

# NuWaves

## RF Solutions

### NuPower™ 12B01A-09 S-Band Solid State Power Amplifier

10 Watt CW  
2.5 Watts Linear, 5% EVM @ 34 dBm  
2.0 GHz - 2.5 GHz



P/N: NW-PA-12B01A-09

NW-PA-12B01A-09-AH [Active High T/R Enable Logic]

**The NuPower™ 12B01A-09 is a small, highly efficient solid state power amplifier that provides over 10 watts of RF power to boost performance of data links and transmitters.**

Based on the latest gallium nitride (GaN) technology, NuPower's 30% - 50% power efficiency and 3.9 in<sup>3</sup> form factor make it ideal for size, weight, and power-constrained broadband RF telemetry and tactical communication systems.

The NuPower 12B01A-09 power amplifier accepts a nominal 0 dBm RF input and provides 40 dB of gain from 2.0 GHz to 2.5 GHz. The NuPower 12B01A-09 module comes standard with a NW-PA-ACC-CB09MA interface cable, for ease of integration. Additional options available with this module are a 1 watt input drive level (P/N: NW-PA-12B01A-09-D30), and active high (inverted) logic (P/N: NW-PA-12B01A-09-AH).

NuPower PAs feature over-voltage and reverse-voltage protection and can operate over a wide temperature range of -30 °C to +60 °C.

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

#### Features

- 10 Watts RF Output Power
- 2.0 GHz to 2.5 GHz
- Miniature Package (3.00" x 2.00" x 0.65")
- High-Efficiency GaN Technology
- 0 dBm Nominal RF Input
- Reverse-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

- Unmanned Aircraft Systems (UAS), Group 2 & 3
- Unmanned Ground Vehicles (UGV)
- Broadband RF Telemetry
- RF Communication Systems
- Software Defined Radios

# NuPower™ 12B01A-09 Power Amplifier

## Specifications

### Absolute Maximums

Parameter	Rating	Unit
Max Device Voltage	32	V
Max Device Current	2.4	A
Max RF Input Power, $Z_L = 50 \Omega$	10	dBm
Max Operating Temperature (ambient)	60	°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		2500	MHz	
RF Output Power	$P_{SAT}$	10	16		W	$P_{in} = 0 \text{ dBm}$
Output Power @ 1dB Compression	$P_{1dB}$		36		dBm	2000 MHz
			35			2250 MHz
			38			2500 MHz
Small Signal Gain	G		46.5		dB	2000 MHz, @ -30 dBm input
			45.8			2250 MHz, @ -30 dBm input
			46.2			2500 MHz, @ -30 dBm input
Small Signal Gain Flatness	$\Delta G$		$\pm 1.3$		dB	$P_{in} = -30 \text{ dBm}$
Power Gain Flatness			$\pm 1$		dB	$P_{in} = 0 \text{ dBm}$
Input VSWR	VSWR		1.6:1			
Nominal Input Drive Level	$P_{IN}$		0		dBm	
Operating Voltage	VDC	11	28	32	V	
Quiescent Current	$I_{DQ}$		0.35		A	
Operating Current	$I_{DD}$		1.5	2.4	A	$P_{in} = 0 \text{ dBm}$
Module Efficiency			20	30	%	
Switching Speed	$TX_{ON/OFF}$			2	$\mu\text{s}$	10% to 90%
Third Order Order Intercept Point (Two tone test at 1 MHz spacing, $P_{out} = 20 \text{ dBm} / \text{tone}$ )	OIP3		38.4		dBm	2000 MHz
			39.2			2250 MHz
			41.3			2500 MHz
Harmonics	2nd		-31		dBc	
	3rd		-28			
Output Mismatch (No Damage)				10:1		

# NuPower™ 12B01A-09 Power Amplifier

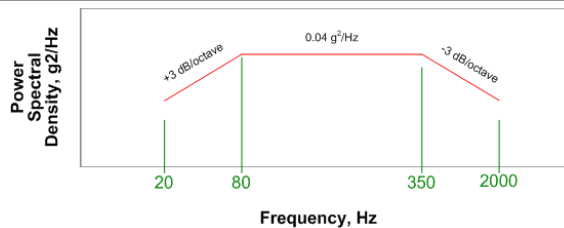
## Specifications (cont.)

### Mechanical Specifications

Parameter	Value	Unit	Limits
Dimensions	3.0 x 2.0 x 0.65	in	Max
Weight	3	oz	Max
RF Connectors, Input/Output	SMA Female		
Interface Connector	Micro-D, 9-pin Socket		
Cooling	External Heatsink (Optional)		

### Environmental Specifications

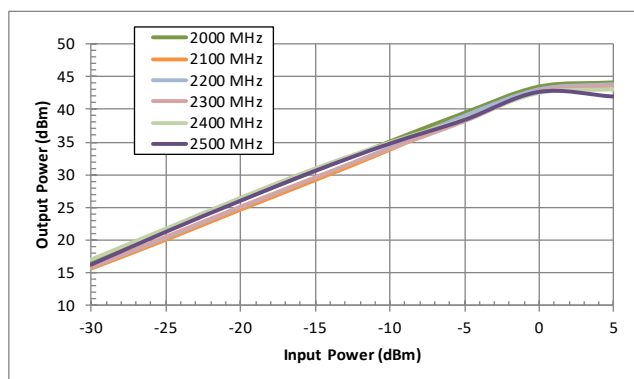
Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature (ambient)	$T_A$	-40		+60	°C
Operating Temperature (baseplate)	$T_C$	-40		+85	°C
Storage Temperature	$T_{STG}$	-55		+85	°C
Relative Humidity (non-condensing)	RH			95	%
Altitude MIL-STD-810F - Method 500.4	ALT			30,000	ft
Vibration / Shock Profile (Random profile in x,y, z axis, as per Figure for 15 minute duration in each axis)					



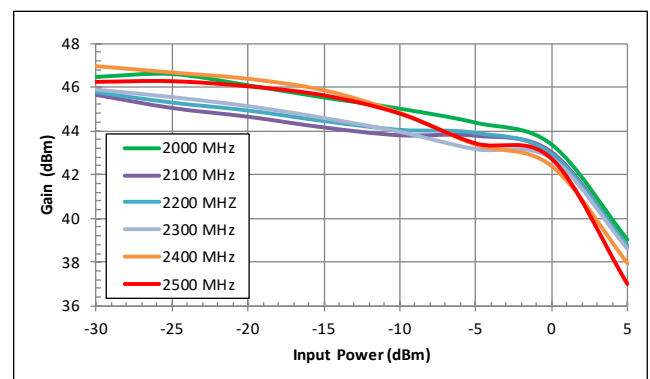
## Performance Plots

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

Output Power vs. Input Power



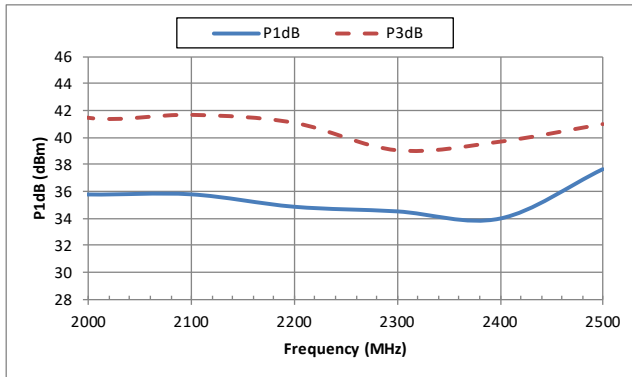
Gain vs. Input Power



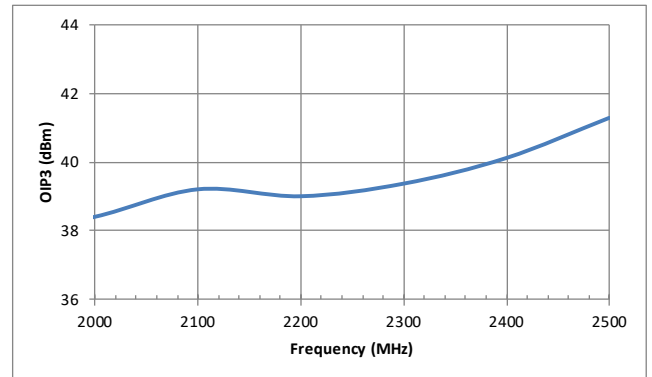
# NuPower™ 12B01A-09 Power Amplifier

## Performance Plots (cont.)

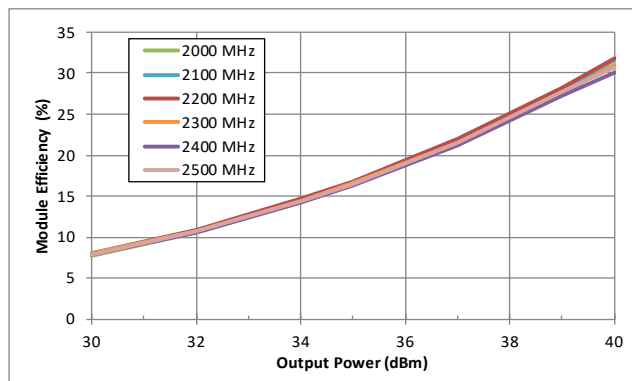
P1dB & P3dB



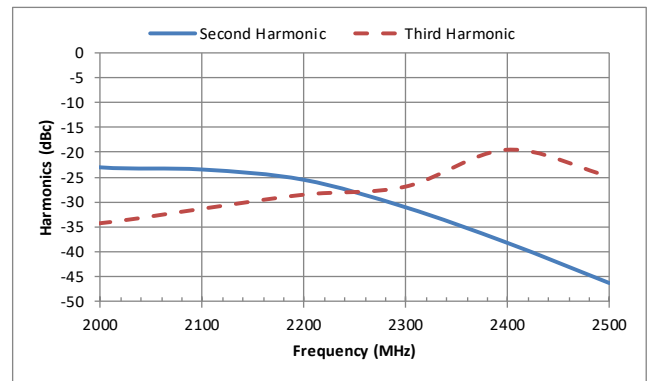
OIP3



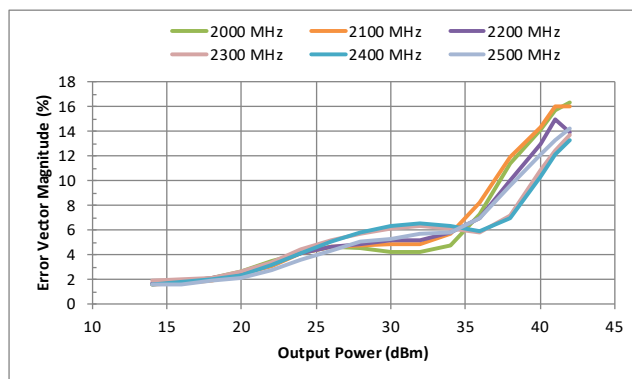
Efficiency



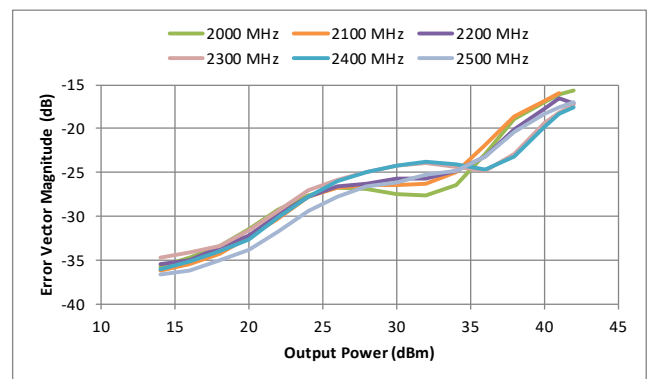
Harmonics (@ Psat)



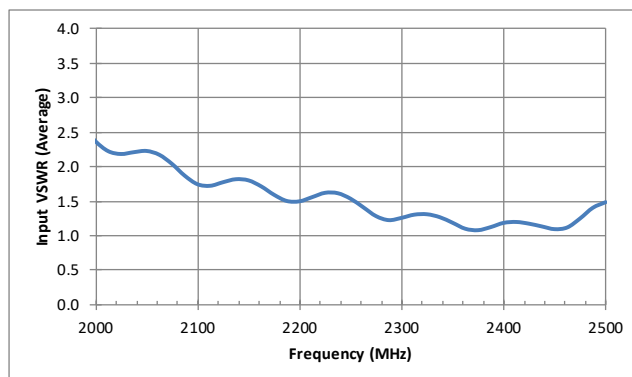
Error Vector Magnitude (%) [w/ OFDM Waveform]



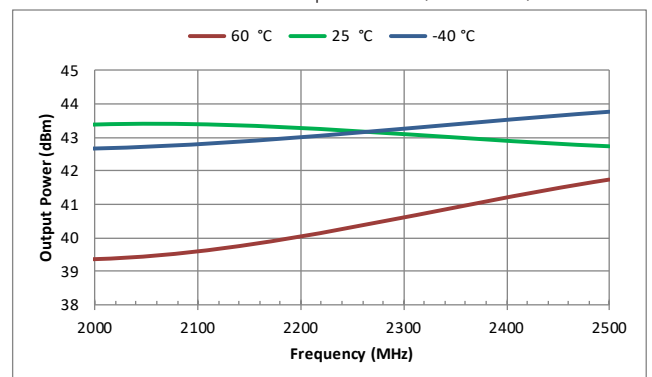
Error Vector Magnitude (dB) [w/ OFDM Waveform]



VSWR

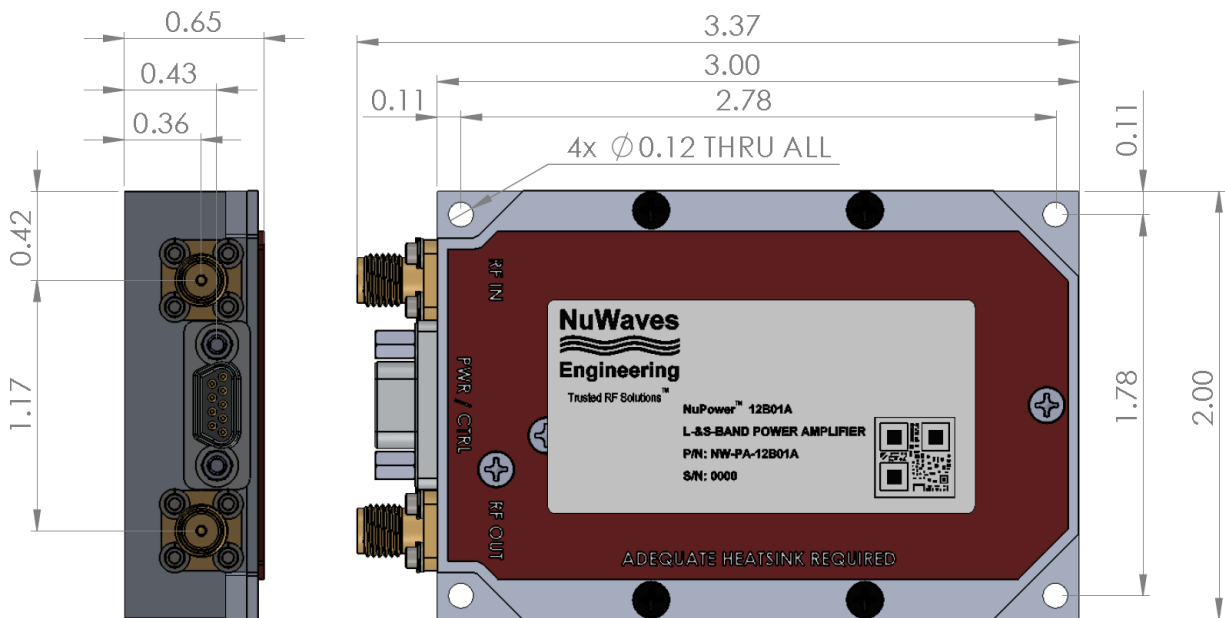


Power Out vs. Temperature (ambient)



# NuPower™ 12B01A-09 Power Amplifier

## Mechanical Outline



## Accessory Part Numbers

Part Number	Description
NW-FL-05LPLE-2500-SFSF-M01	Harmonic Filter Module
NW-PA-ACC-CB09MA	Standard Interface Cable Assembly - Flying Leads (included with module)
NW-PA-ACC-CT09MA	Upgraded Interface Cable Assembly - Banana Plug Termination
NW-PA-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 (+11 to +32 VDC)	I	1, 2	–
Ground	I	3, 4	–
Over Temperature Flag 0V = temperature fault +5V = no fault	O	8	–
RF Enable <sup>1</sup> 0V or GND = RF ON NC = RF OFF	I	5	0V to 1.5V = Logic Low 3.0V to +5V = Logic High <sup>2</sup>
No Connect	-	6, 7, 9	–

<sup>1</sup> For Inverted / Active High Logic, please order P/N NW-PA-12B01A-09-AH [0V or GND = RF Off, +5V or NC = RF On]

<sup>2</sup> RF Enable is pulled high internally and does not require user to apply voltage to this line

## Contact NuWaves



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