

## 2S4E\_1U series

2W - Single Output - Fixed Input - Isolated & Unregulated  
ECO - Miniature SIP Package



### DC-DC Converter

2 Watt

- ⊕ Efficiency up to 88%
- ⊕ Small footprint
- ⊕ SIP package
- ⊕ Single output voltage
- ⊕ 1kVDC Isolation
- ⊕ Temperature Range: -40°C~+85°C
- ⊕ Industry standard pinout
- ⊕ UL94-V0 Package
- ⊕ No heat sink required
- ⊕ EMI Complies With EN55022 Class B
- ⊕ Low ripple and noise

The 2S4E\_1U series are specially designed for applications where a single power supply is isolated from the input power supply in a distributed power supply system on a circuit board.

These products apply to:

- Where the voltage of the input power supply is fixed (voltage variation  $\leq \pm 10\%$ );
- Where isolation is necessary between input and output (isolation voltage = 1000VDC)
- Where the regulation of the output voltage and the output ripple and noise are not demanding.

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



#### Common specifications

|                              |                              |
|------------------------------|------------------------------|
| Short circuit protection:    | 1 second                     |
| Case temperature:            | 100°C MAX                    |
| Cooling:                     | Nature convection            |
| Operation temperature range: | -40°C~+85°C                  |
| Storage temperature range:   | -40°C ~+125°C                |
| Storage humidity range:      | < 95%                        |
| Safety standard:             | designed to meet IEC 60950-1 |
| Case material:               | Plastic [UL94-V0]            |
| MTBF:                        | >1.121 Mhours                |
| Dimensions:                  | 11.68*7.5*10.15mm            |
| Weight:                      | 1.9g                         |

#### Input specifications

| Item                            | Test condition | Min | Typ      | Max | Units   |
|---------------------------------|----------------|-----|----------|-----|---------|
| Input voltage range             |                |     | $\pm 10$ |     | %       |
| Input filter                    | Capacitors     |     |          |     |         |
| Input reflected ripple current* |                |     | 20       |     | mApk-pk |
| Input surge voltage             | 100ms          |     |          |     |         |
|                                 | • 5V models    |     |          | 7   | VDC     |
|                                 | • 12V models   |     |          | 15  | VDC     |
|                                 | • 15V models   |     |          | 18  | VDC     |
|                                 | • 24V models   |     |          | 28  | VDC     |
|                                 | • 48V models   |     |          | 54  | VDC     |

\* Measured Input reflected ripple current with a simulated source inductance of 12uH.

#### Isolation specifications

| Item                  | Test condition      | Min  | Typ | Max | Units |
|-----------------------|---------------------|------|-----|-----|-------|
| Isolation voltage     | Tested for 1 minute | 1000 |     |     | VDC   |
|                       |                     | 3000 |     |     | VDC   |
| Isolation resistance  | Tested for 1 minute | 1000 |     |     | MΩ    |
| Isolation capacitance |                     |      | 60  |     | pF    |

#### Output specifications

| Item                    | Test condition                          | Min | Typ | Max        | Units  |
|-------------------------|-----------------------------------------|-----|-----|------------|--------|
| Output voltage accuracy |                                         |     |     | $\pm 3$    | %      |
| Line regulation         | For Vin change of 1%                    |     |     | $\pm 1.2$  | %      |
| Load regulation         | • 20% to 100% full load<br>• 3.3V model |     |     | 10<br>20   | %<br>% |
| Temperature drift       | 100% full load                          |     |     | $\pm 0.03$ | %/°C   |
| Ripple & Noise          | 20MHz Bandwidth                         |     |     | 150        | mVp-p  |
| Switching frequency     | variable                                |     | 70  |            | KHz    |

#### EMC specifications

|     |         |                 |                  |
|-----|---------|-----------------|------------------|
| EMI | CE*     | EN55032         | CLASS B          |
| EMI | RE      | EN55032         | CLASS B          |
| EMS | ESD     | IEC/EN61000-4-2 | perf. Criteria A |
| EMS | RS      | IEC/EN61000-4-3 | perf. Criteria A |
| EMS | EFT**   | IEC/EN61000-4-4 | perf. Criteria A |
| EMS | Surge** | IEC/EN61000-4-5 | perf. Criteria A |
| EMS | CS      | IEC/EN61000-4-6 | perf. Criteria A |
| EMS | PFMF    | IEC/EN61000-4-8 | perf. Criteria A |

\* Input filter components are be required to help meet conducted emission class B, which application refer to the EMI Filter of design & feature configuration.

\*\* An external filter capacitor is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.

#### Example:

**2S4E\_0505S1U**

2 = 2Watt; S4 = SIP4; E = Pinning; 05 = 5Vin; 05 = 5Vout;  
S = Single Output; 1 = 1kVDC; U = Unregulated Output

#### Note:

- All specifications measured at TA = 25°C, humidity < 75%, nominal input voltage and rated output load unless otherwise specified.
- See below recommended circuits for more details.
- If the power module such as the definition of the pin does not match with the hand book, please refer to the actual item.

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| Part Number  | Input Voltage [V] | Input current [mA] |                 | Output Voltage [VDC] | Output current [mA; max] | Efficiency [%; typ] | Capacitor load* [μF, max] |
|--------------|-------------------|--------------------|-----------------|----------------------|--------------------------|---------------------|---------------------------|
|              |                   | No load, max.      | Full load, typ. |                      |                          |                     |                           |
| 2S4E_0503S1U | 5                 | 25                 | 338             | 3.3                  | 400                      | 78                  | 470                       |
| 2S4E_0505S1U | 5                 | 25                 | 494             | 5                    | 400                      | 81                  | 470                       |
| 2S4E_0507S1U | 5                 | 35                 | 500             | 7.2                  | 278                      | 80                  | 470                       |
| 2S4E_0509S1U | 5                 | 25                 | 482             | 9                    | 222                      | 83                  | 470                       |
| 2S4E_0512S1U | 5                 | 30                 | 476             | 12                   | 167                      | 84                  | 470                       |
| 2S4E_0515S1U | 5                 | 30                 | 471             | 15                   | 133                      | 85                  | 470                       |
| 2S4E_0524S1U | 5                 | 30                 | 465             | 24                   | 83                       | 86                  | 470                       |

| Part Number  | Input Voltage [V] | Input current [mA] |                 | Output Voltage [VDC] | Output current [mA; max] | Efficiency [%; typ] | Capacitor load* [μF, max] |
|--------------|-------------------|--------------------|-----------------|----------------------|--------------------------|---------------------|---------------------------|
|              |                   | No load, max.      | Full load, typ. |                      |                          |                     |                           |
| 2S4E_1203S1U | 12                | 20                 | 152             | 3.3                  | 400                      | 72                  | 470                       |
| 2S4E_1205S1U | 12                | 20                 | 206             | 5                    | 400                      | 81                  | 470                       |
| 2S4E_1207S1U | 12                | 15                 | 208             | 7.2                  | 278                      | 80                  | 470                       |
| 2S4E_1209S1U | 12                | 15                 | 196             | 9                    | 222                      | 85                  | 470                       |
| 2S4E_1212S1U | 12                | 15                 | 196             | 12                   | 167                      | 85                  | 470                       |
| 2S4E_1215S1U | 12                | 15                 | 196             | 15                   | 133                      | 85                  | 470                       |
| 2S4E_1224S1U | 12                | 25                 | 196             | 24                   | 83                       | 85                  | 470                       |

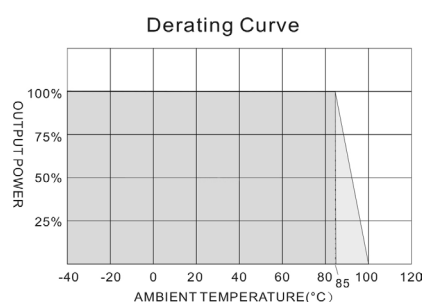
| Part Number  | Input Voltage [V] | Input current [mA] |                 | Output Voltage [VDC] | Output current [mA; max] | Efficiency [%; typ] | Capacitor load* [μF, max] |
|--------------|-------------------|--------------------|-----------------|----------------------|--------------------------|---------------------|---------------------------|
|              |                   | No load, max.      | Full load, typ. |                      |                          |                     |                           |
| 2S4E_1503S1U | 15                | 15                 | 116             | 3.3                  | 400                      | 76                  | 470                       |
| 2S4E_1505S1U | 15                | 15                 | 165             | 5                    | 400                      | 81                  | 470                       |
| 2S4E_1507S1U | 15                | 15                 | 161             | 7.2                  | 278                      | 83                  | 470                       |
| 2S4E_1509S1U | 15                | 15                 | 167             | 9                    | 222                      | 80                  | 470                       |
| 2S4E_1512S1U | 15                | 15                 | 158             | 12                   | 167                      | 84                  | 470                       |
| 2S4E_1515S1U | 15                | 13                 | 155             | 15                   | 133                      | 86                  | 470                       |
| 2S4E_1524S1U | 15                | 17                 | 159             | 24                   | 83                       | 84                  | 470                       |

| Part Number  | Input Voltage [V] | Input current [mA] |                 | Output Voltage [VDC] | Output current [mA; max] | Efficiency [%; typ] | Capacitor load* [μF, max] |
|--------------|-------------------|--------------------|-----------------|----------------------|--------------------------|---------------------|---------------------------|
|              |                   | No load, max.      | Full load, typ. |                      |                          |                     |                           |
| 2S4E_2403S1U | 24                | 7                  | 68              | 3.3                  | 400                      | 81                  | 470                       |
| 2S4E_2405S1U | 24                | 8                  | 100             | 5                    | 400                      | 83                  | 470                       |
| 2S4E_2407S1U | 24                | 10                 | 102             | 7.2                  | 278                      | 82                  | 470                       |
| 2S4E_2409S1U | 24                | 6                  | 98              | 9                    | 222                      | 85                  | 470                       |
| 2S4E_2412S1U | 24                | 8                  | 97              | 12                   | 167                      | 86                  | 470                       |
| 2S4E_2415S1U | 24                | 8                  | 97              | 15                   | 133                      | 86                  | 470                       |
| 2S4E_2424S1U | 24                | 8                  | 95              | 24                   | 83                       | 88                  | 470                       |

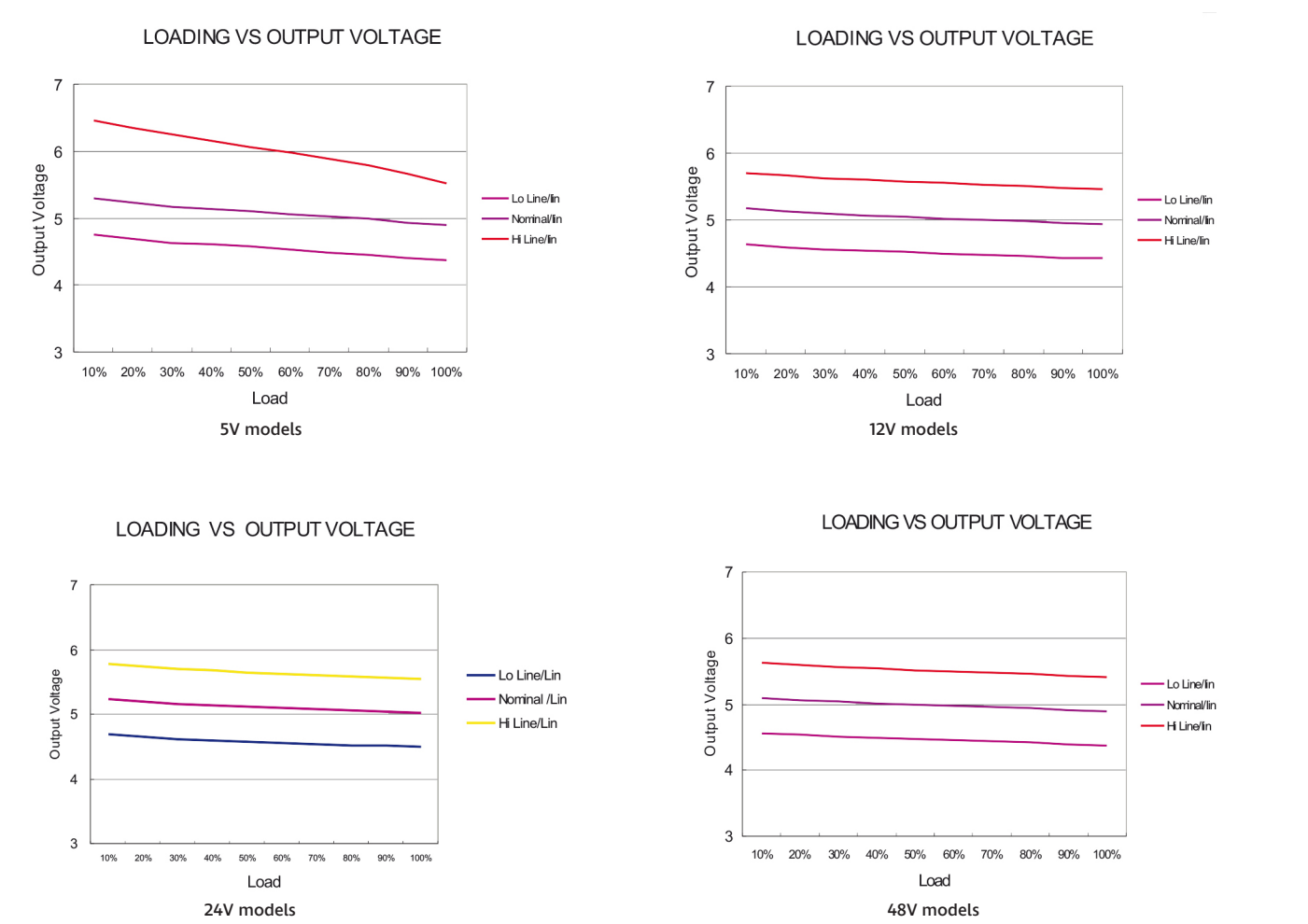
| Part Number  | Input Voltage [V] | Input current [mA] |                 | Output Voltage [VDC] | Output current [mA; max] | Efficiency [%; typ] | Capacitor load* [μF, max] |
|--------------|-------------------|--------------------|-----------------|----------------------|--------------------------|---------------------|---------------------------|
|              |                   | No load, max.      | Full load, typ. |                      |                          |                     |                           |
| 2S4E_4803S1U | 48                | 5                  | 37              | 3.3                  | 400                      | 74                  | 470                       |
| 2S4E_4805S1U | 48                | 5                  | 53              | 5                    | 400                      | 79                  | 470                       |
| 2S4E_4807S1U | 48                | 5                  | 50              | 7.2                  | 278                      | 83                  | 470                       |
| 2S4E_4809S1U | 48                | 5                  | 50              | 9                    | 222                      | 83                  | 470                       |
| 2S4E_4812S1U | 48                | 5                  | 51              | 12                   | 167                      | 81                  | 470                       |
| 2S4E_4815S1U | 48                | 5                  | 51              | 15                   | 133                      | 82                  | 470                       |
| 2S4E_4824S1U | 48                | 5                  | 48              | 24                   | 83                       | 86                  | 470                       |

\* Tested by minimal Vin and constant resistive load.

## Typical characteristics

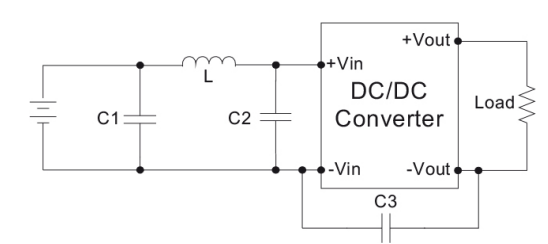


Typical characteristics



EMI filter

Input filter components (C1, L, C2, C3) are used to help meet conducted emissions requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.

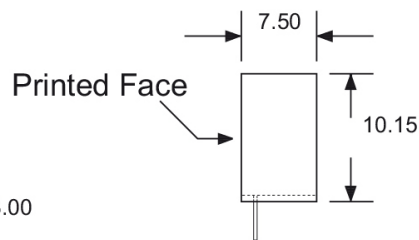
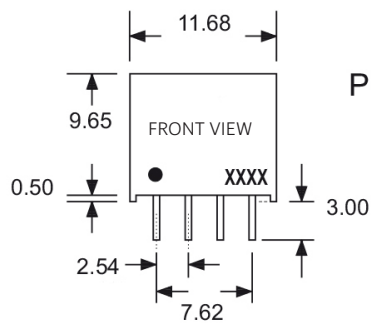


|              | C1                                      | L    | C2                  | C3                 |
|--------------|-----------------------------------------|------|---------------------|--------------------|
| 2S4E_05xxS1U | 1210,<br>2.2uF/100V                     | 18μH |                     |                    |
| 2S4E_12xxS1U | 1210,<br>2.2uF/100V                     | 18μH |                     |                    |
| 2S4E_15xxS1U | 1210,<br>2.2uF/100V                     | 18μH |                     |                    |
| 2S4E_24xxS1U | 1210,<br>2.2uF/100V                     | 18μH | 1210,<br>2.2uF/100V | 1206,<br>470pF/2KV |
| 2S4E_48xxS1U | Electrolytic<br>Capacitor,<br>10uF/100V | 18μH | 1210,<br>2.2uF/100V | 1206,<br>470pF/2KV |

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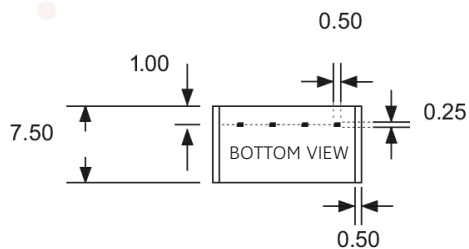
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### Mechanical dimensions



| PIN CONNECTIONS |           |
|-----------------|-----------|
| PIN NUMBER      | SINGLE    |
| 1               | -V Input  |
| 2               | +V Input  |
| 3               | -V Output |
| 4               | +V Output |

(The Pin Connection of high isolation one is the same with normal one.)



### 4 Pin SIL Package

Notes : All dimensions are typical in millimeters

1. Pin diameter:  $0.5 \pm 0.05$
2. Pin pitch and length tolerance:  $\pm 0.35$
3. Case Tolerance:  $\pm 0.5$