

MORNSUN®

E_S-2W & F_S-2W SERIES 2W, FIXED INPUT, ISOLATED & UNREGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



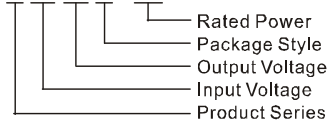
Patent Protection RoHS CE G RL us

FEATURES

- Small Footprint
- Efficiency up to 85%
- SIP Package
- High Power Density
- Low Temperature Rise
- Up to 3KV Isolation
- Operating Temperature Range: -40°C to +85°C
- No External Component Required
- Industry Standard Pinout
- Certificate CE/UL

PART NUMBER SYSTEM

E0505S-2W



APPLICATIONS

The E_S-2W & F_S-2W Series are designed for application where isolated output is required from a distributed power system.

These products apply to where:

- 1) Input voltage variation $\leq \pm 10\%$;
- 2) 3KVDC input and output isolation;
- 3) Regulated and low ripple noise is not required.

Such as: digital circuits, low frequency analog circuits, and IGBT power device driving circuits.

SELECTION GUIDE

| Model Number | Input Voltage(VDC) Nominal (Range) | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(typ.) | | Reflected Ripple Current (mA,typ.) | Max. Capacitive Load# (μF) | Efficiency (% , typ.) @Max. Load | Approval | |
|--------------|---------------------------------------|----------------------|---------------------|------|--------------------------|----------|------------------------------------|----------------------------|----------------------------------|----------|-------|
| | | | Max. | Min. | @Max. Load | @No Load | | | | | |
| E0503S-2W | 5 (4.5-5.5) | ±3.3 | ±303 | ±30 | 495 | 30 | 25 | 100 | 73 | UL CE | |
| E0505S-2W | | ±5 | ±200 | ±20 | 485 | | | | 82 | | |
| E0509S-2W | | ±9 | ±111 | ±12 | 463 | | | | 83 | | |
| E0512S-2W | | ±12 | ±83 | ±9 | 462 | | | | 84 | | |
| E0515S-2W | | ±15 | ±67 | ±7 | 459 | | | | 82 | | |
| F0503S-2W | | 3.3 | 400 | 40 | 492 | | | | 30 | | 220 |
| F0505S-2W | | 5 | 400 | 40 | 483 | 81 | | | | | |
| F0509S-2W | | 9 | 222 | 23 | 468 | 83 | | | | | |
| F0512S-2W | | 12 | 167 | 17 | 465 | 83 | | | | | |
| F0515S-2W | | 15 | 133 | 14 | 477 | 83 | | | | | |
| F0524S-2W | | 24 | 83 | 9 | 458 | 84 | | | | | |
| E1203S-2W | | 12 (10.8-13.2) | ±3.3 | ±303 | ±31 | 207 | 20 | 25 | 100 | 76 | UL CE |
| E1205S-2W | ±5 | | ±200 | ±20 | 203 | 80 | | | | | |
| E1209S-2W | ±9 | | ±111 | ±12 | 194 | 83 | | | | | |
| E1212S-2W | ±12 | | ±83 | ±9 | 189 | 85 | | | | | |
| E1215S-2W | ±15 | | ±67 | ±7 | 198 | 82 | | | | | |
| F1205S-2W | 5 | | 400 | 40 | 199 | 30 | | | | 220 | |
| F1209S-2W | 9 | | 222 | 23 | 195 | | 82 | | | | |
| F1212S-2W | 12 | | 167 | 17 | 188 | | 83 | | | | |
| F1215S-2W | 15 | | 133 | 14 | 196 | | 83 | | | | |
| F1224S-2W | 24 | | 83 | 9 | 194 | | 82 | | | | |
| E1515S-2W | 15 (13.5-16.5) | | ±15 | ±67 | ±7 | | 152 | 15 | 37 | | 100 |
| F1505S-2W | | | 5 | 400 | 40 | 160 | 56 | | 220 | 78 | |
| F1515S-2W | | 15 | 133 | 14 | 152 | 30 | 80 | | | | |

| | | | | | | | | | | |
|-----------|-------------------|-----|------|-----|-----|----|----|-----|----|-------|
| E2405S-2W | 24 (21.6-26.4) | ±5 | ±200 | ±20 | 101 | 10 | 30 | 100 | 82 | UL CE |
| E2409S-2W | | ±9 | ±111 | ±12 | 97 | | | | 82 | UL CE |
| E2412S-2W | | ±12 | ±83 | ±9 | 96 | | | | 85 | UL CE |
| E2415S-2W | | ±15 | ±67 | ±7 | 95 | | | | 85 | UL CE |
| F2405S-2W | | 5 | 400 | 40 | 100 | | 30 | 220 | 80 | UL CE |
| F2409S-2W | | 9 | 222 | 23 | 97 | | | | 82 | UL CE |
| F2412S-2W | | 12 | 167 | 17 | 94 | | | | 83 | UL CE |
| F2415S-2W | | 15 | 133 | 14 | 96 | | | | 84 | UL CE |
| F2424S-2W | | 24 | 83 | 9 | 93 | | | | 85 | |

Note: 1. Models listed with strike-through text have been officially discontinued.
2. * For each output.

INPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-----------------|--------------------|------|------|------|
| Input Surge Voltage (1sec. max.) | 3.3VDC input | -0.7 | -- | 5 | VDC |
| | 5VDC input | -0.7 | -- | 9 | |
| | 12VDC input | -0.7 | -- | 18 | |
| | 15VDC input | -0.7 | -- | 21 | |
| | 24VDC input | -0.7 | -- | 30 | |
| Input Filter | | Capacitance Filter | | | |

OUTPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------|-----------------------------|------------------------------|------|-------|-------|------|
| Output Power | | 0.2 | -- | 2 | W | |
| Output Voltage Accuracy | | See tolerance envelope curve | | | | |
| Output Voltage Balance | Dual Output, Balanced Loads | -- | ±0.5 | ±1.0 | % | |
| Line Regulation | For Vin change of ±1% | 3.3VDC output | -- | -- | | ±1.5 |
| | | Others | -- | -- | | ±1.2 |
| Load Regulation | 10% to 100% load | 3.3VDC output | -- | 12 | | 20 |
| | | 5VDC output | -- | 10 | | 15 |
| | | 9VDC output | -- | 8.3 | | 15 |
| | | 12VDC output | -- | 6.8 | | 15 |
| | | 15VDC output | -- | 6.3 | 15 | |
| 24VDC output | -- | 5.0 | 15 | | | |
| Temperature Drift | 100% load | -- | -- | ±0.03 | %/°C | |
| Ripple & Noise* | 20MHz Bandwidth | -- | 75 | 150 | mVp-p | |
| Short Circuit Protection** | | -- | -- | 1 | s | |

Note: 1. Dual output models unbalanced load: ±5%.

2. *Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.

3. **Supply voltage must be discontinued at the end of short circuit duration.

COMMON SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|--|------------------|------|------|---------|----|
| Isolation Voltage | Tested for 1 minute and leakage current less than 1 mA | 3000 | -- | -- | VDC | |
| Isolation Resistance | Test at 500VDC | 1000 | -- | -- | MΩ | |
| Isolation Capacitance | Input/Output, 100KHz/1V | F2424S-2W | -- | 100 | -- | pF |
| | | Others | -- | 30 | -- | |
| Switching Frequency | Full load, nominal input | -- | 70 | -- | KHz | |
| MTBF | MIL-HDBK-217F@25°C | 3500 | -- | -- | K hours | |
| Case Material | | Plastic(UL94-V0) | | | | |
| Weight | | -- | 2.1 | -- | g | |

ENVIRONMENTAL SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|--------------------------------|---------------------|------|------|------|
| Storage Humidity | Non condensing | -- | -- | 95 | % |
| Operating Temperature | Power derating (above 85°C) | -40 | -- | 85 | °C |
| Storage Temperature | | -55 | -- | 125 | |
| Temp. rise at full load | | -- | 25 | -- | |
| Lead Temperature | 1.5mm from case for 10 seconds | -- | -- | 300 | |
| Cooling | | Free air convection | | | |

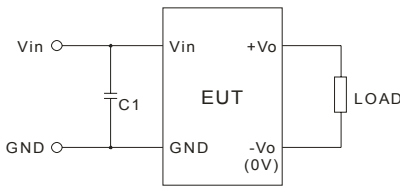
EMC SPECIFICATIONS

| | | |
|-----|-----|--|
| EMI | CE | CISPR22/EN55022 CLASS A(External Circuit Refer to Figure1) |
| EMS | ESD | IEC/EN61000-4-2 Contact ±8KV perf. Criteria B |

EMC RECOMMENDED CIRCUIT

E05XXS-2W, F24XXS-2W already meet CLASS A, for other models following Figure 1.

EMI Recommended External Circuit:



(Figure 1)

E_S-2W Series

Recommended external circuit parameters:

①Vin: 12V, 15V

C1: 2.2μF/50V

②Vin: 24V

C1: 4.7μF/50V

F_S-2W Series

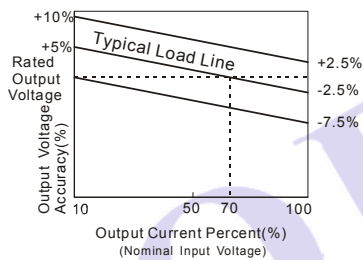
Recommended external circuit parameters:

Vin: 5V, 12V, 15V

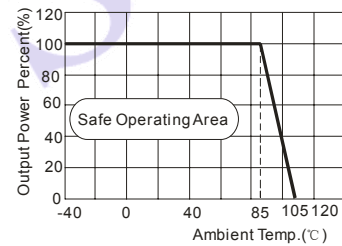
①C1: 4.7μF/50V

PRODUCT TYPICAL CURVE

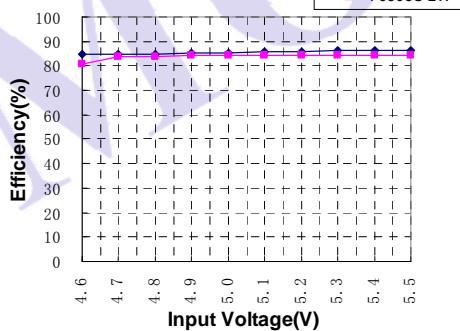
Tolerance Envelope Curve



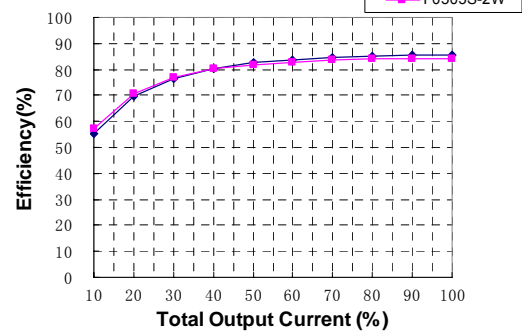
Temperature Derating Curve



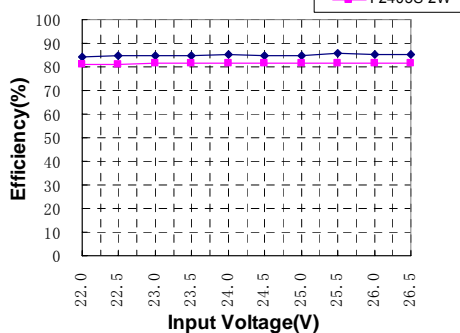
Efficiency VS Input Voltage curve (Full Load)



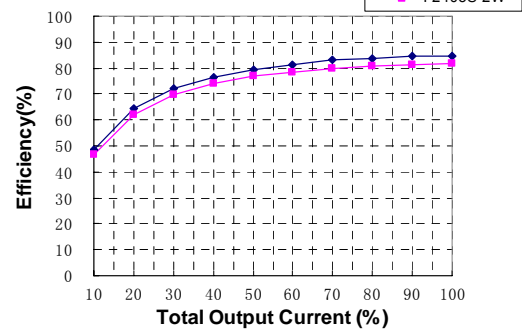
Efficiency VS Output Load curve (Vin=Vin-nominal)



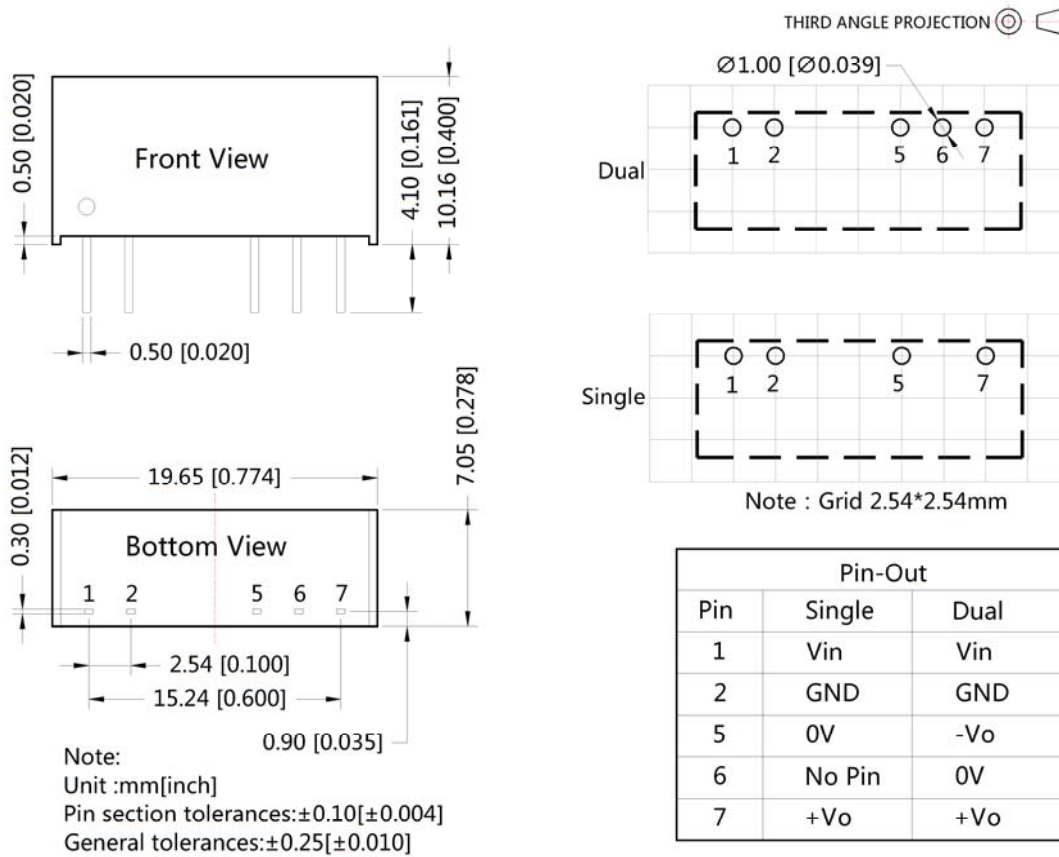
Efficiency VS Input Voltage curve (Full Load)



Efficiency VS Output Load curve (Vin=Vin-nominal)



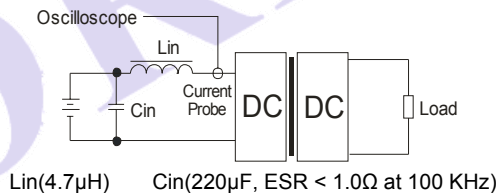
OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING



TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.



DESIGN CONSIDERATIONS

1) Requirement on output load

To ensure this module can operate efficiently and reliably, During operation, the minimum output load **could not be less than 10% of the full load**. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load, or use our company's products with a lower rated output power (E_S-1W & F_S-1W series).

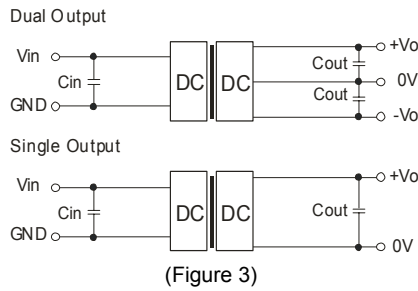
2) Overload protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to add a circuit breaker to the circuit.

3) Recommended circuit

If you want to further decrease the input/output ripple, an capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 3).

It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 1).



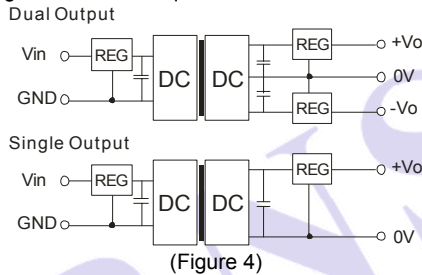
EXTERNAL CAPACITOR TABLE (TABLE 1)

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

Note: # For each output. It's not recommended to connect any external capacitor in the application field with less than 0.5 watt output.

4) Output voltage regulation and over-voltage protection circuit

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear regulator and a capacitor filtering network with overheat protection that is connected to the input or output end in series (Figure 4), the recommended capacitance of its filter capacitor sees (Table 1), linear regulator based on the actual voltage and current required.



5) Cannot use in parallel and hot swap

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specification listed.
2. Max. Capacitive Load tested at input voltage range and full load.
3. All data in the datasheet are measured according to nominal input voltage, rated output load, $T_A=25^\circ\text{C}$, humidity<75%, unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. The performance in the datasheet is just fit for the part number in the selection guide, and may be different from the customer-designed product, you can get more details from MORNSUN FAE.
6. Contact us for your specific requirement.
7. Specifications subject to change without prior notice.

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