DC/DC Converter

SURB1D_LMD-10WR3 Series

10W, ultra wide input isolated & regulated single output DC-DC converter

RoHS Patent Protection

FEATURES

- Ultra wide input voltage range (4:1)
- High efficiency up to 85%
- Enhanced isolation, isolation voltage: 2250VDC
- Operating temperature range: -40℃ to +85℃
- Input under-voltage Protection, Output short circuit, over-current, over–voltage protection
- Low ripple & noise
- EMI meet EN50121-3-2 & CISPR22/EN55022 CLASS A, without external components
- Meets requirements of railway standard EN50155
- Meet the IEC60950, UL60950, EN60950 approval
- Reverse voltage protection available with A2S(Chassis mounting) or A4S(35mm DIN-Rail mounting)
- International standard pin-out

SURB1D_LMD-10WR3 series are isolated 10W DC-DC products with 4:1 input voltage .Their feature efficiency up to 85%, 2250VDC isolation with enhanced isolation, operating temperature of -40 ℃to +85℃, Input Under-voltage Protection, Output short circuit, over-current, over–voltage protection. Railway vehicle electronic equipment widely used in 72V, 96V and 110V.

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.)		
--	SURB1D03LMD-10WR3	110 (40-160)	170	3.3	2400/0	74/76	5400
	SURB1D05LMD-10WR3			5	2000/0	78/80	5400
	SURB1D12LMD-10WR3			12	833/0	82/84	470
	SURB1D15LMD-10WR3			15	667/0	82/84	330
	SURB1D24LMD-10WR3			24	417/0	83/85	100

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 SURB1D05LMD-10WHR3A2S is chassis mounting of with heat sink, SURB1D05LMD-10WR3A4S 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;

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)	Nominal input voltage	3.3V output	--	95/3	98/8	mA
		Others	--	110/3	117/8	
Reflected Ripple Current	Nominal input voltage		--	25	--	
Surge Voltage (1sec. max.)			-0.7	--	180	VDC
Starting Voltage	100% load		--	--	40	
Shutdown Voltage			28	33	--	
Starting Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			

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Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0%-100% load		--	±1	±3	%
Line Regulation	Full load, the input voltage is from low voltage to high voltage		--	±0.2	±0.5	
Load Regulation	0%-100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V/5V output	--	±3	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth , 5%-100% load		--	50	100	mV p-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			120	--	210	%Io
Short circuit Protection			Continuous, self-recovery			

Note: ①0%-5% load ripple&Noise is no more than 5%Vo.Ripple and noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation.

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.	2250	--	--	VDC
	Input and output respectively on the shell, with the test time of 1 minute and the leak current lower than 1mA.	1600	--	--	
Insulation Resistance	Input-output, insulation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	2200	--	pF
Operating Temperature	see Fig.1	-40	--	+85	℃
Storage Temperature		-55	--	+125	
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds.	--	--	+300	
Storage Humidity	Non-condensing	5	--	95	%RH
Vibration		IEC61373 car body 1 B mold			
Switching Frequency *	PWM Mode	--	300	--	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			Aluminum alloy
Dimensions	Horizontal package(without heat sink)		50.80*25.40*11.80 mm
	Horizontal package(with heat sink)		50.80*25.40*16.30 mm
	A2S wiring package (without heat sink)		76.00*31.50*21.20 mm
	A2S wiring package(with heat sink)		76.00*31.50*25.10 mm
	A4S rail package(without heat sink)		76.00*31.50*25.80 mm
	A4S rail package(with heat sink)		76.00*31.50*29.70 mm
Weight	without heat sink	Horizontal package/A2S wiring package/A4S rail package	26g/48g/68g(Typ.)
	with heat sink	Horizontal package/A2S wiring package/A4S rail package	34g/56g/76g(Typ.)
Cooling Methods			Free air convection

EMC Specifications

EMI	CE	CISPR22/EN55022	CLASS A (without external components)/ CLASS B (see Fig.4 forrecommended circuit)	
	RE	CISPR22/EN55022	CLASS A (without external components)/CLASS B (see Fig.4 for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±4KV(see Fig.3 or Fig.4 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (2Ω 0.5uF see Fig.3 for recommended circuit) line to ground ±4KV (12Ω 0.5uF see Fig.3 for recommended circuit)	perf. Criteria B
		EN50121-3-2	line to line ±1KV (42Ω 0.5uF see Fig.4 for recommended circuit) line to ground ±2KV (42Ω 0.5uF see Fig.4 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Product Characteristic Curve

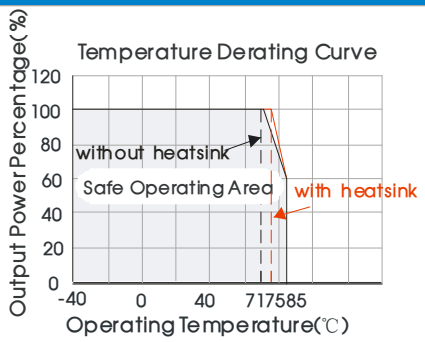
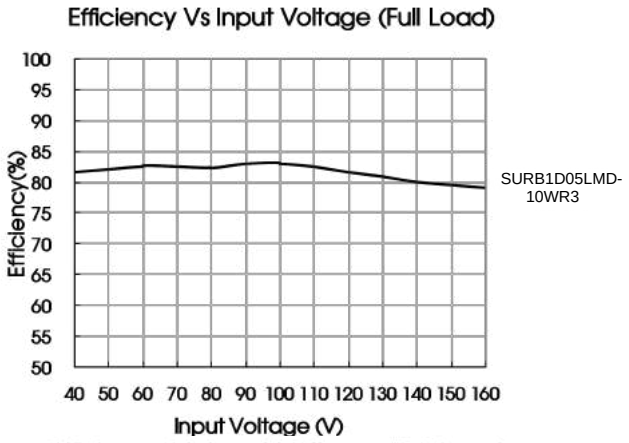
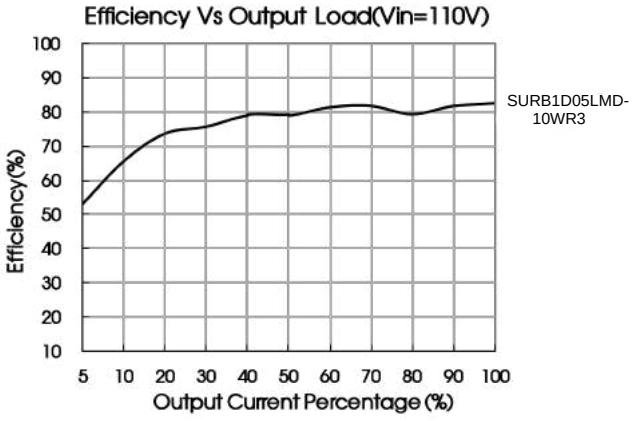
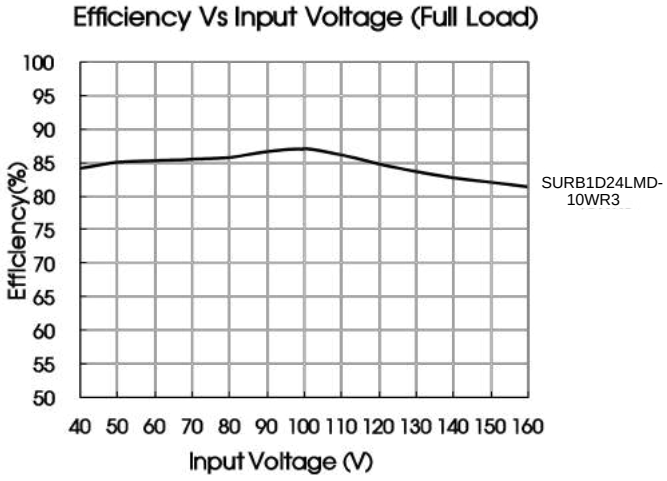
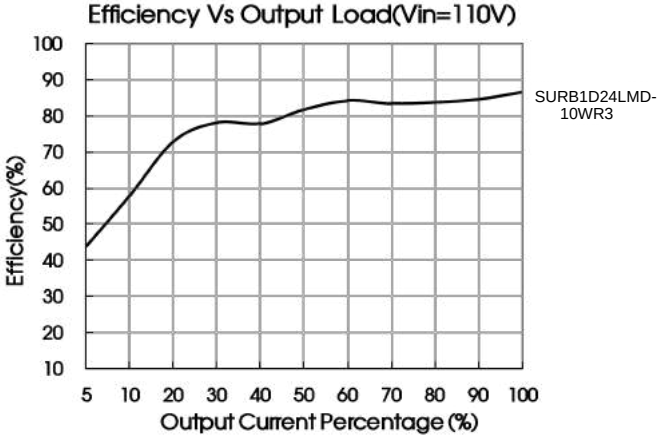


Fig. 1









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 a further decrease of the input and output ripple is required, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance，and ensure the capacitance should be lower than the max. capacitive load of the product.

Fig. 2

Vout(VDC)	Fuse	Cin	Cout
3.3/5	2A，slow blow	10μF - 47μF	100μF
12/15			47μF
24			22μF

2. EMC solution-recommended circuit

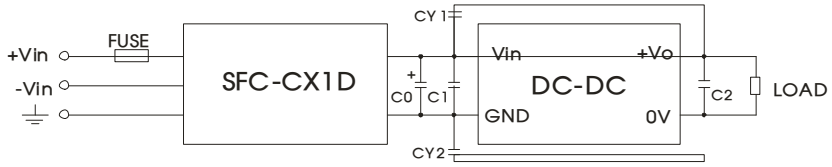


Fig. 3

Fig. 3 Parameter description：

FUSE	Choose according to actual input current
FC-CX1D	SFC-CX1D is the EMC auxiliary component of our company. Input voltage range: 40V-160V
C0	100μF/200V
C1	Refer to the Cin in Fig.2
C2	Refer to the Cout in Fig.2
CY1、CY2	1000pF/400VAC

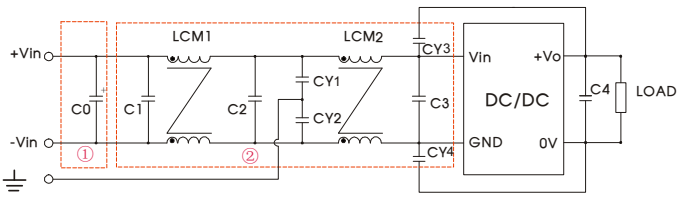


Fig. 4

Notes: Part ① in the Fig. 4 is used for EMS test and part ② for EMI filtering; selected based on needs.

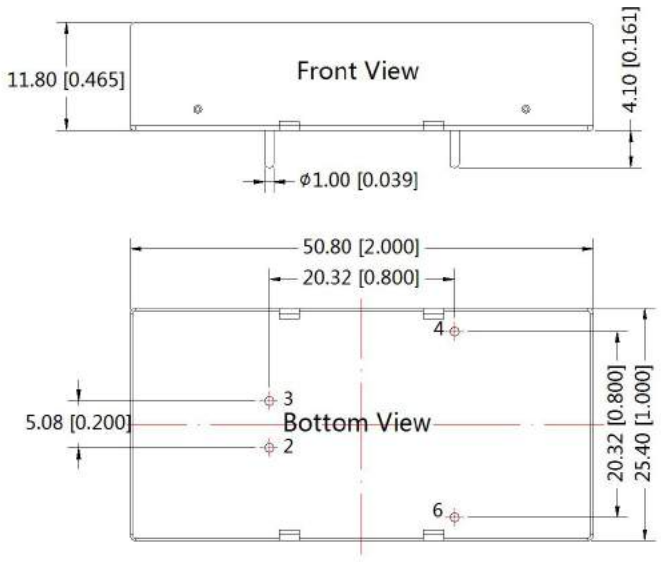
Fig. 4 Parameter description：

C0	100μF/200V
C1、C2	0.22μF/250V
C3	Refer to the Cin in Fig.2
LCM1	2.2mH(FL2D-10-222)
LCM2	1.1mH (material:TN150P-RH12.7*12.7*7.9)
CY1、CY2、CY3、CY4	1000pF/400VAC
C4	Refer to the Cout in Fig.2
Notes: FL2D-10-222 is the EMC auxiliary component of our company.	

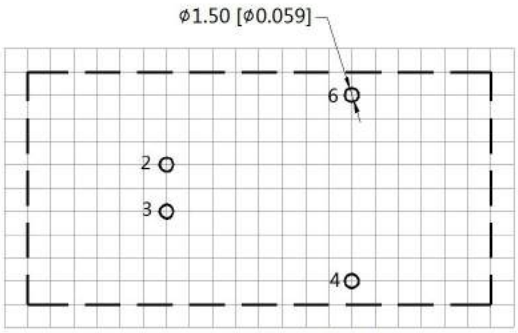
3. It is not allowed to connect modules output in parallel to enlarge the power

Horizontal Package (without heat sink) Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



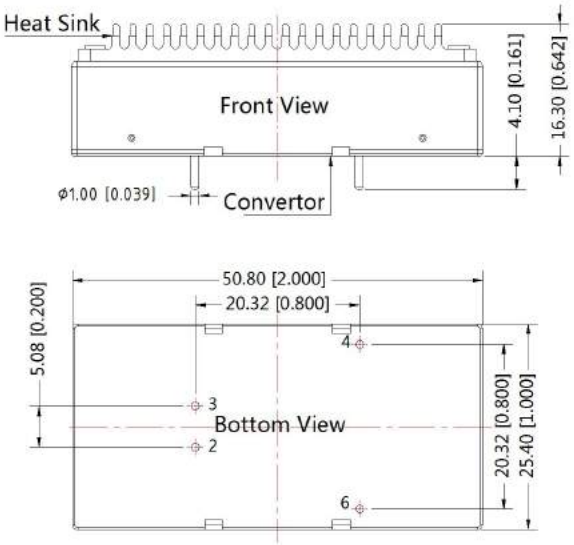
Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]



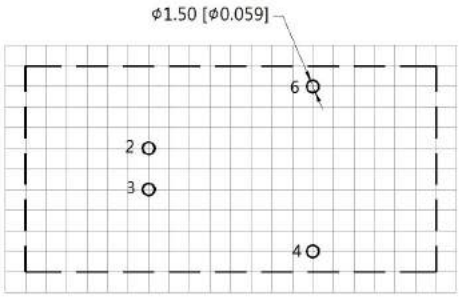
Note : Grid 2.54*2.54mm

Pin-Out	
Pin	Function
2	GND
3	Vin
4	+Vo
6	0V

Horizontal Package (with heat sink) Dimensions



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

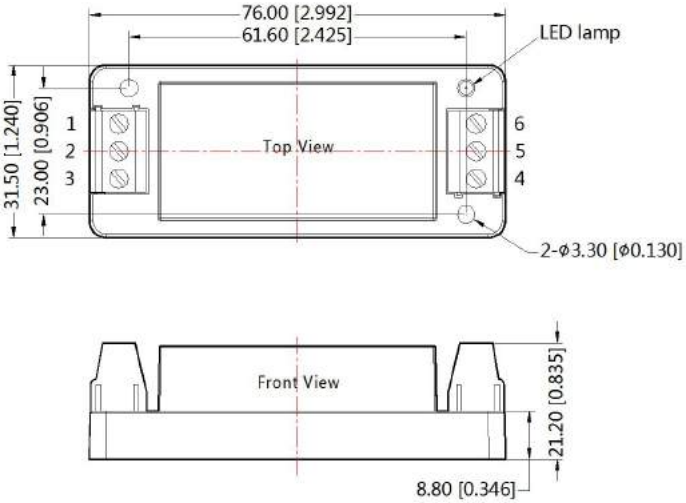


Note : Grid 2.54*2.54mm

Pin-Out	
Pin	Function
2	GND
3	Vin
4	+Vo
6	0V

SURB_LMD-10WR3A2S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

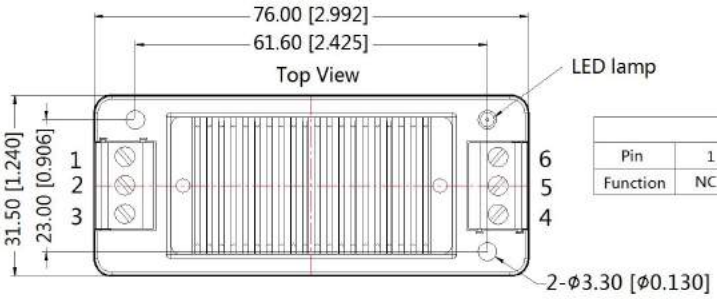


Pin-Out						
Pin	1	2	3	4	5	6
Function	NC	GND	Vin	+Vo	NC	0V

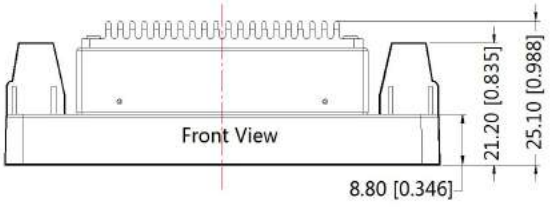
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±0.50[±0.020]

SURB_LMD-10WHR3A2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION



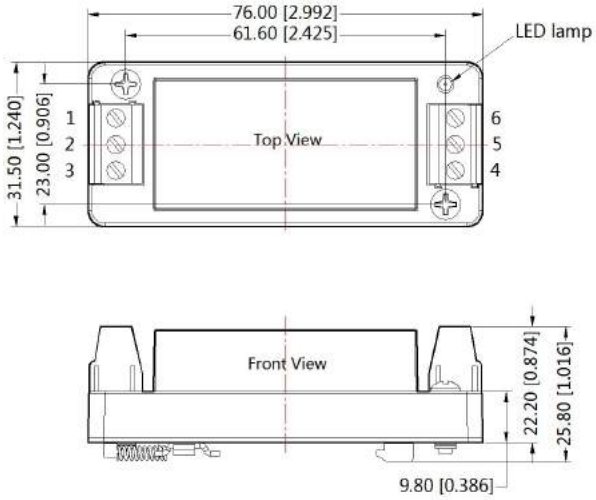
Pin-Out						
Pin	1	2	3	4	5	6
Function	NC	GND	Vin	+Vo	NC	0V



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

SURB_LMD-10WR3A4S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

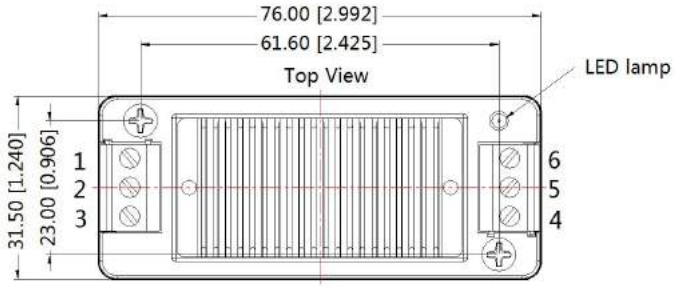


Pin-Out						
Pin	1	2	3	4	5	6
Function	NC	GND	Vin	+Vo	NC	0V

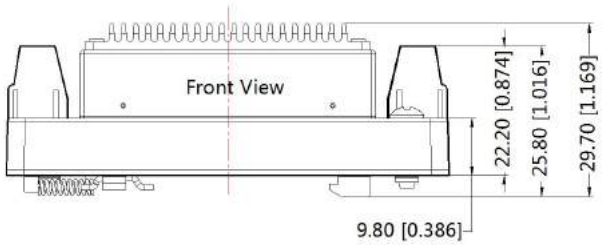
Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]

SURB_LMD-10WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION



Pin-Out						
Pin	1	2	3	4	5	6
Function	NC	GND	Vin	+Vo	NC	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]

Note:

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 Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on Company's corporate standards;
4. Other product application information, please see DC-DC（railway power supply）Converter Application Notes for specific operation methods;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Specifications are subject to change without prior notice.