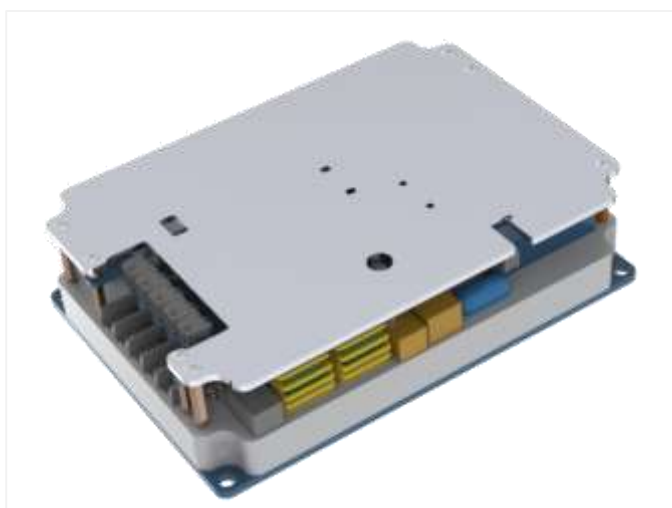




3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

MODEL NO.: ATRC3K3-XXXXXXM series

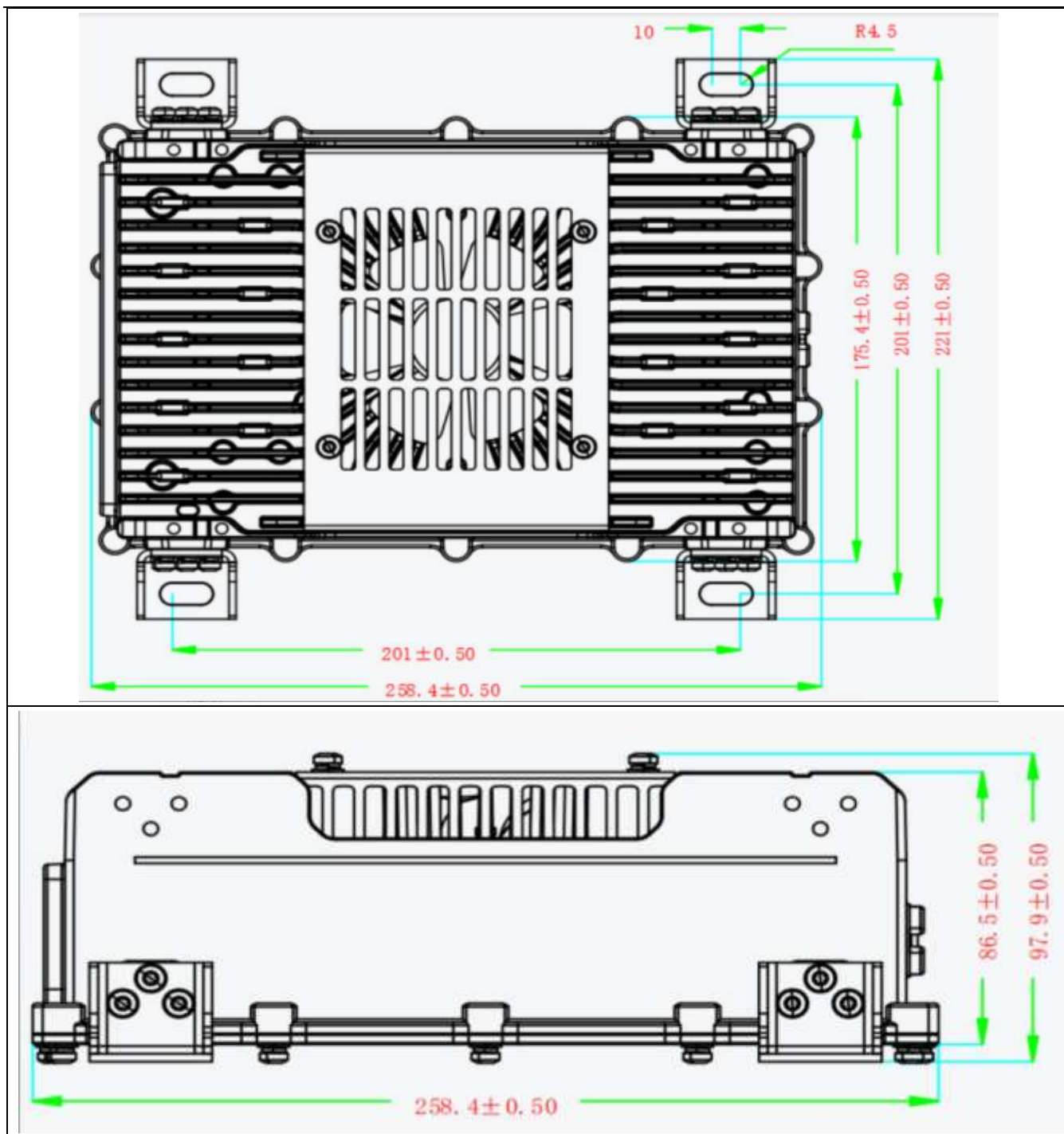
Model	Input Voltage	Output Power	Rated Output Voltage	Output Voltage/Current Range	3D Model
ATRC3K3-54006M	90~265VAC	3.3KW	540VDC	0~720V/0~6A	901.10020000.00.stp
ATRC3K3-36010M	90~265VAC	3.3KW	360VDC	0~500V/0~10A	
ATRC3K3-14422M	90~265VAC	3.3KW	144VDC	0~200V/0~22A	901.10060000.00.stp
ATRC3K3-10830M	90~265VAC	3.3KW	108VDC	0~140V/0~30A	
ATRC3K3-07245M	90~265VAC	3.3KW	72VDC	0~95V/0~45A	
ATRC3K3-04860M	90~265VAC	3.3KW	48VDC	0~68V/0~60A	
ATRC3K3-024100M	90~265VAC	3.3KW	24VDC	0~36V/0~100A	901.10070000.00.stp



Enclosure Dimensions(mm) if needed. Model No.: M30



3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification





3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

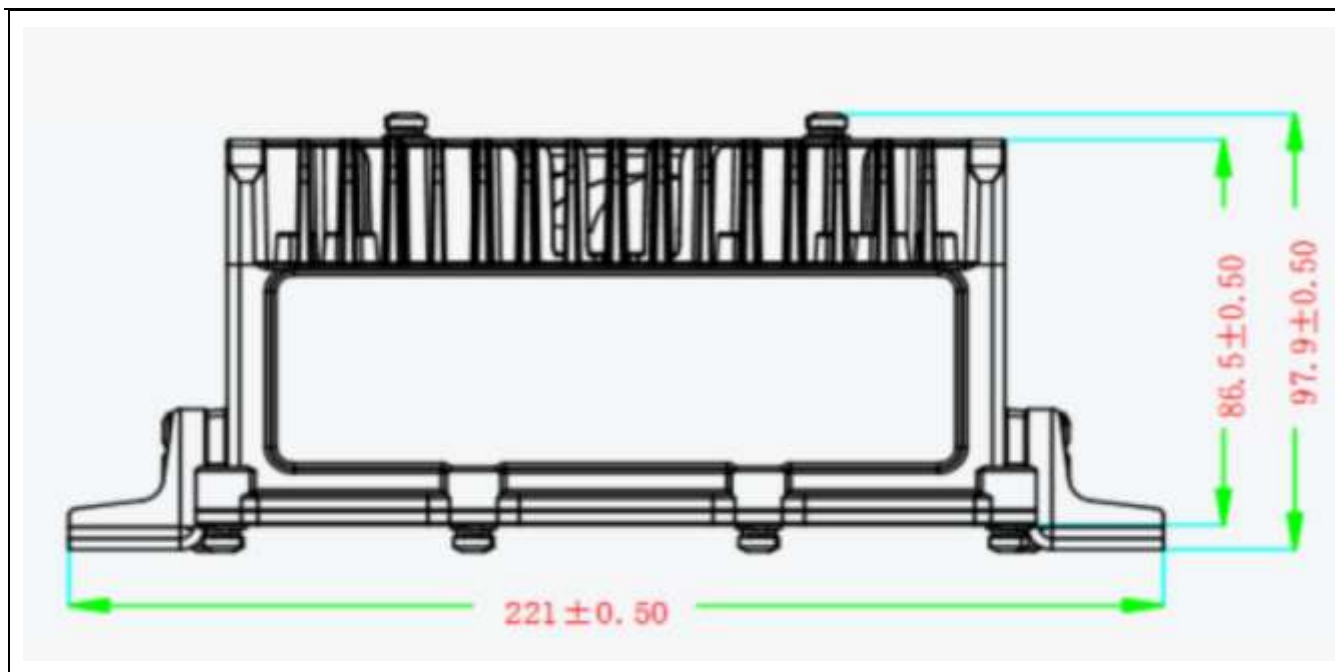


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3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

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1. Product Overview

The ATRC3K3 series on-board charger is a high-power-density, high-efficiency charger developed for new-energy vehicles such as lithium-battery pure electric vehicles and logistics vehicles. It is designed around modularization, standardization, and common-platform principles. The module accepts 90-265 VAC input, and its DC output voltage is adjustable across the full specified range.

The module uses fully digital control technology, providing flexible and intelligent control, comprehensive protection, and strong system robustness. An integrated microprocessor communicates with the supervisory controller, allowing internal parameters to be set or adjusted by the upper-level controller through the CAN interface.

Multiple protection functions are provided, including input over/undervoltage protection, output overcurrent protection, output overvoltage protection, output short-circuit protection, and overtemperature protection.

Main Specifications:

Model	Input Voltage	Output Power	Rated Output Voltage	Output Voltage/Current Range	3D Model
ATRC3K3-54006M	90~265VAC	3.3KW	540VDC	0~720V/0~6A	901.10020000.00.stp
ATRC3K3-36010M	90~265VAC	3.3KW	360VDC	0~500V/0~10A	
ATRC3K3-14422M	90~265VAC	3.3KW	144VDC	0~200V/0~22A	901.10060000.00.stp
ATRC3K3-10830M	90~265VAC	3.3KW	108VDC	0~140V/0~30A	
ATRC3K3-07245M	90~265VAC	3.3KW	72VDC	0~95V/0~45A	
ATRC3K3-04860M	90~265VAC	3.3KW	48VDC	0~68V/0~60A	
ATRC3K3-024100M	90~265VAC	3.3KW	24VDC	0~36V/0~100A	901.10070000.00.stp

Model Selection Guide:

Type	Type 01 (Not Recommended)	Type 02	Type 03
Description	Basic Version	Customized Auxiliary-Power Version	Fast-Charging Compatible Version
Control Board Color	Black #1	Blue #2	Green #3
Control Board Model	10023001	10023002	10023003



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

Part No.		901.100*0001.00	901.100*0002.00	901.100*0003.00
Function Function Difference Difference Table	CAN Communication	Yes	Yes	Yes
	CAN Communication Isolation	No	Yes	No
	RS-485 Communication	Yes	No	No
	TTL Serial Communication	No	No	Yes
	PP Detection and PP Wake-Up	Yes	Yes	Yes
	CP Detection and CP Wake-Up	Yes	Yes	Yes
	Dual 12 V/0.3 A Fan Drive	Yes	Yes	Yes
	12 V/3 A Auxiliary Power Output	No	Yes	No
	Bi-Color Common- Cathode LED Drive	Yes	Yes	Yes
	Switch Signal (On/Off) Detection	No	Yes	No
	GB/T 27930 Charger- Side Protocol Support	No	Yes	No
	Compatible with DC Fast-Charging Input	No	No	Yes
	GB/T 27930 Vehicle- Side Protocol Support	No	No	Yes



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

2. Electrical Characteristics

2.1. Electrical Characteristics

Type					
On-Board Power Supply Type	Modular On-Board Charger				
Input/Output Characteristics 1					
Model	ATRC3K3-54006M	ATRC3K3-36010M	ATRC3K3-14422M	ATRC3K3-10830M	ATRC3K3-07245M
Rated Input Voltage	220VAC				
Input Voltage Range	90~265VAC				
Startup Inrush Current	≤16A				
Rated Output Power	3.3KW				
Rated Output Voltage	540VDC	360VDC	144VDC	108VDC	72VDC
Output Voltage Range	0~720VDC	0~500VDC	0~200VDC	0~140VDC	0~95VDC
Output Current Range	0~6A	0~10A	0~22A	0~30A	0~45A
Typical Efficiency	≥94%			≥93%	
Input Power Factor	≥0.99（@220Vin,Pomax）				
Voltage Regulation Accuracy (at Load Root)	±1%				
Output Voltage Ripple Factor	≤1%				
Input/Output Characteristics 2					
Model	ATRC3K3-04860M	ATRC3K3-024100M			
Rated Input Voltage	220VAC				
Input Voltage Range	90~265VAC				
Startup Inrush Current	≤16A				
Rated Output Power	3.3KW				
Rated Output Voltage	48VDC	24VDC			
Output Voltage Range	0~68VDC	0~36VDC			
Output Current Range	0~60A	0~100A			
Typical Efficiency	≥92%	≥91%			
Input Power Factor	≥0.99（@220Vin,Pomax）				
Voltage Regulation Accuracy (at Load Root)	±1%				
Output Voltage Ripple Factor	≤1%				
Performance					



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

Parameters		
Output Response Time		≤200mS
Power-On Startup Time		< 1s
Output Voltage Ripple Factor		≤5% (with one 0.1 μF ceramic capacitor and one 10 μF electrolytic capacitor connected in parallel at the output; oscilloscope bandwidth: 20 MHz)
Operating Noise		-
Protection Features		
Over/Undervoltage Protection		Automatic recovery after shutdown caused by input over/undervoltage or output over/undervoltage.
Output Reverse-Polarity and Short-Circuit Protection		Shuts down on output short circuit or reverse polarity; automatic recovery.
Overtemperature Protection		Output power is derated when the heat-sink temperature exceeds 75 °C. The circuit is disconnected above 95 °C, and charger output resumes when the temperature falls below 85 °C.
Environmental Conditions		
Operating Ambient Temperature		-40 °C to +85 °C (internal temperature of the integrated-system enclosure); Liquid-cooling system coolant temperature ≤65 °C
Storage Temperature		-40~95°C
Humidity		TBD
Altitude		0~3000m
IP Rating		TBD
Cooling		Modular design; a water-cooled or air-cooled heat-dissipation enclosure/baseplate must be provided.
Communication		CAN Bus
Control Method		No-enable control; hardwired active-high enable control; CAN communication enable control.
Safety Characteristics		
Dielectric Strength	Model	Test Conditions
	ATRC3K3-54006M ATRC3K3-36010M	Primary-to-secondary (2000 VAC); primary-to-earth (2000 VAC); secondary-to-earth (2000 VAC)
	ATRC3K3-10830M ATRC3K3-07245M	Primary-to-secondary (2000 VAC); primary-to-earth (2000 VAC); secondary-to-earth (1500 VAC)
	ATRC3K3-07245M ATRC3K3-04860M	Primary-to-secondary (2000 VAC); primary-to-earth (2000 VAC); secondary-to-earth (1000 VAC)



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

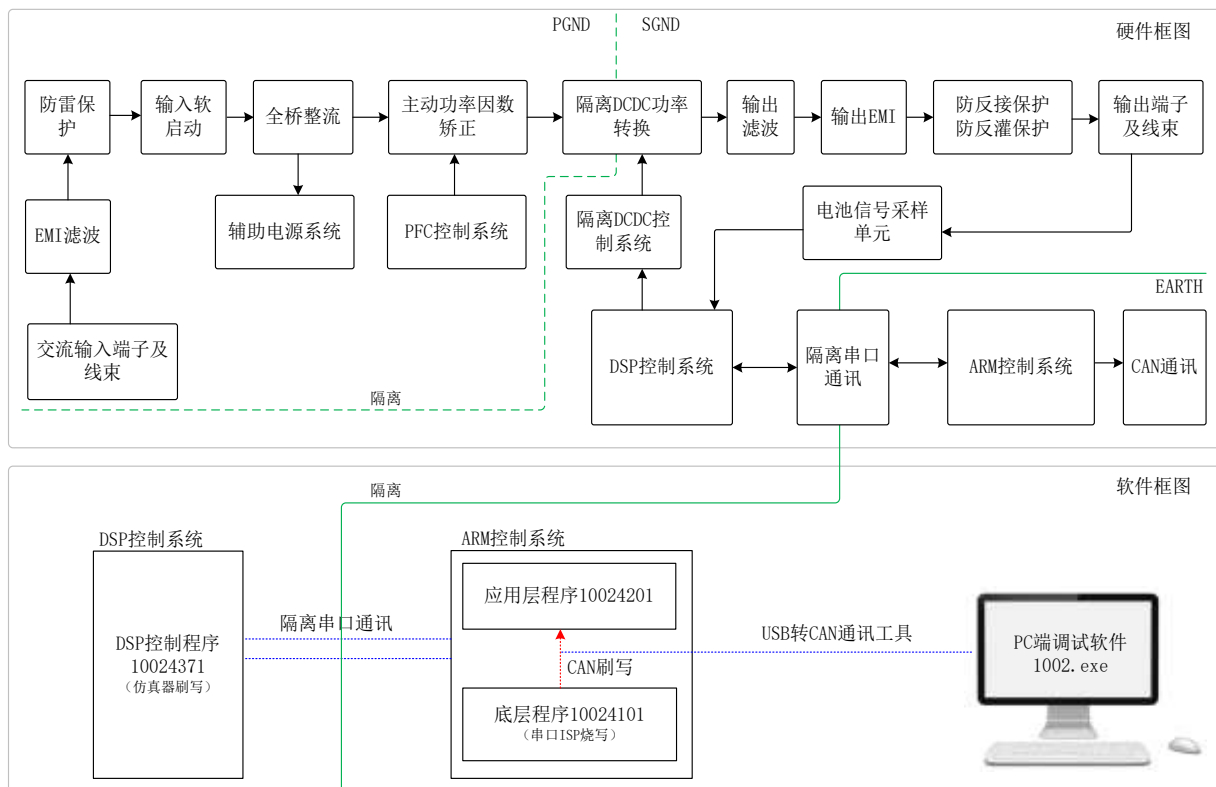
	ATRC3K3-024100M	
Insulation Resistance	Primary-to-secondary ≥50 MΩ	
Harmonic Current	Complies with the requirements of GB 17625.1-2003, Clause 6.7.3.1	
Vibration Resistance	After swept-frequency vibration testing in the X, Y, and Z directions, components shall show no damage and fasteners shall show no loosening.	
Shock Resistance	Refer to the requirements of GB/T 15139-1994, Clause 6.5	
Industrial Solvent Resistance	Metal components shall have an effective corrosion-resistant coating.	
Salt-Spray Resistance	Refer to GB/T 2423.17	
Durability	Meets or exceeds the applicable requirements of GB/T 24347-2009	
EMC Characteristics		
Electromagnetic Immunity	Complies with GB/T 18487.3, Clause 11.3.1	
Electromagnetic Emissions	Complies with GB/T 18487.3, Clause 11.3.2	



3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

2.2. System Block Diagram

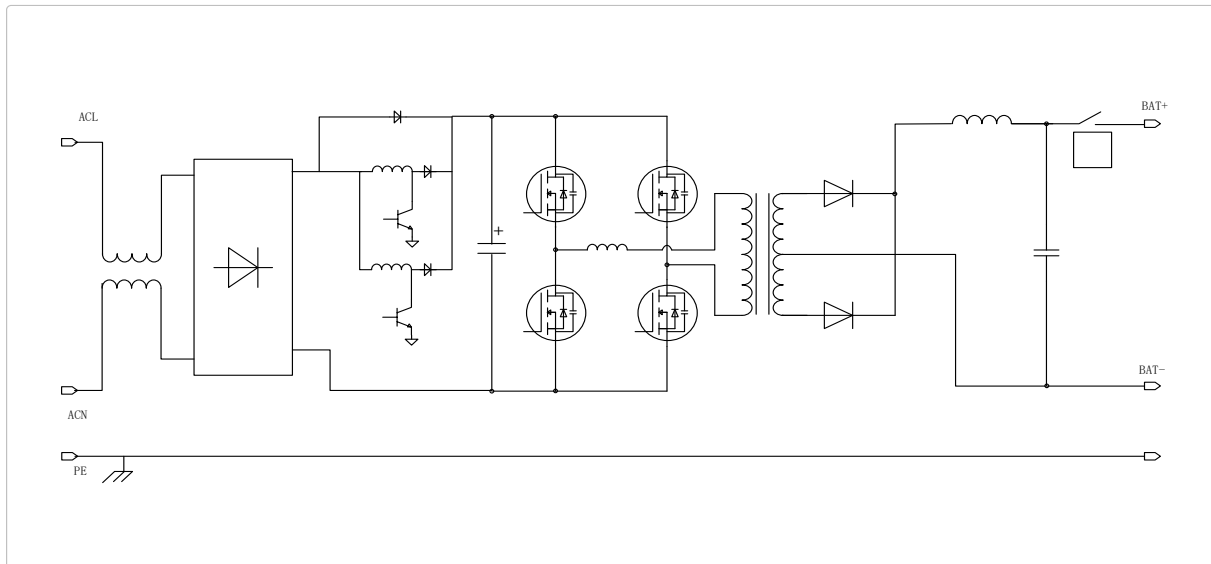
2.2.1. Electrical Principle Block Diagram



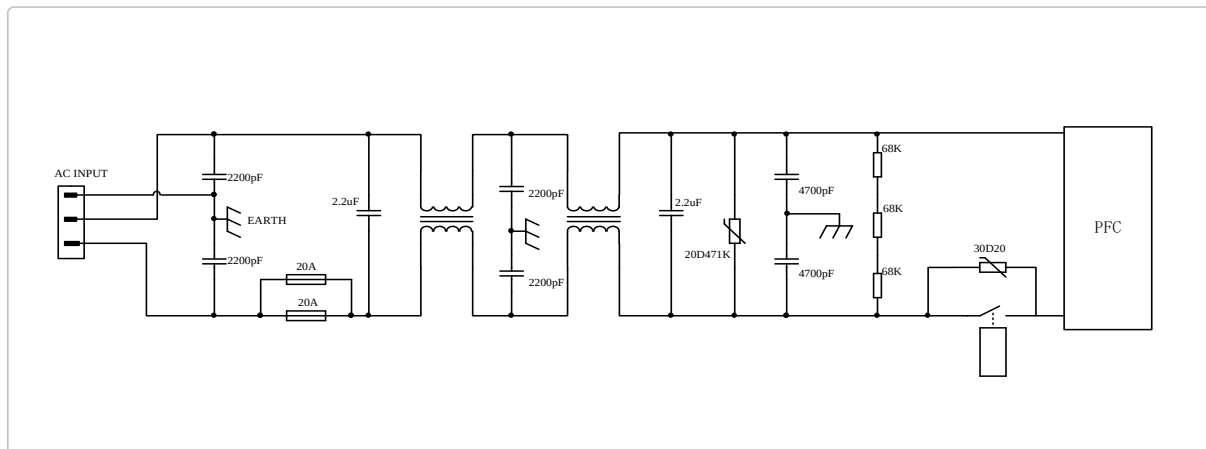


3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

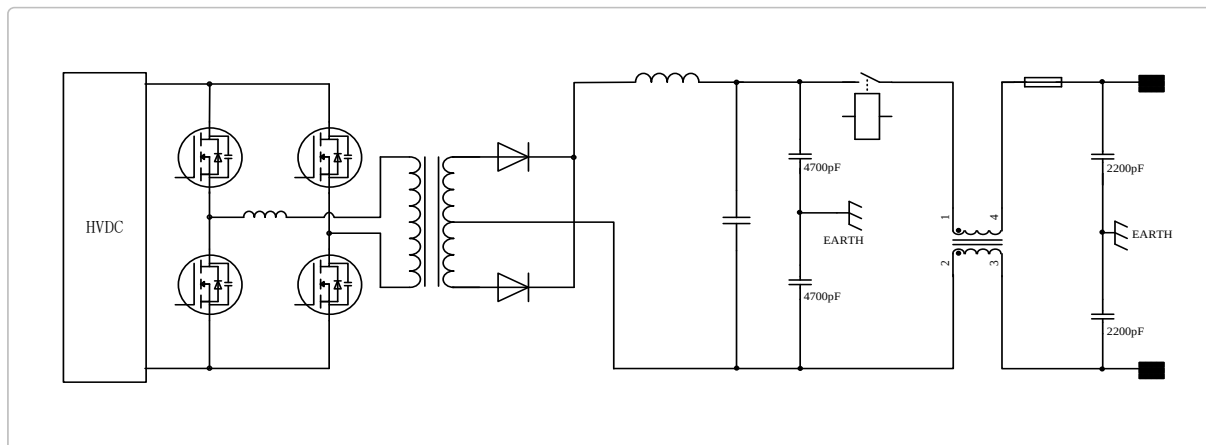
2.2.2. Electrical Topology Diagram



2.2.3. Input Filter and Precharge Circuit Parameters



2.2.4. Output Filter Circuit Parameters

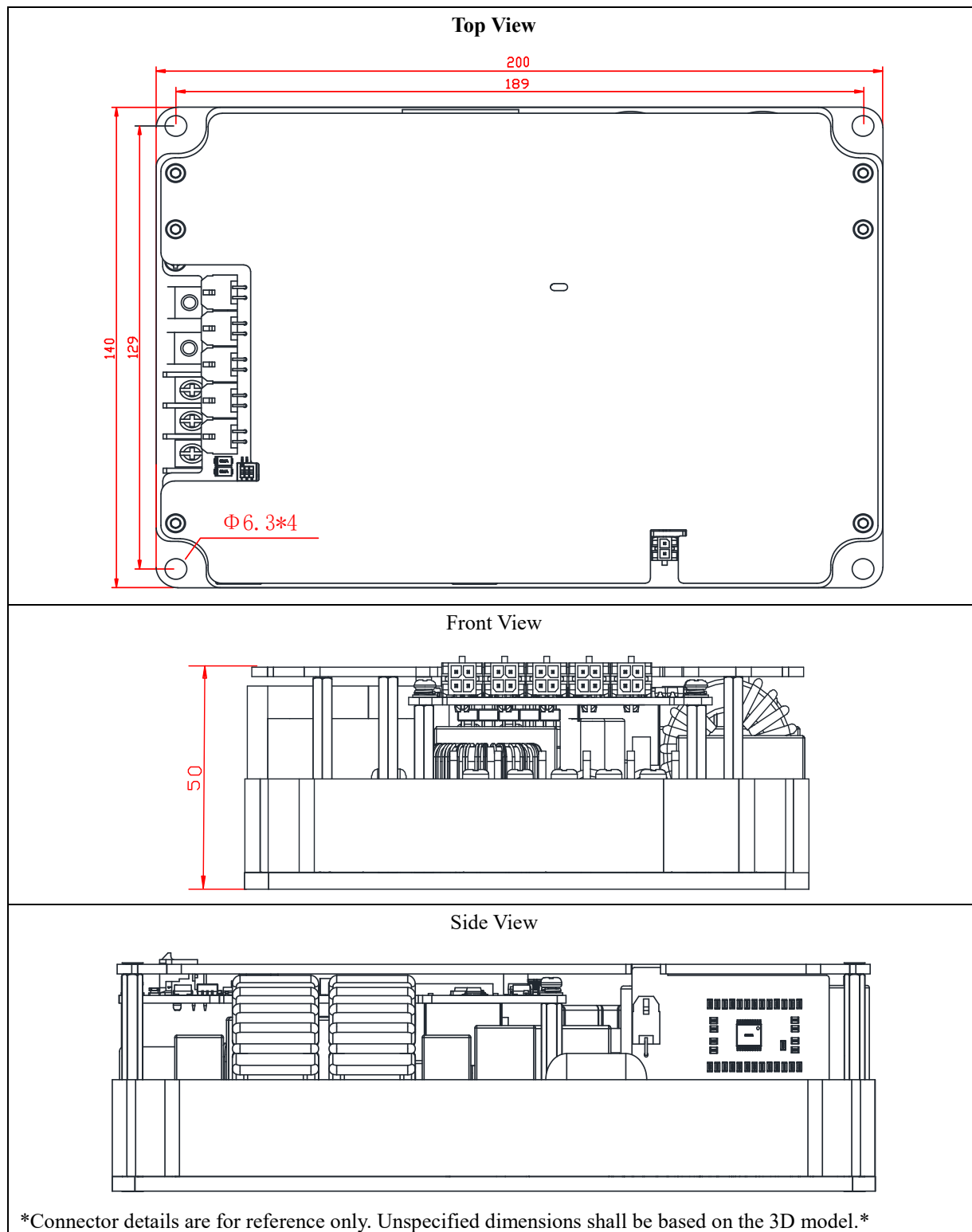




3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

3. Dimensions and Weight

3.1. Product Dimensions





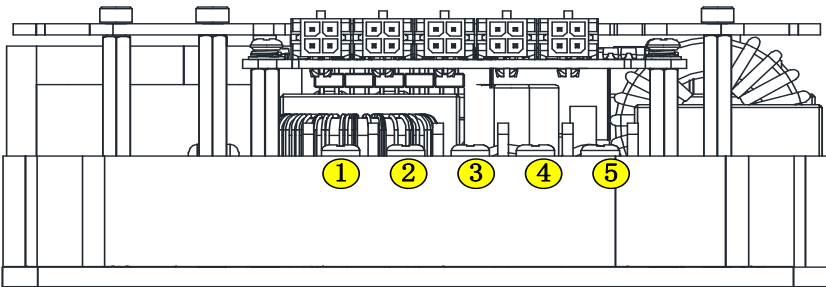
3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

3.2. Product Weight

2.5Kg±0.2Kg

4. Connector and Terminal Definitions

4.1. Power Port Definitions

Power Port Definitions						
						
Applicable Model	No.	Definition	Pin Description	Connector Specifications		Recommended Connection
TR1001 TR1002	①	VO+	Charger Positive Output		Name: Barrier Terminal Connector Screw: M4.0; Pitch: 11 mm Recommended wire size: 22-12 AWG, 4.0 mm ² Torque: 12.24kff-cm/1.2Nm/10.6Lbin	Ring Terminal
	②	VO-	Charger Negative Output			
	③	PE	Protective Earth			
	④	L	Charger AC Line Input			Ring Terminal
	⑤	N	Charger AC Neutral Input			
TR1003 TR1004 TR1005 TR1006	①	VO+	Charger Positive Output		Pitch: 5.00 mm Rated current: 80 A Screw-hole size: M4 Screw torque: 13 lbf-in	Ring terminal/ Busbar
	②	VO-	Charger Negative Output			
	③	PE	Protective Earth		Screw: M4.0; Pitch: 9.5 mm Recommended wire size: 22-12 AWG, 4.0 mm ²	Ring Terminal
	④	L	Charger AC Line Input			
	⑤	N	Charger AC Neutral Input			

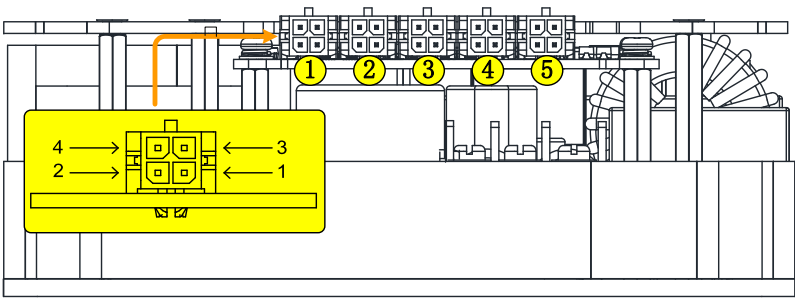


3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

					Temperature range: -40 to +105 °C Screw torque: 12.24kff-cm/1.2Nm/10.6Lbin	
TR1007	①	VO+	Charger Positive Output		Pitch: 10.00 mm Rated current: 100 A Screw-hole size: M6 Screw torque: 18 lbf·in	Busbar
	②	VO-	Charger Negative Output			
	③	PE	Protective Earth		Screw: M4.0; Pitch: 9.5 mm Recommended wire size: 22-12 AWG, 4.0 mm ² Temperature range: -40 to +105 °C Screw torque: 12.24kff-cm/1.2Nm/10.6Lbin	Ring Terminal
	④	L	Charger AC Line Input			
	⑤	N	Charger AC Neutral Input			

4.2. Signal Port Definitions

Signal Port Definitions				
Type A Type B				
Pin	Definition	Type A	Type B	
①	1	CAN-L	CAN-L signal (S- for non-vehicle applications)	
	3	CAN-H	CAN-H signal (S+ for non-vehicle applications)	
	2	GND	Signal ground (12 V output ground, chassis ground, CAN shield ground) (A- for non-vehicle applications)	
	4	12V Output	12 V/0.2 A Wake-Up Output	12 V/3 A auxiliary power output (A+ for non-vehicle applications)
②	1	FAN- 12V0.3A	12 V/0.3 A Fan 1 Interface -	
	3	FAN+ 12V0.3A	12 V/0.3 A Fan 1 Interface +	



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

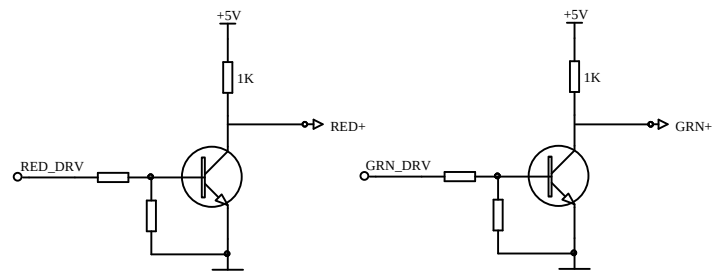
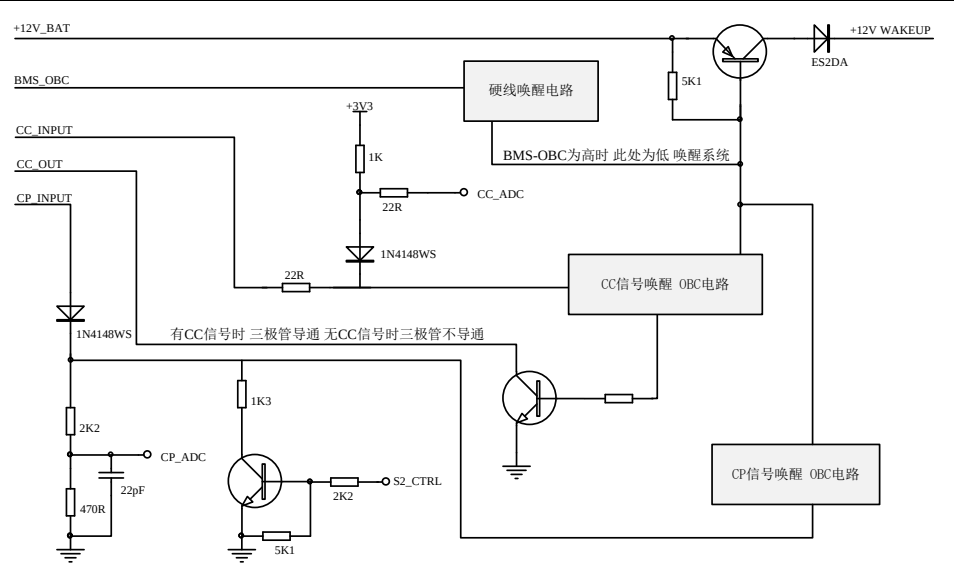
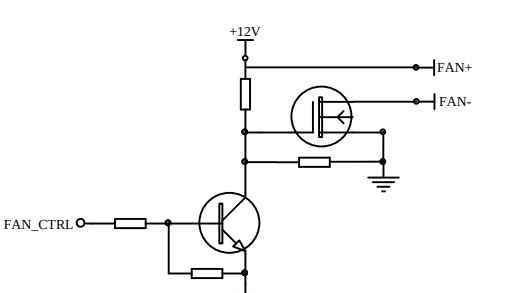
	2	FAN- 12V0.3A	12 V/0.3 A Fan 2 Interface -	
	4	FAN+ 12V0.3A	12 V/0.3 A Fan 2 Interface +	
③	1	+5V0	+5 V Low-Voltage Output	
	3	Red Led Control+	Bi-Color LED Red Control Pin (+)	
	2	GND	Common-cathode LED common ground (chassis ground, connected to ①-3)	
	4	Green Led Control+	Bi-Color LED Green Control Pin (+)	
④	1	Connection Pilot	CP (Connection Pilot) Signal	
	3	Connection Confirm	CC (connection confirmation) signal (CC1 for non-vehicle applications)	
	2	GND	Always-on power ground (chassis ground, connected to ①-3)	
	4	12V Battery	12 V Always-On Power Input	
⑤	1	485A/S1-1/TXD1	RS-485 Communication A	Switch Detection P1
	3	485B/S1-2/RXD1	RS-485 Communication B	Switch Detection P2
	2	CCout signal	CCout Signal Output	
	4	Wake up signal input+	Wake-Up Signal Input	

4.3. Signal Interface Schematic

Signal Connector Definitions and Selection		
Signal Connector	Mating Connector	Terminal Contact
Default Signal Connector Selection [MOLEX]		
MOLEX 0430450400	MOLEX 0430250400	MOLEX 430300001
Domestic Alternative [Dongguan Yuliang Electronics Co., Ltd.]		
YL009-047-004(6)	YL009-047-A04(6)	YL009-047
Domestic Alternative [Dongguan Kangdao New Energy Technology Co., Ltd.]		
23001W90-2*2(3)PA-A1-SN	23001H-2*2(3)PA-66	23001TOP-SN
Domestic Alternative [Zhejiang Hongxing Electric Co., Ltd.]		
HX30002-4(6)WA	HX30002-4(6)P	HX30001-PT
Signal Description		
CAN Communication	ACDC模块默认无120Ω终端电阻	



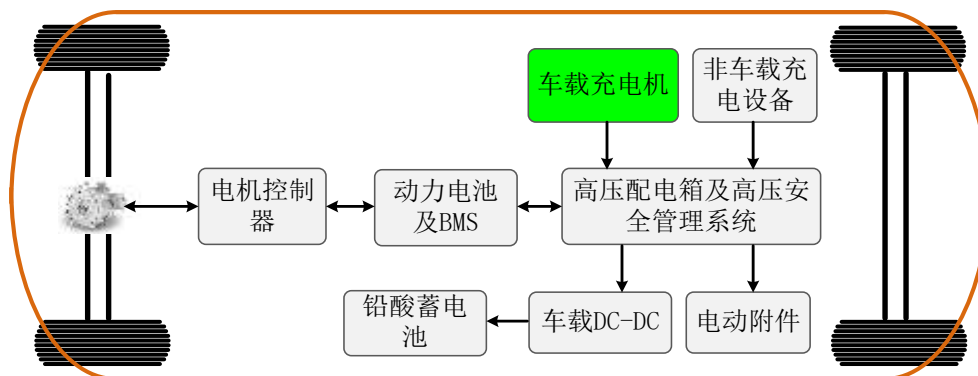
3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

LED Drive Circuit	
CC/CP Circuit	
Fan Drive	

3.3 KW OBC Series Integrated On-Board Charger Module Technical Specification

5. User Guide

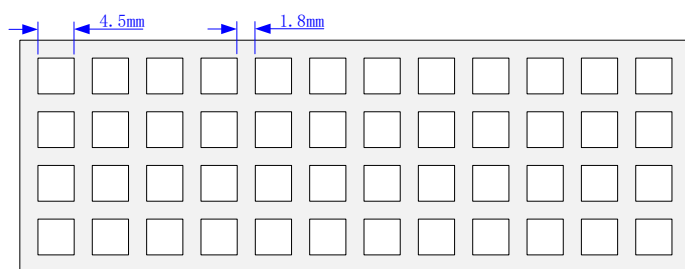
5.1. Electrical Connection Block Diagram



5.2. Product Installation

- 5.2.1. Mounting surface flatness: The flatness of the power-supply mounting surface shall be ≤ 0.2 mm.
- 5.2.2. Thermal interface material: Apply thermal grease to the bottom of the power-supply heat sink. The thermal conductivity of the grease shall be ≥ 1.0 W/(m·K).
- 5.2.3. Clean the mounting surfaces: The bottom of the power-supply heat sink and the corresponding mounting surface shall be clean and free of foreign matter.
- 5.2.4. Stencil printing: Use a metal stencil to apply thermal grease to the bottom of the power-supply heat sink.

Recommended stencil thickness: 0.45 mm, with an opening ratio of approximately 50% (square openings 4.5 mm × 4.5 mm, spacing 1.8 mm), as shown in the figure.



- 5.2.5. After applying thermal grease to the bottom of the power-supply heat sink, place the unit on the mounting surface, apply appropriate pressure, and move it slightly in all directions so that the thermal grease spreads evenly and fills any gaps.
- 5.2.6. Align the mounting holes and tighten the mounting screws to secure the unit. The screw quantity and recommended screw type are shown in the table below.

Mounting Screws	Mounting Hole Diameter	Φ6.3
	Quantity	4
	Recommended Screw Type	M5 Hex-Socket Combination Screw



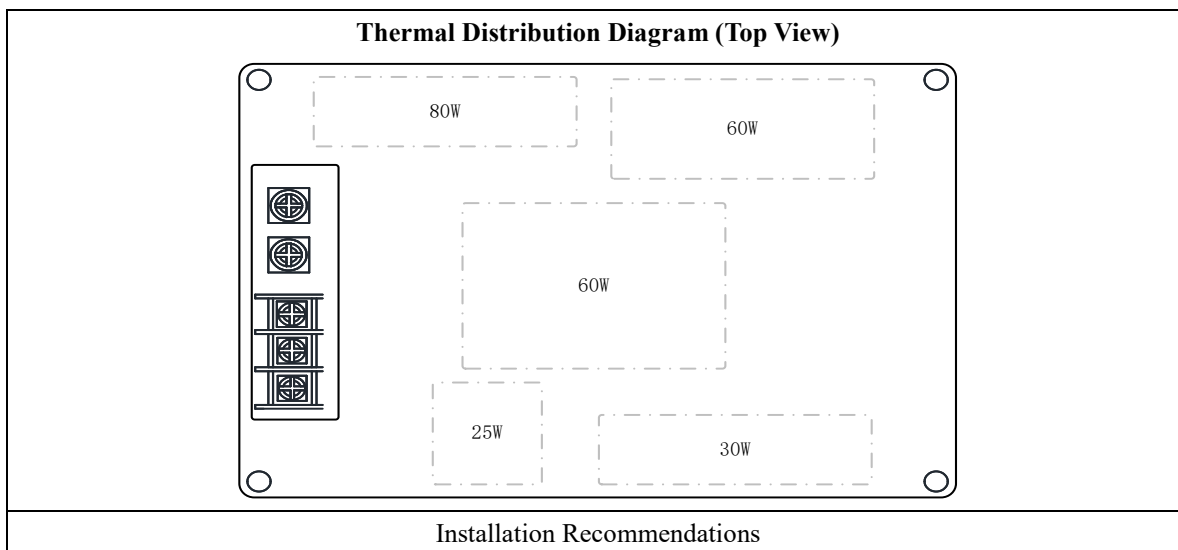
3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

5.2.7. Tightening torque requirements: During installation, select the appropriate tightening torque according to screw size and connection type. Refer to the table below for details.

Specification / Model		Tightening Torque (Tolerance: $\pm 10\%$) / Unit: kgf·cm						
Main Category	Subcategory	Plastic-Plastic	Steel-Plastic Plastic-Copper Copper-Copper	General Connection		High-Density Connection		
				Steel-Steel	Copper-Cast Aluminum Steel-Aluminum Profile	Steel-Steel	Steel-Cast Aluminum Steel-Copper	Steel-Aluminum Profile
Hex-Socket Screw	M3	1.5	3	5.5	5	10	8	6
	M4		6	12	10	16	14	12
	M5		10	20	13	30	28	20
	M6		15	30	28	50	48	30
	M8					80	80	-

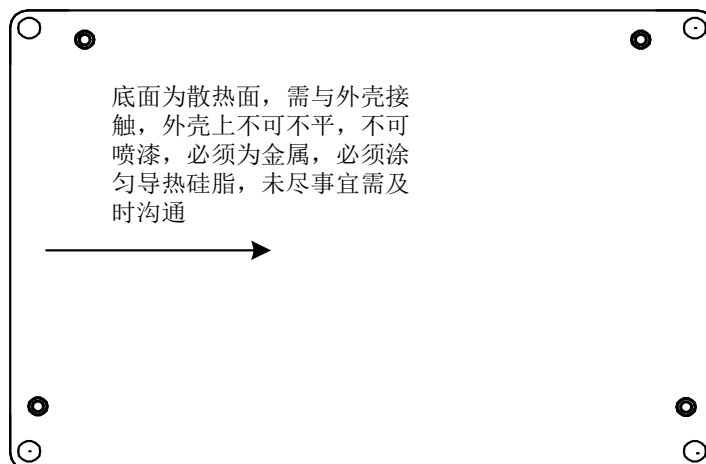
5.3. Thermal Design Guide





3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification



- ① The heat-dissipation enclosure may be designed using theoretical calculations or thermal simulation; final acceptance shall be based on measured point temperatures.
- ② At rated input and rated output, after 1 hour the maximum heat-sink surface temperature rise above ambient shall be $\leq 40^{\circ}\text{C}$.
- ③ The contact surfaces between the heat sink and module shall be flat, smooth, clean, and free of oil. When placed naturally, there shall be no visible gap at the interface.
- ④ If the heat sink is cast aluminum, the contact surface between the heat sink and the module aluminum channel shall be CNC-machined to ensure good thermal contact.
- ⑤ Apply an appropriate, even layer of thermal grease to the contact surface between the modular heat sink and the module.
- ⑥ When designing the heat sink, ensure that the heat-sink thickness at the module contact area is $\geq 4\text{ mm}$.

5.4. CAN Communication Protocol

Item	Technical Requirement	Remarks
Crystal Oscillator Tolerance	$\pm 0.15\%$	Within the operating temperature range
Communication Baud Rate	Configurable through the PC software; settings are retained after power loss.	Tolerance: $\pm 0.375\text{ Kbit/s}$
Sample Point	The sample point shall be set close to, but not later than, 7/8 of the bit time.	
Transceiver	Maximum transceiver loop delay (transmit to receive): 300 ns.	The CAN transceiver shall comply with ISO 11898-2.
Termination Resistor	By default, the charger CAN communication circuit does not include a $120\ \Omega$ termination resistor.	
Default CAN Communication Protocol	 OBC_CAN_Protocol_V1.2.pdf	



3.3 KW OBC Series

Integrated On-Board Charger Module Technical Specification

5.5. LED Indicator Pattern Definitions

The charging section includes an LED indicator control output (5 V drive voltage with a standard internal 1 kΩ current-limiting resistor). The operating state can be determined from the indicator pattern.

Recommended indicator: red/green bi-color common-cathode LED.

LED Indicator Pattern		Cycle period: 4 s; ON/OFF frequency: 1 Hz							
No.	Status	0s-0.5s	0.5s-1s	1s-1.5s	1.5s-2s	2s-2.5s	2.5s-3s	3s-3.5s	3.5s-4s
1	Standby	Red	Red	Red	Red	Red	Red	Red	Red
2	Charging	Red	-	Red	-	Red	-	Red	-
3	Fully Charged	Green	Green	Green	Green	Green	Green	Green	Green
4	No Load	Red	-	Green	-	Red	-	Green	-
5	Communication Fault	Red	-	Red	-	Green	-	-	-
6	Input Fault	Red	-	Green	-	Green	-	-	-
7	Output Overvoltage	Red	-	Green	-	Green	-	Green	-
8	Internal Overtemperature	Red	-	Red	-	Green	-	Green	-

Notes:

Blinking priority: AC input fault > output overvoltage > no load > communication fault > internal overtemperature.

Because output short circuit, output reverse polarity, and output undervoltage cannot be strictly distinguished while the charger is operating under closed-loop current-limit protection, the output-undervoltage fault indication also covers reverse-polarity and short-circuit conditions. In this case, check the voltage at the charger output terminals.

The indicator pattern uses a 4-second cycle. “-” indicates that all indicator colors are OFF.

5.6. Fault Detection Criteria and Handling

Fault	Fault Detection Condition	Detection Time	Charger Action	Fault-Clear Condition
Input Overvoltage	Input voltage exceeds the overvoltage threshold	2s	Disable High-Voltage Output	Automatic recovery when input voltage falls below the recovery threshold
Input Undervoltage	Input voltage is below the undervoltage threshold	2s	Disable High-Voltage Output	Automatic recovery when input voltage rises above the recovery threshold
Output Overvoltage	Output voltage exceeds the overvoltage threshold	2s	Disable High-Voltage Output	Automatic recovery when output voltage falls below the recovery threshold



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Integrated On-Board Charger Module Technical Specification

Output Overcurrent	Output current exceeds the overcurrent threshold	1s	Disable High-Voltage Output	Automatic recovery when output current falls below the recovery threshold
Battery Overvoltage	Battery voltage exceeds the overvoltage threshold	2s	Disable High-Voltage Output	Automatic recovery when battery voltage falls below the recovery threshold
Battery Undervoltage	Battery voltage is below the undervoltage threshold	2s	Disable High-Voltage Output	Automatic recovery when battery voltage rises above the undervoltage threshold
Fan Fault	Fan current is zero while the fan is enabled	5s	Disable High-Voltage Output	Replace the fan
Serial-Port Fault	Internal serial communication timeout	1s	Disable High-Voltage Output	Automatic recovery when serial data is received
Chip Overtemperature	Chip temperature exceeds the protection threshold	2s	Disable High-Voltage Output	Automatic recovery when chip temperature falls below the threshold
Main-Board Overtemperature	Temperature exceeds the overtemperature protection threshold	2s	Disable High-Voltage Output	Automatic recovery when main-board temperature falls below the threshold
Parameter Fault	Invalid parameter setting	1ms	Disable High-Voltage Output	Parameter settings meet the requirements
Relay Fault	Relay contact-weld fault	5s	Disable High-Voltage Output	Return to factory for service
Input Overcurrent	Primary-side current setpoint is triggered	1ms	Disable High-Voltage Output	Restart; automatic recovery
CAN Fault	CAN communication fault	6s	Disable High-Voltage Output	Automatic recovery when a CAN message is received

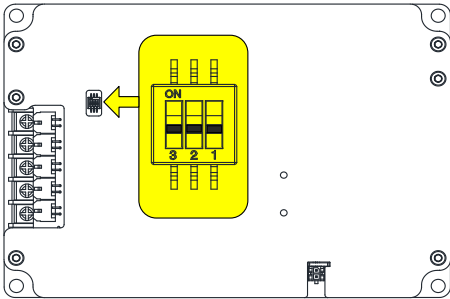
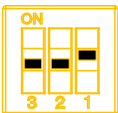
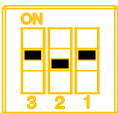
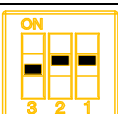
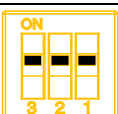


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5.7. Parallel Operation of Multiple Units

The charger module includes CAN-bus current-sharing logic and supports masterless current sharing for up to eight units. All modules used for current sharing must be the same model, and addresses must be assigned using the DIP switch on each module. The DIP-switch positions and address assignments are shown below.

DIP-Switch Position	DIP-Switch State	Address	DIP-Switch State	Address
		0		4
		1		5
		2		6
		3		7

5.8. PC Commissioning Software

Product Type	On-Board Charger Module	
PC Software Version	1002 Setup V2.0	
PC Software Communication Method	CAN Communication	Adjustable baud rate: 125K / 250K / 500K
Installation and Usage Help		 PCGuide.pdf
Supported CAN Adapter Brand	1. Beijing Aitai USBCAN-2I 2. Beijing Aitai USBCAN-I	 USBCAN Driver for Windows 10-amd64-1.0.1.exe
Supported CAN Adapter Brand 2	TBD	

5.9. Troubleshooting and Verification

Symptom	Common Cause	Corrective Action
Charger does not power on	No AC input from the AC charging connector	Check the upstream AC circuit breaker or receptacle



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		AC connector not fully seated	Disconnect and reconnect the connector
		Charge-pilot signal connector not fully seated	Disconnect and reconnect the signal connector
No messages from charger		Signal connector not properly connected	Disconnect and reconnect the signal connector
		CAN lines reversed	Correct the CAN wiring order
		Communication protocol mismatch	Verify that the protocols match
		Baud-rate mismatch	Verify that the baud rates match
No high-voltage output		High-voltage output not connected to the battery	Check the high-voltage connector and wiring harness
		Charger has not received a BMS command	Check the CAN messages
		Battery polarity reversed	Check the high-voltage connector and wiring harness
Overtemperature Fault		Air-cooled unit: fan stalled or airflow path obstructed	Check the fan and airflow path
		Liquid-cooled unit: no coolant or coolant temperature too high	Check the coolant condition and circulation

6. User Information and Precautions

Before using the product, read the Warnings and Precautions sections. Improper operation may damage the power supply, cause electric shock, or result in fire. Confirm that all warnings and precautions have been read before use.

WARNING:

Do not disassemble the product for unauthorized repair, adjustment, or modification.

When power is applied, keep hands and face away from the product to avoid accidental injury.

High voltage and high temperatures are present inside the product. Do not touch internal components, as electric shock or burns may result.

If abnormal noise or odor is detected during operation, immediately disconnect the input power.

Use connectors that meet the specified requirements and ensure that all plugs and receptacles are securely connected. Loose connections may cause localized heating and fire.

Do not charge a damaged battery or a battery that cannot accept charge.

Operate the power supply only within the specified technical limits. Operation outside these limits may damage the product.

During normal battery charging, keep the unit away from ignition sources and flammable or explosive materials.

Do not leave the product exposed to rain for extended periods.

Use a three-conductor AC power cable with a protective earth conductor, and connect the earth conductor correctly.

Before installation, verify that the enclosure is intact. If damaged, replace it immediately or contact the manufacturer.



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PRECAUTIONS:

Verify that the input/output terminals and signal terminals are connected according to this manual. Disconnect input power before wiring, and never plug or unplug connectors while energized.

External fuses or other overcurrent-protection devices shall be provided at the power-supply input/output terminals.

Potential electrical hazards at the output must be considered so that end users cannot contact hazardous parts. The end-equipment manufacturer shall implement suitable protective measures to prevent hazards caused by accidental contact with power terminals by service personnel or tools.

If any safety protection is compromised, stop operating the equipment and service it in accordance with the applicable maintenance requirements.

When the power equipment is moved from a cold environment to a warm environment, condensation may create a leakage-current hazard. Protective-earth requirements shall therefore be strictly observed.

Only qualified personnel may connect the equipment to the power source.

After disconnecting power, wait at least five minutes to allow the capacitors to discharge fully before servicing the power equipment.

Observe all safety markings. Do not touch areas marked with safety warnings or high-voltage symbols, as electric shock or burns may result.



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7. Referenced Standards and Specifications

- QC/T 413-2002 Basic Technical Requirements for Automotive Electrical Equipment
- QC/T 895-2011 Conductive On-Board Charger for Electric Vehicles
- GB/T 2423.1-2001 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test A: Cold
- GB/T 2423.2-2001 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test B: Dry Heat
- GB/T 2423.3-1993 Basic Environmental Testing Procedures for Electric and Electronic Products - Test Ca: Damp Heat, Steady State
- GB/T 2423.4-1993 Basic Environmental Testing Procedures for Electric and Electronic Products - Test Db: Damp Heat, Cyclic
- GB/T 2423.5-1995 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test Ea and Guidance: Shock
- GB/T 2423.6-1995 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Bump/Collision
- GB/T 2423.8-1995 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test Ed: Free Fall
- GB/T 2423.10-1995 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test Fc and Guidance: Vibration (Sinusoidal)
- GB/T 2423.11-1997 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test Fd: Broadband Random Vibration
- GB/T 2423.22-2002 Environmental Testing for Electric and Electronic Products - Part 2: Test N: Change of Temperature
- GB/T 14508-93 Mechanical Environmental Conditions for Freight Transportation on Classified Highways
- GB/T 18384.3-2001 Electric Vehicles - Safety Requirements - Part 3: Protection of Persons Against Electric Shock
- GB/T 17619 Limits and Methods of Testing for Immunity of Electrical/Electronic Components in Vehicles to Electromagnetic Radiation
- GB/T 18488.1-2006 Drive Motor System for Electric Vehicles - Part 1: Technical Specification
- GB/T 24347-2009 DC/DC Converter for Electric Vehicles
- GB/T 18655-2010 Vehicles, Boats and Internal Combustion Engines - Radio Disturbance Characteristics - Limits and Methods of Measurement for the Protection of On-Board Receivers
- Q/FT B102-2005 Traceability Marking Requirements for Vehicle Product Components
- GB/T 17626.2-2006 Electromagnetic Compatibility - Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
- GB/T 17626.3-2006 Electromagnetic Compatibility - Testing and Measurement Techniques - Radiated RF Electromagnetic Field Immunity Test
- GB/T 17626.4-2008 Electromagnetic Compatibility - Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
- GB/T 17626.5-2008 Electromagnetic Compatibility - Testing and Measurement Techniques - Surge Immunity Test



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GB 4943-2001 Safety of Information Technology Equipment



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8. Packaging, Transportation and Storage

Packaging

Product packaging information is as follows:

Packaging Quantity and Carton Information	Net Weight per Module (kg)	2.5Kg
	Carton External Dimensions (mm)	412*512*227
	Modules per Carton	12
	Total Packaged Weight (kg)	30Kg

The packaging shall identify the product name, product model, and manufacturer. Technical documentation supplied with the product shall include the product factory inspection certificate.

The product shall be transported in a robust package. The package exterior shall comply with applicable national standards and bear markings such as “Handle with Care” and “Keep Dry.” Packaged products may be transported by various means. During transportation, avoid direct exposure to rain or snow and prevent mechanical impact. Transportation markings are shown in Figure 7-2 below:



Transportation Markings

Storage

When not in use, the product shall be stored in its packaging. Warehouse temperature shall be -10 to 40 °C and relative humidity shall not exceed 80%. The warehouse shall be free of harmful gases, flammable or explosive materials, corrosive chemicals, strong mechanical vibration, shock, and strong magnetic fields. Packages shall be raised at least 20 cm above the floor and kept at least 50 cm from walls, heat sources, windows, or air inlets. Under these conditions, the normal storage period is two years; products stored for more than two years shall be re-inspected.

Store the product in a ventilated, dry location, away from high-temperature sources, ignition sources, and chemicals. Store neatly and avoid throwing, dropping, or impact.



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9. Revision History

Date	Version	Change Description	Remarks
2019/10/29	V1.0	Initial release	
2019/11/17	V1.1	Updated control logic	
2020/5/12	V1.2	Added input frequency range parameter	
2020/6/22	V1.3	Updated isometric drawing	
2020/9/25	V1.4	Updated signal connector definitions	
2021/4/8	V1.5	Updated to common-cathode LED	
2021/5/20	V1.6	Added signal terminal contact definitions	
2022/4/9	V1.7	Updated signal terminal definitions	
2022/4/21	V1.8	Updated signal terminal definitions	
2023/7/8	V1.9	Added independent RS-485 communication interface	
2023/8/13	V2.0	Updated document format and added User Information and other sections	
2023/9/17	V2.1	Added instructions for parallel operation of multiple units	
2024/2/8	V2.2	Consolidated specifications for all voltage platforms	
2024/3/20	V2.3	Added data for the 540 V rated-voltage platform	
2024/5/17	V2.4	Added switch-detection pin definitions for Type B charger	
2024/7/16	V2.5	Added signal and power-port definitions for Type C charger	
2024/8/19	V2.6	Added fault detection criteria and handling methods Added input/output EMC circuit parameter descriptions	
2024/11/29	V2.7	Updated TR1003 output characteristic curve	
2025/1/13	V2.8	Corrected signal-connector labeling error in the signal table	
2025/6/5	V2.9	Changed finished-product part number	
2025/6/12	V3.0	Updated TR1002 output current parameter	
2025/7/7	V3.1	Removed the parameter table for the fast/slow charging compatible version	
2025/12/02	V3.2	Updated rendering and changed parameter to output voltage ripple factor	
2025/12/16	V3.3	Updated dielectric withstand-voltage parameters	
2025/12/24	V3.4	Updated parameters, template, and dielectric withstand-voltage data	



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2026/1/11	V3.5	Updated dielectric withstand-voltage data	