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GRF5110

28.8 dBm Power-LNA™
Tuning Range: 1.5 – 3.8 GHz



Product Description

GRF5110 is a high linearity PA /Linear Driver with low noise figure (NF). It delivers excellent P1dB, IP3 and NF over a wide range of frequencies with fractional bandwidths of roughly 5 to 10%.

The device can be tuned over a wide range of frequencies from around 1.5 GHz to 3.8 GHz.

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

Features

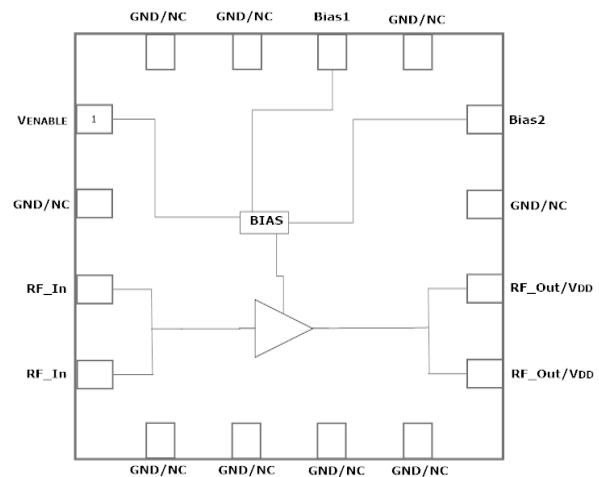
Reference: 5V/160mA/1.9GHz

- Gain: 15.0 dB
- OP1dB: 28.8 dBm
- OIP3: 46.0 dBm
- Eval Board NF:0.9 dB

- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- Power Amplifier
- Linear Driver Amplifier for High PAR Waveforms
- Multi-stage LNA



3.0 x 3.0 mm QFN-16



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Absolute Ratings:

| Parameter | Symbol | Min. | Max. | Unit |
|--|-----------------------|------|------|------|
| Drain Voltage | V _{DD} | | 6.0 | V |
| Transient Average RF Input Power: (Load VSWR < 2:1; Duration: <1 hour) | P _{IN MAX} | | 24.0 | 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} | | 1.0 | W |
| Electrostatic Discharge: | | | | |
| Charged Device Model: (TBD) | 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

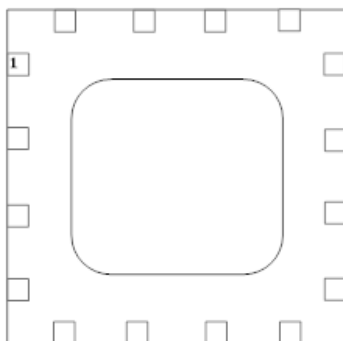


Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Note: For package dimensions and manufacturing information, see the Guerrilla-RF.com website for the following document located on the GRF5110 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 | RF Input | Pins 3-4 tied together on system board |
| 4 | RF_In | RF Input | Pins 3-4 tied together on system board |
| 5 | NC | No Connect or Ground | No internal connection to die |
| 6 | NC | No Connect or Ground | No internal connection to die |
| 7 | NC | No Connect or Ground | No internal connection to die |
| 8 | NC | No Connect or Ground | No internal connection to die |
| 9 | RF_Out/V _{DD} | PA Output/Bias | Pins 9-10 tied together on system board. Supply V _{DD} here. |
| 10 | RF_Out/V _{DD} | PA Output/Bias | Pins 9-10 tied together on system board. Supply V _{DD} here. |
| 11 | NC | No Connect or Ground | No internal connection to die |
| 12 | Bias2 | Bias Circuit Supply | Connect to V _{DD} through external resistor |
| 13 | NC | No Connect or Ground | No internal connection to die |
| 14 | Bias1 | Bias Circuit Ground | Consult application schematic |
| 15 | NC | No Connect or Ground | No internal connection to die |
| 16 | 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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Nominal Operating Parameters:

| Parameter | Symbol | Specification | | | Unit | Condition |
|--|----------------------|---------------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Target Performance (1.7 to 2.2 GHz Tune) | | | | | | Bias: 5.0 V and 160 mA unless otherwise noted. (+25C) |
| Test Frequency | F _{TEST} | | 1.9 | | GHz | |
| Gain | S(2,1) | 14.0 | 15.0 | | dB | |
| Noise Figure (Evaluation Board) | NF | | 0.9 | | dB | |
| Output 1dB Compression Point | OP1dB | 27.3 | 28.8 | | dBm | |
| Output Third Order Intercept Point | OIP3 | | 46.0 | | dBm | |
| Switching Rise Time | T _{RISE} | | 100 | | ns | |
| Switching Fall Time | T _{FALL} | | 800 | | ns | |
| Quiescent Supply Current | I _{DDQ} | | 160 | 190 | mA | V _{dd} =V _{enable} =5.0volts R _{bias} : 5k ohms |
| Enable Current | I _{ENABLE} | | 2.0 | | mA | |
| Disabled Mode | | | | | | |
| Supply Current (Leakage) | I _{DD} | | 30 | | uA | |
| Thermal Data | | | | | | |
| Thermal Resistance: (IR Scan Method) | Θ _{jc} | | 80 | | °C/W | |
| Channel Temperature @ +85C Reference (package heat sink) | T _{CHANNEL} | | 149 | | °C | V _{DD} : 5.0 volts; I _{DDQ} : 160 mA P _{DISS} : 800 mW; No RF |

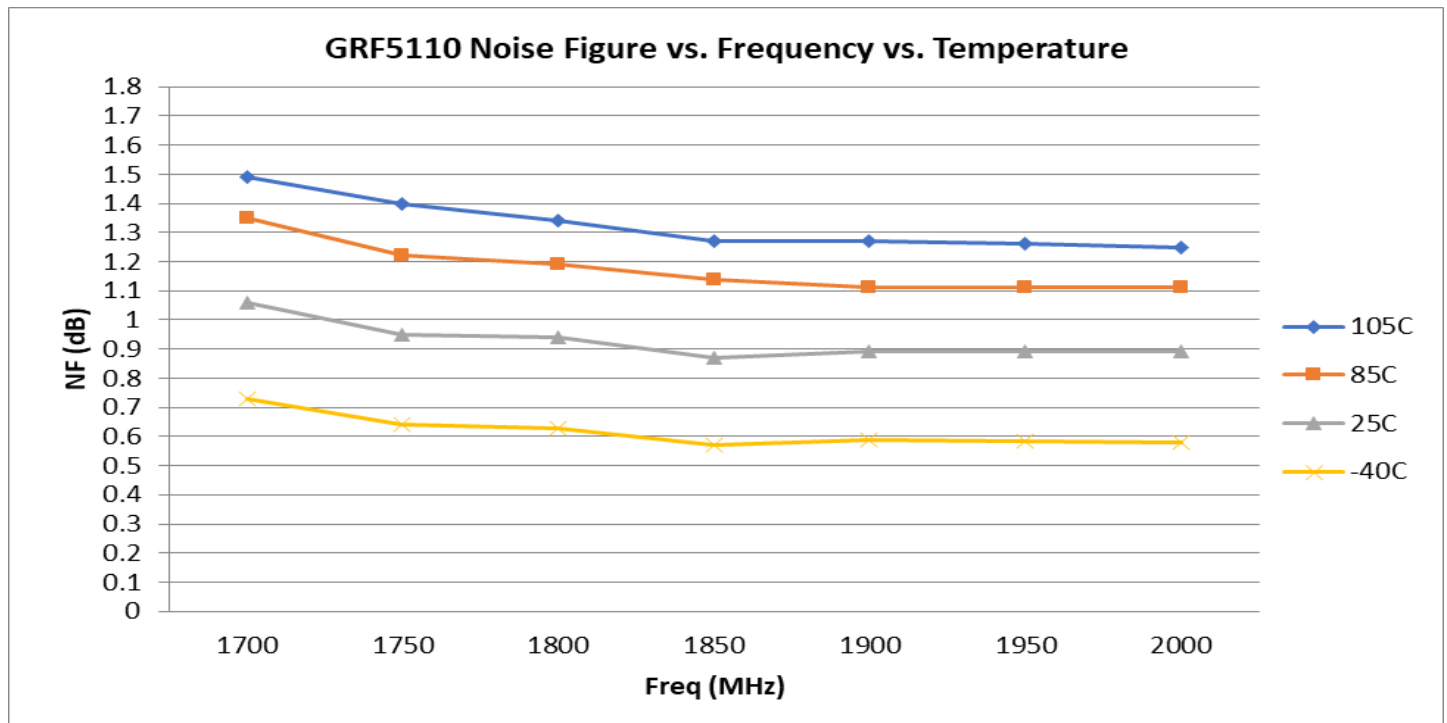
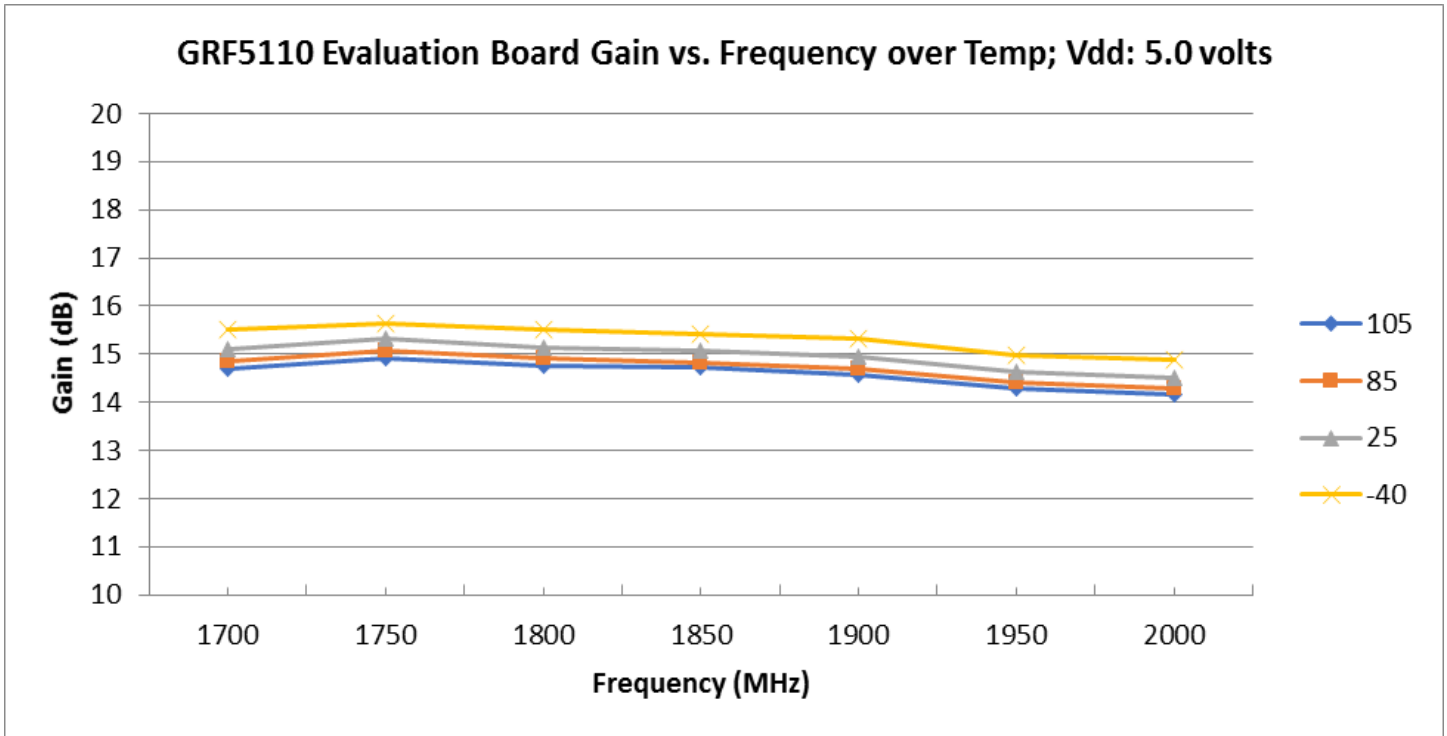


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GRF5110 Evaluation Board Measured Data: (1.7 to 2.0 GHz Tune)



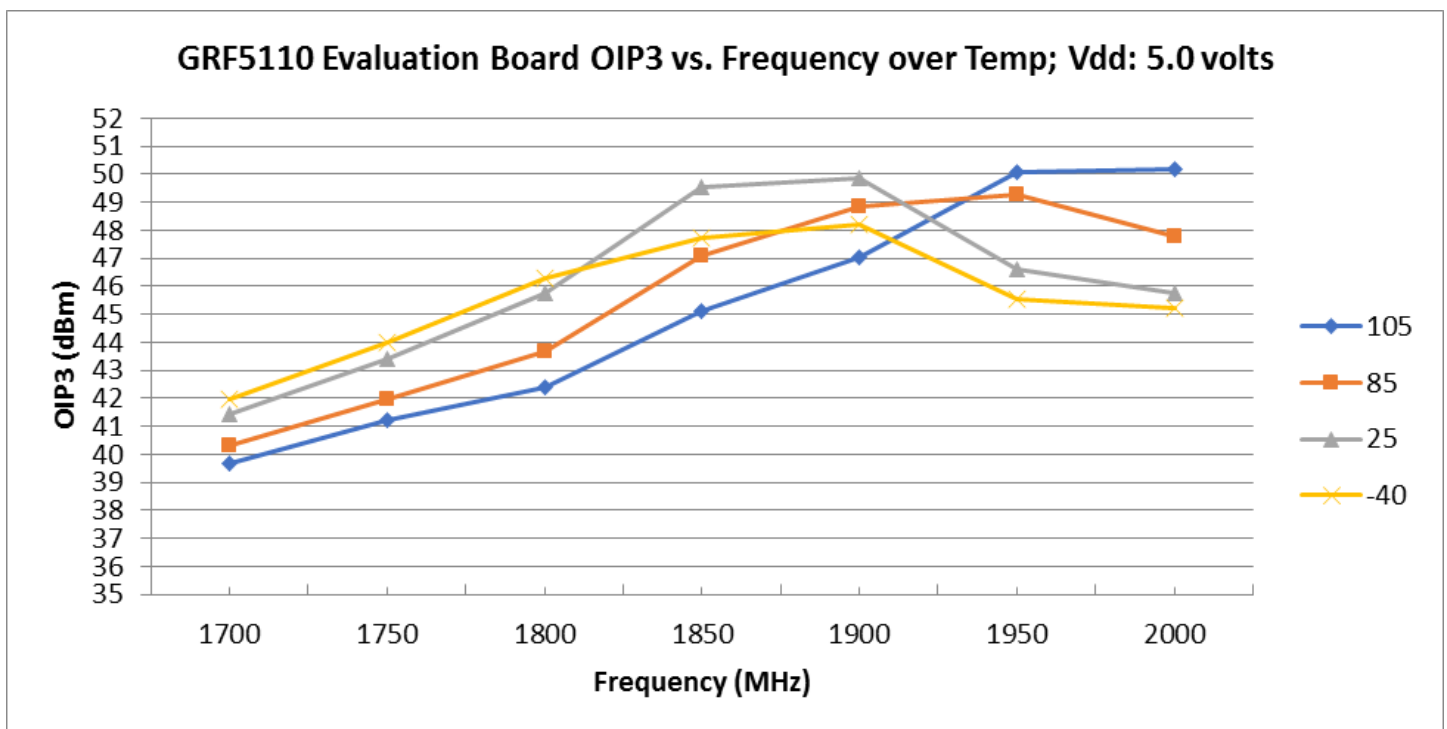
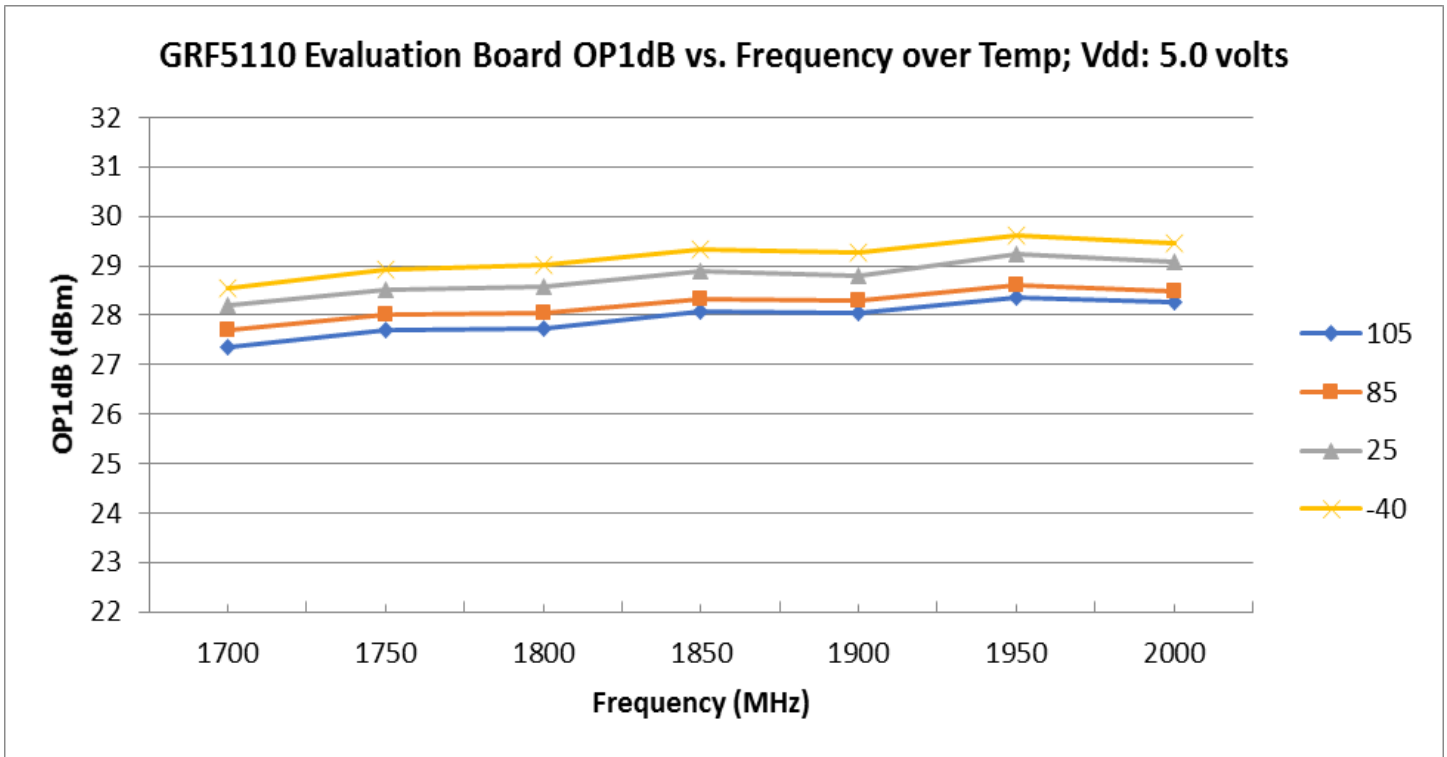


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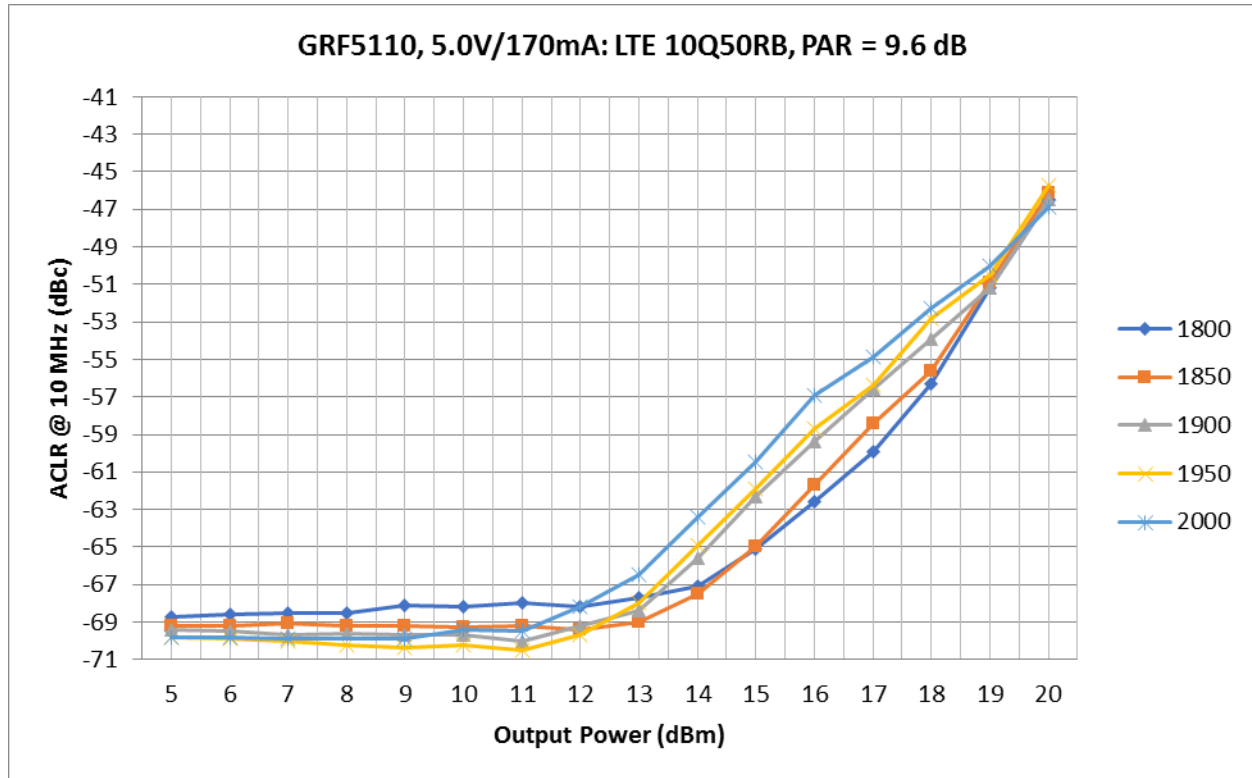


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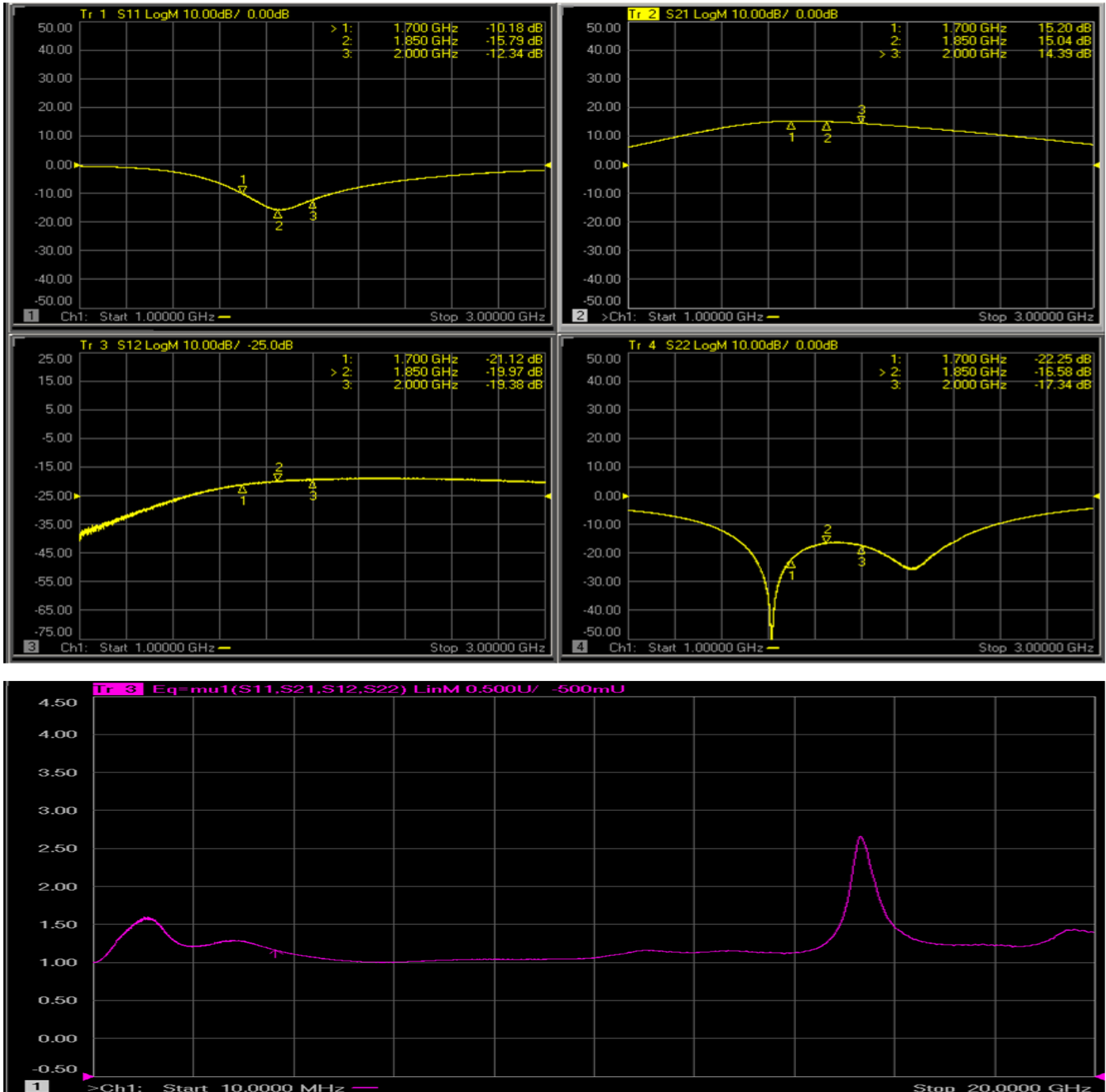


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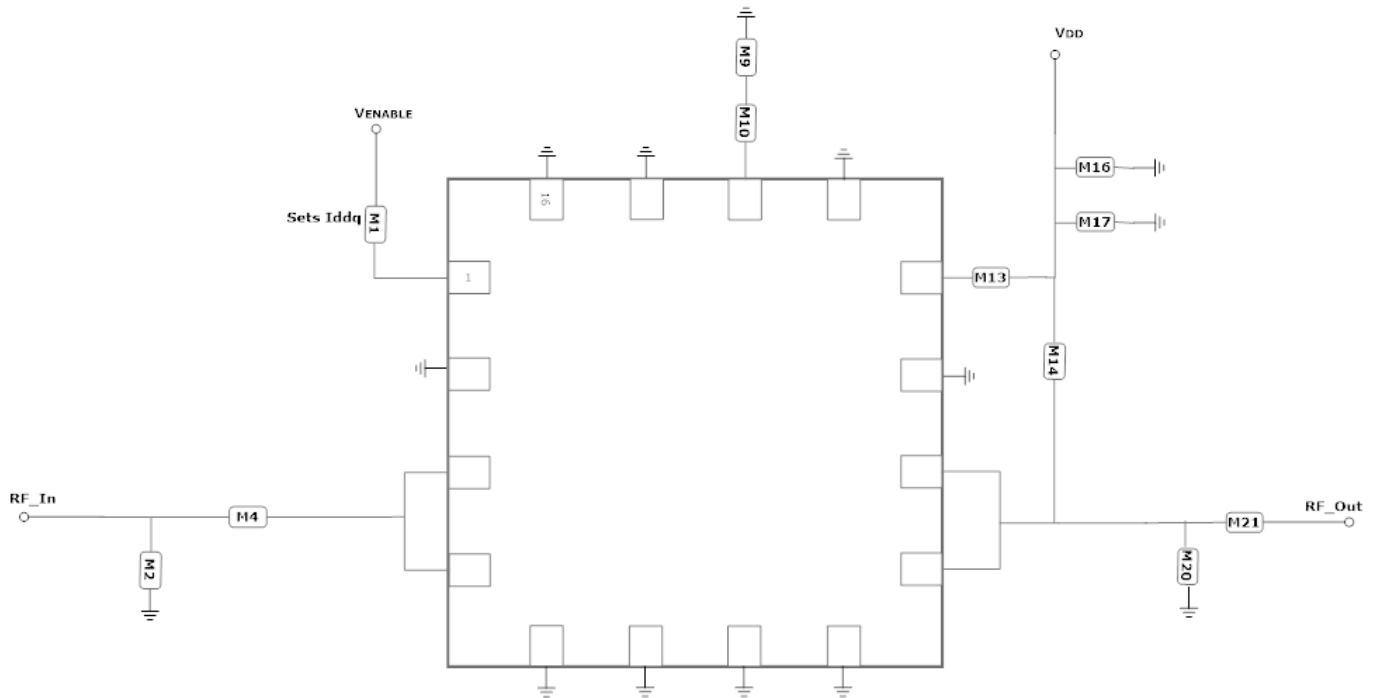
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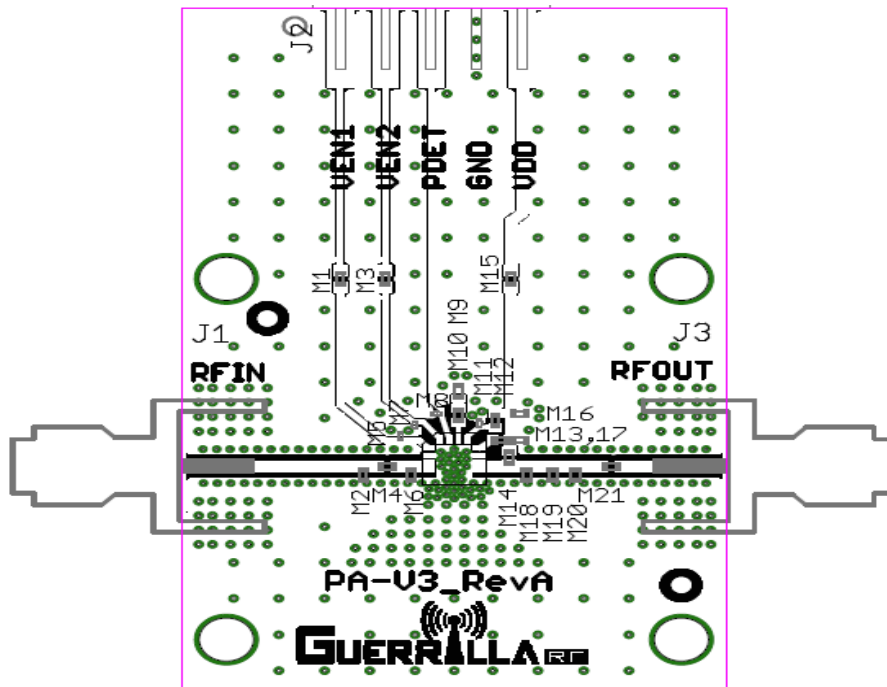
GRF5110 Evaluation Board S-Parms: (1.7 to 2.0 GHz Tune)



Note: Mu factor ≥ 1.0 implies unconditional stability.



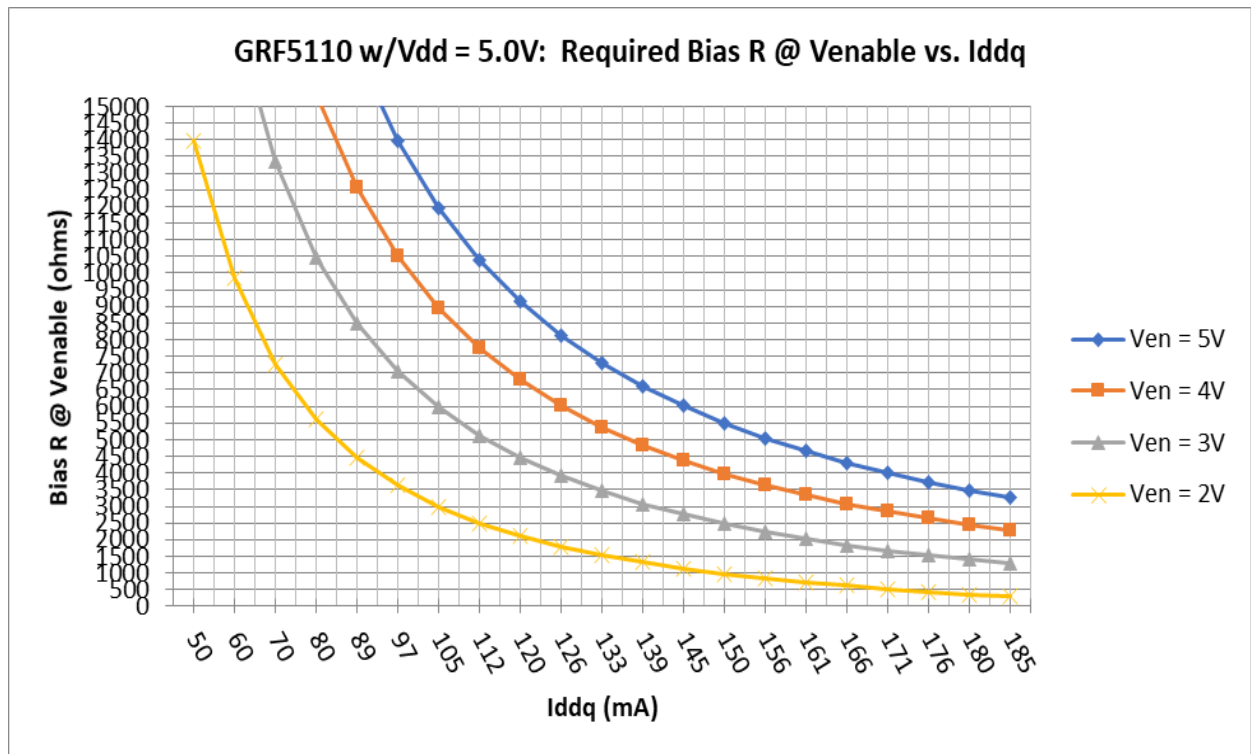
GRF5110 Application Schematic: (1.7 to 2.0 GHz)



GRF5110 Evaluation Board Assembly Drawing

GRF5110 Evaluation Board BOM: (1.7–2.0 GHz)

| Component | Type | Manufacturer | Family | Value | Package Size | Substitution |
|-----------------|-------------------|--------------|---------|-----------|--------------|--------------|
| M1 (See curves) | Resistor | Various | 5% | Sets Iddq | 0402 | ok |
| M2 | Inductor: High Q | Coilcraft | HP | 2.7 nH | 0402 | ok |
| M4 | Capacitor: High Q | Murata | GJM | 2.0 pF | 0402 | ok |
| M9 | Resistor | Various | 5% | 0 Ohm | 0402 | ok |
| M10 | Inductor | Murata | LQP/LQG | 12 nH | 0402 | ok |
| M13 | Resistor | Various | 5% | 0 Ohm | 0402 | ok |
| M14 | Inductor: High Q | Coilcraft | HP | 18 nH | 0402 | ok |
| M16 | Capacitor | Murata | GRM | 0.1 uF | 0402 | ok |
| M17 | Capacitor | Murata | GRM | 100 pF | 0402 | ok |
| M20 | Capacitor | Murata | GJM | 1.5 pF | 0402 | ok |
| M21 | Capacitor | Murata | GJM | 10 pF | 0402 | ok |



GRF5110 Bias Resistor (M1) 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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