



Product Description

GRF2070 is a broadband, linear, ultra-low noise amplifier designed for small cell, wireless infrastructure and other high performance RF applications requiring ultra-low NF, high gain and linearity.

Configured as a first stage LNA, linear driver or cascaded gain block, it offers high levels of reuse both within a design and across platforms.

GRF2070 is a member of a family of pin compatible, ultra low noise devices which cover a wide range of frequency bands with industry leading NF and gain:

GRF2070: 0.4 to 1.5 GHz

GRF2071: 0.7 to 2.7 GHz

GRF2072: 2.3 to 3.8 GHz

GRF2073: 3.0 to 6.0 GHz

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

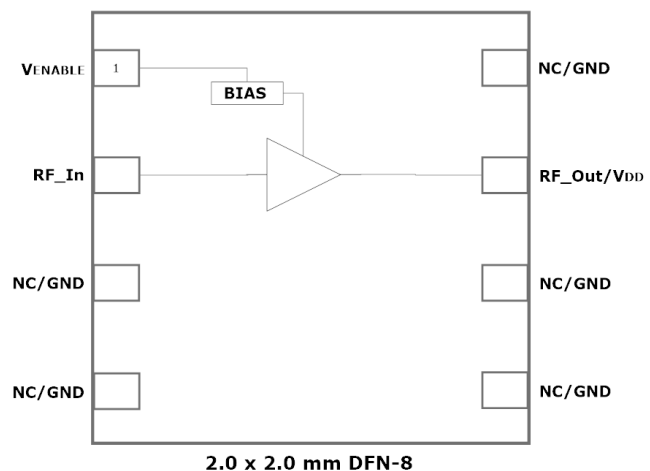
Features

Reference: 5V/75mA/0.9 GHz

- Gain: 21.2 dB
- Eval Board NF: 0.38 dB
- OP1dB: 20.4 dBm
- OIP3: 38.8 dBm
- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- Cellular Infrastructure
- Small Cells and Cellular Repeaters
- Distributed Antenna Systems



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} | | 500 | mW |
| Electrostatic Discharge: | | | | |
| Charged Device Model: | CDM | 1500 | | V |
| Human Body Model: | HBM | 500 | | V |
| Storage: | | | | |
| Storage Temperature | T _{STG} | -65 | 150 | °C |
| Moisture Sensitivity Level | MSL | | 1 | -- |



Caution! ESD Sensitive Device

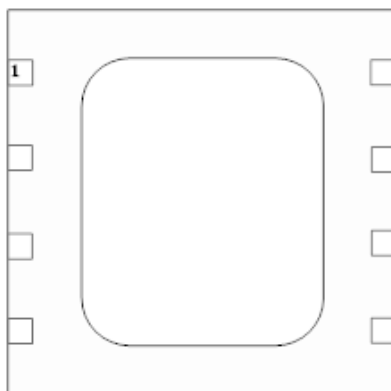


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For package dimensions and manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF2070 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 | VENABLE | Enable Voltage Input | VENABLE and series resistor set I _{DDQ} . VENABLE < =0.2 volts disables device. On -die pull-down resistor will turn the part off if this node is allowed to float. |
| 2 | RF_In | RF Input | External match must provide DC block |
| 3 | NC/GND | No Connect or Ground | No internal connection to die |
| 4 | NC/GND | No Connect or Ground | No internal connection to die |
| 5 | NC/GND | No Connect or Ground | No internal connection to die |
| 6 | NC/GND | No Connect or Ground | No internal connection to die |
| 7 | RF_Out/VDD | RF Output | Provide device V _{DD} via external bias inductor |
| 8 | NC/GND | 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

GRF2070

Ultra-Low Noise Amplifier
Tuning Range: 0.4 – 1.5 GHz

Nominal Operating Parameters:

| Parameter | Symbol | Specification | | | Unit | Condition |
|---|---------------|---------------|------|------|---------------------------|---|
| | | Min. | Typ. | Max. | | |
| Gain Mode (Venable high) | | | | | | $V_{DD} = 5.0\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$ |
| Test Frequency | F_{TEST} | | 900 | | MHz | 700 to 960 MHz Tune |
| Evaluation Board Gain | S21 | | 21.2 | | dB | |
| Evaluation Board Noise Figure | NF | | 0.38 | | dB | Evaluation Board SMA to SMA |
| Output 3rd Order Intercept Point | OIP3 | | 38.8 | | dBm | +4.0 dBm P_{OUT} per tone at 2 MHz Spacing (899 and 901 MHz) |
| Output 1dB Compression Point | OP1dB | | 20.4 | | dBm | |
| Switching Rise Time | T_{RISE} | | 1800 | | ns | |
| Switching Fall Time | T_{FALL} | | 900 | | ns | |
| Supply Current | I_{DD} | | 70 | | mA | Adjustable for optimal IP3 |
| Enable Current | I_{ENABLE} | | 3.5 | | mA | |
| Thermal Data | | | | | | |
| Thermal Resistance (measured via IR scan) | Θ_{jc} | | 54 | | $^\circ\text{C}/\text{W}$ | On standard evaluation board |
| Channel Temperature @ +85 C Reference (Package Heat Sink) | $T_{CHANNEL}$ | | 104 | | $^\circ\text{C}$ | $V_{DD}: 5.0\text{ V}$; $I_{DDQ}: 70\text{ mA}$; No RF; $P_{DISS}: 350\text{ mW}$ |

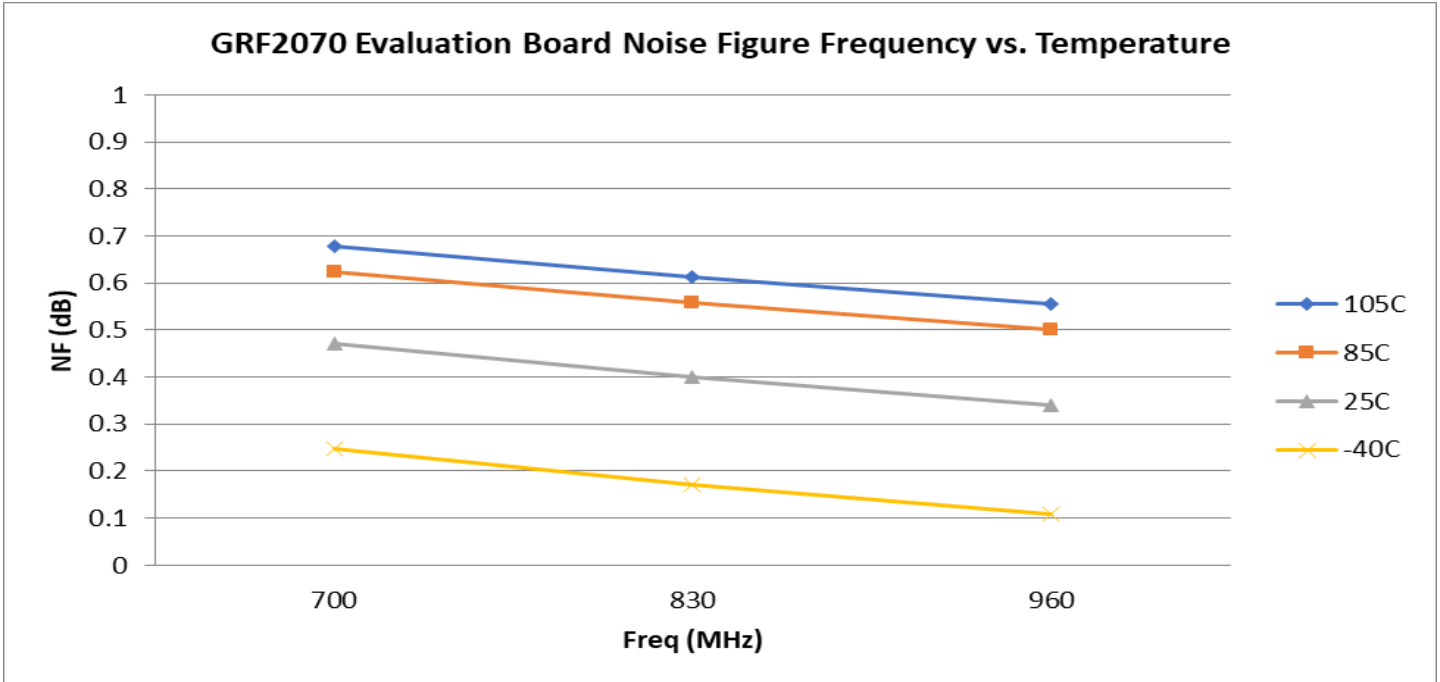
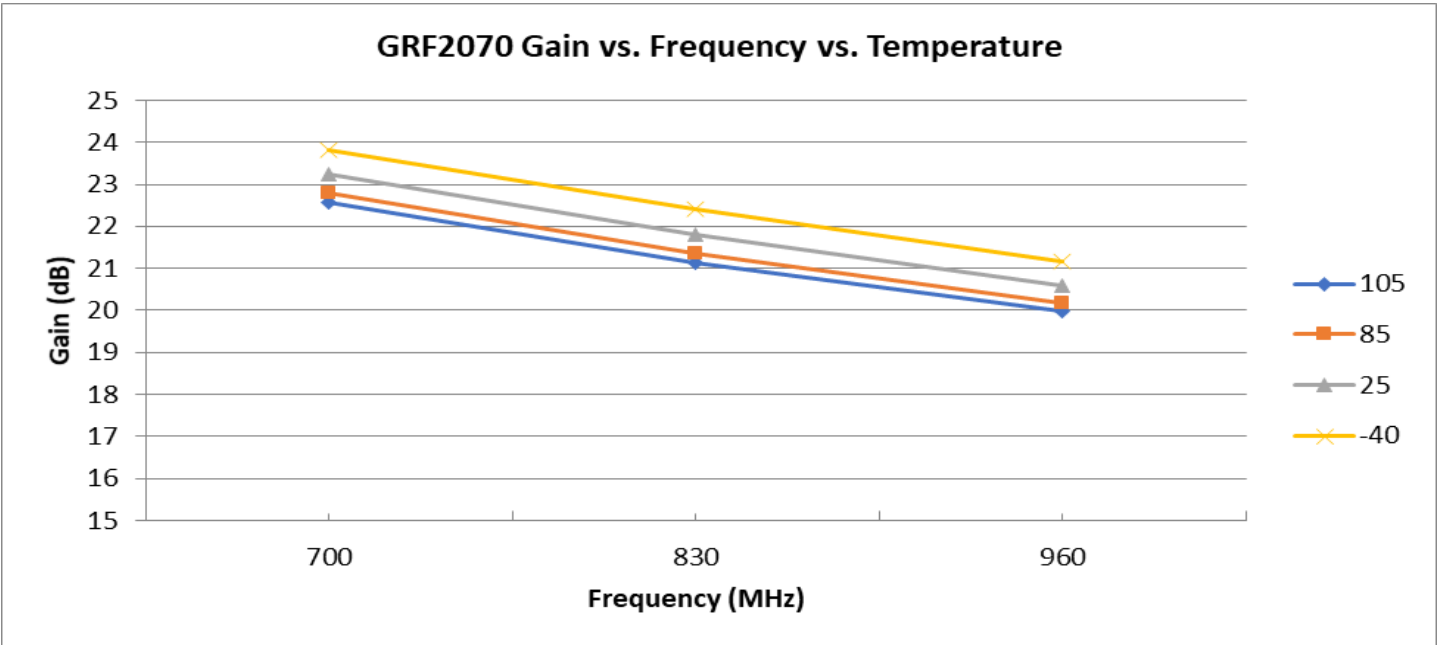


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GRF2070 Evaluation Board Measured Data:



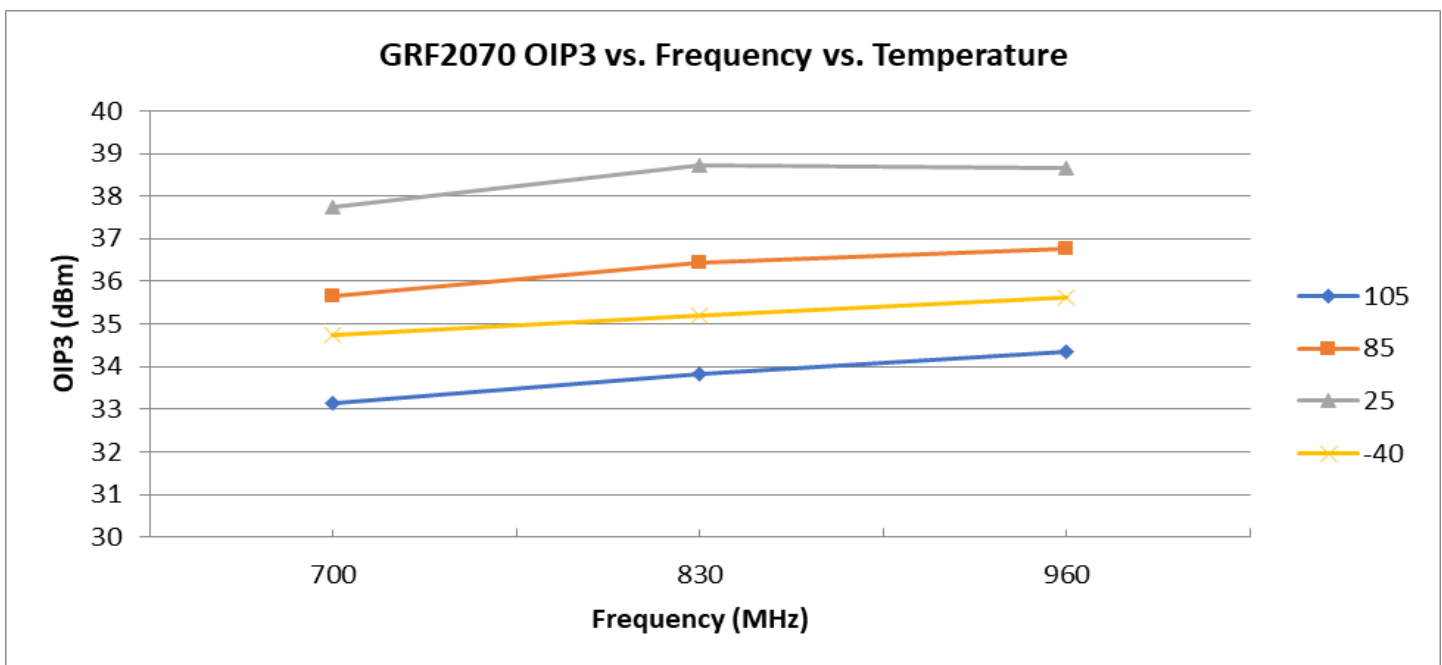
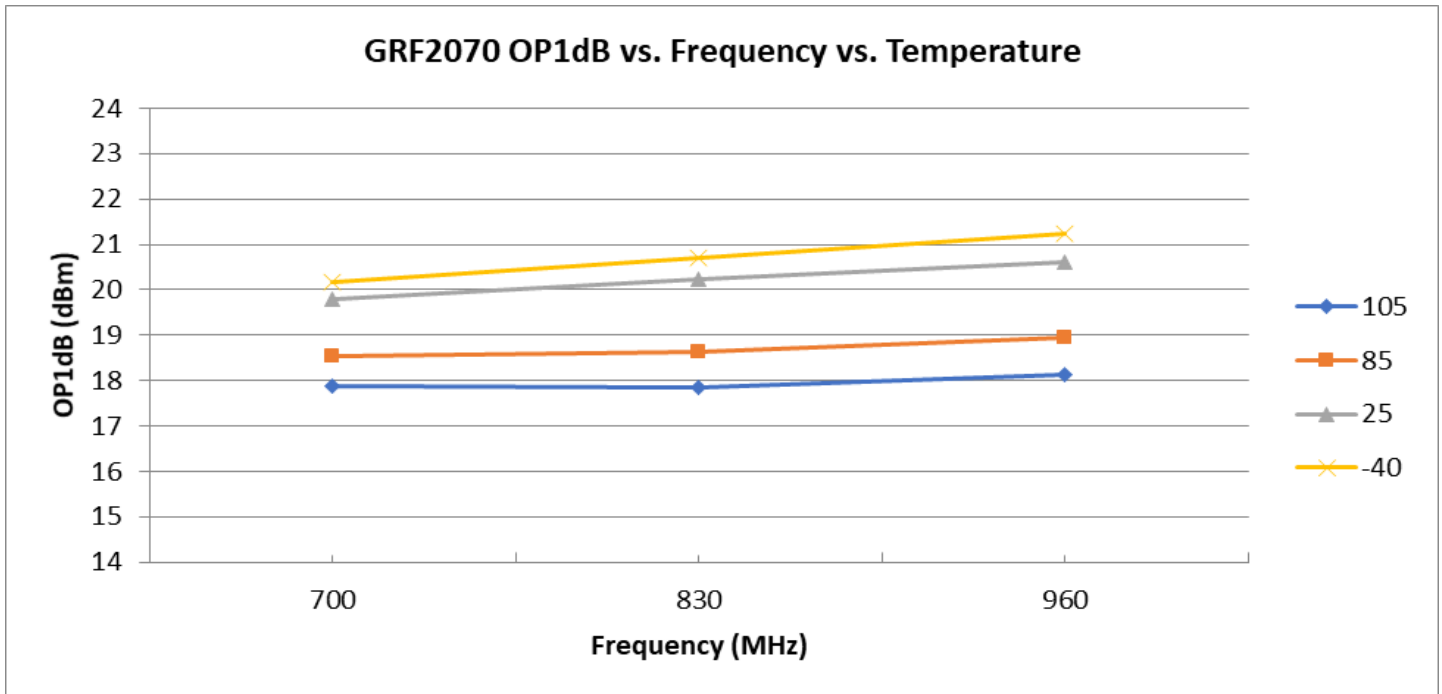


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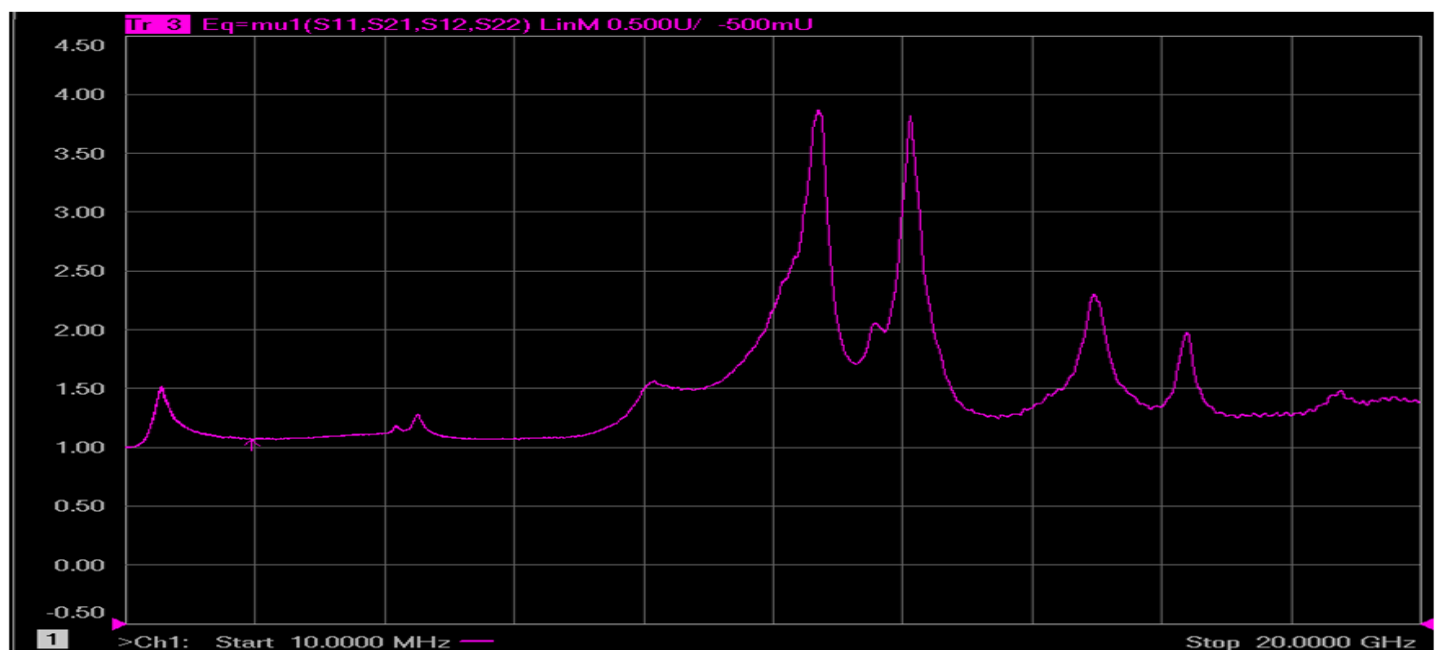
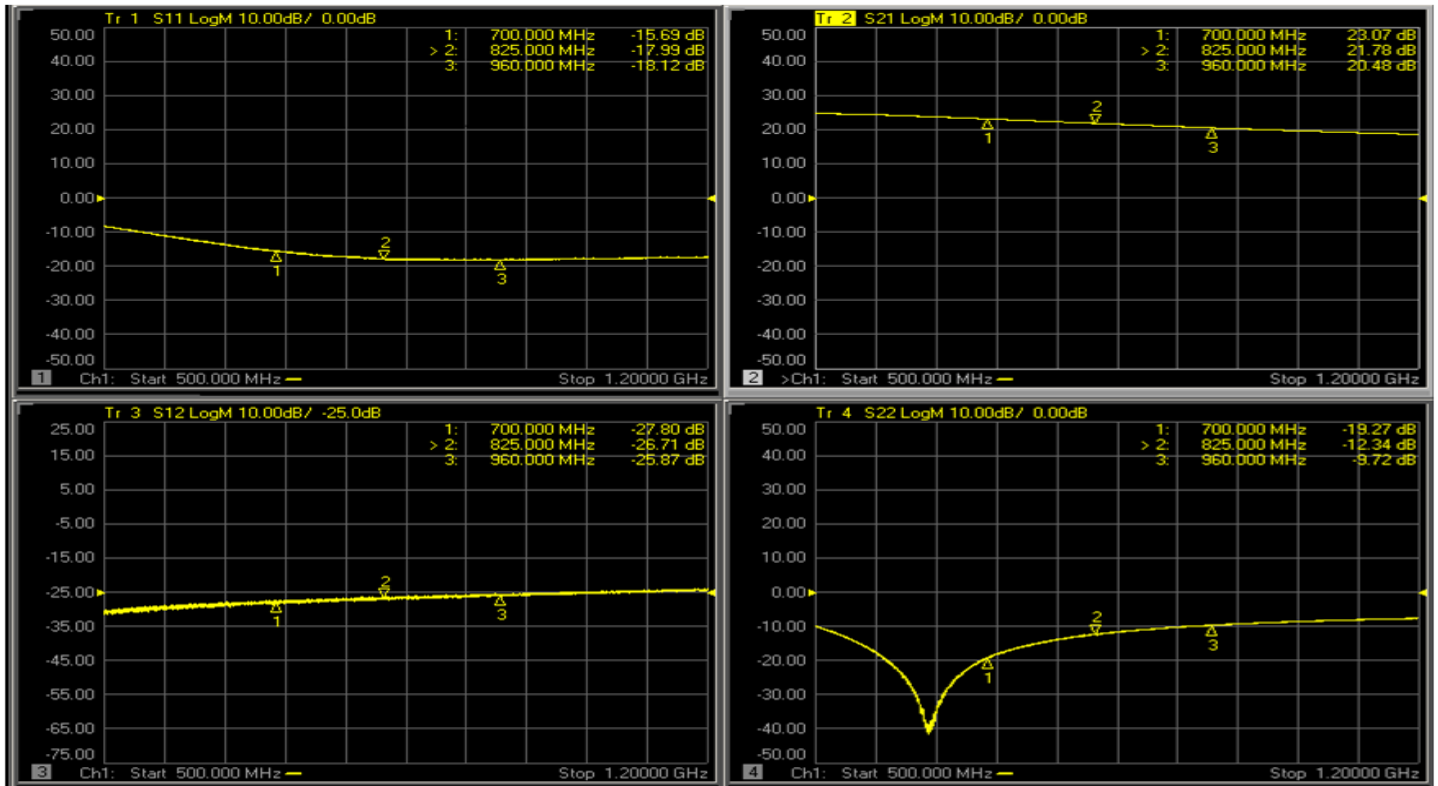


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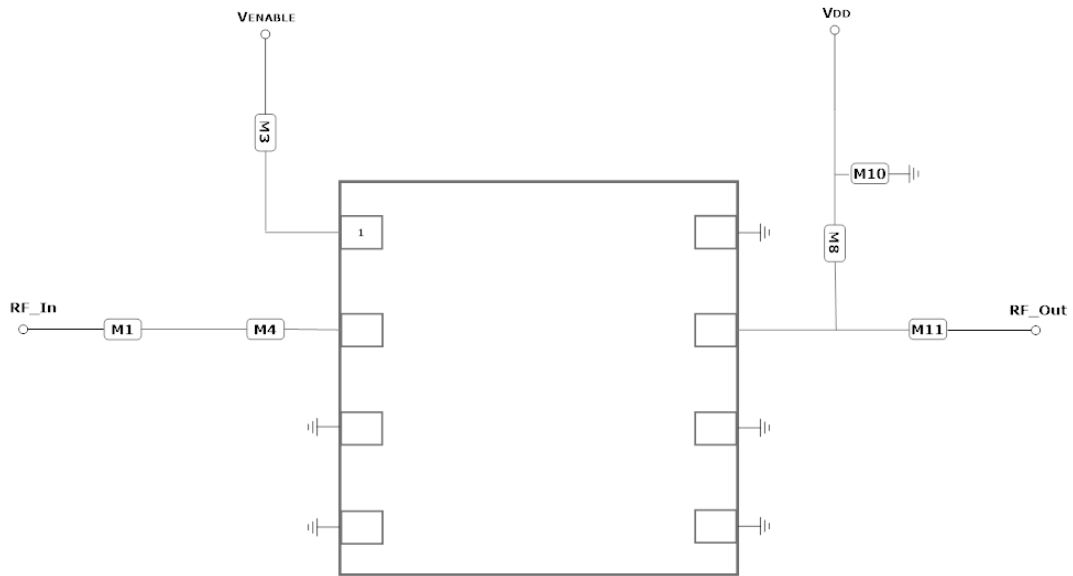
GRF2070

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Tuning Range: 0.4 – 1.5 GHz

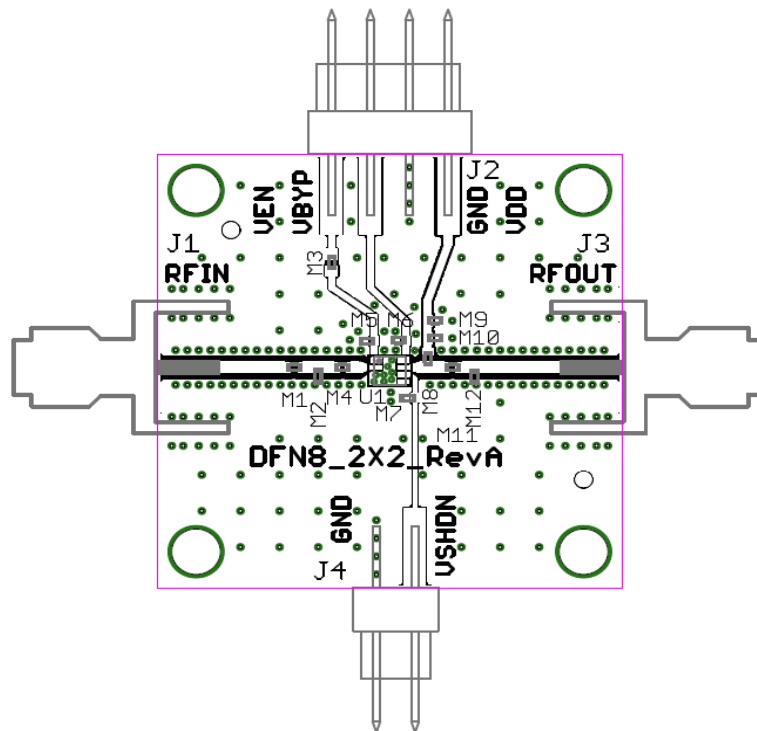
GRF2070 Evaluation Board S-Pars: (0.7 to 0.96 GHz Match)



Note: Mu factor ≥ 1.0 implies unconditional stability.



GRF2070 Application Schematic



GRF2070 EVB Assembly Drawing



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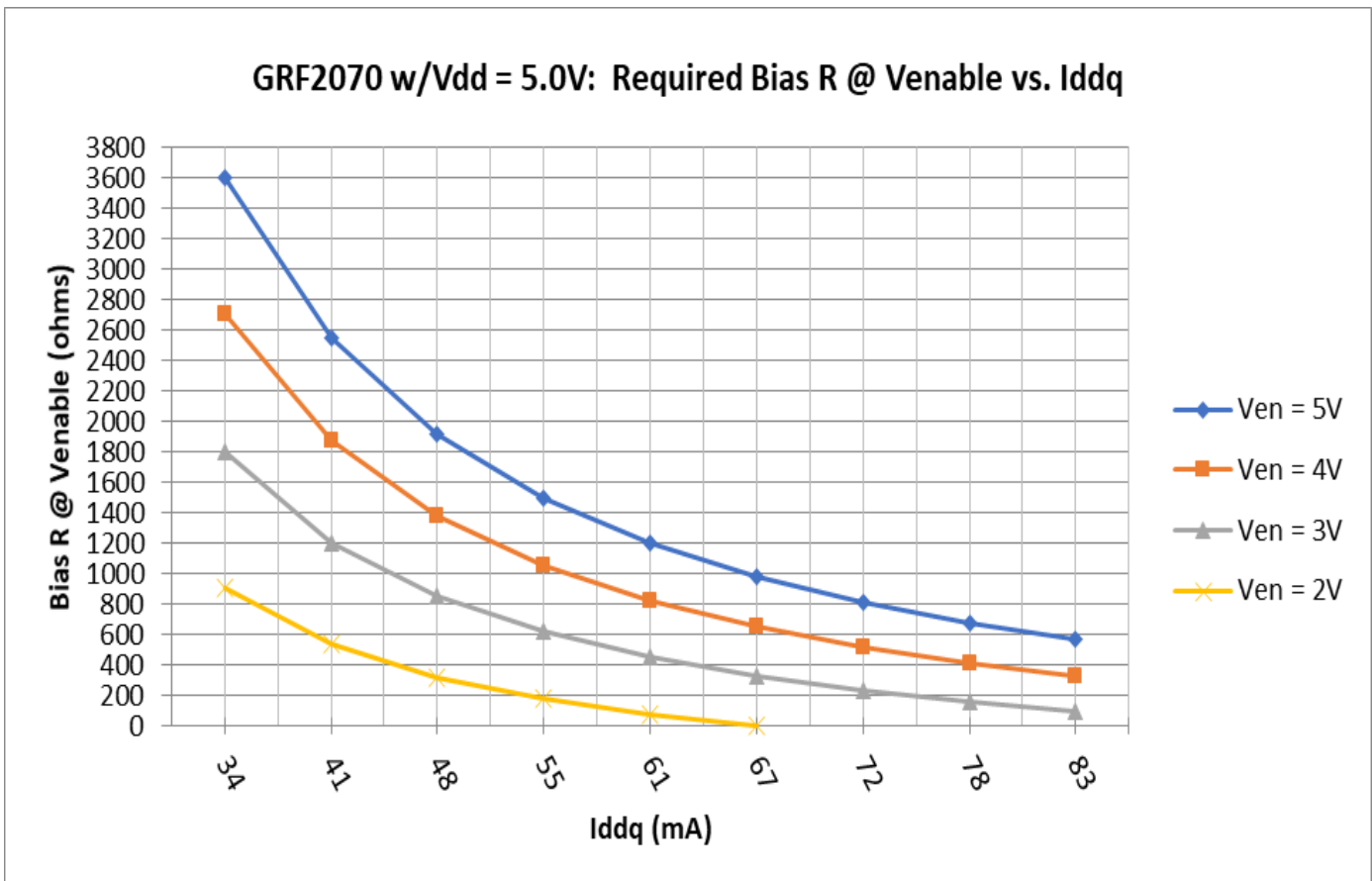
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GRF2070 Standard Evaluation Board BOM: (0.7 to 0.96 GHz Tune)

| Component | Type | Manufacturer | Family | Value | Package Size | Substitution |
|------------------|-------------------|--------------|--------|-----------|--------------|--------------|
| M1 | Resistor (jumper) | Various | — | 0 Ohm | 0402 | ok |
| M3 | Resistor | Various | 5% | Sets Iddq | 0402 | ok |
| M4 | Capacitor | Murata | GJM | 47 pF | 0402 | ok |
| M8 | Inductor | Murata | LQW | 22 nH | 0402 | ok |
| M10 | Capacitor | Murata | GRM | 0.1 uF | 0402 | ok |
| M11 | Capacitor | Murata | GRM | 4.7 pF | 0402 | ok |
| Evaluation Board | DFN8_2x2_RevA | — | — | — | — | — |

GRF2070 Bias Resistor Selection Curves:





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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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JONHON

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