

**Future Technology
Devices
International Ltd
Datasheet
RPi HUB Module
Datasheet**



RPi HUB Module connects to a Raspberry-Pi computer and expands the number of interfaces that can be accessed downstream from a Host. RPi HUB Module also provides a dual channel USB UART/245FIFO/SPI/I²C/JTAG/GPIO interface converter.

1 Introduction

The FT2232H based RPi HUB Module is a USB to UART/245FIFO/SPI/I²C/JTAG/GPIO interface expansion module targeted at connecting to Raspberry-Pi computer 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 FT2232H 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 utilising the FT2232H USB Hi-Speed dual-port bridge chip which handles all the USB signalling and protocols, the module can easily support up to two flexible interfacing ports. It is ideal for development purposes to quickly prove functionality of adding USB to a target design.

This 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 chip USB hub solution. The GL850G is a full function solution which supports both Individual/Gang power management modes and two-colour (green/amber) status LED.

The FT2232H used on the Module is FTDI’s 5th generation of USB devices. The FT2232H is a USB 2.0 Hi-Speed (480Mb/s) to UART/MPSSE IC. The device features two interfaces that can be configured for asynchronous or synchronous serial communications or Parallel FIFO Interface. The two interfaces can also be independently configured via an MPSSE engine. This allows the FT2232H to operate as two UART/Bit-Bang ports or two MPSSE engines which can be used to emulate JTAG, SPI, I²C, Bit-bang or other synchronous serial modes. All I/Os of the RPi HUB Module operate at 3.3V TTL and are 5V safe.

FT2232H’s MPSSE interfaces are controlled over USB, for details on MPSSE see: Application Note [AN_108](#).

For more details on FT2232H see: FT2232H datasheet [DS_FT2232H](#).

1.1 Ordering Information

| Product Name | Order Code | Description |
|----------------|----------------|---|
| RPi HUB Module | RPi-HUB-Module | USB HUB and USB to dual channel multi interface converter module designed for Raspberry Pi. |

Table 1.1 – Ordering Information



Table of Contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 1 |
| 1.1 | Ordering Information | 1 |
| 2 | Product Details | 3 |
| 2.1 | Features | 3 |
| 2.2 | Driver Support | 3 |
| 2.3 | Functions Overview | 4 |
| 3 | Pin Out and Signal Description | 5 |
| 3.1 | Module Connector Descriptions | 5 |
| 3.2 | FT2232H Pin and Signal Descriptions | 6 |
| 3.3 | Module Pin and Signal Descriptions | 7 |
| 4 | Guide to Supplying Power | 9 |
| 5 | Mechanical Details | 10 |
| 6 | Schematic Diagram | 11 |
| 7 | Contact Information | 13 |
| | Appendix A – FT2232H EEPROM Configuration | 14 |
| | Appendix B – References | 15 |
| | Appendix C – List of Figures and Tables | 15 |
| | List of Figures | 15 |
| | List of Tables | 15 |
| | Appendix D – Revision History | 16 |

2 Product Details

2.1 Features

The RPi HUB Module has the following features:

General:

- USB 2.0 Hi-Speed compatible
- One standard USB type A plug to connect to the Host
- USB Hi-Speed FT2232H device for USB-Serial/Bit bang communications. Entire USB protocol handled by USB module
- USB 2.0 Hi-Speed hub controller integrated to support up to 3 downstream USB ports
- External power input connector available to supply external downstream USB ports.
- Support for USB suspend and resume
- Defaults to two independent UART interfaces.
- All I/O pins are 5V Safe
- UART data transfer rates from 300 baud to 12 Mbaud at 3.3V TTL levels
- Synchronous Serial (MPSSE) data rates of up to 30Mbps on JTAG, SPI and I²C
- One dual-port USB type A connector and 0.1" pitch header to support up to 3 downstream USB ports
- Green/Red status LED for downstream USB port 1 & 2.
- LED indicating power supply to external downstream USB ports
- On-board EEPROM 93LC56 for FT2232H configuration
- UHCI / OHCI / EHCI host controller compatible

2.2 Driver Support

Royalty-Free VIRTUAL COM PORT (VCP) DRIVERS for:

- Windows 7 32,64-bit
- Windows Vista
- Windows XP 32,64-bit
- Windows XP Embedded
- Windows CE.NET 4.2 , 5.0 and 6.0
- MAC OS OS-X
- Linux 2.6.32 or later
- ARM Linux
- Android

Royalty-Free D2XX Direct Drivers (USB Drivers + DLL S/W Interface):

- Windows 7 32,64-bit
- Windows Vista
- Windows XP 32,64-bit
- Windows XP Embedded
- Windows CE.NET 4.2, 5.0 and 6.0
- MAC OS OS-X
- Linux 2.6.32 or later
- ARM Linux
- Android

The drivers listed above are all available to download for free from www.ftdichip.com. Various 3rd Party Drivers are also available for various other operating systems - visit www.ftdichip.com for details.

For driver installation instructions please see:

<http://www.ftdichip.com/Support/Documents/InstallGuides.htm>.

2.3 Functions Overview

A block diagram of RPi HUB Module is illustrated in Figure 1.2.

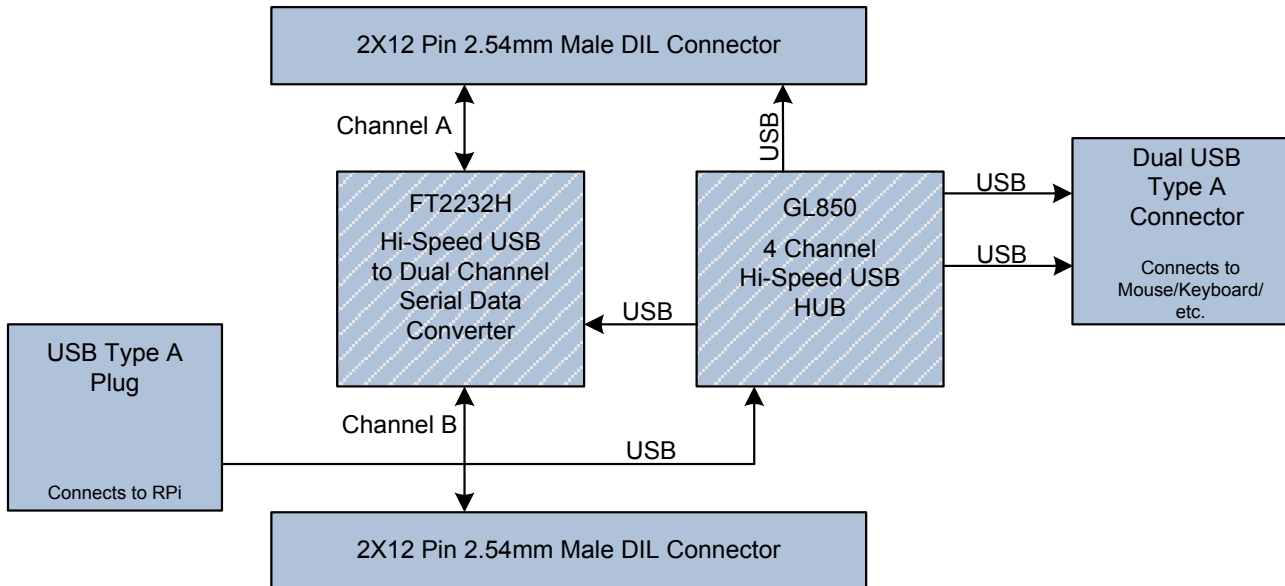


Figure 1.2 – Block diagram of RPi HUB Module

The block diagram Figure 1.2 illustrates: the RPi HUB Module routes the signals from the GL850G and FT2232H devices to two 2X12-pin, 0.1", headers and a dual-port USB type A connector. This allows easy connection to most PCB header sockets and ribbon cables.

To use the FT2232H connected to a RPi. The RPi operating system by default includes the necessary virtual com port (VCP) drivers to access both ports of the FT2232H through the TTY.

FTDI D2XX drivers, which allow access to the FT2232H through a DLL, are available for free by clicking [here](http://www.ftdichip.com/Drivers/D2XX.htm). For more information on FTDI drivers see: <http://www.ftdichip.com/Drivers/D2XX.htm>.

The main target application for the RPi HUB Module is that it can be attached to a Raspberry-Pi computer as an expansion module. The RPi HUB Module expands the interfaces of Raspberry-Pi computer with up to 3 USB ports or 2 serial ports. More information is available on the Raspberry-Pi computer at <http://www.Raspberry-Pi.org/>

3 Pin Out and Signal Description

3.1 Module Connector Descriptions

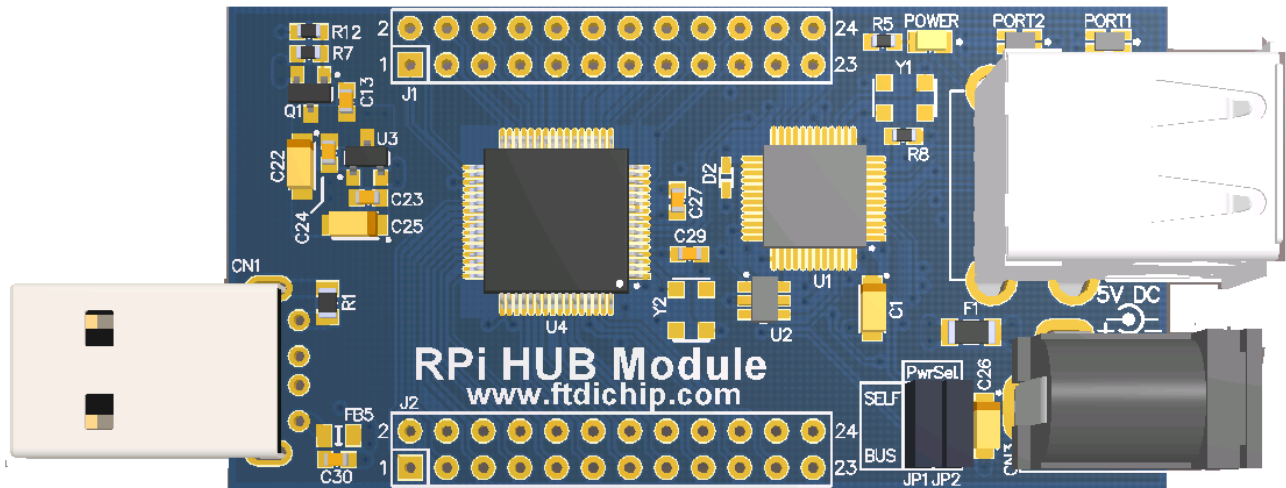


Figure 3.1 – RPi HUB Module Connector Description (Top View)

RPi 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 type A signal connector to connect to the host port |
| CN2 | Dual-port USB type A connector to connect 2 downstream USB devices |
| CN3 | +5V power input from external PSU to power the module. |
| J1 | 0.1" 2X12-pin header |
| J2 | 0.1" 2X12-pin header |

Table 3.1 – RPi HUB Module Connector Descriptions

A detailed description of each pin out is given in the next section.

3.2 FT2232H Pin and Signal Descriptions

A list of functions available for every signal pin of the FT2232H is given in Figure 3.1.

| FT2232H | | | | | | | | | | |
|---------------------------------------|----------|--|---------------|-----------|----------------|---------------|-----------|-----------------------|----------------|--------------------|
| Pin | | Pin functions depend on EEPROM configuration | | | | | | | | |
| Pin # | Pin Name | UART | 245 FIFO SYNC | 245 FIFO | ASYNC Bit-bang | SYNC Bit-bang | MPSSE | Fast Serial interface | CPU Style FIFO | Host Bus Emulation |
| Channel A | | | | | | | | | | |
| 16 | ADBUS0 | TXD | D0 | D0 | D0 | D0 | TCK/SK | USES CHANNEL B | D0 | AD0 |
| 17 | ADBUS1 | RXD | D1 | D1 | D1 | D1 | TDI/DO | | D1 | AD1 |
| 18 | ADBUS2 | RTS# | D2 | D2 | D2 | D2 | TDO/DI | | D2 | AD2 |
| 19 | ADBUS3 | CTS# | D3 | D3 | D3 | D3 | TMS/CS | | D3 | AD3 |
| 21 | ADBUS4 | DTR# | D4 | D4 | D4 | D4 | GPIOL0 | | D4 | AD4 |
| 22 | ADBUS5 | DSR# | D5 | D5 | D5 | D5 | GPIOL1 | | D5 | AD5 |
| 23 | ADBUS6 | DCD# | D6 | D6 | D6 | D6 | GPIOL2 | | D6 | AD6 |
| 24 | ADBUS7 | RI# | D7 | D7 | D7 | D7 | GPIOL3 | D7 | AD7 | |
| 26 | ACBUS0 | TXDEN | RXF# | RXF# | ** | ** | GPIOH0 | | CS# | A8 |
| 27 | ACBUS1 | ** | TXE# | TXE# | WRSTB# | WRSTB# | GPIOH1 | | A0 | A9 |
| 28 | ACBUS2 | ** | RD# | RD# | RDSTB# | RDSTB# | GPIOH2 | | RD# | A10 |
| 29 | ACBUS3 | RXLED# | WR# | WR# | ** | ** | GPIOH3 | | WR# | A11 |
| 30 | ACBUS4 | TXLED# | SIWUA | SIWUA | SIWUA | SIWUA | GPIOH4 | | SIWUA | A12 |
| 32 | ACBUS5 | ** | CLKOUT | ** | ** | ** | GPIOH5 | | ** | A13 |
| 33 | ACBUS6 | ** | OE# | ** | ** | ** | GPIOH6 | | ** | A14 |
| 34 | ACBUS7 | ** | ** | ** | ** | ** | GPIOH7 | | ** | A15 |
| Channel B | | | | | | | | | | |
| 38 | BDBUS0 | TXD | | D0 | D0 | D0 | TCK/SK | FSDI | D0 | CS# |
| 39 | BDBUS1 | RXD | | D1 | D1 | D1 | TDI/DO | FSCLK | D1 | ALE |
| 40 | BDBUS2 | RTS# | | D2 | D2 | D2 | TDO/DI | FSDO | D2 | RD# |
| 41 | BDBUS3 | CTS# | | D3 | D3 | D3 | TMS/CS | FSCTS | D3 | WR# |
| 43 | BDBUS4 | DTR# | | D4 | D4 | D4 | GPIOL0 | | D4 | IORDY |
| 44 | BDBUS5 | DSR# | | D5 | D5 | D5 | GPIOL1 | | D5 | CLKOUT |
| 45 | BDBUS6 | DCD# | | D6 | D6 | D6 | GPIOL2 | | D6 | I/O0 |
| 46 | BDBUS7 | RI# | | D7 | D7 | D7 | GPIOL3 | | D7 | I/O1 |
| 48 | BCBUS0 | TXDEN | | RXF# | ** | ** | GPIOH0 | | CS# | ** |
| 52 | BCBUS1 | ** | | TXE# | WRSTB# | WRSTB# | GPIOH1 | | A0 | ** |
| 53 | BCBUS2 | ** | | RD# | RDSTB# | RDSTB# | GPIOH2 | | RD# | ** |
| 54 | BCBUS3 | RXLED# | | WR# | ** | ** | GPIOH3 | | WR# | ** |
| 55 | BCBUS4 | TXLED# | | SIWUB | SIWUB | SIWUB | GPIOH4 | SIWUB | SIWUB | ** |
| 57 | BCBUS5 | ** | | ** | ** | ** | GPIOH5 | | ** | ** |
| 58 | BCBUS6 | ** | | ** | ** | ** | GPIOH6 | | ** | ** |
| 59 | BCBUS7 | PWRSVAV # | PWRSVAV # | PWRSVAV# | PWRSVAV# | PWRSVAV# | GPIOH7 | PWRSVAV# | PWRSVAV# | PWRSVAV# |
| 60 | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# | PWREN# |
| 36 | SUSPEND# | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND # | SUSPEND# |
| Configuration memory interface | | | | | | | | | | |
| 63 | EECS | | | | | | | | | |
| 62 | EECLK | | | | | | | | | |
| 61 | EEDATA | | | | | | | | | |

Table 3.2 – FT2232H Functions Table

3.3 Module Pin and Signal Descriptions

The pin descriptions of J1 and J2 are given in Table 3.2 and Table 3.3.

| Connector Pin | Name | Description |
|---------------|----------|--|
| J1-1 | AC7 | FT2232H ACBUS7 pin |
| J1-2 | AC6 | FT2232H ACBUS6 pin |
| J1-3 | AC5 | FT2232H ACBUS5 pin |
| J1-4 | AC4 | FT2232H ACBUS4 pin |
| J1-5 | AC3 | FT2232H ACBUS3 pin |
| J1-6 | AC2 | FT2232H ACBUS2 pin |
| J1-7 | AC1 | FT2232H ACBUS1 pin |
| J1-8 | AC0 | FT2232H ACBUS0 pin |
| J1-9 | AD7 | FT2232H ADBUS7 pin |
| J1-10 | AD6 | FT2232H ADBUS6 pin |
| J1-11 | AD5 | FT2232H ADBUS5 pin |
| J1-12 | AD4 | FT2232H ADBUS4 pin |
| J1-13 | AD3 | FT2232H ADBUS3 pin |
| J1-14 | AD2 | FT2232H ADBUS5 pin |
| J1-15 | AD1 | FT2232H ADBUS1 pin |
| J1-16 | AD0 | FT2232H ADBUS0 pin |
| J1-17 | SUSPEND# | FT2232H SUSPEND# pin |
| J1-18 | GND | Ground |
| J1-19 | PWRN# | FT2232H PWREN# pin |
| J1-20 | RESET# | FT2232H RESET# pin |
| J1-21 | PAMBER4 | USB hub downstream port 4 Overcurrent LED indicator signal pin |
| J1-22 | PGREEN4 | USB hub downstream port 4 LED Traffic indicator signal pin |
| J1-23 | DP4 | USB hub downstream port 4 D+ signal pin |
| J1-24 | DM4 | USB hub downstream port 4 D- signal pin |

Table 3.2 – RPi HUB Module Connection – J1

| Connector Pin | Name | Description |
|---------------|--------|--|
| J2-1 | BD0 | FT2232H BDBUS0 pin |
| J2-2 | BD1 | FT2232H BDBUS1 pin |
| J2-3 | BD2 | FT2232H BDBUS2 pin |
| J2-4 | BD3 | FT2232H BDBUS3 pin |
| J2-5 | BD4 | FT2232H BDBUS4 pin |
| J2-6 | BD5 | FT2232H BDBUS5 pin |
| J2-7 | BD6 | FT2232H BDBUS6 pin |
| J2-8 | BD7 | FT2232H BDBUS7 pin |
| J2-9 | BC0 | FT2232H BCBUS0 pin |
| J2-10 | BC1 | FT2232H BCBUS1 pin |
| J2-11 | BC2 | FT2232H BCBUS2 pin |
| J2-12 | BC3 | FT2232H BCBUS3 pin |
| J2-13 | BC4 | FT2232H BCBUS4 pin |
| J2-14 | BC5 | FT2232H BCBUS5 pin |
| J2-15 | BC6 | FT2232H BCBUS6 pin |
| J2-16 | BC7 | FT2232H BCBUS7 pin |
| J2-17 | DATA | FT2232H EEDATA pin |
| J2-18 | GND | Ground |
| J2-19 | CLK | FT2232H EECLK pin |
| J2-20 | VCCSW | Switchable power sourced from VBUS |
| J2-21 | CS | FT2232H EECS pin |
| J2-22 | VCC3V3 | 3.3VDC generated from VCC (output) |
| J2-23 | VBUS | USB +5V VBUS power pin (output) from upstream USB port |
| J2-24 | VCC5V | +5v power pin. |

Table 3.3 – RPi HUB Module Connection – J2

In most cases, the FT2232H pin is connected directly to the associated pin on J1 or J2.

There are also several LEDs available on the FT2232H Hub-I/O to indicate the status of power and USB hub port. Detailed functions of LEDs are described in Table 3.4.

| LED Reference Designator | Colour | Function Description |
|--------------------------|--------|---|
| POWER | Yellow | Power active to downstream USB ports indicator |
| PORT1 | Red | Overcurrent status of downstream USB port 1 indicator |
| PORT1 | Green | Enumeration status of downstream USB port 1 indicator |
| PORT2 | Green | Enumeration status of downstream USB port 2 indicator |
| PORT2 | Red | Overcurrent status of downstream USB port 2 indicator |

Figure 3.4 – Functions of status LEDs on the module

4 Guide to Supplying Power

When RPi HUB Module is connected to Raspberry Pi board it must be powered from external +5V power supply. The Raspberry Pi board can be powered by connecting P1-02 header to J2-24 on RPi HUB Module. To date, the Raspberry Pi uses a 140mA fuse on the power line to the USB connector; this fuse will not allow an adequate amount of current to power the RPi HUB Module from this USB connector.

USB Bus powered configuration may be used with other host devices, such as PCs or laptops. To enable external power supply feature, switch the jumper JP1 and JP2 to SELF position, pins 2 & 3 shorted for both jumpers. The maximum total current consumed by the external USB devices on downstream port 1 and 2 is 1A. If the total current exceeds 1A, the fuse on the RPi HUB Module will disconnect the power to the USB downstream ports. If this occurs then LEDs PORT1 and PORT2 on the module will illuminate red to indicate over-current status.

When powered from USB bus power, the estimated current consumed by the circuits on the module is between 100-300mA depending on the application. User should ensure that the host can supply this current via USB potation.

5 Mechanical Details

The mechanical details of the RPi HUB Module are shown in Figure 5.1:

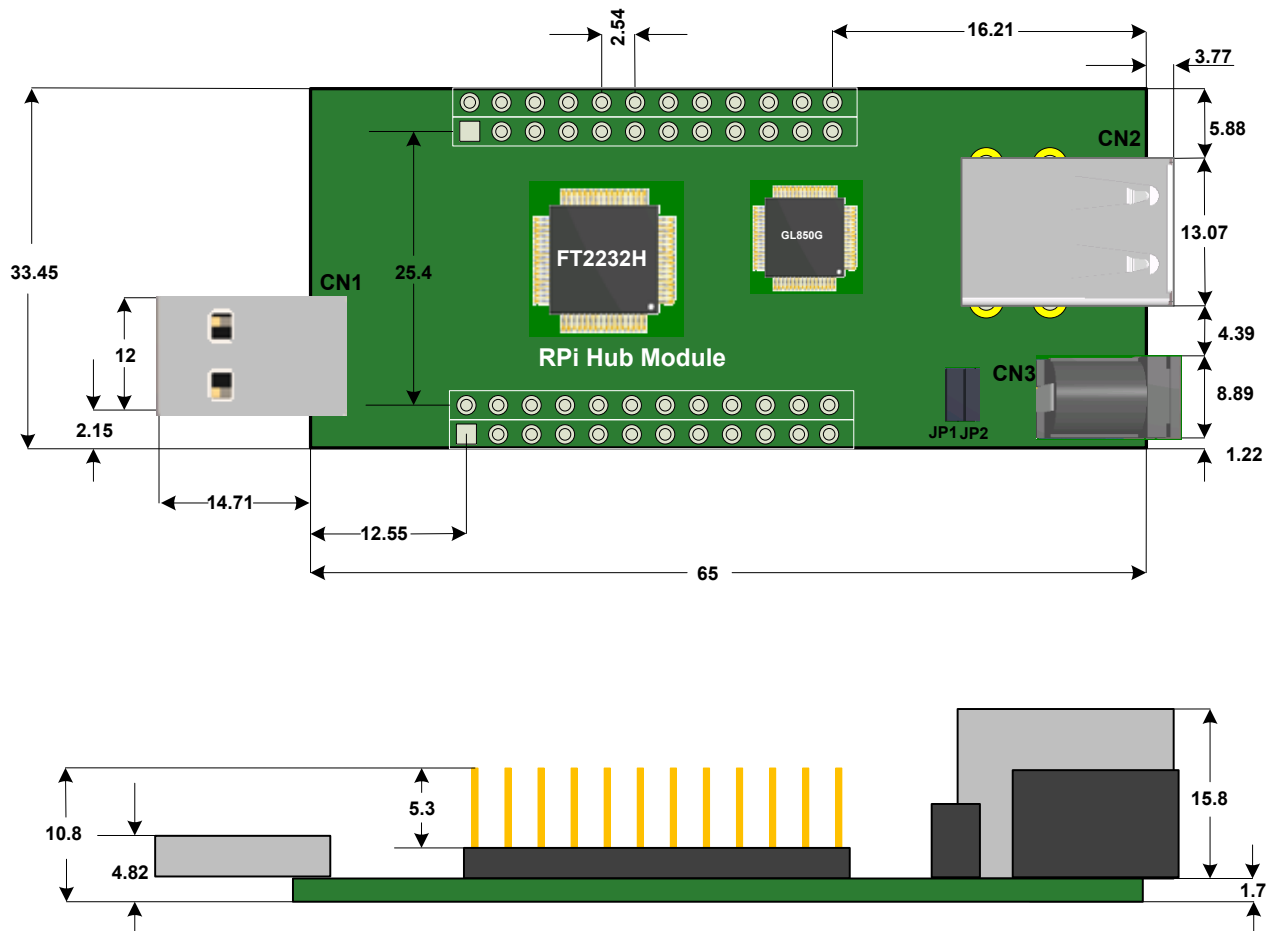


Figure 5.1 – RPi HUB Module Dimensions diagram

All dimensions are in millimetres.

The headers J1 and J2 are mounted to the top of the PCB and the overall height is 10.8mm, with a body which exposes 5.3mm of the pins. The pins are 0.025 inch square.

6 Schematic Diagram

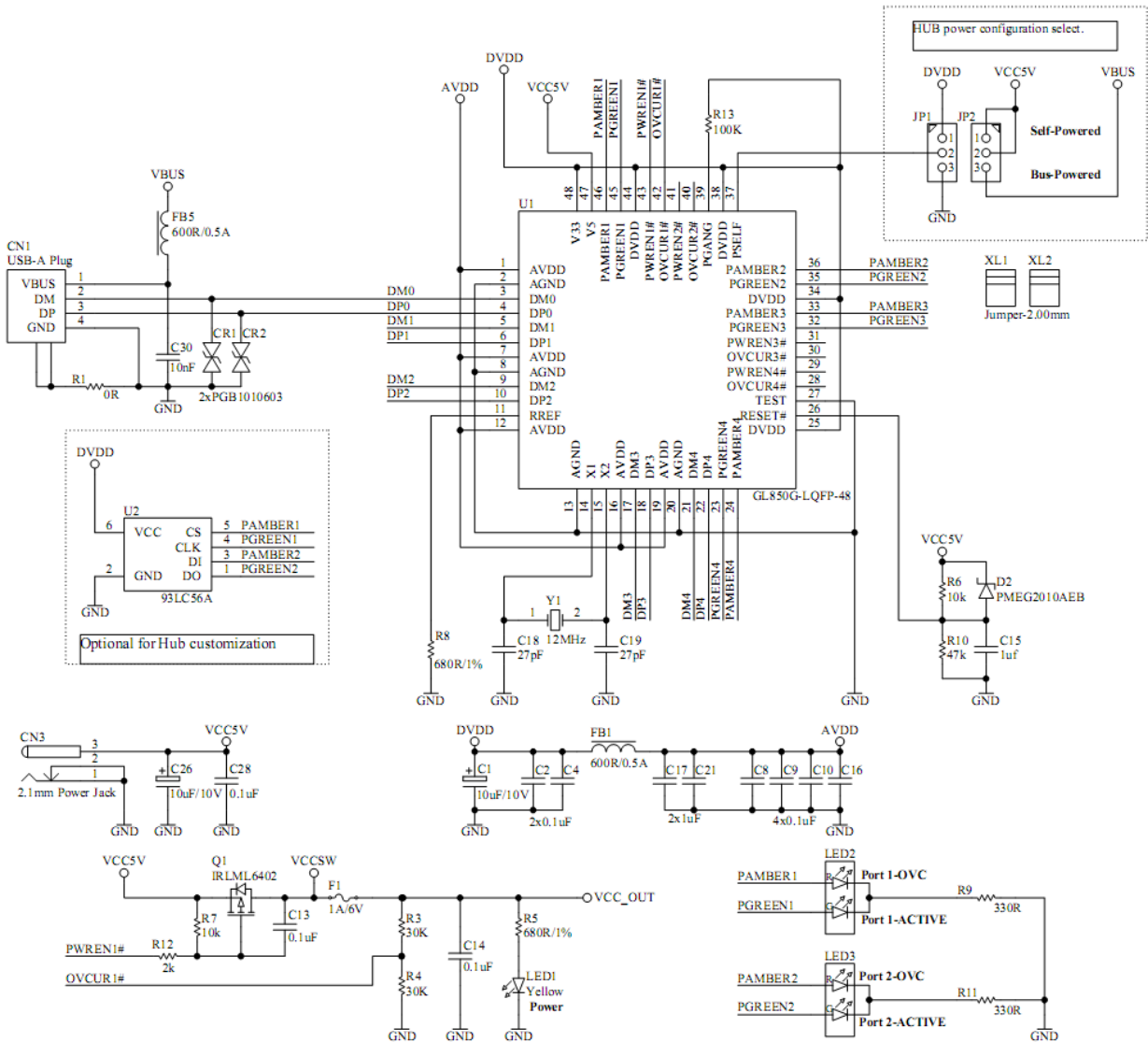


Figure 6.1 – RPi HUB Module Schematic Part 1 of 2

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Appendix A – FT2232H EEPROM Configuration

The RPi HUB Module utilizes an EEPROM which contains the USB configuration descriptors for the FT2232H. When the RPi HUB 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 7.1.

| Parameter | Value | Notes |
|-----------------------------------|------------------------|--|
| USB Vendor ID (VID) | 0403h | FTDI default VID (hex) |
| USB Product ID (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 RPi HUB Module | |
| Max Bus Power Current | 90mA | |
| Power Source | Bus Powered | |
| Device Type | FT2232 | |
| USB Version | 0200 | Returns USB 2.0 device description to the host. |
| 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 I/O pins |
| Load VCP Driver | Enabled | Makes the device load the VCP driver interface for the device. |

Table 7.1 – Default Internal EEPROM Configuration

The EEPROM for FT2232H chip on the RPi 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.

Appendix B – References

[FT2232H Datasheet](#)

[Application and Technical Notes](#)

Appendix C – List of Figures and Tables

List of Figures

| | |
|--|----|
| Figure 3.1 – RPi HUB Module Connector Description (Top View) | 5 |
| Figure 5.1 – RPi HUB Module Dimensions diagram..... | 10 |
| Figure 6.1 – RPi HUB Module Schematic Part 1 of 2..... | 11 |
| Figure 6.2 – RPi HUB Module Schematic Part 2 of 2..... | 12 |

List of Tables

| | |
|--|----|
| Table 1.1 – Ordering Information | 1 |
| Table 3.1 – RPi HUB Module Connector Descriptions..... | 5 |
| Table 3.2 – FT2232H Functions Table..... | 6 |
| Table 7.1 – Default Internal EEPROM Configuration..... | 14 |

Appendix D – Revision History

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Document Feedback: [Send Feedback](#)

Version 1.0 Initial Datasheet Released

15/06/12



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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