

BMS

## For Mahindra's racing e-car uses

Renesas supplies for the Formula-E car by Mahindra the ISL78714 Li-ion battery management system and the RH850 micro-controller with integrated CAN FD modules.



(Source: Renesas)

“The ISL78714 enables battery management systems (BMS) with a best-in-class combination of battery pack monitoring accuracy, fast data acquisition, and fault checking features,” said Niall Lyne from Renesas. “Our Formula-E technology partnership with Mahindra Racing is already helping them win on the race track. Together, we designed and integrated a low-voltage Li-ion battery management system featuring ISL78714 ICs and RH850 micro-controllers in Mahindra Racing electric race cars.”

The ISL78714 provides accurate cell voltage and temperature monitoring, along with cell balancing and extensive system diagnostics to protect 14-cell Li-ion battery packs while maximizing driving time and range for hybrid and electric vehicles. The battery management IC meets the stringent reliability and performance requirements of battery pack systems including safety features enabling automotive manufacturers to achieve the ISO 26262 automotive safety integrity level (ASIL D). In addition,

the chip monitors and reads back over/under voltage, temperature, open wire conditions, and fault status for 112 cells in less than 10 ms, or 70 cells in 6,5 ms.

The Japanese chipmaker provides a battery management system (BMS) reference design is available, which includes five ISL78714 ICs and a RH850/P1M MCU to form a complete 70-cell evaluation platform for external balancing. The reference design kit provides setup and data logging via Classical CAN or CAN FD. Also provided is a GUI, Altium layout files, and low-level drivers for the RH850 peripherals (including CAN) and ISL78714. Hardware, software, and interface reference manuals are included, along with an EMC report.

Multiple ISL78714's can be connected together via a proprietary daisy chain that supports systems up to 420 cells (30 ICs) that provide industry-leading transient and EMC/EMI immunity, exceeding automotive requirements. The I daisy-chain architecture uses low-cost capacitive or transformer isolation, or a combination of both, with twisted pair wiring to stack multiple battery packs together while protecting against hot plug and high voltage transients. A watchdog timer automatically shuts down a daisy-chained IC, if communications is lost with the host MCU.

Mahindra has implemented the battery management ICs in conjunction with the RH850/E2x micro-controller in its Formula-E racing e-cars. The RH850/E2x automotive MCU is an embedded flash 400-MHz lockstep dual-core with an FPU (floating-point unit) that supports functional safety. It also has integrated A/D converters and a wide range of communication interfaces, including five CAN FD modules.

The BMS used in Mahindra's racing cars was developed in close co-operation with Renesas. This collaboration involved regular communication between Renesas' engineering team and Mahindra Racing's principal engineers. Renesas engineers were also present at Mahindra Racing to optimize the BMS integration.



Electric-powered racing car by Mahindra (Source: Renesas)

[hz](#)