DATA SHEET

RELEASE B DATA SHEET





GRF2071W

Ultra-Low Noise Amplifier 0.7 to 2.7 GHz

FEATURES

- Excellent Noise Figure Performance
- High Gain
- Outstanding Linearity
- Flexible Bias Voltage and Current
- Drop-in Compatible with Legacy SDARS LNA Solutions
- Compact 2.0 x 2.0 mm DFN-8 Package
- Process: GaAs pHEMT

AEC-Q100 Grade 2 Qualified

- 100% Device Reflow at Assembly
- 100% Optical Die Inspection

Reference: 5 V / 70 mA / 1900 MHz

- Gain: 19 dB
- OIP3: 36 dBm
- OP1dB: 20 dBm
- Evaluation Board Noise Figure: 0.36 dB

Reference: 5 V / 70 mA / 2332.5 MHz

- Gain: 17 dB
- OIP3: 36 dBm
- OP1dB: 20 dBm
- Evaluation Board Noise Figure: 0.45 dB

APPLICATIONS

- SDARS LNA
- Cellular Boosters (Compensator)
- Cellular Infrastructure
- High Performance GPS

DESCRIPTION

The GRF2071W is a linear LNA designed for SDARS, GPS, small cell, and other high performance RF applications requiring ultra-low noise figure (NF), high gain and linearity.

It is an ideal LNA solution for high-performance, multi-stage SDARS LNA solutions.

This device is a member of a family of automotive-qualified, pin-compatible, amplifiers to include:

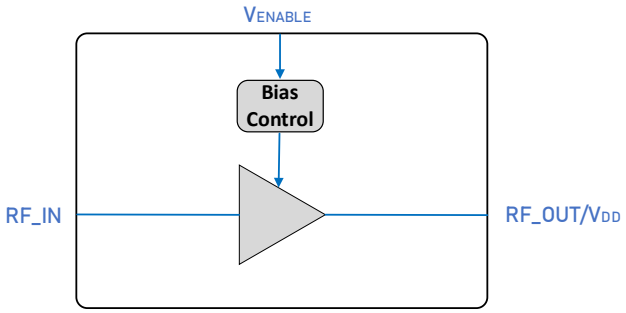
GRF2071W: 0.7 to 2.7 GHz

GRF2073W: 1.0 to 6.8 GHz

GRF2074W: 1.0 to 6.0 GHz

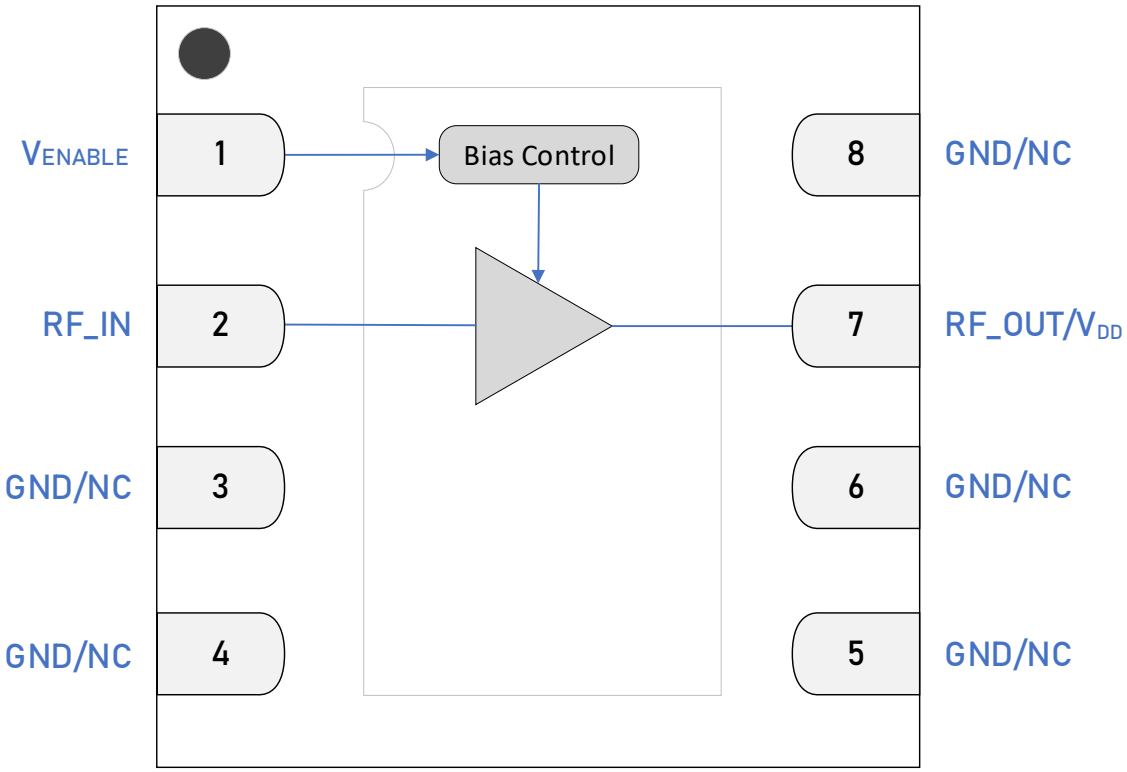
Please consult with the GRF applications engineering team for application notes and custom tuning/evaluation board data. De-embedded S-Parameters with Noise Parameters are available on the website.

BLOCK DIAGRAM



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2.0 x 2.0 mm DFN-8 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 device.
2	RF_IN	RF Input	External match must provide DC block.
3, 4, 5, 6, 8	GND/NC	Ground or No Connect	No internal connection to die. We recommend connecting these pins to GND.
7	RF_OUT/V_{DD}	RF Output	Provides device V_{DD} via external bias inductor.
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.

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Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	0	6	V
RF Input Power: CW, Load VSWR < 2:1, V_{DD} = 5 V	$P_{IN\ MAX}$		23	dBm
Operating Temperature (package base)	$T_{PKG\ BASE}$	-40	105	°C
Maximum Channel Temperature (MTTF > 10^6 hours)	T_{MAX}		170	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		500	mW

Electrostatic Discharge

Charged Device Model	CDM	1500		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*

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Recommended Operating Conditions

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	0	5	6	V	
Operating Temperature (package base)	$T_{PKG\ BASE}$	-40		105	°C	
RF Frequency Range	F_{RF}	0.7	1.9	2.7	GHz	Typical application schematic with external matching components **(notes 1 & 2)**.
RF_IN Port Impedance	Z_{RFIN}		50		Ω	Single-ended.
RF_OUT Port Impedance	Z_{RFOUT}		50		Ω	Single-ended.

Note 1: Operation outside this range is possible, but with degraded performance of some parameters. Examples of other optimized tunes can be found here: GRF2071W 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

The following conditions apply unless noted otherwise: Typical application schematic using the 0.7 to 2.7 GHz tuning set, V_{DD} = 5 V, V_{ENABLE} = 5 V, I_{DD} = 70 mA, M3 = 1070 Ω, F_{TEST} = 1.9 GHz, $T_{PKG\ BASE}$ = 25 °C. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Supply Current	I_{DD}	50	70	90	mA	
Enable Current	I_{ENABLE}		3		mA	
Switching Rise Time	T_{RISE}		700		ns	Disabled mode to Gain mode (**note 3**).
Switching Fall Time	T_{FALL}		300		ns	Gain mode to Disabled mode **(note 4)**.
Disabled Mode						
Leakage Current	$I_{LEAKAGE}$		150	250	µA	V_{DD} = 5 V, V_{ENABLE} = 0 V.
Thermal Data						
Thermal Resistance: (Infrared Scan)	Θ_{JC}		60		°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 $T_{CHANNEL}$ ≤ 170 °C.

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Nominal Operating Parameters – RF

The following conditions apply unless noted otherwise: Typical application schematic using the 0.7 to 2.7 GHz tuning set, V_{DD} = 5 V, V_{ENABLE} = 5 V, I_{DD} = 70 mA, M3 = 1070 Ω, $T_{PKG\ BASE}$ = 25 °C. Evaluation board losses are included within the specifications.

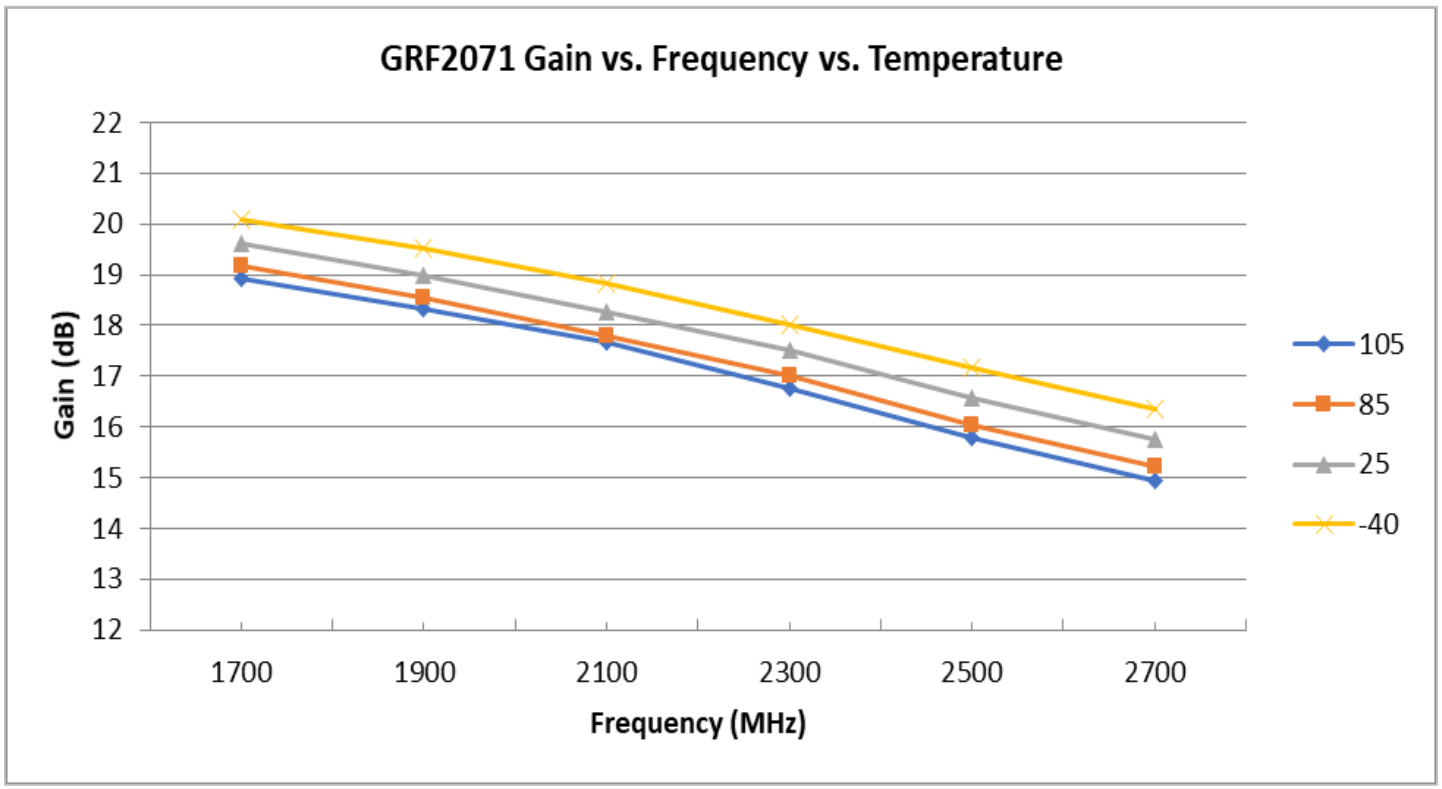
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		1900		MHz	
Gain	S21	18	19	21	dB	
Reverse Isolation	S12		< -24		dB	
Noise Figure	NF		0.36	0.56	dB	On standard evaluation board.
Output 3rd Order Intercept Point	OIP3		36		dBm	+4 dBm P_{OUT} per tone at 2 MHz spacing (1899 and 1901 MHz).
Output 1 dB Compression Power	OP1dB	18.5	20		dBm	

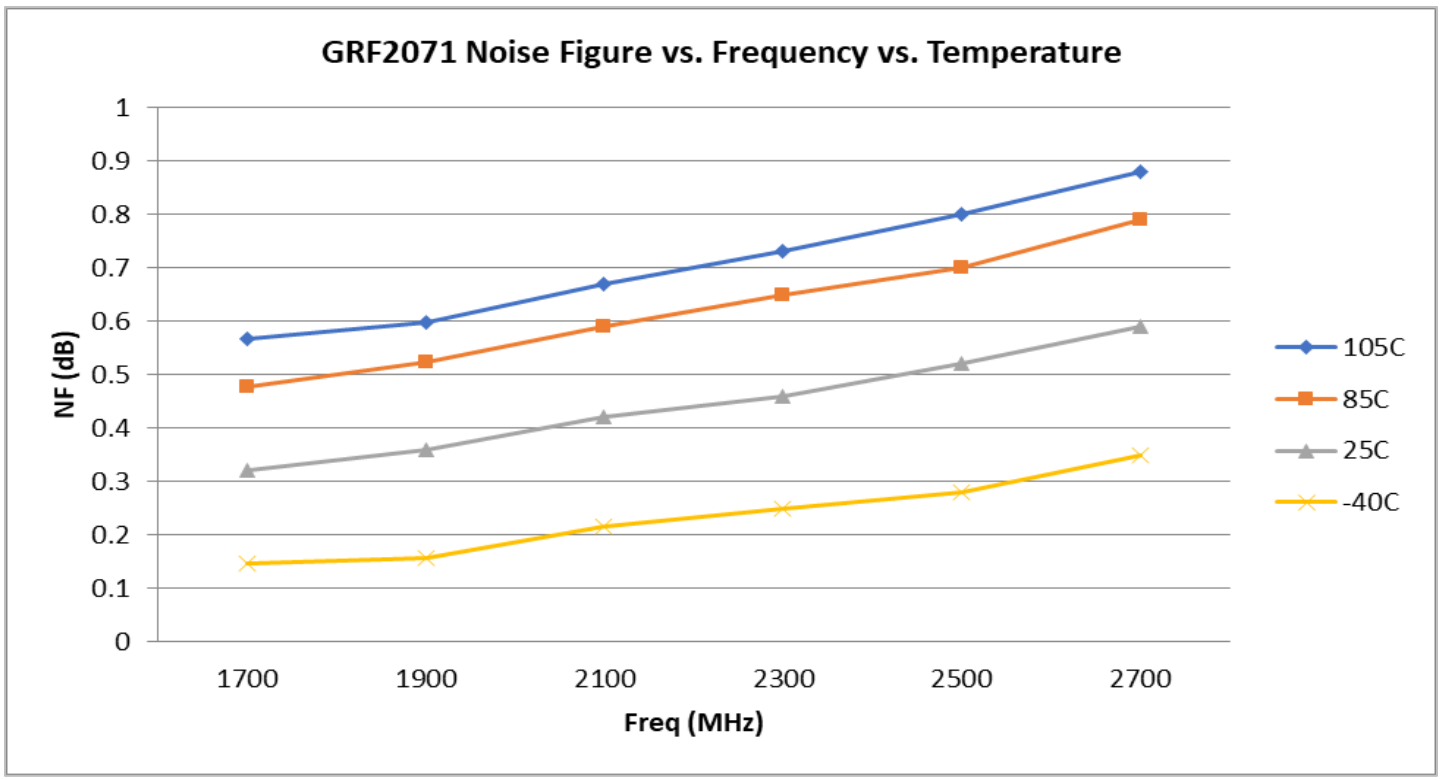
Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		2332.5		MHz	
Gain	S21	16	17	19	dB	
Reverse Isolation	S12		< -24		dB	
Noise Figure	NF		0.45	0.65	dB	On standard evaluation board.
Output 3rd Order Intercept Point	OIP3		36.5		dBm	+4 dBm P_{OUT} per tone at 2 MHz spacing (2331.5 and 2333.5 MHz).
Output 1 dB Compression Power	OP1dB	18.5	20		dBm	

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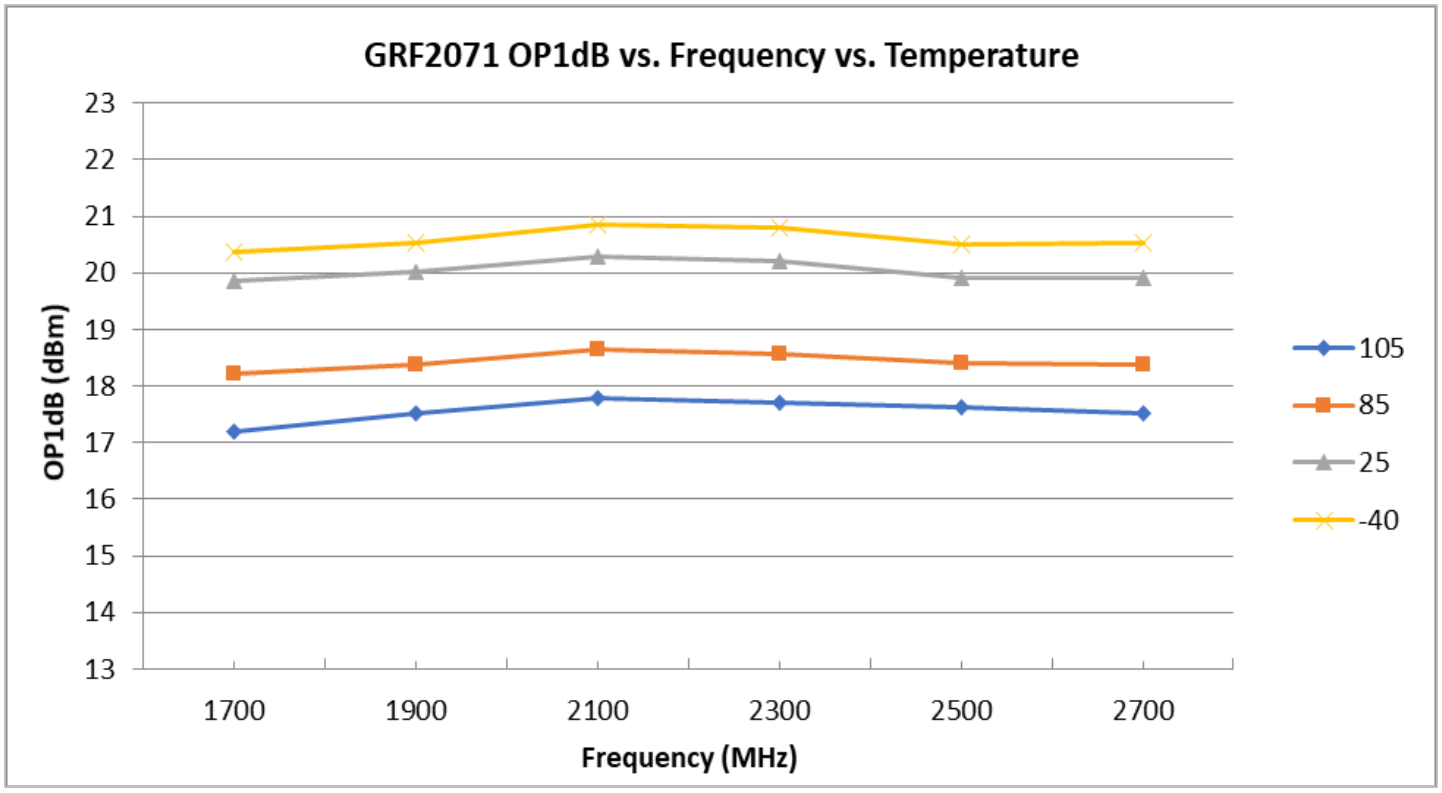
GRF2071W Typical Operating Curves: 1.7 to 2.7 GHz Tune

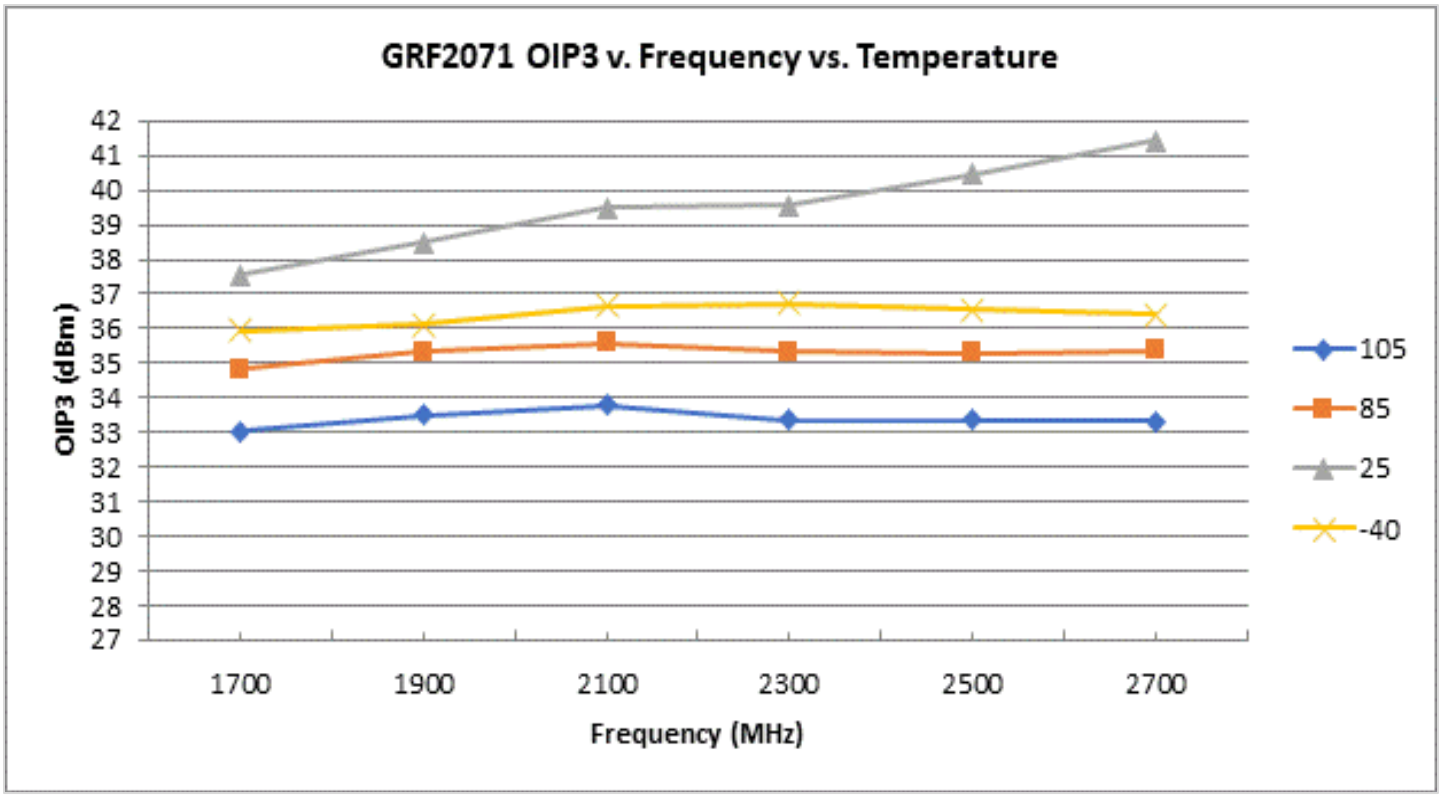




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GRF2071W Typical Operating Curves: 1.7 to 2.7 GHz Tune

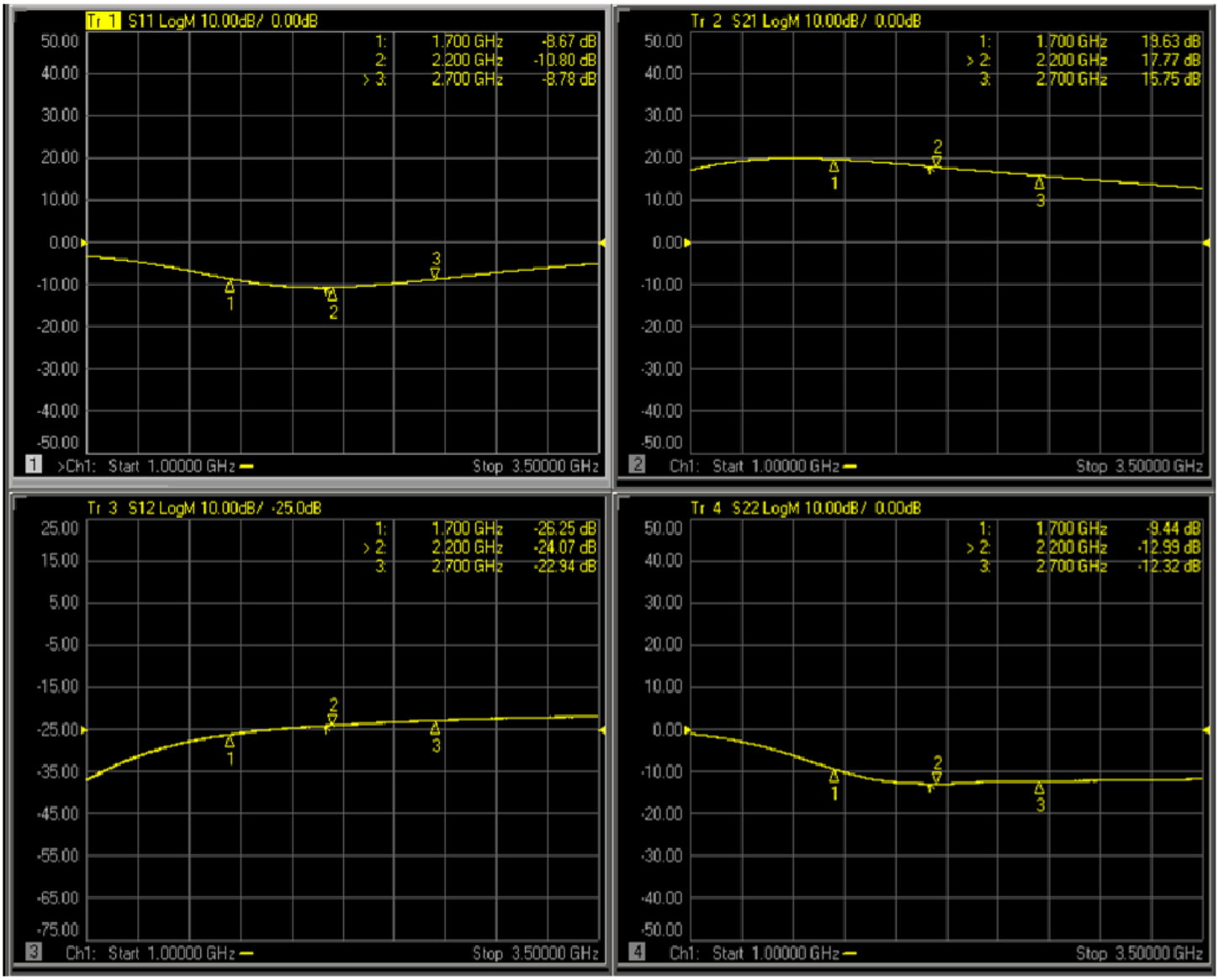




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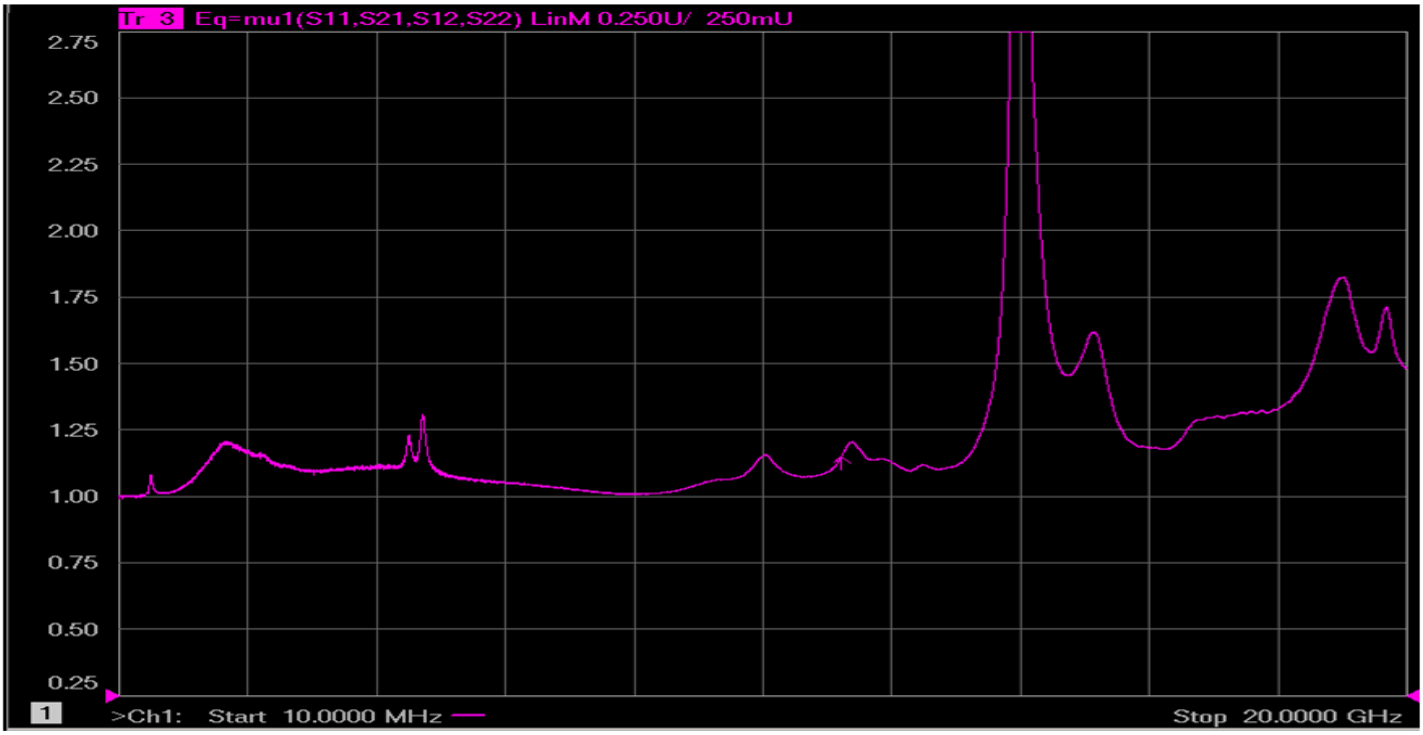
GRF2071W Typical Operating Curves: S-Parameters (1.7 to 2.7 GHz Tune)



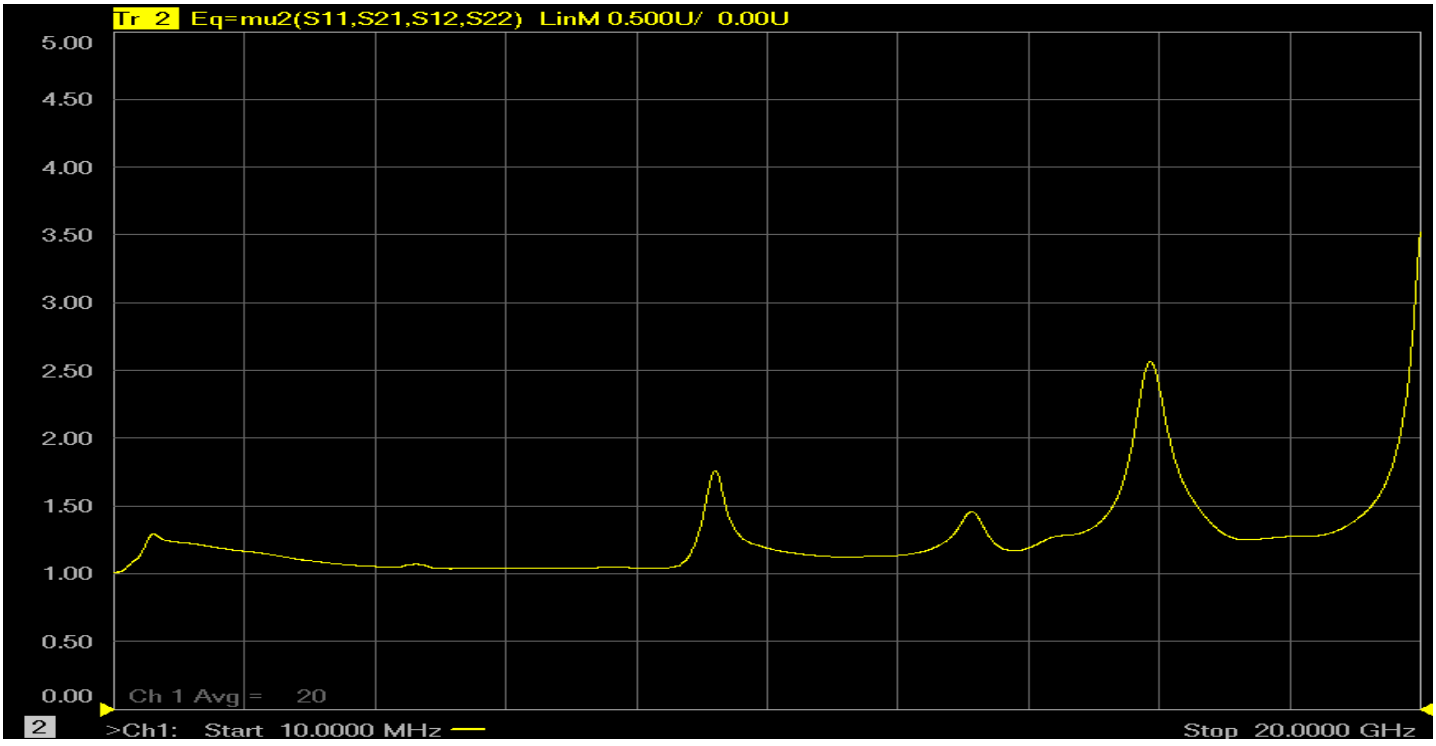
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GRF2071W Typical Operating Curves: Stability Mu (10 MHz to 20 GHz)

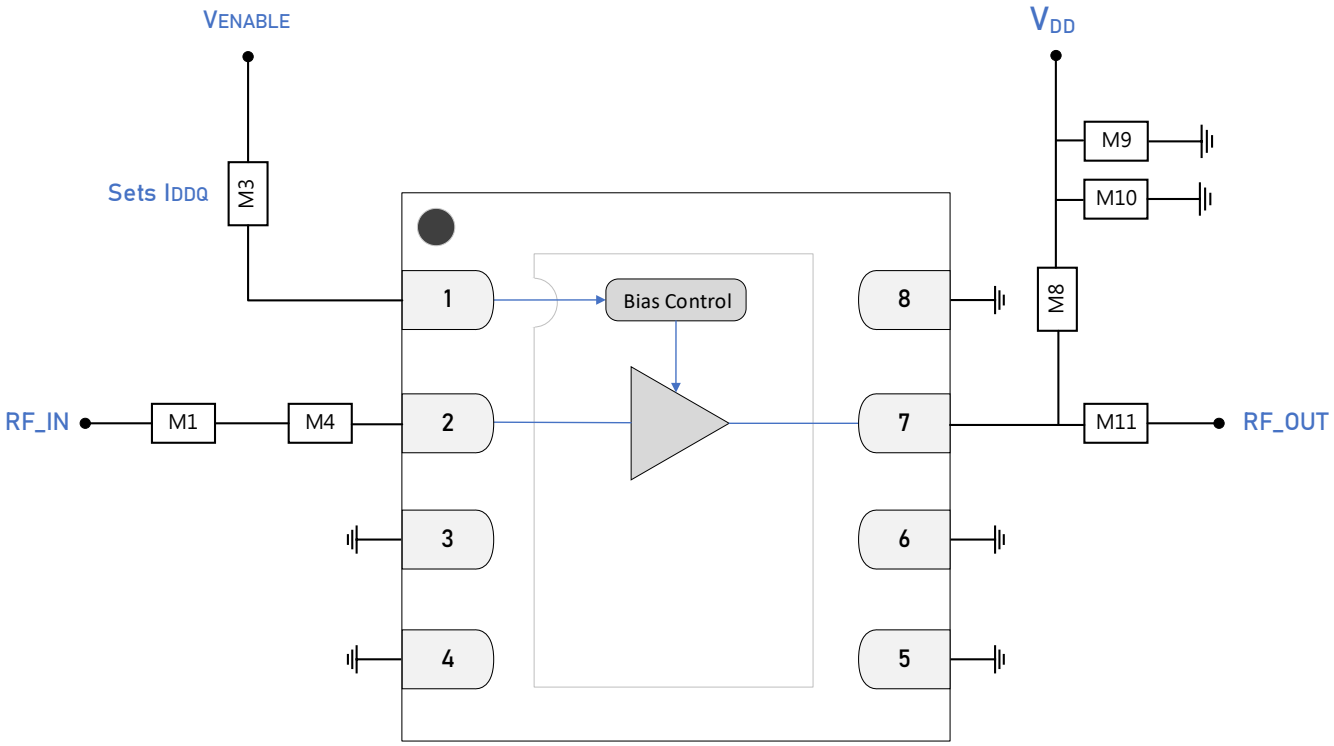


Stability Mu Prime (10 MHz to 20 GHz)

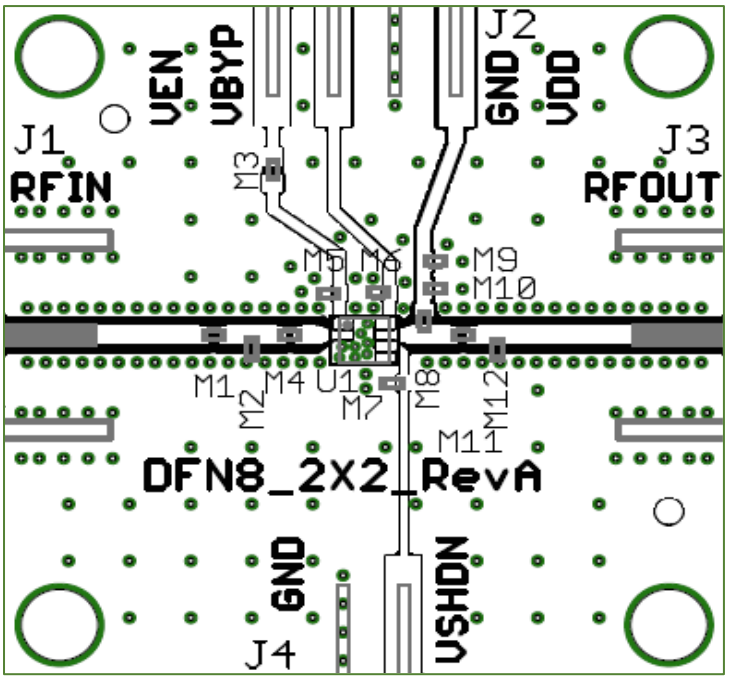


Note: Mu ≥ 1.0 implies unconditional stability.

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GRF2071W Standard Evaluation Board Schematic



GRF2071W Evaluation Board Assembly Diagram

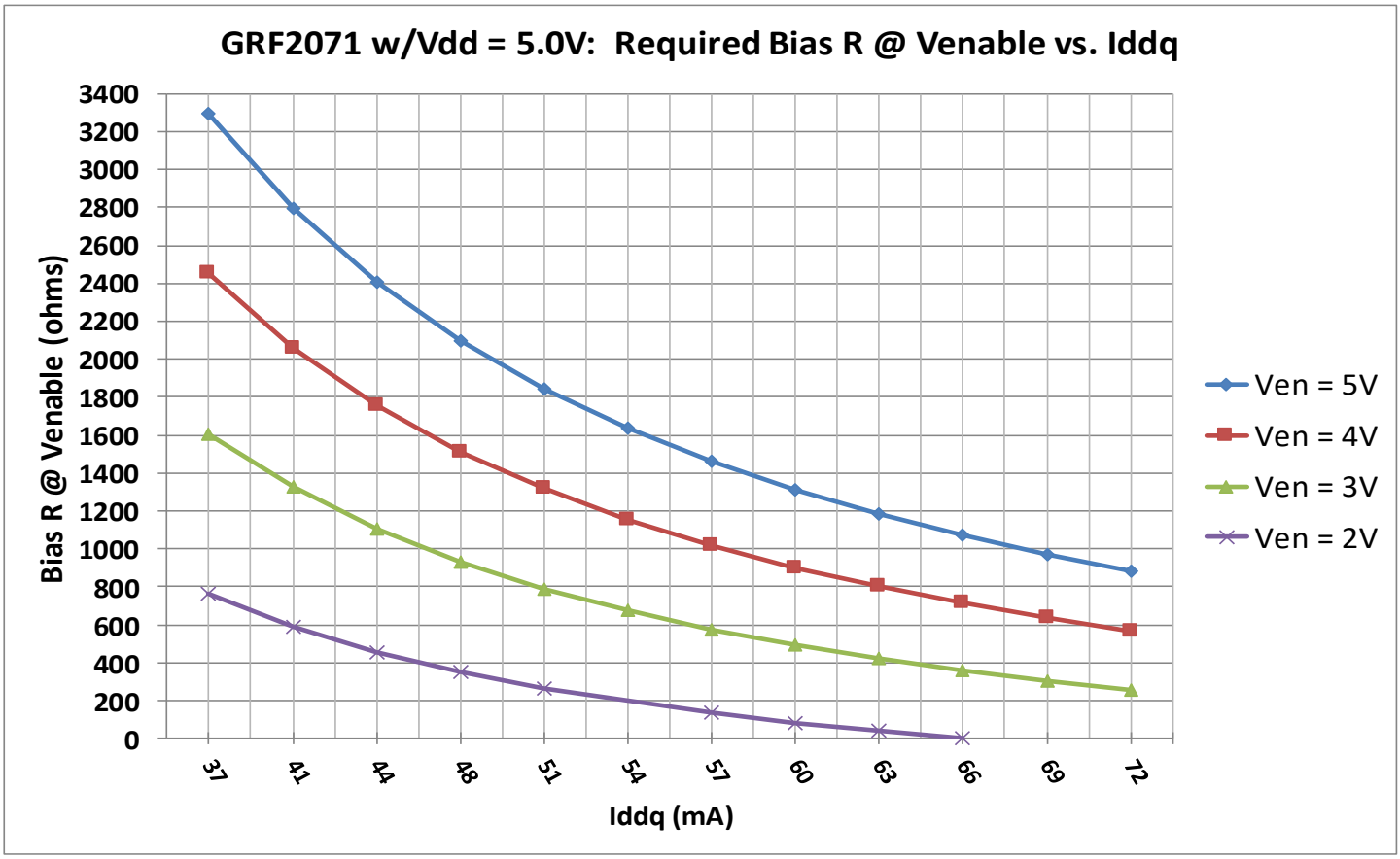
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GRF2071W Evaluation Board Assembly Diagram Reference: 1.7 to 2.7 GHz Tune

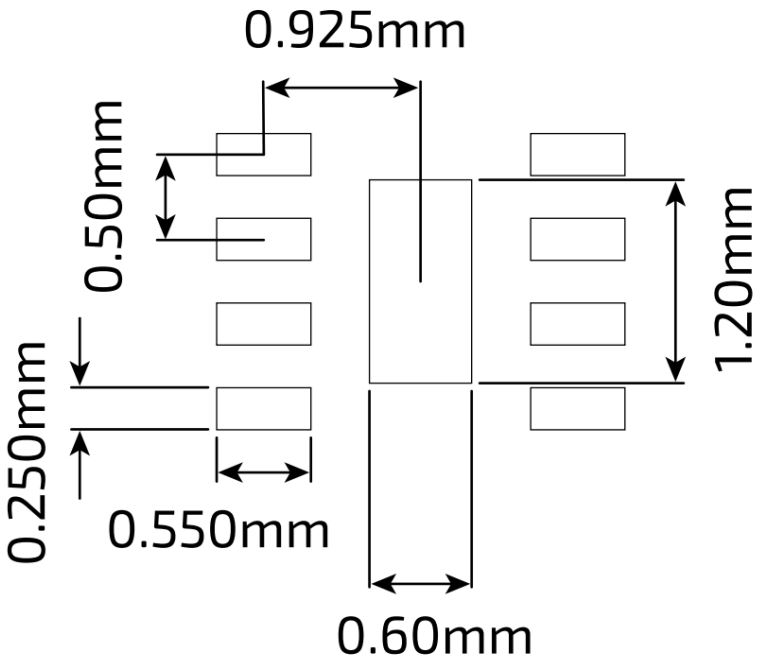
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Capacitor	Murata	GJM	12 pF	0402	ok
M3 (sets I_{DDQ})	Resistor	Various	5%	See Curves	0402	ok
M4	Inductor	Coilcraft	HP	2.0 nH	0402	ok
M8	Inductor	Murata	LQG	3.3 nH	0402	ok
M9	Capacitor	Murata	GRM	0.1 µF	0402	ok
M10	Capacitor	Murata	GRM	100 pF	0402	ok
M11	Capacitor	Murata	GJM	2.7 pF	0402	ok
Evaluation Board	DFN8_2x2_RevA					

GRF2071W Bias Resistor Selection Curves

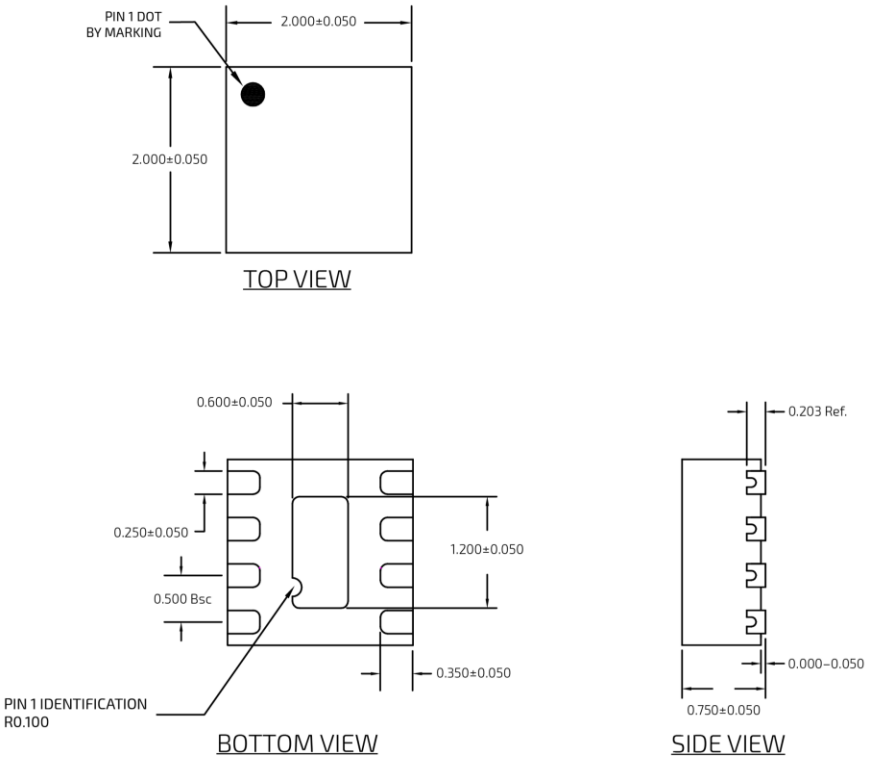


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2.0 x 2.0 mm DFN-8 Suggested PCB Footprint (Top View)

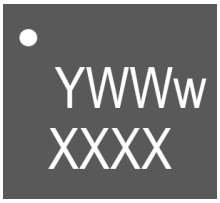


2.0 x 2.0 mm DFN-8 Package Dimensions

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Package Marking Diagram



Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK and "w" = W for automotive.

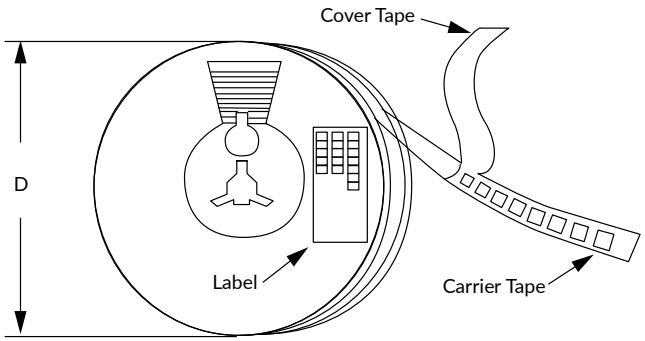
Line 2: "XXXX" = Device PART NUMBER.

Tape and Reel Information

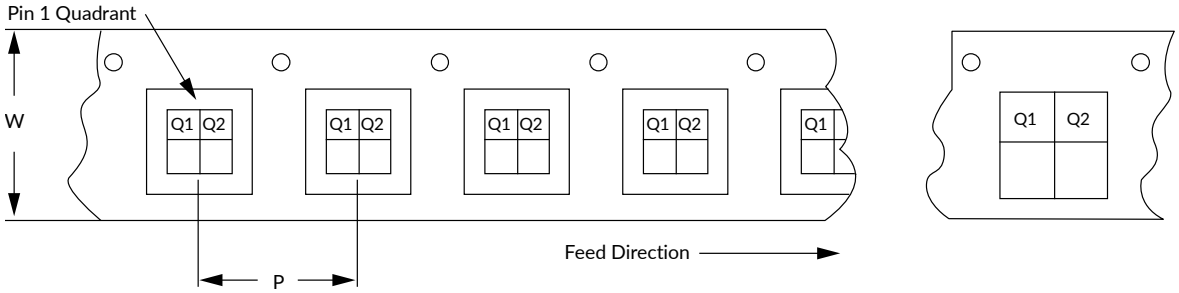
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table,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



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
November 11, 2020	Release Ø Data Sheet.
August 30, 2021	Release A Data Sheet. Upgraded Data Sheet to new format. Updated Gain lower limit.
May 31, 2023	Release B Data Sheet. Changed the following to match Production Test Plan: added I_{DD} Min/Max limits. Raised I_{DD} typical from 60 to 70 mA. Lowered M3 from 1300 Ω to 1070 Ω.
March 20, 2024	Converted Data Sheet to new format only. No change to device or device specifications.
May 22, 2025	Updated frequency range of family of part numbers listed on page 1.
September 10, 2025	Converted Data Sheet to new format. No change to device or device specifications.

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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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