Future Technology Devices International Ltd

C232HD

USB 2.0 Hi-Speed to UART Cable

Datasheet

Document Reference No.: FT_000430

Version 1.1

Issue Date: 2012-03-14

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1 Description

The **USB 2.0 Hi-Speed to UART cable** incorporates FTDI's FT232H USB to UART interface IC device which handles all the USB signalling and protocols. The cable provides a fast, simple way to connect devices with 3.3 volt digital interfaces to USB.

The C232HD UART cable contains a small internal electronic circuit board, utilising the FT232H, which is encapsulated into the USB connector end of the cable. The FT232H is a single channel USB 2.0 Hi-Speed (480Mb/s) to UART IC. For full details, features and enhancement descriptions please refer to the FT232H datasheet, this is available from

http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232H.pdf.

The digital interface of the cable is made up of ten individual wires which are terminated with single pole connectors which can be connected next to each other on a male header. The cables digital interface logic is 3.3 volts.

The USB side of the cable is USB powered and is USB 2.0 Hi-Speed compatible. The cable is 1.8m long and supports a data transfer rate up to 12 Mbaud.

The C232HD UART cable requires USB drivers, available free from http://www.ftdichip.com , which are used to make the FT232H in the cable appear as a virtual COM port (VCP). This then allows the user to communicate with the USB interface via a standard PC serial emulation port (for example TTY).

Another FTDI USB driver, the D2XX, is used with application software to directly access the FT232H on the cable though a DLL. This is illustrated in the Figure 1-1.

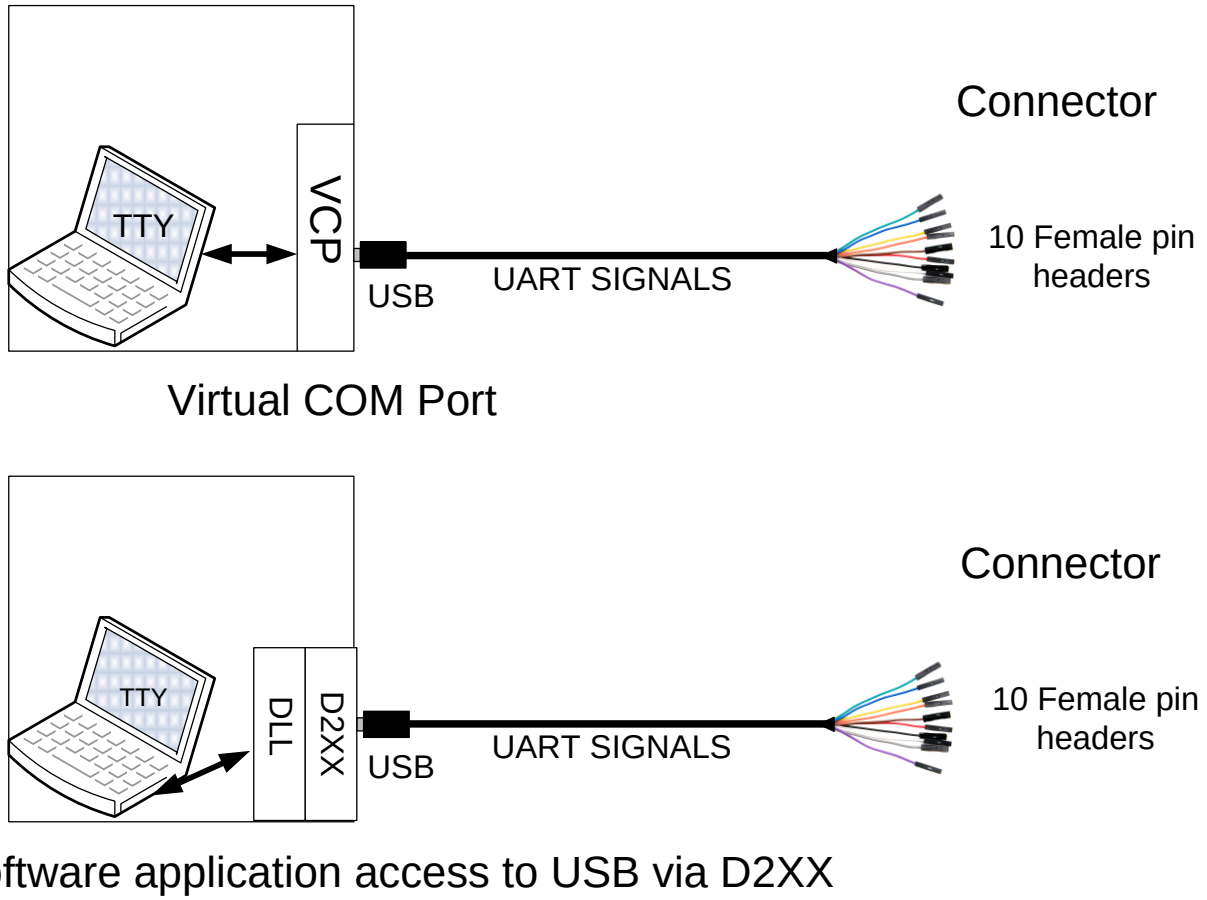

Figure 1-1 Using the C232HD UART Cable

1.1 Available Cables and Part Numbers

The following Table 1.1 gives details of the available C232HD UART cables.

Part Number	Description	End Connector	Cable details
C232HD-DDHSP-0	USB to UART cable with +3.3V digital level signals. Maximum output of 250mA @ 3.3VDC on VCC (see ***Note 1***)	Single pole, receptacle x 10	10 core, UL2464 24 AWG, diameter=6.5mm length = 1800mm
C232HD-EDHSP-0	USB to UART cable with +3.3V digital level signals. Maximum output of 450mA @ 5.0VDC on VCC (see ***Note 2***)	Single pole, receptacle x 10	10 core, UL2464 24 AWG, diameter=6.5mm length = 1800mm

Table 1.1 C232HD UART Cable Descriptions and Part Numbers

Note 1: *The VCC power output signal (RED wire) is 3.3V. The source of 3.3V is the on-board regulator output, which is switched onto the power output signal.*

Note 2: *The VCC power output signal (RED wire) is 5.0V. The source of 5.0V is the USB VBUS input, which is switched onto the power output signal.*

FTDI supports customised end connector designs. For more information, please contact your local FTDI sales office (see end of datasheet for contact details).

1.2 Certifications

The FTDI C232HD UART cables are fully RoHS compliant. At the time of writing this datasheet the cables were being CE and FCC tested.

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2 Typical Applications

- Interfacing MCU / PLD / FPGA based designs to USB
- USB Medical applications
- Rapid USB integration into existing electronic systems
- Prototyping platform for USB interface on new systems
- USB to RS232 / RS422 / RS485 Converters
- USB Instrumentation
- Set Top Box PC - USB interface
- USB Digital Camera Interface
- USB Hardware Modems
- USB Wireless Modems
- USB Bar Code Readers
- USB Industrial Control
- Upgrading Legacy Peripherals to USB

2.1 Driver Support

Royalty free VIRTUAL COM PORT (VCP) DRIVERS for…

- Microsoft Windows 2000, Server 2003, XP and Server 2008
- Microsoft Windows XP and XP 64-bit
- Microsoft Windows 7 and Windows 7 64-bit
- Microsoft Windows Vista and Vista 64-bit
- Microsoft Windows CE 4.2, 5.0 and 6.0
- Apple Mac OS-X
- Linux 2.6.39 or later

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

- Microsoft Windows 2000, Server 2003, XP and Server 2008
- Microsoft Windows XP and XP 64-bit
- Microsoft Windows 7 and Windows 7 64-bit
- Microsoft Windows Vista and Vista 64-bit
- Microsoft Windows CE 4.2, 5.0 and 6.0
- Linux 2.6.32 or later

The drivers listed above are all available to download for free from http://www.ftdichip.com. Various Third Party Drivers are also available for various other operating systems - see http://www.ftdichip.com/Support/Links.htm for details.

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2.2 Features

- Based on the single chip USB Hi-Speed FT232H device
- USB 2.0 Hi-Speed (480Mbits/Second) and Full Speed (12Mbits/Second) compatible
- Entire USB protocol handled on the chip – No USB-specific firmware programming required
- USB Type A connector for direct connection to USB host or hub
- USB bus powered
- Asynchronous UART transfer data rate up to 12Mbaud
- UART interface support for 7 or 8 data bits, 1 or 2 stop bits and odd / even / mark / space / no parity
- Fully assisted hardware or X-On / X-Off software handshaking
- 1kByte receive and transmit buffers for high data throughput
- Transmit and receive LEDs
- Adjustable receive buffer timeout
- Support for USB suspend and resume
- Low operating and USB suspend current
- Low USB bandwidth consumption
- UHCI / OHCI / EHCI host controller compatible
- -40°C to +85°C operating temperature range
- Cable length is 1.8m (6 feet)
- Custom versions also available (subject to Minimum Order Quantity (MOQ))
- FTDI's royalty-free VCP and D2XX drivers eliminate the requirement for USB driver development in most cases

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3 C232HD UART Cable connection and Mechanical Details

The following Figure 3-1 shows the cable signals and the wire colours for these signals on the C232HD UART cable.

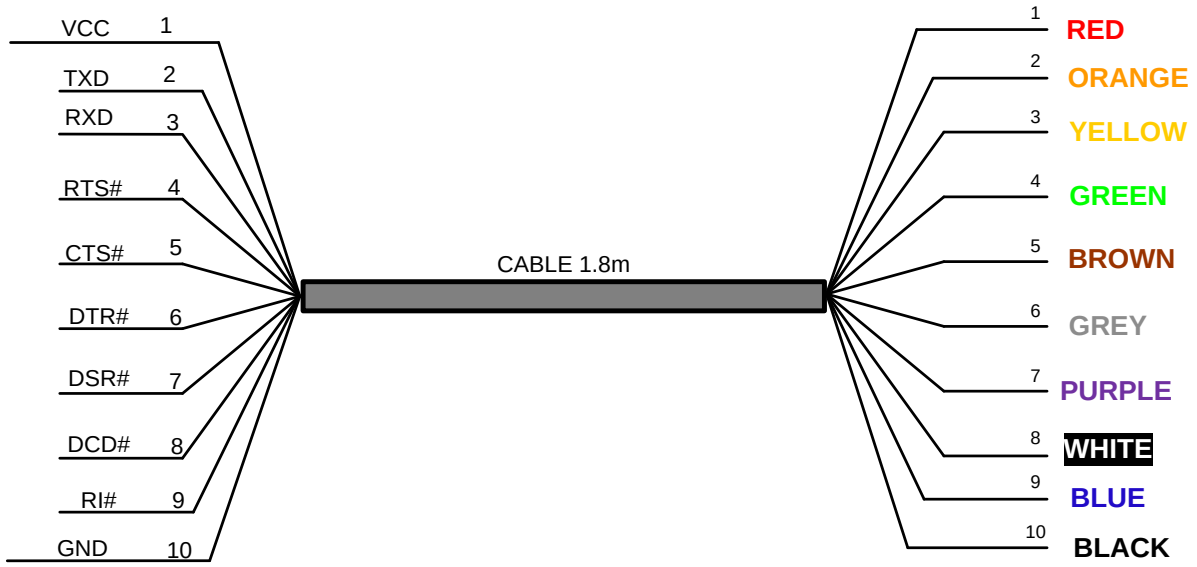

Figure 3-1 C232HD UART Cable Connections (numbers refer to pad numbers on the PCB)

3.1 C232HD UART Cable Signal Descriptions

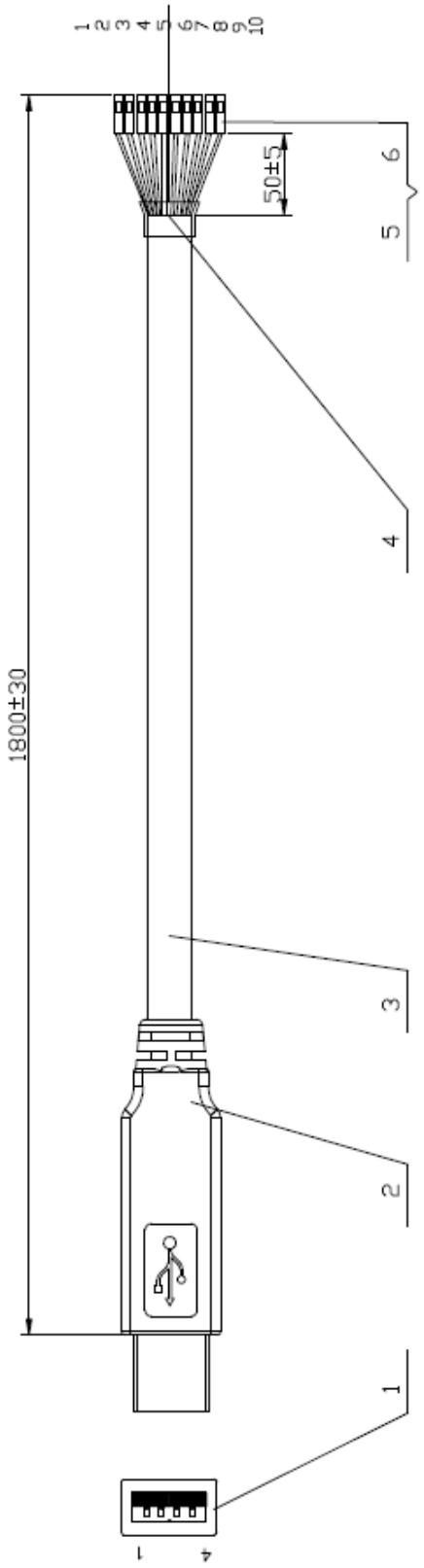

Figure 3-2 C232HD UART Cable Mechanical Details (dimensions in mm)

3.2 C232HD UART Cable Signal Descriptions

Colour	Pin Number	Name	Type	Description
Red	1	VCC	Output	Power Supply Output to target board.
Orange	2	TXD	Output	Transmit Asynchronous Data output.
Yellow	3	RXD	Input	Receive Asynchronous Data input.
Green	4	RTS#	Output	Request To Send Control Output / Handshake signal.
Brown	5	CTS#	Input	Clear to Send Control input / Handshake signal.
Gray	6	DTR#	Output	Data Transmit Ready modem signalling line
Purple	7	DSR#	Input	Data Set Ready modem signalling line
White	8	DCD#	Input	Data Carrier Detect modem signalling line
Blue	9	RI#	Input	RI# = Ring Indicator Control Input. When the Remote Wake up option is enabled in the EEPROM, taking RI# low can be used to resume the PC USB Host controller from suspend.
Black	10	GND	GND	Device ground supply pin.

Table 3.1 C232HD UART Cable Signal Descriptions

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3.3 C232HD UART Cable Electrical Parameters

3.3.1 C232HD-DDHSP-0 Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
VCC	Output Power Voltage	3.2	3.3	3.6	V	
I_O	Output Power Current	-	-	200	mA	
T	Operating Temperature Range	-40		+85	°C	

Table 3.2 C232HD-DDHSP-0

3.3.2 C232HD-EDHSP-0 Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
VCC	Output Power Voltage	4.75	5	5.25	V	
I_O	Supply Current	-	-	200	mA	Must be less than 2.5mA during suspend.
T	Operating Temperature Range	-40		+85	°C	

Table 3.3 C232HD-EDHSP-0 Power Supply Output Parameters

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3.3.3 C232HD-DDHSP-0 and C232HD-EDHSP-0 I/O Characteristics

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
Voh	Output Voltage High	2.40	3.14		V	Ioh = +/-2mA I/O Drive strength* = 4mA
			3.20		V	I/O Drive strength* = 8mA
			3.22		V	I/O Drive strength* = 12mA
			3.22		V	I/O Drive strength* = 16mA
Vol	Output Voltage Low		0.18	0.40	V	Iol = +/-2mA I/O Drive strength* = 4mA
			0.12		V	I/O Drive strength* = 8mA
			0.08		V	I/O Drive strength* = 12mA
			0.07		V	I/O Drive strength* = 16mA
Vil	Input low Switching Threshold		-	0.80	V	LVTTL
Vih	Input High Switching Threshold	2.00	-		V	LVTTL
Vt	Switching Threshold		1.50		V	LVTTL
Vt-	Schmitt trigger negative going threshold voltage	0.80	1.10	-	V	
Vt+	Schmitt trigger positive going threshold voltage		1.60	2.00	V	
Rpu	Input pull-up resistance	40	75	190	KΩ	Vin = 0
Rpd	Input pull-down resistance	40	75	190	KΩ	Vin =VCCIO
Iin	Input Leakage Current	15	45	85	µA	Vin = 0
Ioz	Tri-state output leakage current		±10		µA	Vin = 5.5V or 0

Table 3.4 C232HD-DDHSP-0 and C232HD-EDHSP-0 I/O Pin Characteristics

* The I/O drive strength and slow slew-rate are configurable in the EEPROM.

The I/O pins are +3.3v cells, which are +5V tolerant

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4 Cable PCB Circuit Schematic

The circuit schematics for the small internal electronic circuit board, utilising the FTDI FT232H, which is encapsulated into the USB connector end of the cable, are shown in Figure 4-1 Circuit Schematic of PCB - C232HD-DDHSP-0 and Figure 4-2 - Circuit Schematic of PCB - C232HD-EDHSP-0.

Customised versions of these cables can also be developed. Users interested in customised versions of these cables should contact FTDI sales (sales1@ftdichip.com).

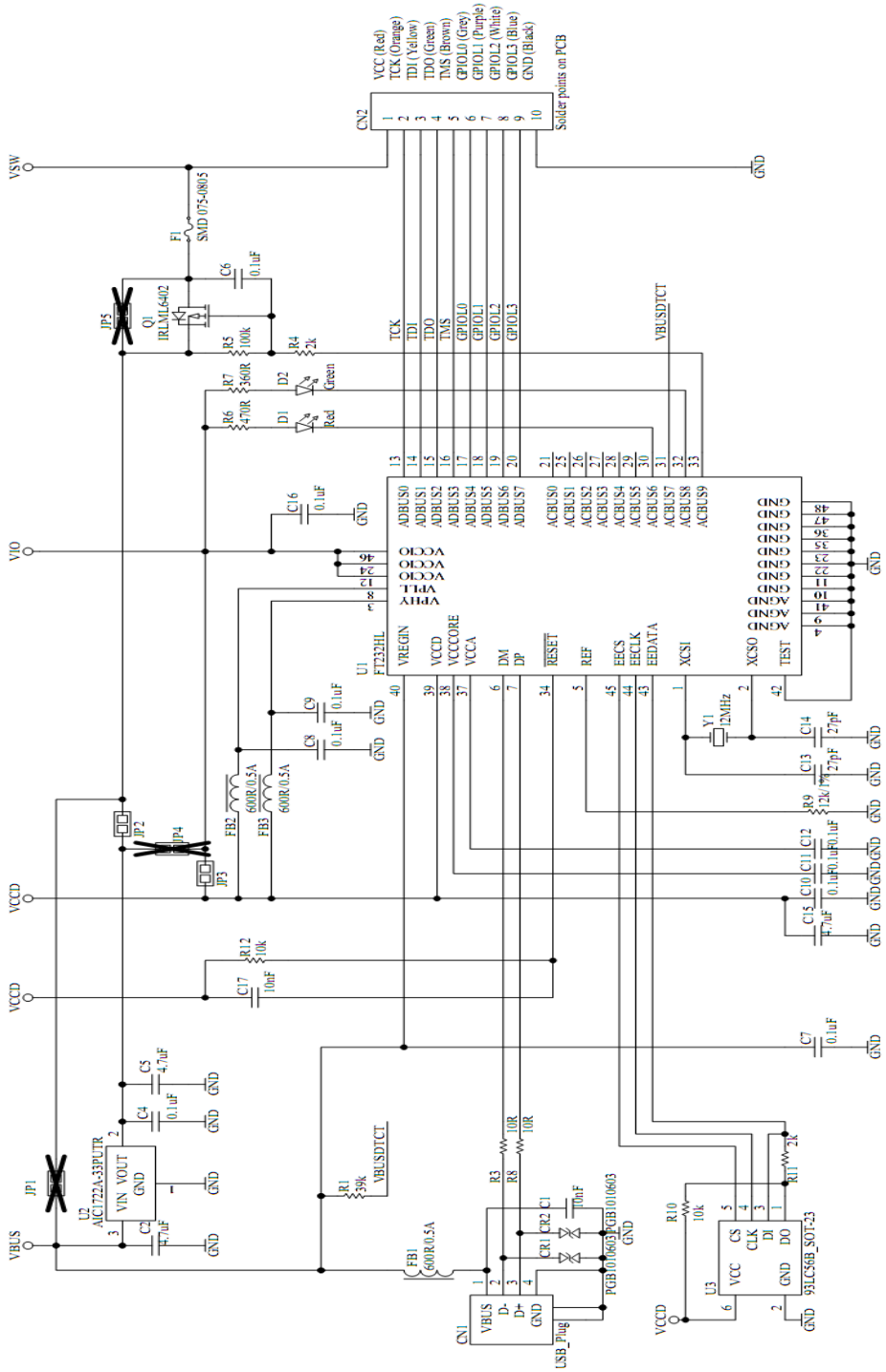

Figure 4-1 Circuit Schematic of PCB - C232HD-DDHSP-0

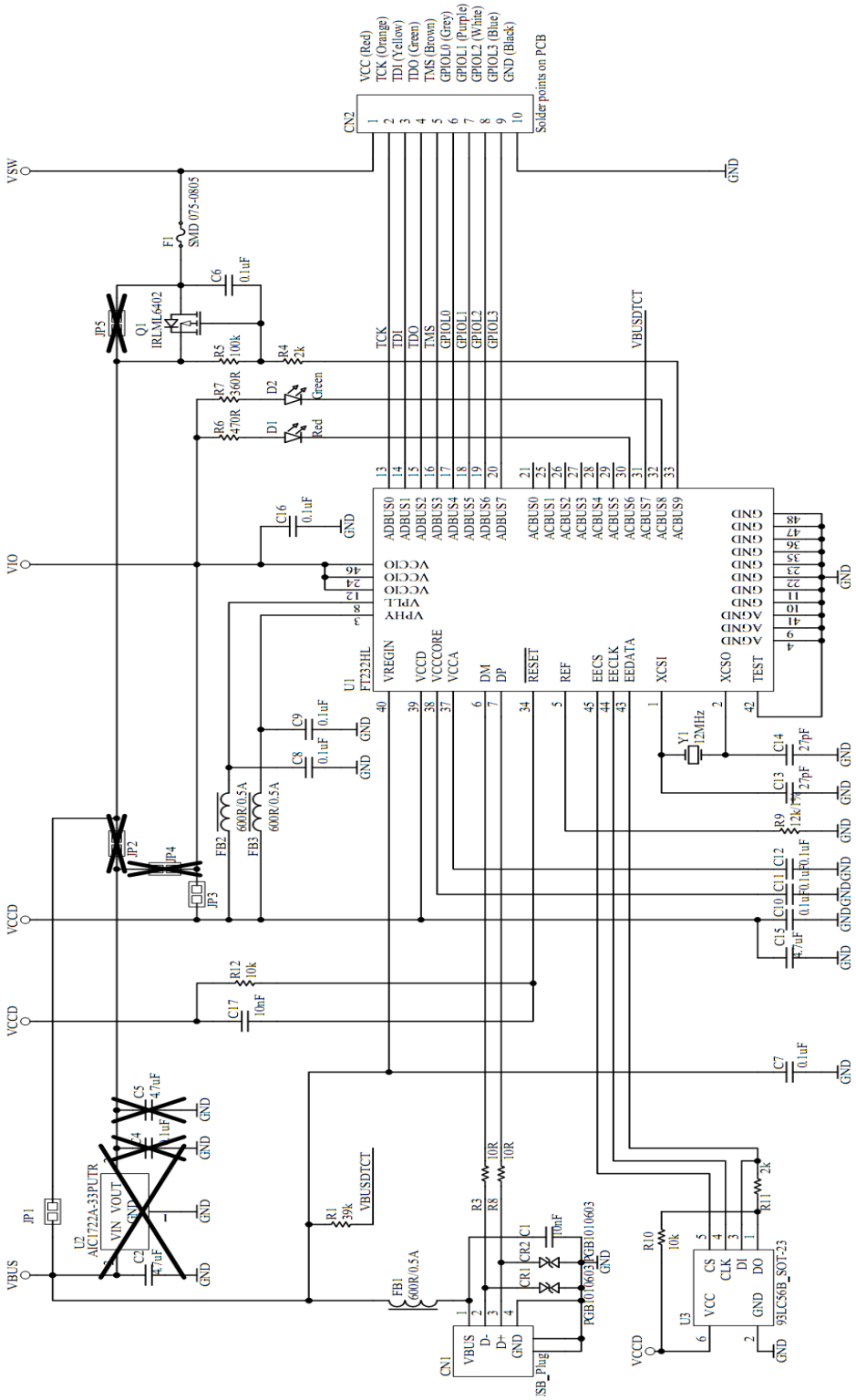

Figure 4-2 - Circuit Schematic of PCB - C232HD-EDHSP-0

5 Contact Information

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Appendix A - Cable EEPROM Configuration

Each C232HD cable is controlled by the FTDI FT232H IC. This cable contains an EEPROM which contains the USB configuration descriptors for that device. When the cable is plugged into a PC or a USB reset is performed, the PC will read these descriptors. The default values stored into the internal EEPROM are defined in the following table.

Parameter	Value	Notes
USB Vendor ID (VID)	0403h	FTDI default VID (hex)
USB Product UD (PID)	6014h	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	See note	Product description depends on the cable. The following lists a the Product descriptions for each different cable. C232HD-DDHSP-0 C232HD-EDHSP-0
Max Bus Power Current	500mA	Includes power to operate the FT232H plus the cable output current.
Power Source	Bus Powered	
Device Type	FT232H	
USB Version	0200	Returns USB 2.0 device description to the host. Note: The device is a USB 2.0 Hi-Speed device (480Mb/s).
Remote Wake Up	Disabled	
High Current I/Os	Enabled	Enables the high drive level on the UART and CBUS I/O pins.
Load VCP Driver	Enabled	Makes the device load the VCP driver interface for the device.
Invert TXD	Disabled	Signal on this pin becomes TXD# if enable.
Invert RXD	Disabled	Signal on this pin becomes RXD# if enable.
Invert RTS#	Disabled	Signal on this pin becomes RTS if enable.
Invert CTS#	Disabled	Signal on this pin becomes CTS if enable.

Default Internal EEPROM Configuration

The cable EEPROM in the cable can be re-programmed over USB using the utility program FT_PROG. Both can be downloaded from www.ftdichip.com.

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Appendix C – Revision History

Version 1.0	Initial Release	29th September 2011
Version 1.1	Updated schematic to give correct the correct part number for the fuse, and correct current limits in Table1.1. Updated section 1.1, Linux Version	14th March 2012

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