

Circuits and Mechanisms for Battery Self - Heating Based on the Automotive Traction Motor

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ABSTRACT

Embodiments disclose a method and a system for battery pack self-heating based on automotive traction motor reconfiguration. In the battery pack temperature control, firstly the controller will get turned ON by making the vehicle ON. Secondly, the temperature sensor will measure/monitor battery pack temperature and sent it to the controller and is compared with the set threshold temperature. If the temperature is below the set value, then the controller enters into heating mode else into drive mode. When in the heating mode the battery temperature and associated electrical parameters like voltage and current are continuously monitored. However, if the monitored temperature in the heating mode is above the set value or a user wants to enter the drive mode directly even at a temperature below the set value, then the controller will change the mode from heating into drive mode making the converter operate in the power transfer mode.

KEY APPLICATION AREAS

- 1.Electric Vehicles (EVs).
- 2.Battery Thermal Management Systems (BTMS).
- 3.Automotive Power Electronics.
- 4.EV Charging & Cold Climate Operation.
- 5.Battery Management Systems (BMS).
- 6.Energy Storage Systems (ESS).

POTENTIAL USES

1. Self-heating of Li-ion batteries in EVs before charging or driving in cold climates.
2. Fast battery warm-up using the existing traction motor and inverter without dedicated heating hardware.
3. Improved cold-start performance by maintaining batteries within the optimal operating temperature range.
4. Prevention of lithium plating during low-temperature charging, improving battery safety and lifespan.
5. Integrated AC heating and power transfer using a common converter, reducing system size, cost, and energy consumption.
6. Battery heating for multi-pack EV battery architectures through traction motor reconfiguration.
7. Thermal management of stationary battery energy storage systems operating in cold environments.