

## 200W Wide Band Solid State Power Amplifier With Air Cooling 0.6GHz-6GHz



### Product Description

RFLUPA0506GF is a wide band power amplifier with a frequency range of 0.6 to 6GHz.

The power output of this amplifier is 200W or 53dBm typical. The typical small signal gain is 55dB with a flatness of  $\pm 4.0$ dB. This performance is achieved through the use of GaN devices.

The power amplifier input connector is N-Female and output connector is N-Female.

The operating temperature of this product is within -40°C to +60°C.

### Features

- Solid State Power Amplifier
- Air Cooling
- Small Signal Gain 55dB Typical
- Output Saturation Power 53dBm Typical
- Supply Voltage +48VDC
- 50 Ohm Matched
- Over Temperature Protection
- Over Current Protection
- Auto Calibration

### Typical Applications

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

### Electrical Specifications ( $T_A = +25^\circ\text{C}$ )

| Parameter                                        | Min  | Typ       | Max       | Min  | Typ       | Max                            | Units |
|--------------------------------------------------|------|-----------|-----------|------|-----------|--------------------------------|-------|
| Frequency Range                                  | 0.6  |           | 3.0       | 3.0  |           | 6.0                            | GHz   |
| Small Signal Gain                                | 50   | 55        |           | 50   | 55        |                                | dB    |
| Gain Flatness                                    |      | $\pm 3.0$ |           |      | $\pm 4.0$ |                                | dB    |
| Gain Variation Over Temperature (-40°C to +60°C) |      | $\pm 3.0$ |           |      | $\pm 3.0$ |                                | dB    |
| Input VSWR                                       |      | 1.3       | 2.0       |      | 1.3       | 2.0                            | :1    |
| Output 1dB Compression Point (P1dB)              |      | 50        |           |      | 49        |                                | dBm   |
| Saturated Output Power (Psat) (CW)               | 52.5 | 53.5      |           | 51.5 | 52        |                                | dBm   |
| Supply Current (+48V)                            |      | 20        | 30        |      | 20        | 30                             | A     |
| Power Added Efficiency (PAE)                     |      | 10        |           |      | 10        |                                | %     |
| Turn On/Off Speed (Switch Disable)               | ON   |           | 200       |      |           |                                | ns    |
|                                                  | OFF  |           | 200       |      |           |                                | ns    |
| Turn On/Off Speed (Drain Disable)                | ON   |           | 140       |      |           |                                | ms    |
|                                                  | OFF  |           | 500       |      |           |                                | us    |
| Turn On/Off Speed (Gate Disable)                 | ON   |           | 1000      |      |           |                                | us    |
|                                                  | OFF  |           | 50        |      |           |                                | us    |
| Weight                                           |      |           | 87.74 Max |      |           |                                | lbs.  |
| Impedance                                        |      |           | 50        |      |           |                                | Ohms  |
| Input / Output Connectors                        |      |           |           |      |           | N-Female                       |       |
| Package                                          |      |           |           |      |           | Epoxy Sealed (Standard)        |       |
|                                                  |      |           |           |      |           | Hermetically Sealed (Optional) |       |

### Absolute Maximum Ratings

| Parameter              | Rating                   |
|------------------------|--------------------------|
| Supply Voltage Range   | +50VDC                   |
| *RF Input Power (RFIN) | Psat – Large Signal Gain |

### Bias Up Procedure

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

### Bias Down Procedure

1. Turn off power supply
2. Remove positive supply Connection
3. Remove RF Connection
4. Remove ground

### Environmental Specifications and Test Standards

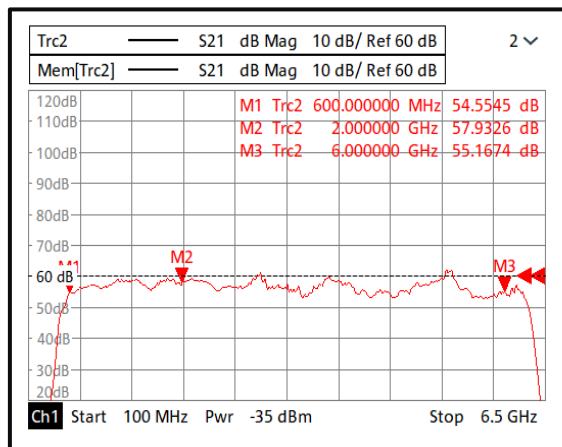
| Parameter                         | Description                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational Temperature           | -40°C to +60°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 +60°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.

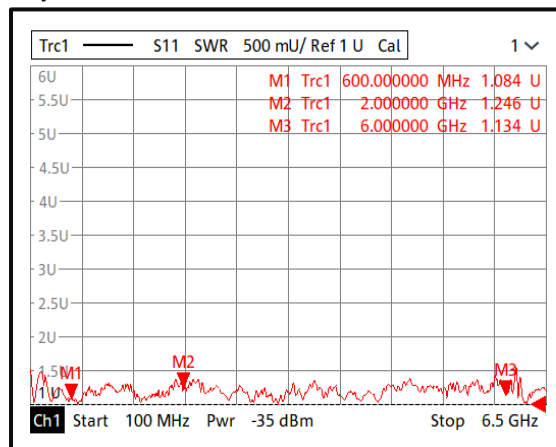
\*\*For vibration testing details please see additional information section.

## Typical Performance Plots

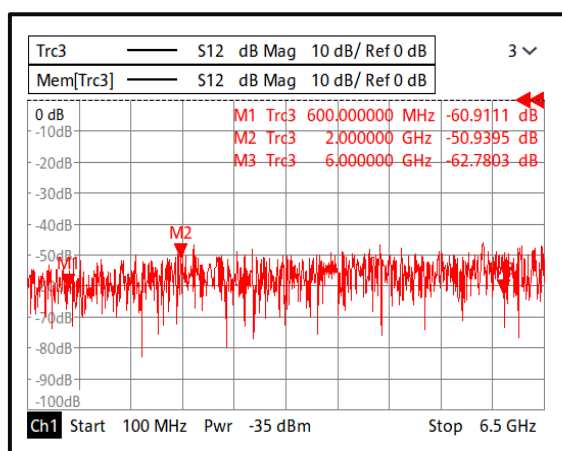
**Gain**



**Input VSWR**



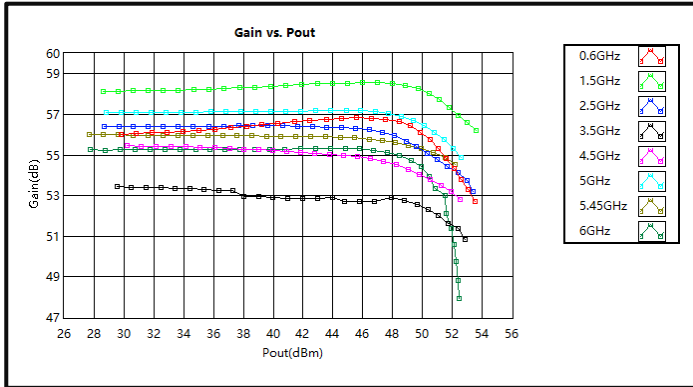
**Isolation**



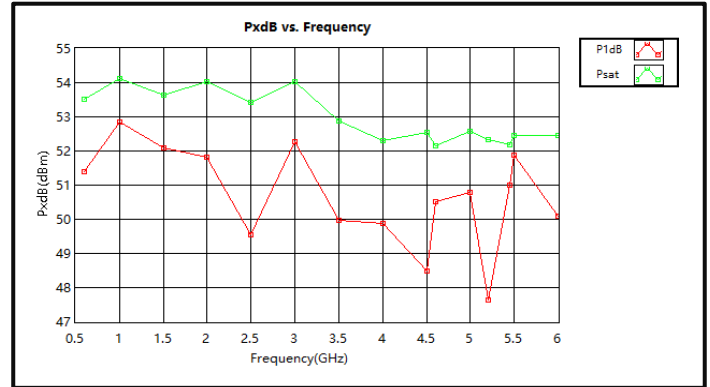
Note: Small signal VNA measurements include attenuators to protect equipment

## Typical Performance Plots

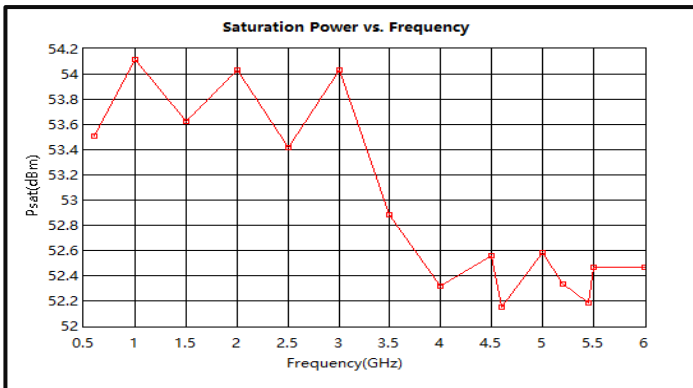
**Gain vs. Output Power CW**



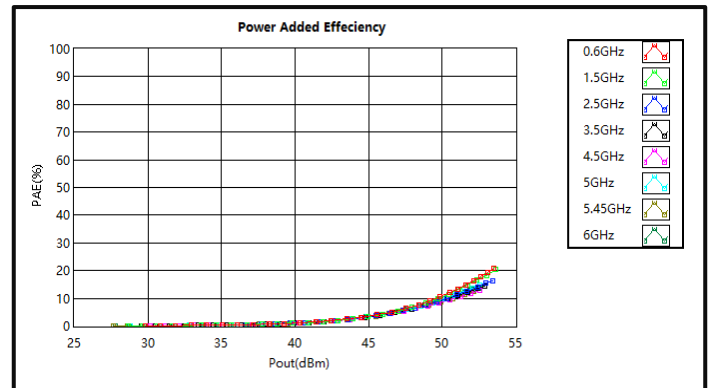
**PndB vs. Frequency CW**



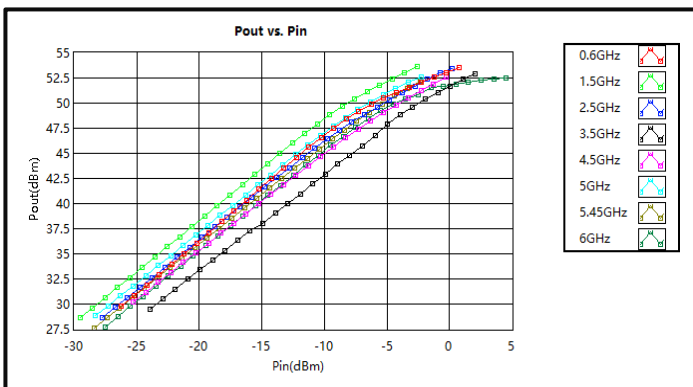
**Saturation Power vs. Frequency CW**



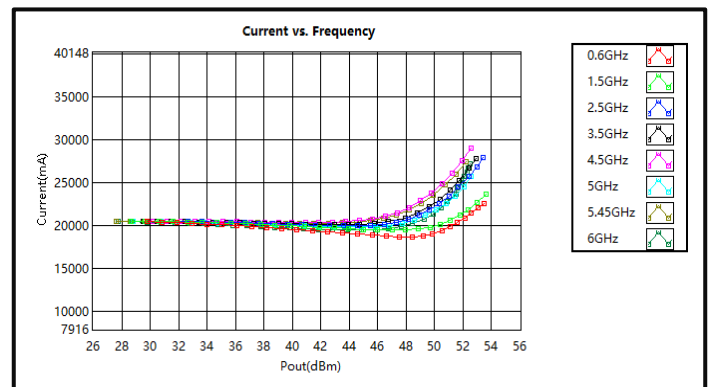
**Power Added Efficiency CW**



**Pout vs. Pin CW**

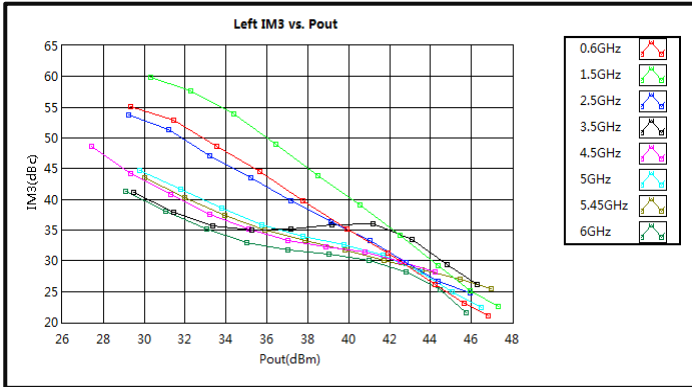


**Current vs. Frequency CW**

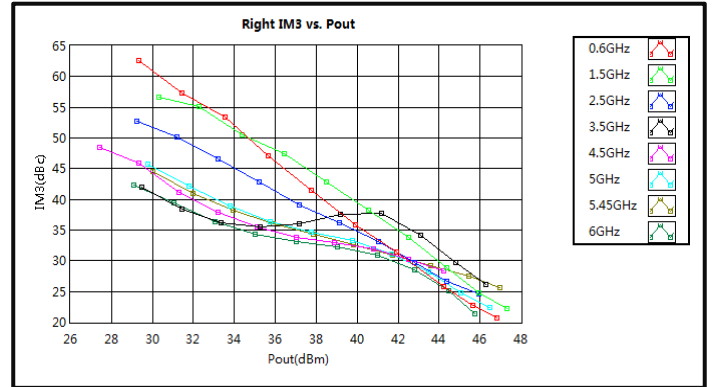


Typical Performance Plots

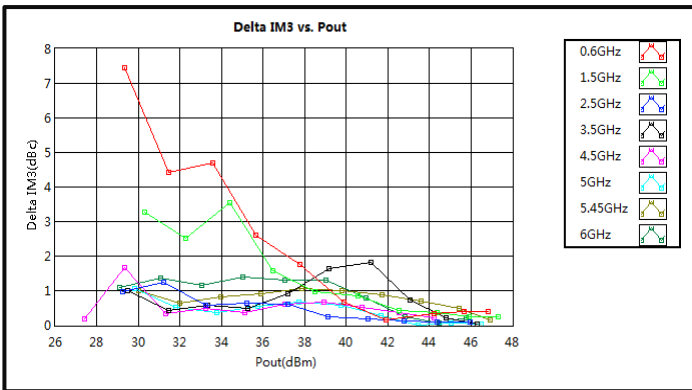
Left IM3 vs. Pout



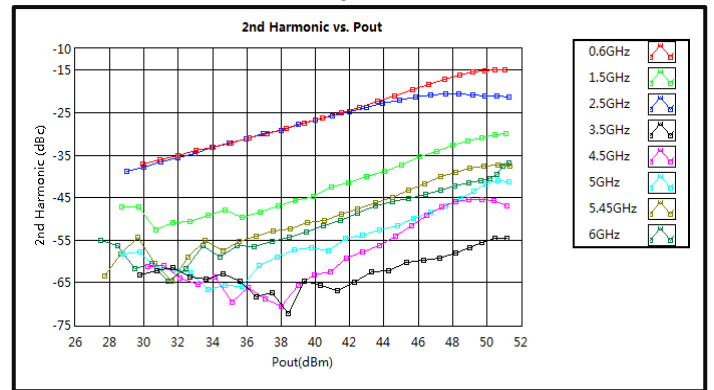
Right IM3 vs. Pout



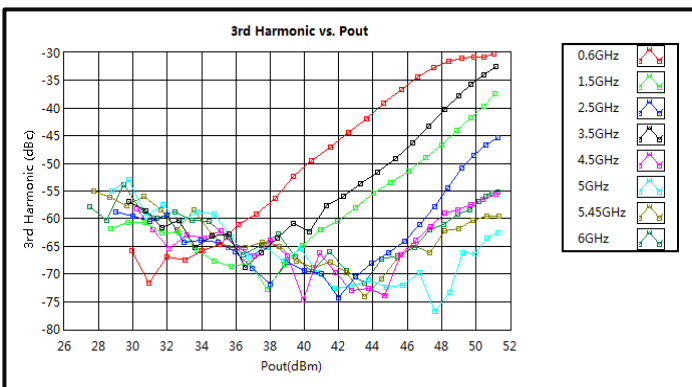
Delta IM3 vs. Pout



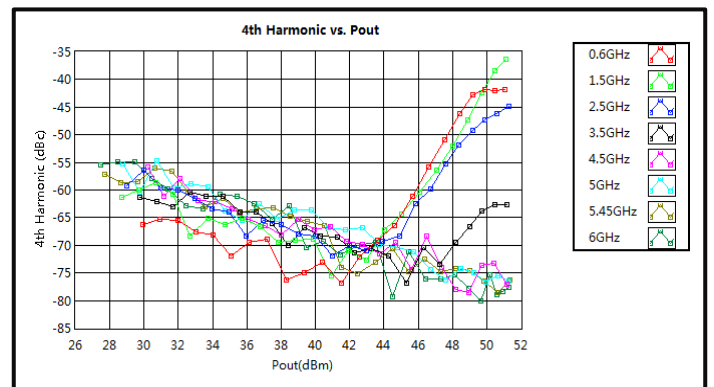
2nd Harmonic Wave Output Power



3rd Harmonic Wave Output Power



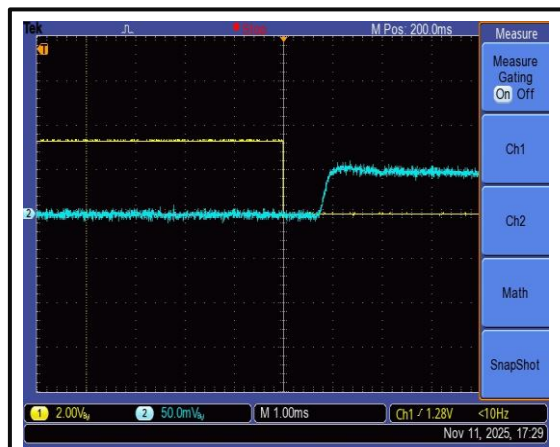
4th Harmonic Wave Output Power



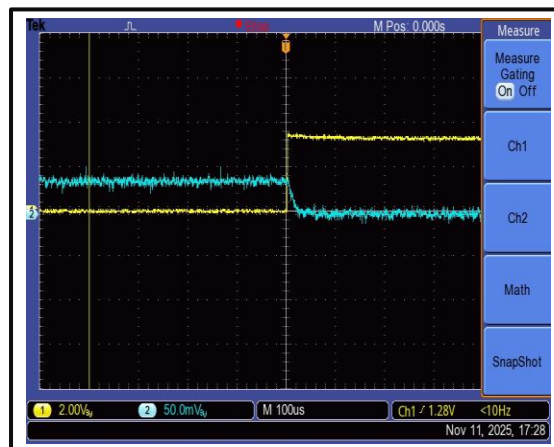
Note: IM3 test performed with 1MHz tone spacing

## Typical Performance Plots

The Gates Open Time is 1000 us @+25°C

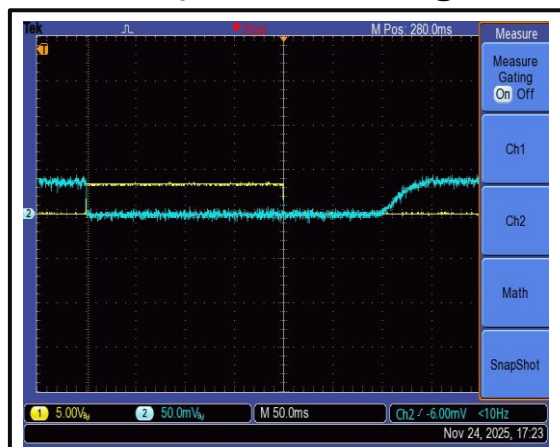


The Gates Closure Time is 50 us @+25°C

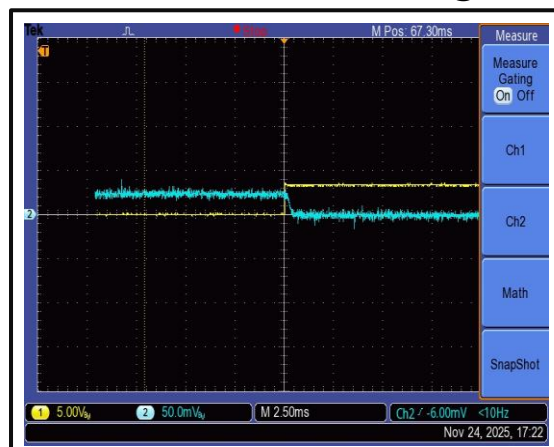


The gate control port: D-sub 15 PIN #2 (Gate Disable).  
The yellow curve is the gate control signal, the blue curve is RF output envelope.

The Drains Open Time is 140 ms @+25°C

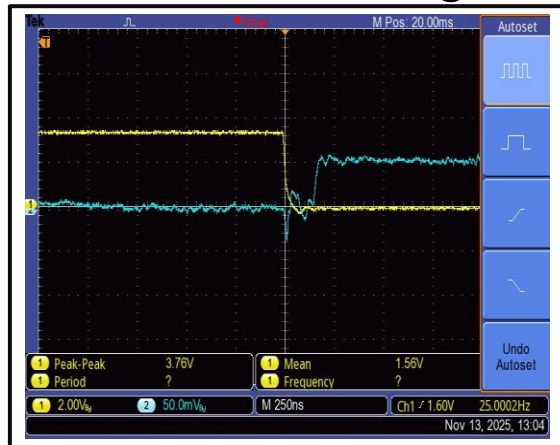


The Drains Closure Time is 500 us @+25°C

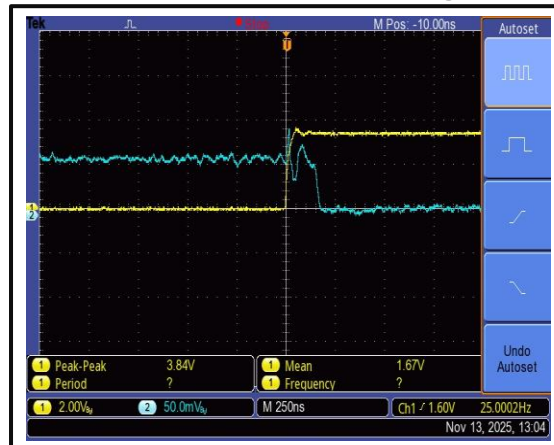


The drain control port: D-sub 15 PIN #3(Drain Disable).  
The yellow curve is the drain control signal, the blue curve is RF output envelope.

The RF Switch On Time is 200 ns @+25°C



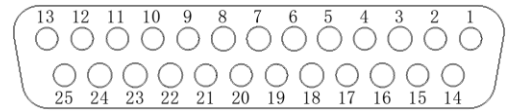
The RF Switch Off Time is 200 ns @+25°C



Switch control port: D-sub 15 PIN #10(Switch Disable).  
The yellow curve is the switch control signal, the blue curve is RF output envelope.

## Protection Connector Table

Female D-Sub is on the housing  
The mating Male part number: 172-E25-103R001



| Pin # | Name                   | Function     | Initial State | Description                                                                                               | Applied |
|-------|------------------------|--------------|---------------|-----------------------------------------------------------------------------------------------------------|---------|
| 1     | Reset                  | Control      | HIGH          | Resets PA when logic <u>LOW</u> is applied for five more seconds and released                             | Yes     |
| 2     | Gate Disable           | Control      | LOW           | Applying logic <u>HIGH</u> disable gates of amplifiers                                                    | Yes     |
| 3     | Drain Disable          | Control      | LOW           | Applying logic <u>HIGH</u> disable drains of amplifiers                                                   | Yes     |
| 4     | RF Input Over Drive    | Indicator    | LOW           | Pin will be latched to logic HIGH when input signal is over limit                                         | Yes     |
| 5     | Temperature Over       | Indicator    | LOW           | Pin will be latched to logic HIGH when amplifier is driven over temperature                               | Yes     |
| 6     | Current Over           | Indicator    | LOW           | Pin will be latched to logic HIGH when drain current limit is reached                                     | Yes     |
| 7     | Current Imbalance      | Indicator    | LOW           | Pin will be latched to logic HIGH when an imbalance in the drain current of the combining branches occurs | No      |
| 8     | PA Off Alarm           | Indicator    | LOW           | Pin will be latched to logic HIGH when any of the protection limit is reached                             | Yes     |
| 9     | Fan Alarm              | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when Fan limit is reached                                        | Yes     |
| 10    | RF Input Switch        | Control      | LOW           | Applying logic HIGH turns OFF RF front-end switch to terminator                                           | Yes     |
| 11    | VSWR                   | Indicator    | LOW           | Pin will be latched to logic HIGH when output reflection is over limit                                    | Yes     |
| 12    | Fixed Attenuation 10dB | Control      | LOW           | Applying and holding logic HIGH to enable 10dB fixed attenuation                                          | Yes     |
| 13    | Fixed Attenuation 20dB | Control      | LOW           | Applying and holding logic HIGH to enable 20dB fixed attenuation                                          | Yes     |
| 14    | +5V                    | Power Supply | +5V           | +5V DC is supplied for reference (200mA)                                                                  | Yes     |
| 15    | GND                    | Ground       | GND           | Ground                                                                                                    | Yes     |
| 16    | Calibration            | Control      | LOW           | Applying logic <u>HIGH</u> startup calibration                                                            | Yes     |
| 17    | PA ON/OFF              | Control      | LOW           | Applying logic <u>HIGH</u> opens amplifier RF output                                                      | Yes     |
| 18    | Calibration indication | Indicator    | LOW           | Default output low level, output high level during calibration state                                      | Yes     |
| 19~25 | NC                     | NC           | NC            | NC                                                                                                        | No      |

**Notes:**

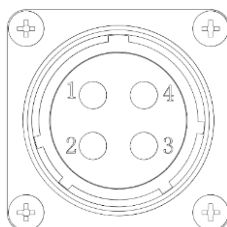
- HIGH/LOW voltages are standard TTL signals 0.0V-0.8V = LOW. 2.8V-5V = HIGH.



## Equipment Specifications

| Name           | Description                                            |
|----------------|--------------------------------------------------------|
| -40dB Coupling | Coupling output interface of amplifier output terminal |
| USB-B          | USB-B Port(remote control)                             |
| LAN            | LAN Port (remote control)                              |
| USB-A          | USB-A Port (work log)                                  |
|                | USB-A Port (N/A)                                       |

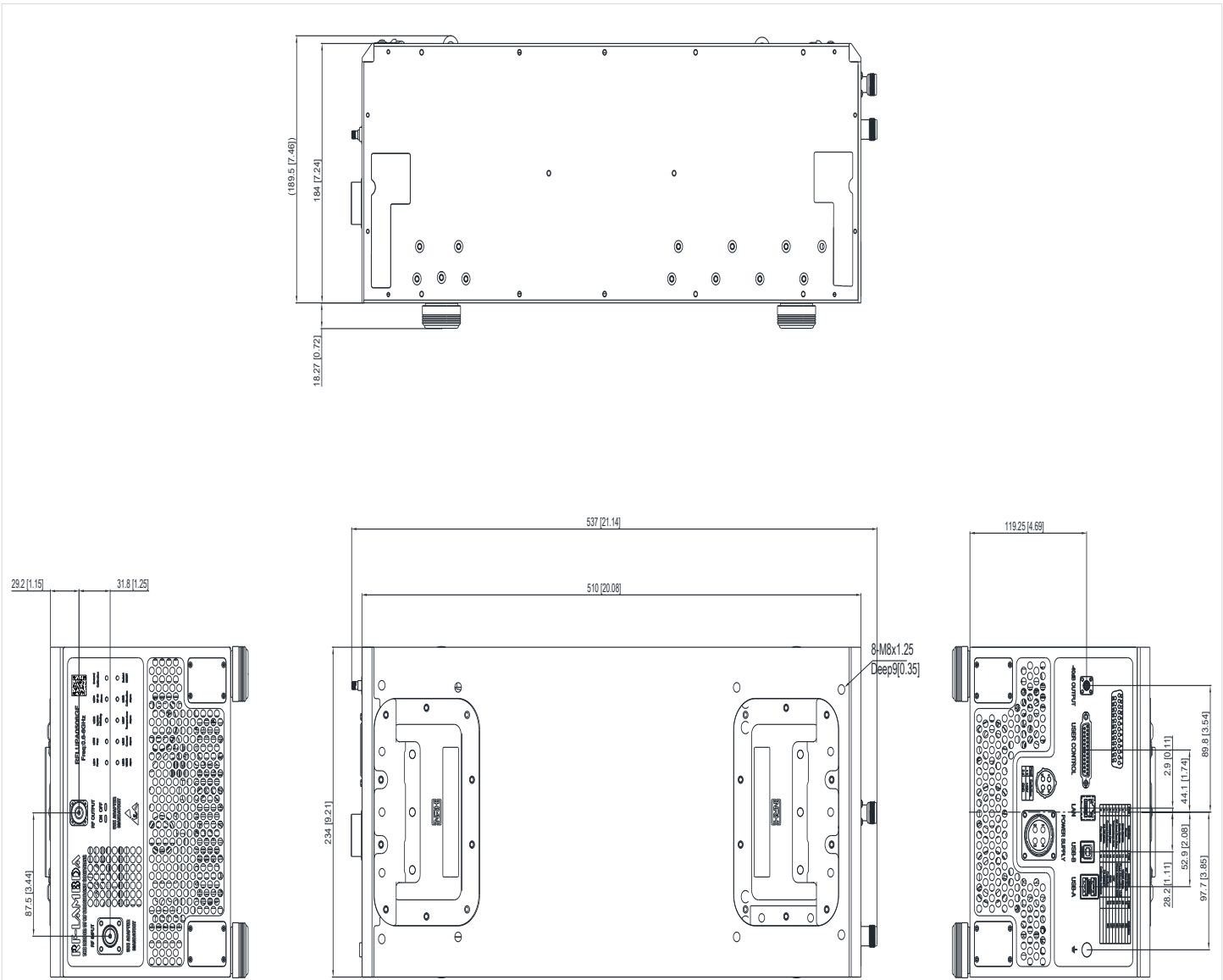
## Protection Connector Table



| Pin # | Name    | Function     | Initial State | Description  | Applied |
|-------|---------|--------------|---------------|--------------|---------|
| 1,2   | +48 VDC | Power Supply | +48 VDC       | Power Supply | Yes     |
| 3,4   | GND     | Ground       | GND           | Ground       | Yes     |



Outline Drawing



- Notes:
- 1. All dimensions are in millimeters [inches].
  - 2. Standard torque wrench must be used to secure RF connectors.

Packing List

| ID | Description                            | QTY |
|----|----------------------------------------|-----|
| 1  | Fig a. DB25 cable (RFCBLADB25-M)       | 1   |
| 2  | Fig b. Power Supply cable (3600006095) | 1   |

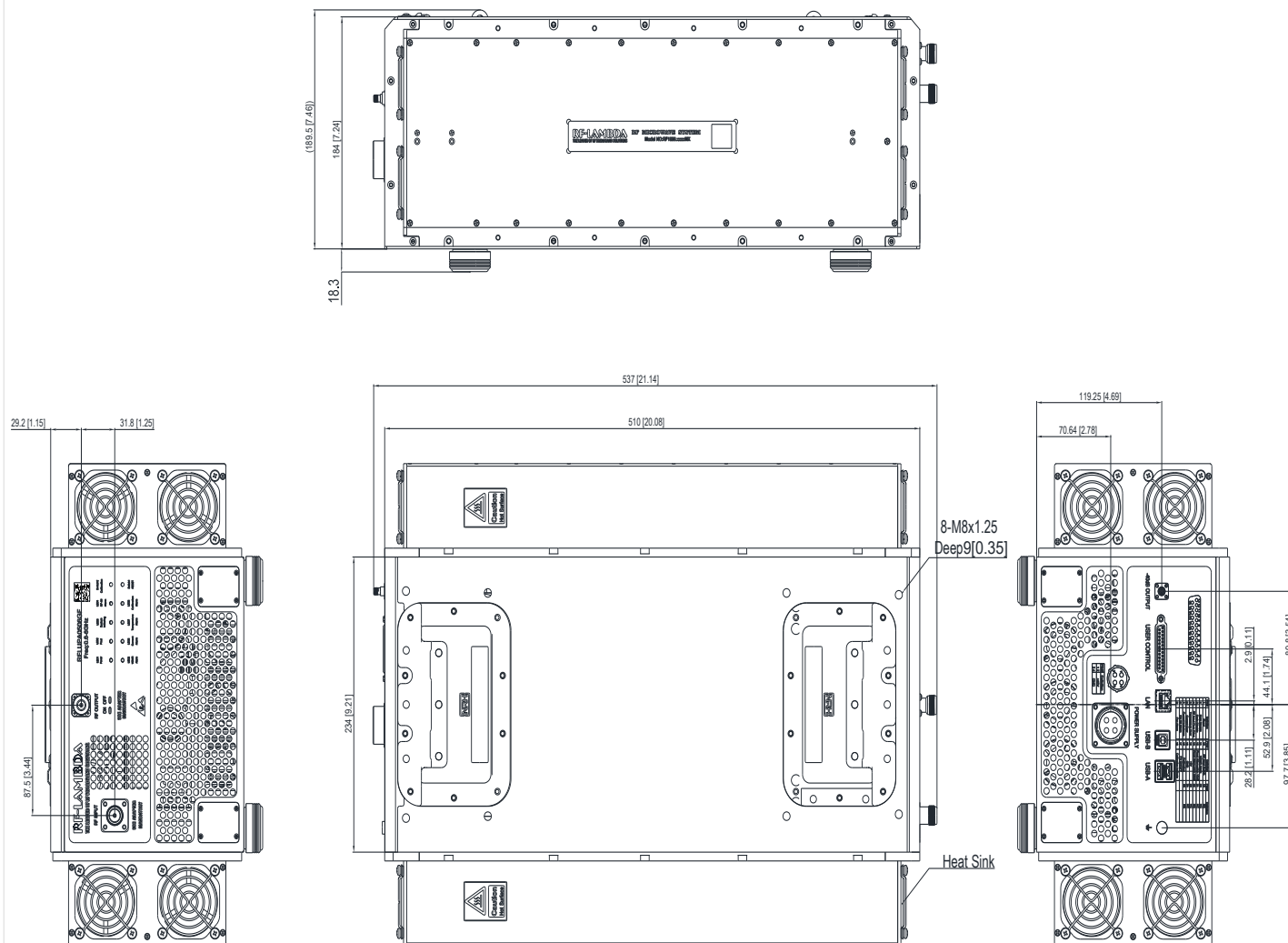


Fig a.



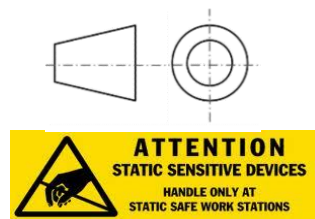
Fig b.

**Outline Drawing**



**Notes:**

1. All dimensions are in millimeters [inches].
2. 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                 |
|--------------|-----------------------------------------------------------|-----------------------------|
| RFLUPA0506GF | Input Connector N-Female<br>and Output Connector N-Female | 0.6GHz-6GHz Power 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 VSWR 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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