

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	Credit Card Size VM800B module, supports 3.3/5v MCU Adapter Board, 3.5 inch TFT LCD display panel preinstalled, black bezel
VM800B43A-BK	Credit Card Size VM800B module, supports 3.3/5v MCU Adapter Board, 4.3 inch TFT LCD display panel preinstalled, black bezel
VM800B35A-BK	Credit Card Size VM800B module, supports 3.3/5v MCU Adapter Board, 5.0 inch TFT LCD display panel preinstalled, black bezel
VM800B35A-PL	Credit Card Size VM800B module, supports 3.3/5v MCU Adapter Board, 3.5 inch TFT LCD display panel preinstalled, pearl bezel
VM800B43A-PL	Credit Card Size VM800B module, supports 3.3/5v MCU Adapter Board, 4.3 inch TFT LCD display panel preinstalled, pearl bezel
VM800B35A-PL	Credit Card Size 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

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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, 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.

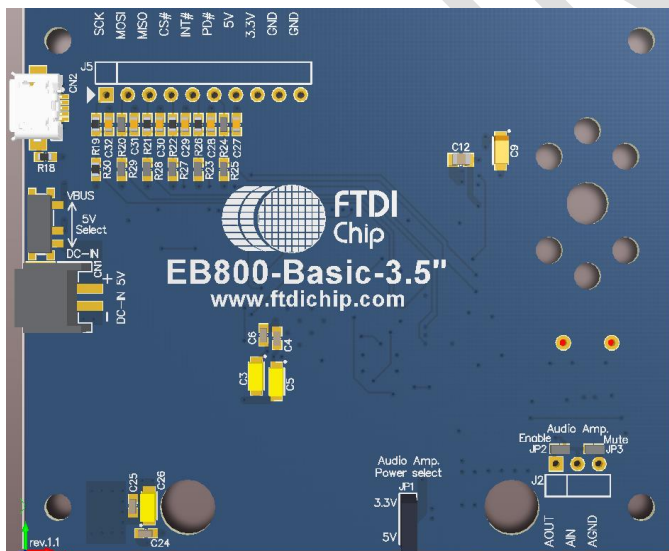


Figure 3-4 - VM800B module PCB view, 3.5 inch display version

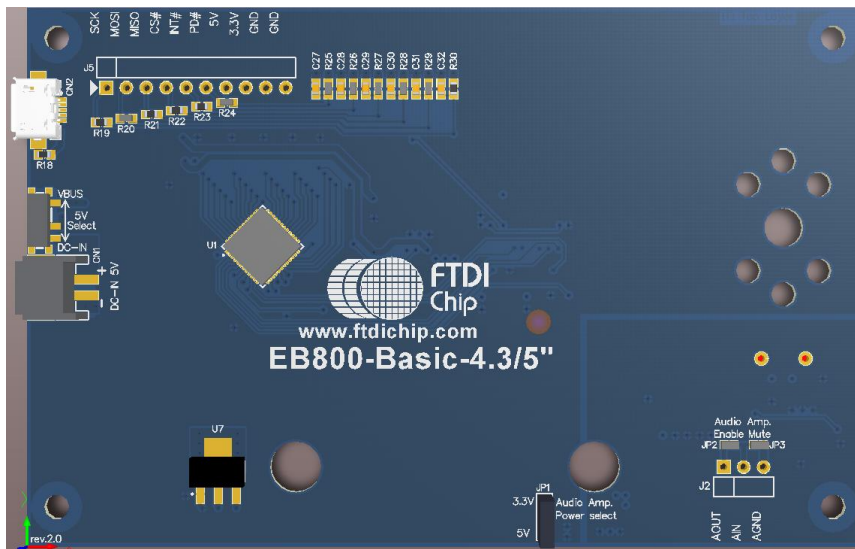


Figure 3-5 - VM800B module PCB view, 4.3 and 5 inch display version

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 Receptical**

This receptical 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 or loop back into the power amplifier.**

Selection between audio Lineout or loop back into the power amplifier. (Footprint only, JP2 next to J2 is connected by default for on board amplifier and on board mini speaker). If J2 is soldered and used for audio output selection, JP2 needs to be removed.

Pin No.	Name
1 -2	Audio amp enabled
2-3	Audio amp mute, Audio lineout on pin 1

Table 3-3 – J2 Pin Options

- **J3 – SP+**

Audio speaker +ve from the onboard amplifier.

- **J4 – SP-**

Audio speaker -ve from the onboard amplifier.

- **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. Note J5 is not soldered on the VM800B board by default.

Pin No.	Name	Type	Description
1	SCLK	I	SPI Clock input
2	MOSI	I	Master Out Slave in
3	MISO	O	Master In Slave out
4	CS#	I	Chip select , active low
5	INT#	OD	Host interrupt open drain output, active low. On board 47kΩ pull-up to 3.3V.
6	PD#	I	Active low power down input.
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 onboard power amplifier.

Pin No.	Name
1-2	3V3 selected
2-3	5V selected

Table 3-5 – JP1 Pin options

*This needs to be configured before audio can be heard

- **JP2 – On board amplifier enable**

Solder connection fitted by default.

- **JP3 - On board amplifier mute**
Solder connection not fitted by default.
- **SW1 - Power source select**

Pin No.	Name
1-2	Power from CN1
2-3	Power from CN2

Table 3-6 - JP1 Pin options

PRELIMINARY

4 Board Schematics

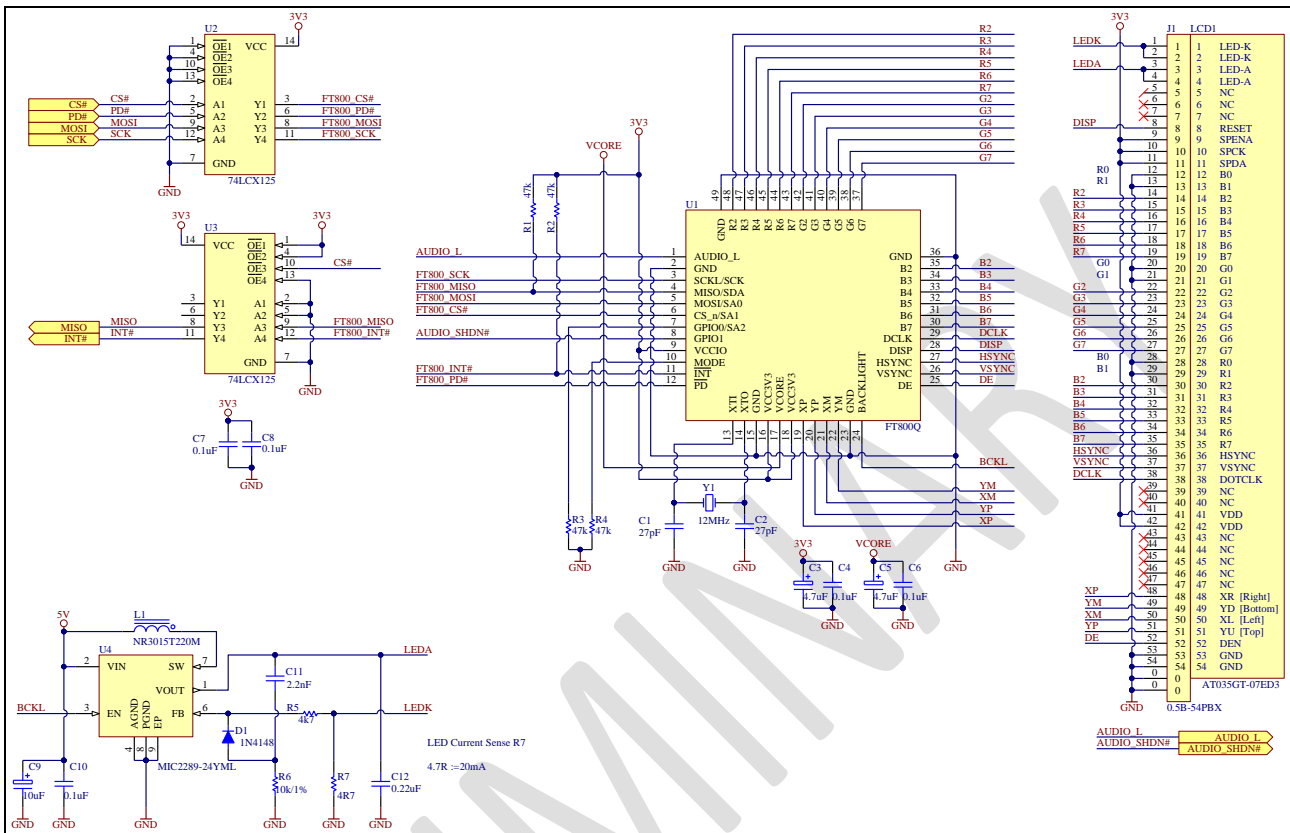


Figure 4-1 - VM800B35 (3.5" Version)

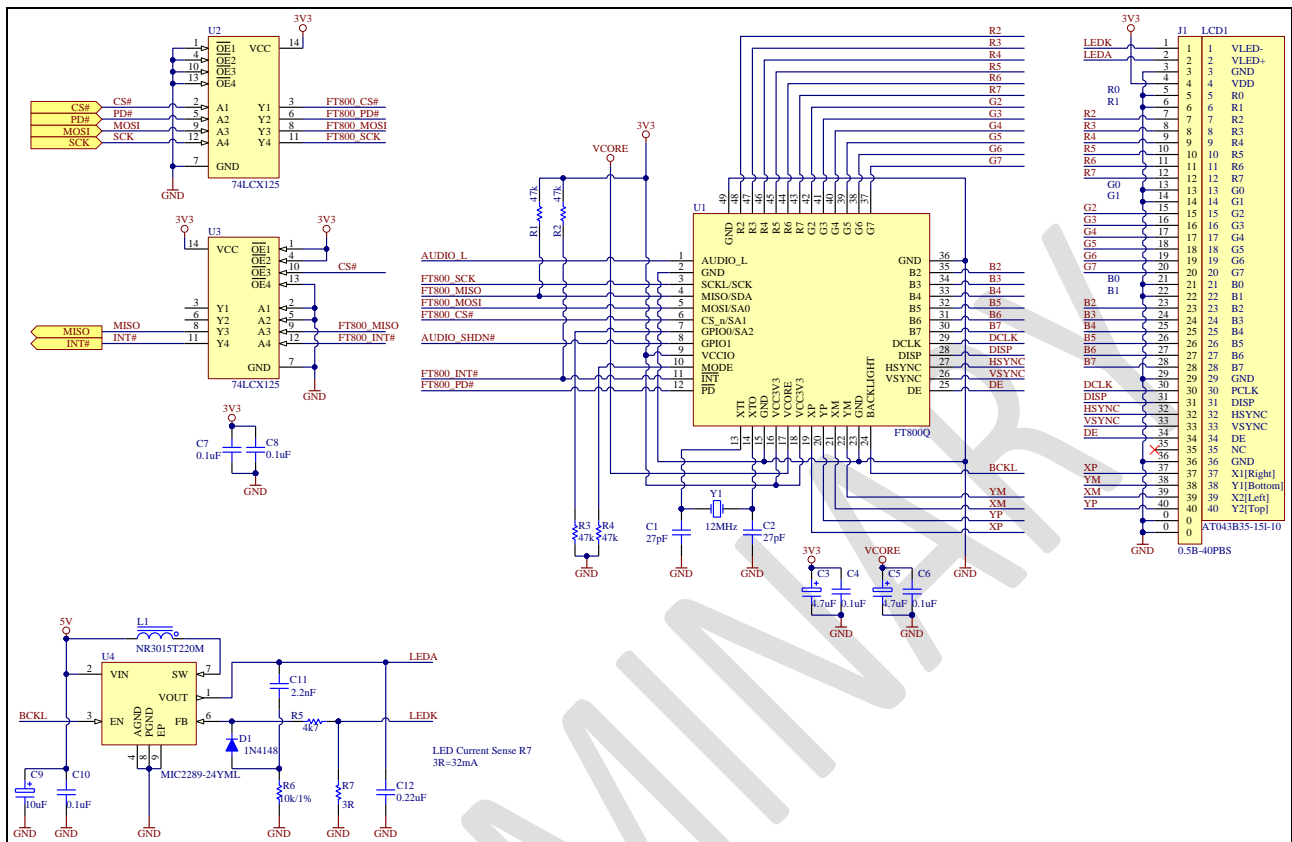


Figure 4-2 - VM800B43/VM800B50 (4.3"/5.0" Version)

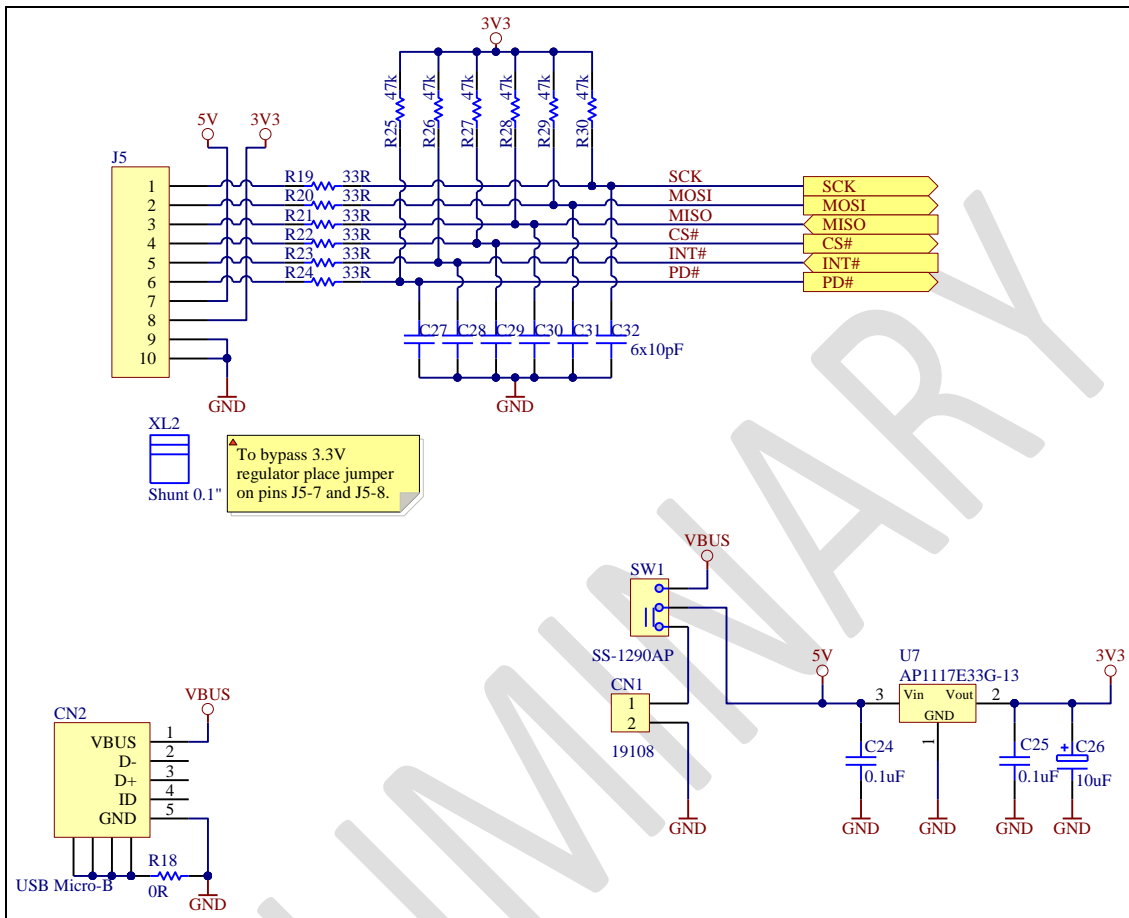
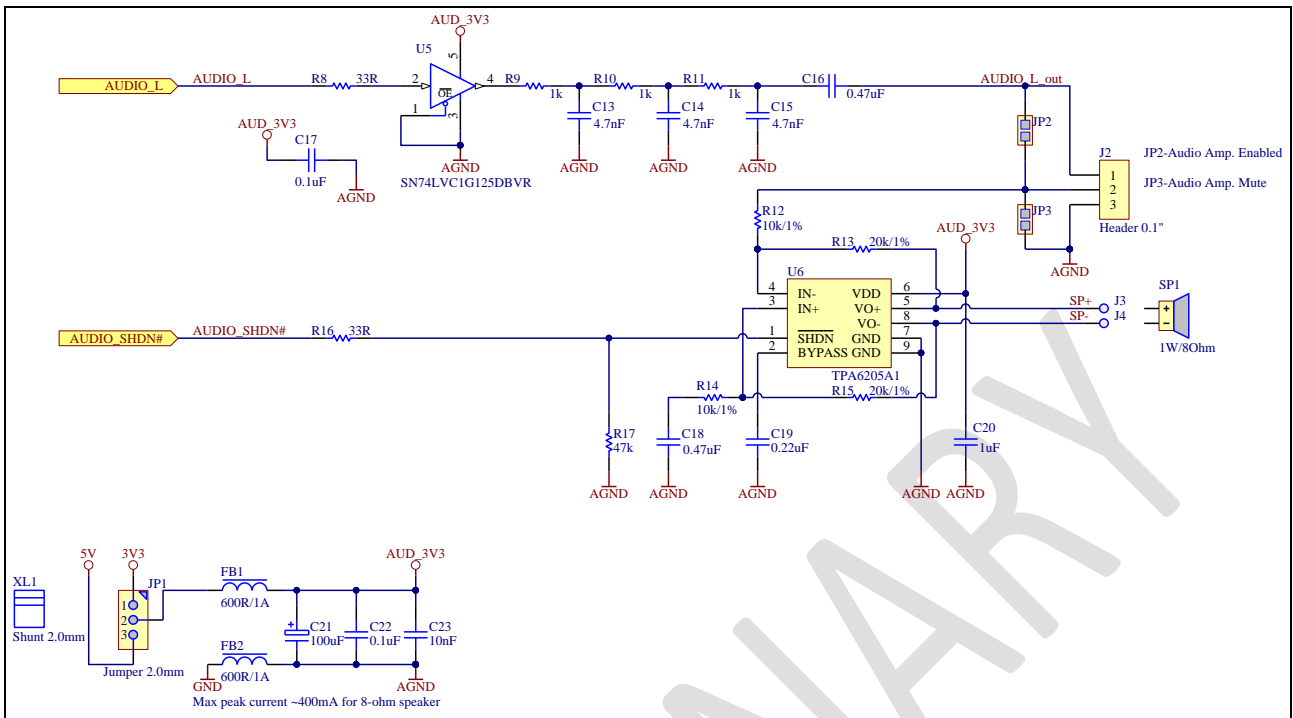


Figure 4-3 – VM800B SPI Interface and IO



PRELIMINARY

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, FT2232H and FT4232H). This engine allows users to bridge from a USB port on a PC to an I²C 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 multi purpose 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.

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.

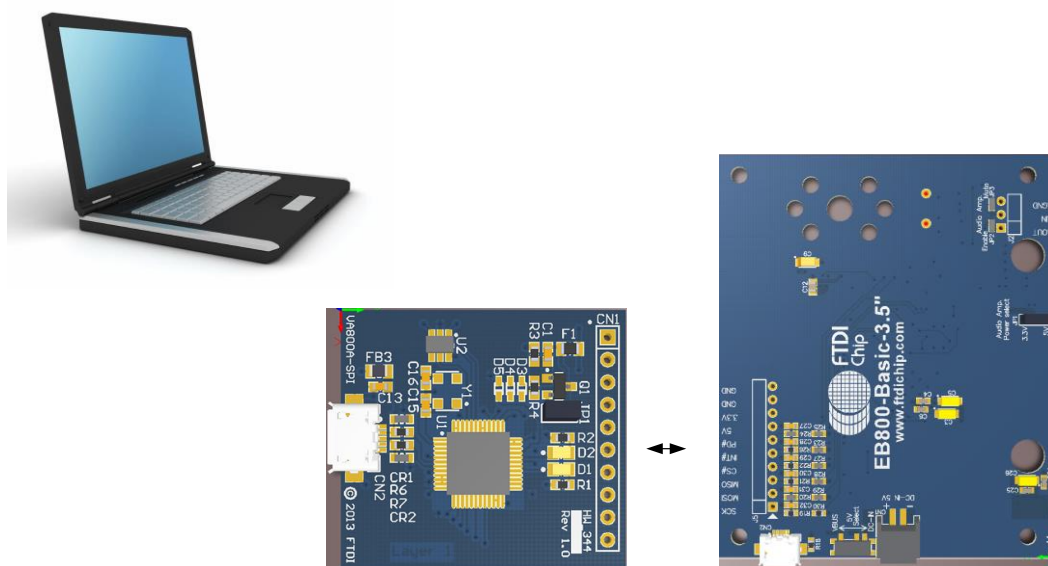


Figure 5-1 – VM800B connects to PC through VA800A-SPI accessory.

Hardware Setup

- Connect the VA800A-SPI to the VM800B module in the correct orientation.
- 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.
- 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-DDHSL-0(3.3V) cable then the connection is as:

J5 Pin number	J5 Signal	MPSSE pin number	MPSSE Signal	MPSSE Cable Lead Color
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 or 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>

PRELIMINARY

6 Assembling the Bezel and Panel Mounting

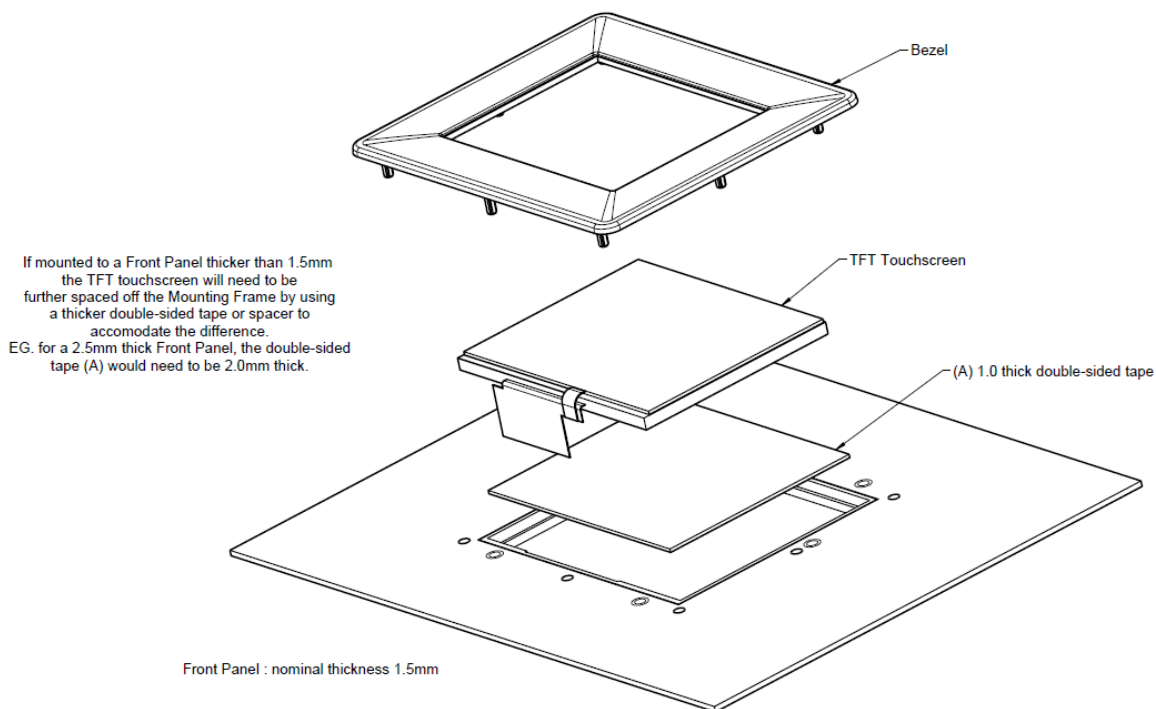


Figure 6-1 - VM800B Panel Mount (Front view)

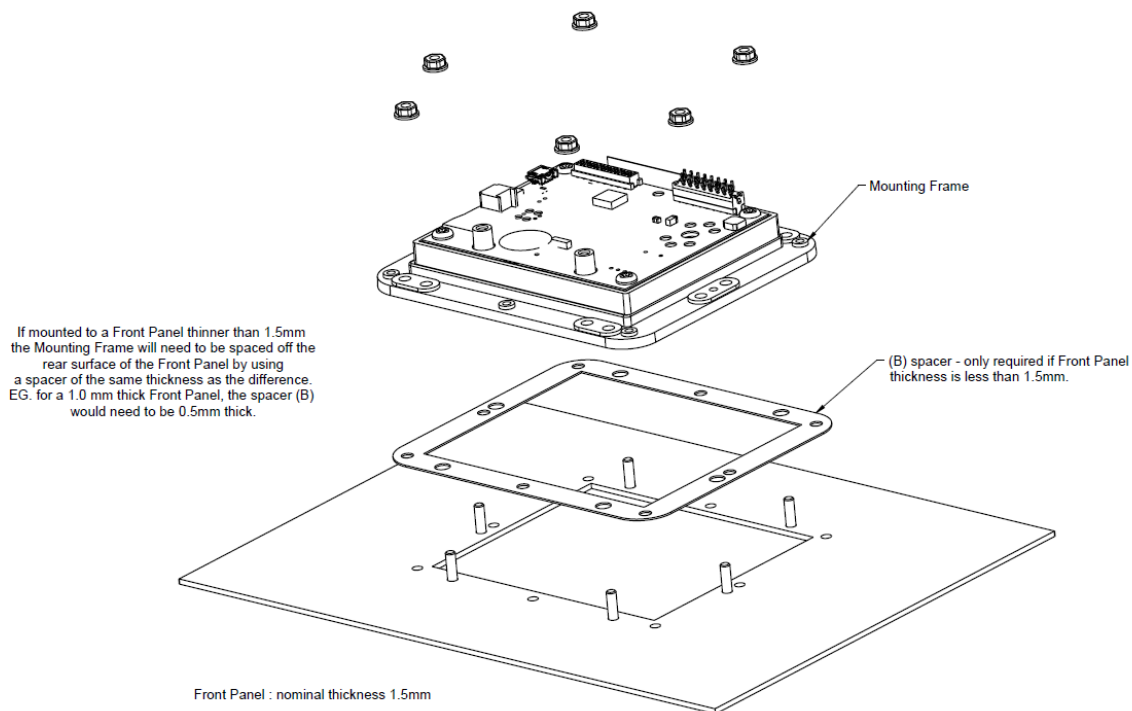
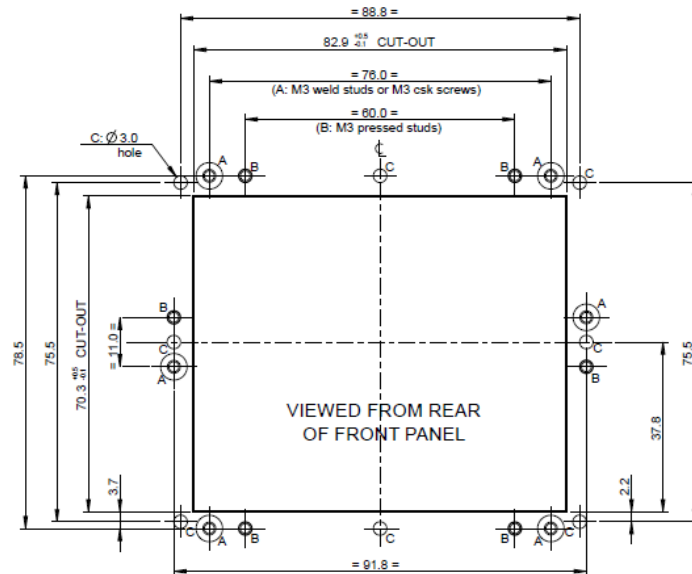


Figure 6-2 - VM800B Panel Mount (Rear view)

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

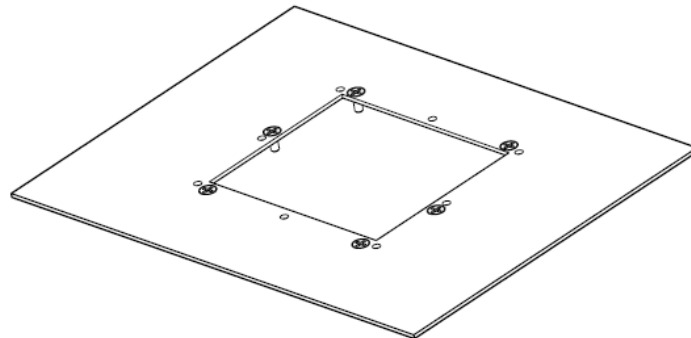


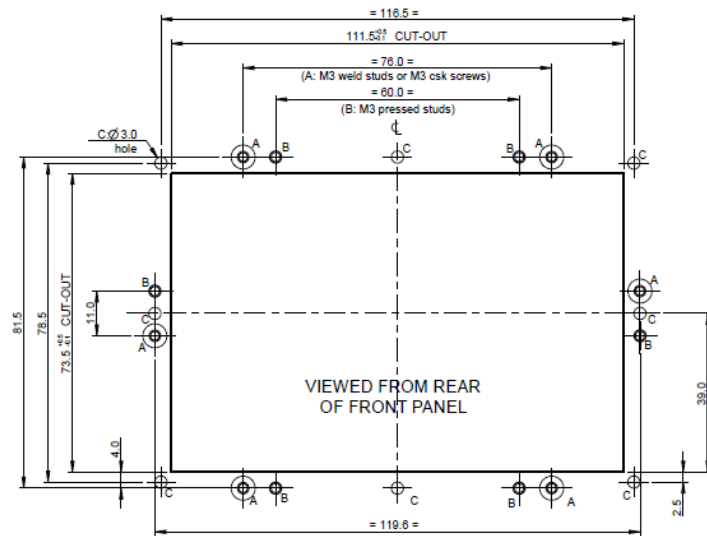
Figure 6-3 - VM800B 3.5" panel mount dimensions

PREVIEW

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

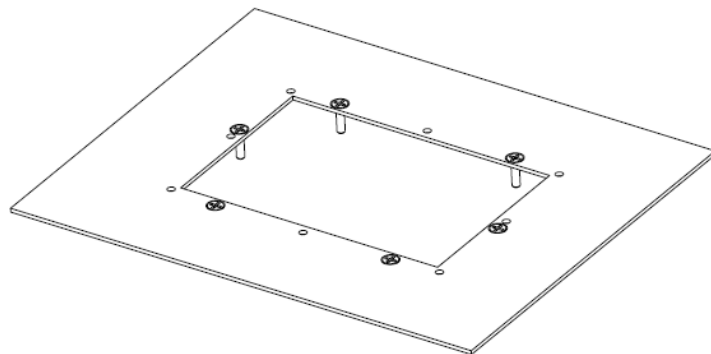


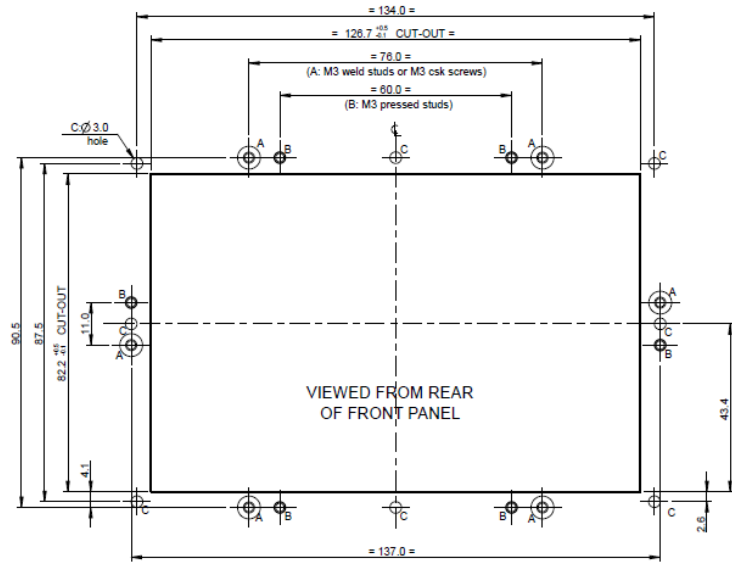
Figure 6-4 - VM800B 4.3" panel mount dimensions

PREVIEW

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

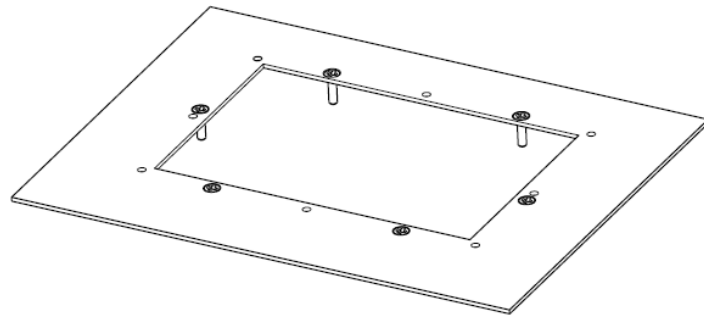


Figure 6-5 - VM800B 5.0" panel mount dimensions

PREVIEW

7 Specifications

7.1 Optical Specification

Item	Symbol	Condition	Min	Typ.	Max.	Unit
View Angles	θT	$CR \geq 10$	30	40		Degree
	θB		50	60		
	θL		50	60		
	θR		50	60		
Contrast Ratio	CR	$\theta = 0^\circ$		350		
Response Time	Ton	25°C		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/m ²

Table 7-1 - 3.5" TFT Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness	Bp	$\theta=0^\circ$	450	500	-	Cd/m ²
Uniformity	ΔBp	$\Phi=0^\circ$	70	80	-	%
Viewing Angle	3:00	$CR \geq 10$	-	65	-	Deg
	6:00		-	55	-	
	9:00		-	65	-	
	12:00		-	45	-	
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	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	$\theta=0^\circ$ $\Phi=0^\circ$	45	60	-	%

Table 7-2 - 4.3" TFT Optical Specification

Item	Symbol	Condition	Values			Unit
			Min.	Typ.	Max.	
Viewing angle ($CR \geq 10$)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-	
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-	
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-	
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	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 ²
Luminance uniformity	Y_U		70	75	-	%

Table 7-3 - 5" TFT Optical Specification

8 Contact Information

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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-DDHSL-0 datasheet:

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

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Appendix C – Revision History

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