

FMC-HMI™ Reference Manual

Revised September 19, 2012

This manual applies to the FMC-HMI rev. B

Overview

The FPGA Mezzanine Card - Human Machine Interface (FMC-HMI) peripheral board enables developers to add a human interface to field-programmable gate array (FPGA) based systems. The FMC-HMI provides a development platform for customers to utilize image capture, touch digitizer and graphical user interface applications.

Features include:

- Aptina MT9D112 fixed-focus, 2Mp CMOS digital image sensor
- ADI SSM2603 audio codec with 3.5mm line in, microphone in, line out and headphone out jacks
- Shanghai Tianma TM050RBH01 5" 800x480 TFT LCD with integrated 4-wire touch panel
- Male FMC LPC connector for digital signals
- AMS header for analog signals
- 12-pin female Pmod header
- Piezoelectric buzzer
- Compatible with wide range of VADJ voltages (1.8V-3.3V)



The FMC-HMI.

1 Functional Description

The FMC-HMI captures light with the Aptina MT9D112 digital image sensor. This sensor provides a maximum resolution of 1600x1200 at 15 frames per second. The Aptina has a 10-bit raw color depth, an I²C control bus, and can utilize Bayer, RGB, and YCrCb output formats. This image sensor utilizes an automatic exposure, gain, and white balance with powerful image correction algorithms, image scaling, and a FIFO output.

1.1 Aptina MT9D112

The Aptina MT9D112 is a small (8.5mm x 8.5mm x 5mm) integrated System-on-Chip (SoC) assembly that includes a 2Mp complementary metal-oxide-semiconductor (CMOS) sensor array, a fixed-focus lens with a 3.81mm equivalent focal length, and an image processor. The sensor assembly comes taped to the board and connects through a 23-pin flexible printed circuit (FPC) cable.

Users can control the image processor via a standard two-wire interface. The FMC-HMI transfers image data via an 8-bit pixel bus with additional synchronization signals.

Note: Operators that desire more information on the Aptina MT9D112 should consult the

Aptina Imaging product information sheets at:

<http://www.aplina.com/products/soc/mt9d112d00stc/>

Or consult the Digiilent Inc. VmodCAM product reference manual at:

http://digiilentinc.com/Data/Products/VMOD-CAM/VmodCAM_rm.pdf

1.2 ADI SSM2603

The FMC-HMI features an Analog Devices Inc. SSM2603 Low Power Audio Codec that

provides simultaneous playback and recording capabilities to and from a variety of sources through standard audio jacks. Users control the audio with a standard two-wire interface and an I²S compatible bus presents the digital audio.

Note: For more information on the SSM2603 see ADI datasheets available online at:

<http://www.analog.com/en/audiovideo-products/audio-codecs/ssm2603/products/product.html>

1.3 Shanghai Tianma TM050RBH01

The Shanghai Tianma TM050RBH01 has a 5" light emitting diode (LED) backlit thin film transistor-liquid crystal display (TFT-LCD) assembly that integrates a resistive touch panel covering the whole active display area.

The TFT-LCD assembly arrives taped to the printed circuit board (PCB) and connects through a 45-pin FPC connector. The FPC cable carries both the digital display interface and analog touch panel signals.

The display interface is a straight-forward 24-bit RGB pixel bus. The support circuitry on-board the FMC-HMI provides backlight intensity control with pulse width modulation.

The four analog signals, X+, X-, Y+, Y- comprise the X and Y plate electrodes. To determine the touch coordinates, users must bias the plates and measure the resistive divider formed by the electrically charged resistive plates using an analog-to-digital converter (ADC) count. When operators use the Shanghai Tianma with system boards that have XADC support, they can use the AMS header to digitalize the analog touch panel signals. An on-board analog multiplexer (MUX) switch helps users select the correct panel electrodes for measurement.

Note: For more information on the TM050RBH01 consult the product details for the VmodTFT - Color LCD Touch Screen available online at:

<http://digiilentinc.com/Products/Detail.cfm?NavPath=2,648,979&Prod=VMOD-TFT>

1.4 FMC Support

The FMC-HMI uses a Samtec ASP-134604-01 low pin-count male connector as the main connector for digital signals. Everything except for the PCB dimension requirements conforms to the VITA 57.1 specs. The connector supports the full range of 1.8V-3.3V bank supply voltages (VADJ).

1.5 AMS Header

The AMS header is there to provide support for the XADC feature of seven-series system boards. Operators can use the AMS header signals to bias the touch panel by selecting the analog MUX inputs and carrying the differential analog signal to the FPGA pins for measurement.

1.6 12-pin Pmod Header

A female double Pmod connector offers users the option to connect various Pmods to the system board. Operators can utilize the ADG3308 auto-sensing bidirectional level translator to level shift from 3.3V to VADJ. It is important to note that due to its low drive current this level translation prohibits the use of strong pull resistors (<60kOhm) on data signals.

1.7 Piezoelectric Buzzer

A Kingstate Electronics Corp. KMTG1603-1 is beneath the screen to provide audible feedback for various frequencies.

Note: For more information on the KMTG1603-1 see Kingstate product information at:

<http://www.kingstate.com.tw/Products/Products/ProductItem/tabid/186/rtab/187/Default.aspx?ItemId=399>