

In battery packs, batteries need to be serially connected to obtain high voltage, connected in parallel to acquire high current, and the defected batteries need to be bypassed. In this study, dynamically reconfigurable, independent cellular switching circuits have been proposed in order to connect the batteries in desired configuration. Each cell comprises a battery, a serial switch, a bypass switch, a parallel switch, and triggering switches. The batteries within the pack can be connected in different configurations according to their operation mode such as all in serial, all in parallel, all bypassed, or hybrid (serial-parallel-bypass). The novel aspect of the proposed circuit is that only intracellular battery energy is utilized in order to trigger the switches that are controlled with a very simple circuit. Each cell is independent and completely modular. Moreover, a single mosfet is sufficient instead of two mosfets which is connected in serial in order to control the current. The complexity of the circuit has been reduced to three mosfets for each cell and its efficiency has been increased. The operation of the proposed circuit has been tested with a prototype that includes twelve batteries and its advantages have been confirmed.

