# TP-P3.5-80024

# Product Manual



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# I. Overview

**1、 application**

This high-voltage DC power supply is a specially customized solution featuring a compact size, lightweight construction, high efficiency, and integrated fan cooling. Conversion efficiency is ≥96% at 750 VDC input and half load. The power supply module employs an aluminum housing design, offering a lightweight and aesthetically pleasing profile, along with a waterproof design, making it a viable alternative to imported high-voltage DC module power supplies.

**2、 Product Features**

- DC-DC isolated power converter: accepts 680–800 VDC input and provides a 24 V-class output. The rated output is 24 VDC nominal, with a 21–25.2 VDC output range and 3,500 W maximum output power.
- Features include high power density, compact size, and lightweight construction.
- The design complies with power supply reliability requirements: the input features over-and under-voltage protection, while the output provides over-voltage protection, current limiting, short-circuit protection, and over-temperature protection.

**3、 product photograph**

**4、 Key Product Specifications**

| input voltage range | Rated output voltage | Maximum output power | Efficiency | Voltage regulation accuracy | Output waveform and noise |
|---|---|---|---|---|---|
| 680 ~ 800Vdc | 24 VDC nominal | 3500W | ≥96% | ≤±1% | ≤±2%Vo |

# II. Environmental Conditions

| order number | project | qualification | unit | remarks |
|---|---|---|---|---|
| 1 | working temperature | -40℃ ~ +50℃ | ℃ | |
| 2 | storage temperature | -40℃ ~ +80℃ | ℃ | / |
| 3 | relative humidity | ≤95 | % | No condensation (40 °C ± 2 °C) |
| 4 | above sea level | 0-2000 | m | |
| 5 | atmospheric pressure | 76 ~ 106 | K pa | / |
| 6 | Heat dissipation method | Built-in air cooling | / | / |

## III. Electrical Characteristics

| 1 | input characteristics | | | |
|---|---|---|---|---|
| order number | project | technical requirement | unit | remarks |
| 1.1 | Rated input voltage | 750 | Vdc | |
| 1.2 | input voltage range | 680 ~ 800 | Vdc | |
| 1.3 | Maximum input current | 7 | A | In=680Vdc，Po=3500W |
| 2 | output characteristic | | | |
| order number | project | technical requirement | unit | remarks |
| 2.1 | Output rated voltage | 24 | Vdc | / |
| 2.2 | Output voltage range | 21 ~ 25.2 | Vdc | |
| 2.3 | rated output current | 120 | A | / |
| 2.4 | maximum output current | 140 | A | / |
| 2.5 | Maximum output power | 3500 | W | / |
| 2.6 | Conversion efficiency | ≥96 | % | In = 750 Vdc, half-load |
| 2.7 | Voltage regulation accuracy | ±1 | % | / |
| 2.8 | Line regulation | ±1 | % | / |
| 2.9 | load regulation | ±1 | % | / |
| 2.10 | Output waveform and noise | ±2 | %/Vo | Bandwidth limit: 20 MHz; the test end is equipped with a 10 μF electrolytic capacitor and a 0.1 μF film capacitor; rated load |
| 2.11 | temperature coefficient | ±0.02 | %/℃ | / |
| 2.12 | Output rise time | ≤200 | ms | / |
| 2.13 | Power-on output latency | ≤5 | S | Rated input |
| 2.14 | Power-on and power-off overshoot | △V：≤±5 | % | / |
| 2.15 | Dynamic overshoot | △V：≤±5 | % | / |
| 2.16 | Dynamic response recovery time | ≤2 | ms | Load variations of 25%–50%–25% or 50%–75%–50%, at 25 °C |
| 3 | protection feature | | | |
| order number | project | technical requirement | unit | remarks |

| | | | | |
|---|---|---|---|---|
| 3.1 | Input undervoltage protection | 620 ~ 640 | Vdc | Offset greater than 10 V |
| 3.2 | Input undervoltage recovery | ≦650 | Vdc | |
| 3.3 | Input overvoltage protection | 810 ~ 830 | Vdc | Offset greater than 10 V |
| 3.4 | Input overvoltage recovery | ≧800 | Vdc | |
| 3.5 | Input reverse polarity protection | Reverse polarity does not cause damage | | Input: 800 V DC, reverse polarity |
| 3.6 | Output overvoltage protection | 28 ~ 31 | Vdc | Automatic recovery |
| 3.7 | Output overcurrent protection | 158 ~ 165 | A | Automatic recovery |
| 3.8 | Output short-circuit protection | have | | Automatic recovery |
| 3.9 | Overtemperature protection | have | ℃ | Recoverable |
| **4** | **Parallel current sharing** | | | |
| **order number** | **project** | **technical requirement** | **unit** | **remarks** |
| 4.1 | Current balancing imbalance | ≤5 | % | Output exceeds 50% of load |
| 4.2 | Parallel processing method | Connect the current-balancing busbar signals in parallel, and connect the load outputs in parallel. | | |
| 4.3 | Number of parallel units | ≤8 | PCS | |

## IV. Safety Features

| order number | project | | test condition | remarks |
|---|---|---|---|---|
| 1 | dielectric strength | Input to output | 2500Vdc/2mA/1min | No flashover or breakdown |
| | | Input to outer housing | 2000Vdc/2mA/1min | |
| | | Output to housing | 500Vdc/2mA/1min | |
| 2 | insulation resistance | Input to output | ≥10MΩ@ 500Vdc | At normal atmospheric pressure, with a relative humidity of 90% and a test DC voltage of 500 V, |
| | | Input and Housing | ≥10MΩ@ 500Vdc | |
| | | Output to housing | ≥10MΩ@ 500Vdc | |

## VI. Other Characteristics

1. Flame retardancy requirements:

The flame retardancy rating of the PCBs used in the system shall meet the V-0 requirement specified in GB4943.1-2011; the flame retardancy rating of the insulated cables shall meet the requirements specified in GB/T 18380.12-2008; and the flame retardancy rating of other insulating materials shall meet the V-1 requirement specified in GB4943.1-2011.

2. System noise

The system noise shall not exceed 60 dB(A).

3. System Reliability

MTBF≥100Khour ；

Test conditions: 25 °C, rated input, full-load output; MIL-HDBK-217F Notice 2 stress method prediction.

4. Protection Rating

The protection rating shall meet the IP54 requirements. No water accumulation is permitted on the top of the power supply housing.

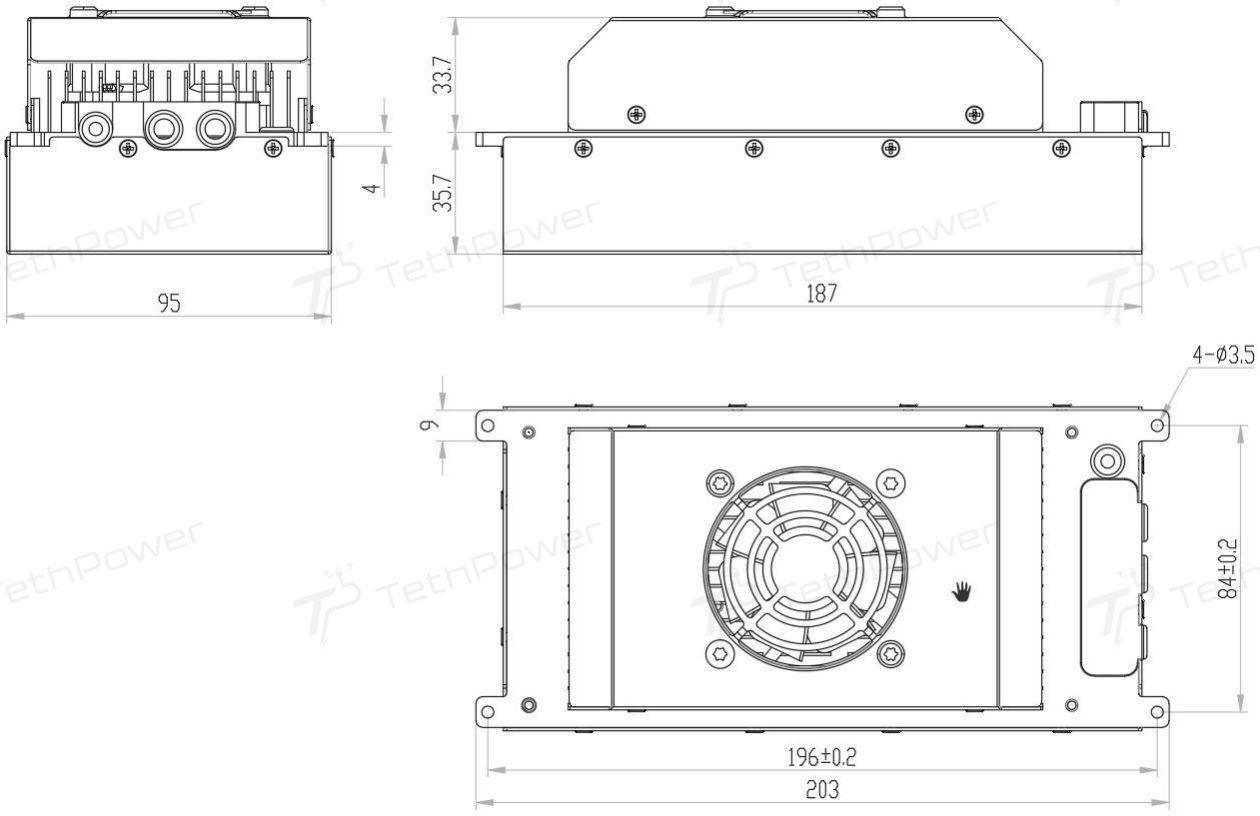
5. Three Protections (against moisture, mold, and salt spray)

The printed circuit boards, connectors, and other circuit components within the product shall be treated against moisture, mold, and salt spray; specifically, their salt spray resistance shall comply with the requirements of Table 9 in GB/T 4797.6, ensuring that the product can operate normally in outdoor environments characterized by humidity and salt spray.

# 8、 Mechanical Dimensions and Connector Definitions

**1、Product installation dimension diagram**

| parameter | metric |
|---|---|
| Heat sink dimensions | 187mm*95mm*70mm±1mm |




## IX. Packaging, Transportation, and Storage

1. Packaging

The packaging box shall bear the product name, model number, manufacturer's logo, inspection certificate from the manufacturer's quality department, manufacturing date, etc.; the interior of the packaging box shall contain an accessories list.

2. Transportation

Products shall be transported in sturdy packaging crates. The exterior of the crates shall comply with relevant national standards and shall bear appropriate markings such as "Handle with Care" and "Protect from Moisture." The packaging crates containing the products may be transported using any type of vehicle. During transport, direct exposure to rain or snow, as well as mechanical impact, shall be avoided.

3. Storage

When not in use, the product shall be stored in its packaging crate under the following conditions: the ambient temperature in the warehouse shall be between-10 °C and 40 °C, the relative humidity shall not exceed 80 %; the warehouse shall be free of harmful gases, flammable or explosive materials, and corrosive chemicals; and it shall be free from intense mechanical vibration, impact, or strong magnetic field effects. The packaging crate shall be placed at least 20 cm above the floor and at least 50 cm away from walls, heat sources, windows, or air inlets. The shelf life under these specified conditions is generally 2 years; after this period, the product shall undergo re-inspection.

## X. Safety Precautions

1. Once the safety protection of the equipment is compromised, the equipment must be shut down, and the relevant maintenance procedures shall be followed.

2. When power equipment is moved from a cold environment to a warm environment, condensation may pose a risk of electrical leakage; therefore, grounding requirements must be strictly complied with.

Only qualified personnel may connect the equipment to the power supply.

3. Before performing maintenance on the power equipment, the power supply must be disconnected, followed by a five-minute wait to provide sufficient time for the capacitors to discharge completely.

4. Exercise caution when using the equipment: Avoid touching the equipment with your hands in areas marked with safety warning signs or high-voltage warnings to prevent electric shock or burns.

## XI. Standards and Specifications Cited

GB/T 2423.1-2001 Environmental testing of electrical and electronic products — Part 2: Test methods — Test A: Low temperature
GB/T 2423.2-2001 Environmental testing of electrical and electronic products — Part 2: Test methods — Test B: High temperature
GB/T 2423.3-1993 Basic environmental test regulations for electrical and electronic products — Test Ca: Constant temperature and humidity test method;
GB/T 2423.4–1993 Basic environmental test regulations for electrical and electronic products — Test Db: Alternating temperature and humidity test method
GB/T 2423.5-1995 Environmental testing of electrical and electronic products — Part 2: Test methods / Test Ea and guidelines: impulse
GB/T 2423.6-1995 Environmental testing of electrical and electronic products — Part 2: Test methods / Test Ea and guidelines: Impact
GB/T 2423.8-1995 Environmental testing of electrical and electronic products — Part 2: Test methods / Test: Free fall
GB/T 2423.10-1995 Environmental testing of electrical and electronic products — Part 2: Test methods / Test Fc and guidelines: Vibration (sinusoidal)
GB/T 2423.11-1997 Environmental testing of electrical and electronic products — Part 2: Test methods / Test Fd: Wide-band random vibration — General requirements
GB/T 2423.22-2002 Environmental testing of electrical and electronic products — Part 2: Test N — Temperature variation
GB/T 14508-93 Environmental conditions for freight transport machinery on classified highways
EN55022:1998 — Information technology equipment — Wireless interference characteristics — Limits and measurement methods;
EN55024:1998 — Information technology equipment — Immunity — Limits and test methods;
CEI IEC 61000-4-2: 2001 — Electromagnetic compatibility — Test and measurement techniques — Electrostatic discharge immunity test
CEI IEC 61000-4-3: 2002 – Electromagnetic Compatibility – Test and measurement techniques – Radio-frequency electromagnetic field radiation immunity test

CEI IEC 61000-4-4: 1998 — Electromagnetic Compatibility — Test and measurement techniques — Immunity test using electrical fast transient pulse sequences

CEI IEC 61000-4-5: 1999 — Electromagnetic compatibility — Test and measurement techniques — Surge (impulse) immunity testing

CEI IEC 61000-4-6: 2001 – Electromagnetic Compatibility – Test and Measurement Techniques – Immunity to conducted radiated interference induced by radio frequency fields

CEI IEC 61000-4-8: 1993 – Electromagnetic Compatibility – Test and Measurement Techniques – Power-frequency magnetic field immunity test

CEI IEC 61000-4-11:1994 — Electromagnetic compatibility — Test and measurement techniques — Immunity tests against voltage sags, short-term interruptions, and voltage variations

CEI IEC 61000-4-29:2000 – Electromagnetic compatibility – Test and measurement techniques – Immunity tests for DC input port voltage sags, short-term interruptions, and voltage variations

IEC 61000-3-2: 2001 – Limits for electromagnetic compatibility – Limits for harmonic current emissions (for equipment with phase input current ≤ 16 A)

IEC 61000-3-3: 1994 — Electromagnetic compatibility — Limits for voltage fluctuations and flicker in low-voltage power supply systems (equipment rated current ≤ 16 A)

GB4943-2001 Safety of information technology equipment

YD/T 282-2000 General Test Methods for Reliability of Communication Equipment

GB/T 13722-92 Technical requirements and test methods for mobile communication power supplies

YD/T 732-95 Test method for communication DC-DC converters

YD/T 731-2002 High-frequency switching rectifier for communication applications

GB14287.1-2005 Electrical fire monitoring system — Part 1: Electrical fire monitoring equipment