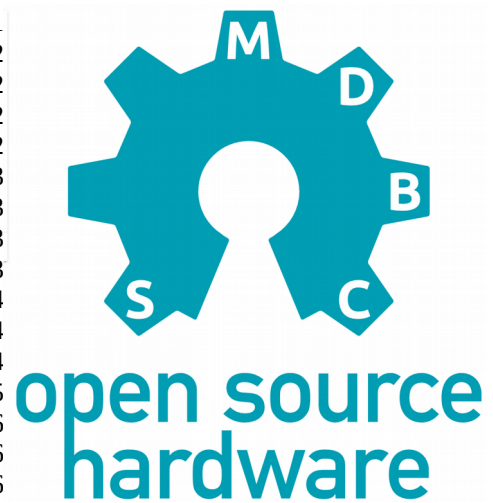


ZeptoBit Isolated USB-UART Adapter – Datasheet

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Summary

The ZeptoBit Isolated USB-UART Adapter allows communications between a device using logic level (1.8V to 5V) serial communication and a computer with a USB port. The adapter is optically isolated, there is no electrical connection between the connected device and the USB port. Supports baud rates from 300 baud to 2 Mbaud. Available with Micro USB connector or “full size“ USB B connector.

Main features

- Avoids ground loops.
- Circuits ground and computer ground does not need to be at the same potential.
- Maintains isolation from mains supply.
- Protects the computers USB port from damage.
- Separates sensitive analog circuits from potentially noisy computer ground.
- Works with devices which can not drive an opto isolator directly.
- Supports all common baud rates from 300 baud to 2 Mbaud
- Works with IO levels from 1.8V to 5V
- No driver installation required on Windows 10 or on recent Linux versions.
- Open source hardware: All the documentation needed to repair or modify the adapter is provided including schematic, BOM and design notes. 3D models of the device and 3D printable enclosures are also available.

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Driver

The adapter uses the CH340G USB interface IC. Drivers for the CH340G IC are built into Windows 10 and recent Linux kernels so the adapter will work with no driver installation. OSX requires a driver to be installed. If required, the driver can be downloaded from zeptobit.com.

Electrical characteristics

Absolute maximum ratings

Conditions outside the absolute maximum ratings are expected to cause permanent damage to the device.

	Minimum	Maximum
Supply voltage UART side	-0.3V	5.5V
I/O voltage UART side (Vio)	-0.3V	5.5V
Voltage RX/TX pins	-0.3V	Vio+0.5V

Operating conditions

	Minimum	Typical	Maximum
Voltage USB side	4.75V	5.0V	5.25V
Current USB side	-	12mA	16mA
Supply voltage UART side	3.0V ¹	3.3V or 5.0V	5.5V
Supply current UART side	-	7mA@3.3V 12mA@5V	16mA
I/O voltage UART side (Vio)	1.6V	1.8V, 2.5V, 3.3V, 5V	5.5V
Current required to drive RX pin	-	-	3µA
High level input voltage	-	-	Vio * 0.7
Low level input voltage	Vio * 0.35	-	-
Isolation voltage USB to UART side	2500V ²	-	-

1 The adapter may work with supply voltage as low as ~1.8V, particularly at low baud rates, but performance or functionality is not guaranteed.

2 Limited to 2500V by opto isolators. Creepage voltage >2500V (IPC9592B).

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Pinout

Pin	Function
1	Gnd
2	RX
3	TX
4	Gnd
5	+V I/O
6	+V I/O / Jumper
7	+3.3-5V / Jumper
8	+3.3-5V

Mechanical

	Micro USB	Full size USB
Length of board	49 mm (1.93")	49 mm (1.93")
Length including USB connector	50 mm (1.97")	56 mm (2.2")
Width	22.5 mm (0.89")	22.5 mm (0.89")
Height	4.5 mm (0.18")	14mm (0.55")
Mounting hole diameter	2.2mm (0.087")	2.2mm (0.087")
Mounting hole spacing	41 mm x 18.5 mm (1.614"x0.728")	41 mm x 18.5 mm (1.614"x0.728")

Mechanical 3D CAD models of the adapter and enclosures are available for download from zeptobit.com.

Principles of operation

USB-UART bridge

The CH340 (U2) is a USB to UART bridge. It is powered from the USB port. U2 requires a 12Mhz clock, which is provided by Y1.

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TX

The TX port on U2 drives an SN74LVC1T45 (U3) which in turn drives an 6N137 (VO2) optical isolator (U3). U3 is needed because U2 TX can not supply the current required to drive the optical isolator directly. U3 also inverts the signal, which is required to get an non-inverted output as VO2 also inverts the signal.

VO2 is powered by a +3.3V to +5V supply, but the output voltage on the TX pin of the adapter is independent of this. +V_IO (+1.8V to +5V) sets the output logic high voltage.

RX

The signal on the RX pin of the adapter drives an SN74LVC1T45 (U1) which drives the 6N137 optical isolator (VO1) . U1 shifts the voltage from the level on the +V_IO pin to the voltage on the +3.3-5V pin of the adapter. As on the TX side, U1 inverts the signal to cancel the inversion of the optical isolator. U1 draws only 3 μ A from the RX pin of the adapter.

Open Source Hardware License

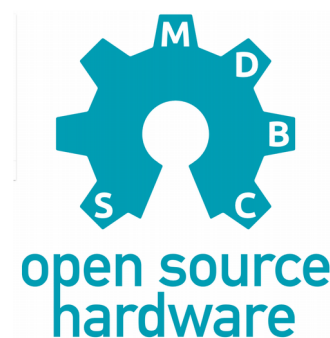
The ZeptoBit Optically Isolated USB-UART adapter is open source hardware, licensed under Creative Commons – Attribution 3.0.

The following is released as open source:

- Schematic in Diptrace and .pdf format.
- Bill of Materials
- Design Notes (principles of operation)
- Mechanical CAD files for adapter and enclosures.

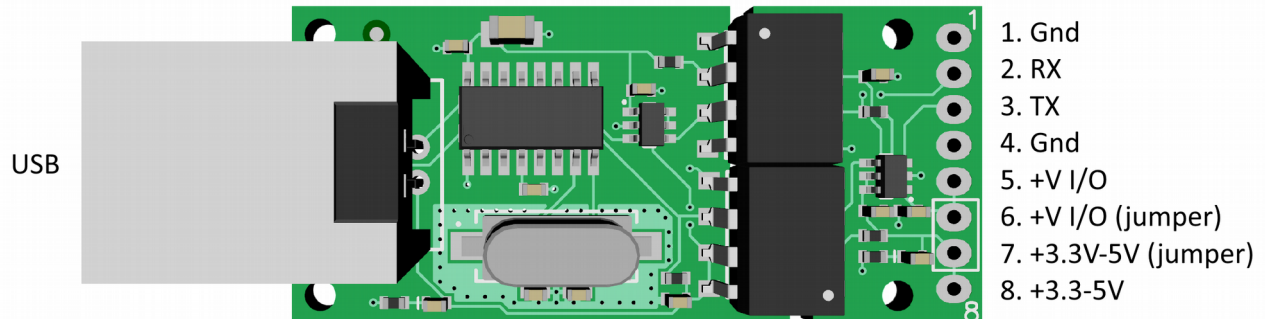
The following is not released as open source:

- Board layout files
- Gerber/drill files



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Quick Start Guide



Connections

- Connect pin 1 or 4 (Gnd) to Gnd on your device.
- Connect pin 2 (RX) to TX on your device.
- Connect pin 3 (TX) to RX on your device.
- Connect pin 5 (+V I/O) to the positive supply of your device (1.8V to 5V).
- If the voltage on pin 5 is 3.3V or higher, place a jumper between pin 6 and 7.
- If the voltage on pin 5 is less than 3.3V, connect pin 8 (+3.3-5V) to a positive supply with a voltage between 3.3 and 5 volts. In this case, DO NOT place the jumper.

On the computer

Plug in the USB cable, in most cases there is no need to install a driver and the adapter will show up as a serial port after a few seconds (for example COM3 on Windows or /dev/ttyUSB1 on linux). If it shows up as an unknown device in Windows you will need to download and install the driver from zeptobit.com.

Open your terminal emulator (for example Tera Term or Putty) and connect to the serial port. The terminal emulator and your device need to use the same baud rate.