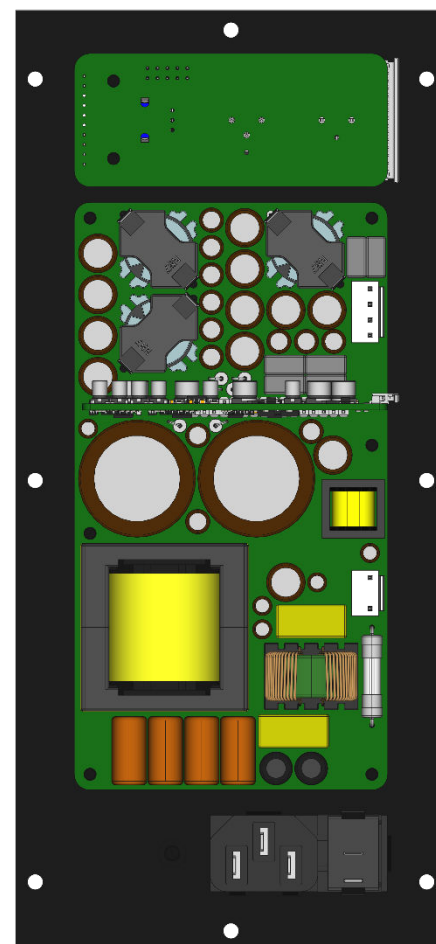


750W/8ohm + 300W/4ohm Amplifier Module With Integrated DSP

1 Features

- Turn-Key Active Speaker Solution
 - Integrated DSP
 - Integrated ADC / DAC
 - Two Channels (1 x 750W/8ohm + 1 x 300W/4ohm)
 - Accepts Various Audio Interfaces (Analog, AES-EBU, SPDIF, I2S, ...)
 - FIR/IIR filtering with freely configurable audio path
- High fidelity, low THD, IMD
- Customers Specific Design Support Available
 - Audio Networking (Dante/AVB/...)
 - Remote Network Control
- Extensive Low-End Bass Capabilities (BTL configuration - No Supply Pumping)
- Compact Design
 - Very Small Dimensions (150 x 80 x 45mm / 5.9 x 3.15 x 1.77 inch)
 - Low Weight
- True Universal Mains Input
 - 100V – 240VAC / 50 - 60Hz
 - **Build-in active PFC**
- High-Efficiency
 - Class D Amplifiers
 - Low Standby Power Consumption
 - Low Idle Losses
- High-Reliability
 - Intelligent DSP Controlled Protection Scheme
 - Fully protected against overload
- Very low EMI signature, Low AC leakage current, Class I Construction



2 Description

This self-powered Class D amplifier module is set out to be an easily customizable full turnkey solution targeting the active 2-way PA speaker market. The heart of this solution is a purposely designed amplifier module which basically has all the bells and whistles on board to easily adapt it to the customers wishes without the need for a long and expensive custom development trajectory. It combines the switch mode power supply, two class D power amplifiers, a powerful Analog Devices ADAU1462 DSP supported by high performance AKM Analog to Digital (AK5552VN) and Digital to Analog (AK4452VN) conversion stages and all the necessary analog circuitry optimized for best sonic performance possible on a single very compact PCBA. The customizing is basically done by means of the small input connector PCB together with the mechanics which still allows you to determine the layout of the connectors and controls, possibly additional input sources like microphone inputs, BT and even network audio, the control over the advancedness of the user interface (i.e. graphic display or simple LED indicators). This will enable you to keep control over the general look of your brand.

The very basic customer implementation like the one pictured above would be a single Line Input, a Link Output, a volume knob and some status LEDs for signaling Power, Signal and Limit requires no advanced electronics knowledge at all it is basically just connecting wires and you are all set to go. Because of the very versatile input section of the core module even the most advanced functionality can be designed with the absolute minimum of effort.

The integrated high-performance DSP enables the user to easily implement custom filter algorithms and thus creating their sound signature without having to worry about the hardware or any interconnections. Just connect an input signal, be it analog, digital or even wireless, connect the loudspeakers and plug it into any mains in any country and PLAY! Simple as that!

3 Block Diagram (Of the core Amplifier Module)

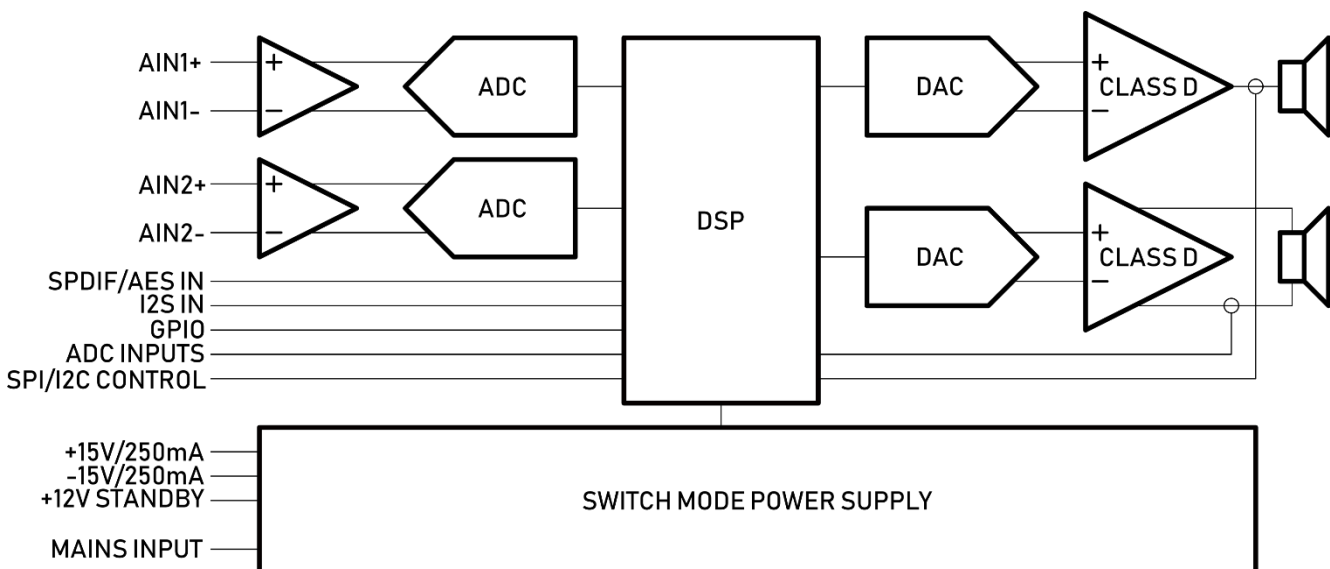
In below illustration a simplified block diagram of the SMA-1 hardware is displayed. The heart of the system is the DSP which not only does the processing of the audio signals according to the needs of the user but also controls the internal household of the whole module to ensure worry free reliable operation anywhere, any time in any conditions.

In the top-left side there are two balanced analog line inputs, one digital SPDIF/AES and one I2S input which all can be processed by the DSP simultaneously.

Below, some lines intended to externally control the module are provided. There are some general purpose I/O lines which can be used to connect external switches or indicating LED's, some ADC inputs to connect for instance to an external pot meter to implement volume control and last but not least a user selectable SPI/I2C serial interface to enable external communication with more advanced user applications which may require this.

The SMA-1 also accommodates Auxiliary standby power for powering optional user applications (+ and – 15V) for enabling low-standby power applications.

On the right side of the diagram you can see the two Digital to Analog converters which drive their corresponding Class D amplifier which power the connected loudspeaker loads. The HF driver is powered by a single ended Class D amplifier while the LF driver is powered by a Bridged Class D amplifier configuration. In the drawing it can also be seen that the output current for both channels is sensed and fed back into the DSP which internally uses this for protection purposes adding up to best reliability possible.



4 Specifications

Specification	Value	Notes
GENERAL		
Operating temperature range	0 to +50°C	Full load over entire voltage range
Isolation	3000VAC	Class I construction
Max. Operational Altitude	< 2000m	
Max. Standby Power	< 500mW	Module in Standby mode; User application < 10mW
Max. Active Idle Power	< 12W	Amplifier active; Channels not driven
MAINS INPUT		
Input Voltage range	100 – 240VAC	
Input Frequency	50 – 60Hz	
Input Current	< 5A @ 230VAC	
Inrush Current	< 80A	Over entire voltage range
Input Protection	Internal T6.3AH/250VAC fuse	
Analog Audio Input		
Input Impedance	47k	
Max Full Scale Input Voltage	21dBu	
Digital Audio Input		
Digital I/O voltage levels	3.3V	
Max Sample Rate	192kHz	
AUDIO OUTPUT CHANNEL 1		
Max. RMS Output Power	750 W	@8Ohm, 1kHz, 1% THD
Max. THD+N	0.01%	20Hz – 20kHz; Pout < Pr/2
Typ. CMRR	70dB	
Max. Output Noise	50uV	20Hz – 20kHz
Min. SN Ratio	100dB	
Frequency Response	20Hz – 20kHz	
AUDIO OUTPUT CHANNEL 2		
Max. RMS Output Power	300W	@4Ohm, 1kHz, 1% THD
Max. THD+N	0.01%	20Hz – 20kHz; Pout < Pr/2
Typ. CMRR	70dB	
Max. Output Noise	50uV	20Hz – 20kHz
Min. SN Ratio	100dB	
Frequency Response	20Hz – 20kHz	
AUXILIARY OUTPUT VOLTAGES		
Typ. Auxiliary Output Voltage 1	15V +/- 1V	Available in standby
Typ. Auxiliary Output Voltage 2	15V +/- 1V	Available in standby
Max. Auxiliary Output Current	250mA	

5 Safety Warning



These units operate directly from the mains and carry hazardous voltages at accessible parts. It is mandatory to make sure none of these parts are exposed to inadvertent touch. Observe extreme care during installation and pay attention to never touch ANY parts of the unit while it is connected to the mains. Wait at least 1 minute after disconnecting the mains cord before

touching or handling the unit.

6 Connector Pinout

6.1 Mains Input Connector J1

Pin	Name	Description
1	NEUTRAL	Mains Input Connection (100 – 240VAC / 50 – 60Hz)
2	LINE	

6.2 Signal Input Connector J3

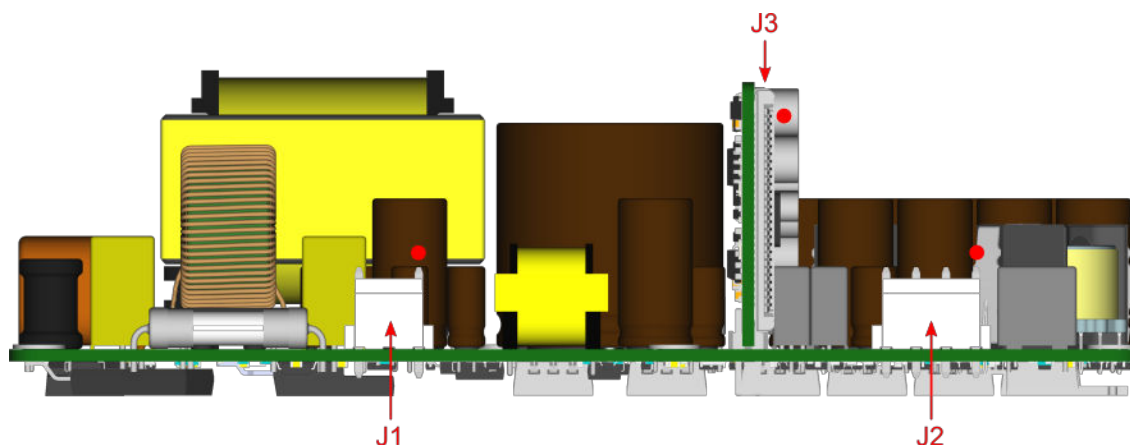
Pin	Name	Description
1	AIN1P	Analog Audio Input 1 (Hot)
2	AIN1N	Analog Audio Input 1 (Cold)
3	GND	Ground Connection
4	AIN2P	Analog Audio Input 2 (Hot)
5	AIN2N	Analog Audio Input 2 (Cold)
6	GND	Ground Connection
7	+12VSB	+12V Standby output
8	ENABLE	Module Enable Input
9	+15V	+15V Auxiliary Output
10	-15V	-15V Auxiliary Output
11	GND	Ground Connection
12	SDATA IN	Digital Audio I2S Data Input
13	LRCLK IN	Digital Audio I2S Word Clock Input
14	BCLK IN	Digital Audio I2S Bit Clock Input
15	MCLK OUT	Digital Audio I2S Master Clock Output
16	SPDIF IN	Digital Audio SPDIF/AES Input
17	GND	Ground Connection
18	RESET	DSP Reset Input
19	WP	DSP Eeprom Write Protect Input
20	SELFBOOT	DSP Selfboot Input
21	MISO/SDA	SPI data input/I2C Data Line
22	SCLK/SCL	SPI Clock input/I2C Clock Line
23	MOSI/ADDR1	SPI data output/I2C Address selection 1
24	SS/ADDR0	SPI Chip Select/I2C Address Selection 0
25	ADC	Analog Control Input
26	GND	Ground Connection

6.3 Loudspeaker Output Connector J2

Pin	Name	Description
1	HFOUT-N	HF Loudspeaker Output (Cold)
2	HFOUT-P	HF Loudspeaker Output (Hot)
3	LFOUT-N	LF Loudspeaker Output (Cold)
4	LFOUT-P	LF Loudspeaker Output (Hot)

6.4 Connector locations

The SMA-1 module has only 3 connectors located at one side of the board as is illustrated in the drawing below.



Please note above drawing is made from an early prototype exact locations and connector pinout is not representable for the current hardware. J3 is moved to the daughter board and is now a 26-pole 1mm pitch FPC connector.

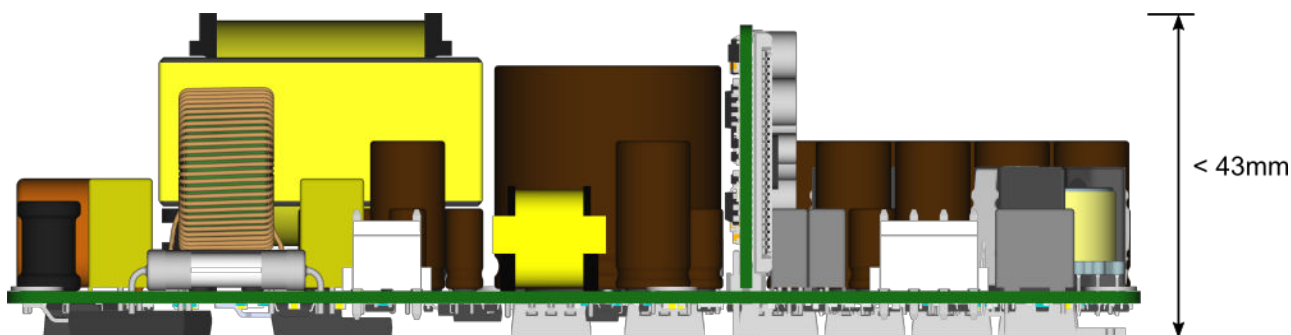
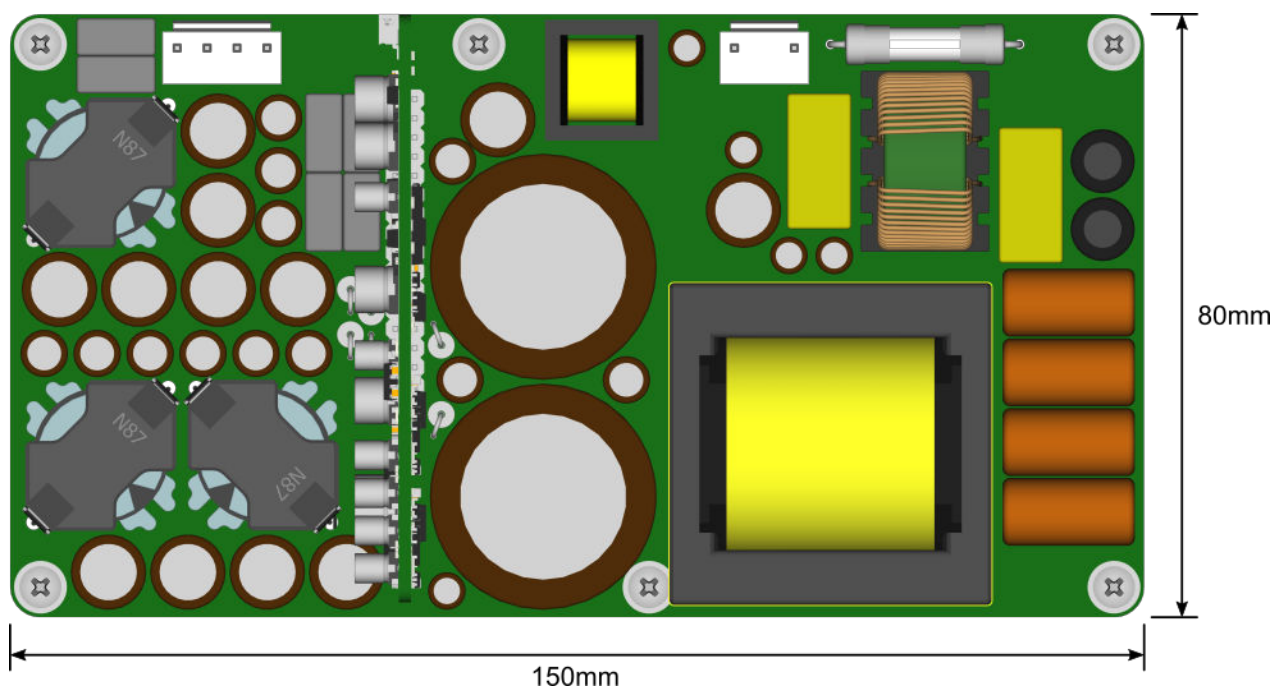
7 Application Information

TBD

8 Typical Performance Data

TBD

9 Mechanical Dimensions



10 Version History

Revision	Date	Author	Changes
0.0	28 Jun 2018	NE	Initial Specification
0.1	15 Sept 2018	NE	<ul style="list-style-type: none"> - Added Connector Information - Added Mechanical Dimensions
0.2	2 Jan 2019	NE	<ul style="list-style-type: none"> - Updated Features - Updated Description - Added Block Diagram - Updated Specifications - Updated Connector Information
0.3	7 Jun 2019	HJG	<ul style="list-style-type: none"> - Upgraded power rating and specs