



Typical Features

- ◆ Wide input voltage range 4:1
- ◆ Efficiency 91% (Typ.)
- ◆ Low standby power consumption
- ◆ Operating temperature from -40°C to +105°C
- ◆ 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

ZBD150-110S12A is a high-performance DC-DC converter specially designed for railway field with the rated input voltage 110VDC (full range from 43V to 160VDC), regulated single output 12V/150W without minimum load limit. It has the advantage of high isolation voltage, operating temperature up to 105°C Max, input under voltage protection, output over current, over voltage, over temperature and short circuit protections, input ON/OFF control, output voltage distal end compensation and output voltage Trim, etc. It is compliant with the standard EN50155 and widely used in the railway systems related equipment.

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
ZBD150-110S12AC	43-160	150	12	12.5	120	89/91	Positive logic Standard
ZBD150-110S12AN							Negative logic Standard
ZBD150-110S12AC-H							Positive logic With heat sink
ZBD150-110S12AN-H							Negative logic With heat sink

Input Specifications

Item	Operating conditions	Min.	Typ.	Max.	Unit
Input current Max	Input 43VDC, full load	--	--	5	A
No-load current	Rated input voltage	--	--	15	mA
Input inrush voltage (1sec. max.)	The unit could be permanently broken over this voltage	-0.7	--	185	VDC
Start-up voltage		--	--	43	
Under voltage protection	With No load (The over current protection could work in advance at full load)	--	--	42	Reference voltage -Vin
ON/OFF Control (CNT)	Positive logic: CNT no connection or connected to 3.5-15V to turn ON, connected to 0-1.2V to turn OFF the converter.				
	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	±1.0	%
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	%/°C
Ripple & Noise	20M bandwidth, with external capacitor ≥220uF	--	80	120	mVp-p
Output voltage adjustment (TRIM)		-10	--	+10	%
Distal end compensation (Sense)		--	--	+5	%
Over temperature protection	Maximum temperature of the Metal Base	105	115	125	°C
Over voltage protection		125	--	140	%
Over current protection		14	--	20	A
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			--	500	--	KHz
MTBF			150	--	--	K hours

Environmental characteristics

Item	Operating conditions	Min.	Typ.	Max.	Unit	
Operating temperature	Refer to the temperature derating graph	-40	--	+105	°C	
Storage humidity	No condensing	5	--	95	%RH	
Storage temperature	1.5mm from the case, soldering time <1.5S	-40	--	+125	°C	
Pin soldering temperature		--	--	+350		
Cooling requirement		EN60068-2-1				
Dry and heat requirements		EN60068-2-2				
Moisture and heat requirements		EN60068-2-30				
Shock and vibration		IEC/EN 61373 C1/Body Mounted Class B				

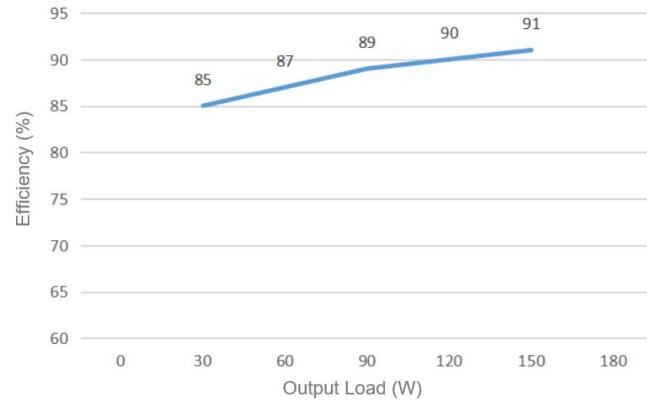
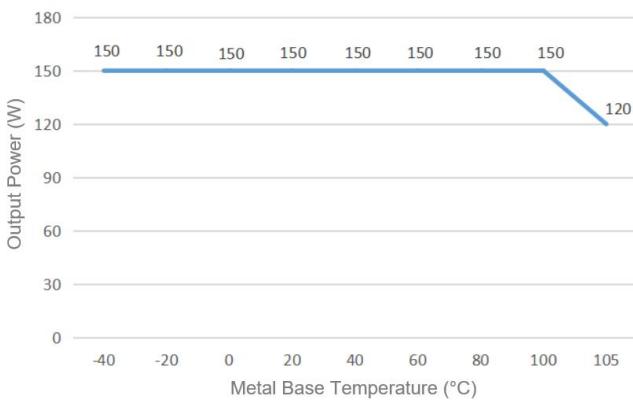
EMC Performances

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	IEC/EN61000-4-2/GB/T 17626.2-2006	Contact $\pm 6\text{KV}$ /Air $\pm 8\text{KV}$	perf. Criteria A
	RS	IEC/EN61000-4-3/GB/T 17626.3-2006	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4/GB/T 17626.4-2008	$\pm 2\text{kV}$ 5/50ns 5kHz	perf. Criteria A
	Surge	IEC/EN61000-4-5/GB/T 17626.5-2008	Line to line $\pm 1\text{KV}$ (42Ω , $0.5\mu\text{F}$)	perf. Criteria A
	CS	IEC/EN61000-4-6/GB/T 17626.6-2008	0.15MHz-80MHz 10 Vr.m.s	perf. Criteria A

Physical Characteristics

Case materials	Metal base + Plastic case in black with flame class UL94-V0
Heat sink	Dimension 61.0x57.9x15.0mm, weight 72g, Aluminum, anodized black
Cooling method	Conduction cooling or forced air cooling with fan
Unit weight	Standard 115g, with heatsink 188g

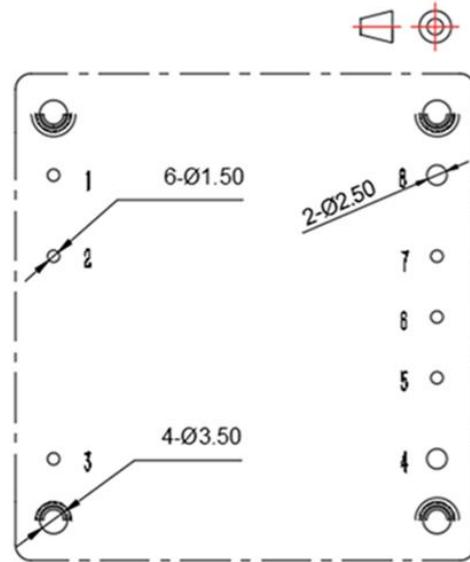
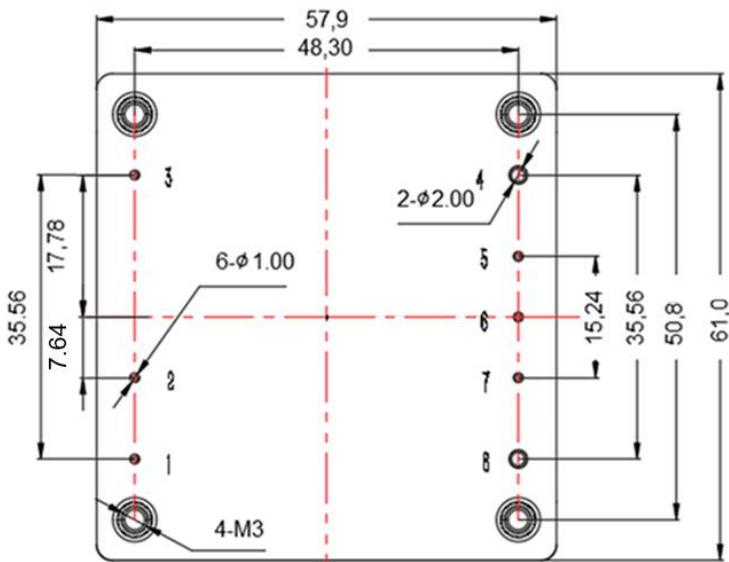
Product Characteristics Graphs



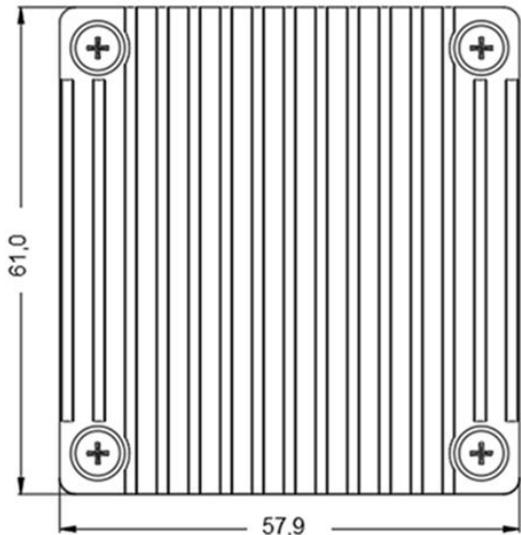
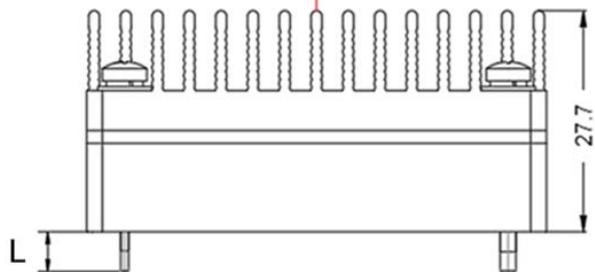
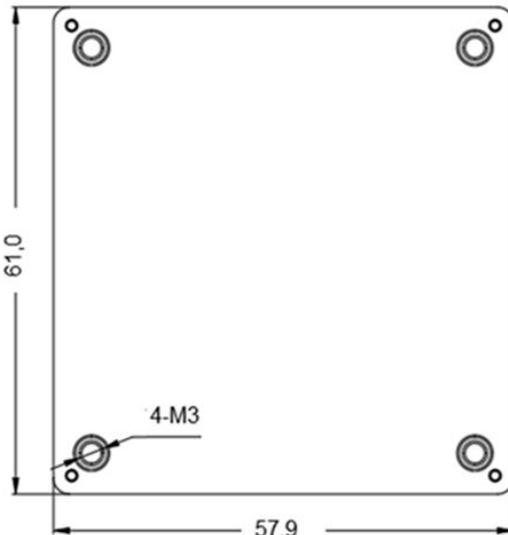
Note:

- Both the output power and efficiency in the graphs have been tested with typical values.
- The data in the temperature derating graph have 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 application.

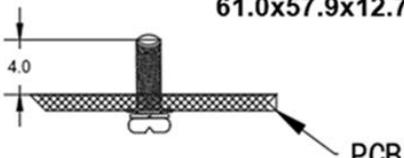
Mechanical Dimensions and Pin-out Function Description



Recommended holes for PCB

Standard+Heat sink
61.0x57.9x27.7Standard
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 \pm 0.5mm, X.XX \pm 0.1mm
Screwing torque: 0.4N.m Max



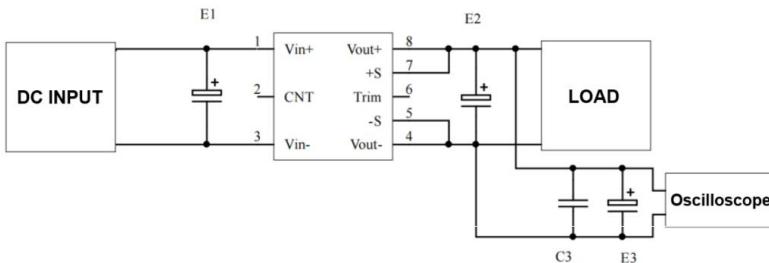
Pin Length L=3.4mm

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

Recommended circuits for application

1. Ripple & Noise

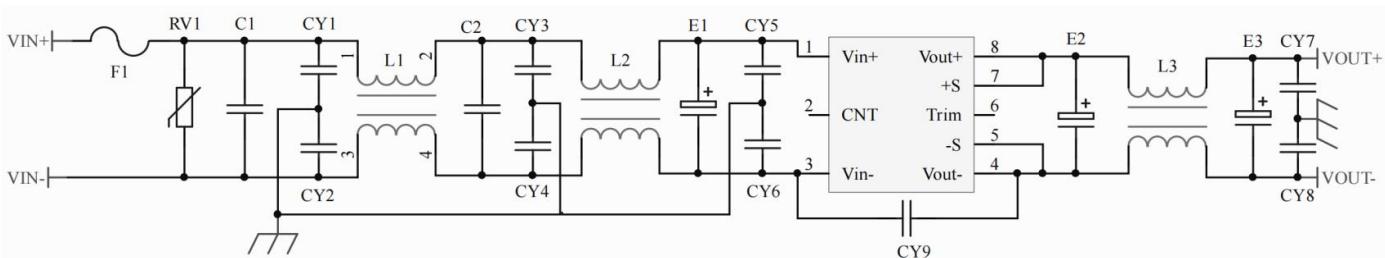
All this series of products will be tested according to this circuit diagram below before shipping.



Capacitance Output Volt.	E1 (μ F)	E2 (μ F)	C3 (μ F)	E3 (μ F)
3.3VDC		1000		
5VDC		680		
12VDC	100			
.....		470		
48VDC				
.....				
110VDC	68	68		

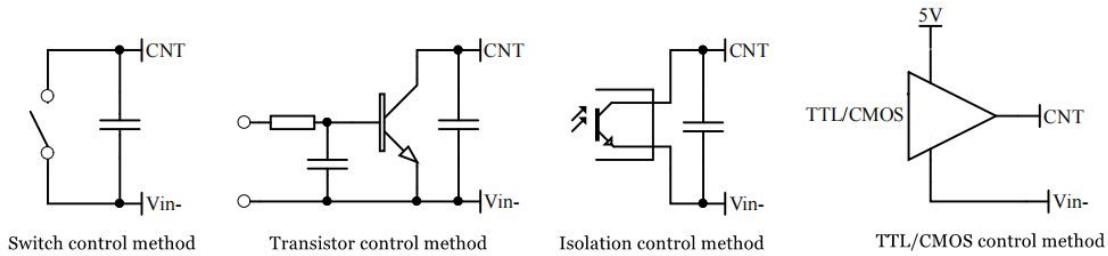
2. Recommended circuit for application

If this circuit diagram recommended below is not adopted, an electrolytic capacitor $\geq 100 \mu\text{F}$ should be used at the input to suppress the possible surge voltage.



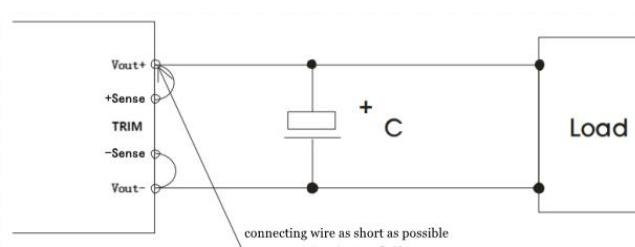
F1	T10A/250V FUSE
RV1	14D 200V Varistor
C1, C2	105/450V Polyester film capacitor
CY1, CY2, CY3, CY4, CY5, CY6	102/250Vac Y2 capacitor
CY7, CY8	103/2KV Ceramic capacitor
CY9	471/250Vac Y1 capacitor
E1	220 μ F/200V Electrolytic capacitor
E2, E3	470 μ F/16V Low ESR capacitor
L1, L2	>6mH, Temperature rise less than 25° @5A
L3	>220uH, Temperature rise less than 25° @12.5A

3. Recommended circuits for the ON/OFF Control (CNT)



4. Application for Sense

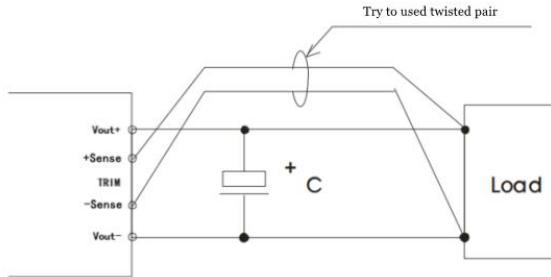
1) With NO distal end compensation



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:

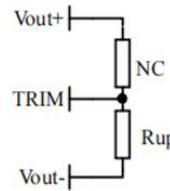
1. The output voltage may be unstable if the compensation cables are too long.
2. The twisted pair or shielded cables are recommended, the cable length should be as short as possible.
3. Wide copper path on PCB or thick lead wires between the power supply and the load should be used to achieve the line 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

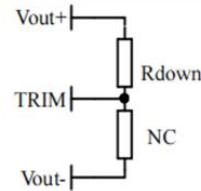
The calculation of ΔU and R_{up} & R_{down} :

$$R_{up} = 31 / \Delta U - 5.1 \text{ (K}\Omega\text{)}$$

$$R_{down} = 12.4 * (12 - 2.5 - \Delta U) / \Delta U - 5.1 \text{ (K}\Omega\text{)}$$



Voltage-up: Add R_{up} between Trim and Vout-



Voltage-down: Add R_{down} between Trim and Vout+

6. This product is not available to be used 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 fails 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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