

Reliable, Secure Wireless Battery Management System

# Wireless Battery Management System (WBMS) with independent Dual-RF system for robustness

## ■ Description

Nuvoton has developed a technology that integrates two RF systems to achieve fast data acquisition (~10 ms) while maintaining robust and secure communication using BLE (Bluetooth Low Energy) 5.4 with PAwR (Periodic Advertising with Responses).

WBMS simplifies battery module design, shortens pack assembly time, and enables partial module replacement.

Nuvoton aims to accelerate the transition to a sustainable and circular battery ecosystem by advancing battery diagnostics, including Electrochemical Impedance Spectroscopy (EIS)–based residual value assessment and WBMS integration in the BMS.

Nuvoton plans to provide WBMS sample prototypes—featuring the following characteristics and utilizing this technology, by 2026.

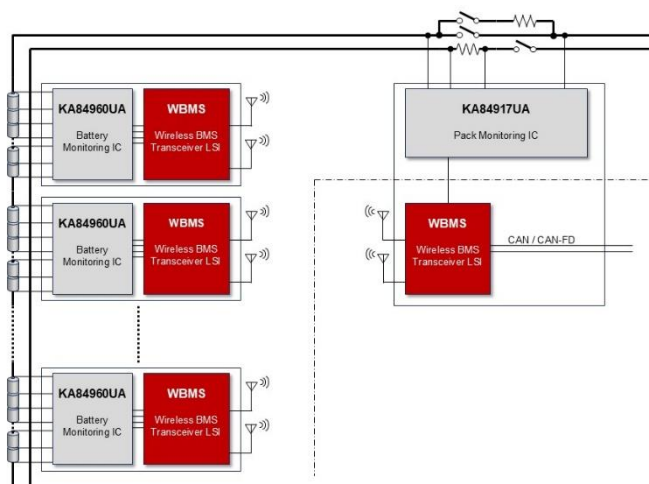
## ■ Features

- Standardized wireless technology  
Based on Bluetooth® Low Energy 5.4 (2.4 GHz), suitable for WBMS.
- Robust wireless communication comparable to conventional wired daisy-chain communication.  
Dual-RF for robust communication with time, frequency, spatial diversity and fail-operational behavior.
- Minimal impact on upper-layer E/E architecture  
Achieves ~10 ms data acquisition with 8 slave BMS nodes by BLE5.4.  
The 3-MCU configuration minimizes changes in the upper E/E architecture.
- Compliance with functional safety (ISO26262 ASIL-D)
- Compliance with road vehicle cybersecurity (ISO/SAE 21434 CAL-4)

## ■ Application

- Battery electric vehicle, Hybrid electric vehicle, Energy storage system

## ■ System diagram



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