Battery Tester

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Information Technology, Option of Device and Product Design

Introduction

This project aims to create a battery tester that can charge and discharge Lithium-ion batteries. The battery charger also has an encoder with a push button and an LCD screen for a user interface.

Objectives

The first objective of this project was to select the correct components that make this project possible and to design a schema and layout for the circuit board. The circuit board layout is shown in Figure 1 below.

The next objective was to program the ATmega328P MCU to read and process analog measurement data and display it on an LCD.

The last objective was to solder all components to the circuit board and test that everything works as planned.
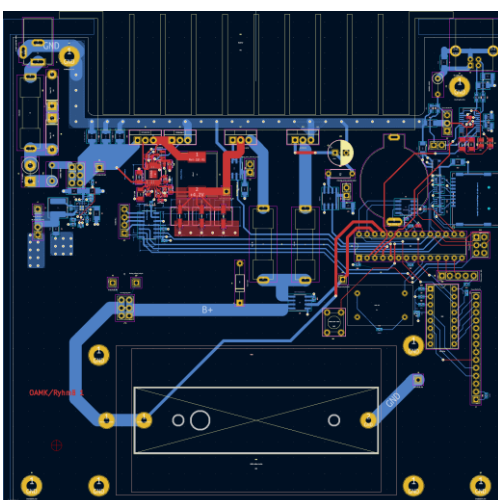

FIGURE 1. Board layout.

Electronics Application Project

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Methods

KiCad CAD software was used to design the circuit board. The school's lab equipment was used to solder and test all circuit board components. The battery tester is being tested in Figure 2 below.
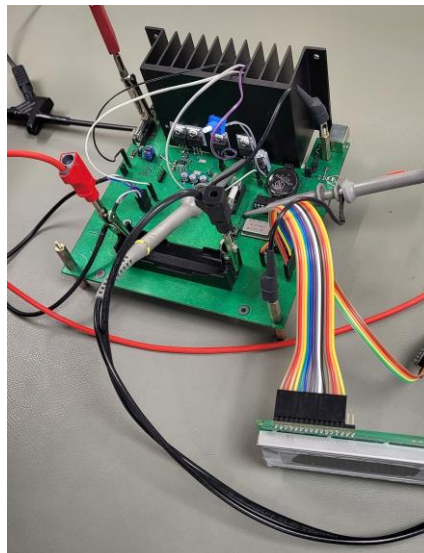

FIGURE 2. The Battery Tester.

Results

Choosing the correct components and designing the Circuit board layout turned out to be a difficult task with a tight time schedule. The circuit board had many broken vias which resulted in the MAX15046C 4.2V buck converter not working at all. The 4.2V buck converter was replaced with an external DC power supply.

The User interface had the option to choose Discharge or Charge mode. In the info screen user could monitor the battery voltage, Charge, and discharge current, and see battery capacity. The UI is shown in Figure 3.

The MAX17630C buck converter was used to get 5V 1A output for the ATmega328P MCU and ACS712 current sensor.

FIGURE 3. UI, Info page selected.

Conclusions

The circuit board had many broken vias. This caused major delays and MicroSD card and USB connectivity functions were not quite finished.

Temperature measurements were dropped due to time constraints. The basic functionality of charging and discharging a 18650 li-ion battery works. LCD UI and monitoring of the battery voltage and capacity in real-time works.

References

5V buck converter datasheet: https://www.analog.com/media/en/technical-documentation/data-sheets/max17630.pdf

4.2V buck converter datasheet: https://www.analog.com/media/en/technical-documentation/data-sheets/max15046-max15046b.pdf