DC/DC Converter

WRA_S-1WR2 & WRB_S-1WR2 Series

MORNSUN®

1W isolated DC/DC converter in SIP package
Wide input and regulated dual/single output

Patent Protection

3 years Warranty

CE Report EN62368-1

UKCA Report BS EN62368-1

RoHS

FEATURES

- Ultra compact SIP package
- Wide input voltage range (2:1)
- Operating temperature range: -40℃ to +85℃
- I/O Isolation test voltage: 1.5k VDC
- Low ripple & noise
- Short-circuit protection (self-recovery)
- Remote On/Off

WRA_S-1WR2 & WRB_S-1WR2 series are isolated 1W DC-DC converter productions with a wide 2:1 input voltage range and input isolation is tested with 1500VDC. The product has a relatively compact SIP-8 plastic package, and features high efficiency, operating temperature of -40℃ to +85℃, remote control, and continuous short-circuit protection. The smaller size and cost-effective 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 (mVp-p) Typ./Max.	Full Load Efficiency (%)Min./Typ.	Capacitive Load② (μF)Max.
		Nominal (Range)	Max.①	Voltage(VDC)	Current(mA) Max./Min.			
EN	WRA0505S-1WR2	5 (4.5-9)	11	±5	±100/±5	70/100	71/73	1000
	WRA0512S-1WR2			±12	±42/±2		74/76	470
	WRA0515S-1WR2			±15	±33/±2		73/75	330
	WRB0503S-1WR2			3.3	303/15		69/71	1800
	WRB0505S-1WR2			5	200/10		70/72	2200
	WRB0512S-1WR2			12	83/4		74/76	1000
	WRB0515S-1WR2			15	67/3		73/75	680
	WRB0524S-1WR2			24	42/2		71/73	470
	WRA1205S-1WR2	12 (9-18)	20	±5	±100/±5	100/150	75/77	1000
	WRA1212S-1WR2			±12	±42/±2		79/81	470
	WRA1215S-1WR2			±15	±33/±2		76/78	330
	WRB1203S-1WR2			3.3	303/15		73/75	2700
	WRB1205S-1WR2			5	200/10		75/77	2200
	WRB1209S-1WR2			9	111/6		77/79	1800
	WRB1212S-1WR2			12	83/4		76/78	1000
	WRB1215S-1WR2			15	67/3		78/80	680
	WRB1224S-1WR2			24	42/2		74/76	470
	WRA2405S-1WR2	24 (18-36)	40	±5	±100/±5	70/100	77/79	1000
	WRA2409S-1WR2			±9	±56/±3		77/79	680
	WRA2412S-1WR2			±12	±42/±2		76/78	470
	WRA2415S-1WR2			±15	±33/±2		76/78	330
	WRB2403S-1WR2			3.3	303/15		73/75	2700
	WRB2405S-1WR2			5	200/10		75/77	2200
	WRB2412S-1WR2			12	83/4		76/78	1000
	WRB2415S-1WR2			15	67/3		76/78	680
	WRB2424S-1WR2			24	42/2		75/77	470

EN/BS EN	WRA4805S-1WR2	48 (36-75)	80	±5	±100/±5	100/150	74/76	1000
	WRA4812S-1WR2			±12	±42/±2		76/78	470
	WRA4815S-1WR2			±15	±33/±2		78/80	330
	WRB4803S-1WR2			3.3	303/15		73/75	2700
	WRB4805S-1WR2			5	200/10		74/76	2200
	WRB4812S-1WR2			12	83/4		78/80	1000
	WRB4815S-1WR2			15	67/3		77/79	680

Notes: ①Exceeding the maximum input voltage may cause permanent damage;
②For the dual output modules, the capacitive loads of positive and negative outputs are the same.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	5VDC Input	--	281/40	290/60	mA
	12VDC Input	--	111/15	114/30	
	24VDC Input	--	55/6	57/10	
	48VDC Input	--	27/4	28/6	
Reflected Ripple Current	5VDC Input	--	30	--	
	12VDC Input	--	40	--	
	24VDC Input	--	55	--	
	48VDC Input	--	45	--	
Surge 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*	Module on	Ctrl pin open (high resistance)			
	Module off	Ctrl pin pulled high (current 5-10mA typ. into Ctrl.)			

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	3.3V/5V output	--	±2	±5	%
		others	--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation	5%-100% load		--	±0.4	±0.75	
Transient Recovery Time	25% load step change		--	0.5	2	ms
Transient Response Deviation			--	±2.5	±5	%
Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
Short Circuit Protection			Continuous, self-recovery			

Note: * The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Insulation 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 Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Storage Humidity	Non-condensing	--	--	95	%RH
Switching Frequency (PFM Mode)	Full load, nominal input voltage	--	200	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Mechanical Specifications

Case Material	Black flame-retardant and heat-resistant plastic
Dimension	22.00 x 9.50 x 12.00 mm
Weight	4.5g(Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig. 3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 3-② for recommended circuit)	
Immunity	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	line to line ±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

Typical Characteristic Curves

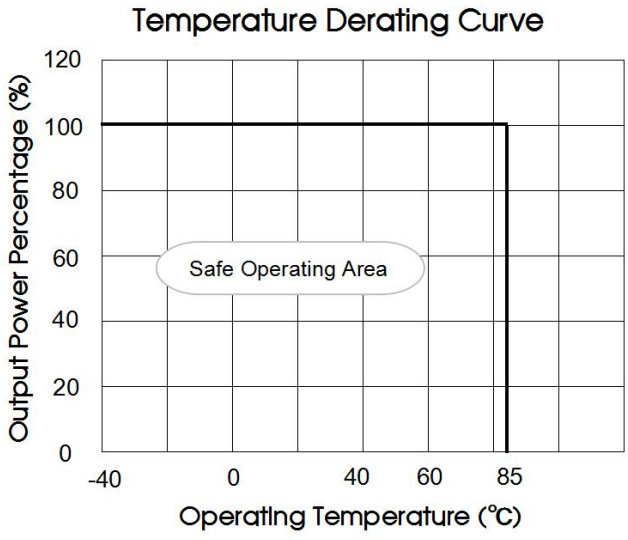
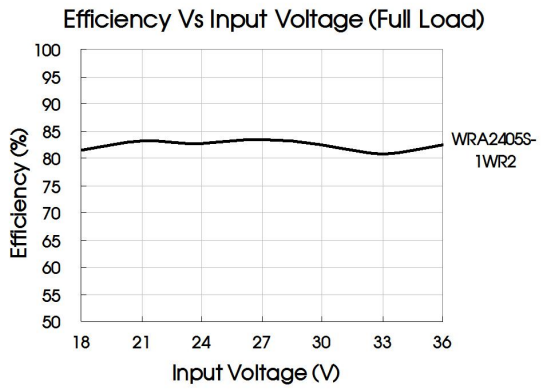
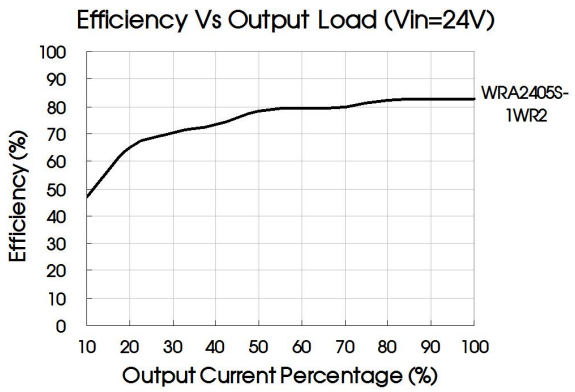
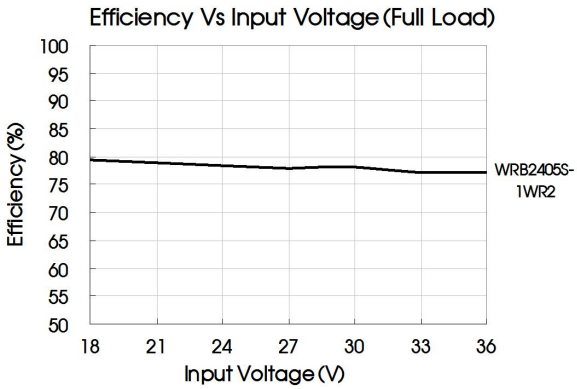
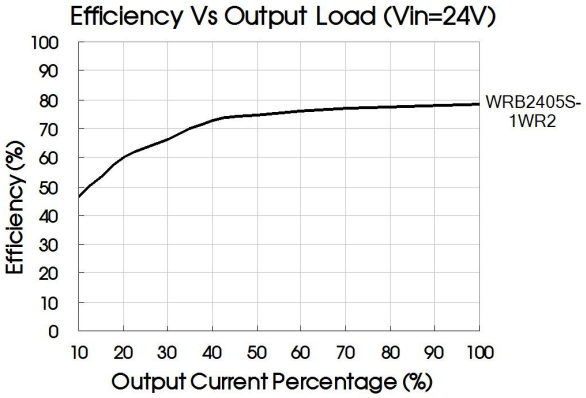


Fig 1







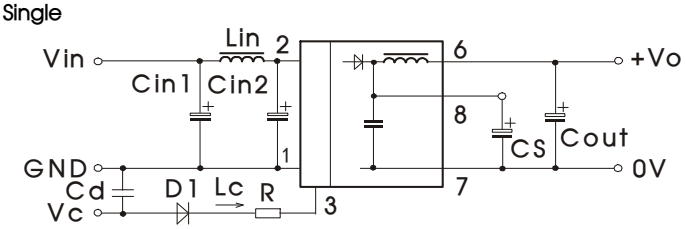


Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.
Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout 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.

Single



Dual

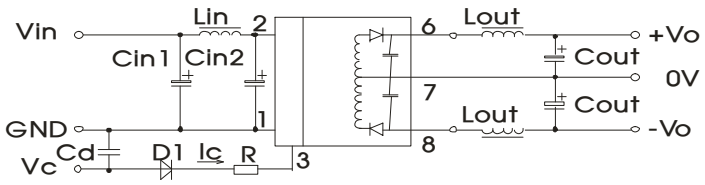


Fig. 2

Vin	5VDC&12VDC	24VDC&48VDC
Cin1	100μF/25V	10μF/100V
Cin2	47μF/25V	1μF/100V
Lin	4.7μH-12μH	
Cs	10μF-22μF/50V	
Cout	Vo(3/±3/5/±5/9/±9V):100μF/16V	
	Vo(12/±12/15/±15V):100μF/25V	
	Vo(24/±24V):100μF/50V	
Lout	2.2μH-10μH	
Cd	47nF/100V	

2. EMC compliance circuit

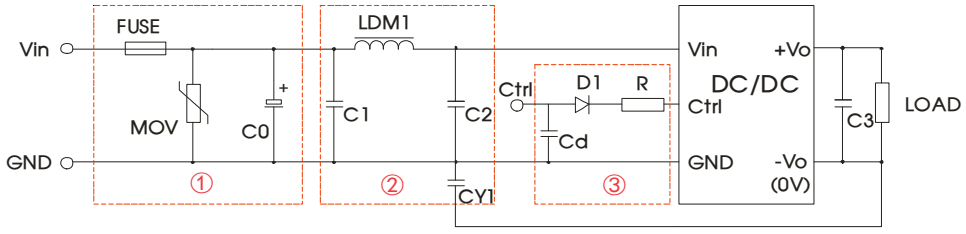


Fig. 3

Parameter description:

Model	Vin: 5VDC	Vin: 12VDC	Vin: 24VDC	Vin: 48VDC
FUSE	Slow-blow, selecting based on needs			
MOV	--	S14K25	S14K35	S14K60
C0	1000μF/16V	1000μF/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	60V/1A			
R	In accordance with the formula: $R = \frac{V_C - V_D - 1.0}{I_C} - 300$			
Cd	47nF/100V			

Notes:

① For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting 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 =445mA
Vin=12V series Iave =205mA
Vin=24V series Iave =104mA
Vin=48V series Iave =53mA

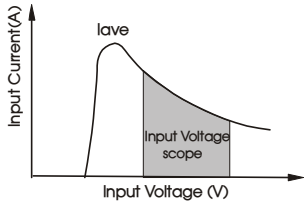


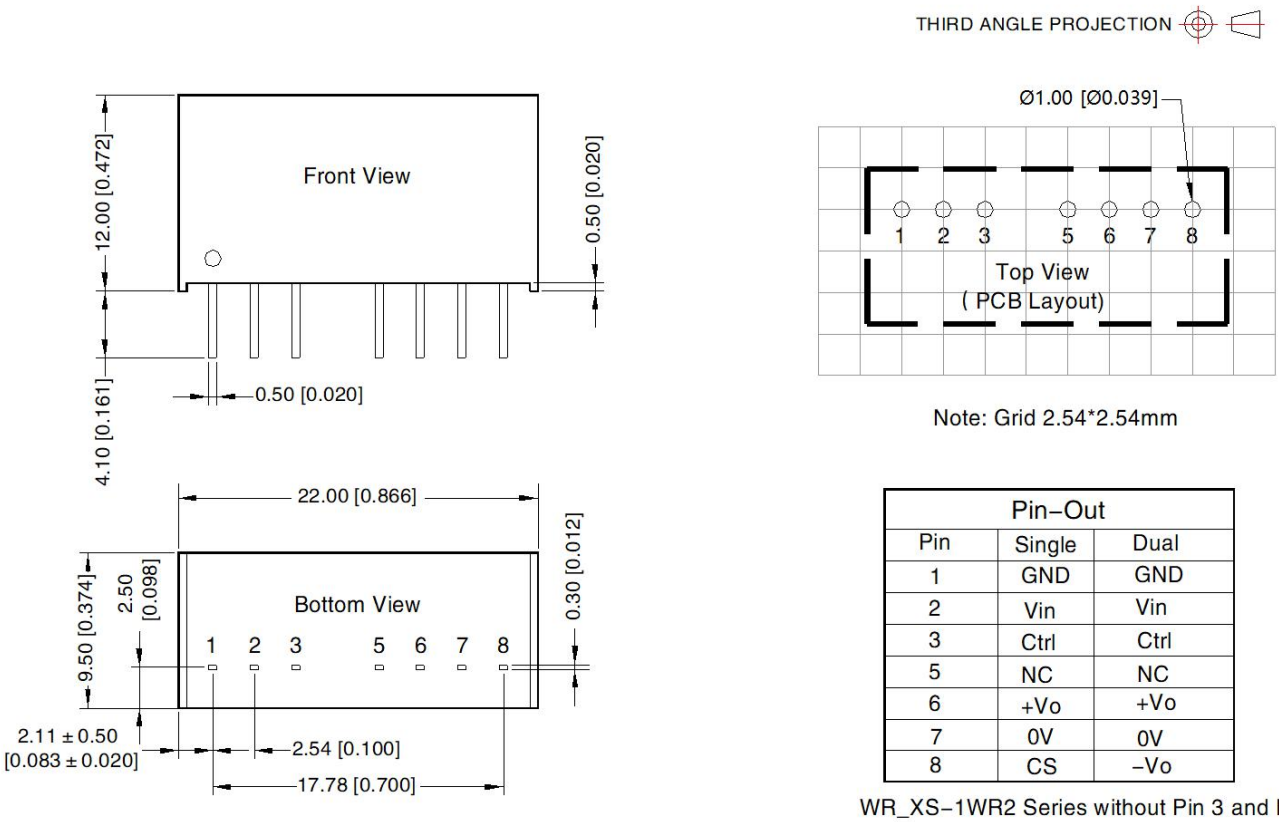
Fig. 5

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 additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout



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

WR_XS–1WR2 Series without Pin 3 and Pin 5

NC: Not available for electrical connection

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

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging 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%, then 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 input voltage range 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 corporate standards;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Specifications are subject to change without prior notice.

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