

DDDAC1794MK3 Dual Power Supply - PSU Board

Index & links:

A.	Introduction	Page 1
B.	Features and Specification	Page 1
C.	Board Layout and Dimensions	Page 2
D.	Completing the PCB with the delivered through hole parts	Page 3
E.	Connecting the PSU PCB to the outside world	Page 8
F.	Connecting to the DDDAC1794MK3 DAC Board and testing	Page 11
G.	Possible options and tweaks to improve sound quality	Page 12
H.	Disclaimer Brand and Copyrights DDDAC	Page 12

A. Introduction

This manual gives background, specifications, recommendations and act as a construction guide for assembling the PCB board and installing the Power Supply (PSU).

Why a new revision? The previous DAC model, the DDDAC1794PBT, was 10 years old. During lifetime, I received a lot of feedback from the DIY community with tweaks, ideas for use or implementation of other parts etc. Also, during that time, I gained a better understanding of PCB design, digital signal routing and analog power supply impedance and noise generation. Time to start thinking on a new version... As for the Power Supply, it became clear, that it needed to be more modular to be able to use different styles and sizes of mains transformers.

Also, after many experiments and feedback from users of MOSFET rectifiers, it was clear: electronic rectifying was the way to go. I decided to embed the LT4320 and MOSFETs instead of diodes. Last but not least, for ease of building, I have been using some more SMD parts, so easier to build for DIY.

B. Features and Specification

The new MK3 Dual Power Supply (PSU) design is featuring:

- Based on the previous DDDAC1794 PSU design.
- Audiophile electronic MOSFET rectifying with the famous LT4320.
- Selected capacitors for specific functions, based on research and long year experience and feedback from the user community of the previous DDDAC1794 series.
- Two separate PSU-Units on a single board, which can be physically separated for single board use thanks to easy to use break off points.
- Two output terminals with variable voltage setting (roughly between 3 and of 15V regulated power).
- Two terminals for connecting an optional choke to change filtering from RCRC to RCLC.
- More on board SMD parts for higher performance and easier DIY construction.

Electrical Specifications and recommended values:

- AC Input 7Vac – 15Vac (for DDDAC1794MK3 recommended use: 2x12Vac)
- DC Output Adjustable 3Vdc – 15Vdc
- Maximum Current 1A – take care with power dissipation! Bigger heatsinks needed
- Choke Option Recommend 1H with max 40hm for DDDAC1794MK3 use

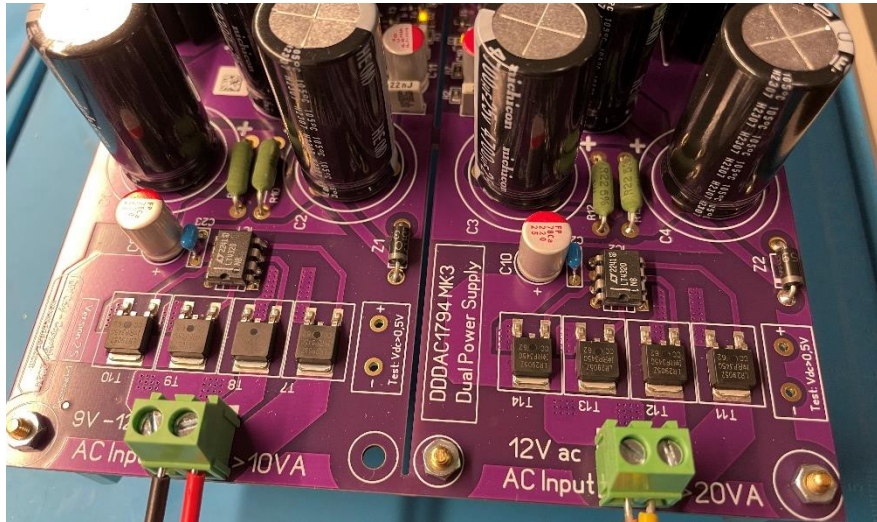
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By Doede Douma,

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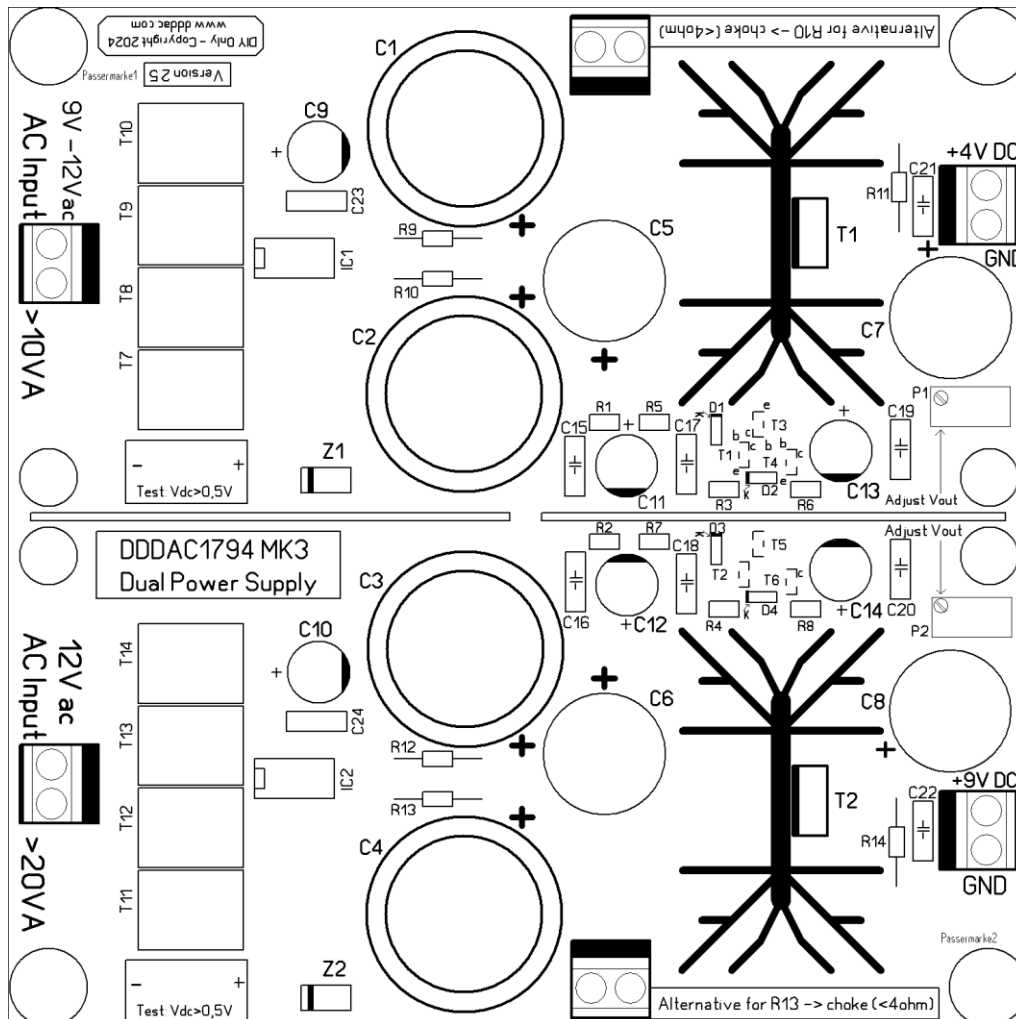
A view of the electronic rectifying with MOSFETs – a special feature of this Power Supply:



C. Board Layout and Dimensions

Size 130 x 130 mm

Mounting holes 120mm x 120mm - Dia. 3,5mm



D. Completing the PCB with the delivered through hole parts

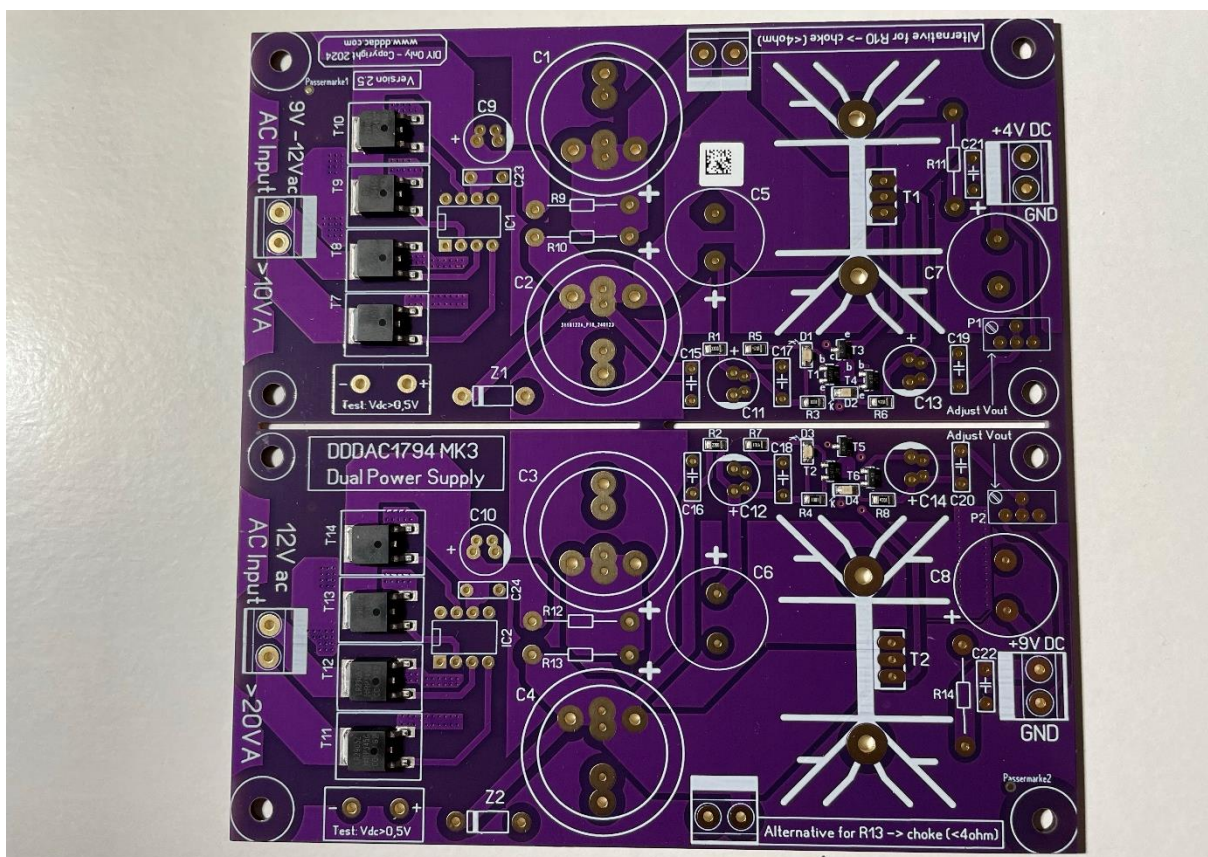
Unboxing

In the Kit you will find:

- PCB with all SMD Parts already assembled
- Two heatsinks
- Plastic back with all the through hole parts and other assembly material
- For the actual kit the corresponding part list – (the part list may differ in futures versions, depending on availability of certain parts)

Chronological order of assembling the PSU board

This is the board with SMD Parts, we start from here.



1. In case of split boards: mount the 8x 10mm standoffs with the external thread trough the PCB – keep 8x M3 screws aside for later assembly in a chassis
2. In case the board is used as a whole: 6 standoffs are sufficient.

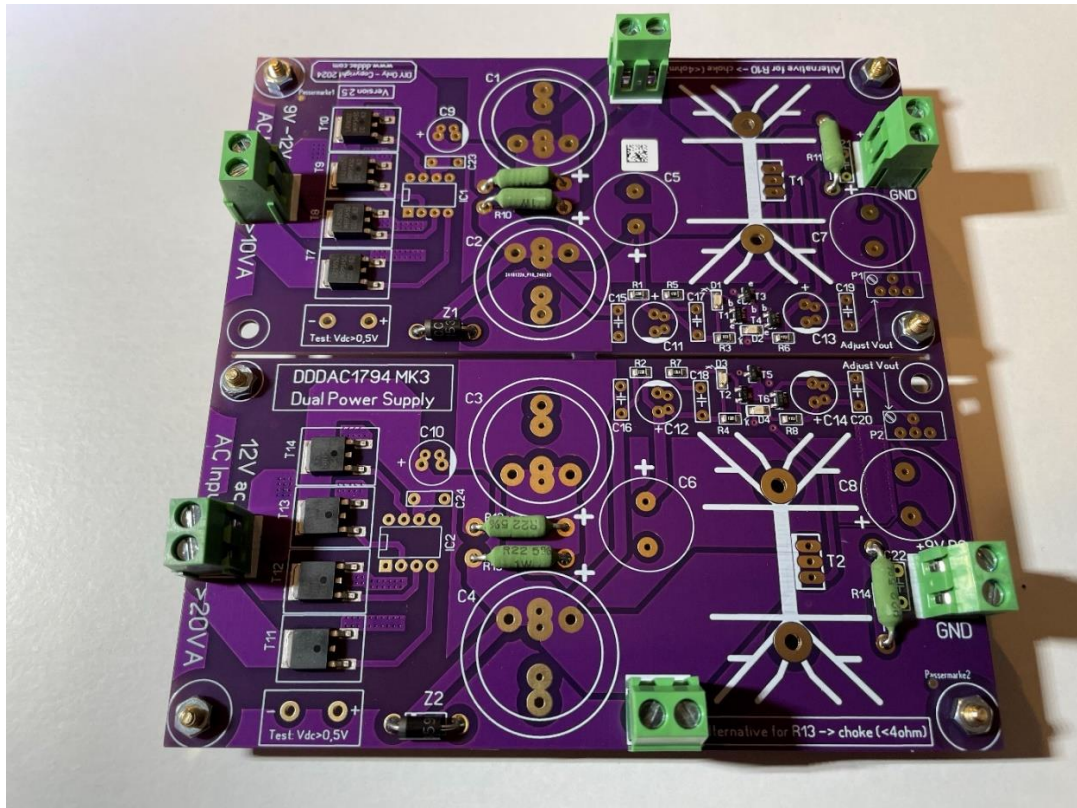
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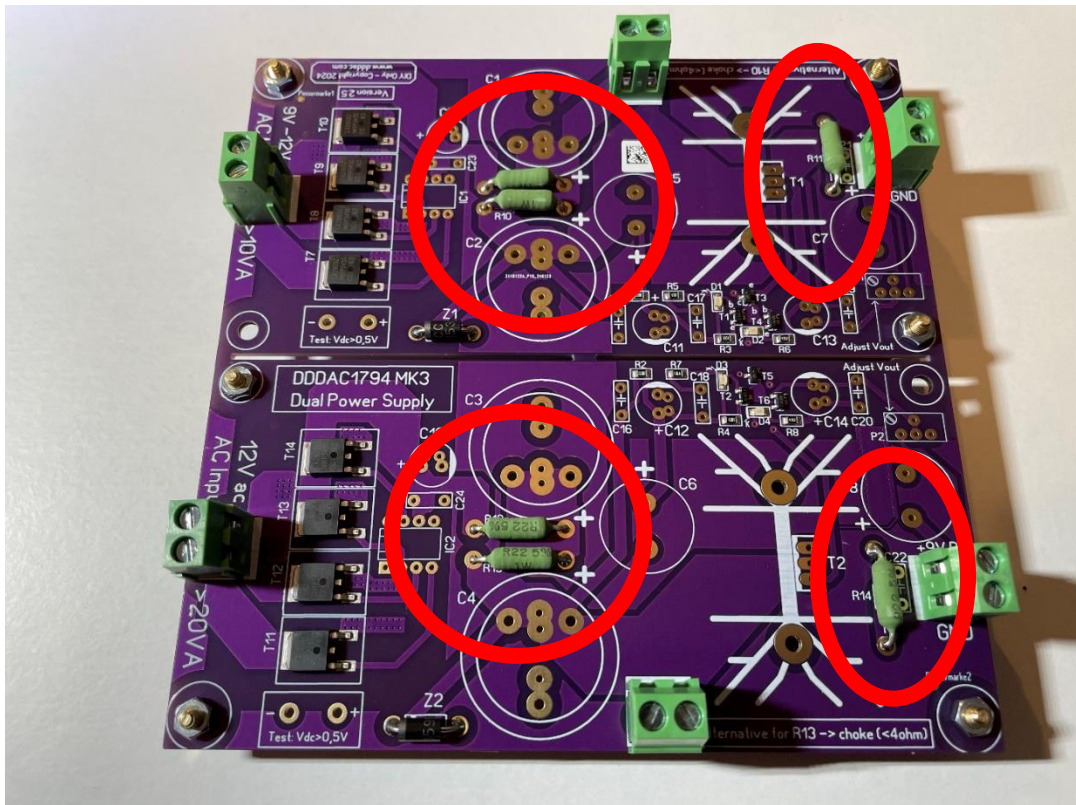
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3. Solder the 6x 2-pole “PCB Power Connectors”



4. Solder the 6x 0,22 Ohm resistors R9-R14.

In case you are using one or 2 chokes, do NOT solder R10 and/or R13 (!!)



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5. Solder the 24 Volt Zener diodes Z1-Z2 – watch the polarity!



6. Solder both 8 Dip IC's IC1-IC2 (LT4320)
7. Solder both Ceramic 1uF Capacitors C23-C24 next to the ICs



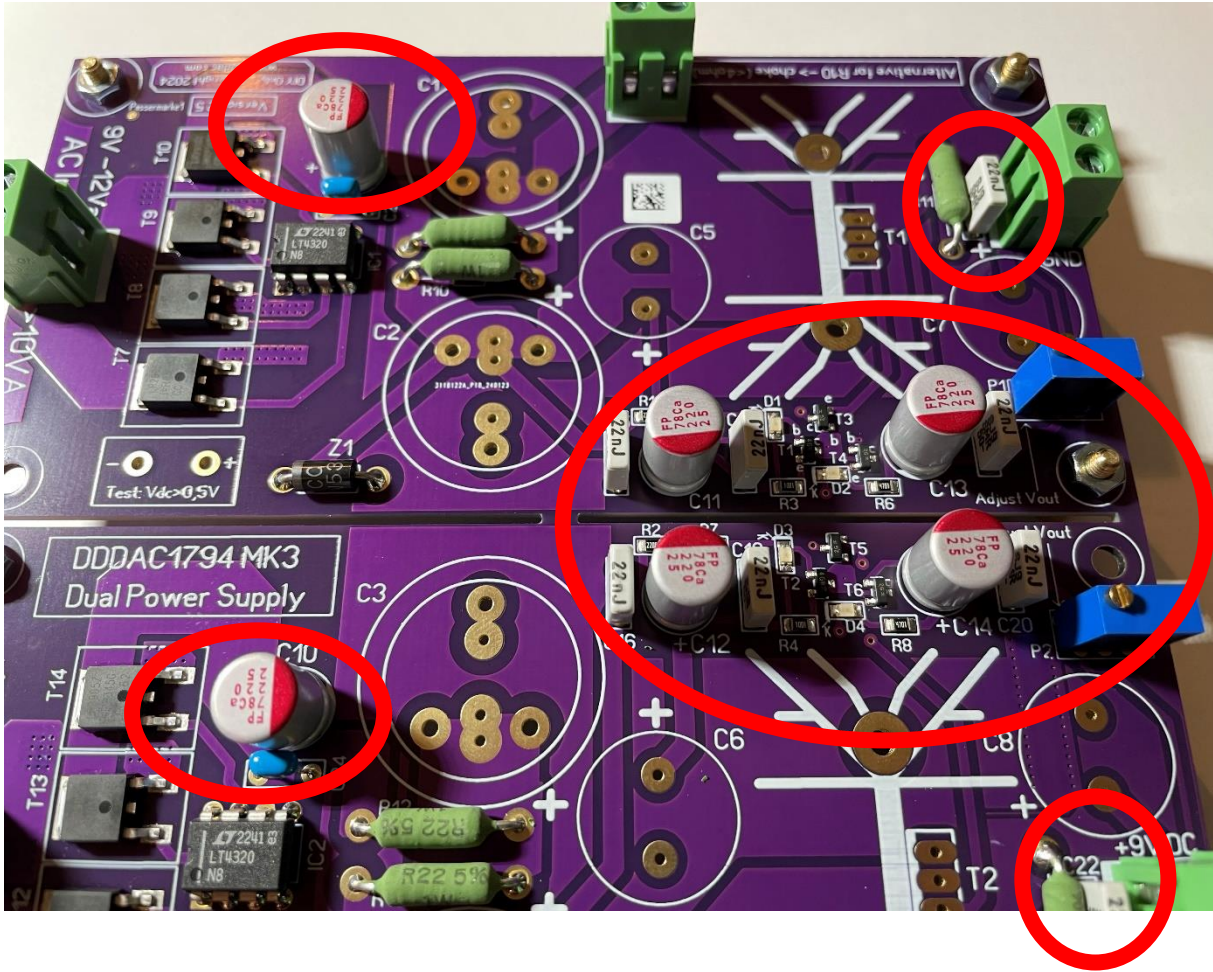
8. Solder the 8x SMR film capacitors C15-C22
9. Solder the 2x trimming potentiometers P1-P2
10. Solder the 6x polymer capacitors C9-C14

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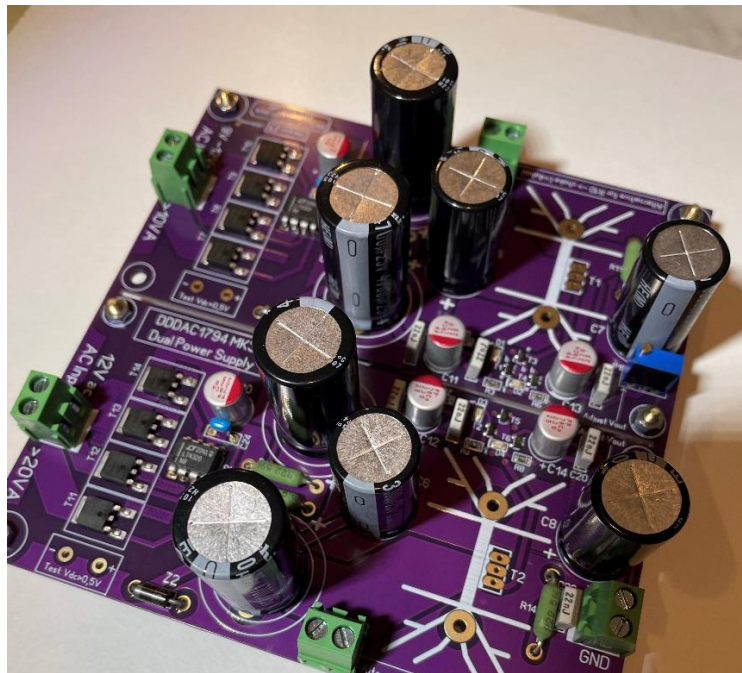
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11. Solder the 4x Electrolyte capacitors C1-C4
12. Solder the 4x Electrolyte capacitors C5-C8



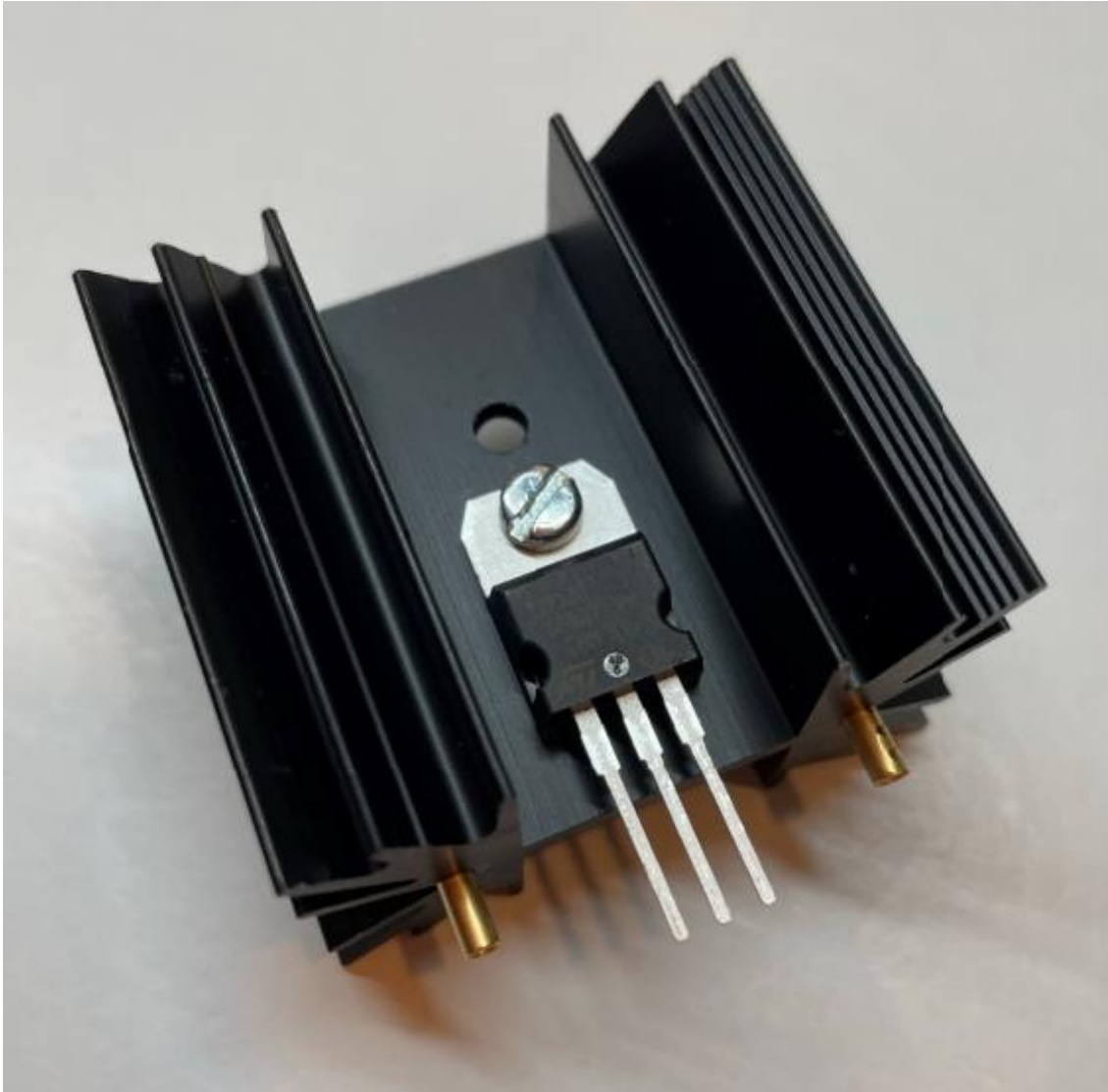
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13. Stick the two TIP120 (or 121 or 122) darlington transistors in the heatsinks
14. Tighten the transistor to the heatsink with the M3 screw and nut
15. Stick this pre-assembly on the PCB and turn it upside down, so it stays steady
16. Only NOW, solder the studs of the heatsink and then the pins of the Tip120s.
17. READY!!



E. Connecting the PSU PCB to the outside world

Do **NOT connect** the finished board to anything yet, follow these steps...

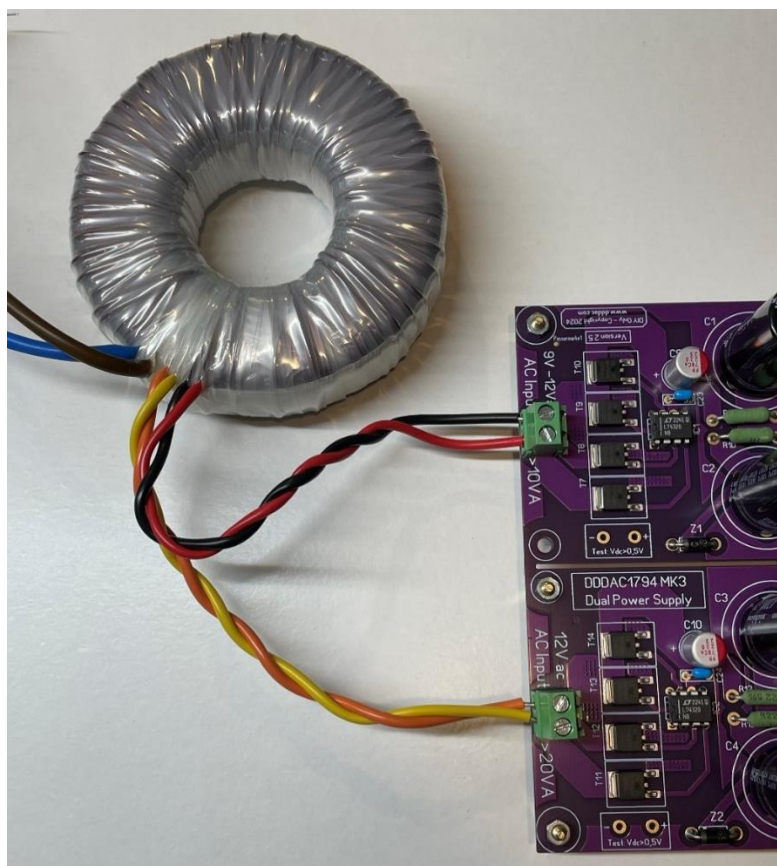
Power Supply Terminals and connections

There are 3 connections per PSU section:

- Input terminal for the 12 Vac (for the 9 Volt DC Output section) / or for 9-12Vac (for the 4 Volt DC Output section)
- Terminal for the optional choke (read “optional chokes”)
- DC Output terminal

Transformer Suggestions

- Two possibilities: two transformers with single secondary winding or one transformer with two independent secondary windings. Do NOT use windings with center tap!! This will not work properly.
- I use in my own setup one 50VA transformer with two 12Vac separated secondary windings
- The maximum AC voltage of the transformer is 15 Vac for proper operation.
- I suggest a minimum 50VA Transformer for optimum compromise between headroom and cost. Bigger is “better” but also more expensive. Try for yourself if it is really “better”
- Even if a 15VA transformer will work fine, I would not use those as they are more prone for output voltage swings under different (no) load conditions



Optional Chokes

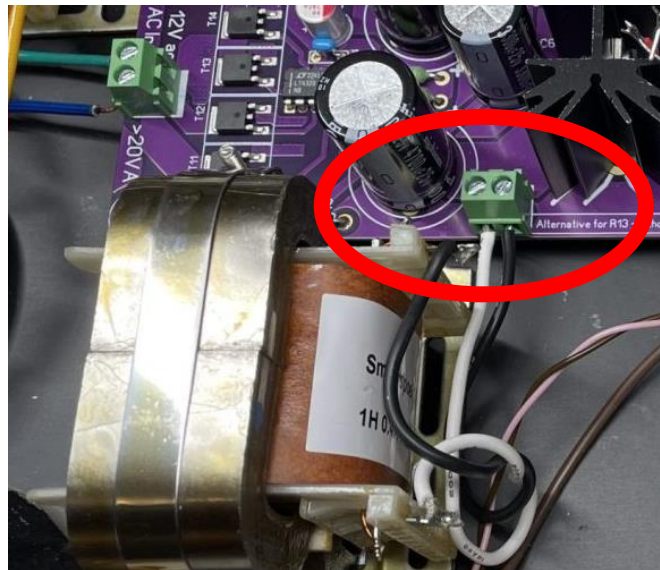
On my blog website blog.dddac.com there is a post on the use of chokes.

<http://blog.dddac.com/dddac-psu-c-l-c-choke-tests/>

Suggestions are between 50mH and 1H – as long as the DC resistance is below 4 Ohm. This applies, when used with the DDDAC1794MK3 board (1 or 2 boards)

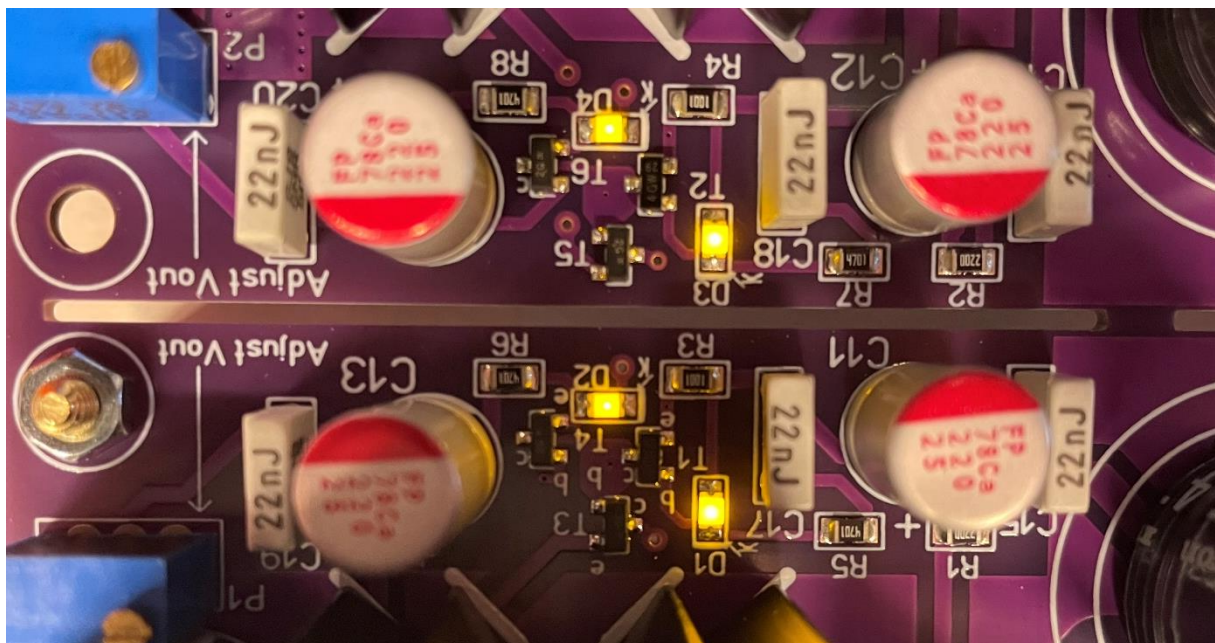
Below, the DDDAC AE Choke is shown and how it is connected. The choke can be ordered at

<https://www.aetransformers.com/products/choke-coils.html>



Adjusting output voltage

We are now ready to check if all is fine and start adjusting the output voltage for the intended use. Switch on the mains and see if all 4 LEDs are light up. **If not, stop here and check for mistakes.**



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If all is fine, measure the DC outputs with a DC Multimeter or alike.

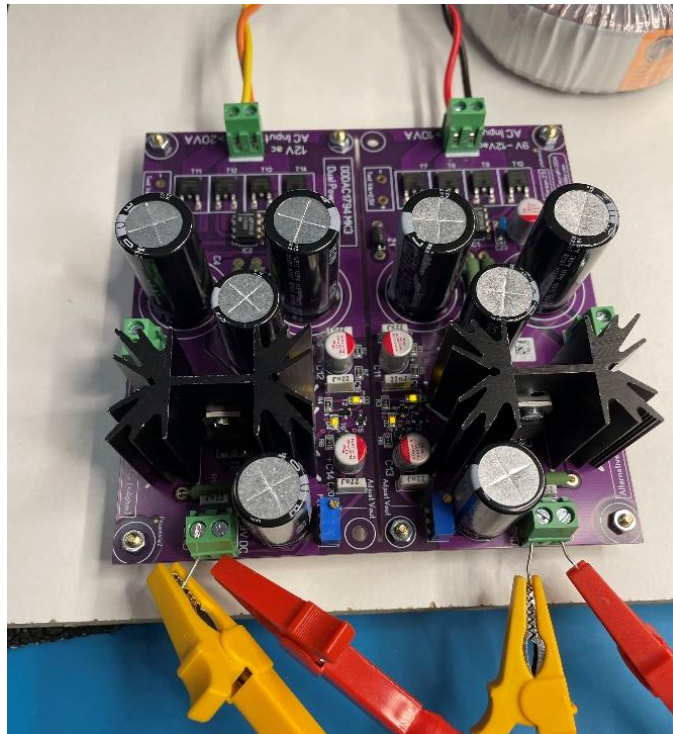
Depending on the initial position of the trimmers, this could be any value, so no worries.

Adjust both voltages to **4Vdc and 9Vdc for use with the DDDAC1794MK3 Board.**

Voltage goes up when turning anti-clockwise and vice versa.

If you use the Power Supply for another application, adjust to whatever voltage you need.

If the PSU is in operation, let it warm up for 30 minutes and if needed, fine-adjust the outputs.



“Test: Vdc>0,5V”

You might have noticed the two check areas: solder pads at the PCB called “Test: Vdc>0,5V.”



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On my blog website blog.dddac.com there is [a post on the DDDAC Power supply](#). I go in detail, why there must be a certain headroom across the error amplifier. I made life easy and added two measure points. The DC voltage between these two points must be minimum 0,5Volt – important note: Measure this only when the power supply is operating at the current supply it is intended for.

In case the voltage is lower or zero, you need a transformer with a higher AC voltage. Max 15V ac
With a 15Vac transformer you can go up to 12Vdc output

Typically, this value is several Volt. The 0,5 is the absolute minimum and the Design is such it will be higher for more headroom. This is more intended for other applications or experiments.

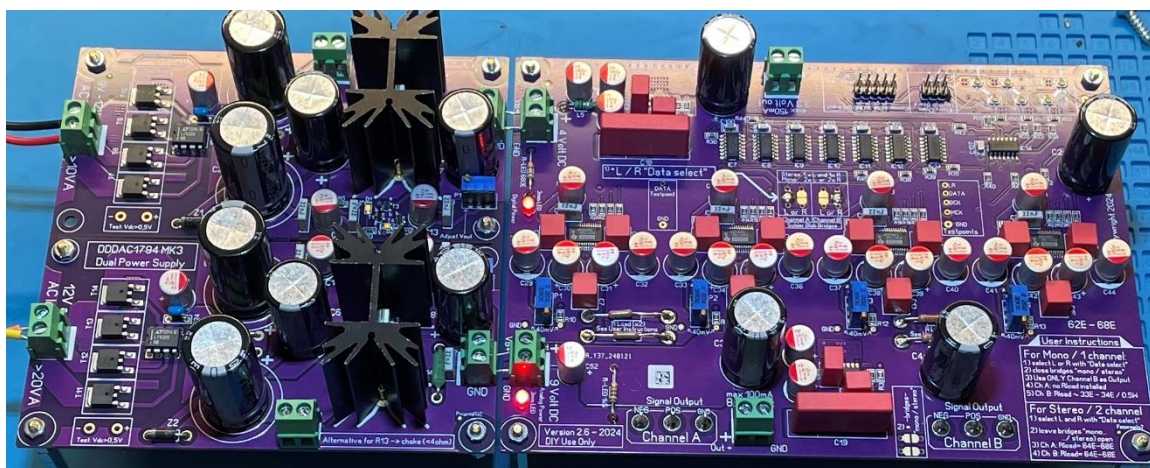
Maximum current output

The PSU can deliver easily 1A or more. But with the delivered heatsinks it is intended for maximum two DDDAC1794MK3 DAC boards, where predominantly the analog section (9 Vdc) is drawing up to 200mA per Board. Two boards are below 400mA and perfectly safe when a 12 Vac transformer is being used. For higher currents increase of heatsink size is necessary! This is DIY experiments...

F. Connecting to the DDDAC1794MK3 DAC Board and testing

Connecting to the DDDAC1794MK3

The DDDAC1794MK3 PSU is designed in such way, it is a mechanical fit to the DAC board
This way the connection between boards can be done with just short pieces of wire



“It does not work” – what now?

If you see smoke coming from some parts, there is something fundamentally wrong. There is no real guidance how to fix, as there might be further damage to ICs for example. Better contact me...

If there is just “no power” just follow the following quick check steps:

- Are the yellow LED lights lit up?
- What DC voltage at the outputs?
- Is the heatsink getting extremely hot?
- Is there a DC voltage at the Choke option terminals? (This is the raw DC power coming from the rectifier)?
- What AC voltage is measured at the AC input terminals?

The above will help deducting where the problem might be. Possible and typical errors:

- Wires are not connected well
- Cold solder joints making bad contacts
- Solder drops making short connections

In general, if you are stuck, please feel free to contact me for online help (Email – pls do not call me). Last resort is to agree to send the defective board to me for analysis and possible repair.

G. Possible options and tweaks to improve sound quality

The best tweak is to use the choke option. Sonic improvement is remarkable

Second best is to use “large” transformers. Differences are small. Just consider that 200VA transformers are hardly more expensive than 50VA for example

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