1 W DC-DC Converter P1C-Series

PHI-CON

- 7 Pin SIL
- Low ripple and noise
- Isolation 6 kV_{DC} 60 sec. 100 % tested
- Rated operating voltage for 250 V_{rms} / 400 V_{DC}
- MTBF > 2.3 Mio. h
- Operating temperature range -40 ... 85 °C
- Efficiency up to 84 %
- Usable for IGBT driver application

CE

Model guide

Type	Input voltage		Output voltage	Output current	Efficiency typ.	Capacitve load (note 1)
	Nominal [V_{DC}]	Range [V_{DC}]	[V_{DC}]	[mA]	[%]	[µF] max.
Single						
P1C053R3S	5	4.5..5.5	3.3	303	69..75	220
P1C0505S	5	4.5..5.5	5.0	200	70..77	220
P1C0509S	5	4.5..5.5	9.0	111	70..80	220
P1C0512S	5	4.5..5.5	12.0	84	70..80	220
P1C0515S	5	4.5..5.5	15.0	67	70..80	220
P1C093R3S	9	8.1..9.9	3.3	303	69..75	220
P1C0905S	9	8.1..9.9	5.0	200	70..77	220
P1C0909S	9	8.1..9.9	9.0	111	70..80	220
P1C0912S	9	8.1..9.9	12.0	84	70..80	220
P1C0915S	9	8.1..9.9	15.0	67	70..80	220
P1C123R3S	12	10.8..13.2	3.3	303	69..75	220
P1C1205S	12	10.8..13.2	5.0	200	70..77	220
P1C1209S	12	10.8..13.2	9.0	111	70..80	220
P1C1212S	12	10.8..13.2	12.0	84	70..80	220
P1C1215S	12	10.8..13.2	15.0	67	70..80	220
P1C153R3S	15	13.5..16.5	3.3	303	69..75	220
P1C1505S	15	13.5..16.5	5.0	200	70..77	220
P1C1509S	15	13.5..16.5	9.0	111	70..80	220
P1C1512S	15	13.5..16.5	12.0	84	70..80	220
P1C1515S	15	13.5..16.5	15.0	67	70..80	220
P1C243R3S	24	21.6..26.4	3.3	303	69..75	220
P1C2405S	24	21.6..26.4	5.0	200	70..77	220
P1C2409S	24	21.6..26.4	9.0	111	70..80	220
P1C2412S	24	21.6..26.4	12.0	84	70..80	220
P1C2415S	24	21.6..26.4	15.0	67	70..80	220
Dual						
P1C0505D	5	4.5..5.5	±5.0	±100	70..78	2 x 100
P1C0509D	5	4.5..5.5	±9.0	±56	70..81	2 x 100
P1C0512D	5	4.5..5.5	±12.0	±42	72..81	2 x 100
P1C0515D	5	4.5..5.5	±15.0	±34	70..81	2 x 100
P1C051509	5	4.5..5.5	+15 & -9	+33 & -55	74..84	2 x 100
P1C0905D	9	8.1..9.9	±5.0	±100	70..78	2 x 100
P1C0909D	9	8.1..9.9	±9.0	±56	70..81	2 x 100
P1C0912D	9	8.1..9.9	±12.0	±42	72..81	2 x 100
P1C0915D	9	8.1..9.9	±15.0	±34	70..81	2 x 100
P1C091509	9	8.1..9.9	+15 & -9	+33 & -55	74..84	2 x 100
P1C1205D	12	10.8..13.2	±5.0	±100	70..78	2 x 100
P1C1209D	12	10.8..13.2	±9.0	±56	70..81	2 x 100
P1C1212D	12	10.8..13.2	±12.0	±42	72..81	2 x 100
P1C1215D	12	10.8..13.2	±15.0	±34	70..81	2 x 100
P1C121509	12	10.8..13.2	+15 & -9	+33 & -55	74..84	2 x 100
P1C1505D	15	13.5..16.5	±5.0	±100	70..78	2 x 100
P1C1509D	15	13.5..16.5	±9.0	±56	70..81	2 x 100
P1C1512D	15	13.5..16.5	±12.0	±42	72..81	2 x 100
P1C1515D	15	13.5..16.5	±15.0	±34	70..81	2 x 100
P1C151509	15	13.5..16.5	+15 & -9	+33 & -55	74..84	2 x 100
P1C2405D	24	21.6..26.4	±5.0	±100	70..78	2 x 100
P1C2409D	24	21.6..26.4	±9.0	±56	70..81	2 x 100
P1C2412D	24	21.6..26.4	±12.0	±42	72..81	2 x 100
P1C2415D	24	21.6..26.4	±15.0	±34	70..81	2 x 100
P1C241509	24	21.6..26.4	+15 & -9	+33 & -55	74..84	2 x 100

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Specifications

Input		
Voltage range		± 10 %
Filter		Capacitor
Reflected input ripple current		20 mAp-p, typ. (see Figure 1)
I/O-Isolation:		
DC-Isolation voltage (60 s)		6 kV_{DC}
Capacitance		10 pF, typ.
Resistance		≥ 10^9 Ω
Clearance distance In/Out		≥ 2.5 mm
Output		
Voltage tolerance		≤ ± 3 %
Voltage balance (dual outputs)		± 1 %
Ripple and noise (at 20 MHz BW)		200 mVp-p, max. (Figure 2)
Short circuit protection		Continuous, automatic restart
Line voltage deviation		± 1.2 % @ 1 % V_{in} change
Output voltage deviation at load change 20...100 %		± 10 % ± 20 % @ 3.3 V output
Temperature coefficient		0.03 %/°C
EMC		
CE	EN 55032	Class B
RE	EN 55032	Class B
ESD	EN-, IEC 61000-4-2	perf. criteria A
RS	EN-, IEC 61000-4-3	perf. criteria A
EFT	EN-, IEC 61000-4-4	perf. criteria A (see Figure 3)
CS	EN-, IEC 61000-4-5	perf. criteria A (see Figure 3)
PFMF	EN-, IEC 61000-4-8	perf. criteria A

General	
Safety designed to meet	IEC 60950-1
Switching frequency	20…50 kHz
Reliability calc. MTBF (MIL-HDBK-217F)	≥ 2.39 Mio. h
Environmental	
Operating ambient temperature	-40 … 85 °C
Storage temperature	-40 … 125 °C
Case temperature	≤ 100 °C
Derating	None required
Humidity storage	≤ 95 % non condensing
Cooling	Free air convection, 30…65 LFM
Physical	
Dimensions	19.5 x 9.8 x 12.5 mm
Weight	4.3 g
Case material	Non conductive black plastic (UL94V-0 rated)
Potting material	Epoxy (UL94V-0 rated)
Absolute maximum ratings	
Input surge voltage	P1C05xxx: ≤ 7 V_{DC}, 100 ms P1C09xxx: ≤ 12 V_{DC}, 100 ms P1C12xxx: ≤ 15 V_{DC}, 100 ms P1C15xxx: ≤ 18 V_{DC}, 100 ms P1C24xxx: ≤ 28 V_{DC}, 100 ms
Pin soldering temperature	≤ 260 °C duration ≤ 10 s ≥1.5 mm distance from body

Note:

1. Tested by minimal Vin 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 these devices, however they may not meet all listed specifications.

Figure 1 Measure circuit for reflected input ripple current

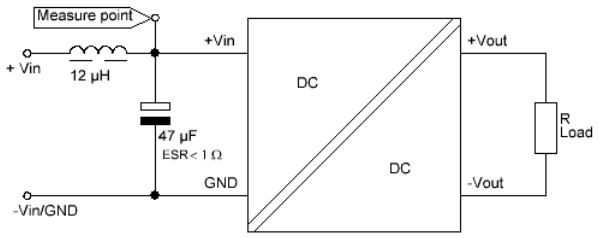

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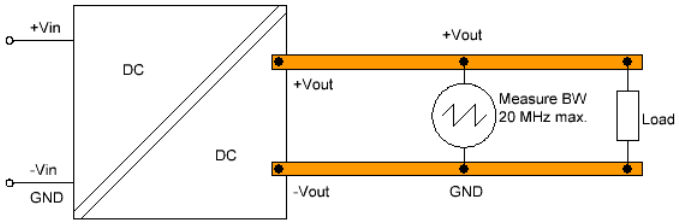
Figure 2 Measure circuit output ripple & noise voltage

Single output



Dual output

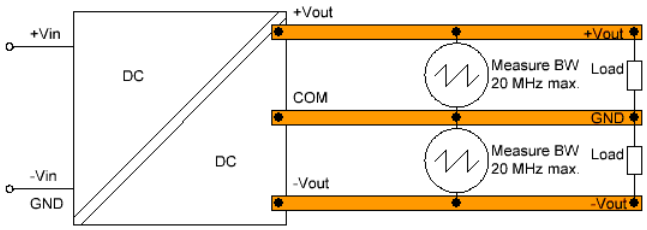
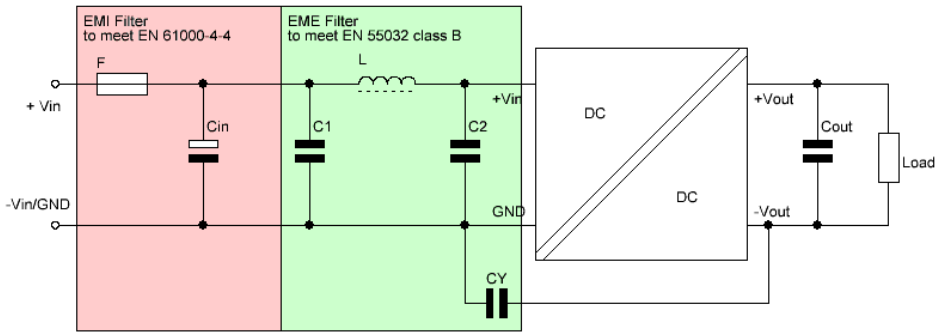


Figure 3 Application circuit to meet EFT EN 61000-4-4 performance criteria A and EMI EN 55032 class B



BOM to figure 3					
Vin type	Cin	C1	L	C2	CY
P1C05xxx	470 µF, 100 V, ESR ≤ 1Ω @ 100 kHz	2.2 µF, 100 V, 1210	18 µH	-	-
P1C09xxx	470 µF, 100 V, ESR ≤ 1Ω @ 100 kHz	2.2 µF, 100 V, 1210	18 µH	-	-
P1C12xxx	470 µF, 100 V, ESR ≤ 1Ω @ 100 kHz	2.2 µF, 100 V, 1210	18 µH	-	-
P1C15xxx	470 µF, 100 V, ESR ≤ 1Ω @ 100 kHz	2.2 µF, 100 V, 1210	18 µH	-	-
P1C24xxx	470 µF, 100 V, ESR ≤ 1Ω @ 100 kHz	2.2 µF, 100 V, 1210	18 µH	2.2 µF, 100 V, 1210	470 pF, 10 kV

C1, L, C2, CY are used to meet conducted emissions requirement for the converter. These components should be assembled as near as possible to the converter. All leads should be minimized to decrease noise radiation.

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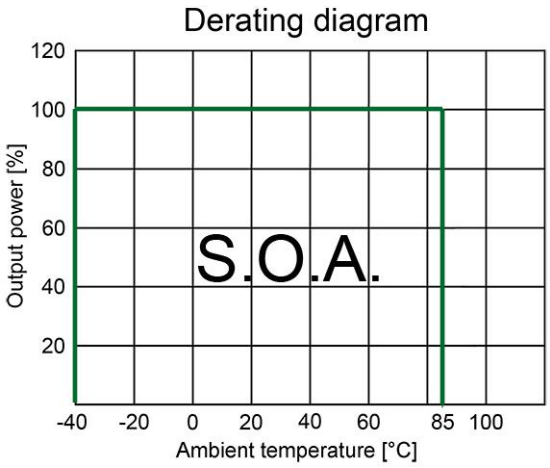
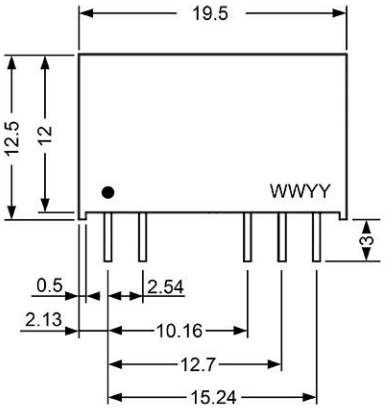
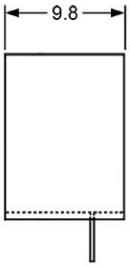
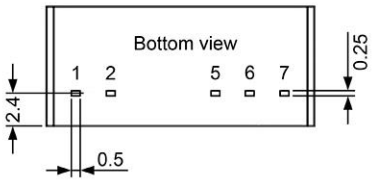


Mechanical dimensions





Pin assignment		
	Single	Dual
1	+V Input	+V Input
2	-V Input	-V Input
3	No Pin	No Pin
4	No Pin	No Pin
5	-V Output	-V Output
6	No Pin	Common
7	+V Output	+V Output



All units in mm
1. Pin diameter tolerance ±0.05 mm
2. Pin pitch tolerance ±0.35 mm
3. Pin length tolerance ±0.35 mm
4. Case tolerance ±0.5 mm

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