



PHI-CON

20 W AC-DC Power Supply PAC20DxxS6-Series

- Enclosed plastic case
- 90 ... 528 V_{AC} or 100 ... 745 V_{DC} wide input range
- Isolation voltage 4000 V_{AC}
- Over voltage protected
- Over current & continuously short circuit protected
- Isolation class II
- MTBF > 300000 h
- 3 years product warranty



Model guide

Type	Output voltage [V _{DC}]	Output voltage tolerance [%] typ.	Output current [mA] max.	Output power [W] max.	Efficiency @ full load [%] typ.	Capacitive load [µF] max.
PAC20D03S6	3.3	±3	3600	11.88	74	10000
PAC20D05S6	5.0	±2	3600	18	78	10000
PAC20D09S6	9.0	±2	2350	20	79	7000
PAC20D12S6	12	±2	1660	20	82	5000
PAC20D15S6	15	±2	1330	20	83	3000
PAC20D24S6	24	±2	833	20	83	1000

Specifications

Input	
Voltage range	90..528 V _{AC} or 100..745 V _{DC} Power derating see diagram
Line frequency range	47...63 Hz
Full load input current	≤ 0.8 A @ 115 V _{AC} ≤ 0.4 A @ 230 V _{AC}
Inrush current	35 A typ. @ 115 V _{AC} 60 A typ. @ 230 V _{AC}
No load power consumption	≤ 0.75 W
Recommended fuse	3.15 A / 500 V _{AC} , time delayed type
Hot plug	Unavailable
Isolation	
Isolation voltage (input to output)	≥ 4000 V _{AC} for 1 minute
Leakage current	0.25 mArms, typ. @ Vin 230 V _{AC} / 50 Hz
Output	
Voltage tolerance	PAC20D03S6 ± 3 %, typ. All others ± 2 %, typ.
Line regulation	± 0.5 %, typ.
Temperature coefficient	± 0.02 % / °C
Ripple & noise up to 20 MHz	≤ 150 mVp-p (see Figure 1)
Load regulation @ load change 0 % to 100 %	1 %, typ.
Minimum load	not required
Protection	
Short circuit	Continuous, auto recovery
Over current	130 ... 400 %, of full load
Output over voltage protection (external TVS D1, see Figure 2)	PAC20D03S6: < 7.5 V _{DC}
	PAC20D05S6: < 7.5 V _{DC}
	PAC20D09S6: < 15 V _{DC}
	PAC20D12S6: < 20 V _{DC}
	PAC20D15S6: < 20 V _{DC} PAC20D24S6: < 30 V _{DC}
General	
Power derating at Ta 55...70 °C	3 % / °C (see derating diagram)
Power derating at Ta -40...-10 °C	1 % / °C (see derating diagram)
Power derating at Vin 90...110 V _{AC}	2 % / V _{AC} (see derating diagram)
Power derating at Vin 480...528 V _{AC}	0.42%/V _{AC} (see derating diagram)
Switching frequency	65 kHz typ.

Safety standard	
Vout: 3.3V, 5V, 9V, 12V, 15V, 24V	EN 62368-1
Vout: 12 V and 24 V	UL 60950-1
Safety	Class II
Reliability MTBF MIL-HDBK-217 @ 25° C	≥ 300000 h
Hold up time @ full load	35 ms @ 230 V _{AC} , typ. 100 ms @ 400 V _{AC} , typ.
EMC specification	
CE	EN 55032, CISPR32 Class B
RE	EN 55032, CISPR32 Class B
ESD	EN-, IEC 61000-4-2 Contact ± 6 kV, Perf. Criteria B Air ± 8 kV, Perf. Criteria B
RS	EN-, IEC 61000-4-3 10 V / m, Perf. Criteria A
EFT	EN-, IEC 61000-4-4 ± 2 kV, Perf. Criteria B ± 4 kV, Perf. Criteria B (see Figure 2 or 4)
Surge	EN-, IEC 61000-4-5 Line to line ± 2 kV, Perf. Criteria B Line to line ± 4 kV, Perf. Criteria B (see Figure 3 or 4)
CS	EN-, IEC 61000-4-6 10 Vrms, Perf. Criteria A
Voltage dips, short interruptions and voltage variations immunity EN-, IEC 61000-4-11	0 %...70 %, Perf. Criteria B
Environmental	
Operating ambient temperature range	-40 ...70 °C, see derating diagram
Storage temperature	-40 ...85 °C
Storage humidity	95 %, max., non condensing
Cooling	Free air convection, ≥ 35 LFM
Physical	
	Dimensions
PAC20D_S6	70 x 48 x 30 mm
PAC20D_S6A2	96.1 x 54 x 38 mm
PAC20D_S6A4	96.1 x 54 x 43 mm
	Weight
PAC20D_S6	160 g
PAC20D_S6A2	210 g
PAC20D_S6A4	250 g
Case material	Black plastic, UL94 V-0 rated
Wave soldering temperature	≤ 265 °C, peak duration ≤ 10 s, ≥ 1.5 mm distance from case
Manual soldering temperature	≤ 370 °C, peak duration ≤ 5 s, ≥ 1.5 distance mm from case

Notes:

1. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta 25 °C, humidity <75 % with nominal input voltage and rated output load.

Part number structure														
Brand		Type		Output power		Series	Output voltage		Outputs		Vin Range		Mounting	
P	PHI-CON	AC	AC/DC-Converter	20	20 W	D	03	3.3 V	S	single	6	90...528 V~	Blank	PCB
							05	5 V					A2	Chassis
							09	9 V					A4	DIN-Rail
							12	12 V						
							15	15 V						
							24	24 V						
Example:		PAC20D24S6		PHI-CON AC/DC-Converter, Pout 20 W, E-Serie, Vout 24 V, Single Output, Vin 90...528 VAC, PCB mountable										

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Figure 1 Output ripple & noise measure method

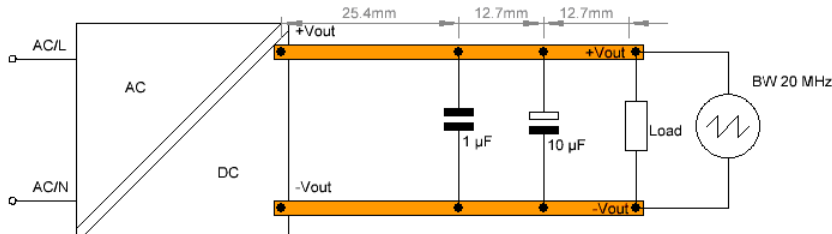


Figure 2 Typical application circuit

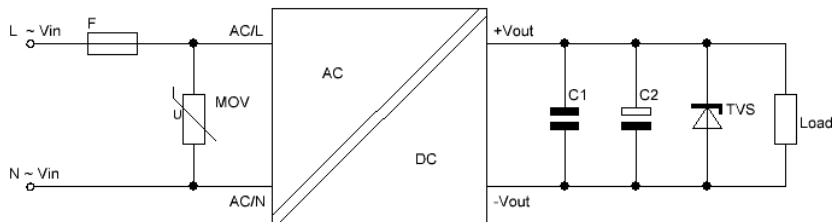


Table for typical circuit					
Type	Fuse time delayed	MOV	C1	C2	TVS1
PAC20D03S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	330 µF	SMBJ7.0A
PAC20D05S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	330 µF	SMBJ7.0A
PAC20D09S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	220 µF	SMBJ12A
PAC20D12S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	220 µF	SMBJ20A
PAC20D15S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	220 µF	SMBJ20A
PAC20D24S6	3.15 AT / 500 V~	S20K625	1 µF, MLCC	220 µF	SMBJ30A

20 W AC-DC Power Supply PAC20DxxS6-Series

Figure 3 Recommended circuit for applications which require 4 kV differential mode inrush standard (half wave rectification)

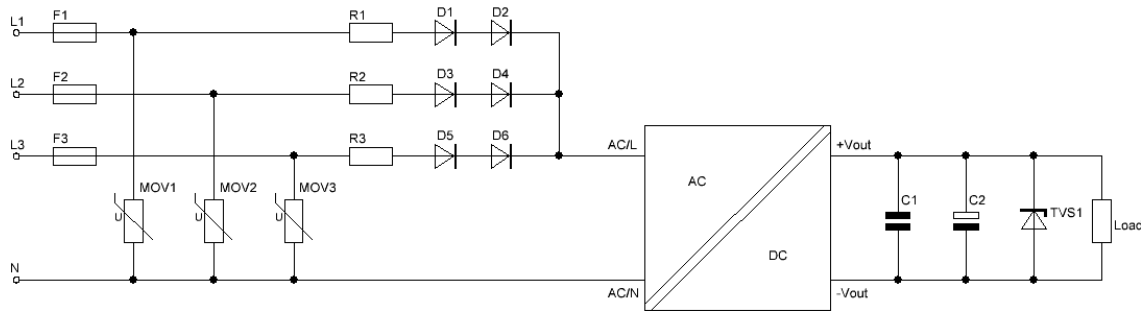


Table for Figure 3							
Type	Fuse F1 ... F3	MOV1 ... MOV3	R1 ... R3	D1 ... D6	C1	C2	TVS1
PAC20D3R3S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	330 μF	SMBJ7.0A
PAC20D05S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	330 μF	SMBJ7.0A
PAC20D09S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ12A
PAC20D12S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ20A
PAC20D15S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ20A
PAC20D24S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ30A
				E.g.: RL207-G			

Figure 4 Recommended circuit for applications which require 4 kV differential mode inrush standard (full wave rectification)

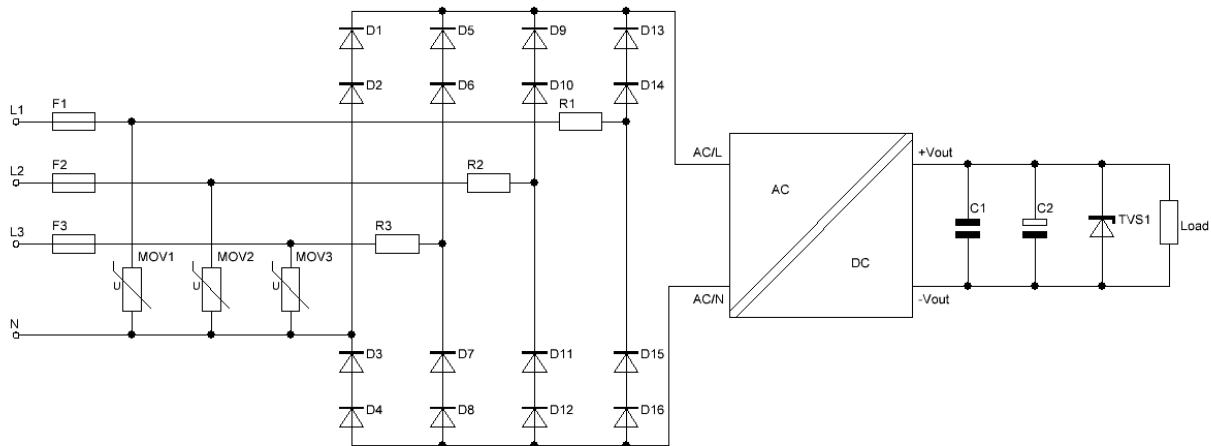
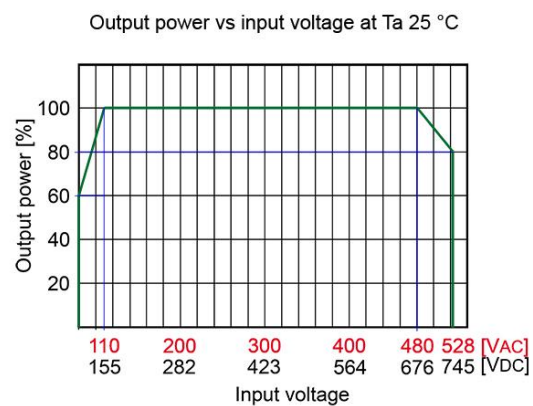
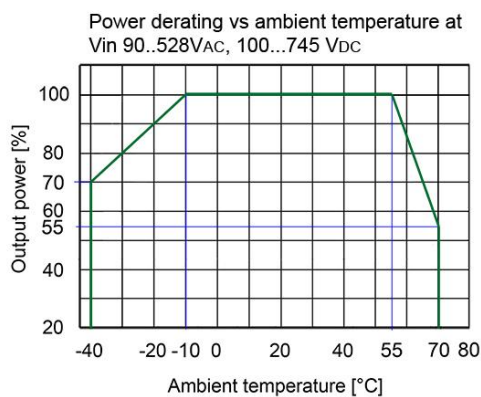
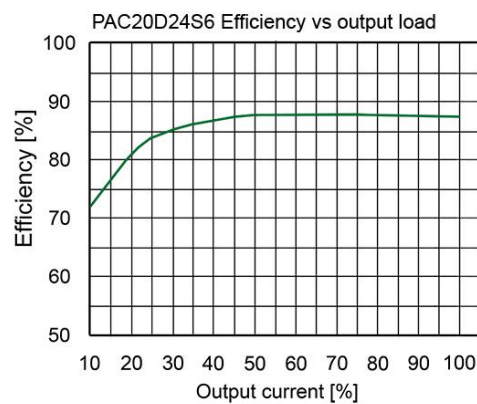
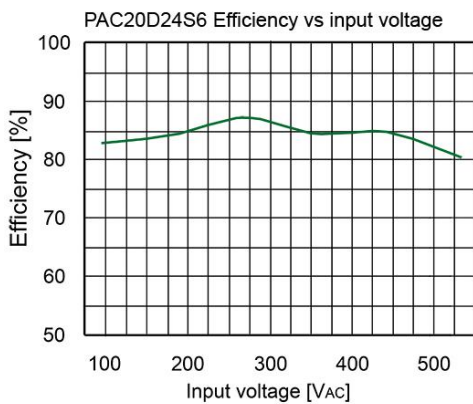
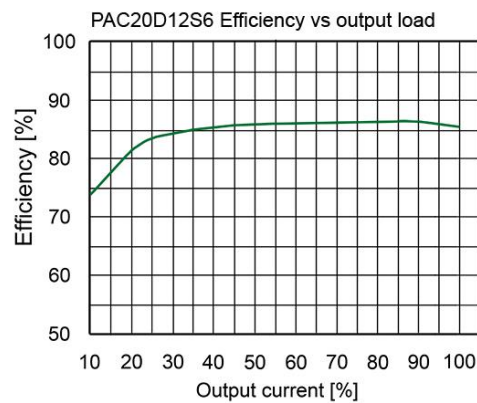
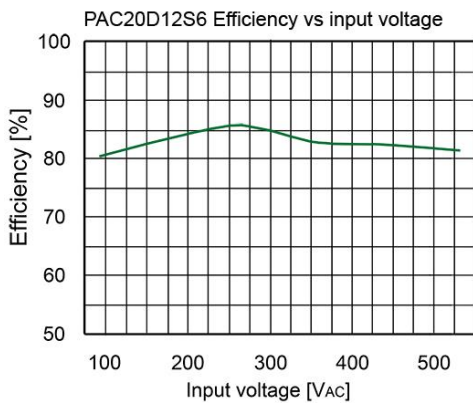
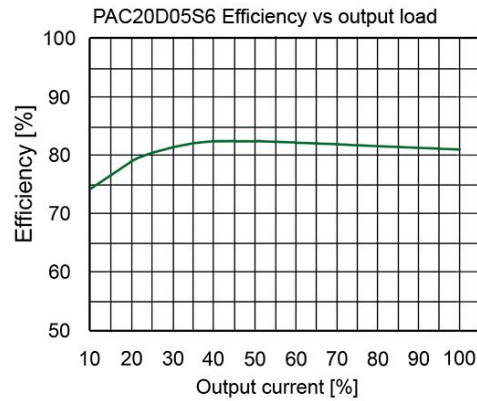
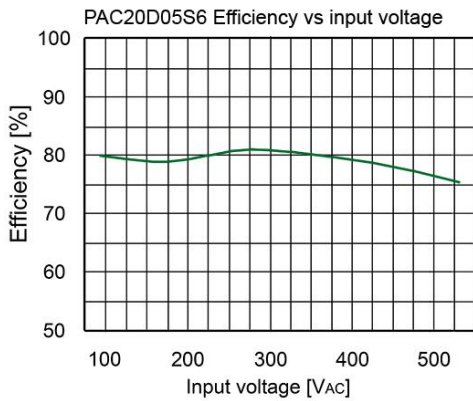


Table for Figure 4							
Type	Fuse F1 ... F3	MOV1 ... MOV3	R1 ... R3	D1 ... D16	C1	C2	TVS1
PAC20D3R3S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	330 μF	SMBJ7.0A
PAC20D05S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	330 μF	SMBJ7.0A
PAC20D09S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ12A
PAC20D12S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ20A
PAC20D15S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ20A
PAC20D24S6	3.15 A time delayed	S20K510	10 Ω, 5 W	2 A, 2000 V, I _{FSM} >50A	1 μF, MLCC	220 μF	SMBJ30A
				E.g.: RL207-G			



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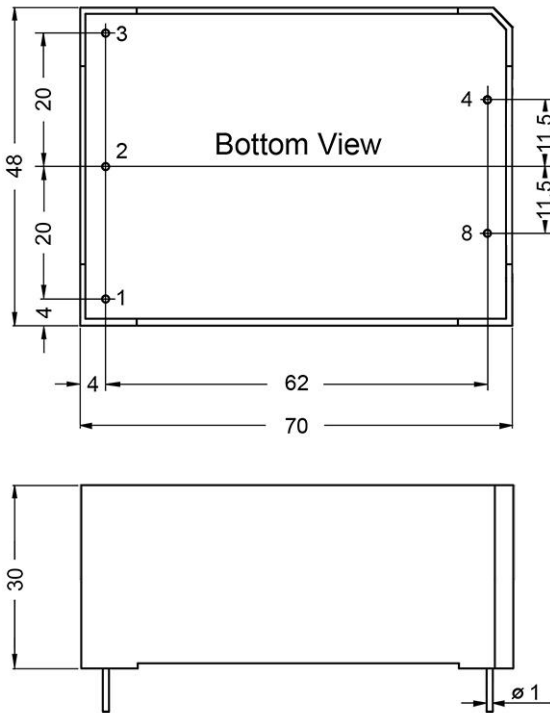




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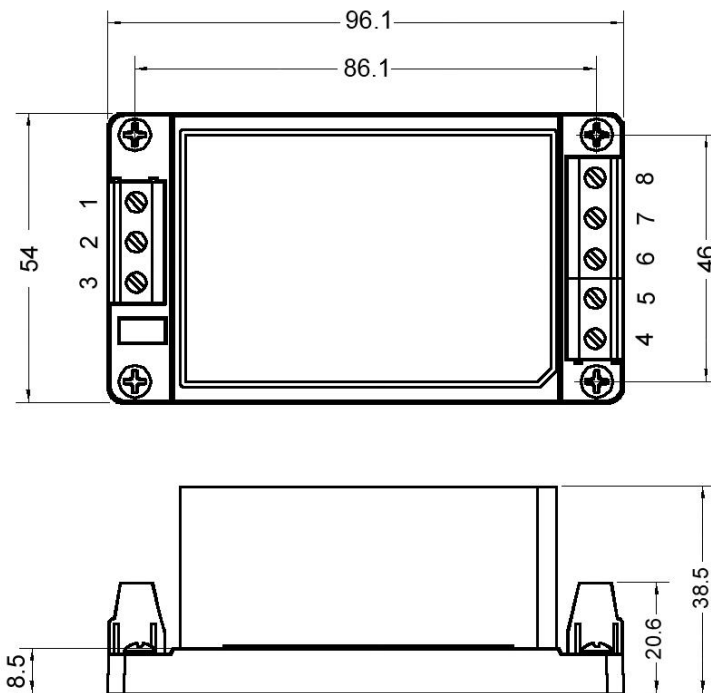
Mechanical dimensions PCB module



Pin assignment	
1	No pin
2	AC in, N
3	AC in, L
4	+ V out
5	No pin
6	No pin
7	No pin
8	- V out

Note:
 Unit: mm
 Pin diameter tolerance: ± 0.1 mm
 General tolerances: ± 0.5 mm
 Recommended hole diameter 1.5 mm

Mechanical dimensions chassis mountable version (PAC20DxxSA2)



Terminal assignment	
1	NC
2	AC in, N
3	AC in, L
4	+ V out
5	NC
6	NC
7	NC
8	- V out

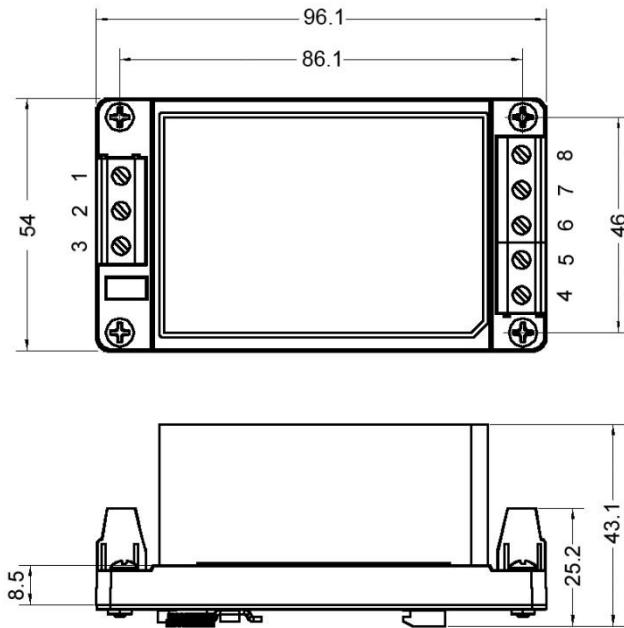
Units in mm
 General tolerances: ± 1 mm
 Wire range: 24...12 AWG
 Tightening torque: 0.4 Nm, max.
 The DIN rail must be connected to protection ground



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20 W AC-DC Power Supply PAC20DxxS6-Series

Mechanical dimensions DIN Rail version (PAC20DxxSA4)



Terminal assignment	
1	NC
2	AC in, N
3	AC in, L
4	+ V out
5	NC
6	NC
7	NC
8	- V out

Units in mm
 General tolerances: ± 1 mm
 Wire range: 24...12 AWG
 Tightening torque: 0.4 Nm, max.
 The DIN rail must be connected to protection ground

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