Future Technology Devices International Ltd.

USB Hi-Speed Serial/Hub Module

Datasheet

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1 Introduction

The FT4232H based USB Hi-Speed Serial/Hub Module is a USB interface expansion module targeted at connecting to the FTDI V2DIPx modules to expand the number of interfaces. However, it is not limited to this application. It can also be used as a hub device or an FT4232H evaluation module. The module has a USB 2.0 Hi-Speed hub chip which supports up to three external downstream USB ports: 2 via a dual USB connector and 1 via the DIL connector pins. Aditionally, by utilizing the FT4232H USB Hi-Speed four-port bridge chip which handles all the USB signalling and protocols, the module can easily support up to 4 flexible interfacing ports. It is ideal for development purposes to quickly prove functionality of adding USB to a target design.

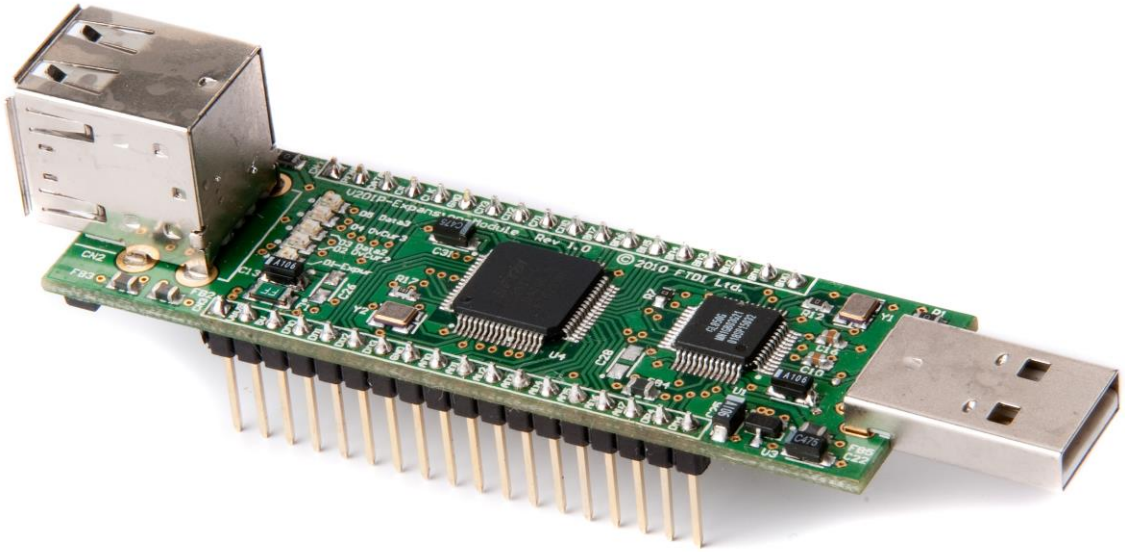

Figure 1.1 - FT4232H Serial/Hub Module

The module utilises the GL850G USB 2.0 hub controller which provides a low-cost, and widely used USB 2.0 hub solution, to provide up to 4 downstream USB ports. The GL850G is a single USB hub solution. The GL850G is a full function solution which support both Individual/Gang power management modes and two-color (green/amber) status LED. GL850G can be used with an external EEPROM (on the module) which can be used to customize PID/VID and other more complicated settings.

The FT4232H used on the Module is FTDI's 5th generation of USB devices. The FT4232H is a USB 2.0 Hi-Speed (480Mb/s) to UART/MPSSE IC. The device features four interfaces that can be configured for asynchronous or synchronous serial communications. Two of these interfaces have an option to be independently configured via an MPSSE engine. This allows the FT4232H to operate as two UART/Bit-Bang ports plus two MPSSE engines which can be used to emulate JTAG, SPI, I^2C, Bit-bang or other synchronous serial modes. The FT4232H datasheet, **DS_FT4232H**, is available at **http://ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT4232H.pdf**

The block diagram of FT4232H Hub Module is shown in Figure 1.2.

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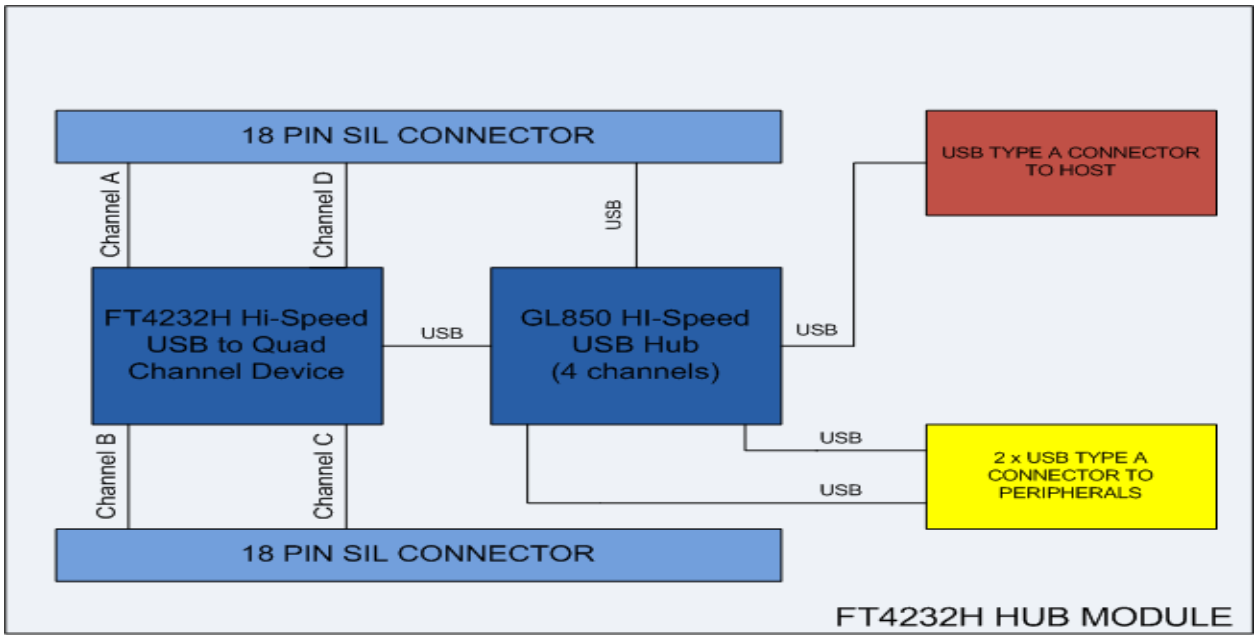

Figure 1.2 – Block diagram of USB Hi-Speed Serial/Hub Module

As the block diagram Figure 1.2 shows, the USB Hi-Speed Serial/Hub Module routes the signals from the GL850G and FT4232H devices to two 18-pin, 0.1”, single-row headers and a dual-port USB A-type socket. This allows easy connection to most PCB header sockets and ribbon cables.

To reduce the connector pin count, only channel A and B fan out all the 8 data signals to the 18-pin header. For the channel C and channel D, since many designs only use the TXD/RXD/CTS/RTS signals in UART communication, only these 4 data signals are fanned out. This meets most application requirements.

To use the FT4232H connected to a PC , the FT4232H Hub Module requires specific USB device drivers, available free from **http://www.ftdichip.com**. The drivers are used to make the FT4232H on the Module appear as a four 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 FT4232H on the Mini Module though a DLL.

The main target application for the USB hi-Speed Serial/Hub Module is that it can be attached to the FTDI VNC2 based V2DIPx modules (there are 6 different sizes) as a expansion module. By connecting the USB Hi-Speed Serial/Hub Module to the USB socket on the V2DIPx modules, the two modules can work as a single module to be placed on the bread board. The USB Hi-Speed Serial/Hub Module expands the interfaces of V2DIPx module with up to 3 USB ports and 4 serial ports. More information is available on the V2DIPx modules at **http://www.ftdichip.com/Products/Modules/DevelopmentModules.htm**.

1.1 Part Numbers

Part Number	Description
FT-MOD-4232HUB	USB Hi-Speed_Serial/Hub_Module

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2 Typical Applications

- Expansion module for the FTDI V2DIPx modules to expand usb ports and interfaces.
- Rapid USB integration into existing electronic systems.
- Prototyping platform for USB interface on new systems.
- USB 2.0 hub device to support up to 3 downstream USB ports.
- USB to muli-port JTAG, SPI and I^2C interfaces (Two Multi-Protocol Synchronous Serial Engines – MPSSE – available with the FT4232H)
- USB to multi-port asynchronous serial interfaces (up to 4 ports available).

2.1 Features

The USB Hi-Speed Serial/Hub Module has the following features:

General:

- USB 2.0 Hi-Speed compatible
- One standard Type A USB header to connect to the Host
- USB Hi-Speed FT4232H device for USB-Serial/Bitbang communications. Entire USB protocol handled by USB module
- USB 2.0 Hi-Speed hub controller integrated to support up to 3 downstream USB ports
- USB hub controller and FT4232H are USB bus powered – no external power supply needed
- External power input pin available to supply external downstream USB ports.
- Support for USB suspend and resume
- 4 Asynchronous serial interfaces available which include 2 independent MPSSE engines.
- Defaults to 4 RS232 interfaces.
- 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^2C
- One dual-port USB A socket and 0.1” pitch header to support up to 3 downstream USB ports
- Green/Amber status LED for downstream USB port 2&3.
- LED indicating power supply to external downstream USB ports
- Onboard EEPROM 93LC56 for FT4232H configuration
- UHCI / OHCI / EHCI host controller compatible

2.2 Driver Support

Royalty free VIRTUAL COM PORT (VCP) DRIVERS for…

- Windows 10 32, 64-bit
- Windows 8/8.1 32, 64-bit
- Windows 2000, Server 2003, XP Server 2008
- Windows XP and XP 64-bit
- Windows Vista and Vista 64-bit
- Windows 7 and 7 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 10 32, 64-bit
- Windows 8/8.1 32, 64-bit
- Windows 2000, Server 2003, Server 2008
- Windows XP and XP 64-bit
- Windows Vista and Vista 64-bit
- Windows 7 and 7 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**/FTDrivers.htm

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3 Electrical Details

The electrical details and connections of the USB Hi-Speed Serial/Hub Module are shown in Figure 3.1 and table 3.1 – table 3.3.

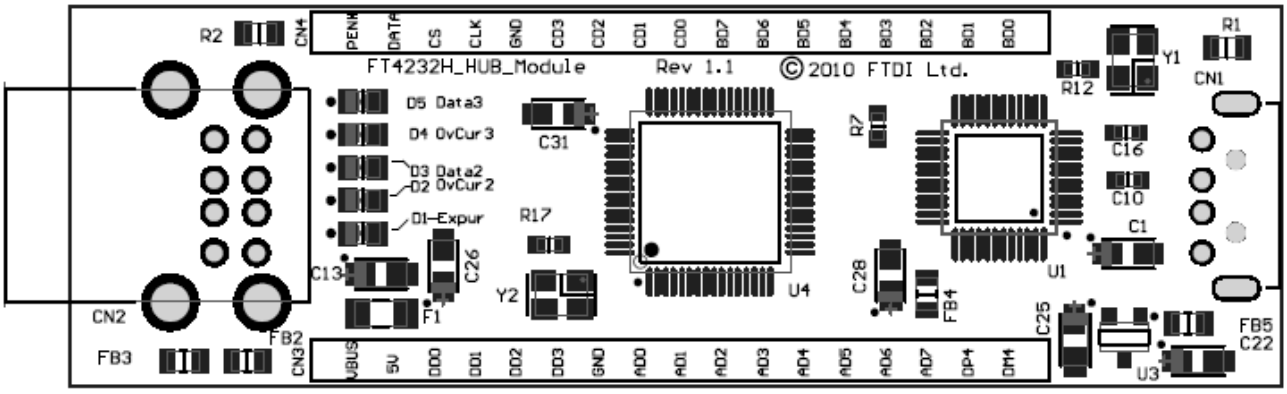

Figure 3.1 USB Hi-Speed Serial/Hub Module Electrical Connections (Top View)

USB Hi-Speed Serial/Hub Module has 4 connectors on the board. The detailed descriptions of these connectors are listed in Table 3.1.

Reference Designator	Description
CN1	USB A signal header to connect to the host port
CN2	Dual-port USB A socket connects to 2 downstream USB devices
CN3	0.1” 18-pin header
CN4	0.1” 18-pin header

Table 3.1 USB Hi-Speed Serial/Hub Module Connectors

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The pin descriptions of CN3 and CN4 are given in Table 3.2 and Table 3.3.

Connector Pin	Name	Description
CN3-1	NC	Not connected pin
CN3-2	VCC_BUS	USB +5V VBUS power pin (output) from upstream USB port
CN3-3	5V	+5v power pin (input) to supply downstream USB ports
CN3-4	DD0	FT4232H DD0 pin
CN3-5	DD1	FT4232H DD1 pin
CN3-6	DD2	FT4232H DD2 pin
CN3-7	DD3	FT4232H DD3 pin
CN3-8	GND	0V Power pin
CN3-9	AD0	FT4232H AD0 pin
CN3-10	AD1	FT4232H AD1 pin
CN3-11	AD2	FT4232H AD2 pin
CN3-12	AD3	FT4232H AD3 pin
CN3-13	AD4	FT4232H AD4 pin
CN3-14	AD5	FT4232H AD5 pin
CN3-15	AD6	FT4232H AD6 pin
CN3-16	AD7	FT4232H AD7 pin
CN3-17	DP4	USB hub downstream port 4 D+ signal pin
CN3-18	DM4	USB hub downstream port 4 D- signal pin

Table 3.2 USB Hi-Speed Serial/Hub Module Connection – CN3

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Connector Pin	Name	Description
CN4-1	NC	Not connected pin
CN4-2	PWREN#	FT4232H PWREN# pin
CN4-3	DATA	FT4232H EEDATA pin
CN4-4	CS	FT4232H EECS pin
CN4-5	CLK	FT4232H EECLK pin
CN4-6	GND	0V Power pin
CN4-7	CD3	FT4232H CD3 pin
CN4-8	CD2	FT4232H CD3 pin
CN4-9	CD1	FT4232H CD1 pin
CN4-10	CD0	FT4232H CD0 pin
CN4-11	BD7	FT4232H BD7 pin
CN4-12	BD6	FT4232H BD6 pin
CN4-13	BD5	FT4232H BD5 pin
CN4-14	BD4	FT4232H BD4 pin
CN4-15	BD3	FT4232H BD3 pin
CN4-16	BD2	FT4232H BD2 pin
CN4-17	BD1	FT4232H BD1 pin
CN4-18	BD0	FT4232H BD0 pin

Table 3.3 USB Hi-Speed Serial/Hub Module Connection – CN4

In most cases, the FT4232H pin is connected directly to the associated pin on CN3 or CN4.

There are also several LEDs available on the FT4232H Hub Module to indicate the status of power and USB hub port. Detailed functions of LEDs are described in Table 3.4.

LED Reference Designator	Color	Function Description
D1	Yellow	Power to supply external downstream USB ports
D2	Amber	Overcurrent status of downstream USB port 2
D3	Green	Transfer status of downstream USB port 2
D4	Green	Transfer status of downstream USB port 3
D5	Amber	Overcurrent status of downstream USB port 3

Figure 3.4 Functions of status LEDs on the module

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3.1 Power Supply of FT4232H Hub Module

The GL850G and the FT4232H ICs and their related circuits on the USB Hi-Speed Serial/Hub Module are directly powered by USB bus power. The estimated current consumed by the cirucuits of module is about 100-300mA depending on the application. It is important that the user ensures that the host can supply this current via USB.

The maximum total current consumed by the external usb devices on downstream port 2 and 3 is 1A. If the total current exceed 1A, the fuse on the USB Hi-Speed Serial/Hub Module will be disconnected. If this occurs then LEDs D2 and D5 on the module will illuminate to indicate over-current status.

There are two options to supply power to external downstream usb devices connected to ports 2 and 3.

1. **Use USB bus power to supply downstream ports:**

Connect 5V to VCC_BUS (CN3, pin 3 to CN3, pin 2). This connection uses the power from upstream USB bus to supply the downstream USB ports of the USB hub. With this connection, user should make sure that the usb host can supply enough current to the external USB devices – in addition to the current required by the module.

2. **Use external power to supply downstream ports:**

Connect 5V (CN3, pin 3) to external +5v DC power supply. This connection takes the power from external power to supply the downstream USB ports of USB hub. Users should also make sure that the external power can supply enough current required by the external devices.

Note:

1. **In USB bus power mode always ensure that CN3-pin 2 (VCC_BUS) and CN3-pin 3 (5V) are shorted together. In external power mode pins CN3-2 and CN3-3 should be disconneted and external power supply should be connected to pin CN3-3 only.**
2. **It is recommened to select the mode of operation before connecting the USB Hi-Speed Serial/Hub Module.**

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4 Mechanical details

The mechanical details of the USB Hi-Speed Serial/Hub Module are shown in Figure 4.1:

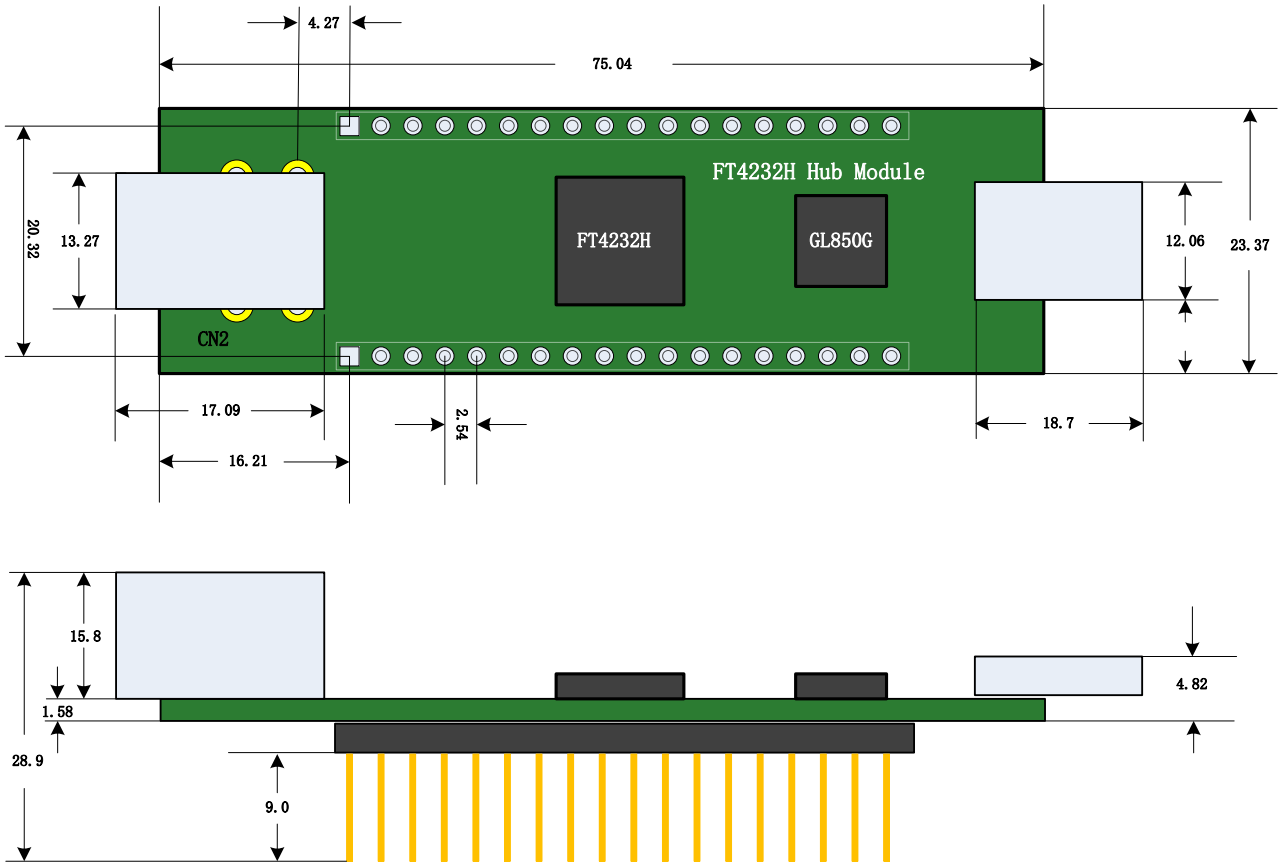

Figure 4.1 USB Hi-Speed Serial/Hub Module Dimensions

All dimensions are in millimetres.

The headers CN3 and CN4 are mounted to the bottom of the PCB. The overall height below the PCB is 11.5mm, with a body which exposes 9.0mm of the pins. The pins are 0.025 inch square.

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5 Schematic Diagram

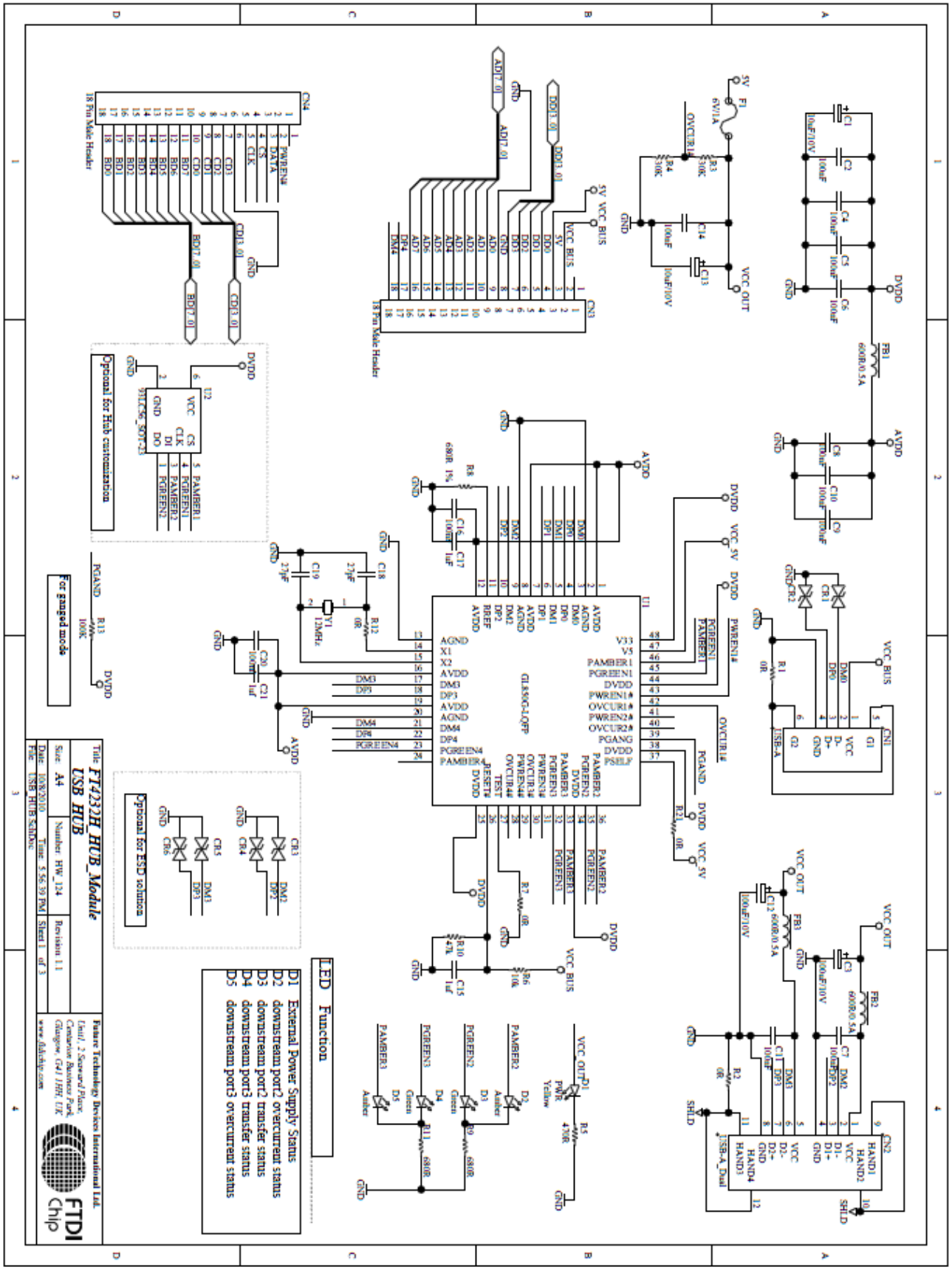

Figure 5.1 USB Hi-Speed Serial/Hub Module Schematic – Page 1

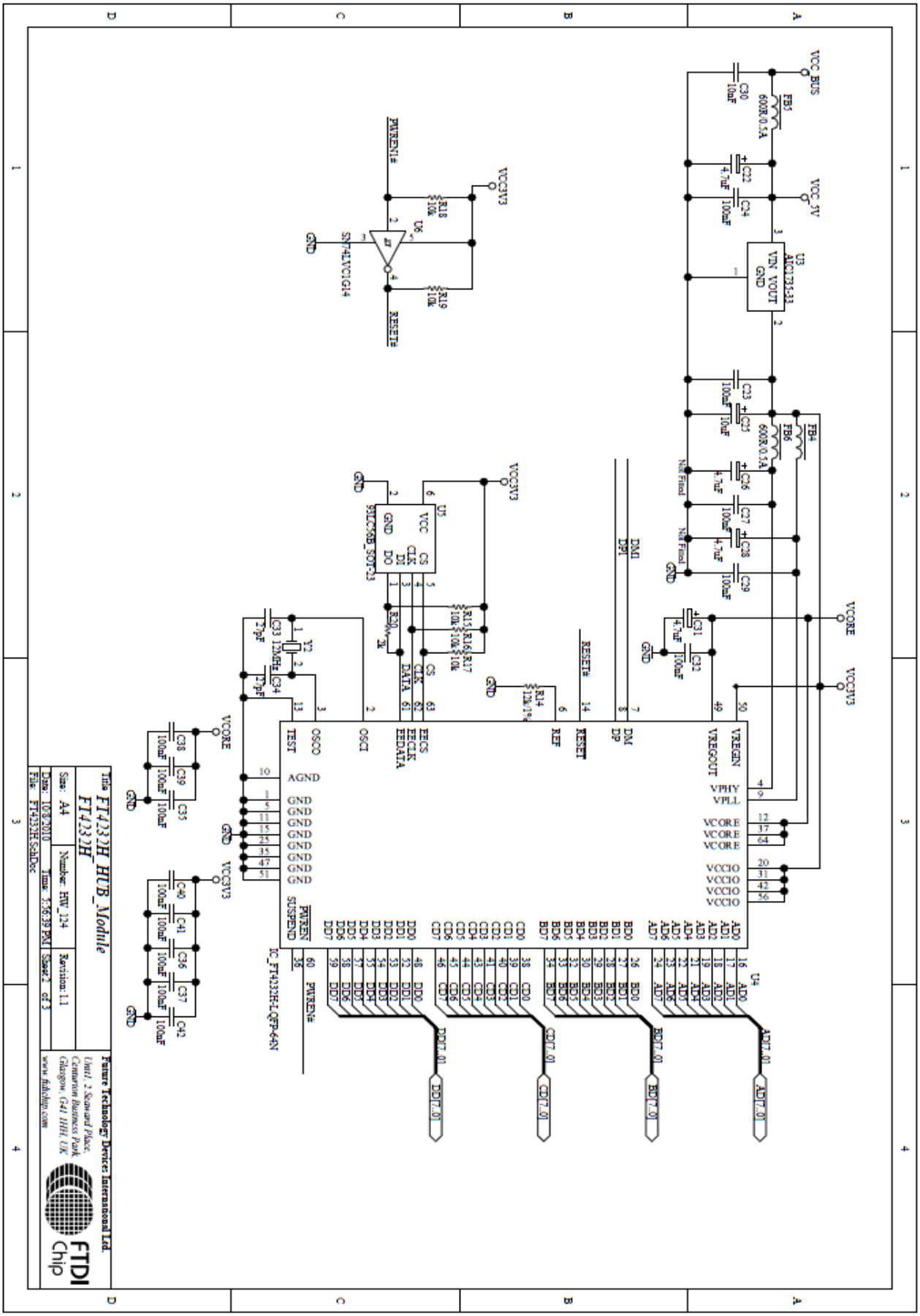

Figure 5.2 USB Hi-Speed Serial/Hub Module Schematic – Page 2

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Distributor and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

Appendix A – FT4232H EEPROM Configuration

The USB Hi-Speed Serial/Hub Module utilizes an EEPROM which contains the USB configuration descriptors for the FT4232H. 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)	6011h	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	FT4232H Hub Module	
Max Bus Power Current	500mA	
Power Source	Bus Powered	
Device Type	FT4232	
USB Version	0200	Returns USB 2.0 device description to the host. Note: The device is be a USB 2.0 Full Speed device (12Mb/s) as opposed to a USB 2.0 Hi-Speed device (480Mb/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 for FT4232H chip on the USB Hi-Speed Serial/Hub Module can be re-programmed over USB using the utility program FT_Prog. FT_Prog can be downloaded from http://www.ftdichip.com/Support/Utilities.htm. 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 C – Revision History

Document Title:	FT4222H USB2.0 TO QUADSPI/I2C BRIDGE IC
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Document Feedback:	Send Feedback

Version 1.0	First Release	13th October 2010
Version 1.1	Added part number	21st October 2010
Version 1.2	Changed title from FT4232H Hub Module to USB Hi-Speed Serial/Hub Module Corrected Fig. 1.2	28th October 2010
Version 1.2	Released Rev 1.2	28st October 2010
Version 1.3	Added Mechanical details in Figure 4.1 Added a note in section 3.1. Contact Information updated	20th March 2012
Version 1.4	Update to contact info Update to mechanical info	23rd May 2016

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