MORNSUN®

E_S-2W & F_S-2W Series

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

Patent Protection **RoHS**

PRODUCT FEATURES

- ●Efficiency up to 85%
- ●High Power Density
- ●Low Temperature rise
- ●Up to 3KV Isolation
- ●SIP Package
- ●Internal SMD construction
- ●Operating Temperature Range: -40°C to +85°C
- ●No External Component Required
- ●Industry Standard Pinout
- ●Meets UL,CE Approval

PART NUMBER SYSTEM

E0505S-2W

- Rated Power
- Package Style
- Output Voltage
- Input Voltage
- Product Series

APPLICATIONS

The E_S-2W & F_S-2W Series are designed for application where isolated output is required from a distributed power system.

These products apply to where:

1) Input voltage variation ≤ ±10%;
2) 3KV input and output isolation;
3) Regulated and low ripple noise is not required.

Such as: digital circuits, low frequency analog circuits, and IGBT power device driving circuits.

SELECTION GUIDE

Model Number	Input Voltage(VDC) Nominal (Range)	Output Voltage (VDC)	Output Current (mA) Max.	Output Current (mA) Min.	Input Current (mA)(typ.) @Max. Load	Input Current (mA)(typ.) @No Load	Reflected Ripple Current (mA,typ.)	Max. Capacitive Load(μF)	Efficiency (%, typ.) @Max. Load	Approval
E0503S-2W	5 (4.5-5.5)	±3.3	±303	±30	495	30	25	100	73	
E0505S-2W		±5	±200	±20	485				82	UL CE
E0509S-2W		±9	±111	±12	463				83	UL CE
E0512S-2W		±12	±83	±9	462				84	UL CE
E0515S-2W		±15	±67	±7	459				82	UL CE
F0503S-2W		3.3	400	40	492		30	220	74	
F0505S-2W		5	400	40	483				81	UL CE
F0509S-2W		9	222	23	468				83	UL CE
F0512S-2W		12	167	17	465				83	UL CE
F0515S-2W		15	133	14	477				83	UL CE
F0524S-2W		24	83	9	458				84	
E1203S-2W	12 (10.8-13.2)	±3.3	±303	±31	207	20	25	100	76	
E1205S-2W		±5	±200	±20	203				80	UL CE
E1209S-2W		±9	±111	±12	194				83	UL CE
E1212S-2W		±12	±83	±9	189				85	UL CE
E1215S-2W		±15	±67	±7	198				82	UL CE
F1205S-2W		5	400	40	199		30	220	80	UL CE
F1209S-2W		9	222	23	195				82	UL CE
F1212S-2W		12	167	17	188				83	UL CE
F1215S-2W		15	133	14	196				83	UL CE
F1224S-2W		24	83	9	194				82	

Model Number	Input Voltage(VDC) Nominal (Range)	Output Voltage (VDC)	Output Current (mA) Max.	Output Current (mA) Min.	Input Current (mA)(typ.) @Max. Load	Input Current (mA)(typ.) @No Load	Reflected Ripple Current (mA,typ.)	Max. Capacitive Load(μF)	Efficiency (%, typ.) @Max. Load	Approval
E1515S-2W	15 (13.5-16.5)	±15	±67	±7	152	15	37	100	82	
F1505S-2W		5	400	40	160		56	220	78	
F1515S-2W		15	133	14	152		30		80	
E2405S-2W	24 (21.6-26.4)	±5	±200	±20	101	10	30	100	82	UL CE
E2409S-2W		±9	±111	±12	97				82	UL CE
E2412S-2W		±12	±83	±9	96				85	UL CE
E2415S-2W		±15	±67	±7	95				85	UL CE
F2405S-2W		5	400	40	100		30	220	80	UL CE
F2409S-2W		9	222	23	97				82	UL CE
F2412S-2W		12	167	17	94				83	UL CE
F2415S-2W		15	133	14	96				84	UL CE
F2424S -2W		24	83	9	93				85	

INTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Input Surge Voltage (1sec. max.)	3.3VDC Input Models	-0.7	--	5	VDC
	5VDC Input Models	-0.7	--	9	
	12VDC Input Models	-0.7	--	18	
	15VDC Input Models	-0.7	--	21	
	24VDC Input Models	-0.7	--	30	
Reverse Voltage Protection*		--	--	0.4	A
Input Filter		C Filter			
Note: *During reverse connection,if current is not limited, may result in injury or permanent damage, testing is not recommended.					

OUTPUT SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Units
Output Power			0.2	--	2	W
Output Voltage Accuracy			See tolerance envelope graph			
Output Voltage Balance	Dual Output, Balanced Loads		--	±0.5	±1.0	%
Line Regulation	For Vin change of ±1%	3.3V output	--	--	±1.5	
		Others	--	--	±1.2	
Load Regulation	10% to 100% load	3.3V output	--	12	20	
		5V output	--	10	15	
		9V output	--	8.3	15	
		12V output	--	6.8	15	
		15V output	--	6.3	15	
		24V output	--	5.0	15	
Temperature Drift	100% full load		--	--	±0.03	%/°C
Ripple & Noise*	20MHz Bandwidth		--	75	150	mVp-p
Short Circuit Protection**			--	--	1	s

Note: Dual output models unbalanced load: ±5%.
*Ripple and noise tested by “parallel cable” method. See detailed operation instructions at Testing of Power Converter section, application notes.
**Supply voltage must be discontinued at the end of short circuit duration.

COMMON SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Units
Isolation Voltage	Tested for 1 minute and leakage current less than 1 mA		3000	--	--	VDC
Isolation Resistance	Test at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input/Output,100KHz/1V	F2424S-2W	--	100	--	pF
		Other Models	--	30	--	
Switching Frequency	Full load, nominal input		--	70	--	KHz
MTBF	MIL-HDBK-217F@25℃		3500	--	--	K hours
Case Material			Plastic(UL94-V0)			
Weight			--	2.1	--	g

ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Storage Humidity		--	--	95	%
Operating Temperature	Non condensing(above 85℃)	-40	--	85	℃
Storage Temperature		-55	--	125	
Temp. rise at full load		--	25	--	
Soldering Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

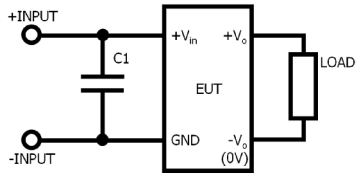
EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022	CLASS A(External Circuit Refer to Figure1)
EMS	ESD	IEC/EN61000-4-2	Contact ±8KV perf. Criteria B

EMC RECOMMENDED CIRCUIT

E05XXS-2W, F24XXS-2W already meet CLASS A, for other models following Figure 1.

EMI Recommended External Circuit：



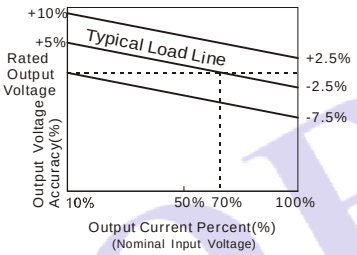
(Figure 1)

E_S-2W Series
Recommended external circuit parameters:
①Vin：12V、15V
C1：2.2μF/50V 1210
②Vin：24V
C1：4.7μF/50V 1210

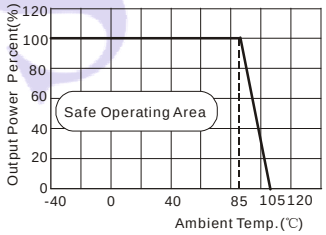
F_S-2W Series
Recommended external circuit parameters:
Vin：5V、12V、15V
①C1：4.7μF/50V 1210

PRODUCT TYPICAL CURVE

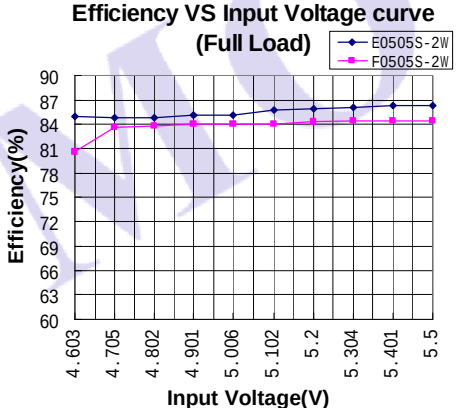
Tolerance Envelope Graph



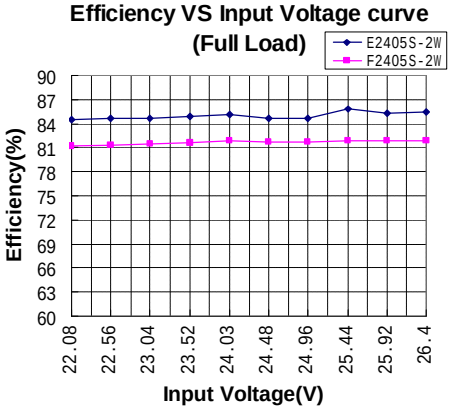
Temperature Derating Graph



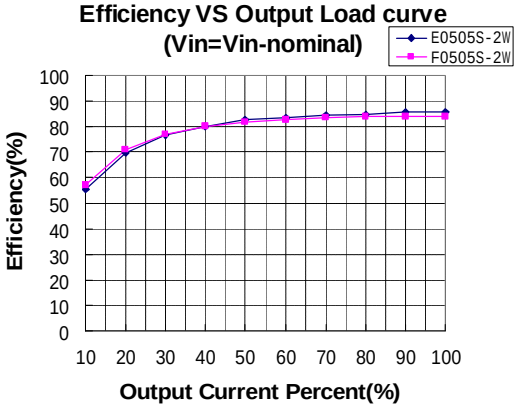
Efficiency VS Input Voltage curve (Full Load)



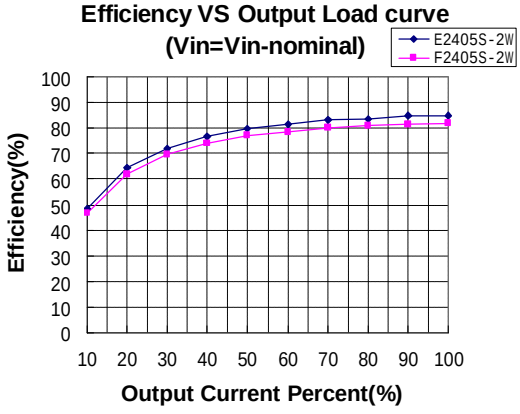
Efficiency VS Input Voltage curve (Full Load)



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

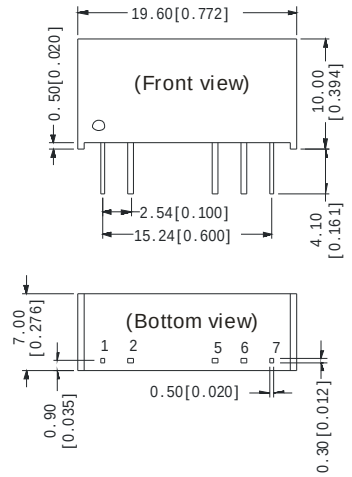


Efficiency VS Output Load curve (Vin=Vin-nominal)



OUTLINE DIMENSIONS、RECOMMENDED FOOTPRINT & PACKAGING

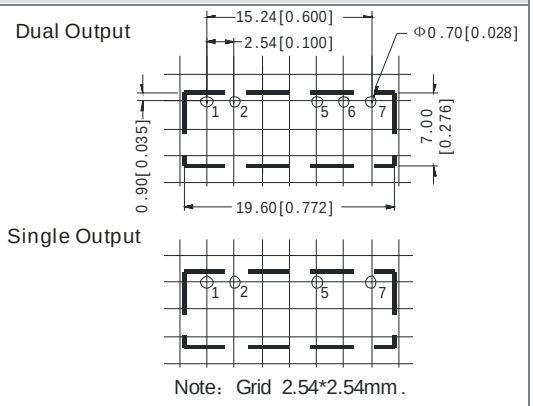
MECHANICAL DIMENSIONS



Note:
Unit:mm(inch)
Pin section:0.50*0.30mm(0.020*0.012inch)
Pinsection tolerances:± 0.10mm (± 0.004inch)
General tolerances:± 0.50mm (± 0.020inch)

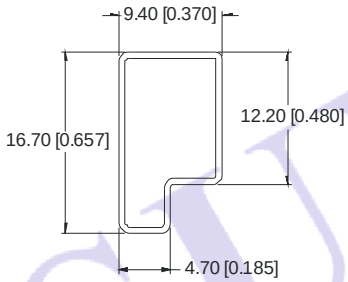
FOOTPRINT DETAILS		
Pin	Single	Dual
1	Vin	Vin
2	GND	GND
5	0V	-Vo
6	No pin	0V
7	+Vo	+Vo

RECOMMENDED FOOTPRINT



Note：Grid 2.54*2.54mm.

TUBE OUTLINE DIMENSIONS

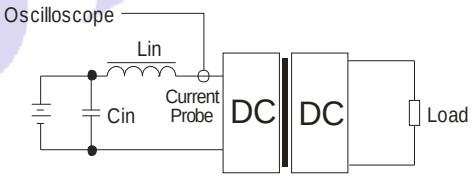


Note:
Unit :mm[inch]
General tolerances:± 0.50mm[± 0.020inch]
L=530mm[20.866inch] Tube Quantity: 25pcs
L=220mm[8.661inch] Tube Quantity: 10pcs
Short tube inner packaging dimensions: L*W*H=255*170*80mm;
Short tube outer packaging dimensions(with six inner packaging boxes): L*W*H=375*280*270mm;
Long tube inner packaging dimensions: L*W*H=580*200*100mm;
Long tube outer packaging dimensions(with two inner packaging boxes) L*W*H=600*215*220mm;
Long tube outer packaging dimensions(with three inner packaging boxes) L*W*H=600*215*325mm.

TEST CONFIGURATIONS

Input reflected-ripple current test setup

Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



Lin(4.7μH) Cin(220μF, ESR < 1.0Ω at 100 KHz)

DESIGN CONSIDERATIONS

1) Requirement on output load

To ensure this module can operate efficiently and reliably, During operation, 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 with proper resistance at the output end in parallel to increase the load, or use our company's products with a lower rated output power (E_S-1W & F_S-1W series).

2) Overload protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit.

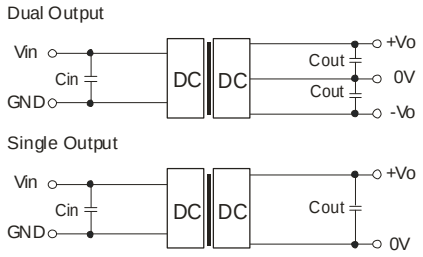
Input Fuse Selection Guide

3.3VDC Input Models	1000mA slow-Blow Type	15VDC Input Models	250mA slow-Blow Type
5VDC Input Models	1000mA slow-Blow Type	24VDC Input Models	250mA slow-Blow Type
12VDC Input Models	500mA slow-Blow Type		

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, see (Figure 3).

It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 1).



(Figure 3)

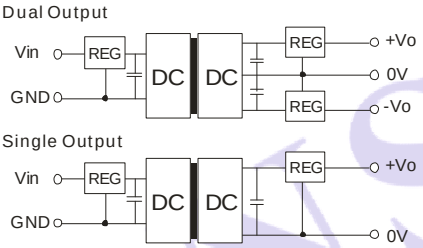
EXTERNAL CAPACITOR TABLE (TABLE 1)

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

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 and an capacitor filtering network with overheat protection that is connected to the input or output end in series (Figure 4), the recommended capacitance of its filter capacitor sees (Table 1), linear regulator based on the actual voltage and current required.



(Figure 4)

5) Cannot use in parallel and hot swap

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specification listed.
2. Max. Capacitive Load tested at input voltage range and full load.
3. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. All characteristics are for listed model only, non-standard models may perform differently, please contact our technical person for more detail.
6. Contact us for your specific requirement.
7. Specifications subject to change without prior notice.

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