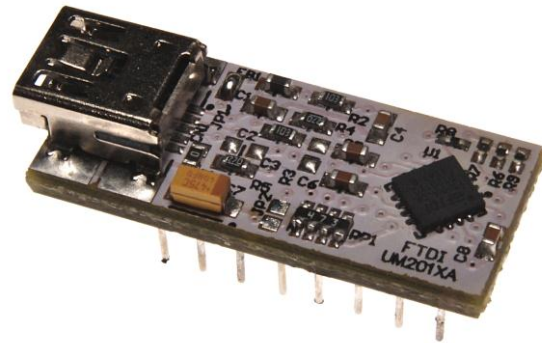


# Future Technology Devices International Ltd

## Datasheet

### UMFT201XA USB to I2C Development Module



*UMFT201XA is a USB to I<sup>2</sup>C DIP module with a 0.3" row pitch.*

## 1 Introduction

The UMFT201XA is a development module for FTDI's FT201XQ, one of the devices from FTDI's range of USB interface bridging integrated circuit devices. FT201X is a USB to I<sup>2</sup>C interface with a battery charger detection feature, which can allow batteries to be charged with a higher current from a dedicated charger port (without the FT201X being enumerated). In addition, asynchronous and synchronous bit bang interface modes are available. The internally generated clock (6MHz, 12MHz and 24MHz) can be brought out on one of the CBUS pins to be used to drive a microprocessor or external logic.

The UMFT201XA is a module which is designed to plug into a standard 0.3" wide 16 pin DIP socket. All components used, including the FT201XQ are Pb-free (RoHS compliant).

### 1.1 Features

The UMFT201XA utilises the FTDI FT201XQ; all the features of the FT201X can be utilized with the UMFT201XA. For a full list of the FT201X's features please see the FT201X datasheet which can be found by clicking [here](#). In addition to the features listed in the FT201X datasheet, the UMFT201XA has the following features:

- Small PCB assembly module designed to fit a standard 7.62mm (0.3") wide 16 pin DIP socket. Pins are on a 2.54mm (0.1") pitch.
- On board USB 'mini-B' socket allows module to be connected to a PC or USB host via a standard A to mini-B USB cable.
- Functionally configurable using solder links. The default solder links setup enables the module to function without peripheral wires or application board. Other configurations enable external power supply options and variation of logic reference levels.



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## 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 3.0 and greater
- 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 3.0 and greater
- Android

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

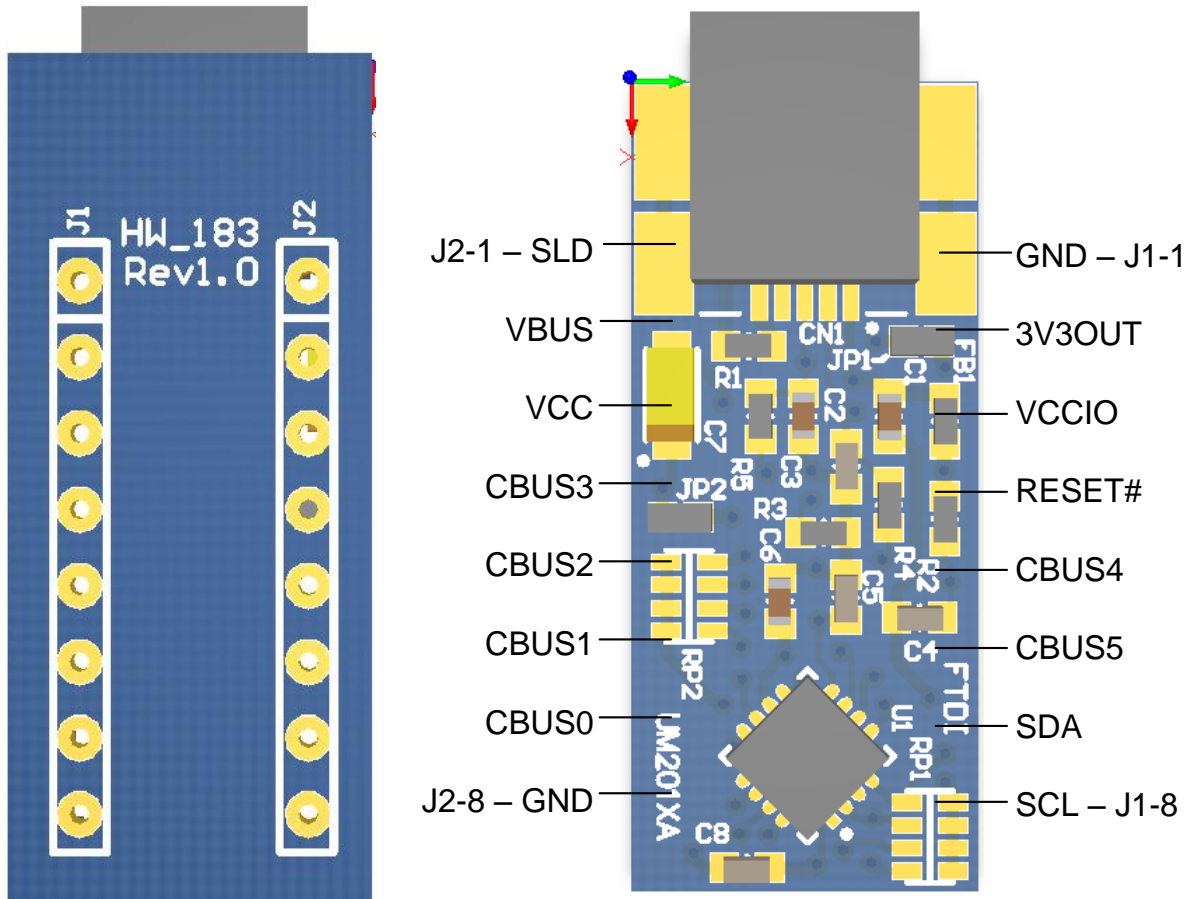
## 3 Ordering Information & TID

| Module Code                  | Utilised IC Code        | TID                      | Description   |
|------------------------------|-------------------------|--------------------------|---|
| <a href="#">UMFT201XA-01</a> | <a href="#">FT201XQ</a> | <a href="#">10006629</a> | <a href="#">USB to I<sup>2</sup>C evaluation module. Pin length: 5.6mm. Rev B silicon.</a>                            |
| <a href="#">UMFT201XA-02</a> | <a href="#">FT201XQ</a> | <a href="#">TBC</a>      | <a href="#">USB to I<sup>2</sup>C evaluation module. Pin length: 4.6mm. Rev C silicon. Available at a later date.</a> |
| <a href="#">UMFT220XA-01</a> | <a href="#">FT220XQ</a> | <a href="#">10006630</a> | <a href="#">USB to 4-bit SPI/FT1248 evaluation module.</a>  |
| <a href="#">UMFT221XA-01</a> | <a href="#">FT221XQ</a> | <a href="#">10006631</a> | <a href="#">USB to 8-bit SPI/FT1248 evaluation module.</a>  |
| <a href="#">UMFT230XA-01</a> | <a href="#">FT230XQ</a> | <a href="#">10006632</a> | <a href="#">USB to Basic UART evaluation module.</a>  |
| <a href="#">UMFT231XA-01</a> | <a href="#">FT231XQ</a> | <a href="#">10006633</a> | <a href="#">USB to Full-Handshake UART evaluation module.</a>   |
| <a href="#">UMFT240XA-01</a> | <a href="#">FT240XQ</a> | <a href="#">10006634</a> | <a href="#">USB to 8-bit 245 FIFO evaluation module.</a>  |

TID is the test identification code.

## 4 UMFT201XA Signals and Configurations

### 4.1 UMFT201XA Pin Out



**Figure 4.1 – Module Pin Out**

Figure 4 illustrates the signals available on the DIL pins. The LHS shows the pinout when the module is viewed from the bottom. The RHS shows what signals are available (on the pins below) when viewed from the top. The pins do not go completely through the PCB.

## 4.2 Signal Descriptions

| Pin No.       | Name   | Type         | Description  |
|---------------|--------|--------------|--|
| J1-1,<br>J2-8 | GND    | PWR          | Module Ground Supply Pins  |
| J1-2          | 3V3OUT | Power Output | 3.3V output from integrated LDO regulator. This pin is decoupled with a 100nF capacitor to ground on the PCB module. The prime purpose of this pin is to provide the 3.3V supply that can be used internally. For power supply configuration details see section 5.  |
| J1-3          | VCCIO  | Power Input  | +1.8V to +3.3V supply to the I <sup>2</sup> C Interface and CBUS I/O pins. For power supply configuration details see section 5.   |
| J1-4          | RESET# | Input        | FT201X active low reset line. Configured with an on board pull-up and recommended filter capacitor. When no power is applied to the USB bus, reset will be held low, this prevents current from flowing to the host or hub when in self-powered mode.  |
| J1-5          | CBUS4  | Input        | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS Signal Options, Table 4.2.  |
| J1-6          | CBUS5  | Output       | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS signal options, Table 4.2.  |
| J1-7          | SDA    | I/O          | I <sup>2</sup> C bi-directional data line with recommended 1K pull-up.   |
| J1-8          | SCL    | Input        | I <sup>2</sup> C clock input with recommended 1K pull-up.  |
| J2-1          | SLD    | GND          | USB Cable Shield. Connected to GND via a 0ohm resistor.  |
| J2-2          | VBUS   | Power Output | 5V Power output from the USB bus. For a low power USB bus powered design, up to 100mA can be sourced from the 5V supply and applied to the USB bus. A maximum of 500mA can be sourced from the USB bus in a high power USB bus powered design. Currents up to 1A can be sourced from a dedicated charger and applied to the USB bus. |
| J2-3          | VCC    | Power Input  | 5V power input for FT201X. For power supply configuration details see section 5.   |
| J2-4          | CBUS3  | I/O          | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS signal options, Table 4.2.  |
| J2-5          | CBUS2  | I/O          | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS signal options, Table 4.2.  |
| J2-6          | CBUS1  | I/O          | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS signal options, Table 4.2.  |
| J2-7          | CBUS0  | I/O          | Configurable CBUS I/O Pin. Function of this pin is configured in the IC's internal MTP ROM. See CBUS signal options, Table 4.2.  |

**Table 4.1 – Module PinOut Description**

### 4.3 CBUS Signals 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 9](#).

| CBUS Signal Option | Available On CBUS Pin      | Description  |
|--------------------|----------------------------|--|
| Tristate           | CBUS0 - CBUS5              | IO Pad is tri-stated   |
| DRIVE_1            | CBUS0 - CBUS5              | Output a constant 1  |
| DRIVE_0            | CBUS0 - CBUS5              | Output a constant 0  |
| PWREN#             | CBUS0 - CBUS5              | 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.<br><b>NOTE:</b> This function is driven by an open-drain to ground with no internal pull-up, this is specially designed to aid battery charging applications. UMFT201XE connects an on-board 47K pull-up on each CBUS and DBUS signal. |
| TXLED#             | CBUS0 - CBUS5              | Transmit data LED drive – pulses low when transmitting data via USB.   |
| RXLED#             | CBUS0 - CBUS5              | Receive data LED drive – pulses low when receiving data via USB.   |
| TX&RXLED#          | CBUS0 - CBUS5              | LED drive – pulses low when transmitting or receiving data via USB.  |
| SLEEP#             | CBUS0 - CBUS5              | 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.  |
| CLK24MHz           | CBUS0 - CBUS5              | 24 MHz Clock output.**   |
| CLK12MHz           | CBUS0 - CBUS5              | 12 MHz Clock output.**   |
| CLK6MHz            | CBUS0 - CBUS5              | 6 MHz Clock output.**  |
| GPIO               | CBUS0, CBUS1, CBUS2, CBUS3 | CBUS bit bang mode option. Allows up to 4 of the CBUS pins to be used as general purpose I/O. Configured individually for CBUS0, CBUS1, CBUS2 and CBUS3 in the internal MTP ROM. A separate application note, <a href="#">AN232R-01</a> , available from <a href="http://www.ftdichip.com">FTDI website (www.ftdichip.com)</a> describes in more detail how to use CBUS bit bang mode.   |
| BCD_Charger        | CBUS0 - CBUS5              | Battery charge Detect, indicates when the device is connected to a dedicated battery charger host. Active high output.   |
| BCD_Charger#       | CBUS0 - CBUS5              | Inverse of BCD Charger   |
| BitBang_WR#        | CBUS0 - CBUS5              | Synchronous and asynchronous bit bang mode WR# strobe output.  |
| BitBang_RD#        | CBUS0 - CBUS5              | Synchronous and asynchronous bit bang mode RD# strobe output.  |
| I2C_TXE            | CBUS0 - CBUS5              | Transmit buffer empty, used to indicate to I2C master device status of the FT201X transmit buffer  |
| I2C_RXF            | CBUS0 - CBUS5              | Receive buffer full, used to indicate to I2C master device status of FT201X receive buffer   |
| VBUS_Sense         | CBUS0 - CBUS5              | Input to detect when VBUS is present.  |
| Time_Stamp         | CBUS0 - CBUS5              | Toggle signal which changes state each time a USB SOF is received  |
| Keep_Awake#        | CBUS0 - CBUS5              | Active Low input, prevents the chip from going into suspend.   |

**Table 4.2 – CBUS Signal Options**

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

## 5 Module Configurations

### 5.1 Solder Link Configuration Options

| Solder Link No. | Setting | Status      | Description  |
|-----------------|---------|-------------|--|
| JP1             | Shorted | Default     | Connects internal 3.3V regulator to VCCIO. This restricts signal drive to only 3.3V level signals.   |
| JP1             | Opened  | Non-Default | Disconnects internal 3.3V regulator connection to VCCIO. This mode allows for the supply of 1.8V-3.3V power from an external power supply, thus allows the processing of signals with logic levels between 1.8V and 3.3V. VCCIO can be adjusted to match the interface requirements of external circuitry. |

**Table 5.1 – Solder Links JP1 Pin Description**

| Solder Link No. | Setting | Status      | Description  |
|-----------------|---------|-------------|--|
| JP2             | Shorted | Default     | Connects VBUS to VCC. This mode is known as “USB-Powered” mode.  |
| JP2             | Opened  | Non-Default | Disconnects VBUS to VCC. This allows the supply of power from an external power supply. This mode is known as “Self-Powered” mode. |

**Table 5.2 – Solder Links JP2 Pin Description**

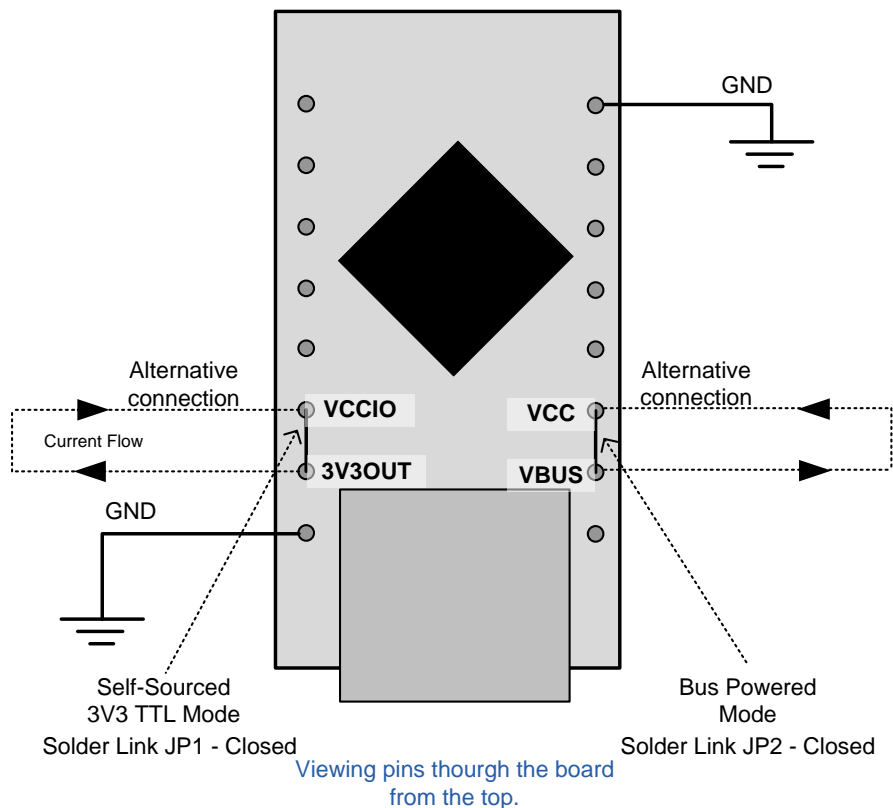
**Note:** There should never be more than one power output supplied to the same net. Failure to properly remove solder from JP1 and JP2 can cause a direct short between two different power supplies (when a self-powered set-up is applied and the USB bus is connected) resulting in damage to the UMFT201XA module and the target circuit.

### 5.2 Solder Link Modifications

The UMFT201XA has two solder links fixed to the top side of the PCB. These solder link can be adjusted by removing the solder linking the two PADS to produce an open or by placing a solder bridge to produce a short.

By default the UMFT201XA has both solder links shorting their pads. To allow for enhanced flexibility of this module remove both solder links and wire the header pins according to the power setup required.

### 5.3 BUS Powered Configuration



**Figure 5.1 – Bus Powered Configuration**

A bus powered configuration draws its power from the USB host/hub. The UMFT201XA is configured by default to be in bus powered mode.

Figure 5.1 illustrates the UMFT201XA module in a typical USB bus powered design configuration. By default, solder bridge connections link VCCIO to 3V3OUT, and VCC to VBUS. (Note that Figure 5.1 is for illustration only and that the pins do not actually go all the way through the PCB)

For a bus power configuration power is supplied from the USB VBUS:

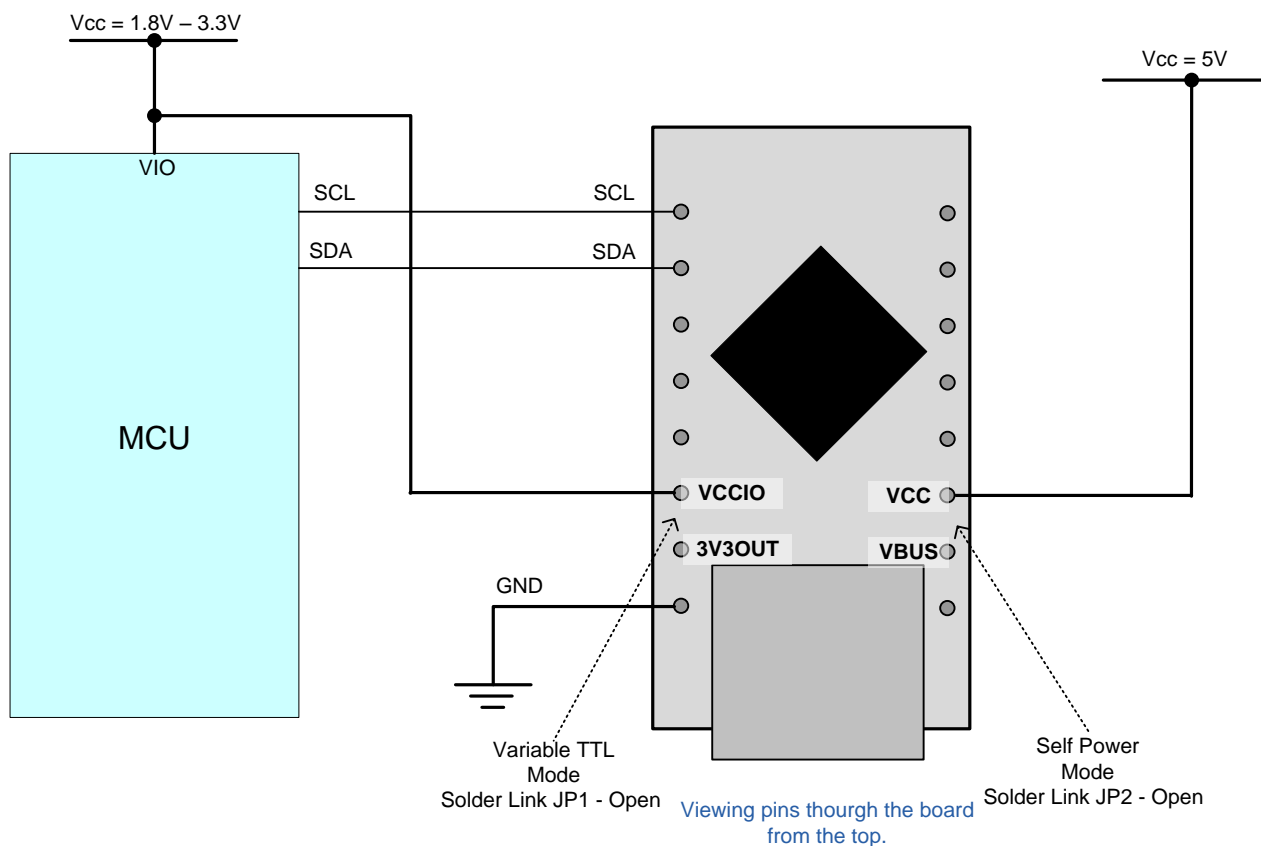
- +5V VBUS power is sourced from the USB bus and is connected to the FT201X power input (VCC)

- +3.3V power is sourced from the FT201X’s voltage regulator output and is connected to the FT201X IO port’s power input (VCCIO).

Interfacing the UMFT201XA module to a microcontroller (MCU), or other logic devices for bus powered configuration is done in exactly the same way as a self-powered configuration (see Section 5.3), except that it is possible for the MCU or external device to take its power supply from the USB bus (either the 5V from the USB pin, or 3.3V from the 3V3OUT pin).



## 5.4 Self Powered Configuration



**Figure 5.2 – Self-Powered Configuration**

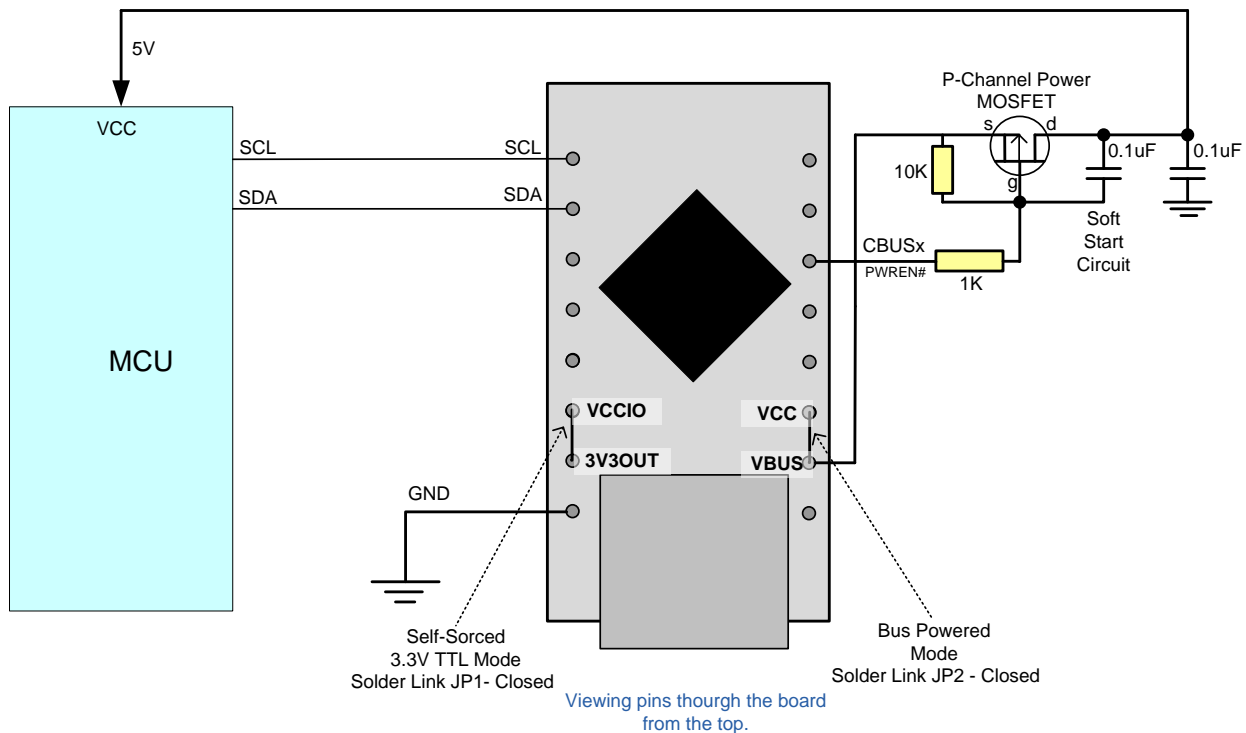
A self-powered configuration operates on the principle of drawing power from an external power supply, as opposed to drawing power from the USB host. In this configuration no current is drawn from the USB bus.

Figure 5.2 illustrates the UMFT201XA in a typical USB self-powered configuration. In this case the solder link connection of JP1 is removed, which allows 5V power to be supplied to the module VCC pins from an external source. VCCIO can be powered from 3V3OUT or the VCC of an external source. (Note that Figure 5.2 is for illustration only and that the pins do not actually go all the way through the PCB)

For a self-powered configuration, it is necessary to prevent current from flowing back to the USB data lines when the connected USB host or hub has powered down. To carry out this function the UMFT201XA uses an on-board voltage divider network connected to the USB power bus and RESET# pin. This operates on the principle that when no power is supplied to the VBUS line, the FT201X will automatically be held in reset by a weak pull-down, when power is applied the voltage divider will apply a weak 3.3V pull-up. Driving a level to the RESET# pin of the UMFT201XA will override the effect of this voltage divider. When the FT201X is in reset the USB DP signal pull-up resistor connected to the data lines is disconnected and no current can flow down the USB lines.

An example of interfacing the FT201X with a Microcontroller's I<sup>2</sup>C interface is also illustrated in Figure 5.2.

## 5.5 USB Bus Powered with Power Switching Configuration



**Figure 5.3 – Bus Powered with Power Switching Configuration**

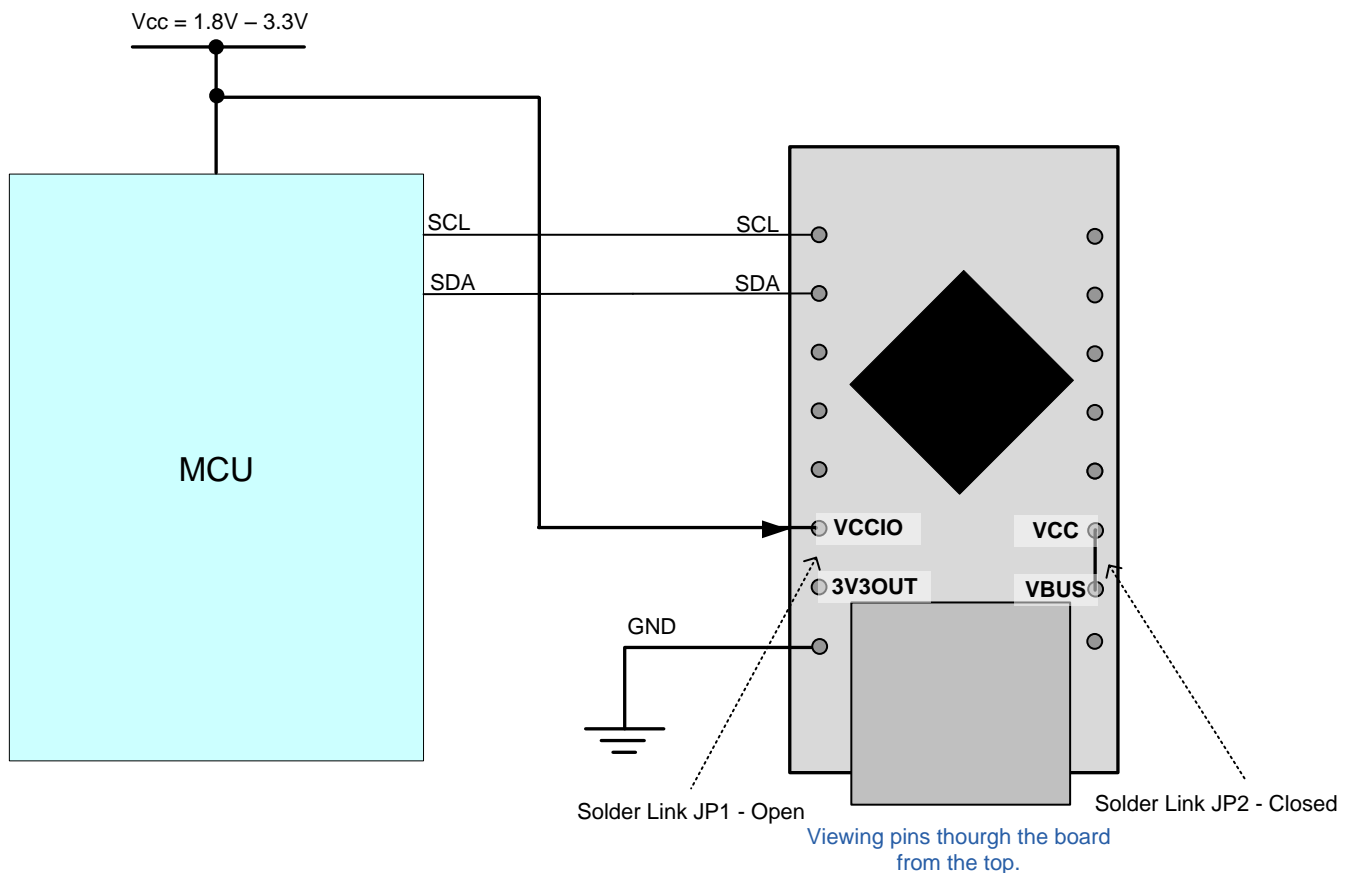
USB bus powered mode is introduced in Section 5.3. This section describes how to use bus-powered mode with a power switch.

USB bus powered circuits are required by USB compliance standards to consume less than 2.5mA (and less than 100mA when not enumerated and not suspended) when connected to a host or hub in USB suspend mode. The PWREN# CBUS function can be used to remove power from external circuitry whenever the FT201X is not enumerated. (Note: It is impossible to be in suspended mode when enumerated.) (Note that Figure 5.3 is for illustration only and that the pins do not actually go all the way through the PCB)

To implement a power switch using PWREN#, configure a P-Channel Power MOSFET to have a soft start by fitting a 10K pull-up, a 1K series resistor and a 100nF cap as shown in Figure 5.3.

Connecting the source of the P-Channel MOSFET to 3V3OUT instead of VBUS can allow external logic to source 3.3V power from the FT201X without breaking USB compliance. In this setup it is important that the VCCIO is not sourced from the drain of this MOSFET, this is because the power used to drive the gate of this transistor is sourced from VCCIO. VCCIO should be connected directly to 3V3OUT for this setup to function effectively. It is also important that the external logic must and IO core of the FT201X must not draw more than 50mA, this is because the current limit of the internal 3.3V regulator is 50mA.

## 5.6 Variable IO Voltage Supply



**Figure 5.4 – USB Bus Powered 3.3V Logic Drive**

The FT201X can process signals at CMOS/TTL logic levels in the range of 1.8V to 3.3V. This section describes how to utilise this feature.

Figure 5.4 shows a configuration where the FT201X is interfaced to a device with IOs operating in the range of 1.8V - 3.3V. The IO ports of this module need to be powered with a voltage level that is equal to the level of the signals it is processing. Since the FT201X's embedded voltage regulator only outputs 3V3 the IO ports will need to be powered from another power source when operating at voltage levels other than 3.3V.

By default, a short is present between 3V3OUT (embedded voltage regulator) and VCCIO (IO port's power input) by solder links JP1. If an external power supply is used to power the IO ports this solder links needs to be open. This can be done by removing the solder linking the two pads of the solder links.

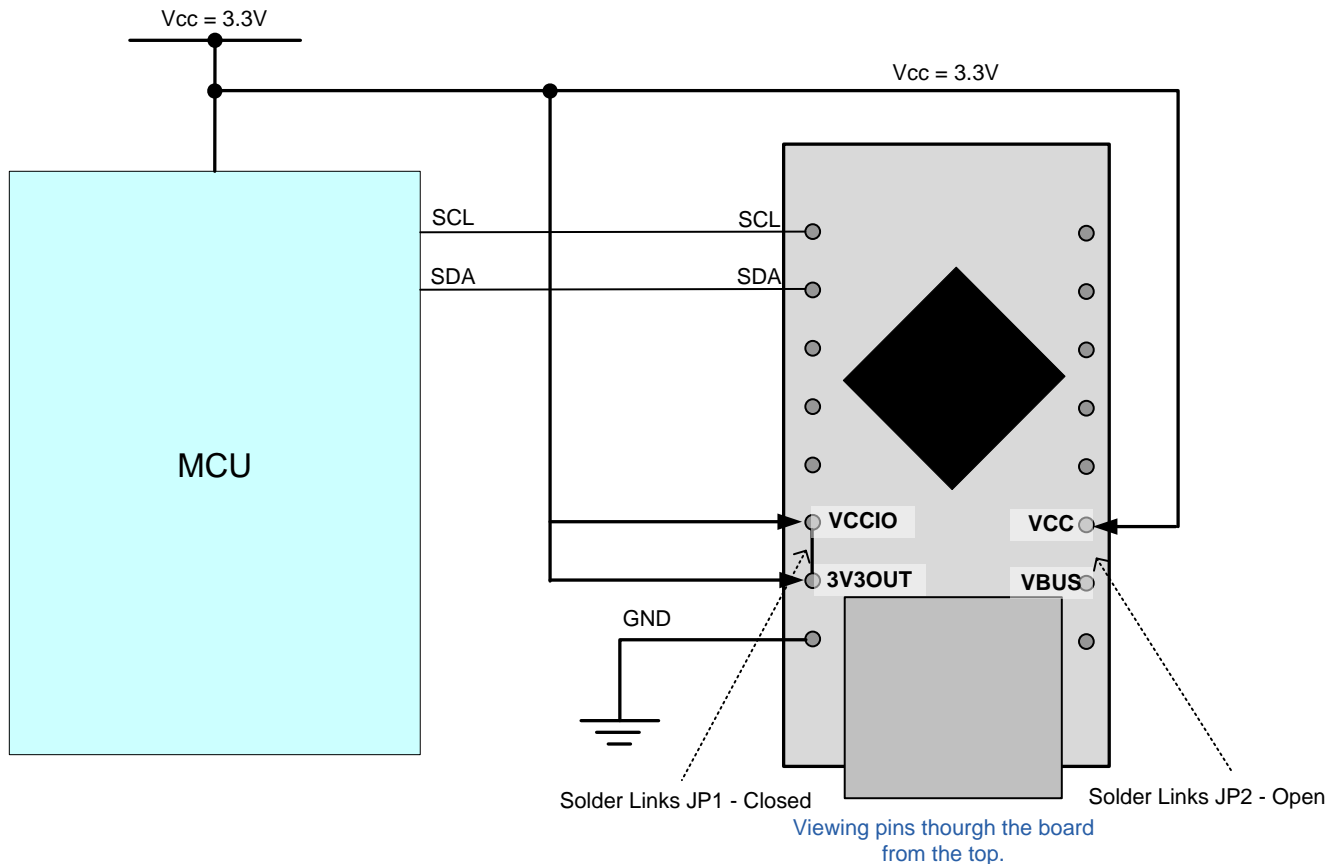
The configuration described in this section can be implemented in either bus-powered mode or self-powered mode.

Note 1: The CBUS and DBUS pins are 5V tolerant; however these signals cannot drive signals at 5V TTL/CMOS. VCCIO is not 5V tolerant; applying 5V to VCCIO will damage the chip.

Note 2: If power is applied to VCCIO and no power is applied to VCC all IOs will be at an unknown state, this however will not damage the chip. The FT201X also has protective circuitry to prevent the chip being damaged by a voltage discrepancy between VCCIO and the level of the signal being processed.

Note 3: When using VCCIO less than 3V3 on a chip from FTDI's X-chip range, it is recommended to use pull up resistors (47K) to VCCIO on the data lines, all of the UMFT2xxXA devices include an on-board pull-up for these lines.

## 5.7 3.3V Voltage Supply



**Figure 5.5 – USB Self Powered 3.3V Logic Drive**

The FT201X can be powered from a single 3.3V supply. This feature is an alternative to having the FT201X powered at 5V in standard self-powered configuration.

The 3.3V Self Powered configuration is illustrated in Figure 5.5. Note that the 3.3V input is connected to VCC, VCCIO and 3V3OUT.

(Note that Figure 5.5 is for illustration only and that the pins do not actually go all the way through the PCB)

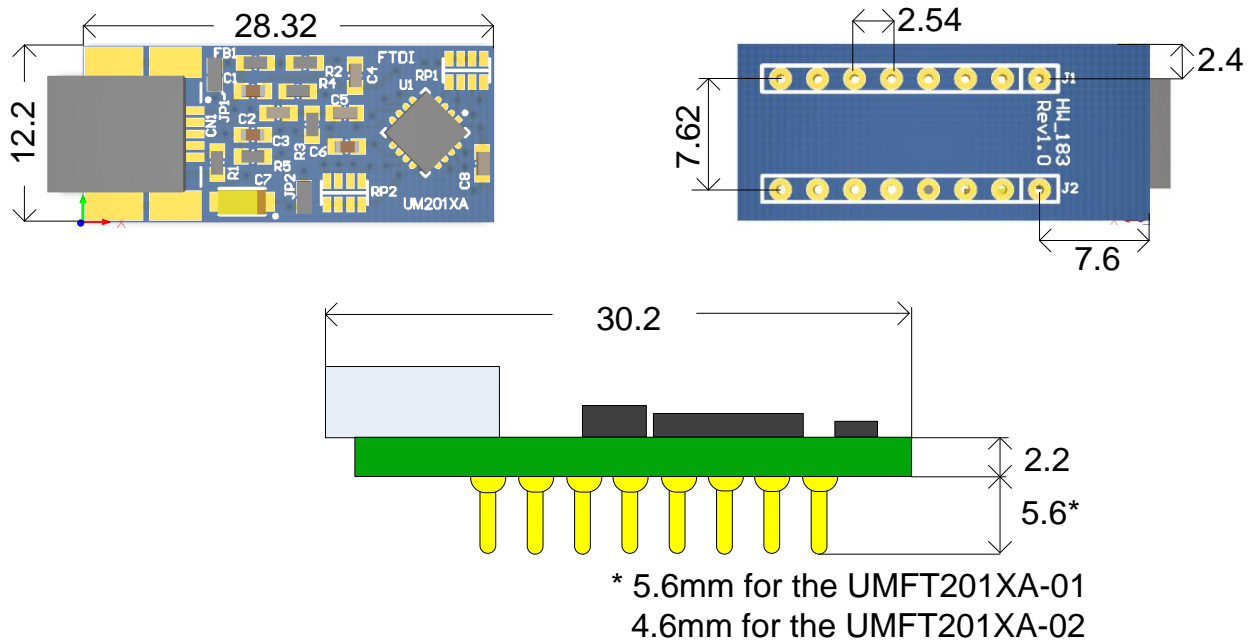
## 5.8 Configuring the MTP ROM

The FT201X contains an embedded MTP ROM. 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 MTP ROM/EEPROM programming utility FT\_PROG, please see the FT\_PROG User Guide [and the FT201X datasheet](#).

When programming the MTP ROM please note:

- i) One of the CBUS Pins can be configured as PWREN# in the internal MTP ROM. This can be used to switch the power supply to the external circuitry.
- ii) The Max Bus Power setting of the MTP ROM should specify the maximum current to be drawn from the USB host/hub when enumerated. For high-powered USB devices the current limit when enumerated is between 100mA and 500mA, for low-powered USB devices the current limit is 100mA.

## 6 Module Dimensions



**Figure 6.1 – UMFT201XA Module Dimensions**

All dimensions are given in millimetres.

The UMFT201XA module exclusively uses lead free components, and is fully compliant with European Union directive 2002/95/EC.

## 7 UMFT201XA Module Circuit Schematic

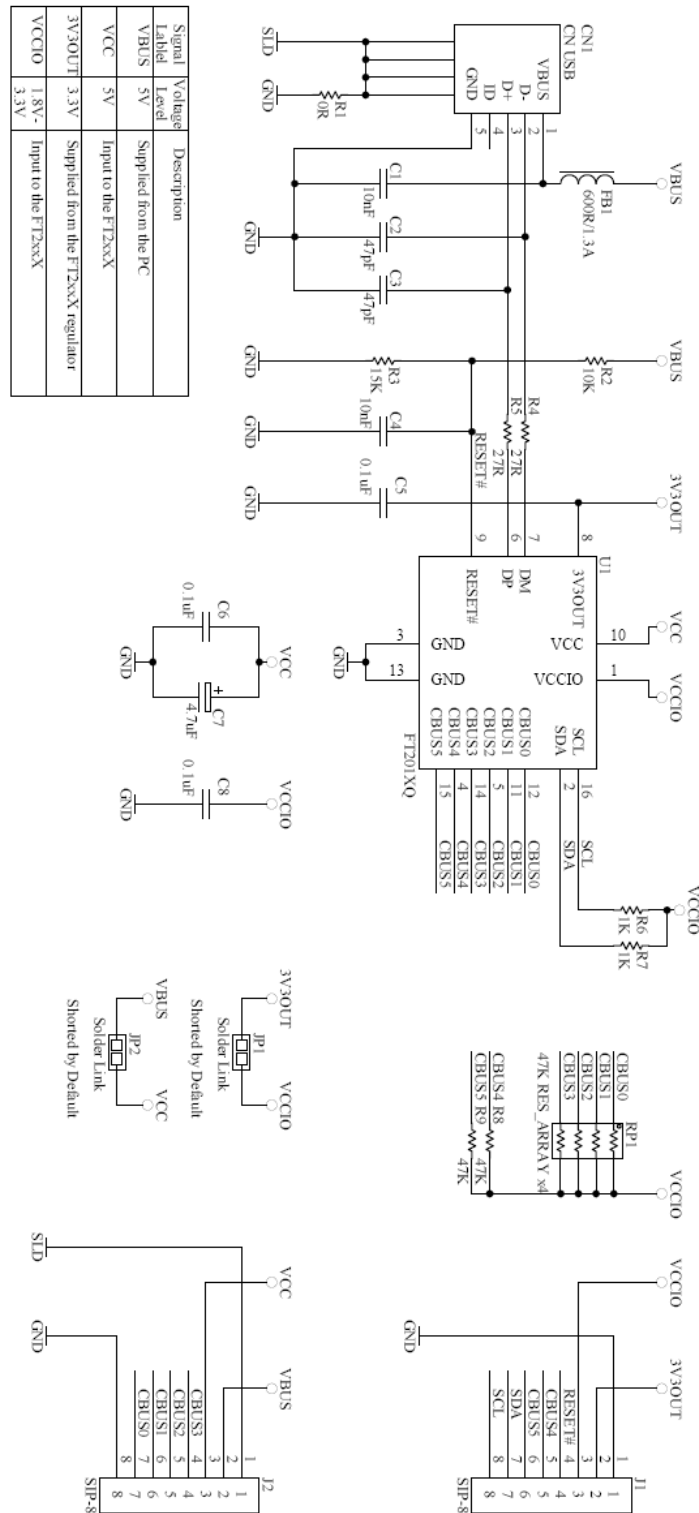


Figure 7.1 – Module Circuit Schematic

## 8 Internal MTP ROM Configuration

Following a power-on reset or a USB reset the FT201X will scan its internal MTP ROM and read the USB configuration descriptors stored there. The default values programmed into the internal MTP ROM in the FT201XQ used on the UMFT201XA are shown in Table 8.1.

| Parameter                         | Value       | Notes   |
|-----------------------------------|-------------|---|
| USB Vendor ID (VID)               | 0403h       | FTDI default VID (hex)  |
| USB Product UD (PID)              | 6015h       | FTDI default PID (hex)  |
| Binary Code Decimal (BCD)         | 1000h       | FTDI default BCD (hex)  |
| Serial Number Enabled?            | Yes         |   |
| Serial Number                     | See Note    | A unique serial number is generated and programmed into the MTP ROM during final test of the module.  |
| Pull down I/O Pins in USB Suspend | Disabled    | Enabling this option will make the device pull down on the I <sup>2</sup> C interface lines when the power is shut off (PWREN# is high).                      |
| Manufacturer Name                 | FTDI        |   |
| Product Description               | UMFT201XA   |   |
| Max Bus Power Current             | 90mA        |   |
| Power Source                      | Bus Powered |   |
| Device Type                       | FT201X      |   |
| USB Version                       | 0200        | Returns USB 2.0 device description to the host. Note: The device is a USB 2.0 Full Speed device (12Mb/s) as opposed to a USB 2.0 High Speed device (480Mb/s). |
| 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 I <sup>2</sup> C and CBUS I/O pins.   |
| Load VCP Driver                   | Enabled     | Makes the device load the CVP driver interface for the device.  |
| CBUS0                             | GPIO        |   |
| CBUS1                             | GPIO        |   |
| CBUS2                             | GPIO        |   |
| CBUS3                             | GPIO        |   |
| CBUS4                             | Tristate    |   |
| CBUS5                             | Tristate    |   |

**Table 8.1 – Default Internal MTP ROM Configuration**

The internal MTP ROM in the FT201X 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](#).

## 9 Contact Information

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## **Appendix B – Revision History**

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|--------------------|---|----------|
| <b>Version 1.0</b> | Initial Datasheet Created                                   | 09/02/12 |
| <b>Version 1.1</b> | Added links, referances to silicon revision, TID and logos. | 13/06/12 |