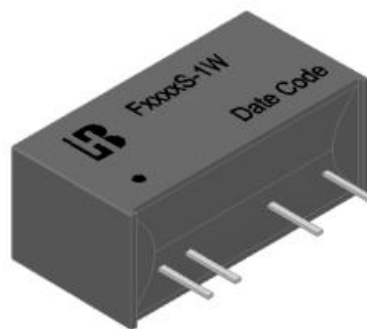


Features

- 7pin SIP Package with Industry-Standard Footprint
- Input / Output Isolation Voltage: 3kVDC
- High Efficiency
- Lead Free Design, RoHS Compliant
- Operating temperature: -40°C to +105°C
- Meet Safety Standard / Approval: IEC / EN60950-1



Applications

These converters are well suitable for battery operated equipment, measurement equipment, telecom, wireless network, Industry control system, everywhere where isolated, tightly regulated voltages and compact size are required.

Technical Specification All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

Model Number	Input Voltage Range(V)	Output Voltage (V)	Output Current (mA) ⁽¹⁾		Input Current (mA) Typ.		Eff. (%) ⁽²⁾ Typ.	Capacitive Load, max. ⁽³⁾ (uF)				
			Full Load	No Load	No Load	Full Load						
F0303S-1W	2.97-3.63 Nominal:3.3	3.3	300	35	405	74	68					
F0305S-1W		5	200									
E0303S-1W		±3.3	±150									
E0305S-1W		±5	±100									
F0503S-1W	4.5-5.5 Nominal:5	3.3	300	28	264	75	68					
F0505S-1W		5	200									
F0509S-1W		9	110									
F0512S-1W		12	83									
F0515S-1W		15	67									
F0524S-1W		24	42									
E0503S-1W		±3.3	±150									
E0505S-1W		±5	±100									
E0509S-1W		±9	±55									
E0512S-1W		±12	±42									
E0515S-1W		±15	±33									
E0524S-1W		±24	±21									
F0905S-1W		8.1-9.9 Nominal:9	5					200	19	137	81	47
F1203S-1W		10.8-13.2 Nominal:12	3.3					300	17	109	76	68
F1205S-1W	5		200									
F1209S-1W	9		110									
F1212S-1W	12		83									
F1215S-1W	15		67									
F1224S-1W	24		42									
E1203S-1W	±3.3		±150									
E1205S-1W	±5		±100									
E1209S-1W	±9		±55									
E1212S-1W	±12		±42									

Model Number	Input Voltage Range(V) Nominal:12	Output Voltage (V)	Output Current (mA) ⁽¹⁾ Full Load	Input Current (mA) Typ.		Eff. (%) ⁽²⁾ Typ.	Capacitive Load, max. ⁽³⁾ (uF)		
				No Load	Full Load				
E1215S-1W	10.8-13.2 Nominal:12	±15	±33	17	104	80	10/10		
F1503S-1W	13.5-16.5 Nominal:15	3.3	300	15	87	76	68		
F1505S-1W		5	200		85	78	47		
F1509S-1W		9	110		85	78	33		
F1512S-1W		12	83		83	80	22		
F1515S-1W		15	67		83	80	22		
F1524S-1W		24	42		83	80	10		
E1503S-1W		±3.3	±150		87	76	33/33		
E1505S-1W		±5	±100		85	78	22/22		
E1509S-1W		±9	±55		85	78	10/10		
E1512S-1W		±12	±42		83	80	10/10		
E1515S-1W		±15	±33		83	80	10/10		
F2403S-1W		21.6-26.4 Nominal:24	3.3		300	8	54	77	68
F2405S-1W			5		200		53	79	47
F2409S-1W	9		110	52	80		33		
F2412S-1W	12		83	51	81		22		
F2415S-1W	15		67	51	81		22		
F2424S-1W	24		42	51	81		10		
E2403S-1W	±3.3		±150	54	77		33/33		
E2405S-1W	±5		±100	53	79		22/22		
E2409S-1W	±9		±55	52	80		10/10		
E2412S-1W	±12		±42	51	81		10/10		
E2415S-1W	±15		±33	51	81		10/10		

Input Specifications

3.3V nominal input	2.97-3.63V
5V nominal input	4.5-5.5V
9 V nominal input	8.1-9.9V
12V nominal input	10.8-13.2V
15V nominal input	13.5-16.5V
24V nominal input	21.6-26.4V

Input filter

Capacitor

Environmental Specifications

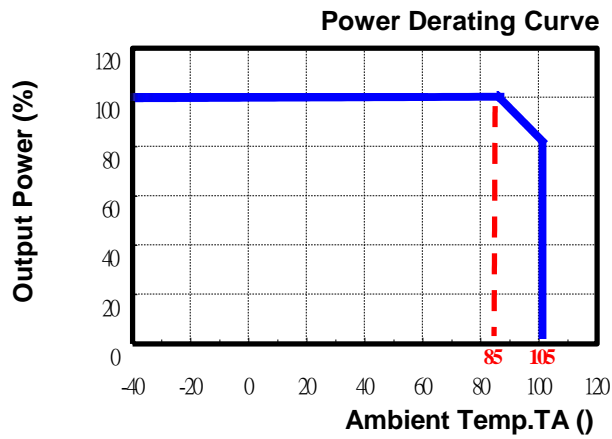
Operating ambient temperature	-40°C to +105°C
Maximum case temperature	+125°C
Storage temperature range	-55°C to +125°C
Relative humidity	95% RH max.

Output Specifications		
Output power		1Watts max.
Voltage accuracy	Nominal Vin and full load	
	3.3Vdc	3.135-3.399V
	5Vdc	4.75-5.15V
	9Vdc	8.73-9.18V
	12Vdc	11.64-12.24V
	15Vdc	14.55-15.30V
	24Vdc	23.52-24.36V
Voltage balance	Dual output	±1% max.
Minimum load		10% load of full load
Line regulation	For Vin change of 1%	±1.2% Typ.
	Nominal Vin and 10%-100% load	
Load regulation	3.3Vdc	15% Typ.
	5Vdc	13% Typ.
	9Vdc	9% Typ.
	12Vdc	8% Typ.
	15Vdc	7% Typ.
	24Vdc	6% Typ.
Ripple and Noise (20MHz Bandwidth)		50mVp-p Typ. 100mVp-p Max.
Maximum capacitive load		See table
Temperature coefficient		±0.03%/°C Typ.
General Specifications		
Efficiency	Nominal input and full load	See table
Isolation voltage	Input to output	1500VDC (60 second)
Isolation resistance	500VDC	1000MΩ min.
Isolation capacitance		30pF typ.
Switching frequency		150kHz typ.
		300kHz max.
Reliability, calculated MTBF		2×10 ⁶ Hrs
Physical Specifications		
Case material		Plastic (UL94 V-0)
Potting material		PU (UL94 V-0)
Dimensions		19.6× 10.1× 6.0 mm
Weight		2g Typ.

Note

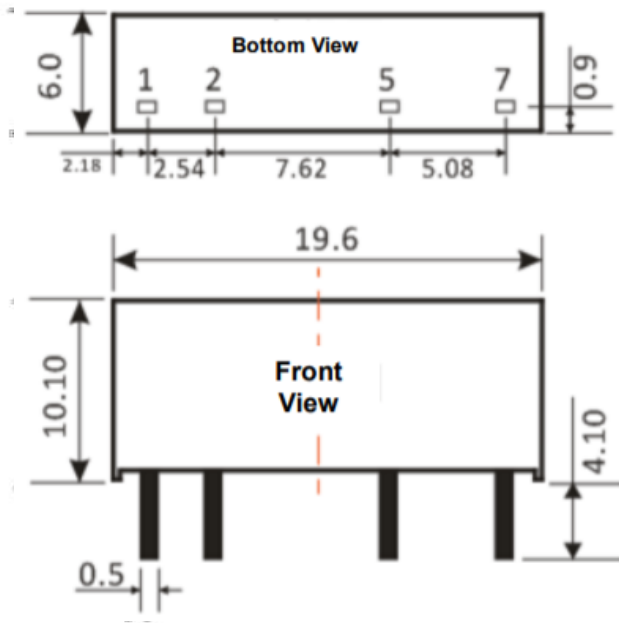
1. lo below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.
4. Specifications subject to change without notice.
5. This series of products do not support CC mode, CR mode is recommended.
6. In case of long input lines or hot plug-in requirements, we recommended to use an external low ESR capacitor (22uF) near to the converter's input pins.

Power Derating Curve

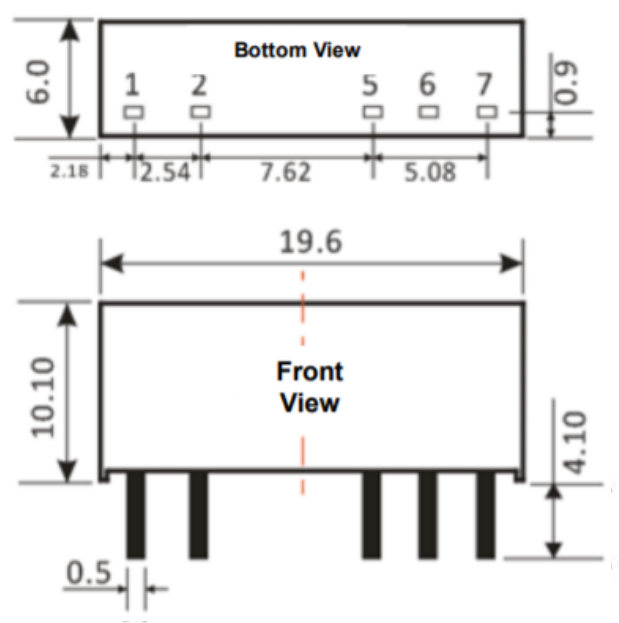


Mechanical Dimensions

F_S-1W Series



E_S-1W Series

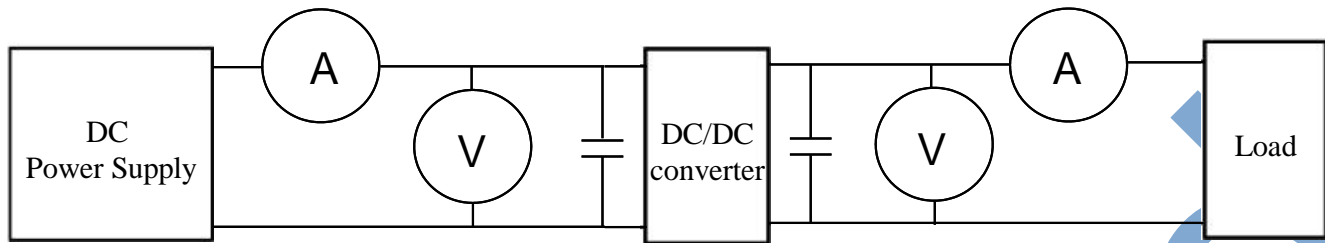


Unit: mm (inch)
 Pin section tolerances: $\pm 0.1 (\pm 0.004)$
 General tolerances: $\pm 0.5 (\pm 0.02)$

Pin Assignment		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
4	-Vout	-Vout
5	No pin	Common
6	+Vout	+Vout

Test Configurations

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.



- ◎DC Power Supply: It offers a wide voltage and current range precisely.
- ◎Current meter (A): Accuracy → 200μA ~ 200mA 4 ranges $\pm(0.2\% \text{ rdg} + 2 \text{ digits})$
2000mA ~ 20A 2 ranges $\pm(0.3\% \text{ rdg} + 2 \text{ digits})$.
- ◎Voltage meter (V): Accuracy → $\pm(0.03\% \text{ rdg} + 4 \text{ digits})$.
- ◎Load: At full load.
- ◎Wires: The resistance of the wires must be small.

1. Input voltage range: Narrow input voltage range ($\pm 10\%$)、wide input voltage range (2:1 and 4:1)。

EX: Narrow input voltage range ($\pm 10\%$)

- 5V nominal input → 4.5~5.5V
- 12V nominal input → 10.8~13.2V
- 24V nominal input → 21.6~26.4V

Wide input voltage range 2:1

- 5V nominal input → 4.5~9V
- 12V nominal input → 9~18V
- 24V nominal input → 18~36V
- 48V nominal input → 36~75V

Wide input voltage range 4:1 (W)

- 24V nominal input → 9~36V
- 48V nominal input → 18~75V

2. Input power :

$$P_{in} = V_{in} \times I_{in}$$

V_{in} : Input voltage
 I_{in} : Input current

3. Output power :

$$P_{out} = V_{out} \times I_{out}$$

V_{out} : Output voltage
 I_{out} : Output current

4. Efficiency :

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

P_{out} : Output power
 P_{in} : Input power

5. Voltage accuracy:

$$\frac{|V_{out} - V_{out(nominal)}|}{V_{out}} \times 100\%$$

V_{out} : Output voltage
 $V_{out(nominal)}$: Nominal output voltage

6. Line regulation:

Narrow input voltage range ($\pm 10\%$) and unregulated output voltage series.

$$\text{Line regulation} = \frac{\Delta V_{out}}{\Delta V_{in}}$$

$$\Delta V_{out} = \frac{V_{out(+10\%)} - V_{out(-10\%)}}{V_{out}} \times 100\%$$

$V_{out(+10\%)}$: Output voltage at $V_{in} = 1.1 \times V_{in}(\text{nominal})$ & full load

$V_{out(-10\%)}$: Output voltage at $V_{in} = 0.9 \times V_{in}(\text{nominal})$ & full load

V_{out} : Output voltage at $V_{in} = V_{in}(\text{nominal})$ & full load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in}(\text{nominal})} \times 100\%$$

$V_{in(+10\%)}$: Input voltage = $1.1 \times V_{in}(\text{nominal})$

$V_{in(-10\%)}$: Input voltage = $0.9 \times V_{in}(\text{nominal})$

$V_{in}(\text{nominal})$: Nominal Input voltage

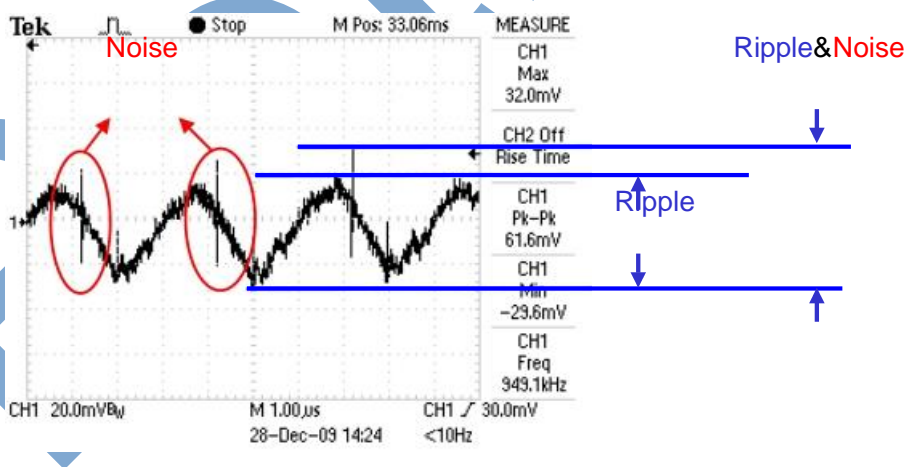
7. Load regulation :

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

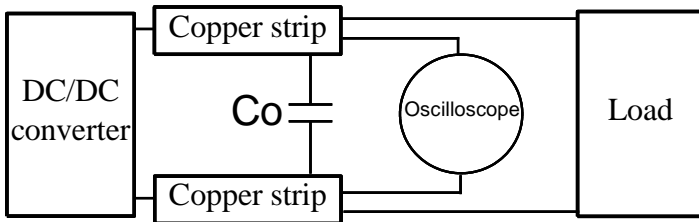
$V_{out(FL)}$: Output voltage at full load

$V_{out(NL)}$: Output voltage at 25% full load or 10% full load

8. Ripple and Noise: as shown below. The bandwidth is 0-20MHz.

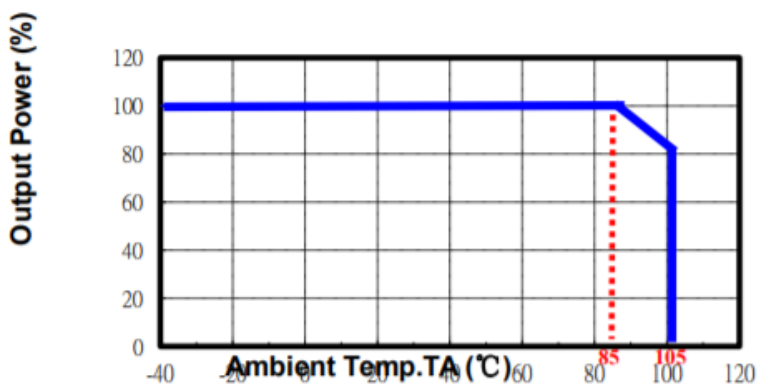


Output Ripple&Noise measurement test circuit: as shown below.



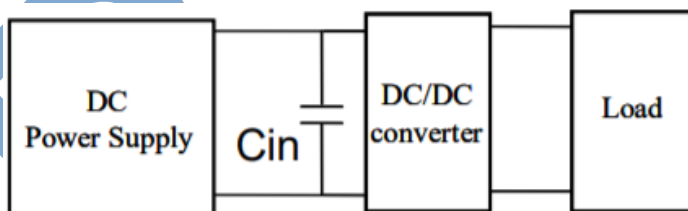
Co: usually 0.47uF.

9. **Temperature derating curve:** The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



10. **Switching frequency:** The nominal operating frequency of the DC-DC converters.
11. **Input to output isolation:** The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.
12. **Input source impedance:** The power module should be connected to low ac-impedance input source.

Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR <math>< 0.1 \Omega</math> at 100KHz) capacitor of a 22uF for the power module.



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