

# RTK-251-SinkCharger-RAA489118 100W USB Type-C® Battery system reference

This is a single port reference design for implementing battery systems with 2 to 7 cells connected in series. This reference design supports a mode where power is only supplied from the USB Type-C® port and a mode that enables a power bank in combination with a lithium-ion battery with BMS.

## Introduction

The RTK-251-SinkCharger-RAA489118 is an evaluation board for Universal Serial Bus Power Delivery (USB PD). The RTK-251-SinkCharger-RAA489118 is designed with USB PD controller R9A02G011 and On-Board Charger RAA489118. RAA489118 supports 2 to 7 cells in series configuration. The RTK-251-SinkCharger-RAA489118 supports USB PD 2.0, USB PD3.1, USB Type-C® Specification.

The RTK-251-SinkCharger-RAA489118 works as a USB Type-C® power sink charger or a power bank. The Battery module requires Renesas' Battery Management System to avoid over discharging, especially when the RTK-251-SinkCharger-RAA489118 is used in the power bank mode. The configuration switches enable the selection of the number of battery cells, the maximum charge current and the operation mode.

The RTK-251-SinkCharger-RAA489118 may be combined with an Evaluation Module of the Battery Fuel Gauging IC (FGIC)

## Features

- USB PD Spec Rev 2.0 and 3.1
- USB Type-C® Cable Spec Rev 2.2.
- Sink Only or Dual Role Power (DRP)
- Under Sink Only SPR Mode 5, 9, 15, or 20V input from USB Type-C® sourcing device.
- PDP rating of 15W, 27W, 45W or 60W in sourcing mode.
- Power Supply Indicator (3 LEDs, green)
- Battery Configuration control for RAA489118
- Charging Current limits control for R9A02G011
- Renesas on-chip debugging emulator interface for firmware programming and debugging for R9A02G011.
- BMS Evaluation board interface to communicate with Battery w/FGIC.
- Standalone battery charging for power tools, portable vacuums, battery-powered lawn mowers, drones.
- Rotary DIP Switch to select number cells from 2 to 7 cells and charging current from 1A to 6A.

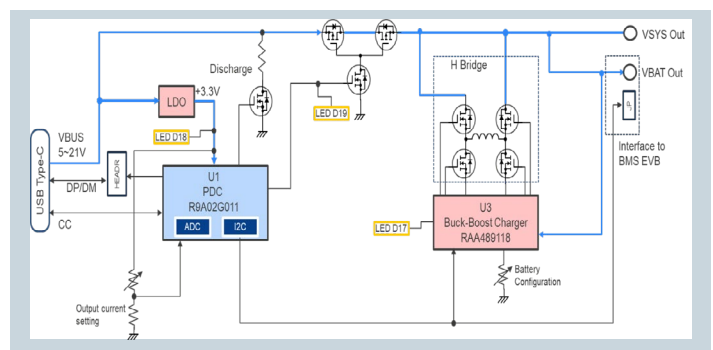
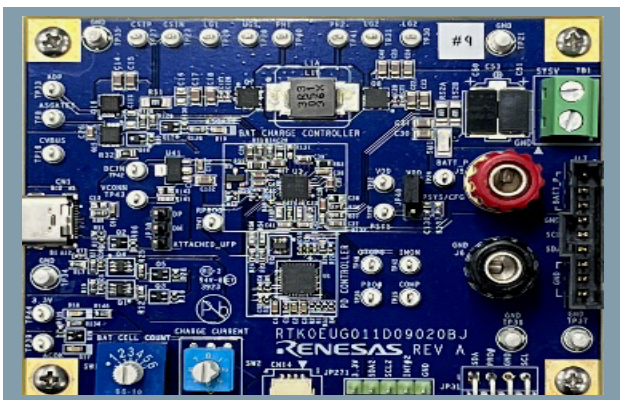
## Part Number

RTK-251-SinkCharger-RAA489118: RTK0EUG011D09020BJ

USB Power Delivery controller: R9A02G011

Buck-Boost Narrow VDC Battery Charger: RAA489118

## Evaluation board and Block Diagram



## About switch setting

The RTK-251-SinkCharger-RAA489118 has two rotary switches to control the numbers of battery cells and battery charging current limit. In combination to support battery voltage range from 5.632 to 28.336V, and battery charging current range from 1A to 6A. In addition, the board can be supported battery charging current up to 10A by changing the firmware generated by VIDWriter tool.

**Table 2-1 Rotary switch setting value for Battery Configuration**

| SW position | RTK0EUG011D09020BJ |
|-------------|--------------------|
| 1           | 2 Cells in series  |
| 2           | 3 Cells in series  |
| 3           | 4 Cells in series  |
| 4           | 5 Cells in series  |
| 5           | 6 Cells in series  |
| 6           | 7 Cells in series  |

**Table 2-2 Battery Configuration vs MaxSysVol/MinSysVol for LiCoO<sub>2</sub> and LiMn<sub>2</sub>O<sub>4</sub> battery in Standard FW**

| Battery Configuration | MaxSysVol (mV) | MinSysVol (mV) |
|-----------------------|----------------|----------------|
| 2 Cells in series     | 8096           | 5632           |
| 3 Cells in series     | 12144          | 8448           |
| 4 Cells in series     | 16192          | 11264          |
| 5 Cells in series     | 20240          | 14080          |
| 6 Cells in series     | 24288          | 16896          |
| 7 Cells in series     | 28336          | 19712          |

**Table 2-4 Rotary switch setting value for Charging Current Limits**

| SW position | Charging Current Limits (SW2)  |
|-------------|--|
| 0           | The specific values (MaxSysVol, MinSysVol, and Charging Current limit) can be set in FW  |
| 1           | 1A   |
| 2           | 2A   |
| 3           | 3A   |
| 4           | 4A   |
| 5           | 5A   |
| 6           | 6A   |
| 7           | The values (MaxSysVol, Charging Current limit and so on) are retrieved via BMS interface |

## Related Document

Use this document in combination with the following documents.

The related documents mentioned in this publication may include preliminary versions. However, preliminary versions are not marked as such.

- R9A02G011 Data Sheet: R19DS0088EJ
- R9A02G011 User's Manual: R19UH0102EJ
- E1 Emulator E20 Emulator User's Manual: R20UT0398EJ
- E2 Emulator Lite User's Manual: R20UT3240EJ
- E1/E20 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78): R20UT1994EJ
- Renesas Flash Programmer V3.13 Flash memory programming software User's Manual: R20UT5312EJ
- RAA489118 Short-Form Data Sheet: R16D00024EU