

# DC/DC Converter

## VRA\_(X)D-10WR2 & VRB\_(X)D-10WR2 Series

10W, wide input isolated & regulated positive and negative dual/single output DC-DC converter



Patent Protection RoHS

### FEATURES

- Wide range of input voltage (2:1)
- Efficiency up to 90%
- Isolation voltage : 1.5K VDC
- Short circuit protection
- Output over-voltage protection
- Operating temperature range: -40° C to +85° C
- Six-sided metal shielding package
- International standard pin-out
- Low ripple & noise
- Meet CISPR22/EN55022 CLASS A
- A2S (wring mounting) and A4S (35mm rail mounting) products featuring anti-reverse connection for input
- Meet EN60950

VRA\_(X)D-10WR2 & VRB\_(X)D-10WR2 series products are of 10W output power, extremely wide range of voltage input of 9-18VDC, 18-36VDC, 36-75VDC isolation voltage of 1500VDC, output over-voltage protection and output short circuit protection with the bare component in compliance with CISPR22/EN55022 CLASS A; these products are widely used in fields such as industrial control, electric power, instruments and communication.

### Selection Guide

Part No. <sup>①</sup>	Input Voltage(VDC)		Output		Efficiency <sup>②</sup> (%,Typ.) @ Full Load	Max. Capacitive Load <sup>③</sup> (μF)	certification
	Nominal (Range)	Max. <sup>②</sup>	Output Voltage (VDC)	Output Current (mA) (Max./Min.)			
VRA1205(X)D-10WR2	12V (9-18)	20	±5	±1000/±50	82	680	
VRA1212(X)D-10WR2			±12	±416/±21	86	220	
VRA1215(X)D-10WR2			±15	±333/±16	87	100	
VRA1224(X)D-10WR2			±24	±208/±10	87	47	
VRB1203(X)D-10WR2			3.3	2400/120	77	2200	
VRB1205(X)D-10WR2			5	2000/100	82	2200	CE
VRB1212(X)D-10WR2			12	833/42	86	470	CE
VRB1215(X)D-10WR2			15	667/33	87	220	
VRB1224(X)D-10WR2			24	416/21	88	100	
VRA2405(X)D-10WR2			24V (18-36)	40	±5	±1000/±50	83
VRA2412(X)D-10WR2	±12	±416/±21			86	330	CE
VRA2415(X)D-10WR2	±15	±333/±16			88	220	CE
VRA2424(X)D-10WR2	±24	±208/±10			87	100	
VRB2403(X)D-10WR2	3.3	2400/120			77	2200	
VRB2405(X)D-10WR2	5	2000/100			84	2200	CE
VRB2412(X)D-10WR2	12	833/42			88	680	CE
VRB2415(X)D-10WR2	15	667/33			90	330	CE
VRB2424(X)D-10WR2	24	416/21			87	100	CE
VRA4805(X)D-10WR2	48V (36-75)	80			±5	±1000/±50	83
VRA4812(X)D-10WR2			±12	±416/±21	88	470	CE
VRA4815(X)D-10WR2			±15	±333/±16	89	220	
VRA4824(X)D-10WR2			±24	±208/±10	88	100	
VRB4803(X)D-10WR2			3.3	2400/120	78	2200	
VRB4805(X)D-10WR2			5	2000/100	82	2200	CE
VRB4812(X)D-10WR2			12	833/42	88	820	CE

### Selection Guide

Part No. <sup>①</sup>	Input Voltage(VDC)		Output		Efficiency ®(%Typ.) @ Full Load	Max. Capacitive Load <sup>④</sup> (μF)	certification
	Nominal (Range)	Max. <sup>②</sup>	Output Voltage (VDC)	Output Current (mA) (Max./Min.)			
VRB4815(X)D-10WR2	48V ( 36-75)	80	15	667/33	89	470	
VRB4824(X)D-10WR2			24	416/21	88	220	CE

Note:

- ①. "X" means the model without Ctrl pin, series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example VRB2405XD-10WR2A2S is chassis mounting without Ctrl pin, VRB2405D-10WR2A4S is DIN-Rail mounting with Ctrl pin.
- ②. Absolute maximum rating without damage on the converter, but it isn't recommended.
- ③. The efficiency of "A2S" and "A4S" is approx. 2% lower for the protection of inverse polarity.
- ④. For dual output converter, the given value is the same for each output.

### Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	12VDC input	--	25/1016	--	mA
	24VDC input	--	12/496	--	
	48VDC input	--	6/254	--	
Reflected Ripple Current	12VDC input	--	20	--	VDC
	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	mV
	24VDC input	--	--	18	
	48VDC input	--	--	36	
Input Filter		Pi filter			
Ctrl*	Module switch on	Ctrl suspended or connected to TTL high level (3.5-12VDC)			
	Module switch off	Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched off	--	1	3	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	±2	%
Balance of Output Voltage	Dual output, balanced load	--	±0.5	±1.5	
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	
Cross Regulation	Dual output, main circuit with 50% load, auxiliary circuit with 10%-100% load	--	--	±5	
Transient Recovery Time	25% load step change	--	300	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift Coefficient	Full load	--	--	±0.03	%/°C
Ripple*	20MHz bandwidth	--	15	35	mV p-p
Noise*		--	40	80	
Output Over-voltage Protection	Input voltage range	110	120	140	%Vo
Short circuit Protection		Continuous, self-recovery			

Note: \* Ripple and noise tested with "parallel cable" method, please see *DC-DC Converter Application Notes* for specific operation methods.

### 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	--	1000	--	pF
Operating Temperature	Derating if the temperature is $\geq 71^{\circ}\text{C}$ (see Fig. 1)*	-40	--	85	%
Storage Humidity	Non-condensing	5	--	95	°C
Storage Temperature		-55	--	125	
Max. Operating Temperature for Casing	Within the operating temperature curve	--	--	105	
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	
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

Note: \* VRB1205 (X) D-10WR2 temperature derating to 65 °C with full load , 85 °C corresponding load is constant.

### Physical Specifications

Casing Material	Aluminum alloy	
Package Dimensions	Horizontal package	50.8*25.4*11.8 mm
	A2S wiring package	76.0*31.5*21.2 mm
	A4S rail package	76.0*31.5*25.8 mm
Weight	Horizontal package/A2S wiring package/A4S rail package	22g/44g/64g(Typ.)
Cooling method	Free air convection	

### EMC Specifications

EMI	Conducted disturbance	CISPR22/EN55022	CLASS A (Bare component)/ CLASS B (see Fig.3-② for recommended circuit)
	Radiated emission	CISPR22/EN55022	CLASS A (Bare component)/ CLASS B (see Fig.3-② for recommended circuit)
EMS	Electrostatic discharge	IEC/EN61000-4-2	Contact $\pm 4\text{KV}$ perf. Criteria B
	Radiation immunity	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4	$\pm 2\text{KV}$ (see Fig.3-① for recommended circuit) perf. Criteria B
	Surge immunity	IEC/EN61000-4-5	$\pm 2\text{KV}$ (see Fig.3-① for recommended circuit) perf. Criteria B
	Conducted disturbance immunity	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

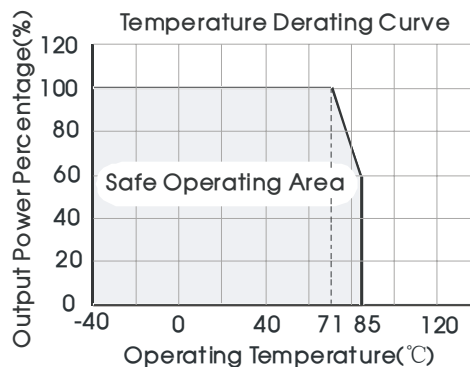
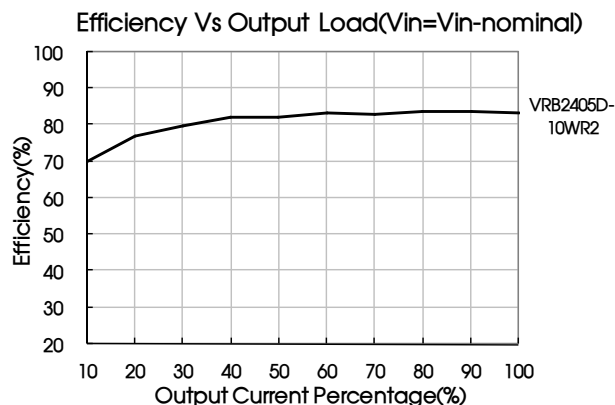
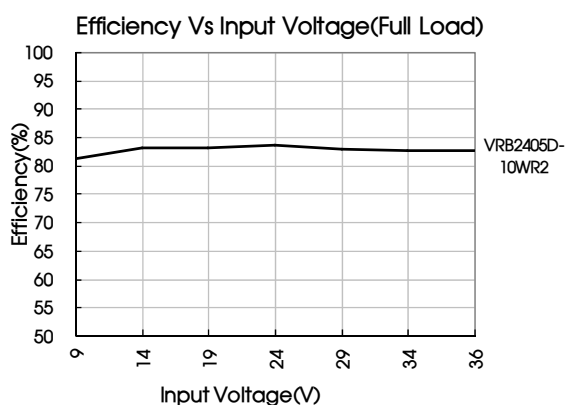
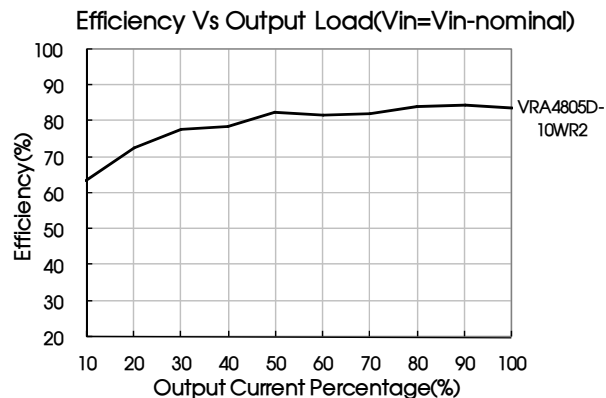
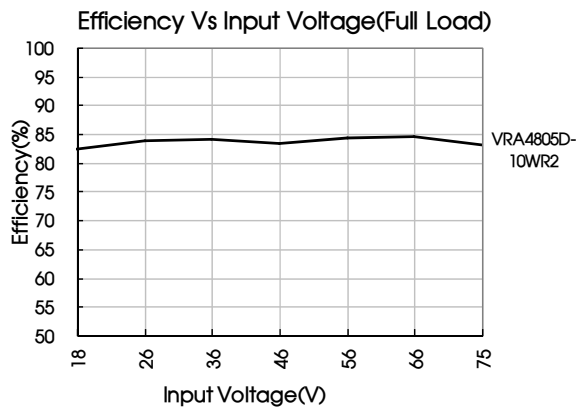


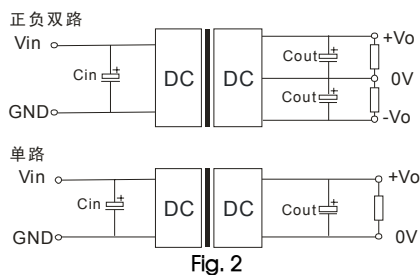
Fig. 1



## 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  $C_{in}$  and  $C_{out}$  or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.



$V_{in}$	$C_{in}$	$C_{out}$
12V	100 $\mu$ F	10 $\mu$ F
24V&48V	10 $\mu$ F ~47 $\mu$ F	

### 2. EMC solution-recommended circuit

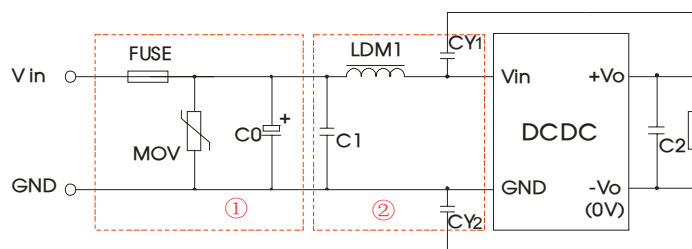


Fig. 3

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	$V_{in}$ : 12V	$V_{in}$ : 24V	$V_{in}$ : 48V
FUSE	Choose according to actual input current		
MOV	S14K25	S14K35	S14K60
C0	680 $\mu$ F/25V	330 $\mu$ F/50V	330 $\mu$ F/100V
C1	1 $\mu$ F/50V		1 $\mu$ F/100V
LDM1	4.7 $\mu$ H		
CY1	1nF/2KV		
CY2	1nF/2KV		
C2	Refer to the $C_{out}$ in Fig.2		

EMC solution-recommended circuit PCB layout

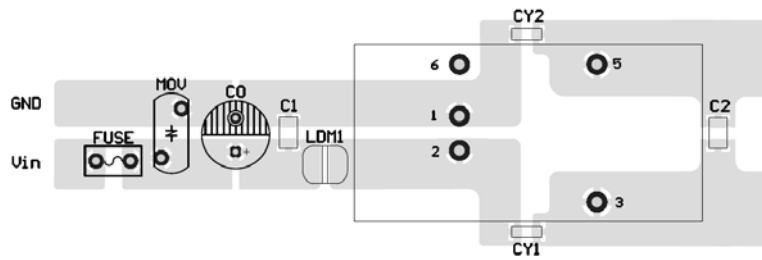
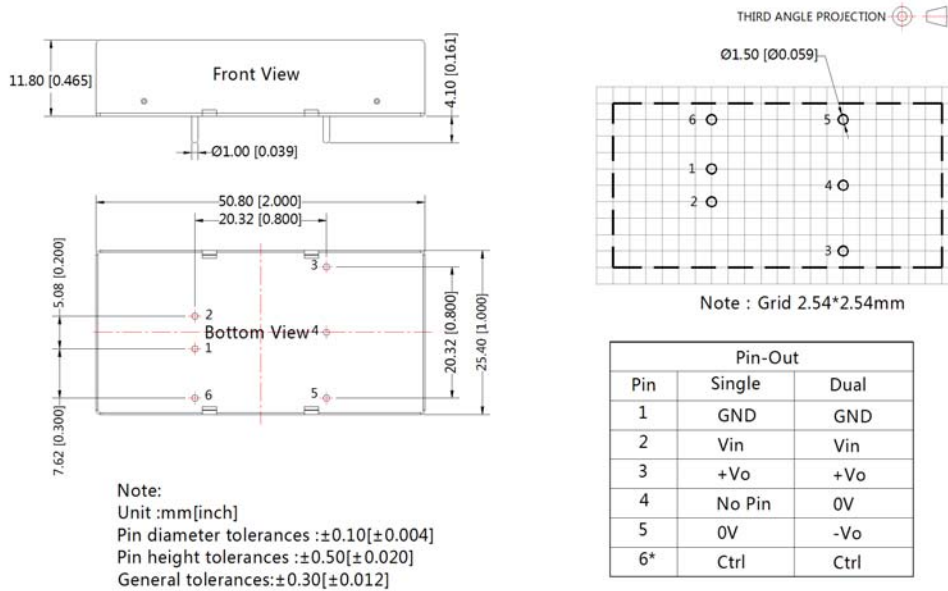


Fig. 4

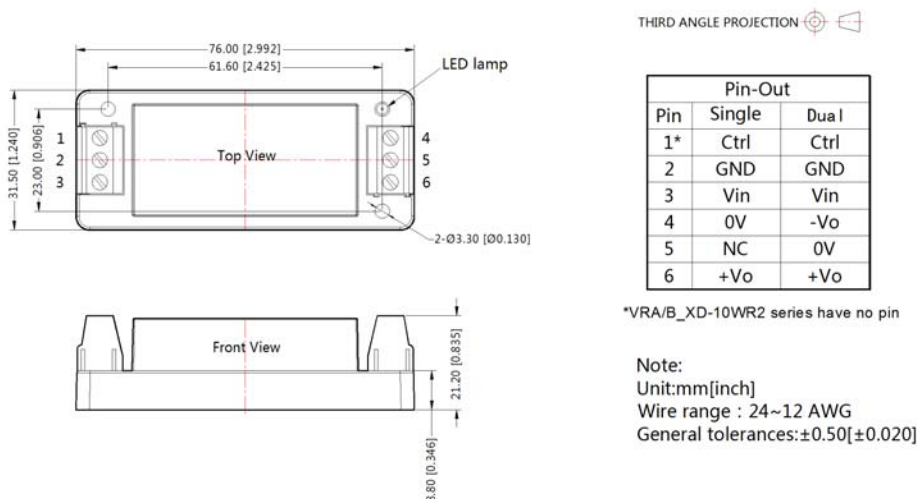
Note: the min. distance of the bonding pads between input & output isolation capacitors (CY1/CY2) shall be  $\geq 2\text{mm}$ .

3. The product does not support output in parallel with power per liter or hot-plug use
4. For more information please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout

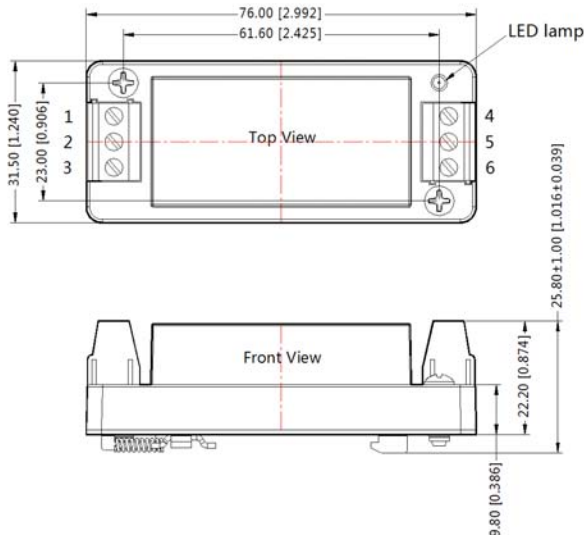


VRA\_(X)D-10WR2A2S & VRB\_(X)D-10WR2A2S Wiring Package



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

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]

Note:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package : 58200035, the Packing bag number of A2S/A4S package:58220022;
2. The min. load shall be no lower than 5% , or the output ripple may increase rapidly; If the product is operated under the min. required load, the product performance cannot be guaranteed to comply with all performance indexes in the Manual, but the reliability of the product will not be influenced;
3. The unbalance degree of the recommended dual output module load:  $\leq 5\%$ ; if the degree exceeds  $\pm 5\%$ , then the product performances cannot be guaranteed to comply with all the performance indicators in the manual, and please directly contact our technicians for specific information;
4. The max. capacitive load should be tested within the input voltage range and under full load conditions;
5. Unless otherwise specified, data in this datasheet should be tested under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75% when inputting nominal voltage and outputting rated load;
6. All index testing methods in this datasheet are based on our Company's corporate standards;
7. The performance indexes of the product models listed in this datasheet are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technicians for specific information;
8. We can provide product customization service;
9. Specifications of this product are subject to changes without prior notice.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Luogang District, Guangzhou, P. R. China  
Tel: 86-20-38601850-8801 Fax: 86-20-38601272 E-mail: [info@mornsun.cn](mailto:info@mornsun.cn)