

## USB Type-C™ power meter reference design based on TSZ122, LDK120, ST715, and STM32



Fully assembled board developed for performance evaluation only,  
[not available for sale](#)

### Features

- Input voltage range: 5 to 20 V
- Input current range: 0 to 5 A
- Bidirectional current measurement
- USB Type-C™ port power calculation
- Pass-through for USB data lines
- Allows understanding the charger power capability
- Allows viewing the USB sink/source roles

### Description

The **STDES-USBPWRMT1** is a measurement device that can be inserted between a USB Type-C™ power source and a USB Type-C™ power sink device.

The **STDES-USBPWRMT1** power meter includes a USB Type-C™ receptacle connector on one side and a USB Type-C™ plug on the other side.

The power meter embeds a shunt resistor that is inserted on the USB Vbus lines and enables the measurement of the current flowing through the dongle.

All data lines are carefully routed from the input of the power meter to the output, so that transmitted data are affected as little as possible by the insertion of the power meter.

The bright display provides an accurate information of the USB port voltage, current, resulting power, and current direction.

This type of information can help the user to understand which charger is more efficient, in order to charge a device faster, or simply to visualize the power transfer from one device to another.

Product summary	
USB Type-C™ power meter reference design based on TSZ122, LDK120, ST715, and STM32	<a href="#">STDES-USBPWRMT1</a>
Mainstream Arm Cortex-M0 Access line MCU with 16 Kbytes of Flash memory, 48 MHz CPU	<a href="#">STM32F031F4P6</a>
200 mA low quiescent current very low noise LDO	<a href="#">LDK120PU33R</a>
Application	USB Type-C™

## 1 Electrical characteristics

**Table 1. STDES-USBWRMT1 electrical characteristics**

Symbol	Description	Min.	Type	Max.	Unit
$V_{bus}$	Input offset voltage temperature drift	5		20	V
$I_{USB}$	Input bias current	0		5	A
Power	Input offset current	0		100	W

## 2 Reference design overview

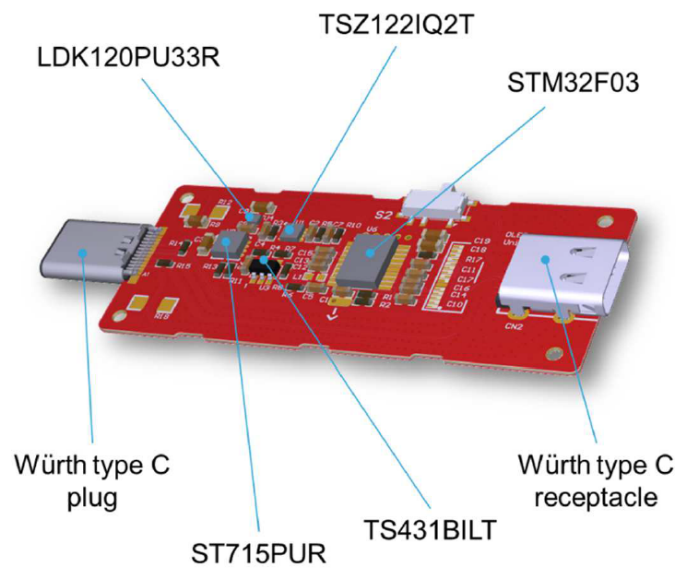
The USB power delivery protocol allows changing the USB bus voltage from the standard 5 V to higher voltages, such as 9 or even 20 V.

The **STDES-USBPWRMT1** power meter is able to handle voltages as high as 20 V. Therefore, it allows viewing the USB bus voltage change and the resulting charging power change.

**Figure 1. Charging at different  $V_{BUS}$  voltages according to the USB Power Delivery protocol**



**Figure 2. 3D PCB view and main components**

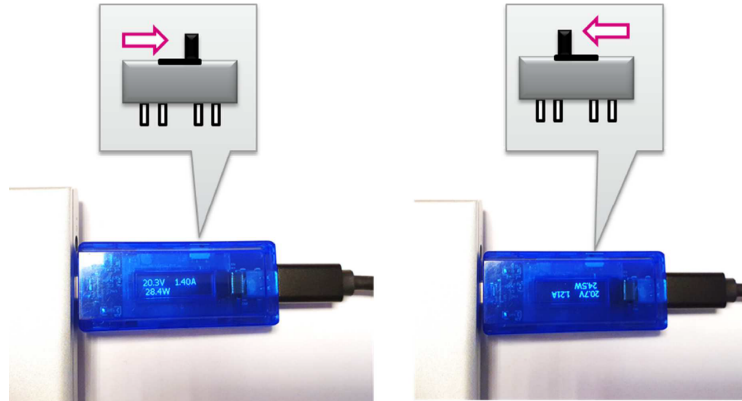


### 3 Display inverting feature description

The power meter includes a toggle switch that enables the inversion of the display for a more comfortable reading.

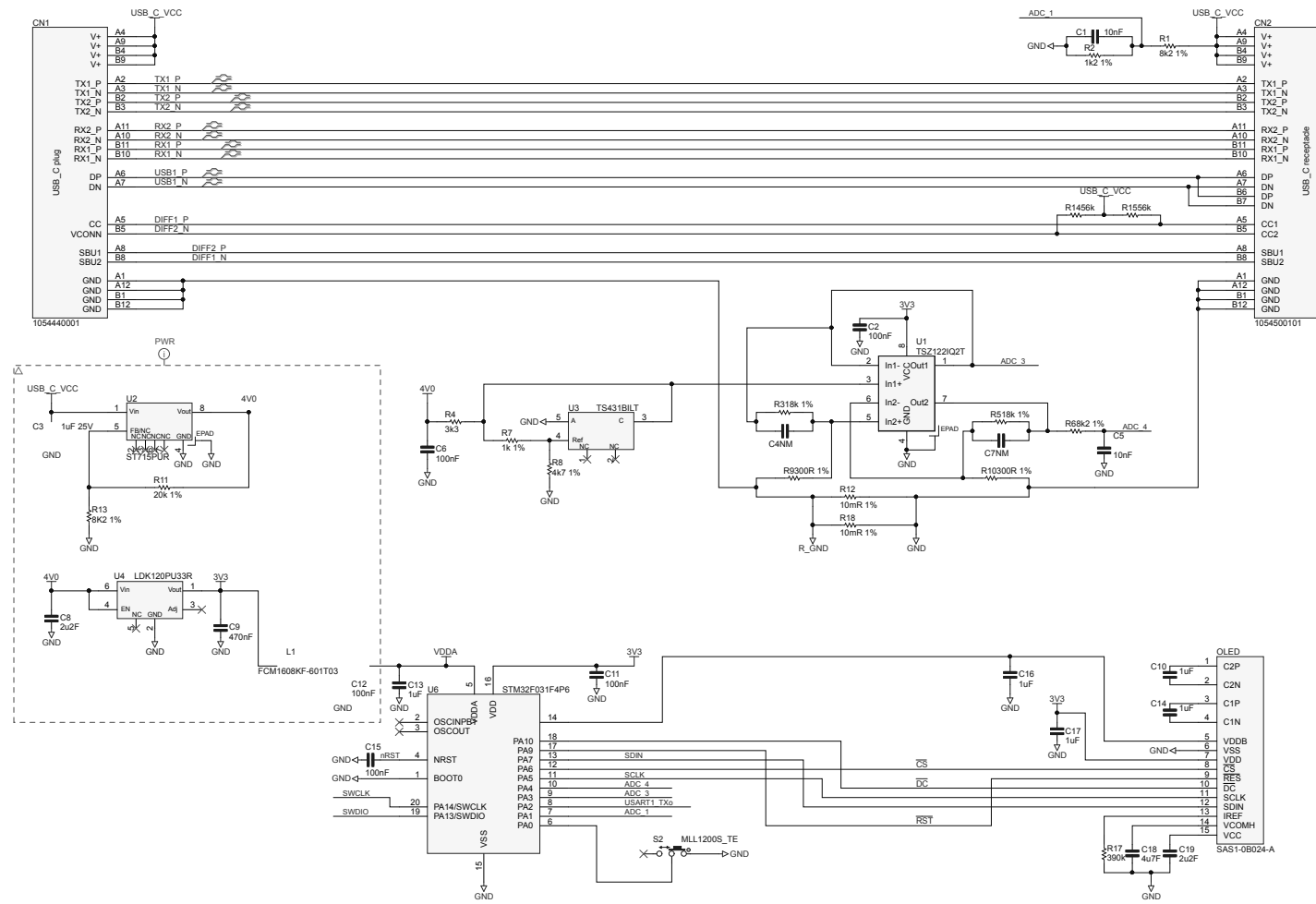
This is especially useful if the power meter is used in a fixed setup, such as a demonstration panel. The figure below shows the display inversion.

**Figure 3. Using the switch to invert the display**



# 4 Schematic diagrams

Figure 4. STDES-USBPWRMT1 circuit schematic



## Revision history

**Table 2. Document revision history**

Date	Revision	Changes
17-Jun-2022	1	Initial release.

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