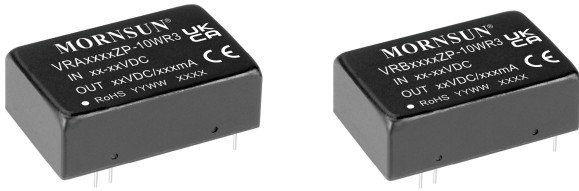


10W isolated DC-DC converter DIP package  
Wide input and regulated dual/ single output



### FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.11W
- I/O isolation test voltage 1.5k VDC
- Operating ambient temperature range: -40°C to +85°C
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Meet CISPR32/EN55032 CLASS A without extra components
- Industry standard pin-out

VRA\_ZP-10WR3 & VRB\_ZP-10WR3 series are isolated 10W DC-DC converter products with a wide range of voltage input of 9-18VDC, 18-36VDC, 36-75VDC, isolation voltage of 1500VDC, input under-voltage protection, output short-circuit, over-current, over-voltage protection and EMI meets CISPR32/EN55032 CLASS A without external components; these products are widely used in fields such as industrial control, electric power, instruments and communication.

### Selection Guide

| Certification | Part No.        | Input Voltage (VDC) |                   | Output       |                           | Full Load Efficiency <sup>②</sup><br>(%)Min./Typ. | Capacitive Load <sup>③</sup><br>(μF)Max. |
|---------------|-----------------|---------------------|-------------------|--------------|---------------------------|---|--|
|               |                 | Nominal (Range)     | Max. <sup>①</sup> | Voltage(VDC) | Current (mA)<br>Max./Min. |   |  |
| EN/BS EN      | VRA1205ZP-10WR3 | 12<br>(9-18)        | 20                | ±5           | ±1000/0                   | 81/83   | 1000                                     |
|               | VRA1212ZP-10WR3 |                     |                   | ±12          | ±416/0                    | 85/87   | 470                                      |
|               | VRA1215ZP-10WR3 |                     |                   | ±15          | ±333/0                    | 85/87   | 330                                      |
|               | VRB1203ZP-10WR3 |                     |                   | 3.3          | 2400/0                    | 84/86   | 1200                                     |
|               | VRB1205ZP-10WR3 |                     |                   | 5            | 2000/0                    | 84/86   | 1000                                     |
|               | VRB1212ZP-10WR3 |                     |                   | 12           | 833/0                     | 85/87   | 470                                      |
|               | VRB1215ZP-10WR3 |                     |                   | 15           | 667/0                     | 85/87   | 330                                      |
|               | VRB1224ZP-10WR3 |                     |                   | 24           | 416/0                     | 86/88   | 100                                      |
|               | VRA2405ZP-10WR3 | 24<br>(18-36)       | 40                | ±5           | ±1000/0                   | 81/83   | 1000                                     |
|               | VRA2412ZP-10WR3 |                     |                   | ±12          | ±416/0                    | 85/87   | 470                                      |
|               | VRA2415ZP-10WR3 |                     |                   | ±15          | ±333/0                    | 85/87   | 330                                      |
|               | VRB2403ZP-10WR3 |                     |                   | 3.3          | 2400/0                    | 83/85   | 1200                                     |
|               | VRB2405ZP-10WR3 |                     |                   | 5            | 2000/0                    | 85/87   | 1000                                     |
|               | VRB2412ZP-10WR3 |                     |                   | 12           | 833/0                     | 85/87   | 470                                      |
|               | VRB2415ZP-10WR3 |                     |                   | 15           | 667/0                     | 85/87   | 330                                      |
|               | VRB2424ZP-10WR3 |                     |                   | 24           | 416/0                     | 85/87   | 100                                      |
|               | VRA4805ZP-10WR3 | 48<br>(36-75)       | 80                | ±5           | ±1000/0                   | 81/83   | 1000                                     |
|               | VRA4812ZP-10WR3 |                     |                   | ±12          | ±416/0                    | 85/87   | 470                                      |
|               | VRA4815ZP-10WR3 |                     |                   | ±15          | ±333/0                    | 85/87   | 330                                      |
|               | VRB4803ZP-10WR3 |                     |                   | 3.3          | 2400/0                    | 84/86   | 1200                                     |
|               | VRB4805ZP-10WR3 |                     |                   | 5            | 2000/0                    | 85/87   | 1000                                     |
|               | VRB4812ZP-10WR3 |                     |                   | 12           | 833/0                     | 85/87   | 470                                      |
|               | VRB4815ZP-10WR3 |                     |                   | 15           | 667/0                     | 85/87   | 330                                      |
|               | VRB4824ZP-10WR3 |                     |                   | 24           | 416/0                     | 86/88   | 100                                      |

Notes:

- ① Exceeding the maximum input voltage may cause permanent damage;
- ② Efficiency is measured at nominal input voltage and rated output load;
- ③ The specified maximum capacitive load for positive and negative output is identical;
- ④ We suggest to connect an external electrolytic capacitor if there is a spike voltage at the input, details please refer to application circuit.

Input Specifications

| Item                                   | Operating Conditions                              | Min.                                     | Typ. | Max.   | Unit    |    |
|--|---|--|------|--------|---------|----|
| Input Current<br>(full load / no-load) | 12VDC input, nominal<br>input voltage             | 3.3VDC single output                     | --   | 759/15 | 777/30  | mA |
|  |   | 5VDC single output                       | --   | 958/15 | 980/30  |    |
|  |   | others                                   | --   | 980/9  | 1028/15 |    |
|  | 24VDC input, nominal<br>input voltage             | 3.3VDC single output                     | --   | 384/10 | 393/25  |    |
|  |   | 5VDC single output                       | --   | 474/5  | 485/12  |    |
|  |   | others                                   | --   | 490/5  | 515/12  |    |
|  | 48VDC input, nominal<br>input voltage             | 3.3VDC single output                     | --   | 190/8  | 195/20  |    |
|  |   | 5VDC single output                       | --   | 237/5  | 243/12  |    |
|  |   | others                                   | --   | 245/4  | 258/8   |    |
| Reflected Ripple Current               | 12VDC nominal input series, nominal input voltage | --                                       | 50   | --     | VDC     |    |
|  | 24VDC nominal input series, nominal input voltage | --                                       | 40   | --     |         |    |
|  | 48VDC nominal input series, nominal input voltage | --                                       | 30   | --     |         |    |
| Surge Voltage (1sec. max.)             | 12VDC nominal input series                        | -0.7                                     | --   | 25     | VDC     |    |
|  | 24VDC nominal input series                        | -0.7                                     | --   | 50     |         |    |
|  | 48VDC nominal input series                        | -0.7                                     | --   | 100    |         |    |
| Start-up Voltage                       | 12VDC nominal input series                        | --                                       | --   | 9      | VDC     |    |
|  | 24VDC nominal input series                        | --                                       | --   | 18     |         |    |
|  | 48VDC nominal input series                        | --                                       | --   | 36     |         |    |
| Input Under-voltage Protection         | 12VDC nominal input series                        | 5.5                                      | 6.5  | --     | VDC     |    |
|  | 24VDC nominal input series                        | 12                                       | 15.5 | --     |         |    |
|  | 48VDC nominal input series                        | 25                                       | 30.5 | --     |         |    |
| Input Filter                           |   | PI filter                                |      |        |         |    |
| Hot Plug                               |   | Unavailable                              |      |        |         |    |
| Ctrl *                                 | Module on   | Ctrl pin open or pulled high (3.5-12VDC) |      |        |         |    |
|  | Module off  | Ctrl pin pulled low to GND (0-1.2VDC)    |      |        |         |    |
|  | Input current when off                            | --                                       | 6    | 10     | mA      |    |

Note: \*The voltage of Ctrl pin is relative to input pin GND.

Output Specifications

| Item                          | Operating Conditions   | Min.                      | Typ. | Max.  | Unit |       |
|-------------------------------|--|---------------------------|------|-------|------|-------|
| Voltage Accuracy <sup>①</sup> | 0%-100% load   | Positive output           | --   | ±0.5  | ±2   | %     |
|                               |  | Negative output           | --   | ±1    | ±3   |       |
| Linear Regulation             | Full load, the input voltage is<br>from low voltage to high<br>voltage           | Positive output           | --   | ±0.2  | ±0.5 |       |
|                               |  | Negative output           | --   | ±0.5  | ±1   |       |
| Load Regulation <sup>②</sup>  | 5%-100% load   | Positive output           | --   | ±0.5  | ±1   |       |
|                               |  | Negative output           | --   | ±0.5  | ±1.5 |       |
| Cross Regulation              | Dual output, main circuit with 50% load,<br>auxiliary circuit with 25%-100% load | --                        | --   | ±5    |      |       |
| Transient Recovery Time       |  | --                        | 300  | 500   | μs   |       |
| Transient Response Deviation  | 25% load step change,<br>Nominal input voltage                                   | 3.3VDC/5VDC single output | --   | ±5    | ±8   |       |
|                               |  | others                    | --   | ±3    | ±5   |       |
| Temperature Coefficient       | Full load  | --                        | --   | ±0.03 | %/°C |       |
| Ripple & Noise <sup>③</sup>   | 20MHz bandwidth, 5%-100%<br>load   | 3.3VDC/5VDC single output | --   | 40    | 80   | mVp-p |
|                               |  | others                    | --   | 40    | 100  |       |
| Over-voltage Protection       | Input voltage range  | 110                       | --   | 160   | %Vo  |       |
| Over-current Protection       | Input voltage range  | 3.3VDC/5VDC single output | 110  | 160   | 230  | %Io   |
|                               |  | others                    | 110  | 140   | 190  |       |
| Short-circuit Protection      | Input voltage range  | Continuous, self-recovery |      |       |      |       |

Notes:

- ① At 0% -5% load, the Max. output voltage accuracy of  $\pm 5\text{VDC}$  output converter is  $\pm 5\%$ , the Max. output voltage accuracy of 3.3VDC 5VDC output converter is  $\pm 3\%$ ;
- ② Load regulation for 0% -100% load increases to  $\pm 5\%$ ;
- ③ Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information. Ripple & Noise at <5% load is 5%Vo max.

### General Specifications

| Item                                 | Operating Conditions  | Min.                                   | Typ. | Max. | Unit       |
|--------------------------------------|---|--|------|------|------------|
| Isolation                            | Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max. | 1500                                   | --   | --   | VDC        |
| Insulation Resistance                | Input-output resistance at 500VDC   | 1000                                   | --   | --   | M $\Omega$ |
| Isolation Capacitance                | Input-output capacitance at 100kHz/0.1V   | --                                     | 2000 | --   | pF         |
| Operating Temperature                | see Fig. 1  | -40                                    | --   | +85  | °C         |
| Storage Temperature                  |   | -55                                    | --   | +125 |            |
| Storage Humidity                     | Non-condensing  | 5                                      | --   | 95   | %RH        |
| Pin Soldering Resistance Temperature | Welding spot is 1.5mm away from the casing, 10 seconds                              | --                                     | --   | +300 | °C         |
| Vibration                            |   | 10-150Hz, 5G, 0.75mm. along X, Y and Z |      |      |            |
| Switching Frequency *                | PWM mode  | --                                     | 350  | --   | kHz        |
| MTBF                                 | MIL-HDBK-217F@25°C  | 1000                                   | --   | --   | k hours    |

Note: \*Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

### Mechanical Specifications

|                |                         |
|----------------|-------------------------|
| Case Material  | Aluminum alloy          |
| Dimensions     | 32.00 x 20.00 x 10.80mm |
| Weight         | 12.0g(Typ.)             |
| Cooling Method | Free air convection     |

### Electromagnetic Compatibility (EMC)

|           |  |                  |  |
|-----------|--|------------------|--|
| Emissions | CE   | CISPR32/EN55032  | CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit) |
|           | RE   | CISPR32/EN55032  | CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit) |
| Immunity  | ESD  | IEC/EN61000-4-2  | Contact $\pm 4\text{kV}$ perf. Criteria B  |
|           | RS   | IEC/EN61000-4-3  | 10V/m perf. Criteria A   |
|           | EFT  | IEC/EN61000-4-4  | $\pm 2\text{kV}$ (see Fig.3-① for recommended circuit) perf. Criteria B              |
|           | Surge  | IEC/EN61000-4-5  | line to line $\pm 2\text{kV}$ (see Fig.3-① for recommended circuit) perf. Criteria B |
|           | CS   | IEC/EN61000-4-6  | 10 Vr.m.s perf. Criteria A   |
|           | Immunities of voltage dip, drop and short interruption | IEC/EN61000-4-29 | 0%, 70% perf. Criteria B   |

### Typical Characteristic Curves

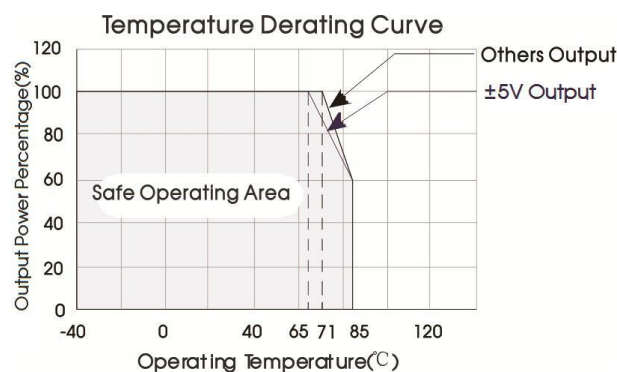
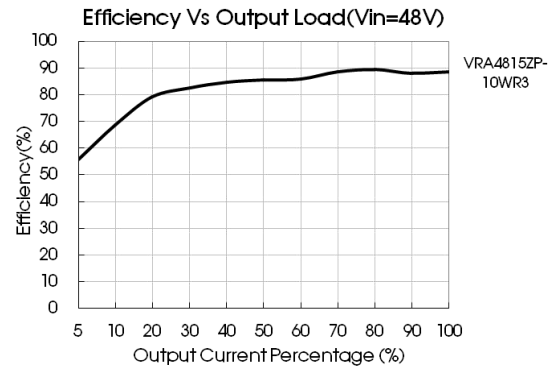
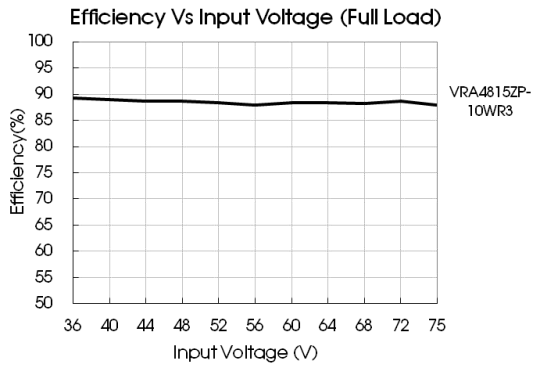
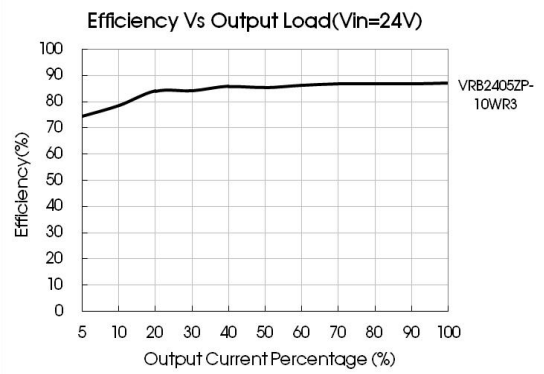
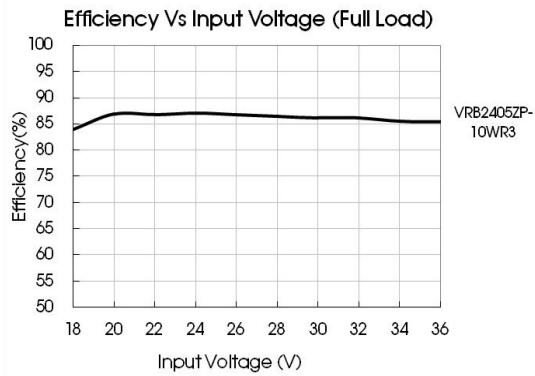
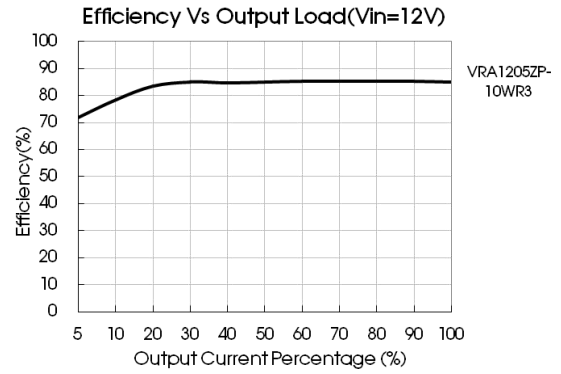
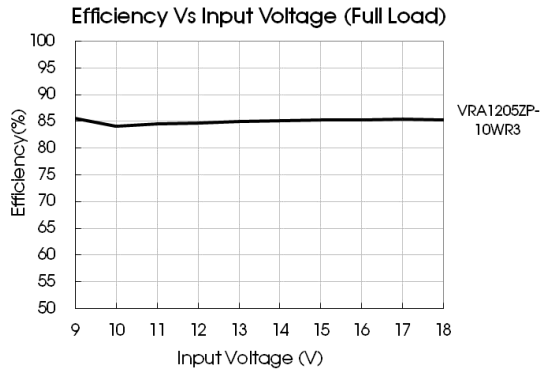


Fig. 1



Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.

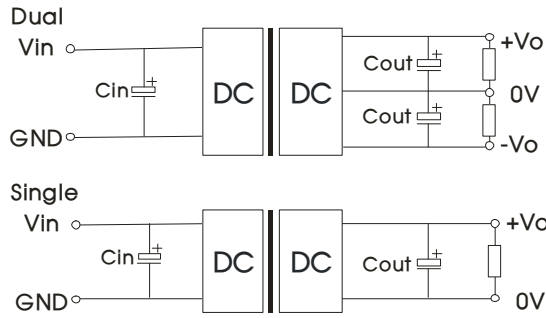
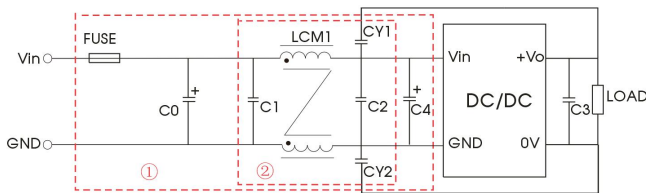


Fig. 2

| Vin(VDC) | Vout(VDC)     | Cin                | Cout     |
|----------|---------------|--------------------|----------|
| 12       | 3.3/5/±5      | 100µF/35V          | 10µF/16V |
|          | 12/15/±12/±15 |                    | 10µF/25V |
|          | 24            |                    | 10µF/50V |
| 24       | 3.3/5/±5      | 100µF/50V          | 10µF/16V |
|          | 12/15/±12/±15 |                    | 10µF/25V |
|          | 24            |                    | 10µF/50V |
| 48       | 3.3/5/±5      | 10µF<br>~47µF/100V | 10µF/16V |
|          | 12/15/±12/±15 |                    | 10µF/25V |
|          | 24            |                    | 10µF/50V |

2. EMC solution-recommended circuit

3.3VDC/5VDC single output:



Others:

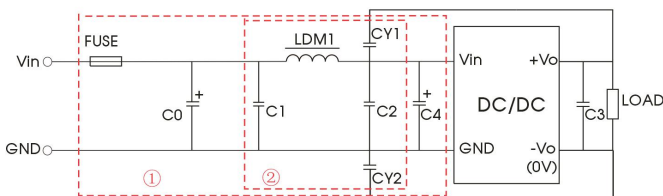


Fig. 3

Note: Part ① in the Fig. 3 is used for EMC test and part ② for emissions filtering; Selecting based on needs.

Parameter description:

| Model    | Vin: 12VDC  | Vin: 24VDC | Vin: 48VDC |
|----------|---|------------|------------|
| FUSE     | Selected based on the actual input current in application |            |            |
| C0, C4   | 470µF/35V   | 330µF/50V  | 330µF/100V |
| C1, C2   | 10µF/50V  |            | 10µF/100V  |
| C3       | Refer to the Cout in Fig.2                                |            |            |
| LDM1     | 10µH  |            |            |
| LCM1     | 1.4-1.7mH (TN150P-RH12.7*12.7*7.9)                        |            |            |
| CY1, CY2 | 1nF/2kV   |            |            |

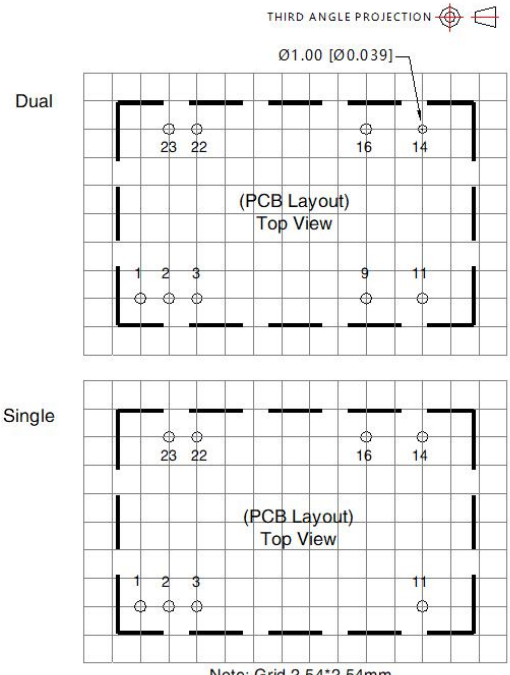
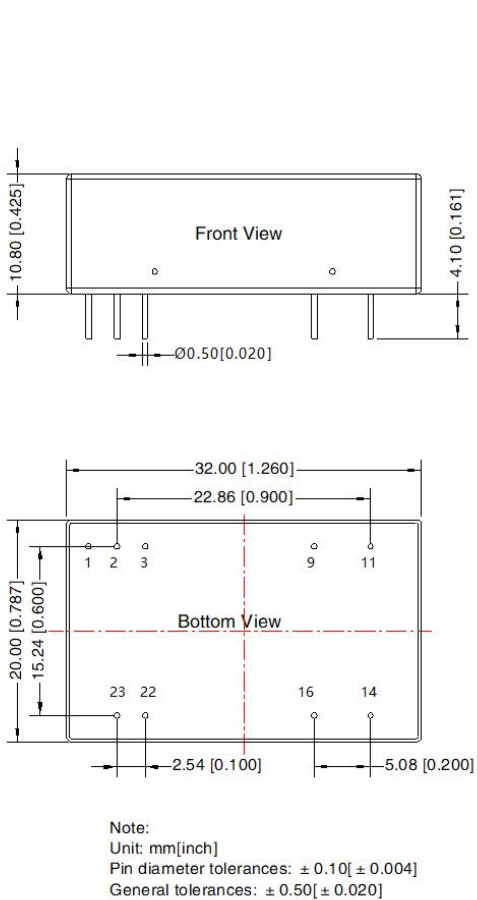
3. The products do not support parallel connection of their output

4. For additional information please refer to DC-DC converter application notes on

[www.mornsun-power.com](http://www.mornsun-power.com)



Dimensions and Recommended Layout



| Pin-Out |        |      |
|---------|--------|------|
| Pin     | Single | Dual |
| 1       | Ctrl   | Ctrl |
| 2,3     | GND    | GND  |
| 9       | No Pin | 0V   |
| 11      | NC     | -Vo  |
| 14      | +Vo    | +Vo  |
| 16      | 0V     | 0V   |
| 22,23   | Vin    | Vin  |

NC: Pin to be isolated from circuit

Notes:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58210008;
- The maximum capacitive load offered were tested at input voltage range and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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