
RAJ240090/100

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R-BMS F Quick Start Guide

Introduction

The RAJ240090/100 R-BMS F evaluation kit consists of an evaluation module (EVM), a USB System Management Bus (SMBus) and an interface adaptor which allows users to evaluate their battery management system using Renesas RAJ240090/100 Li-ion battery Fuel Gauge IC (FGIC).

Additionally, the kit comes with the R-BMS F firmware, which is a fixed and easy to use software requiring no additional development with user configurable settings for determining different thresholds of the device.

This User's Manual provides detailed information of the evaluation kit and how to set it up to construct 3 - 8 (RAJ240090) or 3 - 10 (RAJ240100) Li-ion battery cell series to start operation and performance evaluation.

Target Device

RAJ240090

RAJ240100

Note:

Contact your regional agencies / distributors for the details.

RAJ240100 R-BMS F evaluation module can be used for RAJ240090.

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1. Evaluation Kit Features & Contents

This chapter overviews the EVM features and hardware contents.

1.1 Features

- Complete evaluation system for the RAJ240090/100 with 3-8 cell (RAJ240090) or 3 – 10 cell (RAJ240100) Li-ion battery.
- Optimized circuit module for 3-cell to 8-cell (RAJ240090) or 10-cell (RAJ240100) configuration for quick setup.
- SMBus I/F communication.
- Built in resistor cell simulator for quick setup with minimum wire connections.
- GUI based PC software for configuration.

1.2 Hardware Contents

The R-BMS F evaluation kit comes with the hardware items shown in [Table 1-1](#) below.

Table 1-1 R-BMS F Evaluation Kit Contents

Item	Description
R-BMS F EVM	EVM for evaluating R-BMS F with RAJ240090/100 FGIC.
USB SMBus Converter (I/F)	USB SMBus interface adapter.
Cables	A USB cable for connecting the SMBus I/F to the PC. A serial cable to connect the SMBus I/F to the EVM.

1.3 Performance Specification Summary

The R-BMS F evaluation kit specifications are shown in [Table 1-2](#) below.

Table 1-2 Performance Specification Summary

Specification	Min	TYP	Max	Unit
Input voltage Pack+ to Pack-			45	V
Battery voltage V1/V2/V3/...../V10	2.5		4.2	V
Charge and discharge current	0		30	A

Note: Board cooling may be required for continuous operation at or below the maximum current.

1.4 Required Equipment

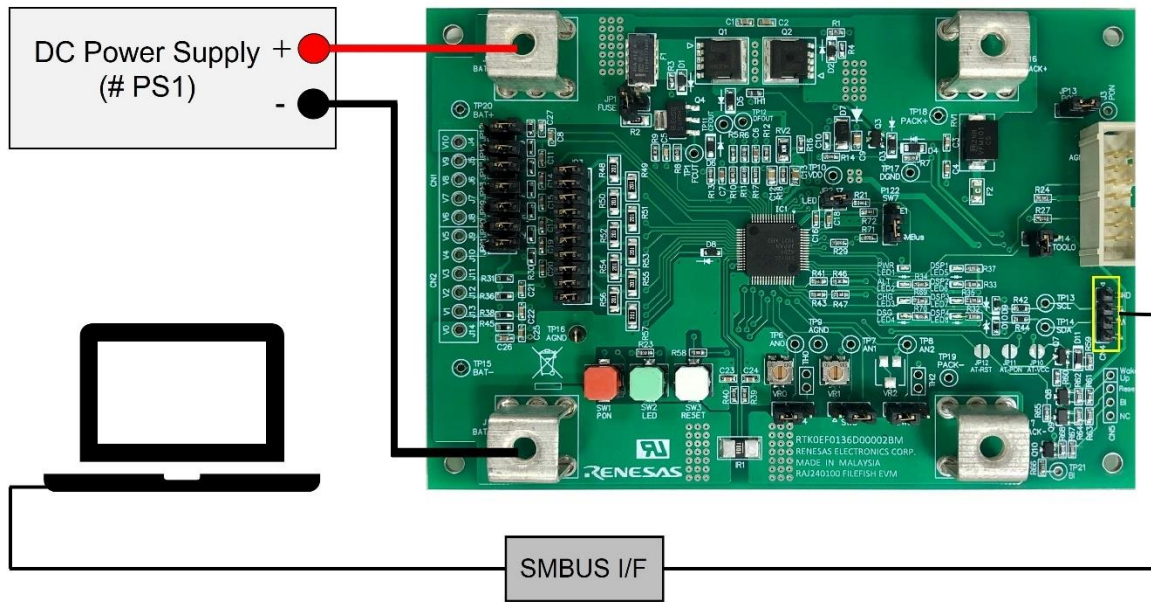
The equipment in [Table 1-3](#) is required to operate the EVM.

Table 1-3 Required Equipment list

Item	Symbol	Description
DC power supply 1	PS#1	For Battery simulation. Bipolar DC power supply will be needed for charger test.
DC power supply 2	PS#2	Optional and may be needed to simulate the charger.
DC load or assorted resistors	DCL	Optional and may be needed to simulate the system load. A bipolar DC power supply can be used instead.
Computer with a USB port	-	Windows operating system is required.

Note: Additional equipment may be needed to operate the EVM with a more extensive test.

1.5 EVM Connection with Minimum Configuration (10 cells)



2. Function Outline

2.1 Features

- High accuracy Voltage, Current, and Temperature detection and safety protection.
- Safety and outperformed charging controlling.
- Accurate capacity calculation
- Make less power consumption by power saving control.
- Supports the Smart Battery Data specification V1.1
- Supports various system by parameter of FlashROM (Fixed data / Own data / Flexible data)
- Supports on-board firmware updating via SMBus
- Current Range: -32768 mA to 32767 mA

2.2 Function outline

- Voltage, Current, Temperature measurement
- Remaining Capacity (RC) Calculation
- Relative State Of Charge (RSOC) Calculation
- Full Charge Capacity (FCC) update
- Initial Calibration mode for accurate measurement
- Capacity correction by Lookup table
- Mode transition: Normal, Sleep, Shutdown, Fail
- Over Current, Over / Under Voltage, and Over Temperature protection
- Fuse Blow
- RMA Data & Fault Logging
- LED Display Module (optional)
- JEITA Charging (optional)
- Master Communication (optional)

3. R-BMS_F_Tool

The R-BMS_F_Tool is a GUI software used for monitoring and evaluating the R-BMS F EVM. It provides the features shown in [Table 3-1](#).

Table 3-1 Function Overview

Menu Name	Function/Description
HOME	Home Screen.
SYSTEM MONITOR	Read/Log the SMBus register data.
FIXED DATA	Battery Parameter read/write.
FLEXIBLE DATA	Latest system data read/write.
CALIBRATION DATA	Board level calibration read/write.
CALIBRATION	Perform board level calibration.
FLASH UPDATE	Firmware flash memory (Fixed/Calibration, Flexible) data update
FACTORY DEFAULT	EVM roll back function
FUNCTION CONFIG	Easy battery parameter setting function



Figure 3-1 R-BMS_F_TOOL Overview

3.1 Software Requirements

The R-BMS_F_Tool requires a Windows 10 or later system.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Mar. 3, 2025		First release

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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