

FTDI Chip

VM800P Datasheet

Embedded Video Engine Plus Module



General Purpose Multi Media Controller

The VM800P is a development module for FTDI's FT800, which is used to develop and demonstrate the functionality of the FT800 Embedded Video Engine, EVE.

The VM800P is a stand-alone display system which has a flash based microcontroller on board, thus providing a fully integrated display system ready to go.

The VM800P supports many I/O daughter cards or shields for expanding external interfacing and control. These shields use 1 or 2 Micro-MaTch miniature connectors to interface to the VM800P main module. Users will be able to purchase shields from FTDI Chip in the coming months, or alternatively can build their own shield for specific applications.

The VM800P series of 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).

- VM800P35A-xx is the 3.5" LCD
- VM800P43A-xx is the 4.3" LCD
- VM800P50A-xx is the 5.0" LCD

The VM800P utilises the FTDI FT800 Embedded Video Engine, EVE. Graphic, audio and touch features of the FT800 chip can be accessed with the VM800P. For a full list of the FT800's features please see the FT800 datasheet.

The VM800P module has the following features:

- FT800 for graphics, audio and touch processing
- ATMEGA328P system microcontroller operating at 5V/16MHz supporting Arduino libraries
- Touch screen LCD panel
- Backlight LED driver
- Audio power amplifier and micro speaker
- FT232R USB serial port for firmware upgrade
- Micro-SD socket for application storage, including 4GByte SD Card pre-loaded with sample applications
- Battery backed Real Time Clock
- 2x Micro-MaTch miniature connectors for daughter card expansion
- 5V power supply from micro-USB or battery connector
- Precision fitted bezel in black(-BK) or pearl (-PL)

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1 Ordering Information

| Part No. | Description |
|--------------------|---|
| VM800P35A-BK | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 3.5" TFT LCD touch panel, black case |
| VM800P43A-BK | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 4.3" TFT LCD touch panel, black case |
| VM800P50A-BK | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 5.0" TFT LCD touch panel, black case |
| VM800P35A-PL | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 3.5" TFT LCD touch panel, pearl case |
| VM800P43A-PL | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 4.3" TFT LCD touch panel, pearl case |
| VM800P50A-PL | FT800 Display System, ATMEG328P @ 5V/16MHz, Micro-SD socket, 5.0" TFT LCD touch panel, pearl case |
| ACCESSORIES | |
| VA800A-PROG | Accessory - PLUS Production Programmer for ATMEGA328P inc Tag Connect TC2030-IDC-FP cable |
| 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) |
| 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 1.1 VM800P & Accessory Ordering Information

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2 Hardware Description



Figure 2.1 VM800P35A Module Profile 3.5" Display Version



Figure 2.2 VM800P43A Module Profile 4.3" Display Version



Figure 2.3 VM800P50A Module Profile 5.0" Display Version

NOTE: The above modules are also available with pearl coloured bezels.

The VM800P module is available for different LCD sizes: 3.5", 4.3" or 5".

Each VM800P module is assembled with following parts:

- VM800PxxA PCB board
- LCD panel with touch screen
- Bezel

The main functions of the VM800PxxA PCB board are as follows:

- FT800 EVE for graphic, audio and touch control
- ATMEGA328P microcontroller operating at 5V and 16MHz, controlling the FT800 and other peripheral interfaces
- 3 stage audio filter
- 8Ω micro speaker to work with on-board audio amplifier
- Jumper selection allowing audio line out option
- LCD backlight LED driver
- Real Time Clock(RTC) with button battery

- USB interface for power supply and firmware programming
- 2-pin JST connector for alternative power source
- 3.3V regulator: takes 5V input and outputs 3.3V for on-board circuits
- 2x Micro-MaTch miniature connectors for various daughter card expansion
- SD Card Socket (4GByte card supplied with module)

2.1 Physical Description

The VM800P module dimensions are illustrated in **Figure 2.4** and **Figure 2.5**.

2.1.1 Dimensions

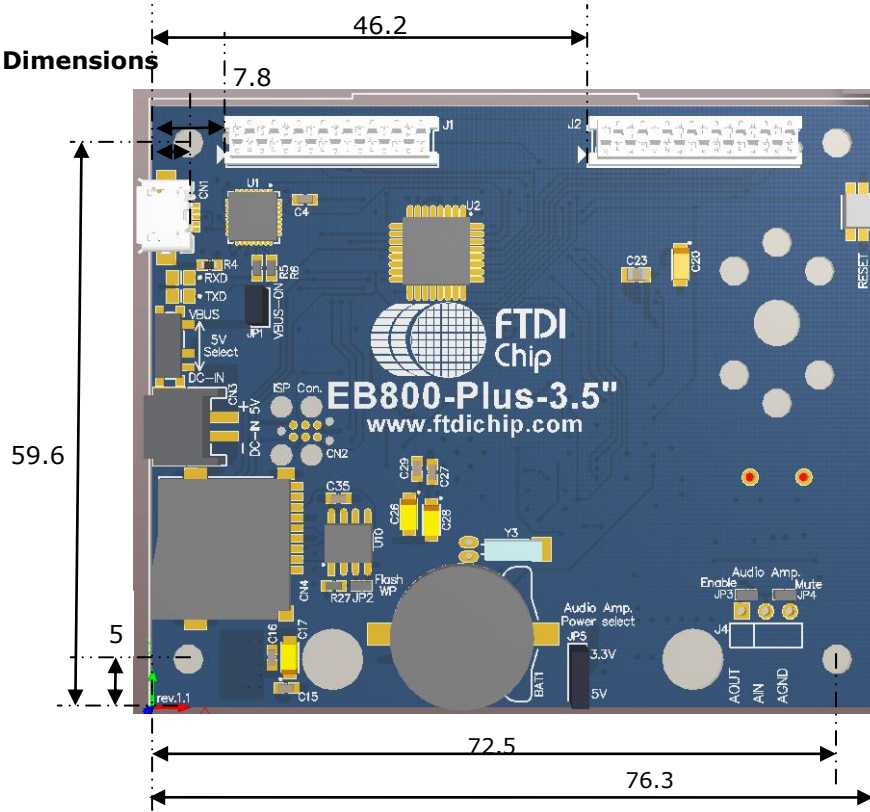


Figure 2.4 VM800P35A Dimensions (Top view)

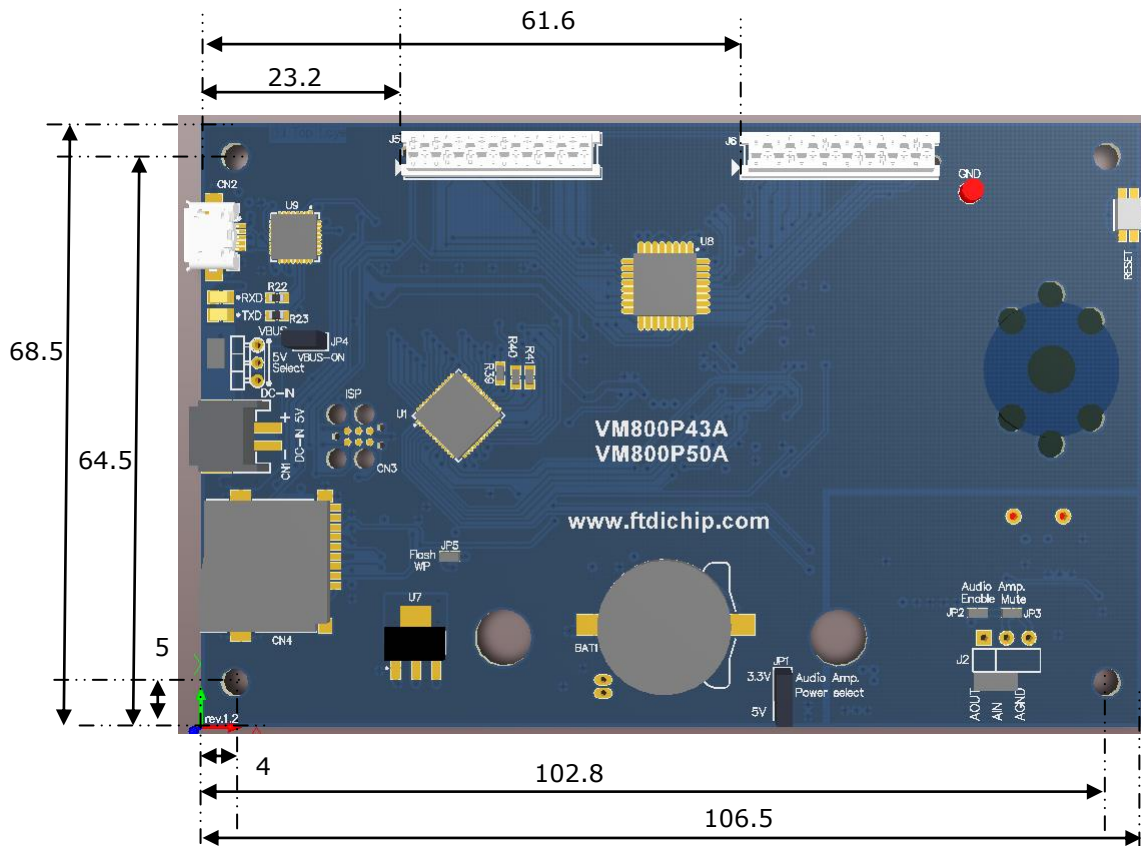


Figure 2.5 VM800P43A/VM800P50A Dimensions (Top view)

±0.50mm Tolerance

All dimensions are in mm

2.1.2 Connectors and Jumpers

Connectors and jumpers are described in the following sections.

2.1.3 CN1 - 2-pin power connector

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

Table 2.1 CN1 - Power Pin-out

2.1.4 CN2 – Micro USB Receptacle

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

Table 2.2 CN2 – Micro USB Pin-out
2.1.5 J2 – Audio Selection

Select between audio line-out or connection to 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 2.3 J2 – Audio Options
2.1.6 J5 – Expansion Connector for I/O Daughter Card

This 16-pin Micro-MaTch miniature connector provides ATmega328P SPI/I²C/IO control to the daughter card. 5V and 3.3V power supplies are also available.

| Pin No. | Name | Type | Description |
|---------|------|------|--|
| 1 | SCK | O | SPI Clock output |
| 2 | MOSI | O | SPI Master Out Slave in |
| 3 | MISO | I | SPI Master In Slave out |
| 4 | IO7 | O | SPI slave select |
| 5 | INT0 | I | Interrupt input from DC |
| 6 | IO6 | O | Active LOW reset output to DC |
| 7 | AD4 | IO | I ² C SDA data input/output |
| 8 | AD5 | O | I ² C SCL clock output |
| 9 | 3V3 | P | 3.3V power supply to DC |
| 10 | 5V | P | 5V power supply to DC |
| 11 | GND | P | Ground |

| Pin No. | Name | Type | Description |
|---------|------|------|---------------------|
| 12 | RST# | O | System reset output |
| 13 | IO5 | IO | GPIO |
| 14 | AD0 | IO | GPIO |
| 15 | AD7 | AI | ADC input |
| 16 | AD6 | AI | ADC input |

Table 2.4 J5 - I/O Expansion Connector Pin-out

2.1.7 J6 - Expansion Connector for Comm Daughter Card

This 16-pin Micro MaTch Miniature connector provides ATmega328P SPI/I²C/IO control to the daughter card. 5V and 3.3V power supplies are also available.

| Pin No. | Name | Type | Description |
|---------|------|------|--|
| 1 | SCK | O | SPI Clock output |
| 2 | MOSI | O | SPI Master Out Slave in |
| 3 | MISO | I | SPI Master In Slave out |
| 4 | SS | O | SPI salve select |
| 5 | INT0 | I | Interrupt input from DC |
| 6 | IO6 | O | Active LOW reset output to DC |
| 7 | AD4 | IO | I ² C SDA data input/output |
| 8 | AD5 | O | I ² C SCL clock output |
| 9 | 3V3 | P | 3.3V power supply to DC |
| 10 | 5V | P | 5V power supply to DC |
| 11 | GND | P | Ground |
| 12 | RST# | O | System reset output |
| 13 | AD1 | IO | GPIO |
| 14 | IO4 | IO | GPIO |
| 15 | AD3 | AI | GPIO |
| 16 | AD2 | AI | GPIO |

Table 2.5 J5 - Communication Expansion Connector Pin-out

2.1.8 JP1 – Audio Amplifier Power Selection

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 2.6 JP1 - Audio Amplifier Power Pin Options

NOTE: This needs to be configured before audio can be heard. Default is 3.3V. Select 5V to increase the maximum volume for the speaker.

2.1.9 SW1 – Power Source Selection

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

Table 2.7 SW1 - Power Source Selection**2.1.10 JP4 – USB Power Selection**

| Jumper position | Description |
|-----------------|---|
| Open | Enable USB power to application circuits when FT232R is enumerated (Default). USB power will be turned off during USB suspend |
| Short | USB power always enabled |

Table 2.8 JP4 - USB Power Selection

2.2 Board Schematics

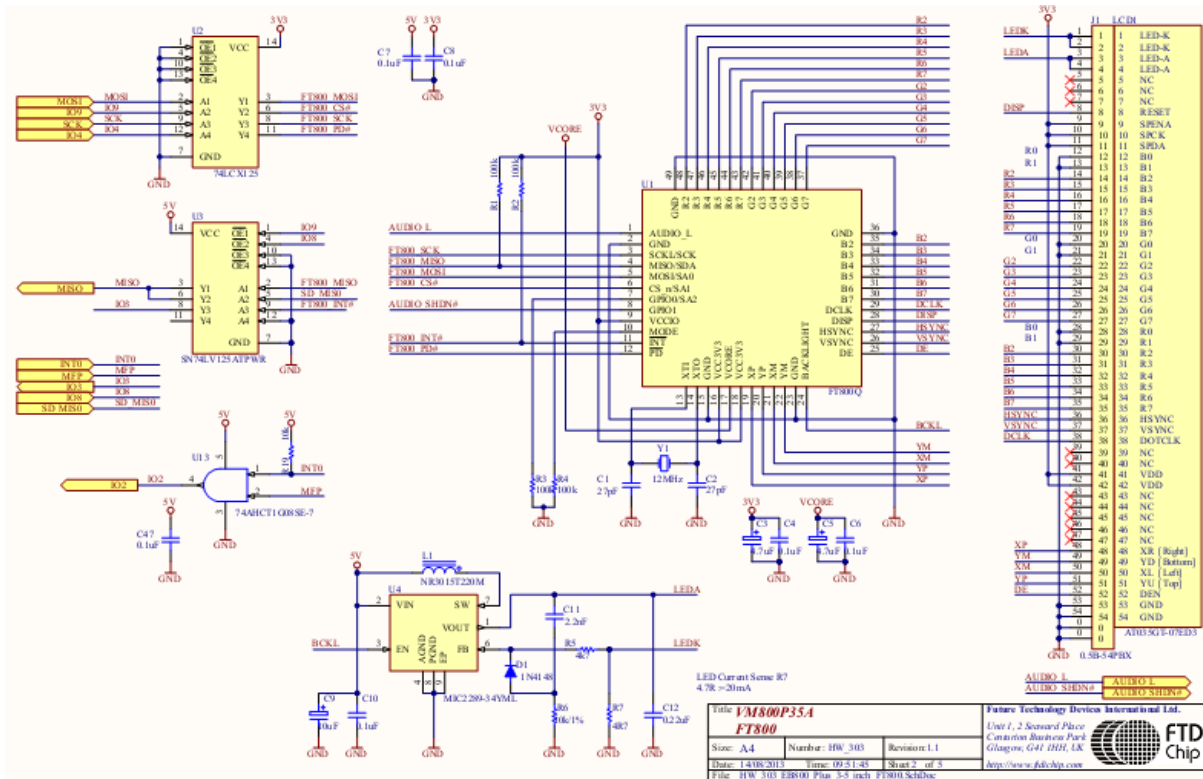


Figure 2.6 VM800P35A FT800 and LCD Interface

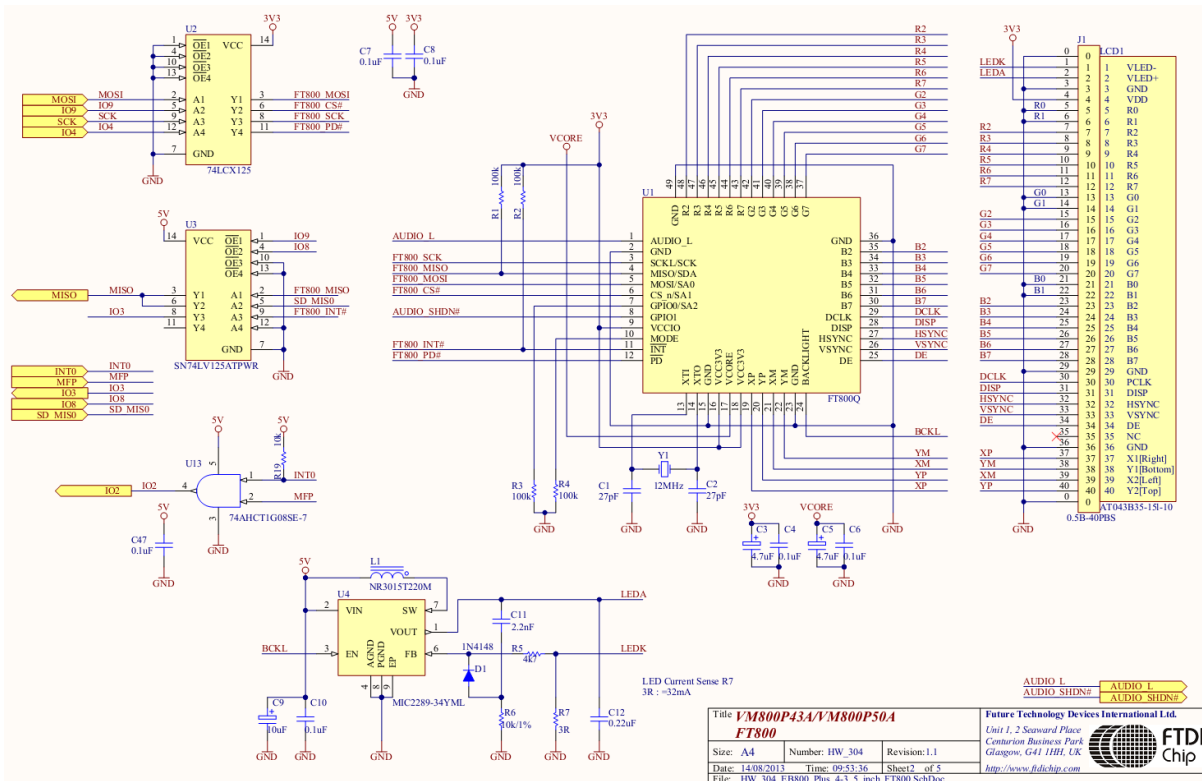


Figure 2.7 VM800P43A/VM800P50A FT800 and LCD Interface

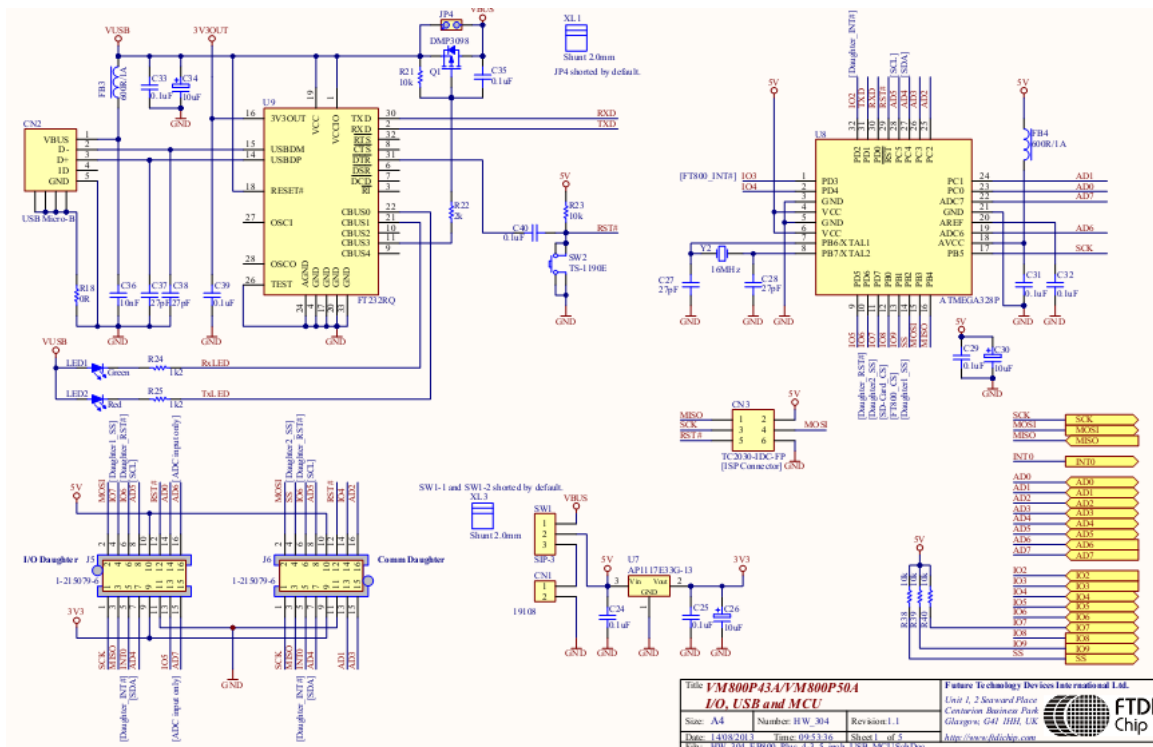


Figure 2.8 VM800PxxA MCU, USB and I/O

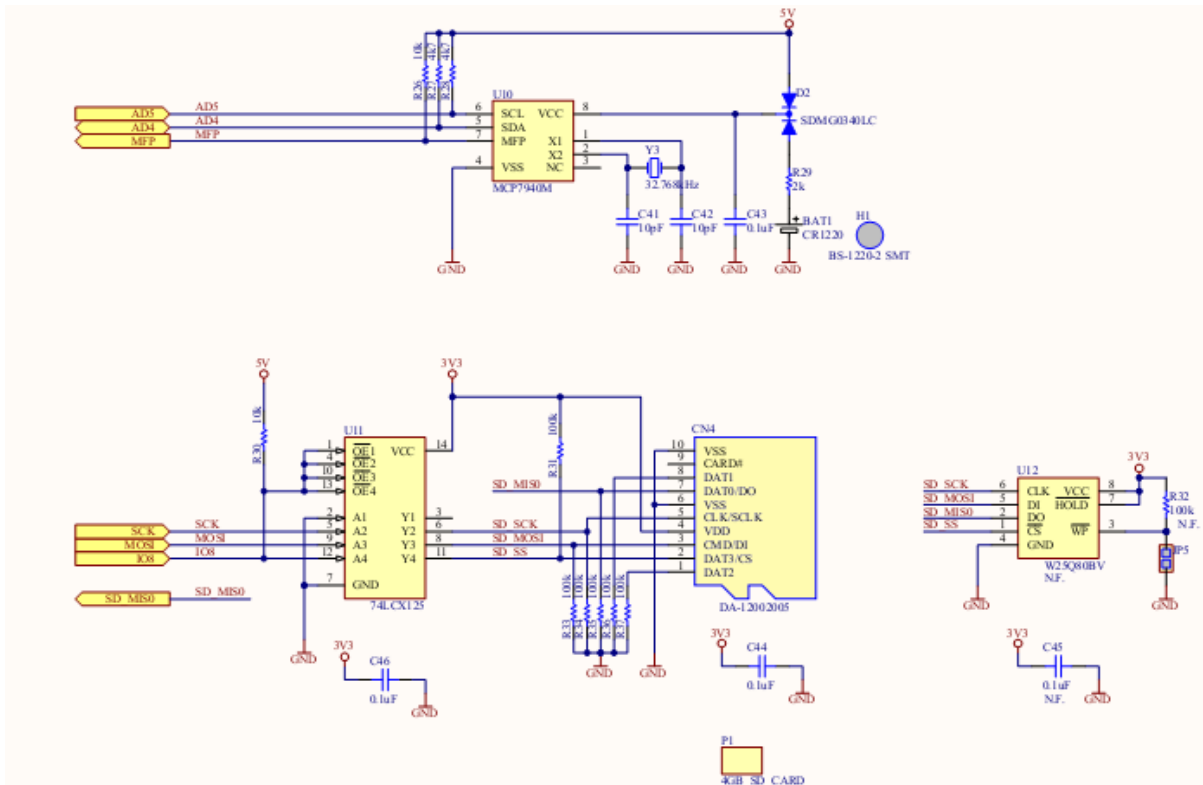


Figure 2.9 VM800PxxA SD-Card, Flash and RTC

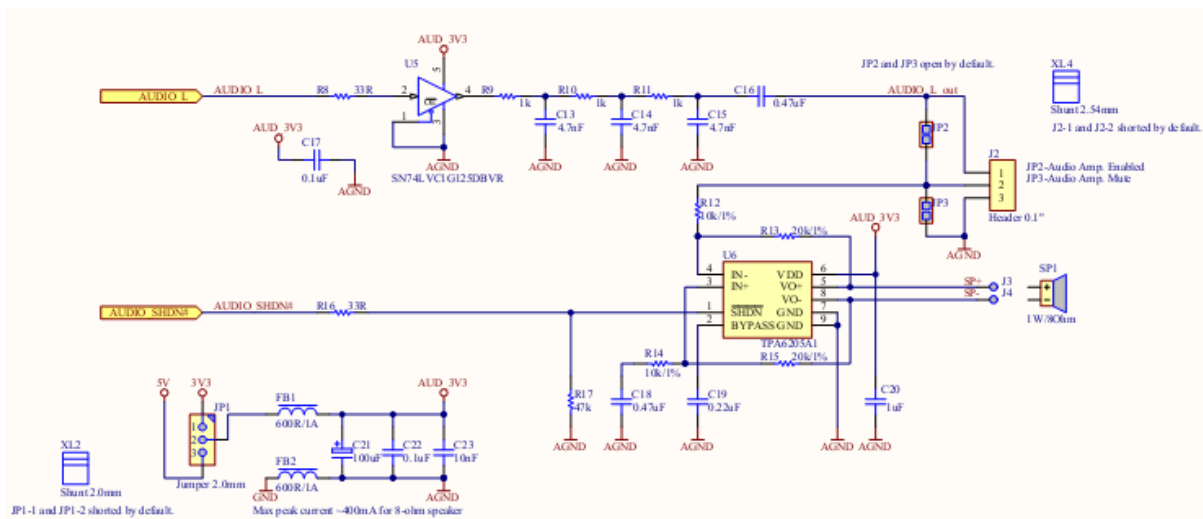


Figure 2.10 VM800PxxA Audio

3 Hardware Setup Guide

3.1 Power Configuration

There are 2 methods of powering the VM800P board.

- 1) USB Power(5V) - Connect USB power through micro-USB cable to CN2
- 2) DC IN(5V) - Connect 5V to CN1

The following table summarizes how to power the VM800P board using the various methods.

| Power Method | CN1 | CN2 | SW1 |
|--------------|-----|-----|-------------------------|
| USB Power | N/C | 5V | Short pin 2-3 (default) |
| DC IN(5V) | 5V | 5V | Short pin 1-2 |

Table 3.1 Board Power Configuration

4 Arduino® Setup

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://www.ftdichip.com/Support/Documents/AppNotes/AN_318_Arduino_Library_for_FT800_Series.pdf

http://www.ftdichip.com/Support/Documents/AppNotes/AN_275_FT800_Example_with_Arduino.pdf

http://www.ftdichip.com/Support/Documents/AppNotes/AN_246%20VM800CB_SampleApp_Arduino_Introduction.pdf

4.1 Hardware Setup

- Connect a USB cable (suggest FTDI accessory VA-FC-1M-BKW or VA-FC-1M-BLW) from the VM800P USB port CN2 to the PC USB host port or self-powered hub port.
- The PC will supply power to the VM800P after the FTDI FT232R driver is properly loaded and the USB host completes USB device configuration.

4.2 Software Setup

The arduino code can be downloaded from the Arduino IDE to the ATMEGA328P through the USB connector CN2 connected to the PC. The USB connector CN2 is also used to display debug output from the ATMEGA328P to the PC terminal application.

Default sample code is downloaded to the ATMEGA328P during the VM800P module manufacturing. When the VM800P is connected to the PC through the USB connector CN2, the VM800P is powered up and the sample code is functional with the demo applications.

- Download the Arduino IDE from <http://arduino.cc/en/main/software>.
- Install the Arduino IDE
- Open the Arduino IDE
- Open the FT800 sample project to be downloaded to the VM800P

(Examples are available from:

http://www.ftdichip.com/Support/SoftwareExamples/FT800_Projects.htm

Or you may have developed your own code)

- Select the Tools->Board-> Arduino Pro or Pro Mini(5V, 16MHz) w/ATmega328 as shown in Fig 4.1.
- Select the Tools->Serial Port->COMxx corresponding to the VM800P as shown in Fig 4.2.
- Click the Upload button as shown in Fig 4.3. This will upload the FT800 sample to the VM800P.

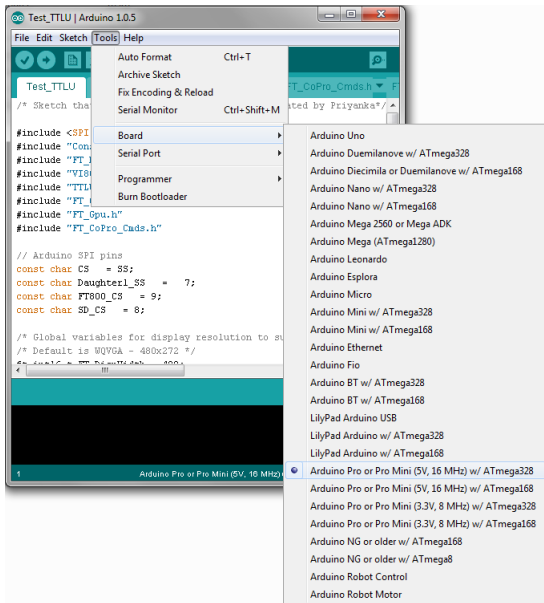


Figure 4.1 Select Board

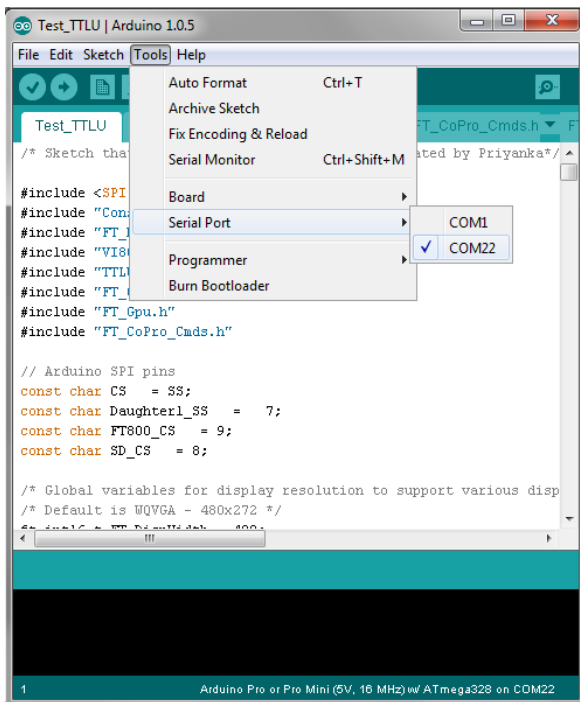


Figure 4.2 Select Serial Port

(NOTE: Your device may not be COM22 as shown. Select the COM port you have installed)

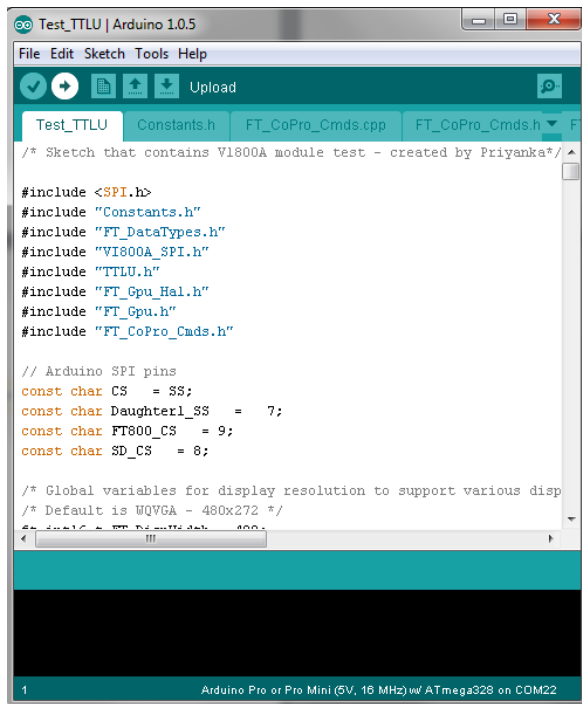


Figure 4.3 Click Upload Button

5 Assembling the Bezel and Panel Mounting

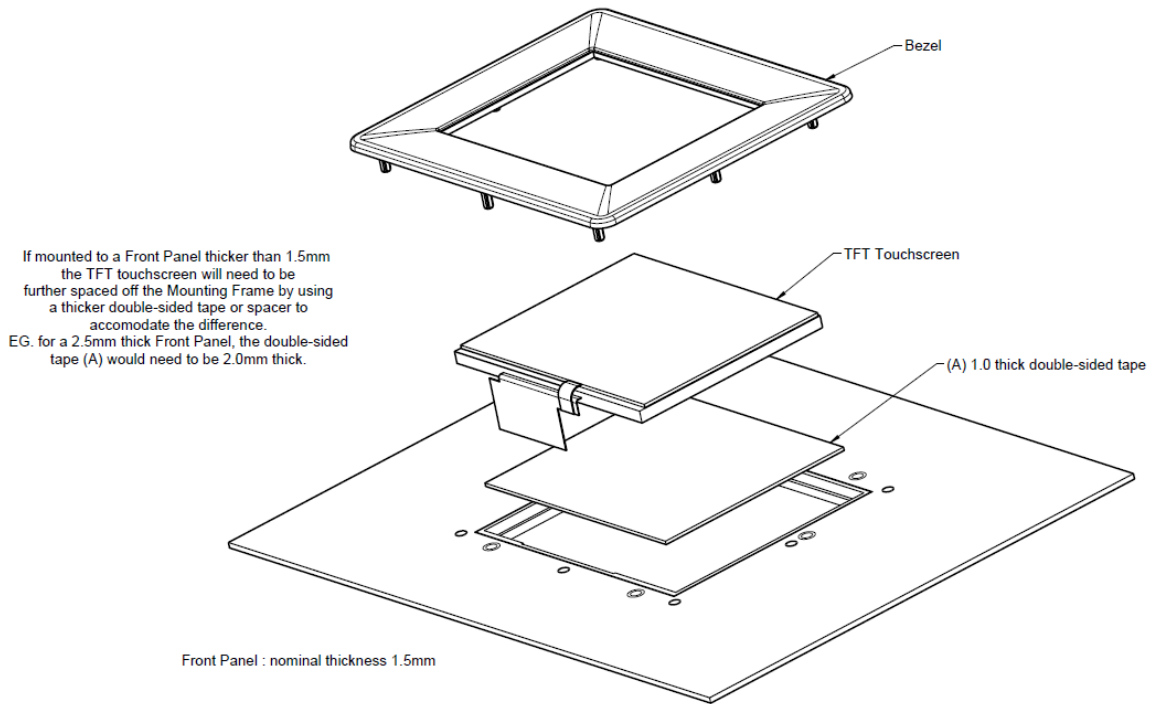


Figure 5.1 VM800P Panel Mount (Front view)

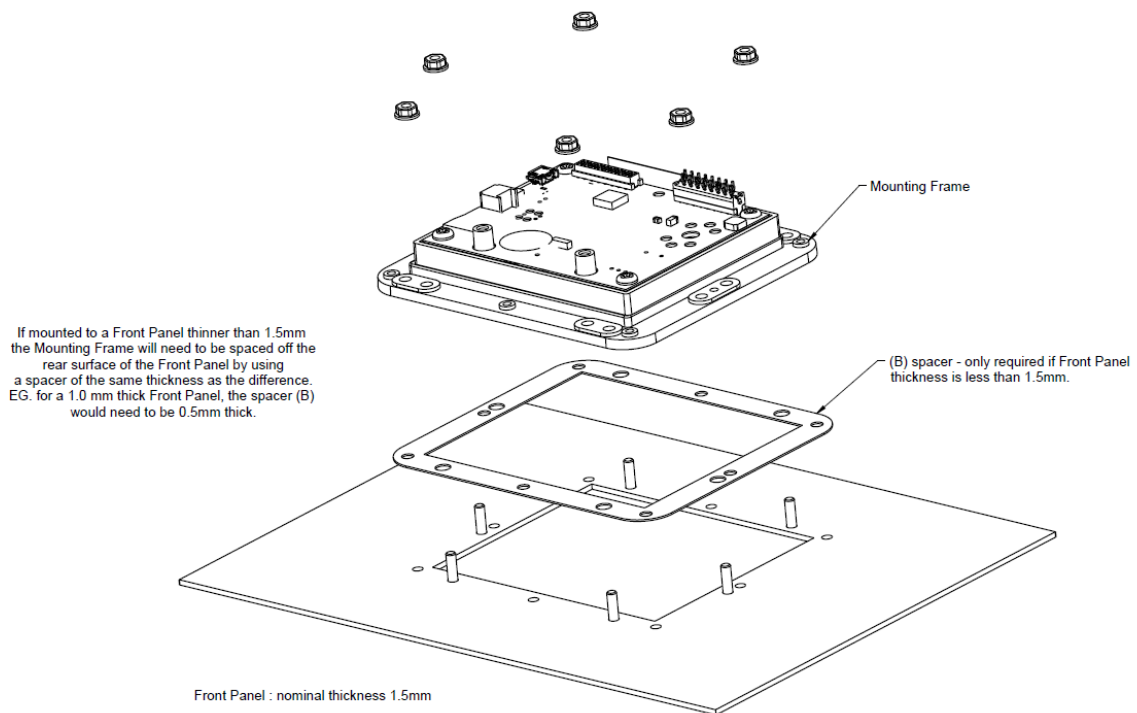
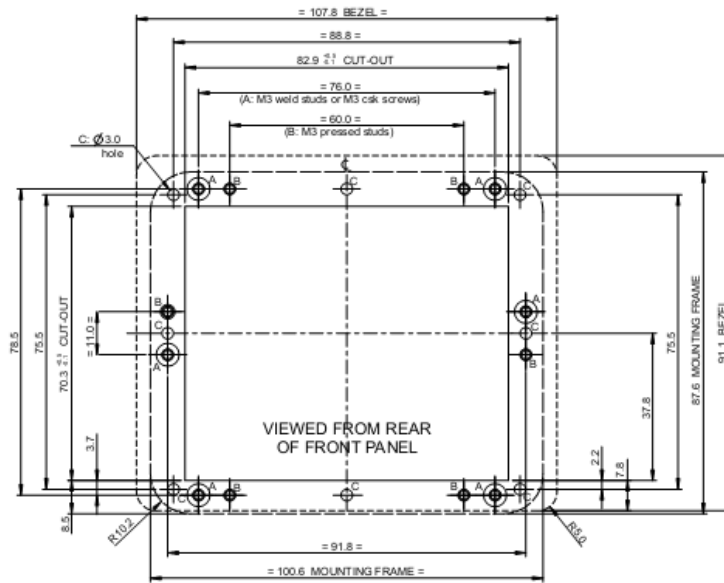


Figure 5.2 VM800P Panel Mount (Rear view)

5.1 Dimensions for 3.5" Bezel

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

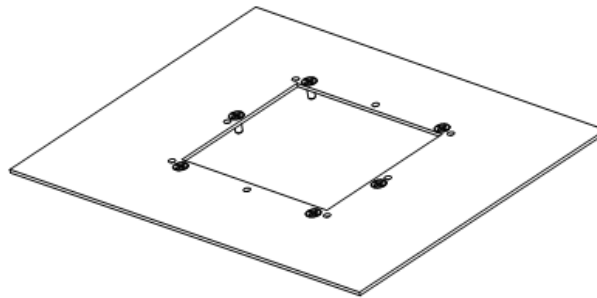


Figure 5.3 VM800P 3.5" panel mount dimensions

5.2 Dimensions for 4.3" Bezel

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

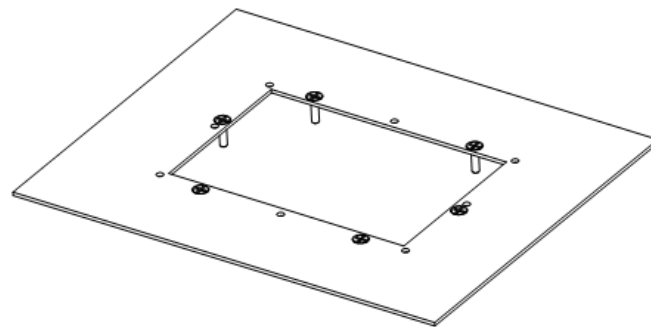
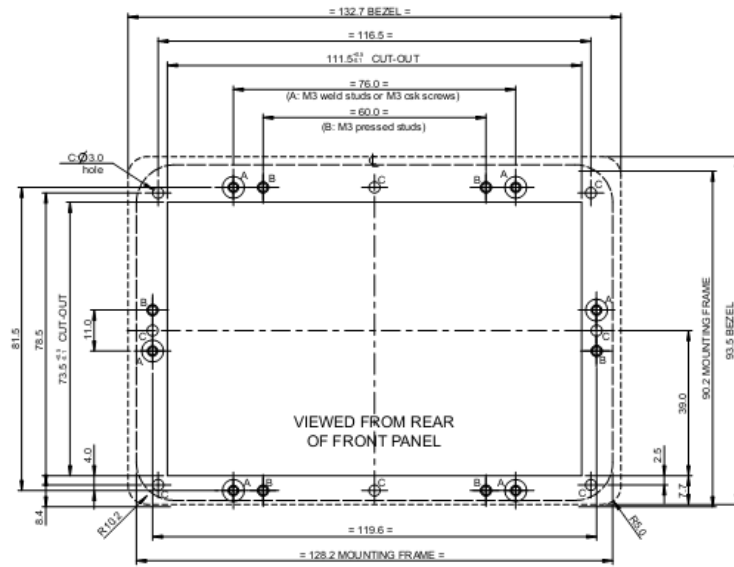


Figure 5.4 VM800P 4.3" panel mount dimensions

5.3 Dimensions for 5.0" Bezel

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

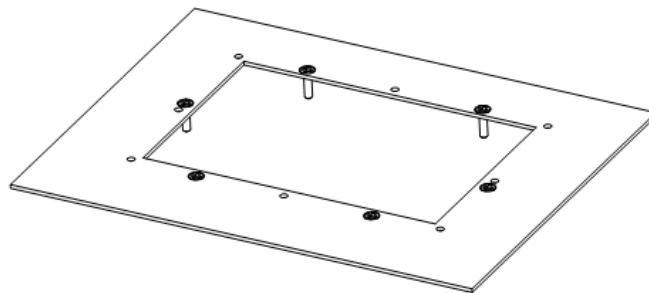
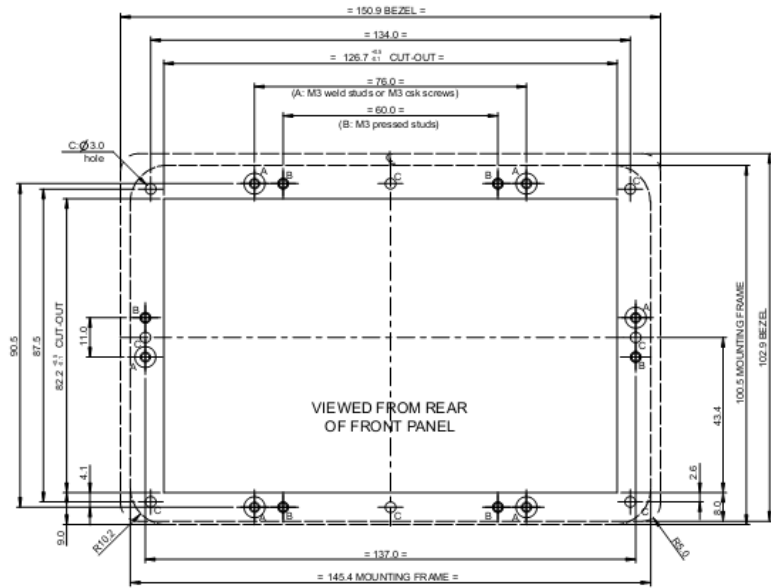


Figure 5.5 VM800P 5.0" panel mount dimensions

6 Specifications

6.1 LCD Optical Specifications for 3.5" Panel

| 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 |

Figure 6.1 3.5" TFT Optical Specifications

6.2 LCD Optical Specifications for 4.3" Panel

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | |
|-------------------------|-------------|------------------|------------------------------------|-------|------|-------------------|---|
| Brightness | Bp | $\theta=0^\circ$ | 450 | 500 | - | Cd/m ² | |
| Uniformity | Δ 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 | $\theta=0^\circ$ | 200 | 250 | - | - | |
| Response Time | T_r | $\Phi=0^\circ$ | - | 16 | - | ms | |
| | T_f | | - | 12 | - | ms | |
| Color of CIE Coordinate | W | x | $\theta=0^\circ$ $\Phi=0^\circ$ | 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 | - | % | |

Figure 6.2 4.3" TFT Optical Specifications

6.3 LCD Optical Specifications for 5.0" Panel

| Item | Symbol | Condition | Values | | | Unit |
|---------------------------|------------|---------------------------------|--------|------|------|-------------------|
| | | | Min. | Typ. | Max. | |
| Viewing angle (CR≥ 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 | - | % |

Figure 6.3 5.0" TFT Optical Specifications

7 Contact Information

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Appendix A – References

Document References

For module documentations, please refer to URL below:

<http://www.ftdichip.com/Products/modules/VM800P.html>

FT800 datasheet: [DS FT800 Embedded Video Engine](#)

FT800 software programming guide: [FT800 Programmer Guide](#)

AN_318: [Arduino Library for FT800 Series](#)

AN_275 : [FT800 Example with Android](#)

AN_246: [VM800CB SampleApp Arduino Introduction](#)

Acronyms and Abbreviations

| Terms | Description |
|------------------|---|
| IO | Input Output |
| I ² C | Inter Integrated Circuit |
| LCD | Liquid Crystal Display |
| RTC | Real Time Clock |
| SD CARD | Secure Digital Card |
| SPI | Serial Peripheral Interface |
| UART | Universal Asynchronous Receiver Transmitter |
| USB | Universal Serial Bus |
| USB-IF | USB Implementers Forum |

Appendix B – List of Tables & Figures

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Appendix C – Revision History

Document Title: VM800P Embedded Video Engine Plus Module Datasheet
Document Reference No.: FT_000989
Clearance No.: FTDI# 385
Product Page: <http://www.ftdichip.com/EVE.htm>
Document Feedback: [Send Feedback](#)

| Revision | Changes | Date |
|----------|-----------------|------------|
| 1.0 | Initial Release | 2014-04-24 |
| | | |
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Revision History

Revision history (internal use only, please clearly state all changes here before saving the file)

| Revision | Date YYYY-MM-DD | Changes | Editor |
|----------|--------------------|--|----------------|
| Draft | 2013-09-12 | First draft | David Wang |
| Draft | 2013-09-13 | Reviewed and commented. Recommend starting by getting the doc into the standard template format | G Lunn |
| Draft | 2013-11-07 | Moved document to proper template | Bob Recny |
| Draft | 2013-11-11 | Added images and corrected hyperlinks | G Lunn |
| Draft | 2014-01-17 | updated the document number added text in section 3.2 Arduino Setup | Sriram Paulraj |
| Draft | 2014-01-24 | Revised with further edits | G Lunn |
| Draft | 2014-04-09 | Updated based on review comments. Added steps to program using the Arduino IDE. | Sriram Paulraj |
| Draft | 2014-04-14 | Reviewed. Removed section 1.1 Simplified accessory table to allow release of board without daughter cards. Recommend section 2.1 (pcb layout be deleted) Recommend we need dimensions for the assembled depth of the product Added reference to AN_318 Updated copyright to 2014 Corrected font in section 4 Updated appendix A | G Lunn |
| Draft | 2014-04-16 | Updated based on review comments | Sriram Paulraj |
| Draft | 2014-04-18 | Reviewed recommend for approval | G Lunn |
| 1.0 | 2014-04-24 | Approved by PH and LCE | A Gordon |
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