



FEATURES

- ◆ Wide input voltage range: 2.5:1
- ◆ Efficiency up to 92%
- ◆ Low non-load power consumption
- ◆ Operating temperature range: -40℃ to +105℃
- ◆ High insulation voltage: Input-output 3000VDC, input-case 2100VDC
- ◆ Input under-voltage protection, output over-current, over-voltage, over-temperature, short circuit protection
- ◆ Standard 1/2 brick package

CE

MDH400-110S48 is a high-performance power supply designed for the railway industry. It has a rated input voltage of 110VDC, an output of 48V/400W, no minimum load requirements, a wide voltage input of 66-160VDC, and a stable single output. High isolation insulation voltage, allowing working temperatures up to 105℃, with functions such as input undervoltage protection, output overcurrent protection, overvoltage protection, over temperature protection, short circuit protection, remote control and remote compensation, and output voltage regulation. Compliant with EN50155 railway standard, widely used in railway systems and their associated equipment.

Selection Guide

| Part No. | Input Voltage (VDC) | output power (W) | Output Voltage (VDC) | output current (A) | Ripple&Noise (mV) | Full Load Efficiency (%) Min/Typ. | Remark |
|-----------------|---------------------|------------------|----------------------|--------------------|-------------------|-----------------------------------|-------------------------|
| MDH400-110S48 | 66-160 | 400 | 28 | 14.3 | 280 | 88/90 | Standard positive logic |
| MDH400-110S48N | | | | | | | Standard negative logic |
| MDH400-110S48H | | | | | | | Radiator positive logic |
| MDH400-110S48NH | | | | | | | Radiator negative logic |

Input Specifications

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|---|------|------|------|-------------------------------|
| Maximum input current | 66V input voltage, full load output | -- | -- | 8.5 | A |
| No load input current | Rated input voltage | -- | -- | 15 | mA |
| Input surge voltage (1sec. max) | Input voltage exceeding this range may cause permanent damage | -0.7 | -- | 185 | VDC |
| Start up voltage | | -- | -- | 66 | |
| Input under-voltage protection | No load test, full load test will provide over-current protection in advance | -- | -- | 64 | |
| Input start-up delay | | 200 | | 300 | mS |
| Remote control foot (CNT) | Positive logic: CNT suspended or connected to 3.5-15V it starts up, connected to 0-1.2V it shuts down | | | | Reference voltage- VIN |
| | Negative logic: CNT suspended or connected to 3.5-15V it shuts down, connected to 0-1.2V it starts up | | | | |

Output Specifications

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|---|--|--|------|-------|-------|
| Output Voltage Accuracy | standard input voltage, ranging from 0% to 100% load | -- | ±0.2 | ±1.0 | % |
| Linear regulation rate | Full load, input voltage changes from low voltage to high voltage | -- | ±0.1 | ±0.2 | |
| Load regulation rate | Nominal input voltage, ranging from 10% to 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, external connection of over 220uF capacitor for testing | -- | 250 | 480 | mVp-p |
| Adjustable output voltage (TRIM) | | -10 | -- | +10 | % |
| Remote compensation of output voltage (Sense) | | -- | -- | 105 | % |
| Over Temperature Protection | Internal detection of resistance temperature in the product | 105 | 115 | 125 | °C |
| Output over-voltage protection | | 125 | -- | 140 | % |
| Output over-current protection | | 8.8 | -- | 11 | A |
| Short Circuit Protection | | Hiccup style, sustainable, self recovering | | | |

General Specifications

| Item | Operating conditions | | Min. | Typ. | Max. | Unit |
|----------------------------|----------------------|---|------|------|------|---------|
| Isolation voltage | Input-output | Electric Strength Test for 1 minute with a leakage current of 3 mA max. | -- | -- | 3000 | VDC |
| | input-case | | -- | -- | 2100 | VDC |
| | Output-case | | -- | -- | 500 | VDC |
| insulation resistance | Input-output | insulation voltage 500VDC | 100 | -- | -- | MΩ |
| switching frequency | | | -- | 310 | -- | KHz |
| Mean time between failures | | | 150 | -- | -- | K hours |

Environmental Characteristics

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|--------------------------------------|--|--------------|------|------|------|
| Operating temperature | See temperature derating curve | -40 | -- | +105 | ℃ |
| storage temperature | No condensation | 5 | -- | 95 | %RH |
| Storage humidity | | -40 | -- | +125 | ℃ |
| Pin resistant to welding temperature | The distance between the welding point and the case is 1.5mm, and the welding time is less than 1.5S | -- | -- | +350 | |
| Cooling Requirements | | EN60068-2-1 | | | |
| Dry heat requirement | | EN60068-2-2 | | | |
| Humidity and heat requirement | | EN60068-2-30 | | | |
| shock and vibration | | IEC/EN 61373 | | | |

EMC (EN50155)

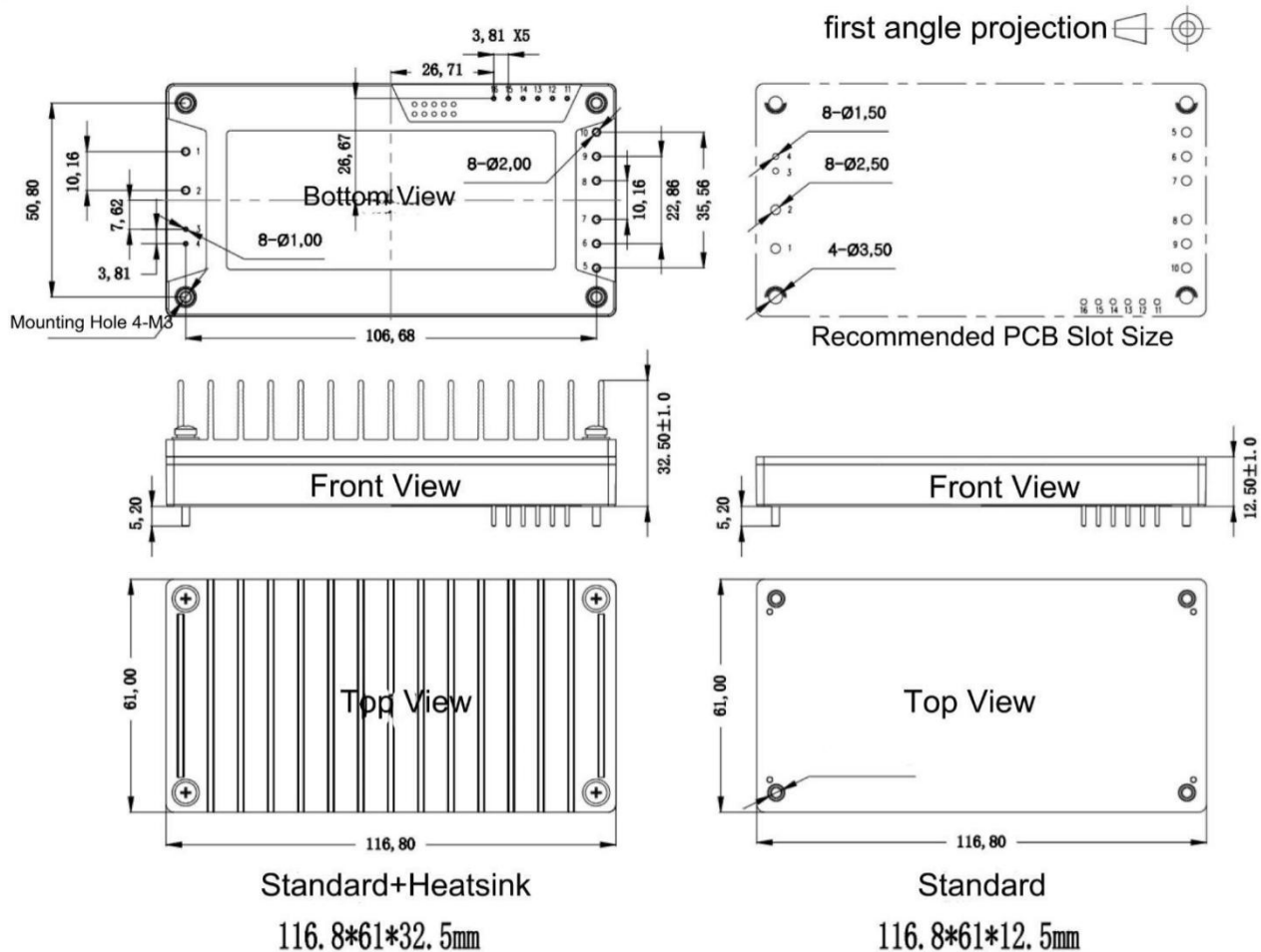
| | | | | |
|-----|----|-------------|----------------------|--|
| EMI | CE | EN50121-3-2 | 150kHz-500kHz 79dBuV | |
| | | EN55016-2-1 | 500kHz-30MHz 73dBuV | |

| | | | | |
|-----|-------|-------------|---------------------------------|------------------|
| | 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 Vr.m.s | perf. Criteria A |

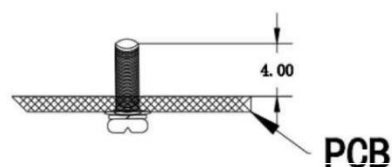
Physical Specifications

| | |
|----------------|--|
| Case Material | Metal bottom shell+black flame-retardant material case (UL94-V0) |
| Radiator | Size 61*57.9*15mm , weight 65g , aluminum alloy material, anodized black |
| Cooling Method | Conducted heat dissipation or forced air cooling |
| Weight | Standard type 120g, radiator type 188g |

Dimensions and Pin-Out

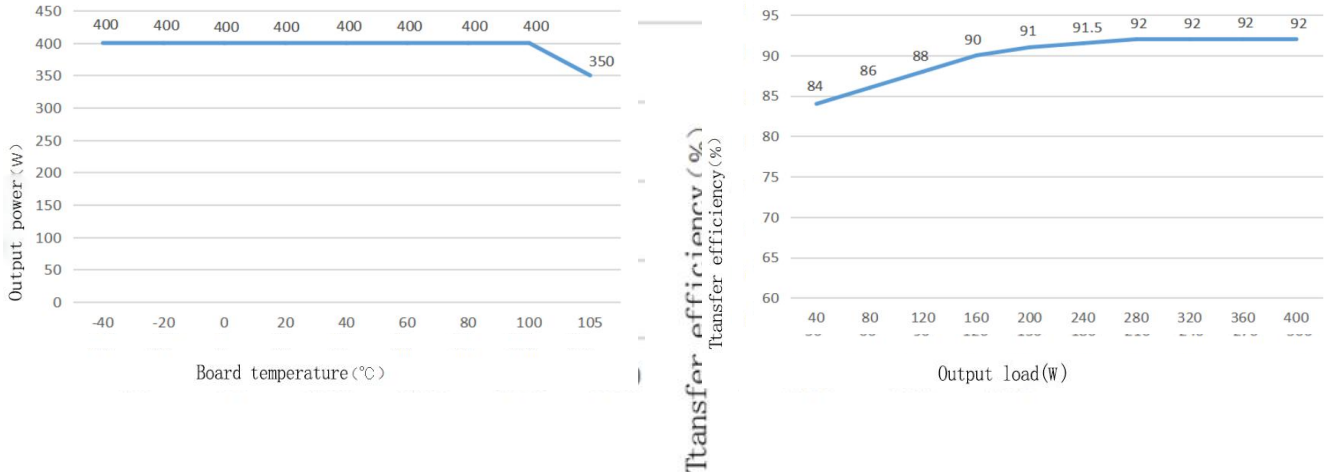


Note:
unit:mm
Pin1,2,5,6,7,8,9,10 dia:2.00
Pin3,4,11,12,13,14,15,16:1.00
general tolerance:±0.10
mounting hole tightening torque: Max 0.4N*m



| No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------|----------------|-------------|----------------|-----------------|-----------------------------------|-------------|-----------------------------------|-----------------|
| Definition | Vin+ | CNT | Vin- | OUT- | -S | TRIM | +S | OUT+ |
| function | Input positive | Remote pole | Input negative | Output negative | Remote compensation negative pole | Output trim | Remote compensation positive pole | Output positive |

Typical Characteristic Curves



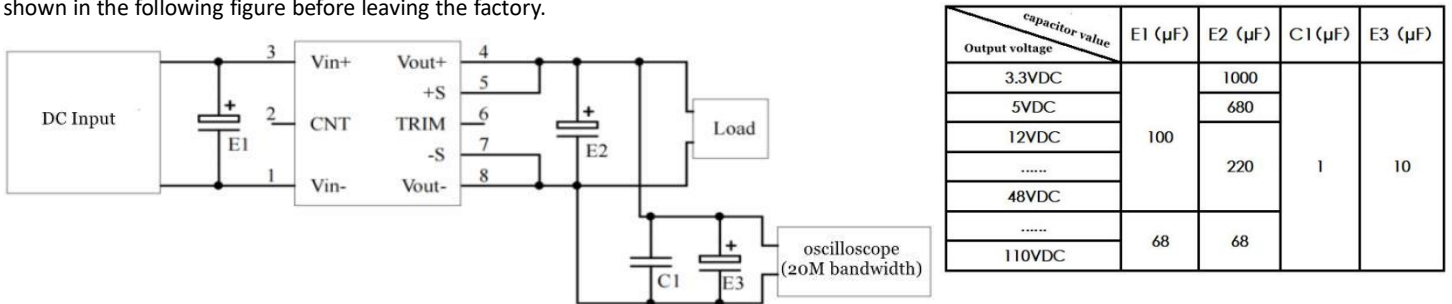
Note:

1. The temperature derating curve and efficiency curve are both typical value tests;
2. The temperature derating curve is tested according to our laboratory testing conditions. If the actual environmental conditions used by the customer are inconsistent, it is necessary to ensure that the temperature of the aluminum shell of the product does not exceed 105 °C and can be used within any rated load range.

Design Reference

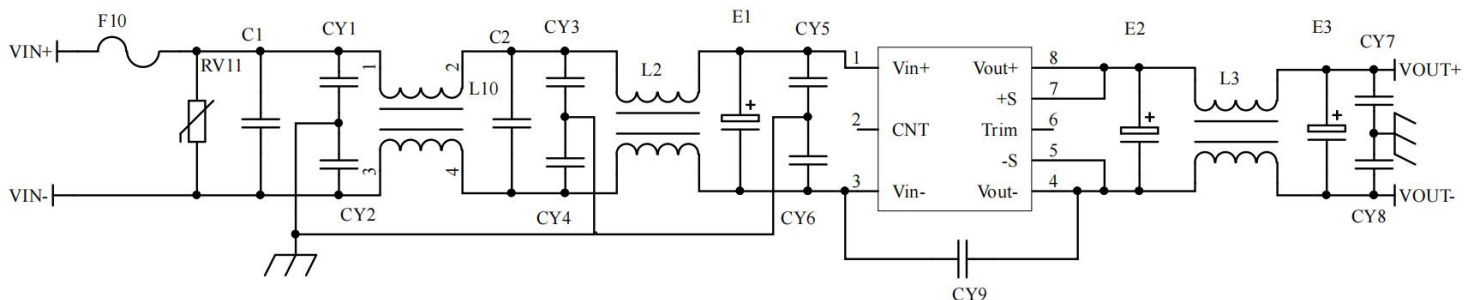
1. Ripple&Noice

All DC/DC converters in this series are tested according to the recommended test circuit shown in the following figure before leaving the factory.



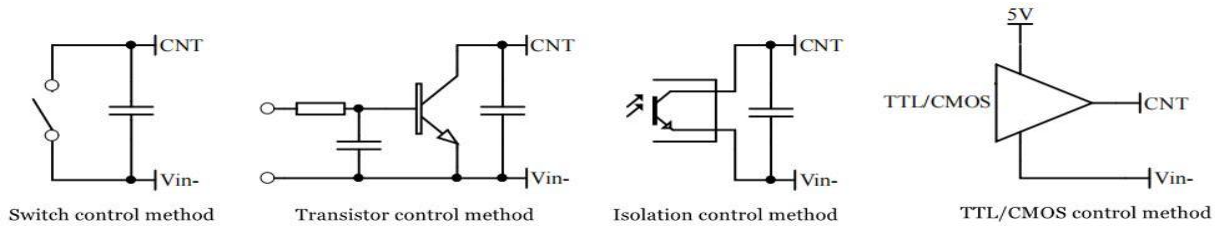
2. Recommended application circuit

If the customer does not use our recommended circuit, please make sure to parallel an electrolytic capacitor of at least 100 μ F at the input end to suppress the surge voltage that may be generated at the input end.



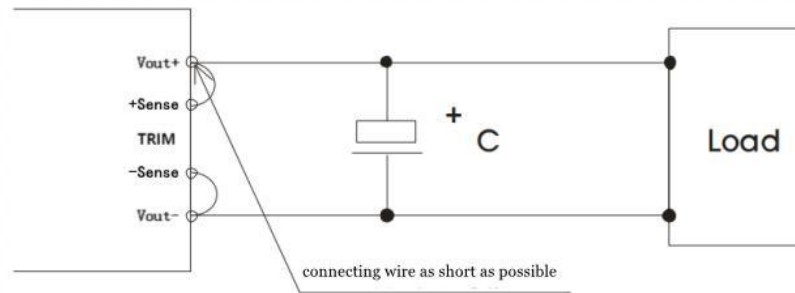
| | |
|-------------------------|--|
| F1 | T10A/250V fuse |
| RV1 | 14D 200V varistor |
| C1,C2 | 105/450V Polyester film capacitor |
| CY1,CY2,CY3,CY4,CY5,CY6 | 102/250Vac safety standard Y2 capacitor |
| CY7,CY8 | 103/2KV ceramic capacitor |
| CY9 | 471/250Vac safety standard Y2 capacitor |
| E1 | 220 μ F/200V Electrolytic capacitor |
| E2, E3 | 220 μ F/63V low ESR capacitor |
| L1,L2 | Inductance greater than 3.5mH, over current 8.5A, temperature rise less than 25 °C |
| L3 | Inductance greater than 0.3mH, over current 8.5A, temperature rise less than 25 °C |

3. Recommended application of remote control terminal (CNT) control mode



4. Usage and precautions of Sense

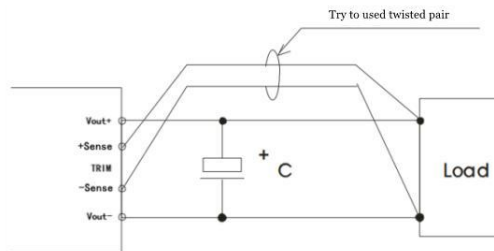
(1) without using far-end compensation:



attention:

1. when without using far-end compensation, ensure that V_{out+} is short circuited to $Sense+$ and V_{out-} is short circuited to $Sense-$;
2. The connection between V_{out+} and $Sense+$, V_{out-} and $Sense-$ should be as short as possible and close to the pins, otherwise it may cause instability of the module.

(2) using far-end compensation:

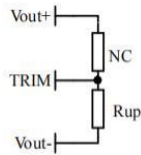


attention:

- When using a far-end compensation lead, it may cause unstable output voltage;
- If using far-end compensation, please use twisted pair or shielded wire and make the lead as short as possible;
- 3. Please use wide PCB leads or thick wires between the power module and the load, and keep the line voltage drop below 0.3V to ensure that the power output voltage remains within the specified range;
- 4. The impedance of the lead may cause output voltage oscillation or significant ripple. Please verify before use.

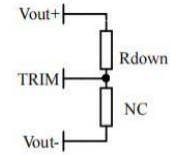
5. The use of TRIM and the calculation of TRIM resistance

The relationship between the output change voltage ΔU and resistance is as follows:



Voltage up regulation: add resistor R_{up} between Trim and output negative

$$R_{up} = 70 / \Delta U - 5.1 \text{ (K}\Omega\text{)}$$



Voltage Down: Add resistor R_{down} between Trim and output positive

$$R_{down} = 28 * (24 - 2.5 - \Delta U) / \Delta U - 5.1 \text{ (K}\Omega\text{)}$$

6. This product does not support direct parallel connection to increase power. If parallel connection is required, please consult our technical personnel

Others

1. This product has a two-year warranty period. If it is naturally damaged during the warranty period, it will be repaired free of charge. If the malfunction is caused by incorrect usage or manufacturing techniques, repairs will be charged.
2. Our company can provide customized products and matching filter modules. For specific details, please contact our technical personnel directly.