

Cell Management Unit (CMU) for energy storage devices

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A battery management system (BMS) is any electronic system that manages a rechargeable battery (cell or battery pack), such as by protecting the battery from operating outside its safe operating area, monitoring its state, calculating secondary data, reporting that data, controlling its environment, authenticating it and/or balancing it. SENSIPLUS is a microelectronics platform for multiple heterogeneous sensors integration into a single chip or into miniature multi-sensor-microsystems. SENSIPLUS integrates precision analytics with heterogeneous multi-sensors in a single microchip of 3x3 mm size with 1.5mW power consumption. It includes a comprehensive wideband electrochemical spectrometer with a lock-in amplifier, a potentiostat/galvanostat along with on-chip sensors for temperature, relative humidity and gassing. Its off-chip interface supports external sensors such: strain, force, electrolyte leakage, moisture, vibration, shock. Multi-sensor measurements are cross-correlated with an internal configurable deep learning inference accelerator to stream minimal amount of data to the BMS.

The CMU exploits SENSIPLUS electrochemical measurements to analyze from outside the relevant chemical and physical process inside the cell, the anode and cathode integrity, while monitoring safety, during battery operation and improved estimation of state of charge (SOC), state of health (SOH), state of function (SOF) and state of power (SOP). Data supplied to the BMS helps controlling cell charge and thermal balancing. SENSIPLUS also includes a multi-drop single wire high voltage isolated bus to chain multiple cells to the BMS or it can be used with an external chip in a smart mesh wireless configuration for increased safety and flexibility.

The CMU is battery chemistry independent and it can be used with Li-Ion and LiFePO₄ battery packs, similarly it can be applied to 3b generation of LNMO cells, supercapacitors and fuel cells combinations.