

Wide Band Solid State Power Amplifier With Liquid Cooling 26.5GHz-40GHz



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

Features

- Solid State Power Amplifier
- Liquid Cooling
- Small Signal Gain 60dB Typical
- Output Saturation Power 52dBm Typical
- Supply Voltage +48VDC
- 50 Ohm Matched
- Over Temperature Protection
- Over Current Protection
- Auto Calibration

Product Description

RFLUPA26G40GG-L is a wide band power amplifier with a frequency range of 26.5 to 40GHz.

The power output of this amplifier is 52dBm typical. The typical small signal gain is 60dB with a gain flatness of ± 4 dB. This power amplifier works with typically +48 VDC power supply.

The power amplifier input connector is 2.92mm-Male and output connector is WR-28.

The operating temperature of this product is -40 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	Units
Frequency Range	26.5		40	GHz
Small Signal Gain	55	60		dB
Gain Flatness		± 4.0		dB
Gain Variation Over Temperature (-40°C to +60°C)		± 3.0		dB
Input Return Loss		10		dB
Output 1dB Compression Point (P1dB)		49		dBm
Saturated Output Power (Psat)	50.5	52		dBm
Supply Current (Vcc=+48V)		25	36	A
Power Added Efficiency (PAE)		10		%
Turn On/Off Speed (Switch Disable)	ON	100		ns
	OFF	100		ns
Turn On/Off Speed (Drain Disable)	ON	500		us
	OFF	250		us
Turn On/Off Speed (Gate Disable)	ON	1000		us
	OFF	200		us
Weight		67.13		lbs.
Impedance		50		Ohms
Input / Output Connectors	2.92mm-Male(Input) / WR28(Output) (H-Plane available with adapter)			
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

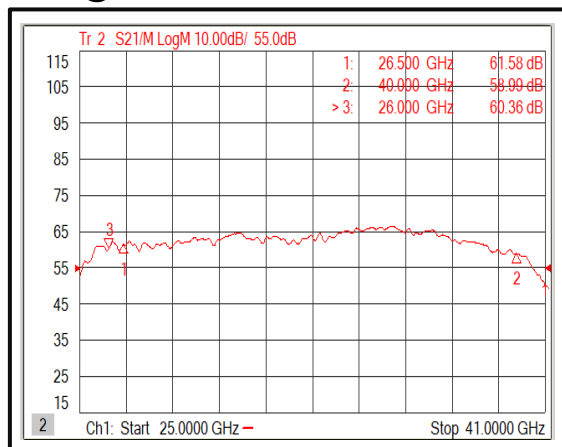
Parameter	Description
Operational Temperature	-40°C to +60°C (Case Temperature)
Storage Temperature	-50°C to +105°C
Thermal Shock	-40°C → +85°C (5 Cycles / 10 hours)
**Random Vibration	MIL-STD-202G Table 214-I, Test Condition Letter C 1.5 Hours Per Axis
High Temperature Burn In	Temperature +70°C for 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.

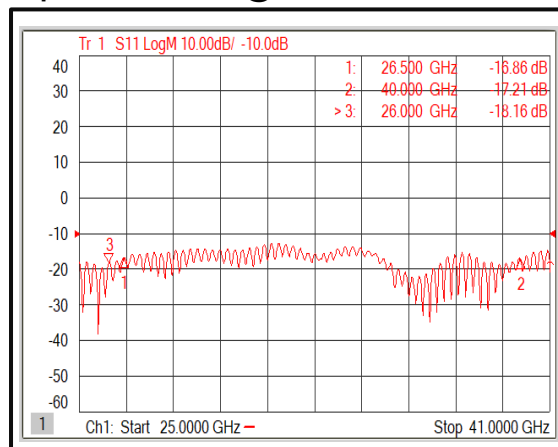
**For vibration testing details please see additional information section.

Typical Performance Plots

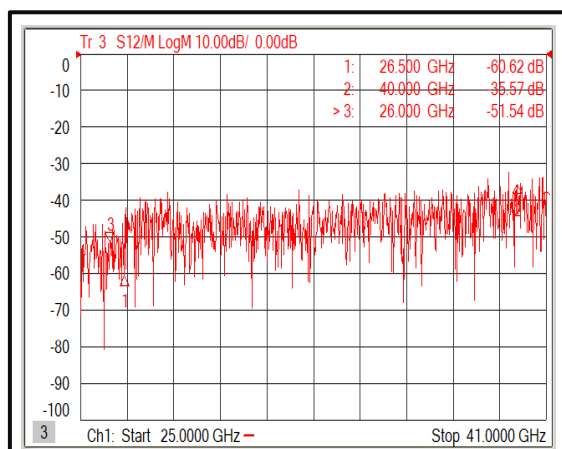
Gain @ +25°C



Input Return Loss @ +25°C



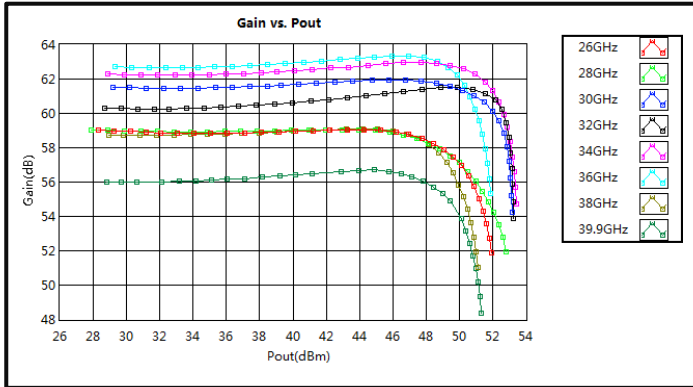
Isolation @ +25°C



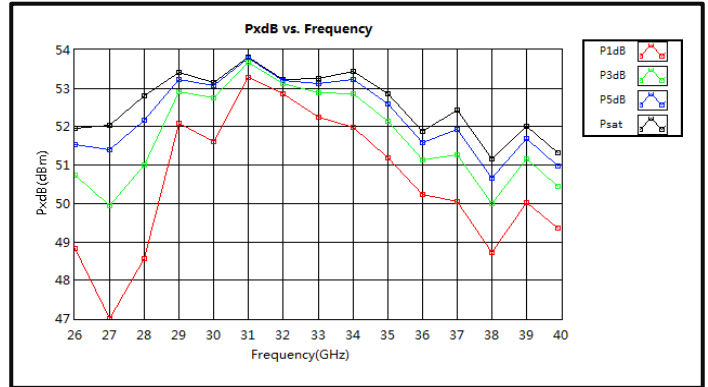
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

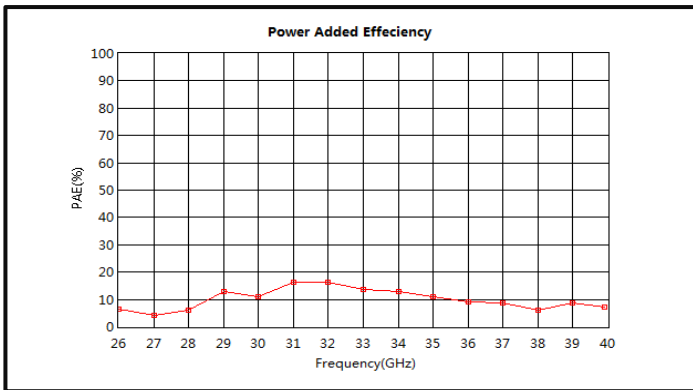
Gain vs. Output Power CW



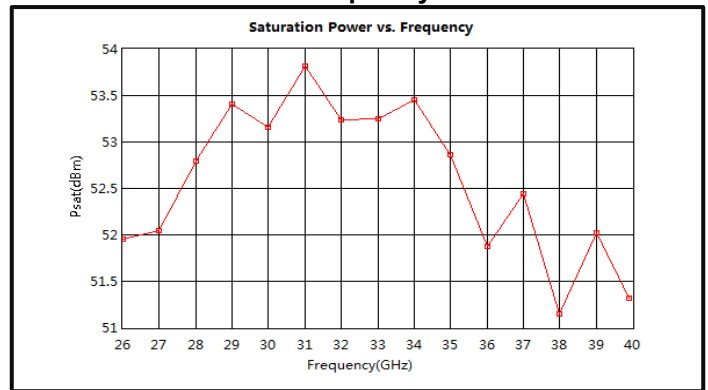
PndB vs. Frequency CW



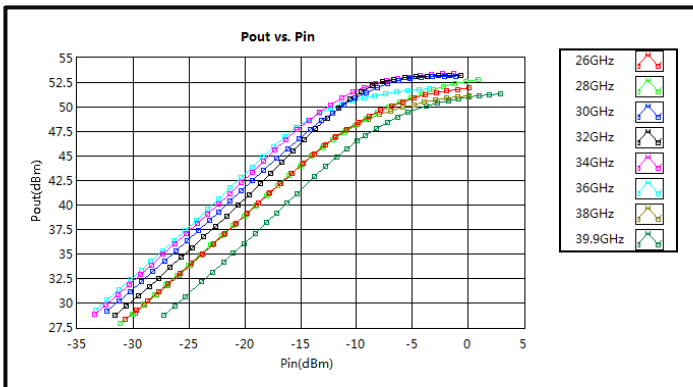
Power Added Efficiency CW



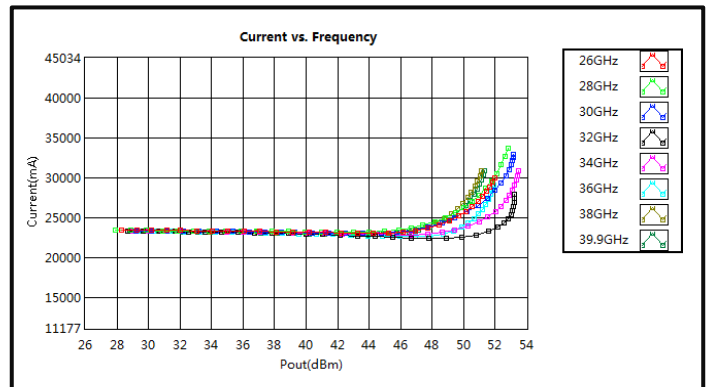
Saturation Power vs. Frequency CW



Pout vs. Pin

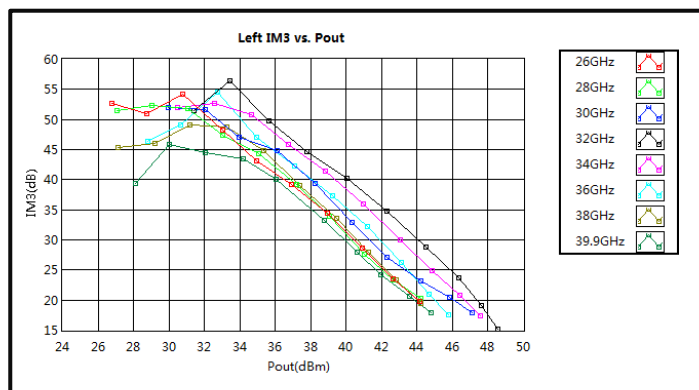


Current vs. Pout

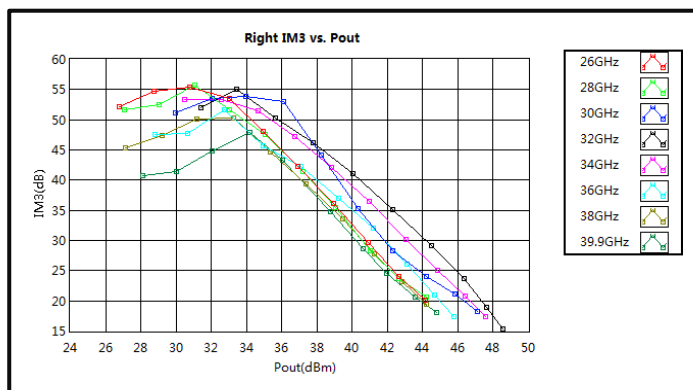


Typical Performance Plots

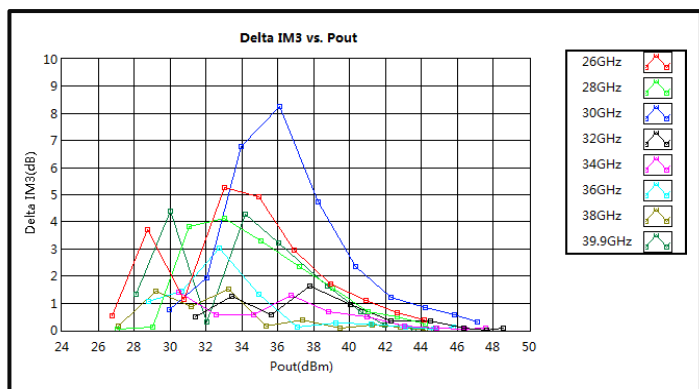
Left IM3 vs. Pout



Right IM3 vs. Pout



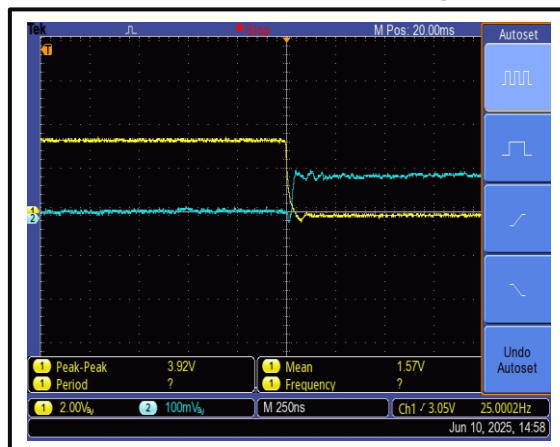
Delta IM3 vs. Pout



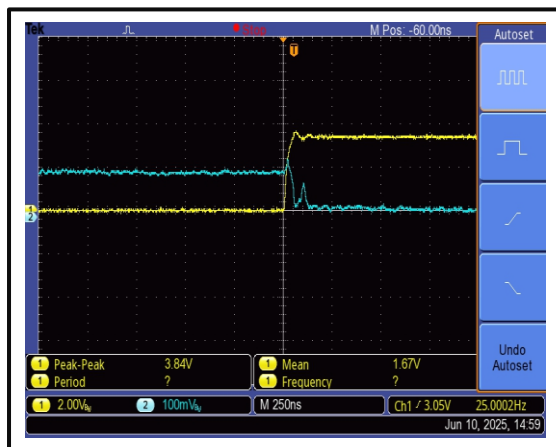
Note: IM3 test performed with 1MHz tone spacing

Typical Performance Plots

The RF Switch On Time is 100ns @+25°C



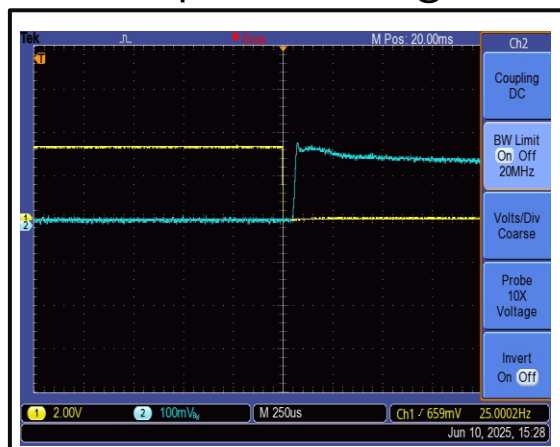
The RF Switch Off Time is 100ns @+25°C



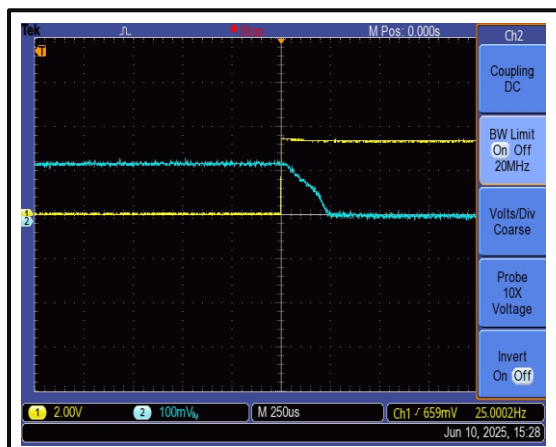
Switch control port: D-sub 25 PIN #10(RF Input Switch).

The yellow curve is the switch control signal, the blue curve is RF output envelope.

The Drains Open Time is 500us @+25°C



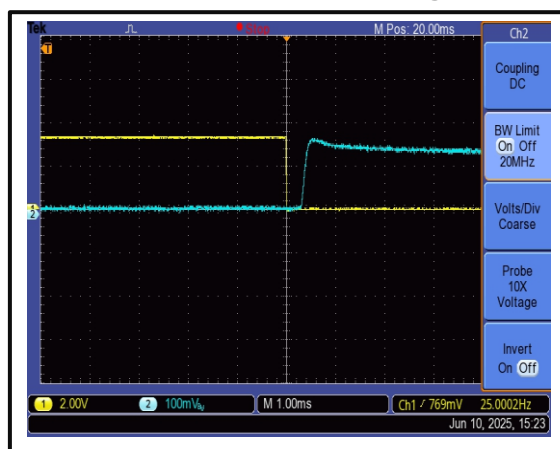
The Drains Closure Time is 250us @+25°C



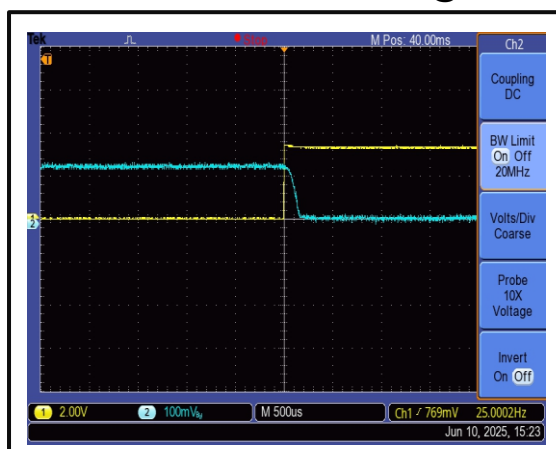
The Drain control port: D-sub 25 PIN #3 (Drain Disable).

The yellow curve is the drain control signal, the blue curve is RF output envelope.

The Gates Open Time is 1000us @+25°C



The Gates Closure Time is 200us @+25°C

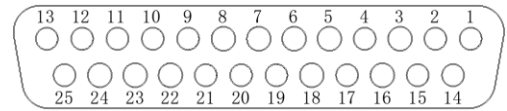


The gate control port: D-sub 25 PIN #2 (Gate Disable).

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: 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	Yes
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 Alarm	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:

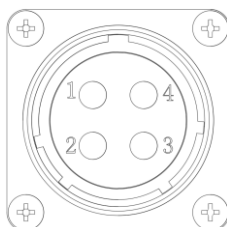
- HIGH/LOW voltages are standard TTL signals 0.0V-0.8V = LOW. 2.8V-5V = HIGH.

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)

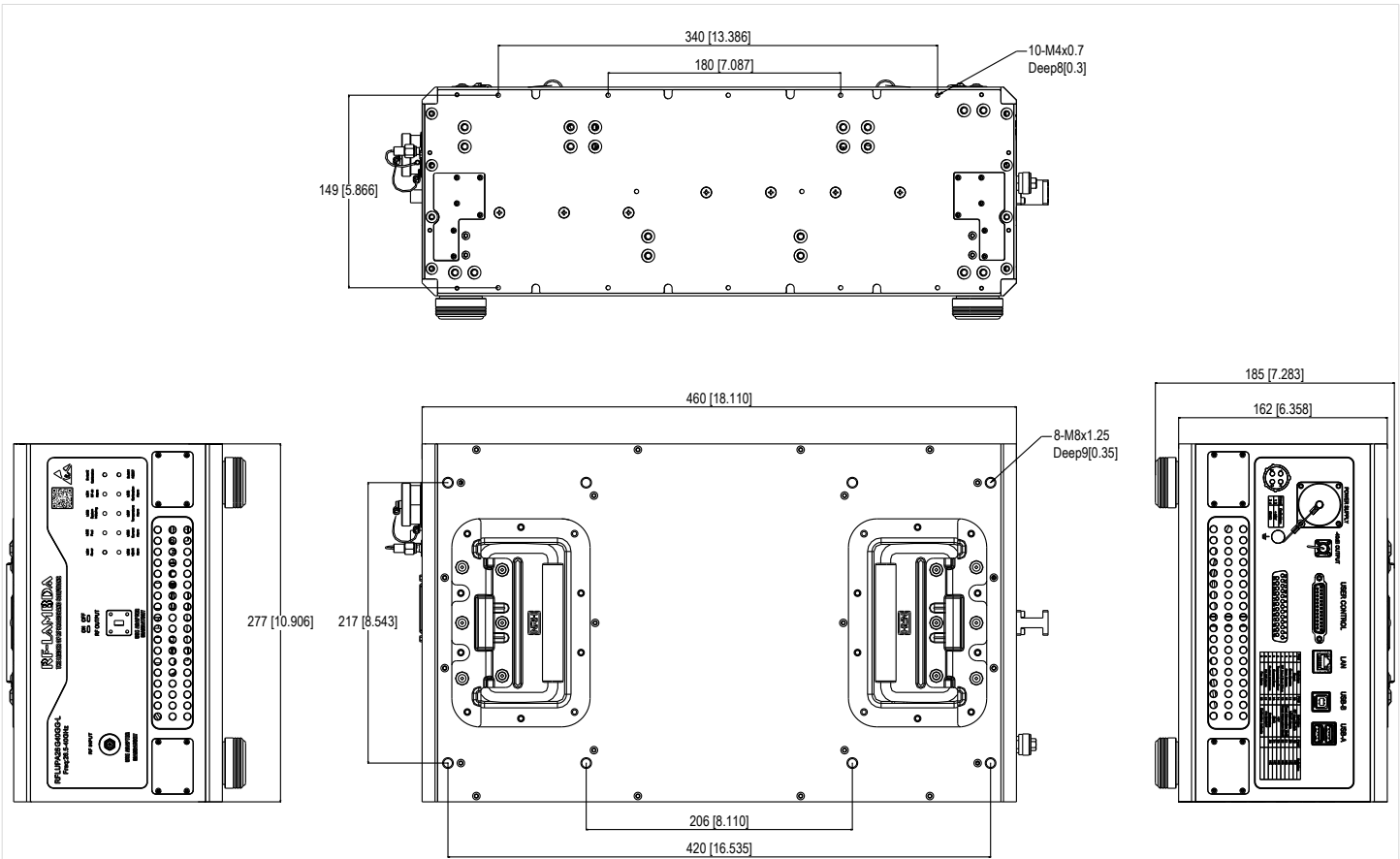
Protection Connector Table

Part number: JR25WRH-4P



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
3	Fig c. Adapter (RFCARAKFKF)	1
4	Fig d. Waveguide to coaxial adapter (RFWA28E0COAL) (Consulting sales)	0
5	Fig e. Waveguide to coaxial adapter (RFTWWR28) (Consulting sales)	0



Fig a.



Fig b.



Fig c.

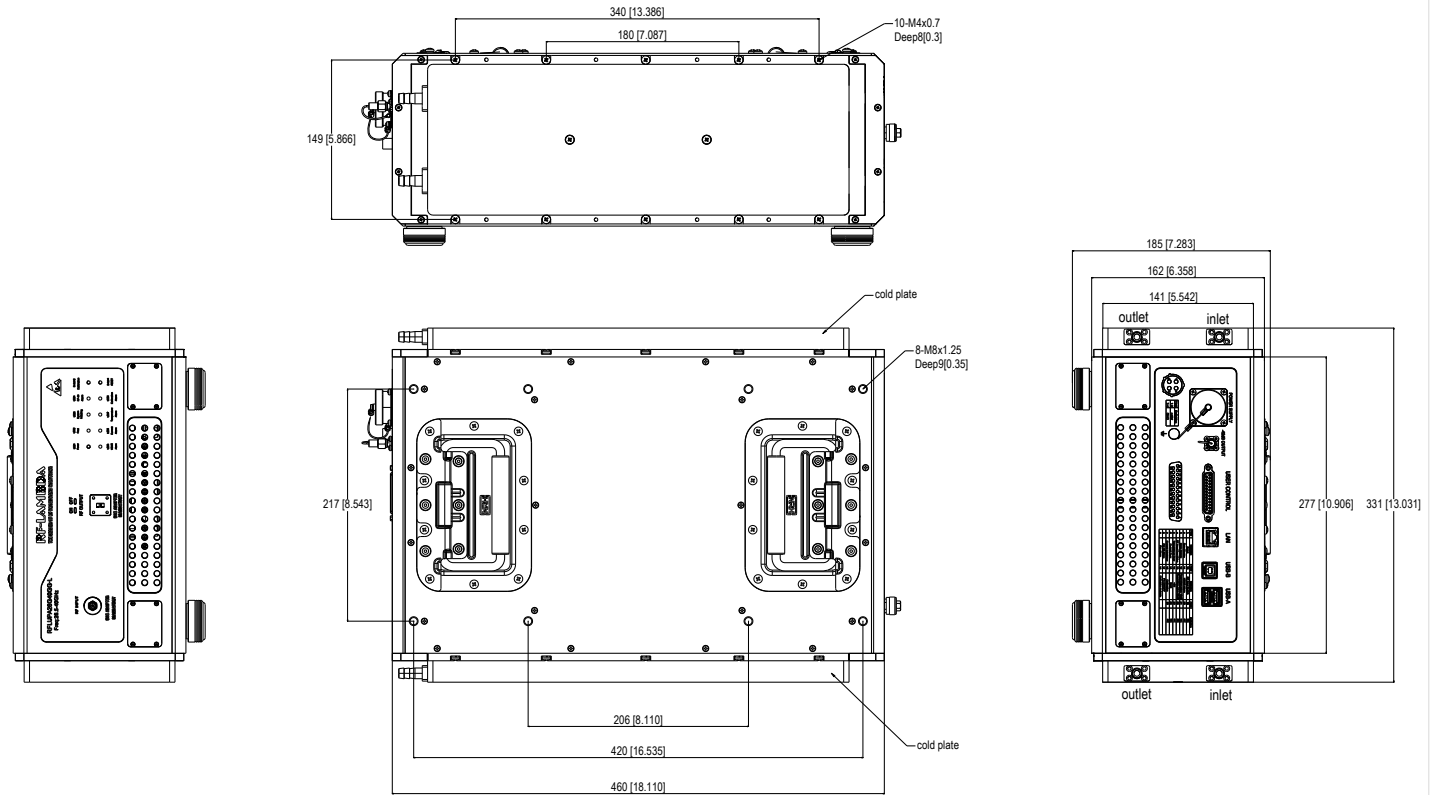


Fig d.



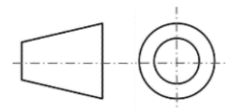
Fig e.

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	https://rflambda.com/pdf/rflambda_esd_control.pdf
Heatsink Lookup Specifications	https://rflambda.com/search_heatsink.jsp
Connector Torque Specifications	https://www.rflambda.com/pdf/Torque_Specifications.pdf
Random Vibration Test Standard	https://www.rflambda.com/pdf/rflambda_random_vibration_MIL-STD-202G.pdf

Ordering Information

Part Number	Modification	Description
RFLUPA26G40GG-L	Input Connector 2.92mm-Male and Output Connector WR-28	26.5GHz-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 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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