



## E\_S-2W & F\_S-2W Series

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

### FEATURES

- High Efficiency up to 85%
- 3000VDC Isolation
- SIP Package
- Internal SMD construction
- No Heat sink Required
- Temperature Range: -40°C to +85°C
- No External Component Required
- Industry Standard Pinout
- RoHS Compliance

### APPLICATIONS

The E\_S-2W & F\_S-2W 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.

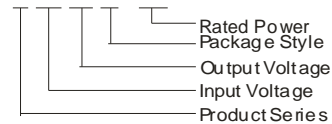
### PRODUCT PROGRAM

| Part Number | Input         |           | Output        |              |          | Efficiency (% , Typ) | Certificate |    |       |
|-------------|---------------|-----------|---------------|--------------|----------|----------------------|-------------|----|-------|
|             | Voltage (VDC) |           | Voltage (VDC) | Current (mA) |          |                      |             |    |       |
|             | Nominal       | Range     |               | Max          | Min      |                      |             |    |       |
| E0505S-2W   | 5             | 4.5-5.5   | $\pm 5$       | $\pm 200$    | $\pm 20$ | 82                   | UL CE       |    |       |
| E0509S-2W   |               |           | $\pm 9$       | $\pm 111$    | $\pm 12$ | 83                   | UL CE       |    |       |
| E0512S-2W   |               |           | $\pm 12$      | $\pm 83$     | $\pm 9$  | 84                   | UL CE       |    |       |
| E0515S-2W   |               |           | $\pm 15$      | $\pm 67$     | $\pm 7$  | 82                   | UL CE       |    |       |
| F0503S-2W*  |               |           | 3.3           | 400          | 40       | 74                   |             |    |       |
| F0505S-2W   |               |           | 5             | 400          | 40       | 81                   | UL CE       |    |       |
| F0509S-2W   |               |           | 9             | 222          | 23       | 83                   | UL CE       |    |       |
| F0512S-2W   |               |           | 12            | 167          | 17       | 83                   | UL CE       |    |       |
| F0515S-2W   |               |           | 15            | 133          | 14       | 83                   | UL CE       |    |       |
| E1205S-2W   |               |           | 12            | 10.8-13.2    | $\pm 5$  | $\pm 200$            | $\pm 20$    | 80 | UL CE |
| E1209S-2W   | $\pm 9$       | $\pm 111$ |               |              | $\pm 12$ | 83                   | UL CE       |    |       |
| E1212S-2W   | $\pm 12$      | $\pm 83$  |               |              | $\pm 9$  | 85                   | UL CE       |    |       |
| E1215S-2W   | $\pm 15$      | $\pm 67$  |               |              | $\pm 7$  | 82                   | UL CE       |    |       |
| F1205S-2W   | 5             | 400       |               |              | 40       | 80                   | UL CE       |    |       |
| F1209S-2W   | 9             | 222       |               |              | 23       | 82                   | UL CE       |    |       |
| F1212S-2W   | 12            | 167       |               |              | 17       | 83                   | UL CE       |    |       |
| F1215S-2W   | 15            | 133       |               |              | 14       | 83                   | UL CE       |    |       |
| E2405S-2W   | 24            | 21.6-26.4 |               |              | $\pm 5$  | $\pm 200$            | $\pm 20$    | 82 | UL CE |
| E2409S-2W   |               |           |               |              | $\pm 9$  | $\pm 111$            | $\pm 12$    | 82 | UL CE |
| E2412S-2W   |               |           | $\pm 12$      | $\pm 83$     | $\pm 9$  | 85                   | UL CE       |    |       |
| E2415S-2W   |               |           | $\pm 15$      | $\pm 67$     | $\pm 7$  | 85                   | UL CE       |    |       |
| F2405S-2W   |               |           | 5             | 400          | 40       | 80                   | UL CE       |    |       |
| F2409S-2W   |               |           | 9             | 222          | 23       | 82                   | UL CE       |    |       |
| F2412S-2W   |               |           | 12            | 167          | 17       | 83                   | UL CE       |    |       |
| F2415S-2W   |               |           | 15            | 133          | 14       | 84                   | UL CE       |    |       |
| F2424S-2W   |               |           | 24            | 83           | 9        | 85                   |             |    |       |

\*Designing

### MODEL SELECTION

#### E0505S-2W



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### COMMON SPECIFICATIONS

| Item                     | Test conditions                | Min                 | Typ | Max | Units   |
|--------------------------|--------------------------------|---------------------|-----|-----|---------|
| Storage humidity range   |                                |                     |     | 95  | %       |
| Operating Temp. Range    |                                | -40                 |     | 85  | °C      |
| Storage Temp. Range      |                                | -55                 |     | 125 |         |
| Temp. rise at full load  |                                |                     | 15  | 25  |         |
| Lead temperature         | 1.5mm from case for 10 seconds |                     |     | 300 |         |
| Short circuit protection |                                |                     |     | 1   | s       |
| Cooling                  |                                | Free air convection |     |     |         |
| Case material            |                                | Plastic (UL94-V0)   |     |     |         |
| MTBF                     |                                | 3500                |     |     | K hours |
| Weight                   |                                |                     | 2.1 |     | g       |

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

## ISOLATION SPECIFICATIONS

| Item                 | Test conditions                  | Min  | Typ | Max | Units |
|----------------------|----------------------------------|------|-----|-----|-------|
| Isolation voltage    | Tested for 1 minute and 1 mA max | 3000 |     |     | VDC   |
| Isolation resistance | Test at 500VDC                   | 1000 |     |     | MΩ    |

## OUTPUT SPECIFICATIONS

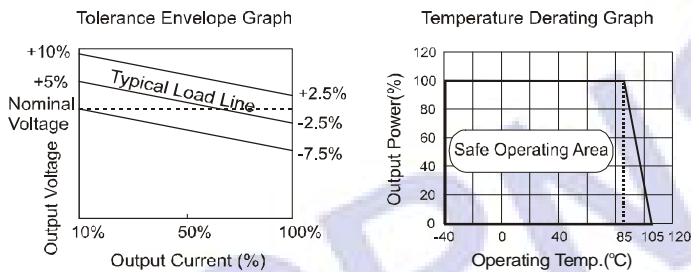
| Item                    | Test conditions          | Min                          | Typ | Max  | Units |
|-------------------------|--------------------------|------------------------------|-----|------|-------|
| Output power            |                          | 0.2                          |     | 2    | W     |
| 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 | 10   |       |
|                         |                          | (12V output)                 | 6.8 | 10   |       |
|                         |                          | (15V output)                 | 6.3 | 10   |       |
| Output voltage accuracy |                          | See tolerance envelope graph |     |      |       |
| Temperature drift       | 100% full load           |                              |     | 0.03 | %/°C  |
| Ripple & Noise*         | 20MHz Bandwidth          |                              | 75  | 150  | mVp-p |
| Switching frequency     | Full load, nominal input |                              | 70  |      | KHz   |

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

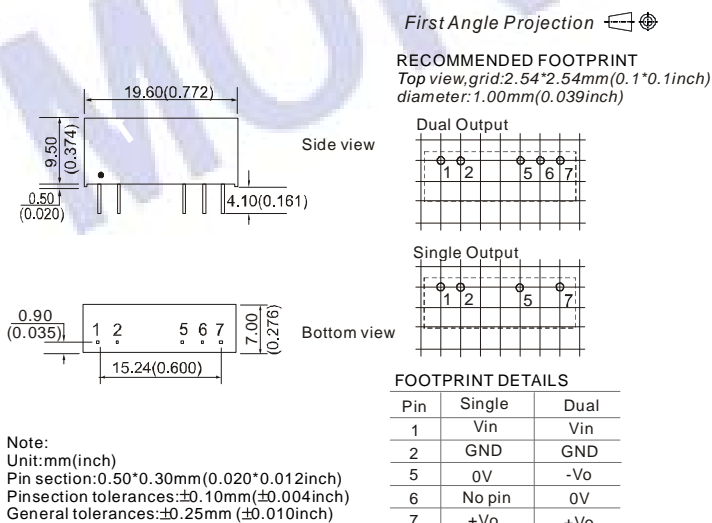
Note:

- All specifications measured at  $T_A=25^{\circ}\text{C}$ , humidity < 75%, nominal input voltage and rated output load unless otherwise specified.
- Dual output models unbalanced load: ±5%.

## TYPICAL CHARACTERISTICS



## OUTLINE DIMENSIONS & PIN CONNECTIONS



## APPLICATION NOTE

### Requirement on output load

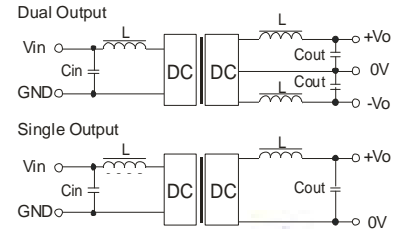
To ensure this module can operate efficiently and reliably, During operation, the minimum output load is not less than 10% of the full load, and that this product **should never be operated under no load!** If the actual output power is very small, please connect a resistor with proper resistance at 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).

### 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.

### Recommended circuit

If you want to further decrease the input/output ripple, an "LC" filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 1).



(Figure 1)

It should also be noted that the inductance and the frequency of the "LC" filtering network should be staggered with the DC/DC frequency to avoid mutual interference. However, the capacitance of the output 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).

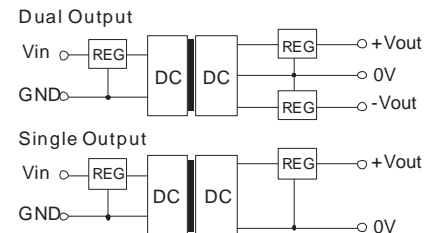
EXTERNAL CAPACITOR TABLE (TABLE 1)

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

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

### Output Voltage Regulation and Over-voltage Protection Circuit

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (Figure 2).



(Figure 2)

**No parallel connection or plug and play.**