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Version No.: V1.0

# Capacitive Active Balancer ( EK-C21S5A ) Product Datasheet

Shenzhen Enerkey BMS Power Technology Co., LTD

## Shenzhen Enerkey BMS Power Technology Co., LTD.

Product Name	Capacitive Active Balancer
Product Model	EK-C21S5A
Version	V1.0
Adapt Battery String	17S/18S/19S/20S/21S
Adapt Battery Type	NCM/ LFP/LTO
Effective date	18th.Nov.2023

Product change history			
Version	Date	Change point description	Approve
V1.0	2023-12-18	Initial version	

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## 1. Overview

- ①. This series of capacitive active balancing boards is a balancing management system tailor-made for 30AH-300AH capacity series battery packs.
- ②. Patented balancing architecture Fit capacitor method (Patent No.: ZL 2019 1 1259513.3), the capacitor Fit transfers the charge porter, and the entire battery pack participates in energy transfer and active balancing at the same time. 24-hour uninterrupted overall balancing, no external power supply is required, and the entire group is balanced by relying on the internal energy transfer of the battery, with ultra-low loss.
- ③. The maximum balancing current of this series of capacitive active balancing boards is 5.5A. The voltage difference is positively related to the balancing current. Suitable for mainstream ternary lithium batteries, lithium iron phosphate batteries, and lithium titanate batteries on the market. Supports 3 to 21 battery strings. Supports cascade use.
- ④. It is mostly used in large-capacity battery PACKs for outdoor energy storage, home energy storage, industrial and commercial energy storage, RV modification, low-speed vehicles, solar photovoltaics and other products. It can also be temporarily used for battery balancing maintenance, repair and other occasions. It mainly plays the role of repairing the battery pack voltage, restoring the battery pack capacity, and extending the battery pack life.

## 2. Technical Parameters

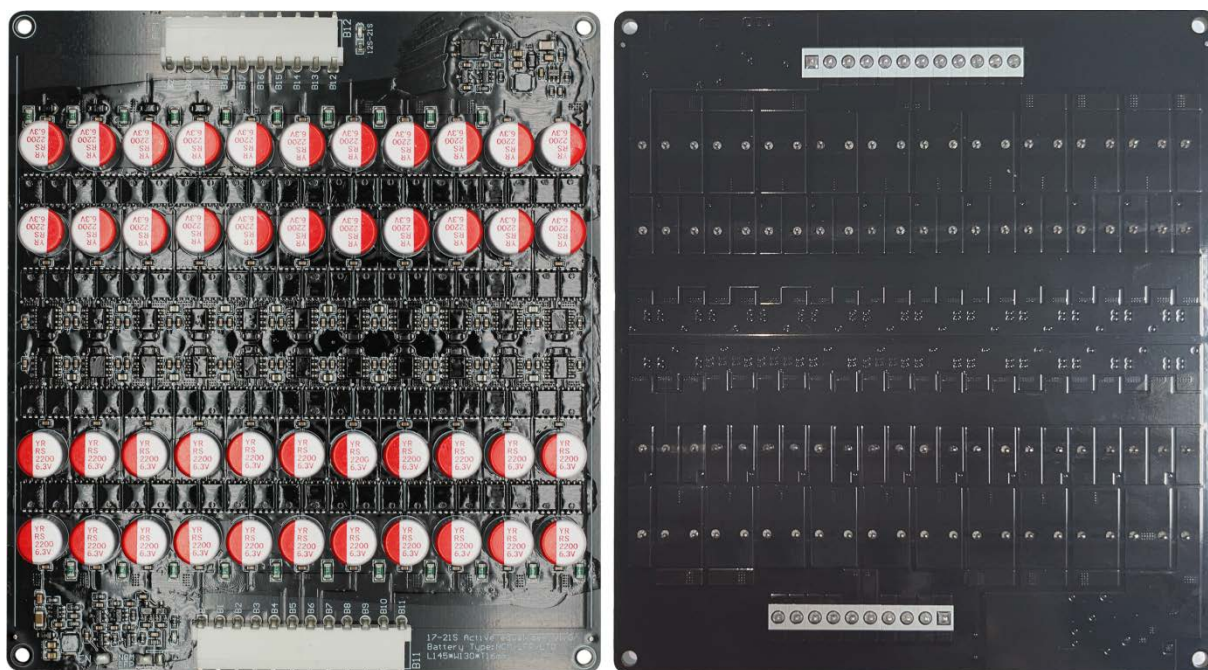
Product Name	EK-C21S5A
Adapt String	17S/18S/19S/20S/21S
Adapt Battery Type	Ternary lithium NCM/iron lithium LFP Lithium Titanate LTO (Jumper Select)
Adapt battery capacity	30AH-300AH
Cell Voltage Working Range	Ternary/lithium iron battery (NCM/LFP): 2.7-4.2V Lithium titanate battery (LTO): 1.8-4.2V
Cascading	Support
Voltage Balancing Accuracy	5mV (typical value)
Balanced Approach	Patented (Patent No.: ZL 2019 1 1259513.3) balanced architecture Fit capacitor method, the entire battery pack is balanced at the same time. Connect to the battery pack for automatic balancing (default). You can add a switch to manually turn on or off balancing.
Balanced Current	0.1V voltage difference 1A balancing current, the voltage difference is proportional to the balancing current, The maximum allowable operating current is 5.5A
Undervoltage Protection Sleep Voltage	Ternary/lithium iron battery (NCM/LFP): lower than 2.7 V (collect B1 voltage) Lithium titanate battery (LTO): lower than 1.8 V (collect B1 voltage).
Under voltage protection Start balancing voltage	Ternary/lithium iron battery (NCM/LFP): 2.835 V (collect B1 voltage) Lithium titanate battery (LTO): 1.89 V (collect B1 voltage)

Do you need an external power supply?	No
Quiescent operating current	7mA, Taking power from the total string
Sleep standby current	0.1mA
Working Temperature	-20℃ - +60℃
Whether need an external power supply	No external power supply required; Relying on internal energy transfer of the battery to achieve adjacent equilibrium
Product Size	L145*W130*T16mm
Product Gross Weight	250g

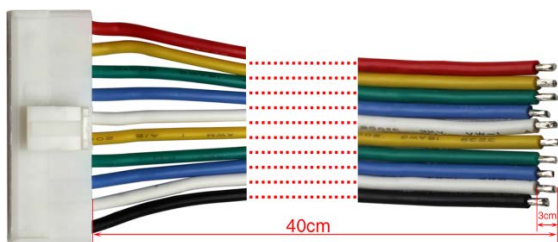
### 3. Product Photo

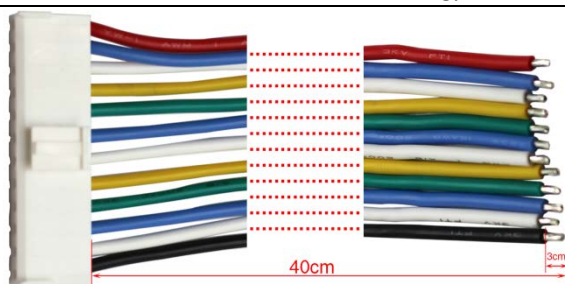
#### 1) Product Appearance

Special note: The shipped products are all coated with conformal anti-paint.



#### 2) Accessories

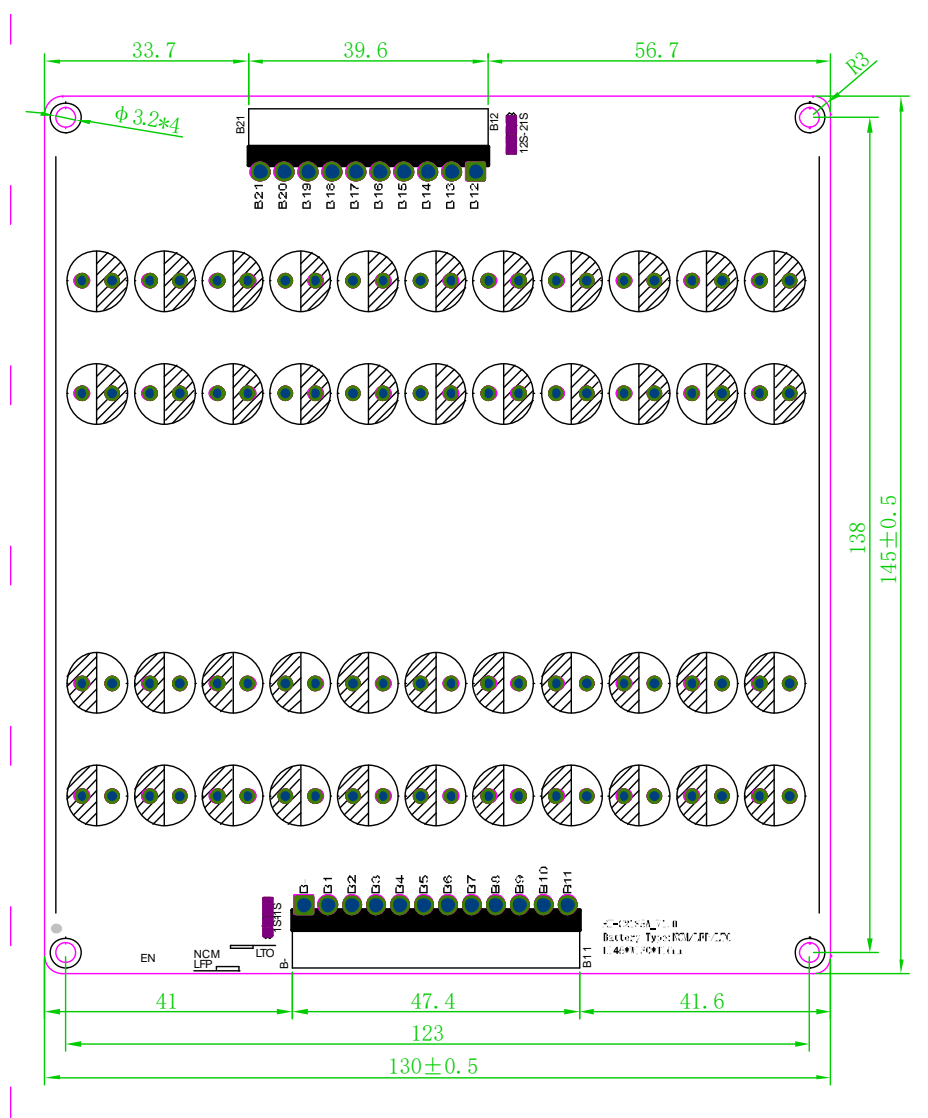




Accessories specifications					
Terminal specifications	Material	Line number	Line length	Stripping length	Quantity
VH3.96mm_10Pin	Cu	18AWG	40cm	3cm	1
VH3.96mm_12Pin	Cu	18AWG	40cm	3cm	1

## 4. Product Drawing

(No tolerance noted:  $\pm 0.15$ , Unit: mm)

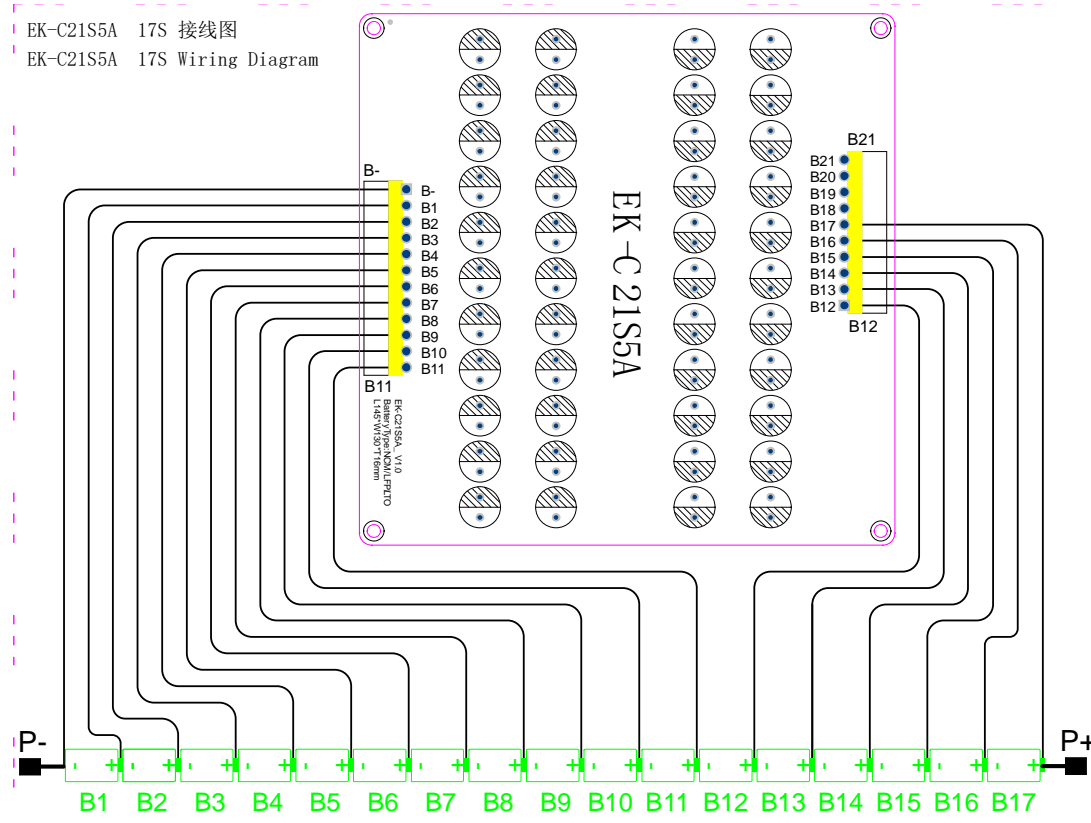


PCB Specifications			
Material	FR-4	Layer	4 layer
PCB thickness	0.6±0.10	Copper(CU) thickness	2.0 oz
Pads plating	Lead-free spray tin	Plate thickness	
Solder	Black	Silkscreen	White

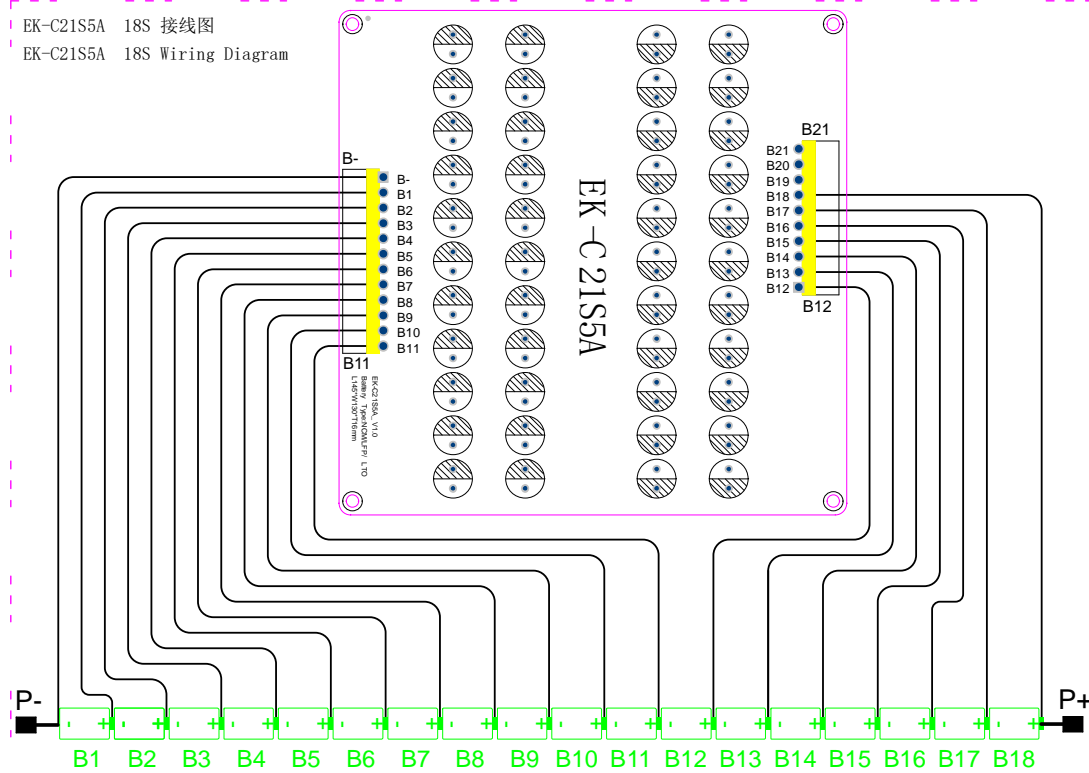
## 5. Product wiring diagram

### 1). Single board wiring diagram

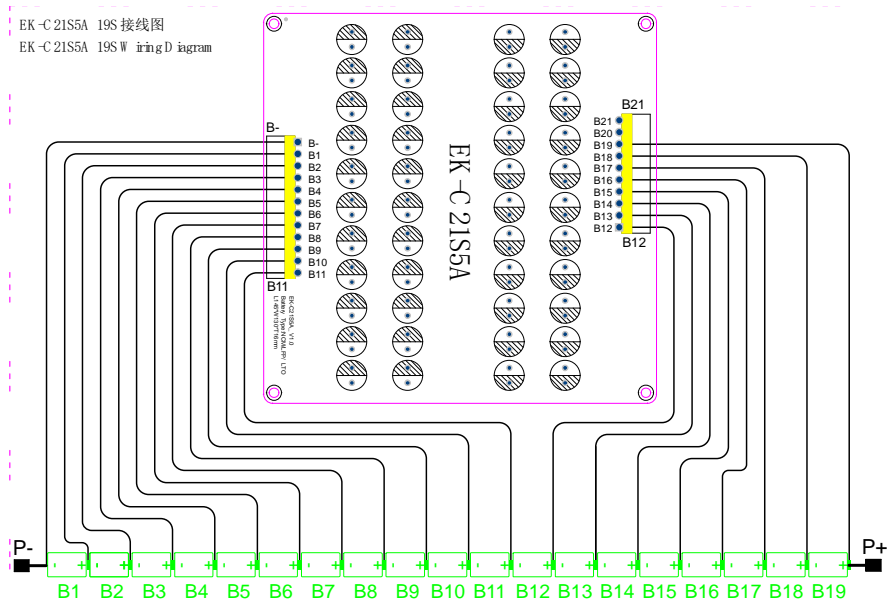
A single EK-C21S5A supports 17s, 18s, 19s, 20s and 21s battery packs. The wiring method is as follows:



EK-C21S5A 18S 接线图  
EK-C21S5A 18S Wiring Diagram

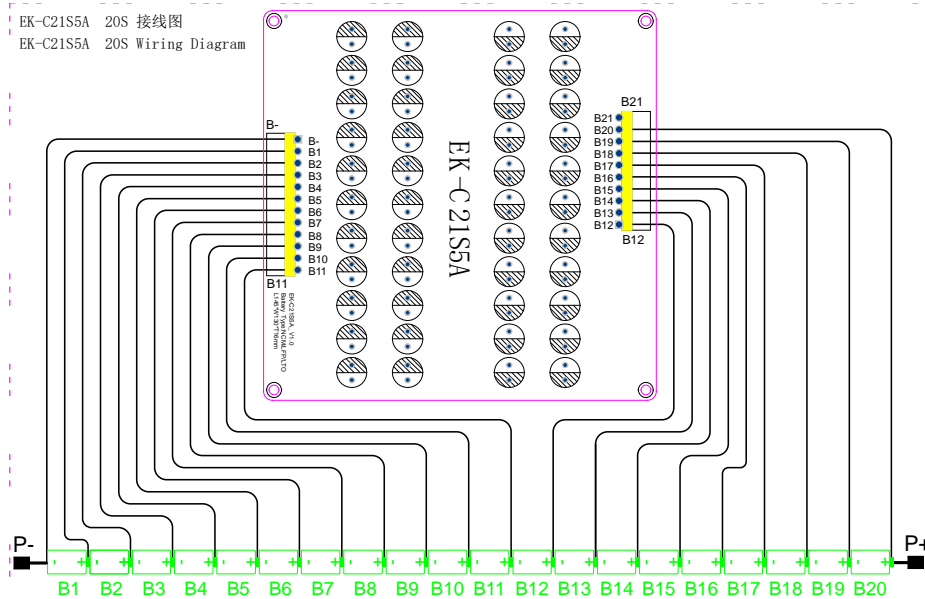


EK-C21S5A 19S 接线图  
EK-C21S5A 19S Wiring Diagram

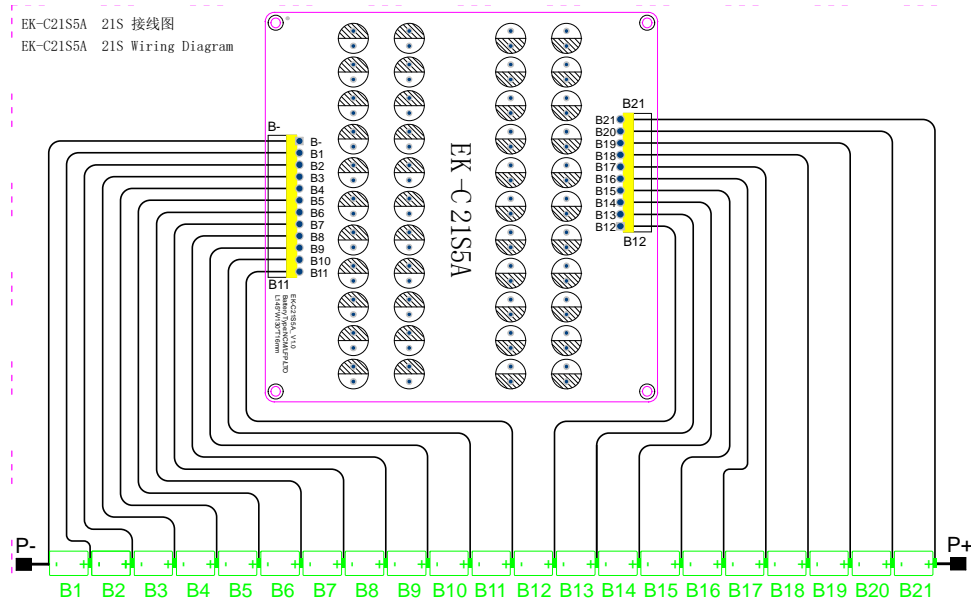




EK-C21S5A 20S 接线图  
EK-C21S5A 20S Wiring Diagram



EK-C21S5A 21S 接线图  
EK-C21S5A 21S Wiring Diagram





### 3). Cascade wiring diagram

- ①. The assembly of this product requires welding operations; please strictly follow the wiring diagram! If you have any questions during the assembly process, please contact after-sales personnel.
- ②. When assembling, please weld the terminal wire to the battery pack first, and then insert the terminal wire into the product;
- ③. After connecting the battery, please pay attention to the insulation protection of the product to avoid short circuit when power is on;
- ④. When used in cascade, there must be at least one "energy exchange common terminal" between each two balancing boards.

When welding, please pay attention to whether the connection here is correct and whether there is any false welding or false welding.

- ⑤. Cascade use is a high-voltage environment, please repeatedly check whether the wiring is correct. If it cannot be used after connection, please contact after-sales personnel to consult the corresponding cascade wiring diagram.

## 6. Applicable battery type switching & external switch instructions

### 1). Applicable battery type switching instructions

Illustration:



This balancing board is suitable for NCM ternary lithium and LFP lithium iron batteries by default. The applicable battery type can be changed by jumper welding, and the battery type can be selected according to the "1", "2", and "3" pads in the picture above;

Applicable battery type	Pad number in the picture	Physical illustration	Remark
LTO Lithium titanate	1+2 connect (Illustration frame ①)		Customers need to weld and switch by themselves
NCM ternary lithium LFP Lithium iron	2+3 连接 (Illustration frame ②)		Factory default mode

### 2). External switch instructions

" Illustration frame ③" can be connected with an external switch to control the opening and closing of equalization.

The factory default is to connect the battery pack and automatically turn on balancing.

## 7. Product indicator light description

Indicator status	Product operation status
Always on	Balance at work
Extinguish	Under voltage sleep

## 8. 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

## 9. Safety protection 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 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  $\geq 1.0\text{KgF}$ ; 0603 components  $\geq 1.5\text{KgF}$ ; IC and MOS tubes  $\geq 2.0\text{KgF}$ .

### 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  $0^{\circ}\text{C}\sim 35^{\circ}\text{C}$  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.