

20 W DC-DC Converter P20HxxxxCx-Series

- 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
- Standard package 2" x 1" x 0.4"



Model guide

Type	Input voltage		Input current		Output voltage [V _{DC}]	Output current		Efficiency @ full load [%] typ.	Capacitive load (see note 2) [μF] max.
	Nominal [V _{DC}]	Range [V _{DC}]	no load [mA]	full load [mA]		Min. [mA]	Max. [mA]		
P20H243R3CS	24	9...36	40	800	3.3	0	5000	86	10000
P20H2405CS	24	9...36	60	916	5	0	4000	90	10000
P20H2409CS	24	9...36	18	947	9	0	2222	88	4700
P20H2412CS	24	9...36	15	937	12	0	1667	89	1600
P20H2415CS	24	9...36	15	926	15	0	1333	90	1000
P20H2424CS	24	9...36	20	927	24	0	834	90	500
P20H483R3CS	48	18...75	35	400	3.3	0	5000	86	10000
P20H4805CS	48	18...75	35	463	5	0	4000	90	10000
P20H4812CS	48	18...75	10	468	12	0	1667	89	1600
P20H4815CS	48	18...75	10	463	15	0	1333	90	1000
P20H4824CS	48	18...75	10	463	24	0	834	90	500
P20H2405CD	24	9...36	20	969	±5	0	±2000	86	2 x 4800
P20H2409CD	24	9...36	20	969	±9	0	±1111	88	2 x 1000
P20H2412CD	24	9...36	15	948	±12	0	±834	88	2 x 800
P20H2415CD	24	9...36	15	947	±15	0	±667	88	2 x 625
P20H4805CD	48	18...75	18	485	±5	0	±2000	86	2 x 4800
P20H4812CD	48	18...75	14	474	±12	0	±834	88	2 x 800
P20H4815CD	48	18...75	14	468	±15	0	±667	89	2 x 625

With suffix "K" heatsink version

Specifications

Input	
Start up voltage	P20H24xxCx: ≤9 V _{DC} P20H48xxCx: ≤18 V _{DC}
Under voltage lockout	P20H24xxCx: ≥5.5 V _{DC} P20H48xxCx: ≥14 V _{DC}
Filter	π – type
Reflected ripple current	30 mA _{p-p} , typ. (see figure 2)
Remote control threshold	On state 3.5...12 V _{DC} , or open input
	Off state 0...1.2 V _{DC}
Input idle current @ Off state	4 mA, typ., <7 mA
Isolation input - output:	
Rated voltage (tested 60 s @ ≤1 mA leakage current)	1500 V _{DC}
Resistance	> 10 ⁹ Ω, measured @ 500 V _{DC}
Input / output capacitance	All others 1000 pF, typ. @ 100 kHz, 0.1 V
	P20C2424CS 2000 pF, typ. @ 100 kHz, 0.1 V
Output	
Output voltage tolerance	≤ ±3 % @ 0...100 % load range
Output voltage load regulation	≤ ±1 % deviation, 5...100 % load
Output voltage trim range	± 10 %, typ.
Dual output voltage cross balance	≤ ±5 %, @ 90 % load difference
Output voltage Vin regulation	≤ ±1 % deviation @ full Vin range
Temperature coefficient	± 0.03 % / °C
Transient recovery time	≤ 500 μs, @ 25 % load change steps
Transient response deviation @ 25 % load change steps	P20Hxx3R3Cx, P20Hxx05Cx: <8 % All others: <5 %
Over voltage protection via integrated Z-Diode	110...160 %
Over current protection	110...190 %
Short circuit protection	Continuous, hiccup
Short circuit restart	Automatic
Ripple & noise, BW 20 MHz	≤100 mV _{p-p} @ 5...100 % load range (see fig. 3)
Start up time	10 ms, typ @ R-load

General	
Safety standard	IEC-, UL-, EN60950-1
Switching frequency (PWM)	270 kHz, typ.
Reliability calculated MTBF MIL-HDBK-217F @ 25 °C	> 1 Mio. h
Vibration along X, Y and Z axis	10...55 Hz, 10 g, 30 minutes
EMC characteristics	
Radiated emissions (see fig. 1)	CISPR22 / EN55022 Class A
Conducted emissions (see fig.1)	CISPR22 / EN55022 Class A
Radiated emissions (see fig. 4)	CISPR22 / EN55022 Class B
Conducted emissions, (see fig. 4)	CISPR22 / EN55022 Class B
ESD, contact ±4 kV (see fig. 4)	IEC-, EN61000-4-2 perf. crit. B
RS, 10 V/m	IEC-, EN61000-4-3 perf. crit. A
EFT, ±2 kV, (see fig. 4)	IEC-, EN61000-4-4 perf. crit. B
Surge, line to line ±2 kV (see fig. 4)	IEC-, EN61000-4-5 perf. crit. B
Conducted surge 3 Vrms	IEC-, EN61000-4-6 perf. crit. A
Voltage dips, short interruptions and voltage variations immunity, 0...70 %	IEC-, EN61000-4-29 perf. crit. B
Environmental	
Operating ambient temperature	-40 ... 85 °C with derating
Case temperature	105 °C, max.
Storage temperature	-55 ... 125 °C
Over temp. protection	Case temp. 110 °C, typ
Storage humidity	5...95 %, non condensing
Cooling	Free air convection
Physical	
Dimensions	without heatsink 50.80 x 25.40 x 11.8 mm
	with heatsink 50.80 x 25.40 x 16.3 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 sec	P20H24xxCx -0.7...50 V _{DC}
	P20H48xxCx -0.7...100 V _{DC}

20 W DC-DC Converter P20HxxxxCx-Series

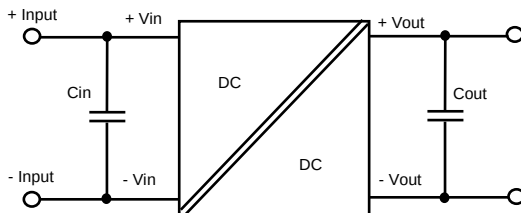
Note:

1. The recommended unbalanced load of dual output converter should be low than 5 %. If the load asymmetry greater than 5 %, it may not be guaranteed to meet all specifications listed. Please contact our technical support for more details.
2. Maximum capacitive load is tested at full input voltage range and full load current.
3. All specifications measured at Ta 25 °C, humidity < 75 %, nominal input voltage and rated output load current unless otherwise specified.
4. Specifications of this product are subject to changes without prior notice.
5. It is not recommended to increase the output power capability by connecting two or more converters in parallel.
6. The converters are not hot swappable

1) Recommended circuit

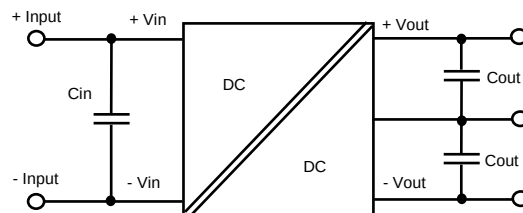
The P20H series is been tested according to the following recommended test circuit before leaving the factory (see Figures 1). If you want to further decrease the input / output ripple, you can increase a capacitance values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the maximum load capacitance value (see „Model guide“ table).

Figure 1a



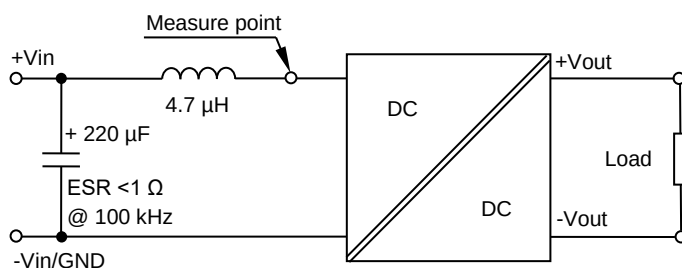
Recommended peripheral components to figure 1a		
	Cin	Cout
P20Hxx3R3CS	100 µF	470 µF
P20Hxx05CS		470 µF
P20Hxx09CS		220 µF
P20Hxx12CS		220 µF
P20Hxx15CS		220 µF
P20Hxx24CS		100 µF

Figure 1b



Recommended peripheral components to figure 1b		
	Cin	Cout
P20Hxx05CD	100 µF	220 µF
P20Hxx09CD		100 µF
P20Hxx12CD		
P20Hxx15CD		

Figure 2 Measure circuit input reflected ripple current



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

20 W DC-DC Converter P20HxxxxCx-Series

Figure 3 Measure circuit input reflected ripple

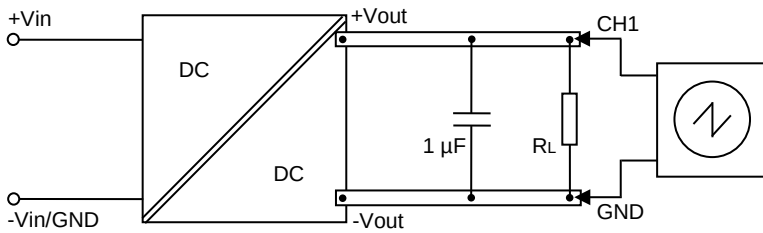
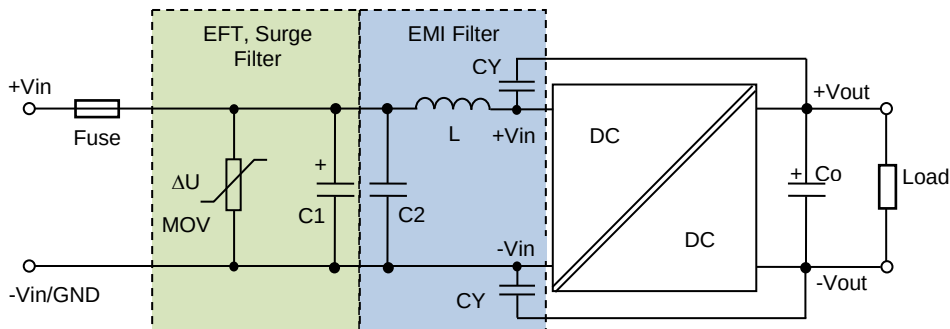
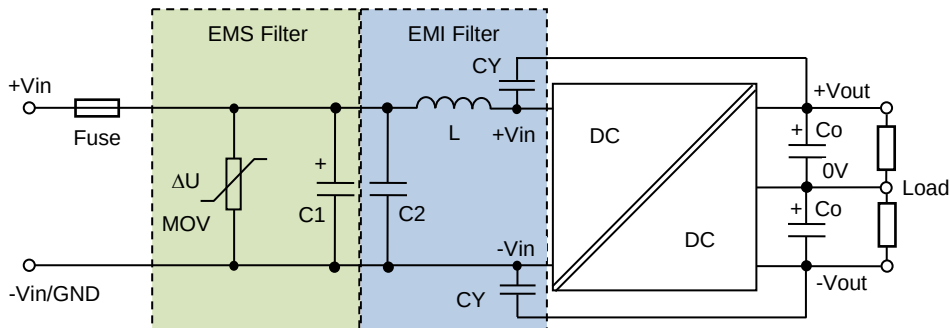


Figure 4, EMC filter circuit for IEC/EN61000-4-4, IEC/EN61000-4-5 performance criteria B and EN55022 Class B Single output



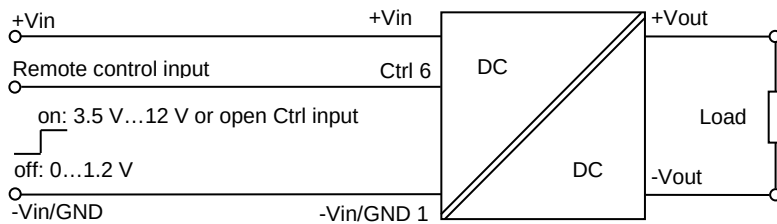
Dual output



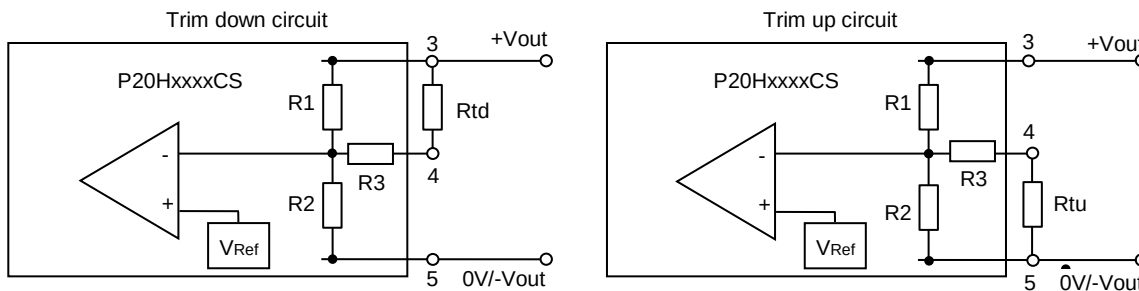
Recommended peripheral components to circuits in figures 4						
Type	Fuse Slow blow	MOV Type	L	C1	C2	CY
P20H24xxCS	2.5 A	S20K30	4.7 µH	330 µF, 50 V	1 µF, 50 V	1 nF, 2 kV
P20H24xxCD	2.5 A	S20K30	4.7 µH	330 µF, 50 V	1 µF, 50 V	1 nF, 2 kV
P20H48xxCS	1.5 A	S14k60	4.7 µH	330 µF, 100 V	1 µF, 100 V	1 nF, 2 kV
P20H48xxCD	1.5 A	S14k60	4.7 µH	330 µF, 100 V	1 µF, 100 V	1 nF, 2 kV

20 W DC-DC Converter P20HxxxxCx-Series

Application circuit for remote control function



Application circuit for trimming function. Only for single output converter.



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]
P20Hxx3R3CS	4.801	2.87	12.4	1.24	11.75	6.43
P20Hxx05CS	2.883	2.87	10	2.5	1.28	4.75
P20Hxx09CS	7.5	2.87	15	2.5	30	6.63
P20Hxx12CS	11	2.87	15	2.5	56.2	9.6
P20Hxx15CS	14.494	2.87	15	2.5	83	11.36
P20Hxx24CS	24.872	2.87	17.8	2.5	167	10

Maximum output voltage adjust range $\pm 10\%$ of Vout nominal, see min. Rtd / Rtu

Trim down resistor formula

$$b = \frac{V_{out} - V_{ref}}{V_{ref}} \cdot R2$$

$$R_{td} = \frac{R1 \cdot b}{R1 - b} - R3$$

Trim up resistor formula

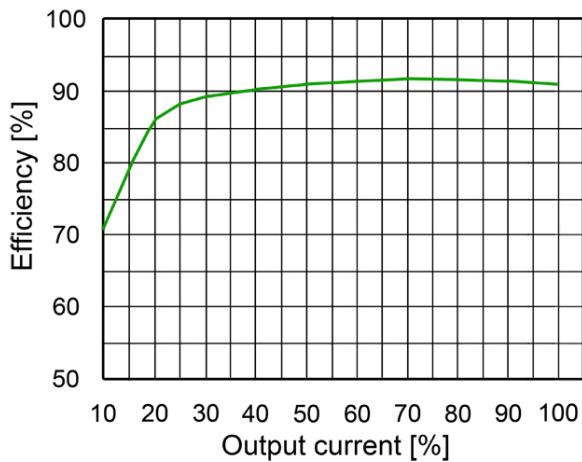
$$a = \frac{V_{ref}}{V_{out} - V_{ref}} \cdot R1$$

$$R_{tu} = \frac{R2 \cdot a}{R2 - a} - R3$$

20 W DC-DC Converter P20HxxxxCx-Series

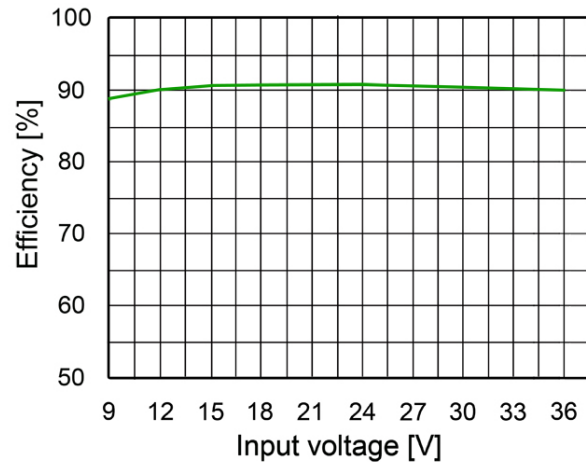
P20H2405CS

Efficiency vs output load at Vin 24 V



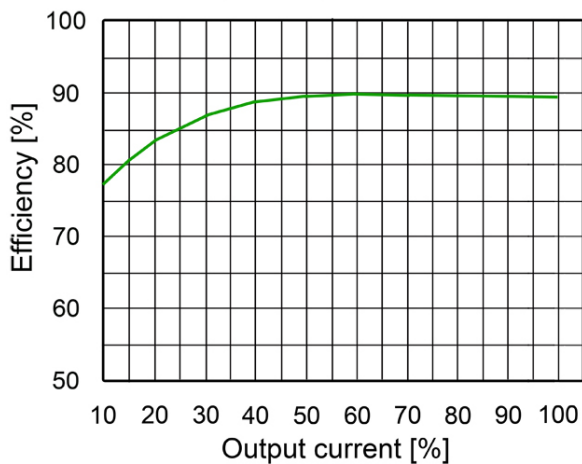
P20H2405CS

Efficiency vs input voltage at full load



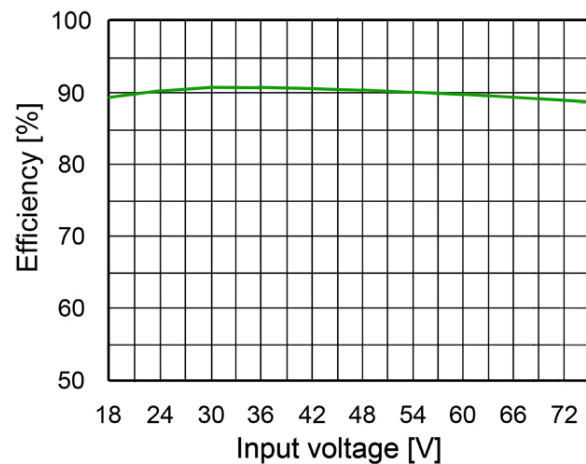
P20H4815CD

Efficiency vs output load at Vin 48 V

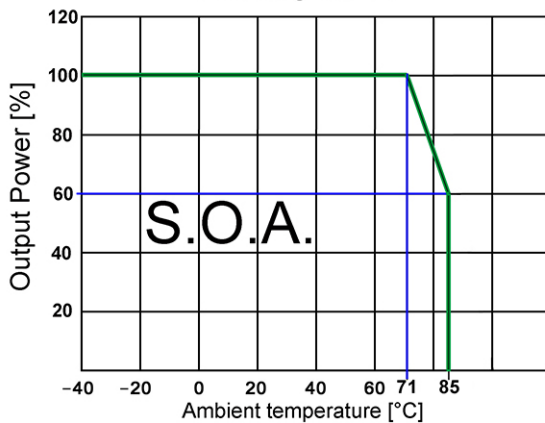


P20H4815CD

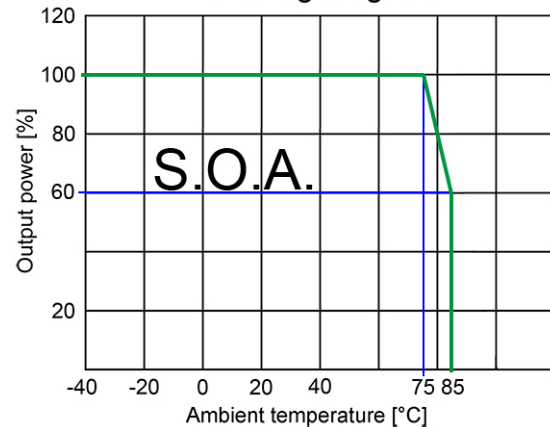
Efficiency vs input voltage at full load



Without heatsink
Derating Curve

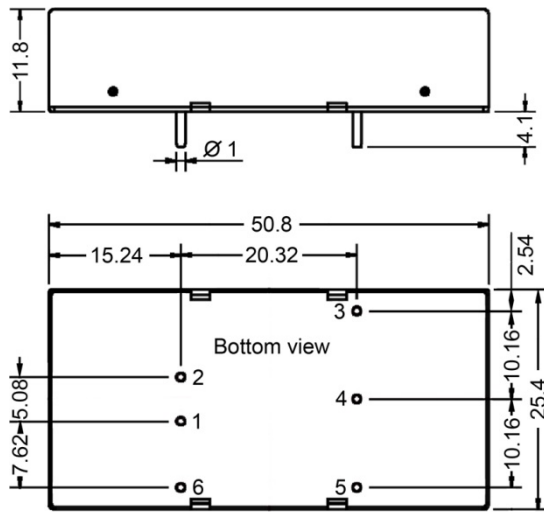


With heatsink
Derating diagram



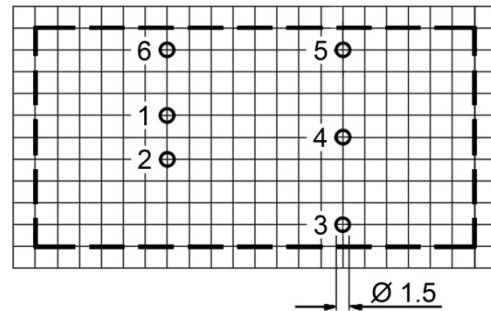
20 W DC-DC Converter P20HxxxxCx-Series

Dimensions standard version

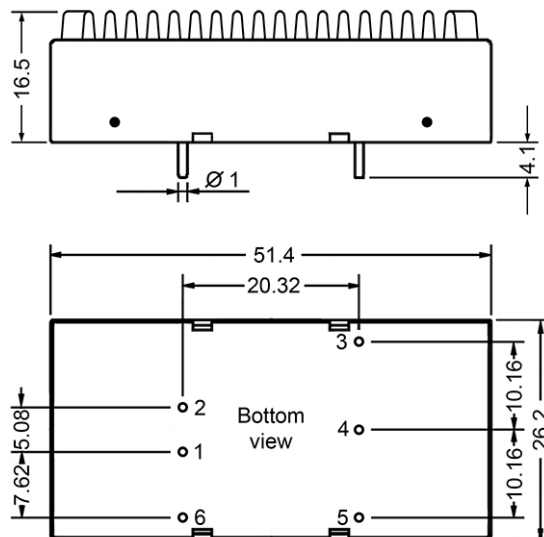


Unit: mm
 Pin diameter tolerance: 0.1 mm
 Pin height tolerance: 0.5 mm
 General tolerances: 0.5 mm

Pin Assignment		
Pin	Single	Dual
1	- Vin/GND	- Vin/GND
2	+ Vin	+ Vin
3	+ Vout	+ Vout
4	Trim	0V/Com.
5	0V/-Vout	- Vout
6	Rem Ctrl	Rem Ctrl



Dimensions heatsink version



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

PHI-CON is a trademark of HY-LINE Holding GmbH.

Only for professional use by professionals! Not for resale or distribution to the general public in any way! Read the instructions carefully before using!

Life Support Policy: HY-LINE does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user. Rev: 20180309 f