Getting Started Guide

Version 1.1

HDMI Input/Output FMC Module

AVNET DESIGN KIT TECHNICAL SUPPORT FILES AND DOWNLOADS WEB ACCESS INSTRUCTIONS

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On your first visit to the DRC, You will be required to site register before you can download the documents. To get started, select the name of the manufacturer associated with your design kit from the drop down menu. A complete listing of available design kits will appear. Select the kit you purchased. Scroll to the bottom of the design kit page to access the support files. Before you download a file, you will be prompted to login. If you are an existing user, please login. If you are a new user, click on the "Need to sign-up?" text. Please complete the short registration form. Upon completion, be sure to retain your login and password information for future visits to Avnet's DRC. Logging in once gives you unlimited access to all technical support files and downloads. You will also have the chance to request email notifications whenever there are updates to your design kit.

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TABLE OF CONTENTS

ABOUT THIS GUIDE

This guide provides detailed directions for getting started with the HDMI Input/Output FMC Module.

Additional Documentation

To access the most current documentation for the HDMI Input/Output FMC Module, please visit the product website. http://www.em.avnet.com/fmc-imageon

The following documentation is also available from the manufacturers featured on this FMC module:

- ADV7511 HDMI Transmitter Resources

  - Product Information: http://www.analog.com/adv7511
  - Technical Resources on EngineerZone: http://ez.analog.com/docs/DOC-1740

- ADV7611 HDMI Receiver Resources

  - Product Information: http://www.analog.com/adv7611
  - Technical Resources on EngineerZone: http://ez.analog.com/docs/DOC-1745

Additional Support Resources

To contact Avnet Technical Support, please visit the product website, then click on the "Online Technical Support" button.

- http://www.em.avnet.com/fmc-imageon

To access the Avnet Technical Community Forums, please visit the following Web page:

- http://community.em.avnet.com/

To search the Xilinx database of silicon and software questions and answers, or to create a technical support case in WebCase, visit the Xilinx website. http://www.xilinx.com/support

Revision History

DATE	VERSION	REVISION
04/20/2012	1.0	Initial Release
08/20/2012	1.1	ISE® Design Suite 14.2: Embedded Edition Update

INTRODUCTION

The HDMI Input/Output FMC Module provides several high-definition video interfaces for Xilinx® FMC-enabled baseboards. An HDMI video source can provide video content to the module. The module also provides an HDMI output to display FPGA driven video content.

This Getting Started Guide will walk you through the steps to setup the HDMI Input/Output FMC Module and to run the out-of-the-box demonstration. The demonstration illustrates the basic hardware functionality of the HDMI Input/Output FMC Module.

What's Inside the Box

- HDMI Input/Output FMC Module (FMC-IMAGEON), featuring:
  - HDMI input
  - HDMI output
  - Video clock synthesizer
  - Interface for ON Semiconductor VITA-2000 Color Image Sensor Module

- Documentation
  - Getting Started with the HDMI Input/Output FMC Module

- Reference Designs
  - FMC-IMAGEON EDK Reference Design Tutorial
  - Creating a Video Design from Scratch Tutorial

What's Available Online

- HDMI Input/Output FMC Module Web page with documentation and reference designs
  - http://www.em.avnet.com/fmc-imageon

- Avnet Technical Support
  - Visit http://www.em.avnet.com/fmc-imageon and then click on the "Online Technical Support" button.

- Avnet Technical Community Forums
  - http://community.em.avnet.com

NOTE: This Getting Started Guide assumes that you already have the ISE® Design Suite installed on your computer.

GETTING STARTED

This HDMI Input/Output FMC Module comes with a 'Getting Started' demonstration, which is available for download from the Avnet Design Resource Center (DRC). If your FMC carrier is supported, you can run this demo to get familiar with the image sensor.

Overview of the Getting Started Reference Design

The FMC-IMAGEON EDK reference design illustrates the following capabilities of the HDMI Input/Output FMC Module:

- Driving video content on the HDMI output interface

- Receiving video content from the HDMI input interface

- Receiving video content from the VITA-2000 image sensor

- Processing the image sensor content with a simple image processing pipeline
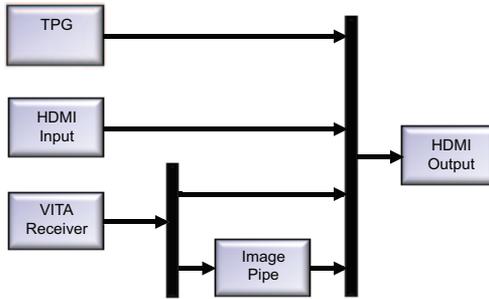
Figure 1: FMC-IMAGEON EDK Reference Design - Simplified Block Diagram

The HDMI output is configured via software for 1080p/60 video resolution.

Any one of the four video content sources can be selected to be driven to the HDMI output:

- Xilinx test pattern generator

- HDMI input

- VITA-2000 image sensor – unprocessed raw pixels

- VITA-2000 image sensor – processed with the simple image processing pipeline

For this Getting Started demonstration, we will not be using the VITA-2000 image sensor input.

Demo Software Requirements

The software required to use and run the demonstration is:

- Xilinx ISE® Design Suite 14.2: Embedded Edition

- Terminal emulator (HyperTerminal or TeraTerm)

Demo Hardware Requirements

- The bare minimum required to run this demonstration is:

  - HDMI (or DVI-D) monitor

- In order to demonstrate the HDMI input feature, the following additional hardware is required:

  - HDMI source (non-encrypted content) or DVI-D source

Download the FMC-IMAGEON EDK Reference Design Tutorial

Go to the HDMI Input/Output FMC Module product Web page.
http://www.em.avnet.com/fmc-imageon

At the bottom of this web page, click on the link "Support Files and Downloads."

To download the Getting Started design files, click on the link "FMC-IMAGEON – EDK Reference Design Tutorial." This will download the file, "FMC_IMAGEON_EDK_Reference_Design_Tutorial_{date}.zip" to your computer.

To install the Getting Started design files, unzip this file using the "Extract to Here" option and then extract the files to the root C: drive of your computer. The top-level folder name should be "FMC_IMAGEON." If this is not the name of the folder, then rename it. There are hard paths in the design files that require this exact naming convention.

Directory Structure

The FMC-IMAGEON EDK Reference Design Tutorial has the following directory structure:

- C:\FMC_IMAGEON\EDK\repository => EDK IP repository

- C:\FMC_IMAGEON\EDK\{carrier}_fmc_imageon_getting_started_hw => EDK project

- C:\FMC_IMAGEON\EDK\{carrier}_fmc_imageon_getting_started_sw => SDK project

- C:\FMC_IMAGEON\EDK\{carrier}_fmc_imageon_getting_started_bin => pre-built binaries

Where {carrier} refers to each of the FMC carriers supported by this demonstration.

Demo Setup Instructions

Each supported FMC carrier will have its own hardware setup instructions in the following text file:{carrier}_ fmc_imageon_getting_started_bin\{carrier}_fmc_imageon_readme.txt

This text file will describe:

- How to setup your FMC carrier, including which FMC slot you should use to populate the FMC-IMAGEON module

- How to load the demonstration design on your FMC carrier

Using the Application

After loading the design, you should see the following appear on your serial console:

```
-----------------------------------------------
--          Text-based Console for          --
-- FMC-IMAGEON Getting Started Demonstration  --
-----------------------------------------------
General Commands:
        help       Print the Top-Level menu Help Screen
        quit       Exit console (if applicable)
        verbose    Toggle verbosity on/off
        delay      Wait for specified delay
        mem        Memory accesses
I2C Commands
        iic0       IIC accesses on FMC-IPMI I2C chain
        iic1       IIC accesses on FMC-IMAGEON I2C chain
VITA Commands
        vita       VITA commands (init, status, ...)
        vspi       SPI accesses to VITA sensor
        vreg       Memory accesses to VITA receiver
        again      Analog gain (0-10)
        dgain      Digital gain (0-4095) where 128 corresponds
                   to 1.00
        exposure   Exposure time (1-99) in percentage of frame
                   period
Image Processing Pipeline Commands
        cfa        Color Filter Array Interpolation
                   configuration
Video Source Selection
        video      Select Video source (tpg, hdmi, vita)
        tpg        Test Pattern Generator configuation (menu)
------------------------------------------------------
AVNET>
```

At this point, the design has initialized the HDMI output interface for 1080p/60 video resolution. You should see a "zone plate" test pattern on your HDMI monitor.

The console supports several commands. The list of commands can be displayed with the "help" command. More information on each command can be displayed by typing the command and specifying "help" as a second argument. For example, to display help on the "video" command, type "video help."

If you have an HDMI source connected, you can enable this input with the "video hdmi" command, as shown below:

```
AVNET>video hdmi
Waiting for ADV7611 to locked on incoming video ...
        ADV7611 Video Input LOCKED
ADV7611 Video Input Information
        Video Input     = HDMI, Progressive
        Color Depth     = 8 bits per channel
        HSYNC Timing    = hav=1920, hfp=88, hsw=44(hsp=1),
        hbp             = 148
        VSYNC Timing    = vav=1080, vfp=04, vsw=05(vsp=1),
        vbp             = 036
        Video Dimensions = 1920 x 1080
Setting Video Multiplexer to HDMI Input (HDMI)
FMC-IMAGEON HDMI Output Initialization ...
```

At this point, you should see the contents of your HDMI source on the HDMI monitor.

Congratulations!

You have now run the Getting Started demonstration with the HDMI Input/Output FMC Module. Using this fully functional reference design, you may now develop video applications.

Note:
Spread Spectrum Clocking (SSC) is used on the FMC-IMAGEON module's HDMI output interface (HDMIO_CLK) to reduce radiated emissions to industry approved levels. This can be implemented using the SSC feature of the on-board TI CDCE913 video clock synthesizer.

NEXT STEPS

Tutorials

The additional tutorials for the HDMI Input/Output FMC Module are available from the Avnet website for download.

FMC-IMAGEON EDK Reference Design Tutorial

- Generate a 1080p/60 video test pattern

- Configure the HDMI output interface

- Configure the HDMI input interface

- Configure the VITA image sensor

Creating a Video Design from Scratch Tutorial

- Create a video design from scratch

Getting Help and Support

For questions regarding products within a Product Entitlement Account, send an email message to the regional customer services representative.

- Canada, USA and South America — isscs_cases@xilinx.com

- Europe, Middle East and Africa — eucases@xilinx.com

- Asia Pacific including Japan — apaccase@xilinx.com

For technical support, including the installation and use of a product license file, contact Xilinx Online Technical Support at http://www.support.xilinx.com. This website also provides the following support resources:

- Software, IP and documentation updates

- Access to technical support Web tools

- Searchable answer database with over 4,000 solutions

- User forums

- Training — Select instructor-led classes and recorded e-learning options

Contact Avnet Technical Support for any questions regarding the HDMI Input/Output FMC Module hardware or reference designs. http://www.em.avnet.com/fmc-imageon

GS-AES-FMC-IMAGEON-G-14.2-v1.1-v1