NuWaves RF Solutions

# NuPower Xtender™ SCISR-20-C04-S01

## Tri-Band, Multi-Channel Bidirectional Amplifier

L-Band: 1000 MHz - 2000 MHz
S-Band: 2000 MHz - 2500 MHz
C-Band: 4400 MHz - 5100 MHz

P/N: NW-BA-SCISR-20-C04-S01

(Custom options available: contact us at sales@nuwaves.com for more information)

**The NuPower Xtender™ SCISR-20-C04-S01 is a multi-channel, tri-band, solid-state bidirectional amplifier (BDA) that provides 20 watts of highly efficient RF power and 14 dB of receive gain†. This BDA is ideal for extending the communication range of multi-channel half-duplex (in-band) or full-duplex (cross-band) transceivers running constant envelope waveforms such as FM, BPSK, and GMSK, as well as high peak-to-average waveforms such as OFDM.**

The efficiency and compact form factor of the NuPower Xtender™ SCISR-20-C04-S01 BDA makes it ideal for size, weight, and power-constrained RF telemetry and tactical communication systems. This solid state BDA features a compact form-factor, allowing the system integrator to easily incorporate the unit into the communications payload of small unmanned aircraft systems (UAS) or other small platforms.

## Features

- Improved channel to channel isolation
- Independently-controlled RF channels for half-duplex (in-band) and full-duplex (cross-band) operation
- Auto-sense or manual T/R control
- Optimized size, weight, and power (SWaP)
- High-efficiency GaN technology
- Non-proprietary interfaces
- Over-voltage protection
- 3.3 V or 5 V logic control

## Applications

- Unmanned Aircraft Systems (UAS) -Group 2 - 5
- Unmanned Ground Vehicles (UGV)
- Software Defined Radios
- Counter UAS Detection and Mitigation
- MIMO/MANET Radio Range Extension
- SISO Radio Range Extension
- Airborne datalinks allowing ISR and command and control C2 data transmission

## Supports

- Collins Aerospace RT-2071 (C) Secure CDL ISR (SCISR) Radio*
- Cubic Nano Multiband Transceiver (nMT)/SCISR
- Kratos SCISR/TBS Radio*
- L3 BANDIT™ 2/SCISR Transceiver

† Band-dependent
* Verified compatibility with radio OEM

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# NuPower Xtender™ SCISR-20-C04-S01

## Specifications

### Absolute Maximums

| Parameter | | Rating | Unit |
|---|---|---|---|
| Max Device Voltage | | 32 | V |
| Max Device Current [L- & S-Band] | @ 11 VDC | 8.9 | A |
| | @ 28 VDC | 3.5 | A |
| | @ 32 VDC | 3.1 | A |
| Max Device Current [C-Band] | @ 27 VDC | 2.0 | A |
| | @ 28 VDC | 2.14 | A |
| | @ 32 VDC | 2.25 | A |
| Max RF Input Power @ XCVR Port, $Z_L = 50\ \Omega$, CW [All Bands] | | +33 | dBm |
| Max RF Input Power @ ANT Port, $Z_L = 50\ \Omega$, CW [L- & S-Band] | | -20 (Autosense) | dBm |
| | | +30 (Manual T/R) | |
| Max RF Input Power @ ANT Port, $Z_L = 50\ \Omega$, CW [C-Band] | | +30 | dBm |
| Max Operating Temperature (baseplate) | | 85 | ℃ |
| Max Storage Temperature | | 85 | ℃ |

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

### Electrical Specifications - Operational

@ 28 VDC, 25 ℃, $Z_S$=$Z_L$=50 Ω, CW, +30 dBm Input Drive (unless otherwise specified)

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Operating Frequency | BW | 1000 | | 2500 | MHz | L- & S-Band |
| | | 4400 | | 5100 | | C-Band |
| Switching Speed | $TX_{ON/OFF}$ | | | 2 | µS | 10% to 90% |
| Operating Voltage | VDC | 11 | 28 | 32 | V | L- & S-Band |
| | | 27 | 28 | 32 | | C-Band |
| Operating Current - Transmit | $I_{DD}$ | | 2.5 | | A | L- & S-Band |
| | | | 1.6 | | | C-Band |
| Operating Current - Receive | $I_{DD}$ | | 75 | | mA | L- & S-Band |
| | | | 50 | | | C-Band |
| Quiescent Current | $I_{DQ}$ | | 75 | | mA | L- & S-Band |
| | | | 50 | | | C-Band |
| Isolation | | -70 | -80 | | dB | L-Band to C-Band / S-Band to C-Band |
| Module Efficiency | | | 39 | | % | L- & S-Band |
| | | | 22 | | | C-Band |

### In-Band and Cross-Band Operation

Each channel operates independent of one another. Here are a few examples of how the SCISR-20-C04-S01 could be operated:

- Receiving on S-band while transmitting on S-band (half-duplex)
- Receiving on S-band while transmitting on C-band (full-duplex)
- Receiving on S-band while transmitting on L- and C-band (full-duplex)
- Receiving on L-, S-, and C-band simultaneously
- Transmitting on L-, S-, and C-band simultaneously

# Specifications (cont.)

## Electrical Specifications - Transmit (L- & S-Band)

@ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, CW, +30 dBm Input Drive (unless otherwise specified)

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| RF Output Power, Psat | Psat | 7 | 25 | | W | |
| Power Gain | G | | 14 | | dB | |
| Power Gain Flatness | ΔG | | ±1.1 | | dB | 1.0 - 2.5 GHz |
| Small Signal Gain | G | | 20 | | dB | Pin = -5 dBm |
| Small Signal Gain Flatness | ΔG | | ±2.5 | | dB | Pin = -5 dBm; 1 - 2.5 GHz |
| Input VSWR | VSWR | | 2:1 | | | |
| Output Mismatch VSWR | VSWR | | | 10:1 | ψ | No damage at all phase angles |
| Nominal Input Drive Level | $P_{IN}$ | | +30 | | dBm | |
| 2nd Harmonic | | | -18 | | dBc | |
| 3rd Harmonic | | | -22 | | dBc | |

## Electrical Specifications - Transmit (C-Band)

@ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, CW, + 30 dBm Input Drive (unless otherwise specified)

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| RF Output Power, Psat | Psat | 8 | 12 | | W | |
| Power Gain | G | | 10 | | dB | |
| Power Gain Flatness | ΔG | | 0.4 | | dB | 4.4 - 5.1 GHz |
| Small Signal Gain | G | | 18 | | dB | Pin = -5 dBm |
| Small Signal Gain Flatness | ΔG | | ±2.4 | | dB | Pin = -5 dBm; 4.4 - 5.1 GHz |
| Input VSWR | VSWR | | 2.8:1 | | | |
| Output Mismatch VSWR | VSWR | | | 10:1 | ψ | No damage at all phase angles |
| Nominal Input Drive Level | $P_{IN}$ | | +30 | | dBm | |
| 2nd Harmonic | | | 42 | | dBc | |

## Electrical Specifications - Receive (L- & S-Band)

@ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, -5 dBm Input Drive (unless otherwise specified)

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Receive Gain | G | 12 | 14 | | dB | |
| Receive Gain Flatness | ΔG | | ±1 | | dB | 1 - 2.5 GHz |
| Receive Noise Figure | NF | | 1.4 | | | -40 °C |
| | | | 2.1 | | | +25°C |
| | | | 2.0 | | | +60 °C |

## Electrical Specifications - Receive (C-Band)

@ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, -5 dBm Input Drive (unless otherwise specified)

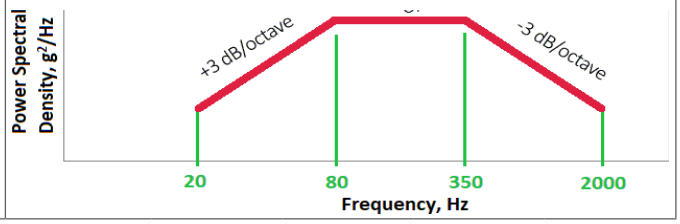
| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Receive Gain | G | 9 | 12 | | dB | |
| Receive Gain Flatness | ΔG | | ±1 | | dB | 4.4 - 5.1 GHz |
| Receive Noise Figure | NF | | 2.2 | | | -40 °C |
| | | | 2.8 | | | +25 °C |
| | | | 3.45 | | | +60 °C |

# Specifications (cont.)

## Mechanical Specifications

| Parameter | Value | Unit | Limits |
|---|---|---|---|
| Dimensions | 7.25 x 4.50 x 1.00 | in | Max |
| Weight | 36 | oz | |
| RF Connectors, Input/Output | SMA Female (6x)<br>(2/ea per L-, S-, and C-band) | | |
| Interface Connector | Micro-D, 25-pin Socket | | |
| Cooling | Adequate Heatsink Required | | |

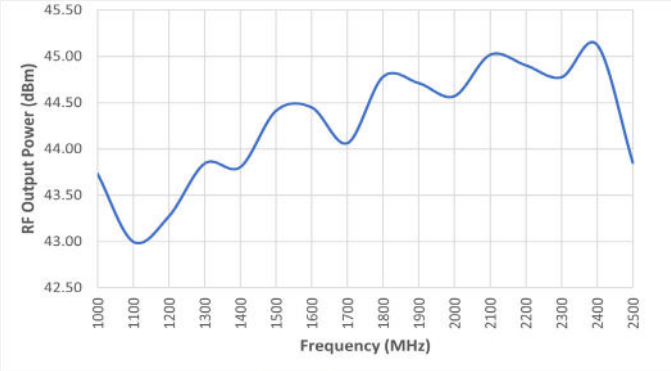
## Environmental Specifications

| 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 Profile<br>(Random profile in x,y, z axis, as per Figure for 15 minute duration in each axis) |  | | | | |

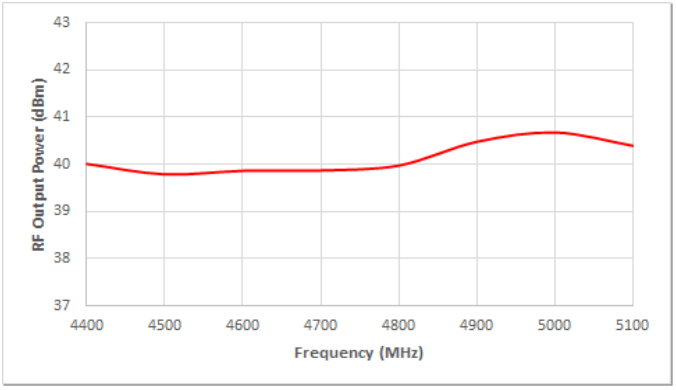
# NuPower Xtender™ SCISR-20-C04-S01

## Performance Plots - Transmit @ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, Pin = +30 dBm

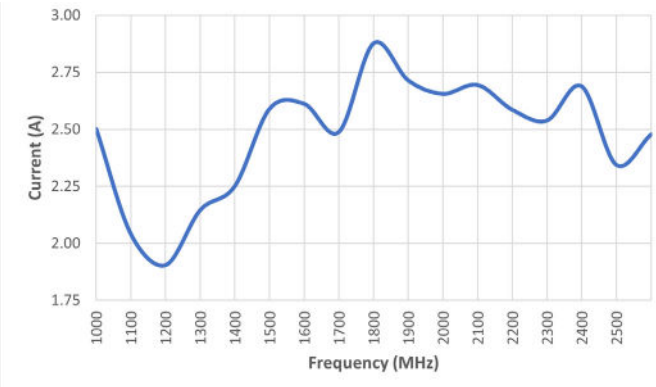
### Output Power - L/S-Band



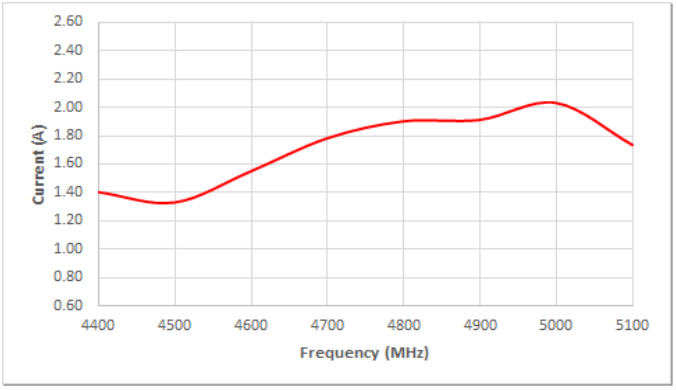

### Output Power - C-Band



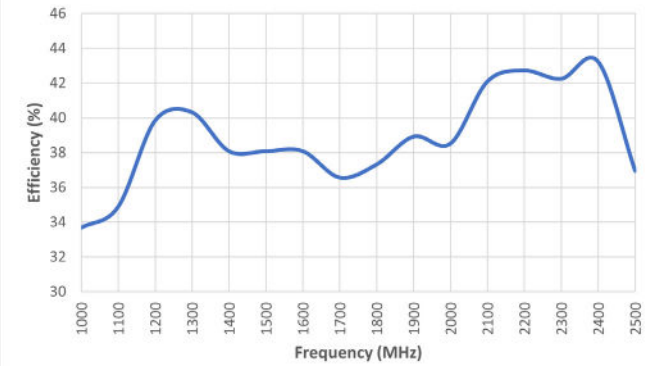

### Current Consumption - L/S-Band



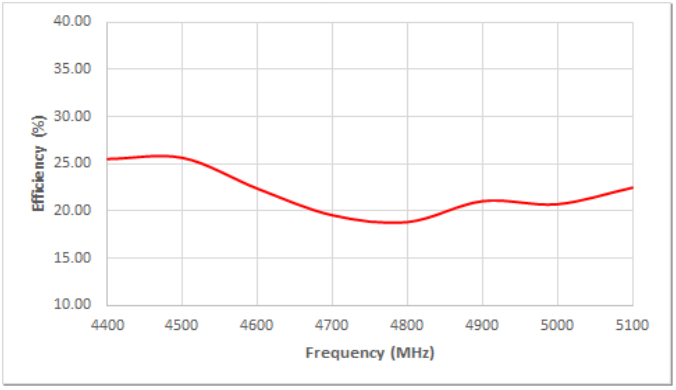

### Current Consumption - C-Band




### Efficiency - L/S-Band



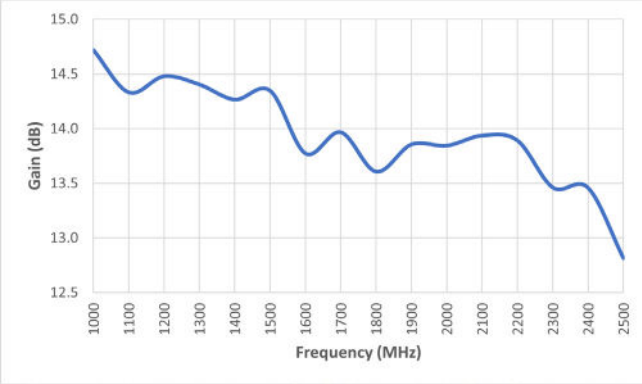

### Efficiency - C-Band



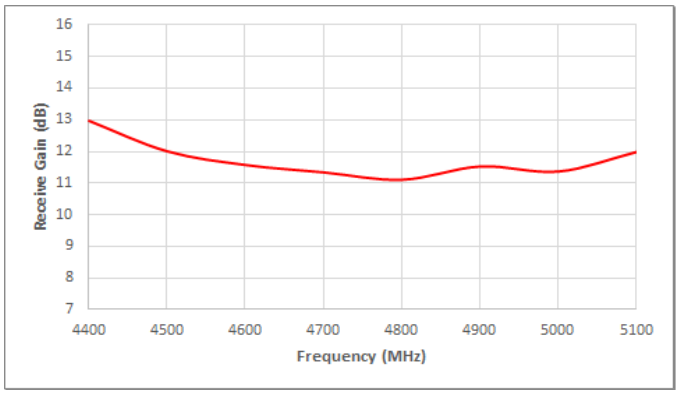
# NuPower Xtender™ SCISR-20-C04-S01

## Performance Plots - Receive @ 28 VDC, 25 °C, $Z_S$=$Z_L$=50 Ω, Pin = -30 dBm

Receive Gain - L/S-Band

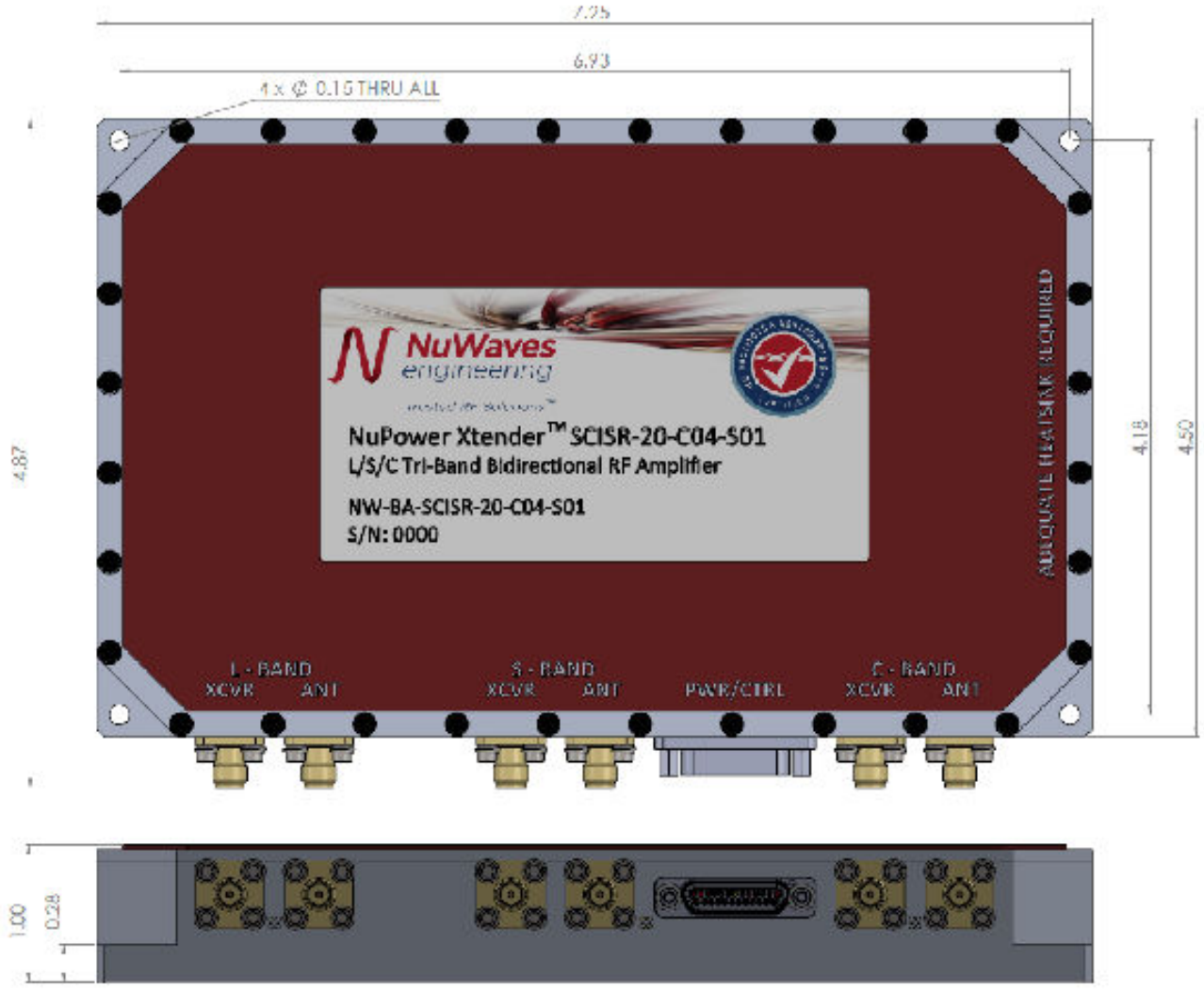



Receive Gain - C-Band



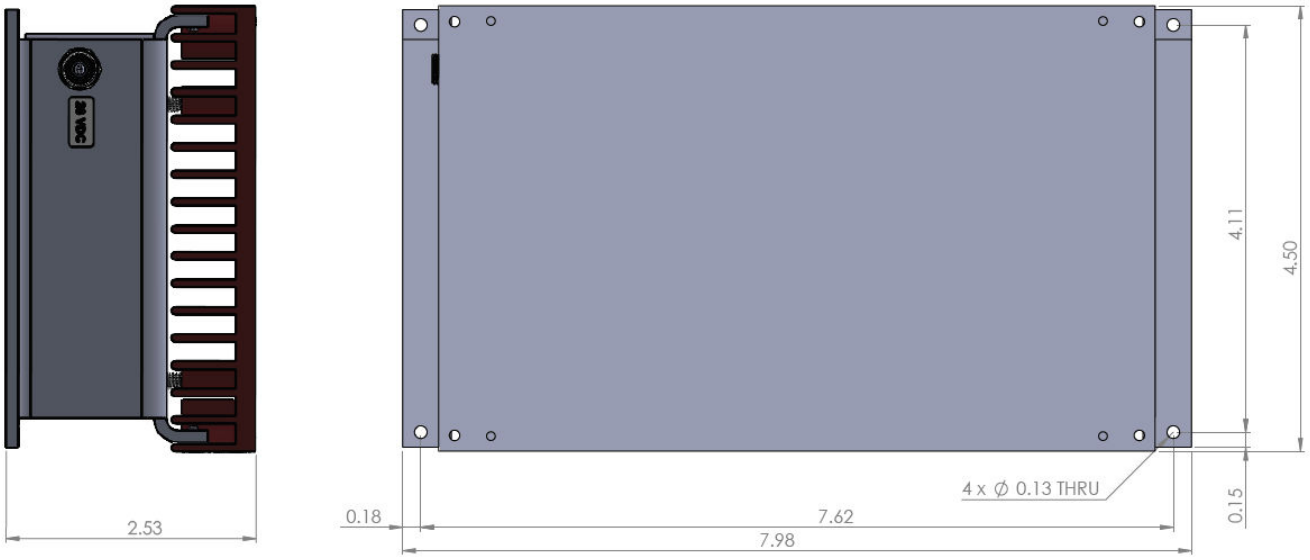

## Mechanical Outline

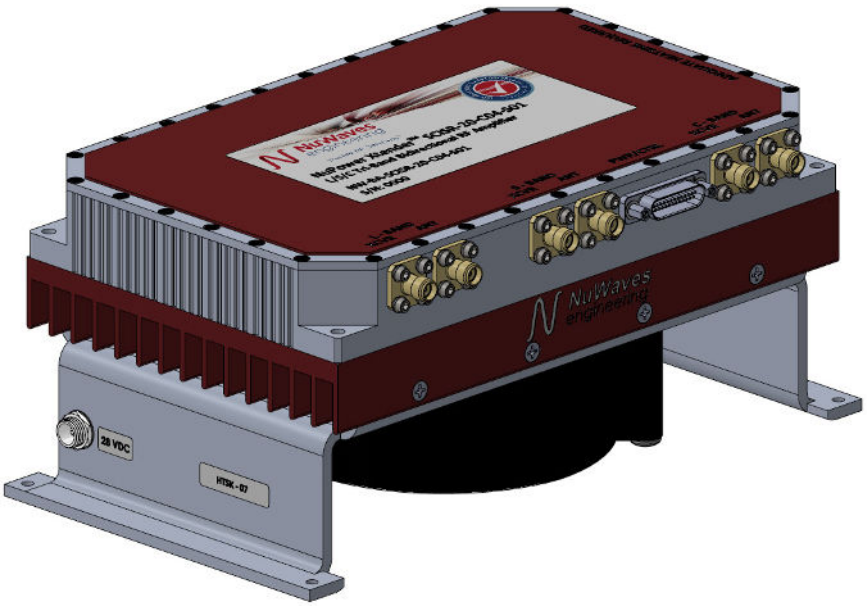
Module



## Mechanical Outline (cont.)

Optional Heatsink



# NuPowerXtender™ SCISR-20-C04-S01

## Accessory Part Numbers - Sold Separately

| Part Number | Description |
|---|---|
| BDA-CBL-03-F | Standard Interface Cable Assembly - Flying Leads |
| BDA-CBL-03-B | Upgraded Interface Cable Assembly - Banana Plug Termination |
| BDA-CBL-08-F | Shielded Interface Cable Assembly - Flying Leads |
| BDA-CBL-08-B | Shielded Interface Cable Assembly - Banana Plug Termination |
| HTSK-07 | Heatsink with Integrated Fan |

## Pinout

| Function | I/O | Pin |
|---|---|---|
| DC Power, L-Band (+11 to +32 Volts) | I | 12, 13. 22 |
| DC Power, S-Band (+11 to +32 Volts) | I | 5, 20, 21 |
| DC Power, C-Band (+28 Volts) | I | 1, 2 |
| DC Ground, L-Band | I | 10, 11 |
| DC Ground, S-Band | I | 18, 19 |
| DC Ground, C-Band | I | 3, 4 |
| T/R Control, L-Band | O | 23 |
| T/R Control, S-Band | O | 6 |
| T/R Control, C-Band | O | 14 |
| RS-485 Data +, L-Band | I | 24 |
| RS-485 Data -, L-Band | I | 25 |
| Digitial Ground, L-Band | I | 9 |
| RS-485 Data +, S-Band | I | 7 |
| RS-485 Data -, S-Band | I | 8 |
| Digitial Ground, S-Band | I | 17 |
| Over Temperature Flag, C-Band<br>0 V = Temperature Fault<br>+5 V = No Fault | O | 15 |

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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