



SmartCharge

Smart integrated circuits for advanced battery management

Battery management systems (BMSs) play a major role in optimising the use of ever-increasing large battery stacks by improving endurance, performance and reliability. They ensure proper charge and discharge of lithium battery packs which controls the temperature of each lithium cell to avoid hazardous breakdowns, and also balances and protects each cell in the system. BMSs are key components of EV batteries, typically representing about 15 % of overall system costs.

The EU-funded SmartCharge project sought to reduce the cost of BMSs by approximately one third by using application-specific integrated circuit (ASIC) technology to develop a novel integrated circuit for advanced battery management (ICAB). ICAB is an ASIC-based integrated circuit to be deployed as a local monitoring unit within large BMSs. "Lowering the cost of BMSs and improving performance is key to minimising the battery-related bottlenecks for wide EV adoption," says Lars Barkler, CEO of project coordinator LiTHIUM BALANCE in Denmark.

Cost-effective, reliable and optimal functioning battery management solutions for EVs

Project partners developed and demonstrated a novel ICAB that will be used in BMSs produced and manufactured by LiTHIUM BALANCE. The BMS can be sold to EV manufacturers at a price that's 30 % lower than the competition. As a result, the EV's most expensive component – the battery pack – will be reduced by 5 %. This will greatly contribute to slashing the cost of EVs for end users and facilitating the adoption of electric transportation.

The project team began by conducting a feasibility study that included a market analysis to validate the viability of the SmartCharge concept for an ASIC for battery management. Respondents clearly indicated that there is currently a demand in the market and that the high cost of existing BMSs is a concern among original equipment manufacturers in the automotive industry. There's a general interest by these manufacturers in cutting BMS costs and improving performance so as to overcome the battery-related hurdles to widespread EV take-up. In addition, the feasibility study helped to identify potential partners for ASIC development and manufacturing, for international certification and for sales of the resulting BMSs to automotive manufacturers.

At present, there are no high-voltage automotive-grade BMSs capable of performing active balancing in volume production as a standard, "although additional ASICs can be added to provide active balancing at over a three-fold increase in chip costs, making it unbearable for large production use," explains Barkler. "ICAB's patent-protected hybrid balancing concept is a significant technical breakthrough, untapping the advantages of



active balancing without scaling the chip costs thanks to an innovative approach for in-module active balancing directly implemented in the ASIC chip itself.” In addition, LiTHIUM BALANCE’s unique analogue front end helps to avoid the impact of noisy dry cell environments, enabling power line communication use within BMSs.

“ICAB is seen by our potential customers as a significant step forward over the current technical state of the art in the sector,” concludes Barkler. The consortium will now focus on the full-scale demonstration and commercial roll-out of the ASIC itself and the BMS that utilises the ASIC component.



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