

# Application Note



## Camera to Touchscreen Demonstration for MicroZed 7020 carrier board, Avnet 7-inch Zed Touch Display and Avnet Toshiba Industrial 1080P60 Camera Module

Designed with Xilinx Vivado 2015.2 and SDK 2015.2 design  
flow

Raissa Likhonina, Lukáš Kohout, Jiří Kadlec  
[likhonina@utia.cas.cz](mailto:likhonina@utia.cas.cz), [kohoutl@utia.cas.cz](mailto:kohoutl@utia.cas.cz), [kadlec@utia.cas.cz](mailto:kadlec@utia.cas.cz)

### Revision history

Rev.	Date	Author	Description
0	28.04.2016	R. Likhonina	Initial version for Vivado 2015.2
1			
2			

## Contents

1	Introduction.....	1
2	Description.....	1
2.1	Avnet 7-inch Zed Touch Display .....	1
2.2	Avnet Toshiba Industrial 1080P60 Camera Module .....	1
2.3	Camera-to-touchscreen demo.....	1
3	Required HW Resources .....	2
4	Demonstrator Startup.....	5
5	Package contents .....	6
6	References .....	6

## Acknowledgement

This work has been supported from project ALMARVI, project number ARTEMIS JU 621439 and MSMT 7H14004.

## 1 Introduction

This document describes a camera-to-touchscreen demonstrator, which has been created using MicroZed 7020 carrier board, Avnet 7-inch Zed Touch Display and Avnet Toshiba Industrial 1080P60 Camera Module. The Camera Module sends full HD (1080p high-definition) image at 60 fps, which is processed by MicroZed 7020 carrier board and transferred to the 7-inch LCD display with active area 800x480 pixels. Thus, there is a part of full HD image displayed on the LCD display. The full image can be looked through moving along the active area by touching the screen (see Fig. 1).

## 2 Description

This application note describes a camera-to-touchscreen demonstrator, which has been created in Xilinx Vivado 2015.2 and SDK 2015.2 design flow.

### 2.1 Avnet 7-inch Zed Touch Display

The 7-inch Zed Touch Display Kit has a WVGA (800x480) TFT-LCD panel with an industrial projective capacitive touch sensor, I2C-based touch controller, ALI3 Sharp7 adapter, LED backlight, 12V power supply. It has the following characteristics [1]:

- Active area: 800x480;
- Frame rate: 60 Hz;
- Pixel rate: 33.333333 MHz;
- Pixel format: 24 bits RGB.

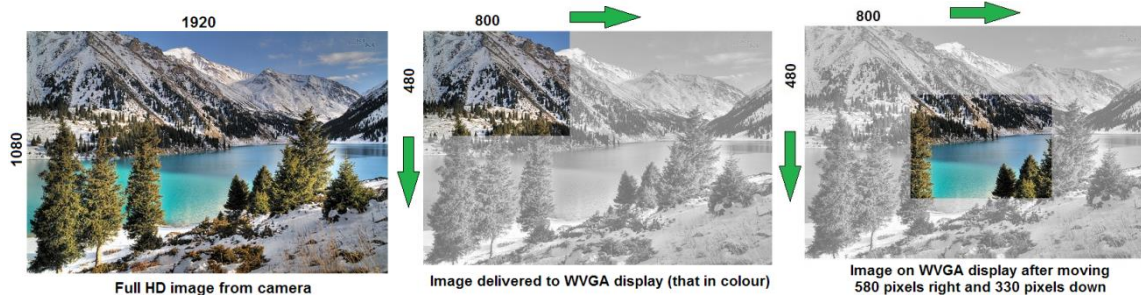
### 2.2 Avnet Toshiba Industrial 1080P60 Camera Module

The camera module includes TCM3232PB full HD image sensor, which utilizes High Dynamic Range (HDR) and Color Noise Reduction (CNR) technologies. The sensor delivers high-quality video at 60 fps. The color image sensor has the following features [5]:

- Full HD Resolution: 1920 (H) x 1080 (V) format, progressive;
- 60 Frames Per Second (fps) at Full Resolution;
- 2.7um x 2.7um Pixel Size;
- 1/3 inch Optical Format;
- Wide High Dynamic Range (100dB HDR);
- Very Wide Operating Temperature Range (-20 to 60degC).

### 2.3 Camera-to-touchscreen demo

The camera-to-touchscreen demo shows how to get full HD color image from Toshiba Industrial 1080p60 Camera Module to the 7-inch Zed Touch Display with resolution 800 x 480 (WVGA) and to move along the image by touching the screen. This demo works with video signal 1920x1080p60 with pixel clock at 148.5 MHz. The 7-inch Zed Touch LCD uses pixel clock at 33.333333 MHz and output signal in RGB format. By touching the screen you can move along the full HD color image delivered by the camera module and part by part examine the whole picture captured by the camera (see Fig. 1).



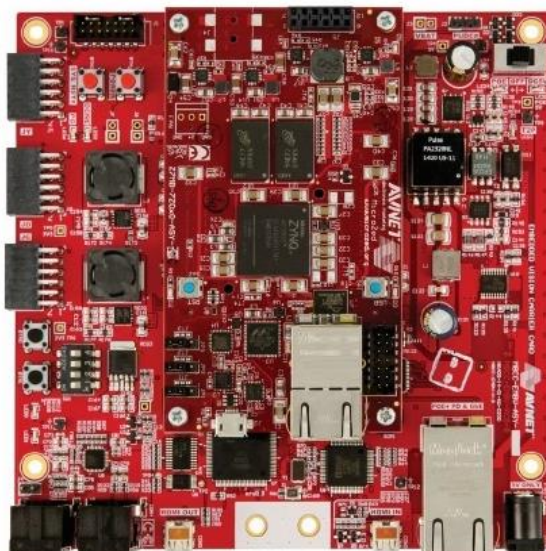
**Fig 1: Moving through the image by touching the screen (Image taken from <http://demiart.ru/forum/journal.php?user=46610&comm=68192>)**

### 3 Required HW Resources

The list below presents required HW components to run the demo:

- MicroZed Embedded Vision Carrier Card and MicroZed 7020 carrier board [2], Fig. 2
- Avnet 7-inch Zed Touch Display [1], Fig. 3.
- Avnet Toshiba TCM3232PB full HD color image sensor [3], [4], Fig. 4 and Fig. 5.

Complete demo kit is illustrated in Fig. 6.



**Fig. 2: MicroZed mounted on EMBV [4; 8]**



Fig. 3: Avnet's 7-inch Zed Touch Display Kit [1; 7]



Fig. 4: Toshiba Industrial 1080P60 Camera Module [4; 5]



**Fig. 5: Toshiba Industrial 1080P60 Camera Module, mounted on the MicroZed Embedded Vision Carrier Card [4; 4]**



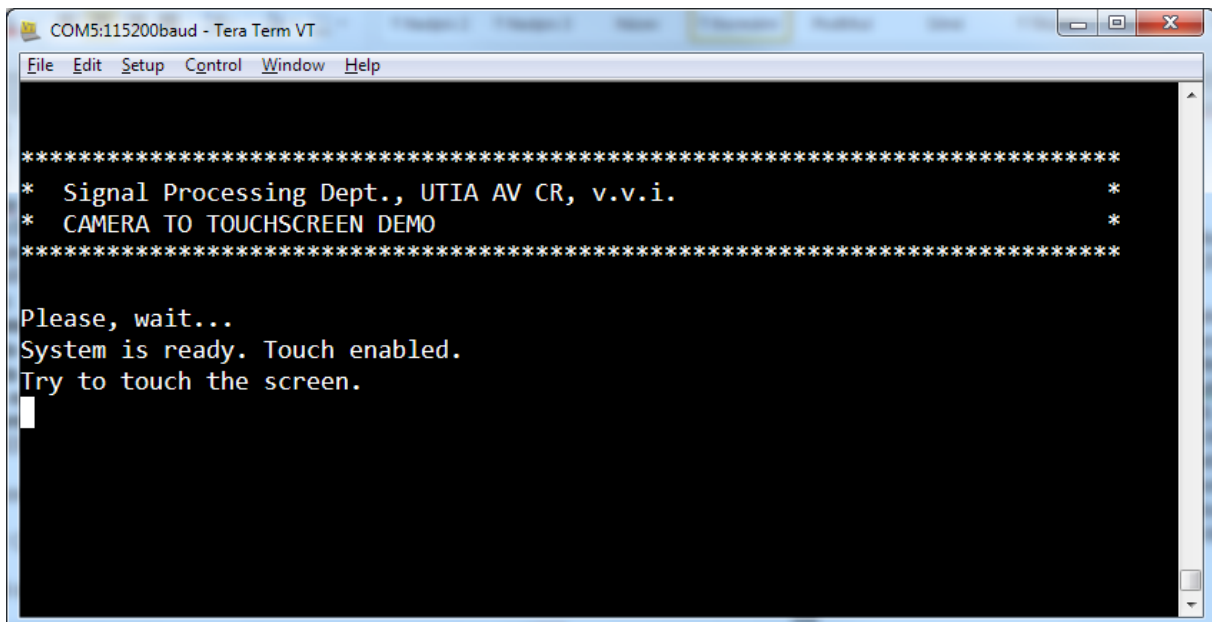
**Fig. 6: Complete camera-to-touchscreen demo kit**



## 4 Demonstrator Startup

1. Insert the MicroZed 7020 SOM onto the EMBV.
2. Insert the Toshiba Camera Module onto the EMBV.
3. Attach the Zed LCD Interface into **JD** and **JC** on the EMBV.
4. Attach the DisplayPort cable from the Zed LCD Interface to the ALI3 Sharp7 Adapter on the back of the LCD assembly.
5. Ensure the following MicroZed jumper settings are set for microSD booting:
  - **JP1: 1-2**
  - **JP2: 2-3**
  - **JP3: 2-3**
6. Copy **BOOT.bin** file to microSD card from your PC.
7. Insert the microSD card into the microSD card slot (**J6**) located on the underside of MicroZed module.
8. Connect the UART port of MicroZed (**J2**) to your PC using the MicroUSB cable. Serial terminal settings:
  - **Baud rate – 115200**
  - **Data bits – 8**
  - **Stop bits – 1**
  - **Parity – none**
  - **Flow control – none**
9. Make sure the EMBV Carrier Card power switch (**SW2**) is off. Connect the 5V power supply.
10. Connect 12V power supply to the ALI3 Sharp7 Adapter (**CON4**) on the back of the LCD assembly.
11. Turn the EMBV Carrier Card power switch (**SW2**) to ON position.

An example of terminal output can be seen in Fig. 7.



```
COM5:115200baud - Tera Term VT
File Edit Setup Control Window Help
*****
* Signal Processing Dept., UTIA AV CR, v.v.i. *
* CAMERA TO TOUCHSCREEN DEMO *
*****
Please, wait...
System is ready. Touch enabled.
Try to touch the screen.
```

Fig. 7: Terminal window

## 5 Package contents

The camera-to-touchscreen demo is supplied with the following items:

- doc/
  - appnote.pdf
- pre-built/
  - mz7020\_TCM\_LCD
  - BOOT.bin

## 6 References

- [1] Avnet Electronics Marketing. *7-inch Zed Touch Display Kit - Getting Started Guide: Version 3.0*; June 16, 2015 [online]. Available at <http://zedboard.org/product/7-inch-zed-touch-display-kit>
- [2] Avnet Electronics Marketing. *EMBV Quick Start Card: MicroZed Embedded Vision Carrier Card: Version 5b*; December 9, 2014 [online]. Available at <http://zedboard.org/sites/default/files/documentations/QSC-MicroZed-Embedded-Vision-Development-Kit-v5b-web.pdf> - 3
- [3] Avnet Electronics Marketing. *TCM3232PB Camera Quick Start Card: Toshiba Industrial 1080P60 Camera Module: Version 3b*; April 17, 2015 [online]. Available at <http://zedboard.org/sites/default/files/documentations/QSC-Toshiba-Industrial-1080P60-v3b-web.pdf> - 4
- [4] Avnet Electronics Marketing. *Toshiba Industrial 1080P60 Camera Module - Getting Started Guide: Version 1.2*; April 29, 2015 [online]. Available at <https://zedboard.org/content/getting-started-guide-3> - 2
- [5] Avnet Electronics Marketing. *Toshiba Industrial 1080P60 Camera Module: Hardware User Guide: Version 1.0*; January 22, 2015 [online]. Available at <http://zedboard.org/sites/default/files/documentations/BD-CAM-TOSH1080P-B%20User%20Guide%20-%20v1.0.pdf>



## Disclaimer

This disclaimer is not a license and does not grant any rights to the materials distributed herewith. Except as otherwise provided in a valid license issued to you by UTIA AV CR v.v.i., and to the maximum extent permitted by applicable law:

(1) THIS APPLICATION NOTE AND RELATED MATERIALS LISTED IN THIS PACKAGE CONTENT ARE MADE AVAILABLE "AS IS" AND WITH ALL FAULTS, AND UTIA AV CR V.V.I. HEREBY DISCLAIMS ALL WARRANTIES AND CONDITIONS, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, OR FITNESS FOR ANY PARTICULAR PURPOSE; and

(2) UTIA AV CR v.v.i. shall not be liable (whether in contract or tort, including negligence, or under any other theory of liability) for any loss or damage of any kind or nature related to, arising under or in connection with these materials, including for any direct, or any indirect, special, incidental, or consequential loss or damage (including loss of data, profits, goodwill, or any type of loss or damage suffered as a result of any action brought by a third party) even if such damage or loss was reasonably foreseeable or UTIA AV CR v.v.i. had been advised of the possibility of the same.

### Critical Applications:

UTIA AV CR v.v.i. products are not designed or intended to be fail-safe, or for use in any application requiring fail-safe performance, such as life-support or safety devices or systems, Class III medical devices, nuclear facilities, applications related to the deployment of airbags, or any other applications that could lead to death, personal injury, or severe property or environmental damage (individually and collectively, "Critical Applications"). Customer assumes the sole risk and liability of any use of UTIA AV CR v.v.i. products in Critical Applications, subject only to applicable laws and regulations governing limitations on product liability.