

## Ultra Low Noise Amplifier 6GHz-12GHz



### Product Description

R6G12GSQ is an ultra low noise amplifier with a frequency range of 6 to 12GHz.

The power output of this amplifier is 10dBm typical. The typical gain is 21dB with a flatness of  $\pm 1.0$ dB.

The working temperature of this product is between - 40°C and + 85°C.

### Features

- Gain 21dB Typical
- P1dB Output Power +10dBm Typical
- Supply Voltage +12VDC
- 50 Ohm Matched Input/Output
- Low Noise Figure +1.2dB Typical
- Gain Flatness +/-1.0dB

### Typical Applications

- Wireless Infrastructure
- Military and Aerospace Applications
- Test Instrumentation
- Radar Systems
- 5G Wireless Communications
- Microwave Radio Systems
- TR Modules
- Research and Development
- Cellular Base Stations

### Electrical Specifications (T<sub>A</sub>=+25°C)

| Parameter                                      |                                | Min        | Typ  | Max  | Units  |
|------------------------------------------------|--------------------------------|------------|------|------|--------|
| Frequency Range                                |                                | 6          |      | 12   | GHz    |
| Gain                                           |                                | 19.5       | 21   | 24   | dB     |
| Gain Flatness                                  |                                |            | ±1.0 | ±1.5 | dB     |
| Gain Variation Over Temperature (-40°C~+85°C ) |                                |            | ±1.0 |      | dB     |
| Noise Figure                                   |                                |            | 1.2  | 1.4  | dB     |
| Input VSWR                                     |                                |            | 1.6  | 2.0  | : 1    |
| Output VSWR                                    |                                |            | 1.6  | 2.0  | : 1    |
| Output 1dB Compression Point (P1dB)            |                                | 8          | 10   |      | dBm    |
| Saturated Output Power (Psat)                  |                                |            | 12   |      | dBm    |
| Output Third Order Intercept (OIP3)            |                                |            | 20   |      | dBm    |
| Supply Current (Vcc=+12V)                      |                                |            | 50   | 60   | mA     |
| Isolation                                      |                                |            | -40  |      | dB     |
| Weight                                         | Net                            | 0.3 Max.   |      |      | Ounces |
|                                                | Including Heat Sink            | 0.9 Max.   |      |      |        |
| Impedance                                      |                                |            | 50   |      | Ohms   |
| Input / Output Connectors                      |                                | SMA-Female |      |      |        |
| Package                                        | Epoxy Sealed (Standard)        |            |      |      |        |
|                                                | Hermetically Sealed (Optional) |            |      |      |        |

### Absolute Maximum Ratings

| Parameter              | Rating |
|------------------------|--------|
| Operating Voltage      | +15VDC |
| *RF Input Power (RFIN) | +15dBm |

### Bias Up Procedure

1. Connect ground
2. Connect input and output with 50 Ohm source/load. (In band VSWR < 1.9:1 or >10dB return loss.)
3. Connect positive supply and make sure power supply can handle max current.

### Bias Down Procedure

1. Turn off power supply and remove positive supply
2. Disconnect input and output with 50 Ohm source/load. (In band VSWR < 1.9:1 or >10dB return loss.)
3. Remove ground

### Environmental Specifications and Test Standards

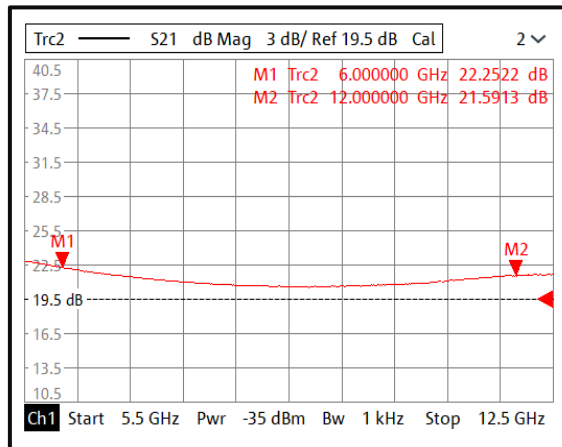
| Parameter                         | Description                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational Temperature           | -40°C to +85°C<br>(Case Temperature)                                                                                                                                                                            |
| Storage Temperature               | -50°C to +105°C                                                                                                                                                                                                 |
| Thermal Shock                     | -40°C → +85°C<br>(5 Cycles / 10 hours)                                                                                                                                                                          |
| **Random Vibration                | MIL-STD-202G<br>Table 214-I, Test Condition Letter C<br>1.5 Hours Per Axis                                                                                                                                      |
| High Temperature Burn In          | Temperature +85°C for 72 Hours                                                                                                                                                                                  |
| Shock                             | 1. Weight >20g, 50g half sine wave for 11ms, Speed variation 3.44m/s<br>2. Weight <=20g, 100g Half sine wave for 6ms, Speed variation 3.75m/s<br>3. Total 18 times (6 directions, 3 repetitions per direction). |
| Altitude                          | Standard: 30,000 Ft (Epoxy Sealed Controlled Environment)<br>Optional: Hermetically Sealed (60,000 ft. 1.0 PSI min)                                                                                             |
| Hermetically Sealed<br>(Optional) | MIL-STD-883 (For Hermetically Sealed Units)                                                                                                                                                                     |

\*Maximum RF input power is set to assure safety of amplifier. Input power may be increased at own risk to achieve full power of amplifier. Please reference gain and power curves.

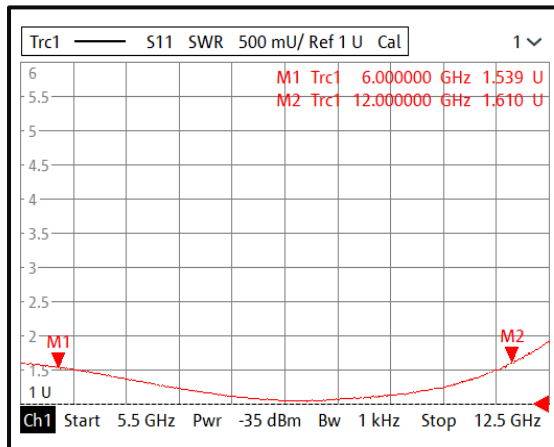
\*\*For vibration testing details please see additional information section.

Typical Performance Plots

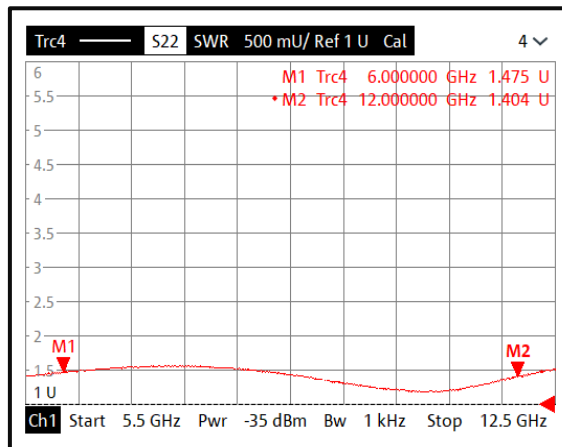
Gain@+25°C



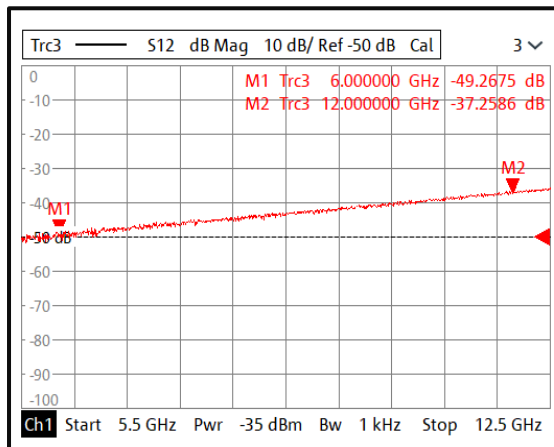
Input VSWR@+25°C



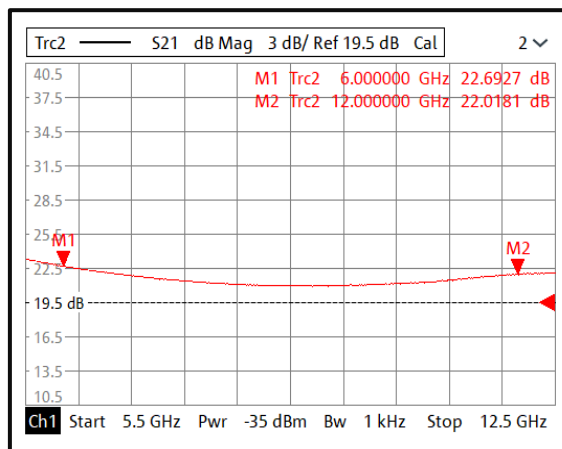
Output VSWR@+25°C



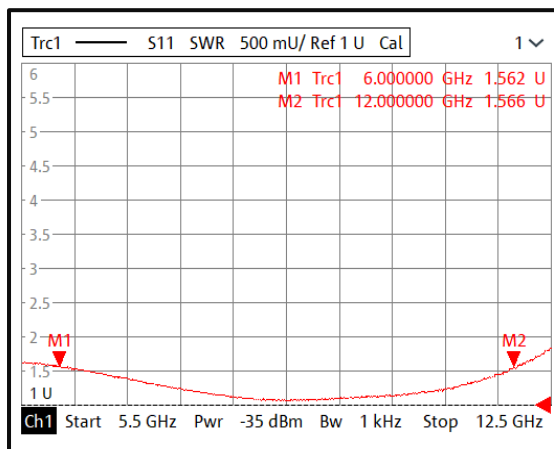
Isolation@+25°C



Gain@-40°C



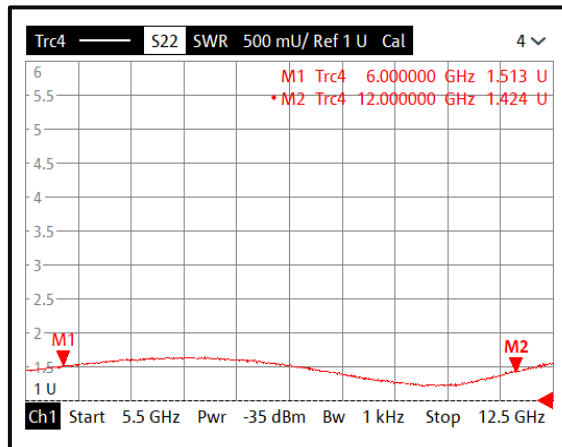
Input VSWR@-40°C



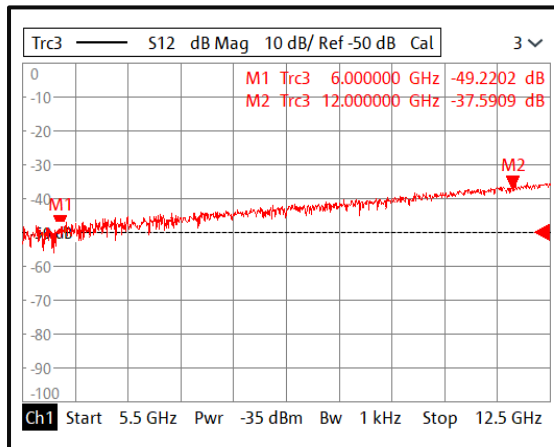
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

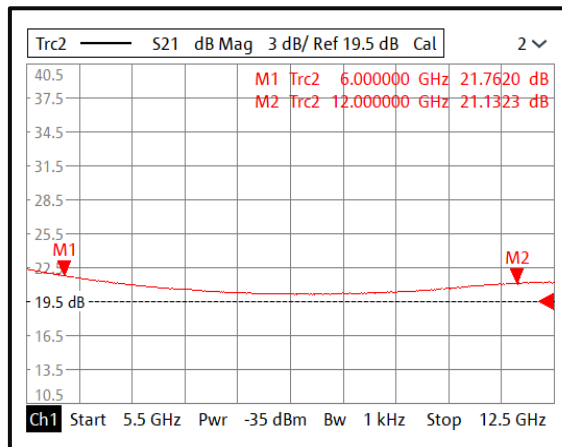
Output VSWR@-40°C



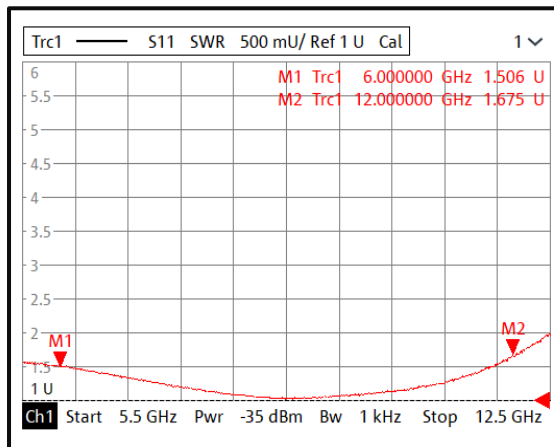
Isolation@-40°C



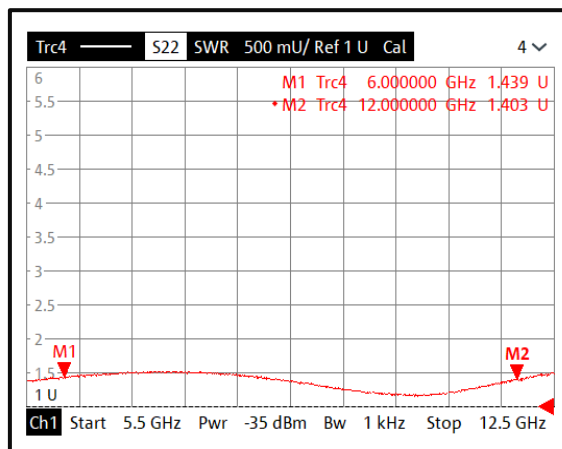
Gain@+85°C



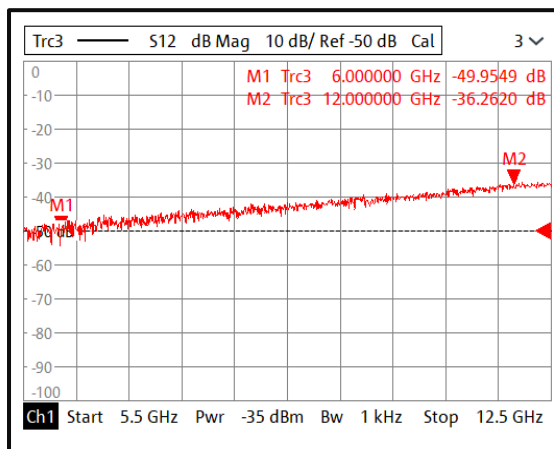
Input VSWR@+85°C



Output VSWR@+85°C



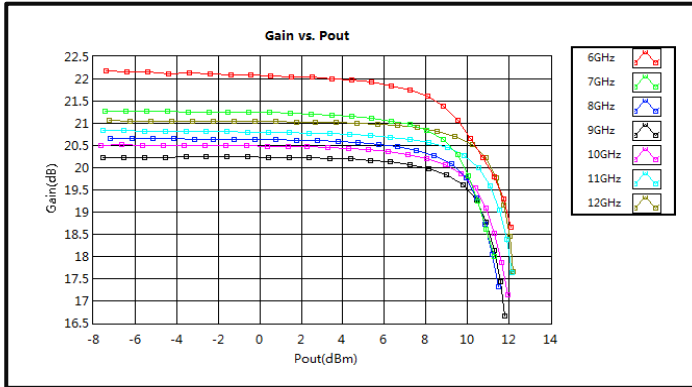
Isolation@+85°C



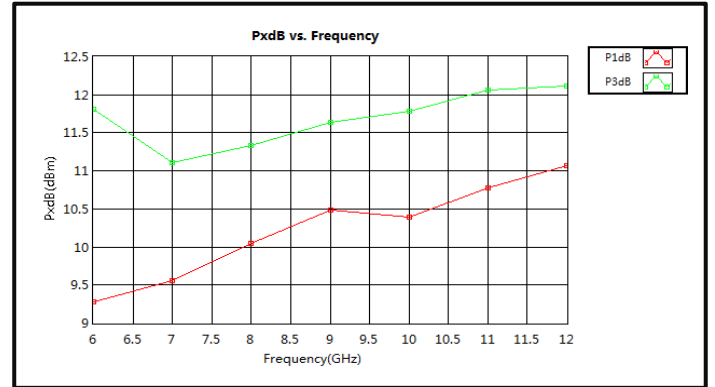
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

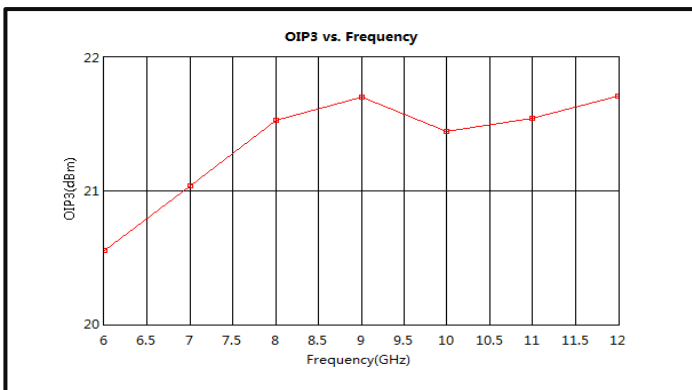
Gain vs. Output Power



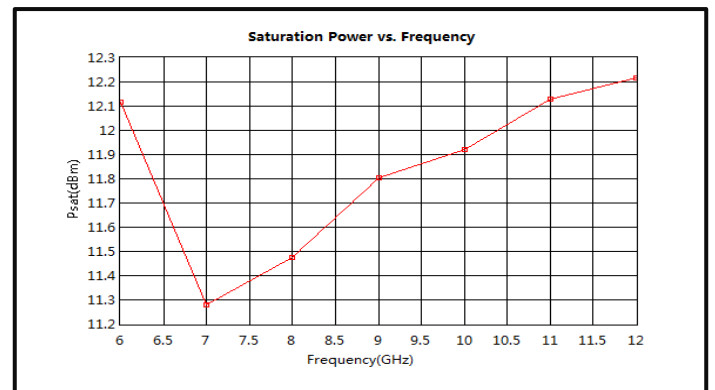
P1dB & P3dB vs. Frequency



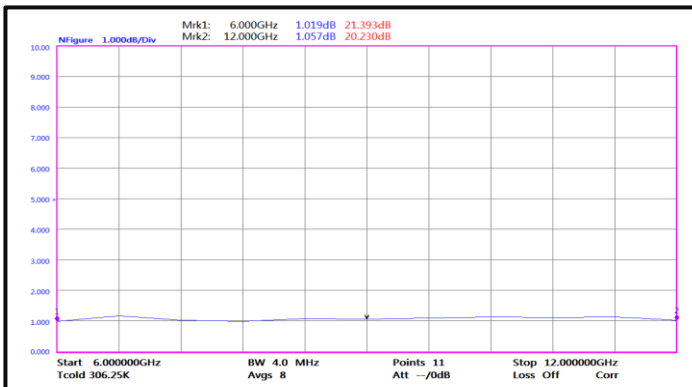
Output Third Order Intercept (OIP3)



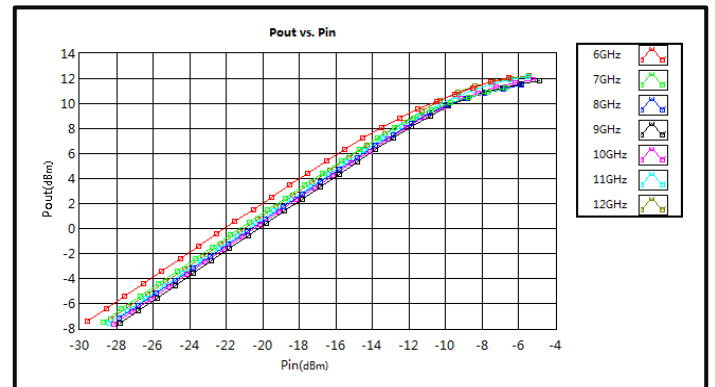
Saturation Power vs. Frequency



Noise Figure

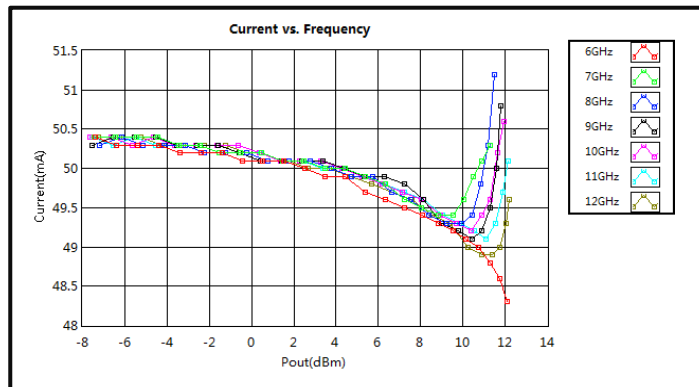


Pout vs. Pin

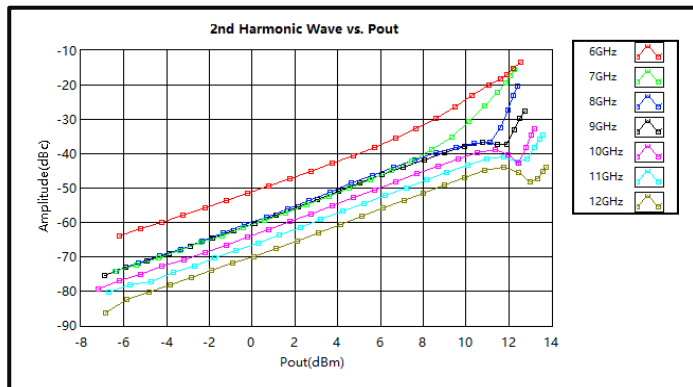


Typical Performance Plots

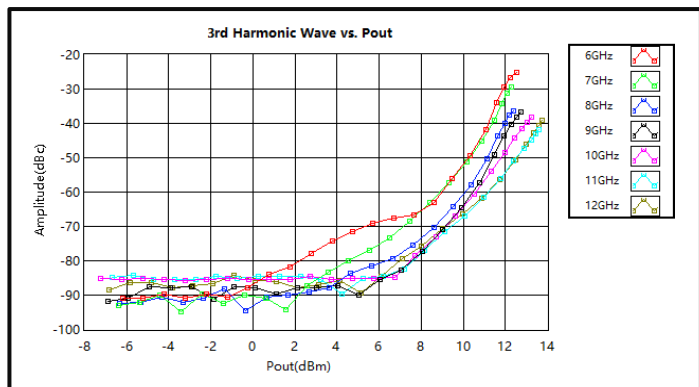
Current vs. Frequency



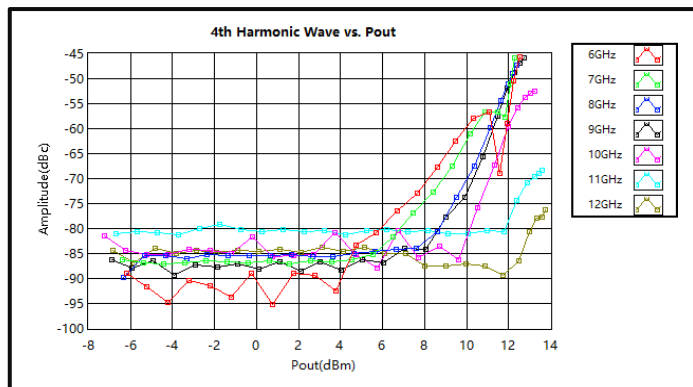
2nd Harmonic Wave Output Power



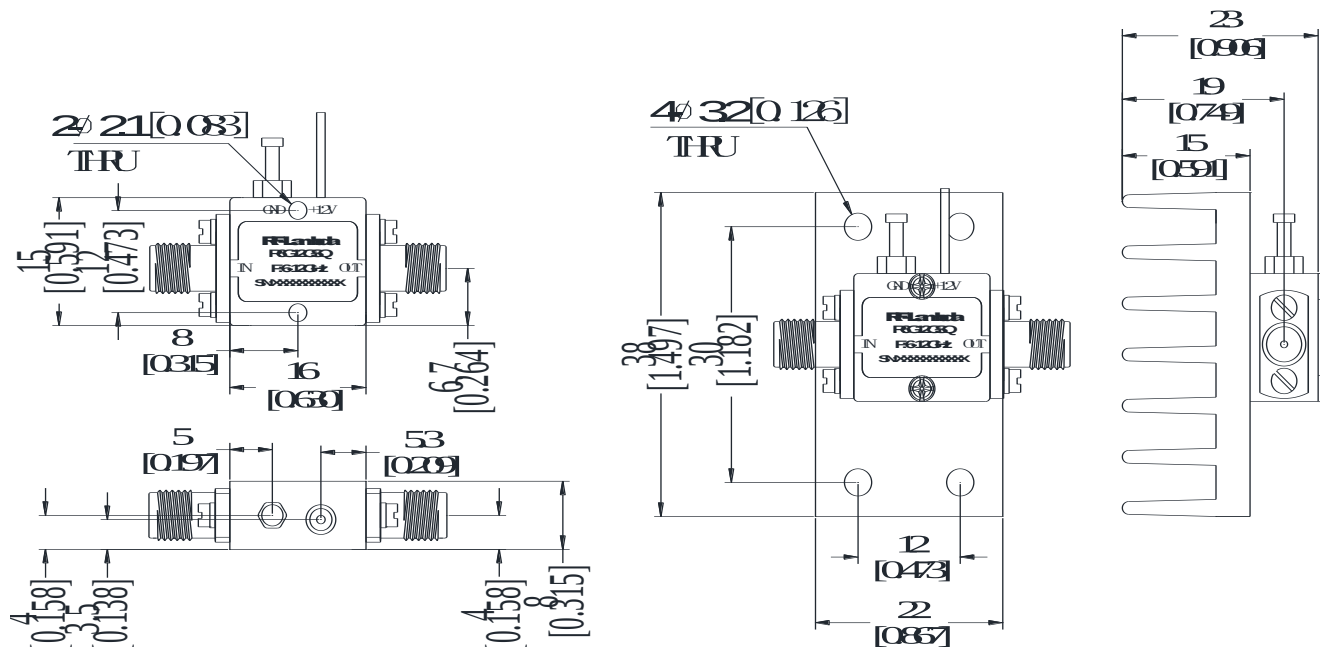
3rd Harmonic Wave Output Power



4th Harmonic Wave Output Power

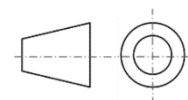


**Outline Drawing**



**Notes:**

1. Package Material: Aluminum
2. Finish: Gold Plated
3. All dimensions are in millimeters [inches].
4. Housing Tolerances  $\pm 0.1$  [0.004] unless otherwise specified(Excl Heat Sink).
5. Heat sink required during operation (sold separately). Matching heatsink is listed on our website. If customer would like to use their own cooling method, please make sure the amplifier will operate under the specs that listed in page 2 of this datasheet.
6. Standard torque wrench must be used to secure RF connectors.



**Additional Information**

| Documentation                   | Webpage                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ESD Policy                      | <a href="https://rflambda.com/pdf/rflambda_esd_control.pdf">https://rflambda.com/pdf/rflambda_esd_control.pdf</a>                                             |
| Heatsink Lookup Specifications  | <a href="https://rflambda.com/search_heatsink.jsp">https://rflambda.com/search_heatsink.jsp</a>                                                               |
| Connector Torque Specifications | <a href="https://www.rflambda.com/pdf/Torque_Specifications.pdf">https://www.rflambda.com/pdf/Torque_Specifications.pdf</a>                                   |
| Random Vibration Test Standard  | <a href="https://www.rflambda.com/pdf/rflambda_random_vibration_MIL-STD-202G.pdf">https://www.rflambda.com/pdf/rflambda_random_vibration_MIL-STD-202G.pdf</a> |

## Ordering Information

| Part Number | Modification | Description                          |
|-------------|--------------|--------------------------------------|
| R6G12GSQ    | Standard     | 6GHz-12GHz Ultra Low Noise Amplifier |

## Amplifier Use

Ensure that the amplifier input and output ports are safely terminated into a proper 50 ohm load before turning on the power. Never operate the amplifier without a load. A proper 50 ohm load is defined as a load with impedance less than 1.9:1 or return loss larger than 10dB relative to 50 Ohm within the specified operating band width.

### Power Supply Requirements

Power supply must be able to provide adequate current for the amplifier. Power supply should be able to provide 1.5 times the typical current or 1.2 times the maximum current (whichever is greater).

In most cases, RF - Lambda amplifiers will withstand severe mismatches without damage. However, operation with poor loads is discouraged. If prolonged operation with poor or unknown loads is expected, an external device such as an isolator or circulator should be used to protect the amplifier.

Ensure that the power is off when connecting or disconnecting the input or output of the amp.

Prevent overdriving the amplifier. Do not exceed the recommended input power level.

Adequate heat-sinking required for RF amplifier modules. Please inquire.

Amplifiers do not contain Thermal protection, Reverse DC polarity or Over voltage protection with the exception of a few models. Please inquire.

Proper electrostatic discharge (ESD) precautions are recommended to avoid performance degradation or loss of functionality.

### What is not covered with warranty?

Each RF - Lambda amplifier will go through power and temperature stress testing.

Since the die, ICs or MMICs are fragile, these are not covered by warranty. Any damage to these will NOT be free to repair.

## Important Notice

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