

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 to +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 to +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 resistance 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 Characteristic Curves

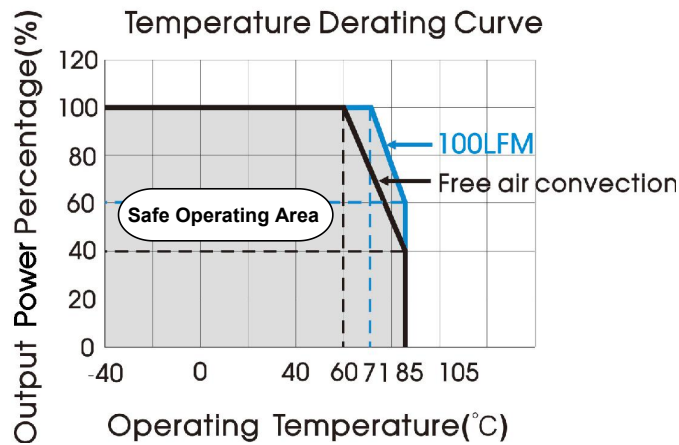
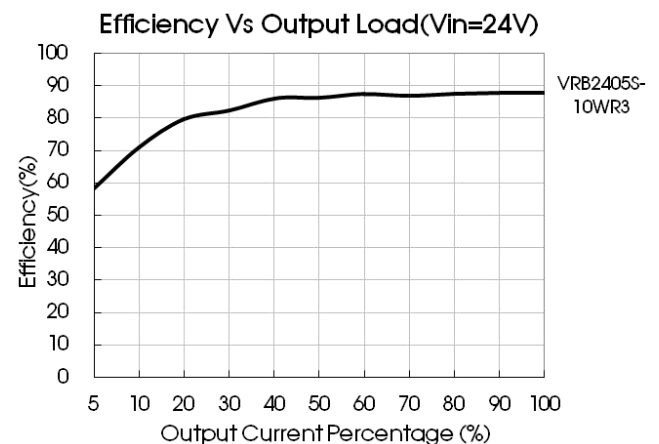
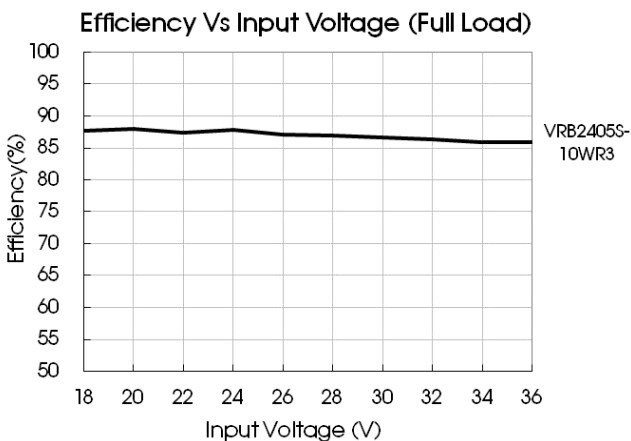
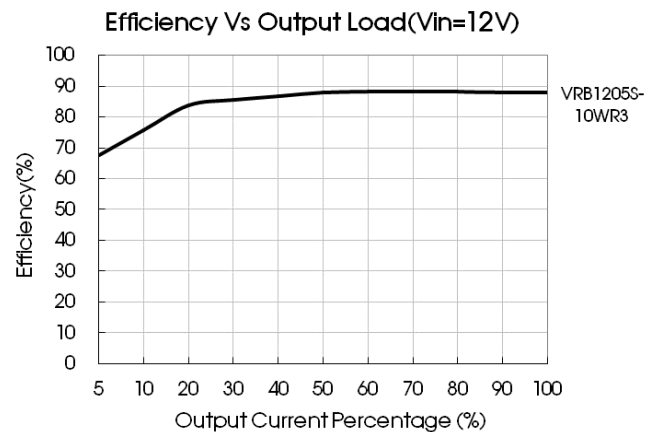
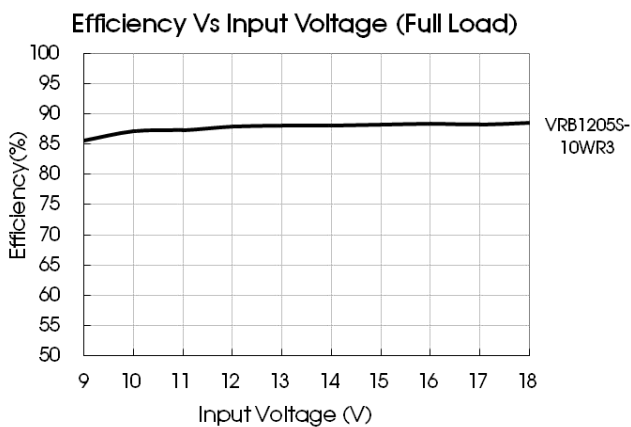


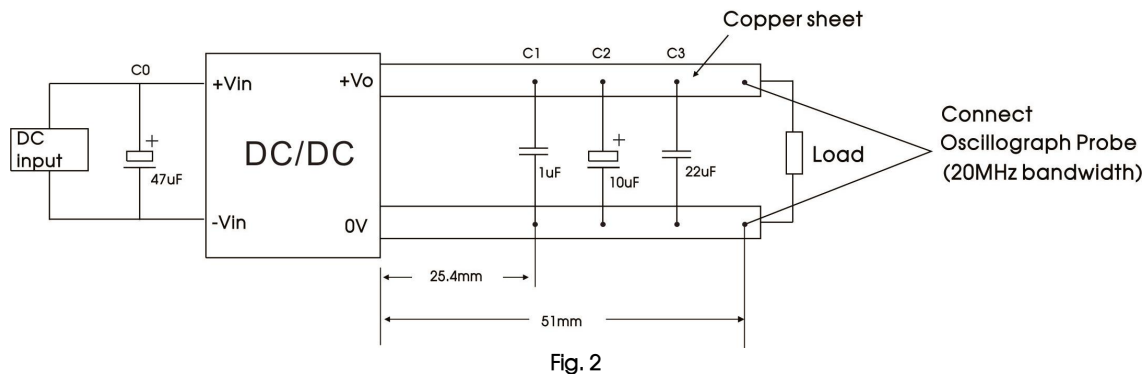
Fig. 1



Design Reference

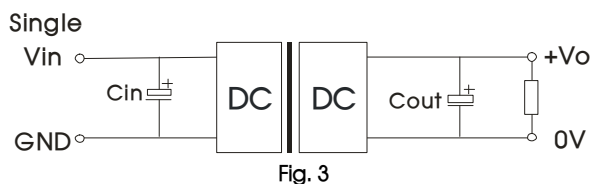
1. Ripple & Noise

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.



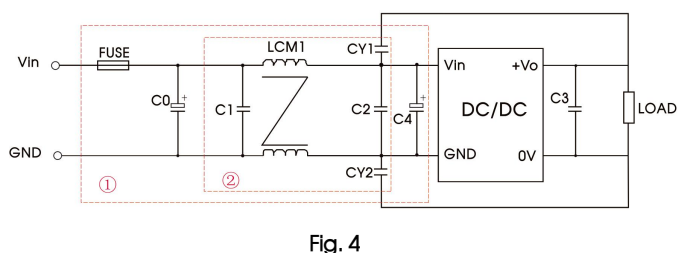
2. Typical application

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



Parameter description

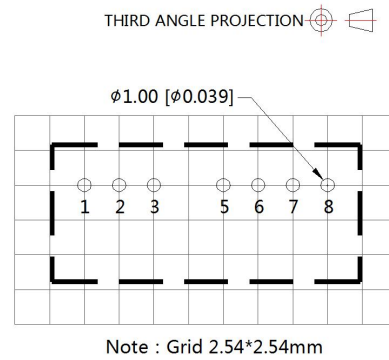
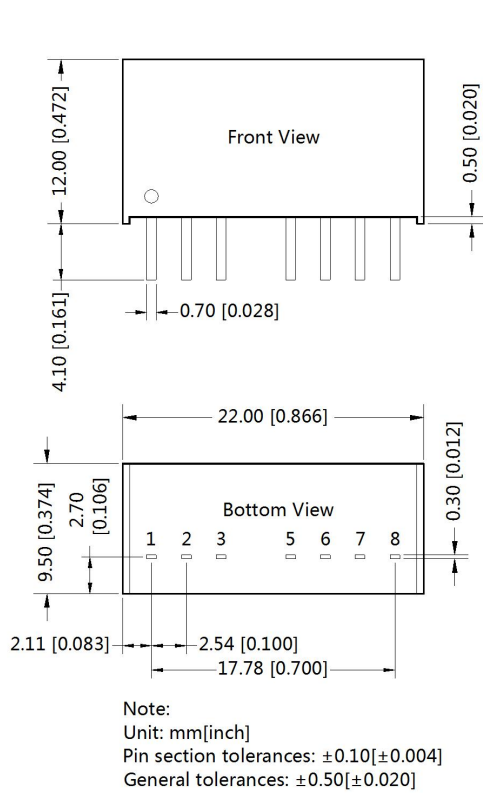
Model	$V_{in}:12V$	$V_{in}:24V$
FUSE	Choose according to actual input current	
C0, C4	330µF/35V	330µF/50V
C1, C2	10µF/50V	
C3	22µF/50V	
LCM1	1.4-1.7mH (TN150P-RH12.7*12.7*7.9)	
CY1, CY2	1nF/2000VDC	

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

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. 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 $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated output load;
 - All index testing methods in this datasheet are based on our Company's 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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