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TSM-HV DCDC Converter Manual

V1.0 December 2020

Description: DC2512D-365-13.8/1500W Isolated

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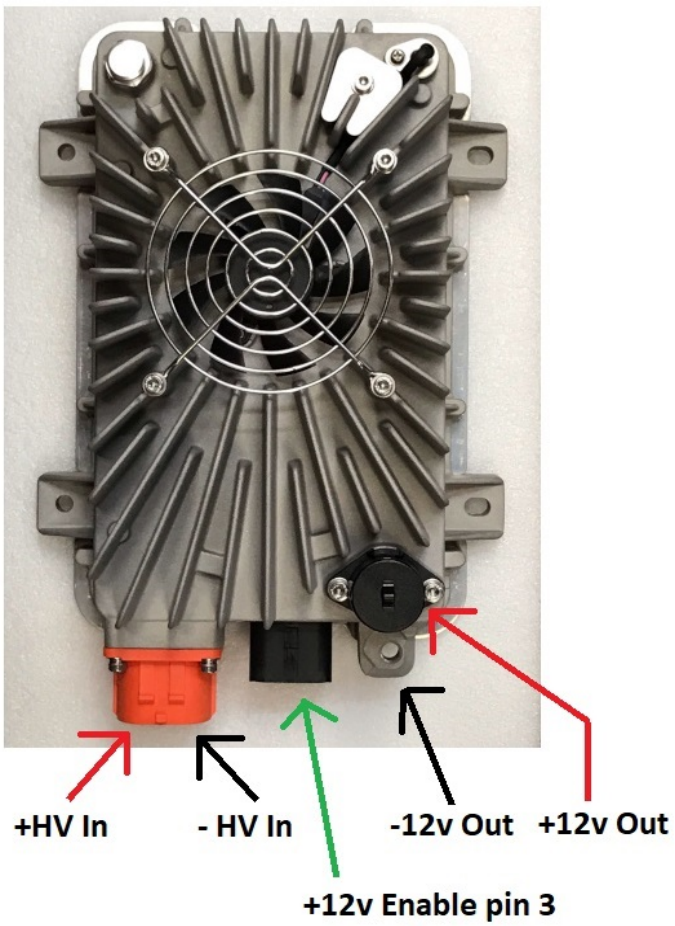
1.Overview

The TSM HV DCDC converter adopts advanced high-frequency power electronic conversion technology. It is a high-performance vehicle-mounted DCDC converter specially developed for electric vehicles with high voltage traction systems. Following are the main features:

1. Input and output are completely electrically isolated, safe and reliable
2. The highest conversion efficiency exceeds 95%
3. High power density and small volume
4. Uses multi-stage power conversion technology, compatible with a wide input voltage range
5. Uses soft switching technology to reduce power device losses and greatly improved EMC performance of the product
6. Air cooled IP67 rated aluminum case with mounting points
7. Utilizes dual controller digital architecture, with automatic protection and fault diagnosis functions
8. High peak power and strong overload capacity, meeting the usage requirements of impact loads
9. Includes optional CAN communication, BootLoader function, low voltage enable control, high voltage sleep and designated CAN message sleep function
10. Non-CAN operation is accomplished by connecting as shown in the diagram below



2.Environmental Conditions

Item	Parameter	Value	Unit	Remarks
1	Working Temperature	-40 to +85	℃	
2	Ambient Storage Temperature	-40 to +105	℃	
3	Relative Humidity	5 - 95	%	Non-condensing
4	Cooling Method	Air-cooled	-	Outside the Shell
5	Protection Class	IP67	-	Shell Part
6	Working Noise	＜60	dBA	Air Cooling System
7	Anti-vibration Leve	GB 413-2002 3.12	-	Requirements for Non-engine Parts

3.Electrical Performance

3.1 Input and Output Characteristics

Item	Parameter	Value	Unit	Remarks
1	Input Voltage range	280-450	Vdc	200~450
2	Input Current	6.8	A	
3	Input Inrush Current	8.2	A	Spikes Caused by X Capacitance in 0.5 ms, not Counted

Item	Parameter	Value	Unit	Remarks	
1	Rated Output Voltage	13.8±0.2	Vdc	Can be adjusted according to system requirements, the adjustment range is 10.8~15V	
2	Rated Output Power	1500	W	@Rated Input Voltage	
3	Peak output power	1800	W	@Rated Input Voltage	
4	Voltage Regulation	＜±1	%	Regulation Accuracy	
5	Load Regulation	＜±1	%		
6	Current Reporting Error	＜1	A	＜5A	Report Error
		＜0.5		>5A	
7	Voltage Reporting Error	＜0．2	V		
8	Current Control Error	＜1	A	Control Precision	
9	Voltage Control Accuracy	＜0．2	V		

10	Work Efficiency		＞94.5	%	40%~70% Load (Warm Up 2mi)
			＞94.0		70%~100% Load (Warm Up 2min)
			＞95.0		Highest Efficiency
11	Output current		130±2	A	
12	Output Ripple and Noise		＜240	mVp-p	20Mhz bandwidth, output connected to 10uF electrolytic capacitor and 0.1uF ceramic capacitor
13	Transient Response	Overshoot amplitude	＜5	%	30% -80% -30% load step change, amplitude 100A/ms
		Recovery Time	＜500	μs	
14	Output current while stand by		≤1	mA	Secondary-side MCU enables sleep and wake-up through hard wire to ensure current at the output while standby

4.Protection and Control Functions

Item	Parameter		Value	Unit	Remark
1	Hard-wired Enable Control	Signal voltage	9-16	Vdc	When the hard-wire enable signal is input to the DC-DC, the DC-DC is turned on (default sleep); when the signal is floating or grounded, the DC-DC is turned off (default sleep).
		Signal Current	2	mA	
2	Input undervoltage protection	Protection point	272±2	Vdc	Instant protection, automatic recovery
		Recovery point	278±2	Vdc	Instant protection, automatic recovery

3	Input Overvoltage Protection	Protection point	458±2	Vdc	Instant protection, automatic recovery
		Recovery point	452±2	Vdc	Instant protection, automatic recovery
4	Output Undervoltage Protection	Protection point	7.0±1	Vdc	Instant protection, automatic recovery
		Recovery point	9.0±1	Vdc	Instant protection, automatic recovery
5	Output Overvoltage Protection	Protection point	16.0±0.5	Vdc	Greater than protection point, turn off output
		Recovery point	15.5±0.5	Vdc	Less than recovery point, works normally
6	Output Current Limit Protection		130±2	A	When the output current increases to the current limit protection point, it enters the constant current voltage limit mode
7	Output Short Circuit Protection			-	Instant protection, automatic recovery
8	Input Reverse Connection Protection		DC-DC input does not start after reverse connection	-	

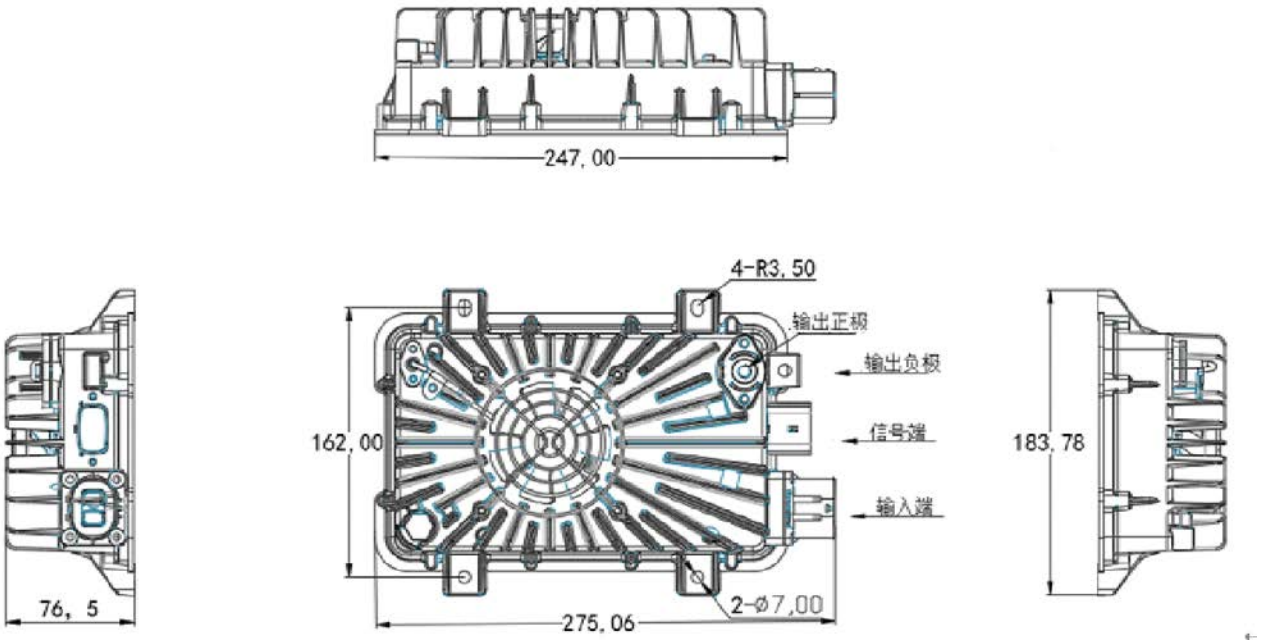
9	Overheat Protection	Power attenuation	100（Primary）/112（Secondary）	℃	When the temperature reaches the attenuation point, the module limits the power output; the power is attenuated at 8% / ℃! Meet one, derated output.
		Protection shutdown	110（Primary）/118（Secondary）	℃	Meet one, turn off the output voltage
		Protection Recovery	95（Primary）/90（Secondary）	℃	After meet all,work properly
10	CAN communication function		1. With BootLoader function, software can be updated by CAN communication; 2. Can report DC-DC working status, input voltage, output voltage, output current, hardware failure, communication failure and other information; 3. Support hard-wired and arbitrarily formulated message sleep and wake-up.		
	Logical function		If the customer has no special logic requirements, the default is: 1. Enable hard-line control of DCDC converter on / off, high level start; 2. Enable hard-wired control for DCDC sleep and wake up, high level wake up.		

5. Safety Regulations and EMC Characteristics

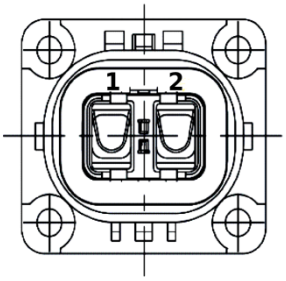
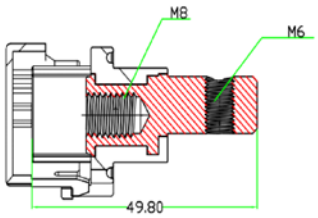
Item	Parameter		Value	Unit	Remarks
1	Withstand voltage	Input to Output	2120	Vdc	Leakage current ≤5mA, 1min, No breakdown, no flashover, basic insulation
		Input to Earth	2120	Vdc	
2	Insulation resistance	Input to Output	≥50	MΩ	Test Voltage 500Vdc
		Input to Earth	≥50	MΩ	
3	EMI	RE	GB / T 18655-2010, Chapter 6.4, CLASS 3 standard	-	
		CE			
4	EMS	Radiation Immunity	GB/T 6113.1	-	
		High Current Injection	ISO 11452-4: 2005 Article 7, 100mA		
		RF Immunity	ISO 11452-9		
		Conducted Immunity	ISO 7637-2: 2004 Article 5		
		Transient Conducted Immunity	ISO 7637-3: 2007 Article 3.4.2		
		Electrostatic Discharge	ISO 10650-2008		

6. Structure and Interface Description

6.1 Structure size diagram



6.2 Interface definition

Connector Pinouts				
Connector schematic	**Name**	**Pin definition**		**Specifications**
	High Voltage Input connector	Input+	1	REM-Z2PA-2.5-A
		Input—	2	
	DC Output Connector	Output+	NA	ACTB142-C-N
M8 screw hole		Output-	Case	M8 bolt

	Signal Connector	CANH	5	MOLEX 477259010
		CANL	6	
		Enable	3	
		Output Ground	1	

7. Precautions

1. Ensure that the input voltage is within the allowable input voltage range of the DC-DC converter.
2. The converter is not equipped with an HV input fuse. It is recommended that the module be equipped with 15A / 600V fuse at the HV battery when using the module.
3. Ensure that the input polarity is correct before connecting to the HV battery.
4. Ensure that the output polarity is correct before connecting to the 12V auxiliary battery.
5. The output side of the DCDC converter must be connected to a 12V auxiliary battery in order to operate.
6. Do not mix or reverse the input and output wires.
7. Avoid hot plugging the HV connector to avoid arcing. Due to the high power, make sure that the HV input connector is firmly connected before turning on the main power switch or contactor on the high-voltage side.
8. Disconnect output connections from the 12V auxiliary battery when EV system is powered down. Options include use of a KSI or other relay of adequate current.