

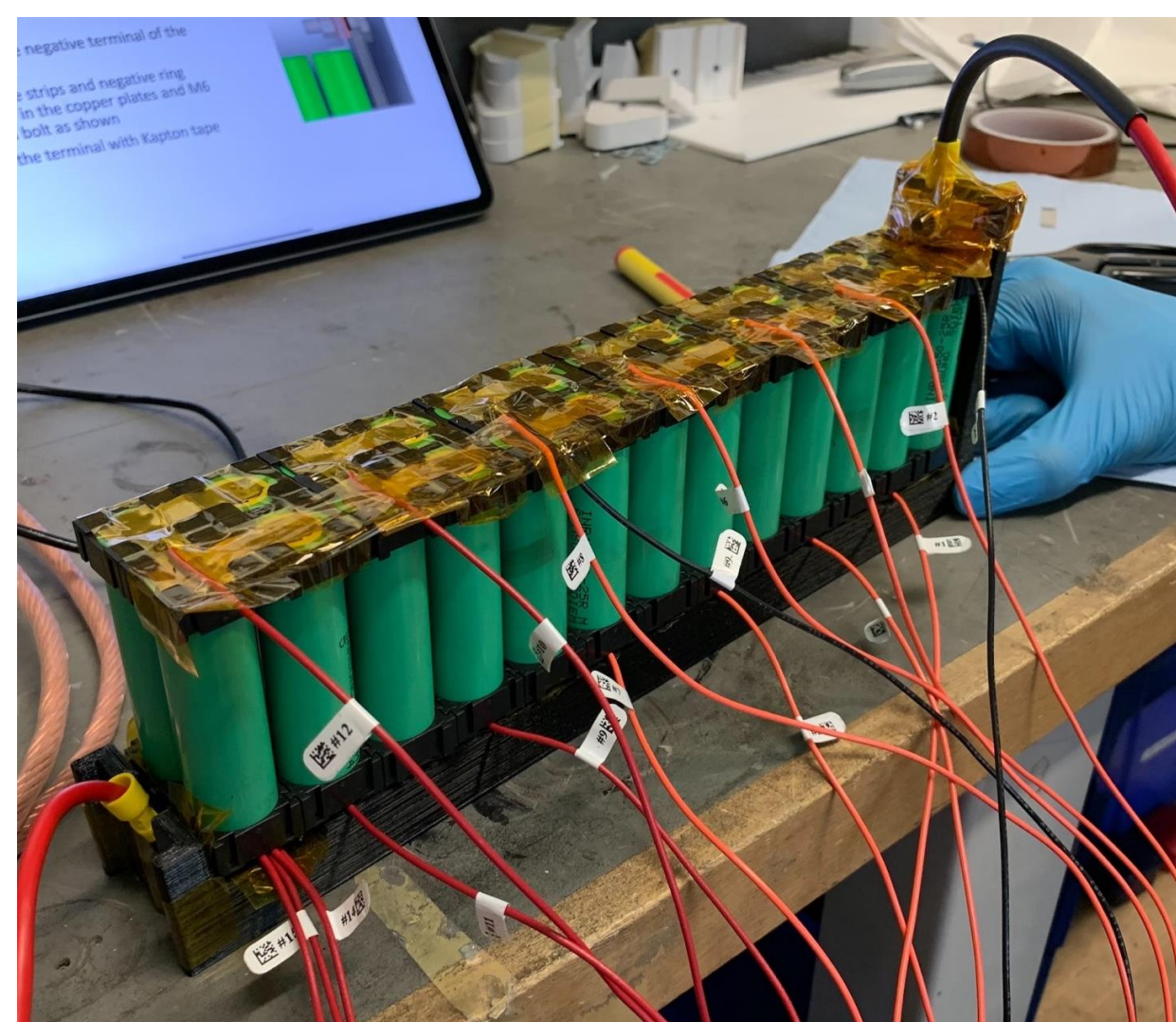


## Shell Eco Marathon Aim

- Imperial Racing Green (IRG) is working to present a single-seater electric vehicle to compete in the battery electric prototype class of the annual Shell Eco-Marathon (SEM) Race.
- This is a competition in energy efficiency, with teams competing to use the least electrical energy to complete 11 laps of the Mercedes-Benz World race-track in Weybridge, giving a total race length of 15.6km in under 39 minutes.
- Our DMT aimed to produce a competition ready vehicle and focused mainly on the battery and powertrain.

## Battery & Circuit

- Samsung 25R lithium-ion cells in a 13 series 2 parallel cell configuration.
- Orion Jr 2 Battery Management System (BMS).
- Safety Circuit designed using relays, switches and button with logical order and ergonomics.



Assembled battery and holder, with BMS voltage taps.



Assembled Powertrain and Circuit

## Powertrain

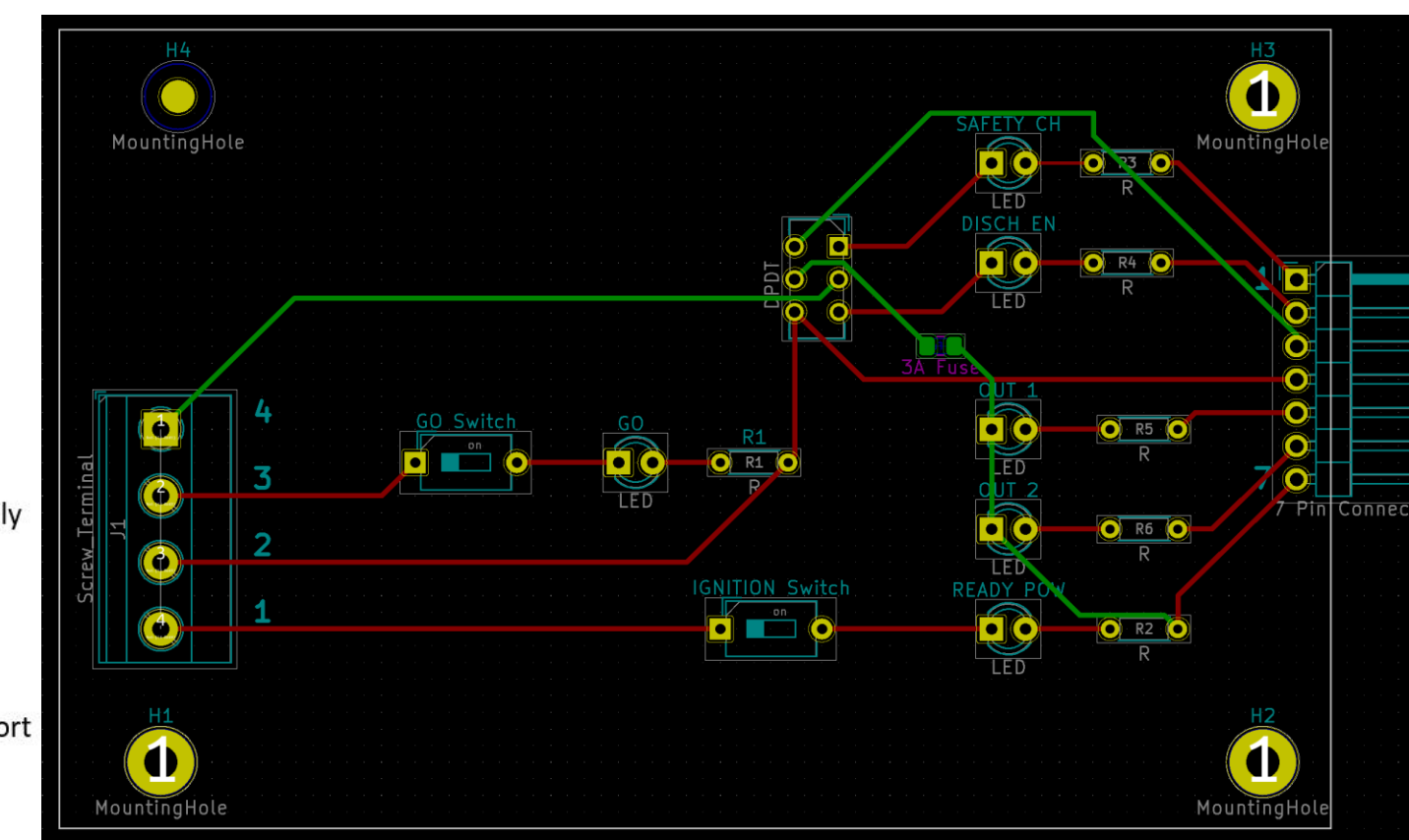
- Single-step chain drive transmits the mechanical power from a 200W DC motor to our real-wheel driven car using 46:11 ratio.
- Chain tensioning and sprocket alignment provided using slots in the motor mount and powertrain base plate.
- Testing performed on the powertrain under mechanical load and freewheel.



Labelled photograph of assembled powertrain

## Printed Circuit Board

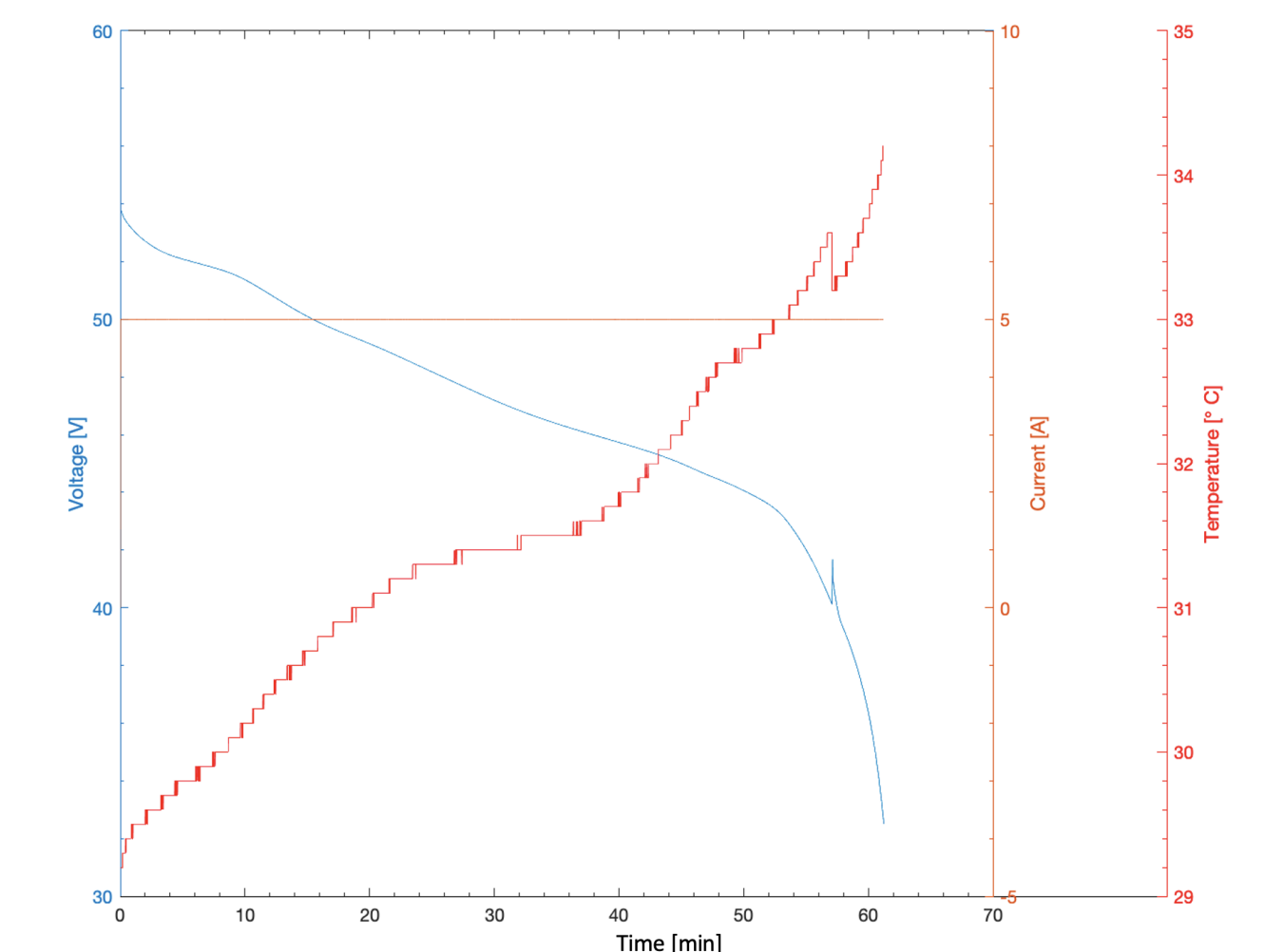
- Chosen component for re-design.
- Objective → Add warning LEDs and make assembly easier.
- Green tracks → Top surface of PCB.
- Red tracks → Bottom surface of PCB.



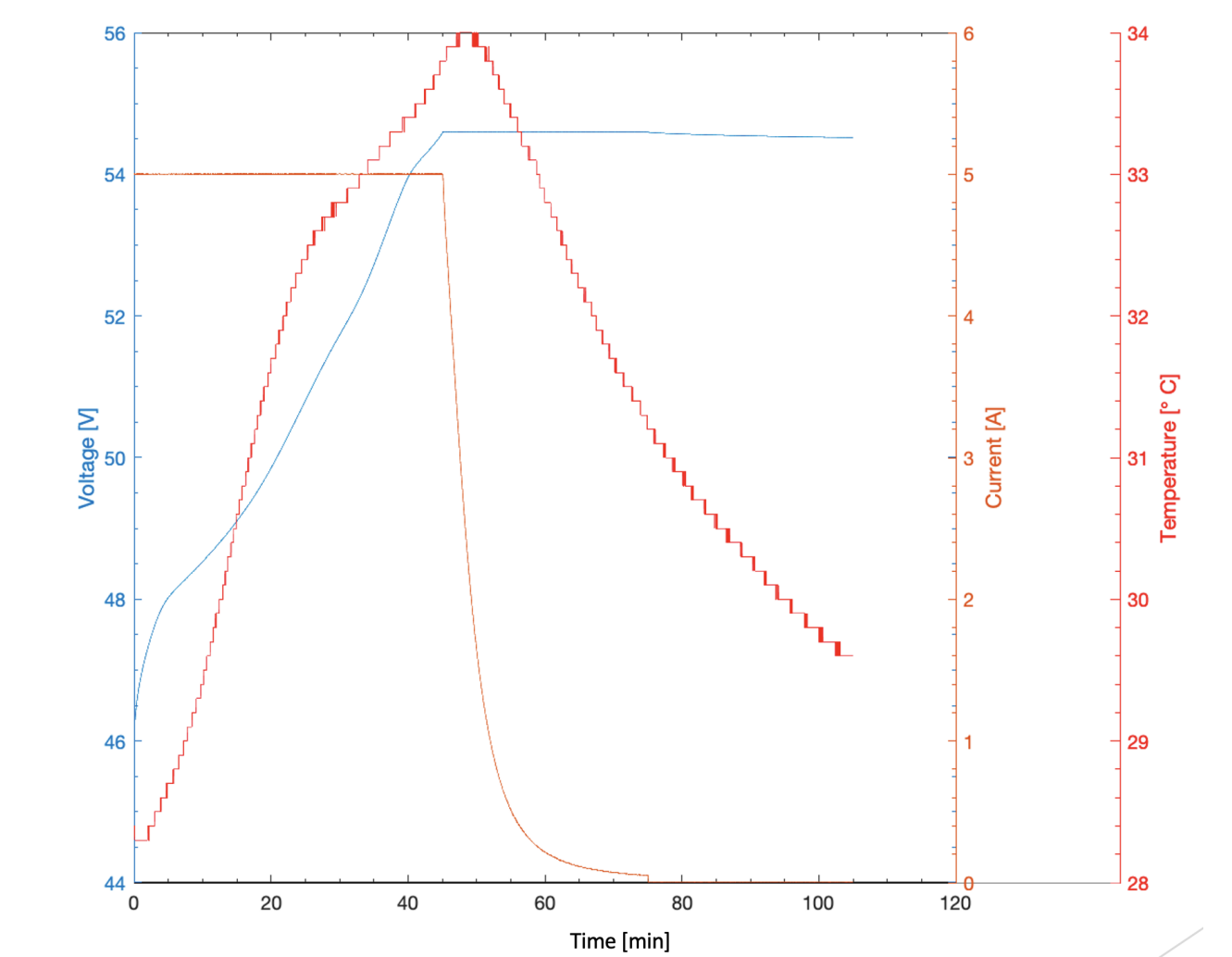
PCB Manufacturing Layout.

## Results

- Battery Test showed a capacity of 5Ah when discharged at 5A with a temperature rise of no greater than 6°C.
- All electrical components functioned as expected.
- 7.2W of input electrical power required to overcome transmissions losses at 7.5m/s.
- We are confident, the vehicle will perform well based on our results.



Voltage, Current and Temperature vs Time during constant 5A Discharge



Voltage, Current and Temperature vs Time during constant 5A Charge