



PHI-CON

200 W DC-DC Converter P200B-Series

- Wide 4:1 input range
- Efficiency up to 91 %
- Adjustable output voltage
- Remote control on / off
- In / Out isolation 2250 V_{DC}
- Input under voltage protection
- Continuous short circuit protection
- Over current protection
- Over temperature protection
- Five sided shielded metal package



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]		[mA] min.	[A] max.		
P200B4805S	48	18...75	≤ 200	≤ 4845	5	0	40	88	6000
P200B4812S	48	18...75	≤ 200	≤ 4845	12	0	16.7	91	2000
P200B4815S	48	18...75	≤ 200	≤ 4845	15	0	13.3	89	2000
P200B4824S	48	18...75	≤ 200	≤ 4845	24	0	8.4	91	1000
P200B4848S	48	18...75	≤ 200	≤ 4845	48	0	4.2	91	470

Specifications

Input		
Start up voltage	≤ 18 V _{DC}	
Under voltage lockout	≥ 14 V _{DC}	
Surge voltage ≤ 1 s	-0.7 ... 90 V _{DC}	
Filter	π - type	
Reflected ripple current	100 mA/p, typ. (see figure 1)	
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	10 mA, max.	
Isolation input - output:		
Rated isolation voltage (tested duration 60 s @ < 5 mA leakage current)	Input to output: 2250 V _{DC} , max.	
	Input to case: 1500 V _{DC} , max.	
Resistance	Output to case: 500 V _{DC} , max. > 10 ⁹ Ω, measured @ 500 V _{DC}	
Input / output capacitance	2200 pF, typ. @ 100 kHz, 0.1 V	
Output		
Output voltage tolerance	≤ ± 3 %, max.	
Line regulation	≤ ± 0.5 %; max., full input range	
Load regulation	≤ ± 0.75 %; max., 5...100 % load	
Output voltage trim range	90 ... 110 %	
Output voltage compensation via sense	≤ 105 %	
Output voltage V _{in} regulation	≤ ± 0.5 % deviation @ full V _{in} range	
Temperature coefficient	± 0.03 % / °C	
Transient recovery time	≤ 500 μs @ 25 % load change steps	
Transient response deviation @ 25 % load change steps	P200Bxx05S: < ± 7.5 %	
	All others: < ± 5 %	
Over voltage protection	110 ... 160 % of nominal V _{out}	
Over current protection	110 ... 150 % of maximal I _{out}	
Short circuit protection	Continuous, hiccup	
Short circuit restart	Automatic	
Ripple & noise, BW 20 MHz (see figure 2)	≤ 250 mVp-p	
Start up time	20 ms, typ @ R-load	
General		
Safety standard		
Switching frequency (PWM)	250 kHz, typ.	
Reliability calculated MTBF	> 500 000 h	
MIL-HDBK-217F @ 25 °C		
Safety standart	EN 62368-1	

EMC characteristics		
Conducted emissions		
EN 55032, EN 50121-3-2		
Radiated emissions		
EN 55032, EN 50121-3-2		
ESD	IEC-, EN 61000-4-2, EN 50121-3-2	contact ± 6 kV, air ± 8 kV, perf. Criteria B
RS	IEC-, EN 61000-4-3, EN 50121-3-2	10 V/m, perf. Criteria A
EFT	IEC-, EN 61000-4-4, EN 50121-3-2	± 2kV, (see fig. 4a) perf. Criteria A
Surge	EN 50121-3-2	Line to line ± 1 kV (see figure 4a) perf. Criteria B
CS	IEC-, EN 61000-4-6, EN 50121-3-2	10 Vrms, perf. Criteria A
Environmental		
Operating ambient temperature		-40 ... 85 °C with derating
Storage temperature		-55 ... 125 °C
Over temp. protection		≤ 120 °C
Storage humidity		5...95 %, non condensing
Thermal impedance		P200B48xxS: 7.5 K / W P200B48xxSK: 5.2 K / W P200B48xxSHB: 6.3 K / W
Cooling		See derating diagram
Vibration		IEC-, EN 61373 train 1 B category
Physical		
Dimensions	P200BxxS	61.8 x 40.2 x 12.7 mm
	P200BxxSK	61.8 x 40.2 x 27.7 mm
	P200BxxSHB	62 x 56 x 14.6 mm
Weight	P200BxxS	90 g
	P200BxxSK	110 g
	P200BxxSHB	121 g
Case material	Aluminium alloy	
Potting Material	Plastic (UL94V-0 rated)	
Absolute max. ratings		
Wave soldering temperature	≤ 260 °C for ≤ 10 sec, ≥ 1.5 mm distance from body	
Manual soldering temperature	≤ 300 °C for ≤ 5 sec, ≥ 1.5 mm distance from body	

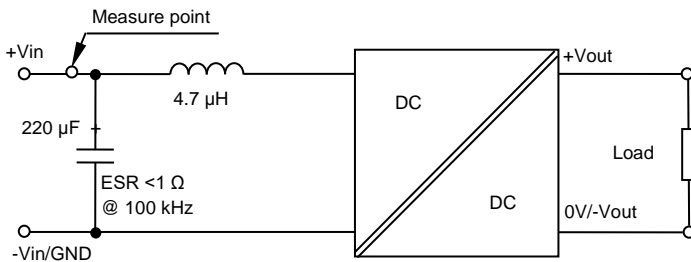
Ordering information									
Output Power	Series	Input voltage		Output voltage		Output		Package	
P200	B	48		05		S		HB	
200 Watt		48	48 V _{DC}	05	5 V _{DC}	S	single	blank	Standart version
					12			HB	Slotted base plate version
					15			K	Heat sink version
					24				
					48				

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Note:

1. All specifications measured at T_a 25 °C, humidity < 75 %, nominal input voltage and rated output load current unless otherwise specified.
2. Maximum capacitive load is tested at full input voltage range and full load current.
3. It is not recommended to increase the output power capability by connecting two or more converters in parallel.
4. The converters are not hot swappable

Figure 1 Measure circuit input reflected ripple current



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

Figure 2 Measure circuit output ripple and noise (BW 20 MHz)

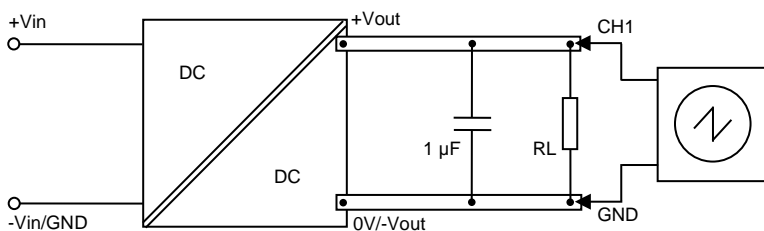
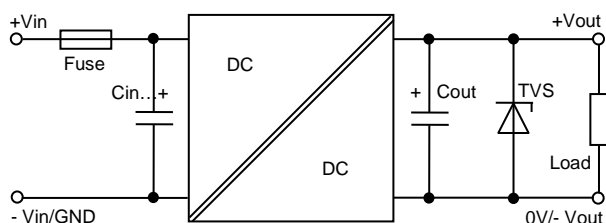


Figure 3 Typical test circuit

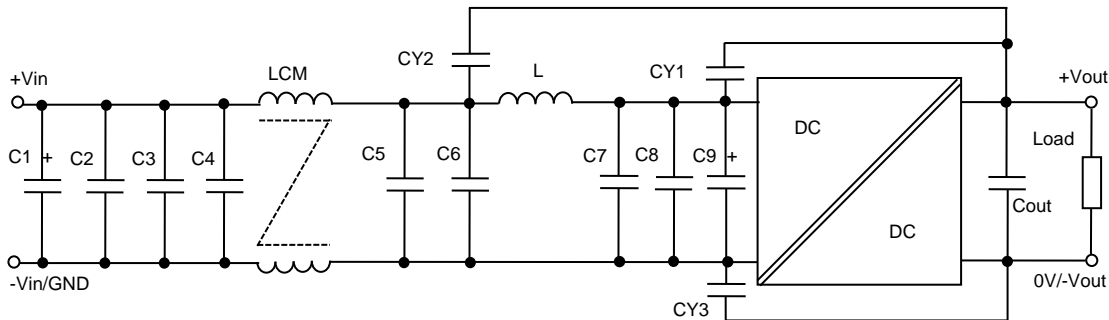
The P200B series is been tested according to the following recommended test circuit before leaving the factory (see following circuit and table). If you want to further decrease the input or output ripple, you can increase a capacitance values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the maximum load capacitance value (see „Model guide“ table).



Recommended peripheral components to figure 3				
Type	Fuse	Cin	Cout	TVS
P200B4805S	20 A Time delayed type	220 µF	470 µF	SMDJ6.0A
P200B4812S			220 µF	SMDJ14A
P200B4815S			220 µF	SMDJ17A
P200B4824S			100 µF	SMDJ28A
P200B4848S			100 µF	SMDJ54A

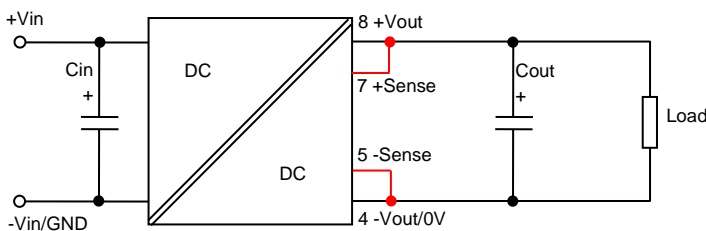
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Figure 4, EMC filter circuit for IEC/EN 61000-4-4, EN 50121-3-2 performance criteria B and EN 55032 Class A



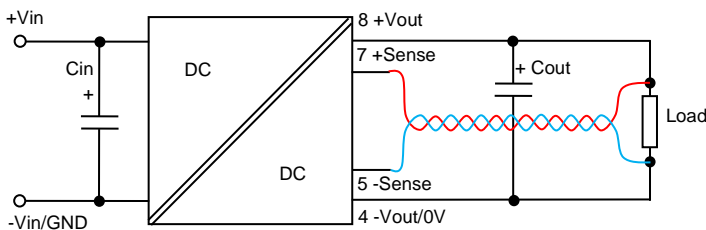
Recommended peripheral components to circuits in figure 4						
C1 electrolytic	LCM	C2, C3, C4, C5, C6, C7, C8 ceramic chip	L	C9 electrolytic	CY1, CY2 Type	CY3 Type
150 μ F	1 mH	2.2 μ F	1.5 μ H	47 μ F	1 nF	2.2 nF

Application circuit without output voltage dropout remote compensation



1. If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.
2. The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

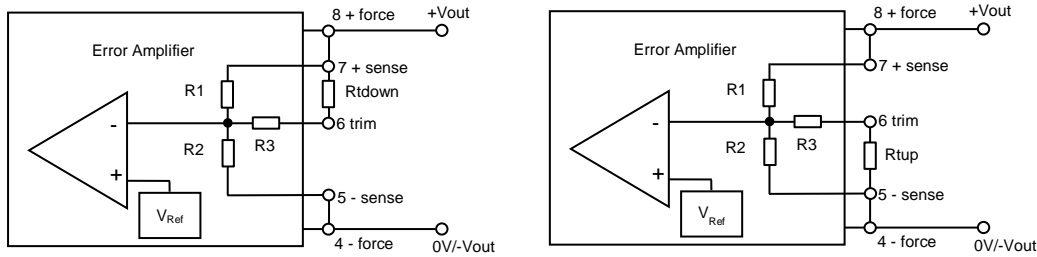
Application circuit with output voltage dropout remote compensation



1. PCB-tracks or wires for Remote Sense must be kept as short as possible.
2. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.
3. Using remote sense with long wires long wires may cause unstable operation. Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple.
4. We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in.

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Application circuit for trimming function.



When using the Trim down function make sure that the "Rtdown" resistor value is calculated correctly. If the "Trim" pin is shorted with "+Vout" pin, or it's value of "Rtdown" is too low, the output voltage "Vout" would be lower than 90% of Vout nominal value, which may cause the product to fail.

Trim resistor calculation						
Model series	R1 [kΩ]	R2 [kΩ]	R3 [kΩ]	V Ref [V]	Rtdown min. [kΩ]	Rtup min. [kΩ]
P200B4805S	3.036	3	10	2.5	1.46	6.15
P200B4812S	11	2.87	15	2.5	56	9.6
P200B4815S	14.03	2.8	15	2.5	86	8.8
P200B4824S	24.872	2.87	15	2.5	304	12.8
P200B4848S	53.017	2.913	15	2.5	434	12.6

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

Trim down resistor formula

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

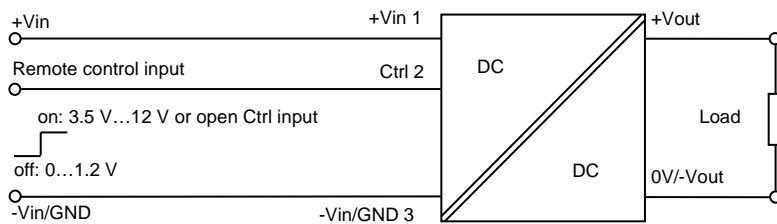
$$R_{tdown} = \frac{R1 \cdot b}{R1 - b} - R3$$

Trim up resistor formula

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

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

Application circuit for remote control function

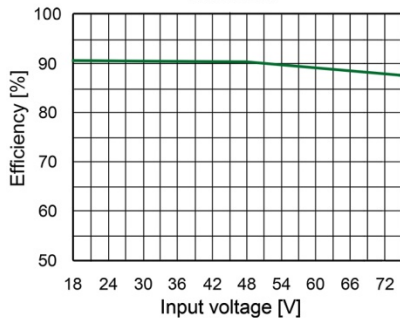




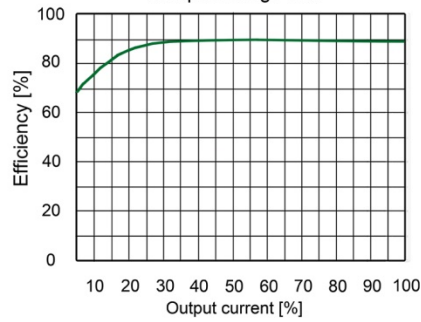
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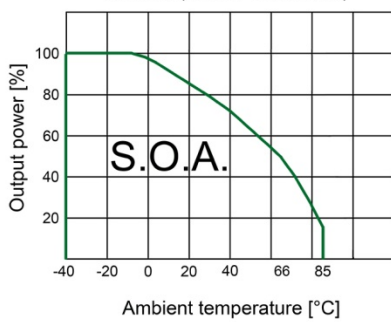
P200B4812S Efficiency vs input Voltage at full load



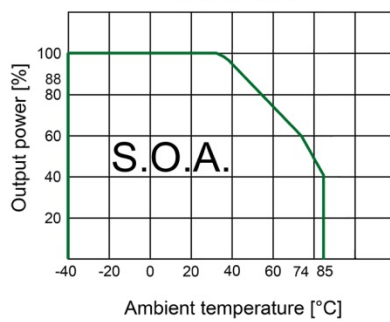
P200B4812S Efficiency vs output load at input voltage 48V



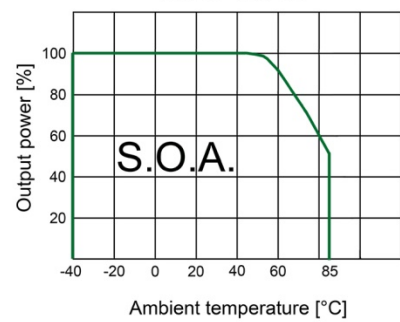
P200B4824S Temperature derating at 20 LFM (free air convection)



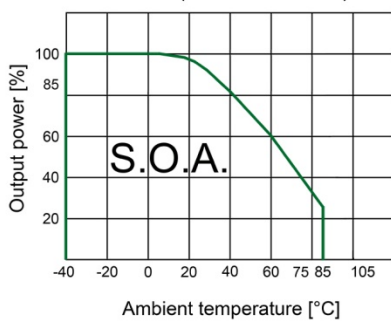
P200B4824S Temperature derating at air flow 200 LFM



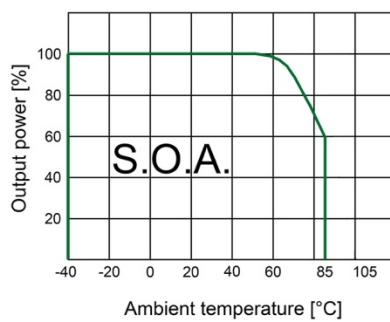
P200B4824S Temperature derating at air flow 400 LFM



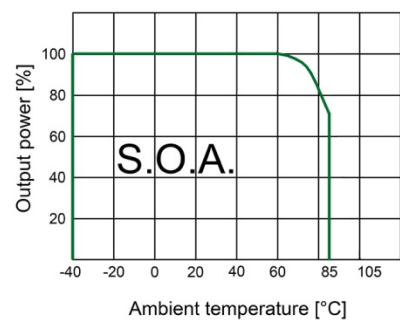
P200B4824SK Temperature derating at 20 LFM (free air convection)



P200B4824SK Temperature derating at air flow >200 LFM

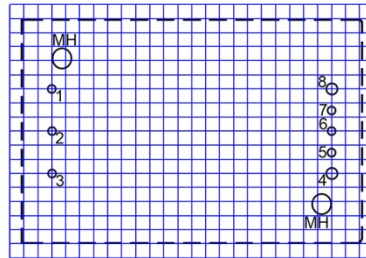
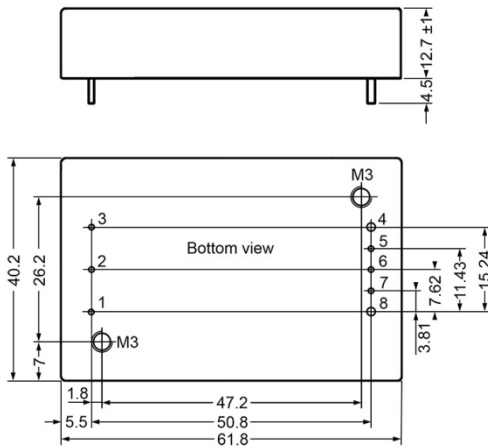


P200B4824SK Temperature derating at air flow 400 LFM



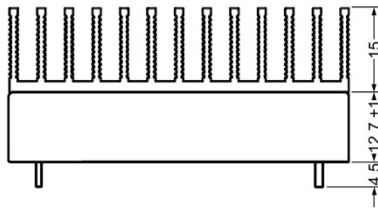
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Mechanical dimensions standard version P200B48xxS

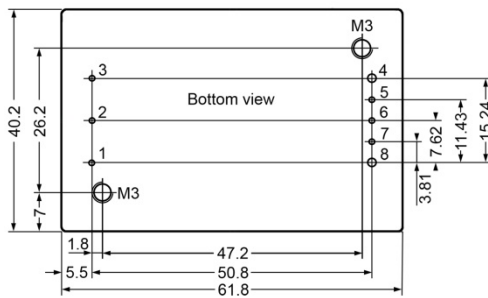


Note
 All units in mm
 Diameter pin 1, 2, 3, 5, 6, 7: 1 mm
 Diameter pin 4, 8: 1.5 mm
 Pin diameter tolerance: ± 0.1 mm
 Pin height tolerance: ± 0.5 mm
 General tolerances: ± 0.5 mm
 Mounting hole (MH) diameter: 3.5 mm
 Mounting thread hole: M3
 Mounting torque: < 0.4 Nm

Mechanical dimensions heatsink version P200B48xxSK



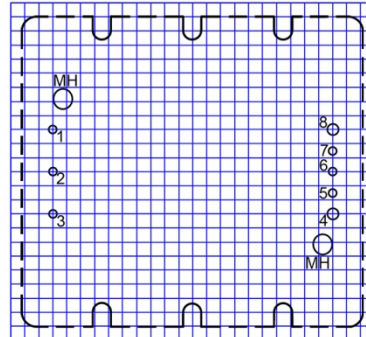
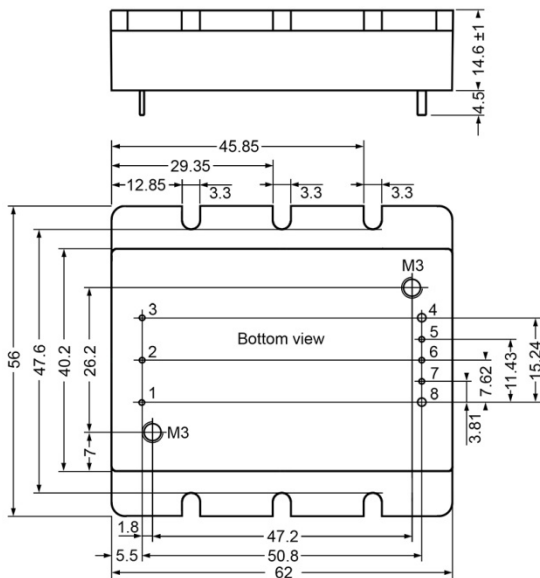
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 Pin height tolerance: ± 0.5 mm
 General tolerances: ± 0.5 mm
 Mounting thread hole: M3
 Mounting torque: < 0.4 Nm



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

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Mechanical dimensions half brick version with slotted base plate P200B48xxSHB



Note
 All units in mm
 Diameter pin 1, 2, 3, 5, 6, 7: 1 mm
 Diameter pin 4, 8: 1.5 mm
 Pin diameter tolerance: ± 0.1 mm
 Pin height tolerance: ± 0.5 mm
 General tolerances: ± 0.5 mm
 Mounting thread hole: M3
 Mounting torque: < 0.4 Nm

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

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