DC/DC Converter
WRA_ST/SD-1WR2 Series

MORNSUN®

1W isolated DC-DC converter
Wide input and regulated dual output

CE Patent Protection RoHS

3 years Warranty

EN62368-1

FEATURES

- Ultra compact DIP/SMD package
- Wide 2:1 input voltage range
- Operating ambient temperature range: -40℃ to +85℃
- I/O isolation test voltage: 1.5K VDC
- Short circuit protection (continuous)
- Industry standard pin-out
- EN62368 approved
- Meets UL62368 standards

WRA_ST/SD-1WR2 series of isolated 1W DC-DC converter products with a 2:1 input voltage range. The product has a ultra-compact DIP/SMD package, operating temperature of -40℃ to +85℃ and continuous short circuit protection. The ultra-small volume design makes the converters an ideal solution for communications, instrumentation and industrial electronics applications.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Ripple & Noise② (mVp-p) Typ./Max.	Full Load Efficiency (%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal (Range)	Max.①	Voltage(VDC)	Current (mA) Max./Min.			
EN	WRA1205SD/ST-1WR2	12 (9-18)	20	±5	±100	100/150	75/77	1000
	WRA1209SD/ST-1WR2			±9	±56		78/80	680
	WRA1212SD/ST-1WR2			±12	±42		78/80	470
	WRA1215SD/ST-1WR2			±15	±33		75/77	330
	WRA2405SD/ST-1WR2	24 (18-36)	40	±5	±100	70/100	75/77	1000
	WRA2409SD/ST-1WR2			±9	±56		75/77	680
	WRA2412SD/ST-1WR2			±12	±42		75/77	470
	WRA2415SD/ST-1WR2			±15	±33		75/77	330

Note: ①Exceeding the maximum input voltage may cause permanent damage;
②Ripple & noise testing condition at nominal input voltage and 5%-100% load, the "tip and barrel" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	12VDC input voltage	--	108/15	112/30	mA
	24VDC input voltage	--	54/6	56/12	
Reflected Ripple Current	12VDC input voltage	--	40	--	
	24VDC input voltage	--	55	--	
Surge Voltage (1sec. max.)	12VDC input voltage	-0.7	--	25	VDC
	24VDC input voltage	-0.7	--	50	
Start-up Voltage	12VDC input voltage	--	--	9	
	24VDC input voltage	--	--	18	
Input Filter		Capacitance filter			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	5%-100% load, input voltage range	Vo1	--	±1	±3	%
		Vo2	--	±3	±5	
No-load Output Voltage Accuracy	Input voltage range	Vo1	--	±2	±5	
		Vo2	--	--	±8	
Linear Regulation	Input voltage variation from	Vo1	--	±0.2	±0.5	

	low to high, 5%-100% load	Vo2	--	±0.5	±1	
Load Regulation	5%-100% load	Vo1	--	±0.5	±1	%
		Vo2	--	--	±2	
Transient Recovery Time	25% load step change		--	1	3	ms
Transient Response Deviation			--	±3	±5	%
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Short-circuit Protection			Continuous, self-recovery			

General Specifications

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	--	100	--	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	
	Wave soldering,10 seconds	255	260	265	
Reflow Soldering Temperature		Peak temperature ≤245℃, duration ≤60s max. over 217℃. see also IPC/JEDEC J-STD-020D.1.			
Storage Humidity	Non-condensing	5	--	95	%RH
Switching Frequency (PFM Mode)	Full load, nominal input voltage	--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours

Note:*The pin resistance temperature is not the actual set temperature of the soldering iron, but the temperature required for a good solder joint. The actual set temperature by the customer needs to be comprehensively set based on the thickness of the PCB, the size of the copper cladding, the power of the soldering iron, and the selection of the soldering iron tip.

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94-V0)	
Dimensions	WRA_SD-1WR2	14.00 x 14.00 x 9.00 mm
	WRA_ST-1WR2	15.00 x 14.00 x 9.10 mm
Weight	2.2g (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 ±6KV	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

Typical Characteristic Curves

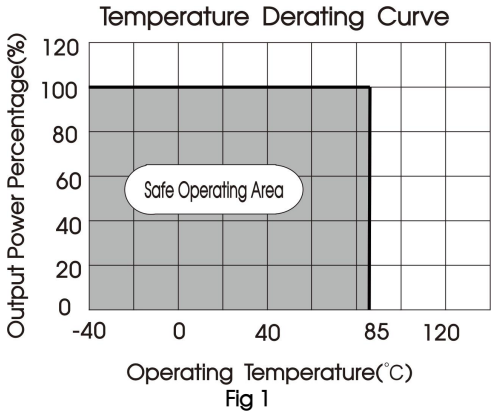
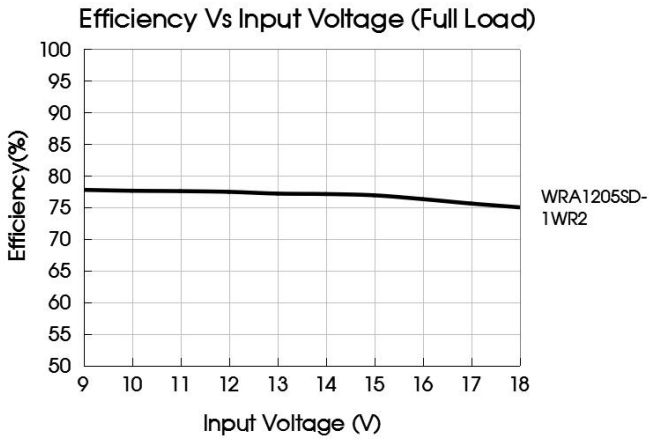
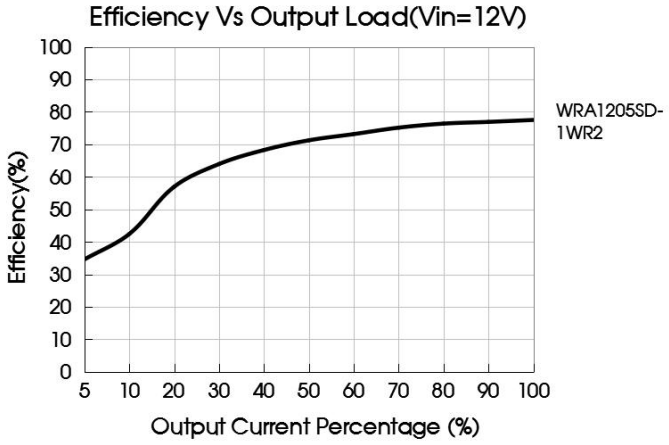
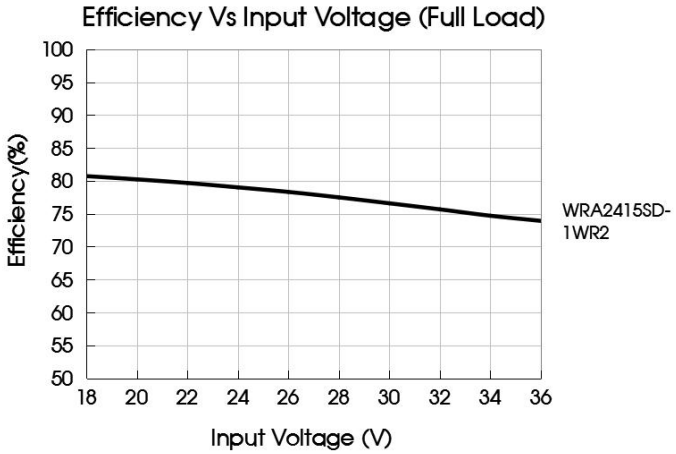
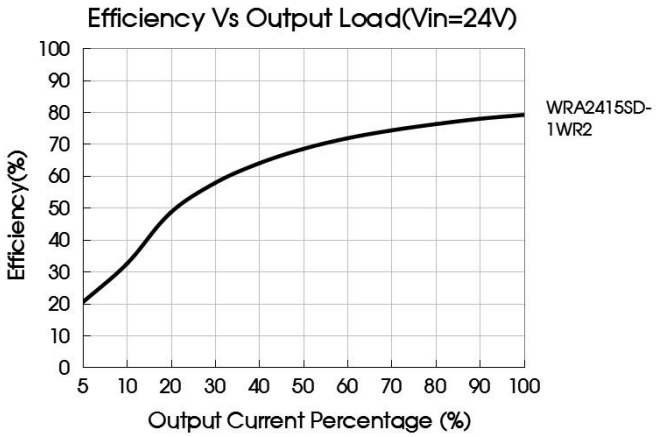


Fig 1









Design Reference

1. Recommended circuit

All the 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, connecting a "Y" capacitor between input "GND" and output "0V", and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.

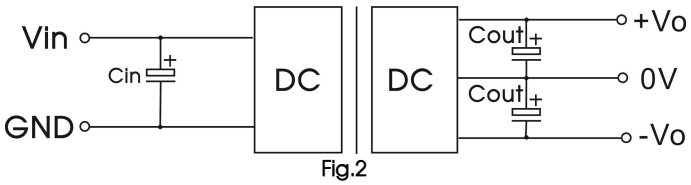


Fig.2

Vin(VDC)	12	24
Cin	47uF/25V	47uF/50V

Vo(VDC)	±5, ±9	±12, ±15
Cout	100uF/16V	27uF/25V

2. EMC compliance circuit

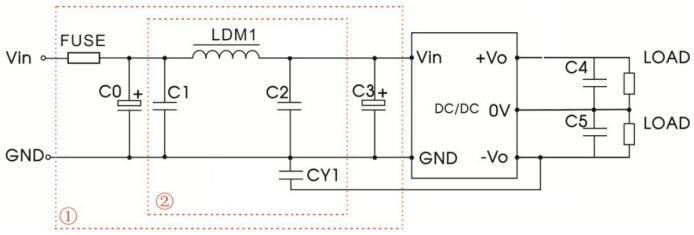


Fig.3

Parameter description:

Part No.	Vin:12VDC	Vin:24VDC
FUSE	slow blow, choose according to actual input current	
C0	1000μF/25V	680μF/50V
C1	4.7μF/50V	
LDM1	15μH	
C2	4.7μF/50V	
C3	330μF/50V	
CY1	1nF/2KV	
C4, C5	Refer to the Cout Fig.2	

Note: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

3. 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 start-up current of this kind of DC/DC module(see Fig. 4).

Generally:Vin=12V series Iave =205mA
Vin=24V series Iave =104mA

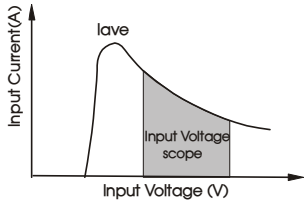


Fig. 4

4. Output load requirements

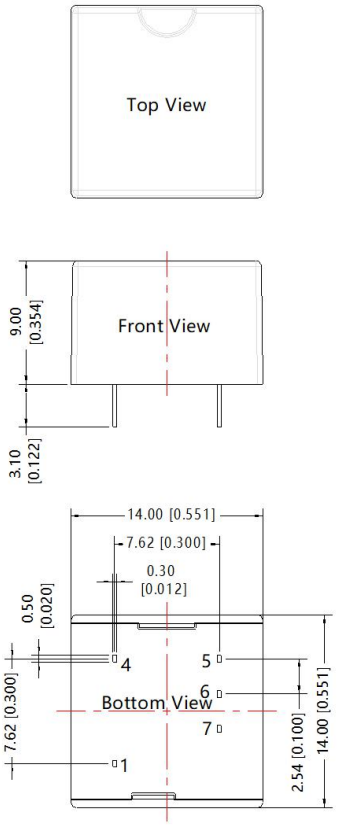
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to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

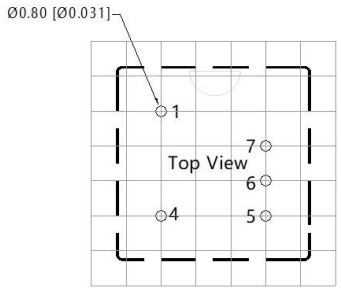
5. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout

WRA_SD-1WR2 series

THIRD ANGLE PROJECTION



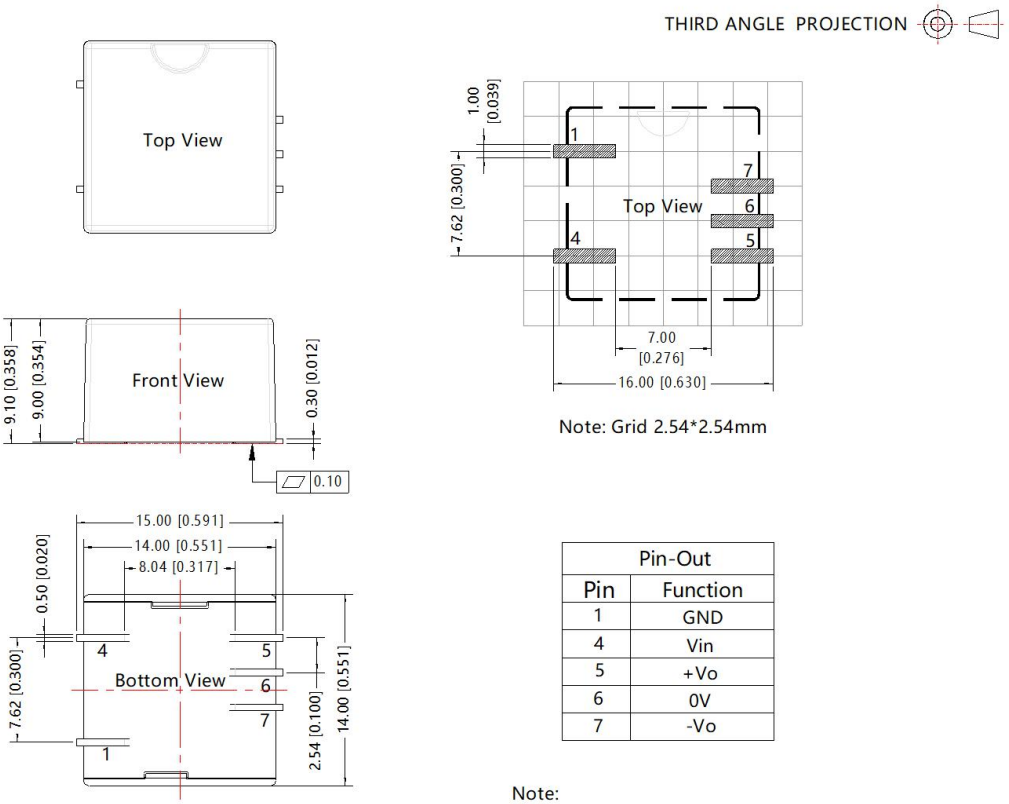


Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	GND
4	Vin
5	+Vo
6	0V
7	-Vo

Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

WRA_ST-1WR2 series



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Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210095, Roll packaging bag number: 58210094;
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 maximum capacitive load offered were tested at nominal input voltage and full load;
4. 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;
5. All index testing methods in this datasheet are based on company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 8 Nanyun 4th Road, Huangpu District, Guangzhou, China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com