

10W, wide input, isolated & regulated single output, SIP package, DC-DC converter



Patent Protection RoHS

FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 88%
- Isolation voltage :1.5K VDC
- Input under-voltage protection, output short circuit, over-current protection
- Operating temperature range: -40°C to +85°C
- International standard pin-out
- Meets EN62368 standards (Pending)

VRB_S-10WR3 series are isolated 10W DC-DC products with 2:1 input voltage. The feature efficiency up to 88%, 1500VDC isolation, operating temperature of -40°C to +85°C, input under-voltage protection, output over-current, short circuit protection, which make them widely applied in medical care, industrial control, electric power, instruments and communication fields.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Efficiency® (%Min./Typ.) @ Full Load	Max. Capacitive Load (µF)
		Nominal (Range)	Max.①	Output Voltage (VDC)	Output Current (mA) (Max./Min.)		
CE Pending	VRB1203S-10WR3	12 (9-18)	20	3.3	2400/0	81/83	2200
	VRB1205S-10WR3			5	2000/0	84/86	2200
	VRB1209S-10WR3			9	1111/0	84/86	680
	VRB1212S-10WR3			12	833/0	84/86	470
	VRB1215S-10WR3			15	667/0	84/86	330
	VRB1224S-10WR3			24	417/0	84/86	220
	VRB2403S-10WR3	24 (18-36)	40	3.3	2400/0	83/85	2200
	VRB2405S-10WR3			5	2000/0	86/88	2200
	VRB2409S-10WR3			9	1111/0	86/88	680
	VRB2412S-10WR3			12	833/0	86/88	470
	VRB2415S-10WR3			15	667/0	86/88	330
	VRB2424S-10WR3			24	417/0	86/88	220

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)	12VDC nominal input series, nominal input voltage	3.3V output	--	777/35	796/50	mA
		5V output	--	969/35	992/50	
		Others	--	969/9	992/18	
	24VDC nominal input series, nominal input voltage	3.3V output	--	389/25	398/45	
		5V output	--	474/25	485/45	
		Others	--	474/9	485/18	
Reflected Ripple Current		--	50	--		
Surge Voltage (1sec. max.)	12VDC nominal input voltage	-0.7	--	25	VDC	
	24VDC nominal input voltage	-0.7	--	50		
Starting Voltage	12VDC nominal input voltage	--	--	9		
	24VDC nominal input voltage	--	--	18		
Input Under-voltage Protection	12VDC nominal input voltage	5.5	6.5	--	VDC	
	24VDC nominal input voltage	12	15.5	--		
Input Filter		Capacitance Filter				
Hot Plug		Unavailable				

Ctrl*	Module switch on	Ctrl open circuit 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	--	6	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 ^①	5%-100% load	--	±1.5	±2	%	
Line Regulation	Full load, the input voltage is from low voltage to high voltage	--	±0.25	±0.5		
Load Regulation ^②	5%-100% load	--	±0.5	±1		
Transient Recovery Time		--	300	500	μs	
Transient Response Deviation	25% load step change	3.3V/ 5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise ^③	20MHz bandwidth, 5%-100% load	3.3V/ 5V output	--	60	120	mV p-p
		Others	--	75	150	
Output Over-current Protection	Input voltage range	110	160	230	%Io	
Short circuit Protection		Continuous, self-recovery				

Note: ① At 0%-5% load, the Max. output voltage accuracy is ±3%;

② When testing from 0% -100%load working conditions, load regulation index is ±3%;

③ 0%-5% load ripple&Noise is no more than 300mV. Ripple and noise are measured by Fig.2

General Specification

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	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	1000	--	pF
Operating Temperature	see Fig. 1	-40	--	+85	°C
Storage Humidity	Without condensation	5	--	95	%RH
Storage Temperature		-55	--	+125	°C
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	+300	
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency *	PWM mode	--	500	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	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	Black flame-retardant and heat-resistant plastic (UL94 V-0)
Dimension	22.00*9.50*12.00 mm
Weight	5.5g (Typ.)
Cooling method	Free air convection (20LFM)

EMC Specifications

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

Product Characteristic Curve

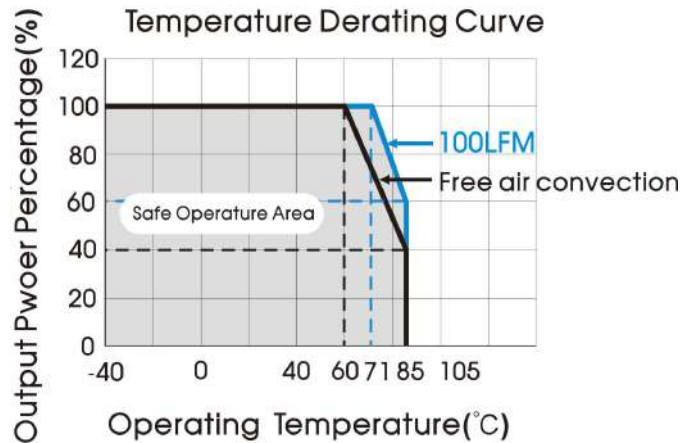
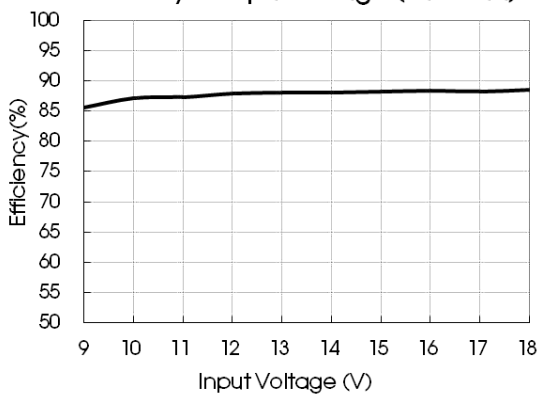
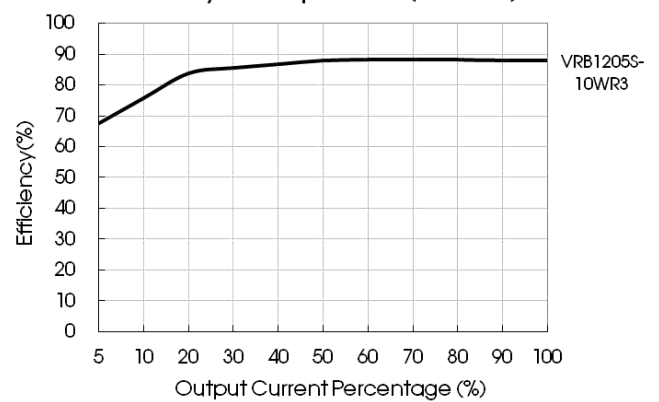


Fig. 1

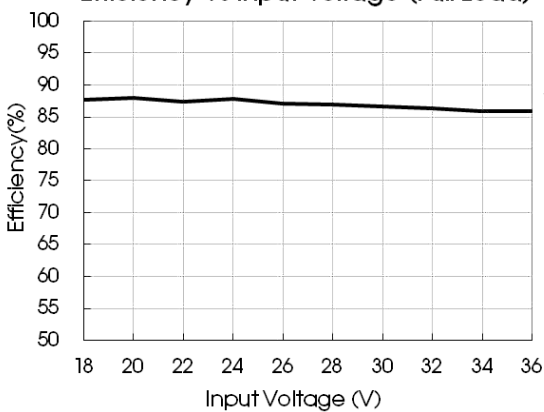
Efficiency Vs Input Voltage (Full Load)



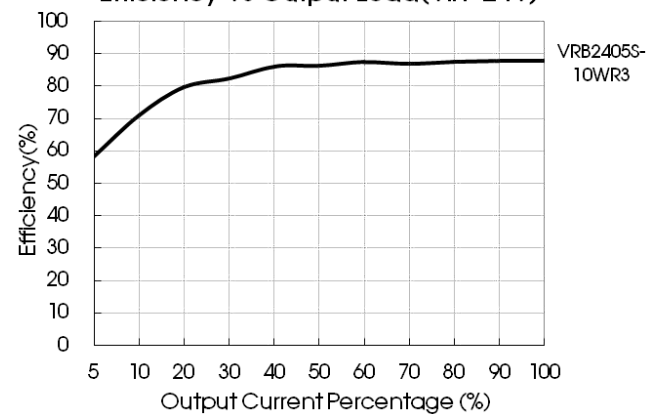
Efficiency Vs Output Load (Vin=24V)



Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=24V)



Design Reference

1. Ripple & Noise

All the VRB_S-10WR3 series have been tested according to the following recommended test circuit before delivery (see Fig. 2). The connection of probe to copper foil is shortened as far as possible.

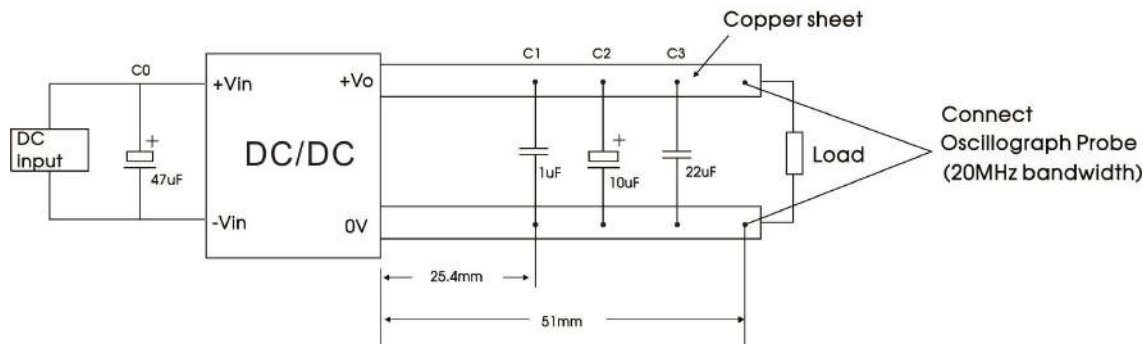


Fig. 2

2. Typical application

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

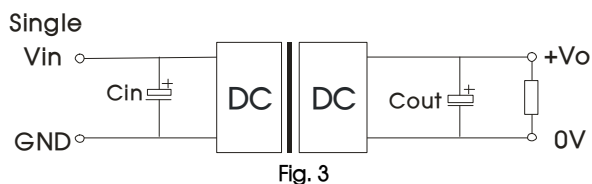


Fig. 3

$C_{in}(\mu F)$	$C_{out}(\mu F)$
47	22

3. EMC solution-recommended circuit

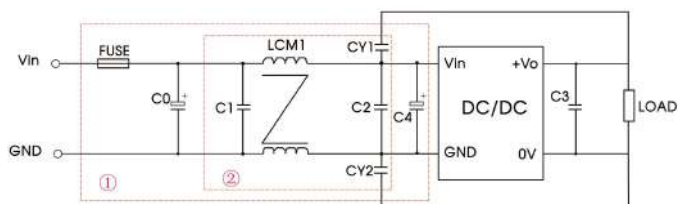


图 4

Notes: Part ① in the Fig. 4 is used for EMC test and part ② for EMI filtering; selected based on needs.

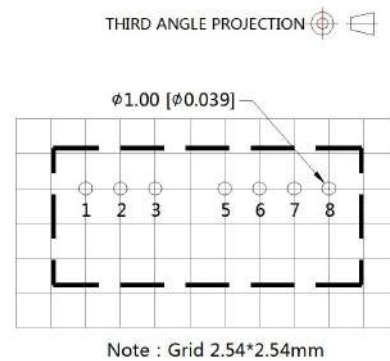
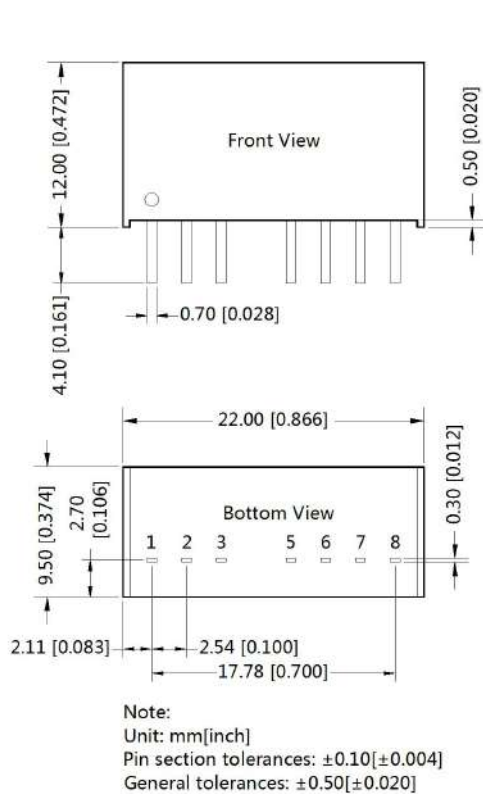
Fig. 4 Parameter description

Model	$V_{in}:12V$	$V_{in}:24V$
FUSE	Choose according to actual input current	
C0, C4	330µF/35V	330µF/50V
C1, C2	10µF/50V	
C3	22µF/50V	
LCM1	1.4-1.7mH (TN150P-RH12.7*12.7*7.9)	
CY1, CY2	1nF/2000VDC	

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

Dimensions and Recommended Layout



Pin-Out	
Pin	Function
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	NC

NC: Pin to be isolated from circuitry

- Note:
1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number: 58210004;
 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.

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