# 1S5W_1.5RP series

1W - Single Output DC-DC Converter - Isolated & Regulated


## DC-DC Converter 1 Watt

- 2:1 input voltage range
- Up to 81% efficiency
- Input under voltage
- Output over voltage,
- Short circuit protection (SCP)
- Overcurrent protection
- Operating temperature range: -40°C to +85°C
- Meets CISPR32/EN55032 CLASS A

Introducing our new 1S5W_1.5RP series, a compact and robust DC-DC converter designed for reliable performance in demanding applications. With a 2:1 input voltage range, it adapts easily to fluctuating supply conditions while maintaining stable output behavior. The converter delivers efficiency levels of up to 81%, supporting energy-conscious designs without sacrificing performance. Built-in protection features include input undervoltage protection, output overvoltage protection, short-circuit protection (SCP) and overcurrent protection, ensuring safe operation even under fault conditions. The unit performs confidently across a wide operating temperature range from –40°C to +85°C, making it suitable for harsh or thermally challenging environments. Compliant with CISPR32/EN55032 Class A EMI standards, this series integrates smoothly into systems requiring controlled electromagnetic emissions.

### Common specifications

| | |
|---|---|
| Short circuit protection | Input voltage range, sustainable, self-recovering |
| Switching frequency | 350 kHz 100% load, nominal input voltage (PWM Mode) |
| Operation temperature | -40°C ~+85°C (with derating) |
| Storage temperature | -55°C ~+125°C |
| Pin welding can withstand the highest temperature | +300°C (solder joint distance from housing: 1.5mm, 10 seconds) |
| Case temperature rise | 25°C (Ta = 25°C, nominal input, output load) |
| Storage humidity | 5~95% RH (no condensation) |
| MTBF: (MIL-HDBK-217F@25°C) | 1,000,000 hours |
| Input filter | Pi Filter |
| Hot plug | Not supported |
| Vibration | 10-55Hz, 10G, 30 Min. along X, Y and Z |
| Housing material | Black plastic |
| Dimensions | 12 x 11 x 7.55 mm |
| Weight | 3.1g |
| Cooling method | Natural air cooling |

### Input specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Input current (Full load/ no load) | 5V input<br>12V input<br>24V input<br>48V input | | 267/26<br>111/12<br>56/5<br>28/4 | 286/28<br>119/18<br>60/12<br>32/8 | mA |
| Reflected ripple current | | | 80 | | mA |
| Input surge voltage (1 sec. max.) | 5V input<br>12V input<br>24V input<br>48V input | -0.7<br>-0.7<br>-0.7<br>-0.7 | | 10<br>20<br>40<br>80 | VDC |
| Startup voltage | 5V input<br>12V input<br>24V input<br>48V input | | | 4.5<br>9<br>18<br>36 | VDC |
| Undervoltage shutdown | 5V input<br>12V input<br>24V input<br>48V input | 4<br>5<br>15<br>31 | 4.3<br>8<br>17<br>35 | | VDC |
| Startup time | Nominal input and constant-resistance load | | 19 | 30 | ms |

### Output specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Output voltage accuracy | 0% to 100% load | | ±1 | ±3 | % |
| Linear voltage regulation (Full load, input voltage low to high) | Positive output<br>Negative output | | ±0.2<br>±0.5 | ±0.5<br>±1 | % |
| Load regulation (from 5% to 100% load) | Positive output<br>Negative output | | ±0.5<br>±0.5 | ±1<br>±1.5 | % |
| Transient recovery time | 25% load step change | | 300 | 500 | µs |
| Transient response deviation | 25% load step change | | ±5.1<br>±2.13 | ±5.5<br>±3 | % |
| Temperature drift coefficient | Full load | | | ±0.03 | %/°C |
| Ripple and noise | 20MHz bandwidth, 5% to 100% load | | 50 | 100 | mVp-p |
| Overvoltage protection | Input voltage range | 110 | | 160 | %Vo |
| Overcurrent protection | Input voltage range | 110 | 150 | 200 | %Io |

Note: 1. When tested under operating conditions ranging from 0% to 100% load, the load regulation specification is ±5%;
2. Ripple & noise specifications are tested within the nominal input voltage range of 5%-100% load. The ripple and noise measurement method employs the parallel-line test method (as shown in figure 5).

### Isolation specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Isolation voltage | Input-output, test duration 1 minute, leakage current < 1mA | 1500 | | | VDC |
| Isolation resistance | Input-output, isolation Voltage 500VDC | 1000 | | | MΩ |
| Isolation capacitance | Input-output, 100kHz/0.1V | | 20 | | pF |

**Example:**
**1S5W_2405S1.5RP**
**1 = 1Watt; S5 = SIP5; W = Wide Input; 24 = 24Vin; 05 = 5Vout; S = Single Output; 1.5 = 1500VDC isolation; R = Regulated Output; P = Short circuit protection**

1. Recommended load imbalance for dual-output modules: ≤±5%. If exceeding ±5%, product performance cannot be guaranteed to meet all specifications in this manual. Contact our technical staff for specific scenarios.
2. Maximum capacitive loads tested under full load conditions within input voltage range.
3. Unless otherwise specified, all data in this document was measured at Ta = 25°C, humidity <75%, nominal input voltage, and rated output load.
4. All testing methods for specifications herein comply with our internal standards;
5. The above performance metrics apply exclusively to models listed in this manual. Non-standard models may exhibit certain metrics exceeding these requirements. For specific details, please contact our technical personnel directly;
6. Product specifications are subject to change without prior notice.


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| EMC specifications | | |
|---|---|---|
| EMI | Conducted disturbance | CISPR32/EN55032 CLASS A (bare unit)/CLASS B (recommended circuit shown in figure 3-②) |
| EMI | Radiated disturbance | CISPR32/EN55032 CLASS A (bare unit)/CLASS B (recommended circuit shown in figure 3-②) |
| EMS | Electrostatic discharge | IEC/EN61000-4-2 Contact ±4kV/ Air ±8kV perf. Criteria B |
| EMS | Radiated immunity | IEC/EN61000-4-3 10V/m perf. criteria A |
| EMS | Burst immunity | IEC/EN61000-4-4 ±2kV (recommended circuit shown in fig. 3-①) perf. criteria B |
| EMS | Surge immunity | IEC/EN61000-4-5 ±2kV (recommended circuit shown in fig. 3-①) perf. criteria B |
| EMS | Conducted disturbance immunity | IEC/EN61000-4-6 3 UR.m.s perf. criteria A |
| EMS | Voltage dip, sag, and short interruption immunity | IEC/EN61000-4-29 - 0% - 70% perf. criteria B |

# Product Selection Guide

| Approval | Part number | Input Voltage Nominal/Range (VDC) | Input Voltage Max. (VDC) | Output Voltage (VDC) | Output Current max./Min. (mA) | Efficiency Typ. (%) | Capacitive Load max. (µF) |
|---|---|---|---|---|---|---|---|
| | 1S5W_0503S1.5RP | 5 (4.5-9) | 10 | 3.3 | 243/0 | 76 | 2000 |
| | 1S5W_0505S1.5RP | 5 (4.5-9) | 10 | 5 | 200/0 | 77 | 2000 |
| | 1S5W_0509S1.5RP | 5 (4.5-9) | 10 | 9 | 111/0 | 78 | 470 |
| | 1S5W_0512S1.5RP | 5 (4.5-9) | 10 | 12 | 84/0 | 79 | 330 |
| | 1S5W_0515S1.5RP | 5 (4.5-9) | 10 | 15 | 67/0 | 80 | 220 |
| | 1S5W_0524S1.5RP | 5 (4.5-9) | 10 | 24 | 42/0 | 81 | 100 |
| | 1S5W_1203S1.5RP | 12 (9-18) | 20 | 3.3 | 243/0 | 76 | 3000 |
| | 1S5W_1205S1.5RP | 12 (9-18) | 20 | 5 | 200/0 | 77 | 3000 |
| | 1S5W_1209S1.5RP | 12 (9-18) | 20 | 9 | 111/0 | 78 | 680 |
| | 1S5W_1212S1.5RP | 12 (9-18) | 20 | 12 | 84/0 | 79 | 470 |
| | 1S5W_1215S1.5RP | 12 (9-18) | 20 | 15 | 67/0 | 80 | 330 |
| | 1S5W_1224S1.5RP | 12 (9-18) | 20 | 24 | 42/0 | 81 | 220 |
| | 1S5W_2403S1.5RP | 24 (18-36) | 40 | 3.3 | 243/0 | 76 | 3000 |
| | 1S5W_2405S1.5RP | 24 (18-36) | 40 | 5 | 200/0 | 77 | 3000 |
| | 1S5W_2409S1.5RP | 24 (18-36) | 40 | 9 | 111/0 | 78 | 680 |
| | 1S5W_2412S1.5RP | 24 (18-36) | 40 | 12 | 84/0 | 79 | 470 |
| | 1S5W_2415S1.5RP | 24 (18-36) | 40 | 15 | 67/0 | 80 | 330 |
| | 1S5W_2424S1.5RP | 24 (18-36) | 40 | 24 | 42/0 | 81 | 220 |
| | 1S5W_4803S1.5RP | 48 (36-75) | 80 | 3.3 | 243/0 | 76 | 3000 |
| | 1S5W_4805S1.5RP | 48 (36-75) | 80 | 5 | 200/0 | 77 | 3000 |
| | 1S5W_4809S1.5RP | 48 (36-75) | 80 | 9 | 111/0 | 78 | 680 |
| | 1S5W_4812S1.5RP | 48 (36-75) | 80 | 12 | 84/0 | 79 | 470 |
| | 1S5W_4815S1.5RP | 48 (36-75) | 80 | 15 | 67/0 | 80 | 330 |
| | 1S5W_4824S1.5RP | 48 (36-75) | 80 | 24 | 42/0 | 81 | 220 |

Note: 1. Input voltage must not exceed this value, otherwise permanent and irreparable damage may occur;
2. The above efficiency values were measured at nominal input voltage and rated output load; a minimum efficiency greater than Min.-2 is acceptable.

# Typical characteristics

### Temperature derating graph

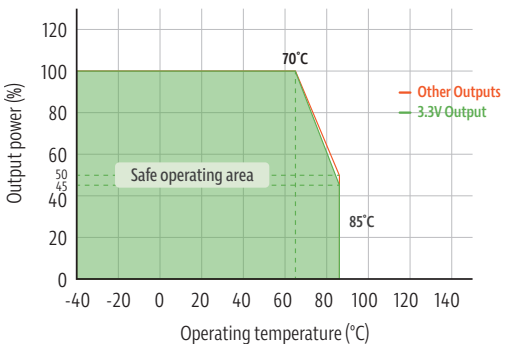
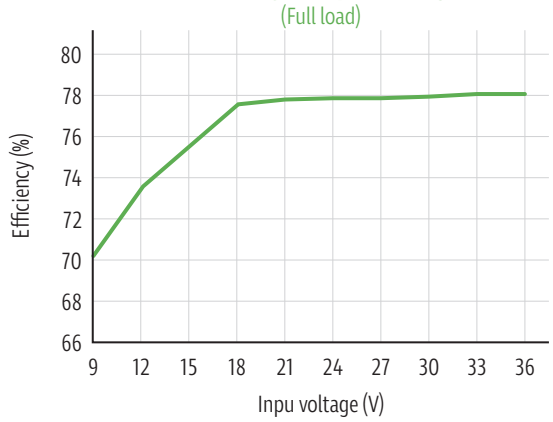


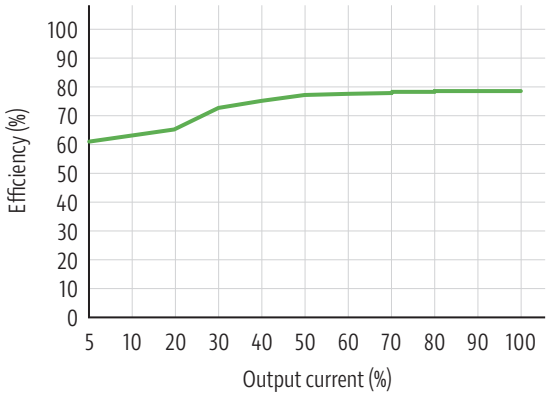

Figure 1

# Typical characteristics

### Efficiency vs input voltage
(Full load)




### Efficiency vs output load




# Typical circuit design and application

Dual (positive and negative)


Single


Figure 2

Recommended capacitive load value table

| VIN | 5V | 12V | 24V | 48V |
|---|---|---|---|---|
| CIN | 330uF | 220uF | 100uF | 100uF |
| Cout | 10uF | | | |

# Recommended EMC circuit diagram

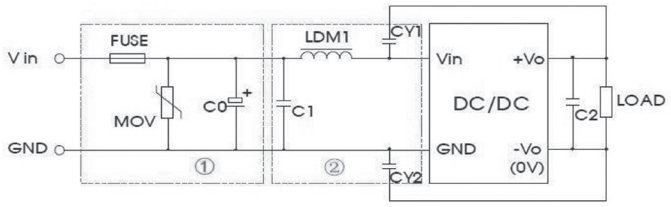


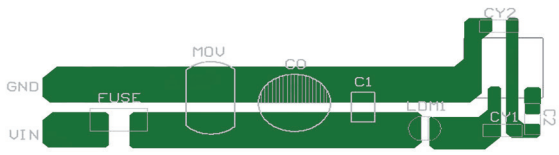

Figure 3

Note: In figure 3, part ① is used for EMS testing; part ② is used for EMI filtering and can be selected as needed.

EMI recommended parameter table

| Model | Vin: 5V | Vin: 12V | Vin: 24V | Vin: 48V |
|---|---|---|---|---|
| FUSE | Select based on the customer's actual input current. | | | |
| MOV | 14D580K | 14D270K | 14D560K | 14D101K |
| C0 | 330 μ F/20V | 330 μ F/20V | 330 μ F/50V | 330 μ F/100V |
| C1 | 10 μ F/25V | 10 μ F/25V | 1 μ F/50V | 1 μ F/100V |
| C2 | | Refer to Figure 2 for the Cout parameter. | | |
| LDM1 | | 4.7 μ H | | |
| CY1/CY2 | | 1nF/2KV | | |

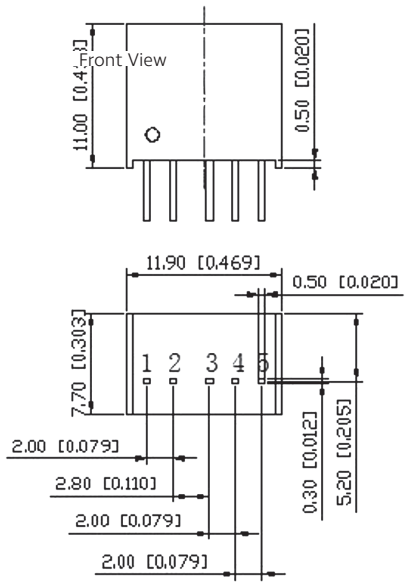
**EMC Recommended circuit—PCB layout diagram**

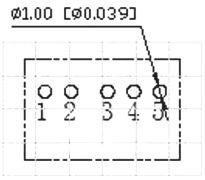



Note: The minimum distance between the input/output isolation capacitor pads (CY1/CY2) must be ≥2mm.

- This product series does not support parallel operation for power boosting.
- For more information, refer to the DC-DC Application Notes or consult our technical staff.

# Mechanical dimensions




Recommended Printing

Note: Grid spacing is 2.54 × 2.54 mm.

| Pin Definition Table | |
|---|---|
| Pin | Function |
| 1 | -Vin (GND) |
| 2 | +Vin (Vcc) |
| 3 | +Vout |
| 4 | no pin |
| 5 | -Vout |

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