MORNSUN®

VRB_LD-15WR2

15W, WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER

Patent Protection RoHS

FEATURES

- Efficiency up to 90%
- 2:1 wide input voltage range
- Low Temperature rise
- Short circuit protection
- 1.5KVDC isolation
- Operating temperature range: -40°C ~ +85°C
- Six-sided metal shield
- Industry standard pinout
- Industrial level specifications
- Meet CISPR22/EN55022 CLASS A

PART NUMBER SYSTEM

VRB2405LD-15WR2

- Rated Power
- Package Style
- Output Voltage
- Input Voltage
- Product Series

APPLICATION

VRB_LD-15WR2 series are applied to wide voltage range input situation such as data transmission device、battery power supply device、tele-comunication device、distributed power supply system、remote control system、industrial robot system etc.

SELECTION GUIDE

Model Number	Input Voltage (VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		reflection ripple Current (mA,typ.)	Max. Capacitor Load (max,μF)	Efficiency (%, typ.) @ Max. load
	Nominal (Range)	Max*		Max.	Min.	@ Max.load	@ No load			
VRB1203LD-15WR2	12 (9-18)	20	3.3	4000	200	1265	100	30	10500	87
VRB1205LD-15WR2			5	3000	150	1405			4020	89
VRB1212LD-15WR2			12	1250	63	1405	30		1035	89
VRB1215LD-15WR2			15	1000	50	1405			705	89
VRB2403LD-15WR2	24 (18-36)	40	3.3	4000	200	625	100		10500	88
VRB2405LD-15WR2			5	3000	150	695			4020	90
VRB2412LD-15WR2			12	1250	63	703	30		1035	89
VRB2415LD-15WR2			15	1000	50	695			705	90
VRB4803LD-15WR2	48 (36-75)	80	3.3	4000	200	316	80		10500	87
VRB4805LD-15WR2			5	3000	150	360			4020	87
VRB4812LD-15WR2			12	1250	63	352	30		1035	89
VRB4815LD-15WR2			15	1000	50	348			705	90

Note:* Input voltage can't exceed this value, or will cause the permanent damage。

INPUT SPECIFICATIONS

Item	Test conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. max.)	12VDC Input	--	--	25	VDC
	24VDC Input	--	--	50	
	48VDC Input	--	--	100	
Start-up Voltage	12VDC Input	--	--	9	
	24VDC Input	--	--	17.8	
	48VDC Input	--	--	35.8	
Under Voltage Shutdown	12VDC Input	7.5	--	--	
	24VDC Input	16	--	--	
	48VDC Input	32	--	--	
Start-up time	Nominal input & constant resistance load	--	10	--	ms
Ctrl*	Models ON	Ctrl open or connect TTL high level (2.5-12VDC)			
	Models OFF	Ctrl connect GND or low level (0-1.2VDC)			
	Input current (Models OFF)	--	1	--	mA
Input filter		π Filter			

*The CTRL control pin voltage is refer to GND.

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Power		0.75	--	15	W
Output Voltage Accuracy		--	±1	±3	%
Line Regulation	Full load, Input voltage from low to high	--	±0.2	±0.5	
Load Regulation	10% to 100% load	--	±0.5	±1	
Transient Recovery Time	25% load step change	--	300	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift	100% load	--	±0.02	--	%/°C
Ripple & Noise *	20MHz Bandwidth	55	70	100	mVp-p
Trim		--	±10%	--	VDC
Output Over Voltage Protection	3.3V output	--	3.9	--	
	5V output	--	6.2	--	
	12V output	--	15	--	
	15V output	--	18	--	
Over Current Protection	Input voltage range	--	150	--	%
Output Short Circuit Protection		Hiccup, Continuous, automatic recovery			

* 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/0.1V	--	1000	--	pF
Switching Frequency		--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Case Material		Aluminum Alloy			
Weight		--	28	--	g

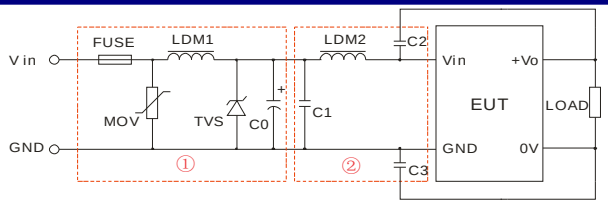
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	See Temperature Derating Curve	-40	--	85	℃
Storage Temperature		-55	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Soldering 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）
	RE	CISPR22/EN55022 CLASS A（Without External Circuit）/ CLASS B（External Circuit Refer to Figure1-②）
EMS	ESD	IEC/EN61000-4-2 Contact ±4KV perf. Criteria B
	RS	IEC/EN61000-4-3 3V/m perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV perf. Criteria B（External Circuit Refer to Figure1-①）
	Surge	IEC/EN61000-4-5 ±2KV perf. Criteria B（External Circuit Refer to Figure1-①）
	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)

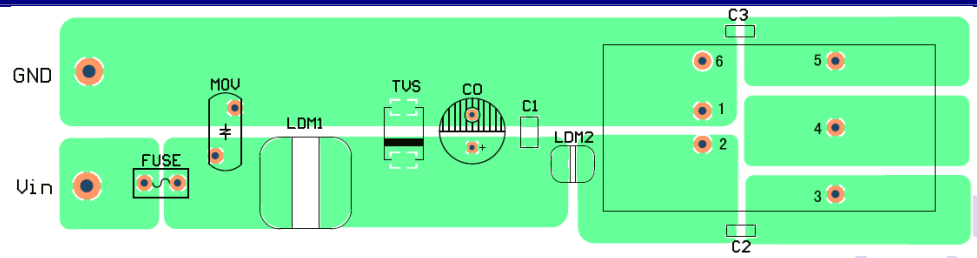
Note:1.In Figure 1,part①is EMS Recommended external circuit, part② is EMI recommended external circuit(CLASS B). Choose according to requirements.

2. If there is no recommended parameters, the model no require the external component.

Recommended external circuit parameters:

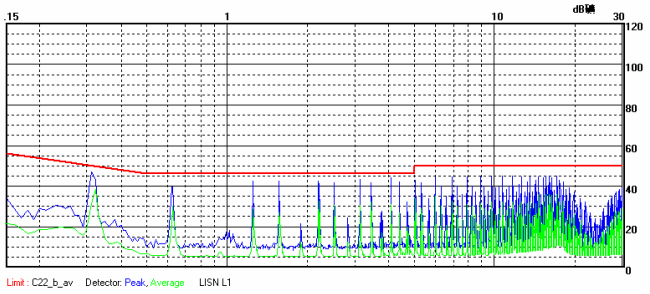
Model	VRB12_LD-15WR2	VRB24_LD-15WR2	VRB48_LD-15WR2
FUSE	Choose according to practical input current		
MOV	--	10D560	10D101
LDM1	--	56μH	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680μF/25V	120μF/50V	120μF/100V
C1	105K/50V	105K/50V	105K/100V
LDM2	4.7μH		
C2、C3	102K/2KV		

EMC RECOMMENDED CIRCUIT PCB LAYOUT

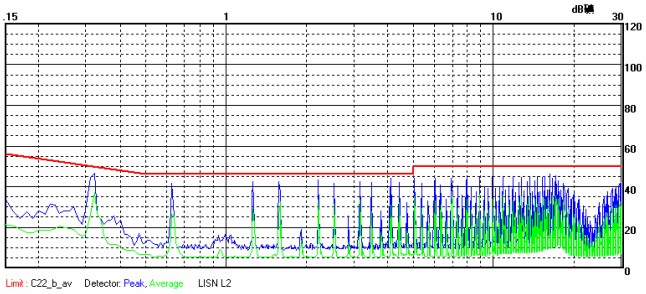


(Figure 2)

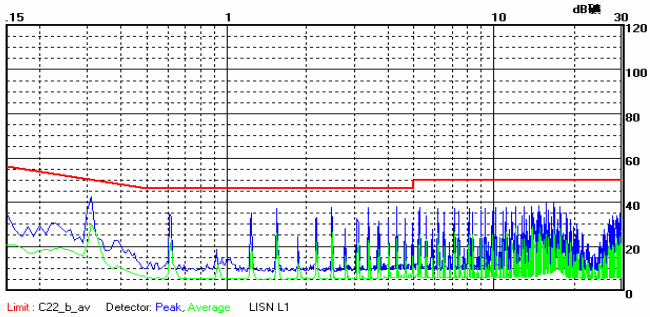
EMC TEST WAVEFORM



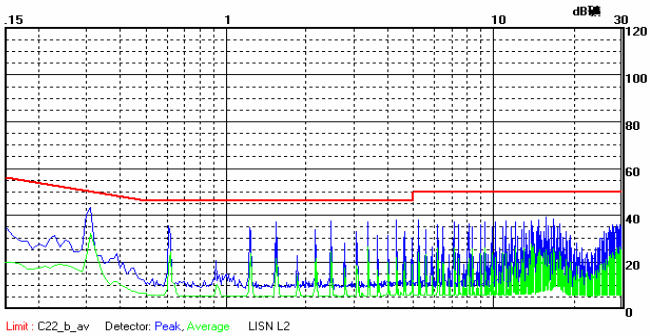
VRB2405LD-15WR2 CE (Positive line)



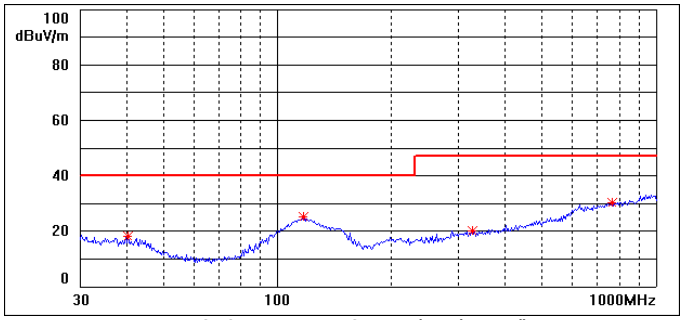
VRB2405LD-15WR2 CE (Negative line)



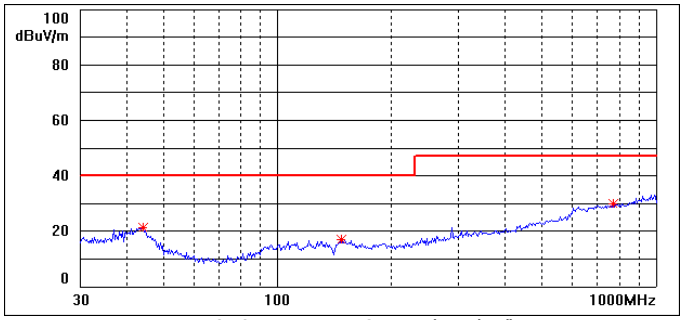
VRB4815LD-15WR2 CE (Positive line)



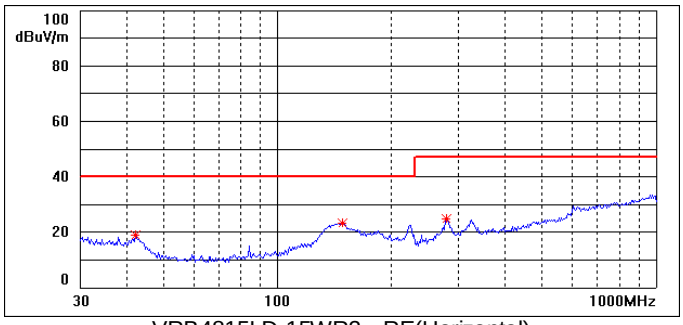
VRB4815LD-15WR2 CE (Negative line)



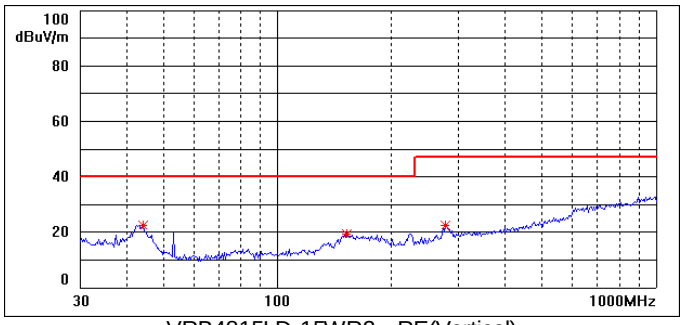
VRB2405LD-15WR2 RE(Horizontal)



VRB2405LD-15WR2 RE(Vertical)



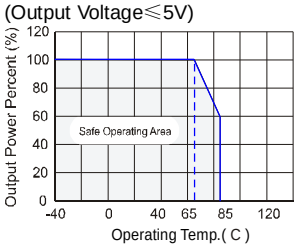
VRB4815LD-15WR2 RE(Horizontal)



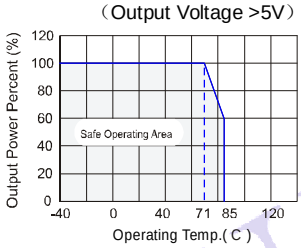
VRB4815LD-15WR2 RE(Vertical)

PRODUCT TYPICAL CURVE

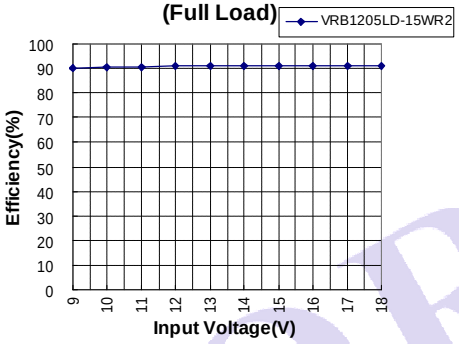
(Output Voltage≤5V)



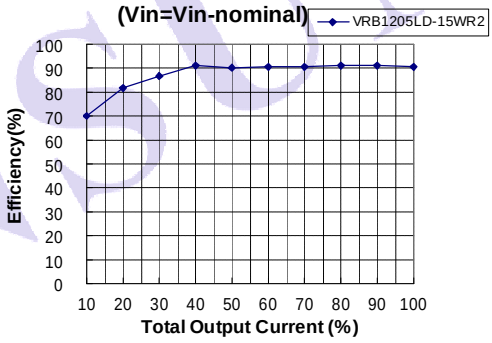
（Output Voltage >5V）



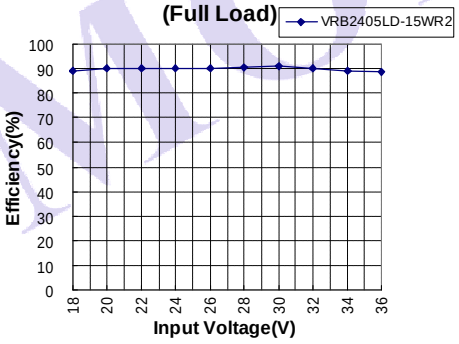
Efficiency VS Input Voltage curve (Full Load)



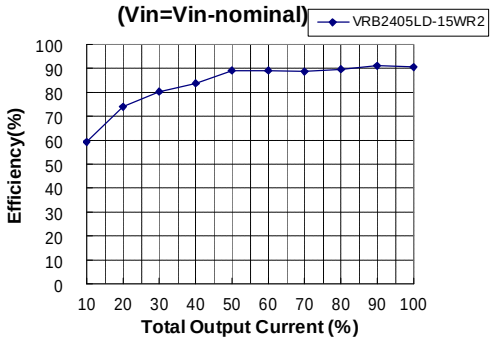
Efficiency VS Output Load curve (Vin=Vin-nominal)



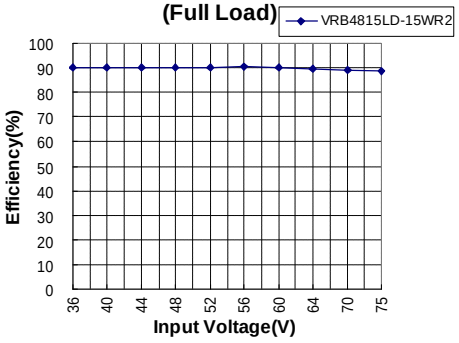
Efficiency VS Input Voltage curve (Full Load)



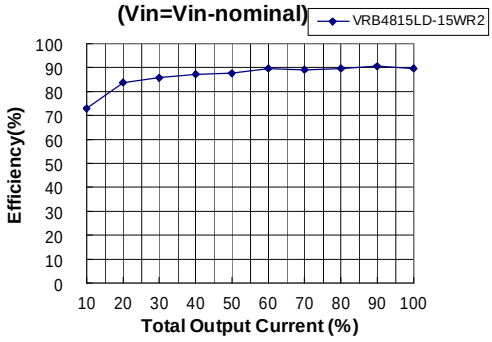
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)

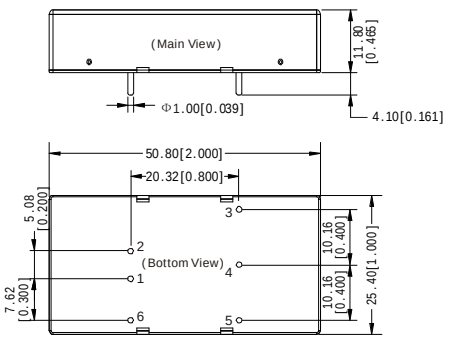


Efficiency VS Output Load curve (Vin=Vin-nominal)



OUTLINE DIMENSIONS、RECOMMENDED FOOTPRINT & PACKAGING

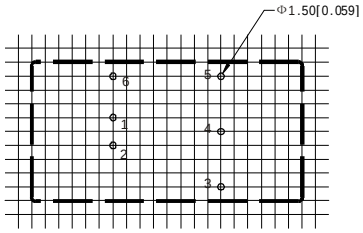
MECHANICAL DIMENSIONS



FOOTPRINT DETAILS	
Pin	Function
1	GND
2	Vin
3	+Vo
4	Trim
5	0V
6	Ctrl

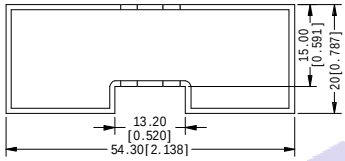
Note:
Unit:mm[inch]
Pin diameter tolerances:±0.10mm[±0.004inch]
Pin height tolerances: ±0.50mm[±0.020inch]
General tolerances:±0.30mm[±0.012inch]

RECOMMENDED FOOTPRINT



Note:grid 2.54*2.54mm.

TUBE OUTLINE DIMENSIONS

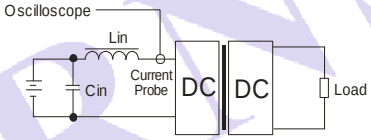


Unit :mm[inch]
General tolerances: ±0.50mm[±0.020inch]
L=220mm[8.661inch] Pcs/Tube:7
Inner package dimensions: L*W*H= 255*170*80mm
Outer package dimensions(with six inner packaging boxes):
L*W*H= 375*280*270mm

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

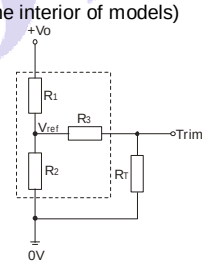
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



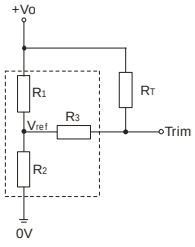
Lin(4.7μH) Cin(220μF, ESR < 1.0Ω at 100 KHz)

TRIM APPLICATION & TRIM RESISTANCE

Application circuit for TRIM (Part in broken line is the interior of models)



Trim up



Trim down

Formula for resistance of Trim

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vo' - Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} \cdot R_2$$

Note: Value for R1, R2, R3, and Vref refer to the above table 1.
R_T: Resistance of Trim
a: User-defined parameter, no actual meanings.
Vo': The trim up/down voltage.

(TABLE 1)

Parameter \ Vo	3.3(VDC)	5(VDC)	12(VDC)	15(VDC)
R1(KΩ)	4.801	2.883	10.971	14.497
R2(KΩ)	2.863	2.864	2.864	2.864
R3(KΩ)	15	10	17.8	17.8
Vref(V)	1.24	2.5	2.5	2.5

RECOMMENDED CIRCUIT

If you want to further decrease the input surge voltage and the output ripple etc, an capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 3).

It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 2).

(Figure 3)

EXTERNAL CAPACITOR TABLE (TABLE 2)

Capacitance / Output Voltage	Cout(μF)	Cin(μF)
3.3V/5V	470	100
12V/15V	220	

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 nominal input voltage and constant resistive 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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