

Typical Characteristics

- Fixed-voltage input, isolated unregulated output, 2W power
- Isolation voltage: 3500VAC
- Low no-load power consumption: 0.025W(Typ.)
- Efficiency: up to 82% (Typ.)
- Operating ambient temperature: -40℃~+105℃
- MTBF≥3.5 million hours (3500000Hrs)
- Output short-circuit protection: Continuous short-circuit protection, automatic recovery
- Compact SIP package, plastic housing
- Industry standard pin-out
- Ripple/noise (20MHz bandwidth): 30mVp-p(Typ.)

DC/DC Power Module for SiC MOSFET Drivers



QAxCx series is a line of DC-DC module power supplies designed by Huizhi Electronics specifically for IGBT drivers. It features an asymmetric voltage output configuration to minimize IGBT drive losses as much as possible. It also includes output short-circuit protection and self-recovery capabilities. This product is suitable for:

- General-purpose variable-frequency drives
- AC servo drive systems
- Electric welding machine
- Uninterruptible power supplies (UPS)

Product selection table

| Ce<br>rt<br>if<br>ic<br>at<br>io<br>n | Model number | Input voltage range<br>(Vdc)        | Output<br>Voltage/Cur<br>rent | Ripple and Noise                |                                   | Efficiency@<br>Full load | Max.<br>capaci<br>tive<br>load |
|---------------------------------------|--------------|-------------------------------------|-------------------------------|---------------------------------|-----------------------------------|--------------------------|--------------------------------|
|                                       |              | Rated value <sup>②</sup><br>(Range) | Output V<br>(Vdc)             | Output I<br>(mA)<br>(Max. Min.) | Full Load<br>(mVp-p)<br>Typ. /Max | %,<br>(Min. /Typ.<br>)   | μ F                            |
|                                       | QA01C        | 15<br>(13.5-16.5)                   | +20/-4                        | +100/-100                       | 50/100                            | 76/78                    | 220                            |
|                                       | QA01C-18     | 15<br>(13.5-16.5)                   | +18/-3                        | +100/-100                       | 50/100                            | 76/79                    | 220                            |
|                                       | QA051C       | 5<br>(4.5-5.5)                      | +20/-5                        | +80/-40                         | 50/100                            | 75/79                    | 100                            |
|                                       | QA151C       | 15<br>(13.5-16.5)                   | +20/-5                        | +80/-40                         | 50/100                            | 73/75                    | 220                            |
|                                       | QA121C2      | 12<br>(10.8-13.2)                   | +15/-3.5                      | +80/-40                         | 50/100                            | 77/81                    | 220                            |

|  |            |                   |        |           |        |       |     |
|--|------------|-------------------|--------|-----------|--------|-------|-----|
|  | QA121C-20  | 12<br>(10.8-13.2) | +20/-5 | +111/-111 | 50/100 | 77/79 | 220 |
|  | QA151C3    | 15<br>(13.5-16.5) | +15/-4 | +100/-100 | 50/100 | 77/82 | 220 |
|  | QA1201C-20 | 12<br>(10.8-13.2) | +20/-4 | +100/-100 | 50/100 | 79/80 | 220 |
|  | QA2401C-20 | 24<br>(21.6-26.4) | +20/-4 | +100/-100 | 50/100 | 75/80 | 220 |

Note: 1. Due to space limitations, the above is only a list of representative products. For products not included in this list, please contact our Sales Department.

2. The maximum capacitive load indicates the maximum capacitive load that can be connected to +Vo or -Vo. If this value is exceeded, the product will not start properly.

Test Conditions: Unless otherwise specified, all parameter measurements were taken at the nominal input voltage, with a purely resistive rated load, and at an ambient temperature of 25° C.

Input characteristics

| Items                                | Working conditions     |            | Min. | Typ.   | Max.   | Unit |
|--------------------------------------|------------------------|------------|------|--------|--------|------|
| Input voltage<br>(full load/no-load) | Rated voltage<br>input | QA01C      | --   | 193/16 | --     | mA   |
|                                      |                        | QA01C-18   | --   | 177/16 | 185/30 |      |
|                                      |                        | QA051C     | --   | 456/53 | --     |      |
|                                      |                        | QA151C     | --   | 150/20 | 160/30 |      |
|                                      |                        | QA121C2    | --   | 210/15 | --     |      |
|                                      |                        | QA121C-20  | --   | 260/20 | --     |      |
|                                      |                        | QA151C3    | --   | 151/15 | --     |      |
|                                      |                        | QA1201C-20 | --   | 240/20 | --     |      |
|                                      |                        | QA2401C-20 | --   | 125/13 | --     |      |
| Input voltage                        | QA01C                  | -0.7       | --   | 21     | VDC    |      |
|                                      | QA01C-18               | -0.7       | --   | 21     |        |      |
|                                      | QA051C                 | -0.7       | --   | 9      |        |      |
|                                      | QA151C                 | -0.7       | --   | 21     |        |      |
|                                      | QA121C2                | -0.7       | --   | 18     |        |      |
|                                      | QA121C-20              | -0.7       | --   | 18     |        |      |
|                                      | QA151C3                | -0.7       | --   | 21     |        |      |
|                                      | QA1201C-20             | -0.7       | --   | 18     |        |      |
|                                      | QA2401C-20             | -0.7       | --   | 30     |        |      |
| Input filter type                    | Capacitor filtering    |            |      |        |        |      |
| Hot swap                             | Not supported          |            |      |        |        |      |

Output characteristics

| Items          | Working conditions |       |       |     | Min. | Typ. | Max. | Unit |
|----------------|--------------------|-------|-------|-----|------|------|------|------|
| Output voltage | Rated voltage      | QA01C | Light | +Vo | +2   | +4   | +6   |      |

|  |  |            |            |     |      |       |       |   |
|--|--|------------|------------|-----|------|-------|-------|---|
|  |  |            | Full load  | -Vo | +5   | +10   | +15   | % |
|  |  |            |            | +Vo | -4   | -1.5  | +1    |   |
|  |  |            |            | -Vo | -4   | +0.5  | +5.5  |   |
|  |  | QA01C-18   | Light load | +Vo | 0    | +4    | +9    |   |
|  |  |            |            | -Vo | +6   | +12   | +20   |   |
|  |  |            | Full load  | +Vo | -7   | -3    | +2    |   |
|  |  |            |            | -Vo | -5   | 0     | +7    |   |
|  |  | QA051C     | Light load | +Vo | +4   | +8    | +12   |   |
|  |  |            |            | -Vo | +6   | +12   | +18   |   |
|  |  |            | Full load  | +Vo | -3   | +0.5  | +4    |   |
|  |  |            |            | -Vo | +1   | +4    | +8    |   |
|  |  | QA151C     | Light load | +Vo | -0.5 | +1.5  | +3.5  |   |
|  |  |            |            | -Vo | 0    | +3    | +6    |   |
|  |  |            | Full load  | +Vo | -5   | -3    | -1    |   |
|  |  |            |            | -Vo | -5   | -2    | 1     |   |
|  |  | QA121C2    | Light load | +Vo | 0    | +7    | +15   |   |
|  |  |            |            | -Vo | 0    | +15   | +30   |   |
|  |  |            | Full load  | +Vo | -4   | 0     | +5    |   |
|  |  |            |            | -Vo | -5   | +5    | +15   |   |
|  |  | QA121C-20  | Light load | +Vo | +5.5 | +8    | +10.5 |   |
|  |  |            |            | -Vo | +10  | +12.5 | +15   |   |
|  |  |            | Full load  | +Vo | -2   | 0     | +2    |   |
|  |  |            |            | -Vo | +0   | +3    | +6    |   |
|  |  | QA151C3    | Light load | +Vo | +2   | +6    | +10   |   |
|  |  |            |            | -Vo | 0    | +10   | +18   |   |
|  |  |            | Full load  | +Vo | -2   | 0     | +2    |   |
|  |  |            |            | -Vo | -5   | 0     | +5    |   |
|  |  | QA1201C-20 | Light load | +Vo | 0    | +5    | +10   |   |
|  |  |            |            | -Vo | 0    | +7.5  | +15   |   |
|  |  |            | Full load  | +Vo | -2   | 0     | +2    |   |

|                                 |                                 |            |            |      |       |      |       |  |
|---------------------------------|---------------------------------|------------|------------|------|-------|------|-------|--|
|                                 |                                 | QA2401C-20 | Light load | -Vo  | -7.5  | -2.5 | +2.5  |  |
|                                 |                                 |            |            | +Vo  | +6.5  | +8   | +10.5 |  |
|                                 |                                 |            |            | -Vo  | +5.5  | +13  | +20.5 |  |
|                                 |                                 |            | Full load  | +Vo  | -2.5  | 0    | +2.5  |  |
|                                 |                                 |            |            | -Vo  | -7.5  | 0    | +7.5  |  |
| Line Regulation                 | Input voltage variation<br>±10% | QA01C      | --         | ±1.1 | ±1.3  | %    |       |  |
|                                 |                                 | QA01C-18   | --         | ±1.1 | ±1.3  |      |       |  |
|                                 |                                 | QA051C     | --         | ±1.4 | ±2    |      |       |  |
|                                 |                                 | QA151C     | --         | ±1.1 | ±1.3  |      |       |  |
|                                 |                                 | QA121C2    | --         | ±1.1 | ±1.2  |      |       |  |
|                                 |                                 | QA121C-20  | --         | --   | ±1.5  |      |       |  |
|                                 |                                 | QA151C3    | --         | ±1.1 | ±1.3  |      |       |  |
|                                 |                                 | QA1201C-20 | --         | ±1.5 | ±2    |      |       |  |
|                                 |                                 | QA2401C-20 | --         | ±1.1 | ±1.3  |      |       |  |
| Load Regulation                 | 10% -100% load                  | + output   | --         | 5    | 10    | %    |       |  |
|                                 |                                 | - output   | --         | 5    | 20    |      |       |  |
| Temperature drift coefficient   | Full load                       |            |            | --   | ±0.03 | --   | %/°C  |  |
| Ripple & Noise *                | 20MHz bandwidth                 |            |            | --   | 50    | 100  | mVp-p |  |
| Output short-circuit protection |                                 |            |            | --   | --    | 1    | s     |  |

Note: \*The test method for ripple and noise uses the twisted-pair test method; see the Test Application Reference.

General characteristics

| Items                           | Working conditions                                                     | Min. | Typ. | Max. | Unit |
|---------------------------------|------------------------------------------------------------------------|------|------|------|------|
| Insulation voltage              | Input-output, test duration: 1 minute, leakage current less than 1 mA. | 3500 | --   | --   | VDC  |
|                                 |                                                                        | 6000 | --   | --   |      |
| Insulation resistance           | Input-output, insulation voltage 500 VDC.                              | 1000 | --   | --   | MΩ   |
| Isolation                       | Input-Output, 100 kHz/0.1 V                                            | --   | 3.5  | --   | pF   |
| Operating temperature           | Derate for use when temperature ≥85℃ (see Figure 1)                    | -40  | --   | 105  | ℃    |
| Storage temperature             |                                                                        | -55  | --   | +125 |      |
| Operating case temperature rise |                                                                        | --   | 25   | --   |      |

|                                    |                                                         |                                                          |     |      |     |
|------------------------------------|---------------------------------------------------------|----------------------------------------------------------|-----|------|-----|
| Storage                            | No condensation                                         | -55                                                      | —   | 125  | %RH |
| Pin soldering temperature          | The solder point is 1.5 mm from the housing; 10 seconds | —                                                        | —   | +300 | ℃   |
| Switching frequency                | Full load, rated voltage input                          | —                                                        | 100 | —    | KHz |
| Vibration                          |                                                         | 10-55Hz, 10G, 30 Min. along X, Y and Z                   |     |      |     |
| Housing material                   |                                                         | Black flame-retardant, heat-resistant plastic (UL94 V-0) |     |      |     |
| Minimum mean time between failures | MIL-HDBK-217F@25℃                                       | 3.5X10 <sup>6</sup>                                      | —   | —    | Hrs |

Product Performance Curve

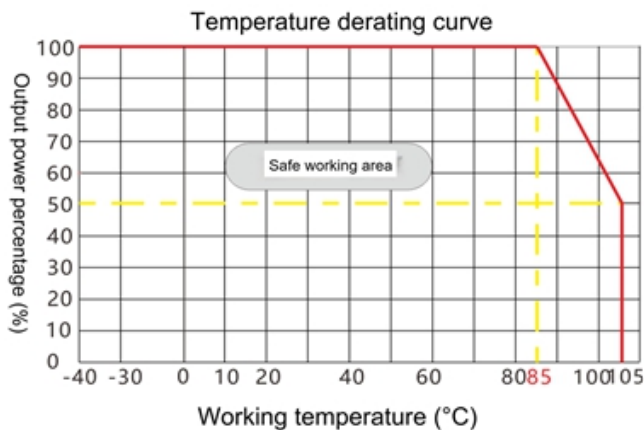


Figure 1

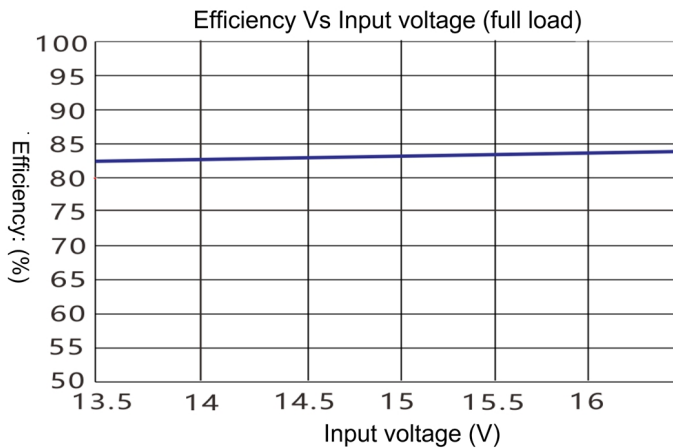


Figure 2

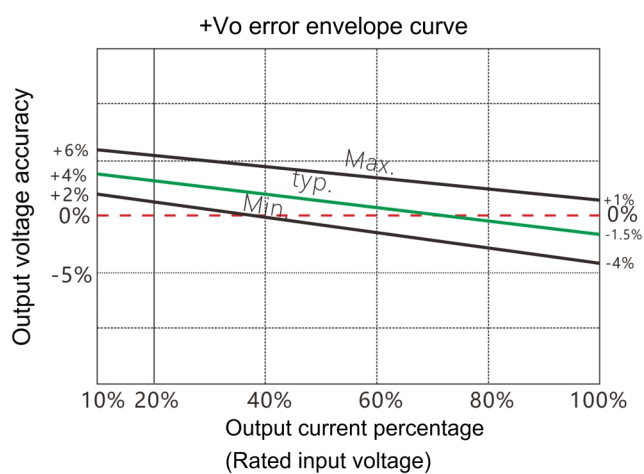


Figure 1 (QA01C)

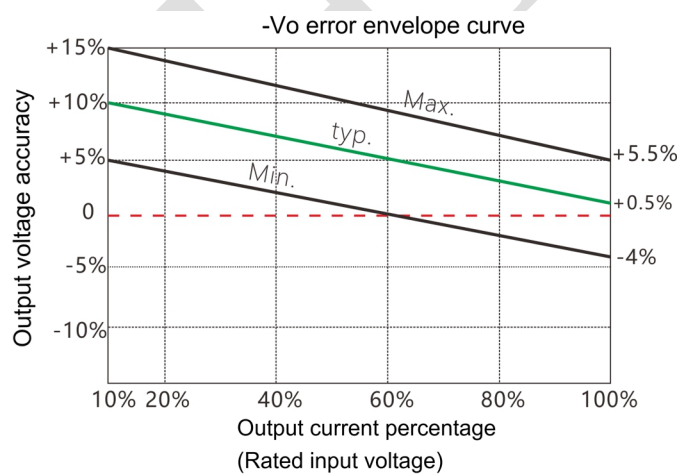


Figure 2 (QA01C)

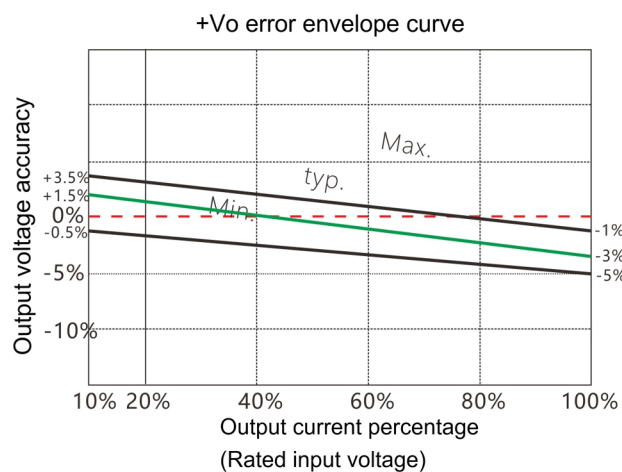


Figure 3 (QA151C)

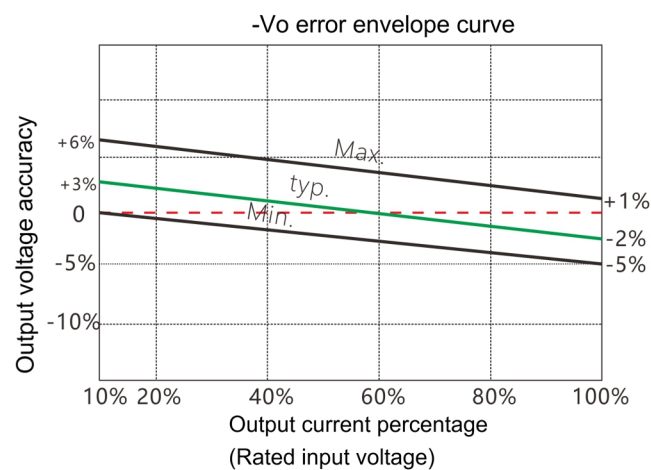


Figure 4 (QA151C)

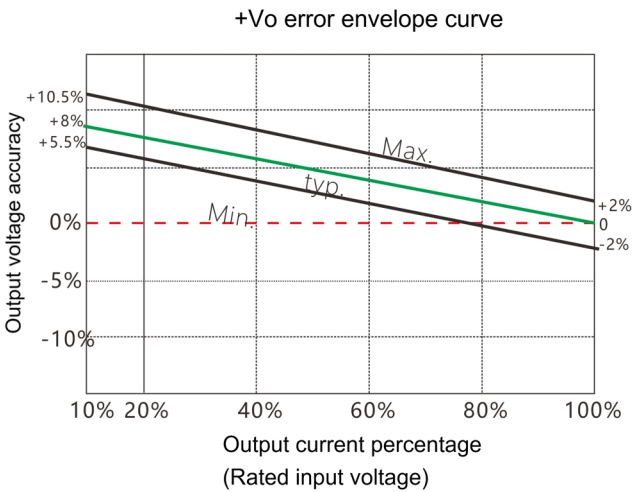


Figure 5 (QA121-20C)

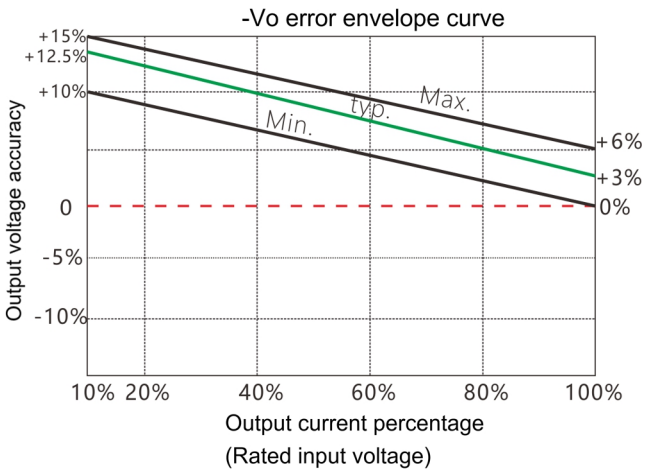
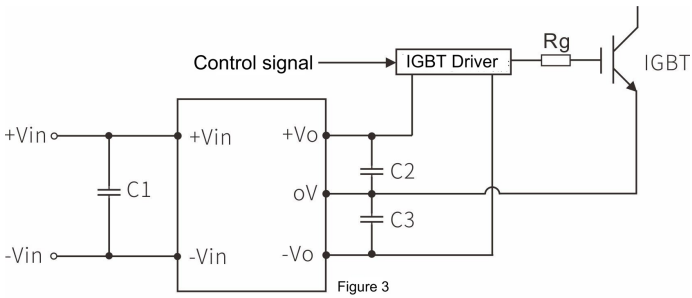


Figure 6 (QA121-20C)

Typical Application Reference Circuit (Recommended Parameters)

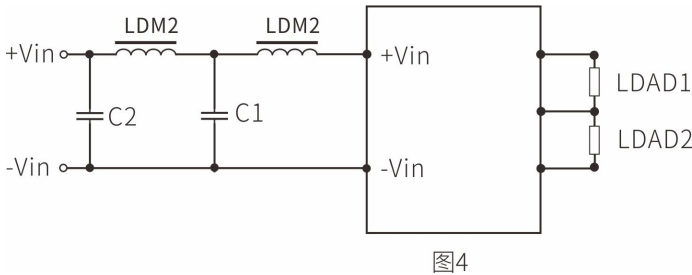
1. General applications:

If further reduction of input and output ripple is required, a capacitor filter network can be connected across the input and output terminals; the circuit is shown in Figure 1. However, care must be taken to select an appropriate filter capacitor. If the capacitor is too large, it is likely to cause startup issues. For each output channel, the recommended capacitive load values—which ensure safe and reliable operation—are listed in Table 1.



| C1/ C2 /C3 |                           |
|------------|---------------------------|
| 100uF/35V  | (Low-impedance capacitor) |

2. Typical EMI application circuit

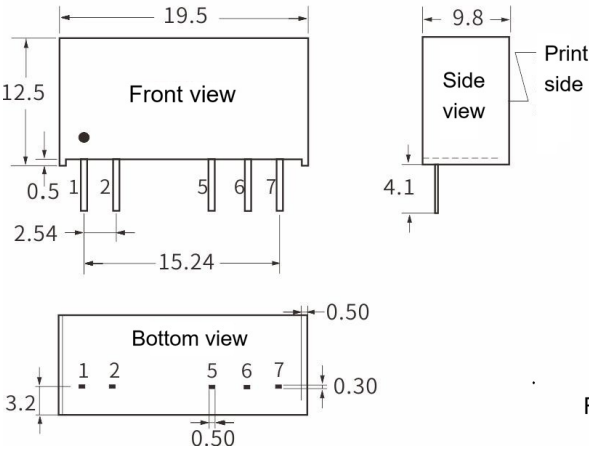


Recommended EMI reference circuit values (Table 2)

| Input voltage |         | 12/ 15/24VDC |
|---------------|---------|--------------|
| EMI           | C1 、 C2 | 4.7μF /50V   |
|               | LDM1    | 12μ H        |
|               | LDM2    | 47μ H        |

Appearance Dimensions and Pin Assignment, Recommended PCB Layout

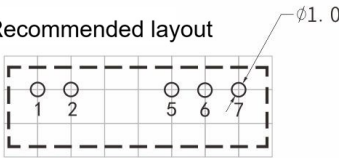
1) Appearance Dimensions (Unit: mm, Tol.: xx ±0.25)



2) Pin Assignment

| 1    | 2    | 3      | 4      | 5     | 6   | 7     |
|------|------|--------|--------|-------|-----|-------|
| +Vin | -Vin | No Pin | No Pin | -Vout | COM | +Vout |
| 输入正  | 输入负  | 空脚     | 空脚     | 输出负   | 公共地 | 输出正   |

3) Recommended layout



Remarks: grid distance : 2.54\*2.54mm

\*Note: If the pin definitions of the power module differ from those in the selection guide, refer to the labels on the actual product.

Package Description

| Package code | L x W x H           |                          |
|--------------|---------------------|--------------------------|
| QA           | 19.5 x 9.8x 12.5 mm | 0.768 × 0.386 ×0.492inch |

Test Application Reference

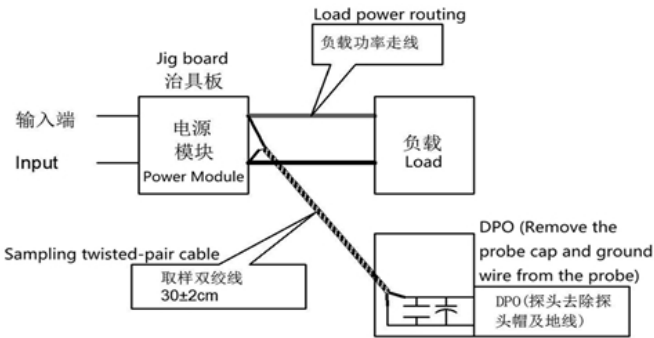
Ripple & Noise Testing: (Twisted-pair method, 20 MHz bandwidth)

Test Method:

1. For ripple and noise testing, use a Category 12 twisted-pair cable. Set the oscilloscope bandwidth to 20 MHz and use a 100 MHz bandwidth probe. Connect a 0.1 μF polypropylene capacitor and a 4.7 μF high-frequency, low-impedance electrolytic capacitor in parallel at the probe tip. Set the oscilloscope to "Sample" mode.

2. Schematic diagram for output ripple and noise testing:

Connect the power supply input to the power source. Connect the power supply output to the electronic load via the fixture board. For testing, use a 30 cm ± 2 cm sampling lead to take a direct sample from the power supply output port. Select insulated wires with appropriate gauge based on the magnitude of the output current.





## Application Precautions

1. Input Requirements: Ensure that the output voltage fluctuation range of the power supply does not exceed the input requirements of the DC/DC module itself; the output power of the input power supply must be greater than the output power of the DC/DC module.
2. Recommended Circuit 1: For applications with general ripple and noise requirements, a filter capacitor can be connected in parallel at both the input and output terminals. The external circuit is shown in Figure (1) below; refer to Table (1). Output Load Requirements: Avoid operating under no-load conditions whenever possible. When the actual power consumption of the load is less than 10% of the module's rated output power or no-load conditions occur, it is recommended to connect a dummy load to the output. The dummy load (resistor) can be calculated based on 5 - 10% of the module's rated power, where the resistance value =  $U_{out} / (1W \times R3 \times 10\%)$ ;
3. Overload Protection: Under normal operating conditions, the product's output circuit does not provide overload protection. Prolonged overload will trigger over-temperature protection, causing the output to shut down;
4. The output features continuous short-circuit protection with automatic recovery.
5. The capacitance of the external capacitor connected to the output should not be too large, as this may cause overcurrent or poor startup during module startup;
6. If the product operates below the minimum required load, performance compliance with all specifications in this manual cannot be guaranteed;
7. Maximum capacitive loads are tested within the input voltage range and under full-load conditions;
8. Unless otherwise specified, all specifications in this manual are measured at  $T_a=25^{\circ}\text{C}$ , humidity <75% RH, nominal input voltage, and rated output load;
9. All test methods for the specifications in this manual are based on our company's standards;
10. We offer product customization; please contact our technical staff directly for details;
11. Product specifications are subject to change without notice.

## Contact

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