

## DC/DC Converter

### SURB1D\_LD-15W & SURB1D\_LD-20W Series



15W&20W,Ultra wide input isolated & regulated  
DC/DC converter  
dua 1 / single output DC/DC converter



## FEATURES

- Wide range of input voltage (4:1)
- Efficiency up to 89%
- Isolation voltage :1.5K VDC
- Operating temperature range: -40°C to +85°C
- Output over current protection, output over voltage protection, output short circuit protection(automatic recovery)
- Six-sided metal shielding package
- International standard pin-out
- A2S (wring mounting) and A4S (35mm rail mounting) products featuring anti-reverse connection for input
- Meet EN60950



*SURB1D\_LD-15W & SURB1D\_LD-20W series Wide input voltage range is 40-160VDC. It is suitable for 72 V, 96 V, 110 V standard input of the bus voltage.single output and 1500VDC isolation,over current, over voltage and short-circuit protection.It offers good EMC performance,meet EN60950 standards.All models are particularly suited to railway etc.*

## Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Efficiency ③(%Min/Typ.) @ Full Load	Max. Capacitive Load(μF)
		Nominal (Range)	Max. ②	Output Voltage (VDC)	Output Current (mA)(Max./Min.)		
CE	SURB1D03LD-15W	110 (40-160)	176	3.3	4000/200	85/87	4020
	SURB1D05LD-15W			5	3000/150	87/89	4020
	SURB1D12LD-15W			12	1250/63	86/88	1600
	SURB1D15LD-15W			15	1000/50	86/88	1000
	SURB1D24LD-15W			24	625/32	86/88	470
	SURB1D05LD-20W			5	4000/200	87/89	4020
	SURB1D12LD-20W			12	1667/83	86/88	1600
	SURB1D15LD-20W			15	1333/67	86/88	1000
	SURB1D24LD-20W			24	833/42	86/88	470

Note:  
 ①Series with suffix "H" are heat sink mounting; series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example SURB1D05LD-20WHA2S is chassis mounting of with heat sink,SURB1D05LD-20WA4S is DIN-Rail mounting of without heat sink;if the application has a higher requirement for heat dissipation, you can choose modules with heat sink;  
 ②Absolute maximum rating without damage on the converter, but it isn't recommended;  
 ③The efficiency of A2S (wiring type) and A4S (rail type) products is 2% lower than the above-mentioned value due to the reverse connection protection for input;

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	SURB1D_LD-15W Series	--	153/15	159/20	mA
	SURB1D_LD-20W Series	--	204/15	212/20	
Reflected Ripple Current		--	25	--	
Input Impulse Voltage (1sec. max.)		-0.7	--	200	VDC
Starting Voltage	100% load	--	--	39.8	
Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Input Filter		Pi filter			

# DC/DC Converter

## SURB1D\_LD-15W & SURB1D\_LD-20W Series

Ctrl*	Module switch on	Ctrl suspended or connected to TTL high level (3.5-12VDC)			
	Module switch off	Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched off	--	1	--	mA

Note: \* the voltage of Ctrl pin is relative to input pin GND.

### Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy		--	±1	±3	%
Line Regulation	Full load, the input voltage is from low voltage to high voltage	--	±0.2	±0.5	
Load Regulation	5%-100% load	--	±0.5	±1	
Transient Recovery Time	25% load step change	--	500	800	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift Coefficient	Full load	--	±0.02	--	%/°C
Ripple & Noise *	20MHz bandwidth	50	75	100	mV p-p
Output Voltage Range(Trim)			±10%Vo		VDC
Output Over-voltage Protection	3.3VDC output	--	4.1	--	
	5VDC output	--	6.2	--	
	12VDC output	--	15	--	
	15VDC output	--	18	--	
	24VDC output	--	28.8	--	
Output Over-current Protection	Input voltage range	110	130	170	%Io
Output Short circuit Protection		Continuous, self-recovery			

Note: \* Ripple and noise tested with "parallel cable" method, please see *DC-DC Converter Application Notes* for specific operation methods.

### General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Isolation Resistance	Input-output, isolation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	2000	--	pF
Operating Temperature	see Fig. 1	-40	--	+85	°C
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Max. Operating Temperature for casing	Within the operating temperature curve	--	--	+105	°C
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	+300	
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Safety approvals		EN60950			

### Physical Specifications

Casing Material		Aluminum alloy			
Package Dimensions	Without heat sink	Horizontal package		50.80*25.40*11.80mm	
		A2S wiring package		76.00*31.50*21.20 mm	
		A4S rail package		76.00*31.50*25.80 mm	
	With heat sink	Horizontal package		50.80*25.40*16.30mm	
		A2S wiring package		76.00*31.50*25.10 mm	
		A4S rail package		76.00*31.50*29.70 mm	
Weight	Without heat sink	Horizontal package/A2S wiring package/A4S rail package		28.00g/50.00g/70.00g(Typ.)	
	With heat sink	Horizontal package/A2S wiring package/A4S rail package		36.00g/58.00g/78.00g(Typ.)	
Cooling Method		Free air convection			

# DC/DC Converter

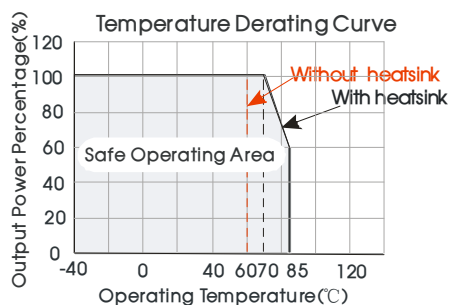
## SURB1D\_LD-15W & SURB1D\_LD-20W Series

### EMC Specifications

EMI	Conducted disturbance	CISPR22/EN55022	CLASS B (see Fig.3 for recommended circuit)	
	Radiated emission	CISPR22/EN55022	CLASS B (see Fig.3 for recommended circuit)	
EMS	Electrostatic discharge	IEC/EN61000-4-2	Contact $\pm 6\text{kV}$	perf. Criteria B
	Radiation immunity	IEC/EN61000-4-3	10V/m	perf. Criteria B
	EFT	IEC/EN61000-4-4	$\pm 4\text{kV}$ (see Fig.3 for recommended circuit)	perf. Criteria B
	Surge Immunity	IEC/EN61000-4-5	$\pm 2\text{kV}/\pm 4\text{kV}$ (see Fig.3 for recommended circuit)	perf. Criteria B
	Conducted disturbance immunity	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria B
	Immunities of voltage dip, drop and short interruption	IEC/EN61000-4-29	0-70%	perf. Criteria B

### Product Characteristic Curve

SURB1D05LD-15W



SURB1D05LD-20W

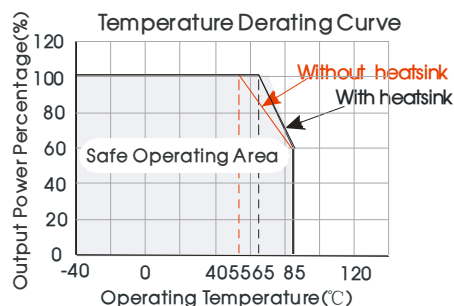
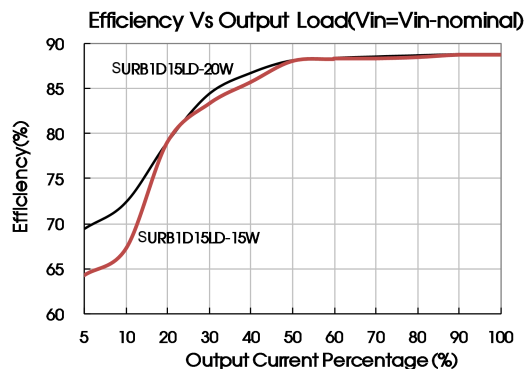
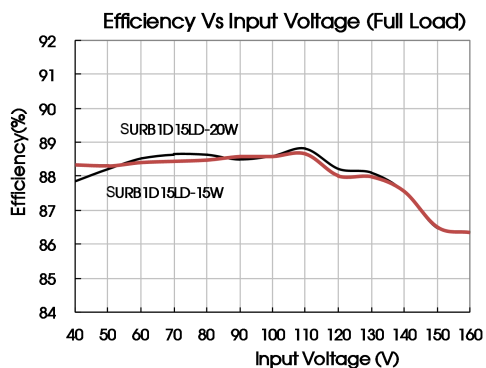
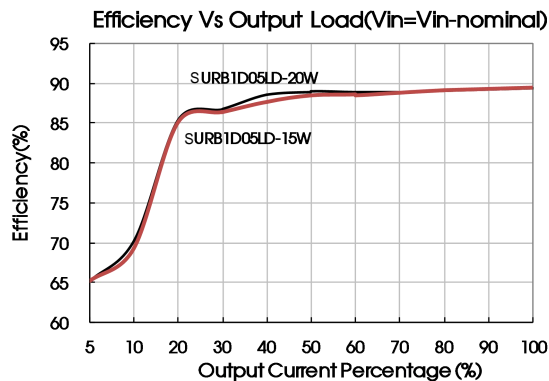
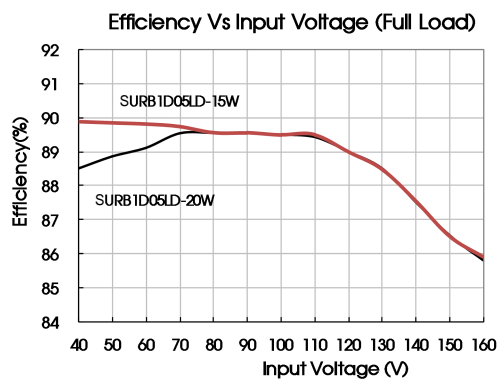


Fig. 1



### Design Reference

#### 1. Typical application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.

If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors  $C_{in}$  and  $C_{out}$  or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.

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SURB1D\_LD-15W & SURB1D\_LD-20W Series

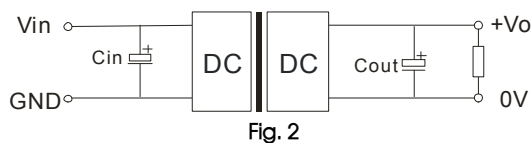


Fig. 2

	Vout(VDC)	Cin(μF)	Cout(μF)
Single	3.3/5	100	470
	12/15		220
	24		100

## 2. EMC module solution-recommended circuit

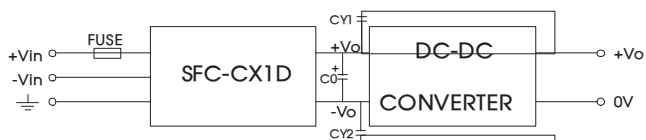
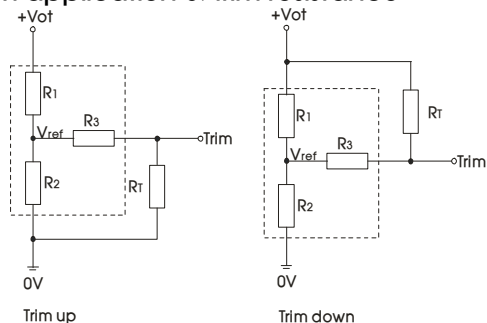


Fig. 3

Parameter description

Parameter	Description
FUSE	Choose according to actual input current
C0	100μF/200V
CY1、CY2	1nF/2KV

## 3. Trim application & Trim resistance



Application circuit for TRIM (Part in broken line is the interior of models)

Note: Leave open if not used. R<sub>T</sub>: Resistance of Trim. α: User-defined parameter, no actual meanings.

Calculation formula of Trim resistance:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

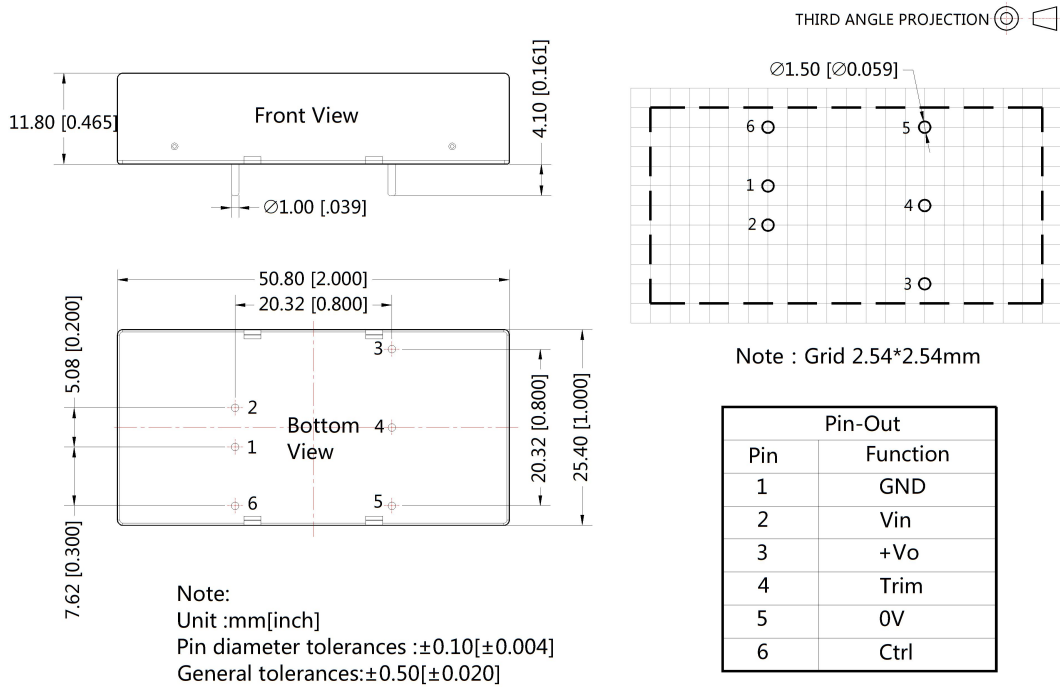
Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.864	15	1.24
5	2.883	2.864	10	2.5
12	10.971	2.864	17.8	2.5
15	14.497	2.864	17.8	2.5
24	24.872	2.863	17.8	2.5

## 4. The product does not support output in parallel with power per liter or hot-plug use

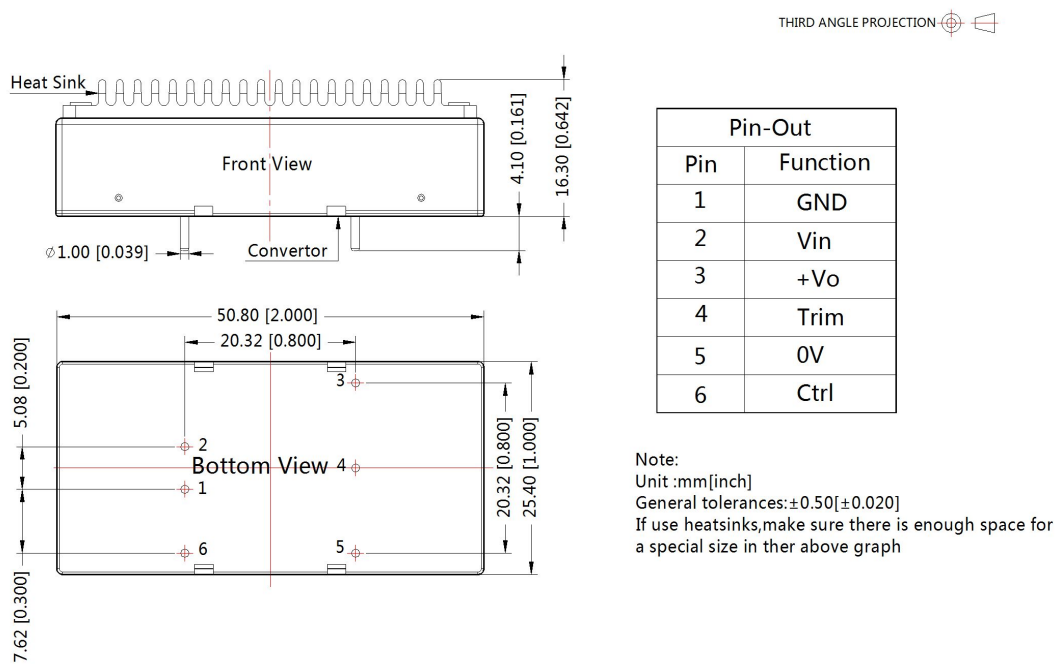
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## SURB1D\_LD-15W & SURB1D\_LD-20W Series

### Dimensions and Recommended Layout(without heatsink)



### Dimensions (with heatsink)

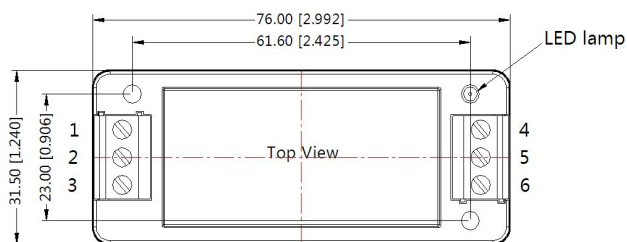


# DC/DC Converter

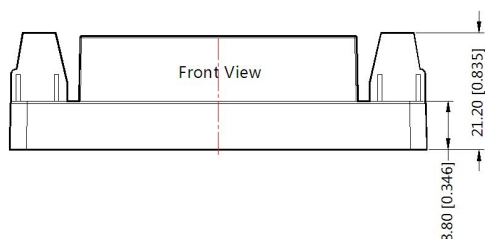
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### A2S Wiring Package Dimensions(without heatsink)

THIRD ANGLE PROJECTION 



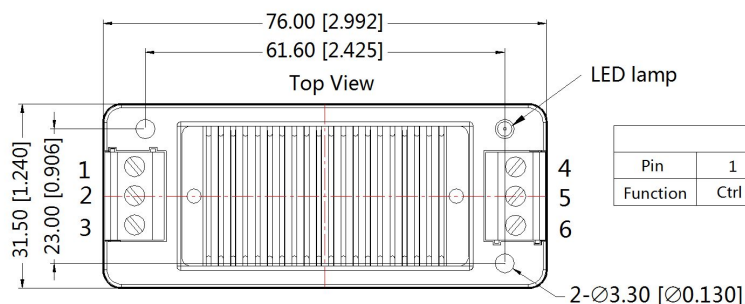
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo



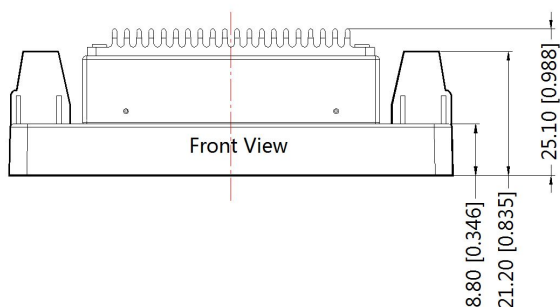
Note:  
 Unit:mm[inch]  
 Wire range : 24~12 AWG  
 General tolerances:±0.50[±0.020]

### A2S Wiring Package Dimensions(with heatsink)

THIRD ANGLE PROJECTION 



Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo



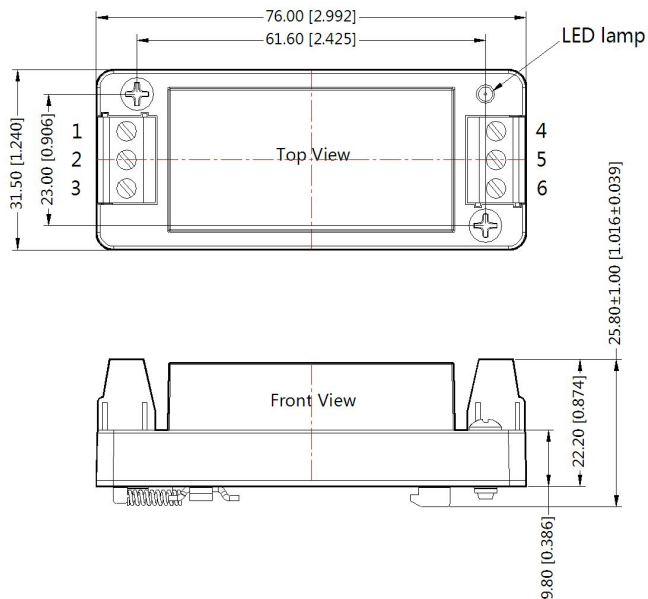
Note:  
 Unit:mm[inch]  
 Wire range:24~12 AWG  
 General tolerances:±0.50[±0.020]

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## SURB1D\_LD-15W & SURB1D\_LD-20W Series

### A4S Rail Package Dimensions(without heatsink)

THIRD ANGLE PROJECTION 

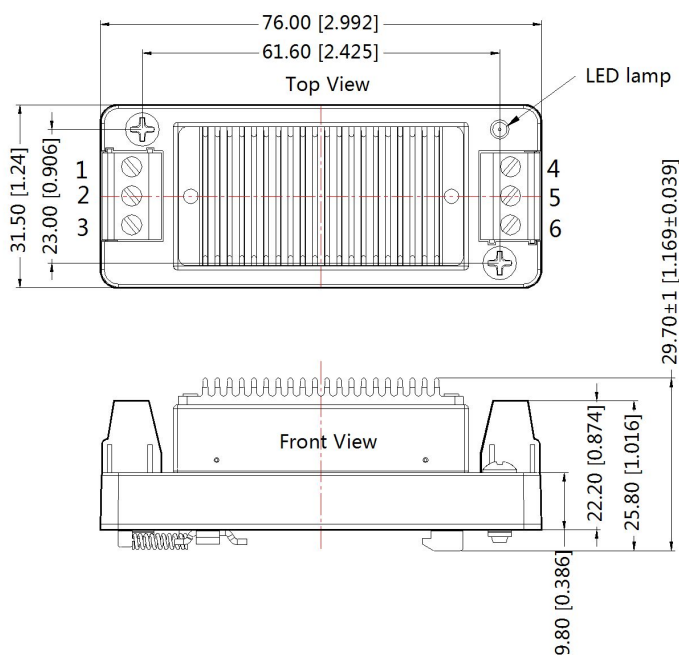


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo

Note:  
 Unit:mm[inch]  
 Wire range:24~12 AWG  
 General tolerances:±0.50[±0.020]

### A4S Rail Package Dimensions(with heatsink)

THIRD ANGLE PROJECTION 



Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo

Note:  
 Unit:mm[inch]  
 Wire range:24~12 AWG  
 General tolerances:±0.50[±0.020]

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### Notes:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package: 58200035(without heatsink),58200051(with heatsink), the Packing bag number of A2S/ A4S package: 58220022;
2. Recommended used in more than 5% load, if the load is lower than 5%, then the ripple index of the product may exceed the specification, but does not affect the reliability of the product;
3. The max. capacitive load should be tested within the input voltage range and under full load conditions;
4. Unless otherwise specified, data in this datasheet should be tested under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75% when inputting nominal voltage and outputting rated load;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. The performance indexes of the product models listed in this datasheet are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technicians for specific information;
7. We can provide product customization service;
8. Specifications of this product are subject to changes without prior notice.