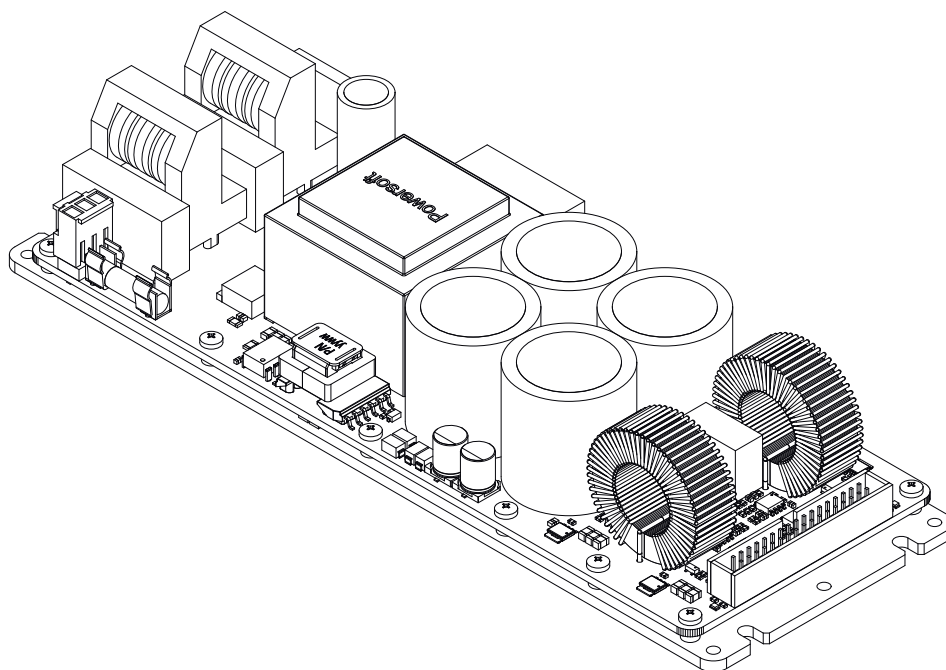


LiteMod and LiteMod HV



USER GUIDE

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Data are subject to change without notice.
For latest update please refer to the
online version available on www.powersoft-audio.com.

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Important safety instructions

This amplifier module is intended to be installed inside other devices and must be checked in the final product.

EXPLANATIONS OF GRAPHICAL SYMBOLS

 The triangle with the lightning bolt is used to alert the user to the risk of electric shock.

 The triangle with the exclamation point is used to alert the user to important operating or maintenance instructions.

 The CE-mark indicates the compliance with the low voltage and electromagnetic compatibility.

 Symbol for earth/ground connection.

 Symbol for conformity with Directive 2002/96/EC and Directive 2003/108/EC of the European Parliament on waste electrical and electronic equipment (WEEE).

 Symbol for electrostatic discharge sensitive devices.



1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this equipment near water.
6. Do not block any ventilation openings. Install in accordance with Powersoft's instructions.
7. Do not install near any heat sources such as radiators, heat registers, stover or other apparatus that produce heat.
8. Do not defeat the safety purpose of the polarized or grounding-type plug.
9. Only use attachments/accessories specified by Powersoft.
10. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

 TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT ATTEMPT TO OPEN ANY PART OF THE UNIT. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

 DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE, DRIPPING OR SPLASHING LIQUIDS. OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.

 SPEAKER TERMINALS COULD BE HAZARDOUS LIVE IF SPEAKER BRIDGE MODE CONNECTION IS USED.

 PROPER CONNECTIONS AND INSULATIONS TECHNIQUES MUST BE ADOPTED WHEN SPEAKER BRIDGE MODE CONNECTION IS USED.

Importantes instructions de sécurité

Ce module d'amplification est destiné à être installé à l'intérieur d'autres dispositifs et doit donc être contrôlé sur le produit fini.

EXPLICATION DES SYMBOLES GRAPHIQUES



La triangle avec le symbol du foudre est employée pour alerter l'utilisateur au risque de décharge électrique.



Le triangle avec un point d'exclamation est employée pour alerter l'utilisateur d'instruction importantes pour lors opérations de maintenance.



Le marquage CE indique la conformité à la directive de basse tension et la compatibilité électromagnétique.



Symbole pour la connexion à la terre.



Symbole pour la conformité al la Directive 2002/96/EC et la Directive 2003/108/EC du Parlement Européen sur les équipements électriques et électroniques (WEEE).



Symbole pour les appareils sensibles aux décharges électrostatiques.



AVIS
RISQUES D'ÉLECTROCUTION
NE PAS OUVRIR



1. Lisez ces instructions.
2. Gardez ces instructions.
3. Tenez compte de toutes les mises en garde.
4. Suivez toutes les instructions.
5. N'utilisez pas cet amplificateur à proximité de l'eau.
6. Assurez-vous d'une bonne ventilation de l'appareil. Installez en accord avec les instructions préconisées par Powersoft.
7. N'installez pas l'appareil à proximité de sources de chaleur ou d'autres appareils produisant de la chaleur.
8. Respectez le dispositif de mise à la terre de la prise secteur.
9. Utilisez uniquement les accroches et accessoires spécifiés par Powersoft.
10. Confiez toute réparation à un technicien qualifié. L'intervention d'un technicien est nécessaire dans les cas suivants : le cordon d'alimentation ou la prise secteur sont endommagés, des corps étrangers ou du liquide se sont introduits dans l'appareil, l'appareil a été exposé à la pluie ou à l'humidité, l'appareil montre des signes de dysfonctionnement ou est tombé.



MISE EN GARDE : AFIN DE RÉDUIRE LES RISQUES DE CHOC ÉLECTRIQUE, N'ESSAYEZ PAS D'OUVRIR L'UNITÉ, MEME EN PARTIE. AUCUNE PIÈCE A L'INTERIEUR NE PEUT ETRE CHANGÉE PAR L'UTILISATEUR. LAISSEZ L'ENTRETIEN A UN PERSONNEL QUALIFIÉ.



NE PAS EXPOSER CET APPAREIL A LA PLUIE OU A L'HUMIDITÉ, AUX GOUTTES OU AUX ÉCLABOUSSURES. LES OBJETS REMPLIS DE LIQUIDE, TELS QUE LES VASES, NE DOIVENT PAS ETRE PLACÉS SUR CET APPAREIL.



LES BORNES D'ENCEINTES POURRAIENT ÊTRE DANGEREUX SI LA CONNEXION DE MODE PONT DU HAUT-PARLEUR EST UTILISÉ.



ADOPTER DES TECHNIQUES CORRECTES DE CONNEXION ET D'ISOLEMENT LORSQUE LA CONNEXION EN MODE BRIDGE HAUT-PARLEUR EST UTILISÉ.

Instrucciones de seguridad importantes

Este módulo amplificador está diseñado para ser instalado dentro de otros dispositivos y debe verificarse en el producto final.

EXPLICACIÓN DE LOS SÍMBOLOS GRÁFICOS



El triángulo con el símbolo de rayo eléctrico es usado para alertar al usuario de el riesgo de un choque eléctrico.



El triángulo con el signo de admiración es usado para alertar al usuario de instrucciones importantes de operación o mantenimiento.



La marca CE indica el cumplimiento de la directiva de bajo voltaje y de compatibilidad electromagnética.



Símbolo de la conexión a tierra.



Símbolo de conformidad con la Directiva 2002/96/EC y Directiva 2003/108/EC del Parlamento Europeo sobre los aparatos eléctricos y electrónicos (WEEE).



Símbolo para los dispositivos sensibles a descargas electrostáticas.



PRECAUCIÓN

**RIESGO DE CHOQUE ELÉCTRICO
NO ABRA LA UNIDAD**



1. Lea estas instrucciones.
2. Guarde estas instrucciones.
3. Preste atención a todas las advertencias.
4. Siga todas las instrucciones.
5. No use este aparato cerca del agua.
6. No bloquee las aberturas de ventilación. Realice la instalación de acuerdo con las indicaciones de Powersoft.
7. No instale cerca ninguna fuente de calor como, por ejemplo, radiadores, rejillas de calefacción, hornos u otros aparatos que produzcan calor.
8. No elimine el diseño de seguridad del enchufe, ya sea del tipo polarizado o con conexión a tierra.
9. Use exclusivamente los dispositivos/accesorios indicados por Powersoft.
10. El servicio técnico debe realizarlo siempre personal cualificado. Se requerirá servicio de asistencia técnica cuando el aparato sufra algún tipo de daño como, por ejemplo, que el cable de alimentación o el enchufe estén dañados, que se haya derramado líquido o hayan caído objetos dentro del aparato, que éste se haya expuesto a la lluvia o humedad, que no funcione normalmente o que se haya caído.



PRECAUCIÓN: PARA REDUCIR EL RIESGO DE DESCARGA ELÉCTRICA, NO DESMONTE LA TAPA (NI EL PANEL TRASERO). NO HAY PIEZAS REPARABLES POR EL USUARIO EN EL INTERIOR. LLÉVELO A REPARAR A PERSONAL DE SERVICIO CUALIFICADO.



NO EXPONGA ESTE UNIDAD A LA LLUVIA O LA HUMEDAD, GOTEO O SALPICADURAS. NO COLOQUE OBJETOS LLENOS DE LÍQUIDOS, TALES COMO VASIJAS, SOBRE EL APARATO.



TERMINALES DE LOS ALTAVOCES PODRÍA SER PELIGROSO, SI SU CONEXIÓN SE UTILIZA EL ALTAVOZ MODO PUENTE.



ADOPTAR TÉCNICAS CORRECTAS DE CONEXIÓN Y AISLAMIENTO CUANDO SE USA CONEXIÓN DE ALTAVOZ MODO PUENTE.

Importanti istruzioni di sicurezza

Questo modulo amplificatore è destinato ad essere installato dentro altri dispositivi e deve quindi essere controllato nel prodotto finito.

SPIEGAZIONE DEI SIMBOLI GRAFICI



Il triangolo con il lampo è utilizzato per avvisare l'utente del rischio di scossa elettrica.



Il triangolo con il punto esclamativo è utilizzato per avvisare l'utente di importanti istruzioni d'uso e manutenzione.



The CE-mark indicates the compliance with the low voltage and electromagnetic compatibility.



Simbolo della connessione di terra.



Simbolo di conformità alla Direttiva 2002/96/CE e alla Direttiva 2003/108/CE del Parlamento Europeo sulle apparecchiature elettriche ed elettroniche (RAEE).



Simbolo per le apparecchiature sensibili alle scariche elettrostatiche



ATTENZIONE

RISCHIO DI SCOSSE ELETTRICHE, NON APRIRE



1. Leggere queste istruzioni.
2. Conservare le istruzioni.
3. Tenere conto di tutti gli avvisi.
4. Seguire tutte le istruzioni.
5. Non usare l'apparecchio in prossimità di acqua.
6. Non ostruire le prese di ventilazione. Installare secondo le indicazioni del produttore.
7. Non installare vicino a fonti di calore quali radiatori, bocchette dell'aria calda, stufe o altri apparecchi (compresi gli amplificatori) che producono calore.
8. Non compromettere la sicurezza delle spine polarizzate o con messa a terra.
9. Usare solo accessori specificati dal produttore.
10. Ricorrere a personale qualificato per qualsiasi intervento. Tali interventi sono necessari in caso di guasti dell'apparecchio quali danneggiamento del cavo di alimentazione o della spina, versamento di liquidi o caduta di oggetti nell'apparecchio, esposizione a pioggia o umidità o se l'apparecchio non funziona normalmente o è caduto.



ATTENZIONE: PER RIDURRE IL RISCHIO DI SCOSSE ELETTRICHE, NON TENTARE DI APRIRE ALCUNA PARTE DELL'UNITÀ. NON CI SONO PARTI INTERNE AD USO DELL'UTENTE. RIVOLGERSI A PERSONALE QUALIFICATO PER L'ASSISTENZA.



NON ESPORRE QUESTO APPARECCHIO ALLA PIOGGIA, UMIDITÀ O SOSTANZE LIQUIDE. OGGETTI PIENI DI LIQUIDI, COME VASI, NON DEVONO ESSERE COLLOCATI SU QUESTO APPARATO.



I TERMINALI DEI DIFFUSORI POTREBBERO ESSERE PERICOLOSI, SE VIENE UTILIZZATA LA CONNESSIONE IN MODALITÀ BRIDGE DEGLI ALTOPARLANTI.



ADOPTARE LE CORRETTE TECNICHE DI CONNESSIONE E ISOLAMENTO QUANDO VIENE UTILIZZATA LA CONNESSIONE IN MODALITÀ BRIDGE DEGLI ALTOPARLANTI.

Regulatory information

FCC COMPLIANCE NOTICE

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

WEEE DIRECTIVE

If the time arises to throw away your product, please recycle all the components possible.



This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling. By separating this product from other household-type waste, the volume of waste sent to incinerators or land-fills will be reduced and natural resources will thus be conserved.

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) aims to minimise the impact of electrical and electronic goods on the environment. Powersoft S.p.A. comply with the Directive 2002/96/EC and 2003/108/EC of the European Parliament on waste electrical and electronic equipment (WEEE) in order to reduce the amount of WEEE that is being disposed of in land-fill site. All of our products are marked with the WEEE symbol; this indicates that this product must NOT be disposed of with other waste. Instead it is the user's responsibility to dispose of their waste electrical and electronic equipment by handing it over to an approved reprocessor, or by returning it to Powersoft S.p.A. for reprocessing. For more information about where you can send your waste equipment for recycling, please contact Powersoft S.p.A. or one of your local distributors.

EC DECLARATION OF CONFORMITY

Manufacturer:
Powersoft S.p.A.
via E. Conti 5
50018 Scandicci (Fi)
Italy



We declare that under our sole responsibility the products:

Model Name: LiteMod, LiteMod HV

Intended use: Professional Audio Amplifier Module

Are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

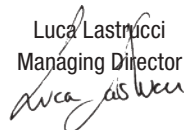
- ▶ 2006/95/EC Low Voltage Directive
- ▶ 2004/108/EC Electromagnetic Compatibility Directive
- ▶ 2002/95/CE RoHS Directive

The following armonized standards are applied:

- ▷ EN 55103-1
- ▷ EN 61000-3-2
- ▷ EN 61000-3-3
- ▷ EN 55103-2
- ▷ EN 61000-4-2
- ▷ EN 61000-4-3
- ▷ EN 61000-4-4
- ▷ EN 61000-4-5
- ▷ EN 61000-4-6
- ▷ EN 61000-4-11
- ▷ EN 60065

Scandicci,
March 2014

Luca Lastrucci
Managing Director



For compliance questions only: compliance@powersoft.it

Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is one of the most significant factors leading to damage and failure of a wide variety of electronic components.

Poor handling can cause internal damage, which is invisible. This internal damage can then cause electrical failure or reliability problems.



It is recommended that all workstations where Electrostatic Discharge Sensitive devices (ESDS) and assemblies are handled outside of full static protection packaging (i.e. within static control areas) should be provided with some form of ground conductive or dissipative flooring.

7:1.Welcome

Congratulations on your purchase of the Powersoft LiteMod module.

We know you are eager to use the LiteMod module, but please take a moment to read this user's manual and safety instructions. In case you have any questions, please do not hesitate to contact your dealer or Powersoft.

The LiteMod is a two channel amplifier modules specifically designed to drive high power loudspeakers now available in two fashions: the LiteMod delivering up to 600 W on 4 Ω per channel and the LiteMod HV capable to reach up to 700 W on 8 Ω per channel, all channels driven.

The LiteMod represents an important evolution in power amplifier modules: extremely compact and lightweight LiteMod can be easily integrated into any appliance such as active loudspeakers and stand alone rack amplifiers.

The new design of the power supply equipped with PFC, reduces power consumption (less than 0.55 W in standby) while enhancing reliability and consistency in all operating conditions. The high efficiency of the output stage improves overall performance delivering pristine power and clean output signal. A dedicated optional DSP board can be easily plugged to the module providing a complete solution in a compact package.

Powersoft LiteMod is the ultimate flexible platform suiting your application design.

7:2.Unpacking & checking for shipping damage

Your Powersoft product has been completely tested and inspected before leaving the factory. Carefully inspect the shipping package before opening it, and then immediately inspect your new product. If you find any damage notify the shipping company immediately.

7:3.Disposal of the packing material

The transport and protective packing has been selected from materials which are environmentally friendly for disposal and can normally be recycled.

Rather than just throwing these materials away, please ensure they are offered for recycling.

Thermal constrains

This device must be correctly heatsinked for proper and reliable operation: an appropriate external passive heat sink guarantees by design thermal efficiency and reliability.

Proper heatsink planarity is strongly suggested to allow thermal transfer from the module's bottom plate to the heatsink; a thermal compound may be used, but it is not strictly necessary.

In order to ensure proper ventilation of the module, reasonable spacing of at least 100 mm must be left between the frame of the unit and any side component or surface of the enclosure.

The module has been designed to fit into a loudspeaker cabinet: please refer to [FIGURE 1](#) for proper module placing.

IN [FIGURE 1](#) HEATSINK FINS ARE SET HORIZONTALLY (WRONG!) ONLY FOR DESCRIPTIVE PURPOSE.

All configuration showed in [FIGURE 1](#) are viable for proper module placing and cooling. We suggest to position the module vertically with respect the ground in order to take advantage of the chimney effect for ventilation and heat dissipation.

In [FIGURE 1.a](#) the module and the loudspeakers share the same room into the cabinet. This is the default placement solution: it allows good ventilation because of woofer diaphragm movement and high air volume; be aware of magnetic field interaction: place the module far enough from loudspeakers magnet in order to prevent fans blockage.

[FIGURE 1.b](#) shows the more efficient cooling configuration, even if it is less effective against dust and moisture that can get into the module. By allowing external air flow, it is possible to reduce the fins width on the heatsink by maintaining good cooling performances.

8:1.Heatsink performance

Here we suggest a rule of thumb to calculate the thermal resistance of the heatsink.

The absolute thermal resistance of the heatsink is the temperature difference (kelvin or celsius) across it structure when a unit of heat energy flows through it in unit time (watt). For seek of simplicity: a heatsink with low thermal resistance offers high heat dissipation, as well as a low electric resistance allows high current flowing through a conductive wire.

In order to define the maximum allowed thermal resistance for the heatsink let assume the following:

- ▶ e as the amp module efficiency
- ▶ cf as the crest factor of the audio signal
- ▶ W_{max} as the peak power delivered by the module
- ▶ T_{amb} as the highest ambient temperature
- ▶ T_{mod} as the highest operating temperature

The thermal resistance of the heatsink derives from the following formula:

$$R_{th} = \frac{T_{mod} - T_{amb}}{\text{Dissipated power}}$$

The maximum dissipated power can be calculated as:

$$\text{Dissipated power} = \frac{W_{max} (1 - e)}{cf}$$

For example, stating an efficiency of 80%, 6 dB crest factor and 3400 W peak power, the dissipated heat is:

$$\frac{3400 (1 - 0.8)}{4} = 170 \text{ W}$$

Supposing that the thermal protection of the module (T_{mod}) is set at 75°C (167°F) on the bottom plate and stating an ambient temperature of 45 °C (113°F), the previous example gives:

$$\frac{75 - 45}{170} = 0.14^\circ\text{C/W}$$

meaning that the temperature of the bottom plate is always lower than 75°C if the heatsink has a thermal resistance better than 0.14°C/W (or 0.14 K/W) with ambient temperature up to 45 °C.

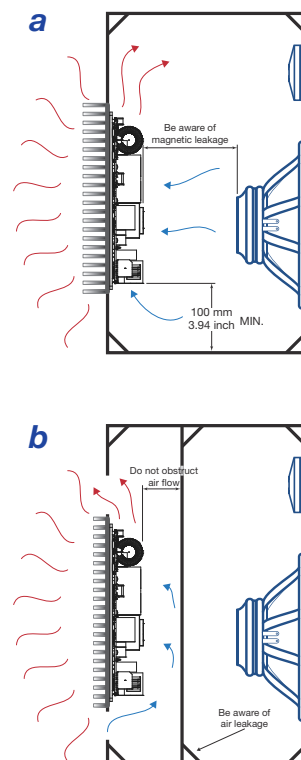


FIGURE 1: Cooling solutions
(for descriptive purpose the heatsink fins are set in wrong direction);
a) Module and loudspeaker into the same chamber;
b) Module in a separate vented chamber.

Electromagnetic Compatibility (EMC)

9:1.AC MAIN filter



In order to improve the electromagnetic compatibility an EMC filter must be inserted before the AC MAINS plugs on the power supply. Powersoft suggests the Schaffner FN2070-3-06 model.

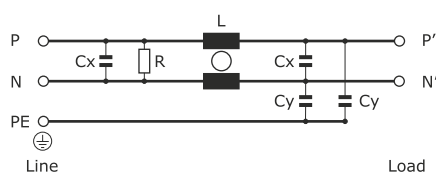


FIGURE 2: Typical electrical schematic of the EMI Filter.

9:2.Earth connection



This device must be powered exclusively by earth connected mains sockets in electrical networks compliant to the IEC 364 or similar rules. Is absolutely necessary to verify this fundamental requirement of safety and, in case of doubt, require an accurate check by a qualified personal.

Is absolutely necessary to ground this device using the proper earth connection on the metal frame of the chassis; use M4 nut and bolt with proper split washer – grover washer – to secure the earth terminal lug.

9:3.Cabling

Wiring between the amp module and the load may lead to radio frequency noise. The following guide lines should be observed:

- ▶ reduced cabling length is advisable;
- ▶ keep cable pairs as close as possible to each other in order to minimize the antenna effect;
- ▶ design the cabling path far from RF noise source;
- ▶ set the cabling for RF noise rejection: shielded or twisted cables are advisable configuration (ref. FIGURE 4);
- ▶ use electromagnetic compatible connectors.

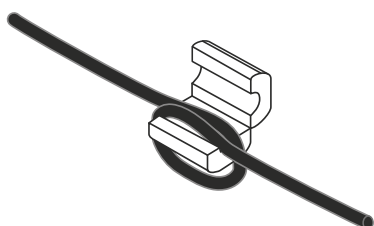
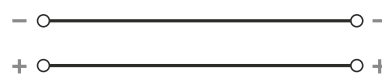


FIGURE 3: Ferrite core installation on I/O wirings.



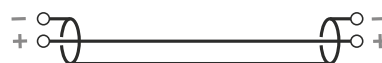
Loose pair
Configuration prone to high RF noise



Parallel pair
Configuration prone to RF noise



Twisted pair
Highly immune to RF noise



Shielded pair
Highly immune to RF noise

FIGURE 4: Cabling configuration.

9:4.Ferrite cores

Reject RF noise from input and output cabling by installing ferrite shields. Powersoft suggests the Kitagawa RFC-H13 ferrite core.

Wrap the cable around one side of each ferrite so that it pass through each ferrite twice (ref. FIGURE 3). Install the ferrite shield as close as possible to where the cable plug into the amplifier. Placing the ferrite elsewhere on the cable noticeably reduces its effectiveness.

9:5.Chassis shielding

If not already present on the product, a full body metal chassis or a shielding cage will provide best shielding of RF emission. In order to achieve the highest shielding, minimize the amount and size of holes or opening in the chassis.

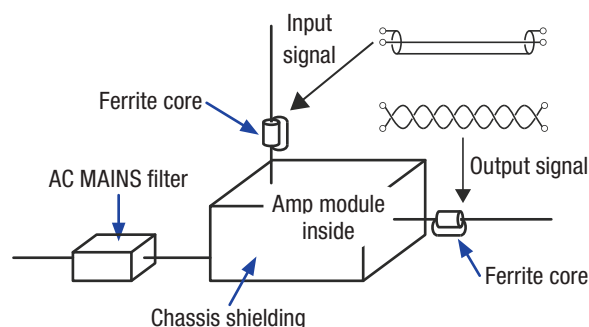


FIGURE 5: Tools and best practice for improving the electromagnetic compatibility.

Mechanical drawings

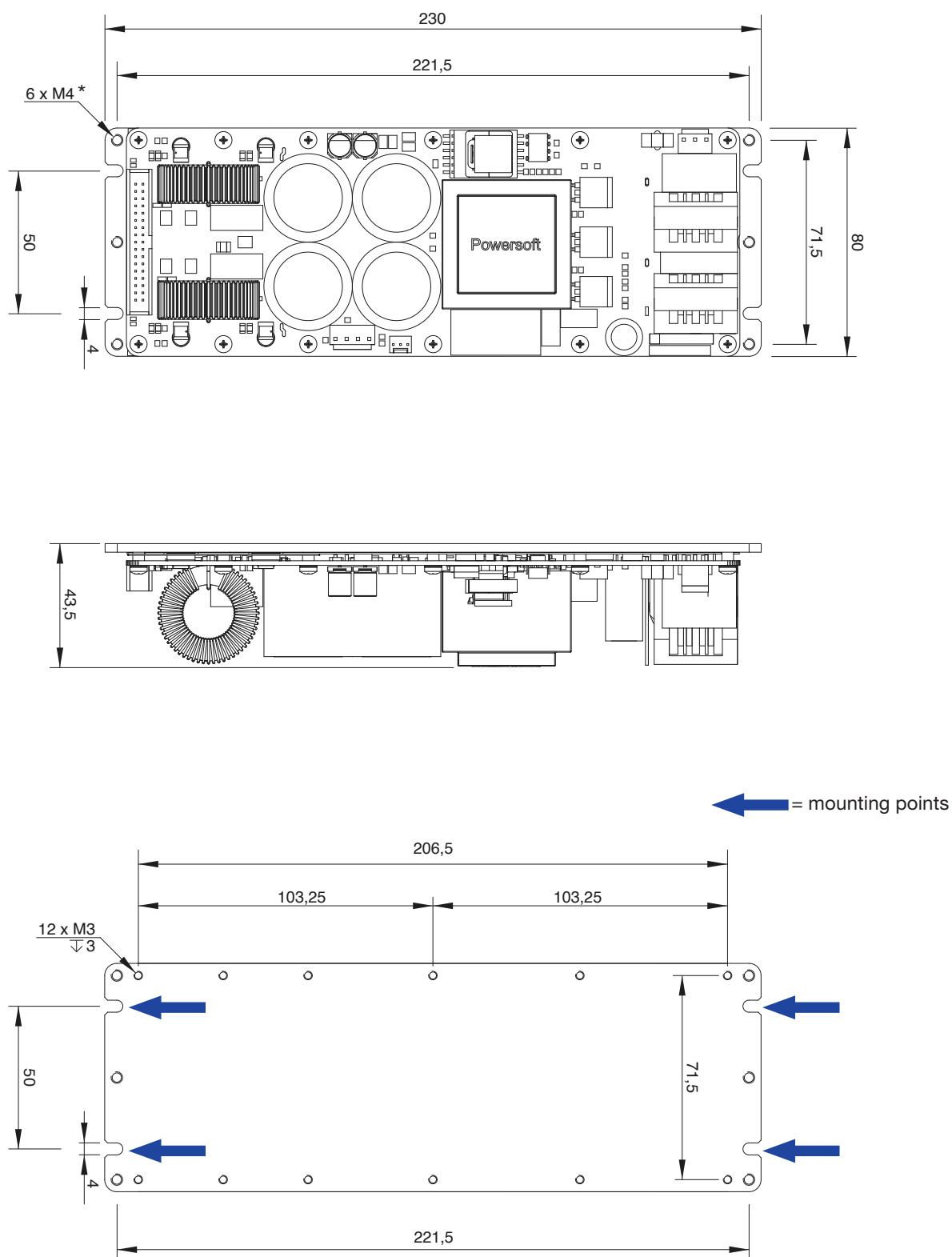


FIGURE 6: LiteMod and LiteMod HV: side and back plate (all dimensions in millimeters).

* General Tolerance = UNI-ISO 2768-M

Connections

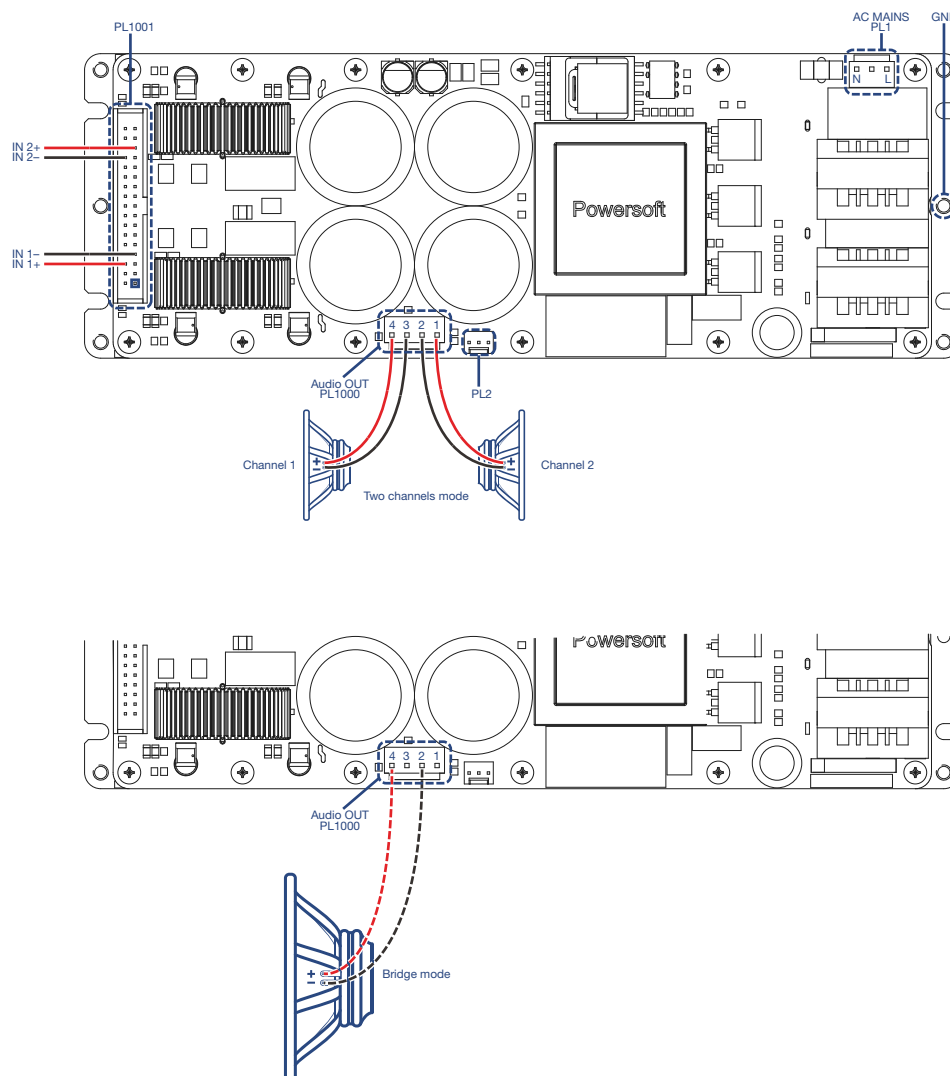


FIGURE 7: LiteMod and LiteMod HV connections.

11:1. Grounding

The amplifier module is intended to be assembled in a End Product.

In the End Product, the metal plate of the amplifier module shall be mechanically fixed and electrically connected to conductive parts connected to protective earth – PE.

The main PE connector of the End Product shall be connected first to the chassis, or the accessible conductive enclosure parts, with suitable measures according the standard and applicable national deviations.

11:2. Bill of connectors

CODE	NAME	TYPE
PL1001	Input connector	IDC socket 34 pin
PL1000	Output connector	JST B4P-VH
PL1	AC Mains	JST B3P-VH
PL2	FAN	Molex 22-27-2031

Loudspeaker wires housing: JST VHR-4N (not provided)

Power wires housing: JST VHR-3N (not provided)

11:2.1.PL1 pinout

Pin#	Symbol	Description
1	L	AC Mains: phase input
2	n/c	not connected
3	N	AC Mains: neutral input

11:2.2.PL2 pinout

Pin#	Symbol	Description
1	GND	Ground connection
2	HOT	+12 V, 150 mA max current draw
3	GND	Ground connection

The PL2 molex plug in intended for connecting a fan whose activation is driven by the temperature.

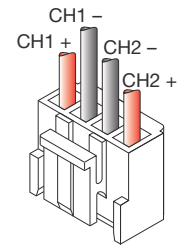
11:2.3.PL1001 pinout

PIN#	Name	IN	OUT	POWER	Range	Scale factor	Impedance	Notes	Tolerance	Description
1	SDPWS	●			Active High, Logic input 3.3 to 12 Vdc		1 kΩ	Logic input to be fed by "OR" diode		Power Supply Shut Down
2	RESERVED									
3	MODEL ID		●		Amplifier Model ID Resistor connected between pin 32 and GND (inf. Ω)					
4	+5VDCOUT			●	+5 V _{DC} ; 0.1 A max output current available				±5%	Regulated AUX Supply
5	GND			●						Ground
6	IN 1 +	●			3Vrms for full output (LiteMod STD) 4.2Vrms for full output (LiteMod HV) 7Vrms Absolute MAX input (LiteMod STD and HV)		Differential= 3 kΩ Common Mode= 3.5 kΩ (BAL) 3.5 kΩ (UNBAL)	Absolute MAX Input: 8V _{rms}		Channel 1 Balanced Input (non inverting) Channel 1 Unbalanced Input (non inverting when shorting pin 7 to ground)
7	IN 1 -	●			3Vrms for full output (LiteMod STD) 4.2Vrms for full output (LiteMod HV) 7Vrms Absolute MAX input (LiteMod STD and HV)		Differential= 3 kΩ Common Mode= 0.95 kΩ (BAL) 1.5 kΩ (UNBAL)			Channel 1 Balanced Input (inverting) Channel 1 Unbalanced Input (inverting when shorting pin 6 to ground)
8	GND			●						Ground
9	VOUT1MON		●			20 V/V	4.5 kΩ			Channel 1 Output Voltage Monitor
10	PROTECT1		●		Level 1 (4 to 5) = not in Protection Level 0 (0 to 1) = Protection		330Ω			Channel 1 Output Stage Protection Monitor
11	IOUT1MON		●			8.35 A/V	4.5 kΩ			Channel 1 Output Current Monitor
12	TEMPMON12		●		0 – 5 V	See table	7 kΩ			NTC sensor tap output
13	+12VDCOUT			●	+12 V _{DC} ; 0.5 A max output current available				±15%	Positive regulated analog section supply (same as pin 22)
14	-12VDCOUT			●	-12 V _{DC} ; 0.2 A max output current available				±15%	Negative regulated analog section supply (same as pin 21)
15	MUTE	●			Active Low, To be pulled to GND by current sink of at least 20 mA					CH1 and CH2 Output Stage Mute (disable output stages PWM)
16	+VCCMON		●		LiteMod= +4.25 V _{dc} Nominal LiteMod HV= +6 V _{dc} Nominal	20V/V	4.5 kΩ			Rail Bus Positive Monitor
17	-VCCMON		●		LiteMod= -4.25 V _{dc} Nominal LiteMod HV= -6 V _{dc} Nominal	20V/V	4.5 kΩ			Rail Bus Negative Monitor
18	-VCCMON		●		LiteMod= -4.25 V _{dc} Nominal LiteMod HV= -6 V _{dc} Nominal	20V/V	4.5 kΩ			Rail Bus Positive Monitor

Table continues on the next page...

11:2.4.PL1000 pinout

Pin#	Power polarity	Loudspeaker polarity	Description
1	GND	+	Channle 2 POSITIVE unbalanced output
2	HOT	-	Channle 2 NEGATIVE unbalanced output
3	GND	-	Channle 1 NEGATIVE unbalanced output
4	HOT	+	Channle 1 POSITIVE unbalanced output



Loudspeaker wires housing: JST VHR-4N

...continued from previous page.

PIN#	Name	IN	OUT	POWER	Range	Scale factor	Impedance	Notes	Tolerance	Description
19	+VCCMON		●		LiteMod= +4.25 V _{dc} Nominal LiteMod HV= +6 V _{dc} Nominal	20V/V	4.5 kΩ			Rail Bus Negative Monitor
20	MUTE	●			Active Low, To be pulled to GND by current sink of at least 20 mA					CH1 and CH2 Output Stage Mute (disable output stages PWM)
21	-12VDCOUT			●	-12 V _{DC} ; 0.2 A max output current available				±15%	Negative regulated analog section supply (same as pin 14)
22	+12VDCOUT			●	+12 V _{DC} ; 0.5 A max output current available				±15%	Positive regulated analog section supply (same as pin 13)
23	TEMPMON12		●		0 – 5 V	See table 1	7 kΩ			NTC sensor tap output
24	IOUT2MON		●			8.35 A/V	4.5 kΩ			Channel 2 Output Current Monitor
25	PROTECT2		●		Level 1 (4 to 5V _{dc}) = not in Protection Level 0 (0 to 1V _{dc}) = Protection		330Ω			Channel 2 Output Stage Protection Monitor
26	VOUT2MON		●			20 V/V	4.5 kΩ			Channel 2 Output Voltage Monitor
27	GND			●						Ground
28	IN 2 -	●			3Vrms for full output (LiteMod STD) 4.2Vrms for full output (LiteMod HV) 7Vrms Absolute MAX input (LiteMod STD and HV)		Differential= 3 kΩ Common Mode= 3.5 kΩ (BAL) 3.5 kΩ (UNBAL)		Absolute MAX Input: 8V _{rms}	Channel 2 Balanced Input (inverting) Channel 2 Unbalanced Input (inverting when shorting pin 29 to ground)
29	IN 2 +	●			3Vrms for full output (LiteMod STD) 4.2Vrms for full output (LiteMod HV) 7Vrms Absolute MAX input (LiteMod STD and HV)		Differential= 3 kΩ Common Mode= 0.95 kΩ (BAL) 1.5 kΩ (UNBAL)			Channel 2 Balanced Input (non inverting) Channel 1 Unbalanced Input (non inverting when shorting pin 28 to ground)
30	GND			●						Ground
31	+5VDCOUT			●	+5 V _{DC} ; 0.1 A max output current available				±5%	
32	MODEL ID		●		Amplifier Model ID Resistor connected between pin 32 and GND (inf. Ω)					
33	RESERVED									
34	SDPWS	●			Active High, Logic input 3.3 to 12 Vdc		1 kΩ	Logic input to be fed by "OR" diode		Power Supply Shut Down

11:3.Internal Signal Path Polarity

In order to increase the power's supply energy storage efficiency, signals coming from channel pairs 1-2 are polarity reversed, one with respect to the other within the pair, when entering the amplifier. This ensures a symmetrical use of the voltage rails: if, for example, both channels' 1 and 2 input signals are going through a peak at the same time, channel 1's energy will come from the positive voltage rails while channel 2, whose polarity is reversed with respect to channel 1, will be fed energy from the negative voltage rails. In this manner, the power supply will work symmetrically, with one channel catered by the positive rails and the other by the symmetrical negative rails. Channel 2's signal will be polarity reversed once more to ensure that both channels output with the same polarity as their corresponding input signals.

For this reason it is very important not to invert the polarity of either channels before feeding them to the module. A double polarity inversion (the first by the user inserting the input signal and the other by the amplifier's internal circuitry) results in no inversion at all. If this were the case, both channels would be weighing on only one side (positive or negative) of the power supply's voltage rails. This would result in an inefficient use of the power supply's energy.

Please pay special attention in using balanced inputs on all measurement equipment (such as oscilloscope probes) when you are bench testing.

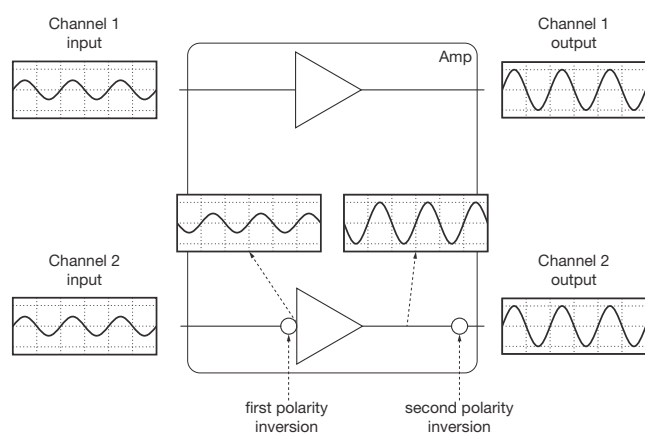


FIGURE 8: Internal signal path polarity with example input signals. Both channels 1 and 2 are fed with the same sine signal.

Protections

Fault protections are systems designed to protect people from severe or fatal electric shocks and avoid severe damages on the amplifier or the loudspeakers in case of electrical parameters out of scaling or critical changes in environmental conditions.

The architecture of Powersoft's amplifiers encompass several protection mechanisms triggered by harmful signal and temperature. Protection systems and triggers are independently implemented in the power supply section (power supply protection) and the amplifier section (amplifier protections) in order to minimize system damages and maximize efficiency.

11:4. Power supply protections

Power supply protections aim to isolate a faulty section in electrical power system from the rest of the device in order to prevent the propagation of the fault and limit device damages.

11:4.1. Primary AC mains overcurrent protection

AC main overcurrent are filtered by a 5 A time-lag fuse (also known as time-delay or low blow-fuse). The purpose of the time lag fuse is to allow the supply in electricity for a short time before the fuse actually blows. If the time-lag fuse blows out the amplifier switch off; replace the fuse with a proper 5 A time-lag fuse in order to restore the full functionality of the amplifier.

11:4.2. Primary AC mains overvoltage protection

AC mains overvoltage threshold is set to $280 V_{RMS}$. If the AC mains voltage exceeds $280 V_{RMS}$ the primary power supply stop working, but the auxiliary remain active.

The power supply turns on again when the AC mains voltage drops under $275 V_{RMS}$.

AC mains peak overvoltage are well tolerated by the power supply: non damages can be caused to the system even in case of severe peak overvoltage up to $380 V_{RMS}$.

11:4.3. Primary thermal protection

The temperature is detected at power supply's MOSFETs located on the Main Board bottom surface and at the primary transformer.

When the actual temperature of the power supply components exceeds the safety threshold, the system switch off.

T (°C)	V	T (°C)	V
-40	4.82	60	1.3
-35	4.76	65	1.16
-30	4.69	70	1.04
-25	4.6	75	0.93
-20	4.5	80	0.83
-15	4.37	85	0.75
-10	4.22	90	0.67
-5	4.05	95	0.61
0	3.86	100	0.55
5	3.66	105	0.5
10	3.43	110	0.46
15	3.2	115	0.42
20	2.96	120	0.38
25	2.71	125	0.35
30	2.47	130	0.33
35	2.24	135	0.31
40	2.02	140	0.29
45	1.82	145	0.27
50	1.63	150	0.25
55	1.46		

TABLE 1: Temperature to voltage relationship on TEMPMON pins in PL1001

11:5. Amplifier protections

Amplifier protections are triggered by audio signal current and voltage – by comparing input and output – and NTC, negative temperature coefficient, thermistors. NTC thermistors provide thermal feedback: NTC resistance decreases with increasing temperature. TABLE 1 displays the relationship between temperature and voltage drop across NTC thermistors. NTC's voltage drop for each channel are routed to the respective TEMPMON contacts (pin #12 and #23) on PL1001.

Since the temperature is detected on the PCB surface it does not represent the actual module temperature: be aware that some parts of the amplifier may be at higher temperature.

11:5.1.Harmful signal protections

Bad signals can cause amplifier and loudspeakers damages. In order to limit damages, harmful signal triggers specific protections.

11:5.1.1.Output short circuit

If the load impedance is too low or the loudspeaker line has a short circuit (because of voice coil damages, wires short circuit, improper wiring, etc), the amplifier output current rises to harmful values.

When the output current reaches $3 I_{A_{peak}}$ the amplifier section switches off, the power supply still working. After 2 seconds the amplifier section switches on: if the short circuit still persists, the current rises and the amplifier switches off again. The system toggles the amplifiers on and off every 2 seconds until the short circuit is removed.

11:5.1.2.RMS output current protection

When the load is absorbing more than $10 I_{A_{rms}}$ for a long time span the amp module intends this as a fault that can damage the output stage: the amplifier section switches off, the power supply still working. After 2 seconds the amplifier section switches on: if the fault still persists, the current rises and the amplifier switches off again. The system toggles the amplifiers on and off every 2 seconds until the fault is removed.

11:5.1.3.High frequency stationary loud signals

High frequency stationary signals, like steady sinusoid signals – improperly referred as continuous signals – with high amplitude tend to stress the amplifier section of the module as well as the loudspeakers voice coils.

If the output signal in the band 10 kHz – 20 kHz exceeds $40 V_{RMS}$ than the amplifier stage switch off; above 20 kHz the protection operates when the output amplitude exceeds $20 V_{RMS}$.

Support and warranty

13:1.Service

There are no user-serviceable parts in your amplifier. Refer servicing to qualified technical personnel. In addition to having an in-house service department, Powersoft supports a network of authorized service centers. If your amplifier needs repair contact your Powersoft dealer (or distributor). You can also contact the Powersoft Technical Service department to obtain the location of the nearest authorized service center.

13:2.Warranty

Powersoft guarantees its manufactured products to be free from defective components and factory workmanship for a period of 12 (twelve) months, starting from the date printed in the invoice of purchase.

All warranty repairs and retrofits must be performed at Powersoft facilities or at an Authorized Service Center at no cost for the purchaser. Warranty exclusion: Powersoft's warranty does not cover product malfunctioning or failure caused by: misuse, abuse, repair work or alterations performed by non-authorized personnel, incorrect connections, exposure to harsh weather conditions, mechanical damages (including shipping accidents), and normal wear and tear.

Powersoft will perform warranty services provided that the product is not damaged during transportation.

13:2.1.Return of Goods

Goods can be returned to Powersoft only after they have been granted a Return Merchandise Authorization – RMA – number to be attached to the external packaging. Powersoft (or its Authorized Service Center) has the right to refuse any returned good without a RMA number.

13:2.2.Repair or replacement

Powersoft reserves the right to repair or replace any defective goods covered by product warranty at its sole discretion and as it deems best.

13:2.3.Cost and responsibility of transport

The purchaser (or end user/customer) is solely responsible for all transportation costs and risks associated with sending warranty covered goods to Powersoft or its Authorized Service Center. Powersoft will assume full responsibility and cover all costs incurred to send the goods back to the purchaser (or end user/customer).

13:3.Assistance

Even though most product malfunctioning can be solved at your premises through Powersoft Customer Care or your direct knowledge, occasionally, due the nature of the failure, it might be necessary to return defective products to Powersoft for repair. In the latter case, before shipping, you are kindly asked to follow step by step the procedure described below:

- ▶ Obtain the “Defect Report Form” by contacting our Customer Care Department via email: service@powersoft.it or download the “Defect Report Form”.
- ▶ Fill out one “Defect Report form” for each returned item (the form is an editable tab guided document) and save as your name, amp model and serial number (for example: distributortname-MDRIVE-17345.doc) providing all required information except the RMA code/s and send it to service@powersoft.it for Powersoft approval.
- ▶ In case of defect reports approved by the Powersoft Customer Service Representative you will receive an RMA authorization code (one RMA code for each returning device). Upon receiving the RMA code you must package the unit and attach the RMA code outside the pack, protected in a waterproof transparent envelope so it is clearly visible.

All returning items must be shipped to the following address:

Powersoft S.p.A.
Via Enrico Conti, 13-15
50018 Scandicci (FI) Italy

In case of shipment from countries NOT belonging to the European Community make sure you have also followed the instructions described in the document available for download at the TEMPORARY EXPORTATION / IMPORTATION PROCEDURE link at <http://www.powersoft-audio.com/en/support/service>.

Thank you for your understanding and cooperation and continued support as we work to improve our partnership.

Specifications

LiteMod

General	
Number of channels	2
Output power	
2-channel mode	
4 Ω / Ch (balanced)	600 W
8 Ω / Ch (balanced)	400 W
bridged mode	
8 Ω / Ch pair	1200 W
Max output voltage	85 V _{peak}
Max output current	31 A _{peak}
AC Mains Power	
Power supply	Universal, regulated switch mode
Nominal power requirement	AC 100 V - 240 V, 50/60 Hz with PFC
Operating voltage	AC 90 - 264 V
Power factor	$\cos\phi = 0.9$ @ 360 W
Consumption	
Standby	0.5 W
Idle	13.5 W
1/8 of max output power @ 8 Ω	220 W

AUX supplies	
Fan plug (+12 V), max supply current draw	150 mA
Max aux supply current draw @ +12 V	500 mA
Max aux supply current draw @ -12 V	200 mA
Max aux supply current draw @ +5V	100 mA

Audio	
Gain	26 dB
Frequency response	20 Hz - 33 kHz (+0/-1 dB) @ 1 W, 8 Ω
S/N ratio	115 dB
Crosstalk separation	85 dB @ 1 kHz
Input sensitivity @ 8 Ω	3 V _{rms} / 11.7 dBu
Input impedance	10 k Ω balanced
THD+N / DIM100	< 0.08% from 0.1 W to full power (typically <0.05%)
Slew rate	50 V/ μ s @ 8 Ω , input filter bypassed
Damping factor @ 8 Ω	> 10000 @ 100 Hz

Construction	
Dimensions L x W x H	230 mm x 80 mm x 43.5 mm 9" x 3.1" x 1.7"
Weight	870 g (1.92 lb)

LiteMod HV

General	
Number of channels	2
Output power	
2-channel mode	
8 Ω / Ch (balanced)	700 W
bridged mode	
16 Ω / Ch pair	1400 W
Max output voltage	120 V _{peak}
Max output current	31 A _{peak}
AC Mains Power	
Power supply	Universal, regulated switch mode
Nominal power requirement	AC 100 V - 240 V, 50/60 Hz with PFC
Operating voltage	AC 90 - 264 V
Power factor	$\cos\phi = 0.9$ @ 360 W
Consumption	
Standby	0.5 W
Idle	18 W
1/8 of max output power @ 8 Ω	260 W

AUX supplies	
Fan plug (+12 V), max supply current draw	150 mA
Max aux supply current draw @ +12 V	500 mA
Max aux supply current draw @ -12 V	200 mA
Max aux supply current draw @ +5V	100 mA

Audio	
Gain	26 dB
Frequency response	20 Hz - 33 kHz (+0/-1 dB) @ 1 W, 8 Ω
S/N ratio	119 dB
Crosstalk separation	85 dB @ 1 kHz
Input sensitivity @ 8 Ω	4.23 V _{rms} / 14.7 dBu
Input impedance	10 k Ω balanced
THD+N / DIM100	< 0.08% from 0.1 W to full power (typically <0.05%)
Slew rate	50 V/ μ s @ 8 Ω , input filter bypassed
Damping factor @ 8 Ω	> 10000 @ 100 Hz

Construction	
Dimensions L x W x H	230 mm x 80 mm x 43.5 mm 9" x 3.1" x 1.7"
Weight	870 g (1.92 lb)



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