



### Product Description

GRF7001 is a broadband, high-linearity mixer with integrated LO buffer that can be used as either an up or down converter.

The device inputs and outputs are single-ended and internally matched to 50 ohms. The device implementation requires an external image-reject filter on the RF port and an IF bandpass filter on the IF port. Pins 4 and 6 can be used for either RF or IF with appropriate filtering in place.

The integrated LO buffer is operated from a single positive supply of 3.0 to 5.0 V with a selectable  $I_{DDQ}$  range of 10 to 30 mA.

Consult with the GRF applications engineering team for custom tuning/evaluation board data.

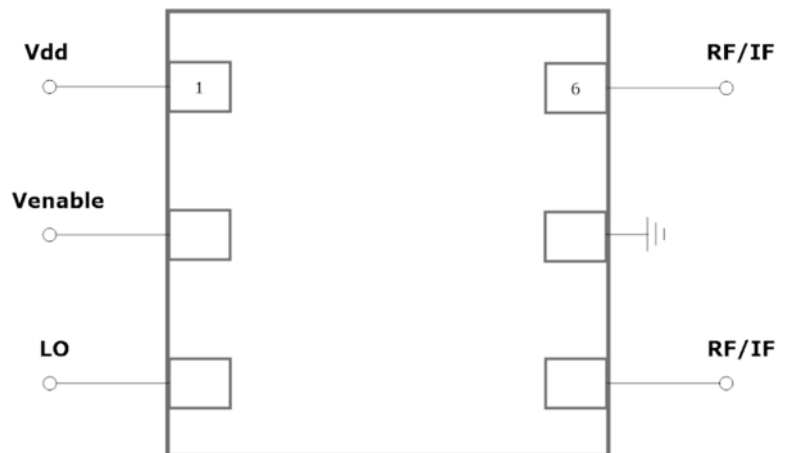
### Features

Reference: RF: 808 MHz; LO: 965 MHz;  
IF: 157 MHz

- Conversion Loss: 6.0 dB
- SSB NF: 7.1 dB
- IIP3: 25.4 dBm
- IP1dB: >17.0 dBm
- RF/IF Range: 0.1 to 5.0 GHz
- LO Range: 0.1 to 4.0 GHz
- Flexible Bias Voltage and Current
- Internally Matched to 50  $\Omega$
- Process: GaAs pHEMT

### Applications

- Bi-directional Mixer for High-linearity Transmit/Receive Chains





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## High Linearity Mixer with Integrated LO Buffer

### Absolute Ratings:

| Parameter   | Symbol                | Min. | Max. | Unit |
|---|-----------------------|------|------|------|
| Supply Voltage  | V <sub>DD</sub>       | 0    | 6.0  | V    |
| RF/IF/LO Input Power: (Load VSWR < 2:1; V <sub>D</sub> : 5.0) | 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> |      | 100  | 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



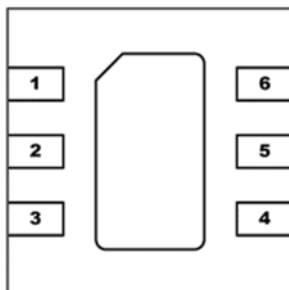
Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

**Note:** For package dimensions and manufacturing information, see the [Guerrilla-RF.com](http://Guerrilla-RF.com) website for the following document located on the GRF7001 landing page (pending): 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>DD</sub>     | LO buffer voltage input        | Vdd: 3.0 to 5.0 volts   |
| 2        | V <sub>ENABLE</sub> | I <sub>ddq</sub> control input | Venable and external resistor set I <sub>ddq</sub> for LO buffer. Venable < =0.2 volts disables the device  |
| 3        | LO                  | Input to LO buffer             | Target LO input power: 0 dBm  |
| 4        | RF/IF               | RF/IF input or output          | External filtering required   |
| 5        | NC/GND              | No Connect or Ground           | No internal connection to die   |
| 6        | RF/IF               | RF/IF input or output          | External filtering required   |
| 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. |



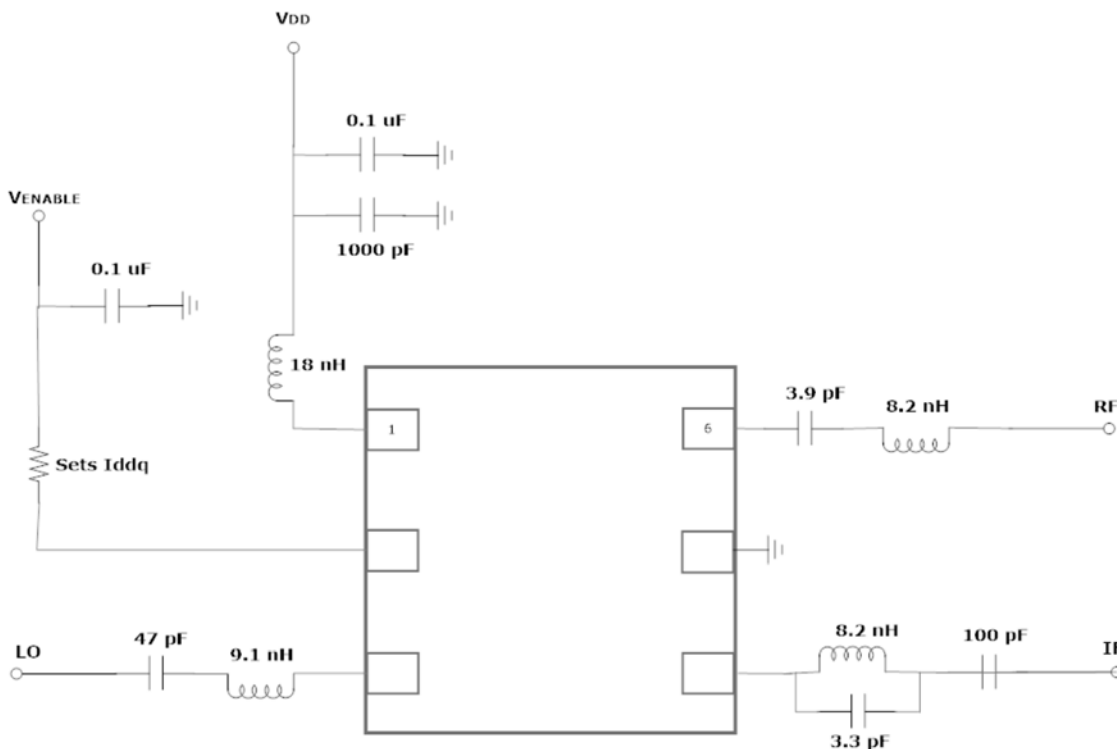
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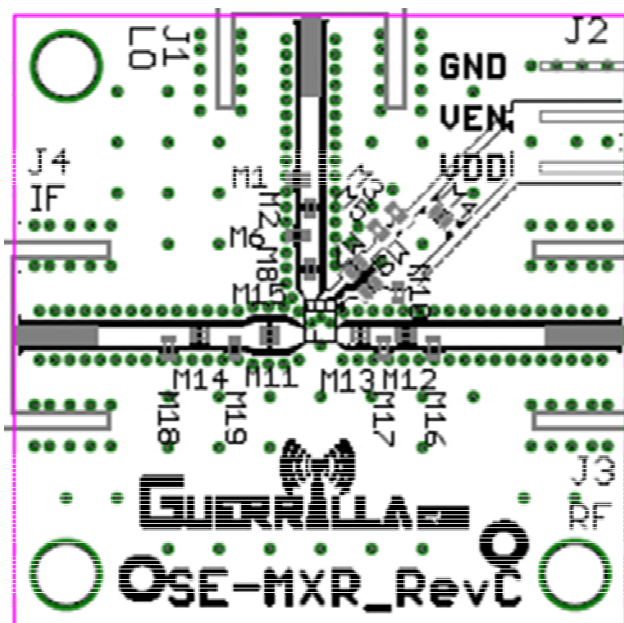
High Linearity Mixer with  
Integrated LO Buffer

## Nominal Operating Parameters:

| Parameter   | Symbol               | Specification |       |      | Unit | Condition  |
|---|----------------------|---------------|-------|------|------|--|
|   |                      | Min.          | Typ.  | Max. |      |  |
|   |                      |               |       |      |      | Vdd = 3.0 V, T <sub>A</sub> = 25 °C                                  |
| RF Frequency (Down conversion)                            | F <sub>RF</sub>      |               | 808   |      | MHz  |  |
| LO Frequency:   | F <sub>LO</sub>      |               | 965   |      | MHz  |  |
| IF Frequency:   | F <sub>IF</sub>      |               | 157   |      | MHz  |  |
| Evaluation Board Conversion Gain                          | S <sub>21</sub>      |               | -6.0  |      | dB   |  |
| Evaluation Board SSB Noise Figure                         | NF                   |               | 7.1   |      | dB   |  |
| Input 3rd Order Intercept Point                           | IIP3                 |               | 25.4  |      | dBm  |  |
| Input 1dB Compression Point                               | IP1dB                |               | >17.0 |      | dBm  |  |
| LO Drive Level  | LO_IN                |               | 0     |      | dBm  |  |
| Buffer Supply Current                                     | I <sub>DD</sub>      |               | 10    |      | mA   | Adjustable for optimal mixer performance and efficiency              |
| Enable Current  | I <sub>ENABLE</sub>  |               | 1.0   |      | mA   |  |
| <b>Thermal Data</b>                                       |                      |               |       |      |      |  |
| Thermal Resistance (measured via IR scan)                 | Θ <sub>JC</sub>      |               | TBD   |      | °C/W | On standard evaluation board   |
| Channel Temperature @ +85 C Reference (Package Heat Sink) | T <sub>CHANNEL</sub> |               | TBD   |      | °C   | Vdd: 3.0 V; I <sub>DDQ</sub> :10 mA; No RF; P <sub>diss</sub> :30 mW |



GRF7001 Standard Application Schematic



GRF7001 Evaluation Board Assembly Drawing



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High Linearity Mixer with  
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## GRF7001 Standard Evaluation Board BOM:

| Component         | Type               | Manufacturer | Family   | Value           | Package Size | Substitution |
|-------------------|--------------------|--------------|----------|-----------------|--------------|--------------|
| M2                | Capacitor          | Murata       | GJM      | 47 pF           | 0402         | Ok           |
| M5                | Capacitor          | Murata       | GRM      | 0.1 uF          | 0402         | Ok           |
| M7                | Resistor           | Various      | —        | 0 Ohm           | 0402         | ok           |
| M8                | Inductor           | Murata       | LQP      | 9.1 nH          | 0402         | ok           |
| M9                | Inductor           | Murata       | LQG      | 18 nH           | 0402         | ok           |
| M10               | Capacitor          | Murata       | GRF      | 1000 pF//0.1 uF | 0402         | Ok           |
| M11               | Inductor/Capacitor | Murata       | LQG//GJM | 8.2 nH//3.3 pF  | 0402         | ok           |
| M12               | Inductor           | Murata       | LQG      | 8.2 nH          | 0402         | ok           |
| M13               | Capacitor          | Murata       | GRM      | 3.9 pF          | 0402         | Ok           |
| M14               | Capacitor          | Murata       | GRM      | 100 pF          | 0402         | Ok           |
| Evaluation Board: | SE-MXR_RevC        |              |          |                 |              |              |



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## High Linearity Mixer with Integrated LO Buffer

| 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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