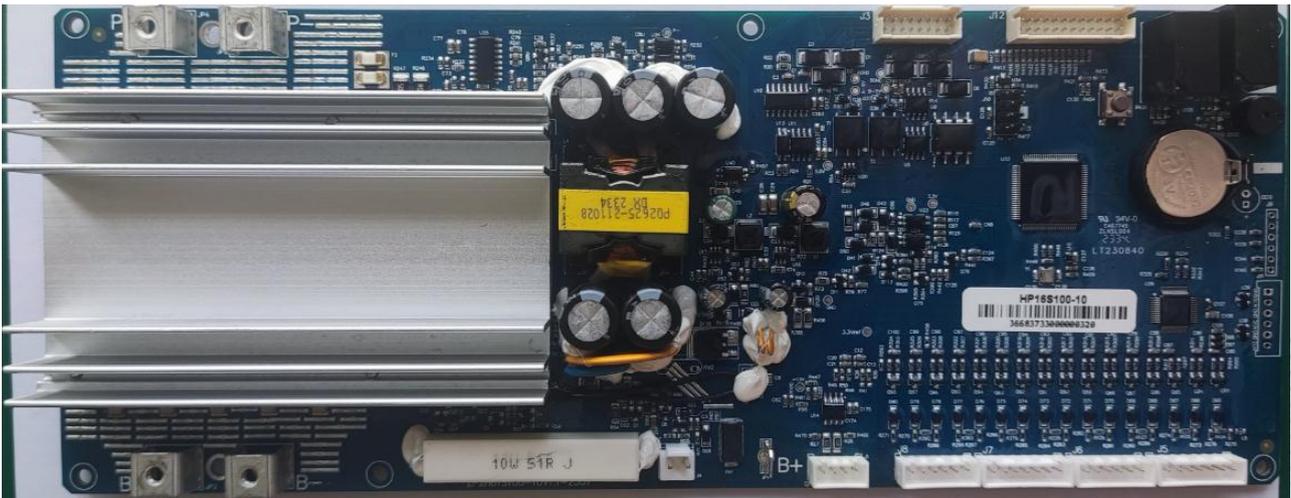# SmartGen
MAKING CONTROL SMARTER

HP16S100-10 SERIES

LITHIUM BATTERY PROTECTION BOARD

USER MANUAL

HP16S100-10 Series Main Board

郑州众智科技股份有限公司
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CONTENTS

SmartGenRegistered trademark

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Table 1 Software Version

Date	Version	Note
2023-07-26	1.0	Original release.
2023-12-27	1.1	Change the physical images of protection board and communication board; Add the adapted inverter model.
2024-03-06	1.2	Modify the pin definition; Add the panel cutout table of power switch.
2024-12-24	1.3	Change the naming standard; Add the physical introduction of the display board and key function description; Add the adapted inverter model.

Table 2 Notation Clarification

Sign	Instruction
⚠ NOTE	Highlights an essential element of a procedure to ensure correctness.
⚠ CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
☠ WARNING!	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

Glossary and List of Abbreviations

BMS: Battery Management System

AFE: Analog Front End

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1 OVERVIEW

HP16S100 series lithium battery protection board is a significant part of low-voltage lithium battery module, which is mainly used as backup power supply for 15~16 strings lithium battery base station communication, household energy storage and other systems. It can monitor the working status (voltage, current, temperature, etc.) of battery pack to alarm and protect the over/under voltage, over current, over temperature, reverse connection, etc. It can also provide the balanced protection function to extend the service life for battery cell, and realize the data monitoring, parameter configuration and firmware upgrade via RS232, RS485, CANBUS and other interfaces.

2 NAMING CONVENTIONS

2.1 NAMING CONVENTIONS
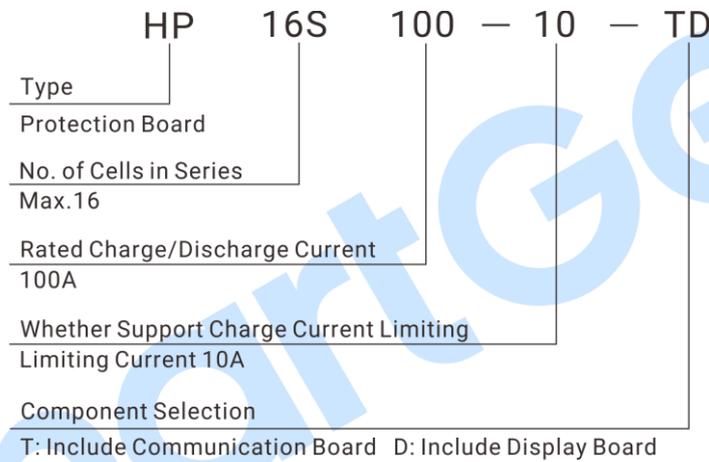
Fig.1 Naming Conventions

2.2 PHYSICAL PICTURE AND MODEL COMPARISON

Fig.2 Communication Board

Fig.3 Display Board

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Table 3 Model Comparison

No.	Model	Component		
		Main Board	Display Board	Comm. Board
1	HP16S100-10-T	●		●
2	HP16S100-10-TD	●	●	●

3   PERFORMANCE AND CHARACTERISTICS

——The stable and reliable AFE chip is adopted to realize the voltage detection of the cells, which supports the voltage detection of up to 16 strings of cells;

——Max. 4 channels of cell temperature detection are supported, and the temperature sensor type is NTC 10K-3950;

——1 MOS temperature sampling function, 1 ambient temperature sampling function;

——Alarm and protection functions of over/under voltage, over current, over temperature, reverse connection, etc.;

——Battery loop charge and discharge control, carrying current capacity is 100A;

——With 1# isolated CANBUS interface, 1# isolated RS232 interface, 1# isolated RS485 interface, 1# isolated and parallel connected RS485 interface, max.15 modules cascade communication are supported;

——LED indication includes power supply indicator, charge/discharge indicator, power indicator and alarm indicator;

——2 Aux. output ports;

——DIP switch is used to set module address and access to the 120Ω impedance matching resistor of the communication interface;

——Current limiting function 10A (Optional);

——It has sleep and wake-up functions for low power consumption;

——Passive balance function, and the max. balanced current is 85mA;

——RTC display and event log functions, which can circularly record 1000 groups of warning, protection, fault and other alarms when they occur and disappear;

——The black box function can record 3 groups of protection and fault events. Each group records 60 pieces of data 50s before and 10s after an event occurs;

——The power is supplied by battery module;

——With buzzer alarm function;

——With heating function, which is used for battery module heating;

——The maximum capacity load of the pre-charging circuit is 30000uF, and specific value is subject to the actual measurement of the system;

——The firmware is upgraded via RS485 and RS232 interfaces.

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4 TECHNICAL INDEX

Table 4 Technical Index

Item	Contents
Working Voltage	Battery supply: 30VDC~70VDC
Overall Power Consumption	Normal working: ≤1.6W; Max.: ≤2.8W, Sleep: ≤15mW
Cell Voltage Collection	Range: (0~5000)mV Resolution: 1mV Accuracy: ±10mV
Temperature Collection	Range: -40˚C ~+125°C Resolution: 1°C Accuracy: ±1˚C Temp. Sensor Type: NTC 10K
Current Collection	Range: -150A~+150A Resolution: 0.1A Accuracy: 1%FS
SOC Accuracy	±5%
CAN Interface	1#, 250kbps, isolation
RS232 Interface	1#, 9600bps, isolation
RS485 Interface	2#, 9600bps, isolation
Digital Output Port 1-2	2A DC30V Volts free output (relay output)
Cell Heating Output Power	Max.3A, voltage supplied by P+, P-
EMC Standard	GB/T 34131-2023
Vibration	5Hz~8Hz: displacement±7.5mm 8Hz~500Hz: a±2g IEC 60068-2-6
Shock	50g, 11ms, half-sine, three consecutive shocks are applied in each of the three mutually perpendicular directions, i.e. a total of 18 times. IEC 60068-2-27
Bump	25g, 16ms, half-sine IEC 60255-21-2
Case Dimensions	Lithium Battery Protection Board: 280mmx110mmx33.5mm Communication Board: 160mmx40mmx24.6mm
Panel Cutout	Lithium Battery Protection Board: 271mmx102mm Communication Board: 150mmx30mm
Working Temperature	(-40~+70)°C
Working Humidity	(20~93)%RH
Storage Temperature	(-40~+80)°C
Weight	550g (Total weight of lithium battery protection board, communication board and communication wiring harness.)

5 ILLUSTRATION OF LED INDICATORS

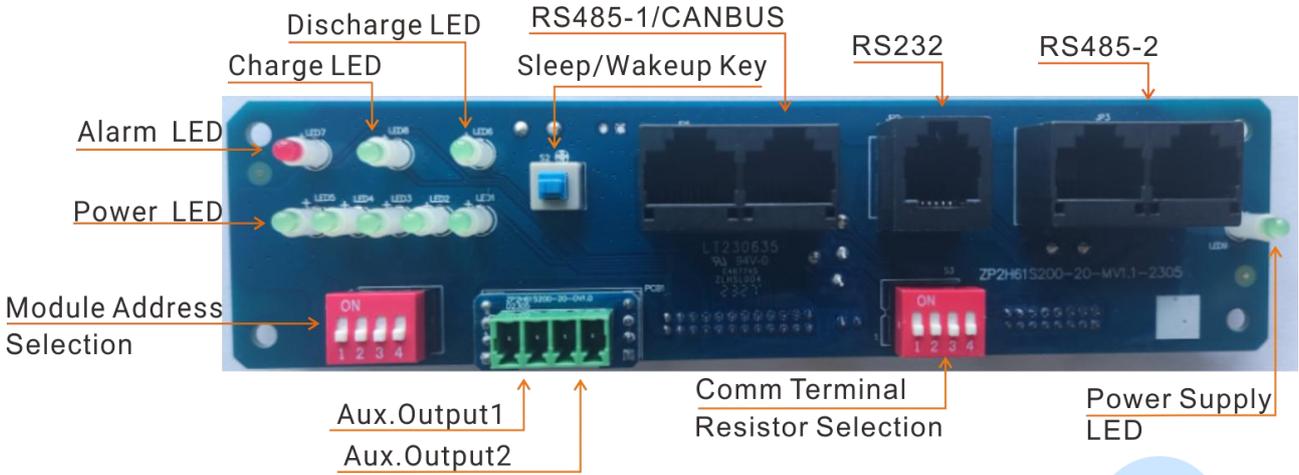## 5.1 POSITIONS AND FUNCTIONS OF LED INDICATORS AND OTHER COMPONENTS

Fig.4 Communication Board Indication

5.2 COMMUNICATION TERMINAL RESISTANCE CORRESPONDS TO DIP SWITCH

Table 5 Communication Terminal Resistance Corresponds to DIP Switch

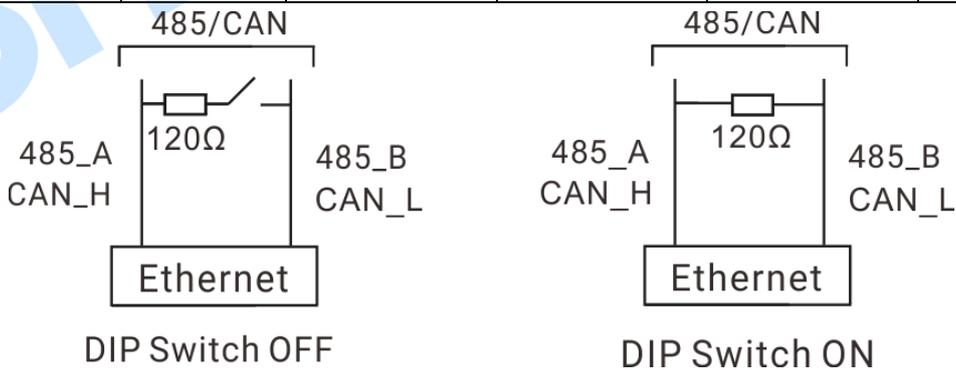| DIP Switch	Dial-up Position	DIP Switch Position			
		1	2	3	4
	ON	RS485-1 connected to 120Ω terminal matching resistance	CAN-BUS connected to 120Ω terminal matching resistance	/	RS485-2 connected to 120Ω terminal matching resistance
	OFF	RS485-1 No terminal Resistance	CAN-BUS No terminal Resistance	/	RS485-2 No terminal Resistance

Fig.5 DIP Switch Corresponds to Terminal Resistance

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5.3 LED WORKING STATUS INDICATION

Table 6 LED Working Status Indication

No.	Indicator	Description
1	Power Supply	Light off when the protection board is power off or sleep; light on when the protection board is running.
2	Alarm	Slow flashing (once per second) when warns, fast flashing (5 times per second) when protection works, always illuminated when it fails and extinguished when there is no alarm.
3	Charging	Light on when battery module is charging, while light off at other times.
4	Discharging	Light on when battery module is discharging, while light off at other times.
5	Capacity	See Table 7.

Table 7 Capacity Indicator Description

Status		Charging					Discharging				
Capacity Indicator		LED5	LED4	LED3	LED2	LED1	LED5	LED4	LED3	LED2	LED1
Power (%)	0%~20%	◐	○	○	○	○	●	○	○	○	○
	20%~40%	●	◐	○	○	○	●	●	○	○	○
	40%~60%	●	●	◐	○	○	●	●	●	○	○
	60%~80%	●	●	●	◐	○	●	●	●	●	○
	80%~100%	●	●	●	●	◐	●	●	●	●	●
NOTE: ◐ means indicator is flashing, ● means indicator is always illuminated, ○ means indicator is extinguished.											

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6 KEY DESCRIPTION OF DISPLAY SCREEN

Fig.6 Key Description of Display Screen

Table 8 Key Description

Key	Description
Up	Press it to display the previous page.
Confirm	1. Long press it to enter the setting interface; in the setting interface, you can select language and view version information. 2. In the configuration interface, press it to enter the next interface; no action in the main interface.
Down	Press it to display the next page.
ESC	1. Press it to return to the previous interface; in the configuration interface, return to the main interface. 2. Long press it to return directly to the first page of the main interface.

Table 9 Screen Display

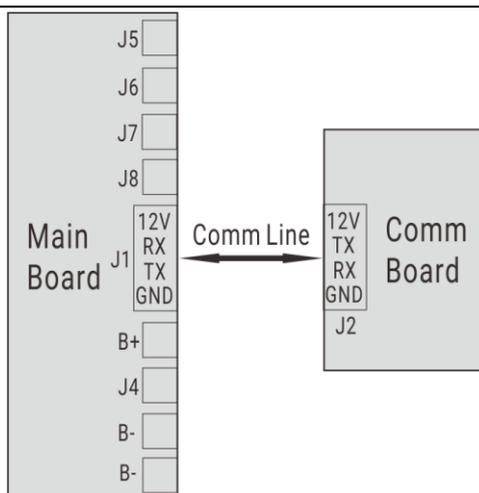| Screen	Description
Screen1	Real-time display of SOC, charge/discharge status, total voltage, total current.
Screen2	Real-time display of total capacity, remaining capacity, SOH, cycle times.
Screen3	Real-time display of battery voltage from 1st to 4th cell.
Screen4	Real-time display of battery voltage from 5th to 8th cell.
Screen5	Real-time display of battery voltage from 9th to 12th cell.
Screen6	Real-time display of battery voltage from 13th to 16th cell.
Screen7	Real-time display of battery temperature.
Screen8	Real-time display of MOS temperature, ambient temperature.
Screen9	Real-time display of charging and discharging MOS status and the status of two output ports.
Screen10	RTC display.
Setting Screen	Language selection and version information can be viewed in the Settings screen.

Fig.7 Wiring Diagram Between Main Board and Comm. Board

7 BUZZER ACTION

Table 10 Description of Buzzer Action

Enable Status	Action Description
Disable	The buzzer does not sound.
Enable	The buzzer will sound for 1s when you power on the device for the first time or wake up from sleep mode.
	The buzzer will sound for 0.3s in sleep mode.
	The buzzer will sound for 2s and rest for 0.5s in warning; sound for twice per second in protection (except overcharge protection); sound for 5 times per second in fault protection. After the short circuit protection is locked for 3 times, the buzzer does not sound.
NOTE: The buzzer functions can be set to enable or disable through PC, and the factory default is disabled.	

8 SLEEP/WAKEUP KEYS DESCRIPTION

When BMS is in sleep mode, press the sleep/wake-up key for more than 1s, then BMS enters the running mode, LED indicators will light on successively from the discharging indicator.

When BMS is in running mode, long press sleep/wake-up key for 3~6s, then BMS enters the sleep mode, LED indicators will light on successively from SOC indicator, finally, all the indicators will extinguish and enter the sleep mode.

9 SLEEP/WAKEUP DESCRIPTION

System will enter the sleep mode if any of the following conditions are met:

(1) The single cell or the total voltage over discharge protection is not removed after a delay of 30s;

(2) Long press the key for 3~6s;

(3) System does not have any operation for more than 24h and no communication & charger connection;

(4) Sleep by PC software;

(5) System does not have any operation, and the min. single cell voltage is lower than the sleep

voltage, and the duration reaches the sleep delay time without communication and charger connection.

System will enter the running mode if any of the following conditions are met:

(1) Connect to charger, the output voltage of charger will be greater than 36V;

(2) Long press the key for more than 1s;

(3) Communicate with PC via RS232.

10   DIP SWITCH SETTING

The DIP switch is used to set the module address to realize the monitoring of multiple battery modules.

Table 11 DIP Switch Corresponds to Module Address

DIP Switch	Module Address	DIP Switch Position			
		1	2	3	4
	1	OFF	OFF	OFF	ON
	2	OFF	OFF	ON	OFF
	3	OFF	OFF	ON	ON
	4	OFF	ON	OFF	OFF
	5	OFF	ON	OFF	ON
	6	OFF	ON	ON	OFF
	7	OFF	ON	ON	ON
	8	ON	OFF	OFF	OFF
	9	ON	OFF	OFF	ON
	10	ON	OFF	ON	OFF
	11	ON	OFF	ON	ON
	12	ON	ON	OFF	OFF
	13	ON	ON	OFF	ON
	14	ON	ON	ON	OFF
	15	ON	ON	ON	ON

11 INTERFACE DEFINITION

Table 12 RS232 Communication Connector Definition

Connector Figure	Description	
1 2 3 4 5 6	1	NC
	2	NC
	3	RS232_TX
	4	RS232_RX
	5	NC
	6	GND

Table 13 RS485&CAN Communication Connector Definition
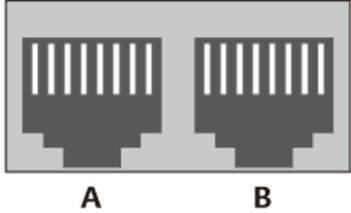
Connector Figure	Description		
1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 A B	A/B Section	1	RS485_1_A
		2	RS485_1_B
		3	NC
		4	NC
		5	NC
		6	NC
		7	CAN_H
		8	CAN_L
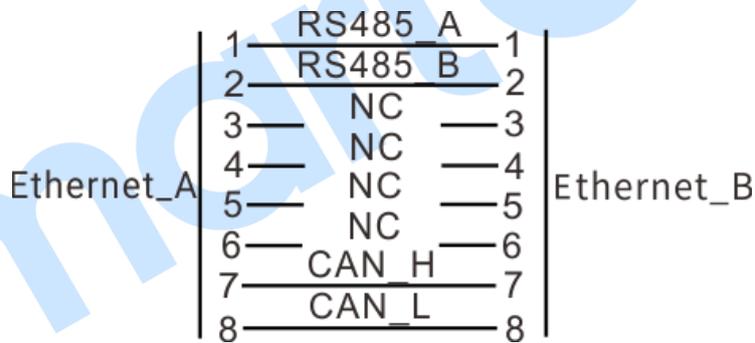
Fig.8 Internal Diagram of RS485&CAN Communication Connector

Table 14 Communication Connector Definition of RS485 Parallel Connection
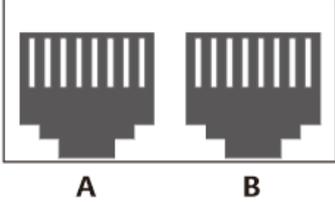
Connector Figure	Description		
1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 A B	A/B Section	1	RS485_2_A
		2	RS485_2_B
		3	NC
		4	NC
		5	NC
		6	NC
		7	RS485_2_A
		8	RS485_2_B
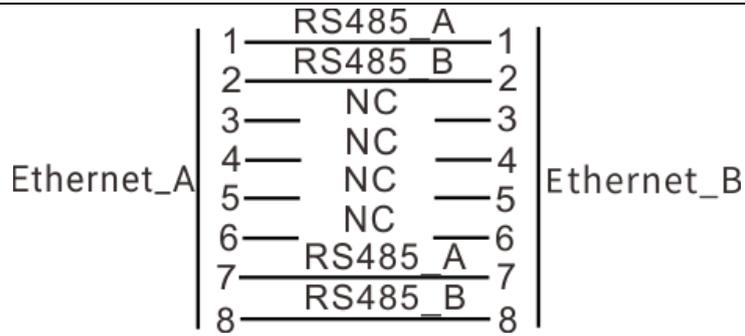
Fig.9 Internal Diagram of Communication Connector of RS485 Parallel Connection

Table 15 Dry Contact Definition

Connector Figure	Description	
	1	RELAY_OUT1-1
	2	RELAY_OUT1-2
	3	RELAY_OUT2-1
	4	RELAY_OUT2-2
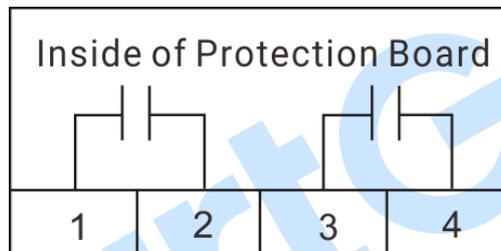
Fig.10 Internal Diagram of Dry Contact

12 PARAMETER SETTING

12.1 CONTENTS AND RANGES OF PARAMETER SETTING

Table 16 Contents and Ranges of Parameter Setting

No.	Item	Range	Default	Description
Module Setting				
1	Password	(0-65534)	1234	
2	RS485_1 Comm. Baud Rate	(0-2)	0	0: 9600bit/s 1: 19200bit/s 2: 115200bit/s
3	RS485_1 Comm. Stop Bit	(0-1)	0	0: 1 bit 1: 2 bits
4	RS485_1 Parity Check Bit	(0-2)	0	0: No parity 1: Odd 2: Even
5	RS485_2 Comm. Baud Rate	(0-2)	0	0: 9600bit/s 1: 19200bit/s 2: 115200bit/s
6	RS485_2 Comm. Stop Bit	(0-1)	0	0: 1bit 1: 2 bits
7	RS485_2 Parity Check Bit	(0-2)	0	0: No parity 1: Odd 2: Even
8	RS232 Comm. Baud Rate	Not Selectable	9600bit/s	
9	RS232 Comm. Stop Bit	Not Selectable	1bit	
10	RS232 Parity Check Bit	Not Selectable	None	
11	CAN Comm. Baud Rate	Not Selectable	250kbps	
12	Digital Output 1 Content	(0-1)	0	0: NO 1: NC
13		(0-20)	1	See Table 17 of digital output setting.
14	Digital Output 2 Content	(0-1)	0	0: NO 1: NC
15		(0-20)	2	See Table 17 of digital output setting.
16	Buzzer Mute	(0-1)	0	0: Disable 1: Enable

No.	Item			Range	Default	Description
17	Inverter Type			(0-50)	0	0: Not used 1: AISWEI 2: Epever 3: JYHY-JBD 4: SRNE 5: SINEXCEL 6-50: Reserved
Battery Module						
1	System Nominal Capacity			(1-600.0)AH	100.0	
2	System Total Capacity			(1-600.0)AH	100.0	
3	Rated Charging Current			(1.0-100.0)A	100.0	
4	Rated Discharging Current			(1.0-100.0)A	100.0	
5	Balance Start Voltage			(2000-5000) mV	3450	When the voltage difference between the cells is greater than 1V, the balance should not be started.
6	Balance Start Voltage Difference			(0-1000)mV	50	
7	Sleep Voltage for Single Cell			(2000-5000) mV	2500	
8	Sleep Delay for Single Cell			(0-120)min	5	
9	Full Charging Voltage			(20.0-70.0)V	57.6	
10	Full Cut-off Current			(50-10000) mA	2000	
11	Intermittent Charging SOC			(50-100)%	95	
12	Charging Active Current Limiting Value			(0-200.0)%	100.0	
13	Cells Number			(0-1)	0	0: 16 Strings 1: 15 Strings
14	Limiting Current			(0-1)	0	0: 10A 1: 20A
Protection Parameter Setting						
1	Single Cell Over Volt. Protection	Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
2			Warning Threshold	(2000-5000) mV	3550	Return voltage difference is 10mV.
3			Protection Threshold	(2000-5000) mV	3650	
4			Protection Delay	(0-60.0)s	3.0	
5		Return Condition	Return Volt.	(2000-5000) mV	3450	When the cell voltage is less than or equal to the setting threshold, the protection returns;
6			Return SOC	(0-100)%	90	

No.	Item			Range	Default	Description
7			Return Current	(0-50.0)A	1.0	or when SOC is less than or equal to the setting threshold, the protection returns; or when the discharging current is greater than or equal to the threshold, the protection returns.
8		Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
9			Warn	(20.0-70.0)V	56.0	
10			Protection	(20.0-70.0)V	57.6	
11		Return Condition	Delay	(0-60.0)s	3.0	
12			Return	(20.0-70.0)V	54.4	When total voltage is less than or equal to the setting threshold, the protection returns; or when SOC is less than or equal to the setting threshold, the protection returns; or when discharging current is greater than or equal to the setting threshold, the protection returns.
13	Total Cell Over Volt. Protection		Return SOC	(0-100)%	90	
14			Return Current	(0-50.0)A	1.0	
15		Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
16			Warn	(2000-5000) mV	2700	
17	Single Cell Under Volt. Protection		Protection	(2000-5000) mV	2600	When under voltage protection lasts for 30s and still cannot be recovered, the unit enters the low-power mode and returns when charging voltage signal is detected.
18			Protection Delay	(0-60.0)s	1.0	
19		Return Condition	Return	(2000-5000) mV	2950	The protection returns when the lowest voltage is greater than or equal to the setting threshold.

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No.	Item			Range	Default	Description
20	Total Cell Under Volt. Protection	Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
21			Warn	(20.0-70.0)V	44.0	
22			Protection	(20.0-70.0)V	42.4	When under voltage protection lasts for 30s and still cannot be recovered, the unit enters the low-power mode and returns when charging voltage signal is detected.
23			Delay	(0-60.0)s	2.0	
24		Return Condition	Return	(20.0-70.0)V	48.0	The protection returns when total voltage is greater than or equal to the setting threshold.
25	Charging Over Current Protection	Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
26			Warn	(0.1-150.0)%	102.5	
27			Protection	(0.1-150.0)%	105	The status will be locked and not be automatically recovered after 3 consecutive overcurrent. It will be automatically recovered after 1 minute.
28			Delay	(0-60.0)s	2.0	
29		Return Condition	Return Current	(0-50.0)A	1.0	The protection returns when discharging current is greater than or equal to the setting threshold.
30	Discharge Over	Protection Setting	Warning Enable	(0-1)	1	0: Disable 1: Enable
31			Warn	(0.1-150.0)%	102.5	

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No.	Item			Range	Default	Description
32	Current Protection		Protection 1	(0.1-150.0)%	105	The status will be locked and not be automatically recovered after 3 consecutive overcurrent. It will be automatically recovered after 1 minute. It will be recovered when charging current is greater than the setting threshold.
33			Delay	(0-60.0)s	0.1	
34			Protection 2	(0.1-200.0)%	112.5	The status will be locked and not be automatically recovered after 3 consecutive overcurrent. It will be automatically recovered after 1 minute. It will be recovered when charging current is greater than the setting threshold.
35			Delay	(0-30.0)s	0.1	
36		Return Condition	Return Current	(0-50.0)A	1.0	The protection returns when charging current is greater than or equal to the setting threshold.
37	Short-Circuit Protection		Delay	(100-1000)us	300	The status will be locked and not be automatically recovered after 3 consecutive short-circuit. It will be recovered when charging voltage signal is detected or load is removed.
38	MOS High Temp. Protection	Protection Setting	Warning Enable	(0-1)	1	
39			Warn	(-40-120)°C	95	
40			Protection	(-40-120)°C	115	
41		Return Condition	Return	(-40-120)°C	85	The protection returns when MOS temperature is less than or equal to the setting threshold.

No.	Item			Range	Default	Description
42	Low Ambient Temp. Protection	Protection Setting	Warning Enable	(0-1)	1	
43			Warn	(-40-120)°C	-10	
44			Protection	(-40-120)°C	-20	
45		Return Condition	Return	(-40-120)°C	0	The protection returns when the ambient temperature is greater than or equal to the setting threshold.
46	High Ambient Temp. Protection	Protection Setting	Warning Enable	(0-1)	1	
47			Warn	(-40-120)°C	60	
48			Protection	(-40-120)°C	70	
49		Return Condition	Return	(-40-120)°C	50	The protection returns when the ambient temperature is less than or equal to the setting threshold.
50	High Charge Temp. Protection	Protection Setting	Warning Enable	(0-1)	1	
51			Warn	(-40-120)°C	50	
52			Protection	(-40-120)°C	65	
53		Return Condition	Return	(-40-120)°C	55	The protection returns when the charging temperature is less than or equal to the setting threshold.
54	Low Charge Temp. Protection	Protection Setting	Warning Enable	(0-1)	1	
55			Warn	(-40-120)°C	0	
56			Protection	(-40-120)°C	-10	
57		Return Condition	Return	(-40-120)°C	-1	The protection returns when the charging temperature is greater than or equal to the setting threshold.
58	High Discharge	Protection Setting	Warning Enable	(0-1)	1	
59			Warn	(-40-120)°C	50	

No.	Item			Range	Default	Description
60	Temp. Protection		Protection	(-40-120)°C	65	
61		Return Condition	Return	(-40-120)°C	60	The protection returns when the discharging temperature is less than or equal to the setting threshold.
62		Protection Setting	Warning Enable	(0-1)	1	
63			Warn	(-40-120)°C	0	
64	Low Discharge Temp. Protection		Protection	(-40-120)°C	-20	
65		Return Condition	Return	(-40-120)°C	-10	The protection returns when the discharging temperature is greater than or equal to the setting threshold.
66	Low Power Warning		Warning Threshold	(0-100)%	5	No warning when charging.

12.2 SETTING CONTENTS OF DIGITAL OUTPUT PORTS

Table 17 Setting Contents of Digital Output Ports

No.	Item	Range	Default	Description
1	Active Type	(0-1)	0	0: NO 1: NC
2	Output Port Setting	(0-20)		See Table 18 Definable Contents of Digital Output Ports

12.3 DEFINABLE CONTENTS OF DIGITAL OUTPUT PORTS

Table 18 Definable Contents of Digital Output Ports

No.	Item	Description
00	Not Used	
01	Remote Control Output	Output PC request order.
02	SOC Low Output	Output when SOC is lower than the setting SOC warning threshold.
03	Alarm Output	Output when system alarms.
04	Reserved	
05	Reserved	
06	Reserved	
07	Reserved	
08	Reserved	
09	Reserved	
10	Reserved	
11	Reserved	

No.	Item	Description
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	
16	Reserved	
17	Reserved	
18	Reserved	
19	Reserved	
20	Reserved	

Table 19 Interface Definition of Battery Pack

Interface			Description
B+			PACK positive side, used to supply power for BMS; the power positive P+ is directly connected to the positive of the cell.
B-			PACK negative
P-			PACK negative, both battery negative and discharge negative (charge and discharge are the same port)
J5	1	NTC1-	Negative of cell temperature sampling line 1
	2	NTC1+	Positive of cell temperature sampling line 1
	3	B0	Cell negative of Section 1
	4	B1	Cell positive of Section 1
	5	B2	Cell positive of Section 2
	6	B3	Cell positive of Section 3
	7	B4	Cell positive of Section 4
J6	1	NTC2-	Negative of cell temperature sampling line 2
	2	NTC2+	Positive of cell temperature sampling line 2
	3	B5	Cell positive of Section 5
	4	B6	Cell positive of Section 6
	5	B7	Cell positive of Section 7
	6	B8	Cell positive of Section 8
J7	1	NTC3-	Negative of cell temperature sampling line 3
	2	NTC3+	Positive of cell temperature sampling line 3
	3	NC	
	4	B9	Cell positive of Section 9
	5	B10	Cell positive of Section 10
	6	B11	Cell positive of Section 11
	7	B12	Cell positive of Section 12
J8	1	NTC4-	Negative of cell temperature sampling line 4
	2	NTC4+	Positive of cell temperature sampling line 4
	3	B13	Cell positive of Section 13
	4	B14	Cell positive of Section 14
	5	B15	Cell positive of Section 15
	6	B16	Cell positive of Section 16

13 PHYSICAL IMAGE AND CASE DIMENSIONS

13.1 PHYSICAL IMAGE

Fig.11 HP16S100-10 Series Main Board

Fig.12 HP16S100-10 Series Communication Line

Fig.13 HP16S100-10 Series Sampling Line

SmartGen

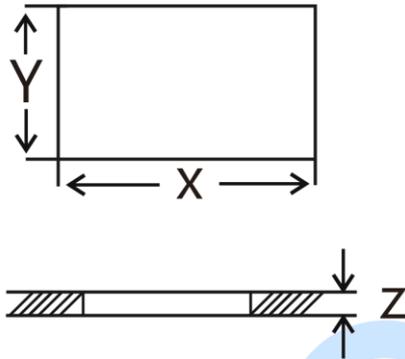**Fig.14 HP16S100-10 Series Power Switch**

Fig.15 Panel Cutout of Power Switch

Table 20 Panel Cutout of Power Switch (Unit: mm)

Thickness (z)	Opening Width (Y)	Opening Length (X)
0.7 - 1.25	12.8 - 12.9	19.2 - 19.3
1.25 - 2.0	12.8 - 12.9	19.3 - 19.4
2.0 - 3.0	12.8 - 12.9	19.5 - 19.6

NOTE: The communication cable (0.3m), sampling cable (1m) and wiring harness of power switch are provided by factory. If other harness lengths are required, please illustrate special instructions when ordering.
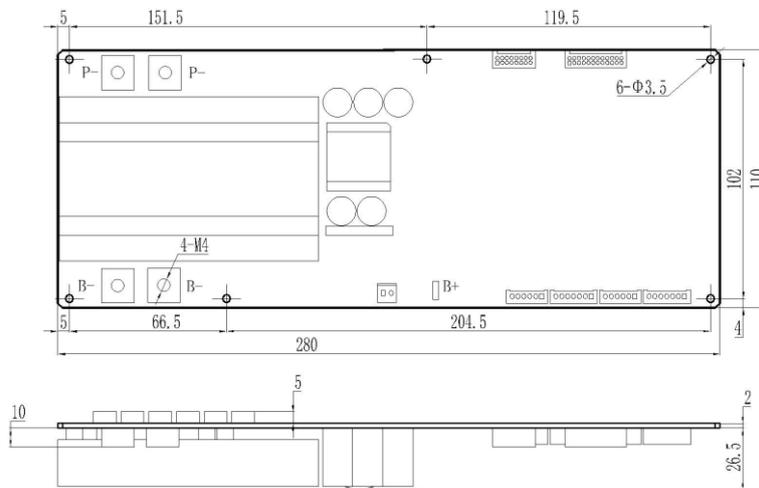
13.2 CASE DIMENSIONS

Unit: mm

Fig.16 Case Dimensions of HP16S100-10 Series Main Board

![SmartGen]

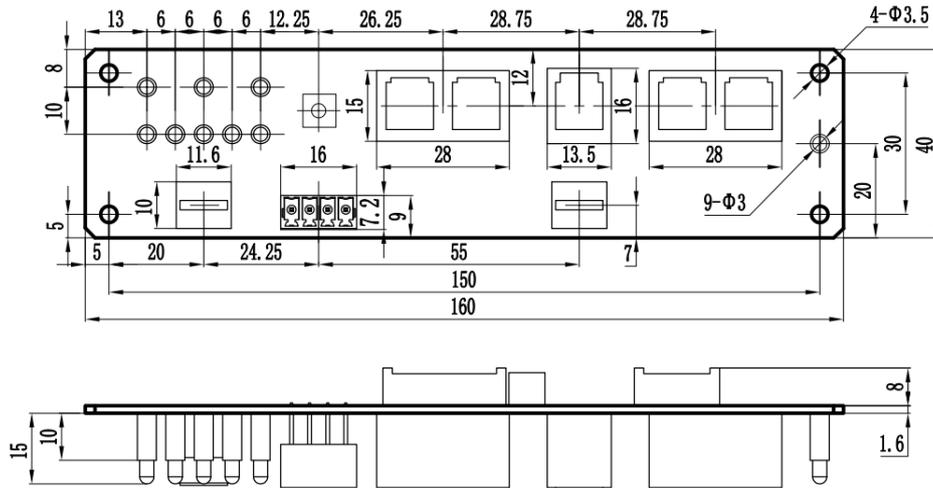**NOTE:** B+ cable lug: FDFD1.25-250 (one), provided by factory.

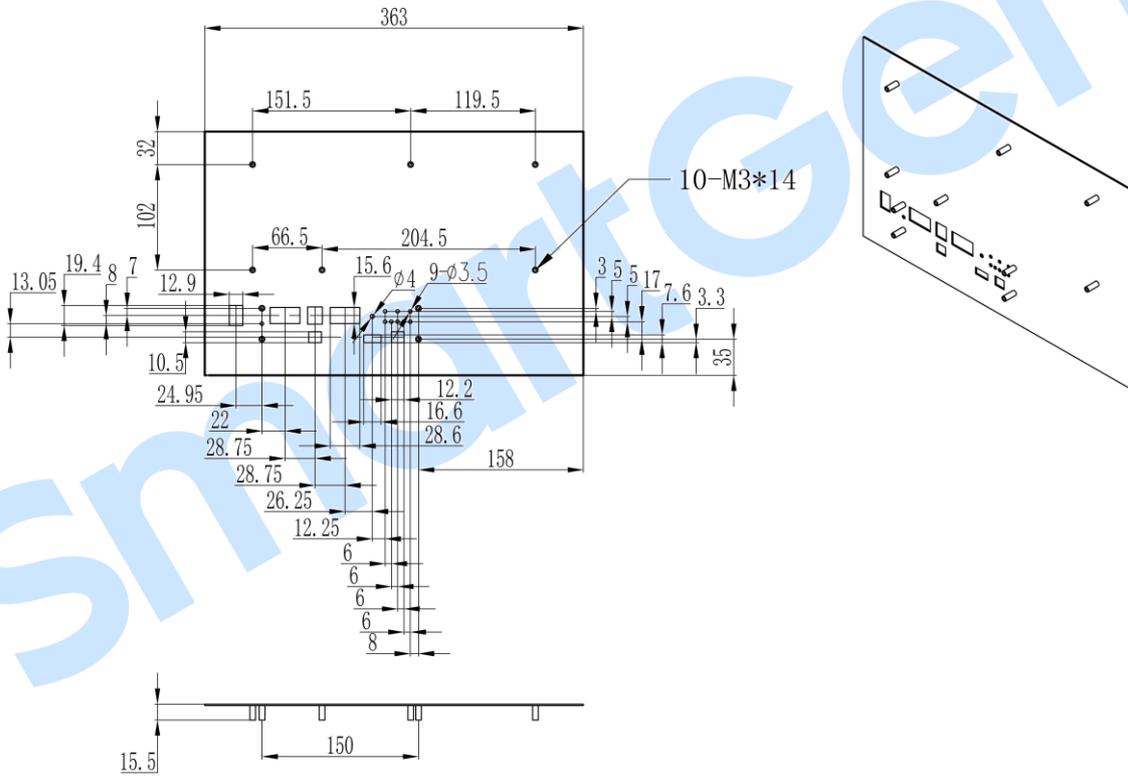**Fig.17 Case Dimensions of HP16S100-10 Series Communication Board**

Fig.18 Panel Cutout of HP16S100-10 Series

14   COMMISSIONING AND INSTALLATION

There are strict sequence requirements for power on the protection board, connect the corresponding cables to terminals B-, P-, B+ in turns, and then connect the sampling cables to the corresponding terminals according to their numbers. Power on by pressing the power switch on the communication board. Load or charger can only be added after all cables are installed.

Remove the charger or load first, then remove the sampling cables from the corresponding terminals, and finally remove the B+, B- and P- cables in sequence.
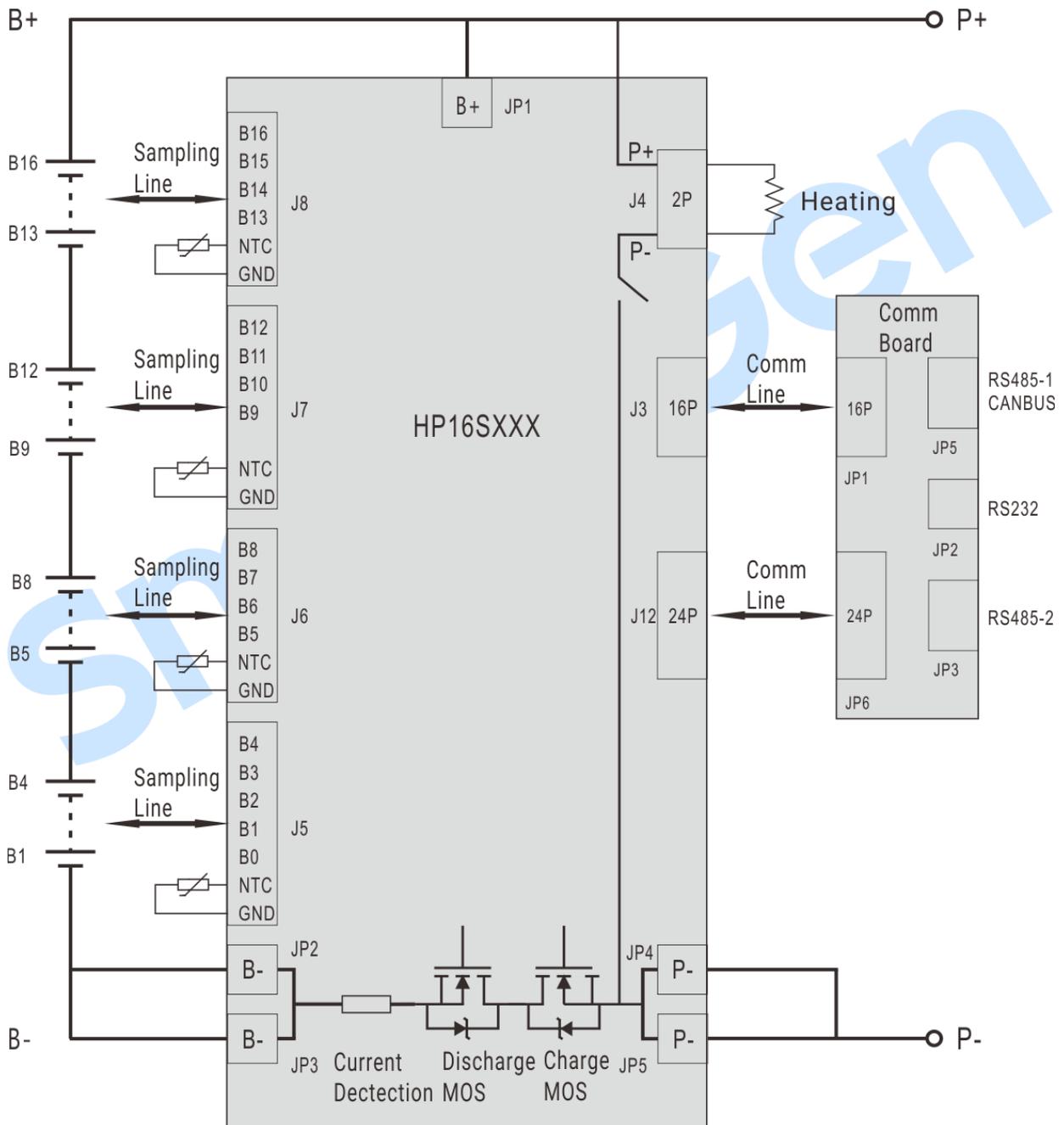
15   APPLICATION DIAGRAM

Fig.19 Application Diagram of HP16S100-10 Series Lithium Battery Protection Board

16 TROUBLE SHOOTING

Table 21 Trouble Shooting

Fault Symptom		Possible Measurement
Protection board no response when power on		Check the wirings of protection board.
Communication Failure	CAN Communication Fault	Check the wirings; Check if the wirings between CAN_H and CAN_L are reversely connected; A 120Ω resistor is recommended to connect between CAN_H and CAN_L.
	485 Communication Fault	Check the wirings; Check ID setting; Check if the wirings between RS485_A and RS485_B are reversely connected; Check if COM port setting is correct; Check if PC communication port is damaged; A 120Ω resistor is recommended to connect between A&B of RS485.
	232 Communication Fault	Check the wirings; Check ID setting; Check if the wirings between RS232_TX and RS232_RX are reversely connected; Check if COM port setting is correct; Check if PC communication port is damaged.
Abnormal battery voltage and temperature data		Check the wirings; Check the connector is tightly inserted.

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