

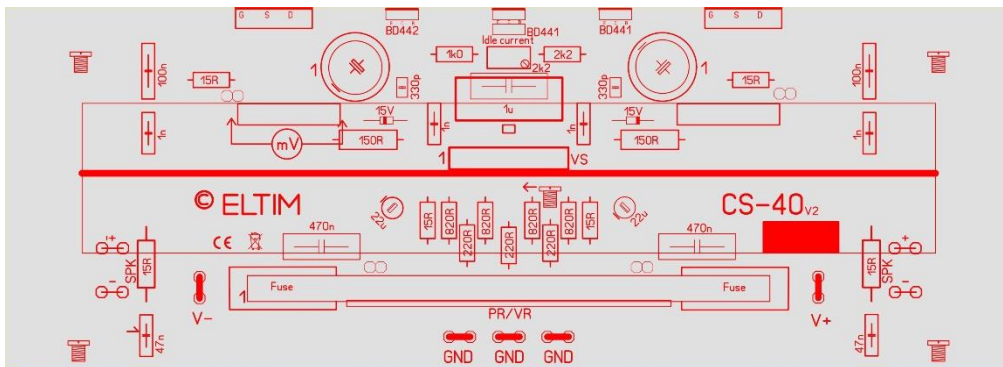
CS-40 v2 Current Stage module

Due to our completely different way of thinking when it comes to PCB design and layout, mechanical and thermal stress, magnetic interference, EMI, etc., an ELTIM amplifier built with these modules looks and acts a bit different, which is [confirmed by our customers](#). According to them they make *MUSIC*, not just power ! And that for a (very) long period of time due to the stress free setup and quality components.

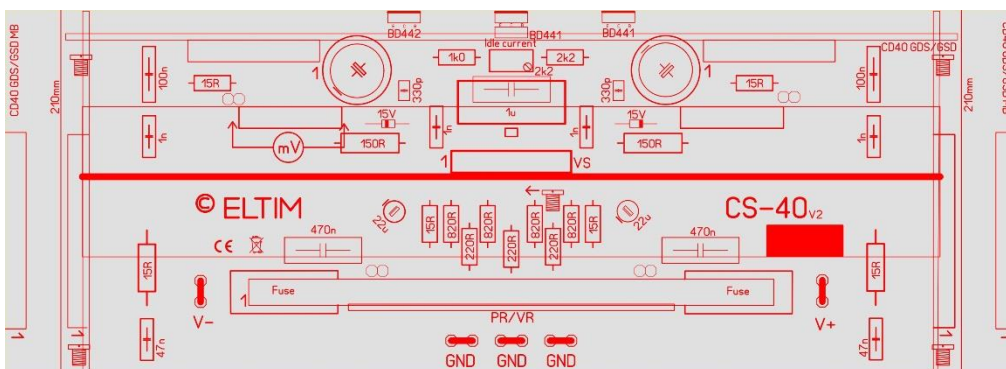
In order to make a true difference, we split our power amplifier schematics in a voltage- and a current stage board in order to obtain the maximum possible sound quality. This means that an ELTIM amplifier is based on these two (VS + CS) modules. A VS-input stage processes the sensitive and often small signal voltages and transfers it into signals powering a CS-module, which is leading the transient rich high currents. This cooperation works very well indeed as many indicated as a “tube like” sound.

While using large TO-247 or even TO-264 sized power Fets, our amplifier systems are extremely stable, can deliver lots of power and more important, together with our totally different pcb setup, they have way better control over your speaker system compared to most other amplifier designs.

With the two layouts of this CS-40 there are several possibilities of building a very interesting amplifier. We only use very high quality materials lasting for 20 years and heat resistant, double sided FR4+ PCB's made by a highly regarded European manufacturer, double sided (2x35um), tinned isles, text on both sides, etc.



In a basic (CS-40) variant it is supplied with 8A or 16A Mosfets at the top end.
Direct L-mounting of a pair of GDS oriented Mosfets.



In a CS-40 CB (Connector Board) version there are multiple connectors mounted instead:
Two headers close to the Mosfet locations (not mounted then) AND
Two headers at left and right of the PCB.
At following pages we explain what you could connect there.

We like to refer to our [special document](#) where we explain all the details we implemented in our designs.

This **CS-40** power (current) stage PCB highlights:

- Positions for GSD (mostly Mosfets) types, TO-247 or TO-264.
- Header connectors for mounting a large Mosfet (2-4 pairs) module instead.
- Header connectors for mounting a pair of large (2-4 pairs) Monoblock modules instead.
- MKP capacitor in the idle current network.
- Current driven feedback in the centre of PCB with multiple paralleled resistors, reducing noise.
- Speaker output and extra Mosfet/Hexfet connector both left and right.
- The absence of a coil in the output line results in way better impulse behaviour.
- Separate Current stage (CS) and Voltage stage (VS) voltage rails.
- Separate tracks for Power-, speaker-, RF-ground, feedback, VS-stage and input ground.
- All grounds are leading to the centre area of the bottom connector.
- Wide and thick (35um) speaker-, ground- and power rails tracks.
- Milled, gold plated beryllium copper connectors, with multiple pin (12x 3A for supply) connections.
- Speaker signal for signalling/protection purposes at all connectors.
- PCB position to mount an NTC/PTC at centre, connected to both horizontal connectors.
- Dimensions: 250(210 cut) x85mm.



At the following pages we list the data of the different CS-40 modules and CD-40 combinations we have in our program. After some years of selling them, we decided to change the way we supply and offer them. Basically all these modules are the same, except for the types of Power Fets. Due to the specifications of these power transistors, the “figures” of the remaining base modules are different and based on the max. voltage/current they can handle Hexfet versions are no longer available since these types are obsolete now.

Extra power

In the basic CS-40 variant just a single pair of Mosfets is mounted at the top of the board. L-mount it to a suitable heatsink as is done with most other amplifier modules.

We have a so called CS-40 CB (Connector Board) variant available, where instead of a pair of Mosfets there are several header connectors mounted. To those you can connect our CD-40 add-on modules. At the following pages we explain their function and what you can connect in order to make it an extremely powerful amplifier.

We have versions where N- and P-channel Mosfets, so a complete half bridge(s), are mounted and versions where we split the N-side and P-side and mounted them on separate boards. They are mounted left and right of a CS-40 CB and together they form a very nice Monoblock, exactly fitting in MODU Mini Dissipante 330mm wide casings. Power range is depending of the size of this cabinet.

Monoblocks built like this are real serious ones and worth to be connected to about any speaker system!

SMALL Monoblocks

Please note that with the “brother” of this CS-40 module, our CS-40ps module, one could build very compact Monoblocks in MODU Galaxy 230mm wide cabinets.

Power is then limited to around 200W due to the integrated power supply figures and limited space / cooling surface.

An example of those is shown at the right picture:

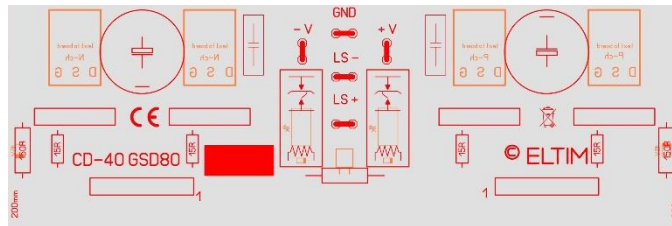
Its running for 3,5 years now in our living room.

Explanation of CD-40 modules

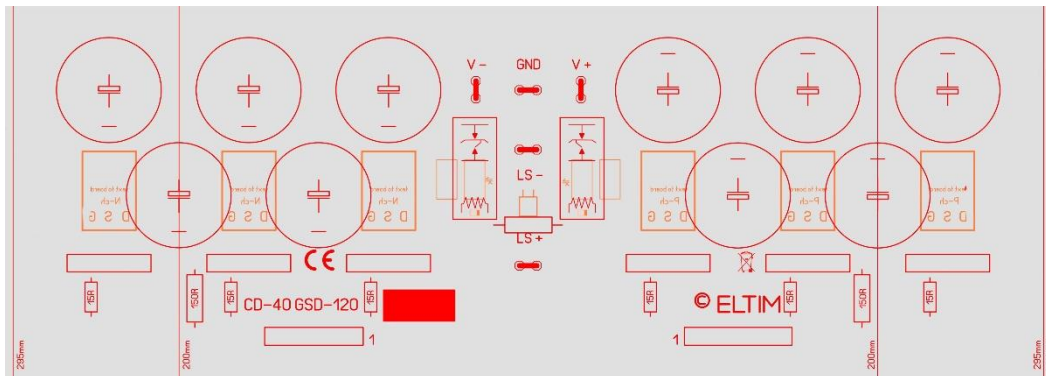
At the following pages we explain the layouts of CD-40 modules which can be connected to the CS-40 we talk about in this document.



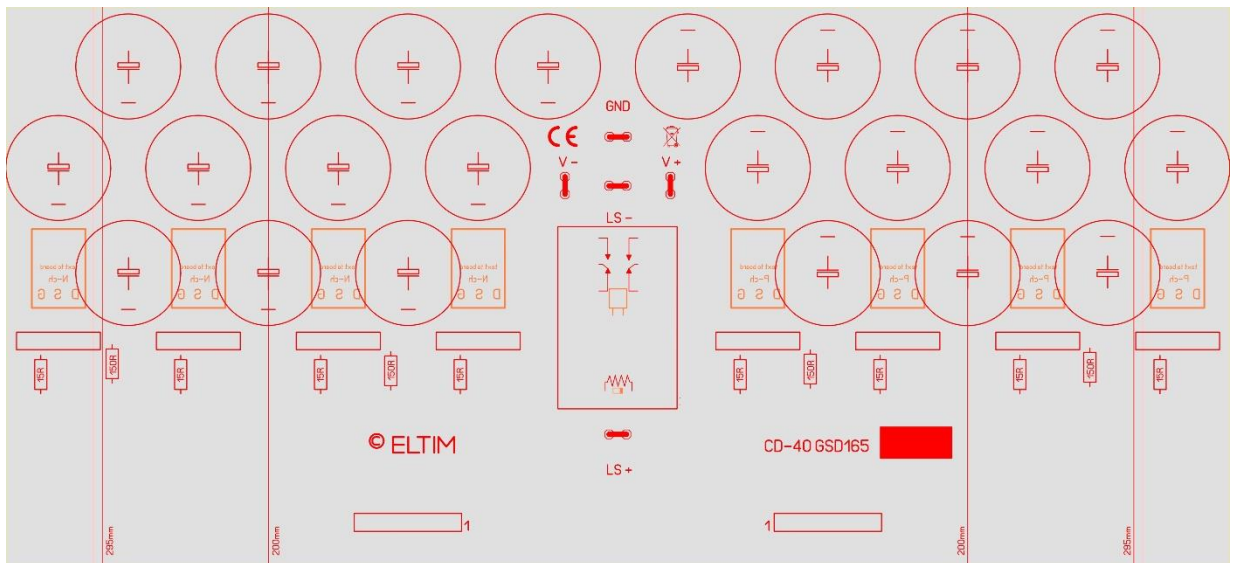
At the two top end connectors you can connect following CD-40 modules:



CD-40 GSD-80, 80x200mm, 2 pairs, fits in MODU Dissipante 3U cabinets



CD-40 GSD-120, 120x300mm, 3 pairs, fits in MODU Dissipante 4U cabinets.
If you want, the outer pairs can be cut of, making it 200mm wide.

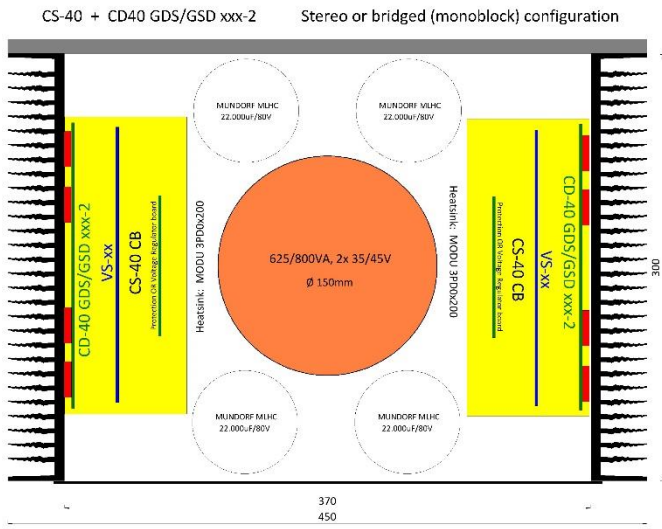


CD-40 GSD-165, 165x350mm, 4 pairs, fits in Dissipante 5U cabinets. 350mm is max. pcb size possible.
If you want, the outer pairs can be cut of, making it 300mm wide.
Also, the two outer pairs can be cut of, making it 200mm wide.

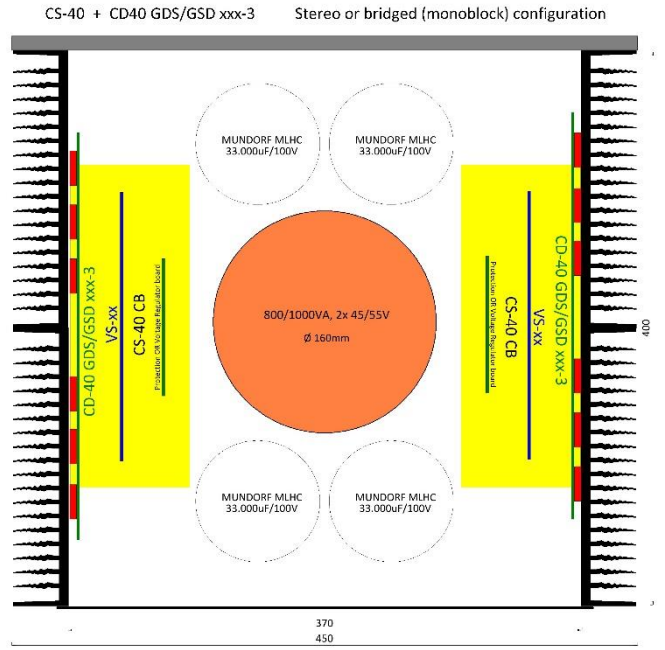
With all three you could make a stereo or bridged mode amplifier, fitting in a MODU Dissipante casing.
According to our calculations, with the last one in bridged mode, you could make round 2kW.....

While doing so, you drain around 16A from the 230V power grid !
We need to try this, but where do we store this amount of power in?

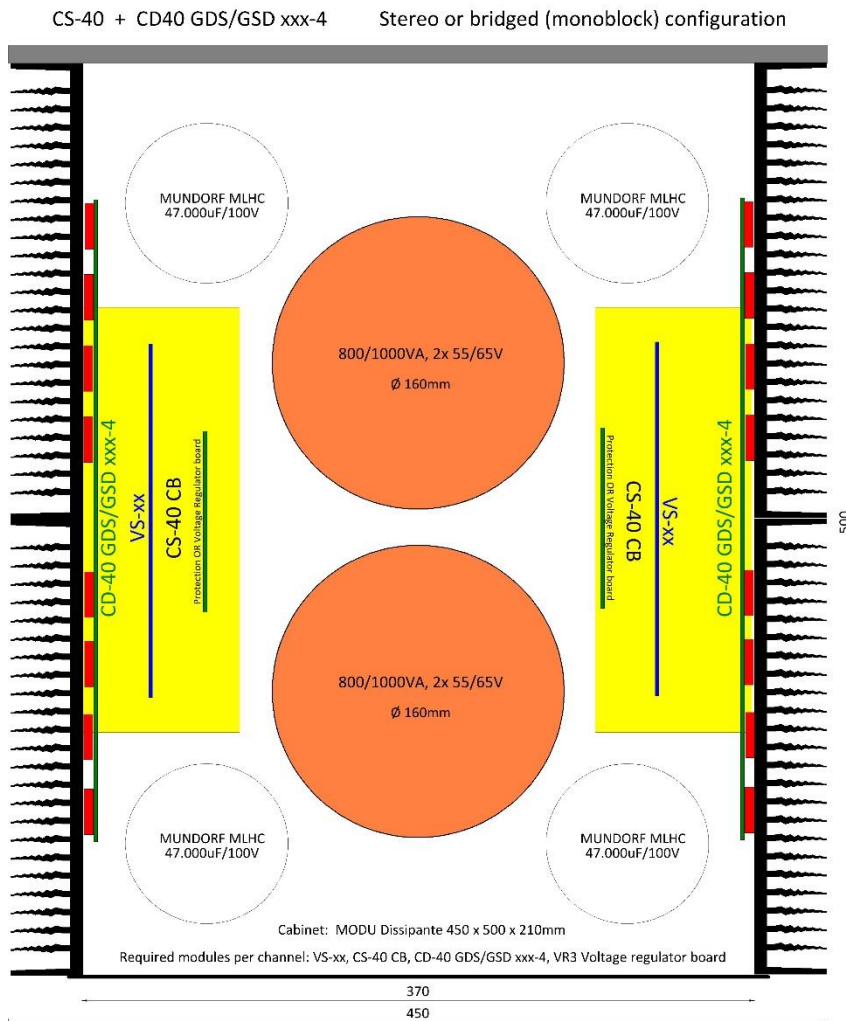
NOTE: The Dissipante casing uses L-mounts, connecting the heatsink with the plating. Therefor there is less space than the height of the cabinet available for mounting the modules above! Always use 1U (44mm) higher.



Cabinet: MODU Dissipante 450 x 300 x 80/120/165/210mm
Required modules per channel: VS-xx, CS-40 CB, CD-40 GDS/GSD xxx-2, VR3 Voltage regulator board



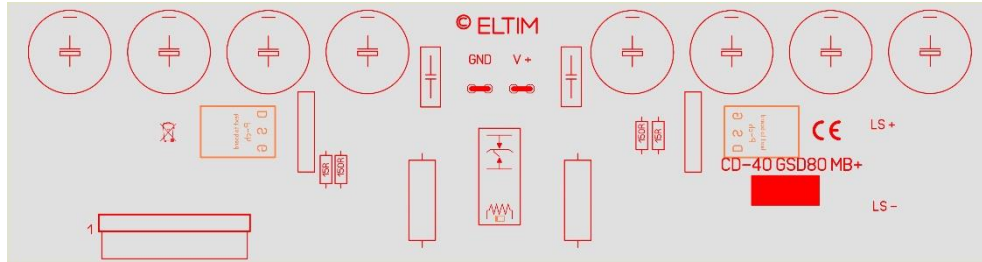
Cabinet: MODU Dissipante 450 x 400 x 80/120/165/210mm
Required modules per channel: VS-xx, CS-40 CB, CD-40 GDS/GSD xxx-3, VR3 Voltage regulator board



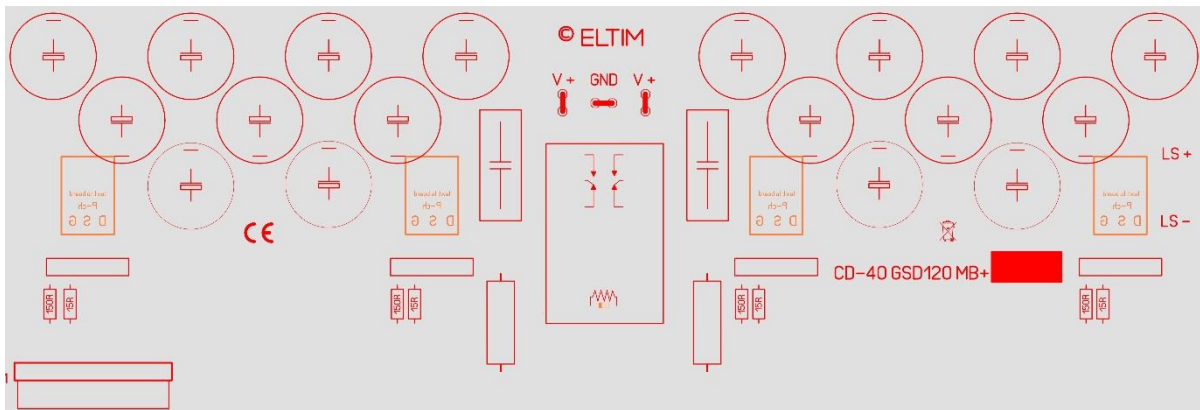
Cabinet: MODU Dissipante 450 x 500 x 210mm
Required modules per channel: VS-xx, CS-40 CB, CD-40 GDS/GSD xxx-4, VR3 Voltage regulator board

NOTE: Most probably we'll change the layout of the CS-40 module in a way that it can be mounted vertical. In that case there is more space available in the cabinet and cooling air flows better as well.

Left and right of a CS-40 module you could mount a pair of [CD-40 MB modules](#) (just one shown!):



With these, the Monoblock pack fits in a [MODU Mini Dissipante](#) 2U height/330mm wide.



With these, the Monoblock pack fits in a [MODU Mini Dissipante](#) 3U height/330mm wide.

According to our calculations it could deliver up to around 1kW monoblock power.....

Right hand side modules shown only, at left is another mirrored one.
Together they form a very impressive, high power monoblock amplifier.
They are always delivered as a pair.

Standard, a CS-40 / CD-40 MB combination fits exactly in a 330mm wide MODU Mini Dissipante. There are markings (210mm) on the CS-40 boards. If you cut the CS-40 CB at those lines, his cut CS-40 MB + CD-40 MB modules will fit exactly in the 230mm wide MODU Galaxy cabinets. While using those cabinets, max. power is limited due to less cooling surface compared to the MODU Mini Dissipante range with their large heatsinks. Perhaps more cost effective is to use our CS-40ps instead as mentioned before.

With all mentioned CD-40 (MB) modules above we reserved space for a significant amount of Ø25mm supply capacitors very close to the power Fets, giving an unbeaten power punch and extremely well woofer control.

Also, with all we took special precautions in the length of all gate tracks: they exactly have the same lengths.

All these CD-40 (MB) modules are delivered with selected EXICON mosfets.

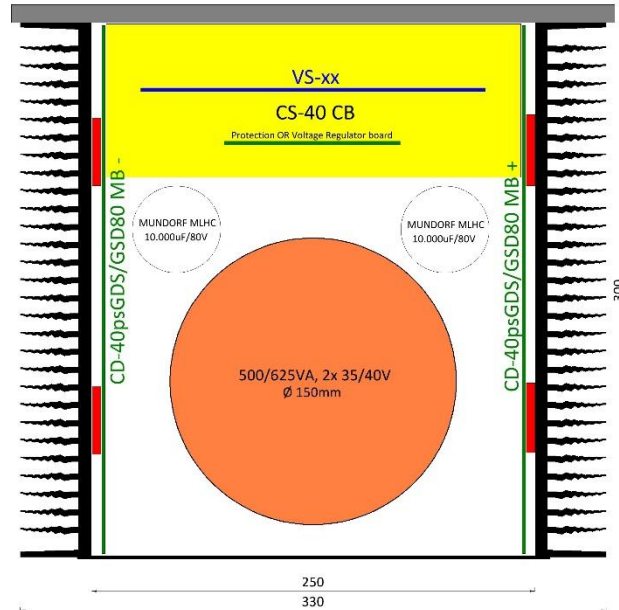
With the very high current capability of all modules above, the supply voltage to these transistor banks cannot be fed via the connected CS-40 CB module and has to be done directly to these boards. If there is power fed to the CS-40 itself, this will activate the supply power relay(s) on the CD-40 module(s).

Also the speaker leads are directly connected at these CD-40 (MB) modules.

In the graphs below we show the CS-40 data in thick lines, assisted by CD-40's in thinner lines.

MONOBLOCK configurations in MODU Mini Dissipante, 330mm wide

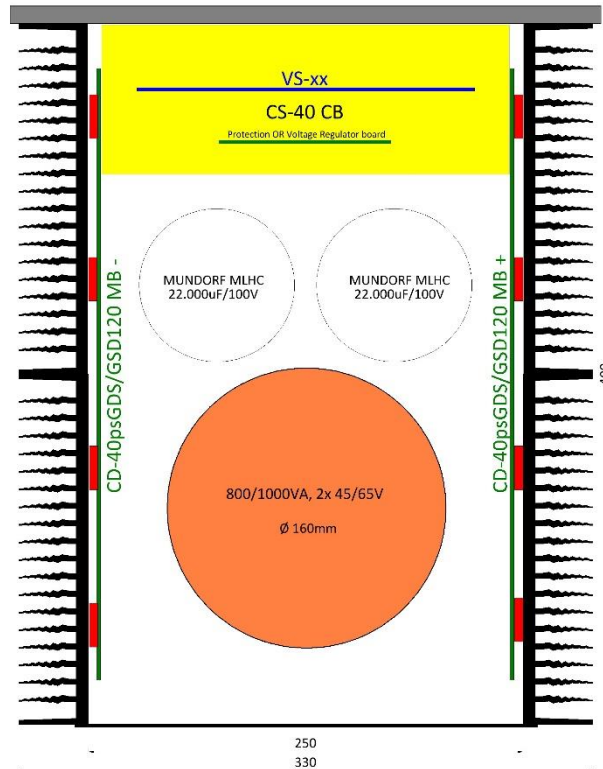
CS-40 CB + CD40 GDS/GSD 80 MB Monoblock configuration



Cabinet: MODU Mini Dissipante 330 x 300 x 80mm (1MNPA02/33/300x)

Required modules: VS-xx, CS-40 CB, CD-40 GDS/GSD80 MB pair, VR3 Voltage regulator board

CS-40 CB + CD40 GDS/GSD 120 MB Monoblock configuration

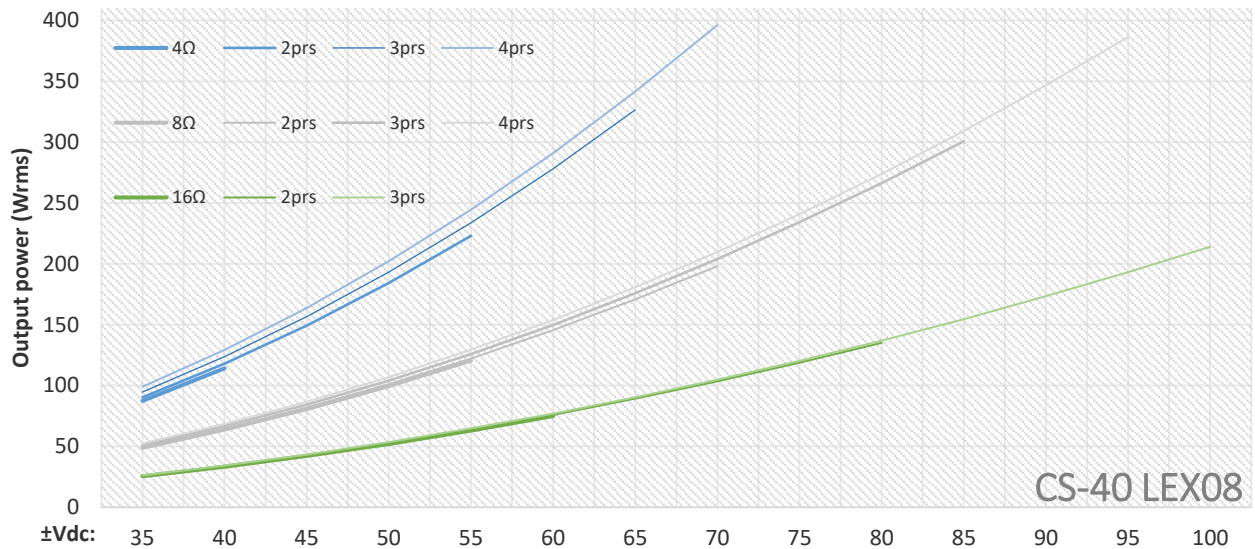


Cabinet: MODU Mini Dissipante 330 x 400 x 120mm (1MNPA03/33/400x)

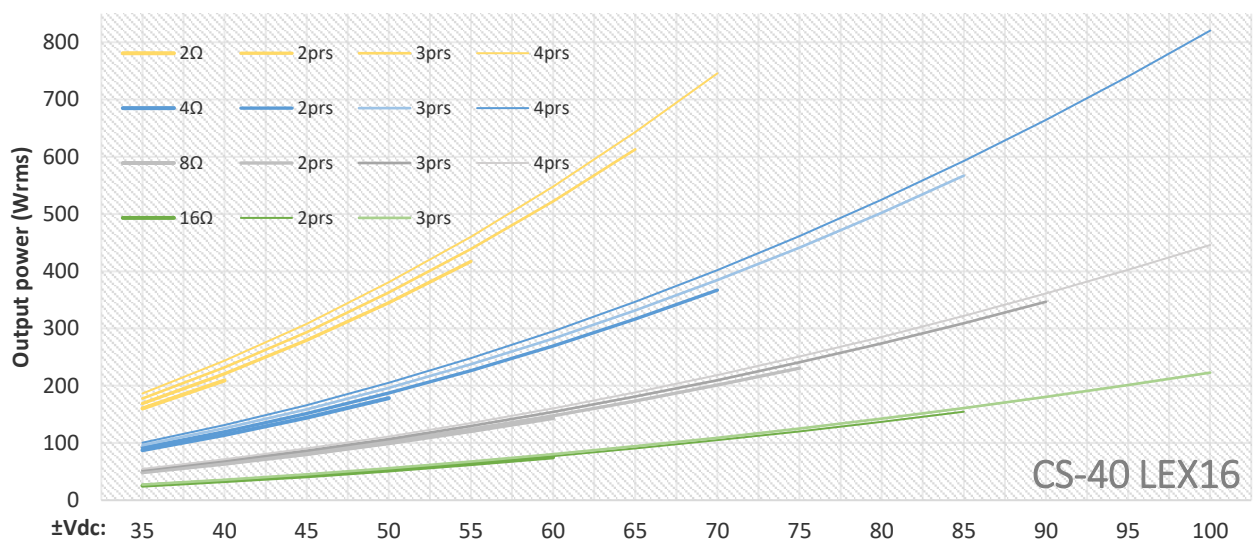
Required modules: VS-xx, CS-40 CB, CD-40 GDS/GSD120 MB pair, VR3 Voltage regulator board

NOTE: Most probably we'll change the layout of the CD-40 MB modules in a way that CS-40 can be mounted vertical. In that case there is more space available in the cabinet and cooling air flows better as well.

Output power for models with audiophile [EXICON lateral Mosfets](#):



CS-40 LEX08, with EXICON 8A/200V/125W, TO-247 lateral Mosfets (ECX10N20 / ECX10P20)
One pair directly on CS-40, 2-4 pairs on CD-40 GSD modules only

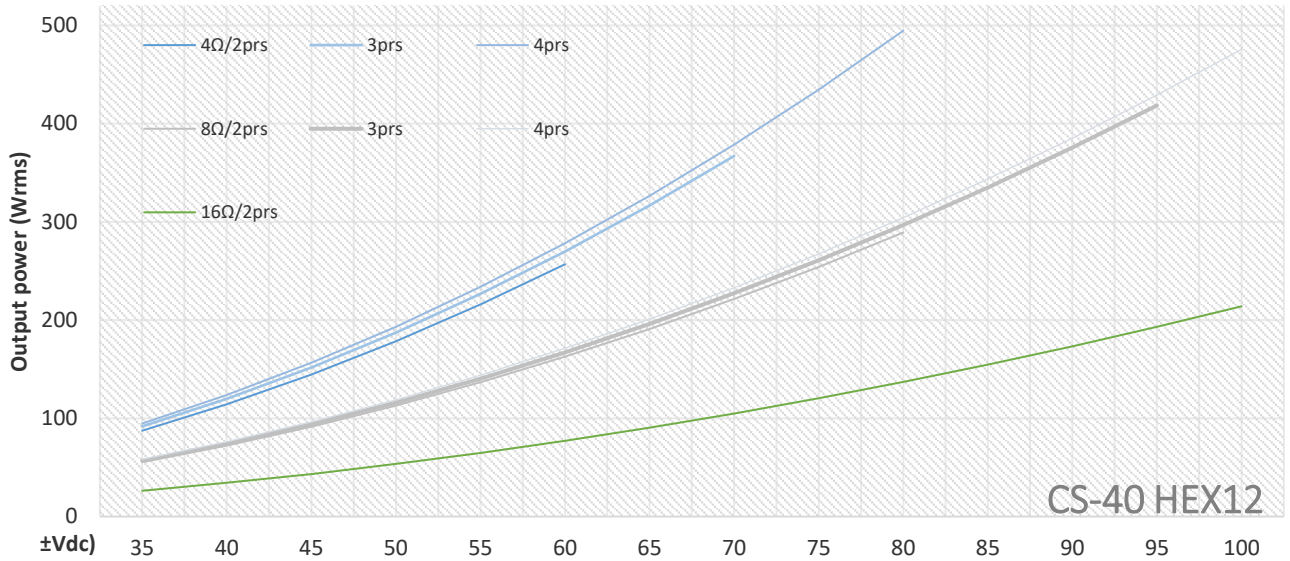


CS-40 LEX16, with EXICON 16A/200V/250W, TO-264 lateral Mosfets (ECW20N20 / ECW20P20)
One pair directly on CS-40, 2-4 pairs on CD-40 GSD modules only

Technical specifications:

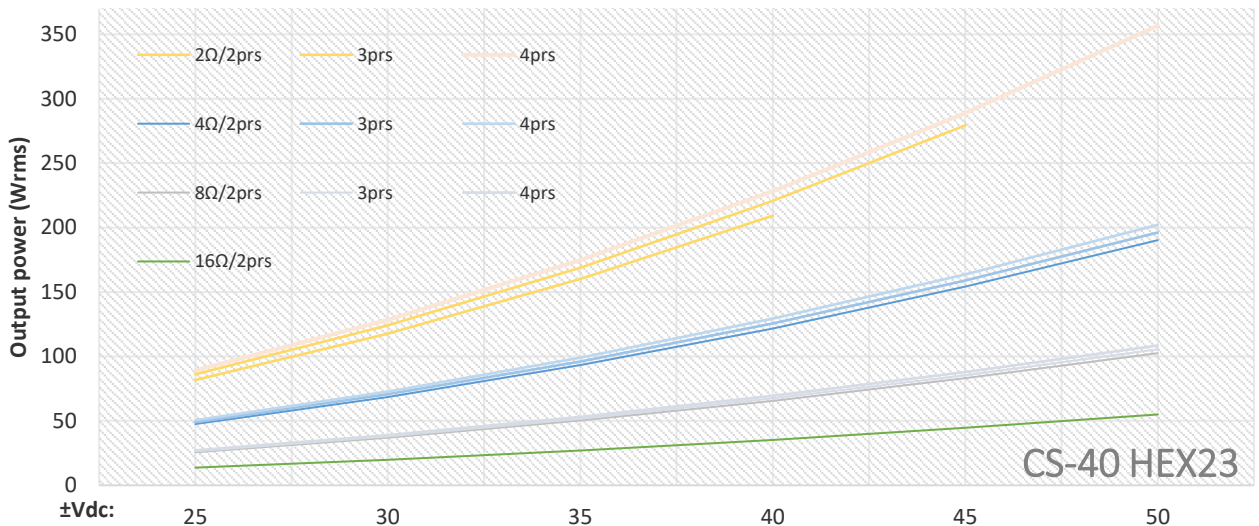
Frequency range:	DC - >2MHz within 2dB (limited and defined by VS-module used, 270kHz/450kHz)
Distortion figure (THD):	< 0,001% (1W/1kHz/8ohm with Hexfets, Exicon's are even far better) < 0,002% (80W/1kHz/8ohm with Hexfets, Exicon's are even far better)
Slew rate:	> 60V/uS (@ +/- 30V). Limited by AC-input filter on VS-module used.
Harmonics:	<< -55dB, NONE specific, see graph right below. With Exicon's unmeasurable.
Damping factor:	> 200 (strongly depending on power Mosfets and supply used)
Input voltage:	1 Volt
Input impedance:	47kOhm
Output load:	depending on model and supplied voltages, see graphs
Supply voltage:	depending on the model, see graphs
Output power:	depending on the model and supplied voltages, see graphs.
Dimensions:	200x80x35mm

Output power for models with rugged Hexfets:



CS-40 HEX12, with IR 12A/200V/140W, TO-247 Hexfets (IRFP240N / IRFP9240N)

Only available on the CD-40 GDS add on modules!



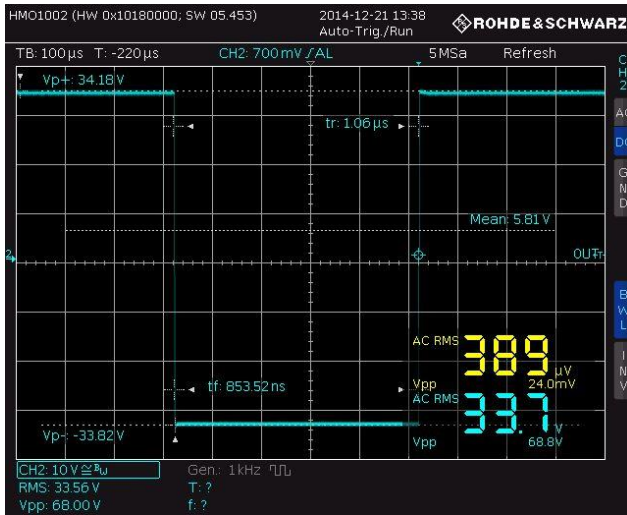
CS-40 HEX23, with IR 23A/100V/140W, TO-247 Hexfets (IRFP140N / IRFP9140N)

Only available on the CD-40 GDS add on modules!

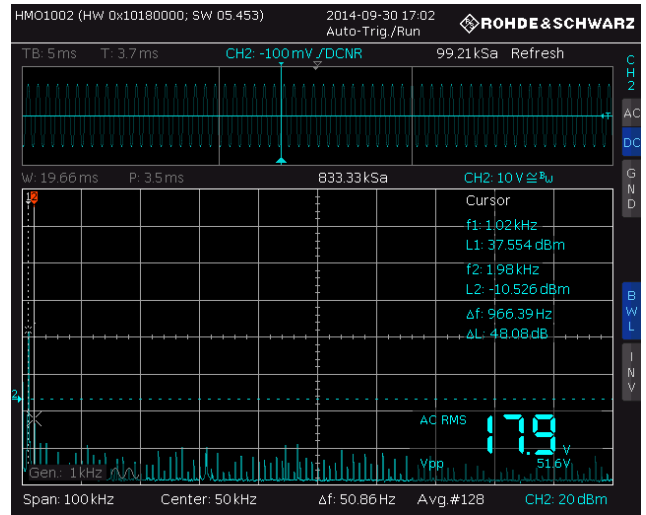
Technical specifications:

Frequency range:	DC - >2MHz within 2dB (limited and defined by VS-module used, 270kHz/450kHz)
Distortion figure (THD):	< 0,001% (1W/1kHz/8ohm with Hexfets, Exicon's are even far better) < 0,002% (80W/1kHz/8ohm with Hexfets, Exicon's are even far better)
Slew rate:	> 18V/uS (@ +/- 30V). Limited by AC-input filter on VS-module used.
Harmonics:	<< -55dB, NONE specific, see graph right below. With Exicon's unmeasurable.
Damping factor:	> 200 (strongly depending on power Mosfets and supply used)
Input voltage:	1 Volt
Input impedance:	47kOhm
Output load:	depending on model and supplied voltages, see graphs
Supply voltage:	depending on the model, see graphs
Output power:	depending on the model and supplied voltages, see graphs.
Dimensions:	200x80x35mm

Some measurement data:



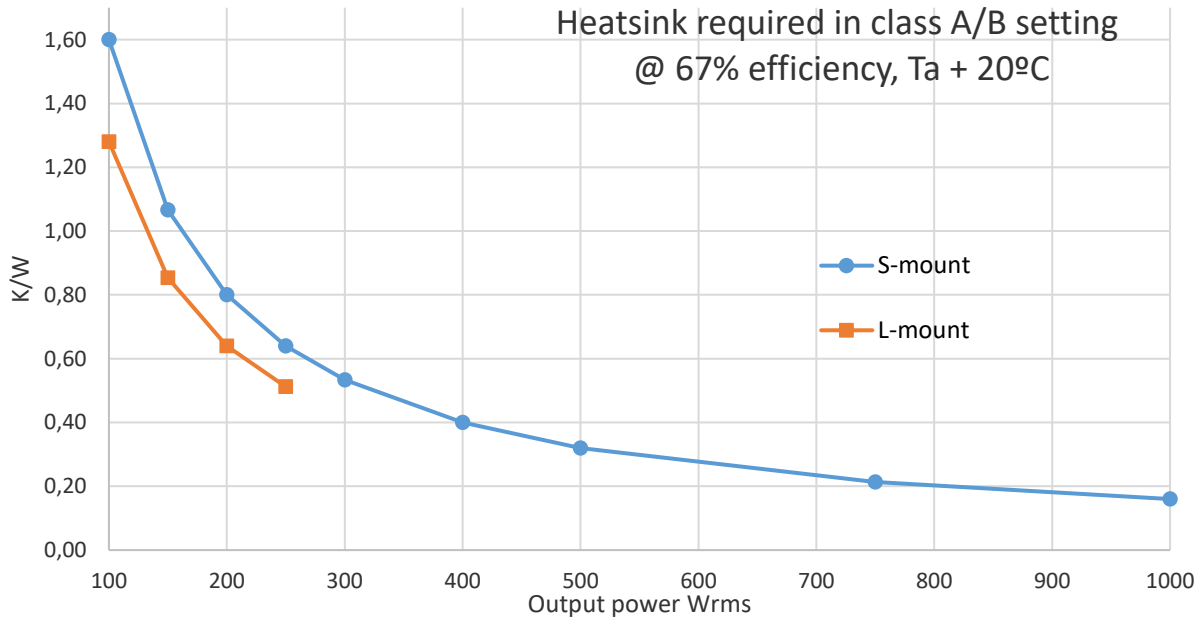
Square wave signal without ANY irregularities
 It also shows a slew rate of around 60V/uS.
 Limiting factor is the low-pass network in the input circuit!



Frequency domain (100kHz wide) without any significant harmonics.
 Please note that we run on 40W/8ohms here, not 1W as others do!

NOTE: the more Mosfet pairs are paralleled, the "slower" the amp will perform, so use a minimum required!

HEAT SINK data



CONNECTOR FUNCTIONS

The bottom connector of our CS-modules are meant to connect a Voltage regulator or a Protection Module.

You need to connect a hardwired or universal power supply here and connect it to the 6,3mm Faston blades. In case you use any of our CD-40 (MB) modules, connect the power supply to those instead. The CS-40 CB will get its power from there instead.

The centre connector is where one of our [VS10/20 Voltage Stage modules](#) is connected, L-mounted or sandwiched. This last option sets the total height at a minimum of around 30mm.

Please note that only a set of a CS and VS module is a working amplifier!

Besides the needed connections for basic amplifier function, there are also connections for a PTC and the centre contact leads to the idle current potmeter. With later VS-modules you could adjust idle current, f.e. to switch to class A mode automatically when only low power is used or to class B when NO power is used The PTC leads via the header connectors to our Protection module which can be mounted optionally. Mount the PTC to the heatsink used and a possible Protection module will guard the temperature and even regulates a possible fan.

On the base module, at the left and right connectors the speaker leads are to be connected. If any of our CD-40 (MB) modules are used, connect the speaker leads there.

Side and top connector signals: Ground, Speaker output, Hexfet drive signal, + or - power voltage and four extra paths for random use or power measurement.

At the last page we give a block diagram of how our modules are connected.

Protection

If you want to protect your speaker, you need one of our [Protection modules](#). This module detects differences between in- and output signals and acts if this event occurs, f.e. overloading it or if the amp has a fault. The protection module separates the power supply from the electronics and/or discharges them very fast, instead of a relay with unsuitable nickel/wolfram contacts causing distortion, especially with small signals. A max. of 4 pos. side AND four neg. side Mosfets are checked and action is taken if something is wrong. This board is mounted at the long horizontal header. It replaces the fuses at the same location. However, the Mosfets we use show NO irregularities as many other Mosfets (easy breakdown) and regular transistors (thermal runaway and oscillations at high power) tend to show. So far we nor any of our customers experienced breakdown of power Fets in our designs.

There could be three warning LED's mounted: overheating (interior AND heatsinks), overloaded and distortion. All three signalling have their own warning LED's, mostly used in PA-amplifiers.

A **MASTER WARNING** Led will flash in a mix of all three above, in order to warn you that shortly after this one is on, the amp WILL shut itself down ! The way it lights indicates the kind of problem:

- Shortly on while a shortcut or overload is detected. The amp shuts down fast.
- Blinks bright with the beat while clipping. Waiting too long, the amps shuts down
- Blinks dimming while a distortion is detected. Shuts down when there is too much distortion.
- Starts glowing more intense with temperature rise. Shuts down while exceeding 100°C somewhere.
- Or any combination of above.

Due to this different way of lightning it is not necessary to use the other warning lights, you also could see what's wrong in the way the master warning light flashes. We use the red ring in the power switch for this.

THE MISSING PARTS, or less is more....

While using the Mosfets we do, the schematics can be kept very simple. We don't need to feed the power transistors with a lot of current and they show a negative temperature characteristic. Due to this effect we also don't need to take precautions avoiding a so called "thermal runaway" effect as regular transistor based amps tend to show. We also don't need rows of Mosfets as seen everywhere and required to keep the Mosfets inside their Safe Operating Area (SOA). The ones we use have no SOA and so need only one pair.

By using a fully symmetrical design, electrical AND mechanical, there are no DC-irregularities in the output while switching the amp on or off, there is NO speaker "anti-plop" protection needed, mostly a (distorting) relay in the speaker line. With this amp module there is just a tiny "tick", without any woofer DC shifts when power comes on and about 1,5 secs. some minor distortion when power goes down (@ around 15Vdc) before signal stops, also without slow and far moving around of the woofer cone.

If this short period of distortion disturbs you, take away the input signal with power off or use our protection module, which prevents this event by discharging the power supply fast, instead of a relay in the speaker line.

There is also no output coil in the output line, meant to prevent current peaks. As a matter of fact, especially short impulse peaks make the music more real and this network is killing it..... So, we left this out.

The Fets we use can easily handle these peaks, don't worry. The main fuses will blow first if it gets too bad.

We did about all possible, 24 hours of clipping them, short circuit (unintentionally of course....), etc.

This coil comes from ancient times where the power transistors (f.e. famous mother of all 2N3055) just barely could handle the power even without serious peak currents.....

And still they blew out even while rows of them were mounted.

The same counts for older Mosfet based amplifiers giving power Mosfets a bad name.

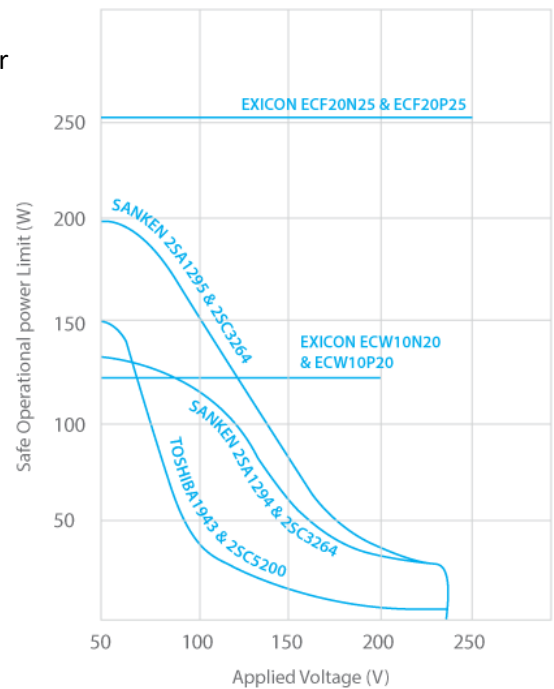
The Fets we use can easily handle these peaks, actually 3-5x more than the supply chain can deliver.

We did about all possible, 24 hours of clipping them, short circuit (unintentionally of course....), etc.

Their bad "SOA" behaviour also made it necessary to mount multiple pairs instead of just one pair as we use.

The graph at right shows a comparison with famous ones.

We only use the amount of Mosfet pairs matching the amount of power required, being way higher compared to older designs. They also will become less (hardly) hot, since their idle current is 5x lower compared to regular transistors. Not forget to mention that they are linear, straight from this idle current (30-50mA) on, so there is NO need to set them in class A mode. It will hardly make a difference in sound.



Integrated Power Supply

We also have a module like this, being exactly the same, but with a basic, integrated Power Supply.

Due to its restrictions in size it can make up to around 200Wrms. It's our [CS-40ps module](#).

With this module there is only a transformer required to complete the supply.

CABINET tips

Since [ELTIM audio BV also represents Italian MODU cabinets](#) our designs were adjusted in size to these cabinet dimensions. This way, we get remarkable High-End cabinet looks as well. Some idea's where this CS-40 fits:

- All MODU Pesante (Dissipante) models, leaving room for one or even two max. Ø150mm toroidal transformer(s). With Pesante you need heatsinks, mounted interior.
- MODU mini Pesante Dissipante, as Monoblock cabinet.
- All MODU Slimline models leaving room for one or even two max. Ø150mm toroidal transformer(s). For low/medium power (100-150Wrms) the profiled sides can be used as cooling surface, otherwise you need separate heatsinks. Preferably use CS-40 / PS-40 combination.

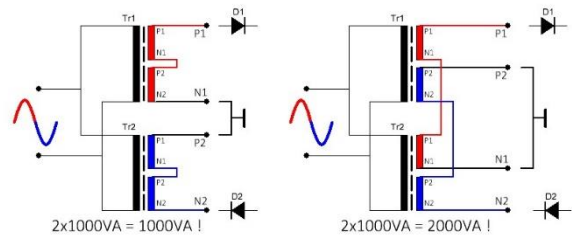
Transformer(s) tips:

With the high power these amplifiers can deliver, a single large transformer possibly doesn't fit in the cabinet.

Since it is a symmetrical supply design, you need two secondary windings.

With two trafo's you could make two combinations to make this work. The first is recommended by about everybody, where at every half sine only ONE transformer is loaded.

The way we do it, BOTH cores are loaded all the time, resulting in higher power and less hot transformers. In power on mode, switch the primary sides in series for a second or two and then parallel them. The huge inrush current caused by the large trafo cores and massive capacitor banks will significantly be reduced then, since each transformer gets only 115V for a moment.



LISTENING

We listened to our modules for a real long time and simply forgot that it's there. We used it as anyone else would do, listening to music, watch the news, series and movies. Unlike our [Accuphase P-450](#) there are NO irregularities, especially noticed with spoken voices. Bass fundament is simply fantastic and correct and makes you smile. The "air" around voices and instruments is amazingly beautiful..... Cymbals sing g g g g g g g g g g.....

Even non-audiophile visitors got tears in their eyes ! Actually, we don't use our P-450 (€ 10k) any more.

Our experiences are [confirmed by several true audiophile](#) listeners. They all are amazed about the natural sound and fantastic 3D presentation. The "air" around voices and instruments amazes all, incl. us -)

We also got some replies mentioning that the bass is deep and very well under control.

Some confirmed that it sounds better than the high-end stuff (even expensive, regarded brands) they use.....

One word came up more than once: **EMOTIONAL**. Just as we wanted it.

Right, marketing bla, bla. NO, we are audiophile technicians hating this as you do.

More specific info of every separate module you can find at [our website](#).

[Check our website for ordering or check our dealers list](#)

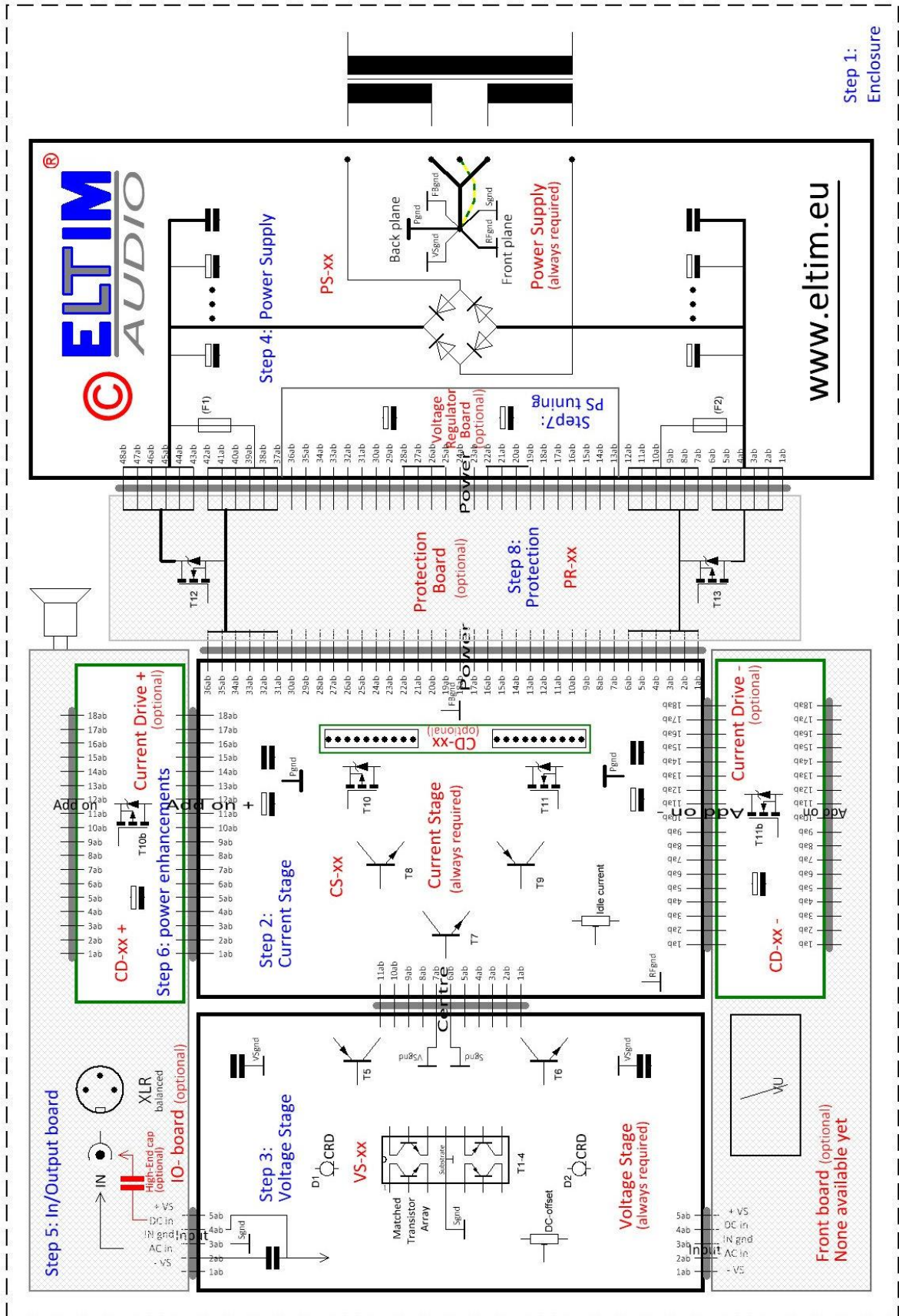
For bespoke built amps: www.eltimaudio.com

We are setting up a dealer network of our modules program. Want to join us? [MAIL](#).

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[PE1LTM](#)

www.eltim.eu



Step 1:
Enclosure

*Here our functional layout of our modules program.
Just define the way you want to build your amp and follow the steps.*