

20W isolated DC-DC converter  
Ultra-wide input and regulated dual/single output



**UL** **CE** **CB** Patent Protection **RoHS**

### FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90%
- No-load power consumption as low as 0.15W
- I/O isolation test voltage 1.5K VDC
- Input under-voltage protection, output short-circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C to +85°C
- Meets CISPR32/EN55032 CLASS A, without extra components
- Six-sided metal shielding package
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version
- IEC60950, UL60950, EN60950 approved
- Meets EN50155 railway standard
- Meets EN62368 standard

*SURA\_LD-20WR3 & SURB\_LD-20WR3 series of isolated 20W DC-DC products with an ultra 4:1 input voltage range. They feature efficiencies up to 90%, input to output isolation is tested with 1500VDC, operating ambient temperature range of -40 °C to +85 °C, input under-voltage protection, output short-circuit, over-voltage, over-current protection. They meet CLASS A of CISPR32/EN55032 standards without extra components, optional packages are offered for chassis or DIN-rail mounting (A2S, A4S), adding additional input reverse polarity protection and they are widely used in applications such as data transmission device, battery power supplies, telecommunication device, distributed power supply system, hybrid module system, remote control system, industrial robot system and railway fields.*

### Selection Guide

Certification	Part No. <sup>①</sup>	Input Voltage (VDC)		Output		Full Load Efficiency <sup>②</sup> (%) Min./Typ.	Capacitive Load <sup>③</sup> (μF)Max.
		Nominal <sup>②</sup> (Range)	Max. <sup>③</sup>	Voltage (VDC)	Current (mA) Max./Min.		
UL/CE/CB	SURA2405LD-20WR3	24 (9-36)	40	±5	±2000/0	84/86	4800
	SURA2409LD-20WR3			±9	±1111/0	86/88	1000
	SURA2412LD-20WR3			±12	±834/0	86/88	800
	SURA2415LD-20WR3			±15	±667/0	86/88	625
	SURB2403LD-20WR3			3.3	5000/0	84/86	10000
	SURB2405LD-20WR3			5	4000/0	86/88	10000
	SURB2409LD-20WR3			9	2222/0	87/89	4700
	SURB2412LD-20WR3			12	1667/0	87/89	1600
	SURB2415LD-20WR3			15	1333/0	88/90	1000
	SURB2424LD-20WR3	24	834/0	88/90	500		
	SURA4805LD-20WR3	48 (18-75)	80	±5	±2000/0	84/86	4800
	SURA4812LD-20WR3			±12	±834/0	86/88	800
	SURA4815LD-20WR3			±15	±667/0	87/89	625
	SURB4803LD-20WR3			3.3	5000/0	84/86	10000
	SURB4805LD-20WR3			5	4000/0	84/86	10000
	SURB4809LD-20WR3			9	2222/0	87/89	4700
	SURB4812LD-20WR3			12	1667/0	85/87	1600
	SURB4815LD-20WR3			15	1333/0	88/90	1000
SURB4824LD-20WR3	24			834/0	86/88	500	

Notes:  
 ① Use "H" suffix for heat sink mounting, "A2S" suffix for chassis mounting and "A4S" suffix for DIN-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;  
 ② The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;  
 ③ Exceeding the maximum input voltage may cause permanent damage;

# DC/DC Converter

## SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

④ Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse polarity protection circuit;

⑤ The specified maximum capacitive load for positive and negative output is identical.

### Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Input Current (full load / no-load)	24VDC input	3.3V output	--	799/40	818/45	mA
		5V output	--	969/40	993/80	
		Others	--	947/6	969/10	
	48VDC input	3.3V output	--	400/20	409/25	
		5V output	--	485/20	497/60	
		Others	--	474/5	485/9	
Reflected Ripple Current	24VDC input	--	30	--		
	48VDC input	--	30	--		
Surge Voltage (1sec. max.)	24VDC input	-0.7	--	50	VDC	
	48VDC input	-0.7	--	100		
Start-up Voltage	24VDC input	--	--	9	VDC	
	48VDC input	--	--	18		
Input Under-voltage Protection	24VDC input	5.5	6.5	--		
	48VDC input	12	15.5	--		
Start-up Time	Nominal input & constant resistance load	--	10	--	ms	
Input Filter		PI filter				
Ctrl *	Module on	Ctrl pin open or pulled high (3.5-12VDC)				
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)				
	Input current when off	--	4	7	mA	
Hot Plug		Unavailable				

Note: \*The Ctrl pin voltage is referenced to input GND.

### Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Voltage Accuracy <sup>①</sup>	0%-100% load	--	±1	±3	%	
Linear Regulation	Input voltage variation from low to high at full load	Positive Output	--	±0.2		±0.5
		Negative Output	--	±0.5		±1
Load Regulation <sup>②</sup>	5%-100% load	Positive Output	--	±0.5		±1
		Negative Output	--	±0.5		±1.5
Cross Regulation	Dual output with Positive output at 50% load and Negative output from 10%-100% load	--	--	±5		
Transient Recovery Time		--	300	500	μs	
Transient Response Deviation	25% load step change, nominal input voltage	3.3V/5V/±5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise <sup>③</sup>	20MHz bandwidth, 5%-100% load	--	50	100	mVp-p	
Trim	Input voltage range	--	±10	--	%Vo	
Over-voltage Protection		110	--	160		
Over-current Protection		110	--	190	%Io	
Short-circuit Protection		Hiccup, continuous, self-recovery				

Note:

① Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;

② Load regulation for 0%-100% load is ±5%;

③ Ripple & Noise at ≤ 5% load is 5%Vo. Max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

# DC/DC Converter

## SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

### General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Isolation	Input-output Electric Strength test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC	
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ	
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	SURB2424LD-20WR3	--	2050	--	pF
		Others	--	1050	--	
Operating Temperature	See Fig. 1	-40	--	+85	°C	
Storage Temperature		-55	--	+125		
Storage Humidity	Non-condensing	5	--	95	%RH	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	°C	
Vibration		IEC/EN61373 - Category 1, Grade B				
Switching Frequency*	PWM mode	--	270	--	KHz	
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours	

Note:\*Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

### Mechanical Specifications

Case Material	Aluminum alloy				
Dimensions	Horizontal package (without heat sink)			50.80 x 25.40 x 11.80 mm	
	Horizontal package (with heat sink)			51.40 x 26.20 x 16.50mm	
	A2S chassis mounting (without heat sink)			76.00 x 31.50 x 21.20 mm	
	A2S chassis mounting (with heat sink)			76.00 x 31.50 x 25.30 mm	
	A4S Din-rail mounting (without heat sink)			76.00 x 31.50 x 25.80 mm	
	A4S Din-rail mounting (with heat sink)			76.00 x 31.50 x 29.90 mm	
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting		25.0g/48.0g/68.0g(Typ.)	
	With heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting		34.0g/56.0g/76.0g(Typ.)	
Cooling Method	Free air convection				

### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (without extra components)/ CLASS B (see Fig.3-② for recommended circuit)		
	RE	CISPR32/EN55032	CLASS A (without extra components)/ CLASS B (see Fig.3-② for recommended circuit)		
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV		perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m		perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)		perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)		perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s		perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70%		perf. Criteria B

### Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	EN50121-3-2	150kHz-500kHz	99dBμV (see Fig.3-② for recommended circuit)	
		EN55016-2-1	500kHz-30MHz	93dBμV (see Fig.3-② for recommended circuit)	
	RE	EN50121-3-2	30MHz-230MHz	40dBμV/m at 10m (see Fig.3-② for recommended circuit)	
		EN55016-2-1	230MHz-1GHz	47dBμV/m at 10m (see Fig.3-② for recommended circuit)	
Immunity	ESD	EN50121-3-2	Contact ±6KV/Air ±8KV		perf. Criteria A
	RS	EN50121-3-2	20V/m		perf. Criteria A
	EFT	EN50121-3-2	±2kV 5/50ns 5kHz (see Fig.3-① for recommended circuit)		perf. Criteria A
	Surge	EN50121-3-2	line to line ±1KV (42Ω, 0.5μF) (see Fig.3-① for recommended circuit)		perf. Criteria A
Immunity	CS	EN50121-3-2	0.15MHz-80MHz	10V r.m.s	perf. Criteria A

# DC/DC Converter

SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

## Typical Characteristic Curves

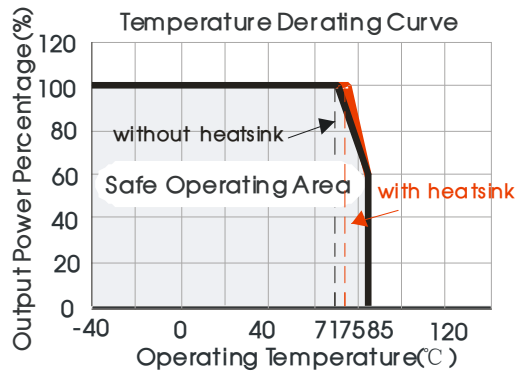
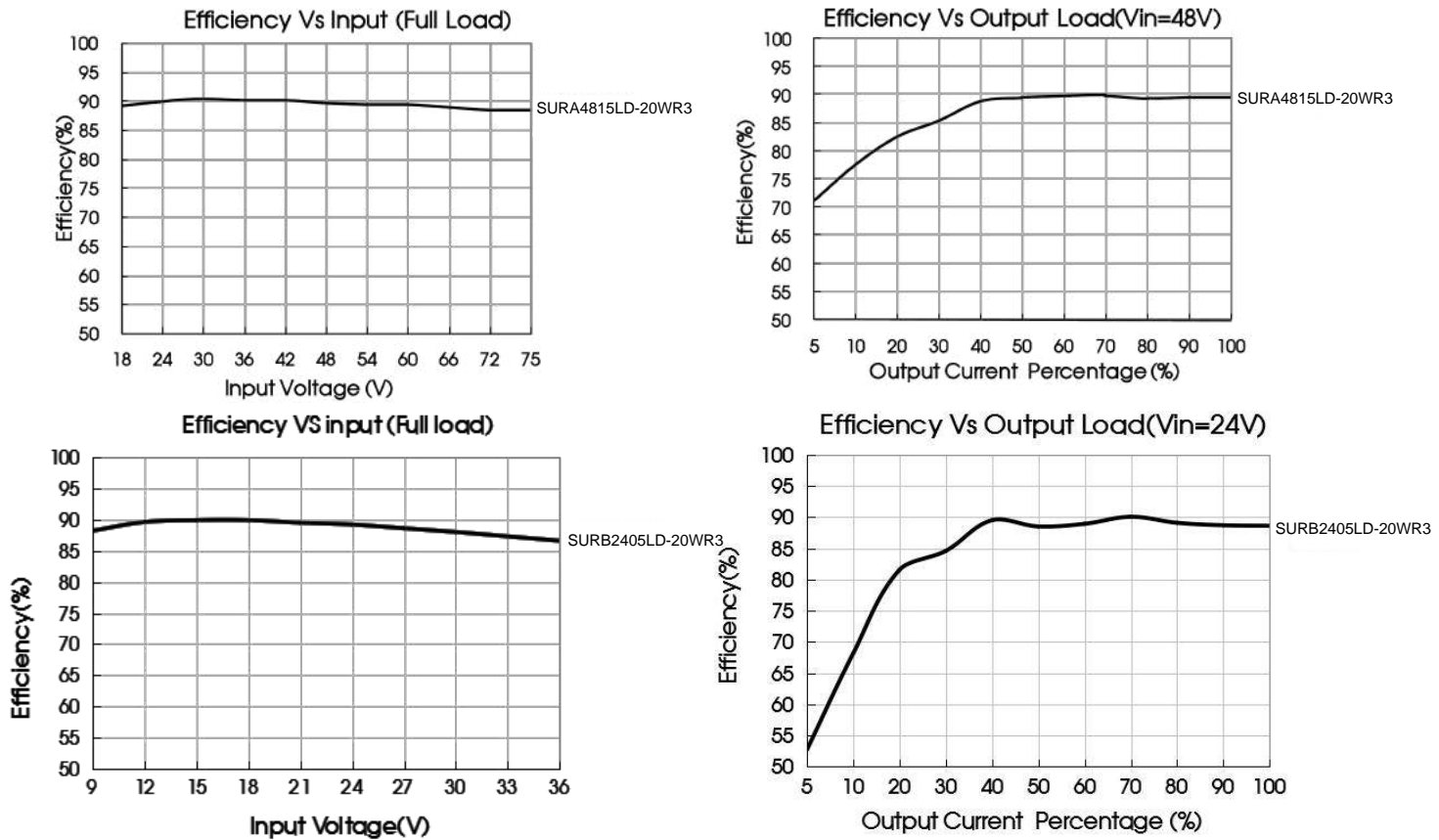


Fig. 1



## Design Reference

### 1. Typical application

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  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

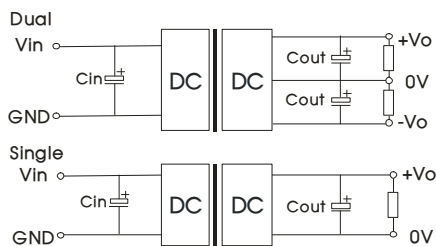


Fig. 2

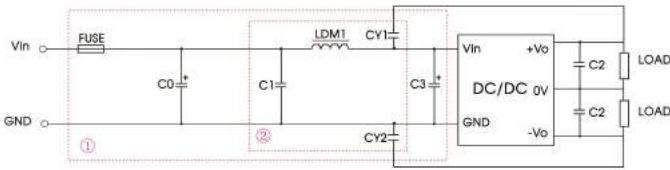
$C_{in}$		Single $V_o$ (VDC)	$C_{out}$	Dual $V_o$ (VDC)	$C_{out}$
$V_{in}:24VDC$	$V_{in}:48VDC$				
100 $\mu$ F/50 V	100 $\mu$ F/1 00V	3.3/5	470 $\mu$ F/16V	$\pm 5$	220 $\mu$ F/16V
		9	220 $\mu$ F/16V	$\pm 9$	100 $\mu$ F/16V
		12/15	220 $\mu$ F/25V	$\pm 12/\pm 15$	100 $\mu$ F/25V
		24	100 $\mu$ F/50V	--	--

# DC/DC Converter

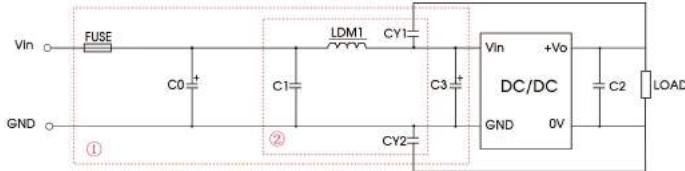
## SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

### 2. EMC compliance circuit

Dual



Single



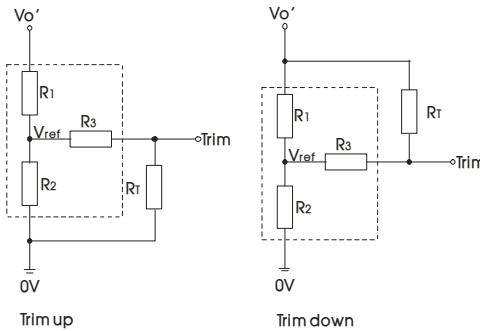
Parameter description:

Model	Vin:24VDC	Vin:48VDC
FUSE	Choose according to actual input current	
C0/C3	330µF/50V	330µF/100V
C1	1µF/50V	1µF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7µH/3.1A	
CY1/CY2	1nF/2KV	

Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

### 3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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

$R_T$  = Trim Resistor value  
 $\alpha$  = self-defined parameter

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	12.4	1.24
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

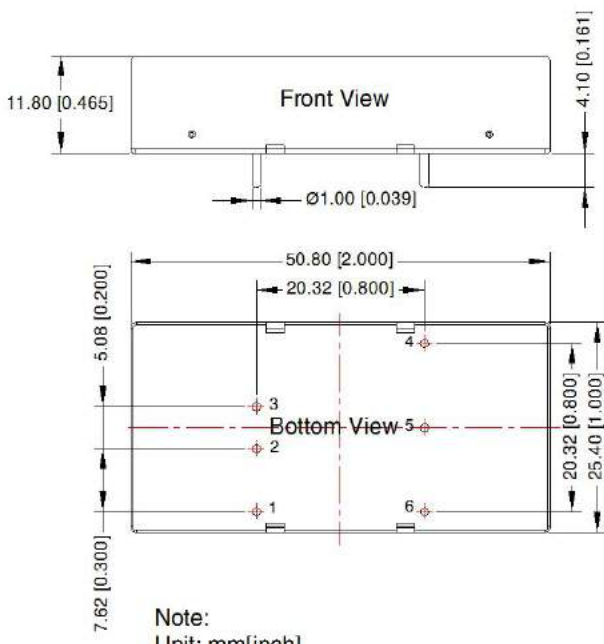
### 4. The products do not support parallel connection of their output



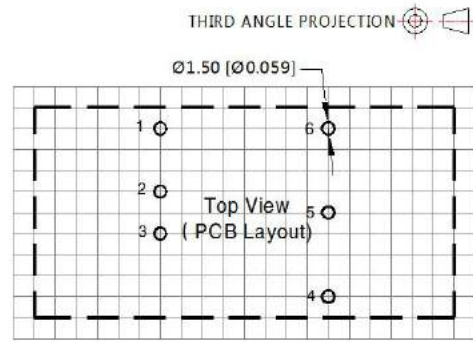
# DC/DC Converter

SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

## Horizontal Package (without heat sink) Dimensions and Recommended Layout



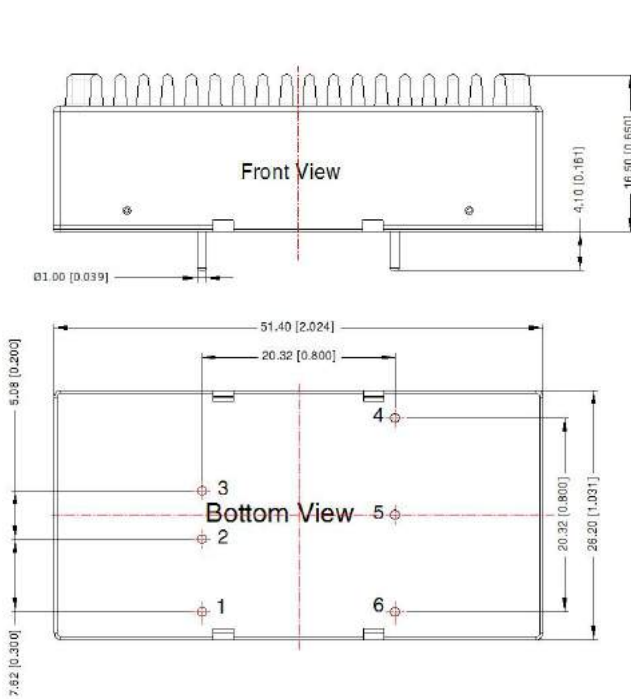
Note:  
 Unit: mm[inch]  
 Pin diameter tolerances:  $\pm 0.10 [\pm 0.004]$   
 General tolerances:  $\pm 0.50 [\pm 0.020]$



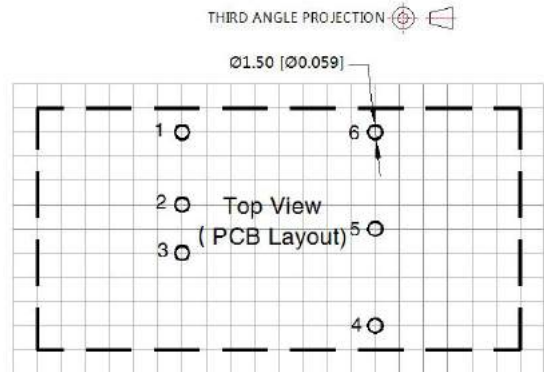
Note: Grid 2.54\*2.54mm

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

## Horizontal Package (with heat sink) Dimensions



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



Note: Grid 2.54\*2.54mm

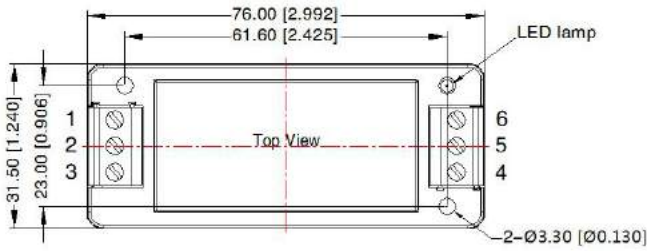
Pin-Out		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	Trim	0V
6	0V	-Vo

# DC/DC Converter

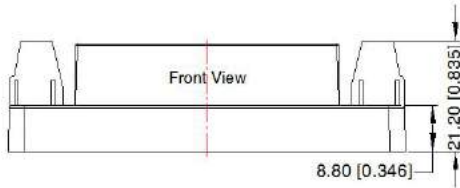
## SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

### SURA\_LD-20WR3A2S & SURB\_LD-20WR3A2S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



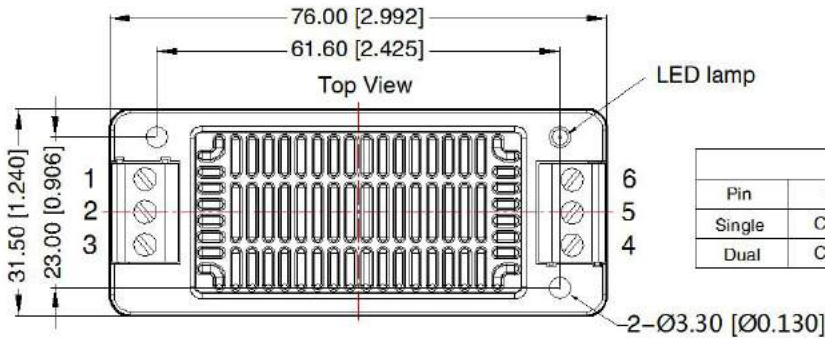
Pin-Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo
Single	Ctrl	GND	Vin	+Vo	Trim	0V



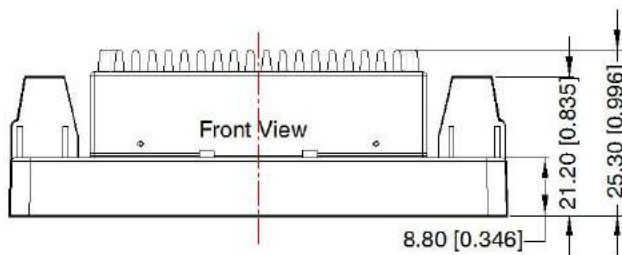
Note:  
 Unit: mm[inch]  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.0[± 0.039]

### SURA\_LD-20WHR3A2S & SURB\_LD-20WHR3A2S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



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



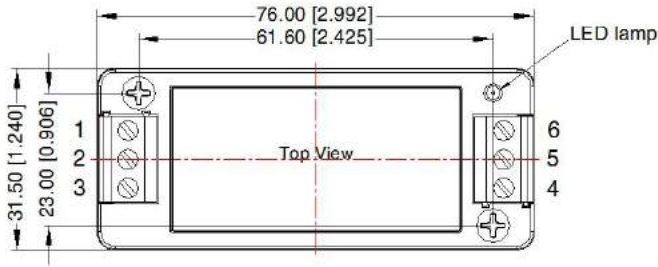
Note:  
 Unit: mm[inch]  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.0[± 0.039]

# DC/DC Converter

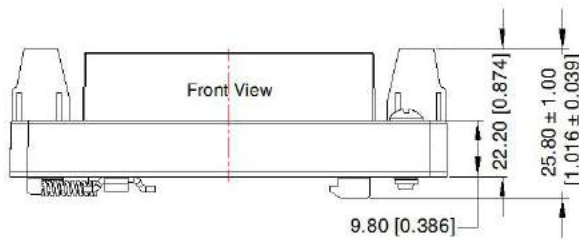
## SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

### SURA\_LD-20WR3A4S & SURB\_LD-20WR3A4S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



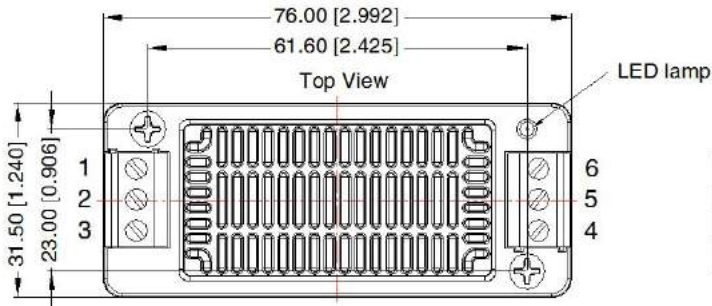
Pin-Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo
Single	Ctrl	GND	Vin	+Vo	Trim	0V



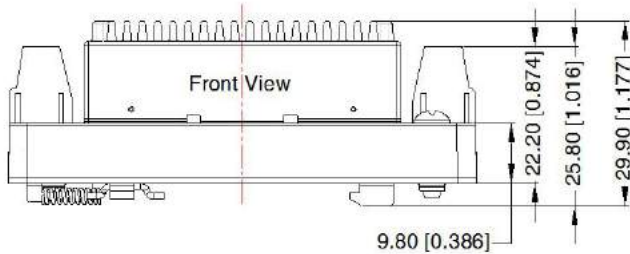
Note:  
 Unit: mm[inch]  
 Mounting rail: TS35  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.00[ ± 0.039]

### SURA\_LD-20WHR3A4S & SURB\_LD-20WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



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



Note:  
 Unit: mm[inch]  
 Mounting rail: TS35  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.00[ ± 0.039]



# DC/DC Converter

SURA\_LD-20WR3 & SURB\_LD-20WR3 Series

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## Notes:

1. The maximum capacitive load offered were tested at input voltage range and full load;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.