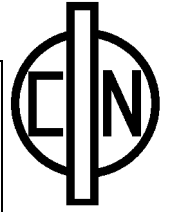


# 20W DC-DC Converter P20H-Series



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- Wide 4:1 input range
- Efficiency up to 90 %
- Adjustable output voltage
- Remote control on / off
- 1500 V<sub>DC</sub> isolation
- Continuous short circuit protection
- Over voltage protection
- Standard package 2" x 1" x 0.4"
- MTBF > 1 Mio. hours
- -40...+85 °C operating temperature range



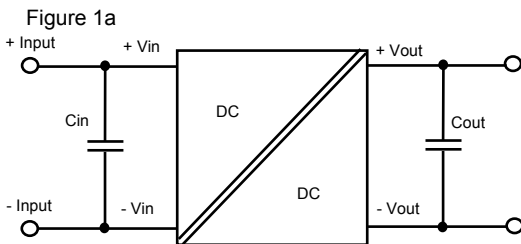
## Model guide

Type	Input nominal voltage [V <sub>DC</sub> ]	Input current		Output voltage [V <sub>DC</sub> ]	Output current		Efficiency @ full load typ. [%]	Capacitive load (see note 3) [μF] max.
		no load [mA]	full load [mA]		minimum load [mA]	maximum load [A]		
<b>Single output</b>								
P20H243R3S	9...36	40	800	3.3	250	5000	86	18700
P20H2405S	9...36	60	916	5	200	4000	90	9600
P20H2409S	9...36	18	947	9	111	2222	88	4700
P20H2412S	9...36	15	937	12	84	1667	89	1600
P20H2415S	9...36	15	926	15	67	1333	90	1000
P20H2424S	9...36	20	927	24	42	834	90	500
P20H483R3S	18...75	35	400	3.3	250	5000	86	18700
P20H4805S	18...75	35	463	5	200	4000	90	9600
P20H4812S	18...75	10	468	12	84	1667	89	1600
P20H4815S	18...75	10	463	15	67	1333	90	1000
P20H4824S	18...75	10	463	24	42	834	90	500
<b>Dual output</b>								
P20H2405D	9...36	20	969	±5	±100	±2000	86	2 x 4800
P20H2412D	9...36	15	948	±12	±42	±834	88	2 x 800
P20H2415D	9...36	15	947	±15	±33	±667	88	2 x 625
P20H4805D	18...75	18	485	±5	±100	±2000	86	2 x 4800
P20H4812D	18...75	14	474	±12	±42	±834	88	2 x 800
P20H4815D	18...75	14	468	±15	±33	±667	89	2 x 625

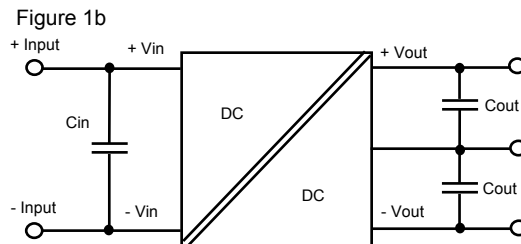
With suffix "K" heatsink version

## 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).



Recommended peripheral components to figure 1a		
	C <sub>in</sub>	C <sub>out</sub>
P20Hxx3R3S	100 μF	470 μF
P20Hxx05S		470 μF
P20Hxx09S		220 μF
P20Hxx12S		220 μF
P20Hxx15S		220 μF
P20Hxx24S		100 μF



Recommended peripheral components to figure 1b		
	C <sub>in</sub>	C <sub>out</sub>
P20Hxx05D	100 μF	220 μF
P20Hxx12D		100 μF
P20Hxx15D		100 μF



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# 20W DC-DC Converter P20H-Series

## Specifications

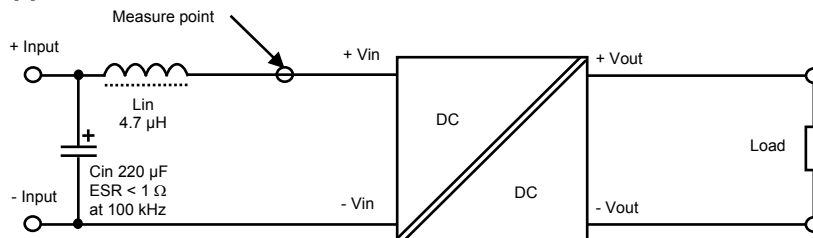
Input			
Under voltage lockout	P20H48xxx	on @ 9 V <sub>DC</sub>	off @ 7.5 V <sub>DC</sub>
	P20H24xxx	on @ 17.8 V <sub>DC</sub>	off @ 16 V <sub>DC</sub>
Filter	π - type		
Reflected ripple current *6	30 mA <sub>p-p</sub> , typ.		
Remote control threshold	On state	2.5...12 V <sub>DC</sub> , or open input	
	Off state	0...1.2 V <sub>DC</sub>	
Input idle current @ Off state	1 mA, typ.		
Isolation input - output:			
Rated voltage (tested for 1 min.)	1500 V <sub>DC</sub>		
Resistance	> 10 <sup>9</sup> Ω, measured @ 500 V <sub>DC</sub>		
Input / output capacitance	All others	1000 pF, typ.	
	P40Cxx24x	2000 pF, typ.	
Output			
Voltage tolerance	± 3 %, max.		
Voltage load regulation	± 1 % @ 5 %...100 % load		
Output voltage trim range	± 10 %		
Voltage cross balance (dual outputs)	±5 %, max. @ 10 % / 100 % load difference		
Voltage regulation	± 0.5 %, max @ full Vin range		
Temperature coefficient	± 0.02 % / °C		
Transient recovery time	<500 μs, @ 25 % load steps		
Transient response deviation	<5 %, @ 25 % load steps		
Short circuit protection	Continuous, hiccup		
Short circuit restart	Automatic		
Over load protection	150 % of full load, typ.		
Rippel & noise, BW 20MHz	100 mV <sub>p-p</sub> , max.		
Over voltage protection via integrated TVS-Diode	P20Hxx3R3x:	3.9 V <sub>DC</sub>	
	P20Hxx05x:	6.2 V <sub>DC</sub>	
	P20Hxx09x:	10.8 V <sub>DC</sub>	
	P20Hxx12x:	15 V <sub>DC</sub>	
	P20Hxx15x:	18 V <sub>DC</sub>	
	P20Hxx24x:	30 V <sub>DC</sub>	

General			
Start up time	10 ms, typ @ R-load		
Switching frequency	300...345 kHz, typ.		
Reliability calculated MTBF MIL-HDBK-217F @ 25 °C	> 1 Mio. hours		
EMC characteristics			
Radiated emissions	CISPR22 / EN55022 Class A		
Radiated emissions, with Fig. 2	CISPR22 / EN55022 Class B		
Conducted emissions	CISPR22 / EN55022 Class A		
Conducted emissions, with Fig. 2	CISPR22 / EN55022 Class B		
ESD, with Fig. 2	EN61000-4-2 perf. crit. B		
RS	EN61000-4-3 perf. crit. A		
EFT, with Fig. 2	EN61000-4-4 perf. crit. B		
Surge, with Fig. 2	EN61000-4-5 perf. crit. B		
CS	EN61000-4-6 perf. crit. A		
Environmental			
Operating ambient temperature	-40 °C to +85 °C with derating		
Case temperature	105 °C, max.		
Storage temperature	-55 °C to +125 °C		
Over temp. protection	t-case 110 °C, typ		
Storage humidity	5...95 %, non condensing		
Cooling	Free air convection		
Physical			
Dimensions	with heatsink	50.80 x 25.40 x 11.8 mm	
	without heatsink	50.80 x 25.40 x 16.3 mm	
Weight	with heatsink	28 g	
	without heatsink	36 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	P20H24xxx	-0.7...50 V <sub>DC</sub>	
	P20H48xxx	-0.7...100 V <sub>DC</sub>	

### Note:

- 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.
- 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.
- Maximum capacitive load is tested at input voltage range and full load.
- All specifications measured at Ta 25°C, humidity < 75 %, nominal input voltage and rated output load unless otherwise specified.
- In this datasheet, all test methods are based on our corporate standards.
- All characteristics are for listed models, and non standard models may perform differently. Please contact our technical support for more details.
- Please contact our technical support for any specific requirement.
- Specifications of this product are subject to changes without prior notice.
- It is not recommended to increase the output power capability by connecting two or more converters in parallel. The converters are not hot swappable

### Input reflected ripple measure circuit



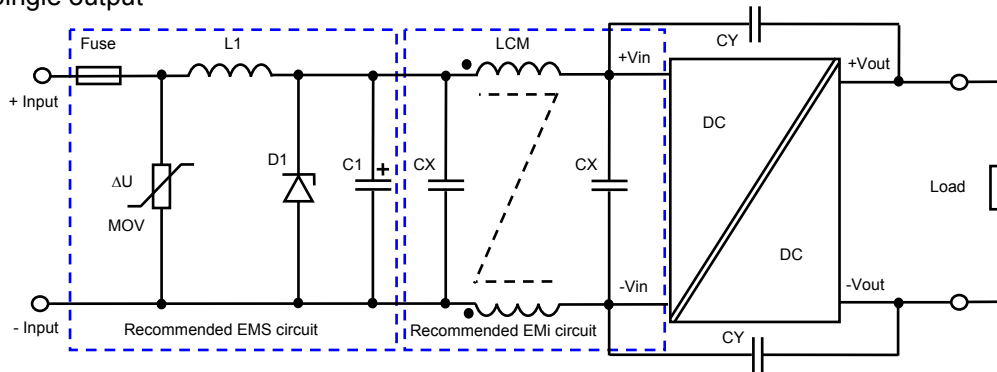
The input reflected ripple current is measured with inductor  $L_{in}$  and capacitor  $C_{in}$  to simulate source impedance.

# 20W DC-DC Converter P20H-Series

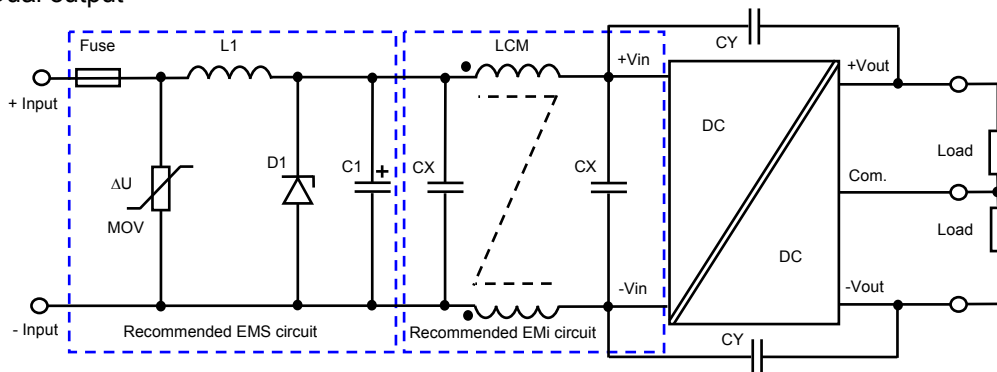


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Figures 2, Recommended EMC circuit  
Single output



Dual output



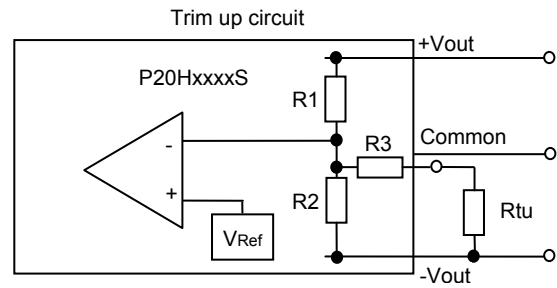
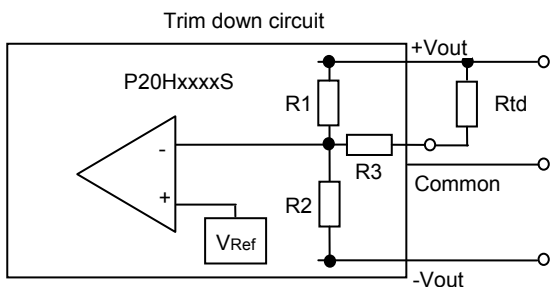
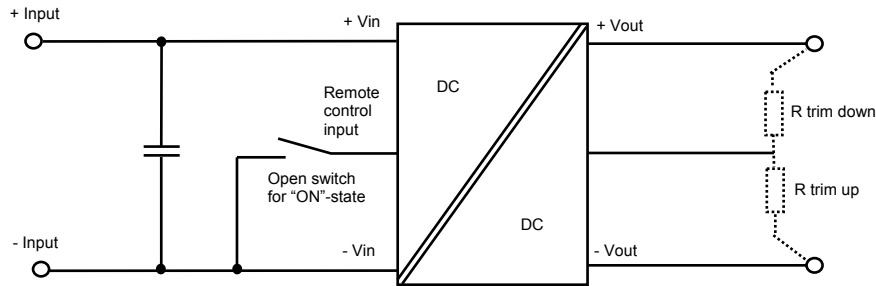
Recommended peripheral components to circuits in figures 2								
	Fuse Slow blow	MOV Type	L1	D1 Type	C1	CX	LCM	CY
P20H24xxS	2.5 A	10D560K	56 μH	SMCJ48A	120 μF, 50 V	4.7μF	2.2 mH	1nF, 2 kV
P20H24xxD	2.5 A	10D560K	56 μH	SMCJ48A	120 μF, 50 V	4.7μF	2.2 mH	1nF, 2 kV
P20H48xxS	1.5 A	10D101K	56 μH	SMCJ90A	120 μF; 100 V	2.2μF	2.2 mH	1nF, 2 kV
P20H48xxD	1.5 A	10D101K	56 μH	SMCJ90A	120 μF, 100 V	2.2μF	2.2 mH	1nF, 2 kV

# 20W DC-DC Converter P20H-Series



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Application note to remote control / trim function



## Calculation for trim down resistor (Rtd) or trim up resistor (Rtu)

Model series	R1 [kΩ]	R2 [kΩ]	R3 [kΩ]	V <sub>Ref</sub> [V]	Rtd min. [kΩ]	Rtu min. [kΩ]
P20Hxx3R3S	4.801	2.864	15	2.5	8.65	4.27
P20Hxx05S	2.883		10		1.16	4.9
P20Hxx09S	7.5		15		29.4	7
P20Hxx12S	10.971		17.8		53.5	6.6
P20Hxx15S	14.497		17.8		78.6	9.1
P20Hxx24S	24.872		20		162	8.37

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

### Trim down resistor formula

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

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

### Trim up resistor formula

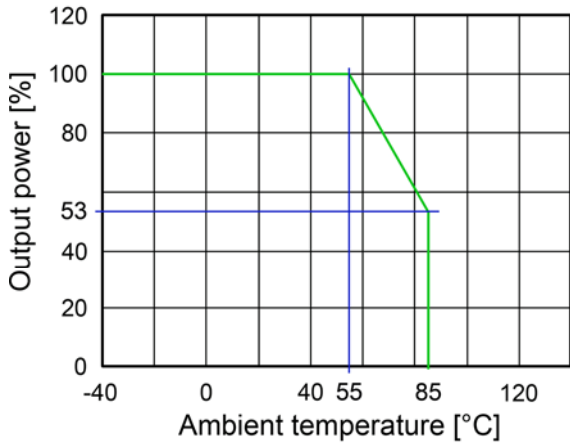
$$a = \frac{V_{ref}}{V_{out} - V_{ref}} * R1$$

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

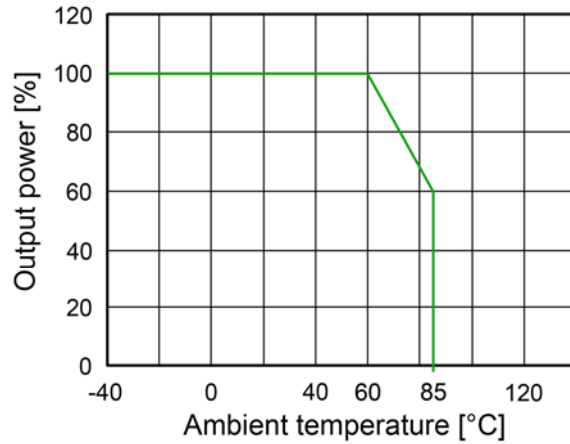
# 20W DC-DC Converter P20H-Series



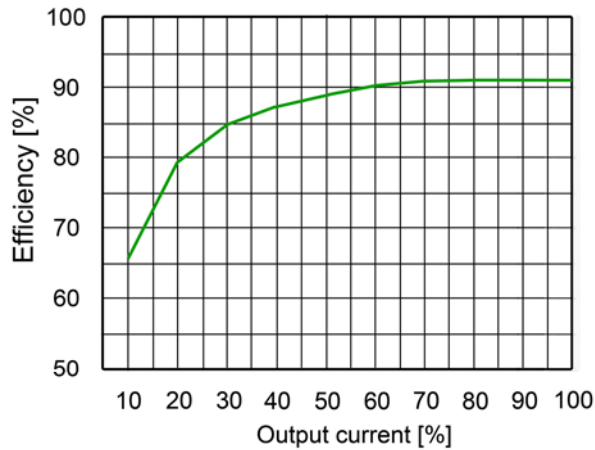
Temperature derating curve without heatsink



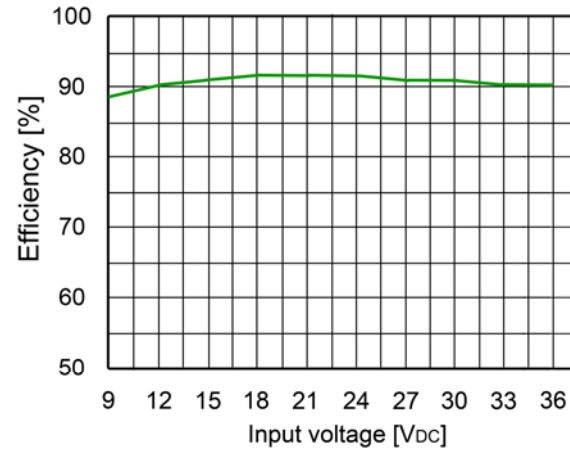
Temperature derating curve with heatsink



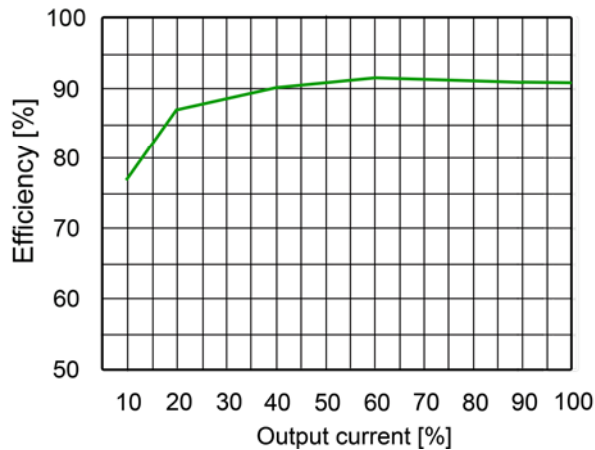
P20H2405S Efficiency vs output load



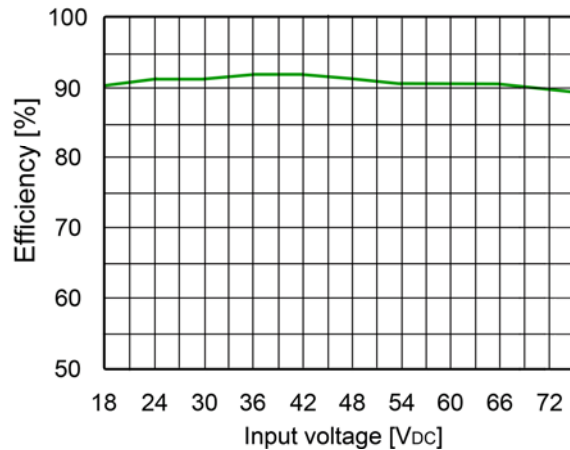
P20H2405S Efficiency vs input Voltage



P20H4815S Efficiency vs output load



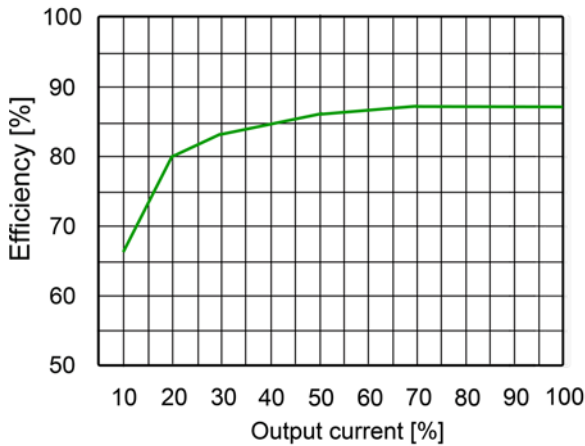
P20H4815S Efficiency vs input Voltage



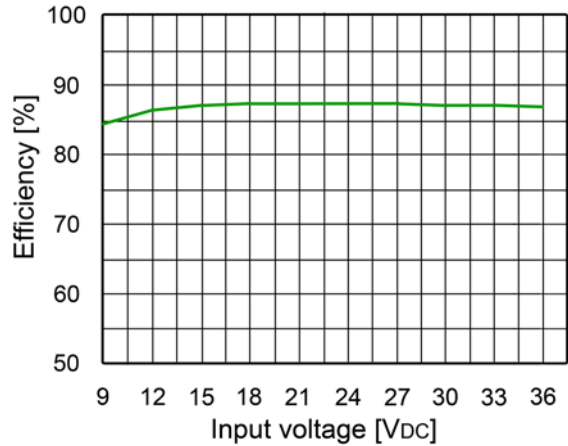


# 20W DC-DC Converter P20H-Series

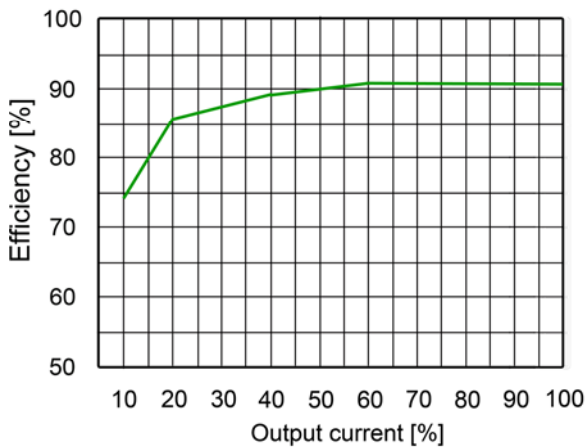
P20H2405D Efficiency vs output load



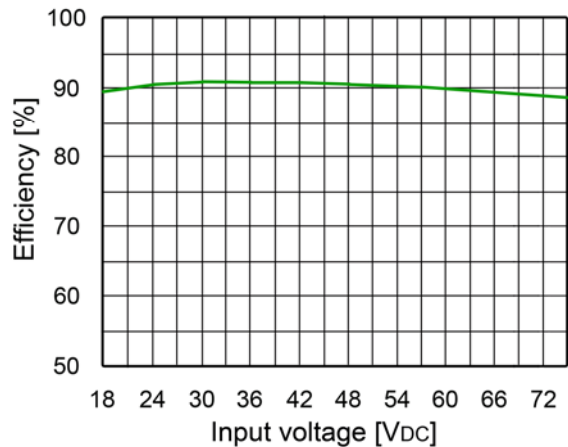
P20H2405D Efficiency vs input Voltage



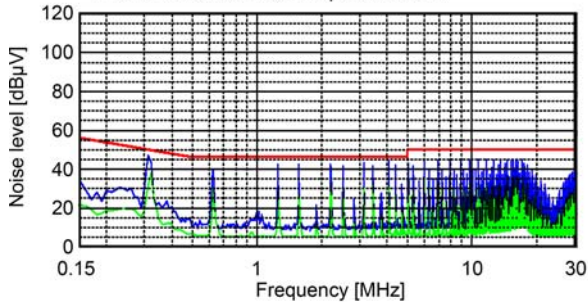
P20H4815D Efficiency vs output load



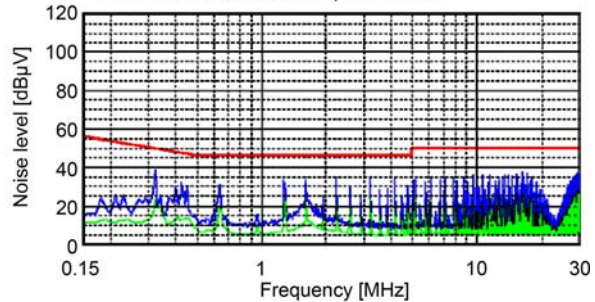
P20H4815D Efficiency vs input Voltage



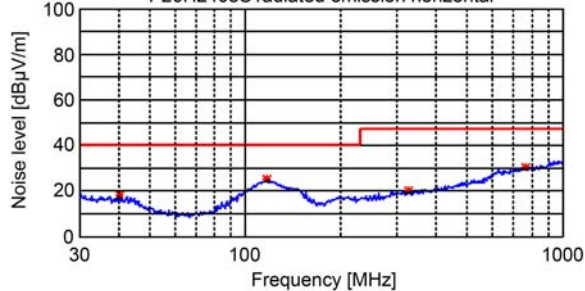
P20H2405S conducted input emission



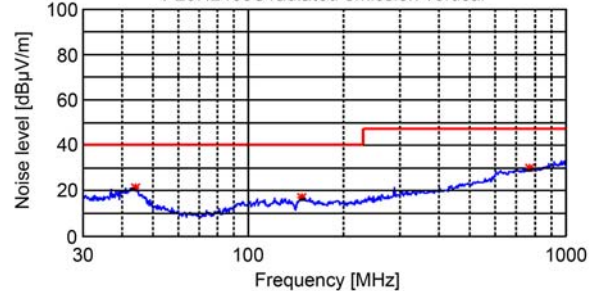
P20H2405D conducted input emission



P20H2405S radiated emission horizontal

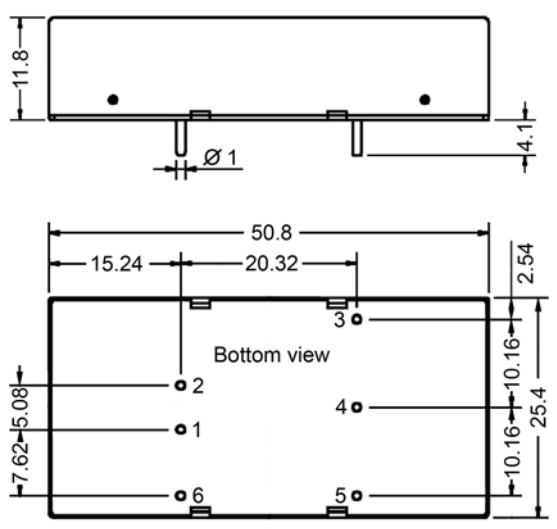


P20H2405S radiated emission vertical

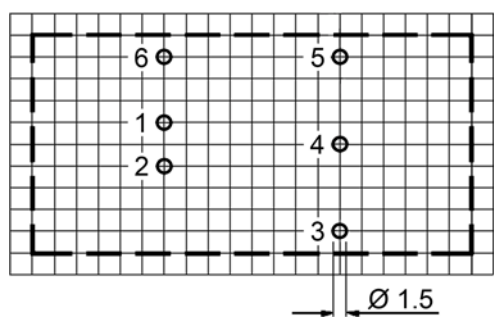


# 20W DC-DC Converter P20H-Series

## Dimensions standard version

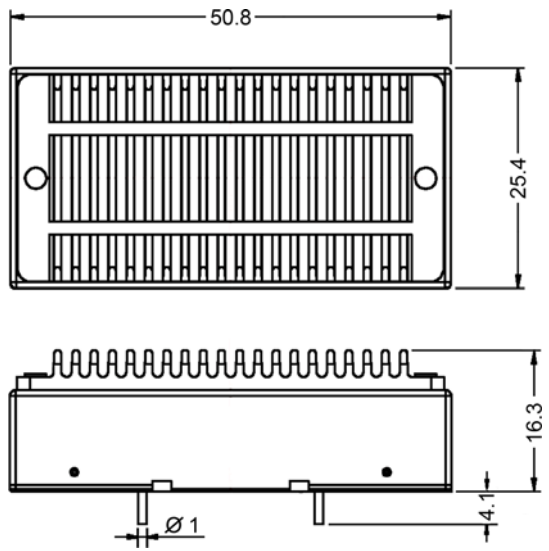


Pin configuration		
Pin	Single	Dual
1	- Vin	- Vin
2	+ Vin	+ Vin
3	+ Vout	+ Vout
4	Trim	Common
5	- Vout	- Vout
6	Rem ctrl	Rem ctrl



Unit: mm  
 Pin diameter tolerance: 0.1 mm  
 Pin height tolerance: 0.5 mm  
 General tolerances: 0.30 mm

## Dimensions heatsink version



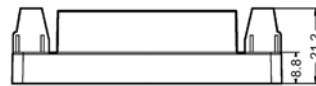
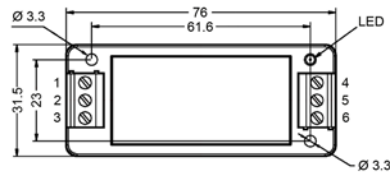
Unit: mm  
 Pin diameter tolerance: 0.1 mm  
 Pin height tolerance: 0.5 mm  
 General tolerances: 0.30 mm



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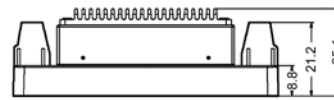
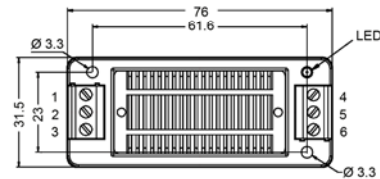
# 20W DC-DC Converter P20H-Series

Ordering designation P20HxxxxA2



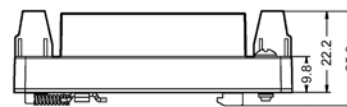
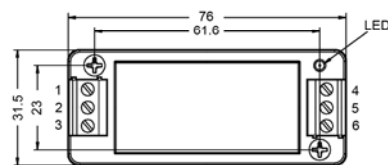
Dimensions in mm, general tolerances  $\pm 0.5$

Ordering designation P20HxxxxKA2



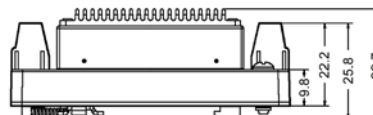
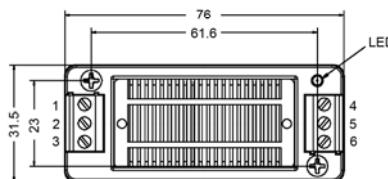
Dimensions in mm, general tolerances  $\pm 0.5$

Ordering designation P20HxxxxD



Dimensions in mm, general tolerances  $\pm 0.5$

Ordering designation P20HxxxxKD



Dimensions in mm, general tolerances  $\pm 0.5$

Terminal assignment		
Terminal	Single	Dual
1	Ctrl.	Ctrl.
2	-Vin	-Vin
3	+Vin	+Vin
4	-Vout	-Vout
5	Trim	Com.
6	+Vout	+Vout

Wire range 24...12 AWG

The DIN-Rail versions are TS35 compatible.

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