

15W, Ultra wide input, isolated & regulated dual / single output DC/DC converter

FEATURES

- Wide range of input voltage (2:1)
- High efficiency up to 90%
- No-load power consumption as low as 0.12W
- Isolation voltage : 1500VDC
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Operating temperature range: -40°C to +85°C
- Meet CISPR22/EN55022 CLASS A
- Six-sided metal shielding package
- Reverse voltage protection available with A2S(Chassis mounting) or A4S(DIN-Rail mounting)
- IEC60950, UL60950, EN60950 approval



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

VRB_LD-15WR3 series are applied to wide voltage range input situation, such as data transmission equipment, battery-operated device, battery power supply device, tele-communication device, distributed power system, remote control system, industrial robot system 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.)		
UL/CE/CB	VRB2405LD-15WR3	24 (18-36)	40	5	3000/0	87/89	4700
	VRB2412LD-15WR3			12	1250/0	87/89	1000
	VRB2415LD-15WR3			15	1000/0	87/89	820
	VRB2424LD-15WR3			24	625/0	88/90	270

Notes: ①Series with suffix "H" are heat sink mounting; series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example URB2405LD-20WHR3A2S is of chassis mounting package with heat sink, URB2405LD-20WR3A4S is of DIN-Rail mounting without heat sink; if the application has a higher requirement for heat dissipation, we recommend 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)	24VDC input	5V output	--	702/30	718/75	mA
		Others	--	702/5	718/10	
Reflected Ripple Current	24VDC input		--	30	--	VDC
Input impulse Voltage (1sec. max.)			-0.7	--	50	
Starting Voltage			--	--	18	
Under Voltage Shutdown			14.0	15.5	--	
Starting Time	Nominal input & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Ctrl*	Module switched on		Ctrl pin suspended or connected to TTL high level (3.5-12VDC)			
	Module switched off		Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched off		--	4	7	mA
Hot Plug			Unavailable			

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

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	--	±0.2	±0.5	
Load Regulation	Nominal input	--	±0.5	±1	
Transient Recovery Time	25% load step change	--	300	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift Coefficient	Full load	--	--	±0.03	%/°C
Ripple & Noise*	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: *Ripple and noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation.
0%-5% load ripple&Noise is no more than 5%Vo.

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	VRB2424LD-15W(H)R3 (A2S/A4S)	--	2050	--	pF
		Others	--	1050	--	
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	--	270	--	KHz	
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours	

Note: * This series of products employ the technique of lower frequency, the switching frequency is tested with full load, When the load is being reduced to below 50%, the switching frequency decreases accordingly.

Physical Specifications

Casing Material			Aluminum alloy
Package 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	26.00g/48.00g/68.00g(Typ.)
	with heat sink	Horizontal package/A2S wiring package/A4S rail package	34.00g/56.00g/76.00g(Typ.)
Cooling Method			Free air convection

EMC Specifications

EMI	CE	CISPR22/EN55022	CLASS A (Bare component)/ CLASS B (see Fig.3-② for recommended circuit)	
	RE	CISPR22/EN55022	CLASS A (Bare component)/ 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	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
	CS	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

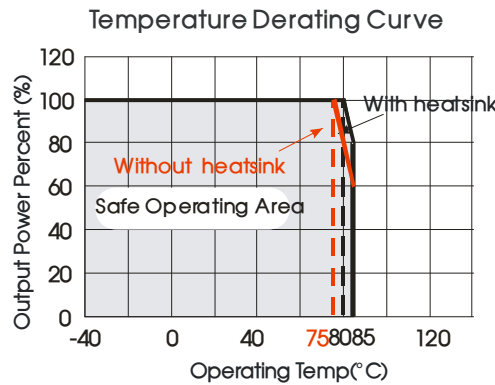
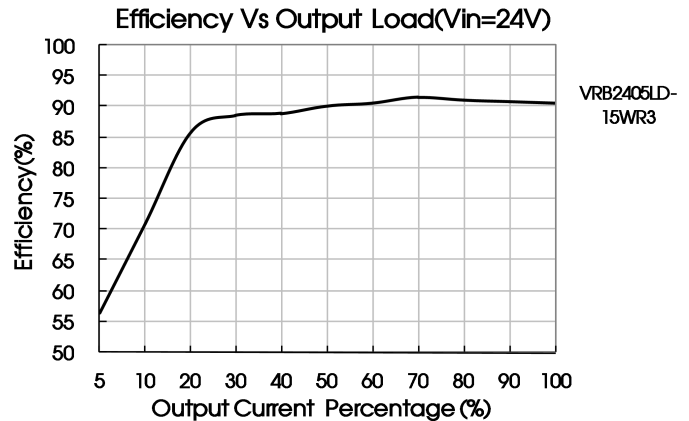
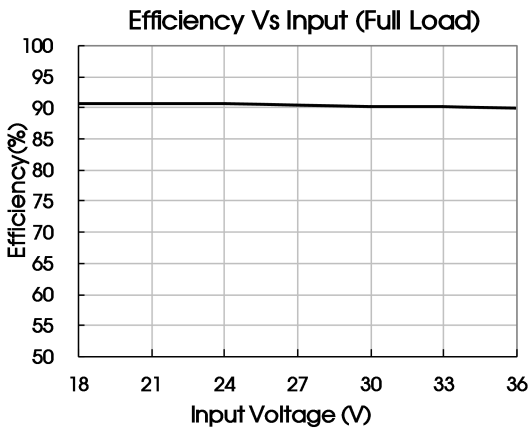


Fig. 1



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.

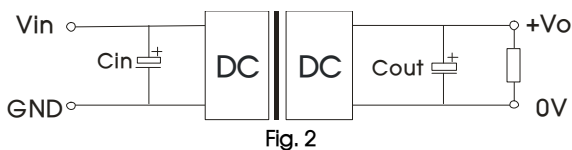


Fig. 2

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

2. EMC solution-recommended circuit

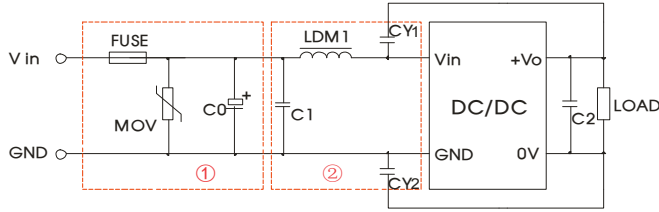


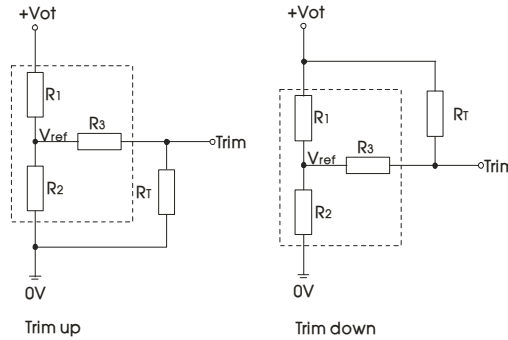
Fig. 3

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
FUSE	Choose according to actual input current
MOV	S20K30
C0	330μF/50V
C1	1μF/50V
C2	Refer to the Cout in Fig.2
LDM1	4.7μH
CY1/CY2	1nF/2KV

3. Application of Trim and the calculation of Trim resistance



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

Calculation formula of Trim resistance:

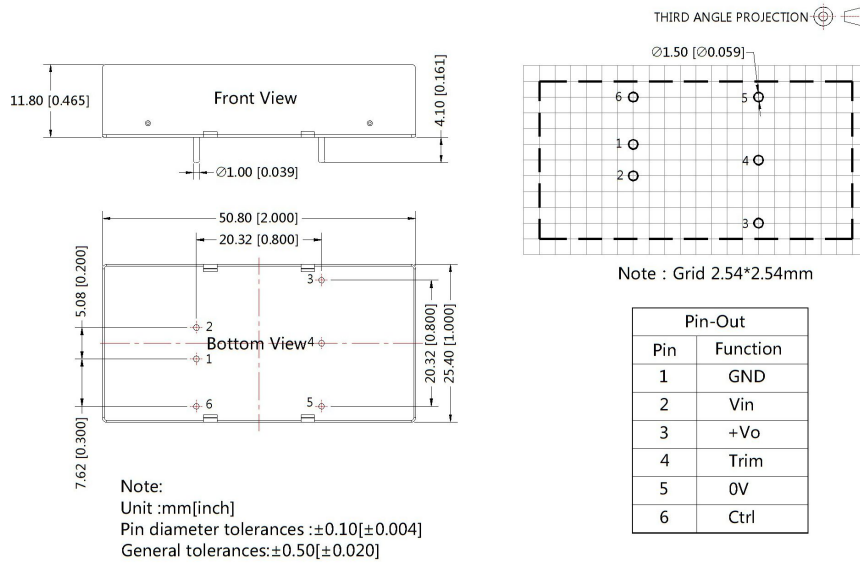
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

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

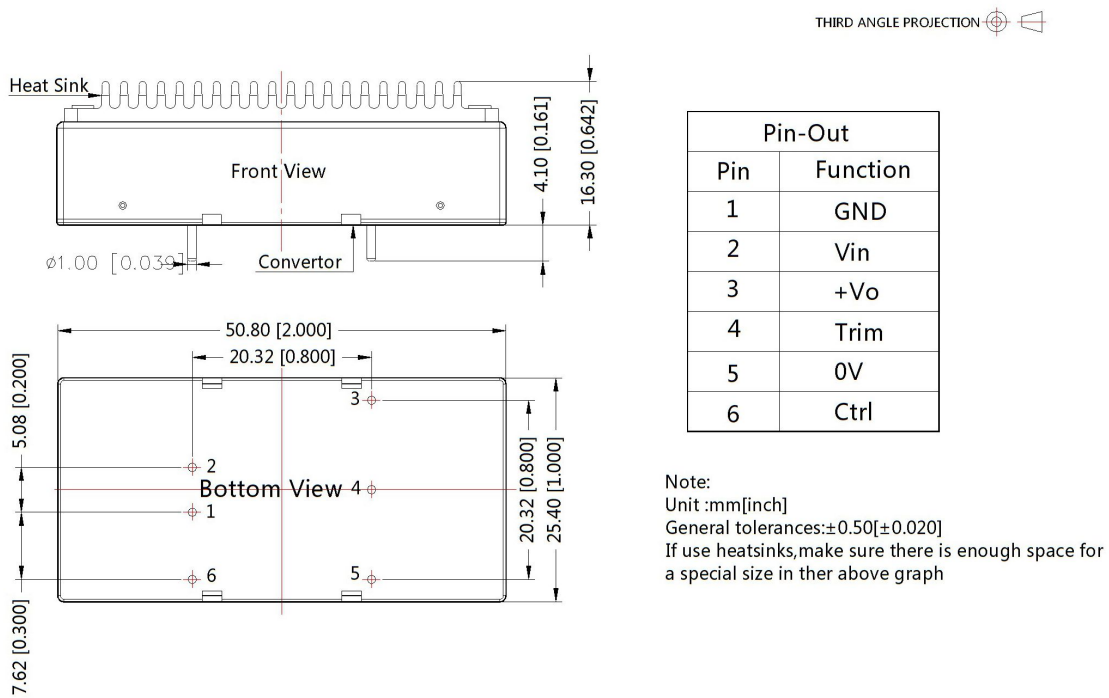
Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
5	2.883	2.87	10	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

- It is not allowed to connect modules output in parallel to enlarge the power
- For more information please find DC-DC converter application notes on www.mornsun.com

Horizontal Package (without heat sink) Dimensions and Recommended Layout

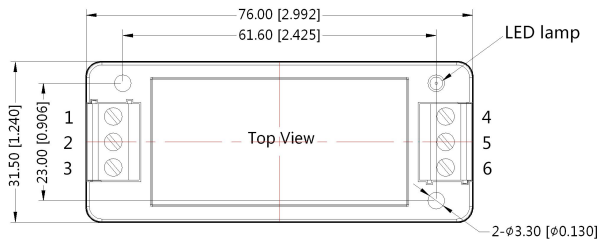


Horizontal Package (with heat sink) Dimensions

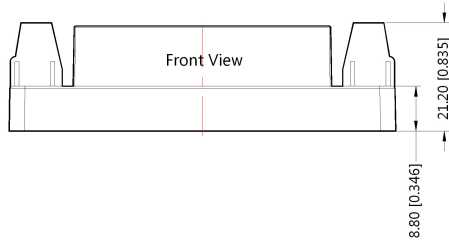


VRB_LD-15WR3A2S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



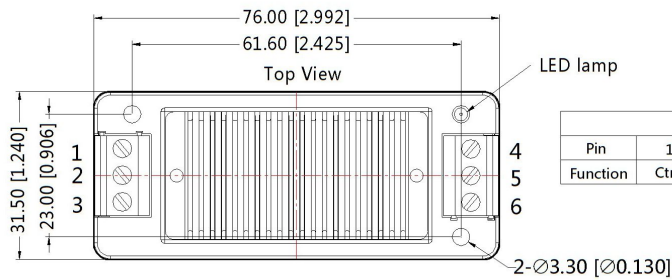
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo



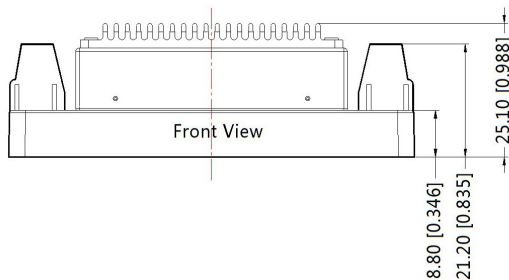
Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

VRB_LD-15WHR3A2S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



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

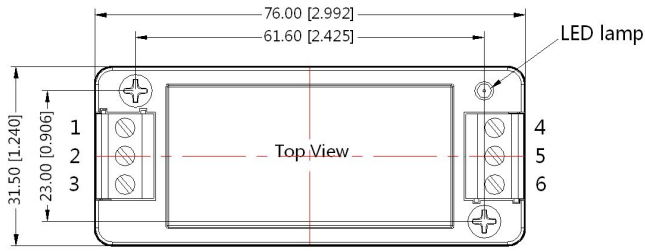


Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]

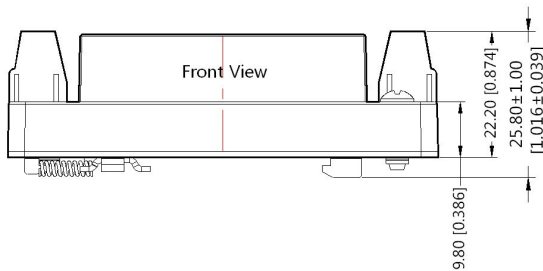
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VRB_LD-15WR3A4S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



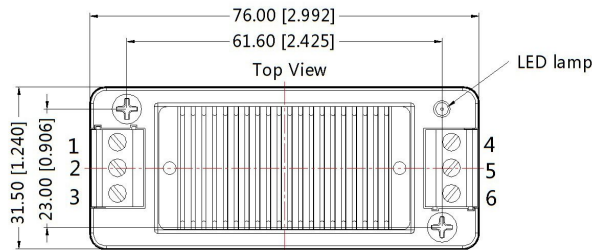
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo



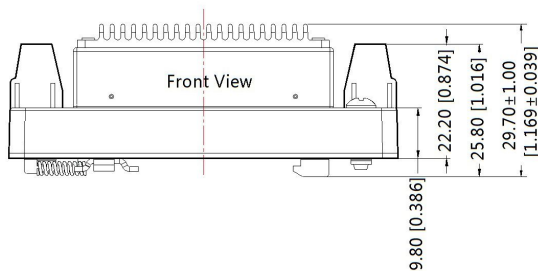
Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

VRB_LD-15WHR3A4S(with heat sink) Dimensions

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]

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. The Packing bag number of Horizontal package :58200035(without heat sink), 58200051(with heat sink, A2S/ A4S package number: 58220022;
2. The max. capacitive load should be tested within the input voltage range and under full load conditions;
3. 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;
4. All index testing methods in this datasheet are based on our Company's corporate standards;
5. The performance parameters of the product models listed in this manual are as above, but some parameters of non-standard model products may exceed the requirements mentioned above. Please contact our technicians directly for specific information;
6. We can provide product customization service;
7. Specifications of this product are subject to change without prior notice.

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