

Specification Manual

Part	DC/DC Converter
Model	TCDUN5000202
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Revision

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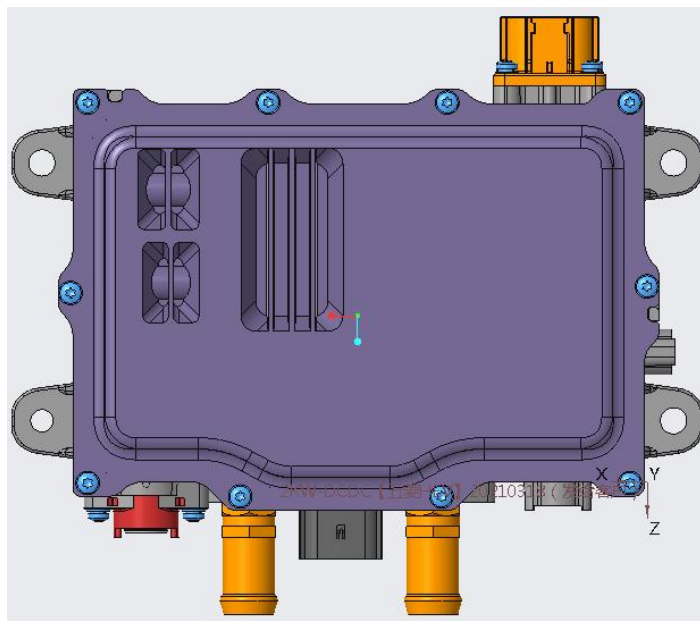
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1. Overview

1.1 Abstract

This DC/DC converter is specially designed and developed for new energy battery vehicle. It has the characteristics of high integration and high power density. The main function of dc/dc is to convert the high-voltage power of the battery pack into 14V low-voltage power to supply power to the automotive accessory system. The product adopts cast aluminum shell and connector, and the protection grade reaches IP67.



1.2 Terminology

No.	Abbreviations	Description
1	BMS	Battery Management System
2	ADS	Auto-Disconnect System
3	SOC	State of Charge
4	CAN	Controller Area Network
5	ECU	Electronic Control Unit
6	EV	Electric Vehicle
7	OBC	On Board Charger
8	DCDC	DC-DC Converter
9	PDU	Power Distribution Unit
10	HV	High Voltage
11	LV	Low Voltage
12	CC	Constant Current
13	CV	Constant Voltage
13	MCU	Motor Control Unit
14	VCU	Vehicle Control Unit
15	CAN	Controller Area Network
16	UDS	Unified Diagnostic Services
17	ASIL	Automotive Safety Integrity Level
18	HVIL	High Voltage Interlock Loop

1.3 Major function Introduction

1.3.1 DC-DC Converter function

By receiving the control signal from the vehicle controller, the DCDC converter converts the high voltage of the power battery to the low voltage 14V output to meet the charging and load requirements of the subsequent on-board battery, and can realize its own state and load state feedback.

1.3.2 Self diagnosis and multiple protection functions

It has the functions of self diagnosis, input and output overvoltage, undervoltage protection, output short circuit protection, hardware fault protection, over-temperature protection and recovery of the whole machine;

1.3.3 Cooling Way

Liquid cooling

2. Standards Reference

No.	Standard/File	Standard/File Name
1	GB/T 24347-2009	The DC/DC Converter for Electric Vehicles
2	GB/T 18488.1-2015	Drive Motors System for Electric Vehicles - Part 1: Specification
3	GB/T 18384.2-2015	Electrically propelled road vehicles-Safety specification Part 2: Vehicle operational safety means and protection against failures
4	GB/T 18384.3-2015	Electrically propelled road vehicles-Safety specification Part 3: Protection of persons against electric shock
5	GB/T 18487.1-2015	Electric vehicle conductive charging system Part 1: General requirements
6	GB/T 2423.1	Environmental testing for electric and electronic product Part 2: Test method-Test A Cold
7	GB/T 2423.2	Environmental testing for electric and electronic product Part 2: Test method-Test B: Dry heat
8	GB/T 2423.10	Environmental testing for electric and electronic products Part2: Test methods Test Fc and guidance: vibration (Sinusoidal)
9	GB/T 2423.17	Environmental testing for electric and electronic products Part2: Test methods Test Ka: Salt mist
10	GB/T 2423.22	Environmental testing for electric and electronic products- Part 2; Test methods Test N: Change of temperature
11	GB/T 28046.2	Road vehicles-Environmental conditions and testing for electrical and electronic equipment-Part 2: Electrical loads
12	GB/T 17619—1998	Limits and methods of testing for immunity of electrical/electronic sub-assemblies in vehicle to electromagnetic radiation
13	GB/T 4094.2—2005	Electric vehicles-Symbols for controls, indicators and tell-tales
14	QC/T 413-2002	Vehicles electronic equipment basic technical condition
15	IEC 61851—1	Electric vehicle conductive charging system Part 1: General requirement
16	GB 14023—2011	Vehicles, boats and internal combustion engine-Radio disturbance characteristics- Limits and methods of measurement for the protection of off-road receivers
17	GBT 18387—2017	Limits and test method of magnetic and electric field strength from electric vehicles, Broadband, 9KHZ—30MHZ related requirement

3. Application Environment

Environmental conditions for this part:

No.	Item	Technical Indicators	Unit	Remark
1	Operation Temperature	-40~85	℃	Coolant no more than 65℃
2	Storage Temperature	-55~100	℃	Without power supply
3	Relative Humidity	5~95	%RH	No condensation, no frosting
4	Protection Level	IP67		
5	Cooling Way	Liquid cooling		
6	Vibration Level	Meet GB/T24347-2009		
7	Noisy Level	65	dB	Meet GB/T24347-2009
8	Salt spray Level	Meet QC/T2423.17-2011		
9	Altitude	3000	m	GB/T16935.1-2008

4. Technical Specification

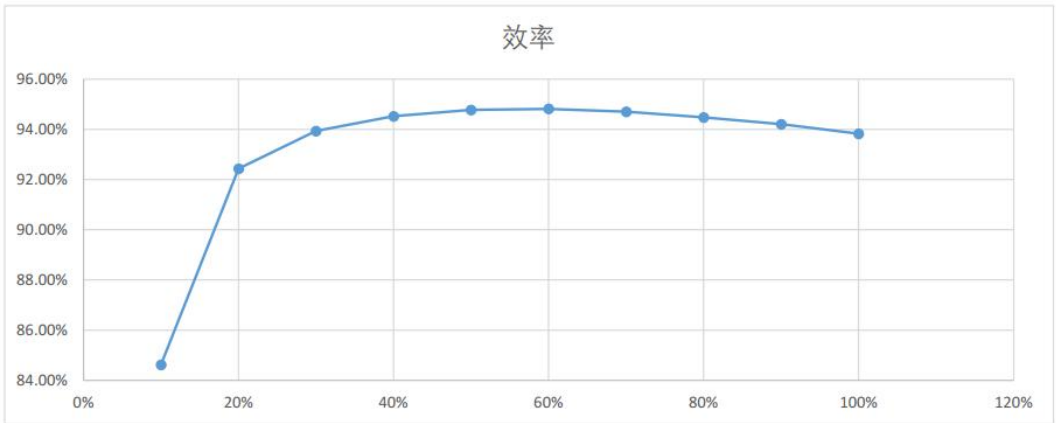
5. 4.1 DC/DC Specification parameters

Item	Min	Typ	Max	Unit	Remark
DC/DC Parameter					
1、 Input					
Input voltage range	206	-	454	Vdc	
2、 Output					
Output voltage range	13.6		14.0	Vdc	
Nominal output current	-	143	-	A	
Peak output current	-	172	-	A	1.2 times of rated output current
Output power	-	2000	-	W	
Output peak power	-	-	2400	W	Working time≤6 minutes
DC efficiency	93	-	-	%	Rated input voltage, load more than 30%
Output voltage rising time			300	mS	Time for output voltage from 10% to 90%
Output static current	-	-	1	mA	Output voltage is 14V
3、 Protection parameters					
Input over voltage protection point	425		435	Vdc	Shut off output
Input voltage recovery point	420		430	Vdc	
Input low voltage protection point	225		235	Vdc	Shut off output
Input low voltage recovery point	230		240	Vdc	
Output over voltage protection level	15		16	Vdc	15-16VDC, turn off, 15VDC automatic recovery
Output low voltage protection point	6		7	Vdc	6-7VDC, turn off, 9VDC automatic recovery
Over temperature protection		95		℃	DC/DC internal CPU inspect DC/DC internal temperature, when reach to this point, power goes down and derating output
		110		℃	DC/DC internal CPU inspect DC/DC internal temperature, when reach to this point, DC/DC shut off
Output over current protection	>178			A	This value is for the hardware, it can be adjusted by the firmware

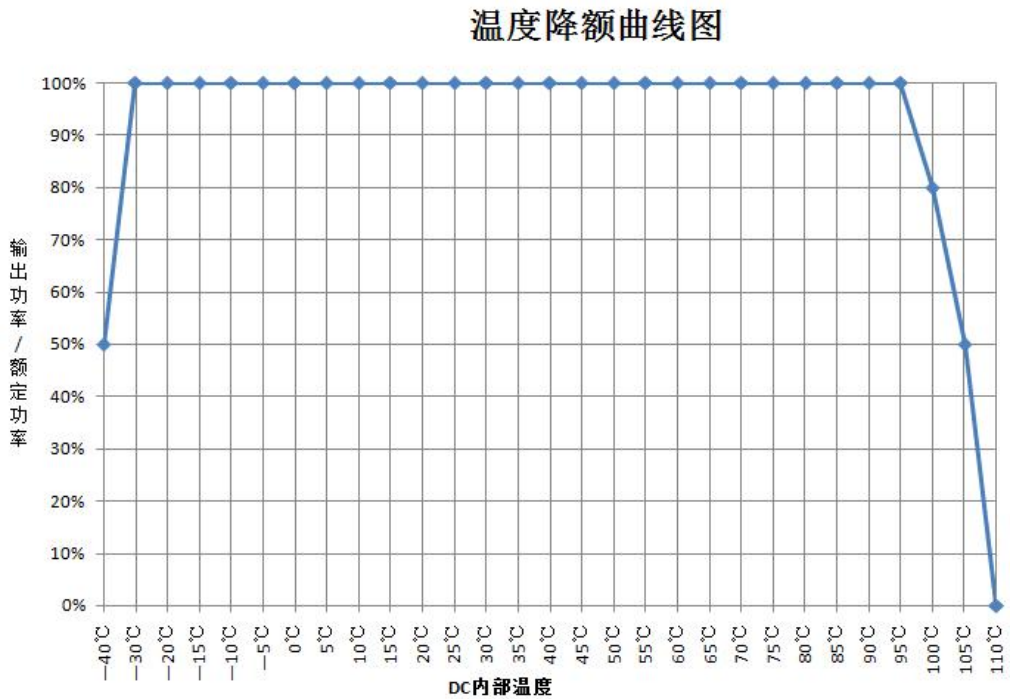
4.2 DC-DC output efficiency and temperature derating curve

峰值效率 94.82%
平均效率 93.24%
100%效率 93.83%

350V	负载额度	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	输出电压	13.99	13.95	13.96	13.89	13.92	13.89	13.87	13.85	13.83	13.81
	输出电流	14.2	28.4	42.6	56.8	71	85.2	99.4	113.6	127.8	142
	输入电压	349.96	349.94	349.93	349.92	349.91	349.88	349.88	349.86	349.84	349.83
	输入电流	0.6706	1.2245	1.8086	2.3847	2.9792	3.5671	4.1603	4.7592	5.3631	5.9737
	效率	84.63%	92.44%	93.94%	94.53%	94.78%	94.82%	94.71%	94.48%	94.21%	93.83%



DC efficiency curve



DC temperature derating curve

4.3 Low voltage port parameters

Low voltage port parameter			
	Pin	Status	Remark
Signal port	CAN_H		
	HVIL 1		
	KL15(DCDC WAKE UP)		
	CAN_L		
	HVIL 2		

4.4 Safety performance and others

Item		Technical Indicator	Unit	Remark	
Safety Performance					
Electrical Strength	DC high voltage—DC low voltage (housing is the grounding	2000VAC≤10mA 1min		No breakdown and flashover	
Insulation Resistance	DC high voltage—DC low voltage (housing/ grounding	Resistance≥20MΩ test voltage 1000VDC		No breakdown and flashover	
Grounding Resistance	Grounding wire to housing-DC low voltage (housing/grounding)	≤0.1	Ω	The resistance between the grounding point and the radiator is less than 100 milliohms, and the test current is 25A AC	
Creepage Clearance		Meet GB/T18488.1-2001table 3			
Electrical Clearance		Meet GB/T 18488.1-2001table 3			
MTBF		128000	h	Ambient temperature25℃	

4.5 EMC

Test Item	Standard Reference	Performance Index	Criterion	Remark	
1、EMI test					
Conduction Emission	GB/T 18655-2010	Level 3			
Radiation Emission	GB/T 18655-2010	Level 3			
2、EMS test					
Conduction Emission		10LIVE3 0.15-80MHz	A		
Radiation Emission	GB/T 18487.3-2001 GB/T 17626.3-2006	3V/m 80-1000MHz	A		

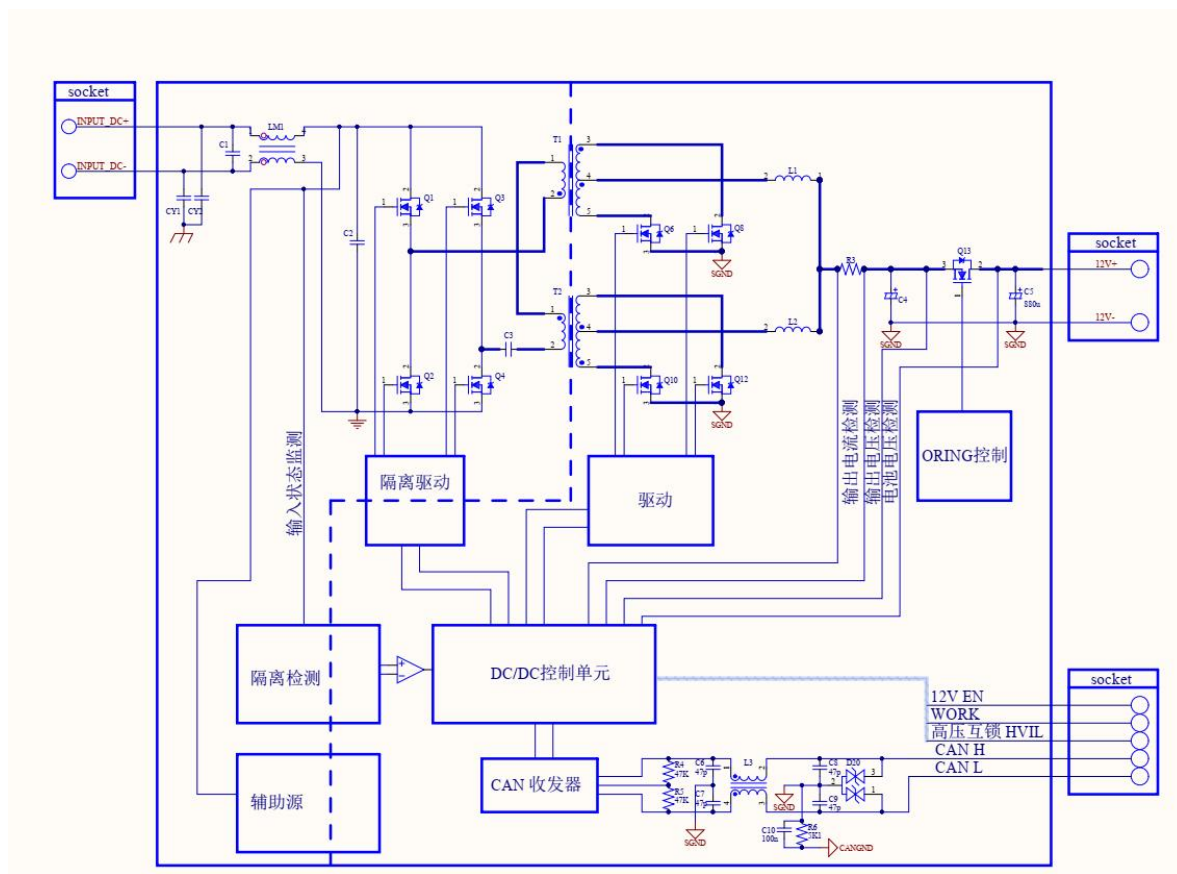
Definition of criteria:

A: The test process indicators are within the specification range

B: After the test, it can be automatically restored to the specification range

C: After the test, it can be restored to the specification range manually

4.6 Block Diagram



5 Connector Informatin

5.1 Low voltage port

Signal Port

Connector Name	Part Side Connector		Mating Connector (wiring harness)		Remark
	P/N	Supplier	P/N	Supplier	
Signal connector	477256010	Molex		Molex	

Signal Pin Definition

No.	Pin No.	Description	Wire section area	Wire color	Remark
1	3	CANH	0.5	Blue	
2	5	HVIL	0.5	Black	
3	7	KL15 (hard wire ACC)	0.5	Brown	
4	9	CANL	0.5	Yellow	
5	11	HVIL	0.5	Black	
6	Others				

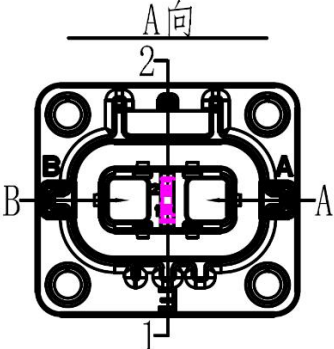
5.2 DC output

DC Positive Port

Connector Name	Part Side Connector		Mating Connector (wiring harness)		Remark
	P/N	Supplier	P/N	Supplier	
DC Output positive	DC0-15	TC Charger		/	Bolt M8*16。 Torque 9-11N.m

5.3 High Voltage Input Port Definition

DC Input Connector

Connector Name	DC Input		Connector P/N	Socket	Jonhon EVH2-M2ZJ-RE
				Plug	Jonhon EVH2-M2TK-RDE
Pin No.	Wire	Color	Definition		
A	4 mm ²	black	Negative		
B	4 mm ²	red	Positive		
1	0.5 mm ²	grey	HVIL+		
2	0.5 mm ²	brown	HVIL-		

6.Mechanical Parameters

6.1 Installation dimensions and specifications

Please find the drawing in the end

6.2 Appearance

The surface of parts shall be smooth and free from defects such as delamination, rust, crack, spot, burr, deformation and hand accessible concave convex phenomenon. The connectors shall be complete, and the parts shall be fastened and reliable without rust, burr, crack and other defects and damages. The connector sheath and pins shall be intact without damage, and all parts shall be firmly connected.

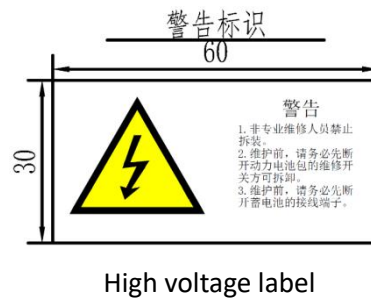
6.3 重量

No.	Part Name	Part Number	Net Weight (kg)	Remark
1	DC/DC Converter		2.5±0.1kG	

7.Warning signs, Packaging, Transportation and Storage

7.1.Warning Signs

Below is for reference:



7.2.Package

No.	Product	Quantity	Unit	Remark
1	DC/DC Converter	1	PIECE	1PC/1CARTON

7.3.Transportation

The product shall be transported in a firm packing box, which shall comply with the provisions of relevant national standards and shall be marked with "handle with care" and "moisture-proof". The packaging box containing the product can be transported by various means of transportation. Direct rain and snow and mechanical impact shall be avoided during transportation.

7.4.Storage

The products shall be stored in the packing box when not in use. The ambient temperature of the warehouse shall be -10-40 ℃ and the relative humidity shall not be greater than 80%. There shall be no harmful gas, flammable, explosive products and corrosive chemicals in the warehouse, and there shall be no strong mechanical vibration, impact and strong magnetic field. The packing box shall 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 the specified conditions is generally 2 years, and the inspection shall be carried out again after more than 2 years. The product shall be stored in a ventilated and dry place. At the same time, high temperature sources, fire sources and chemicals must be avoided. Store neatly to avoid throwing.

8. Safety Guide

Warning: remind the user that the operation is dangerous

- * it is strictly prohibited to disassemble and refit the on-board charger for repair or commissioning
 - * do not place the parts in the rain
 - * please confirm that the housing is intact before installation. If it is damaged, please replace it immediately or contact the after-sales service department
 - * all plugs and sockets shall be connected firmly. If they are damaged or loose, please replace them immediately
 - *It is strictly prohibited to plug and unplug the connector when the product is powered on, otherwise personal injury may be caused
 - *It is strictly prohibited to open the product shell during the power on operation of the product, otherwise personal injury may be caused
 - *it is strictly forbidden to touch the high-voltage live parts of the product with bare hands. Please wear insulating gloves, insulating shoes, Insulating clothing, live maintenance and detection are strictly prohibited
 - *During the replacement of fuses and contactors, barbaric operation is strictly prohibited to avoid damaging the product and causing potential safety hazards
 - *three core cable with grounding wire shall be selected for AC power supply, and the grounding wire shall be correctly installed
 - *please unplug the power plug if there is abnormal sound or smell during the operation of the charger
 - *please keep away from fire sources and inflammables and explosives when the battery is normally charged
 - *do not charge damaged or non rechargeable batteries
- Note: remind the user that the following operations are important operations of the product
- *do not block the air inlet and outlet of the charger to prevent overheating
 - *please make sure that the output cable is not too long to avoid the impact of line voltage drop on charging
 - *please disconnect the power cord and charging plug when moving the charger
 - *the battery voltage must be consistent with the nominal voltage of the charger
 - *avoid collision, compression, pulling, twisting or shaking the charging cable
 - *the product should be placed in a safe, ventilated, dust-free and rain free environment
 - *please pack and store if not used for a long time

Annex: Drawing

