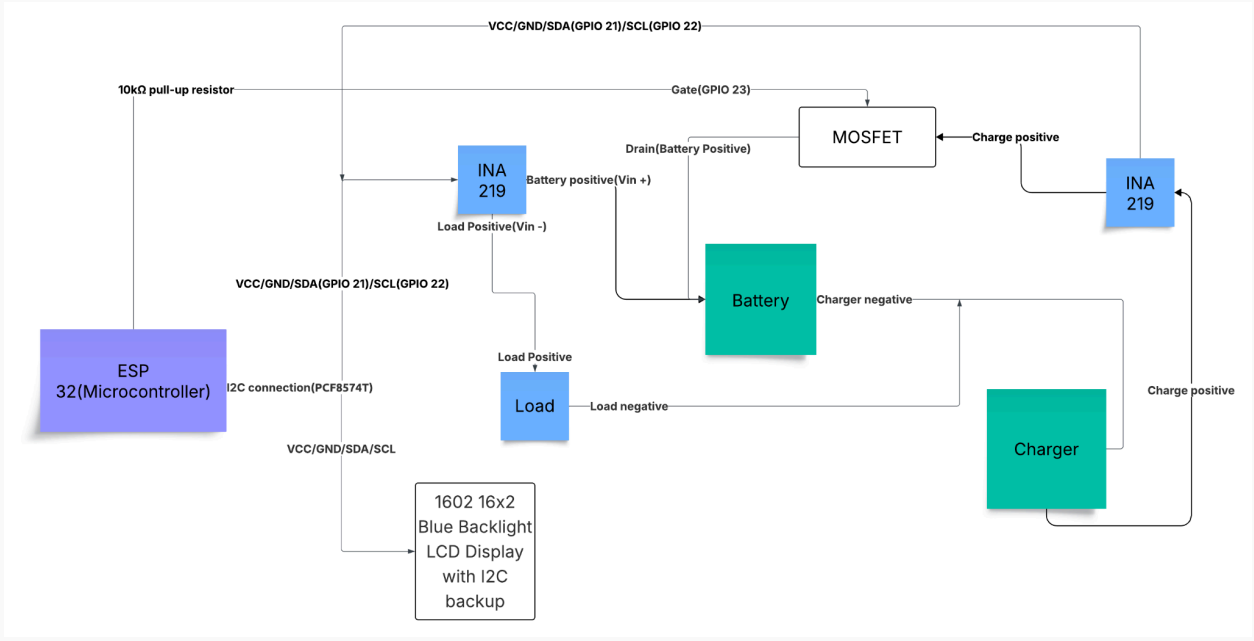
Updated Project Proposal.

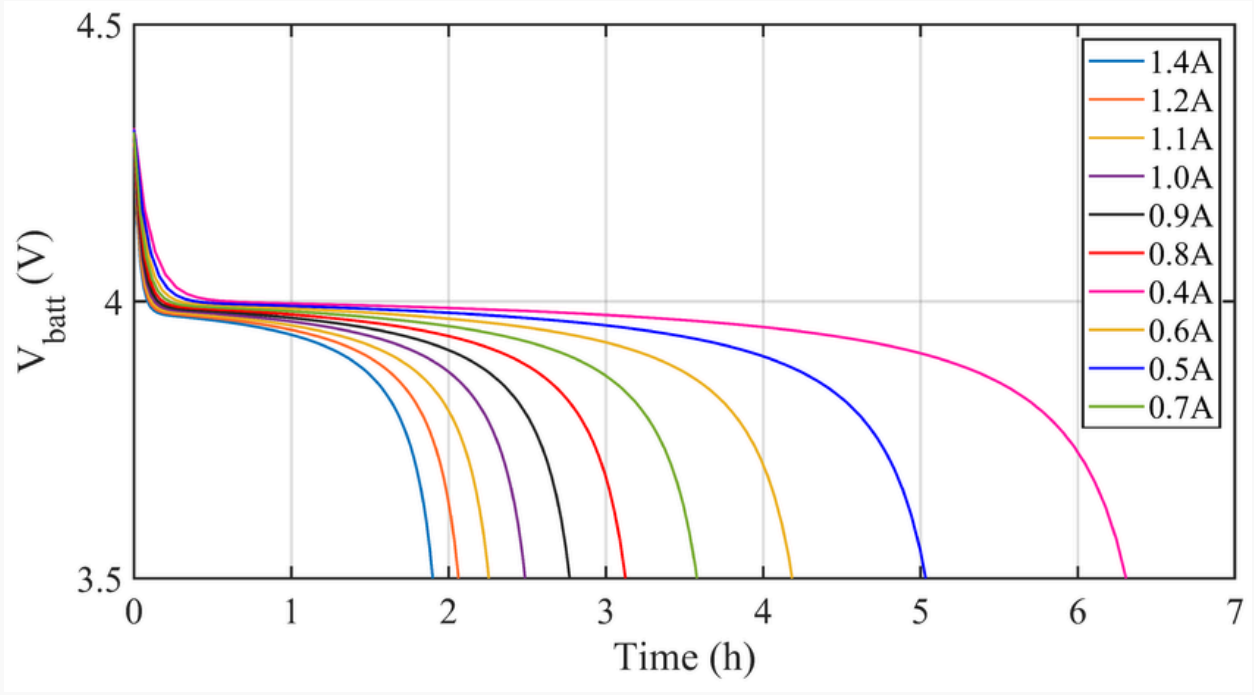
Relevant Components :
INA219 Current Monitor Voltage Sensor Module I2C 0-26V 3.2A Supply 3-5VDC - Rs.420
https://tronic.lk/product/ina219-current-monitor-voltage-sensor-module-i2c-0-26v-?srsltid=AfmBOop3T3LZ8Y2IJewfmsqibkeW2jtIms9QVPsp0FdidRe1dPagNcir
ESP 32 - Rs.1100
1602 16x2 Blue Backlight LCD Display - Rs 320
https://tronic.lk/product/1602-16x2-blue-backlight-lcd-display?srsltid=AfmBOopXBzj6PsD0DqRl6kXT6KU2xYW58dcir82kUDWxyHQuzUYldIlb
IRF540N Power MOSFET - Rs.70
https://tronic.lk/product/irf540n-power-mosfet?srsltid=AfmBOoqewqEqIg4nlYBA_cxQlp8QPsZecLCFkeRiac2KBTwUYFUJ3uXc
PCF8574T 8-bit IO Extension - Rs.320
https://tronic.lk/product/pcf8574t-8-bit-io-extension-expander-module-iic-i2c-wit?srsltid=AfmBOor4rr182MRGDxAAssaHIL-ugJe205SUk4AENJAtFFHr0F2D5o1f
Battery Charger - Rs.50
https://tronic.lk/product/tp4056-5v-1a-micro-usb-18650-special-lithium-battery-ch?srsltid=AfmBOop14VVq15i8IMJCYJFbC5WOzY3hCpCEa9Cz5Cdsie217vtOhrsM

Hardware Structure :

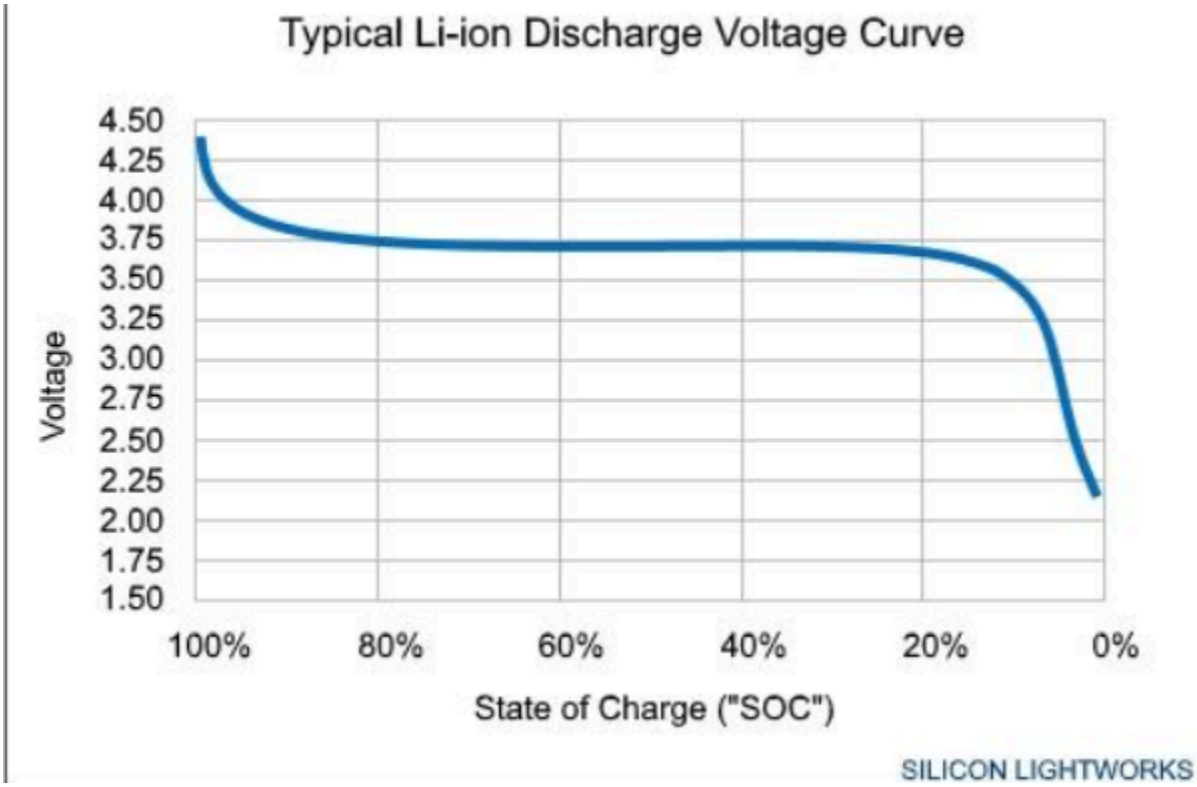


Link :
https://lucid.app/lucidchart/ab63548f-051f-4156-9031-f49bf163c6a3/edit?viewport_loc=-1075%2C-928%2C2844%2C1316%2C0_0&invitationId=inv_29a397d6-b607-4a47-abae-1adfe2832558

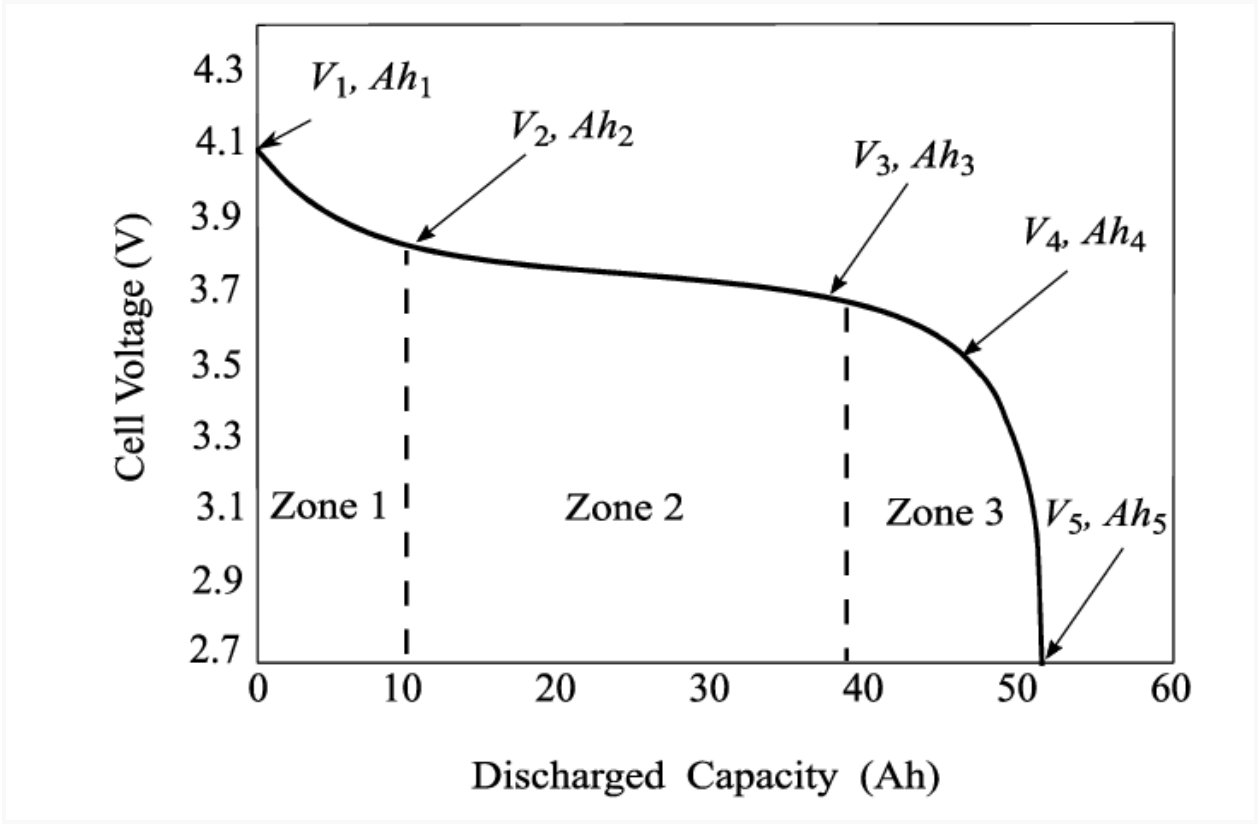
Graph analysis and algorithms :



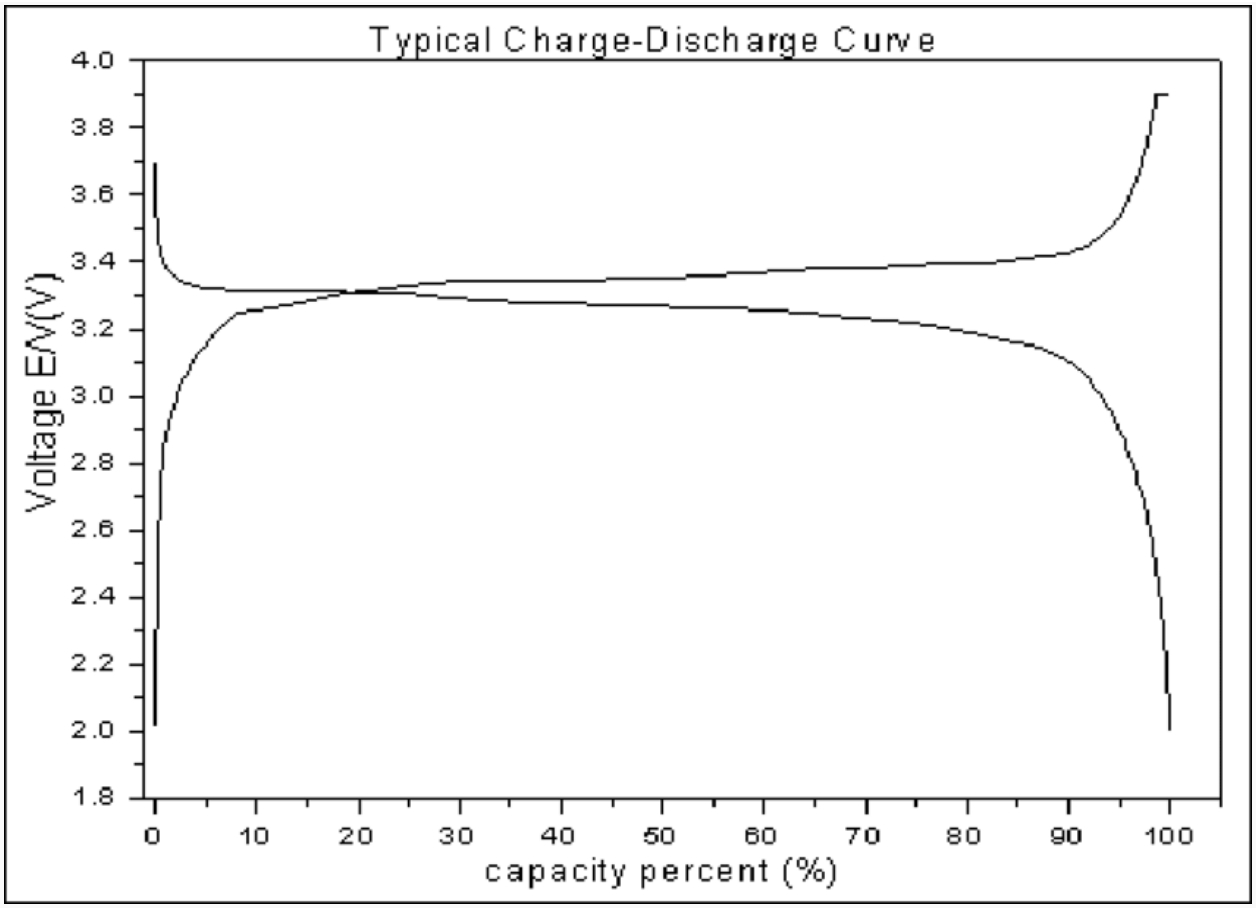
Graph 1



Graph 2


4.3
4.1
3.9
3.7
3.5
3.3
3.1
2.9
2.7
Cell Voltage (V)
V_1, Ah_1
V_2, Ah_2
V_3, Ah_3
V_4, Ah_4
V_5, Ah_5
Zone 1
Zone 2
Zone 3
0
10
20
30
40
50
60
Discharged Capacity (Ah)

Graph 3



Graph 4

Process :

- Power up the battery and calculate the voltages and current draw via INA module and use a timer in esp 32 to get the time.
- Then it breaks the connection with the charger and begins to power up the load.
- The INA module connected to the load will give the current draw and voltage of the system.
- Using a calculation the remaining time and SoC will be displayed in the LED screen.

Used algorithms

The charging curve and the discharge curve with capacity vary in nearly the same manner(Graph 4).

- Capacity(mAh) = Current(mA) x time
- Time = Capacity / Current

Future improvements

- Using simple machine learning model to get the output without charging inputs

Comments and Suggestions

- Week 1
  Change the battery management system to energy management system
  Try to charge the cells when discharging at the special position
- Week 2

Understand the diagrams
Use an AI model and algorithms

- Week 3

No need to use AI model
Reduce the components(High cost and high power consumption)
Restructure the structures

- Week 4

Refer the graphs and simplify the system

- Week 5

Use data sheets to help
Try to find good MOSFET
And more efficient battery charger than TP4036
Add the MOSFET near the charger.

- Week 6
- Week 7