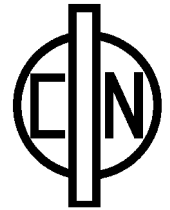


# 2W SMD DC-DC Converter P2ES-Series



PHI-CON

- Up to 1500 V<sub>DC</sub> isolation
- MTBF > 3.5 Mio. h at 25 °C
- -40...105 °C Operating temperature range
- Continuous short circuit protection
- Efficiency up to 86 %



## Model guide

Type	Input voltage range [V <sub>DC</sub> ]	Output voltage [V <sub>DC</sub> ]	Input current		Output current		Output voltage drift @ load 10~100% [%]	Reflected input ripple current (see Fig.1) typ. [mA]	Efficiency typ. [%]	Capacitive load max. [µF]
			no-load typ. [mA]	full-load typ. [mA]	min. [mA]	max. [mA]				
P2ES053R3S	4.5..5.5	3.3	30	500	40	400	10	15	72	220
P2ES0505S	4.5..5.5	5.0	30	500	40	400	10	15	79	220
P2ES0509S	4.5..5.5	9.0	30	500	22	222	10	15	82	220
P2ES0512S	4.5..5.5	12.0	30	500	17	167	10	15	82	220
P2ES0515S	4.5..5.5	15.0	30	500	13	133	10	15	83	220
P2ES1205S	10.8..13.2	5.0	25	210	40	400	10	15	79	220
P2ES1209S	10.8..13.2	9.0	25	210	22	222	10	15	82	220
P2ES1212S	10.8..13.2	12.0	25	210	17	167	10	15	82	220
P2ES1215S	10.8..13.2	15.0	25	210	13	133	10	15	83	220
P2ES1224S	10.8..13.2	24.0	25	210	8	83	10	15	84	220
P2ES1515S	13.5..16.5	15.0	18	170	13	133	10	15	83	220
P2ES2405S	21.6..26.4	5.0	15	105	40	400	10	15	79	220
P2ES2412S	21.6..26.4	12.0	15	105	17	167	10	15	82	220
P2ES2415S	21.6..26.4	15.0	15	105	13	133	10	15	83	220
P2ES2424S	21.6..26.4	24.0	15	105	8	83	10	15	86	220

Part designation structure												
PHI-CON & output power		Series designation	Mounting technology		Input voltage		Output voltage		Output configuration		Packing	
P2	2 W	E	S	SMD	05	5 V	3R3	3.3V	S	Single	blank	Tube
					12	12 V	05	5 V			TR	Reel
					15	15 V	09	9 V				
					24	24 V	12	12 V				
							15	15 V				
							24	24 V				

## Specifications

Input	
Voltage range	± 10 %
Filter	Capacitor
Input / output:	
Isolation voltage tested for 60 sec. @ leakage current < 1mA	1.5 kV <sub>DC</sub>
Isolation Resistance @ 500 V <sub>DC</sub>	10 <sup>9</sup> Ω, min.
Capacitance	20 pF, typ. @
Output	
Output voltage drift @ input voltage change	Only P2ESxx3R3S ± 1.5 % @ 1% V <sub>in</sub> change All others ± 1.2 % @ 1% V <sub>in</sub> change
Output voltage tolerance at 70 % load	± 5 % max. See diagram below
Output voltage drift @ 10 % to 100 % load change	See diagram below
Temperature coefficient	0.03 % / °C, max., at full load
Short circuit protection	Continuous, automatic recovery P1ES24xxS only <1 sec.
Ripple & noise (BW 20 MHz)	30 mV @ Vout 5, 9, 12 V Types 60 mV @ Vout 12 & 24 V Types
General	
Switching frequency	~ 100 kHz... 300 kHz

Environmental	
EMI conducted emission, with external filter circuit Fig. 2	CISPR22 / EN55022 CLASS B
EMI radiated emission, with external filter circuit Fig. 2	CISPR22 / EN55022 CLASS B
EMS, ESD	IEC-, EN61000-4-2, contact ± 6 kV perf. criteria B
Operating temperature (ambient)	-40 °C to +105 °C with derating
Storage temperature	-55 °C to +125 °C
Case temperature rise at full load	25 °C, typ.
Derating	See derating curve
Storage humidity	Up to 95 %, non-condensing
Cooling	Free air convection
Physical	
Package material	Epoxy resin (UL94-V0)
Weight	1.52 g
Reliability, MTBF (MIL-HDBK-217 @ 25 °C)	3.5 Mio. hours
Absolute maximum ratings	
P2ES05xxS	-0.7 ~ 9 V <sub>DC</sub> , max. 1 s
P2ES12xxS	-0.7 ~ 18 V <sub>DC</sub> , max. 1 s
P2ES15xxS	-0.7 ~ 21 V <sub>DC</sub> , max. 1 s
P2ES24xxS	-0.7 ~ 30 V <sub>DC</sub> , max. 1 s
Manual soldering lead temperature	300 °C max. 10 s max., 1.5 mm distance from body
Soldering temperature	217 °C for 60 s max., 245 °C peak
Moisture sensitivity level (MSL)	IPC/JEDEC J-STD-020D.1

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Fig. 1 Input reflected ripple current measure circuit

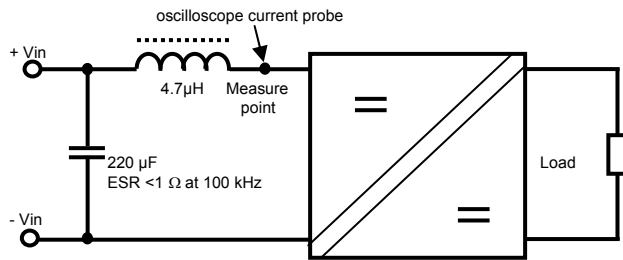
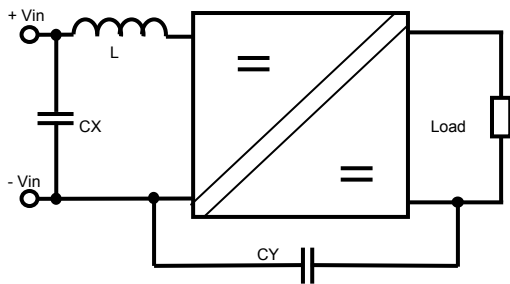


Fig. 2 EMI recommended external circuit



External components to meet IEC/EN55022, CLASS A to Fig. 2			
Model series	CX	CY	L
P2ES05xxS	4.7 µF, 50 V	not assembled	6.8 µH
P2ES12xxS	2.2 µF, 50 V	not assembled	6.8 µH
P2ES15xxS	2.2 µF, 50 V	470 pF, 2 kV	6.8 µH
P2ES24xxS	1 µF, 50 V	470 pF, 2 kV	6.8 µH

Fig. 3 Typical application for ripple & noise reduction

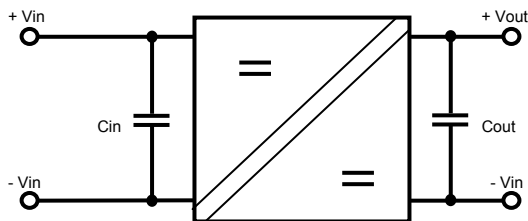


Table A External capacitor table for Figure 3			
Vin version	Cin	Vout version	Cout
P2ES05xxS	4.7 µF	P2ESxx05S	10 µF
P2ES12xxS	2.2 µF	P2ESxx09S	4.7 µF
P2ES15xxS	2.2 µF	P2ESxx12S	2.2 µF
P2ES24xxS	1 µF	P2ESxx15S	1 µF
		P2ESxx24S	0.47 µF

### Recommended circuit

If you want to further decrease the input/output ripple, a capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 3).

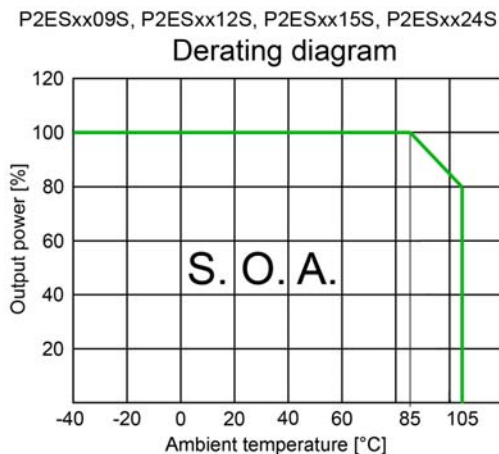
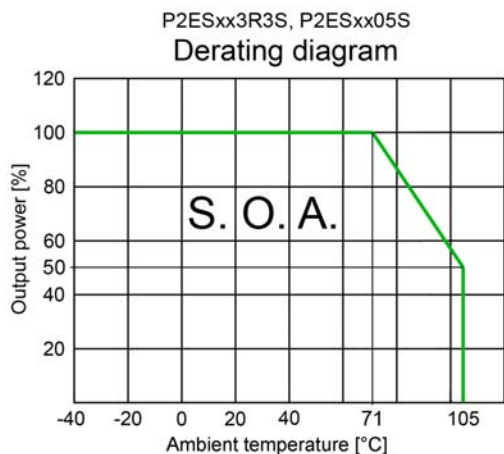
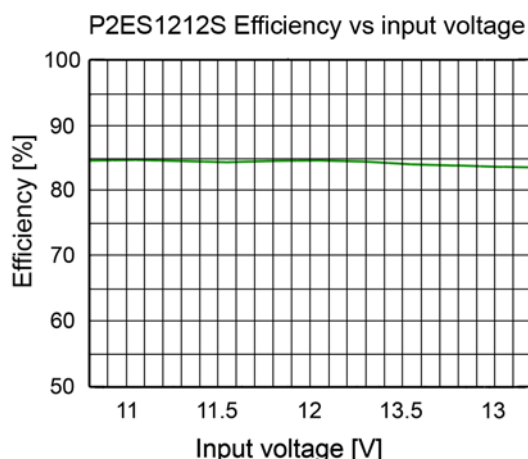
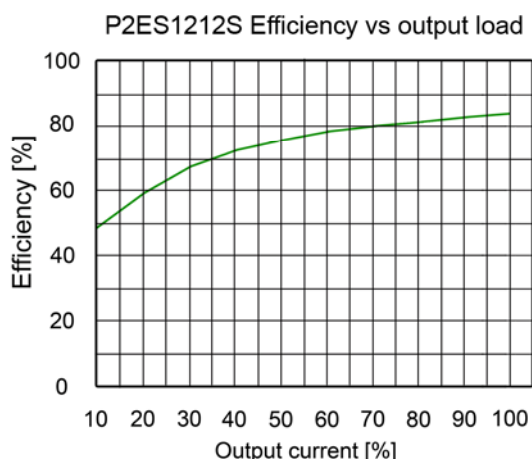
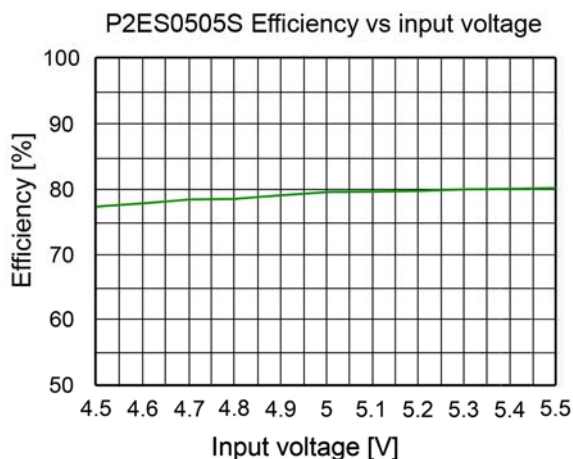
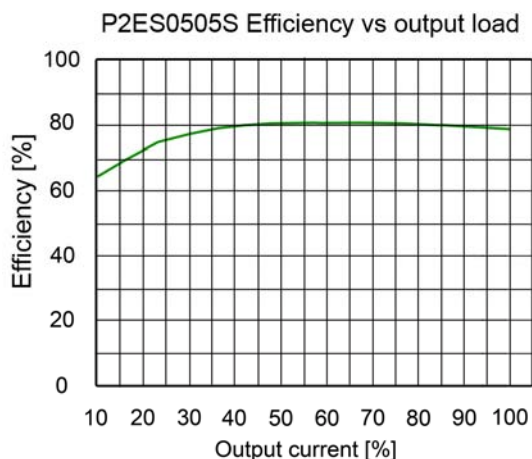
It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a start up problem might arise. To ensure safe and reliable operation, the capacitance of the output filter for each output channel may not exceed certain values (see table page 1).

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

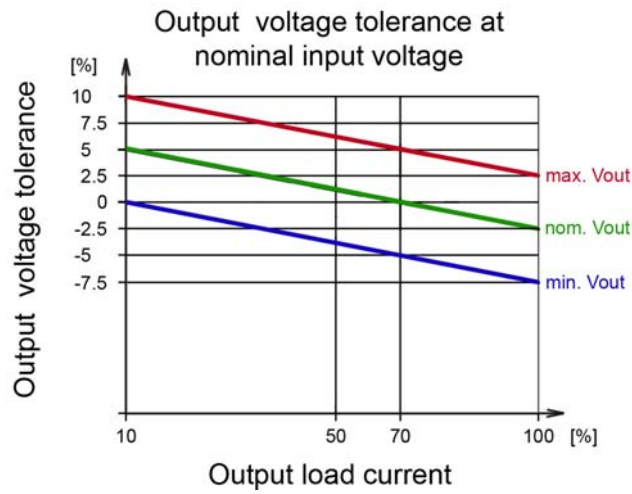
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Note:

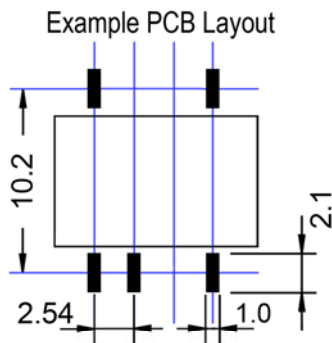
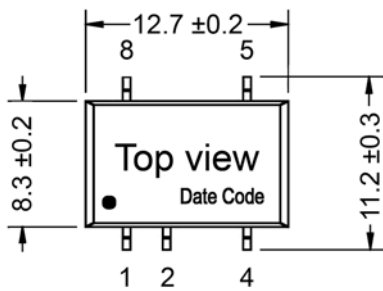
1. Operation under minimum load will not damage the converter. However, they may not meet all specifications.
2. Maximum capacitive load is tested at nominal input voltage and full load.
3. Unless otherwise noted, all specifications are measured at Ta 25 °C, humidity <75 %, nominal input voltage and rated output load.
4. Specifications of this product are subject to changes without prior notice.
5. P2ES series is not usable for IGBT driver applications.



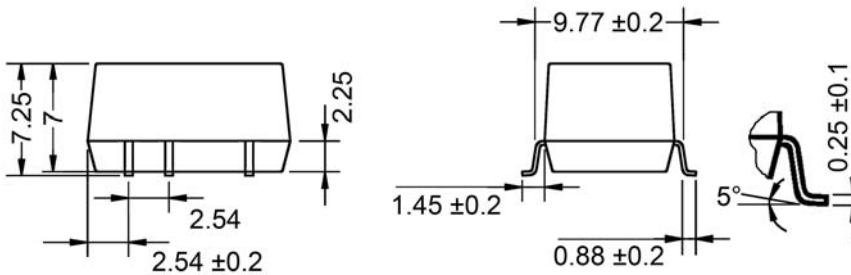
# 2W SMD DC-DC Converter P2ES-Series



## Dimensions Footprint



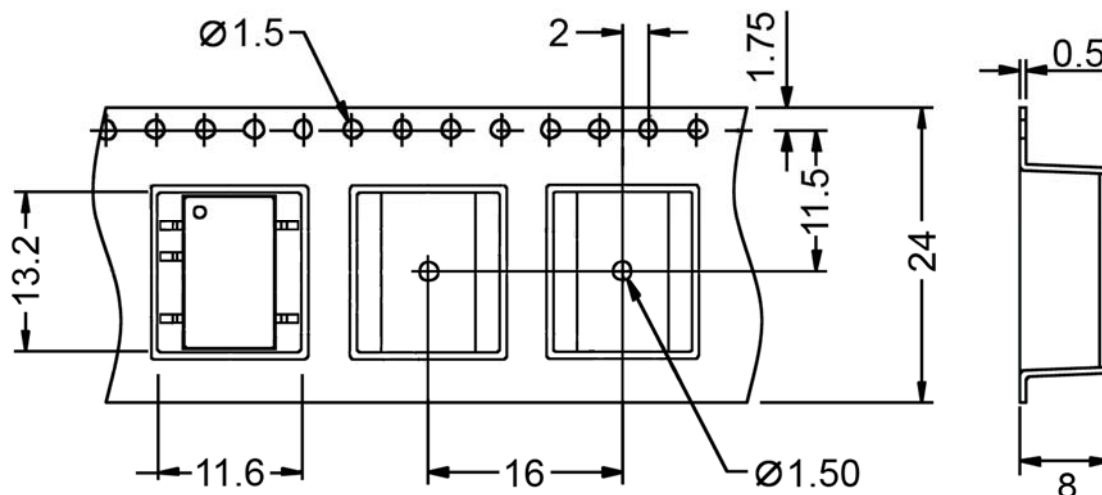
Notes:  
 All dimensions are in mm  
 General tolerances  $\pm 0.25$  mm  
 Pin tolerances  $\pm 0.1$  mm



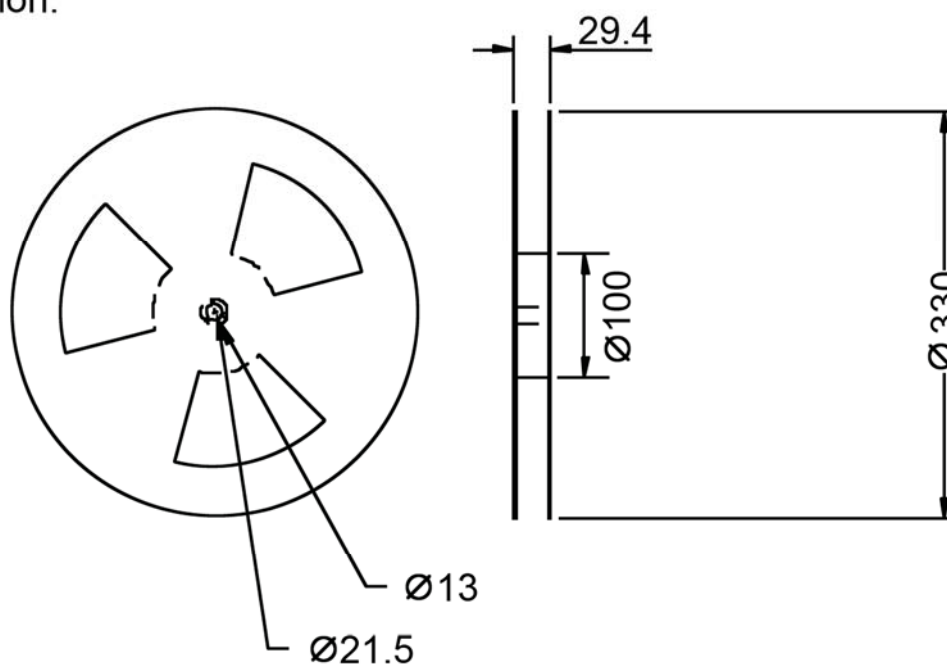
Lead	Lead connection
1	- Vininput
2	+ Vininput
3	No lead
4	- Voutput
5	+ Voutput
6	No lead
7	No lead
8	Not connected

# 2W SMD DC-DC Converter P2ES-Series

Tape dimension:



Reel dimension:



Note:

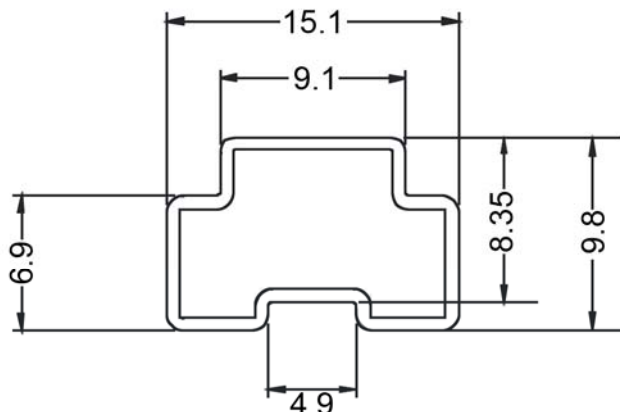
Unit: mm

General tolerances: 0.5 mm

Quantity per reel: 500 pieces

## 2W SMD DC-DC Converter P2ES-Series

Tube dimensions:



Note:

Unit: mm

General tolerances:  $\pm 0.5$  mm

Short tube 220 mm, quantity 15 pieces,  
 Inner packing box dimensions L 255 mm, W 170 mm, H 80 mm.  
 Outer packing box contain six inner boxes,  
 dimensions: L 375 mm, W 280 mm, H 270 mm.

Long tube 530 mm, quantity 40 pieces,  
 Inner packing box dimensions L 580 mm, W 200 mm, H 100 mm.  
 Outer packing box with two inner packing boxes,  
 dimensions: L 600 mm, W 215 mm, H 220 mm.  
 Outer packing box with three inner packing boxes,  
 dimensions: L 600 mm, W 215 mm, H 325 mm.

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