DC/DC Converter

SURF_LP-20WR3 Series

20W,Ultra wide input, isolated & regulated single output , DIP package, DC-DC converter

FEATURES

- Ultra wide range of input voltage (4:1)
- Efficiency up to 89%
- No-load power consumption as low as 0.2W
- Isolation voltage :3K VDC
- Operating temperature range: -40℃ to +85℃
- Input under-voltage protection, output short circuit protection, over-voltage protection, Over-current protection
- Meet CISPR22/EN55022 CLASS A
- International standard pin-out
- A2S (wring mounting) and A4S (35mm rail mounting) products featuring anti-reverse connection for input

SURF_LP-20WR3 series are applied to ultra wide voltage range input , high isolation such as power industry, data transmission device, battery power supply device, tele-comunication device, distributed power supply system, remote control system, industrial robot system etc.

Selection Guide

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.)		
SURF2403LP-20WR3	24 (9-36)	40	3.3	5000/250	84/86	10000
SURF2405LP-20WR3			5	4000/200	87/89	10000
SURF2409LP-20WR3			9	2222/111	86/88	4700
SURF2412LP-20WR3			12	1667/84	86/88	1600
SURF2415LP-20WR3			15	1334/67	87/89	1000
SURF2424LP-20WR3			24	833/42	87/89	500
SURF4803LP-20WR3	48 (18-75)	80	3.3	5000/250	84/86	10000
SURF4805LP-20WR3			5	4000/200	86/88	10000
SURF4812LP-20WR3			12	1667/84	86/88	1600
SURF4815LP-20WR3			15	1334/67	87/89	1000
SURF4824LP-20WR3			24	833/42	87/89	500

Notes:
① product model with a suffix of "A2S" means chassis mounting and that with a suffix of "A4S" indicates DIN-Rail mounting (e.g.SURF2405LP-20WR3A2S means chassis mounting; SURF2405LP-20WR3A4S means DIN-Rail mounting);
②Absolute maximum rating without damage on the converter, but it isn't recommended;
③Efficiency is measured In nominal input voltage and rated output load;A2S (wiring) and A4S (rail) Model due to input reverse polarity protection, minimum efficiency greater than Min.-2 is qualified.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	3.3V, 5V output	--	936/20	--	mA
		Others	--	936/5	--	
	48VDC input	3.3V, 5V output	--	468/10	--	
		Others	--	468/4	--	
Reflected Ripple Current	24VDC input		--	30	--	
	48VDC input		--	30	--	
Input impulse Voltage (1sec. max.)	24VDC input		-0.7	--	50	VDC
	48VDC input		-0.7	--	100	
Starting Voltage	24VDC input		--	--	9	
	48VDC input		--	--	18	
under-voltage turn-off	24VDC input		5.5	6.5	--	
	48VDC input①		14.0	15.5	--	

Starting Time	Nominal input& constant resistance load	--	10	--	ms
Input Filter		Pi filter			
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	--	4	7	mA
Note: *The voltage of Ctrl pin is relative to input pin GND.					

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output 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		--	300	500	μs
Transient Response Deviation		3.3V,5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Drift Coefficient	Full load		--	±0.02	--	%/℃
Ripple & Noise*	20MHz bandwidth		--	50	100	mV p-p
Output Over-voltage Protection	Input voltage range		110	--	160	%Vo
Output Voltage Regulation Trim			--	±10%Vo	--	VDC
Output Over-current Protection			110	140	190	%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
Insulation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	3000	--	--	VDC
Insulation Resistance	Input-output, insulation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	500	--	pF
Operating Temperature	Derating if the temperature is ≥55℃ (see Fig. 1)	-40	--	85	℃
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Max. Operating Temperature for casing	Within the operating temperature curve	--	--	105	%
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	
Vibration		10-55Hz, 10G, 30 Min. along X, Y and Z			
Switching Frequency *	PWM mode	--	270	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Note:*This series of products using reduced frequency technology, the switching frequency is test value of full load,When the load is reduced to below 50%, the switching frequency decreases with decreasing load.					

Physical Specifications

Casing Material		Plastic (UL94-V0)
Package Dimensions	Horizontal package	51.50*26.50*12.00 mm
	A2S wiring package	76.00*31.50*21.20 mm
	A4S rail package	76.00*31.50*25.80 mm
Weight	Horizontal package/A2S wiring package/A4S rail package	24.00g/46.00g/66.00g (Typ.)
Cooling method		Free air convection

EMC Specifications

EMI	Conducted disturbance	CISPR22/EN55022 CLASS A (Bare component)/ CLASS B (see Fig.3-② for recommended circuit)	
	Radiated emission	CISPR22/EN55022 CLASS A (Bare component)/ CLASS B (see Fig.3-② for recommended circuit)	
EMS	Electrostatic discharge	IEC/EN61000-4-2 Contact ±4KV	perf. Criteria B
	Radiation immunity	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 immunity	IEC/EN61000-4-5 ±2KV (see Fig.3-①for recommended circuit)	perf. Criteria B
	Conducted disturbance immunity	IEC/EN61000-4-6 3 Vr.m.s	perf. Criteria A
	Immunities of voltage dip, drop and short interruption	IEC/EN61000-4-29 0-70%	perf. Criteria B

Product Characteristic Curve

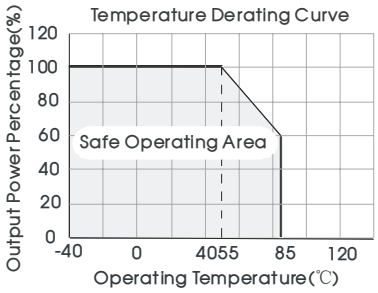
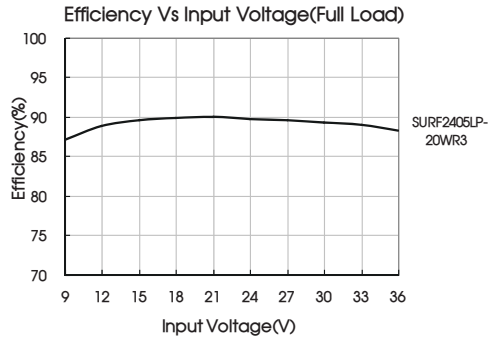
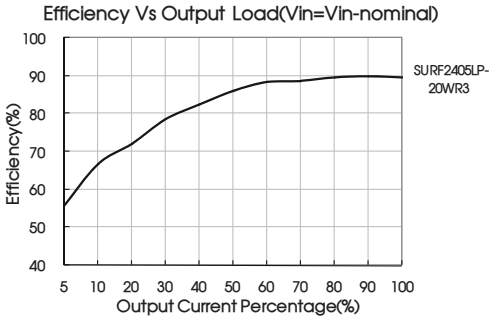
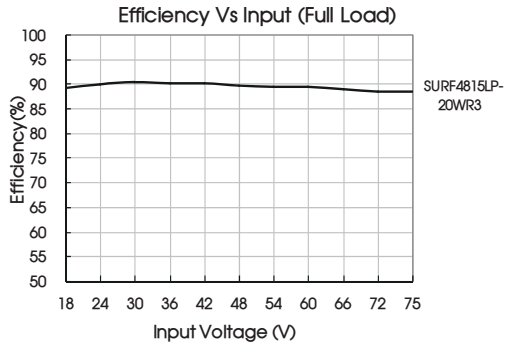
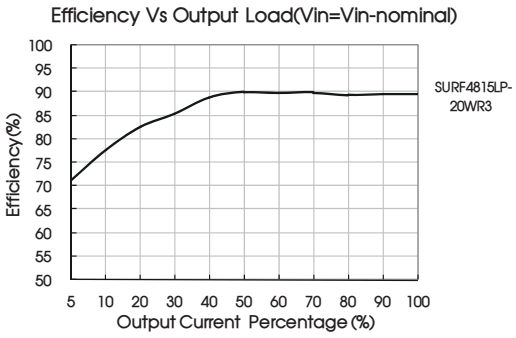


Fig. 1









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 Cin and Cout or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.

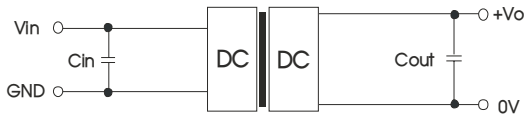


Fig. 2

Vin(VDC)	Cout(μF)	Cin(μF)
3.3/5	470	100
9/12/15	220	
24	100	

2. EMC solution-recommended circuit

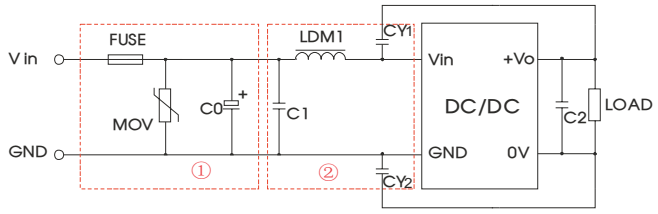


Fig. 3

Notes: Part ① in the Fig. 3 is used for EMS test and part ② for EMI filtering; selected based on needs.

Parameter description

Model	Vin:24V	Vin:48V
FUSE	Choose according to actual input current	
MOV	S14K35	S14K60
C0	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH	
CY1	1nF/3KV	
CY2	1nF/3KV	

EMC solution-recommended circuit PCB layout

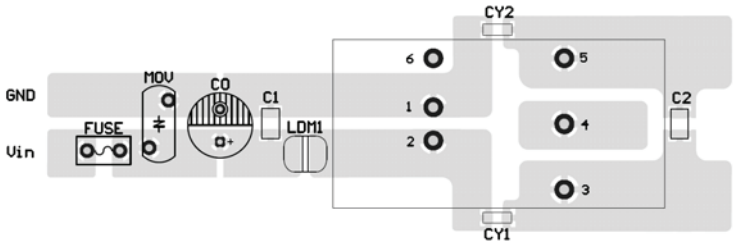
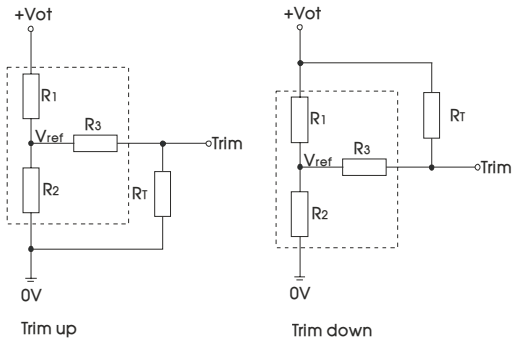


Fig. 4

Note: the min. distance of the bonding pads between input & output isolation capacitors (CY1/CY2) shall be ≥ 2mm.

3. Application of Trim and calculation of Trim resistance



Applied circuits of Trim (Part in broken line is the interior of models)

Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vo' - Vref} \cdot R_1$$

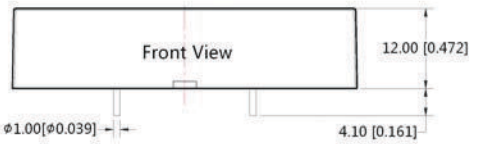
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} \cdot R_2$$

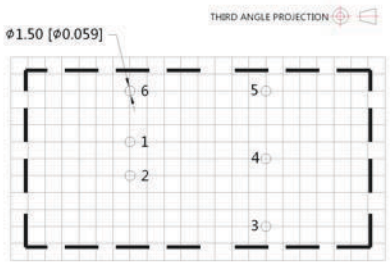
R_T is Trim resistance
a is a self-defined parameter, with no real meaning.

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	12.4	1.25
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

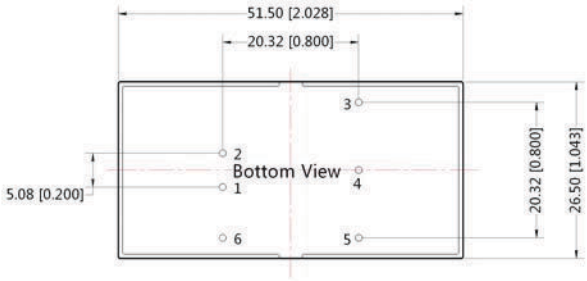
4. The product does not support output in parallel with power per liter or hot-plug use

Dimensions and Recommended Layout





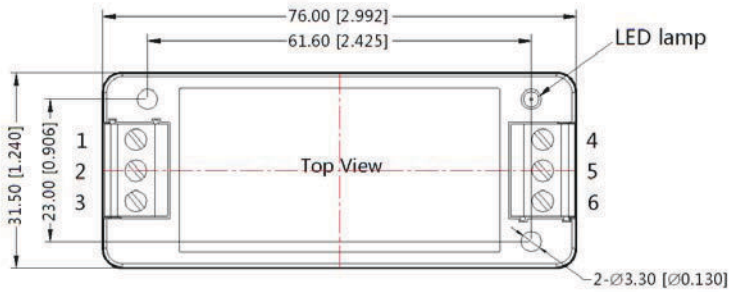
Note : Grid 2.54*2.54mm



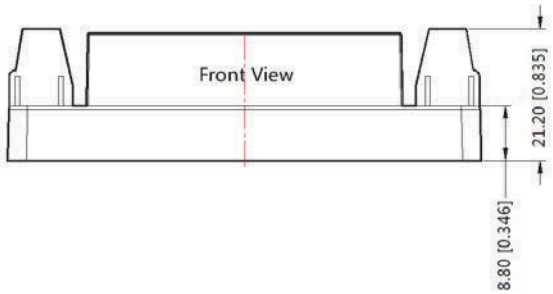
Note:
Unit :mm[inch]
Pin diameter tolerances :±0.10[±0.004]
General tolerances:±0.50[±0.020]

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

SURF_LP-10WR3A2S Dimensions

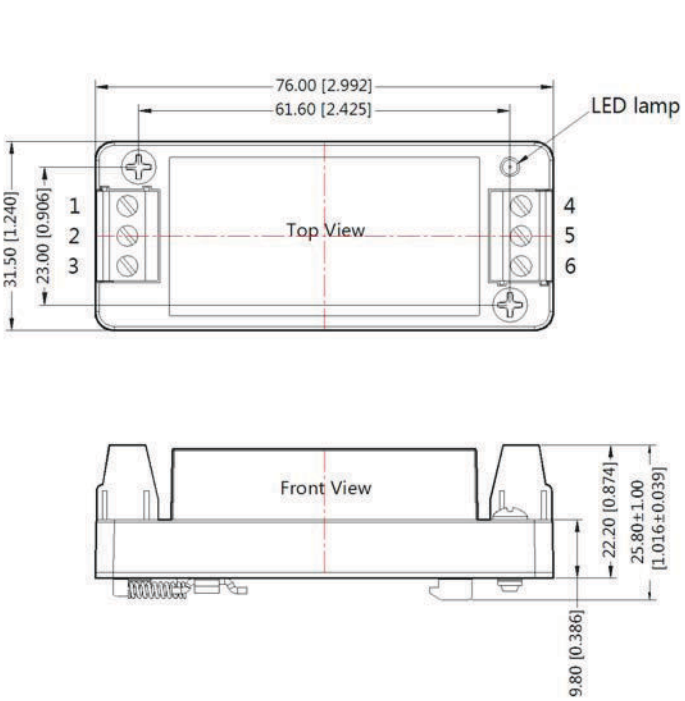


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo



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

SURF_LP-10WR3A4S Dimensions



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]

Note:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package : 58210039, 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 Ta=25℃, 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.