



Document Number: EK-C00S5A-L
-010

Latest version: V1.10

Capacitive active balancing board (EK-CxxS5A)

Selection Table

JKBMS Electronic Technology Co.,Ltd.

JKBMS Electronic Technology Co.,Ltd.

Product Name	Capacitive equalizer board
Product Model	EK-CxxS5A (x=0-9)
Version	V1.10
Applicable battery string number	3S- 21S
Applicable battery type	NCM/LFP/ LTO
Applicable battery capacity	30AH- 300AH
Effective Date	July 15, 2024

Product Change History			
Version	date	Change point description	Approved
V1.10	2024-07-15	Initial version	

website	www.enerkey.cn
Telephone	13332965127
address	No. 20, Hedi Road, Shangcun Community, Gongming Street, Guangming District, Shenzhen, Guangdong Area A, 9th Floor, Building G, Guancheng Low Carbon Industrial Park

Table of contents

Chapter 1: Overview	1
1. Feature	1
2. Application	1
3. Product model indication method	1
Chapter 2: Main technical parameters	1
Chapter 3: Product Selection	2
4. Product Description	5
1. Product appearance description	5
2. Accessory Description	5
Chapter 4: Product wiring diagram	6
1. Single board wiring diagram Figure	6
2. Wiring method	6
1. Pin Definition	6
2. Wiring precautions	6
Chapter 5: Product level connection line diagram	8
1. Cascade wiring diagram	8
1. Usage of a "common end for energy exchange" (basic usage)	8
2. How to use more than one "Energy Exchange Common Port" (Advanced Usage)	9
2. Cascade usage precautions	9
Chapter 6: Applicable battery type switching & external switch instructions .	10
1. Applicable battery type switching instructions	10
2. External switch description	10
Chapter 7: Product indicator light description	10
Chapter 8: Environmental material requirements	11
Chapter 9: Safety protection measures, transportation and storage	11
1. Safety measures	11
1. Packaging and Shipping.....	11
2. Storage	11

Chapter 1: Overview

1. Features

This series of capacitive active balancing board is for 30AH-300AH balancing management system tailored for high-capacity series battery packs.

Patented balanced architecture and capacitor method (**Patent No.: ZL 2019 1 12595 1**

3.3) the capacitor transfers the charge carrier, and the entire **battery** pack participates in the energy transfer to active balance at the same time. 24 hours of uninterrupted overall balance, no external power supply required, relying on the internal energy of the battery

The whole group is balanced and the loss is ultra-low.

This series of capacitive active balancing boards has a maximum balancing current of 5.5A. The voltage drop is positively correlated with the balancing current. They are suitable for mainstream ternary lithium batteries, lithium iron phosphate batteries, and lithium titanate batteries. They support 3 to 21 battery strings and support cascading of other balancing boards.

2. Application

packs are widely used in outdoor energy storage, home energy storage, industrial and commercial energy storage, RV modification, low-speed vehicles, solar photovoltaic and other products. It can also be temporarily used for battery balancing maintenance and repair. It mainly plays the role of repairing the battery pack voltage, restoring the battery pack capacity and extending the battery pack life.

3. Product model indication

EK - **C** **3S** **5A**
 ① ② ③ ④

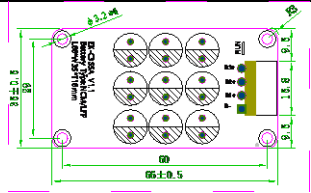
serial number	meaning	express
①	International Trademark Abbreviations	ENERKEY
②	Product series code	Capacitive equalizer board
③	Suitable number of battery strings	Suitable for battery packs with 3 single cells connected in series
④	Maximum balancing current	5 amps

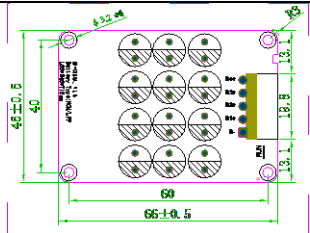
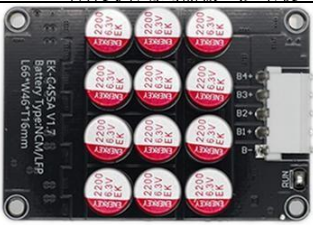
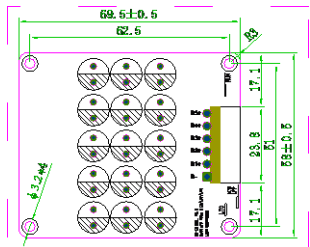
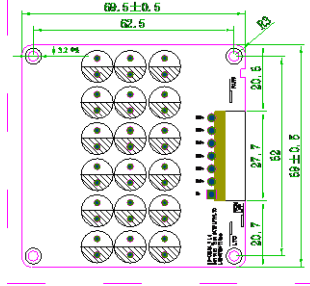
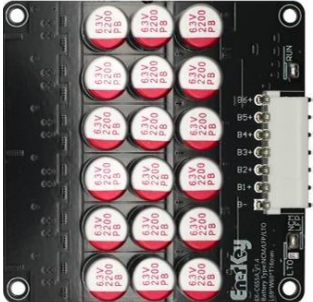
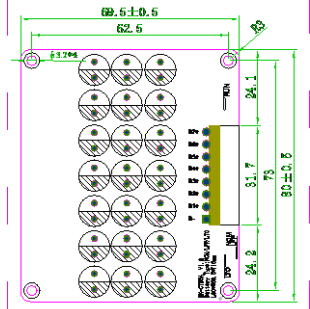
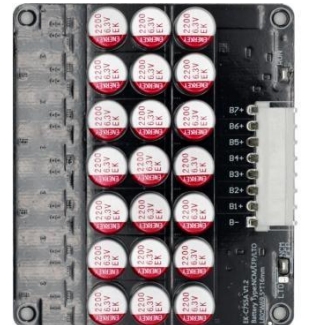
Chapter 2: Main Technical Parameters

PCB Material	FR- 4	Substrate copper thickness	2.0 oz
PCB Plate layer	4 layer	Pad processing	Lead-free HASL

Applicable number of strings (S)	3S- 21S	Applicable battery capacity	30AH- 300AH
cascade	support	Is an external power supply required?	no
Applicable battery type	Ternary lithium NCM/ Fe lithium LFP Lithium Titanate (LTO) (jumper selection)		
Single voltage operating range	NCM/LFP battery: 2.7-4.2V Lithium titanate battery (LTO): 1.8-4.2V		
Voltage balancing accuracy	5mV (typical)		
Balanced method	Patent (Patent No.: ZL 2019 1 1259513.3) Balancing architecture Fit capacitor method, the entire battery pack is balanced simultaneously. Automatic balancing of connected battery packs (default), which can be manually turned on or off by adding a switch.		
Balancing current	0.1V voltage difference and 1A balancing current, the voltage difference is proportional to the balancing current. The maximum allowable operating current is 5.5A		
Undervolt age protection Shutdown sleep voltage	NCM/LFP battery: Less than 2.7 V (collect B1 voltage) Lithium Titanate Battery (LTO): Less than 1.8 V (collect B1 voltage)		
Undervolt age protection Starting equalization voltage	NCM/LFP battery: 2.835 V (collect B1 voltage) Lithium titanate battery (LTO): 1.89 V (collect B1 voltage)		
Quiescent operating current	7mA, total series power		
Sleep standby current	0.1mA		
Working temperature	-20 °C to + 60°C		

Chapter 3: Product Selection

Board	Model	Series	Dimensions Gross Weight	Layout	Actual Image
1	EK- C3S5A	3S	L66*W35*T16mm 45g		

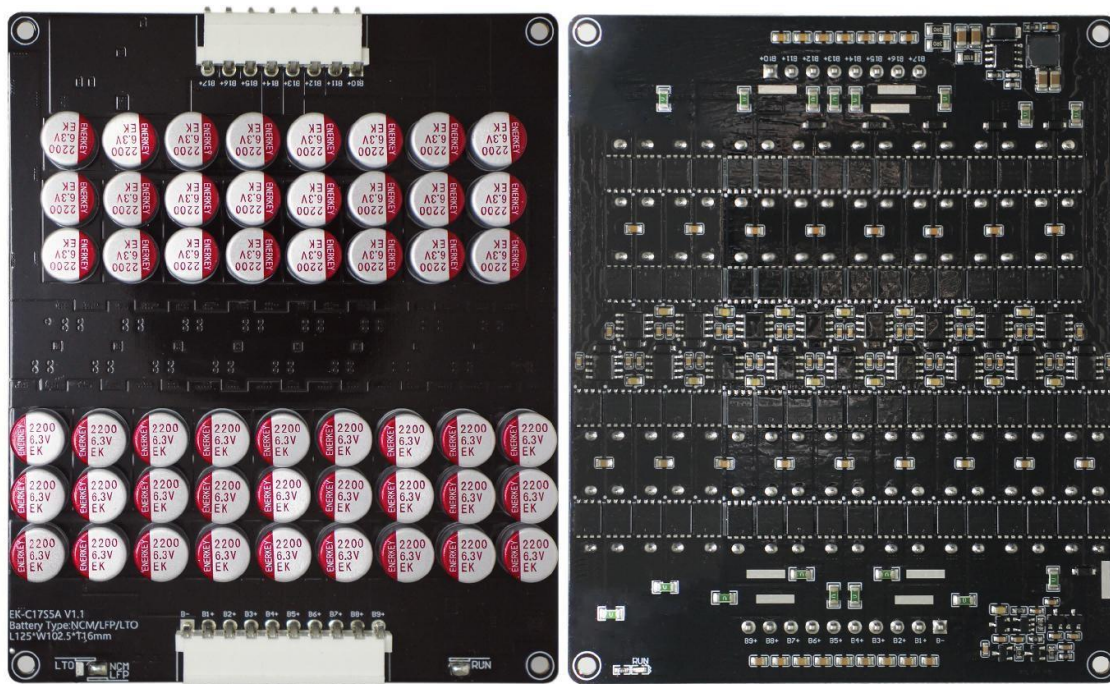
2	EK- C4S5A	3S 4S	L66*W46*T16mm 55g		
3	EK- C5S5A	4S 5S	L69*W58*T16mm 70g		
4	EK- C6S5A	4S 5S 6S	L69*W69*T16mm 85g		
5	EK- C7S5A	5S 6S 7S	L80*W69.5*T16mm 95g		

— 4 —

Board	Model	Series	Dimensions Gross Weight	Layout	Actual Image
10	EK-C16S5A	12S 13S 14S 15S 16S	L125*W91*T16mm 205g		
11	EK-C17S5A	13S 14S 15S 16S 17S	L125*W103*T16mm 225g		
12	EK-C21S5A	17S 18S 19S 20S 21S	L145*W130*T16mm 250g		

4. Product Description

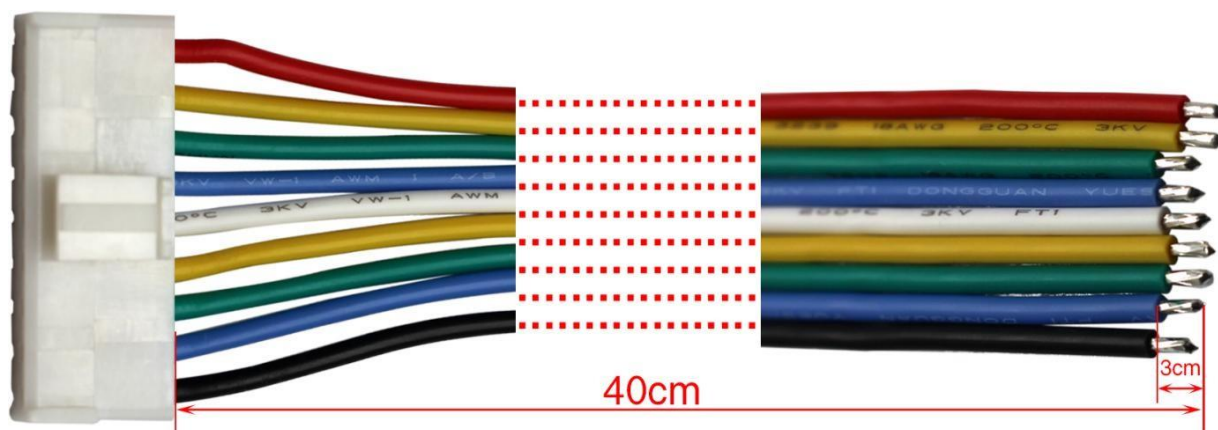
1. Product appearance description



- ① . This product has components on both sides. Please pay attention to insulation when using it.
- ② . All shipped products are coated with three-conformal paint.
- ③ . PCB The diameter of the mounting screw hole is 3.2mm .

2. Accessory Description

This balancing board is shipped with terminal wires of corresponding specifications.



Accessory specifications				
Terminal specifications	Material	Line number	Line length	Stripping length
VH3. 96mm	copper	18AWG	40cm	3cm

Chapter 4: Product Wiring Diagram

1. Single board wiring diagram

In 21S for example, the wiring diagram is shown in Figure 4.1.1. If you need wiring diagrams for other models, please refer to the corresponding product specifications.

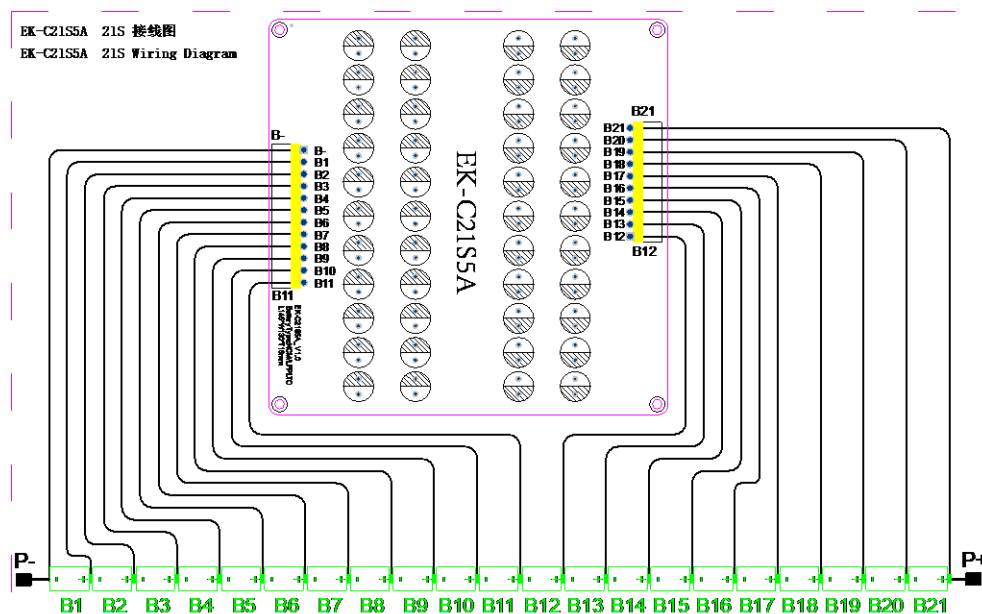


Figure 4.1.1

2. Wiring method

1. Pin definition

Pin Silkscreen	definition
B-	the first battery string
B1	the first battery string
B2	of the second battery string
.....	And so on
B20	Positive electrode of the 20th battery
B21	Positive electrode of battery in string 21

2. Wiring precautions

①. This product requires welding operations to be assembled. Please strictly follow the wiring diagram! If you have any questions during the assembly process, please contact after-sales personnel

②. During assembly, please solder the terminal wires to the battery pack first, then insert the terminal wires into the product

③. **Plugs with more than 13 strings** need to be inserted diagonally, first touching the B-pin and then inserting it diagonally upwards. Otherwise, the board may burn out.

- ④ . After connecting the battery, please pay attention to the insulation protection of the product to avoid short circuit when powered on.
- ⑤ . When the board is in use and there are spare pins, leave the spare pins floating/unconnected. Connect 20S When using a battery pack, " B 2 1 " is left floating.

Please refer to the corresponding model specifications for details.

Chapter 5: Product Level

Connection Diagram

1. Cascade wiring diagram

1. How to use a "common end for energy exchange" (basic usage)

Use 2pcs "EK-C16S5A" for 31S Take the battery pack as an example,
the wiring diagram is shown in Figure 5.1.1. If you need other
serial wiring diagrams, please contact sales staff.

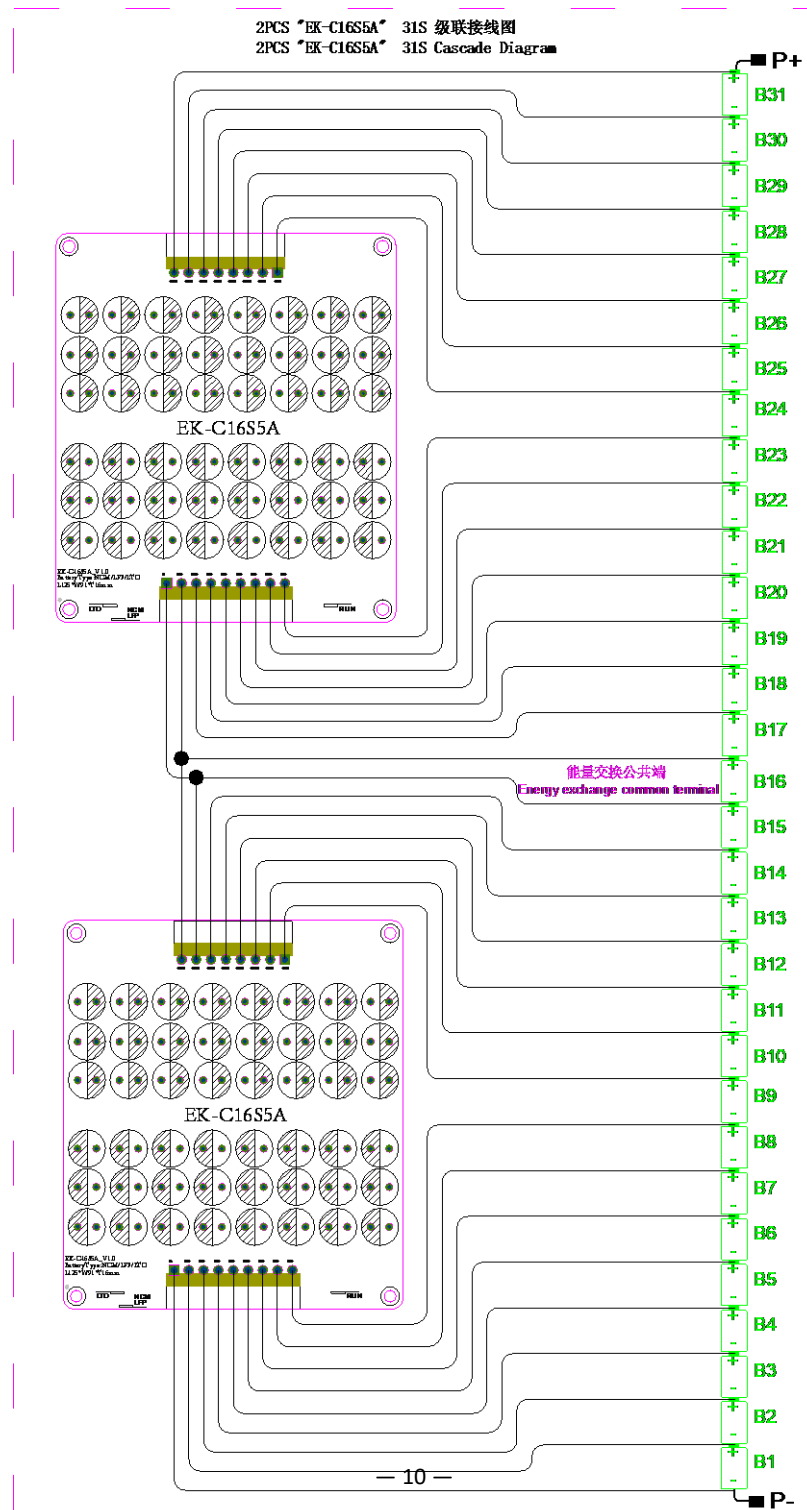


Figure 5.1.1

2. How to use more than one "Energy Exchange Common Port" (Advanced Usage)

The advantage of having more than one "energy exchange common end" is that the balancing efficiency will be higher.

The following uses 2 PCS "EK-C16S5A" for 26S Take the battery pack as an example, the wiring diagram is shown in Figure 5.2.1 shown.

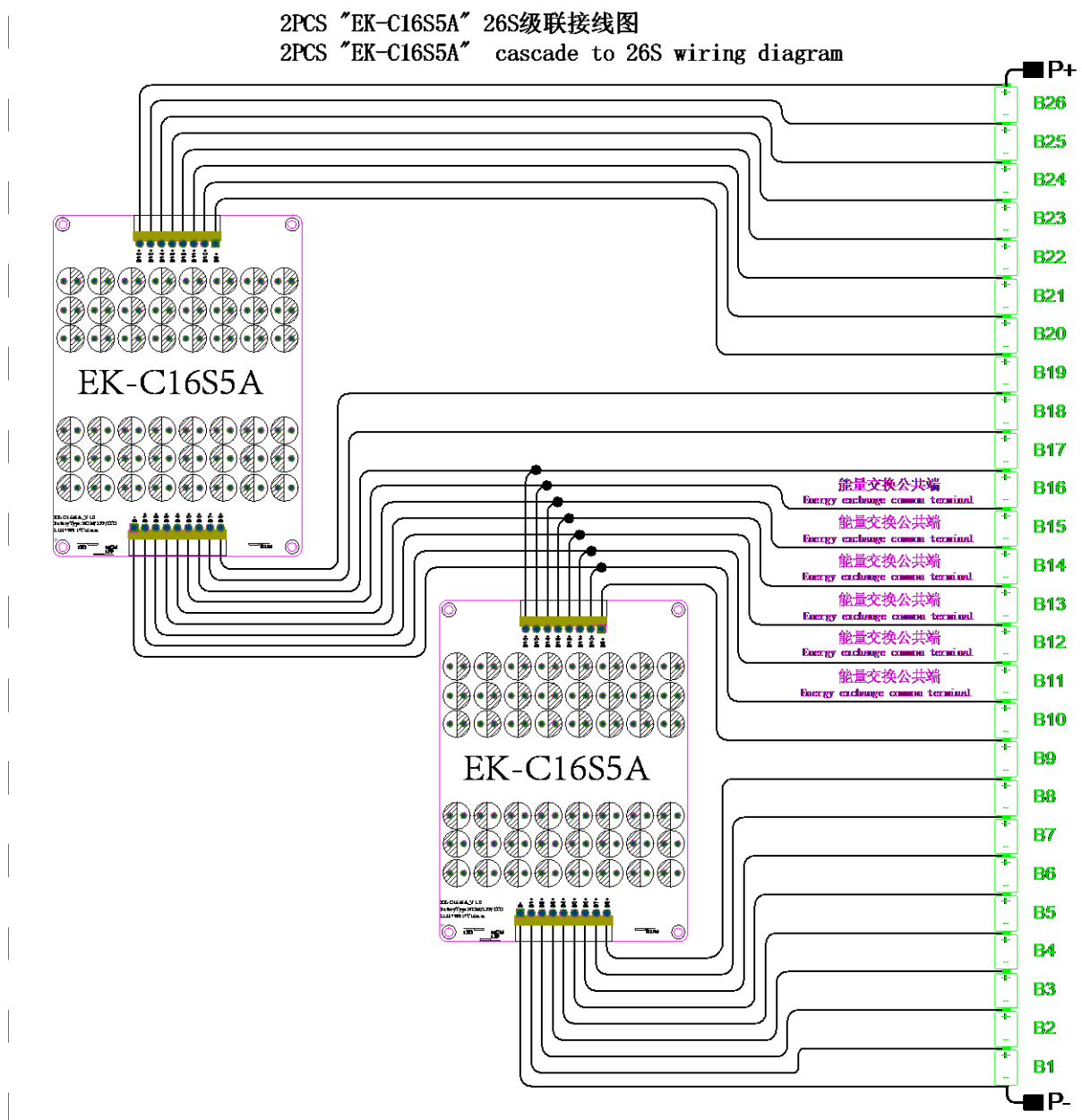


Figure 5.2.1

2. Precautions for cascading use

① . When using in cascade, there is at least one "energy exchange common terminal" between every two balancing boards. When welding, please pay attention to whether the connection here is correct and whether there are any cold solder joints or false solder joints.

- ② . The cascade use of one "energy exchange common terminal" and more than one "energy exchange common terminal" is feasible.

It is recommended to use a cascade method of "energy exchange common end", which is relatively simple to operate.

- ③ . Cascading is a high-voltage environment, so please take personal protection measures.

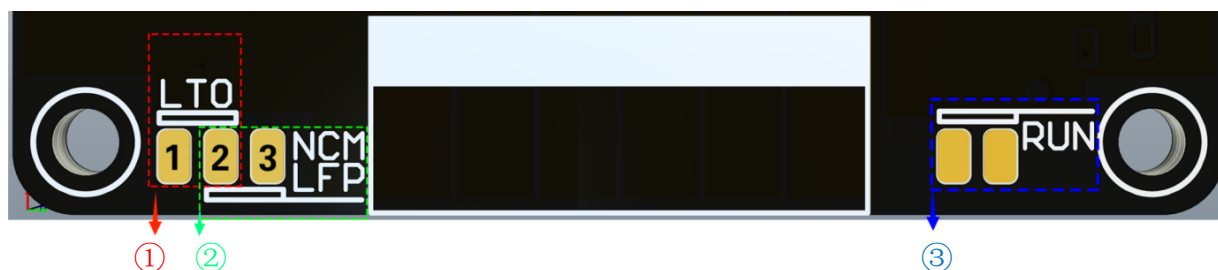
Please check the wiring repeatedly to see if there are any errors. Wrong wiring may burn the board.

If it does not work after connection, please contact after-sales personnel to inquire about the corresponding cascade wiring diagram.

Applicable battery type switching & external switch instructions

1. Instructions for switching applicable battery types

Diagram:



This balancing board is suitable for NCM lithium and LFP lithium iron batteries by default.

The applicable battery type can be changed by soldering jumpers. Select the battery type according to the "1", "2" and "3" pads in the figure above;

Applicable battery type	Pad number in the figure	Physical picture	Remark
LTO lithium titanate	1+2 connection (Image frame ①)		Customers need to weld and switch by themselves
NCM ternary lithium LFP Lithium Iron	2+3 connection (Image frame ②)		Factory default mode

2. External switch instructions

" diagram box ③ " to control balancing on and off. The factory default is to automatically turn on balancing when connected to a battery pack.

Chapter 6: Product Indicator Light Description

Indicator status	Product operation status
Constantly on	Balanced work
Extinguished	Undervoltage sleep

Chapter 7: Environmental Material Requirements

The contents of this specification comply with the requirements of the EU RoHS directive, and the content of hazardous substances meets the following standards:

Hazardous substances	Limit standard (mg/kg)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent chromium (Cr6+)	1000
Polybrominated biphenyls (PBBs)	1000
Polybrominated diphenyl ethers (PBDEs)	1000

Chapter 8: Safety measures, transportation and storage

1. Safety protection measures

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

② Do not repair the balancing board while the power is on. All repairs should be performed by qualified maintenance personnel. If the operating voltage is changed from the factory setting, the safety certificate will no longer apply.

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

ESD protection when using this product.

⑤ . This product complies with our company's thrust standards: 0402 components $\geq 1.0\text{KgF}$; 0603 components $\geq 1.5\text{KgF}$; IC and MOS tube

$\geq 2.0\text{KgF}$.

1. Packaging and transportation

①. Use anti-static bubble bags to separate the PCBA and PCBA.

②. The packed products can be transported by common means of transport, provided they are not directly affected by rain, snow, or severe collisions or bumps. They must not be placed together with corrosive substances such as acids and alkalis during transportation.

2. Storage

Packaged products should be stored in a permanent warehouse with a temperature of $0\text{ }^{\circ}\text{C} \sim 35\text{ }^{\circ}\text{C}$ and a relative humidity of no more than 80% . There should be no acid, alkali, or corrosive gases in the warehouse, no strong mechanical vibration and impact, and no strong magnetic field.