

## Ultra Wide Band Power Amplifier 20 – 54GHz



### Product Description

RFLUPA20G54GB is a wideband power amplifier with a frequency range of 20 to 54GHz.

The power output of this amplifier is 36 dBm typical. The typical small signal gain is 50 dB with a flatness of  $\pm 5$ dB.

The power amplifier's input and output connectors are 2.4mm. The operating temperature of this product is within -40 to +85°C.

### Features

- Wideband EMC Solid State Power Amplifier
- Small Signal Gain 50dB Typical
- Output Saturation Power 36dBm Typical
- Supply Voltage +36VDC
- 50 Ohm Matched Input/Output
- Overcurrent Protection

### 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		20 – 54		GHz
Small Signal Gain		50		dB
Gain Flatness		+/-5		dB
Gain Variation Over Temperature (-40°C to +70°C)		+/-3		dB
Input Return Loss		-15		dB
*Output 1dB Compression Point (P1dB)		32		dBm
*Saturated Output Power (Psat)		36		dBm
Supply Current (Vcc = +36VDC)		1600	2000	mA
Power Added Efficiency (PAE)		15		%
Weight		3.3/1.5		lbs./Kg
Impedance		50		Ohms
Input / Output Connectors		2.4mm Female		
Package		Epoxy Sealed (Standard)		
		Hermetically Sealed (Optional)		

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

\* For average CW power testing or increased duty cycle, a 3dBm back off from Psat is required.

### Absolute Maximum Ratings

Parameter	Rating
Supply Voltage Range	+40VDC
*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

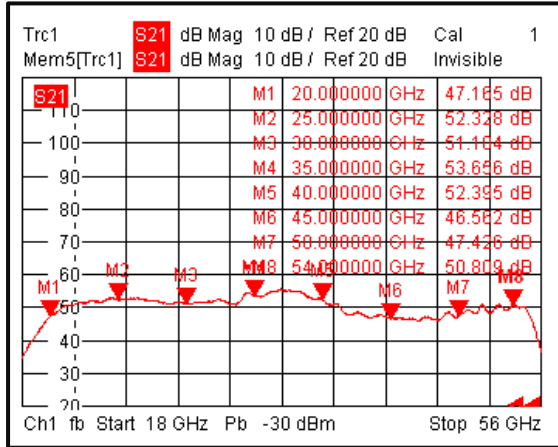
Parameter	Description
Operational Temperature	-30°C to +70°C (Ambient Temperature)
Storage Temperature	-55°C to +125°C
Thermal Shock	-40°C → +85°C (5 Cycles / 10 hours)
**Random Vibration	MIL-STD-202G Table 214-I, Test Condition Letter C 1.5 Hours Per Axis
High Temperature Burn In	Temperature +85°C for 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)

\*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.

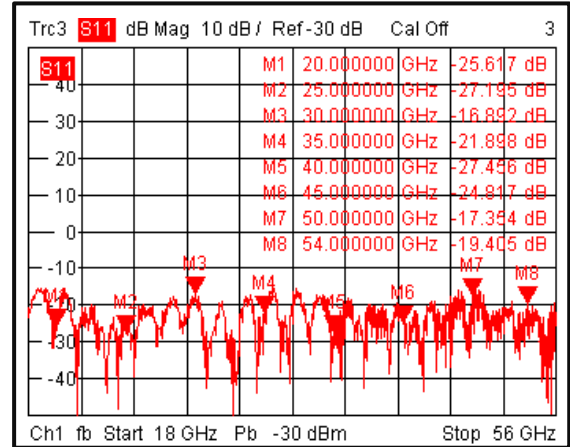
\*\*For vibration testing details please see additional information section.

**Typical Performance Plots**

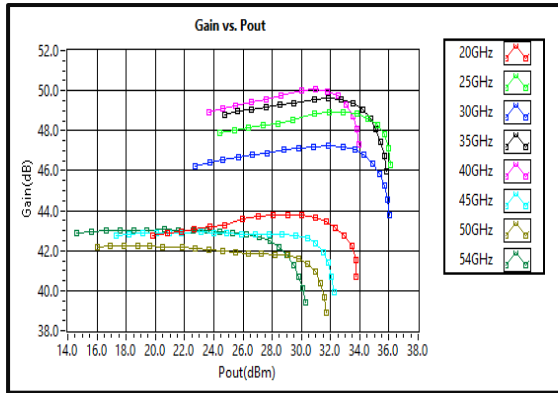
**Gain vs. Frequency @+25°C**



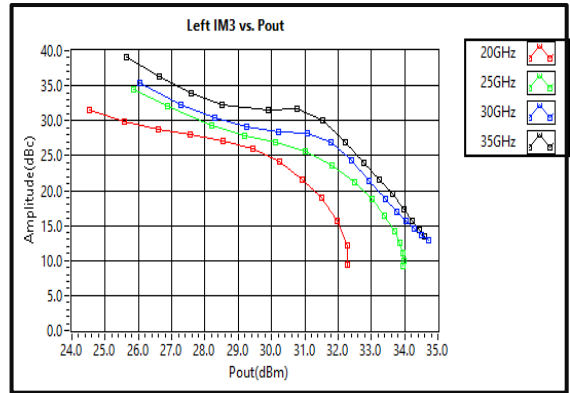
**Input Return Loss @+25°C**



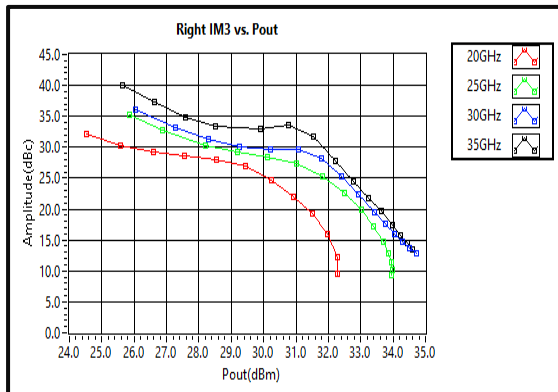
**Gain vs. Output Power @+25°C**



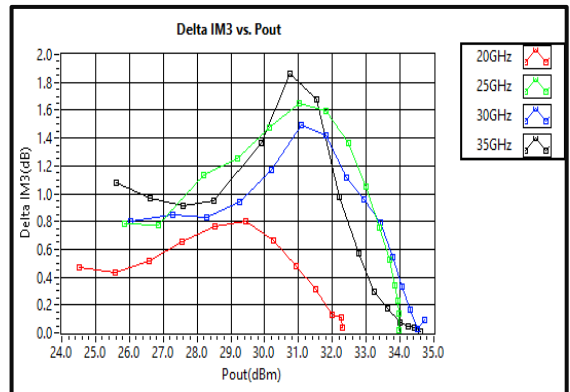
**Left IM3 @+25°C**



**Right IM3 @+25°C**



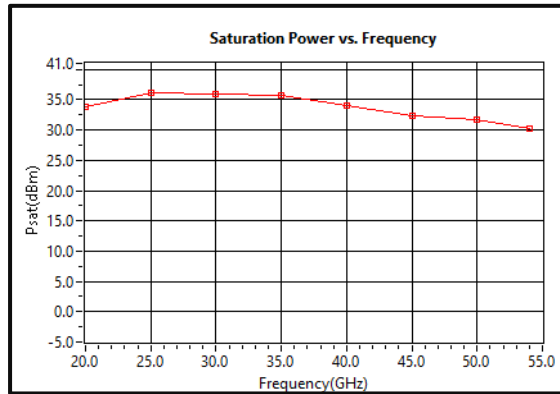
**Delta IM3 @+25°C**



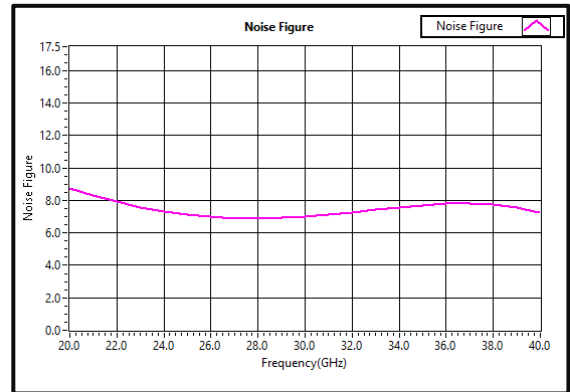
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

**Psat vs. Frequency @+25°C**

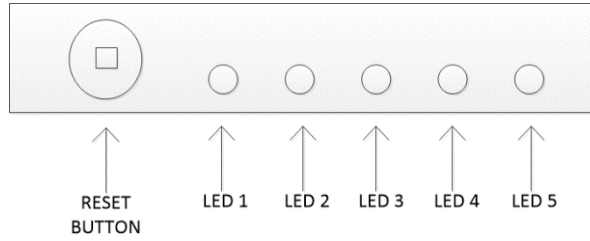


**Noise Figure vs. Frequency @+25°C**



Note: Small signal VNA measurements include attenuators to protect equipment

**Alarm Status Panel**

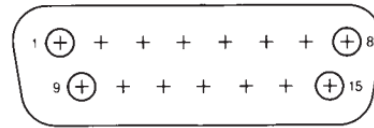


LED #	Name	Function	Initial State	Description	Applied
	RESET	Control		Manual reset button to reset PA	Yes
LED 1	POWER	Indicator	RED Color	LED will light to <u>RED</u> color when supply power is applied	Yes
LED 2	RF IN	Indicator	GREEN Color	PA will shut down and latch this LED to a <u>RED</u> color when 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	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 5	TEMP	Indicator	GREEN Color	PA will shut down and latch this LED to a <u>RED</u> color when driven over temperature *	No

\*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 male part number: 172-E15-113R001



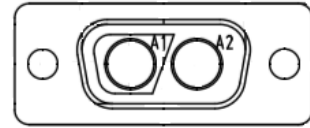
Pin #	Name	Function	Initial State	Description	Applied
1	Reset	Control		Resets PA when logic <u>LOW</u> is applied and released	Yes
2	Drain Disable	Control	LOW	Applying logic <u>HIGH</u> disables drains of amplifiers	Yes
3	Gate Disable	Control	LOW	Applying logic <u>HIGH</u> disables gates of amplifiers	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

Notes:

- HIGH/LOW voltages are standard TTL signals 0.0V-0.8V = LOW. 2V-5V = HIGH. Input current is 10uA.
- 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 700mA.
- Indicator output signals can source 24mA.

**Power Supply Connector Table**

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

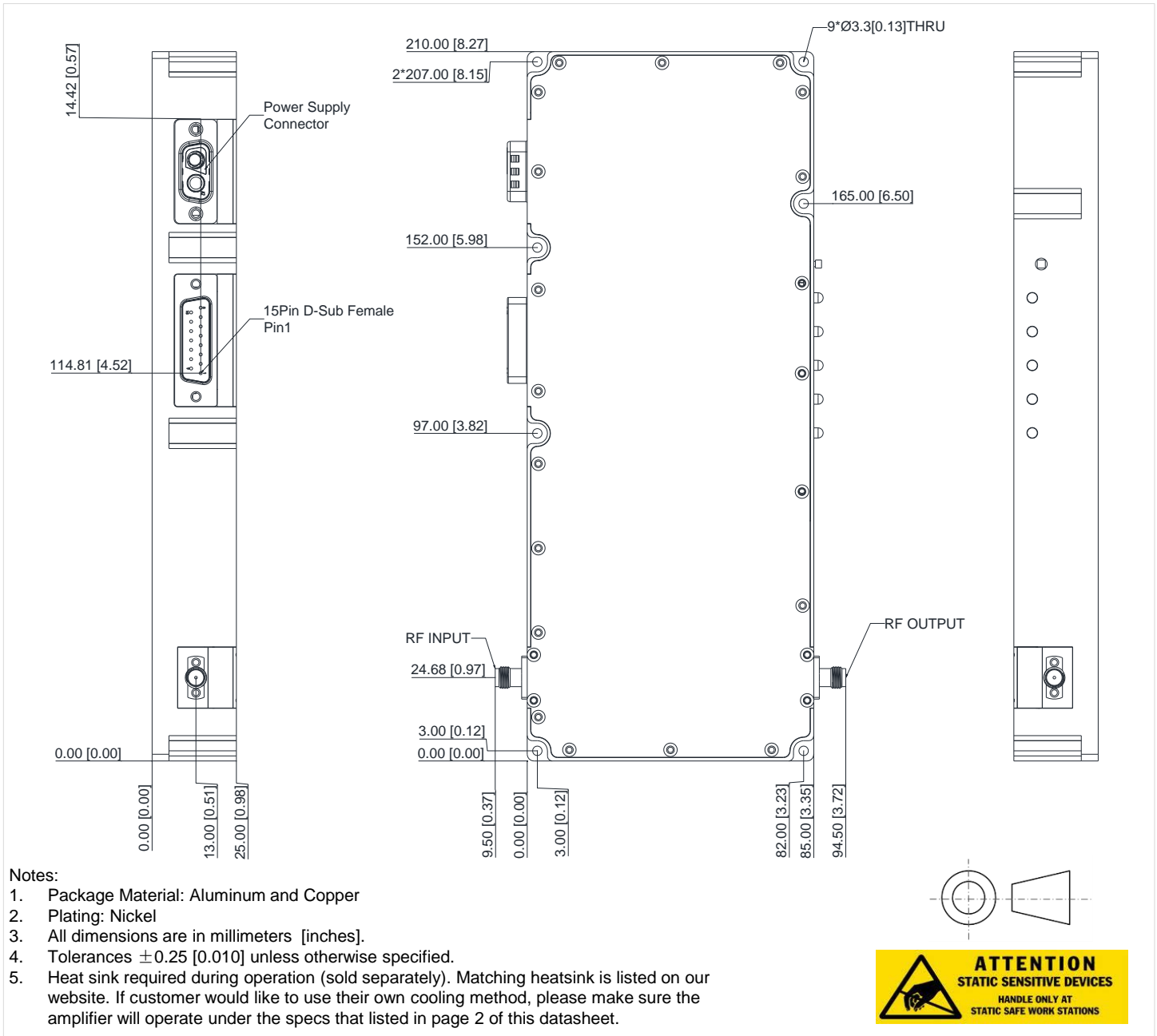


Pin #	Gender on the Housing	Function	Initial State	Description	Applied
A1	Female	VDC	VDC	Supply Voltage (this pin is up to 20A)	Yes
A2	Male	GND	GND	GND (this pin is up to 20A)	Yes

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**



**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
RAMP20G54GB	Input and output connectors 2.4mm	20GHz-54GHz Power Amplifier with AC 110/220VAC
RFLUPA20G54GB	Input and output connectors 2.4mm	20GHz-54GHz Power Amplifier with DC +36V

**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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