# INTERFACE MODULE

## Interface Module
## UART to USB Serial Bridge Adapter

# Features

- Input Logic: 2V to 5V (TTL Compatible)
- Utilizes Low Profile SMT Components
- Virtual COM port drivers (Windows, Mac, and Linux)
- Software configurable data, stop, and parity bits
- Fully Compliant  with USB 1.1/2.0 Specification
- USB Certified CP2102 USB to UART transceiver
- LED USB Connectivity Indicator
- Small Footprint:
  Without Connector: 0.4" x 0.8" (10.16mm x 20.32mm)
  With Connector: 0.4" x 1.04" (10.16mm x 26.5mm)
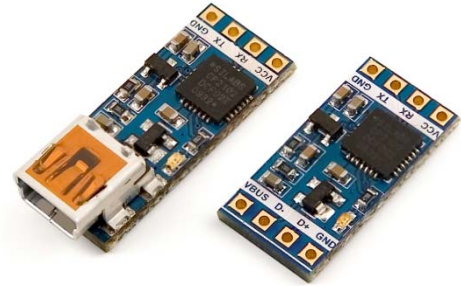
# Applications

- Easily Update RS-232 designs to support USB
- Power Embedded Projects via USB
- Add USB I/O capabilities to existing Devices via Virtual COM port
- Access UART Serial Devices from Host PC with existing COM Port applications
- Great for Robotics and RC applications with strict weight and space limitations
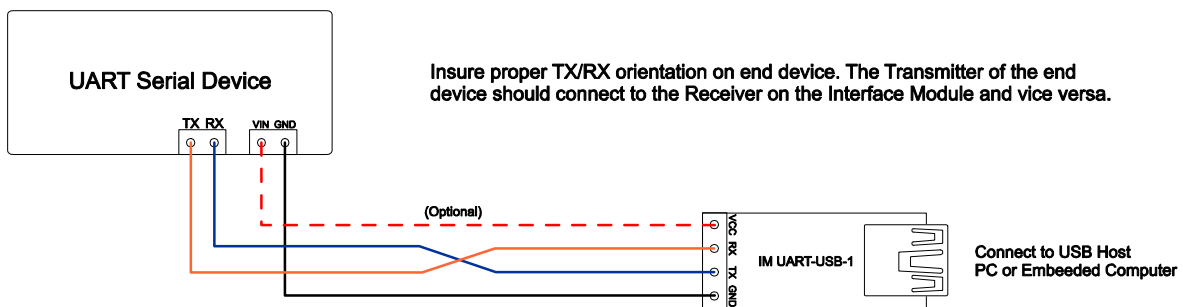
# Typical Application



Figure 1 - Connecting IM UART-USB to a UART Serial Device

# Part Description

## Overview

The UART to USB Interface Module is designed to simplify interfacing serial based devices to USB host computer systems. This USB-powered module can be interfaced to micro-controllers and other serial devices running at logic levels from 2V up to 5V. The module simplifies interfacing as it removes the need for traditional RS-232 level converters.

Its small footprint is designed to fit easily in existing robotics and/or RC projects and is available with or without the USB Mini-B connector.

The VCC pin can be used to power micro-controllers and other electronics directly from the USB bus with no additional power sources. The device is built in strict accordance to the USB specification and operates safely on all USB 1.1 and 2.0 compliant host systems including PCs and embedded computers.

## Design Considerations

Many UART to USB and Serial to USB adapters are bulky and take up a lot of space with many pins. There are many applications out there that only require the TX and RX pins of a UART line and can therefore be accomplished with a much simpler device with fewer pinouts.

The primary purpose behind this module was to develop an easy, simple to use, UART to USB interface. Because many applications require only the TX/RX lines, it was decided to minimize the I/O of this module for simplicity.

In these simplified applications it may be desirable to power the device from a USB host system. Pulling power from the USB host system is straight forward but requires certain precautions to protect the host system from erratic device behavior. Therefore, this device was built with exacting measures to the USB specification. Proper avalanche diodes and power-down circuitry allow this device to take full advantage of USB bus power while still operating safely within the specifications. While few other USB bridge devices go to this extent, this uncompromising design insures that the Revolution Robotics Interfaces Modules are robust and reliable.

# Part Information

## Absolute Maximum Ratings

Stresses at or above those listed may cause permanent damage to the device. These ratings represent a stress rating only, and functional operation of the devices at or exceeding these conditions is not implied. Exposure to maximum rating conditions for extended periods may reduce the operating life and affect device reliability.

| | |
|---|---|
| **Absolute Maximum Input Voltage:** | 5.8V |
| **Operating Temperature Range:** | -55$^0$ C to 125$^0$ C |
| **Storage Temperature Range:** | -65$^0$ C to 150$^0$ C |
| **Maximum Total Current:** | 500mA (USB limit) |
| **Board Dimensions:** | 0.8" x 1" (20.3mm x 25.4mm) |
| **Mounting Screws Holes:** | 2-56  (Fits Metric M2 & M2.2) |

## Global DC and I/O Electrical Characteristics

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| VCC Supply Voltage (USB spec) | | 4.75 | - | 5.25 | V |
| VCC Supply Current | | - | 20 | 26 | mA |
| Operating Temperature Range | | -40 | | +85 | °C |
| Output Logic High Voltage | $I_{OH}$ = -4mA<br>$I_{OH}$ = -10uA<br>$I_{OH}$ = -10mA | 2.6<br>3.2<br>- | -<br>-<br>2.5 | -<br>-<br>- | V |
| Output Logic Low Voltage | $I_{OL}$ = 8.5mA<br>$I_{OL}$ = 10uA<br>$I_{OL}$ = 25mA | -<br>-<br>- | -<br>-<br>1.0 | 0.6<br>0.1<br>- | V |
| Input Logic High Voltage | | 2.0 | - | - | V |
| Input Logic Low Voltage | | - | - | 0.8 | V |
| Input Leakage Current | | - | 25 | 50 | uA |

## Pinout Definitions

| Name | Type | Description |
|---|---|---|
| VCC | Power Out | Connected to VBUS via FET to disconnect power during USB suspend state. |
| RX | Digital IN | Asynchronous Data Input (UART Receiver). |
| TX | Digital OUT | Asynchronous Data Output (UART Transmitter) |
| GND | | Ground |
| VBUS [1] | Power IN | USB Bus Voltage Input from HOST |
| D- [1] | Digital I/O | USB D- |
| D+ [1] | Digital I/O | USB D+ |

[1] Pinouts only found on No Connector versions (SI UART-USB-NC-1).

# Application & Usage Information

## Usage

The Interface Module can be connected to any UART serial device with TTL compatible logic levels using 3 wires. Refer to Figure 1 for a wiring diagram.

Connect the TX pin of the serial device to the RX pin of the Interface Module, and the RX pin of the serial device to the TX pin on the Interface Module. It is necessary to cross these cables because the signals are directional and relative to each device. Think about it as the Transmitter (TX) of one device being received by the Receiver (RX) on the other end and vice versa.

To achieve proper signal levels, the device must have a common ground. Connect the GND pin on the Interface Module to the ground pin of the serial device. Typically this would be the same GND pin used by the power supply input as indicated in Figure 1

Some applications may inadvertently label their TX/RX backwards to show how to connect it to an end device. Interpret the directionality of these I/O pins and connect the device according to the guidelines above.

To power the remove device using USB power, simply use the VCC pin to connect the VIN of the end device. In applications requiring 5V with a +/- 5% supply, the VCC pin can directly power the target, otherwise dc regulation may be necessary. Most USB compliant devices will easily handle loads up to 100mA. The USB bus specification allows up to 500mA of power to be draw per USB device. Check with the HOST device to make sure it is capable of supplying the full load. If an external hub is used, it may be necessary to power it with an external power adapter.

The device can be tested easily by jumpering the TX and RX lines and opening up a serial terminal to the device. Any data sent will be echo back to the terminal.

## PC Interface and Drivers

Most operating systems will see this device as a generic virtual com port and will work without additional drives. Simply plug-in the device's USB to the host system and wait for the USB indicator LED to turn green.

If the system is unable to find drivers, they can be downloaded from the Silicon Labs website. The link to the drives can be found here:  http://www.revolution-robotics.com/im_uart-usb-1
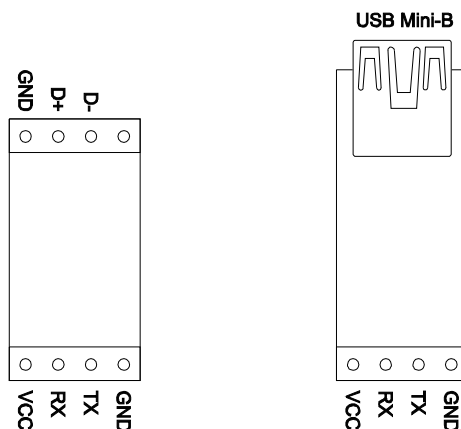
For additional usage information or application specific concerns, please contact our support staff, post a question on the support forums, or see the Silicon Labs website.

# Package Description

### Board Dimensions
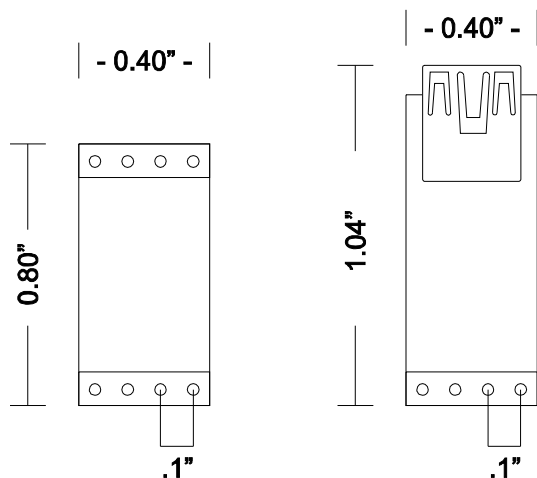


### Board Pinout



# Ordering Information

| Part No. | Ordering Code | Part Description | Price (Single) |
|---|---|---|---|
| IM UART-USB-WC-1 | IMUARTUSBWC1 | Interface Module UART to USB Bridge with USB Mini-B Connector | 14.95 |
| IM UART-USB-NC-1 | IMUARTUSBNC1 | Interface Module UART to USB Bridge without Connector | 14.95 |

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