

10W isolated DC-DC converter in SIP package
Wide input & regulated single output



CE Patent Protection RoHS



VRB_S-10WR3 series are isolated 10W DC-DC products with 2:1 input voltage. They feature efficiencies up to 88%, 1500VDC isolation, operating ambient temperature of -40°C ~ +85°C, input under-voltage protection, output over-current, short circuit protection. They are widely used in applications such as medical care, industrial control, electric power, instruments, communications and other industries.

FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 88%
- I/O isolation test voltage 1.5K VDC
- Input under-voltage protection, output short circuit and over-current protection
- Operating ambient temperature range: -40°C ~ +85°C
- Industry standard pin-out
- EN62368 approved

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency ^② (%) Min./Typ.	Max. Capacitive Load (μF)
		Nominal (Range)	Max. ^①	Voltage (VDC)	Current (mA) (Max./Min.)		
CE	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 Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured at 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		
Start-up Voltage	12VDC nominal input voltage	--	--	9		
	24VDC nominal input voltage	--	--	18		
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 Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy ^①	5%-100% load	--	±1.5	±2	%	
Linear Regulation	Input voltage variation from low to high at full load	--	±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	
Over-current Protection	Input voltage range	110	160	230	%Io	
Short-circuit Protection		Continuous, self-recovery				

Note: ① Output voltage accuracy for 0%-5% load is ±3% max.;
 ② Load regulation for 0% -100% load increases to ±3%;
 ③ 0%-5% load ripple&noise <300mV. Ripple and noise are measured by Fig.2.

General Specification

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 insulation at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	--	1000	--	pF
Operating Temperature	See Fig. 1	-40	--	+85	°C
Storage Humidity	Non-condensing	5	--	95	%RH
Storage Temperature		-55	--	+125	°C
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 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:* Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

Case Material	Black plastic, flame-retardant and heat-resistant (UL94 V-0)
Dimension	22.00×9.50×12.00 mm
Weight	5.5g (Typ.)
Cooling Method	Free air convection (20LFM)

Electromagnetic Compatibility (EMC)

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

Typical Performance Curves

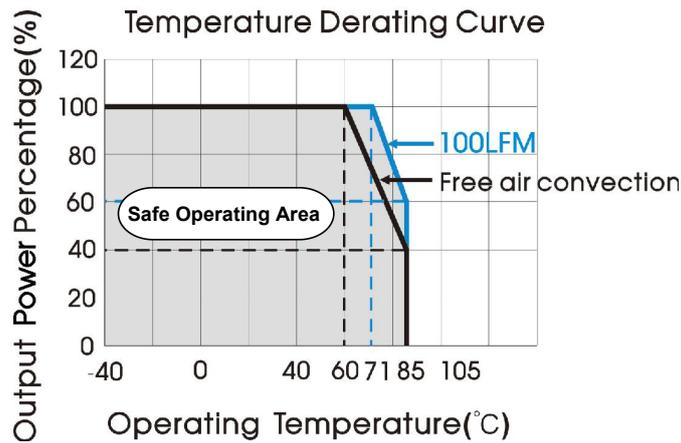
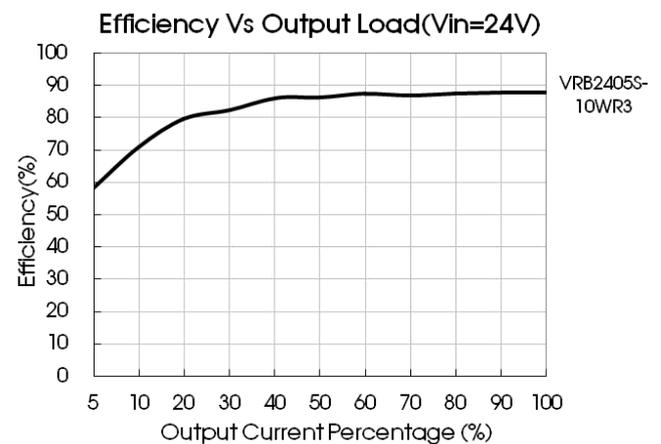
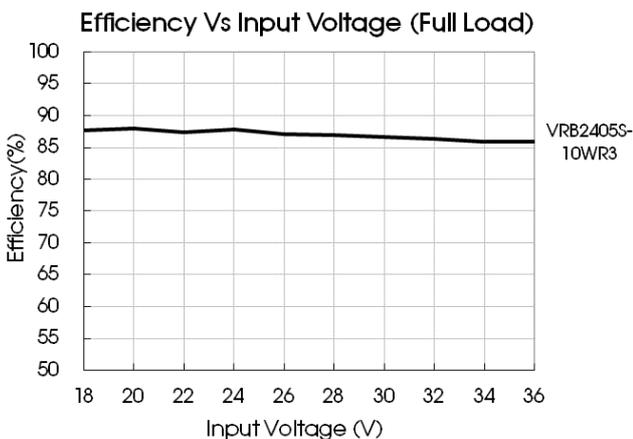
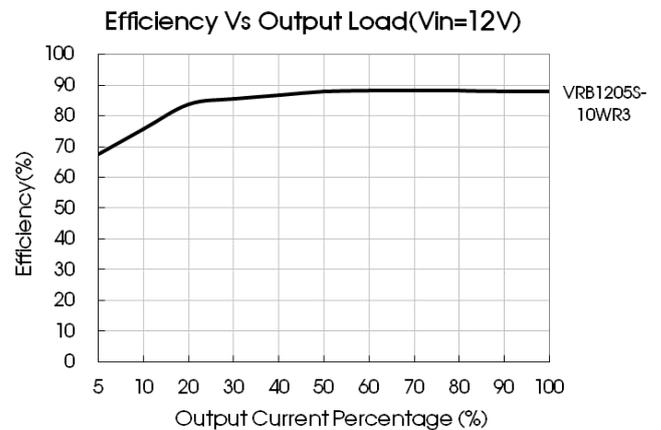
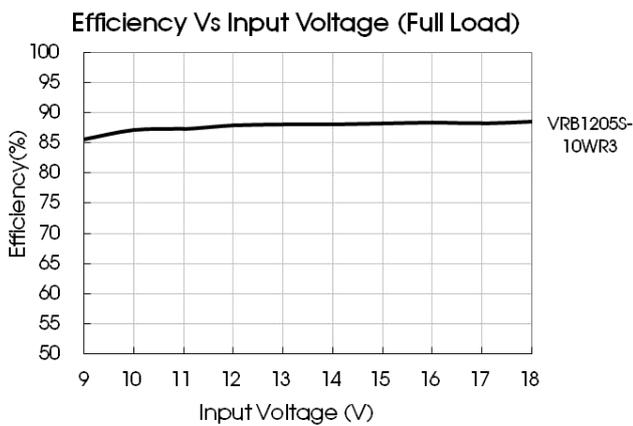


Fig. 1



Design Reference

1. Ripple & Noise

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2. Please keep the wire of probe to copper as short as possible.

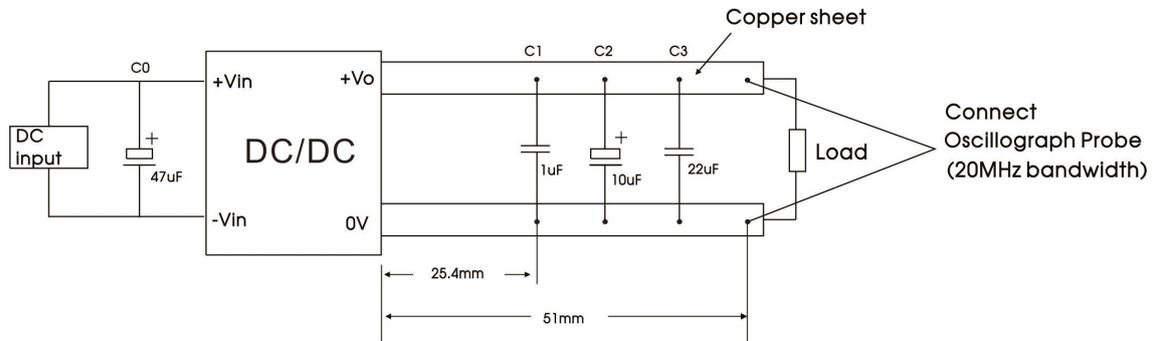
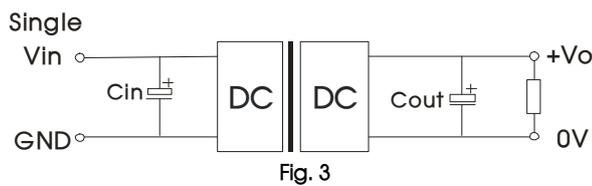


Fig. 2

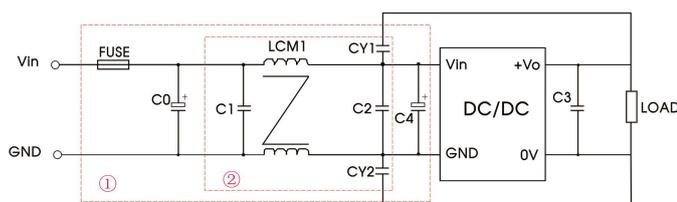
2. Typical application

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



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

3. EMC solution-recommended circuit



Notes: We use Part ① in Fig. 4 for EMC and part ② for emissions test. Selecting based on needs.

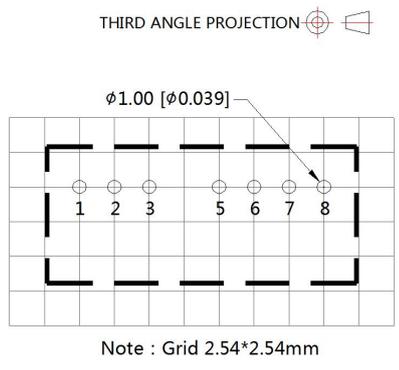
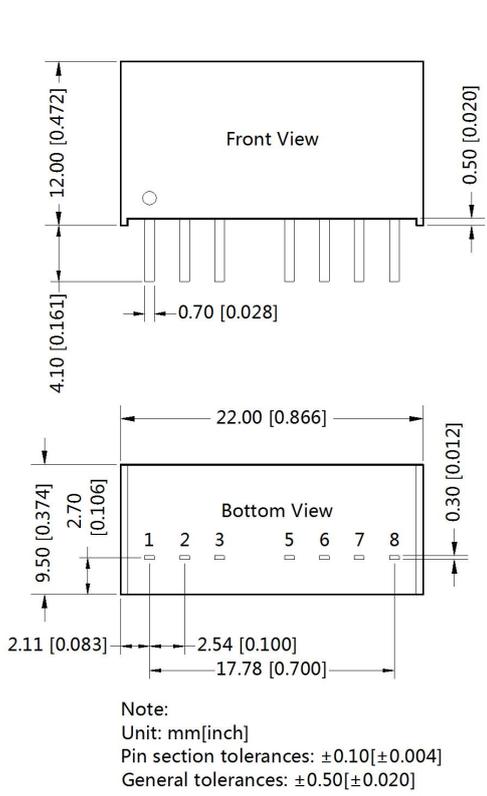
Parameter description

Model	$V_{in}:12V$	$V_{in}:24V$
FUSE	Choose according to actual input current	
C_0, C_4	330 $\mu F/35V$	330 $\mu F/50V$
C_1, C_2	10 $\mu F/50V$	
C_3	22 $\mu F/50V$	
LCM1	1.4-1.7mH (TN150P-RH12.7*12.7*7.9)	
CY_1, CY_2	1nF/2000VDC	

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.

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:
- For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number:58210004;
 - The maximum capacitive load offered were tested at input voltage range and full load;
 - Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
 - All index testing methods in this datasheet are based on company corporate standards;
 - We can provide product customization service, please contact our technicians directly for specific information;
 - Products are related to laws and regulations: see "Features" and "EMC";
 - 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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