



## Product Description

GRF2003 is a broadband, low noise linear gain block designed for small cell, wireless infrastructure and other high performance RF applications. A single match will offer strong RF performance over 0.5 to 10.0 GHz. With optimized external components, the device can be operated down to 100 MHz.

The device can be operated over a range of supply voltages from 2.7 to 5.0 V with a typical  $I_{ddq}$  range of 40 to 80 mA for optimal efficiency and linearity.

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

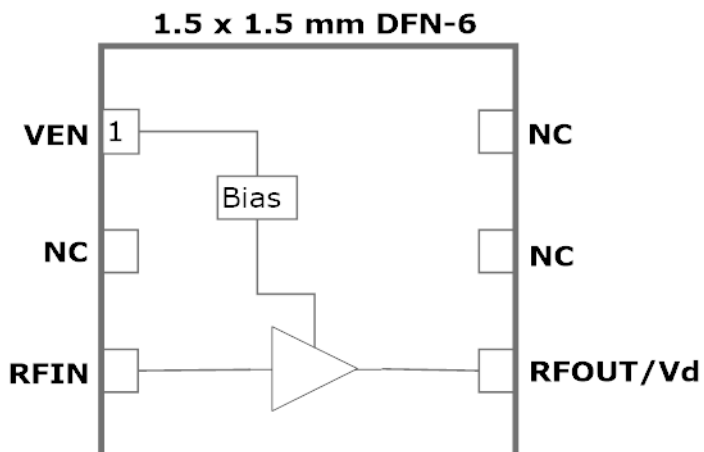
## Features

Reference: 5V/55 mA/5.5 GHz

- Gain: 12.0 dB
- OP1dB: 15.0 dBm
- OIP3: 29.0 dBm
- Eval Board NF: 3.5 dB
  
- Flexible Bias Voltage and Current
- Internally Matched to  $50 \Omega$
- Process: GaAs pHEMT

## Applications

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



## Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V <sub>DD</sub>	0	6.0	V
RF Input Power: (Load VSWR < 2:1; V <sub>D</sub> : 5.0 volts)	P <sub>IN MAX</sub>		15	dBm
Operating Temperature (Package Heat Sink)	T <sub>AMB</sub>	-40	105	°C
Maximum Channel Temperature (MTTF > 10 <sup>6</sup> Hours)	T <sub>MAX</sub>		170	°C
Maximum Dissipated Power	P <sub>DISS MAX</sub>		400	mW
<b>Electrostatic Discharge:</b>				
Charged Device Model:	CDM	1500		V
Human Body Model:	HBM	250		V
<b>Storage:</b>				
Storage Temperature	T <sub>STG</sub>	-65	150	°C
Moisture Sensitivity Level	MSL		1	--



**Caution!** ESD Sensitive Device

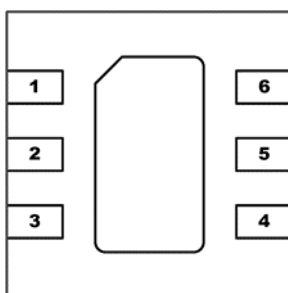


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

**Note:** For package dimensions and manufacturing information, see the [Guerrilla-RF.com](http://Guerrilla-RF.com) website for the following document located on the GRF2003 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 <sub>ENABLE</sub>	Enable Voltage Input	V <sub>ENABLE</sub> and series resistor set I <sub>DDQ</sub> . V <sub>ENABLE</sub> < 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 <sub>In</sub>	LNA RF input	Internally matched 50Ω. An external DC blocking cap must be used.
4	RF <sub>Out</sub> /V <sub>DD</sub>	LNA RF output	Internally matched 50Ω. V <sub>DD</sub> 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.



Preliminary

# GRF2003

Broadband Gain Block  
0.1–10.0 GHz

## Nominal Operating Parameters:

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Test Frequency	$F_{TEST}$		5.5		GHz	$V_{DD} = 5.0\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$
Gain	S21	11.0	12.0		dB	
Eval Board Noise Figure	NF		3.5		dB	
Output 3rd Order Intercept	OIP3		29.0		dBm	0 dBm $P_{OUT}$ per tone at 2 MHz Spacing (5499 and 5501 MHz)
Output 1dB Compression Point	OP1dB	12.5	15.0		dBm	
Switching Rise Time	$T_{RISE}$		1600		ns	
Switching Fall Time	$T_{FALL}$		1000		ns	
Supply Current	$I_{DD}$		55		mA	
Enable Current	$I_{ENABLE}$		1.5		mA	
Leakage Current	$I_{LEAKAGE}$		1		uA	$V_{DD}: 5.0\text{V}$ ; $V_{ENABLE}: 0.0\text{V}$
Thermal Data						
Thermal Resistance: (Infra-Red Scan)	$\Theta_{jc}$		198		$^\circ\text{C}/\text{W}$	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	$T_{CHANNEL}$		140		$^\circ\text{C}$	$V_{DD}: 5.0\text{ V}$ ; $I_{DDQ}: 55\text{ mA}$ ; No RF; $P_{DISS}: 275\text{ mW}$

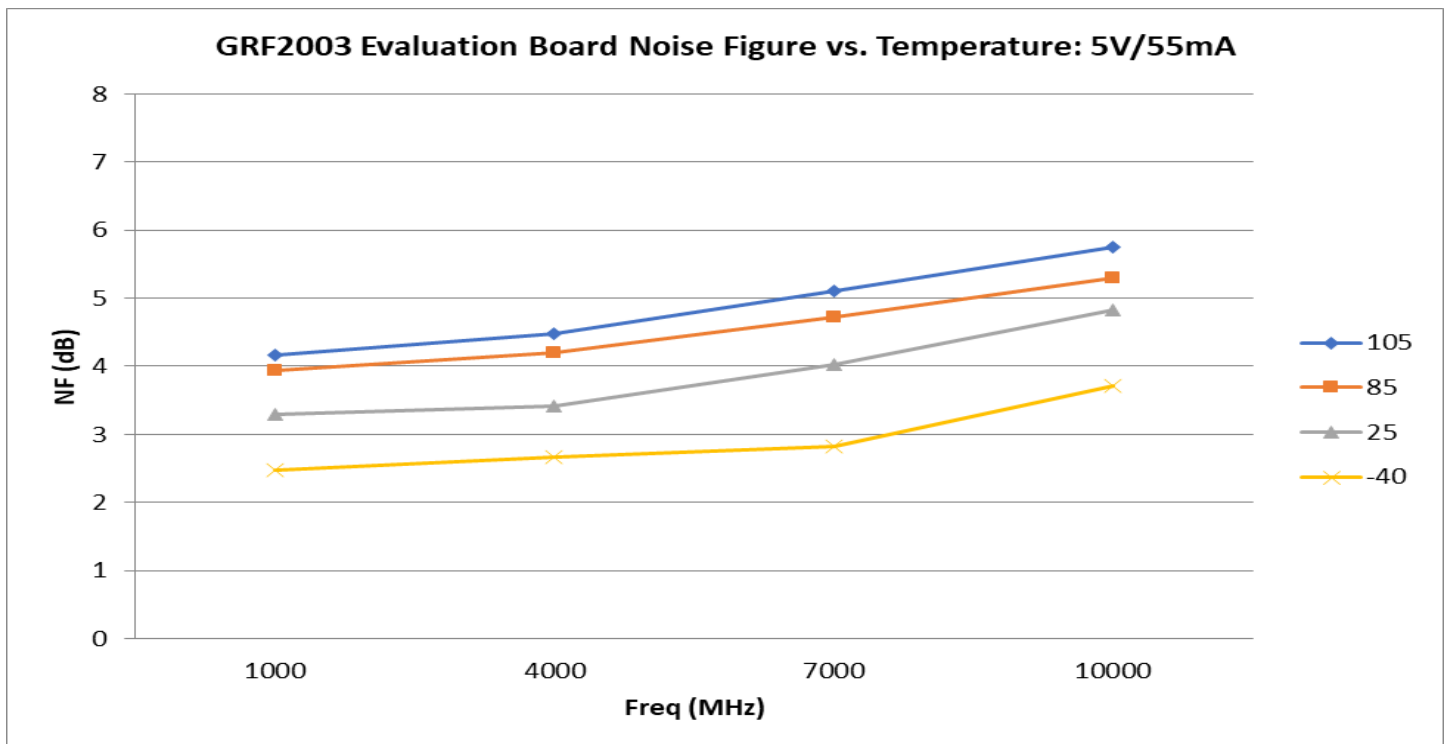
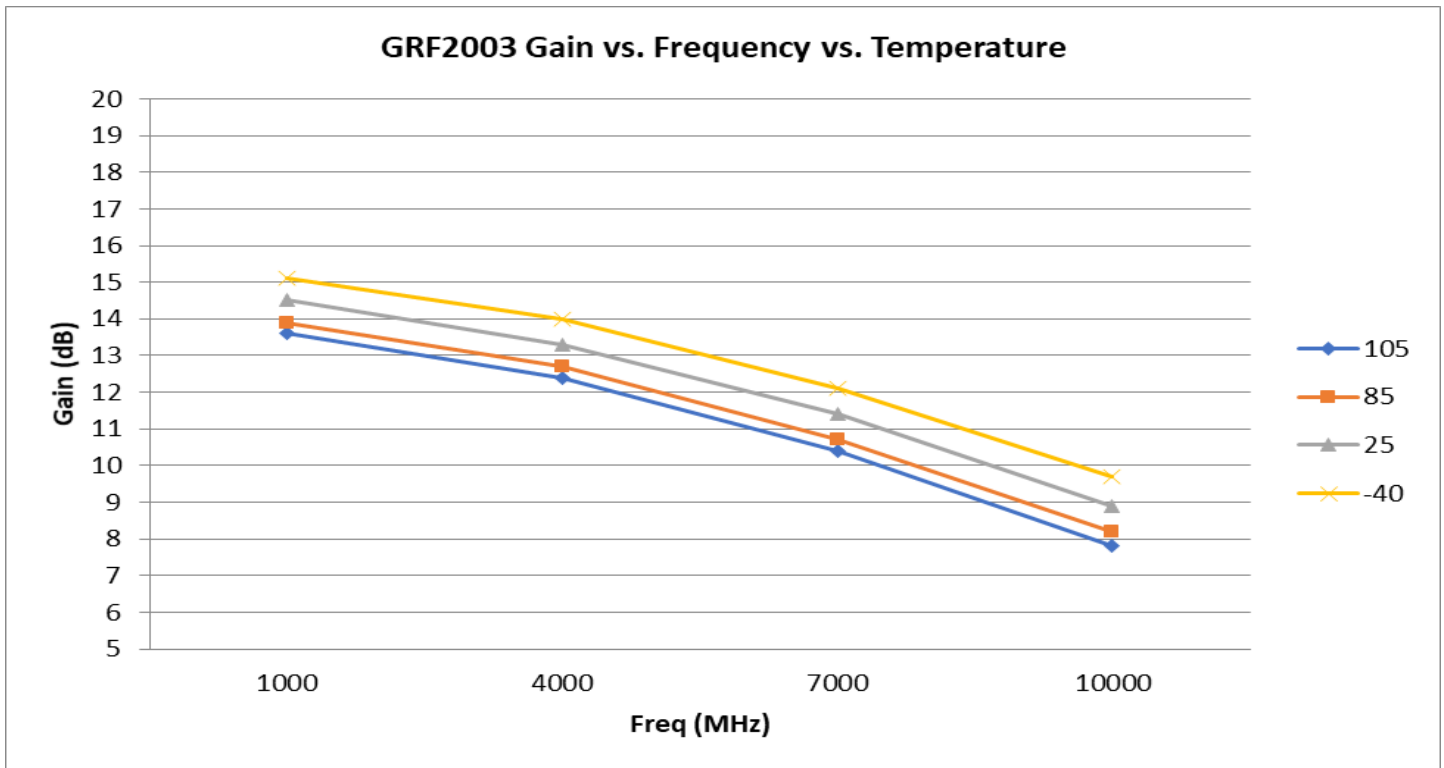


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Broadband Gain Block  
0.1–10.0 GHz

GRF2003 Measured Data: (5.0 volts; 55 mA)



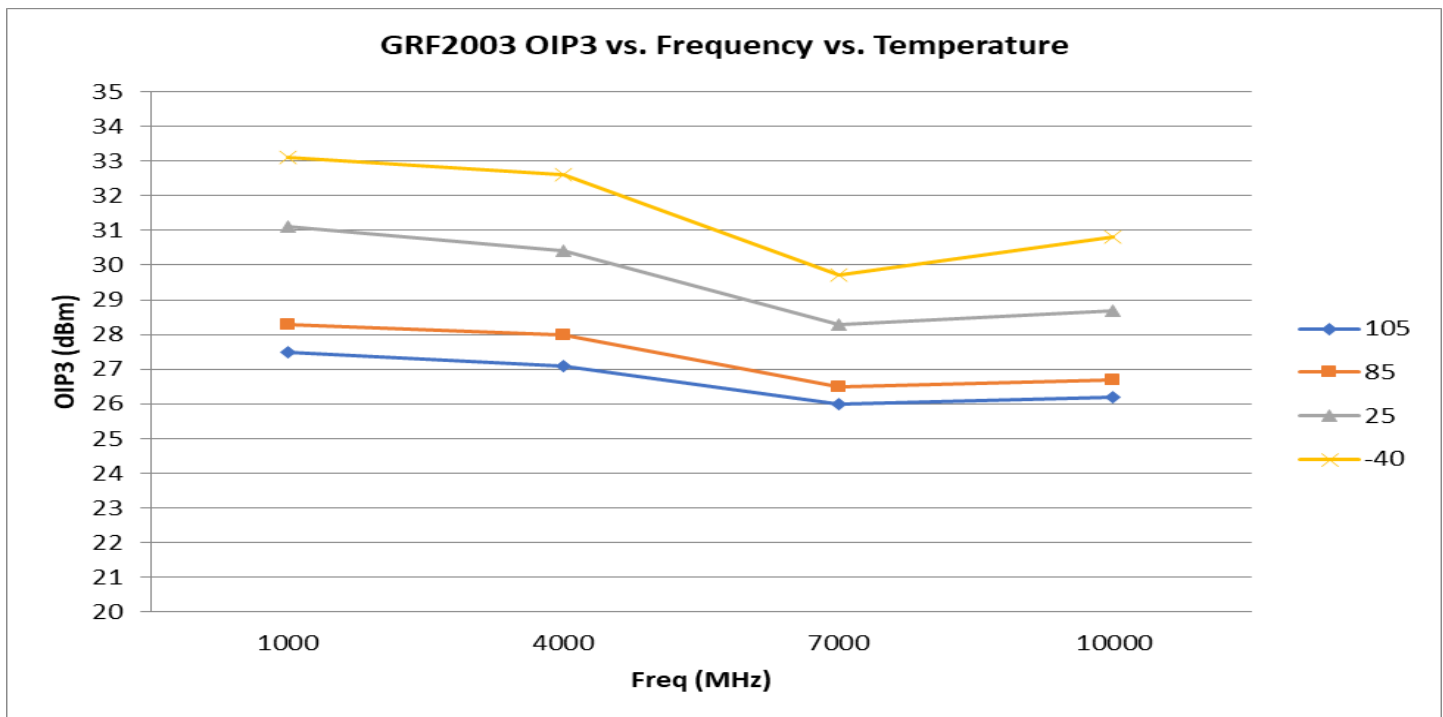
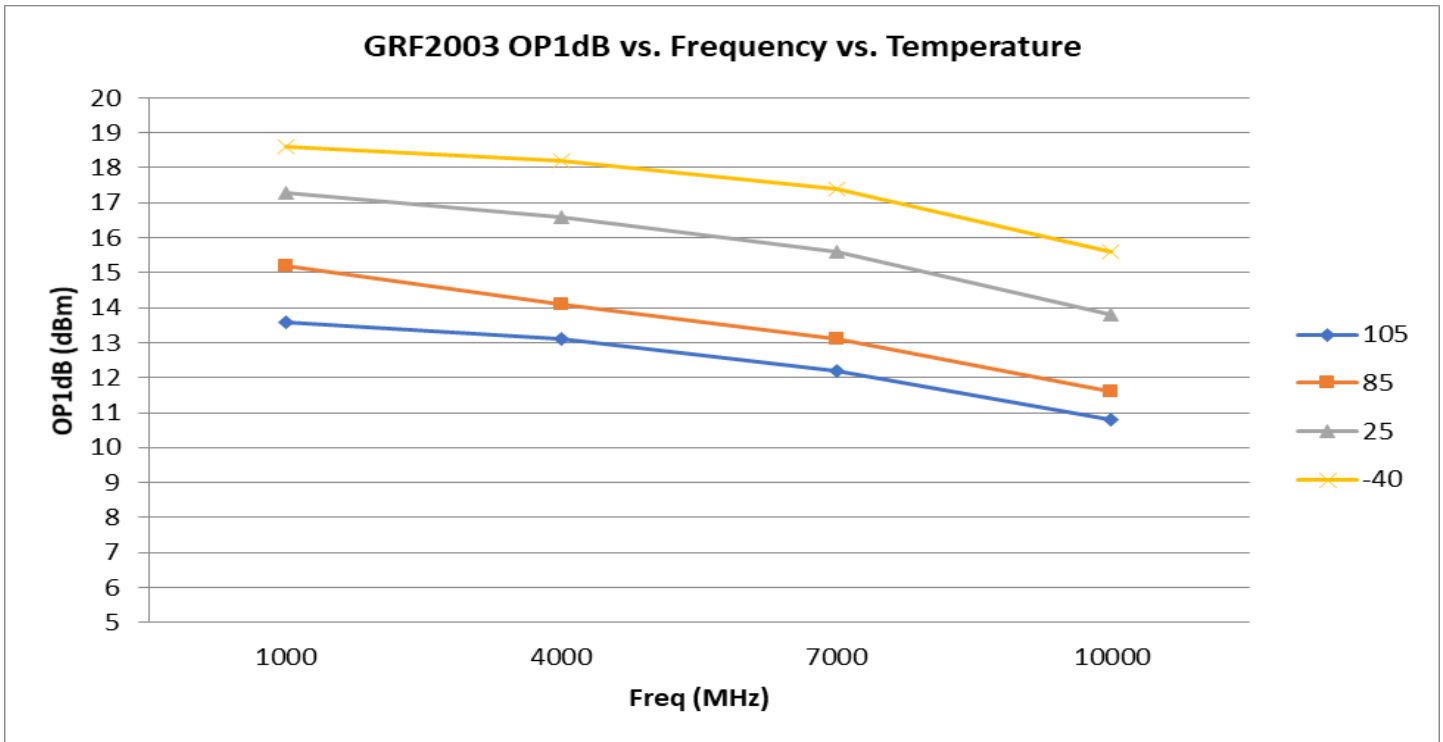


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0.1–10.0 GHz

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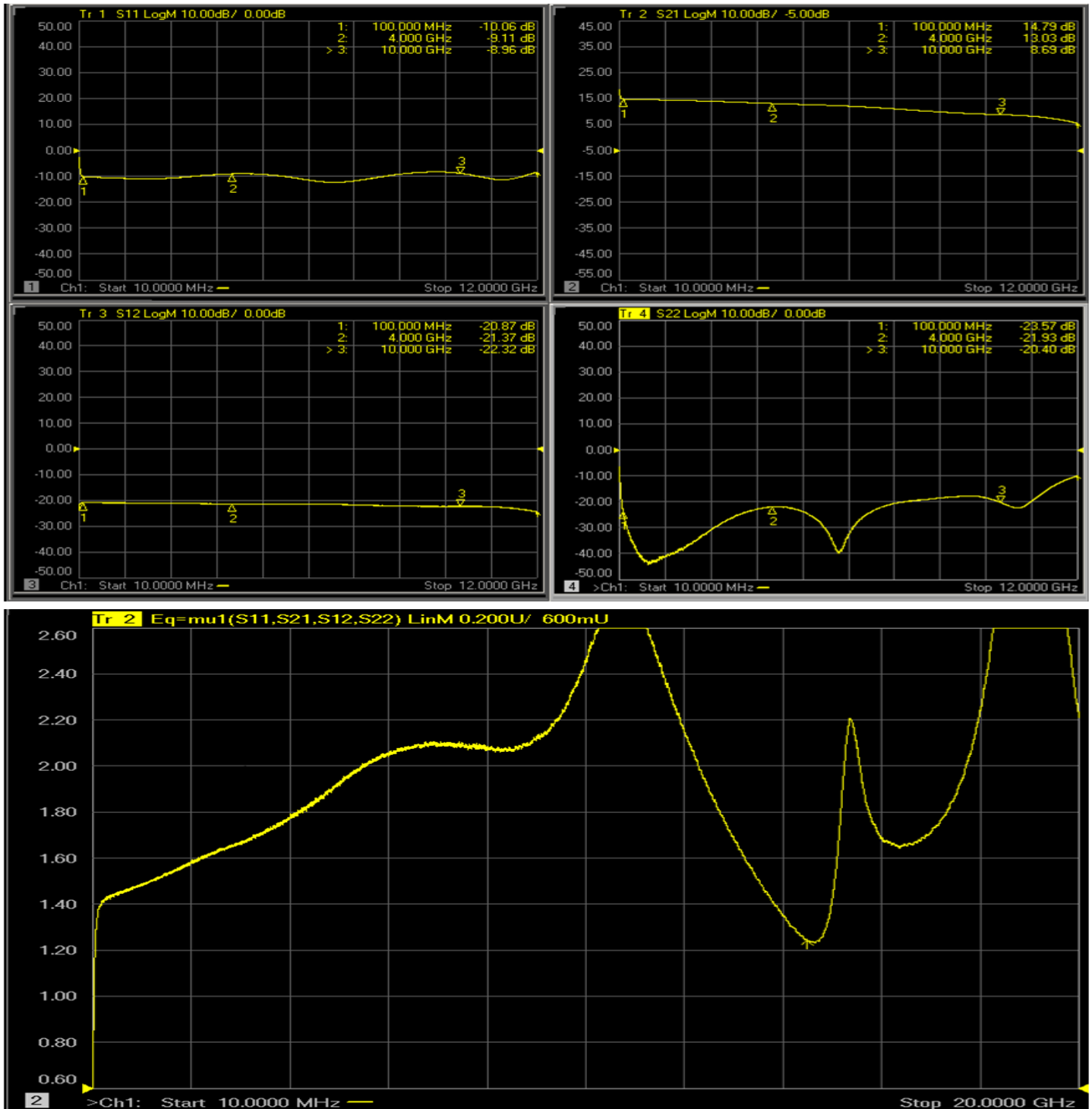


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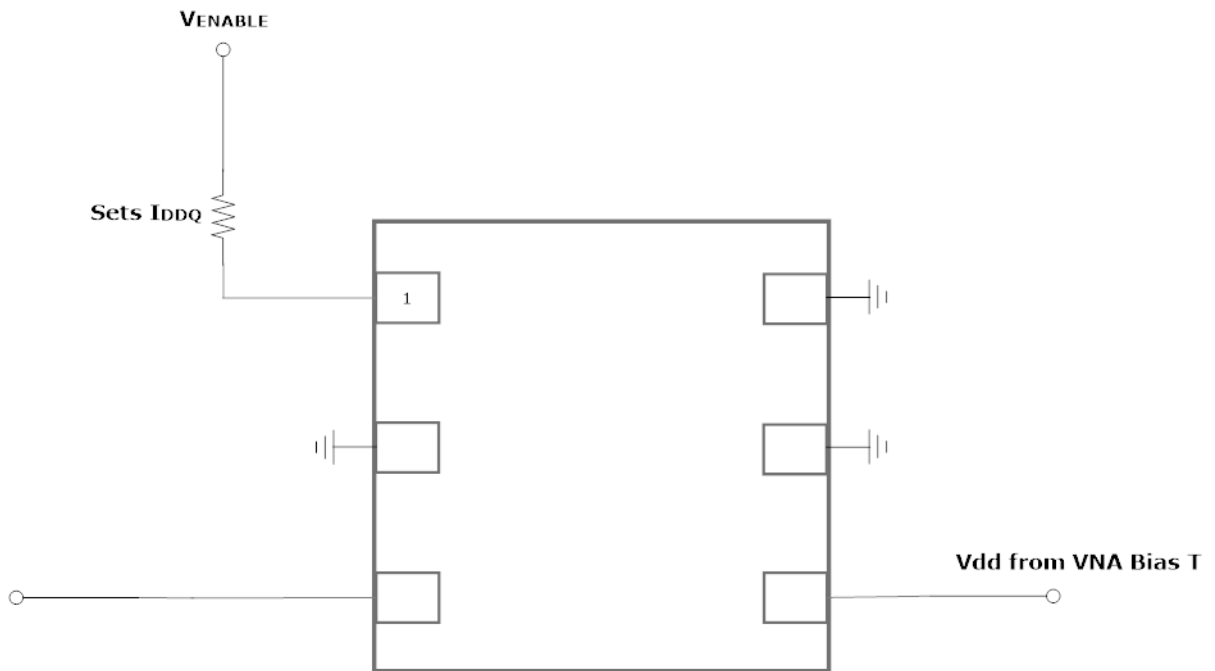
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Broadband Gain Block  
0.1–10.0 GHz

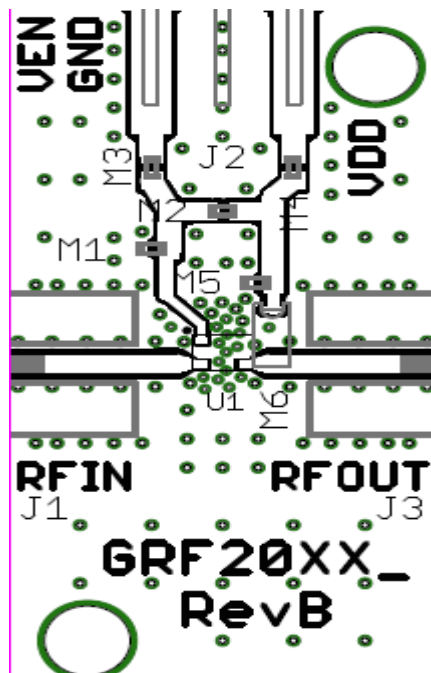
## GRF2003 Evaluation Board S-Pars and Stability Mu Factor: (0.5 to 10.0 GHz Tune)



Note: Mu factor  $\geq 1.0$  implies unconditional stability.



GRF2003 Broadband Measurement Schematic



GRF2003 Evaluation Board Assembly Drawing



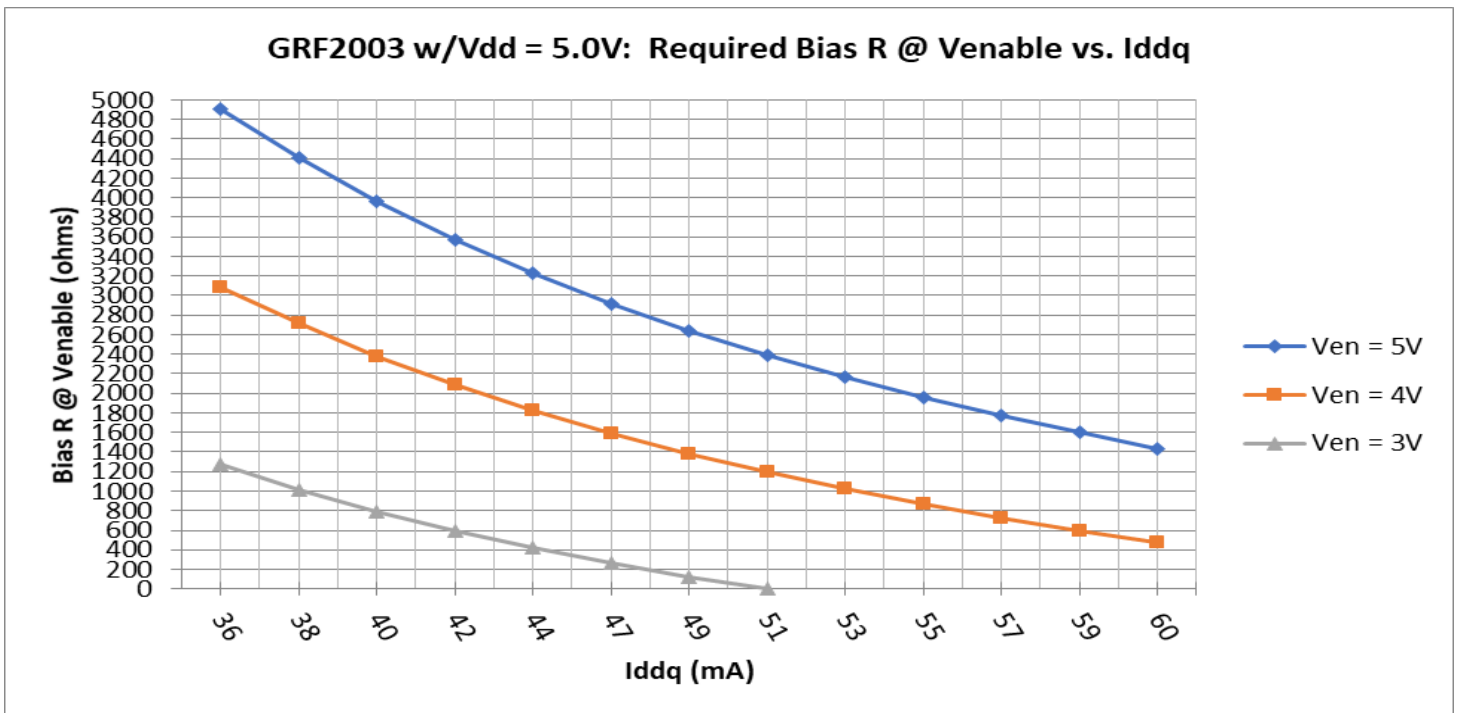


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Broadband Gain Block  
0.1–10.0 GHz

## GRF2003 Bias Resistor Selection Curves





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# GRF2003

## Broadband Gain Block 0.1–10.0 GHz

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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