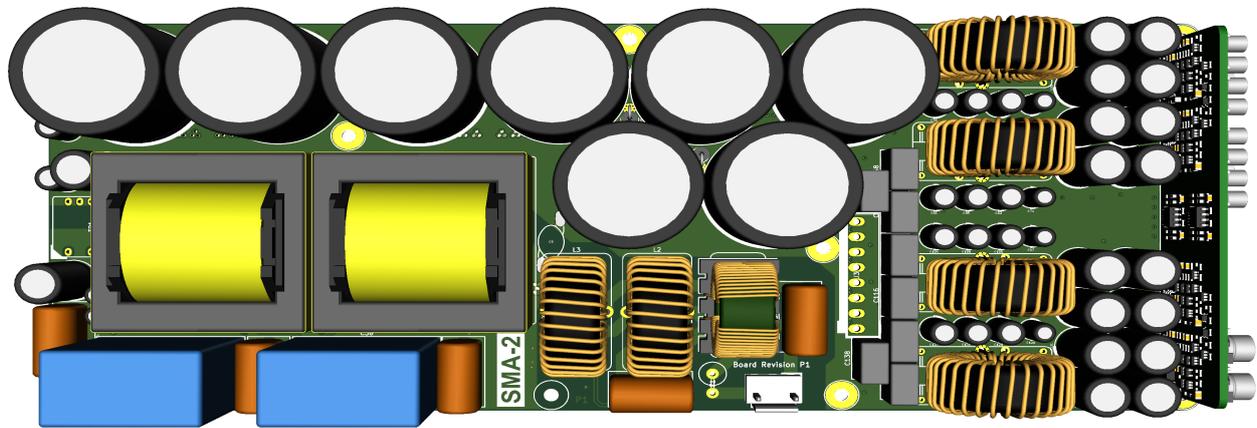




## SMA-2 (1,5 & 3 KW)

High Efficiency 4-Channel Class-D Amplifier with DSP

D a t a s h e e t



### Description

The Apex SMA-2 is an amplifier module featuring four output channels specifically designed for multi-way loudspeakers and asymmetric loads.

The highly compact design makes the Apex SMA-2 an unique product, capable of delivering up to 3000 W on a single 4 Ohm channel, granting the highest power available for driving all speakers on multi-way systems.

It combines a switch mode power supply, two class D power amplifiers, a powerful Analog Devices ADAU1462 DSP supported by high performance (ESS9842) Analog to Digital and Digital to Analog (ESS9010) 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 or networked audio. This will enable you to keep control over the general look of your brand.

The SMA-2 module features the Apex direct drive technology like the recently released two channel SMA-1.

DirectDrive is a proprietary ClassD technology where the DSP system is an integral part of the amplifier system. Other than one capacitor at the audio input side to protect amplifying DC voltages, the audio signal path traveling through the ADC-DSP-DAC-AMPLIFIER is completely DC coupled.

Direct drive technology results in some serious improvements on a Class D amplifier. It results in a significant improvement over cone excursion and transient response

A module equipped with Direct Drive technology will clip later due to the fact that the peak levels on both sides of the sinus are close to equal.

And another thing.. DDT has more output at the initial impuls (+ 10%) and the cones swing less after the signal stops even at 200Hz (-10% excursion).

All these improvements are audible very clear and result in a more cleaner and powerfull low end experience compared to traditional Class D amplifiers.

(A more detailed description of the Direct Drive Technology can be found in the Whitepaper at [www.apex.be](http://www.apex.be)).

The output power for each amplifier channel can be assigned through the software creating numerous possibilities, from high power bridged submodules to 4 x identical power modules or a combination of different power options.

Apex SMA-2 is a turnkey power amplifier module for OEM's which enables a fast time to market. With its very small size of 100x250mm it fit even the smallest cabinets. It features up to 8 preset selections and field firmware updates. The highly efficient double power supply (one PSU for 2 channels) with active PFC allows worldwide input voltage range. Custom printing is offered with a scratch-free polycarbonate overlay.

\*Both modules are equipped with the exact same amplifiers modules however the SMA-2, 1,5 kW only has one power supply and therefore its maximum combined outputpower is limited to 1,5 kW.



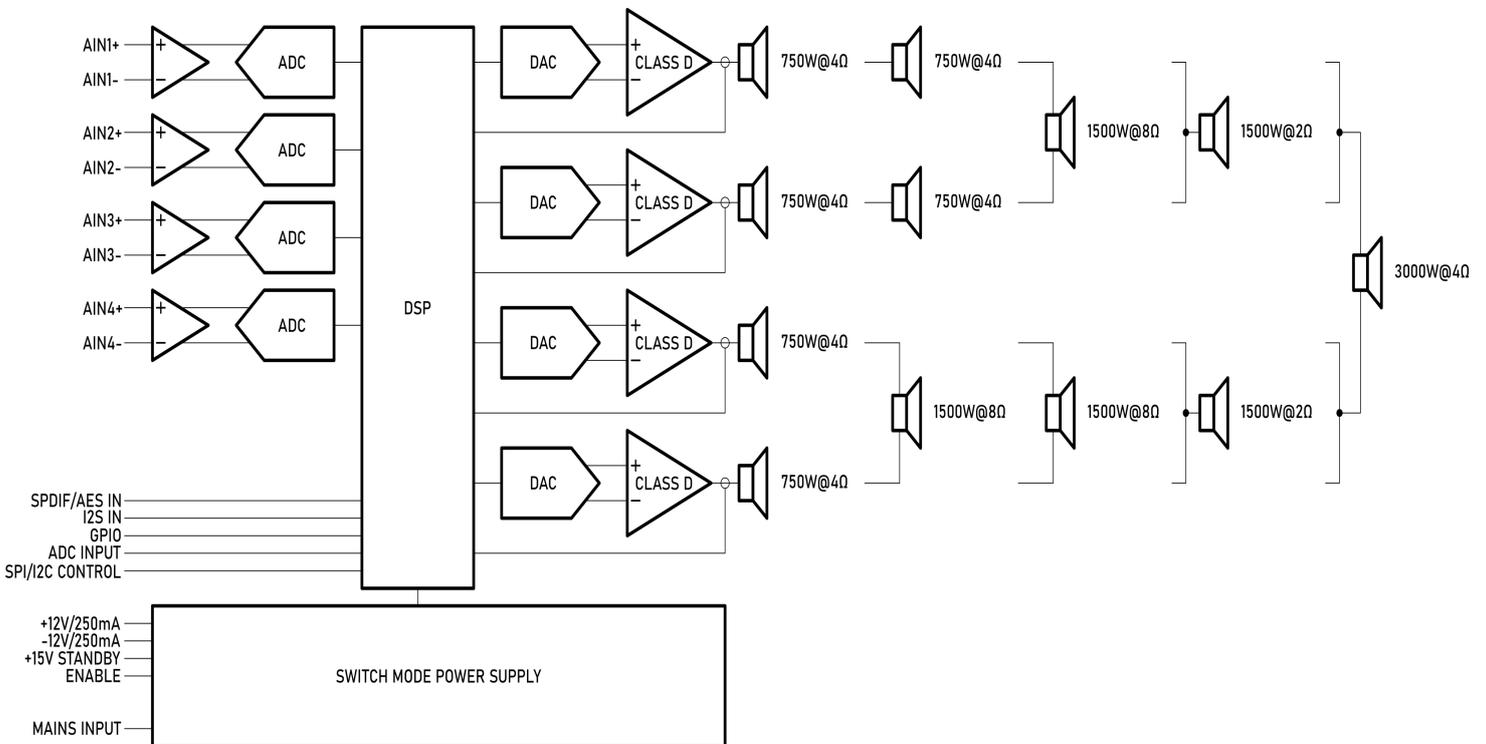
## Block Diagram

In the illustration below a simplified block diagram of the SMA-2 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 and in any conditions. In the top-left side there are four 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-2 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 four Digital to Analog converters, which drive their corresponding Class D amplifier, which power the connected loudspeaker loads. In the drawing it can also be seen that the output current for all channels is sensed and fed back into the DSP which internally uses this for protection purposes adding up to best reliability possible.





## Specifications

Specification	Value	Notes
<b>GENERAL</b>		
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	< 20W	Amplifier active; Channels not driven
<b>MAINS INPUT</b>		
Input Voltage range	100 - 240VAC (+- 10%)	
Input Frequency	50 - 60Hz	
Input Current	< 12A @ 230VAC	
Inrush Current	< 80A	Over entire voltage range
Input Protection	Internal T6.3AH/250VAC fuse	
<b>ANALOG AUDIO INPUT</b>		
Input Impedance	20k	
Max Full Scale Input Voltage	21dBu	
<b>DIGITAL AUDIO INPUT</b>		
Digital I/O voltage levels	3.3V	
Max Sample Rate	192kHz	
<b>AUDIO OUTPUT CHANNELS</b>		
4x SE	750 W @4ohm	1kHz, 1% THD
2x PTL	1500 W @2ohm	
2x BTL	1500 W @4ohm	
1x PBTL	3000 W @4ohm	
1x PTL + 2x SE	1500 W @2ohm + 2 x 750 W @4ohm	
1x BTL + 2x SE	1500 W @4ohm + 2 x 750 W @4ohm	
Max. THD+N	0.01%	20Hz - 20kHz; Pout < Pr/2
Typ. CMRR	70dB	
Max. Output Noise	70uV	20Hz - 20kHz
Min. SN Ratio	100dB	
Frequency Response	20Hz - 20kHz	
<b>AUXILIARY OUTPUT VOLTAGES</b>		
Typ. Auxiliary Output Voltage 1	12V +/- 1V	Disabled in standby
Typ. Auxiliary Output Voltage 2	12V +/- 1V	Disabled in standby
Max. Auxiliary Output Current	250mA	Available in standby

(\*) Total output power can not exceed 1500 W for SMA2-1,5 kW

## Connector Pinout

### Mains Input Connector J1

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

### Signal Input Connector J3

Pin	Name	Description
1	AIN1P	Analog Audio Input 1 (Hot)
2	GND	Ground Connection
3	AIN1N	Analog Audio Input 1 (Cold)
4	AIN2P	Analog Audio Input 2 (Hot)
5	GND	Ground Connection
6	AIN2N	Analog Audio Input 2 (Cold)
7	AIN3P	Analog Audio Input 3 (Hot)
8	GND	Ground Connection
9	AIN3N	Analog Audio Input 3 (Cold)
10	AIN4P	Analog Audio Input 4 (Hot)
11	GND	Ground Connection
12	AIN4N	Analog Audio Input 4 (Cold)
13	GPIO0	General purpose pin 0
14	GPIO1	General purpose pin 1
15	GPIO2	General purpose pin 2
16	GPIO3	General purpose pin 3
17	ADC	Analog Control Input
18	SPDIF	Digital Audio SPDIF/AES Input
19	BCLK	Digital Audio I2S Bit Clock Input
20	LRCLK	Digital Audio I2S Word Clock Input
21	SDATA	Digital Audio I2S Data Input
22	GND	Ground Connection
23	ENABLE	Module Enable Input
24	SELFBOT	DSP Selfboot Input
25	ADDR0	SPI Chip Select/I2C Address Selection 0
26	ADDR1	SPI data output/I2C Address selection 1
27	I2C_SDA	SPI data input/I2C Data Line
28	I2C_SCL	SPI Clock input/I2C Clock Line
29	-12Vreg	-12V Auxiliary Output (follows enable)
30	-12Vreg	-12V Auxiliary Output (follows enable)
31	GND	Ground Connection
32	GND	Ground Connection
33	+12Vreg	+12V Auxiliary Output (follows enable)
34	+12Vreg	+12V Auxiliary Output (follows enable)
35	GND	Ground Connection
36	GND	Ground Connection
37	GND	Ground Connection
38	+15Vunreg	+15V Standby output
39	+15Vunreg	+15V Standby output
40	+15Vunreg	+15V Standby output

## Speaker Output Connector J2

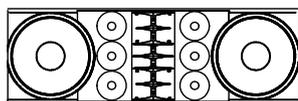
Pin	Name	Description
1	CH1OUT-N	CH1 Loudspeaker Output (Cold)
2	CH1OUT-P	CH1 Loudspeaker Output (Hot)
3	CH2OUT-N	CH2 Loudspeaker Output (Cold)
4	CH2OUT-P	CH2 Loudspeaker Output (Hot)
5	CH3OUT-N	CH3 Loudspeaker Output (Cold)
6	CH3OUT-P	CH3 Loudspeaker Output (Hot)
7	CH4OUT-N	CH4 Loudspeaker Output (Cold)
8	CH4OUT-P	CH4 Loudspeaker Output (Hot)



### Safety Warning:

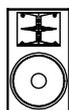
These units operate directly from the mains and carry hazardous voltages at accessible parts. It is mandatory to make sure none of these parts are exposed to inadvertent touch. Observe extreme care during installation and pay attention to never touch ANY parts of the unit while it is connected to the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

## Application examples



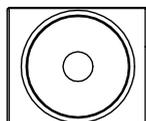
3-way Line Array system

HF: 750w @ 8 ohm  
MF: 750w @ 8 ohm  
LF: 1500w @ 8 ohm



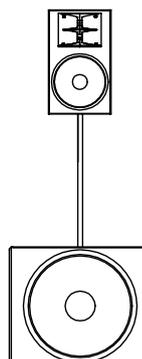
2-way

MF/HF: 1500w @ 8 ohm  
LF: 1500w @ 8 ohm



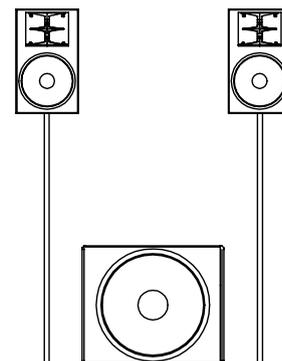
Mono Sub

LF: 3000w @ 4 ohm



Sub + 2-way

HF: 750w @ 8 ohm  
MF: 750w @ 8 ohm  
LF: 1500w @ 8 ohm

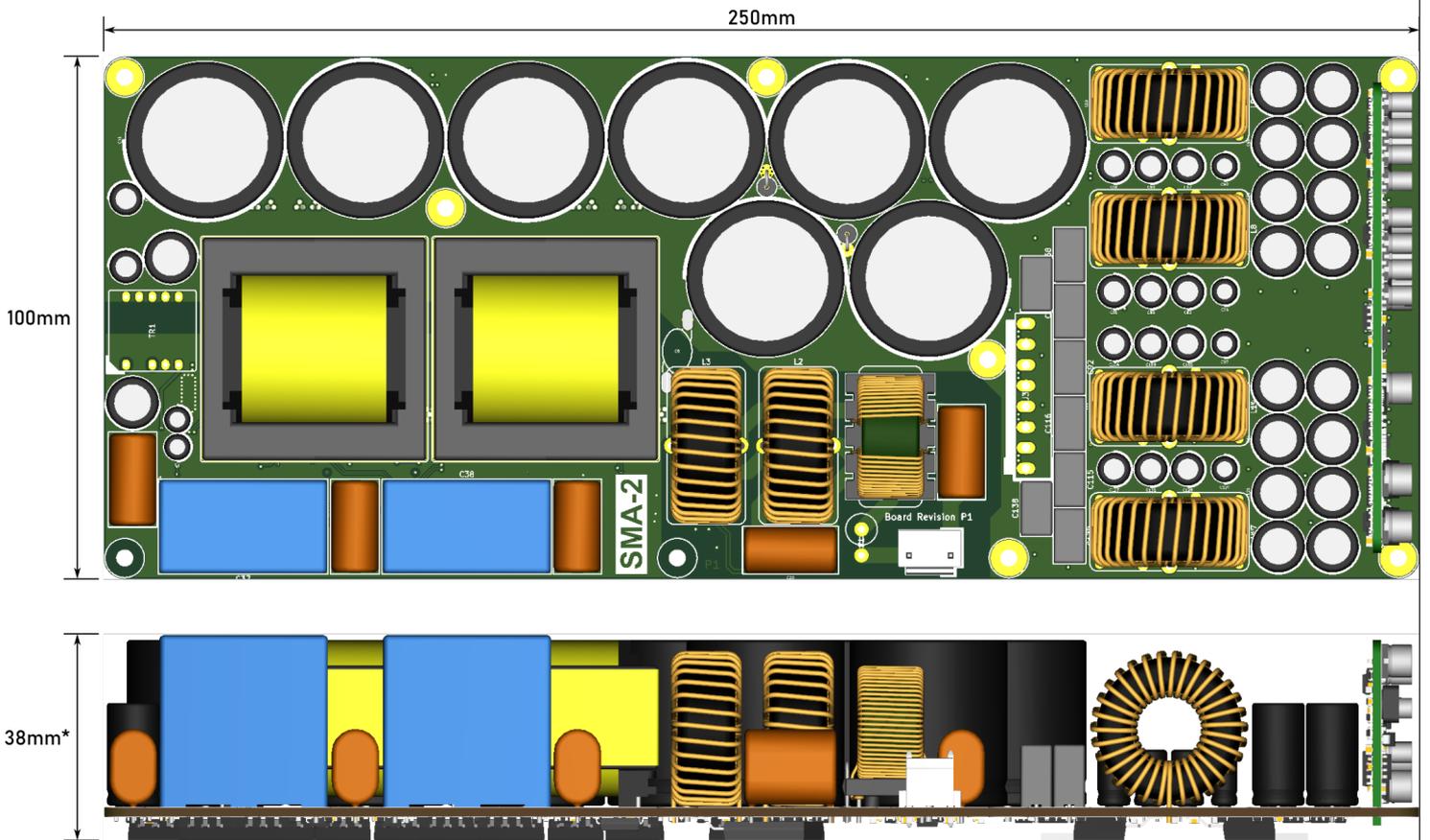


Sub + 2 Full Range systems

MF/HF: 2 x 750w @ 8 ohm  
LF: 1500w @ 8 ohm

(°) Total output power can not exceed 1500 W for SMA2-1,5 kW

## Dimensions



## SMA-2 Model options

Type	Option	Total Output	Description
SMA-2	Standard	1,5 kW	1,5 kW module PCB board
SMA-2	Standard	3 kW	3 kW module PCB board
SMA-2	Base	1,5 kW	1,5 kW module PCB board in metal housing mounted on backplate with XLR IO, level pot and preset selector
SMA-2	Base	3 kW	3 kW module PCB board in metal housing mounted on backplate with XLR IO, level pot and preset selector
SMA-2	CP	1,5 kW	1,5 kW module in metal housing mounted on backplate with CP display,encoder, XLR IO for analog audio & network
SMA-2	CP	3 kW	3 kW module in metal housing mounted on backplate with CP display,encoder, XLR IO for analog audio & network
SMA-2	CP-Dante	1,5 kW	1,5 kW module in metal housing mounted on backplate with CP display,encoder, XLR IO for analog audio & network. Dante on board
SMA-2	CP-Dante	3 kW	3 kW module in metal housing mounted on backplate with CP display,encoder, XLR IO for analog audio & network. Dante on board