

DC/DC Converter

VRA_YMD-10WR3 & VRB_YMD-10WR3 Series

MORNSUN®

10W isolated DC-DC converter in DIP package,
Wide input and regulated dual/single output



FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 88%
- No load power consumption as low as 0.12W
- I/O isolation test voltage 1.5K VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40°C ~ +85°C
- Meets CISPR32/EN55032 CLASS A, without extra components
- Industry standard pin-out
- EN60950, EN62368 approved



Patent Protection RoHS



VRA_YMD-10WR3 & VRB_YMD-10WR3 series are isolated 10W DC-DC converter products with a 2:1 input voltage range. They feature efficiencies up to 88%, 1500VDC input to output isolation, operating temperature of -40°C ~ +85°C, input under-voltage protection, output over-voltage, over-current and short circuit protection. They meet CLASS A CISPR32/EN55032 EMI standards(except 5VDC nominal input) without external components and they are widely used in applications such as industrial controls, electric power, instrumentation and communications.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency ^④ (%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal ^② (Range)	Max. ③	Voltage (VDC)	Current(mA) Max./Min.		
CE	VRA0505YMD-10WR3	5 (4.5-9)	12	±5	±1000/0	76/78	1000
	VRA0512YMD-10WR3			±12	±417/0	81/83	470
	VRA0515YMD-10WR3			±15	±334/0	82/84	330
	VRA0524YMD-10WR3			±24	±209/0	81/83	100
	VRB0505YMD-10WR3			5	2000/0	83/85	470
	VRB0512YMD-10WR3			12	834/0	81/83	470
	VRB0515YMD-10WR3			15	667/0	82/84	330
	VRB0524YMD-10WR3			24	417/0	81/83	100
--	VRB1205YMD-10WR3	12 (9-18)	20	5	2000/0	81/83	2200
CE	VRB2405YMD-10WR3	24 (18-36)	40	5	2000/0	81/83	2200
	VRB2412YMD-10WR3			12	833/0	85/87	470
	VRB2415YMD-10WR3			15	667/0	86/88	330
	VRB2424YMD-10WR3			24	416/0	86/88	100
--	VRB4803YMD-10WR3	48 (36-75)	80	3.3	2400/0	77/79	2200
	VRB4805YMD-10WR3			5	2000/0	81/83	2200
	VRB4812YMD-10WR3			12	833/0	85/87	470
	VRB4815YMD-10WR3			15	667/0	85/87	330
	VRB4824YMD-10WR3			24	416/0	86/88	100

Notes:

- ① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured at nominal input voltage and rated output load.

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Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no load)	5VDC nominal input series, nominal input voltage	5V output	--	2353/100	2410/150	mA
		Others	--	2500/10	2564/30	
	12VDC nominal input series, nominal input voltage		--	1004/5	1029/12	
	24VDC nominal input series, nominal input voltage		--	502/5	515/12	
	48VDC nominal input series, nominal input voltage	3.3V output	--	208/4	215/8	
		Others	--	251/4	258/8	
Reflected Ripple Current	5VDC / 12VDC nominal input series		--	50	--	
	24VDC nominal input series		--	40	--	
	48VDC nominal input series		--	30	--	
Surge Voltage (1sec. max.)	5VDC nominal input series		-0.7	--	16	
	12VDC nominal input series		-0.7	--	25	
	24VDC nominal input series		-0.7	--	50	
	48VDC nominal input series		-0.7	--	100	
Start-up Voltage	5VDC nominal input series		--	--	4.5	VDC
	12VDC nominal input series		--	--	9	
	24VDC nominal input series		--	--	18	
	48VDC nominal input series		--	--	36	
Under-voltage Protection	5VDC nominal input series		3	3.5	--	
	12VDC nominal input series		5.5	6.5	--	
	24VDC nominal input series		12	15.5	--	
	48VDC nominal input series		26	30	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl*	Module on		Ctrl pin open or pulled high TTL (3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off		--	6	10	mA

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

Output Specifications

Item	Operating Conditions			Min.	Typ.	Max.	Unit
Voltage Accuracy	0%-100% load	5VDC input	Positive output	--	±1	±2	%
			Negative output	--	±1	±3	
		Others		--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load	5VDC input	Singe output	--	--	±0.5	
			Dual output	--	--	±1	
		Others		--	±0.2	±0.5	
Load Regulation ^①	0%-100% load	5VDC input	Singe output	--	--	±1	
			Dual output	--	--	±1.5	
	5%-100% load	12VDC/48VDC input		--	±0.5	±1	
	0%-100% load	24VDC input		--	±0.5	±1	
Cross Regulation	Input voltage range, 25%-100% load			--	--	±5	
Transient Recovery Time				--	300	500	μs
Transient Response Deviation	25% load step change, nominal input voltage	±5V output, VRB4803YMD-10WR3, VRB4805YMD-10WR3		--	±5	±8	%
		Others		--	±3	±5	

Temperature Coefficient	Full load	--	--	±0.03	%/°C
Ripple & Noise ^②	20MHz bandwidth, 5%-100% load	--	40	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:
^①Load regulation for 0% -100% for 12VDC/48VDC nominal input series parts to ±5%;
^②Ripple & Noise at < 5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 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 Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	°C
Vibration		10-150Hz, 5G, 90 Min. along X, Y and Z			
Switching Frequency*	PWM mode	--	350	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours

Note:*Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

Case Material	Aluminum alloy	
Dimensions	Horizontal package	25.40 x 25.40 x 11.70 mm
Weight	VRB0505YMD-10WR3	15.0g (Typ.)
	Others	12.5g (Typ.)
Cooling Method	Free air convection	

Electromagnetic Compatibility (EMC)

Emissions	CE	5VDC nominal input	CISPR32/EN55032	CLASS B (see Fig.5-② for recommended circuit)	
		12VDC nominal input	CISPR32/EN55032	CLASS A (without extra components.)/ CLASS B (see Fig.4-② for recommended circuit)	
		24VDC nominal input	CISPR32/EN55032	CLASS A (without extra components.)/ CLASS B (see Fig.3-② for recommended circuit)	
		48VDC nominal input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
	RE	5VDC nominal input	CISPR32/EN55032	CLASS B (see Fig.5-② for recommended circuit)	
		12VDC nominal input	CISPR32/EN55032	CLASS A(without extra components.)/CLASS B(see Fig.4-② for recommended circuit)	
		24VDC nominal input	CISPR32/EN55032	CLASS A(without extra components.)/CLASS B(see Fig.3-② for recommended circuit)	
		48VDC nominal input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
Immunity	ESD	5VDC nominal input	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria B
		Others	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS		IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	Others	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
		5VDC nominal input	IEC/EN61000-4-4	±2KV (see Fig.5-① for recommended circuit)	perf. Criteria B
		12VDC nominal input	IEC/EN61000-4-4	±2KV (see Fig.4-① for recommended circuit)	perf. Criteria B

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Immunity	Surge	Others	IEC/EN61000-4-5	line to line $\pm 2\text{KV}$ (see Fig.3-① for recommended circuit)	perf. Criteria B
		5VDC nominal input	IEC/EN61000-4-5	line to line $\pm 2\text{KV}$ (see Fig.5-① for recommended circuit)	perf. Criteria B
		12VDC nominal input	IEC/EN61000-4-5	line to line $\pm 2\text{KV}$ (see Fig.4-① for recommended circuit)	perf. Criteria B
	CS		IEC/EN61000-4-6	3 V _{r.m.s}	perf. Criteria A

Typical Characteristic Curves

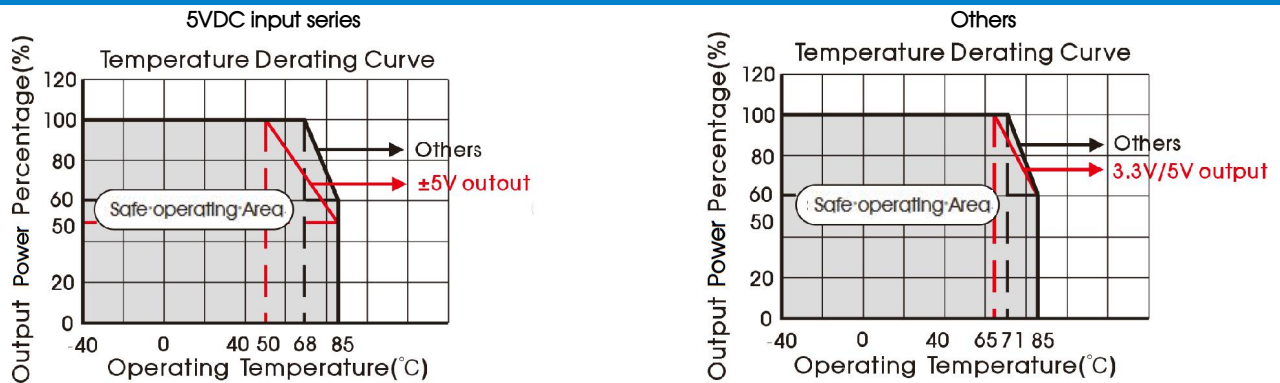
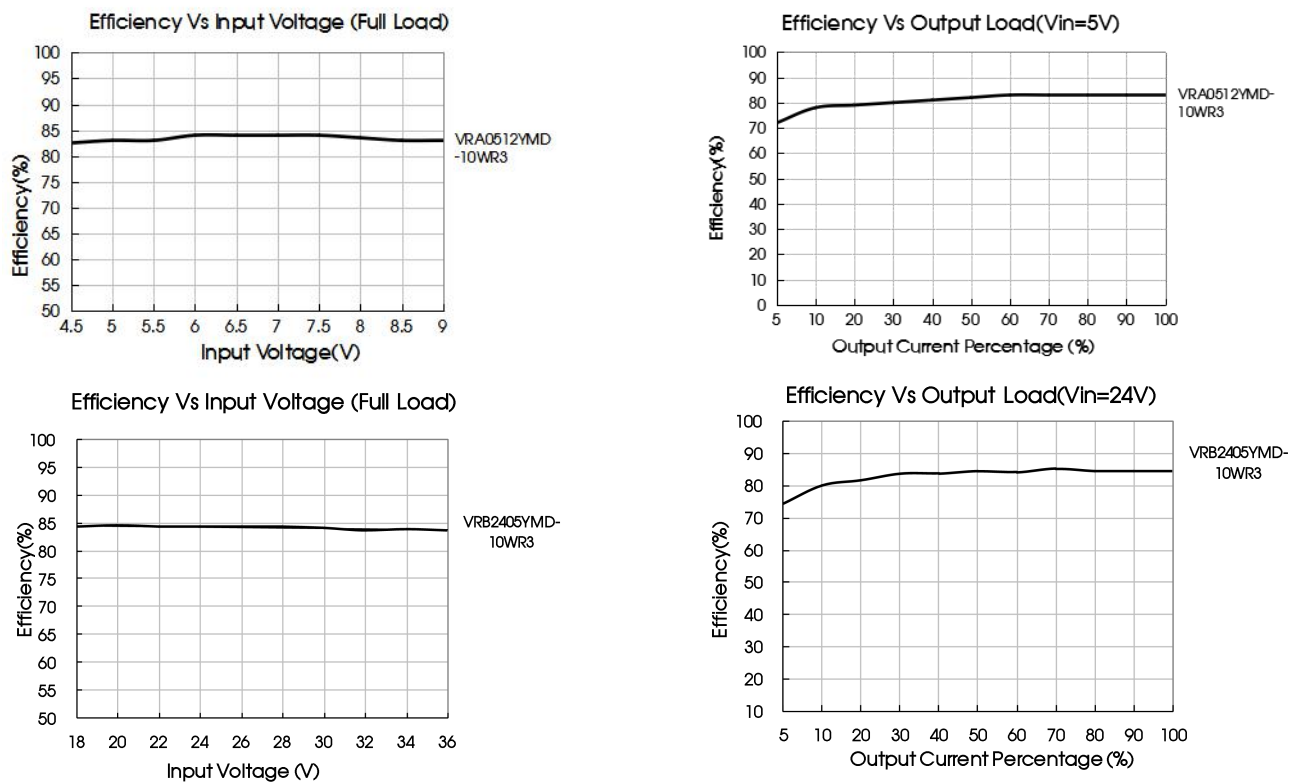


Fig. 1

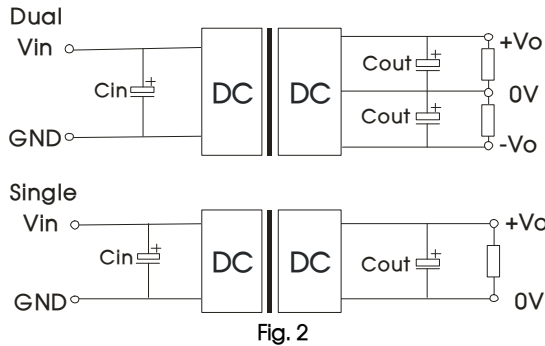


Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

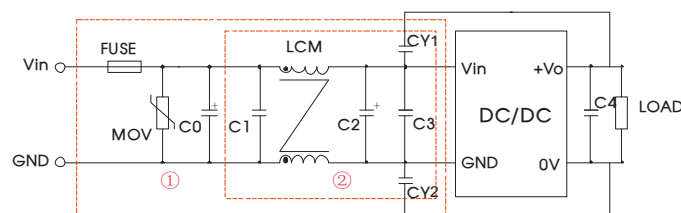
Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Vin	5V/12V/24V/48V
Cin	100μF
Cout	10μF

2. EMC compliance circuit

24VDC/48VDC nominal input series

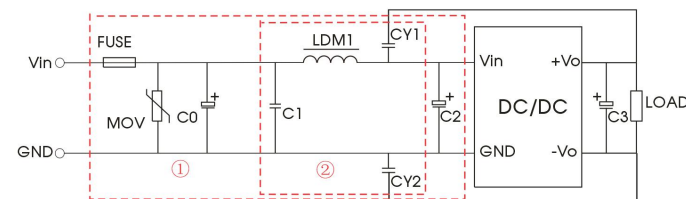


Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

Model	Vin:24V	Vin:48V
FUSE	Select fuse value according to actual input current	
MOV	S20K30	S14K60
C0	680μF/50V	680μF/100V
C1	1μF/50V	1μF/100V
C2	330μF/50V	330μF/100V
C3	4.7μF/50V	4.7μF/100V
C4	Refer to the Cout in Fig.2	
LCM	4.7mH, recommended to use MORNSUN FL2D-30-472	
CY1/CY2	1nF/2KV	

12VDC nominal input series



Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs

Parameter description:

Model	Vin:12V
FUSE	Select fuse value according to actual input current
MOV	S20K30
C0/C2	330μF/50V
C1	1μF/50V
C3	Refer to the Cout in Fig.2
LDM1	4.7μH
CY1/CY2	1nF/2KV

5VDC nominal input series

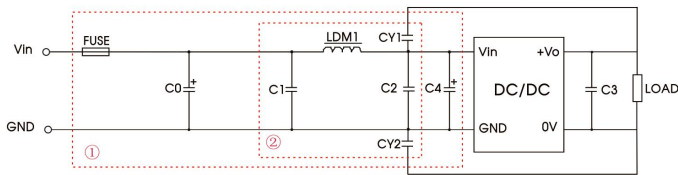


Fig. 5

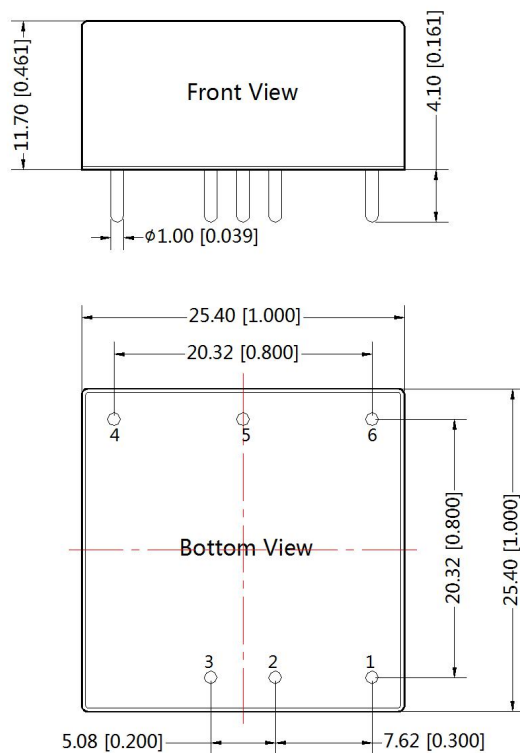
Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs

Parameter description:

Model	Vin: 5V
FUSE	Select fuse value according to actual input current
C0	2200μF/35V
C1/C2	4.7μF/50V
C3	Refer to the Cout in Fig.2
C4	1000μF/35V
LDM1	4.7μH
CY1/CY2	1nF/2KV

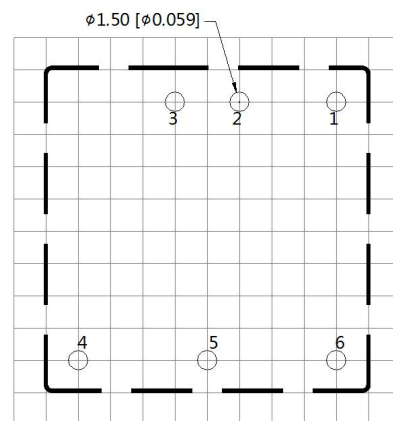
- The products do not support parallel connection of their output
- For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin diameter tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[\pm 0.020]$

THIRD ANGLE PROJECTION



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

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210003 (DIP);
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 $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company 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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