

DC/DC Converter

VRA_ZP-6WR3 & VRB_ZP-6WR3 Series

MORNSUN®

6W, wide input, isolated & regulated dual/
single output, DIP package, DC-DC converter



CE Patent Protection RoHS



VRA_ZP-6WR3 & VRB_ZP-6WR3 series products are of 6W output power, wide range of voltage input of 4.5-9VDC, 9-18VDC, 18-36VDC, 36-75VDC isolation voltage of 1500VDC, input under-voltage protection, output over-voltage, over-current, short circuit protection and EMI meets CISPR32/EN55032 CLASS A without external components (except for 5VDC input); these products are widely used in fields such as industrial control, electric power, instruments and communication.

FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 88%
- No-load power consumption as low as 0.09W
- Isolation voltage :1.5K VDC
- Operating temperature range: -40℃ to +85℃
- Meet CISPR32/EN55032 CLASS A without external components (except for 5VDC input)
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- International standard pin-out
- EN60950 approval

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Efficiency ^② (%M in./Typ.) @ Full Load	Max. Capacitive Load ^③ (μF)
		Nominal (Range)	Max. ^①	Output Voltage (VDC)	Output Current (mA) (Max./Min.)		
--	VRA0505ZP-6WR3	5 (4.5-9)	12	±5	±600/0	76/78	1000
	VRA0512ZP-6WR3			±12	±250/0	82/84	470
	VRA0515ZP-6WR3			±15	±200/0	82/84	220
	VRA0524ZP-6WR3			±24	±125/0	82/84	100
	VRB0505ZP-6WR3			5	1200/0	76/78	1000
	VRB0512ZP-6WR3			12	500/0	82/84	470
	VRB0515ZP-6WR3			15	400/0	82/84	220
	VRB0524ZP-6WR3			24	250/0	82/84	100
CE	VRA1205ZP-6WR3	12 (9-18)	20	±5	±600/0	78/80	680
	VRA1212ZP-6WR3			±12	±250/0	82/84	330
	VRA1215ZP-6WR3			±15	±200/0	83/85	220
	VRA1224ZP-6WR3			±24	±125/0	82/84	100
	VRB1203ZP-6WR3			3.3	1500/0	73/75	1800
	VRB1205ZP-6WR3			5	1200/0	78/80	1000
	VRB1212ZP-6WR3			12	500/0	82/84	470
	VRB1215ZP-6WR3			15	400/0	83/85	220
	VRB1224ZP-6WR3			24	250/0	83/85	100
	VRA2405ZP-6WR3	24 (18-36)	40	±5	±600/0	81/83	680
	VRA2412ZP-6WR3			±12	±250/0	84/86	330
	VRA2415ZP-6WR3			±15	±200/0	85/87	220
	VRA2424ZP-6WR3			±24	±125/0	83/85	100
	VRB2403ZP-6WR3			3.3	1500/0	76/78	1800
	VRB2405ZP-6WR3			5	1200/0	80/82	1000
	VRB2412ZP-6WR3			12	500/0	83/85	470
	VRB2415ZP-6WR3			15	400/0	84/86	220
	VRB2424ZP-6WR3			24	250/0	84/86	100

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2018.05.05-A/2

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CE	VRA4805ZP-6WR3	48 (36-75)	80	±5	±600/0	81/83	680
	VRA4812ZP-6WR3			±12	±250/0	85/87	330
	VRA4815ZP-6WR3			±15	±200/0	83/85	220
	VRA4824ZP-6WR3			±24	±125/0	83/85	100
	VRB4803ZP-6WR3			3.3	1500/0	77/79	1800
	VRB4805ZP-6WR3			5	1200/0	81/83	1000
	VRB4812ZP-6WR3			12	500/0	85/87	470
	VRB4815ZP-6WR3			15	400/0	86/88	220
	VRB4824ZP-6WR3			24	250/0	85/87	100

Notes:

- ① Absolute maximum rating without damage on the converter, but it isn't recommended;
- ② Efficiency is measured in nominal input voltage and rated output load;
- ③ The capacitive loads of positive and negative outputs are identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit	
Input Current (full load / no-load)	5VDC input	5V / ±5V output	--	1538/10	1578/30	mA	
		Others	--	1428/10	1463/30		
	12VDC input	3.3V output	--	550/7	566/25		
		Others	--	607/7	641/25		
	24VDC input	3.3V output	--	265/7	272/25		
		Others	--	296/7	313/25		
	48VDC input	3.3V output	--	131/7	134/25		
		Others	--	147/7	155/25		
Reflected Ripple Current	5VDC input		--	50	--	VDC	
	Others		--	20	--		
Surge Voltage (1sec. max.)	5VDC input		-0.7	--	16		
	12VDC input		-0.7	--	25		
	24VDC input		-0.7	--	50		
	48VDC input		-0.7	--	100		
Starting Voltage	5VDC input		--	--	4.5		
	12VDC input		--	--	9		
	24VDC input		--	--	18		
	48VDC input		--	--	36		
Shutdown Voltage	5VDC input		3	3.5	--		
	12VDC input		5.5	6.5	--		
	24VDC input		13	15	--		
	48VDC input		26	30	--		
Input Filter			Pi filter				
Hot Plug			Unavailable				

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	5VDC input, 0%-100% load	Positive output	--	±1	±2	%
		Negative output	--	±1	±3	
	Others ①	Positive output	--	±1	±3	
		Negative output	--	±1	±3	
Line Regulation	Full load, the input voltage is from low voltage to high voltage	Positive output	--	±0.2	±0.5	
		Negative output	--	±0.5	±1	
Load Regulation®	5VDC input, 0%-100% load	Positive output	--	--	±1	
		Negative output	--	--	±1.5	

Load Regulation ^②	other input, 5%-100% load ^②	Positive output	--	±0.5	±1	%
		Negative output	--	±0.5	±1.5	
Cross Regulation	Dual output, main circuit with 50% load, auxiliary circuit with 10%-100% load		--	--	±5	
Transient Recovery Time	25% load step change, Nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V/5V/±5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise ^③	20MHz bandwidth, 5%-100% load		--	--	100	mV p-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	140	190	%Io
Short circuit Protection			Continuous, self-recovery			
Note: ①At 0%~5% load, the Max. output voltage accuracy of ±5VDCoutput converter is ±5%. ②When testing from 0% to 100%load working conditions, load regulation index of ±5%; ③0%-5% load ripple&Noise is no more than 5%Vo.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
Insulation Resistance	Input-output, insulation 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	
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		10-150Hz, 5G, 30 Min. along X, Y and Z			
Switching Frequency *	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours

Note: * This series of products using reduced frequency technology, the switching frequency is test value of full load. When the load is reduced to below 50%, the switching frequency decreases with decreasing load.

Physical Specifications

Casing Material		Aluminum alloy
Package Dimensions		32.00*20.00*10.80mm
Weight	5VDC input	12g(Typ.)
	Others	14g(Typ.)
Cooling Method		Free air convection

EMC Specifications

EMI	CE	5VDC input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
		Others	CISPR32/EN55032	CLASS A (Bare component)/ CLASS B (see Fig.4-② for recommended circuit)	
	RE	5VDC input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
		Others	CISPR32/EN55032	CLASS A (Bare component)/ CLASS B (see Fig.4-② for recommended circuit)	
EMS	ESD	5VDC input	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS	Others	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	5VDC input	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
		Others	IEC/EN61000-4-4	±2KV (see Fig.4-① for recommended circuit)	perf. Criteria B
	Surge	5VDC input	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
		Others	IEC/EN61000-4-5	line to line ±2KV (see Fig.4-① for recommended circuit)	perf. Criteria B
	CS		IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Product Characteristic Curve

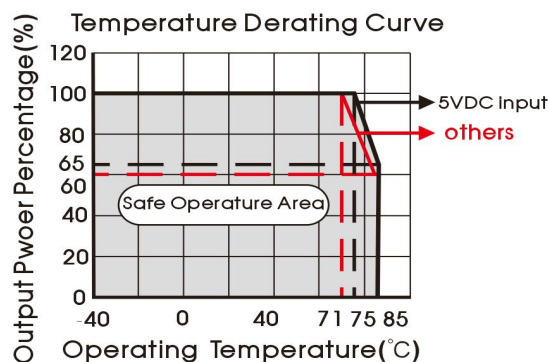
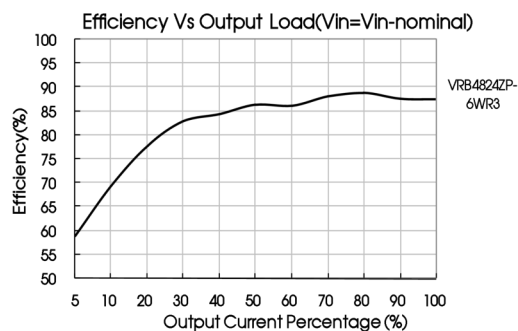
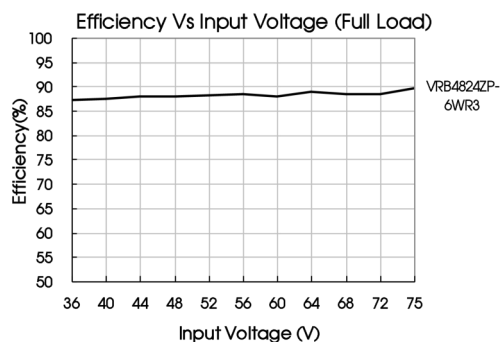
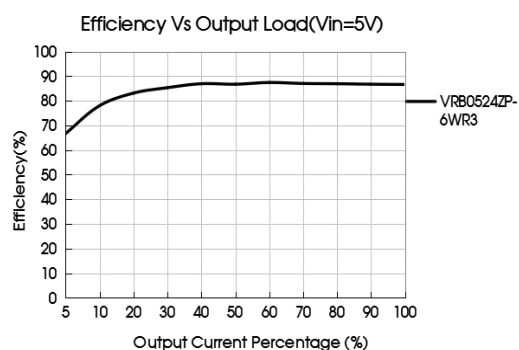
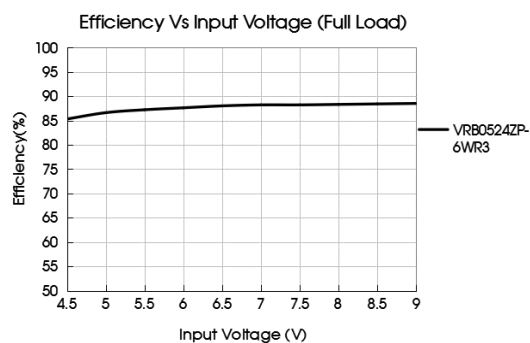
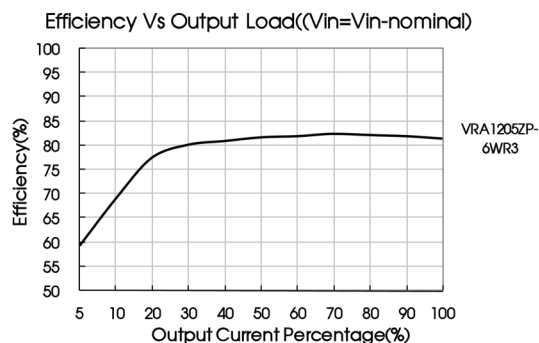
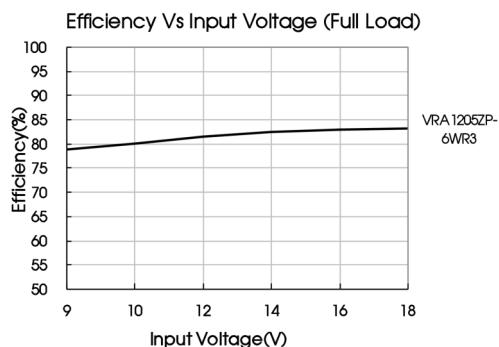
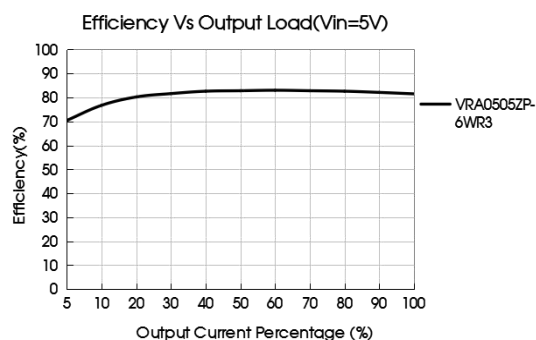
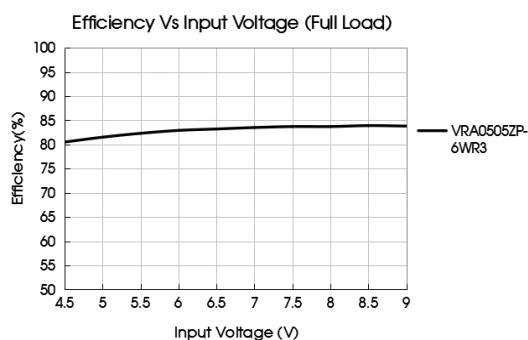


Fig. 1



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 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.

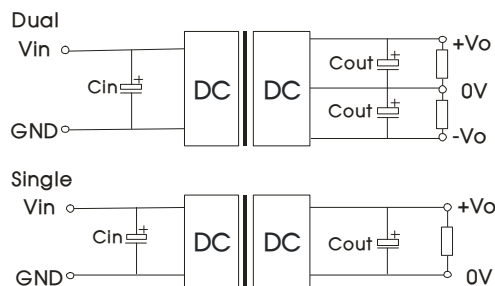
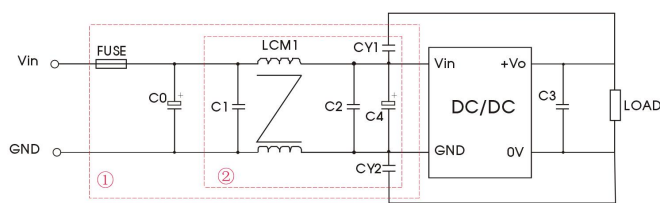


Fig. 2

Vin(VDC)	Cin	Cout
5/12/24	100μF	10μF
48	10μF - 47μF	

2. EMC solution-recommended circuit

5VDC input



Notes: Part ① in the Fig. 3 is used for EMC test and part ② for EMI filtering; selected based on needs.

Parameter description:

Model	Vin: 5V
FUSE	Choose according to actual input current
C0	2200μF/35V
C1/C2	4.7μF/50V
C3	Refer to the Cout in Fig.2
C4	100μF/35V
LCM1	2.2mH, recommended to use MORNSUN's FL2D-30-222
CY1, CY2	2.2nF/2KV

12VDC/24VDC/48VDC input

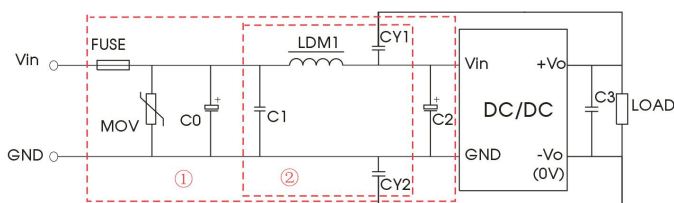


Fig. 4

Notes: Part ① in the Fig. 4 is used for EMC test and part ② for EMI filtering; selected based on needs.

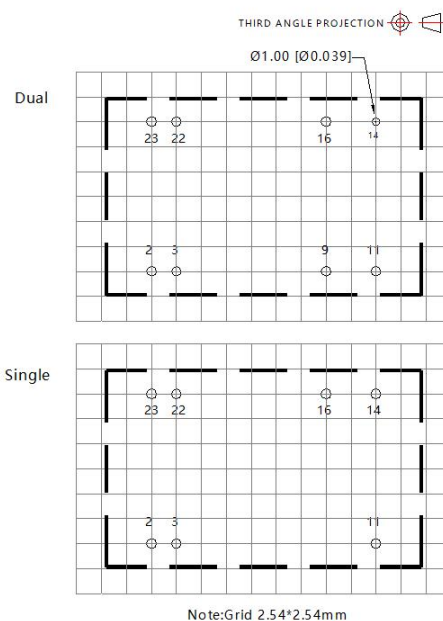
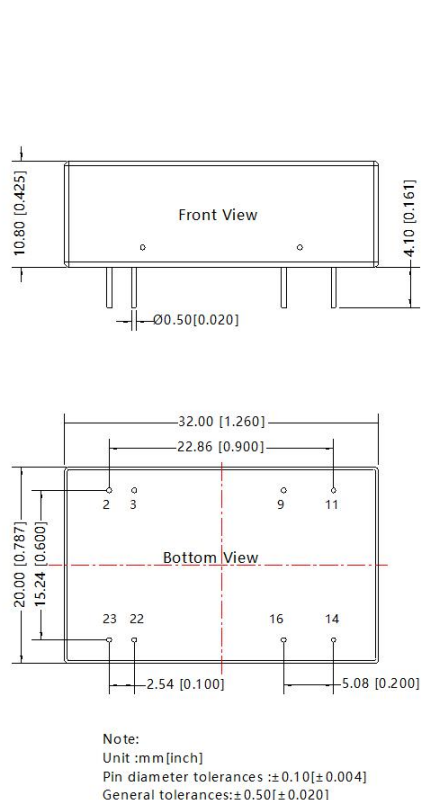
Parameter description:

Model	Vin:12V	Vin:24V	Vin:48V
FUSE	Choose according to actual input current		
MOV	S14K20	S20K30	S14K60
C0	1000μF/35V	1000μF/50V	680μF/100V
C2	100μF/35V	100μF/50V	100μF/100V
C1	1μF/50V		1μF/100V
C3	Refer to the Cout in Fig.2		
LDM1	4.7μH		
CY1, CY2	1nF/2KV		

3. The product does not support output in parallel with power per liter

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

Dimensions and Recommended Layout



Pin-Out		
Pin	Single	Dual
2,3	GND	GND
9*	No Pin	0V
11	NC	-Vo
14	+Vo	+Vo
16	0V	0V
22,23	Vin	Vin

* Note: 5V input product without 9th pin
NC: Pin to be isolated from circuit

Notes:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number : 58210008;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. 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;
4. All index testing methods in this datasheet are based on Company's corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. 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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