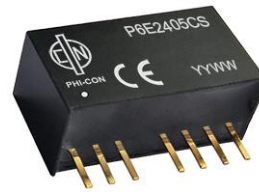




PHI-CON

6 W DC-DC Converter P6ExxxCx-Series

- Wide 2:1 input range
- 1600 V_{DC} isolation
- Standard SIL 8 Pin package
- Continuous short circuit protection
- -40...105 °C operating temperature range



Model guide

Type	Input voltage		Input current		Output voltage [V _{DC}]	Output current		Efficiency @ full load		Capacitive load (C _{out}) (see note 3) [μF] max.
	nominal [V _{DC}]	Range [V _{DC}]	no load max. [mA]	full load max. [mA]		min. load [mA]	max. load [mA]	[%] min.	[%] typ.	
Single Output										
P6E123R3CS	12	9...18	18	500	3.3	0	1350	74	76	1800
P6E1205CS	12	9...18	18	640	5	0	1200	78	80	1000
P6E1209CS	12	9...18	18	640	5	0	667	80	82	470
P6E1212CS	12	9...18	18	640	12	0	500	82	84	470
P6E1215CS	12	9...18	18	640	15	0	400	82	84	220
P6E1224CS	12	9...18	18	640	24	0	250	82	84	100
P6E243R3CS	24	18...36	12	245	3.3	0	1350	76	78	1800
P6E2405CS	24	18...36	12	315	5	0	1200	80	82	1000
P6E2409CS	24	18...36	16	315	5	0	667	82	84	470
P6E2412CS	24	18...36	16	315	12	0	500	84	86	470
P6E2415CS	24	18...36	16	315	15	0	400	85	87	220
P6E2424CS	24	18...36	16	315	24	0	250	83	85	100

Specifications

Input	
Under voltage protection	Start up voltage Under voltage lockout
P6E12xxCx	≤ 9 V _{DC} ≥ 5.5 V _{DC}
P6E24xxCx	≤ 18 V _{DC} ≥ 12 V _{DC}
Filter	Capacitor
Reflected ripple current	50 mA _{p-p} , typ. (see Figure 1)
Input surge voltage	P6E12xxCS ≤ 25 V _{DC} duration ≤ 1 s P6E24xxCS ≤ 50 V _{DC} duration ≤ 1 s
Remote control threshold (see Figure 5)	ON state OFF state 3.5...12 V ≤1.2 V Or open input
OFF state idle input current	≤10 mA
Isolation input - output:	
Rated voltage (tested for 1 Minute)	1600 V _{DC} , at ≤ 1 mA
Resistance	≥ 10 ⁹ Ω, measured @ 500 V _{DC}
Capacitance	1000 pF, typ.
Output	
Voltage tolerance	≤ ± 2 %, load range 5...100 %
Voltage load regulation	≤ ± 1.5 %, at 5%...100 % load
Input voltage regulation	≤ ± 1 %, over full Vin range
Temperature coefficient	± 0.03 % / °C
Transient recovery time	≤ 500 μs, at 25 % load steps
Transient response deviation @ 25 % load steps	≤ 8 %, P6Exx3R3CS, P6Exx05CS ≤ 5 % all others
Short circuit protection	Continuous, hiccup, auto restart
Over current protection	110...230 % of rated current
Ripple & noise, BW 20MHz	≤ 100 mV _{p-p} (see Figure 2)

General	
Safety standard	EN 62368-1
Start up time	10 ms, typ at R-load
Switching frequency	500 kHz, typ.
Reliability calculated MTBF MIL-HDBK-217F @ 25 °C	≥ 1 Mio. h
EMC characteristics	
CE	EN 55032, CISPR 32 Class B (see Figure 4)
RE	EN 55032, CISPR 32 Class B (see Figure 4)
ESD	EN-, IEC 61000-4-2 Contact ± 4 kV perf. Criteria B
RS	EN-, IEC 61000-4-3 10V/m perf. Criteria A
EFT	EN-, IEC 61000-4-4 ± 2 kV perf. perf. Criteria B (see Figure 4)
Surge	EN-, IEC 61000-4-5 Line to line ± 2 kV perf. Criteria B (see Figure 4)
CS	EN-, IEC 61000-4-6 3 Vrms perf. Criteria A
Environmental	
Operating ambient temperature	-40 °C ... 105 °C with derating
Storage temperature	-55 °C ... 125 °C
Storage humidity	5...95 %, non condensing
Cooling	Free air convection, ≥ 35 LFM
Vibration X-, Y- and Z-axis	10...150 Hz, 5 g, 0.75 mm
Physical	
Dimensions	9.5 x 22 x 12 mm
Weight	4.6 g
Case material	Plastic (UL94V-0 rated)
Potting Material	Epoxy (UL94V-0 rated)
Absolute max. ratings	
Pin soldering temperature	≤ 300°C peak duration ≤ 10 s, ≥ 1.5mm body distance

Product ordering information						
Series P6E	Input voltage		Output voltage		Revision	Output configuration
PHI-CON 6 W	24	24 V	3R3	3.3 V	C	S Single
			05	5 V		
			09	9 V		
			12	12 V		
			15	15 V		
			24	24 V		
Example:	P6E2405CS	Pout: 6 W, Vin: 24 V (18...36 V), Vout: 5 V				

6 W DC-DC Converter P6ExxxCx-Series

Note:

1. Min. load should not be less than 5 %, otherwise ripple maybe increased dramatically, If the product operates under min. load, it may not be guaranteed to meet all specifications listed. Operation under minimum load will not damage the converter.
2. The recommended unbalanced load of dual output converter should be $\leq 5\%$. At load asymmetry $\geq 5\%$, it may not be guaranteed to meet all specifications listed.
3. Maximum capacitive load is tested at input voltage range and full load.
4. All specifications measured at $T_a 25\text{ }^\circ\text{C}$, humidity $< 75\%$, nominal input voltage and rated output load unless otherwise specified.
5. It is not recommended to increase the output power capability by connecting two or more converters in parallel.

Figure 1 Measure circuit input reflected ripple current

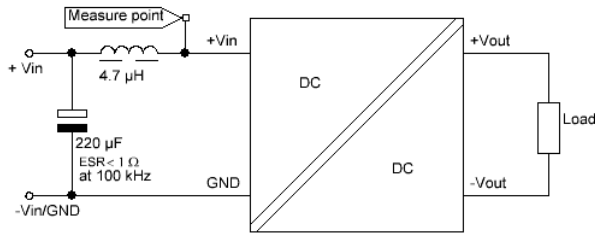
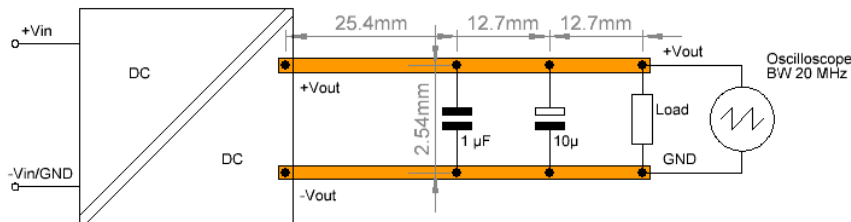
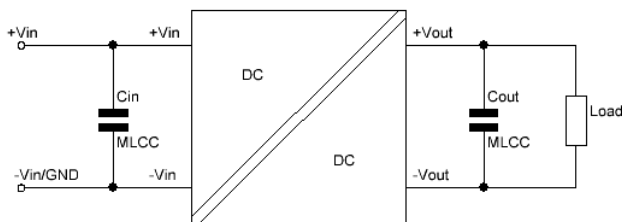


Figure 2 Measure circuit output ripple & noise voltage



Figures 3 Typical application circuit

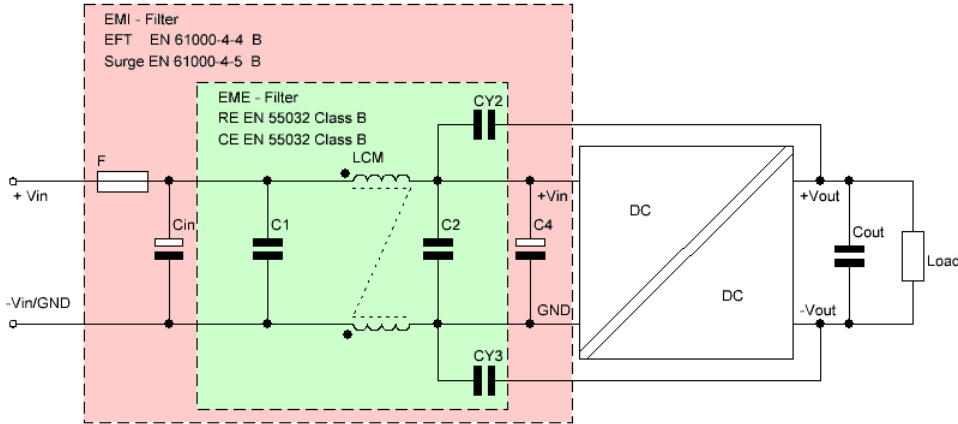
The P6E series been tested according to the following recommended test circuit before leaving the factory (see Figures 3a & 3b). If you want to further decrease the input / output ripple, you can increase a capacitance values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the maximum load capacitance value (see Model guide table).



Recommended peripheral components to figure 3a & 3b		
Vin type	Cin	Cout
P6E12xxCS	100 µF, 50 V	22 µF
P6E24xxCS	100 µF, 100 V	22 µF

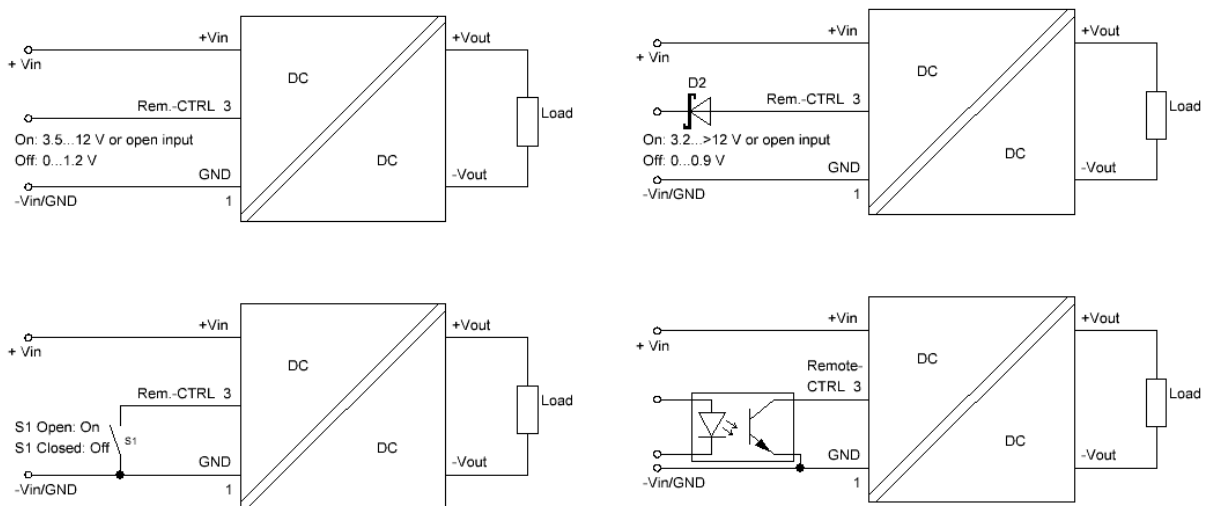
6 W DC-DC Converter P6ExxxCx-Series

Figure 4
EFT and Surge Filter to meet EN-, IEC 61000-4-4 Class B and EN-, IEC 61000-4-5 Class B
EMI-Filter to meet conducted- and radiated- emission EN 55032-, CISPR32- Class B



Recommended peripheral components to circuits in figures 4 a & b							
Type	Fuse Time delay type	Cin, C4	C1, C2	L	LCM	CY	Cout
P6E12xxCS	2 A	330 μ F, 100 V	10 μ F, 100 V	10 μ H	0.47 mH	1 nF, 2 kV	See table Figure 3
P6E24xxCS	2 A	330 μ F, 100 V	10 μ F, 100 V	10 μ H	0.47 mH	1 nF, 2 kV	

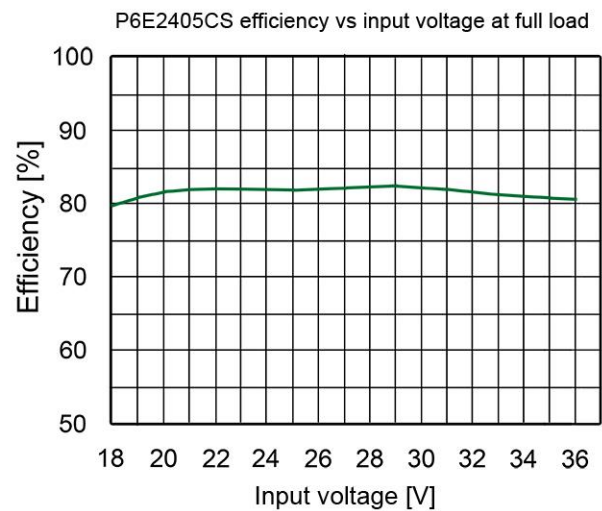
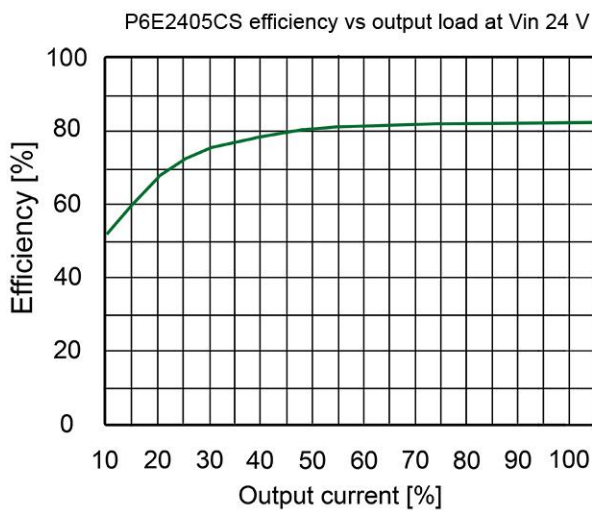
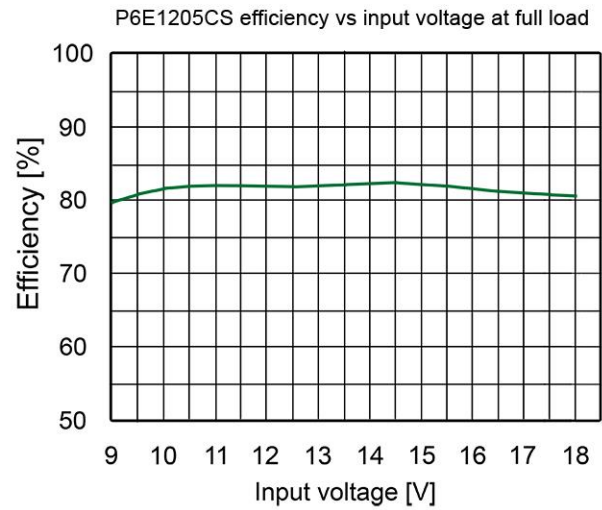
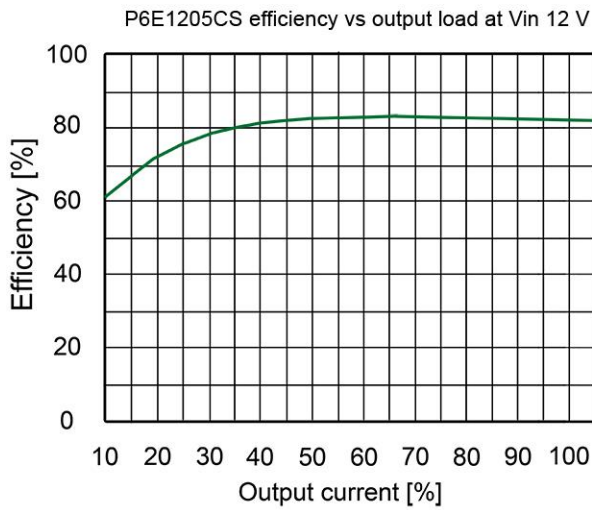
Figure 5 Remote control application circuits



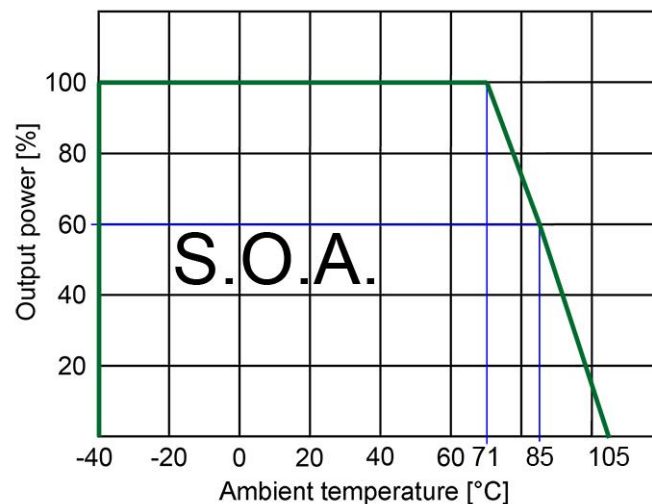


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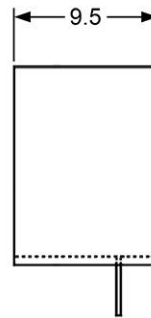
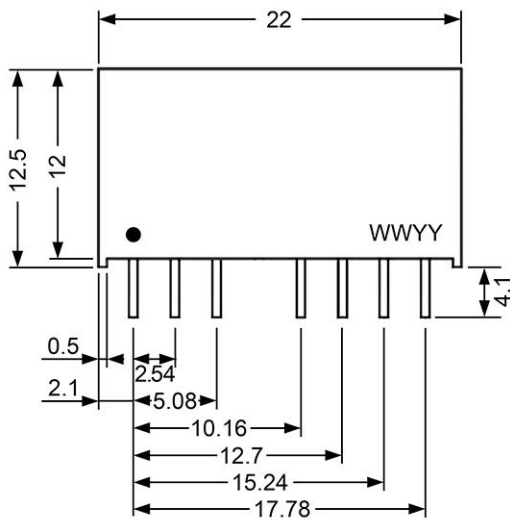


P6ExxxxS Power derating

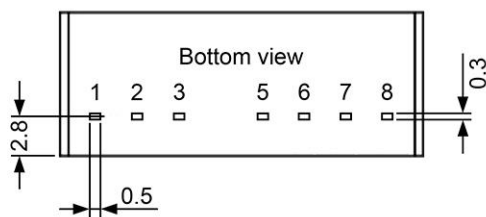


6 W DC-DC Converter P6ExxxxCx-Series

Mechanical dimensions



Unit: mm
Pin diameter tolerance: 0.1 mm
General tolerances: 0.5 mm



Pin assignment	
	Single
1	- Vin
2	+ Vin
3	Rem. Ctrl
4	No pin
5	N.C.
6	+ Vout
7	- Vout/ 0V
8	N.C.

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