

## 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 • 3.3VDC output • 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		

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	500VDC	1000			MΩ	
Isolation capacitance	100KHz/0.1V		100		pF	

### 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.

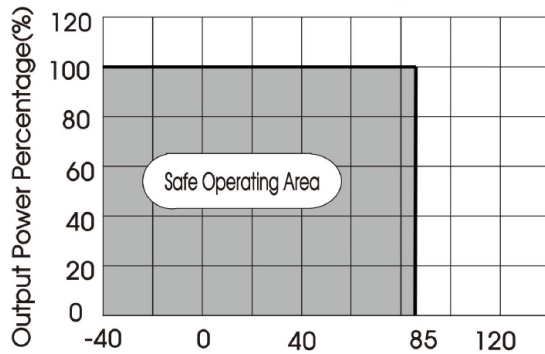
# 1D8W\_1.5RP series

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

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

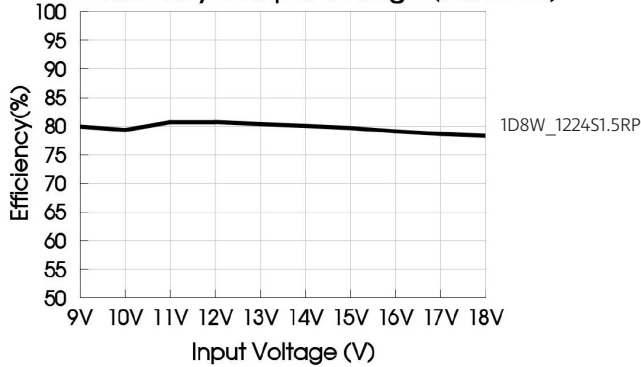
## Typical characteristics

Temperature derating graph

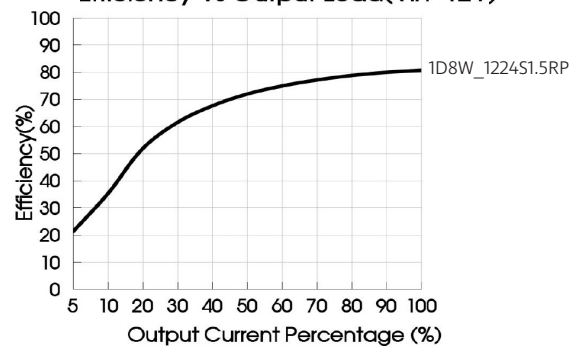


## Efficiency

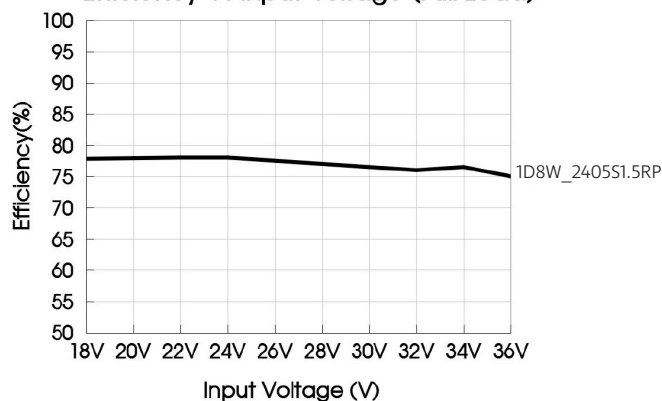
Efficiency Vs Input Voltage (Full Load)



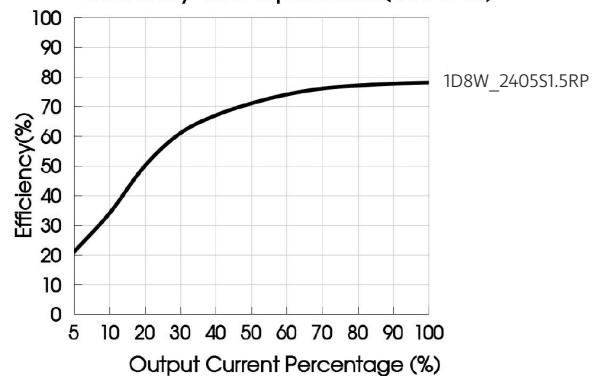
Efficiency Vs Output Load (Vin=12V)



Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=24V)



## 1D8W\_1.5RP series

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

### Recommended circuit

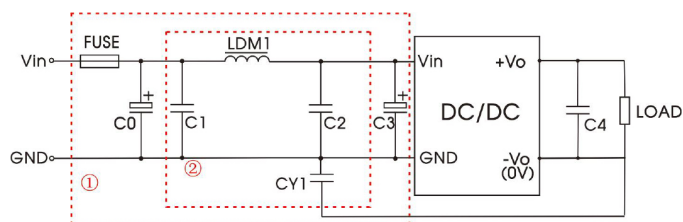
All the DC/DC converters of this series are tested before delivery using the recommended circuit shown below. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$ , connecting a "Y" capacitor between input "GND" and 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.



Vin(VDC)	12	24
Cin	47uF/25V	47uF/50V

Vo(VDC)	3.3, 5	12, 15, 24
Cout	100uF/6.3V	27uF/35V

### EMC compliance circuit

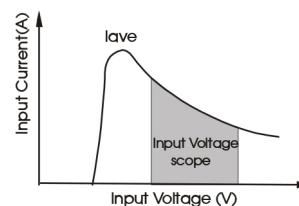


Part	12VDC	24VDC
FUSE	slow blow, choose according to actual input current	
C0	1000μF/25V	680μF/50V
C1	4.7μF/50V	
LDM1	15μH	
C2	4.7μF/50V	
C3	330μF/50V	
CY1	1nF/2KV	
C4	Refer to the Cout in recommended circuit	

### 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: Vin=12V series Iave =205mA  
Vin=24V series Iave =104mA



### Output load requirements

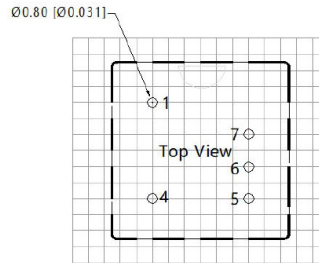
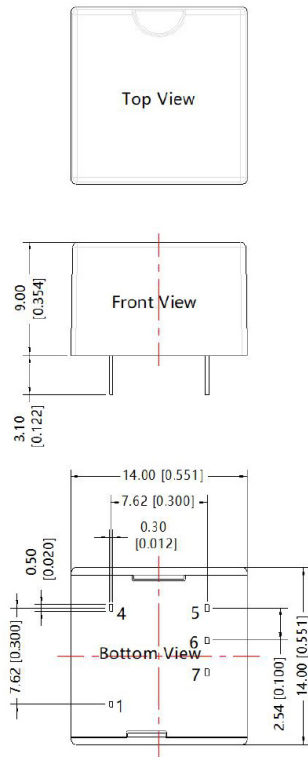
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to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

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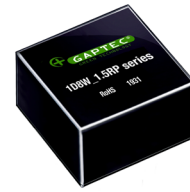
## Mechanical dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	Function
1	GND
4	Vin
5	+Vo
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 (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				

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 • Vo1 • Vo2		±1	±3	%
			±3	±5	%
No load output voltage accuracy	input voltage range • Vo1 • Vo2		±2	±5	%
				±8	%
Line regulation	Input voltage variation from low to high, 5%-100% load • Vo1 • Vo2		±0.2	±0.5	%
			±0.5	±1	%
Load regulation	5%-100% load • Vo1 • 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:**

1. 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;
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.

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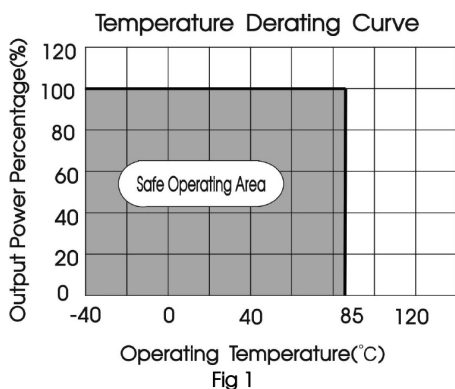
## Product Selection Guide

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

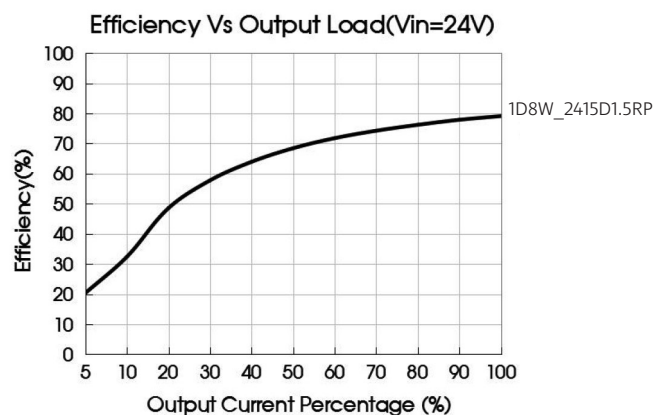
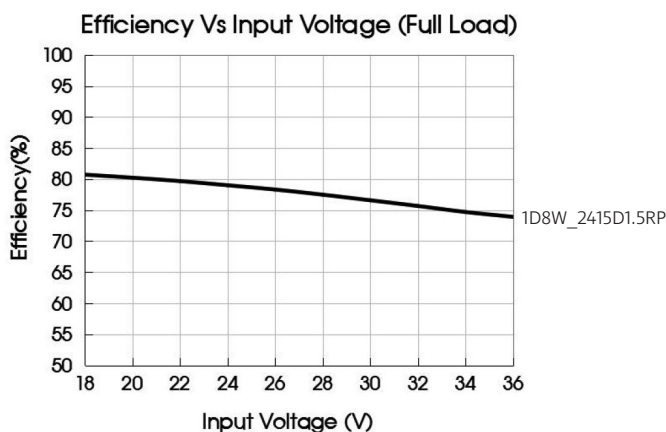
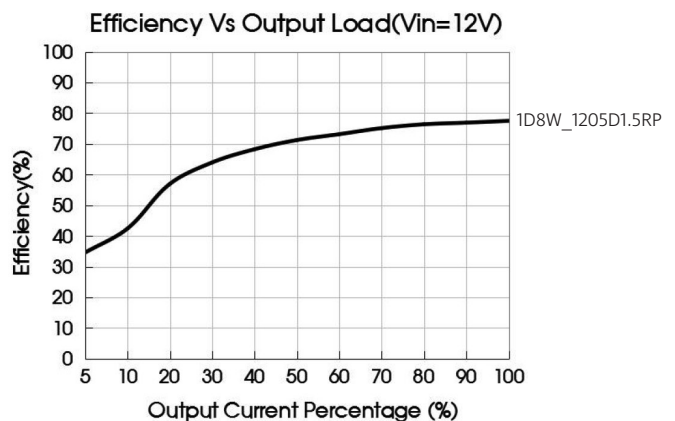
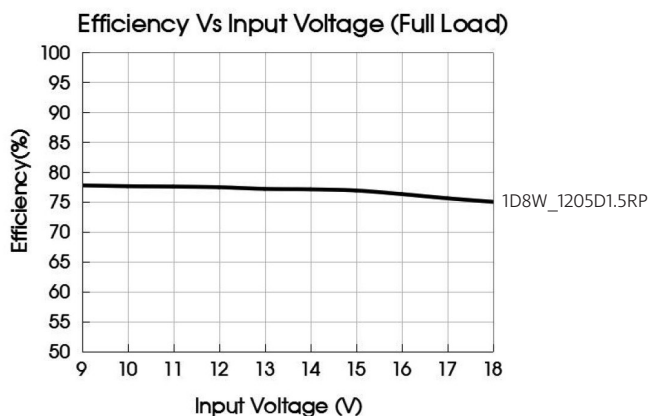
① Exceeding the maximum input voltage may cause permanent damage;

② Ripple & 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

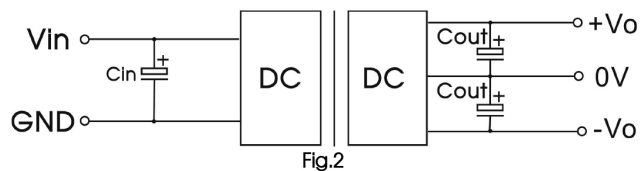


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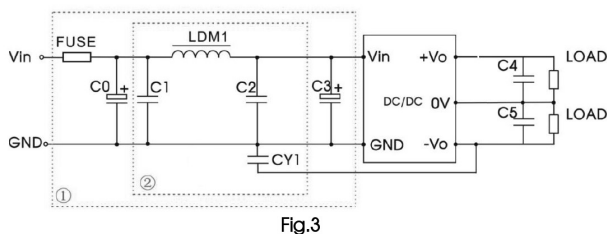
### Recommended circuit

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



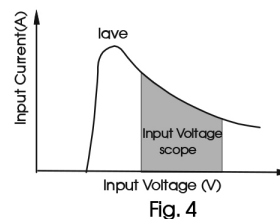
Part	12VDC	24VDC
FUSE	slow blow, choose according to actual input current	
C0	1000 $\mu$ F/25V	680 $\mu$ F/50V
C1	4.7 $\mu$ F/50V	
LDM1	15 $\mu$ H	
C2	4.7 $\mu$ F/50V	
C3	330 $\mu$ F/50V	
CY1	1nF/2KV	
C4, C5	Refer to the $C_{out}$ Fig.2	

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  $I_{ave} \approx 205mA$   
 $V_{in}=24V$  series  $I_{ave} \approx 104mA$



### Output load requirements

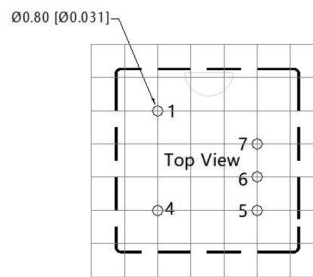
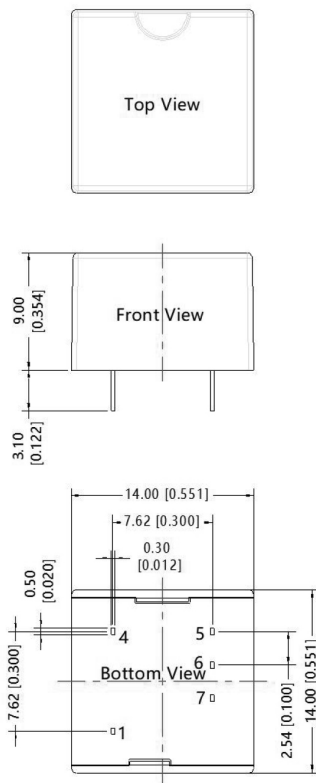
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to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

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## Mechanical dimensions (DIP)

THIRD ANGLE PROJECTION 



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

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