USB-AC-PD

230V_{ac} 20W USB-C Power Delivery (PD) 5V 9V 12V DIN Rail Charger

USB-AC-PD: A 230V_{ac} 20W USB-C Power Delivery (PD) 5V 9V 12V DIN Rail Charger

Features

- 18mm DIN Rail width
- <50mW Standby Power
- Long life / Electrolytic capacitor free
- USB-PD Supported Levels:
  - 5 V_{dc} - 3 $A_{dc,max}$
  - 9 V_{dc} - 2.22 $A_{dc,max}$
  - 12 V_{dc} - 1.67 $A_{dc,max}$
- Auxilliary 5V Output
- 207 V_{ac} to 253 V_{ac} input voltage range
- Output short circuit proof
- Active output overvoltage protection
- Green Power LED

Product description

The USB-AC-PD is 230V_{ac} power supply for DIN RAIL control cabinets. It delivers 5V/3A, 9V/2.22A and 12V/1.67A. It's intended use are tight control cabinets with AC Inputs, to supply USB-C-PD devices, such as laptops, embeded computer, tablles or smart meter gateways with electrical energy.

The device is resilient to typical operating failures: Input transient protection, output short circuit, open circuit, moderate input transients and moderate output transients. The device is designed for long-livity by not using electrolytic capaitors. A green power led indicates stable operation.

The device may be operated at ambient temperatures between -40°C and 50°C. Derating might be required.

Specification overview

Description	Value
Input	
Input Voltage Range (V_{ac})	207 - 253
Input Voltage Frequency (Hz)	49-61
Output	
Voltage (V)	5 / 9 / 12
Current (A)	3 / 2.22 / 1.67
Power Good Indicator	Green LED
Protection	
Input Fuse	yes
Temperature Prection	yes
Short circuit protection	yes
Input Overvoltage supressor	MOV
Mechanical	
Dimensions LxWxH (mm)	17.6 x 106 x 60

Ordering information

Ordercode	Description
USB-AC-PD	230V_{ac} 20W USB-C Power Delivery (PD) 5V 9V 12V DIN Rail Charger
Customisation available. Contact DPS.	

Engineering standards

Applied engineering standards	
IEC 55032	IEC 61000-4-2
IEC 61000-4-3	IEC 61000-4-4
IEC 61000-4-5	IEC 61000-4-6
IEC 61000-4-7	IEC 61000-4-8

1 Functional description

1.1 Overview

The USB-AC-PD is 230V_{ac} power supply for DIN RAIL control cabinets. It delivers 5V/3A, 9V/2.22A and 12V/1.67A. It's intended use are tight control cabinets with AC Inputs, to supply USB-C-PD devices, such as laptops, embeded computer, tablles or smart meter gateways with electrical energy.

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Operating range: -40°C to 50°C. Temperature derating is required.

1.2 Protections

The following output protection mechanisms are implemented to ensure reliable and safe operation of the USB-AC-PD:

- **Input Overvoltage Protection:** A Metal Oxide Varistor (MOV) safeguards the input against overvoltage conditions.
- **Output Short Circuit Protection:** The USB-AC-PD includes an overtemperature shut-down mechanism to prevent damage during short circuit conditions.
- **Short Circuit Resilience:** The output can withstand a short circuit indefinitely without adverse effects.
- **Open Circuit Resilience:** The output can safely operate in an open-circuit condition for an unlimited duration.
- **Output Overvoltage Protection:** The USB-AC-PDis equipped with an active transient voltage protection of 12V to prevent destruction.

1.3 Safety Advice / Risk of Destruction

Do not disconnect the USB-AC-PD AC connection while a DC voltage is applied. Always disconnect the DC supply voltage before performing any work on the USB-AC-PD. The USB-AC-PDis only inteded for professional users.

1.4 Ordering Information

Ordercode	Description	EAN
USB-AC-PD	230V_{ac} 20W USB-C Power Delivery (PD) 5V 9V 12V DIN Rail Charger	0735654854166
Customisation available. Contact DPS.		

2 Pinout

The pinout of the converter is depicted in Figure 1.

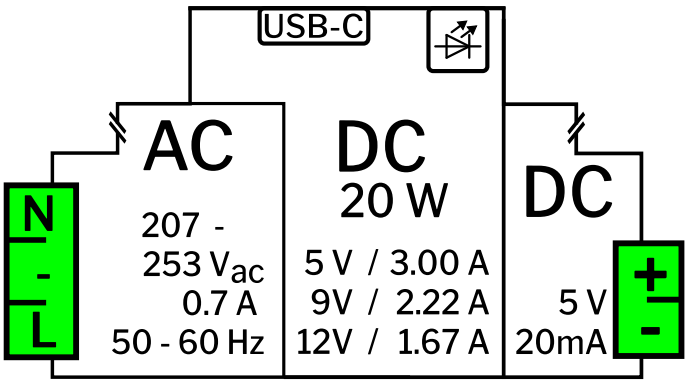

Figure 1: Pinout USB-AC-PD power supply. Pinout is explained in belows table 1.

Pin	Functional Description
	Input
N L	Neutral, AC input pin. Line (Live), AC input pin. *Note: N and L can be interchanged.*
	Output USB
USB C	USB-C power connector.
	Output 5V
+ -	Positive output terminal 5V. Negative output terminal 5V. *Note: USB and 5V share the same ground.*
	Indicator
LED	A green LED indicates that the output is functioning properly.

Table 1: Connector Descriptions and Functional Details

3 Specification

The specification for USB-AC-PD is shown in the following table. If not otherwise specified the following parameters have been used: T_{amb}=25°C and U_{in}=24 V_{dc}.

	Min	Typ	Max	Unit
Eingang Input				
Eingangsspannung U_{out}=5V Input Voltage Range	207		253	V_{dc}
Eingangskapazität Input Capacitance		4.7		µF
Standby Leistungsverbrauch Standby Power		30	50	mW
Eingangssicherung Input Fuse		750		mA
USB-C Ausgang USB-C Output				
Ausgangsspannung U_{out}=5 V Output Voltage U_{out}=5 V		tbd		V
Ausgangsstrom U_{out}=5 V Output Current U_{out}=5 V	0		3	A
Ausgangsspannung U_{out}=9 V Output Voltage U_{out}=9 V		tbd		V
Ausgangsstrom U_{out}=9 V Output Current U_{out}=9 V	0		2.22	A
Ausgangsspannung U_{out}=12 V Output Voltage U_{out}=12 V		tbd		V
Ausgangsstrom U_{out}=12 V Output Current U_{out}=12 V	0		1.67	A
Wandlungeffizienz Conversion Efficiency		tbd		%
Zener Schutzdiode Ausgang Zener Protection Output	active transistor clamp 12V			
5V Ausgang 5V Output				
Ausgangsspannung Output Voltage	4.8	5.0	5.2	V
Ausgangsstrom Output Current		20		mA

	Min	Typ	Max	Unit
Gehäuse Case				
Montageform Mounting Type		Din Rail		
Teilungseinheiten Modular width uinits		1		
Montagebereite Mounting Width		17.6		mm
Montagebereite Mounting Length		106		mm
Montagebereite Mounting Height		60		mm
Montagestiehl Mounting Style		Household Installation BOX		
Sicherheitsfeatures Safety Features				
Eingangsüberspannungsschutz Input overvoltage protection		yes		
Übertemperaturschutz Over Temperature Precotection		70	80	°C
Kurzschlussschutz Short circuit protection		yes		
Leerlaufschutz Open circuit protection		yes		
Betriebsbedingungen Operating Conditions				
Temperaturbereich Temperature Range	-40		50	°C
Technische Merkmale Technical Characteristics				
Elektrolytkondensatoren Electrolytic Capacitors		No electrolytic capacitors		
Platinen Lackierung PCB conformal coating		No conformal coating.		

4 Measurements

4.1 Measurement Conditions

The measurement conditions are noted in table 4, if not otherwise noted in the specific measurement.

	Min	Typ	Max	Unit
Eingang Input				
Eingangsspannung Input Voltage	23.5	24	24.5	V_{dc}
Umgebungsbedingungen Environment Conditions				
Temperatur Temperature	20		24	°C
Feuchtigkeit Humidity	30		90	$\%_{rel}$

Table 4: Measurement Conditions, if not otherwise noted.

4.2 Output Voltage Stability

Measurement - To be done! The output voltage is measured over the operation range in Figure 2. The output voltages are set to 5 V_{dc}, 9 V_{dc} and 12 V_{dc}.

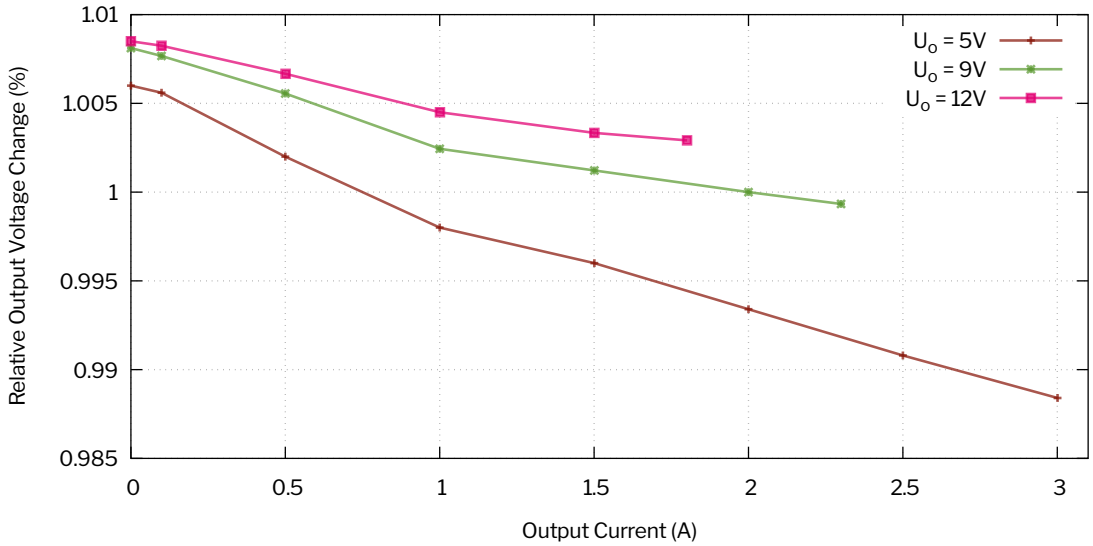

Figure 2: Relative Output Voltage stability over Output Current

4.3 Output Voltage Ripple

Measurement - To be done! The output voltage ripple is measured over the operation range and plotted in Figure 3.

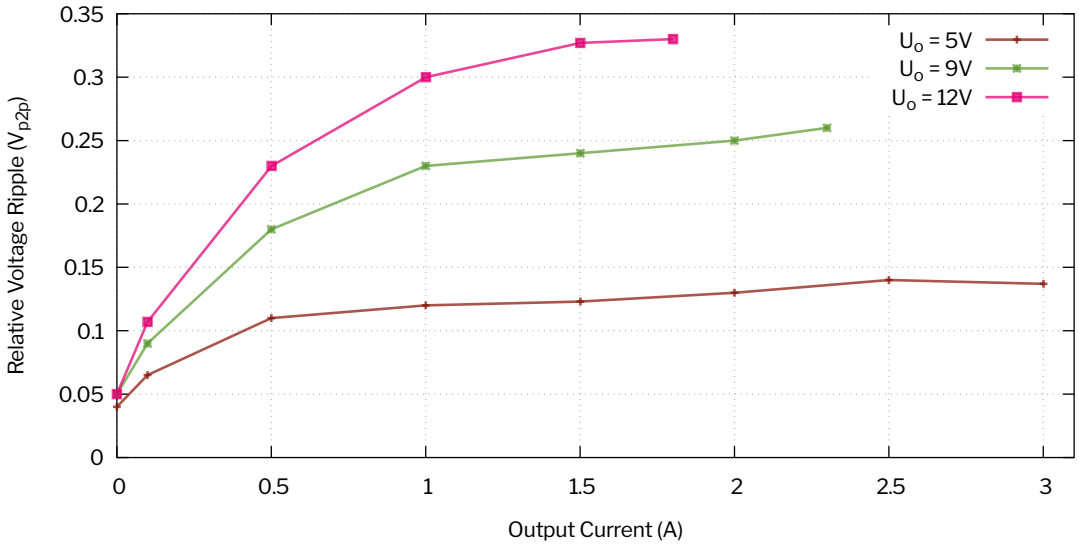

Figure 3: The output voltage ripple is measured over the output current range.

4.4 Conversion Efficiency

Measurement - To be done! The conversion efficiency is plotted over the output current range.

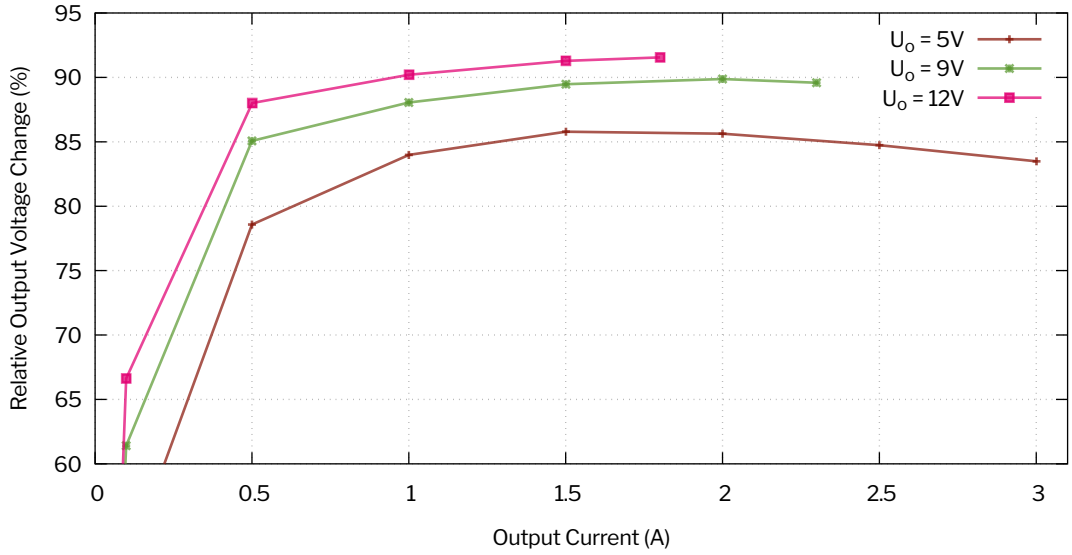

Figure 4: Conversion Efficiency Output Current

4.5 Input Standby Current

Measurement - To be done! The input standby power over the output voltage is plotted over the input voltage range.

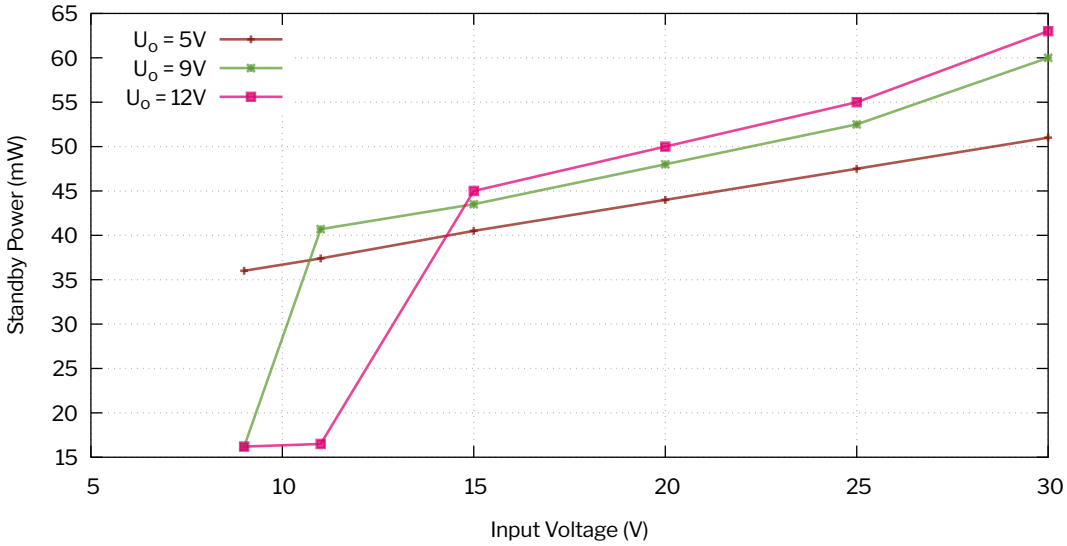

Figure 5: Standby Current over Input Voltage

4.6 Step Response 5 V

Measurement - To be done! For the step response the output current was changed from 0 A to 3 A at an output voltage of 5 V. The output voltage is shown in the subsequent figure 6.

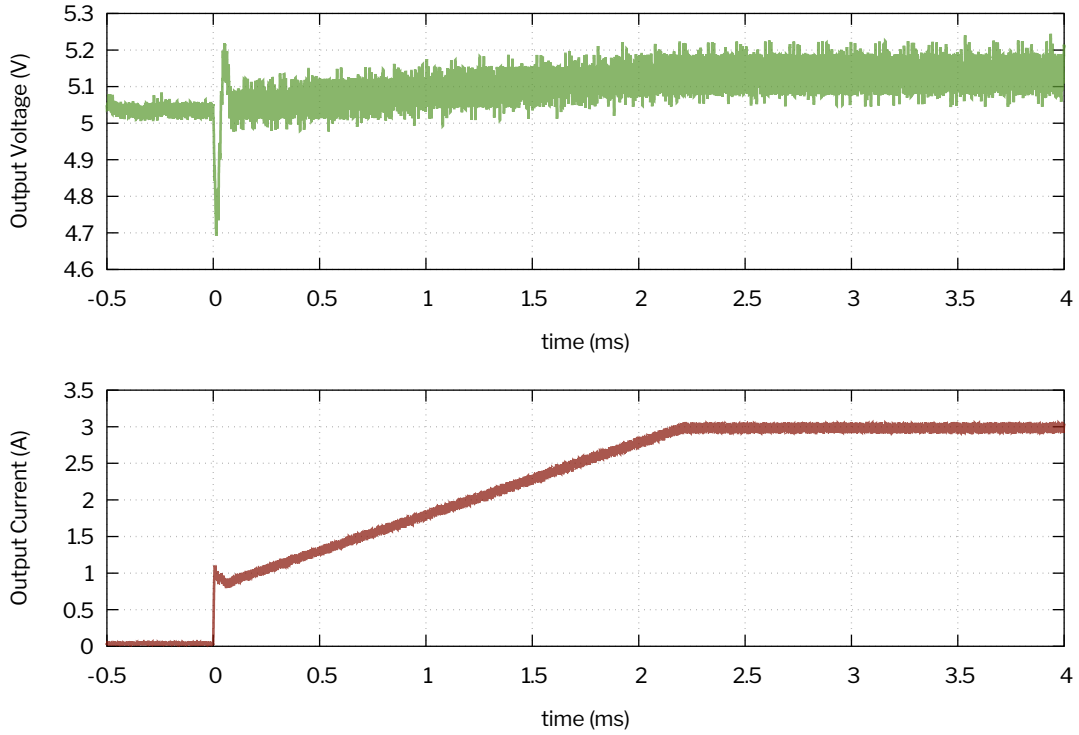

Figure 6: 5V Transient response 5V

4.7 Step Response 9 V

Measurement - To be done! For the step response the output current was changed from 0 A to 3 A at an output voltage of 9 V. The output voltage is shown in the subsequent Figure 7.

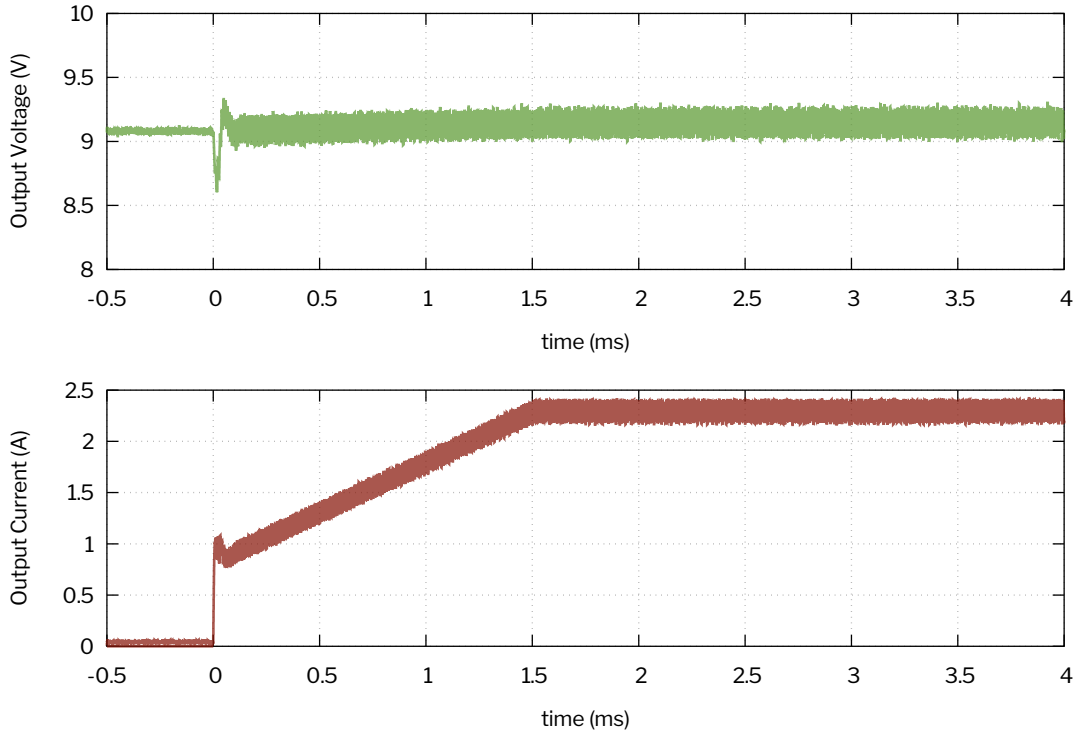

Figure 7: Transient response 9V

4.8 Step Response 12 V

Measurement - To be done! For the step response the output current was changed from 0 A to 1.8 A. The output voltage is shown in the subsequent Figure 8.

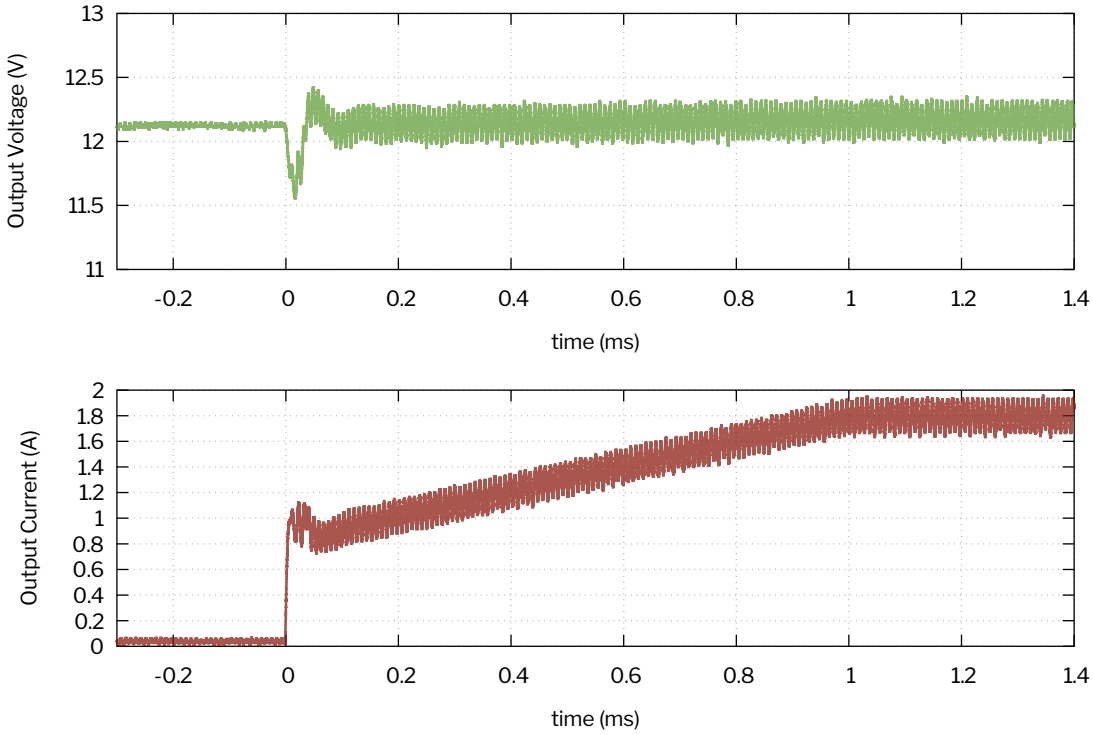

Figure 8: Transient response 12 V

5 EMC Measurements

Measurement - To be done!

The average and quasipeak input EMC conducted line emission of USB-AC-PD are depicted in 9. The output emssions are depicted in Figure 10.

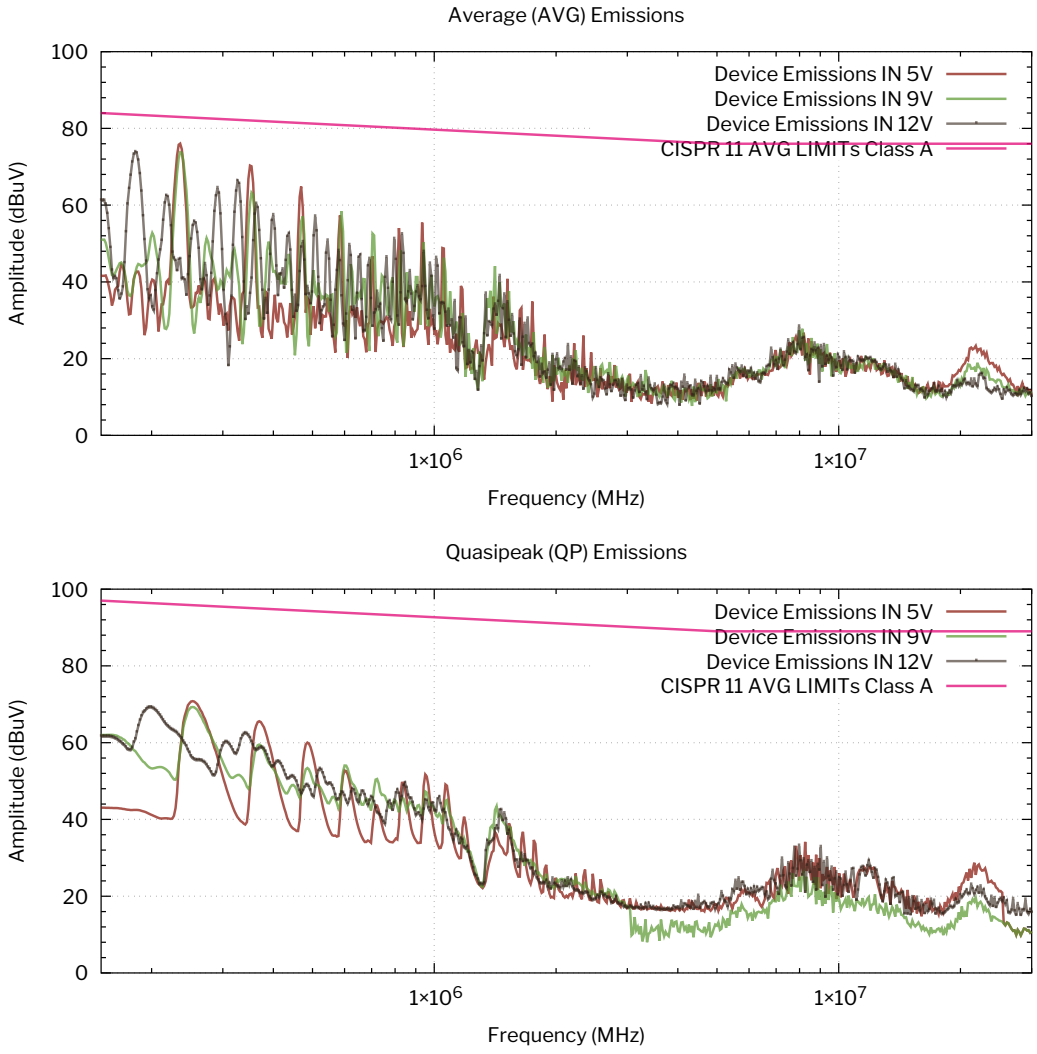

Figure 9: Input EMC Emission USB-AC-PD.

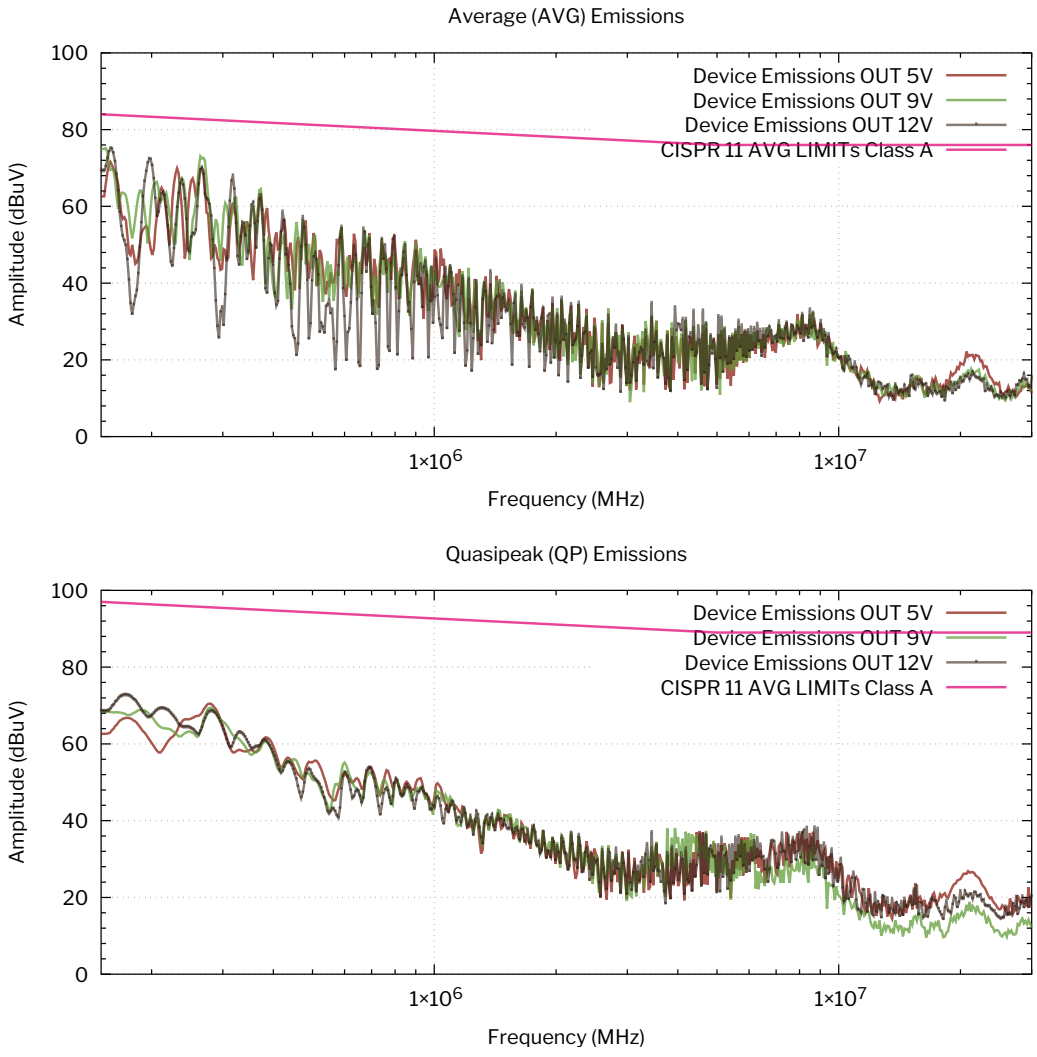

Figure 10: Output EMC Emission USB-AC-PD.

6 Case

The case drawing of the USB-AC-PD is shown in Figure 11.

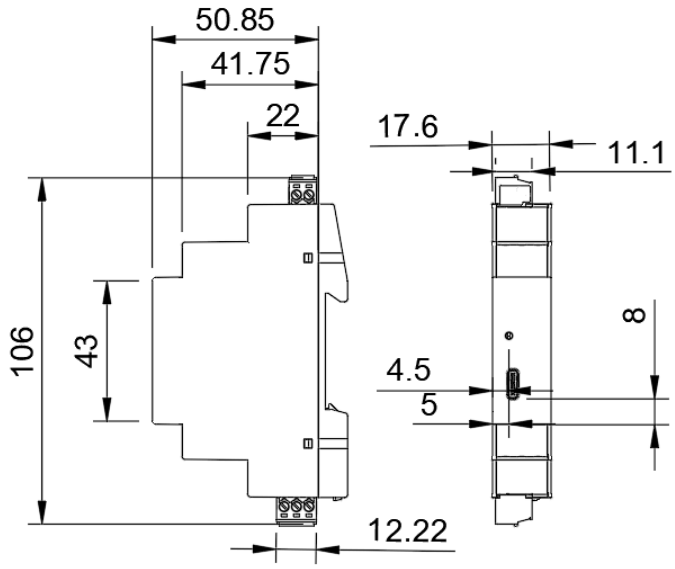

Figure 11: USB-AC-PD Product drawing with dimensions.

7 Product label

The product label of the USB-AC-PD is depicted in the following Figure 12. The magenta cutouts show the position of the USB-C connector (large) and the LED (small).

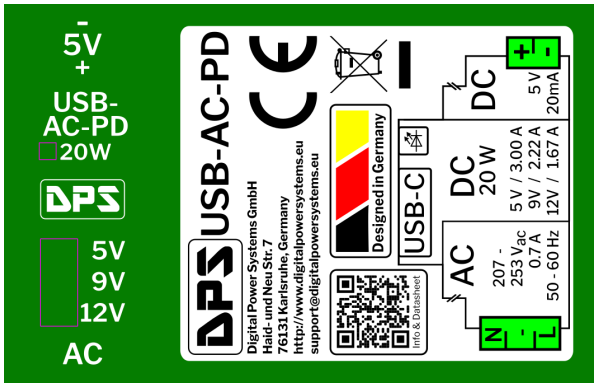

Figure 12: The product label USB-AC-PD(Revision 1).

8 Document

8.1 Latest Document Revision

The latest document revision can be downloaded here:

https://digitalpowersystems.eu/usb-ac-pd/

8.2 Datasheet Quality

Digital Power Systems aims for the highest datasheet quality. We value your feedback to improve this document. Please email:

`datasheet (ät) digitalpowersystems (döt) eu`

8.3 Revision History

The revision history is depicted in the following table.

Date	Changes in Revision
18.2.2025	Preview with missing data

8.4 Contact Information

This is a product of the Digital Power Systems GmbH (DPS).

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