GRF4142

Released

LNA/Driver w/Bypass
Tuning Range: 0.1 to 6.0 GHz

Features

Reference: 3.3V/50mA/1.9 GHz

- Gain: 15.3 dB
- EVB NF: 0.90 dB
- OP1dB: 19.3 dBm
- OIP3: 33.0 dBm
- Bypass Mode Gain: -1.9 dB
- Bypass OP1dB: 25.4
- Bypass OIP3: 43.7

- Flexible Bias Voltage and Current
- Single Control Logic Input
- Pre-matched to 50 Ω
- Process: GaAs pHEMT

Applications

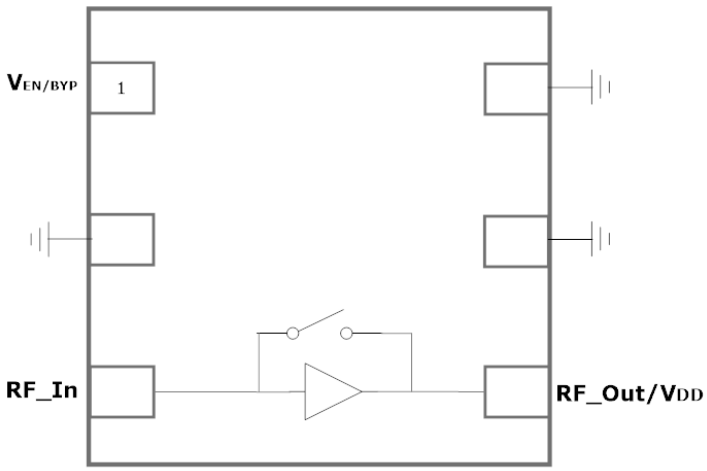
- Cellular Repeaters and Signal Boosters
- Cellular Infrastructure
- VHF/UHF and ISM Radios

Product Description

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 LNA is operated from a single positive supply of 1.8 to 5.0 V with a selectable Iddq range of 15 to 80 mA.

Consult with the GRF applications engineering team for custom tuning/evaluation board data and device s-parameters.



1.5 x 1.5 mm DFN-6

Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	0	6.0	V
RF Input Power CW (Load VSWR < 2:1; V_D: 5.0 volts)	$P_{IN\ MAX}$		20	dBm
Operating Temperature (Package Heat Sink)	T_{AMB}	-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	250		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		2	--

RoHS Compliant

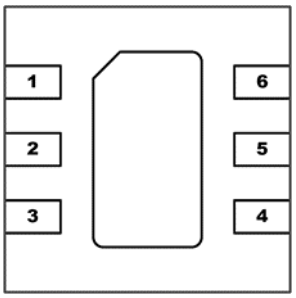
Caution! ESD Sensitive Device

Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF4142 landing page: Manufacturing Note—MN-001 Product Tape and Reel, Solderability and Package Outline Specification.

Link to manufacturing note:

Pin Out (Top View)



Pin Assignments:

Pin	Name	Description	Note
1	$V_{ENABLE/BYPASS}$	Enable Voltage Input	Venable < =0.2 volts sets bypass Mode. Venable and external series resistor control the device Iddq when Venable is high.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	Partially-matched 50Ω. An external DC blocking cap must be used.
4	RF_Out	LNA RF output	Internally matched 50Ω. V_{DD} must be applied through a choke to this pin
5	NC	No Connect or Ground	No internal connection to die
6	NC	No Connect or Ground	No internal connection to die
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.

Control Logic Truth Table:

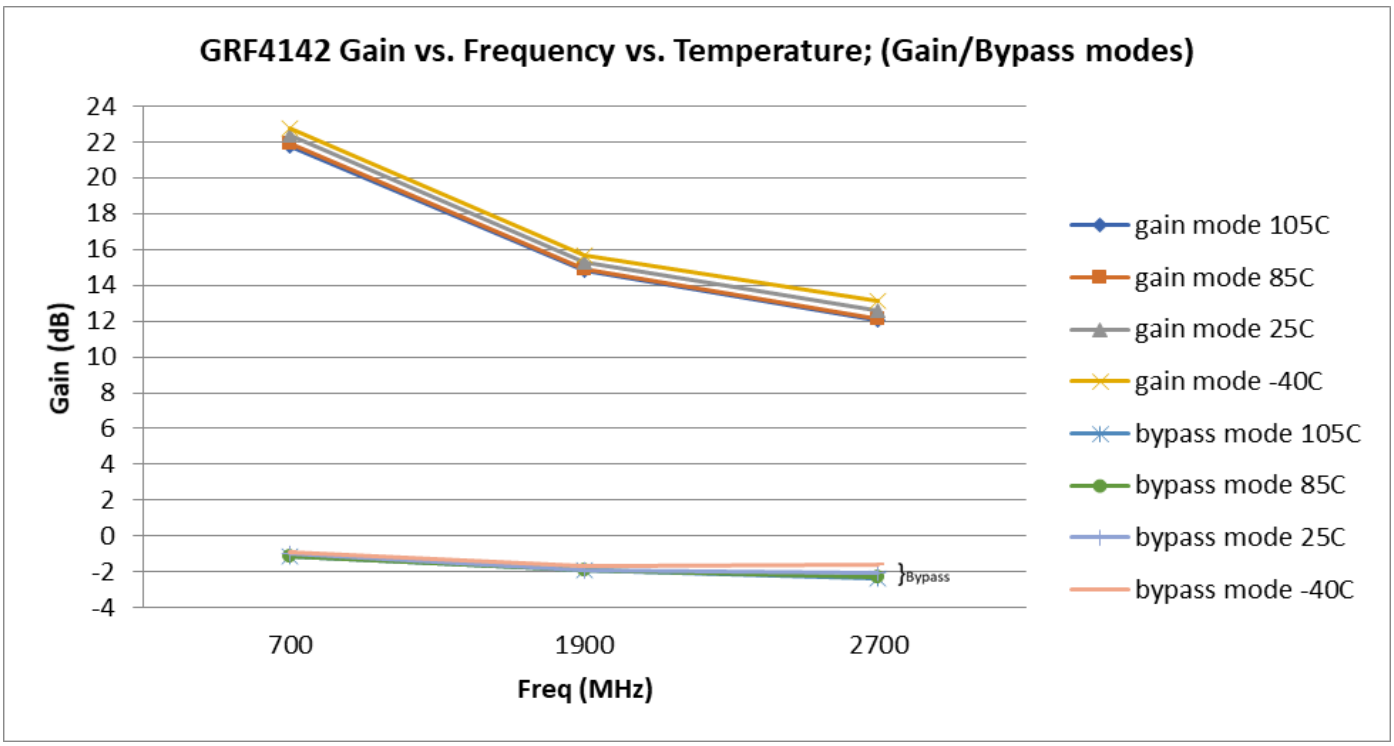
Mode	Description	V_{DD}	$V_{ENABLE/BYPASS}$
High Gain	High LNA Gain	1	1
Bypass	Linear Bypass Mode	1	0
Logic Level “0”	Logic Low	0.0V to 0.2V	0.0V to 0.2V
Logic Level “1”	Logic High	1.8V to 5.0V	1.5V to Vdd

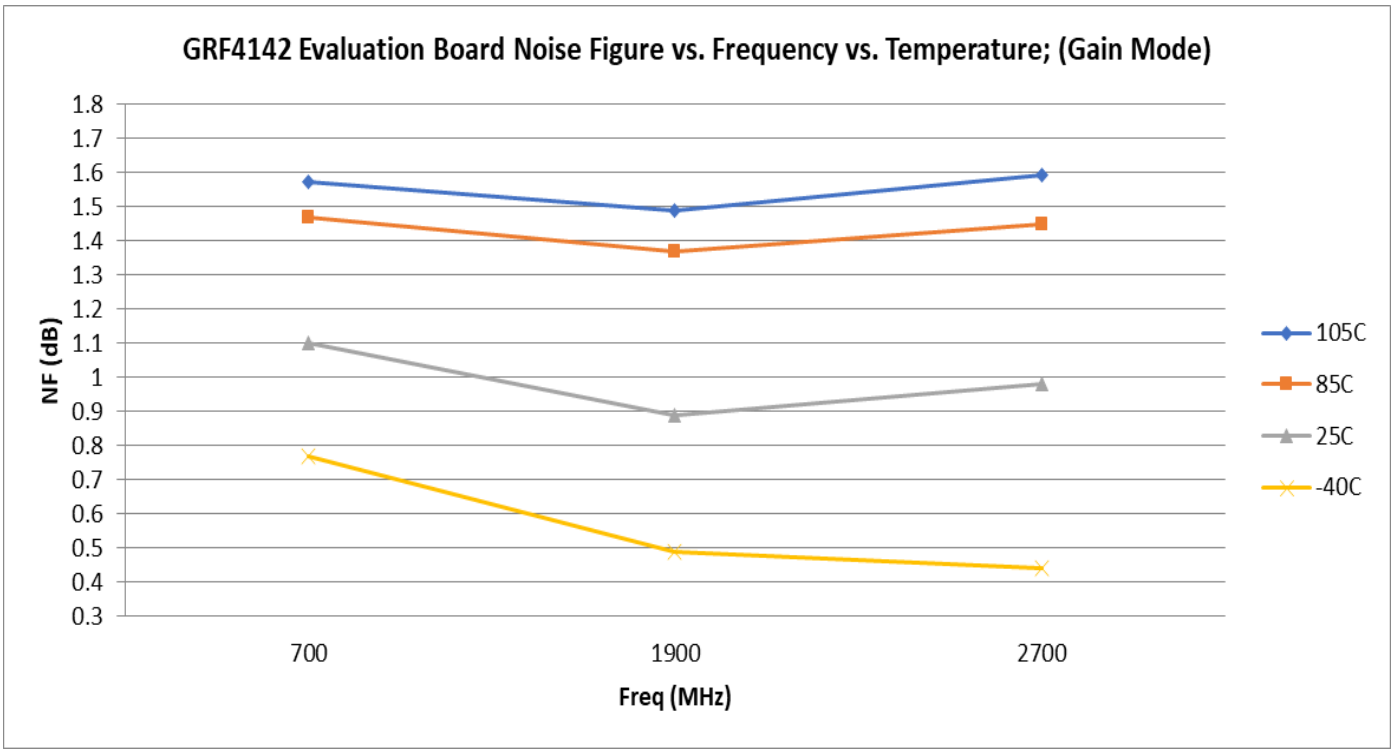
Nominal Operating Parameters: (Standard Match)

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
High Gain Mode						V_{DD} = 3.3 V; V_{ENABLE}: High
Test Frequency	F_{TEST}		1.9		GHz	
Gain	S21	14.3	15.3		dB	
Noise Figure (Evaluation Board)	NF		0.90	1.1	dB	
Output 1dB Compression Point	OP1dB	17.7	19.2		dBm	
Output Third Order Intercept Point	OIP3		33.0		dBm	
Switching Rise Time	T_{RISE}		800		ns	Bypass to gain mode
Switching Fall Time	T_{FALL}		200		ns	Gain to bypass mode
Supply Current	I_{DD}		55		mA	
Enable Current	I_{ENABLE}		2.0		mA	
Bypass Mode						V_{DD}: 3.3 V; Ven: 0.0 V;
Gain	S(2,1)	-3.0	-2.0		dB	
Output 1dB Compression Point	OP1dB		25.4		dBm	
Output Third Order Intercept Point	OIP3		43.7		dBm	
Leakage Current	$I_{LEAKAGE}$		475		uA	V_{DD}: 3.3V; V_{ENABLE}: 0.0V
Thermal Data						
Thermal Resistance (Infra-Red Scan)	Θjc		132		°C/W	
Channel Temperature @ +85 C reference (Package heat sink)	$T_{CHANNEL}$		109		°C	V_{DD}: 3.3 V; I_{DDQ}: 55 mA; No RF; Dissipated Power:182 mW

Note: MTTF >10^6 hours for $T_{CHANNEL}$ < =170 degrees C.

GRF4142 Evaluation Board Data: (3.3V/55mA)





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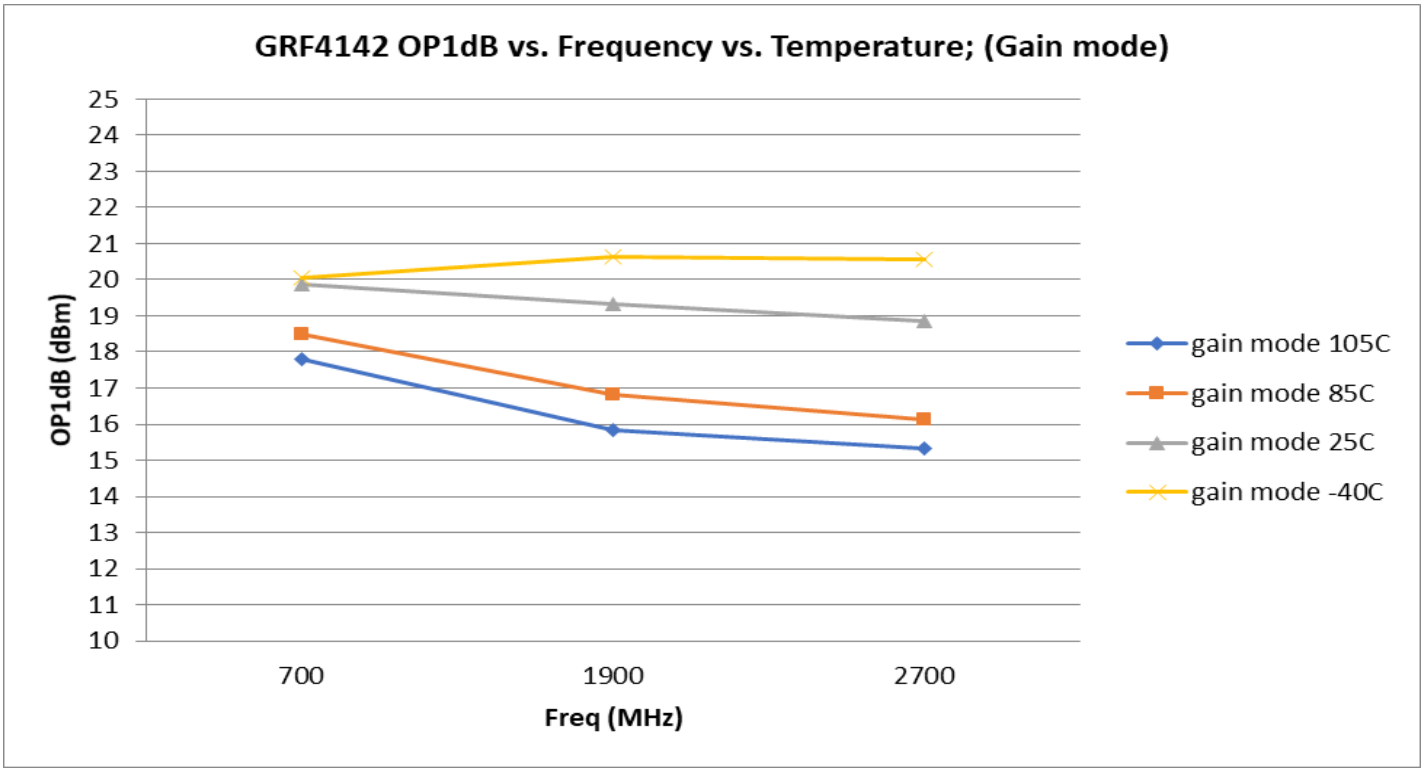

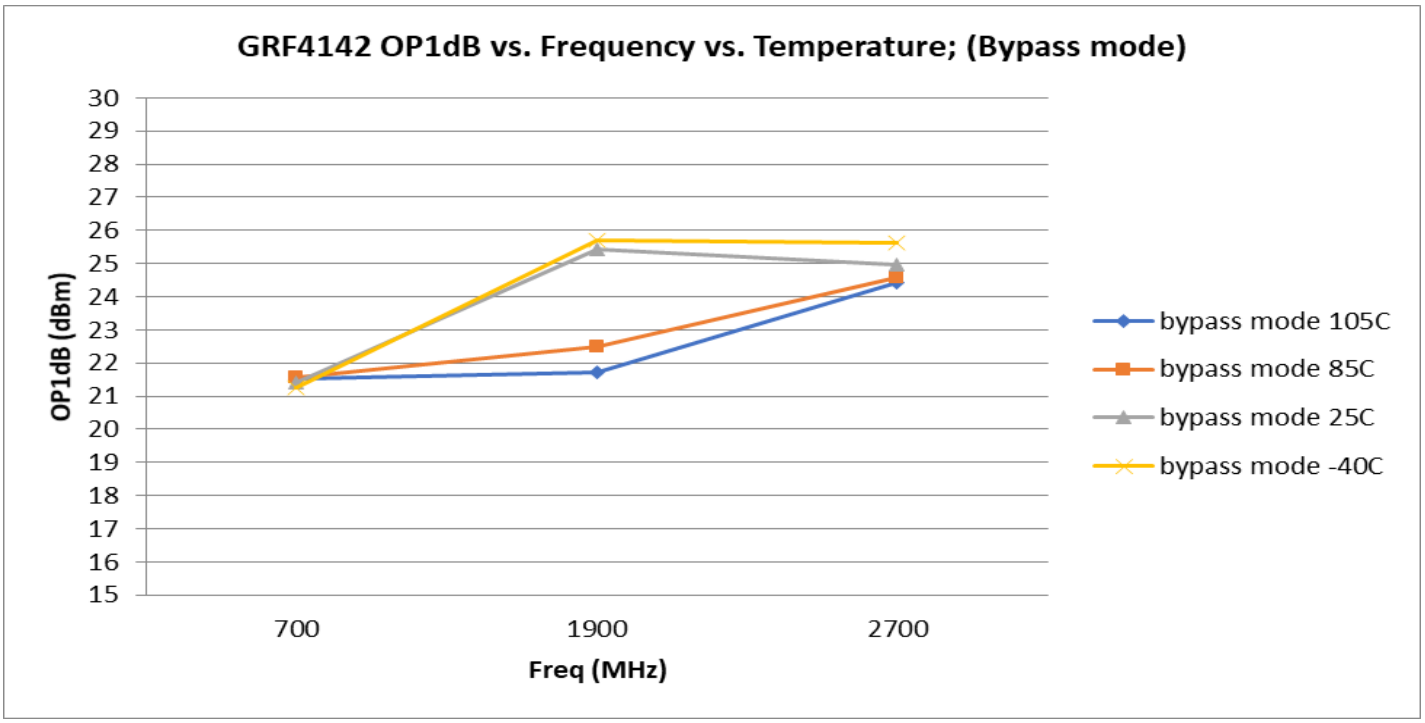

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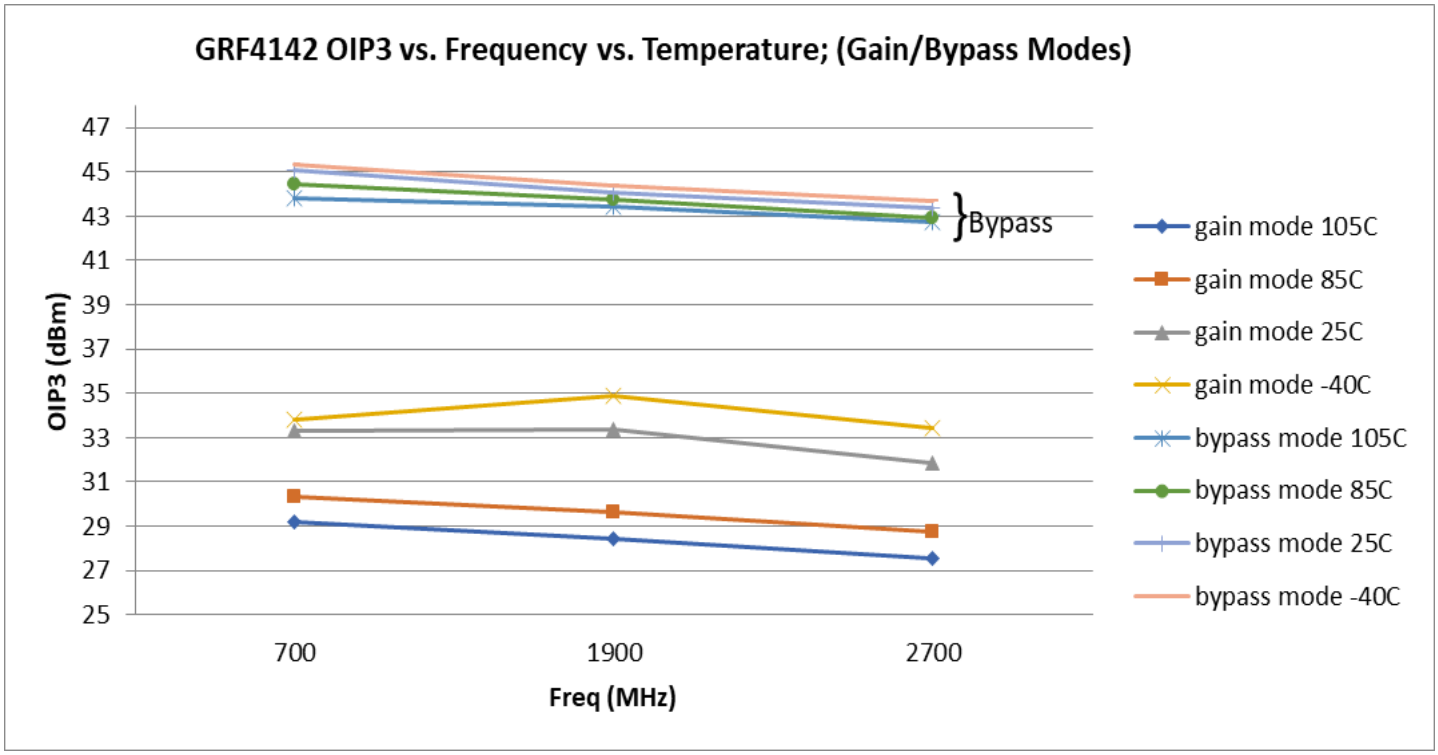
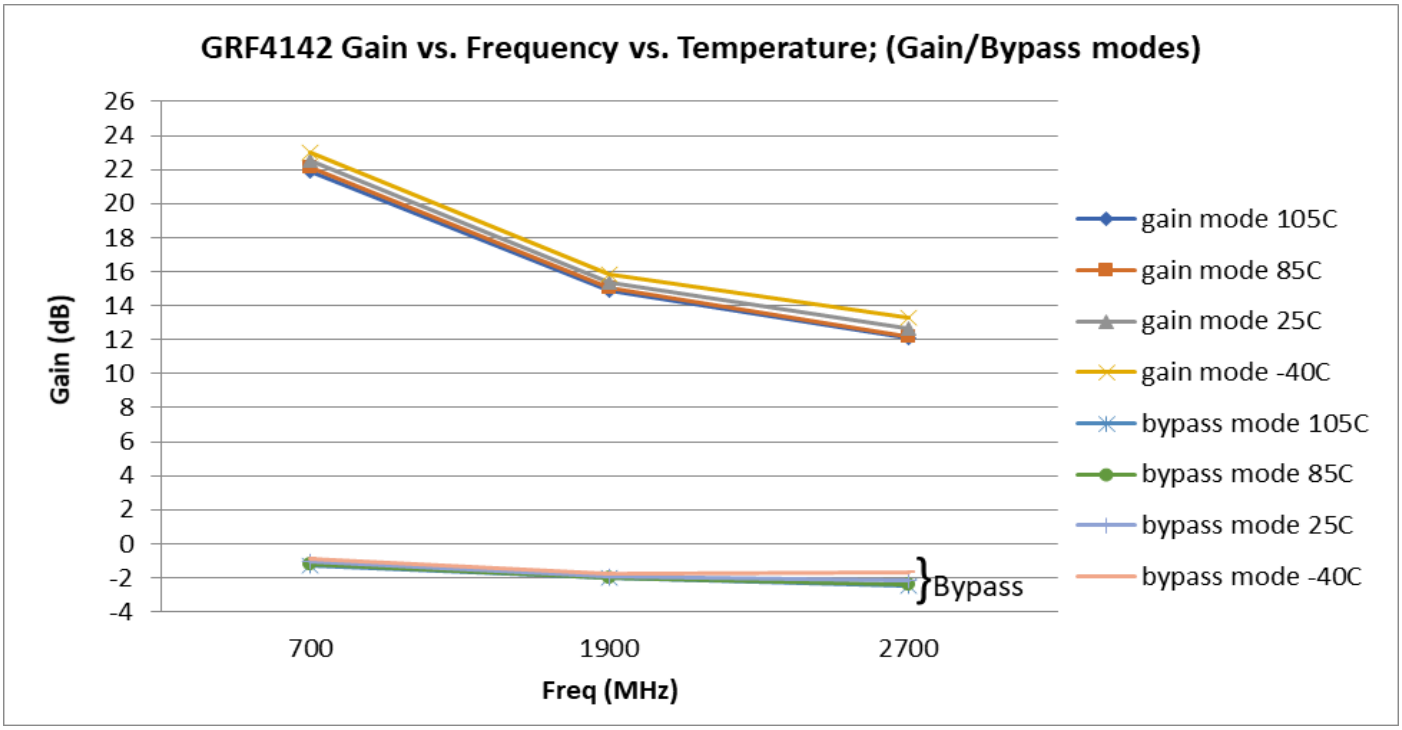
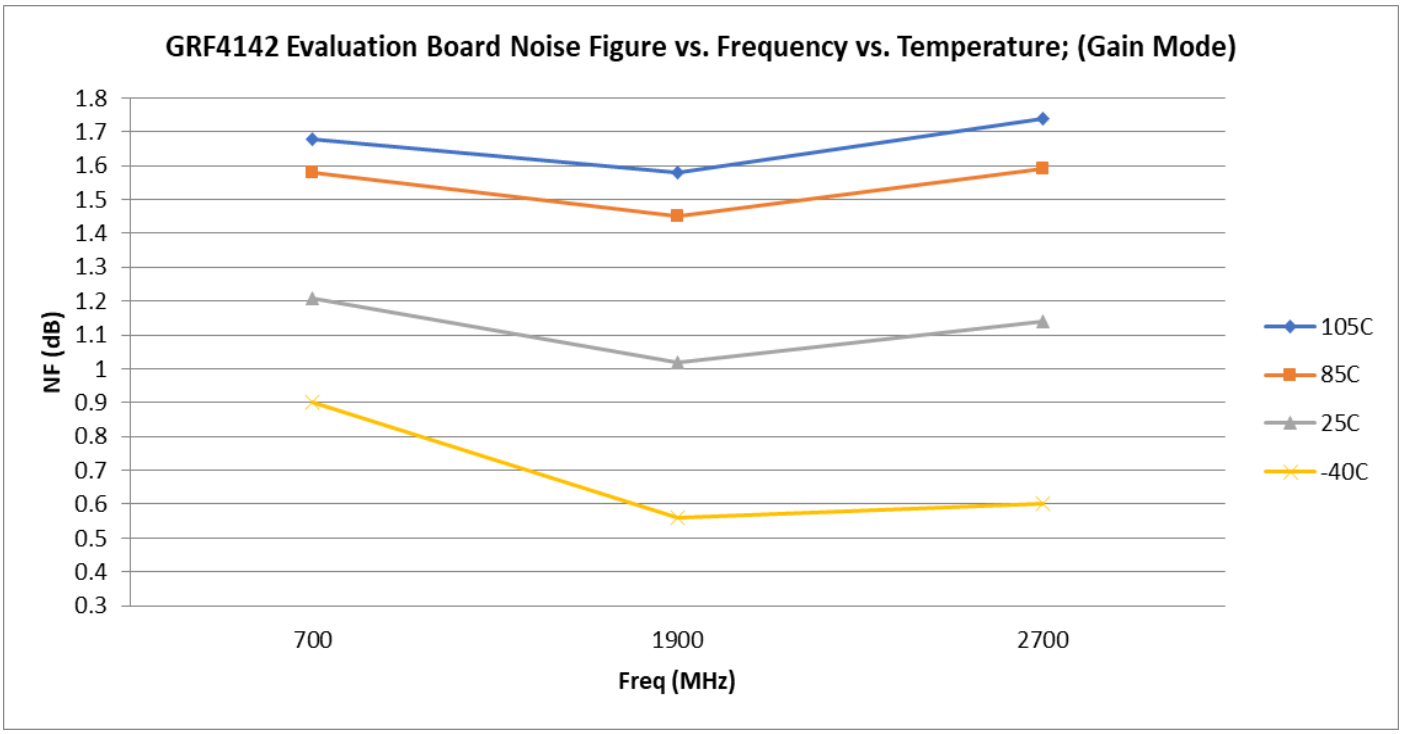


GRF4142 Evaluation Board Data: (5.0V/70mA)





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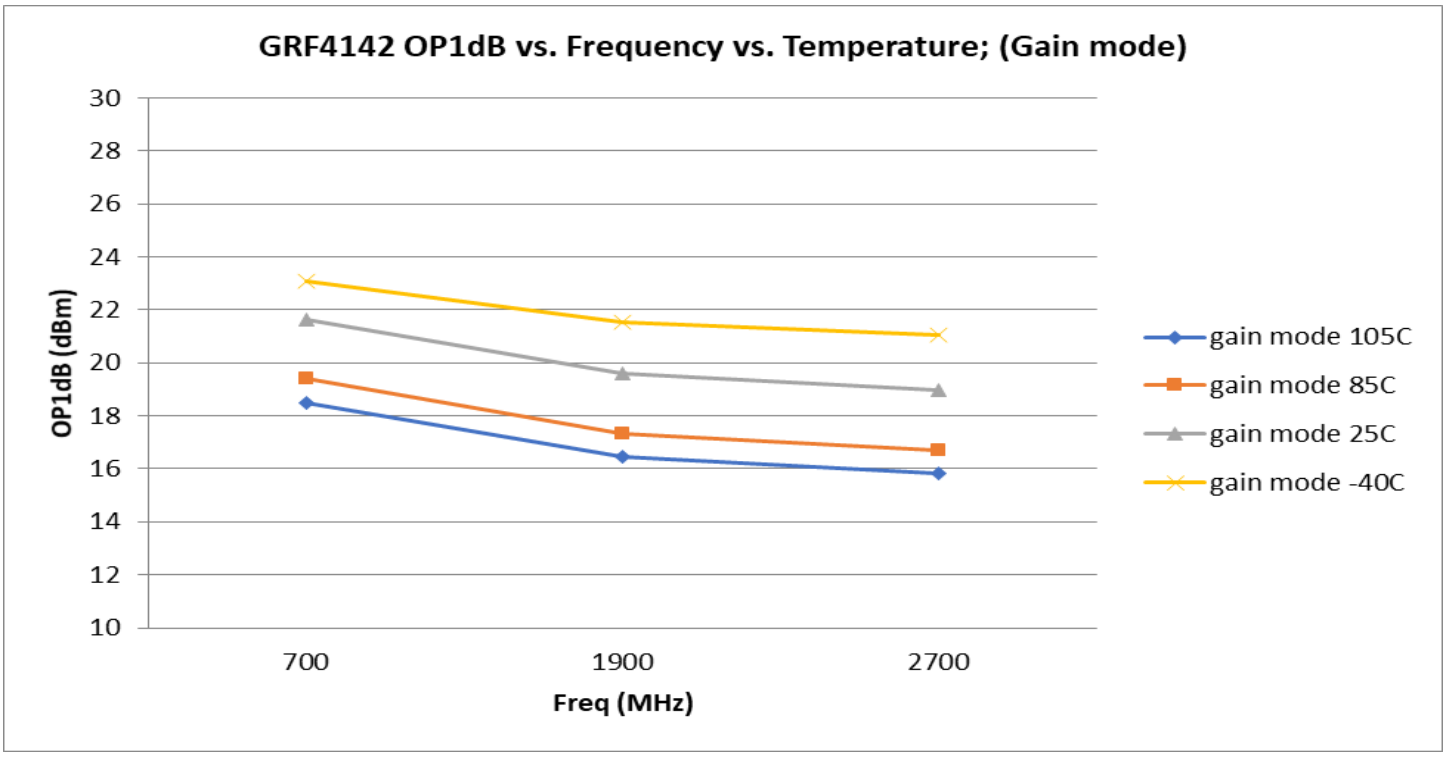

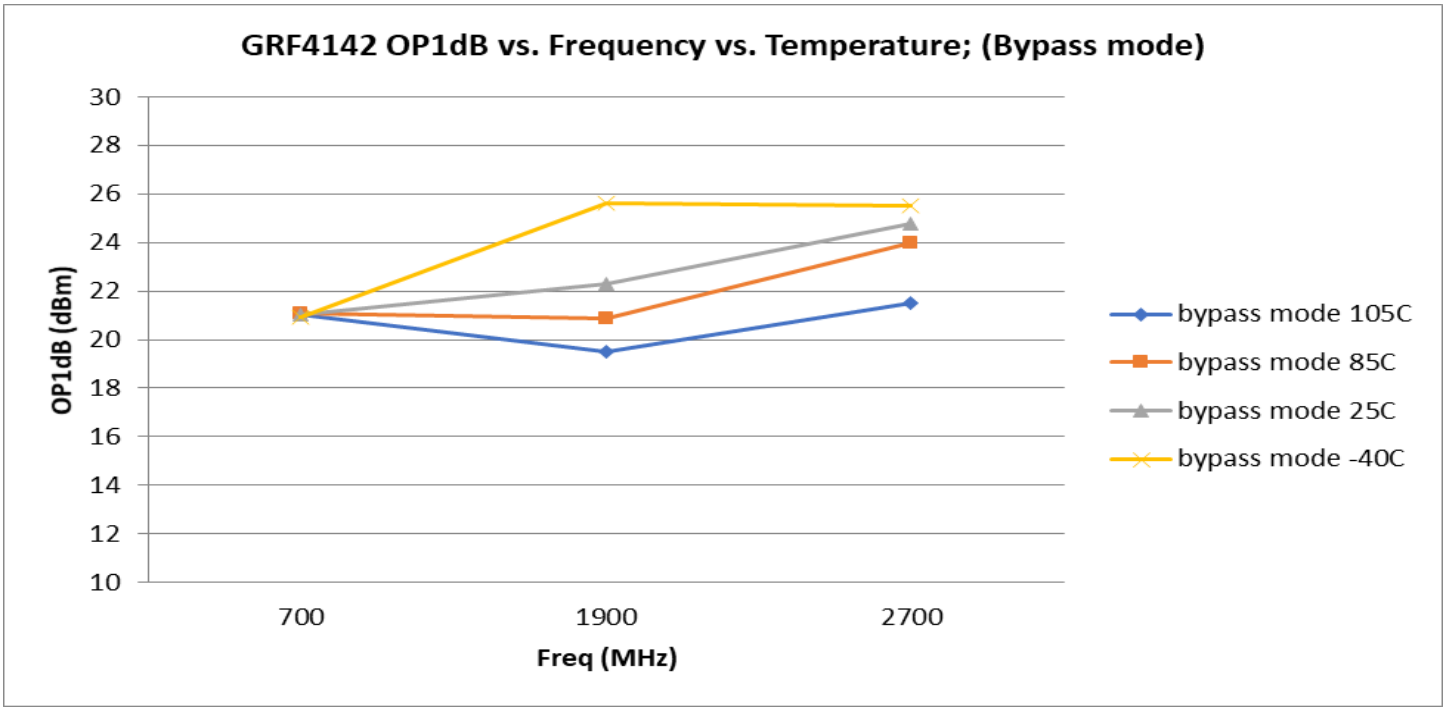

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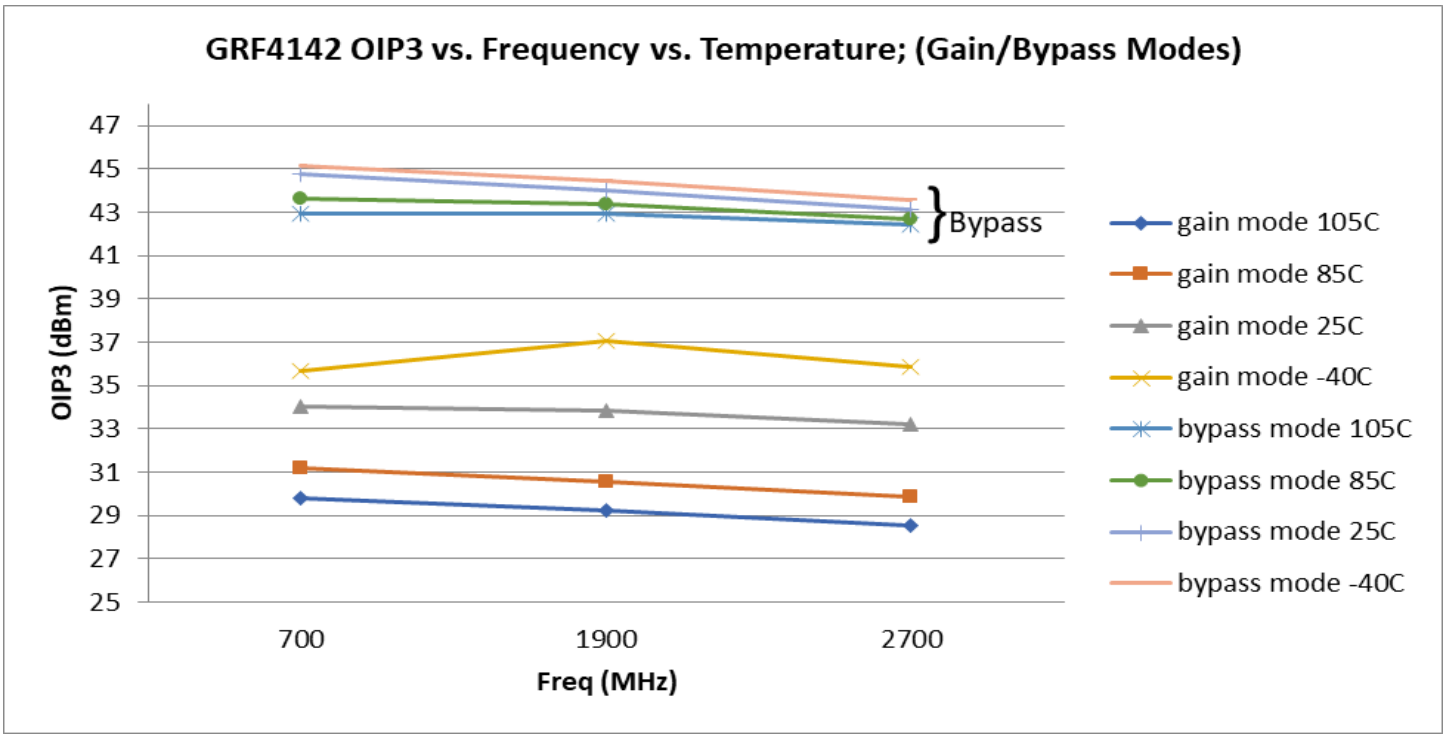
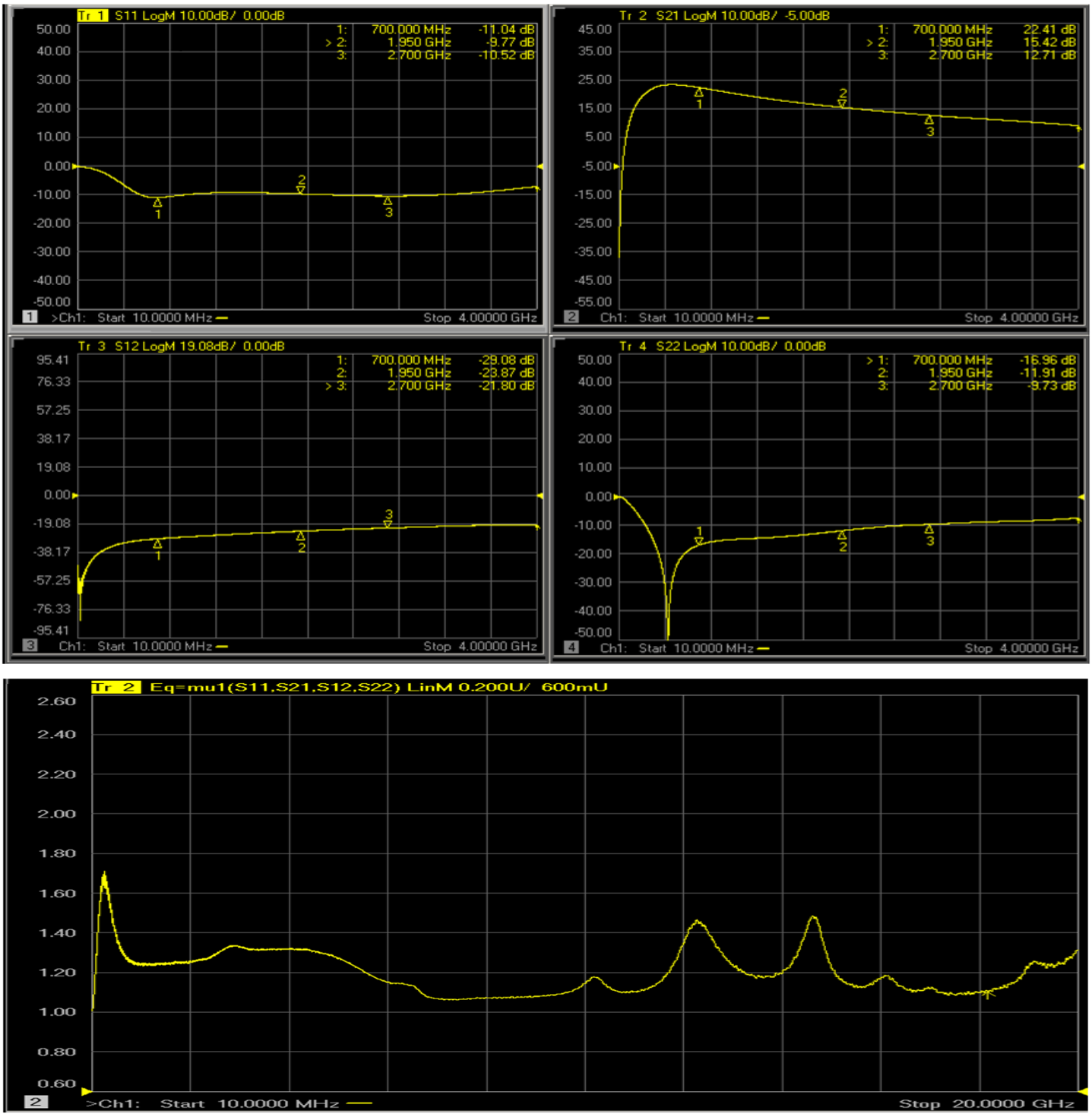
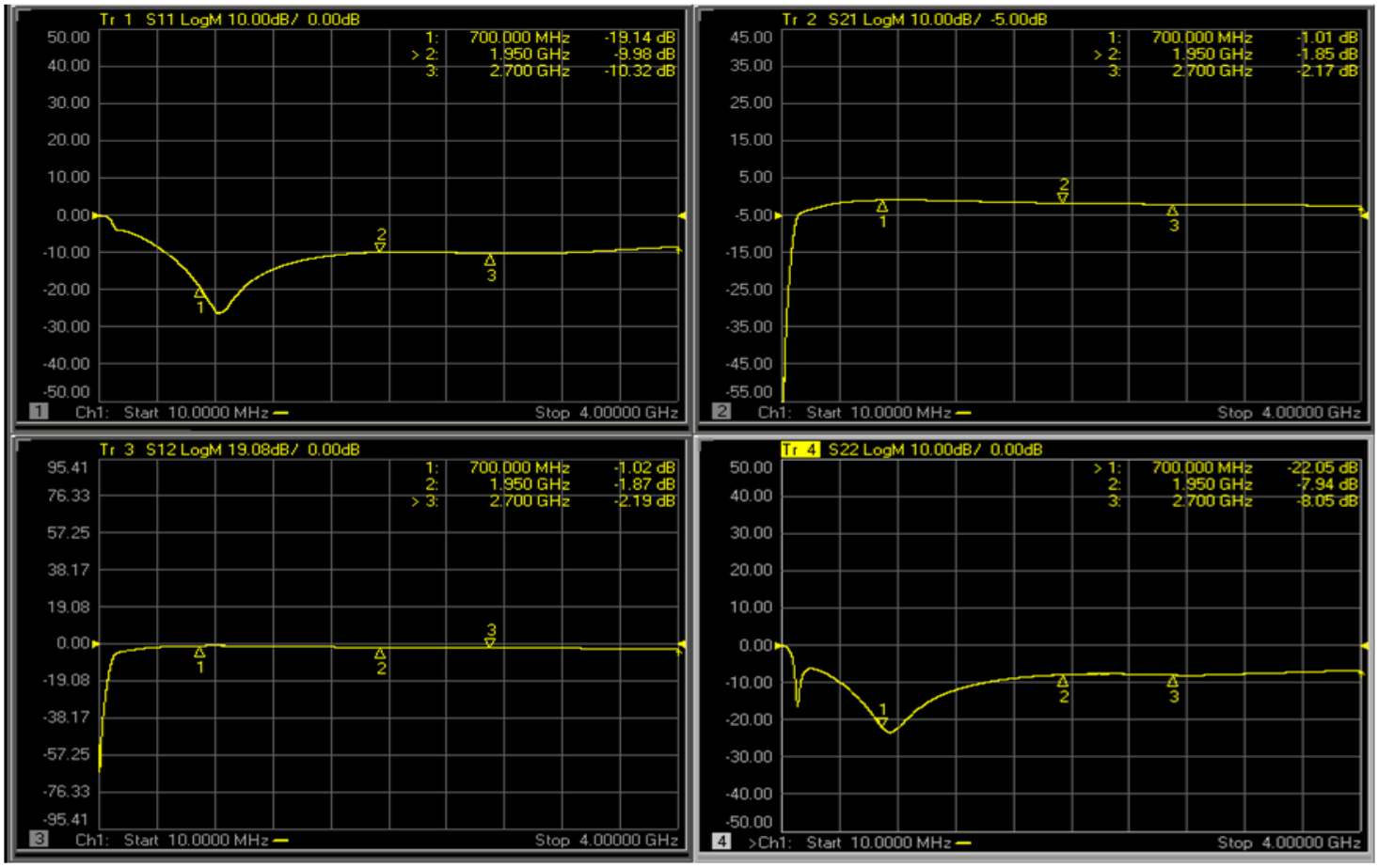


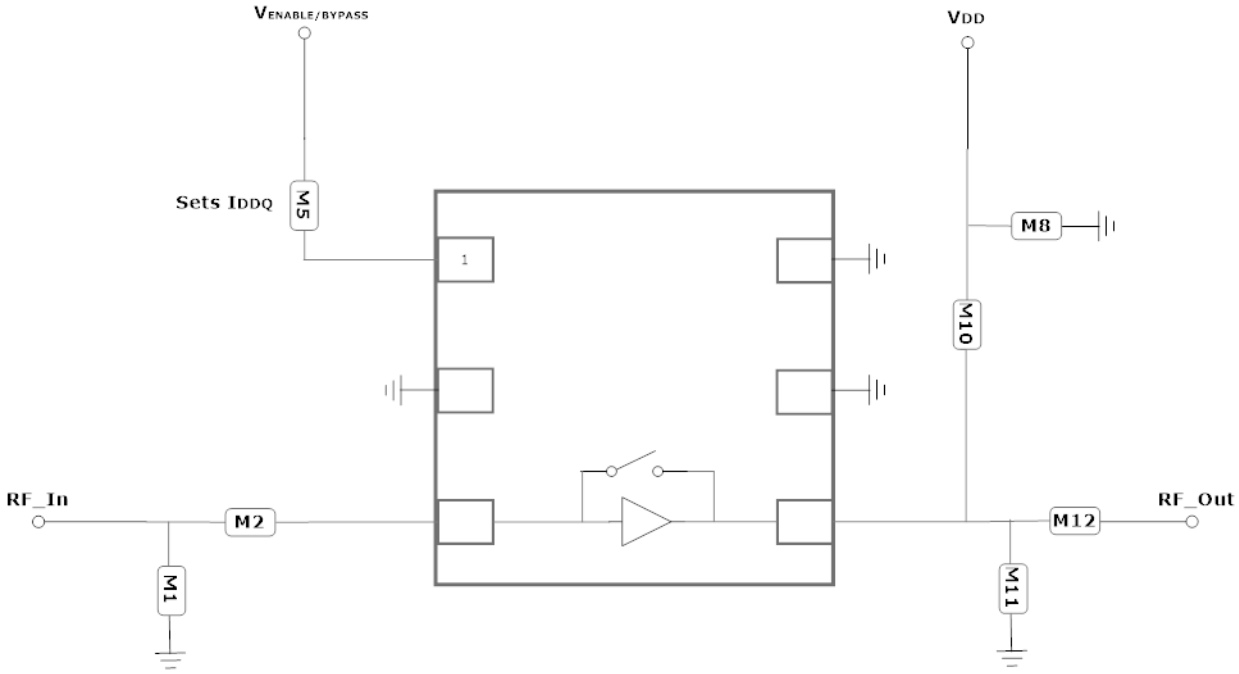
GRF4142 Evaluation Board S-Pars and Stability Mu Factor: (0.7 to 2.7 GHz Match)



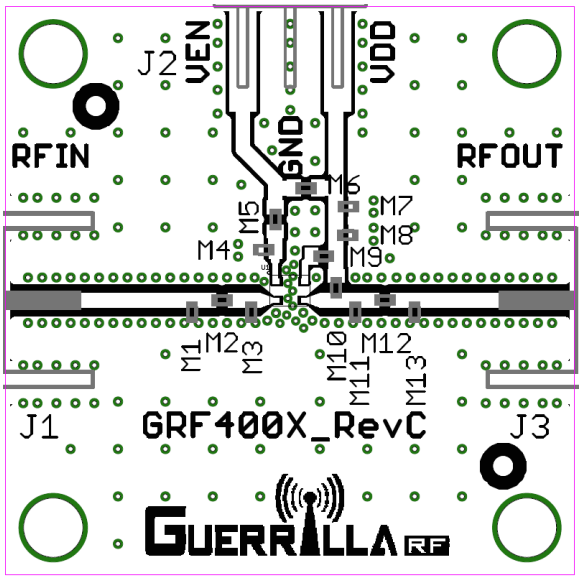
Note: Mu factor >= 1.0 implies unconditional stability.

GRF4142 Evaluation Board S-Pars and Stability Mu Factor: (Bypass Mode; 0.7 to 2.7 GHz)





GRF4142 Application Schematic

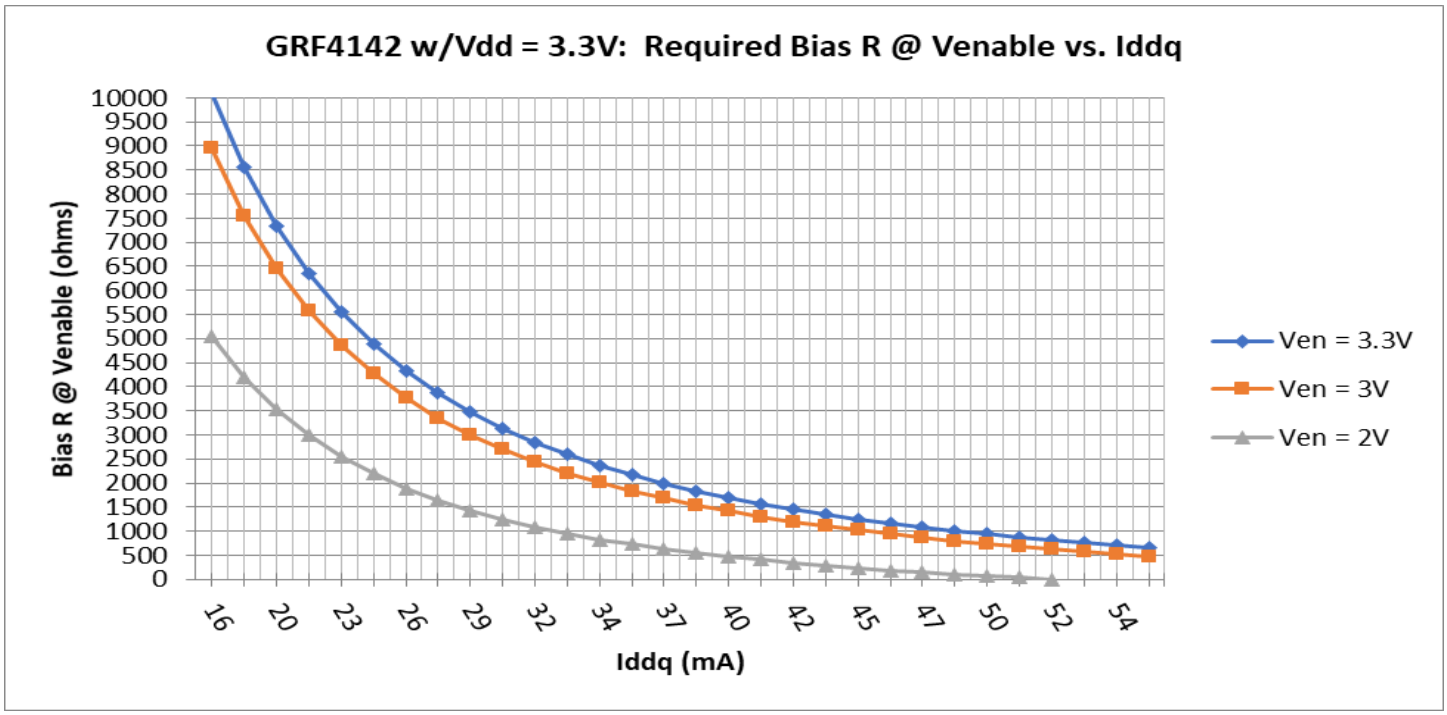


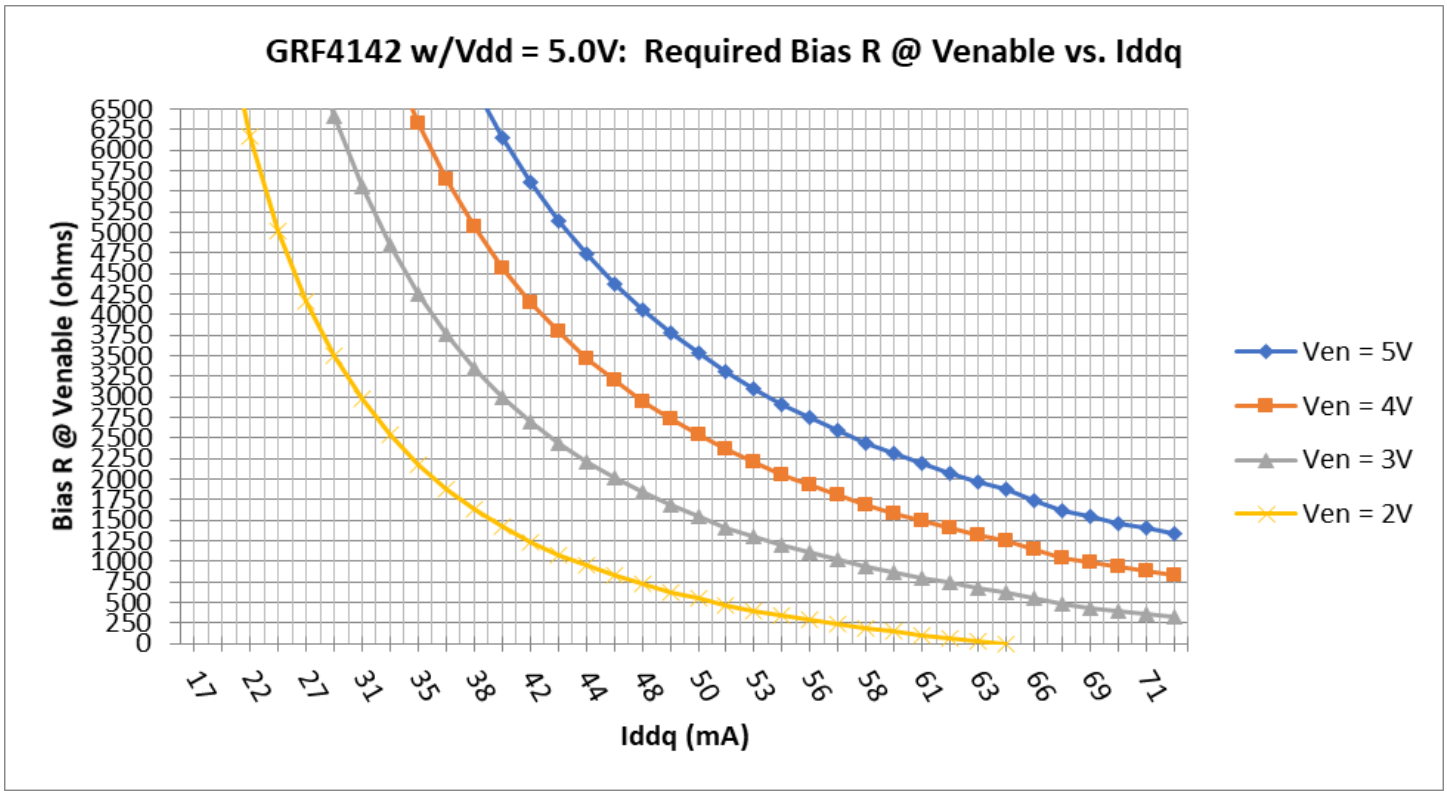
GRF4142 Evaluation Board Assembly Diagram

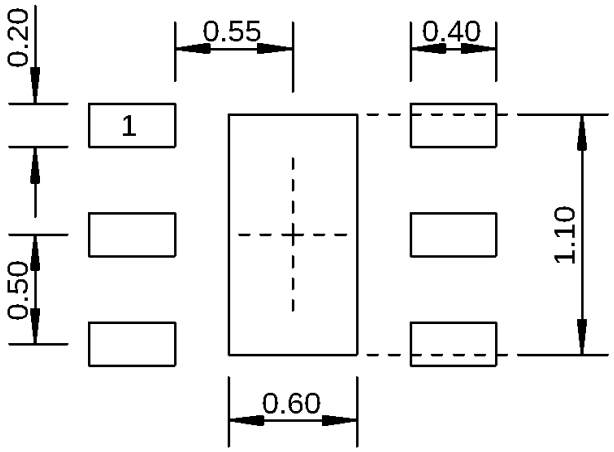
GRF4142 Standard Evaluation Board BOM: (Standard 0.7 to 2.7 GHz Tune)

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 (See Curves)	Resistor	Various	5%	Sets Iddq	0402	ok
M8	Capacitor	Murata	GRM	0.1 uF	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
Evaluation Board	GRF400X_RevC					

GRF4142 Bias Resistor Selection Charts

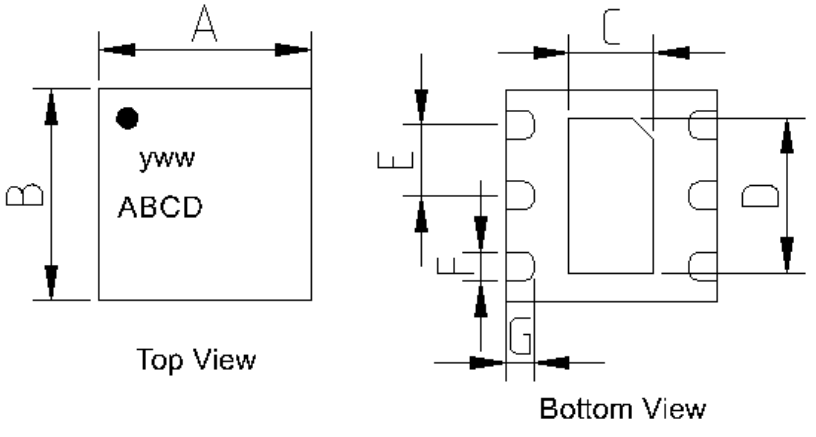






Dimensions in millimeters

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



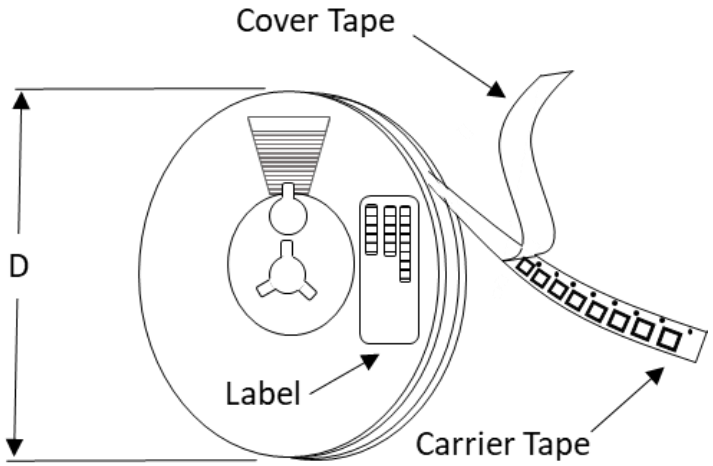
Dimensions (MM)	
A	1.5 +/- 0.050
B	1.5 +/- 0.050
C	.6 +/- 0.050
D	1.1 +/- 0.050
E	.5 Bsc
F	.2 +/- 0.050
G	.2 +/- 0.050
H	.45 +/- 0.050
J	.12 Ref.

1.5 mm DFN-6 Package Dimensions

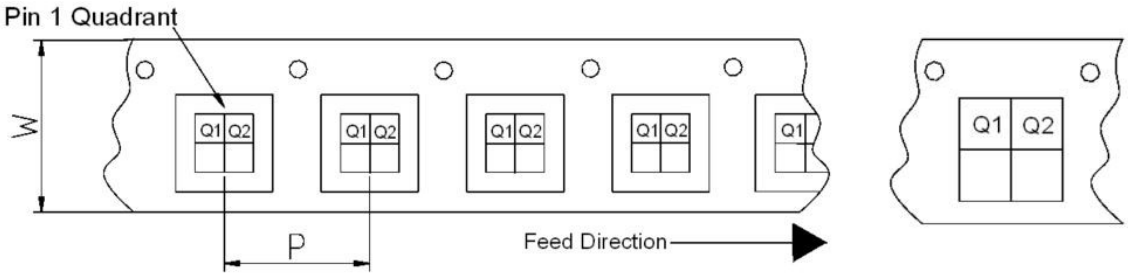
Tape and Reel Information:

Guerrilla RF's Tape and Reel specification complies with the Electronics Industries Association (EIA) standards for 'Embossed Carrier Tape of Surface Mount Components for Automatic Handling". Reference EIA-481. See the table on the following page for Tape and Reel specifications along with units per reel.

Devices are loaded with pins down into the carrier pocket with protective cover tape, wound into a plastic reel. Each reel will be packaged in a cardboard box. There will be product labels on the reel, the protective ESD bag and the outside surface of the box.



Tape and Reel Packaging with Reel Diameter Noted (D)



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

Tape and Reel Specification and Device Package Information Table

Package				Carrier Tape			Reel	
Type	Dimensions (mm)	Leads	Weight (mg)	Width (W) (mm)	Pocket Pitch (P) (mm)	Pin 1 Quad-rant	Diameter (D) (inches)	Units per Reel
QFN	2.0 x 2.0 x 0.50	12	7	8	4	Q1	7	2500
QFN	3.0 x 3.0 x 0.85	16	24	12	8	Q1	7	1500
DFN	1.5 x 1.5 x 0.45	6	4	8	4	Q1	7	2500
DFN	2.0 x 2.0 x 0.75	8	12	8	4	Q1	7	2500
LFM	3.5 x 3.5 x 0.75	See	TBD	12	8	Q2	7	1500
LFM	4.0 x 4.0 x 0.75	See note	TBD	12	8	Q2	7	1500

Note: Lead count may vary. Reference applicable product data sheet