



Battery Management System

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Akshay Godase

Embedded Systems Engineer 2

BOSON MOTORS PUNE

Overview

Battery management systems are designed to prolong the battery life for electric vehicles. Boson came up with an idea of designing in house BMS.

Goals

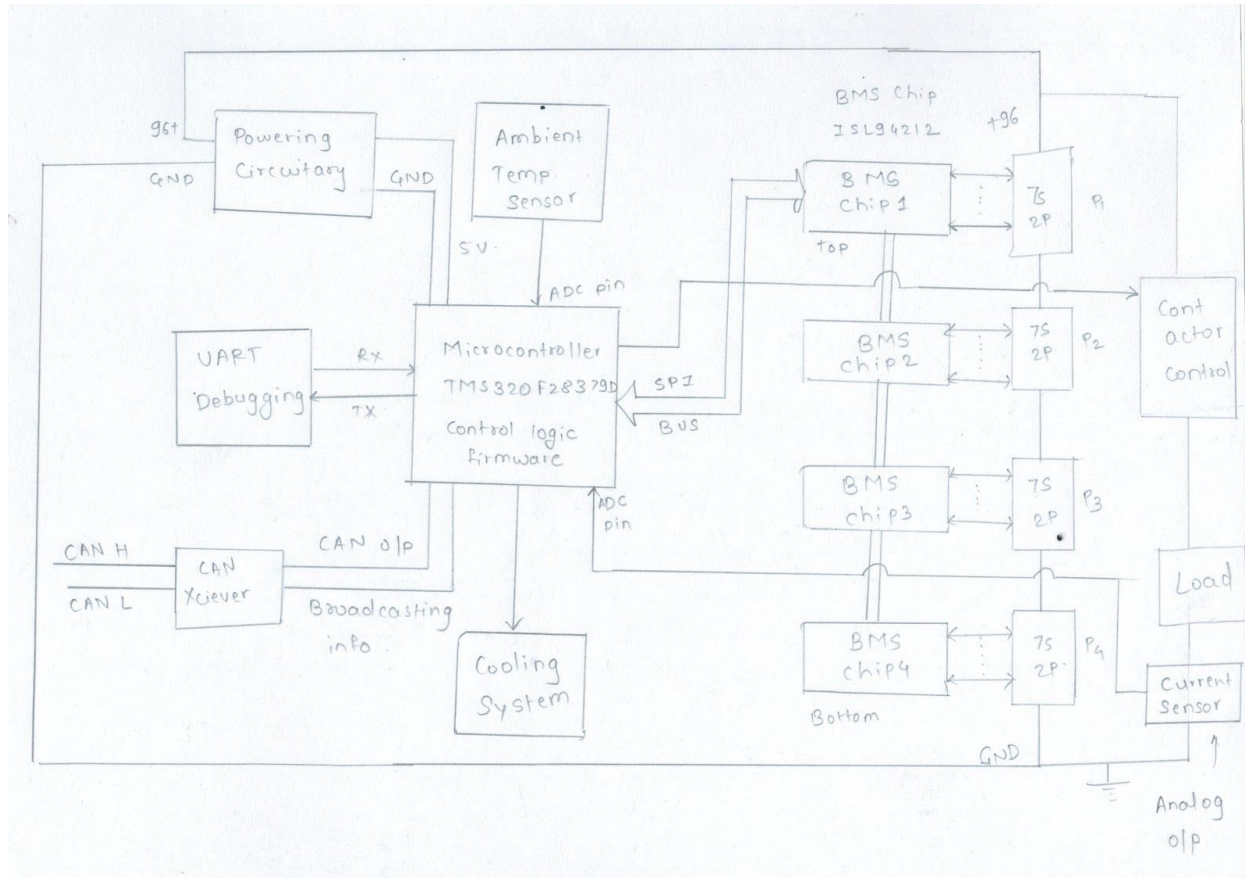
1. Protect battery pack from hazardous conditions like Under Voltage , Over Voltage, Over Current, Over Temperature, Excess Charging Current
2. Approximate SOC to some value using enhanced battery modelling and algorithms , perform cell balancing and provide appropriate limits of charging/discharging currents
3. Broadcast can messages for BMS info required.

Description:

As shown in a block diagram below, it has units

- 1) 4 BMS chips for 7S2P(7 in series 2 in parallel) packs designed for BOSON electric bike
- 2) Ambient Temp and Current sensor (wasn't finalized) as an ADC input
- 3) Contactors and driver circuit to control power to load
- 4) Cooling system to cool down battery pack in case of temp rise
- 5) Power circuitry to convert 5 volts from 96V battery pack which will power the BMS
- 6) Heart of the BMS, TMS320F28379D 32-bit micro-controller for controlling application

Block Diagram



Specifications

As per the datasheet given by the cell manufacturer, the battery protection limits will change. Nominal limits are Undervoltage = 2.8V, Overvoltage = 4.2V for 18650 lithium-ion cells. Documentation about cell is given in [Samsung 18650 cell](#).

We had divided entire BMS project in versions [Plan](#). Each version will add new specs to BMS project.

While working in the month of May version 1 [firmware](#) development was finished.

The code has been tested successfully and documented with comments. One needs to go through step by step debugging to understand firmware flow.

Hardware:

Current setup for testing is like [this](#). As hardware was outsourced and project was abandoned by team we never had inhouse manufactured BMS hardware. Team was using [evaluation boards](#) of [ISL94212](#) Ics.

Team:

Battery management system team was lead and directed by Moreshwar and Mohit. Main contributors were Akshay, Seniorita, Yugansh and Ajinkya Vyas.

I. Akshay Godase

Akshay has written all the firmware necessary to

- Read cell voltages
- Detect Handle fault conditions
- Read ambient temp and current sensor ADC output
- Control the contactors depending and send CAN messages to ECU

For the firmware development is94212 evaluation board setup was used and tested with controlling operation initiated with 32-bit controller [TMS320F28379D](#)

II. Seniorita and Yugansh

Seniorita and Yugansh were supposed to design BMS slave board and master boards

- BMS slave board is updated version of available evaluation board and modification contains updated design for 7 cells
- Controller board with all accessories like contactor control logic and circuitry

III. Ajinkya Vyas

Ajinkya has designed enhanced battery model necessary for SOC approximation algorithm using matlab tool. His research on SOH algorithm is still incomplete and need to be taken forward.

Documentation of his work is [here](#).