

## Wide Band Solid State Power Amplifier 18GHz-40GHz



Note: Photo is for illustration purposes only.  
Please refer to outline drawing.

### Features

- Solid State Power Amplifier
- Small Signal Gain 65dB Typical
- Output Saturation Power 48dBm Typical
- Supply Voltage +36VDC
- 50 Ohm Matched Input / Output

### Product Description

RFLUPA18G40GD is a wide band power amplifier with a frequency range of 18 to 40GHz.

The power output of this amplifier is 48dBm typical. The typical small signal gain is 65dB with a gain flatness of  $\pm 6$ dB. This performance is achieved through the use of GaN devices. This power amplifier works with a +36VDC power supply.

The power amplifier input connector is 2.92mm-female and output connector is WRD180C24.

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

### 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	18		20	20		40	GHz
Small Signal Gain	52	65		52	65		dB
Gain Flatness		$\pm 3.0$			$\pm 6.0$		dB
Gain Variation Over Temperature (-40°C to +60°C)		$\pm 3.0$			$\pm 3.0$		dB
Input Return Loss		12			12		dB
Output 1dB Compression Point (P1dB)		41			42		dBm
Saturated Output Power (Psat)	44	47		46	48		dBm
Supply Current (Vcc=+36V)		16			16	25	A
Power Added Efficiency (PAE)		10			10		%
Turn On/Off Speed (Switch Disable)	ON	100			100		ns
	OFF	100			100		ns
Turn On/Off Speed (Drain Disable)	ON	50			50		us
	OFF	250			250		us
Turn On/Off Speed (Gate Disable)	ON	500			500		us
	OFF	250			250		us
Weight	Net		15.7				lbs.
	Including Heat Sink		33.3				
Impedance			50				Ohms
Input / Output Connectors	2.92mm-Female(Input) / WRD180C24 (Output) (E-Plane) (H-Plane available with adapter)						
Package	Epoxy Sealed (Standard)						
	Hermetically Sealed (Optional)						

**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**

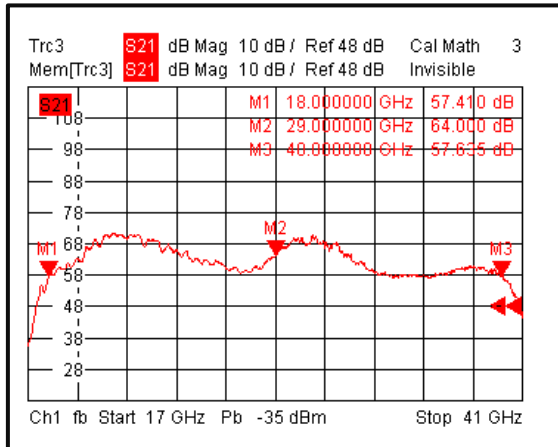
Parameter	Description
Operational Temperature	-40°C to +60°C (Case Temperature)
Storage Temperature	-50°C to +105°C
Thermal Shock	-40°C → +85°C (5 Cycles / 10 hours)
**Random Vibration	MIL-STD-202G Table 214-I, Test Condition Letter C 1.5 Hours Per Axis
High Temperature Burn In	Temperature +60°C for 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.

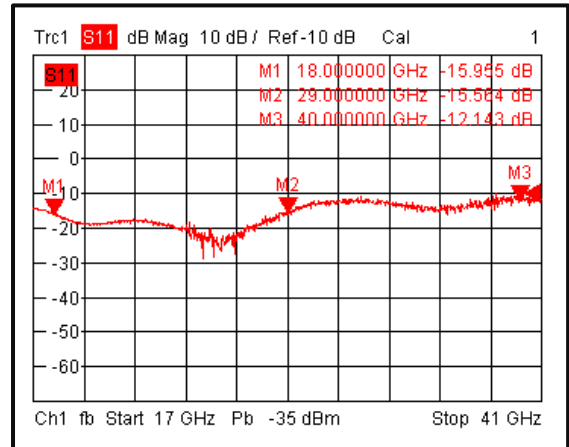
\*\*For vibration testing details please see additional information section.

Typical Performance Plots

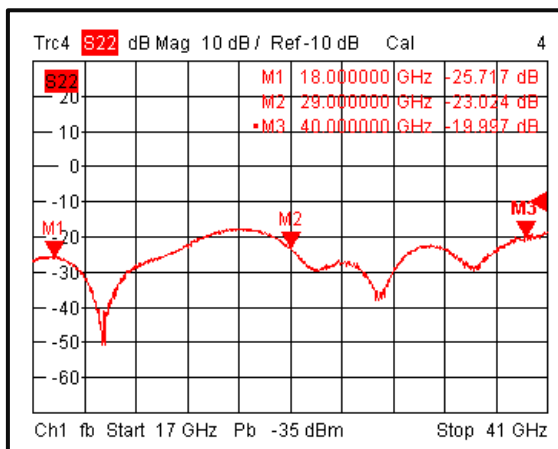
Gain @ +25°C



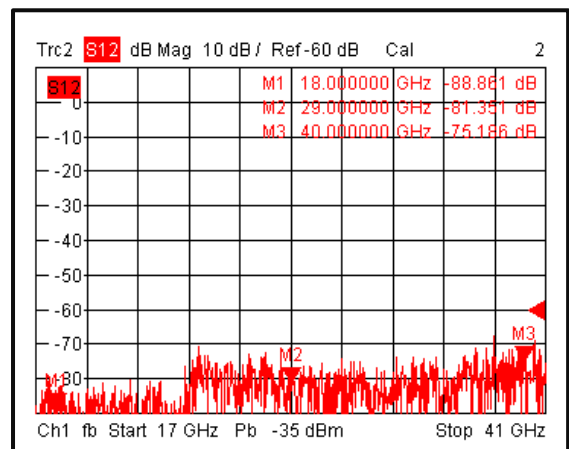
Input Return Loss @ +25°C



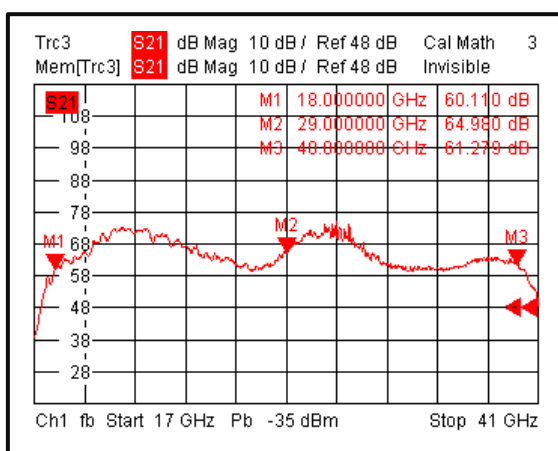
Output Return Loss @ +25°C



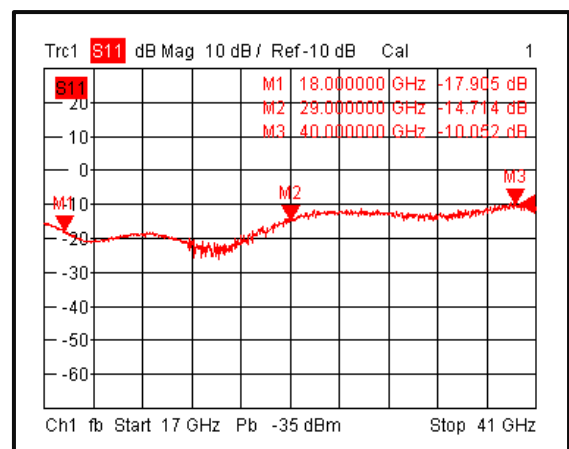
Isolation @ +25°C



Gain @ -40°C



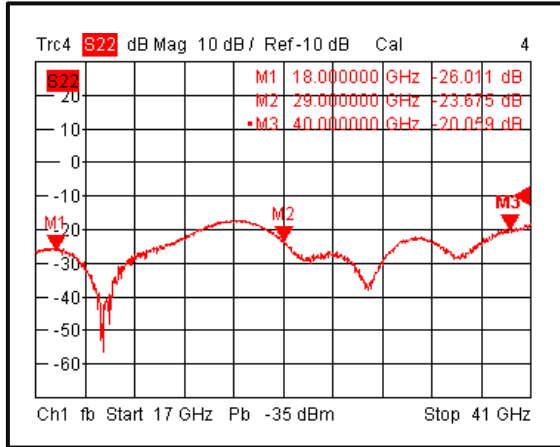
Input Return Loss @ -40°C



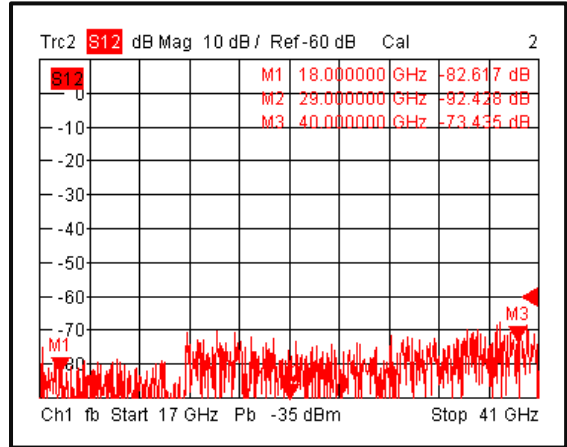
Note: Small signal VNA measurements include attenuators to protect equipment

**Typical Performance Plots**

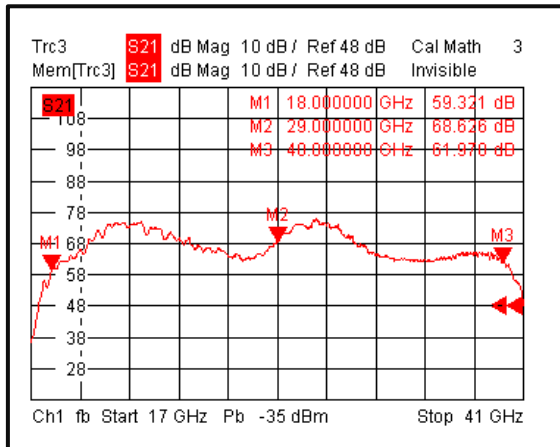
**Output Return Loss @ -40°C**



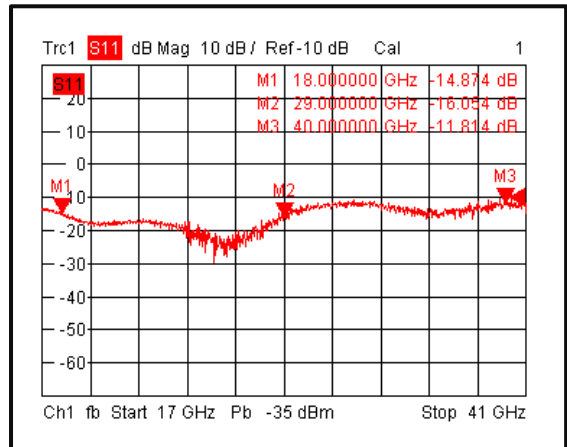
**Isolation @ -40°C**



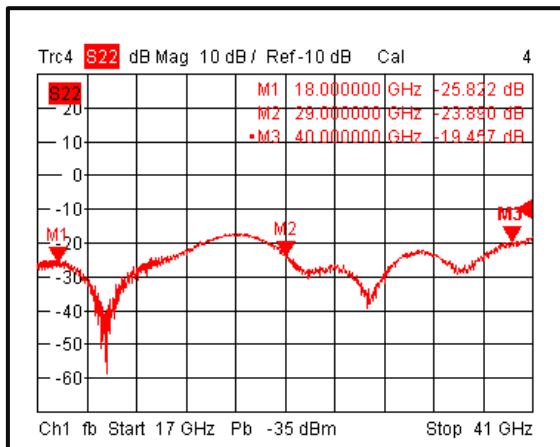
**Gain @ +60°C**



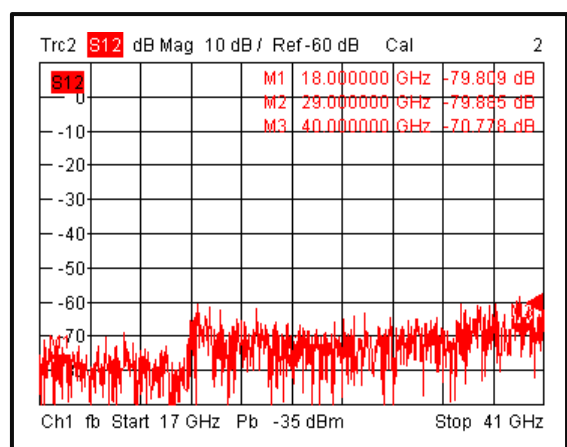
**Input Return Loss @ +60°C**



**Output Return Loss @ +60°C**



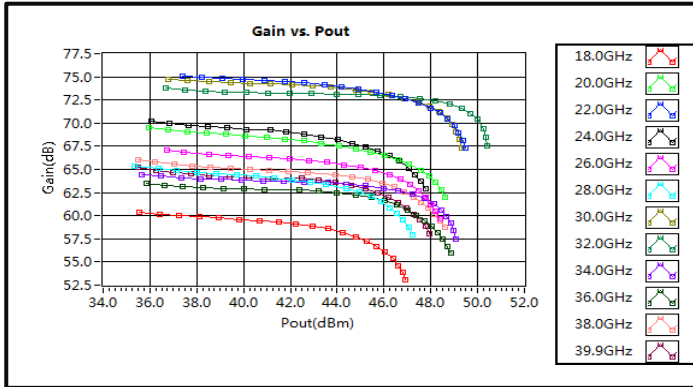
**Isolation @ +60°C**



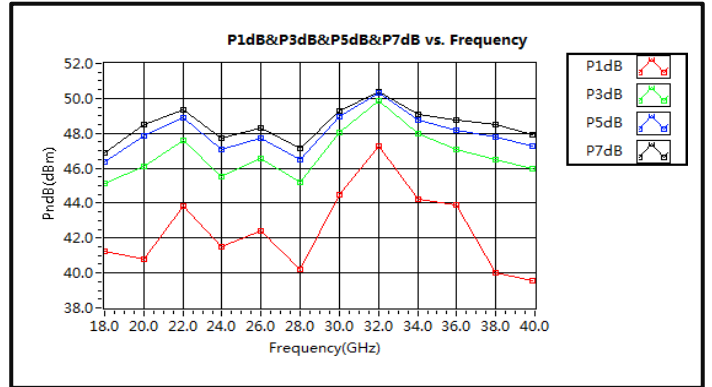
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

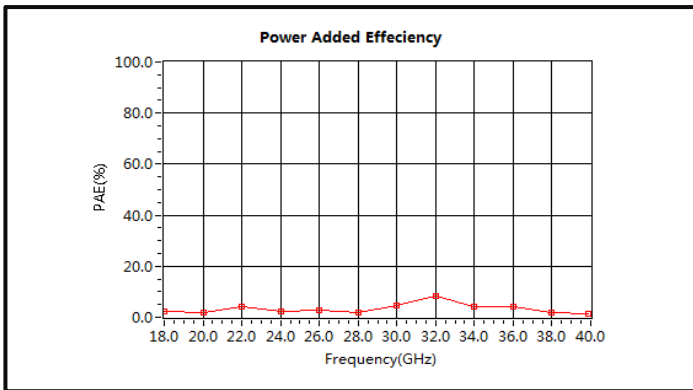
Gain vs. Output Power CW



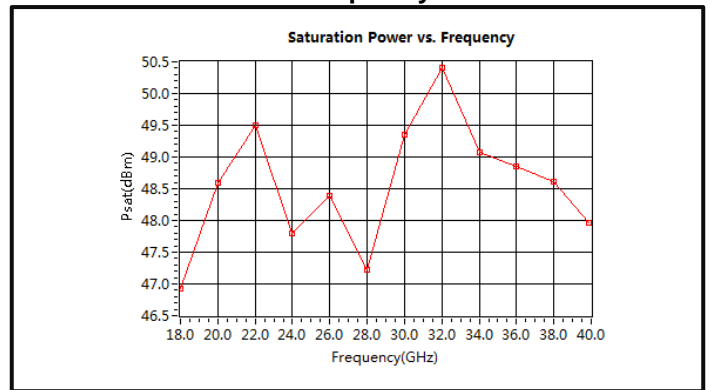
PndB vs. Frequency CW



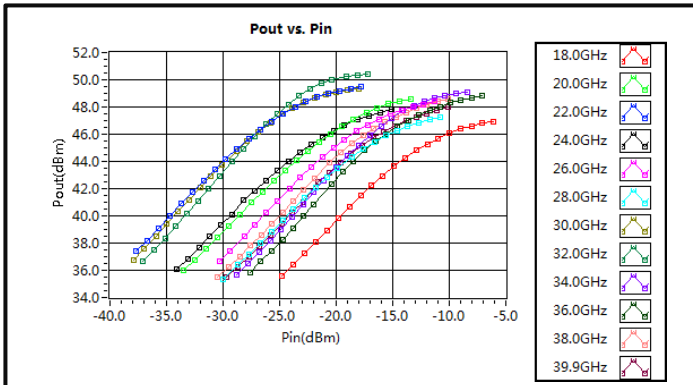
Power Added Efficiency CW



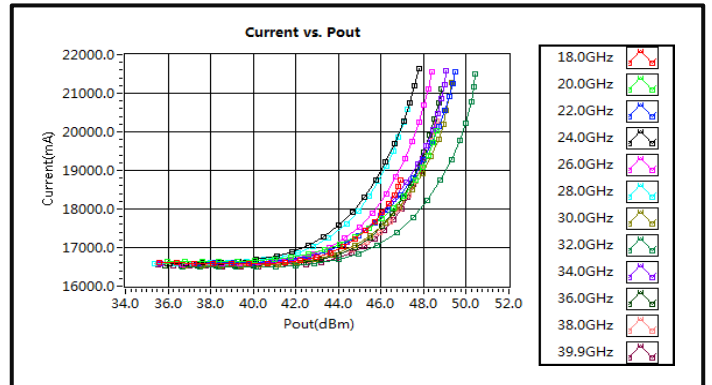
Saturation Power vs. Frequency CW



Pout vs. Pin

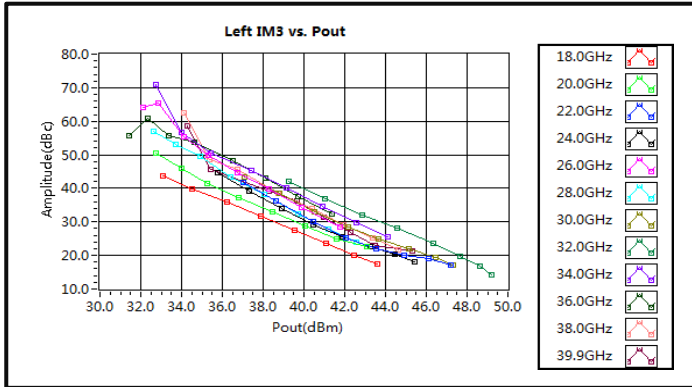


Current vs. Pout

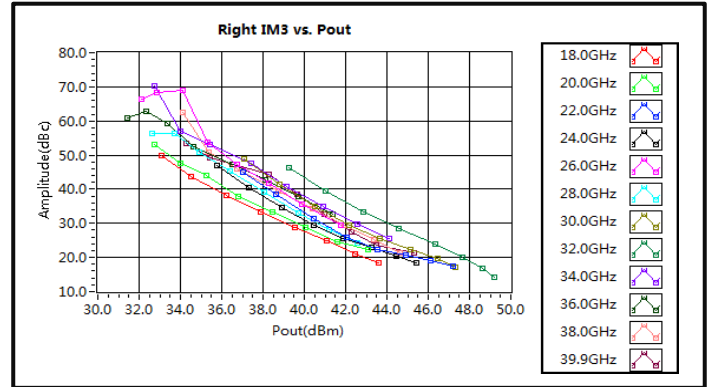


Typical Performance Plots

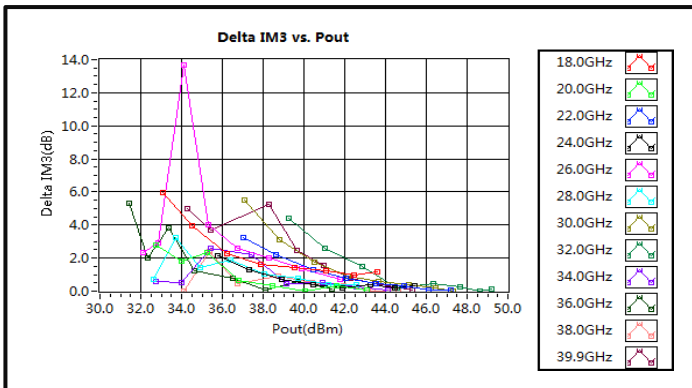
Left IM3 vs. Pout



Right IM3 vs. Pout



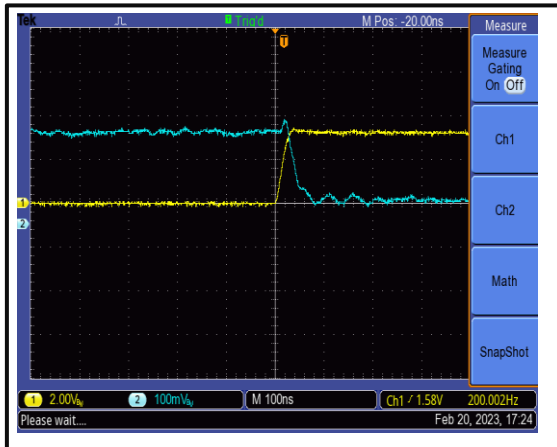
Delta IM3 vs. Pout



Note: IM3 test performed with 1MHz tone spacing

**Typical Performance Plots**

**The Switching Rise Time is 100 ns @+25°C**

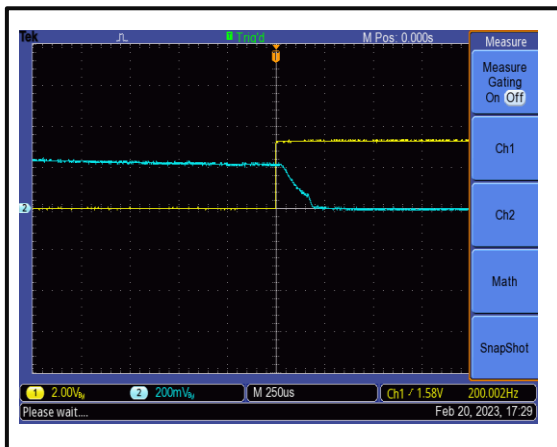


**The Switching Fall Time is 100 ns @+25°C**

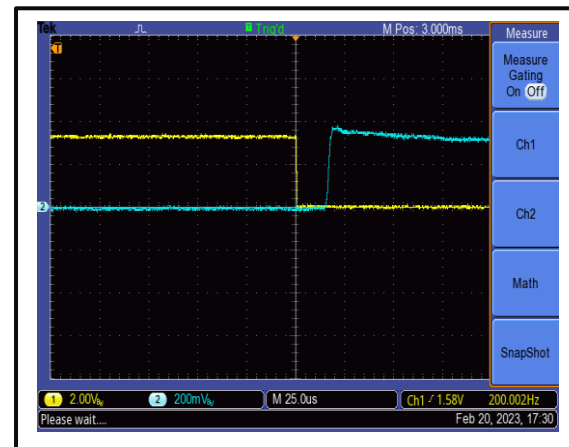


Switch control port: D-sub 15 PIN #12(RF\_Switch\_Off) .  
The yellow curve is the switch control signal, the blue curve is RF output envelope.

**The Drain-Enable Rise Time is 250 us @+25°C**

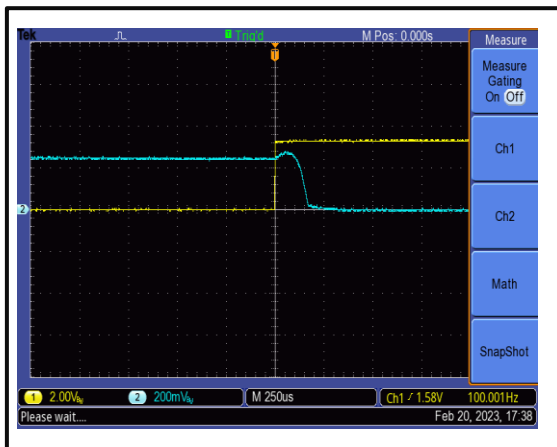


**The Drain-Disable Fall Time is 25 us @+25°C**

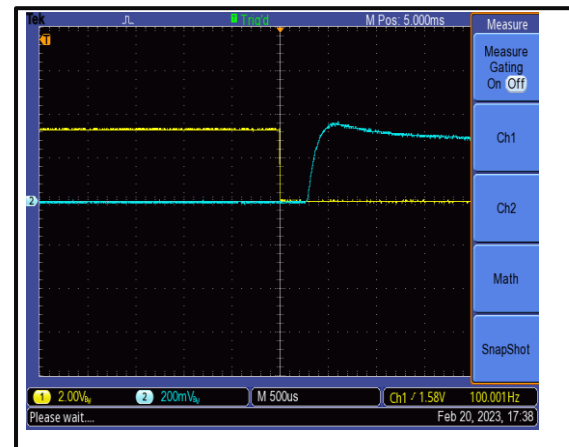


The drain control port: D-sub 15 PIN #13 (Drain\_OFF) .  
The yellow curve is the drain control signal, the blue curve is RF output envelope.

**The Gate-Enable Rise Time is 250us @+25°C**



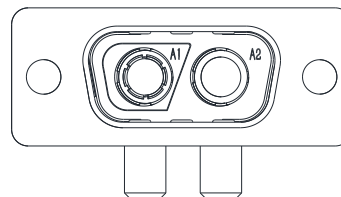
**The Gate-Enable Fall Time is 500 us @+25°C**



The gate control port: D-sub 15 PIN #14 (GATE\_OFF) .  
The yellow curve is the gate control signal, the blue curve is RF output envelope.

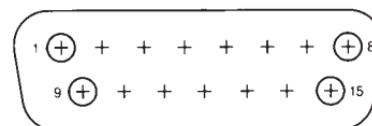
**Protection Connector Table**

Female D-Sub is on the housing  
The mating Male part number: 09691100022



Pin #	Name	Function	Initial State	Description	Applied
A1	GND	Ground	GND	Ground	Yes
A2	+36 VDC	Power Supply	+36 VDC	Power Supply	Yes

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



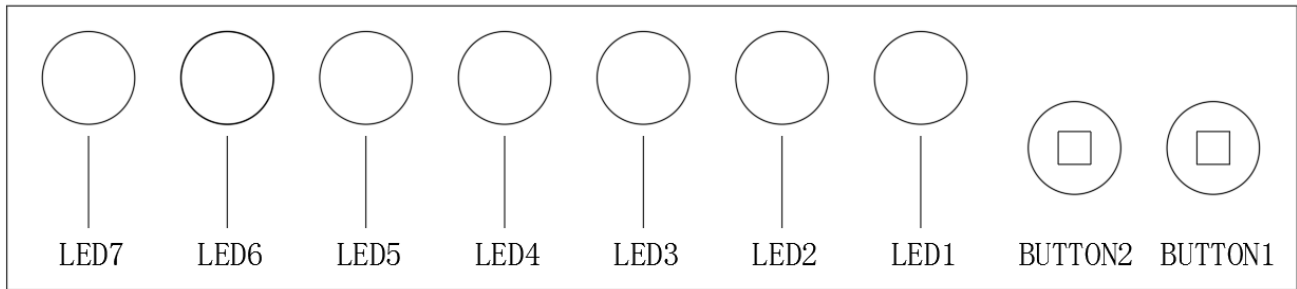
Pin #	Name	Function	Initial State	Description	Applied
1,2,9,10		NC		NC	No
3,11	GND	Ground	GND	Ground	Yes
4	PA_OFF	Indicator	LOW	Amplifier working state, high level is off	Yes
5	RF Input Over Drive	Indicator	LOW	Pin will be latched to logic HIGH when input signal is over limit	Yes
6	Over Current	Indicator	LOW	Pin will be latched to logic HIGH when drain current limit is reached or current imbalance	Yes
7	Over Temp	Indicator	LOW	Pin will be latched to logic HIGH when amplifier is driven over temperature	Yes
8	VSWR	Indicator	LOW	Pin will be latched to logic HIGH when output reflection is over limit	No
12	Switch Disable	Control	LOW	Applying logic HIGH disconnect RF signal of amplifiers	Yes
13	Drain Disable	Control	LOW	Applying logic HIGH disable drains of amplifiers	Yes
14	Gate Disable	Control	LOW	Applying logic HIGH disable gates of amplifiers	Yes
15	Reset	Control	HIGH	Resets PA when logic LOW is applied and released	Yes

Notes:

- HIGH/LOW voltages are standard TTL signals 0 to 0.8V = LOW. 2.8V to 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.
- Indicator output signals can source 24mA.



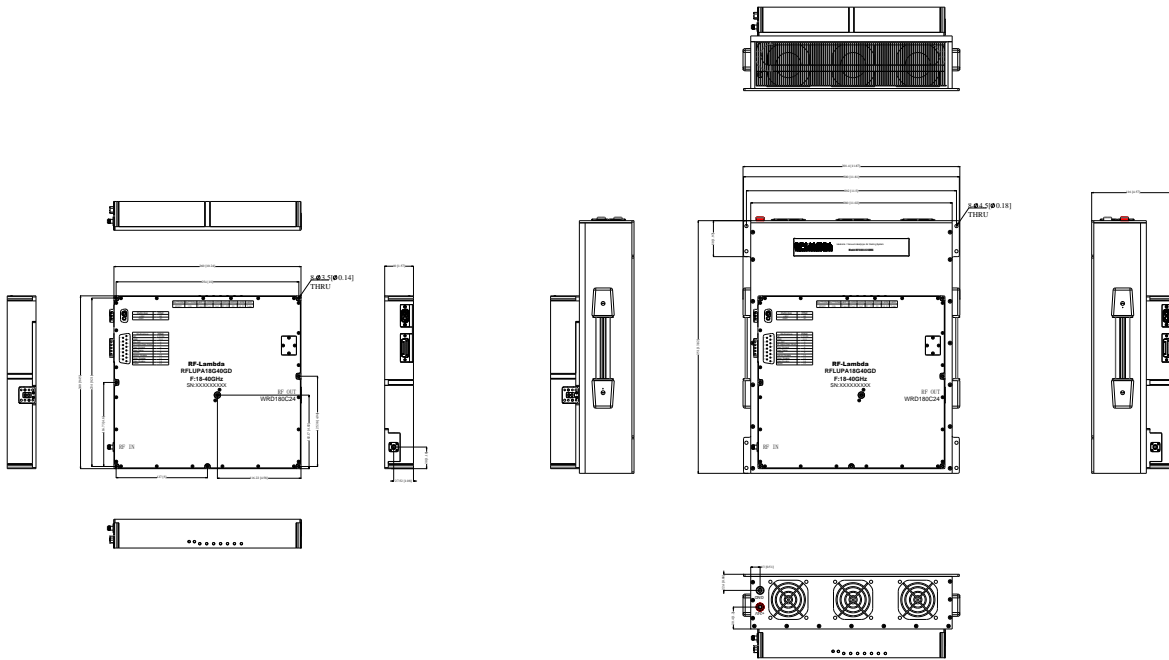
**Alarm Status Panel**



Name	Function	Initial State	Description	Applied	
BUTTON1	Reset	Control	Manual reset button to reset PA	Yes	
BUTTON2	Calibration	Control	Manual calibration button to correct PA	Yes	
LED 1	Power	Indicator	GREEN Color	Power supply normal indicator*	Yes
LED 2	RF ON/OFF	Indicator	GREEN Color	RF output status indicator. PA will shut down and latch this LED to a <b>RED</b> color when any protection is triggered*	Yes
LED 3	Calibration State	Indicator	GREEN Color	Calibration status indicator. The red light indicates that calibration is required. The indicator will flash during calibration*	Yes
LED 4	RF Input Over Drive	Indicator	GREEN Color	PA will shut down and latch this LED to a <b>RED</b> color when input signal is over limit *	Yes
LED 5	Over Current	Indicator	GREEN Color	PA will shut down and latch this LED to a <b>RED</b> color when current limit is reached *	Yes
LED 6	ID-Balance	Indicator	GREEN Color	PA will shut down and latch this LED to a <b>RED</b> color when an imbalance in the drain current of the combining branches occurs *	Yes
LED 7	Over Temp	Indicator	GREEN Color	PA will shut down and latch this LED to a <b>RED</b> color when driven over temperature *	Yes

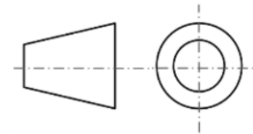
\*LED needs to be manually reset to initial state by pressing RESET button

**Outline Drawing**



**Notes:**

1. Package Material: Aluminum/Copper
2. Finish: Nickel Plated
3. All dimensions are in millimeters [inches].
4. Tolerances  $\pm 0.5$  [0.02] 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. DB15 cable is configured for power connection port by default (RFCBLADB15)
7. Standard torque wrench must be used to secure RF connectors



**Packing List**

ID	Description	QTY
1	Fig a. DB15 cable (RFCBLADB15)	1
2	Fig b. DB2 cable (RFCBLADB2M)	1
3	Fig c. Double ridge waveguide interface (WRD180C24)	1
4	Fig d. Waveguide to coaxial adapter (RFWAD180E0COBS) (Consult sales)	0
5	Fig e. Double ridge waveguide twist (RFWTWWRD180C24) (Consult sales)	0



**Fig a.**



**Fig b.**



**Fig c.**



**Fig d.**



**Fig e.**

**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
RFLUPA18G40GD	Input Connector 2.92mm-Female and Output Connector WRD180C24	18GHz-40GHz 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 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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