

Battery Supervision and Control System

Prashik Hatkar¹, Zanish Hussain², Vedant Nankar³, S. D. Raut⁴

BTech Students, Department of Electronics Engineering¹⁻³

Assistant Professor, Department of Electronics Engineering⁴

K.K Wagh Institute of Engineering Education and Research, Nashik, India

Abstract: *The Battery Supervision and Control System (BSCS) is an advanced embedded solution designed for real-time monitoring, protection, and optimization of lithium-ion battery packs in electric vehicles. The system employs an STM32 microcontroller to continuously monitor critical parameters such as cell voltage, current, temperature, and State of Charge (SoC), while estimating the State of Health (SoH) for predictive maintenance. The BSCS incorporates smart auto-cutoff mechanisms to prevent overcharging, cell balancing circuits to maintain voltage uniformity, and robust protection circuits against overvoltage, overcurrent, deep discharge, and short-circuit conditions. Additionally, an integrated thermal management subsystem regulates battery temperature, and IoT-based remote monitoring enables users to track performance metrics and receive safety alerts. By combining efficient circuit design, intelligent control algorithms, and robust safety protocols, the BSCS enhances energy utilization, operational reliability, and battery lifespan, contributing to the advancement of safer and more sustainable electric transportation technologies.*

Keywords: Battery Management System (BMS), Lithium-ion Battery State of Charge (SoC) State of Health (SoH) Cell Balancing, Electric Vehicle (EV), Overcharge Protection, Overcurrent Protection, Deep Discharge Protection, Short Circuit Protection

