BMS Algorithm

(Please refer the INDEX on the last page for elaboration of the abbreviations used)

Step 1: Start by displaying Hello message

Step 2: Read individual voltages from all voltage sensors (Voltage monitoring function)

Step 3: While Charger is not connected, and Battery is connected

Step 4: If any of the cell voltage is <=2.5 display low charge warning message, turn off D-FET and exit.

Step 5: Else call the discharge function where power is supplied continuously to the load till the cells discharge up to 2.5V

Step 6: Call voltage monitoring function

Step 7: While charger is connected, and voltages of cells are <=3.9 or 4V

Step 8: Call charger function where the C-FET is turned ON and Cell balancing function is called.

Voltage Monitoring:

1. Continuously read the analogue output of Voltage sensors into the ADC of STM32.
2. Voltage V1=Vs1 (Vs is Voltage read by the sensor)
   V2=Vs2-V1
   V3=Vs3-V2
   V4=Vs4-V3
   V5=Vs5-V4
   V6=Vs6-V5
   V7=Vs7-V6
   V8=Vs8-V7 (Vs8 is the Total voltage of the battery pack)
3. Display individual cell voltages along with Vs8.

Discharge Function:

Let's consider the pin connected at source of C-FET as Dp

1. Call voltage monitoring function()
2. While Dp==1 && V1>2.5 && V2>2.5.....V8>2.5{
3. Set o/p pin connected to D-FET
4. Call voltage monitoring function ()
5. If (V1<=2.5 or V2<=2.5 or.....V8<=2.5) {
6. Display LOW CHARGE WARNING!
7. Clear output pin connected to D-FET (Discharging MOSFET)
8. Exit}}

Charger Function:

Let's consider the pin connected at source of D-FET as Cp

1. Set output pin connected to C-FET (Charging MOSFET)
2. Call cell balancing function
3. Clear output pin connected to C-FET (Charging MOSFET)
4. Exit

Calculation Function:

N/A

Cell Balancing Function:

Assign the gates in parallel to voltage sensors as G1, G2, …. G8 for V1, V2, …. V8 respectively

1. While V1<=3.9 and V2<=3.9 and.....V8<=3.9
2. Call voltage monitoring function ()
3. Sort the voltages
4. Calculate the difference Dm between the max. and min.
5. Display max., min., and the difference
6. While (max. >= 2nd highest+0.01) {
7. Turn ON the gates associated with cells having max. voltage
8. }

Main Function:

1. Display("Hello!!!")
2. While (1)
3. Call voltage monitoring function ()
4. While Cp! =1&& Dp==1{
5. If (V1<=2.5 or V2<=2.5 or.....V8<=2.5) {
6. Display LOW CHARGE WARNING!
7. Clear output pin connected to D-FET (Discharging MOSFET)
8. Exit}
9. Call Discharge function ()}
10. Clear output pin connected to D-FET (Discharging MOSFET)
11. Call voltage monitoring function ()
12. while Cp==1 and V1<=3.9 and V2<=3.9 and.....V8<=3.9
13. Call Charger function ()
14. After coming out of the while loop Clear o/p connected to C-FET
15. Call voltage monitoring function ()
16. If 3.9<V1<4 && 3.9<V2<4 &&.....3.9<V8<4
17. Display ("Fully Charged")

INDEX:

C-FET : (Charging MOSFET)

D-FET : (Discharging MOSFET)

V1, V2...V8 : Individual Voltages of the cells

Vs1, Vs2.....Vs8 : Voltages read by individual voltage sensors

Dp : Discharging pin connected at source of C-FET (refer Detailed Design)

Cp : Charging pin connected at source of D-FET (refer Detailed Design)

G1, G2.....G8 : Output pins connected to the gates of MOSFET's for cell charge

Dissipation in the cell balancing circuit (refer Detailed Design)