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**

FEATURES

- 2:1 wide input voltage range
- Efficiency up to 90%
- 1.5KVDC isolation
- Short circuit protection
- Output over voltage 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 suitable for industrial, electric power, instrumentation, telecommunication applications.

PART NUMBER SYSTEM

VRB2405(X)D-10WR2

- Rated Power
- Package Style
- No CTRL
- Output Voltage
- Input Voltage
- Product Series

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
*VRA1224(X)D-10WR2			±24	±208	±10	969			47	86
*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	969			100	86
*VRA2405(X)D-10WR2	24 (18-36)	40	±5	±1000	±50	508	12		680	82
*VRA2412(X)D-10WR2			±12	±416	±21	484			330	86
VRA2415(X)D-10WR2			±15	±333	±16	473			220	88
VRA2424(X)D-10WR2			±24	±208	±10	479			100	87
*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	479			100	87
*VRA4805(X)D-10WR2	48 (36-75)	80	±5	±1000	±50	254	6		680	82
*VRA4812(X)D-10WR2			±12	±416	±21	237			470	88
*VRA4815(X)D-10WR2			±15	±333	±16	234			220	89
*VRA4824(X)D-10WR2			±24	±208	±10	237			100	88
*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	237			220	88

Note: 1.*desgning. **Input voltage can't exceed this value, or will cause the permanent damage.
2. # For each output.
3."X" means the model without CTRL pin.

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	
	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	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift	100% load	--	--	±0.03	%/℃
Ripple*	20MHz Bandwidth	--	15	35	mVp-p
Noise*		--	40	80	
Output Over Voltage Protection	Input voltage range	110	120	140	%Vo
Output Short Circuit Protection		Continuous, automatic recovery			

Note: 1.Dual outpt models unbalanced load:±5%.
2.*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℃	1000	--	--	K hours
Case Material		Aluminum Alloy			
Weight		--	22	--	g

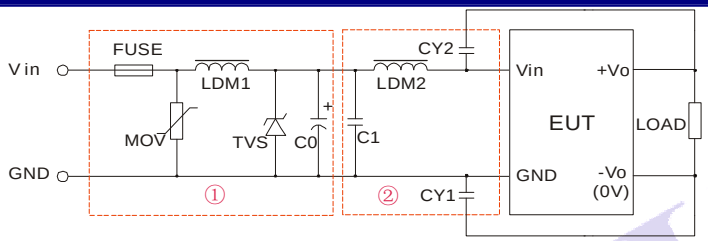
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	Power derating (above 71℃)	-40	--	85	℃
Storage Temperature		-55	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
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 ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B（External Circuit Refer to Figure1-①）
		IEC/EN61000-4-4	±4KV	perf. Criteria B（External Circuit Refer to Figure 3）
	Surge	IEC/EN61000-4-5	±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



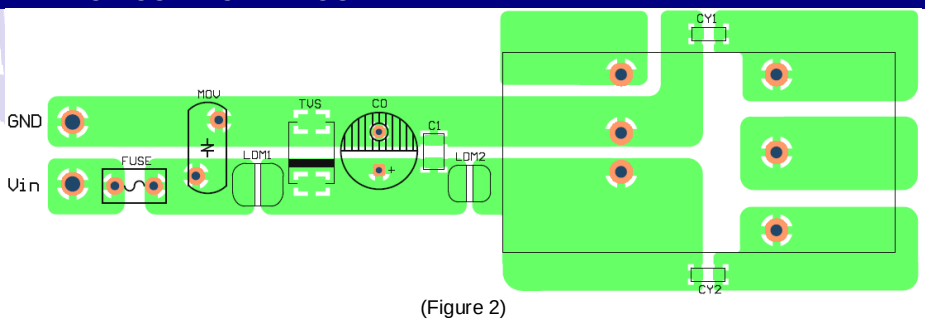
(Figure1)

Recommended external circuit parameters:

Model	Vin: 12V	Vin: 24V	Vin: 48V
FUSE	Choose according to practical input current		
MOV	--	10D560K	10D101K
LDM1	--	56μH	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680μF/25V	120μF/50V	120μF/100V
C1	1μF/50V		1μF/100V
LDM2	4.7μH		
CY1	102K/2KV		
CY2	102K/2KV		

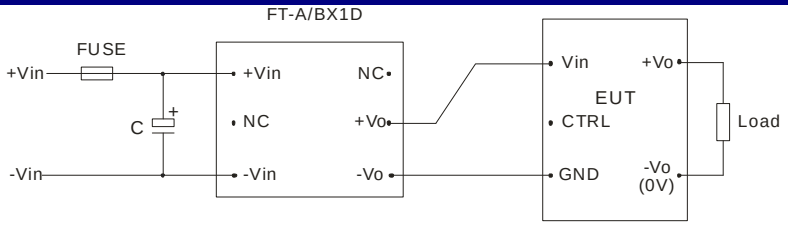
Note: 1. In Figure 1,part①is EMS Recommended external circuit, part②is EMI recommended external circuit. Choose according to requirements.
2. If there is no recommended parameters, the model no require the external component.

EMC RECOMMENDED CIRCUIT PCB LAYOUT



(Figure 2)

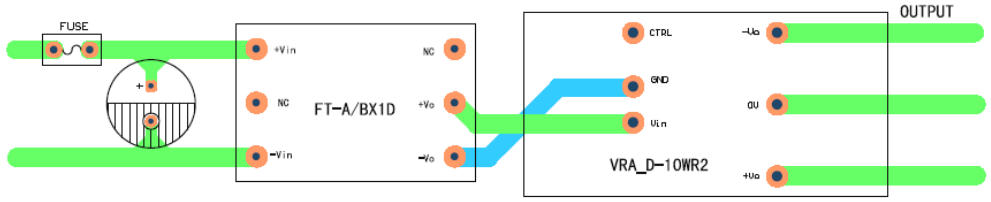
EMC MODULE APPLICATION CIRCUIT



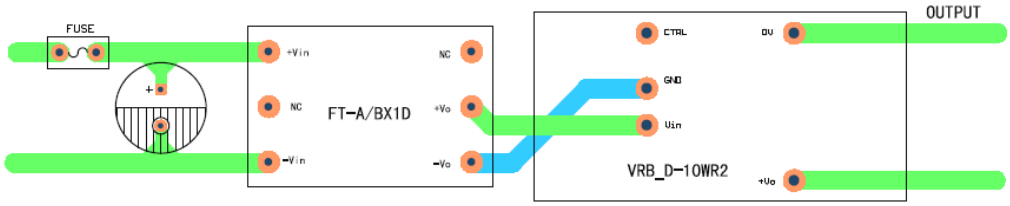
When nominal voltage <48V，C≥330μF/50V
When nominal voltage =48V，C≥330μF/100V
(Figure 3)

EMC MODULE RECOMMENDED CIRCUIT PCB LAYOUT

DUAL

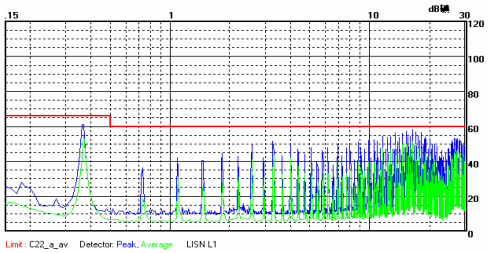


SINGLE

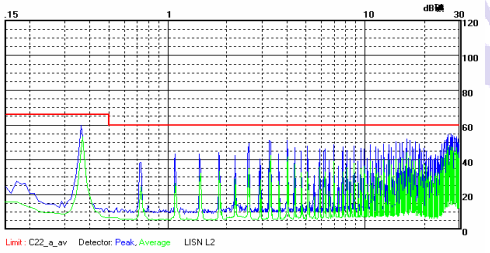


(Figure 4)

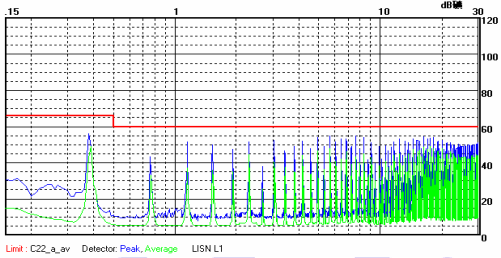
EMI TEST WAVEFORM (FULL LOAD)



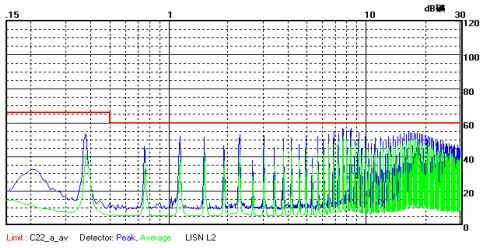
VRB1205(X)D-10WR2 Without External Circuit Power+（Class A）



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



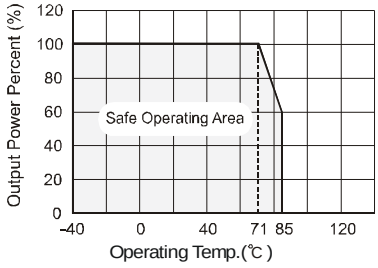
VRA2415(X)D-10WR2 Without External Circuit Power+（Class A）



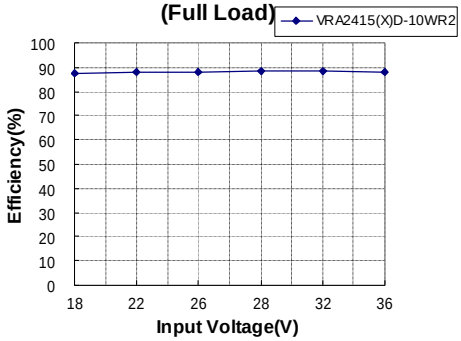
VRA2415(X)D-10WR2 Without External Circuit Power-（Class A）

PRODUCT TYPICAL CURVE

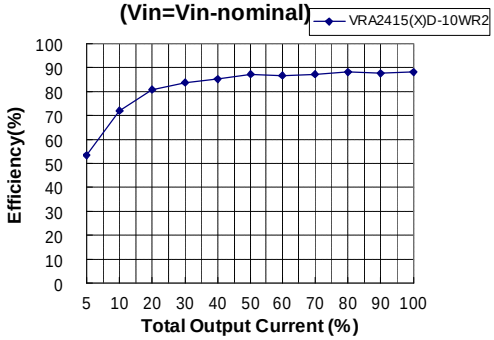
Temperature Derating Graph



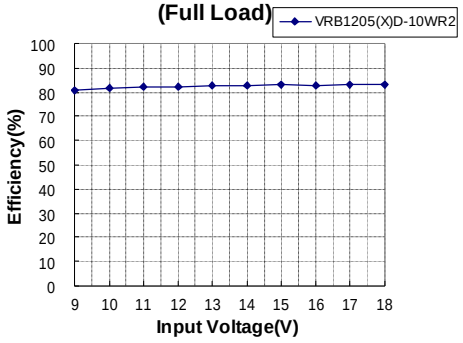
Efficiency VS Input Voltage curve (Full Load)



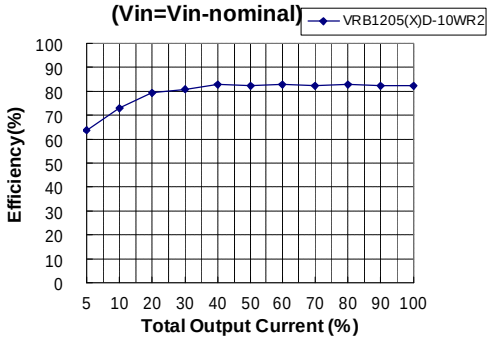
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)

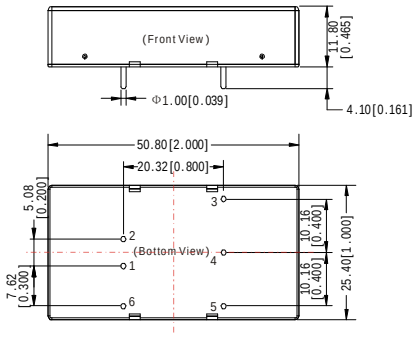


Efficiency VS Output Load curve (Vin=Vin-nominal)



OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

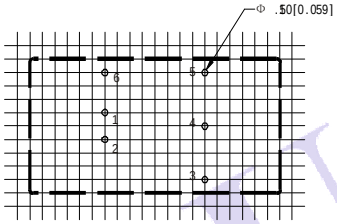


FOOTPRINT DETAILS		
Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	No Pin	0V
5	0V	-Vo
6*	CTRL	CTRL

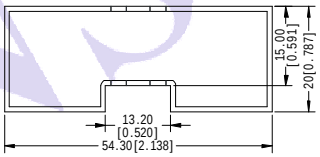
*VRA/B_XD-10WR2 series without this pin.

Note:
Unit:mm[inch]
Pin diameter tolerances:±0.10mm[0.004inch]
Pin height tolerances:±0.50mm[0.020inch]
General tolerances:±0.30mm[0.012inch]

RECOMMENDED FOOTPRINT



TUBE OUTLINE DIMENSIONS

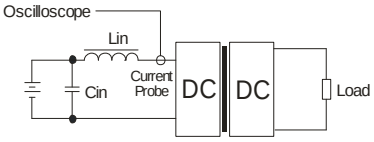


Unit:mm[inch]
General tolerances: ±0.50mm[0.020inch]
L=220mm[8.661inch] Pcs/Tube:7
Inner package dimensions: L*W*H= 255*170*80mm
Outer package dimensions(with six inner packaging boxes):
L*W*H= 375*280*270mm

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



Lin(4.7μH) Cin(220μF, ESR < 1.0Ω at 100 KHz)

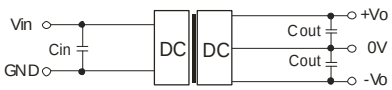
DESIGN CONSIDERATIONS

1) Recommended circuit

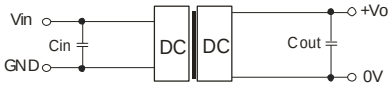
All the VRA_(X)D-10WR2 & VRB_(X)D-10WR2 Series have been tested according to the following recommended testing circuit before leaving factory (see Figure 5).

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.

Dual Output



Single Output



(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 Ta=25°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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