



PHI-CON

1 W DC-DC Converter P1F-Series

- 6 Pin SIL
- Wide 2:1 input range
- 1500 V_{DC} isolation
- MTBF ≥ 2.8 Mio. h.
- Continuous short circuit protection



Model guide

Type	Input voltage		Input current		Output voltage [V _{DC}]	Output current		Efficiency @ full load [%]typ.	Capacitive output load (see Note 2) [μF] max.
	nominal [V _{DC}]	range [V _{DC}]	no-load [mA]	full-load [mA]		[mA] min.	[mA] max.		
Single output									
P1F0505S	5	4.5...9	35	263	5.0	0	200	76	1680
P1F0512S	5	4.5...9	35	253	12.0	0	83	79	820
P1F0515S	5	4.5...9	35	250	15.0	0	67	80	680
P1F0524S	5	4.5...9	35	250	24.0	0	42	80	470
P1F1205S	12	9...18	20	107	5.0	0	200	78	1680
P1F1212S	12	9...18	20	105	12.0	0	83	80	820
P1F1215S	12	9...18	20	103	15.0	0	67	81	680
P1F1224S	12	9...18	20	105	24.0	0	42	80	470
P1F2405S	24	18...36	10	54	5.0	0	200	78	1680
P1F2412S	24	18...36	10	52	12.0	0	83	80	820
P1F2415S	24	18...36	10	52	15.0	0	67	80	680
P1F2424S	24	18...36	10	52	24.0	0	42	81	470
P1F4805S	48	36...75	7	28	5.0	0	200	76	1680
P1F4812S	48	36...75	7	27	12.0	0	83	78	820
P1F4815S	48	36...75	7	27	15.0	0	67	78	680
P1F4824S	48	36...75	7	27	24.0	0	42	77	470
Dual output									
P1F0512D	5	4.5...9	35	259	±12.0	0	±42	77	2 x 470
P1F0515D	5	4.5...9	35	254	±15.0	0	±33	79	2 x 330
P1F1212D	12	9...18	20	106	±12.0	0	±42	79	2 x 470
P1F1215D	12	9...18	20	105	±15.0	0	±33	80	2 x 330
P1F2412D	24	18...36	10	52	±12.0	0	±42	80	2 x 470
P1F2415D	24	18...36	10	53	±15.0	0	±33	79	2 x 330
P1F4812D	48	36...75	7	27	±12.0	0	±42	77	2 x 470
P1F4815D	48	36...75	7	27	±15.0	0	±33	77	2 x 330

Specifications

Input	
Filter	Capacitors
Input reflected current	35 mA p-p, typ. (see Figure 1)
Isolation:	
Rated voltage, input / output, tested for 60 s	1500 V _{DC}
Resistance	≥ 10 ⁹ Ω
Capacitance	70 pF, typ.
Output	
Voltage tolerance	± 2 %
Ripple and noise (at 20 MHz BW)	≤ 50 mVp-p, (see Figure 2)
Short circuit protection	Continuous, automatic restart
Line voltage regulation	± 0.2 %
Dual output cross regulation at 75 % load difference	± 5 %
Transient recovery time at 25 % load change steps	500 μs, typ.
Transient response deviation at 25 % load change steps	≤ ± 3 %
Load regulation @ 0...100 % load range	single output: ≤ ± 1 % dual output: ≤ ± 2 %
Temperature coefficient	± 0.02 % / °C
General	
Switching frequency	150...550 kHz
Reliability calc. MTBF (MIL-HDBK-217 F)	2.8 Mio. h

Safety standard, designed to meet	EN-, IEC-, UL-, cUL 60950-1 EN-, IEC 62368-1
EMC Specifications	
RE	EN 55032 Class A
CE	EN 55032 Class A (see Figure 3)
ESD	EN 61000-4-2 perf. criteria A
RS	EN 61000-4-3 perf. criteria A
EFT	EN 61000-4-4 perf. criteria A (see Figure 3)
Surge	EN 61000-4-5 perf. criteria A (see Figure 3)
CS	EN 61000-4-6 perf. criteria A
PFMF	EN 61000-4-8 perf. criteria A
Environmental	
Operating temperatur (ambient)	-40 ... 85 °C
Case temperature	≤ 105 °C
Storage temperature	-40 ... 125 °C
Derating	See curve
Humidity	Up to 95 %, non-condensing
Cooling	Free air convection, 30...65 LFM
Physical	
Dimensions	17 x 7,62 x 11 mm
Weight	3 g
Case material	non-conductive black plastic, UL94V-0
Potting material	Epoxy UL94V-0
Absolute maximum ratings	
Input voltage	P1F05xxx: ≤ 15 V _{DC} , ≤ 100 ms P1F12xxx: ≤ 25 V _{DC} , ≤ 100 ms P1F24xxx: ≤ 50 V _{DC} , ≤ 100 ms P1F48xxx: ≤ 100 V _{DC} , ≤ 100 ms
Pin soldering temperature	≤ 260 °C duration ≤ 10 s, ≥ 1.5 mm distance from body

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Part number structure							
Output power	Series	Input voltage		Output voltage		Outputs	
P1	F	05		3R3		S	
1 Watt		05	4.5..9 V	05	5 V	S	single
		12	9..18 V	12	12 V	D	dual
		24	18..36 V	15	15 V		
		48	36..75 V	24	24 V		

Note

1. All parameter are typical specified at T_a 25 °C, nominal input voltage and full load unless otherwise specified.
2. Maximal capacitive output load is specified at minimal input voltage and constant resistive load.
3. Not usable for high voltage IGBT- and MOSFET-driver applications.

Figure 1... Measure circuit for reflected input ripple current

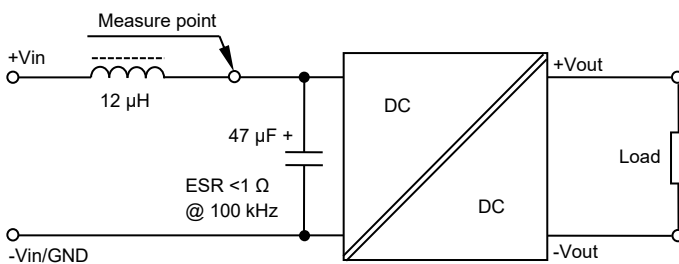
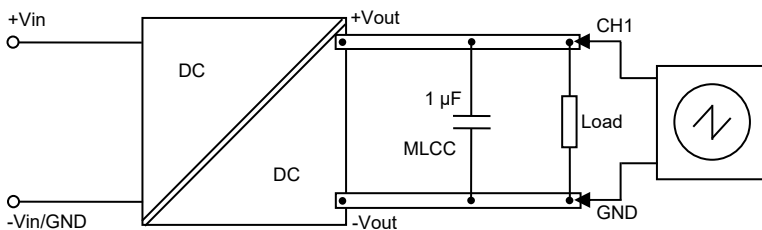
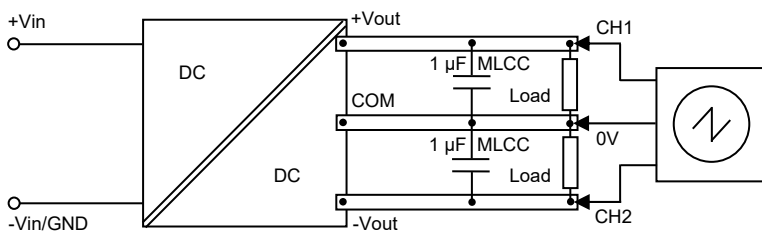


Figure 2... Measure circuit for Output ripple & noise (BW 20 MHz)

Single output



Dual output

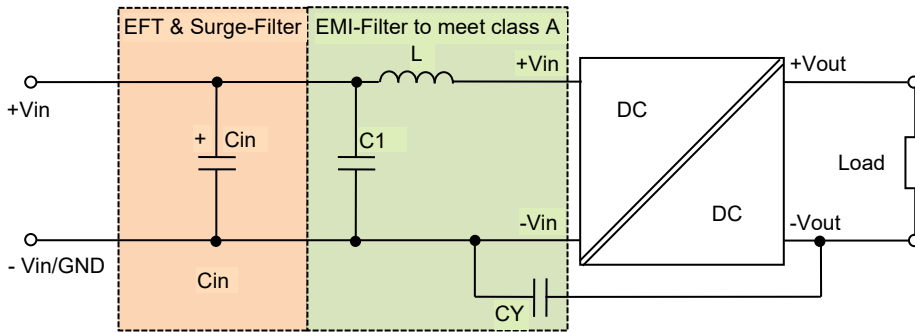


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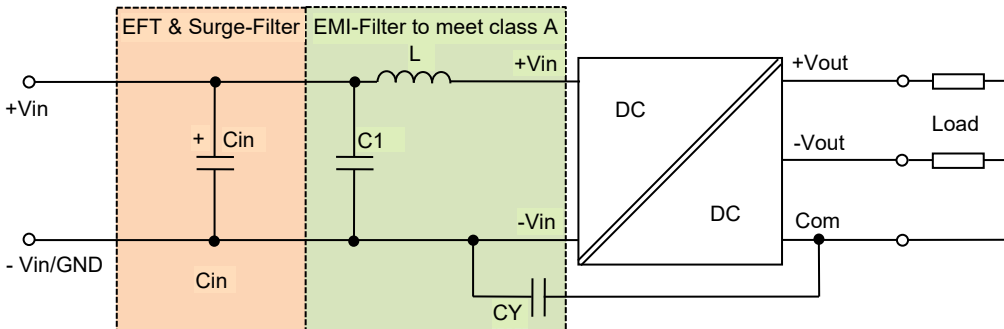
Figure 3 Recommended application circuit for EMC filter

The EMI input filter components C1, CY and L are used to help meet conducted emissions requirement EN 55032 class A for the module. These components should be mounted as close as possible to the module. All conductions should be minimized to decrease the radiated emission. Filter Capacitor Cin is used to meet the standards EFT EN 61000-4-4 and Surge EN 61000-4-5 performance criteria A

Single output

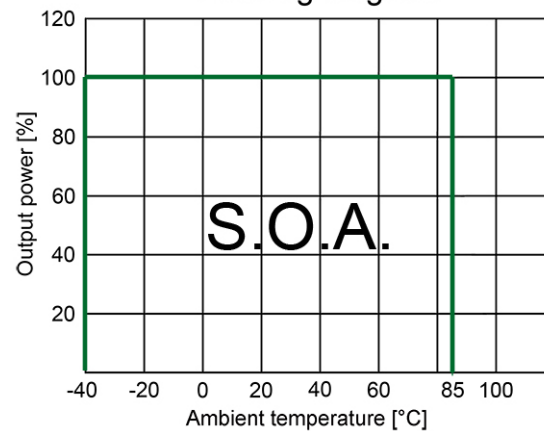


Dual output



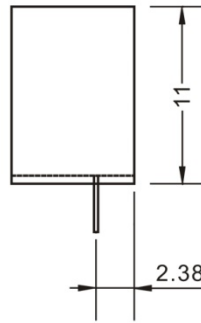
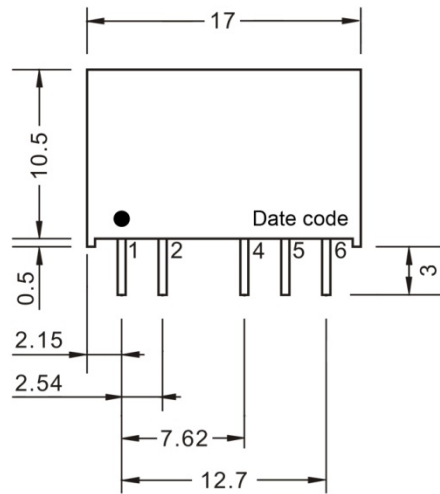
Type	C in	C1	L in	CY
P1F05xxS	330 μ F, 100 V	4.7 μ F, 50 V, MLCC	4.7 μ H	220 pF, 3 kV, Y2
P1F12xxS	220 μ F, 100 V	4.7 μ F, 50 V, MLCC	4.7 μ H	220 pF, 3 kV, Y2
P1F24xxS	220 μ F, 100 V	4.7 μ F, 50 V, MLCC	18 μ H	220 pF, 3 kV, Y2
P1F48xxS	220 μ F, 100 V	4.7 μ F, 100 V, MLCC	18 μ H	220 pF, 3 kV, Y2

Derating diagram



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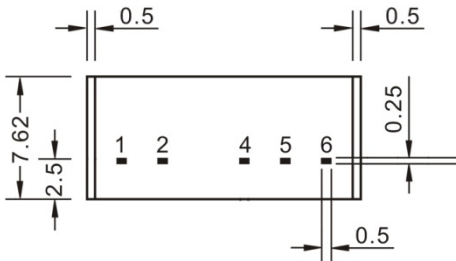
Mechanical dimensions



Note:

All dimensions are in millimeters

1. Pin width: 0.5 ± 0.05 mm
2. Pin pitch and length tolerance: ± 0.35 mm
3. Pin to case tolerance: ± 0.5 mm
4. Case tolerance: ± 0.5 mm
5. Stand off tolerance: ± 0.1 mm



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

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