M-CIS-S6-FX3CON
user manual ENG

REVISION 1.0.0

MGSG CO.,LTD

Revision history

Revision	Date	Description	Update by
1.0.0	2019.02.23	Initial creation	jhyoo
	2019.04.27	Update	jhyoo

Table of Contents

1. Package

1.1 Package contents

- 2.54mm jumper 6EA
- Tripod and nut
- PCB board
- USB power cable(USB A to USB mini B)
- Not included CYUSB3KIT-003 board.
- Not included Xilinx JTAG cable

Figure 1.1.1 M-CIS-S6-FX3CON package and contents
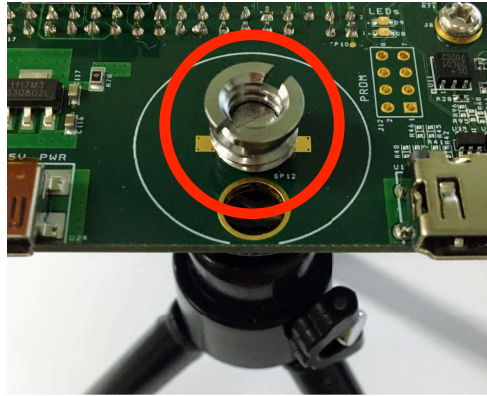
1.2 Tripod and but assembly

Figure 1.2.1 M-CIS-S6-FX3CON assembled tripod

2. Overview

The M-CIS-S6-FX3CON is a FPGA development board for image sensor, USB3.0, Gigabit ethernet,HDMI. It provides various examples and can also be used for image processing.
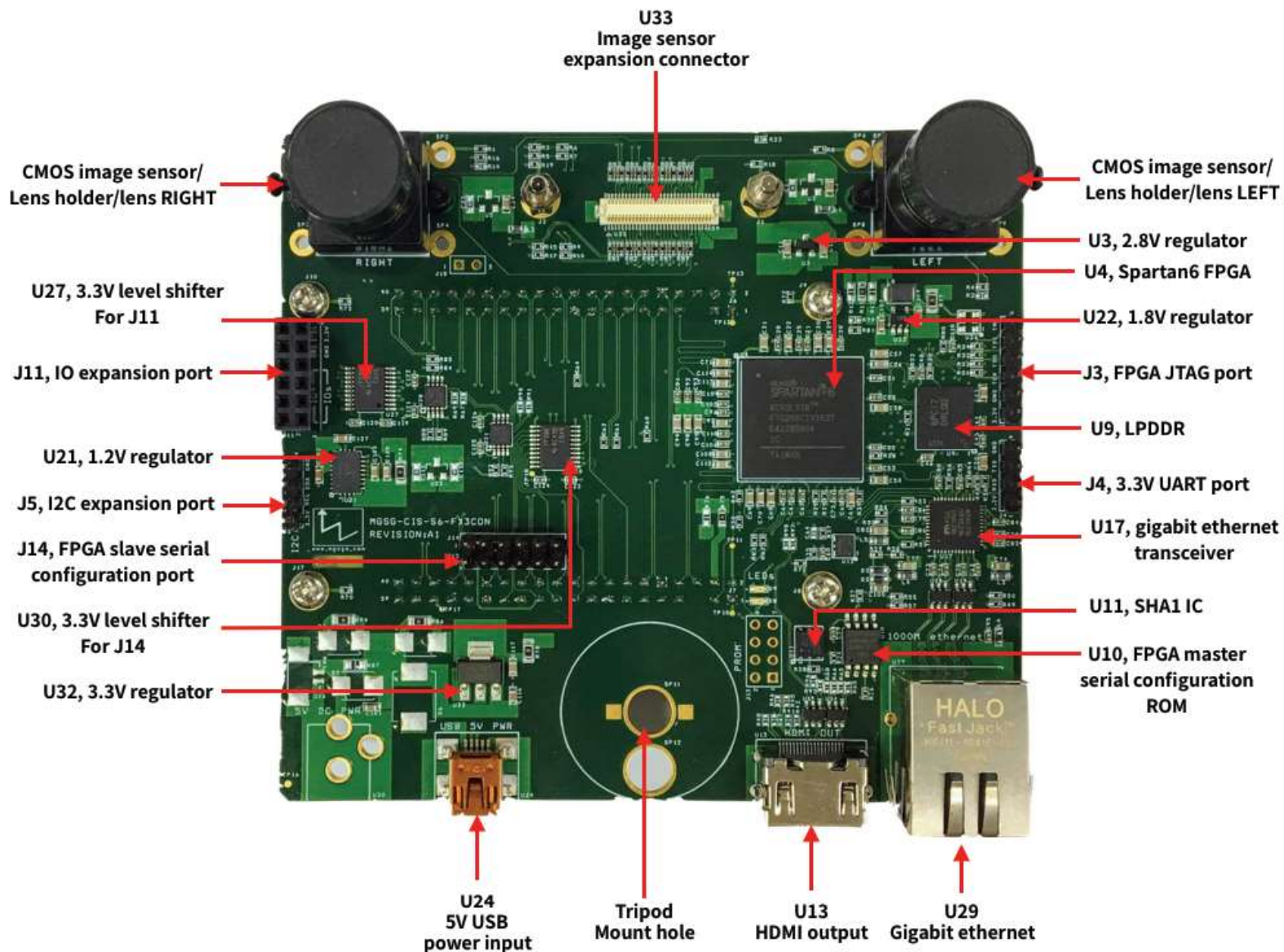
2.1 Layout

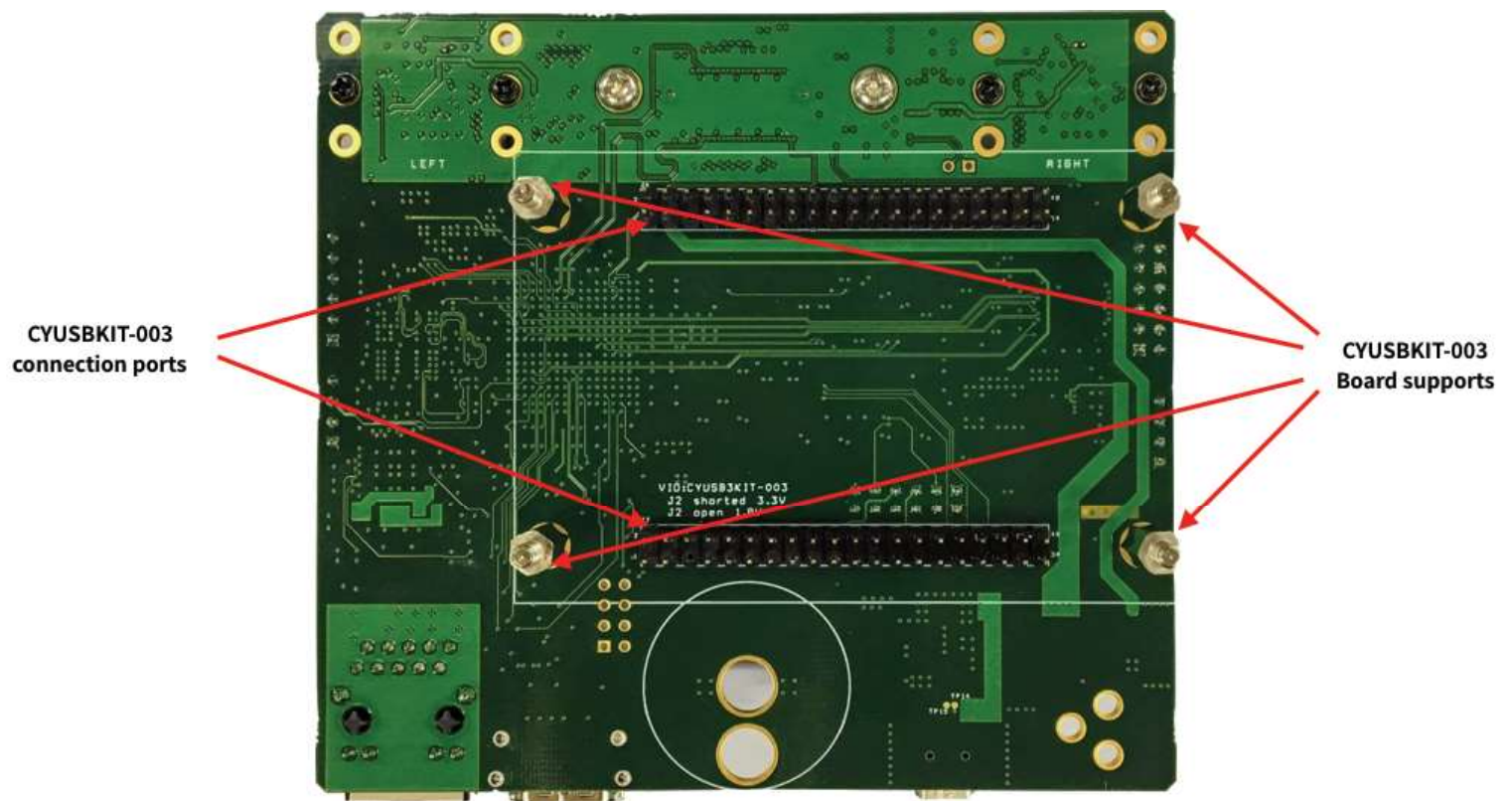
Figure 2.1.1 M-CIS-S6-FX3CON top side layout

Figure 2.1.2 M-CIS-S6-FX3CON bottom side layout
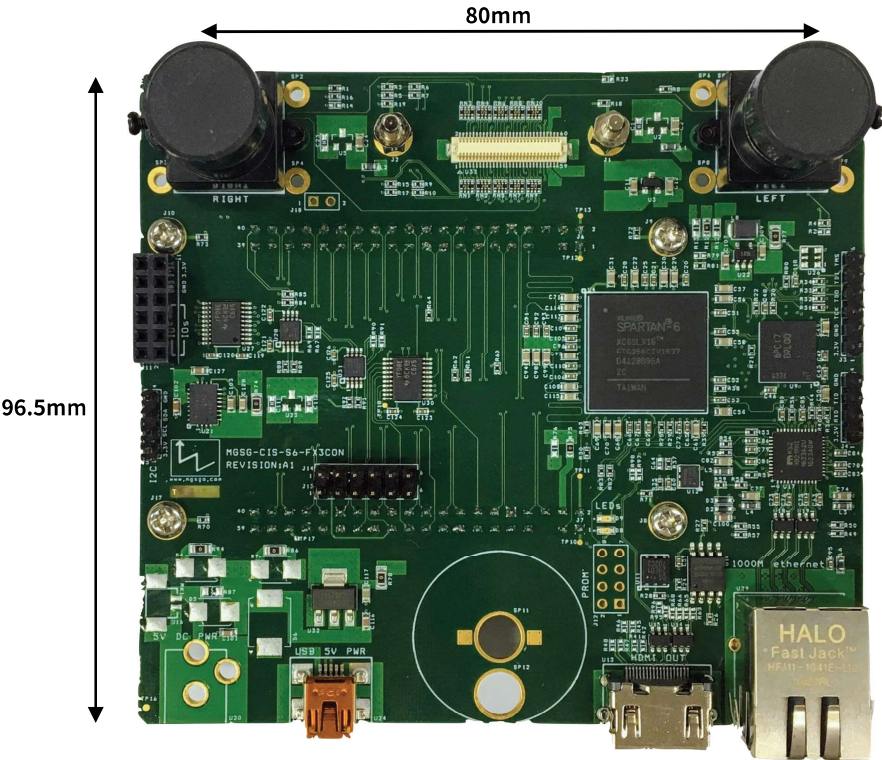
2.2 Dimension

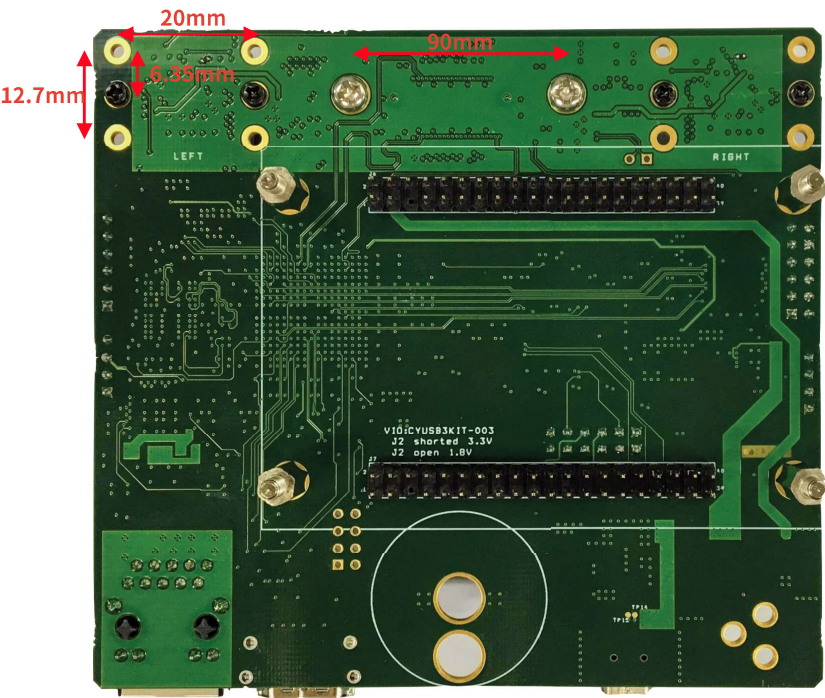Figure 2.2.1 M-CIS-S6-FX3CON top side dimension

Figure 2.2.2 M-CIS-S6-FX3CON bottom side dimension

2.3 Specifications

- Power input
  - DC 5V 1A maximum
  - USB mini-B port
- FPGA
  - XC6SLX16-2FTG256C
  - Xilinx Spartan6
- Two CIS(CMOS image sensor)s
  - MT9M114EBLSTCZ-CR1
  - ONSEMI(Aptina) 1280x960 CIS
- Two M12 lens holders
- Two M12 lenses
  - Focal length 3.6mm or similar
  - No IR cut filter
- LPDDR DRAM
  - MT46H32M16LFBF-5 IT:C
  - Micron LPDDR
- Gigabit ethernet PHY
  - KSZ9021RNI
  - MICREL Gigabit ethernet PHY
- CYUSB3KIT-003(Cypress FX3 board) connection ports
  - Two 2.54mm pitch 40pin connectors
  - Not included CYUSB3KIT-003 board
- HDMI port
  - Only TMDS signal output through Spartan6 use TMDS_33 IO
  - No support HDMI HOT plug detect voltage output
  - No HDMI CEC/I2C(DDC) controls

3. Examples

3.1 System requirements and basics

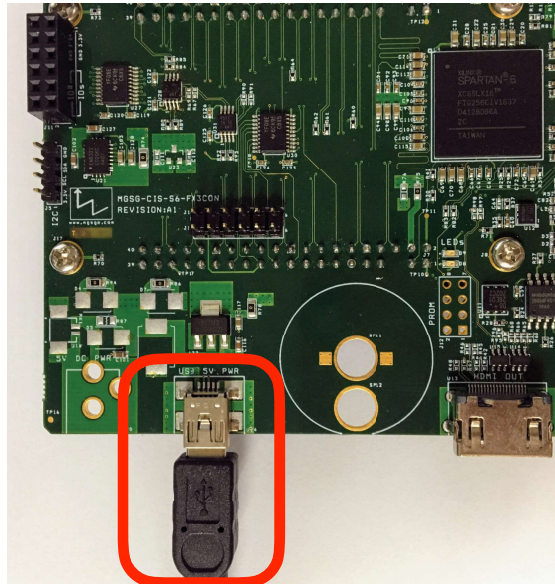• DC 5V USB power cable connect(cable included, power source not included)

Figure 3.1.1 M-CIS-S6-FX3CON USB power cable connection

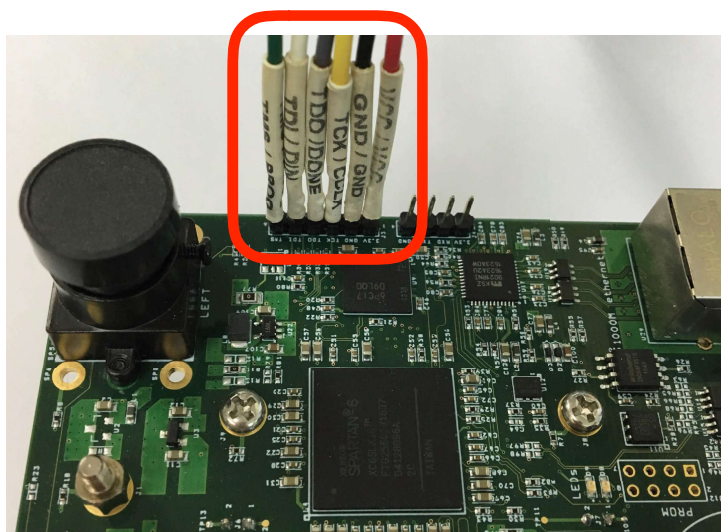• Xilinx JTAG(for FPGA configuration) cable : 3.3V IOs

Figure 3.1.2 M-CIS-S6-FX3CON Xilinx JTAG cable(not included) connection

- Xilinx Spartan6/Cypress FX3 development tool
  - Xilinx ISE 14.7
    - https://www.xilinx.com/support/download/index.html/content/xilinx/en/downloadNav/design-tools/v2012_4---14_7.html
    - https://www.xilinx.com/support/download/index.html/content/xilinx/en/downloadNav/design-tools/14_7-windows.html
  - Cypress FX3 SDK 1.3.4
    - https://www.cypress.com/documentation/software-and-drivers/ez-usb-fx3-software-development-kit

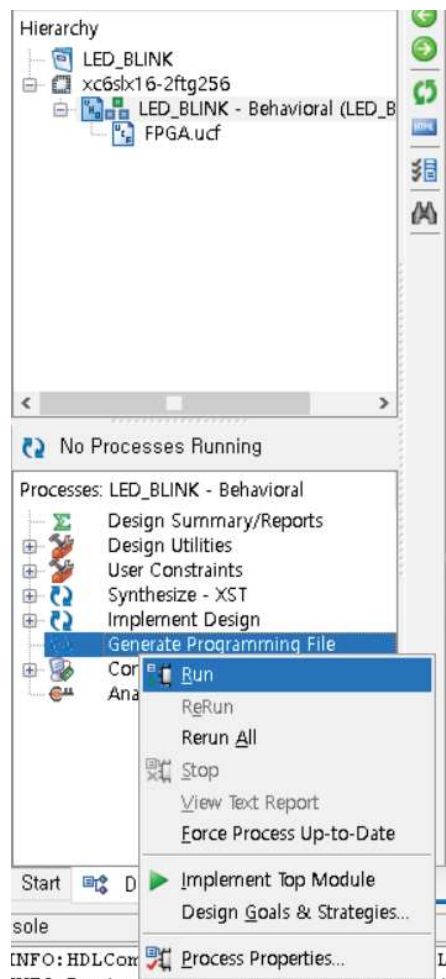- Bit file generate using Xilinx ISE14.7

Figure 3.1.3 Bit file generate use Xilinx ISE14.7

- Bit file download to Spartan6 FPGA using Xilinx JTAG and iMPACT
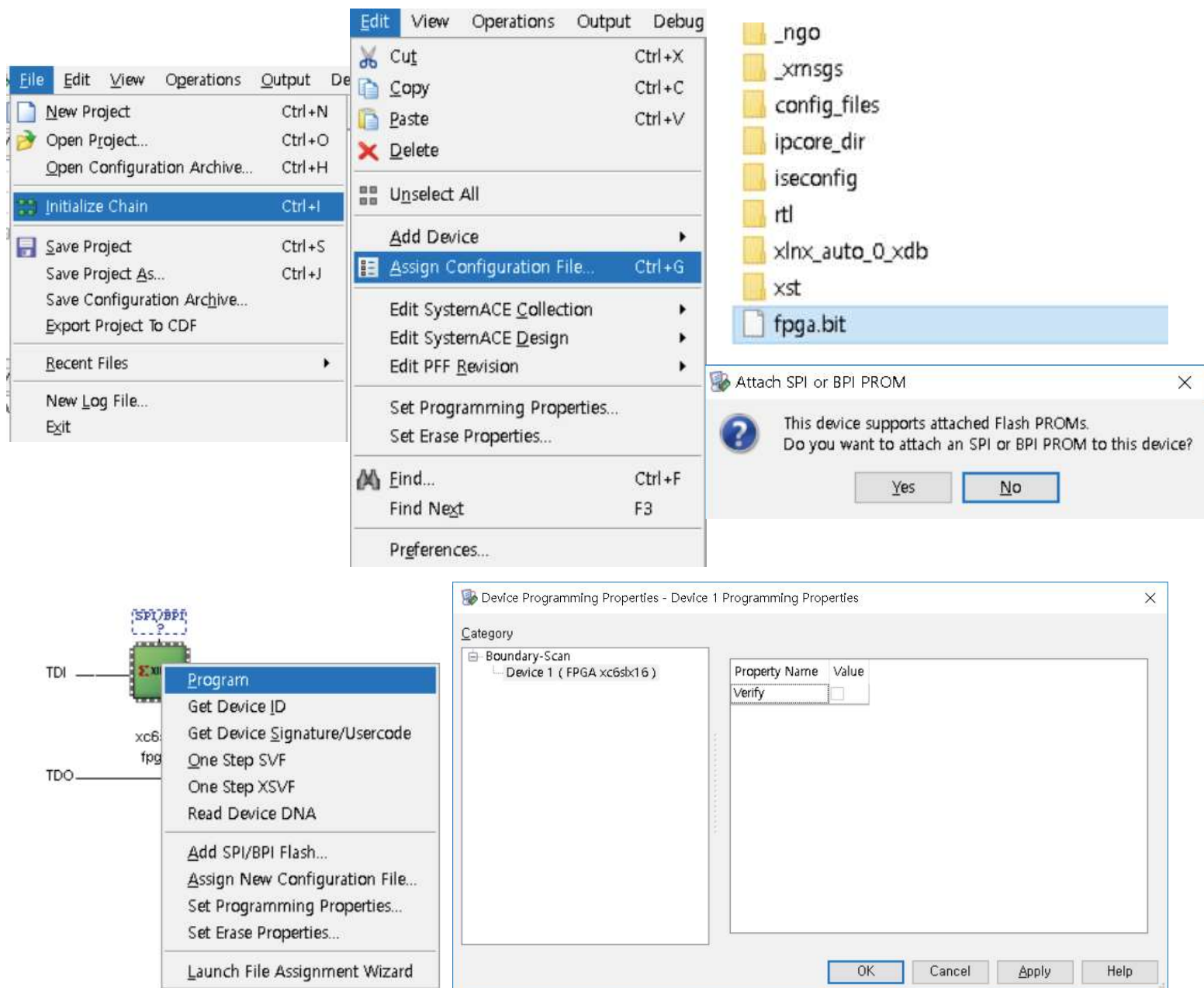

Figure 3.1.4 Bit file download to Spartan6 FPGA use Xilinx JTAG and iMPACT

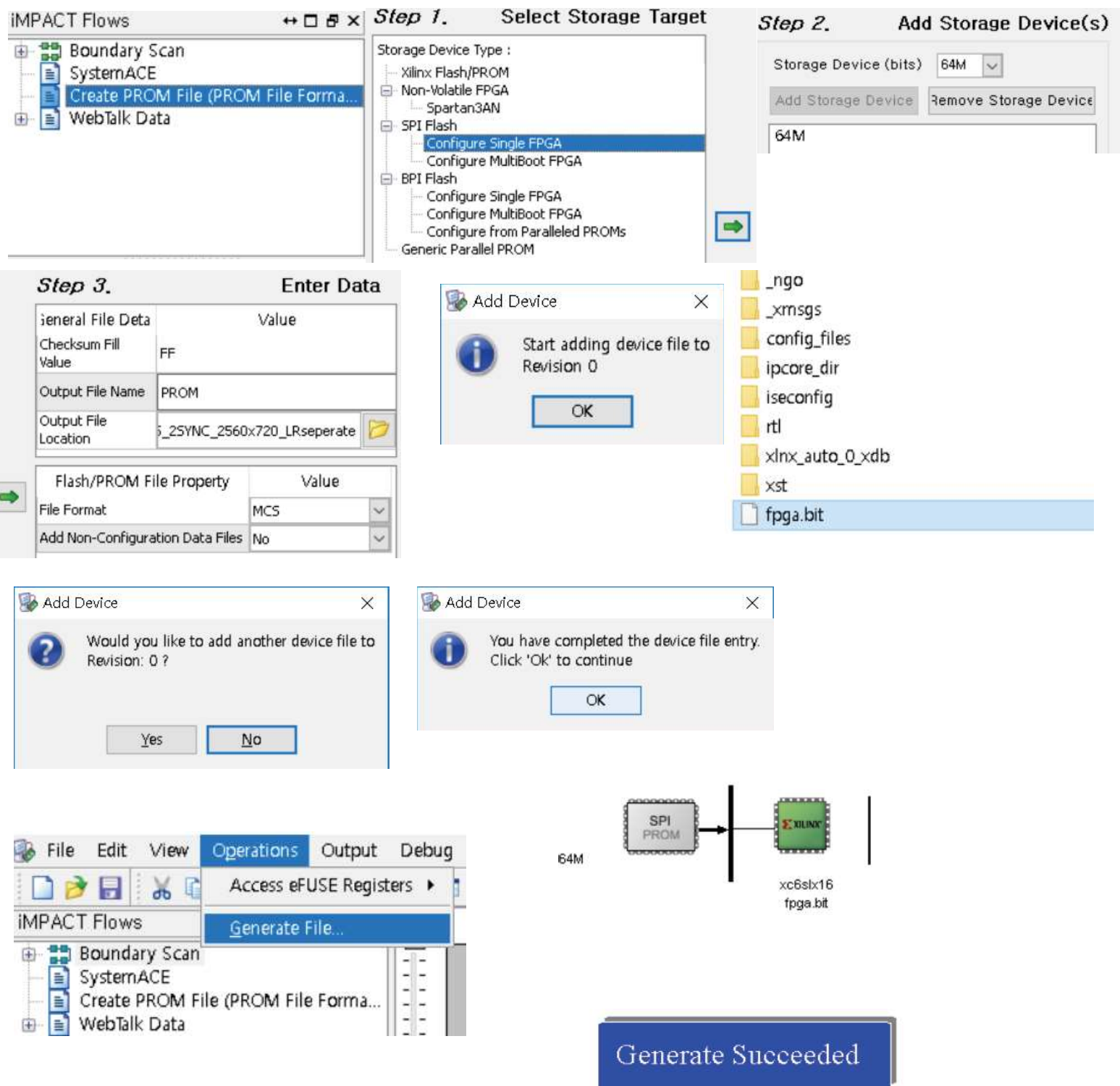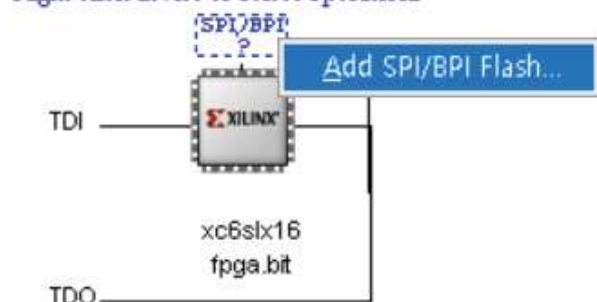- Flash(MCS) file generate for 64MB FPGA boot flash(W25Q64FVSSIG) using iMPACT

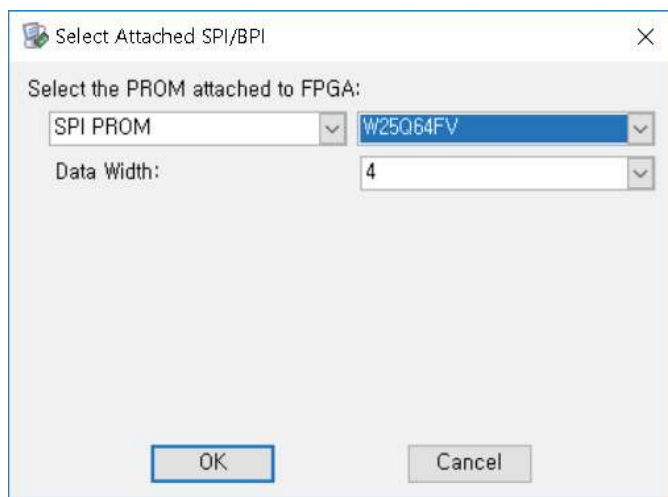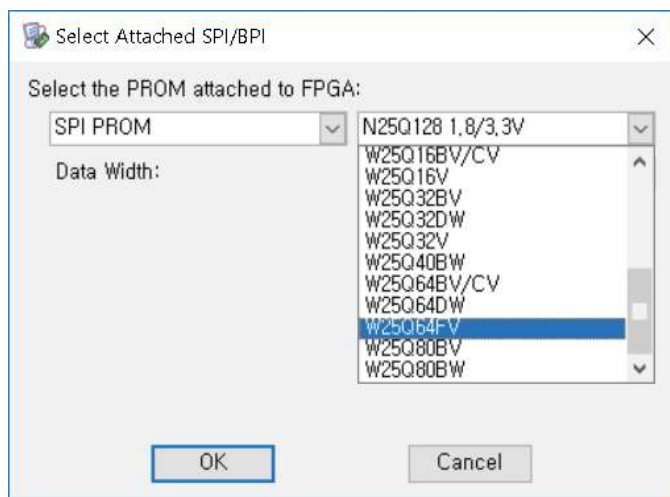Figure 3.1.5 Flash(MCS) file generate for 64MB FPGA boot flash(W25Q64FVSSIG) use iMPACT

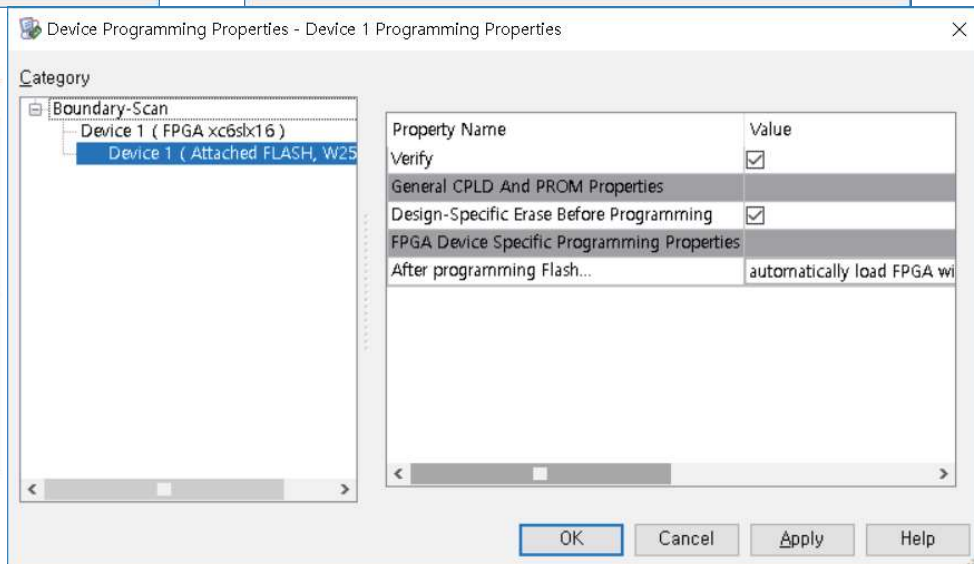- Flash(MCS) file download to 64MB FPGA boot flash(W25Q64FVSSIG) using iMPACT
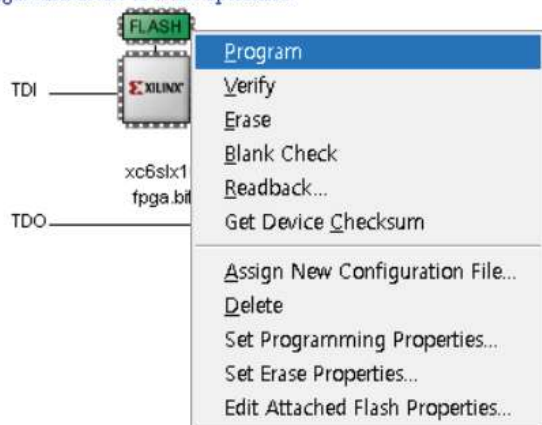
Figure 3.1.6 Flash(MCS) file download to 64MB FPGA boot flash(W25Q64FVSSIG) use iMPACT

3.2 LED blink example

- LED_BLINK : Example of LEDs D8 and D9 turning on alternately
- FPGA N11 pin output is low(0V), D8 LED ON
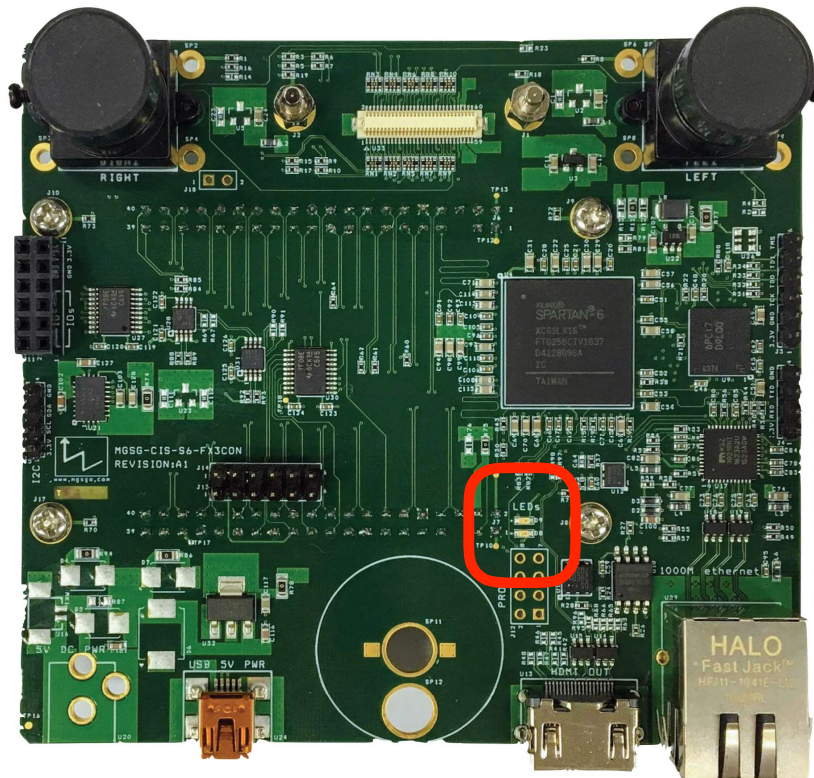- FPGA T11 pin output is high(3.3V), D9 LED ON

Figure 3.2.1 LED D8 and D9 on M-CIS-S6-FX3CON board

3.3 USB3.0 UVC single CIS (AN75779, 1280x720@30fps) example

- UVC_CIS_BYPASS_LEFT_1280x720 : Example of UVC(Universal Video Class) camera using 1 image sensor

- In AN75779(Cypress FX3 UVC example), M-CIS-S6-FX3CON act likes MT9M114 sensor board
  - AN75779 : https://www.cypress.com/documentation/application-notes/an75779-how-implement-image-sensor-interface-using-ez-usb-fx3-usb
  - AN75779 firmware can be used without modification.

- CYUSB3KIT-003 board not included
  - CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3
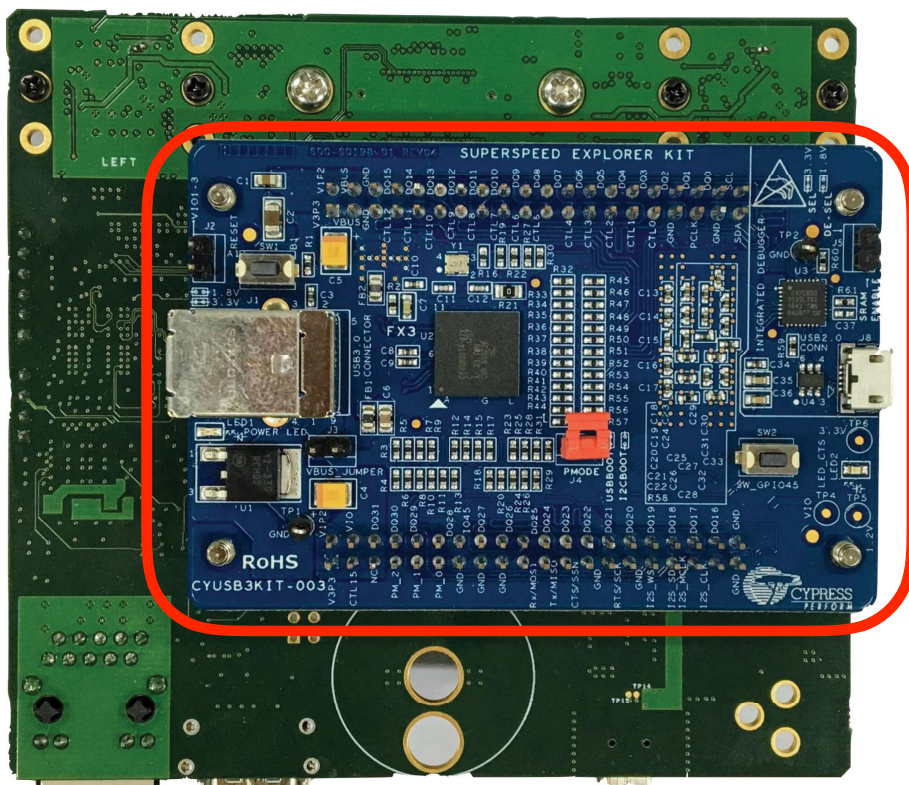

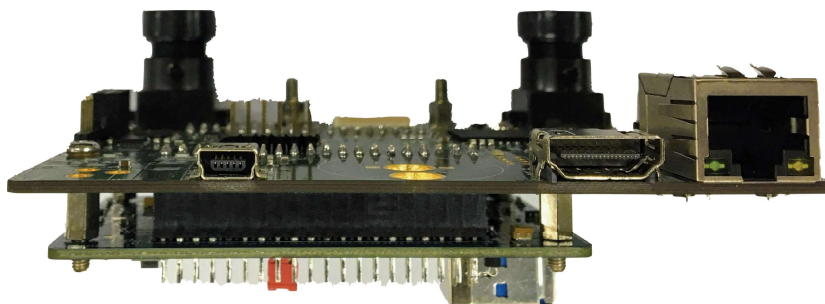Figure 3.3.1 M-CIS-S6-FX3CON and CYUSBKIT-003(not included, all jumper OFF except PMODE J4)

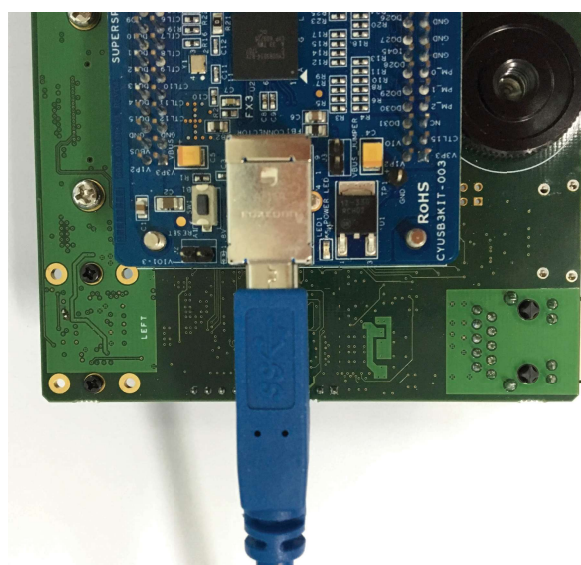Figure 3.3.2 M-CIS-S6-FX3CON and CYUSBKIT-003(not included) connection

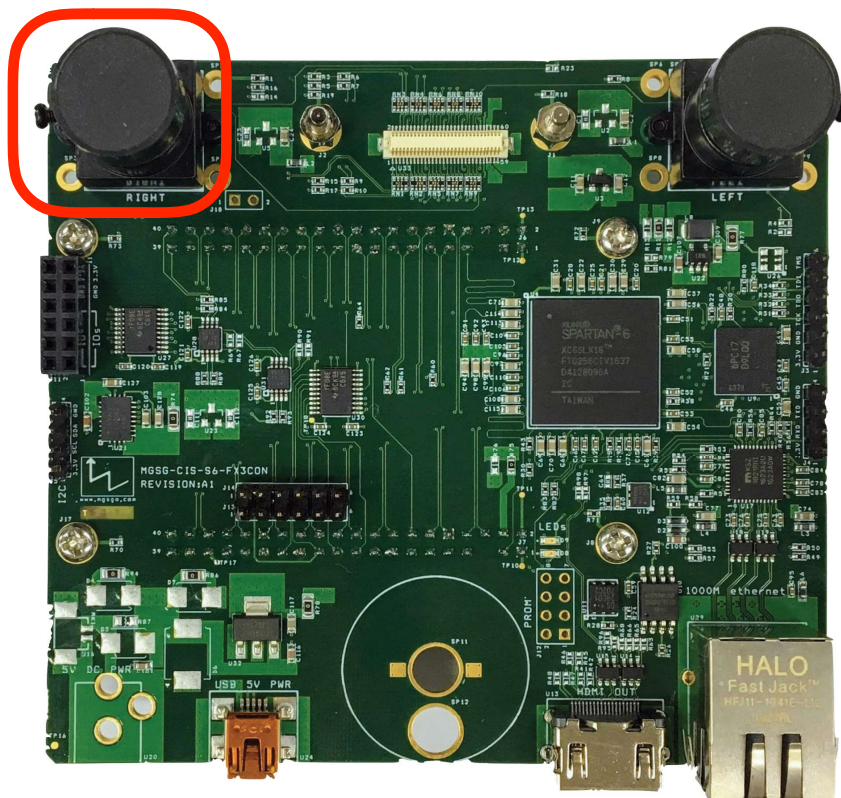Figure 3.3.3 CYUSBKIT-003(not included) USB3.0 cable connection

Figure 3.3.4 MT9M114 CMOS image sensor and lens

3.4 USB3.0 UVC dual CIS (AN75779, 2560x720@30fps) example

- UVC_CIS_LEFT_RIGHT_2560x720 : Example of UVC(Universal Video Class) camera using 2 image sensor
- In AN75779(Cypress FX3 UVC example), M-CIS-S6-FX3CON act likes MT9M114 sensor board
  - AN75779 : https://www.cypress.com/documentation/application-notes/an75779-how-implement-image-sensor-interface-using-ez-usb-fx3-usb
  - AN75779 firmware modifications.
    - GPIF bus width : 8bit ==> 16bit
    - Image resolution@frame rate : 1280x720@30fps ==> 2560x720@30fps
- CYUSB3KIT-003 board not included
  - CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3
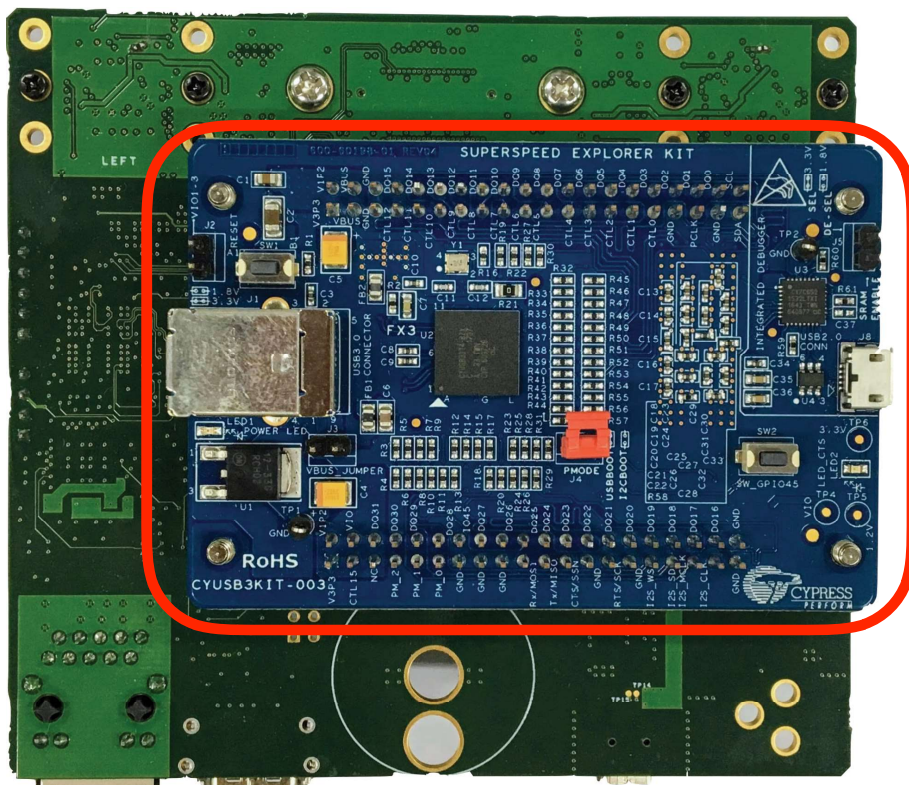

Figure 3.4.1 M-CIS-S6-FX3CON and CYUSBKIT-003(not included, all jumper OFF except PMODE J4)
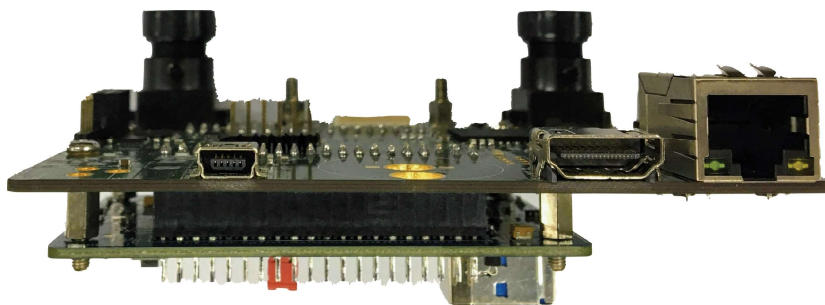
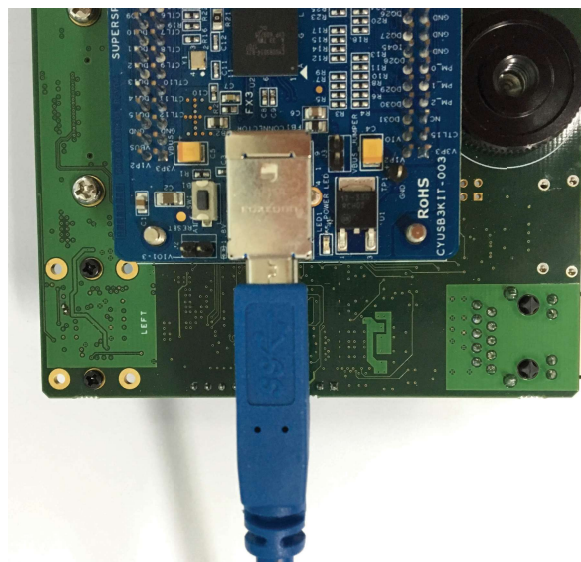Figure 3.4.2 M-CIS-S6-FX3CON and CYUSBKIT-003(not included) connection

Figure 3.4.3 CYUSBKIT-003(not included) USB3.0 cable connection
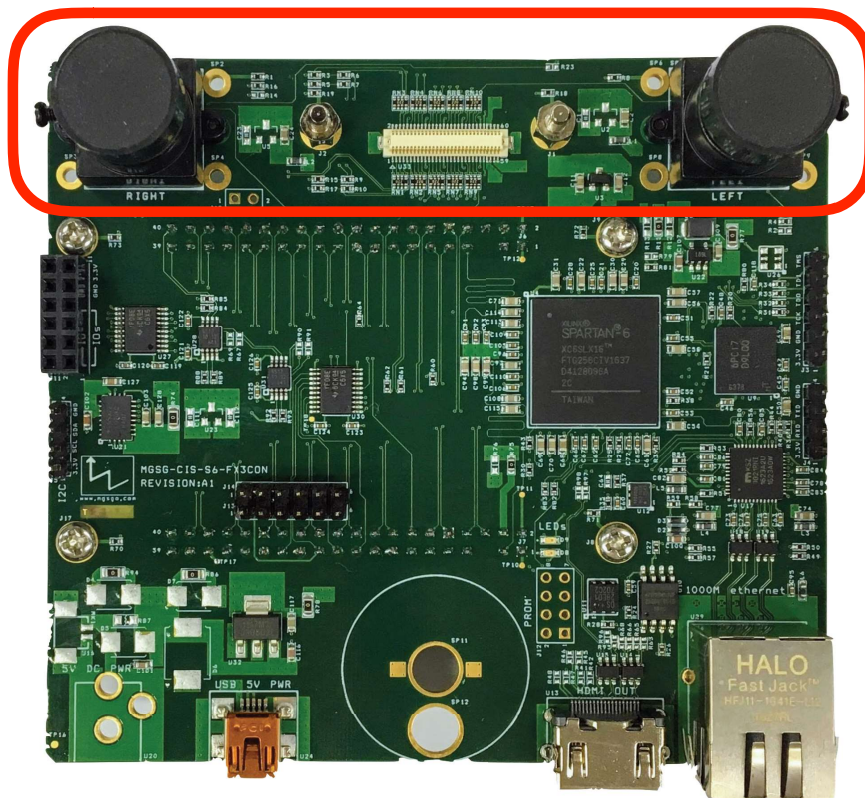
Figure 3.4.4 CMOS image sensors MT9M114 and lenses

3.5 Configuring an FPGA over FX3(use AN84868) example

- CONFIG_FPGA_OVER_FX3 : Example of FX3 configure Spartan6 FPGA(slave serial mode) using AN84868(Configuring FPGA example)
  - AN84868 : https://www.cypress.com/documentation/application-notes/an84868-configuring-fpga-over-usb-using-cypress-ez-usb-fx3
  - FPGA binary file use LED blink example
- CYUSB3KIT-003 board not included
  - CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3

Figure 3.5.1 M-CIS-S6-FX3CON and CYUSBKIT-003(not included, all jumper OFF except PMODE J4)

Figure 3.5.2 M-CIS-S6-FX3CON and CYUSBKIT-003(not included) connection

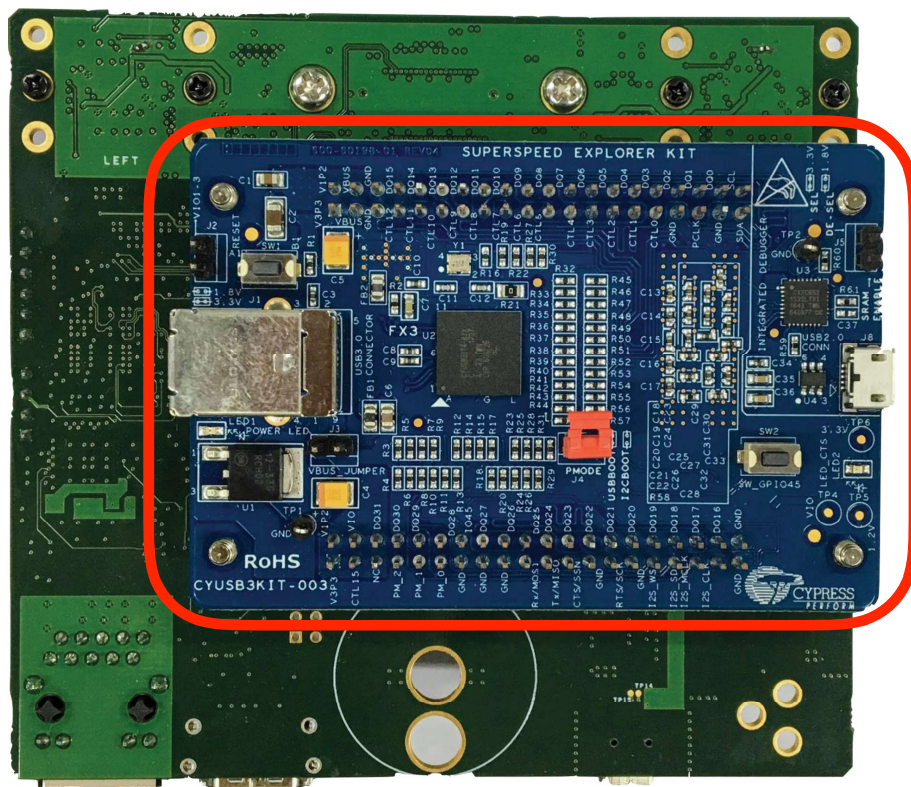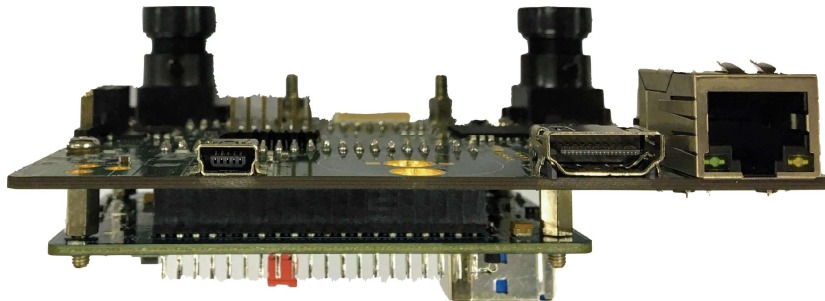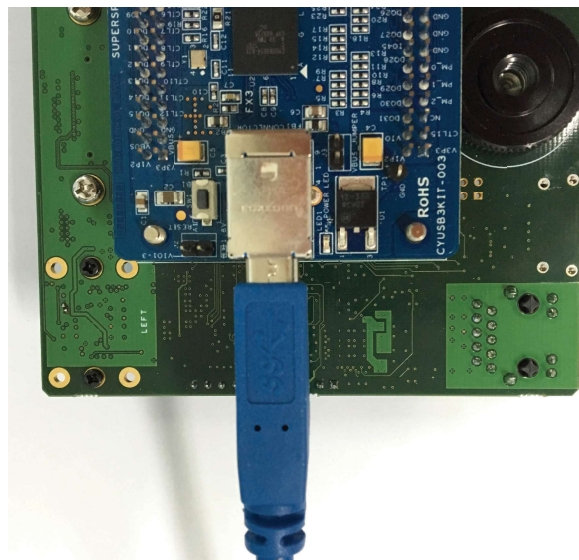Figure 3.5.3 CYUSBKIT-003(not included) USB3.0 cable connection
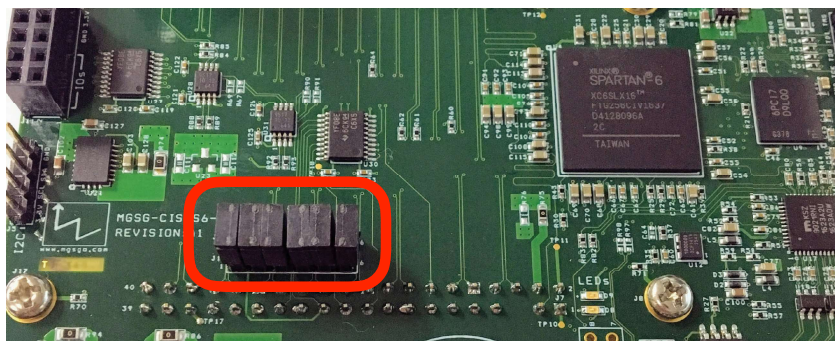

Figure 3.5.4 M-CIS-S6-FX3CON J14 jumper connections for AN84868

3.6 HDMI(TMDS) video output example

- HDMI_TMDS_VIDEO_OUT : Example of TMDS video signal output through HDMI connector using TMDS_33 IO of Spartan6 FPGA
  - Xilinx UG381(https://www.xilinx.com/support/documentation/user_guides/ug381.pdf)
- Up to 1280x720@60Hz or 1920x1080@30Hz TMDS signal output through HDMI connector
- No support HDMI HOT plug detect voltage output and HDMI CEC/I2C(DDC) controls
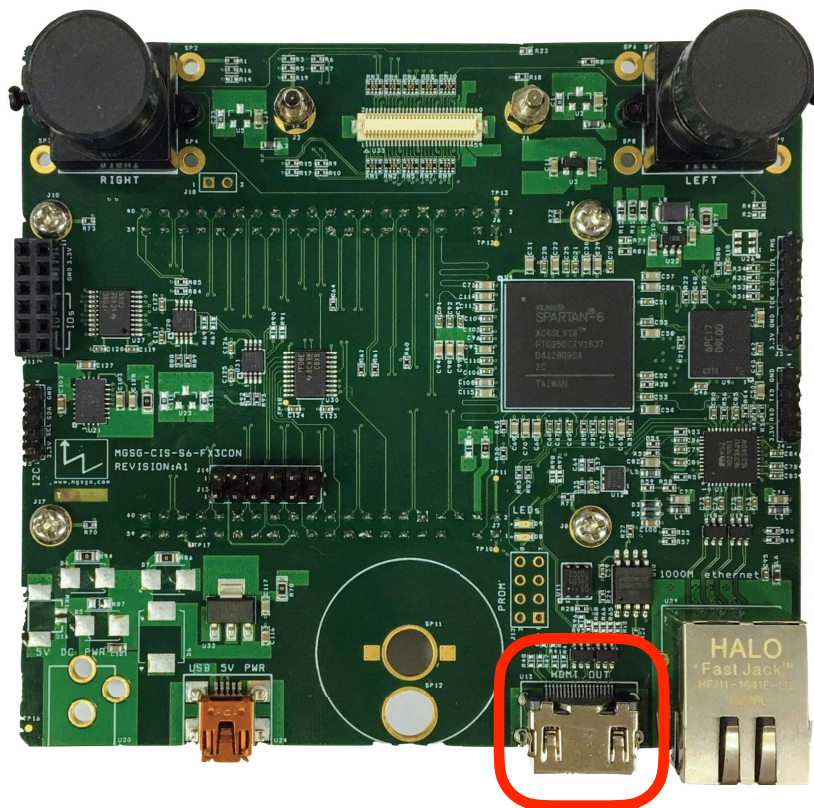- HDMI cable is not included

Figure 3.6.1 M-CIS-S6-FX3CON HDMI output port

3.7 Gigabit ethernet(1000M) UDP throughput test example

- GIGABIT_UDP_THROUGPUT_TEST_BINARY : Example of UDP throughput test using gigabit ethernet MAC/UDP stack (bit file only)
- Gigabit ethernet(1000M) PHY : KSZ9021 IC
- Gigabit ethernet(1000M) MAC/UDP stack
  - COMBLOCK IP use(COM-5401SOFT, COM-5402SOFT)
  - https://comblock.com/download/com5401soft.pdf
  - https://comblock.com/download/com5402soft.pdf
- Ethernet cable is not included
  - CAT5E or higher cable use for 1Gbps connection
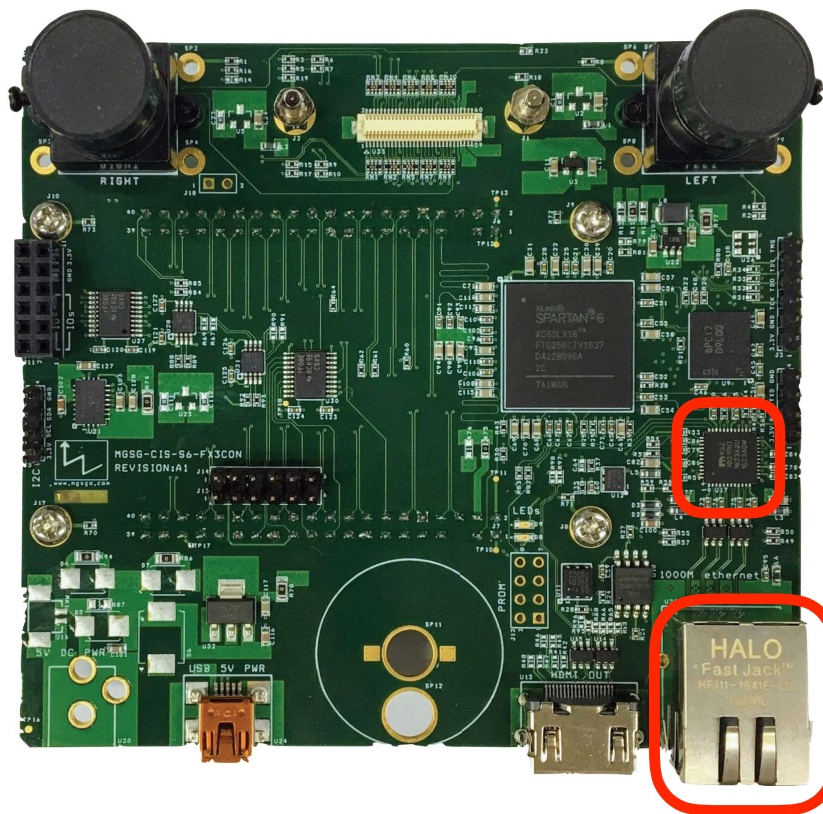 - Use cross cable to connect direct PC LAN card

Figure 3.7.1 M-CIS-S6-FX3CON Ethernet port(RJ45) and PHY IC(KSZ9021)

3.8 LPDDR test use Xilinx MIG example

- LPDDR_MIG_TRAFFIC : Example of LPDDR write/read example at 200MHz use Xilinx MIG(UG388)

  - https://www.xilinx.com/support/documentation/user_guides/ug388.pdf
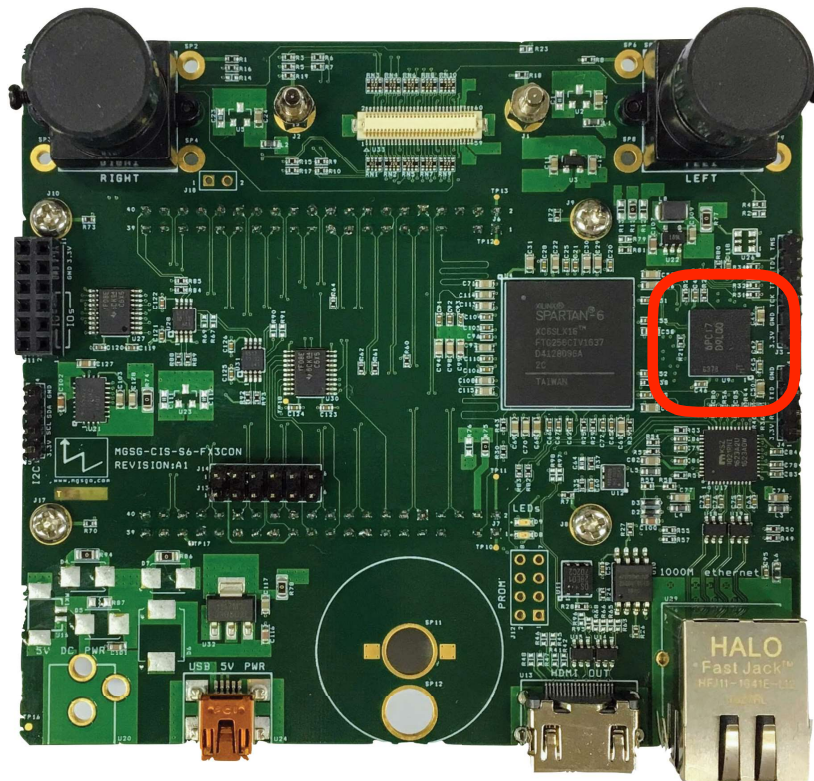
  - LPDDR part number : MT46H32M16LFBF-5 IT:C

Figure 3.8.1 M-CIS-S6-FX3CON LPDDR memory

3.9 SHA-1 EEPROM control example

- SHA1_AUTHENTICATION : Example of SHA-1 EEPROM control((AVNET reference design required)
  - DS28E01 reference design
    - https://www.avnet.com/shop/us/products/avnet-engineering-services/aes-s6ev-lx16-g-3074457345630217084/
  - XAPP780(for DS2432)
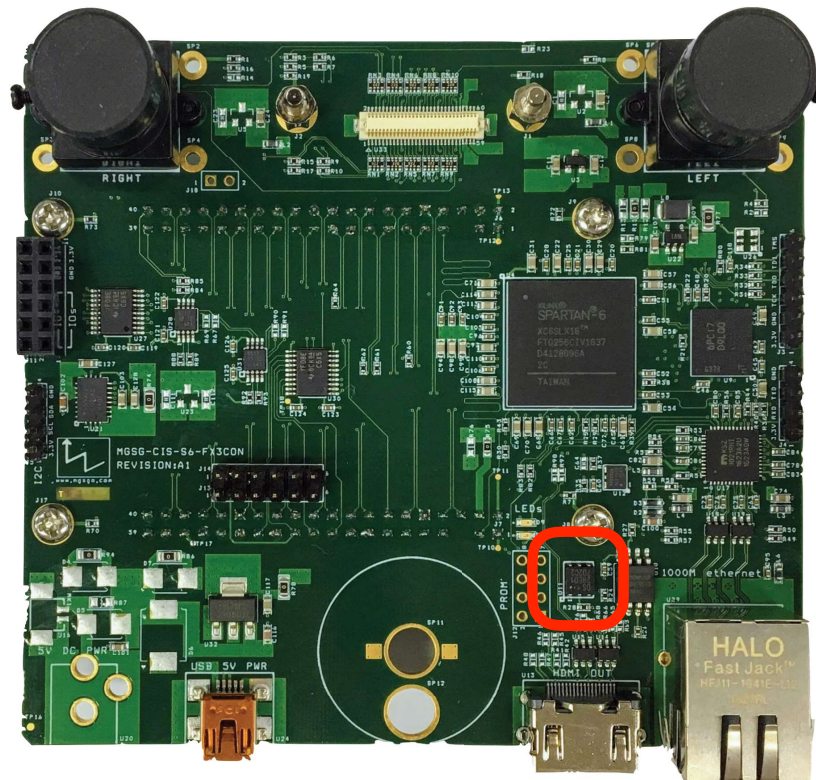   - https://www.xilinx.com/support/documentation/application_notes/xapp780.pdf

Figure 3.9.1 SHA-1 IC(DS28E01)

4. Support

4.1 Purchase support

Contact to each distributor.

4.2 Technical support

Contact to mgsg_opensource@gmail.com

Github page github.com/mgsgo/M-CIS-S6-FX3CON