The FT800 supports a wide range of LCD panels due to its programmable display settings registers. This document covers some of the factors which should be considered when selecting an LCD panel to be used with the FTDI FT800 device and when configuring the panel to work with the FT800.

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1 Introduction

The FT800 supports a wide range of LCD panels due to its programmable display settings registers. This document covers some of the factors which should be considered when selecting an LCD panel to be used with the FTDI FT800 device and when configuring the panel to work with the FT800.
2 Choosing a Display

When selecting an LCD panel and determining it’s compatibility with the FT800, some of the most important factors are highlighted below:

- The FT800 supports resolutions up to 512 x 512, and supports WQVGA (480 x 272) and QVGA (320 x 240) displays.
- Check that the ribbon cable of the display is compatible with the FT800 board which you plan to use (e.g. the VM800C Credit Card module). Some modules also have different electrical requirements, for example the LED connections for the backlight driver.
- If the panel uses a touchscreen, it must be a resistive screen for the FT800.
- Check that the display is configured for RGB mode. Some panels may require programming over a separate data interface in order to configure the display controller chip, and so the board may need to provide connections between these lines on the LCD ribbon cable and the MCU.
- Some FT800 boards use different GPIO lines to enable the display etc. The sample code provided on the FTDI website is configured to use the GPIO assignments to match our VM800 series evaluation modules.
- Consult the datasheets of the LCD panel and the controller chip in the LCD panel, to check the required values for the FT800’s display setting registers. Further details on these are given in the following section.
3 Display Parameters

The following figures show the relationship between the timing registers of the FT800 and the parameters which are typically used in an LCD panel datasheet.

![Diagram showing LCD Display Parameters]

**Figure 1** LCD Display Parameters

<table>
<thead>
<tr>
<th>FT800</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REG_HCYCLE</td>
<td>T_H</td>
<td><strong>Total</strong> length of line (visible and non-visible) (in PCLKs)</td>
</tr>
<tr>
<td>REG_HSIZE</td>
<td>T_HD</td>
<td>Length of <strong>visible</strong> part of line (in PCLKs)</td>
</tr>
<tr>
<td>REG_HOFFSET</td>
<td>T_HF  + T_HP  + T_HB</td>
<td>Length of <strong>non-visible</strong> part of line (in PCLK cycles)</td>
</tr>
<tr>
<td>REG_HSYNC0</td>
<td>T_HF</td>
<td>Horizontal Front Porch</td>
</tr>
<tr>
<td>REG_HSYNC1</td>
<td>T_HF  + T_HP</td>
<td>Horizontal Front Porch plus Hsync Pulse width</td>
</tr>
<tr>
<td>REG_VCYCLE</td>
<td>T_V</td>
<td><strong>Total</strong> number of lines (visible and non-visible) (in lines)</td>
</tr>
<tr>
<td>REG_VSIZE</td>
<td>T_VD</td>
<td>Number of <strong>visible</strong> lines (in lines)</td>
</tr>
<tr>
<td>REG_VOFFSET</td>
<td>T_VF  + T_VP  + T_VB</td>
<td>Number of <strong>non-visible</strong> lines (in lines)</td>
</tr>
<tr>
<td>REG_VSYNC0</td>
<td>T_VF</td>
<td>Vertical Front Porch</td>
</tr>
<tr>
<td>REG_VSYNC1</td>
<td>T_VF  + T_VP</td>
<td>Vertical Front Porch plus Vsync Pulse width</td>
</tr>
<tr>
<td>REG_PCLK</td>
<td>T_PCLK</td>
<td>48MHz / REG_PCLK = PCLK frequency</td>
</tr>
<tr>
<td>REG_PCLK_POL</td>
<td></td>
<td>PCLK polarity (0 = rising edge, 1 = falling edge)</td>
</tr>
<tr>
<td>REG_SWIZZLE</td>
<td></td>
<td>Defines the arrangement of the RGB pins of the FT800</td>
</tr>
</tbody>
</table>

**Table 1** Translating between FT800 and Display parameters
The following diagrams show how the timing parameters from Table 1 and Figure 1 above relate to the actual waveforms produced by the FT800.

Note that some display datasheets show the front porch (T_{HF}) at the left-hand side of the timing diagram (as shown below) and others show it at the right-hand side.

![Horizontal timing information](image1)

![Vertical timing information](image2)

**Figure 2 Timing Waveforms**

In addition to the Horizontal and Vertical settings, Table 1 also mentions the PCLK and Swizzle settings, as described below.

**PCLK**

The LCD datasheet will specify a range of allowable PCLK frequencies. The REG_PCLK register in the FT800 must be configured to set PCLK to a value within this range. For example, setting REG_PCLK to 5 will give a PCLK frequency of 48/5 = 9MHz.

The display datasheet will also indicate which edge of PCLK the data must be valid on. The FT800 supports either polarity through setting the REG_PCLK_POL.

**Swizzle**

The Swizzle setting allows the R/G/B video signals to be arranged to one of several different orders on the FT800’s RGB pins. This simplifies the process of laying out the PCB traces between the FT800 and the display. Ensure that the swizzle is set correctly for the actual connections on the PCB between the FT800 and LCD.
4 Conclusion

The FT800 supports a wide range of LCD panels thanks to the configurability of its video output timing. This application note provides information to help when selecting an LCD panel and also to illustrate the relationship between LCD datasheet parameters and the FT800’s display settings registers.
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Appendix A – References

Document References

1. FT800 Datasheet
2. FT800 Programmers Guide

Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Terms</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>EVE</td>
<td>Embedded Video Engine</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
</tr>
<tr>
<td>SPI</td>
<td>Serial Peripheral Interface</td>
</tr>
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</table>
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## Appendix C – Revision History

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<table>
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<th>Revision</th>
<th>Changes</th>
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<tbody>
<tr>
<td>1.0</td>
<td>Initial release</td>
<td>20014-07-15</td>
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