1KW DC/DC CONVERTER MODULE MODEL NO. ATD1K540S12M-HD1010-12F



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1.Product Introduction

The ATD1K540S12M-HD1010-12F vehicle-mounted DC-DC converters are high-power, high-density and highefficiency DC-DC converters specially developed for new lithium-ion electric vehicles, logistics vehicles, special vehicles, engineering machinery and other new energy vehicles. They are designed and developed with modular, standardized and universal design ideas.

The module is designed with full digital control technology, with flexible and intelligent control, good protection characteristics and strong system robustness. It has its own microprocessor to communicate with the monitoring unit, and the internal parameters can be set or adjusted by the superior 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 Specifications:

Input voltage	Output Power	Rated output	Output voltage and	3D data model
		voltage	current range	
280 700VDC	1.0KW	14VDC	0-16VDC/0-85A	901.20110000.00
380~700 VDC				.stp

2.Electrical Characteristics

2.1 Electrical Characteristics

model					
Vehicle power supply type	Integrated isolated automotive DC-DC converter module				
Input and output characteristics					
Rated input voltage V	540				
Input voltage range V	380-700				
Input precharge circuit	built-in				
Input pre-charge resistance	120R				
Bus Capacitor	7uF				
Rated output power	1.0KW				
Rated output voltage	14V				
Output voltage range	0~16V				
Output current range	0~85A				
Voltage regulation accuracy V	±0.2				
Output response time	≤200mS				
Typical efficiency	≥91%				
Working noise	-				
Protection features					
Over-voltage and under- voltage protection	The input over-voltage or under-voltage shutdown can be self-recovered, and the output over-voltage or under-voltage shutdown can be self- recovered.				
Output reverse connection and short circuit protection	Shutdown when output is short-circuited or reverse connected, self-recovery				



Over temperature protection	When the heat sink temperature is higher than 75°C, the output power is reduced. When the temperature is higher than 95°C, the circuit is disconnected. The charger resumes output when the charging temperature returns to below 85°C.					
Environmental conditions						
Operating temperature	-40°C~+85°C (internal temperature of integrated system cavity); Water cooling system liquid temperature ≤65°C					
Storage temperature	-40~95°C					
Cooling function	Modular design, water cooling or air cooling housing/substrate required					
Communication function	CAN bus					
Control method	No enable control; hard line high level enable control; CAN communication enable control					
Safety features						
Dielectric strength	Primary side - secondary side 2000VAC Primary side - case 1500VAC					
Insulation resistance	Primary side - secondary side $\geq 50M\Omega$					
Vibration resistance	After the X, Y, and Z direction sweep frequency vibration test, the parts were not damaged and the fasteners were not loose.					
Impact resistance	Refer to the requirements of 6.5 in GB/T15139-1994					
Industrial solvent resistance	Metal parts have good anti-corrosion layer					
Anti-salt spray performance	See GB/T 2423.17					
Durability	At no less than the relevant provisions of GB/T 24347-2009					
EMC characteristics						
Electromagnetic immunity	Meet the requirements of Chapter 4 of GB/T17619-1998					
Electromagnetic disturbance	See the limits specified in Chapter 12 and Chapter 14 of GB18655-2002					

2.2 Electrical topology diagram





2.3. System Block Diagram



2.4. Characteristic curve





3.Dimensions and weight

3.1Product size



3.2. Product Weight 1.5Kg±0.3Kg

4.Definition of connector and connection terminals

4.1. Power Port Definition

Power Port Definition

ANNREN TECHNOLOGIES CO., LTD.



4.2 Signal port definition

Sign	Signal port definition							
Pino	ut	definition	Pin Description					
	1	CAN-L	CAN-Low signal					
1	3	CAN-H	CAN- High signal					
	2	Enable input	Hardwire enable signal input (8-32V)					
	4	12V-OUT	12V wake-up signal output (maximum output current 0.2A)					
2	1	FAN- 12V0.2A	12V/0.2A fan driver negative Control ground (connected to output ground)					
2 FAN+ 12V0.2A		FAN+ 12V0.2A	12V/0.2A fan driver positive port					
Note	: None	2						



Definition and selection of signal connectors								
4-core sig	gnal	4-pin	plug-in	2-core	signal	2-pin	plug-in	Terminal core
connector		connector		connector	_	connect	or	
		14		H		T	1	A.
Default signal co	nnec	tor selection	MOL	EX				
0430450400 0430250		0430250400)	043045020	0	043025	0200	430300001
Domestic alterna	tive 1	models [Don	gguan Yul	iang Electro	nics Co.,	Ltd.]		
YL009-047-004		YL009-047	-A04	YL009-047	-002	YL009-	047-A02	YL009-047
Domestic alterna	tive 1	models [Don	gguan Ka	ngdao New I	Energy T	echnolog	y Co., Ltd.]	
23001W90-2*2P	PA-	2200111 2*	DDA 66	23001W90	-	23001H	-1*2PA-	23001TOP-
A1-SN		2300111-2	2FA-00	1*2PA-A1-	SN	66		SN
Domestic alterna	Domestic alternative models [Zhejiang Hongxing Electric Co., Ltd.]							
HX30002-4WA		HX30002-4	P	HX30002-2	2WA	HX300	02-2P	HX30001-PT

4.3. Signal interface schematic diagram



5. User Guide

5.1 Electrical connection diagram





5.2. Product Installation

- 5.2.1 Flatness of mounting table: The flatness of the power mounting table must be ≤ 0.2 mm.
- 5.2.2 Thermal conductive material: Apply thermal conductive silicone grease to the bottom of the power supply heat sink. The thermal conductivity of the silicone grease should be ≥ 1.0 W/m.K.
- 5.2.3 Clean the installation surface: The bottom of the power supply heat sink and the corresponding power supply mounting platform surface are clean and free of foreign matter.
- 5.2.4 Stencil printing: Use stencil printing to apply thermal grease to the bottom of the power supply heat sink.

The recommended steel mesh thickness is 0.45mm, and the window opening rate is about 50% (square window is 4.5mm*4.5mm, with a spacing of 1.8mm). As shown in the figure.



- 5.2.5 After printing the thermal grease on the bottom of the power supply heat sink, place the power supply on the mounting table, apply appropriate pressure, and move the power supply slightly back and forth and left and right to evenly distribute the thermal grease and fill the gaps.
- 5.2.6 viii. Align the mounting holes, tighten the fixing screws, and secure the power supply. The number of screws and recommended screw types are shown in the following table.

Mounting Screws	Mounting hole diameter	Φ6.3			
	Number	4			
	Recommended screw type	M5 hexagon socket combination			
		screw			

5.2.7 Tightening torque requirements: Use appropriate torque for installation based on screw size, connection method, etc. See the table below for details:

Specifications Tightening to				rque (torque range: ±10%)/(unit: Kgf.cm)					
Major	Subclass	Plastic-	Steel-	General Connections		High density connection			
categories		Plastic	Plastic Copper- Copper	Steel- Steel	Copper-cast aluminum Steel- aluminum profile	Steel- Steel	Steel-cast aluminum Steel- copper	Steel- Aluminum Profile	
Hexagon	M3	1.5	3	5.5	5	10	8	6	
socket	M4		6	12	10	16	14	12	
5010 W	M5		10	20	13	30	28	20	
	M6		15	30	28	50	48	30	
	M8					80	80	-	



5.3. Thermal Design Guidelines



① The heat dissipation shell can be designed through theoretical calculation or thermal simulation, and the actual measurement of the point temperature meter shall prevail.

(2) At rated input and rated output, the maximum temperature of each point on the radiator surface minus the ambient temperature should be $\leq 40^{\circ}$ C after 1 hour.

③ The heat dissipation contact surface between the radiator and the module should be flat, smooth, free of foreign matter and oil. The contact surface should be seamless when placed naturally.

④ If the radiator is a cast aluminum part, the contact surface between the radiator and the module aluminum groove must be CNC processed to ensure good contact.

(5) The contact surface between the modular radiator and the module should be evenly coated with silicone grease in an appropriate amount.

(6) When designing the radiator, ensure that the thickness of the radiator at the contact surface between the module and the radiator is greater than or equal to 4mm.

project	Technical indicators	Remark
Crystal	+ 0.15%	In the operating temperature
tolerance	- 0.1370	range
Communica	Configurable through background software,	Tolerance is ± 0.375 Kbit/s
tion rate	configuration will not be lost after power failure	
Sampling	The sampling point should be set close to but	
point	not later than $7/8$ of the bit time.	

5.4. CAN Communication Protocol



Transcaiver	Maxim	um	transceiver	"ring	delay"	(from	CAN transceivers should comply
Transcerver	transmi	t to 1	receive) is 30	0 ns	with ISO 11898-2 standard		
Terminal	The DO	C-DO	C CAN com	munica	tion circ	cuit has	a 120 ohm terminal resistor by
resistance	default.						
Default	CAN						
communicatio	on	ΤB	D				
protocol							

5.5 Multi-machine parallel operation instructions

The DCDC module has its own CAN bus current sharing logic, which can achieve current sharing without masterslave for up to 8 units. The current sharing modules must be of the same model, and the addresses must be assigned through the DIP switches on the modules. The DIP switch positions and address assignment tables are as follows:



Backend software	2001 Setup v2.0		
coding			
Backend software	CAN communication	Baud rate 125K/250K/500K adjustable	
communication			
method			
Installation and			
usage help			
		上位机使用说明.pdf	
Support CAN box	1. Beijing AiTai		
Brand 1	USBCAN-2I	USBCAN Driver for Windows 10-amd64-1.0.1.exe	
	2. Beijing AiTai		



		USBCAN-I				
	Support CAN box Brand 2	x TBD				
5.7	Troubleshooting	and confirmation				
	Fault phenomenon	Common causes of failure		troubleshooting		
	No power output	High voltage input is abn reverse connection)	ormal (no or	Check whether the high voltage input is normal		
		12V voltage input port is voltage, over/under volt connection)	abnormal (no age, reverse	Check whether the 12V voltage input port is normal		
		Output disconnection	Output disconnection			
	DC-DC No message	The signal connector is r properly	Reseat the signal connector			
	-	CAN line is connected rever	sely	Adjust the CAN line sequence		
		Communication protocol do	es not match	Compare whether the protocols match		
		Baud rate mismatch		Compare baud rates to see if they match		
	The high voltage input	Input short circuit		Check whether the high voltage input is normal		
	fuse of the powerInput over/under voltage, output over/under voltage, over temperature, output short circuit/over currentisdamaged.The product reports a faultatal		Check input voltage, output for overcurrent/short circuit, turn off power, let stand for 10 minutes, if still faulty, contact the manufacturer.			
	Over temperature	Air-cooled machine: fan is duct is blocked	blocked or air	Check the fan and air duct		
	fault	Water-cooled machine: no coolant temperature is too hi	Check whether the coolant is normal			

6 User Instructions and Precautions

Please pay attention to the warning and precautions before using the product. Improper operation may cause electric shock damage or fire. Please make sure you have read the warnings and precautions before using the product.

Warning:

It is strictly forbidden to disassemble the product for repair, debugging, and modification without authorization; When the power is on, please keep your hands and face away from the product to avoid accidental injury; There is high voltage and high temperature inside the product. Please do not touch the internal components, which may cause electric shock or burns;

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

Connectors that meet the specifications must be used to ensure that each plug and socket is tightly connected. Looseness may cause local heating and fire;

Please use the power supply within the technical parameters. If it is used beyond the range, it may cause product damage;

Please avoid placing the product in a rainy place for a long time;

Please make sure that the casing is intact before installation. If it is damaged, please replace it immediately or contact the manufacturer.

Version: V0 File No.: SPEC-DC-P-016-0 Notes:

Confirm that the product input/output terminals and signal terminals are correctly connected according to the product manual; when wiring, please cut off the input power and never plug or unplug the connector with power on;

This power input/output terminal requires an external fuse or other overcurrent protection device;

The possible electrical hazards at the output terminal when the product is used must be considered to ensure that the end product user will not touch the product; the terminal equipment manufacturer must design a corresponding protection plan to ensure that there will be no danger due to accidental contact between the power terminal by engineers or tools during operation;

Once the safety protection of the equipment is damaged, the equipment must be stopped and handled in accordance with relevant maintenance regulations.

When the power supply equipment is transferred from a cold environment to a warm environment, condensation may cause leakage hazards, so the grounding requirements must be strictly enforced;

Only qualified personnel can connect the equipment to the power supply.

After cutting off the power supply, the machine must be shut down for five minutes to allow the capacitor to have sufficient discharge time before the power supply equipment can be maintained.

Pay attention to safety in use: avoid touching with your hands where there are safety warning signs and high-voltage signs to avoid electric shock and burns.

7.Reference standards and specifications

GB 14023-2011 Limits and methods of measurement of radio disturbance characteristics of vehicles, ships and devices driven by internal combustion engines

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

GB/T 17626.3-2006 Electromagnetic compatibility test and measurement technology 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 (impact) immunity test

GB/T 17619 1998 Electromagnetic radiation immunity limits and measurement methods for electronic and electrical components in motor vehicles

GB/T 18384.3-2015 Electric vehicles - Safety requirements - Part 3: Protection of personnel against electric shock

GB/T 18387-2008 Limits and measurement methods of electromagnetic field emission intensity of electric vehicles, broadband, $9 \text{KHz} \sim 30 \text{MHz}$

GB/T 18487.2-2001 Electric vehicle conductive charging system Electric vehicle connection requirements for AC and DC power sources (doc)

GB/T 18487.3-2001 Electric vehicle conductive charging system Electric vehicle connection requirements for AC and DC power sources (doc)...

GB/T 18488.1-2015 Drive motor systems for electric vehicles Part 1: Technical requirements

GB/T 18655-2010 Limits and methods of measurement of radio disturbance characteristics of ships and internal combustion engines for the protection of on-board receivers

GB/T 19826-2014 General technical conditions and safety requirements for DC power supply equipment in power engineering

GB/T 21437.2-2008 Road vehicles - Electrical disturbances caused by conduction and coupling - Part 2: Electrical transients conducted along power supply lines

GB/T 2423.1-2008 Environmental testing for electric and electronic products Part 2: Test methods Test A: Low temperature

GB/T 2423.2-2008 Environmental testing for electric and electronic products Part 2: Test methods Test B: High temperature

GB/T 2423.3-2006 Basic environmental test procedures for electrical and electronic products - Test Ca: Steady Version: V0

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state damp heat test method;

GB/T 2423.4-2008	Basic environmental test procedures for electrical and electronic products - Test Db: Cyclic		
damp heat test method			
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/Test Ea and		
guidance: Bump			
GB/T 2423.8-1995	Environmental testing for electric and electronic products, Part 2: Test methods/Test Ed:		
Free fall			
GB/T 2423.10-2008	Environmental testing for electric and electronic products, Part 2: Test methods/Test Fc and		
guidance: Vibration (sinusoidal)			
GB/T 2423.22-2012	Environmental testing for electric and electronic products, Part 2: Test N: Temperature		
changes			
GB/T 24347-2009	Electric vehicle DC/DC converter		
GB 4208-2008	Enclosure protection degree (IP code)		
QC/T 413-2002	Basic technical requirements for automotive electrical equipment		
GB 9254-2008	Limits and methods of measurement of radio disturbances for information technology		
equipment			

8.Packaging, transportation and storage

Product packaging information is as follows:

	Single module net weight Kg	1.5Kg
Packing quantity and box	External dimensions of packaging box (mm)	412*512*227
information	Number of modules per box	18
	Total weight after packaging Kg	28Kg

The packaging box should have the product name, product model, and manufacturer name; the technical documents supplied with the product in the packaging box should include the product factory certificate.

The product should be transported in a sturdy packaging box, and the outer packaging box should comply with the relevant national standards and should have signs such as "handle with care" and "moisture-proof". The packaging box containing the product is allowed to be transported by various means of transportation. During transportation, direct rain and snow and mechanical impact should be avoided. The transportation

Mark is attached, as shown in Figure 7-2 below:









Transport mark

When the product is not in use, it should be stored in the packaging box. The warehouse environment temperature is -10-40°C and the relative humidity is not more than 80%. No harmful gases, flammable and explosive products and corrosive chemicals are allowed in the warehouse. There is no strong mechanical vibration, impact and strong magnetic field. The packaging box should be at least 20cm above the ground and at least 50cm away from the wall, heat source, window or air inlet. The storage period under these conditions is generally 2 years. After more than 2 years, it should be re-inspected.

The product should be stored in a ventilated and dry place. At the same time, it must be kept away from high temperature sources, fire sources and chemicals. Store neatly and avoid throwing and smashing.