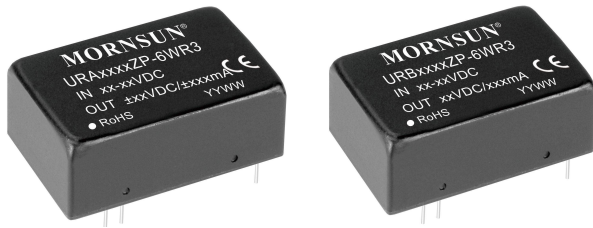


# DC/DC Converter

## URA\_ZP-6WR3 & URB\_ZP-6WR3 Series

# MORNSUN®

6W isolated DC-DC converter in DIP package  
Ultra-wide input and regulated dual/single output



Patent Protection

CE Report

EN62368-1

CB

IEC60950-1

RoHS

## FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage 1.5k VDC
- Operating ambient temperature range: -40°C to +85°C
- Input under-voltage, output over-voltage, short-circuit, over-current protection
- Meets CISPR32/EN55032 CLASS A, without extra components
- Industry standard pin-out

URA\_ZP-6WR3 & URB\_ZP-6WR3 series of isolated 6W DC-DC converter products with an ultra-wide range of voltage input of 9-36VDC(24VDC input), 18-75VDC(48VDC input), input to output isolation is tested with 1500VDC, input under-voltage protection, output over-voltage, short-circuit, over-current protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components and they are widely used in fields such as industrial control, electric power, instruments, communication and railway applications.

## 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<br>(Range)  | Max. <sup>①</sup> | Voltage<br>(VDC) | Current (mA)<br>Max./Min. |                                                    |                                          |
| EN/IEC        | URA2405ZP-6WR3 | 24<br>(9-36)        | 40                | ±5               | ±600/0                    | 80/82                                              | 680                                      |
|               | URA2409ZP-6WR3 |                     |                   | ±9               | ±333/0                    | 82/84                                              | 220                                      |
|               | URA2412ZP-6WR3 |                     |                   | ±12              | ±250/0                    | 83/85                                              | 330                                      |
|               | URA2415ZP-6WR3 |                     |                   | ±15              | ±200/0                    | 86/88                                              | 220                                      |
|               | URA2424ZP-6WR3 |                     |                   | ±24              | ±125/0                    | 84/86                                              | 100                                      |
|               | URB2403ZP-6WR3 |                     |                   | 3.3              | 1500/0                    | 75/77                                              | 1800                                     |
|               | URB2405ZP-6WR3 |                     |                   | 5                | 1200/0                    | 80/82                                              | 1000                                     |
|               | URB2409ZP-6WR3 |                     |                   | 9                | 667/0                     | 81/83                                              | 1000                                     |
|               | URB2412ZP-6WR3 |                     |                   | 12               | 500/0                     | 83/85                                              | 470                                      |
|               | URB2415ZP-6WR3 |                     |                   | 15               | 400/0                     | 84/86                                              | 220                                      |
|               | URB2424ZP-6WR3 |                     |                   | 24               | 250/0                     | 84/86                                              | 100                                      |
|               | URA4805ZP-6WR3 | 48<br>(18-75)       | 80                | ±5               | ±600/0                    | 81/83                                              | 680                                      |
|               | URA4812ZP-6WR3 |                     |                   | ±12              | ±250/0                    | 85/87                                              | 330                                      |
|               | URA4815ZP-6WR3 |                     |                   | ±15              | ±200/0                    | 86/88                                              | 220                                      |
|               | URB4803ZP-6WR3 |                     |                   | 3.3              | 1500/0                    | 78/80                                              | 1800                                     |
|               | URB4805ZP-6WR3 |                     |                   | 5                | 1200/0                    | 82/84                                              | 1000                                     |
|               | URB4809ZP-6WR3 |                     |                   | 9                | 667/0                     | 83/85                                              | 680                                      |
|               | URB4812ZP-6WR3 |                     |                   | 12               | 500/0                     | 85/87                                              | 470                                      |
|               | URB4815ZP-6WR3 |                     |                   | 15               | 400/0                     | 86/88                                              | 220                                      |
|               | URB4824ZP-6WR3 |                     |                   | 24               | 250/0                     | 85/87                                              | 100                                      |
|               | URB4809ZP-6WR3 |                     |                   | 9                | 667/0                     | 83/85                                              | 680                                      |
| EN/IEC        | URB4812ZP-6WR3 |                     |                   | 12               | 500/0                     | 85/87                                              | 470                                      |
|               | URB4815ZP-6WR3 |                     |                   | 15               | 400/0                     | 86/88                                              | 220                                      |
|               | URB4824ZP-6WR3 |                     |                   | 24               | 250/0                     | 85/87                                              | 100                                      |
|               | URB4809ZP-6WR3 |                     |                   | 9                | 667/0                     | 83/85                                              | 680                                      |

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.

## Input Specifications

| Item                                | Operating Conditions | Min. | Typ.  | Max.   | Unit |
|-------------------------------------|----------------------|------|-------|--------|------|
| Input Current (full load / no-load) | 24VDC input          | --   | 302/5 | 333/12 | mA   |
|                                     | 48VDC input          | --   | 156/4 | 160/8  |      |
| Reflected Ripple Current            |                      | --   | 20    | --     |      |

# MORNSUN®

MORNSUN Guangzhou Science & Technology Co., Ltd.

2024.09.10-A/9

Page 1 of 5

MORNSUN Guangzhou Science & Technology Co., Ltd. reserves the copyright and right of final interpretation

|                                |             |      |             |     |     |  |
|--------------------------------|-------------|------|-------------|-----|-----|--|
| Surge Voltage (1sec. max.)     | 24VDC input | -0.7 | --          | 50  | VDC |  |
|                                | 48VDC input | -0.7 | --          | 100 |     |  |
| Start-up Voltage               | 24VDC input | --   | --          | 9   |     |  |
|                                | 48VDC input | --   | --          | 18  |     |  |
| Input Under-voltage Protection | 24VDC input | 5.5  | 6.5         | --  |     |  |
|                                | 48VDC input | 12   | 15.5        | --  |     |  |
| Input Filter                   |             |      | Pi filter   |     |     |  |
| Hot Plug                       |             |      | Unavailable |     |     |  |

## Output Specifications

| Item                                                                                                                                                                                                                                                                                  | Operating Conditions                                         |                      | Min.                      | Typ. | Max.  | Unit  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------|---------------------------|------|-------|-------|
| Voltage Accuracy <sup>①</sup>                                                                                                                                                                                                                                                         | Vo1                                                          |                      | --                        | ±1   | ±3    | %     |
|                                                                                                                                                                                                                                                                                       | Vo2                                                          |                      |                           |      |       |       |
| Balance Of Output Voltage                                                                                                                                                                                                                                                             | Dual output, balanced load                                   |                      | --                        | ±0.5 | ±1.5  |       |
| Linear Regulation                                                                                                                                                                                                                                                                     | Input voltage variation from low to high at full load        | Vo1                  | --                        | ±0.2 | ±0.5  |       |
|                                                                                                                                                                                                                                                                                       |                                                              | Vo2                  | --                        | ±0.5 | ±1    |       |
| Load Regulation <sup>②</sup>                                                                                                                                                                                                                                                          | 5%-100% load                                                 | Vo1                  | --                        | ±0.5 | ±1    |       |
|                                                                                                                                                                                                                                                                                       |                                                              | Vo2                  | --                        | ±0.5 | ±1.5  |       |
| Cross Regulation                                                                                                                                                                                                                                                                      | Dual outputs, Vo1 load at 50%, Vo2 load at range of 10%-100% |                      | --                        | --   | ±5    |       |
| Transient Recovery Time                                                                                                                                                                                                                                                               | 25% load step change                                         |                      | --                        | 300  | 500   | μs    |
| Transient Response Deviation                                                                                                                                                                                                                                                          |                                                              | 3.3V, 5V, ±5V output | --                        | ±5   | ±8    | %     |
|                                                                                                                                                                                                                                                                                       |                                                              | Others               | --                        | ±3   | ±5    |       |
| Temperature Coefficient                                                                                                                                                                                                                                                               | Full load                                                    |                      | --                        | --   | ±0.03 | %/°C  |
| Ripple&Noise <sup>③</sup>                                                                                                                                                                                                                                                             | 20MHz bandwidth                                              |                      | --                        | --   | 85    | mVp-p |
| Over-voltage Protection                                                                                                                                                                                                                                                               | Input voltage range                                          |                      | 110                       | --   | 160   | %Vo   |
| Over-current Protection                                                                                                                                                                                                                                                               |                                                              |                      | 110                       | 140  | 190   | %Io   |
| Short-circuit Protection                                                                                                                                                                                                                                                              |                                                              |                      | Continuous, self-recovery |      |       |       |
| Note: ①Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;<br>②Load regulation for 0%-100% load is ±5%;<br>③The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information. |                                                              |                      |                           |      |       |       |

## 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 | --   | --   | MΩ      |
| Isolation Capacitance                | Input-output capacitance at 100kHz/0.1V                                             | --   | 1000 | --   | pF      |
| Operating Temperature                | Derating when operating temperature up to 71°C (see Fig. 1)                         | -40  | --   | 85   | °C      |
| Storage Temperature                  |                                                                                     | -55  | --   | 125  |         |
| Storage Humidity                     | Non-condensing                                                                      | 5    | --   | 95   | %RH     |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds                               | --   | --   | 300  | °C      |
| Vibration                            | IEC/EN61373 - Category 1, Grade B                                                   |      |      |      |         |
| Switching Frequency *                | PWM mode                                                                            | --   | 300  | --   | 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 extra components)/ CLASS B (see Fig.3-② for recommended circuit) |                                                        |                  |
|           | RE                                                                | CISPR32/EN55032 CLASS A (without extra 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                                                                                   | $\pm 2\text{kV}$ (see Fig.3-① for recommended circuit) | perf. Criteria B |
|           | CS                                                                | IEC/EN61000-4-6                                                                                   | 3 Vr.m.s                                               | perf. Criteria A |
|           | Voltage dips, short interruptions and voltage variations immunity | IEC/EN61000-4-29                                                                                  | 0-70%                                                  | perf. Criteria B |

## Electromagnetic Compatibility (EMC) (EN50155)

|           |       |             |                                                                                                        |                                                                          |
|-----------|-------|-------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Emissions | CE    | EN50121-3-2 | 150kHz-500kHz                                                                                          | 99dB $\mu\text{V}$ (see Fig.3-② for recommended circuit)                 |
|           |       | EN55016-2-1 | 500kHz-30MHz                                                                                           | 93dB $\mu\text{V}$ (see Fig.3-② for recommended circuit)                 |
|           | RE    | EN50121-3-2 | 30MHz-230MHz                                                                                           | 40dB $\mu\text{V}/\text{m}$ at 10m (see Fig.3-② for recommended circuit) |
|           |       | EN55016-2-1 | 230MHz-1GHz                                                                                            | 47dB $\mu\text{V}/\text{m}$ at 10m (see Fig.3-② for recommended circuit) |
| Immunity  | ESD   | EN50121-3-2 | Contact $\pm 6\text{kV}/\text{Air } \pm 8\text{kV}$                                                    | perf. Criteria A                                                         |
|           | RS    | EN50121-3-2 | 20V/m                                                                                                  | perf. Criteria A                                                         |
|           | EFT   | EN50121-3-2 | $\pm 2\text{kV}$ 5/50ns 5kHz (see Fig.3-① for recommended circuit)                                     | perf. Criteria A                                                         |
|           | Surge | EN50121-3-2 | line to line $\pm 1\text{kV}$ (42 $\Omega$ , 0.5 $\mu\text{F}$ ) (see Fig.3-① for recommended circuit) | perf. Criteria A                                                         |
|           | CS    | EN50121-3-2 | 0.15MHz-80MHz 10V r.m.s                                                                                | perf. Criteria A                                                         |

## Typical Characteristic Curves

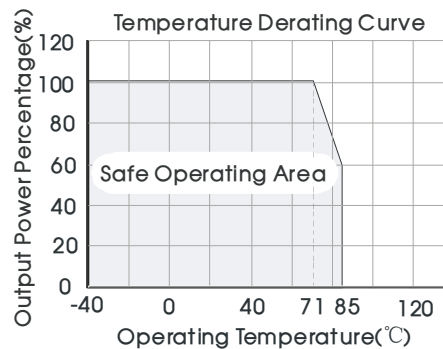
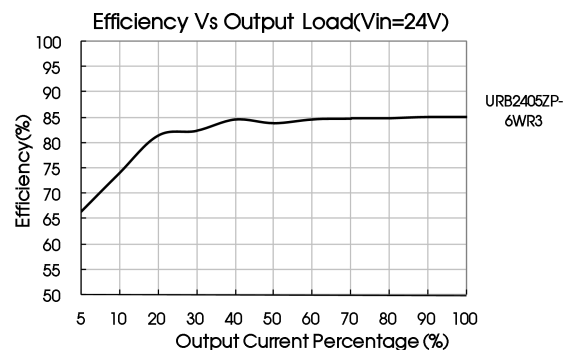
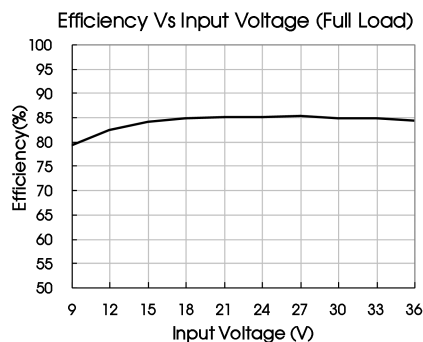
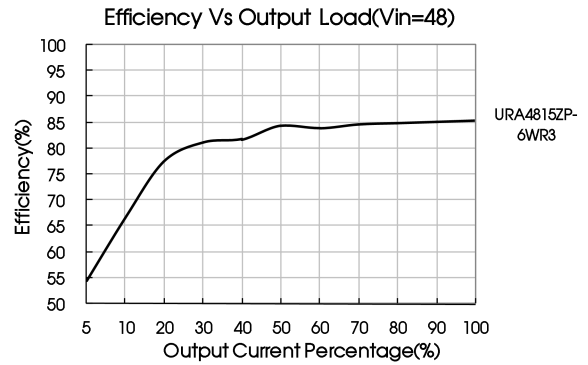
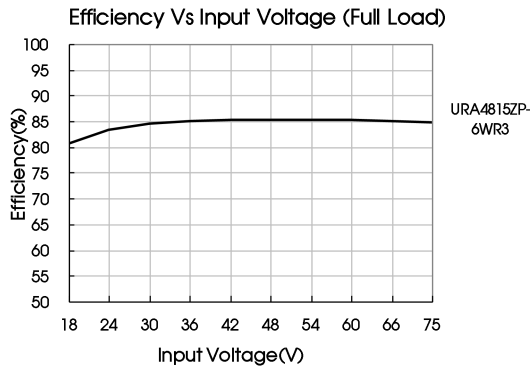


Fig. 1





## Design Reference

### 1. Typical application

All the 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 specified max. capacitive load value of the product.

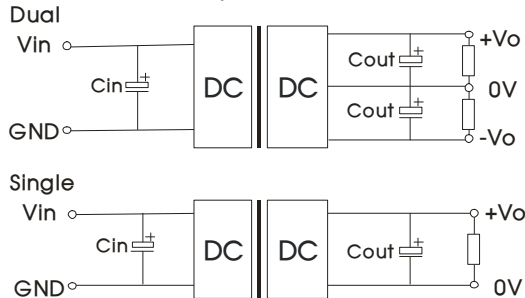
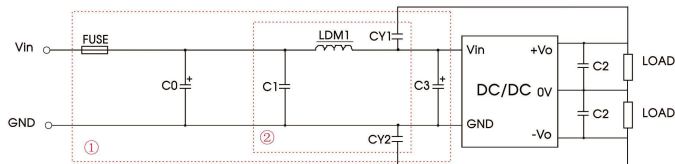


Fig. 2

| Vin(VDC) | Cin                 | Vo(VDC)       | Cout     |
|----------|---------------------|---------------|----------|
| 24       | 100μF/50V           | 3.3/5/9/±5/±9 | 10μF/16V |
|          |                     | 12/15/±12/±15 | 10μF/25V |
|          |                     | 24/±24        | 10μF/50V |
| 48       | 10μF/100V~47μF/100V | 3.3/5/9/±5    | 10μF/16V |
|          |                     | 12/15/±12/±15 | 10μF/25V |
|          |                     | 24            | 10μF/50V |

### 2. EMC compliance circuit

Dual output:



Single output:

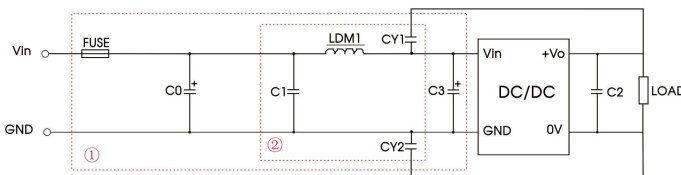


Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

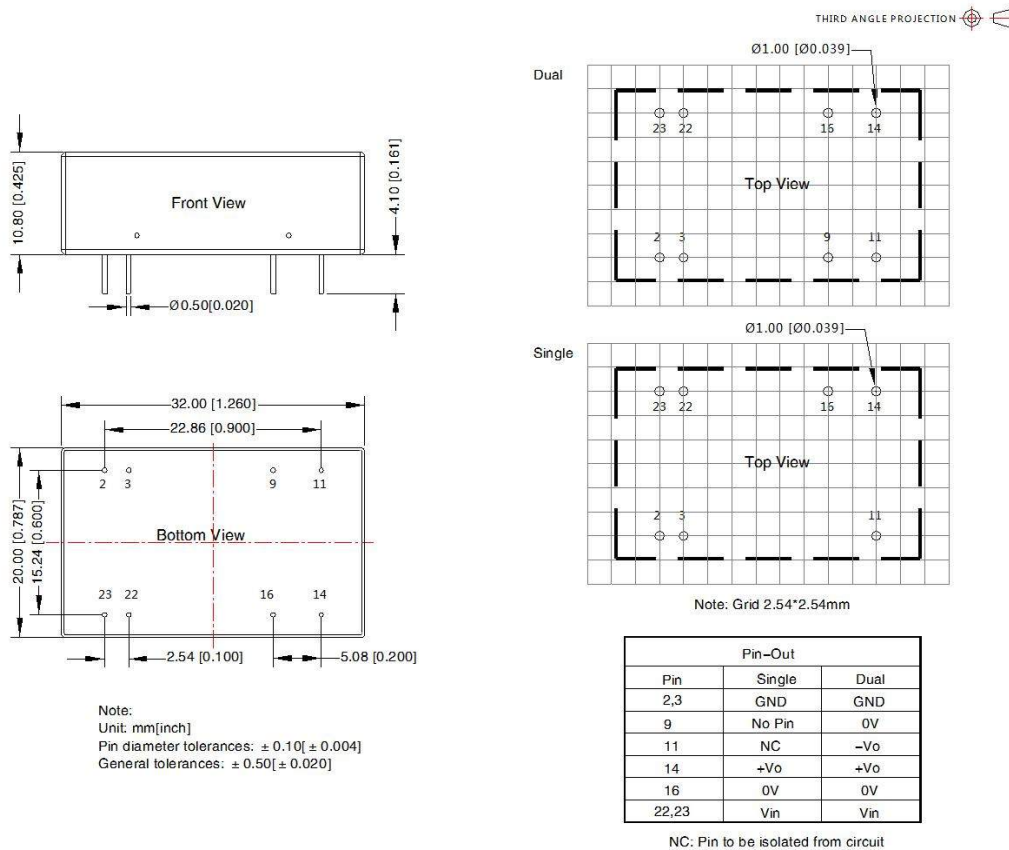
Parameter description:

| Model   | Vin:24VDC                                | Vin:48VDC  |
|---------|------------------------------------------|------------|
| FUSE    | Choose according to actual input current |            |
| C0/C3   | 330μF/50V                                | 330μF/100V |
| C1      | 1μF/50V                                  | 1μF/100V   |
| C2      | Refer to the Cout in Fig.2               |            |
| LDM1    | 4.7μH                                    |            |
| 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



Notes:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58210008;
- It is recommended that the load imbalance of the dual output is  $\leq \pm 5\%$ . If it exceeds  $\pm 5\%$ , the performance of the product cannot be guaranteed to meet as datasheet marked. For details, please contact our technical staff;
- 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  $< 75\% \text{RH}$  with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- The performance indexes of the product models listed in this datasheet are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technicians for specific information;
- We can provide product customization service;
- 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.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 8, Nanyun 4th Road, Huangpu District, Guangzhou, China

Tel: 86-20-38601850

Fax: 86-20-38601272

E-mail: [info@mornsun.cn](mailto:info@mornsun.cn)

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