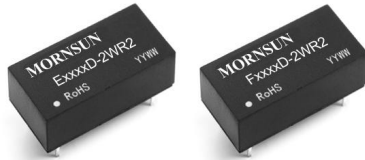


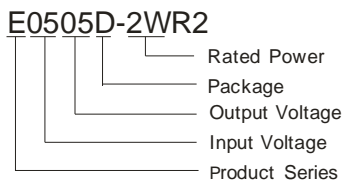
MORNSUN®

E_D-2WR2 & F_D-2WR2 Series 2W, FIXED INPUT, ISOLATED & UNREGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



Patent Protected RoHS

PART NUMBER SYSTEM



FEATURES

- Miniature DIP package
- Efficiency up to 86%
- High power density
- 3000VDC isolation
- Operating temperature range: -40°C ~ +85°C
- No external component required
- Industry standard pinout

APPLICATIONS

The E_D-2WR2 & F_D-2WR2 Series are designed for application where isolated output is required from a distributed power system.

These products apply to where:

- 1) Input voltage variation rang: $\pm 10\% V_{in}$;
- 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.

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 ① (μF)	Efficiency (%) @Max. Load	
			Max.	Min.	@Max. Load	@No Load			Min.	Typ.
E0505D-2WR2	5 (4.5-5.5)	±5	±200	±20	500	25	100	76	80	
E0509D-2WR2		±9	±111	±11	476			80	84	
E0512D-2WR2		±12	±83	±8	476			80	84	
E0515D-2WR2		±15	±67	±7	476			80	84	
E0524D-2WR2		±24	±42	±4	476			80	84	
F0505D-2WR2		5	400	40	506			75	79	
F0509D-2WR2		9	222	22	476			80	84	
F0512D-2WR2		12	167	17	476			80	84	
F0515D-2WR2		15	133	13	476			80	84	
F0524D-2WR2		24	83	8	476			80	84	
E0905D-2WR2	9 (8.1-9.9)	±5	±200	±20	278	20	100	76	80	
E0909D-2WR2		±9	±111	±11	271			78	82	
E0912D-2WR2		±12	±83	±8	274			77	81	
E0915D-2WR2		±15	±67	±7	268			79	83	
E0924D-2WR2		±24	±42	±4	268			79	83	
F0905D-2WR2		5	400	40	278			76	80	
F0909D-2WR2		9	222	22	271			78	82	
F0912D-2WR2		12	167	17	274			77	81	
F0915D-2WR2		15	133	13	268			79	83	
F0924D-2WR2		24	83	8	268			79	83	
E1205D-2WR2	12 (10.8-13.2)	±5	±200	±20	208	15	100	76	80	
E1209D-2WR2		±9	±111	±11	194			82	86	
E1212D-2WR2		±12	±83	±8	201			79	83	
E1215D-2WR2		±15	±67	±7	196			81	85	
E1224D-2WR2		±24	±42	±4	196			81	85	

Model	Input Voltage(VDC)	Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(Typ.)		Reflected Ripple Current (mA, Typ.)	Max. Capacitive Load ① (μF)	Efficiency (%) @Max. Load		
	Nominal (Range)		Max.	Min.	@Max. Load	@No Load			Min.	Typ.	
F1205D-2WR2	12 (10.8-13.2)	5	400	40	203	15	15	220	78	82	
F1209D-2WR2		9	222	22	196				81	85	
F1212D-2WR2		12	167	17	203				78	82	
F1215D-2WR2		15	133	13	198				80	84	
F1224D-2WR2		24	83	8	194				82	86	
E1505D-2WR2	15 (13.5-16.5)	±5	±200	±20	167	15	15	100	76	80	
E1509D-2WR2		±9	±111	±11	159				80	84	
E1512D-2WR2		±12	±83	±8	165				77	81	
E1515D-2WR2		±15	±67	±7	157				81	85	
E1524D-2WR2		±24	±42	±4	157				81	85	
F1505D-2WR2		5	400	40	167				220	76	80
F1509D-2WR2		9	222	22	159					80	84
F1512D-2WR2		12	167	17	165					77	81
F1515D-2WR2		15	133	13	157					81	85
F1524D-2WR2		24	83	8	157					81	85
E2405D-2WR2	24 (21.6-26.4)	±5	±200	±20	104	8	15	100	76	80	
E2409D-2WR2		±9	±111	±11	98				81	85	
E2412D-2WR2		±12	±83	±8	100				79	83	
E2415D-2WR2		±15	±67	±7	99				80	84	
E2424D-2WR2		±24	±42	±4	100				79	83	
F2405D-2WR2		5	400	40	104			220	76	80	
F2409D-2WR2		9	222	22	99				81	84	
F2412D-2WR2		12	167	17	100				79	83	
F2415D-2WR2		15	133	13	99				80	84	
F2424D-2WR2		24	83	8	100				79	83	

Note: ①for each output.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. Max.)	5VDC Input	-0.7	--	9	VDC
	9VDC Input	-0.7	--	12	
	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 ±1%	--	--	±1.2	%	
Load Regulation	10% to 100% load	5VDC output	--	10		--
		9VDC output	--	9		--
		12VDC output	--	8		--
		15VDC output	--	7		--
		15VDC output	--	6	--	
Temperature coefficient	100% load	--	--	±0.03	%/°C	
Ripple & Noise*	20MHz Bandwidth	Output Voltage ≤12VDC	--	60	--	mVp-p
		Output Voltage:15,24VDC	--	75	--	

Short Circuit Protection**	Input Voltage:9,24VDC and E0512D-2WR2,E0515D-2WR2,E0524D-2WR2	--	--	1	s
	Others	Continuous, automatic recovery			

Note:1.* Ripple and noise tested with "parallel cable" method. See detailed operation instructions at *DC-DC Application Notes*
2.**For the products of 9V and 24V Input voltage and E0512D-2WR2,E0515D-2WR2,E0524D-2WR2 , supply voltage must be discontinued at the end of short circuit duration.

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	--	--	MΩ	
Isolation Capacitance	Input-Output, 100KHz/0.1V	E/F2415D-2WR2	--	30	--	pF
		E/F2424D-2WR2	--	20	--	
		Others	--	20	--	
Switching Frequency	Full load, nominal input	--	100	300	KHz	
MTBF	MIL-HDBK-217F@25°C	3500	--	--	K hours	
Case Material		Plastic (UL94-V0)				
Weight		--	2.4	--	g	

ENVIRONMENTAL SPECIFICATIONS

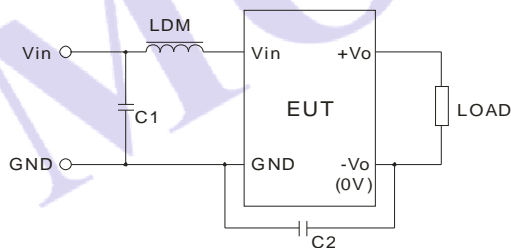
Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	--	--	95	%
Operating Temperature	Power derating ($\geq 85^\circ\text{C}$, see figure 2)	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise	Ta=25°C	--	25	--	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling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

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS B (Recommended Circuit Refer to Figure1)			
	RE	CISPR22/EN55022 CLASS B (Recommended Circuit Refer to Figure1)			
EMS	ESD	E_D-2WR2	IEC/EN61000-4-2 Contact $\pm 6\text{KV}$ perf. Criteria B		
		F_D-2WR2	IEC/EN61000-4-2 Contact $\pm 8\text{KV}$ perf. Criteria B		

EMC RECOMMENDED CIRCUIT

EMI Typical Recommended Circuit (CLASS B):



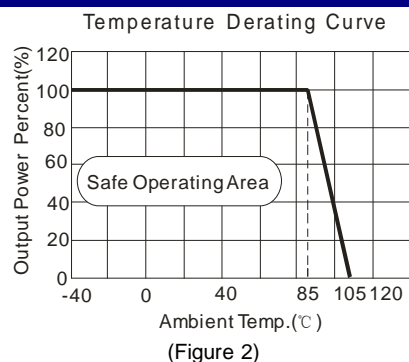
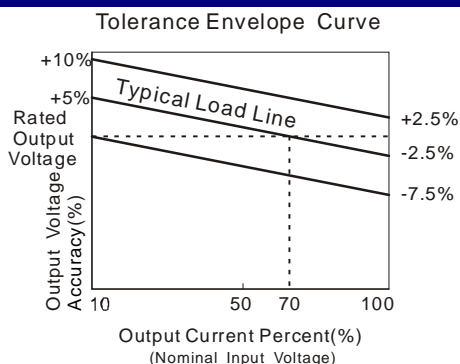
(Figure 1)

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

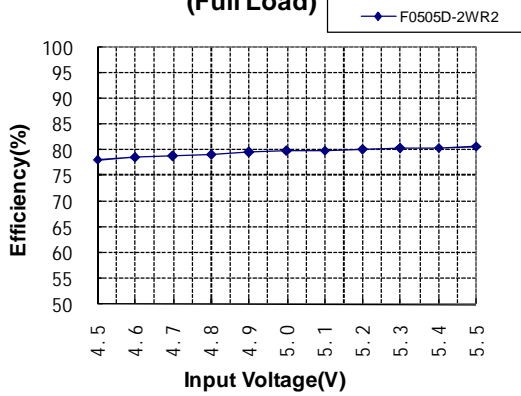
Recommended typical circuit parameters:

Vin(V)		5	9/12/15/24
EMI	C1	4.7μF /50V	4.7μF /50V
	C2	--	470pF/3KV
	LDM	6.8μH	6.8μH

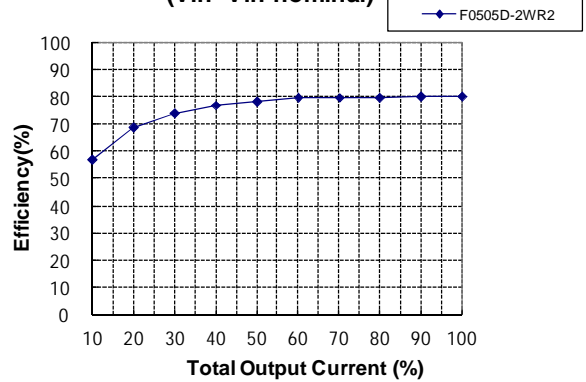
PRODUCT TYPICAL CURVE



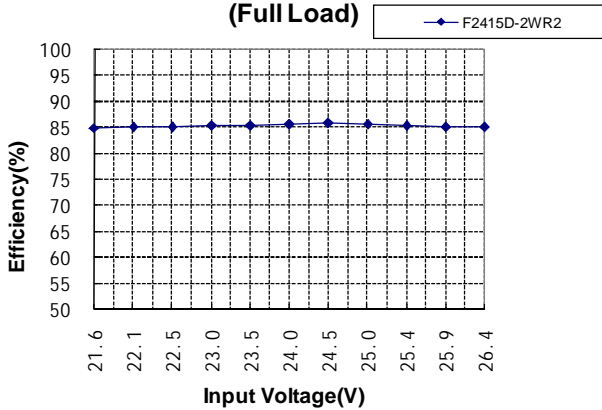
Efficiency VS Input Voltage curve (Full Load)



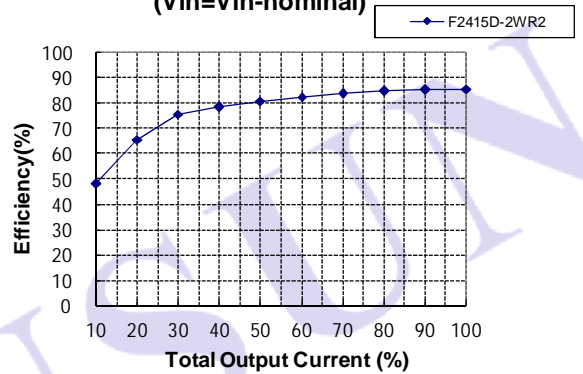
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)



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



OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

Front View dimensions: 8.20 [0.323] height, 4.10 [0.161] pin height, 0.50 [0.020] pin diameter.

Bottom View dimensions: 17.78 [0.700] width, 15.24 [0.600] width, 10.00 [0.394] height, 7.62 [0.300] height, 2.54 [0.100] offset, 20.00 [0.787] width, 1.00 [0.039] hole diameter, 0.30 [0.012] offset.

PIN CONNECTION		
Pin	Single	Dulas
1	GND	GND
7	NC	NC
8	+Vo	+Vo
9	No Pin	0V
10	0V	-Vo
14	Vin	Vin

Note:
 NC: No connection
 Unit: mm[inch]
 Pin section tolerances: ±0.10[±0.004]
 General tolerances: ±0.25[±0.010]

THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS

Dulas footprint: 14, 10, 9, 8, 7, 1 pins, hole diameter 1.00 [0.039].

Single footprint: 14, 10, 8, 7, 1 pins.

Note: grid: 2.54*2.54mm

TUBE PACKAGING DIMENSIONS

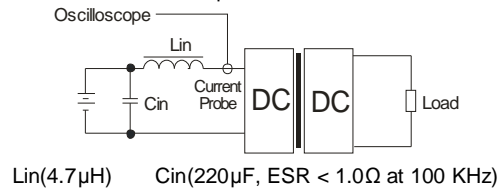
Tube packaging dimensions: 16.50 [0.650] width, 12.50 [0.492] height, 10.50 [0.413] width, 3.50 [0.138] height.

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

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.

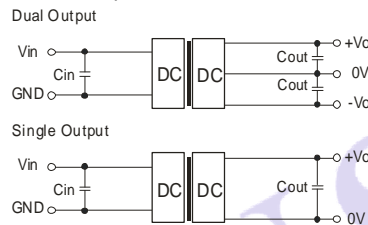
2) Overload Protection

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)

V_{in} (VDC)	C_{in} (μF)	Single V_o (VDC)	C_{out} (μF)	Dual V_o (VDC)	C_{out} (μF)
5	4.7	5	10	± 5	4.7
9	2.2	9	4.7	± 9	2.2
12	2.2	12	2.2	± 12	1
15	2.2	15	1	± 15	0.47
24	1	24	0.47	± 24	0.47

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

4) The input and the output of the product are recommended to be connected to ceramic capacitor or electrolytic capacitor. Using tantalum capacitor may cause risk of failure

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 $T_a=25^\circ C$, 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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