

10W, wide input voltage, isolated & regulated output DC/DC converter



### FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 90%
- Isolation voltage: 1.5K VDC
- Output short circuit, 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)
- Meet CISPR22/EN55022 CLASS A, without external components
- EN60950 approval
- International standard pin-out

**CE** Patent Protection **RoHS**

VRA\_(X)D-10WR2 & VRB\_(X)D-10WR2 series are isolated 10W DC-DC products with 2:1 input voltage. They feature efficiency up to 90%, 1500VDC isolation, operating temperature of -40°C to +85°C, output over-voltage protection, short-circuit protection and EMI meets CISPR22/EN55022 CLASS A, "XD" means product without Ctrl pin; only contains "D" means product with Ctrl pin; which make them widely applied in battery power supplies, industrial control, electricity, instruments, communication fields. And extension package A2S and A4S also enable them with reverse voltage protection.

### Selection Guide

certification	Part No. ①	Input Voltage (VDC)		Output		Efficiency ③ (%, Min./Typ.) @ Full Load	Max. Capacitive Load ④ (μF)		
		Nominal (Range)	Max. ②	Output Voltage (VDC)	Output Current (mA) (Max./Min.)				
--	VRA1205(X)D-10WR2	12 (9-18)	20	±5	±1000/±50	80/82	680		
	VRA1212(X)D-10WR2			±12	±416/±21	84/86	220		
	VRA1215(X)D-10WR2			±15	±333/±16	85/87	100		
	VRA1224(X)D-10WR2			±24	±208/±10	85/87	47		
CE	VRB1203(X)D-10WR2			3.3	2400/120	75/77	2200		
--	VRB1205(X)D-10WR2			5	2000/100	80/82	2200		
CE	VRB1209XD-10WR2			9	1111/55	83/85	470		
CE	VRB1212(X)D-10WR2			12	833/42	84/86	470		
--	VRB1215(X)D-10WR2			15	667/33	85/87	220		
--	VRB1224(X)D-10WR2			24	416/21	86/88	100		
CE	VRA2405(X)D-10WR2	24 (18-36)	40	±5	±1000/±50	81/83	680		
	VRA2412(X)D-10WR2			±12	±416/±21	84/86	330		
	VRA2415(X)D-10WR2			±15	±333/±16	86/88	220		
--	VRA2424(X)D-10WR2			±24	±208/±10	85/87	100		
CE	VRB2403(X)D-10WR2			3.3	2400/120	75/77	2200		
CE	VRB2405(X)D-10WR2			5	2000/100	82/84	2200		
--	VRB2409XD-10WR2			9	1111/55	84/86	470		
CE	VRB2412(X)D-10WR2			12	833/42	86/88	680		
CE	VRB2415(X)D-10WR2			15	667/33	88/90	330		
--	VRB2424(X)D-10WR2			24	416/21	85/87	100		
--	VRA4805(X)D-10WR2			48 (36-75)	80	±5	±1000/±50	81/83	680
CE	VRA4812(X)D-10WR2					±12	±416/±21	86/88	470
--	VRA4815(X)D-10WR2	±15	±333/±16			87/89	220		
--	VRA4824(X)D-10WR2	±24	±208/±10			86/88	100		
CE	VRB4803(X)D-10WR2	3.3	2400/120			76/78	2200		
CE	VRB4805(X)D-10WR2	5	2000/100			80/82	2200		

CE	VRB4812(X)D-10WR2	48 (36-75)	80	12	833/42	86/88	820
--	VRB4815(X)D-10WR2			15	667/33	87/89	470
CE	VRB4824(X)D-10WR2			24	416/21	86/88	220

**Notes:**

- ① "X" means product without Ctrl pin; Part No. with suffix of "A2S" means chassis mounting and suffix of "A4S" means DIN-Rail mounting (e.g. VRB2405XD-10WR2A2S means chassis mounting without Ctrl pin; VRB2405D-10WR2A4S means DIN-Rail mounting with Ctrl pin);
- ② Exceeding the maximum input voltage may cause permanent damage;
- ③ The efficiency of products with chassis mounting or DIN-Rail mounting is 2% lower than the DIP package ones due to the reverse voltage protection;
- ④ For the dual output modules, the capacitive loads of positive and negative outputs are the same.

### Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Input Current (full load / no-load)	12VDC nominal input series, nominal input voltage	3.3V Output	--	857/25	--	mA
		Others	--	980/25	--	
	24VDC nominal input series, nominal input voltage	3.3V Output	--	428/12	--	
		Others	--	481/12	--	
48VDC nominal input series, nominal input voltage	3.3V Output	--	211/6	--		
	Others	--	242/6	--		
Reflected Ripple Current	12VDC nominal input series, nominal input voltage	--	20	--	VDC	
	24VDC nominal input series, nominal input voltage	--	20	--		
	48VDC nominal input series, nominal input voltage	--	20	--		
Surge Voltage (1sec. max.)	12VDC nominal input series	-0.7	--	25	VDC	
	24VDC nominal input series	-0.7	--	50		
	48VDC nominal input series	-0.7	--	100		
Starting Voltage	12VDC nominal input series	--	--	9	VDC	
	24VDC nominal input series	--	--	18		
	48VDC nominal input series	--	--	36		
Input Filter		PI filter				
Ctrl function *	Module turn-on	Ctrl pin floating or connected to TTL high level(3.5-12VDC)				
	Module turn-off	Ctrl pin connected to GND or low level(0-1.2VDC)				
	Input current when switched off	--	1	3	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	Primary output	--	±1	±2	%	
	Secondary output	--	±1	±2		
Line Regulation	Full load, the input voltage is from low to high	Primary side	--	±0.2	±0.5	%
		Secondary side	--	±0.5	±1	
Load Regulation	5%-100% load	--	±0.5	±1		
Cross Regulation	Dual output, primary output with 50% loading, secondary output with 10%-100% loading	--	--	±5		
Transient Recovery Time	25% load step change	--	300	500	μs	
Transient Response Deviation		--	±3	±5	%	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise*	20MHz bandwidth	--	40	80	mV p-p	
Output Over-voltage Protection	Input voltage range	110	120	140	%Vo	
Short circuit Protection		Continuous short-circuit				

Note: \*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	1500	--	--	VDC
Insulation Resistance	Input-output, isolation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	1000	--	pF
Operating Temperature	see Fig. 1	-40	--	+85	°C
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		10-55Hz, 10G, 30 Min. along X, Y and Z			
Switching Frequency	PWM Mode	--	350	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours

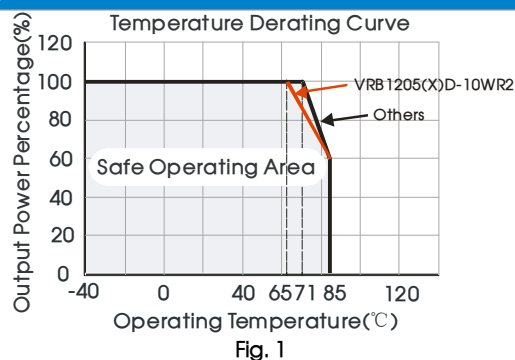
Physical Specifications

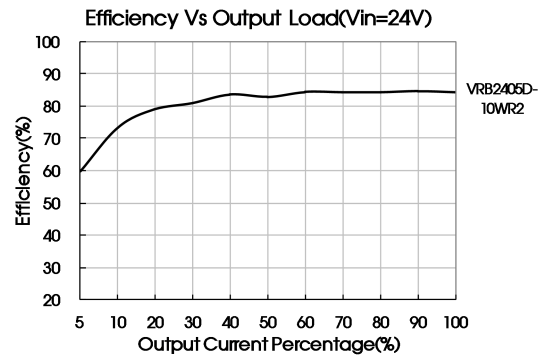
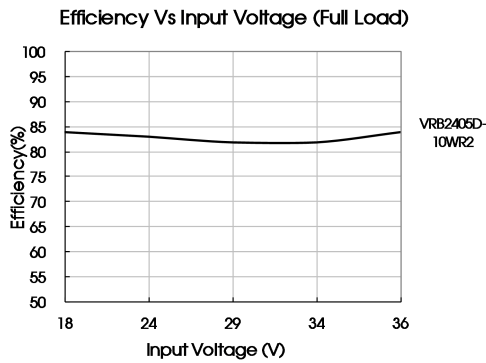
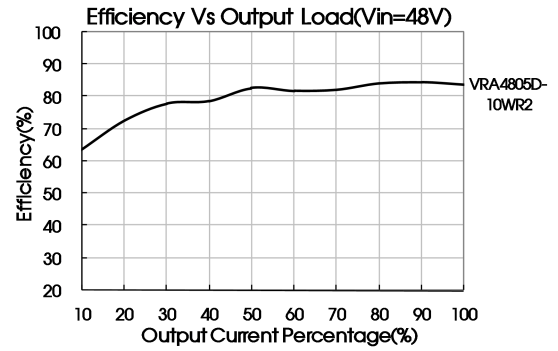
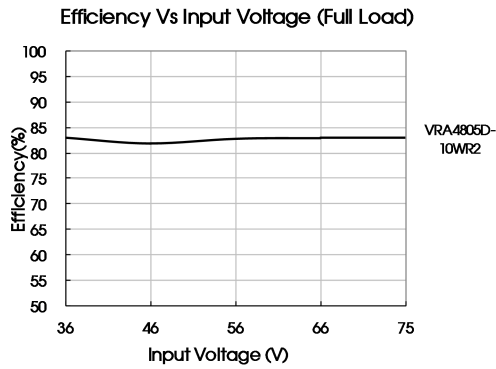
Casing Material	Aluminum alloy	
Dimension	Horizontal package	50.80*25.40*11.80 mm
	A2S wiring package	76.00*31.50*21.20 mm
	A4S rail package	76.00*31.50*25.80 mm
Weight	Horizontal package/ A2S wiring package/ A4S rail package	
Cooling Method	Free air convection	

EMC Specifications

EMI	CE	CISPR22/EN55022	CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit)	
	RE	CISPR22/EN55022	CLASS A (without external components)/ 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
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70%	perf. Criteria B

Product Characteristic Curve





## Design Reference

### 1. Recommended circuit

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  $C_{in}$  and  $C_{out}$  or select capacitors of low equivalent impedance, and ensure the capacitance should be lower than the max. capacitive load of the product.

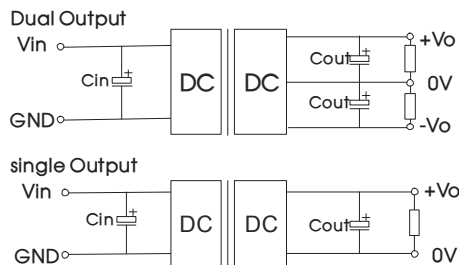


Fig. 2

Vin	Cin	Cout
12V	100 $\mu$ F	10 $\mu$ F
24V/48V	10 $\mu$ F - 47 $\mu$ F	

### 2. EMC solution-recommended circuit

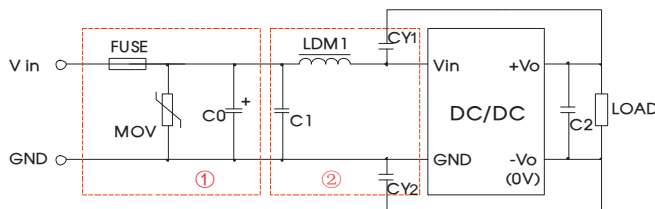


Fig. 3

Note: Part ① in the Fig. 3 is for EMS test, part ② is for EMI filtering; parts ① and ② can be added based on actual requirement.

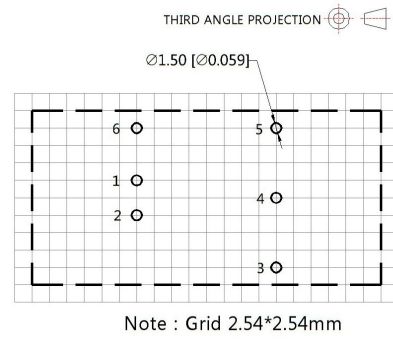
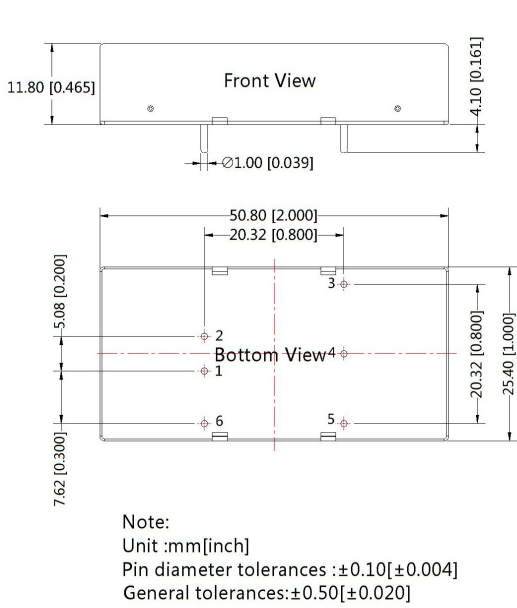
#### Parameter description

Model	Vin: 12V	Vin: 24V	Vin: 48V
FUSE	Choose according to actual input current		
MOV	S14K20	S20K30	S14K60
C0	680 $\mu$ F/25V	330 $\mu$ F/50V	330 $\mu$ F/100V
C1	1 $\mu$ F/50V		1 $\mu$ F/100V
C2	Refer to the Cout in Fig.2		
LDM1	4.7 $\mu$ H		
CY1	1nF/2KV		
CY2	1nF/2KV		

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

4. For more information about Mornsun EMC Filter products, please visit [www.mornsun-power.com](http://www.mornsun-power.com) to download the Selection Guide of EMC Filter

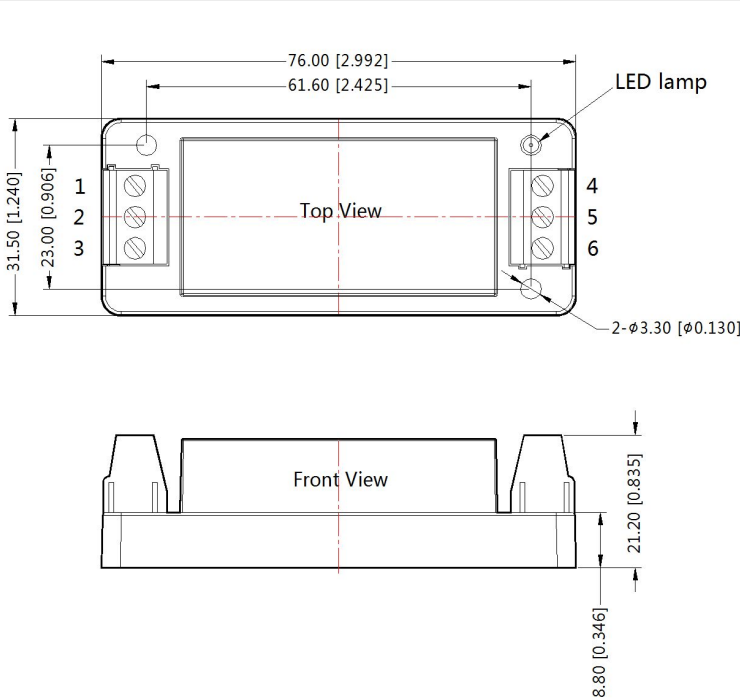
Dimensions and Recommended Layout



Pin-Out		
Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	No Pin	0V
5	0V	-Vo
6*	Ctrl	Ctrl

\* VRA(B)\_XD-10WR2 series have no pin.

VRA\_(X)D-10WR2A2S & VRB\_(X)D-10WR2A2S Chassis Mounting



THIRD ANGLE PROJECTION


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

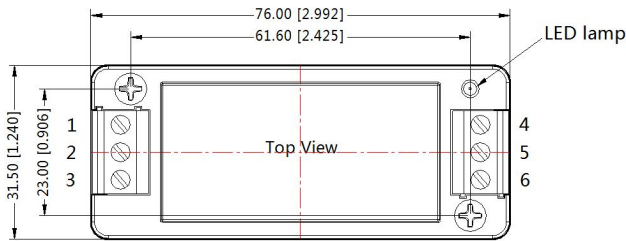
\*VRA/B\_XD-10WR2 series have no pin

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



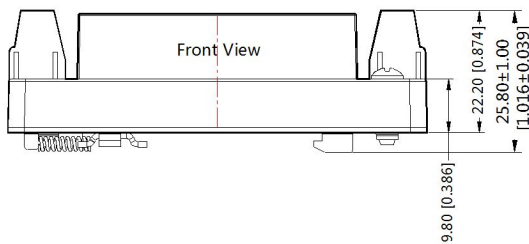
VRA\_(X)D-10WR2A4S & VRB\_(X)D-10WR2A4S Din-Rail Mounting

THIRD ANGLE PROJECTION 



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

\*VRA/B\_XD-10WR2 series have no pin



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

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from [www.mornsun-power.com](http://www.mornsun-power.com). The Packing bag number of Horizontal package : 58200035.A2S/A4S Packing Bag Number: 58220022;
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 recommended unbalance degree of the dual output module load is  $\leq \pm 5\%$ ; if the degree exceeds  $\pm 5\%$ , than the product performance cannot be guaranteed to comply with all parameters in the datasheet. Please contact our technicians directly for specific information;
4. The maximum capacitive load offered were tested at input voltage range and full load;
5. 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;
6. All index testing methods in this datasheet are based on Company's corporate standards;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Specifications are subject to change without prior notice.

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