

# **FTDI Chip**

## **VM800B Datasheet**

### **Embedded Video Engine**

### **Basic module**



*General Purpose Multi Media Controller*

## **1 Introduction**

The VM800B is a development module for FTDI's FT800, which is used to develop and demonstrate the functionality of the FT800 Embedded Video Engine, EVE.

This module behaves as an SPI slave, and requires a SPI Master for proper micro-controller interfacing and system integration.

VM800B modules support 3 different LCD panel size options and are designed for industrial or commercial environments with precision fitted bezels in either black (-BK) or pearl (-PL).

- VM800B35A-xx is the 3.5" LCD
- VM800B43A-xx is the 4.3" LCD
- VM800B50A-xx is the 5.0" LCD

### **1.1 Features**

The VM800B utilises the FTDI FT800 Embedded Video Engine, EVE. Graphic, audio and touch features of the FT800 chip can be accessed with the VM800B. For a full list of the FT800's features please see the FT800 datasheet. The VM800B has the following features:

- Ready to use LCD module.
- Integrated with resistive touch screen LCD panel
- On board LCD backlight LED Driver
- On board audio power amplifier and micro speaker
- Flexible power supply. Powering the VM800B using either a 2.1mm power jack , SPI master connector or via USB Micro-B port
- 5 V tolerant buffers when used with a 5V SPI Master
- Precision fitted bezel in black(-BK) or pearl (-PL)

## 2 Ordering Information

**Note that the kits below require a 5V/1A power supply. It is NOT provided in the development kit, but is offered as an optional accessory with the following part types:**

| Part No.      | Description                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------|
| VM800B35A-BK  | VM800B module, supports 3.3/5v MCU Adapter Board, 3.5 inch TFT LCD display panel preinstalled, black bezel |
| VM800B43A-BK  | VM800B module, supports 3.3/5v MCU Adapter Board, 4.3 inch TFT LCD display panel preinstalled, black bezel |
| VM800B50A-BK  | VM800B module, supports 3.3/5v MCU Adapter Board, 5.0 inch TFT LCD display panel preinstalled, black bezel |
| VM800B35A-PL  | VM800B module, supports 3.3/5v MCU Adapter Board, 3.5 inch TFT LCD display panel preinstalled, pearl bezel |
| VM800B43A-PL  | VM800B module, supports 3.3/5v MCU Adapter Board, 4.3 inch TFT LCD display panel preinstalled, pearl bezel |
| VM800B50A-PL  | VM800B module, supports 3.3/5v MCU Adapter Board, 5.0 inch TFT LCD display panel preinstalled, pearl bezel |
| VA-PSU-UK1    | Accessory - UK Model 5V/1A USB Power Supply (Mfr # JX-B0520C-1-B)                                          |
| VA-PSU-US1    | Accessory - US Model 5V/1A USB Power Supply (Mfr # JX-B0520B-1-B)                                          |
| VA-PSU-EU1    | Accessory - EU Model 5V/1A USB Power Supply (Mfr # JX-B0520A-1-B)                                          |
| VA800A-SPI    | Accessory - High Speed Micro USB to SPI adapter for BASIC boards based on FT232H MPSSE design              |
| VA-FC-1M-BKW  | Accessory - Flat USB A to Micro B Cable 1M- Black and White                                                |
| VA-FC-1M-BLW  | Accessory - Flat USB A to Micro B Cable 1M- Blue and White                                                 |
| VA-FC-STYLUS1 | Accessory - Resistive Touch Screen Pen Stylus                                                              |

**Table 2-1 – Ordering information**

Note: 3.5" display resolution is 320 x 240 (QVGA).

4.3"/5.0" display resolution is 480 x 272 (WQVGA)

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### 3 Hardware Description

Please refer to section **3.2.2** for connector settings. Some VM800B jumpers must be set to work properly with your system.

#### 3.1 VM800B module



**Figure 3-1 – VM800B module profile 3.5" display version**



**Figure 3-2 - VM800B module profile 4.3" display version**



**Figure 3-3 - VM800B module profile 5" display version**

NOTE: Also available in pearl.

The VM800B module is intended for direct use into existing applications that require a display. This module is suitable for interfacing with an external microcontroller that has a SPI Master channel.

The VM800B module is available in multiple options: 3.5, 4.3 or 5.0 inch display options.

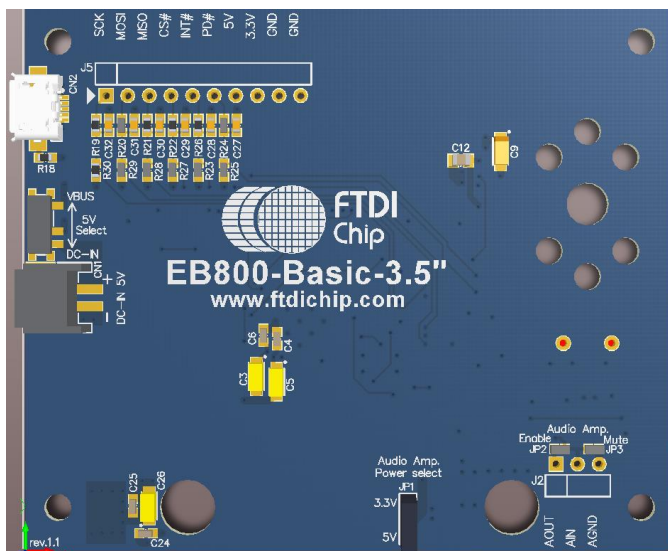
The main functions of the VM800B are as follows:

- Micro USB connector
- SPI connector
- 2-pin connector for power supply
- 3.3V regulator: Takes 5V input and outputs 3.3V for on-board circuits
- LCD touch screen panel
- 5V tolerant buffers between the SPI master interface and the Slave interface of the FT800
  - SPI timing requirements can be found in the FT800 datasheet. The on board level converter buffers introduce additional delay. The actual maximum SPI clock frequency depends on the host system timing and connection cable length to the VM800B PCB.
- 3 stage audio filter and power amplifier
- 8Ω speaker
- Audio line out option
- Precision fitted bezel

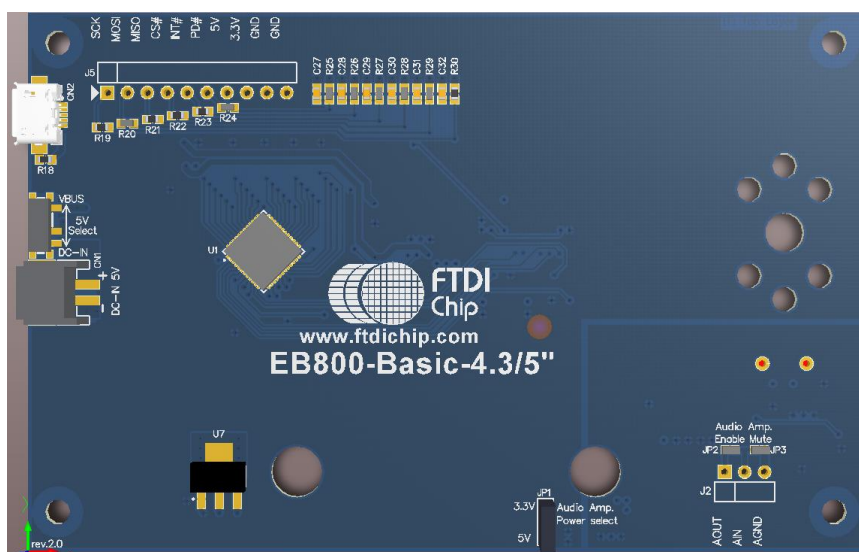
## 3.2 Physical Descriptions

### 3.2.1 PCB layout

The VM800B module PCB layouts are illustrated in Figure 3-4 and Figure 3-5. Boards are four-layer, approximately 1.6 mm thickness.



**Figure 3-4 - VM800B module PCB view, 3.5 inch display version**



**Figure 3-5 - VM800B module PCB view, 4.3 and 5 inch display version**

### 3.2.2 VM800B Connectors

Connectors and jumpers are described in the following sections.

- CN1- 2-pin power connector**

2 pin connector for 5V/3.3V power input to the board. Alternative to Micro USB connector.

| Pin No. | Name | Type | Description                |
|---------|------|------|----------------------------|
| 1       | VCC  | P    | 5V or 3.3V DC power supply |
| 2       | GND  | P    | Ground                     |

**Table 3-1 – CN1 Pinout**

- CN2- Micro USB Receptacle**

This receptacle is strictly for 5V input to power the board. There is no USB Functionality

| Pin No. | Name | Type | Description     |
|---------|------|------|-----------------|
| 1       | VBUS | P    | 5V power supply |
| 2       | NC   | NA   | No connection   |
| 3       | NC   | NA   | No connection   |
| 4       | NC   | NA   | No connection   |
| 5       | GND  | P    | Ground          |

**Table 3-2 – CN2 Pinout**

- **J2 - Selection between Lineout and loop back into the power amplifier.**

Selection between audio lineout and loop back into the power amplifier.

| Jumper position | Description                            |
|-----------------|----------------------------------------|
| Short pin 1-2   | Audio amp enabled (default)            |
| Short pin 2-3   | Audio amp mute, Audio lineout on pin 1 |

**Table 3-3 – J2 Pin Options**

- **J5- SPI Interface**

This is the interface where the SPI control and data signals are routed too. There are also power and ground pins on this interface.

| Pin No. | Name | Type | Description                                               |
|---------|------|------|-----------------------------------------------------------|
| 1       | SCLK | I    | SPI Clock input, 3.3V (5V tolerant)                       |
| 2       | MOSI | I    | Master Out Slave in, 3.3V (5V tolerant)                   |
| 3       | MISO | O    | Master In Slave out, 3.3V                                 |
| 4       | CS#  | I    | Chip select , active low, 3.3V (5V tolerant)              |
| 5       | INT# | O    | Interrupt output active low, 3.3V                         |
| 6       | PD#  | I    | Power down control input, active low , 3.3V (5V tolerant) |
| 7       | 5V   | P    | 5V power supply                                           |
| 8       | 3.3V | P    | 3.3V power supply                                         |
| 9       | GND  | P    | Ground                                                    |
| 10      | GND  | P    | Ground                                                    |

**Table 3-4 – J5 Pinout**

- **JP1- Audio Amplifier Power Select**

This jumper provides the option to select the power supply voltage for the on-board power amplifier.

| Jumper position | Description             |
|-----------------|-------------------------|
| Short pin 1-2   | 3.3V selected (default) |
| Short pin 2-3   | 5V selected             |

**Table 3-5 – JP1 Pin options**

\*This needs to be configured before audio can be heard. Default is 3.3V. Select 5V if wants to increase the maximum volume for the speaker.

- **JP2 – On board amplifier enable**

Solder connection not fitted by default.

- **JP3 - On board amplifier mute**

Solder connection not fitted by default.

- **SW1 – Power source select**

| Jumper position | Description                    |
|-----------------|--------------------------------|
| Short pin 1-2   | Board power from CN1           |
| Short pin 2-3   | Board power from CN2 (default) |

**Table 3-6 – SW1 jumper options**

## 4 Board Schematics

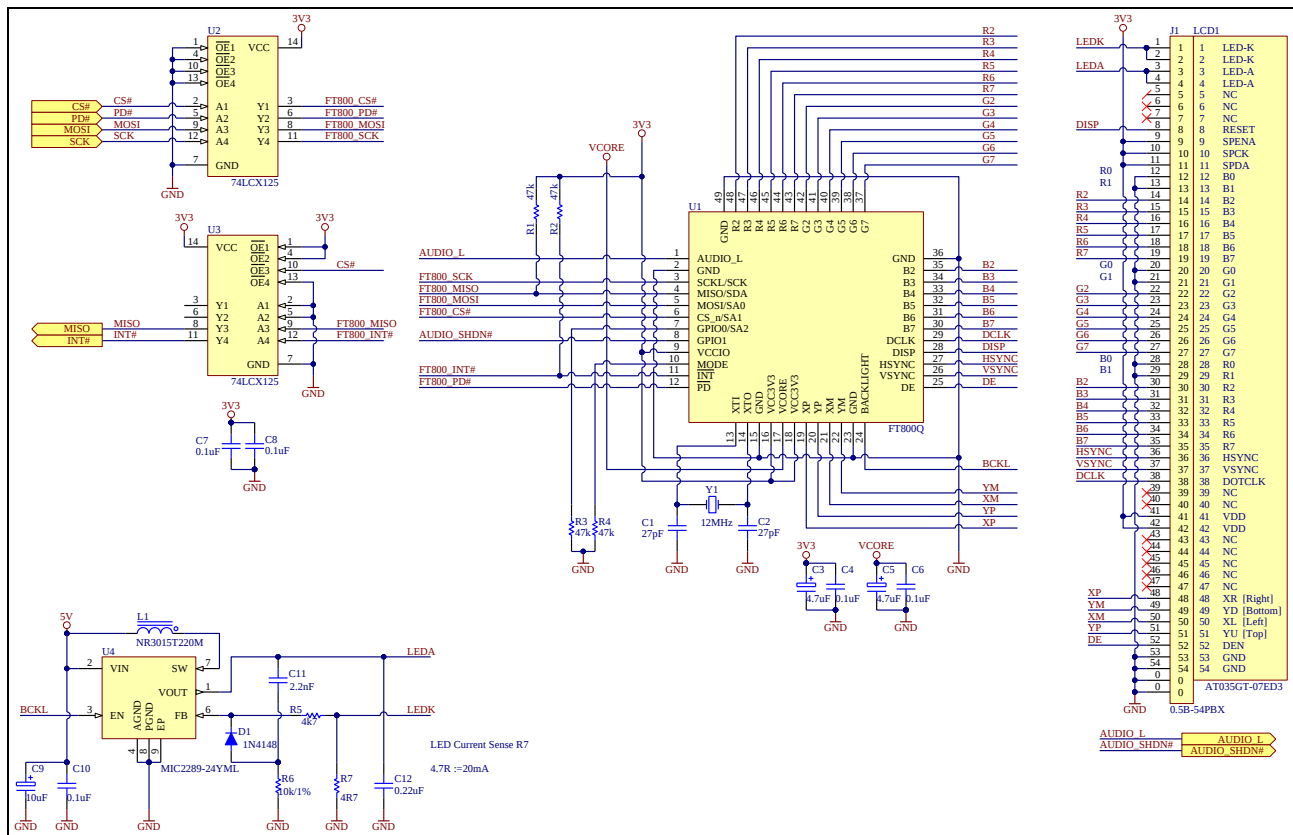
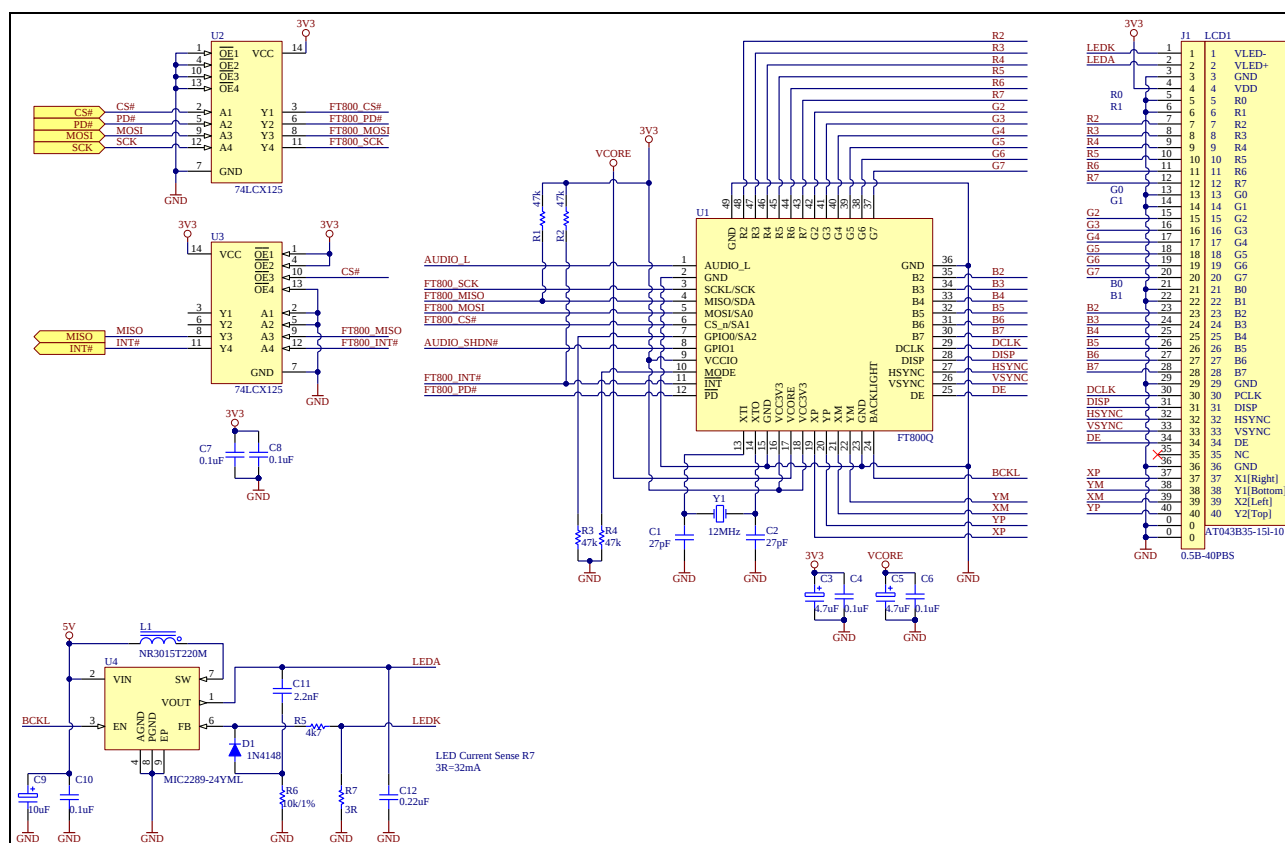
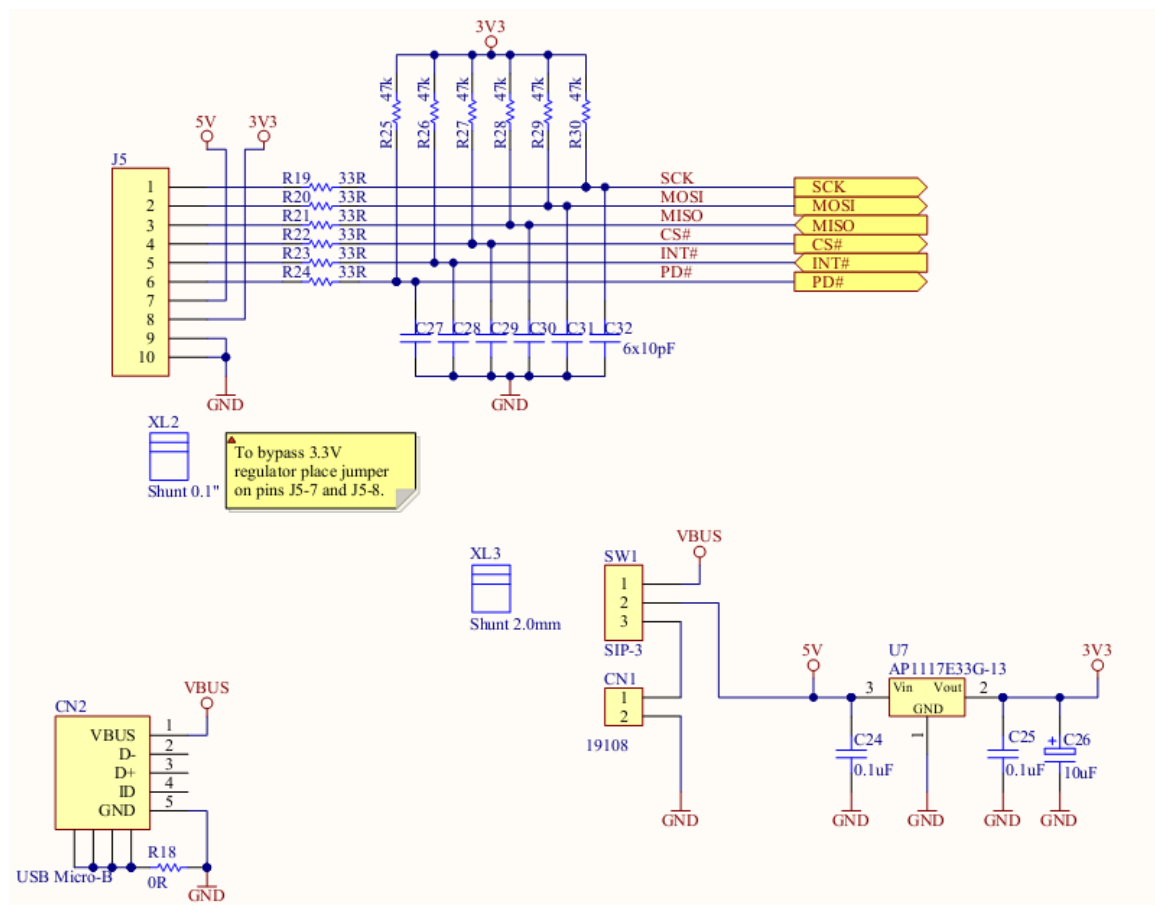


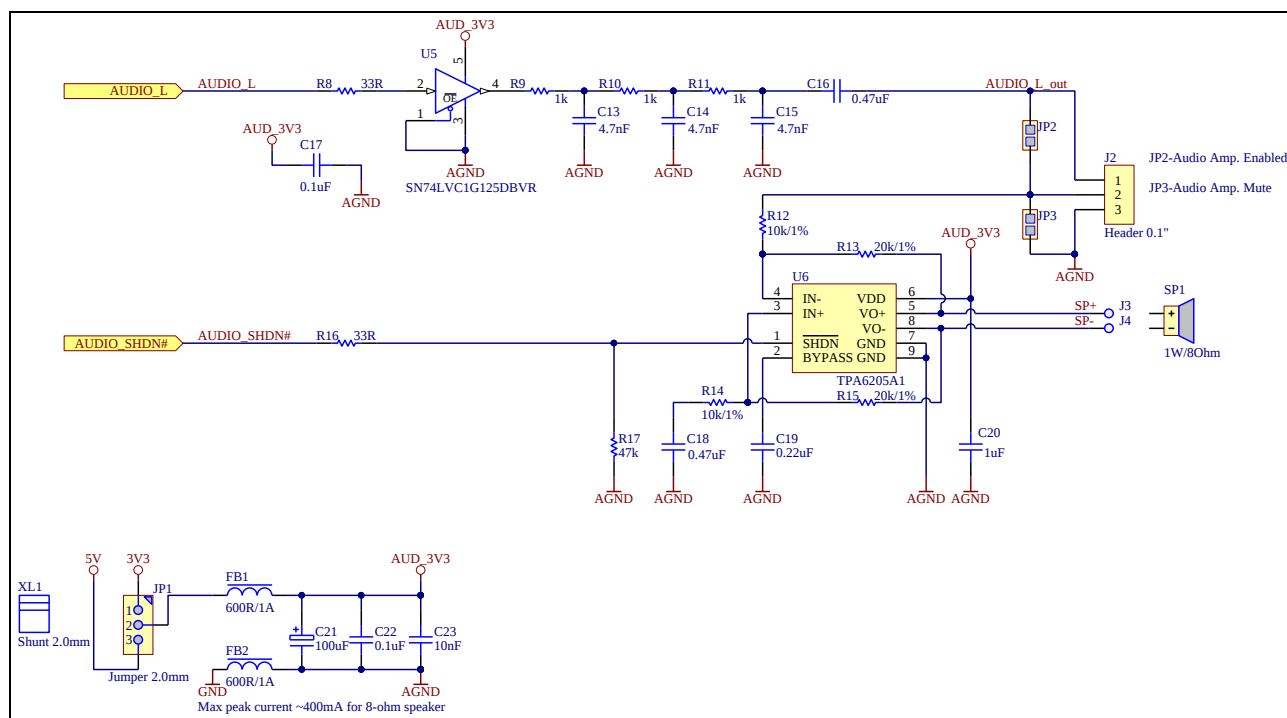
Figure 4-1 - VM800B35A (3.5" Version)



**Figure 4-2 - VM800B43A/VM800B50A (4.3"/5.0" Version)**



**Figure 4-3 – VM800B SPI Interface and IO**



**Figure 4-4 – VM800B Audio**

## 5 Hardware Setup Guide

### 5.1 Power Configuration

There are 5 methods of powering the VM800B board.

- 1) USB Power(5V) - Connect USB power through micro-USB cable to CN2
- 2) DC IN(5V) - Connect 5V to CN1
- 3) DC IN(3.3V) - Connect 3.3V to CN1 and short J5 pin 7 and 8
- 4) J5 Power(5V) - Connect 5V to J5 pin 7
- 5) \*J5 Power(3.3V) - Connect 3.3V to J5 pin 7 and 8

\*Warning: Applying 5 V accidentally in this mode may cause permanent damage to the VM800B module.

The following table summarise how to power the VM800B board using the various methods.

| Power Method    | CN2 | CN1  | J5 Pin 7 | J5 Pin 8 | SW1           |
|-----------------|-----|------|----------|----------|---------------|
| USB Power       | 5V  | N/C  | N/C      | N/C      | Short pin 2-3 |
| DC IN(5V)       | N/C | 5V   | N/C      | N/C      | Short pin 1-2 |
| DC IN(3.3V)     | N/C | 3.3V | SHORT    |          | Short pin 1-2 |
| J5 Power(5V)    | N/C | N/C  | 5V       | N/C      | Any Position  |
| J5 Power (3.3V) | N/C | N/C  | 3.3V     |          | Any Position  |

**Table 5-1 Board power configuration**

### 5.2 MPSSE Setup

To provide a quick start with the VM800B development board, Windows based sample projects including source code are provided for users to get a touch and feel experience with the VM800B. An overview of the process is provided in the following paragraphs with more details in [AN\\_245\\_VM800CB\\_SampleAPP\\_PC\\_Introduction](#)

MPSSE is a "multi purpose synchronous serial engine" interface available in some FTDI devices (e.g. FT2232D, FT2232H, FT2232HL and FT4232H). This engine allows users to bridge from a USB port on a PC to an I<sup>2</sup>C or SPI interface. Sample code is available for driving the FT800 over this interface with a FT232H device.

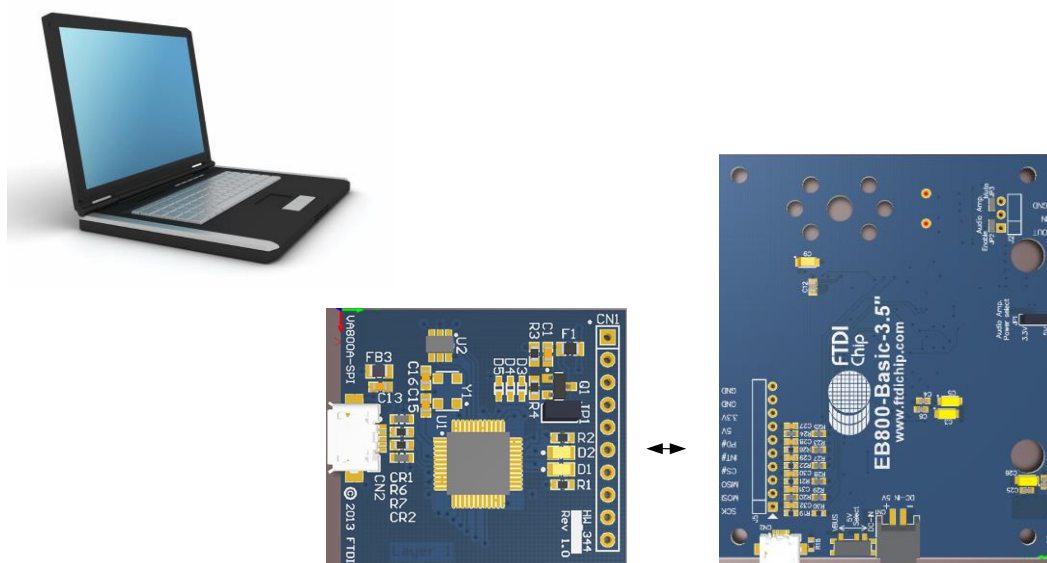
VA800A-SPI is a MPSSE module accessory which can connect to the VM800B modules directly. Detailed information of VA800A-SPI can be found at:

<http://www.ftdichip.com/Products/modules/VA800A-SPI.html>

FTDI also provide a multipurpose MPSSE cable assembly C232HM-EDHSL-0(5V) or C232HM-DDHSL-0(3.3V) for rapid setup. More information on the cable may be found at:

[http://www.ftdichip.com/Support/Documents/DataSheets/Cables/DS\\_C232HM\\_MPSSE\\_CABLE.pdf](http://www.ftdichip.com/Support/Documents/DataSheets/Cables/DS_C232HM_MPSSE_CABLE.pdf).

In this section it is assumed the VA800A-SPI is used. VA800A-SPI supplies 5 V for VM800B modules. If the VM800B is connected to an SPI interface with a 3.3 V power supply, refer to table 5-1 for the board power configuration. Note, improper power supply and/or IO voltage connection may damage the VM800B module.



**Figure 5-1 – VM800B connects to PC through VA800A-SPI accessory.**

### Hardware Setup

- Connect the VA800A-SPI to the VM800B module in the correct orientation (with J5-pin1 of VM800B board connected to CN1-pin1 of VA800A-SPI board).
- Connect a USB cable (suggest FTDI accessory **VA-FC-1M-BKW** or **VA-FC-1M-BLW**) from the VA800A-SPI to the PC USB host port or self-powered hub port.
- The VA800A-SPI will supply power to the VM800B after the MPSSE driver is properly loaded and the USB host completes USB device configuration.

NOTE: If using the C232HM-EDHSL-0(5V) MPSSE cable then the connection is as:

| J5 Pin number | J5 Signal | MPSSE pin number | MPSSE Signal | MPSSE Cable Lead Colour |
|---------------|-----------|------------------|--------------|-------------------------|
| 1             | SCK       | 2                | SK           | ORANGE                  |
| 2             | MOSI      | 3                | DO           | YELLOW                  |
| 3             | MISO      | 4                | DI           | GREEN                   |
| 4             | CS#       | 5                | CS           | BROWN                   |
| 5             | INT#      | 7                | GPIOL1       | PURPLE                  |
| 6             | PD#       | 9                | GPIOL3       | BLUE                    |
| 7             | 5V        | 1                | VCC          | RED                     |
| 8             | 3.3V      | -                | -            | -                       |
| 9             | GND       | 10               | GND          | Black                   |
| 10            | GND       | -                | -            | -                       |

**Table 5-2 – MPSSE cable (C232HM-EDHSL-0) connection**

**Software Setup**

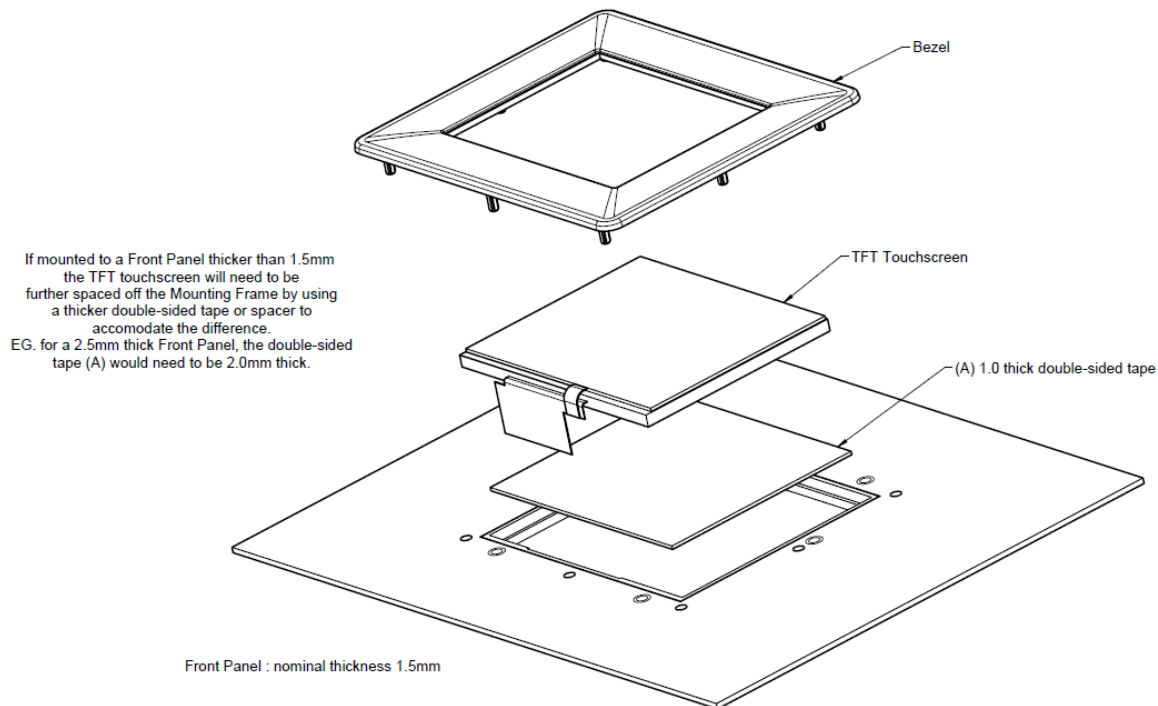
- The following software setup steps apply to both the VA800A-SPI and MPSSE cable assembly.
- Download the MPSSE software. MPSSE cable and driver information can be found at <http://www.ftdichip.com/Products/Cables/USBMPSSE.htm>.
- Launch the demo application based on MPSSE from the PC

The demo application notes can be found at following link:  
[AN\\_245\\_VM800CB\\_SampleAPP\\_PC\\_Introduction](#)

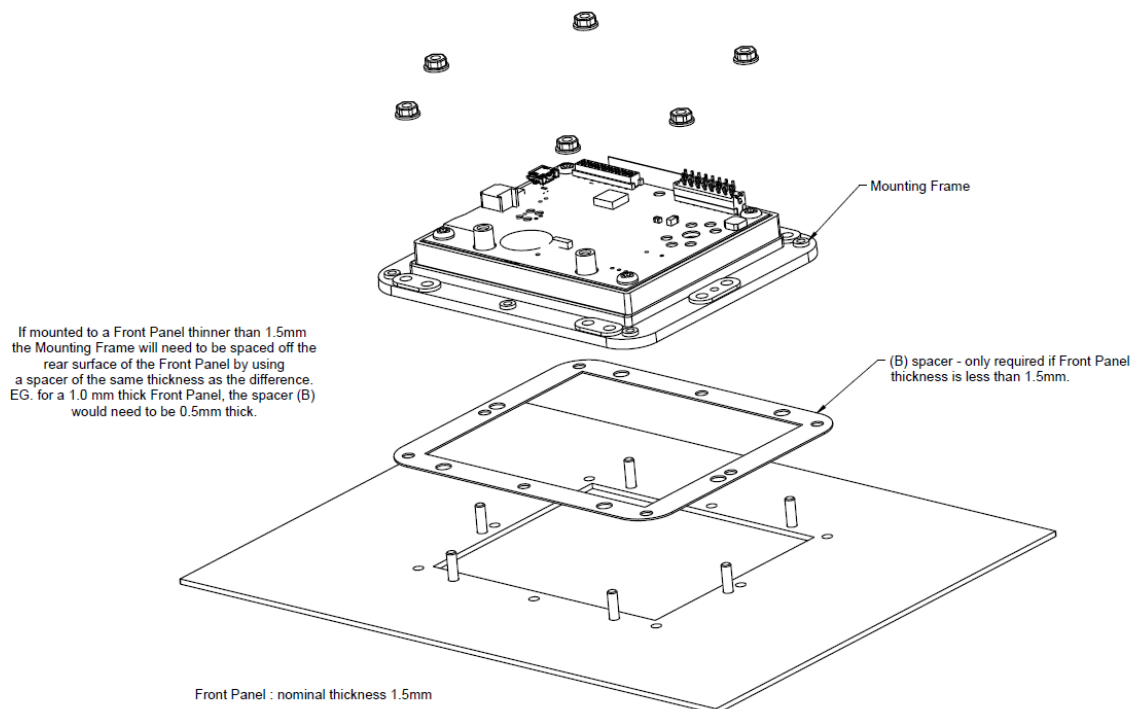
**5.3 Arduino® Setup**

Sample code and demo applications are provided to users who want to connect the VM800B to a MCU. FTDI provides sample source code, sample application notes and a ready to run demo based on the Arduino® platform. Detailed information can be found at:  
<http://testwebsite/Products/modules/VM800B.html>

## 6 Assembling the Bezel and Panel Mounting



**Figure 6-1 - VM800B Panel Mount (Front view)**

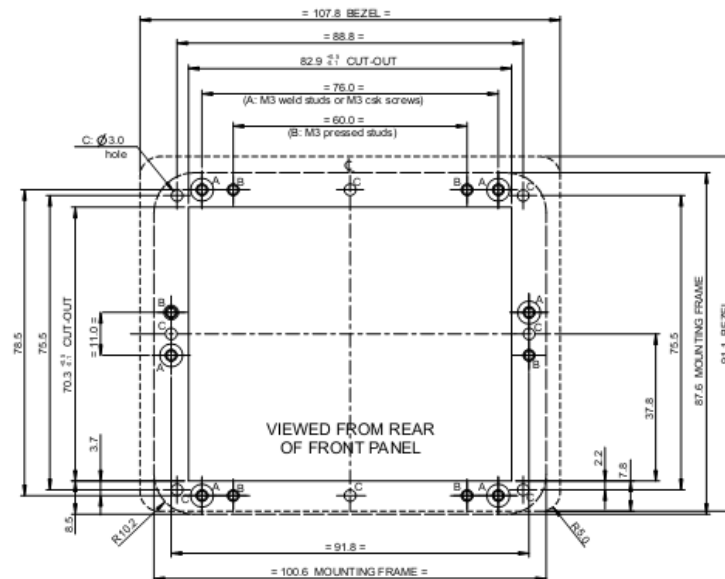


**Figure 6-2 - VM800B Panel Mount (Rear view)**

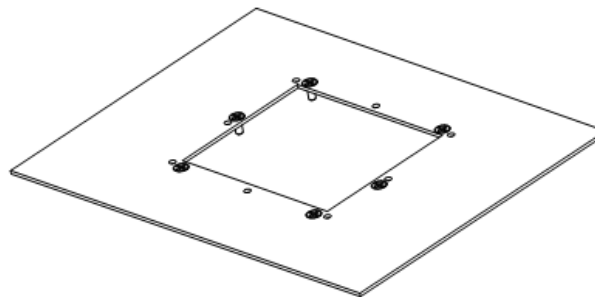
## 6.1 3.5" Dimensions

The TFT Touchscreen Mounting Frame is designed to mount to a 1.5mm thick Front Panel. If mounted to a Front Panel thicker than 1.5mm, longer mounting studs or screws should be used to accommodate the difference.

The Mounting Frame has been designed to work with projection welded studs or csk screws 'A' or press studs 'B'. For a 1.5mm thick Front Panel use -  
M3 x 8 long weld studs,  
M3 x 10 long countersunk screws or  
M3 x 10 long pressed studs



When using countersunk screws to assemble the Mounting Frame, the screws should be located at the 'A' position



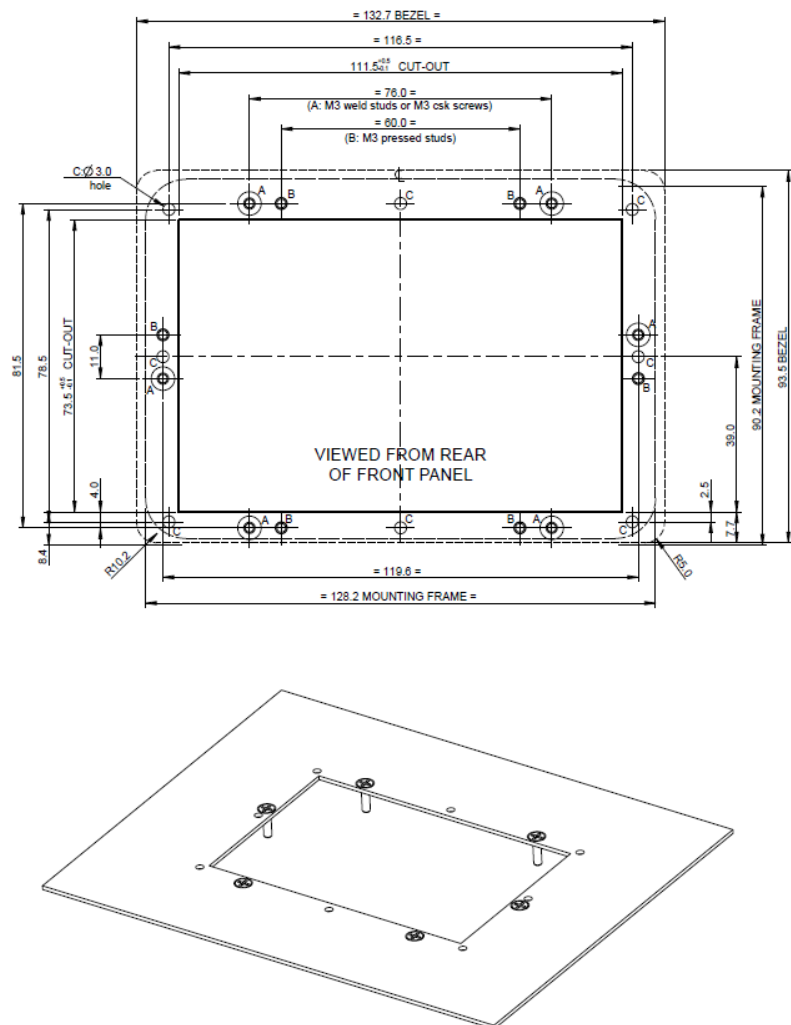
**Figure 6-3 - VM800B 3.5" panel mount dimensions**

## 6.2 4.3" Dimensions

The TFT Touchscreen Mounting Frame is designed to mount to a 1.5mm thick Front Panel. If mounted to a Front Panel thicker than 1.5mm, longer mounting studs or screws should be used to accommodate the difference.

The Mounting Frame has been designed to work with projection welded studs or csk screws 'A' or press studs 'B'. For a 1.5mm thick Front Panel use -  
M3 x 8 long weld studs,  
M3 x 10 long countersunk screws or  
M3 x 10 long pressed studs

When using countersunk screws to assemble the Mounting Frame, the screws should be located at the 'A' position



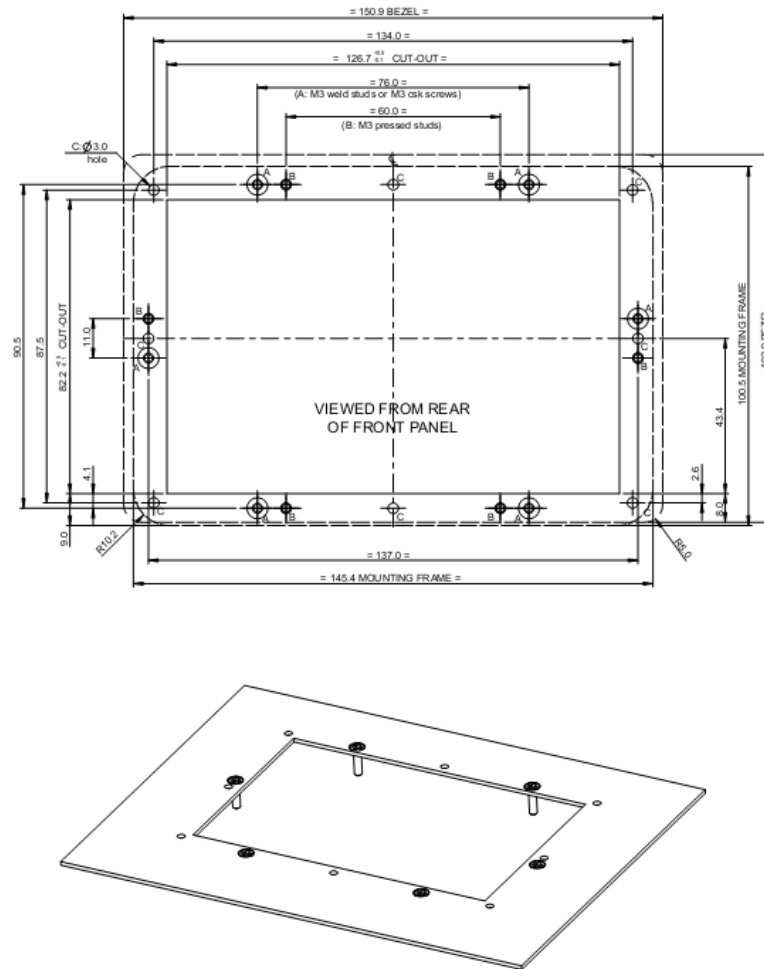
**Figure 6-4 - VM800B 4.3" panel mount dimensions**

## 6.3 5.0" Dimensions

The TFT Touchscreen Mounting Frame is designed to mount to a 1.5mm thick Front Panel. If mounted to a Front Panel thicker than 1.5mm, longer mounting studs or screws should be used to accommodate the difference.

The Mounting Frame has been designed to work with projection welded studs or csk screws 'A' or press studs 'B'. For a 1.5mm thick Front Panel use -  
M3 x 8 long weld studs,  
M3 x 10 long countersunk screws or  
M3 x 10 long pressed studs

When using countersunk screws to assemble the Mounting Frame, the screws should be located at the 'A' position



**Figure 6-5 - VM800B 5.0" panel mount dimensions**

## 7 Specifications

### 7.1 Optical Specification

| Item           |       | Symbol | Condition | Min   | Typ.  | Max.  | Unit   |
|----------------|-------|--------|-----------|-------|-------|-------|--------|
| View Angles    |       | θT     | CR≥10     | 30    | 40    |       | Degree |
|                |       | θB     |           | 50    | 60    |       |        |
|                |       | θL     |           | 50    | 60    |       |        |
|                |       | θR     |           | 50    | 60    |       |        |
| Contrast Ratio |       | CR     | θ=0°      |       | 350   |       |        |
| Response Time  |       | Ton    | 25℃       |       | 25    | 40    | ms     |
|                |       | Toff   |           |       |       |       |        |
| Chromaticity   | White | x      |           | 0.260 | 0.310 | 0.360 |        |
|                |       | y      |           | 0.283 | 0.333 | 0.383 |        |
|                | RED   | x      |           | 0.574 | 0.624 | 0.674 |        |
|                |       | y      |           | 0.318 | 0.368 | 0.418 |        |
|                | GREEN | x      |           | 0.300 | 0.350 | 0.400 |        |
|                |       | y      |           | 0.500 | 0.550 | 0.600 |        |
|                | BLUE  | x      |           | 0.093 | 0.143 | 0.193 |        |
|                |       | y      |           | 0.069 | 0.119 | 0.169 |        |
| Uniformity     |       | U      |           | 75    | 80    |       | %      |
| NTSC           |       |        |           |       | 50    |       | %      |
| Luminance      |       | L      |           |       | 500   |       | cd/m2  |

**Table 7-1 - 3.5" TFT Optical specification**

| Item                    | Symbol      | Condition                          | Min.  | Typ. | Max. | Unit              |
|-------------------------|-------------|------------------------------------|-------|------|------|-------------------|
| Brightness              | Bp          | $\theta=0^\circ$                   | 450   | 500  | -    | Cd/m <sup>2</sup> |
| Uniformity              | $\Delta Bp$ | $\Phi=0^\circ$                     | 70    | 80   | -    | %                 |
| Viewing Angle           | 3:00        | $Cr \geq 10$                       | -     | 65   | -    | Deg               |
|                         | 6:00        |                                    | -     | 55   | -    |                   |
|                         | 9:00        |                                    | -     | 65   | -    |                   |
|                         | 12:00       |                                    | -     | 45   | -    |                   |
| Contrast Ratio          | Cr          | $\theta=0^\circ$<br>$\Phi=0^\circ$ | 200   | 250  | -    | -                 |
| Response Time           | $T_r$       |                                    | -     | 16   | -    | ms                |
|                         | $T_f$       |                                    | -     | 12   | -    | ms                |
| Color of CIE Coordinate | W           | x                                  | 0.23  | 0.28 | 0.33 | -                 |
|                         |             | y                                  | 0.28  | 0.33 | 0.38 | -                 |
|                         | R           | x                                  | 0.46- | 0.51 | 0.56 | -                 |
|                         |             | y                                  | 0.29  | 0.34 | 0.39 | -                 |
|                         | G           | x                                  | 0.26  | 0.31 | 0.36 | -                 |
|                         |             | y                                  | 0.51  | 0.56 | 0.61 | -                 |
|                         | B           | x                                  | 0.10  | 0.15 | 0.20 | -                 |
|                         |             | y                                  | 0.09  | 0.14 | 0.19 | -                 |
| NTSC Ratio              | S           |                                    | 45    | 60   | -    | %                 |

**Table 7-2 - 4.3" TFT Optical Specification**

| Item                            | Symbol     | Condition                       | Values |      |      | Unit              |
|---------------------------------|------------|---------------------------------|--------|------|------|-------------------|
|                                 |            |                                 | Min.   | Typ. | Max. |                   |
| Viewing angle<br>(CR $\geq$ 10) | $\theta_L$ | $\Phi=180^\circ$ (9 o'clock)    | 60     | 70   | -    | degree            |
|                                 | $\theta_R$ | $\Phi=0^\circ$ (3 o'clock)      | 60     | 70   | -    |                   |
|                                 | $\theta_T$ | $\Phi=90^\circ$ (12 o'clock)    | 40     | 50   | -    |                   |
|                                 | $\theta_B$ | $\Phi=270^\circ$ (6 o'clock)    | 60     | 70   | -    |                   |
| Response time                   | $T_{ON}$   | Normal<br>$\theta=\Phi=0^\circ$ | -      | 10   | 20   | msec              |
|                                 | $T_{OFF}$  |                                 | -      | 15   | 30   | msec              |
| Contrast ratio                  | CR         |                                 | 400    | 500  | -    | -                 |
| Color chromaticity              | $W_x$      |                                 | 0.26   | 0.31 | 0.36 | -                 |
|                                 | $W_y$      |                                 | 0.28   | 0.33 | 0.38 | -                 |
| Luminance                       | L          |                                 | 240    | 300  | -    | cd/m <sup>2</sup> |
| Luminance uniformity            | $Y_U$      |                                 | 70     | 75   | -    | %                 |

**Table 7-3 - 5" TFT Optical Specification**

## 8 Contact Information

### Head Office – Glasgow, UK

Unit 1, 2 Seaward Place, Centurion Business Park  
Glasgow G41 1HH  
United Kingdom  
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## Appendix A - References

For module documentations, please refer to URL below:

<http://testwebsite/Products/modules/VM800B.html>

FT800 datasheet: [DS\\_FT800\\_Embedded\\_Video\\_Engine](#)

FT800 software programming guide: [FT800\\_Programmer\\_Guide](#)

FT800 sample application notes:

[AN\\_245\\_VM800CB\\_SampleAPP\\_PC\\_Introduction](#)

[AN\\_246\\_VM800CB\\_SampleAPP\\_Arduino\\_Introduction](#)

C232HM-EDHSL-0 datasheet:

[http://www.ftdichip.com/Support/Documents/DataSheets/Cables/DS\\_C232HM\\_MPSSE\\_CABLE.pdf](http://www.ftdichip.com/Support/Documents/DataSheets/Cables/DS_C232HM_MPSSE_CABLE.pdf)

D2xx Programmers Guide:

[http://www.ftdichip.com/Support/Documents/ProgramGuides/D2XX\\_Programmer's\\_Guide\(FT\\_000071\).pdf](http://www.ftdichip.com/Support/Documents/ProgramGuides/D2XX_Programmer's_Guide(FT_000071).pdf)

AN\_108: Command Processor for MPSSE and MCU Host Bus Emulation Modes

[http://www.ftdichip.com/Support/Documents/AppNotes/AN\\_108\\_Command\\_Processor\\_for\\_MPSSE\\_and\\_MCU\\_Host\\_Bus\\_Emulation\\_Modes.pdf](http://www.ftdichip.com/Support/Documents/AppNotes/AN_108_Command_Processor_for_MPSSE_and_MCU_Host_Bus_Emulation_Modes.pdf)

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## Appendix C – Revision History

Document Title: DS\_VM800B  
Document Reference No.: FT\_000881  
Clearance No.: FTDI# 348  
Product Page: <http://www.ftdichip.com/eve.htm>  
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|                    |                                                        |          |
|--------------------|--------------------------------------------------------|----------|
| <b>Version 1.0</b> | Initial Datasheet released                             | 28/08/13 |
| <b>Version 1.1</b> | Corrected dimensions for 4.3" mpounting in section 6.2 | 25/03/14 |