

# NuWaves

## RF Solutions

### NuPower Xtender™ ULSC-20-C01-S01

### 4-port, Full-Duplex, Ultra Wideband Bidirectional Amplifier

500 MHz - 6.0 GHz

TX: 20 Watts RF Output Power (typ)

RX: 15 dB Gain (typ)

P/N: NW-BA-ULSC-20-C01-S01

(includes external interface cable with flying leads)



**The NuPower Xtender™ ULSC-20-C01-S01 is a small, lightweight, and power-efficient 4-port full-duplex bidirectional amplifier ideal for extending the communication range of full-duplex wideband transceivers, such as the Kratos DS-346 KestrelTWM and Software Defined Radios (SDRs). The ULSC-20-C01-S01 amplifier generates 20 watts (typ) of RF power from 500 MHz to 6 GHz in transmit mode and the integrated low-noise amplifier provides 15 dB of gain.**

The efficiency and compact form factor of the NuPower Xtender™ ULSC-20-C01-S01 BDA makes it ideal for size, weight, and power-constrained RF telemetry and 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 unmanned aircraft systems (UAS) or other small to medium-sized platforms. Ideal for C-UAS mitigation and detection, including signal jamming and C2 takeover. This broadband amplifier allows for easy mitigation and detection across a wide frequency range with a single amplifier, eliminating the need for multiple amplifiers to cover the different UAS operating bands.

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

### Features

- 4-Port Full-Duplex Bidirectional Operation
- 20 Watts (typ) RF Output Power
- 38 dB (typ) of Transmit Gain
- 15 dB (typ) Receive Gain LNA
- Small form factor optimized for size, weight, and power (SWaP)
- High Efficiency GaN Technology
- Over-Voltage & Reverse-Voltage Protection
- Non-proprietary interfaces
- MIL-STD-704F 28 VDC Compliant
- MIL-STD-461F CS101, CS114-116, RS103, RE102, CE102 Compliant

### Applications

- Kratos DS-346 KestrelTWM Radio/SCISR
- Unmanned Aircraft Systems (UAS) - Group 2 and Group 3
- Small to medium-sized manned aircraft
- Airborne datalinks allowing ISR and command and control (C2) data transmission
- Remote video terminals (RTV)
- Unmanned Ground Vehicles (UGV)
- RF Communication Systems
- Software Defined Radios
- Counter UAS

# NuPower Xtender™ ULSC-20-C01-S01 BDA

## Specifications

### Absolute Maximums

Parameter	Rating	Unit
Max Device Voltage	32	V
Max Device Current	4	A
Max RF Input Power, $Z_L = 50 \Omega$	15	dBm
Max Operating Temperature (ambient)	70	°C
Max Operating Temperature (baseplate)	85	°C

Export Classification
EAR99

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

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Operating Frequency	BW	500		6000	MHz	
Operating Voltage	VDC	20	28	30	V	
Operating Current	$I_{DD}$		2.7	4	A	CW, Pin = +5 dBm
Module Efficiency			27		%	CW, Pin = +5 dBm

### Electrical Specifications - Transmit @ 28 VDC, 25 °C, $Z_S=Z_L=50 \Omega$ , Conditions at CW, Pin = +10dBm (unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Unit	Condition
RF Output Power, Psat	Psat		20		W	
Transmit Gain	G		38		dB	
Transmit Gain Flatness	$\Delta G$		$\pm 3$		dB	500MHz to 6 GHz
Output Power @ 1dB Compression	P1dB		25		dBm	500 MHz
			25			1875 MHz
			26			3250 MHz
			23			4625 MHz
			26			6000 MHz
Small Signal Gain	G		46		dB	500 MHz, @ -40 dBm Input
			44			1875 MHz, @ -40 dBm Input
			39			3250 MHz, @ -40 dBm Input
			42			4625 MHz, @ -40 dBm Input
			38			6000 MHz, @ -40 dBm Input
Small Signal Gain Flatness	$\Delta G$		$\pm 5$			Pin = -40 dBm
Transmit Input VSWR	VSWR		2:1			
Nominal Input Drive Level	$P_{IN}$		+10		dBm	
Quiescent Current (unbiased, No RF Signal Applied)	$I_{DQ}$		0.1		A	RF Enable OFF (N/C)
Quiescent Current (biased, No RF Signal Applied)	$I_{DQ}$		0.7		A	RF Enable ON (0V/GND)
Third Order Intercept Point (Two tone test at 1MHz Spacing, Pout = 20dBm/ tone)	OIP3		38		dBm	500 MHz
			37			1875 MHz
			38			3250 MHz
			35			4625 MHz
			38			6000 MHz
Harmonics	2nd		-21		dBc	Psat

# NuPower Xtender™ ULSC-20-C01-S01 BDA

## Mechanical Specifications (cont.)

### Electrical Specifications - Transmit (cont.)

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Harmonics	3rd		-26		dBc	Psat
Transmit Output VSWR Mismatch	VSWR			10:1	Ψ	No damage at all phase angles

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

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Receive Gain	G	15	20		dB	
Receive P1dB	P1dB		8.5		dBm	
Receive Gain Flatness	$\Delta G$		$\pm 3$		dB	500 MHz to 6 GHz
Receive Current	$I_{RX}$		100		mA	
Receive Noise Figure	NF		5		dB	

## Mechanical Specifications

Parameter	Value	Unit	Limits
Dimensions	6.0 x 4.25 x 1.5	in	Max
Weight	30.0	oz	Max
RF Connectors, Input/Output	SMA Female		
Interface Connector	D-sub, 15-pin Socket		
Cooling	Adequate Heatsink Required		

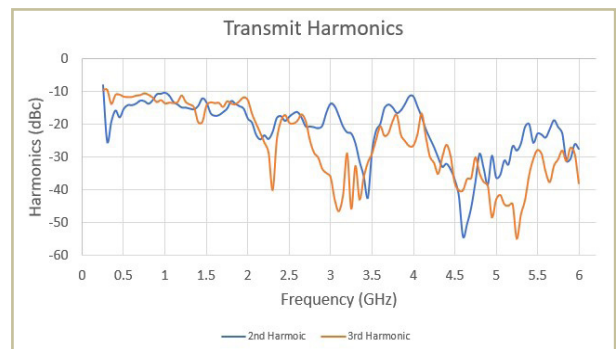
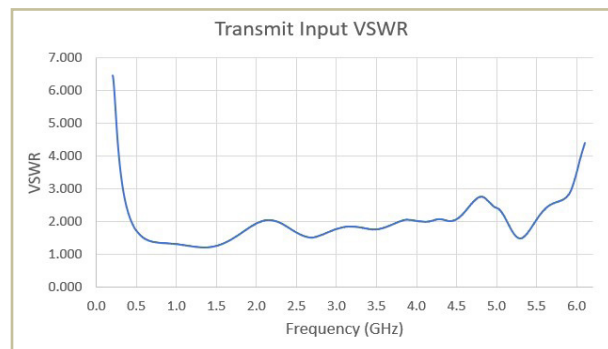
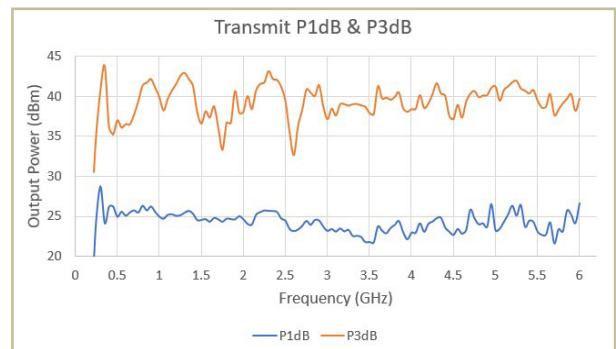
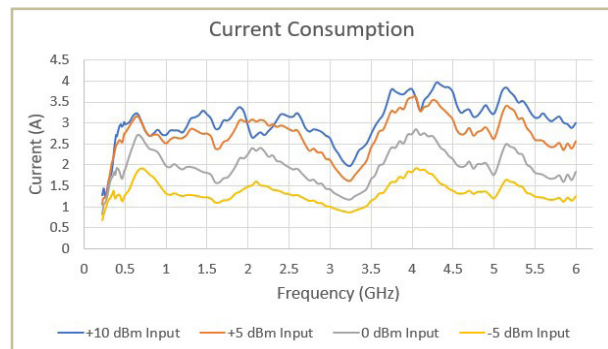
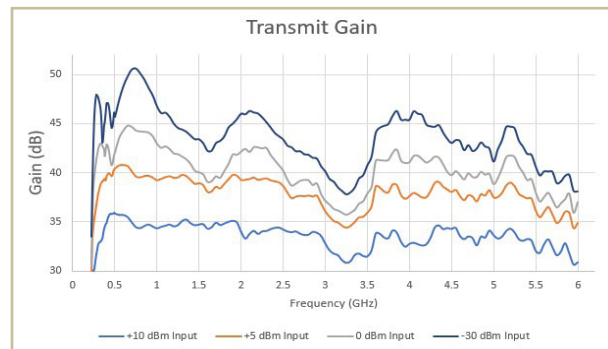
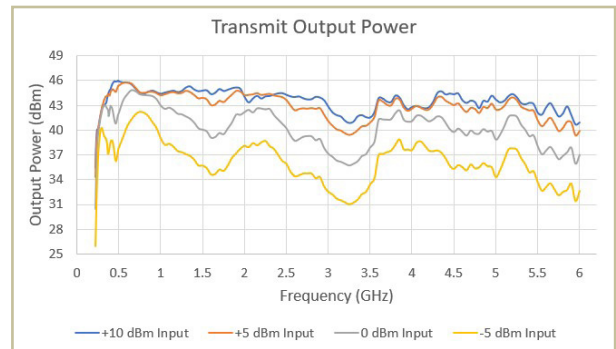
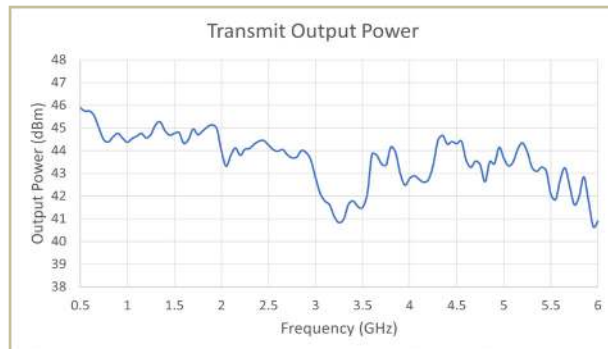
## Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature (ambient)	$T_A$	-40		+70	°C
Operating Temperature (baseplate)	$T_C$	-40		+85	°C
Storage Temperature	$T_{STG}$	-55		+85	°C
Relative Humidity (non-condensing)	RH	5		95	%
Altitude MIL-STD-810F - Method 500.4	ALT			30,000	ft
EMI/EMC MIL-STD-461F CS101, CS114-116, RS103, RE102, CE102					
Blowing Dust Withstand MIL-STD-810F Section 510.4					
Fungal Growth Withstand MIL-STD-810F Section 508.5					
Operational Shock RTCA/DO-160E Section 7, 6g peak value for 11ms					
Operational Vibration RTCA/DO-160F Section 8, Category S, Curve M					
Non-Operational Vibration RTCA/DO-160F Section 8, Category S, Curve M					
Transportation Vibration MIL-STD-810F Section 514.5					
Endurance Vibration RTCA/DO-160F					

# NuPower Xtender™ ULSC-20-C01-S01 BDA

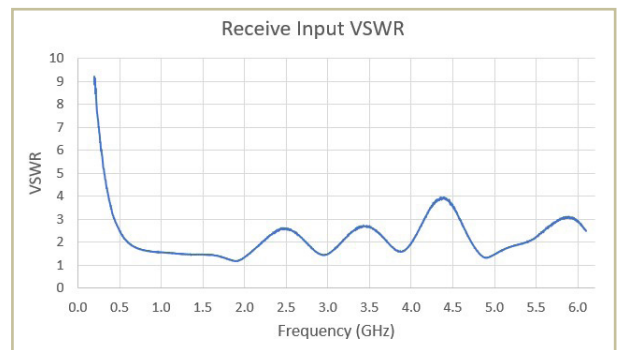
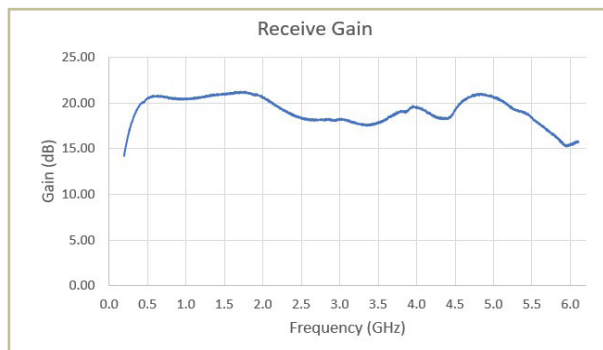
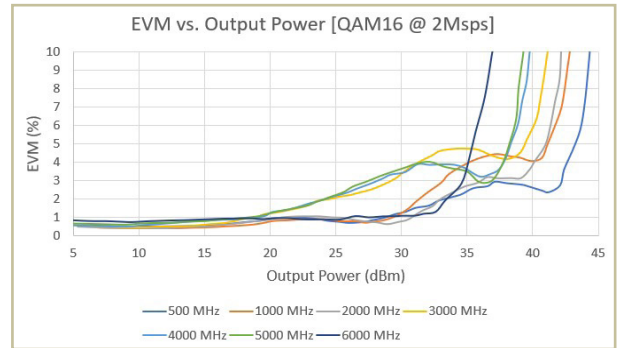
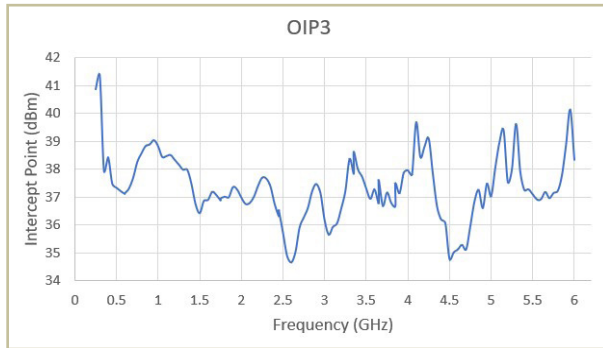
## Performance Plots

Test Conditions: +28 VDC, +25 °C, ZS=ZL=50 Ω, CW, +10dBm Input Power (unless otherwise stated)



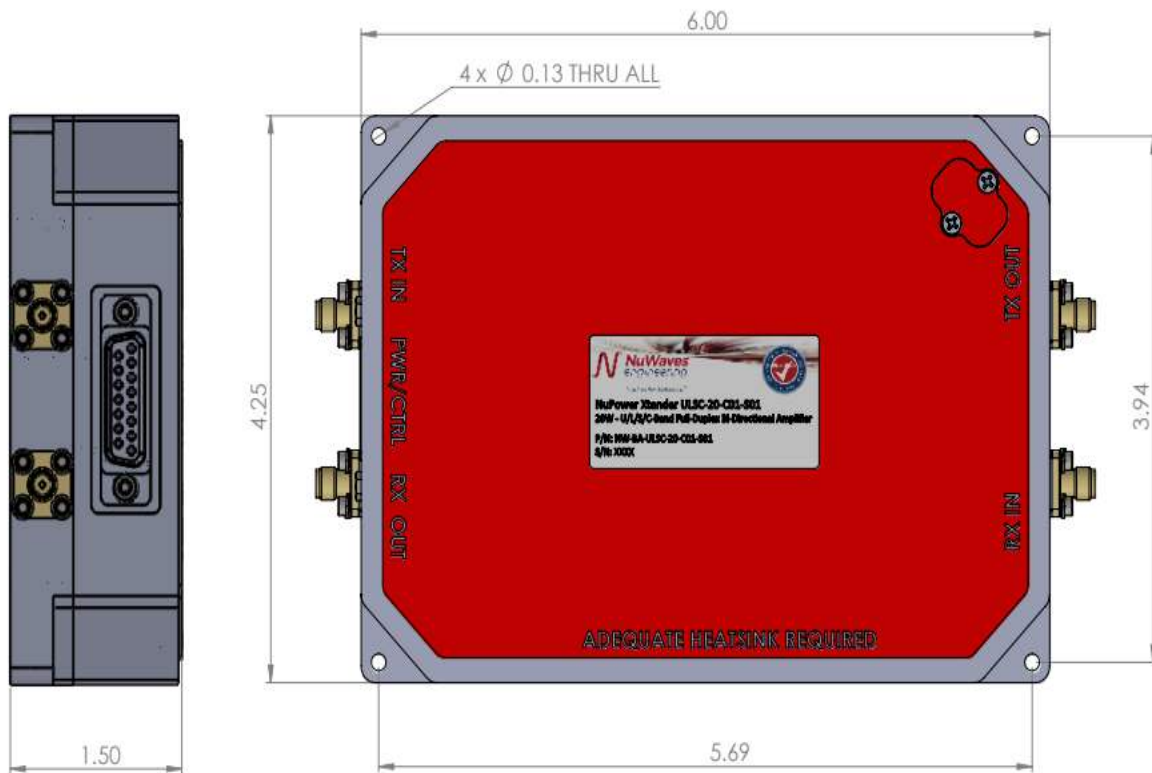
# NuPower Xtender™ ULSC-20-C01-S01 BDA

## Performance Plots (cont.)



# NuPower Xtender™ ULSC-20-C01-S01 BDA

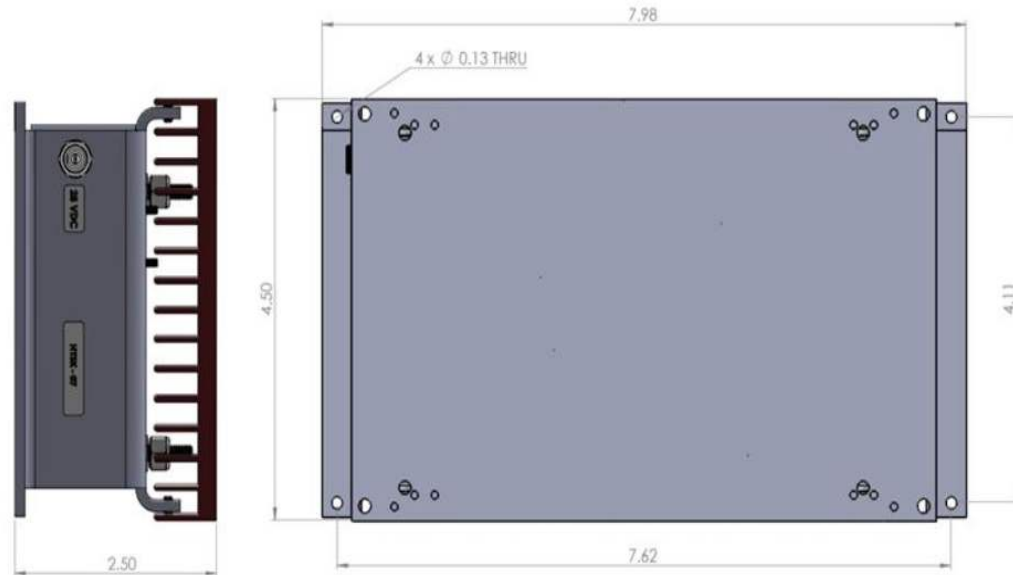
## Mechanical Outline



# NuPower Xtender™ ULSC-20-C01-S01 BDA

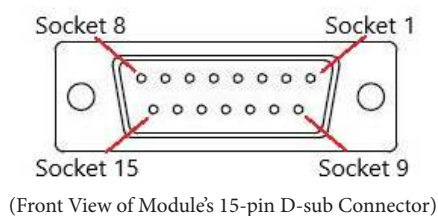
## Optional Heatsink Drawing

Heatsink and Integrated Fan: HTSK-07



## Accessory Part Numbers

Part Number	Description
BDA-CBL-04-F	Standard Interface Cable Assembly - Flying Leads (included with module)
BDA-CBL-04-B	Upgraded Interface Cable Assembly - Banana Plug Termination
HTSK-07	Heatsink



## Pinout

Pin No.	Pin Name	I/O	Description	Logic Voltage
1, 2, 3, 4	V Supply	I	Primary Power (+28 VDC)	
5, 6, 7, 8, 15 <sup>1</sup>	Ground	I	DC Return	
9 <sup>2</sup>	Temp Flag.	O	Over-temp/Fault Indicator (CMOS) [5V: No Fault; 0V: Temp Fault]	0V to +1.5V = LOW 3.5V to +5V = HIGH
10, 13	N.C.	-	N/A	
11 <sup>3</sup>	Data+/RX	I	RS-485 RX	
12 <sup>3</sup>	Data-/TX	O	RS-485 TX	
14 <sup>2</sup>	RF Enable (Transmit)	I	Transmit Control (CMOS) [Floating/ (N/C): RF Enable Off; 0V/GND: RF Enable On]	0V to +1.5V = LOW 3.5V to +5V = HIGH

<sup>1</sup>Pin 15 may be used for RS-485 GND

<sup>2</sup>This line is internally pulled high and does not require applying voltage to this line

<sup>3</sup>For factory use only

## Contact NuWaves



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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>