



PHI-CON

1 W SMD DC-DC Converter P1LS_CD-Series

- Dual output
- Efficiency up to 85 %
- Up to 3000 V_{DC} isolation
- MTBF > 3.5 Mio. h at 25 °C
- -40...105 °C operating temperature range
- Continuous short circuit protection



Model guide

Type	Input voltage		Input current		Output voltage [V _{DC}]	Output current		Efficiency [%] typ.	Capacitive load (See note 2) [μF] max.
	nominal [V _{DC}]	range [V _{DC}]	No load [mA] typ.	Full load [mA] max.		[mA] min.	[mA] max.		
P1LS0505CD	5.0	4.5..5.5	5	257	±5.0	±10	±100	82	2 x 1200
P1LS0509CD	5.0	4.5..5.5	12	254	±9.0	±6	±56	83	2 x 470
P1LS0512CD	5.0	4.5..5.5	12	254	±12.0	±5	±42	83	2 x 220
P1LS0515CD	5.0	4.5..5.5	18	254	±15.0	±4	±34	83	2 x 220
P1LS0524CD	5.0	4.5..5.5	18	254	±24.0	±3	±21	85	2 x 100
P1LS1205CD	12.0	10.8..13.2	8	107	±5.0	±10	±100	82	2 x 1200
P1LS1209CD	12.0	10.8..13.2	8	106	±9.0	±6	±56	83	2 x 470
P1LS1212CD	12.0	10.8..13.2	8	106	±12.0	±5	±42	83	2 x 220
P1LS1215CD	12.0	10.8..13.2	8	106	±15.0	±4	±34	83	2 x 220
P1LS1224CD	12.0	10.8..13.2	8	103	±24.0	±3	±21	85	2 x 100
P1LS1515CD	15.0	13.5..16.5	8	85	±15.0	±4	±34	83	2 x 220
P1LS2405CD	24	21.4..26.4	8	55	±5.0	±10	±100	82	2 x 1200
P1LS2409CD	24	21.4..26.4	8	55	±9.0	±6	±56	83	2 x 470
P1LS2412CD	24	21.4..26.4	8	55	±12.0	±5	±42	83	2 x 220
P1LS2415CD	24	21.4..26.4	8	55	±15.0	±4	±34	83	2 x 220
P1LS2424CD	24	21.4..26.4	8	53	±24.0	±3	±21	85	2 x 100

Specifications

Input	
Voltage range	± 10 %
Filter	Capacitors
Reflected input ripple current	15 mA, typ. (see Figure 1)
Input / output:	
DC-Isolation voltage tested for 60 s @ leakage < 1 mA	≥ 3 kV _{DC}
Isolation Resistance @ 500 V _{DC}	≥ 10 ⁹ Ω
Capacitance @ 100 kHz, 0.1 V	20 pF, typ.
Output	
Ripple and noise (BW 20 MHz), (see Figure 2)	P1LS0524CD ≤ 100 mVp-p All others ≤ 75 mVp-p
Output voltage drift	± 1.2 % @ 1 % V _{in} change
Output voltage deviation @ 10~100 % load change	P1LS0505CD ≤ 15 %
	P1LS0509CD ≤ 10 %
	P1LS0512CD ≤ 10 %
	P1LS0515CD ≤ 10 %
	P1LS0524CD ≤ 10 %
Temperature coefficient	0.02 % / °C, max., at full load
Short circuit protection	Continuous, hiccup, auto restart
General	
Switching frequency	270 kHz, typ.
Safety	EN-, IEC-, UL 62368-1
Moisture sensitivity level IPC/JEDEC J-STD-020D.1	MSL 1

Environmental			
RE	EN 55032, CISPR 32	Class B (see Figure 4)	
CE	EN 55032, CISPR 32	Class B (see Figure 4)	
ESD	EN-, IEC 61000-4-2	All models	Air ±8 kV perf.criteria B
		P1LS05xxCD	Contact ±4 kV perf.criteria B
		All others	Contact ±6 kV perf.criteria B
Operating ambient temperature	-40...105 °C, see derating diagram		
Storage temperature	-55 ... 125 °C		
Case temperature	95 °C, max.		
Case temperature rise at full load	25 °C		
Storage humidity	Up to 95 %, Non condensing		
Cooling	Free air convection, > 35 LFM		
Physical			
Package material	Heat resistant plastic, UL94V-0		
Mechanical Dimensions	11.4 x 15.24 x 7.25 mm		
Weight	1.4 g, typ.		
Reliability, MTBF (MIL-HDBK-217 @ 25 °C)	3.5 Mio. h		
Lead soldering temperature IPC/JEDEC J-STD-020D.1	≤ 217 °C duration ≤ 60 s, ≤ 245 °C peak duration ≤ 10 s		
Absolute maximum ratings			
Input voltage	P1LS05xxCD	-0.7 ~ 9 V _{DC} , max., duration ≤ 1 s	
	P1LS12xxCD	-0.7 ~ 18 V _{DC} , max., duration ≤ 1 s	
	P1LS15xxCD	-0.7 ~ 21 V _{DC} , max., duration ≤ 1 s	
	P1LS24xxCD	-0.7 ~ 30 V _{DC} , max., duration ≤ 1 s	

Part ordering information													
Output power	Series designation	Mounting technology	Input voltage		Output voltage		Revision	Output configuration		Packing			
P1	1 W	L	S	SMD	05	5 V	05	±5 V	C	D	Dual	Blank	Tube
					12	12 V	09	±9 V				TR	Reel
					15	15 V	12	±12 V					
					24	24 V	15	±15 V					
							24	±24 V					
Example: P1LS0512CD		PHI-CON, Pout: 1 W, SMD, Vin: 5 V, Vout: ± 12 V, Revision: C, ± Dual output, Tube packing											

Note:

1. Operation under minimum load will not damage the converter. However, they may not meet all specifications.
2. Max. 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. It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot swappable.
6. To ensure this module operate efficiently and reliably, the minimum output load could not be less than 10 % of the full load.
7. If the output load current is very small, please connect a resistor or a z-diode parallel to the output to increase the load current.

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Figure 1 Measure circuit for reflected input ripple current

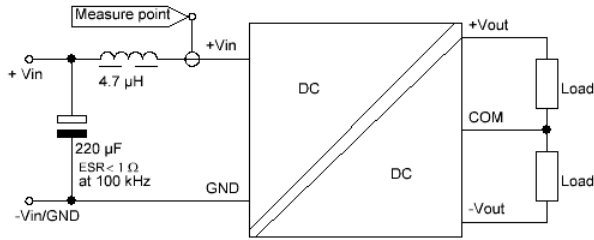


Figure 2 Measure circuit for output ripple & noise, BW 20MHz

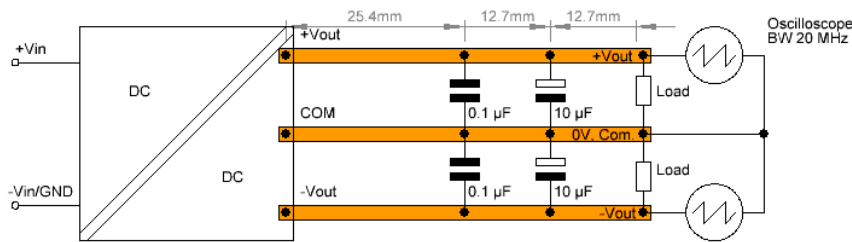
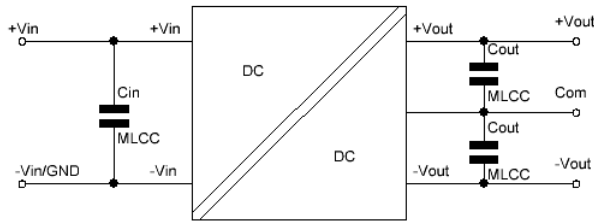
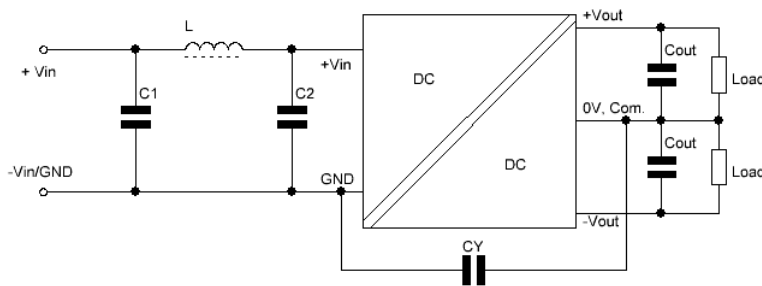


Figure 3 Typical circuit to decrease input & output ripple



Vin Type	Cin		Vout type	Cout	
	[µF]	[V]		[µF]	[V]
P1LS05xxCD	4.7	25	P1LSxx05CD	4.7	16
P1LS12xxCD	2.2	25	P1LSxx09CD	1	16
P1LS15xxCD	2.2	25	P1LSxx12CD	1	25
P1LS24xxCD	1	50	P1LSxx15CD	0.47	25
			P1LSxx24CD	0.47	50

Figure 4 Test circuit to meet EMC EN 55032 Class B



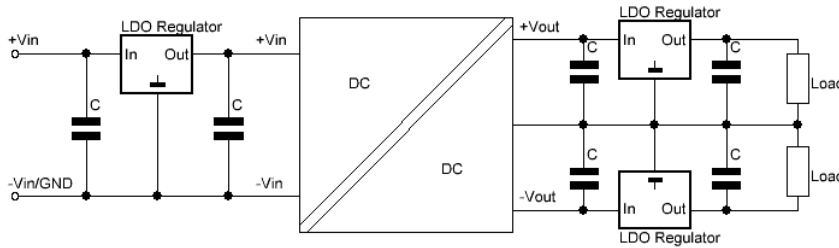
Type	L [µH]	C1, C2		CY		Cout [µF]
		[µF]	[V]	[pF]	[kV]	
P1LS0505CD, P1LS0509CD	6.8	4.7	25	-	-	See Table A
P1LS0512CD, P1LS0515CD, P1LS0524CD	6.8	2.2	25	1000	4 kV	
P1LS12xxCD, P1LS15xxCD	6.8	2.2	25	270	4 kV	
P1LS24xxCD	6.8	1	50	270	4 kV	



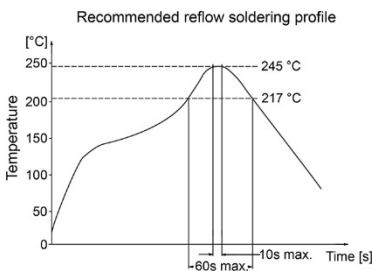
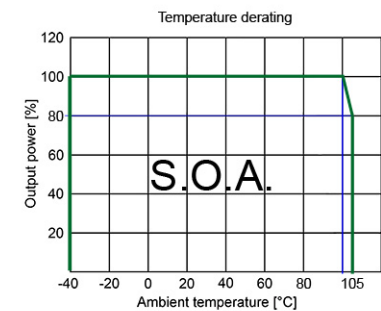
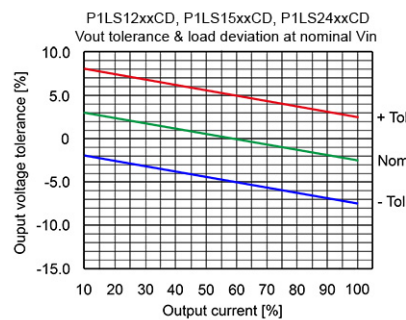
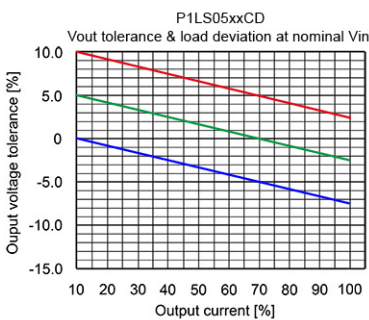
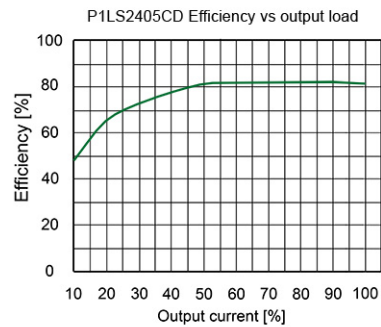
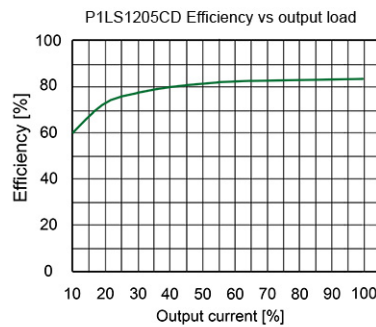
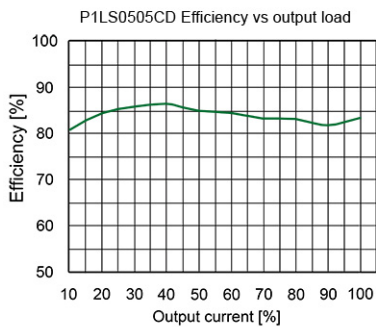
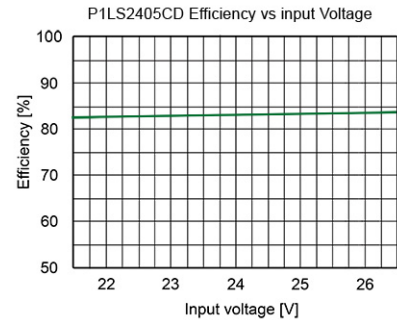
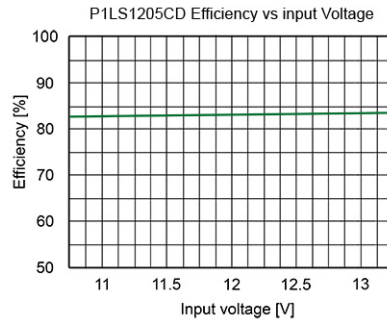
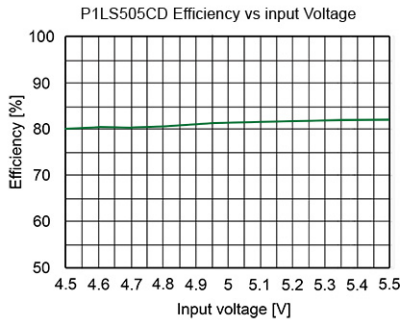
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Application circuit for input protection and output regulation



The simplest method for output voltage regulation, over voltage protection, over current protection and filtering are over temperature protected linear voltage regulator.



This curve applies only to hot air reflow soldering.

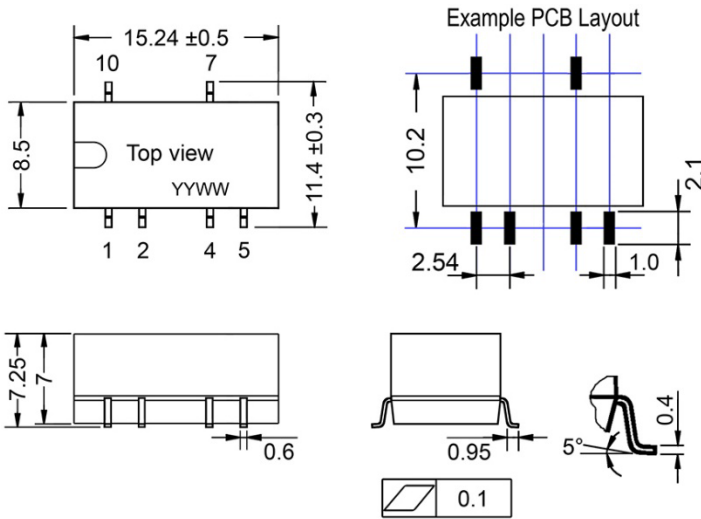




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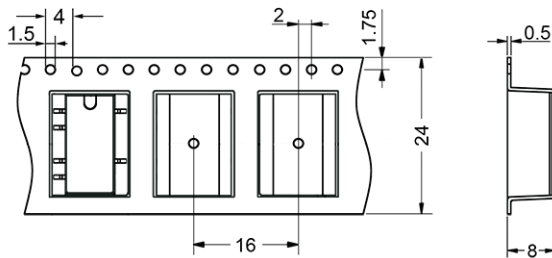
Mechanical dimensions



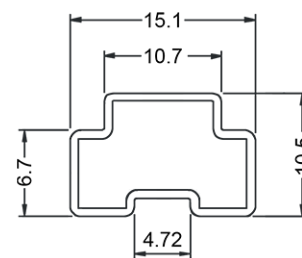
Lead assignment	
Lead	Function
1	- Vinput / GND
2	+ Vinput
3	No Pin
4	Common output / 0V
5	- Voutput
6	No Pin
7	+ Voutput
8	No Pin
9	No Pin
10	Not connected

Note:
 Dimensions in mm
 Pin section tolerances: ± 0.1 mm
 General tolerances: ± 0.25 mm

Tape dimensions:

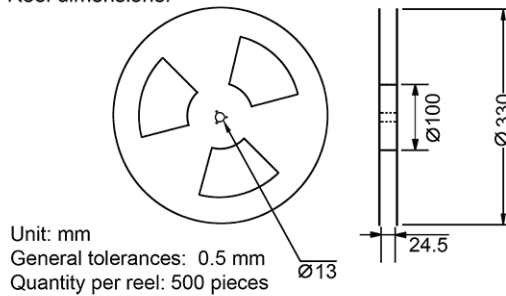


Tube dimensions:



Unit: mm
 General tolerances: ± 0.5 mm
 Quantity per reel: 33 pieces

Reel dimensions:



Unit: mm
 General tolerances: 0.5 mm
 Quantity per reel: 500 pieces

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