

## Solid State Benchtop Power Amplifier 18GHz~45GHz



### Features

- Solid State Benchtop Power Amplifier
- Gain: 45dB Typical
- Output Power: +42dBm Typical

### Typical Applications

- Wireless Infrastructure
- Test and Measurement
- Military and Aerospace

Electrical Specifications,  $T_A = +25^\circ\text{C}$

| Parameter                                      | Min.                              | Typ.  | Max. | Units  |
|------------------------------------------------|-----------------------------------|-------|------|--------|
| Frequency Range                                | 18 – 45                           |       |      | GHz    |
| Gain                                           |                                   | 40    |      | dB     |
| Gain Flatness                                  |                                   | ±5    |      | dB     |
| Gain Variation Over Temperature<br>(-45 ~ +85) |                                   | +/- 5 |      | dB     |
| Input Return Loss                              |                                   | 12    |      | dB     |
| Output Return Loss                             |                                   | 15    |      | dB     |
| Output Power for 1 dB Compression (P1dB)       |                                   | 40    |      | dBm    |
| Saturated Output Power (Psat)                  |                                   | 42    |      | dBm    |
| Isolation S12                                  |                                   | -     |      | dB     |
| Input Max Power (No damage)                    | Psat – Gain                       |       |      | dBm    |
| Supply Voltage                                 | 110/220 VAC                       |       |      | V      |
| Weight                                         | -                                 |       |      | ounces |
| Impedance                                      | 50                                |       |      | Ohms   |
| Input / Output Connectors                      | RAMP18G45G32CDE - 2.40mm (Female) |       |      |        |
|                                                | RAMP18G45G32CDK - 2.92mm (Female) |       |      |        |
| Finish                                         | Nickel Plated                     |       |      |        |
| Material                                       | Aluminum / Copper                 |       |      |        |

\* P1dB, P3dB and Psat power testing signal: 200µs pulse width with 10% duty cycle.

\* For average CW power testing or increased duty cycle, a 5dB back off from Psat is required unless water/oil cooling system is applied.

**Solid State Benchtop Power Amplifier 18GHz-45GHz**

| Absolute Maximum Ratings                          |             |
|---------------------------------------------------|-------------|
| Supply Voltage                                    | 110/220 VAC |
| RF Input Power (RFIN)<br>Pin_max = Psat - Gainsat | Psat – Gain |

Note: 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.

| Biasing Up Procedure |                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------|
| Step 1               | Connect Ground Pin                                                                           |
| Step 2               | Connect input and output with 50 Ohm source/load. ( in band VSWR<1.9:1 or >10dB return loss) |
| Step 3               | Connect VDC                                                                                  |
| Power OFF Procedure  |                                                                                              |
| Step 1               | Turn off VDC                                                                                 |
| Step 2               | Remove RF connection                                                                         |
| Step 3               | Remove Ground.                                                                               |

### Environmental Specifications and Test Standards

| Parameter                      | Description                                                                                                                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational Temperature        | -45°C~+55°C<br>(Case Temperature less than +85°C)                                                                                                                                                               |
| Storage Temperature            | -50°C~+125°C                                                                                                                                                                                                    |
| Thermal Shock                  | -45°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 (Optional) | MIL-STD-883 (For Hermetically Sealed Units)                                                                                                                                                                     |

Note: The operating temperature for the unit is specified at the package base. It is the user's responsibility to ensure the part is in an environment capable of maintaining the temperature within the specified limits

| Ordering Information |                                                                   |
|----------------------|-------------------------------------------------------------------|
| Part No.             | Description                                                       |
| RAMP18G45G32CDE      | 18GHz~45GHz Benchtop Power Amplifier with 2.4mm Female Connector  |
| RAMP18G45G32CDK      | 18GHz~45GHz Benchtop Power Amplifier with 2.92mm Female Connector |

### 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.

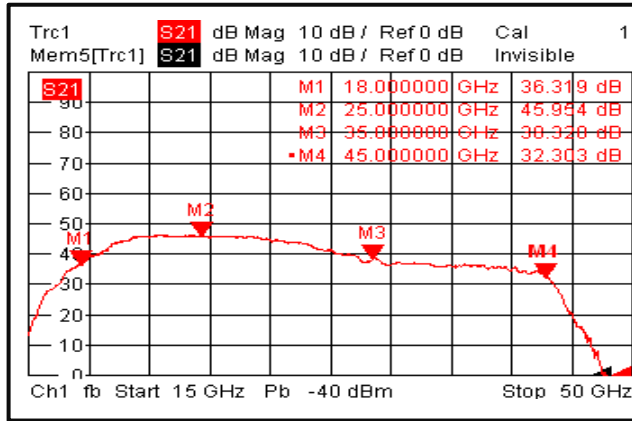
#### What is not covered with warranty?

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

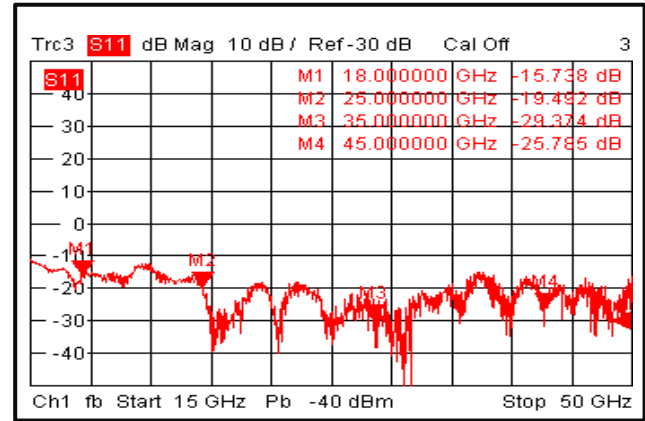
Since the die, ICs or MMICs are fragile, these are not covered by warranty. Any damage to these will NOT be free to repair.

## Typical Performance Plots

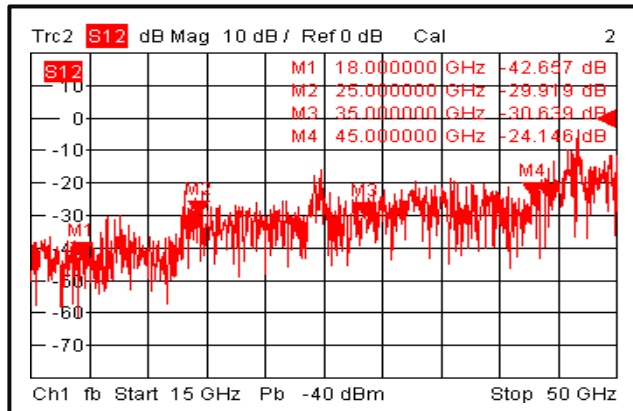
Gain



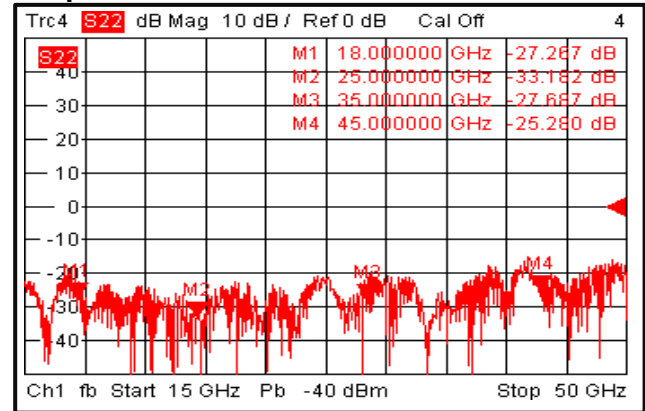
Input Return Loss



Isolation

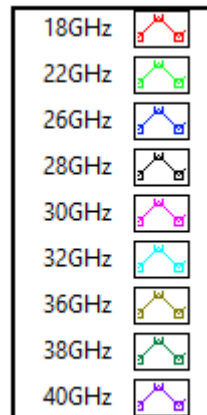
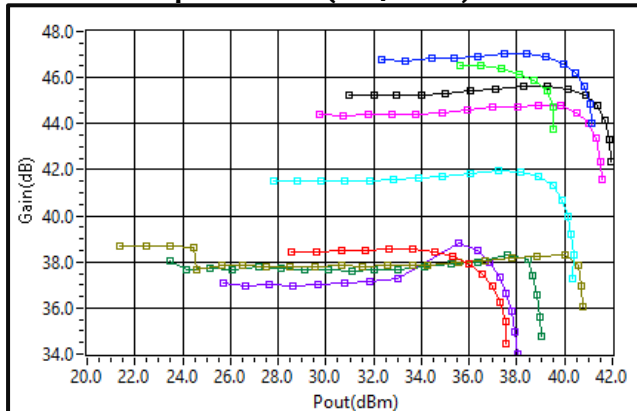


Output Return Loss

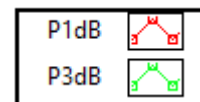
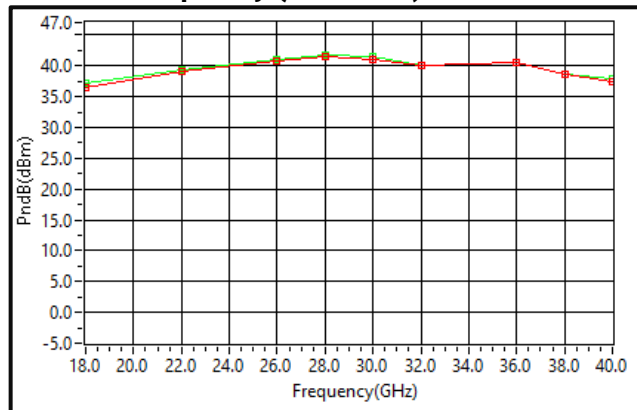


Note: Input/output return loss measurements include attenuators to protect equipment

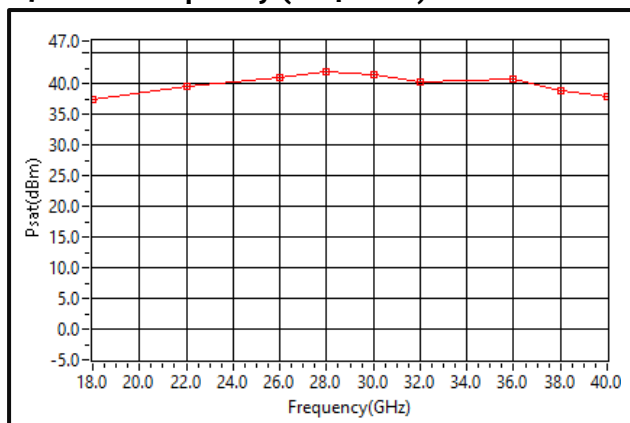
**Gain vs. Output Power (18-40GHz)**



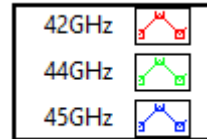
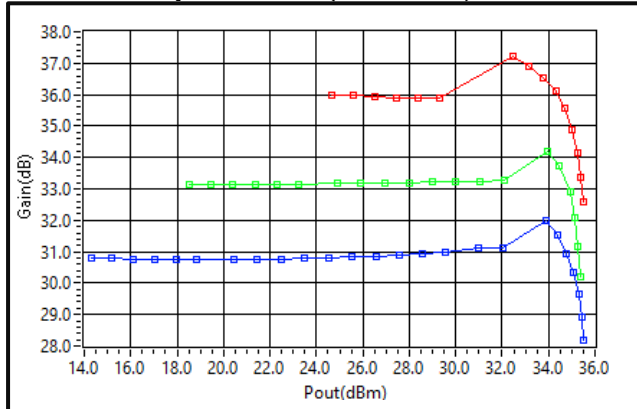
**P1dB vs. Frequency (18-40GHz)**



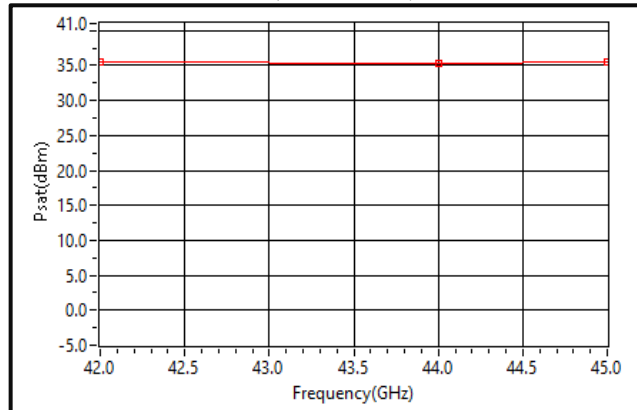
**P7dB vs. Frequency (18-40GHz)**



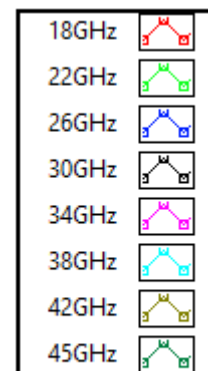
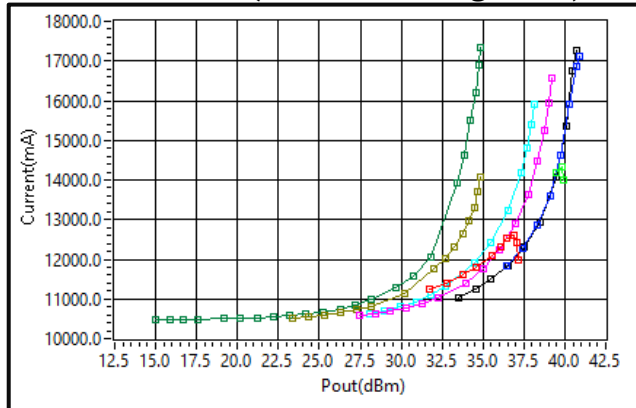
**Gain vs. Output Power (42-45GHz)**



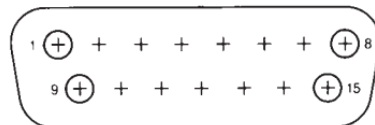
**Psat vs. Frequency (42-45GHz)**



**Current vs. Pout (18-45GHz, Voltage +15V)**



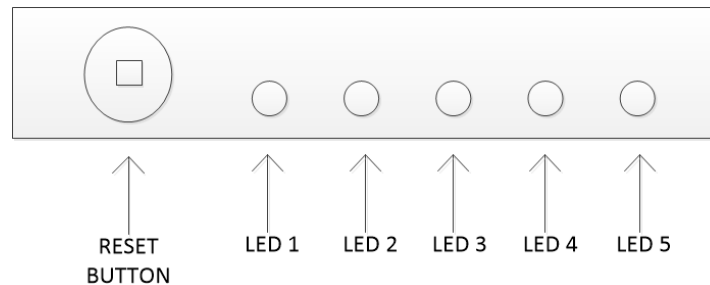
## Protection Connector Table:



| Pin # | Name          | Function     | Initial State | Description                                                                                                                            | Applied |
|-------|---------------|--------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1     | Reset         | Control      |               | Resets PA when logic <u>LOW</u> is applied and released                                                                                | Yes     |
| 2     | Drain Disable | Control      | LOW           | Applying logic <u>HIGH</u> disables drains of amplifiers                                                                               | Yes     |
| 3     | Gate Disable  | Control      | LOW           | Applying logic <u>HIGH</u> disables gates of amplifiers                                                                                | Yes     |
| 4     | RF IN Over    | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when input signal is over limit                                                               | No      |
| 5     | Temp Over     | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when amplifier is driven over temperature                                                     | Yes     |
| 6     | Current Over  | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when drain current limit is reached                                                           | Yes     |
| 7     | VDC           | Power Supply | VDC           | Supply Voltage (this pin is up to 5A, for high current applications please use the power connector, refer to page 9 of this datasheet) | Yes     |
| 8     | VDC           | Power Supply | VDC           | Supply Voltage (this pin is up to 5A, for high current applications please use the power connector, refer to page 9 of this datasheet) | Yes     |
| 9     | VSWR          | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when output reflection is over limit                                                          | No      |
| 10    | +5V           | Power Supply | +5V           | +5V DC is supplied for reference                                                                                                       | Yes     |
| 11    | GND           | GND          | GND           | Ground                                                                                                                                 | Yes     |
| 12    | GND           | GND          | GND           | Ground                                                                                                                                 | Yes     |
| 13    | GND           | GND          | GND           | Ground                                                                                                                                 | Yes     |
| 14    | ID Imbalance  | Indicator    | LOW           | Pin will be latched to logic <u>HIGH</u> when an imbalance in the drain current of the combining branches occurs                       | Yes     |
| 15    | Temp Signal   | Indicator    |               | PA carrier case temperature is represented by voltage                                                                                  | Yes     |

HIGH/LOW voltages are standard TTL signals:  
0.0V-0.8V = LOW  
2V-5V = HIGH

## Alarm Status Panel:



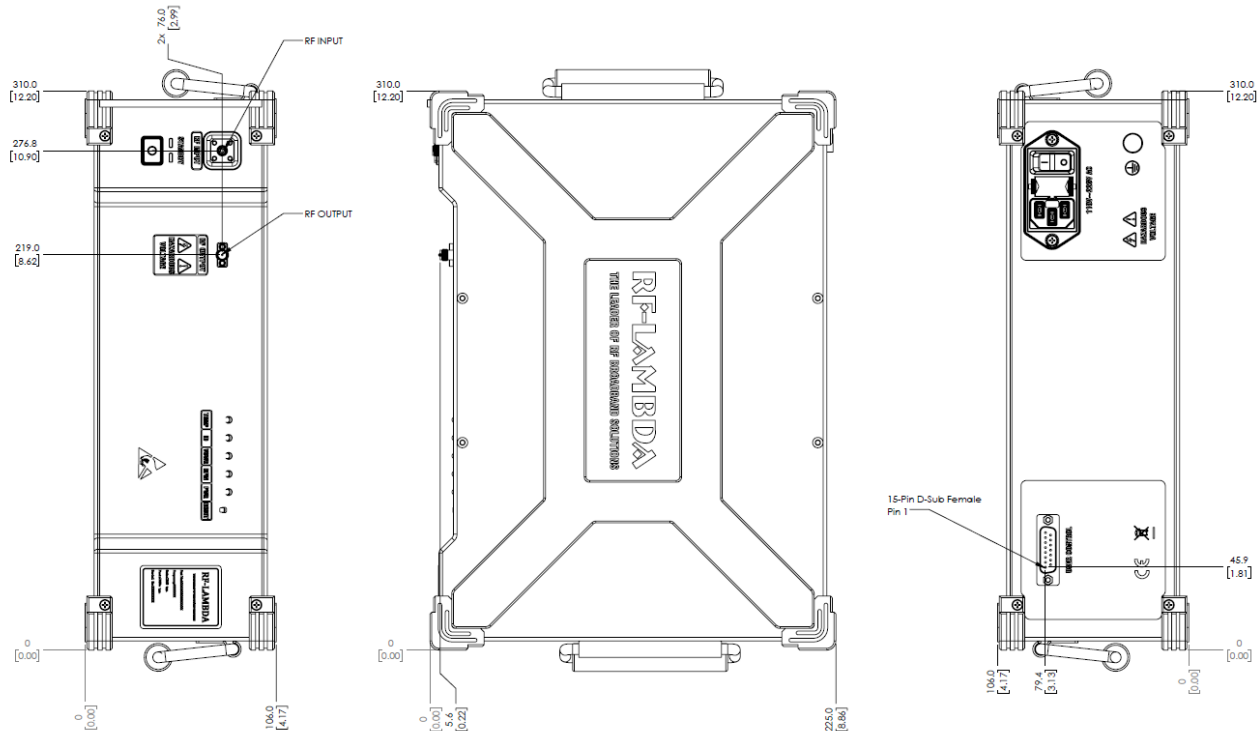
|       | Name  | Function  | Initial State | Description                                                                                                                                                                 | Applied |
|-------|-------|-----------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
|       | RESET | Control   |               | Manual reset button to reset PA                                                                                                                                             | Yes     |
| LED 1 | POWER | Indicator | RED Color     | LED will light to <u>RED</u> color when supply power is applied                                                                                                             | Yes     |
| LED 2 | RF IN | Indicator | GREEN Color   | PA will shut down and latch this LED to a <u>RED</u> color when input signal is over limit *                                                                                | No      |
| LED 3 | VSWR  | Indicator | GREEN Color   | PA will shut down and latch this LED to a <u>RED</u> color when output reflection is over limit *                                                                           | No      |
| LED 4 | TEMP  | Indicator | GREEN Color   | PA will shut down and latch this LED to a <u>RED</u> color when driven over temperature *                                                                                   | Yes     |
| LED 5 | ID    | Indicator | GREEN Color   | PA will shut down and latch this LED to a <u>RED</u> color when an imbalance in the drain current of the combining branches occurs OR if a drain current limit is reached * | Yes     |

\*LED needs to be manually reset to initial state by pressing RESET button



## Outline Drawing:

All Dimensions in mm



Heat Sink required during operation (Sold Separately)



## Important Notice

The information contained herein is believed to be reliable. RF-Lambda makes no warranties regarding the information contained herein. RF-Lambda assumes no responsibility or liability whatsoever for any of the information contained herein. RF-Lambda assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for RF-Lambda products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. RF-Lambda products are not warranted or authorized for use as critical components in medical, life-saving, or life sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

**Solid State Benchtop Power Amplifier 18GHz-45GHz**