Project - PCB Power Supply Design

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OVERVIEW

Goal;
Produce a functional PCB power supply for use in future projects on a breadboard.

Requirements;

- Accepts 12V input via barrel jack.
- Outputs 12V via screw terminal.
- Outputs 5V and 3.3V to connected breadboard rails via pins.
- Acts to dampen peaks and troughs in current flow.
- PCB must have as small a footprint as possible (whilst being able to connect to the breadboards rails).

SUMMARY

Process;

- Design a circuit to satisfy the requirements using components provided in the robotics class kit. Resulting design shown below in figure 1.

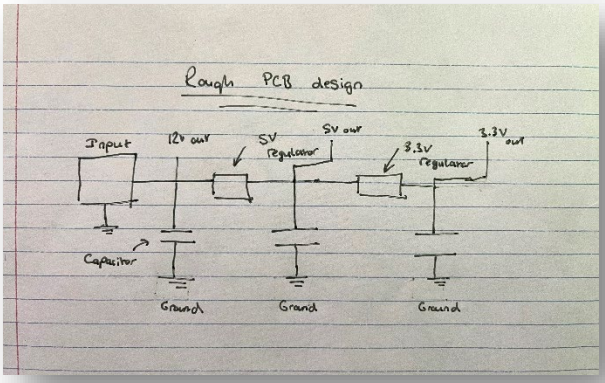

Figure 1

- Using a breadboard produce a functional circuit prototype. Perform sanity checks using the multimeter looking over the different voltages at key points and ensure these align with the desired. Breadboard prototype detailed below in figure 2.

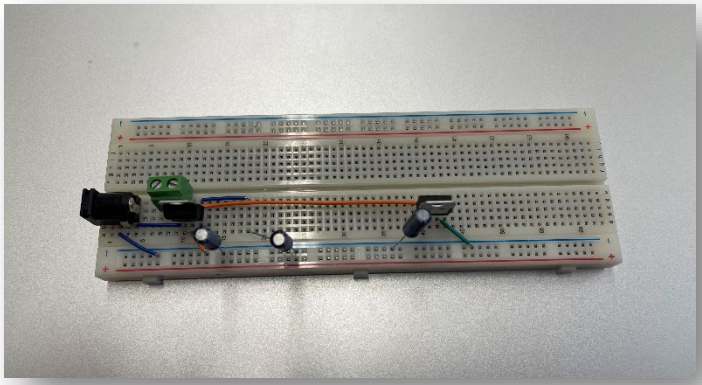

Figure 2

- Draw up the PCB design using KiCad, first via drawing up the circuit and performing and validity check using KiCad. Shown in figure 3.

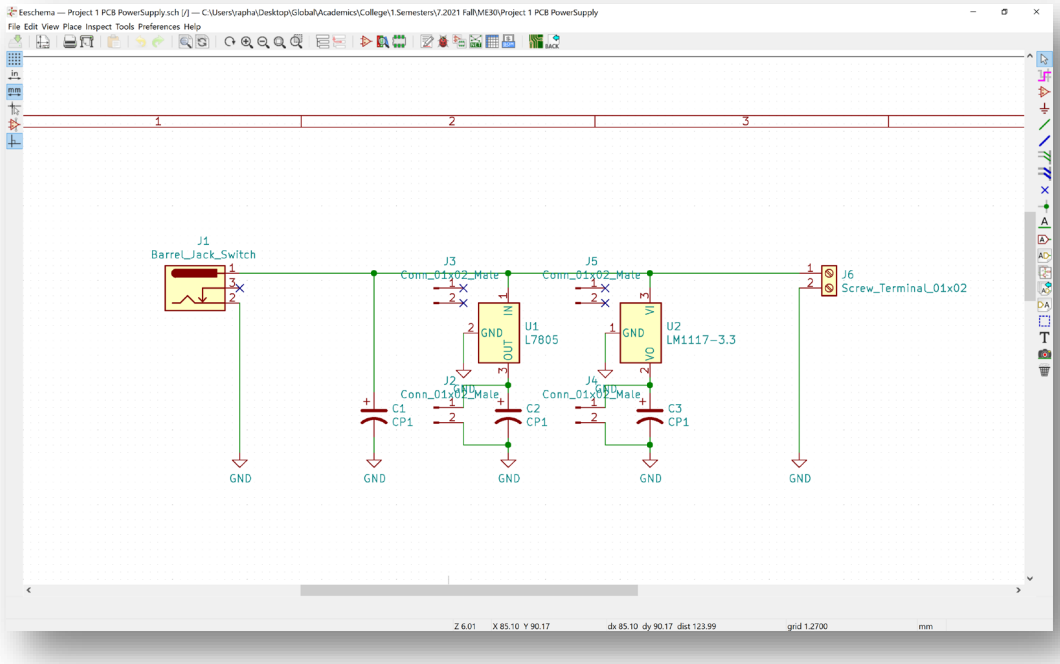

Figure 3

- Assign footprints to each of the components detailed in the circuit diagram, convert the circuit diagram into a net and produce the final PCB design from this. Check the 3D view to confirm everything appears as expected. This is below in figures 4 and 5 respectively.

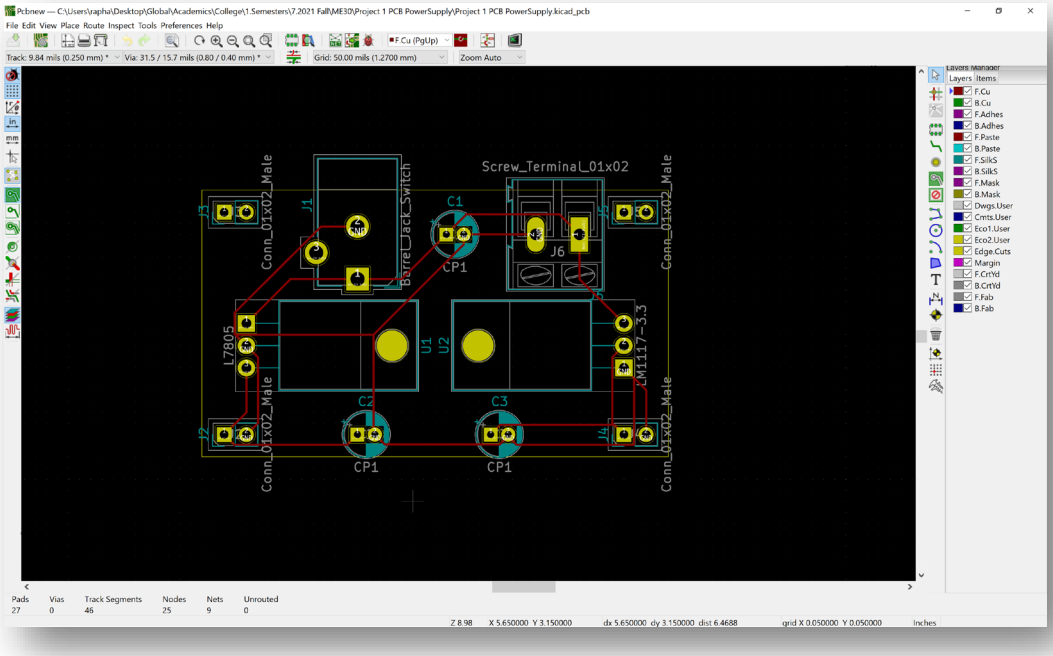

Figure 4

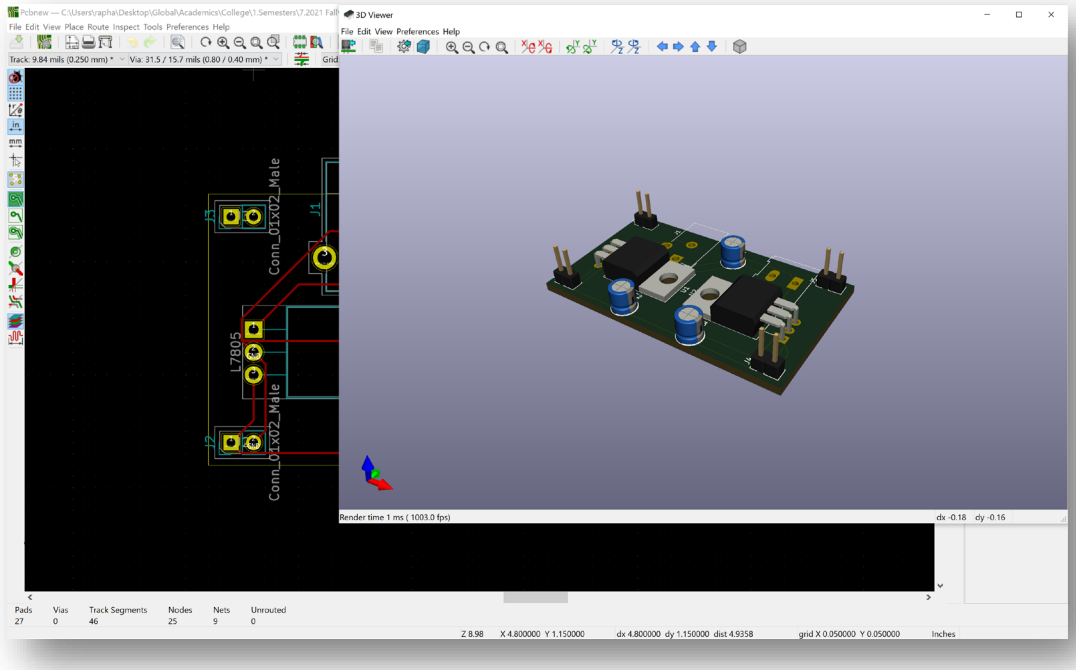

Figure 5

- Submit to OSHPark a PCB manufacturer.
- Upon return from OSHPark solder on components to complete the PCB.

OUTCOME

Result;
Successfully produced a PCB power supply that satisfies the requirements mentioned and can now be used for future breadboard prototyping and projects that require 12V, 5V and 3.3V supplies.

Skills Developed;
Learned how to use a breadboard and varies tools such as a multimeter effectively in the prototyping of circuitry. Developed existing skills in circuit design and learned how to use KiCad for PCB design. Also learnt plenty about using manufacturer specification sheets in the design process and in

Notes;

- Initial sketched design was altered slightly such that each regulator is connected directly to the 12V input, this is because the regulators used are very inefficient and so lose about 50% of the input energy, if connected as initially drawn this would result in the 3.3V output only being at 25% of the input energy. It also minimizes chance of an issue in one circuit impacting another.
- Regulators also needed grounding which was not drawn in the initial rough drawing.