



## 1D8W\_1.5RP series

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

# Single Output DC-DC Converter 1 Watt

- ⊕ Wide input range (2:1)
- ⊕ Ultra compact DIP package
- ⊕ 1.5kVDC isolation
- ⊕ High efficiency up to 80%
- ⊕ RoHS Compliance
- ⊕ Short circuit protection (SCP)
- ⊕ Operating temperature range: -40°C ~ +85°C
- ⊕ International standard pinout
- ⊕ No external component required
- ⊕ Meets EN62368 and UL62368 standards

The 1D8W\_1.5RP Series is specially designed for applications where a wide range input voltage 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 wide range (voltage range  $\leq 2:1$ );
- 2) Where isolation is necessary between input and output (Isolation Voltage  $\leq 1500\text{VDC}$ );
- 3) Where the regulation of the output voltage and the output ripple noise are demanded.

The ultra-small volume design makes the converters an ideal solution for communications, instrumentation and industrial electronics applications.



| Common specifications                 |   |
|---------------------------------------|---|
| Short circuit protection:             | Continuous  |
| Cooling:                              | Free air convection   |
| Operation temperature range:          | -40°C~+85°C   |
| Storage temperature:                  | -55°C~+125°C  |
| Storage humidity range:               | < 95% non-condensing  |
| Pin soldering resistance temperature: | 300°C MAX, 1.5mm away from case for 10s.  |
| Reflow soldering temperature:         | Peak temperature $\leq 245^\circ\text{C}$ , duration $\leq 60\text{s}$ max. over $217^\circ\text{C}$ . see also IPC/JEDEC J-STD-020D.1. |
| Case material:                        | Black flame-retardant, heat-resistant plastic   |
| MTBF (MIL-HDBK-217F@25°C):            | >1,000,000 hours  |
| Weight:                               | 2.2g  |
| Dimensions:                           | 14.00 × 14.00 × 9.00 mm   |

| Output specifications           |  |     |           |            |       |  |
|---------------------------------|--|-----|-----------|------------|-------|--|
| Item                            | Test condition                                     | Min | Typ       | Max        | Units |  |
| Voltage accuracy                | 5%-100% load, input voltage range                  |     | $\pm 1$   | $\pm 3$    | %     |  |
| No load output voltage accuracy | input voltage range<br>• 3.3VDC output<br>• others |     | $\pm 5$   | $\pm 7$    | %     |  |
|                                 |  |     | $\pm 1.5$ | $\pm 5$    | %     |  |
| Line regulation                 | Input voltage from low to high @full load          |     | $\pm 0.2$ | $\pm 0.5$  | %     |  |
| Load regulation                 | 5%-100% load                                       |     | $\pm 0.5$ | $\pm 1$    | %     |  |
| Temperature drift               | 100% full load                                     |     |           | $\pm 0.03$ | %/°C  |  |
| Transient recovery time         | 25% load step change                               |     | 1         | 3          | ms    |  |
| Transient response deviation    | 25% load step change                               |     | $\pm 2.5$ | $\pm 5$    | %     |  |
| Switching frequency             | Full load, nominal input                           |     | 100       |            | KHz   |  |

| Input specifications              |                    |      |        |        |       |  |
|-----------------------------------|--------------------|------|--------|--------|-------|--|
| Item                              | Test condition     | Min  | Typ    | Max    | Units |  |
| Input current (full load/no load) | • 12VDC            |      | 111/15 | 114/30 | mA    |  |
|                                   | • 24VDC            |      | 55/6   | 57/10  | mA    |  |
| Reflected ripple current          | • 12VDC            |      | 40     |        | mA    |  |
|                                   | • 24VDC            |      | 55     |        | mA    |  |
| Surge voltage (1sec. max)         | • 12VDC            | -0.7 |        | 25     | VDC   |  |
|                                   | • 24VDC            | -0.7 |        | 50     | VDC   |  |
| Start-up voltage                  | • 12VDC            |      |        | 9      | VDC   |  |
|                                   | • 24VDC            |      |        | 18     | VDC   |  |
| Input Filter                      | Capacitance filter |      |        |        |       |  |
| Hot plug                          | unavailable        |      |        |        |       |  |

| EMC specifications |       |  |                               |   |  |  |
|--------------------|-------|--|-------------------------------|---|--|--|
| EMI                | CE    | CISPR32/EN55032 CLASS B (See EMC recommended circuit, ②) |                               |   |  |  |
| EMI                | RE    | CISPR32/EN55032 CLASS B (See EMC recommended circuit, ②) |                               |   |  |  |
| EMS                | ESD   | IEC/EN61000-4-2  | Contact $\pm 6\text{KV}$      | perf. Criteria B  |  |  |
| EMS                | RS    | IEC/EN61000-4-3  | 10V/m                         | perf. Criteria A  |  |  |
| EMS                | EFT   | IEC/EN61000-4-4  | $\pm 2\text{KV}$              | perf. Criteria B (External Circuit Refer to recommended circuit, ①) |  |  |
| EMS                | Surge | IEC/EN61000-4-5  | line to line $\pm 2\text{KV}$ | perf. Criteria B (External Circuit Refer to recommended circuit, ①) |  |  |
| EMS                | CS    | IEC/EN61000-4-6  | 3 Vr.m.s                      | perf. Criteria A  |  |  |

### Example:

#### 1D8W\_1205S1.5RP

1 = 1Watt; D8 = DIP8; W = Wide input; 12Vin; 5Vout; S = Single output; 1.5 = 1.5kVDC; R = Regulated output; P = Short circuit protection (SCP)

### Note:

1. Unless otherwise specified, data in this data sheet should be tested under the conditions of  $T_a = 25^\circ\text{C}$ , nominal input voltage and rated output current;
2. The maximum capacitive load offered was tested at input voltage range and full load;
3. All index testing methods in this datasheet are based on our Company's corporate standards.
4. We can provide product customization service, please contact our technicians directly for specific information.

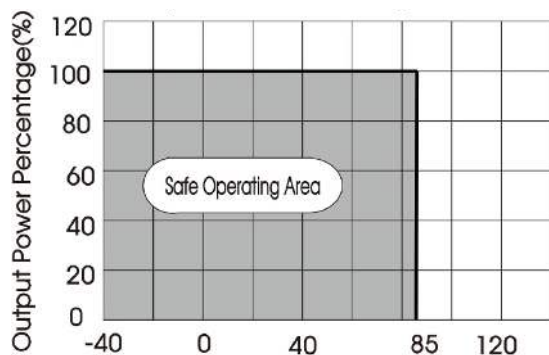
## 1D8W\_1.5RP series

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| Part Number     | Input Voltage Range [V] | Output Voltage [VDC] | Output current [mA, max/min] | Ripple & Noise [mVp-p; typ/max] | Efficiency [%; min/typ] | Capacitive load [ $\mu$ F] |
|-----------------|-------------------------|----------------------|------------------------------|---------------------------------|-------------------------|----------------------------|
| 1D8W_1203S1.5RP | 9-18                    | 3.3                  | 303/15                       | 100/150                         | 73/75                   | 2700                       |
| 1D8W_1205S1.5RP | 9-18                    | 5                    | 200/10                       | 100/150                         | 75/77                   | 2200                       |
| 1D8W_1212S1.5RP | 9-18                    | 12                   | 83/4                         | 100/150                         | 77/79                   | 1000                       |
| 1D8W_1215S1.5RP | 9-18                    | 15                   | 67/3                         | 100/150                         | 78/80                   | 680                        |
| 1D8W_1224S1.5RP | 9-18                    | 24                   | 42/2                         | 100/150                         | 74/76                   | 470                        |
| 1D8W_2403S1.5RP | 18-36                   | 3.3                  | 303/15                       | 50/100                          | 73/75                   | 2700                       |
| 1D8W_2405S1.5RP | 18-36                   | 5                    | 200/10                       | 50/100                          | 75/77                   | 2200                       |
| 1D8W_2412S1.5RP | 18-36                   | 12                   | 83/4                         | 50/100                          | 76/78                   | 1000                       |
| 1D8W_2415S1.5RP | 18-36                   | 15                   | 67/3                         | 50/100                          | 76/78                   | 680                        |
| 1D8W_2424S1.5RP | 18-36                   | 15                   | 42/2                         | 50/100                          | 75/77                   | 470                        |

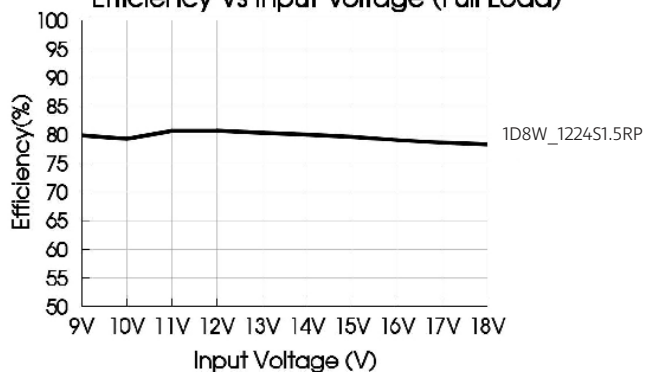
## Typical characteristics

Temperature derating graph

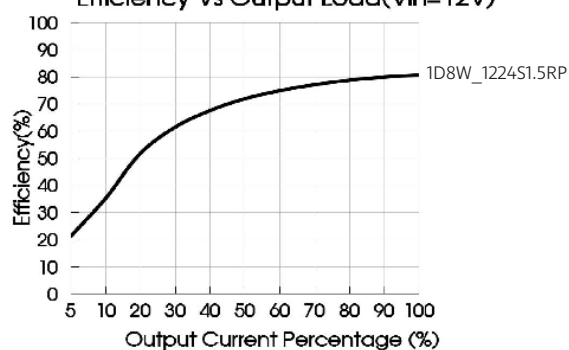


## Efficiency

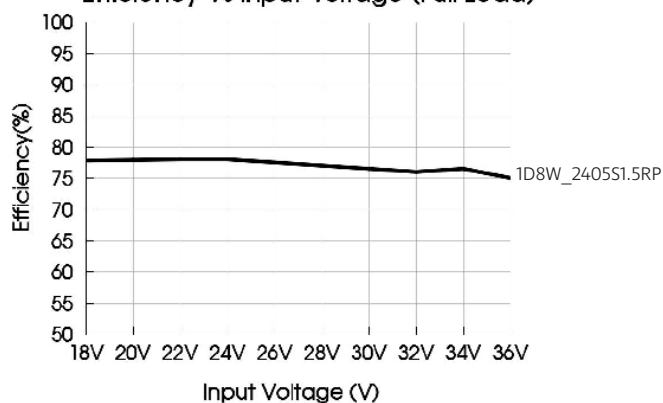
Efficiency Vs Input Voltage (Full Load)



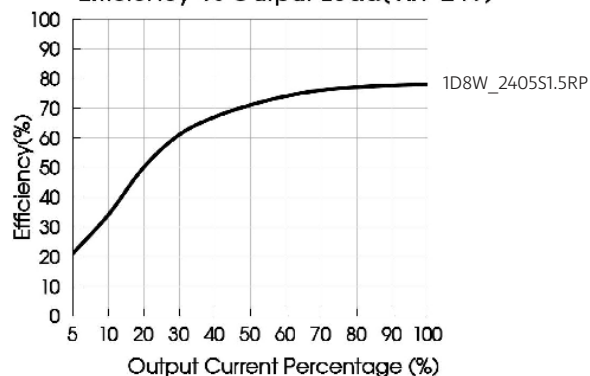
Efficiency Vs Output Load (Vin=12V)



Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=24V)



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### Recommended circuit

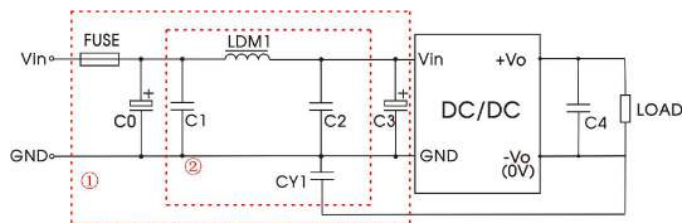
All the DC/DC converters of this series are tested before delivery using the recommended circuit shown below. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$ , connecting a "Y" capacitor between input "GND" and output "0V", and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.



|               |                |                |
|---------------|----------------|----------------|
| $V_{in}(VDC)$ | 12             | 24             |
| $C_{in}$      | 47 $\mu$ F/25V | 47 $\mu$ F/50V |

|            |                  |                |
|------------|------------------|----------------|
| $V_o(VDC)$ | 3.3, 5           | 12, 15, 24     |
| $C_{out}$  | 100 $\mu$ F/6.3V | 27 $\mu$ F/35V |

### EMC compliance circuit

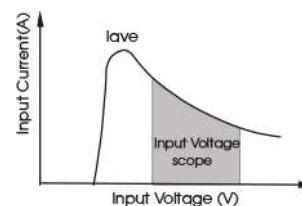


| Part | 12VDC   | 24VDC           |
|------|---|-----------------|
| FUSE | slow blow, choose according to actual input current |                 |
| C0   | 1000 $\mu$ F/25V                                    | 680 $\mu$ F/50V |
| C1   | 4.7 $\mu$ F/50V                                     |                 |
| LDM1 | 15 $\mu$ H  |                 |
| C2   | 4.7 $\mu$ F/50V                                     |                 |
| C3   | 330 $\mu$ F/50V                                     |                 |
| CY1  | 1nF/2KV   |                 |
| C4   | Refer to the $C_{out}$ in recommended circuit       |                 |

### Input current

When the electricity is provided by the unstable power supply, please make sure that the range of the output voltage fluctuation and the ripple voltage of the power supply do not exceed the indicators of the modules. Input current of power supply should afford the flash startup current of this kind of DC/DC module (see Fig. on the right).

Generally:  $V_{in}=12V$  series  $I_{ave}=205mA$   
 $V_{in}=24V$  series  $I_{ave}=104mA$



### Output load requirements

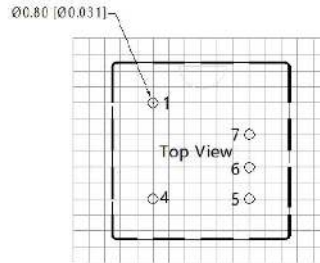
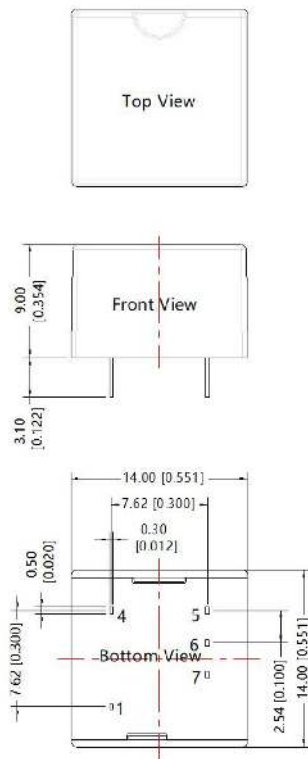
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to be used in derating.

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## Mechanical dimensions

THIRD ANGLE PROJECTION 



| Pin-Out |                 |
|---------|-----------------|
| Pin     | Function        |
| 1       | GND             |
| 4       | V <sub>in</sub> |
| 5       | +V <sub>o</sub> |
| 6       | NC              |
| 7       | 0V              |

Note:  
 Unit: mm[inch]  
 Pin diameter tolerances:  $\pm 0.10[\pm 0.004]$   
 General tolerances:  $\pm 0.50[\pm 0.020]$



## 1D8W\_1.5RP series

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

### Dual Output

- ⊕ Ultra compact DIP/SMD package
- ⊕ Wide 2:1 input voltage range
- ⊕ Operating ambient temp. range: -40°C to +85°C
- ⊕ I/O isolation test voltage: 1.5kVDC

- ⊕ Short circuit protection (continuous)
- ⊕ Industry standard pin-out
- ⊕ EN62368 approved
- ⊕ Meets UL62368 standards



### DC-DC Converter

### 1 Watt

The 1D8W\_D1.5RP series of isolated 1W DC-DC converter products with a 2:1 input voltage range. The product has a ultra-compact DIP/SMD package, operating temperature of -40°C to +85°C and continuous short circuit protection. The ultra-small volume design makes the converters an ideal solution for communications, instrumentation and industrial electronics applications.

| Common specifications                 |  |
|---------------------------------------|--|
| Short circuit protection:             | Continuous, self-recovery  |
| Operation temperature range:          | -40°C~+85°C (See Fig. 1)   |
| Storage temperature:                  | -55°C~+125°C   |
| Storage humidity range:               | 5% ~ 95% RH non-condensing   |
| Pin soldering resistance temperature: | 300°C MAX, 1.5mm away from case for 10s.   |
| Reflow soldering temperature:         | Peak temperature ≤245°C, duration ≤60s max. over 217°C. see also IPC/JEDEC J-STD-020D.1. |
| MTBF (MIL-HDBK-217F@25°C):            | >1,000,000 hours   |
| Case material:                        | Black plastic; flame-retardant and heat-resistant (UL94-V0)                              |
| Cooling:                              | Free air convection  |
| Weight:                               | 2.2g Typ.  |
| Dimensions:                           | 14.00 × 14.00 × 9.00 mm  |

| Input specifications              |                    |      |        |        |       |
|-----------------------------------|--------------------|------|--------|--------|-------|
| Item                              | Test condition     | Min  | Typ    | Max    | Units |
| Input current (full load/no load) | • 12VDC            |      | 108/15 | 112/30 | mA    |
|                                   | • 24VDC            |      | 54/6   | 56/12  | mA    |
| Reflected ripple current          | • 12VDC            |      | 40     |        | mA    |
|                                   | • 24VDC            |      | 55     |        | mA    |
| Surge voltage (Isec. max)         | • 12VDC            | -0.7 |        | 25     | VDC   |
|                                   | • 24VDC            | -0.7 |        | 50     | VDC   |
| Start-up voltage                  | • 12VDC            |      |        | 9      | VDC   |
|                                   | • 24VDC            |      |        | 18     | VDC   |
| Input Filter                      | Capacitance filter |      |        |        |       |
| Hot plug                          | unavailable        |      |        |        |       |

| Isolation specifications |   |      |     |     |       |
|--------------------------|---|------|-----|-----|-------|
| Item                     | Test condition  | Min  | Typ | Max | Units |
| Isolation voltage        | Input-output electric Strength test for 1 min. with a leakage current of 1mA max. | 1500 |     |     | VDC   |
| Isolation resistance     | Input-output insulation at 500VDC   | 1000 |     |     | MΩ    |
| Isolation capacitance    | Input-output capacitance at 100KHz/0.1V   |      | 100 |     | pF    |

**Example:**  
**1D8W\_1205D1.5RP**  
 1 = 1Watt; D8 = DIP8; W = Wide input; 12Vin; 5Vout; D = Dual output; 1.5 = 1.5kVDC; R = Regulated output; P = Short circuit protection (SCP)

| Output specifications           |  |     |      |       |       |
|---------------------------------|--|-----|------|-------|-------|
| Item                            | Test condition   | Min | Typ  | Max   | Units |
| Voltage accuracy                | 5%-100% load, input voltage range<br>• Vo1<br>• Vo2                      |     | ±1   | ±3    | %     |
|                                 |  |     | ±3   | ±5    | %     |
| No load output voltage accuracy | input voltage range<br>• Vo1<br>• Vo2                                    |     | ±2   | ±5    | %     |
|                                 |  |     |      | ±8    | %     |
| Line regulation                 | Input voltage variation from low to high, 5%-100% load<br>• Vo1<br>• Vo2 |     | ±0.2 | ±0.5  | %     |
|                                 |  |     | ±0.5 | ±1    | %     |
| Load regulation                 | 5%-100% load<br>• Vo1<br>• Vo2   |     | ±0.5 | ±1    | %     |
|                                 |  |     |      | ±2    | %     |
| Transient recovery time         | 25% load step change   |     | 1    | 3     | ms    |
| Transient response deviation    | 25% load step change   |     | ±3   | ±5    | %     |
| Temperature Coefficient         | 100% full load   |     |      | ±0.03 | %/°C  |
| Switching frequency             | Full load, nominal input   |     | 300  |       | KHz   |

| EMC specifications |       |  |                   |   |  |
|--------------------|-------|--|-------------------|---|--|
| Emissions          | CE    | CISPR32/EN55032 CLASS B (See EMC recommended circuit, ②) |                   |   |  |
| Emissions          | RE    | CISPR32/EN55032 CLASS B (See EMC recommended circuit, ②) |                   |   |  |
| Immunity           | ESD   | IEC/EN61000-4-2  | Contact ±6KV      | perf. Criteria B  |  |
| Immunity           | RS    | IEC/EN61000-4-3  | 10V/m             | perf. Criteria A  |  |
| Immunity           | EFT   | IEC/EN61000-4-4  | ±2KV              | perf. Criteria B (External Circuit Refer to recommended circuit, ③) |  |
| Immunity           | Surge | IEC/EN61000-4-5  | line to line ±2KV | perf. Criteria B (External Circuit Refer to recommended circuit, ③) |  |
| Immunity           | CS    | IEC/EN61000-4-6  | 3 Vr.m.s          | perf. Criteria A  |  |

#### Note:

- Unless otherwise specified, data in this data sheet should be tested under the conditions of Ta = 25°C, nominal input voltage and rated output current;
- The maximum capacitive load offered was tested at input voltage range and full load;
- All index testing methods in this datasheet are based on our Company's corporate standards.
- We can provide product customization service, please contact our technicians directly for specific information.

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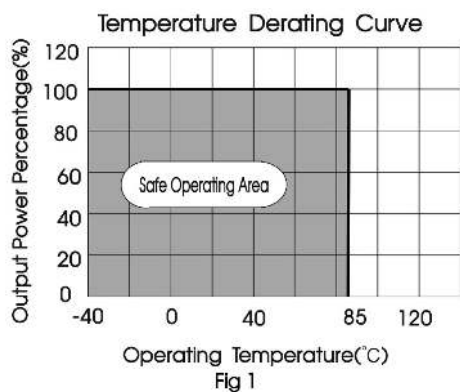
## Product Selection Guide

| Part Number     | Input Voltage Range [V] | Output Voltage [VDC] | Output current [mA, max/min] | Ripple & Noise [mVp-p; typ/max] | Efficiency [%; min/typ] | Capacitive load [ $\mu$ F] |
|-----------------|-------------------------|----------------------|------------------------------|---------------------------------|-------------------------|----------------------------|
| 1D8W_1205D1.5RP | 12 (9-18)               | 20                   | $\pm$ 100                    | 100/150                         | 75/77                   | 1000                       |
| 1D8W_1209D1.5RP | 12 (9-18)               | 20                   | $\pm$ 56                     | 100/150                         | 78/80                   | 680                        |
| 1D8W_1212D1.5RP | 12 (9-18)               | 20                   | $\pm$ 42                     | 100/150                         | 78/80                   | 470                        |
| 1D8W_1215D1.5RP | 12 (9-18)               | 20                   | $\pm$ 33                     | 100/150                         | 75/77                   | 330                        |
| 1D8W_2405D1.5RP | 24 (18-36)              | 40                   | $\pm$ 100                    | 70/100                          | 75/77                   | 1000                       |
| 1D8W_2409D1.5RP | 24 (18-36)              | 40                   | $\pm$ 56                     | 70/100                          | 75/77                   | 680                        |
| 1D8W_2412D1.5RP | 24 (18-36)              | 40                   | $\pm$ 42                     | 70/100                          | 75/77                   | 470                        |
| 1D8W_2415D1.5RP | 24 (18-36)              | 40                   | $\pm$ 33                     | 70/100                          | 75/77                   | 330                        |

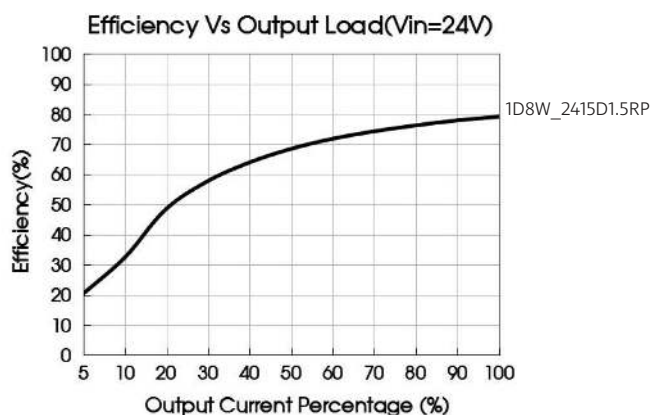
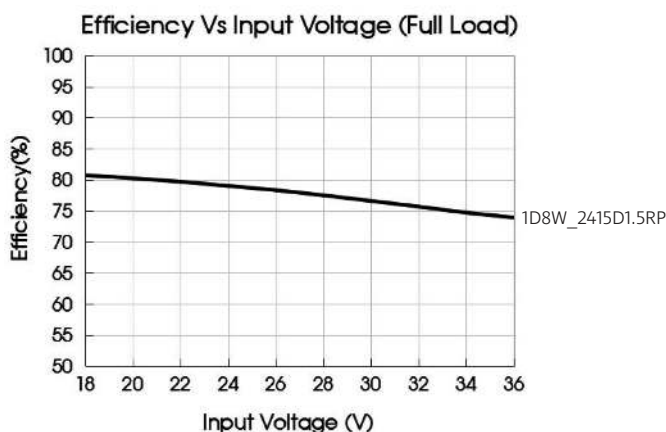
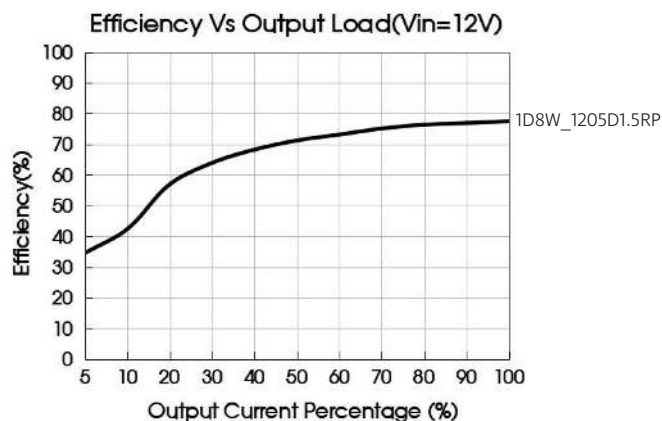
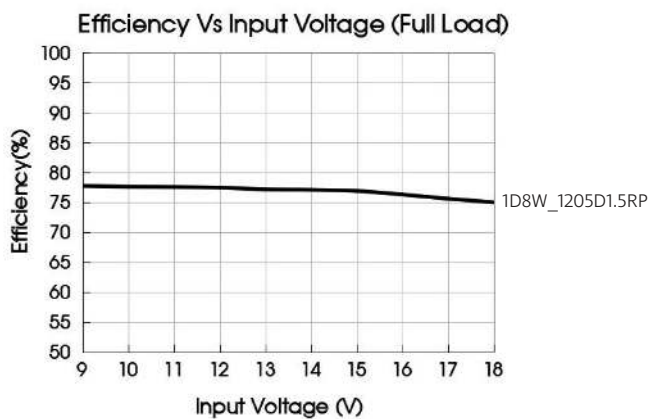
①Exceeding the maximum input voltage may cause permanent damage;

②Ripple & noise testing condition at nominal input voltage and 5%-100% load, the "tip and barrel" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

## Typical characteristics



## Efficiency

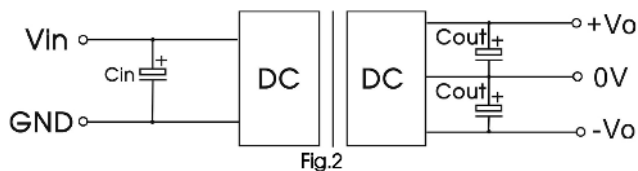


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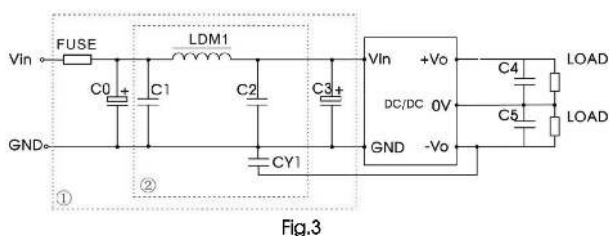
### Recommended circuit

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$ , connecting a "Y" capacitor between input "GND" and output "0V", and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.



|               |                 |                  |
|---------------|-----------------|------------------|
| $V_{in}(VDC)$ | 12VDC           | 24VDC            |
| $C_{in}$      | 47 $\mu$ F/25V  | 47 $\mu$ F/50V   |
| $V_{o}(VDC)$  | $\pm 5, \pm 9$  | $\pm 12, \pm 15$ |
| $C_{in}$      | 100 $\mu$ F/16V | 27 $\mu$ F/25V   |

### EMC compliance circuit



|        |   |                 |
|--------|---|-----------------|
| Part   | 12VDC   | 24VDC           |
| FUSE   | slow blow, choose according to actual input current |                 |
| C0     | 1000 $\mu$ F/25V                                    | 680 $\mu$ F/50V |
| C1     | 4.7 $\mu$ F/50V                                     |                 |
| LDM1   | 15 $\mu$ H  |                 |
| C2     | 4.7 $\mu$ F/50V                                     |                 |
| C3     | 330 $\mu$ F/50V                                     |                 |
| CY1    | 1nF/2KV   |                 |
| C4, C5 | Refer to the $C_{out}$ Fig.2                        |                 |

Notes: For EMC tests we use Part 1 in Fig. 3 for immunity and part 2 for emissions test. Selecting based on needs.

### Input current

When the electricity is provided by the unstable power supply, please make sure that the range of the output voltage fluctuation and the ripple voltage of the power supply do not exceed the indicators of the modules. Input current of power supply should afford the flash start-up current of this kind of DC/DC module (see Fig. 4).

Generally:  $V_{in}=12V$  series  $I_{ave}=205mA$   
 $V_{in}=24V$  series  $I_{ave}=104mA$

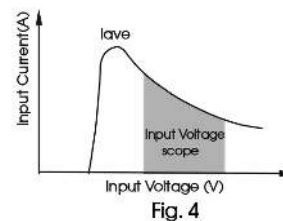


Fig. 4

### Output load requirements

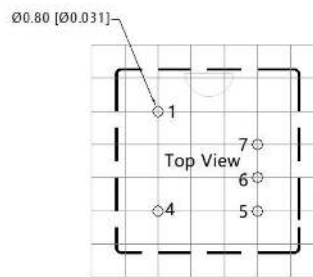
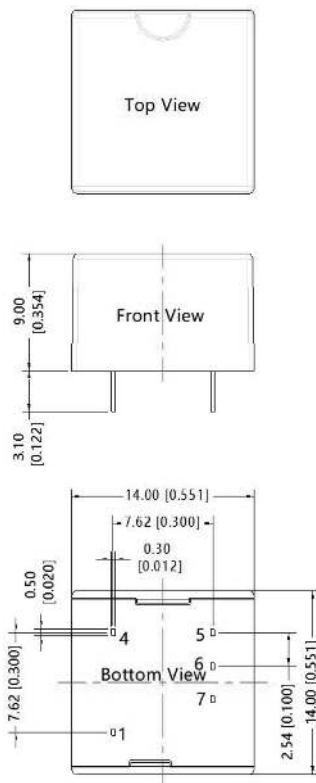
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to be used in derating.

# 1D8W\_1.5RP series

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

## Mechanical dimensions (DIP)

THIRD ANGLE PROJECTION 



Note: Grid 2.54\*2.54mm

| Pin-Out |          |
|---------|----------|
| Pin     | Function |
| 1       | GND      |
| 4       | Vin      |
| 5       | +Vo      |
| 6       | 0V       |
| 7       | -Vo      |

Note:  
 Unit: mm[inch]  
 Pin diameter tolerances:  $\pm 0.10[\pm 0.004]$   
 General tolerances:  $\pm 0.50[\pm 0.020]$