

# Power Dog

operation instructions

(DxxS5A)



product name 产品名称	Capacitive balancing 电容式均衡板
Model 产品型号	PxxS (x=0-9)
Version 版本	V1.10
Applicable number of battery strings 适用电池串数	3S-21S
Applicable battery types 适用电池类型	三元锂 (NCM) /铁锂 (LFP) /钛酸锂 (LTO)
Applicable battery capacity 适用电池容量	30AH-300AH
effective date 生效日期	July 15th, 2024 2024 年 07 月 15 日

official website 网站	<a href="http://www.PowerDog.com,cn">www.PowerDog.com,cn</a>
Phone 电话	13612992617
Address 地址	9th Floor, Area A, Building G, Guancheng Low Carbon Industrial Park, Gongming Street, Guangming District, Shenzhen City, Guangdong Province 广东省深圳市光明区公明街道上村社区河堤路 20 号冠城低碳产业园 G 栋 9 楼 A 区

## overview 概述

### 1、Features 特征

This series of capacitive active balancing boards is a balancing management system tailored for 30AH-300AH series connected battery packs.

Patent Balanced Architecture Fit Capacitor Method (Patent No.: ZL 2019 1 1259513.3), The capacitive flyability transfer charge transporter actively balances the energy transfer of the entire battery pack simultaneously. 24-hour uninterrupted overall balance, no need for external power supply, relying on internal energy transfer of the battery to achieve overall balance, ultra-low loss.

The maximum balancing current of this series of capacitive active balancing boards is 5.5A. The pressure difference is positively correlated with the equilibrium current. Suitable for mainstream ternary lithium batteries, lithium iron phosphate batteries, and lithium titanate batteries on the market. Supports 3 to 21 battery strings. Support cascading use.

此系列电容式主动均衡板是为 30AH-300AH 容量串联电池组量身打造的均衡管理系统。

专利均衡架构飞度电容方式 (专利号: ZL 2019 1 1259513.3), 电容飞度转移电荷搬运工, 整组电池同时参与能量转移主动均衡。24 小时不间断整体均衡, 无需外接电源, 依靠电池内部能量转移实现整组均衡, 超低损耗。

此系列电容式主动均衡板最大均衡电流为 5.5A。压差与均衡电流成正相关。适用于市面上主流的三元锂电池, 磷酸铁锂电池, 钛酸锂电池。支持 3 串到 21 串电池。支持级联使用。

### 2、application 应用

It is widely used in large capacity battery PACKs for outdoor energy storage, household 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. Mainly used to repair battery voltage, restore battery capacity, and extend battery life.

多应用于户外储能、家庭储能、工商储能、房车改装、低速车、太阳能光伏等产品的大容量电池 PACK 内, 亦可临时用于电池均衡维修、修复等场合。主要起到修复电池组电压, 恢复电池组容量, 延长电池组寿命的作用。

### 3、Method for representing product models 产品型号表示方法

P- 3S 5  
① ② ③

number 编号	meaning 含义	show 表示
①	International Trademark Abbreviation 国际商标缩写	POWERDOG



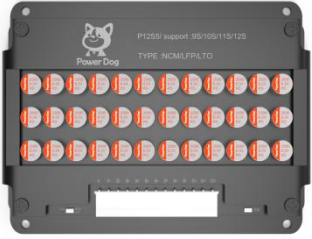




②	Suitable for battery string count 适合电池串数	Suitable for a battery pack with 3 individual cells connected in series 适合 3 个单体电池串联的电池组
③	Maximum equilibrium current 最大均衡电流	5 amperes 5 安培

## Main technical parameters 主要技术参数

PCB Material PCB 材质	FR-4	Copper thickness of substrate 基板铜厚	2.0 oz
PCB board layer PCB 板层	4 layer	Pad processing 焊盘处理	Lead-free HASL 无铅喷锡
Applicable string number (S) 适用串数 (S)	3S-21S	Using battery capacity 适用电池容量	30AH-300AH
cascade 级联	Support 支持	Do you need an external power supply 是否需要外接	No 否
Applicable battery types 适用电池类型	Ternary lithium NCM/iron lithium LFP 三元锂 NCM/铁锂 LFP Lithium titanate LTO (jumper selection) 钛酸锂 LTO (跳线选择)		
Single voltage operating range 单体电压工作范围	三元/铁锂电池 (NCM/LFP) : 2.7-4.2V 钛酸锂电池 (LTO) : 1.8-4.2V		
Voltage balance accuracy 电压均衡精度	5mV (typical value) (典型值)		
Balanced approach 均衡方式	The balanced architecture adopts the Fit capacitor method, where the entire battery pack is balanced simultaneously. Connect the battery pack for automatic balancing (default), which can be manually turned on or off after adding a switch. 均衡架构飞度电容方式, 整组电池同时均衡。接入电池组自动均衡(默认), 可加开关后手动开启或关闭均衡。		
equalizing current 均衡电流	0.1V pressure difference 1A balanced current, the pressure difference is directly proportional to the balanced current, The maximum allowable working current is 5.5A. 0.1V 压差 1A 均衡电流, 压差与均衡电流成正比例, 最大允许工作电流为 5.5A		
Undervoltage protection Shutdown sleep voltage 欠压保护停机休眠电压	三元/铁锂电池 (NCM/LFP) :	Below 2.7 V (collecting B1 voltage) 低于 2.7 V (采集 B1 电压)	
	钛酸锂电池 (LTO) :	Below 1.8 V (collecting B1 voltage) 低于 1.8 V (采集 B1 电压)	
Undervoltage protection starts balancing voltage 欠压保护启动均衡电压	三元/铁锂电池 (NCM/LFP) :	2.835 V (collecting B1 voltage) 2.835 V (采集 B1 电压)	
	钛酸锂电池 (LTO) :	1.89 V (collecting B1 voltage) 1.89 V (采集 B1 电压)	
Quiescent current 静态工作电流	Total string power supply 7mA, 总串取电		
Sleep standby current 休眠待机电流	0.1mA		
Ambient Temperature 工作环境温度	-20°C to +60°C		

## Product Selection 产品型号

Serial Number 序号	Model 型号	Number of strings 串数	Size and gross weight 尺寸 毛重	Physical picture 实物图
1	P4S5	3S 4S	L86*W51*T19mm Holepositi 孔位: 75*30mm Weight 重量: 68g	
2	P8S5	5S 6S 7S 8S	L90*W96*T19mm Holepositi 孔位: 78*75mm Weight 重量: 130g	
3	P12S5	9S 10S 11S 12S	L90*W140*T19mm Holepositi 孔位: 79*121mm Weight 重量: 193g	
4	P16S5	13S 14S 15S 16S	L145*W96*T19mm Holepositi 孔位: 134*76mm Weight 重量: 131g	
4	P21S5	17S 18S 19S 20S 21S	L165*W135*T19mm Holepositi 孔位: 155*115mm Weight 重量: 336g	

## 4、Description 产品说明

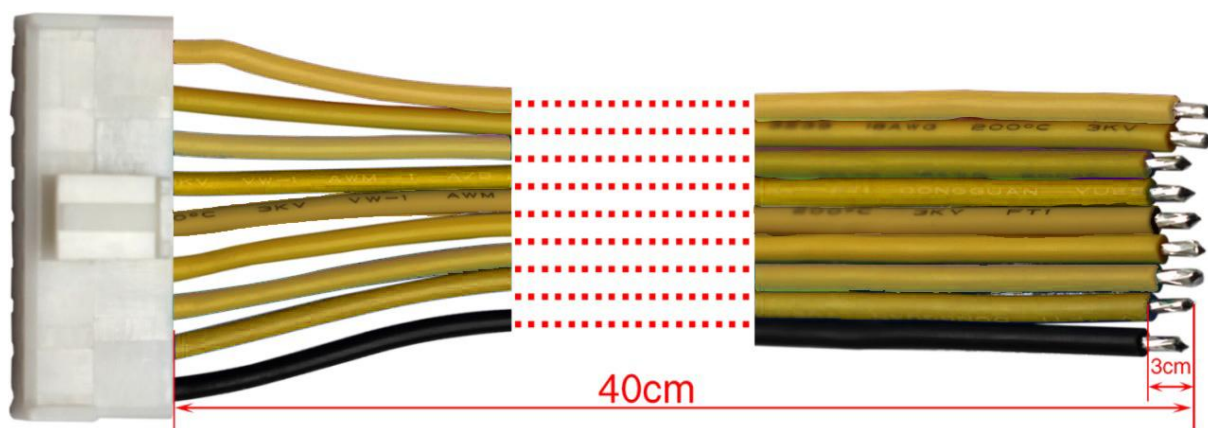
①. This product has components on both sides, please pay attention to insulation treatment when using. 本产品正反两面都有器件，使用时请注意绝缘处理。

②. The shipped products are all coated with three proof paint. 出货产品都是带三防漆涂层的。

③. The diameter of the screw hole for PCB installation is 3.2mm. PCB 安装螺丝孔直径为 3.2mm。

### 1. Accessories Description 配件说明

When this balance board is shipped, it is equipped with corresponding specifications of terminal wires. 此款均衡板出货时，都配备相应规格的端子线。



Accessory specifications 配件规格				
Terminal specifications 端子规格	Material 材质	Line number 线号	Line length 线长	Strip length 剥线长度
VH3.96mm	Copper 铜	18AWG	40cm	3cm

## Product wiring diagram 产品接线图

### 1. Pin Definition Pin 定义

Pin Screen printing 丝印	definition 定义
B-	The negative pole of the first string battery 第 1 串电池负极
B1	The positive pole of the first string battery 第 1 串电池正极
B2	Second string battery positive electrode 第 2 串电池正极
. . . . . and so forth . . . . .	
B20	20th string battery positive electrode 第 20 串电池正极
B21	21th string battery positive electrode 第 21 串电池正极

### 2. Wiring precautions 接线注意事项

①. This product assembly requires welding operation, please strictly follow the wiring diagram for operation! If you have any questions during the assembly process, please contact the after-sales personnel;

②. When assembling, please weld the terminal wires to the battery pack first, and then insert the terminal wires into the product;

③ Cable plugs with 13 or more strings need to be inserted diagonally. First, contact the B-pin and insert it diagonally upwards, otherwise it may cause the board to burn out.

④. After connecting the battery, please pay attention to the insulation protection of the product to avoid short circuits when powered on.

⑤. When a single board is used and there are spare pins, the spare pins are suspended. When connecting the 21S to the 20S battery pack, "B21" is suspended.

①. 本产品组装需要焊接操作，请严格按照接线图操作!组装过程如有疑问请联系售后人员;

②. 组装时，请先将端子线焊接到电池组上，再将端子线插入产品;

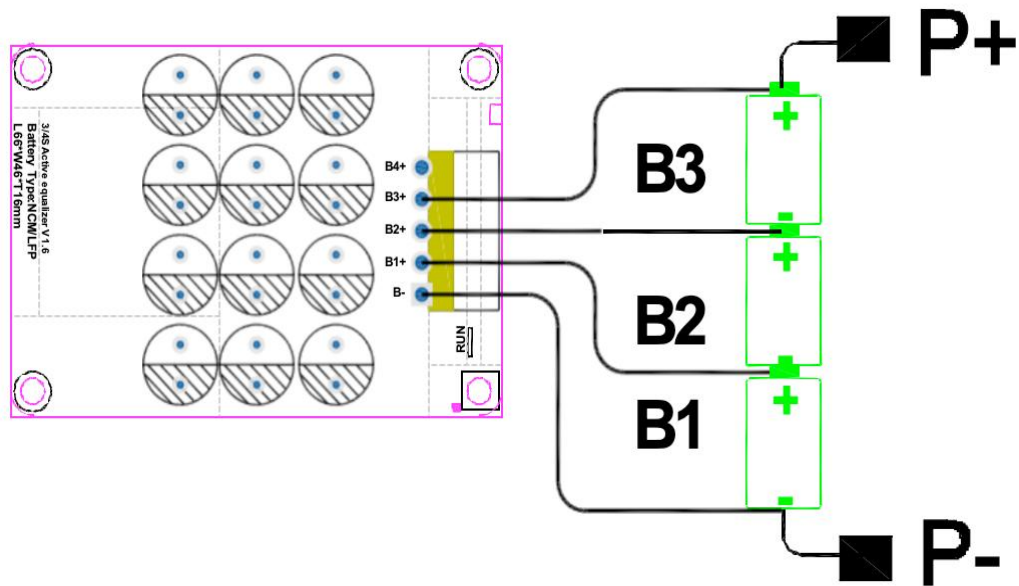
③. 13 串以上的排线插头需要斜着插入，先接触 B-针脚斜着往上插入，否则有可能导致板子烧毁情况发生。

④. 连接电池后，请注意产品的绝缘保护，避免在通电的情况下，造成短路。

⑤. 当单板使用，有空余的管脚时，空余的管脚悬空。如 21S 连接 20S 电池组时，“B21”悬空。

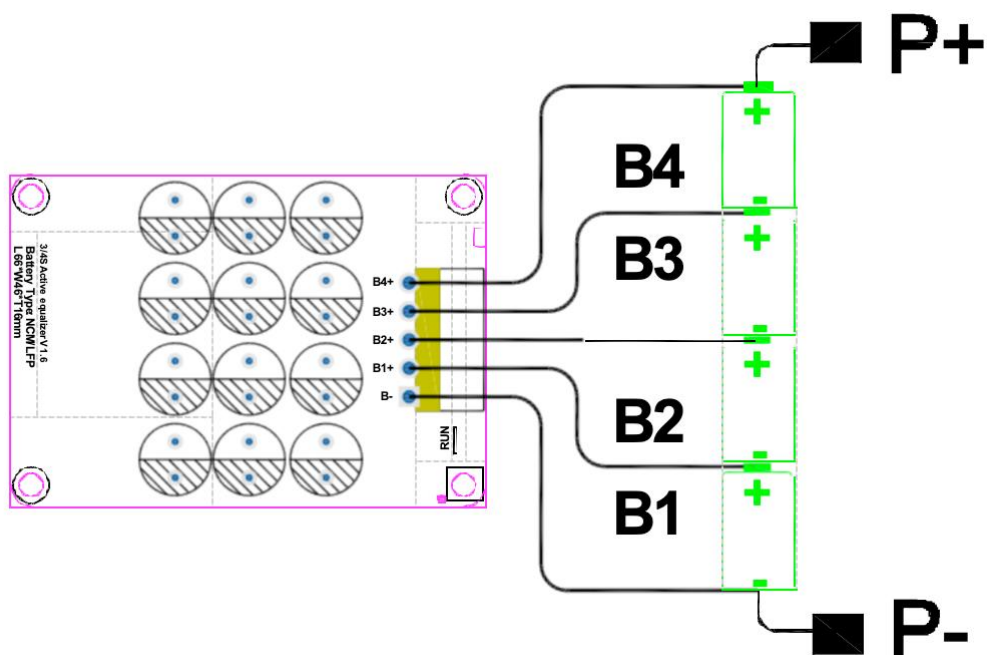
### P4S5 3 series wiring diagram B4+ not connected

P4S5 3 串 接线图 B4+不接



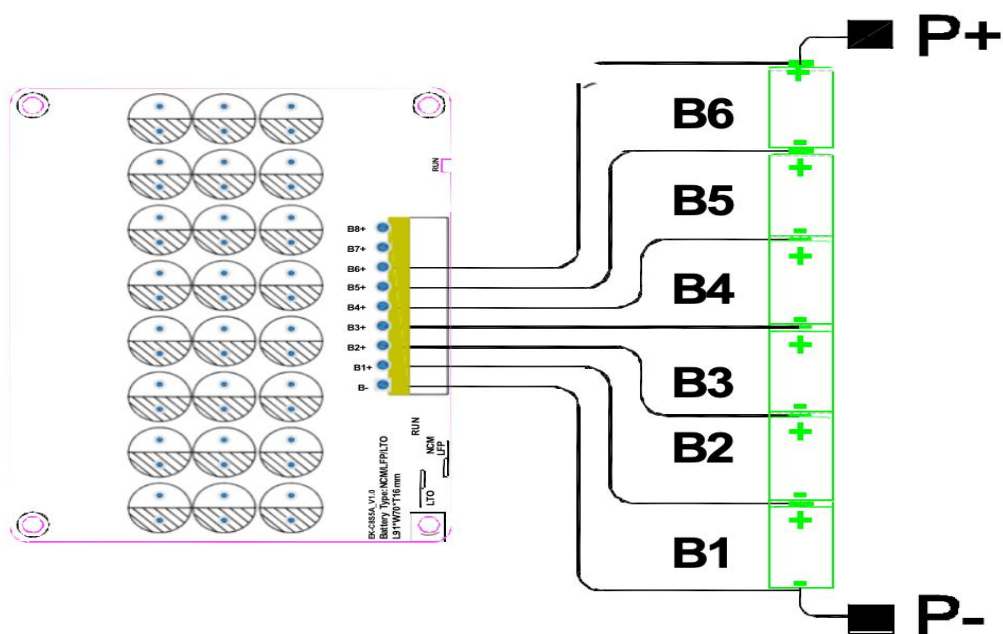
### P4S5 4 series wiring diagram

P4S5 4 串 接线图



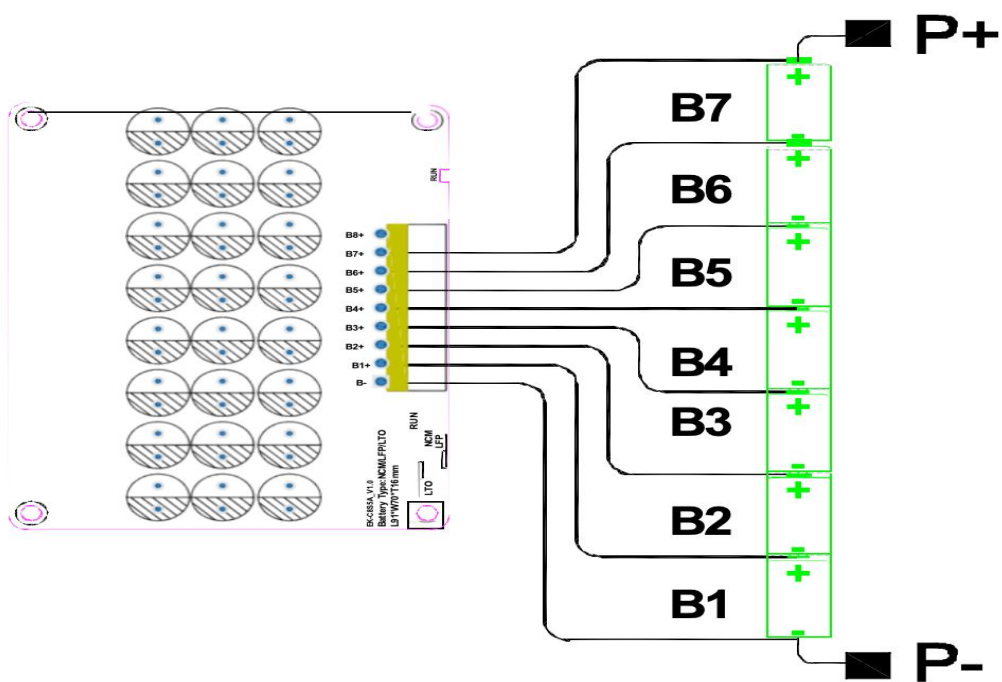
P8S5 6 series wiring diagram B7+ B8+ notconnected

P8S5 6 串接线图 B7+ B8+不接



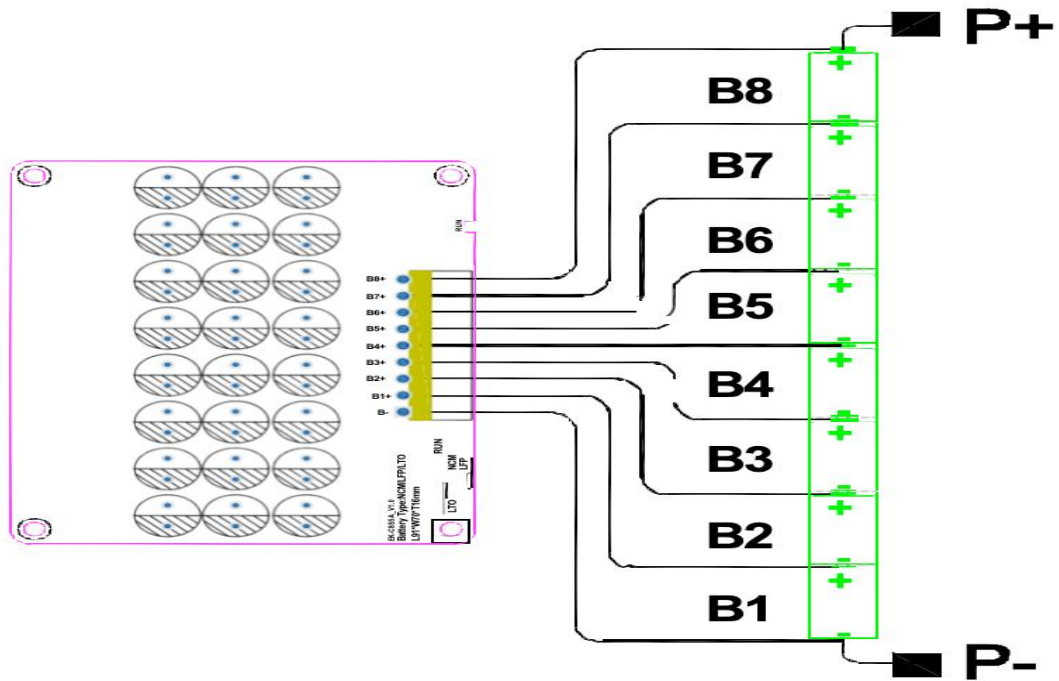
P8S5 7 series wiring diagram B8+ not connected

P8S5 7 串接线图 B8+ 不接



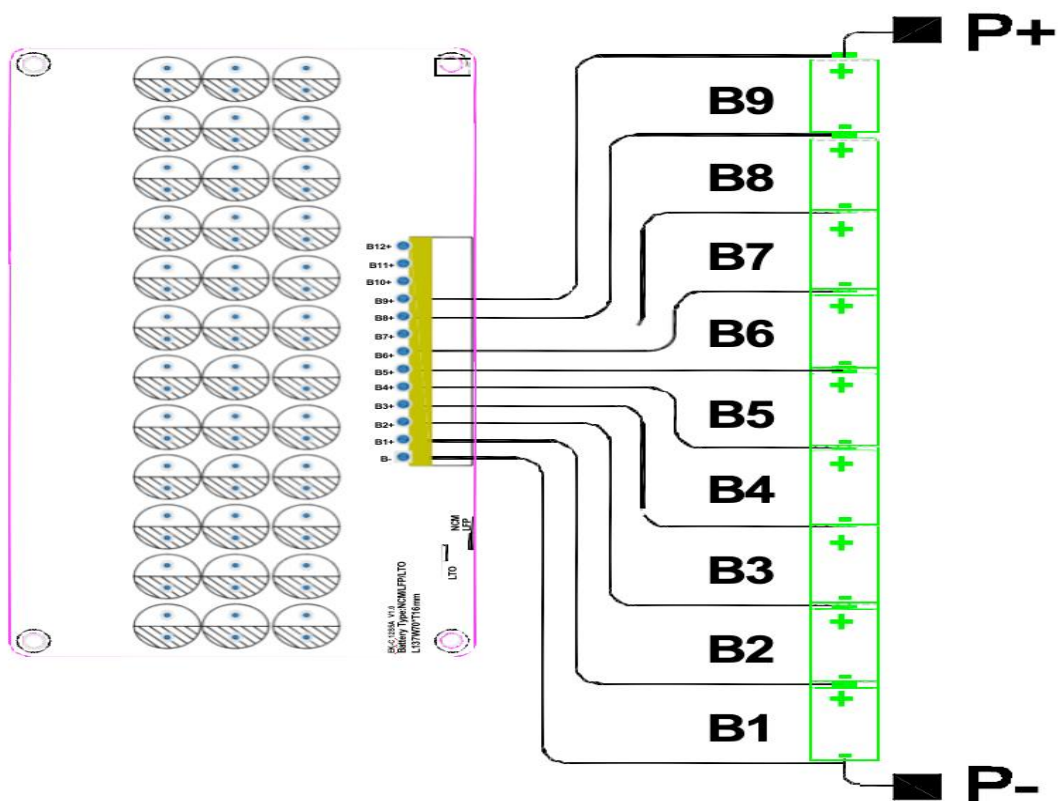
P8S5 8 series wiring diagram

P8S5 8 串接线图



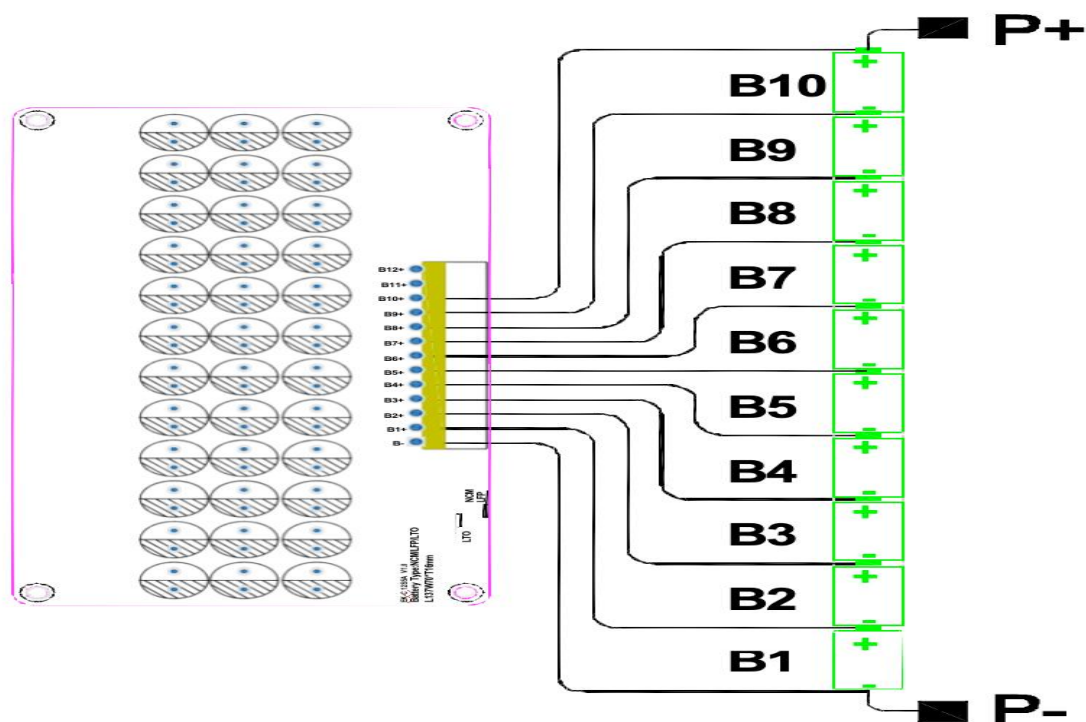
P12S5 9 series wiring diagram B10+B11+B12+ not connected

P12S5 9 串接线图 B10+ B11+ B12+不接



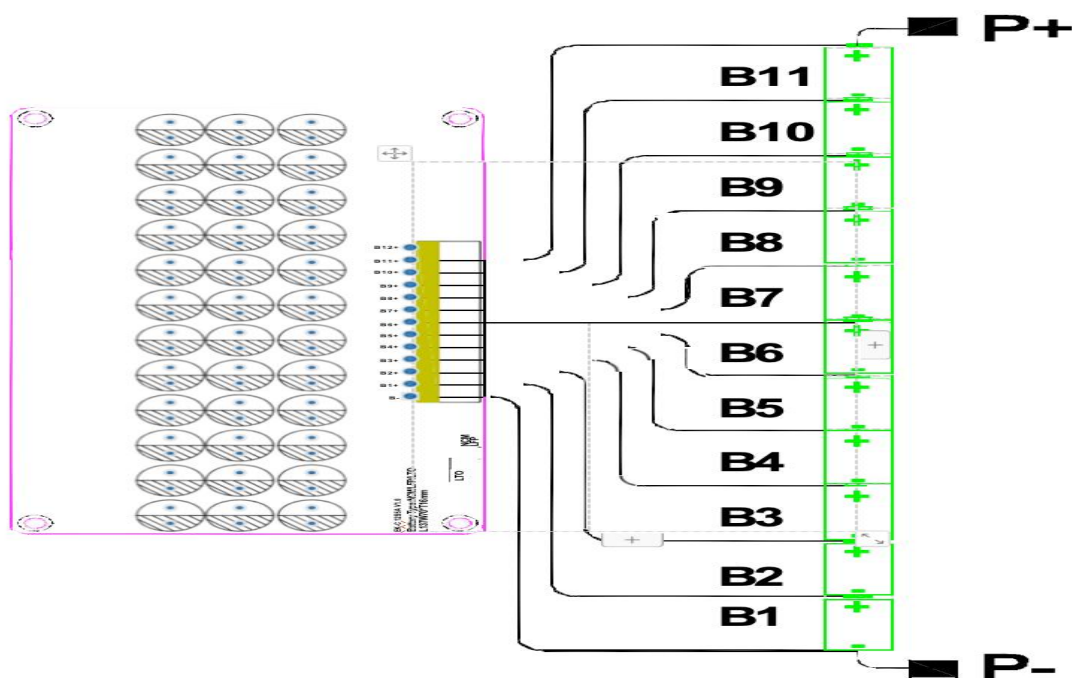
P12S5 10 series wiring diagram B11+B12+ not connected

P12S5 10 串接线图 B11+ B12+ 不接



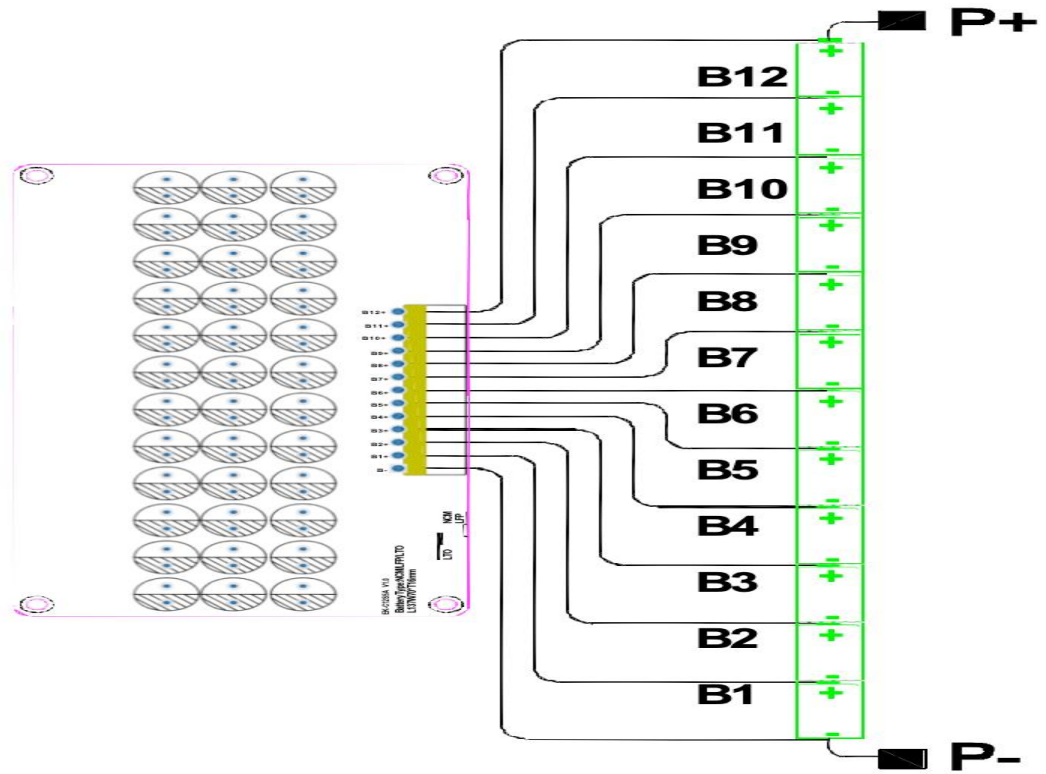
P12S5 11 series wiring diagram B12+ not connected

P12S5 11 串接线图 B12+不接



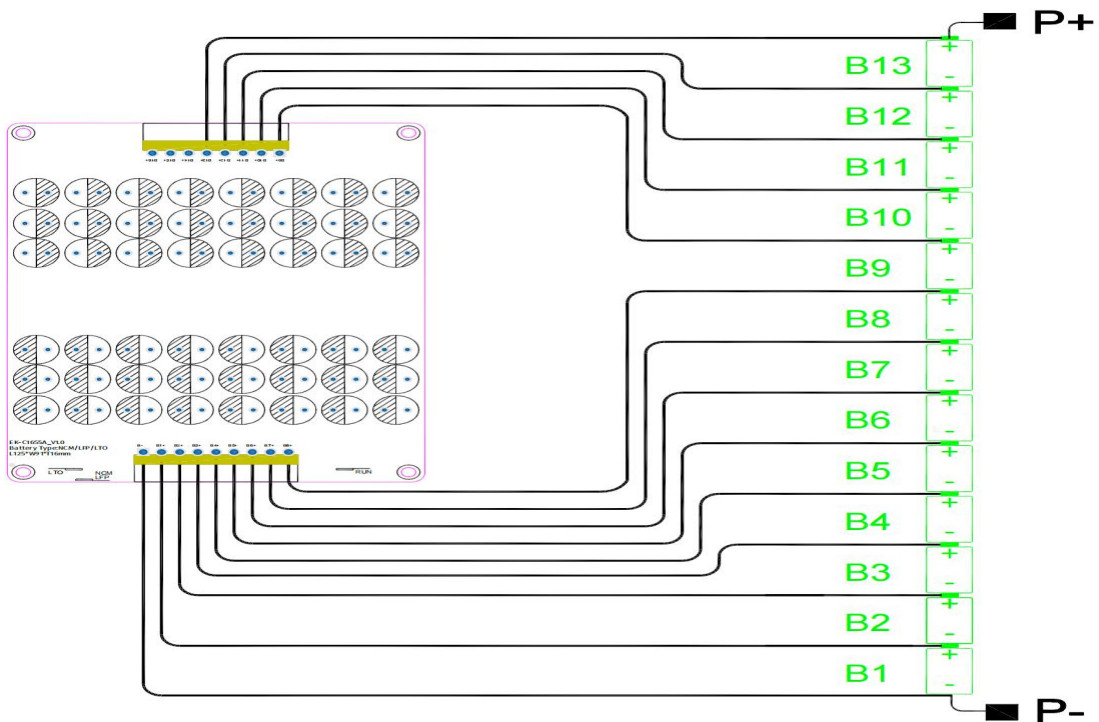
### P12S5 12 series wiring diagram

### P12S5 12 串接线图



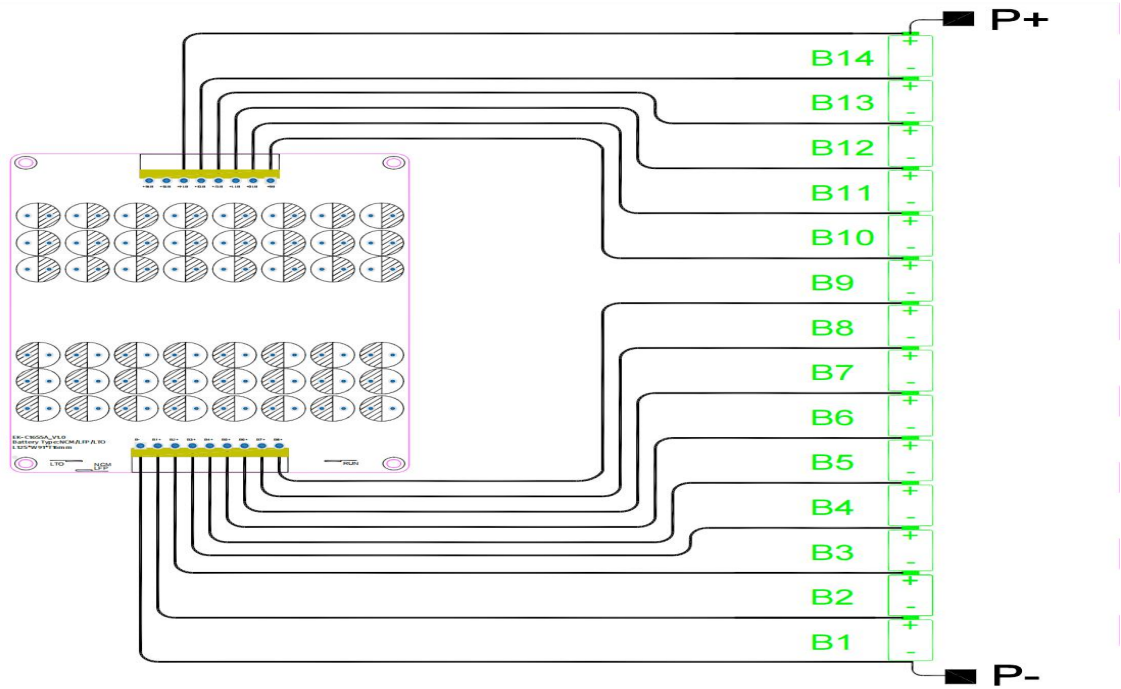
### P16S5 13 series wiring diagram B14+ B15+ B16+ not connected

### P16S5 13 串接线图 B14+ B15+ B16+不接



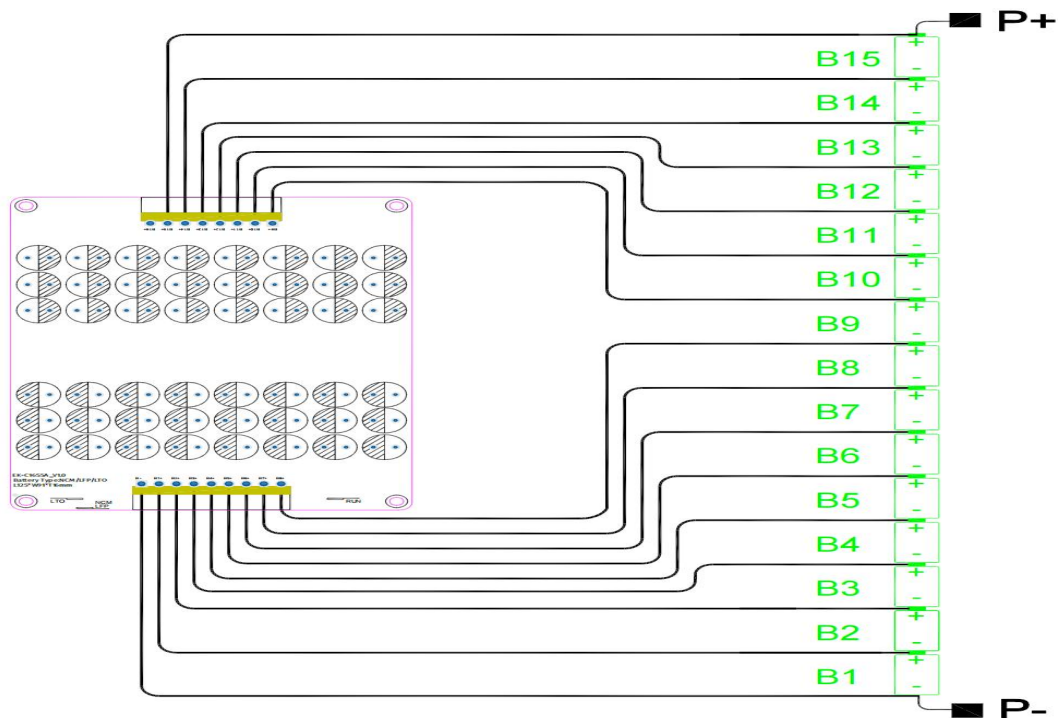
P16S5 14 series wiring diagram B15+ B16+ not connected

P16S5 14 串接线图 B15+ B16+不接

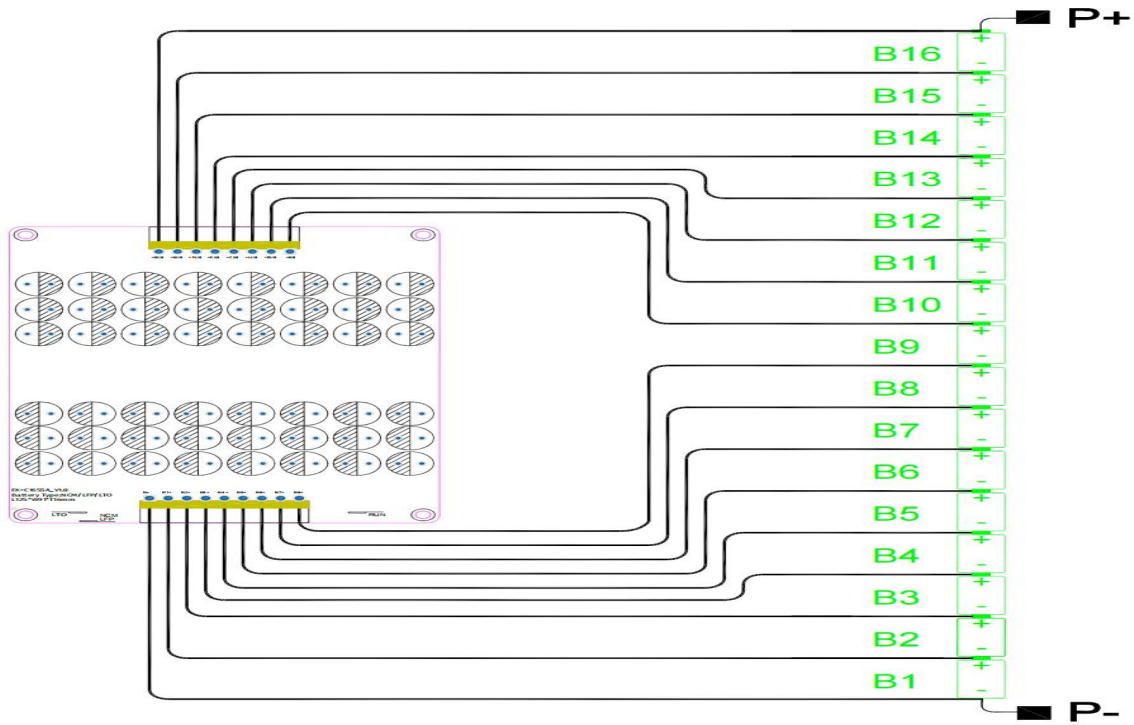


P16S5 15 series wiring diagram B16+ not connected

P16S5 15 串接线图 B16+不接

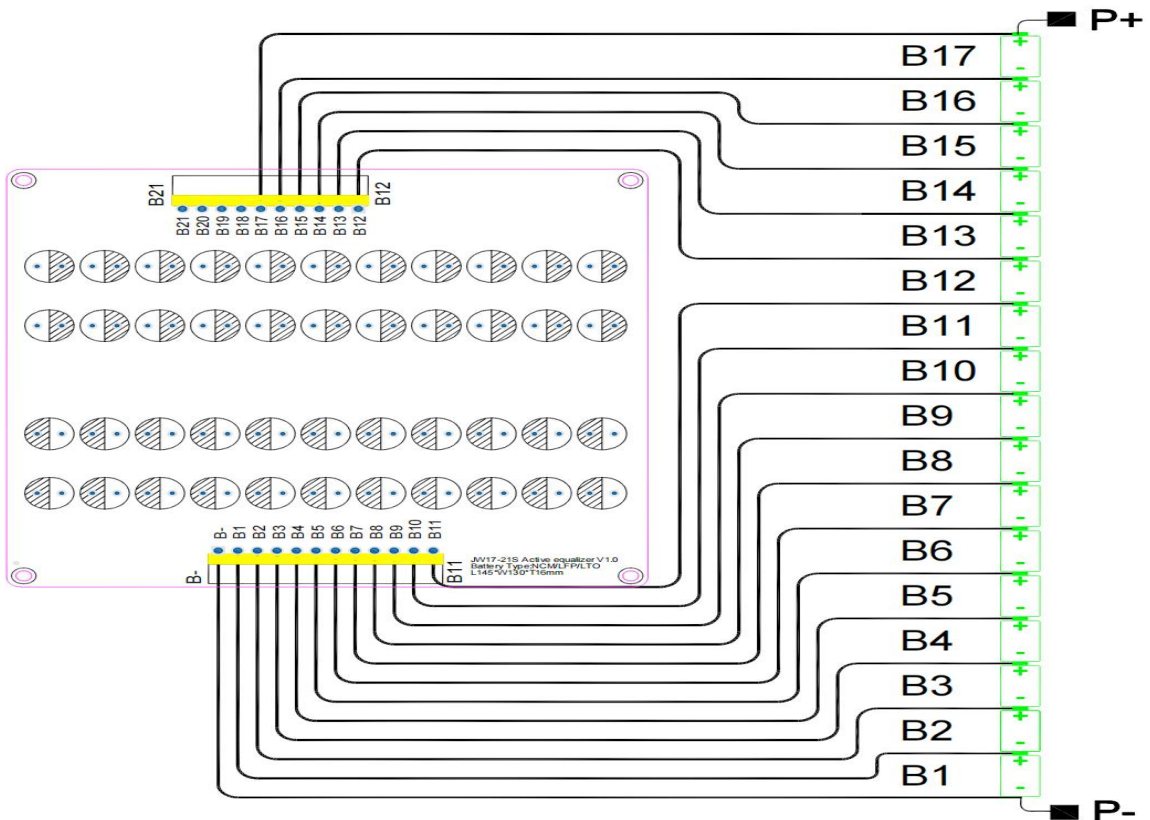


P16S5 16 series wiring diagram P16S5 16 串接线图



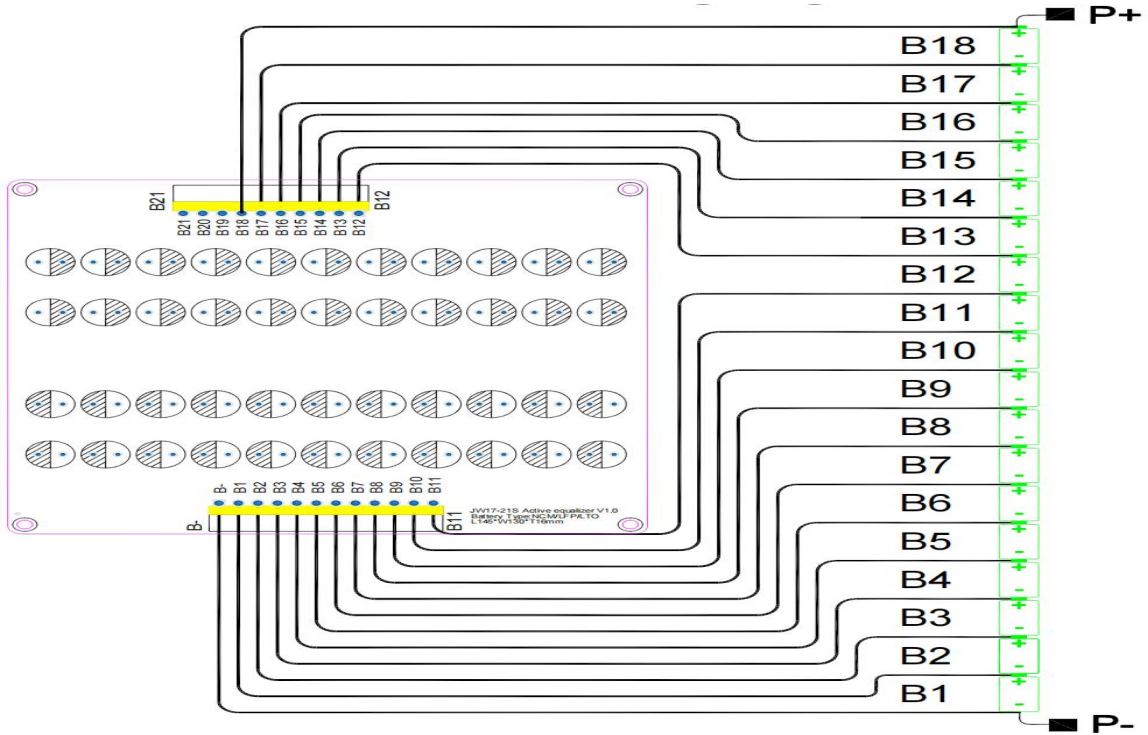
P21S5 17 series wiring diagram B18+ B19+ B20+ B21+ not connected

P21S5 17 串接线图 B18+ B19+ B20 +B21+不接



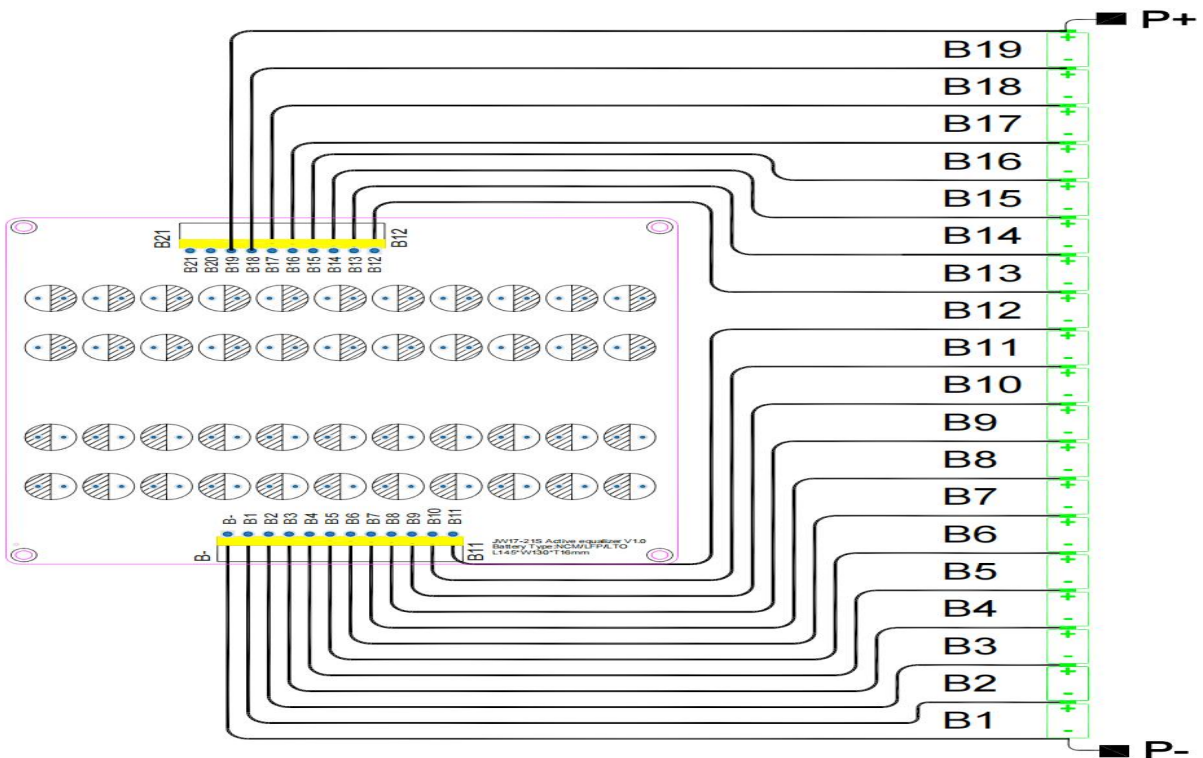
P21S5 18 series wiring diagram B19+ B20+ B21+ not connected

P21S5 18 串接线图 B19+ B20+ B21+不接



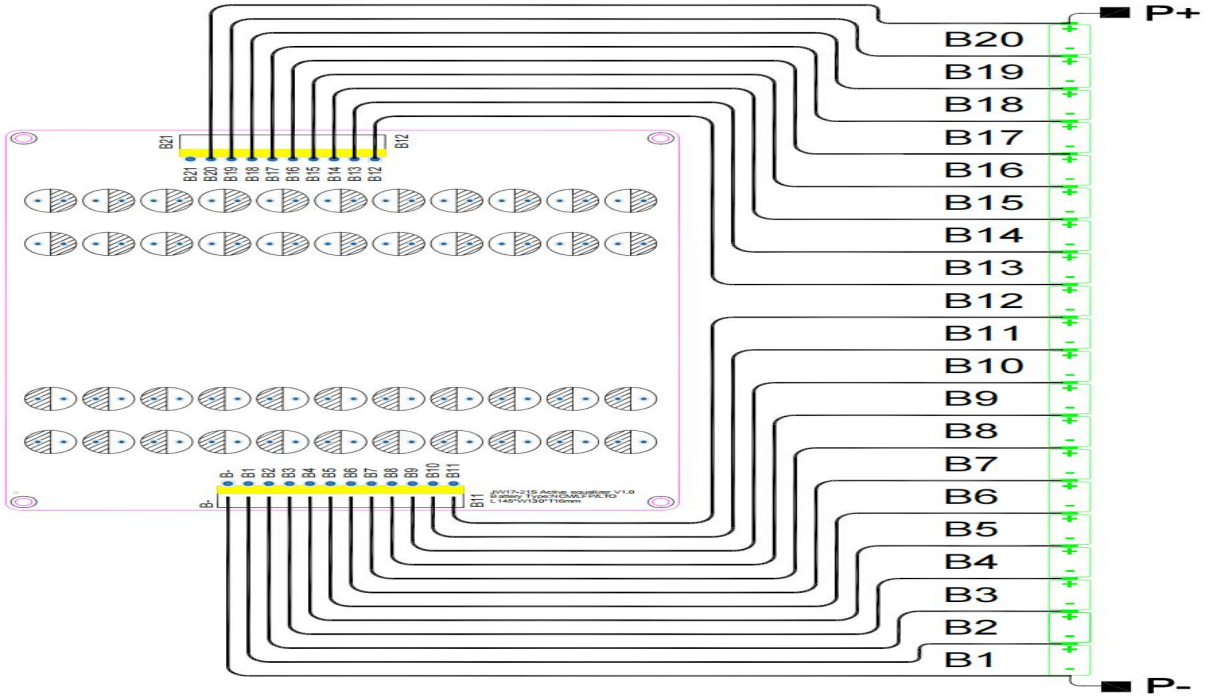
P21S5 19 series wiring diagram B20+ B21+ not connected

P21S5 19 串接线图 B20+ B21+不接



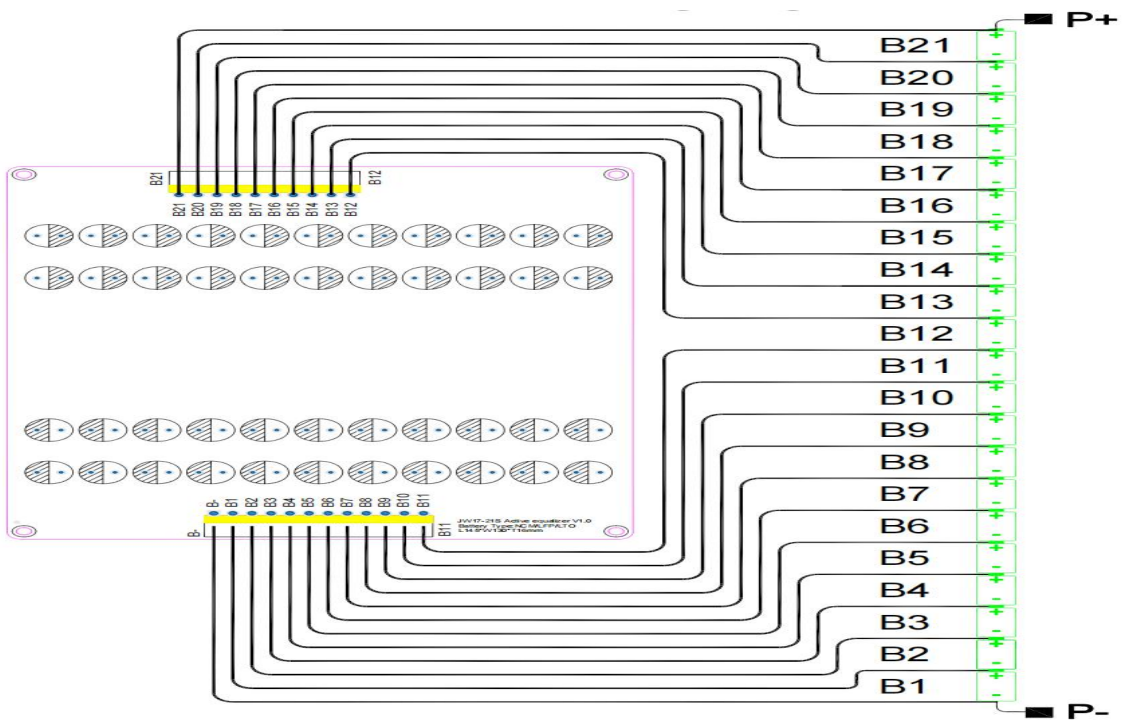
## P21S5 20 series wiring diagram B21+ not connected

P21S5 20 串接线图 B21+不接



## P21S5 21 series wiring diagram

P21S5 21 串接线图



## 1、Applicable battery type switching instructions 适用电池类型切换说明

Illustration 图示:



This balance board is designed by default for NCM ternary lithium and LFP iron lithium batteries.

此款均衡板出厂默认适用于 NCM 三元锂和 LFP 铁锂电池。

The applicable battery type can be changed by jumper welding, and the battery type can be selected based on the "1", "2", and "3" pads in the above figure;

可通过跳线焊接改变适用电池类型，根据上图“1”、“2”、“3”焊盘选择电池类型；

Applicable battery types 适用电池类型	Padnumber in the picture 图中焊盘编号	Physical illustration 实物图示	Notes 备注
LTO 钛酸锂	1+2 connection (Diagram box ①) 1+2 连接 (图示框①)		Customers need to weld and switch by themselves 需要客户自己焊接切换
NCM 三元锂 LFP 铁锂	2+3 connection (Box 2 in the diagram) 2+3 连接 (图示框②)		Factory default mode 出厂默认模式

## 2、External switch instructions 外接开关说明

An external switch can be used to control the opening and closing of the balance at box ③ in the diagram. The factory defaults to automatically enabling balancing when connected to the battery pack.

“图示框③”处可外接开关控制均衡的开启和关闭。出厂默认接入电池组自动开启均衡。

## Product indicator light description 产品指示灯说明

Indicator light status 指示灯状态	Product operation status 产品运行情况
Light 常亮	Balancing work 均衡工作中
Extinguish 熄灭	Undervoltage sleep 欠压休眠中

## Environmental material requirements 环境物质要求

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

本规格书内容符合欧盟 RoHS 指令要求，有害物质的含量符合以下标准：

Hazardous substances 有害物质	Limit standard (mg/kg) 限量标准 (mg/kg)
铅 (Pb)	1000
镉 (Cd)	100
汞 (Hg)	1000
六价铬 (Cr6+)	1000
多溴联苯 (PBB)	1000
多溴二苯醚 (PBDE)	1000

## Safety protection measures and transportation and storage

### 安全保护措施及运输与贮藏

#### 1、Safety precautions 安全保护措施

①. The balance board itself does not have high voltage and will not cause electric shock damage to the body.

②. Do not repair the balance board while it is powered on. All repairs should be carried out by qualified maintenance personnel.

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

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

④. Attention should be paid to ESD protection during the use of this product.

⑤. This product complies with our company's thrust standard: 0402 component  $\geq 1.0\text{KgF}$ ; 0603 component  $\geq 1.5\text{KgF}$ ; IC and MOS transistor  $\geq 2.0\text{KgF}$ .

①. 均衡板本身不存在高压，对身体不会造成电击伤害。

②. 请勿在通电的情况下维修均衡板。所有维修均应由合格的维修人员执行。

如果改变了厂方设置的工作电压，则安全合格证书不再适用。

③. 使用时，请注意产品绝缘处理，避免造成短路。

④. 本产品使用过程中须注意 ESD 防护。

⑤. 本产品执行本公司推力标准：0402 元件  $\geq 1.0\text{KgF}$ ；0603 元件  $\geq 1.5\text{KgF}$ ；IC 和 MOS 管  $\geq 2.0\text{KgF}$ 。

## 2、Packaging and Transportation 包装与运输

①. Use anti-static bubble bags to separate and package PCBA from each other.

②. The packaged products can be transported using conventional transportation tools without being directly affected by rain, snow, or severe collisions and bumps.

During transportation, it is not allowed to be placed together with corrosive substances such as acid and alkali.

①. PCBA 与 PCBA 之间用防静电气泡袋隔开包装。

②. 装箱后的产品在不受雨雪直接影响和剧烈碰撞颠簸下，可用通常的运输工具运输。在运输过程中不允许与酸碱等腐蚀物放在一起。

## 3、Storage 贮藏

Packaged products should be stored in a permanent warehouse with a temperature range of 0 °C~35 °C and a relative humidity not exceeding 80%,

There should be no acidic or corrosive gases, no strong mechanical vibrations or impacts, and no strong magnetic fields in the warehouse.

包装好的产品应放置在永久性的库房内贮存，库房温度为 0℃~35℃，相对湿度不大于 80%，库房内应无酸碱及腐蚀性气体、无强烈机构震动和冲击、无强磁场的作用。