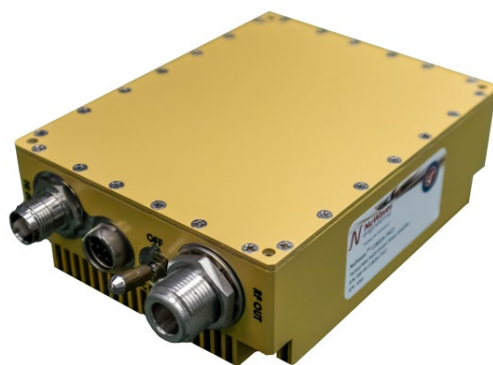


USER MANUAL
NUPOWER™ 11B02A-TAC2
MINI MULTI-OCTAVE POWER AMPLIFIER
W/ INTEGRATED HEATSINK

PART NUMBER:
NW-PA-11B02A-TAC2



NuWaves Engineering
132 Edison Drive
Middletown, Ohio 45044
PH: 513-360-0800
FAX: 513-539-8782
www.nuwaves.com
sales@nuwaves.com

1 NUPOWER™ PRODUCT LINE OVERVIEW

The NuPower family of solid state RF power amplifier (PA) modules is designed to meet the demanding needs of the Aerospace & Defense, Industrial, and Commercial markets. Based on the latest gallium nitride (GaN) technology, NuPower's power efficiency and miniature form factor make it ideal for size, weight, and power-constrained broadband RF telemetry and tactical communications systems.

1.1 NUPOWER™ PRODUCT LINE HIGHLIGHTS

- High Performance: Unique combination of broadband coverage, miniature form factors, and high efficiency.
- Enclosures: The NuPower family of power amplifiers is housed in a silver nickel plated aluminum enclosure with mounting holes incorporated into the chassis.
- Completely Characterized: The NuPower family of solid state power amplifiers has been completely characterized over temperature, voltage, and frequency. These high-performance modules offer significant value for the OEM user or the Systems Integrator.
- User Friendly: Reverse-Voltage & Over-Voltage protection and regulator thermal shutdown provide defenses against user interface issues.
- High Reliability: NuWaves' selection of conservatively rated components provides high reliability. Each NuPower is inspected to IPC-A-610 Class II quality standards. NuWaves' Quality Management System is AS9100:2016 Rev D and ISO 9001:2015 certified.
- Applications: Unmanned Aircraft Systems (UAS) • Unmanned Ground Vehicles (UGV) • Unmanned Surface Vehicles (USV) • Broadband RF Telemetry • RF Communication Systems • Software Defined Radios • Test Labs

2 NUPOWER™ MINI MULTI-OCTAVE PA OVERVIEW

The NuPower™ 11B02A-TAC2 Mini Multi-Octave Power Amplifier (MOPA) is a highly efficient, miniature solid state power amplifier that provides 10 watts (typical) of RF power across multiple octaves, from high VHF through S-band.

Based on the latest gallium nitride (GaN) technology, the NuPower 11B02A-TAC2's power efficiency and 23.63 cubic inch form factor make it ideal for size, weight, and power-constrained broadband RF telemetry and tactical communication systems.

The NuPower 11B02A-TAC2's rugged IP67-rated chassis with integrated heat sink allows the system integrator or operator to easily incorporate the unit into a platform operating in harsh environments with limited space, such as a tactical vehicle or manpack.

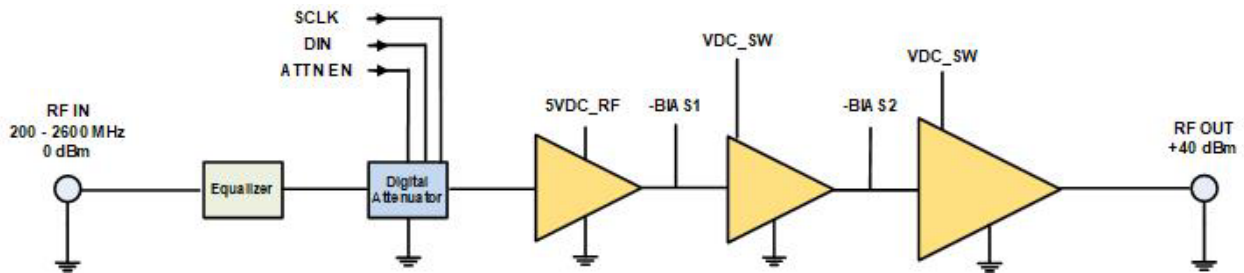


Figure 1: NuPower 11B02A-TAC2 Functional Diagram

2.1 NUPOWER 11B02A-TAC2 SPECIFICATIONS

The subsequent tables in this section outline the NuPower 11B02A-TAC2's performance specifications.

Table 1: NuPower 11B02A-TAC2 Electrical Specifications

Parameter	Specification
Frequency Range	200 MHz to 2.6 GHz
RF Output Power	7 Watts (min)*
RF Gain	40 dB (typ)
2 nd Harmonic	≤-10 dBc
Supply Voltage	+11 to +32 VDC
Current Consumption	1.4 A @ +28 VDC (typ)
Nominal Input Drive Level	0 dBm
Maximum Input Drive Level	+10 dBm

(No damage)	
Power Amplifier Enable	GND On
Impedance	50 Ω

*The NuPower 11B02A-TAC2 will provide 10 watts (typ) RF output power across 200 MHz to 2.6 GHz with an input drive level of +3 dBm.

Table 2: NuPower 11B02A-TAC2 Environmental Specifications

Operating Conditions	Specification
Operating Temperature - Ambient	-40 to +60 °C
Operating Temperature - Baseplate	-40 to +85 °C
Storage Temperature	-55 to +85 °C

Table 3: NuPower 11B02A-TAC2 Mean Time Between Failure (MTBF)

Conditions	Hours
Ground Benign (GB)	645,936
Airborne Inhabited Cargo (AIC)	217,065
Airborne Inhabited Fighter (AIF)	181,272
Airborne Uninhabited Cargo (AUC)	74,792
Airborne Uninhabited Fighter (AUF)	63,350

2.2 NUPOWER 11B02A-TAC2 MECHANICAL SPECIFICATIONS

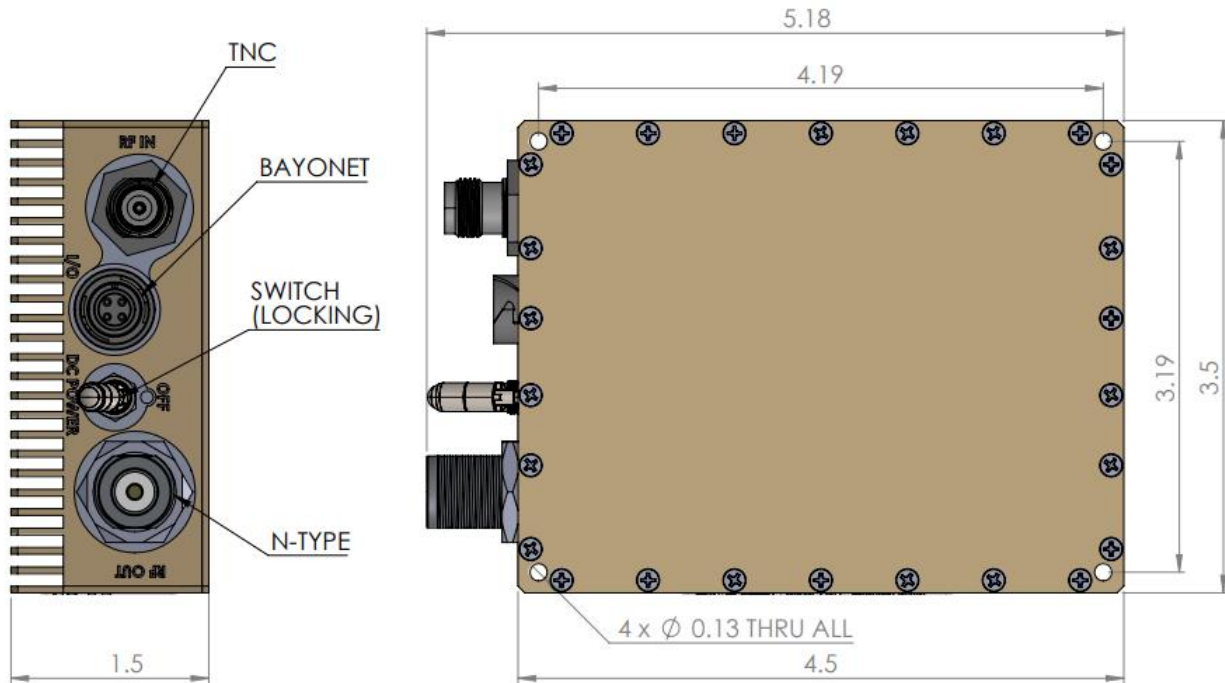


Figure 2: NuPower 11B02A-TAC2 Mechanical Outline

Table 4: NuPower 11B02A-TAC2 Mechanical Specifications

Parameter	Specification
RF Connectors	Input Output
Control / Power Interface Connector	4 Pin Bayonet (socket)
Dimensions (L x W x H)	4.50" x 3.50" x 1.50"
Weight	20 oz.

2.3 HEAT SINKING

The NuPower 11B02A-TAC2 features an integrated heatsink. The chassis/integrated heatsink was designed for short-duration transmit periods. If chassis temperature is allowed to exceed 85°C (default), the Temp Fault line will go low (0VDC) and bias to internal amplifiers will be removed until cooled to approximately 70°C.

Note: If desired, factory can reduce thermal shutdown point to protect users if worn on body. Contact sales@nuwaves.com to request changes.

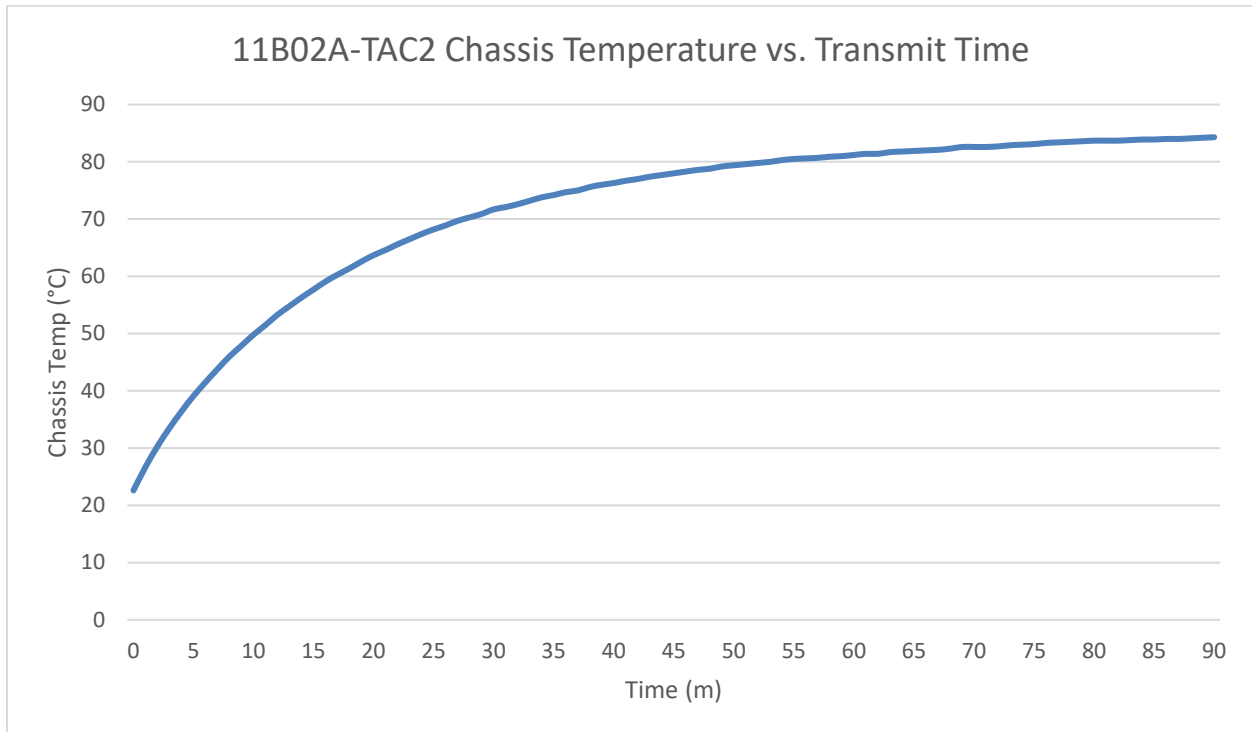


Figure 3: Chassis Temp vs. Time [@22°C Ambient, 25W Power Dissipation (average in band), 0dBm Input, CW]

3 SETUP AND OPERATION

This section provides specific details for proper operation of the NuPower 11B02A-TAC2 module. Following these guidelines will prevent damage to the power amplifier or external equipment.

3.1 POWER SUPPLY REQUIREMENTS

To operate the NuPower 11B02A-TAC2, ensure that the power supply has adequate overhead to source the current demand of the RF power amplifier. The power supply source must provide a typical voltage of +28 VDC with greater than 3 amps capability (or equivalent current based on acceptable 11-32V input voltage range).

3.2 CONNECTING A PROPER LOAD TO THE ANTENNA TERMINAL

To prevent damage to the PA, the antenna terminal must be terminated into a 50 Ω load. Examples of a proper load include:

- Directly connecting to an antenna specified for the frequency range (200 MHz to 2.6 GHz). Connecting to an inappropriate antenna may result in damage to the PA module.
- Connecting to a proper antenna through a 50 Ω transmission line or coaxial cable. Avoid using damaged cables or corroded connectors while attaching the unit to an antenna.
- Terminating the antenna terminal into a 50 Ω power attenuator with minimum 20 dB attenuation.
- Connecting to a load capable of dissipating the RF power from the PA module. Loads capable of handling 30 Watts (min) are recommended.

3.3 POWERING-UP THE 11B02A-TAC2

The NuPower 11B02A-TAC2 must be terminated to a proper load before power is applied. Refer to Section 3.2 for the specifications of the proper load. After the PA is properly terminated, the interface cable can be connected to the unit and power can be applied. The PA is now ready for operation.

3.4 TRANSMIT TURN-ON TIME



Caution: Do not apply transmit data until the PA module is at full power. This will prevent loss of data at the beginning of a message.

The NuPower 11B02A-TAC2 is at full power approximately 30 μ S after the RF Enable switch is placed in the 'ON' position. Therefore, transmit data can be applied to the input after 30 μ S without loss of data.

3.5 RF OUTPUT POWER VS. SUPPLY VOLTAGE

Although the NuPower 11B02A-TAC2 was designed for +28 VDC operation, the module is capable of providing suitable RF power output over a broad range of supply voltages: +11 VDC to +32 VDC.

3.6 DC POWER SWITCH

The DC Power Switch on the front panel will allow or remove power applied to the V Supply pin. This enables the user to connect a battery or power supply to the module without consuming unwanted power. Connect the interface cable to a power source and place switch toward 'DC Power' position to place the amplifier in *standby* mode.

3.7 RF ENABLE

The RF Enable line on the external interface cable controls the internal amplifiers' bias. When the RF Enable line is left floating, the NuPower 11B02A-TAC2 will be in *standby* mode. Pulling the line low (-0.5VDC to +1.5VDC, or GND) will place the module in *transmit* mode.

Note: The RF Enable line is pulled high internally and does not require applying a voltage.

3.8 TEMPERATURE FLAG

The Temp Flag line on the external interface cable is an indicator of an over-temperature condition in the NuPower 11B02A-TAC2. A Logic HIGH (+5VDC) signal indicates normal operation, while a Logic LOW (0VDC) indicates an over-temperature fault condition. The NuPower 11B02A-TAC2 incorporates internal logic circuitry that turns off the DC bias to the RF transistors to naturally allow the module to cool off. Default thermal shutdown point is +85°C and will restore bias and be fully functional when unit cools to approximately 70°C.

4 HARDWARE INTERFACE

- The RF Input connector is TNC (female).
- The RF Output connector is N-type (female).
- The pin-out definitions for the 4 pin bayonet connector are provided in Table 5.



The RF Out N-type connector is the antenna connection. This connection should always be loaded into 50 Ω , otherwise the PA could be damaged.

4.1 INTERFACE CABLE HARNESS

The cable harness that connects the host controller to the 4-pin bayonet connector of the NuPower 11B02A-TAC2 is made up of 4 wires.

Table 5: NuPower 11B02A-TAC2 Interface Pin-Out Definitions

Pin No.	Pin Name	I/O	Description
1	V Supply	I	Primary Power (+28 VDC)
2	GND	I	Signal and Power Ground
3	Temp Flag	O	Temperature Flag (5V=no fault/0V=temp fault)
4	RF Enable	I	RF Enable (Floating=standby/GND=bias enable)

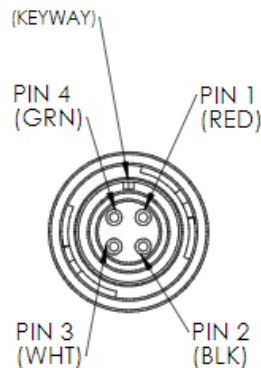


Figure 4: Bayonet Connector Socket Locations

4.2 DC POWER

The nominal supply voltage for the NuPower 11B02A-TAC2 is +28 VDC; however, the amplifier module is able to support operation over a supply voltage range of +11 to +32 VDC.

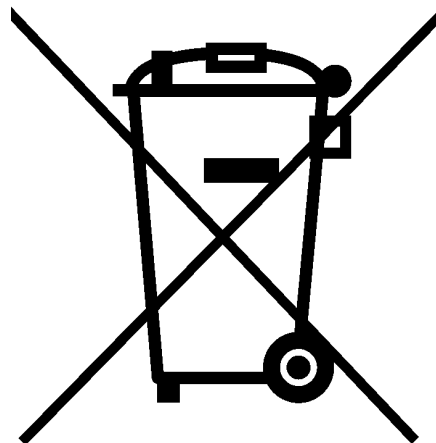
4.3 GROUND

The signal and power grounds are tied together in the PA module.

5 PRODUCT DISPOSAL – END-OF-LIFE

Safety is a guiding principle of NuWaves RF Solutions. We ensure safe production and operation of our products, as well as end-of-life disposal. Improper disposal can adversely affect the environment, wildlife and human health. Please follow these guidelines when disposing of a NuWaves product:

- Do not remove the cover or any hardware
- Do not remove components from the circuit card assembly
- Do not incinerate
- Do not crush or shred
- Do not dispose of as unsorted municipal waste
- Do not export e-waste outside of the original destination country for recycling
- Utilize an e-Steward or ISO14001 certified e-waste recycler
- Consider export controls during recycler selection
- If a NuWaves product is incorporated into a larger system or sub-system, ensure that these guidelines are followed at system end-of-life



6 GETTING HELP - APPLICATIONS ENGINEERING

NuWaves RF Solutions offers technical support for basic configuration help and troubleshooting, Monday through Friday, 8 a.m. to 5 p.m. Eastern Time.

Technical Assistance, Application Engineering, and Sales:

Phone: (513) 360-0800

Email: sales@nuwaves.com

NuWaves Home Page:

<http://www.nuwaves.com>

Product Warranty:

https://products.nuwaves.com/wp-content/uploads/NuWaves_Warranty_Repair.pdf

6.1 GENERAL INFORMATION

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