

40W isolated DC/DC converter,
Wide input and regulated single output



CE Patent Protection RoHS



FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 91%
- No-load power consumption as low as 0.3W
- I/O isolation test voltage: 1.5K VDC
- Output short-circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C ~ +85°C
- Six-sided metal shielding package
- EN62368 approved

VRB_LD-40WHR3 series are isolated 40W DC-DC products with 2:1 input voltage. They feature efficiency up to 91%, 1500VDC isolation, operating temperature of -40°C ~ +85°C, output short circuit protection, over-voltage protection, over-current protection, which make them widely applied in data transmission device, battery power supply device, tele-communication device, distributed power supply system, remote control system, industrial robot fields.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Efficiency ^② (%Min./Typ.) @ Full Load	Max. Capacitive Load(μF)
		Nominal (Range)	Max. ①	Output Voltage (VDC)	Output Current (mA)(Max./Min.)		
--	VRB2405LD-40WHR3	24 (18-36)	40	05	8000/0	86/88	10000
CE	VRB2412LD-40WHR3			12	3333/0	88/90	2700
	VRB2415LD-40WHR3			15	2667/0	90/91	1680
	VRB2424LD-40WHR3			24	1667/0	90/91	680
	VRB4812LD-40WHR3	48 (36-75)	80	12	3333/0	88/90	2700
	VRB4815LD-40WHR3			15	2667/0	90/91	1680
	VRB4824LD-40WHR3			24	1667/0	90/91	680

Notes:

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

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	VRB2405LD-40WHR3	--	1894/60	1938/100	mA
		Other outputs	--	1852/12	1894/25	
	48VDC input		--	926/12	947/25	mA
Reflected Ripple Current	Nominal input voltage		--	30	--	
Surge Voltage (1sec. max.)	24VDC input		-0.7	--	50	VDC
	48VDC input		-0.7	--	100	
Input Under-voltage Protection	24VDC input		13	15.5	--	
	48VDC input		26	33	--	
Start-up Voltage	24VDC input		--	--	18	
	48VDC input		--	--	36	
Start-up Time	Nominal input voltage & constant resistance load		--	10	150	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl *	Module on		Ctrl suspended or connected to TTL high level (3.5-12VDC)			
	Module off		Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when off		--	5	10	mA

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit	
Voltage Accuracy	VRB2405LD-40WHR3 ^①	5%-100% load	--	±1	±3	%	
	Other outputs	0%-100% load					
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5		
Load Regulation	VRB2405LD-40WHR3 ^②	5%-100% load	--	±0.5	±1		
	Other outputs	0%-100% load					
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs	
Transient Response Deviation			VRB2405LD-40WHR3	--	±5	±8	%
			Other outputs	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C	
Ripple & Noise ^③	20MHz bandwidth, nominal input voltage, 100% load		--	50	100	Mv p-p	
Trim			--	±10	--	%Vo	
Over-voltage Protection			110	--	160		
Over-current Protection	Input voltage range		110	--	190		%Io
Short-circuit Protection			Hiccup, continuous, self-recovery				

Note:
 ①VRB2405LD-40WHR3 0%-100% output voltage accuracy 5% max;
 ②VRB2405LD-40WHR3 0%-100% Load Regulation 5% max;
 ③The "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	--	2000	--	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		10-55Hz, 10G, 30 Min. along X, Y and Z			
Switching Frequency *	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	500	--	--	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	51.40×26.20×16.50 mm
Weight	36.0g(Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
Immunity	ESD	Other outputs	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria A
		VRB2405LD-40WHR3	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS		IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	Other outputs	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	
VRB2405LD-40WHR3		IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)		perf. Criteria B

Surge	Other outputs	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)	perf. Criteria A
	VRB2405LD-40WHR3	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
CS	Other outputs	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A
	VRB2405LD-40WHR3	IEC/EN61000-4-6	3 Vr.m.s	

Typical Characteristic Curves

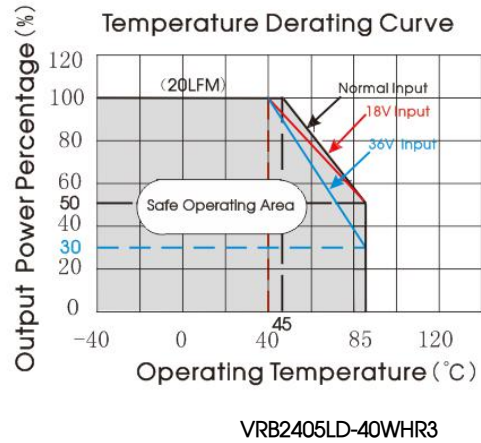
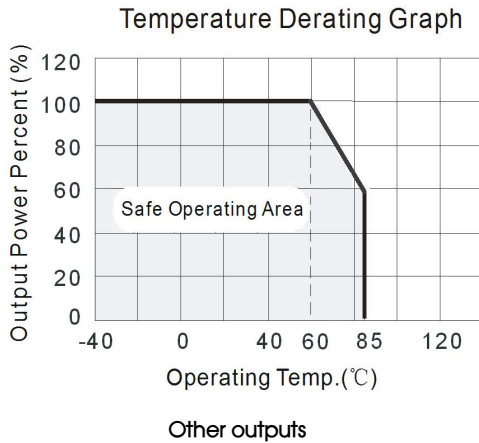
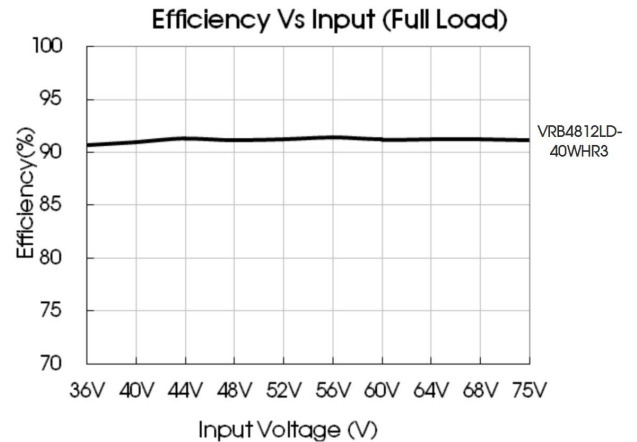
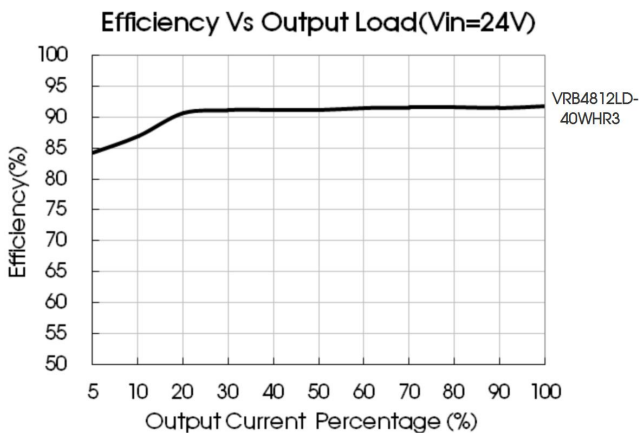
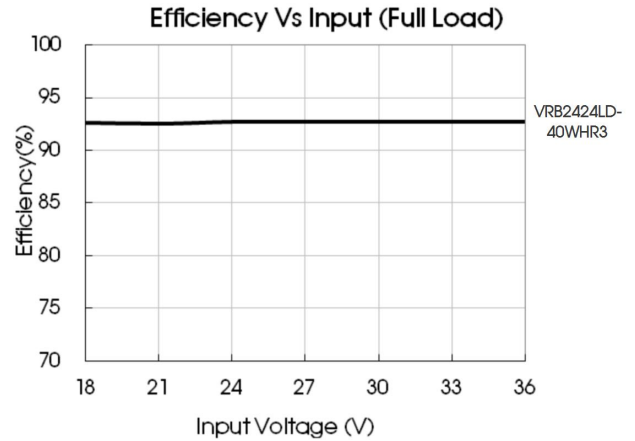
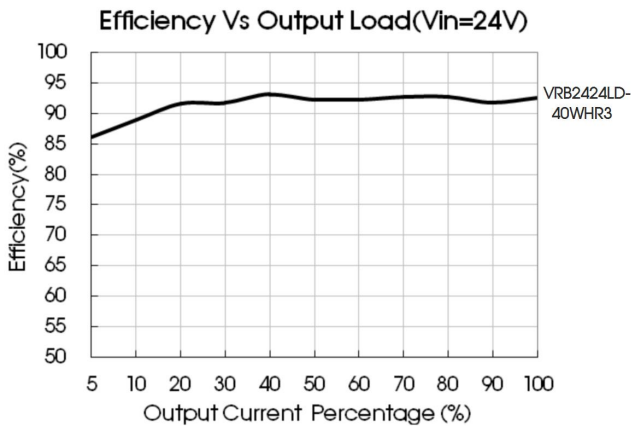


Fig. 1

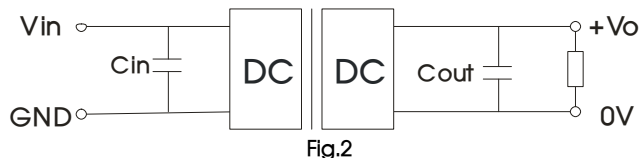


Design Reference

1. Typical application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.

If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.



output voltage (VDC)	Cout (μF)	Cin (μF)
5/12/15/24	100	100

2. EMC solution-recommended circuit

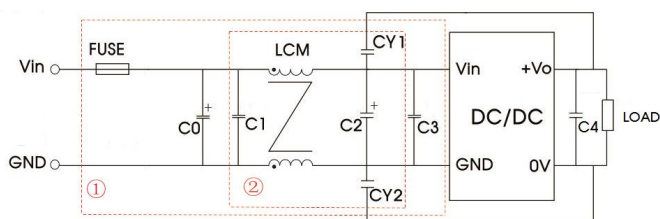


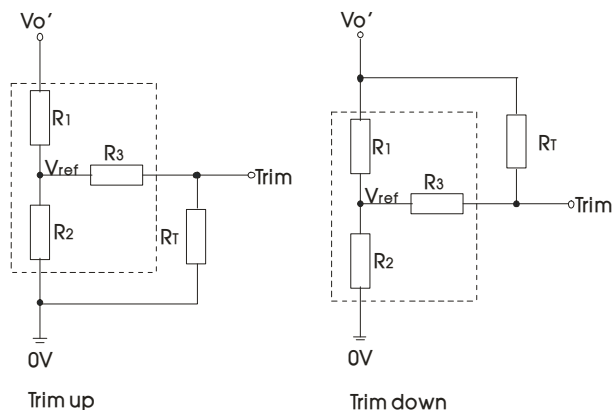
Fig. 3

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	Choose according to actual input current	
C0	680μF/50V	680μF/100V
C1/C3	4.7μF/50V	4.7μF/100V
C2	330μF/50V	330μF/100V
C4	Refer to the Cout in Fig.2	
LCM	2.2mH, recommended to use MORNSUN's FL2D-30-222	
CY1, CY2	2.2nF/2KV	

3. Trim function for output voltage adjustment (open if unused)



Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

RT = Trim Resistor value;
α = self-defined parameter
Vo' = desired output voltage

TRIM resistor connection (dashed line shows internal resistor network)

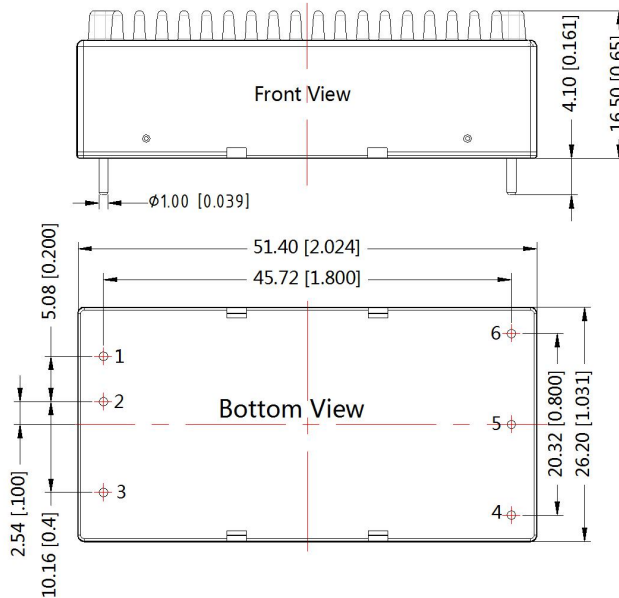
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
05	2.880	2.87	10	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	15	2.5

4. The products do not support parallel connection of their output

5. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Horizontal Package Dimensions

THIRD ANGLE PROJECTION 



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

Note:
Unit: mm[inch]
General tolerances: $\pm 0.50[\pm 0.020]$

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200051(with heat sink)
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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