Task 7.2: Power Distribution System PCB - Draft Schematic

Team I – Lunar ROADSTER

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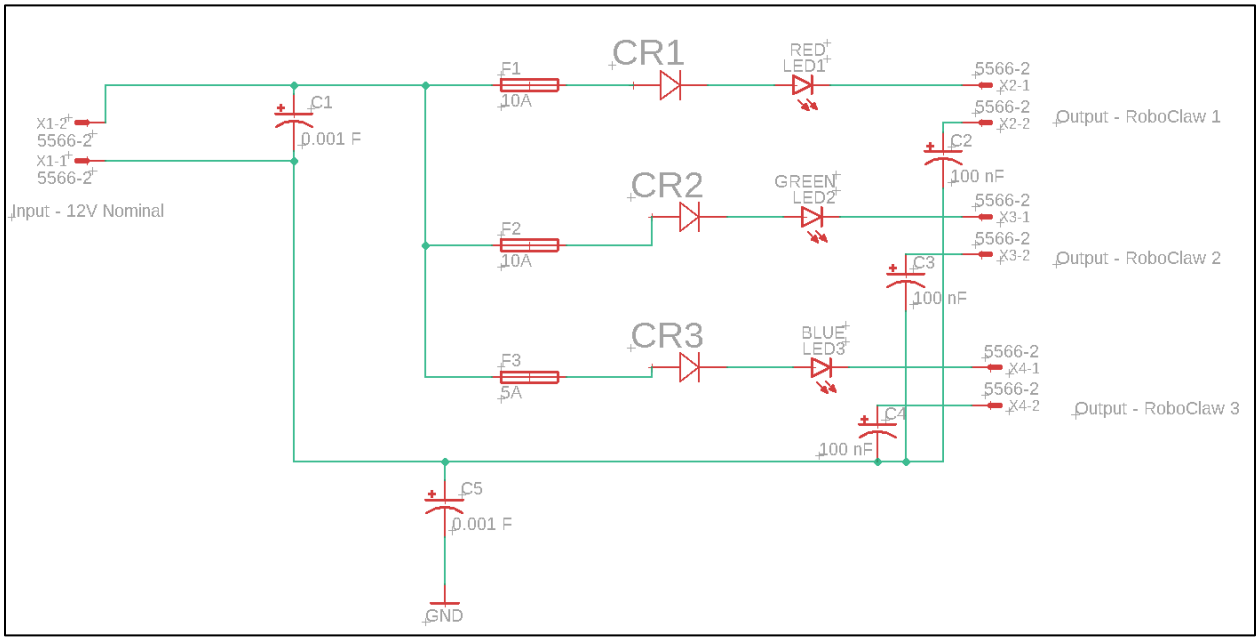
Schematic Design



Along with this PDB Schematic, we will be using an external step-down DC-DC Converter (https://www.mouser.com/ProductDetail/CUI-Inc/VHK200W-Q24-S12-DIN?qs=WyjlAZoYn50MbhLXm0mMOA%3D%3D).

As our current requirements are high (5-10 A), we could not find suitable regulators or step-down converters that could be part of the PDB. The PDB contains 3 outputs for each motor driver (RoboClaw), including overvoltage (using fuses) and reverse voltage (using diodes) protection. Bypass and Decoupling capacitors minimize any noise in the system from the external step-down converter. Additionally, LEDs are used to monitor the power of each output connector.

Heat Dissipation

The VHK200W-DIN operates at an 84% efficiency with a maximum output current of 16.7A. It comes with an onboard heat sync and integrated over-temperature protection, as it shuts down if the device temperature reaches 110°C.

At Peak Conditions,

Output Power (MAX) = 200W
Input Power = 200/0.84 = 238 W
Heat Dissipated = 238 – 200 = 38 W

At Nominal Conditions,

Current Drawn by each motor controller = 3 + 3 = 6A
Output Power = 12 * 6 = 72 W
Input Power Drawn = 72 /0.84 ~ 86 W
Heat Dissipated = 86 -72 = 14 W

The onboard heat sync will dissipate all of the heat. We will ensure that the placement of the step-down converter on the rover allows it to receive the required airflow.

Additionally, the motor drivers are also equipped with onboard heat syncs to dissipate any additional heat.