

# NuWaves

## RF Solutions

### NuPower™ 05E05A S-Band Solid State Power Amplifier

20 Watts (CW)  
2.0 - 2.6 GHz  
12 Watts Linear, 5% EVM @ 41dBm

P/N: NW-PA-05E05A



**The NuPower™ 05E05A is a small, highly efficient connectorized solid state power amplifier that provides 20 watts (min) of RF power to boost performance of data links and transmitters.**

The NuPower 05E05A accepts a nominal 0 dBm (1 mW) RF input and provides >43 dB of gain from 2000 MHz to 2600 MHz for continuous wave (CW) and near-constant-envelope waveforms.

Based on the latest gallium nitride (GaN) technology, the NuPower 05E05A's 35% to 50% power efficiency at rated power and <10 in<sup>3</sup> form factor make it ideal for size, weight, and power-constrained broadband RF telemetry, tactical communication, and electronic warfare systems.

NuPower PAs feature over-voltage protection and can operate over a wide temperature range of -40 °C to +85 °C (baseplate).

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

#### Features

- 20 Watts RF Output Power (min)
- 2000 MHz to 2600 MHz
- Small Form Factor (4.50" x 3.50" x 0.61")
- High-Efficiency GaN Technology
- 0 dBm Nominal RF Input
- Over-Voltage Protection
- Logic On/Off Control

#### Benefits

- Extended Range
- Improved Link Margin
- Reduced load on DC power budget due to high efficiency operation
- Requires less volume on space-constrained platforms

#### Applications

- Broadband RF Telemetry
- RF Communication Systems
- Electronic Warfare - Airborne Electronic Attack
- Unmanned Aircraft Systems (UAS)
- Unmanned Ground Vehicles (UGV)
- Software Defined Radios

# NuPower™ 05E05A Power Amplifier

## Specifications

### Absolute Maximums

| Parameter                             | Rating | Unit |
|---------------------------------------|--------|------|
| Max Device Voltage                    | 32     | V    |
| Max Device Current                    | 3.25   | A    |
| Max RF Input Power, $Z_L = 50 \Omega$ | 12     | dBm  |
| Max Operating Temperature (ambient)   | 85     | °C   |
| Max Operating Temperature (baseplate) | 85     | °C   |
| Max Storage Temperature               | 85     | °C   |

| Export Classification |
|-----------------------|
| EAR99                 |

### Electrical Specifications @ 28VDC, 25 °C, $Z_S=Z_L=50 \Omega$

| Parameter   | Symbol        | Min  | Typ  | Max  | Unit    | Condition                           |
|---|---------------|------|------|------|---------|-------------------------------------|
| Operating Frequency   | BW            | 2000 |      | 2600 | MHz     |                                     |
| RF Output Power   | $P_{SAT}$     | 20   | 30   |      | W       | 2000 MHz - 2600 MHz,<br>0 dBm input |
| Output Power @ 1dB Compression  | $P_{1dB}$     |      | 31   |      | dBm     | 2000 MHz                            |
|   |               |      | 31   |      |         | 2300 MHz                            |
|   |               |      | 29   |      |         | 2600 MHz                            |
| Small Signal Gain   | G             |      | 51   |      | dB      | 2000 MHz, @ -40 dBm input           |
|   |               |      | 49   |      |         | 2300 MHz, @ -40 dBm input           |
|   |               |      | 49   |      |         | 2600 MHz, @ -40 dBm input           |
| Small Signal Gain Flatness  | $\Delta G$    |      | 2.5  |      | dB      | $P_{in} = -40$ dBm                  |
| Input VSWR  | VSWR          |      | 2.2  |      |         |                                     |
| Nominal Input Drive Level   | $P_{IN}$      |      | 0    |      | dBm     |                                     |
| Operating Voltage   | VDC           | 27   | 28   | 30   | V       |                                     |
| Quiescent Current (unbiased)  | $I_{DQ}$      |      | 0.10 |      | A       | RF Enable Floating                  |
| Quiescent Current (biased)  | $I_{DQ}$      |      | 0.65 |      | A       | RF Enable Low                       |
| Operating Current   | $I_{DD}$      |      | 2.4  |      | A       | $P_{in} = 0$ dBm                    |
| Module Efficiency   |               |      | 45   |      | %       | $P_{in} = 0$ dBm, +28V              |
| Switching Speed   | $TX_{ON/OFF}$ |      |      | 2    | $\mu S$ | 10% to 90%                          |
| Third Order Order Intercept Point<br>(Two tone test at 1 MHz spacing,<br>$P_{out} = 20$ dBm / tone) | OIP3          |      | 44   |      | dBm     | 2000 MHz                            |
|   |               |      | 44   |      |         | 2300 MHz                            |
|   |               |      | 43   |      |         | 2600 MHz                            |
| Harmonics   | 2nd           |      | -20  |      | dBc     |                                     |
|   | 3rd           |      | -25  |      |         |                                     |
| Output Mismatch (No Damage)   |               |      |      | 10:1 | $\Psi$  | No Damage at All Phase Angles       |

# NuPower™ 05E05A Power Amplifier

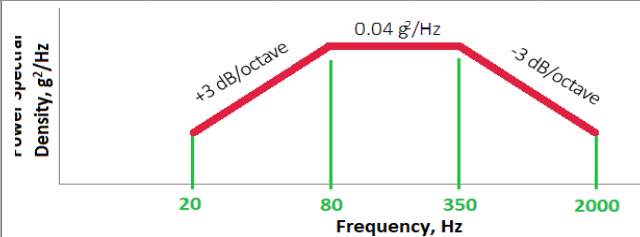
## Specifications (cont.)

### Mechanical Specifications

| Parameter                   | Value                      | Unit | Limits |
|-----------------------------|----------------------------|------|--------|
| Dimensions                  | 4.5 x 3.5 x 0.61           | in   | Max    |
| Weight                      | 9                          | 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   |
| Vibration / Shock Profile<br>(Random profile in x,y, z axis, as per Figure for 15 minute duration in each axis) |           |     |     |        |      |

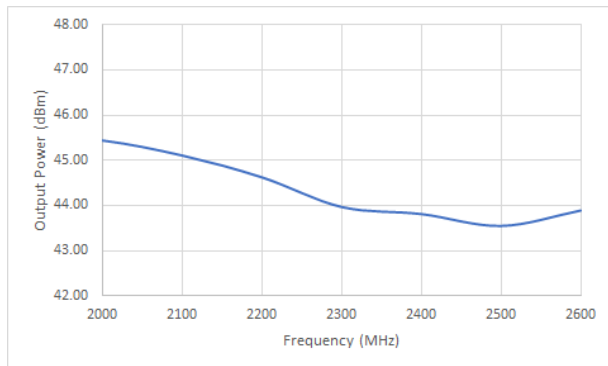


# NuPower™ 05E05A Power Amplifier

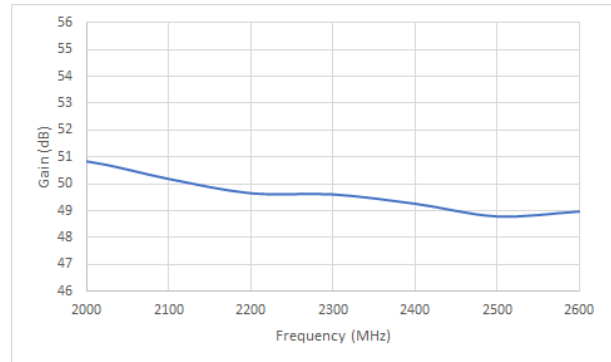
## Performance Plots

Test Conditions: +28 VDC, +25 °C,  $Z_S=Z_L=50 \Omega$

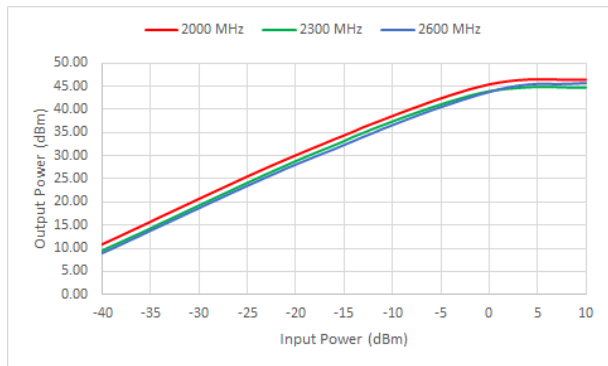
Output Power [0dBm Input Power]



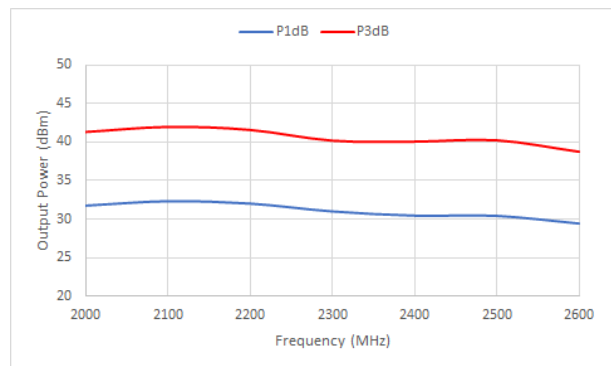
Small Signal Gain [-40dBm Input Power]



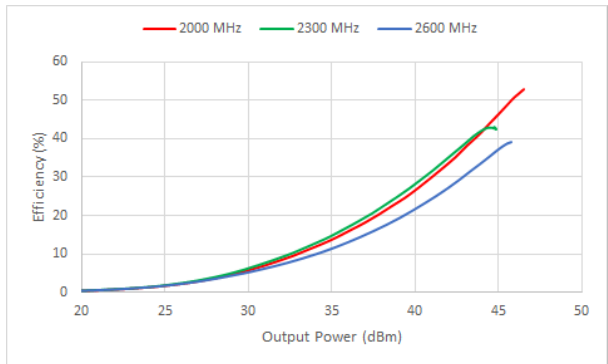
Output Power vs. Input Power



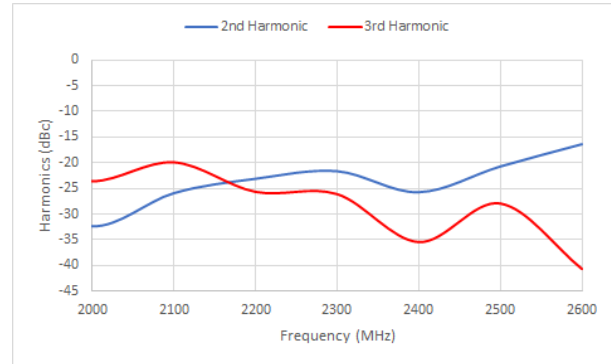
P1dB & P3dB



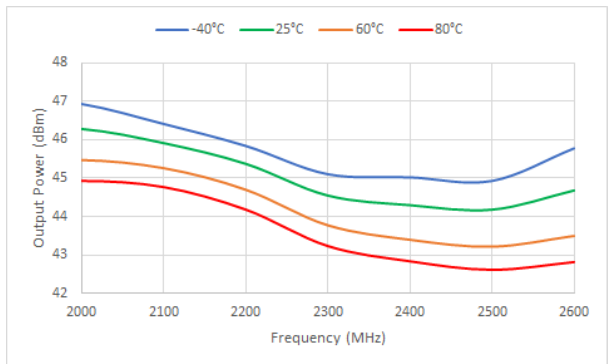
Efficiency vs. Output Power



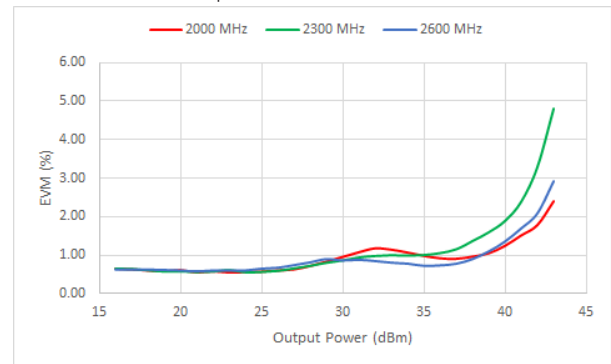
Harmonics [@Psat]



Output Power vs. Temperature [Baseplate]



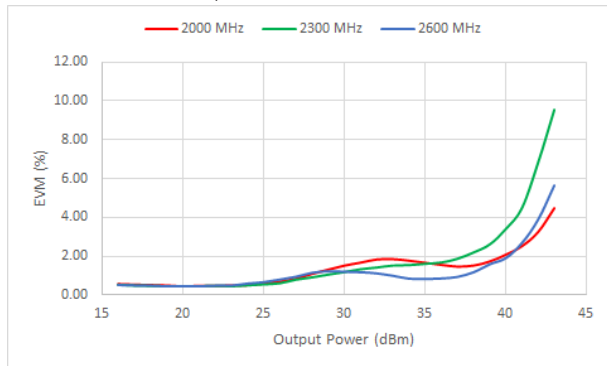
Error Vector Magnitude vs. Output Power [QPSK, 1Msps, 35% Roll Off Rate]



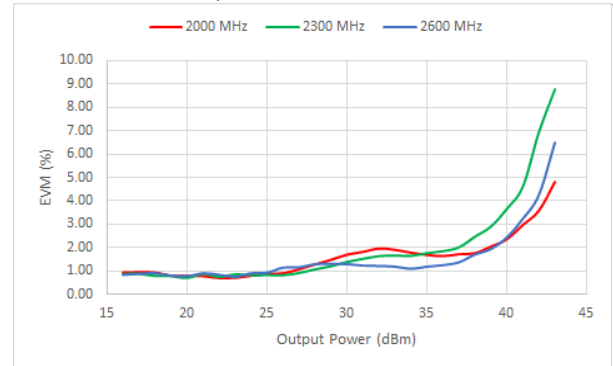
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## Performance Plots (cont.)

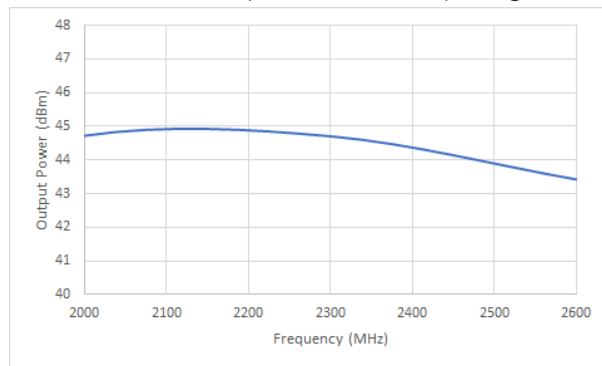
Error Vector Magnitude vs. Output Power [16QAM, 2Msps, 35% Roll Off Rate]



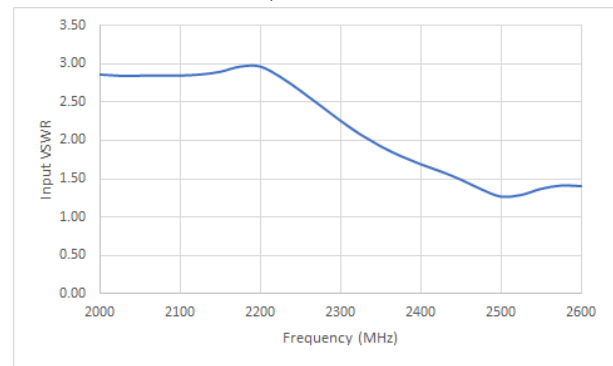
Error Vector Magnitude vs. Output Power [64QAM, 5Msps, 10% Roll Off Rate]



OIP3 [20dBm per tone, 1MHz spacing]

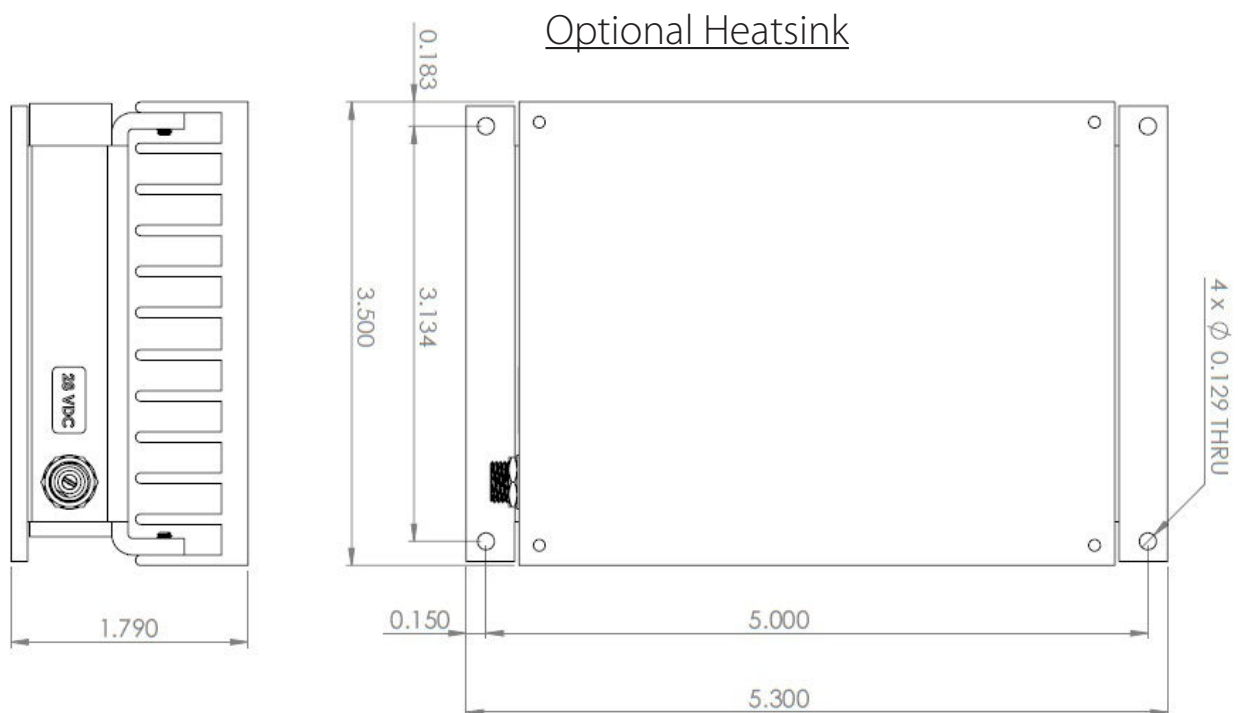
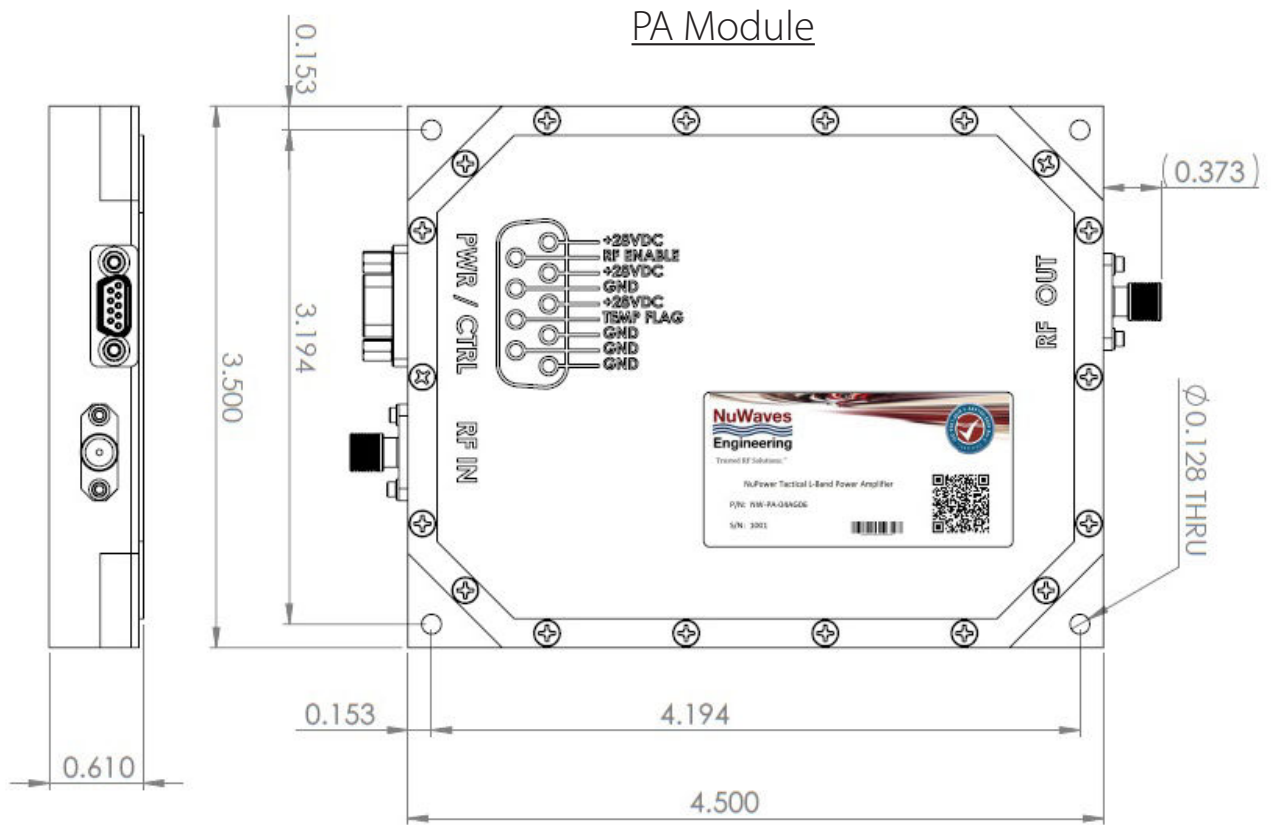


Input VSWR



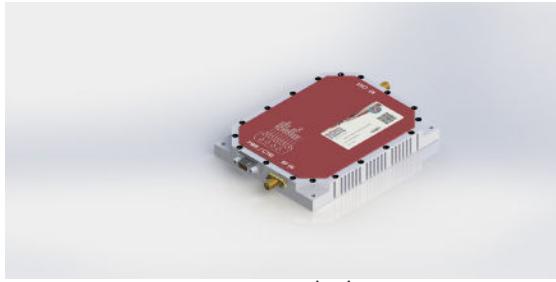
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## Mechanical Outlines

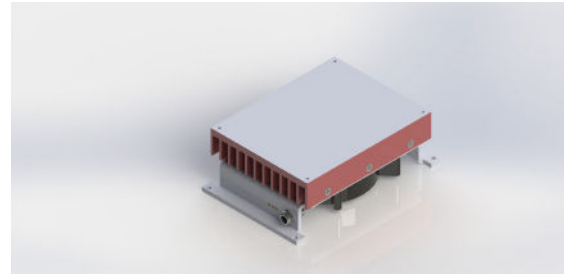


# NuPower™ 05E05A Power Amplifier

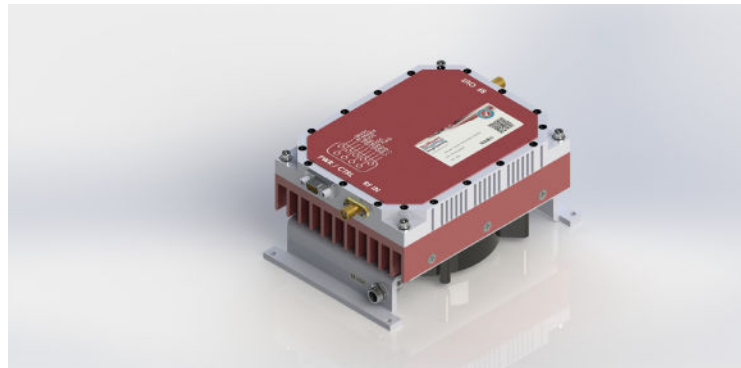
## PA Module and Accessory Images



PA Module



Optional Fan-Cooled Heatsink



PA Module w/ Fan-Cooled Heatsink

## Accessory Part Numbers - Sold Separately

| Part Number                | Description   |
|----------------------------|---|
| NW-FL-05LPLE-2500-SFSF-M01 | Harmonic Filter Module                                      |
| NW-PA-ACC-CB09MC           | Standard Interface Cable Assembly - Flying Leads            |
| NW-PA-ACC-CT09MC           | Upgraded Interface Cable Assembly - Banana Plug Termination |
| HTSK-02                    | Heatsink with Integrated Fan                                |

## Pinout

| Function  | I/O | Pin        |
|---|-----|------------|
| DC Power (+28 Volts)  | I   | 3, 4, 5    |
| Ground  | I   | 1, 2, 6, 8 |
| Over Temperature Flag<br>0V = temperature fault<br>+5V = no fault | O   | 7          |
| RF Enable<br>0V or GND = RF ON<br>+5V or NC = RF OFF              | I   | 9          |

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>

## Contact NuWaves



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