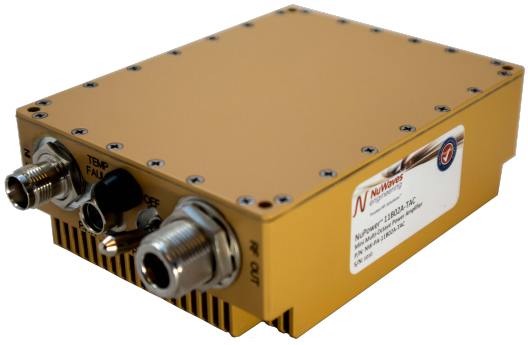
PRELIMINARY
USER MANUAL
NUPOWER™ 11B02A-TAC
MINI MULTI-OCTAVE POWER AMPLIFIER
W/ INTEGRATED HEATSINK

PART NUMBER:
NW-PA-11B02A-TAC

NuWaves engineering

Trusted RF Solutions™



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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 an 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: Man-Portable Tactical Radios • 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-TAC 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-TAC's power efficiency and 2.84 cubic inch form factor make it ideal for size, weight, and power-constrained broadband RF telemetry and tactical communication systems.

The NuPower 11B02A-TAC'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.

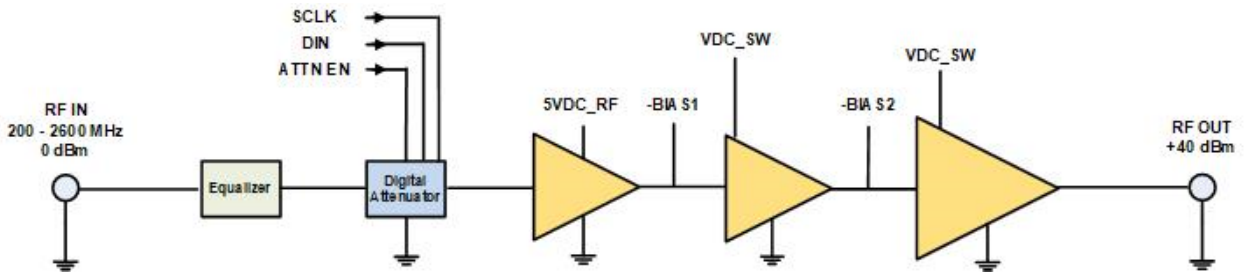


Figure 1: NuPower 11B02A-TAC Functional Diagram

2.1 NUPOWER 11B02A-TAC SPECIFICATIONS

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

Table 1: NuPower 11B02A-TAC Electrical Specifications

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

Nominal Input Drive Level	0 dBm
Maximum Input Drive Level (No damage)	+10 dBm
Power Amplifier Enable	GND On
Impedance	50 Ω

*The NuPower 11B02A-TAC 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-TAC 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-TAC Mean Time Between Failure (MTBF)

Conditions	Hours
Ground Benign (GB)	126,690
Airborne Inhabited Cargo (AIC)	14,800
Airborne Inhabited Fighter (AIF)	10,650
Airborne Uninhabited Cargo (AUC)	8,400
Airborne Uninhabited Fighter (AUF)	5,800

2.2 NUPOWER 11B02A-TAC MECHANICAL SPECIFICATIONS

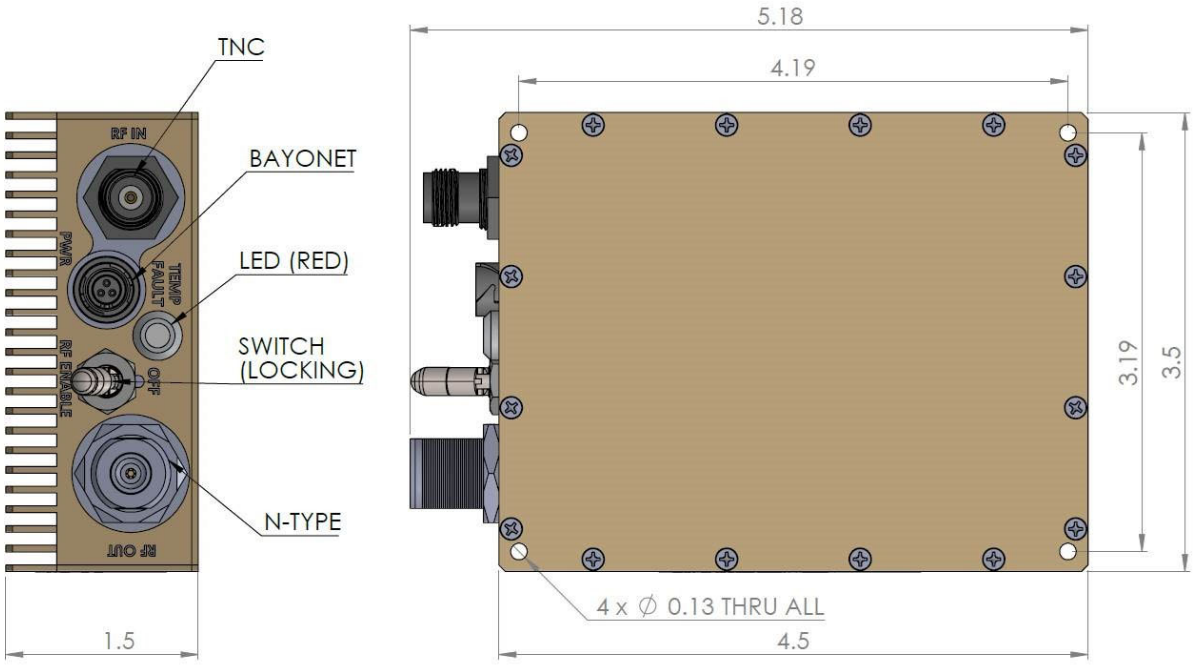


Figure 2: NuPower 11B02A-TAC Mechanical Outline

Table 4: NuPower 11B02A-TAC Mechanical Specifications

Parameter	Specification
RF Connectors Input Output	 TNC (Female) N (Female)
Control / Power Interface Connector	3 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-TAC incorporates an integrated heatsink.

3 SETUP AND OPERATION

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

3.1 POWER SUPPLY REQUIREMENTS

To operate the NuPower 11B02A-TAC, 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.

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 20 Watts (min) are recommended.

3.3 POWERING-UP THE 11B02A-TAC

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

3.5 RF OUTPUT POWER VS. SUPPLY VOLTAGE

Although the NuPower 11B02A-TAC 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 RF ENABLE SWITCH

This signal is the logic control input that designates whether the unit is in transmit or standby mode. If the switch is in the 'OFF' position, the unit will default to *standby* mode. Moving the switch to 'RF Enable' places the unit in *transmit* mode.

3.7 TEMP FAULT LED INDICATOR

The Temp Fault LED is an indicator of an over-temperature condition in the NuPower 11B02A-TAC. If the LED is off, it indicates normal operation, while an illuminated LED indicates an over-temperature condition. The NuPower 11B02A-TAC incorporates internal logic circuitry that turns off the DC bias to the RF transistors.

Caution: The amplifier should be shut down and allowed to cool off when the over-temperature fault LED is illuminated to avoid damage to the module.

4 HARDWARE INTERFACE

- The RF Input connector is TNC (female).
- The RF Output connector is N-type (female).
- The pin-out definitions for the 3 pin bayonet connector are provided in Table 5.
- The RF Enable Switch is described in section 3.6

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 3 pin bayonet connector of the NuPower 11B02A-TAC is made up of 2 wires.

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

Pin No.	Pin Name	I/0	Description
1	V Supply	I	Primary Power (+28 VDC)
2	N/C	-	No Connect
3	GND	I	Signal and Power Ground

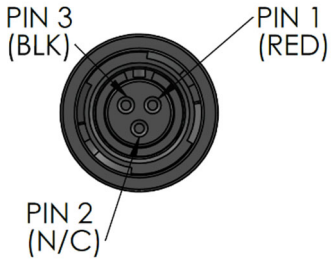


Figure 3: Bayonet Connector Socket Locations

4.2 DC POWER

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

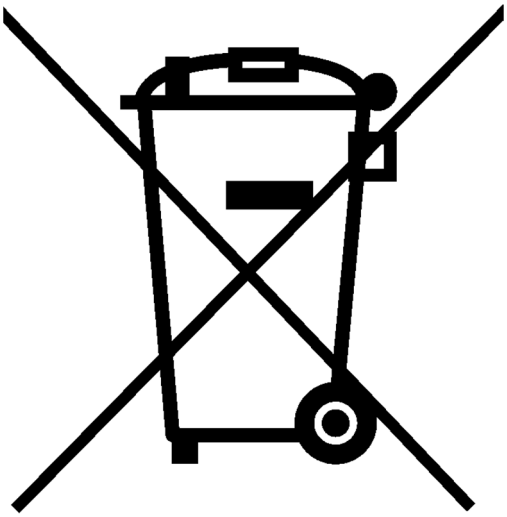
4.3 GROUND

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 Engineering. 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 Engineering 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: product.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