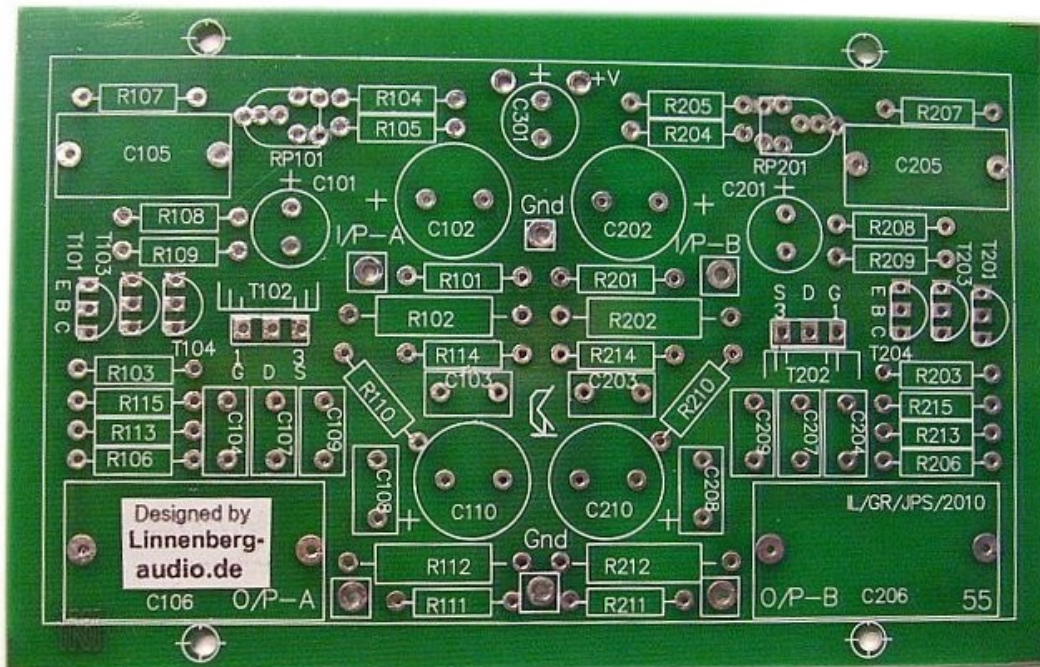


"MOSeiden"

Single Stage MOSFET Phono

Designed by Ivo Linnenberg
of
Linnenberg Audio

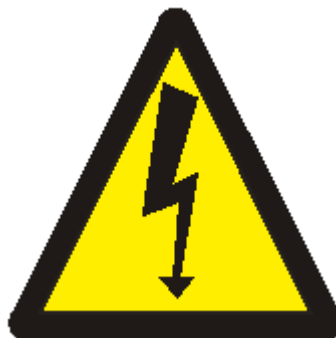


Classic Valve Design



Classic Valve Design assumes no responsibility for circuit or user damage from the use or misuse of these boards or any other product. We simply provide these on an AS-IS basis with workmanship quality as the only thing guaranteed at this time.

This product is designed for and use around **LETHAL VOLTAGES**. We assume the user has a reasonably competent grasp of line operated electronics at the time of sale.



* MOSeiden is © Classic Valve Design*

* Circuit design is © Ivo Linnenberg. Classic Valve Design has manufacturing and distribution rights *

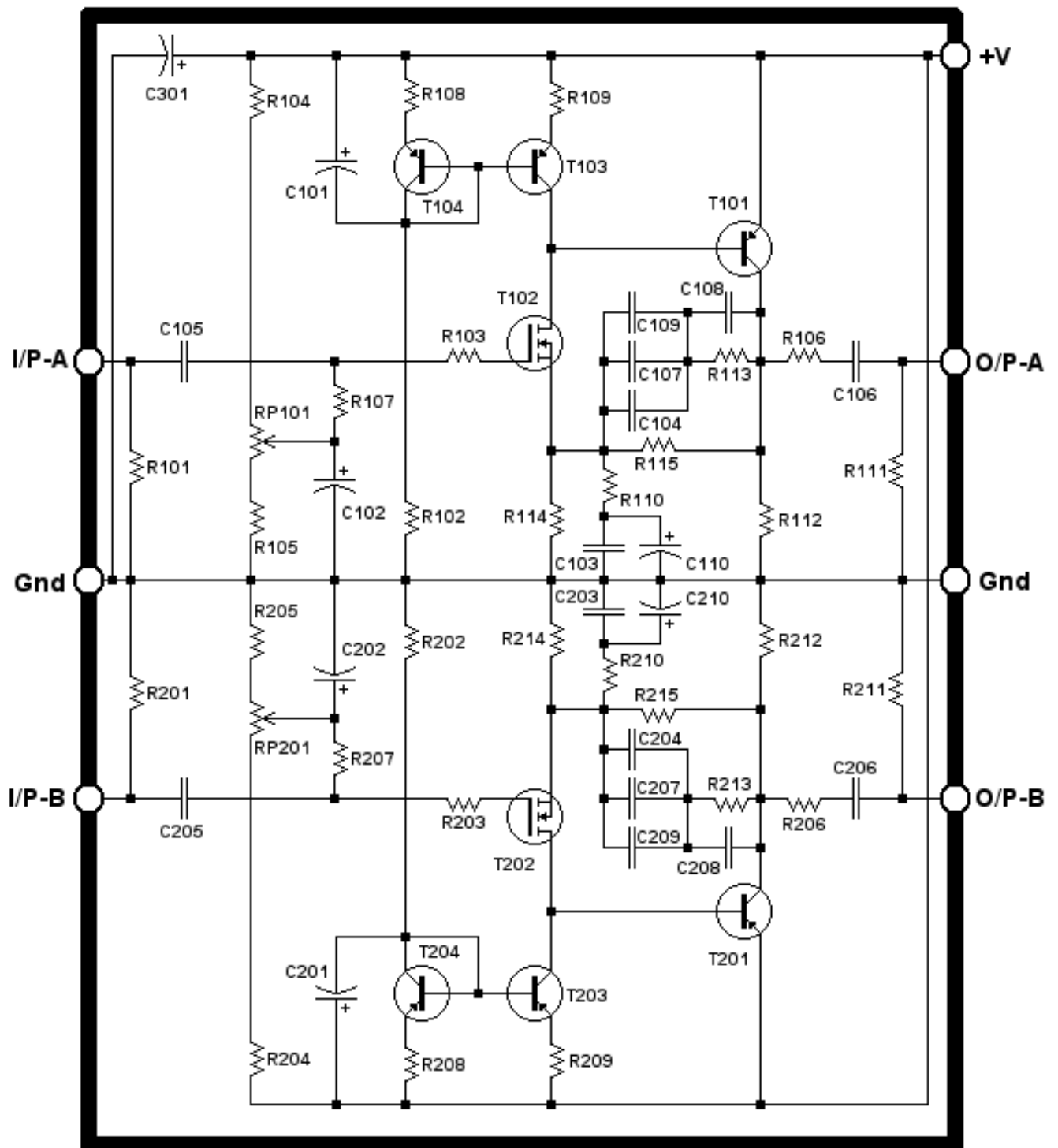
INTRO

This compound single stage MOSFET phono preamp began its life back in 2005 and was designed by Ivo Linnenberg of Linnenberg-Audio.de. It has proven itself a simple, reliable performer.

Noise issues normally associated with low level audio circuits when combined with power MOSFET's are greatly reduced by using a low impedance active RIAA equalization circuit. This combined with the high quality and consistent performance of the ZETEX support transistors in this circuit make it a pleasurable listening experience.

This board is also designed to fit into the phono "PC-6" slot of the Dynaco® PAS preamplifier as a possible solid state upgrade/modification (regulated +24V power supply required). It is the phono companion to our **MooseFET** "PC-5" replacement board.

If you are using this board with our MooseFET, that board already contains the power supply capable of supplying this board as well. See the latter part of the MooseFET documentation for converting your PAS fully to solid state.



Parts List

Resistors:

R101, R201: 91K
R102, R202: 2.2K, 1W
R103, R203: 220 ohms (carbon composition preferred)
R104, R204, R113*, R213*: 820 ohms
R105, R205: 1.8K (400mW minimum)
R106, R206: 100 ohms
R107, R207, R111, R211: 100K
R108, R109, R208, R209: 33 ohms
R110*, R210*: 16 ohms
R112, R212: 560 ohms, 1W
R114, R214: 1.2K
R115*, R215*: 12K
RP101, RP201: 250 ohms trimmer
(* = RIAA critical component)

Capacitors:

C101, C201: 470uF, 25V electrolytic
C102, C202: 3300uF, 25V electrolytic
C103, C203, C104*, C204*, C107*, C207*, C108*, C208*, C109*, C209*: 100n polypropylene film
C105, C205: 1uF polypropylene film
C106, C206: 4.7uF polypropylene film
C110, C210: 4700uF, 16V electrolytic
C301: 100uF, 50V electrolytic
(* = RIAA critical component)

Semiconductors:

T101, T201: ZTX753
T102, T202: IRF610
T103, T104, T203, T204: ZTX550

Circuit Notes

Once assembled, the phono stage only requires a regulated +24V supply at about 100mA. We used a 300mA "wall-wart" adaptor with a LM317T to get sufficient results.

As with most simple designs, the sound quality is directly proportional to the parts quality in this design. In our experiments, we used typical retail store quality components, super quality military specification components and a mixture of the two.

Lowest noise was obtained with 1% metal film resistors. We used the Panasonic ERO, ¼ watt metal film types for all except:

- Panasonic ERG series 1 watt, 5% metal oxide for R102, R202, R112 and R212.
- Vishay/BC Components SFR25 series, 400mW, 1% for R105 and R205.
- Ohmite "Little Demon" series, ¼ watt, 5% carbon composition for R103 and R203.

(a carbon composition is recommended here as MOSFET's tend to oscillate radio frequencies in the VHF radio spectrum with any inductive components in their gate.)

"Warmest sound" (in our opinion) was obtained with some sacrifice in noise level and RIAA accuracy by using ordinary 5% carbon film resistors typically found in an experimenter component stash.

Capacitor quality as well will alter the sonics and RIAA accuracy when used in the equalization line.

We used quality polyester (Panasonic ECQ-E(F)) for the input/output capacitors as well as quality polypropylene (Panasonic ECW-F(B)). While the polypropylene was definitely clearer in our opinion, the difference was not near as phenomenal as the quality of capacitors used in the equalization circuit (C103, C203, C104, C204, C107, C207, C108, C208 and C109, C209).

When Polyester of any type was used in this circuit, even tight tolerance ones, the preamplifier was fatiguing to downright unlistenable. When we upgraded these to EPCOS polypropylene MKP series caps, the sonics improved to on par with triple-digit cost commercial RIAA pre-amplifiers.

All electrolytics used were Panasonic FC series (lowest impedance).

The transistors are also sensitive to type and quality. We tested this circuit with the IRF610 and IRF710 MOSFET for T102 and T202 and found the 610 to have superior dynamics (likely due to the gate construction and lower capacitance). While we tend to favour the IRF510 for our own listening pleasure, it was not tested in this circuit due to the fact it seems to be getting very rare to find in single lot quantity at a reasonable price.

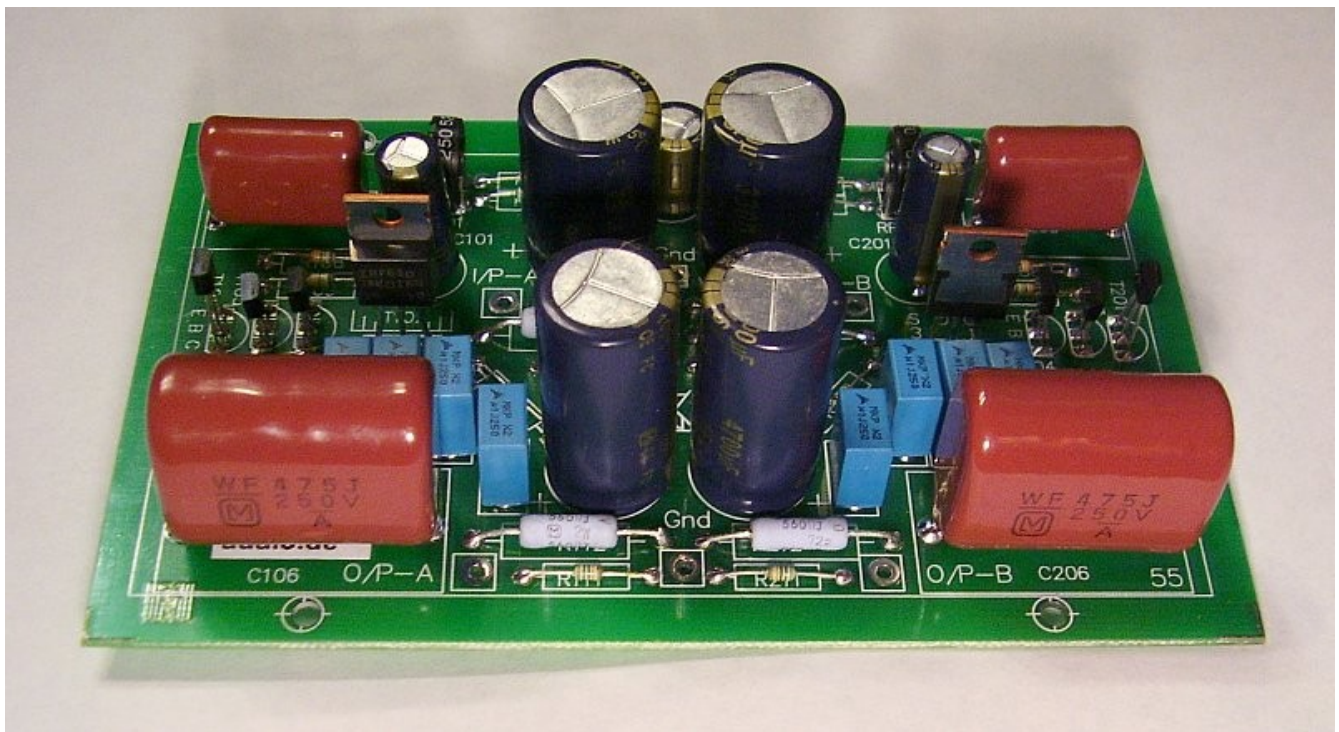
Mr. Linnenberg highly recommended keeping T101 and T201 the ZETEX ZTX753 for consistency, quality and overall parameters. We tried a 2N2907 in its place and found a definite difference between lots, mostly with overall gain of the circuit (confirmed by testing the transistor h_{fe} parameters). If that's all you have though, do at least make sure they are matched for h_{fe} before inserting them in your project, lest you find an annoying right/left channel variance.

We used the recommended ZTX550 for T103, T203, T104 and T204 as well as the 2N3906. No sensitivity was discovered in this area.

One note with the ZETEX transistors is orientation. The wide face of the transistor (the opposite side to the printing in our lots), the pin-out is "E, B, C". This is opposite of most 2N-types where the printed side is the face to be read "E, B, C".

None of the transistors require a heatsink. They will get warm in normal operation and after about 15 minutes, this seems to stabilize the circuit overall for DC performance.

Our Completed Evaluation Circuit



Adjustment

First, confirm everything has been installed correctly (especially semiconductor and electrolytic orientation). Turn trimmers RP101 and RP201 to their centre control position. Apply +24V to your board with no input signal (it helps to ground the inputs for this procedure to eliminate stray hum).

Measure the voltage across R112. Voltage should read between 7V and 15V at this point. Adjust RP101 for 12V across R112. Since there is a large capacitor in the bias circuit, it will take several seconds for the voltage to settle. Repeat the procedure for RP201 while measuring the voltage across R212.

Allow the circuit to warm up for an additional 15 to 20 minutes and repeat the adjustment. You are good to go!

If your output voltage hovers near B+ or will not adjust, there's a few common errors to check for:

- T101 or T201 oriented correctly?
- R104, R105, R204, R205, have they been reversed?
- Poor solder joint.

Less common is the voltage across R112 or R212 to hover near ground. That usually indicates a bad MOSFET or poor solder connection (or incorrect value) for R114 or R214, or perhaps an utter short circuit (solder bridge) somewhere.

When everything is working correctly, sit back, relax and enjoy your vinyl collection with your new phono preamp!