

JKESS

Battery Management System



SPECIFICATION

Product Name: Relay BMS

Product model: BIU-E2-36

Product Code: 60.01.002.0002

Version: Ver1.19

目 录

1. Product Overview	4
1.1 Overview	4
2. Functions and Features.....	5
3. Application Scope.....	6
4. Interface Configuration.....	7
5. Operating Environment	8
6. Typical System Block Diagram.....	9
7. Electrical Characteristics.....	10
7.1 Maximum Limit Parameter (Ta=25℃)	10
7.2 Basic Electrical Parameters (Ta=25℃)	11
7.3 Interface and Electrical Parameters (Ta=25℃)	12
8. Product Appearance	13
8.1 RELAY BMS Interface Definition	13
8.2 Connector Interface Description	16
8.3 Appearance and Dimensions	20
9. Precautions for Use	21
10. Packaging and Storage.....	22
10.1 Packaging.....	22
10.2 Transportation	22
10.3 Storage.....	22
11. Technical Support and Service.....	23

1. Product Overview

1.1 Overview

BIU-E2-36 is an active balance integrated battery management system independently developed by our company. By monitoring battery voltage, current, temperature and other characteristic parameters, and estimating and monitoring the internal state of the battery (SOC, SOH, SOP, etc.) according to the algorithm designed by the company, it realizes the functions of battery pack charge and discharge management, single active balance management and fault alarm, improves the utilization rate of the battery, prevents the battery from overcharging or discharging, and makes the battery pack work in the best working state. Through the independently developed SOC algorithm and active balance algorithm, it realizes the energy balance management of the lithium battery system and extends the service life of the battery.

The system has the characteristics of high reliability, high precision, anti-interference, flexible configuration, wide application, support for remote monitoring, remote OTA upgrade, etc.

The unit voltage sampling accuracy of the system is $\pm 3\text{MV}$, and the temperature sampling accuracy is less than $2\text{ }^{\circ}\text{C}$, and it has the functions of preventing hot plug damage and wrong plug-in damage. The configuration is flexible and has a wide range of applications. 36 series of battery management can be realized through software configuration, and the connection copper bar can be selected to eliminate the impact of long copper bars or power connection lines on the voltage acquisition and energy balance of the lithium battery system.

It supports remote monitoring of the Internet of things. By monitoring the operation status and positioning of the system in real time, and monitoring and controlling the battery system information, status, alarm information, etc., the big data cloud platform enhances the customer experience. The system calculates the relative state of charge difference between the individual batteries, and transfers the excess power of the battery with high SOC state to the battery with low SOC state in the way of switching power supply according to the calculation results of the original equalization algorithm, so as to maximize the capacity of the battery pack and prolong the cycle life of the battery.

The product design follows ISO 26262 functional safety design standard.

2. Functions and Features

- ☆ Charge and discharge management
- ☆ Accurate acquisition of voltage, current and temperature
- ☆ SOC, SOH, SOP estimation
- ☆ Support Bidirectional DC balance (with Bidirectional DC balance BMU)
- ☆ Effective Balancing current 2.0A
- ☆ Low power sleep mode
- ☆ The balance effect is not affected by the battery connection copper bar
- ☆ Prevent hot plug and wrong connector insertion
- ☆ Strong scalability and simple field application
- ☆ Compatible with Li-ion, Lifepo4, LiMn₂O₄, LiCoO₂, LTO, Sodium-ion batteries
- ☆ Data storage, transmission and processing
- ☆ Support national standard DC charging
- ☆ Support national standard AC charging
- ☆ Support human-computer interface interaction
- ☆ Support Beidou and GPS positioning
- ☆ Support remote real-time monitoring
- ☆ Support CANBUS online upgrade
- ☆ Support remote OTA upgrade

3. Application Scope

- ✓ Suitable for lithium iron phosphate batteries(Lifepo4), Ternary lithium batteries(Li-ion), Lithium manganese oxide batteries(LiMn₂O₄), Lithium titanium oxide batteries(LTO), and lithium cobalt oxide batteries(LiCoO₂), Sodium-ion batteries;
- ✓ Energy storage System, Energy storage Power station;
- ✓ Pure electric cruise ship, pure electric pile driver, electric compressor;
- ✓ Special vehicles: field vehicles, pure electric forklifts, low-speed vehicles, heavy AGVs, sightseeing vehicles, small trains, sanitation vehicles, etc;
- ✓ Backup Power supply for communication base stations and radar ground stations;
- ✓ Upgrade the capacity of old batteries in a tiered manner;

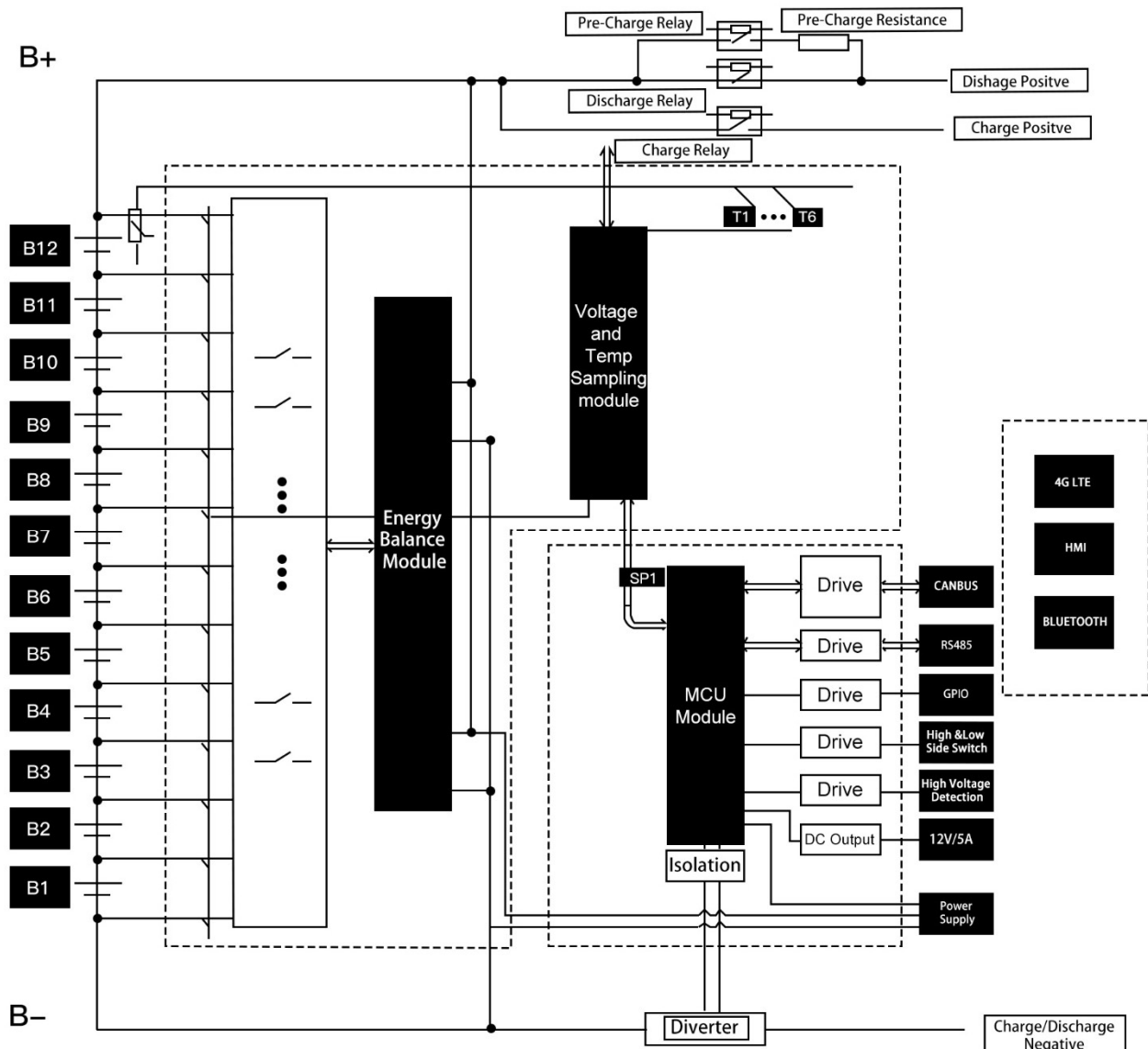
4. Interface Configuration

- ✓ 2-way CANBUS communication interface
- ✓ 2-way RS485 communication interface
- ✓ 6-way GPIO interface
- ✓ 6-way high side switch interface
- ✓ 2-way low side switch interface
- ✓ 1-way HVIL detection interface
- ✓ 4-way high voltage detection interface
- ✓ 1-way DC national standard communication interface
- ✓ 1-way AC national standard communication interface
- ✓ 1-way Hardware power switch interface
- ✓ 1-way High voltage power interface
- ✓ 1-way External output 12V power
- ✓ 1-way External output 5V power
- ✓ 1-way Current detection interface
- ✓ 18-way External temperature sampling
- ✓ 6-way Internal temperature sampling
- ✓ 36S battery cell voltage sampling
- ✓ 36S battery pack energy balance management
- ✓ Support battery connection copper bar configuration
- ✓ Support remote real-time monitoring and GPS positioning configuration
- ✓ Support remote program upgrade configuration

5. Operating Environment

- Working temperature: -25 °C to 85 °C
- Storage temperature: -40 °C to 105 °C
- Relative humidity: 5% to 95% RH in non condensing state
- Working height: 2000 meters

6. Typical System Block Diagram



BIU consists of an energy balance module, a voltage and temperature acquisition module, an MCU control module, and supporting peripherals. In the design, a highly reliable MCU control chip is used, and the latest acquisition technology is utilized to achieve high acquisition accuracy, providing a good physical basis for SOC estimation. On the basis of in-depth research on the complex electromagnetic environment of battery pack applications, the electromagnetic compatibility design of the product was fully considered in the early stages of design. Multiple power isolation schemes and high redundancy designs were adopted, and rigorous testing was conducted to ensure the reliable operation of the product, which can run stably and reliably in various environmental states.

7. Electrical Characteristics

7.1 Maximum Limit Parameter (Ta=25°C)

Features	Symbol	Min	MAX	Unit	Note
Maximum input total voltage	V _{max}		120	V	
BAT _n ~BAT _n -1 input voltage	V _{bn~bn-1}	-0.3	8.0	V	
Voltage drop of battery connected copper bar	V _{vd}	-0.3	8.0	V	Charege +; Discharege -
Ambient Temperature	T _{full}	-40	85	°C	
Storage Temperature	T _{stg}	-55	125	°C	
ESD Protection	V _{esd}	-	16	kV	Air Discharge

Notes:

- 1) The maximum limit value means that beyond the working range, the module may be permanently damaged.
- 2) When the temperature rises, the maximum allowable Power consumption decreases, which is determined by the maximum working temperature T, ambient temperature TA and heat dissipation conditions.

7.2 Basic Electrical Parameters (Ta=25°C)

Features	Symbol	Test Cnditions	MIN	Typical	MAX	Unit
Auxiliary Power Consumption	I_pwr+	PWR+= 12V		20		mA
HSD High Side oOutput	V_hsd			1	3	A
GPIO	V_gp			12		V
Voltage Sampling Range	V_ran		0.5		4.5	V
Voltage Sampling Accuracy	V_acc	0.5V~4.5V -25°C~85°C		±3		mV
Temperature Sampling Range	T_ran		-30		105	°C
Temperature Sampling Accuracy	T_acc				2	°C
Balance Current	I_b			2.0		A
Balance Efficiency	η%				88	%
Sleep static Power Consumption	I_sq				10	uA
Temperature Protection	T_pro			85		°C
Temperature Protection Release	T_rel			75		°C
Balanced Full Power Temperature Rise	T_ful			40		°C

Notes:

1) The input voltage range of single battery refers to the safe working voltage range. Different battery types have different protection thresholds. The default is lithium iron phosphate(Lifepo4) battery. If it is other types of batteries, it is necessary to communicate with the manufacturer to modify the protection threshold.

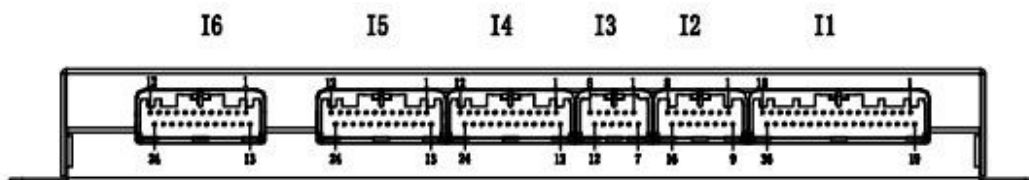
7.3 Interface and Electrical Parameters (Ta=25°C)

The parameters refer to the maximum limit parameters at 25 °C ambient temperature.

Name	NUM	Parameter	MIN	Typical	MAX	Note
Auxiliary Power	2	Voltage	9V	12V	16V	Switching power supply/battery
		Current		0.4A		
Static Power Consumption	2	Analog front end			4uA	
Total Voltage Sampling	1	Voltage	0V		105V	Total Voltage Pre-charging
		Accuracy			±1%FS	Voltage 40V-110V
Voltage Sampling		Voltage			4.5V	
		Accuracy		±3mV		
Charging and Discharging Current Sampling	1	Current	-300A	0A	+300A	Depending on Diverter Model
		Accuracy		±1%FS	±1%FS	Chg/Disg > 30A
				±300mA	±300mA	Chg/Disg ≤ 30A
Insulation Resistance	1		10M			
Analog input	4	Sampling Error		±2%		For Temperature, other AD Inputs, etc
Charging Port	1	CC				DC and AC Charger Sign
	1	CC2				
	1	CP				
High side switch output	6	Voltage/Current		1A	3A@300mS	Vmax=32V
Low side switch output	1	Voltage/Current		1A		
CANBUS port	2	Isolate				
RS485 port	1	Isolate				
	1	Non-Isolated				Optional Welding
Power Output	1	12V Output		1A		
	1	5V Output		200mA		
Sleep Time					7 Day	

8. Product Appearance

8.1 RELAY BMS Interface Definition



BIU-E2-36 Interface front view

Connector	Brand	PIN	BMS Code/Model	Cable Code/Model
Plug spring terminal: 63.09.002.0002/M34S75C4F1 /FOR 0.22~0.35mm2 Wire diameter				
I1	JAE	36	63.09.000.0027/ MX34036NF1	63.09.001.0009/MX34036SF1
I2	JAE	16	63.09.000.0001 / MX34016NF1	63.09.001.0003 / MX34016SF1
I3	JAE	12	63.09.000.0000 / MX34012NF1	63.09.001.0000 /MX34012SF1
I4	JAE	24	63.09.000.0002 / MX34024NF1	63.09.001.0004 /MX34024SF1
I5	JAE	24	63.09.000.0002 / MX34024NF1	63.09.001.0004 /MX34024SF1
I6	JAE	24	63.09.000.0002 / MX34024NF1	63.09.001.0004 /MX34024SF1

I1 (BMS): MX34036NF1

I1 (BMS) : MX34036NF1									
PIN	9	8	7	6	5	4	3	2	1
Definition	H_OUT2	H_OUT1	PWR-	PWR-	PWR-	PW_12V	PW_12V+	CH_12V+	CH_12V+
PIN	18	17	16	15	14	13	12	11	10
Definition	NC	NC	NC	L_OUT2	L_OUT1	H_OUT6	H_OUT5	H_OUT4	H_OUT3
PIN	27	26	25	24	23	22	21	20	19
Definition	EXT_RT3	EXT_RT2	EXT_RT1	Vout_5V	DRY4+	EXT_ACC	EXT_CP	EXT_CC2	EXT_CC
PIN	36	35	34	33	32	31	30	29	28
Definition	NC	EXT_DIO6	EXT_DIO5	EXT_DIO4	EXT_DIO3	EXT_DIO2	EXT_DIO1	EXT_RT-	EXT_RT4

I2 (BMS): MX34016NF1**I2 (BMS): MX34016NF1**

PIN	8	7	6	5	4	3	2	1
Definition	HVIL_OUT	HVIL_IN	RS485_EARTH2	EXT_RS485B2	EXT_RS485A2	RS485_EARTH1	EXT_RS485B1	EXT_RS485A1
PIN	16	15	14	13	12	11	10	9
Definition	EARTH	NC	CANBUS_EARTH2	EXT_CAN2_L	EXT_CAN2_H	CANBUS_EARTH1	EXT_CAN1_L	EXT_CAN1_H

I3 (BMS): MX34012NF1**I3 (BMS): MX34012NF1**

PIN	6	5	4	3	2	1
Definition	EXT_HV_CH1	EXT_BAT-2	EXT_HV_CH3	Wake_Down	EXT_IN0+	EXT_IN0-
PIN	12	11	10	9	8	7
Definition	EXT_BAT+	EXT_BAT+2	EXT_HV_CH2	Wake_Up	EXT_HV_CH4	EXT_BAT-

I4 (BMS): MX34024NF1**I4 (BMS): MX34024NF1**

PIN	8	7	6	5	4	3	2	1
Definition	BAT7	BAT6	BAT5	BAT4	BAT3	BAT2	BAT1	BAT0
PIN	16	15	14	13	12	11	10	9
Definition	6811_GND1	6811_GND1	6811_GND1	PW-1	BAT11	BAT10	BAT9	BAT8
PIN	24	23	22	21	20	19	18	17
Definition	BAT12	PW+1	RT6A1	RT5A1	RT4A1	RT3A1	RT2A1	RT1A1

I5 (BMS): MX34024NF1

I5 (BMS): MX34024NF1								
PIN	8	7	6	5	4	3	2	1
Definition	BAT19	BAT18	BAT17	BAT16	BAT15	BAT14	BAT13	BAT12 B2
PIN	16	15	14	13	12	11	10	9
Definition	6811_GND2	6811_GND2	6811_GND2	PW-2	BAT23	BAT22	BAT21	BAT20
PIN	24	23	22	21	20	19	18	17
Definition	BAT24	PW+2	RT6A2	RT5A2	RT4A2	RT3A2	RT2A2	RT1A2

I6 (BMS): MX34024NF1

I6 (BMS): MX34024NF1								
PIN	8	7	6	5	4	3	2	1
Definition	BAT31	BAT30	BAT29	BAT28	BAT27	BAT26	BAT25	BAT24 B3
PIN	16	15	14	13	12	11	10	9
Definition	6811_GND3	6811_GND3	6811_GND3	PW-3	BAT35	BAT34	BAT33	BAT32
PIN	24	23	22	21	20	19	18	17
Definition	BAT36	PW+3	RT6A3	RT5A3	RT4A3	RT3A3	RT2A3	RT1A3

8.2 Connector Interface Description

I1 Interface Definition

Connector	PIN NUM	Signal Name	Function Description	Default Application
I1 Connector	1	CH_12V+	Input	Charging Power 12v Postive
	2	CH_12V+	Input	Charging Power 12v Postive
	3	PW_12V+	Input	Auxiliary Power 9V~16V Postive
	4	PW_12V+	Input	Auxiliary Power 9V~16V Postive
	5	PWR-	Input	Charger/ Auxiliary Power Negative
	6	PWR-	Input	Charger/ Auxiliary Power Negative
	7	PWR-	Input	Charger/ Auxiliary Power Negative
	8	H_OUT1	Output	High Side Switch 1 Output
	9	H_OUT2	Output	High Side Switch 2 Output
	10	H_OUT3	Output	High Side Switch 3 Output
	11	H_OUT4	Output	High Side Switch 4 Output
	12	H_OUT5	Output	High Side Switch 5 Output
	13	H_OUT6	Output	High Side Switch 6 Output
	14	L_OUT1	Output	Low Side Switch 1 Output
	15	L_OUT2	Output	Low Side Switch 2 Output
	16	NC	Vacant	
	17	NC	Vacant	
	18	NC	Vacant	
	19	EXT_CC	Input	AC Charging Detection Signal
	20	EXT_CC2	Input	DC Charging Detection Signal
	21	EXT_CP	Input	Charge Control Detection Signal
	22	EXT_ACC	Input	Key Start Signal
	23	DO1_WAKE	Input	External DIO Wake-Up, High/Low Level
	24	Vout_5V	Output	External Output 5v/500ma
	25	EXT_RT1	NTC	NTC 1 Sampling, Pull Up 100K
	26	EXT_RT2	NTC	NTC 2 Sampling, Pull Up 100K
	27	EXT_RT3	NTC	NTC 3 Sampling, Pull Up 100K
	28	EXT_RT4	NTC	Ntc4 Sampling, Pull Up 100K
	29	EXT_RT-	External NTC Reference GND	
	30	EXT_DIO1	GPIO	GPIO1 Port, Input And Output Configurable
	31	EXT_DIO2	GPIO	GPIO2 Port, Input And Output Configurable
	32	EXT_DIO3	GPIO	GPIO3 Port, Input And Output Configurable
	33	EXT_DIO4	GPIO	GPIO4 Port, Input And Output Configurable
	34	EXT_DIO5	GPIO	GPIO5 Port, Input And Output Configurable
	35	EXT_DIO6	GPIO	GPIO6 Port, Input And Output Configurable
	36	NC	Vacant	

I2 Interface Definition

Connector	PIN NUM	Signal Name	Function Description	Default Application
I2 Connector	1	EXT_RS485A1	RS485_1	Isolate RS485-1
	2	EXT_RS485B1		
	3	RS 485_EARTH1		
	4	EXT_RS485A2	RS485_2	Isolate RS485-2
	5	EXT_RS485B2		
	6	RS485_EARTH2		
	7	HVIL_IN	HVIL Input	
	8	HVIL_OUT	HVIL Output	
	9	EXT_CAN1_H	CAN_1	Isolate CANBUS-1
	10	EXT_CAN1_L		
	11	CAN_EARTH1		
	12	EXT_CAN2_H	CAN_2	Isolate CANBUS-2
	13	EXT_CAN2_L		
	14	CAN_EARTH2		
	15	NC	Vacant	
	16	EARTH	Case	Insulation Detection Reference Ground Connected to Case

I3 Interface Definition

Connector	PIN NUM	Signal Name	Function Description	Default Application
I3 Connector	1	Ext_In0-	Diverter Sampling Negative	Connected to the Total Negative Port of Battery
	2	EXT_IN0+	Diverter Sampling Positive	Connected to the Diverter Output
	3	Wake_Down	Key Hard Switch _Down	
	4	EXT_HV_CH3	Heating Film Contactor	
	5	EXT_BAT-2	Total Negative Voltage Sampling	High Voltage Sampling, Negative Pole of Sampling Point
	6	EXT_HV_CH1	Charging Relay Detection	Charging Relay Adhesion Detection
	7	EXT_BAT-	System Module Negative	Connected to the Total Negative Port of Battery
	8	EXT_HV_CH4	Negative Relay Detection	Negative Relay Adhesion Detection
	9	Wake_Up	Key Hard Switch _Up	
	10	EXT_HV_CH2	Discharging Relay Detection	Discharging Relay Adhesion Detection
	11	EXT_BAT+2	Total Negative Voltage Sampling	High Voltage Sampling, Positive Pole of Sampling Point
	12	EXT_BAT+	System Module Positive	Connected to the Total Positive Port of Battery

I4 Interface Definition

Connector	PIN NUM	Signal Name	Function Description	Default Application
I4 Connector	1-12; 24	BAT0,BAT1,...,BAT11; BAT12	Input	Sampling Line 00 to Sampling Line 12
	23	PW+1	Input	Sampling Power Positive, Connect The Battery End to The Positive Pole of The Highest Battery in The Battery Pack
	13	PW-1	Input	Sampling Power Negative, Connect The Battery End to The Negative Pole of The Lowest Battery in The Battery Pack
	14-16	6811_GND1		Temperature Sampling GND Wire, Can Choose to Share One GND for Every Two Temperature Sampling Points
	17-22	RT1A1,RT2A1, RT3A1,RT4A1, RT5A1,RT6A1	ADC	6-Way NTC Sampling Line, Default Pull-Up 33K

I5 Interface Definition

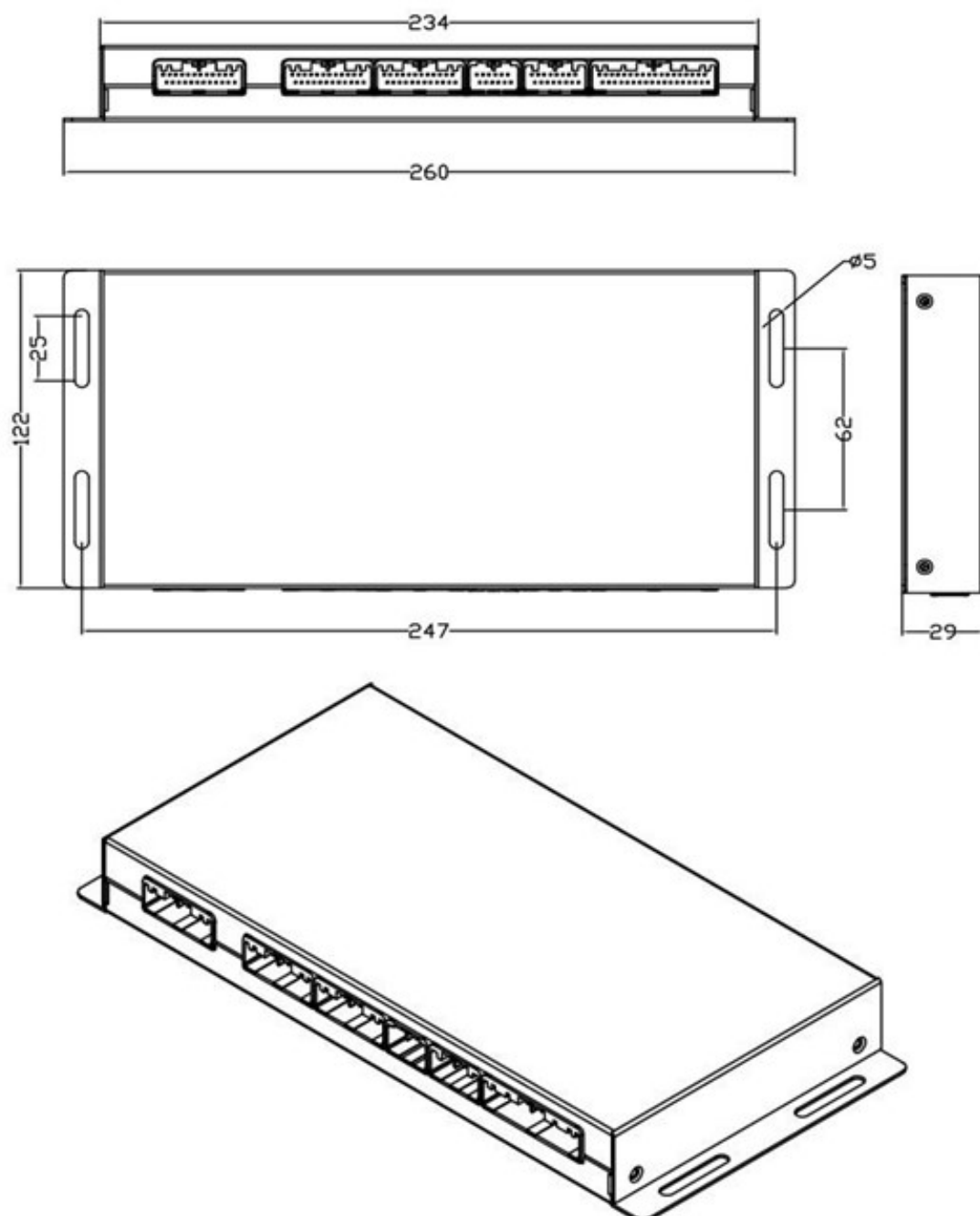
Connector	PIN NUM	Signal Name	Function Description	Default Application
I5 Connector	1-12; 24	BAT12/B2,BAT13,..., BAT23; BAT24	Input	Sampling Line 12 to Sampling Line 24
	23	PW+2	Input	Sampling Power Positive, Connect The Battery End to The Positive Pole of The Highest Battery in The Battery Pack
	13	PW-2	Input	Sampling Power Negative, Connect The Battery End to The Negative Pole of The Lowest Battery in The Battery Pack
	14-16	6811_GND2		Temperature Sampling GND Wire, Can Choose to Share One GND for Every Two Temperature Sampling Points
	17-22	RT1A2,RT2A2, RT3A2,RT4A2, RT5A2,RT6A2	ADC	6-Way NTC Sampling Line, Default Pull-Up 33K

I6 Interface Definition

Connector	PIN NUM	Signal Name	Function Description	Default Application
I5 Connector	1-12; 24	BAT24/B3,BAT25,..., BAT35; BAT36	Input	Sampling Line 24 to Sampling Line 36
	23	PW+3	Input	Sampling Power Positive, Connect The Battery End to The Positive Pole of The Highest Battery in The Battery Pack
	13	PW-3	Input	Sampling Power Negative, Connect The Battery End to The Negative Pole of The Lowest Battery in The Battery Pack
	14-16	6811_GND3		Temperature Sampling GND Wire, Can Choose to Share One GND for Every Two Temperature Sampling Points
	17-22	RT1A3,RT2A3, RT3A3,RT4A3, RT5A3,RT6A3	ADC	6-Way NTC Sampling Line, Default Pull-Up 33K

8.3 Appearance and Dimensions

The shape of the product is a sheet metal shell with 4 waist circle fixing holes, which has a wider product adaptability.



Appearance & Size

9. Precautions for Use

1. Please connect the wire correctly before use. Refer to the product manual or the manufacturer's technical service center for the specific wiring method.
2. If the relay is selected, the charging and discharging current should not exceed the nominal parameter value of the relay or contactor.
3. When not in use, please disconnect the Power supply of the System.
4. Please do not change the System configuration parameters at will.
5. If the product is found abnormal, please cut off the Power in time and contact the company's technical support center.

10. Packaging and Storage

10.1 Packaging

Separate module bubble bag packaging. Carton packaging with cardboard partition.

10.2 Transportation

During transportation, it is necessary to prevent violent vibration, falling from height, extrusion, impact, sun and rain, etc. The stacking height shall not exceed 5 layers, and it is forbidden to place heavy objects.

10.3 Storage

- It is recommended that the storage ambient temperature be between 0 °C and 45 °C.
- It is recommended that the relative humidity for storage be between 25% and 75%.
- Packaged with desiccant to reduce oxidation. Products shall not be stored in harmful gases such as sulfur or chlorine.

11. Technical Support and Service

1. For packaging information, please refer to product shipping packaging information
 2. If the product operates above the load indicated in this manual, the product performance cannot be guaranteed to meet all performance indicators in this manual
 3. Unless otherwise specified, the data in this paper are measured when $t_a=25\text{ }^{\circ}\text{C}$, humidity<75%, Input nominal voltage and Output rated load
 4. The above are the product performance indicators listed in this manual
 5. Our company supports OEM/ODM. Please feel free to contact us about product use and technology. We will reply to you as soon as we receive the information.
- We look forward to communicating with you!