# www.hifisonix.com

# New Hifisonix Ripple Eater PSU aka ‘REP’

This low-noise PSU is designed specifically for stereo class A amplifiers up to 30W RMS per channel output. It can also be used with stereo class AB amplifiers up to 100W per channel. If you adhere to the REP wiring diagram on slide 15, you can readily achieve peak hum and mains noise levels of -110 dBr on your amplifier. The power supply rectifier and series pass transistors are designed to be screwed to the amplifier baseplate metalwork, which acts as the heatsink.

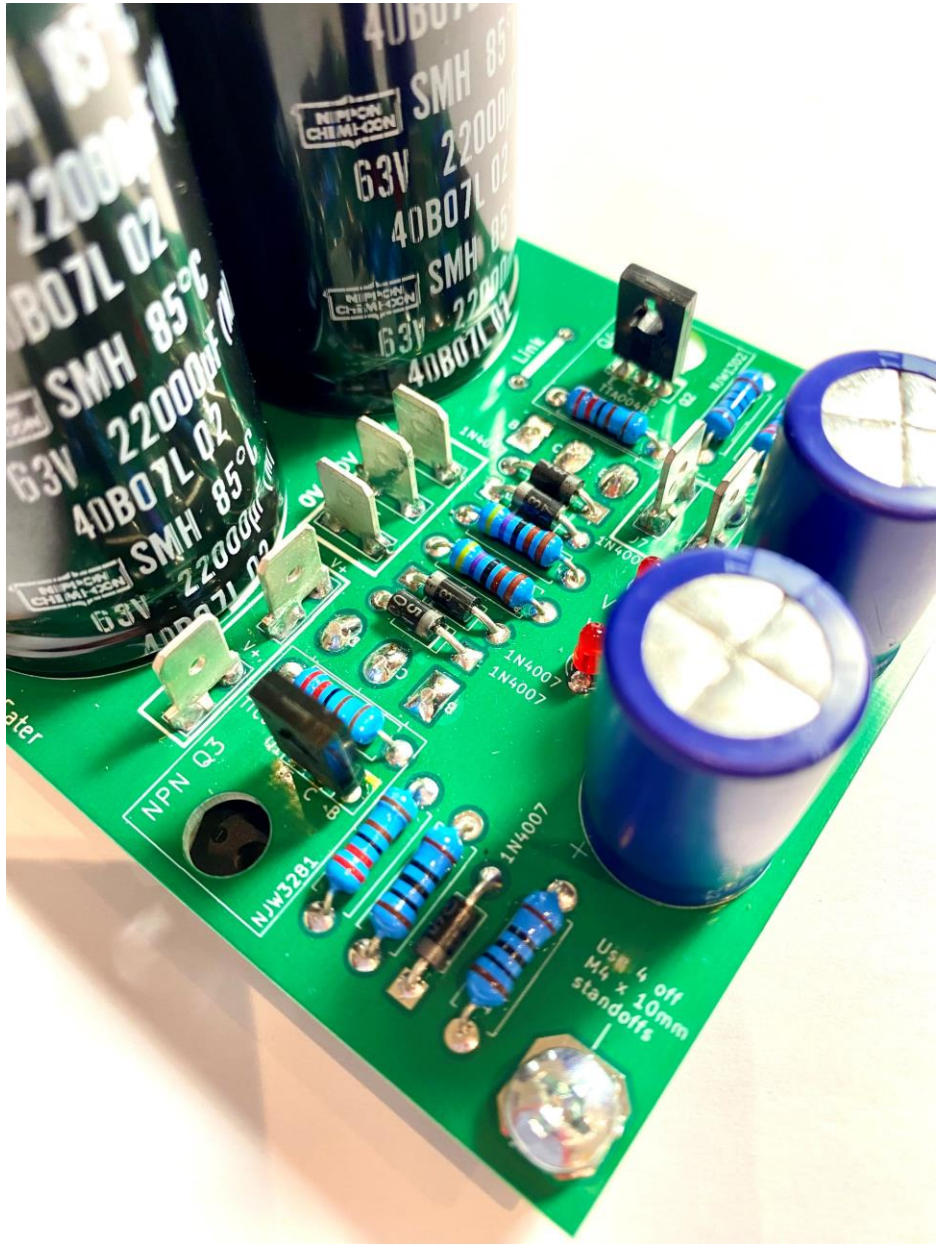
*Read this entire document carefully before assembling the board.*

# REP Specifications

| | | |
|---|---|---|
| Operating voltage range | | +-20V to +-63V maximum (upper limit set by capacitor voltage) |
| Current Draw | | Up to 5A continuous from each rail; 20A peak; assumes adequate heatsinking |
| Power dissipation | | At full continuous load, 12 watts per series pass device + 8 watts for the rectifier, total 32 watts |
| Ripple Rejection | 50 Hz | > 40 dB (100 reduction) |
| | 100Hz | >46 dB (200x reduction) |
| | 1kHz | >50 dB (300x reduction) |
| Ripple Rejection bandwidth | | for >40 dB ripple rejection: 20 Hz to 300kHz |
| Soft-startup time | | ~4 seconds 0V to 90% of final output voltage on each rail; essentially load independent |

Note: For operating voltages below 35V, change R10 and R11 to 3.3k

Order a PCB for the REP by clicking on this link

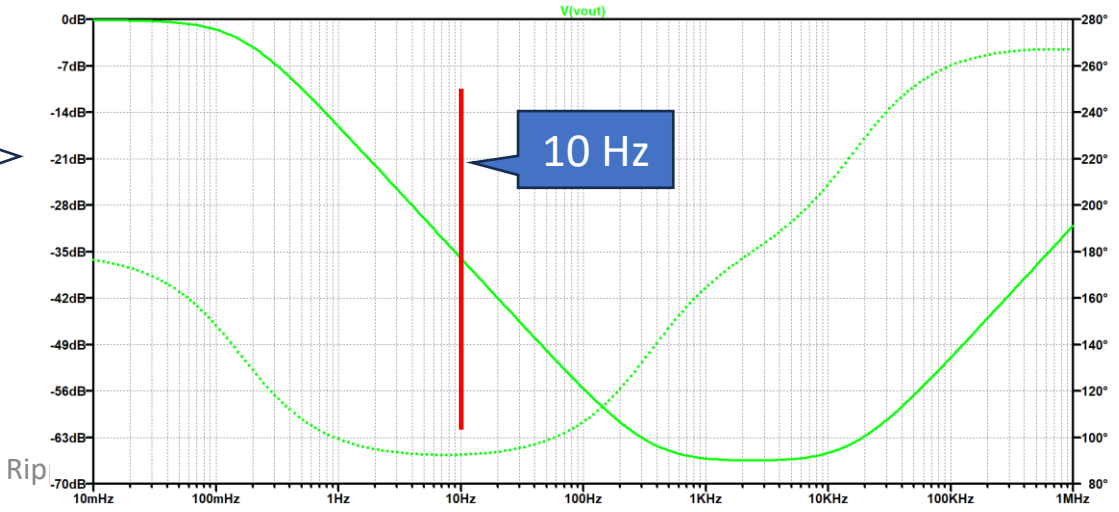

NIPPON CHEMI-CON
63V 22000
40B07L 02
SMH 85°C
1N4007
1N4007
NPN Q3
NJW3281
1N4007
Use 4 off
M4 x 10mm
standoffs


Mount D1 under
PCB with exposed
tab to chassis
heatsink
D1 PB5008
C3

# Hifisonix REP: General Comments

- This split voltage PSU is designed for stereo class A amplifiers up to 30W RMS output per channel and class AB amlifiers up to 100 watts per channel
- It has facilities for 4 off 35mm diameter by 10mm pin spacing capacitors, followed by a ripple eater – one for each rail.
- The user can select the reservoir capacitance they want, within the constraints of the capacitor dimensions mentioned.
- The ripple eater (actually a capacitance multiplier) will drop 1.6 to 2V across each series pass element *at full load*, but effectively *remove all ripple components (rectified AC and load induced) above ~10Hz*.
- The board has been carefully laid out with a contiguous ground plan on the top copper side to ensure radiating loops and common impedance coupling are kept to an absolute minimum.
- The solder mask on the high current carrying conductors under the board is cleared, allowing builders to solder 1mm thick copper wire onto the PC traces to lower trace resistances.
- This improved power supply replaces the original Hifisonix ripple eater power supply and its follow-up version that used NJW1302/1381 series pass devices.

The indicative ripple suppression is shown on the right.



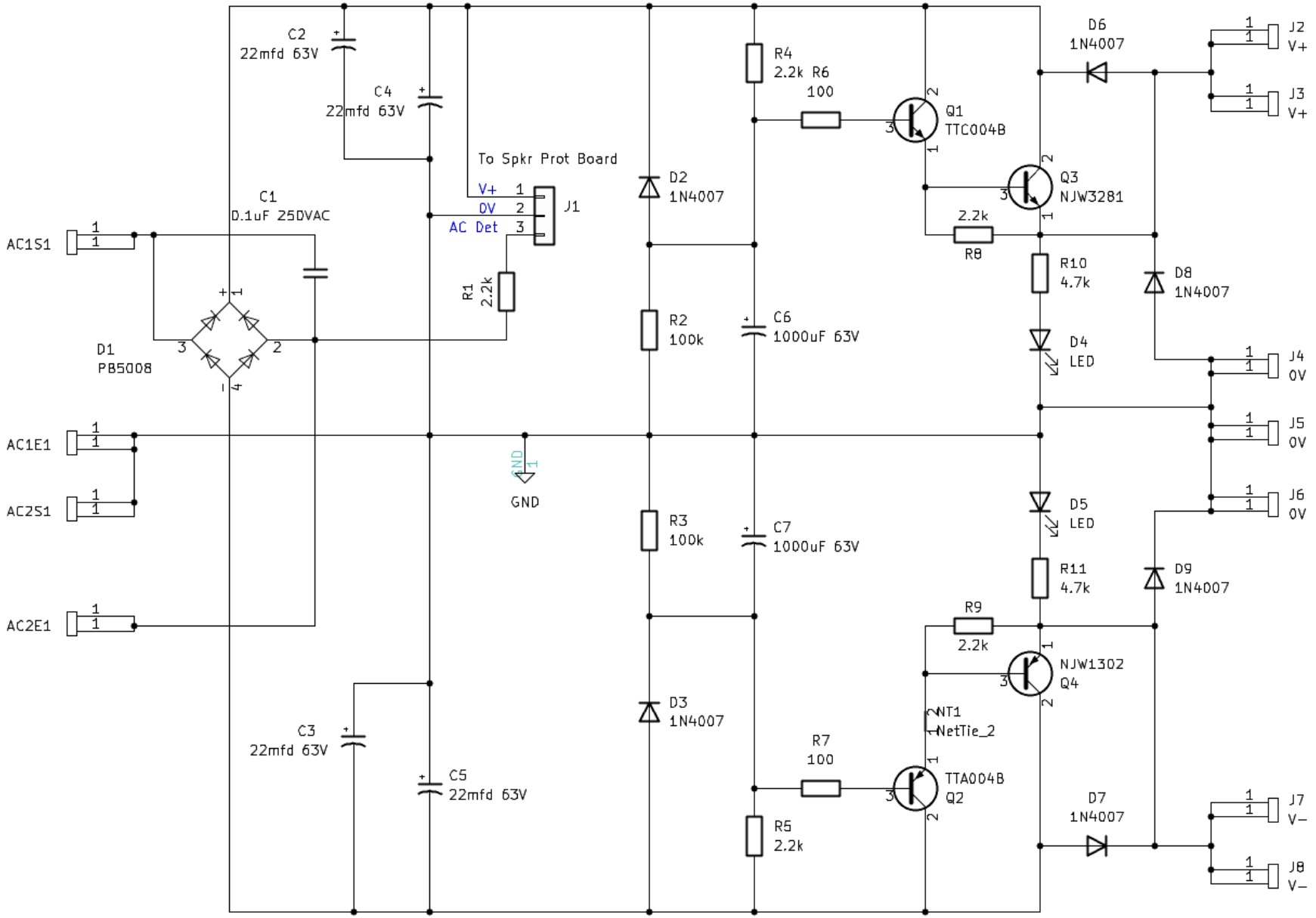



Rip

# Circuit Description

- The REP accepts either a dual or a centre tapped secondary via ACS1 through AC2E1 and uses a single bridge rectifier (D1 PB5008 45A) after which the raw DC feeds the reservoir capacitor bank comprising C2, C3, C4 and C5
- J1, located near D1, provides a convenient set of grouped connections (0V, V+ and AC Detect) to the Hifisonix Speaker Protection Board if you decide to use that. R1 is included to limit the current should the AC detect signal inadvertently be shorted to ground.
- Only the positive half of the circuit will be described here – the negative half is exactly the same.
- R4 and C6 form a low pass filter (fo~.072Hz) which then feeds into the base of Q1 (TTC004B) via base stopper R6 (100 Ohm).
- The emitter of Q1 feeds into the base of Q3, a 15A bipolar transistor (NJW3281), with R8 providing the base emitter bleeder resistor.
- The ripple eater stage feeds the output connectors (J2 and J3 V+), while R10 (4.7k) and LED D4 provice power indication.
- Diode D8 clamps the V+ rail to -0.7V if the rails power up or down unevenly. Note, this diode is designed only to handle short transient spikes of a few 10s of milliseconds.
- Diode D6 ensures Q3 emitter to base voltage cannot become reverse biased - this is an unlikely event, but the eventuality is catered for.
- D2 allows C6 to rapidly discharge on power down. This is important because high currents and high collector to emitter voltages on Q3 stress the device. When C6 initially charges up through R4, the output voltage comes up slowly and therefore the load current on the output.
- R2 provides a further discharge path for when the voltage across C6 is < 0.7V.

# REP Schematic




This ripple eater PSU can be used for amplifiers up to +−63VDC supply rails.

The peak current draw from this supply must not exceed 20A.

For C2 through C5, the PCB will accept 35mm diameter capacitors with 2 pins spaced at 10mm.

For class A amplifiers, 33mfd to 47mfd is recomended.

For class AB amplifiers, 22mfd to 33mfd is recomended.

Capacitor voltage rating must NOT exceed the maximum expected supply voltage.

# Ripple voltage into the ripple eater – estimator. The REP output ripple will be >40 dB lower above 10Hz and 46 dB above 100Hz

Resevoir capacitance in farads

| Resevoir capacitance in farads per rail 50 Hz case | | | | | | | |
|---|---|---|---|---|---|---|---|
| DC Load current per rail | 0.01 | 0.015 | 0.018 | 0.022 | 0.027 | 0.033 | 0.047 |
| 0.5 | 0.50 | 0.33 | 0.28 | 0.23 | 0.19 | 0.15 | 0.11 |
| 1.5 | 1.50 | 1.00 | 0.83 | 0.68 | 0.56 | 0.45 | 0.32 |
| 2.5 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| 3.5 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 4.5 | 4.50 | 3.00 | 2.50 | 2.05 | 1.67 | 1.36 | 0.96 |
| 5.5 | 5.50 | 3.67 | 3.06 | 2.50 | 2.04 | 1.67 | 1.17 |

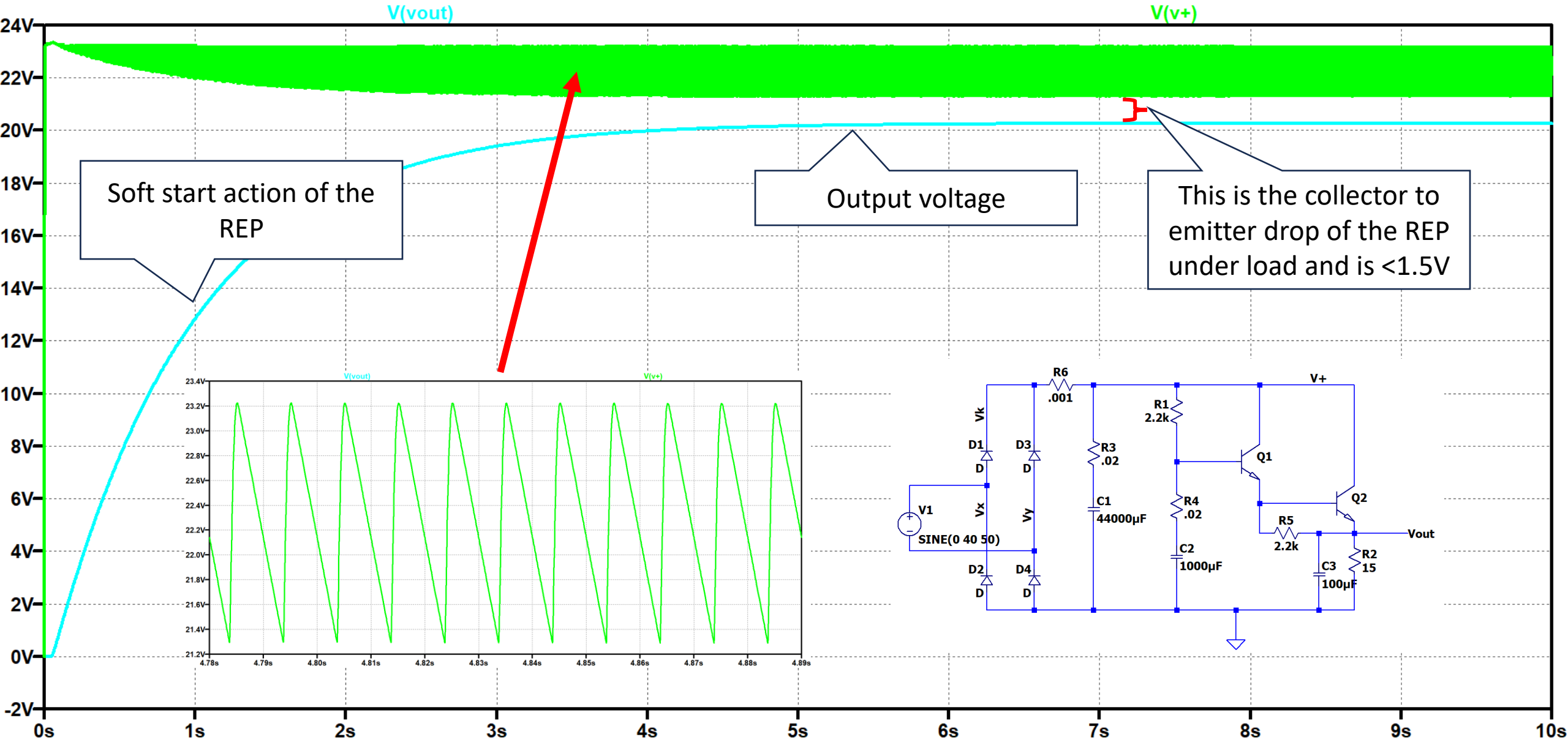
These figures are the pk~pk ripple voltages at the reservoir capacitor output *before the ripple eater stage.* The ripple eater will suppress this ripple by 46 dB at 100Hz and 50 dB at 1kHz

| Resevoir capacitance in farads per rail 60 Hz case | | | | | | | |
|---|---|---|---|---|---|---|---|
| DC Load current per rail | 0.01 | 0.015 | 0.018 | 0.022 | 0.027 | 0.033 | 0.047 |
| 0.5 | 0.42 | 0.28 | 0.23 | 0.19 | 0.15 | 0.13 | 0.09 |
| 1.5 | 1.25 | 0.83 | 0.69 | 0.57 | 0.46 | 0.38 | 0.27 |
| 2.5 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 |
| 3.5 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 |
| 4.5 | 3.75 | 2.50 | 2.08 | 1.70 | 1.39 | 1.14 | 0.80 |
| 5.5 | 4.58 | 3.06 | 2.55 | 2.08 | 1.70 | 1.39 | 0.98 |

You can estimate the pk~pk ripple voltage at the rectifier + reservoir capacitor output from

$$V_{pp} = \frac{I_{load}}{2 \cdot f_{in} \cdot C}$$

# Sim of output ripple vs input ripple for 5A load using a 22mfd reservoir capacitor at 50 Hz



# Assembling the PSU

- The assembly of the board is straightforward, but note the following with respect to the power supply and inrush controller PCB.
- Mount all the components except the main bridge rectifier D1, Q3 and Q4
- Tightly screw the M4 x 10mm + M4 lock washer standoffs to the PCB using 4 off M4 x 8mm machine screws. The lock washer must go to the component side of the PCB. Do not use longer or shorter screws.
- Next, bend D5 and Q3 and Q4 leads up at 90 degrees *towards the front of the devices* at the point on the lead frame where the leads thin.
- Feed the leads into the mounting hole from the bottom.
- Place the PCB with the loose D1, Q3 and Q4 on a FLAT surface
- Make sure the M4 standoffs are flat on the surface, and then ensure D1 is parallel to the edge of the PCB and completely flat on the resting surface before soldering it in position. Repeat the process for Q3 and Q4, making sure they line up with the mounting holes
- Finally, clip off any excess leads protruding through on the component side of the board.

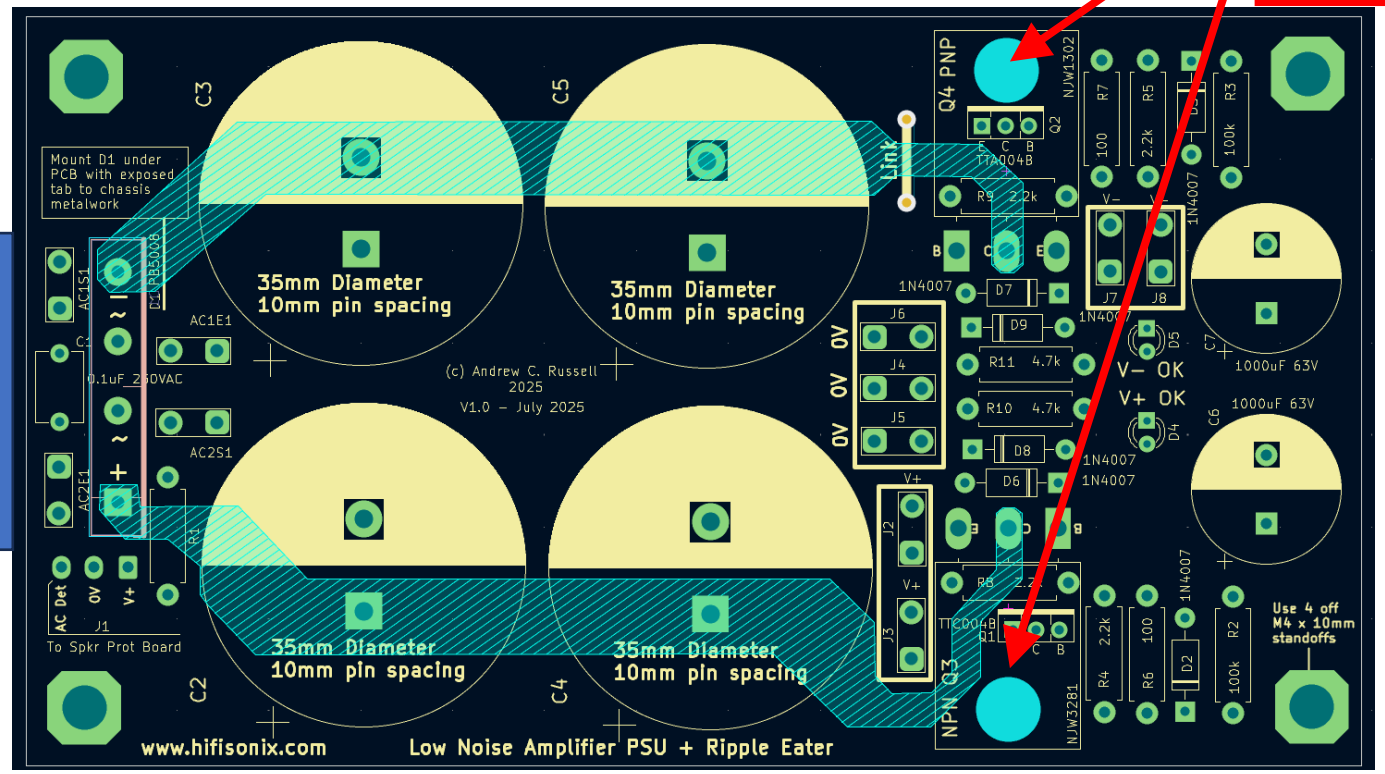
# Testing the PSU before powering up

- Firstly, double check the capacitors are inserted the correct way around. A mistake will be costly and shower your workspace with the capacitor innards. It will stink as well.
- Use you meter and check that the connections between J2 J3 and J4 to to J12 (V+), J14 (0V) and J17 (V-) are all open circuit; check that J9 (AC Detect) to J2, J3 and J4 is open circuit
- Measure from J4 to J2 – it should read between 30k and 33k ohms
- Measure between J2 and J3 – it must be open circuit
- Measure from J14 to J12 – it should start at a low ohm value and increase as the capacitors charge – most important is to make sure it is not a short circuit
- Measure from J14 to J17 – it should behave in a similar manner to the previous step – make sure it is not a short circuit.
- If all of the above steps are ok, the board is ready for use.

# How to mount the REP to the amplifier chassis

Use M3 machine screw to secure Q3 and Q4 to the chassis. Use an insulating thermal washer between Q3 and Q4 and the amplifier base plate

Use M3 machine screw to secure D1 to the chassis. Use some thermal grease between D1 tab and the chassis. You do not need to insuate D1 from the chassis




Use M4 lock washers on the PCB side of the M4 mounting screws.

Do not forget to use insulating thermal washers under to TO-3P Q3 and Q4 devices

D1 and 10mm mtg screw

PCB

M4 x 10mm stand-off

Side view

Chassis base plate

M3 8mm screw

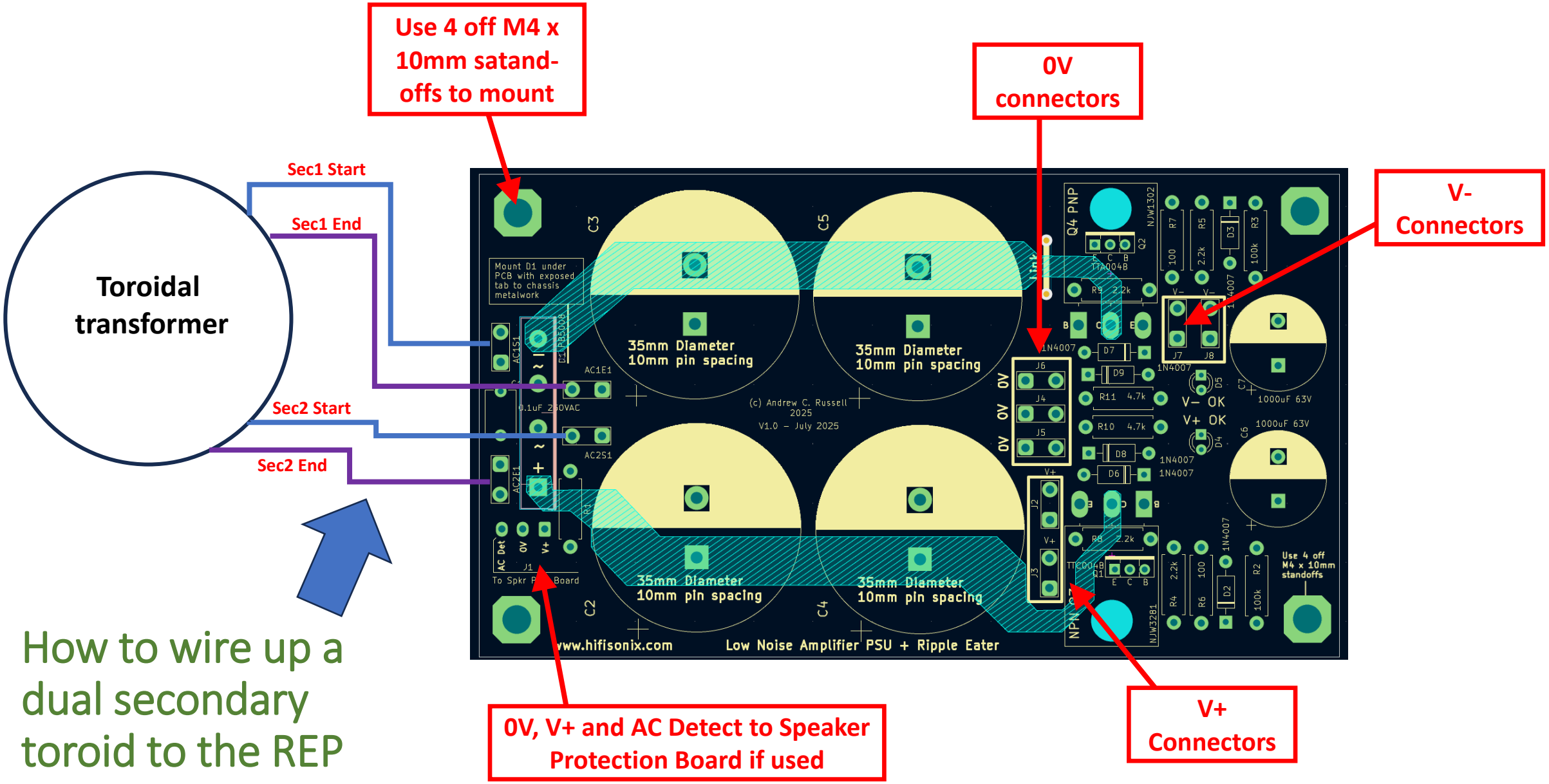
Q3 and Q4

The screws must come from the underside

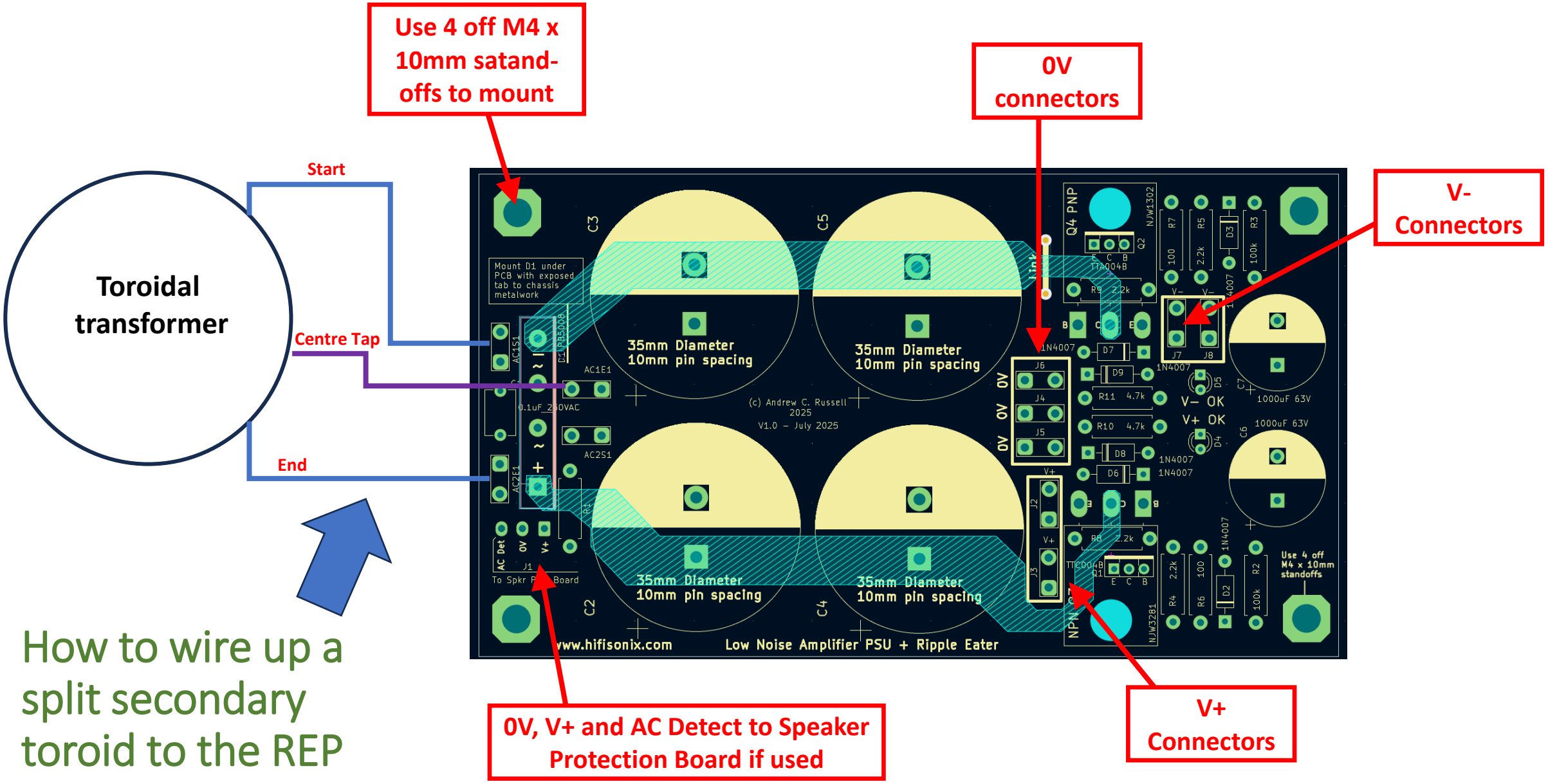
# Important

**Once the REP is mounted on the chassis, check that the connection between the collectors of Q3 and Q4 to the chassis is OPEN CIRCUIT**

# How to wire up a dual secondary toroid to the REP

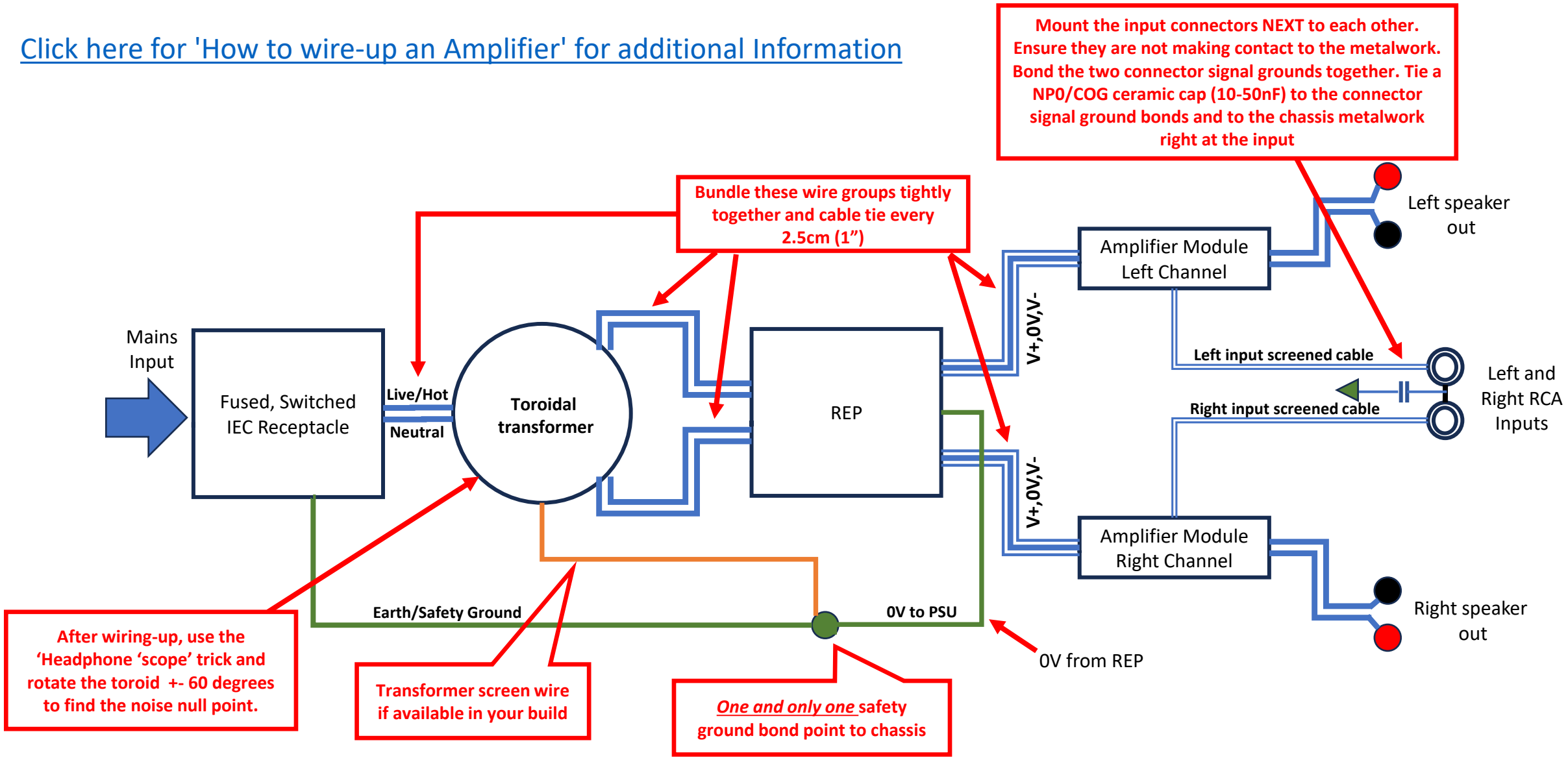


# How to wire up a split secondary toroid to the REP

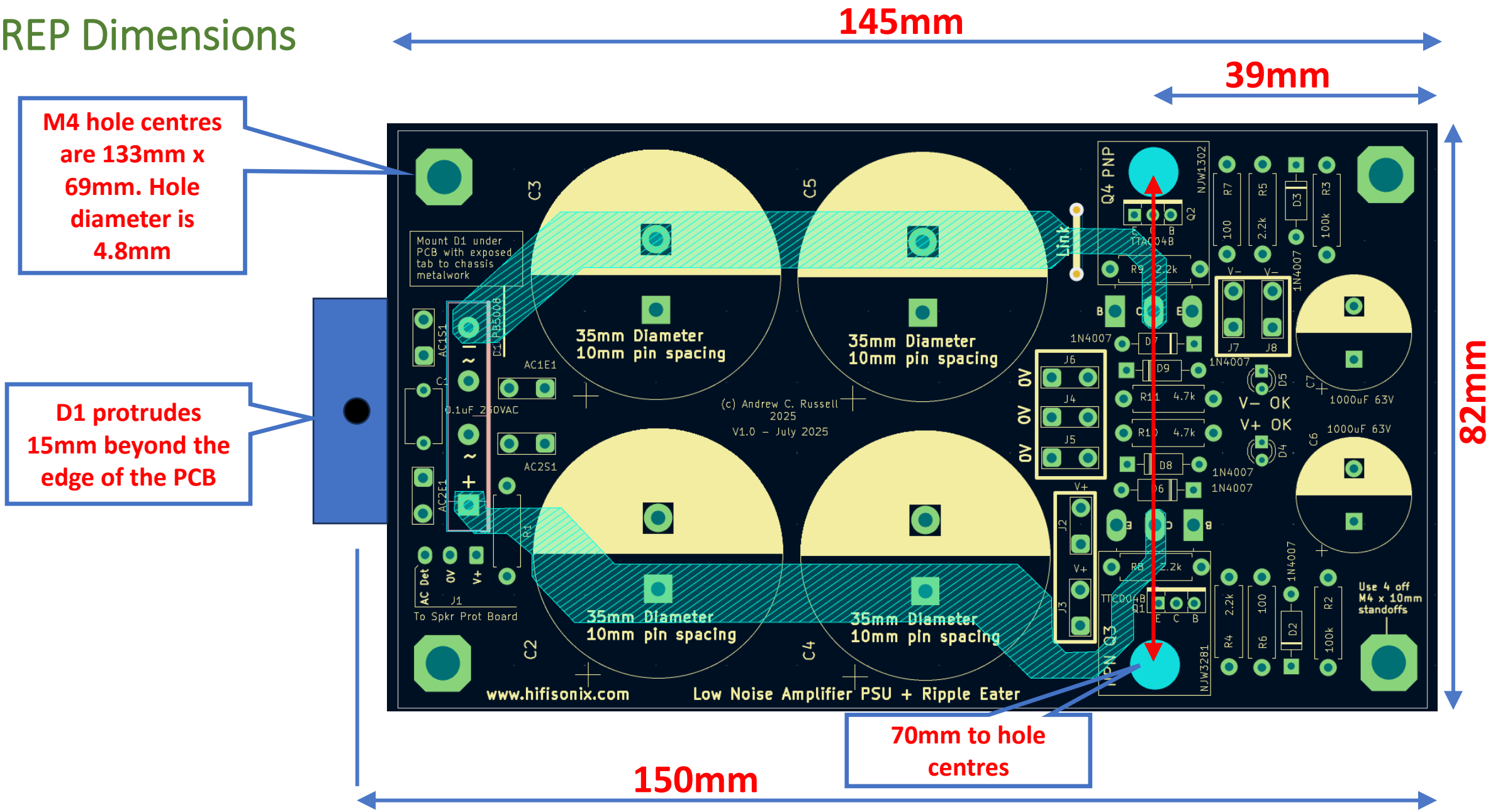


# How to use the REP to get -110 dBr noise floor

[Click here for 'How to wire-up an Amplifier' for additional Information]



# REP Dimensions



# Examples of consumables from Amazon required for wiring up the REP.

Invest in a 6.3mm crimping tool!

Attention: only use fully insulated 6.3mm spade connectors!


ASHINER 580PCS Heat Shrink Tubing Wire Assortment Cable Wrap Sleeve Electric Insulation Tube Kit with Case (6 Colors, 11 Sizes)

Visit the ASHINER Store

4.5 ★★★★½ 744 ratings

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Colour Name: **Multicolored**

£8.99 (£0.02 / count) prime

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4.5 ★★★★½ 7,802

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£19.75

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6.3mm Male Female Insulated Spade Crimp Terminal Connectors Wire Cable Electrical (6.3mm Female Insulated (Pack of 100), Blue)

Brand: Switch Electronics

4.5 ★★★★½ 74 ratings

£5.45 (£0.05 / count)

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**Note:** This item is eligible for **FREE Click and Collect** without a minimum order subject to availability. Details

Size Name: **100 x Female Insulated**

100 x Female | **100 x Female Insulated** | 100 x Male

Colour Name: **Blue**

| | |
|---|---|
| **Colour** | Blue |
| **Gauge** | 16.0 |
| **Stud size** | 6 3 month |

Delivery | Pick-up

£5.45 (£0.05 / count)

prime One-Day

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FREE delivery **Tomorrow, November 17**. Order within 1 hr 4 mins. Details

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Return policy: Returnable until Jan 31, 2023

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