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**Future Technology Devices International Ltd.**

**FT2232H Mini Module**

**USB Hi-Speed FT2232H Evaluation**

**Module**

**Datasheet**

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## 1 Introduction

The FT2232H Mini Module is a USB-to-serial/FIFO development module in the FTDI product range which utilizes the FT2232H USB Hi-Speed two-port bridge chip which handles all the USB signalling and protocols. It is ideal for development purposes to quickly prove functionality of adding USB to a target design. The FT2232H datasheet, [DS\\_FT2232H](#), is available at <http://www.ftdichip.com>,

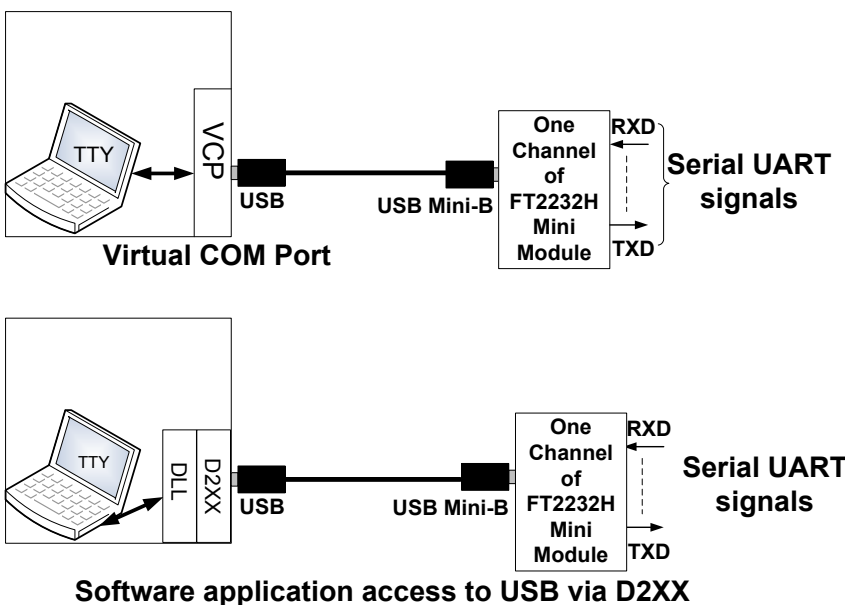


**Figure 1.1 - FT2232H Mini Module**

The FT2232H on the Mini Module is FTDI's 5th generation of USB devices. The FT2232H is a USB 2.0 High Speed (480Mb/s) to UART/MPSSE IC. The device features two interfaces that can be configured for asynchronous or synchronous serial or parallel FIFO interfaces. The two channels can also be independently configured to use an MPSSE engine. This allows the two ports of the FT2232H to operate independently as UART/Bit-Bang ports or MPSSE engines used to emulate JTAG, SPI, I<sup>2</sup>C, Bit-bang or other synchronous serial modes. All components used, including the FT2232H are Pb-free (RoHS compliant).

The FT2232H Mini Module connects the signals of the FT2232H IC to two 26-pin dual-row headers which allow easy connection PCB header sockets and ribbon cables.

The FT2232H Mini Module requires USB device drivers, available free from <http://www.ftdichip.com>, which are used to make the FT2232H on the Mini Module appear as a two virtual COM ports (VCP). This then allows the user to communicate with the USB interface via a standard PC serial emulation port (TTY). Another FTDI USB driver, the D2XX driver, can also be used with application software to directly access the FT2232H on the Mini Module through a DLL. This is illustrated in the Figure 1.2



**Figure 1.2 Using the FT2232H**

Device Drivers for the FT2232H Mini Module are available free from <http://www.ftdichip.com>.

## 1.1 USB Compliant

The FT2232H Mini Modules are fully compliant with the USB 2.0 specification.



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## 2 Typical Applications

- Rapid USB integration into existing electronic systems.
- Prototyping platform for USB interface on new systems.
- USB to multi-port JTAG, SPI and I<sup>2</sup>C interfaces (Two Multi-Protocol Synchronous Serial Engines available with the FT2232H)
- USB to multi-port asynchronous serial interfaces.

### 2.1 Driver Support

#### Royalty free VIRTUAL COM PORT (VCP) DRIVERS for...

- Windows 2000, Server 2003, XP Server 2008
- Windows XP and XP 64-bit
- Windows Vista and Vista 64-bit
- Windows XP Embedded
- Windows CE 4.2, 5.0, 5.2 and 6.0
- Mac OS-X
- Linux (2.6.9 or later)

#### Royalty free D2XX *Direct Drivers* (USB Drivers + DLL S/W Interface)

- Windows 2000, Server 2003, Server 2008
- Windows XP and XP 64-bit
- Windows Vista and Vista 64-bit
- Windows XP Embedded
- Windows CE 4.2, 5.0, 5.2 and 6.0
- Linux (2.4 or later) and Linux x86\_64

The drivers listed above are all available to download for free from [www.ftdichip.com](http://www.ftdichip.com). Various 3rd Party Drivers are also available for various other operating systems - see [www.ftdichip.com](http://www.ftdichip.com) for details.

### 2.2 Features

The FT2232H Mini Module has the following features:

- USB 2.0 Hi-Speed compatible
- Reduced development time
- Rapid integration into existing systems
- USB powered – no external power supply needed
- Based on the USB Hi-Speed FT2232H device
- Entire USB protocol handled by USB module
- Small USB Type B connector common on many commercial devices
- Asynchronous Serial data transfer rates from 300 baud to 12 Mbaud at TTL levels
- Synchronous Serial (MPSSE) data rates of up to 30Mbps on JTAG, SPI and I<sup>2</sup>C
- Support for USB suspend and resume
- UHCI / OHCI / EHCI host controller compatible
- -40°C to +85°C operating temperature range

### 3 Electrical Details

The electrical details and connections to the FT2232H Mini Module are shown in Figure 3.1 and tables 3.1 and 3.2.

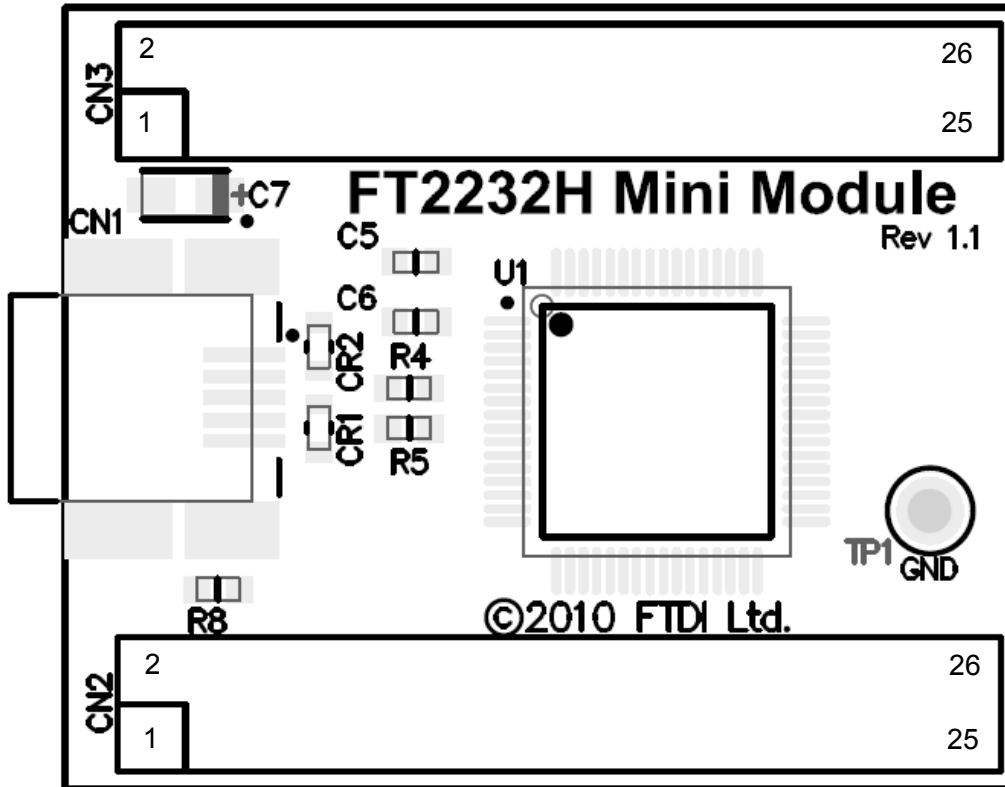


Figure 3.1 FT2232H Mini Module Electrical Connections (Top View)

Connector Pin	Name	Description
CN2-1	V3V3	3.3VDC generated from VCC (output)
CN2-2	GND	0V Power pin
CN2-3	V3V3	3.3VDC generated from VCC (output)
CN2-4	GND	0V Power pin
CN2-5	V3V3	3.3VDC generated from VCC (output)
CN2-6	GND	0V Power pin
CN2-7	AD0	FT2232H AD0 pin
CN2-8	RESET#	FT2232H RESET# pin
CN2-9	AD2	FT2232H AD2 pin
CN2-10	AD1	FT2232H AD1 pin
CN2-11	VIO	Connected to all FT2232H VCCIO pins (input)
CN2-12	AD3	FT2232H AD3 pin

CN2-13	AD5	FT2232H AD5 pin
CN2-14	AD4	FT2232H AD4 pin
CN2-15	AD7	FT2232H AD7 pin
CN2-16	AD6	FT2232H AD6 pin
CN2-17	AC1	FT2232H AC1 pin
CN2-18	AC0	FT2232H AC0 pin
CN2-19	AC3	FT2232H AC3pin
CN2-20	AC2	FT2232H AC2 pin
CN2-21	VIO	Connected to all FT2232H VCCIO pins (input)
CN2-22	AC4	FT2232H AC4 pin
CN2-23	AC6	FT2232H AC6 pin
CN2-24	AC5	FT2232H AC5 pin
CN2-25	SUSPEND#	FT2232H SUSPEND# pin
CN2-26	AC7	FT2232H AC7 pin

**Table 3.1 FT2232H Mini Module Connection – CN2**

Connector Pin	Name	Description
CN3-1	VBUS	USB VBUS power pin (output)
CN3-2	GND	0V Power pin
CN3-3	VCC	+5V Power pin (input) used to generate V3V3, VPLL and VUSB
CN3-4	GND	0V Power pin
CN3-5	CS	FT2232H EECS pin
CN3-6	CLK	FT2232H EECLK pin
CN3-7	DATA	FT2232H EEDATA pin
CN3-8	PWREN#	FT2232H PWREN#
CN3-9	BC7	FT2232H BC7 pin
CN3-10	BC6	FT2232H BC6 pin
CN3-11	BC5	FT2232H BC5 pin
CN3-12	VIO	Connected to all FT2232H VCCIO pins (input)
CN3-13	BC4	FT2232H BC4 pin



CN3-14	BC3	FT2232H BC3 pin
CN3-15	BC2	FT2232H BC2 pin
CN3-16	BC1	FT2232H BC1 pin
CN3-17	BC0	FT2232H BC0 pin
CN3-18	BD7	FT2232H BD7 pin
CN3-19	BD6	FT2232H BD6 pin
CN3-20	BD5	FT2232H BD5 pin
CN3-21	BD4	FT2232H BD4 pin
CN3-22	VIO	Connected to all FT2232H VCCIO pins (input)
CN3-23	BD3	FT2232H BD3 pin
CN3-24	BD2	FT2232H BD2 pin
CN3-25	BD1	FT2232H BD1 pin
CN3-26	BD0	FT2232H BD0 pin

**Table 3.2 FT2232H Mini Module Connection – CN3**

In most cases, the FT2232H pin is connected directly to the associated pin on CN2 or CN3.

The FT2232H Mini Module allows configuration with both USB Bus-powered and USB Self-powered designs:

**USB Bus-powered:**

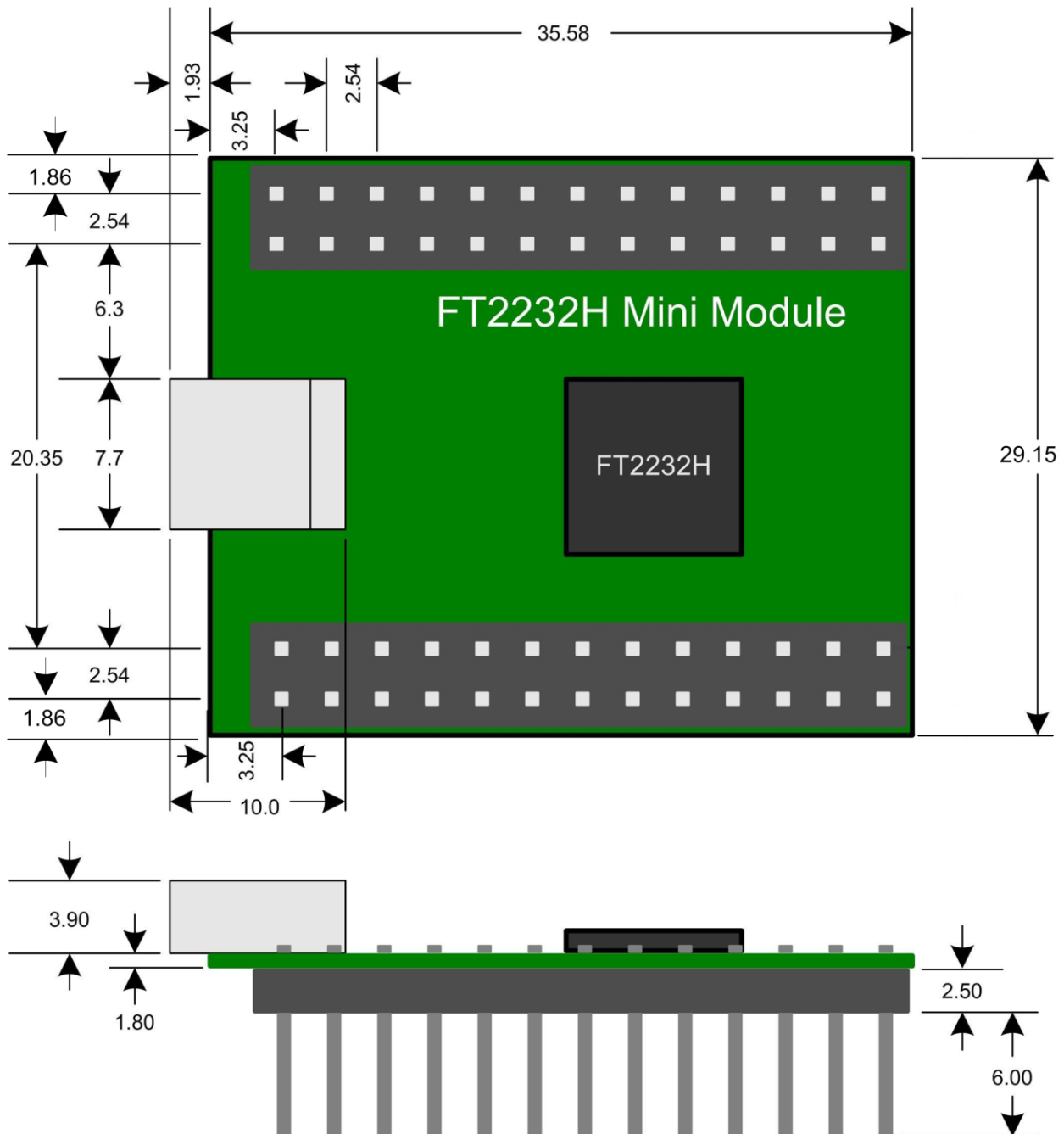
- 1) **Connect VBUS to VCC (CN3, pin 1 to CN3, pin 3).** This connection takes the power from the USB bus (VBUS) and connects it to the voltage regulator input on the FT2232H Mini Module. The voltage regulator, in turn, provides V3V3, VPLL and VUSB power inputs to the FT2232H chip.
- 2) **Connect V3V3 to VIO (CN2, pins 1, 3 & 5 to CN2, pins 11 & 21 and CN3, pins 12 & 22).** This connection provides the correct 3.3VDC operating voltage for VCCIO on the FT2232H chip.

**USB Self-Powered:**

- 1) **Leave VBUS (CN3, pin 1) unconnected.**
- 2) **Connect an external 5.0VDC power supply to VCC (5.0VDC to CN3, pin 3).** This connection takes provides power from an external power supply and connects it to the voltage regulator input on the FT2232H Mini Module. See the FT2232H data sheet for allowable VCC input voltage ranges.
- 3) **Connect V3V3 to VIO (CN2, pins 1, 3 & 5 to CN2, pins 11 & 21 and CN3, pins 12 & 22).** This connection provides the correct 3.3VDC operating voltage for VCCIO on the FT2232H chip.
- 4) **Use MPROG to change the USB power descriptor to "Self-Powered".** This setting indicates to the host system that the USB Host port does not need to supply power to the device. MPROG is a utility provided by FTDI to program various features of the FT-series USB client ICs. In order to access settings for the FT2232H, MPROG, version 3.5 or later is required. [MPROG](#) is available through the [Utilities](#) section of the [FTDI web site](#).

## 4 Mechanical details

The mechanical details (top view) of the FT2232H Mini Module are shown in Figure 4.1:



**Figure 4.1 FT2232H Mini Module Dimensions (Top and Side Views)**

All dimensions are in millimetres. Tolerance is  $\pm 0.1$ mm.

The headers CN2 and CN3 are mounted to the bottom of the PCB. The overall height below the PCB is 8.5mm, with a body which exposes 6.0mm of the pins. The pins are 0.025 inch square.

The mini-B USB connector has a height of 3.9mm.

## 5 Schematic Diagram

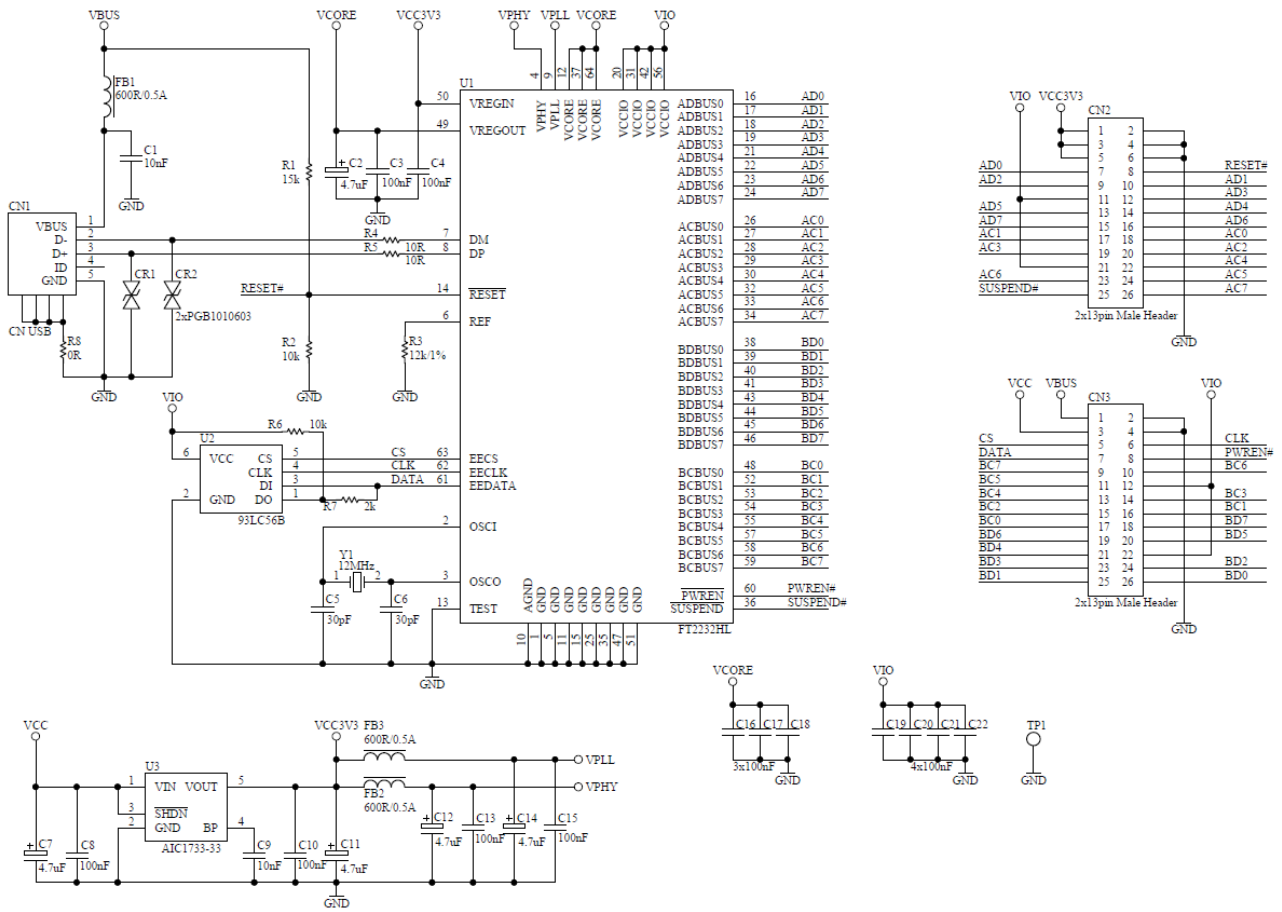


Figure 5.1 FT2232H Mini Module Schematic

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## Appendix A – FT2232H EEPROM Configuration

The FT2232H Mini Module utilizes an EEPROM which contains the USB configuration descriptors for the FT2232H. When the Mini Module is plugged into a PC or a USB reset is performed, the PC will read these descriptors. The default values stored into the EEPROM are defined in Table 6.1.

Parameter	Value	Notes
USB Vendor ID (VID)	0403h	FTDI default VID (hex)
USB Product UD (PID)	6010h	FTDI default PID (hex)
Serial Number Enabled?	Yes	
Serial Number	See Note	A unique serial number is generated and programmed into the EEPROM during device final test.
Pull down I/O Pins in USB Suspend	Disabled	Enabling this option will make the device pull down on the UART interface lines when the power is shut off (PWREN# is high).
Manufacturer Name	FTDI	
Product Description	FT2232H_MM	
Max Bus Power Current	500mA	
Power Source	Bus Powered	
Device Type	FT2232	
USB Version	0200	Returns USB 2.0 device description to the host.  Note: The device is a USB 2.0 High Speed device (480 Mb/s) as opposed to a USB 2.0 Full Speed device (12 Mb/s).
Remote Wake Up	Enabled	Taking RI# low will wake up the USB host controller from suspend.
High Current I/Os	Enabled	Enables the high drive level on the UART and CBUS I/O pins.
Load VCP Driver	Disabled	Makes the device load the VCP driver interface for the device.

**Table 6.1 Default Internal EEPROM Configuration**

The EEPROM on the FT2232H Mini Module can be re-programmed over USB using the utility program MPROG. MPROG can be downloaded from the [www.ftdichip.com](http://www.ftdichip.com). Version 3.5 or later is required for the FT2232H chip. Users who do not have their own USB Vendor ID but who would like to use a unique Product ID in their design can apply to FTDI for a free block of unique PIDs. Contact FTDI support for this service.

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## Appendix B – Revision History

Version 1.0	First Release	12 <sup>rd</sup> Feb 2009
Version 1.1	Corrected VIO to pins 12 and 22 in text below table	4 <sup>th</sup> March 2009
Version 1.2	Changed PCB dimension from 20.32 to 29.4	23 <sup>rd</sup> March 2009
Version 1.3	Corrected PCB dimensions	10 <sup>th</sup> June 2009
Version 1.4	Added more PCB dimensions	25 <sup>th</sup> June 2009
Version 1.5	Removed invert signals and corrected PCB dimension	11 <sup>th</sup> August 2009
Version 1.6	Updated schematic diagram	26 <sup>th</sup> Jan 2011
	Added USB certified Logo in section 1.1	
	Added RoHS compliant statement in section 1	
Version 1.61	Edited Appendix A, Table 6.1, USB Version Parameter	02 <sup>nd</sup> Nov 2011
Version 1.7	Updated Contact Information, Figure 1.1 and 3.1	25 <sup>th</sup> June 2012

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