

# USER MANUAL

## NUPOWER™ 12B01A-03

### L-BAND POWER AMPLIFIER

PART NUMBER:  
NW-PA-12B01A-03



*Trusted RF Solutions™*



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## 1 NUPOWER™ PRODUCT LINE OVERVIEW

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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

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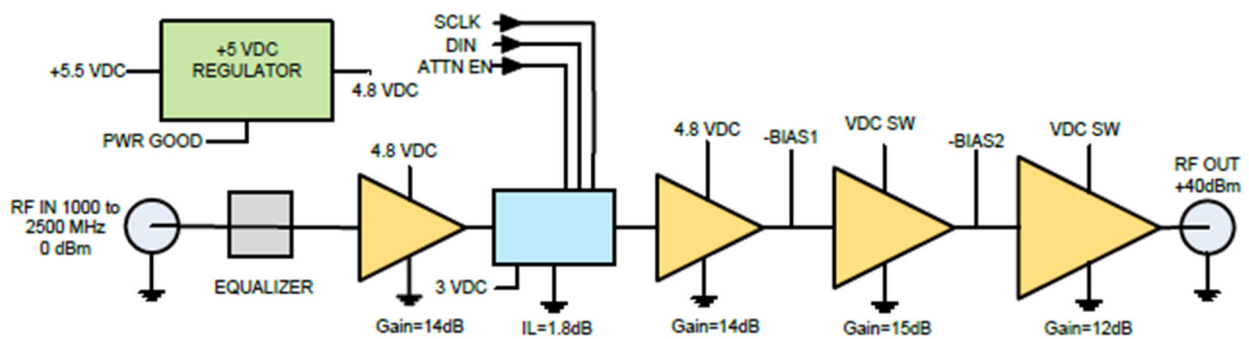
- High Performance: Unique combination of broadband coverage, miniature form factors, and high efficiency.
- Enclosures: The NuPower family of power amplifiers is housed in a silver nickel plated aluminum enclosure with mounting holes incorporated into the chassis.
- Completely Characterized: The NuPower 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
- Available Options:
  - Fan-cooled heat sink with AC/DC adapter
  - Labeled interface cable with banana jack plugs
  - 1 Watt input drive level

## 2 NUPOWER™ 12B01A-03 OVERVIEW

The NuPower™ 12B01A-03 solid state power amplifier (SSPA) is a small, highly efficient PA that provides over 10 watts of RF power across the L-band frequencies of 1435-1525 MHz.

Based on the latest GaN technology, NuPower’s greater than 40% power efficiency and 3.9 cubic inch form factor makes it ideal for size, weight, and power-constrained broadband RF telemetry and tactical communications systems.

The NuPower 12B01A-03 accepts a nominal 0 dBm RF input and provides over 40 dB of gain from 1435 to 1525 MHz. NuPower PAs feature over-voltage and reverse-voltage protection in addition to a simple control line interface allowing the user to easily place the module into transmit or standby mode of operation. A kit is available for purchase which includes a fan-cooled heatsink with AC / DC power adapter, and upgraded interface cable with labeled banana plugs.



**Figure 1: NuPower 12B01A-03 Functional Diagram**

### 2.1 NUPOWER 12B01A-03 SPECIFICATIONS

The subsequent tables in this section outline the NuPower 12B01A-03’s performance specifications.

**Table 1: NuPower 12B01A-03 Electrical Specifications**

Parameter	Specification
Frequency Range	1435 MHz to 1525 MHz
RF Output Power	10 Watts (min)
RF Gain	40 dB (min)
2 <sup>nd</sup> Harmonic	
1000 to 1400 MHz	≤ -6 dBc
1400 to 1525 MHz	≤ -15 dBc

Parameter	Specification
Supply Voltage	+11 to +32 VDC
Current Consumption	2.0 A @ +28 VDC (typ)
Power Amplifier Enable	GND On
Nominal Input Drive Level	0 dBm
Maximum Input Drive Level (No damage)	+10 dBm
Impedance	50 $\Omega$

**Table 2: NuPower 12B01A-03 Environmental Specifications**

Operating Conditions	Specification
Operating Temperature for Continuous Operation (>5 minutes)	-30 to +55 °C (ambient) -30 to +60 °C (baseplate)
Operating Temperature for 20% Duty Cycle	-30 to +60 °C (ambient) -30 to +65 °C (baseplate)
Storage Temperature	-40 to +85 °C

**Table 3: NuPower 12B01A-03 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 12B01A-03 MECHANICAL SPECIFICATIONS

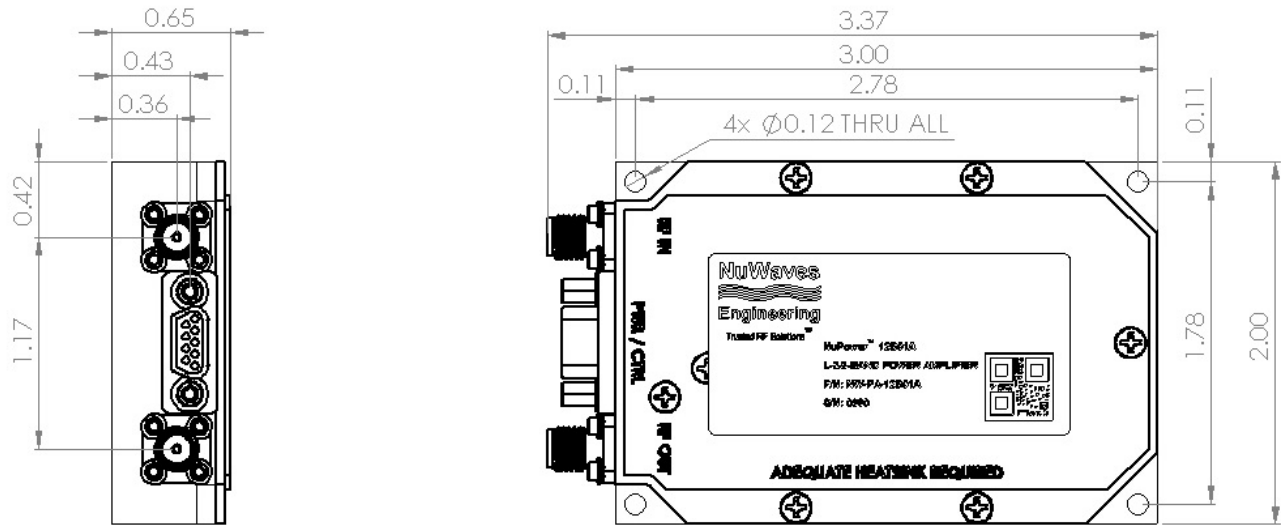


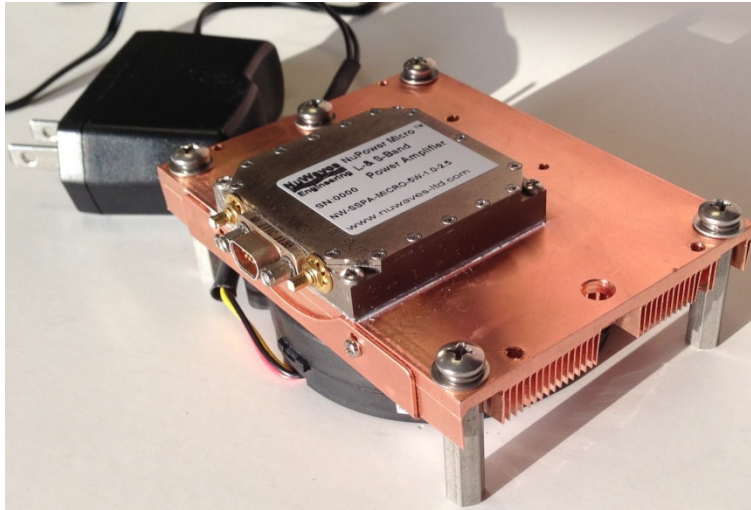
Figure 2: NuPower 12B01A-03 Mechanical Outline

Table 4: NuPower 12B01A-03 Mechanical Specifications

Parameter	Specification
RF Connectors	SMA (female)
Control / Power Interface Connector	9 Pin Micro-D (socket)
Dimensions (L x W x H)	3.00" x 2.00" x 0.65"
Weight	3.7 oz.

## 2.3 HEAT SINKING

The NuPower 12B01A-03 is offered as a stand-alone module or with a kit, which also includes a fan-cooled heatsink with an AC / DC adapter, and an interface cable.



**Figure 3: The NuPower PA Kit offers “out-of-the-box” operation for the user. The fan-cooled heatsink with an AC/DC adapter is shown with an example PA (NuPower 12B01A-03 not shown).**



Caution: The use of external heat-sinking is required especially for those applications requiring high duty cycle operation (e.g. continuous wave) or for extended on-time testing. Operation without a proper heat sink under these conditions will cause permanent damage to the product and will void the product warranty.

The external heatsink thermal resistance requirements are:

- $<0.25$  °C/W for operation up to 60 °C ambient
- $<0.7$  °C/W for operation up to 40 °C ambient

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## 3 SETUP AND OPERATION

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This section provides specific details for proper operation of the NuPower 12B01A-03 module. Following these guidelines will prevent damage to the power amplifier or external equipment.

### 3.1 POWER SUPPLY REQUIREMENTS

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To operate the NuPower 12B01A-03, 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

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

- Directly connecting to an antenna specified for the frequency range (1435 MHz to 1525 MHz). Connecting to an inappropriate antenna may result in damage to the PA module.
- Connecting to a proper antenna through a 50  $\Omega$  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  $\Omega$  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 12B01A-03

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The NuPower 12B01A-03 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

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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 12B01A-03 is at full power approximately 500  $\mu$ S after the RF Enable line goes low (ground). Therefore, transmit data can be applied to the input after 500  $\mu$ S without loss of data.