30 W DC-DC Converter P30HxxxxCx-Series

PHI-CON

- Wide 4:1 input range
- Efficiency up to 90 %
- Adjustable output voltage
- Remote control on / off
- 1500 V_{DC} isolation
- Continuous short circuit protection
- Over voltage protection
- -40...+80 °C operating temperature range

Model guide

Type	Input voltage		Input current		Output voltage	Output current		Efficiency @ full load	Capacitive load (see note 1)
	Nominal [V_{DC}]	Range [V_{DC}]	no load [mA] typ.	full load [mA] typ.	[V_{DC}]	minimum load [mA] typ.	maximum load [mA] typ.	[%] typ.	[µF] max.
Single output									
P30H243R3CS	24	9...36	60	1000	3.3	0	6000	85	10000
P30H2405CS	24	9...36	60	1400	5	0	6000	88	10000
P30H2409CS	24	9...36	6	1400	9	0	3333	88	4700
P30H2412CS	24	9...36	6	1400	12	0	2500	90	2700
P30H2415CS	24	9...36	6	1400	15	0	2000	90	1680
P30H2424CS	24	9...36	6	1400	24	0	1250	90	680
P30H483R3CS	48	18...75	20	500	3.3	0	6000	86	10000
P30H4805CS	48	18...75	20	700	5	0	6000	88	10000
P30H4812CS	48	18...75	5	700	12	0	2500	88	2700
P30H4815CS	48	18...75	5	700	15	0	2000	89	1680
P30H4824CS	48	18...75	5	700	24	0	1250	89	680
Dual output									
P30H2405CD	24	9...36	60	1400	±5	0	±3000	86	2 x 2000
P30H2412CD	24	9...36	6	1400	±12	0	±1250	89	2 x 1250
P30H2415CD	24	9...36	6	1400	±15	0	±1000	89	2 x 680
P30H2424CD	24	9...36	6	1400	±24	0	±625	89	2 x 470
P30H4805CD	48	18...75	20	700	±5	0	±3000	86	2 x 2000
P30H4812CD	48	18...75	5	700	±12	0	±1250	88	2 x 1250
P30H4815CD	48	18...75	5	700	±15	0	±1000	88	2 x 680

Specifications

Input	
Under voltage lockout	P30H24xxCS: 5.5 V_{DC}
	P30H48xxCS: 12 V_{DC}
Start up voltage	P30H24xxCS: 9 V_{DC}
	P30H48xxCS: 18 V_{DC}
Filter	π - type
Reflected ripple current	40 mAp-p, typ. (see Figure 1)
Remote control theshold	On: 3.5…12 V_{DC}, or open input
	Off: 0…1.2 V_{DC}
Off state idle supply current	8 mA, max.
Rated isolation voltage	
Input / output (1 Min. tested)	1500 V_{DC}, min.
Resistance	> 10^9 Ω, measured @ 500 V_{DC}
Input / output capacitance	2000 pF, typ. @ 100 kHz, 0.1V
Output	
Voltage tolerance	± 1 %, typ. @ full load range ± 3 %, max. @ 5…100 % load ± 5 %, max. @ 0…5 % load
Line regulation, positive output	± 0.5 %, max @ full Vin range
Line regulation, negative output	± 1 %, max @ full Vin range
Load regulation, positive output	± 1 %, max. @ 5..100 % load
Load regulation, negative output	± 1.5 %, max. @ 5..100 % load
Dual output cross regulation	± 5 %, max. @ 50 % load +Vout and 10…100 % load -Vout
Temperature coefficient	± 0.03 % / °C
Transient recovery time	< 500 µs, @ 25 % load change steps
Transient response deviation	P30Hxx3R3CS, P30Hxx05Cx < 8 %, @ 25 % load change steps
	Oll others < 5 %, @ 25 % load change steps
Short circuit protection	Continuous, hiccup
Short circuit restart	Automatic
Output voltage trim range	± 10 %
Rippel & noise, BW 20MHz (see Figure 2)	Single output: 100 mVp-p, max.
	Dual output: 150 mVp-p, max.
Over current protection	110…190 % of full load
Over voltage protection	110…160 % of nominal Vout

General		
Start up time		10 ms, typ @ constant R-load
Switching frequency		300 kHz, typ.
Reliability calculated MTBF MIL-HDBK-217F @ 25 °C		> 1 Mio. hours
EMC characteristics		
Radiated emissions		CISPR32 / EN55032 Class A
Radiated emissions, see Fig. 2		CISPR32 / EN55032 Class B
Conducted emissions		CISPR32 / EN55032 Class A
Conducted emissions, see Fig. 2		CISPR32 / EN55032 Class B
ESD, contact ± 4kV		EN61000-4-2 perf. crit. B see Fig. 2
RS 10 V/m		EN61000-4-3 perf. crit. A
EFT ±2 kV		EN61000-4-4 perf. crit. B see Fig. 2
Surge ±2 kV		EN61000-4-5 perf. crit. B see Fig. 2
CS 3 Vrms		EN61000-4-6 perf. crit. A
Environmental		
Operating ambient temperature		-40 … 80 °C with derating
Case temperature		105 °C, max.
Storage temperature		-55 … 125 °C
Storage humidity		5…95 %, non condensing
Cooling		Free air convection
Vibration		10…55 Hz,10 g, 30 Min. along X, Y, Z axis
Physical		
Dimensions	without heatsink	50.8 x 25.4 x 11.8 mm
	with heatsink	51.4 x 26.2 x 16.5 mm
Weight	without heatsink	26 g
	with heatsink	34 g
Case material		Aluminium alloy
Potting Material		Epoxy (UL94V-0 rated)
Absolute max. ratings		
Pin soldering temperature		≤ 300 °C for ≤ 10 sec ≥ 1.5 mm distance from body
Max. input voltage < 1 s		P30H24xxCx: -0.7…50 V_{DC}
		P30H48xxCx: -0.7…100 V_{DC}

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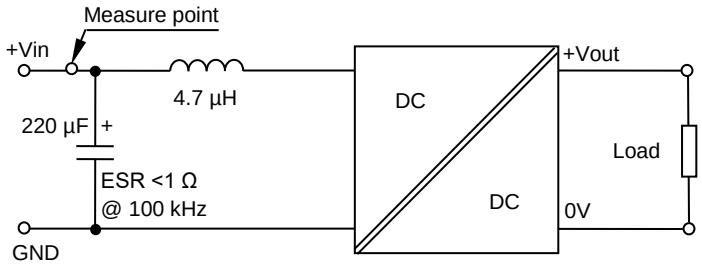
PHI-CON

Odering information															
		Output power		Series designation	Input voltage range		Output voltage		Revision	Output configuration		Case option	
P	PHI-CON	**30**	30 W	**H**	**24**	9…36 V	**3R3**	3.3 V	**C**	**S**	single output	**blank**	standard
					48	36…75 V	**05**	5 V		**D**	± dual output	**K**	heatsink
							12	12 V					
							15	15 V					

Notes:
1. Maximum capacitive load is tested at input voltage range and full load.
2. All specifications measured at Ta 25 °C, humidity < 75 %, nominal input voltage and rated output load unless otherwise specified.
3. Specifications of this product are subject to changes without prior notice.
4. It is not recommended to increase the output power capability by connecting two or more converters in parallel.
5. The converters are not hot swappable.

Figure 1 Input reflected ripple current measure circuit



The input reflected ripple current is measured with inductor Lin and capacitor Cin to simulate source impedance.

Figure 2a Output ripple & noise parallel strip line measurement method

Single output

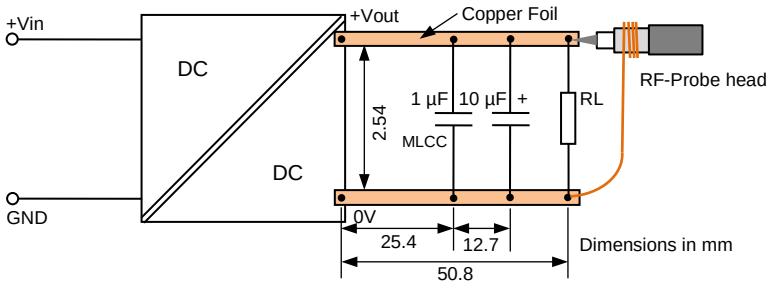


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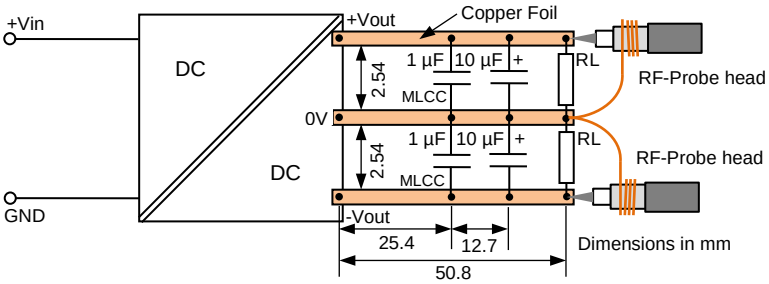
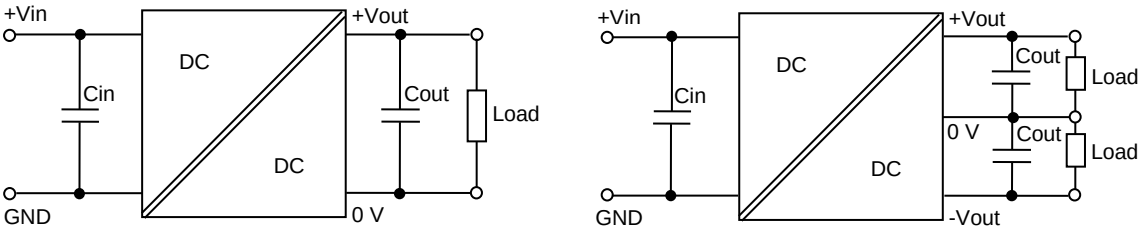
Figure 2b Output ripple & noise parallel strip line measurement method

Dual output



Figures 3 Typical application circuits



Recommended peripheral components to figure 3		
Type	Cout	Cin
P30Hxx3R3CS	220 µF	100 µF
P30Hxx05CS	220 µF	
P30Hxx09CS	220 µF	
P30Hxx12CS	100 µF	
P30Hxx15CS	100 µF	
P30Hxx24CS	100 µF	
P30Hxx05CD	2 x 220 µF	
P30Hxx12CD	2 x 220 µF	
P30Hxx15CD	2 x 220 µF	
P30Hxx24CD	2 x 100 µF	

The P30HxxxxCx series is been tested according to the following recommended test circuit before leaving the factory (see Figures 3).
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 right column)

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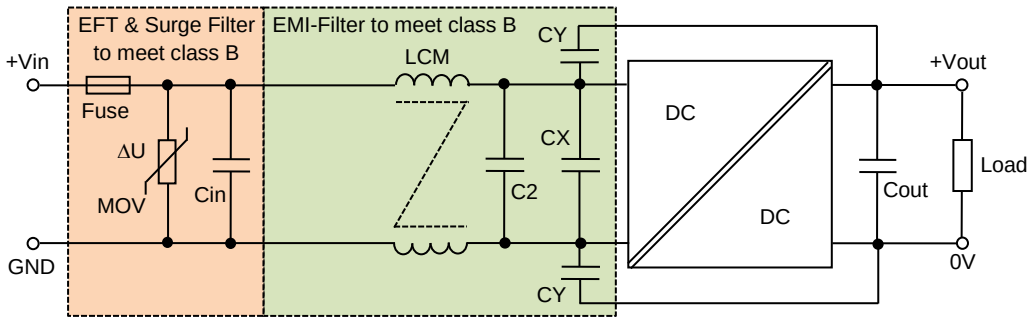
30 W DC-DC Converter P30HxxxxCx-Series

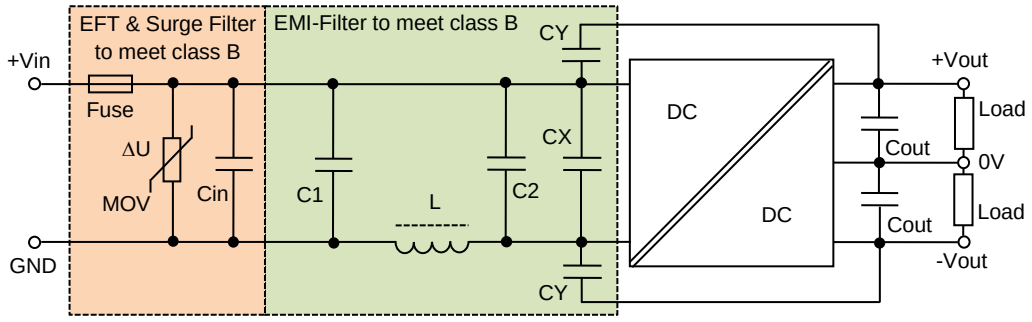
Recommended EMC circuit for higher performance of class B

Figure 4a single output



Recommended peripheral components to circuits in figure 4a, single output version								
Type	Fuse time delayed type	MOV Type	Cin	C2	CX	LCM	CY	Cout
P30H243R3CS	5 A	S20K30	680 µF, 50 V	4.7 µF, 50 V	330 µF, 50V	1 mH	1 nF, 2 kV	220 µF
P30H2405CS								
P30H2409CS								
P30H2412CS	5 A	S20K30	680 µF, 50 V	4.7 µF, 50 V	330 µF, 50V	1 mH	1 nF, 2 kV	100 µF
P30H2415CS								
P30H2424CS								
P30H483R3CS	2.5 A	S14K60	330 µF, 100 V	2.2 µF, 100 V	330 µF, 100 V	1 mH	1 nF, 2 kV	220 µF
P30H4805CS								
P30H4809CS								
P30H4812CS	2.5 A	S14K60	330 µF, 100 V	2.2 µF, 100 V	330 µF, 100 V	1 mH	1 nF, 2 kV	100 µF
P30H4815CS								
P30H4824CS								

Figure 4b dual output



Recommended peripheral components to circuits in figure 4b, dual output version									
Type	Fuse time delayed type	MOV Type	Cin	C1	C2	CX	L	CY	Cout
P30H2405CD	5 A	S20K30	680 µF, 50 V	2.2 µF, 50 V	4.7 µF, 50 V	330 µF, 50V	3.3 µH	1 nF, 2 kV	220 µF
P30H2412CD									
P30H2415CD									
P30H2424CD	5 A	S20K30	680 µF, 50 V	2.2 µF, 50 V	4.7 µF, 50 V	330 µF, 50V	3.3 µH	1 nF, 2 kV	100 µF
P30H4805CD	2.5 A	S14K60	330 µF, 100 V	2.2 µF, 100 V	2.2 µF, 100 V	330 µF, 100 V	3.3 µH	1 nF, 2 kV	220 µF
P30H4812CD									
P30H4815CD									

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Figure 5 Application circuit remote control

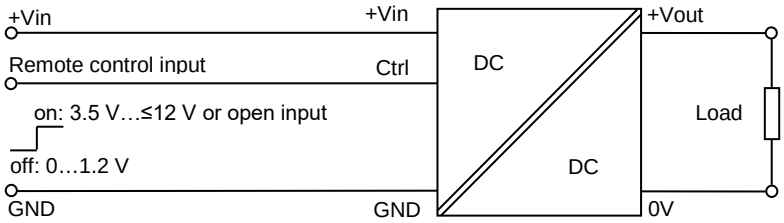
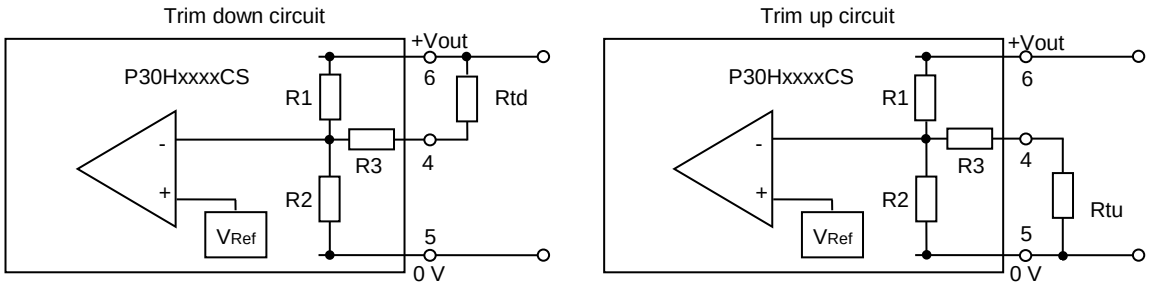


Figure 6 Application circuit to output voltage trimming



Calculation for trim down resistor (Rtd) or trim up resistor (Rtu)						
Model series	R1 [kΩ]	R2 [kΩ]	R3 [kΩ]	V Ref [V]	Rtd min. [kΩ]	Rtu min. [kΩ]
P30Hxx3R3CS	4.801	2.87	12.4	1.24	11.75	6.43
P30Hxx05CS	2.883		10	2.5	1.27	4.75
P30Hxx09CS	7.5		15		30	6.63
P30Hxx12CS	11		15		56	9.6
P30Hxx15CS	14.494		15		83	11.4
P30Hxx24CS	24.872		17.8		167.5	10
Maximum output voltage adjust range ± 10 % of Vout nominal, see min. Rtd / Rtu						

Trim down resistor formula

$$b = \frac{Vout - Vref}{Vref} * R2$$

$$Rtd = \frac{R1 * b}{R1 - b} - R3$$

Trim up resistor formula

$$a = \frac{Vref}{Vout - Vref} * R1$$

$$Rtu = \frac{R2 * a}{R2 - a} - R3$$

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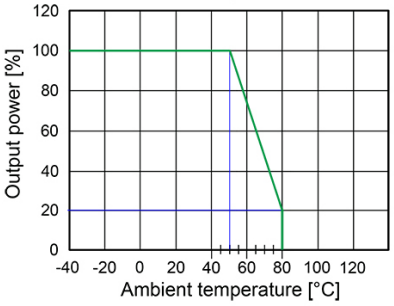
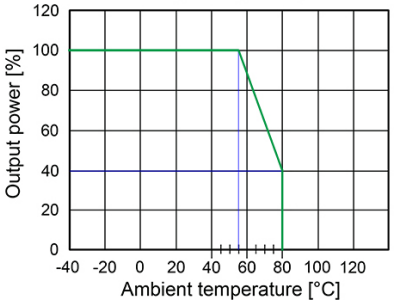
30 W DC-DC Converter P30HxxxxCx-Series

PHI-CON

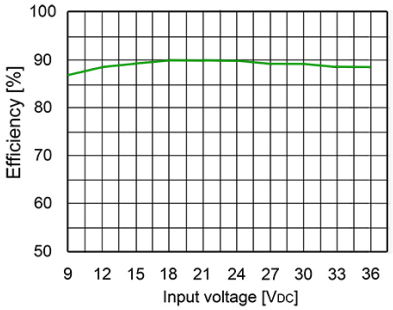
Temperature vs power derating
without heat sink at air convection 20 LFM
P30Hxx3R3CS, P30Hxx05CS



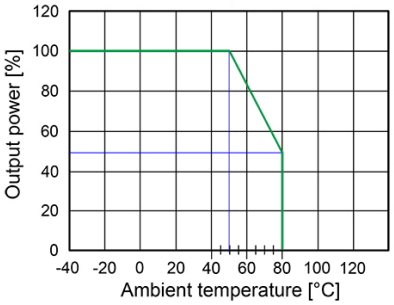
Temperature vs power derating
without heat sink at air convection 20 LFM
P30Hxx09CS, -xx12CS, -xx15CS, -xx24CS



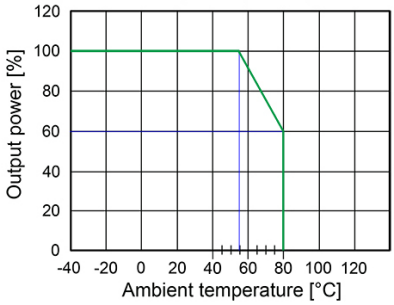
P30H2405CS Efficiency vs input voltage



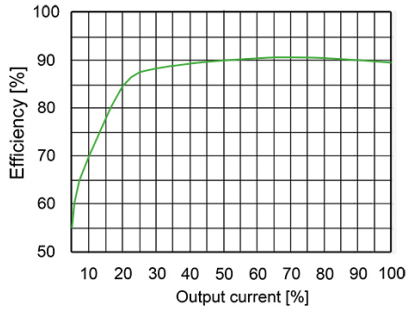
Temperature vs power derating
without heat sink at air convection 100 LFM
P30Hxx3R3CS, P30Hxx05CS



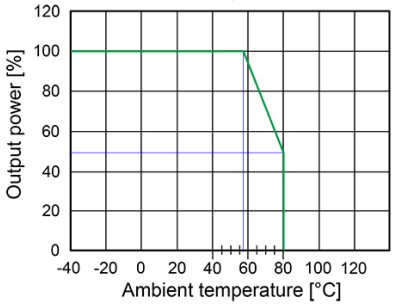
Temperature vs power derating
without heat sink at air convection 100 LFM
P30Hxx09CS, -xx12CS, -xx15CS, -xx24CS



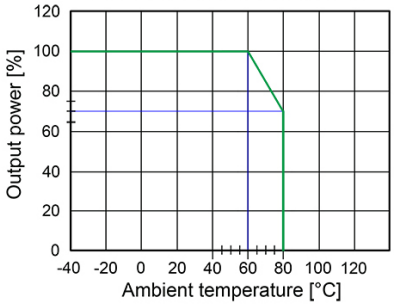
P30H2405CS Efficiency vs output load



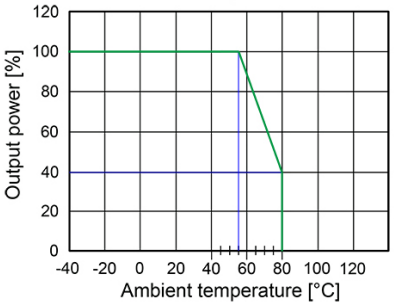
Temperature vs power derating
without heat sink at air convection 200 LFM
P30Hxx3R3CS, P30Hxx05CS



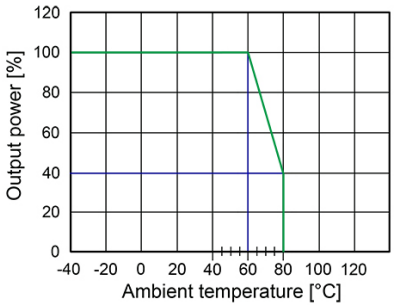
Temperature vs power derating
without heat sink at air convection 200 LFM
P30Hxx09CS, -xx12CS, -xx15CS, -xx24CS



Temperature vs power derating
with heat sink at air convection 20 LFM
P30Hxx3R3CSK, P30Hxx05CSK



Temperature vs power derating
with heat sinkat air convection 20 LFM
P30Hxx09CS, -xx12CSK, -xx15CSK, -xx24CSK



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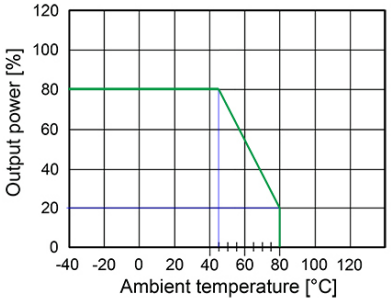
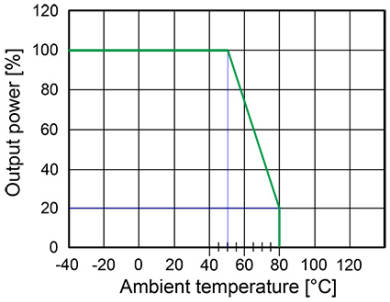
Temperature vs power derating at dual output DC/DC-Converter

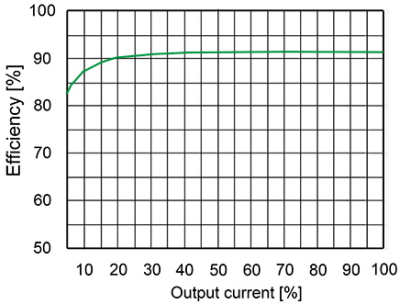
P30H2405CD, P30H2424CD at Vin 9...18 V
P30H4805CD at Vin 18...36 V
without heat sink at air convection 20 LFM



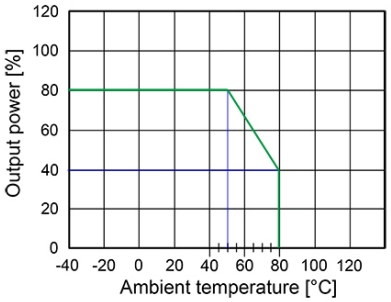
P30H2405CD, P30H2424CD at Vin 18...36 V
P30H4805CD at Vin 36...75 V
P30H2412CD, -2415CD, -4812CD, -4815CD at full Vin range
without heat sink at air convection 20 LFM



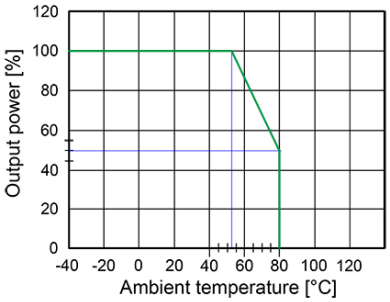
P30H4815CD Efficiency vs output load



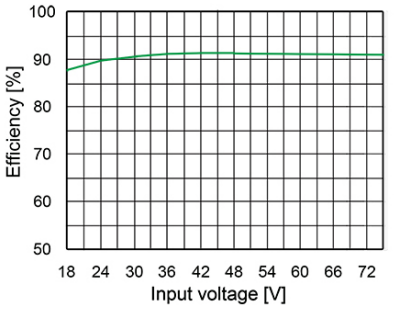
P30H2405CD, P30H2424CD at Vin 9...18 V
P30H4805CD at Vin 18...36 V
without heat sink at air convection 100 LFM



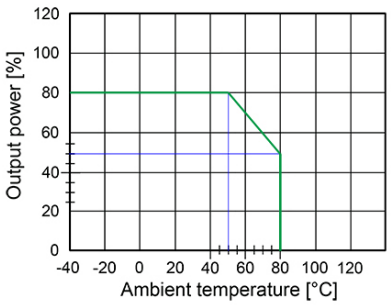
P30H2405CD, P30H2424CD at Vin 18...36 V
P30H4805CD at Vin 36...75 V
P30H2412CD, -2415CD, -4812CD, -4815CD at full Vin range
without heat sink at air convection 100 LFM



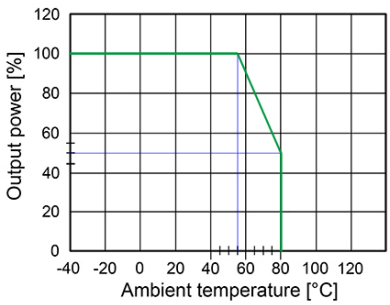
P30H4815CD Efficiency vs input voltage



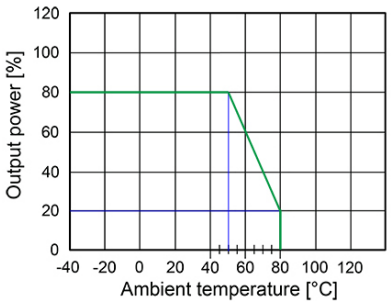
P30H2405CD, P30H2424CD at Vin 9...18 V,
P30H4805CD at Vin 18...36 V
without heat sink at air convection 200 LFM



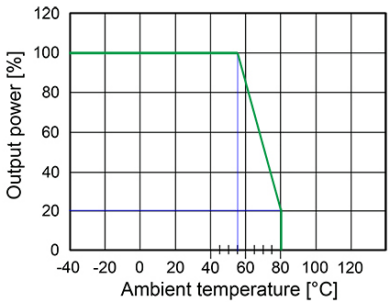
P30H2405CD, P30H2424CD at Vin 18...36 V
P30H4805CD at Vin 36...75 V
P30H2412CD, -2415CD, -4812CD, -4815CD at full Vin range
without heat sink at air convection 200 LFM



P30H2405CDK, P30H2424CDK at Vin 9...18 V,
P30H4805CDK at Vin 18...36 V
with heat sink at air convection 20 LFM



P30H2405CDK, P30H2424CDK at Vin 18...36 V
P30H4805CDK at Vin 36...75 V
P30H2412CDK, -2415CDK, -4812CDK, -4815CDK at full Vin range
without heat sink at air convection 20 LFM



HY-LINE® POWER COMPONENTS

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Inselkammerstraße 10
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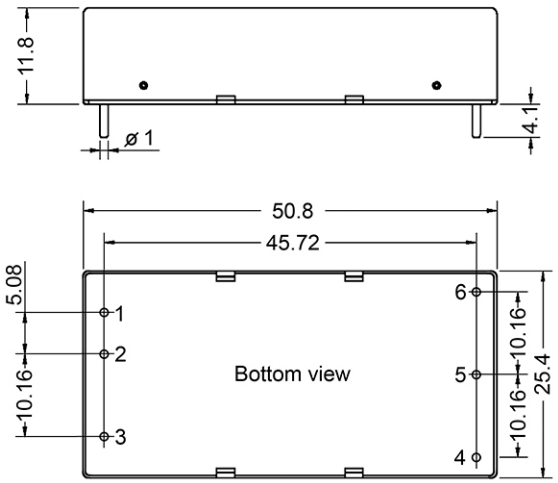
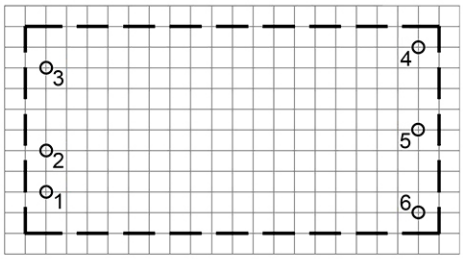
30 W DC-DC Converter P30HxxxxCx-Series

PHI-CON

Dimensions standard version



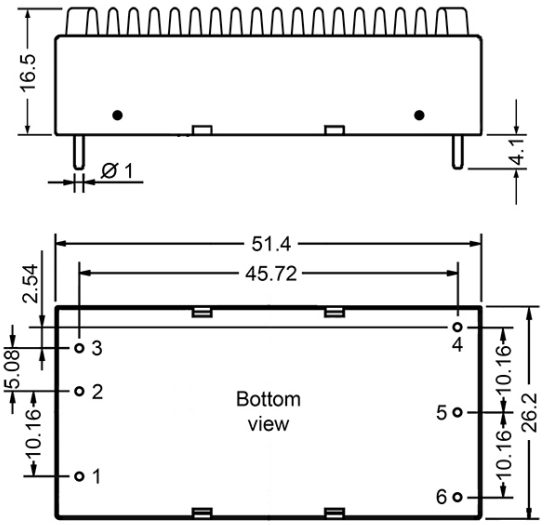
Footprint top view



Pitch 2.54 mm
Recommended hole diameter ø 1.5 mm

Pin assignment		
	single	dual
1	+ Vin	+ Vin
2	GND	GND
3	CTRL	CTRL
4	Trim	- Vo
5	0 V	0 V
6	+ Vo	+ Vo

Dimensions heatsink version



Unit: mm
Pin diameter tolerance:± 0.1 mm
Pin height tolerance:± 0.5 mm
General tolerances:± 0.3 mm

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