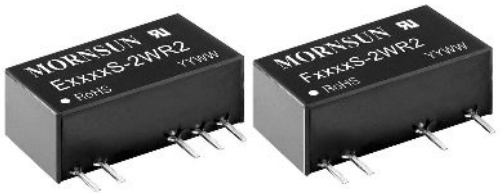
DC/DC Converter

E_S-2WR2 & F_S-2WR2 series

MORNSUN®

2W isolated DC-DC converter
Fixed input voltage, unregulated single & dual output



c UL us CE CB Patent Protected RoHS

3 years Warranty

FEATURES

- Operating ambient temperature range: -40℃ ~ +105℃
- High efficiency up to 86%
- High power density
- Miniature SIP package
- I/O isolation test voltage 3K VDC
- No extra components required
- Industry standard pin-out
- IEC60950, UL60950, EN60950 approved

E_S-2WR2 & F_S-2WR2 series are designed for use in distributed power supply systems and especially suitable in applications such as pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits, where

1. *The voltage of the input power supply is relatively stable with a variation of ±10%Vin or less;*
2. *A high input to output isolation voltage of ≤3000VDC is necessary;*
3. *The requirement for a tight output regulation and low ripple & noise is not as strict.*

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load*(μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max./Min.		
--	E0503S-2WR2	5 (4.5-5. 5)	±3.3	±303/±30	68/72	100
UL/CE/CB	E0505S-2WR2		±5	±200/±20	76/80	
	E0509S-2WR2		±9	±111/±11	80/84	
	E0512S-2WR2		±12	±83/±8	79/83	
	E0515S-2WR2		±15	±67/±7	78/82	
	E0524S-2WR2		±24	±42/±4	80/84	
--	F0503S-2WR2		3.3	400/40	75/79	220
UL/CE/CB	F0505S-2WR2		5	400/40	78/82	
	F0509S-2WR2		9	222/22	78/82	
	F0512S-2WR2		12	167/17	78/82	
	F0515S-2WR2		15	133/13	79/83	
	F0524S-2WR2		24	83/8	80/84	
--	E1203S-2WR2	12 (10.8-13.2)	±3.3	±303/±30	71/75	100
UL/CE/CB	E1205S-2WR2		±5	±200/±20	76/80	
	E1209S-2WR2		±9	±111/±11	78/82	
	E1212S-2WR2		±12	±83/±8	80/84	
	E1215S-2WR2		±15	±67/±7	80/84	
	F1205S-2WR2		5	400/40	78/82	220
	F1209S-2WR2		9	222/22	77/81	
	F1212S-2WR2		12	167/17	80/84	
	F1215S-2WR2		15	133/13	81/85	
	F1224S-2WR2		24	83/8	82/86	
--	E1515S-2WR2	15 (13.5-16.5)	±15	±67/±7	77/81	100
	F1505S-2WR2		5	400/40	74/78	220
	F1509S-2WR2		9	222/22	75/79	
	F1512S-2WR2		12	167/17	75/79	
UL/CE/CB	E2405S-2WR2	24 (21.6-26.4)	±5	±200/±20	76/80	100
	E2409S-2WR2		±9	±111/±11	80/84	
	E2412S-2WR2		±12	±83/±8	80/84	
	E2415S-2WR2		±15	±67/±7	80/84	

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UL/CE/CB	F2405S-2WR2	24 (21.6-26.4)	5	400/40	76/80	220
	F2409S-2WR2		9	222/22	82/86	
	F2412S-2WR2		12	167/17	80/84	
	F2415S-2WR2		15	133/13	82/86	
--	F2418S-2WR2		18	111/11	82/86	
UL/CE/CB	F2424S-2WR2		24	83/8	82/86	

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)	5V input	--	506/35	--/60	mA
	12V input	--	208/20	--/50	
	15V input	--	159/15	--/35	
	24V input	--	104/10	--/30	
Reflected Ripple Current		--	15	--	
Surge Voltage (1sec. max.)	5V input	-0.7	--	9	VDC
	12V input	-0.7	--	18	
	15V input	-0.7	--	21	
	24V 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%	3.3VDC output	--	--	±1.5	--
		Other output	--	--	±1.2	
Load Regulation	10%-100% load	3.3VDC output	--	18	--	%
		5VDC output	--	12	--	
		9VDC output	--	9	--	
		12VDC output	--	8	--	
		15VDC/18VDC output	--	7	--	
		24VDC output	--	6	--	
Ripple & Noise*	20MHz bandwidth		--	75	200	mVp-p
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Short Circuit Protection**	E24xxS-2WR2/F24xxS-2WR2 E12xxS-2WR2/F12xxS-2WR2 E15xxS-2WR2/F15xxS-2WR2 E0524S-2WR2/F0524S-2WR2		--	--	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: E24xxS-2WR2/F24xxS-2WR2/ E12xxS-2WR2/F12xxS-2WR2/ E15xxS-2WR2/F15xxS-2WR2 series, and E0524S-2WR2/F0524S-2WR2.

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.		3000	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	24VDC input	--	50	--	pF
		Other models	--	20	--	
Operating Temperature	Derating when operating temperature up to 85℃ (see Fig. 2)		-40	--	105	℃

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Storage Temperature		-55	--	125	℃
Case Temperature Rise	Ta=25℃, nominal input, full load output	--	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	Full load, nominal input voltage	--	100	--	kHz
MTBF	MIL-HDBK-217F @ 25℃	3500	--	--	k hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	19.65 x 7.05 x 10.16 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-2WR2	IEC/EN61000-4-2	Contact ±6kV performance Criteria B
		F_S-2WR2	IEC/EN61000-4-2	Contact ±8kV performance Criteria B

Typical Performance Curves

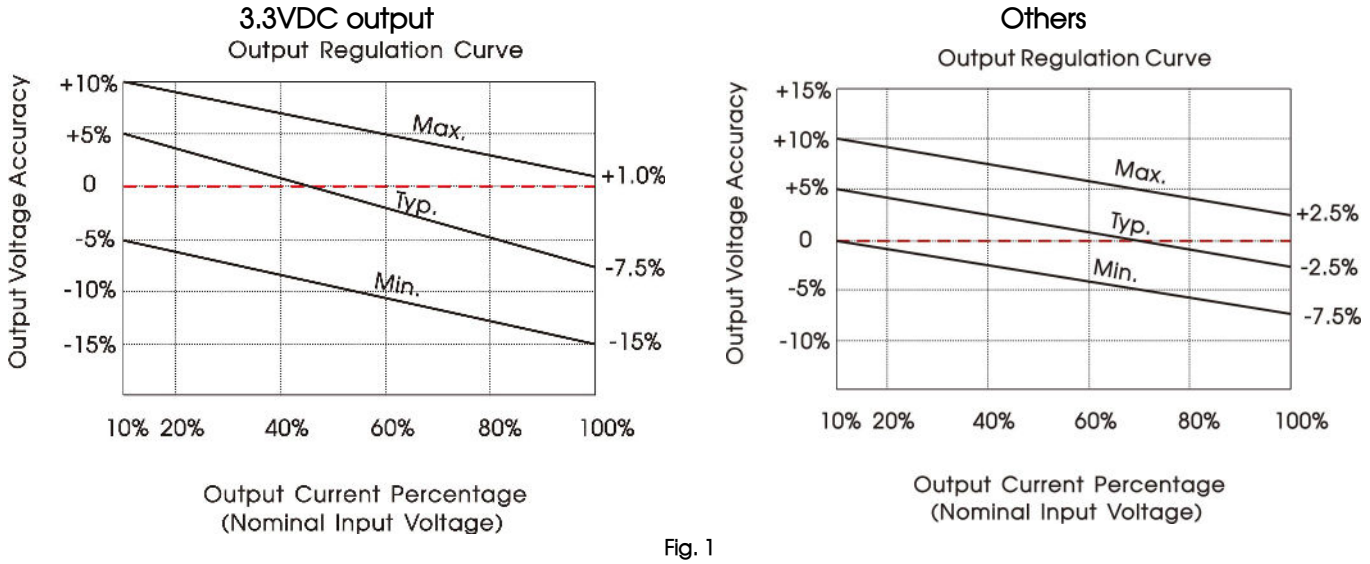

Fig. 1

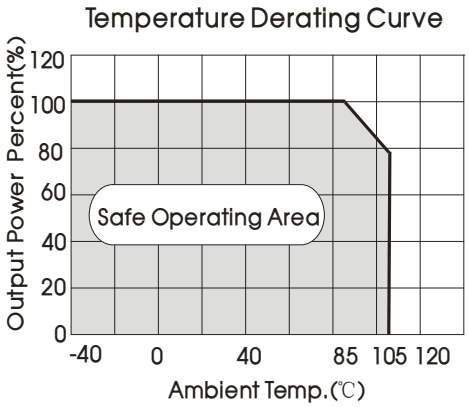

Fig. 2

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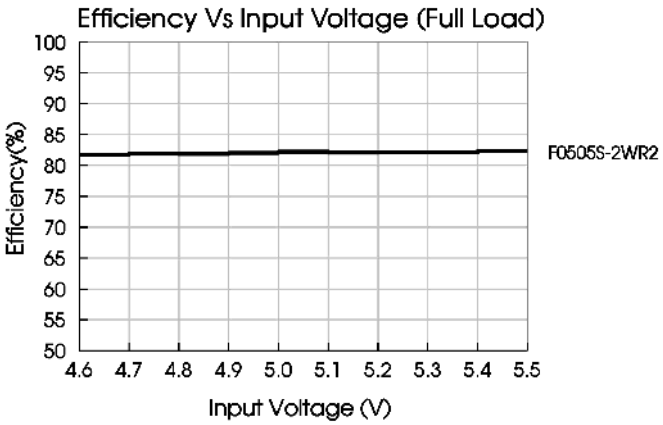

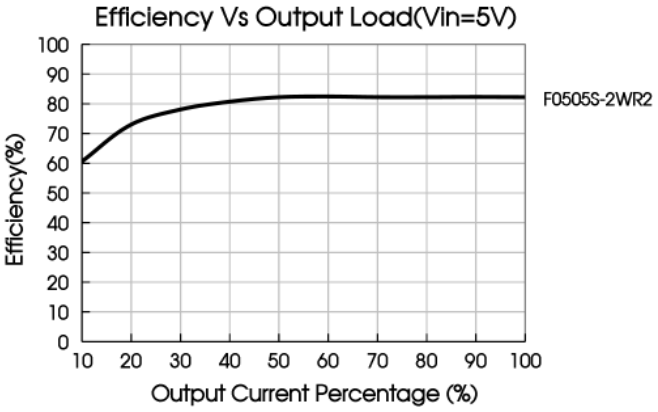

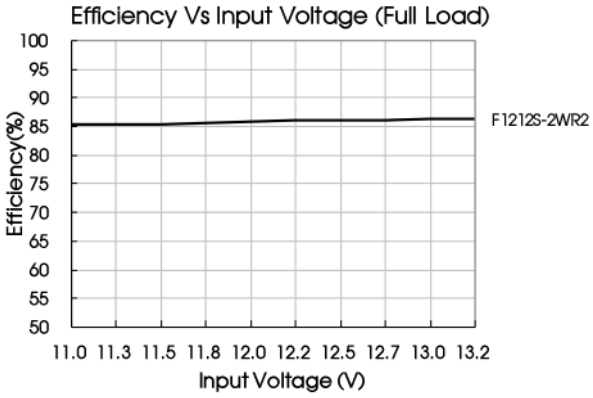

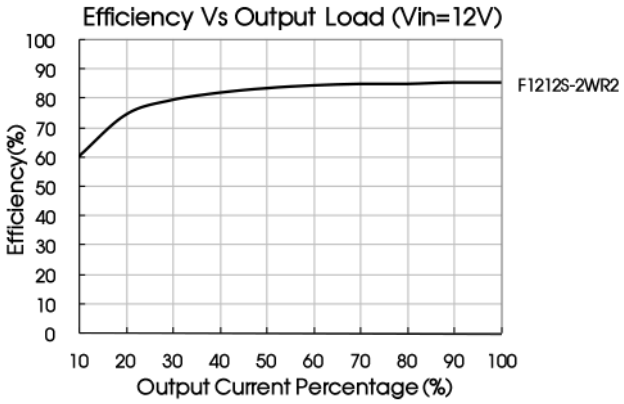

Design Reference

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.

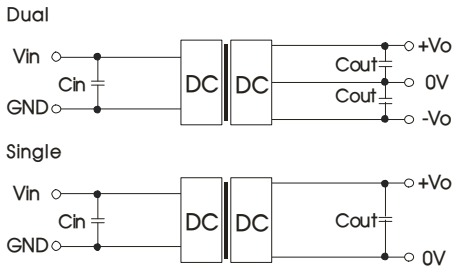

Fig.3

Table 1: Recommended input and output capacitor values

Vin (VDC)	Cin (μF)	Single Vout (VDC)	Cout (μF)	Dual Vout (VDC)	Cout* (μF)
5	4.7	3.3/5	10	±3.3/±5	4.7
12/15	2.2	9/12	2.2	±9/±12	1
24	1	15/18/24	1	±15/±24	0.47

Note: *The capacitor value of the positive and the negative output are identical.

2. EMC (CLASS B) compliance circuit

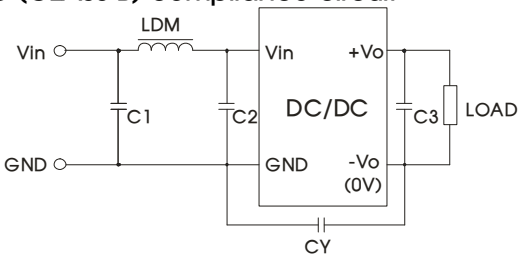

Fig. 4

Input voltage (VDC)		5/12/15	24
EMI	C1/C2	4.7μF/50V	
	CY	--	1nF/3KV
	C3	Refer to the Cout in Fig.3	
	LDM	6.8μH	

Note: For 24V input models, use a Y-capacitor CY of 1nF/3kV.

3. Minimum Output Load Requirement

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.

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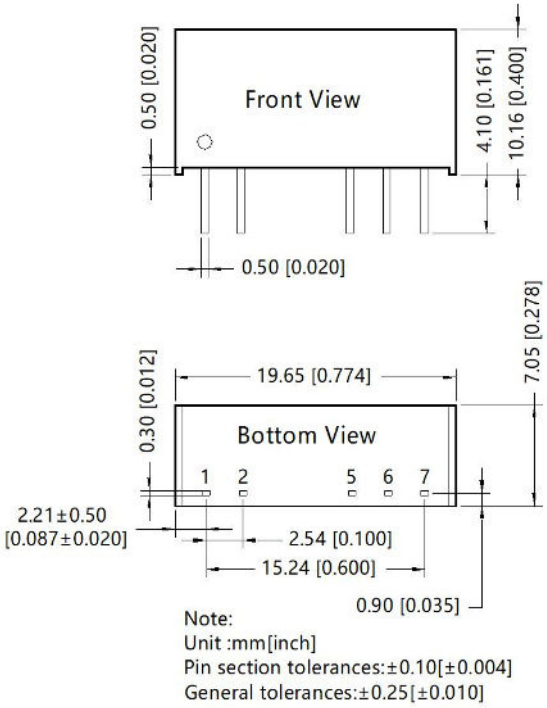
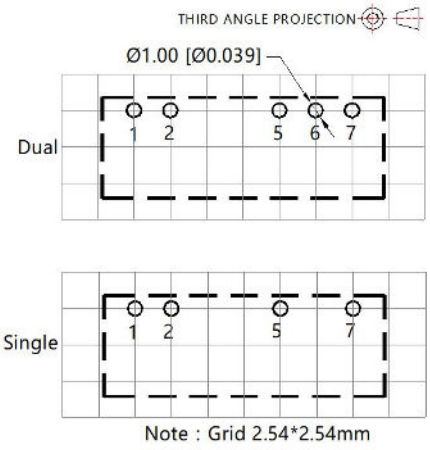
4. For additional information, please refer to the DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout





Pin-Out		
Pin	Single	Dual
1	Vin	Vin
2	GND	GND
5	0V	-Vo
6	No Pin	0V
7	+Vo	+Vo

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200001;
2. In order to guarantee product performance and datasheet compliance, the product must be operated within specifications and load range requirement;
3. The specified maximum capacitive load is tested under full load condition and over the input voltage range;
4. All parameters in this datasheet were measured under following conditions: Ta=25℃, relative humidity<75%RH, nominal input voltage and rated output load (unless otherwise specified);
5. All index testing methods in this datasheet are based on our company corporate standards;
6. For special requirements and customization service, please contact your nearest MORNUSN sales representative or one of our technicians;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be handled according to ISO14001 and related environmental laws and regulations by qualified personnel only .

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