

90W Wide Band Solid State Power Amplifier 46GHz-53GHz



Product Description

RFLUPA46G53GB is a wide band power amplifier with a frequency range of 46 to 53GHz.

The power output of this amplifier is 49.5dBm typical. The typical small signal gain is 56dB with a gain flatness of ± 5.0 dB. This power amplifier works with typically +28VDC power supply.

The power amplifier input connector is 1.85mm-female and output connector is WR-19.

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

Features

- Solid State Power Amplifier
- Small Signal Gain 56dB Typical
- Output Saturation Power 49.5dBm Typical
- Supply Voltage +28VDC
- 50 Ohm Matched
- Over Temperature Protection
- Over Current Protection
- Auto Calibration

Typical Applications

- Wireless Infrastructure
- Test Instrumentation
- Radar Systems
- 5G Wireless Communications
- Microwave Radio Systems
- TR Modules
- Research and Development
- Cellular Base Stations

Electrical Specifications (T_A=+25°C)

Parameter	Min	Typ	Max	Units
Frequency Range	46		53	GHz
Small Signal Gain	50	56		dB
Gain Flatness		± 5.0	± 6.0	dB
Gain Variation Over Temperature (-40°C to +60°C)		± 2.0		dB
Input Return Loss		-10		dB
Output 1dB Compression Point (P1dB)		46		dBm
Saturated Output Power (Psat)	48	49.5		dBm
Supply Current (Vcc=+28V)		16	28	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	100		us
	OFF	150		us
Turn On/Off Speed (Gate Disable)	ON	700		us
	OFF	20		us
Weight		5.1 Max.		lbs.
Impedance		50		Ohms
Input / Output Connectors	1.85mm-Female(Input) / WR19(Output)(E-Plane)			
Package	Epoxy Sealed (Standard)			
	Hermetically Sealed (Optional)			

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage Range	+30VDC
*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

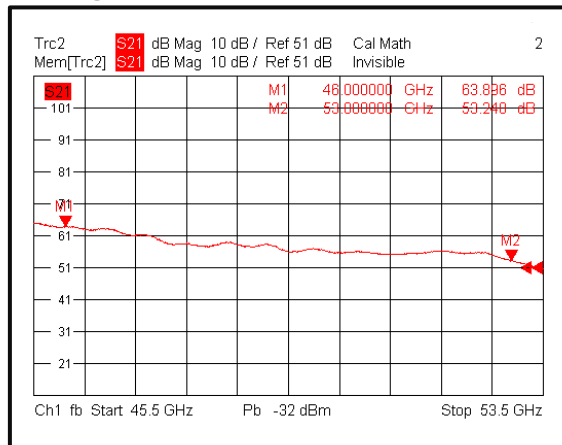
Parameter	Description
Operational Temperature	-40°C to +60°C (Case Temperature)
Storage Temperature	-50°C to +105°C
Thermal Shock	-40°C → +85°C (5 Cycles / 10 hours)
**Random Vibration	MIL-STD-202G Table 214-I, Test Condition Letter C 1.5 Hours Per Axis
High Temperature Burn In	Temperature +60°C for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

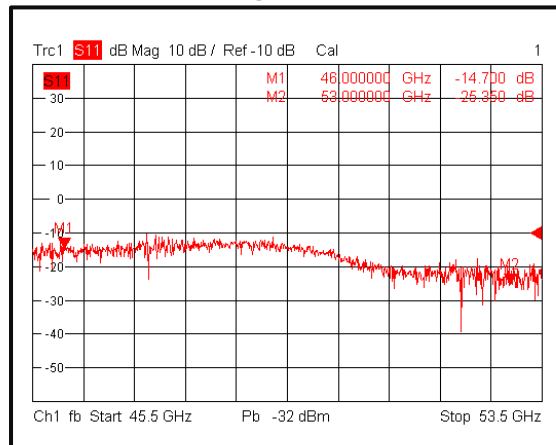
**For vibration testing details please see additional information section.

Typical Performance Plots

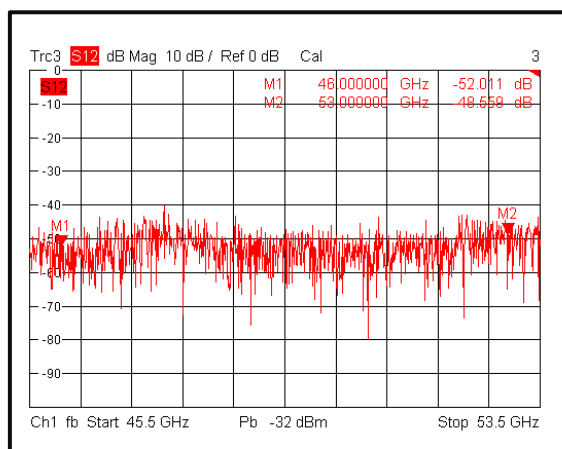
Gain @ +25°C



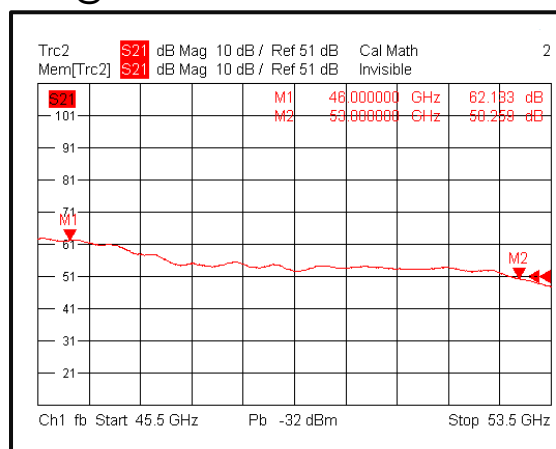
Input Return Loss @ +25°C



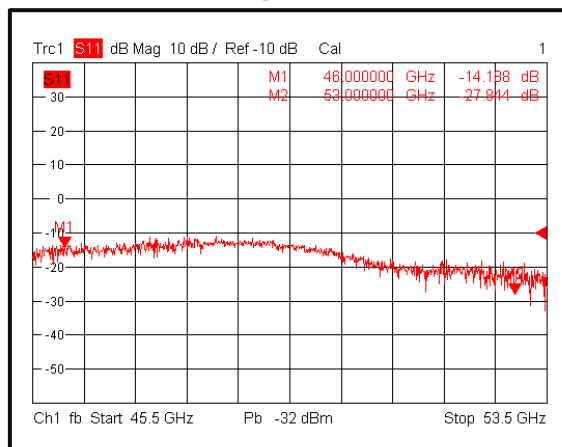
Isolation @ +25°C



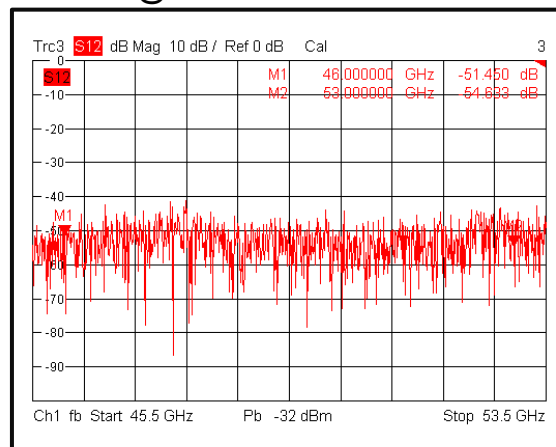
Gain @ -40°C



Input Return Loss @ -40°C



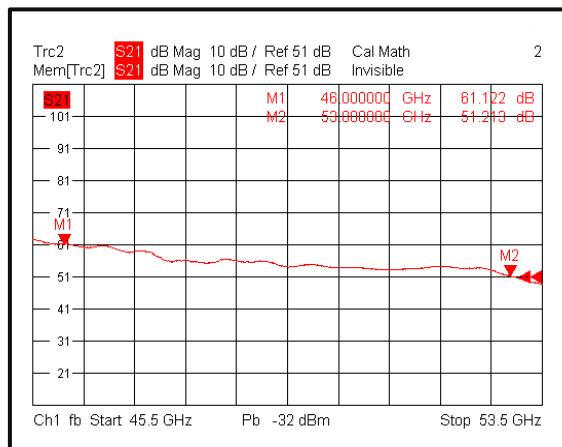
Isolation @ -40°C



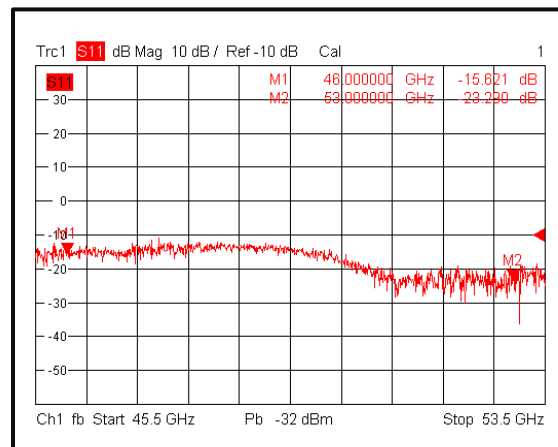
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

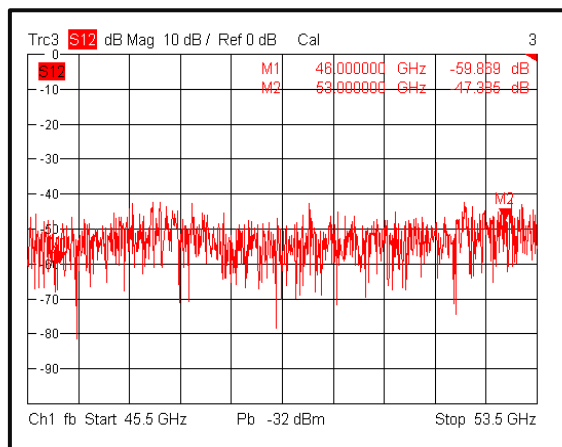
Gain @ +60°C



Input Return Loss @ +60°C



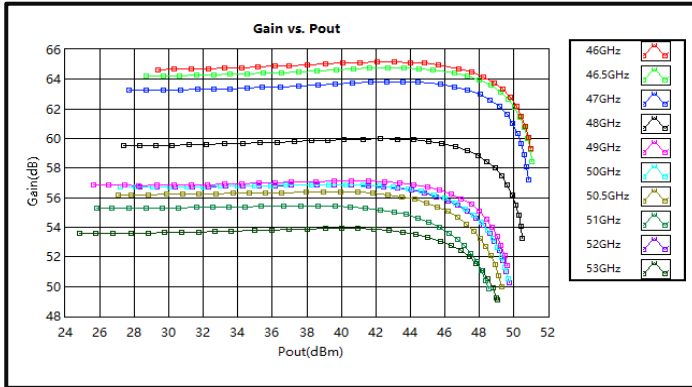
Isolation @ +60°C



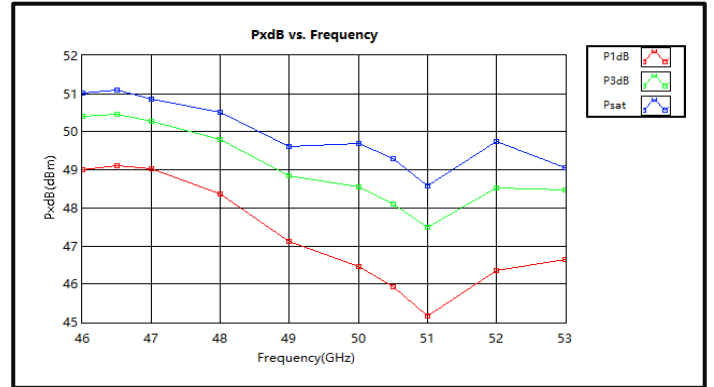
Note: Small signal VNA measurements include attenuators to protect equipment

Typical Performance Plots

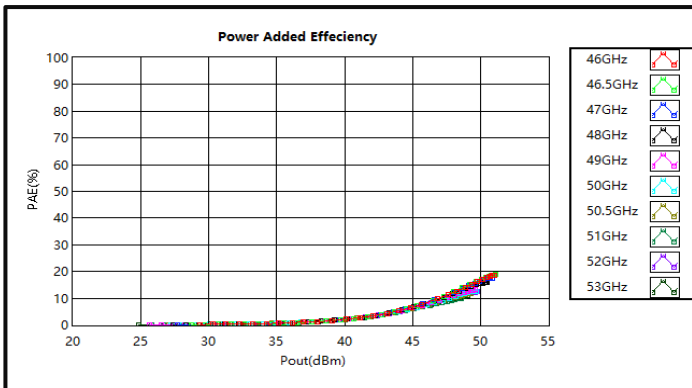
Gain vs. Output Power



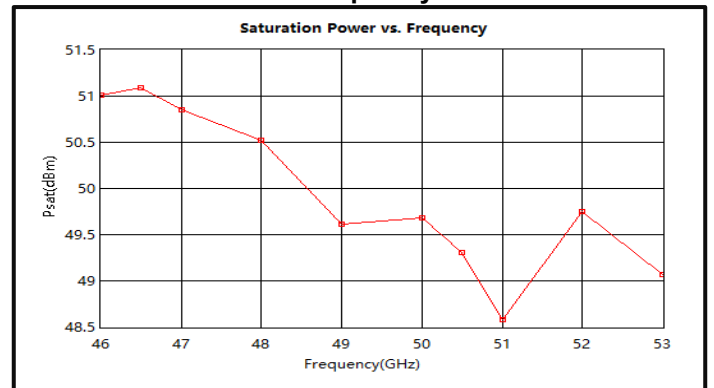
PndB vs. Frequency



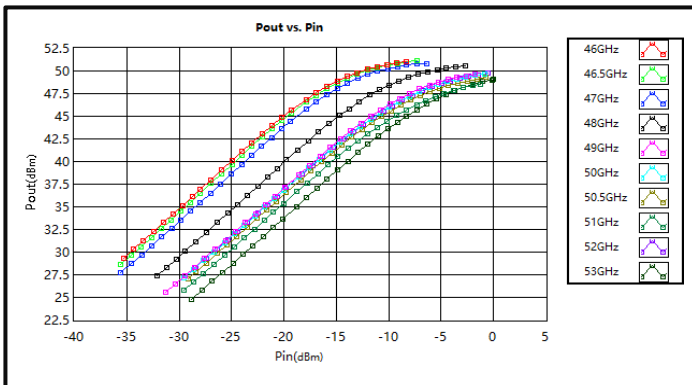
Power Added Efficiency



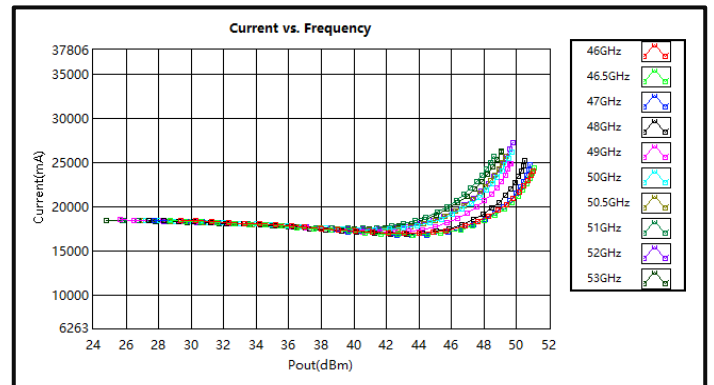
Saturation Power vs. Frequency



Pout vs. Pin

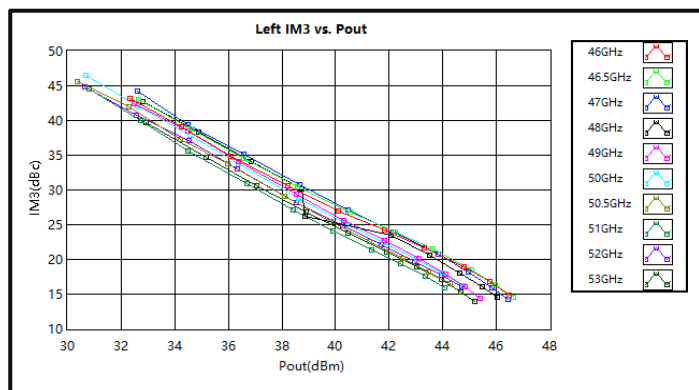


Current vs. Pout

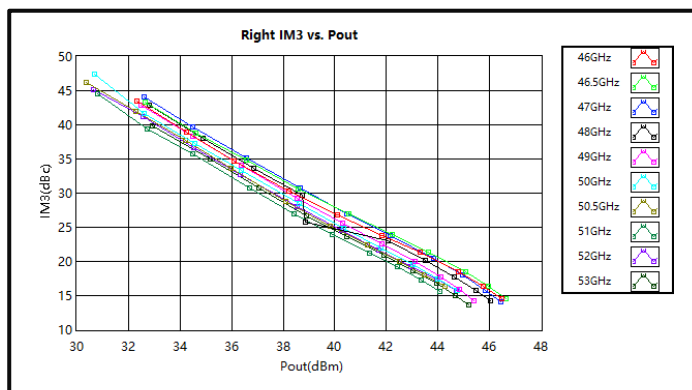


Typical Performance Plots

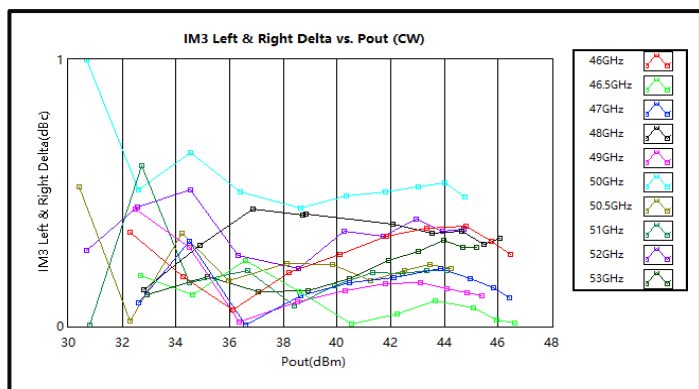
Left IM3 vs. Pout



Right IM3 vs. Pout



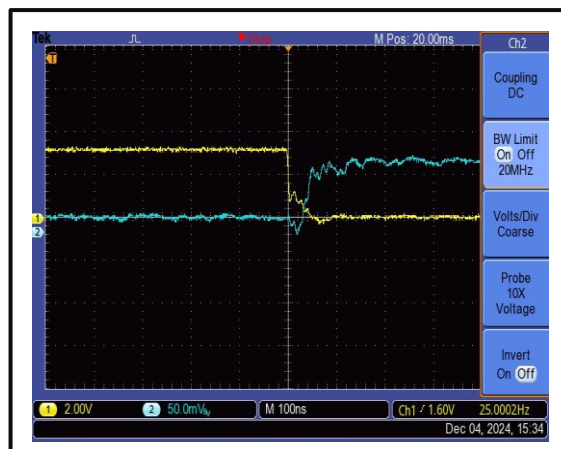
Delta IM3 vs. Pout



Note: IM3 test performed with 1MHz tone spacing

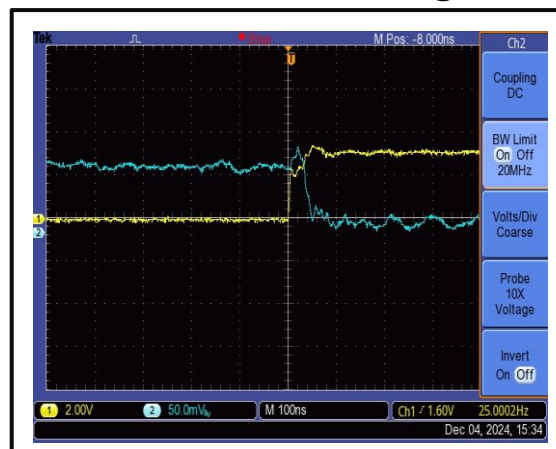
Typical Performance Plots

The RF Switch On Time is 100ns @+25°C

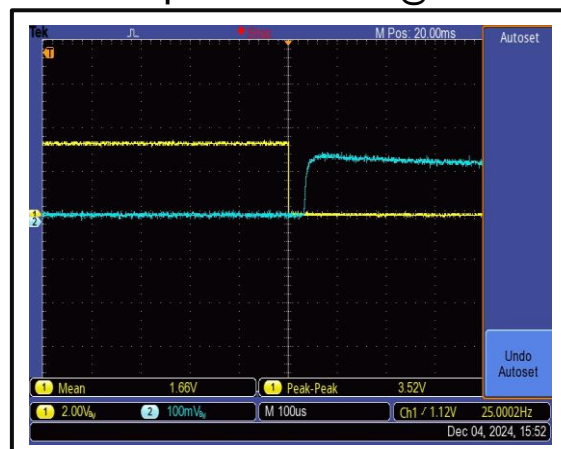


Switch control port: D-sub 17 PIN #4 (RF Input Switch) .
The yellow curve is the switch control signal, the blue curve is RF output envelope.

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

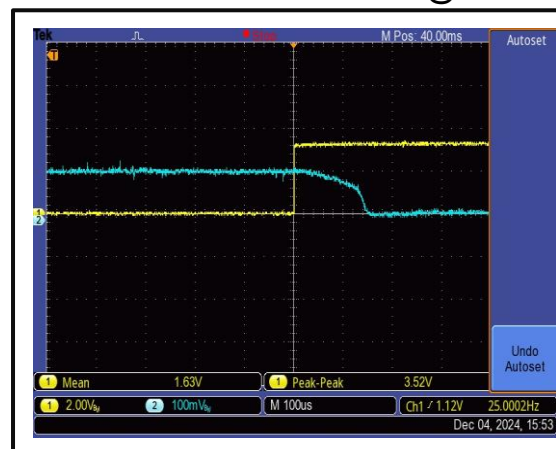


The Drains Open Time is 100us @+25°C

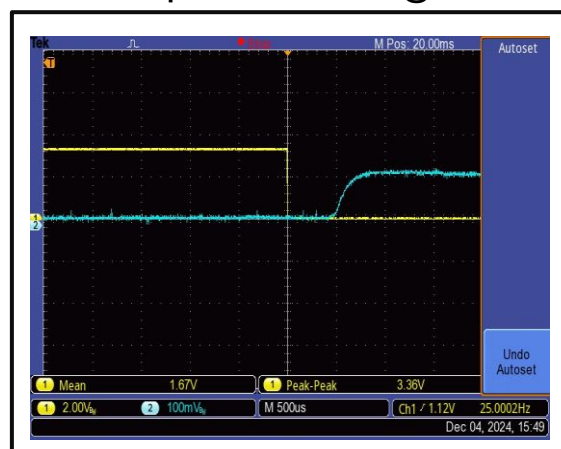


The drain control port: D-sub 17 PIN #3 (Drain Disable).
The yellow curve is the drain control signal, the blue curve is RF output envelope.

The Drains Closure Time is 150us @+25°C

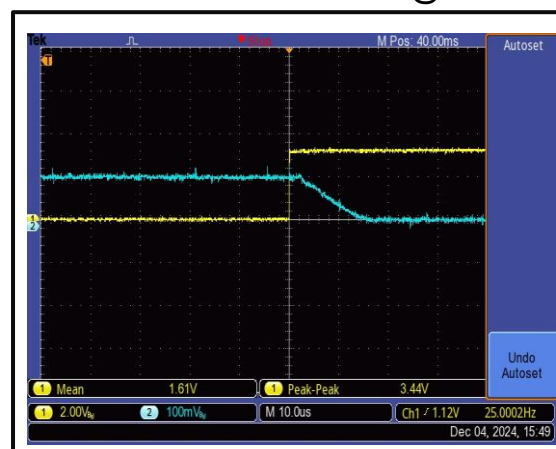


The Gates Open Time is 700us @+25°C



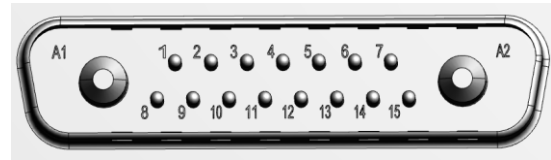
The gate control port: D-sub 17 PIN #2 (Gate Disable) .
The yellow curve is the gate control signal, the blue curve is RF output envelope.

The Gates Closure Time is 20us @+25°C



Interface Connector

Male D-Sub is on the housing
 The mating female part number: RFCBLADB17

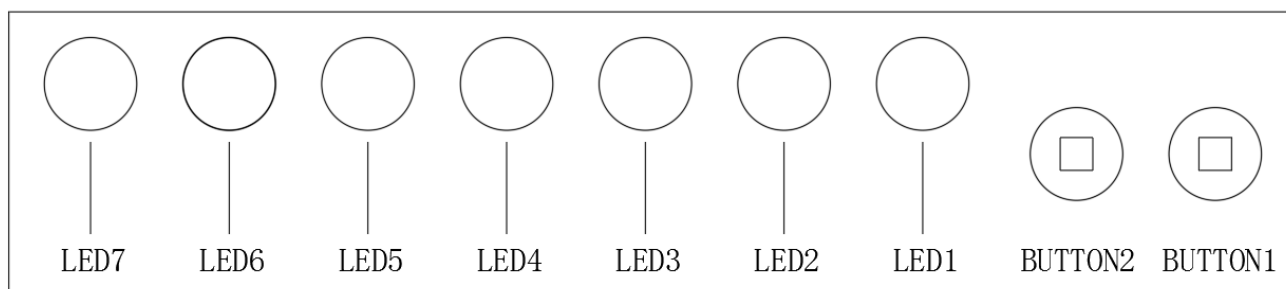


Pin #	Name	Function	Initial State	Description	Applied
A1	VDD	Power Supply	+28V	+28V DC is supply Voltage	Yes
A2	GND	Ground	GND	Ground	Yes
1	Reset	Control	HIGH	Resets PA when logic LOW is applied for five more seconds and released	Yes
2	Gate Disable	Control	LOW	Applying logic HIGH disables gate of amplifiers	Yes
3	Drain Disable	Control	LOW	Applying logic HIGH disables drain of amplifiers	Yes
4	RF Input Switch	Control	LOW	Applying logic HIGH turns OFF RF front-end switch to terminator	Yes
5	PA Off Alarm	Indicator	LOW	Pin will be latched to logic HIGH when any of the protection limit is reached	Yes
6	RF Input Over Drive	Indicator	LOW	Pin will be latched to logic HIGH when input signal is over limit	Yes
7	Temp Over	Indicator	LOW	Pin will be latched to logic HIGH when amplifier is driven over temperature	Yes
8	Current Over	Indicator	LOW	Pin will be latched to logic HIGH when drain current limit is reached	Yes
9	VSWR	Indicator	LOW	Pin will be latched to logic HIGH when output reflection is over limit	No
10	ID Imbalance	Indicator	LOW	Pin will be latched to logic HIGH when an imbalance in the drain current of the combining branches occurs	Yes
11	Temp monitor	Indicator	Voltage	Analog voltage relative to module's temperature	No
12	Current monitor	Indicator	Voltage	Analog voltage relative to module's current	No
13	RF ON/OFF	Control	LOW	Applying logic HIGH turns ON RF signal of amplifier	Yes
14	+5V	Power Supply	+5V	+5V DC is provided for reference *	Yes
15	GND	GND	GND	GND	Yes

Notes:

- HIGH/LOW voltages are standard TTL signals 0V 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.

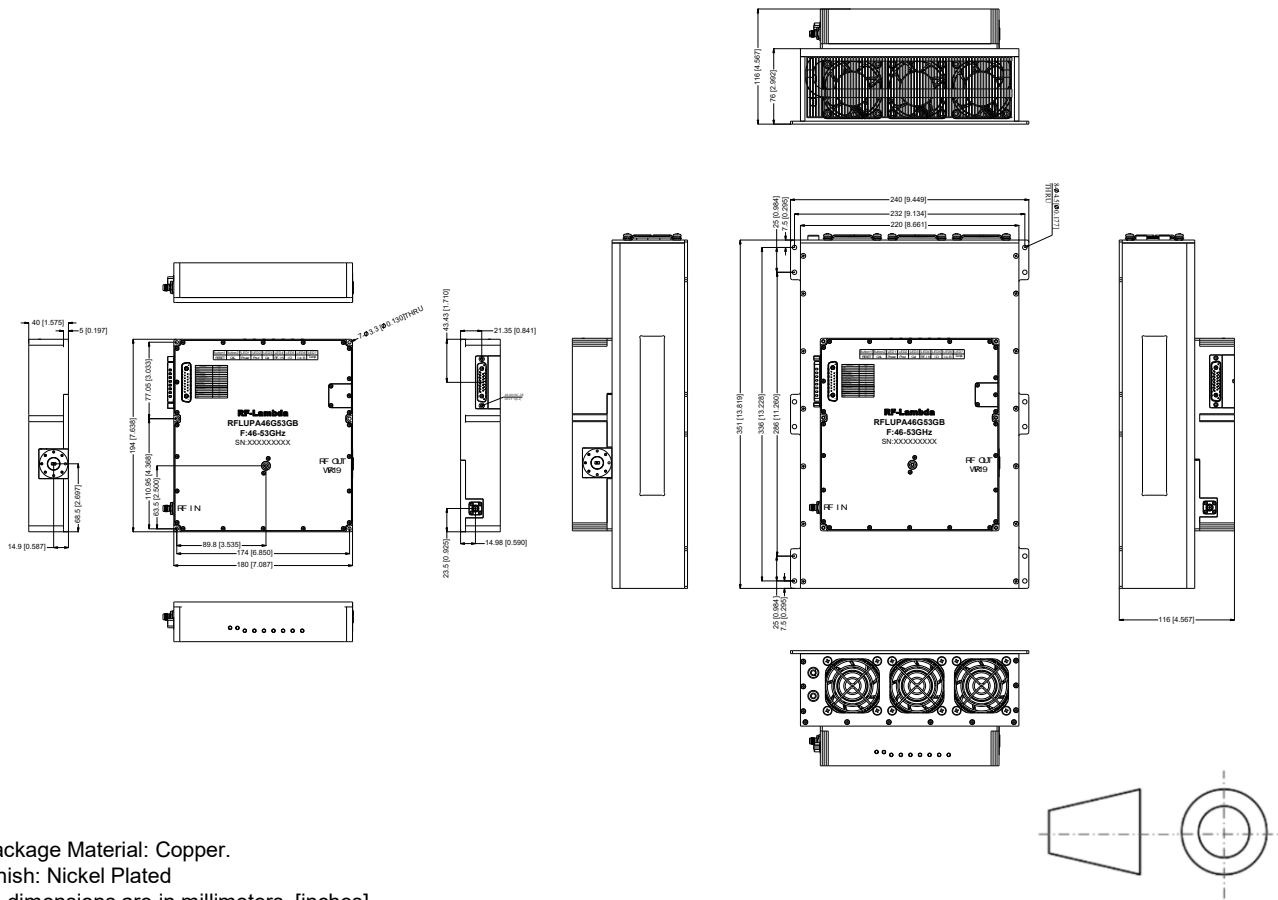
Alarm Status Panel



	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 <u>RED</u> 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 <u>RED</u> 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 <u>RED</u> color when current limit is reached *	Yes
LED 6	ID-Balance	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 *	Yes
LED 7	Over Temp	Indicator	GREEN Color	PA will shut down and latch this LED to a <u>RED</u> 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: Copper.
2. Finish: Nickel Plated
3. All dimensions are in millimeters [inches].
4. Tolerances ± 0.2 [0.008] 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. DB17 cable is configured for power connection port by default (RFCBLADB17)
7. Standard torque wrench must be used to secure RF connectors



Packing List

ID	Description	QTY
1	Fig a. DB17 cable (RFCBLADB17)	1
2	Fig b. Waveguide to coaxial adapter (RFA19V0COAL)(Consult sales)	0
3	Fig c. Screws (#4-40*5+6)	2



Fig a.



Fig b.



Fig c.

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
RFLUPA46G53GB	Input Connector 1.85mm-Female and Output Connector WR19	46GHz-53GHz 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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