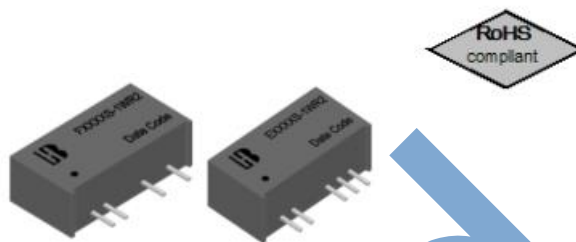


## Features

- 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) <sup>(1)</sup>		Input Current (mA) Typ.		Eff. (%) <sup>(2)</sup> Typ.	Capacitive Load, max. <sup>(3)</sup> (uF)	
			Full Load	No Load	No Load	Full Load			
F0303S-1WR2	2.97-3.63 Nominal:3.3	3.3	300	35	405	74	68		
F0305S-1WR2		5	200		404	75	47		
E0303S-1WR2		±3.3	±150		405	74	33/33		
E0305S-1WR2		±5	±100		404	75	22/22		
F0503S-1WR2	4.5-5.5 Nominal:5	3.3	300	28	264	75	68		
F0505S-1WR2		5	200		260	77	47		
F0509S-1WR2		9	110		248	80	33		
F0512S-1WR2		12	83		247	81	22		
F0515S-1WR2		15	67		247	81	22		
F0524S-1WR2		24	42		247	81	10		
E0503S-1WR2		±3.3	±150		264	75	33/33		
E0505S-1WR2		±5	±100		260	77	22/22		
E0509S-1WR2		±9	±55		248	80	10/10		
E0512S-1WR2		±12	±42		247	81	10/10		
E0515S-1WR2		±15	±33		247	81	10/10		
E0524S-1WR2		±24	±21		247	81	4.7/4.7		
F0905S-1WR2		8.1-9.9 Nominal:9	5		200	19	137	81	47
F1203S-1WR2		10.8-13.2 Nominal:12	3.3		300	17	109	76	68
F1205S-1WR2	5		200	107	78		47		
F1209S-1WR2	9		110	107	78		33		
F1212S-1WR2	12		83	104	80		22		
F1215S-1WR2	15		67	104	80		22		
F1224S-1WR2	24		42	104	80		10		
E1203S-1WR2	±3.3		±150	109	76		33/33		
E1205S-1WR2	±5		±100	107	78		22/22		
E1209S-1WR2	±9		±55	107	78		10/10		
E1212S-1WR2	±12		±42	104	80		10/10		

Model Number	Input Voltage Range(V)	Output Voltage (V)	Output Current (mA) <sup>(1)</sup>	Input Current (mA) Typ.		Eff. (%) <sup>(2)</sup> Typ.	Capacitive Load, max. <sup>(3)</sup> (uF)			
				Full Load	No Load			Full Load		
E1215S-1WR2	10.8-13.2 Nominal:12	±15	±33	17		104	80	10/10		
F1503S-1WR2	13.5-16.5 Nominal:15	3.3	300	15		87	76	68		
F1505S-1WR2		5	200		85	78	47			
F1509S-1WR2		9	110		85	78	33			
F1512S-1WR2		12	83		83	80	22			
F1515S-1WR2		15	67		83	80	22			
F1524S-1WR2		24	42		83	80	10			
E1503S-1WR2		±3.3	±150		87	76	33/33			
E1505S-1WR2		±5	±100		85	78	22/22			
E1509S-1WR2		±9	±55		85	78	10/10			
E1512S-1WR2		±12	±42		83	80	10/10			
E1515S-1WR2		±15	±33		83	80	10/10			
F2403S-1WR2		21.6-26.4 Nominal:24	3.3		300	8		54	77	68
F2405S-1WR2			5		200		53	79	47	
F2409S-1WR2			9		110		52	80	33	
F2412S-1WR2	12		83	51	81		22			
F2415S-1WR2	15		67	51	81		22			
F2424S-1WR2	24		42	51	81		10			
E2403S-1WR2	±3.3		±150	54	77		33/33			
E2405S-1WR2	±5		±100	53	79		22/22			
E2409S-1WR2	±9		±55	52	80		10/10			
E2412S-1WR2	±12		±42	51	81		10/10			
E2415S-1WR2	±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

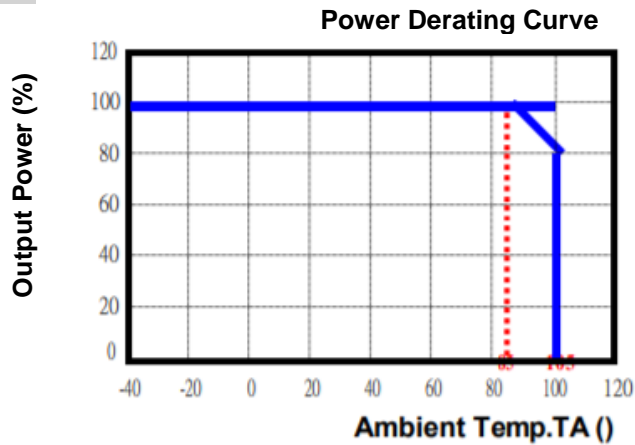
Operating ambient temperature	-40°C to +105°C
Maximum case temperature	+125°C
Storage temperature range	-55°C to +125°C
Relative humidity	95% RH max.

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
Output short circuit protection	F03xxS-1WR2/F24xxS-1WR2	3S Max.
	E03xxS-1WR2/E24xxS-1WR2	
	Other models	Continuous, Automatic recovery
Temperature coefficient		±0.03%/°C Typ.
General Specifications		
Efficiency	Nominal input and full load	See table
Isolation voltage	Input to output	3000VDC (60 second)
Isolation resistance	500VDC	1000MΩ min.
Isolation capacitance		30pF typ.
Switching frequency		150kHz typ.
		300kHz max.
Reliability, calculated MTBF		2×10 <sup>6</sup> 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

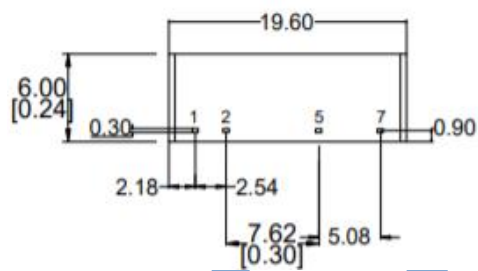
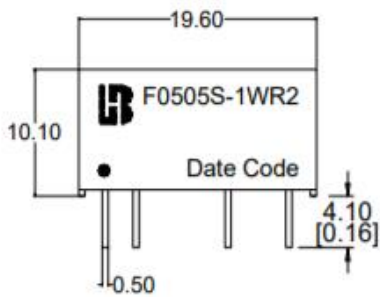
1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.
4. Specifications subject to change without notice.
5. This series of products do not support CC mode, CR mode is 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

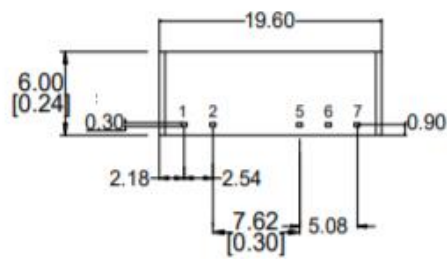
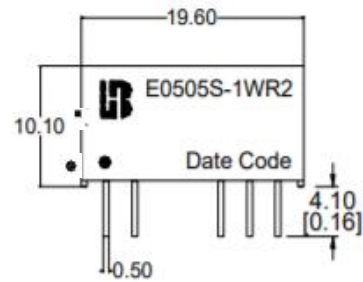


### Mechanical Dimensions

#### F\_S-1WR2 Series



#### E\_S-1WR2 Series



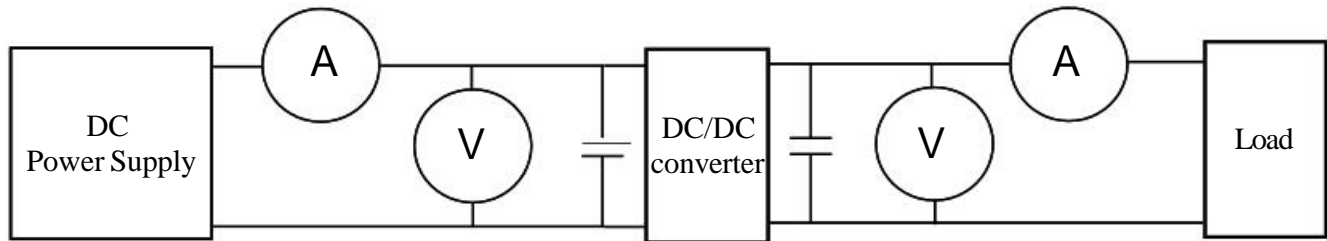
Unit: mm (inch)  
 Pin section tolerances:  $\pm 0.1 (\pm 0.004)$  General  
 tolerances:  $\pm 0.5 (\pm 0.02)$

#### Pin Assignment

Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
5	-Vout	-Vout
6	No pin	Common
7	+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 ±(0.2% rdg + 2 digits)  
2000mA ~ 20A 2 ranges ±(0.3% rdg + 2 digits).
- ◎Voltage meter (V): Accuracy → ±(0.03% rdg + 4 digits).
- ◎Load: At full load.
- ◎Wires: The resistance of the wires must be small.

1. **Input voltage range:** Narrow input voltage range (±10%)、wide input voltage range (2:1 and 4:1)。

EX: Narrow input voltage range (±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

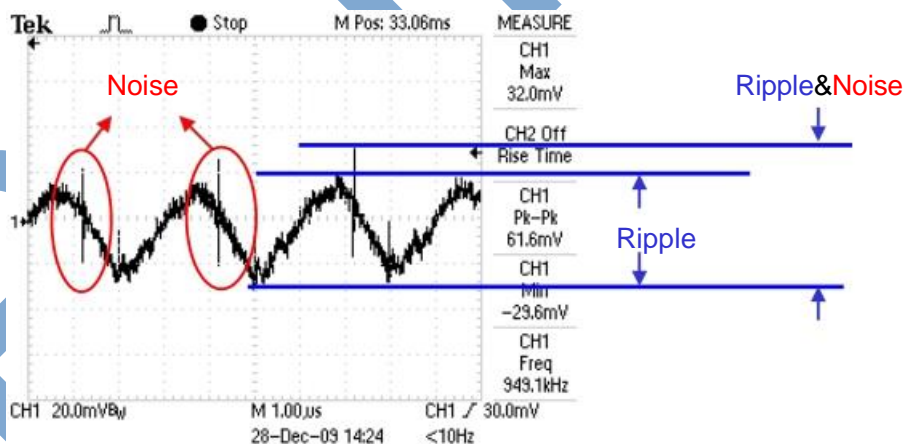
### 7. Load regulation :

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

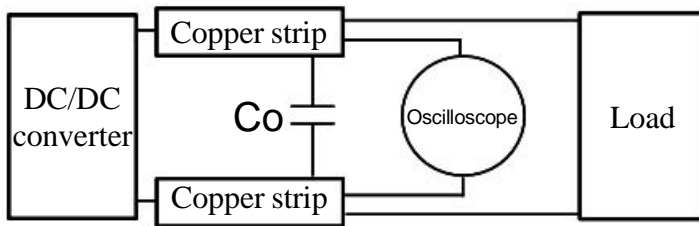
$V_{out(FL)}$ : Output voltage at full load

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

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

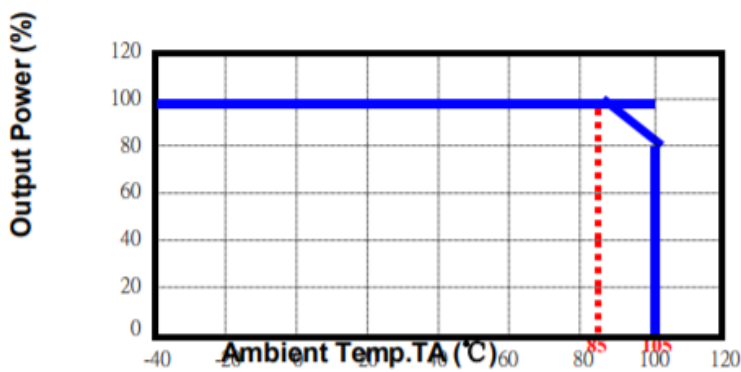


Output Ripple&Noise measurement test circuit: as shown below.



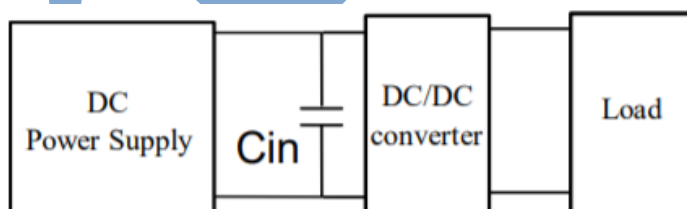
Co: usually 0.47uF.

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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