Typical Features

- Wide input voltage range 2 : 1
- Efficiency 89% (Typ.)
- Low standby power consumption
- Operating Temperature from -40℃ to +105℃
- High isolation voltage 3000VDC(input-output) & 2100VDC(input-case)
- Input under voltage protection, output over current, over voltage, over temp. & short circuit protections
- Standard 1/2 brick size

ZBD300-280S28 A high-performance DC-DC converter specially designed for the railway field. Its rated input voltage 280VDC (full range from 185V to 425VDC), regulated single output 28VDC/300W without minimum load limit. It has the advantages of high isolation voltage, Max operating temperature up to 105°C, with input under-voltage protection, output over-current, over-voltage, over-temperature and short circuit protections, input remote control, output voltage distal end compensation and Trim, etc.

Typical Product List

Part No.	Input voltage range (VDC)	Output Power (W)	Output Voltage (VDC)	Output Current (A)	Ripple & Noise (mVp-p)	Full load Efficiency (%) Min/Typ.	Remark
ZBD300-280S28C	185-425	300	28	10.7	280	87/89	Positive logic Standard
ZBD300-280S28N							Negative logic Standard
ZBD300-280S28C-H							Positive logic With heat sink
ZBD300-280S28N-H							Negative logic With heat sink

Input Specifications

Item	Operating conditions	Min.	Typ.	Max.	Unit
Input current Max	Input 185VAC, full load output	--	--	2	A
No-load current	Rated input voltage	--	--	30	mA
Input inrush voltage (1sec. max.)	Unit could be permanently broken over this voltage	-0.7	--	450	VDC
Start-up voltage		--	--	180	
Under-voltage protection	With No-load (over current protection should start in advance at full load)	--	--	170	
Remote control (CNT)	Positive logic: CNT no connection or connected to 3.5-15V to turn on, connected to 0-1.2V to shut off the converter.			Reference voltage --Vin	
	Negative logic: CNT no connection or connected to 3.5-15V to turn off, connected to 0-1.2V voltage to turn on the converter.				

Output Specifications

Item	Operating conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Nominal input voltage, 0%-100% load	--	±0.2	±2	%
Line Regulation	Full load, input voltage from low to high	--	±0.1	±0.2	
Load Regulation	Nominal input voltage, 10%-100% load	--	±0.1	±0.2	
Transient recovery time	25% load step change (step rate 1A/50uS)	--	200	250	uS
Transient Response Deviation		-5	--	+5	%
Temperature Drift Coefficient	Full load	-0.02	--	+0.02	%/℃
Ripple & Noise	20M bandwidth, test with ≥220uF capacitor	--	200	280	mVp-p
Output voltage adjustment (TRIM)		19	--	32	VDC
Distal end compensation (Sense)		--	--	105	%
Over temperature protection	Maximum temperature of the Metal base	105	115	125	℃
Output over voltage protection		125	--	140	%
Output over current protection		11.7	--	15	A
Output short circuit protection		Hiccup, continuous, self-recovery			

General Specifications

Item	Operating conditions		Min.	Typ.	Max.	Unit
Isolation voltage	I/P-O/P	Test 1min, leakage current < 3mA	--	--	3000	VDC
	I/P-Case	Test 1min, leakage current < 3mA	--	--	2100	VDC
	O/P-Case	Test 1min, leakage current < 3mA	--	--	500	VDC
Insulation resistance	I/P-O/P	@ 500VDC	100	--	--	MΩ
Switching frequency			--	230	--	KHz
MTBF	MIL-HDBK-217F@25℃		150	--	--	K hours

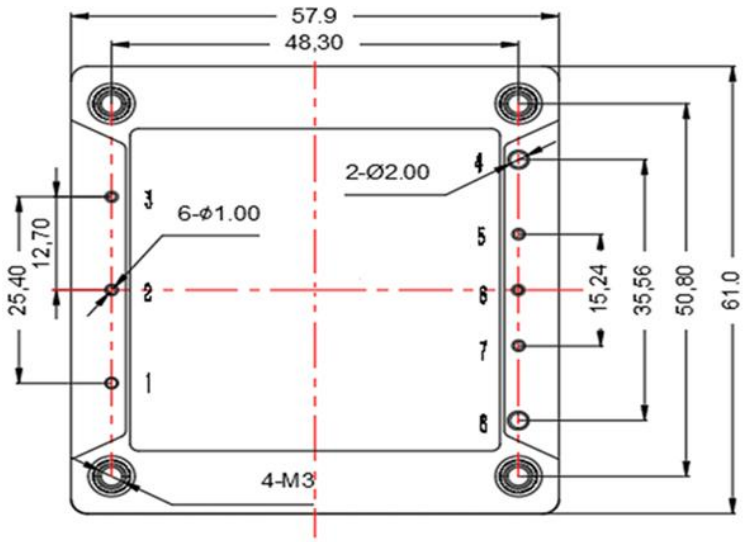
Environmental characteristics

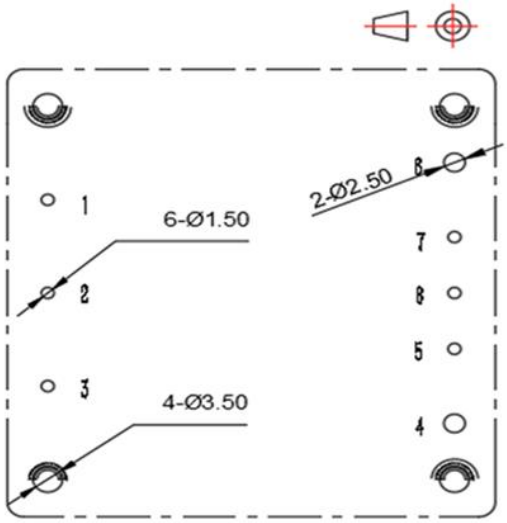
Item	Operating conditions	Min.	Typ.	Max.	Unit
Operating Temperature	Refer to the temperature derating graph	-40	--	+105	℃
Storage Humidity	No condensing	5	--	95	%RH
Storage Temperature		-40	--	+125	℃
Pin Soldering temperature	1.5mm from the case, < 1.5S	--	--	+350	

EMC Performances (EN50155)				
EMI	CE	EN50121-3-2	150kHz-500kHz 79dBuV	
		EN55016-2-1	500kHz-30MHz 73dBuV	
	RE	EN50121-3-2	30MHz-230MHz 40dBuV/m at 10m	
		EN55016-2-1	230MHz-1GHz 47dBuV/m at 10m	
EMS	ESD	EN50121-3-2	Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	EN50121-3-2	10V/m	perf. Criteria A
	EFT	EN50121-3-2	±2kV 5/50ns 5kHz	perf. Criteria A
	Surge	EN50121-3-2	Line to line ± 1KV（42Ω, 0.5μF）	perf. Criteria A
	CS	EN50121-3-2	0.15MHz-80MHz 10 V r.m.s	perf. Criteria A

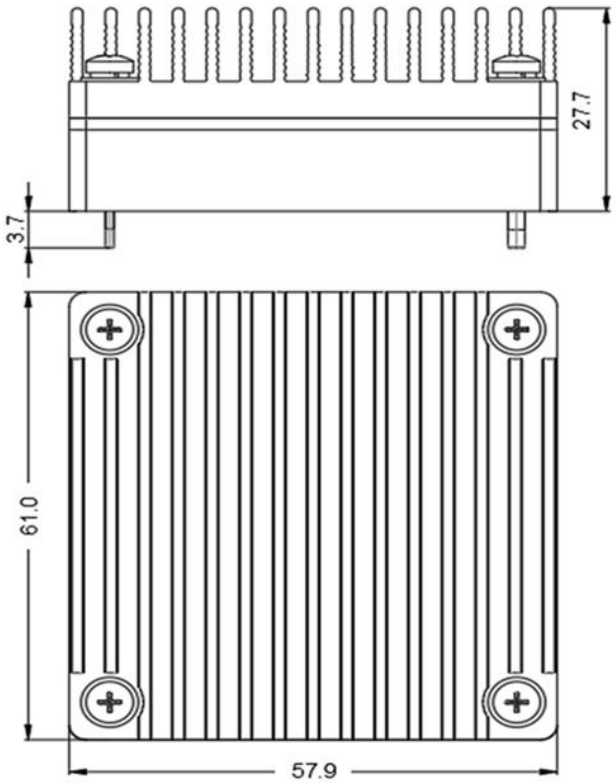
Physical Characteristics	
Case Materials	Metal bottom shell + Plastic case in black with flame class UL94 V-0
Heat Sink	Dimension 61.0x57.9x15.0mm, weight 74g, Aluminum alloy, anodized black
Cooling Method	Conduction cooling or forced air cooling with fan
Weight	Standard 125g, with heatsink 203g

Mechanical Dimensions and Pin-out function description

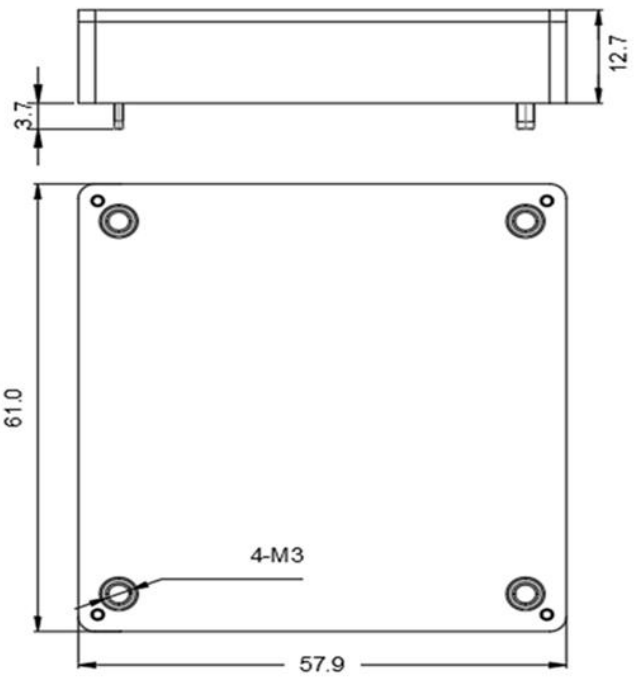




Recommended holes for PCB

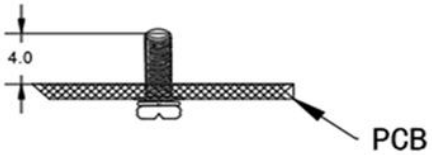


Standard+Heat sink
61.0x57.9x27.7mm



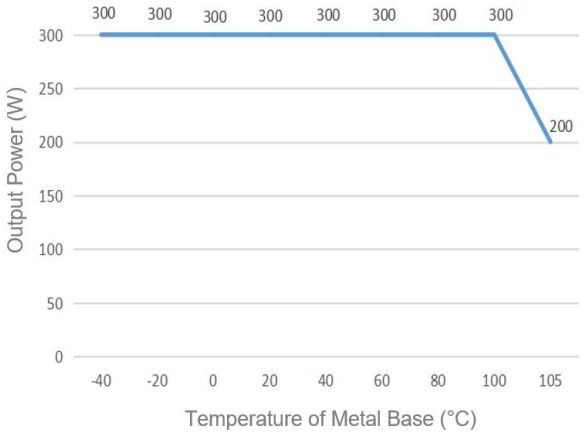
Standard
61.0x57.9x12.7mm

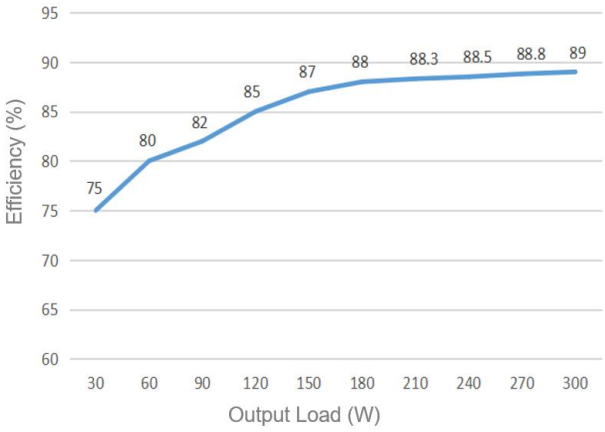
Note:
Unit: mm
Pin 1,2,3,5,6,7 diameter: 1.00mm
Pin 4,8 diameter: 2.00mm
Tolerance: X.X ±0.50mm, X.XX ±0.10mm
Screwing torque: 0.4N.m Max



Pin No.	1	2	3	4	5	6	7	8
Function	+Vin	CNT	-Vin	-Vout	-Sense	TRIM	+Sense	+Vout

Product Characteristics Graphs





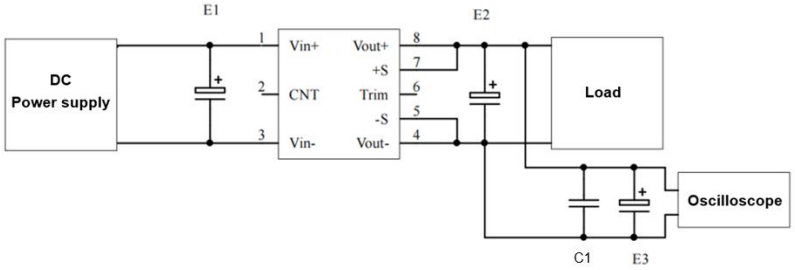
Note:

1. Both the output power and efficiency in the graphs had been tested with typical values.
2. The data in temperature derating graph had been tested at Aipu laboratory test conditions. It is recommended to keep the temperature of the Metal base not more than 100 °C when the converter operates at the rated load for the customer application.

Recommended circuits for application

1. Ripple & Noise

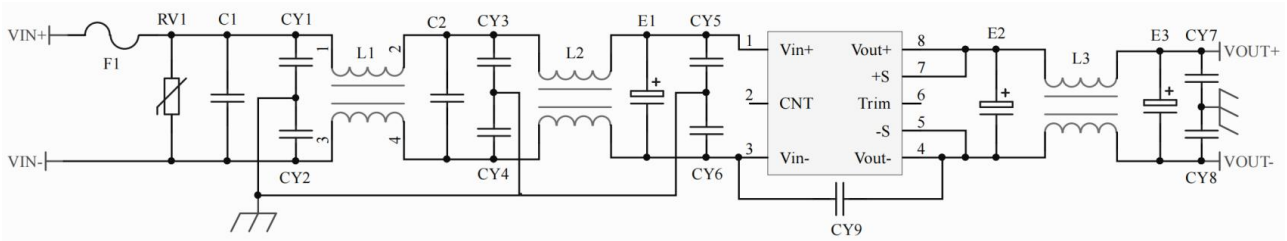
All the products will be tested according to this circuit diagram below before shipping.



Capacitance / Output Volt.	E1 (μF)	E2 (μF)	C1 (μF)	E3 (μF)
3.3VDC	100	1000	1	10
5VDC		680		
12VDC		220		
.....				
48VDC				
.....	68	68		
110VDC				

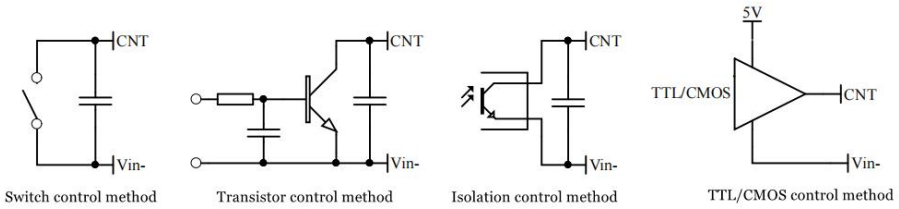
2. Recommended circuit diagram for application

If this circuit recommended below is not adopted, an electrolytic capacitor≥100 μF should be connected at the input to suppress the possible surge voltage.



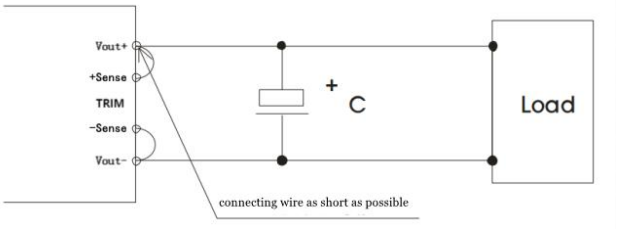
F1	T10A/250Vac FUSE
RV1	14D 560V Varistor
C1, C2	105/450V Polyester film capacitor
CY1, CY2, CY3, CY4, CY5, CY6	472/250Vac Y2 capacitor
CY7, CY8	103/2KV Ceramic capacitor
CY9	471/250Vac Y2 capacitor
E1	100μF/450V Electrolytic capacitor
E2，E3	220μF/35V Electrolytic capacitor
L1, L2	>10mH, temperature rise less than 25° @3A
L3	>1mH, temperature rise less than 25° @10A

3. Recommended circuits for the Remote control (CNT)



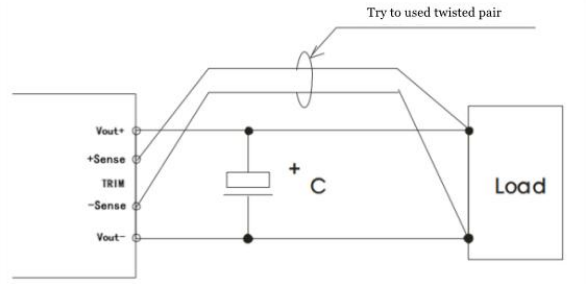
4. Application for Sense

1) With NO distal end compensation



Note:
1. Vout+ & Sense+, Vout- & Sense- should be shorted when distal end compensation is not needed
2. The lead wire between Vout+ and Sense+, Vout- and Sense- should be as short as possible, and close to the pins, or else the output may be unstable.

2) With distal end compensation



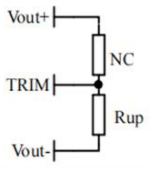
Notes:
1. The output voltage may be unstable if the compensation cables are too long.
2. The twisted pair or shielded cables are recommended, the cable length should be as short as possible.
3. Wide copper path on PCB or thick lead wires between the power supply and the load should be used to achieve the line voltage drop <0.3V. The target is to keep output voltage within the specified range.
4. The leads wire resistance may create the output voltage oscillation or larger ripples. Please verify it before to use.

5. TRIM and calculation of TRIM resistance

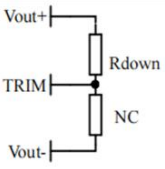
The calculation of △U and Rup & Rdown:

Rup=50/△U-5.1（KΩ）

Rdown=20*(28-2.5-△U)/△U -5.1（KΩ）



Voltage-up: Add Rup between Trim and Vout-



Voltage-down: Add Rdown between Trim and Vout+

6. This product is not available for connection in parallel to increase the output power. Please contact Aipu technician for this kind of requirement.

Others

1. The product warranty period is two years. The failed product can be repaired/replaced free of charge if it operates at normal condition. A paid service shall be also provided if the product failed after operating under wrong or unreasonable conditions.
2. Aipupower can provide customization design and filter modules for matching, please contact our technician for details.

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