

Battery Monitoring Utilizing EIS Technologies as a Next-Generation BMS Approach Supporting a Sustainable Society

*EIS: Electrochemical Impedance Spectroscopy

BMS: Battery monitoring system

■ Overview

Nuvoton Technology develops a battery monitoring IC that can measure the voltage of battery cells at high speed and accuracy by optimizing the configuration of the ADC, and the impedance for battery condition monitoring.



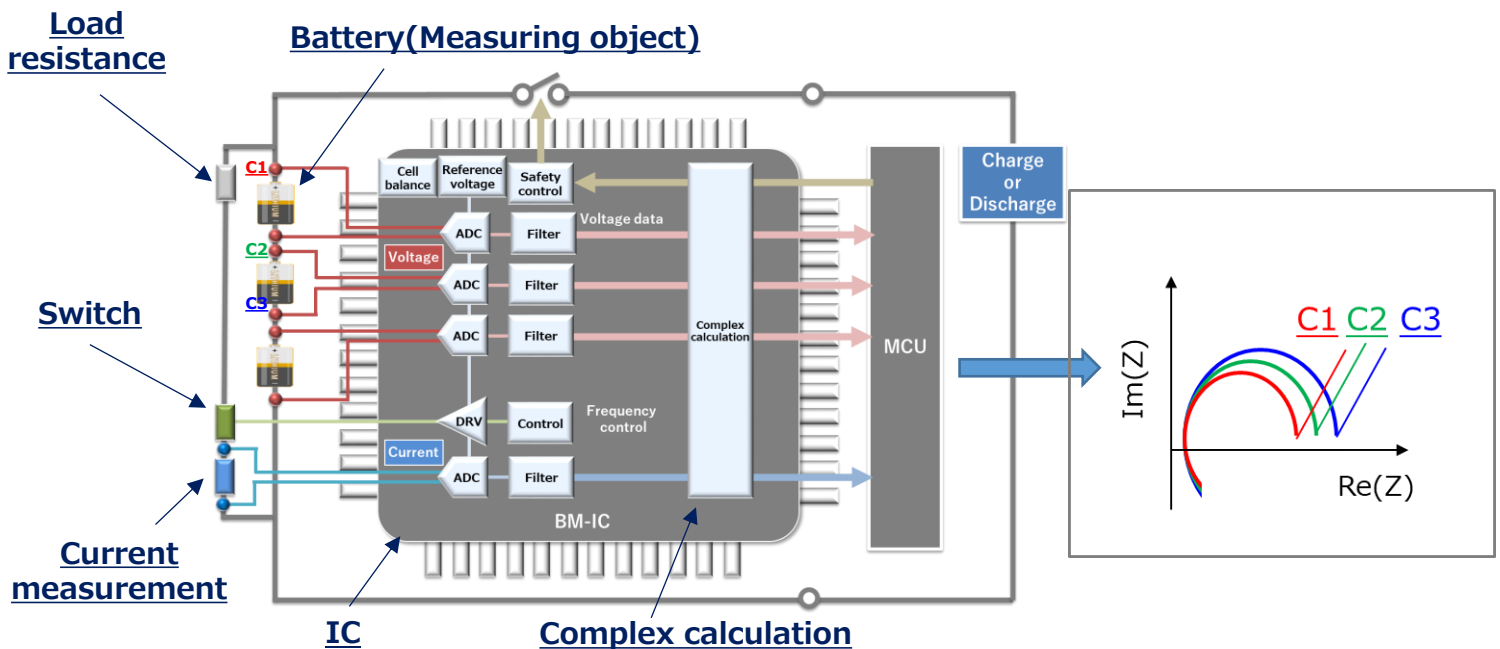
■ IC Features

- ✓ 25ch battery cells AC impedance measurement integrated into one-chip
- ✓ High speed and accurate voltage/EIS measurements using parallel ADC
- ✓ Estimation of battery internal temperature and SOH (State of Health) supported by Nuvoton's patented algorithm

■ 25ch AC impedance measurement integrated into one-chip

- ✓ Implement AC impedance measuring function on your application
- ✓ Measure multiple in-series batteries simultaneously

IC chip schematic diagram

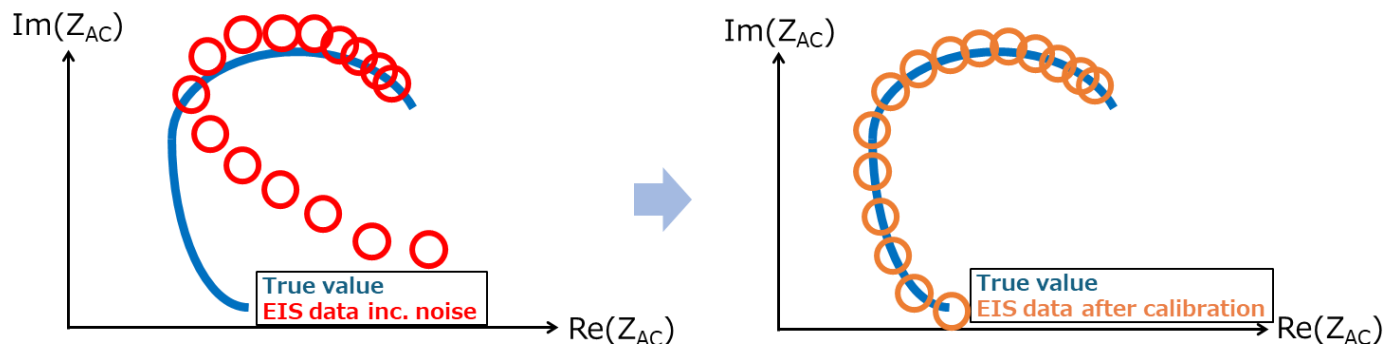


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As of January. 1, 2026

■ Proprietary EIS correction algorithm for real-world operation

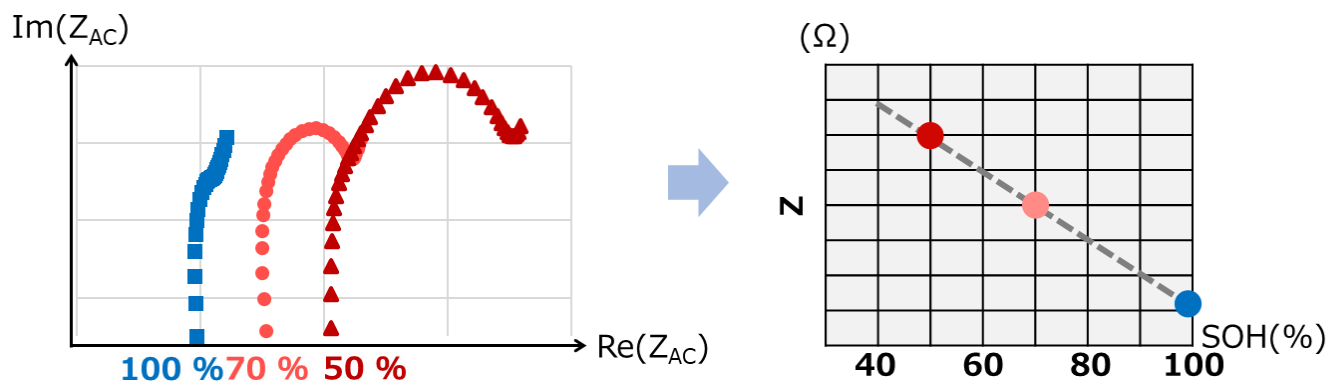
- ✓ The unique algorithms maintain reliable impedance results regardless of EIS discrepancies caused by battery type (LFP, NMC), built-in configuration (harness, connection), and operation (driving, charging, discharging).



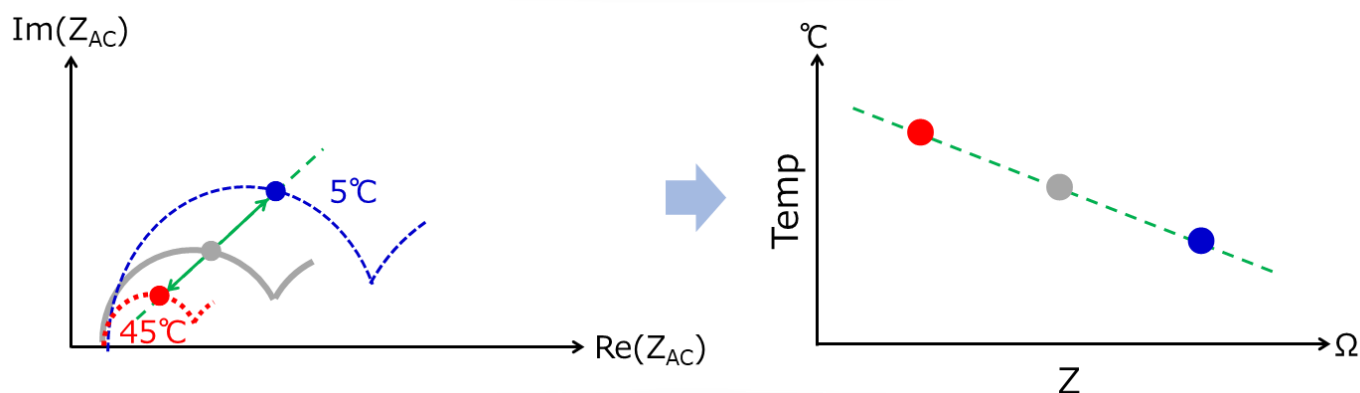
■ Estimation of battery SOH and internal temperature

- ✓ Estimate the internal temperature of each battery cell by utilizing temperature dependency of the impedance.
- ✓ Estimate the SOH of battery cells by calculating the amount of change in each battery component based on measured AC impedance values.

Nyquist diagram (Cole-Cole plot) analysis



Utilizing the correlation between impedance and temperature



Correlation between impedance and degradation

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