

ULTA-10R3 | Ultra Linear Broadband Amplifier

0.25MHz to 220MHz | Class-A | 10W | 22dB typ. gain

ULTA-10 is a professional 40dBm+ ultra linear class-A broadband amplifier built on latest LDMOS technology, with high gain and wide frequency response, for laboratory grade tests and measurements, with outstanding linear performance such as low harmonics distortion and IMD products. It can be used to measure and describe intermodulation distortion products or harmonics behaviour for medium to high power (500...1500W) HF to VHF linear amplifiers. Optimised for signal purity not for power consumption, it was designed and built especially to characterise the IMD products and harmonics for SSPA in HF-VHF, where ultra low distortion is needed. Built in a compact case, externally supplied, with enhanced forced-air cooling. Operation over the band is achieved without any band switching or additional filtering. Compatible with most signal generators, frequency synthesisers, sweep generators or other laboratory signal sources. Accurately reproduces all waveforms within its power and frequency ranges: AM, FM, CW, pulsed and other complex modulation schemes.

■ Features:

- outstanding linear performance
- class-A linear LDMOS design
- suitable for CW, AM, FM, SSB modulations
- bench top enclosure
- internal cooling fans
- SMA-F connectors (options: N-f, BNC-f)
- CE and RED2014 - markings / declarations available



■ Typical applications:

- extending signal generator's output capability
- laboratory test applications
- signal purity measurements
- RFI/EMI applications
- antenna testing
- reliability RF testing
- high gain driver power amplifier

■ Absolute Maximum Ratings¹ & Environmental Specifications

Parameter	Testing conditions	Value	Units
Maximum Input Level	for no damage	+17	dBm
Operating Temperature	ambient	0...+40	°C
Relative Humidity	non condensing	10...90	%
Shock	normal truck transport	-	-
Vibration	normal truck transport	-	-

¹ stressing the device beyond its maximum ratings above, could irreversible damage the amplifier

Note 1: Electrical specifications and performance data contained herein are based on roWaves Technologies applicable test performance criteria and measurement methods. Note 2: This document and the information contained herein is provided for evaluation purposes only and is subject to change without notice.

■ Electrical Specifications:

@ TA = +25°C

Parameter	Testing conditions	Min.	Typ.	Max.	Units
Frequency Range	-	0.25	-	220	MHz
Rated Power Output	-	-	40	44	dBm
Power@ 1dB Compression P1dB	@ 1dB comp.	-	44.7	-	dBm
Operation Class	-	-	-	-	A
Gain	@ 18dBm input	20	22	26	dB
Gain Flatness	from 0.25 to 220MHz	-	± 3	-	dB
Third Order Intercept Point IP3	2 x tones/1kHz spaced 14MHz / 39dBm	-	54.7	-	n/a
3rd Order Intermodulation Distortion IMD3	2 x tones/2kHz spaced 14MHz / 39dBm	-	70	-	dBc
Harmonics Level	2f @ rated power	-	-57	-	dBc
Input VSWR	-	-	1.2:1	2:1	-
Input Impedance	-	-	50	-	Ω
Output Impedance	-	-	50	-	Ω
Input Return Loss	-	-	20.9	-10	dB
Power Consumption	for single ULTA-10 module	-	125	-	W
Operating D.C. Voltage	-	-	50	-	Vdc
Operating D.C. Current	-	2.2	2.5	2.7	Adc

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Typical Performance

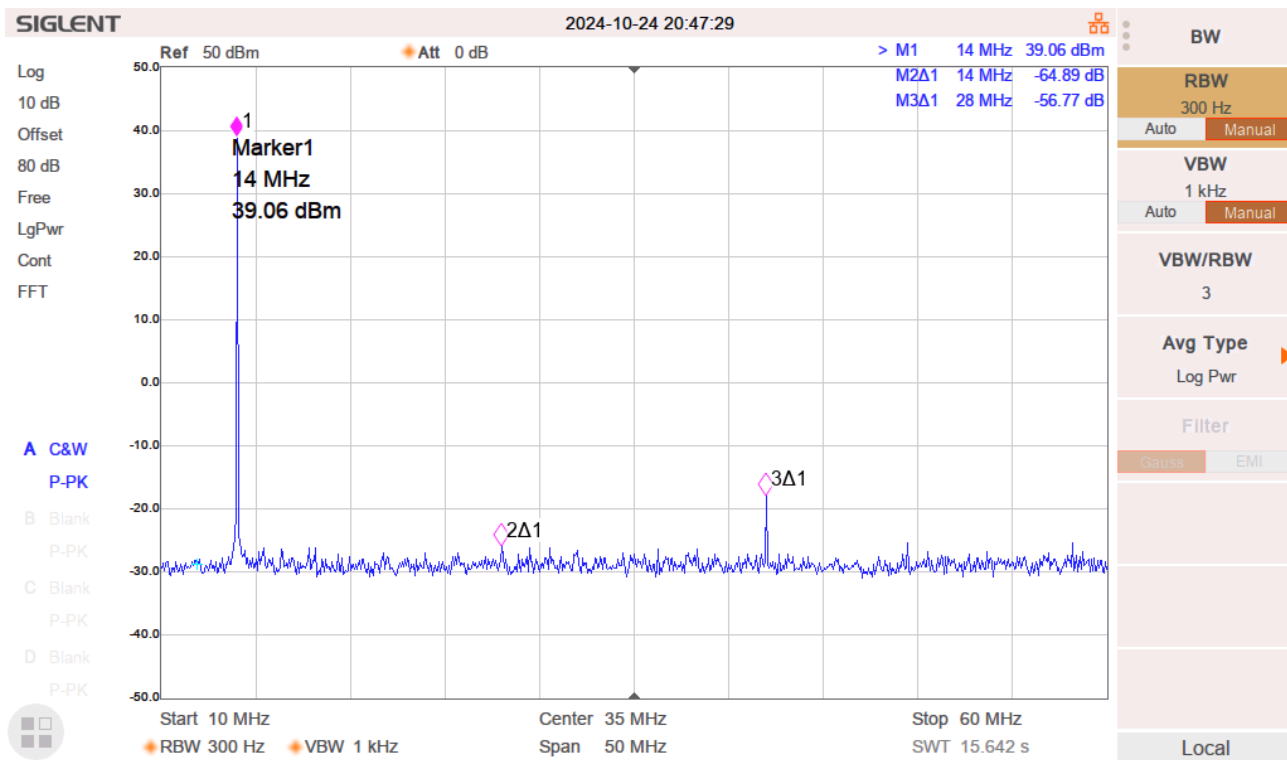


Fig.1 second (2nd) harmonic (-64.9dBc) & 3rd harmonic (-56.77dBc) @ 14MHz / 39dBm

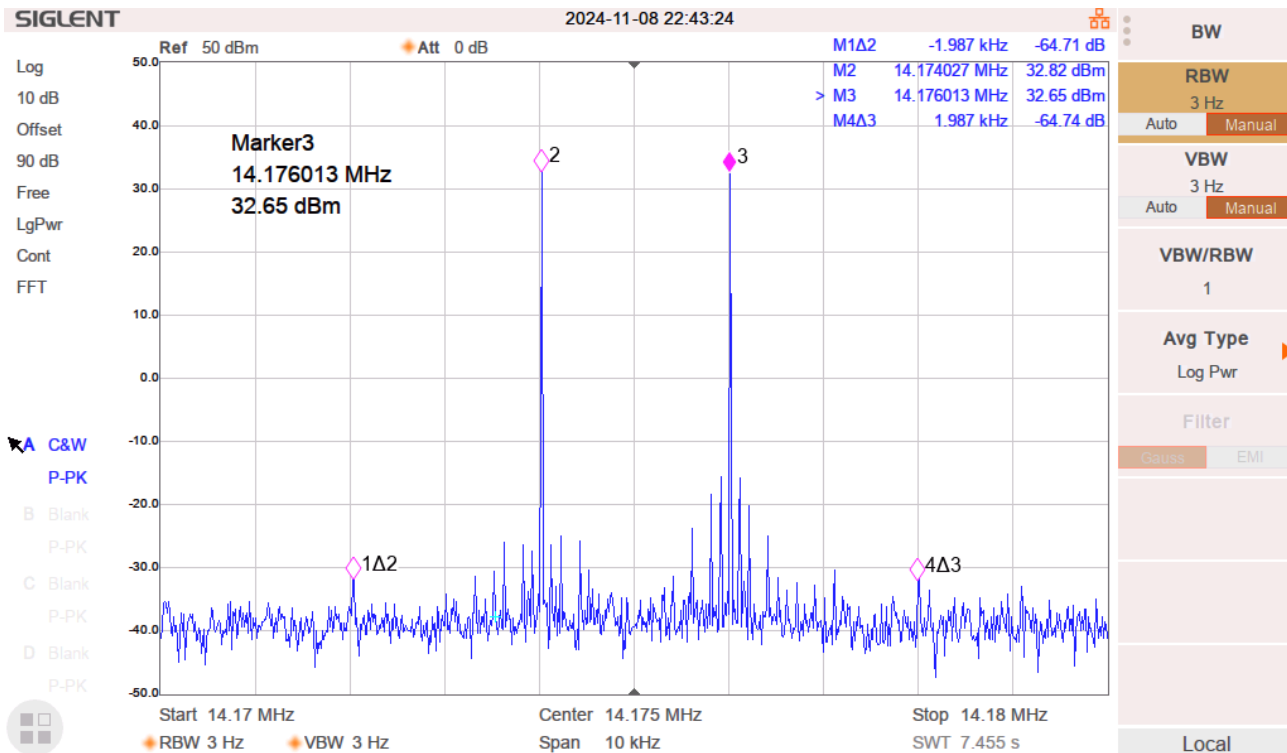


Fig.2 - IMD3 value (typ. -70dBc) for 2 x tones test (spaced at 2kHz) @ 14MHz

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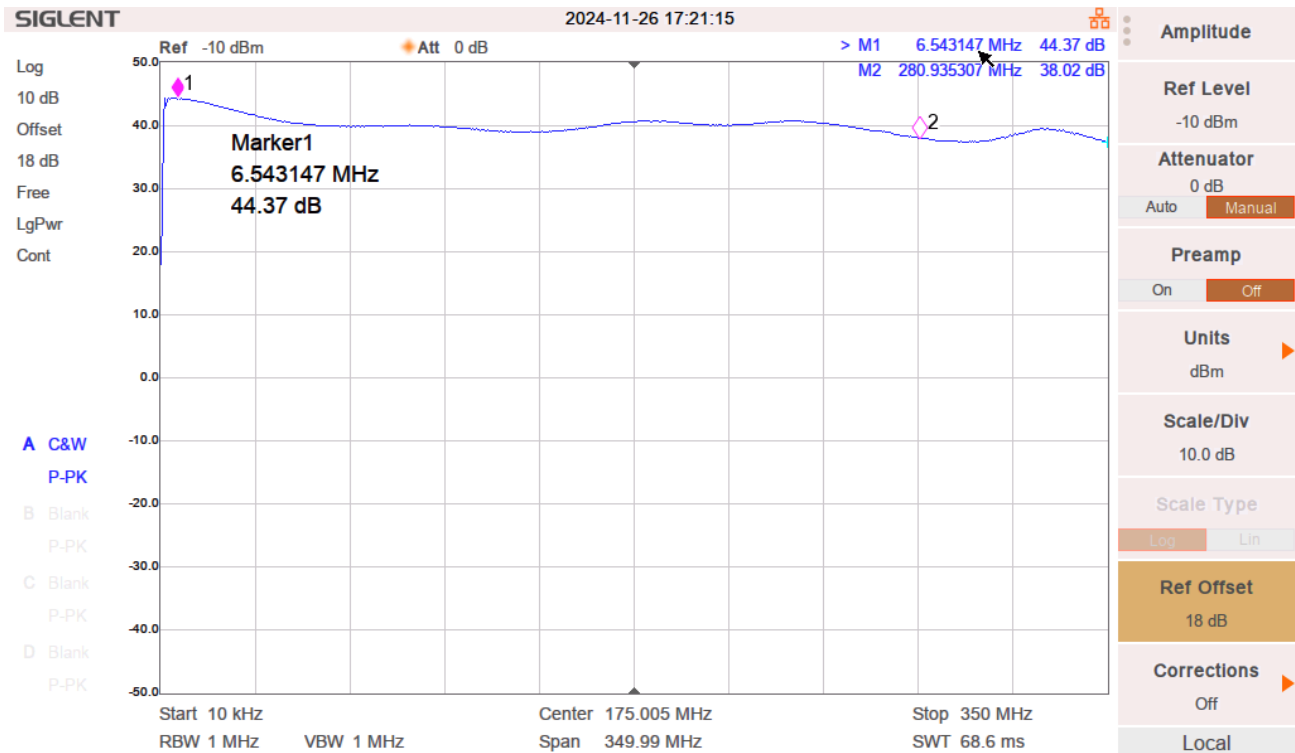


Fig.3 - Output power level @ +18dBm input

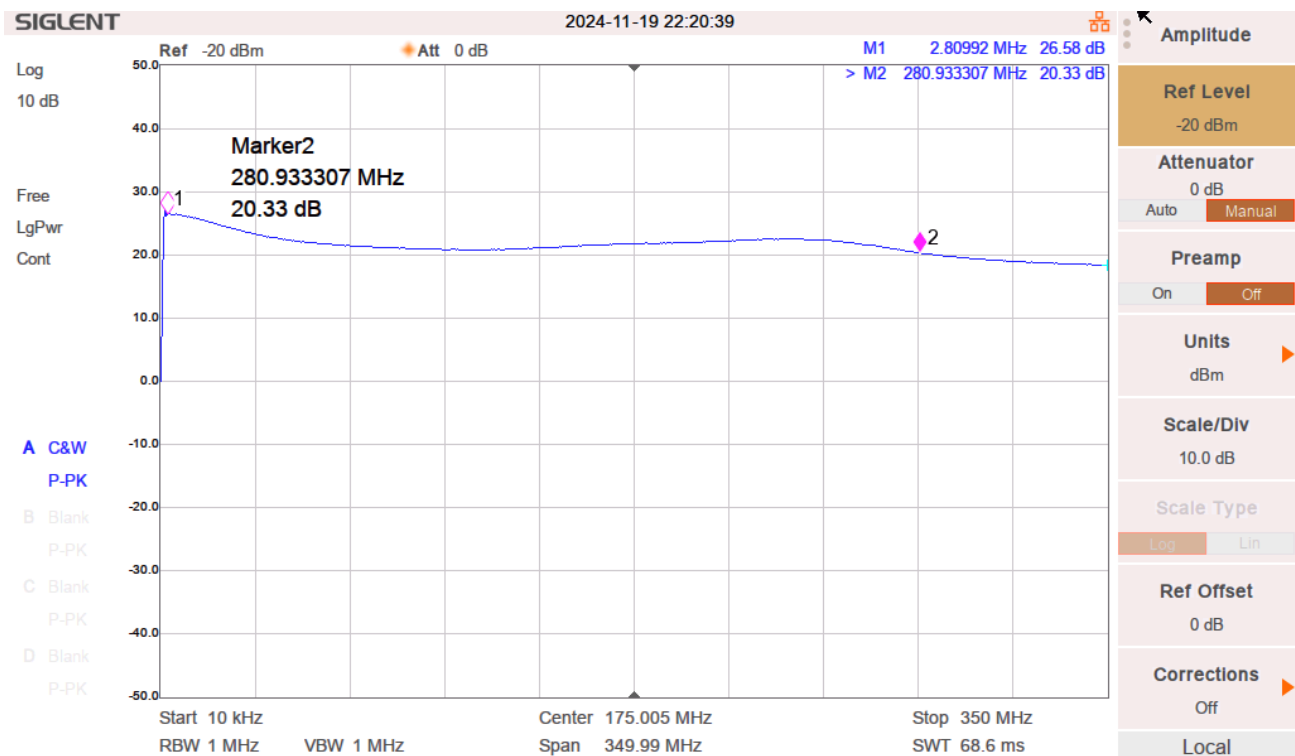
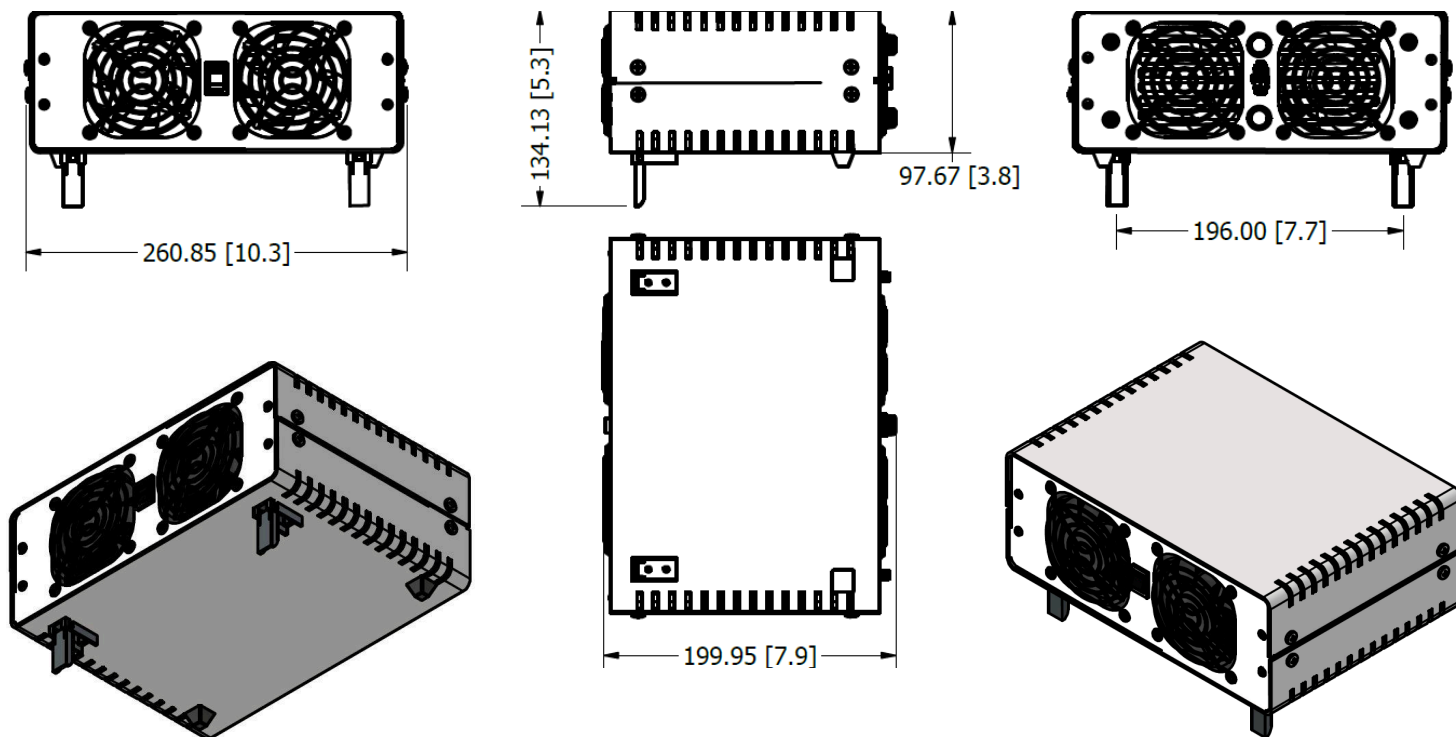


Fig.4 - Small Signal Gain @ 0dBm: typ. 20dB

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■ Outline drawing:



■ Mechanical specifications:

Parameter	Value	Unit	Comments
Length	200 / 7.9 ± 1mm	mm / in	including fuses and fan guards
Width	261 / 10.3 ± 1mm	mm / in	including side screws
Height	104 / 4.1 ± 0.5mm	mm / in	including legs
Weight	3980 / 8.6	g / lbs	without power supply cable
Cooling	-	24Vdc fans	air intake from front, air exhaust at rear

■ Connectors

Description	Connectors amplifier no.1 (PA-1)	Connectors amplifier no.2 (PA-2) ²
Type ³	50Ω SMA-Female, straight	50Ω SMA-Female, straight

² applicable for variant with 2 x ULTA-10 modules inside

³ can be customised for customer needs (e.g. panel mounted N-female, BNC-female)

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■ Ordering Information

Model	Modification	Description
ULTA-10R3-2	standard, 2 x ULTA-10 modules inside	2 x modules inside for high power IMD3 testing / harmonics
ULTA-10R3-1	custom, 1x ULTA-10 module inside	1 x module inside for mid power IMD3 testing / harmonics

■ Recommended usage - verification steps:

- a) values in datasheet are at 25°C, sea level
- b) ESD sensitive material, transport device in approved ESD bags and handle in appropriate ESD workstations
- c) when using it, do not block fan inlet and fan outlet areas to avoid excessive overheating and permanent damage
- d) for safe operation, it is highly recommended a high power isolator or attenuator to be used at the output of the power amplifier
- e) confirm that proper ESD precautions and controls are always in place before handling the amplifier
- f) confirm that adequate system grounding is established. The DC power supply and amplifier must have a common ground in order to operate properly
- g) power amplifiers may require additional DC current when initially powered-up. Depending on the design, the input current draw could range from an additional 10% to 100% above the maximum rated DC current of the amplifier. This varies based on product part number
- h) confirm the DC power supply, if limited, is set to allow for additional start-up current that's rated for the power amplifier.
- i) confirm the system is designed and calibrated for 50Ω ohms
- j) perform a CALIBRATION (if required) with the loads, before connecting the amplifier to the Vector Network Analyzer to ensure proper performance
- k) use a fixed attenuator between the signal source and input port of the amplifier to optimise the input VSWR match
- l) confirm the input power level at the input port of the amplifier does not exceed the maximum rated limit for input power (as stated in the amplifier's datasheet)
- m) confirm the Vector Network Analyzer is always connected to the amplifier first, before DC power is applied to the amplifier.
- n) as long as the input and output ports of the amplifier are connected to a 50 Ohm load and RF signal power is applied, the amplifier can be powered up with DC voltage
- o) confirm the amplifier output load is matched for a 50 Ohm impedance and will not exceed the maximum rated VSWR or Return Loss limit for the amplifier. Exceeding the maximum rated VSWR or Return Loss limit will result in reflected signal power that could damage the amplifier and void the warranty
- p) the attenuator or isolator used at the output port of the amplifier must be rated to handle the output power level and operational frequency band of the amplifier

■ Change History | DS-09

date	change	comment
7 Nov 2024	initial release	1st revision available
8 Nov 2024	"recommended usage" chapter added	1.1 revision available
19 Nov 2024	measured gain flatness calculated P1dB , IP3 (TOI) measured the total freq. BW	1.2 revision with important parameters
26 Nov 2024	added input RL / input VSWR added high power gain removed some testing conditions criteria changed freq. range (due to input mismatch measurements)	1.3 revision
27 Nov 2024	added correct IMD3 plot added small signal gain plot	1.4 revision finished

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