HT-916L Series
Battery Management System
User Manual

1. Product Introduction

This device is an intelligent balancing protection board designed specifically for 10S/12S/13S/14S/16S series lithium batteries, supporting ternary lithium/lithium iron phosphate batteries. Main advantages:

Protect the battery from overcharging, over-discharging, over-current, over-temperature, short circuit protection, balanced charging, achieve long-term maintenance of the battery through voltage balancing, and extend the service life of the battery pack.

Suitable for series connected lithium battery packs. Once the individual cell voltage reaches the equilibrium turn-on voltage, the high voltage battery will be balanced until the equilibrium release voltage is reached.

2. Product Model Selection

Number of strings	10S	12S	13S	14S	16S
Current	80A/120A/160A				
Applicable battery	NCM	NCM/LFP	NCM		NCM/LFP

*The currently available models are listed in the table above. If you have any other requirements, please contact us and we support customization of 9-16S series

3. Parameters

3.1. Lithium iron phosphate:

Test conditions: room temperature 25 ℃

The overcurrent value and internal resistance of the protection board are dynamic parameters

The voltage of each battery cell needs to be ≥ 3.25 V during testing

Project	Symbol	Detailed Content	Standard
Serial number	S	Number of battery strings	9-16S
amperage	A	Current that the shield can withstand	80A/120A/160A
Battery type		Ternary lithium / lithium iron phosphate	lithium iron phosphate
Overcharge protection	V_{DET1}	Overcharge detection voltage	3.65V±0.035V
	tV_{DET1}	Overcharge detection delay time	1.3s（MAX）

	V_{REL1}	Overcharge relieve voltage	3.55V±0.025V
Overdrive protection	V_{DET2}	Over discharge test voltage	2.350V±0.025V
	tV_{DET2}	Delay time for over discharge detection	1.5s（MAX）
	V_{REL2}	Over discharge relieve voltage	2.55V±0.025V relieve
Overcurrent discharge	V_{DET3}	Discharge overcurrent detection voltage	21mV±5mV
	I_{DP}	The theoretical value of the instantaneous single pulse current that can be tolerated (battery voltage = 3.6V) is MOSFET temperature between 20℃ and 45℃	350/450/650A
	I_{DP}	actually withstand instantaneous multi-pulse current	200A/300A/450A
		Duration	6-10s
short-circuit protection		Protection conditions	External load circuit short circuit
	T_{SHORT}	Detect latency	300US（MAX）
		Protection release conditions	Disconnect the short-circuit circuit
internal resistance	R_{DS}	Main circuit on state resistance (battery voltage=3.4V)	B- to P- R_{DS}≤0.2mΩ
Consume current	I_{DD}	Internal consumption of the circuit during operation	MIN：0.3μA MAX：100μA
Power balance	V_{BU}	Electricity balance detection voltage	3.45V±0.035V
	tV_{BU}	Balance startup delay time	1.6S（MAX）
	V_{BL}	Power balance release voltage	3.44V±0.035V
	I_B	3.45V battery balance current	67mA±5mA
Overtemperature protection	Charging optional	Low temperature -0 ℃± 5 ℃	no
	Discharge optional	High temperature 70 ℃± 5 ℃	Yes
The most continuous large working current	Charge	The rated current of the charger when charging the battery pack	80A/120A/160A(Equivalent to A of the protective board)
	Discharge	The rated current of the battery pack when discharging the load	80A/120A/160A(Equivalent to A of the protective board)
Charger selection		Voltage=Number of strings × 3.65 ± 0.05V	≦80A/120A/160A(Equivalent to A of the protective board)

Charging MOS has the highest voltage withstand	V_{DS}	The highest voltage value that the charging port can withstand when connected to the charger	Serial number*3.65V

3.2. Ternary lithium:

Test conditions: room temperature 25℃

The overcurrent value and internal resistance of the protection board are dynamic parameters

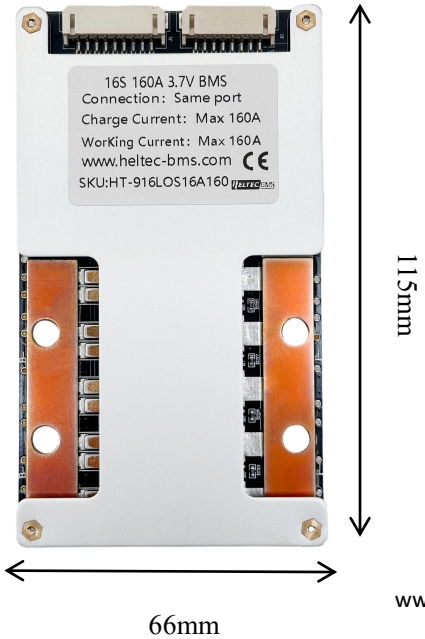
The voltage of each battery cell needs to be ≥ 3.6 V during testing:

Project	Symbol	Detailed Content	Standard
Serial number	S	Number of battery strings	9-16S
amperage	A	Current that the shield can withstand	80A/120A/160A
Battery type		Ternary lithium / lithium iron phosphate	Ternary lithium
Overcharge protection	V_{DET1}	Overcharge detection voltage	4.25V±0.035V
	tV_{DET1}	Overcharge detection delay time	1.3s（MAX）
	V_{REL1}	Overcharge relieve voltage	4.19V±0.025V
Overdrive protection	V_{DET2}	Over discharge test voltage	2.80V±0.025V
	tV_{DET2}	Delay time for over discharge detection	1.5s（MAX）
	V_{REL2}	Over discharge relieve voltage	3.0V±0.025V relieve
Overcurrent discharge	V_{DET3}	Discharge overcurrent detection voltage	21mV±5mV
	I_{DP}	The theoretical value of the instantaneous single pulse current that can be tolerated (battery voltage = 3.6V) is MOSFET temperature between 20℃ and 45℃	350/450/650A
	I_{DP}	actually withstand instantaneous multi-pulse current	200A/300A/450A
		Duration	6-10s
short-circuit protection		Protection conditions	External load circuit short circuit
	T_{SHORT}	Detect latency	300US（MAX）
		Protection release conditions	Disconnect the short-circuit circuit

internal resistance	R_{DS}	Main circuit on state resistance (battery voltage=4.2V)	C- to P- R_{DS}≤0.2mΩ
Consume current	I_{DD}	Internal consumption of the circuit during operation	MIN：0.3μA MAX：100μA
Power balance	V_{BU}	Electricity balance detection voltage	4.2V±0.035V
	tV_{BU}	Balance startup delay time	1.6S（MAX）
	V_{BL}	Power balance release voltage	4.19V±0.035V
	I_B	4.2V battery balance current	90mA±5mA
Overtemperature protection	Charging optional	Low temperature -0 ℃± 5 ℃	no
	Discharge optional	High temperature 70 ℃± 5 ℃	Yes
The most continuous large working current	Charge	The rated current of the charger when charging the battery pack	80A/120A/160A(Equivalent to A of the protective board)
	Discharge	The rated current of the battery pack when discharging the load	80A/120A/160A(Equivalent to A of the protective board)
Charger selection		Voltage=Number of strings × 4.2 ± 0.05V	≦80A/120A/160A(Equivalent to A of the protective board)
Charging MOS has the highest voltage withstand	V_{DS}	The highest voltage value that the charging port can withstand when connected to the charger	Serial number*4.2V

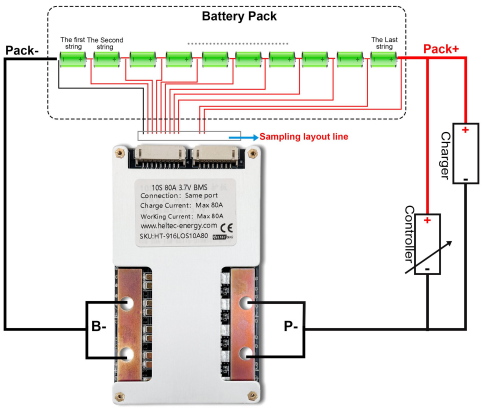
4. Size

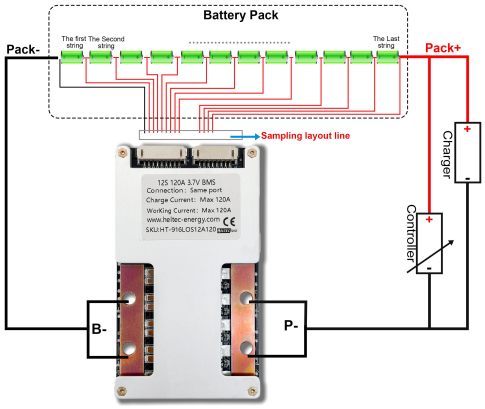
The length and width of the 9-16S series protection board are consistent, and the thickness is distinguished according to the current.

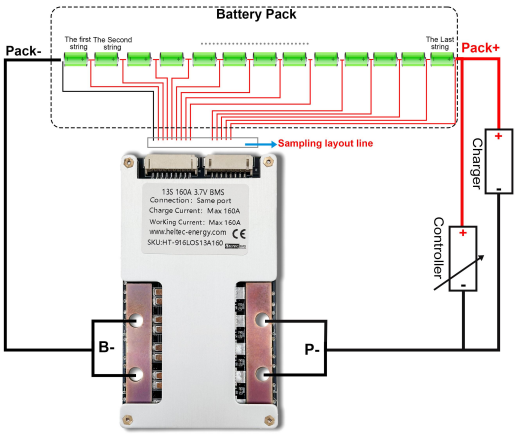


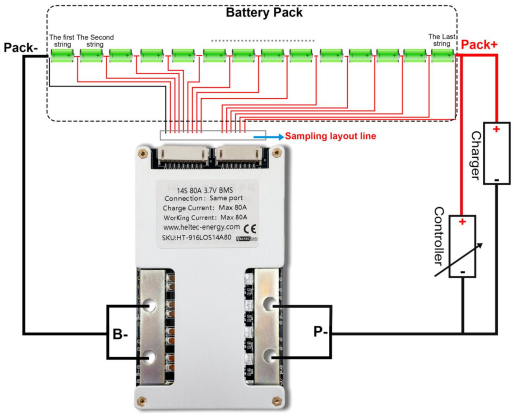
Current	80A	120A	160A
Thickness (MM)	9	12	12

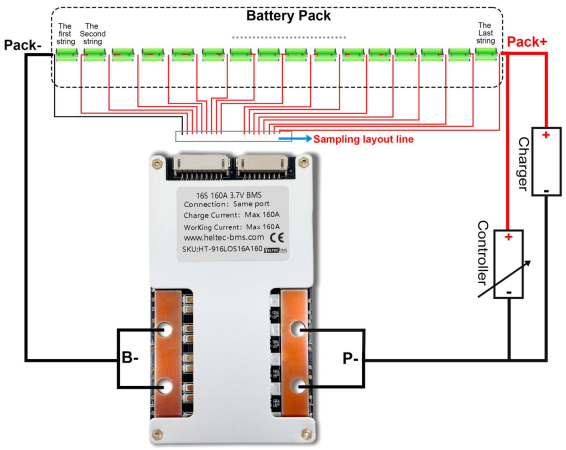
5. Wiring Diagram











6. Protection Function

Type	Overcharge single string detection voltage	Overcharge single string release voltage	Overdischarge single string detection voltage	Overdischarge single string release voltage	Single string balanced charging start
NCM	4.25V±0.035V	4.19V±0.025V	2.8V±0.025V	3.0V±0.025V	4.2V±0.035V
LFP	3.65V±0.035V	3.55V±0.025V	2.35V±0.025V	2.55V±0.025V	3.44V±0.035V

7. Fault Handling

Fault phenomenon	**Fault inspection and cause**	**Processing method**
Can't discharge	First,connect the circuit to activate the protection board for charging,and then measure the voltage of each battery separately.If the voltage of any battery is lower than 3.0V±0.025V(NCM)/2.35V±0.025V(LFP), the protection board will start over-discharge protection	If the battery is lower than 3.0v, please charge the battery to 3.7V(NCM)/3.25V(LFP)and balance it before combining. Do not mix good batteries with poor batteries(if you cannot solve this problem,please contact after-sales service)
Can't charge	Measure the voltage of each battery section.If any battery voltageis higher than 4.215V(NCM)/3.615(LFP)or so, the protection board willstart overcharge protection	If the battery is higher than 4.215v(NCM)/3.615V(LFP),please discharge the battery to about 3.7Vuntil it is balanced before combining.Do not mix good batteries with poor batteries (if you cannot solve this problem, please contact after-sales)

Charging/discharge failure	B-,B1,B2,B3,……B+ Wrong wiring	Redraw the wiring or operate under the guidance of customer service
Overcharge/discharge protection is invalid	B-,B1,B2,B3,……B+ Wrong wiring	Redraw the wiring or operate under the guidance of customer service
Discharge protection	Check whether the current value of the load starting power supply exceeds the overcurrent protection current of the protection board	Replace the protection board with a larger current(if not solved,please contact after-sales)
Componentis welded loosely	One of the components has a pin that is not connected to the PCB pad	You can repair the welding by yourself (if it still cannot be solved,please contact after-sales)
Component welding	There is a short circuit between two or more pins of the element	Remove the component and re-weld (if not,please contact after-sales)
Electrostatic breakdown	When the MOS tube is not powered.the forward and reverse resistance of any two pins of the G,D and S terminals are 0	You can remove and replace the mos tube by yourself (if it still cannot be solved,please contact after-sales)
Our company guarantees that each productis shipped after being tested by professional protection board testing instruments,because the combination battery of the protection board may be damaged by static electricity and current,and it is normal to have defective productsin use.		

Warranty Regulations

Warranty service period is 1 year.

The warranty service is limited to normal use: man-made damage, self-disassembly, modification and repair, use not in accordance with the instructions, and damage caused by external force majeure factors are not within the scope of free warranty.

Accessories such as test fixtures are consumables without warranty.

When you need warranty service, please contact your dealer for processing. If you cannot contact the dealer, you can contact our company by email or phone.

There are no after-sales service stations in other countries except China. If you need warranty service, please send the product to us for free repair, but you need to pay the freight for the round trip.