

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



UL US CE CB Patent Protection RoHS



FEATURES

- Operating ambient temperature range: -40°C ~ +85°C
- High efficiency up to 85%
- High power density
- DIP package
- I/O isolation test voltage 3k VDC
- No extra components required
- Industry standard pin-out
- IEC60950, UL60950, EN60950 approved

E\_D-2WR2 & F\_D-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  $\pm 10\% V_{in}$  or less;
2. A high input to output isolation voltage of  $\leq 3000VDC$  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*( $\mu F$ ) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max./Min.		
UL/CE/CB	E0505D-2WR2	5 (4.5-5.5)	$\pm 5$	$\pm 200/\pm 20$	76/80	100
	E0509D-2WR2		$\pm 9$	$\pm 111/\pm 11$	80/84	
	E0512D-2WR2		$\pm 12$	$\pm 83/\pm 8$	80/84	
	E0515D-2WR2		$\pm 15$	$\pm 67/\pm 7$	80/84	
	F0505D-2WR2		5	400/40	76/80	220
	F0509D-2WR2		9	222/22	80/84	
	F0512D-2WR2		12	167/17	80/84	
	F0515D-2WR2		15	133/13	80/84	
	F0524D-2WR2		24	83/8	80/84	
UL/CE/CB	E1205D-2WR2	12 (10.8-13.2)	$\pm 5$	$\pm 200/\pm 20$	76/80	100
	E1212D-2WR2		$\pm 12$	$\pm 83/\pm 8$	79/83	
	E1215D-2WR2		$\pm 15$	$\pm 67/\pm 7$	81/85	
	E1224D-2WR2		$\pm 24$	$\pm 42/\pm 4$	81/85	220
	F1205D-2WR2		5	400/40	76/80	
	F1212D-2WR2		12	167/17	78/82	
	F1215D-2WR2		15	133/13	80/84	
	F1224D-2WR2		24	83/8	81/85	
-	E1509D-2WR2	15 (13.5-16.5)	$\pm 9$	$\pm 111/\pm 11$	77/81	100
	E1515D-2WR2		$\pm 15$	$\pm 67/\pm 7$	77/81	
	F1505D-2WR2		5	400/40	75/79	220
	F1509D-2WR2		9	222/22	78/82	
	F1515D-2WR2		15	133/13	75/79	
UL/CE/CB	E2405D-2WR2	24 (21.6-26.4)	$\pm 5$	$\pm 200/\pm 20$	75/79	100
	E2412D-2WR2		$\pm 12$	$\pm 83/\pm 8$	79/83	
	E2415D-2WR2		$\pm 15$	$\pm 67/\pm 7$	80/84	
	E2424D-2WR2		$\pm 24$	$\pm 42/\pm 4$	80/84	
	F2405D-2WR2		5	400/40	76/80	220
	F2409D-2WR2		9	222/22	81/85	

UL/CE/CB	F2412D-2WR2	24 (21.6-26.4)	12	167/17	79/83	220
	F2415D-2WR2		15	133/13	80/84	
	F2424D-2WR2		24	83/8	81/85	

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	--	500/25	--/60	mA
	12V input	--	208/15	--/50	
	15V input	--	167/15	--/35	
	24V input	--	105/10	--/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: $\pm 1\%$	--	--	$\pm 1.2$	--	
Load Regulation	10%-100% load	5VDC output	--	10	--	%
		9VDC output	--	9	--	
		12VDC output	--	8	--	
		15VDC output	--	7	--	
		24VDC output	--	6	--	
Ripple & Noise*	20MHz bandwidth	--	75	200	mVp-p	
Temperature Coefficient	Full load	--	--	$\pm 0.03$	%/°C	
Short-Circuit Protection**	E24xxD-2WR2/F24xxD-2WR2 E12xxD-2WR2/F12xxD-2WR2 E15xxD-2WR2/F15xxD-2WR2 E0512D-2WR2/E0515D-2WR2 E0524D-2WR2/F0524D-2WR2	--	--	1	s	
	Others	Continuous, self-recovery				

Notes: \* 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: E24xxD-2WR2/F24xxD-2WR2/  
E12xxD-2WR2/F12xxD-2WR2/ E15xxD-2WR2/F15xxD-2WR2 series, E0512D-2WR2/E0515D-2WR2/E0524D-2WR2/F0524D-2WR2.

### 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	24V input	--	50	--	pF
		Other input	--	20	--	
Operating Temperature	Derating when operating temperature $\geq 85^\circ\text{C}$ ( see Fig. 2)	-40	--	85	°C	
Storage Temperature		-55	--	125	°C	
Case Temperature Rise	Ta=25°C	--	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°C	3500	--	--	K hours

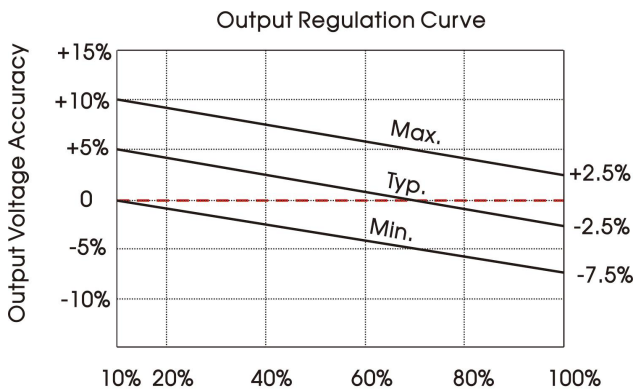
**Mechanical Specifications**

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)				
Dimensions	20.32 x 10.16 x 8.20mm				
Weight	E_D-2WR2	2.4g(Typ.)			
	F_D-2WR2	2.8g(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_D-2WR2	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria B
		F_D-2WR2	IEC/EN61000-4-2	Contact ±8KV	perf. Criteria B

**Typical Characteristic Curves**



Output Current Percentage (Nominal Input Voltage)  
Fig. 1

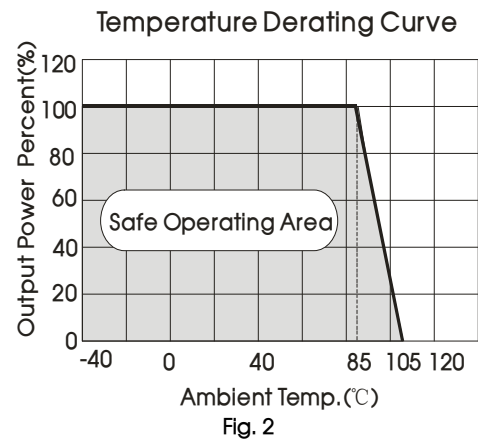
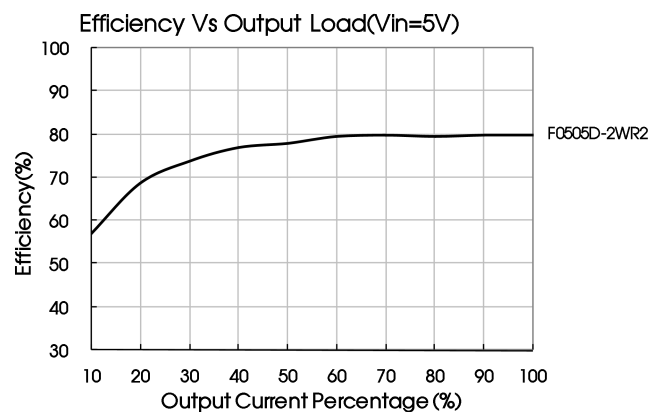
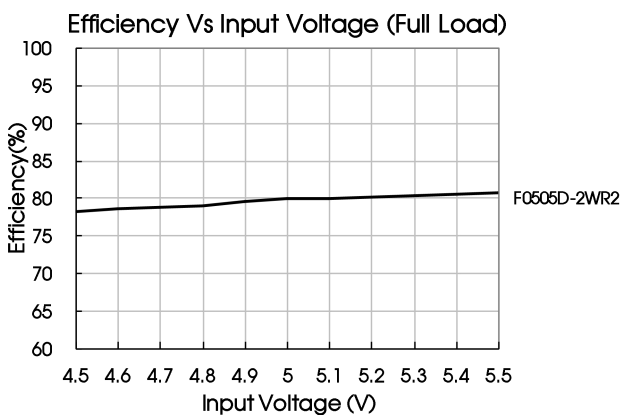
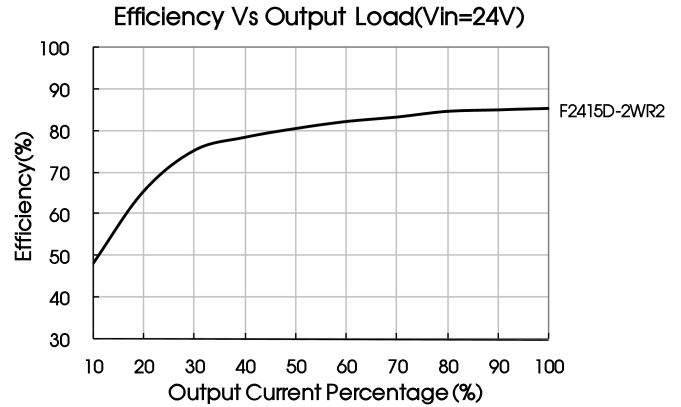
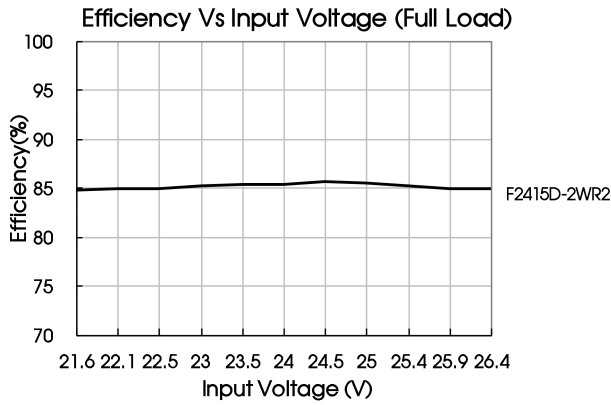


Fig. 2





## 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.

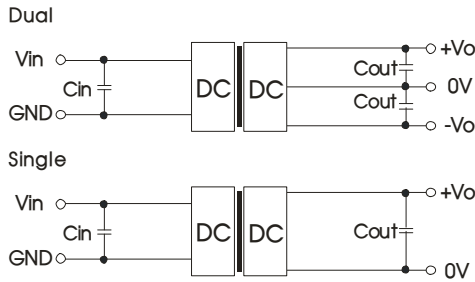


Fig.3

Table 1: Recommended input and output capacitor values

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

### 2. EMC (CLASS B) compliance circuit

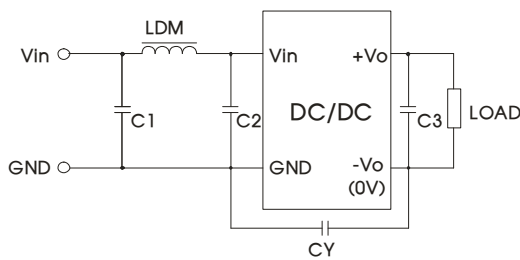


Fig. 4

Input voltage (VDC)		5/12/15	24
Emissions	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

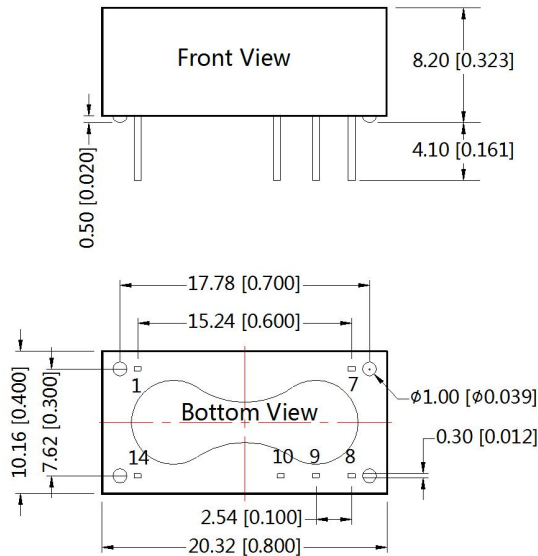
For a reliable and efficient operation of the converter, the minimum load should never be less than 10% of the rated output load. If the total required output power is below 10%, a parallel bleeding resistor is required on the output, ensuring that the sum of the power consumption is always maintained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

### 4. For additional information, please refer to the DC-DC converter application notes on

[www.mornsun-power.com](http://www.mornsun-power.com)

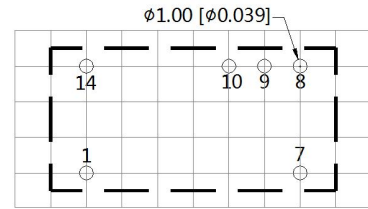
Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 

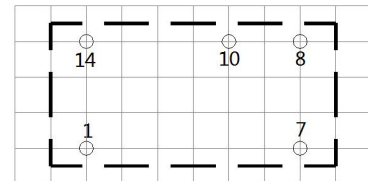


Note:  
Unit: mm[inch]  
Pin section tolerances:  $\pm 0.10[\pm 0.004]$   
General tolerances:  $\pm 0.25[\pm 0.010]$

Dual



Single



Note : Grid 2.54\*2.54mm

Pin	Pin-Out	
	Single	Dual
1	GND	GND
7	NC	NC
8	+Vo	+Vo
9	No Pin	0V
10	0V	-Vo
14	Vin	Vin

NC: Pin to be isolated circuitry

Notes:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200009;
- 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;
- The maximum capacitive load offered were tested at input voltage range and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on our company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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