



# MicroZed Embedded Vision Carrier Card Getting Started Guide



Version 1.0  
December 04, 2014

## Revision History

Version	Description	Date
1.0	Initial Version	December 04, 2014

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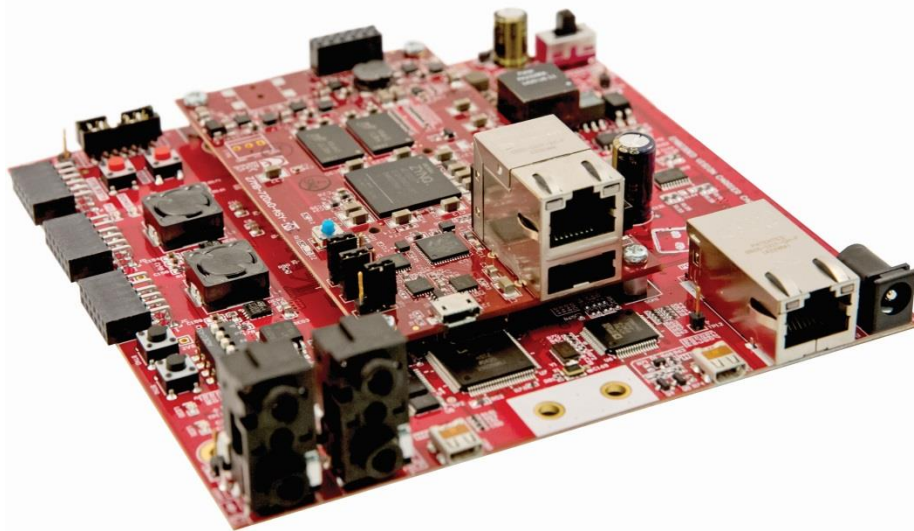
## Getting Started with the Zynq Embedded Vision Carrier Card

The MicroZed™ Embedded Vision Carrier Card builds on the MicroZed SOM by providing a video specific carrier card, which includes on-board HDMI input/output interfaces and a camera connector for optional camera modules.

The MicroZed Embedded Vision Carrier Card is available in one of two kits:

- MicroZed Embedded Vision **Carrier Card Kit**
  - o Without a MicroZed SOM, for users who already have a MicroZed SOM
- MicroZed Embedded Vision **Development Kit**
  - o Which includes a MicroZed 7020 SOM, and Vivado license voucher

The kits provide hardware, software and IP components necessary for the development of custom video applications.



**Figure 1 – MicroZed Embedded Vision Carrier Card Board shown with MicroZed mounted**

This *Getting Started Guide* will outline the steps to setup the MicroZed SOM and Embedded Vision Carrier Card hardware. It documents the procedure to run a simple bare-metal design running on the ARM® dual-core Cortex™-A9 MPCore™ Processing System (PS) that interacts with the HDMI input and output interfaces , and implements a simple pass-through in the Programmable Logic (PL) I/Os.

## What's Inside the Box?



Figure 2 – MicroZed Embedded Vision Development Kit Contents

### MicroZed Embedded Vision Carrier Card Kit contents

- Embedded Vision Carrier Card
- 5V power supply
- microHDMI to HDMI cables (2)
- microUSB to USB cable
- Ethernet cable
- 4GB microSD Card
- Tripod adapter
- Tripod
- Quick Start Card
- Downloadable documentation and reference designs

### MicroZed Embedded Vision Development Kit contents

- same contents as the MicroZed Embedded Vision Carrier Card Kit, in addition to:
- MicroZed 7020
- Xilinx Vivado® Design Edition license voucher (device locked to 7Z020)

## What's on the Web?

MicroZed is a community-oriented kit, with all materials being made available through the [MicroZed.org](http://MicroZed.org) community website.

### Official Documentation:

- Getting started guide
- Hardware user guide
- Schematics
- Bill of materials
- Layout
- PCB net lengths
- Mechanical drawing
- 3D Model

### Tutorials and Reference Designs:

- Tutorials, including:
  - MicroZed Embedded Vision Carrier Card – HDMI IP & Tutorials
- Design examples
- Community projects

For the latest tutorials and reference designs:

1. Go to [www.microzed.org](http://www.microzed.org)
2. Click **Support** → [Reference Designs/Tutorials](#)
3. Click on MicroZed Embedded Vision Carrier Card's **View All** button.

### Training and Videos:

- Overview of MicroZed
- Introduction to Zynq
- Implementing Linux on the Zynq-7000 SoC

For the latest training and videos:

1. Go to [www.microzed.org](http://www.microzed.org)
2. Click **Support** → [Trainings and Videos](#)

## MicroZed Embedded Vision Carrier Card - Key Features

- HDMI Input/Output Interfaces
  - HDMI Input, featuring Analog Devices ADV7611
  - HDMI Output, featuring Analog Devices ADV7511
- Camera Interface, supporting optional camera modules
  - Go to [www.microzed.org](http://www.microzed.org)
  - Click **Products** → **MicroZed Embedded Vision Carrier Card** → **Camera Modules**
- Power Over Ethernet (PoE) Interface
  - PoE Interface, featuring ST Microelectronics PM8803
- Expansion connectors
  - Three Digilent Pmod™ compatible interfaces
    - Access to 24 user I/O
    - One (8 I/O) connected to PS MIO
    - Two (16 I/O) connected to PL, supporting the Zed Touch Display Kit
- Configuration and Debug
  - Xilinx Platform Cable JTAG connector
- General Purpose I/O
  - 2 user LEDs
  - 2 push buttons
- Memory
  - 2 Kb MAC ID EEPROM

September 22, 2014

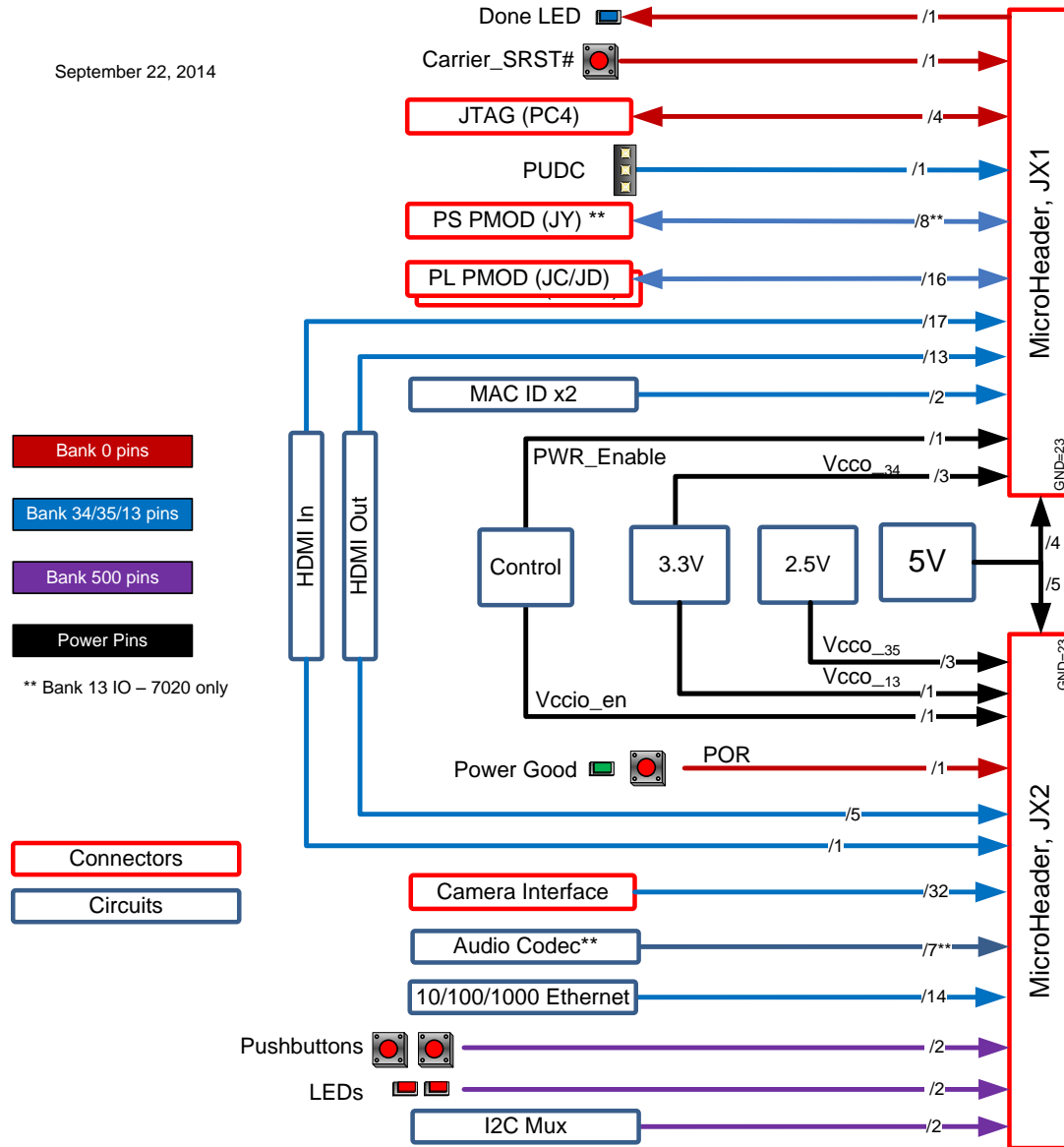


Figure 3 – MicroZed Embedded Vision Carrier Card - Block Diagram



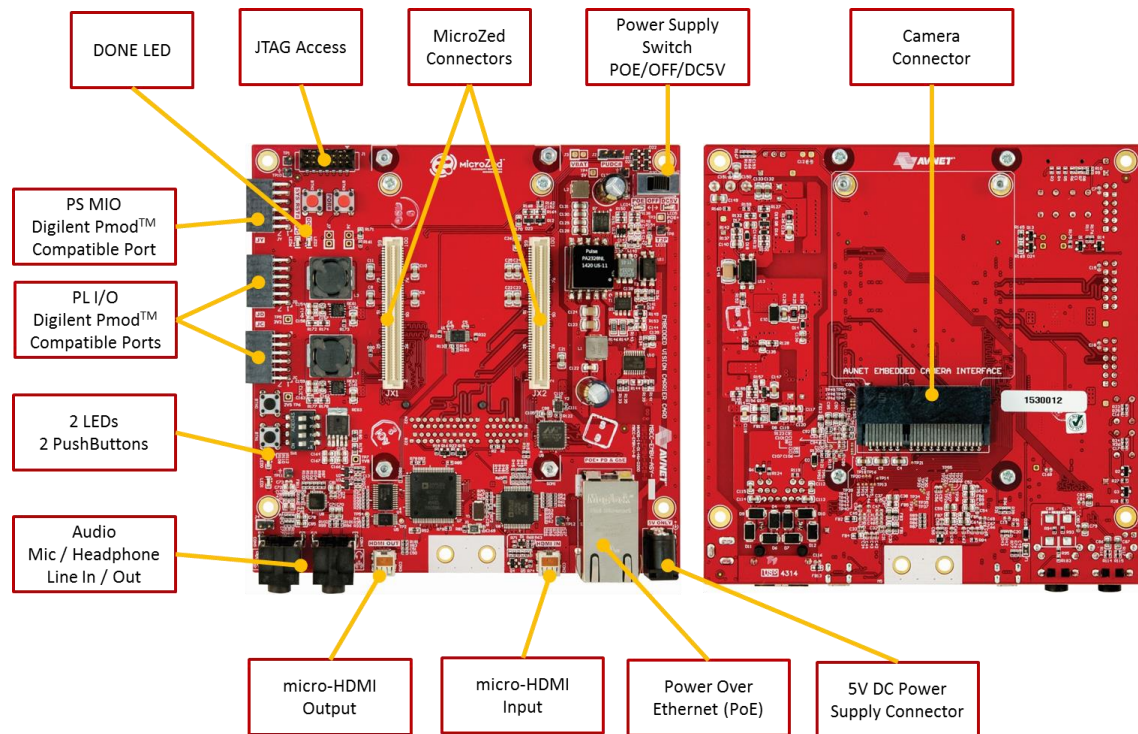
## MicroZed Embedded Vision Carrier Card - Basic Setup and Operation

The operation of the MicroZed Embedded Vision Carrier Card (EMBV) is determined by the MicroZed module. The functionality of both the MicroZed and the EMBV is determined by the application booted from the selected non-volatile memory on the MicroZed itself. Therefore, it is not possible to ship the EMBV with any pre-configured design. This must be loaded by the user into the MicroZed.

This *Getting Started Guide* offers system developers examples of how to do several things with the MicroZed and EMBV together:

1. Initialize the HDMI I/O interfaces from the processor system (PS) via I2C
2. Implement a HDMI pass-through in the programmable logic (PL).
3. Boot the example design from MicroZed's microSD Card

An image of the EMBV in its expected out-of-box configuration is shown below along with the locations of several key components.



**Figure 4 – MicroZed Embedded Vision Carrier Card – Topology**

## Test your DVI-D or HDMI equipment

Before running the Example Design provided with this Getting Started Guide, test your DVI-D and/or HDMI equipment.

1. Connect your DVI-D or HDMI source to your DVI-D or HDMI monitor
2. Verify that you can see the video source on your monitor
3. Using the menu settings on your DVI-D or HDMI monitor to validate the video resolution of your DVI-D or HDMI source. Make sure that it is generating one of the following supported video resolutions

Resolution	Pixel Rate (MHz)	Frame Dimensions	Frame Rate
1080P60	148.5 MHz	1920 x 1080	60 Hz
SXGA	110 MHz	1280 x 1024	60 Hz
720P60	74.25 MHz	1280 x 720	60 Hz
XGA	65 MHz	1024 x 768	60 Hz
SVGA	40 MHz	800 x 600	60 Hz
576P50	27 MHz	720 x 576	50 Hz
480P60	27 MHz	720 x 480	60 Hz
VGA	25.175 MHz	640 x 480	60 Hz

**Table 1 – Supported Video Resolutions**

## Mounting the MicroZed

The EMBV Kit includes mounting hardware that allows you to more permanently secure your MicroZed to the EMBV. This can be done now, but it is not required.

1. Insert one of the screws through the top of one of the mounting holes on the MicroZed.
2. Twist a stand-off onto the screw.
3. Repeat for the other three mounting holes.
4. Plug the MicroZed onto the EMBV.
5. From the bottom-side of the EMBV, use the screws to attach to the standoffs through the EMBV mounting holes.

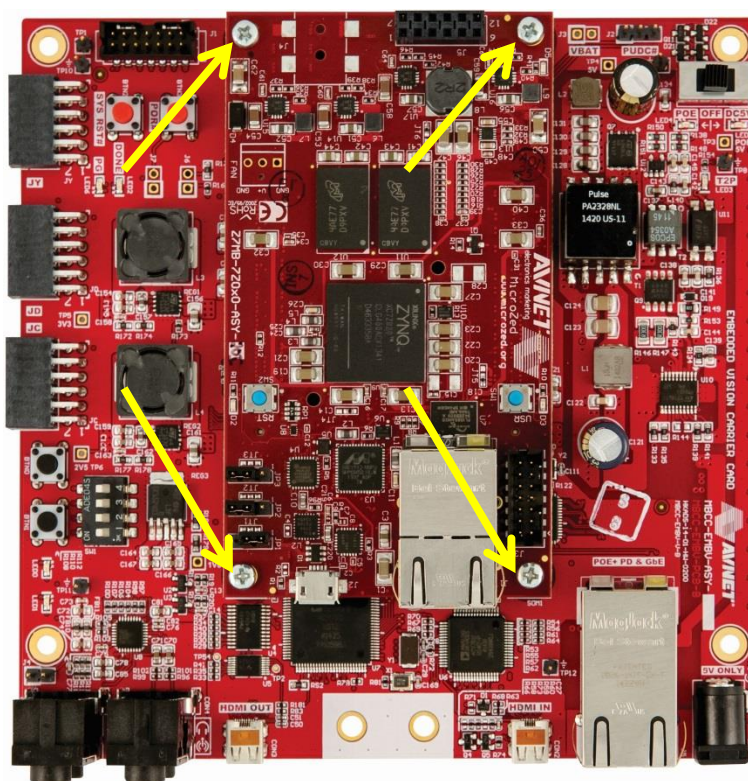
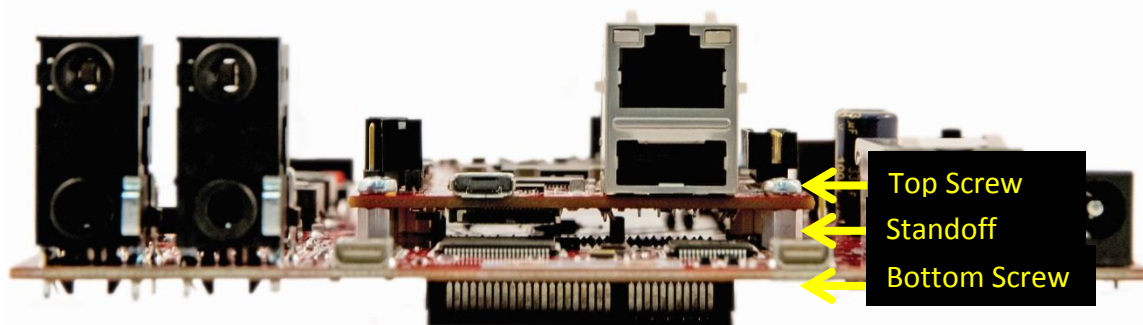


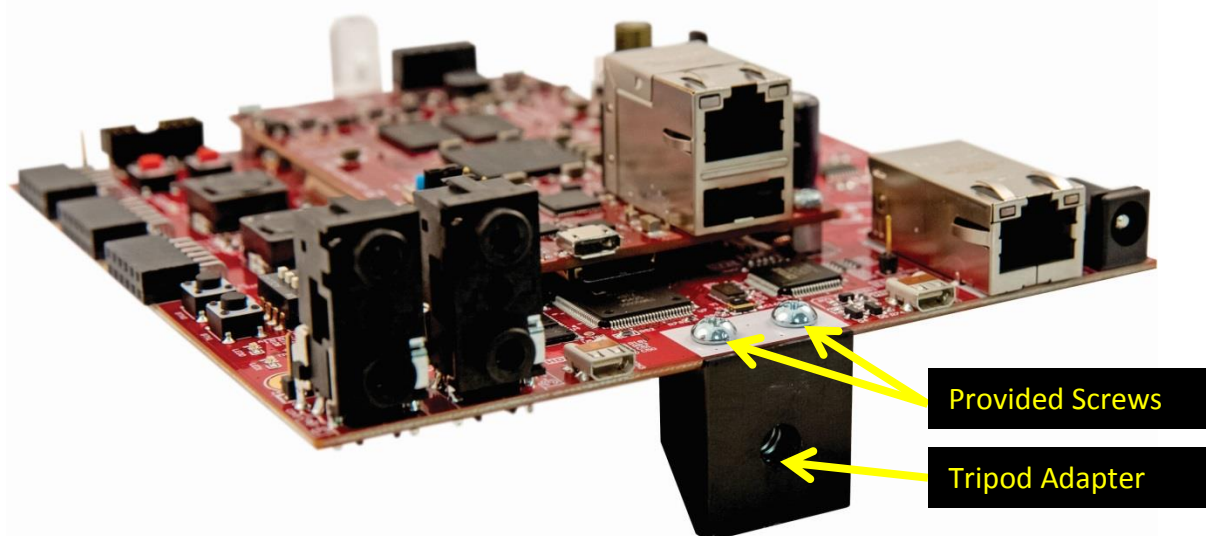
Figure 5 – Location of Four Mounting Holes



**Figure 6 – Sideview Showing Top Screw, Standoff, and Bottom Screw**

The EMBV Kit can be mounted on a tripod that is provided with the kit.

1. Attach the tripod adapter to the bottom side of the EMBV, and Insert the two provided screws through the top of the mounting holes on the EMBV.



**Figure 7 – Attaching Tripod Adapter to EMBV**



2. Attach the tripod to the tripod adapter, as shown in the following image.

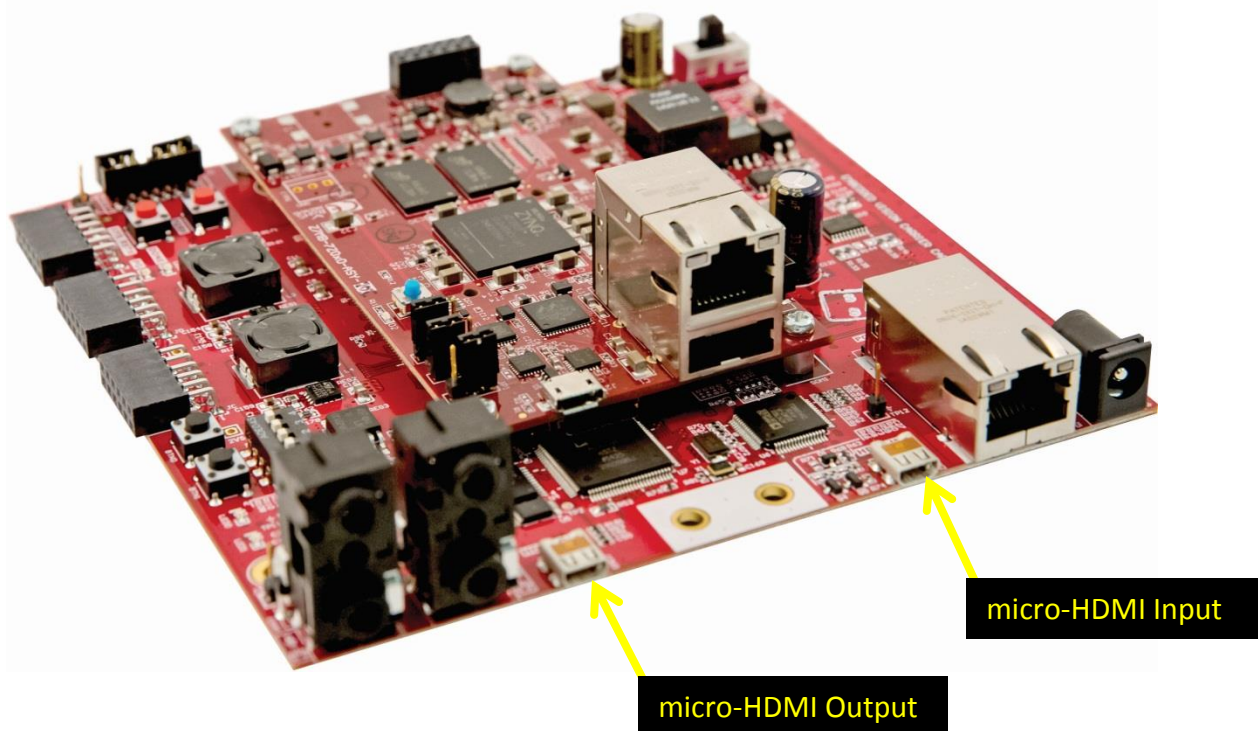


**Figure 8 – Attaching Tripod to Tripod Adapter**

## Example Design

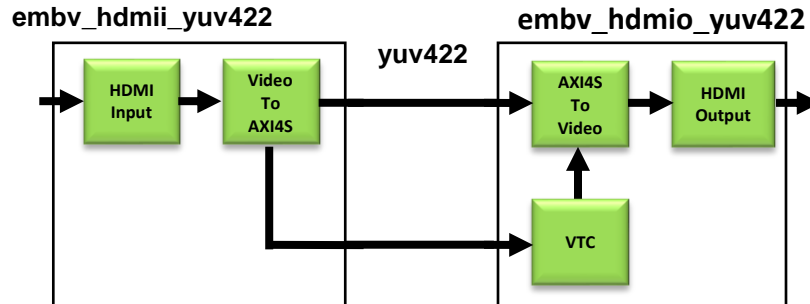
The example EMBV design is based on the **MicroZed Embedded Vision Carrier Card - HDMI IP and Tutorials** which is available at [www.microzed.org](http://www.microzed.org) Reference Design/Tutorials. For more information on how to build this design, please review the tutorial document included with that archive.

The example design uses the Zynq processing system (PS) to initialize the HDMI interfaces via an I2C controller. The design also implements a simple video pass-through inside the programmable logic (PL). The micro-HDMI connectors of interest are highlighted in the photo below.



**Figure 9 – micro-HDMI connectors for Example Design**

The following figure illustrates the block diagram for the hardware design implementing the HDMI pass-through.



**Figure 10 – HDMI Pass-through - Hardware Design**

The Getting Started Guide archive contains this document, as well as a sd\_image directory containing the SD boot images for the MicroZed 7010 SOM and the MicroZed 7020 SOM.

Directory\Filename	Description
sd_image\microzed_7010\BOOT.bin	SD boot image for use with MicroZed 7010 SOM
dd_image\microzed_7020\BOOT.bin	SD boot image for use with MicroZed 7020 SOM

**Figure 11 – Contents of “sd\_image” Sub-directory**

## Hardware Setup

1. The microSD card must be formatted as FAT32. If this has not been previously done, please do that now. Refer to [Appendix A: Format the microSD Card](#) for specific instructions.
2. A terminal program is required. Windows 7 does not come pre-installed with a terminal program. Tera Term was used in this example which can be downloaded from the Tera Term project on the SourceForge Japan page: [ttssh2.sourceforge.jp](http://ttssh2.sourceforge.jp) Install Tera Term or another terminal program of your choice.
3. If not previously installed, go to [www.microzed.org](http://www.microzed.org) to download and install the Silicon Labs CP2104 USB-to-UART driver.  
[www.microzed.org/documentation/1519](http://www.microzed.org/documentation/1519)  
*Silicon Labs CP210x USB-to-UART Setup Guide*
4. Delete all files from the microSD card so we have an empty starting point. Copy all the files from one of the **sd\_image/7010** or **sd\_image/7020** directories (depending on your MicroZed SOM) to the top level of the microSD card.
5. Once the files are copied to the microSD card, eject the microSD card from the PC or SD card reader.
6. Insert the microSD card into the microSD card slot (J6) located on the underside of MicroZed module.

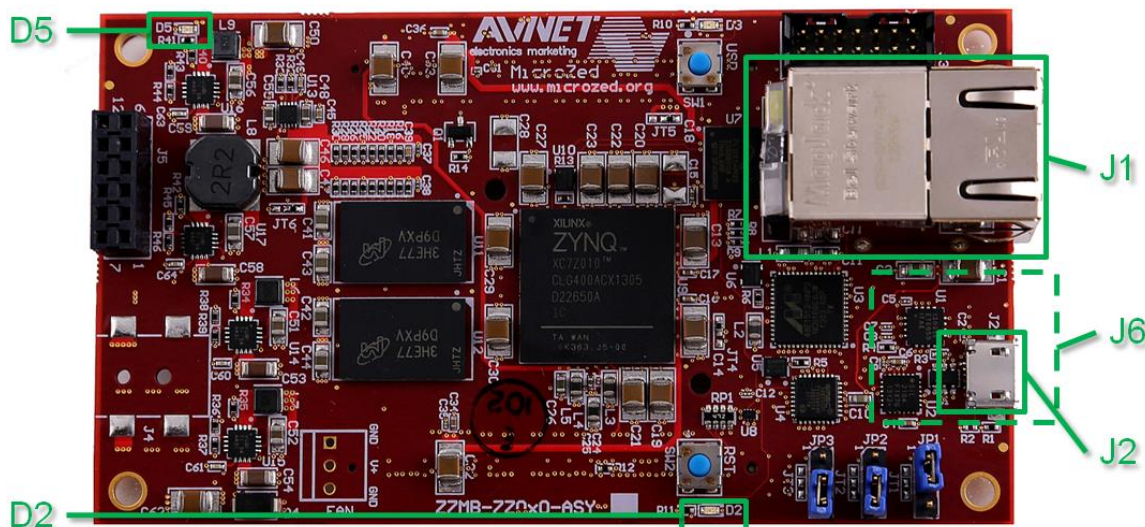


Figure 12 – MicroZed Hardware Reference



7. Set the MicroZed boot mode (JP3-JP1) jumpers to SD card mode as described in the Hardware Users Guide.

### SD Card



**Figure 13 – SD Card Boot Jumper Settings**

8. Make sure the EMBV power switch is in the OFF position.
9. Insert the MicroZed module onto the EMBV.
10. Connect a non-encrypted video source to the micro-HDMI connector labelled "HDMI Input"
11. Connect a DVI or HDMI monitor to the micro-HDMI connector labelled "HDMI Output".
12. Insert the appropriate country plug into the 5V DC Power Supply AC/DC adapter. Plug it into the 5V DC Power Supply Connector.
13. We will be using a micro-USB cable to communicate through a terminal, but this will be plugged in a bit later.

## Running the Example

15. Turn the power switch on the EMBV to the 5VDC position. After a few seconds, you will notice five LEDs that are lit:

- LED5 on EMBV, indicating 5V
- LED6 on EMBV, indicating Power Good
- D5 on MicroZed, indicating Power Good
- D2 on MicroZed, Zynq PL configuration DONE
- LED2 on EMBV, Zynq PL configuration DONE

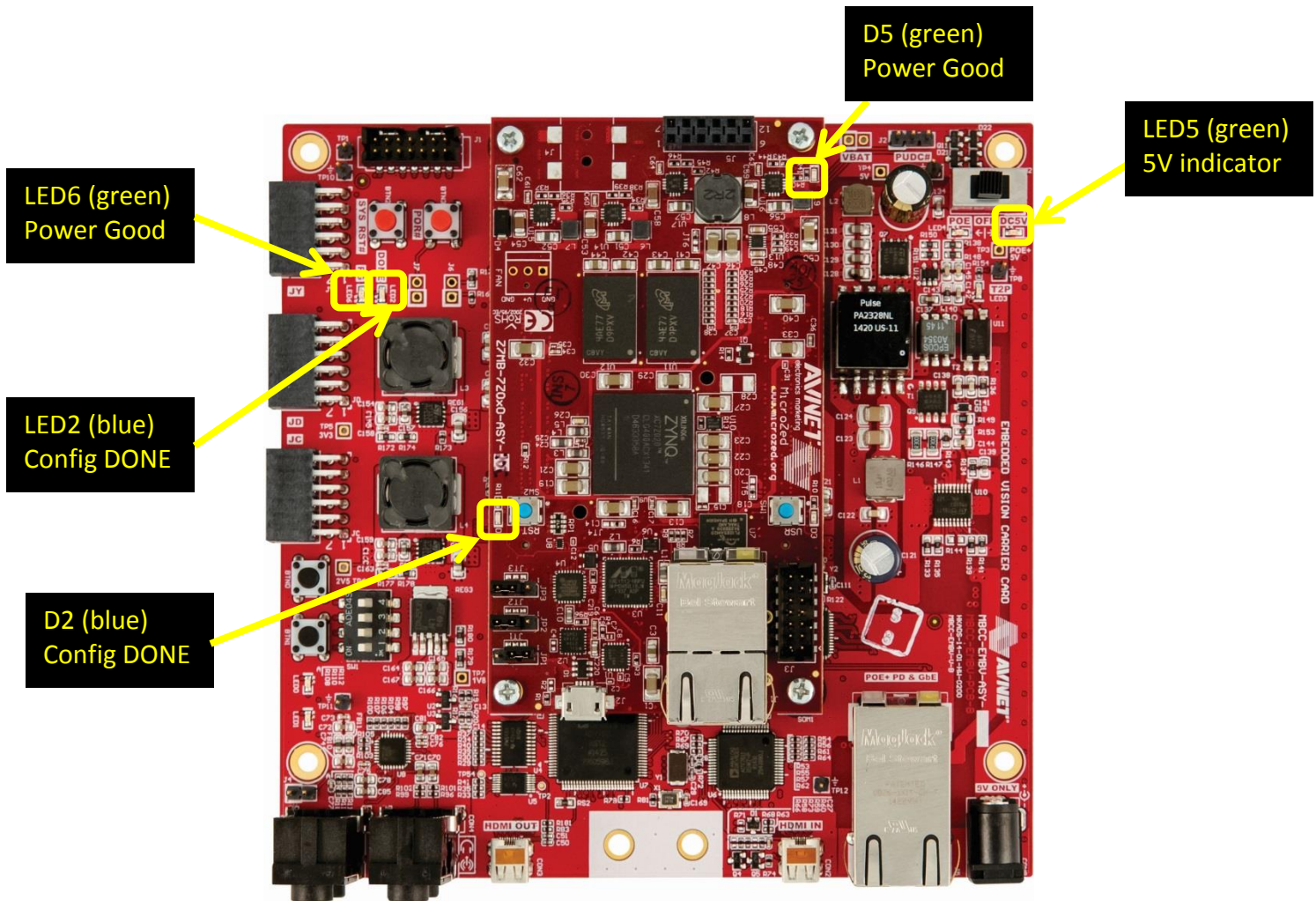
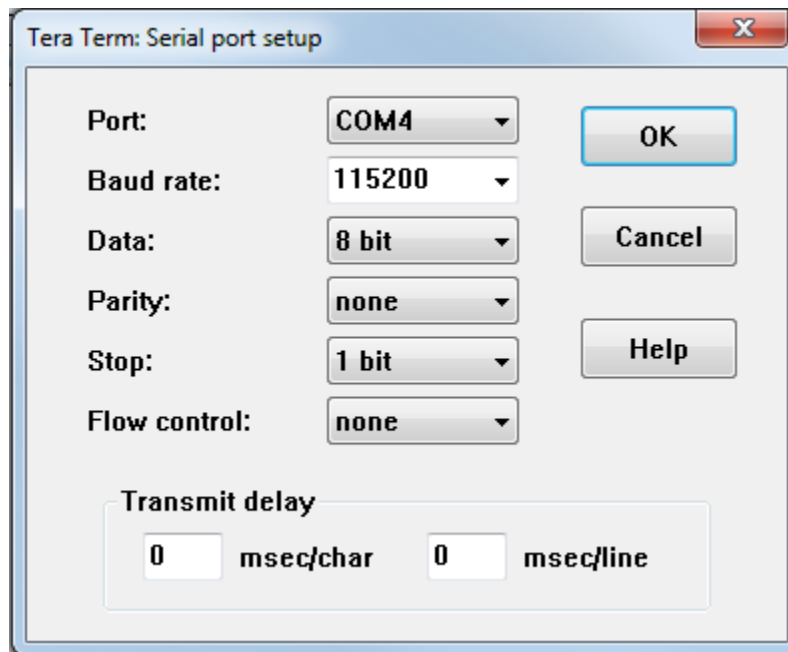


Figure 14 – MicroZed / EMBV Powered On with LEDs

16. Now plug in the microUSB cable between the PC and the J2 USB-UART connector on MicroZed.
17. On the PC, open a serial terminal program. Tera Term is used to show the example output for this lab document. Follow the instructions in the CP210x Setup Guide to set the terminal as shown in Figure 15, using the appropriate COM port that you discover on your own machine.



**Figure 15 – Connect Tera Term to the proper COMx port**

18. Perform a System Processor Reset by pushing the SYS\_RST# button (SW1) on the EMBV. The terminal output displays feedback from the bare-metal example application.

```

-----
--          Embedded Vision Carrier Card          --
--          HDMI Pass-Through                     --
-----

HDMI Input Initialization ...
    LLC polarity = 0
    LLC delay = 0
HDMI Input locked!!
System Ready!

Press ENTER to re-start ...
    
```

**Figure 16 – HDMI Pass-through – Serial Console Output**

You will observe the content of your video source on the DVI/HDMI monitor.

You have successfully executed the HDMI pass-through on hardware !

To re-initialize the HDMI interfaces, press the <ENTER> key.

To further examine this reference design, please refer to the tutorial document included in the **MicroZed Embedded Vision Carrier Card - HDMI IP and Tutorials**. To complete this tutorial, you will need to install Xilinx development tools. For instructions on installing the Xilinx software, please refer to [Appendix B: Installing and Licensing Xilinx Software](#).

## Getting Help and Support

### Avnet Support

MicroZed is a versatile development kit and a SOM ready to be adopted into your next design. All technical support is offered through the [MicroZed.org](http://MicroZed.org) website support forums. MicroZed users are encouraged to participate in the forums and offer help to others when possible.

For questions regarding the MicroZed community website, please direct any questions to:

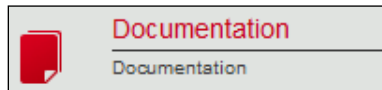
MicroZed.org Web Master – [webmaster@microzed.org](mailto:webmaster@microzed.org)

To access the most current collateral for MicroZed please visit the community support page at:

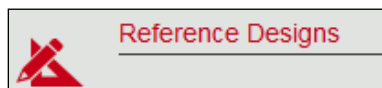
[www.microzed.org/content/support](http://www.microzed.org/content/support)

Once on the [MicroZed.org](http://MicroZed.org) support page:

To access the latest MicroZed documentation, click on the Documentation link:



To access the latest reference designs for MicroZed, click on the following link:



To access the MicroZed technical forums, click on the following link:



## Xilinx Support

For questions regarding products within the Product Entitlement Account, send an e-mail message to the Customer Service Representative in your region:

Canada, USA and South America - [isscs\\_cases@xilinx.com](mailto:isscs_cases@xilinx.com)

Europe, Middle East, and Africa - [eucases@xilinx.com](mailto:eucases@xilinx.com)

Asia Pacific including Japan - [apaccase@xilinx.com](mailto:apaccase@xilinx.com)

For technical support including the installation and use of the product license file, contact Xilinx Online Technical Support at [www.xilinx.com/support](http://www.xilinx.com/support). The following assistance resources are also available on the website:

- Software, IP and documentation updates
- Access to technical support web tools
- Searchable answer database with over 4,000 solutions
- User forums

## Appendix A: Format the microSD Card

The MicroZed Evaluation Kit ships with a blank microSD card. To ensure it is ready to be used in Linux and later as a boot source, it must be properly formatted. To use the microSD card as a boot device, it must be formatted as FAT32.

The following operations were performed on a Windows 7 PC using a built-in SD Card slot. If an SD Card slot is not available on your PC, you will need to purchase an SD Card device or a USB-based microSD adapter.

1. Insert the microSD card into the included SD Adapter.
2. Insert the SD adapter into the SD Card slot and wait for it to enumerate as a Windows drive. If prompted by Windows when inserting the SD card, select the **Continue without scanning** option.

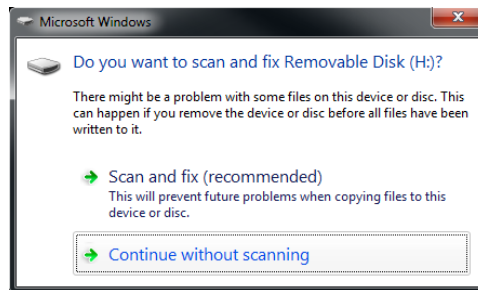
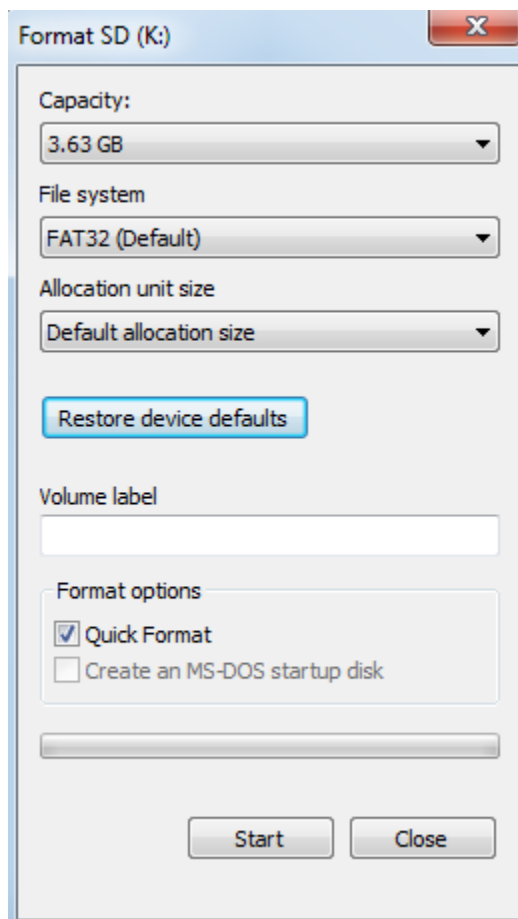


Figure 17 – Windows Prompt for Scanning and Fixing an SD Card

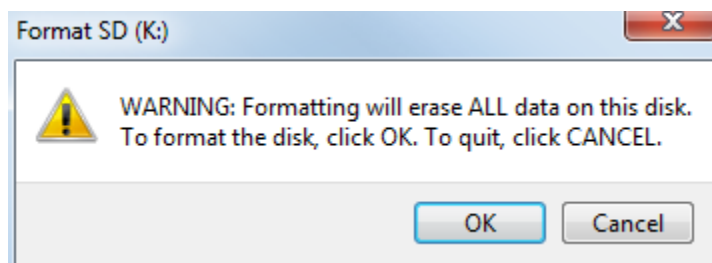
3. Find the assigned SD Drive in Windows Explorer.
4. Right-click and select **Format**.

5. Select the *File System* to be FAT32. The *Allocation unit size* can be set to **Default**. Click **Start**.



**Figure 18 – Format the microSD Card**

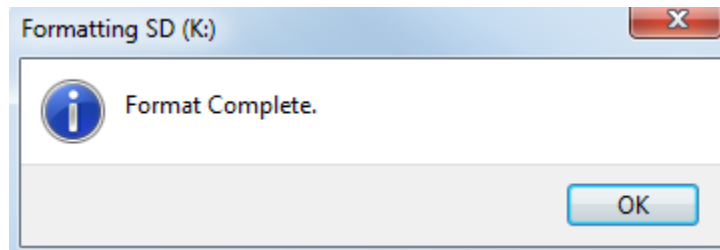
6. As stated in the warning dialog, formatting will erase all data on the disk. Click **OK**.



**Figure 19 – Formatting Will Erase**

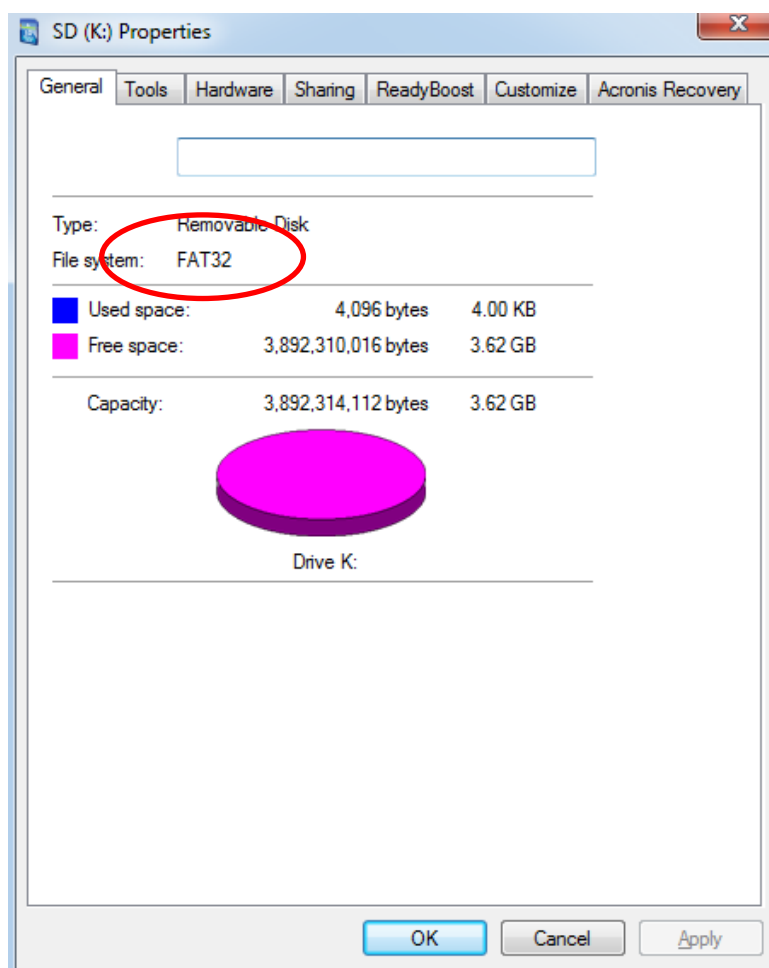


7. If all goes well, you will get a message stating **Format Complete**. Click **OK**.



**Figure 20 – Format Complete**

8. Click **Close** in the Format dialog box.
9. To double-check your card, right-click on the drive in Windows Explorer and select **Properties**. Notice the *File system* displayed as **FAT32**. Click **OK** to close.



**Figure 21 – Properties of the microSD Drive**

## Appendix B: Installing and Licensing Xilinx Software

### Install Vivado Design Edition

The MicroZed XC7Z020-CLG400-1 Zynq-7000 AP SoC device development is supported by Vivado WebPACK licensing. The MicroZed Evaluation Kit also comes with an entitlement voucher to a seat of Vivado Design Edition which is device locked to a XC7Z020-CLG400-1 Zynq-7000 AP SoC device. The Design Edition software is an advantage over WebPACK as it adds the Logic Analyzer capability. See [http://www.xilinx.com/products/design\\_tools/vivado/vivado-webpack.htm](http://www.xilinx.com/products/design_tools/vivado/vivado-webpack.htm)

This software can be downloaded online at:  
[www.xilinx.com/support/download/index.htm](http://www.xilinx.com/support/download/index.htm)

You can also request a free DVD from  
[www.xilinx.com/onlinestore/dvd\\_fulfillment\\_request.htm](http://www.xilinx.com/onlinestore/dvd_fulfillment_request.htm)

If a full seat of Vivado System Edition has already been installed, then no further software will be needed. Please check online for any updates at:  
[www.xilinx.com/support/download/index.htm](http://www.xilinx.com/support/download/index.htm)

For detailed instructions on installing and licensing the Xilinx tools, please refer to the **Vivado Design Suite User Guide Release Notes, Installation, and Licensing (UG973)** available on the Xilinx website:  
[http://www.xilinx.com/support/documentation/sw\\_manuals/xilinx2014\\_2/ug973-vivado-release-notes-install-license.pdf](http://www.xilinx.com/support/documentation/sw_manuals/xilinx2014_2/ug973-vivado-release-notes-install-license.pdf)