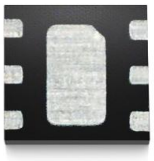
DATA SHEET

RELEASE Ø DATA SHEET





GRF4142

LNA/Driver with Bypass 0.03 to 6 GHz

FEATURES

- Flexible Bias Voltage and Current
- Single Control Logic Input
- Pre-Matched to 50 Ω
- Process: GaAs pHEMT
- Compact 1.5 x 1.5 mm DFN-6 Package

Reference: 3.3 V / 50 mA / 1.9 GHz

- Gain: 15.3 dB
- OP1dB: 19.3 dBm
- OIP3: 33 dBm
- Evaluation Board Noise Figure: 0.9 dB
- Bypass Mode Gain: -1.9 dB
- Bypass Mode OP1dB: 25.4 dBm
- Bypass Mode OIP3: 43.7 dBm

APPLICATIONS

- Cellular Repeaters and Signal Boosters
- Cellular Infrastructure
- VHF/UHF and ISM Radios

DESCRIPTION

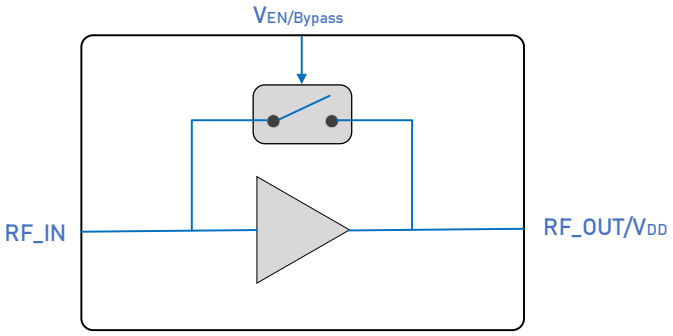
The GRF4142 is a low noise amplifier (LNA) with low loss bypass which requires only a single control input. It is designed for high performance applications up to 6 GHz. With minimal external matching, the device achieves outstanding noise figure (NF), high gain and high linearity.

The device can be operated from a single supply voltage of 1.8 to 5 V with a selectable I_{DDQ} range of 15 to 80 mA.

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

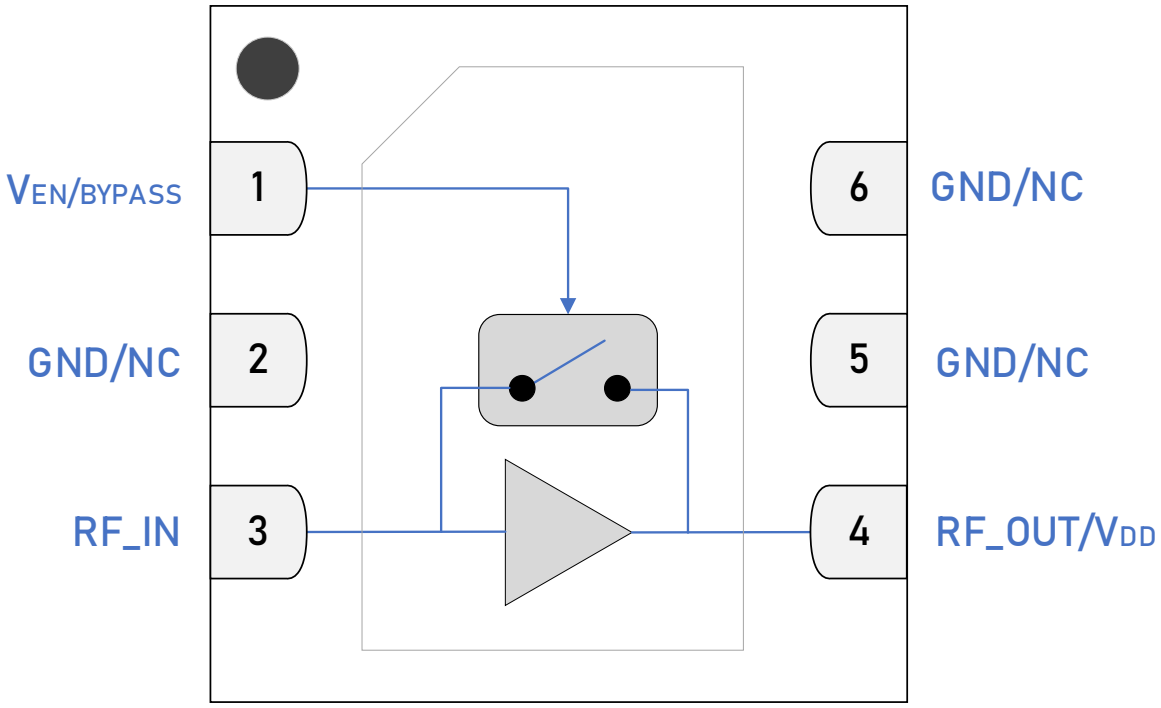
Additional tunes can be found on the GRF4142 "Custom Tunes" product page: GRF4142 Custom Tunes

BLOCK DIAGRAM



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1.5 x 1.5 mm DFN-6 Pin Out (Top View)

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Pin Assignments

Pin	Name	Description	Note
1	$V_{EN/BYPASS}$	$V_{ENABLE/BYPASS}$ Voltage Input	$V_{EN/BYPASS} \leq 0.2$ volts sets Bypass Mode. $V_{EN/BYPASS}$ and external series resistor control the device I_{DDQ} when $V_{EN/BYPASS}$ is high.
2, 5, 6	GND/NC	Ground or No Connect	No internal connection to die. We recommend connecting these pins to ground.
3	RF_IN	RF Input	Partially-matched to 50 Ω. An external DC blocking capacitor must be used.
4	RF_OUT/ V_{DD}	RF Output	Internally matched to 50 Ω. V_{DD} must be applied through a choke to this pin.
PKG BASE	GND	Ground	Provides DC and RF ground for device, 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.

Control Logic Truth Table

Mode	Description	V_{DD}	$V_{EN/BYPASS}$
High Gain	High Gain	1	1
Bypass	Linear Bypass Mode	1	0
Logic Level "0"	Logic Low	0 V to 0.2 V	0 V to 0.2 V
Logic Level "1"	Logic High	1.8 V to 5 V	1.5 V to V_{DD}

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Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	0	6	V
RF Input Power: Load VSWR < 2:1, V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V, Gain Mode.	$P_{IN\ MAX}$		20	dBm
RF Input Power: Load VSWR < 2:1, V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 0 V, Bypass Mode.	$P_{IN\ MAX}$		27	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	$P_{DISS\ MAX}$		330	mW

Electrostatic Discharge

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 *Package Manufacturing Information | Guerrilla RF (guerrilla-rf.com)*

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	3.3	6	V	
Operating Temperature (package base)	$T_{PKG\ BASE}$	-40		105	°C	
RF Frequency Range	F_{RF}	0.03	1.9	6	GHz	Typical application schematic with external matching components **(notes 1 & 2)**.
RF_IN Port Impedance	Z_{RF_IN}		50		Ω	Single-ended with 2-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: GRF4142 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} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V, I_{DDQ} = 55 mA. M5 = 600 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_{DDQ}		55		mA	V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V.
Enable Current	I_{ENABLE}		2		mA	V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V.
Switching Rise Time	T_{RISE}		300		ns	Bypass mode to Gain mode **(note 3).**
Switching Fall Time	T_{FALL}		50		ns	Gain mode to Bypass mode **(note 4).**
Disabled Mode						
Leakage Current	$I_{LEAKAGE}$		500		µA	V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 0 V.
Thermal Data						
Thermal Resistance: (Infrared Scan)	Θ_{JC}		132		°C/W	On standard evaluation board **(note 5).**

Note 3: Switching Time: 50% of $V_{EN/BYPASS}$ to 90% of P_{OUT}.

Note 4: Switching Time: 50% of $V_{EN/BYPASS}$ to 10% of P_{OUT}.

Note 5: MTTF > 10^6 hours for $T_{CHANNEL}$ ≤ 170 °C.

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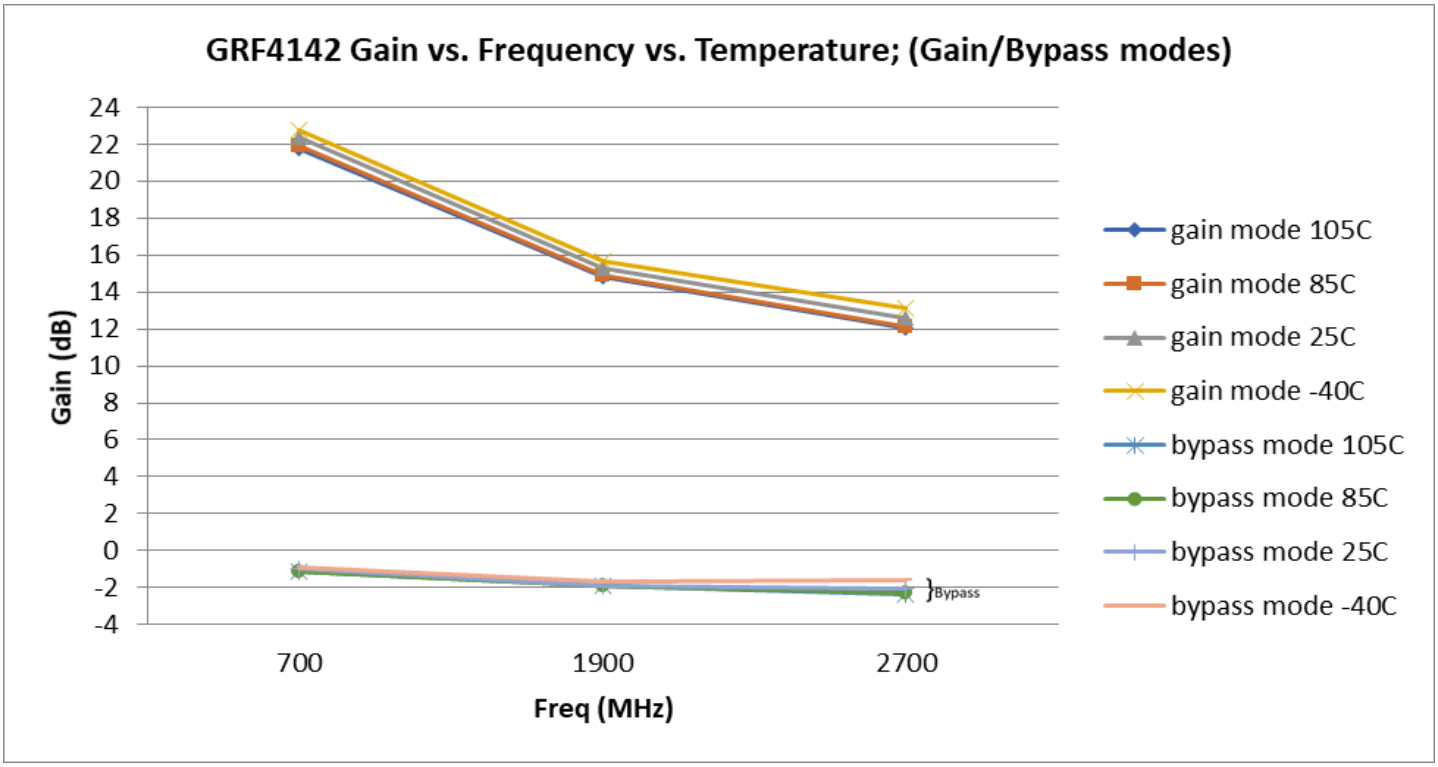
Nominal Operating Parameters – RF

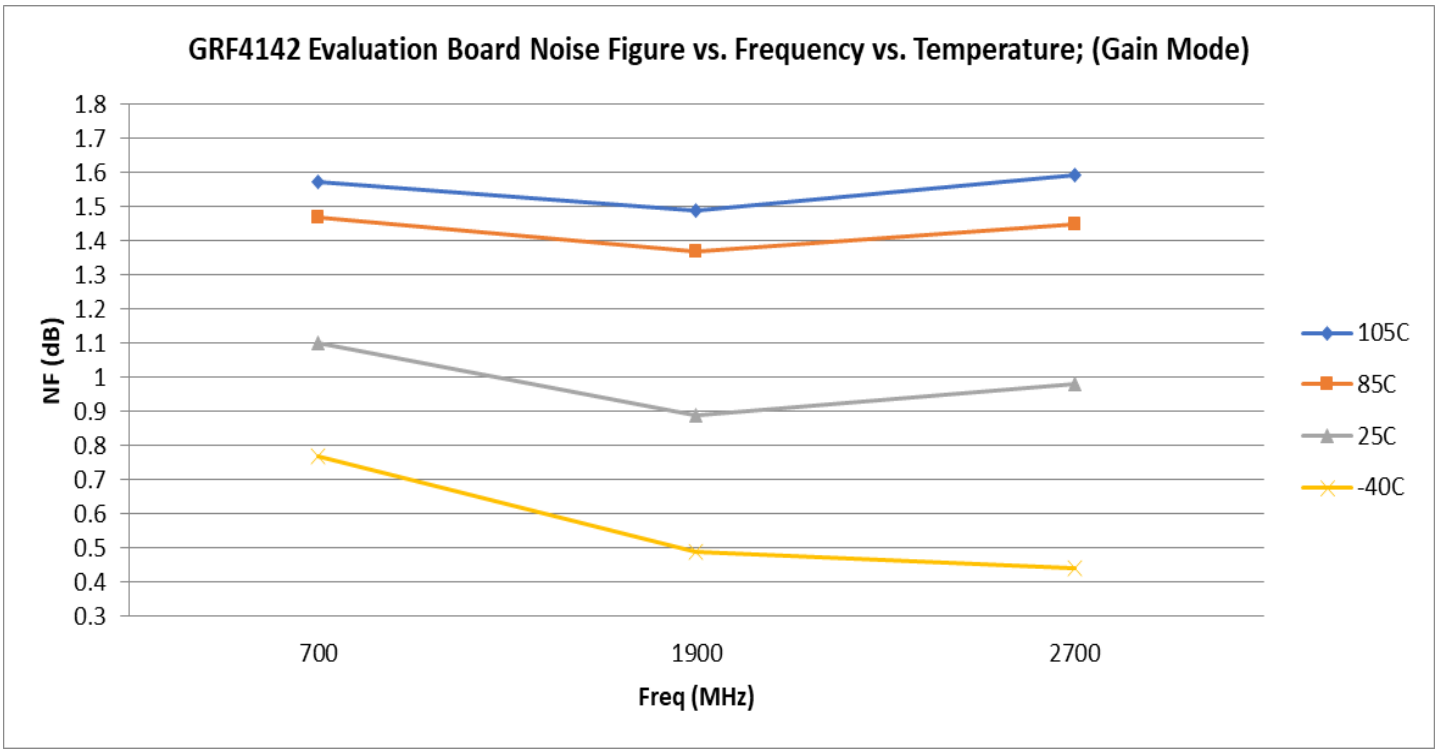
The following conditions apply unless noted otherwise: typical application schematic using the 0.7 to 2.7 GHz tuning set, V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V, I_{DDQ} = 55 mA. M5 = 600 Ω. F_{TEST} = 1.9 GHz. $T_{PKG\ BASE}$ = 25 °C. Evaluation board losses are included within the specifications.

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
High Gain Mode						V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 3.3 V
Gain	S21	14.3	15.3		dB	
Output 3rd Order Intercept Point	OIP3		33		dBm	2 MHz spacing (1899 and 1901 MHz).
Output 1 dB Compression Power	OP1dB	17.7	19.2		dBm	
Noise Figure	NF		0.9	1.1	dB	On standard evaluation board.
Bypass Mode						V_{DD} = 3.3 V, $V_{EN/BYPASS}$ = 0 V
Gain	S21	-3	-2		dB	
Output 3rd Order Intercept Point	OIP3		43.7		dBm	2 MHz spacing (1899 and 1901 MHz).
Output 1 dB Compression Power	OP1dB		25.4		dBm	

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GRF4142 Evaluation Board Data: 3.3 V, 55 mA (0.7 to 2.7 GHz Tune)

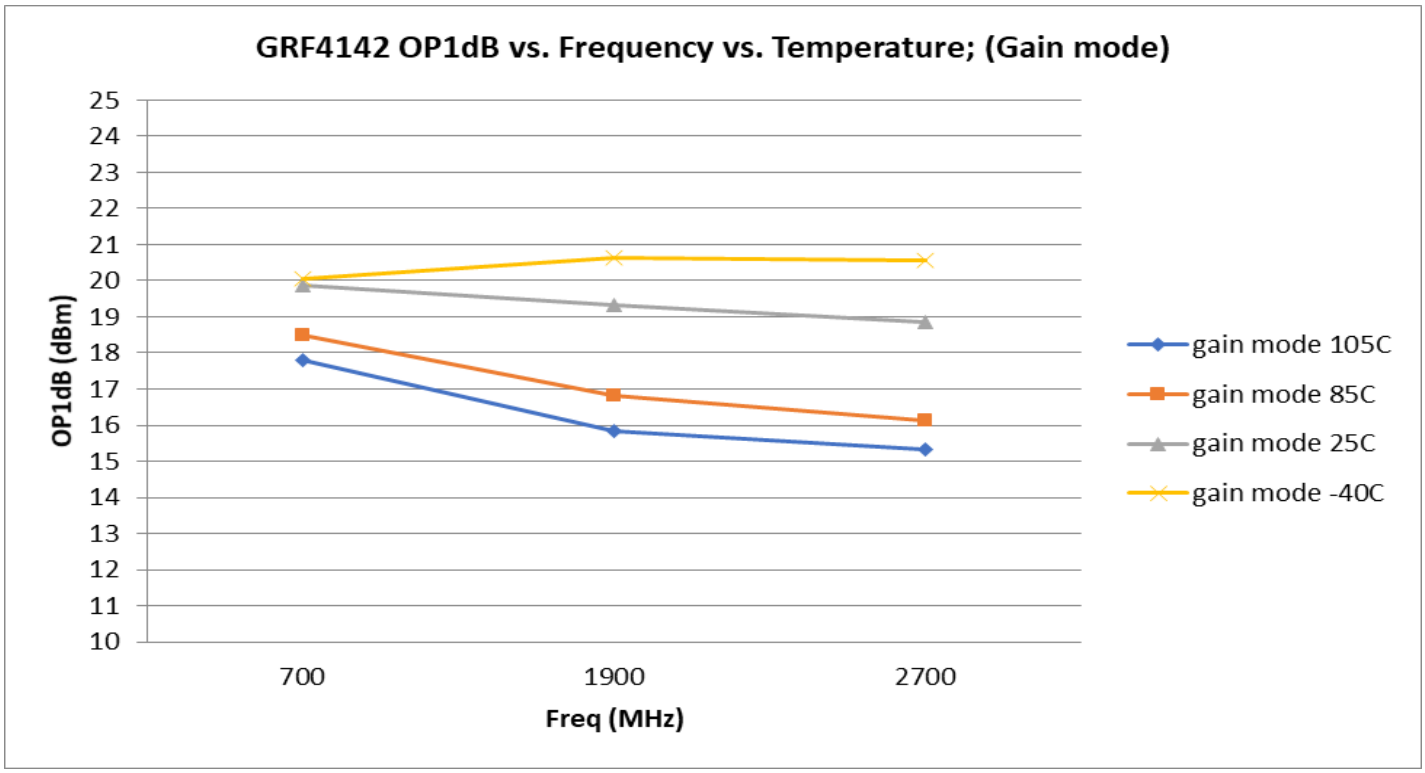


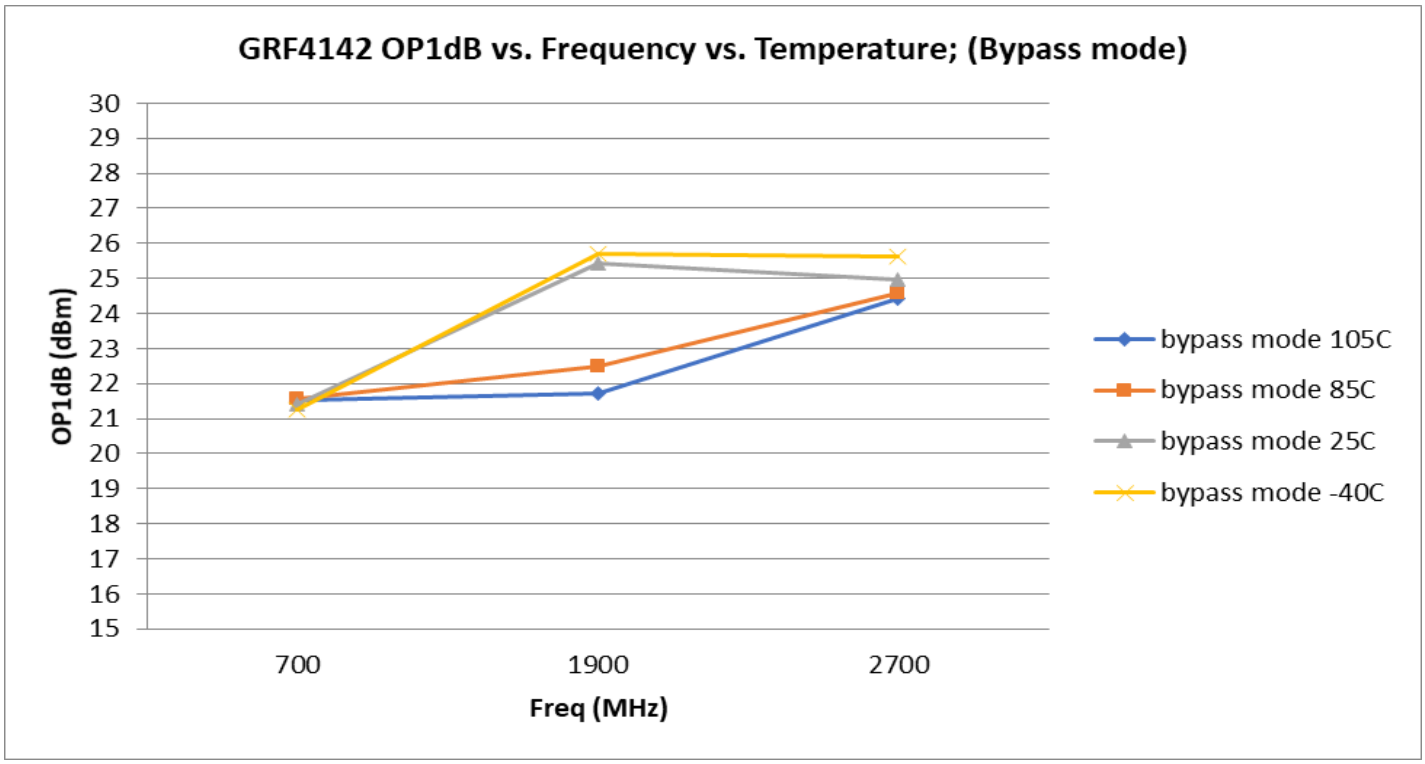


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GRF4142 Evaluation Board Data: 3.3 V, 55 mA (0.7 to 2.7 GHz Tune)

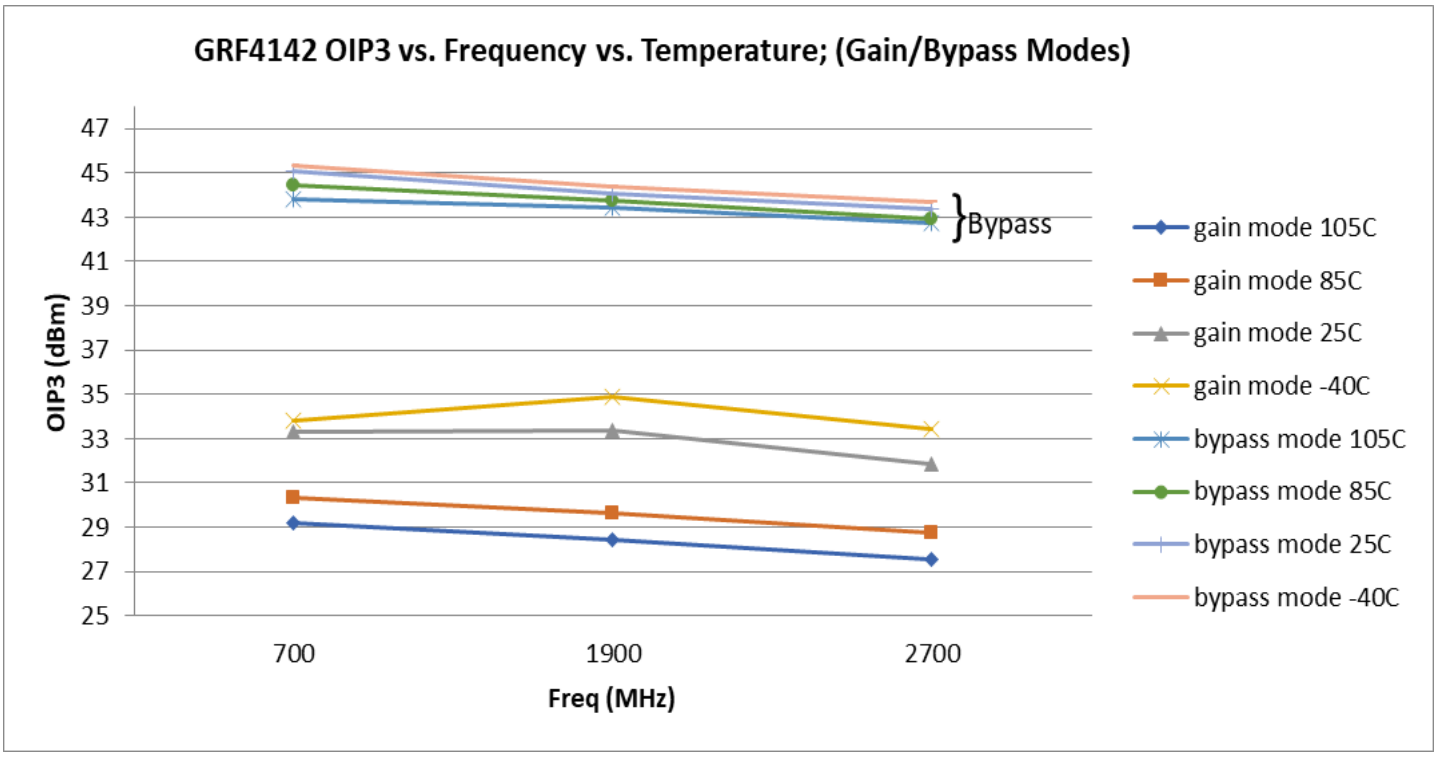




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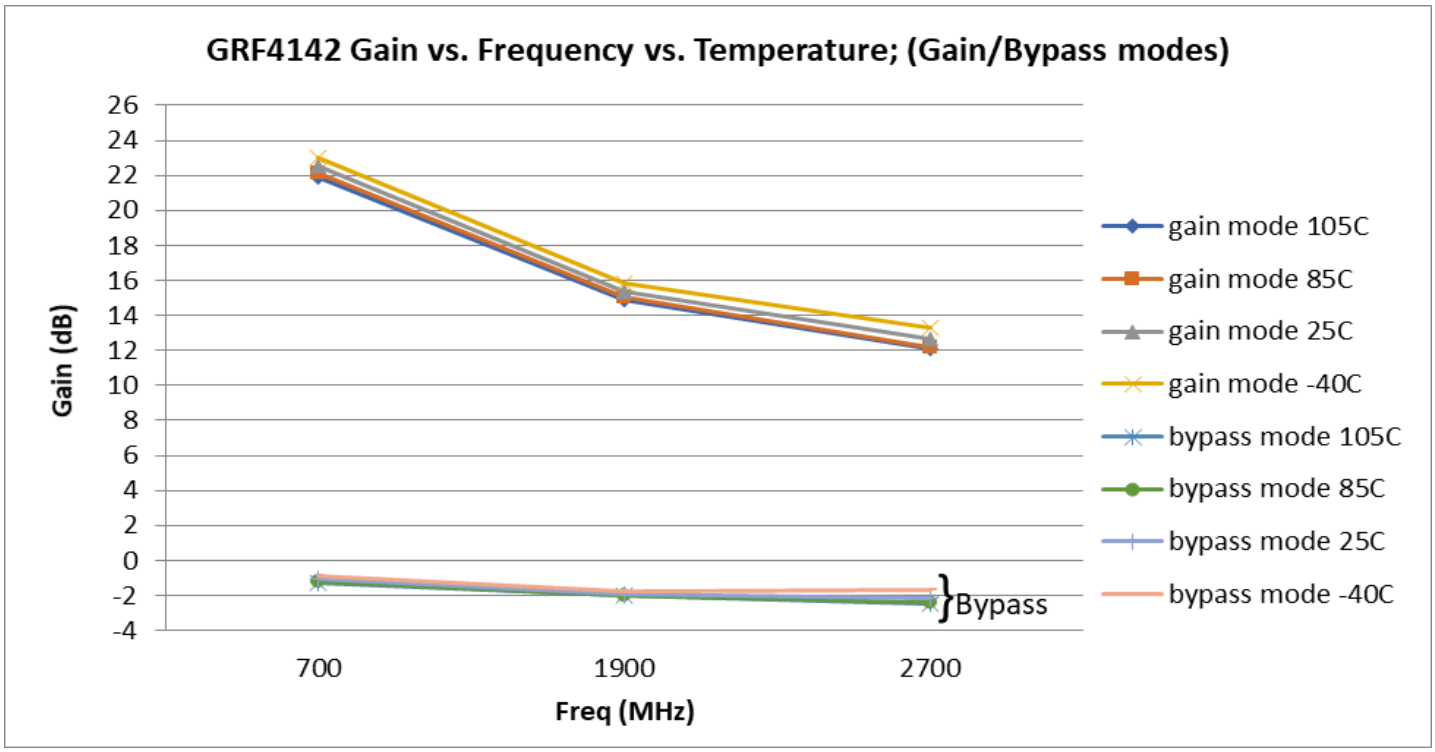
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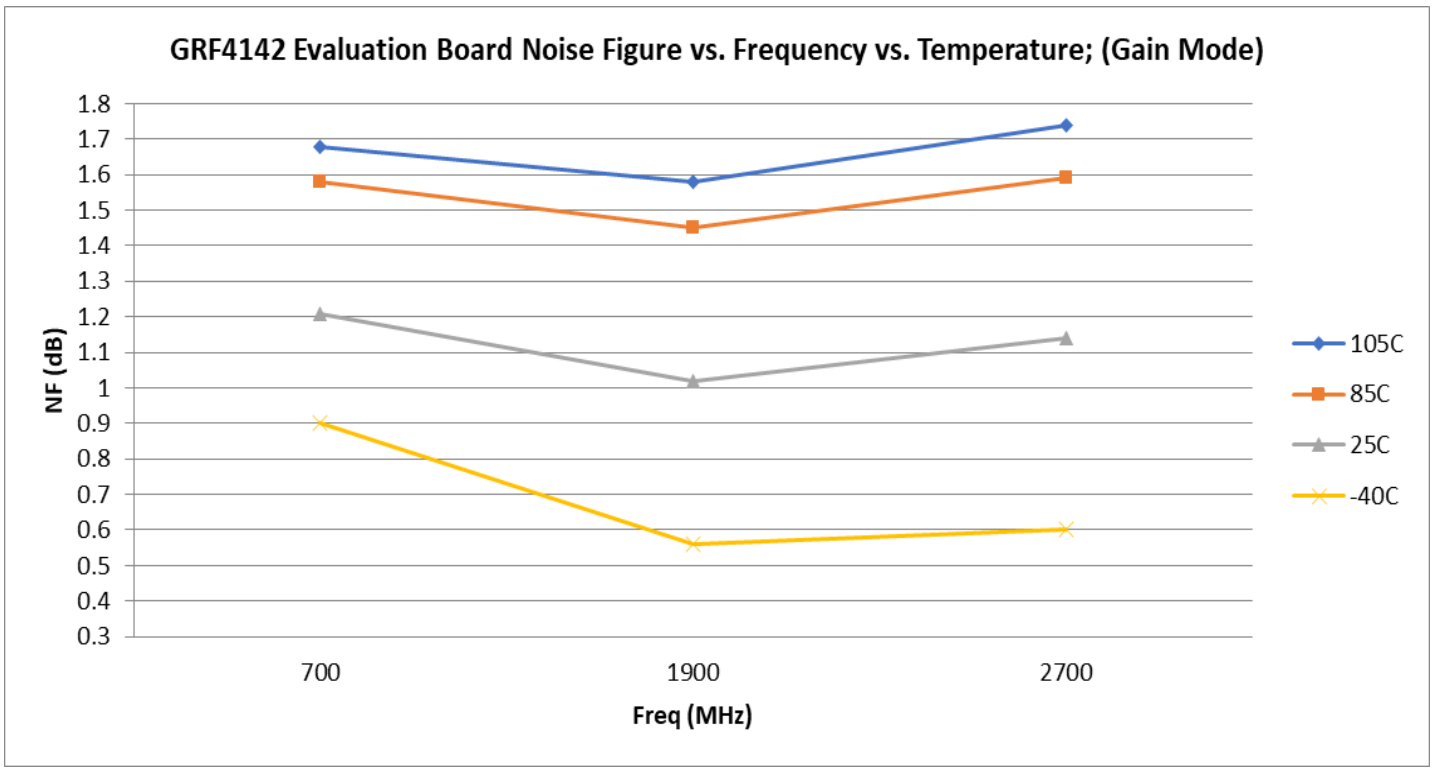
GRF4142 Evaluation Board Data: 3.3 V, 55 mA (0.7 to 2.7 GHz Tune)



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GRF4142 Evaluation Board Data: 5 V, 70 mA (0.7 to 2.7 GHz Tune)

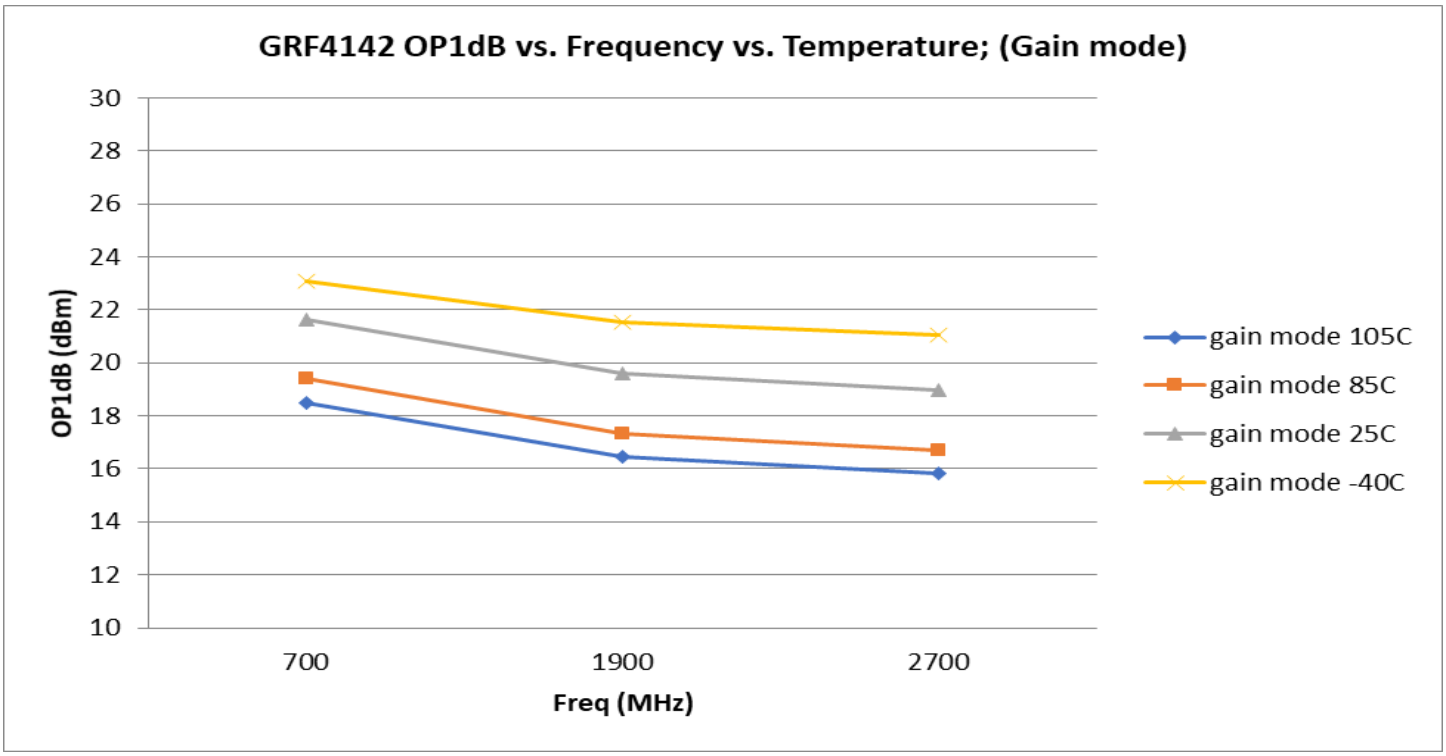


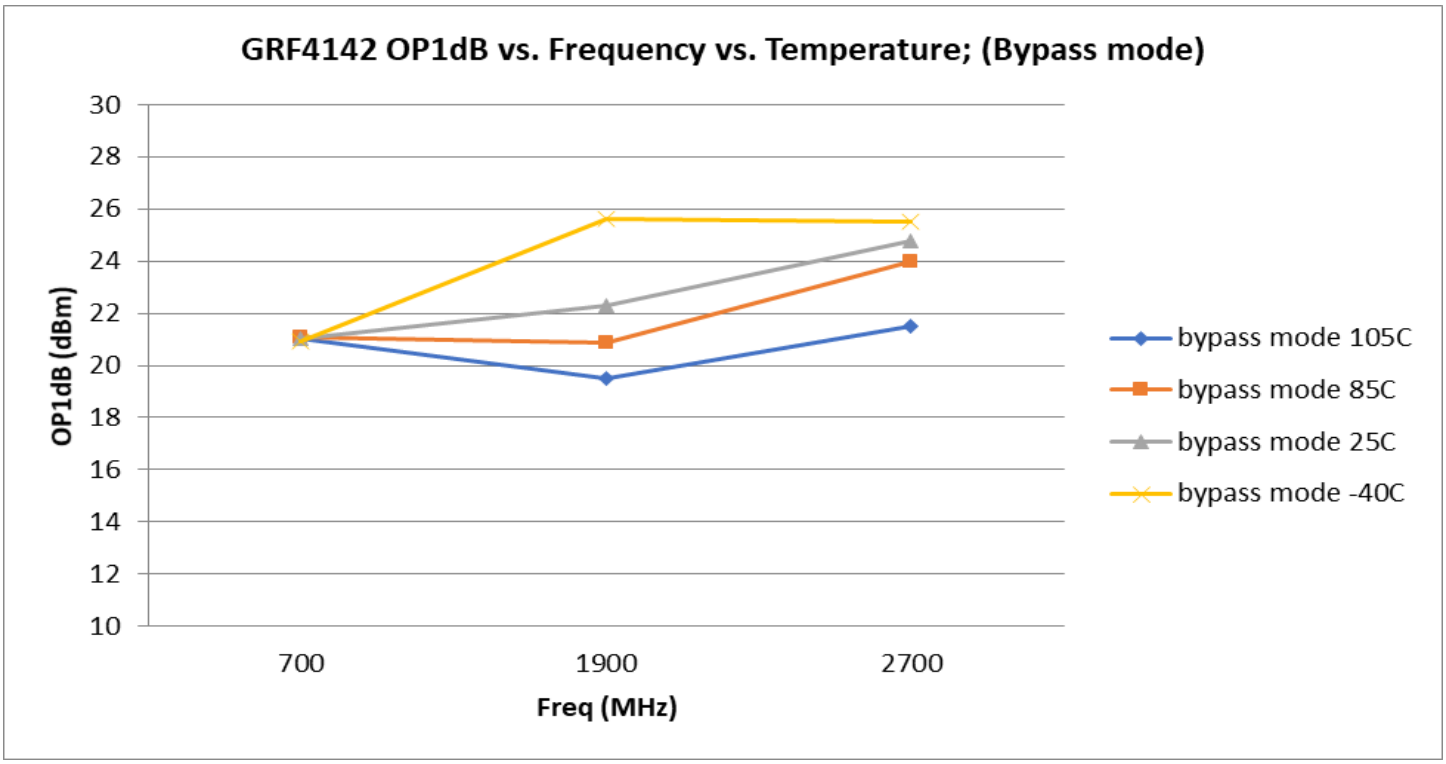


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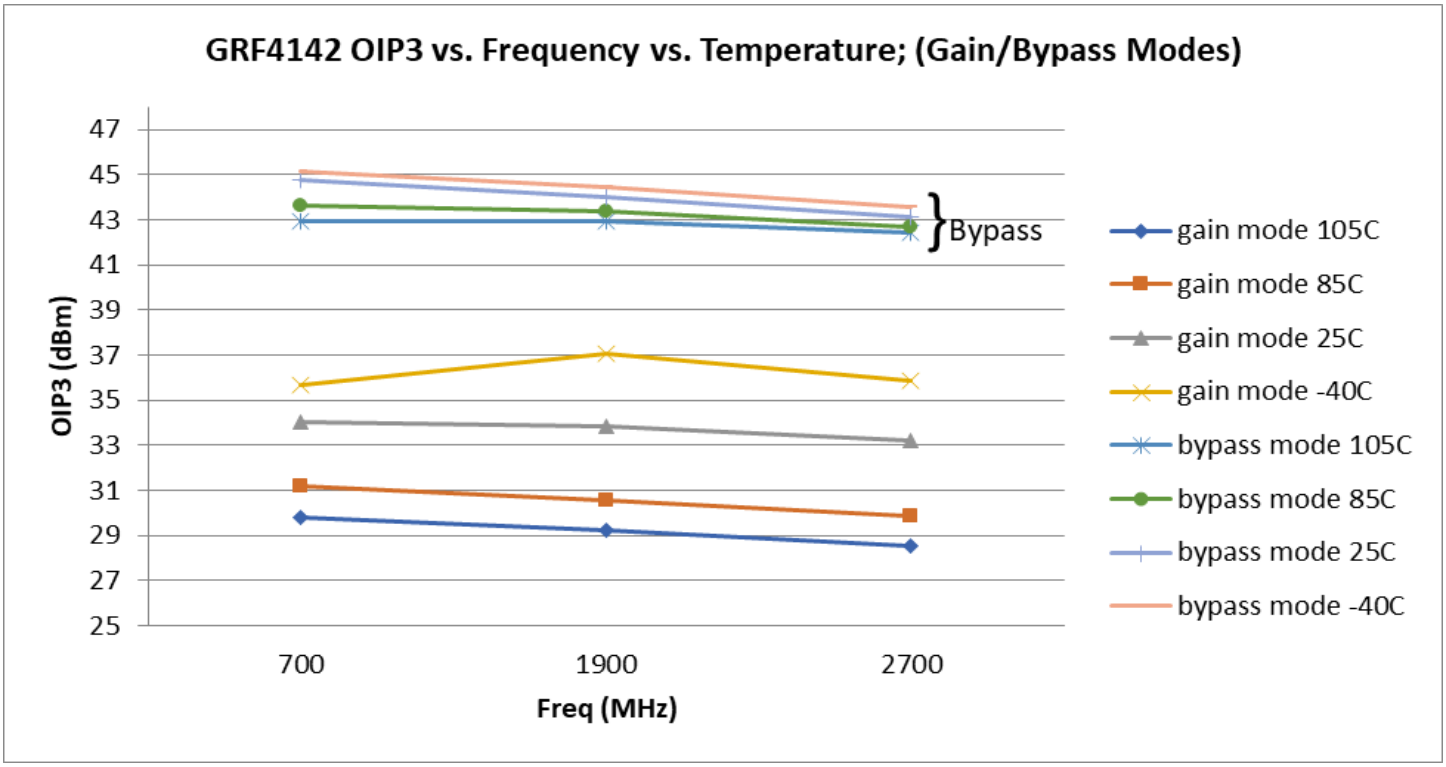
GRF4142 Evaluation Board Data: 5 V, 70 mA (0.7 to 2.7 GHz Tune)





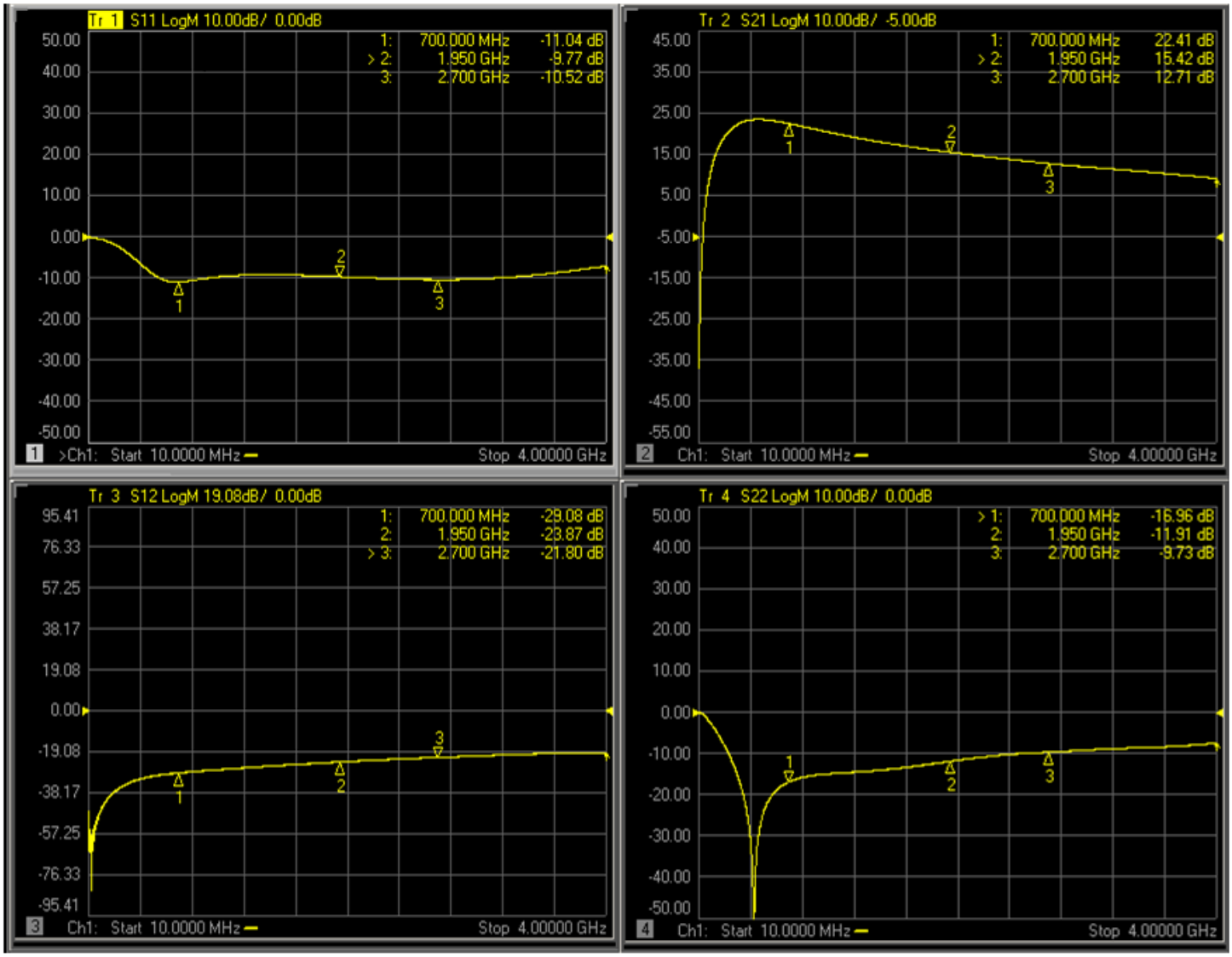
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GRF4142 Evaluation Board Data: 5 V, 70 mA (0.7 to 2.7 GHz Tune)



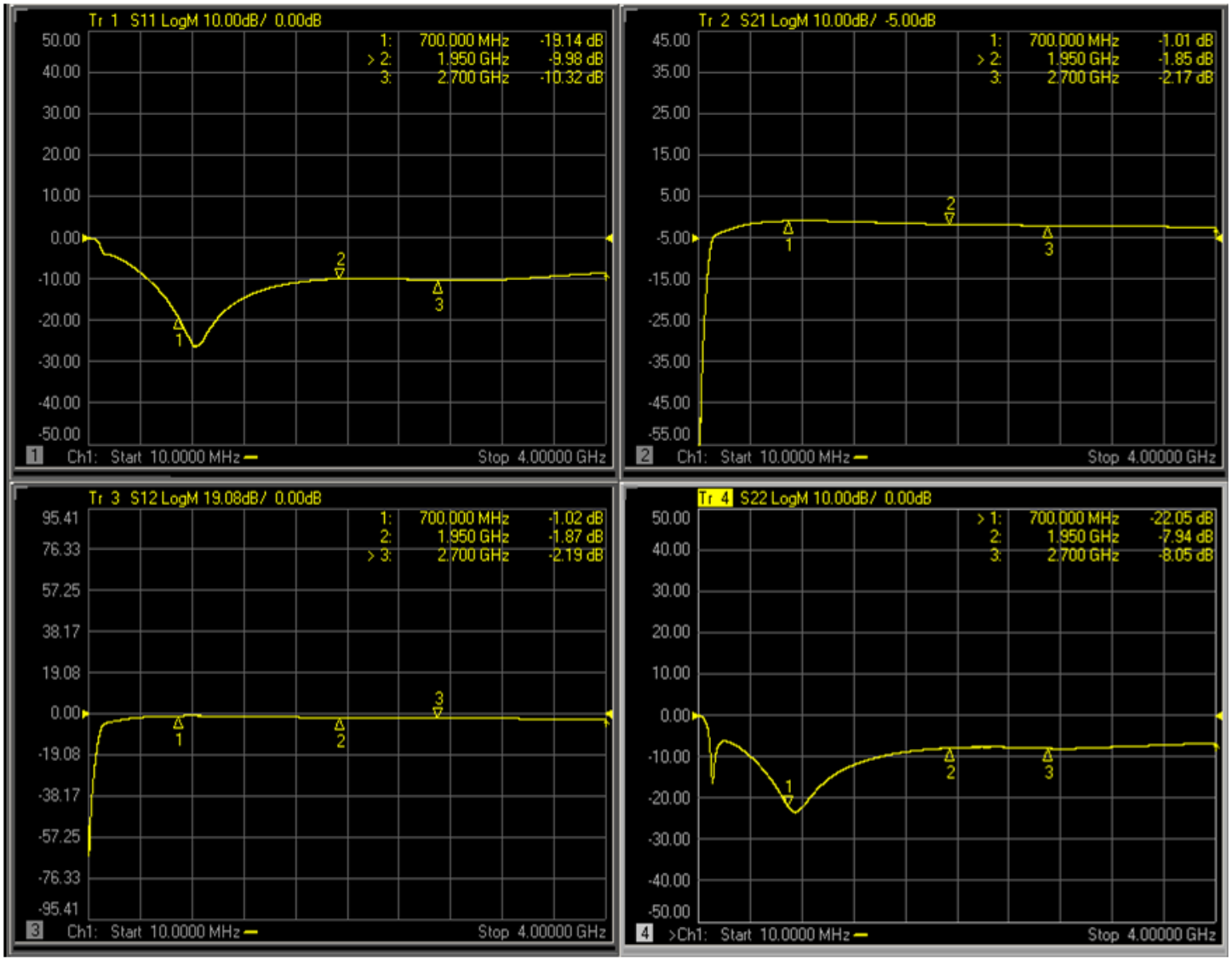
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GRF4142 Evaluation Board S-Parameters: Gain Mode (0.7 to 2.7 GHz Tune)



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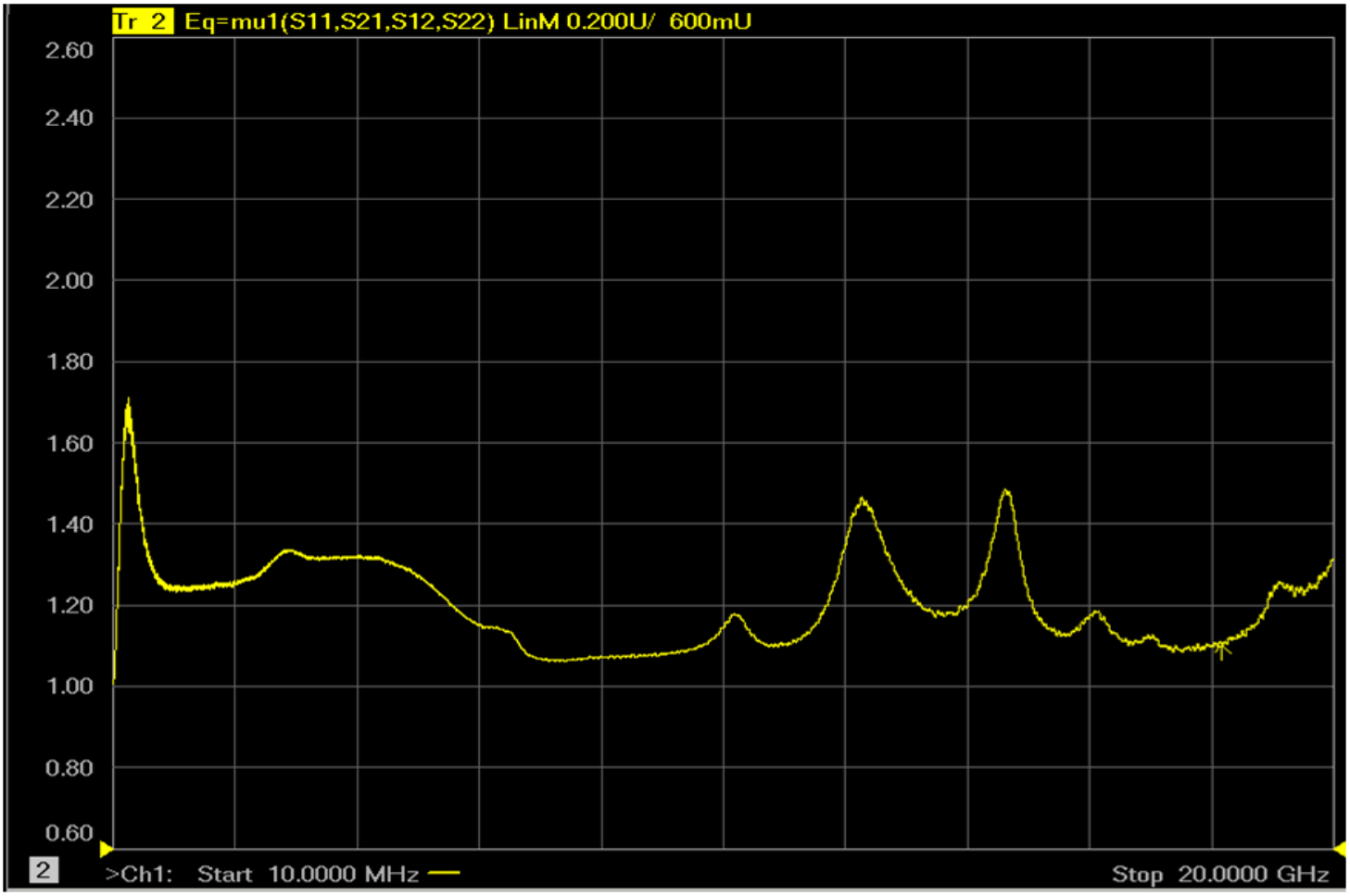
GRF4142 Evaluation Board S-Parameters: Bypass Mode (0.7 to 2.7 GHz Tune)



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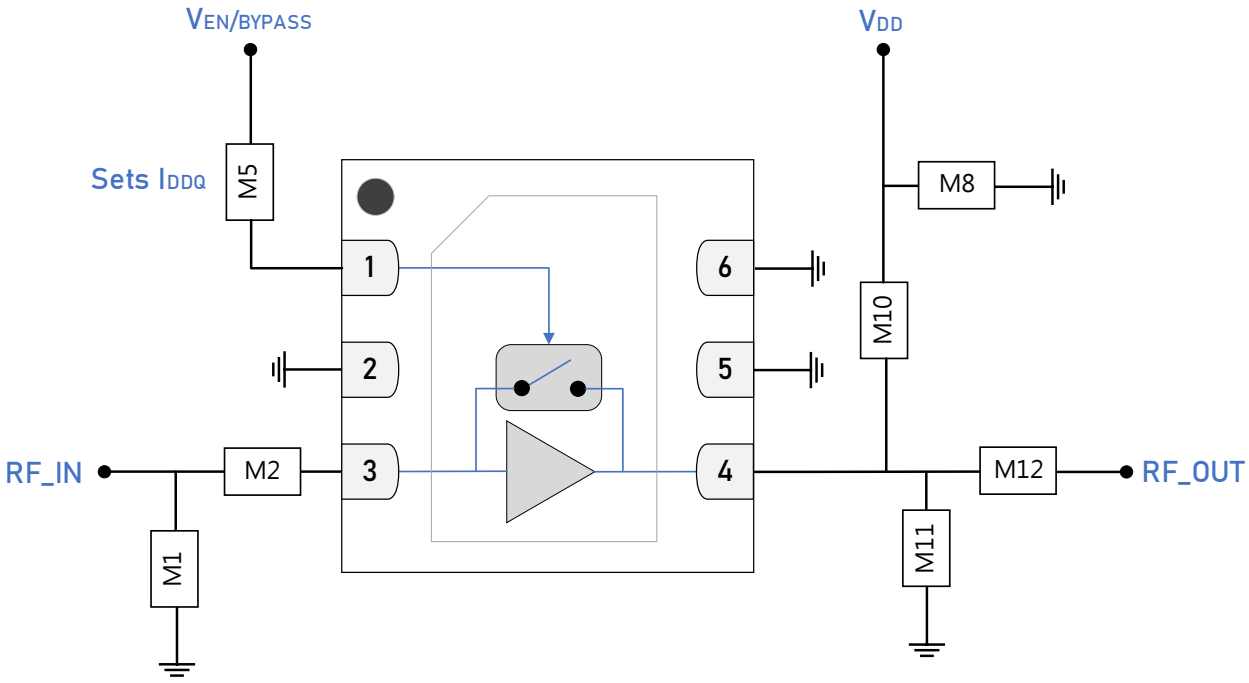
GRF4142 Evaluation Board Stability Mu Factor: 10 MHz to 20 GHz



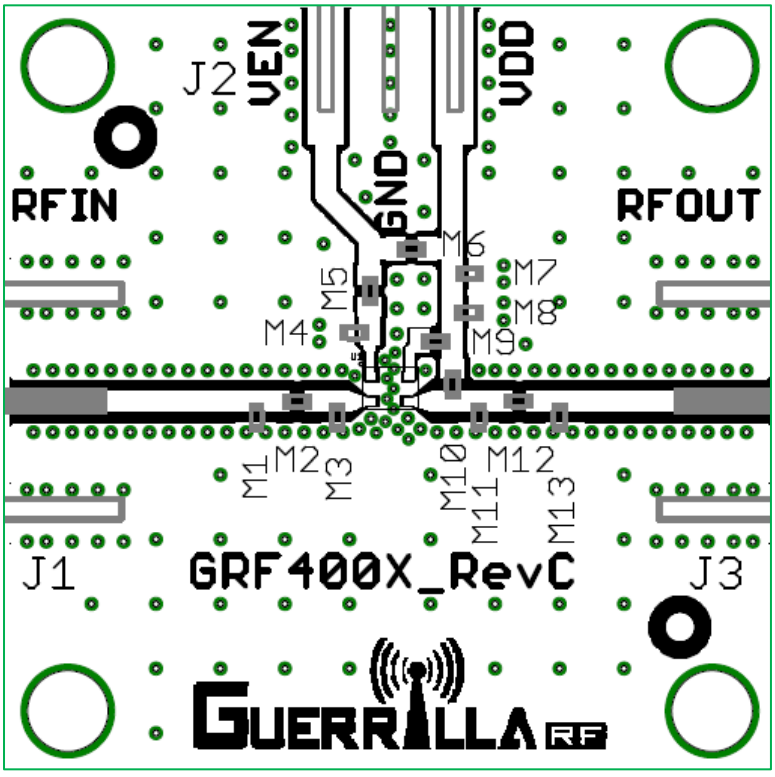
Note: Mu factor >= 1.0 implies unconditional stability.

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GRF4142 Standard Evaluation Board Schematic



GRF4142 Evaluation Board Assembly Diagram

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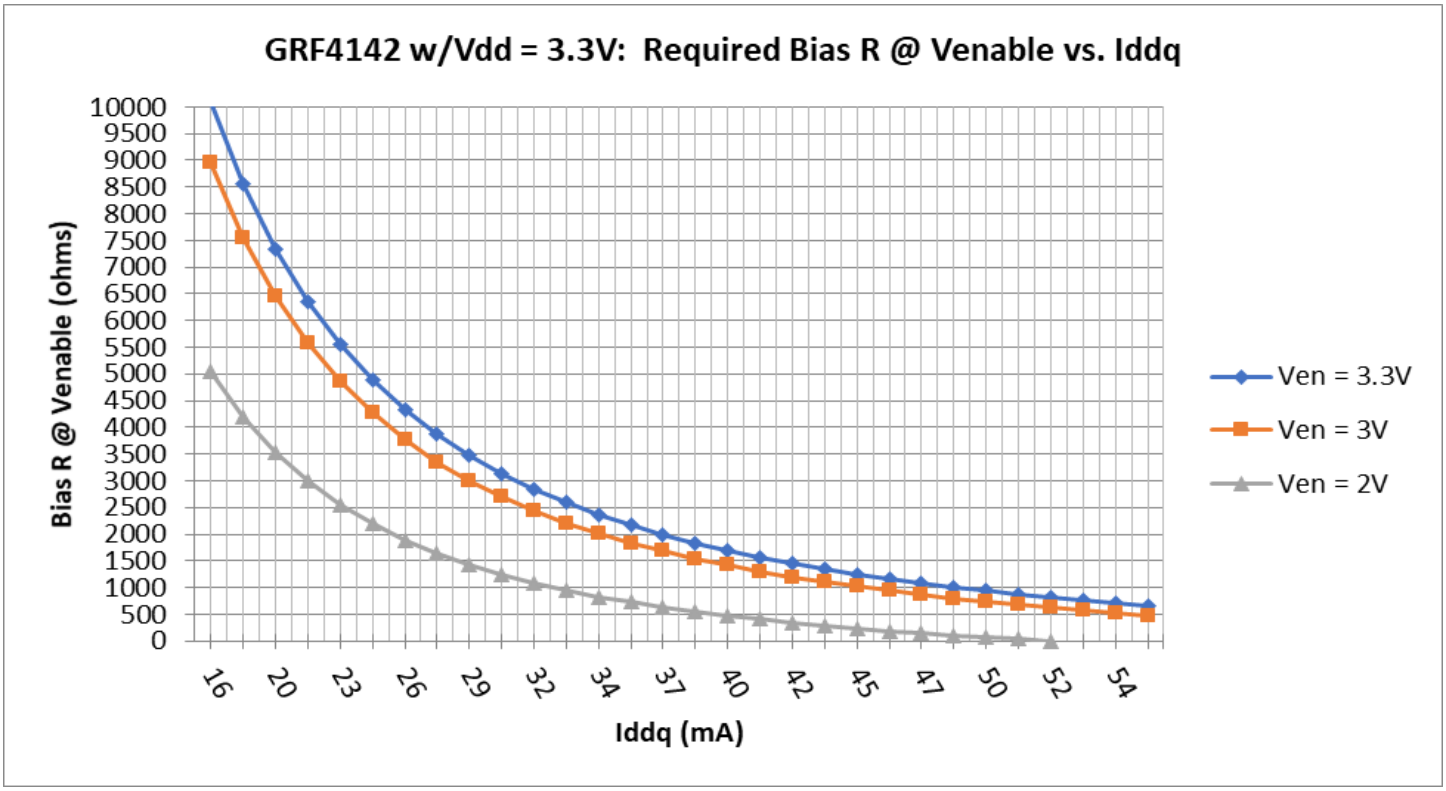
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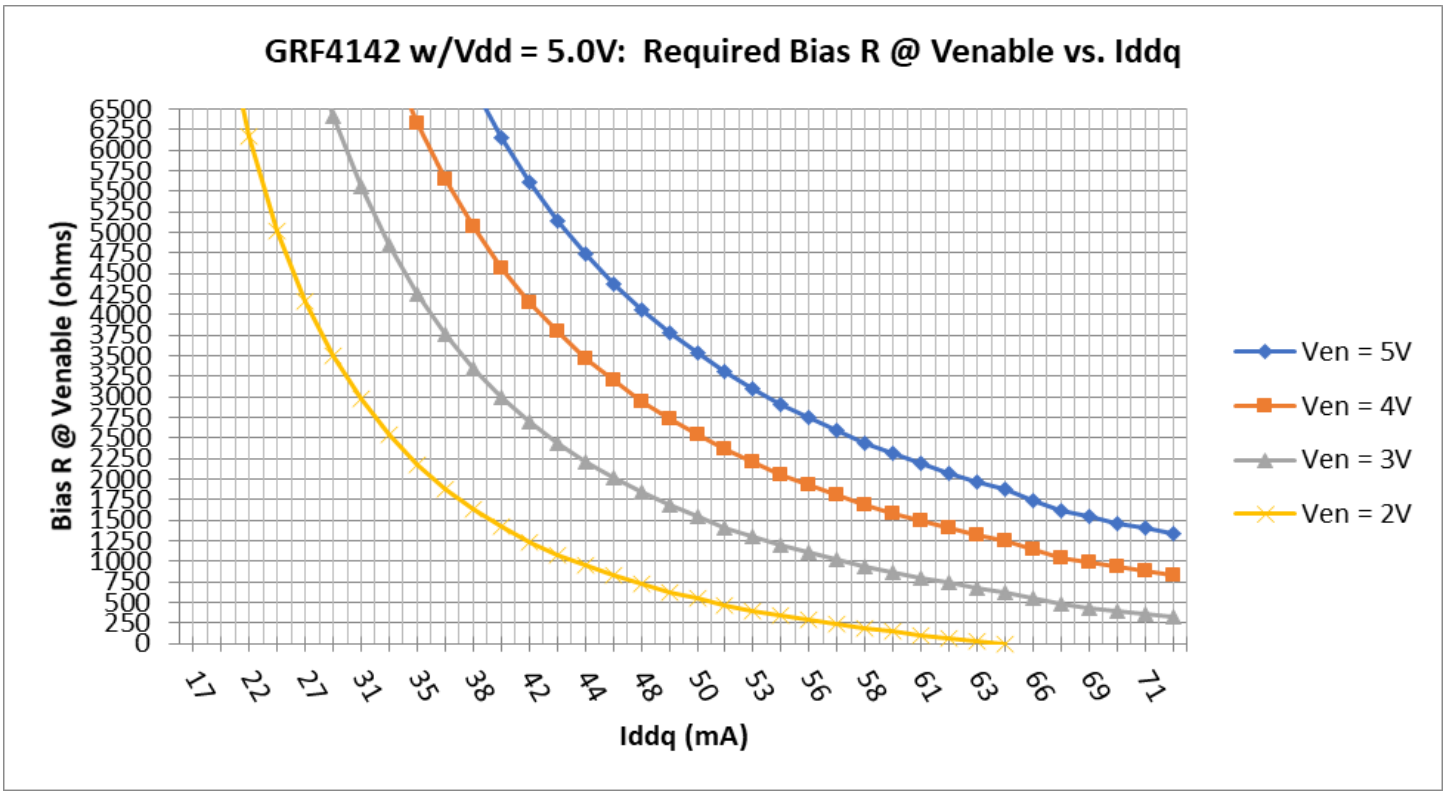
GRF4142 Evaluation Board Assembly Diagram Reference: 0.7 to 2.7 GHz Tune

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Inductor	Murata	LQG	22 nH	0402	ok
M2	Capacitor	Murata	GJM	30 pF	0402	ok
M5 (sets I_{DDQ})	Resistor	Various	5%	see curves	0402	ok
M8	Capacitor	Murata	GRM	0.1 µF	0402	ok
M10	Inductor	Murata	LQG	39 nH	0402	ok
M11	Capacitor	Murata	GJM	0.5 pF	0402	ok
M12	Capacitor	Murata	GRM	100 pF	0402	ok
M3, M4, M6, M7, M9	DNP	--	--	--	--	--
Evaluation Board	GRF400X_RevC					

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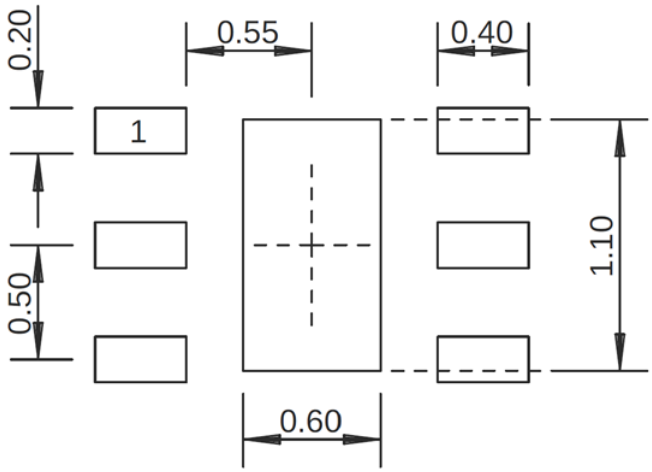
GRF4142 Bias Resistor Selection Curves



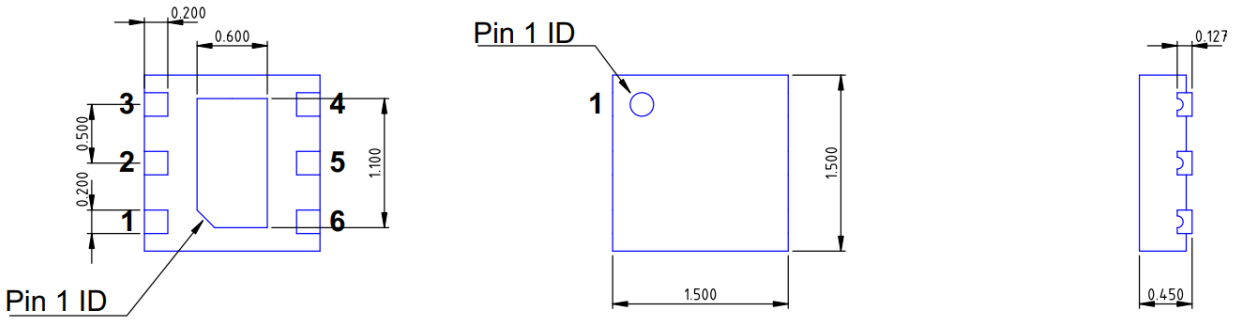


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1.5 x 1.5 mm DFN-6 Suggested PCB Footprint (Top View)



Bottom View **Top View** **Side View**

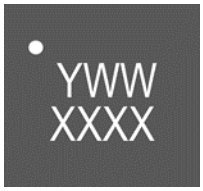
DFN6 1.5x1.5mm
Dimensions in millimeters
Dimensional Tolerance: ±0.05

1.5 x 1.5 mm DFN-6 Package Dimensions

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Package Marking Diagram



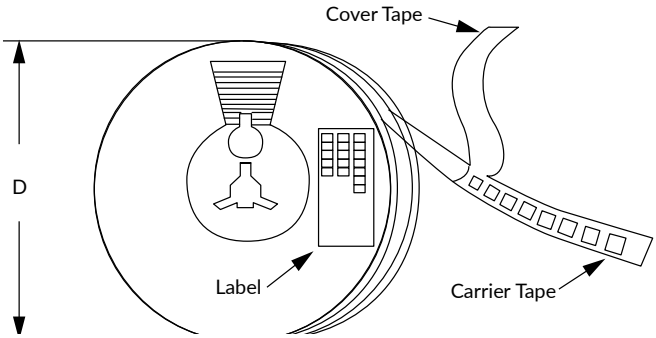
- Line 1: "Y" = YEAR (single digit). "WW" = WORK WEEK the device was assembled.
- Line 2: "XXXX" = Device PART NUMBER.

Tape and Reel Information

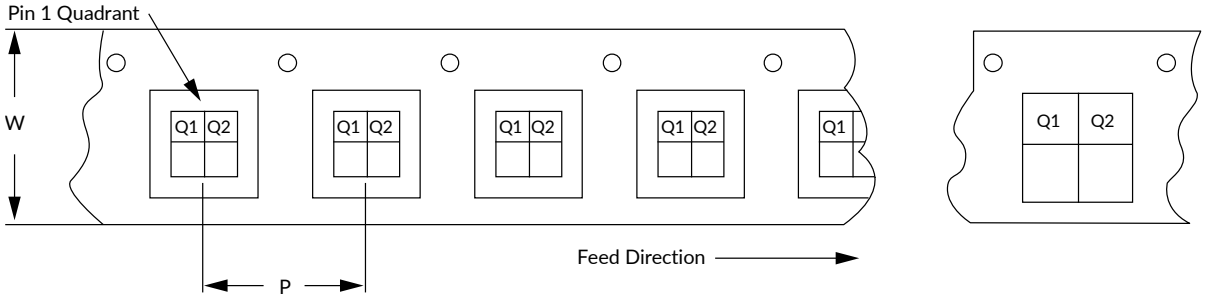
Guerrilla RF's tape and reel specification complies with Electronic Industries Alliance (EIA) standards for "Embossed Carrier Tape of Surface Mount Components for Automatic Handling" (reference EIA-481). See the following page for the Tape and Reel Specification and Device Package Information table,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



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
September 12, 2018	Release Ø Data Sheet.
April 18, 2023	Updated Data Sheet to new format only.
April 3, 2025	Added Pin Max (Bypass mode).
June 9, 2025	Extended lower frequency range from 100 MHz to 30 MHz.
January 8, 2026	Changed evaluation board to GRF400X_RevC.

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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.

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

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