DC/DC Converter

E_S-1WR2 & F_S-1WR2 series

MORNSUN®

1W isolated DC-DC converter

Fixed input voltage, unregulated dual/single output

CE Patent Protection RoHS

3 years Warranty

Continuous Short Circuit Protection

FEATURES

- Compact SIP package
- Industry standard pin-out
- High efficiency up to 81%
- I/O isolation test voltage 3k VDC
- Operating ambient temperature range: -40℃ to +105℃
- EN62368 approved

E_S-1WR2 & F_S-1WR2 series are specially designed for applications where an(two) isolated voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output		Full Load Efficiency (%)	Capacitive Load(μF)*
		Nominal (Range)	Voltage (VDC)	Current (mA) Max./Min.	Min./Typ.	Max.
--	E0312S-1WR2	3.3 (2.97-3.63)	±12	±42/±5	72/76	100
	F0303S-1WR2		3.3	303/30	69/73	220
	F0305S-1WR2		5	200/20	74/78	
	F0324S-1WR2		24	42/5	74/78	
CE	E0505S-1WR2	5 (4.5-5.5)	±5	±100/±10	76/80	100
	E0509S-1WR2		±9	±56/±6	76/80	
	E0512S-1WR2		±12	±42/±5	76/80	
	E0515S-1WR2		±15	±33/±4	77/81	
	E0524S-1WR2		±24	±21/±2	77/81	
--	F0503S-1WR2		3.3	303/30	69/73	220
CE	F0505S-1WR2		5	200/20	76/80	
	F0509S-1WR2		9	111/12	76/80	
	F0512S-1WR2		12	83/9	76/80	
	F0515S-1WR2		15	67/7	77/81	
	F0524S-1WR2		24	42/5	77/81	
--	E0909S-1WR2	9 (8.1-9.9)	±9	±56/±6	76/80	100
	F0909S-1WR2		9	111/12	76/80	220
	F0915S-1WR2		15	67/7	76/80	
CE	E1205S-1WR2	12 (10.8-13.2)	±5	±100/±10	76/80	100
	E1212S-1WR2		±12	±42/±5	77/81	
	E1215S-1WR2		±15	±33/±4	77/81	
	E1224S-1WR2		±24	±21/±2	76/80	
--	F1203S-1WR2		3.3	303/30	71/75	220
CE	F1205S-1WR2		5	200/20	76/80	
	F1209S-1WR2		9	111/12	76/80	
	F1212S-1WR2		12	83/9	76/80	
	F1215S-1WR2		15	67/7	77/81	
	F1224S-1WR2		24	42/5	77/81	
--	E1505S-1WR2	15 (13.5-16.5)	±5	±100/±10	76/80	100
	E1515S-1WR2		±15	±33/±4	77/81	
CE	F1505S-1WR2		5	200/20	76/80	220
--	F1509S-1WR2		9	111/12	76/80	
	F1512S-1WR2		12	83/9	76/80	

CE	F1515S-1WR2		15	67/7	77/81	
--	F1524S-1WR2		24	42/4	76/80	
CE	E2405S-1WR2	24 (21.6-26.4)	±5	±100/±10	76/80	100
	E2409S-1WR2		±9	±56/±6	76/80	
	E2412S-1WR2		±12	±42/±5	77/81	
	E2415S-1WR2		±15	±33/±4	75/79	
	E2424S-1WR2		±24	±21/±2	76/80	
--	F2403S-1WR2		3.3	303/30	71/75	220
CE	F2405S-1WR2		5	200/20	75/79	
	F2409S-1WR2		9	111/12	76/80	
	F2412S-1WR2		12	83/9	77/81	
	F2415S-1WR2		15	67/7	77/81	
	F2424S-1WR2		24	42/5	77/81	

Note: * The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	3.3 VDC input	--	415/25	--/70	mA
	5 VDC input	--	274/20	--/60	
	9 VDC input	--	139/20	--/55	
	12 VDC input	--	114/15	--/50	
	15 VDC input	--	84/10	--/35	
	24 VDC input	--	58/7	--/30	
Surge Voltage (1sec. max.)	3.3 VDC input	-0.7	--	5	VDC
	5 VDC input	-0.7	--	9	
	9 VDC input	-0.7	--	12	
	12 VDC input	-0.7	--	18	
	15 VDC input	-0.7	--	21	
	24 VDC input	-0.7	--	30	
Input Filter		Capacitance filter			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy			See output regulation curve(Fig. 1)			
Linear Regulation	Input voltage change: ±1%	3.3 VDC output	--	--	±1.5	--
		5/9/12/15/24VDC output	--	--	±1.2	
Load Regulation	10%-100% load	3.3VDC output	--	18	--	%
		5VDC output	--	12	--	
		9VDC output	--	9	--	
		12VDC output	--	8	--	
		15VDC output	--	7	--	
		24VDC output	--	6	--	
Ripple & Noise*	20MHz bandwidth	3.3/5/9/12VDC output	--	30	--	mVp-p
		15/24VDC output	--	60	--	
Temperature Coefficient	100% load		--	--	±0.03	%/℃
Short-circuit Protection**	E03xxS-1WR2/F03xxS-1WR2/E0524S-1WR2/ F0524S-1WR2/F1524S-1WR2/ E24xxS-1WR2/ F24xxS-1WR2		--	--	1	s
	Others		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.
**At the end of the short circuit duration, the supply voltage must be disconnected from following models : E03xxS-1WR2/F03xxS-1WR2 series, E24xxS-1WR2 /F24xxS-1WR2 series, and E0524S-1WR2/ F0524S-1WR2/F1524S-1WR2.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	3000	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	20	--	pF
Operating Temperature	Derating when operating temperature up to 85° C, (see Fig. 2)	-40	--	105	℃
Storage Temperature		-55	--	125	
Case Temperature Rise	Ta=25℃	--	25	--	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	
Storage Humidity	Non-condensing	--	--	95	%RH
Switching Frequency	100% load, nominal input voltage	--	100	--	kHz
MTBF	MIL-HDBK-217F @ 25℃	3500	--	--	k hours

Mechanical Specifications

Case Material	Black epoxy resin; flame-retardant heat- resistant (UL94 V-0)
Dimensions	19.50 x 6.00 x 9.30 mm
Weight	2.4g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE		CISPR32/EN55032	CLASS B (see Fig. 4 for recommended circuit)
	RE		CISPR32/EN55032	CLASS B (see Fig. 4 for recommended circuit)
Immunity	ESD	E_S-1WR2	IEC/EN61000-4-2	Contact ±6kV perf. Criteria B
		F_S-1WR2	IEC/EN61000-4-2	Contact ±8kV perf. Criteria B

Typical Characteristic Curves

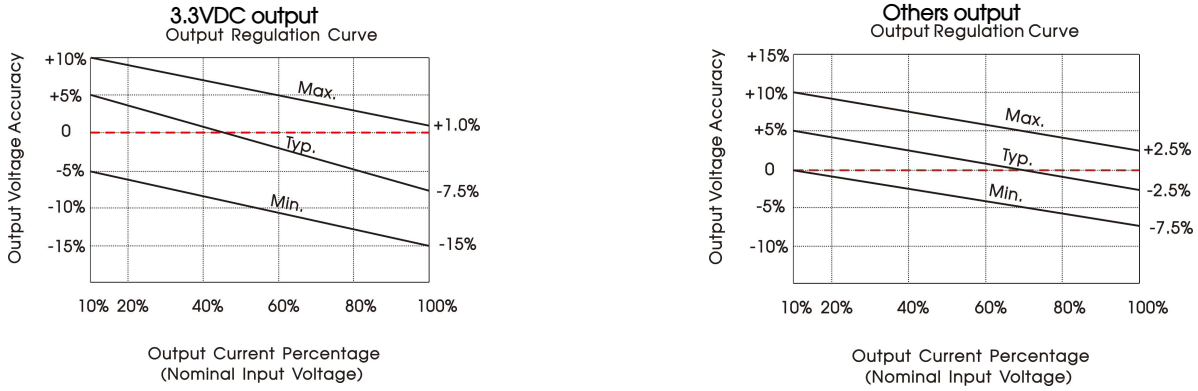


Fig. 1

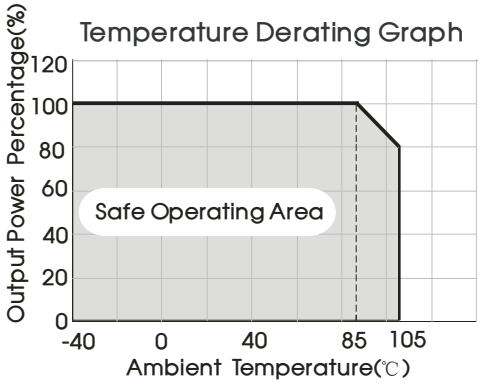
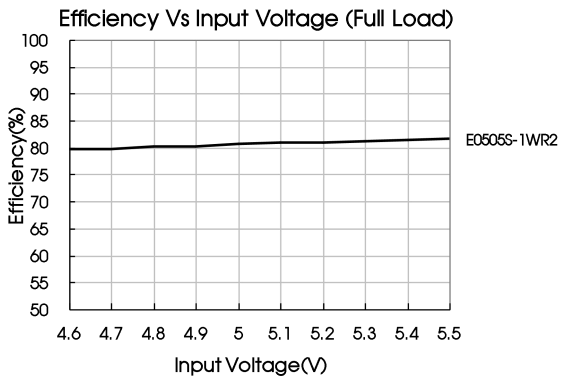
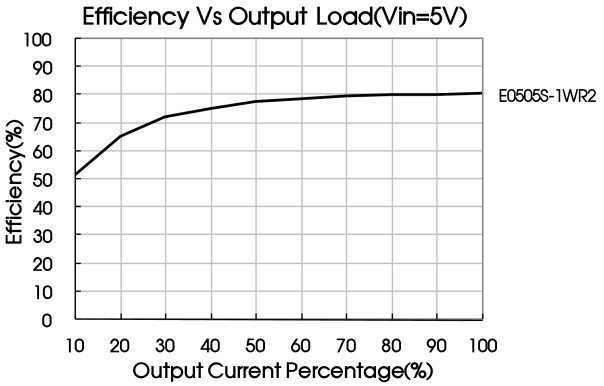
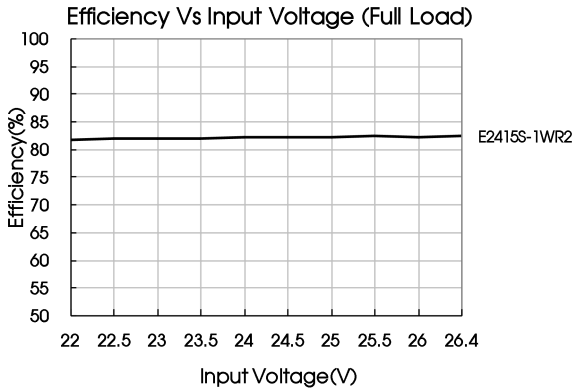
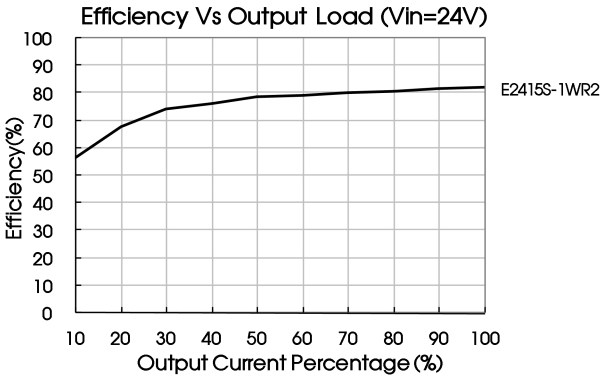


Fig. 2









Design Reference

1. Typical application

Input and/or output ripple can be further reduced, by connecting a filter capacitor from the input and/or output terminals to ground as shown in Fig.3.

Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

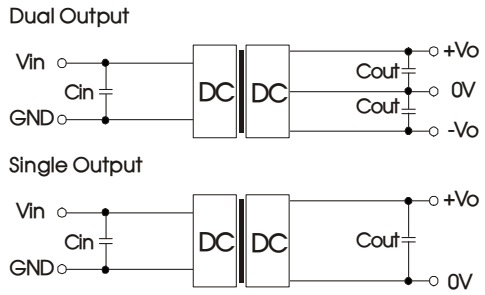


Fig.3

Table 1: Recommended capacitive load value table

Vin	Cin	Single output	Cout	Dual output	Cout
3.3/5VDC	4.7μF/16V	3.3/5/9VDC	10μF/16V	±5VDC	4.7μF/16V
9/12VDC	2.2μF/25V	12VDC	2.2μF/25V	±9/±12VDC	1μF/25V
15VDC	2.2μF/25V	15/24VDC	1μF/50V	±15/±24VDC	0.47μF/50V
24VDC	1μF/50V	--	--	--	--

2. EMC (CLASS B) compliance circuit

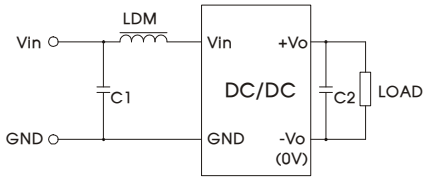


Fig. 4

Input voltage		3.3/5/9/12/15/24VDC
Emissions	C1	4.7μF /50V
	C2	Refer to the Cout in Fig.3
	LDM	6.8μH

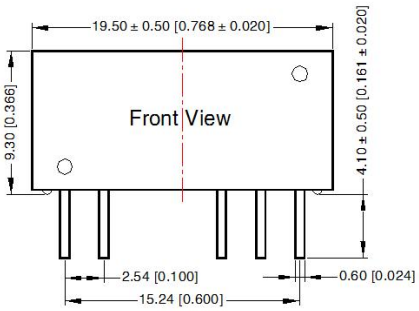
3. Output load requirements

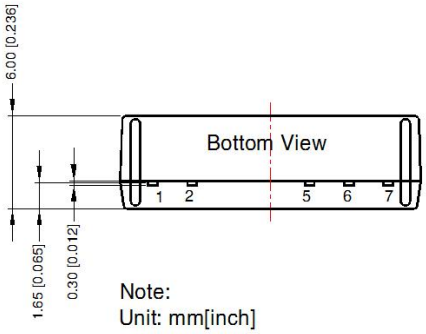
For a reliable and efficient operation of the converter, the minimum load should never be less than 10% of the rated output load. If the total required output power is below 10%, a parallel bleeding resistor is required on the output, ensuring that the sum of the power consumption is always maintained at 10% minimum.

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

Dimensions and Recommended Layout

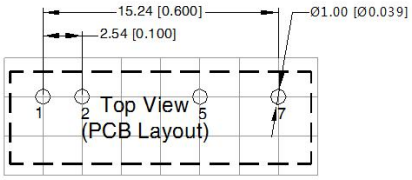
THIRD ANGLE PROJECTION



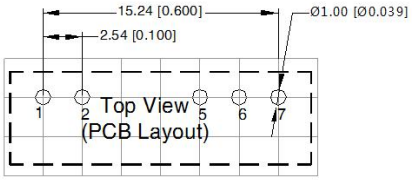


Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.25[± 0.010]

F_S



E_S



Note: Grid 2.54*2.54mm

Pin–Out		
Pin	F_S	E_S
1	Vin	Vin
2	GND	GND
5	0V	–Vo
6	No Pin	0V
7	+Vo	+Vo

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200029;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
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 our 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