ASSIGNMENT-1

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BMS In Li-Ion Batteries

BATTERY MANAGEMENT SYSTEM

Q1 What is a BMS? Types of BMS and differentiate the types of BMS.

Battery management system (BMS) is technology dedicated to the oversight of a battery pack, which is an assembly of battery cells, a BMS manages a battery pack by protecting the battery from operating outside its safe operating zone, monitoring its state, controlling its environment balancing the Li-ion-cells inside the Battery Pack. It is the brain behind the battery and plays a critical role in its levels of safety, performance charge rates, and longevity.

Types of battery management systems.

Battery management systems range from simple to complex and can embrace a wide range of different technologies to achieve their prime directive to take care of the battery. these systems can be categorized based upon their topology.

1) Centralized BMS architecture.

Has one central BMS in the battery Pack assembly. all the battery packages are connected to the central BMS directly.

The centralized BMS has some advantages. It is more compact, and it tends to be the most economical since there is only one BMS. In large battery packs, which complicates both troubleshooting and maintenance.

2) Modular BMS.

Similar to centralized implementation. the BMS is divided into two modules each with a bundle of wires and connections to an adjacent assigned portion of a battery stack.

3) Primary / Subordinate BMS

It is similar to modular topology, however, in this case, the slaves are more restricted to just relaying measurement information, and the master is dedicated to computation and control, as well as external communication. this types the cost may be lower since the functionality of the slaves tends to be simpler. with likely less overhead and fewer unused features.

4) Distributed BMS.

Considerably different from the other topologies, where the electronic hardware and software are encapsulated in models that interface to the cell via bundles of attached wiring. A distributed BMS incorporates all the electronic hardware on a control board placed directly on the cell or module that is being monitored. This alleviates the bulk of the cabling to a few sensor wires and communication wires b/w adjacent BMS models. Consequently, each BMS is more self-contained, and handles computations and communications as required. as it resides deep inside a shield module assembly cost also tend to be higher as there are more BMS

is allows micro controllers and devices to communicate with each other.
Applications workhood a host computer.
It is also implemented for communication between the battery charger and the battery management system.

Q2. What are the technical parameters to keep in mind while procuring a BMS for assembling a battery pack?

The primary job of a BMS is to providing the battery cells. For this to be effective the maximum rating on the BMS should be greater than maximum amperange rating of battery.

Monitoring the temperature. BMS algorithms.

Battery cell monitor

The Battery management systems do not have a fixed or unique set of criteria, they must be adopted. The technology design scope and implemented safety generally correlate with the costs, complexity, and size of the battery pack, application of the battery and any safety, lifespan, and warranty concerns

Mainly there are 6 components of BMS

1. Battery cell monitor
2. CUTOFF FETs
3. Monitoring of Temperature
4. Cell voltage balance.
5. BMS algorithms
6. Real time Clock (RTC)

Q3. What is the purpose of BMS communication? What are the various protocols of communication used in a BMS?

BMS communications is used for communication between devices. It can continuously transmit data of the battery thermal profile and monitor it temperature. Constingy. It uses the collected data points such as temperature voltage, current. to estimate the state of charge and state of health. the data can either stored or can be transmitted by CAN to the VCU or sent to the cloud.

- Monitoring the battery
- Providing protection.
- Reporting operational states to external devices.

A BMS protocol defins the format and meaning of each data element.

CAN

CAN, controller area network, is most widely used communication protocol in the automotive industry. CAN communication are used frequently in automotive applications because it removes all signal noise, such as electromagnetic noise.

UART

UART, which stands for universal Asynchronous Receiver / Transmitter, is the most widely used communication Protocol used in BMS. UART is a form of Serial communication, which means bits are sent one after another sequentially instead of multiple bits sent at once which is what occurs in the Parallel communication. the UART is widely used for communication between a microcontroller and the BMS. IC in a BMS, it is also used for communication between microcontroller and the GSM, bluetooth, or WiFi modules. UART do not operate on clock signals but both boards the board rates can only vary by about 10%. before the timing of the bits goes too far off. Only two wires are needed to transmit data between a UART devices.

SPI

SPI, Serial peripheral interface, is a master-slave type protocol that provides a simple and low cost interface between a microcontroller and its peripherals. the SPI protocol uses a dedicated clock signal that is created by the master device to synchronize the transmitter and receiver or master and slave. one device is considered the master of the bus and the other devices are considered slave devices. the microcontrollers can communicate with the BMS IC via SPI communication.

I2C

I2C, inter-integrated circuits. Communication, is a protocol used for IC to IC communication. I2C is intended primarily for short-distance communication b/w 2 ICs on the same printed circuit board. I2C allows multimaster multi slave topology. The I2C is a standard bydirectional interface that uses a controller known as master communicate with slave devices.