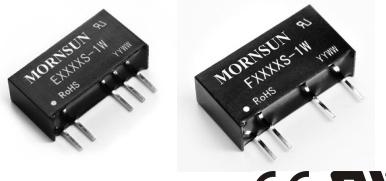
MORNSUN®

E_S-1W & F_S-1W Series

1W, FIXED INPUT, ISOLATED & UNREGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



Patent Protection RoHS

FEATURES

- Small Footprint
- Efficiency up to 80%
- SIP Package
- High Power Density
- Low Temperature Rise
- Up to 3KV Isolation
- Operating Temperature Range: -40°C ~ +85°C
- No External Component Required
- Industry Standard Pinout

PART NUMBER SYSTEM

E0505S-1W

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

APPLICATIONS

The E_S-1W & F_S-1W 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) 3KVDC 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)	Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load# (μF)	Efficiency (%, typ.) @Max. Load	Approval
	Nominal (Range)		Max.	Min.	@Max. Load	@No Load				
F0303S-1W	3.3 (3.0-3.6)	3.3	303	31	415	42	17	100	69	--
F0305S-1W		5	200	20	390				74	--
E0505S-1W	5 (4.5-5.5)	±5	±100	±10	281	30	19	220	71	UL CE
E0509S-1W		±9	±56	±6	265				77	UL CE
E0512S-1W		±12	±42	±5	250				77	UL CE
E0515S-1W		±15	±33	±4	235				79	UL CE
F0503S-1W		3.3	303	30	271	30	21	100	73	--
F0505S-1W		5	200	20	279				72	UL CE
F0509S-1W		9	111	12	266				76	UL CE
F0512S-1W		12	83	9	249				79	UL CE
F0515S-1W		15	67	7	260				78	UL CE
F0524S-1W		24	42	5	238				79	--
F0909S-1W	9 (8.1-9.9)	9	111	11	145	20	21	100	79	--
F0915S-1W		15	67	6	140				82	--
E1205S-1W	12 (10.8-13.2)	±5	±100	±10	106	19	24	220	73	UL CE
E1209S-1W		±9	±56	±6	108				77	UL CE
E1212S-1W		±12	±42	±5	104				80	UL CE
E1215S-1W		±15	±33	±4	115				80	UL CE
F1203S-1W		3.3	303	30	112	16	21	100	70	--
F1205S-1W		5	200	20	113				70	UL CE
F1209S-1W		9	111	12	107				75	UL CE
F1212S-1W		12	83	9	106				78	UL CE
F1215S-1W		15	67	7	104				79	UL CE
F1224S-1W		24	42	5	97				79	--

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-1W	15 (13.5-16.5)	±15	±33	±4	85	14	56	220	75	--
~~F1505S-1W~~		~~5~~	~~200~~	~~20~~	~~94~~	13	22	100	~~69~~	--
~~F1509S-1W~~		~~9~~	~~111~~	~~12~~	~~87~~				~~73~~	--
~~F1515S-1W~~		~~15~~	~~67~~	~~7~~	~~86~~				~~75~~	--
E2405S-1W	24 (21.6-26.4)	±5	±100	±10	53	7	42	220	73	UL CE
~~E2409S-1W~~		~~±9~~	~~±56~~	~~±6~~	~~52~~				~~77~~	~~UL CE~~
E2412S-1W		±12	±42	±5	51				80	UL CE
E2415S-1W		±15	±33	±4	51				80	UL CE
~~F2403S-1W~~		~~3.3~~	~~303~~	~~31~~	~~56~~	7	47	100	~~70~~	--
~~F2405S-1W~~		~~5~~	~~200~~	~~20~~	~~56~~				~~71~~	~~UL CE~~
~~F2409S-1W~~		~~9~~	~~111~~	~~12~~	~~52~~				~~76~~	~~UL CE~~
F2412S-1W		12	83	9	51				78	UL CE
F2415S-1W		15	67	7	52				80	UL CE
F2424S-1W		24	42	5	51				77	--

Note:1.Models listed with strike-through text have been officially discontinued.
2. # For each output.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	3.3VDC input	-0.7	--	5	VDC
	5VDC input	-0.7	--	9	
	9VDC input	-0.7	--	15	
	12VDC input	-0.7	--	18	
	15VDC input	-0.7	--	21	
	24VDC input	-0.7	--	30	
Input Filter		Capacitance Filter			

OUTPUT SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Unit
Output Power			0.1	--	1	W
Output Voltage Accuracy			See tolerance envelope graph			
Output Voltage Balance	Dual Output, Balanced Loads		--	±0.5	±1	%
Line Regulation	For Vin change of ±1%	3.3VDC output	--	--	±1.5	--
		Others	--	--	±1.2	
Load Regulation	10% to 100% load	3.3VDC output	--	12	20	%
		5VDC output	--	10	15	
		9VDC output	--	8.3	15	
		12VDC output	--	6.8	15	
		15VDC output	--	6.3	15	
		24VDC output	--	6	15	
Temperature Drift	100% load		--	--	±0.03	%/°C
Ripple & Noise*	20MHz Bandwidth	ExxxxS-1W	--	50	--	mVp-p
		Exx15S-1W	--	100	--	
		FxxxxS-1W	--	75	--	
		Fxx24S-1W	--	100	--	
Short Circuit Protection**			--	--	1	s

Note:1.*Test ripple and noise by “parallel cable” method. See detailed operation instructions at Testing of Power Converter section, application notes.
2.**Supply voltage must be discontinued at the end of short circuit duration.

COMMON SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Unit
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-1W	--	100	--	pF
		Others	--	30	--	
Switching Frequency	Full load, nominal input		--	100	--	KHz
MTBF	MIL-HDBK-217F@25℃		3500	--	--	K hours
Case Material			Plastic(UL94-V0)			
Weight			--	2.1	--	g

ENVIRONMENTAL SPECIFICATIONS

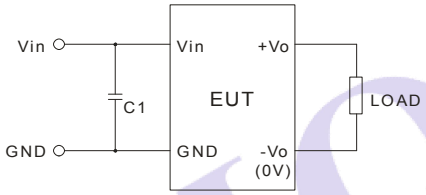
Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	--	--	95	%
Operating Temperature	Power derating (above 85℃)	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise at full load		--	25	--	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

EMC SPECIFICATIONS

EMI	CE		CISPR22/EN55022	CLASS A (External Circuit Refer to Figure1)	
EMS	ESD	ExxxxS-1W	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria B
		FxxxxS-1W	IEC/EN61000-4-2	Contact ±8KV	perf. Criteria B

EMC RECOMMENDED CIRCUIT

EMI Recommended External Circuit:



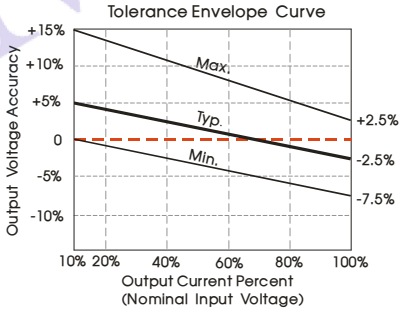
(Figure 1)

E_S-1W Series
Recommended external circuit parameters:
Vin：24V
C1：2.2μF/50V 1210
Note: Product bare input of 5V、12V、15V already meet CLASS A.

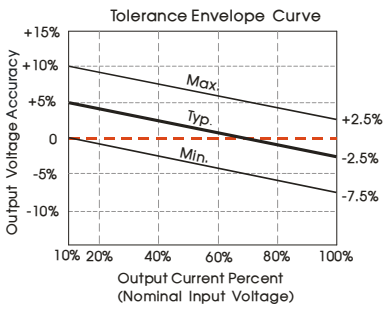
F_S-1W Series
Recommended external circuit parameters:
Vin：3.3V/9V
C1：2.2μF /50V 1210
Vin：5V/12V/24V
C1：1μF /50V 1210
Note: Product bare input of 3.3V、5V、12V、15V already meet CLASS A, increase the capacitor margin increase.

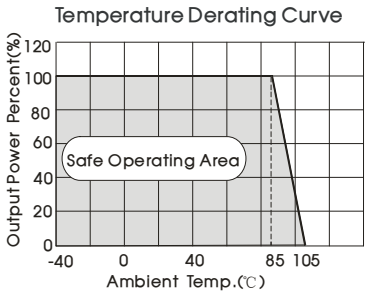
PRODUCT TYPICAL CURVE

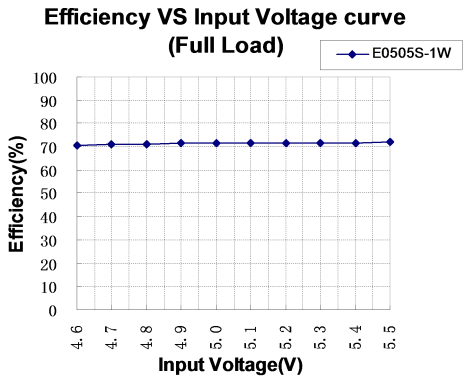
3.3VDC /5VDC output

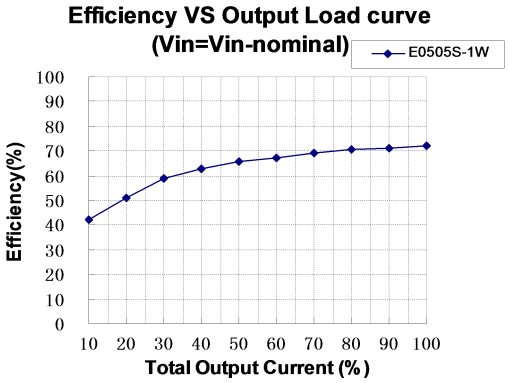


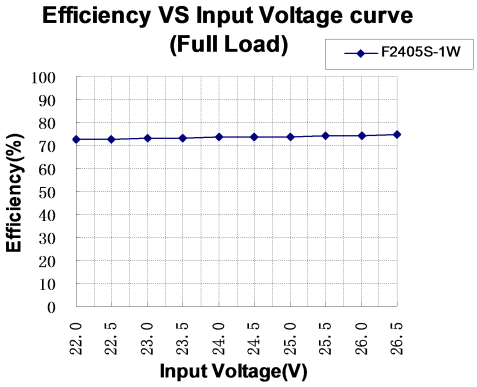
Other output

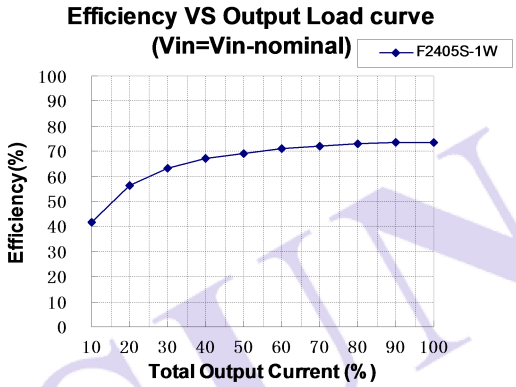




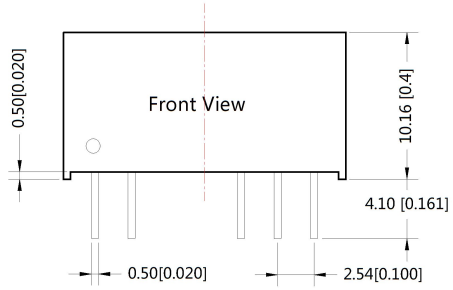


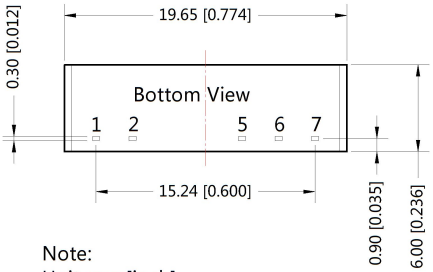




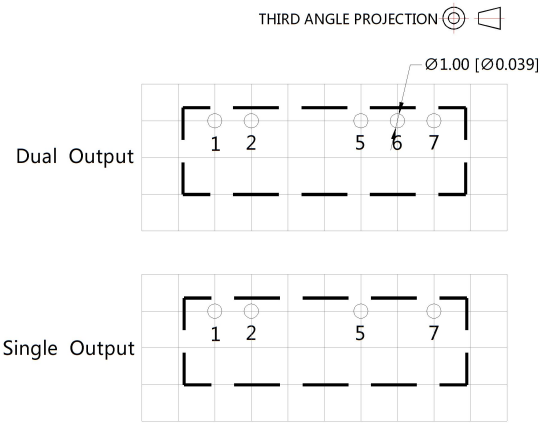


OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING





Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.25[±0.010]



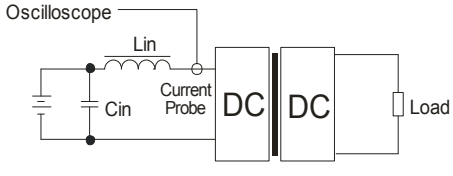
Note : Grid 2.54*2.54mm

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

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 & APPLY 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-W25&F_S-W25).

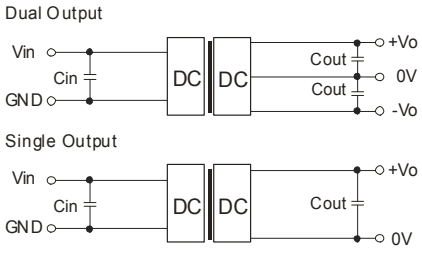
2) Overload protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is add a circuit breaker to 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, see (Figure 2).

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 2)

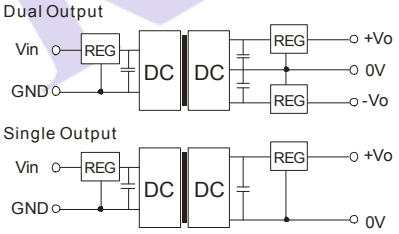
EXTERNAL CAPACITOR TABLE (TABLE 1)

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

Note: # For each output. 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 3), the recommended capacitance of its filter capacitor sees (Table 1), linear regulator based on the actual voltage and current to reasonable selection.



(Figure 3)

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 date in the datasheet are measured according to nominal input voltage, rated output load, TA=25℃, humidity<75%, unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. The performance in the datasheet is just fit for the part number in the selection guide, and may be different from the customer-designed product, you can get more details from MORNSUN FAE.
6. Contact us for your specific requirement.
7. Specifications subject to change without prior notice.

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