

Battery Monitoring Reference Design for 4s–17s Li-ion Battery Packs with Self-Diagnostics and High-Side FET Control

■ DESCRIPTION

This reference design delivers a robust and high-performance battery management solution for a wide range of applications. Supporting 4s to 17s Li-ion battery configurations, it provides accurate cell voltage measurement and reliable monitoring of pack current, cell temperature, and power MOSFET temperature. With built-in protections against overvoltage, undervoltage, overcurrent, short-circuit, and temperature extremes, the design ensures safe and stable battery pack operation. Leveraging a high-side N-channel MOSFET architecture, it is well-suited for residential energy storage systems (ESS), uninterruptible power supplies (UPS), and e-mobility platforms such as golf carts, lawn mowers, and electric two-wheelers. The system also features ultra-low power consumption, achieving a shutdown current as low as 10 μ A—ideal for extended shelf-life and energy-efficient deployments.

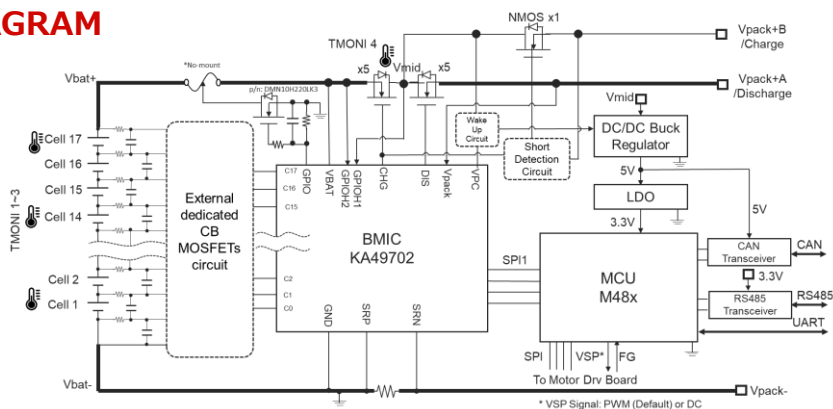
■ FEATURES

- Cell voltage Measurement Accuracy: ± 2.9 mV @ 25 °C; ± 5 mV @ -20 °C to 65 °C
- Ultra-Low Power: 10 μ A typical in shutdown mode
- Integrated Shunt-Based Current Sensing: Uses a high-power precision shunt resistor for accurate pack current monitoring
- Cell Voltage Averaging Function: Reduces standard deviation error for improved measurement stability
- Flexible Cell Support: Monitors 4 to 17 Li-ion cells in series
- High Cell Balancing Current: Up to 200 mA per cell
- Charge/Discharge Handling: Dedicated ports support up to 10 A charging and 50 A discharging
- Comprehensive Protections: Includes overvoltage (OV), undervoltage (UV), overcurrent, short-circuit, and over/under-temperature protection with automatic MOSFET control
- Self-Diagnostics: Detects faults in ADC, MUX, FETs, fuses, cell open-wire, and current sense lines
- Controlled Fuse Architecture: Adds a secondary hardware protection layer for enhanced safety
- Multi-Protocol Communication: Supports UART, CAN, and RS-485 for flexible system integration

■ APPLICATIONS

- Residential & Industrial ESS, Server/Telecom Backup Power, Uninterruptible Power Supply (UPS), e-Mobility: Golf Carts, Lawn Mowers, Electric Two-Wheelers

■ BLOCK DIAGRAM



The products and product specifications described in this document are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

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