

MORNSUN®

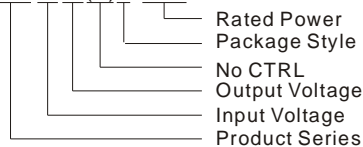
VRA_(X)D-10WR2& VRB_(X)D-10WR2 Series 10W, WIDE INPUT ISOLATED & REGULATED DUAL/SINGLE OUTPUT DIP PACKAGING, DC-DC CONVERTER



Patent Protection RoHS

PART NUMBER SYSTEM

VRB2405(X)D-10WR2



FEATURES

- 2:1 wide input voltage range
- Efficiency up to 90%
- 1.5KVDC isolation
- Short circuit protection
- Output over voltage protection
- Output over current protection
- Operating Temperature range: -40°C ~ +85°C
- Industry standard pinout
- Low ripple & noise
- Meet CISPR22/EN55022 CLASS A

APPLICATION

The VRA_(X)D-10WR2 & VRB_(X)D-10WR2 series offer 10W of output, with 2:1 wide input voltage of 9-18VDC, 18-36VDC, 36-75VDC and features 1500VDC isolation, output over voltage and short-circuit protection. The products meet CISPR22/EN55022 CLASS A. All models are particularly suited to industrial control, electric power, instrumentation, tele-communications etc.

SELECTION GUIDE

Model Number	Input Voltage(VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load(μF)	Efficiency (% , typ.) @Max. Load
	Nominal (Range)	Max**		Max.	Min.	@Max. Load	@No Load			
*VRA1205(X)D-10WR2	12 (9-18)	20	±5	±1000	±50	1016	25	20	680	82
*VRA1212(X)D-10WR2			±12	±416	±21	969			220	86
*VRA1215(X)D-10WR2			±15	±333	±16	958			100	87
*VRB1203(X)D-10WR2			3.3	2400	120	1082			2200	77
VRB1205(X)D-10WR2			5	2000	100	1016			2200	82
VRB1212(X)D-10WR2			12	833	42	969			470	86
VRB1215(X)D-10WR2			15	667	33	958			220	87
*VRB1224(X)D-10WR2			24	416	21	958			100	87
*VRA2405(X)D-10WR2	24 (18-36)	40	±5	±1000	±50	508	12	20	680	82
*VRA2412(X)D-10WR2			±12	±416	±21	484			330	86
VRA2415(X)D-10WR2			±15	±333	±16	473			220	88
*VRB2403(X)D-10WR2			3.3	2400	120	541			2200	77
VRB2405(X)D-10WR2			5	2000	100	496			2200	84
VRB2412(X)D-10WR2			12	833	42	473			680	88
VRB2415(X)D-10WR2			15	667	33	463			330	90
*VRB2424(X)D-10WR2			24	416	21	473			100	88
*VRA4805(X)D-10WR2	48 (36-75)	80	±5	±1000	±50	254	6	20	680	82
*VRA4812(X)D-10WR2			±12	±416	±21	237			470	88
*VRA4815(X)D-10WR2			±15	±333	±16	234			220	89
*VRB4803(X)D-10WR2			3.3	2400	120	271			2200	77
VRB4805(X)D-10WR2			5	2000	100	254			2200	82
VRB4812(X)D-10WR2			12	833	42	237			820	88
VRB4815(X)D-10WR2			15	667	33	234			470	89
*VRB4824(X)D-10WR2			24	416	21	234			220	89

Note: 1.*designing.

2.**Input voltage can't exceed this value, or will cause the permanent damage.

3."X" means the model without CTRL pin.

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INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. max.)	12VDC input	-0.7	--	25	VDC
	24VDC input	-0.7	--	50	
	48VDC input	-0.7	--	100	
Start-up Voltage	12VDC input	--	--	9	VDC
	24VDC input	--	--	18	
	48VDC input	--	--	36	
No-load Input Power		--	0.3	0.5	W
Input Filter		π Filter			
CTRL*	Models ON	Ctrl open or connect TTL high level (3.5-12VDC)			
	Models OFF	Ctrl connect GND or low level (0-1.2VDC)			
	Input current (Models OFF)	--	1	3	mA

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

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Power		0.5	--	10	W
Output Voltage Accuracy		--	±1	±2	%
Output Voltage Balance	Dual Output, Balanced Loads	--	±0.5	±1.5	
Line Regulation	Full load, Input voltage from low to high	--	±0.2	±0.5	
Load Regulation	5% to 100% load	--	±0.5	±1	
Cross Regulation	Dual output, main output 50% load, Supplement output from 10% to 100% load	--	--	±5	
Transient Recovery Time	25% load step change	--	300	500	
Transient Response Deviation		--	±3	±5	%
Temperature Drift	100% load	--	--	±0.03	%/°C
Ripple*	20MHz Bandwidth	--	15	35	mVp-p
Noise*		--	40	80	
Output Over Voltage Protection		110	120	140	%Vo
Over Current Protection	Input voltage range	120	150	180	%Io
Output Short Circuit Protection		Continuous, automatic recovery			

Note: Dual output models unbalanced load: ±5%.

*Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.

COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Tested for 1 minute and leakage current less than 1 mA	1500	--	--	VDC
Isolation Resistance	Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input/Output, 100KHz/1V	--	1000	--	pF
Switching Frequency	PWM mode	--	350	--	KHz
MTBF	MIL-HDBK-217F @25°C	1000	--	--	K hours
Case Material		Aluminum Alloy			
Weight		--	22	--	g

ENVIRONMENTAL SPECIFICATIONS

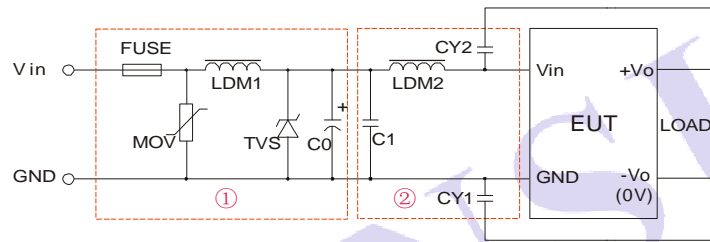
Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	Power derating (above 71°C)	-40	--	85	°C
Storage Temperature		-55	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Soldering Temperature	1.5mm from case for 10 seconds	--	--	300	°C

Cooling		Free air convection
Shake		10-55Hz, 10G, 30 Min. along X, Y and Z

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022	CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-② or Figure 3)	
	RE	CISPR22/EN55022	CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-② or Figure 3)	
EMS	ESD	IEC/EN61000-4-2	Contact $\pm 4KV$ perf. Criteria B	
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A	
	EFT	IEC/EN61000-4-4	$\pm 2KV$	perf. Criteria B (External Circuit Refer to Figure1-①)
		IEC/EN61000-4-4	$\pm 4KV$	perf. Criteria B (External Circuit Refer to Figure 3)
	Surge	IEC/EN61000-4-5	$\pm 2KV$	perf. Criteria B (External Circuit Refer to Figure1-① or Figure 3)
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
Voltage dips, short and interruptions immunity		IEC/EN61000-4-29	0%-70% perf. Criteria B	

EMC RECOMMENDED CIRCUIT



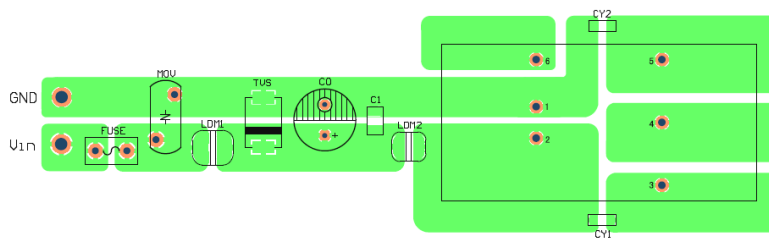
(Figure1)

Recommended external circuit parameters:

Model	VRA12_(X)D-10WR2 VRB12_(X)D-10WR2	VRA24_(X)D-10WR2 VRB24_(X)D-10WR2	VRA48_(X)D-10WR2 VRB48_(X)D-10WR2
FUSE	Choose according to practical input current		
MOV	--	10D560K	10D101K
LDM1	--	56 μ H	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680 μ F/25V	120 μ F/50V	120 μ F/100V
C1	225K/50V		225K/100V
LDM2	4.7 μ H		
CY1	102K/2000V		
CY2	102K/2000V		

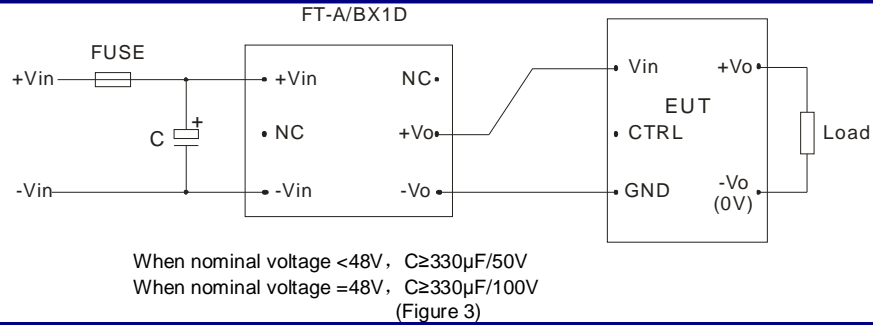
Note: 1. In Figure 1, part① is EMS Recommended external circuit, part② is EMI recommended external circuit. Choose according to requirements.
2. If there is no recommended parameters, the model no require the external component.

EMC RECOMMENDED CIRCUIT PCB LAYOUT

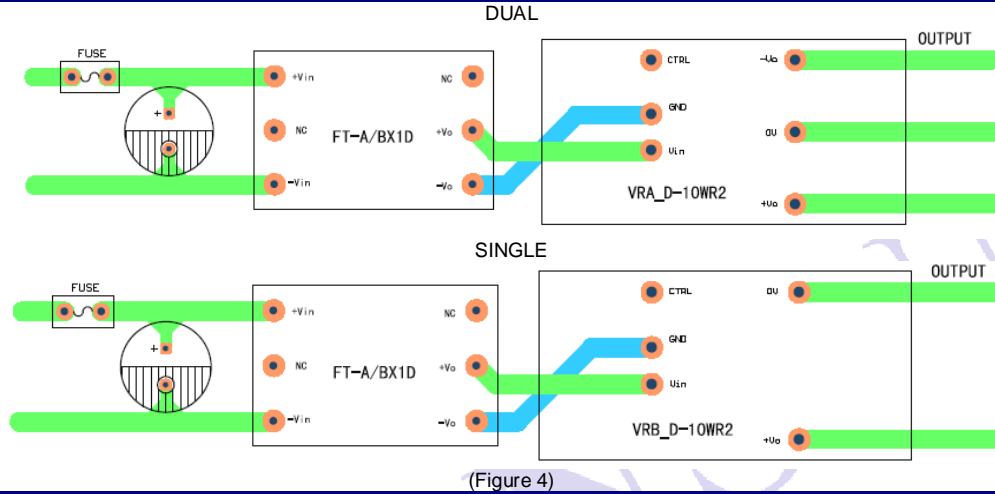


(Figure 2)

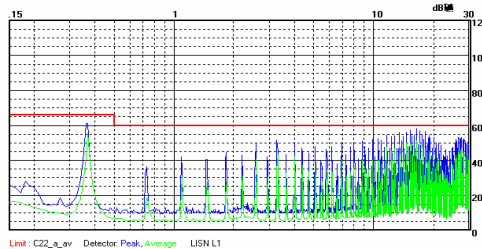
EMC MODULE APPLICATION CIRCUIT



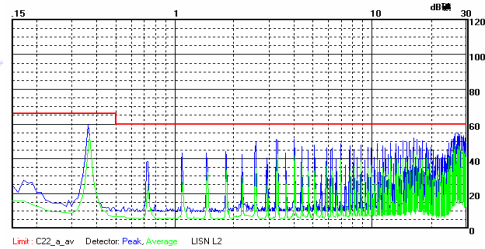
EMC MODULE RECOMMENDED CIRCUIT PCB LAYOUT



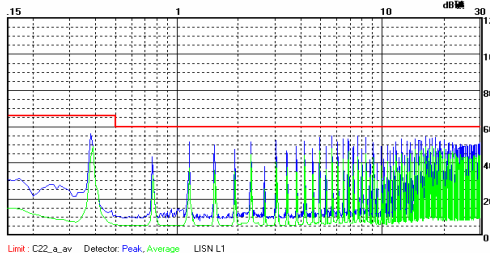
EMI TEST WAVEFORM (FULL LOAD)



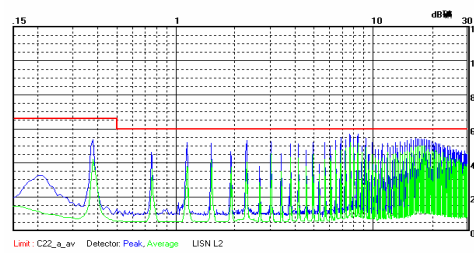
VRB1205(X)D-10WR2 Without External Circuit Power+ (Class A)



VRB1205(X)D-10WR2 Without External Circuit Power- (Class A)

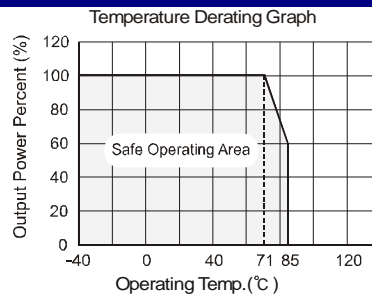


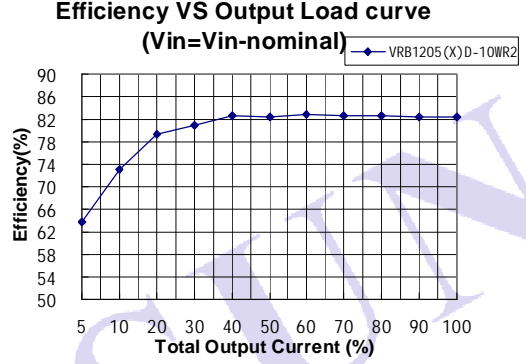
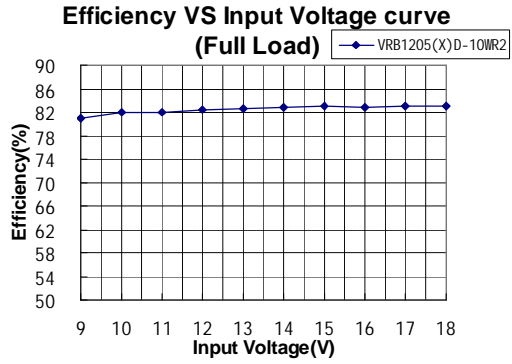
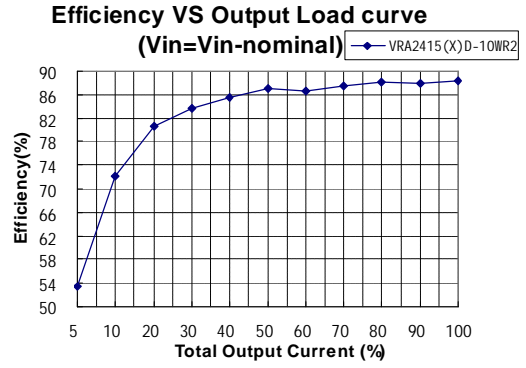
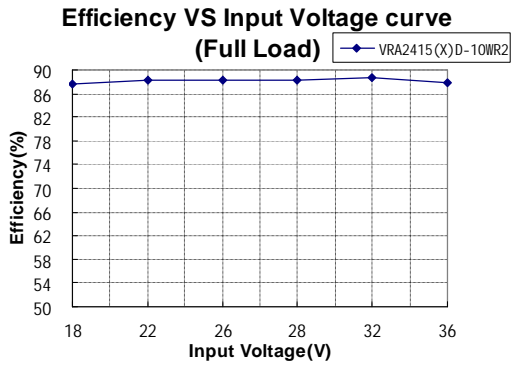
VRA2415(X)D-10WR2 Without External Circuit Power+ (Class A)



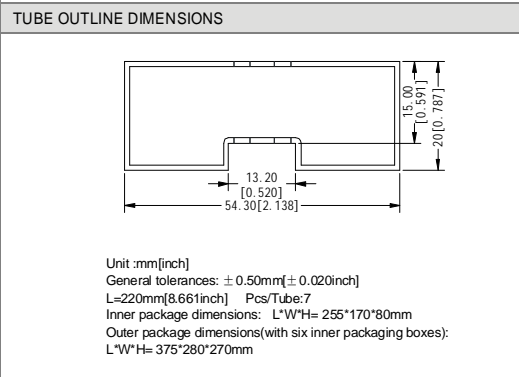
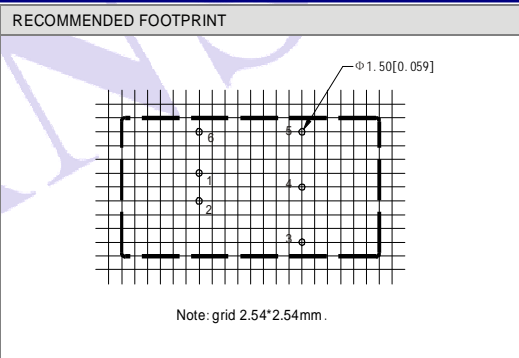
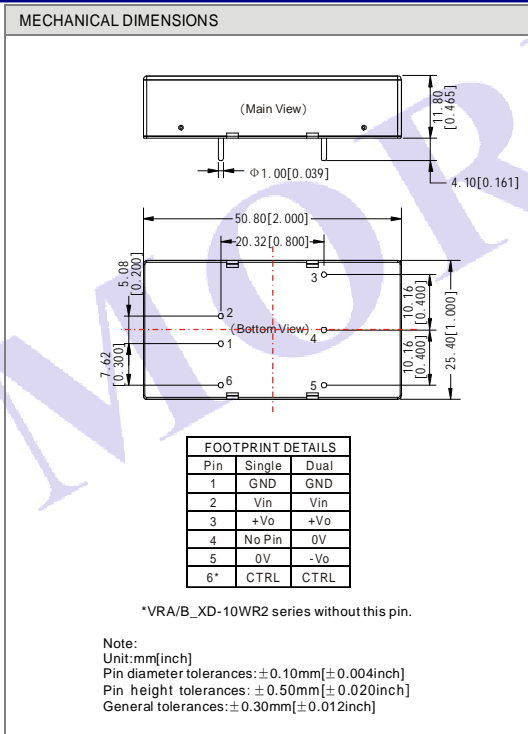
VRA2415(X)D-10WR2 Without External Circuit Power- (Class A)

PRODUCT TYPICAL CURVE





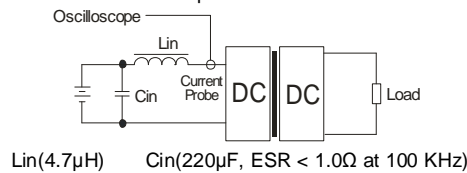
OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING



TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.

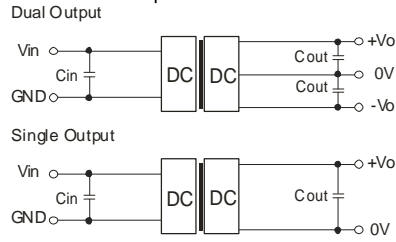


DESIGN CONSIDERATIONS

1) Recommended circuit

All the VRA_(X)D-10WR2 & VRB_(X)D-10WR2 Series have been tested according to the following recommended testing circuit before leaving factory (see Figure 5).

If you want to further decrease the input/output ripple, you can increase a capacitance properly or choose capacitors with low ESR, but the greatest capacitance of its filter capacitor must less than the Max. Capacitive Load.



(Figure 5)

2) Cannot use in parallel and hot swap

Note:

1. Min. load shouldn't be less than 5%, otherwise ripple maybe increase dramatically. Operation under minimum load will not damage the converter, however, they may not meet all specification listed.
2. Max. Capacitive Load tested at input voltage range and full load.
3. All specifications measured at $T_a=25^\circ\text{C}$, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. All characteristics are for listed model, non-standard models may perform differently, please contact our technical person for more detail.
6. Contact us for your specific requirement.
7. Specifications subject to change without prior notice.

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