## Typical Features

- ◆ Fixed input voltage, Isolated & unregulated output, Output power 1W
- ◆ High Efficiency up to 86%
- ◆ Small compact SIP packing
- ◆ Isolation Voltage 3000VDC
- ◆ Operating Temperature: -40℃～+105℃
- ◆ Plastic Case, meet UL94 V-0 standard

Test Condition: Unless otherwise specified, data in the datasheet should be tested under the conditions of inputting nominal voltage, pure resistance rated load and Ta=25℃

## Application Field

*It could be widely used for instrument, communication, pure digital circuit, general low frequency analog circuit, relay drive circuit, data exchange circuit, etc.*

## Typical Product List

| Model | Input Voltage Range (VDC) | | Output Voltage/Current (Vo/Io) | | Input Current(mA) Nominal Voltage | | Max. Capacitive Load | Ripple & Noise (Max.) | Efficiency (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Nominal | Range | Voltage (VDC) | Current(mA) MAX./Min. | Full load Typ. | No Load Typ. | uF | mVp-p | Min. | Typ. |
| FN1-3V3S3V3B3N | 3.3 | 2.97 - 3.63 | 3.3 | 303/30 | 370 | 8 | 2400 | 75/30 | 74 | 78 |
| FN1-3V3S05B3N | | | 5 | 200/20 | 358 | 8 | 2400 | 75/30 | 79 | 83 |
| FN1-3V3S12B3N | | | 12 | 84/9 | 340 | 10 | 560 | 75/30 | 81 | 85 |
| FN1-3V3S15B3N | | | 15 | 67/7 | 345 | 20 | 560 | 75/30 | 79 | 83 |
| FN1-3V3S24B3N | | | 24 | 42/4 | 360 | 20 | 220 | 100/50 | 79 | 83 |
| FN1-05S3V3B3N | 5 | 4.5 - 5.5 | 3.3 | 303/30 | 250 | 8 | 2400 | 75/30 | 76 | 80 |
| FN1-05S05B3N | | | 5 | 200/20 | 225 | 8 | 2400 | 75/30 | 81 | 85 |
| FN1-05S07B3N | | | 7 | 143/14 | 230 | 10 | 1000 | 75/30 | 78 | 82 |
| FN1-05S09B3N | | | 9 | 111/12 | 227 | 10 | 1000 | 75/30 | 81 | 85 |
| FN1-05S12B3N | | | 12 | 84/9 | 220 | 10 | 560 | 75/30 | 81 | 85 |
| FN1-05S15B3N | | | 15 | 67/7 | 220 | 20 | 560 | 100/50 | 81 | 85 |
| FN1-05S24B3N | | | 24 | 42/4 | 266 | 20 | 220 | 75/30 | 80 | 84 |
| FN1-05D3V3B3N | | | ±3.3 | ±152/±15 | 250 | 8 | 1200 | 75/30 | 74 | 78 |
| FN1-05D05B3N | | | ±5 | ±100/±10 | 225 | 8 | 1200 | 75/30 | 79 | 83 |
| FN1-05D09B3N | | | ±9 | ±56/±6 | 227 | 10 | 470 | 75/30 | 81 | 85 |
| FN1-05D12B3N | | | ±12 | ±42/±5 | 220 | 10 | 220 | 75/30 | 81 | 85 |


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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FN1-05D15B3N | | | ±15 | ±34/±4 | 220 | 20 | 220 | 75/30 | 81 | 85 |
| FN1-05D24B3N | | | ±24 | ±21/±2 | 266 | 20 | 100 | 100/50 | 79 | 83 |
| FN1-09S09B3N | 9 | 8.1 - 9.9 | 9 | 111/12 | 128 | 10 | 1000 | 75/30 | 80 | 84 |
| FN1-09S12B3N | | | 12 | 84/9 | 120 | 10 | 560 | 75/30 | 81 | 85 |
| FN1-09S15B3N | | | 15 | 67/7 | 120 | 10 | 560 | 75/30 | 81 | 85 |
| FN1-12S3V3B3N | 12 | 10.8 - 13.2 | 3.3 | 303/30 | 98 | 10 | 2400 | 75/30 | 80 | 82 |
| FN1-12S05B3N | | | 5 | 200/20 | 96 | 10 | 2400 | 75/30 | 84 | 86 |
| FN1-12S09B3N | | | 9 | 111/12 | 92 | 10 | 1000 | 75/30 | 84 | 86 |
| FN1-12S12B3N | | | 12 | 84/9 | 90 | 10 | 560 | 75/30 | 84 | 86 |
| FN1-12S15B3N | | | 15 | 67/7 | 90 | 10 | 560 | 75/30 | 84 | 86 |
| FN1-12S24B3N | | | 24 | 42/4 | 92 | 10 | 220 | 100/50 | 83 | 85 |
| FN1-12D3V3B3N | | | ±3.3 | ±152/±15 | 98 | 10 | 1200 | 75/30 | 79 | 83 |
| FN1-12D05B3N | | | ±5 | ±100/±10 | 96 | 10 | 1200 | 75/30 | 80 | 82 |
| FN1-12D09B3N | | | ±9 | ±56/±6 | 92 | 10 | 470 | 75/30 | 84 | 86 |
| FN1-12D12B3N | | | ±12 | ±42/±5 | 90 | 10 | 220 | 75/30 | 84 | 86 |
| FN1-12D15B3N | | | ±15 | ±34/±4 | 90 | 10 | 220 | 75/30 | 84 | 86 |
| FN1-12D24B3N | | | ±24 | ±21/±2 | 92 | 10 | 100 | 100/50 | 84 | 86 |
| FN1-15S05B3N | 15 | 13.5 - 16.5 | 5 | 200/20 | 78 | 10 | 2400 | 75/30 | 79 | 83 |
| FN1-15S12B3N | | | 12 | 84/9 | 76 | 10 | 1000 | 75/30 | 80 | 82 |
| FN1-15S15B3N | | | 15 | 67/7 | 76 | 10 | 560 | 75/30 | 84 | 86 |
| FN1-15D05B3N | | | ±5 | ±100/±10 | 78 | 10 | 1200 | 75/30 | 84 | 86 |
| FN1-15D09B3N | | | ±9 | ±56/±6 | 76 | 10 | 1200 | 75/30 | 84 | 86 |
| FN1-15D12B3N | | | ±12 | ±42/±5 | 76 | 10 | 470 | 75/30 | 84 | 86 |
| FN1-15D15B3N | | | ±15 | ±34/±4 | 78 | 10 | 220 | 75/30 | 79 | 83 |
| FN1-24S3V3B3N | 24 | 21.6 - 26.4 | 3.3 | 303/30 | 48 | 8 | 2400 | 75/30 | 79 | 83 |
| FN1-24S05B3N | | | 5 | 200/20 | 47 | 8 | 2400 | 75/30 | 80 | 82 |
| FN1-24S09B3N | | | 9 | 111/12 | 48 | 8 | 1000 | 75/30 | 84 | 86 |
| FN1-24S12B3N | | | 12 | 84/9 | 48 | 8 | 560 | 75/30 | 84 | 86 |
| FN1-24S15B3N | | | 15 | 67/7 | 48 | 8 | 560 | 75/30 | 84 | 86 |
| FN1-24S24B3N | | | 24 | 42/4 | 49 | 8 | 220 | 100/50 | 84 | 86 |
| FN1-24D05B3N | | | ±5 | ±100/±10 | 48 | 8 | 1200 | 75/30 | 79 | 83 |
| FN1-24D09B3N | | | ±9 | ±56/±6 | 47 | 8 | 470 | 75/30 | 80 | 82 |
| FN1-24D12B3N | | | ±12 | ±42/±5 | 48 | 8 | 220 | 75/30 | 84 | 86 |
| FN1-24D15B3N | | | ±15 | ±34/±4 | 48 | 8 | 220 | 75/30 | 84 | 86 |
| FN1-24D24B3N | | | ±24 | ±21/±2 | 48 | 8 | 100 | 100/50 | 84 | 86 |


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Note: ① The ripple & noise test method uses the twisted pair method.
In order to ensure that the module can work efficiently and reliably, its minimum output load cannot be less than 10% of the rated load when in use. If the power you need is indeed small, please connect a resistor in parallel at the output end. The recommended resistance value is equivalent to 10% of the rated power.

## Input Specification

| Item | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Overshoot Voltage (1Second.max.) | 3.3Vdc Input | -0.7 | -- | 7 | VDC |
| | 5Vdc Input | -0.7 | -- | 9 | |
| | 9Vdc Input | -0.7 | -- | 12 | |
| | 12Vdc Input | -0.7 | -- | 18 | |
| | 15Vdc Input | -0.7 | -- | 21 | |
| | 24Vdc Input | -0.7 | -- | 30 | |
| Input Filter | Capacitor Filter | | | | |
| Hot Plug | Unavailable | | | | |

## Output Specification

| ITEM | Working Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Power | -- | | 0.1 | -- | 1 | W |
| Output Voltage Accuracy | -- | | See the error envelope curve (Figure 1) | | | |
| Load Regulation | 10% ~ 100% nominal load | 3.3Vdc output | -- | 15 | 20 | % |
| | | Other output | -- | 10 | 15 | |
| Line Voltage Regulation | Input Voltage Change±1% | 3.3Vdc output | -- | -- | 1.5 | |
| | | Other output | -- | -- | 1.2 | |
| Temperature Drift Coefficient | 100% Full Load | | -- | -- | ±0.03 | %/°C |
| Output Short Circuit Protection | Continuous short-circuit protection, self-recovery | | | | | |

## General Specification

| ITEM | Working Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Switching Frequency | Nominal input voltage full load | | 260 | | KHz |
| Operating Temperature | Please refer to the temperature derating curve (Figure 2) | -40 | -- | 105 | ℃ |
| Storage Temperature | -- | -55 | -- | +125 | |
| Shell temperature rise during work | Ta=25℃ | -- | 30 | -- | |
| Pin Withstand Welding Temp | The distance between the soldering point and the shell is 1.5mm, 10 seconds | -- | -- | 300 | |
| Relative Humidity | No condensing | 5 | -- | 95 | %RH |
| Isolation Voltage | I/P-O/P, test 1 minute, leakage current＜1mA | 3000 | | | VDC |


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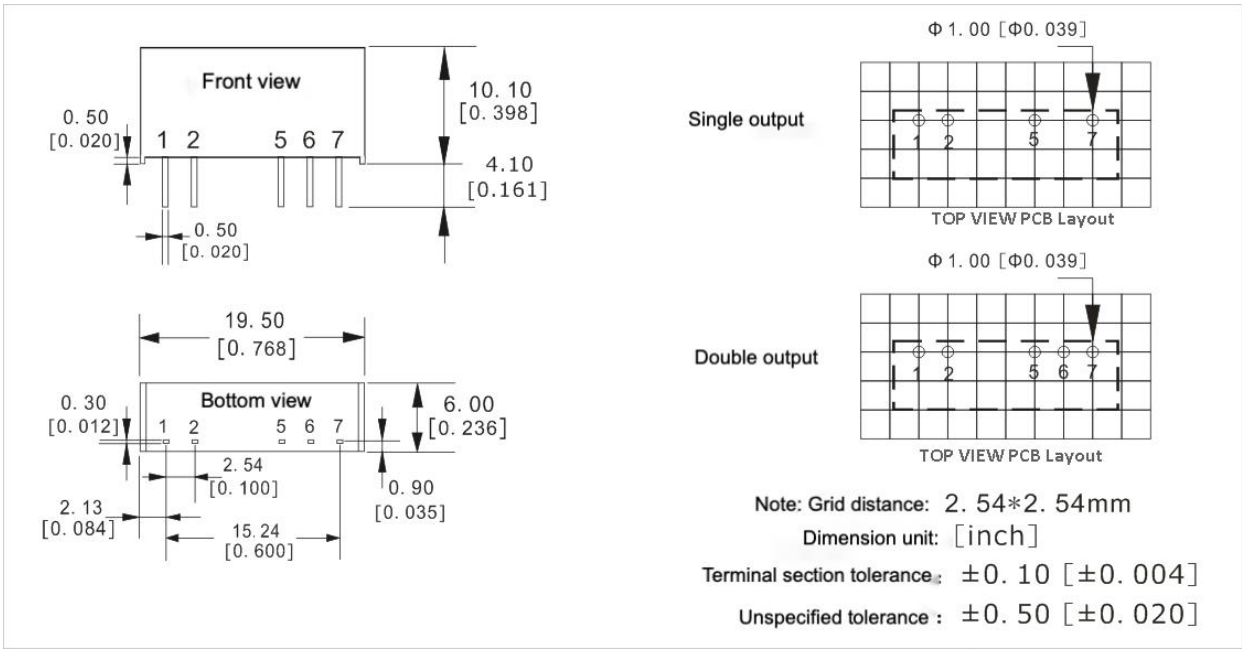
| | | | | | |
|---|---|---|---|---|---|
| Insulation Resistance | I/P-O/P, insulation voltage 500VDC | 1000 | | | MΩ |
| Isolation Capacitor | Input/output, 100KHz/0.1V | | 20 | | pF |
| Vibration | -- | 10-150Hz, 5G, 30 Min. along X, Y and Z | | | |
| MTBF | MIL-HDBK-217F@25℃ | 3500 | | | K hours |
| Case Material | Black flame-retardant heat-resistant Plastic(UL94 V-0) | | | | |
| Product Weight | 2.1g (Typ.) | | | | |
| Cooling Method | Natural air cooling | | | | |
| Package Method | Tube（525*18*10mm） | 25PCS | | | |
| | Minimum packaging box（542*110*155mm） | 2000PCS(Total 80Tubes) | | | |
| Package Dimension | L x W x H | 19.50× 6.00 × 10.10mm | | 0.768 × 0.236 × 0.398inch | |

## EMC Characteristic

| Items | Sub-Items | Test Standard | Class |
|---|---|---|---|
| EMI | CE | CISPR32/EN55032 | CLASS B（EMC Recommended Circuit） |
| | RE | CISPR32/EN55032 | CLASS B（EMC Recommended Circuit） |
| EMS | ESD | IEC/EN61000-4-2 | Air±8kV,Contact±6kV perf.Criteria B |

## Packing Dimension




| Packing Code | L x W x H | |
|---|---|---|
| B | 19.50× 6.00 × 10.10mm | 0.768 × 0.236 × 0.398inch |

## Pin Function

| Pin Function | 1 | 2 | 3 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Single(S) | +Vin | GND | -- | -Vo | -- | +Vo |
| Dual(D) | +Vin | GND | -- | -Vo | COM | +Vo |

Note: if the definition of pin is not in accordance with the model selection manual, please refer to the label on actual item.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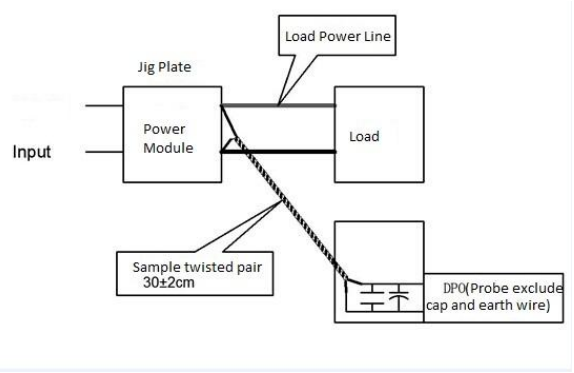
## Ripple& Noise Test: (Twisted Pair Method 20MHZ bandwidth)

Test Method:

a.12# twisted pair to connect, Oscilloscope bandwidth set as 20MHz, 100M bandwidth probe, terminated with 0.1uF polypropylene capacitor and 10uF high frequency low resistance electrolytic capacitor in parallel, oscilloscope set as Sample pattern.

b. Input terminal connect to power supply, output terminal connect to electronic load through jig plate, Use 30cm±2 cm sampling line, Power line selected from corresponding diameter wire with insulation according to the flow of output current.




## Product Characteristic Curve

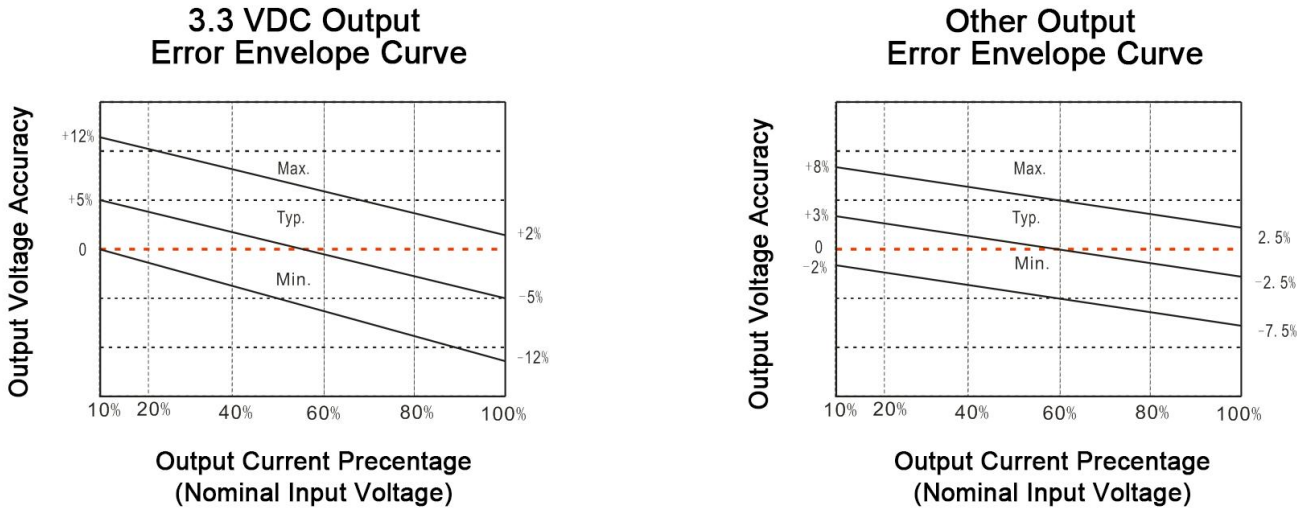



Figure 1

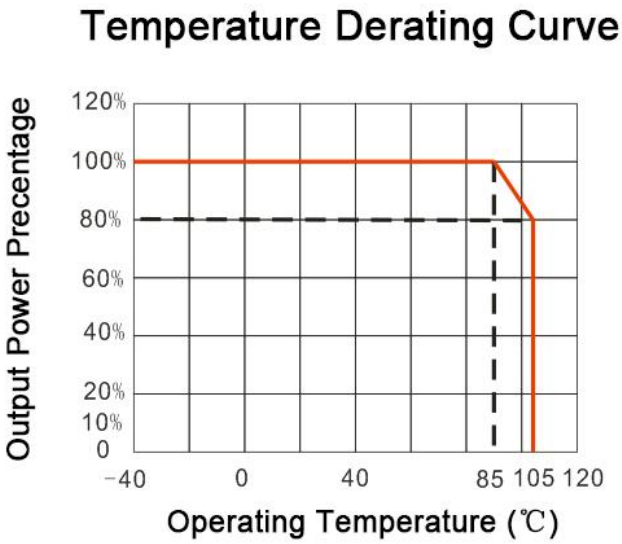



Figure 2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## Design and Application Circuit Recommended

① Output load requirements

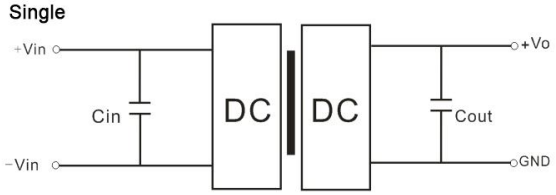
a. In order to ensure that the power module can work efficiently and reliably, it is recommended that its minimum load should not be less than 10% of the rated resistive load; if the power you need is indeed small, please connect a resistor equivalent to 10% of the rated load in parallel at the output end.

b. The maximum capacitive load of the product is obtained from the nominal full load test. When in use, it cannot exceed the maximum capacitive load at the output end, otherwise it is likely to cause startup difficulties and damage the product.

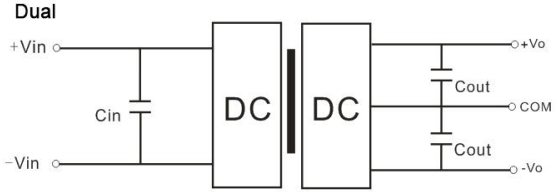
② Recommended circuit

To ensure effective reduction of input and output ripple and noise, a capacitor filter network can be connected to the input and output ends. The application circuit is shown in the figure below; but a suitable filter capacitor should be selected. If the capacitor is too large, it may affect the startup of the product. To ensure that each output works under safe and reliable conditions, the recommended capacitive load value is detailed in Table 1
below.

Single




Dual

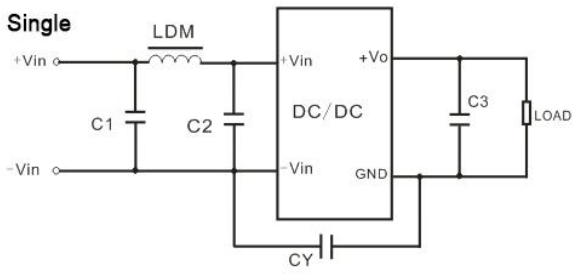



Recommended Capacitive Load Value Table (Table 1)

| Vin (Vdc) | Cin | Single Vout (Vdc) | Cout (μF) | Dual Vout (Vdc) | Cout (μF) |
|---|---|---|---|---|---|
| 5 | 10μF/16V | 3.3 | 10μF/16V | ±3.3 | 4.7μF/16V |
| 12 | 2.2μF/25V | 5 | 10μF/16V | ±5 | 4.7μF/16V |
| 15 | 2.2μF/25V | 9 | 2.2μF/25V | ±9 | 2.2μF/25V |
| 24 | 1μF/50V | 12 | 2.2μF/25V | ±12 | 1μF/25V |
| -- | -- | 15 | 1μF/25V | ±15 | 1μF/16V |
| -- | -- | 24 | 1μF/50V | ±24 | 0.47μF/50V |

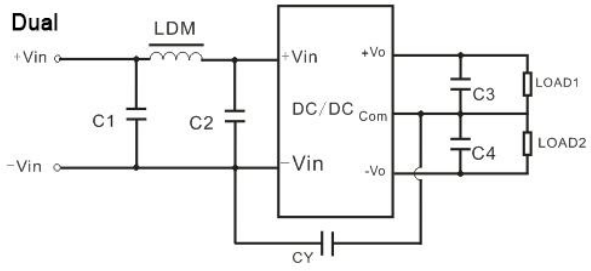
③ EMC typical recommended circuit

Single




| Input Voltage | | 5VDC | 12/15/24VDC |
|---|---|---|---|
| EMI | C1/C2 | 4.7μF/16V | 4.7μF/50V |
| | CY | 270pF/3kV | 270pF/3kV |
| | C3 | Refer to the Cout parameters in Table 1 | |
| | LDM | 6.8μH | 6.8μH |

Dual




| Input Voltage | | 5VDC | 12/15/24VDC |
|---|---|---|---|
| EMI | C1/C2 | 4.7μF/16V | 4.7μF/50V |
| | CY | 270pF/3kVdc | 270pF/3kVdc |
| | C3/C4 | Refer to the Cout parameters in Table 1 | |
| | LDM | 6.8μH | 6.8μH |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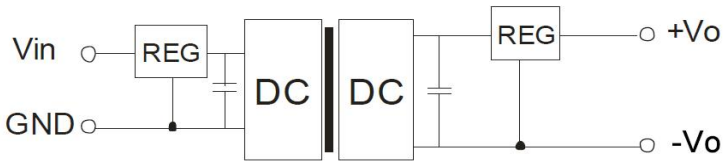
④ Output voltage regulation and overvoltage protection circuit

The simplest device for output voltage regulation, overvoltage and overcurrent protection is to connect a linear voltage regulator with overheat protection in series at its input or output end and connect a capacitor filter network (see the figure below). The recommended value of the filter capacitor is detailed in (Table 1). The linear voltage regulator should be reasonably selected according to the voltage and current required for actual work; or choose our NW series products.

Single




Note:

1.This product cannot be used in parallel, and do not support hot-plugging;

2.If the product works below the minimum required load, it cannot guarantee that the product performance meets all performance indicators in this manual;

3. All index testing methods in this datasheet are based on our Company's corporate standards.

4.The product specification may be changed at any time without prior notice.

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