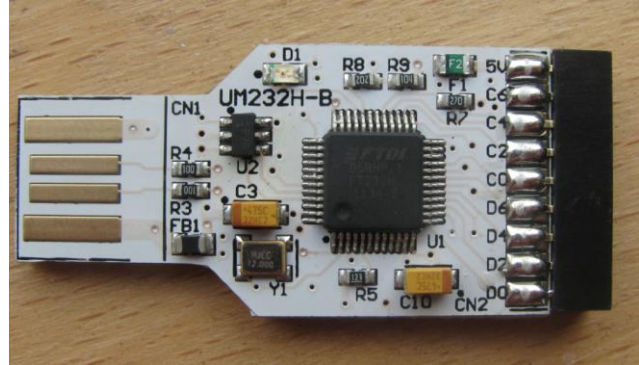


# Future Technology Devices International Ltd

## Datasheet

### UM232H-B USB to Serial/Parallel Break-Out Module



*UM232H-B is a multiple-interface Hi-Speed USB to UART, 245 FIFO, FT1248, I<sup>2</sup>C, SPI and GPIO break-out module.*

## 1 Introduction

The UM232H-B is a development module for FTDI's FT232H Hi-Speed to Serial/Parallel interface converter. This single interface channel IC can be configured to transfer data over the following interfaces UART, 245 FIFO, FT1248, I<sup>2</sup>C, SPI and GPIO.

For detail on FT232H, refer to the [FT232H datasheet](#).

## 1.1 Features

This hardware is a breakout board that converts Hi-Speed USB2.0 to a serial/parallel interface and connects the signals to a 2.00mm pitch 18pin female receptacle. No USB connector is used, instead this module plugs directly into the USB host connector and the pads of the PCB makes electrical contact with the electrical contacts of the host USB connector.

All signals on these modules operate at +3.3V voltage levels, however all I/Os are 5V tolerant.

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## 2 Driver Support

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

- Windows 10 32,64-bit
- Windows 8 and 8.1 32,64-bit
- 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 3.0 and greater
- Android

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

- Windows 10 32,64-bit
- Windows 8 and 8.1 32,64-bit
- 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 3.0 and greater
- Android

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

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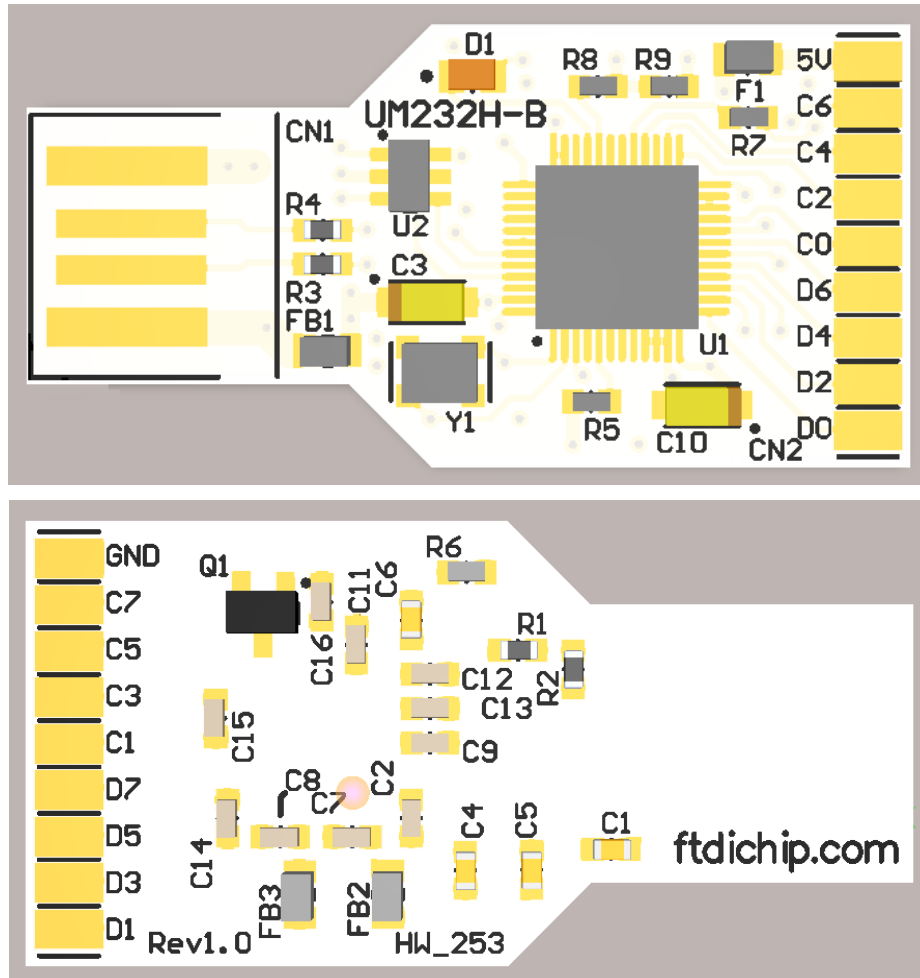
### 3 Ordering Information

<b>Module Code</b>	<b>Utilised IC Code</b>	<b>Description</b>
UM232H-B	FT232H	Single Channel USB to Serial/Parallel interface break-out board, with a female header.
UM232H-B-NC	FT232H	Single Channel USB to Serial/Parallel interface break-out board, with solder pads only.
UM232H-B-WE	FT232H	Single Channel USB to Serial/Parallel interface break-out board, with 6" flying leads connected to the signal pads.

**Table 3.1 – Ordering Information**

## 4 UM232H-B Signals and Configurations

### 4.1 UM232H-B Pin Out



**Figure 4.1 – Module Pin Out**

Figure 4.1 illustrates the signals available on the signal pads. The top figure shows the pinout when the module is viewed from the top side. The bottom figure shows the pinout when the module is viewed from the bottom side.

**Note:** Take care when plugging module into a deep recessed USB port, it may damage component C1.

## 4.2 UM232H-B Signals

A list of all the pins and signals are given in Table 4.2. The EEPROM configuration determines the signal assigned to a pin.

Pins marked \* are EEPROM selectable

FT232H										
Pin		Pin functions (depends on configuration)								
Pin #	Pin Name	ASYNC Serial (RS232)	SYNC 245 FIFO	STYLE ASYNC 245 FIFO	ASYNC Bit-bang	SYNC Bit-bang	MPSSE	Fast Serial interface	CPU Style FIFO	FT1248
13	ADBUS0	TXD	D0	D0	D0	D0	TCK/SK	FSDI	D0	MIOSI0
14	ADBUS1	RXD	D1	D1	D1	D1	TDI/DO	FSCLK	D1	MIOSI1
15	ADBUS2	RTS#	D2	D2	D2	D2	TDO/DI	FSDO	D2	MIOSI2
16	ADBUS3	CTS#	D3	D3	D3	D3	TMS/CS	FSCTS	D3	MIOSI3
17	ADBUS4	DTR#	D4	D4	D4	D4	GPIOL0	** TriSt-UP	D4	MIOSI4
18	ADBUS5	DSR#	D5	D5	D5	D5	GPIOL1	** TriSt-UP	D5	MIOSI5
19	ADBUS6	DCD#	D6	D6	D6	D6	GPIOL2	** TriSt-UP	D6	MIOSI6
20	ADBUS7	RI#	D7	D7	D7	D7	GPIOL3	** TriSt-UP	D7	MIOSI7
21	ACBUS0	* TXDEN	RXF#	RXF#	ACBUS0	ACBUS0	GPIOH0	** ACBUS0	CS#	SCLK
25	ACBUS1	** ACBUS1	TXE#	TXE#	WRSTB#	WRSTB#	GPIOH1	** ACBUS1	A0	SS_N
26	ACBUS2	** ACBUS2	RD#	RD#	RDSTB#	RDSTB#	GPIOH2	** ACBUS2	RD#	MISO
27	ACBUS3	* RXLED#	WR	WR	ACBUS3	ACBUS3	GPIOH3	** ACBUS3	WR	ACBUS3
28	ACBUS4	* TXLED#	SIWU#	SIWU#	SIWU#	SIWU#	GPIOH4	SIWU#	SIWU#	ACBUS4
29	ACBUS5	** ACBUS5	CLKOUT	ACBUS5	** ACBUS5	** ACBUS5	GPIOH5	** ACBUS5	** ACBUS5	ACBUS5
30	ACBUS6	** ACBUS6	OE#	ACBUS6	ACBUS6	ACBUS6	GPIOH6	** ACBUS6	** ACBUS6	ACBUS6
31	ACBUS7	PWRSVAV#	PWRSVAV#	PWRSVAV#	PWRSVAV#	PWRSVAV#	*** GPIOH7	PWRSVAV#	PWRSVAV#	PWRSVAV#
32	ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	** ACBUS8	ACBUS8
33	ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	** ACBUS9	ACBUS9

**Table 4.1 – List of the Modules Signals**

Pins marked \*\* default to tri-stated inputs with an internal 75KΩ (approx.) pull up resistor to VCCIO.

Pin marked \*\*\* default to GPIO line with an internal 75KΩ pull down resistor to GND. Using the EEPROM this pin can be enabled USBVCC mode instead of GPIO mode.

The following 2 tables provide a description of the signals available on each pin of the UM232H module

Pin No.	IC Port Name	PCB Port Name	Type	Description
CN2-1	ADBUS0	D0	Input/Output	EEPROM configurable data transfer pin
CN2-2	ADBUS1	D1	Input/Output	EEPROM configurable data transfer pin
CN2-3	ADBUS2	D2	Input/Output	EEPROM configurable data transfer pin
CN2-4	ADBUS3	D3	Input/Output	EEPROM configurable data transfer pin
CN2-5	ADBUS4	D4	Input/Output	EEPROM configurable data transfer pin
CN2-6	ADBUS5	D5	Input/Output	EEPROM configurable data transfer pin
CN2-7	ADBUS6	D6	Input/Output	EEPROM configurable data transfer pin
CN2-8	ADBUS7	D7	Input/Output	EEPROM configurable data transfer pin
CN2-9	ACBUS0	C0	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-10	ACBUS1	C1	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-11	ACBUS2	C2	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-12	ACBUS3	C3	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-13	ACBUS4	C4	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-14	ACBUS5	C5	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-15	ACBUS6	C6	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-16	ACBUS7	C7	Input/Output	EEPROM configurable control Pin, See Table 4.3
CN2-17	-	5V	Power	5V power output, 500mA limit, protected by a 750mA fuse.
CN2-18	GND	GND	Ground	Module Ground

**Table 4.2 – Module Pin Out Description**

### 4.3 CBUS Signal Options

The following options can be configured on the CBUS I/O pins. These options are all configured in the internal MTP ROM using the utility software FT\_PROG, which can be downloaded from the [www.ftdichip.com](http://www.ftdichip.com). The default configuration is described in Section 8.

ACBUS Signal Option	Available On ACBUS Pin	Description
TXDEN	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	TXDEN = (TTL level). Used with RS485 level converters to enable the line driver during data transmit. TXDEN is active from one-bit time before the start bit is transmitted on TXD until one bit time after the last stop bit.
*PWREN#	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	Output is low after the device has been configured by USB, then high during USB suspend mode. This output can be used to control power to external logic P-Channel logic level MOSFET switch. Enable the interface pull-down option when using the PWREN# in this way.*
TXLED#	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	TXLED = Transmit signalling output. Pulses low when transmitting data (TXD) to the external device. This can be connected to an LED.
RXLED#	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	RXLED = Receive signalling output. Pulses low when receiving data (RXD) from the external device. This can be connected to an LED.

ACBUS Signal Option	Available On ACBUS Pin	Description
TX&RXLED#	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	LED drive – pulses low when transmitting or receiving data from or to the external device. For more details, refer to the FT232H datasheet on the <a href="#">FTDI website</a> .
SLEEP#	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	Goes low during USB suspend mode. Typically used to power down an external TTL to RS232 level converter IC in USB to RS232 converter designs.
**CLK30	ACBUS0, ACBUS5, ACBUS6, ACBUS8, ACBUS9	30MHz Clock output.
**CLK15	ACBUS0, ACBUS5, ACBUS6, ACBUS8, ACBUS9	15MHz Clock output.
**CLK7.5	ACBUS0, ACBUS5, ACBUS6, ACBUS8, ACBUS9	7.5MHz Clock output.
TriSt-PU	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	Input Pull Up
DRIVE 1	ACBUS0, ACBUS5, ACBUS6, ACBUS8, ACBUS9	Output High
DRIVE 0	ACBUS0, ACBUS1, ACBUS2, ACBUS3, ACBUS4, ACBUS5, ACBUS6, ACBUS8, ACBUS9	Output Low
I/O mode	ACBUS5, ACBUS6, ACBUS8, ACBUS9	ACBUS BitBang

**Table 4.3 – CBUS Signal Options**

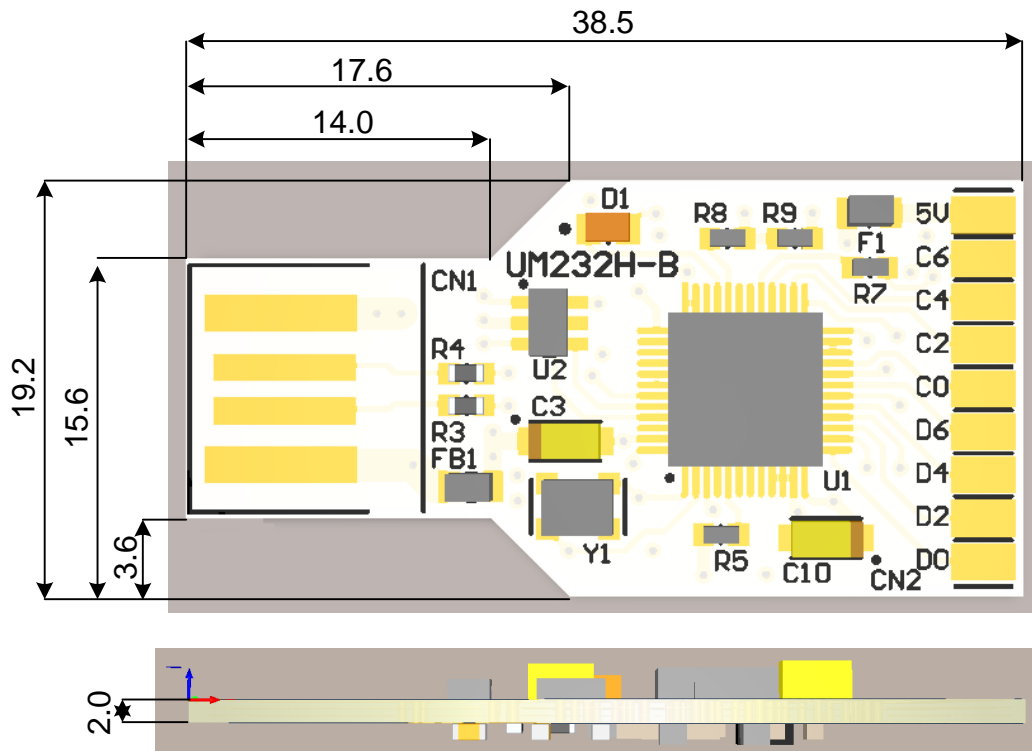
\*\*When in USB suspend mode the outputs clocks are also suspended.

## 4.4 Configuring the EEPROM

The UM232H-B contains an on-board EEPROM. This can be used to configure the functions of each CBUS pin, the current drive on each signal pin, current limit for the USB bus and the other descriptors of the device. For details on using the EEPROM programming utility FT\_PROG, please see the [FT\\_PROG User Guide](#).



## 5 Module Dimensions



**Figure 5.1 – UM232H-B Module Dimensions**

All dimensions are given in millimetres.

The UM232H-B module exclusively uses lead free components, and is fully compliant with European Union directive 2002/95/EC.

## 6 UM232H-B-WE Wire Colours

The -WE variant is supplied with a short cable. The wire colours are matched to signals as indicated below.

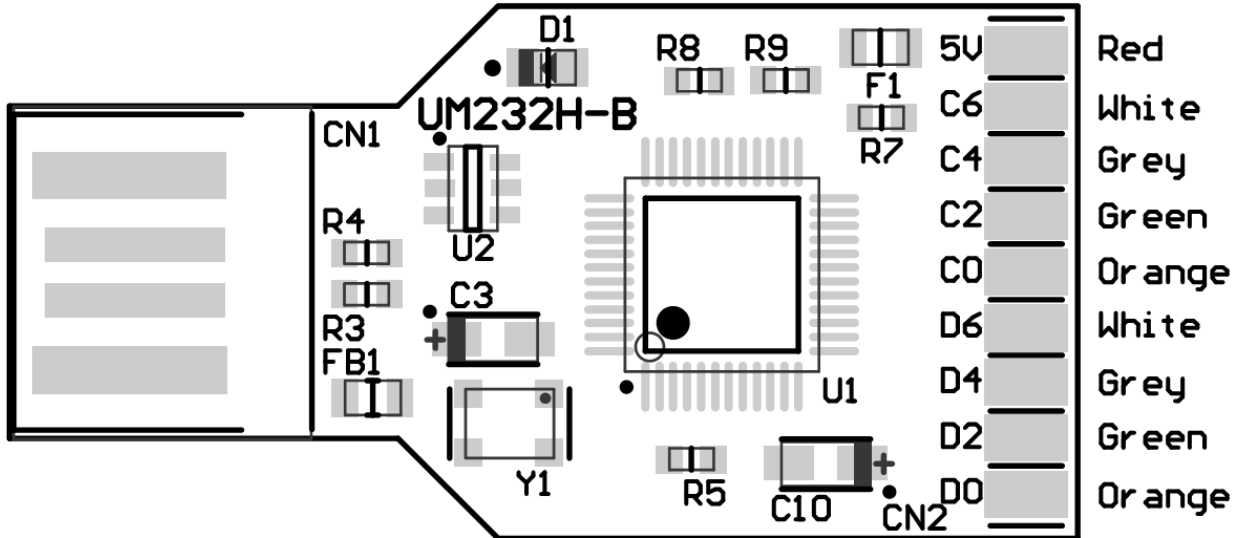


Figure 6.1 - UM232H-B-WE Wire Colours (Top View)

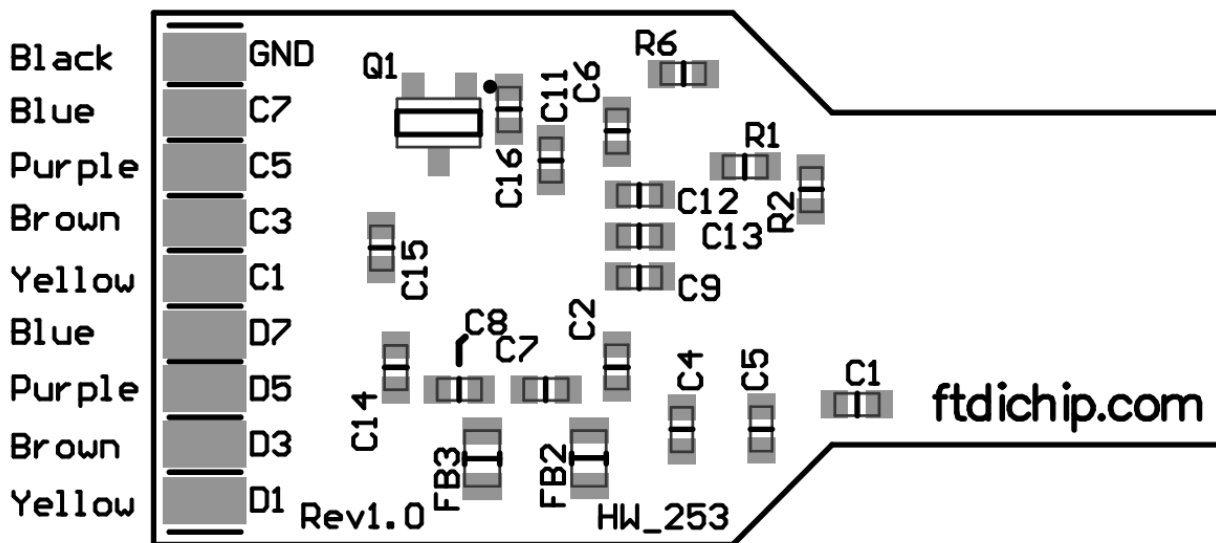
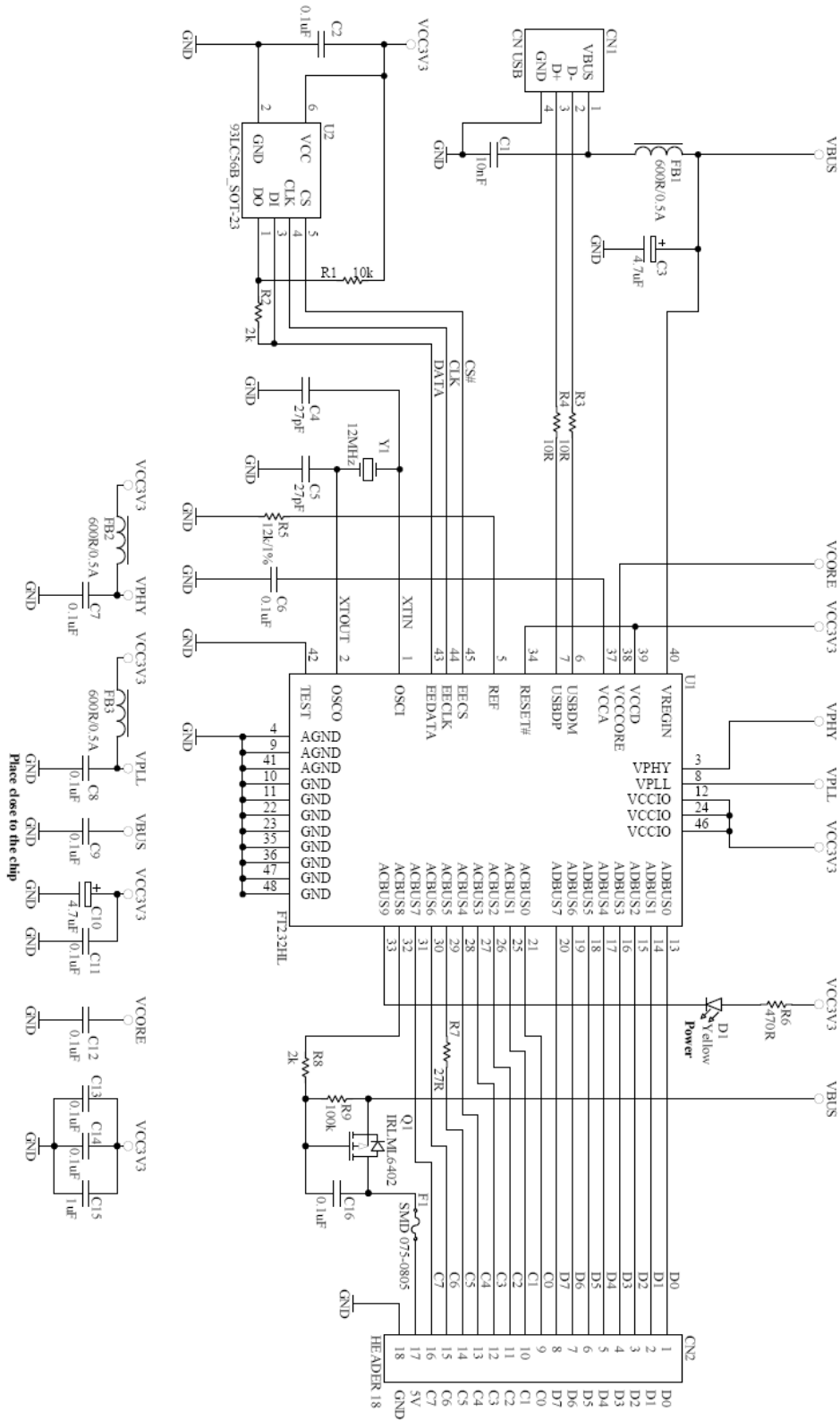


Figure 6.2 - UM232H-B-WE Wire Colours (Bottom View)

## 7 UM232H-B Module Circuit Schematic



**Figure 7.1 – Module Circuit Schematic**

## 8 Internal MTP ROM Configuration

Following a power-on reset or a USB reset the FT232H will scan its internal EEPROM and read the USB configuration descriptors stored there. The default values programmed into the external EEPROM for the FT232H used on the UM232H-B are shown in Table 8.1.

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 final test of the UM232H-B module.
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	UM232H-B	
Max Bus Power Current	90mA	
Power Source	Bus Powered	
Device Type	FT232H	
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	Disabled	Enables the high drive level on the UART and CBUS I/O pins.
Load VCP Driver	Enabled	Makes the device load the CVP driver interface for the device.
CBUS0	TriSt-PU	Tristate Input pulled up
CBUS1	TriSt-PU	Tristate Input pulled up
CBUS2	TriSt-PU	Tristate Input pulled up
CBUS3	TriSt-PU	Tristate Input pulled up
CBUS4	TriSt-PU	Tristate Input pulled up
CBUS5	TriSt-PU	Tristate Input pulled up
CBUS6	TriSt-PU	Tristate Input pulled up
CBUS7	TriSt-PU	Tristate Input pulled up
CBUS8	PWREN#	Power Enable, low when FT232H enumerates, switches 5V output power on when the device enumerates.
CBUS9	PWREN#	Power Enable, low when the FT232H enumerates, , switches the on board LED on when the device enumerates.

**Table 8.1 – Default EEPROM Configuration**

The on board EEPROM can be programmed over USB using the utility program FT\_PROG. FT\_PROG can be downloaded from the [www.ftdichip.com](http://www.ftdichip.com). 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](mailto:support1@ftdichip.com) (support1@ftdichip.com) for this service, also see [TN\\_100](#) and [TN\\_101](#).

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## Appendix A – References

### Document References

[FT232H Datasheet](#)

### Acronyms and Abbreviations

Terms	Description
EEPROM	Electrically Erasable Programmable Read-Only Memory
FIFO	First In First Out
I <sup>2</sup> C	Inter-Integrated Circuit
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

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## **Appendix B – List of Figures and Tables**

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## Appendix C – Revision History

Document Title: UM232H-B USB to Serial/Parallel Break-Out Module  
Document Reference No.: FT\_000721  
Clearance No.: FTDI# 320  
Product Page: <http://www.ftdichip.com/fastlane.htm>  
Document Feedback: [Send Feedback](#)

Revision	Changes	Date
1.0	Initial Release	2012-10-30
1.1	Removed details about complementary male header	2015-02-09
1.2	Added ordering information and support for Win 10	2016-04-11
1.3	Removed "Invert UART" option and revised title of Table 8.1	2016-08-24



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[UM232H-B-01](#) [UM232H-B-WE](#) [UM232H-B-NC](#) [UM232H-B](#)