MD48-100-3U Battery Specification for Residential Energy Storage

Product Model	**MD48-100-3U**		
Version	**V5**		
Wrote by	He Ping	Date	2022.9.6
Audit by	Super zhu	Date	2022.9.6
Approved by	Crispin Guo	Date	2022.9.6

BST POWER (Shenzhen) Limited

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Revise record

Version/Status	Revised by	Date	Note
V0	He Ping	2020.3.2	First release
V1	He Ping	2020.9.24	Define the environmental requirements for battery use, add necessary parameters, and adjust the format of the specification (Chinese and English versions are issued respectively)
V2	He Ping	2021.1.19	Design change
V3	He Ping	2022.8.1	Packaging Specifications
V4	He Ping	2022.8.19	Design change
V5	He Ping	2022.9.6	Design change

Content

1 Overview

This battery is designed and manufactured by **BST Power** for energy storage applications. It has the characteristics of long life, high safety, flexible installation, strong expansibility and strong communication ability. The battery can match many brands of on/off-grid inverter and EMS to form a complete energy storage system.

The design of the battery meets the requirements of UN38.3, CE, IEC62619 and other standards about energy storage battery.

The performance of **MD48-100-3U** battery delivered by BST fully meets the parameters and functions listed in this specification. At the same time, the customer should fully comply with this specification and the User Manual to use the battery.

2 Packing List

The standard packing list of MD48-100-3U is as follows:

Table 2.1 Packing list

Item	Part Name	Description	Unit	Quantity
1	Battery	MD48-100-3U	pcs	1
2	User Manual	MD48-100-3U User Manual	pcs	1
3	Positive pole parallel cable	Orange/0.16m/4AWG	pcs	1
4	Negative pole parallel cable	Black/0.16m/4AWG	pcs	1
5	RJ45 netting cable	RS485 parallel netting cable/0.2m	pcs	1
		Battery with the inverter CAN communication netting twine/2m	pcs	1
6	Grounding wire	Black/1.5m/10AWG	pcs	1

3 Product Diagram

3.1 Appearance and Dimension

Fig 3.1 Appearance and dimension of MD48-100-3U

3.2 Interface Definition

This section details the interface functions of the front panel:

Fig 3.2 Interface definition of MD48-100-3U

①: Positive pole connector*2 — For batteries parallel and power output.

②: RS485-1 port — For communication with inverter or EMS.

③: SOC Indicators — State of charge indicator, showing the capacity of the battery.

④: Dial-up switch — Set the batteries as master or slaves in parallel model.

⑤: RS485-3 port — For communication with Growatt inverter.

⑥: Wake up button — To start or shut down the battery.

⑦: CAN-1 port — For communication with BST,Goodwe ,Solis,Sofar,Sermatec,Deye inverter .

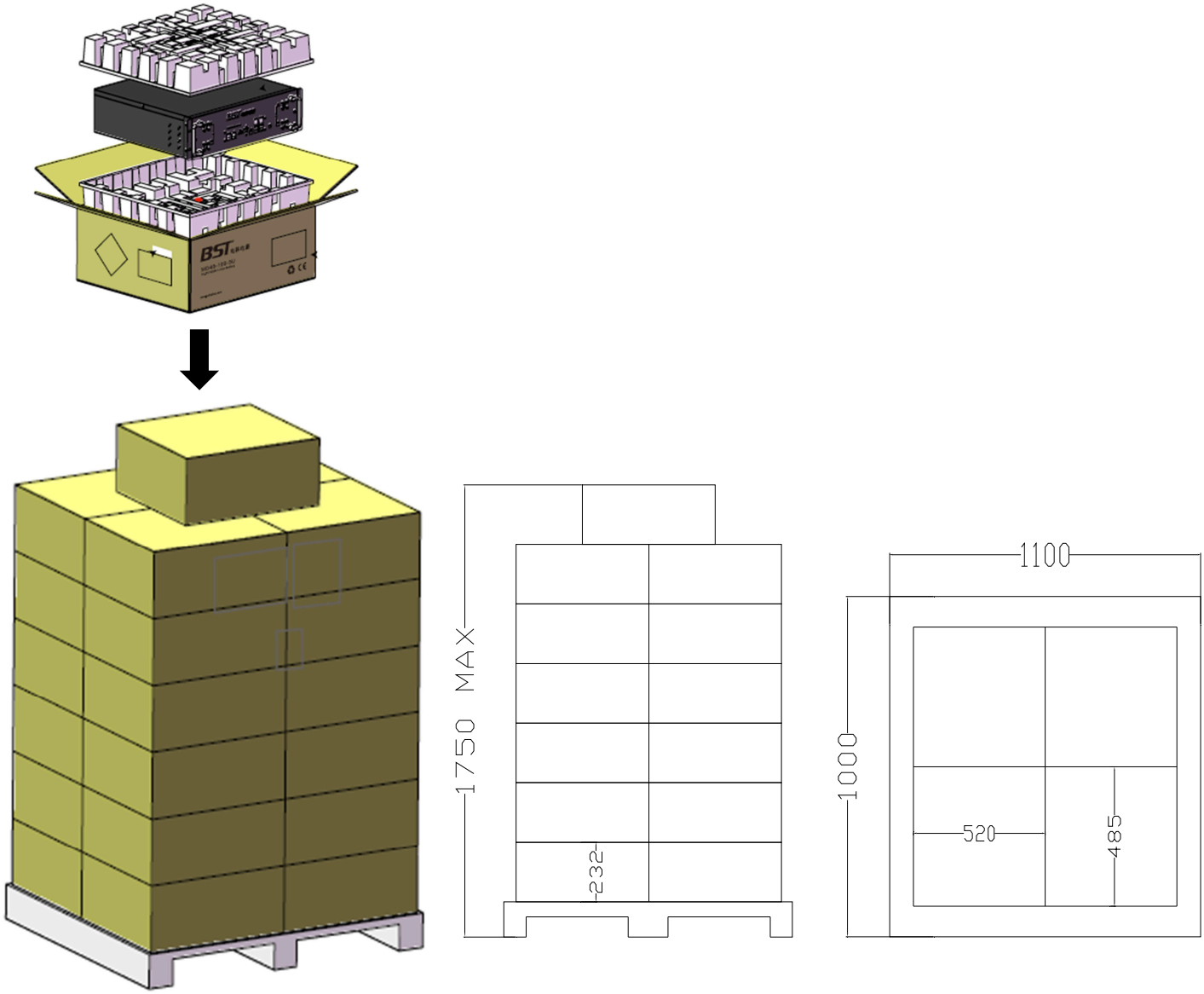
⑧: Status Indicators — Includes RUN and ALARM indicator.

⑨: CAN-2 port — For communication with Victron, SMA inverter .

⑩: RS485-2 port*2 —For communication with Voltronic inverter and inner parallel between batteries .

⑪: Negative pole connector*2 — For batteries parallel and power output.

3.3 Packaging Specifications



4 Product Performance

4.1 Environment Requirement

MD48-100-3U battery must be used and stored in the specified environmental conditions, otherwise it may affect the battery's life, even cause danger. The specific environmental requirements are as follows:

Table 4.1 Environment requirement

NO.	Scenario	Condition		Specification
1	Operation	Charging temperature		0℃~ 50℃
2		Discharging temperature		-10℃~ 50℃
3		Relative Humidity		5%~95% (No Condensation)
4		Altitude		≤4000m
5	Storage	Temperature	1 month	-20℃~ 45℃
6			3 months	-20℃~ 35℃
7			6 months	-20℃~ 25℃
8		Humidity		10%~95% (No Condensation)
9		Altitude		≤4000m

4.2 Technical Parameters

Table 4.2 Parameters

NO.	Items	Condition	Specification
1	Nominal Capacity	Standard charge/discharge	100Ah
2	Nominal Voltage	Average	51.2V
3	Cell Connection Mode	/	16S1P
4	AC Internal Impedance	at 1KHz and 50% SOC	≤30mΩ
5	Standard Charging	Constant current Constant voltage End current (Cut off)	20A (0.2C) 56.8V 5A

6	Charging Voltage Range	/	56.8~57.6V
7	Max. Continuous Charge Current	at 10℃~45℃	100A (1C)
8	Standard Discharging	Constant current Cut off voltage	50A (0.5C) 43.2V
9	MAX. Continuous Discharge Current	at 0℃~45℃	100A (1C)
10	Max. Peak discharge current	At 25±3℃	200A (2C) for 1s
11	Max Output Power	at 0~45℃	5kW
12	Communication Port	/	RS485, CAN, BLE/WIFI(optional)
13	Power cable connectors	/	ESS-120A-25-B/S-BK/OR-00
14	Dimension	/	440mm×420mm×133mm
15	Installation Mode	/	Rack (19") installation
16	Weight	/	~44.2Kg
17	Scalability	Parallel connection	Up to 15
18	Matched inverter	BST,Victron, Goodwe, Growatt, Solis, Sofar, Deye, Sermatec, Voltronic, SMA	

4.3 Electrical Specification

The test conditions specified in this product specification are: temperature 25±3 ℃, relative humidity 45% ~ 85%.

Table 4.3 Electrical specification

Items	**Test Condition**	**Standard**
4.3.1 Standard Charge	The "Standard Charge" means charging the Battery with initial charge current 20A and with constant voltage 56.8 V, then constant voltage 56.8V with floating current taper to 5.0A cut-off (Charger for exclusive use lithium-ion rechargeable battery, with an accuracy ±0.05V) at 25±3℃ for most 6 hours.	/
4.3.2 Standard	The "standard discharge" means that after the standard charge, the battery is discharged at a current of 50A to the	Standard Discharge

<table>
<tr><td>Discharge</td><td>termination voltage of 43.2V, and the discharge is stopped. If not specified, the battery charge and discharge interval is 30 minutes.</td><td>minimum capacity ≥98Ah</td></tr>
<tr><td>4.3.3
Cycle Life</td><td>“One cycle” means after the standard charging is finished, after 30 minutes of storage, discharge 80% DOD at 0.5C constant current at 25± 3℃. After 6000 cycles, the battery needs to be shelved for 1 day, and the capacity is tested according to 4.3.2 standard discharge.</td><td>Discharge capacity ≥60Ah (60% of initial capacity)</td></tr>
<tr><td rowspan="3">4.3.4
Discharge Characteristics</td><td><table>
<tr><td>Discharge current</td><td colspan="4">Discharge temperature</td></tr>
<tr><td>50A</td><td>-10℃</td><td>0℃</td><td>25℃</td><td>40℃</td></tr>
</table></td><td rowspan="3">-10℃ Discharge capacity≥50%

0℃ Discharge capacity≥60%

25℃ Discharge capacity≥95%

40℃ Discharge capacity≥95%</td></tr>
<tr><td>Batteries shall be charged according to 4.3.1 and discharged at 50A to 43.2V. Batteries shall be stored for 6～8 hours at the test temperature and then shall be discharged at the test temperature. The capacity of battery at each temperature shall be compared to the minimum capacity at 25 ℃ and the percentage shall be calculated.</td></tr>
<tr><td></td></tr>
</table>

4.4 Functions

4.4.1 Communication Function

a. Communication method

The product adopts isolated communication design, supports RS485/CAN communication mode, RS485 communication default baud rate 115200 bps, 8-bit data bit, 1 bit stop bit, no test bit;

CAN communication default baud rate 500Kbps.

b. Communication port pinout：

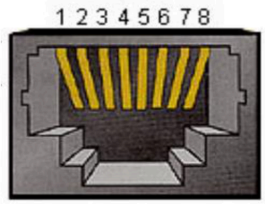


Table 4.4 Pinout definition

RJ45 socket of CAN-1,CAN-2, RS485-1, RS485-2,RS485-3 port	
RJ45 Pin	**Definition**
1、8	RS485-B
2、7	RS485-A
3、6	GND
4	CANH
5	CANL

Remark：The battery has multiple external communication ports. When connecting RS485 and CAN devices at the same time, do not connect them to the same communication port.

4.4.2 Power down function

When any of the following conditions are satisfied, the system will go into power down mode to reduce self-consumption and protect the cells:

a. Press the “Wake-up” button for 3~6 seconds and release it;

b. The lowest cell voltage is lower than the power down voltage, and the duration reaches the power down delay time (while no charging current).

In this mode, the battery power connectors don’t have voltage.

When the battery is in the power down mode and meets any of following conditions, the battery will quit power down mode and wake up.

a. Charging current is detected (charging voltage should be higher than 51.2V);

b. Press the “Wake-up” button for 2~3 seconds and release it.

Remark: Under normal conditions, all MD48-100-3U batteries are in power down mode when they are shipped.

4.4.3 LED Indicating Function

The current energy consumption and operation status of the battery are indicated by the LED lamp. (See Table 4.5, Table 4.6, Table 4.7 for details)

Table 4.5 Operation status indicating

<table>
<tr><th rowspan="2">Operation Mode</th><th rowspan="2">Normal/Alarm/ Protection</th><th>RUN</th><th>ALM</th><th colspan="4">LED</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Standby</td><td>normal</td><td>Flash 1*</td><td>OFF</td><td colspan="4" rowspan="2">According to the energy consumption</td></tr>
<tr><td>Alarm</td><td>Flash 1*</td><td>Flash 3*</td></tr>
<tr><td rowspan="4">Charge</td><td>Normal</td><td>ON</td><td>OFF</td><td colspan="4" rowspan="2">According to the energy consumption
LED for current maximum capacity flash 2*</td></tr>
<tr><td>Alarm</td><td>ON</td><td>Flash 3*</td></tr>
<tr><td>over-charge protection</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Temperature /overcurrent short circuit /reverse connection /failure protection</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
</table>

Discharge	Normal	Flash 3*	OFF	According to the energy consumption			
	Alarm	Flash 3*	Flash 3*				
	Low-voltage protection	OFF	OFF	OFF	OFF	OFF	OFF
	Temperature protection \overcurrent protection /short circuit protection \reverse connection protection	OFF	ON	OFF	OFF	OFF	OFF
Failure		OFF	ON	OFF	OFF	OFF	OFF

Table 4.6 Capacity status indicating

State		**Charge**				**Discharge**			
Capacity indicator		L4	L3	L2	L1	L4	L3	L2	L1
Capacity (%)	0～25%	OFF	OFF	OFF	flash	OFF	OFF	OFF	ON
	25～50%	OFF	OFF	Flash	ON	OFF	OFF	ON	ON
	50～75%	OFF	Flash	ON	ON	OFF	ON	ON	ON
	75～100%	Flash	ON	ON	ON	ON	ON	ON	ON
Running indicator light		ON				Flash 3*			

Table 4.7 Flash state description

Flash	ON	OFF
Flash 1*	0.25S	3.75S
Flash 2*	0.5S	0.5S
Flash 3*	0.5S	1.5S
Flash 4*	3.5S	0.5S

4.4.4 Scalability

- Up to 15 MD48-100-3U are allowed to be used in parallel.
- The batteries used in parallel must be the same batch of cases with the same SOC.
- The Voltage difference of batteries used in parallel must be within 2V.
- The dimensions of parallel cable must be the same.
- When the batteries are used in parallel, only the capacity is expanded and the power is not increased, the batteries can be connected directly.
- When the batteries are used in parallel, and the power need to be cumulative,it is suggested that the **main control box** specially developed by BST should be used.

For example, the following diagram are operation wiring diagram of Max. 500A (Ten MD48-100-3U in parallel).

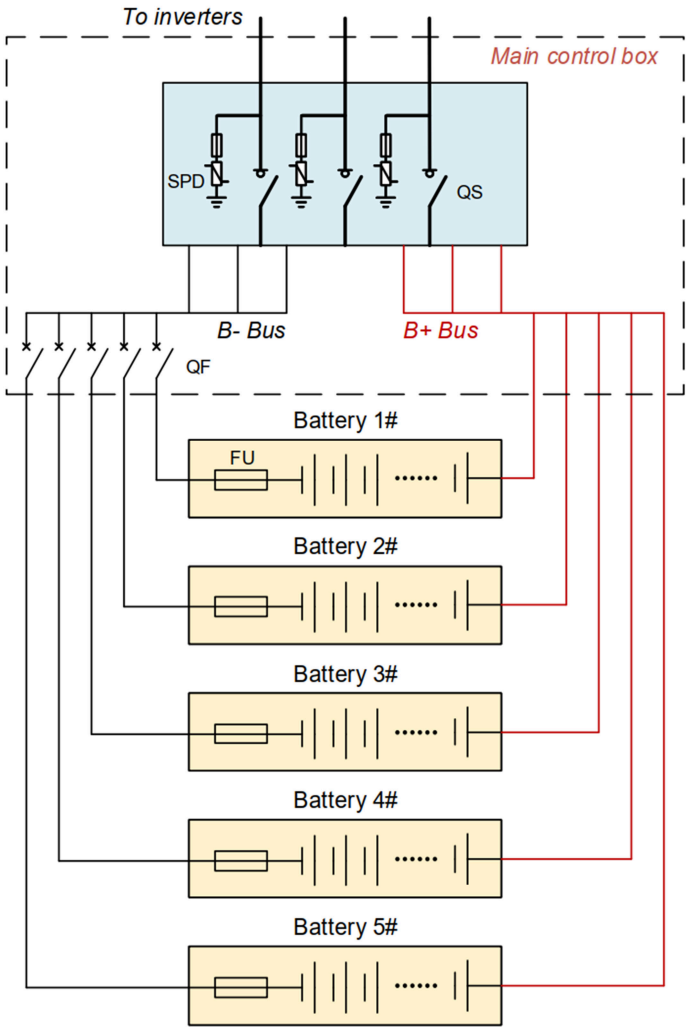


Fig 4.1 Five batteries connected in parallel

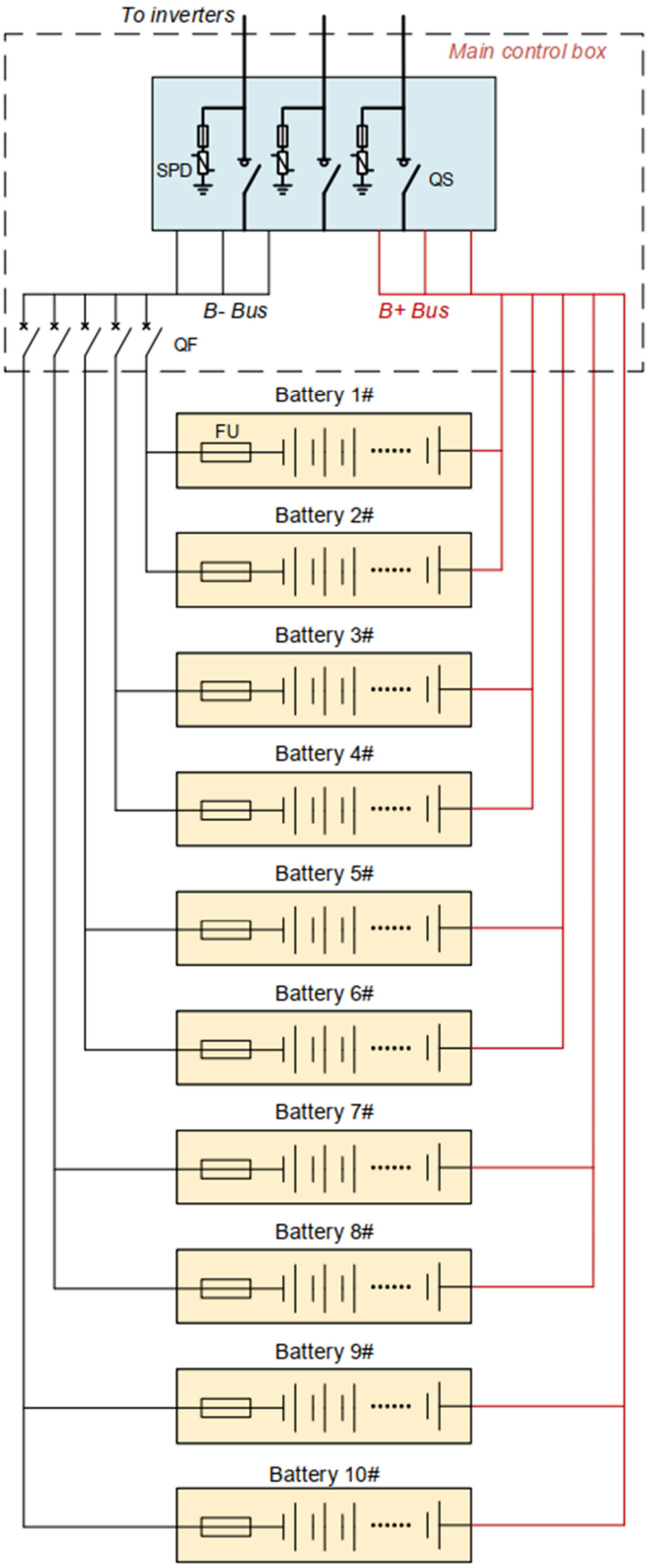


Fig 4.2 Ten batteries connected in parallel

When the batteries are connected in parallel, the dial-code switch should be used to distinguish different battery' addresses. The definition of the dial code switch refers to the following table:

Table 4.8 Flash state description

Address	**Dial switch position**				**Explain**
	#1	#2	#3	#4	
1	ON	OFF	OFF	OFF	Pack1 (master)
2	OFF	ON	OFF	OFF	Pack2
3	ON	ON	OFF	OFF	Pack3
4	OFF	OFF	ON	OFF	Pack4
……					

5 Battery Management System

5.1 Schematic Diagram of BMS

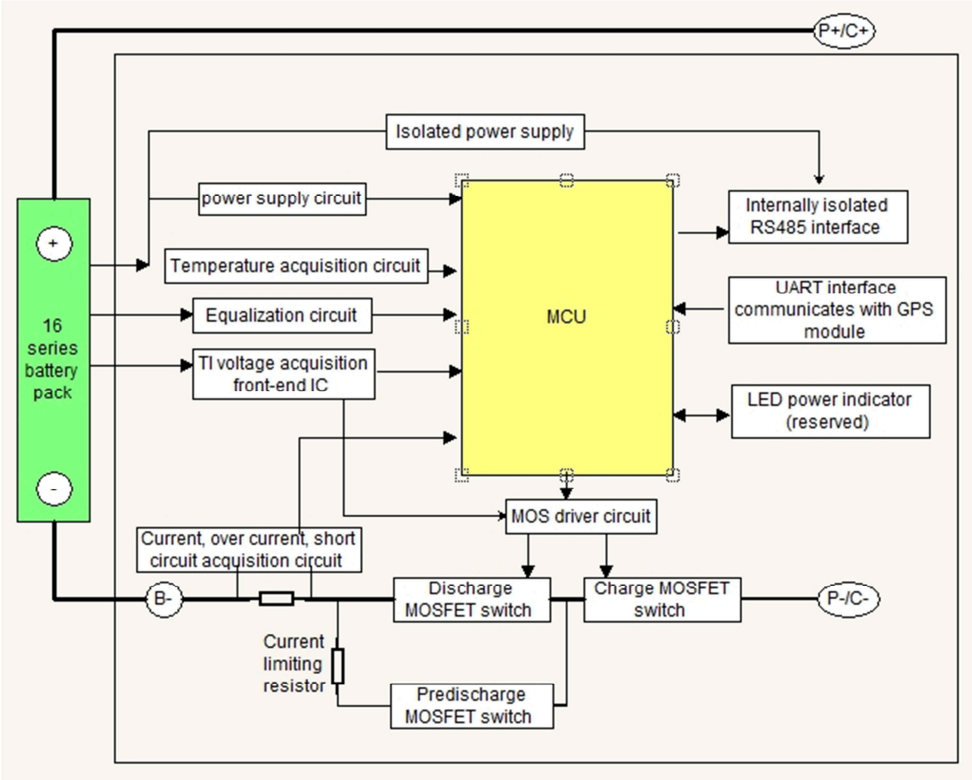


Fig 5.1 Schematic Diagram of BMS

5.2 BMS Parameter

NO.	Item		Parameters
1	Power Consumption	Power down mode	≤100μA
2	Over charge Protection （single cell）	Over charge detection voltage	3.75V
		Over charge release voltage	3.4V
3	Over discharge protection （single cell）	Over discharge detection voltage	2.5V
		Over discharge release voltage	3.0V

4	Over current protection	Charging overcurrent detection current	120A
		Discharging overcurrent detection current 1	120A
		Discharging overcurrent detection current 2	≥150A (200mS)
5	Temp. Protection	Detection temperature	65℃±5℃
6	Balancing	Balancing opening voltage	3.4V

6 Generality

6.1 Shipping

During transportation, keep the battery from acutely vibration, impacting, solarization, drenching.

6.2 Storage

Storage environment requirement：

1 month: Under temperature of -20℃~ 45℃ and relative humidity of 45~85%.

3 months: Under temperature of -20℃~ 35℃ and relative humidity of 45~85%.

6 months and more: Under temperature of -20℃~ 25℃ and relative humidity of 45~85%.

The battery must be charged every six months, and must be charged and discharged a complete cycle every nine months.

6.3 Cautions

- Installation and maintaining should be operated by professional electric personnel.
- Don't push your hands or foreign bodies deep into the interior of the product.
- Do not open the product without a professional.
- Do not mechanically damage the battery module of the energy storage cabinet (perforation, deformation, peeling, etc.).
- Please use dry powder extinguisher as extinguishing agent.
- Do not allow the energy storage battery to contact abnormal metals or conductors.
- Do not continue to use the product after a short circuit.
- Do not expose the energy storage battery to flammable or hazardous chemicals or vapors.