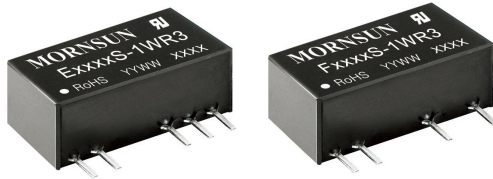


1W Isolated DC-DC converter
Fixed input voltage, unregulated dual/single output



Continuous Short
Circuit Protection



UL 62368-1 EN 62368-1 BS EN 62368-1 CB RoHS Patent Protection
IEC 62368-1

E_S-1WR3 & F_S-1WR3 series are specially designed for applications where an isolated (two isolated) voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.

FEATURES

- Continuous short-circuit protection
- No-load input current as low as 8mA
- Operating ambient temperature range: -40°C to +105°C
- High efficiency up to 81%
- I/O isolation test voltage: 3k VDC
- Industry standard pin-out

Selection Guide

| Certification | Part No. | Input Voltage (VDC) | Output | | Full Load Efficiency (%) Min./Typ. | Capacitive Load(μF) Max.* | |
|-----------------|-------------|---------------------|-------------------|---------------------------|---------------------------------------|------------------------------|------|
| | | Nominal (Range) | Voltage (VDC) | Current (mA) Max./Min. | | | |
| -- | F0909S-1WR3 | 9 (8.1-9.9) | 9 | 111/12 | 77/81 | 470 | |
| UL/EN/BS EN/IEC | E1203S-1WR3 | 12 (10.8-13.2) | ±3.3 | ±152/±15 | 71/75 | 1200 | |
| | E1205S-1WR3 | | ±5 | ±100/±10 | 76/80 | 1200 | |
| -- | E1209S-1WR3 | | ±9 | ±56/±5 | 76/80 | 470 | |
| UL/EN/BS EN/IEC | E1212S-1WR3 | | ±12 | ±42/±5 | 77/81 | 220 | |
| | E1215S-1WR3 | | ±15 | ±34/±4 | 77/81 | 220 | |
| | E1224S-1WR3 | | ±24 | ±21/±2 | 76/80 | 100 | |
| | F1203S-1WR3 | | 3.3 | 303/30 | 71/75 | 2400 | |
| | F1205S-1WR3 | | 5 | 200/20 | 76/80 | 2400 | |
| | F1209S-1WR3 | | 9 | 111/12 | 76/80 | 1000 | |
| | F1212S-1WR3 | | 12 | 83/9 | 76/80 | 560 | |
| | F1215S-1WR3 | | 15 | 67/7 | 77/81 | 560 | |
| | F1224S-1WR3 | | 24 | 42/5 | 77/81 | 220 | |
| | E1505S-1WR3 | ±5 | ±100/±10 | 76/80 | 1200 | | |
| -- | E1509S-1WR3 | ±9 | ±56/±5 | 76/80 | 470 | | |
| UL/EN/BS EN/IEC | E1512S-1WR3 | ±12 | ±42/±5 | 76/80 | 220 | | |
| | E1515S-1WR3 | ±15 | ±34/±4 | 77/81 | 220 | | |
| -- | E1524S-1WR3 | ±24 | ±21/±2 | 77/81 | 100 | | |
| UL/EN/BS EN/IEC | F1505S-1WR3 | 15 (13.5-16.5) | 5 | 200/20 | 76/80 | 2400 | |
| | F1509S-1WR3 | | 9 | 111/12 | 76/80 | 1000 | |
| | F1512S-1WR3 | | 12 | 83/9 | 76/80 | 560 | |
| | F1515S-1WR3 | | 15 | 67/7 | 77/81 | 560 | |
| -- | F1524S-1WR3 | | 24 | 42/5 | 77/81 | 220 | |
| -- | E2403S-1WR3 | | 24 (21.6-26.4) | ±3.3 | ±150/±15 | 72/76 | 1200 |
| UL/EN/BS EN/IEC | E2405S-1WR3 | | | ±5 | ±100/±10 | 74/80 | 1200 |
| -- | E2409S-1WR3 | | | ±9 | ±56/±5 | 74/80 | 470 |
| UL/EN/BS EN/IEC | E2412S-1WR3 | | | ±12 | ±42/±5 | 75/81 | 220 |
| | E2415S-1WR3 | | | ±15 | ±34/±4 | 73/79 | 220 |
| | E2424S-1WR3 | | | ±24 | ±21/±2 | 74/80 | 100 |

| UL/EN/BS EN/IEC | Model | Output Voltage (V) | Output Current (A) | Power (W) | Efficiency (%) | Output Power (W) |
|-----------------|-------------|--------------------|--------------------|-----------|----------------|------------------|
| UL/EN/BS EN/IEC | F2403S-1WR3 | 24 (21.6-26.4) | 3.3 | 303/30 | 69/75 | 2400 |
| | F2405S-1WR3 | | 5 | 200/20 | 73/79 | 2400 |
| -- | F2407S-1WR3 | 24 (21.6-26.4) | 7.2 | 139/13 | 74/80 | 1000 |
| UL/EN/BS EN/IEC | F2409S-1WR3 | | 9 | 111/12 | 74/80 | 1000 |
| | F2412S-1WR3 | | 12 | 83/9 | 75/81 | 560 |
| UL/EN/BS EN/IEC | F2415S-1WR3 | | 15 | 67/7 | 75/81 | 560 |
| | F2424S-1WR3 | 24 | 42/5 | 75/81 | 220 | |

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) | 9V input | -- | 137/8 | 144/-- | mA |
| | 12V input | -- | 112/8 | 118/-- | |
| | 15V input | -- | 84/8 | 88/-- | |
| | 24V input | -- | 56/8 | 59/-- | |
| Reflected Ripple Current* | | -- | 15 | -- | |
| Surge Voltage(1sec. max.) | 9V input | -0.7 | -- | 12 | VDC |
| | 12VDC input | -0.7 | -- | 18 | |
| | 15VDC input | -0.7 | -- | 21 | |
| | 24VDC input | -0.7 | -- | 30 | |
| 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 curves (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 | -- | 15 | 20 | % |
| | | 5VDC output | -- | 10 | 15 | |
| | | Other output | -- | 8 | 10 | |
| Ripple & Noise* | 20MHz bandwidth | 24VDC output | -- | 50 | 100 | mVp-p |
| | | Other output | -- | 30 | 75 | |
| Temperature Coefficient | Full load | -- | ±0.02 | -- | %/°C | |
| 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 |
|--------------------------------------|-------------------------------------------------------------------------------------|------|------|------|------|
| Isolation | 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 | -- | 20 | -- | pF |
| Operating Temperature | Derating when operating temperature ≥ 100°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 | 5 | -- | 95 | %RH |
| Vibration | | 10-150Hz, 5G, 0.75mm. along X, Y and Z | | | |
| Switching Frequency | Full load, nominal input voltage | -- | 260 | -- | kHz |
| MTBF | MIL-HDBK-217F@25°C | 3500 | -- | -- | k hours |

Mechanical Specifications

| | |
|----------------|-------------------------------------------------------------|
| Case Material | Black plastic; flame-retardant and heat-resistant (UL94V-0) |
| Dimensions | 19.65 x 6.00 x 10.16mm |
| Weight | 2.1g(Typ.) |
| Cooling Method | Free air convection |

Electromagnetic Compatibility (EMC)

| | | | |
|-----------|-----|-----------------|-----------------------------------------|
| Emissions | CE | CISPR32/EN55032 | CLASS B |
| | RE | CISPR32/EN55032 | CLASS B |
| Immunity | ESD | IEC/EN61000-4-2 | Air ±8kV, Contact ±6kV perf. Criteria B |

Note: Refer to Fig. 4 for recommended circuit test.

Typical Performance Curves

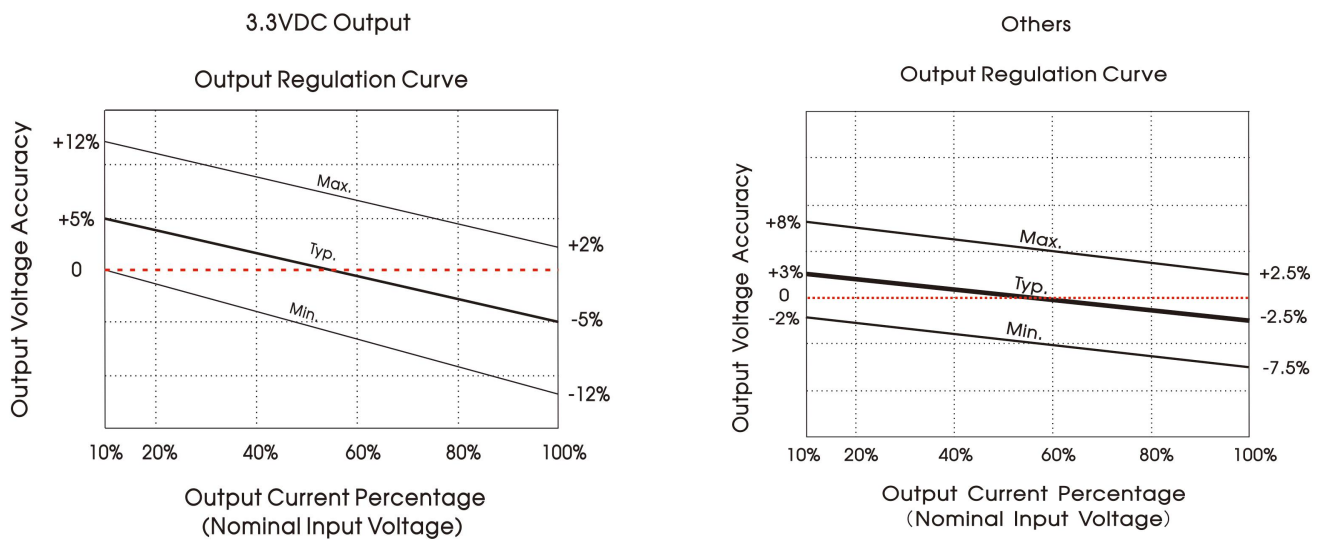


Fig. 1

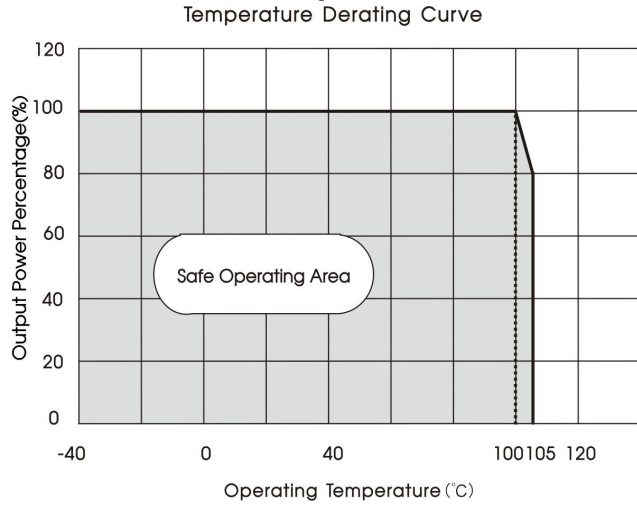
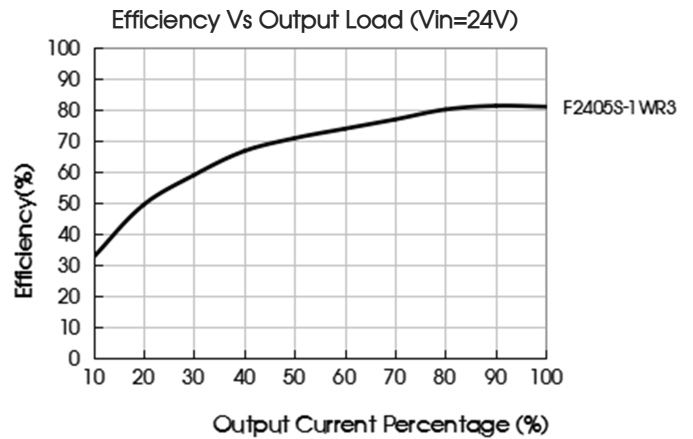
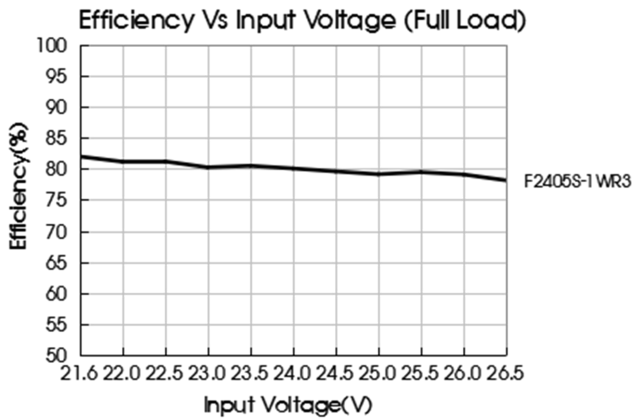
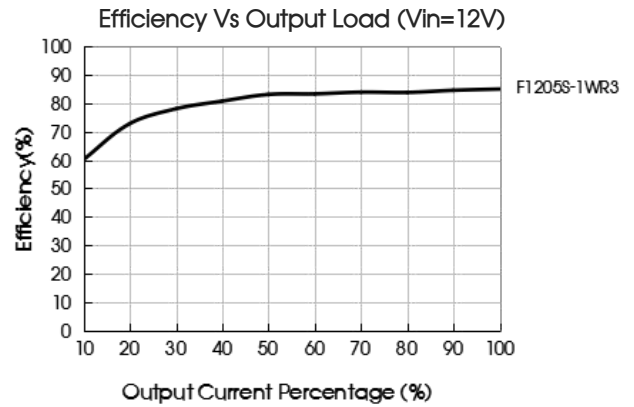
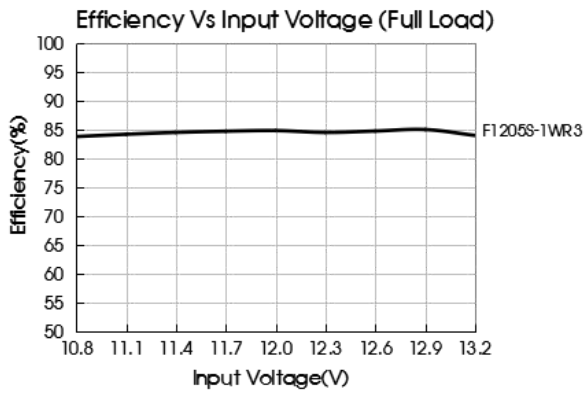


Fig. 2



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.

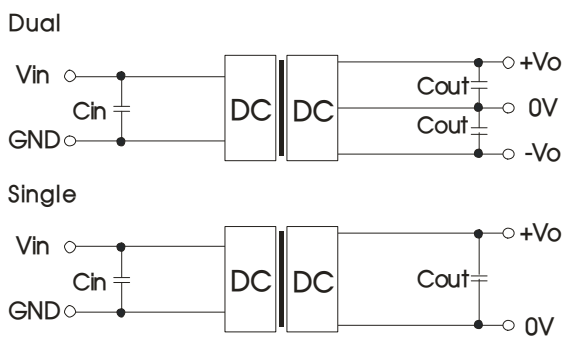


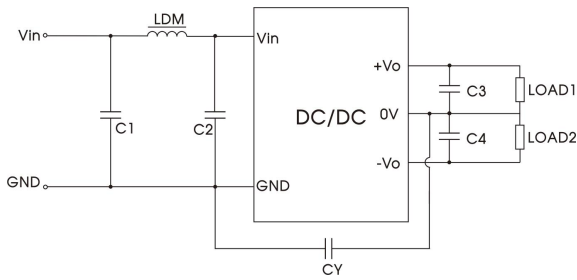
Fig. 3

Table 1: Recommended input and output capacitor values

| Vin | Cin | Single output | Cout | Dual output | Cout |
|-------|-----------|---------------|-----------|-------------|------------|
| 9VDC | 2.2μF/25V | 3.3VDC | 10μF/16V | ±3.3VDC | 4.7μF/16V |
| 12VDC | 2.2μF/25V | 5VDC | 10μF/16V | ±5VDC | 4.7μF/16V |
| 15VDC | 2.2μF/25V | 7.2VDC | 2.2μF/16V | ±9VDC | 1μF/16V |
| 24VDC | 1μF/50V | 9VDC | 2.2μF/16V | ±12VDC | 1μF/25V |
| -- | -- | 12VDC | 2.2μF/25V | ±15VDC | 0.47μF/25V |
| -- | -- | 15VDC | 1μF/25V | ±24VDC | 0.47μF/50V |
| -- | -- | 24VDC | 1μF/50V | -- | -- |

2. EMC compliance circuit

Dual



Single

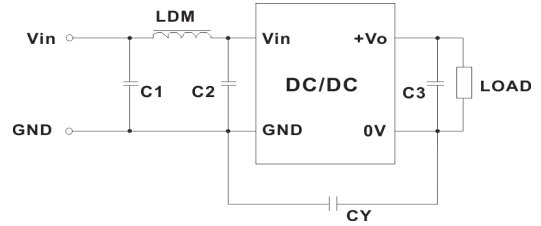


Fig. 4

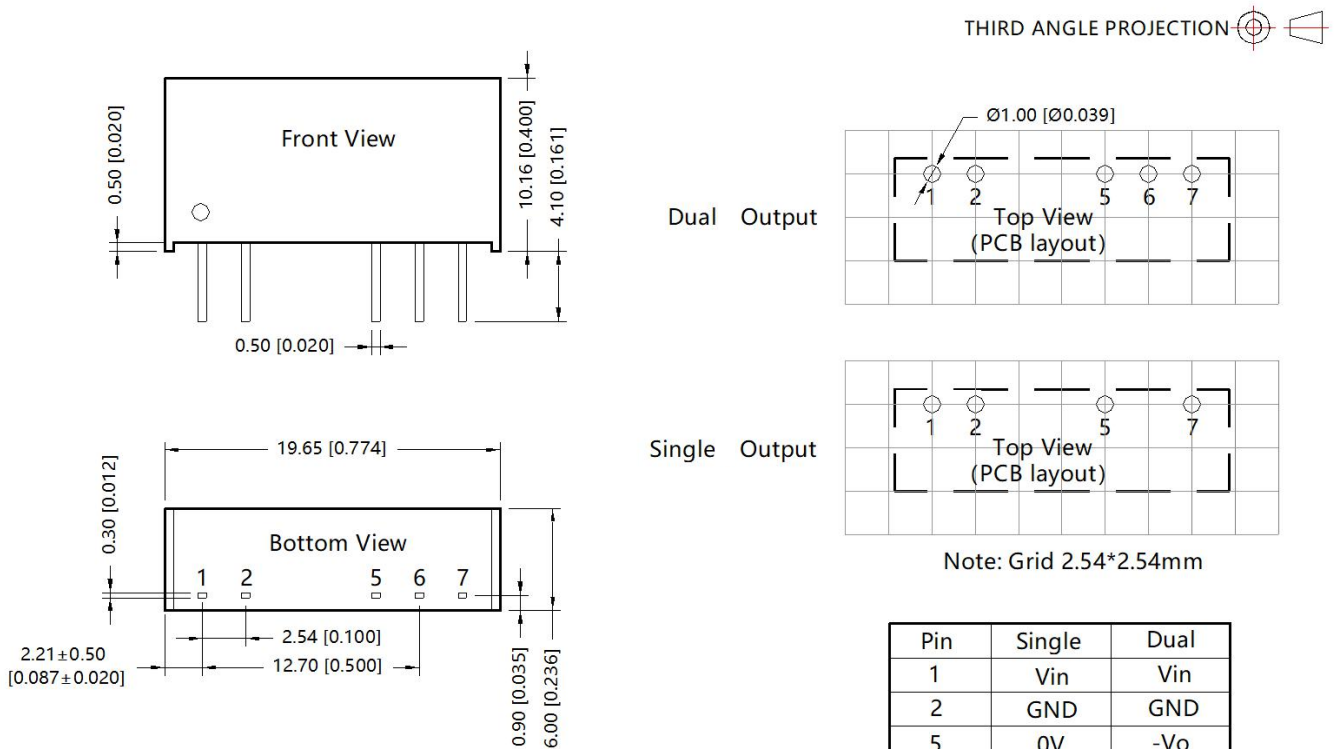
Table 2: EMC recommended circuit value table

| | | |
|-----------|-------|------------------------------|
| Emissions | C1/C2 | 4.7μF /50V |
| | CY | 270pF /3kVDC |
| | C3/C4 | Refer to the Cout in table 1 |
| | LDM | 6.8μH |

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

www.mornsun-power.com

Dimensions and Recommended Layout



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

| Pin | Single | Dual |
|-----|--------|------|
| 1 | Vin | Vin |
| 2 | GND | GND |
| 5 | 0V | -Vo |
| 6 | No Pin | 0V |
| 7 | +Vo | +Vo |

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Tube Packaging bag number: 58200001;
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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