

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
- EN60950 approval
- International standard pin-out

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

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~+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 Load④ (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		
--	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		
--	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		
--	VRB2415(X)D-10WR2			15	667/33	88/90	330		
--	VRB2424(X)D-10WR2			24	416/21	85/87	100		
CE	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 input	3.3V Output	--	857/25	880/42	mA
		Others	--	980/25	1042/42	
	24VDC input	3.3V Output	--	428/12	440/21	
		Others	--	481/12	515/21	
	48VDC input	3.3V Output	--	211/6	217/11	
		Others	--	242/6	261/11	
Reflected Ripple Current	12VDC input		--	20	--	
	24VDC input		--	20	--	
	48VDC input		--	20	--	
Input impulse Voltage (1sec. max.)	12VDC input		-0.7	--	25	VDC
	24VDC input		-0.7	--	50	
	48VDC input		-0.7	--	100	
Starting Voltage	12VDC input		--	--	9	
	24VDC input		--	--	18	
	48VDC input		--	--	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	Main output		--	±1	±2	%
	Secondary output		--	±1	±2	
Balance of Output Voltage	Dual output, balanced load		--	±0.5	±1.5	
Line Regulation	Full load, the input voltage is from low to high	Main 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
Over-voltage Protection	Input voltage range		110	120	140	%Vo
Short circuit Protection			Continuous			

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
Isolation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Isolation 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

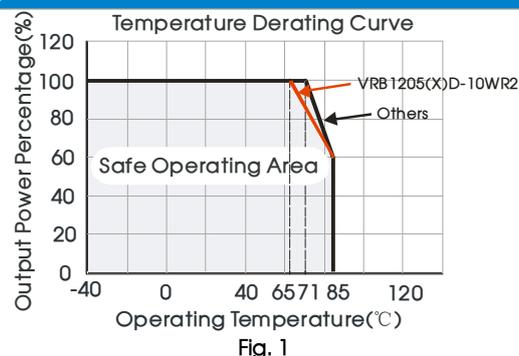
Physical Specifications

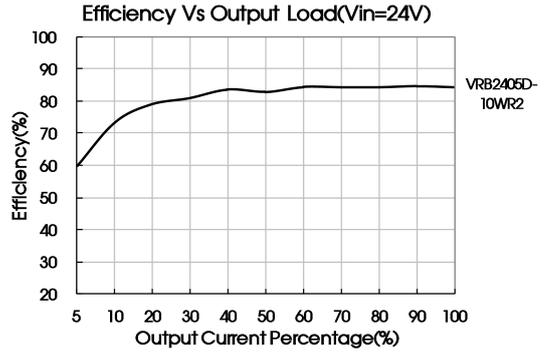
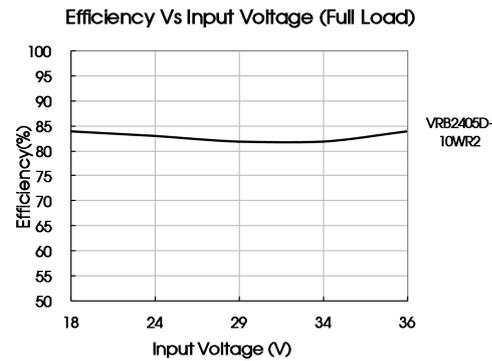
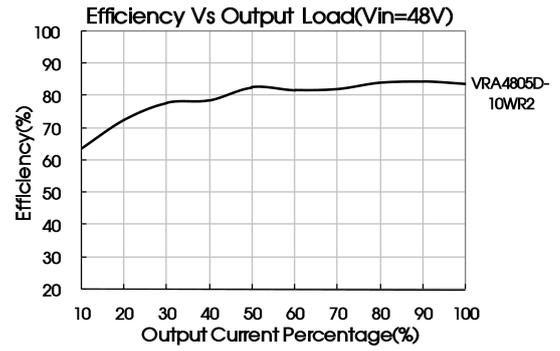
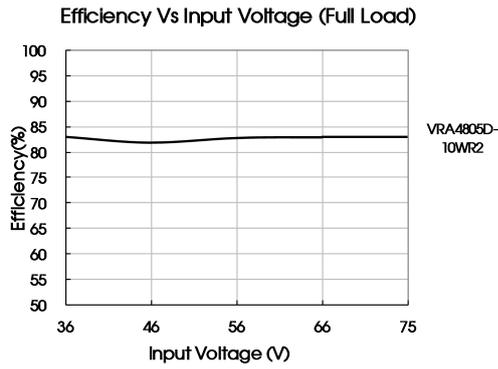
Casing Material		Aluminum alloy
Dimension	DIP	50.80*25.40*11.80 mm
	A2S chassis mounting	76.00*31.50*21.20 mm
	A4S DIN-Rail mounting	76.00*31.50*25.80 mm
Weight	DIP/A2S chassis mounting/A4S DIN-Rail mounting	22g/44g/64g(Typ.)
Cooling Method		Free convection

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
	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.

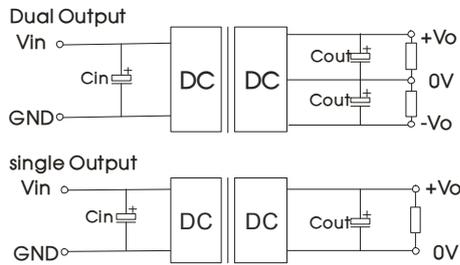


Fig. 2

Vin	Cin	Cout
12V	100μF	10μF
24V/48V	10μF ~47μF	

2. EMC solution-recommended circuit

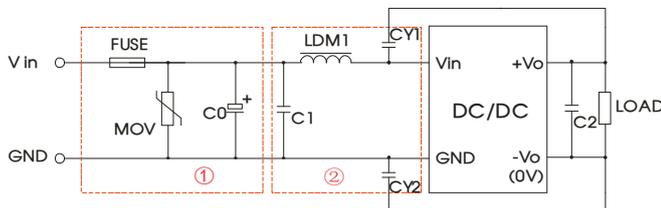


Fig. 3

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.

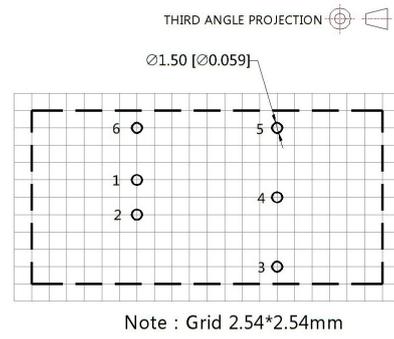
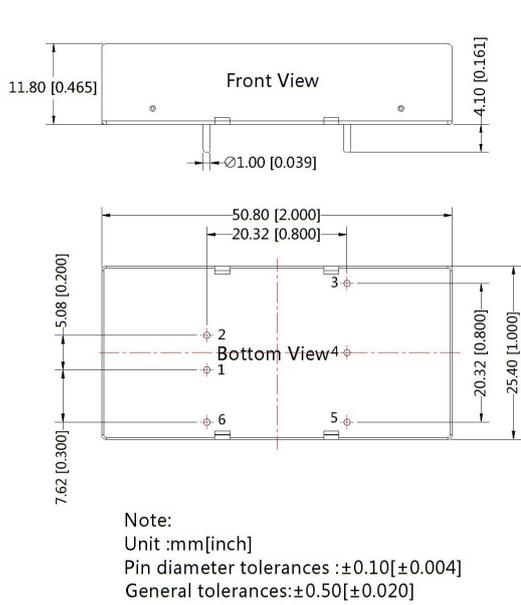
Parameter description

Model	Vin: 12V	Vin: 24V	Vin: 48V
FUSE	Choose according to actual input current		
MOV	S14K20	S20K30	S14K60
C0	680μF/25V	330μF/50V	330μF/100V
C1	1μF/50V		1μF/100V
C2	Refer to the Cout in Fig.2		
LDM1	4.7μH		
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 to download the Selection Guide of EMC Filter

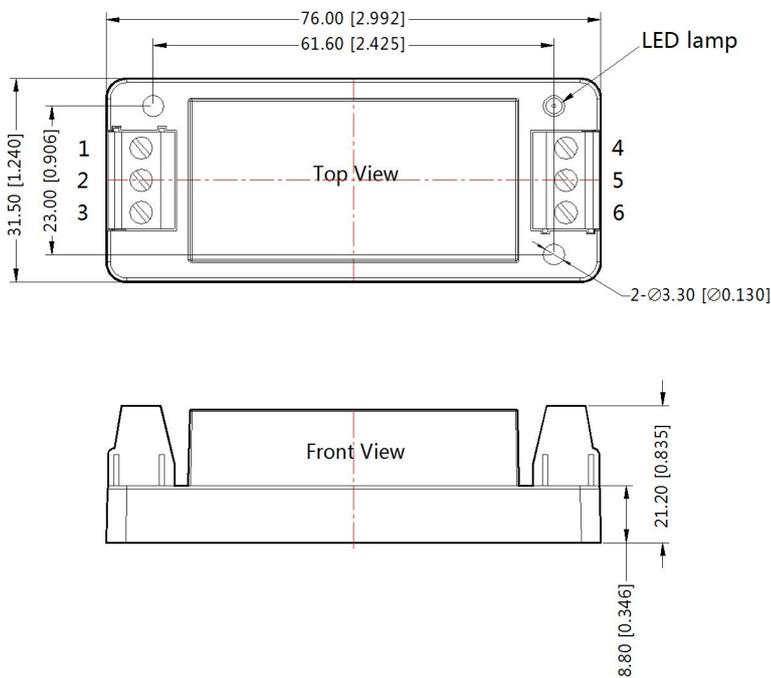
Dimensions and Recommended Layout



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

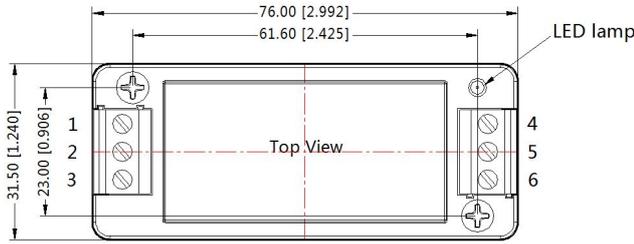
Pin-Out		
Pin	Single	Dual
1*	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	0V	-Vo
5	NC	0V
6	+Vo	+Vo

*VRA/B_XD-10WR2 series have no pin

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

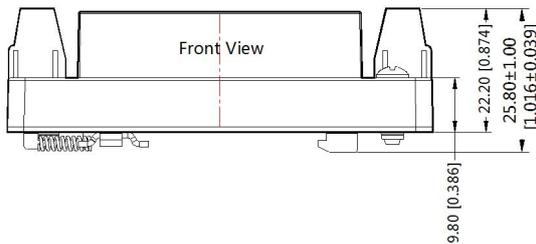
VRA_(X)D-10WR2A4S& VRB_(X)D-10WR2A4S Din-Rail Mounting

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]
 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,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 nominal input voltage 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 our Company's corporate standards;
7. 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;
8. We can provide product customization service;
9. Specifications are subject to change without prior notice.

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