GRF2133

Released

Ultra-High Gain LNA
Tuning Range: 0.1 to 2.7 GHz

Features

Reference: 5.0V/60mA/700 MHz

- Gain: 40.0 dB
- OP1dB: 20.0 dBm
- OIP3: 31.0 dBm
- NF: 0.70 dB

Reference: 5.0V/60mA/1950 MHz

- Gain: 28.0 dB
- OP1dB: 20.0 dBm
- OIP3: 31.0 dBm
- NF: 0.60 dB

Reference: 5.0V/60mA/2500 MHz

- Gain: 23.5 dB
- OP1dB: 20.0 dBm
- OIP3: 30.0 dBm
- NF: 0.75dB

- Internally Matched
- Unconditionally Stable
- Flexible Biasing
- Process: GaAs pHEMT

Applications

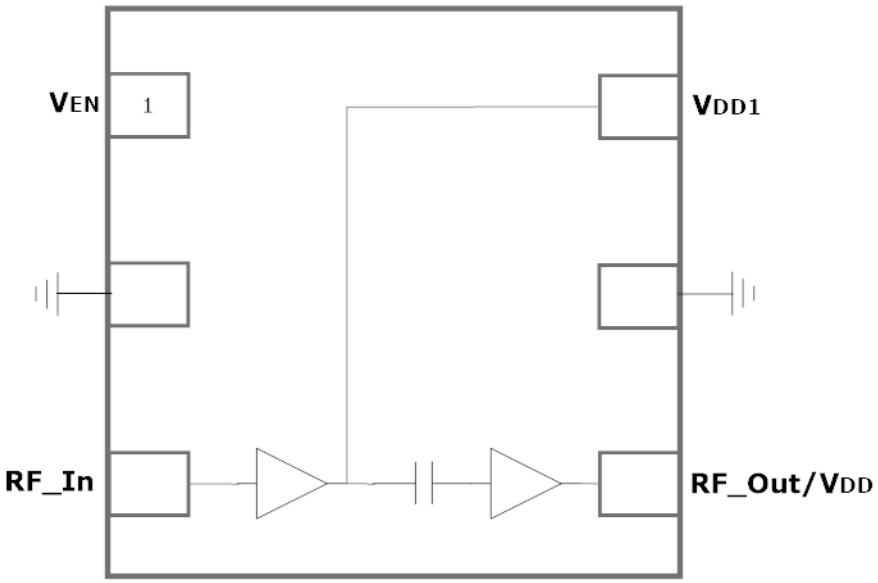
- High Gain LNA
- Cellular Boosters / Repeaters
- Linear Driver Amplifier

Product Description

GRF2133 is a broadband linear gain block featuring ultra-high gain and sub 0.85 dB noise figure for small cell, cellular booster, wireless infrastructure and other high performance applications.

Configured as a linear driver, LNA or cascaded gain block, it offers high levels of reuse both within a design and across platforms. The device is operated from a supply voltage of 1.8 to 5.0 V with a selectable Iddq range of 35 to 120 mA for optimal efficiency and linearity.

Consult with the GRF applications engineering team for custom tuning/evaluation board data, device s-parameters and for applications with Vdd < 2.7 volts.



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: (Load VSWR < 2:1; V_D: 5.0 volts)	$P_{IN\ MAX}$		23	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	$P_{DISS\ MAX}$		700	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		1	--

RoHS Compliant

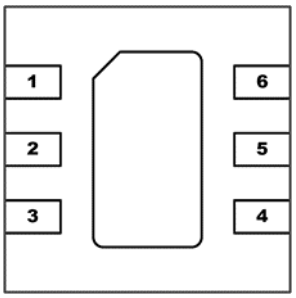
Caution! ESD Sensitive Device

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 GRF2133 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:

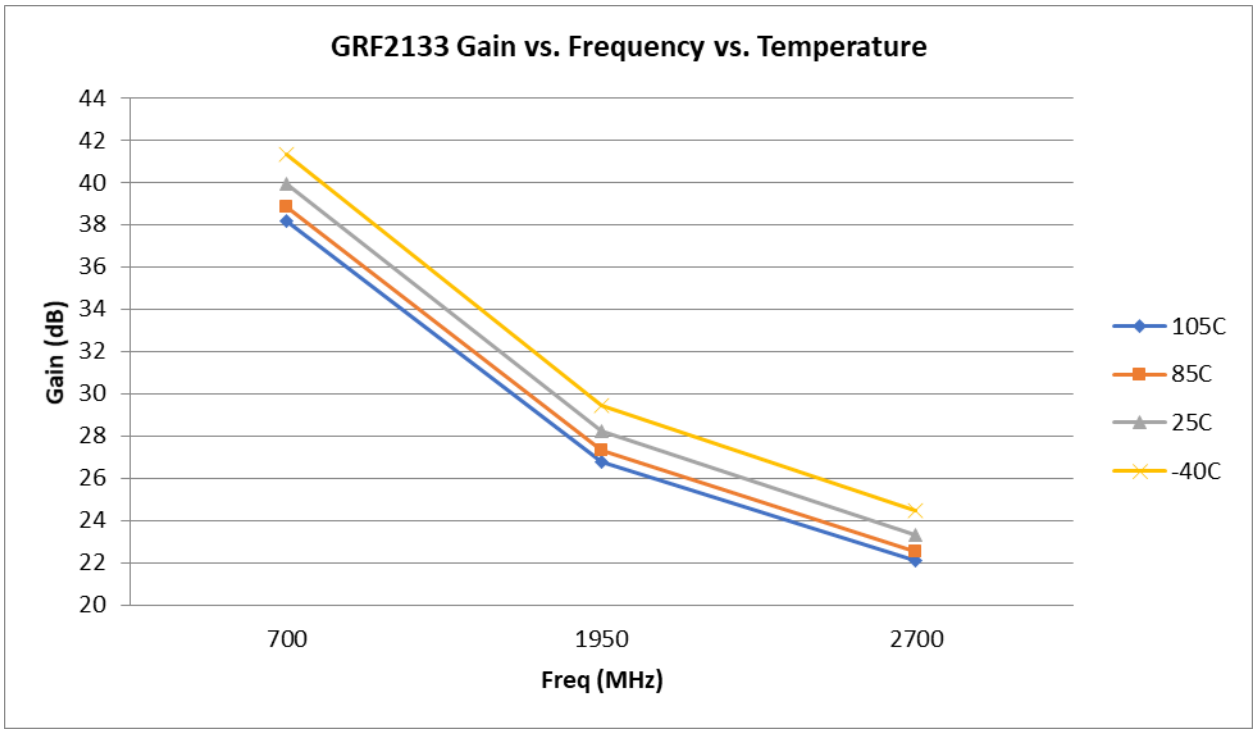
Pin	Name	Description	Note
1	V_{ENABLE}	Enable Voltage Input	V_{ENABLE} and series resistor set I_{DDQ}. V_{ENABLE} < 0.2 volts disables device. On-die pull-down resistor will turn the part off if this node is allowed to float.
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	External DC block required.
4	RF_Out/V_{DD}	LNA RF output	V_{DD} applied to this pin. External DC block required.
5	NC	No Connect or Ground	No internal connection to die
6	V_{DD1}	Bias Supply	Typically tied to V_{DD} via an external resistor or an inductor (for V_{DD} < 4.0 volts). Tying to V_{DD} allows for the re-use of M8 for the required de-coupling
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.

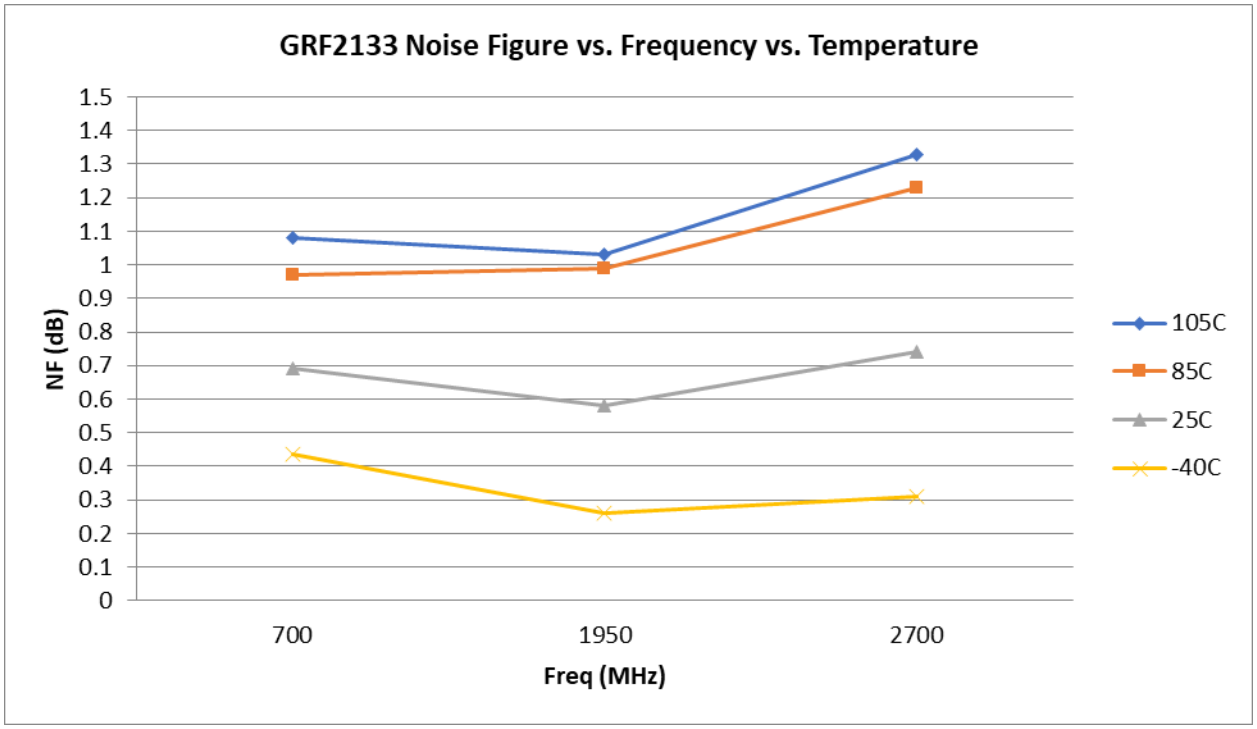
Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	F_{TEST}		1950		MHz	V_{DD} = 5.0 V, T_A = 25°C
Gain	S21	26.5	28.0		dB	
Output 3rd Order Intercept	OIP3		31.0		dBm	+2.0 dBm P_{OUT} per tone at 2 MHz Spacing (1949 and 1951 MHz)
Output 1dB Compression Power	OP1dB	18.0	20.0		dBm	
Evaluation Board Noise Figure	NF		0.60	0.80	dB	
Switching Rise Time	T_{RISE}		10		us	
Switching Fall Time	T_{FALL}		200		ns	
Supply Current	I_{DD}		60		mA	
Enable Current	I_{ENABLE}		2.0		mA	
Disabled Mode						
Leakage Current	$I_{LEAKAGE}$		1		uA	V_{DD}: 5.0V; V_{ENABLE}: 0.0V
Thermal Data						
Thermal Resistance: (Infra-Red Scan)	Θjc		65		°C/W	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	$T_{CHANNEL}$		105 (See note)		°C	V_{DD}: 5.0 V; I_{DDQ}: 60 mA; No RF; P_{DISS}: 300 mW

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

GRF2133 Evaluation Board Performance; (5V/60 mA)





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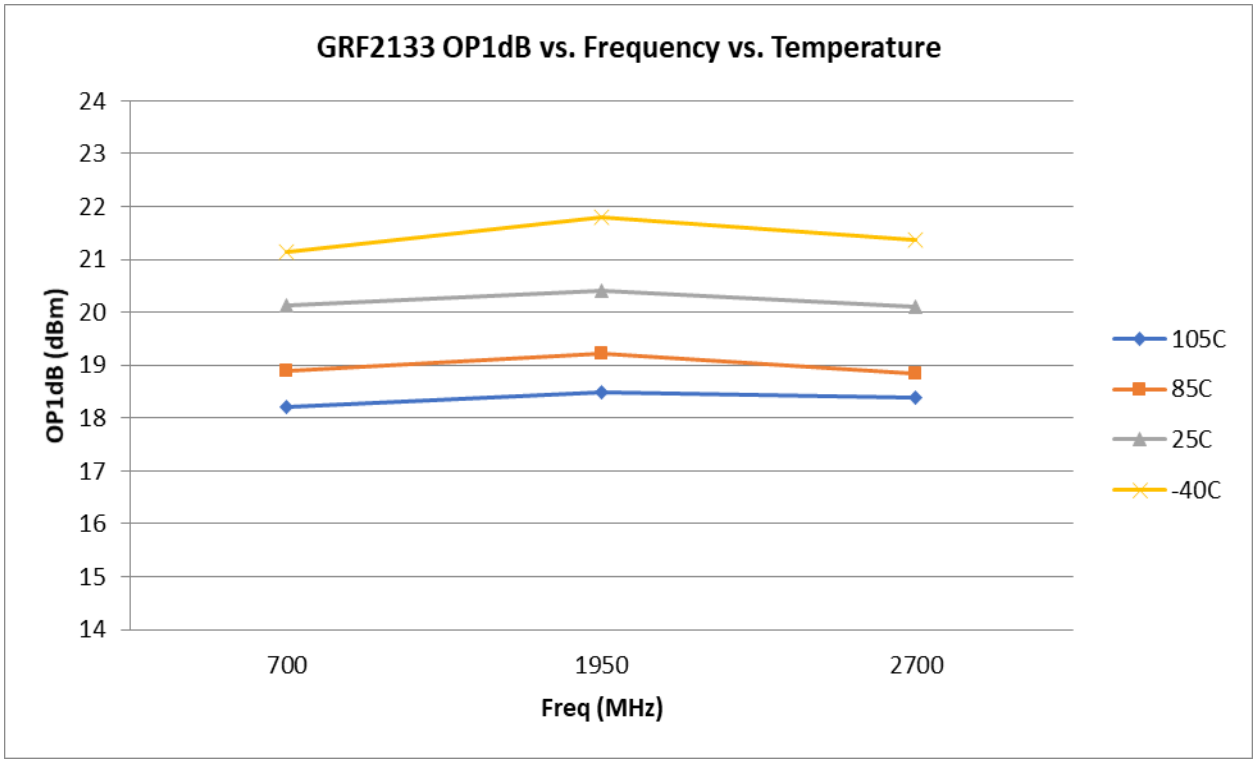
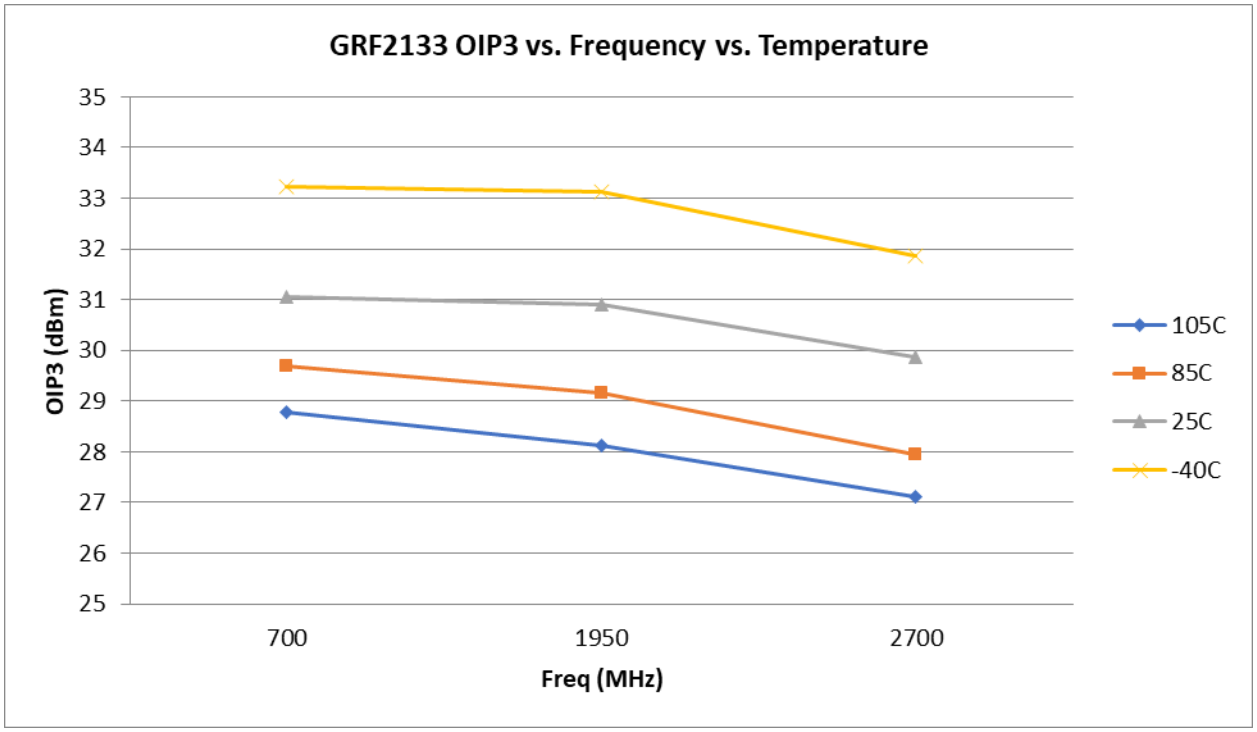
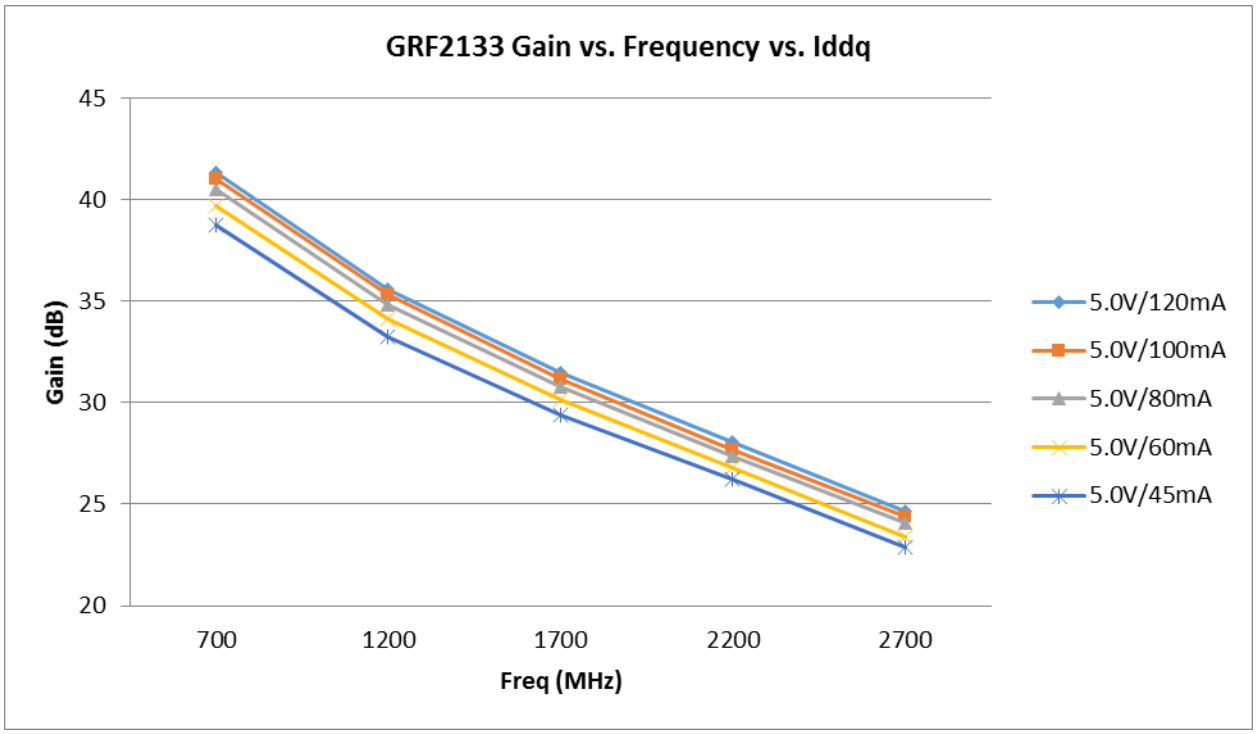




GRF2133 Evaluation Board Performance vs. Bias Current:



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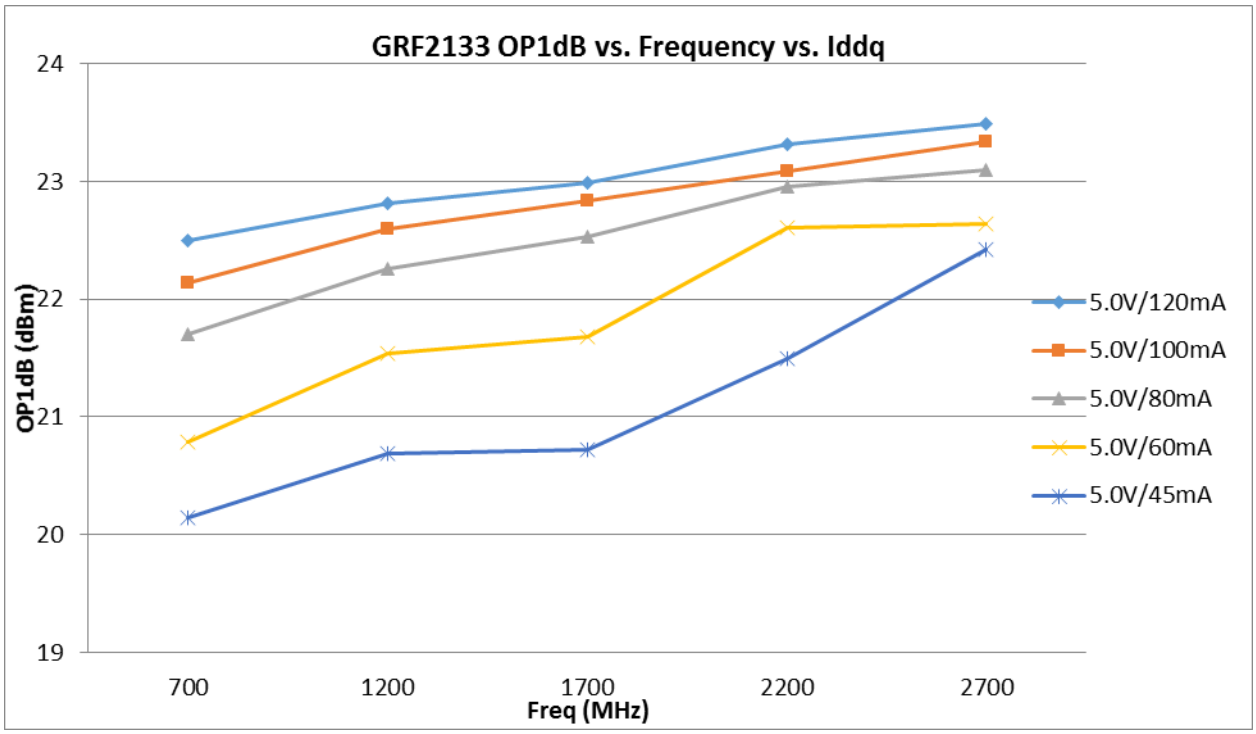
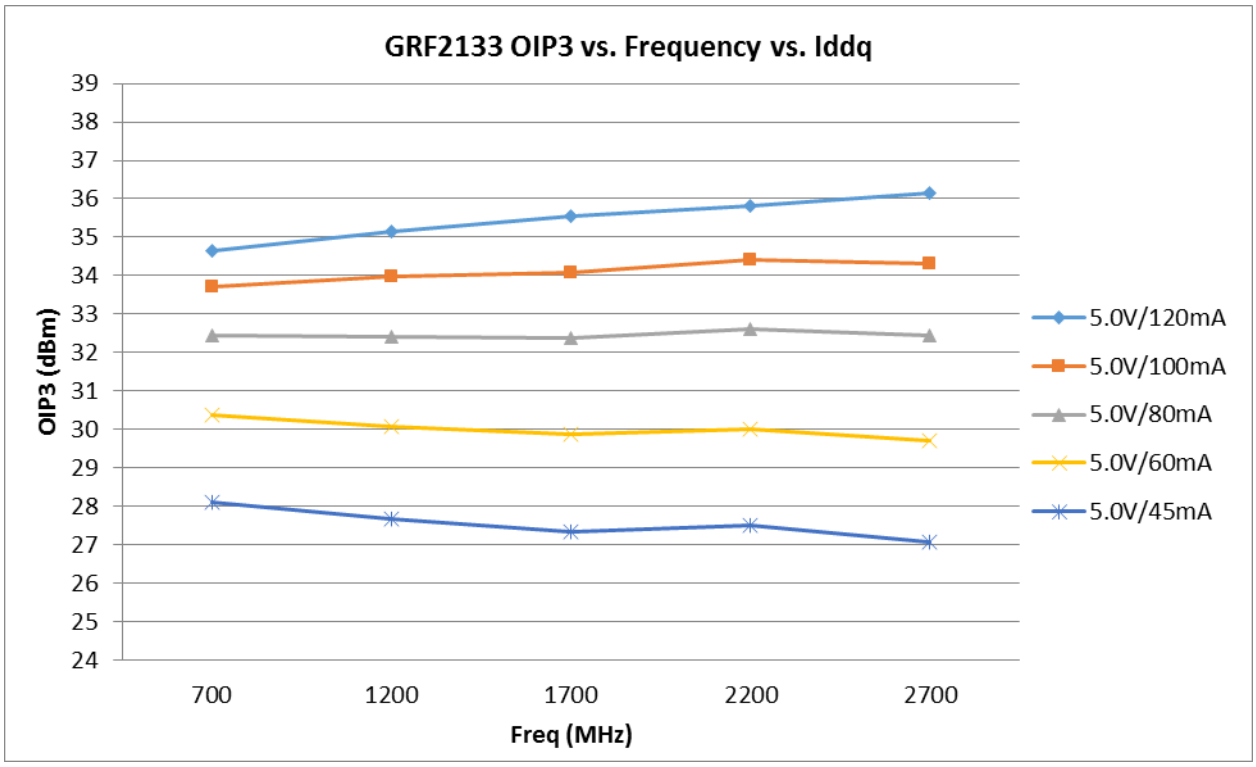
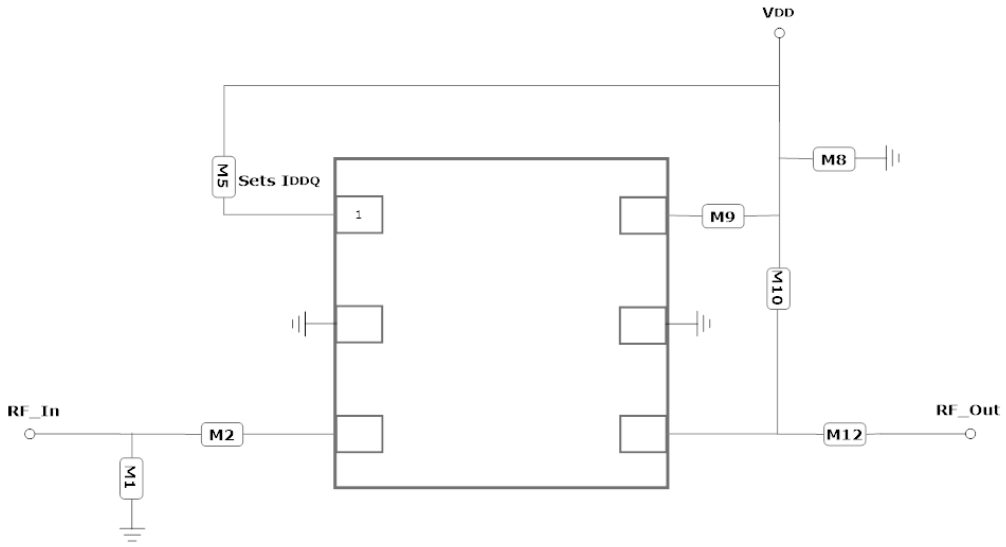
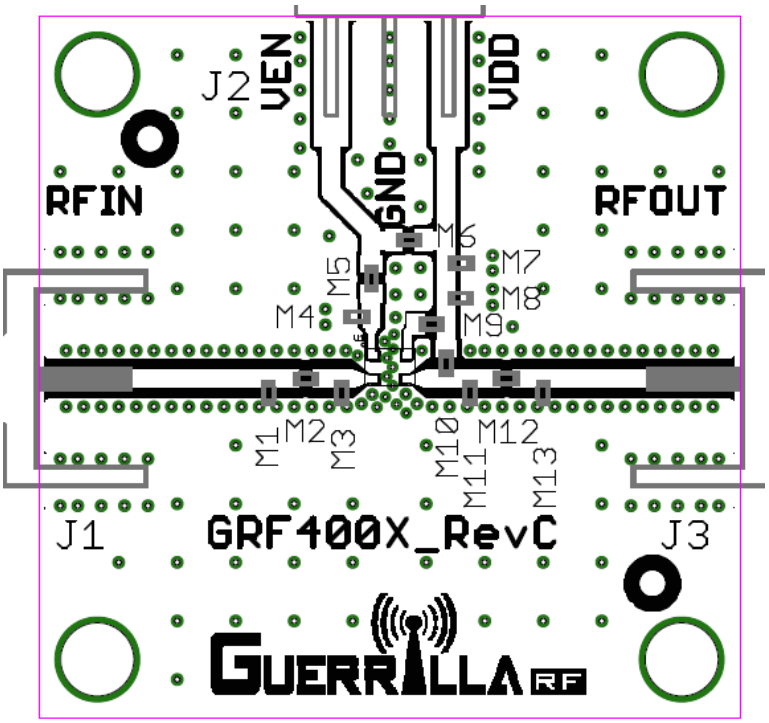




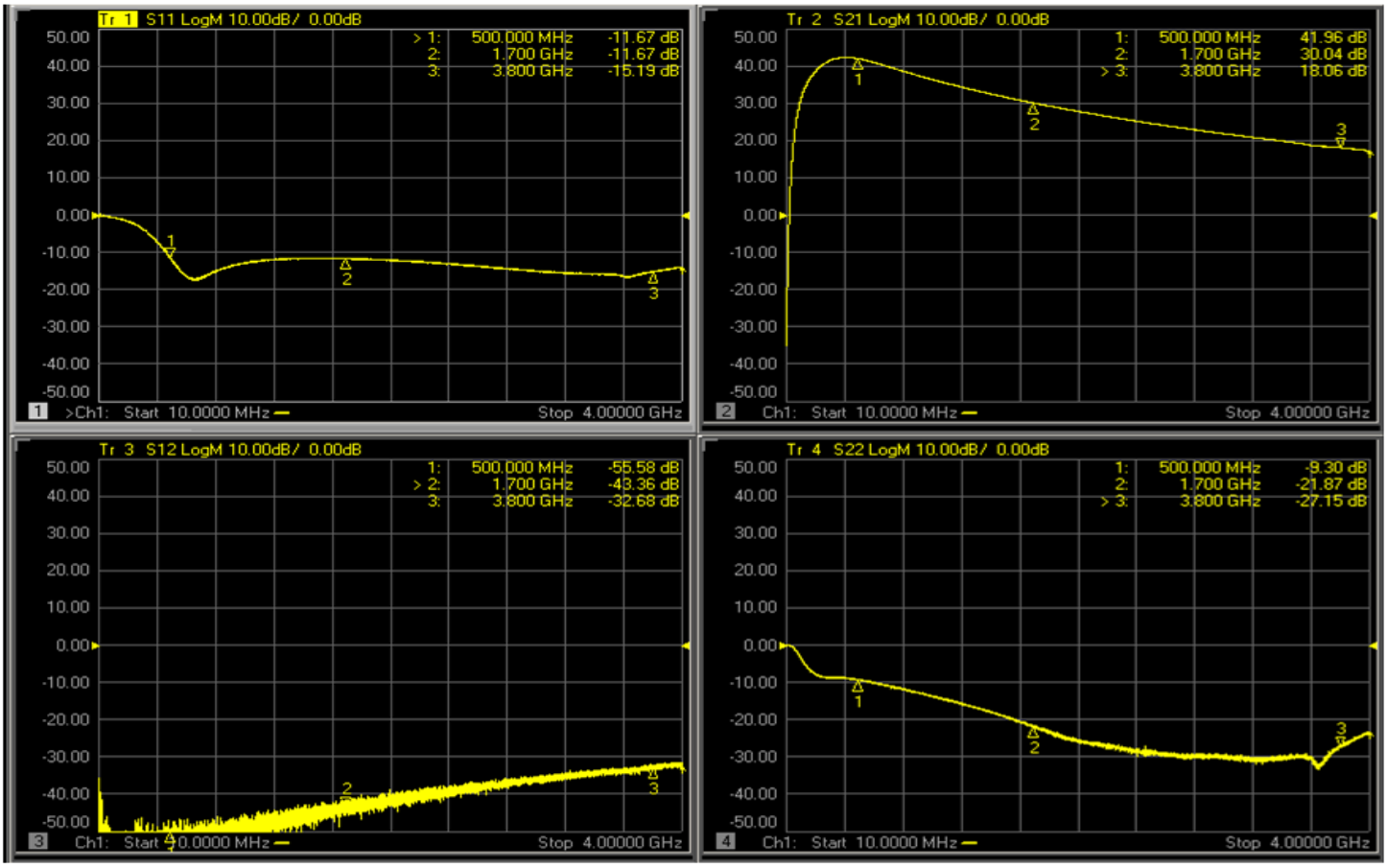


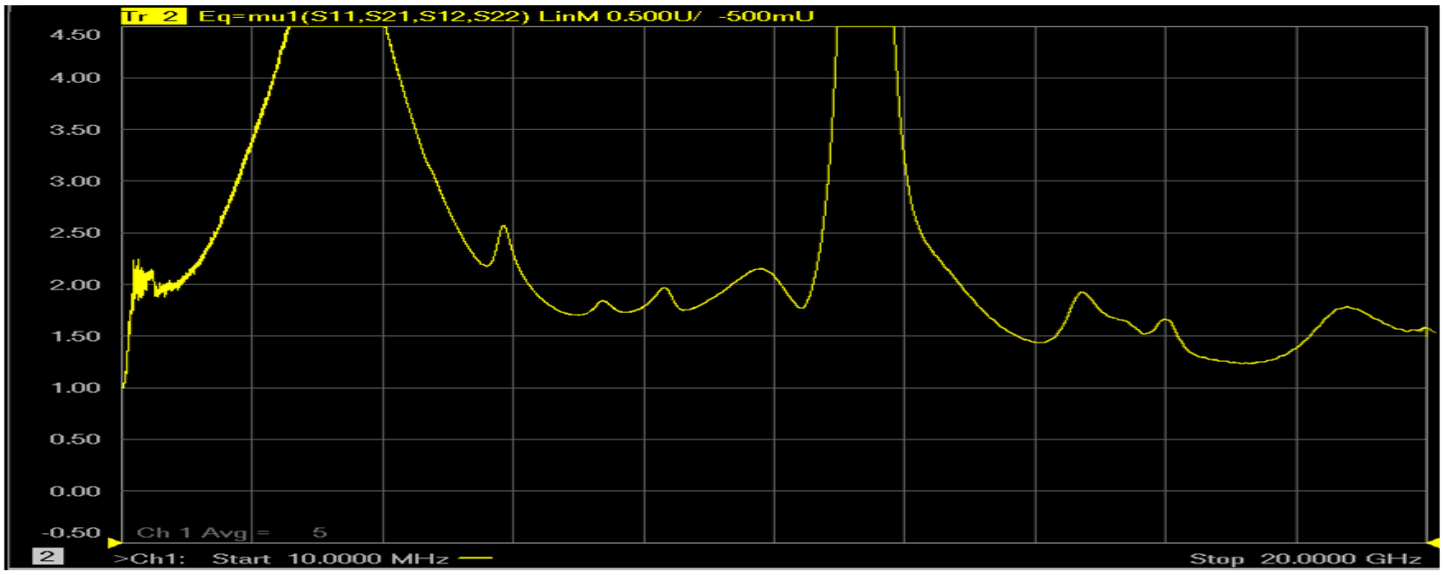
GRF2133 Application Schematic (700—2700 MHz)



GRF2133 Evaluation Board Assembly Drawing

GRF2133 Evaluation Board S-Pars and Stability Mu Factor: (5.0V/60mA)

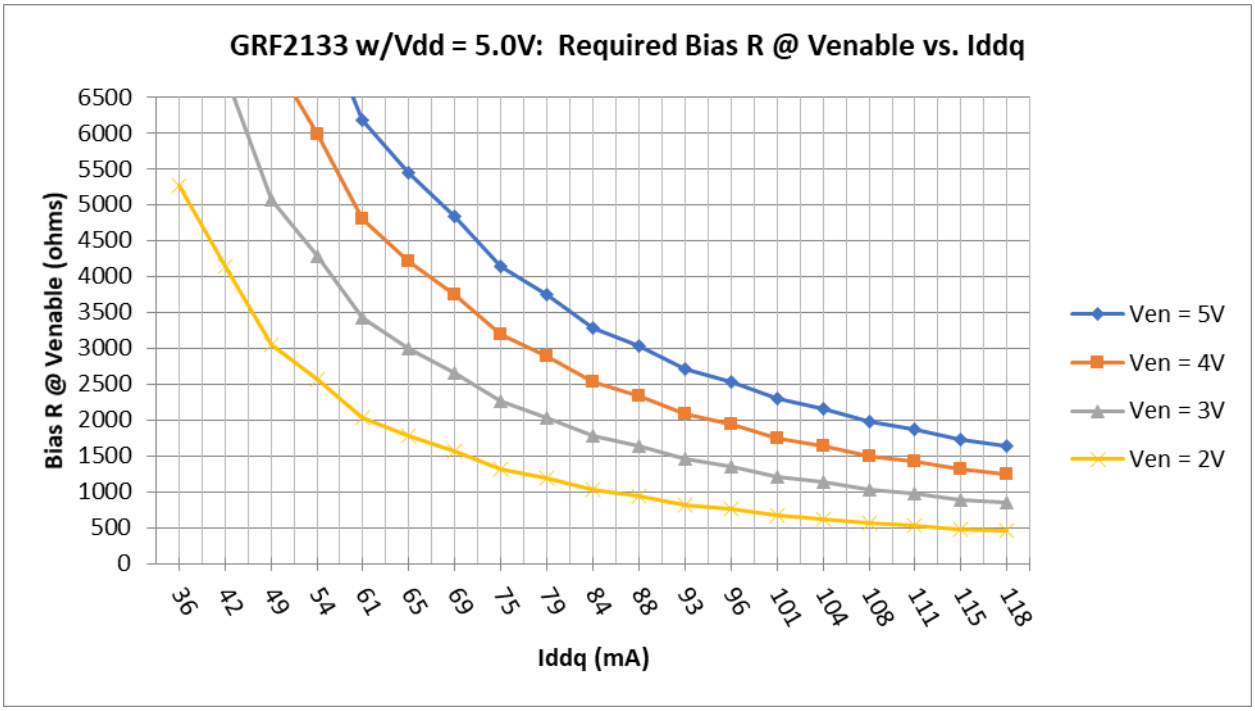


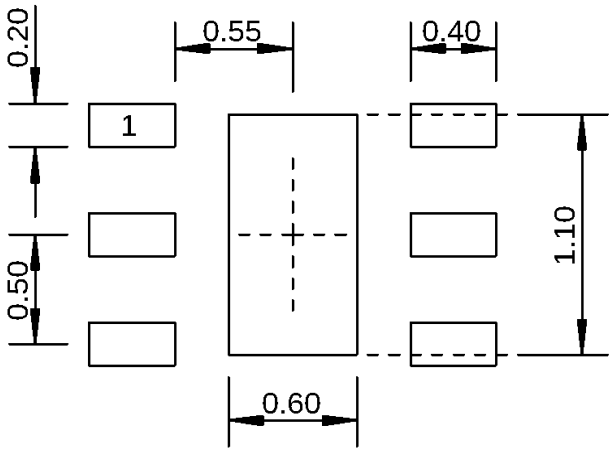


Note: Mu factor >= 1.0 implies unconditional stability.

GRF2133 Evaluation Board BOM: (0.7 to 2.7 GHz)

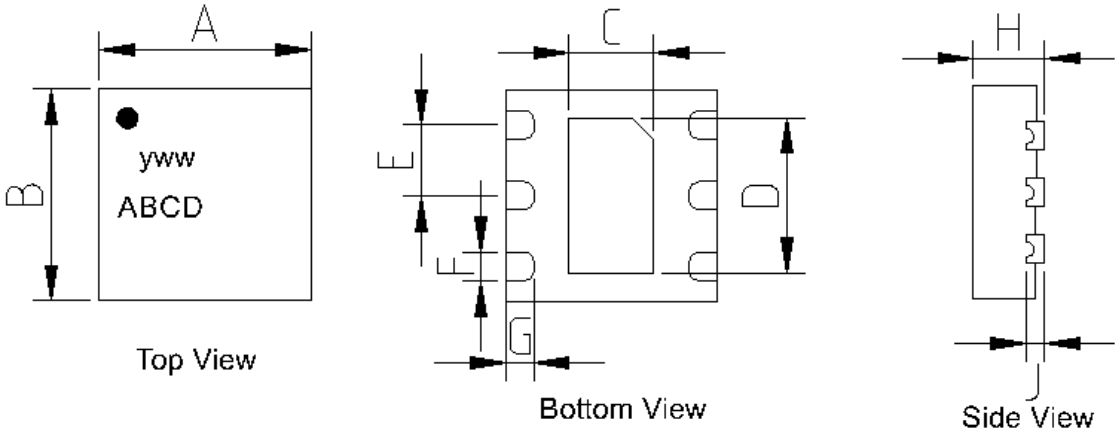
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Inductor	Murata	LQP/LQG	18 nH	0402	ok
M2	Capacitor	Murata	GJM	33 pF	0402	ok
M5	Resistor	Various	5%	Sets Iddq	0402	ok
M8	Capacitor	Murata	GRM	0.1 uF	0402	ok
M9	Resistor	Various	5%	75 ohms	0402	ok
M10	Inductor	Murata	LQP/LQG	33 nH	0402	ok
M12	Capacitor	Murata	GJM	33 pF	0402	ok





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

Released

Data Sheet Release 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 evaluation board measurements in the Guerrilla RF Applications Lab.
Released	All data based on device qualification data. Typically, this data is nearly identical to the data found in the preliminary version. Max and min values for key RF parameters are included.

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