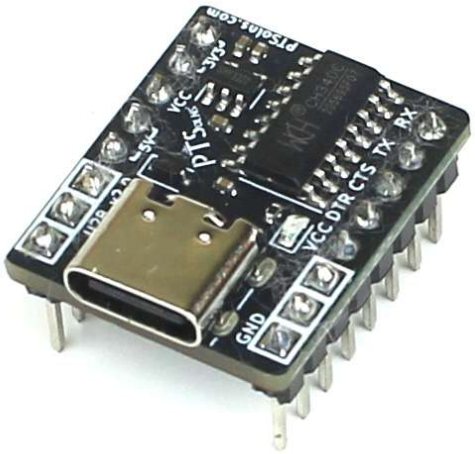
USB-UART Bridge (U2B)

1 DESCRIPTION

The PTSolns *USB-UART Bridge* (*U2B*) is a compact board that converts USB-C signals into asynchronous serial (UART) signals, enabling programming and communication with a wide range of common microcontroller development boards.



The *U2B* supports both 5V and 3.3V logic levels, with fast switching between the two for compatibility across different microcontrollers.

Designed for flexibility, the *U2B* fits cleanly onto standard breadboards when populated with male headers, while also working with female headers for quick, direct pin access.

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2 DOCUMENT REVISION HISTORY

Current document revision is Rev 0.

3 PRODUCT FEATURES

This section highlights notable features of the *USB-UART Bridge.*

3.1 USB-C Port

The *USB-UART Bridge* has a USB-C Port onboard, as shown in Figure 1.

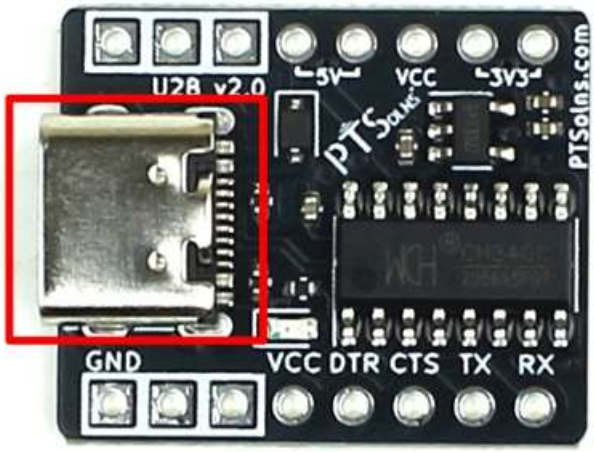

Figure 1: The USB-C Port on the USB-UART Bridge.

3.2 Pinout Diagram

The pinout diagram of the *USB-UART Bridge* is shown in Figure 2. Note that the VCC pin, and hence the operating logic voltage, is by default tied to 5V via the jumper on the back of the board. For more information see Section 3.3.

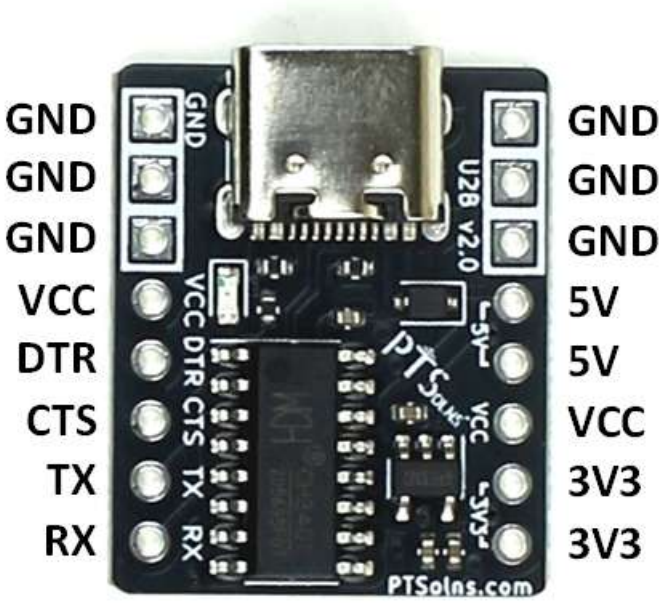

Figure 2: The pinout diagram of the USB-UART Bridge.

3.3 5V (Default) & 3.3V Voltage Selection

By default the operating and logic voltage is set to 5V on the back of the *USB-UART Bridge*, as shown in Figure 3. This can be changed to 3.3V (3V3) operating and logic voltage by cutting the jumper and connecting VCC to 3V3 either by resoldering the respective jumper pads or by using an external wire to connect VCC to 3V3.

For quick solderless changes between 5V and 3.3V operation, the jumper can be cut on the back and the VCC, 5V and 3V3 pins can be connected externally via a breadboard or similar.

Figure 3: The voltage section jumper on the back of the USB-UART Bridge.

3.4 Header Assembly

The *USB-UART Bridge* comes unassembled so that the user is free to solder either standard female headers or male headers as required. The header assembly is shown in Figure 4. Using either female or male headers have different advantages. The female headers offer quick prototyping and programming using dupont wires or similar. Whereas the male headers allow for use with standard breadboards or other prototyping boards.

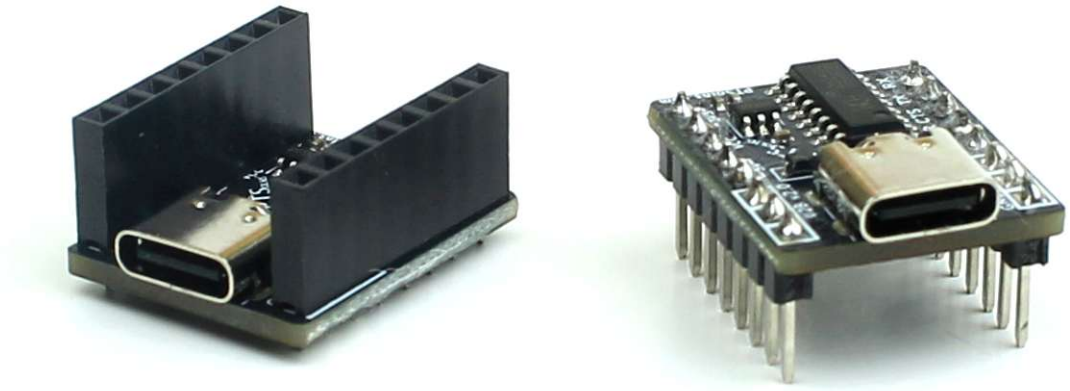

Figure 4: Header assembly of the USB-UART Bridge. Left: using female headers, Right: using male headers.

3.5 Breadboard Friendly

The *USB-UART Bridge* when assembled with standard male headers fits standard breadboards, as shown in Figure 3.

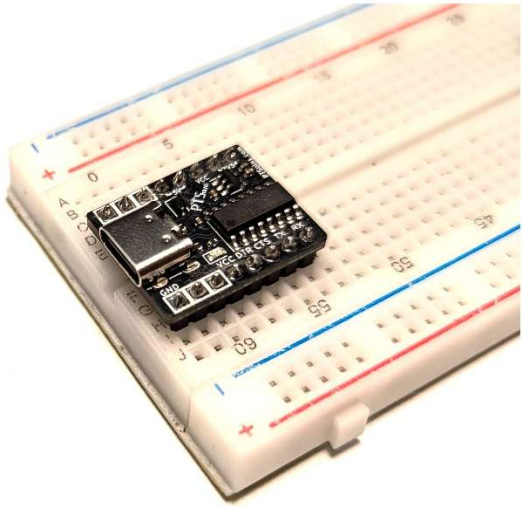

Figure 5: The USB-UART Bridge placed into a standard breadboard.

3.6 Power LED

Onboard the *USB-UART Bridge* is a red power LED. BY default this LED is enabled and will light when power is supplied to the board via USB-C. The power LED can be disabled by cutting a jumper on the back of the board, as shown in

Figure 6: Power LED jumper on the back of the USB-UART Bridge.

3.7 Silkscreen Printing

Due to the small footprint and compact design of the *USB-UART Bridge*, the pins are labelled on the back of the board. Ground pins are easily identified by the white square silkscreen printing around the pin, on both sides of the board.

3.8 CH340 Driver

The *USB-UART Bridge* uses the common CH340 IC to facilitate communication between what is plugged into the USB-C port (e.g. user's laptop). The driver for the CH340 typically must be installed the first time it is needed in any project. Many boards and modules make use of the CH340 so chances are that the driver is already installed. However, if the driver is not yet installed, the user must first install it in order to program other microcontrollers using the *USB-UART Bridge.* This installation typically only must be done once.

Instructions on how to install the CH340 driver (on a Windows machine) can be found in the following reference:

https://www.youtube.com/watch?v=UUQ84VKg3oM

Additionally, SparkFun Electronics has written a comprehensive tutorial on this topic, and the user is referred to their excellent documentation on this. Find the link here:

https://learn.sparkfun.com/tutorials/how-to-install-ch340-drivers/all

There are many other tutorials available online that can be found by searching "CH340 driver installation instructions" or similar.

3.9 Application Examples

The *USB-UART Bridge* can be used to program a range of common microcontroller development boards, including the common Nano, Uno, and ESP32 development board, to name a few.

To use the *USB-UART Bridge* only two power pins and three logic pins need to be connected to the microcontroller development board. The power pins are:

- GND
- 5V (default setting), or 3.3V

Before supplying any power to the boards, the user must ensure that the proper operating and logic voltage is selected on the board. See Section 3.3 for more details.

The logic pins to connect are:

- Tx
- Rx
- DTR

Note that Tx is always connected to Rx on the microcontroller development board. Similarly Rx is always connected to Tx on the microcontroller development board.

The DTR pin has different configurations depending on the nature of the microcontroller development board. For example, if the development board has an exposed reset (RST) pin, such as on the common Nano for example, then a 0.1uF ceramic capacitor must be installed between the DTR pin and the RST pin. However, some boards have a DTR pin exposed with this capacitor already in place, in which case DTR on the *USB-UART Bridge* can be directly connected to the DTR pin on the development board.

Furthermore, the DTR pin can also be left entirely unconnected. If the user is able to manually trigger the proper reset (and sometimes boot) sequence. For boards such as the Nano, Uno and Pro Mini, the sequence is simply pressing the RST button, or pulling low the RST pin, momentarily during the upload process. For boards such as the ESP32 development board, the Boot and RST pin must be triggered in a particular manner. As an example, for the *ESP32 microWatt* development board, the trigger sequence is as follows:

1) Enter Boot mode
    a. Press and hold Boot button
    b. Single quick press RST button
    c. After 1 second, release Boot button
2) Upload sketch
    a. Wait until this is fully completed
3) Exit Boot mode
    a. Single quick press RST button

Common connection examples and trigger sequences are outlined in Table 1.

Table 1: Connection Examples

U2B	GND	VCC	Rx	Tx	DTR	Note
Nano Flip	GND	5V	Tx	Rx	A) Manual reset press during upload B) 0.1uF (104) series cap between DTR and Reset	C) Set U2B to 5V->VCC (default) D) Arduino IDE board “Arduino Nano”
Uno R3+	GND	5V	Tx	Rx	A) Manual reset press during upload B) 0.1uF (104) series cap between DTR and Reset	A) Set U2B to 5V->VCC (default) B) Arduino IDE board “Arduino Uno”
ESP32 microWatt	GND	3.3V	Tx	Rx	See procedure below	A) Set U2B to 3.3V->VCC B) Arduino IDE board “ESP32 Dev Module”
Nano Flip 3V3	GND	3.3V	Tx	Rx	A) Manual reset press during upload B) 0.1uF (104) series cap between DTR and Reset	A) Set U2B to 3.3V->VCC B) Arduino IDE board “Arduino Pro or Pro Mini”
Pro Mini (3.3V or 5V type)	GND	3.3V/ 5V	Tx	Rx	DTR	A) Set U2B to 3.3V or 5V based Pro Mini type B) Arduino IDE board “Arduino Pro or Pro Mini” C) Arduino IDE processor (3.3V, 8MHz) or (5V, 16MHz) based on Pro Mini type

3.10 Mark of Authenticity

Authentic PTSolns PCBs have a black solder mask color and are marked with the “PTSolns” logo in white silkscreen printing. The “Canadian Designed” symbol, consisting of the Canadian Maple Leaf with the word “Designed” underneath, can also be found on the PCB in white silkscreen printing. The “PTSolns” trademark and the “Canadian Designed” symbols are shown in Figure 7.

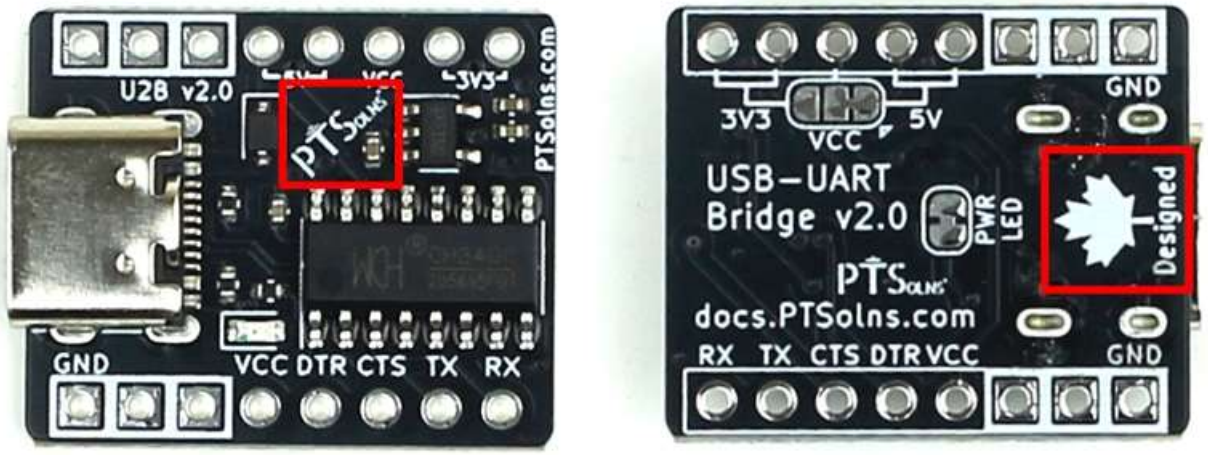

Figure 7: The "PTSolns" trademark and the “Canadian Designed” symbol found on authentic PTSolns PCBs.

4 PHYSICAL PROPERTIES

The physical properties of the *Nano Flip* are outlined in Table 2.

Table 2: Physical Properties.

	Quantity	Value	Reference
PCB	Length	22.5mm	Figure 8
	Width	18.6mm	Figure 8
	Header spacing	15.24mm	Figure 8
	Thickness	1.6mm	--
	Weight (without headers)	3g	--
	Color	Black	--
	Silkscreen	White	--
Material	Lead free HASL-RoHS surface finish		--
	FR-4 base		--

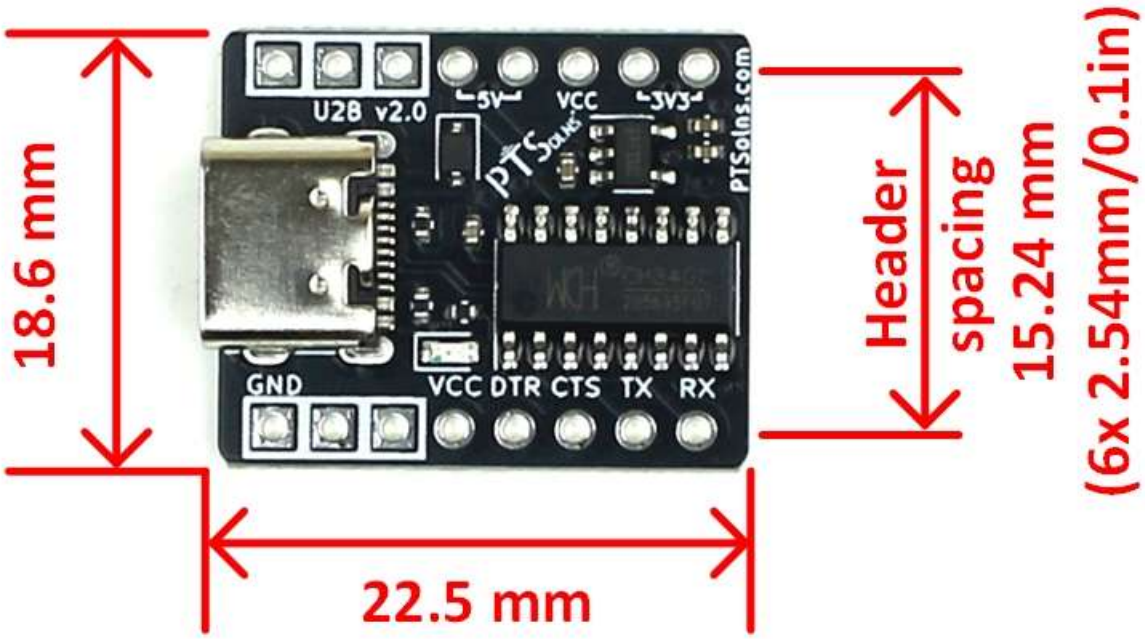

Figure 8: Dimensions of the USB-UART Bridge.

5 REFERENCES

This section lists relevant references.

- PTSolns' Documentation Repository Sub-Domain:
  https://docs.PTSolns.com

- PTSolns website:
  https://PTSolns.com

- CH340 driver installation tutorial:

  By PTSolns:
  https://www.youtube.com/watch?v=UUQ84VKg3oM

  By Sparkfun:
  https://learn.sparkfun.com/tutorials/how-to-install-ch340-drivers/all

- PTSolns support:
  https://ptsolns.com/contact-us