

**NuWaves**  
RF Solutions

## NuPower Xtender™ LS10S01 L- & S-Band Bidirectional Amplifier

20 Watt CW

10 Watts Linear, 5% EVM [QPSK]

1.0 GHz - 2.5 GHz

P/N: NW-BA-LS-10-S01

(includes NW-BA-ACC-CB09MA)

Contact [sales@nuwaves.com](mailto:sales@nuwaves.com) for custom options



**The NuPower Xtender™ LS10S01 is a small, lightweight, and power-efficient bidirectional amplifier ideal for extending the communication range of half-duplex L- or S-band transceivers running constant-envelope or near-constant-envelope waveforms. The bidirectional amplifier generates 20 Watts of RF power from 1000 to 2500 MHz in transmit mode and the integrated low-noise amplifier typically provides 14 dB of gain in receive mode.**

Based on the latest gallium nitride (GaN) technology, the Xtender typically offers 38% power efficiency at most frequencies and its compact size makes it ideal for integration into space-constrained platforms. Adjacent radio frequency bands, such as the popular 900 MHz Industrial, Scientific and Medical (ISM) band, are also supported by the bidirectional PA, at lower peak power levels.

Accepting a +5 dBm RF input, the Xtender typically provides 38 dB of gain. The Xtender also features over-voltage and reverse-voltage protection and operates over a wide temperature range of -40 to +85 °C baseplate.

**Extend your operational communication range with NuPower™ amplifiers from NuWaves RF Solutions.**

### Features

- 20 Watts (typ) RF Output Power
- 1.0 to 2.5 GHz
- Bidirectional Operation
- 38 dB (typ) of Transmit Gain
- 14 dB (typ) Receive Gain
- Fast T/R Mode Switching with Auto-Sensing or Manual T/R Line
- Small Form Factor
- High Efficiency GaN Technology
- Over-Voltage & Reverse-Voltage Protection

### Applications

- Unmanned Aircraft Systems (UAS) - Group 2 and Group 3
- Unmanned Ground Vehicles (UGV)
- Software Defined Radios
- Air Launch Effect (ALE)
- Common Launch Tube (CLT)
- Counter UAS Detection and Mitigation
- MIMO/MANET Radio Range Extension
- SISO Radio Range Extension

# NuPower Xtender™ LS10S01 BDA

## Specifications

### Absolute Maximums

| Parameter                                 | Rating                      | Unit |
|---|-----------------------------|------|
| Max Device Voltage                        | 32                          | V    |
| Max Device Current                        | 3.5                         | A    |
| Max RF Input Power, CW, $Z_L = 50 \Omega$ | XCVR Port: +10              | dBm  |
|   | ANT Port <sup>1</sup> : +30 |      |
| Max Operating Temperature (ambient)       | 60                          | °C   |
| Max Operating Temperature (baseplate)     | 85                          | °C   |
| Max Storage Temperature                   | 85                          | °C   |

| Export Classification |
|-----------------------|
| ECCN 5A991G           |

<sup>1</sup>Max operational receive input power = -20 dBm

### Electrical Specifications - Operational @ 28 VDC, 25 °C, $Z_S=Z_L=50 \Omega$ , CW, Pin = + 5 dBm (unless otherwise specified)

| Parameter                    | Symbol               | Min  | Typ  | Max  | Unit    | Condition            |
|------------------------------|----------------------|------|------|------|---------|----------------------|
| Operating Frequency          | BW                   | 1000 |      | 2500 | MHz     |                      |
| Switching Speed              | TX <sub>ON/OFF</sub> |      | 0.95 | 1.5  | $\mu$ S | Rx - Tx (Manual T/R) |
|                              |                      |      | 1.3  | 1.5  |         | Tx - Rx (Manual T/R) |
|                              |                      |      | 1.3  | 1.5  |         | Rx - Tx (Autosense)  |
|                              |                      |      | 1.6  | 2.0  |         | Tx - Rx (Autosense)  |
| Operating Voltage            | VDC                  | 11   | 28   | 32   | V       |                      |
| Operating Current (Transmit) | I <sub>DD</sub>      |      | 2.3  | 3.5  | A       | CW                   |
| Module Efficiency (Transmit) |                      |      | 38   |      | %       | CW                   |

### Electrical Specifications - Transmit @ 28 VDC, 25 °C, $Z_S=Z_L=50 \Omega$ , CW, Pin = +5 dBm (unless otherwise specified)

| Parameter                       | Symbol          | Min | Typ       | Max  | Unit   | Condition                        |
|---------------------------------|-----------------|-----|-----------|------|--------|----------------------------------|
| RF Output Power, Linear         | P <sub>L</sub>  |     | 10        |      | W      | QPSK, 1 Msps, 35% Filter         |
| RF Output Power, Psat           | Psat            | 10  | 20        |      | W      |                                  |
| Transmit Gain                   | G               |     | 38        |      | dB     |                                  |
| Power Gain Flatness             | $\Delta$ G      |     | $\pm 1.5$ |      | dB     | 1-2.5 GHz                        |
| Small Signal Gain Flatness      | $\Delta$ G      |     | $\pm 4$   |      | dB     | Pin=-30dBm, 1-2.5 GHz            |
| Harmonics                       | 2nd             |     | -18       |      | dBc    |                                  |
|                                 | 3rd             |     | -22       |      |        |                                  |
| Nominal Input Drive Level       | P <sub>IN</sub> |     | 5         |      | dBm    |                                  |
| Quiescent Current               | I <sub>DD</sub> |     | 115       |      | mA     | T/R Enable Off (Receive Current) |
| Transmit Current                | I <sub>TX</sub> |     | 2.3       | 3.5  | A      |                                  |
| Transmit Input VSWR (XCVR Port) | VSWR            |     | 1.4:1     |      |        |                                  |
| Transmit Output Mismatch VSWR   | VSWR            |     |           | 10:1 | $\Psi$ | No damage at all phase angles    |

### Electrical Specifications - Receive @ 28 VDC, 25 °C, $Z_S=Z_L=50 \Omega$ , CW, -30 dBm Input Power (unless otherwise specified)

| Parameter             | Symbol     | Min | Typ     | Max | Unit | Condition |
|-----------------------|------------|-----|---------|-----|------|-----------|
| Receive Gain          | G          | 12  | 14      |     | dB   |           |
| Receive P1dB          | P1dB       |     | 16.2    |     | dBm  |           |
| Receive Gain Flatness | $\Delta$ G |     | $\pm 1$ |     | dB   | 1-2.5 GHz |

# NuPower Xtender™ LS10S01 BDA

## Specifications (cont.)

Electrical Specifications - Receive (cont.) @ 28 VDC, 25 °C,  $Z_s=Z_L=50 \Omega$ , CW, -30 dBm Input Power (unless otherwise specified)

| Parameter                     | Symbol   | Min | Typ   | Max | Unit | Condition |
|-------------------------------|----------|-----|-------|-----|------|-----------|
| Receive Current               | $I_{RX}$ |     | 115   |     | mA   |           |
| Receive Noise Figure          | NF       |     | 2     |     | dB   |           |
| Receive Input VSWR (ANT Port) | VSWR     |     | 1.6:1 |     |      |           |

## Mechanical Specifications

| Parameter                   | Value                      | Unit | Limits |
|-----------------------------|----------------------------|------|--------|
| Dimensions                  | 3.0 x 2.0 x 0.65           | in   | Max    |
| Weight                      | 4                          | oz   | Max    |
| RF Connectors, Input/Output | SMA Female                 |      |        |
| Interface Connector         | Micro-D, 9-pin Socket      |      |        |
| Cooling                     | Adequate Heatsink Required |      |        |

## Environmental Specifications

| Parameter                               | Symbol    | Min | Typ | Max    | Unit |
|---|-----------|-----|-----|--------|------|
| Operating Temperature (ambient)         | $T_A$     | -40 |     | +60    | °C   |
| Operating Temperature (baseplate)       | $T_C$     | -40 |     | +85    | °C   |
| Storage Temperature                     | $T_{STG}$ | -55 |     | +85    | °C   |
| Relative Humidity (non-condensing)      | RH        |     |     | 95     | %    |
| Altitude<br>MIL-STD-810F - Method 500.4 | ALT       |     |     | 30,000 | ft   |

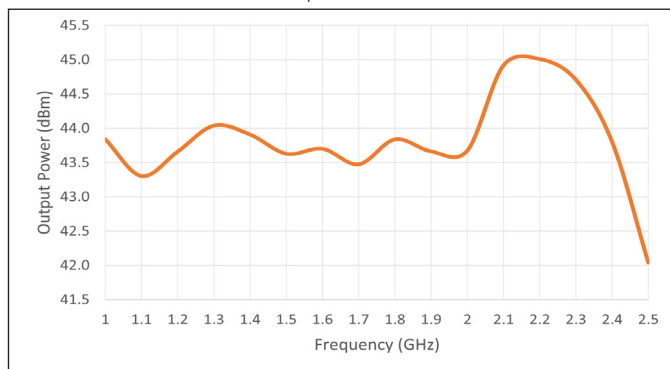
  

|  |   |
|--|---|
| <p>Vibration / Shock Profile<br/>(Random profile in x, y, z axis, as per Figure for 15 minute duration in each axis)</p> | <p>Power Spectral Density, <math>g^2/Hz</math></p> <p>Frequency, Hz</p> |
|--|---|

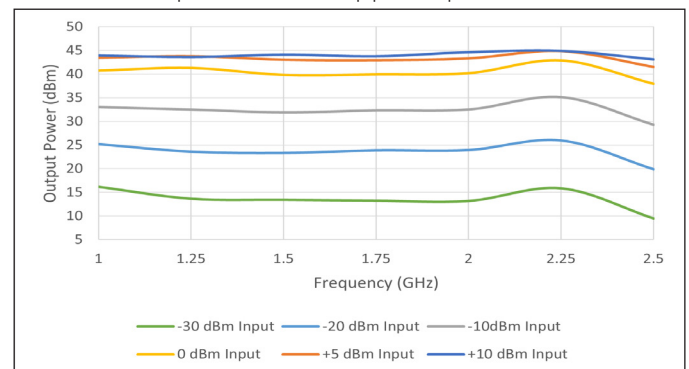
## Transmit Performance Plots

Test Conditions: +28 VDC, +25 °C,  $Z_s=Z_L=50 \Omega$ , CW, +5dBm Input Power (unless otherwise specified)

Output Power



Output Power - Stepped Input Power

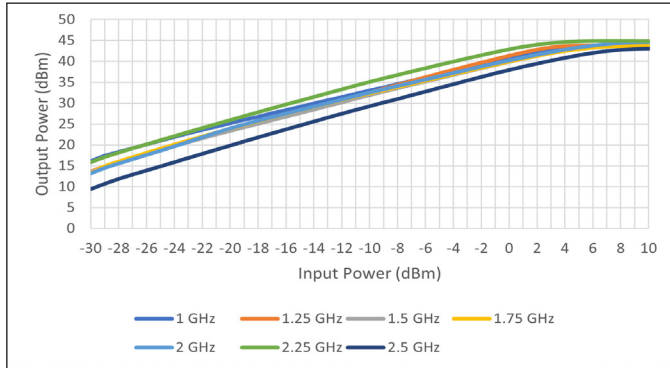


# NuPower Xtender™ LS10S01 BDA

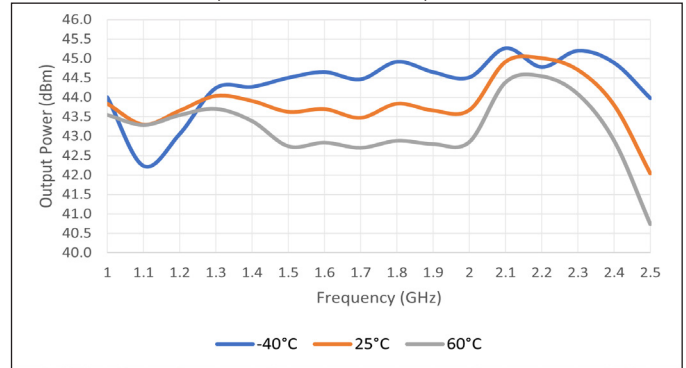
## Transmit Performance Plots (cont.)

Test Conditions: +28 VDC, +25 °C,  $Z_S=Z_L=50 \Omega$ , CW, +5dBm Input Power (unless otherwise specified)

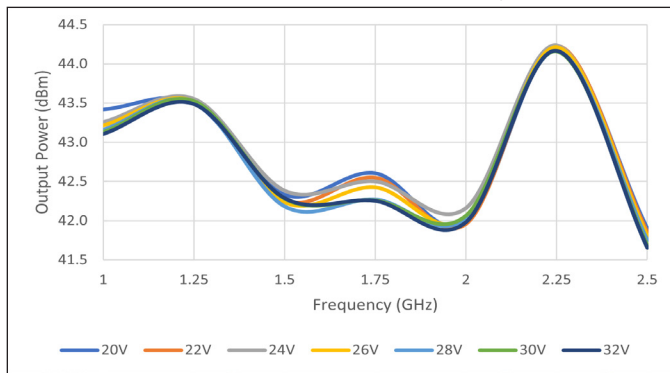
Output Power vs. Input Power



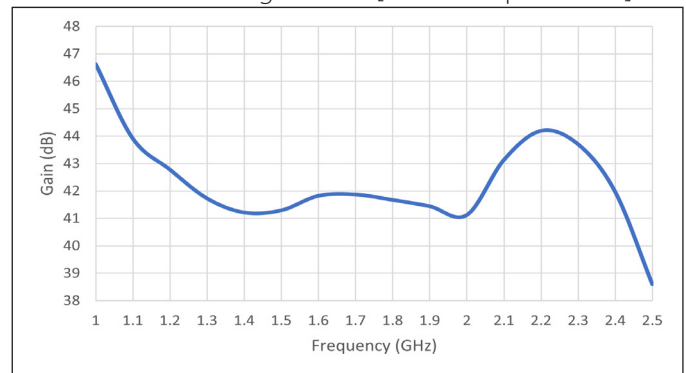
Output Power vs Temperature



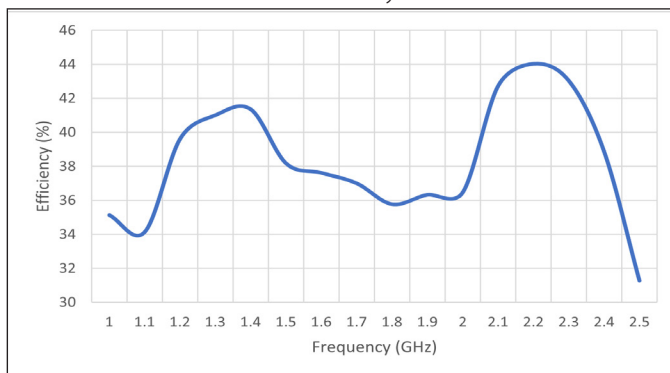
Output Power vs. Input Voltage



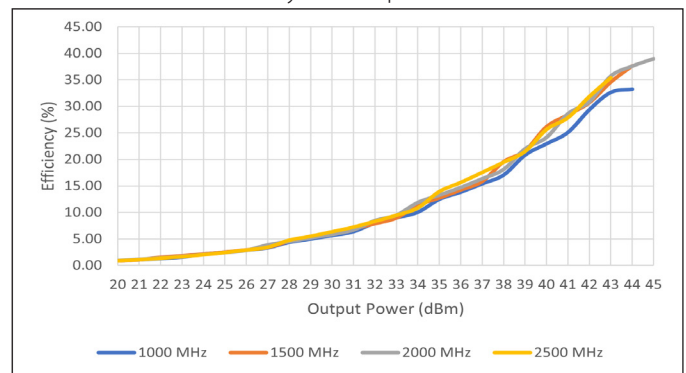
Transmit Small Signal Gain [-30dBm Input Power]



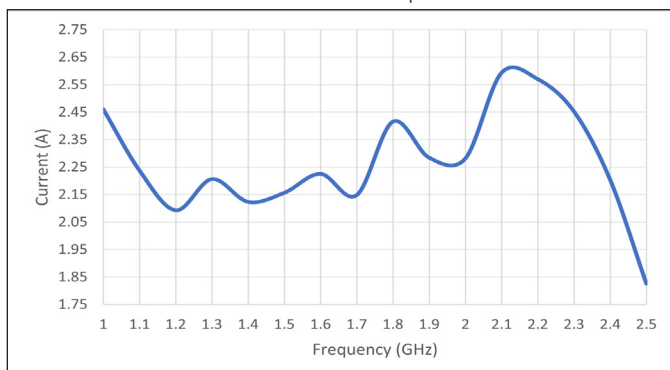
Efficiency



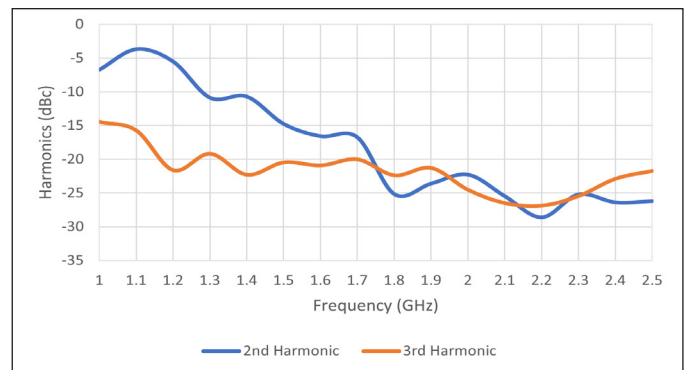
Efficiency vs. Output Power



Current Consumption



Harmonics

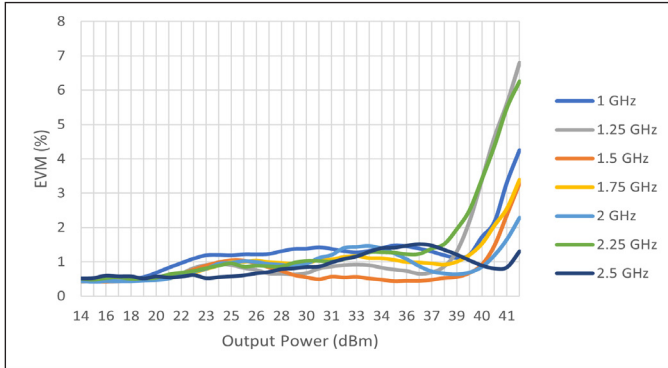


# NuPower Xtender™ LS10S01 BDA

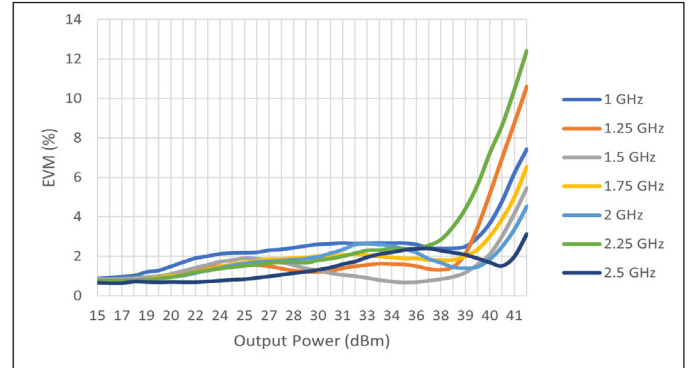
## Transmit Performance Plots (cont.)

Test Conditions: +28 VDC, +25 °C,  $Z_s=Z_L=50 \Omega$ , CW, +5dBm Input Power (unless otherwise specified)

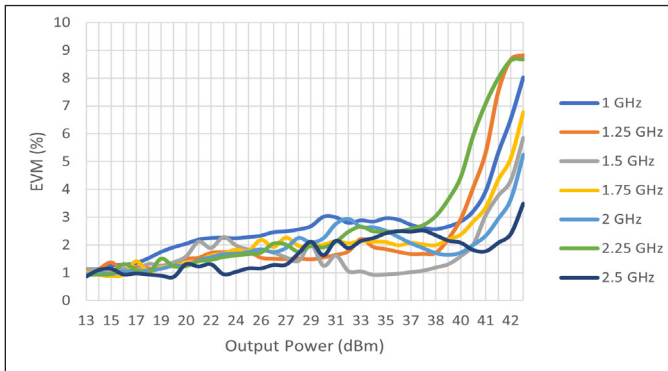
EVM vs. Output Power [QPSK, 1 Msps, 35% Filter]



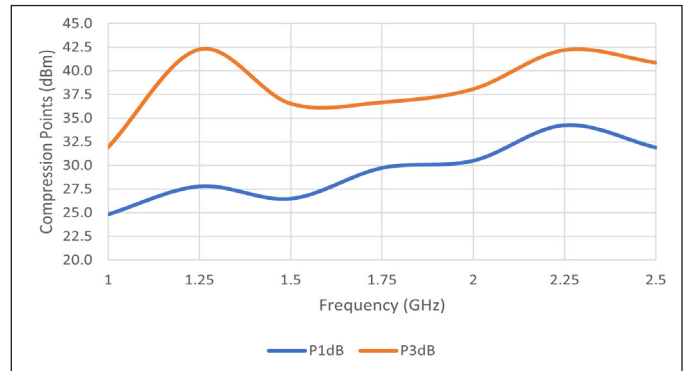
EVM vs. Output Power [16 QAM, 2 Msps, 35% Filter]



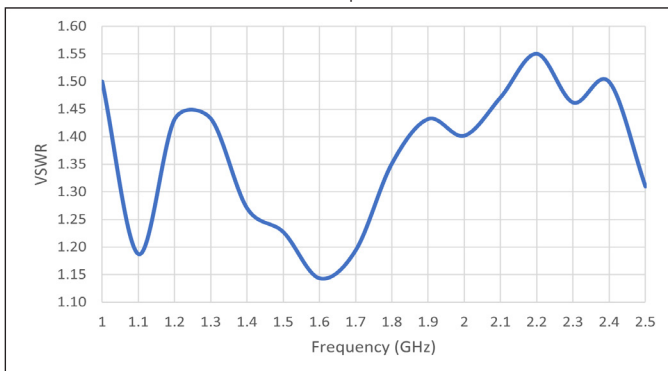
EVM vs. Output Power [64 QAM, 5 Msps, 10% Filter]



Transmit P1dB & P3dB



Transmit Input VSWR

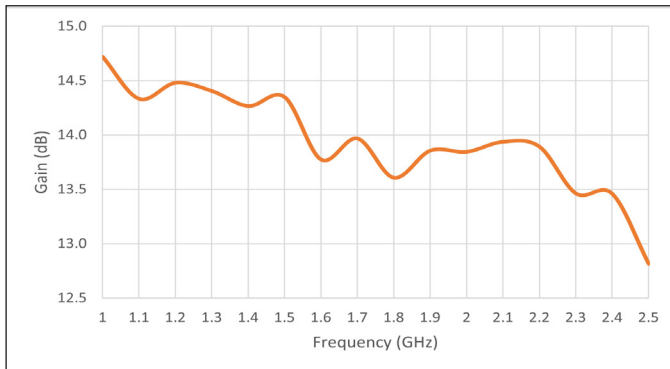


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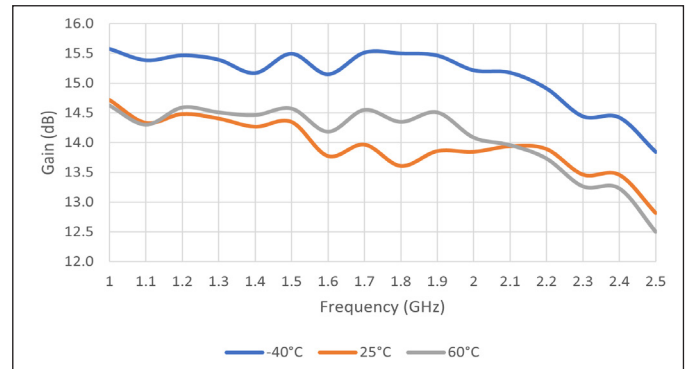
## Receive Performance Plots

Test Conditions: +28 VDC, +25 °C,  $Z_s=Z_L=50 \Omega$ , CW, -30 dBm Input Power (unless otherwise specified)

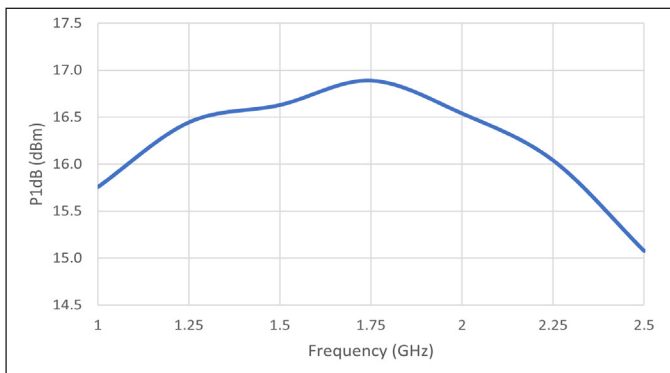
### Receive Gain



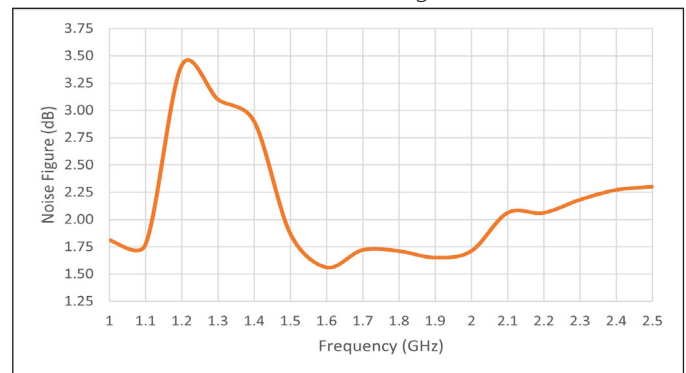
### Receive Gain vs Temperature



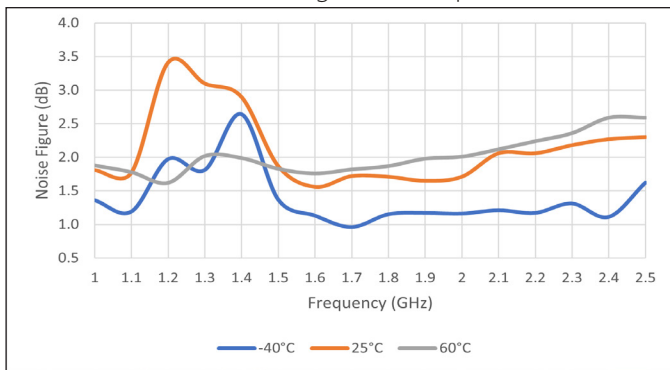
### Receive P1dB



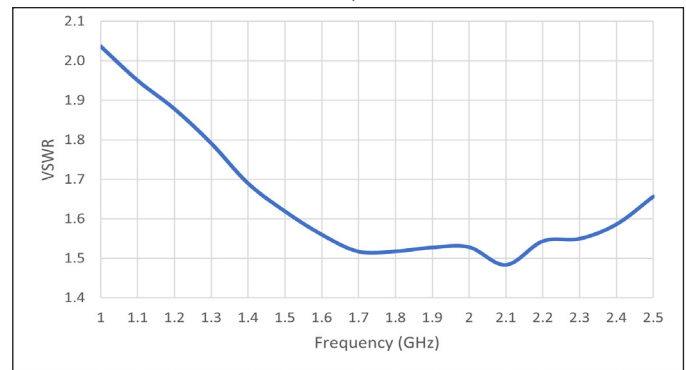
### Receive Noise Figure



### Receive Noise Figure vs Temperature

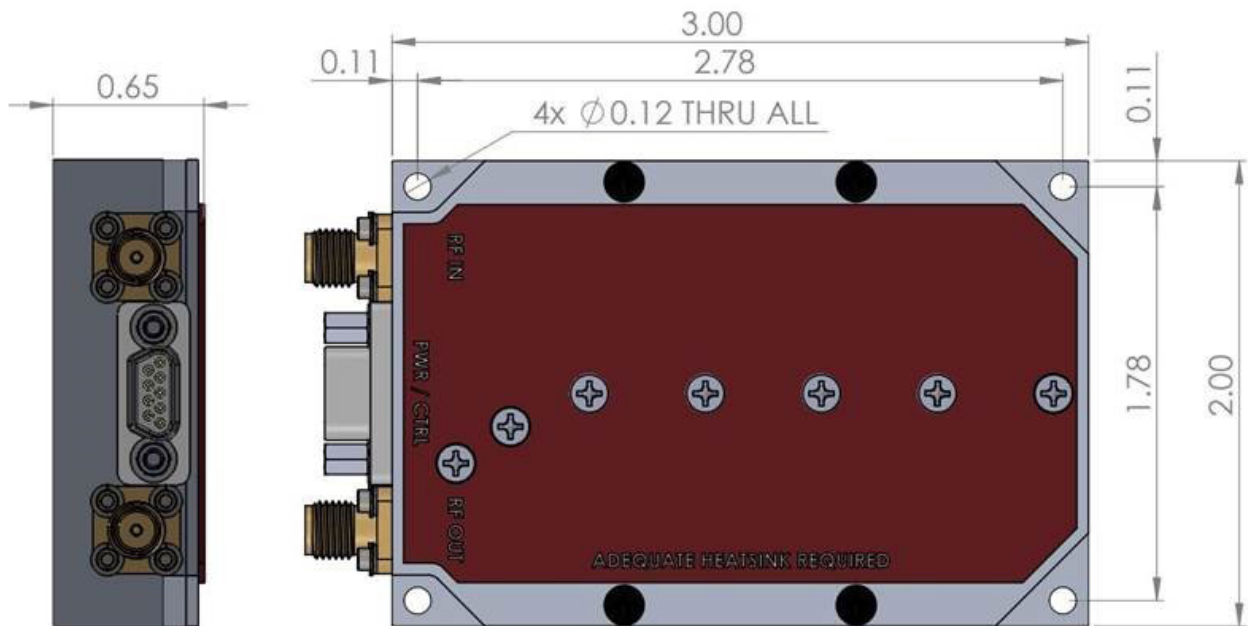


### Receive Input VSWR



# NuPower Xtender™ LS10S01 BDA

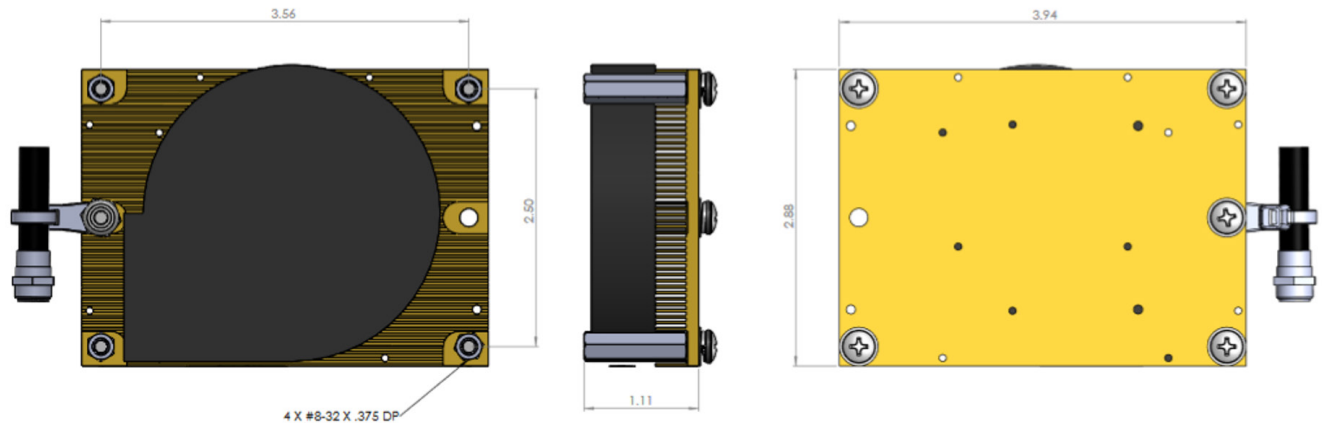
## Mechanical Outline



# NuPower Xtender™ LS10S01 BDA

## Optional Heatsink Drawing

Heatsink and Integrated Fan: HTSK-01



## Accessory Part Numbers

| Part Number                                | Description  |
|--|--|
| <a href="#">NW-FL-05LPLE-2500-SFSF-M01</a> | Harmonic Filter Module   |
| NW-BA-ACC-CB09MA                           | Standard Interface Cable Assembly - Flying Leads (included with module)        |
| NW-BA-ACC-CT09MA                           | Upgraded Interface Cable Assembly - Banana Plug Termination                    |
| NW-BA-ACC-KT01                             | Accessory Kit, which includes Fan-Cooled Heatsink and Upgraded Interface Cable |
| HTSK-01                                    | Heatsink with Integrated Fan   |

For information on product disposal (end-of-life), please refer to this document: <https://nuwaves.com/wp-content/uploads/Product-Disposal-End-of-Life.pdf>

## Pinout

| Function   | I/O | Pin     | Logic Voltage   |
|--|-----|---------|---|
| DC Power (Primary Power, +11 to +32 Volts)   | I   | 1, 2, 9 | -   |
| Ground (DC Return)   | I   | 3, 4, 5 | -   |
| RS-485 Data Transmit   | O   | 6       | -   |
| RS-485 Data Receive  | I   | 7       | -   |
| T/R Enable   |     |         | 3.3V Logic <sup>2</sup><br>High: 2.31 - 3.8 VDC<br>Low: -0.5 - 0.99 VDC |
| T/R Mode: Source (Autosense) <sup>1</sup><br>T/R Mode: Sink (Manual T/R)<br>[High TX / Low RX] | I/O | 8       | 5V Logic <sup>2</sup><br>High: 3.5 - 5.5 VDC<br>Low: -0.5 - 1.5 VDC     |

<sup>1</sup>Autosense automatically switches to transmit and receive based on input signal strength. Typical threshold is 0 dBm; see user manual for complete information.

<sup>2</sup>Logic level configurable by user or factory. Default logic level is 3.3V.

## Contact NuWaves



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