SMPS500RxE

The **SMPS500RxE** Switched Mode Power Supply (SMPS) is specially designed to be used for Class D Audio Amplifiers, primarily with our CxD amplifier series which require multiple auxiliary voltages, Mute control during turn On/Off and real-time speaker DC protection as well as others manufacturers class D amplifiers which require similar voltages both for main differential output and for auxiliary and control voltages.

SMPS500RxE output voltage is regulated and independent of mains voltage variation as long as the mains voltage value and load current consumption is within specified limits. **SMPS500RxE** use state of the art, highly efficient Zero-Voltage-Switching Topology which allows **SMPS500RxE** to have very low EMI noise, lower losses and smaller size compared to an equivalent power rating hard-switched SMPS. Three output voltage values are available plus custom voltage in range of±32V to ±120V. **SMPS500RxE** is suitable to be used with most of the Audio Amplifiers from the market as long as the output voltage and current match the amplifier requirements.

SMPS500RxE has the best size to output power ratio being the most compact regulated SMPS dedicated for class D amplifiers available on the market which features additional auxiliary voltages and control signals required to match both our CxD series Class D amplifier modules as well as most of the class D amplifiers available on the market from various other vendors.

SMPS500RxE Features:

- Zero-Voltage-Switching Topology for high efficiency, up to 94.3% and lowest EMI.
- 230V AC and 120V compatible, jumper selectable.
- 500W Total Output Power, 620W Peak Output Power when used for audio amplifiers with crest ratio of 3.
- Three output voltages versions available from stock version: **SMPS500RxE** differential output: ±45V ±55V ±72V or custom voltages in range of ±32V to ±120V.
- Three Differential Auxiliary Voltage available, tailored to match the auxiliary voltages required by some of the CxD Class D amplifier series and not only, with voltage values in range of ±17V to ±20V at 200mA max.
- Complete protection set, Under-voltage, Over-current, DC Speaker Protection, Mute at turn ON/Off
- On-board Soft Start for smooth turn ON without current peaks or breaker tripping.
- Compact size, 120x60mm and 36mm tall from the PCB base, can fit into 1RU unit, lightweight, 400 grams, lower profile available on request, just 28mm tall from the PCB base and total height 35mm including bottom spacers.

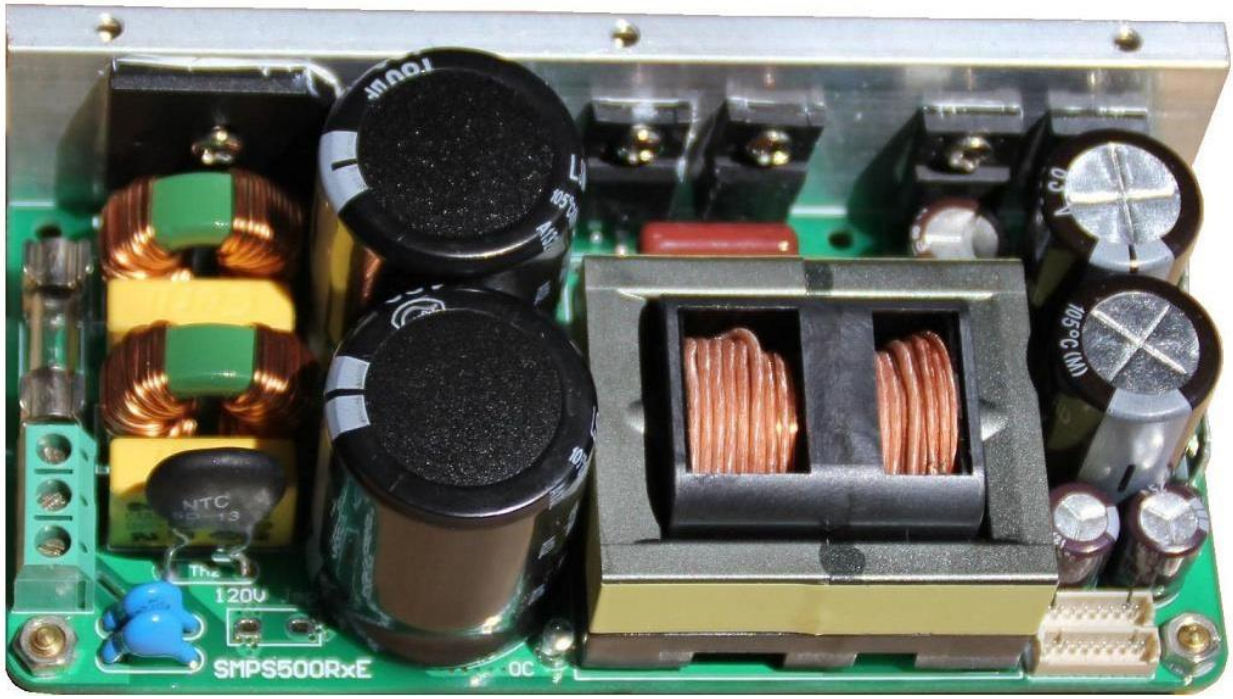


Fig.1 SMPS500RxE appearance

SMPS500RxE Description: Although the first SMPS's was developed nearly 50 years ago, most of the audio amplifiers manufacturers, both in HI-FI or Pro-Audio field, still use the old school linear power supplies made of bulky, heavy and inefficient mains transformer, rectifier bridge and large electrolytic capacitors to provide all necessary supply voltages for an audio amplifier, no matter if is class A, Class AB or switched amplifier, Class D/T. At the other extreme, some audio amplifier manufacturers are using hard-switching unregulated SMPS's which proved to be an EMI inferno, requiring extra additional filtering and shielding to achieve decent EMI performances and to not disturb all the sensitive circuits near-by. The main reasons behind these facts are the development costs and mass production costs and the lack of knowledge and fully understanding of ZVS SMPS operation, the only type of SMPS which has proven suitable for audio use. These facts created a SMPS-phobia among audio enthusiasts and Audio-amplifiers SMPS's are not yet widely accepted, mainly from subjective reasons such as "sound quality degradation" which was a direct effect of the previously mentioned early SMPS's. When it comes about the costs, the development cost of classic old type linear supply with bulky mains transformers is next to zero, in most cases all it takes is choosing the right transformer, an oversized rectifier bridge and some electrolytic capacitors with higher rated voltage than maximum DC voltage on the circuit and enough capacitance to hold the voltage during the most current demanding situation. That's it, rocket science? Not at all. For small and medium quantities, about 10k units, the old type mains transformers costs purchased in mass-production quantities beats the cost of developing and producing a good performance SMPS for audio applications, many companies which produce audio equipment, both for consumer and pro-audio are still using old type mains transformers and some, still use the old, hard-switched type SMPS mainly because most of the SMPS designers came from consumer products field where product cost stays ahead performance and high quality SMPS are out of budget.

Being soft commutated, the **SMPS500RxE** intermodulation noise which might occur has very low values, below the S/N ration threshold, thus inaudible. Switching frequency during normal operation is almost constant, around 100KHz, and is completely rejected by the mains EMI filters, so it doesn't interfere with near-by equipment through power lines. The ZVS topology used for the **SMPS500RxE** was chosen due to its many advantages compared with all other topologies. Among the advantages, we consider that the most important are superior efficiency, up to 94.3% lower EMI and noise, compact size and reasonable complexity. The operation principle of this converter was described in many papers, application notes, and reference designs. Although is not a new technology, being discovered more than 20 years ago, until recently, the lack of knowledge, documentation and availability of good characteristic electronic components such as high-speed MOS-FET's or IGBT's prohibited this topology to spread like other hard switched topologies did. Only after the LCD and Plasma TV's came-up and initiatives to increase efficiency of the consumer products such as 80+, 90+ were imposed, engineers had to look towards other solution than the current, mature hard-switched topologies, which can't break the 90% efficiency barrier without significant cost and complexity increase. For a ZVS resonant converter, efficiencies greater than 92% are common and even 95-96% can be achieved. In some cases the DC-DC converter is supplied from the output of a PFC pre-regulator capable to supply a constant 400V DC. In our case, the PFC stage is not required, due to the purpose of the application and because similar or better efficiencies can be achieved without using a complicated PFC circuitry which would increase the size of the SMPS board, EMI, and decrease the performance due to the fact that the available space is limited and the PFC inductor might interfere with other circuits operation.

The **output voltage** of **SMPS500RxE** is fully regulated and independent of mains voltage variation as long as the mains voltage value and load current consumption is within specified limits. For example, the **SMPS500RxE** ±55V version, the output voltage will not change when is powered from 200 to 250V AC or 100 to 130V AC mains voltage from zero to full load. For comparison, using a classic power supply comprised of a 500W mains transformer, rectifier bridge and same capacitance value for electrolytic capacitors as **SMPS500RxE** use on secondary side, designed to deliver ±55V at amplifier idle current consumption, let's say 200mA, the voltage at no load will be around ±56 to 57V, but under full load will drop down to ±47-50V, due to several factors such as transformer windings DC and AC resistance, and the lack of large primary side storage capacitance which **SMPS500RxE** have and the classic power supply doesn't have. The equivalent of total secondary side capacitance of **SMPS500RxE** is about 3-4 times higher than the value of the actual secondary side capacitors due to the fact that the main storage capacitors placed on the primary side can store more energy per volume being high-voltage type. The actual capacitance in the secondary side of **SMPS500RxE** is lower than the capacitance of similar power SMPS from our products range due to the fact that the fast voltage regulation and low output ripple allow using a smaller capacitance while keeping the small form factor and size.

To deal with bus-pumping phenomenon the amplifiers supplied from **SMPS500RxE** such as **CxD250-HP** can be driven with one channel 180* out of phase or amplifier modules such as **CxD500** which is single channel has an additional 1000uF on each rail installed on board, so the total capacitance of **SMPS500RxE** and the amplifier module is enough to reduce the bus-pumping effect. For high-performance applications, or when the **SMPS500RxE** is used to supply one single **CxD500** amplifier module which is extensively used on bass duty applications, or when two CxD250-HP amplifier modules are used and phase inversion is not a choice, an add-on capacitor-filter board, **LPS212A** is recommended to be used between the **SMPS500RxE** and **CxD500** Amplifier module. **LPS212A** is a dual linear supply board equipped with 4 High quality electrolytic capacitors chosen with values between 2200uF and 6800uF at working voltage between 50V to 100V. It also has two 6.8uH Inductors between each rail capacitors for high frequency ripple rejection as well as 4 high-frequency snubbers to filter furthermore the high-frequency noise which can affect the sound quality. It has two LED's, one for each polarity and separate input-output fast-on type terminal type connectors which can be used to connect thick wires up to 4mm². The **LPS212A** has no rectifier bridge on-board and must be used only between an existing SMPS and one or two amplifier boards as a CLC filter which also increase the total available capacitance. It can be used for any class AB or D amplifier which requires smooth DC rails as well as higher capacitance per rail than the existing power supply can provide. Using **LPS212A** with **SMPS500RxE** the peak power of **SMPS500RxE** increases, as well as headroom, important for subwoofer applications. The LPS212A board size is just 72x100mm and the height depends on the capacitors height, with the lowest profile capacitors, 25mm tall the overall height will be just 32mm including 5mm space below board, keeping the overall height profile of all the boards low. For more information, visit the **LPS212A** product page.

Fig.2 LPS212A Capacitor-filter board

An important aspect which must be considered when the **SMPS500RxE** is powered ON, the initial current drawn from the mains is few times higher than the average operating current. This is called surge current and all electronic equipment show the same behavior, especially SMPS's. The reason for this is that the filter capacitors are completely discharged, and act as a short circuit for a brief period. The current is higher as the capacitors capacity and voltage is higher, and is proportional with the capacitor stored energy ($CU^2/2$). To prevent harmful effects which this high value inrush current might have to the Power Supply components, a thermistor is used to limit the inrush current to a lower value than the mains fuse will trip or might damage any components from the Amplifier Power Supply. The thermistor is a passive component which has the property to decrease its resistance when the temperature increases. It has higher electrical resistance at low temperature, thus reducing the inrush current, and when the current which passes through, will heat-up the thermistor, the resistance will decrease, and the dissipated power will be reduces. One drawback might be the increased operating temperature, especially when the **SMPS500RxE** is supplied at low mains voltage and delivers high output power. The thermistor is placed on the edge of the board close to the Mains input connector, this avoiding heating-up other temperature sensitive components. Note that there is no need to use any other external power soft-start circuit when the **SMPS500RxE** is powered from standard mains supply voltage of 120 or 230V AC.

The **SMPS500RxE** features a soft-start characteristic, which allows progressive charge of the output filter capacitors, with a controlled charging current, without tripping over-current protection. This protection works very well with the on-board existing capacitors. If the extra-capacitors added, the total capacitance of the extra capacitors must not exceed a maximum value of 10,000uF per rail for ±45V version, 6800uF per rail for ±55V version and 4400uF per rail for ±72V version. If the capacitance is exceeded, the **SMPS500RxE** will enter in over-current protection after few start-up attempts. Also, during turn-On sequence the output current is limited to prevent damage to the amplifier if for some reason the current consumption exceeds about 20% of the rated current. Note that any normal amplifier (except class A amplifiers) does not require more than 2-10% of the rated current as quiescent current, and preventing the SMPS to start while a massive current consumption is detected

can prevent damage of the amplifier. The value and the working voltage of the output capacitors depend on the type of the SMPS, single or dual voltage, and the value of the output voltage. The optimal values are chosen for each particular version. On the mains side, 400V type capacitors are used if the **SMPS500RxE** is used at 230V mains only and 180/200V type capacitors are used if **SMPS500RxE** is used on 120V mains voltage or is used at 230V and possibly in the future will be used at 120V mains voltage. Although the soft-switching characteristic allows the **SMPS500RxE** to run a lot cooler than similar power hard-switched SMPS's, over-temperature protection was added to prevent damage if the **SMPS500RxE** is abused or used for continuous operation at high power. This consists of a circuit which monitors the operation temperature and disables the power supply when the operating temperature reach about 90-95˚C. To resume operation, the mains power must be disconnected for at least 10 minutes allowing the temperature to drop and all capacitors to discharge before power on again.

If the **SMPS500RxE** output is left unconnected, or the load is below the minimum threshold mentioned in the parameters table, while the mains supply voltage value is higher than nominal, the **SMPS500RxE** will run in **Burst-Mode** to save power. During burst mode, **SMPS500RxE** will enter a controlled intermittent operation, where a series of a few switching cycles at a nearly fixed frequency are spaced out by long idle periods when the power stage is shut-down. The **SMPS500RxE** audible noise nearby transformer can be heard, as well as the output voltage ripple will be higher than nominal, and low frequency component of ripple (5-30Hz) will be dominant. Burst-mode of operation will not affect the load proper operation because nearly any amplifier has a quiescent current and idle power consumption which exceeds the burst-mode threshold. Each **SMPS500RxE** is tested both with low and high mains voltage as well as minimum and maximum load to make sure the minimum quiescent current is lowest and the threshold for Burst-mode operation is within specified values. If for some particular application the burst-mode is not required and continuous operation at all power levels is desired, adding an external load of just 15 to 30mA across each output voltage rail and GND will provide the minimum load required by **SMPS500RxE** for continuous operation. The load must consist of usual power resistors, 3-5W rated each, and the values must be 1k8 to 2k 3W for ±45V version, 2k2 to 2k7 3W for ±55V and 3k9 to 4k7 3W for ±72V version. Resistors must be installed at least 5cm distance from **SMPS500RxE** to avoid overheating the power supply from the heat radiated by the resistors.

SMPS500RxE features an advanced Over-current protection circuit which in the first phase will reduce the output voltage gradually if an over-current condition is detected and if the over-current condition persists for more than 300ms the **SMPS500RxE** will shut-down for about one and half second then restart. The value of the output current at which the output current protection triggers is about 125% of the nominal current at the full load. If the **SMPS500RxE** output is shorted to GND or shorted across V+ and V- or the current draw exceeds a lot more the maximum current, the **SMPS500RxE** will enter in latched over-current protection mode and the SMPS operation will be disabled and latched and requires to disconnect the mains supply voltage and wait for the primary side capacitors to completely discharge about 10-15min before attempting to power on. This behavior prevents damage by overheating if a permanent short-circuit occur. On the middle of the **SMPS500RxE** board there is one small Red LED which will flash when the maximum current is exceeded and the over-current condition is reached. This can be a good indicator of the instantaneous peak current demand of the amplifier attached to **SMPS500RxE.**

Warning: Although the SMPS500RxE has over-current and short-circuit protections, for reliable long term operation, the user should never abuse them.

SMPS500RxE layout and size:

PCB board size is just 120mm long 60mm wide and the standard height from the PCB board to the top of tallest capacitors is 31mm or 36mm depending on voltage version. The PCB board thickens is about 1.8mm and the clearance under PCB must be at least 5mm if isolating sheet is used. The overall height for standard version is 38mm or 43mm and the height of low-profile, on request version can be as low as 35mm.

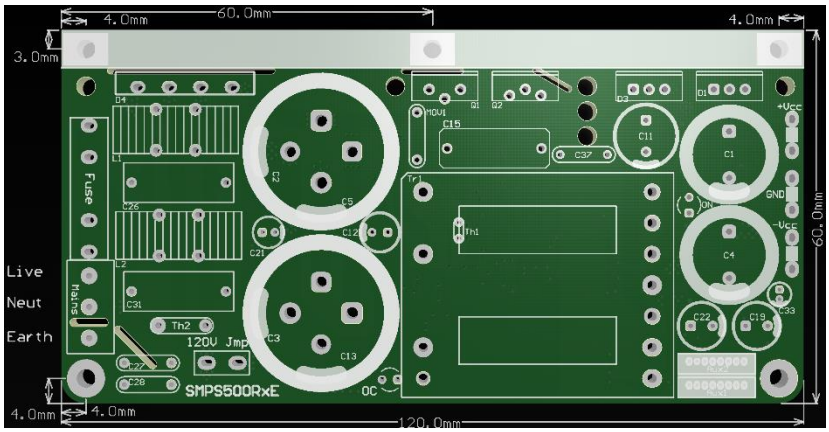


Fig.3 SMPS500RxE board layout and size

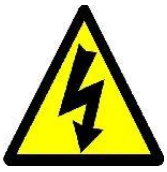
Auxiliary output voltages: **SMPS500RxE** has a differential output auxiliary voltage and one separate, isolated auxiliary voltage which can be connected with its negative output to main negative output to generate the Vcc to V- voltage required by any class D amplifier output stage driver section. For maximum flexibility and to avoid efficiency decrease, the auxiliary output voltages are unregulated and the average value is around ±17V to ±20V at 200mA. The maximum available current for short period is 500mA. All auxiliary outputs are protected against overload and short-circuit using resettable PTC fuses which will disconnect the aux output once the maximum current of ~500mA is exceeded and will reconnect after the overload or short-circuit condition was cleared. Although the output is protected, for long time reliable operation do not use the **SMPS500RxE** with aux. outputs shorted or overloaded. If the **SMPS500RxE** auxiliary outputs are used to supply other circuits than the circuits contained on dedicated amplifier boards such as **CxD500** or **CxD250-HP** which have their own on-board regulators, is recommended to use linear voltage regulators such as 78xx and 79xx series after the auxiliary output to supply regulated voltage to other circuits such as preamplifiers. All he auxiliary voltages of the **SMPS500RxE** are available on the two 8-pins 50mil pitch connectors along with two control signals described below. The pinout is written on the bottom of the **SMPS500RxE** PCB and the significance is explained in the next section.

Control signals: **SMPS500RxE** features three dedicated control signals: **Mute, Enable** and **F_SD** which are used in conjunction with the main and auxiliary voltages to power and control our dedicated class D amplifiers CxD series as well as other amplifiers from other vendors which use similar control signals to enable and control their amplifier modules.

- **Mute** signal: active Low, controls the Mute pin of the amplifier by holding the **Mute** pin low while the **SMPS** power **ON** and reach a stable operation mode, as well as monitors the mains supply voltage and pull the Mute pin low immediately after the mains power was disconnected and while the output DC voltages has not dropped yet to prevent possible noises which might appear during transients. Once the **SMPS** operation is steady, the **Mute** pin is pulled high to approx. 5V and normal operation starts.
- **Enable** signal: open collector active high, it is the inverted version of **Mute** signal, used for compatibility with amplifier boards supplied by other vendors. Same operation principle and timing applies as for Mute signal but with inverted polarity. This signal is not used for our **CxD** amplifiers series and the wire corresponding with this signal is not attached to the harness provided with the **SMPS500RxE** when purchased in pair with any of **CxD** amplifiers.
- **F_SD** signal: or Fast_ShutDown: **DC speaker protection detection** pin. When is pulled low, it disables the **SMPS500RxE** immediately and will only resume operation if the cause which has triggered the protection is removed and after disconnecting the mains power for at least 10 min allowing the mains side capacitors to discharge. During normal operation the voltage on this pin is approx. 17V because it is biased from the +Aux output. Any amplifier which controls this pin must use an active-low open-collector circuit which can withstand up to 20V DC applied directly to the trigger output.

Thermal Management:

SMPS500RxE requires proper thermal management to keep the nominal temperature of all the components within their operating range. The efficiency of **SMPS500RxE** from 10% to 100% load is over 90% with peak efficiency over 94%. Efficiency and dissipated power depends on output voltage version, the highest the voltage the highest the efficiency. Although the soft-switching characteristic allows the **SMPS500RxE** to run cooler than similarly rated hard-switched SMPS, the generated heat must be removed using the heatsink thermally connected to the power devices and placed on a side of the board. If the **SMPS500RxE** is installed in a tight enclosure along with other modules which generate heat, using a cooling fan is strongly recommended to keep the temperature of the whole board and components within normal operation limits, without affecting the reliability or trigger the Over-Temperature protection too early. The fan must be installed on the back side of the enclosure and absorb the hot air through the board from the upper right side (refer to board layout figure) where the rectifier bridge is installed, then the power inductor and power transformer and blow the air outside the enclosure. While the hot air is removed from the enclosure instead of blowing air inside, the average temperature of PCB and temperature sensitive components such as electrolytic capacitors is kept 15-20°C lower than if the air would circulate in opposite direction. The cooling fan must be 12V 80-120mA rated, 50x50mm or 40x40mm type, ball bearing. It is not provided with **SMPS500RxE** but can be supplied on request. The fan can be powered from the **SMPS500RxE** directly, from +Aux and GND connector.



Warning:

Before you proceed with installation, make sure you have read this warning!!!

The SMPS500RXE is powered from the mains voltage and the primary side of the SMPS has hazardous voltages up to 340V DC and up to 300V AC. This voltage levels are present on the top and bottom of the board, and during installation and operation should never touch any part of the SMPS while it is connected to the mains and at least 10 minutes after complete disconnect from mains. If any changes or reconnection needs to be done, disconnect the unit from the mains and allow all capacitors to discharge for at least 10 minutes before handling it. Any ignorance of this warning will be made on user's responsibility, and can lead to serious injuries and possible death by electrocution if is handled improperly. This product has no serviceable parts and the on-board mains fuse has just protection purpose. In case of blown fuse, do not attempt to replace the fuse, contact us first, because other components might be affected if a wrong fuse value is used. Do not attempt to change any other component from the SMPS500RXE. A safety clearance of at least 5mm must be kept between the board and the case, or any conductive part of the amplifier and an insulating sheet made of suitable material must be used between the power supply board and bottom of the enclosure. The heat transfer between the heatsinks and ambient must not be obstructed for proper operation.

SMPS500RXE characteristics:

Output voltage version: **Parameters:**	**SMPS500RxE** **±45V**	**SMPS500RxE** **±55V**	**SMPS500RxE** **±72V**	**SMPS500RxE** **Custom voltage**
Minimum Output Voltage: Measured at 10-100% load	Minimum:±43.8V	Minimum:±53.6V	Minimum:±70.5V	Minimum Low V version:±31V Maximum High V version:±118V
Nominal Output Voltage Measured at 10-100% load	Minimum:±44.5V Maximum:±45.6V	Minimum:±54.4V Maximum:±55.6V	Minimum:±71.3V Maximum:±72.6V	Minimum:±31.6V Maximum:±122V
Maximum Output Voltage: Measured at 10-100% load	Maximum:±46.2V	Maximum:±56.4V	Maximum:±73.2V	Minimum Low V version:±32.8V Maximum High V version:±122V
Aux. Output Voltage:	Minimum:±16.5V Maximum:±20V	Minimum:±16.5V Maximum:±20V	Minimum:±16.5V Maximum:±20V	Minimum:±10V (on request) Maximum:±30V (on request)
Mains Input Voltage range:	120V: 98-127V 230V: 196-254V	120V: 98-127V 230V: 196-254V	120V: 98-127V 230V: 196-254V	120V: 98-127V 230V: 196-254V
Main Output Current:	Nominal: 5.5A Peak: 7A	Nominal: 4.5A Peak: 5.5A	Nominal: 3.5A Peak: 4.5A	Max. Nominal: 8A Max. Peak: 10 A
Aux. Output Current:	Nominal: 0.2 A Peak: 0.5A	Nominal: 0.2 A Peak: 0.5A	Nominal: 0.2 A Peak: 0.5A	Nominal: 0.2 A Peak: 0.5A
No-Load power consumption with burst-mode allowed:	Min: 1.2W Max: 2.5W	Min: 1.4W Max: 2.6W	Min: 1.7W Max: 2.8W	Min: 2 W Max: 3.7W
Average Efficiency at 50-70% load	110V: 91.8 % 230V: 92.7%	110V: 92.2 % 230V: 93.2%	110V: 92.7 % 230V: 93.8%	110V: 93.4 % 230V: 94.3%

All the output voltage values from the table above except Mains Input Voltage range were measured with steady mains voltage 230V AC 50Hz and 120V AC 60Hz respectively. For repeatability, use the same values.

Mains voltage is set by default to 230V to prevent any possible faults if wrong voltage version is ordered, for example 120V version for countries where 230V is also available. In this case the user must connect the 120V jumper IF and ONLY the mains voltage is within 100-127V interval otherwise damage might occur. A 230V configured power supply won't start at 120V and no damage can occur. But if it is configured for 120V and powered with 230V there are many chances to damage the power supply. The SMPS500RxE is designed to allow both 200V and 400V type capacitors to be installed on the primary side in series or parallel connection allowing the most suitable configuration and highest total capacitance to be achieved. The 230V version will use 400V capacitors only while 120V will use 180-200V capacitors. Capacitors are values are chosen for best fit on each power supply voltage version.

Connectors pinout: Mains Voltage Input uses a 3 pins 5mm pitch screw type terminal block with the pinout as follows: the first pin located at the bottom left of the **SMPS500RxE** is the protective Earth, the pin from the middle is Neutral and the upper pin, next to the fuse is Live. The Mains Voltage Input connector pinout is also written on the bottom side of the PCB right below the connector. Make sure the connections are all correct and properly wired before power ON the **SMPS500RxE.**

The Main DC output uses 3 Fast-On type blade connectors one for positive, one for negative and one for Ground. The terminals significance is written on the **SMPS500RxE** PCB. The two small Aux. connectors uses 8 pin small pitch, 1.27mm or 50mils pins distance with the following pins significance from left to right, with the **SMPS500RxE** board placed with the heatsink up the auxiliary connector at the bottom right corner:

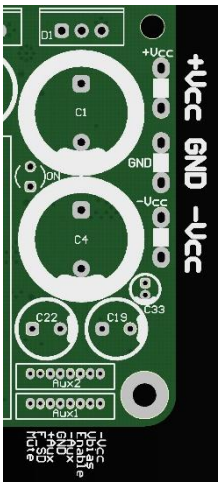


Fig.4 SMPS500RxE board pinout

Pin1: Mute Signal
Pin2: Fast_ShutDown Signal
Pin3: +Aux output. Auxiliary positive voltage output
Pin4: GND. Auxiliary differential voltage Ground
Pin5: -Aux output. Auxiliary negative voltage output
Pin6: Enable Signal. Inverted Mute signal, not used for CxD amplifier series, used for third party amplifiers.
Pin7: Vbias. Positive output of the isolated output voltage used for driver stage.
Pin8: -Vcc. Negative output of the isolated output voltage used for driver stage. Must be connected to main –Vcc on the amplifier board to bring the Vbias to a potential 17-20V higher than –Vcc rail.

Application Information: **SMPS500RxE** can supply one or more amplifier modules as long as the total power required by all amplifiers modules does not exceed the power capability of the **SMPS500RxE.** Usual configurations exemplified in the diagrams below consist of one **SMPS500RxE** supplying one CxD500 or two CxD250-HP Amplifier modules in various configurations.

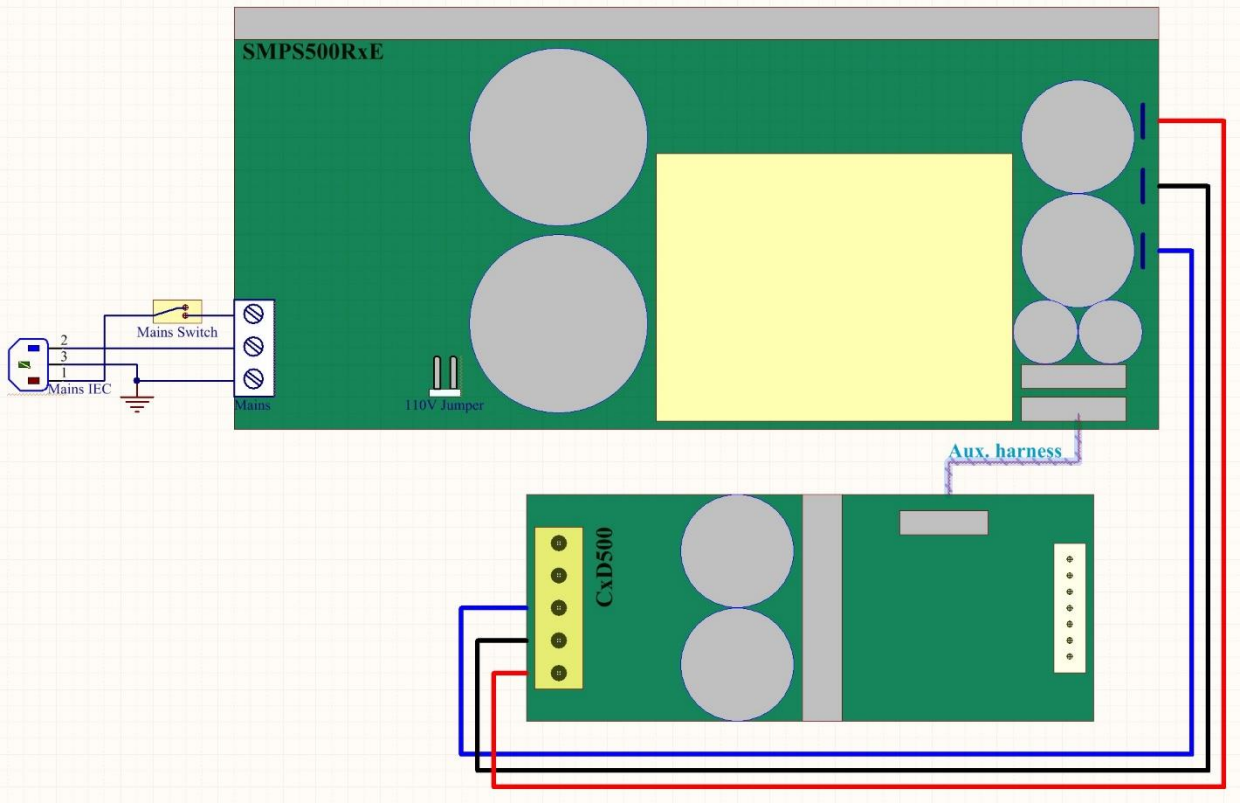


Fig.5 SMPS500RxE supplying one CxD500 Amplifier

The connection diagram shown in **Figure5** represents the simplest implementation, where power is supplied to amplifier board directly from the main output of the SMPS and the Auxiliary voltages and signals are connected from any of the two auxiliary connectors. If more than one amplifier modules are powered from one single **SMPS500RxE,** the total power drawn by all the modules must not exceed the power capability of **SMPS500RxE** and the supply lines can be simply paralleled as shown in **Figure7**.

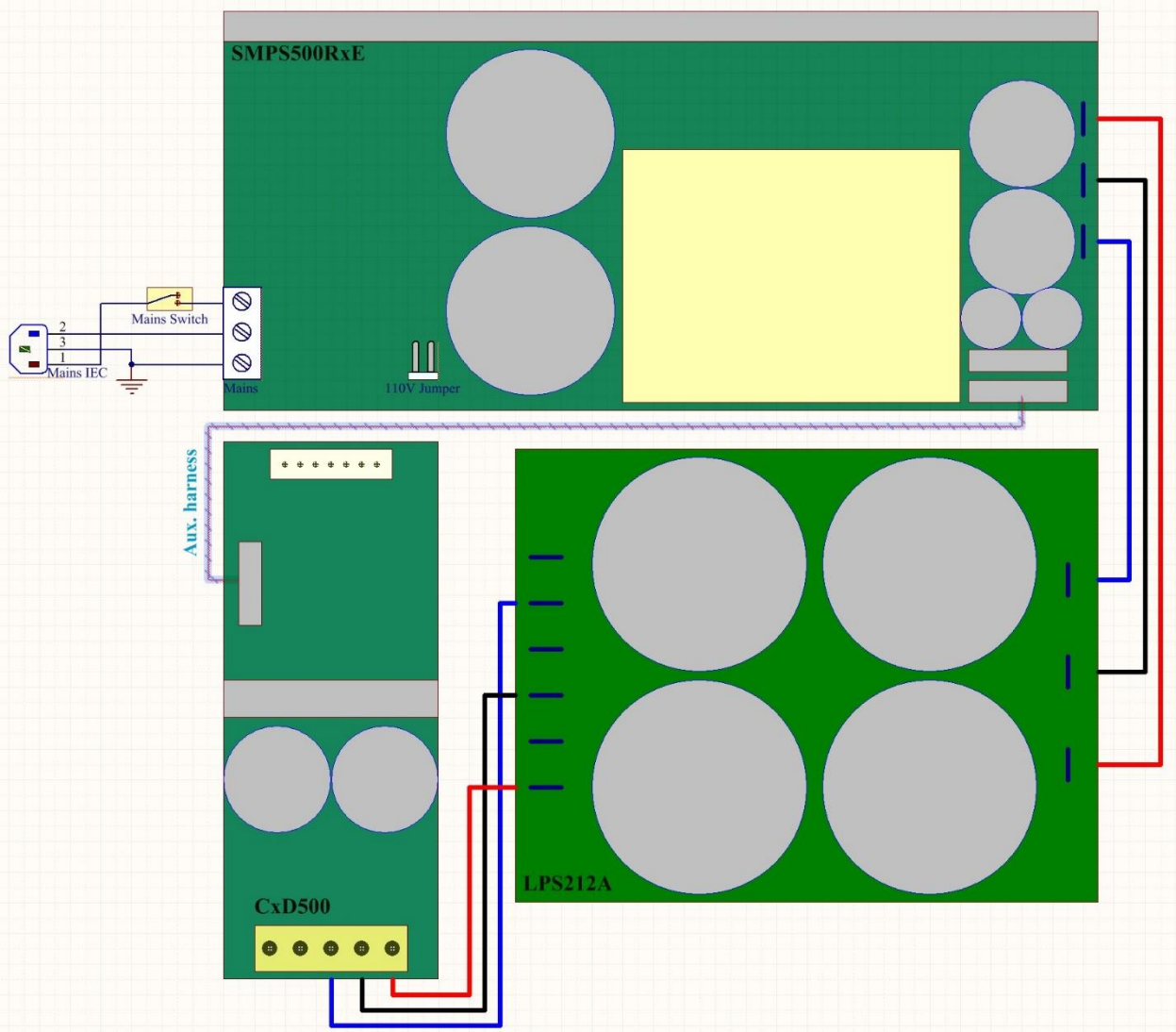


Fig.6 SMPS500RxE supplying one CxD500 Amplifier through LPS212A capacitors bank board

The configuration shown above in **Figure6** is recommended for subwoofer applications where more capacitance than the total capacitance available on both amplifier and **SMPS** board is required. Beside the extra-capacitance, the **LPS212A** board acts like a high-frequency filter which can further attenuate the high frequency ripple and noise by as much as 12dB providing the cleanest DC supply rails for the amplifier operation. Use the thickest and shortest wires available for DC power both from **SMPS500RxE** to **LPS212A** board and from **LPS212A** board to **CxD500** amplifier module, route all the wires as neat as possible and far from signal wires and connectors. Twist all the wires and use cable ties for a neat and rigid layout.

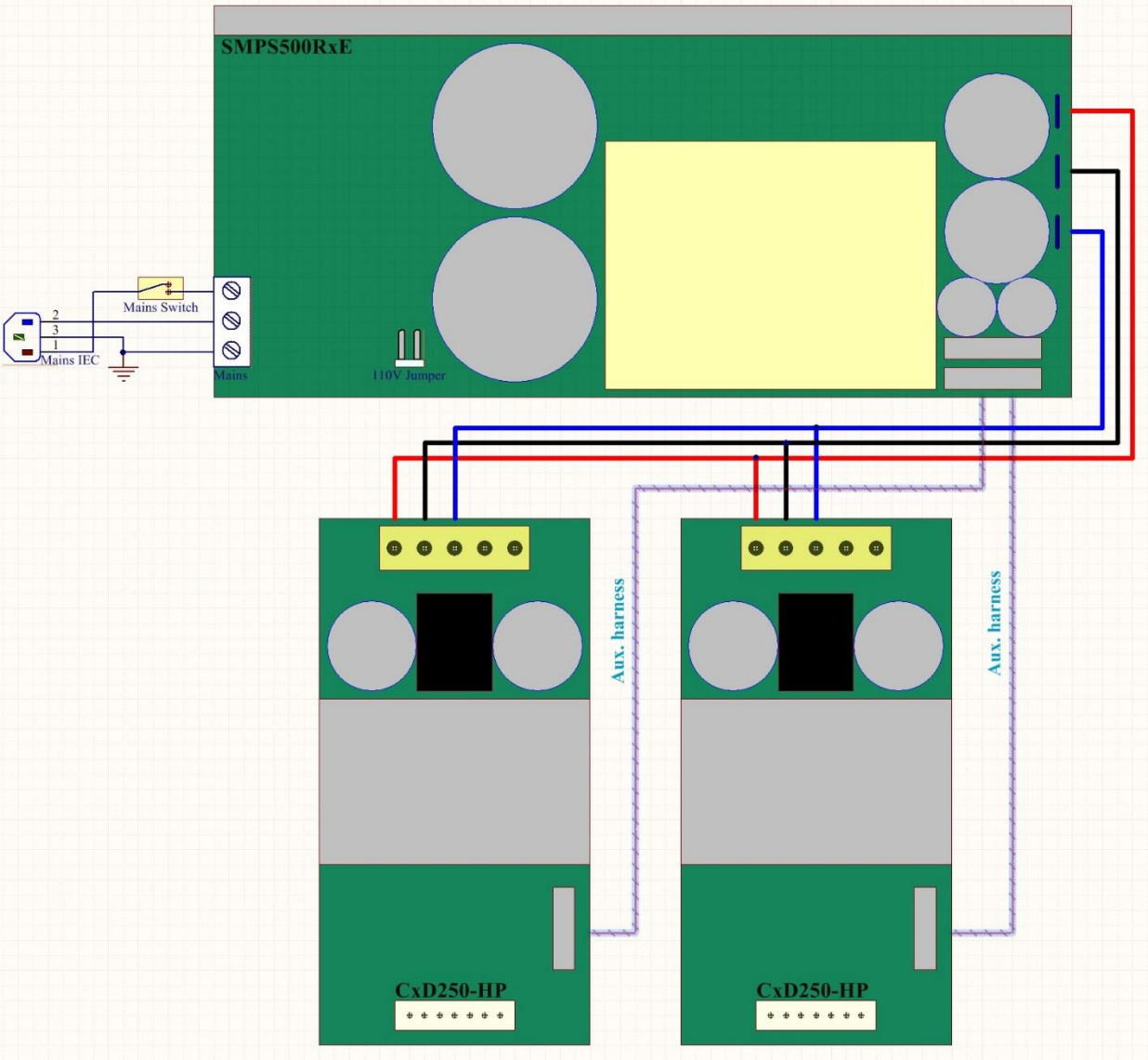


Fig.7 SMPS500RxE supplying two CxD250 Amplifiers

In **Figure7** we have the simplest implementation of one **SMPS500RxE** and two **CxD250-HP** amplifier modules. Main output is split and connected to both amplifier modules while each Auxiliary harness is connected individually to a separate connector. Since the power **GND** common node or **GND** star is shifted from the power supply towards the point where all 3 **GND** wires meet, it is strongly recommended that for **GND** to use the thickest wire available and the shortest length which can be routed. Furthermore, for best performance, for auxiliary harness connection, only the harness cables provided must be used, not improvised cables and if the distance between the amplifier modules and the power supply allows, chose the shortest cables, 150mm long instead of the longer ones, 200mm or 250mm. By default we supply one 150mm cable and one 200mm cable if the **SMPS500RxE** is purchased with two **CxD** amplifier modules. Longer cables can be provided on request. The auxiliary harness wires must be twisted about 10-15 times to minimize the radiated and pick-up noise and must be routed, same as the rest of the power wires as far as possible from signal wires and connectors. If the system has noise, most probably because of a GND loop, review the wires connections, use the shortest and thickest wires for power, use only the original auxiliary cables and add ferrite beads on auxiliary cables if nothing else helps. The total capacitance of the **SMPS500RxE** and two **CxD250-HP** amplifier modules is about 3000uF per rail, enough for more applications if the input signal and speaker output of one of the modules is 180* inverted so that the bus-pumping will be automatically cancelled. If the signal inversion is not allowed in the application, consider the configuration shown below in **Figure8** where the **LPS212A** capacitor bank board is added.

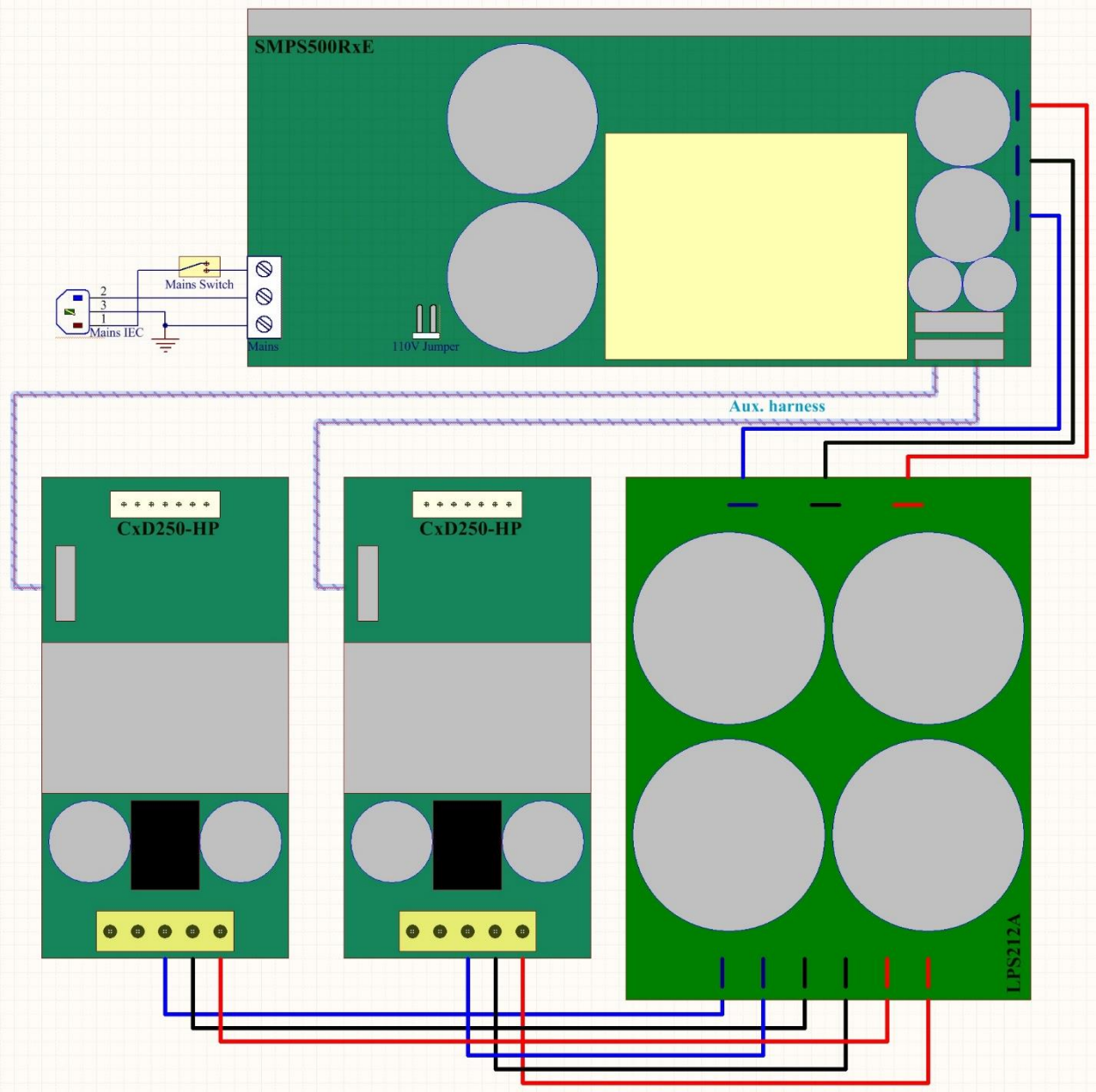


Fig.8 SMPS500RxE supplying two CxD250 Amplifiers through LPS212A capacitors bank board

Figure8 shows a similar implementation of one **SMPS500RxE** and two **CxD250-HP** amplifier modules as we saw in Figure7 with the addition of **LPS212A** capacitor bank module. With the extra capacitance added by **LPS212A** the total capacitance of the system on each rail is brought from about 3000uF to 7400uF if 4x2200uF capacitors are used on **LPS212A** and up to 12400uF if 4x4700uF capacitors are used. Is recommended to keep the total capacitance of each rail below 8200uF to prevent tripping Over-current protection at start-up. If more capacitance is needed, contact us to provide a solution instead of trying to tamper the over-current protection.

Again, same rules apply here, use the shortest and thickest wires for power supply output, route all the supply and auxiliary wires far from signal wires and connectors and twist the wires neatly. Add ferrite beads on auxiliary wires to reduce the noise in case of a GND loop.

Disclaimer:

The SMPS500RxE shall be used according with the instructions provided in this document. The user should NOT attempt to modify or change any of the parameters of this product, which can lead to malfunction. The designer and manufacturer of the product, Connexelectronic, is not liable for any kind of loss or damage, including but not limited to incidental or consequential damages. Due to the mains voltages of this board, only skilled users can install and use this product and the user should take all the measures needed when working with mains voltages, they should not touch any unisolated part of the board or connectors, or short-circuit any part of the board or connectors. Any misusage is the user's responsibility.

The designer and manufacturer reserve the right to make changes or modifications on both the product functions and the performance without notice. The design details and PCB design is **Connexelectronic** proprietary information and shall not be copied published or distributed without **Connexelectronic** written agreement. **Connexelectronic** reserve the right to offer limited support for the boards purchased directly from **Connexelectronic**, and no support at all for the similar boards which aren't purchased directly from **Connexelectronic** or listed resellers, and from various reasons they look or pretend to be similar, exactly the same, or improved version products. **Purchasing the product means that you are aware and agree with these conditions.**

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We are continuously striving to offer the best product quality and availability for our products, and the **SMPS500RxE** can be purchased either directly from our website or through our distributor network as well. The current distributors list can be found on the website, and the list will be updated periodically. For uncompromised quality and support, we strongly recommend to purchase our products only from our website or listed distributors. Any product purchased from any third-party organization or individual does not qualify for our support.