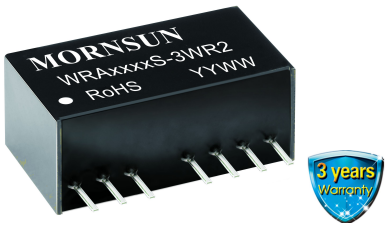
3W, Wide input voltage, isolated & regulated dual / single output DC/DC converter



CE Patent Protection RoHS

FEATURES

- Compact SIP package
- Wide input voltage range (2:1)
- Operating temperature range: -40℃ to +85℃
- Isolation voltage: 1.5K VDC
- Low ripple & noise
- Short circuit protection (self-recovery)
- Remote On/Off
- High Power Density
- EN60950 approval

WRA_S-3WR2 & WRB_S-3WR2 series are isolated 3W DC-DC products with 2:1 input voltage and conventional voltage output. The product has a relatively compact SIP-8 plastic package, and features high efficiency, operating temperature of -40℃~+85℃, remote control, and continuous short-circuit protection. The smaller size and fine cost design make the converter an ideal solution in communication, instruments, and industrial electronics applications.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Ripple&Noise (Typ./Max.) (mVp-p)	Efficiency (%, Min./Typ.) @ Full Load	Max. Capacitive Load[2] (μF)
		Nominal (Range)	Max.[1]	Output Voltage(VDC)	Output Current (mA)(Max./Min.)			
CE	WRA0505S-3WR2	5 (4.5-9)	11	±5	±250/±13	40/75	72/74	1000
	WRA0512S-3WR2			±12	±104/±5		75/77	470
	WRA0515S-3WR2			±15	±83/±4		75/77	330
	WRA0524S-3WR2			±24	±52/±3		74/76	220
	WRB0503S-3WR2			3.3	758/38		66/68	1800
	WRB0505S-3WR2			5	500/25		71/73	2200
	WRB0509S-3WR2			9	278/14		72/74	1000
	WRB0512S-3WR2			12	208/10		75/77	680
	WRB0515S-3WR2			15	167/8		72/74	470
	WRB0524S-3WR2			24	104/5		74/76	330
	WRA1205S-3WR2	12 (9-18)	20	±5	±300/±15		76/78	1000
	WRA1209S-3WR2			±9	±167/±8		76/78	680
	WRA1212S-3WR2			±12	±125/±6		77/79	470
	WRA1215S-3WR2			±15	±100/±5		78/80	330
	WRB1203S-3WR2			3.3	758/38		73/75	2700
	WRB1205S-3WR2			5	600/30		74/76	2200
	WRB1206S-3WR2			6	500/25		77/79	1800
	WRB1209S-3WR2			9	333/17		77/79	1000
	WRB1212S-3WR2			12	250/13	70/100	80/82	680
	WRB1215S-3WR2			15	200/10		81/83	470
	WRB1224S-3WR2			24	125/6	100/150	79/81	330
	WRA2405S-3WR2	24 (18-36)	40	±5	±300/±15	40/75	77/79	1000
	WRA2409S-3WR2			±9	±167/±8		79/81	680
	WRA2412S-3WR2			±12	±125/±6		81/83	470
	WRA2415S-3WR2			±15	±100/±5		81/83	330
	WRB2403S-3WR2			3.3	758/38		72/74	2700
	WRB2405S-3WR2			5	600/30		79/81	2200
	WRB2409S-3WR2			9	333/17		81/83	1000
	WRB2412S-3WR2			12	250/13		81/83	680
	WRB2415S-3WR2			15	200/10	100/150	81/83	470
	WRB2424S-3WR2			24	125/6		81/83	330

CE	WRA4805S-3WR2	48 (36-75)	80	±5	±300/±15	100/150	77/79	1000
	WRA4812S-3WR2			±12	±125/±6	40/75	80/82	470
	WRA4815S-3WR2			±15	±100/±5		80/82	330
	WRB4803S-3WR2			3.3	758/38	100/150	73/75	2700
	WRB4805S-3WR2			5	600/30	40/75	74/76	2200
	WRB4812S-3WR2			12	250/13		78/80	680
	WRB4815S-3WR2			15	200/10		82/84	470
	WRB4824S-3WR2			24	125/6	70/100	80/82	330

Notes:
① Absolute maximum rating without damage on the converter, but it isn't recommended;
② The capacitive loads of positive and negative outputs are identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	5VDC Input	3.3V Output	--	735/40	758/85	mA
		Others		805/40	846/85	
	12VDC Input	3.3V Output	--	278/30	286/40	
		Others		314/30	338/40	
	24VDC Input	3.3V Output	--	140/20	145/40	
		Others		154/20	163/40	
	48VDC Input	3.3V Output	--	69/5	72/15	
		Others		78/5	85/15	
Reflected Ripple Current	5VDC Input		--	20	--	
	12VDC Input		--	20	--	
	24VDC Input		--	55	--	
	48VDC Input		--	55	--	
Input Impulse Voltage (1sec. max.)	5VDC Input		-0.7	--	12	VDC
	12VDC Input		-0.7	--	25	
	24VDC Input		-0.7	--	50	
	48VDC Input		-0.7	--	100	
Starting Voltage	5VDC Input		--	--	4.5	
	12VDC Input		--	--	9	
	24VDC Input		--	--	18	
	48VDC Input		--	--	36	
Input Filter			Filter capacitor			
Hot Plug			Unavailable			
Ctrl function*	Module turn-on		The Ctrl end is suspended or of high resistance			
	Module turn-off		Connect with high level (relative to the input grounding) to make the 5-10mA current flows into the Ctrl end.			

Note: *For use of Ctrl, please refer to the "design reference" in this manual.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	5%-100% load，Input voltage range		--	±1	±3	%
No-load Output Voltage Accuracy	Input voltage range	WRB1203S-3WR2/WRB4803S-3WR2	--	±5	±8	
		others	--	±1.5	±5	
Balance of Output Voltage	Dual output, balanced load		--	±0.5	±1	
Line Regulation	Full load, the input voltage is from low to high		--	±0.2	±0.5	
Load Regulation	5%-100% load		--	±0.6	±1	
Transient Recovery Time	25% load step change		--	0.5	3	ms
Transient Response Deviation			--	±2.5	±5	%
Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃

Short Circuit Protection		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
Isolation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Isolation Resistance	Input-output, isolation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	120	--	pF
Operating Temperature	see Fig. 1	-40	--	85	℃
Storage Temperature		-55	--	125	
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	
Storage Humidity	Non-condensing	--	--	95	%RH
Switching Frequency (PFM Mode)	Full load, nominal input voltage	--	250	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours

Physical Specifications

Casing Material	Black flame-retardant and heat-resistant plastic (UL94-V0)
Dimension	22.00*9.50*12.00 mm
Weight	4.90g(Typ.)
Cooling Method	Free convection

EMC Specifications

EMI	CE	CISPR22/EN55022	CLASS B (see Fig. 3-② for recommended circuit)	
	RE	CISPR22/EN55022	CLASS B (see Fig. 3-② for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	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 B
	Surge	IEC/EN61000-4-5	±2KV (see Fig. 3-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B

Product Characteristic Curve

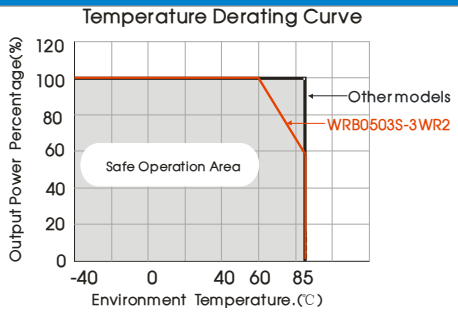
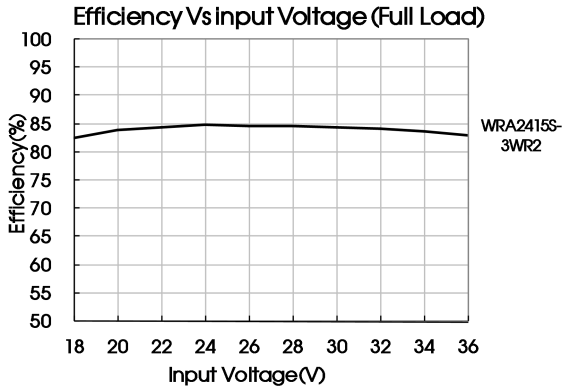
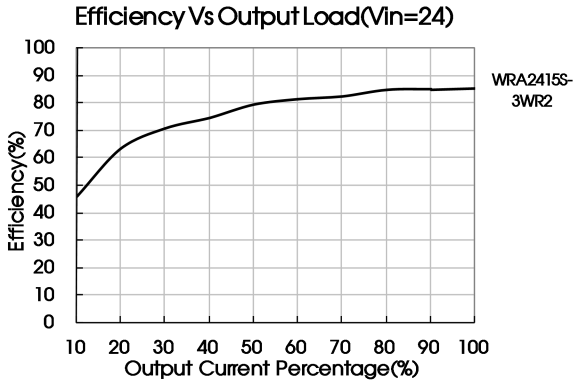
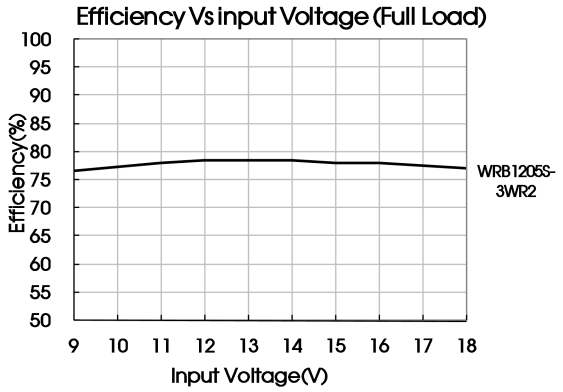
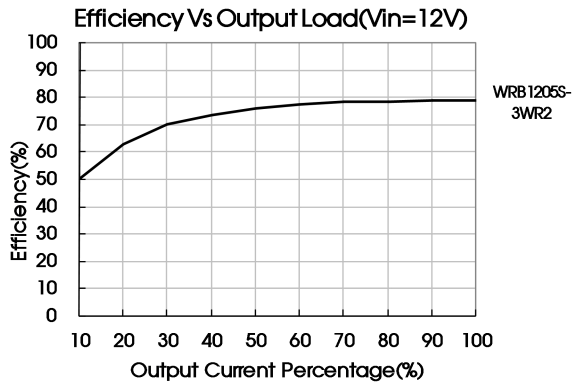


Fig 1







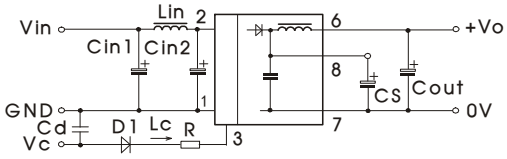


Design Reference

1. Recommended circuit

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.
If a further decrease of the input and output ripple is required, properly increase the input & output of additional capacitors Cin1, Cin2, Cs and Cout; or select capacitors of low equivalent impedance like series capacitor, etc. Cs is used to reduce ripple. No need to add Cs, if ripple meets the demand .Appropriate filter capacitance shall be chosen, start-up problems may be caused if the capacitance is too large. For each output circuit, under the condition of safe and reliable operation, the max. capacity of its filter capacitor should be lower than the max. capacitive load.

Single



Dual

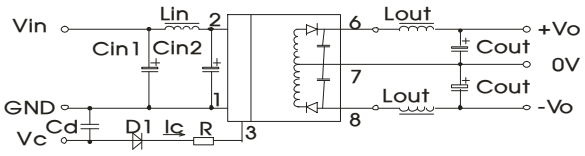


Fig. 2

Vin	5VDC&12VDC	24VDC&48VDC
Cin1	100μF	10μF
Cin2	47μF	1μF
Lin	4.7μH~12μH	
Cs	10μF~22μF	
Cout	100μF(Typ.)	
Lout	2.2μH~10μH	
Cd	47nF/100V	

2. EMC solution-recommended circuit

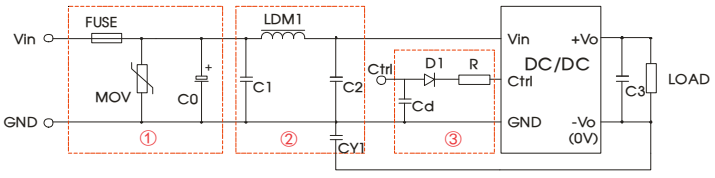


Fig. 3

Parameter description:

Model	Vin:5VDC	Vin:12VDC	Vin:24VDC	Vin:48VDC
FUSE	Slow blown fuses according to the actual input current selections of the clients			
MOV	--	S14K20	S20K30	S14K60
C0	680μF/25V	680μF/25V	330μF/50V	330μF/100V
C1	4.7μF/50V			4.7μF/100V
LDM1	12μH			
C2	4.7μF/50V			4.7μF/100V
C3	Refer to the Cout in Fig.2			
CY1	1nF/2KV			
D1	RB160M-60/1A			
R	In accordance with the formula: $R = \frac{V_C - V_D - 1.0}{I_C} - 300$			
Cd	47nF/100V			

Notes:

① Part ① in Fig. 3 is used for EMS test while part ② is used for EMI filtering; and parts ① and ② may be selected based on needs.
② V_C is the voltage of the Ctrl end relative to the GND of the input grounding; V_D is the positive-going conduction pressure drop of D1; I_C is the current flows into the Ctrl end and its value is generally 5-10mA, see Fig. 3-③ for the peripheral circuit of Ctrl end;
③ If there is no recommended parameters, no external component is required.

3. Ctrl end

The modules are of normal output when the Ctrl end is suspended or of high resistance; the modules turn off when connecting with high level (relative to the input grounding); notice that the current flows into the pin shall be 5 - 10mA, the modules will be permanently damaged if the current exceeds its max. value (20mA in general).
The value of R can be derived as follows:

$$R = \frac{V_C - V_D - 1.0}{I_C} - 300$$

For Detailed parameter, please refer to EMC solution-recommended circuit in this manual.

4. Input current

When the electricity is provided by the unstable power supply, please make sure that the range of the output voltage fluctuation and the ripple voltage of the power supply do not exceed the indicators of the modules. Input current of power supply should afford the flash startup current of this kind of DC/DC module(see Fig. 5).

Generally: Vin= 5V series Iave =1296mA
Vin=12V series Iave =631mA
Vin=24V series Iave =363mA
Vin=48V series Iave =157mA

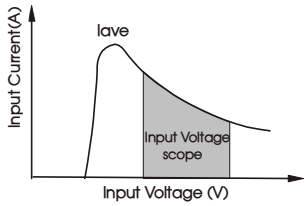


Fig. 5

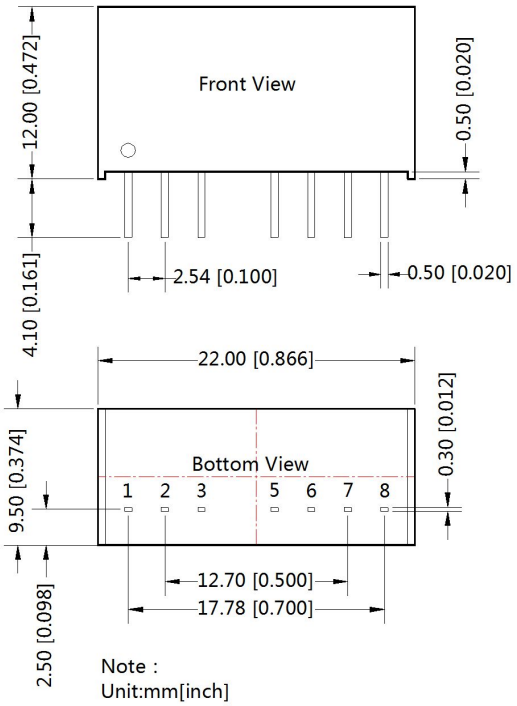
5. Output load requirements

When using, the minimum load of the module output should not be less than 5% of the nominal load.In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to be used in derating.

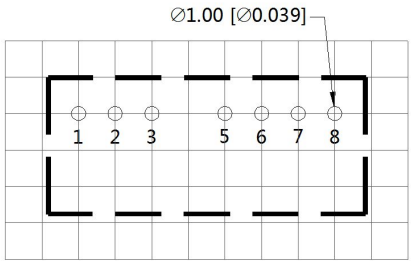
6. For more information please find DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note :
Unit:mm[inch]
Pin section tolerances:±0.10[±0.004]
General tolerances:±0.25[±0.010]



Note : Grid 2.54*2.54mm

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

NC: No connection

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number: 58210004;
2. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
3. The recommended unbalance degree of the dual output module load is ≤±5%; if the degree exceeds ±5%, than the product performance cannot be guaranteed to comply with all parameters in the datasheet. Please contact our technicians directly for specific information;
4. The maximum capacitive load offered were tested at nominal input voltage and full load;
5. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
6. All index testing methods in this datasheet are based on Company's corporate standards;
7. The performance parameters of the product models listed in this manual are as above, but some parameters of non-standard model products may exceed the requirements mentioned above. Please contact our technicians directly for specific information;
8. We can provide product customization service;
9. Specifications are subject to change without prior notice.

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