

2W Isolated DC-DC converter  
Fixed input voltage, unregulated single & dual output



CE CB Patent Protection RoHS



## FEATURES

- Operating ambient temperature range: -40℃ to +85℃
- High efficiency up to 85%
- High power density
- DIP package
- I/O isolation test voltage 3k VDC
- No extra components required
- Industry standard pin-out
- IEC60950, EN62368 approved

E\_D-2WR2 & F\_D-2WR2 series are 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  $\pm 10\%$  Vin or less;
2. A high input to output isolation voltage of  $\leq 3000\text{VDC}$  is necessary;
3. The requirement for a tight output regulation and low ripple & noise is not as strict.

## Selection Guide

| Certification | Part No.    | Input Voltage (VDC) | Output        |                           | Full Load Efficiency (%)<br>Min./Typ. | Capacitive Load*( $\mu\text{F}$ )<br>Max. |
|---------------|-------------|---------------------|---------------|---------------------------|---------------------------------------|-------------------------------------------|
|               |             | Nominal (Range)     | Voltage (VDC) | Current (mA)<br>Max./Min. |                                       |                                           |
| CE/CB         | E0505D-2WR2 | 5<br>(4.5-5.5)      | $\pm 5$       | $\pm 200/\pm 20$          | 76/80                                 | 100                                       |
|               | E0509D-2WR2 |                     | $\pm 9$       | $\pm 111/\pm 11$          | 80/84                                 |                                           |
|               | E0512D-2WR2 |                     | $\pm 12$      | $\pm 83/\pm 8$            | 80/84                                 |                                           |
|               | E0515D-2WR2 |                     | $\pm 15$      | $\pm 67/\pm 7$            | 80/84                                 |                                           |
|               | F0505D-2WR2 |                     | 5             | 400/40                    | 76/80                                 | 220                                       |
|               | F0509D-2WR2 |                     | 9             | 222/22                    | 80/84                                 |                                           |
|               | F0512D-2WR2 |                     | 12            | 167/17                    | 80/84                                 |                                           |
|               | F0515D-2WR2 |                     | 15            | 133/13                    | 80/84                                 |                                           |
|               | F0524D-2WR2 |                     | 24            | 83/8                      | 80/84                                 |                                           |
| CE/CB         | E1205D-2WR2 | 12<br>(10.8-13.2)   | $\pm 5$       | $\pm 200/\pm 20$          | 76/80                                 | 100                                       |
|               | E1212D-2WR2 |                     | $\pm 12$      | $\pm 83/\pm 8$            | 79/83                                 |                                           |
|               | E1215D-2WR2 |                     | $\pm 15$      | $\pm 67/\pm 7$            | 81/85                                 |                                           |
|               | E1224D-2WR2 |                     | $\pm 24$      | $\pm 42/\pm 4$            | 81/85                                 |                                           |
|               | F1205D-2WR2 |                     | 5             | 400/40                    | 76/80                                 | 220                                       |
|               | F1212D-2WR2 |                     | 12            | 167/17                    | 78/82                                 |                                           |
|               | F1215D-2WR2 |                     | 15            | 133/13                    | 80/84                                 |                                           |
|               | F1224D-2WR2 |                     | 24            | 83/8                      | 81/85                                 |                                           |
| --            | E1509D-2WR2 | 15<br>(13.5-16.5)   | $\pm 9$       | $\pm 111/\pm 11$          | 77/81                                 | 100                                       |
|               | E1515D-2WR2 |                     | $\pm 15$      | $\pm 67/\pm 7$            | 77/81                                 |                                           |
|               | F1505D-2WR2 |                     | 5             | 400/40                    | 75/79                                 | 220                                       |
|               | F1509D-2WR2 |                     | 9             | 222/22                    | 78/82                                 |                                           |
|               | F1515D-2WR2 |                     | 15            | 133/13                    | 75/79                                 |                                           |
| CE/CB         | E2405D-2WR2 | 24<br>(21.6-26.4)   | $\pm 5$       | $\pm 200/\pm 20$          | 75/79                                 | 100                                       |
|               | E2412D-2WR2 |                     | $\pm 12$      | $\pm 83/\pm 8$            | 79/83                                 |                                           |
|               | E2415D-2WR2 |                     | $\pm 15$      | $\pm 67/\pm 7$            | 80/84                                 |                                           |
|               | E2424D-2WR2 |                     | $\pm 24$      | $\pm 42/\pm 4$            | 80/84                                 |                                           |
|               | F2405D-2WR2 |                     | 5             | 400/40                    | 76/80                                 | 220                                       |
|               | F2409D-2WR2 |                     | 9             | 222/22                    | 81/85                                 |                                           |

|       |             |                   |    |        |       |     |
|-------|-------------|-------------------|----|--------|-------|-----|
| CE/CB | F2412D-2WR2 | 24<br>(21.6-26.4) | 12 | 167/17 | 79/83 | 220 |
|       | F2415D-2WR2 |                   | 15 | 133/13 | 80/84 |     |
|       | F2424D-2WR2 |                   | 24 | 83/8   | 81/85 |     |

Note: \* The specified maximum capacitive load for positive and negative output is identical.

### Input Specifications

| Item                                   | Operating Conditions | Min.               | Typ.   | Max.  | Unit |
|----------------------------------------|----------------------|--------------------|--------|-------|------|
| Input Current<br>(full load / no-load) | 5V input             | --                 | 500/25 | --/60 | mA   |
|                                        | 12V input            | --                 | 208/15 | --/50 |      |
|                                        | 15V input            | --                 | 167/15 | --/35 |      |
|                                        | 24V input            | --                 | 105/10 | --/30 |      |
| Reflected Ripple Current               |                      | --                 | 15     | --    |      |
| Surge Voltage (1sec. max.)             | 5V input             | -0.7               | --     | 9     | VDC  |
|                                        | 12V input            | -0.7               | --     | 18    |      |
|                                        | 15V input            | -0.7               | --     | 21    |      |
|                                        | 24V input            | -0.7               | --     | 30    |      |
| Input Filter                           |                      | Capacitance filter |        |       |      |
| Hot Plug                               |                      | Unavailable        |        |       |      |

### Output Specifications

| Item                       | Operating Conditions                                                                                                                | Min.                                 | Typ. | Max.       | Unit  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|------------|-------|
| Voltage Accuracy           |                                                                                                                                     | See output regulation curve (Fig. 1) |      |            |       |
| Linear Regulation          | Input voltage change: $\pm 1\%$                                                                                                     | --                                   | --   | $\pm 1.2$  | --    |
| Load Regulation            | 10%-100% load                                                                                                                       | 5VDC output                          | 10   | --         | %     |
|                            |                                                                                                                                     | 9VDC output                          | 9    | --         |       |
|                            |                                                                                                                                     | 12VDC output                         | 8    | --         |       |
|                            |                                                                                                                                     | 15VDC output                         | 7    | --         |       |
|                            |                                                                                                                                     | 24VDC output                         | 6    | --         |       |
| Ripple & Noise*            | 20MHz bandwidth                                                                                                                     | --                                   | 75   | 200        | mVp-p |
| Temperature Coefficient    | Full load                                                                                                                           | --                                   | --   | $\pm 0.03$ | %/°C  |
| Short-Circuit Protection** | E24xxD-2WR2/F24xxD-2WR2<br>E12xxD-2WR2/F12xxD-2WR2<br>E15xxD-2WR2/F15xxD-2WR2<br>E0512D-2WR2/E0515D-2WR2<br>E0524D-2WR2/F0524D-2WR2 | --                                   | --   | 1          | s     |
|                            | Others                                                                                                                              | 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;

\*\* At the end of the short circuit duration, the supply voltage must be disconnected from following models: E24xxD-2WR2/F24xxD-2WR2/  
E12xxD-2WR2/F12xxD-2WR2/ E15xxD-2WR2/F15xxD-2WR2 series, E0512D-2WR2/E0515D-2WR2/E0524D-2WR2/F0524D-2WR2.

### 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. | 3000        | --   | --   | VDC  |
| Insulation Resistance                | Input-output resistance at 500VDC                                                   | 1000        | --   | --   | MΩ   |
| Isolation Capacitance                | Input-output capacitance at 100kHz/0.1V                                             | 24V input   | 50   | --   | pF   |
|                                      |                                                                                     | Other input | 20   | --   |      |
| Operating Temperature                | Derating when operating temperature $\geq 85^\circ\text{C}$ ( see Fig. 2)           | -40         | --   | 85   | °C   |
| Storage Temperature                  |                                                                                     | -55         | --   | 125  | °C   |
| 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 |

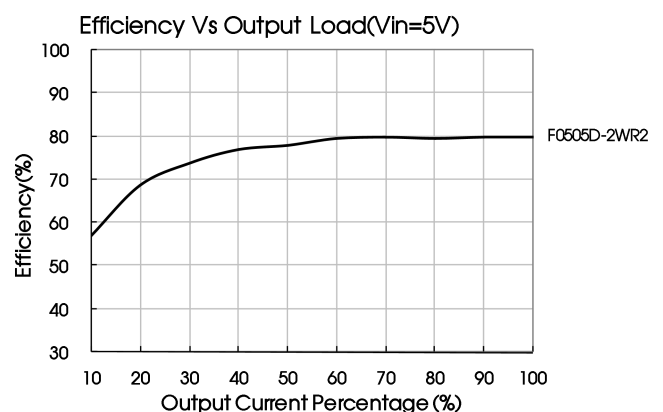
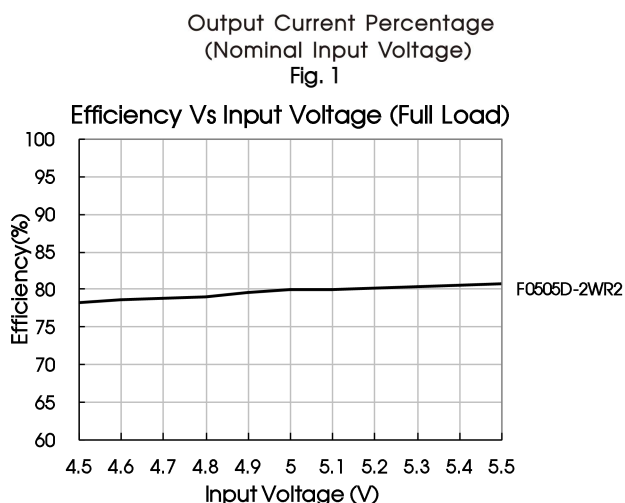
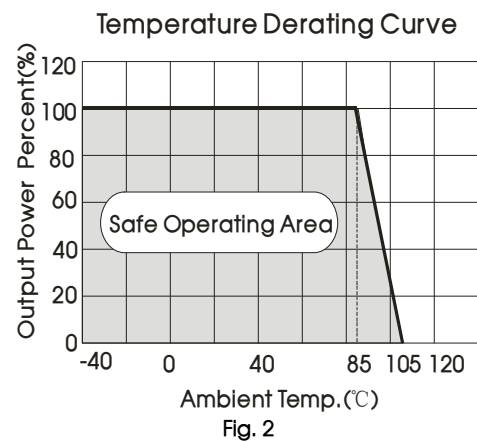
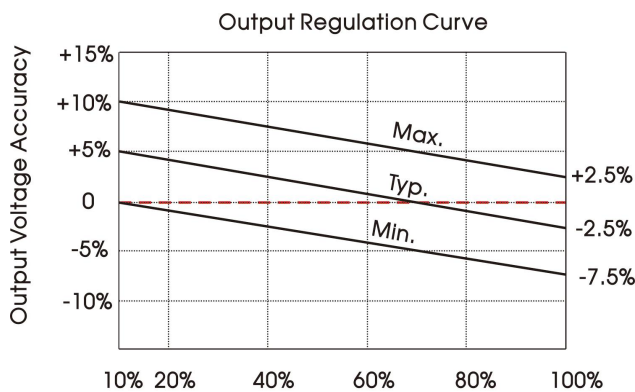
### Mechanical Specifications

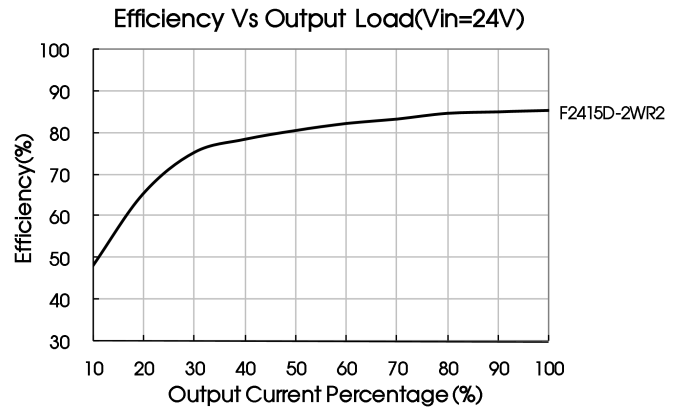
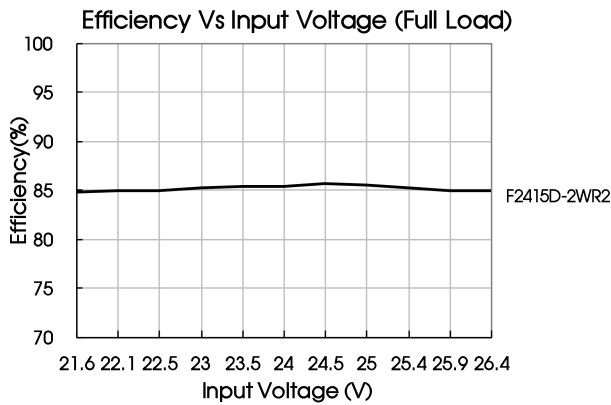
|                |          |                                                              |
|----------------|----------|--------------------------------------------------------------|
| Case Material  |          | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions     |          | 20.32 x 10.16 x 8.20 mm                                      |
| Weight         | E_D-2WR2 | 2.4g (Typ.)                                                  |
|                | F_D-2WR2 | 2.8g (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 | E_D-2WR2        | IEC/EN61000-4-2                              | Contact ±6kV | perf. Criteria B |
|           |     | F_D-2WR2        | IEC/EN61000-4-2                              | Contact ±8kV | perf. Criteria B |

### Typical Characteristic Curves





## 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.

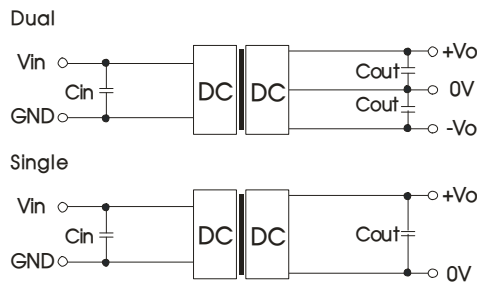


Fig.3

Table 1: Recommended input and output capacitor values

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

### 2. EMC (CLASS B) compliance circuit

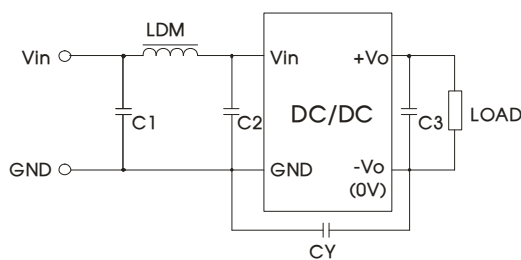


Fig. 4

| Input voltage (VDC) |       | 5/12/15                    | 24      |
|---------------------|-------|----------------------------|---------|
| Emissions           | C1/C2 | 4.7μF/50V                  |         |
|                     | CY    | --                         | 1nF/3kV |
|                     | C3    | Refer to the Cout in Fig.3 |         |
|                     | LDM   | 6.8μH                      |         |

Note: For 24V input models, use a Y-capacitor CY of 1nF/3kV.

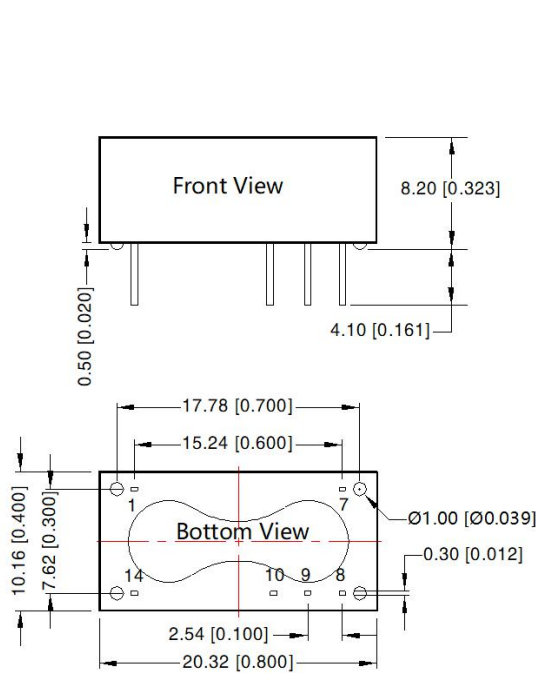
### 3. Minimum Output Load Requirement

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 the DC-DC converter application notes on

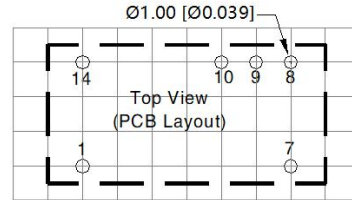
[www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout

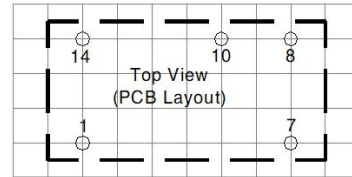


Note:  
Unit: mm[inch]  
Pin section tolerances:  $\pm 0.10 [\pm 0.004]$   
General tolerances:  $\pm 0.25 [\pm 0.010]$

Dual



Single



Note: Grid 2.54\*2.54mm

| Pin-Out |        |      |
|---------|--------|------|
| Pin     | Single | Dual |
| 1       | GND    | GND  |
| 7       | NC     | NC   |
| 8       | +Vo    | +Vo  |
| 9       | No Pin | 0V   |
| 10      | 0V     | -Vo  |
| 14      | Vin    | Vin  |

NC: Pin to be isolated circuitry

Note:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200009 ;
- 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;
- 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 our 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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