla-rf.com\)](https://www.guerrilla-rf.com/package-manufacturing-information)



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
August 24, 2023	Advance Data Sheet.
November 13, 2023	Preliminary Data Sheet.
January 9, 2024	Added C1 to evaluation board, schematic and BOM.
June 6, 2024	Added new Mu plot.
December 6, 2024	Release Ø Data Sheet.
October 22, 2025	Upgraded Data Sheet to new format. No change to device or device specifications.



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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