PRODUCT SPECIFICATION

Product Name: High Voltage Energy Storage (BCU)

Product Model: TBA-C1500

Version: V1.3

Compiler: Bin	Reviewer: Ethan	Approval: Gary
2024-12-5	2024-12-5	2024-12-5

Revision Record			
Date	Revised Version	Revision Note	Reviser
2024-3-25	V1.0	Newly formulate	Bin
2024-4-25	V1.1	Update the definition of the BAT port	Bin
2024-8-14	V1.2	Update the some port definitions	Bin
2024-12-5	V1.3	Optimized functionality and Update some port definitions; New Parameter List	Bin

Catalog

1. Overview of the solution

1.1 Introduction

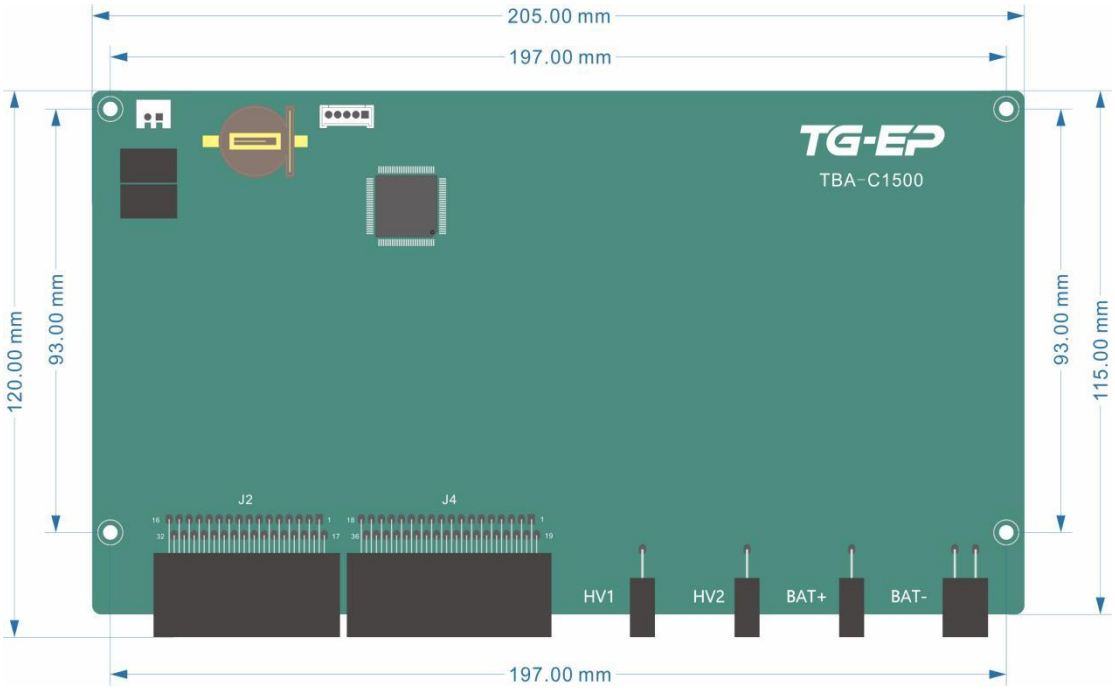
TBA-C1500 is suitable for the 2-level master control of high voltage energy storage system, which manages the battery cluster. It supports flexible configuration of battery modules through daisy-chain communication, enabling various capacity options. The system provides multiple fault alarms and protections, and allows parameter configuration and fault diagnosis via an upper computer.

1.2 Application environment

Index item	Parameter
Use ambient temperature range	-20℃ ~ 70℃
Storage environment temperature range	-40℃ ~ 85℃
Use ambient humidity range	5 ~ 95（45℃±2℃）%RH
Storage environment humidity range	≤95（45℃±2℃）%RH
Atmospheric pressure	76 ~ 106 Kpa
Altitude	Meet GB/T-7251.1
Heat dissipation mode	Natural heat dissipation
IP rating	IP20

2. Hardware parameters

2.1 Main board dimension drawing

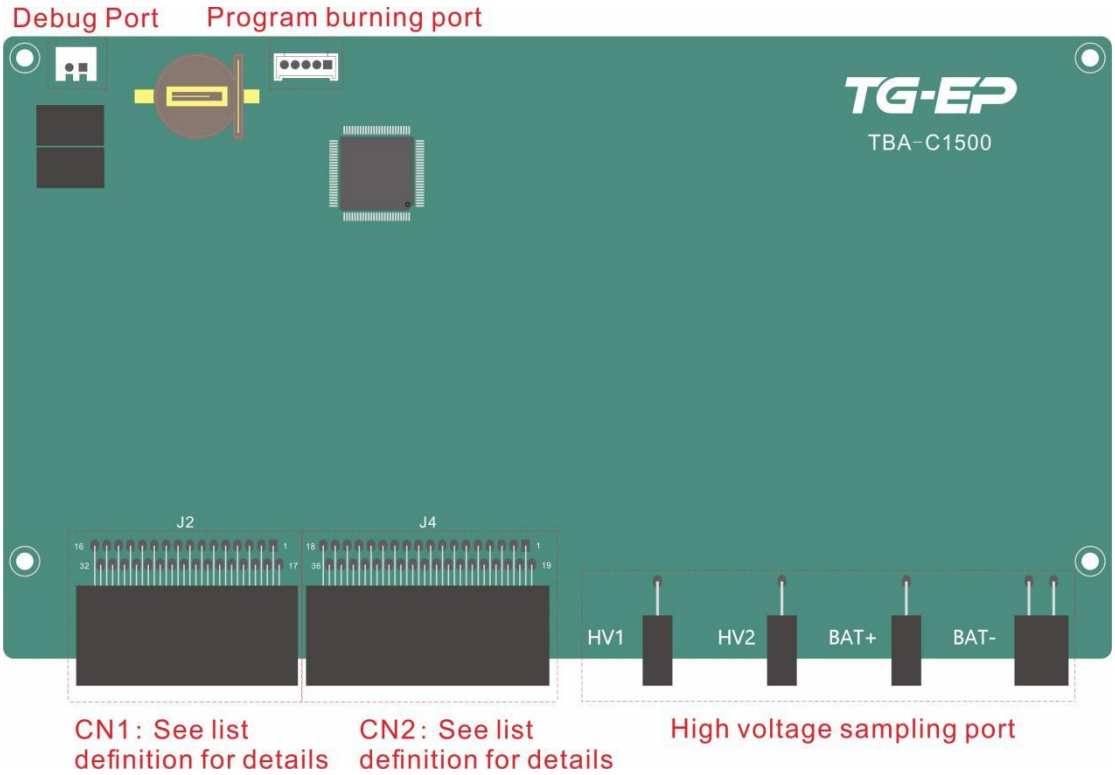


2.2 Hardware parameter list

Index item	Parameter
Overall dimensions of main board	205*115mm
Operating voltage	9 ~ 30 VDC (matching the working power supply range of hardware)
SOC accuracy	≤ 5%, according to YD/T2344.1-2011.
Data storage	≥ 10,000 historical data records
Pre-charging function	Have
Charging current limiting	Have
Upper computer	Have
Program upgrade	Have
Communication methods	CAN, RS485, WIFI (extended), 4G (extended)

3. Motherboard port function

3.1 Port function diagram



3.2 Port definition table

Post	Bit number	Definition	Bit number	Definition
J2	1	/	17	PE
	2	HALL_I2	18	HALL_I1
	3	VCC_HALL	19	VEE_HALL
	4	DIH1	20	GND
	5	DIH2	21	SW1_OUTA
	6	DIH3	22	SW1_OUTB
	7	WKUP	23	SW2_OUTA
	8	DOL1	24	SW2_OUTB
	9	DOL2	25	SW3_OPA
	10	DOL3	26	SW3_OPB
	11	DOH1	27	GND

	12	DOH2	28	GND
	13	DOH3	29	GND
	14	DOH4	30	GND
	15	PW+	31	PW+
	16	PW-	32	PW-
J4	1	SPI_L1	19	SPI_H1
	2	SPI_L2	20	SPI_H2
	3	CAN1H	21	CAN1R
	4	GND_CAN1	22	CAN1L
	5	CAN2H	23	CAN2R
	6	GND_CAN2	24	CAN2L
	7	CAN0L	25	CAN0H
	8	485A1	26	GND_CAN0
	9	GND_4851	27	485B1
	10	485B2	28	485A2
	11	DIL1	29	GND_4852
	12	DIL3	30	DIL2
	13	GND	31	DO_ADR
	14	SW1_IN-	32	SW1_IN+
	15	SW2_IN-	33	SW2_IN+
	16	TEMP2	34	TEMP1
	17	TEMP4	35	TEMP3
	18	TGND	36	TGND
HV1	1	High voltage sampling 1	2	/
HV2	1	High voltage sampling 2	2	/
BAT+	1	High voltage sampling positive	2	/
NE	1	Shunt input negative (IS-)	2	High voltage sampling negative (BAT-)
	3	Shunt input positive (IS+)	4	NC

4. Parameter list

In battery faults, Level 1 indicates a minor fault, Level 2 indicates a moderate fault, and Level 3 indicates a severe fault.

Alarm: When a fault is triggered, the alarm status is reported. When the release conditions are met, the alarm status is cleared.

Relay Disconnection: When a fault is triggered, the alarm status is reported, and the relay is disconnected. When the release conditions are met, the alarm status is cleared, and the relay is reconnected.

Restart Release: When a fault is triggered, the alarm status is reported, and the relay is disconnected. When the release conditions are met, the alarm status is not cleared, and the relay remains disconnected until a power cycle is performed.

4.1 Alarm Trigger

1.During charging, monitor charging alarms and general alarms.

Trigger the charging or general alarm :

the current battery parameter value ≥ fault value and the duration ≥ delay time.

2.During discharging, monitor discharging alarms and general alarms.

Trigger the discharging or general alarm :

the current battery parameter value ≥ fault value and the duration ≥ delay time.

3.During standby, monitor general, charging, and discharging alarms.

Trigger the charging/discharging or general alarm:

the current battery parameter value ≥ fault value and the duration ≥ delay time.

4.2 Alarm Release

1.The fault is released (including charging, discharging, and general alarms) if the current battery parameter value < release value and the duration ≥ delay time.

2.During discharging, charging alarms are cleared.

3.During charging, discharging alarms are cleared.

4.3 Charge/Discharge Alarm Parameter

Fault Name	Fault Level	Fault Value	Delay	Release Value	Delay	Reduce Current	Trigger
Discharge Total Voltage Under-voltage	1 level	2.90*Total Cells	3S	3.10*Total Cells	3S	No reduction	Alarm
	2 level	2.80*Total Cells	3S	3.00*Total Cells	3S	Reduce current to 0	Alarm
	3 level	2.70*Total Cells	3S	2.90*Total Cells	3S	Reduce current to 0	Relay disconnection
Discharge Cell Under-voltage	1 level	2.90V	3S	3.10V	3S	No reduction	Alarm
	2 level	2.80V	3S	3.00V	3S	Reduce current to 0	Alarm
	3 level	2.70V	3S	2.90V	3S	Reduce current to 0	Relay disconnection
Discharge Over-current	1 level	Rated current A	3S	Rated current-10A	3S	No reduction	Alarm
	2 level	Rated current+20A	3S	Rated current	3S	Reduce current to 0	Alarm
	3 level	Rated current+50A	3S	Rated current+20A	3S	Reduce current to 0	Relay disconnection
Discharge High Temperature	1 level	50℃	3S	45℃	3S	No reduction	Alarm
	2 level	55℃	3S	50℃	3S	Reduce current to 0	Alarm
	3 level	60℃	3S	55℃	3S	Reduce current to 0	Relay disconnection
Discharge Low	1 level	-5℃	3S	0℃	3S	No reduction	Alarm
	2 level	-10℃	3S	-5℃	3S	Reduce	Alarm

Fault Name	Fault Level	Fault Value	Delay	Release Value	Dela y	Reduce Current	Trigger
Temperature						current to 0	
	3 level	-20℃	3S	-10℃	3S	Reduce current to 0	Relay disconnection
Discharge Voltage Difference	1 level	0.4V	3S	0.35V	3S	No reduction	Alarm
	2 level	0.6V	3S	0.55V	3S	Reduce current to 0	Alarm
	3 level	1.0V	3S	0.95V	3S	Reduce current to 0	Relay disconnection
Discharge Temperature Difference	1 level	10℃	3S	7℃	3S	No reduction	Alarm
	2 level	13℃	3S	10℃	3S	Reduce current to 0	Alarm
	3 level	15℃	3S	12℃	3S	Reduce current to 0	Relay disconnection
Low SOC During Discharge	1 level	15%	3S	17%	3S	No reduction	Alarm
Charge Total Voltage Under-volta ge	1 level	3.55*Total Cells	3S	3.40*Total Cells	3S	No reduction	Alarm
	2 level	3.60*Total Cells	3S	3.45*Total Cells	3S	Reduce current to 0	Alarm
	3 level	3.65*Total Cells	3S	3.55*Total Cells	3S	Reduce current to 0	Relay disconnection
Charge Cell Under-volta ge	1 level	3.55V	3S	3.40V	3S	No reduction	Alarm
	2 level	3.60V	3S	3.45V	3S	Reduce current to 0	Alarm
	3 level	3.65V	3S	3.55V	3S	Reduce current to 0	Relay disconnection
Charge Over-current	1 level	Rated current+0 0A	3S	Rated current-20 A	3S	No reduction	Alarm
	2 level	Rated current+2 0A	3S	Rated current	3S	Reduce current to 0	Alarm
	3 level	Rated current+5 0A	3S	Rated current+20 A	3S	Reduce current to 0	Relay disconnection
Charge High Temperature	1 level	45℃	3S	40℃	3S	No reduction	Alarm
	2 level	50℃	3S	45℃	3S	Reduce current to 0	Alarm

Fault Name	Fault Level	Fault Value	Delay	Release Value	Dela y	Reduce Current	Trigger
	3 level	55℃	3S	50℃	3S	Reduce current to 0	Relay disconnection
Charge Low Temperature	1 level	5℃	3S	10℃	3S	No reduction	Alarm
	2 level	0℃	3S	5℃	3S	Reduce current to 0	Alarm
	3 level	-5℃	3S	0℃	3S	Reduce current to 0	Relay disconnection
Charge Voltage Difference	1 level	0.4V	3S	0.35V	3S	No reduction	Alarm
	2 level	0.6V	3S	0.55V	3S	Reduce current to 0	Alarm
	3 level	1.0V	3S	0.95V	3S	Reduce current to 0	Relay disconnection
Charge Temperature Difference	1 level	10℃	3S	7℃	3S	No reduction	Alarm
	2 level	13℃	3S	10℃	3S	Reduce current to 0	Alarm
	3 level	15℃	3S	12℃	3S	Reduce current to 0	Relay disconnection

4.4 General Alarm Parameter

Fault Name	Fault Level	Fault Value	Delay	Release Value	Delay	Reduce Current	Trigger
Insulation Fault	1 level	500Ω/V	3S	600Ω/V	3S	No reduction	Alarm
	2 level	350Ω/V	3S	450Ω/V	3S	Reduce current to 0	Alarm
	3 level	200Ω/V	3S	300Ω/V	3S	Reduce current to 0	Relay disconnection
T1 High Temperature	/	60℃	3S	50℃	3S	Reduce current to 0	Relay disconnection
T1 Low Temperature	/	-5℃	3S	-2℃	3S	Reduce current to 0	Relay disconnection
T2 High Temperature	/	60℃	3S	50℃	3S	Reduce current to 0	Relay disconnection
T2 Low Temperature	/	-5℃	3S	-2℃	3S	Reduce current to 0	Relay disconnection
High Voltage Anomaly		30V	15S	10V	3S	Reduce current to 0	Restart to release
Master-Slave Communication	/	Mismatch between	20S	Match between	5S	Reduce current to 0	Relay disconnection

Fault Name	Fault Level	Fault Value	Delay	Release Value	Delay	Reduce Current	Trigger
Fault		configured and online slave devices.		configured and online slave devices.			
Standby Sleep	Standby Sleep Delay			1440min			
	Standby Sleep Current			2A			
Balance	Turn-on voltage			3450mV			Turn-on after 1 hour of inactivity
	Turn-on Voltage Difference			40mV			
	Turn-off Voltage Difference			20mV			
Full Charge Calibration	1. Maximum cell voltage ≥ Full charge calibration voltage (3650mV, configurable) AND Average cell voltage ≥ Full charge calibration average voltage (3650mV, configurable) 2. Total battery voltage ≥ Full charge calibration total voltage (3650mV * Number of cells, configurable)						If either condition is met for 1s, SOC is calibrated to 100%
Full Discharge Calibration	1. Minimum cell voltage ≤ 2700mV (configurable) And Average cell voltage ≤ 2700mV (configurable) 2. Total battery voltage ≤ Full discharge calibration total voltage (2700mV * Number of cells, configurable)						If either condition is met for 1s, SOC is calibrated to 0%

5. Other precautions

Before starting installation or operation, please read the operating instructions and precautions carefully to avoid accidents. During the installation or operation of our equipment, we must abide by the safety specifications and engineering design specifications of related industries, and strictly abide by the precautions and special safety instructions of related equipment provided by our company.

- The external switch on the circuit board is forbidden to connect with other equipment. If necessary, please connect with the technology for confirmation,

otherwise you will not bear any responsibility for damaging the circuit board.

- When assembling, the protective plate should not directly touch the surface of the battery cell to avoid damaging the battery cell; The assembly should be firm and reliable.
- Be careful not to touch the components on the circuit board, such as lead head, soldering iron and solder, otherwise it may damage the circuit board.
- Attention should be paid to anti-static, moisture-proof and waterproof during use.
- Please follow the design parameters and use conditions during use, and do not exceed the values in this specification, otherwise the protection board may be damaged.
- Power on and off, you must operate in the order of power on and off.
- When connecting the battery pack, do not connect it wrongly or even reversely.
- After assembling the battery pack and the protection board, if no voltage output or charging is found during the initial power-on, please check whether the wiring is correct.
- The final interpretation right belongs to our company.

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