

# MORNSUN®

## E\_S-2WR2 & F\_S-2WR2 Series

2W, FIXED INPUT, ISOLATED & UNREGULATED  
DUAL/SINGLE OUTPUT DC-DC CONVERTER



Continuous Short  
Circuit Protection

Patent Protected RoHS

### FEATURES

- Miniature SIP package
- Efficiency up to 89%
- High power density
- 3000VDC isolation
- Operating temperature range:  
-40°C ~ +105°C
- No external component required
- Industry standard pinout

### APPLICATIONS

The E\_S-2WR2 & F\_S-2WR2 Series are designed for application where isolated output is required from a distributed power system.

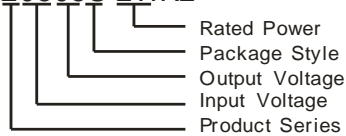
These products apply to where:

- 1) Input voltage variationrang:  $\pm 10\%V_{in}$ ;
- 2) 3000VDC input and output isolation;
- 3) Regulated and low ripple noise is not required.

Such as: digital circuits, low frequency analog circuits, and relay drive circuits.

### PART NUMBER SYSTEM

E0505S-2WR2



### SELECTION GUIDE

Model	Input Voltage(VDC) Nominal (Range)	Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load <sup>①</sup> (μF)	Efficiency (%, typ.) @Max. Load	
			Max.	Min.	@Max. Load	@No Load				
E0505S-2WR2	5 (4.5-5.5)	±5	±200	±20	476	25	10	100	80	
E0512S-2WR2		±12	±83.3	±8.3	476				84	
E0515S-2WR2		±15	±66.6	±6.7	476				84	
E0524S-2WR2		±24	±41.6	±4.2	476				84	
F0505S-2WR2		5	400	40	450			220	89	
F0512S-2WR2		12	166.6	16.6	476				84	
F0515S-2WR2		15	133.3	13.3	476				84	
F0524S-2WR2		24	83.3	8.3	476				84	
E1205S-2WR2	12 (10.8-13.2)	±5	±200	±20	198	15	100	84		
E1212S-2WR2		±12	±83.3	±8.3	196			85		
E1215S-2WR2		±15	±66.6	±6.7	198			84		
F1205S-2WR2		5	400	40	198			220	84	
F1212S-2WR2		12	166.6	16.6	198				84	
F1215S-2WR2		15	133.3	13.3	198				84	
E1515S-2WR2	15 (13.5-16.5)	±15	±66.6	±6.7	157	10	5	85		
E2405S-2WR2	24 (21.6-26.4)	±5	±200	±20	99			8	100	84
E2412S-2WR2		±12	±83.3	±8.3	99					84
E2415S-2WR2		±15	±66.6	±6.7	99					84
F2405S-2WR2		5	400	40	99				220	84
F2412S-2WR2		12	166.6	16.6	99					84
F2415S-2WR2		15	133.3	13.3	99					84
F2424S-2WR2		24	83.3	8.3	98					85

PowerPax UK Ltd

Unit 5 Kennet Weir Business Park, Arrowhead Road, Theale, Berkshire, RG7 4AD, United Kingdom

Tel: +44 (0) 118 9033290 Fax: +44 (0) 118 9033291

info@powerpaxuk.com Website: www.mornsun.co.uk

Note: ①For dual output converter, the given value is the same for each output.

## INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. Max.)	5VDC Input	-0.7	--	9	VDC
	12VDC Input	-0.7	--	18	
	15VDC Input	-0.7	--	21	
	24VDC Input	-0.7	--	30	
Input Filter		Capacitance			

## OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy		See tolerance envelope curve				
Line Voltage Regulation	For Vin change of $\pm 1\%$	--	--	$\pm 1.2$	%	
Load Regulation	10% to 100% load	5VDC output	--	10		--
		12VDC output	--	8		--
		15VDC output	--	7		--
		24VDC output	--	6	--	
Temperature coefficient	100% load	--	--	$\pm 0.03$	%/ $^{\circ}$ C	
Ripple & Noise*	20MHz Bandwidth	Output Voltage $\leq 12$ VDC	--	60	--	mVp-p
		Output Voltage: 15VDC, 24VDC	--	75	--	
Short Circuit Protection		Continuous, automatic recovery				

Note:\* Ripple and noise tested with "parallel cable" method. See detailed operation instructions at *DC-DC Application Notes*.

## COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit	
Isolation Voltage	Input-Output, Tested for 1 minute and leakage current less than 1 mA	3000	--	--	VDC	
Isolation Resistance	Input-Output, Test at 500VDC	1000	--	--	M $\Omega$	
Isolation Capacitance	Input-Output, 100KHz/0.1V	E2415S-2WR2/F2424S-2WR2	--	30	--	pF
		Others	--	20	--	
Switching Frequency	Full load, nominal input	--	100	300	KHz	
MTBF	MIL-HDBK-217F @25 $^{\circ}$ C	3500	--	--	K hours	
Case Material		Plastic (UL94-V0)				
Weight		--	2.4	--	g	

## ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	--	--	95	%
Operating Temperature	Power derating ( $\geq 85^{\circ}$ C, see figure 2)	-40	--	105	$^{\circ}$ C
Storage Temperature		-55	--	125	
Temp. rise	Ta=25 $^{\circ}$ C, 100% Load	--	25	--	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

## EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS B (Typical Recommended Circuit Refer to Figure1)			
	RE	CISPR22/EN55022 CLASS B (Typical Recommended Circuit Refer to Figure1)			

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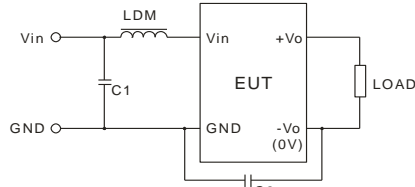
Tel: +44 (0) 118 9033290 Fax: +44 (0) 118 9033291

info@powerpaxuk.com Website: www.mornsun.co.uk

EMS	ESD	E_S-2WR2	IEC/EN61000-4-2 Contact ±6KV	perf. Criteria B
		F_S-2WR2	IEC/EN61000-4-2 Contact ±8KV	perf. Criteria B

## EMC RECOMMENDED CIRCUIT

EMI Typical Recommended Circuit (CLASS B):



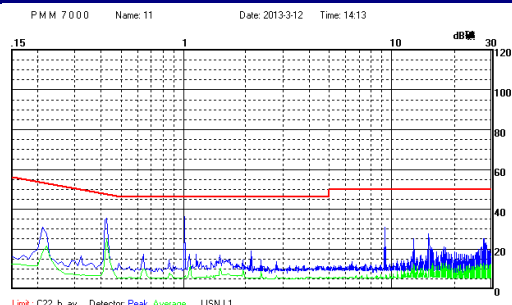
(Figure 1)

Recommended typical circuit parameters:

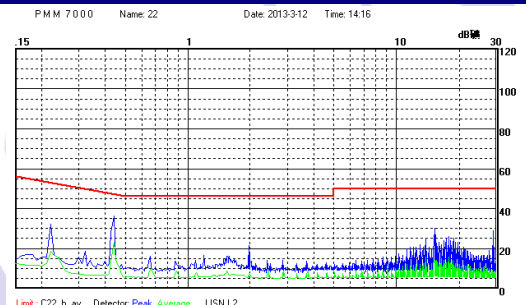
		Vin(V)	5	12/15/24
EMI	C1		4.7μF /50V	4.7μF /50V
	C2		--	470pF/3KV
	LDM		6.8μH	6.8μH

Note: If there is no recommended parameters, the model no require the external component.

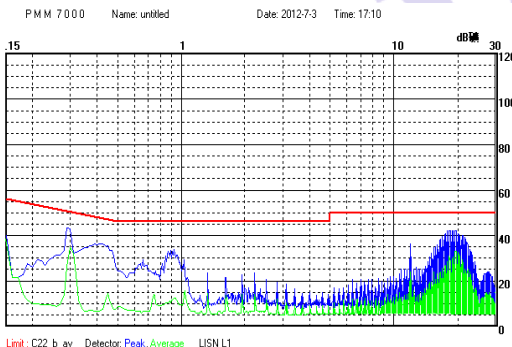
## EMC TEST WAVEFORM (CLASS B APPLY CIRCUIT)



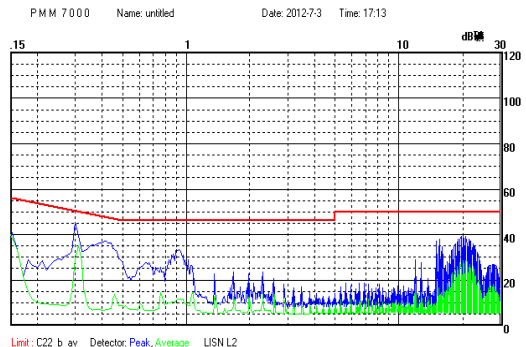
E2415S-2WR2 CE (Positive line)



E2415S-2WR2 CE (Negative line)

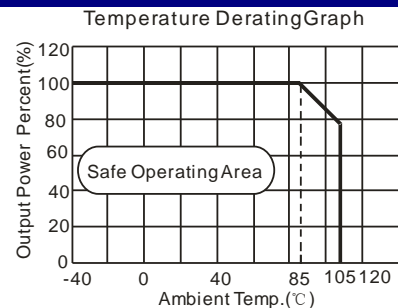
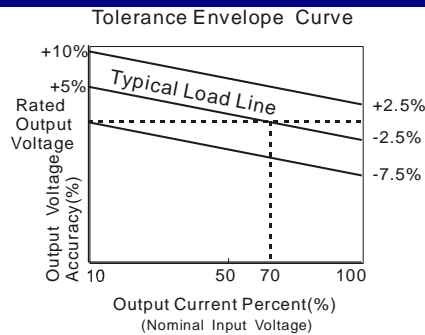


F2405S-2WR2 CE (Positive line)



F2405S-2WR2 CE (Negative line)

## PRODUCT TYPICAL CURVE



(Figure 2)

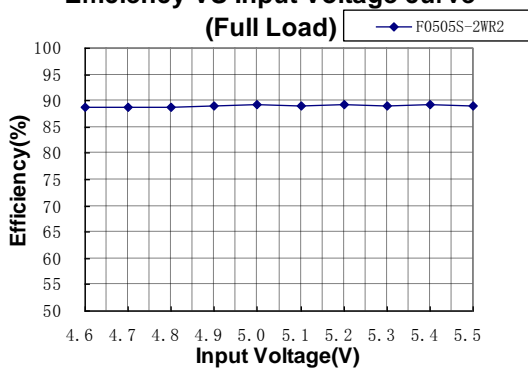
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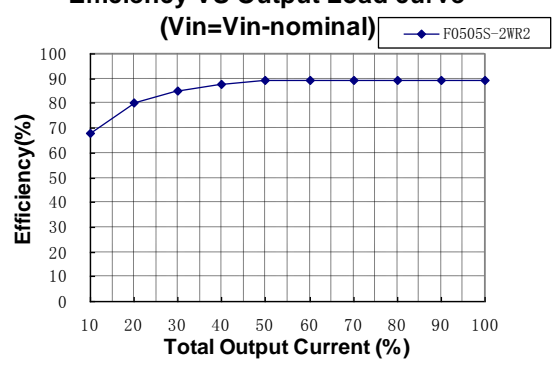
Tel: +44 (0) 118 9033290 Fax: +44 (0) 118 9033291

info@powerpaxuk.com Website: www.mornsun.co.uk

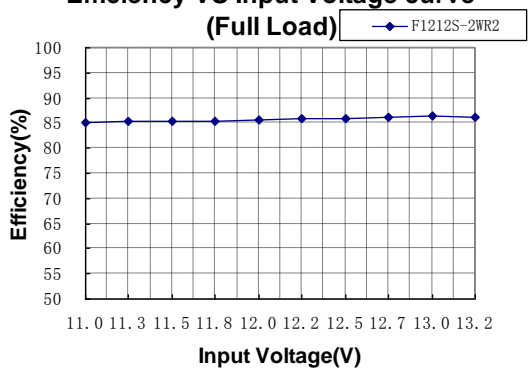
**Efficiency VS Input Voltage curve  
(Full Load)**



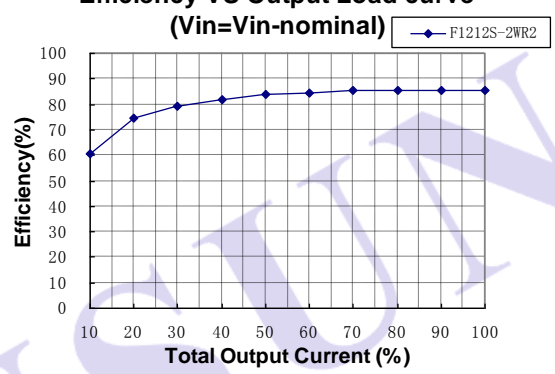
**Efficiency VS Output Load curve  
(Vin=Vin-nominal)**



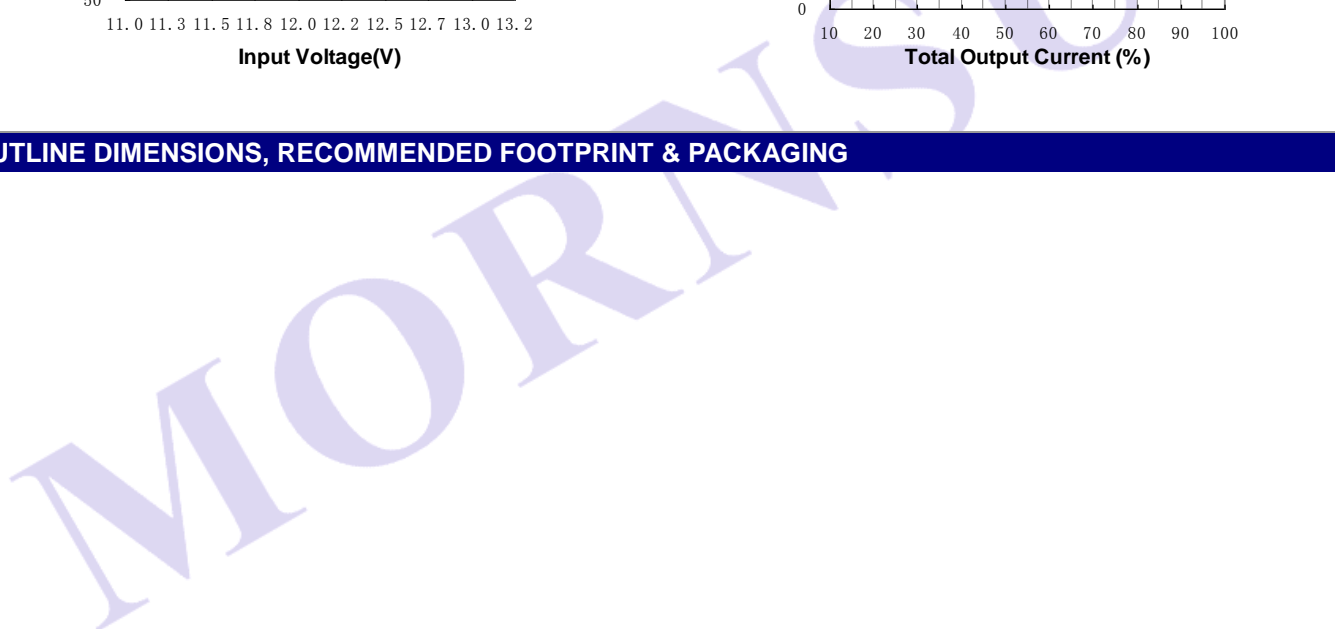
**Efficiency VS Input Voltage curve  
(Full Load)**



**Efficiency VS Output Load curve  
(Vin=Vin-nominal)**



**OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING**



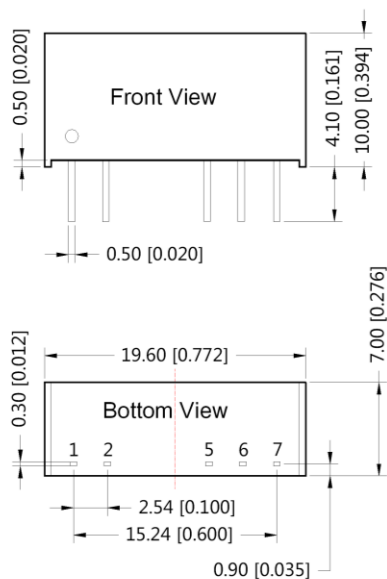
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Unit 5 Kennet Weir Business Park, Arrowhead Road, Theale, Berkshire, RG7 4AD, United Kingdom

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## MECHANICAL DIMENSIONS

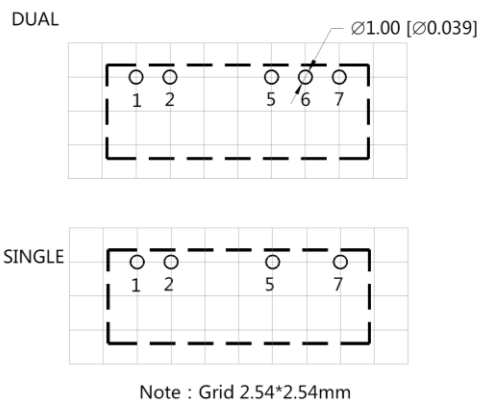


PIN CONNECTION		
Pin	Single	Dual
1	Vin	Vin
2	GND	GND
5	0V	-Vo
6	No Pin	0V
7	+Vo	+Vo

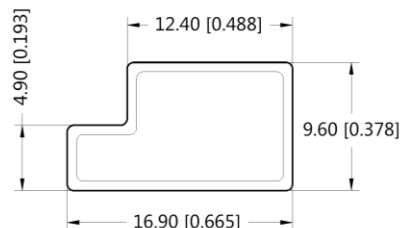
Note:  
 Unit :mm[inch]  
 Pin section tolerances:±0.1mm[±0.004inch]  
 General tolerances:±0.25mm[±0.010inch]

THIRD ANGLE PROJECTION

## RECOMMENDED FOOTPRINT DETAILS



## TUBE PACKAGING DIMENSIONS

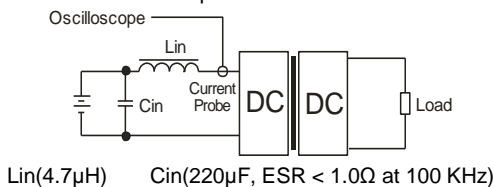


Note:  
 Unit:mm[inch]  
 General tolerances:±0.50mm[±0.020inch]  
 L=530mm[20.866inch] Tube Quantity:25 pcs  
 L=220mm[8.661inch] Tube Quantity:10 pcs  
 Inner carton(S): L\*W\*H=255\*170\*80 mm  
 Outer carton(S): L\*W\*H=375\*280\*270mm, 6 inner cartons(S);  
 Inner carton(L): L\*W\*H=580\*200\*100mm;  
 Outer carton(L): L\*W\*H=600\*215\*220mm, 2 inner cartons(L);  
 Outer carton(L): L\*W\*H=600\*215\*325mm, 3 inner cartons(L);

## TEST CONFIGURATIONS

### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor  $L_{in}$  and Capacitor  $C_{in}$  to simulate source impedance.



## DESIGN CONSIDERATIONS

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**1) Requirement for output load**

To ensure this module can operate efficiently and reliably, the minimum output load could not be less than 10% of the full load. If the actual output power is very small, please connect a resistor to the output in parallel to increase the load.

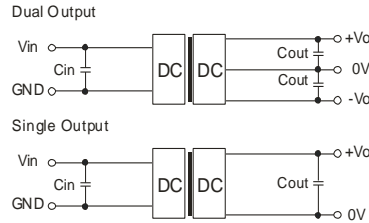
**2) Overload Protection**

Under normal operating conditions, the output circuit of these products have not overload protection. The simplest method is to add a breaker circuit in the circuit.

**3) Recommended circuit**

If you want to further decrease the input/output ripple, an capacitor filtering network may be connected to the input and output ends of the DC/DC converter, refer to Figure 3.

It should also be noted that the capacitance of the capacitor must be proper. If the capacitance is too large, a startup problem might arise. For ensuring every channel of output can provide a safe and reliable operation, the recommended capacitance of the capacitor refer to Table 1.



(Figure 3)

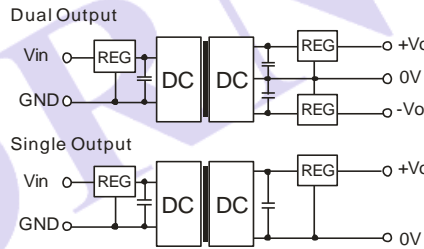
EXTERNAL CAPACITOR TABLE (Table 1)

Vin (VDC)	Cin (μF)	Single Vo (VDC)	Cout (μF)	Dual Vo (VDC)	Cout# (μF)
5	4.7	5	10	±5	4.7
12	2.2	12	2.2	±12	1
15	2.2	15/24	1	±15/±24	0.47
24	1	--	--	--	--

It's not recommended to connect any external capacitor in the application field with less than 0.5 watt output.

**4) Output Voltage Regulation and Over-voltage Protection Circuit**

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear regulator with overheat protection which is connected to the input or output in series (Figure 4) and an capacitor filtering network. The recommended capacitance of the capacitor refer to Table 1, linear regulator based on the actual voltage and current to make a reasonable selection.



(Figure 4)

**5) It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable**

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specifications.
2. Max. Capacitive Load is tested at nominal input voltage and full load.
3. Unless otherwise noted, All specifications are measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more detail.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.

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