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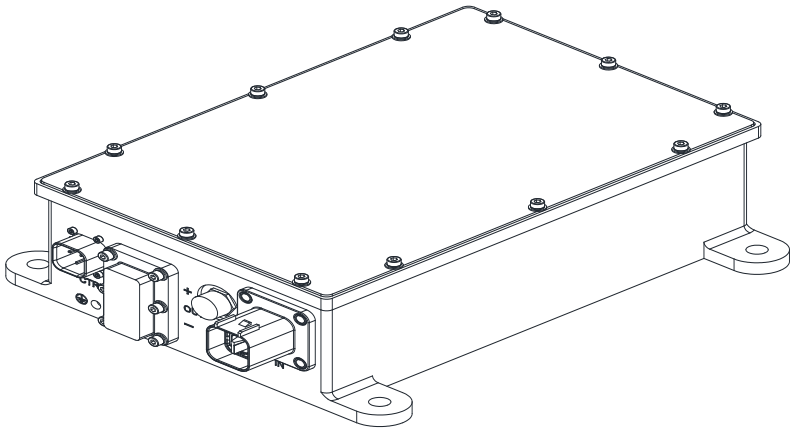
6KW DC/DC Converter Liquid Cooled System

Model No.: ATD6K-TR2480 Series

Features

1. UDS Diagnostics: Supported (SID)
2. FUTA: ISO 26262 ASIL C Functional safety supported
3. Cyber security: Supported
4. EMC R10 certified



Specification Index

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1. Product Introduction

ATD6K-TR2480 series DC-DC converter is a high-power, dense, high-efficiency DC-DC converter specially developed for new lithium electric vehicles, logistics vehicles, special vehicles, construction machinery and other new energy vehicles.

The module is designed with full digital control technology, with flexible and intelligent control, good protection characteristics and strong system robustness. The built-in microprocessor communicates with the monitoring unit, and the parameters in the machine can be set by the higher-level monitoring unit or adjusted by the higher-level monitoring unit through the CAN interface.

It has multiple protection functions such as input over-voltage and under-voltage protection, output over-current protection, output over-voltage protection, output short-circuit protection, and over-temperature protection.

Main specification:

Type	Input	Rated Pout	Rated Voltage	Output range	3D
ATD6K-TR2480	200~500 VDC	6.0KW	27VDC	0-32VDC/0-220A	902.24870000.00.stp
ATD6K-TR2481	400~900 VDC	6.0KW	27VDC	0-32VDC/0-220A	
ATD6K-TR2482	400-900VDC	6.0KW	48VDC	0-68VDC/0-125A	

2. Electrical Characteristics

2.1. Electrical Characteristics

Type			
5. Name	Water-cooled Isolation DC-DC converter		
Input/Output Characteristic			
6. Model	ATD6K-TR2480	ATD6K-TR2481	ATD6K-TR2482
7. Rated input voltage	360V	540V	540V
8. Input voltage range	200～500V	400～900V	400～900V
9. Precharge circuit	Built-in	Built-in	Built-in
10. Precharge resistor	120R	120R	120R
11. Inrush current	≤7.5A	≤11A	≤11A
12. Bus capacitors	33uF	24uF	24uF
13. Output rated power	6.0KW	6.0KW	6.0KW
14. Rated output voltage	27V	27V	48V
15. Output voltage range	0～32V	0～32V	0～68V
16. Output current range	0～220A	0～220A	0～125A
17. Voltage regulation accuracy	±0.2V	±0.2V	±0.4V
18. Typical efficiency	≥92%	≥92%	≥93%
19. Output peak power	TBD	TBD	TBD
20. Response time	≤200mS		

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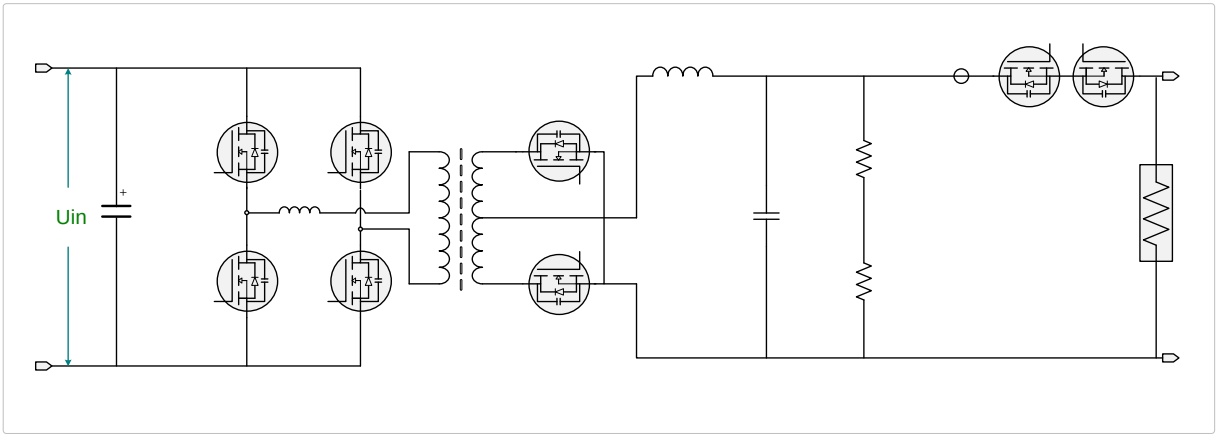
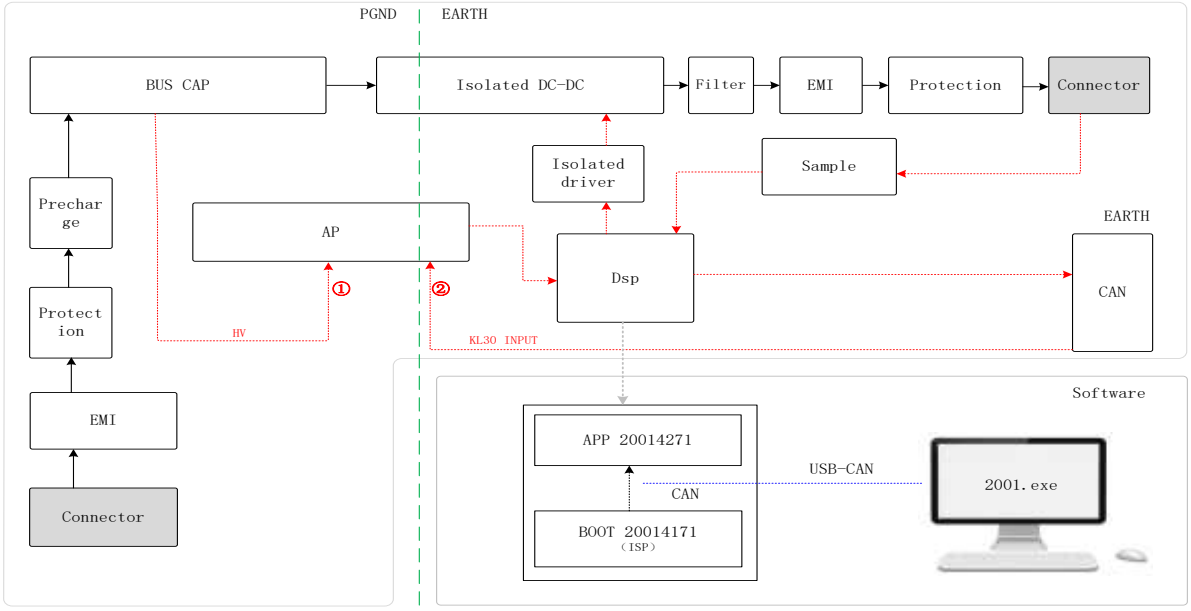
21. Run-up time	＜1s
22. Output ripple and noise	23. ≤300mVp-p（The band width of oscilloscope should be 20MHz. The probe is in parallel with a 10uF electrolytic capacitor and a 104 ceramic capacitor(test with over 50A load.）
24. Static loss current	25. ＜1mA（The leakage current when high voltage power supply and 12Vdc control power supply are not connected, and output end is in parallel with a 14Vdc battery.）
26. Enable signal range	8-32V
27. Operating noise	≯50dB
Protection characteristics	
28. Input/output voltage protection	Input/output OVP/UVP Can be self-recovering
Output short circuit protection	Hiccup, self-recovery when the fault is clear
Input power on sequence	1.high voltage first, and then control signals 2.control signals first, and then high voltage 3.high voltage and control signals are at the same time In above 3 kinds input power on sequence, the power supply can work normally, and no protection or damage.
Over temperature protection	When the water inlet temperature is over 75℃, output will be linear derating with temperature. When the temperature is over 85℃, power supply will turn off output. When temperature is under 80℃, output will be self-recovery.
Environmental condition	
Working temperature	-40℃～+85℃
Storage temperature	-40～95℃
Relative humidity	5%～95%
Altitude	0～3000m
Dust proof and waterproof	IP67
Cooling	Fan cooling/water cooling
Control method	CAN control and EN high level are efficiency relationship
Safety characteristics	
Dielectric strength	input—output 3000VDC Input-to-Protective Earth 3000VDC can bear DC 3500V for 1 minute, leakage current≤1mA, no breakdown, no flashover
Insulation resistance	input—output ≥50MΩ test with input-output 1000Vdc, normal atmospheric pressure and relative humidity 90%
Charge dissipation capacity	≤60 10 minutes after DCDC power off
Vibration Resistance	ISO 16750-3,2012（E）

	After X,Y,Z three directions of sweep frequency vibration testing, no damage for parts , no loose for fastening piece
Impact Resistance	ISO 16750,4.2.2.2 See Requirements 6.5 in GB/T15139-1994
Resistance to Industrial solvents	Metal parts have a good corrosion protection layer
Salt Spray Resistance	See GB/T 2423.17
EMC characteristics	
29. Electromagnetic immunity	GB/T17619-1998 chap4
30. Electromagnetic disturbance	GB18655-2002chap 12 chap14

2.2 System Block Diagram



2.3 Function block



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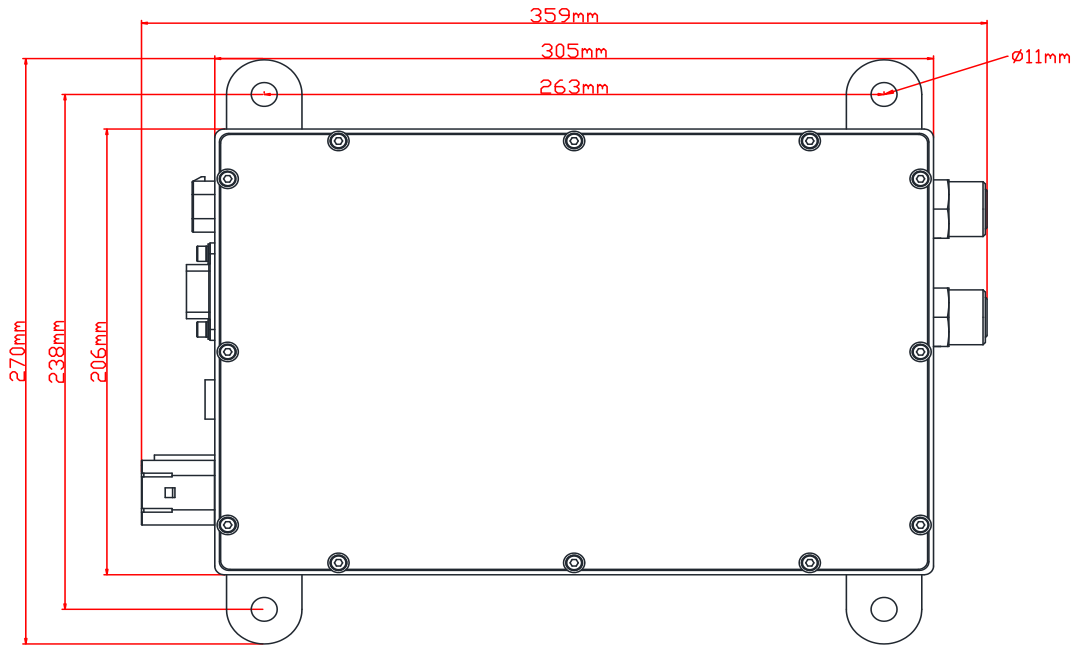
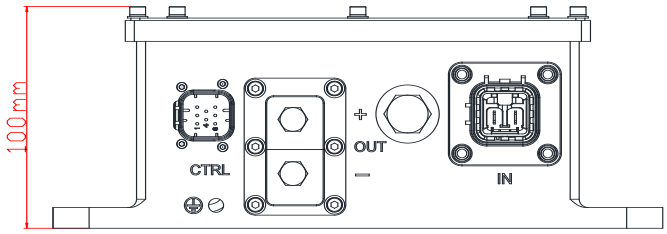
3 Dimensions and Weight

3.2 Product size

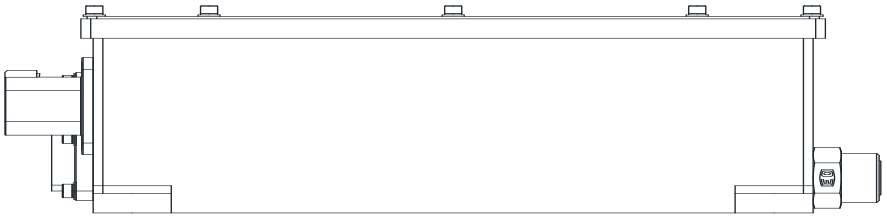
Top View



Front View



Side View



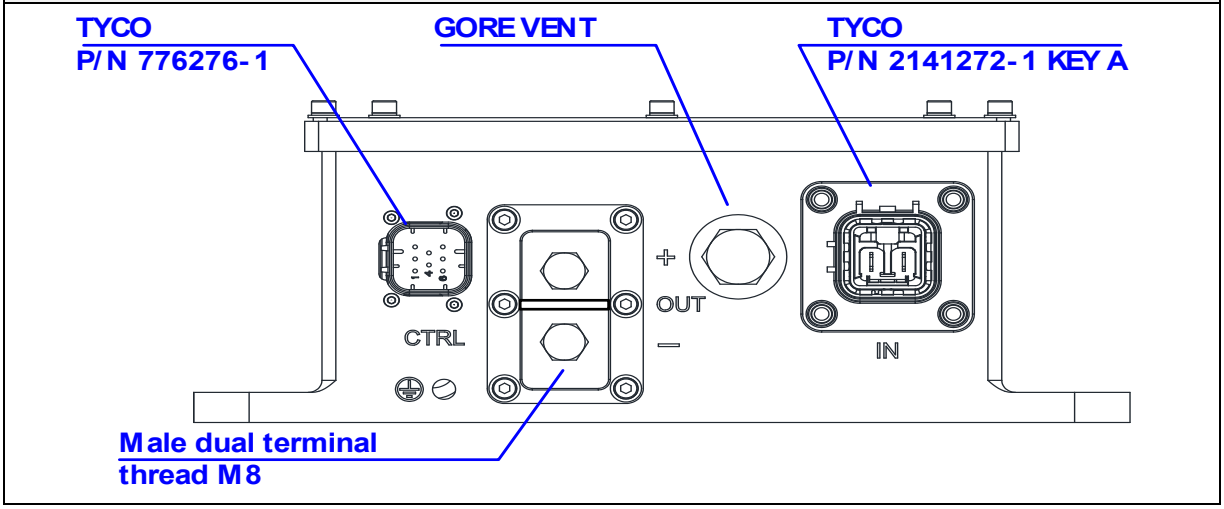
3.3 Product Weight

TBD

4 Define Connectors and Connection Terminals

4.2 Connectors Definition

Overview

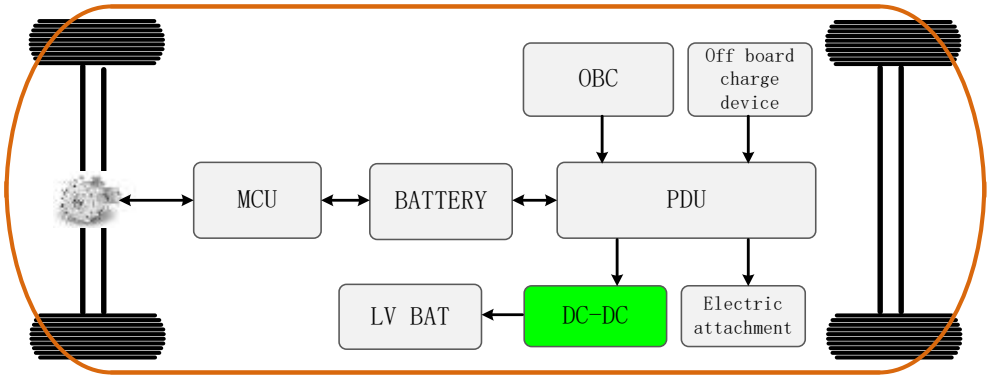


PARAMETER	CONDITION	MANUFACTURER	MPN
Input connector(IN)	High voltage connector with HVIL function	TYCO	2141272-1; KEY A
Output connector(OUT)	Male dual terminal thread M8		
CAN BUS and signal interface(CTRL)	Panel mounted	TYCO	776276-1

CONNECTOR	PIN	SIGNAL DESCRIPTION	Note
2141272-1	1	HV+	High Voltage Supply
	2	HV-	High Voltage Supply
	3	HVIL	HVIL Loop
	4	HVIL	HVIL Loop
776276-1	1	PS_WAKEUP	Wakeup Signal
	2	ADR0	Hardware Address 0
	3	ADR1	Hardware Address 1
	4	CAN_SPEED	CAN Speed Selection
	5	CAN_H	CANbus High
	6	CAN_L	CANbus Low
	7	SENSE+	Voltage Sense for Compensation
	8	SENSE-	Voltage Sense for Compensation

5 Operating Guide

5.2 Electrical Connection



5.3 Product installation

5.4 Cooling specifications

Parameter	Condition
Maximum Inlet Coolant Temperature	+70°C
Coolant Medium/Mixture	50/50 Propylene or Ethylene Glycol/Water
Min. Coolant Flow	0.0208 l/s (0.33 GPM)
Max. Coolant Flow	0.1166 l/s (1.85 GPM)
Max. Coolant Pressure	20 psi
Max. Pressure Drop	1 psi

5.5 CAN Communication Protocol

Item	Technical Indicator	Remark
Crystal vibration Tolerance	± 0.15%	Within the operating temperature range
Communication rate	You can use the background software to ensure that the configuration is not lost after power failure	Tolerance ±0.375 Kbit/s
Sampling point	The sampling point should be set near but not later than 7/8 of the bit time	
Transceiver	The maximum transceiver "loop delay" (from send to receive) is 300 ns	CAN transceivers shall conform to ISO 11898-2
Terminal resistance	The DC-DC CAN communication circuit has a 120 ohm terminal resistance by default	
Default CAN communication protocol	TBD	

5.6 Background Debugging Software Description

Background software coding	2002 Setup V2.0	
Background software communication method	CAN communication	Baud rate 125K/250K/500K adjustable
Installation and use help		

CAN box support Brand 1	1. Beijing ATai USBCAN-2I 2. Beijing Aitai USBCAN-I	
CAN box support Brand 2	TBD	

5.7 Troubleshooting and confirmation

Fault phenomenon	Common causes of failures	Troubleshooting
The power supply has no output	High Voltage Input Exception (None or Reverse)	Check if the high-voltage input is normal
	12V voltage input port is abnormal (none, over/undervoltage, reverse connection)	Check whether the 12V voltage input port is normal
	The output is disconnected	Check whether the output connection is normal
No packets are sent from DC-DC	The signal connector is not properly connected	Reseat the signal connector
	The CAN cable is reversed	Adjust the CAN line sequence
	The communication protocol does not match	Compare whether the protocols match
	Baud rates don't match	Compare whether the protocols match
The distribution box high voltage input fuse is damaged The product reports a fault signal	Input short circuit	Check if the high-voltage input is normal
	Input over/undervoltage, output over/undervoltage, overtemperature, output short-circuit/overcurrent	Check the input voltage, output for overcurrent/short circuit, turn off the power, let stand for 10 minutes, if it still fails, contact the manufacturer.
Overtemperature failure	Air-cooled machines: The fan is stalled or the air duct is blocked	Check the fan and air duct
	Water-cooled machines: No coolant or too high coolant temperature	Check that the coolant is normal

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6 User Notices and Cautions

Please note the Warnings and cautions section before using the product. Incorrect operation may cause damage to the power supply or cause a fire. Make sure you have read the warnings and cautions before using the product.

Warning:

It is strictly forbidden to disassemble the product for maintenance, debugging and modification;

When powered on, keep hands and face away from the product to avoid accidental injury;

There are high voltage and high temperature inside the product, please do not touch the internal components, may cause electric shock or burn;

During use, if the power supply has abnormal sound or odor, please turn off the input immediately;

Use compliant connectors to ensure that plugs and sockets are tightly connected. Loose connectors may cause part heat and fire.

Please use the power supply according to technical parameters, if it is used wrong power supply, it may cause product damage;

When the battery is charging normally, keep away from fire sources and inflammable and explosive materials;

Please avoid placing the product in a rain for a long time;

Ac power supply should choose a three-core cable with a ground wire, and install the ground wire correctly;

Before installation, ensure that the shell is kept well. If it is damaged, replace it immediately or contact the manufacturer.

Note:

Confirm that the product input/output terminal and signal terminal are connected correctly according to the product instructions; When connecting cables, please cut off the input power supply and do not plug or unplug the connector with power on.

The input/output of the power supply should be supplemented with a blown fuse or other overcurrent protection device;

The possible electrical hazards at the output end of the product must be considered to ensure that the end product user will touch the product; The manufacturer of the terminal equipment must design the appropriate protection scheme to ensure that the operation will not cause danger due to accidental touching the terminal of power supply;

Once the safety protection of the equipment is damaged, the equipment must stop working and refer to the relevant maintenance regulations.

When the power supply device is switched from a cold environment to a warm environment, condensation may cause leakage hazards, so the grounding requirements must be strictly implemented.

Only a qualified person can connect the equipment to the power supply.

The power supply must be shut down for five minutes, so that the capacitor has sufficient discharge time before repairing power supply equipment.

Pay attention to the use of safety: do not touching safety warning signs and high pressure signs, to avoid electric shock, burns.

7 Reference standards and specifications

QC/T 413-2002 Basic technical conditions for automotive electrical equipment

QC/T 895-2011 Conduction on-board charger for electric vehicles

GB/T 2423.1-2001 Environmental tests for electrical and electronic products-Part 2: Test methods/Test A: Low temperature

GB/T 2423.2-2001 Environmental tests for electrical and electronic products-Part 2: Test methods/Test B: High temperature

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GB/T 2423.3-1993 Basic environmental test procedure for electrical and electronic products-Test Ca: constant wet heat test method;

GB/T 2423.4.1993 Basic environmental test procedure for electrical and electronic products-Test Db: alternating wet heat test method

Environmental tests for electrical and electronic products-Part 2: Test methods/test Ea and guidelines: shock

Environmental testing of electrical and electronic products-Part 2: Test methods/test Ea and guidelines: collision

Environmental testing of electrical and electronic products-Part 2: Test methods/tests Ed: free drop

Environmental testing of electrical and electronic products - Part 2: Test methods/test Fc and guidelines: Vibration (sinusoidal)

Environmental tests for electrical and electronic products-Part 2: Test methods/test Fd: wide-band random vibration

GB/T 2423.22-2002 Environmental tests for electrical and electronic products-Part 2: Test N: Temperature change

GB/T 14508-93 grade road cargo transport machinery environmental conditions

GB/T 18384.3-2001 Safety requirements for electric vehicles - Part 3: Protection against personal electric shock

GB/T 17619 Electromagnetic radiation immunity limits and measurement methods for electronic and electrical components of motor vehicles

GB/T 18488.1-2006 Drive motor systems for electric vehicles - Part 1: Technical requirements

GB/T 24347-2009 DC/DC converter for electric vehicles

GB/T 18655-2010 Measurement, ship and internal combustion engine radio disturbance characteristics Limits and measurement methods for the protection of in-vehicle receivers

Q/FT B102-2005 Requirements for Traceability marking of components of vehicle products

GB/T 17626.2-2006 Electromagnetic compatibility test and measurement techniques Electrostatic discharge immunity test

GB/T 17626.3-2006 Electromagnetic compatibility test and measurement techniques Radio frequency electromagnetic field radiation immunity test

GB/T 17626.4-2008 Electromagnetic compatibility test and measurement technology Electrical fast transient pulse group immunity test

GB/T 17626.5-2008 Electromagnetic compatibility test and measurement technology Surge (shock) immunity test

GB4943-2001Security of information technology equipment

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8 Package & Transportation & Storage

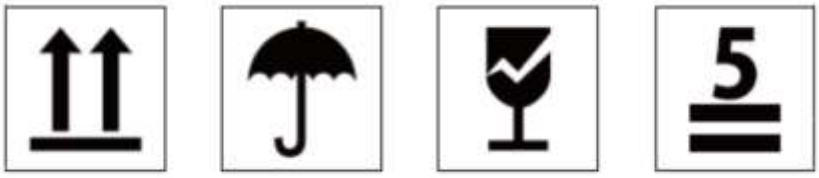
Package

Product packaging information:

31. Packing Quantity and Carton Information	The net weight of one module : Kg	TBD
	Carton size: mm	412*512*227
	Qty/Carton	1
	Total weight of product and carton : Kg	TBD

The product name, model and the name of the manufacturer are shown on the packing carton; The technical documents including certificate of product are supplied in the carton.

The product should be firmly packed when transported, and the external use of the carton should be in accordance with the relevant national standards and should be marked "handle with care" and " maintain dryness". Containers containing products are allowed to be transported by various of transport. Direct rain and snow and mechanical impact should be avoided during transportation. Transport marks should be attached, as shown in pictures 7-2 below:



Transport Mark

Storage

Products should be stored in the packing carton when not in use, the ambient temperature of the warehouse is -10-40 ℃ and the relative humidity is not more than 80%, harmful gases, flammable, explosive products and corrosive chemicals are not allowed in the warehouse, and there is no strong mechanical vibration, impact and strong magnetic field, the packing carton should be padded at least 20cm high from the ground. At least 50cm away from the wall, heat source, window or air inlet, the storage period under these conditions is generally 2 years, if more than 2 years the products should be re-tested.

Products should be stored in a ventilated, dry place. At the same time, to avoid high temperature sources, fire sources and chemicals. Store neatly to avoid throwing.

9 Version update record

Date	Edition	Reason for change	Remark
2024/1/23	V1.0		
2024/3/6	V1.1	Update the fan driver schematic	
2024/7/16	V1.2	Update the signal connector definition	
2024/7/27	V1.3	Add parameter of TR2488	
2024/8/8	V1.4	Update parameter	
2024/9/12	V1.5	Define voltage regulation accuracy	
2024/9/18	V1.6	Add instructions for parallel operation of multiple machines	
2024/12/16	V1.7	Update double-sided heat dissipation	