



Spring reverb effect

11-11-2023

—

Version 1.0

github.com/ExquisiteCatBread/SpringReverb

I. Version history

| Version | Changes |
|---------|---------------|
| 1.0 | First version |
| | |
| | |
| | |

II. Table of contents

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1. Product description

The spring reverb effect is an effect used to create a reverb. It is based on a opamp driver circuit and a 8EB2C1B spring reverb tank.

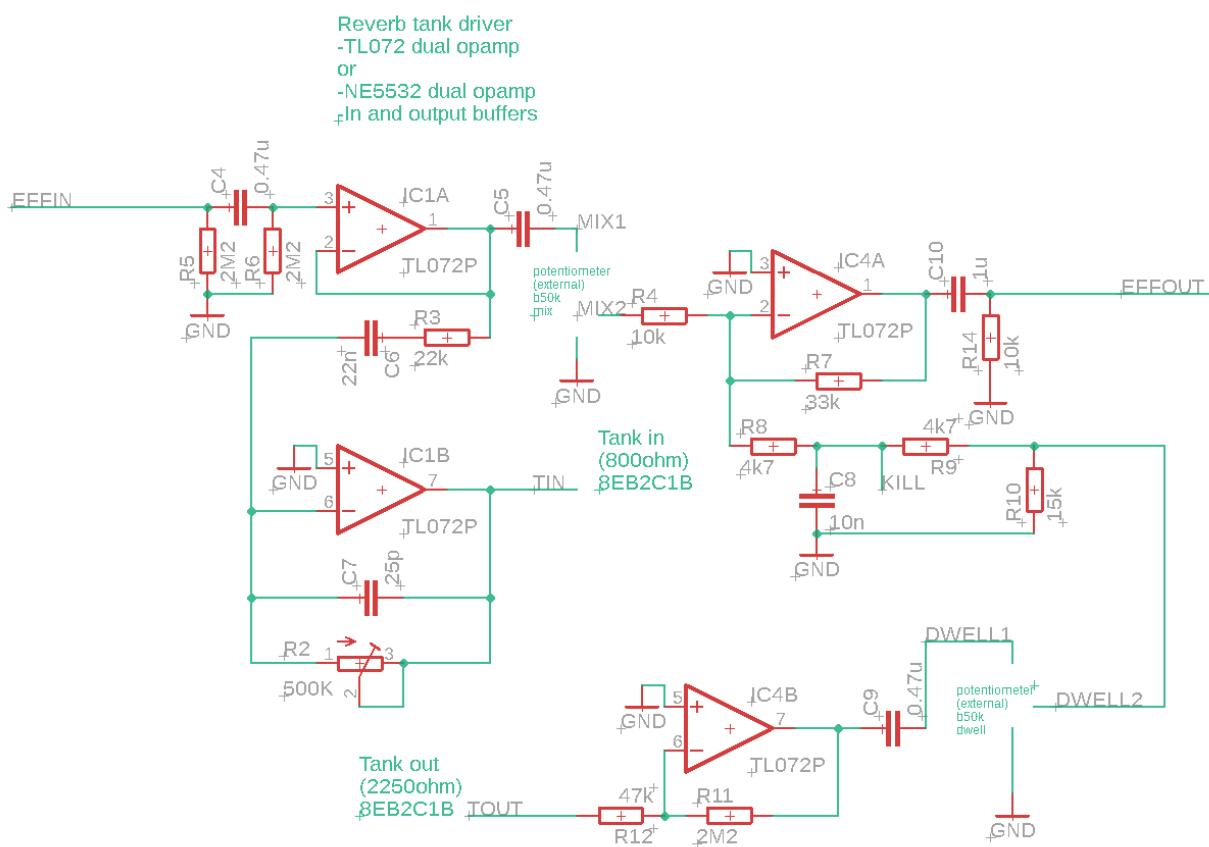
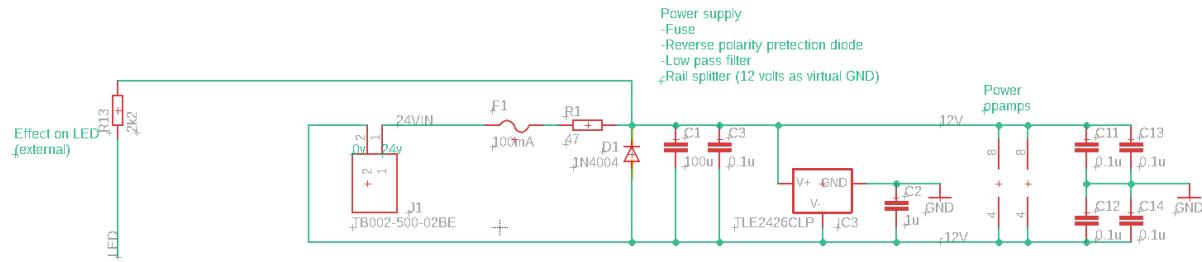
The effect is powered by its own 230VAC power supply. The effect circuit itself works on 24VDC. It is fused via a PTC 100mA fuse and protected against reverse polarity via a diode. The power stage contains a low pass filter to filter out noise. A TLE2426 is used to create 12 volts used as a virtual ground for the opamps.

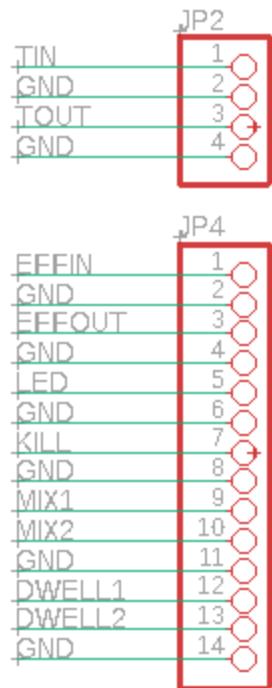
Both the input and output contain an opamp based signal buffer. Both the in and output from the tank have their own opamp driver. This gives the circuit a total of 4 opamps.

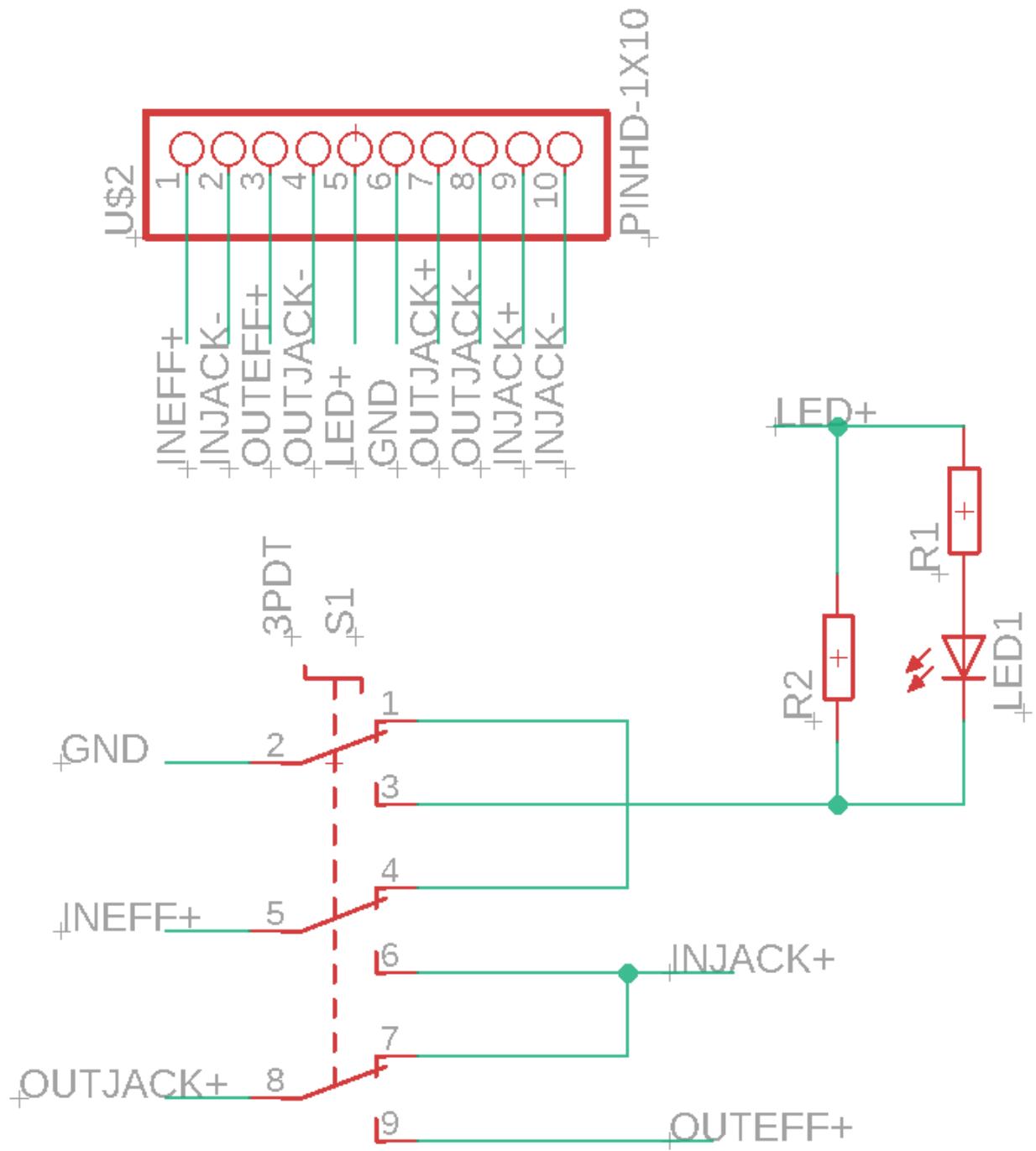
The opamp used is currently 2x a NE5532 dual opamp. The TL072 opamp is also tested in development. This one works, although seems to be a bit more noisy.

The effect is housed in an aluminum pedal housing. Power can be supplied via a Schuko plug (230VAC). For the audio in- and output 6.35mm mono audio jacks are used. A stomp switch is used to create a true bypass.

2. Schematics

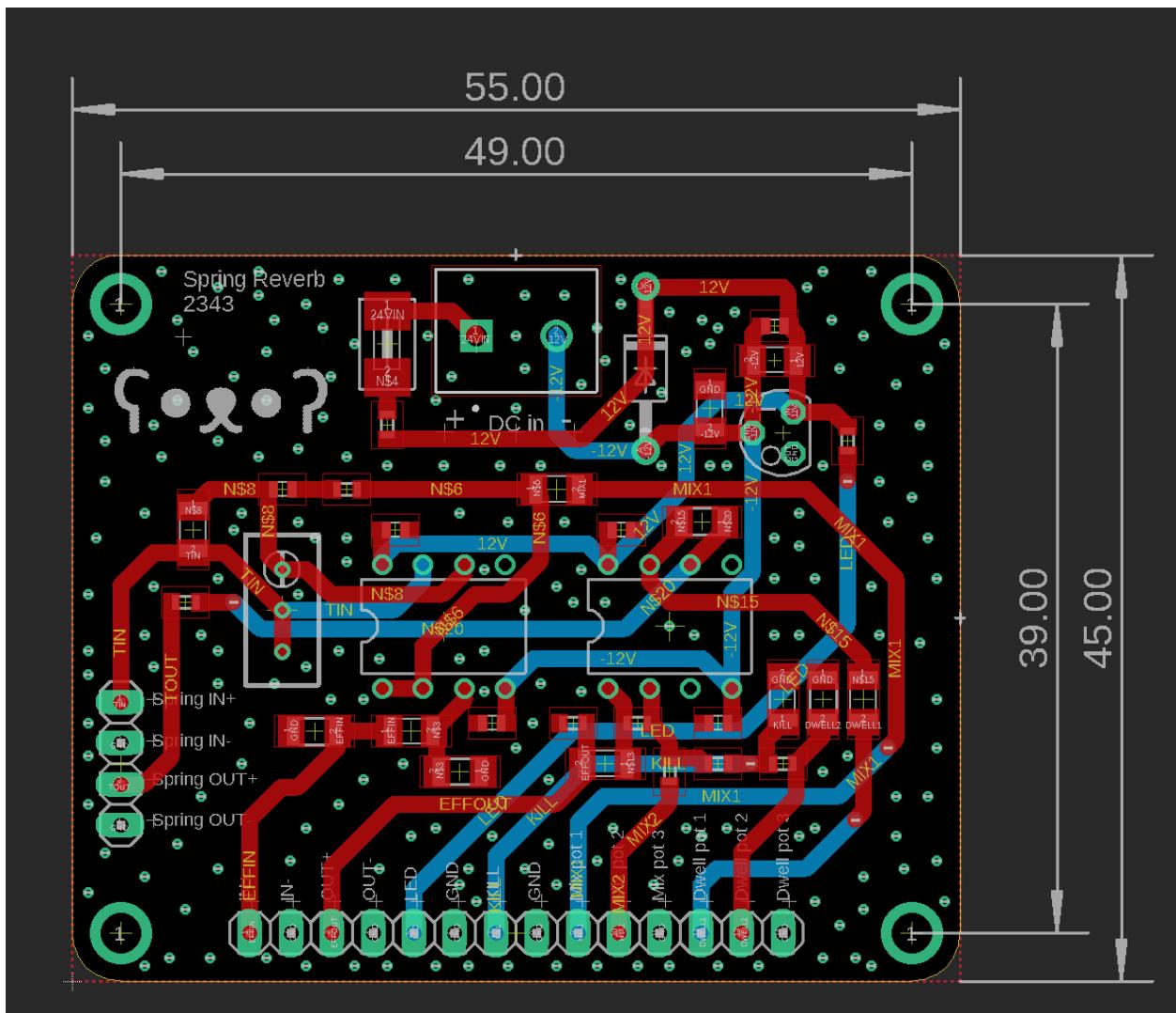




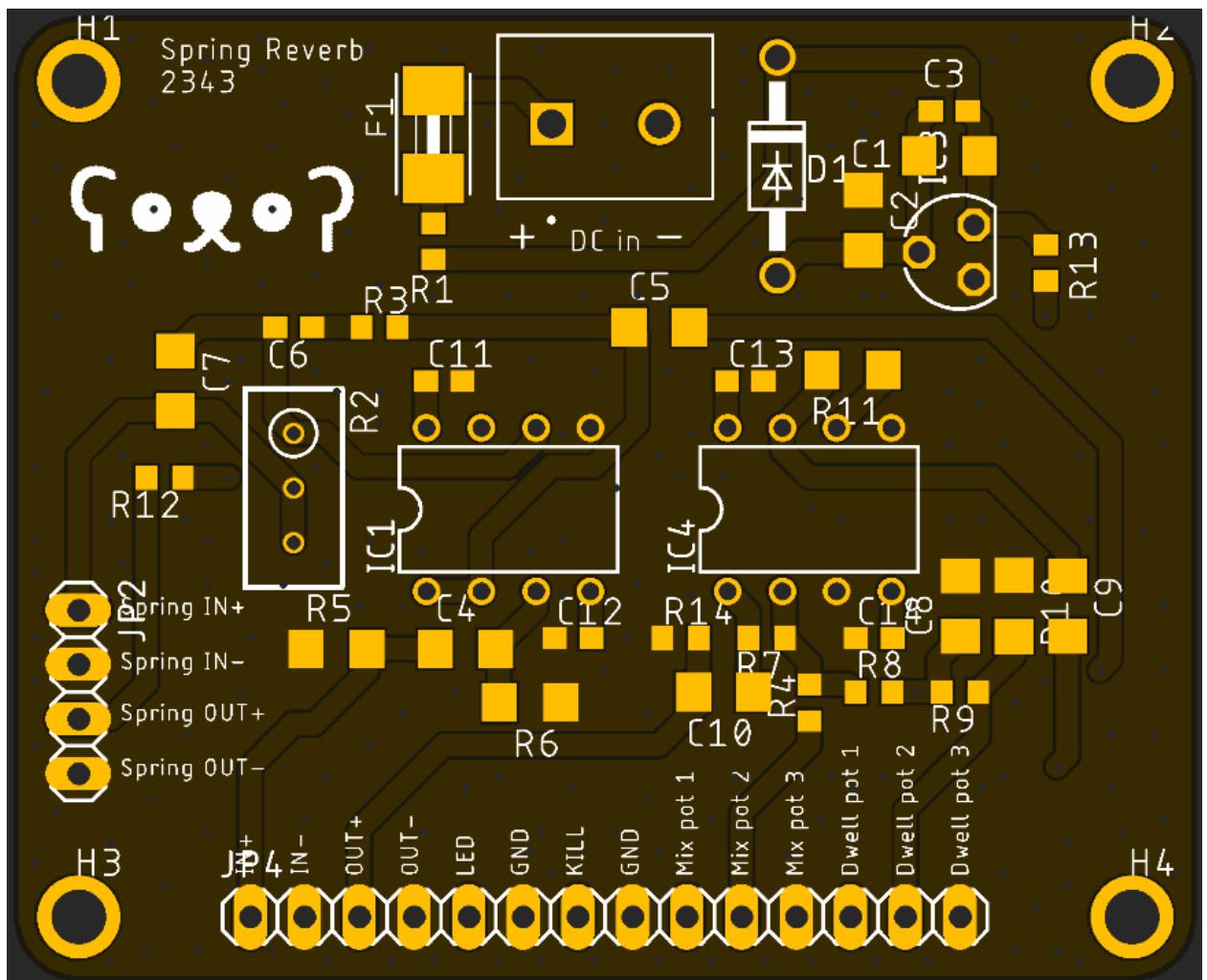


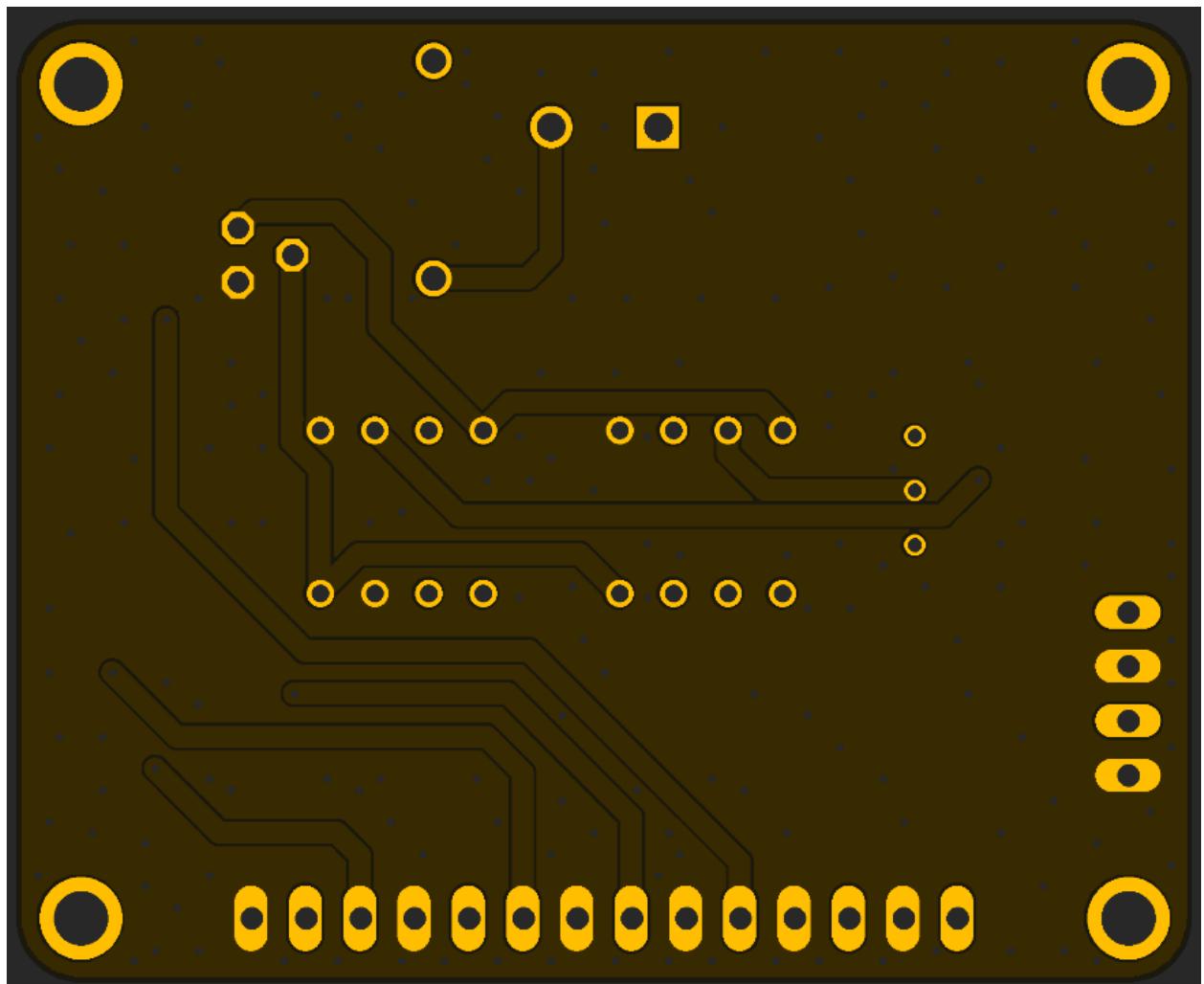
3. PCB layout

The PCB design is as shown in the picture below. The dimensions of the PCB are also shown in the drawing.

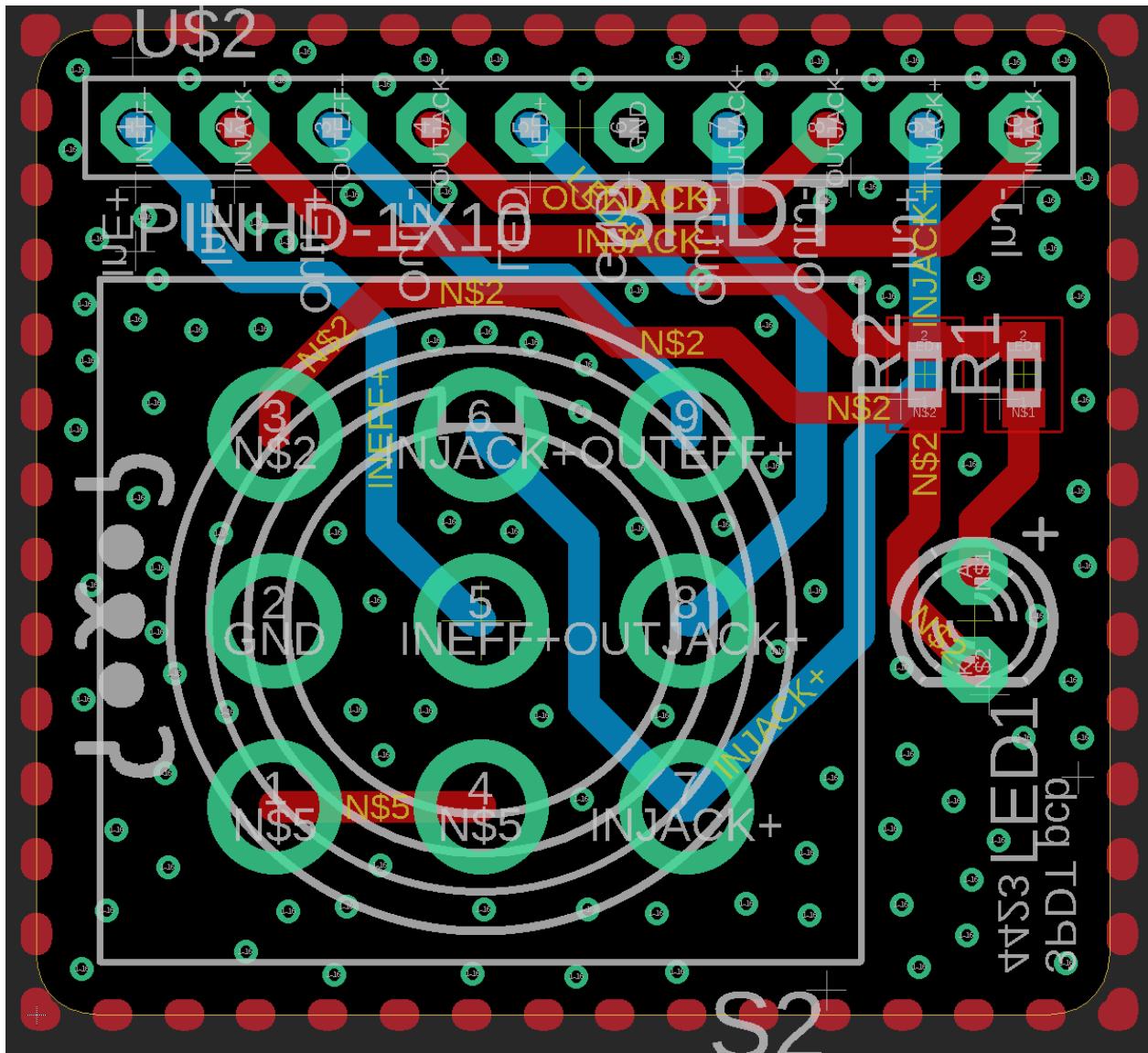


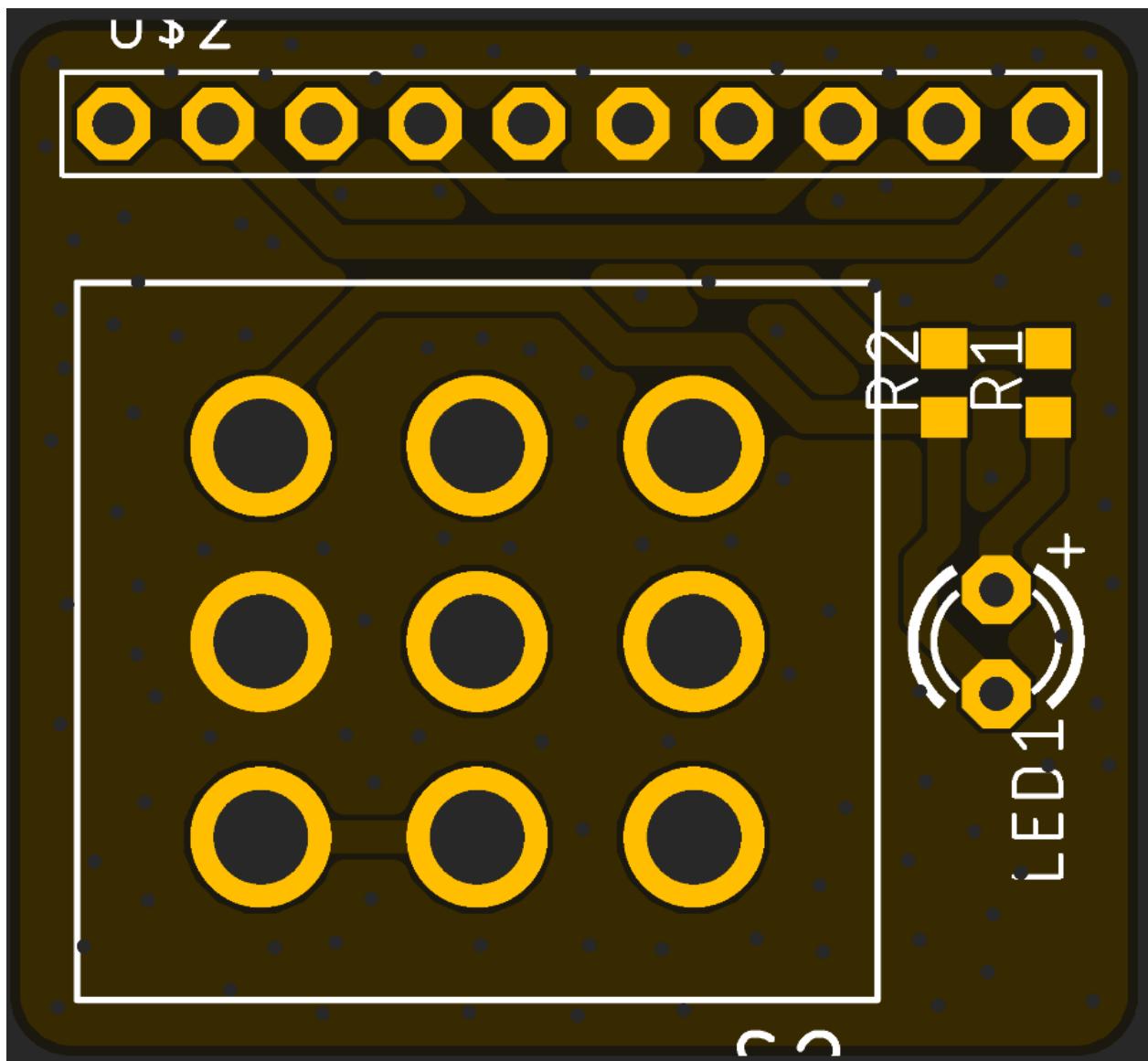
Note: Component number not visible on real PCB

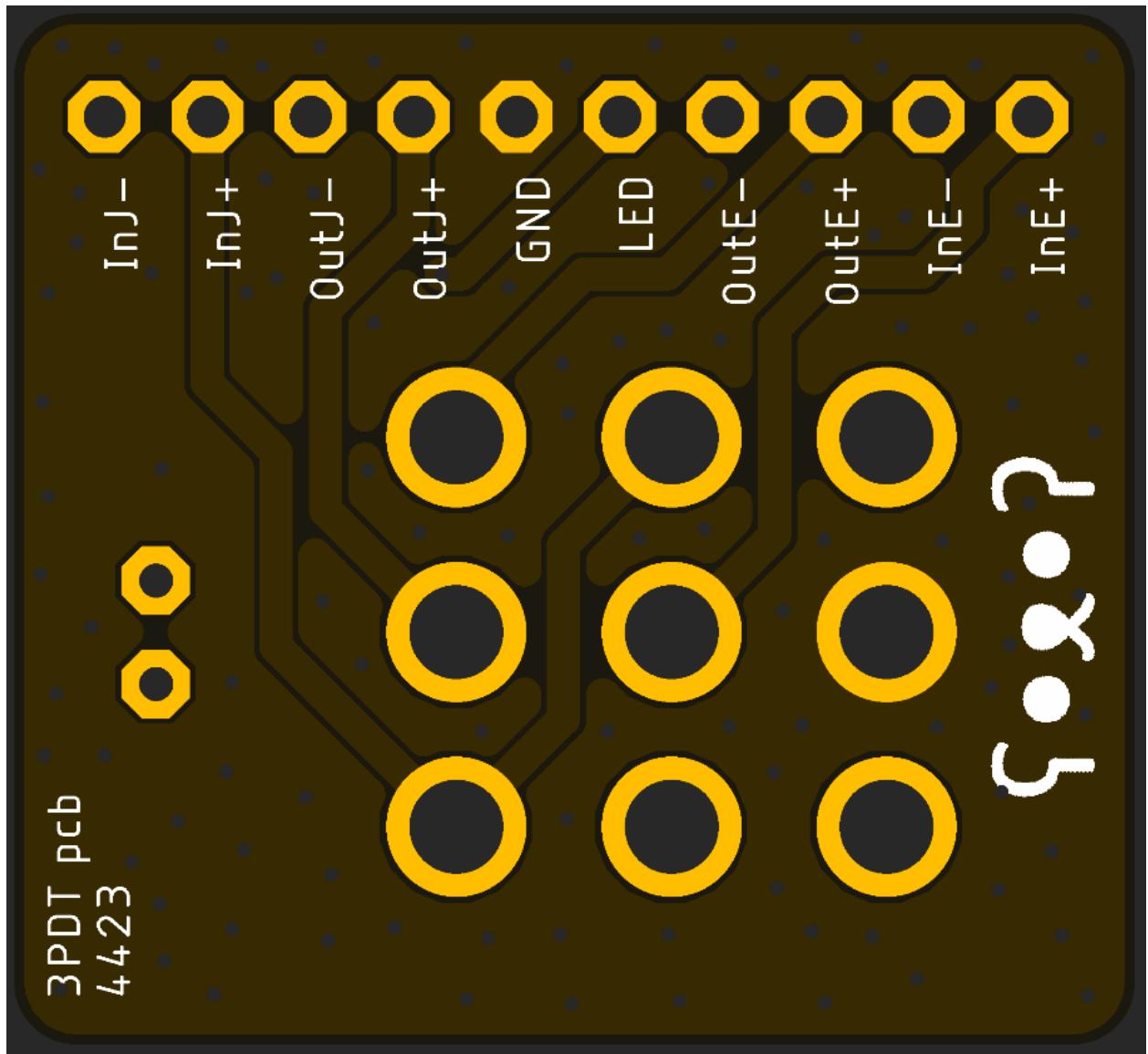




The 3PDT switch also has its own PCB. This is done for easy wiring.







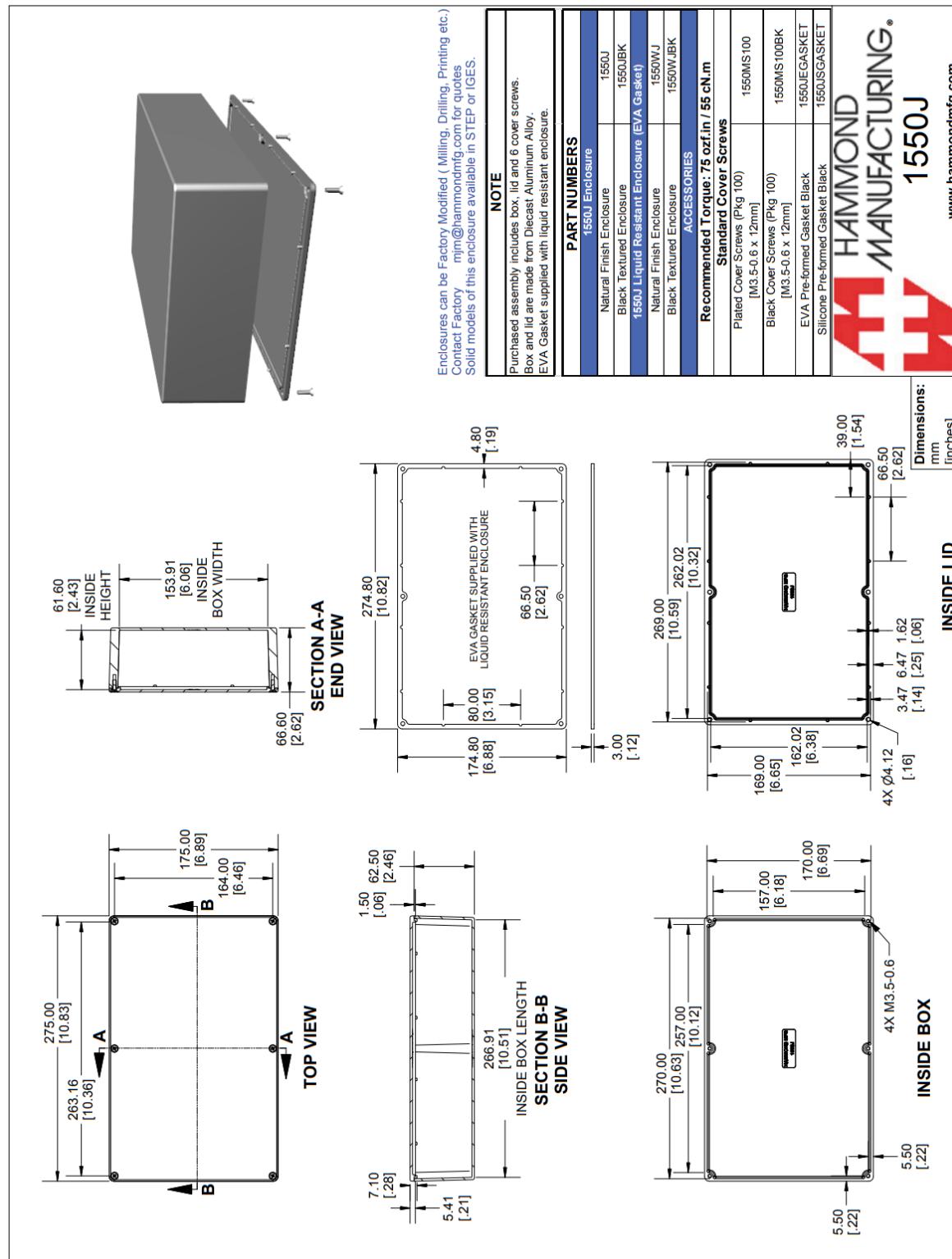
4. Bill of materials

| Part number | Device | Footprint | Type / value | Total parts |
|------------------------|----------------------|------------------|---------------------|-------------|
| C1 | Capacitor | 1206 | 100uF | 1 |
| C2, C10 | Capacitor | 1206 | 1uF | 2 |
| C3, C11, C12, C13, C14 | Capacitor | 0603 | 0.1uF | 5 |
| C4, C5, C9 | Capacitor | 1206 | 0.47uF | 3 |
| C6 | Capacitor | 0603 | 22nF | 1 |
| C7 | Capacitor | 1206 | 25pF | 1 |
| C8 | Capacitor | 1206 | 10nF | 1 |
| R1 | Resistor | 0603 | 47 ohm | 1 |
| R2 | Variable resistor | 3296 trimmer | 500k trimmer (3296) | 1 |
| R3 | Resistor | 0603 | 22k ohm | 1 |
| R4, R14 | Resistor | 0603 | 10k ohm | 2 |
| R5, R6, R11 | Resistor | 1206 | 2.2M ohm | 3 |
| R7 | Resistor | 0603 | 33k ohm | 1 |
| R8, R9 | Resistor | 0603 | 4.7k ohm | 2 |
| R10 | Resistor | 1206 (0603 used) | 15k ohm | 1 |
| R12 | Resistor | 0603 | 47k ohm | 1 |
| R13 | Resistor | 0603 | 2.2k ohm | 1 |
| D1 | Diode | D041 | 1N4004 | 1 |
| F1 | Polyfuse | 1812 | 100mA | 1 |
| J1 | Power screw terminal | KF301-2P | KF301-2P | 1 |
| JP2 | 1x4 JST pin header | 1x4 2.56mm pitch | 1x4 | 1 |

| | | | | |
|------------------------|---|--------------------------------------|--|----------------------------|
| JP4 | 1x14 JST pin header | 1x14 2.56mm pitch | 1x14 | 1 |
| IC1 | Unipolar to bipolar power separator | T092 | TLE2426CP | 1 |
| IC3, IC4 | Opamp | DIL08 / DIP08 | TL072 or NE5532 (used) | 2 |
| LED | LED | 3mm trough hole | 3mm LED | 1 |
| MIX pot, Dwell pot | Potentiometer | Panel mount | b50k | 2 |
| Reverb tank | Spring reverb tank | 235mm x 86mm x 33mm | 8EB2C1B | 1 |
| Power supply | Power supply | 62mm x 51mm x 28mm | Mean Well RS-15-24 24 Volt, 15 watt | 1 |
| Wire (2x0.25) | Wire (2x0.25) | 2x0.25mm2 | Lapp LIYCY 2x0,25 | 1m |
| Wire (3x0.25) | Wire (3x0.25) | 3x0.25mm2 | Lapp LIYCY 3x0,25 | 1m |
| Internal earth wire | Wire (3x0.75) (separated earth wire) | 3x0.75mm2 | H03VV | 0.3mm |
| Power cable | Wire (3x0.75) with Schuko | Wire (3x0.75) with Schuko | Wire (3x0.75) with Schuko | 2m |
| Power cable gland | rubber gland | 6mm inside diameter | KDF6 | 1 |
| 3PDT switch | 3PDT switch | 3PDT | 3PDT | 1 |
| Audio in, Audio out | Audio jack | 6.35mm | 6.35mm | 2 |
| JST connectors | JST connectors | JST 2pin, 3pin, 6pin 2.56mm pitch | 2pin, 3pin, 6pin | 4 2pin 2 3pin 2 6pin |
| M2 standoffs | M2 standoffs | M2 | M2 standoff + screw | 4 |
| Tank in, out | Coaxial connectors | Cinch | red, white | 1 red 1 white |
| Housing | Housing | 1550J | Hammond 1550JBK | 1 |
| Housing feet | Rubber feet | 12,7mmx3mm round | GF61 | 4 |
| Pot knobs | Knobs | 30 x 13mm | 30 x 13mm | 2 |

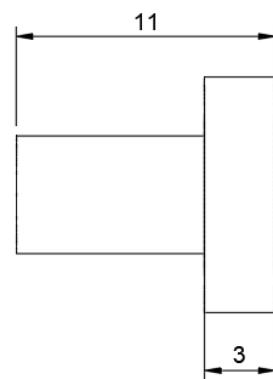
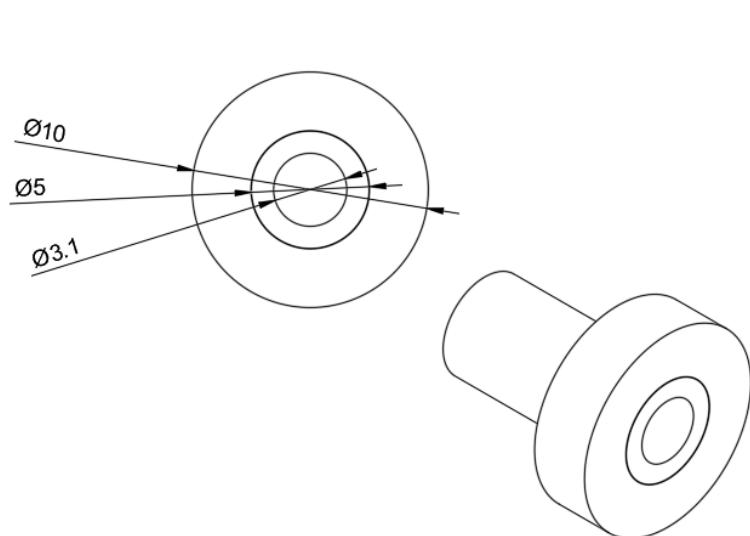
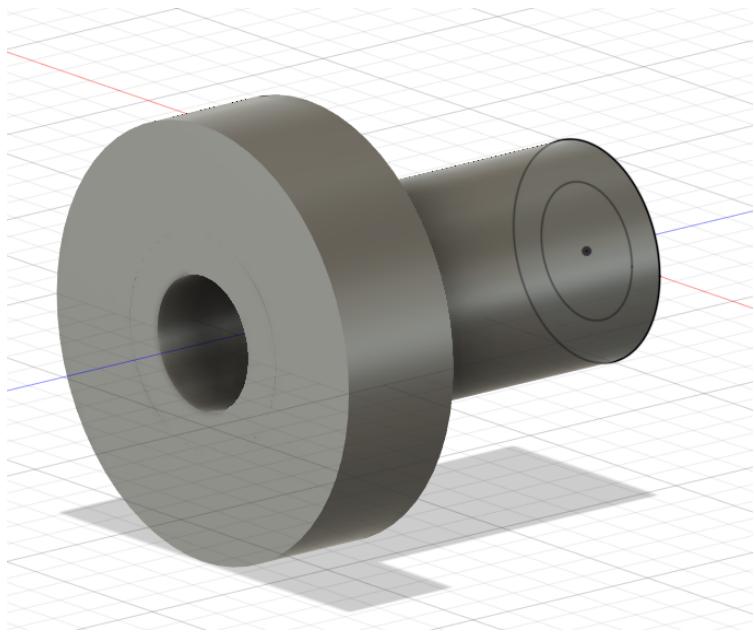
| | | | | |
|------------------------|--|-----------------|--------------|---|
| PCB switch | PCB | 27.6mm x 25.4mm | version 2344 | 1 |
| PCB effect | PCB | 45mm x 55mm | version 2343 | 1 |
| Heatshrink | Heatshrink | Misc | Misc | - |
| Solder paste | Solder | Bi57Sn42Ag1 | Bi57Sn42Ag1 | - |
| Solder wire | Solder | Sn60Pb39Cu1 | Sn60Pb39Cu1 | - |
| Misc mounting hardware | M3 screws, nuts, ferrules, cable shoes, tiewraps | Misc | Misc | - |

5. Housing dimensions



6. Mounting 3D models

Mounting spacer for reverb tank. Printed with 3D printer.



7. Development costs

Only the material costs (no hours) are included in the development costs.

| Part number | Device | Type / value | Total parts ordered | Total parts price (€) | Shipping price (€) | Total price incl shipping (€) | Total price per piece (€) | Total in project | Total price per pieces used (€) | Link (at time of order) | Remark |
|------------------------------------|-------------------|---------------------|---------------------|-----------------------|--------------------|-------------------------------|---------------------------|------------------|---------------------------------|----------------------------|------------|
| C1 | Capacitor | 100uF | 20 | 4,91 | 3,15 | 8,06 | 0,40 | 1 | 0,40 | Aliexpress | |
| C2, C10 | Capacitor | 1uF | - | - | - | - | - | 2 | - | Aliexpress | From stock |
| C3, C11, C12, C13, C14 | Capacitor | 0.1uF | - | - | - | - | - | 5 | - | Reichelt | From stock |
| C4, C5, C9 | Capacitor | 0.47uF | 100 | 1,07 | 1,13 | 2,20 | 0,02 | 3 | 0,06 | Aliexpress | |
| C6 | Capacitor | 22nF | - | - | - | - | - | 1 | - | | From stock |
| C7 | Capacitor | 25pF | 100 | 1,12 | 1,13 | 2,25 | 0,02 | 1 | 0,02 | Aliexpress | |
| C8 | Capacitor | 10nF | 100 | 1,01 | 1,13 | 2,14 | 0,02 | 1 | 0,02 | Aliexpress | |
| R1 | Resistor | 47 ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| R2 | Variable resistor | 500k trimmer (3296) | 10 | 1,08 | 1,11 | 2,19 | 0,22 | 1 | 0,22 | Aliexpress | |
| R3 | Resistor | 22k ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| R4, R14 | Resistor | 10k ohm | - | - | - | - | - | 2 | - | Aliexpress | From stock |
| R5, R6, R11 | Resistor | 2.2M ohm | 100 | 0,54 | 1,13 | 1,84 | 0,02 | 3 | 0,06 | Aliexpress | |
| R7 | Resistor | 33k ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| R8, R9 | Resistor | 4.7k ohm | - | - | - | - | - | 2 | - | Aliexpress | From stock |
| R10 | Resistor | 15k ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| R12 | Resistor | 47k ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| R13 | Resistor | 2.2k ohm | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| D1 | Diode | 1N4004 | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| F1 | Polyfuse | 100mA | - | - | - | - | - | 1 | - | Aliexpress | From stock |

| | | | | | | | | | | | |
|---------------------|---------------------------------------|-------------------------------------|-------|-------|------|-------|-------|-----|-------|----------------------------------|---|
| J1 | Power screw terminal | KF301-2P | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| JP2 | 1x4 JST pin header | 1x4 | 1 kit | 25,99 | - | 25,99 | 0,04 | 1 | 0,04 | Amazon | Piece price assuming price divided by ~800 pieces |
| JP4 | 1x14 JST pin header | 1x14 | - | - | - | - | 0,04 | 1 | 0,04 | Amazon | See JP2 |
| IC1 | Unipolar to bipolar power separator | TLE2426CP | 4 | 8,20 | 2,95 | 11,15 | 2,79 | 1 | 2,79 | Aliexpress | |
| IC3, IC4 | Opamp | NE5532 | 10 | 4,84 | 1,25 | 6,09 | 0,61 | 2 | 1,22 | Reichelt | shipping divided among other used parts in same order |
| LED | LED | 3mm LED | 10 | 0,71 | 1,25 | 1,96 | 0,20 | 1 | 0,20 | Reichelt | shipping divided among other used parts in same order |
| MIX pot, Dwell pot | Potentiometer | b50k | 5 | 6,75 | 2,00 | 8,75 | 1,75 | 2 | 3,50 | vanalleenmeer.nl | |
| Reverb tank | Spring reverb tank | 8EB2C1B | 1 | 29,30 | 6,95 | 36,25 | 36,25 | 1 | 36,25 | tonefactor.vnl | |
| Power supply | Power supply | Mean Well RS-15-24 24 Volt, 15 watt | 1 | 12,66 | - | 12,66 | 12,66 | 1 | 12,66 | Amazon | |
| Wire (2x0.25) | Wire (2x0.25) | Lapp LIYCY 2x0,25 | 10 | 7,19 | - | 7,19 | 0,72 | 1 | 0,72 | Lapp | Ordered via Technische Unie |
| Wire (3x0.25) | Wire (3x0.25) | Lapp LIYCY 3x0,25 | 3 | 2,80 | - | 2,80 | 0,93 | 1 | 0,93 | Lapp | Ordered via Technische Unie |
| Internal earth wire | Wire (3x0.75) (separate d earth wire) | H03VV | 5m | 5,19 | 1,25 | 6,44 | 1,29 | 0,3 | 0,39 | Reichelt | shipping divided among other used parts in same order |

| | | | | | | | | | | | |
|---------------------|---------------------------|--|----|-------|------|-------|-------|---|-------|----------------------------|---|
| Power cable | Wire (3x0.75) with Schuko | Wire (3x0.75) with Schuko | - | - | - | - | - | 2 | - | NA | From stock, reissued from old device |
| Power cable gland | rubber gland | 6mm inside diameter | 15 | 1,52 | 1,25 | 2,77 | 0,18 | 1 | 0,18 | Reichelt | shipping divided among other used parts in same order |
| 3PDT switch | 3PDT switch | 3PDT | - | - | - | - | - | 1 | - | Aliexpress | From stock |
| Audio in, Audio out | Audio jack | 6.35mm | 10 | 8,23 | - | 8,23 | 0,82 | 2 | 1,64 | Aliexpress | |
| JST connectors | JST connectors | 2pin | - | - | - | - | 0.04 | 4 | 0.16 | Amazon | See JP2 |
| JST connectors | JST connectors | 3pin | - | - | - | - | 0.04 | 2 | 0.08 | Amazon | See JP2 |
| JST connectors | JST connectors | 6pin | - | - | - | - | 0.04 | 2 | 0.08 | Amazon | See JP2 |
| M2 standoffs | M2 standoffs | M2 standoff + screw | - | - | - | - | - | 4 | - | NA | From stock |
| Tank out | Coaxial connectors | Red | 5 | 0,91 | 1,25 | 2,16 | 0,43 | 1 | 0,43 | Reichelt | shipping divided among other used parts in same order |
| Tank in | Coaxial connectors | White | 5 | 1,12 | 1,25 | 2,37 | 0,47 | 1 | 0,47 | Reichelt | shipping divided among other used parts in same order |
| Housing | Housing | Hammond 1550JBK | 1 | 34,98 | 1,25 | 36,23 | 36,23 | 1 | 36,23 | Reichelt | shipping divided among other used parts in same order |
| Housing feet | Rubber feet | 12,7mmx3 mm round, rubber, self adhesive | 50 | 2,90 | 1,25 | 4,15 | 0,08 | 4 | 0,32 | Reichelt | shipping divided among other used parts in same order |

| | | | | | | | | | | | |
|------------------------|--|--------------|---|------|-------|------|------|---|------|----------------------------|---|
| Pot knobs | Knobs | 30 x 13mm | 3 | 4,23 | 2,87 | 7,10 | 2,37 | 2 | 4,74 | Aliexpress | |
| PCB switch | PCB | version 2344 | 5 | 3,30 | 3,75 | 7,05 | 1,41 | 1 | 1,41 | JLCPCB | |
| PCB effect | PCB | version 2343 | 5 | 3,30 | 28,40 | 31,7 | 6,34 | 1 | 6,34 | JLCPCB | |
| PCB stencil | PCB stencil | - | 1 | 6,55 | - | 6,55 | 6,55 | 0 | - | JLCPCB | shipping is included with PCB effect, this stencil is optional for production |
| Heatshrink | Heatshrink | Misc | - | - | - | - | - | - | - | Aliexpress | From stock |
| Solder paste | Solder | Bi57Sn42Ag1 | - | - | - | - | - | - | - | Digikey | From stock |
| Solder wire | Solder | Sn60Pb39Cu1 | - | - | - | - | - | - | - | NA | From stock |
| Misc mounting hardware | M3 screws, nuts, ferrules, cable shoes, tiewraps | Misc | - | - | - | - | - | - | - | NA | From stock |

Total single unit cost based on the per piece prices is **€111,60**. PCB stencil, time and parts already in house are not included in this calculation.

Assuming in-stock parts are worth about 20 euros (probably less in reality) , total unit price would be **€121,60**.

To give an idea of how much the project really costs in total, the total order costs per shop:

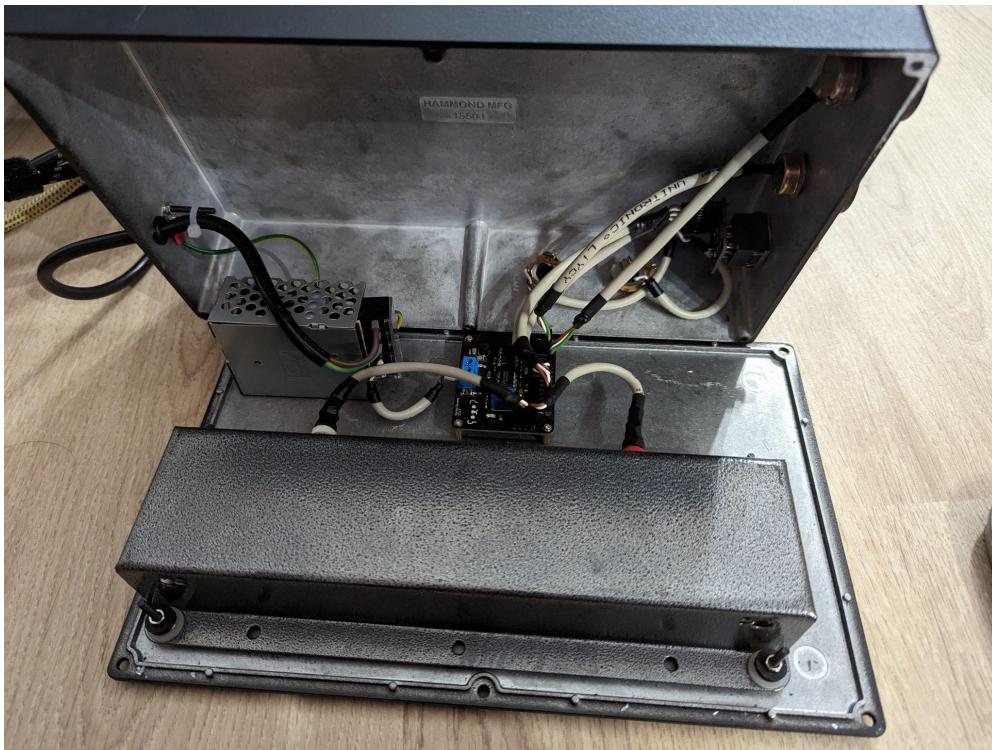
| Shop | Cost |
|-----------------|-------|
| Aliexpress | 74,54 |
| Amazon | 84,84 |
| Technische Unie | 12,78 |
| Vanallesenmeer | 42,90 |
| Reichelt | 89,60 |
| JLCPCB | 50,46 |
| Tonefactory | 36,25 |

Total development cost including prototyping parts, unused parts ordered and new tools, excluding parts already in house is **€391,37**.

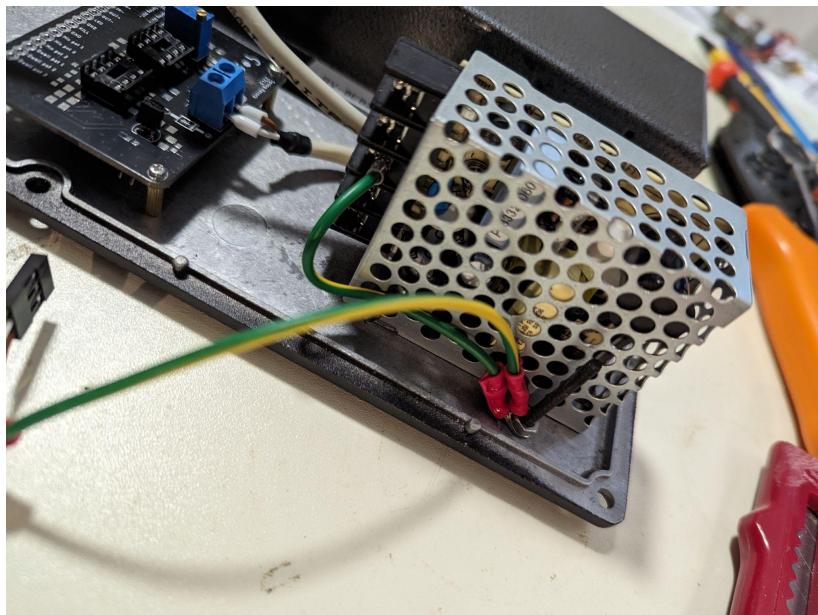
Excluding the new tools this cost would be about **€290,-**.

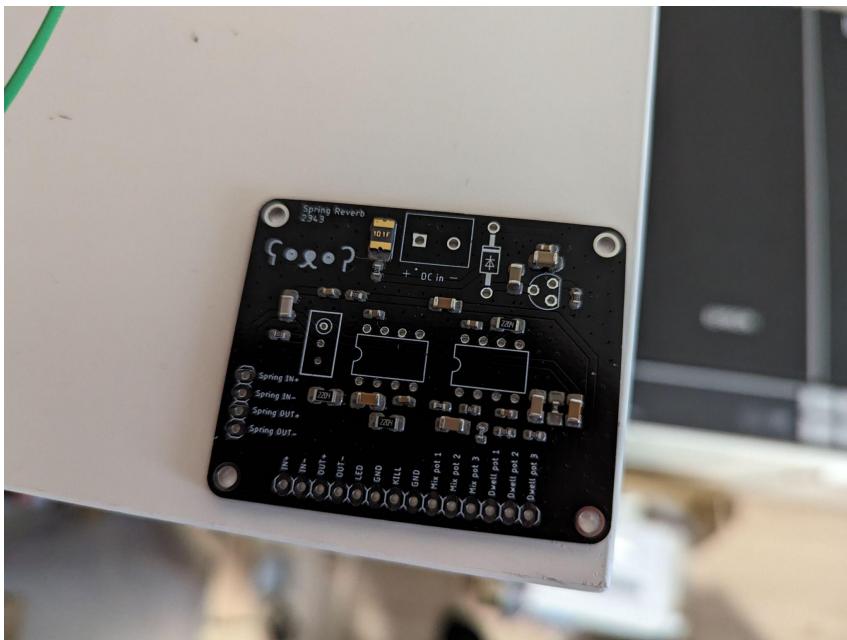
Again assuming stock parts are worth about 10 euros (probably less in reality) , total development price, without tools, would be around **€300,-**.

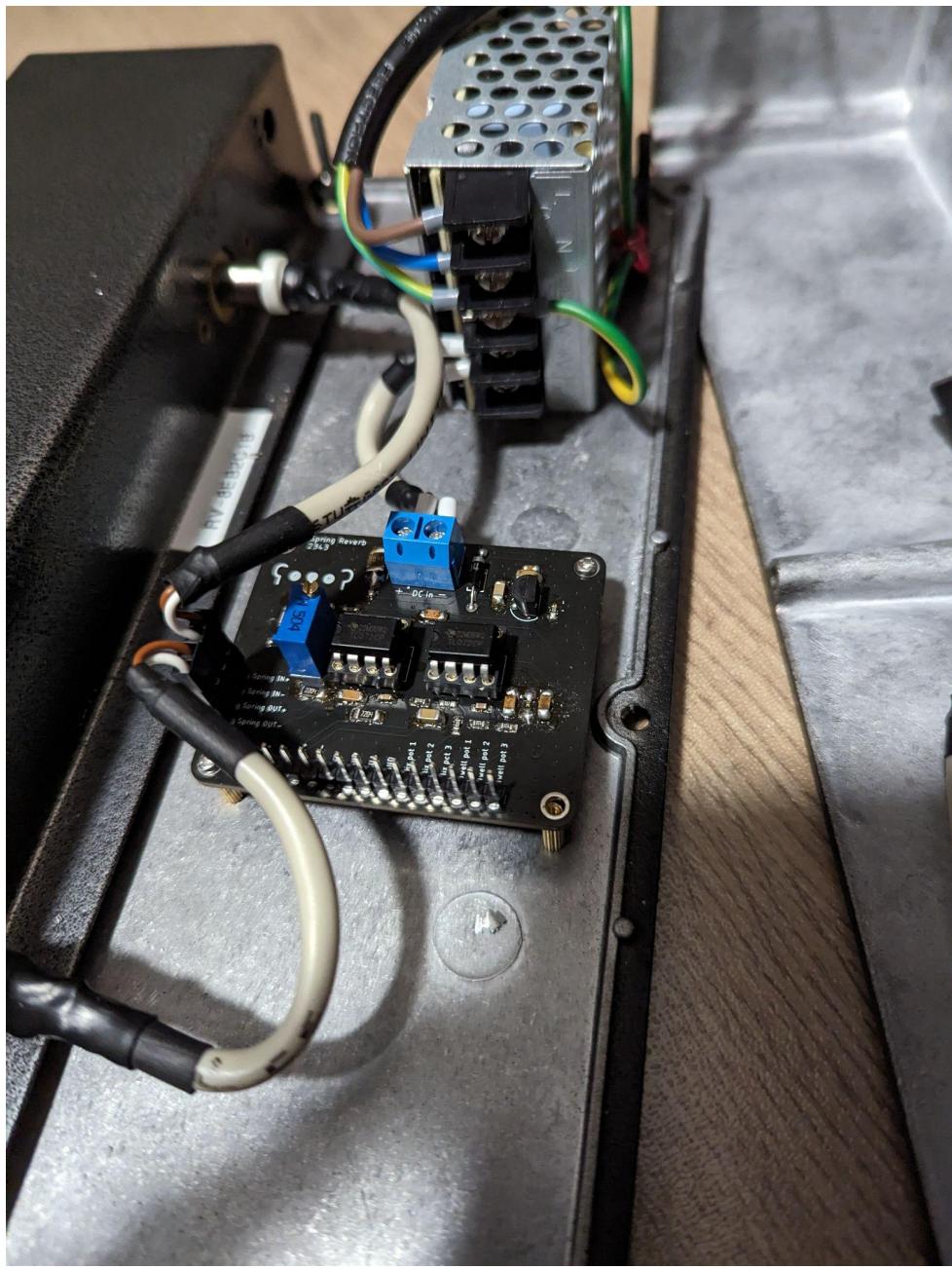
9. Pictures









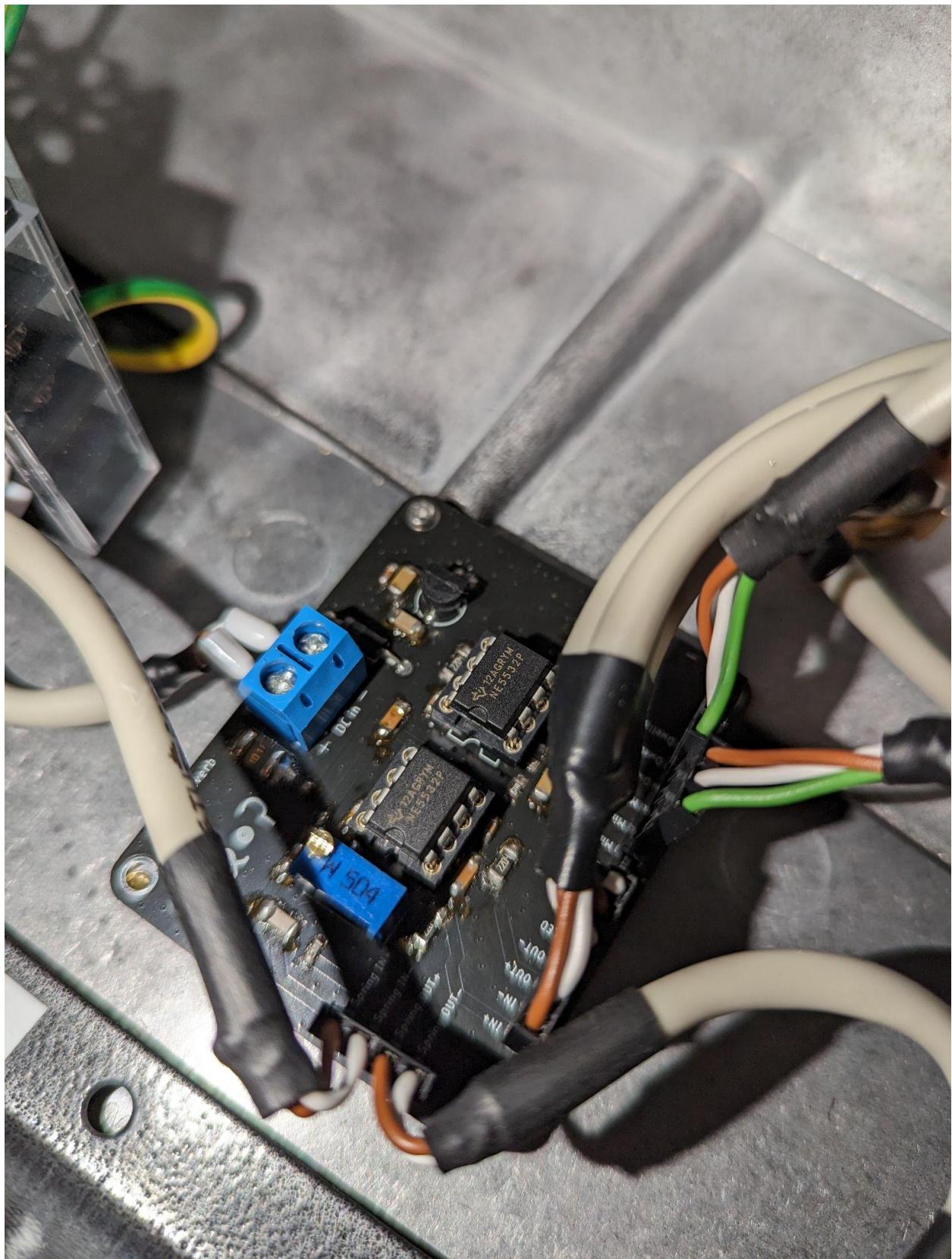














10. Used sources

- [1] Reddit. 2021. *Build my own spring reverb pedal* [online] Available at: <https://www.reddit.com/r/diypedals/comments/mw9ptj/build_my_own_spring_reverb_pedal/> [Accessed November 2023].
- [2] Imgur. 2021. *Spring Reverb Schematic & PCB* [online] Available at: <<https://imgur.com/a/YJTHmMS>> [Accessed November 2023].
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- [6] General Gadgets. 2017. *Stage Center Reverb* [online] Available at: <<https://generalguitargadgets.com/effects-projects/reverb/stage-center-reverb/>> [Accessed November 2023].
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