



AYAA TECHNOLOGY CO., LTD

Datasheet

12S-14S 200A Battery monitoring board

BMS Product Approval Specification

Customer Name	Shenzhen Ayaa Technology Co., Ltd
Product Model	EF-005
Output Mode	Power MOSFET
Comm Interface	CAN UART Type-C BLE
FCS	PX4 & jiyuav & VKCAN & SKYRCCAN & BOYINGCAN & DroneCAN (formerly UAVCAN/Cyphal)
Validity Period	2024.10.7

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1. Overview

This battery management system is a BMS product developed by our company for medium- and low-voltage lithium battery packs. It is suitable for mainstream 3.7 V lithium cells. The system main control board and power output board are available in integrated and split configurations to meet different size requirements.

The system integrates cell voltage monitoring, cell balancing, cell overcharge and overdischarge alarms, battery pack temperature monitoring, intelligent charge and discharge control, thermal management, and data communication, providing reliable support for safe and stable lithium battery pack operation. The embedded software includes high-accuracy SOC and SOH algorithms, effectively improving battery pack health management and extending service life.

2. Product Operating Principle

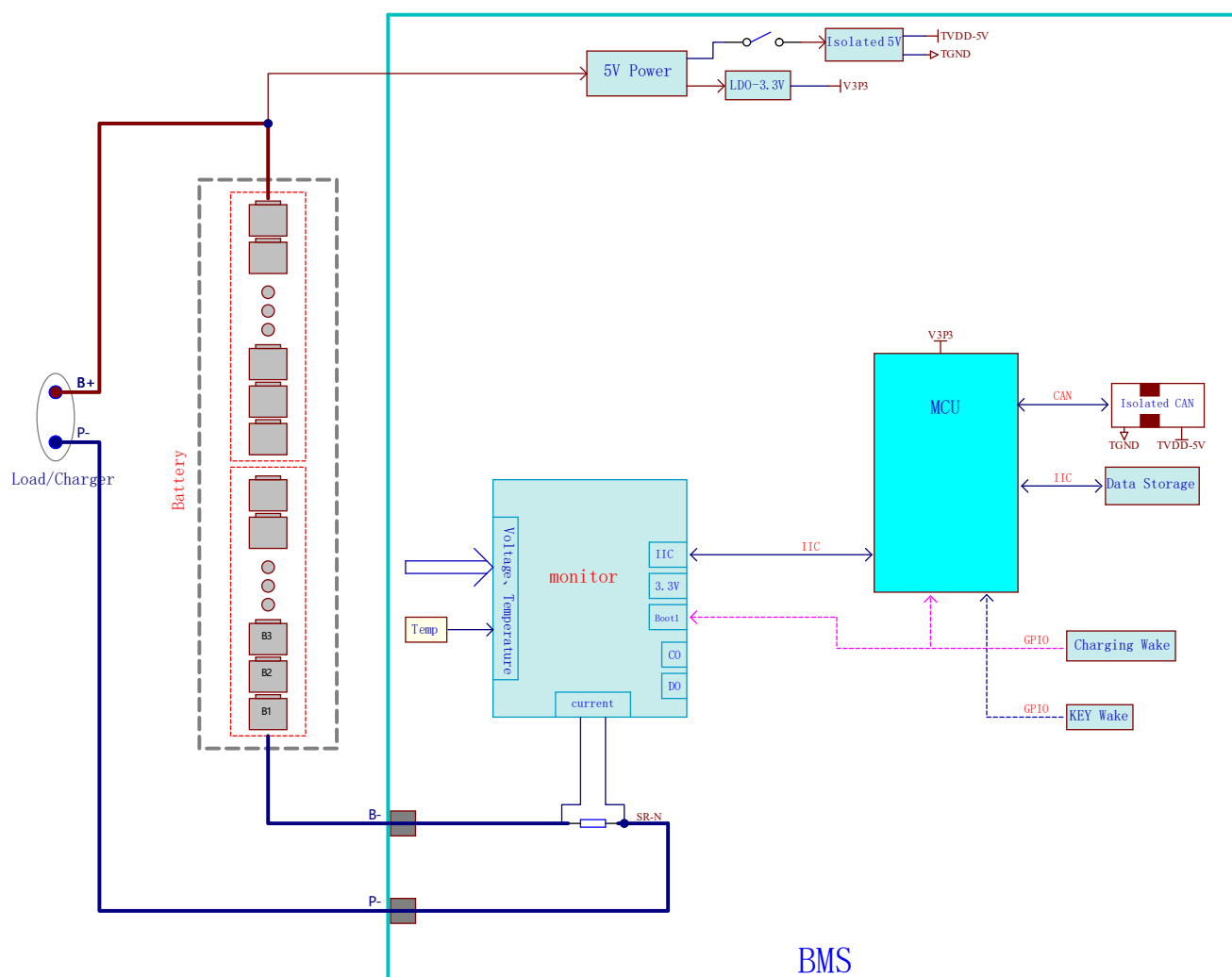


Figure 1. Product block diagram. Original schematic labels are retained.

This BMS system integrates the main control and power output functions. The main control section collects battery status information such as voltage, current, and temperature, calculates battery pack capacity, stores data, transmits communication data, and provides charge/discharge alarm functions.

The system has three operating modes. In normal operating mode, the system enters this mode after power-on and monitors battery pack status in real time while communicating with external devices. In sleep mode, when



the BMS detects that the battery pack has remained idle for longer than the configured time, it automatically enters low-power sleep; charger signal, CAN communication signal, discharge signal, or key signal will return the system to normal operation. In deep sleep mode, when the BMS detects battery pack overdischarge, it enters deep sleep automatically; charging is required to wake the BMS and resume operation.

3. Function Description

3.1 Voltage Detection, Balancing, and Alarm Functions (No Protection)

Voltage detection includes total battery pack voltage detection and individual cell/string voltage detection. Based on configured parameters such as cell undervoltage, overvoltage, and balancing start thresholds, the system can balance cell voltage and issue overcharge and overdischarge alarms.

3.2 Current Detection and Alarm Functions (No Protection)

Current detection includes bidirectional charge and discharge current detection. Based on configured overcurrent and short-circuit parameters, the system can issue charge/discharge overcurrent alarms and perform short-circuit protection actions.

3.3 Temperature Detection and Alarm Functions (No Protection)

The system supports multi-channel battery pack temperature detection and power component overtemperature detection. Based on configured low-temperature and overtemperature parameters, it monitors battery pack operation in high- and low-temperature environments in real time and performs low-temperature and overtemperature alarm and protection actions.

3.4 Battery Pack SOC Calculation

SOC is a core battery pack parameter, and its calculation accuracy directly affects battery pack utilization efficiency and service life. The system uses an independently optimized Kalman filtering method for SOC calculation, controlling SOC calculation error within 5% and providing automatic correction to maintain calculation accuracy.

3.5 Data Communication

The system includes communication interfaces. These interfaces support communication with PC software for viewing real-time battery pack status and configuring system parameters.

4. Product Technical Specifications

No.	Parameter	Min	Typ	Max	Tolerance	Tolerance	Unit
4.1 Single-Cell Parameters							
1	Single-cell overcharge alarm		4.25		+/-0.025	+/-0.025	V
2	Single-cell overcharge alarm release		4.10		+/-0.025	+/-0.025	V
3	Single-cell undervoltage alarm		3.0		+/-0.025	+/-0.025	V
4	Single-cell undervoltage alarm release		3.2		+/-0.025	+/-0.025	V
5	Balancing start voltage		3.85		+/-0.02	+/-0.02	V



No.	Parameter	Min	Typ	Max	Tolerance	Tolerance	Unit
6	Balancing start voltage difference		0.05		+/-0.02	+/-0.02	V
7	Balancing current		75		+/-10	+/-10	mA
4.2 Battery Pack Parameters							
8	Maximum battery pack charge-limit voltage		4.25 x 14		+/-1.0	+/-1.0	V
9	Battery pack undervoltage alarm		3.0 x 14		+/-1.0	+/-1.0	V
10	Battery pack undervoltage alarm release		3.2 x 14		+/-1.0	+/-1.0	V
4.3 Battery Temperature Protection							
11	Charge temperature alarm	-5		65	+/-3	+/-3	deg C
12	Charge temperature alarm release	0		55	+/-3	+/-3	deg C
13	Discharge temperature alarm	-20		70	+/-3	+/-3	deg C
14	Discharge temperature alarm release	-15		60	+/-3	+/-3	deg C
15	Battery temperature monitoring points		1				channel
4.4 Board-Level Parameters							
16	Rated charge current		60		+/-5	+/-5	A
17	Charge overcurrent alarm		90		+/-5	+/-5	A
18	Rated discharge current		200		+/-5	+/-5	A
19	Software level-1 discharge overcurrent alarm		350		+/-10	+/-10	A
20	Hardware discharge overcurrent alarm		560		+/-10	+/-10	A
21	Short-circuit current alarm value	880	880	880	+/-20	+/-20	A
22	Short-circuit protection note	No protection switch; short-circuit testing is prohibited.	No protection switch; short-circuit testing is prohibited.	No protection switch; short-circuit testing is prohibited.	No protection switch; short-circuit testing is prohibited.	No protection switch; short-circuit testing is prohibited.	No protection switch; short-circuit testing is prohibited.
23	Normal operating power consumption		5	30	+/-5	+/-5	mA
24	Normal sleep power consumption		0.5	3	+/-1	+/-1	mA
25	Overdischarge standby power consumption		1.2	60	+/-10	+/-10	uA
26	Operating temperature range	-20		70			deg C
27	Storage temperature	-40		85			deg C
28	Charge/discharge interface type	Common port	Common port	Common port	Common port	Common port	Common port
29	Communication interface	CAN: baud rate 1 Mbps; BMS ID: 1.	CAN: baud rate 1 Mbps; BMS ID: 1.	CAN: baud rate 1 Mbps; BMS ID: 1.	CAN: baud rate 1 Mbps; BMS ID: 1.	CAN: baud rate 1 Mbps; BMS ID: 1.	CAN: baud rate 1 Mbps; BMS ID: 1.



No.	Parameter	Min	Typ	Max	Tolerance	Tolerance	Unit
30	Communication interface	USB: host-computer function; baud rate 115200; BMS ID: 1; supports BMS firmware upgrade.	USB: host-computer function; baud rate 115200; BMS ID: 1; supports BMS firmware upgrade.	USB: host-computer function; baud rate 115200; BMS ID: 1; supports BMS firmware upgrade.	USB: host-computer function; baud rate 115200; BMS ID: 1; supports BMS firmware upgrade.	USB: host-computer function; baud rate 115200; BMS ID: 1; supports BMS firmware upgrade.	
31	Flight-control protocol	Supports Boying and JIYI flight-control protocols.	Supports Boying and JIYI flight-control protocols.	Supports Boying and JIYI flight-control protocols.	Supports Boying and JIYI flight-control protocols.	Supports Boying and JIYI flight-control protocols.	Supports Boying and JIYI flight-control protocols.
32	Key function	One onboard key switch activates the BMS.	One onboard key switch activates the BMS.	One onboard key switch activates the BMS.	One onboard key switch activates the BMS.	One onboard key switch activates the BMS.	One onboard key switch activates the BMS.
33	Main board dimensions (L x W x T)	<=123.2 x 67.5 x 12	<=123.2 x 67.5 x 12	<=123.2 x 67.5 x 12	<=123.2 x 67.5 x 12	mm	mm
34	Installation method	Built-in, M3 screws	Built-in, M3 screws	Built-in, M3 screws	Built-in, M3 screws	Built-in, M3 screws	Built-in, M3 screws

5. Product Installation and Use

5.1 Product Electrical Wiring Diagram

5.1.1 Charge/Discharge Test Wiring Diagram



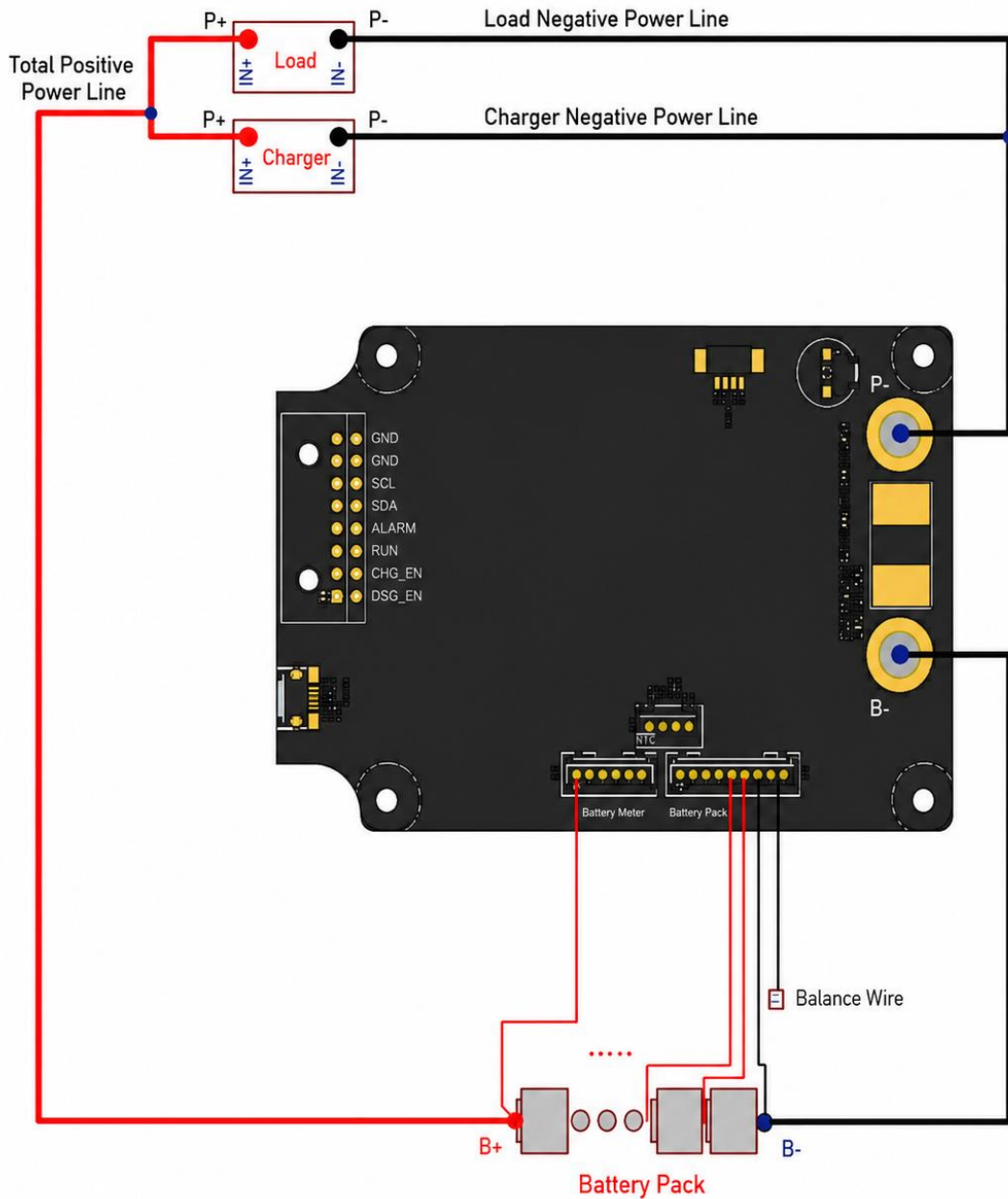


Figure 2. Charge/discharge test wiring diagram. Original drawing labels are retained.

Step 1: Connect one B- power cable, CAN communication, and Bluetooth module.

Step 2: For discharge, connect one P- power cable; for charge, connect one C- power cable.

Step 3: Connect the positive terminal of the load or charger to battery pack B+.

Step 4: The low-position sampling harness must be connected before the high-position sampling harness.

Note: Power-off sequence is the reverse of the above. Incorrect operation may damage the BMS board.



5.2 PCB Layout and Dimension Drawing

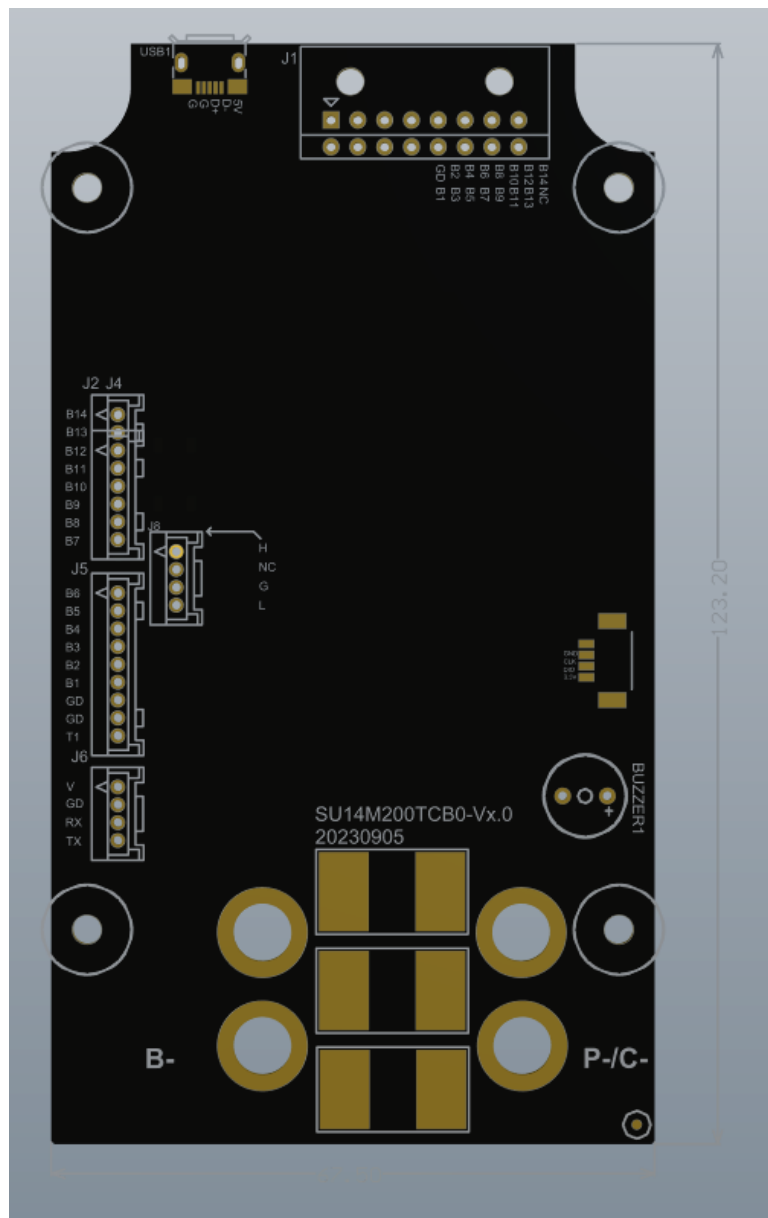


Figure 3. PCB layout and dimension drawing.

5.3 BMS Board Interface Definitions

Low-Position Voltage and Temperature Sampling (J5)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	T1	Temperature probe 1 positive	2	GD	Temperature probe 1 negative
3	GD	Negative of cell string 1	4	B1	Positive of cell string 1
5	B2	Positive of cell string 2	6	B3	Positive of cell string 3
7	B4	Positive of cell string 4	8	B5	Positive of cell string 5
9	B6	Positive of cell string 6			



High-Position Voltage Sampling (J2)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	B7	Positive of cell string 7	2	B8	Positive of cell string 8
3	B9	Positive of cell string 9	4	B10	Positive of cell string 10
5	B11	Positive of cell string 11	6	B12	Positive of cell string 12
7	B13	Positive of cell string 13	8	B14	Positive of cell string 14

CAN Communication (J8)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	L	CAN communication signal L	2	G	CAN communication GND
3	NC	NC	4	H	CAN communication signal H

Bluetooth Communication (J6)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	TX	Bluetooth module / serial signal transmit	2	RX	Bluetooth module / serial signal receive
3	GD	Bluetooth module / serial ground	4	V	Bluetooth module / serial power positive

USB Communication (USB1)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	5V	External 5V input positive	2	D-	USB signal DM
3	D+	USB signal DP	4	G	External 5V input GND
5	G	External 5V input GND			

Active Balancing (J1)

Pin No.	Definition	Description	Pin No.	Definition	Description
1	GD	Negative of cell string 1	2	B1	Positive of cell string 1
3	B2	Positive of cell string 2	4	B3	Positive of cell string 3
5	B4	Positive of cell string 4	6	B5	Positive of cell string 5
7	B6	Positive of cell string 6	8	B7	Positive of cell string 7
9	B8	Positive of cell string 8	10	B9	Positive of cell string 9
11	B10	Positive of cell string 10	12	B11	Positive of cell string 11
13	B12	Positive of cell string 12	14	B13	Positive of cell string 13
15	B14	Positive of cell string 14	16	NC	NC

