

NuWaves

RF Solutions

NuPower™ 12D05A L- & S-Band Solid State Power Amplifier

35 Watts CW @ 1.7 GHz to 2.1 GHz
20 Watts CW @ 2.1 GHz to 2.4 GHz
12 Watts Linear, 5% EVM @ 41dBm

P/N: NW-PA-12D05A



The NuPower™ 12D05A is a small, highly efficient, solid state power amplifier that provides 20 watts (min) of RF power to boost performance of data links and transmitters.

The NuPower 12D05A accepts a nominal 0 dBm (1 mW) RF input and provides 45 dB of gain (typ) from 1,700 to 2,400 MHz for continuous wave (CW) and near-constant envelope waveforms.

Based on the latest gallium nitride (GaN) technology, the NuPower 12D05A's 40% to 50% power efficiency and 10 in^3 form factor make it ideal for size, weight, and power-constrained broadband RF telemetry, tactical communication systems, and electronic warfare systems.

NuPower PAs feature over-voltage and protection and can operate over a wide temperature range of $-40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$ (baseplate).

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

Features

- 35 Watts RF Output Power (typ)
- 1,700 to 2,400 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), Group 2 & 3
- Unmanned Ground Vehicles (UGV)
- Software Defined Radios

NuPower™ 12D05A Power Amplifier

Specifications

Absolute Maximums

| Parameter | Rating | Unit |
|---------------------------------------|--------|------|
| Max Device Voltage | 32 | V |
| Max Device Current | 3.75 | 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 | 1700 | | 2400 | MHz | |
| RF Output Power | P_{SAT} | 20 | 35 | | W | 1700 MHz - 2400 MHz 0 dBm input |
| Output Power @ 1dB Compression | P_{1dB} | | 30 | | dBm | 1700 MHz |
| | | | 32 | | | 2100 MHz |
| | | | 30 | | | 2400 MHz |
| Small Signal Gain | G | | 52 | | dB | 1700 MHz, @ -40 dBm input |
| | | | 50 | | | 2100 MHz, @ -40 dBm input |
| | | | 49 | | | 2400 MHz, @ -40 dBm input |
| Small Signal Gain Flatness | ΔG | | 3 | | dB | $P_{in} = -40$ dBm |
| Input VSWR | VSWR | | 2.7 | | | |
| 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} | | 2.75 | | A | $P_{in} = 0$ dBm |
| Module Efficiency | | | 45 | | % | $P_{in} = 0$ dBm, +28 V |
| Switching Speed | $T_{XON/OFF}$ | | 1 | 2 | μS | 10% to 90% |
| Third Order Intercept Point (Two tone test at 1 MHz spacing, $P_{out} = 20$ dBm / tone) | OIP3 | | 44 | | dBm | |
| Harmonics | 2nd | | -25 | | dBc | |
| | 3rd | | -20 | | | |
| Output Mismatch (No Damage) | | | | 10:1 | Ψ | No Damage at All Phase Angles |

NuPower™ 12D05A Power Amplifier

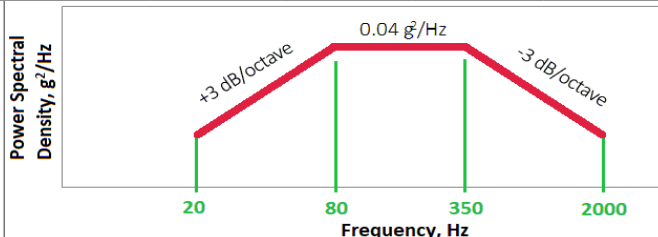
Specifications (cont.)

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 | | +55 | °C |
| Operating Temperature (baseplate) | T_C | -40 | | +85 | °C |
| Storage Temperature | T_{STG} | -55 | | +85 | °C |
| Relative Humidity (non-condensing) | RH | | | 95 | % |
| Altitude MIL-STD-810F - Method 500.4 | ALT | | | 30,000 | ft |
| Vibration / Shock Profile (Random profile in x,y, z axis, as per Figure for 15 minute duration in each axis) | | | | | |

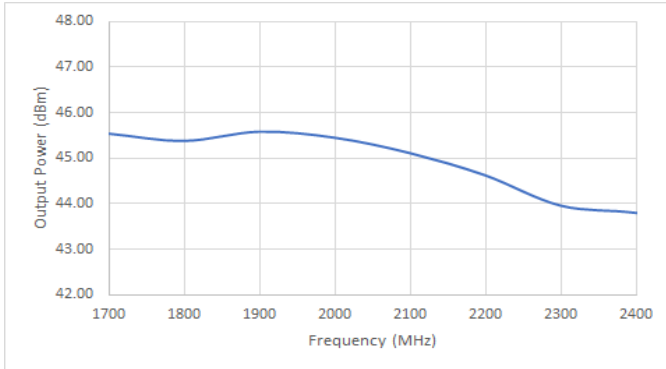


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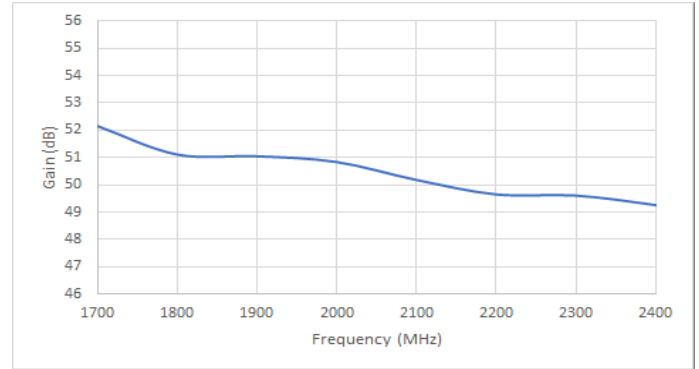
Performance Plots

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

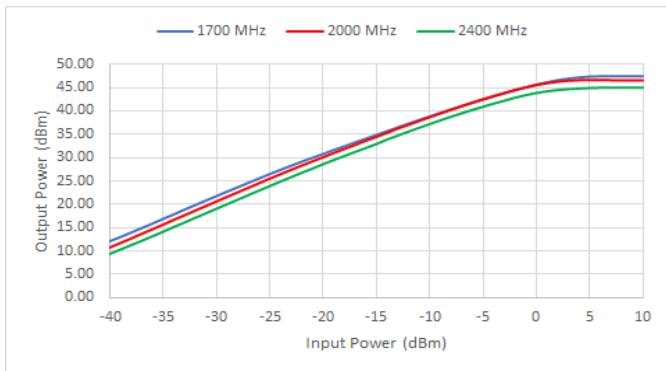
Output Power [0dBm Input Power]



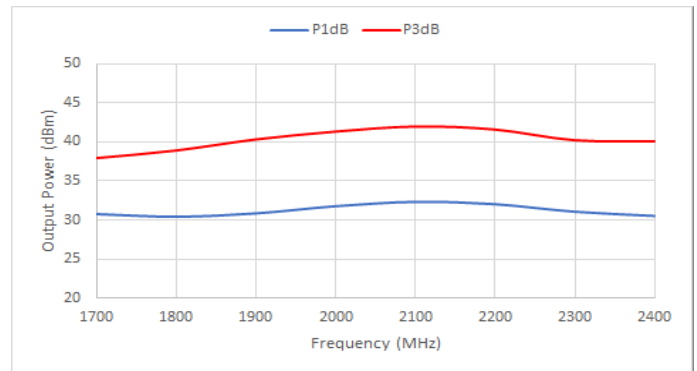
Small Signal Gain [-40dBm Input Power]



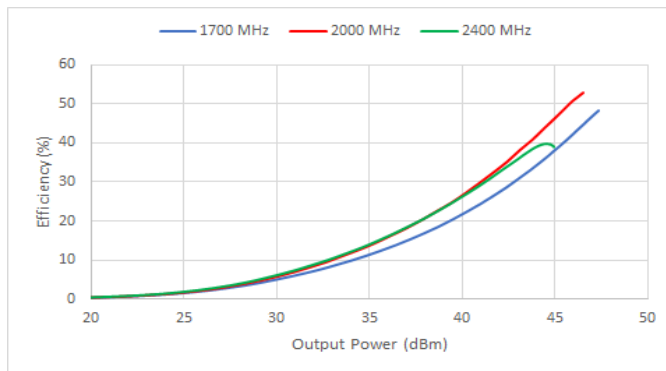
Output Power vs. Input Power



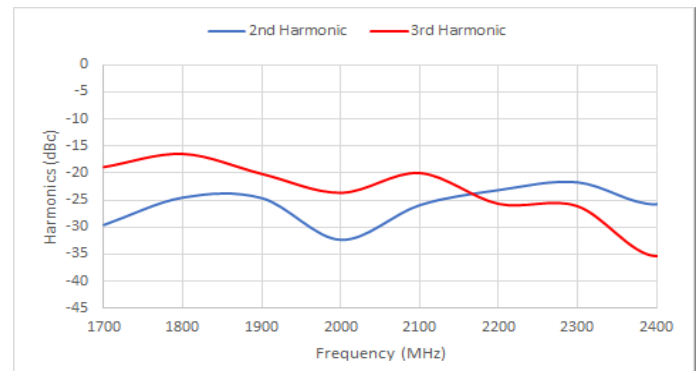
P1dB & P3dB



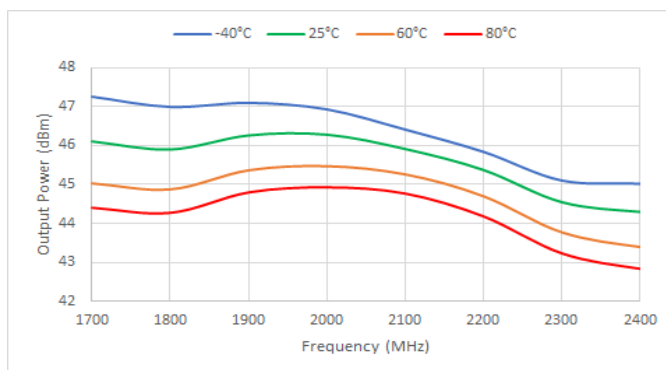
Efficiency vs. Output Power



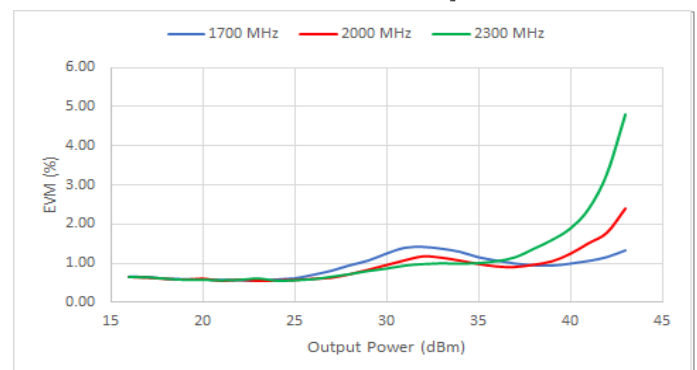
Harmonics [@Psat]



Output Power vs. Temperature [Baseplate]



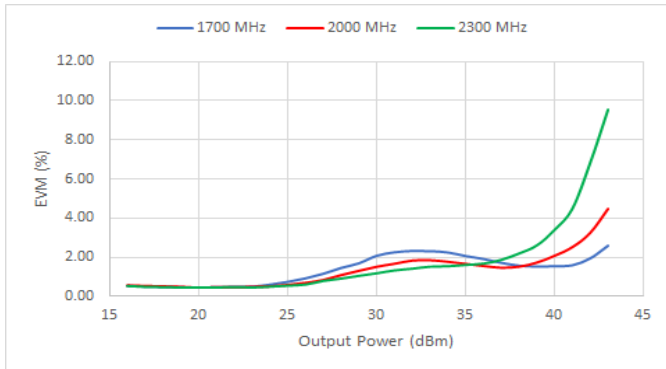
Error Vector Magnitude vs. Output Power [QPSK, 1Mps, 35% Roll Off Rate]



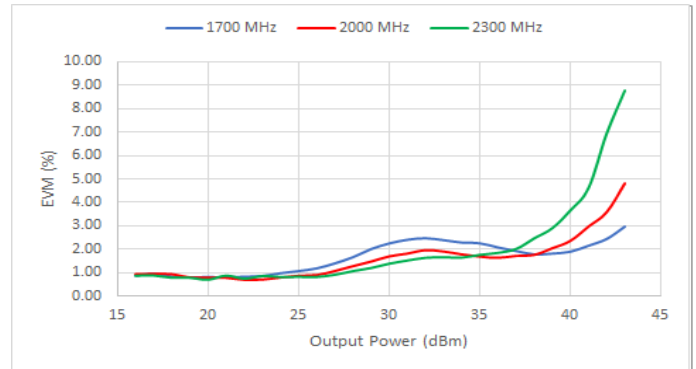
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Performance Plots (cont.)

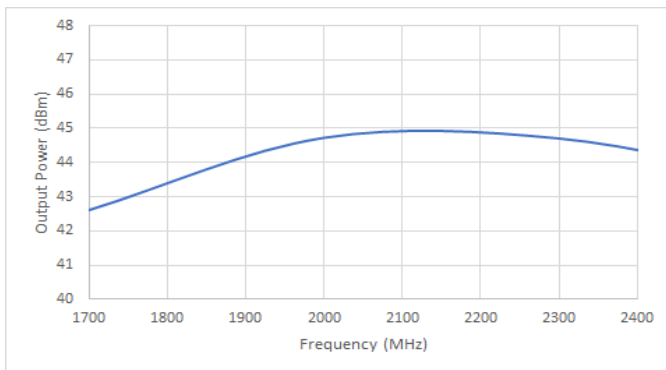
Error Vector Magnitude vs. Output Power [16QAM, 2Msps, 35% Roll Off Rate]



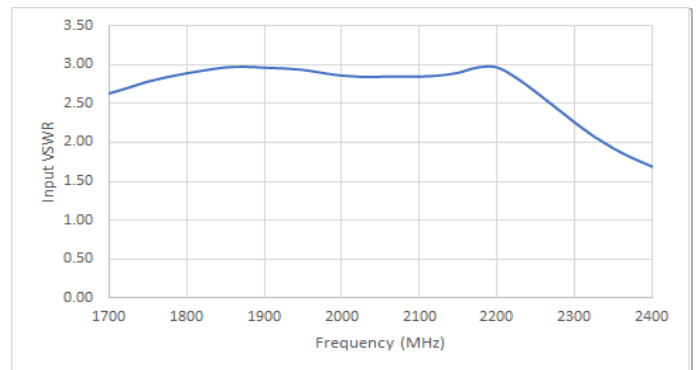
Error Vector Magnitude vs. Output Power [64QAM, 5Msps, 10% Roll Off Rate]



OIP3 [20dBm per tone, 1MHz spacing]

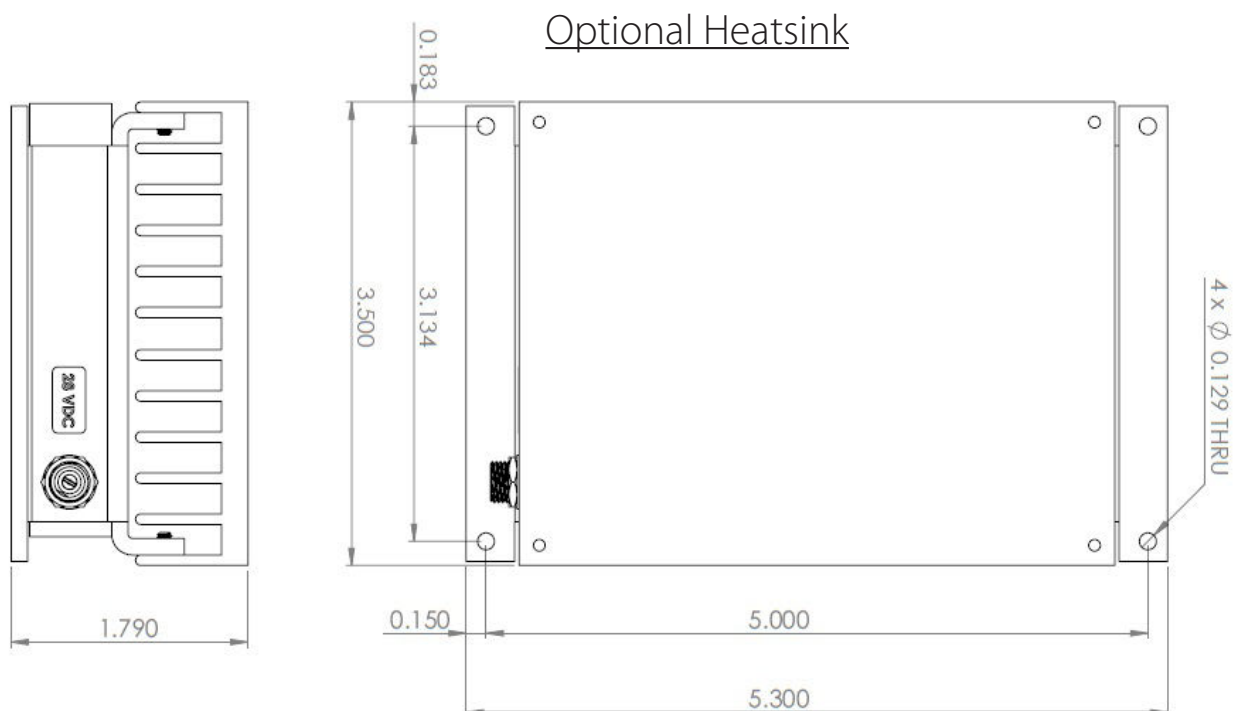
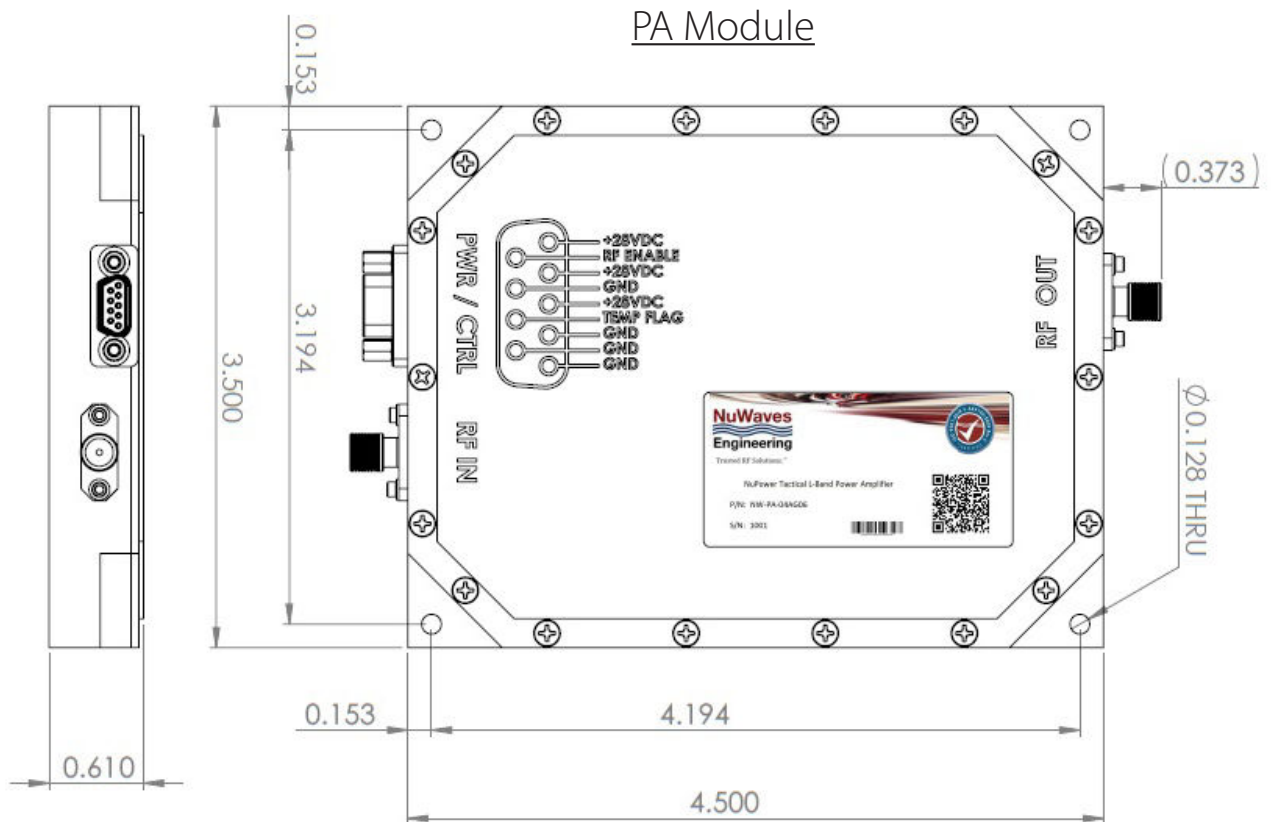


Input VSWR



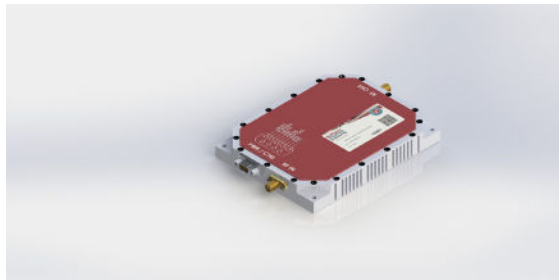
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Mechanical Outlines

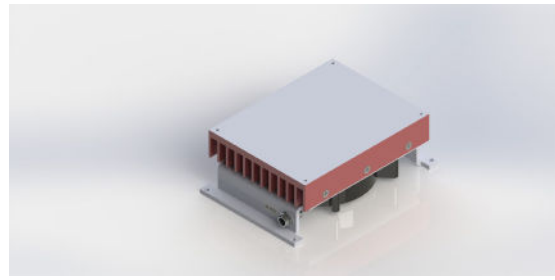


NuPower™ 12D05A Power Amplifier

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-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 0V = temperature fault +5V = no fault | O | 7 |
| RF Enable 0V or GND = RF ON +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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