

# USB-C Power 3 Click



PID: MIKROE-6954

**USB-C Power 3 Click** is a compact add-on board designed for USB Type-C power management, enabling controlled USB Power Delivery operation in systems that need source and sink power-role support. This board is based on the [PTN5110](#), a single-port USB Type-C Port Controller from [NXP](#), compliant with the USB Type-C Port Controller Interface specification. It implements the Type-C Configuration Channel interface and USB PD physical layer functions, working with a Type-C Port Manager for PD policy management. The board supports source and sink voltages of up to 20V and integrates the [NX20P5090](#) 5A unidirectional power switch, [NX48P0407](#) CC and SBU protection IC, and [ACT5101QI102](#) buck-boost converter, with I2C control, configurable interrupt selection, current limit control, fault LED indicators, and diagnostic test points. USB-C Power 3 Click is suitable for USB-C power accessories, embedded source and sink devices, portable equipment, industrial systems, evaluation platforms, and configurable USB Power Delivery applications.

For more information about **USB-C Power 3 Click** visit the official [product page](#).

## How does it work?

USB-C Power 3 Click is based on the PTN5110, a single-port USB Type-C Port Controller from NXP compliant with the USB Type-C Port Controller Interface specification. The PTN5110 implements the Type-C Configuration Channel interface and USB Power Delivery physical layer functions, working together with a Type-C Port Manager that handles USB PD policy management. This makes the board suitable for applications that need controlled negotiation and management of USB Type-C power roles. USB-C Power 3 Click supports both sink and source operation, with a maximum supported source and sink voltages of up to 20V, allowing it to be used in systems that either provide power to an external USB-C device or receive power

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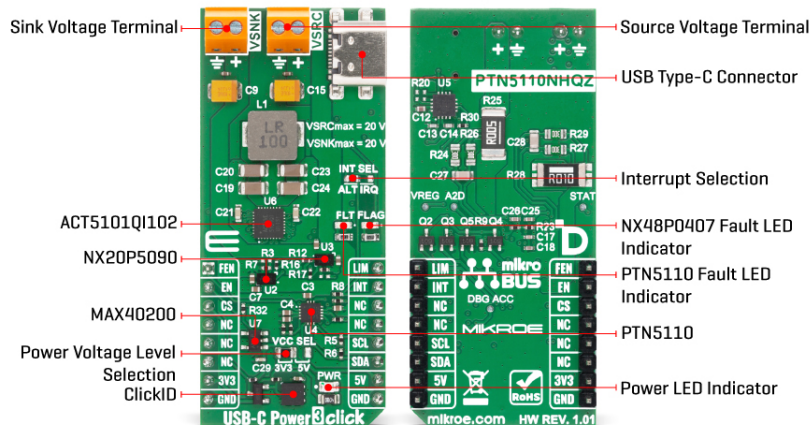


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from a USB-C power source.



In addition to the PTN5110, the board integrates the NX20P5090 from NXP, an advanced 5A unidirectional power switch for USB Power Delivery applications, enabling controlled and protected power switching in the USB-C power path. It also includes the NX48P0407 from NXP, a CC and SBU protection IC designed to protect the USB Type-C Configuration Channel and Sideband Use pins from short-to-VBUS damage through ultrafast overvoltage protection detection. This combination of USB PD control, high-current power switching, and CC/SBU protection makes USB-C Power 3 Click a reliable solution for power management, USB-C power accessories, embedded source and sink devices, industrial control systems, portable equipment, evaluation platforms, and designs requiring safe and configurable USB-C power delivery.

The board communicates with the host MCU through the I2C interface, which is used for controlling both the PTN5110 and the ACT5101QI102 buck-boost converter. Several additional mikroBUS pins are used for board-level control and monitoring. The FEN pin functions as the source load switch enable signal, while the EN pin is used as the ACT5101QI102 enable and VCC enable signal, providing device enable control through the MAX40200. The LIM pin is used for current limit selection, allowing the system to configure the operating current limit according to application requirements. The INT pin serves as the interrupt output to the host MCU and receives one of the selected interrupt sources through the onboard INT SEL jumper. Depending on the jumper configuration, the interrupt signal can come from the ALT interrupt of the PTN5110 or from the IRQ interrupt of the ACT5101QI102 buck-boost converter. For visual fault monitoring, the board includes two red LED indicators: FLT, which indicates a fault condition related to the PTN5110, and FLAG, which indicates a fault condition from the NX48P0407 protection IC.

The back side of the board also provides several useful test points for debugging, monitoring, and evaluation. The DBG ACC test point, provided by the PTN5110, indicates the presence of a USB Type-C Debug Accessory. The STAT test point, provided by the ACT5101QI102, is an open-drain status output used to indicate various operating conditions of the converter; a LOW state indicates that the converter is enabled and has a valid output, while a high-impedance state indicates that the converter is disabled for any reason. The VREG test point gives access to the internal VREG LDO output of the ACT5101QI102, with a programmable output voltage range from 2V to 5.1V. The A2D test point is connected to the ADC converter function of the ACT5101QI102, providing an additional signal monitoring point for system evaluation.

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This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used as a reference for further development.

## Specifications

|                  |                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type             | USB-C PD                                                                                                                                                                                                                                                                                    |
| Applications     | Ideal for USB-C power accessories, embedded source and sink devices, portable equipment, industrial systems, evaluation platforms, and configurable USB Power Delivery applications                                                                                                         |
| On-board modules | PTN5110 - single-port USB Type-C Port Controller from NXP   NX20P5090 - 5A unidirectional power switch for USB Power Delivery applications from NXP   NX48P0407 - CC and SBU protection IC for USB Type-C short-to-VBUS protection from NXP                                                 |
| Key Features     | USB Type-C power management, USB Power Delivery support, source and sink operation, I2C control interface, source load switch enable, device enable control through MAX40200, current limit selection, selectable interrupt routing, fault LED indicators, diagnostic test points, and more |
| Interface        | GPIO, I2C                                                                                                                                                                                                                                                                                   |
| Feature          | ClickID                                                                                                                                                                                                                                                                                     |
| Compatibility    | mikroBUS™                                                                                                                                                                                                                                                                                   |
| Click board size | L (57.15 x 25.4 mm)                                                                                                                                                                                                                                                                         |
| Input Voltage    | 3.3V or 5V, External                                                                                                                                                                                                                                                                        |

## Pinout diagram

This table shows how the pinout on USB-C Power 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

| Notes                      | Pin         |  |      |     |    | Pin        | Notes                   |
|----------------------------|-------------|-------------------------------------------------------------------------------------|------|-----|----|------------|-------------------------|
| SRC Load Switch Enable     | <b>FEN</b>  | 1                                                                                   | AN   | PWM | 16 | <b>LIM</b> | Current Limit Selection |
| ACT5101Q Enable/VCC Enable | <b>EN</b>   | 2                                                                                   | RST  | INT | 15 | <b>INT</b> | Interrupt               |
| ID COMM                    | <b>CS</b>   | 3                                                                                   | CS   | RX  | 14 | NC         |                         |
|                            | NC          | 4                                                                                   | SCK  | TX  | 13 | NC         |                         |
|                            | NC          | 5                                                                                   | MISO | SCL | 12 | <b>SCL</b> | I2C Clock               |
|                            | NC          | 6                                                                                   | MOSI | SDA | 11 | <b>SDA</b> | I2C Data                |
| Power Supply               | <b>3.3V</b> | 7                                                                                   | 3.3V | 5V  | 10 | <b>5V</b>  | Power Supply            |
| Ground                     | <b>GND</b>  | 8                                                                                   | GND  | GND | 9  | <b>GND</b> | Ground                  |

## Onboard settings and indicators

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| Label | Name    | Default | Description                                                                |
|-------|---------|---------|----------------------------------------------------------------------------|
| LD1   | PWR     | -       | Power LED Indicator                                                        |
| LD2   | FLAG    | -       | NX48P0407 Fault LED Indicator                                              |
| LD3   | FLT     | -       | PTN5110 Fault LED Indicator                                                |
| JP1   | VCC SEL | Left    | Power Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V |
| JP2   | INT SEL | Left    | Interrupt Selection ALT/IRQ: Left position ALT, Right position IRQ         |

## USB-C Power 3 Click electrical specifications

| Description    | Min | Typ | Max | Unit |
|----------------|-----|-----|-----|------|
| Supply Voltage | 3.3 | -   | 5   | V    |
| Source Voltage | -   | -   | 20  | V    |
| Sink Voltage   | -   | -   | 20  | V    |

## Software Support

[USB-C Power 3 Click](#) demo application is developed using the [NECTO Studio](#), ensuring compatibility with [mikroSDK](#)'s open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a [mikroBUS™](#) socket.

## Example Description

This example demonstrates the use of the USB-C Power 3 Click board for monitoring USB Type-C connection and power status. The application reads CC and power status registers, detects connection changes, and logs detailed information about VBUS state, connection type, and cable orientation.

## Key Functions

- `usbcpower3_cfg_setup` This function initializes Click configuration structure to initial values.
- `usbcpower3_init` This function initializes all necessary pins and peripherals used for this Click board.
- `usbcpower3_default_cfg` This function executes a default configuration of USB-C Power 3 Click board.
- `usbcpower3_ptn_read_reg_byte` This function reads one byte from the selected PTN USB PD register using the block read function.
- `usbcpower3_ptn_write_reg_byte` This function writes one byte to the selected PTN USB PD register using the block write function.
- `usbcpower3_restart_device` This function restarts the device by disabling and re-enabling it.

## Application Init

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Initializes the logger and USB-C Power 3 Click driver, applies the default configuration, and reads device identification information.

## Application Task

Continuously monitors CC and power status registers, detects changes, parses connection state, and controls VBUS direction (sink/source) accordingly.

## Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following [this tutorial](#).
- UART Terminal - Monitor data via the UART Terminal using a [USB to UART converter](#). For detailed instructions, check out [this tutorial](#).

## Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the [NECTO Studio](#). The application code can also be found on the MIKROE [GitHub](#) account.

## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

## Downloads

[USB-C Power 3 Click example package](#)

[USB-C Power 3 Click 2D and 3D files v101](#)

[PTN5110 datasheet](#)

[NX48P0407 datasheet](#)

[NX20P5090 datasheet](#)

[ACT5101QI102 datasheet](#)

[USB-C Power 3 click schematic v101](#)

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