Document No.:EK- B3Sr4S50AR -P-010
Version No.：V1.0

Lithium battery protection board

（EK-B3Sr4S50AR）

Product Datasheet

Shenzhen Enerkey BMS Power Technology Co., LTD

Shenzhen Enerkey BMS Power Technology Co., Ltd.

Product Name	Lithium battery protection board
Product Model	EK- B3Sr4S50AR
Version	V1.0
Adapt Battery String	3S/4S
Adapt Battery Type	Ternary lithium （NCM）
Function	Overcharge protection, over-discharge protection, over-current protection, over-temperature protection, short-circuit protection
Effective date	26th.Dec.2023

Product change history			
Version	Date	Change point description	Approve
V1.0	2023-12-26	Initial version	

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Contents

1. Overview

①. This series of lithium battery protection boards is a power management system (BMS) tailored for ternary lithium batteries.

②. This series of lithium battery protection boards uses automotive-grade MOS, 2oz thickened copper foil and copper strips for current sharing, making the protection board highly precise, with ultra-low internal resistance and ultra-low heat generation.

③. On the basis of basic protection board functions such as overcharge protection, over-discharge protection, over-current protection, over-temperature protection, short-circuit protection, etc., a balancing function, reset function, electrostatic protection, dust-proof protection and moisture protection are added.

④.This lithium battery protection board (EK-B3Sr4S50AR) adopts 3S and 4S integrated solutions. You can flexibly select the required number of strings according to the wiring diagram provided by our company.

⑤. It is mostly used in the battery packs of electric scooters, electric bicycles, power tools, car washers, small household appliances, model aircraft and other products. Mainly plays the role of protecting the battery pack.

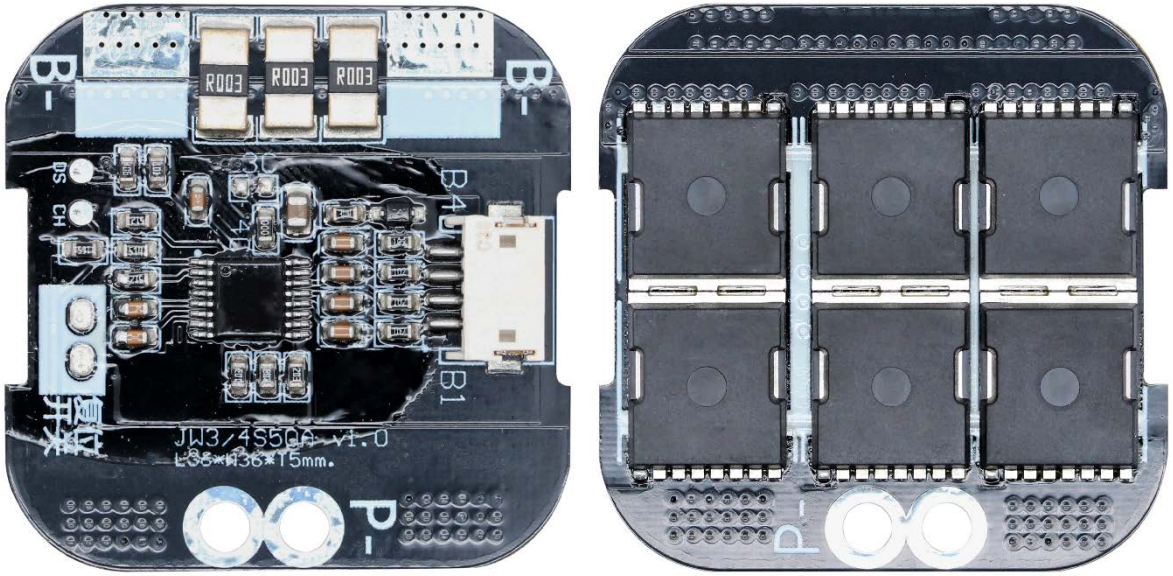
2. Technical Parameters

No.	Item		Min value	Typical value	Max value	Unit
1	Parameter overview	Rated working voltage B+B-			30	V
		Rated discharge current		50		A
		Peak starting current			100	A
2	Overcharge protection	P+P- input withstand voltage			40	V
		Charging overcurrent protection		not limited		A
		Charge detection voltage	4.200	4.225	4.250	V
		Charge detection delay time	0.5	1	1.3	S
		Overcharge release voltage	4.000	4.005	4.050	V
3	Over discharge protection	Discharge detection voltage	2.650	2.700	2.750	V
		Discharge detection delay time	20	100	150	ms
		Discharge release voltage	2.85	2.95	3.05	V
		Conditions for lifting protection	Disconnect external load or charge self-recovery			
4	Overcurrent protection	Overcurrent detection voltage		0.1		V
		Overcurrent protection current	90	100	110	A
		Overcurrent protection time	0.7	1	1.3	S
		Conditions for lifting protection	Disconnect external load or charge self-recovery			
5	Short circuit protection	Short circuit protection current		100		A
		Detection delay time	150	250	400	μS
		Conditions for lifting protection	Disconnect external load or charge self-recovery			
6	Internal resistance	Main circuit on-state resistance		1.7	2	mΩ

7	**Current consumption**	Normal working current consumption		10	15	μA
8	**Quiescent Current**	Current consumption during sleep			2.5	μA
9	**Operating temperature**	-	-40	25	85	℃

3. Product Photo

1) Product Appearance



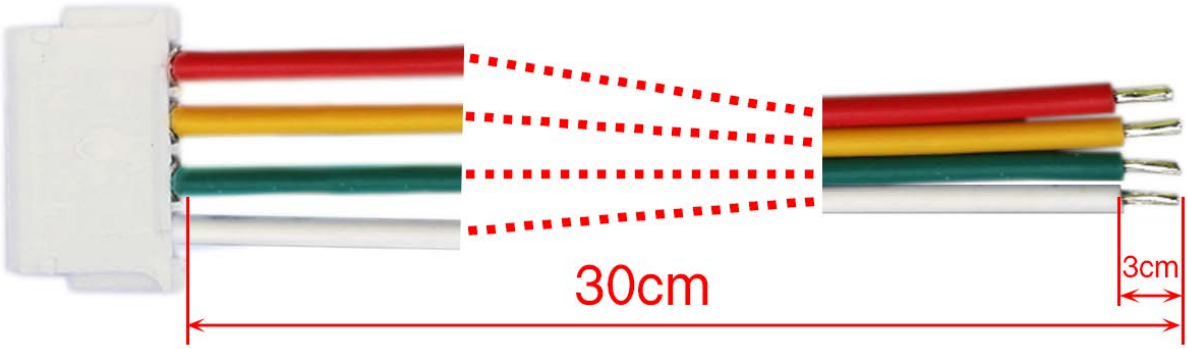
Special Note:

①. All products shipped are coated with conformal coating.

②. The factory default is 4S.

③. You can short-circuit the "reset switch" in the figure to reset the protection board with one click.

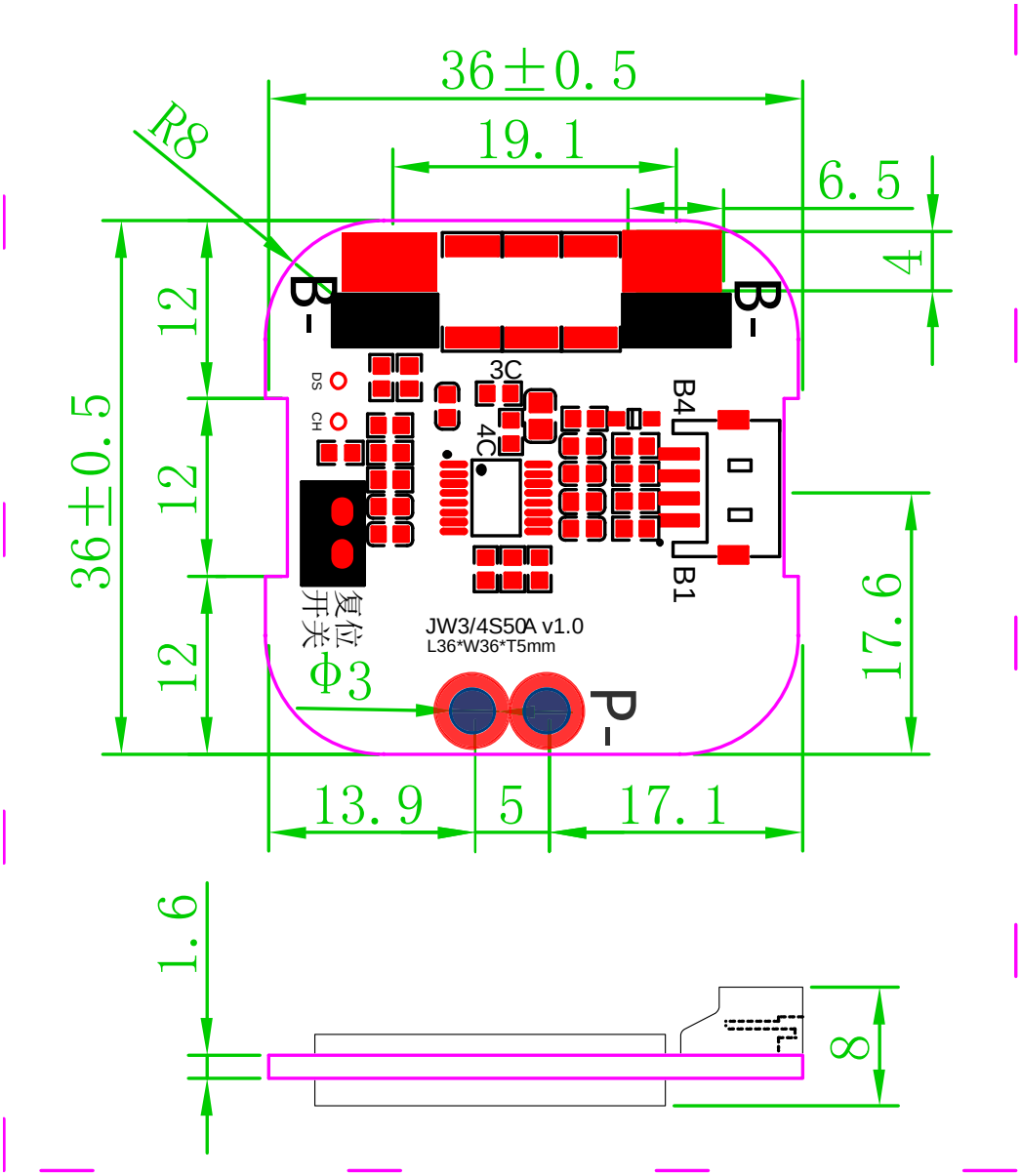
2) Accessories



Accessories specifications					
Terminal specifications	Material	Line number	Line length	Stripping length	Quantity
PZH1.5mm _4Pin	Cu	28AWG	30cm	3cm	1

4. Product Drawing

(No tolerance noted：±0.15， Unit: mm)

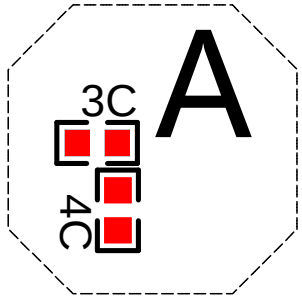


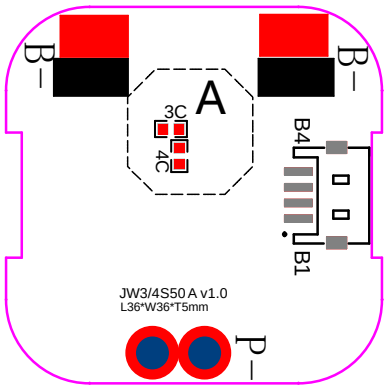
PCB Specifications			
Material	FR-4	Layer	2 layer
PCB thickness	1.6±0.10	Copper(CU) thickness	2.0 oz
Pads plating	Lead-free spray tin	Plate thickness	
Solder	Black	Silkscreen	White

5. Product wiring diagram

1). Instructions for switching the number of strings

EK-B3Sr4S50AR supports 3-string and 4-string battery pack. Switch the appropriate number of strings by changing part A as shown in "Figure 5.1.1".





This protection board supports 3S-4S to achieve different string number selection by changing the A part.

3S: Connect the "3C" position with 02 resistors; the "4C" position is empty.

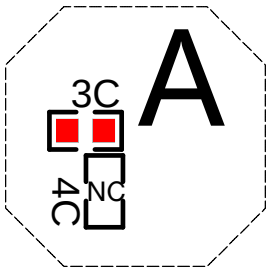
4S: Connect the "4C" position with 0 resistors; the "3C" position is empty.

Figure 5.1.1

2). Wiring diagram

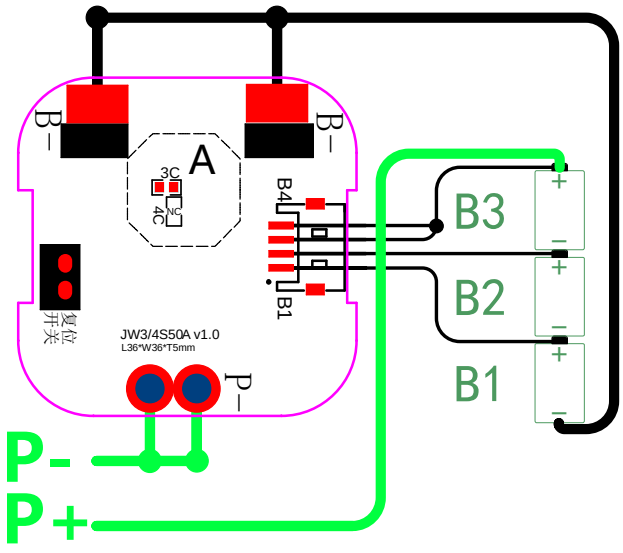
①. 3S Wiring diagram

"EK-B3Sr4S50AR" 3S 接线图
"EK-B3Sr4S50AR" 3S Wiring Diagram

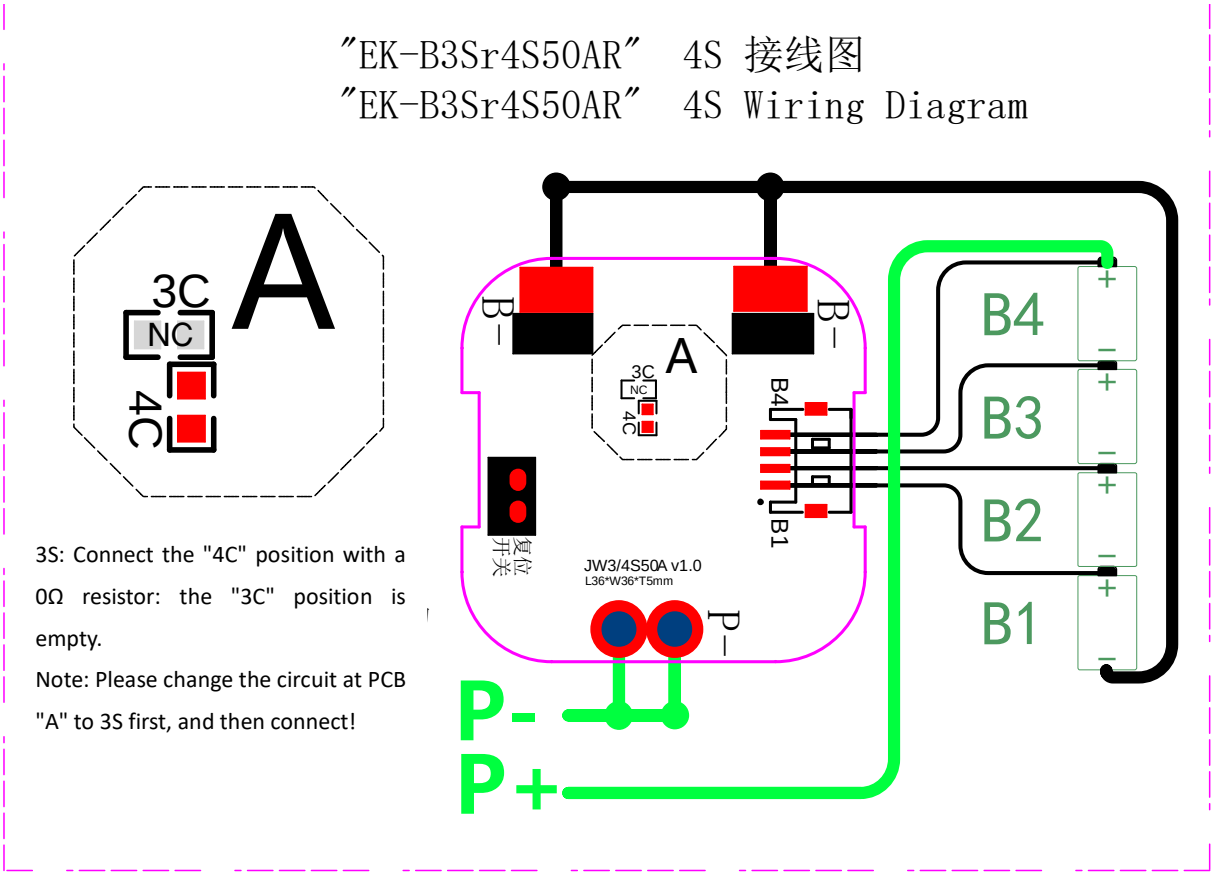


3S: Connect the "3C" position with a 0Ω resistor: the "4C" position is empty.

Note: Please change the circuit at PCB "A" to 3S first, and then connect!



②. 4S Wiring diagram



3). Precautions for wiring

①. Installing the protective board requires a certain amount of technical electronic knowledge.

②. When wiring, first connect the B- line at the soldering pad position to the total negative terminal of the battery (the B- line should be soldered to a short and thick wire).

And first solder the wired terminals to the battery pack, and then insert the protective plate.

③. The connection between the battery terminal B- and the protection board terminal B- should be short and thick, otherwise it will cause the protection board to charge and discharge in advance and malfunction.

You need to use thick wires when wiring P+/P-. Wires that are too thin and too long will burn the board!

④. After connecting the battery, please pay attention to the insulation protection of the product to avoid short circuit when the power is on;

6. Frequently Asked Questions

Phenomenon	Solution
After the protective board is installed, No output or wrong output voltage	① Activate the protection board: Connect the charger to power on or short-circuit P- and B- for 2-3 seconds, and then measure whether the output voltage is normal; ② The wiring order is wrong: measure whether the voltage of each battery string is normal.

After the protective board is installed, After using it for a while, the power was cut off.	Check whether the installation position of the NTC probe is normal,It should be installed close to the battery and not placed on the protective board.

7. Environmental substance requirements

Each battery corresponds to an LED indicator, and you can clearly observe whether each cell is balanced.

Harmful Substance	Limit standard (mg/kg)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent chromium (Cr6+)	1000
Polybrominated biphenyls (PBB)	1000
Polybrominated diphenyl ethers (PBDE)	1000

8. Safety protection measures, transportation and storage

1) Safety protection measures

①. There is no high voltage in the protection board board itself, and it will not cause electric shock damage to the body.

②. Do not repair the balancing board while the power is on. All repairs should be performed by qualified service personnel.

If the working voltage set by the factory is changed, the safety certificate no longer applies.

③. When using, please pay attention to the insulation treatment of the product to avoid short circuit.

④. Pay attention to ESD protection when using this product.

⑤. This product complies with the company's thrust standards: 0402 components ≥1.0KgF; 0603 components ≥1.5KgF; IC and MOS tubes ≥2.0KgF.

2) Packaging and shipping

①. Separate and package PCBA with anti-static bubble bags.

②. The packed products can be transported by ordinary means of transportation when they are not directly affected by rain, snow or violent collisions and bumps.

It is not allowed to be placed together with corrosive substances such as acids and alkalis during transportation.

3) Storage

Packaged products should be stored in a permanent warehouse with a temperature of 0℃~35℃ and a relative humidity of no more than 80%.

The warehouse should be free of acid, alkali and corrosive gases, strong mechanical vibration and impact,

and no strong magnetic field.