



Product Description

GRF3044 is a broadband low noise gain block designed for applications up to 11.0 GHz, exhibiting a typical low noise figure (NF) of 1.8 dB along with high gain.

This resistively biased device employs an external resistor in series with V_{DD} to set a nominal I_{DDQ} of 100 mA. GRF3044 is internally matched to 50 Ω at the input and output ports.

The device can be operated down to low frequency via the selection of suitably large input/output caps and bias inductor.

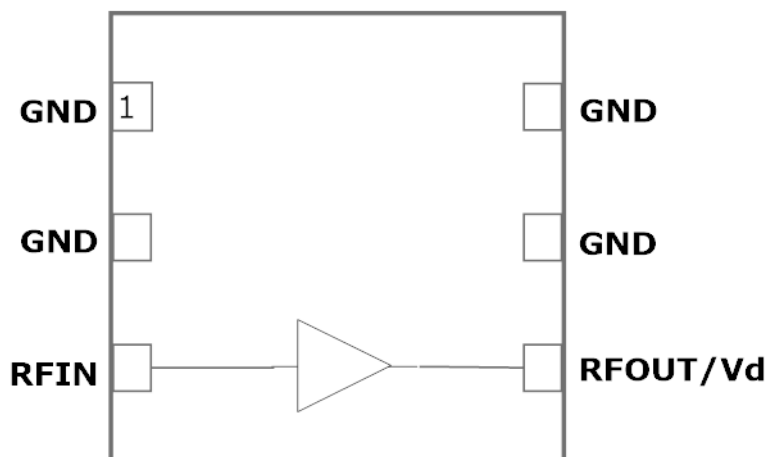
Consult with the GRF applications engineering team for custom tuning/evaluation board data and device s-parameters.

Features

- Reference: 4.0 GHz; I_{DDQ} : 100 mA
- Gain: 16.6 dB
- OP1dB: 19.8 dBm
- OIP3: 31.5 dBm
- NF: 1.8 dB
- Internally Matched to 50 Ω
- Process: GaAs pHEMT

Applications

- Microwave Backhaul
- C and X-Band Amplifiers
- General Purpose Amplifiers
- Instrumentation



1.5 x 1.5 mm DFN-6



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GRF3044

Broadband Gain Block
100 MHz to 12.0 GHz

Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Drain Voltage	V_D	0	6.0	V
RF Input Power: (Load VSWR < 2:1; V_D : 5.0 volts)	$P_{IN\ MAX}$		17	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	--



Caution! ESD Sensitive Device

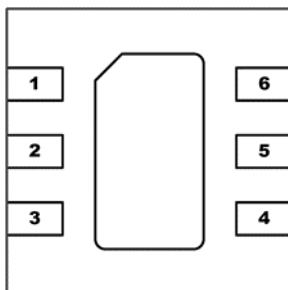


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF3044 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	NC	No Connect or Ground	No internal connection to die
2	NC	No Connect or Ground	No internal connection to die
3	RF_In	LNA RF input	Internally matched 50Ω. An external DC blocking cap must be used.
4	RF_Out/V _{DD}	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.



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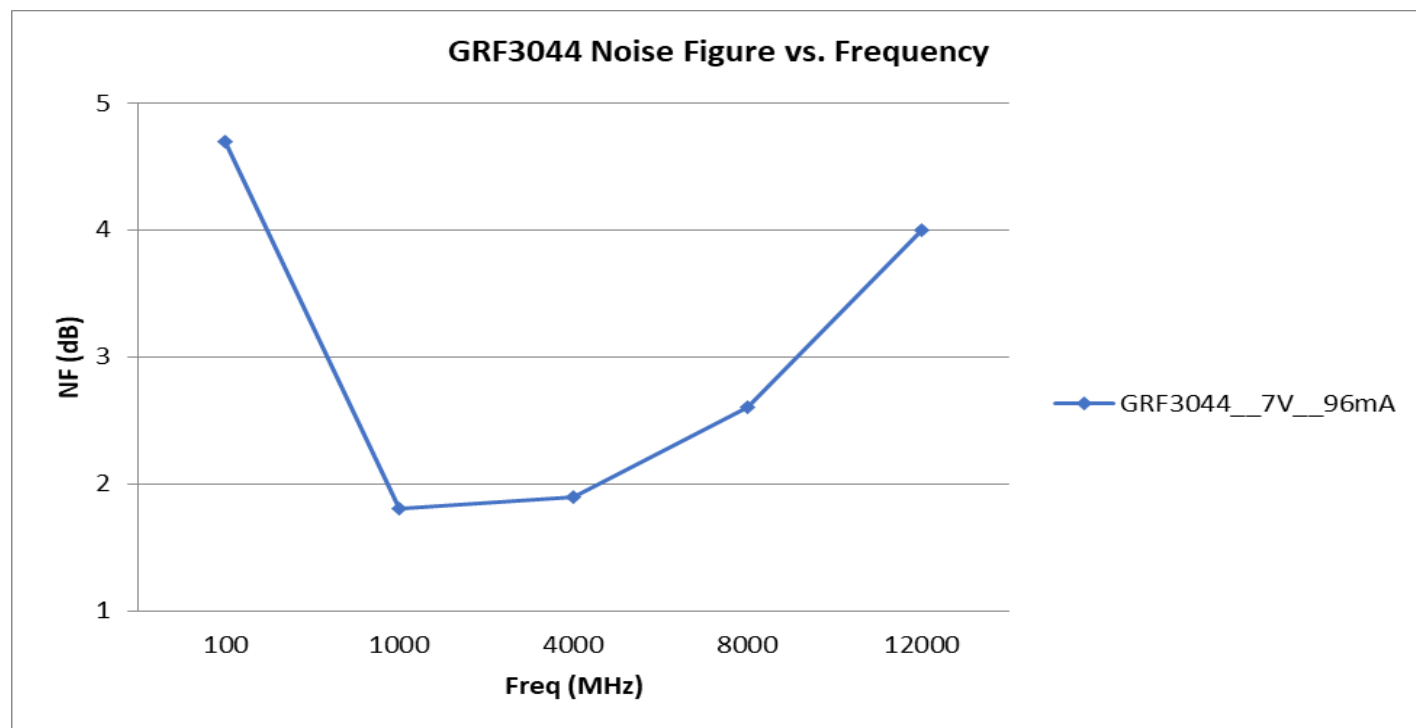
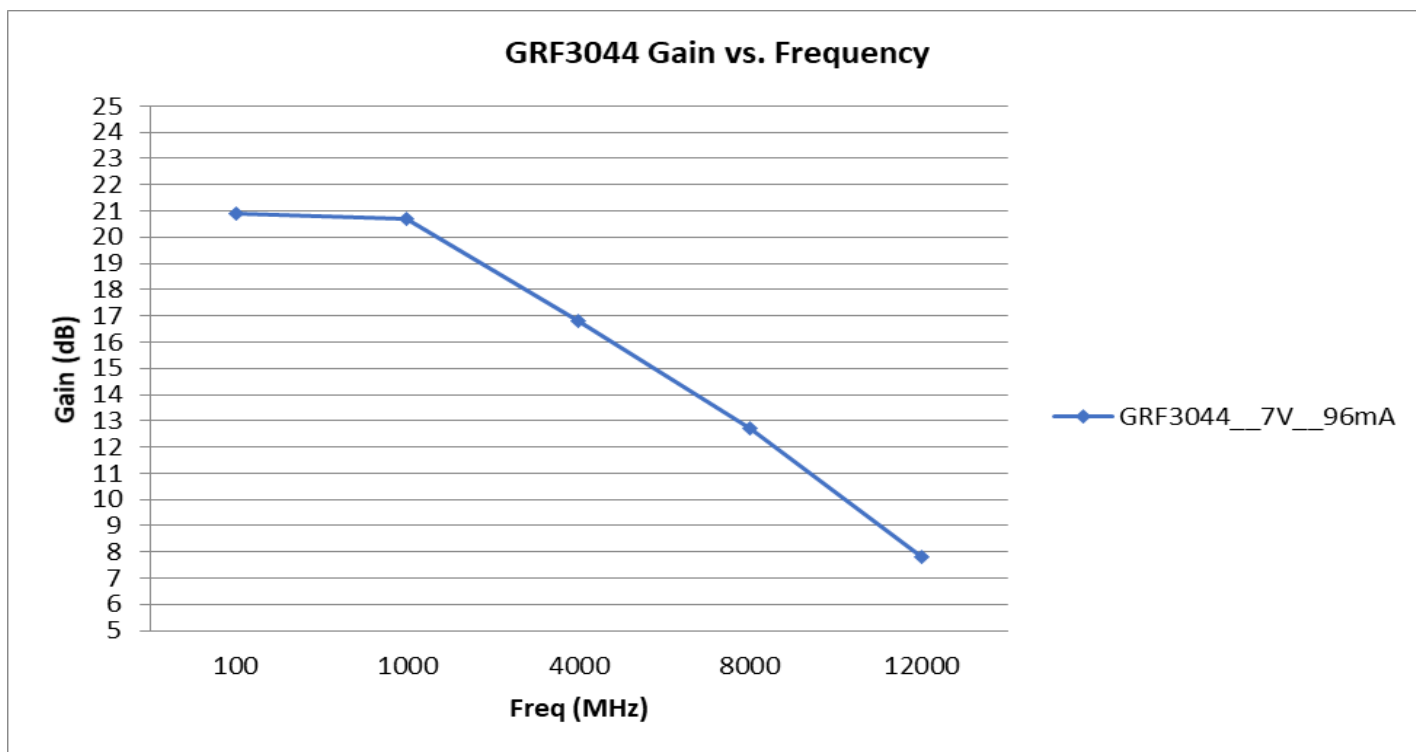
Broadband Gain Block
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Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Gain Mode (Venable high)						I _{DDQ} = 100 mA, T _A = 25 °C
Test Frequency	F _{TEST}		4.0		GHz	
Gain	S ₂₁	15.6	16.6		dB	
Noise Figure	NF		1.8		dB	Input trace losses de-embedded
Output 3rd Order Intercept	OIP3		31.5		dBm	+2 dBm P _{OUT} per tone at 2 MHz Spacing (3999 and 4001 MHz)
Output 1dB Compression Power	OP1dB	18.8	19.8		dBm	
Switching Rise Time	T _{RISE}		500		ns	
Switching Fall Time	T _{FALL}		500		ns	
Supply Current	I _{DDQ}	90	100	110	mA	Ref: V _{DD} : 7.0 V; R _{BIAS} : 13 Ohm
Thermal Data						
Thermal Resistance (measured via IR scan)	Θ _{JC}		102		°C/W	On standard evaluation board
Channel Temperature @ +85 C Reference (Package Heat Sink)	T _{CHANNEL}		148 (See note)		°C	V _D : 5.6 V; I _{DDQ} : 110 mA; No RF; P _{DISS} : 616 mW

Note: MTTF >10⁶ hours for T_{CHANNEL} < =170 degrees C.

GRF3044 Evaluation Board Measured Data



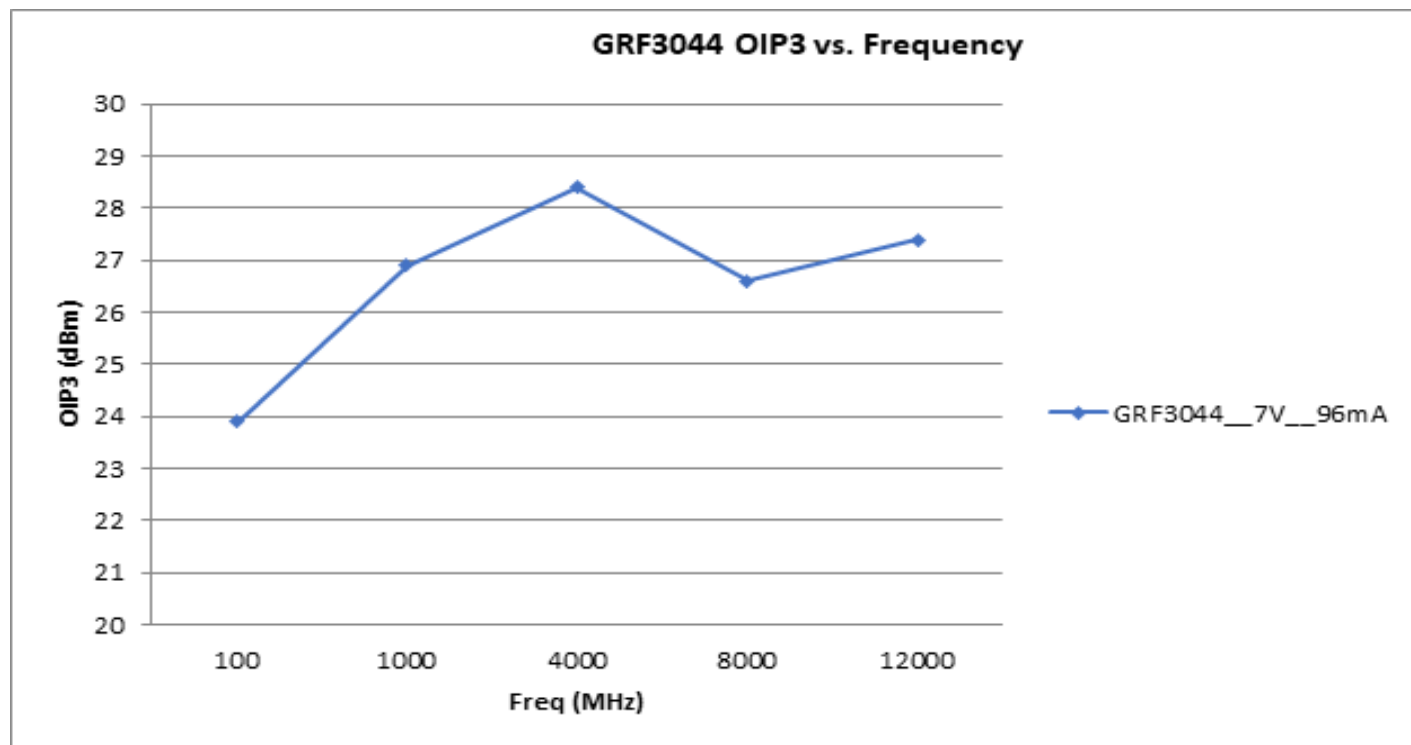
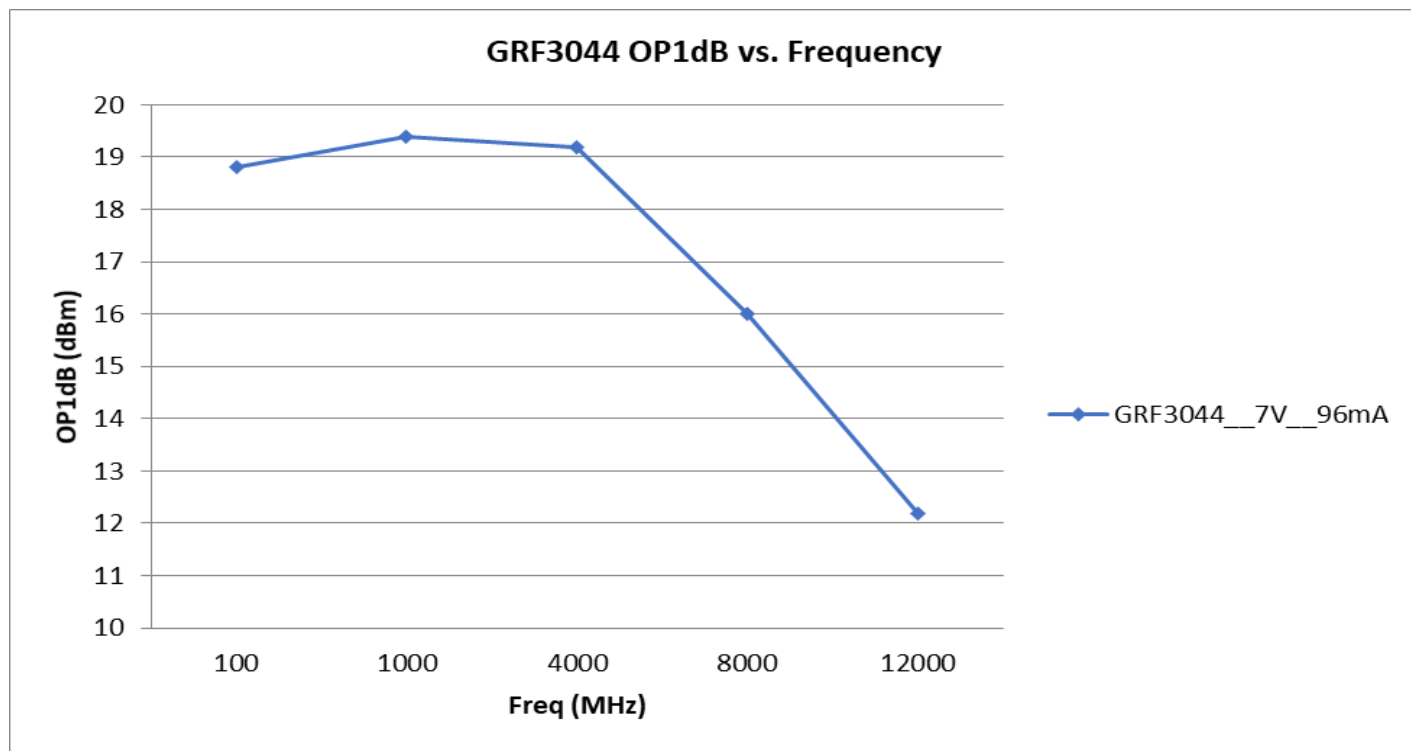


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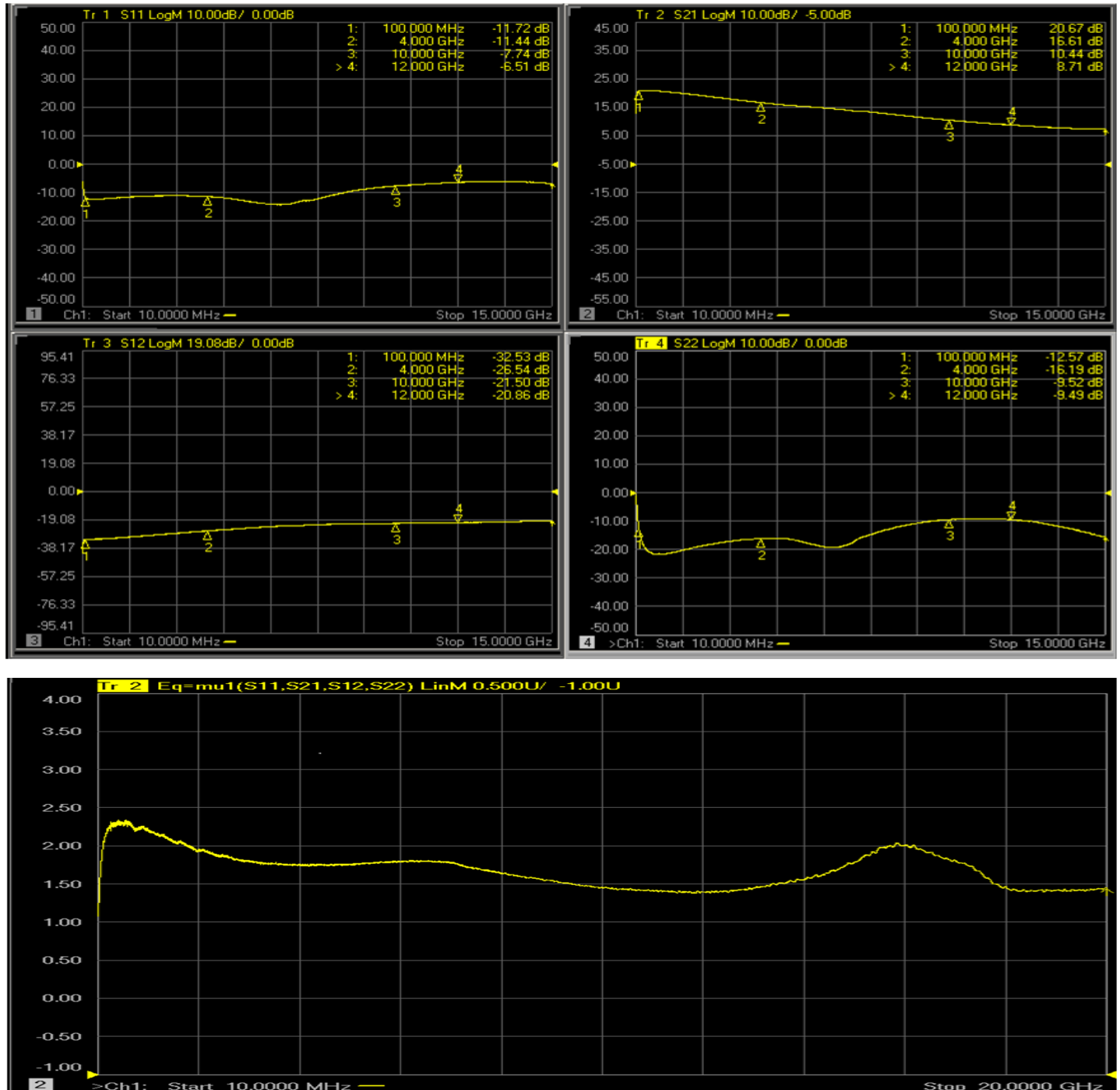
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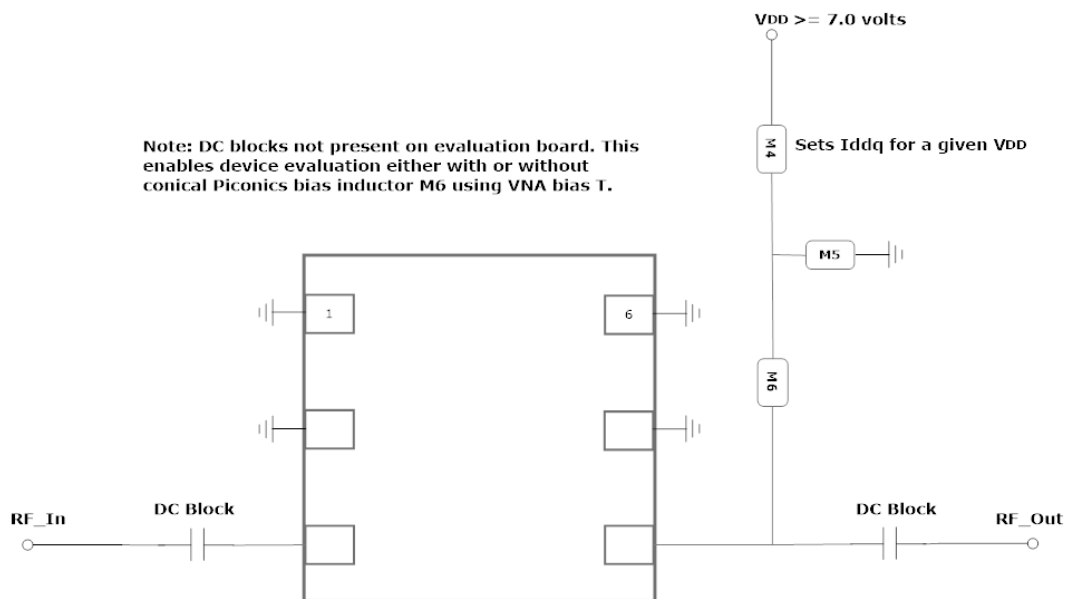
GRF3044 Evaluation Board Measured Data



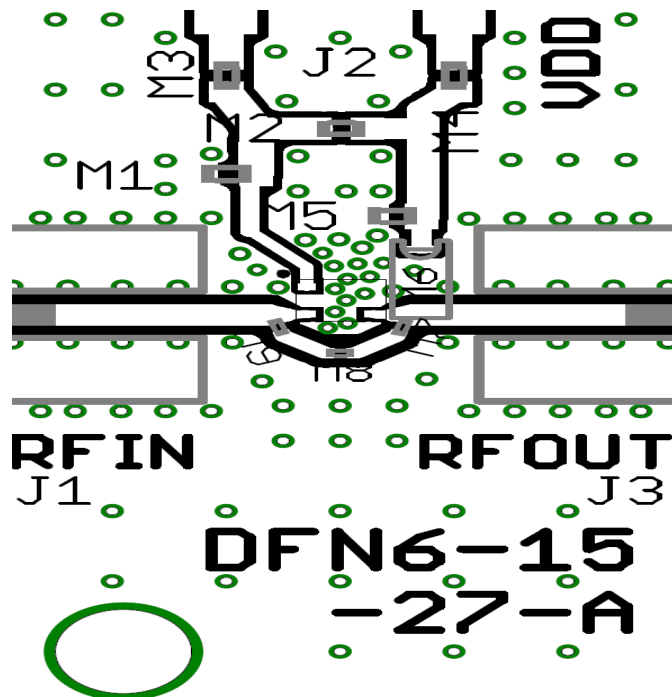
GRF3044 Evaluation Board S-Pars and Stability Mu Factor:



Note: Mu factor ≥ 1.0 implies unconditional stability.



GRF3044 Standard Application Schematic



GRF3044 Evaluation Board Assembly Drawing



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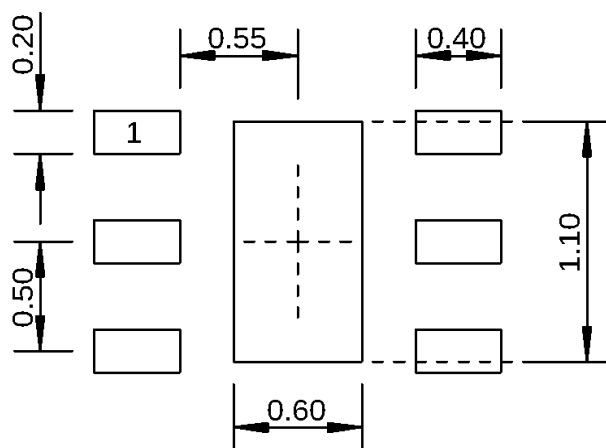
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**Broadband Gain Block
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GRF3044 Standard Evaluation Board BOM:

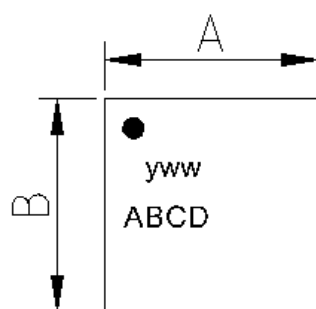
Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M4 (See table)	Resistor	Various	5%	Sets Iddq	0402	ok
M5	Capacitor	Murata	GRM	0.1 uF	0402	ok
M6	Inductor	Piconics	CC19T40K240G5-C	220 nH	0402	ok

GRF3044 Bias Resistor Selection Table (TBD):

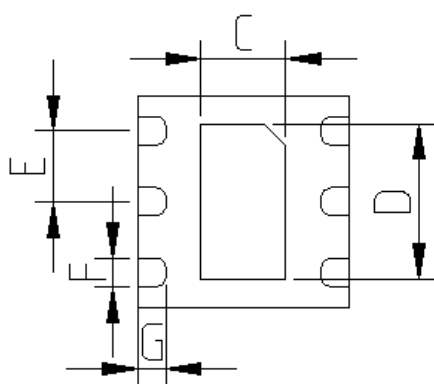


Dimensions in millimeters

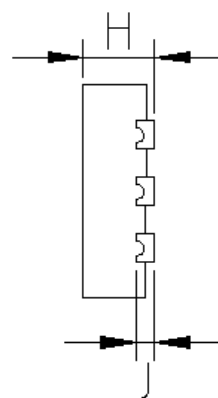
1.5 mm DFN-6 Suggested PCB Footprint (Top View)



Top View



Bottom View



Side View

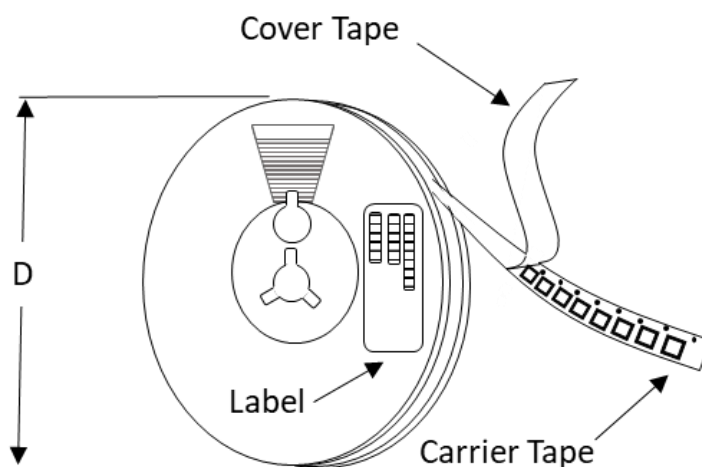
Dimensions (MM)	
A	1.5 +/- 0.050
B	1.5 +/- 0.050
C	.6 +/- 0.050
D	1.1 +/- 0.050
E	.5 Bsc
F	.2 +/- 0.050
G	.2 +/- 0.050
H	.45 +/- 0.050
J	.12 Ref.

1.5 mm DFN-6 Package Dimensions

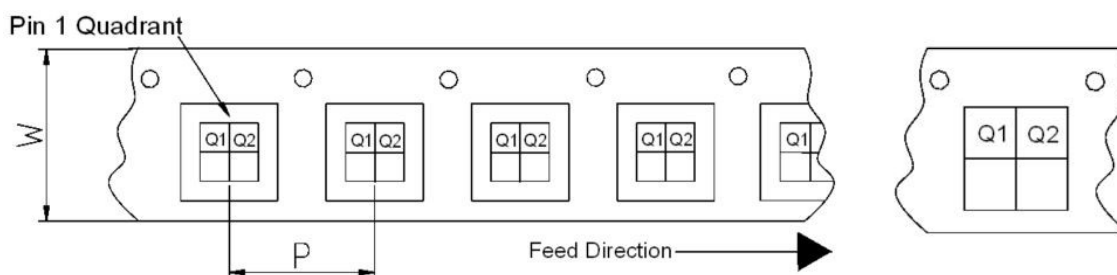
Tape and Reel Information:

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



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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 Quadrant	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



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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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