6 W DC-DC Converter P6L24xxCx-Series

PHI-CON

- Wide 4:1 input range
- 1500 V_{DC} isolation
- Standard SIL 8 Pin package
- Continuous short circuit protection
- -40...85 °C operating temperature range

Model guide

Type	Input voltage		Input current		Output voltage	Output current		Efficiency @ full load		Capacitive load (Cout) (see note 3)
	nominal [V_{DC}]	Range [V_{DC}]	no load max. [mA]	full load max. [mA]	[V_{DC}]	min. load [mA]	max. load [mA]	[%] min.	[%] typ.	[µF] max.
Single Output										
P6L243R3CS	24	9...36	12	245	3.3	0	1350	76	78	1800
P6L2405CS	24	9...36	12	315	5	0	1200	80	82	1000
P6L2409CS	24	9...36	16	315	5	0	667	82	84	470
P6L2412CS	24	9...36	16	315	12	0	500	84	86	470
P6L2415CS	24	9...36	16	315	15	0	400	85	87	220
P6L2424CS	24	9...36	16	315	24	0	250	83	85	100
Dual Output										
P6L2405CD	24	9...36	16	320	±5	0	±600	78	80	2 x 470
P6L2409CD	24	9...36	16	310	±9	0	±333	81	83	2 x 220
P6L2412CD	24	9...36	16	310	±12	0	±250	81	83	2 x 120
P6L2415CD	24	9...36	16	310	±15	0	±200	81	83	2 x 100
P6L2424CD	24	9...36	16	315	±24	0	±125	80	82	2 x 68

Specifications

Input			
Under voltage protection	Start up voltage	Under voltage lockout	
P6L24xxCx	≤ 9 V_{DC}	≥ 5.5 V_{DC}	
Filter	Capacitor		
Reflected ripple current	50 mAp-p, typ. (see Figure 1)		
Input surge voltage	≤ 50 V_{DC} duration ≤ 1 s		
Remote control threshold (see Figure 5)	ON state	OFF state	
	3.5…12 V Or open input	≤1.2 V	
OFF state idle input current	≤10 mA		
Isolation input - output:			
Rated voltage (tested for 1 Minute)	P6L24xxCS: 1600 V_{DC}, at ≤ 1 mA		
	P6L24xxCD: 1500 V_{DC}, at ≤ 1 mA		
Resistance	≥ 10^9 Ω, measured @ 500 V_{DC}		
Capacitance	1000 pF, typ.		
Output			
Voltage tolerance	≤ ± 3 %, load range 5…100 %		
Voltage load regulation	≤ ± 1.5 %, at 5 %...100 % load		
Voltage cross balance (dual outputs)	≤ ± 1.5 %, at balanced load		
Voltage cross deviation (dual outputs)	≤ ± 5 %, at 50 % load difference		
Line voltage regulation	≤ ± 1.5 %, 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 %, P6L243R3Cx, P6L2405Cx ≤ 5 % all others		
Short circuit protection	Continuous, hiccup, auto restart		
Over current protection	110 %... 230 % of rated current		
Rippel & noise, BW 20MHz P6L24..CS	≤ 100 mVp-p	(see Figure 2)	
Rippel & noise, BW 20MHz P6L24..CD	≤ 150 mVp-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	P6L…CS	-40 °C … 85 °C	with derating
	P6L…CD	-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, 5g, 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 P6L	Input voltage		Output voltage		Revision	Output configuration	
PHI-CON 6 W	24	24 V	3R3	3.3 V	C	S	Single
			05	5 V		D	Dual
			09	9 V			
			12	12 V			
			15	15 V			
			24	24 V			
Example:	P6L2405CD	Pout: 6 W, Vin: 24 V (9…36 V), Vout: ±5 V					

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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 ≤ 5 %. At load asymmetry ≥ 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 Ta 25 °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

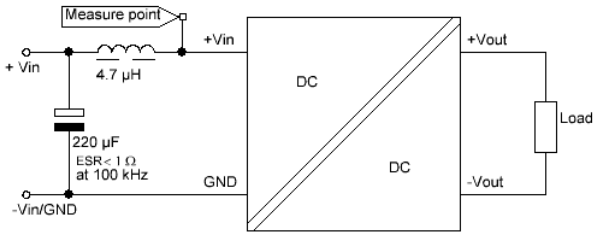
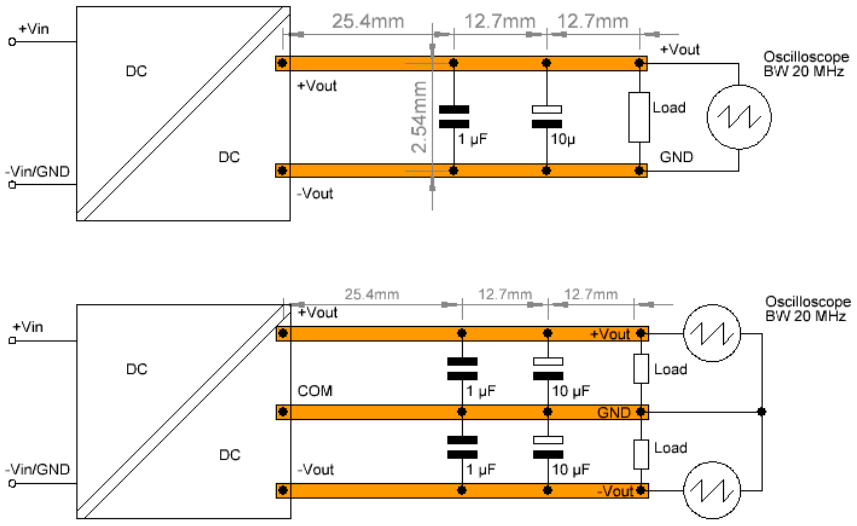


Figure 2 Measure circuit output ripple & noise voltage



Figures 3 Typical application circuit

The P6L 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).

Figure 3a

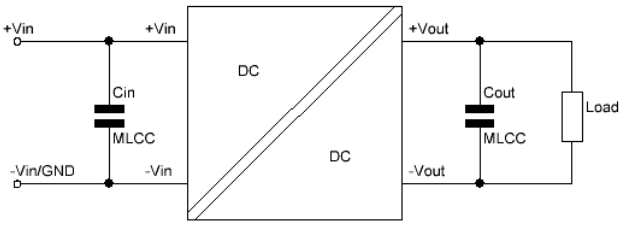
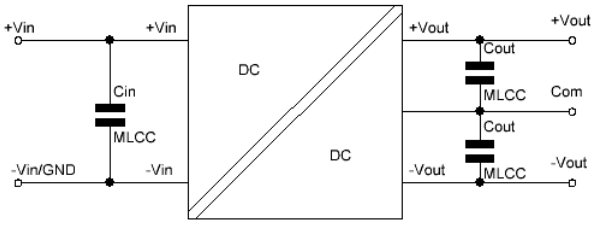


Figure 3b



Recommended peripheral components to figure 3a & 3b		
Vin type	Cin	Cout
P6L24xxCS	100 µF, 50 V	22 µF
P6L24xxCD	100 µF, 50 V	2 x 22 µF

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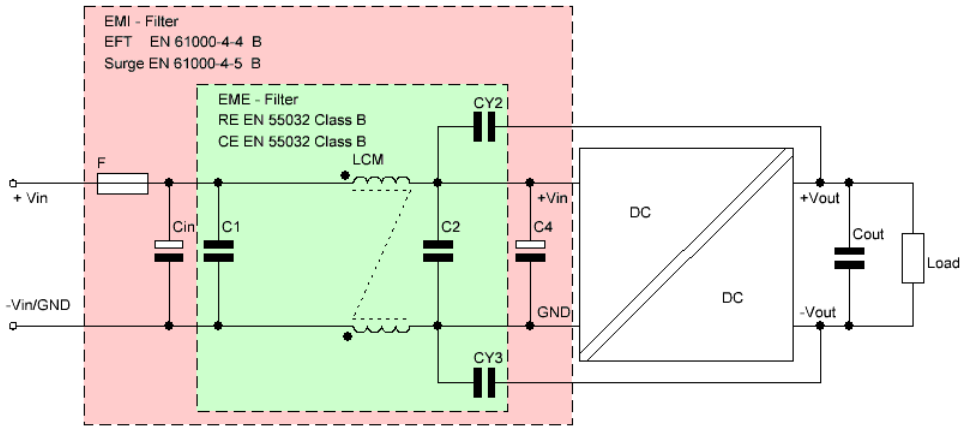
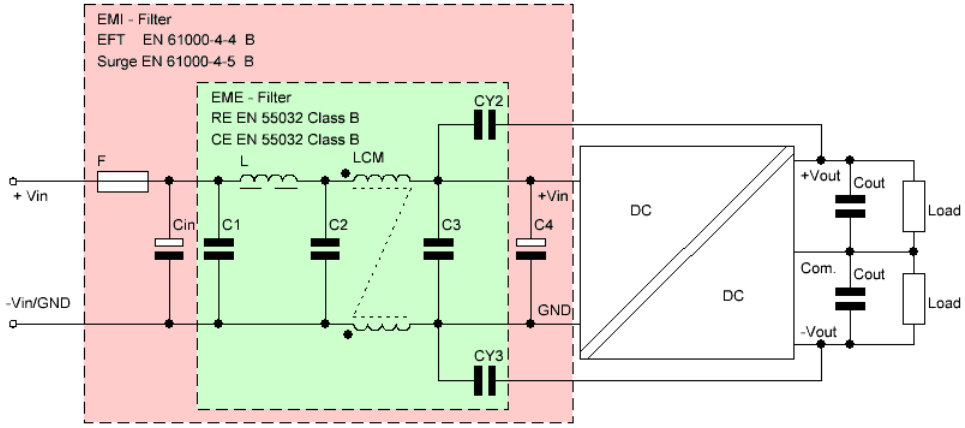
Figures 4a & b

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

Single output application



Dual output application



Recommended peripheral components to circuits in figures 4 a & b								
Type	Fuse Time delay type	Cin, C4	C1, C2	L	LCM	C3	CY	Cout
P6L24xxCS	2 A	330 µF, 100 V	10 µF, 100 V	-	0.47 mH	-	1 nF, 2 kV	See table Figure 3
P6L24xxCD	2 A	330 µF, 100 V	10 µF, 100 V	10 µH	1.5 mH	10 µF, 50 V	1 nF, 2 kV	

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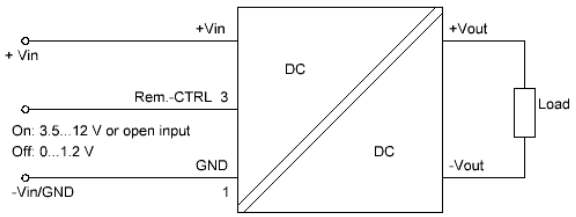
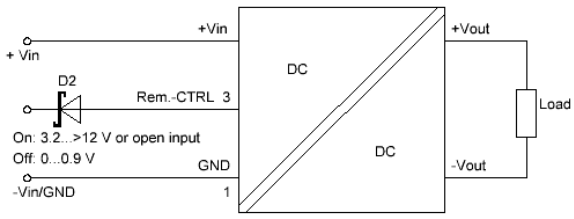
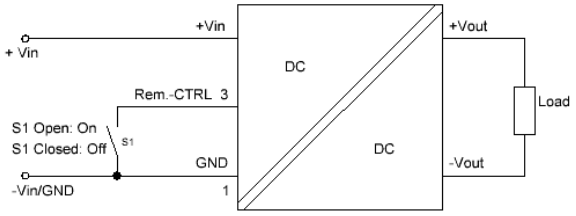
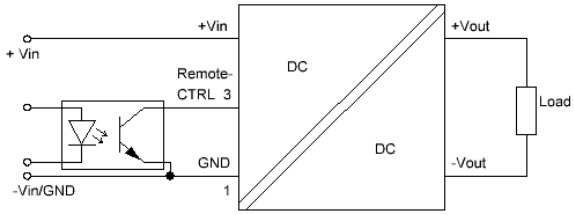
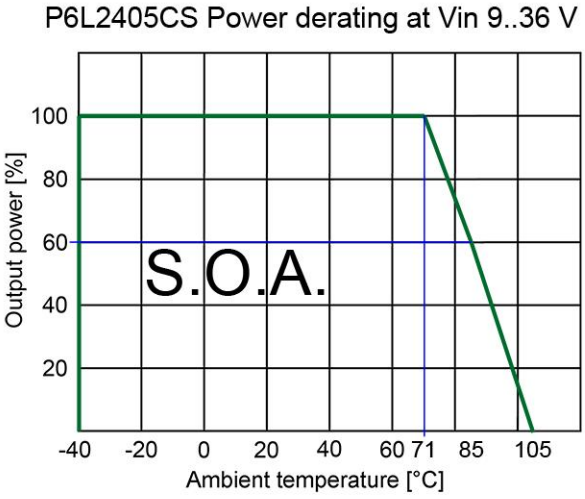
Figure 5 Remote control application circuits

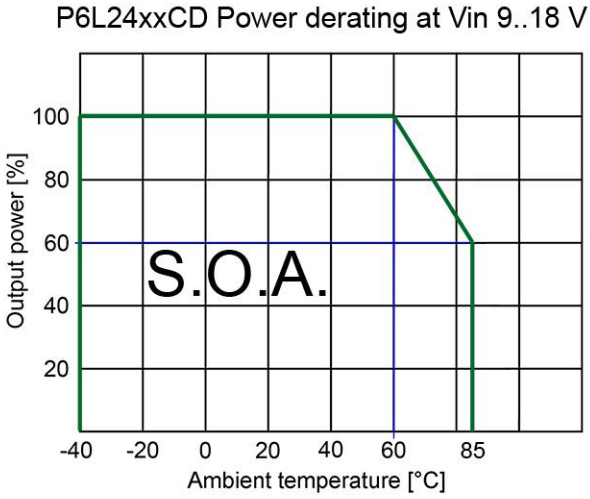


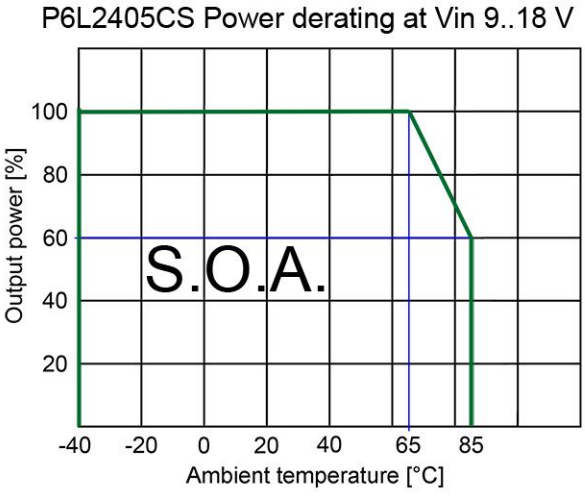


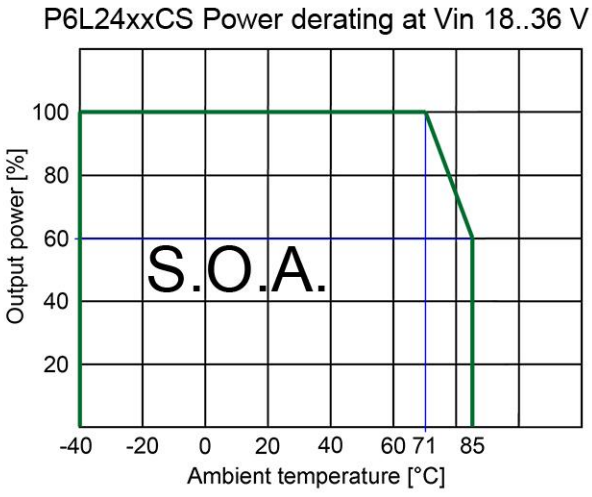












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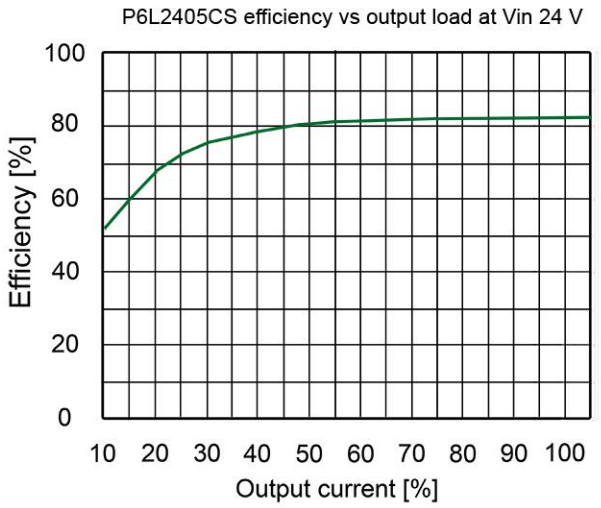
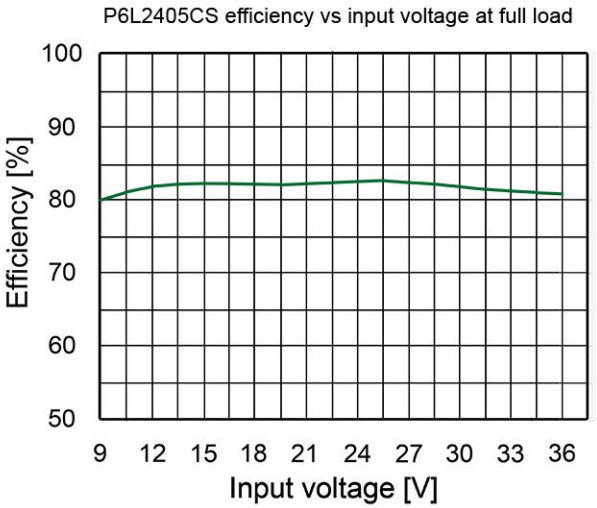
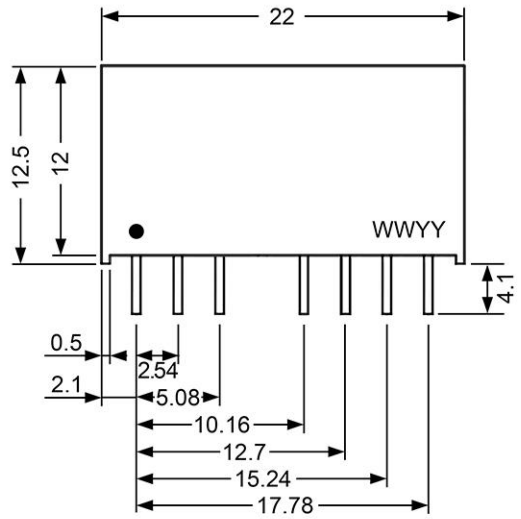
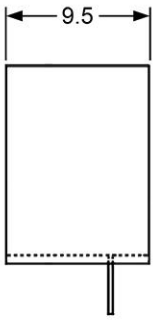


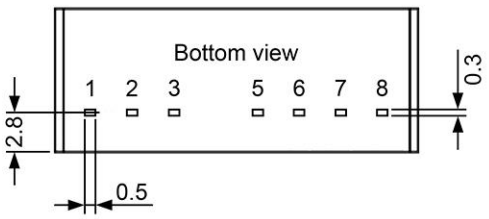


Mechanical dimensions





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



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

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