



Typical Features

- ◆ Wide input voltage range 2.5 : 1
- ◆ Efficiency up to 90%
- ◆ Low no-load power consumption
- ◆ Operating Temperature from -40℃ to +105℃
- ◆ High isolation voltage 3000VAC(input-output) & 2100VAC(input-case)
- ◆ Input under voltage protection, output over voltage, short circuit, over current and over temp protections
- ◆ Standard 1/4 brick size

ZCD200-110S24 is a high-performance DC-DC converter specially designed for the railway field. Its rated input voltage 110VDC (full range from 66V to 160VDC), regulated single output 24V/200W without minimum load limit. It has the advantage of high isolation voltage, Max operating temperature up to 105℃, with 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 Trim, etc. It is compliant with the railway 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. | Remarks |
|------------------|---------------------------|------------------|----------------------|--------------------|------------------------|-----------------------------------|-------------------------|
| ZCD200-110S24C | 66 - 160 | 200 | 24 | 8.3 | 240 | 88/90 | Standard Positive logic |
| ZCD200-110S24N | | | | | | | Standard Negative logic |
| ZCD200-110S24C-H | | | | | | | Heatsink Positive logic |
| ZCD200-110S24N-H | | | | | | | Heatsink Negative logic |

Input Specifications

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|------|------|------|------------------------|
| Max input current | Input voltage 66V, full load | -- | -- | 4 | A |
| No load input current | Rated input voltage | -- | -- | 10 | mA |
| Input Inrush voltage (1sec. max.) | The unit could be permanently damaged by input over this Voltage | -0.7 | -- | 185 | VDC |
| Start-up voltage | | -- | -- | 66 | |
| Input under voltage protection | With No-load (over current protection will work in advance at full load) | -- | -- | 64 | |
| ON/OFF Control (CNT) | Positive logic - CNT no connection or connect to 3.5-15V to turn ON, connect to 0-1.2V to turn OFF | | | | Reference voltage -Vin |
| | Negative logic - CNT no connection or connect to 3.5-15V to turn OFF, connect to 0-1.2V to turn ON | | | | |

Output Specifications

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|--|---|-----------------------------------|------|-------|-------|
| Output Voltage Accuracy | Nominal input voltage, 10%-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 | -- | 150 | 240 | mVp-p |
| Output voltage adjustment (TRIM) | | -20 | -- | +10 | % |
| Output voltage distal end compensation (Sense) | | -- | -- | 105 | % |
| Over temp protection | Maximum temperature of the metal base | 105 | 115 | 125 | °C |
| Over voltage protection | | 125 | -- | 140 | % |
| Over current protection | | 9 | -- | 12.5 | 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 | VAC |
| | I/P-Case | Test 1min, leakage current <3mA | -- | -- | 2100 | VAC |
| | O/P-Case | Test 1min, leakage current <3mA | -- | -- | 500 | VAC |
| Insulation resistance | I/P-O/P, @ 500VDC | | -- | -- | 100 | MΩ |
| Switching frequency | | | -- | 250 | -- | 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 | | -40 | -- | +125 | °C |
| Pin Soldering temperature | 1.5mm from the case, soldering time <1.5S | -- | -- | +350 | |
| Cooling requirement | | EN60068-2-1 | | | |
| Dry heat requirement | | EN60068-2-2 | | | |
| Damp heat requirement | | EN60068-2-30 | | | |
| Shock and vibration | | IEC/EN 61373 C1/Body Mounted Class B | | | |

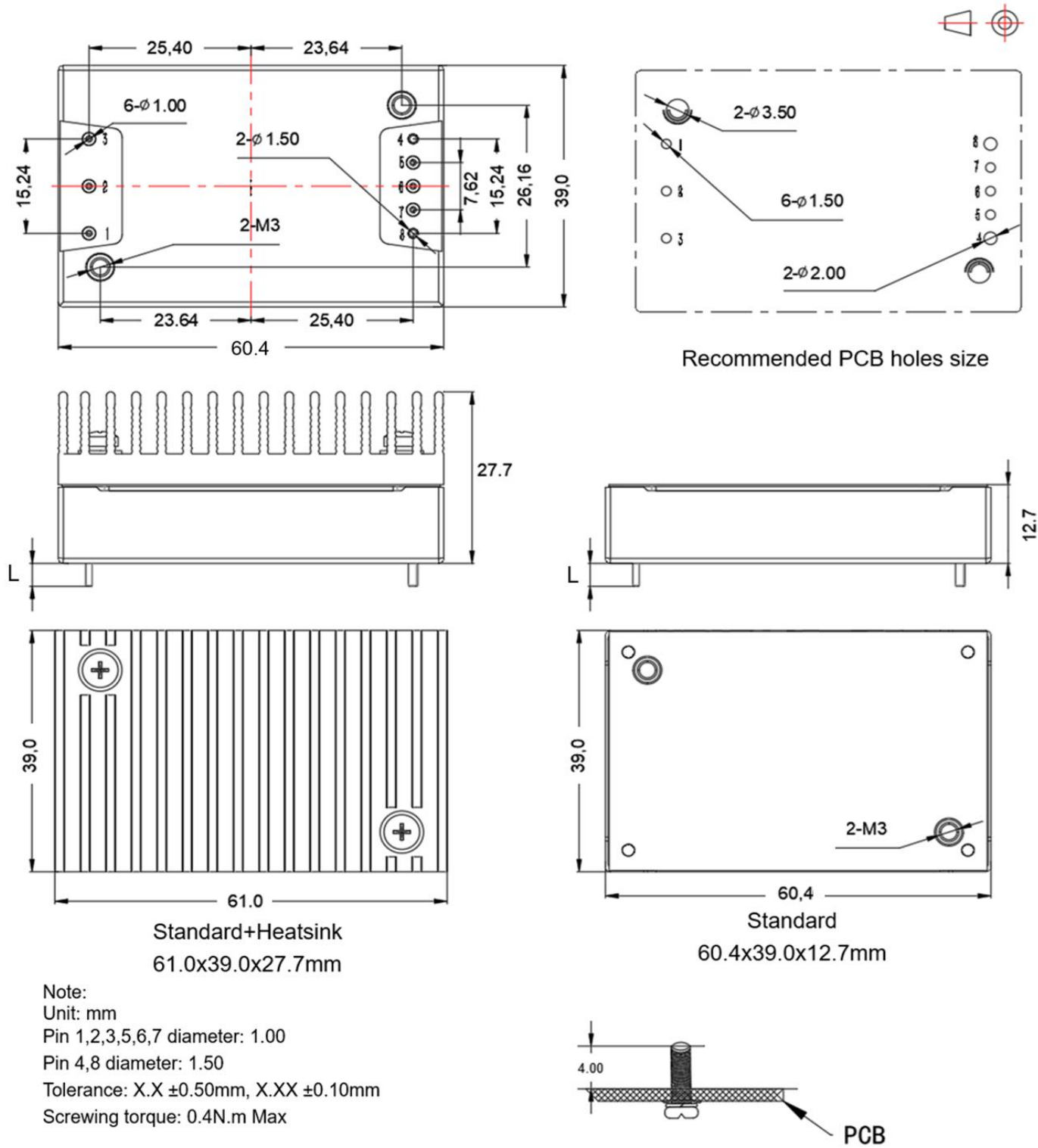
EMC Performances

| | | | | |
|-----|-------|-----------------------------------|---------------------------------|------------------|
| 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 ±6KV/Air ±8KV | 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 | ±2kV 5/50ns 5kHz | perf. Criteria A |
| | Surge | IEC/EN61000-4-5/GB/T 17626.5-2008 | Line to line ± 1KV (42Ω, 0.5μF) | 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, flame class UL94-V0 |
| Heat sink | Dimension 61.0x39.0x15.0 mm, weight 50g, aluminum alloy, anodized black |
| Cooling method H | Conduction cooling or forced air cooling with fan |
| Unit Weight | Standard 72g, with heatsink 125g |

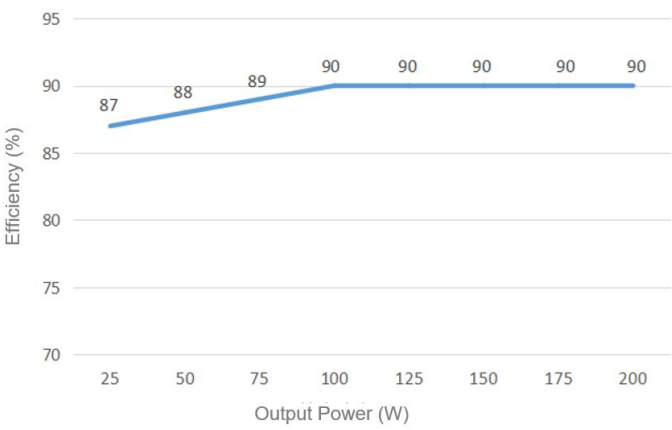
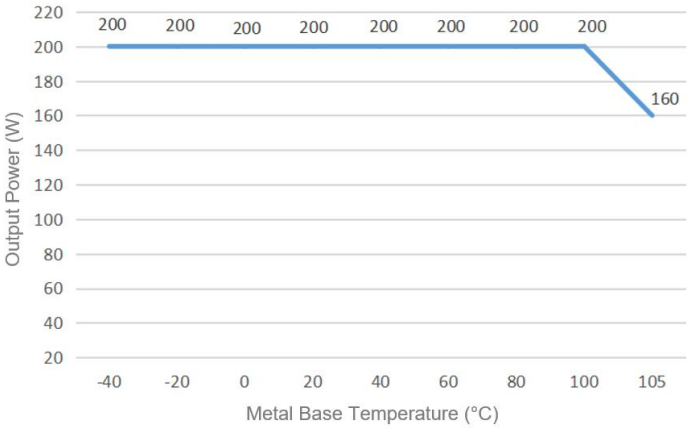
Mechanical Dimensions and Pin-Out Description



Pin Length L=3.7mm

| Pin No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------|----------|----------------|----------|-----------|-----------------------------------|---------------------|-----------------------------------|-----------|
| Function | Vin+ | CNT | Vin- | Vout- | -Sense | TRIM | +Sense | Vout+ |
| Description | Input V+ | ON/OFF Control | Input V- | Output V- | Output distal end compensation S- | Output Voltage Trim | Output distal end compensation S+ | Output V+ |

Product Characteristics Graphs

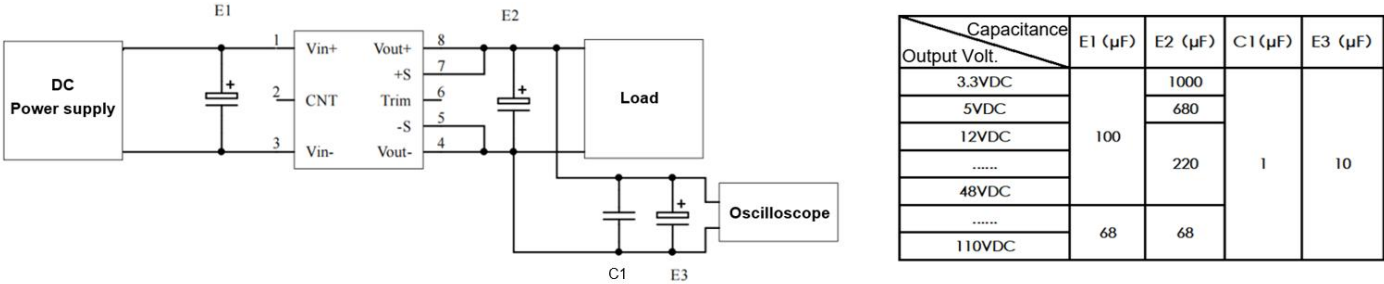


Note:
 1. The output power and the efficiency in the graphs are tested with typical values.
 2. The data in temperature derating graph is tested under Aipu laboratory test conditions. It is recommended to keep the temperature of the Metal base not more than 100 °C while the converter operates at the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

Recommended circuits for application

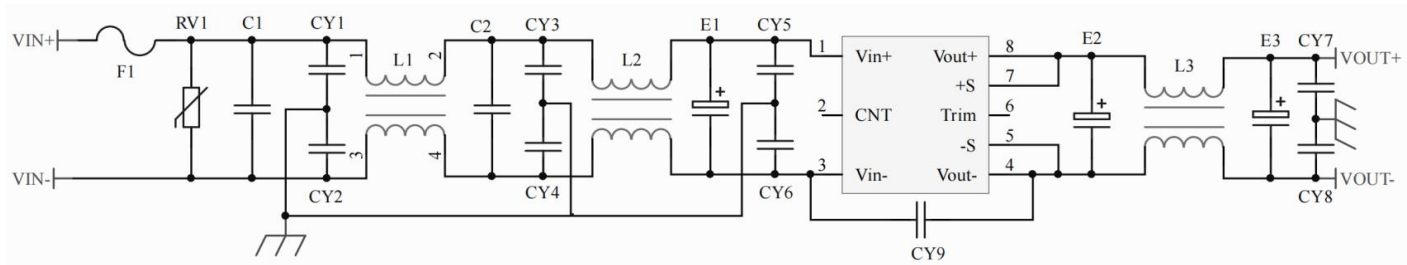
1. Ripple and Noise

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



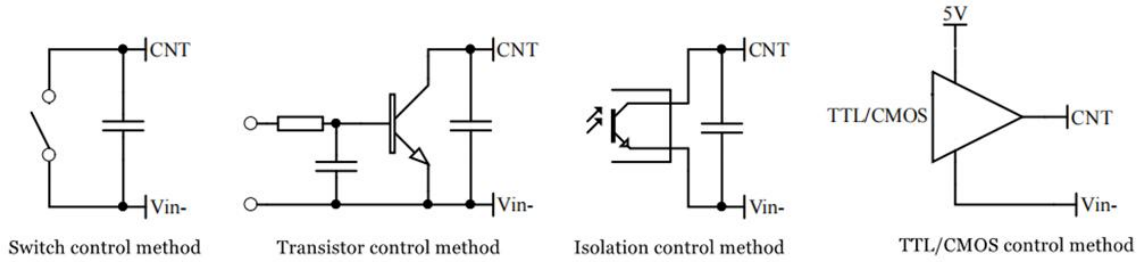
2. Typical application circuit

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



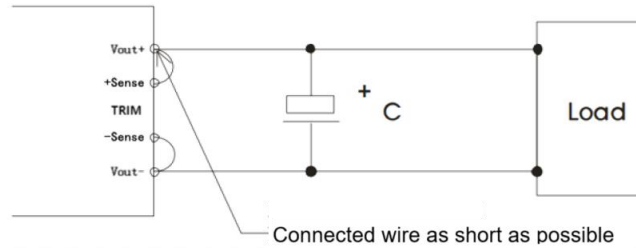
| | |
|------------------------------|---|
| F1 | T6.3A/250V Time-delay fuse |
| RV1 | 14D 200V Varistor |
| C1, C2 | 105/250V Polyester Film Capacitor |
| CY1, CY2, CY3, CY4, CY5, CY6 | 102/250Vac Y2 capacitor |
| CY7, CY8 | 103/2KV Ceramic SMD Capacitor |
| CY9 | 471/250Vac Y1 capacitor |
| E1 | 100μF/200V Electrolytic Capacitor |
| E2, E3 | 220μF/35V Electrolytic Capacitor |
| L1, L2 | >8mH, temperature rise less than 25°@4A |
| L3 | >220uH, temperature rise less than 25°@8.3A |

3. ON/OFF control (CNT) application



4. Application for Sense

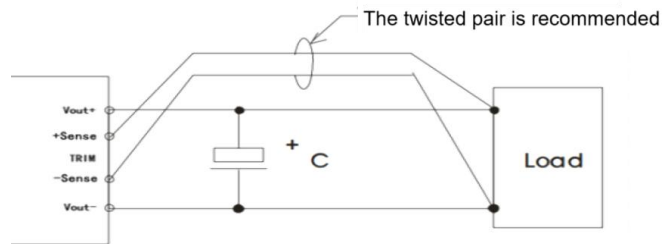
1) With NO distal end compensation



Notes:

1. Vout+ & Sense+, Vout- & Sense- should be shorted when distal 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:

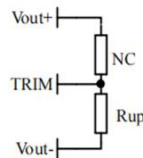
1. The output voltage may be unstable if the compensation cables are too long.
2. The Twisted pair or shielded cables are recommended, the cable length should be as short as possible.
3. Wide copper path on PCB or thick lead wires between the power supply and the load should be used to achieve the line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

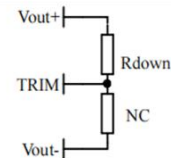
The calculation of ΔU and R_{up} & R_{down} :

$$R_{up} = 70 / \Delta U - 20 \text{ (K}\Omega\text{)}$$

$$R_{down} = 28 * (24 - 2.5 - \Delta U) / \Delta U - 20 \text{ (K}\Omega\text{)}$$



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



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

6. This converter 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 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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