MORNSUN®

VRB_LD-50W Series

50W，*WIDE INPUT ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER*

Patent Protection RoHS

PART NUMBER SYSTEM

VRB2405LD-50W

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

PRODUCT FEATURES

- Efficiency up to 93%
- Ultra wide input range(2:1)
- High and low temperature characteristics
- Output short circuit protection
- Input over- under voltage protection
- Ourput over current protection
- Ourput over voltage protection
- 1500VDC isolation
- Operating temperature range: -40℃~+85℃
- Six-sided metal shield
- Industry standard pinout
- Industrial level specifications
- Good EMC performance

APPLICATIONS

VRB_LD-50W series offer 50W of output, 18-36VDC, 36-75VDC,single output, and features 1500VDC isolation, Six-sided metal shield, under over current and short circuit protection. All models are particularly suited to tele-communications, industrial, test equipments power 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			
*VRB2403LD-50W	24 (18-36)	40	3.3	10000	500	1545	50	40	27000	91
VRB2405LD-50W			5	10000	500	2240	70		18900	93
*VRB2412LD-50W			12	4167	208	2240	85		3700	93
*VRB2415LD-50W			15	3333	167	2240	85		2000	93
*VRB2424LD-50W			24	2083	104	2240	85		1000	93
*VRB4803LD-50W	48 (36-75)	80	3.3	10000	500	772	35	30	27000	91
*VRB4805LD-50W			5	10000	500	1120	45		18900	93
*VRB4812LD-50W			12	4167	208	1120	50		3700	93
*VRB4815LD-50W			15	3333	167	1120	50		2000	93
*VRB4824LD-50W			24	2083	104	1120	50		1000	93

Note:1. *Designing.
2. **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.)		24VDC Input	-0.7	--	50	VDC
		48VDC Input	-0.7	--	100	
Input Under Voltage Protection	Start-up Voltage	24VDC Input	--	17.5	18	
		48VDC Input	--	35.8	36	
	Under Voltage Shutdown	24VDC Input	16	--	--	
		48VDC Input	33	--	--	
Input Over Voltage Protection	Start-up Voltage	24VDC Input	--	--	36	
		48VDC Input	--	--	75	
	Over Voltage Shutdown	24VDC Input	39	--	--	
		48VDC Input	79	--	--	

Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Ctrl*	Models ON	Ctrl open or connect TTL high level(3-12VDC)			
	Models OFF	Ctrl connect GND or low level(0-1.2VDC)			
	Input current (Models OFF)	--	1	--	mA
Input Filter		π Filter			
Note: *The Ctrl pin voltage is referenced to GND.					

OUTPUT SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Unit
Output Power			2.5	--	50	W
Output Voltage Accuracy	Refer to recommended circuit		--	±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	Main output 50% Supplement output from 25% to 100% load		--	300	500	μs
Transient Response Deviation			--	±3	±5	%
Temperature Drift	100% full load		--	±0.02	--	%/°C
Ripple*	20MHz Bandwidth		--	50	75	mVp-p
Noise*			--	100	150	
Output Voltage Range(Trim)			--	±10%Vo	--	VDC
Output Over Voltage Protection **	Full input voltage	3.3VDC output	--	3.9	--	
		5VDC output	--	6.2	--	
		12VDC output	--	15	--	
		15VDC output	--	18	--	
		24VDC output	--	30	--	
Over Current Protection	Full input voltage		120	130	160	%
Output Short Circuit Protection			Hiccup, continuous, automatic recovery			

Note: 1.* Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.
2.** Need to reboot after Output over-voltage protection, the module output recovers normal.

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	--	2000	--	pF
Switching Frequency	Full load, nominal input	--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Safety Certification		UL/EN60950(Pending)			
Case Material		Aluminum alloy			
Weight		--	35	--	g

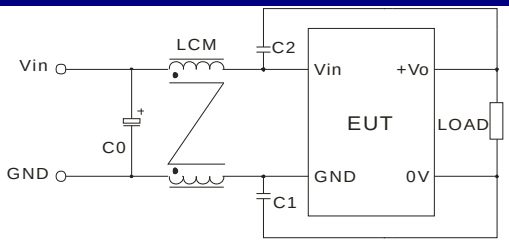
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	Derating When Temperature≥55℃	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise allowed at full load	Operating Temperature curve range	--	--	105	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			
Shoke		10-55Hz, 10G, 30 Min. along X, Y and Z			

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022	CLASS B（External Circuit Refer to Figure 1）	
	RE	CISPR22/EN55022	CLASS B（External Circuit Refer to Figure 1）	
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV/ Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. CriteriaA
EMS	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B
	Surge	IEC/EN61000-4-5	±2KV	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria B
	Voltage dips、short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B

EMC RECOMMENDED CIRCUIT



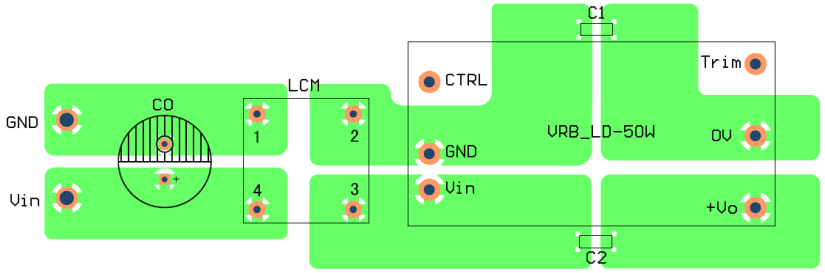
(Figure 1)

Recommended external circuit parameters:

Model	VRB24XXLD-50W*
C0	330uF/63V
C1、C2	102K/2KV 1206
LCM	TS7 core T13*7*5 16 laps 1mH

Note:1.The external recommended circuit of EMS test section of figure 1 can be used for transient pulse protection and EMI filtering，Choose according to requirements.
2.*VRB48XXLD-50W series is designing.

EMC RECOMMENDED CIRCUIT PCB LAYOUT

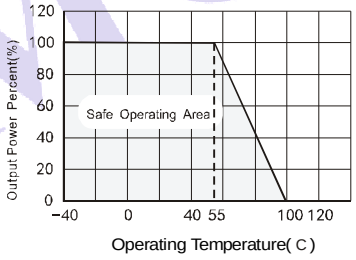


(Figure 2)

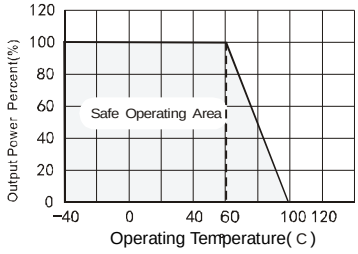
PRODUCT TYPICAL CURVE

Temperature Derating Curve

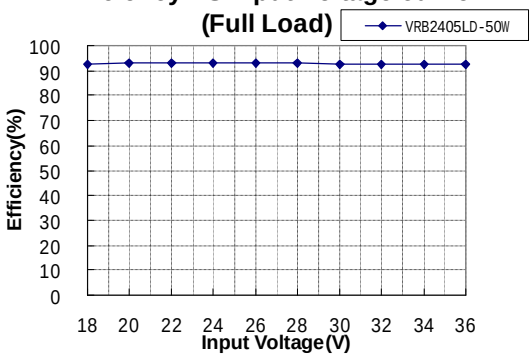
Output Voltage≤5V



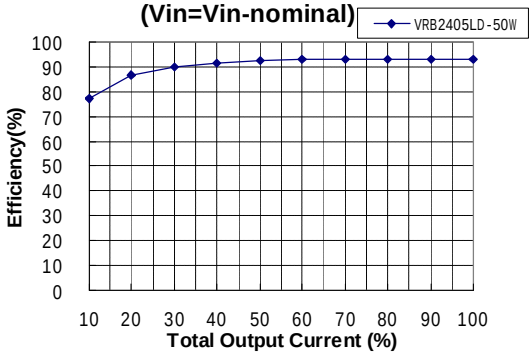
Output Voltage >5V



Efficiency VS Input Voltage curve (Full Load)

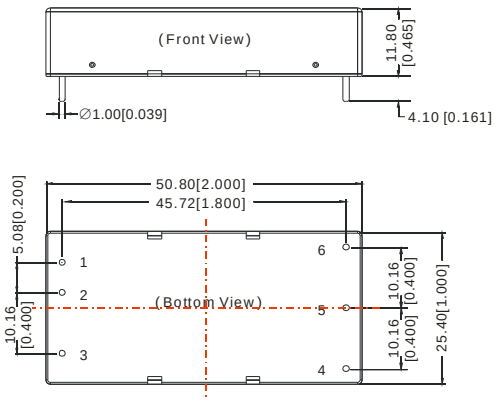


Efficiency VS Output Load curve (Vin=Vin-nominal)



OUTLINE DIMENSIONS、RECOMMENDED FOOTPRINT & PACKAGING

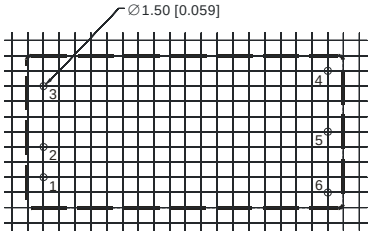
MECHANICAL DIMENSIONS



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

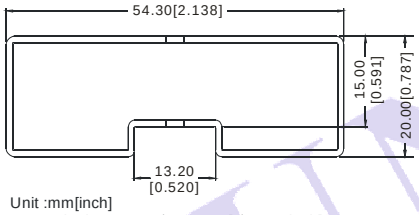
Note:
Unit:mm[inch]
Pin diameter tolerances:±0.10mm[±0.004inch]
Pin height tolerances:±0.50mm[±0.020inch]
General tolerances:±0.30mm[±0.012inch]

RECOMMENDED FOOTPRINT



Note:grid 2.54*2.54mm.

TUBE OUTLINE DIMENSIONS

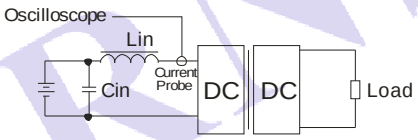


Unit :mm[inch]
General tolerances: ±0.50mm[±0.020inch]
L=220mm[8.661inch] Pcs/Tube:7
Inner package dimensions: L*W*H= 255*170*80mm
Outer package dimensions(with six inner packaging boxes):
L*W*H= 375*280*270mm

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

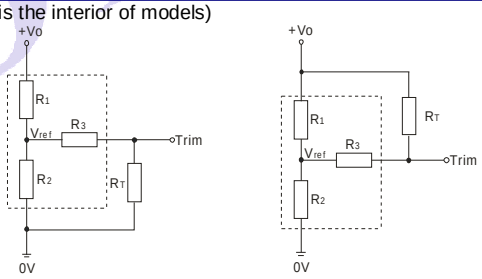
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



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)



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)	24(VDC)
R1(KΩ)	8.622	5.151	19.439	25.563	44.137
R2(KΩ)	5.1	5.1	5.1	5.1	5.1
R3(KΩ)	22	20	33	33	35.7
Vref(V)	1.24	2.5	2.5	2.5	2.5

DESIGN CONSIDERATIONS

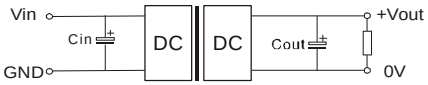
1) Requirement on output load

To ensure this module can operate efficiently and reliably, During operation, the minimum output load ***could not be less than 10% of the full load***. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load.

2) Recommended circuit

All the VRB_LD-50W Series have been tested according to the following recommended testing circuit before leaving factory. This series should be tested under load. Never be tested under no load (see Figure 3).

If you want to further decrease the output ripple, you can increase capacitance properly or choose capacitors with low ESR. However, the capacitance can't exceed the maximum capacitor load in the list (Table 2).



(Figure3)

EXTERNAL CAPACITOR TABLE (TABLE 2)

Capacitance / Output Voltage	Cout(μF)	Cin(μF)
3.3V、5V	220	100
12V、15V	100	
24V	47	

3) 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. Specifications subject to change without prior notice.

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