

1W isolated DC-DC converter  
Fixed input voltage, unregulated single or dual output



Patent Protection RoHS



### FEATURES

- High power density
- High efficiency of up to 80%
- Operating ambient temperature range: -40°C to +105°C
- Ultra compact SIP package
- Industry standard pin-out
- I/O isolation test voltage 1.5k VDC
- UL60950/EN60950 approved
- Meets EN62368

A\_S-1WR2 & B\_LS-1WR2 series is designed for use in distributed power supply systems and especially suitable in applications such as pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits, where:

1. The voltage of the input power supply is relatively stable with a variation of  $\pm 10\%V_{in}$  or less;
2. An input to output isolation voltage of up to 1500VDC is necessary;
3. The requirement for a tight line and load regulation is not as strict.

### Selection Guide

| Certification | Part No.     | Input Voltage (VDC) | Output        |                          | Full Load Efficiency (%)<br>Min./Typ. | Capacitive Load( $\mu$ F)*<br>Max. |     |
|---------------|--------------|---------------------|---------------|--------------------------|---------------------------------------|------------------------------------|-----|
|               |              | Nominal (Range)     | Voltage (VDC) | Current(mA)<br>Max./Min. |                                       |                                    |     |
| --            | A0305S-1WR2  | 3.3<br>(2.97-3.63)  | $\pm 5$       | $\pm 100/\pm 10$         | 70/74                                 | 100                                |     |
|               | A0312S-1WR2  |                     | $\pm 12$      | $\pm 42/\pm 5$           | 70/74                                 |                                    |     |
|               | A0315S-1WR2  |                     | $\pm 15$      | $\pm 34/\pm 4$           | 72/76                                 |                                    |     |
|               | B0303LS-1WR2 |                     | 5             | 3.3                      | 303/31                                | 68/72                              | 220 |
|               | B0305LS-1WR2 |                     |               | 5                        | 200/20                                | 74/78                              |     |
|               | A0503S-1WR2  |                     |               | $\pm 3.3$                | $\pm 152/\pm 15$                      | 67/71                              |     |
| UL/CE         | A0505S-1WR2  | 5<br>(4.5-5.5)      | $\pm 5$       | $\pm 100/\pm 10$         | 76/80                                 | 100                                |     |
|               | A0509S-1WR2  |                     | $\pm 9$       | $\pm 56/\pm 6$           | 76/80                                 |                                    |     |
|               | A0512S-1WR2  |                     | $\pm 12$      | $\pm 42/\pm 5$           | 76/80                                 |                                    |     |
|               | A0515S-1WR2  |                     | $\pm 15$      | $\pm 34/\pm 4$           | 76/80                                 |                                    |     |
|               | A0524S-1WR2  |                     | $\pm 24$      | $\pm 21/\pm 3$           | 76/80                                 |                                    |     |
| --            | B0503LS-1WR2 | 9<br>(8.1-9.9)      | 3.3           | 303/31                   | 70/74                                 | 220                                |     |
|               | B0505LS-1WR2 |                     | 5             | 200/20                   | 76/80                                 |                                    |     |
|               | B0509LS-1WR2 |                     | 9             | 111/11                   | 76/80                                 |                                    |     |
|               | B0512LS-1WR2 |                     | 12            | 84/9                     | 76/80                                 |                                    |     |
|               | B0515LS-1WR2 |                     | 15            | 67/7                     | 76/80                                 |                                    |     |
|               | B0524LS-1WR2 |                     | 24            | 42/5                     | 76/80                                 |                                    |     |
| --            | A0909S-1WR2  | 12<br>(10.8-13.2)   | $\pm 9$       | $\pm 56/\pm 6$           | 76/80                                 | 100                                |     |
|               | A0915S-1WR2  |                     | $\pm 15$      | $\pm 34/\pm 4$           | 76/80                                 |                                    |     |
|               | A1203S-1WR2  |                     | $\pm 3.3$     | $\pm 152/\pm 15$         | 72/76                                 |                                    |     |
|               | A1205S-1WR2  |                     | $\pm 5$       | $\pm 100/\pm 10$         | 76/80                                 |                                    |     |
|               | A1209S-1WR2  |                     | $\pm 9$       | $\pm 56/\pm 6$           | 76/80                                 |                                    |     |
|               | A1212S-1WR2  |                     | $\pm 12$      | $\pm 42/\pm 5$           | 76/80                                 |                                    |     |
|               | A1215S-1WR2  |                     | $\pm 15$      | $\pm 34/\pm 4$           | 76/80                                 |                                    |     |
| A1224S-1WR2   | $\pm 24$     | $\pm 21/\pm 3$      | 76/80         |                          |                                       |                                    |     |
| --            | B1203LS-1WR2 | 9                   | 3.3           | 303/31                   | 72/76                                 | 220                                |     |
|               | B1205LS-1WR2 |                     | 5             | 200/20                   | 76/80                                 |                                    |     |
|               | B1209LS-1WR2 |                     | 9             | 111/11                   | 76/80                                 |                                    |     |

|       | B1212LS-1WR2 |                   | 12     | 84/9     | 76/80 |     |
|-------|--------------|-------------------|--------|----------|-------|-----|
| UL/CE | B1215LS-1WR2 | 12<br>(10.8-13.2) | 15     | 67/7     | 76/80 | 220 |
|       | B1224LS-1WR2 |                   | 24     | 42/5     | 76/80 |     |
| --    | A1505S-1WR2  | 15<br>(13.5-16.5) | ±5     | ±100/±10 | 76/80 | 100 |
|       | A1512S-1WR2  |                   | ±12    | ±42/±5   | 76/80 |     |
| UL    | A1515S-1WR2  |                   | ±15    | ±34/±4   | 76/80 |     |
| CE    | B1505LS-1WR2 |                   | 5      | 200/20   | 76/80 | 220 |
| --    | B1512LS-1WR2 |                   | 12     | 84/9     | 76/80 |     |
| CE    | B1515LS-1WR2 |                   | 15     | 67/7     | 76/80 |     |
| UL/CE | A2405S-1WR2  | 24<br>(21.6-26.4) | ±5     | ±100/±10 | 76/80 | 100 |
|       | A2409S-1WR2  |                   | ±9     | ±56/±6   | 76/80 |     |
|       | A2412S-1WR2  |                   | ±12    | ±42/±5   | 76/80 |     |
|       | A2415S-1WR2  |                   | ±15    | ±34/±4   | 76/80 |     |
|       | A2424S-1WR2  |                   | ±24    | ±21/±3   | 76/80 |     |
| --    | B2403LS-1WR2 |                   | 3.3    | 303/31   | 70/74 | 220 |
| UL/CE | B2405LS-1WR2 | 5                 | 200/20 | 76/80    |       |     |
|       | B2409LS-1WR2 | 9                 | 111/11 | 76/80    |       |     |
|       | B2412LS-1WR2 | 12                | 84/9   | 76/80    |       |     |
|       | B2415LS-1WR2 | 15                | 67/7   | 76/80    |       |     |
|       | B2424LS-1WR2 | 24                | 42/5   | 76/80    |       |     |

Note: \* 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) | 3.3V input           | --                 | 426/30 | -/70 | mA   |
|                                     | 5V input             | --                 | 281/25 | -/60 |      |
|                                     | 9V input             | --                 | 142/20 | -/60 |      |
|                                     | 12V input            | --                 | 106/15 | -/50 |      |
|                                     | 15V input            | --                 | 84/10  | -/35 |      |
|                                     | 24V input            | --                 | 54/7   | -/30 |      |
| Surge Voltage (1sec. max.)          | 3.3V input           | -0.7               | --     | 5    | VDC  |
|                                     | 5V input             | -0.7               | --     | 9    |      |
|                                     | 9V input             | -0.7               | --     | 12   |      |
|                                     | 12V input            | -0.7               | --     | 18   |      |
|                                     | 15V input            | -0.7               | --     | 21   |      |
|                                     | 24V input            | -0.7               | --     | 30   |      |
| Reflected Ripple Current*           |                      | --                 | 15     | --   | mA   |
| Input Filter                        |                      | Capacitance filter |        |      |      |
| Hot Plug                            |                      | Unavailable        |        |      |      |

Note: \* Refer to DC-DC Converter Application Notes for detailed description of reflected ripple current test method.

### Output Specifications

| Item              | Operating Conditions      | Min.                                 | Typ. | Max. | Unit |    |
|-------------------|---------------------------|--------------------------------------|------|------|------|----|
| Voltage Accuracy  |                           | See output regulation curve (Fig. 1) |      |      |      |    |
| Linear Regulation | Input voltage change: ±1% | 3.3VDC output                        | --   | --   | ±1.5 | -- |
|                   |                           | Other output                         | --   | --   | ±1.2 |    |
| Load Regulation   | 10%-100% load             | 3.3VDC output                        | --   | 18   | --   | %  |
|                   |                           | 5VDC output                          | --   | 12   | --   |    |
|                   |                           | 9VDC output                          | --   | 9    | --   |    |
|                   |                           | 12VDC output                         | --   | 8    | --   |    |

|                            |  |                           |    |    |       |       |
|----------------------------|--|---------------------------|----|----|-------|-------|
|                            |  | 15VDC output              | -- | 7  | --    | %     |
|                            |  | 24VDC output              | -- | 6  | --    |       |
| Ripple & Noise*            | 20MHz bandwidth  |                           | -- | 60 | 150   | mVp-p |
| Temperature Coefficient    | 100% load  |                           | -- | -- | ±0.03 | %/°C  |
| Short-circuit Protection** | B03xxLS-1WR2/A24xxS-1WR2 /B24xxLS-1WR2<br>A0524S-1WR2/B0524LS-1WR2/A0315S-1WR2 |                           | -- | -- | 1     | s     |
|                            | others   | Continuous, self-recovery |    |    |       |       |

Notes: \* The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.  
\*\* At the end of the short circuit duration, the supply voltage must be disconnected from following models: B03xxLS-1WR2/A24xxS-1WR2 /B24xxLS-1WR2 series, and A0524S-1WR2/ B0524LS-1WR2/A0315S-1WR2.

General Specifications

| Item                                 | Operating Conditions  | Min. | Typ. | Max. | Unit    |
|--------------------------------------|---|------|------|------|---------|
| Isolation Voltage                    | 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   | --   | 20   | --   | pF      |
| Operating Temperature                | Derating if the temperature ≥85° C, (see Fig. 2)                                    | -40  | --   | 105  | °C      |
| Storage Temperature                  |   | -55  | --   | 125  |         |
| Case Temperature Rise                | Ta=25°C   | --   | 25   | --   |         |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds                               | --   | --   | 300  |         |
| Storage Humidity                     | Non-condensing  | --   | --   | 95   | %RH     |
| Switching Frequency                  | 100% load, nominal input voltage  | --   | 100  | --   | kHz     |
| MTBF                                 | MIL-HDBK-217F @ 25°C  | 3500 | --   | --   | k hours |

Mechanical Specifications

|                |   |
|----------------|---|
| Case Material  | Black epoxy resin; flame-retardant heat- resistant (UL94 V-0) |
| Dimensions     | 19.50 x 6.00 x 9.30 mm  |
| Weight         | 2.4g (Typ.)   |
| Cooling Method | Free air convection   |

Electromagnetic Compatibility (EMC)

|           |     |                 |  |              |                  |
|-----------|-----|-----------------|--|--------------|------------------|
| Emissions | CE  | CISPR32/EN55032 | CLASS B (see Fig. 4 for recommended circuit) |              |                  |
|           | RE  | CISPR32/EN55032 | CLASS B (see Fig. 4 for recommended circuit) |              |                  |
| Immunity  | ESD | A_S-1WR2        | IEC/EN61000-4-2                              | Contact ±6kV | perf. Criteria B |
|           |     | B_LS-1WR2       | IEC/EN61000-4-2                              | Contact ±8kV | perf. Criteria B |

Typical Performance Curves

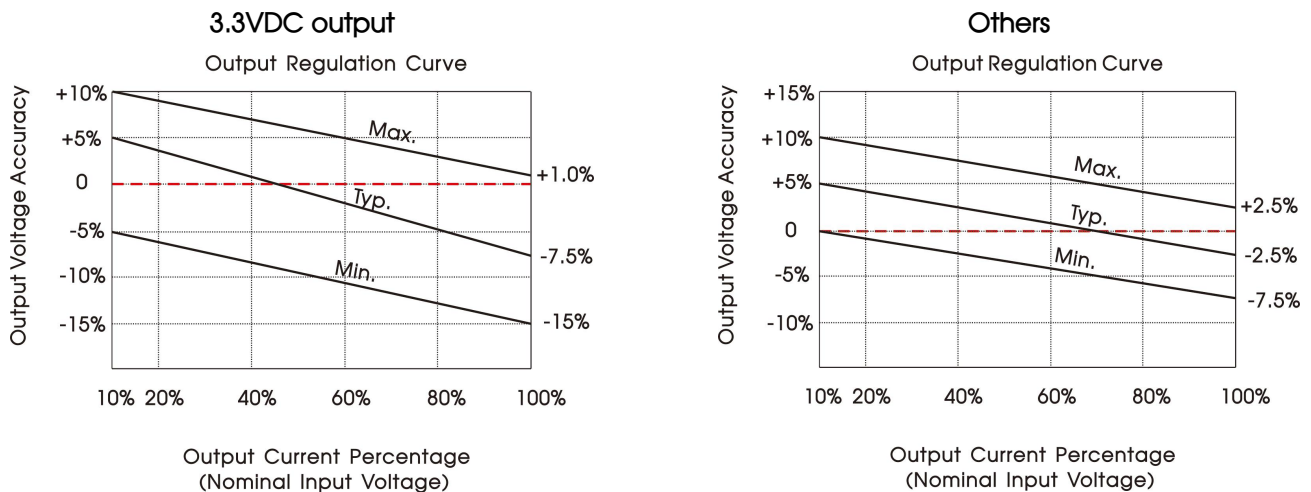


Fig. 1

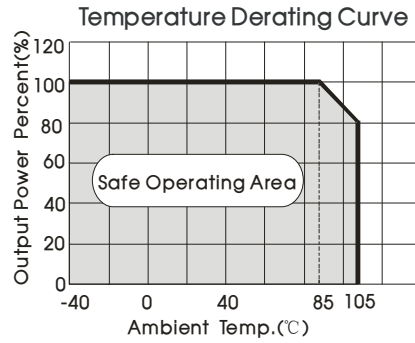
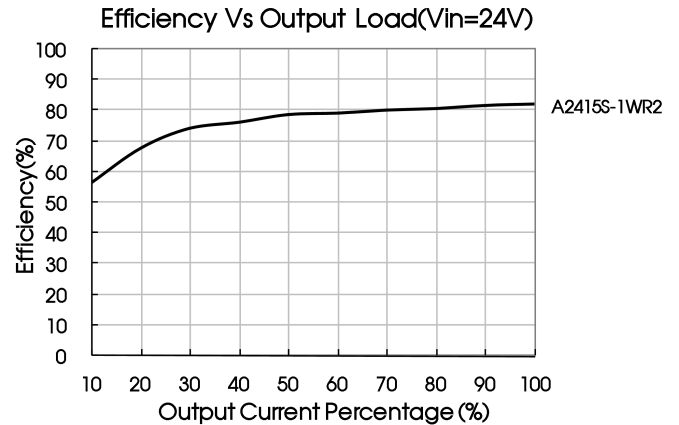
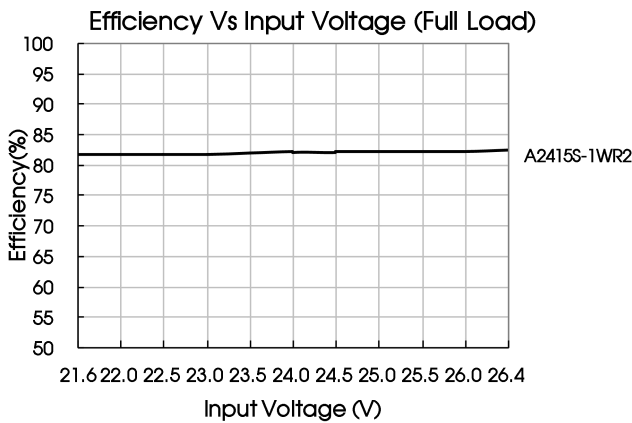
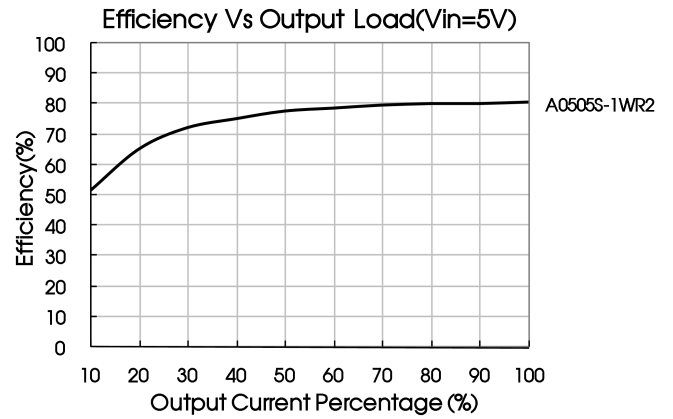
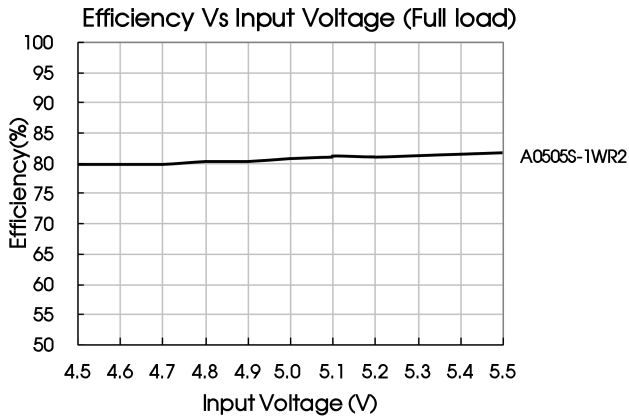


Fig. 2



## Design Reference

### 1. Typical application

Input and/or output ripple can be further reduced, by connecting a filter capacitor from the input and/or output terminals to ground as shown in Fig.3.

Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

Dual



Single



Fig.3

Table 1: Recommended input and output capacitor values

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

2. EMC (CLASS B) compliance circuit

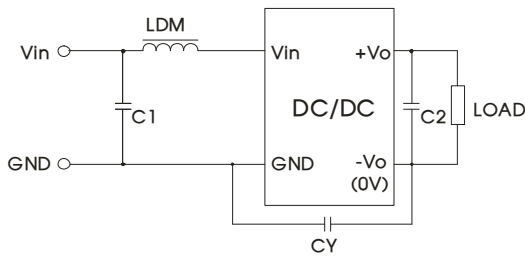


Fig. 4

| Input voltage (VDC) |     | 3.3/5/9/12             | 15/24   |
|---------------------|-----|------------------------|---------|
| EMI                 | C1  | 4.7μF /50V             |         |
|                     | C2  | Refer to Cout in Fig.3 |         |
|                     | CY  | --                     | 1nF/2kV |
|                     | LDM | 6.8μH                  |         |

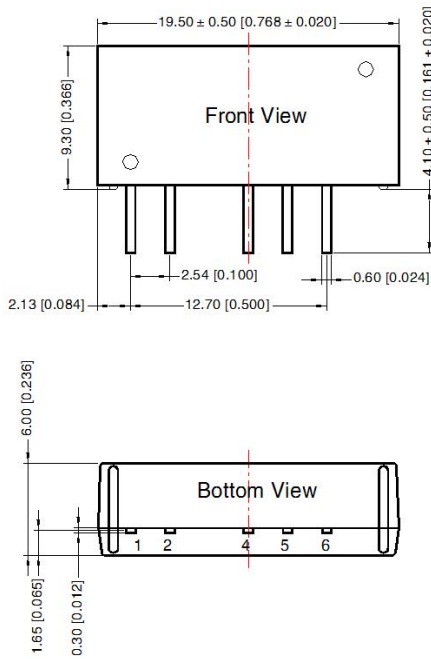
Note: For 15V/24V input models use a Y-capacitor CY of 1nF/2kV.

3. Minimum Output Load Requirement

For a reliable and efficient operation of the converter, the minimum load should never be less than 10% of the rated output load. If the total required output power is below 10%, a parallel bleeding resistor is required on the output, ensuring that the sum of the power consumption is always maintained at 10% minimum.

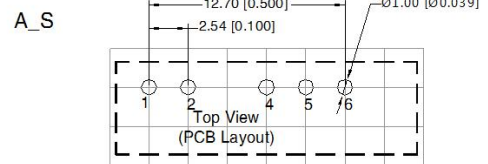
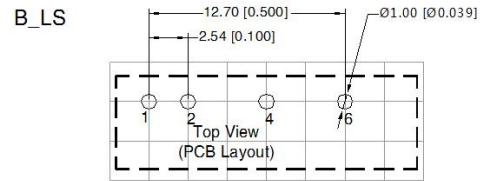
4. For additional information, please refer to DC-DC converter application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



Note:  
Unit: mm[inch]  
Pin section tolerances: ± 0.10[± 0.004]  
General tolerances: ± 0.25[± 0.010]

THIRD ANGLE PROJECTION



Note: Grid 2.54\*2.54mm

| Pin | Pin-Out |     |
|-----|---------|-----|
|     | B_LS    | A_S |
| 1   | Vin     | Vin |
| 2   | GND     | GND |
| 4   | 0V      | -Vo |
| 5   | No Pin  | 0V  |
| 6   | +Vo     | +Vo |

Note:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200029;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. 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;
5. All index testing methods in this datasheet are based on our company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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