

50W, Wide input, isolated & regulated single output
DIP packaging, DC/DC converter



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VRB_LD-50W series products are of 50W output power, wide range of voltage input of 18-36VDC, 36-75VDC, isolation voltage of 1.5K VDC, output over-current protection, output over-voltage protection and output short circuit protection with the six-sided metal shielding package, these products are widely used in fields such as industrial control, electric power, instruments, communication and industrial robot system.

FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 93%
- Isolation voltage : 1.5K VDC
- Input over-voltage, under-voltage protection, output short circuit, over-current and over-voltage protection
- Operating temperature range: -40°C to +85°C
- Six-sided metal shielding package
- Reverse voltage protection available with A2S(Chassis mounting) or A4S(DIN-Rail mounting)
- International standard pin-out
- EN60950 approval

Selection Guide

Certification	Part No. ^①	Input Voltage (VDC)	Output		Efficiency ^③ (%Min./Typ.) @ Full Load	Max. Capacitive Load (μF)
		Nominal ^② (Range)	Output Voltage (VDC)	Output Current (mA) (Max./Min.)		
CE	VRB2403LD-50W	24 (18-36)	3.3	10000/500	89/91	27000
	VRB2405LD-50W		5	10000/500	89/91	18900
	VRB2412LD-50W		12	4167/208	91/93	3700
	VRB2415LD-50W		15	3333/167	91/93	2000
	VRB2424LD-50W		24	2083/104	89/91	1000
	VRB4803LD-50W	48 (36-75)	3.3	10000/500	89/91	27000
	VRB4805LD-50W		5	10000/500	89/91	18900
	VRB4812LD-50W		12	4167/208	91/93	3700
	VRB4815LD-50W		15	3333/167	91/93	2000
	VRB4824LD-50W		24	2083/104	90/92	1000

Note:
 ① Series with suffix "H" are heat sink mounting, such as VRB2405LD-50WH; series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example VRB2405LD-50WA2S is chassis mounting, VRB2405LD-50WA4S is DIN-Rail mounting; If the application has a higher requirement for heat dissipation, you can choose modules with heat sink;
 ② A2S (wiring) and A4S (rail) Model due to input reverse polarity protection function, input voltage range the minimum value and starting voltage is higher than 1VDC DIP package;
 ③ Efficiency 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 nominal input series, nominal input voltage	3.3VDC output	--	1511/42	1545/55	mA
		5VDC output	--	2289/59	2341/105	
		12VDC output	--	2240/85	2290/105	
		15VDC output	--	2240/90	2290/105	
		24VDC output	--	2289/45	2341/65	
	48VDC nominal input series, nominal input voltage	3.3VDC output	--	756/30	773/35	
		5VDC output	--	1144/50	1171/55	
		12VDC output	--	1120/34	1145/55	
		15VDC output	--	1120/50	1145/70	
		24VDC output	--	1132/30	1158/50	

Reflected Ripple Current	24VDC nominal input series, nominal input voltage		--	40	--	mA
	48VDC nominal input series, nominal input voltage		--	30	--	
Surge Voltage (1sec. max.)	24 VDC nominal input series		-0.7	--	50	VDC
	48 VDC nominal input series		-0.7	--	100	
Starting Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Under-voltage Protection	24 VDC nominal input series	Starting Voltage	--	--	18	VDC
		Shutdown Voltage	15	--	--	
	48 VDC nominal input series	Starting Voltage	--	--	36	
		Shutdown Voltage	31	--	--	
Input Over-voltage Protection	24 VDC nominal input series	Starting Voltage	36	--	--	
		Shutdown Voltage	--	--	41	
	48 VDC nominal input series	Starting Voltage	75	--	--	
		Shutdown Voltage	--	--	83	
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl*	Module switch on		Ctrl suspended or connected to TTL high level (3-12VDC)			
	Module switch off		Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched off		--	6	--	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	Nominal input voltage, 25% load step change	24VDC output	--	500	1000	μs
		Others	--	200	500	
Transient Response Deviation	Nominal input voltage, 25% load step change	--	±3	±5	%	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise ^①	20MHz bandwidth	VRB2403LD-50W, VRB4803LD-50W, VRB2405LD-50W, VRB4805LD-50W	--	100	250	mVp-p
		VRB4824LD-50W	--	200	350	
		Others	--	200	300	
Trim		--	±10%Vo	--		
Output Over-voltage Protection ^②	Input voltage range	3.3VDC output	--	3.9	--	VDC
		5VDC output	--	6.2	--	
		12VDC output	--	15	--	
		15VDC output	--	18	--	
		24VDC output	--	30	--	
Output Over-current Protection	Input voltage range	120	--	160	%Io	
Short circuit Protection		Hiccup, continuous, self-recovery				

Note: ① Ripple and noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation;

② After the output over-voltage protection, you need to reboot the module to output properly.

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	1500	--	--	VDC
Insulation Resistance	Input-output, insulation 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
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	+300	°C
Vibration		10-55Hz, 10G, 30 Min. along X, Y and Z			
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours

Physical Specifications

Casing Material	Aluminum alloy				
Package Dimensions	without heat sink	Horizontal package		50.80*25.40*11.80 mm	
		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		51.40*26.20*16.50 mm	
		A2S wiring package		76.00*31.50*25.30 mm	
		A4S rail package		76.00*31.50*29.90 mm	
Weight	without heat sink	Horizontal package/A2S wiring package/A4S rail package		35g/57g/77g(Typ.)	
	with heat sink	Horizontal package/A2S wiring package/A4S rail package		43g/65g/85g(Typ.)	
Cooling Method	Free air convection				

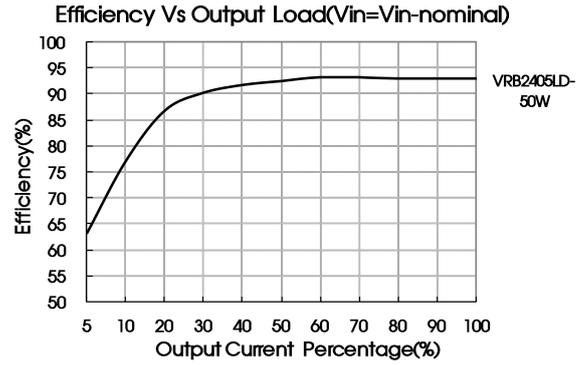
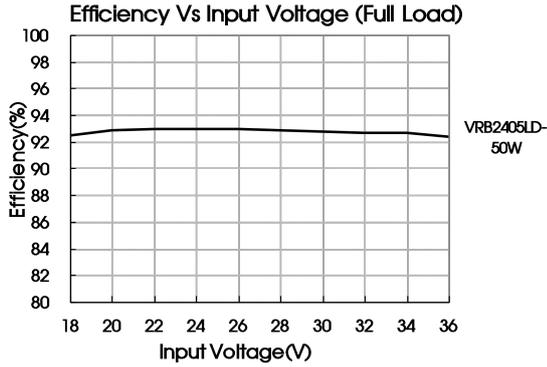
EMC Specifications

EMI	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
EMS	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

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.

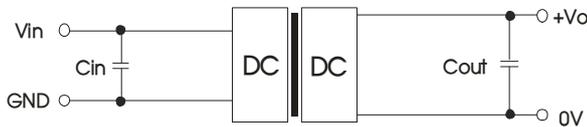


Fig. 2

Vout(VDC)	Cin(μF)	Cout(μF)
3.3/5	100	470
12/15		100
24		47

2. EMC solution-recommended circuit

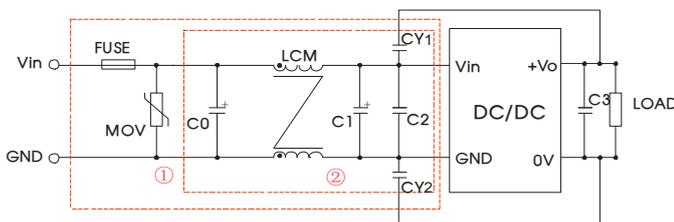


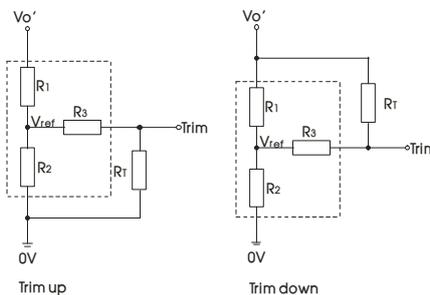
Fig. 3

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	S20K30	S14K60
C0	680μF/50V	330μF/100V
LCM	2.2mH(FL2D-30-222)	
C1	330μF/50V	330μF/100V
C2	4.7μF/50V	2.2μF/100V
CY1、CY2	Y1 Safety capacitor 3.3nF/250VAC	
C3	Refer to the Cout in Fig.2	

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:

$$\begin{aligned} \text{up: } R_T &= \frac{aR_2}{R_2-a} - R_3 & a &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{aR_1}{R_1-a} - R_3 & a &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

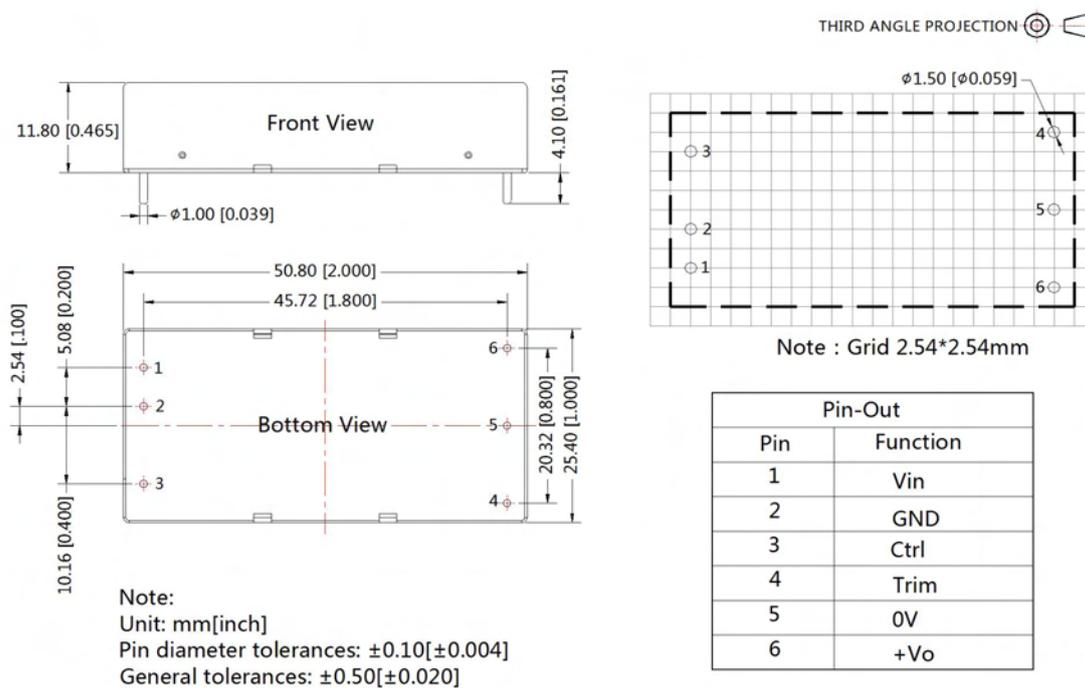
R_T is Trim resistance
a is a self-defined parameter, with no real meaning. V_{o'} for the actual needs of the up or down regulated voltage

Nominal input voltage	Vout	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
24/48	3.3	4.788	2.87	12.4	1.24
24/48	5	2.87	2.87	10	2.5
24/48	12	11	2.87	15	2.5
24/48	15	15	3	17.4	2.5
48	24	26	3	15	2.5
24	24	20	2.308	15	2.5

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

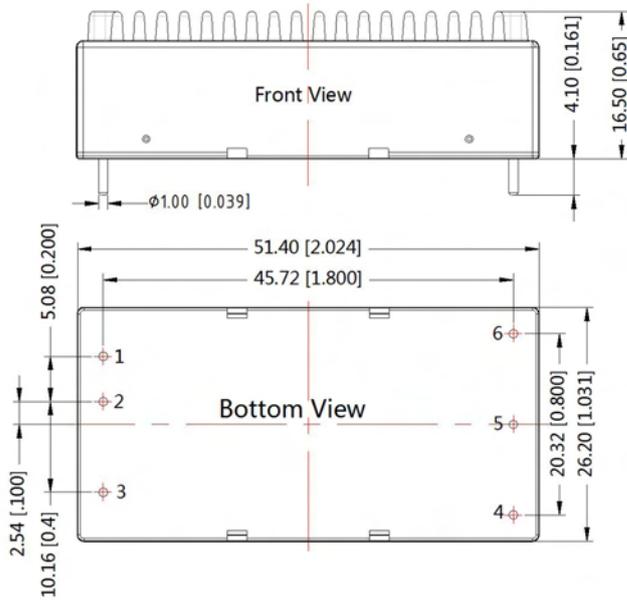
5. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout (Horizontal package without heat sink)



Dimensions (Horizontal package with heat sink)

THIRD ANGLE PROJECTION 

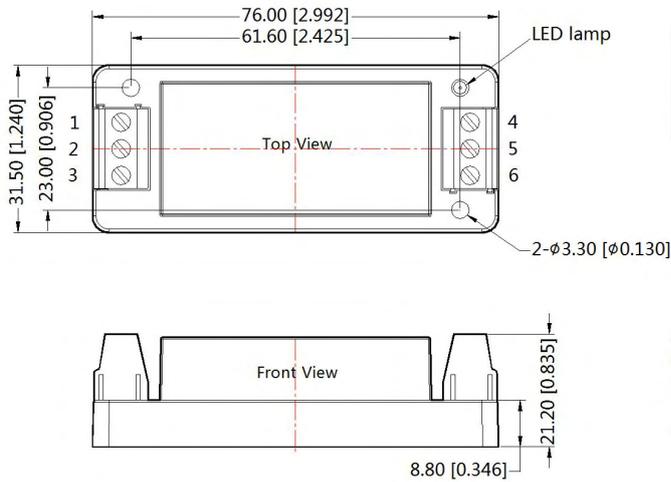


Pin-Out	
Pin	Function
1	Vin
2	GND
3	Ctrl
4	Trim
5	0V
6	+Vo

Note:
Unit: mm[inch]
General tolerances: $\pm 0.50[\pm 0.020]$

A2S Wiring Package Dimensions (without heat sink)

THIRD ANGLE PROJECTION 

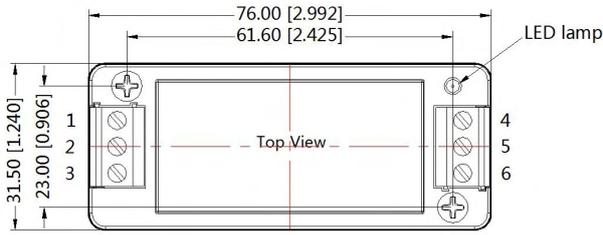


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	Trim	0V	+Vo

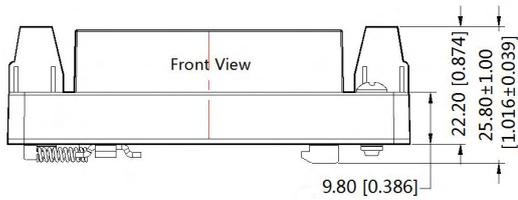
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: $\pm 0.50[\pm 0.020]$

A4S Rail Package Dimensions (without heat sink)

THIRD ANGLE PROJECTION



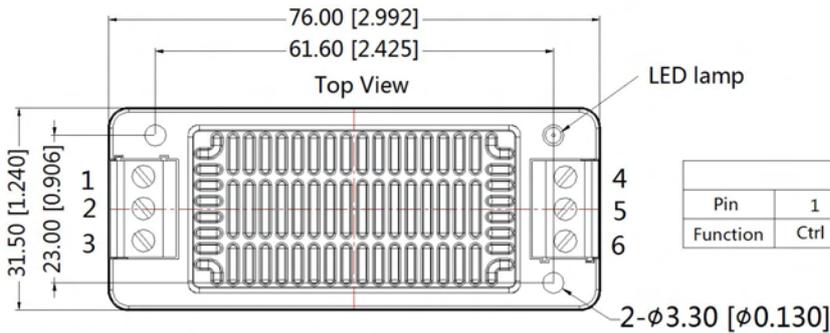
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	Trim	0V	+Vo



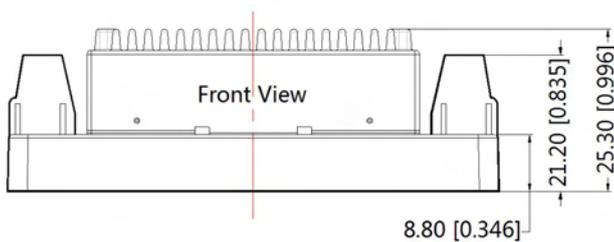
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±0.50[±0.020]

A2S Wiring Package Dimensions (with heat sink)

THIRD ANGLE PROJECTION



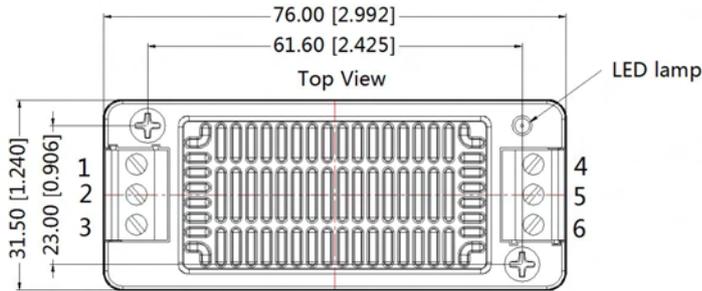
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	Trim	0V	+Vo



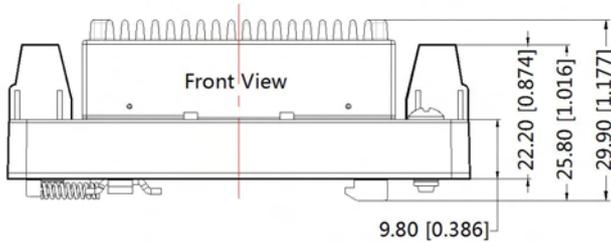
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±0.50[±0.020]

A4S Rail Package Dimensions (with heat sink)

THIRD ANGLE PROJECTION 



Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	Trim	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]

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(without heatsink and with heat sink);
2. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on Company's corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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