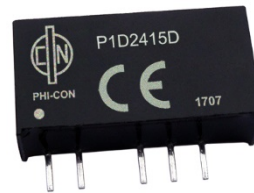




PHI-CON

1 W DC-DC Converter P1D-Series

- 7 Pin SIL
- Low ripple and noise
- 1000 V_{DC} optional 3000 V_{DC} isolation
- -40...85 °C Operating temperature range
- Output voltage semi regulated



Model guide

Type	Input voltage		Input current		Output voltage [V _{DC}]	Output current [mA] max.	Regulation at Δ Load 10..100% [%] typ.	Efficiency typ. [%] typ.	Capacitive load (note 1) [μF] max.
	nominal [V _{DC}]	range [V _{DC}]	no load [mA]	full load [mA] typ.					
Single output									
P1D0505S	5	4.5..5.5	20	250	5.0	200	6	83	220
P1D0509S	5	4.5..5.5	20	230	9.0	111	5.5	86	220
P1D0512S	5	4.5..5.5	20	230	12.0	84	5.5	87	100
P1D0515S	5	4.5..5.5	20	230	15.0	67	5	87	100
P1D1205S	12	10.8..13.2	15	100	5.0	200	4	84	220
P1D1209S	12	10.8..13.2	15	95	9.0	111	3.5	86	220
P1D1212S	12	10.8..13.2	15	95	12.0	84	3.5	88	100
P1D1215S	12	10.8..13.2	15	95	15.0	67	3	88	100
P1D1505S	15	13.5..16.5	10	80	5.0	200	4	84	220
P1D1509S	15	13.5..16.5	10	75	9.0	111	3.5	86	220
P1D1512S	15	13.5..16.5	10	75	12.0	84	3.5	87	100
P1D1515S	15	13.5..16.5	10	75	15.0	67	3	89	100
P1D2405S	24	21.6..26.4	7	50	5.0	200	4	81	220
P1D2409S	24	21.6..26.4	7	50	9.0	111	3.5	84	220
P1D2412S	24	21.6..26.4	7	50	12.0	84	3.5	85	100
P1D2415S	24	21.6..26.4	7	50	15.0	67	2.5	86	100
P1D4805S	48	43.2..52.8	5	25	5.0	200	4	78	220
P1D4809S	48	43.2..52.8	5	25	9.0	111	3.5	80	220
P1D4812S	48	43.2..52.8	5	25	12.0	84	3	81	100
P1D4815S	48	43.2..52.8	5	25	15.0	67	3	81	100
Dual output									
P1D0505D	5	4.5..5.5	20	270	±5.0	±100	6	84	2 x 100
P1D0509D	5	4.5..5.5	20	245	±9.0	±56	5.5	86	2 x 100
P1D0512D	5	4.5..5.5	20	250	±12.0	±42	5.5	87	2 x 47
P1D0515D	5	4.5..5.5	20	245	±15.0	±33	5	87	2 x 47
P1D1205D	12	10.8..13.2	15	100	±5.0	±100	4	85	2 x 100
P1D1209D	12	10.8..13.2	15	95	±9.0	±56	3.5	86	2 x 100
P1D1212D	12	10.8..13.2	15	95	±12.0	±42	3.5	87	2 x 47
P1D1215D	12	10.8..13.2	15	95	±15.0	±33	3.5	87	2 x 47
P1D1505D	15	13.5..16.5	10	80	±5.0	±100	3.5	85	2 x 100
P1D1509D	15	13.5..16.5	10	75	±9.0	±56	2.5	87	2 x 100
P1D1512D	15	13.5..16.5	10	75	±12.0	±42	2.5	87	2 x 47
P1D1515D	15	13.5..16.5	10	75	±15.0	±33	2.5	88	2 x 47
P1D2405D	24	21.6..26.4	7	50	±5.0	±100	3.5	82	2 x 100
P1D2409D	24	21.6..26.4	7	50	±9.0	±56	2.5	85	2 x 100
P1D2412D	24	21.6..26.4	7	48	±12.0	±42	2.5	87	2 x 47
P1D2415D	24	21.6..26.4	7	48	±15.0	±33	2.5	87	2 x 47
P1D4805D	48	43.2..52.8	5	27	±5.0	±100	3	77	2 x 100
P1D4809D	48	43.2..52.8	5	26	±9.0	±56	3	81	2 x 100
P1D4812D	48	43.2..52.8	5	26	±12.0	±42	3	82	2 x 47
P1D4815D	48	43.2..52.8	5	26	±15.0	±33	2	81	2 x 47

Part number ordering information										
Output power		Series	Input voltage		Output voltage		Output		Isolation	
P1	1 W	D	05		05		D		H	
P1	1 W	D	05	4.5..5.5 V	05	5 V	S	single	blanc	1 kV _{DC}
			12	10.8..13.2 V	09	9 V	D	dual	H	3 kV _{DC}
			15	13.5..16.5 V	12	12 V				
			24	22.6..26.4 V	15	15 V				
			48	43.2..52.8 V	24	24 V				

Notes:

1. Maximum capacitive load specified at minimal input voltage and constant resistive load.
2. Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.
3. Operation under no load conditions will not damage converter, however they may not meet all listed specifications.
4. All converters are to be used about an external fuse. See figure 3.
5. Specifications at 25 °C, nominal input voltage and full load unless otherwise specified.
6. Not usable for IGBT and MOSFET driver applications.



PHI-CON

1 W DC-DC Converter P1D-Series

Specifications

Input	
Voltage range	± 10%
Filter	Capacitors
Reflected input ripple current	P1D05xxx: 20 mA _{p-p} , typ. P1D12xxx: 20 mA _{p-p} , typ. P1D15xxx: 30 mA _{p-p} , typ. P1D24xxx: 40 mA _{p-p} , typ. P1D48xxx: 50 mA _{p-p} , typ. (see Figure 1)
I/O-Isolation:	
Isolation voltage input/output (60 s)	≥ 1 kV _{DC} ≥ 3 kV _{DC} (suffix "H")
Resistance	≥ 10 ⁹ Ω
Capacitance	60 pF, typ.
Output	
Voltage tolerance	± 3 %
Ripple and noise (20 MHz BW)	50 mV _{p-p} , typ. (see Figure 2)
Short circuit protection	None
Line voltage deviation @ 1% Vin change	± 1.2 %
Temperature drift	± 0.02 %/°C
EMC	
RE	EN 55032 Class B
CE	EN 55032 Class B (see Figure 3)
ESD	EN-, IEC 61000-4-2 Perf. crit. A
RS	EN-, IEC 61000-4-3 Perf. crit. A
EFT	EN-, IEC 61000-4-4 Perf. crit. A (see Figure 3)
CS	EN-, IEC 61000-4-6 Perf. crit. A
PFMF	EN-, IEC 61000-4-8 Perf. crit. A

General	
Safety standard designet to meet	IEC 60950-1
Switching frequency	70 kHz, typ.
Reliability calculated MTBF (MIL-HDBK-217 F)	≥ 2 Mio. h
Environmental	
Operating ambient temperature	-40 ... 85 °C,
Storage temperature	-40 ... 125 °C
Case temperature	≤ 100 °C
Derating	None required
Humidity	Up to 95 %, non condensing
Cooling	Free air convection, 30...65 LFM
Physical	
Dimensions	P1D48xxx: 19.5 x 7.2 x 10 mm All other: 19.5 x 6 x 10 mm
Weight	P1D48xxx: 2.8 g All others: 2.4 g
Case material	Non conductive black plastic (UL94V-0 rated)
Potting material	Epoxy (UL94V-0 rated)
Absolute maximum values	
P1D05xxx-Series	Vin: 9 VDC, 100 ms, max.
P1D12xxx-Series	Vin: 18 VDC, 100 ms, max.
P1D15xxx-Series	Vin: 20 VDC, 100 ms, max.
P1D24xxx-Series	Vin: 30 VDC, 100 ms, max.
P1D48xxx-Series	Vin: 54 VDC, 100 ms, max.
Pin soldering temperature	≤ 260 °C duration ≤ 10 s, ≥ 1.5 mm distance from body

Figure 1 Measure circuit for input ripple current

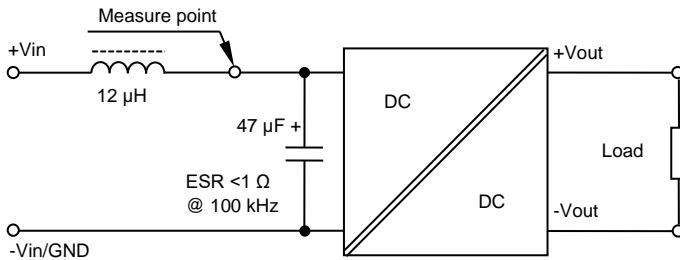
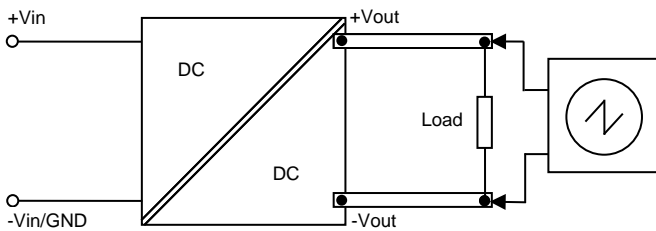
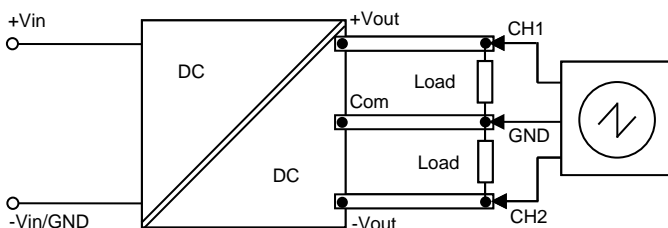


Figure 2 Output ripple & noise measure circuit (measure BW 20 MHz)
Single output

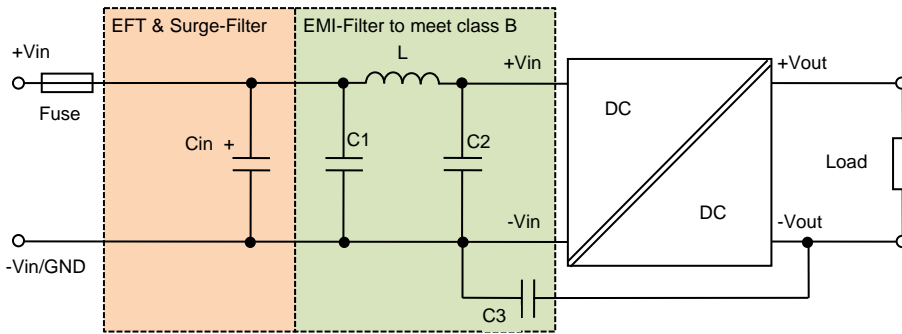


Dual output



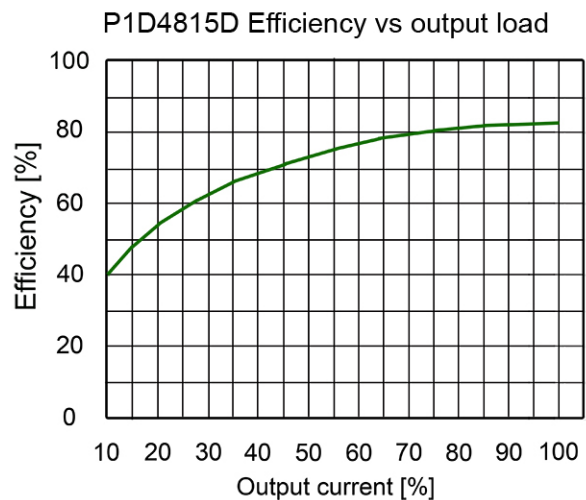
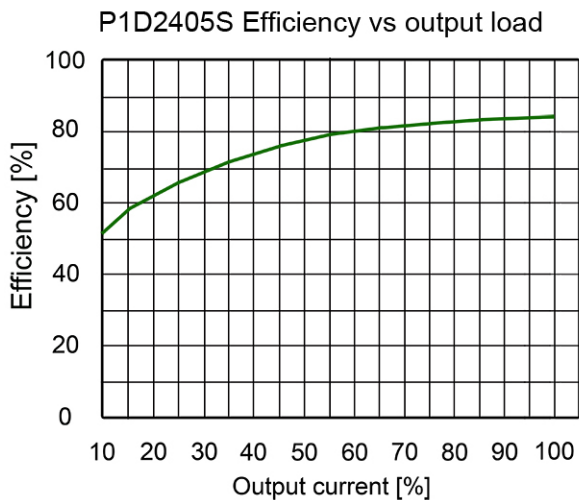
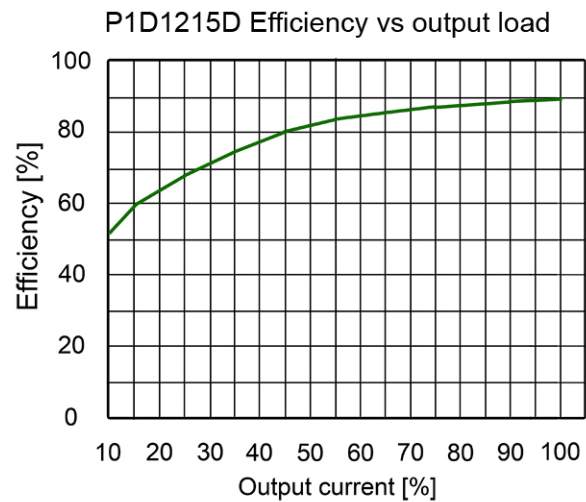
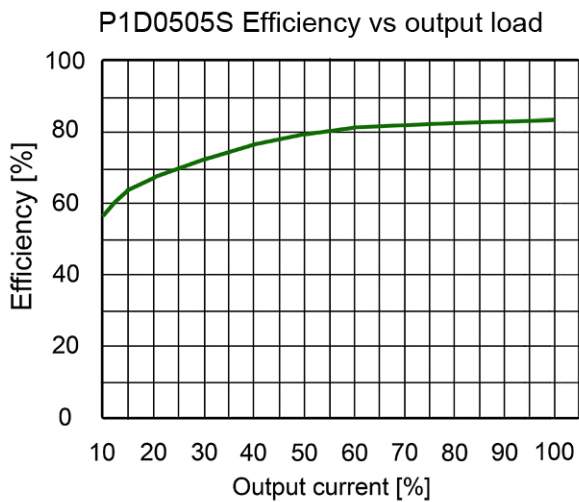
1 W DC-DC Converter P1D-Series

Figure 3 Application circuit to meet EN 61000-4-4 perf. crit. A, EN 61000-4-5 perf. crit. A and EMI EN 55032 class B



BOM to Figure 3						
Type	Fuse, time delay type	Cin	C1	L	C2	C3
P1D05xxx	500 mA	220 μ F/ 100V/ ESR < 1 Ω	2.2 μ F MLCC	18 μ H	-	-
P1D12xxx	300 mA	220 μ F/ 100V/ ESR < 1 Ω	2.2 μ F MLCC	18 μ H	-	-
P1D15xxx	300 mA	220 μ F/ 100V/ ESR < 1 Ω	2.2 μ F MLCC	18 μ H	-	-
P1D24xxx	300 mA	220 μ F/ 100V/ ESR < 1 Ω	2.2 μ F MLCC	18 μ H	2.2 μ F MLCC	470 pF MLCC
P1D48xxx	300 mA	220 μ F/ 100V/ ESR < 1 Ω	2.2 μ F MLCC	18 μ H	2.2 μ F MLCC	470 pF MLCC

The EMI filter components are to meet the contacted emissions requirement of the converter. These components should be as near as possible mounted to the converter. All leads should be as short as possible to minimize the radiation.

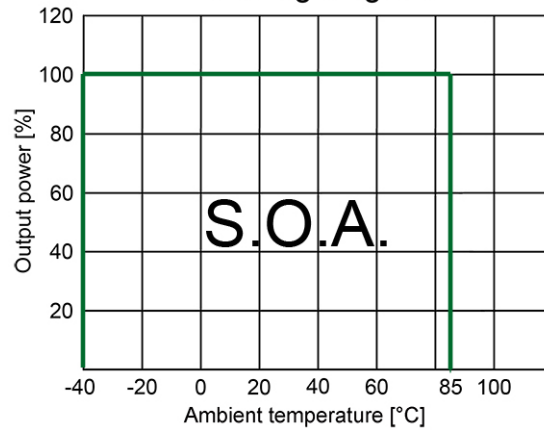




PHI-CON

1 W DC-DC Converter P1D-Series

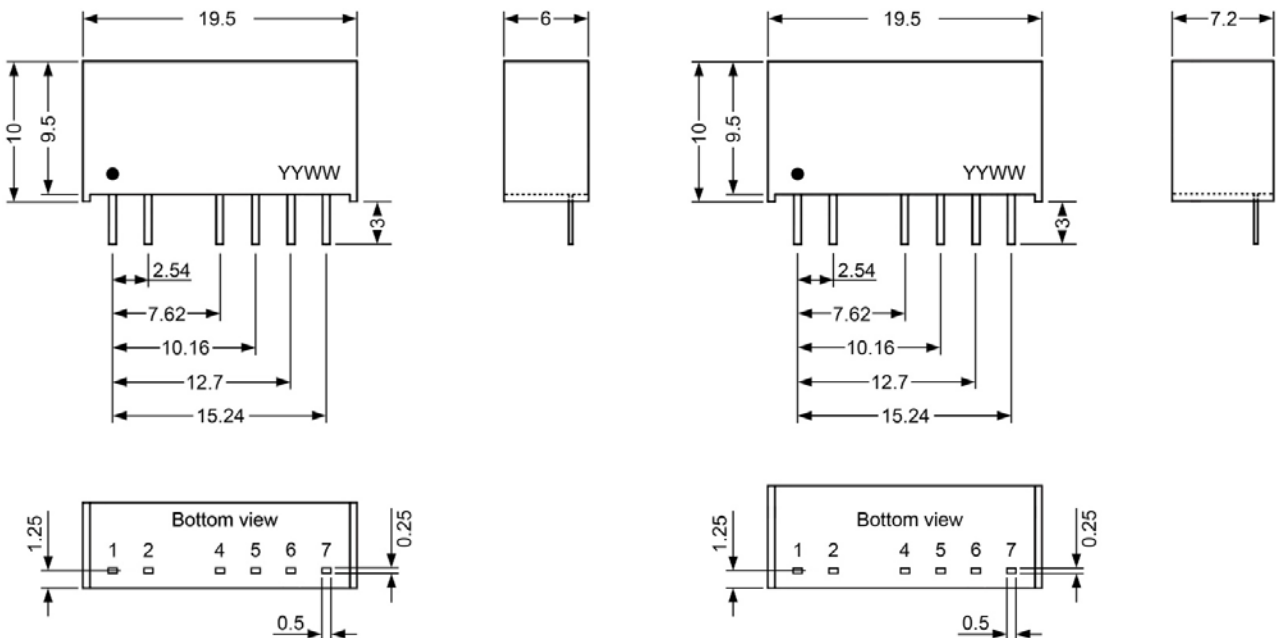
Derating diagram



Mechanical dimensions

P1D05xxx, P1D12xxx, P1D15xxx and P1D24xxx

Only P1D48xxx



Note:

All units are in millimeters

1. Pin cross section tolerance ± 0.05
2. Pin pitch and length tolerance ± 0.35
3. Pin pitch and length tolerance ± 0.35
4. Case tolerance ± 0.5

	1 kV _{DC} Isolation		3 kV _{DC} Isolation	
	Single	Dual	Single	Dual
1	+V Input	+V Input	+V Input	+V Input
2	-V Input	-V Input	-V Input	-V Input
4	-V Output	-V Output	No Pin	No Pin
5	No Pin	Common	-V Output	-V Output
6	+V Output	+V Output	No Pin	Common
7	No Pin	No Pin	+V Output	+V Output

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