Future Technology Devices International Ltd.

USB Hi-Speed Serial/Hub Module

Datasheet

Document Reference No.: FT_000331
Version 1.4
Issue Date: 2016-05-23

Future Technology Devices International Ltd (FTDI)
Unit 1, 2 Seaward Place, Centurion Business Park, Glasgow, G41 1HH, United Kingdom
Tel.: +44 (0) 141 429 2777 Fax: + 44 (0) 141 429 2758
E-Mail (Support): support1@ftdichip.com Web: http://www.ftdichip.com

Neither the whole nor any part of the information contained in, or the product described in this manual, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. This product and its documentation are supplied on an as-is basis and no warranty as to their suitability for any particular purpose is either made or implied. Future Technology Devices International Ltd will not accept any claim for damages howsoever arising as a result of use or failure of this product. Your statutory rights are not affected. This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury. This document provides preliminary information that may be subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Future Technology Devices International Ltd, Unit 1, 2 Seaward Place, Centurion Business Park, Glasgow, G41 1HH, United Kingdom. Scotland Registered Number: SC136640

Copyright © Future Technology Devices International Limited
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. Additionally, 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, I2C, 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.
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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT-MOD-4232HUB</td>
<td>USB Hi-Speed_Serial/Hub_Module</td>
</tr>
</tbody>
</table>
Table of Contents

1 Introduction.................................................................................................................. 1
  1.1 Part Numbers ........................................................................................................... 2
2 Typical Applications........................................................................................................ 4
  2.1 Features ..................................................................................................................... 4
  2.2 Driver Support .......................................................................................................... 4
3 Electrical Details............................................................................................................. 5
  3.1 Power Supply of FT4232H Hub Module ............................................................... 8
4 Mechanical details......................................................................................................... 9
5 Schematic Diagram ....................................................................................................... 10
6 Contact Information...................................................................................................... 12
  Appendix A – FT4232H EEPROM Configuration ....................................................... 10
  Appendix B – List of Figures and Tables ..................................................................... 11
  List of Figures ................................................................................................................ 11
  List of Tables .................................................................................................................. 11
  Appendix C – Revision History .................................................................................. 12
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 multi-port JTAG, SPI and I²C 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 I²C
- 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 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 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](http://www.ftdichip.com/FTDrivers.htm)
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.

![USB Hi-Speed Serial/Hub Module Electrical Connections (Top View)](image)

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

<table>
<thead>
<tr>
<th>Reference Designator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN1</td>
<td>USB A signal header to connect to the host port</td>
</tr>
<tr>
<td>CN2</td>
<td>Dual-port USB A socket connects to 2 downstream USB devices</td>
</tr>
<tr>
<td>CN3</td>
<td>0.1” 18-pin header</td>
</tr>
<tr>
<td>CN4</td>
<td>0.1” 18-pin header</td>
</tr>
</tbody>
</table>

Table 3.1 USB Hi-Speed Serial/Hub Module Connectors
The pin descriptions of CN3 and CN4 are given in Table 3.2 and Table 3.3.

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

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

<table>
<thead>
<tr>
<th>LED Reference Designator</th>
<th>Color</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Yellow</td>
<td>Power to supply external downstream USB ports</td>
</tr>
<tr>
<td>D2</td>
<td>Amber</td>
<td>Overcurrent status of downstream USB port 2</td>
</tr>
<tr>
<td>D3</td>
<td>Green</td>
<td>Transfer status of downstream USB port 2</td>
</tr>
<tr>
<td>D4</td>
<td>Green</td>
<td>Transfer status of downstream USB port 3</td>
</tr>
<tr>
<td>D5</td>
<td>Amber</td>
<td>Overcurrent status of downstream USB port 3</td>
</tr>
</tbody>
</table>

Figure 3.4 Functions of status LEDs on the module
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 circuits 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 disconnected and external power supply should be connected to pin CN3-3 only.

2. It is recommended to select the mode of operation before connecting the USB Hi-Speed Serial/Hub Module.
4 Mechanical details

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

![Diagram of USB Hi-Speed Serial/Hub Module](image)

**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.
Figure 5.1 USB Hi-Speed Serial/Hub Module Schematic – Page 1
Figure 5.2 USB Hi-Speed Serial/Hub Module Schematic – Page 2
## 6 Contact Information

**Head Office – Glasgow, UK**

Future Technology Devices International Limited  
Unit 1, 2 Seaward Place, Centurion Business Park  
Glasgow G41 1HH  
United Kingdom  
Tel: +44 (0) 141 429 2777  
Fax: +44 (0) 141 429 2758  
E-mail (Sales) sales1@ftdichip.com  
E-mail (Support) support1@ftdichip.com  
E-mail (General Enquiries) admin1@ftdichip.com

**Branch Office – Tigard, Oregon, USA**

Future Technology Devices International Limited (USA)  
7130 SW Fir Loop  
Tigard, OR 97223-8160  
USA  
Tel: +1 (503) 547 0988  
Fax: +1 (503) 547 0987  
E-mail (Sales) us.sales@ftdichip.com  
E-mail (Support) us.support@ftdichip.com  
E-mail (General Enquiries) us.admin@ftdichip.com

**Branch Office – Taipei, Taiwan**

Future Technology Devices International Limited (Taiwan)  
2F, No. 516, Sec. 1, NeiHu Road  
Taipei 114  
Taiwan, R.O.C.  
Tel: +886 (0) 2 8797 1330  
Fax: +886 (0) 2 8751 9737  
E-mail (Sales) tw.sales1@ftdichip.com  
E-mail (Support) tw.support1@ftdichip.com  
E-mail (General Enquiries) tw.admin1@ftdichip.com

**Branch Office – Shanghai, China**

Future Technology Devices International Limited (China)  
Room 1103, No. 666 West Huaihai Road,  
Shanghai, 200052  
China  
Tel: +86 21 62351596  
Fax: +86 21 62351595  
E-mail (Sales) cn.sales@ftdichip.com  
E-mail (Support) cn.support@ftdichip.com  
E-mail (General Enquiries) cn.admin@ftdichip.com

**Web Site**

http://ftdichip.com

**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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Vendor ID (VID)</td>
<td>0403h</td>
<td>FTDI default VID (hex)</td>
</tr>
<tr>
<td>USB Product UD (PID)</td>
<td>6011h</td>
<td>FTDI default PID (hex)</td>
</tr>
<tr>
<td>Serial Number Enabled?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Serial Number</td>
<td>See Note</td>
<td>A unique serial number is generated and programmed into the EEPROM during device final test.</td>
</tr>
<tr>
<td>Pull down I/O Pins in USB Suspend</td>
<td>Disabled</td>
<td>Enabling this option will make the device pull down on the UART interface lines when the power is shut off (PWREN# is high).</td>
</tr>
<tr>
<td>Manufacturer Name</td>
<td>FTDI</td>
<td></td>
</tr>
<tr>
<td>Product Description</td>
<td>FT4232H Hub Module</td>
<td></td>
</tr>
<tr>
<td>Max Bus Power Current</td>
<td>500mA</td>
<td></td>
</tr>
<tr>
<td>Power Source</td>
<td>Bus Powered</td>
<td></td>
</tr>
<tr>
<td>Device Type</td>
<td>FT4232</td>
<td></td>
</tr>
<tr>
<td>USB Version</td>
<td>0200</td>
<td>Returns USB 2.0 device description to the host.</td>
</tr>
<tr>
<td>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).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Wake Up</td>
<td>Enabled</td>
<td>Taking RI# low will wake up the USB host controller from suspend.</td>
</tr>
<tr>
<td>High Current I/Os</td>
<td>Enabled</td>
<td>Enables the high drive level on the UART and CBUS I/O pins.</td>
</tr>
<tr>
<td>Load VCP Driver</td>
<td>Disabled</td>
<td>Makes the device load the VCP driver interface for the device.</td>
</tr>
</tbody>
</table>

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](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.
Appendix B – List of Figures and Tables

List of Figures

Figure 1.1 - FT4232H Serial/Hub Module ........................................................................................................... 1
Figure 3.1 USB Hi-Speed Serial/Hub Module Electrical Connections (Top View) ................................................. 5
Figure 4.1 USB Hi-Speed Serial/Hub Module Dimensions ......................................................................................... 9
Figure 5.1 USB Hi-Speed Serial/Hub Module Schematic – Page 1 ................................................................. 10
Figure 5.2 USB Hi-Speed Serial/Hub Module Schematic – Page 2 ................................................................. 11

List of Tables

Table 3.1 USB Hi-Speed Serial/Hub Module Connectors ......................................................................................... 5
Table 6.1 Default Internal EEPROM Configuration ......................................................................................... 10
## Appendix C - Revision History

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