

VS-50bal Voltage Stage module

Our amplifier module range is based on a quite basic, yet fully symmetrical and very reliable concept. 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 as you probably are used to. Check our [comments page](#) with responses.

To make a true difference, the power amplifier schematics is split in a voltage- (input) and a current (output) stage board to meet the long list of demands. Unlike many other designs the input circuit is based on a DIP14 4-transistor array (2x NPN, 2x PNP). So, this IC is not an Opamp!

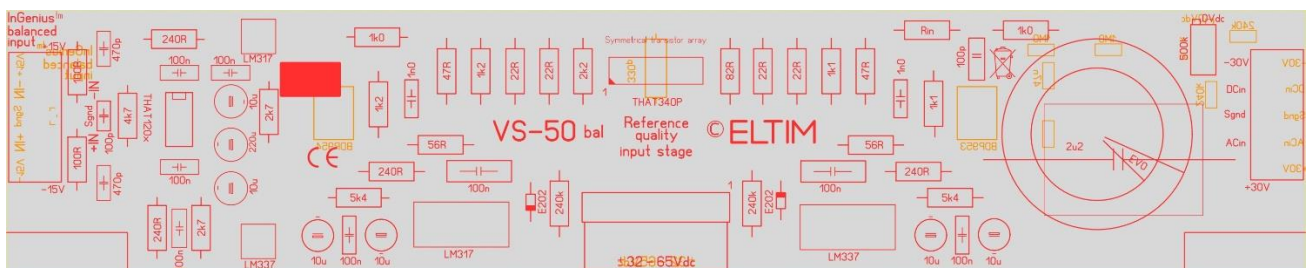
Instead of often used LED-circuits to feed a constant current into the completely symmetrical mirror circuit, we use special and hard to find wide range Current Regulator Diodes.

The circuit itself works best in the range 25-35Vdc and we regulate the supply voltages on board to 30V. All tracks on this module are in a shortest possible way without any ?-like loops.

Due to this all our amplifier systems are very stable with detailed sound over a wide supply range.

You need at least a VS- as well as a CS-module to form a working ELTIM Power Amplifier.

- Some of the highlights of this [VS-50bal](#) Voltage (input) Stage module:
 - Reference quality input stage module with line and [InGenius™ balanced input](#).
 - Separate, fully symmetrical input (voltage) stage, feeding any [CS-output module](#).
 - About 98% symmetrical PCB layout, even the used transistor array IC is (*so, is not an opamp!*).
 - [Symmetrical, extremely fast, 500uV matched/trimmed SMD transistor array](#) in the input circuit.
 - Transistor array substrate grounded to input ground, avoiding any noise and EMI.
 - Transistor array is extra shielded by the PCB at the back and front side, also cooling it.
 - Very stable, selected, wide range Current regulator diodes in the mirror circuits (CRD's).
 - DC input on right side. *Large High-End capacitor between this input and RCA-inlet possible.*
 - AC (>4Hz, other on request) input on right side (*where cap. is, see picture below*).
 - Input capacitor type/quality by choice in the order process. *You can even use other than we list.*
 - Balanced input on left side, using best possible, 100% symmetrical ([THAT1200](#)) circuitry.
 - Mica 1% capacitors in frequency limiting (800kHz) and input filter circuit.
 - Styroflex RF-capacitor in overall feedback circuit. *Fast impulse behaviour.*
 - VISHAY/DALE RN60 2% MOX resistors.
 - Milled, gold plated copper/beryllium copper header (3A) contacts >
 - Double sided, EU made FR4+ PCB with copper thickness of 35um.
 - Integrated power supply regulators for wide range ops. ($V+/V- = 32 - 65V$).
 - Regulated +/- 30V (low current) available at right side.
 - Regulated +/- 15V (low current) available at left side.
 - Bottom ground plane and most of top ground plane is signal ground.
 - Supply ground is separated from input ground.
 - L-mounted to any ELTIM CS-Current Stage module.
 - Dimensions: 246x50x8mm, exactly fitting MODU Mini Dissipante 330mm wide.



VS-50bal module with on left side balanced and at right side line inputs.

Connector functions

The centre connector is where one of our Current Stage modules is connected in L-mount position. The second outer contacts are signal- resp. power ground, separated from each other. You'll find both connections at the centre of any ELTIM PS-Power Supply module where both are lead to in shortest way with wide tracks to the centre ground where the transformer centre tap is connected. This assures a hum- and noise free operation.

At the left connector you can feed a balanced input signal. It is transferred to a line signal by a THAT120x IC, Probably the best balanced to line converter available. It is available with 0dB, -3dB and -6dB gain, resulting in an input voltage of 1V, 2V or 4V. Connector: reg. +15V, IN-, Signal ground, IN+, reg. -15V.

At right side a line input signal can be connected to a regular INac input where a serious capacitor blocs a possible dc signal. If this is done in the connected preamp already you can use the INdc input where the input capacitor is bypassed. Connector: reg. -30V, INdc, Signal ground, INac, reg. +30V. Signal ground is separated from the power ground. Even a very large capacitor like Mundorf SESGO-2,2uF will fit (Ø36mm) and even MUNDORF Supreme or other long capacitors as well up to a size Ø20x50mm.

At the DC-input a DC-voltage can be fed by some electronics, monitoring the DC-level of the output of the amplifier. This servo system (in development) always controls and regulates the output DC-level to 0Vdc.

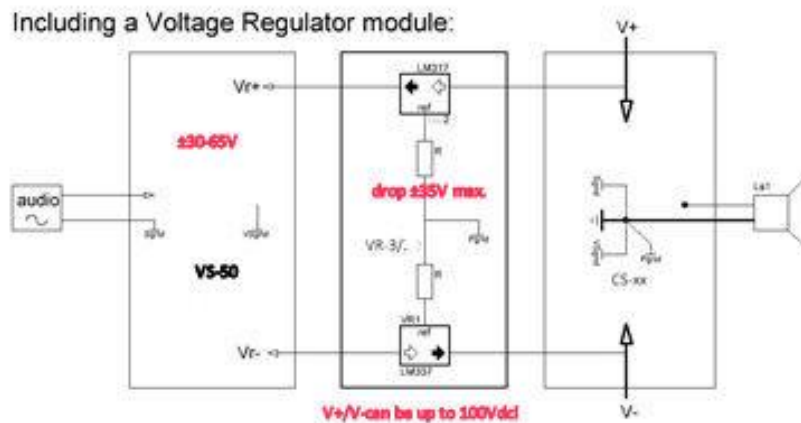
Supply voltage

Unlike f.e. VS-20 models, this VS-50 can handle $\pm 32 - 65\text{Vdc}$ due to the built-in voltage regulator IC's LM317/337. So, your VS-50/CS-xx combination can be fed by up to $\pm 65\text{Vdc}$ without an extra VR-module.

For higher supply voltages, you still need to use one of our Voltage Regulator modules as extra, pre-regulating the VS-50 supply voltages down to say $\pm 50-65\text{Vdc}$ and is just used for the VS-module and possible preceding electronics. Each LM-regulator is a "floating" device and can handle up to 37V in/out voltage difference.

While using an extra [VR-voltage regulator module](#) this VS-50 input module works on double regulated, very stable supply voltages. We suggest using VR-3/65, providing $\pm 65\text{V}$ regulated by linear LM317/337 SMD types. This high-quality regulating will further increase stability and effects in a higher sound quality.

While adding a VR-xx module the max. supply voltage of the total pack can be increased to $\pm 100\text{Vdc}$.



You can mount it on every power supply module we provide.
Remove the diodes on the CS-module then!

Technical specifications:

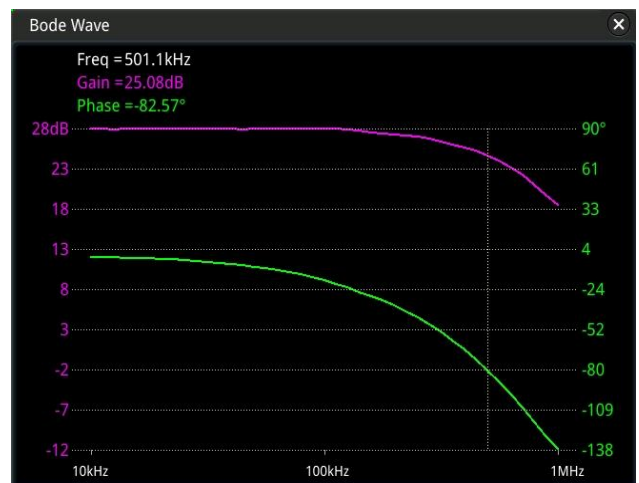
Frequency range:	DC - 250kHz within $\pm 0,2\text{dB}$
-3dB point:	> 800kHz (limited by us, 1MHz -10dB)
Audio band phase shift:	< $-0,2^\circ$ (20-20000Hz), -3° @ 25kHz
Distortion figure (THD):	< 0,005% (1W/1kHz/8ohm) < 0,01% (80W/1kHz/8ohm)
Slew rate:	> 65V/us (@ +/- 30V). <i>Limited by input filter (600kHz).</i>
Harmonics:	< -65dB, Nonspecific, see graph right below. <i>Well below noticeable.</i>
Recc. input voltage:	1 Volt (0dB, THAT1200), 2V (-3dB, THAT1203) or 4V (-6dB, THAT1206)
Input impedance:	22kOhm
Supply voltage:	$\pm 32 - 67\text{Vdc}$ (While using higher V+/V-, use one of our Voltage Regulator modules!)
Dimensions:	246x50mm.

Some measurement data

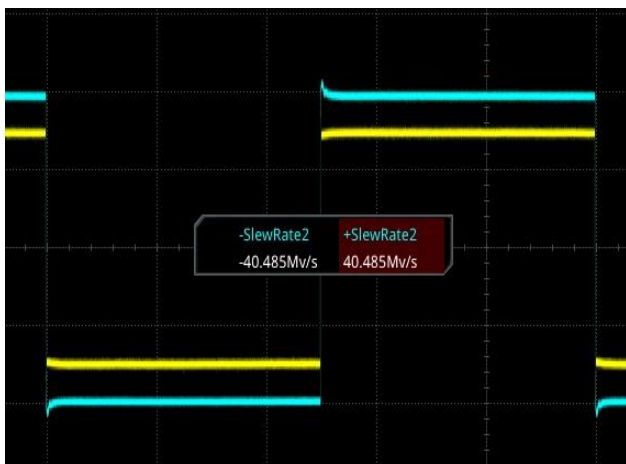
We ourselves prefer listening over measuring, since our ears and senses are way better instruments than any other equipment. Besides that, the idea is that you will listen to your amplifier and not staring blind on measuring equipment... However, since a lot of DIYers want to see figures (acknowledging our senses) instead, we show some measurements below. We also [made a video](#) while measuring a VS-20 / CS-150 setup. Since all our CS-current stages run way over 1MHz, the VS-input modules (except for the output power and "punch") define the sound character and data. Below the measurement of little brother VS-20. The graphs below are valid, regardless of CS-module used:



Wide audio bandwidth graph 10-100.000Hz with the marker set at 20kHz. Freq. graph straight as a ruler $\pm 0,1\text{dB}$. At this 20kHz the input to output phase error is at a minor -3° , meaning that the 3D staging (= phase!) is phenomenal.



Extended bandwidth graph 10kHz – 1MHz with the marker at the -3dB point. Nice and clean roll offs. This -3dB point as mostly given is just over 500kHz here. Also often listed -10dB point is over 800kHz actually.

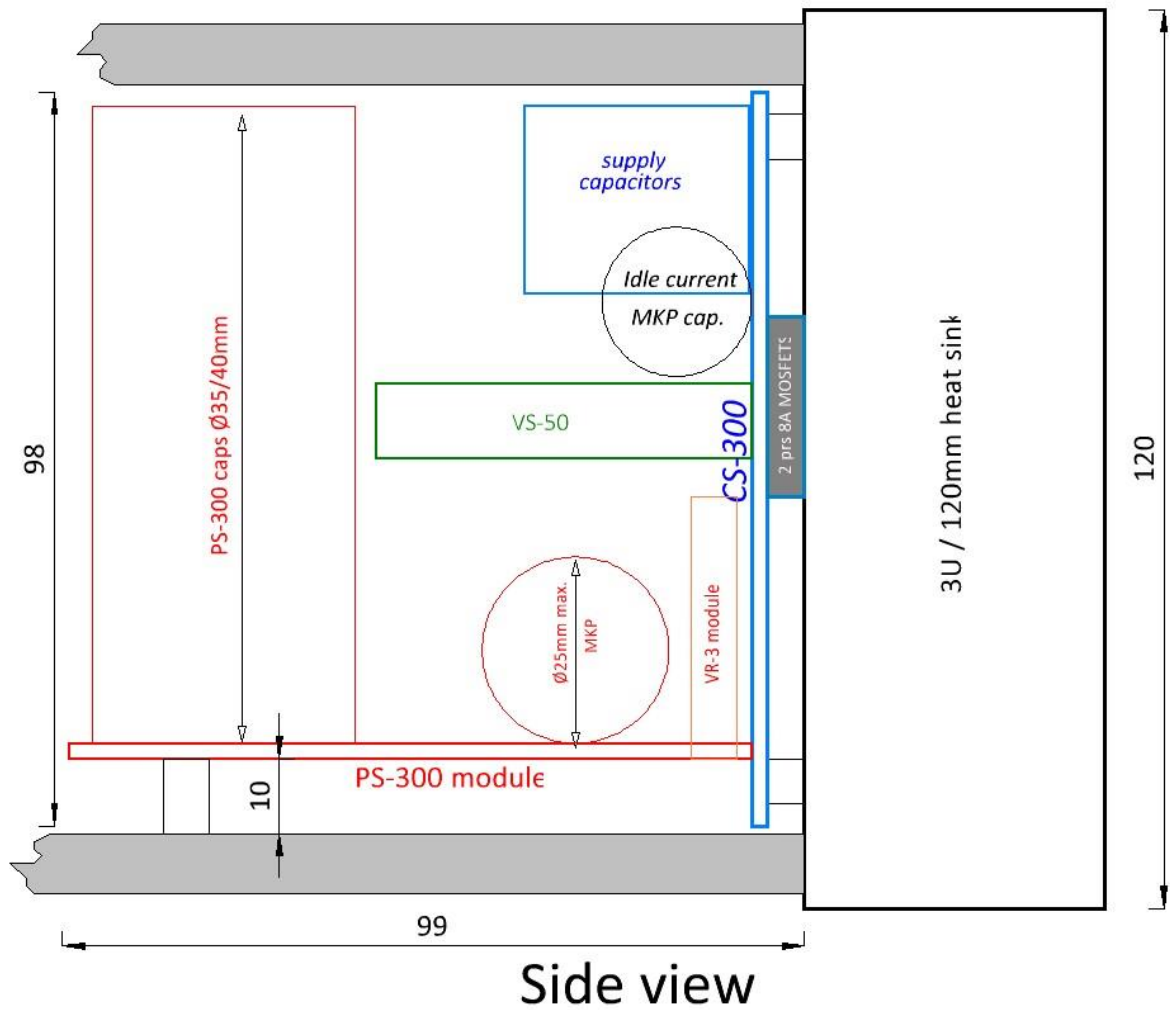


1kHz square wave signal without any significant irregularities. Ye-in, BI=out. It also shows a slew rate of >40V/us in this setup. VS-50 can do >65V/us with higher input signal.



Frequency domain (50kHz wide). Harmonics < -65dB (13+53). The irritating 3rd harmonics (3kHz) is at a low level of -66,7dB. Even more irritating 5th is below the scale.

Modular connection example of VS-50 with a CS-300REF output and PS-300 Power supply module:



This VS-50 module, L mounted to a
CS-150, CS-250 or a CS-400 current Stage module, in turn connected to
a PS-3 Power Supply module.

If Ø40mm (4-pin, f.e. KEMET ALC10) capacitors are mounted on a connected PS-3, these huge capacitors just pass the VS-50 by 1mm. They are stable enough by themselves.
KEMET ALC10 we mostly mount where high quality and at the same time an extra-long life (18.000 hours) is required, f.e. in professional equipment.
Besides the four long types, you can add an extra two with max. length of 35mm instead of the MKP types.

Picture soon

Connecting a VS-50bal input stage module

This VS-50bal is provided with voltage regulators, allowing to use them over a wide supply range of ± 32 -65Vdc.

± 30 Vdc regulated is available at right side for extra electronics like a balanced input module, etc.

NOTE: This module cannot be used in "reverse polarity mode" (see notes on infosheet) !

DC-input can be used if the received signal is free from DC, f.e. because the preceeding equipment has an output capacitor already.

Input ground is connected to the neg. lead of the input signal with top side ground plane. Via our CS-boards it leads to the centre tap of the transformer completely isolated from all other grounds as it always should be.

* Input connector ground connection is recommended by a wide copper strip, directly to the Power grid Earth connection.

VS-50bal power ground (bottom ground plane) leads in similar way to the centre transformer tap.

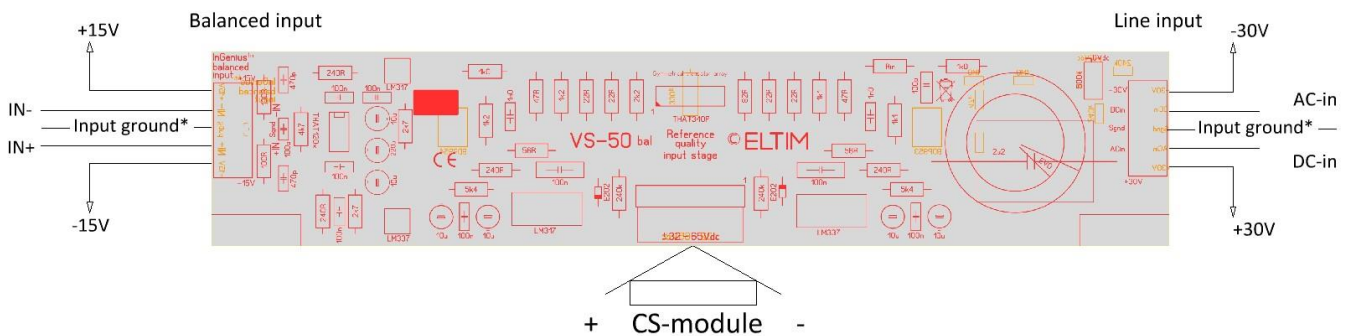
Both VSgnd and INgnd can be found at the centre of the supply connector of our CS- and PS-modules.
If you use a "foreign" power supply, make sure you also connect them to ground!

AC-input leads to the on board 2,2uF capacitor, mostly used. It's connected to a serious 2,2uF input capacitor.

On the other side of the board a balanced signal can be fed. A THAT1200 transfers it transformerlike (better) in a line signal.



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