

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



CE Patent Protection **RoHS**

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 to +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.

FEATURES

- wide input voltage range (2:1)
- High efficiency up to 91%
- No-load power consumption as low as 0.3W
- Isolation voltage: 1.5K VDC
- Output short circuit, over-voltage, over-current protection
- Operating temperature range: -40°C to +85°C
- Six-sided metal shielding package
- EN62368 approval

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.)		
CE	VRB2412LD-40WHR3	24 (18-36)	40	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 Absolute maximum rating without damage on the converter, but it isn't recommended;
 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	--	1852/12	1894/25	mA
	48VDC input	--	926/12	947/25	
Reflected Ripple Current	Nominal input voltage	--	30	--	VDC
Surge Voltage (1sec. max.)	24VDC input	-0.7	--	50	
	48VDC input	-0.7	--	100	
Input Under-voltage Protection	24VDC input	13	15.5	--	
	48VDC input	26	33	--	
Starting Voltage	24VDC input	--	--	18	
	48VDC input	--	--	36	
Starting Time	Nominal input voltage & constant resistance load	--	10	150	ms
Input Filter		Pi filter			
Hot Plug		Unavailable			
Ctrl *	Module switch on	Ctrl suspended or connected to TTL high level (3.5-12VDC)			
	Module switch off	Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched 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
Output Voltage Accuracy	0%-100% load	--	±1	±3	%
Line Regulation	Full load, the input voltage is from low voltage to high voltage	--	±0.2	±0.5	
Load Regulation	0%-100% load	--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage	--	300	500	µs
Transient Response Deviation		--	±3	±5	%
Temperature Coefficient	Full load	--	--	±0.03	%/°C
Ripple & Noise ^①	20MHz bandwidth, nominal input voltage, 100% load	--	50	100	Mv p-p
Trim		--	±10	--	%Vo
Output Over-voltage Protection		110	--	160	
Output Over-current Protection	Input voltage range	110	--	190	%Io
Short circuit Protection		Hiccup, Continuous, self-recovery			

Note: ①Ripple and noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Insulation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Insulation Resistance	Input-output, insulation voltage 500VDC/60sec., Ta=25°C, humidity=75%RH	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	2000	--	pF
Operating Temperature	see Fig. 1 and Fig. 2	-40	--	85	°C
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	°C
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency *	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	500	--	--	K hours

Note: *This series of products using reduced frequency technology, the switching frequency is test value of full load, When the load is reduced to below 50%, the switching frequency decreases with decreasing load.

Physical Specifications

Casing Material	Aluminum alloy
Package Dimensions	51.40*26.20*16.50 mm
Weight	36g(Typ.)
Cooling Method	Free air convection

EMC Specifications

EMI	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria A
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)	perf. Criteria A
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Product Characteristic Curve

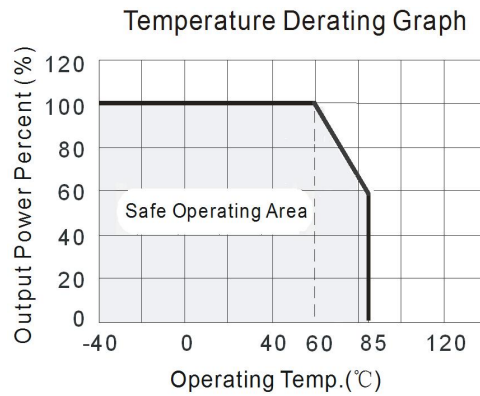
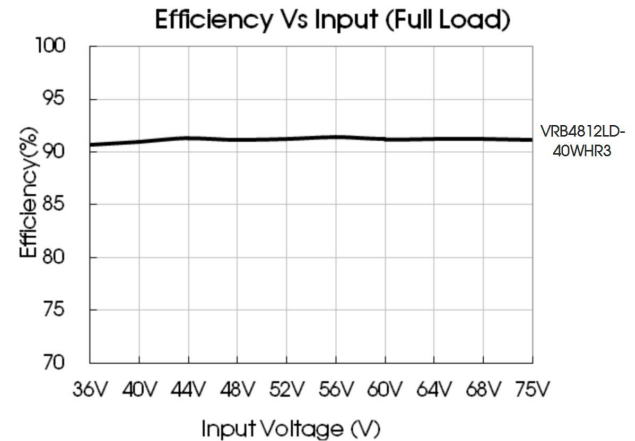
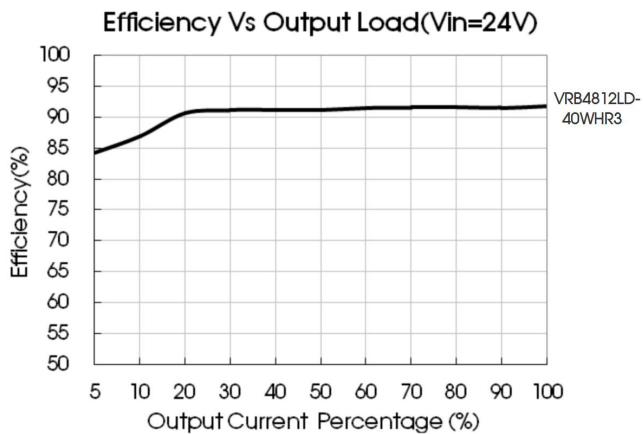
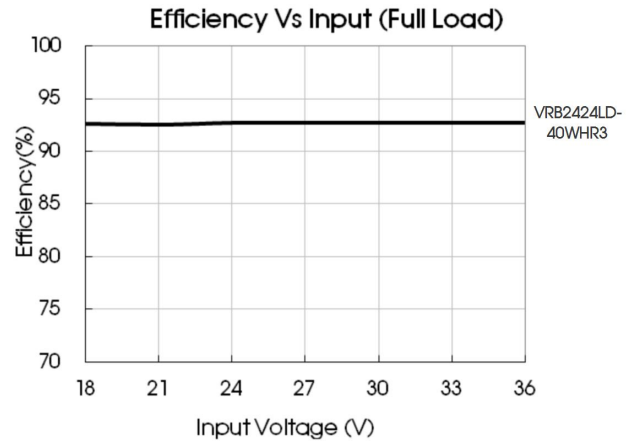
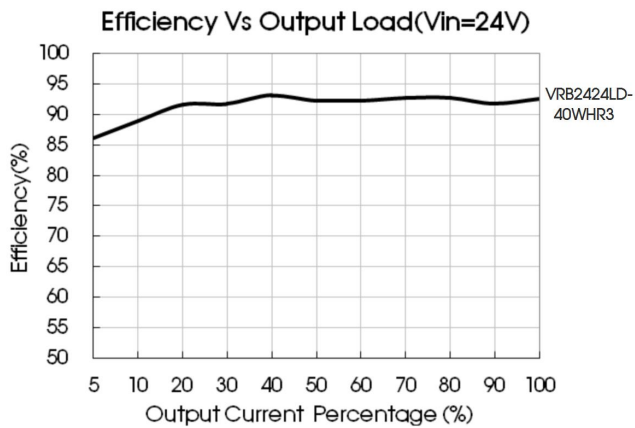


Fig. 1



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.



Fig.2

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

2. EMC solution-recommended circuit

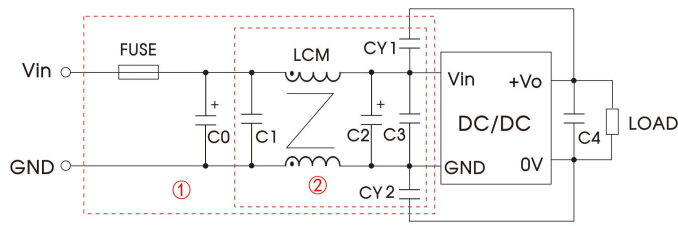


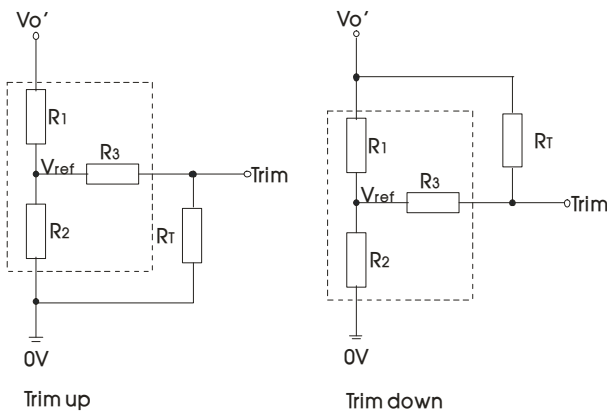
Fig. 3

Notes: Fig. 3-① is used for EMC test and Fig. 3-② for EMI filtering; selected 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. Application of Trim and calculation of Trim resistance



Calculation formula of Trim resistance:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T is Trim resistance, α is a self-defined parameter, with no real meaning.
 V_o' for the actual needs of the up or down regulated voltage

Applied circuits of Trim (Part in broken line is the interior of models)

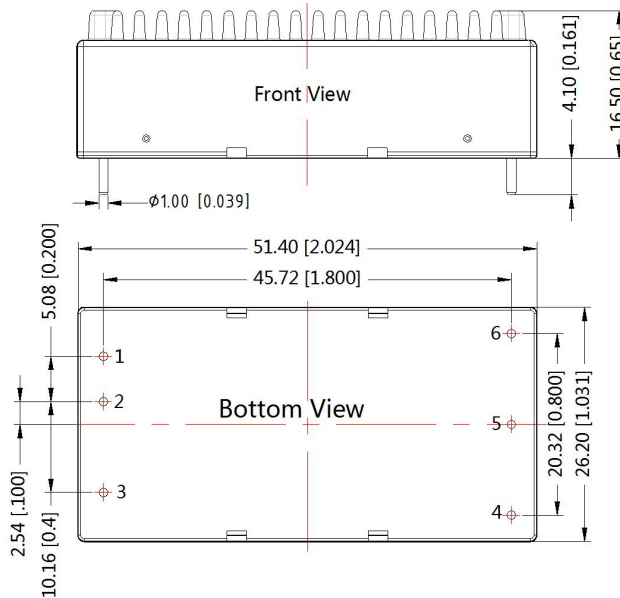
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	15	2.5

4. It is not allowed to connect modules output in parallel to enlarge the power

5. For more information please find 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: ± 0.50 [± 0.020]

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. 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's 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.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Luogang District, Guangzhou, P. R. China
Tel: 86-20-38601850-8801 Fax: 86-20-38601272 E-mail: info@mornsun.cn