

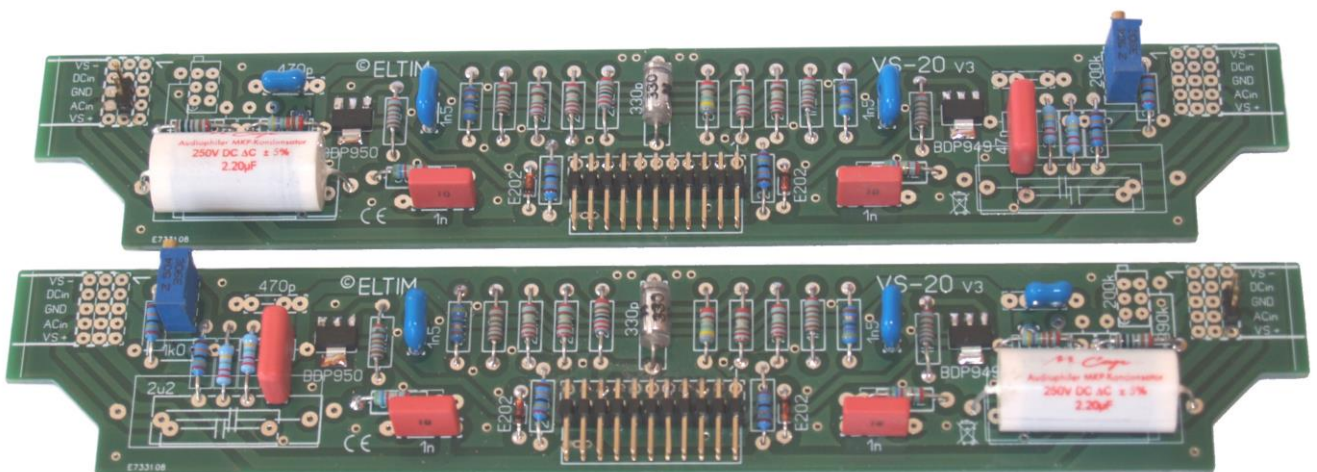
VS-20 v3 Voltage Stage module

ELTIM Power amplifiers are, unlike other modules, split in two parts in order to gain the highest quality possible. This VS-20 is an input, or Voltage Stage (VS) part. 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 module looks and acts a bit different.

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In this Voltage Stage board we are using a 100% symmetrical transistor array with a grounded substrate and special wide range Current Regulator Diodes. Doing so, our amplifier system is way more stable, and more important having way better sound compared to the original setup.

- Some of the highlights of this [VS-20](#) Voltage Stage module:
 - Separate (upgradeable) most basic fully symmetrical pre-driving (voltage) stage
 - [Symmetrical, 500uV matched trimmed SMD transistor array](#) (instead of T1-T4) input stage.
 - Transistor array substrate grounded to input ground, avoiding any noise and EMI.
 - Extremely stable, wide range Current regulator diodes (CRD's) instead of LED circuits.
 - DC input on left and right side. High end capacitor between this input and RCA-inlet possible.
 - AC (>2Hz, other on request) input on left or right side.
 - High quality, audiophile MUNDORF MCAP250-2,2uF MKP input capacitor.
 - Mica 1% capacitors in local feedback and input filter circuit.
 - Best quality 0,1% MOX resistors.
 - V+ and V- available on left- and right side.
 - RF-interference blocking capacitors in strategic positions.
 - Styroflex RF-capacitor in overall feedback circuit.
 - Separated power ground and input ground tracks avoiding hum and noise.
 - L- or Stack mounted to any CS-board. On CS-40(ps) stack mount possible.
 - Dimensions: 200x35x8mm.

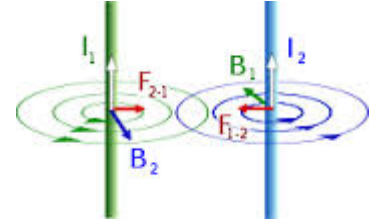


**VS-20 module (one left and one right channel) with angled connector for L-mounting.
By soldering a straight connector at the back side, it can be stack mounted
if you require lowest possible height.**

This new V1 board can, unlike V1 and V2 models, also be used on CS-40ps MB

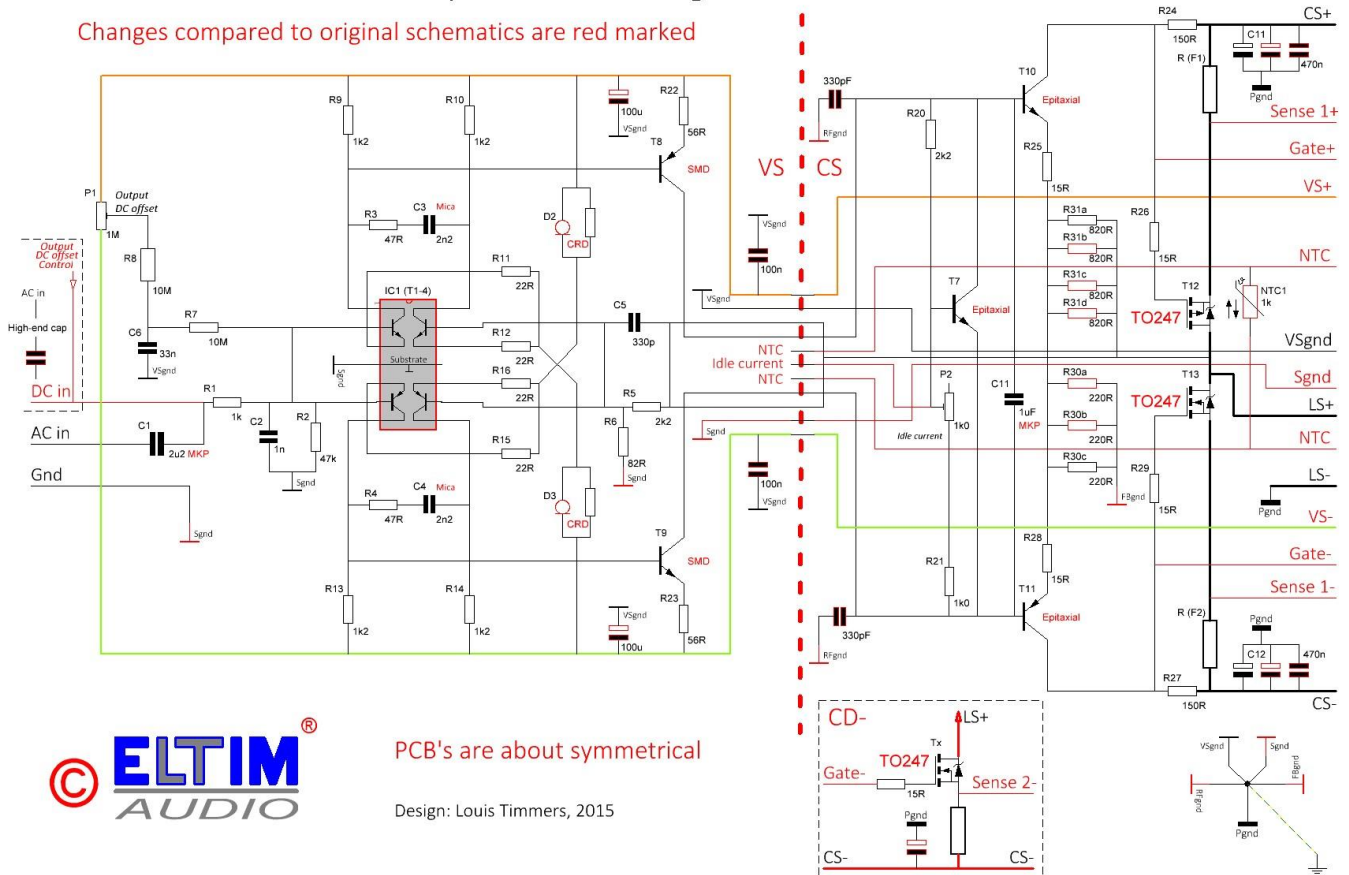
What a difference can make.

Compared to the original design we made quite some changes, mostly regarding routing, mechanical and thermal stability as well as functionality. Our approach of separating the schematics in two parts is new. The input parts of the electronic circuit accepts very small signals, while the output circuit handles large (peak) currents causing magnetic energy around the PCB tracks. Normally this affects the small input signal tracks. In order to minimise the influence of this effect into the input circuit we simply split the amplifier schematics in two parts. For optimal magnetic suppression the paths of the input stage and the ones from the output part are mostly “crossing” in a 90° angle, and/or are quite far apart from each other resulting in about NO magnetic influence. Furthermore we made all unused copper of the double sided PCB’s ground tracks and all power leading tracks are covered by the ground plane or voltage rail tracks. Special attention was spent on the input ground track. This one ONLY leads to the three connectors of the VS-board, input low pass components and the substrate ground of the transistor array. On this line there is NO voltage component present. In the following CS- and PS-modules this track is also completely separated and finally leads to the centre tap of the transformer connector, which should be connected to earth.



Basic Hexfet amplifier design differences

Changes compared to original schematics are red marked



Right from the red dotted line is the principle of our Current Stage boards, processing large currents. Depending on the model there are some slight differences in the number of parts and their values. At the right side you see a lot of extra lines for different grounding, current control, gate drive lines and NTC connections. All current loaded tracks are as wide and short as possible and “covered” by ground or Voltage rails in order to prevent magnetic spreading.

The circuit left of the dotted line refers to the schematics of our VS (Voltage Stage) modules. Both parts are connected by the centre connector of every CS-board. By separating this VS-part from the heat conducting parts, the amp will function much more stable. At this time only VS-20 module is available and can be mounted vertical or horizontal if low profile is needed.

Referring to the schematics above, the left part IS this VS-20 module exactly.

Note the separated ground tracks for power supply and input ground, which is ONLY connected to the input signal referring components. The input filter capacitor C2 as well as the local feedback capacitors C3/C4 are extremely high quality (and relatively expensive) 1% mica types (new dec. 2014). Doing so increases the slewrate of the total (Mosfet !) amplifier.

Since we separated the VS-module power lines from the CS-stage power lines, we are able to provide a regulated power to the VS-20 module at +/-35V max., being the limit of the transistor array used. If the power grid exceeds +/-35V, this regulating is even necessary in order to prevent damaging the transistor array. Our Power Supply modules (able to exceed +/-35V) are equipped with a suitable regulating voltage in such cases. Of course you could make a small, separate power supply of +/-35V as well to feed this VS-20.

Frequency range:	2 – 70.000Hz (limited, max range DC-300.000Hz, still limited.....)
Distortion figure (THD):	< 0,001%
Slew rate:	> 60V/uS
Input voltage:	1 Volt
Input impedance:	47kOhm

CONNECTOR FUNCTIONS

The centre connector is where one of our Current Stage modules are connected, normally in vertical (L-mount) position. For low profile solutions f.e. mounting in MODU Galaxy 40mm or Slimline 1U cabinets, this VS module can be mounted horizontal (Stack mounted) as well. You only need to use another type of connector And mount it at the bottom side.

Besides the needed connections for basic amplifier function, there are also connections for the NTC and the centre contact leads to the idle current potmeter of any CS-module. In this VS-20 it has no function, nor is the NTC functioning here.

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

At the left or right connectors the input signal is connected. Both have the same connections.

Connector signals: + and - voltage, AC and DC input and signal ground.

At these side connectors you also can stack an input/output board where the RCA connectors are connected.

You could also use a better quality input capacitor on that board, connected to the DC-input of this VS-20 module and so bypassing the on-board, small capacitor. A Mundorf MCAP250-2,2uF will already fit though.

We also provide a board with [InGeniusTM](#) balanced XLR inputs with ultralow CMRR of 90dB. This transformer acting principle also allows the use of very long interlink cables, f.e. required for live performances.

At the same DC-input a DC-voltage can be fed by some electronics, monitoring the DC-level of the output of the amplifier. This servo system so controls and regulates the DC-level to 0 at all times.

Actually we tried this in our prototype, powering a car wiper motor used as a servo without any problems.....-)

OPTIONS

Since the transistor array used can handle up to 35V only, there is a regulated supply board available. This stack on module fits on about all Power Supply modules in our program. Without this module the total Power Supply voltage limits are +/- 35Vdc (transformer 2x 25V). Using this add-on module the total amplifier can work at higher voltages and stability and sound quality will increase.

ACTIVE POWER

With our setups an active way of powering speakers becomes interesting. In order to make this possible, quite small enclosures are needed though. In these cases this VS-20 can be mounted horizontal (parallel) to a [CS-40\(ps\)](#) board, just by using another connector type.



Doing so, the power capacitors on the CS-module define the height of the total electronics.

With the possibility of fitting a VS-20/CS-40ps combination in a tiny 124mm wide and only 42 (82)mm high MODU Galaxy (Maggiorato) cabinet, we see the possibility of using this module active, so mounted in the back of a loudspeaker system.

You could even make it more active by using multiple modules and active (DSP?) filtering.

Since the transformer is then located outside these small cabinets, you could power them all by just a single transformer.

You also could mount our modules directly in the cabinet, since it is hardly responding to any EMI interference, even without a metal cabinet surrounding it. Actually you can put a calling GSM on top of it without hearing the dut, dudut, dudut..... As ANY amp design should.....but mostly doesn't.

AVAILABILITY

This module is available in different way of finish:

- Bare, professional, through hole, double sided, tinned PCB with solder masks and prints on both sides, incl. schematics and components location plan and tips. All necessary parts (incl. audiophile MUNDORF MCap250-2,2uF input capacitor), schematics and components location plan.
- Ready built and tested module with MUNDORF MCap250-2,2uF input capacitor.

[Check our website for ordering](#)

In our website you can choose a L-mounted or Stack mounted version.

We are also able to build your bespoke amplifier completely, based on our modules and MODU cabinets.

It will be soldered, assembled and checked by Louis personally, by hand from start to end.

If you are interested in an exclusive amplifier like this, please [send a mail](#) with your demands and requirements. You can f.e. pick any connectors from our program. We will answer with an offer.

In order to give you an idea we have listed some models under "Hifi equipment".

We now installed an independent website for our bespoke, hand built amplifiers: www.eltimaudio.com

If you have questions or comments on this project, [let us know!](#)

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

Nice, but how does this concept sound?

Well, since it is difficult to judge your own stuff, [we let others speak](#).

What next?

Our next project is to build a preamplifier, to be used as separate or mounted behind our Power Amplifier modules in order to get an integrated amplifier built as a Power Amplifier with extra inputs, without restrictions made actually.

The input boards are selected by special small signal (silver contacts) relays immediately after the input connector.

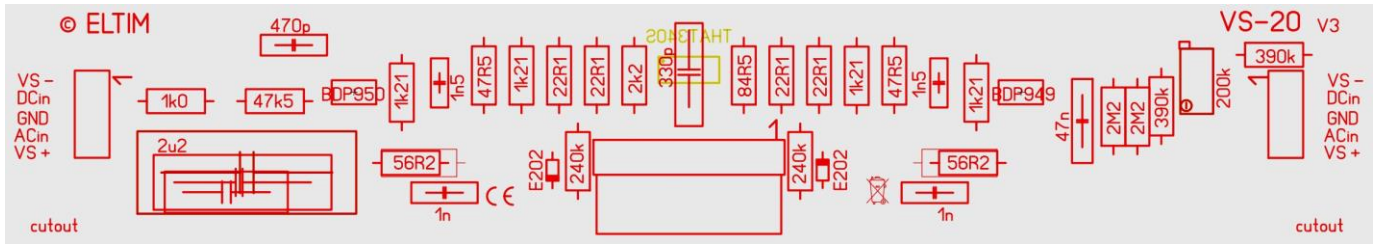
All unused inputs are grounded by the same relays with a similar impedance as the input impedance of the pre amplifier circuit in order to avoid heavy "clicks" while switching to another input. More soon.....

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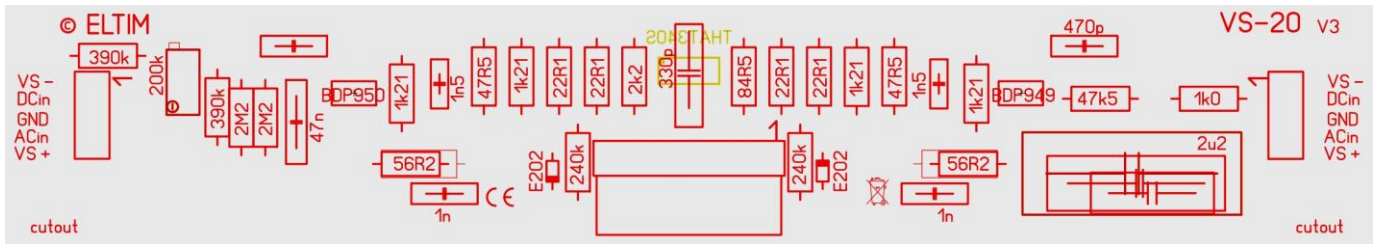
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Possible components layout on ELTIM VS-20 module:

L-mounted versions:



L-mounted with input connector at the right side of a complete amp (= left channel).

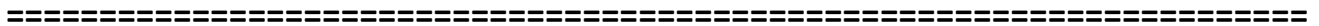


L-mounted with input connector at the left side of a complete amp (= right channel).

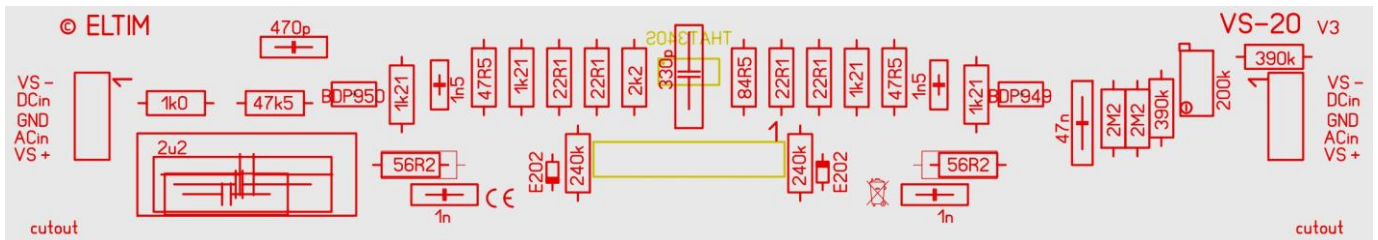
Note 1: mounted on a CS module the VS-module will be rotated, so inputs will be on the other side as in pictures above.

Note 2: mount the 2x11 angled male header at the front side of the PCB.

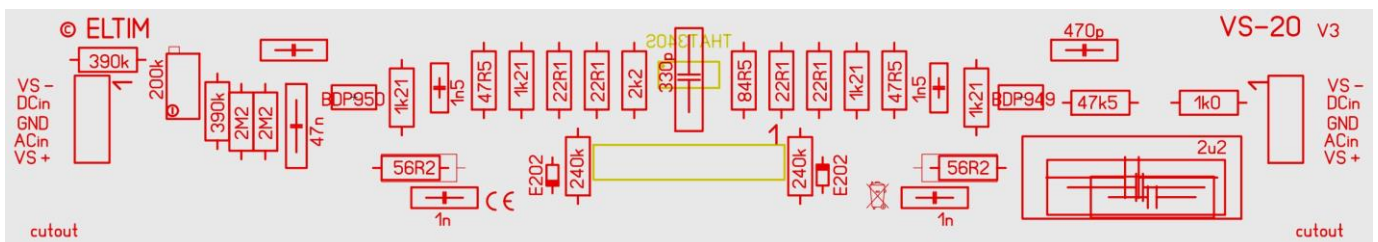
Note 3: If reversed polarity is required, rotate 340S, exchange BDP's and reverse E202's, that's all.



Stack mounted versions for use on CS40ps LP (lowest possible height):



Stack-mounted with input connector at the right side of a complete amp (= left channel).



Stack-mounted with input connector at the left side of a complete amp (= right channel).

Note 4: mounted on a CS module the VS-module will be rotated, so inputs will be on the other side as in pictures above.

Note 5: mount the 2x11 straight male header at the back side of the PCB.

Note 6: If reversed polarity is required, rotate 340S, exchange BDP's and reverse E202's, that's all.

Since CS-40ps has its own Power Supply, we believe this makes no sense, but possible.

