

## Wide Band Solid State Power Amplifier 2GHz-20GHz



### Product Description

RFLUPA0220GD is a wideband power amplifier with a frequency range of 2 to 20GHz.

The power output of this amplifier is 48dBm typical. The typical small signal gain is 55dB with a gain variance of  $\pm 2$ dB. This performance is achieved through the use of GaN devices.

The power amplifier's input connector is SMA and output connector is N-Type. This product has a calibration feature which enables customer to obtain great performance through time and temperature changes.

The operating temperature of this product is within -40 to +85°C.

### Features

- Wideband Solid State Power Amplifier
- Optional Fast Blanking version available (RFLUPA0220GD-B)
- Small Signal Gain 50dB Typical
- Output Saturation Power 48dBm Typical
- Supply Voltage +48VDC
- 50 Ohm Matched Input/Output
- Overvoltage Protection
- Overcurrent Protection
- Auto Calibration

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

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		2 – 16			16 – 20		GHz
Small Signal Gain		55			45		dB
Gain Variance		+/-5			+/-5		dB
Gain Variation Over Temperature (-40°C to +70°C)		+/-5			+/-5		dB
Input Return Loss		-20			-20		dB
*Output 1dB Compression Point (P1dB)		44			41		dBm
*Saturated Output Power (Psat)		48			45		dBm
Supply Current (Vcc = +48VDC)		8.5	12.1		8.5	12.1	A
IM3		-20			-20		dBc
Optional RF Fast Blanking Off Speed		500			500		ns
Optional RF Fast blanking On Speed		20			20		us
Weight			6.5				lbs.
Impedance			50				Ohms
Input / Output Connectors				SMA/N-Type Female			
Package				Screw Sealed (Standard)			
				Hermetically Sealed (Optional)			

Note: Special screening is available with extra cost. Please inquire with sales.

**Absolute Maximum Ratings**

Parameter	Rating
Supply Voltage Range	+60VDC
*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 return loss.)
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**

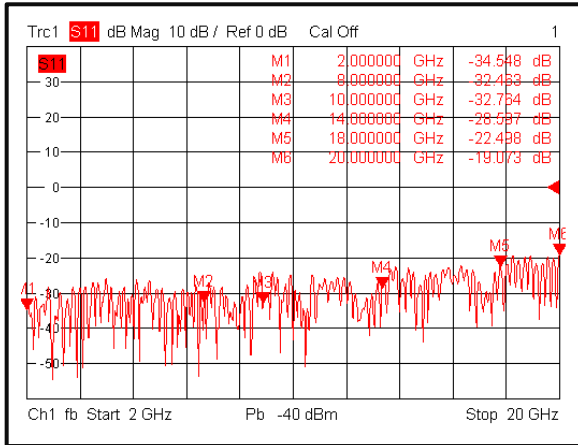
Parameter	Description
Operational Temperature	-40°C to +85°C (Case Temperature)
Storage Temperature	-55°C to +125°C
Thermal Shock	-40°C → +85°C (5 Cycles / 10 hours)
**Random Vibration	MIL-STD-202G Table 214-I, Test Condition Letter C 1.5 Hours Per Axis
High Temperature Burn In	Temperature +85°C for 72 Hours
Shock	1. Weight >20g, 50g half sine wave for 11ms, Speed variation 3.44m/s 2. Weight <=20g, 100g Half sine wave for 6ms, Speed variation 3.75m/s 3. Total 18 times (6 directions, 3 repetitions per direction).
Altitude	Standard: 30,000 Ft (Epoxy Sealed Controlled Environment) Optional: Hermetically Sealed (60,000 ft. 1.0 PSI min)
Hermetically Sealed (Optional)	MIL-STD-883 (For Hermetically Sealed Units)

Notes:

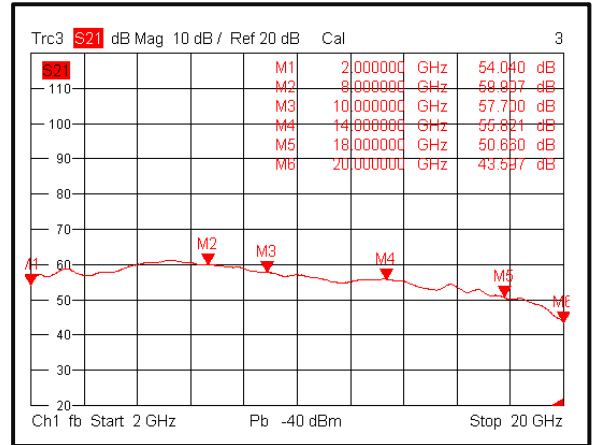
- Maximum RF input power is set to assure safety of amplifier. Input power may be increased at own risk to achieve full power of amplifier. Please reference gain and power curves.
- For vibration testing details please see additional information section

Typical Performance Plots

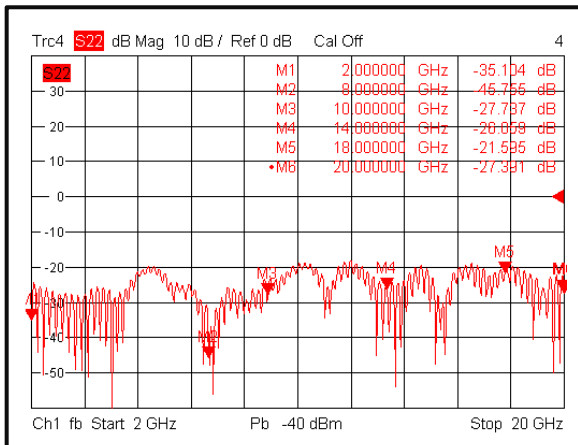
Input Return Loss vs Frequency @+25°C



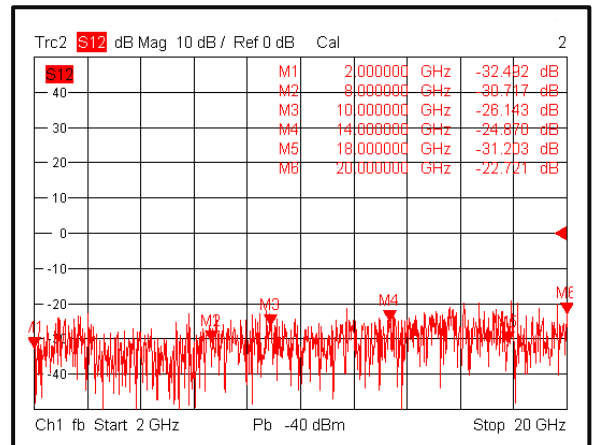
Gain vs Frequency @+25°C



Output Return Loss vs Frequency @+25°C



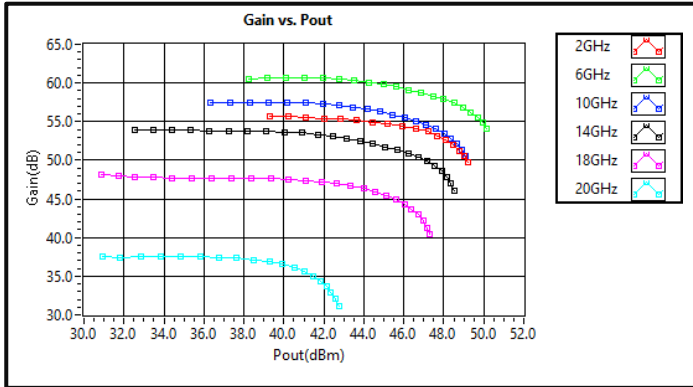
Isolation vs Frequency @+25°C



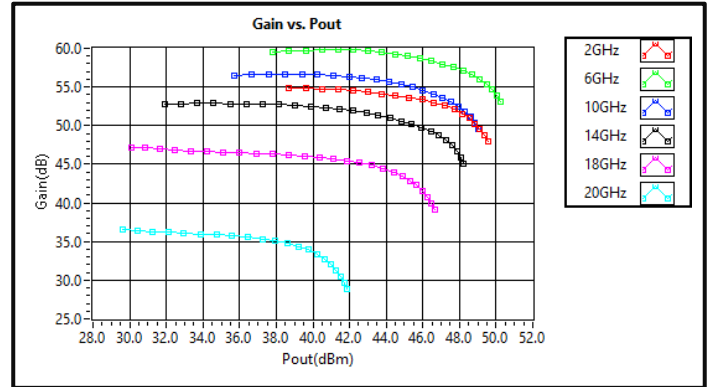
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

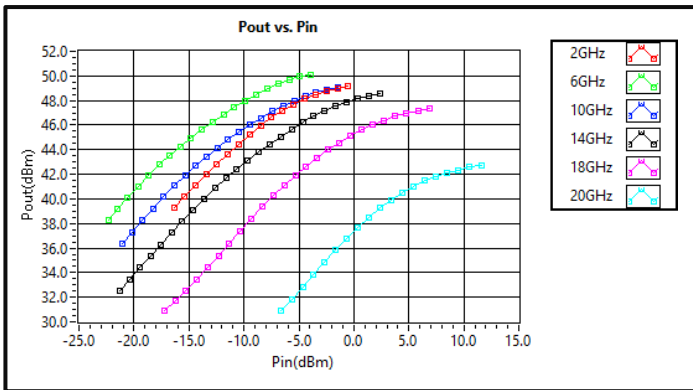
Gain vs Output Power CW



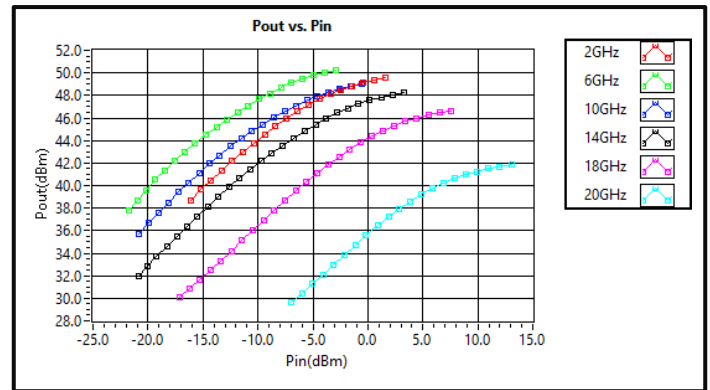
Gain vs Output Power \*Pulse



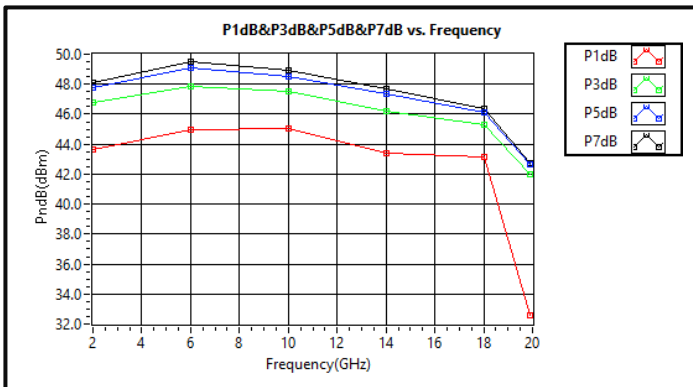
Output vs Input Power CW



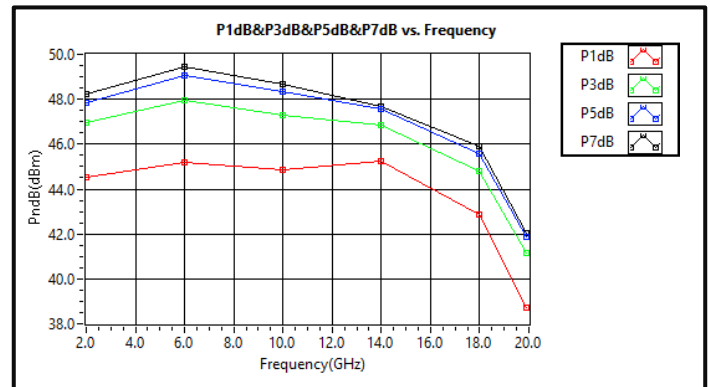
Output vs Input Power \*Pulse



PxdB vs Frequency CW



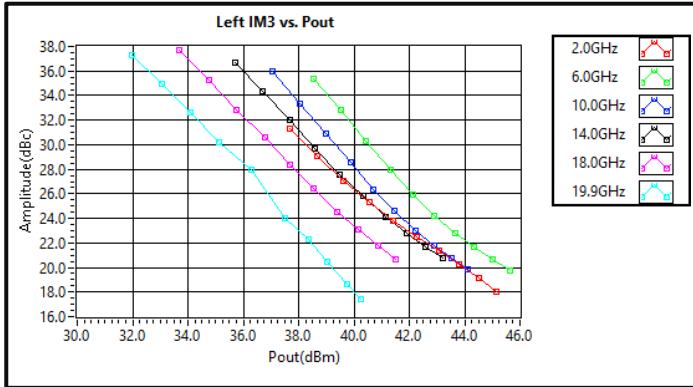
PxdB vs Frequency \*Pulse



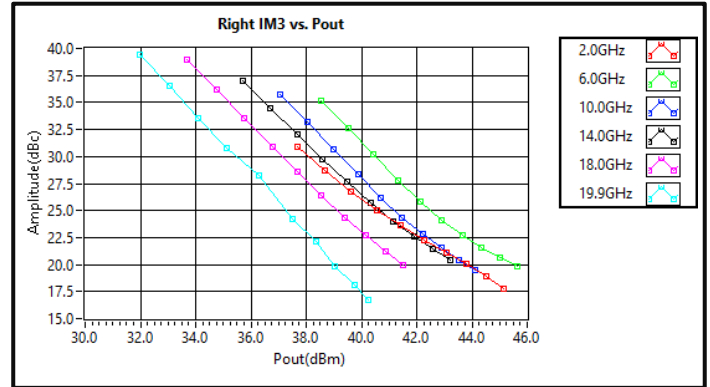
\*Pulse Psat power test signal: 20μs pulse width with 10% duty cycle.

Typical Performance Plots

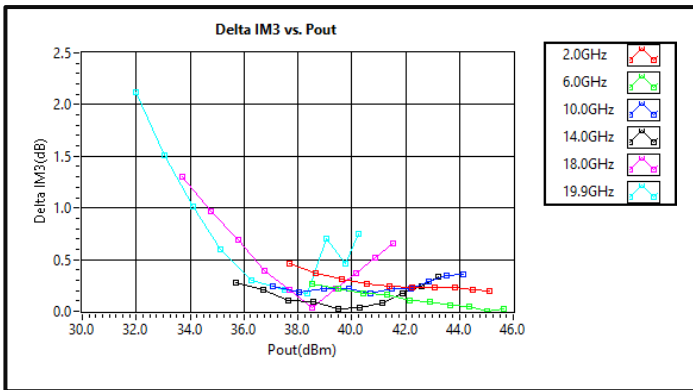
Left IM3 vs Output Power



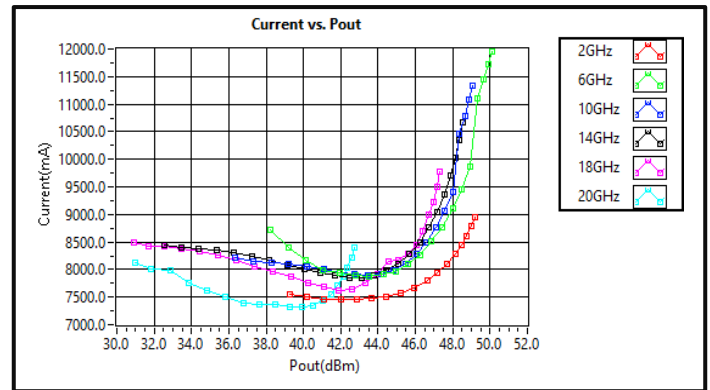
Right IM3 vs Output Power



Delta IM3 vs Output Power



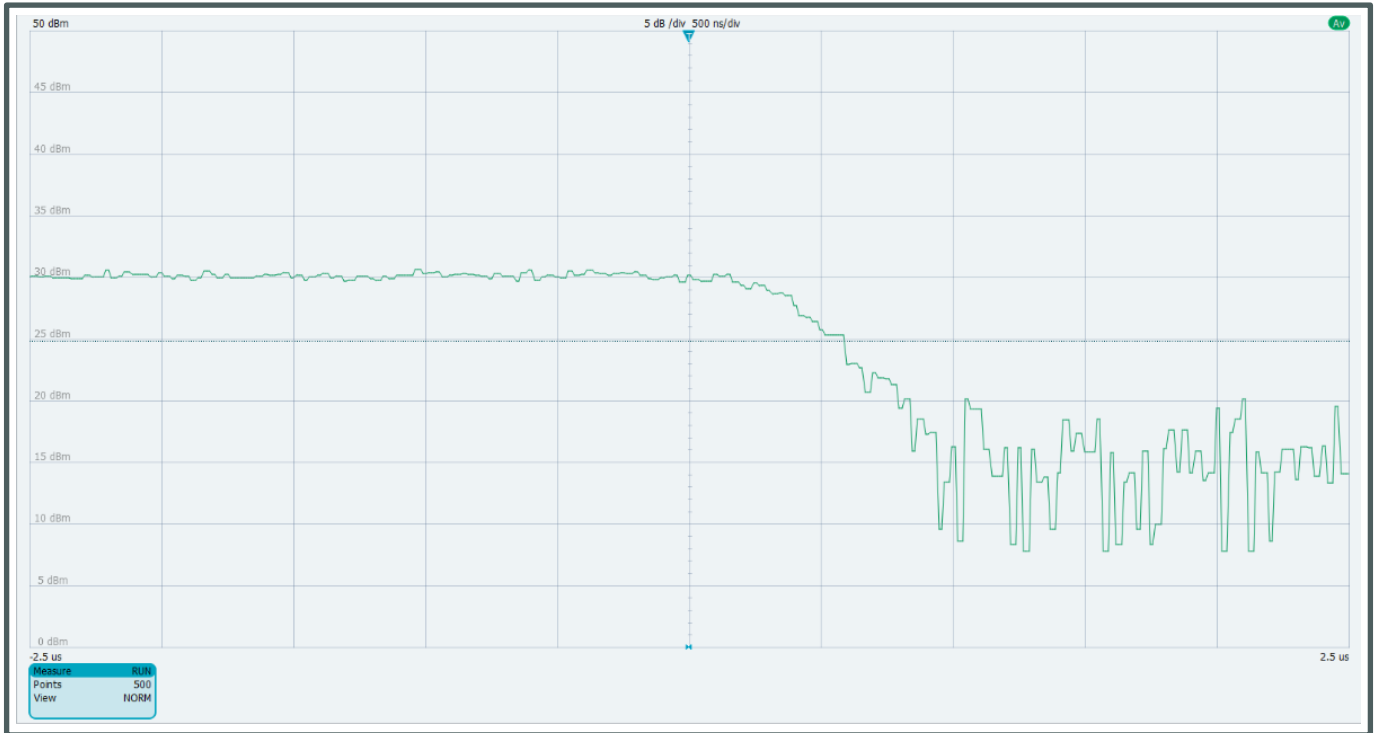
Current vs Output Power (+48VDC)



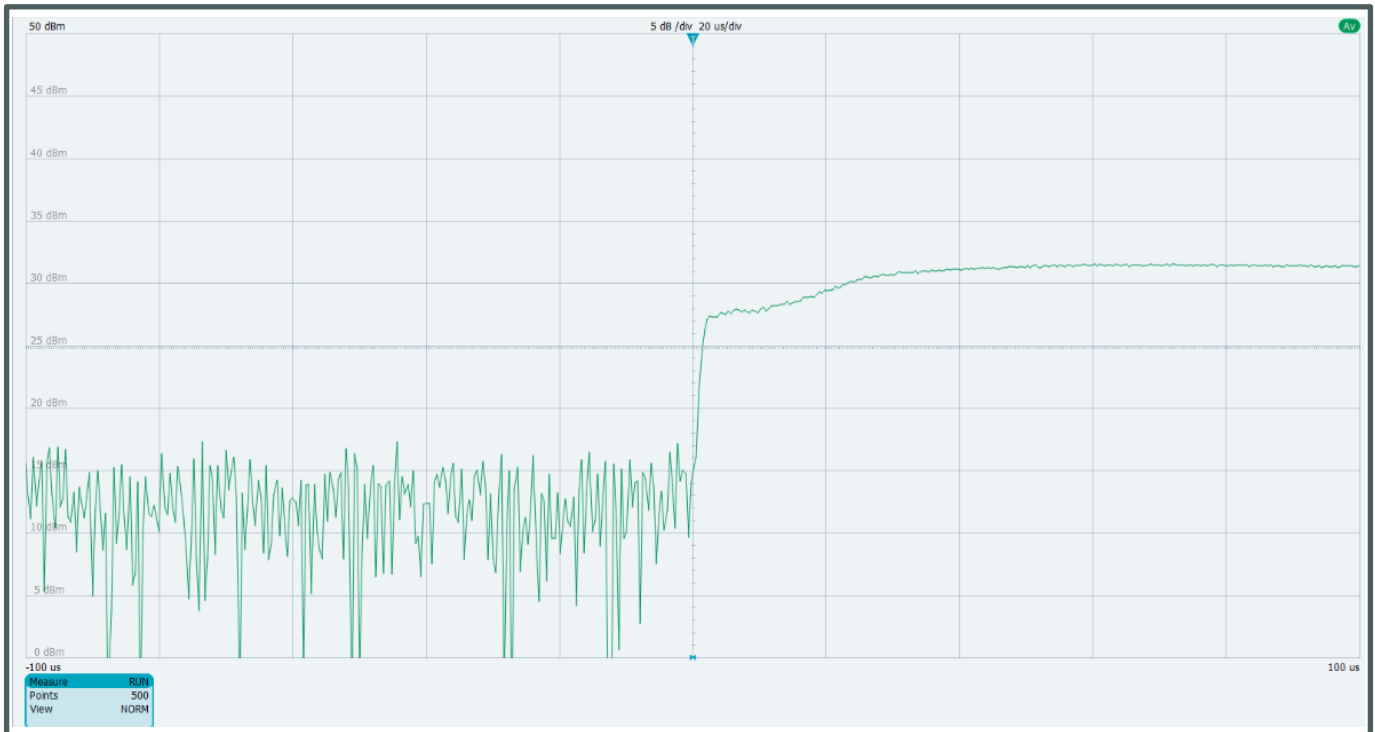
Note: IM3 test performed with 1MHz tone spacing

\*Speeds Shown are for Optional Fast Blanking Circuit

Blanking RF off timing: 30dBm Output Power (500 ns/div)

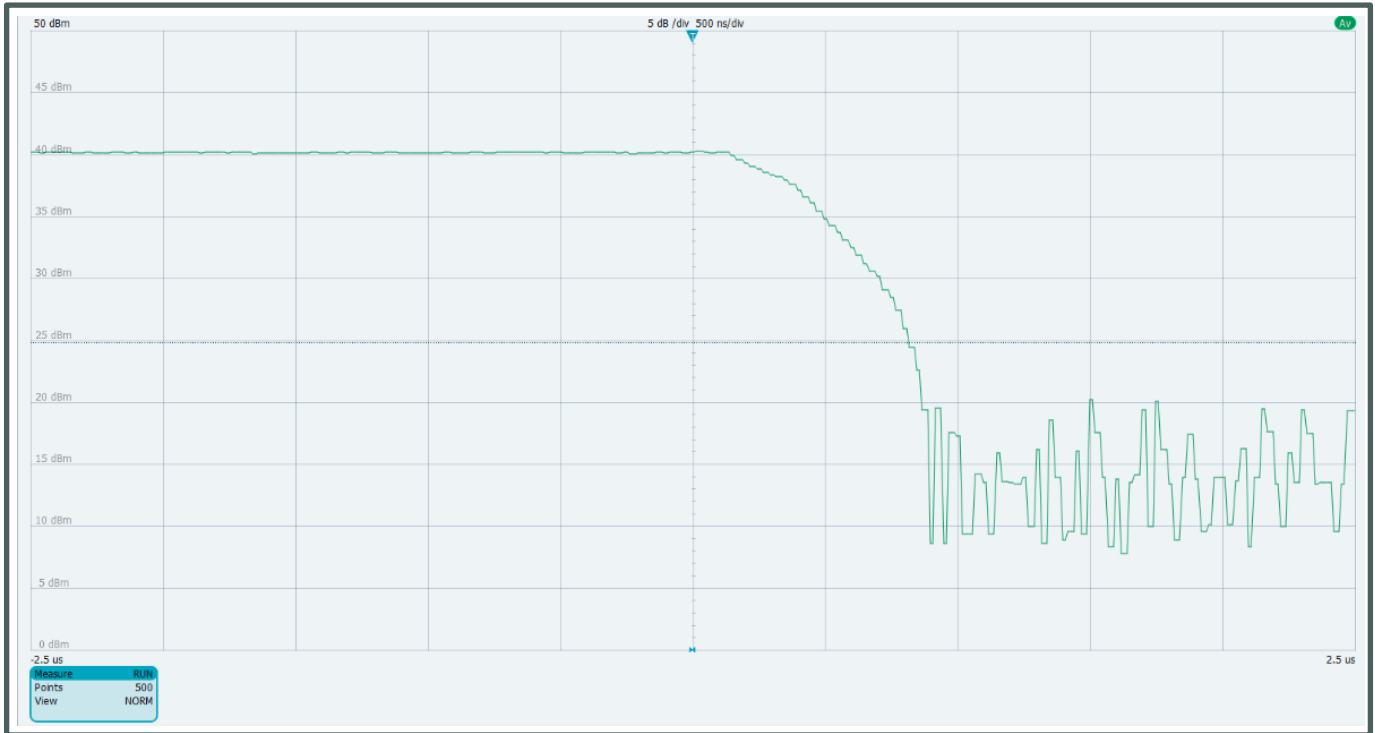


Blanking RF on timing: 30dBm Output Power (20 us/div)

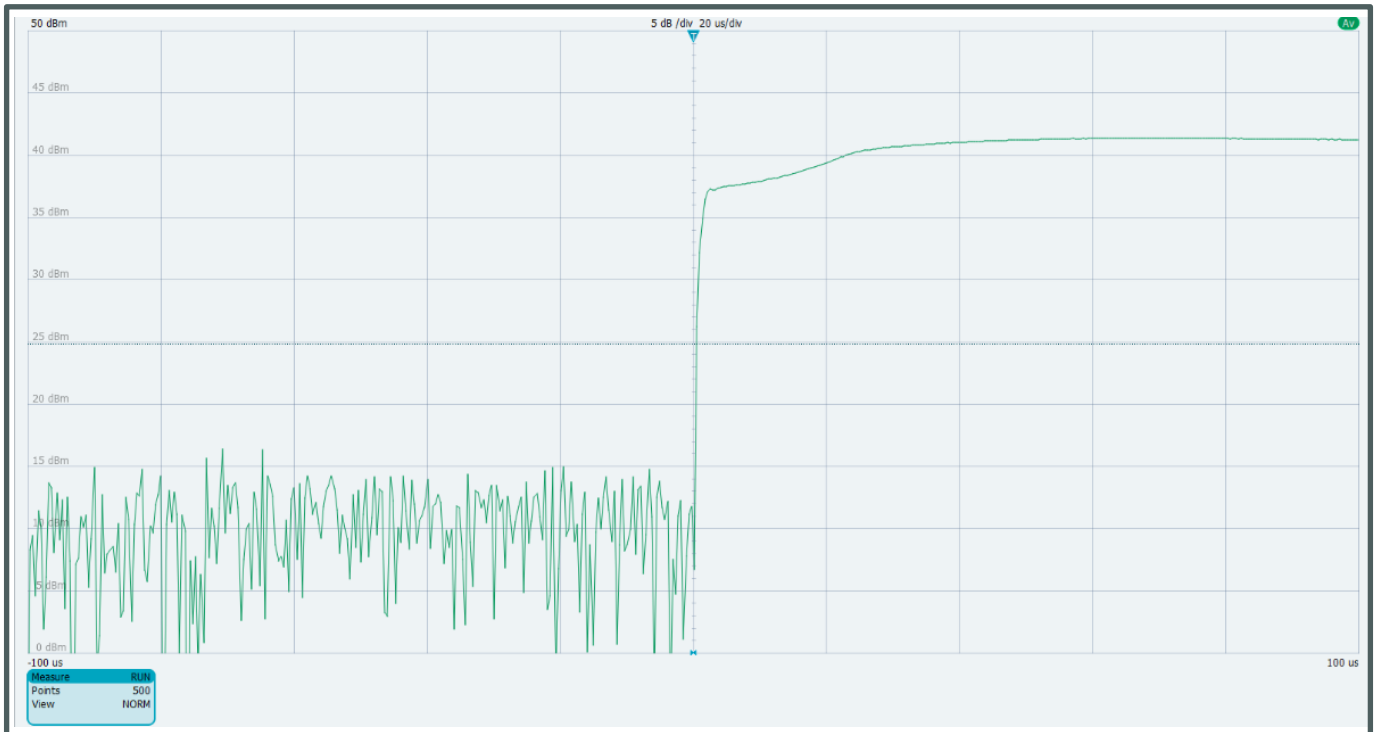


\*Speeds Shown are for Optional Fast Blanking Circuit

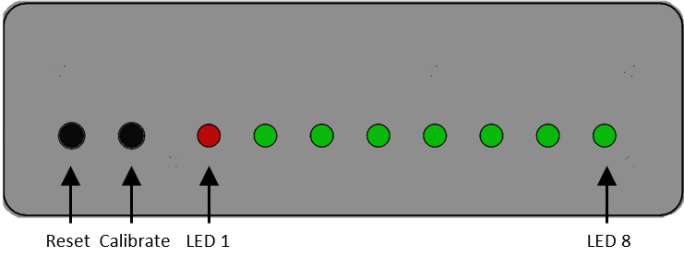
Blanking RF off timing: 40dBm Output Power (500 ns/div)



Blanking RF on timing: 40dBm Output Power (20 us/div)



**Alarm Status Panel**



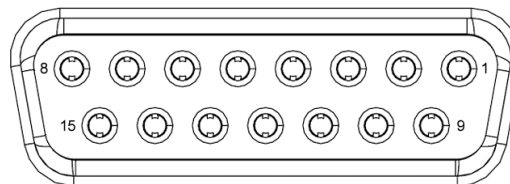
LED #	Name	Function	Initial State	Description	Applied
	Reset*	Control		Manual reset button to reset PA	Yes
	Calibration	Control		When pressed, button will start manual calibration	Yes
1	Power	Control	Red	LED will light to RED color when supply power is applied	Yes
2	Pout	Indicator	Red	LED will light to GREEN color when RF output power is ON	Yes
3	System Initialing	Indicator	Green	LED will blink while system is booting or calibrating	Yes
4	RF IN	Indicator	Green	PA will shut down and latch this LED to a RED color when input signal is over limit *	Yes
5	VSWR	Indicator	Green	PA will shut down and latch this LED to a RED color when output reflection is over limit *	Yes
6	ID	Indicator	Green	PA will shut down and latch this LED to a RED color when an imbalance in the drain current of the combining branches occurs or if a drain current limit is reached *	Yes
7	TEMP	Indicator	Green	PA will shut down and latch this LED to a RED color when driven over temperature *	Yes
8	CAL	Indicator	Green	PA will shut down and latch this LED to a RED while in calibration mode	Yes

Note: LED needs to be manually reset to initial state by pressing RESET button



**Protection Connector Table**

Female D-Sub is on the housing  
The mating female part number: 172-E15-203R001



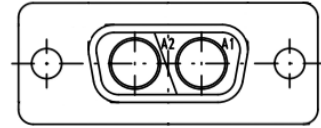
Pin #	Name	Function	Initial State	Description	Applied
1	Reset	Control		Resets PA when logic <u>LOW</u> is applied and released	Yes
2	Gate Disable	Control	LOW	Applying logic <u>HIGH</u> disables gate of amplifiers	Yes
3	Drain Disable	Control	LOW	Applying logic <u>HIGH</u> disables drain of amplifiers	Yes
4	RF IN Over	Indicator	HIGH	Pin will be latched to logic <u>HIGH</u> when input signal is over limit	Yes
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	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
8	PA Off Alarm	Indicator	LOW	Pin will be latched to logic <u>HIGH</u> when any of the protection limit is reached	No
9	Fan Alarm	Indicator	LOW	Pin will be latched to logic <u>HIGH</u> when Fan limit is reached	Yes
10	RF Fast Blanking (-B only)	Control	LOW	Applying logic <u>HIGH</u> disables drains fast on last stage of amplifiers.	Optional
11	VSWR	Indicator	HIGH	Pin will be latched to logic <u>HIGH</u> when output reflection is over limit	Yes
12	5dB Attenuation	Control	LOW	Applying logic <u>HIGH</u> enables 5dB attenuation	No
13	10dB Attenuation	Control	LOW	Applying logic <u>HIGH</u> enables 10dB attenuation	No
14	+5V	Power Supply	+5V	+5V DC is available for reference 400mA current ability	Yes
15	GND	Ground	GND	Ground	Yes

Notes:

- HIGH/LOW voltages are standard TTL signals 0.0V-0.8V = LOW. 2V-5V = HIGH. Input current is 500uA.
- Matching connector and cable will be shipped with the product.
- Applied=Yes means the feature is included. Applied=No means the feature is not included with this model.
- 5V reference supply can source 250mA.
- Indicator output signals can source 5mA.

**Power Supply Connector Table**

Male D-Sub is on the housing, part number: 09691000022  
The mating female part number: 09691100022

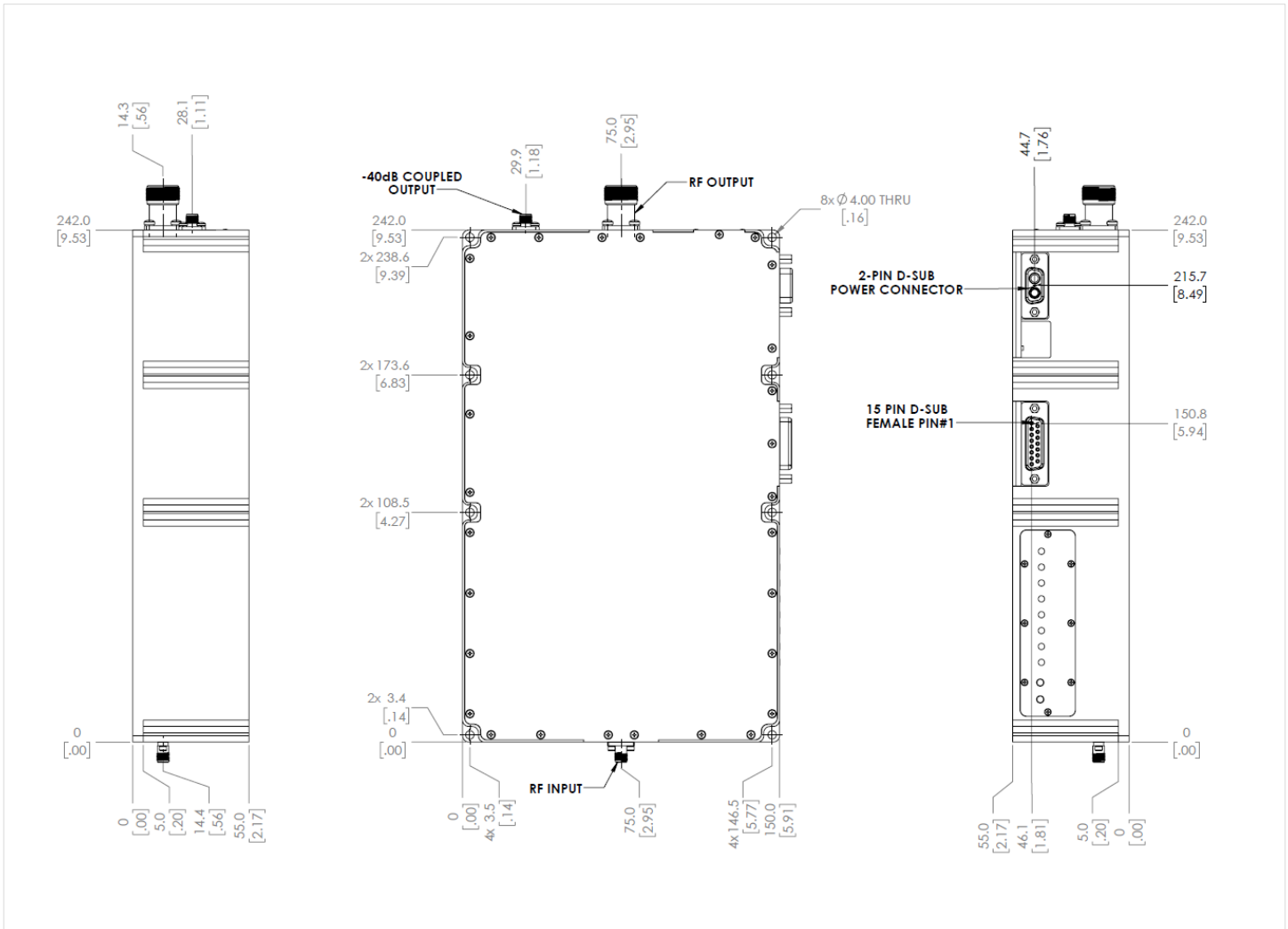


Pin #	Gender on the Housing	Function	Initial State	Description	Applied
A2	Female	VDC	VDC	Supply Voltage (this pin is up to 20A)	Yes
A1	Male	GND	GND	GND (this pin is up to 20A)	Yes

Notes:

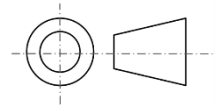
- Matching connector and cable will be shipped with the product.
- If customer would like to use their own wires, 12 AWG wire is required for high current applications

**Outline Drawing**



**Notes:**

1. Package Material: Aluminum and Copper
2. Plating: Nickel
3. All dimensions are in millimeters [inches].
4. Tolerances  $\pm 0.25$  [0.010] unless otherwise specified.
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.



**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
RFLUPA0220GD	Input connector SMA and Output connector N-Type	2GHz-20GHz Power Amplifier
RFLUPA0220GD-B	Fast Blanking Feature Option	2-20GHz Power Amplifier with RF Blanking Option
REMC0220GD	Digital Attenuation, USB/Ethernet Remote Control, LED display, etc.	AC Power Benchtop Equipment

**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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