

3W isolated DC-DC converter  
Wide input and regulated single output



Patent Protection **RoHS**

## FEATURES

- Wide 2:1 input voltage range
- Ultra-small size, SMD package
- I/O isolation test voltage 1.5k VDC
- Short-circuit protection (self-recovery)
- Operating ambient temperature range: -40°C ~ +85°C
- Flame-retardant package, meets UL94V-0
- EN60950 Approved

The WRB\_LT-3WR2 series are specially designed for applications where a wide range input voltage power supplies are isolated from the input power supply in a distributed power supply system on a circuit board.

These products apply to where:

- 1) Input voltage range  $\leq 2:1$ ;
- 2) 1.5kV input and output isolation;
- 3) Regulated and low ripple noise is required.

## Selection Guide

| Certification | Part No.       | Input Voltage (VDC) |        | Output        |                           | Full Load Efficiency(%)<br>Min./Typ. | Max. Capacitive Load ( $\mu$ F) |
|---------------|----------------|---------------------|--------|---------------|---------------------------|--------------------------------------|---------------------------------|
|               |                | Nominal (Range)     | Max. ① | Voltage (VDC) | Current (mA)<br>Max./Min. |                                      |                                 |
| CE            | WRB1203LT-3WR2 | 12<br>(9-18)        | 22     | 3.3           | 909/46                    | 72/74                                | 3700                            |
|               | WRB1205LT-3WR2 |                     |        | 5             | 600/30                    | 73/75                                | 3300                            |
|               | WRB1212LT-3WR2 |                     |        | 12            | 250/12                    | 75/77                                | 1800                            |
|               | WRB1215LT-3WR2 |                     |        | 15            | 200/10                    | 77/79                                | 1000                            |
|               | WRB2403LT-3WR2 | 24<br>(18-36)       | 40     | 3.3           | 909/46                    | 72/74                                | 3700                            |
|               | WRB2405LT-3WR2 |                     |        | 5             | 600/30                    | 74/76                                | 3300                            |
|               | WRB2412LT-3WR2 |                     |        | 12            | 250/12                    | 79/81                                | 1800                            |
|               | WRB2415LT-3WR2 |                     |        | 15            | 200/10                    | 78/80                                | 1000                            |
|               | WRB4805LT-3WR2 | 48<br>(36-75)       | 80     | 5             | 600/30                    | 75/77                                | 3300                            |
|               | WRB4812LT-3WR2 |                     |        | 12            | 250/12                    | 78/80                                | 1800                            |
|               | WRB4815LT-3WR2 |                     |        | 15            | 200/10                    | 78/80                                | 1000                            |

Notes:

① Exceeding the maximum input voltage may cause permanent damage;

## Input Specifications

| Item                       | Operating Conditions | Min.        | Typ.   | Max.   | Unit |
|----------------------------|----------------------|-------------|--------|--------|------|
| Input current              | 12VDC input          | --          | 334/18 | 343/25 | mA   |
|                            | 24VDC input          | --          | 165/10 | 169/14 |      |
|                            | 48VDC input          | --          | 82/5   | 84/18  |      |
| Surge Voltage (1sec. max.) | 12VDC input          | -0.7        | --     | 25     | VDC  |
|                            | 24VDC input          | -0.7        | --     | 50     |      |
|                            | 48VDC input          | -0.7        | --     | 100    |      |
| Start-up Voltage           | 12VDC input          | 4.5         | 8      | 9      |      |
|                            | 24VDC input          | 11          | 16     | 18     |      |
|                            | 48VDC input          | 24          | 33     | 36     |      |
| Input Filter               |                      | Pi filter   |        |        |      |
| Hot Plug                   |                      | Unavailable |        |        |      |

Output Specifications

| Item                         | Operating Conditions   | Min. | Typ.  | Max.  | Unit   |
|------------------------------|--|------|-------|-------|--------|
| Voltage Accuracy             | 5% to 100% load  | --   | ±1    | ±3    | %      |
| No load Voltage Accuracy     | Vo≤5V  | --   | ±1.5  | ±5    |        |
|                              | Vo>5V  | --   | ±1.5  | ±3    |        |
| Linear Regulation            | Full load, the input voltage is from low voltage to high voltage | --   | ±0.2  | ±0.4  |        |
| Load Regulation              | 5%-100% load   | --   | ±0.2  | ±0.75 |        |
| Transient Recovery Time      | 25% load step change   | --   | 0.5   | 1     | ms     |
| Transient Response Deviation |  | --   | ±2    | ±5    | %      |
| Temperature Coefficient      | Full load  | --   | ±0.02 | ±0.03 | %/°C   |
| Ripple & Noise*              | 20MHz bandwidth  | --   | 45    | 60    | mV p-p |
| Short-circuit Protection     | Continuous, self-recovery  |      |       |       |        |

Note: \*The "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    |
|--------------------------------------|--|---|------|------|---------|
| Insulation                           | Input-output, with the test time of 1 minute and the leak current lower than 1mA | 1500  | --   | --   | VDC     |
| Insulation Resistance                | Input-output, resistance voltage 500VDC  | 1000  | --   | --   | MΩ      |
| Isolation Capacitance                | Input-output, 100KHz/0.1V  | --  | 1    | --   | nF      |
| Operating Temperature                | Derating if the temperature is ≥85°C (see Fig. 1)                                | -40   | --   | +85  | °C      |
| Storage Temperature                  |  | -55   | --   | +125 |         |
| Casing Temperature Rise              | Ta=25°C  | --  | +25  | --   |         |
| Pin Soldering Resistance Temperature | Welding spot is 1.5mm away from the casing, 10 seconds                           | --  | --   | +300 |         |
| Storage Humidity                     | Non-condensing   | --  | --   | 95   | %RH     |
| Switching Frequency (PFM mode)       | 100% load, nominal input voltage   | --  | 350  | --   | KHz     |
| MTBF                                 | MIL-HDBK-217F@25°C   | 1000  | --   | --   | K hours |
| Reflow Soldering Temperature         |  | Peak temp.≤240°C, maximum duration time≤60s over 217°C. For actual application, please refer to IPC/JEDEC J-STD-020D.1. |      |      |         |

Mechanical Specifications

|                |   |
|----------------|---|
| Case Material  | Black flame-retardant and heat-proof epoxy resin (UL94 V-0) |
| Dimension      | 23.86 x 13.70 x 7.50 mm                                     |
| Weight         | 5.2g(Typ.)  |
| Cooling Method | Free air convection   |

Electromagnetic Compatibility (EMC)

|           |   |                  |  |                  |
|-----------|---|------------------|--|------------------|
| Emissions | CE  | CISPR32/EN55032  | CLASS B (see Fig.3 for recommended circuit)          |                  |
|           | RE  | CISPR32/EN55032  | CLASS B (see Fig.3 for recommended circuit)          |                  |
| Immunity  | ESD   | IEC/EN61000-4-2  | Contact ±4KV   | perf. Criteria B |
|           | RS  | IEC/EN61000-4-3  | 10V/m  | perf. Criteria A |
|           | EFT   | IEC/EN61000-4-4  | ±2KV (see Fig.3 for recommended circuit)             | perf. Criteria B |
|           | Surge   | IEC/EN61000-4-5  | line to line ±2KV (see Fig.3for 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%  |                  |

Typical Characteristic Curves

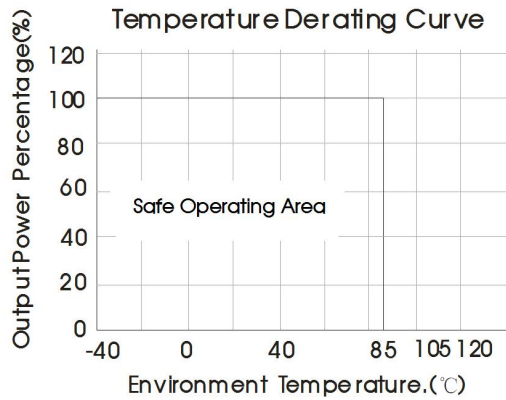
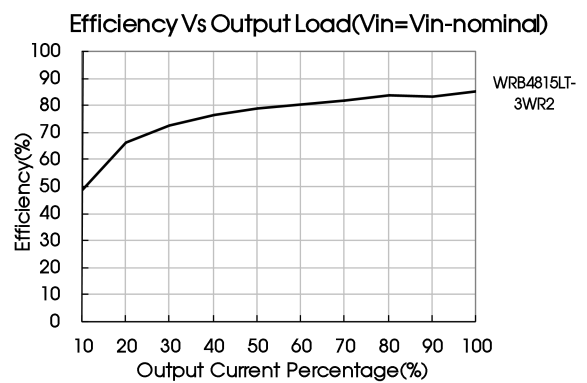
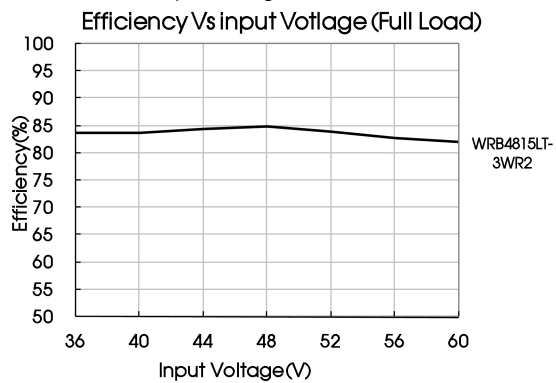
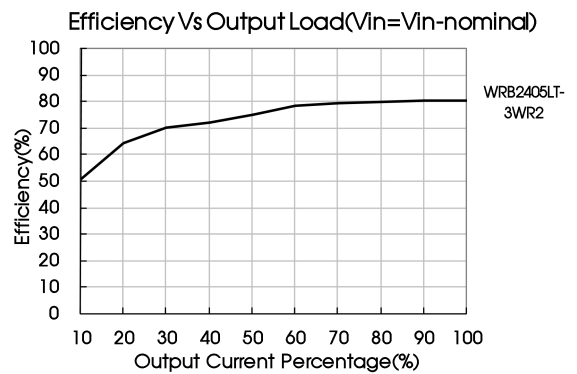
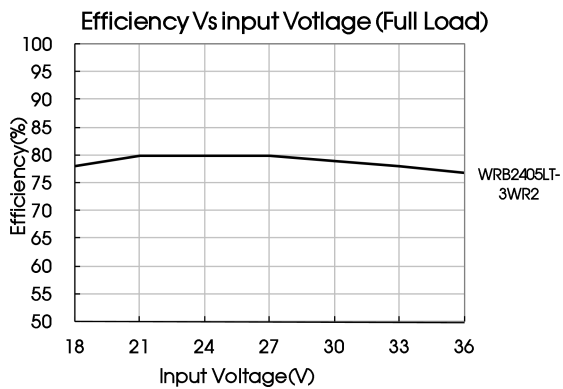


Fig. 1



Design Reference

1. Output load requirements

To ensure that the module can work efficiently and reliably, its output min. load shall be no lower than 5% of the rated load when using, or the output ripple may increase rapidly. Ensure that the product working load must be higher than 5% of the rated load.

2. Typical application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.

If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.

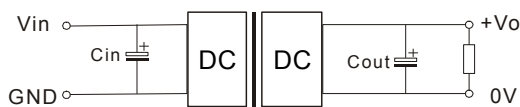


Fig. 2

|      |       |           |
|------|-------|-----------|
| Vin  | 12V   | 24V&48V   |
| Cin  | 100μF | 10μF~47μF |
| Cout | 10μF  |           |

3. EMC compliance circuit

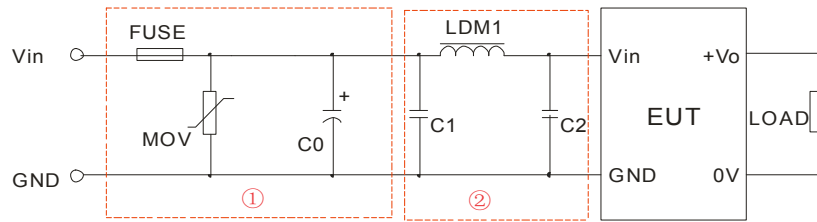


Fig. 3

Parameter description:

| Model | Vin:12V                                  | Vin:24V     | Vin:48V      |
|-------|--|-------------|--------------|
| FUSE  | Choose according to actual input current |             |              |
| MOV   | --                                       | S14K35      | S14K60       |
| LDM1  | 12 μ H                                   |             |              |
| C0    | 680 μ F/25V                              | 120 μ F/50V | 120 μ F/100V |
| C1    | 4.7uF/50V                                |             | 4.7uF/100V   |
| C2    | 4.7uF/50V                                |             | 4.7uF/100V   |

Notes: Part ① in the Fig. 3 is used for immunity test and part ② for emissions filtering; selecting based on needs.

EMC compliance circuit PCB layout

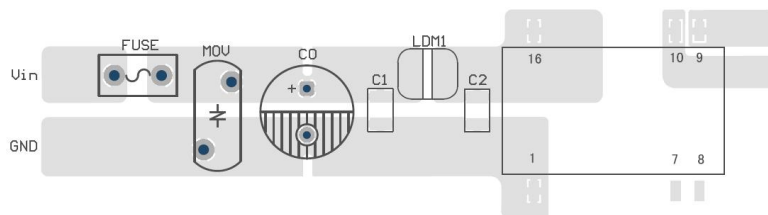


Fig. 4

4. Input current

When it is used in unregulated power supply, be sure that the fluctuating range of the power supply and the rippled voltage do not exceed the module standard. Input current of power supply should afford the flash startup average current of this kind of DC/DC module (see Fig. 5).

- General: Vin:12V Iave =640mA
- Vin:24V Iave =316mA
- Vin:48V Iave =156mA

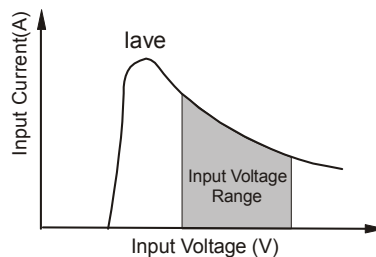
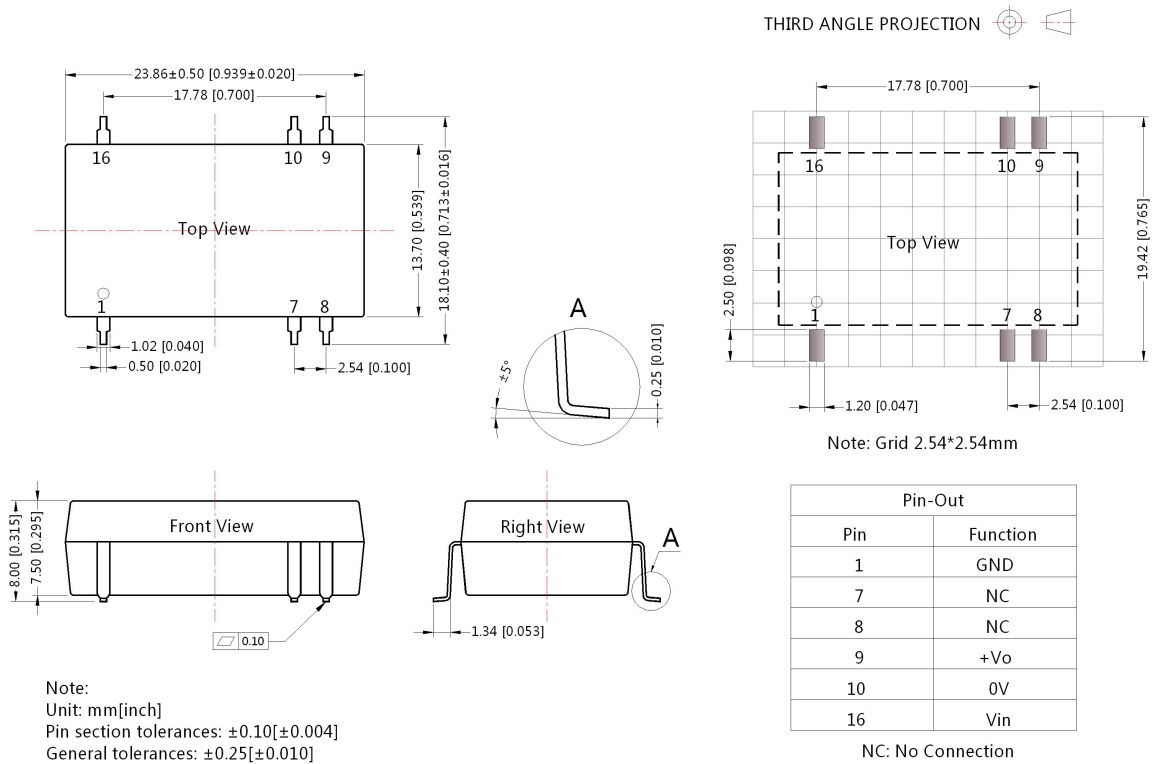


Fig. 5

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

6. 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). Packing bag number: 58210019;
- Recommended used in more than 10% load, if the load is lower than 10%, then the ripple index of the product may exceed the specification, but does not affect the reliability of the product;
- The recommended unbalance degree of the dual output module load is  $\leq \pm 5\%$ ; if the degree exceeds  $\pm 5\%$ , than the product performance cannot be guaranteed to comply with all parameters in the datasheet. Please contact our technicians directly for specific information;
- 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;
- 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, please contact our technicians directly for specific information;
- 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. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. 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)