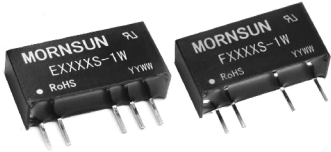


E_S-1W & F_S-1W Series

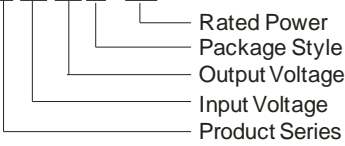
1W, FIXED INPUT, ISOLATED & UNREGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



Patent Protection RoHS CE c RoHS US

MODEL SELECTION

E0505S-1W



PRODUCT FEATURES

- High Efficiency up to 82%
- SIP Package
- 3000VDC Isolation
- High Density, High Stability
- No Heat sink Required
- Temperature Range: -40°C ~ +85°C
- No External Component Required
- Industry Standard Pinout
- RoHS Compliance

APPLICATIONS

The E_S-1W & F_S-1W series are specially designed for applications where a group of polar power supplies are isolated from the input power supply in a distributed power supply system on a circuit board.

These products apply to:

- 1) Where the voltage of the input power supply is fixed (voltage variation $\leq \pm 10\%$);
- 2) Where isolation is necessary between input and output (isolation voltage $\leq 3000\text{VDC}$);
- 3) Where the regulation of the output voltage and the output ripple noise are not demanding.

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

PRODUCT PROGRAM

| Model Number | Input Voltage(VDC) | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(typ.) | | Reflected Ripple Current (mA,typ.) | Max. Capacitive Load(μF) | Efficiency (% , typ.) @Max. Load | Approval |
|--------------|--------------------|----------------------|---------------------|----------|--------------------------|----------|------------------------------------|---------------------------------------|----------------------------------|----------|
| | Nominal (Range) | | Max. | Min. | @Max. Load | @No Load | | | | |
| F0303S-1W | 3.3 (3.0-3.6) | 3.3 | 303 | 31 | 415 | 42 | 17 | 100 | 69 | |
| F0305S-1W | | 5 | 200 | 20 | 390 | | | | 74 | |
| E0505S-1W | 5 (4.5-5.5) | ± 5 | ± 100 | ± 10 | 281 | 30 | 19 | 220 | 71 | UL CE |
| E0509S-1W | | ± 9 | ± 56 | ± 6 | 265 | | | | 77 | UL CE |
| E0512S-1W | | ± 12 | ± 42 | ± 5 | 250 | | | | 77 | UL CE |
| E0515S-1W | | ± 15 | ± 33 | ± 4 | 235 | | | | 79 | UL CE |
| F0503S-1W | | 3.3 | 303 | 30 | 271 | 30 | 21 | 100 | 73 | |
| F0505S-1W | | 5 | 200 | 20 | 279 | | | | 72 | UL CE |
| F0509S-1W | | 9 | 111 | 12 | 266 | | | | 76 | UL CE |
| F0512S-1W | | 12 | 83 | 9 | 249 | | | | 79 | UL CE |
| F0515S-1W | | 15 | 67 | 7 | 260 | | | | 78 | UL CE |
| F0524S-1W | | 24 | 42 | 5 | 238 | | | | 79 | |
| F0909S-1W | 9 (8.1-9.9) | 9 | 111 | 11 | 145 | 20 | 21 | 100 | 79 | |
| F0915S-1W | | 15 | 67 | 6 | 140 | | | | 82 | |
| E1205S-1W | 12 (10.8-13.2) | ± 5 | ± 100 | ± 10 | 106 | 19 | 24 | 220 | 73 | UL CE |
| E1209S-1W | | ± 9 | ± 56 | ± 6 | 108 | | | | 77 | UL CE |
| E1212S-1W | | ± 12 | ± 42 | ± 5 | 104 | | | | 80 | UL CE |
| E1215S-1W | | ± 15 | ± 33 | ± 4 | 115 | | | | 80 | UL CE |
| F1203S-1W | | 3.3 | 303 | 30 | 112 | 16 | 21 | 100 | 70 | |
| F1205S-1W | | 5 | 200 | 20 | 113 | | | | 70 | UL CE |
| F1209S-1W | | 9 | 111 | 12 | 107 | | | | 75 | UL CE |
| F1212S-1W | | 12 | 83 | 9 | 106 | | | | 78 | UL CE |
| F1215S-1W | 15 | 67 | 7 | 104 | 79 | | | | UL CE | |

| Model Number | Input Voltage(VDC) | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(typ.) | | Reflected Ripple Current (mA,typ.) | Max. Capacitive Load(μF) | Efficiency (% , typ.) @Max. Load | Approval |
|--------------|--------------------|----------------------|---------------------|------|--------------------------|----------|------------------------------------|--------------------------|----------------------------------|----------|
| | Nominal (Range) | | Max. | Min. | @Max. Load | @No Load | | | | |
| F1224S-1W | 12(10.8-13.2) | 24 | 42 | 5 | 97 | 16 | 21 | 100 | 79 | |
| E1515S-1W | 15 (13.5-16.5) | ±15 | ±33 | ±4 | 85 | 14 | 56 | 220 | 75 | |
| F1505S-1W | | 5 | 200 | 20 | 94 | 13 | 22 | 100 | 69 | |
| F1509S-1W | | 9 | 111 | 12 | 87 | | | | 73 | |
| F1515S-1W | | 15 | 67 | 7 | 86 | | | | 75 | |
| E2405S-1W | 24 (21.6-26.4) | ±5 | ±100 | ±10 | 53 | 7 | 42 | 220 | 73 | UL CE |
| E2409S-1W | | ±9 | ±56 | ±6 | 52 | | | | 77 | UL CE |
| E2412S-1W | | ±12 | ±42 | ±5 | 51 | | | | 80 | UL CE |
| E2415S-1W | | ±15 | ±33 | ±4 | 51 | | | | 80 | UL CE |
| F2403S-1W | | 3.3 | 303 | 31 | 56 | 7 | 47 | 100 | 70 | |
| F2405S-1W | | 5 | 200 | 20 | 56 | | | | 71 | UL CE |
| F2409S-1W | | 9 | 111 | 12 | 52 | | | | 76 | UL CE |
| F2412S-1W | | 12 | 83 | 9 | 51 | | | | 78 | UL CE |
| F2415S-1W | | 15 | 67 | 7 | 52 | | | | 80 | UL CE |
| F2424S-1W | | 24 | 42 | 5 | 51 | | | | 77 | |

INPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|---------------------|----------|------|------|-------|
| Input Surge Voltage (1 sec. max.) | 3.3VDC Input Models | -0.7 | -- | 5 | VDC |
| | 5VDC Input Models | -0.7 | -- | 9 | |
| | 9VDC Input Models | -0.7 | -- | 15 | |
| | 12VDC Input Models | -0.7 | -- | 18 | |
| | 15VDC Input Models | -0.7 | -- | 21 | |
| | 24VDC Input Models | -0.7 | -- | 30 | |
| Reverse Polarity Input Current* | | -- | -- | 0.4 | A |
| Internal Power Dissipation* | | -- | -- | 0.45 | W |
| Input Filter | | C Filter | | | |

Note: *If the product reverse did not seek to limit current or work does not limit the maximum power, may result in injury or permanent damage, testing is not recommended.

OUTPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Units | |
|----------------------------|-----------------------------|------------------------------|------|-------|-------|-------|
| Output Power | | 0.1 | -- | 1 | W | |
| Output Voltage Accuracy | | See tolerance envelope graph | | | | |
| Output Voltage Balance | Dual Output, Balanced Loads | -- | ±0.5 | ±1 | % | |
| Line Regulation | For Vin change of ±1% | (3.3V output) | -- | ±1.5 | | |
| | | (Others output) | -- | ±1.2 | | |
| Load Regulation | 10% to 100% load | (3.3V output) | -- | 12 | | 20 |
| | | (5V output) | -- | 10 | | 15 |
| | | (9V output) | -- | 8.3 | | 15 |
| | | (12V output) | -- | 6.8 | | 15 |
| | | (15V output) | -- | 6.3 | 15 | |
| (24V output) | -- | 6 | 15 | | | |
| Temperature Drift | 100% full load | -- | -- | ±0.03 | %/°C | |
| Ripple & Noise* | 20MHz Bandwidth | (ExxxxS-1W) | -- | 50 | 75 | mVp-p |
| | | (Exx15S-1W) | -- | 100 | 150 | |
| | | (FxxxxS-1W) | -- | 75 | 100 | |
| | | (Fxx24S-1W) | -- | 100 | 150 | |
| Short Circuit Protection** | | -- | -- | 1 | s | |

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

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

COMMON SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Units | |
|-----------------------|---------------------------------|------------------|------|------|---------|----|
| Isolation Voltage | Tested for 1 minute and 1mA max | 3000 | -- | -- | VDC | |
| Isolation Resistance | Test at 500VDC | 1000 | -- | -- | MΩ | |
| Isolation Capacitance | Input/Output, 100KHz/1V | F2424S-1W | -- | 100 | -- | pF |
| | | Other Models | -- | 30 | -- | |
| Switching Frequency | Full load, nominal input | -- | 100 | -- | 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. | Units |
|-------------------------|--------------------------------|---------------------|------|------|-------|
| Storage Humidity | | -- | -- | 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 | | | |

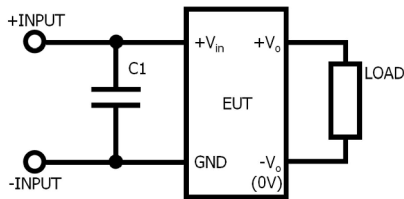
EMC SPECIFICATIONS

| | | | | | |
|-----|-----|---|-----------------|---------|-----------------------|
| EMI | CE | CISPR22/EN55022 CLASS A (External Circuit Refer to Figure1) | | | |
| EMS | ESD | ExxxxS-1W Series | IEC/EN61000-4-2 | Contact | ±6KV perf. Criteria B |
| | | FxxxxS-1W Series | IEC/EN61000-4-2 | Contact | ±8KV perf. Criteria B |

EMC RECOMMENDED CIRCUIT

EMI Recommended External Circuit

(CLASS A):



(Figure 1)

E_S-1W Series

Recommended external circuit parameters:

Vin: 24V

C1: 2.2μF/50V 1210

Remarks: Product bare input of 5V、12V、15V can be tested by the CLASS A.

F_S-1W Series

Recommended external circuit parameters:

Vin: 3.3V/9V

C1: 2.2μF /50V 1210

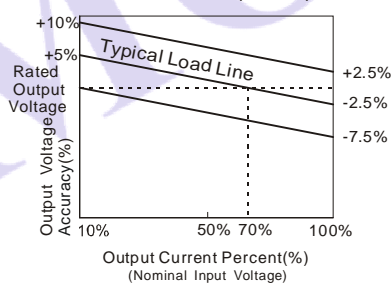
Vin: 5V/12V/24V

C1: 1μF /50V 1210

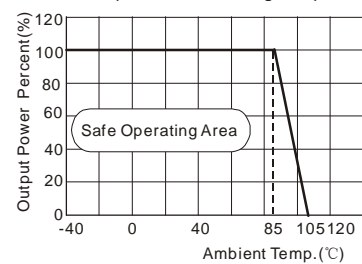
Remarks: Product bare input of 3.3V、5V、12V、15V can be tested by the CLASS A, increase the capacitor margin increase.

PRODUCT TYPICAL CURVE

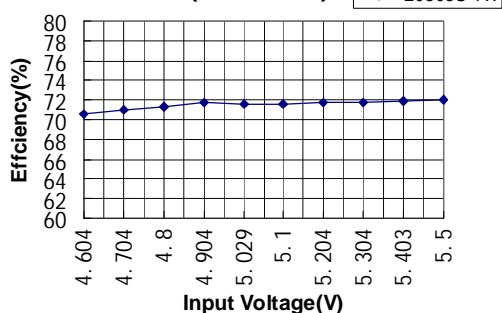
Tolerance Envelope Graph



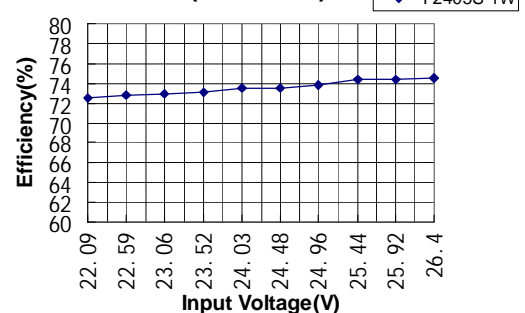
Temperature Derating Graph



Efficiency VS Input Voltage curve (Full Load)

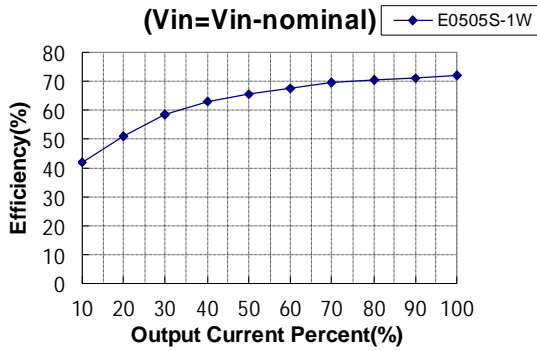


Efficiency VS Input Voltage curve (Full Load)



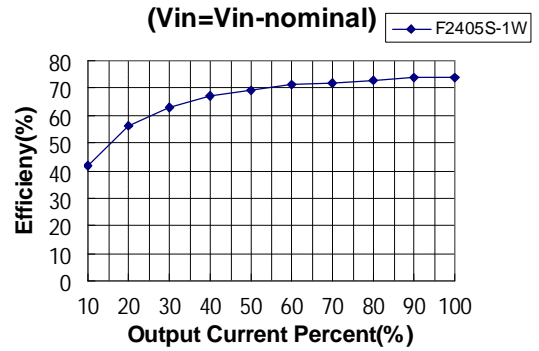
Efficiency VS Output Load curve

(Vin=Vin-nominal)



Efficiency VS Output Load curve

(Vin=Vin-nominal)



OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

FOOTPRINT DETAILS

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

Note:
Unit:mm[inch]
Pin section tolerances: ± 0.10mm[±0.004inch]
General tolerances:± 0.50mm[±0.020inch]

RECOMMENDED FOOTPRINT

Note:
Grid: 2.54*2.54 mm.

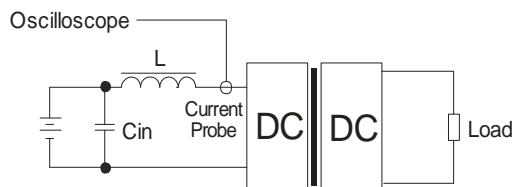
TUBE OUTLINE DIMENSIONS

Note:
Unit :mm[inch]
General tolerances: ±0.50mm[±0.020inch]
L=530mm[20.866inch] Devices per tube quantity : 25pcs
L=220mm[8.661inch] Devices per tube quantity: 10pcs
Short tube inner packaging dimensions: L*W*H=255*170*80mm;
Short tube outer packaging dimensions(with six inner packaging boxes):
L*W*H=375*280*270mm;
Long tube inner packaging dimensions: L*W*H=580*200*100mm;
Long tube outer packaging dimensions(with two inner packaging boxes):
L*W*H=600*215*220mm;
Long tube outer packaging dimensions(with three inner packaging boxes):
L*W*H=600*215*325mm.

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor Lin and Cin to simulate source impedance.



Lin(4.7μH) Cin(220μF, ESR < 1.0Ω at 100 KHz)

DESIGN & APPLY 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-W25&F_S-W25).

2) Overload protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit.

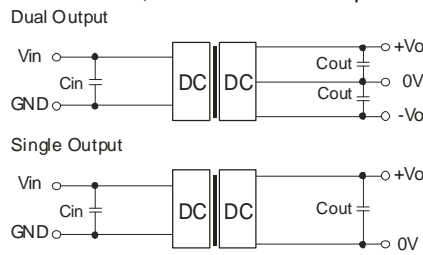
Input Fuse Selection Guide

| | | | |
|---------------------|----------------------|--------------------|----------------------|
| 3.3VDC Input Models | 500mA slow-Blow Type | 12VDC Input Models | 200mA slow-Blow Type |
| 5VDC Input Models | 500mA slow-Blow Type | 15VDC Input Models | 100mA slow-Blow Type |
| 9VDC Input Models | 200mA slow-Blow Type | 24VDC Input Models | 100mA slow-Blow Type |

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 2).

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).



(Figure 2)

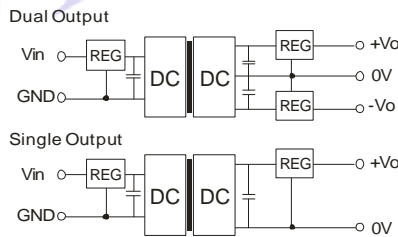
EXTERNAL CAPACITOR TABLE (TABLE 1)

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

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 an capacitor filtering network with overheat protection that is connected to the input or output end in series (Figure 3), the recommended capacitance of its filter capacitor sees (Table 1), linear regulator based on the actual voltage and current to reasonable selection.



(Figure 3)

5) No parallel connection or plug and play

Note:

- 1.Operation under minimum load will not damage the converter; However, they may not meet all specification listed, and that will reduce the life of product.
- 2.All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
- 3.In this datasheet, all the test methods of indications are based on corporate standards.
- 4.Only typical models listed, other models may be different, please contact our technical person for more details.
- 5.Our company offer custom products.
- 6.Specifications subject to change without notice.

MORNSUN Science & Technology Co.,Ltd.

Address: No. 5, Kehui St. 1, Kehui development center, Science Ave., Guangzhou Science City, Luogang district, Guangzhou, P.R.China.

Tel: 86-20-28203030

Fax:86-20-28203068

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