

M-CIS-S6-FX3CON

사용설명서 KOR

REVISION 1.0.0

MGSG CO.,LTD

Revision history

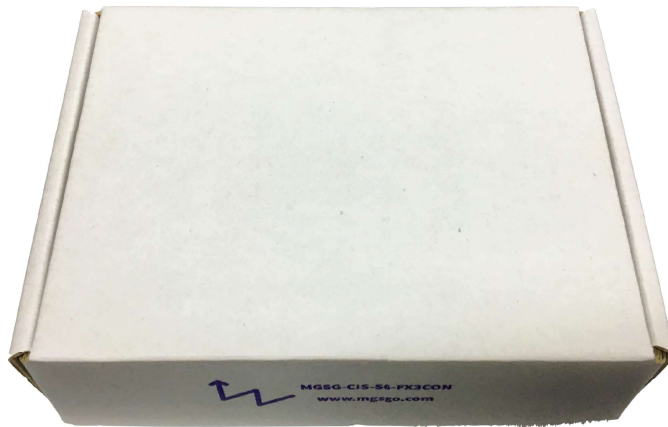
Revision	Date	Description	Update by
1.0.0	2019.02.23	Initial creation	jhyoo
	2019.04.27	Update	jhyoo

Table of Contents

1. Package
2. Overview
3. Examples
4. Support

1. Package

1.1 내용물



- 2.54mm jumper 6개
- Tripod 와 고정용 nut
- PCB 보드
- USB 전원 케이블(USB A to USB mini B)
- CYUSB3KIT-003 보드 미포함
- Xilinx JTAG cable 미포함



Figure 1.1.1 M-CIS-S6-FX3CON 내용물

1.2 삼각대

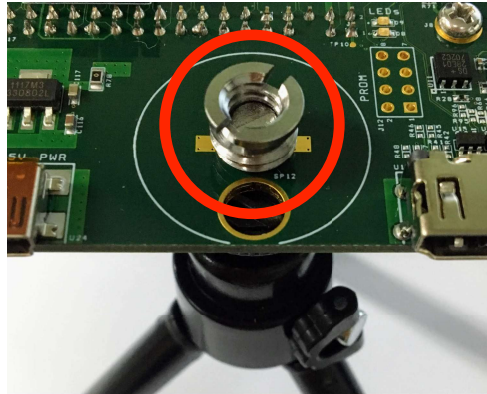


Figure 1.2.1 M-CIS-S6-FX3CON 삼각대와 고정용 너트 조립

2. Overview

M-CIS-S6-FX3CON은 이미지센서, USB3.0, Gigabit ethernet, HDMI를 위한 FPGA 개발보드입니다. 다양한 예제를 제공하며, 영상처리를 위한 용도로도 사용 할 수 있습니다.

2.1 보드 구성

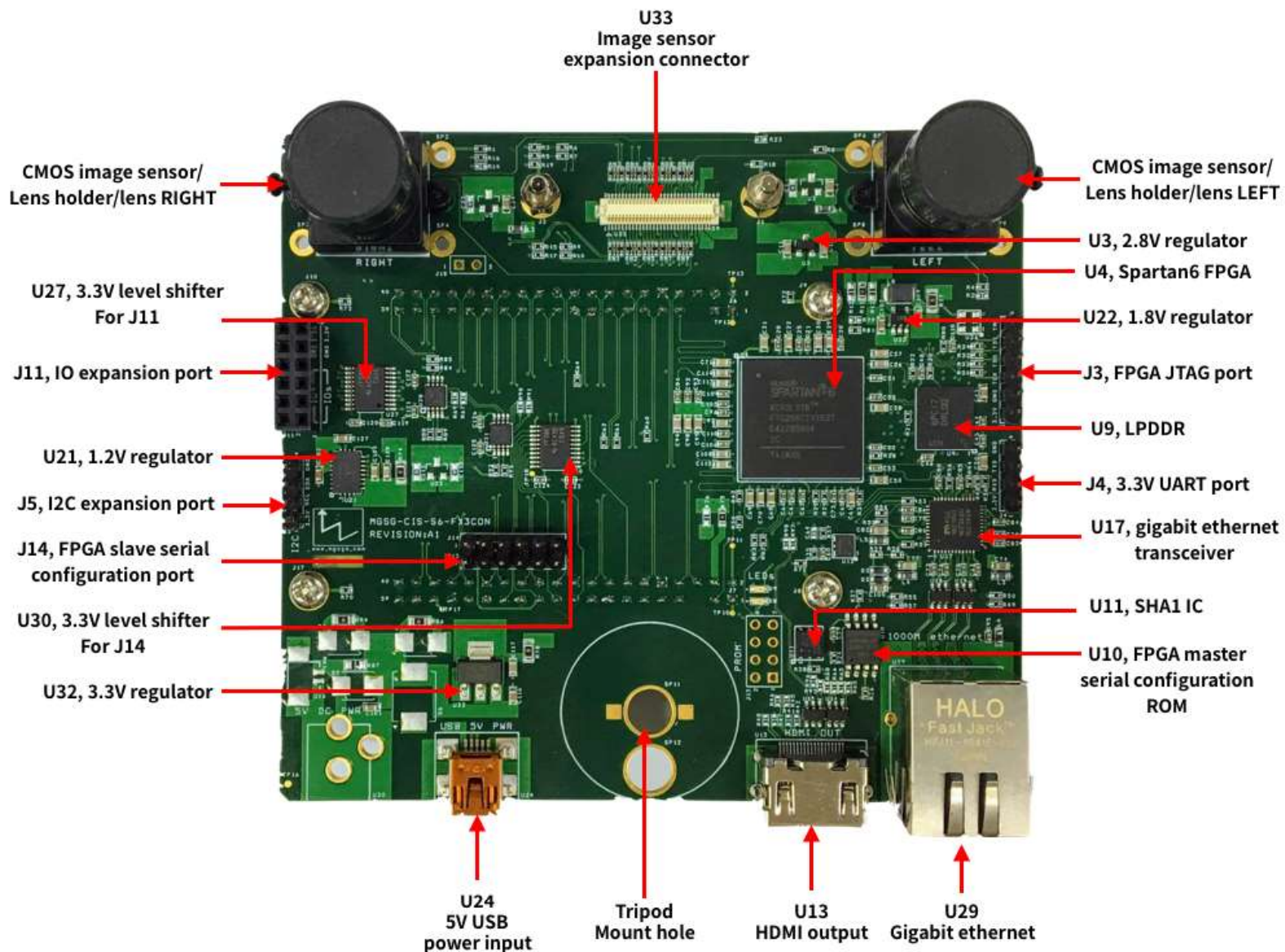


Figure 2.1.1 M-CIS-S6-FX3CON 보드 뒷면 구성

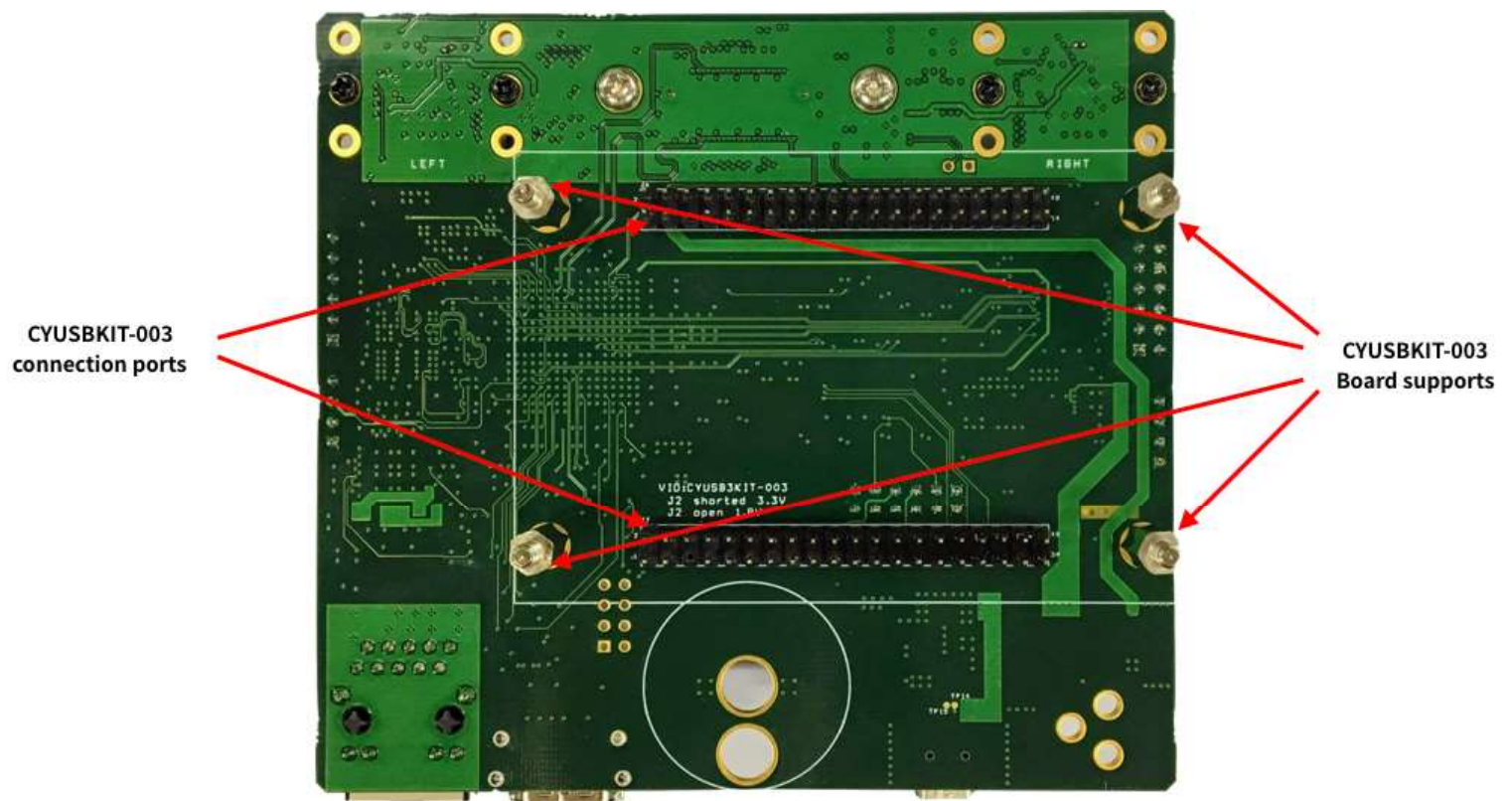


Figure 2.1.2 M-CIS-S6-FX3CON 보드 아랫면 구성

2.2 보드 크기

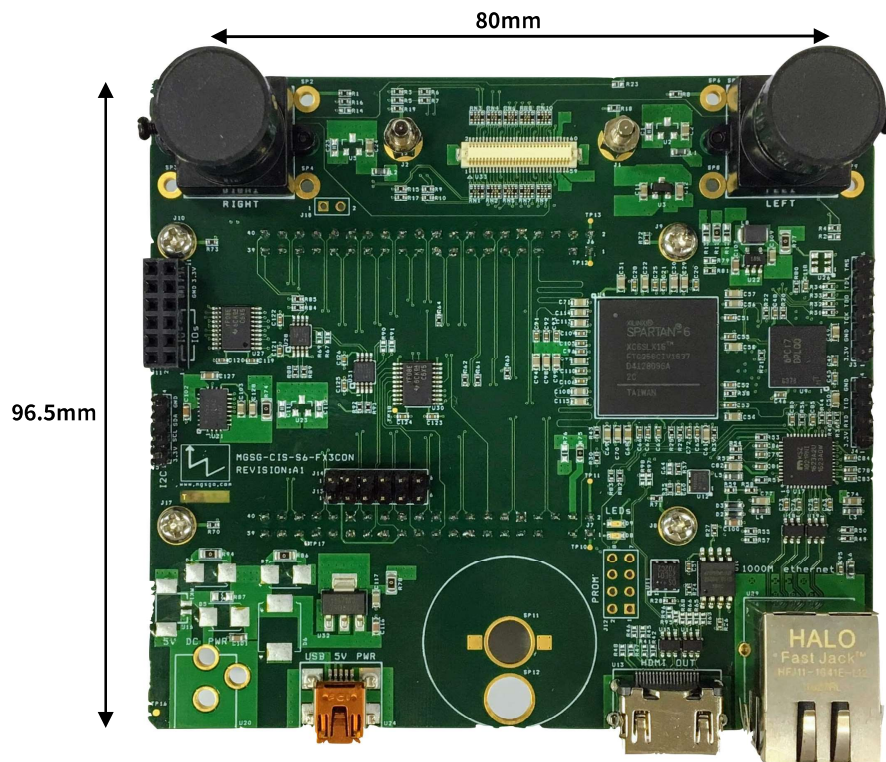


Figure 2.2.1 M-CIS-S6-FX3CON 보드 윗면 치수

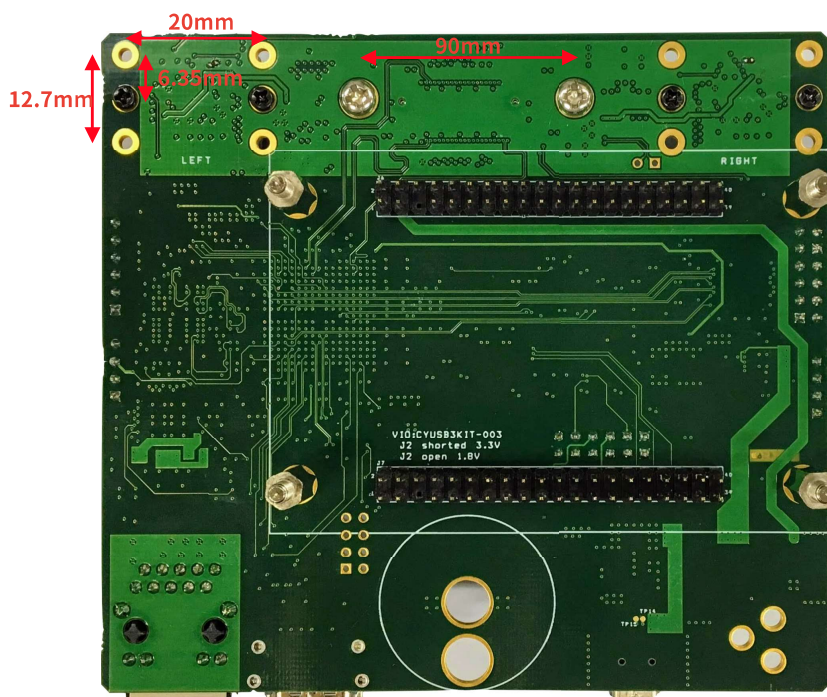


Figure 2.2.2 M-CIS-S6-FX3CON 보드 아랫면 치수

2.3 사양

- 전원 입력
 - DC 5V 최대 1A
 - USB mini-B port
 - FPGA
 - XC6SLX16-2FTG256C
 - Xilinx Spartan6
 - 두개의 CIS(CMOS image sensor)
 - MT9M114EBLSTCZ-CR1
 - ONSEMI(Aptina) 1280x960 CIS
 - 두개의 M12(지름 12mm) 렌즈 홀더
 - 두개의 M12 렌즈
 - 초점거리 3.6mm 혹은 유사한 초점거리
 - IR 차단 필터 없음
 - LPDDR DRAM
 - MT46H32M16LFBF-5 IT:C
 - Micron LPDDR
 - Gigabit ethernet PHY
 - KSZ9021RNI
 - MICREL Gigabit ethernet PHY
 - CYUSB3KIT-003(Cypress FX3 board) 연결 단자
 - 두개의 2.54mm 간격 40핀 커넥터
 - **CYUSB3KIT-003 보드 미포함**
 - HDMI 단자
 - Spartan6에서 출력된 TMDS 신호(TMDS_33 IO) 연결
 - HDMI HOT plug detect voltage output 미지원
 - HDMI CEC/I2C(DDC) 제어 미지원
-

3. Examples

3.1 시스템 요구 및 기본사항

- DC 5V USB 전원 케이블 연결(키트에 포함됨, 전원 아답터 미포함)

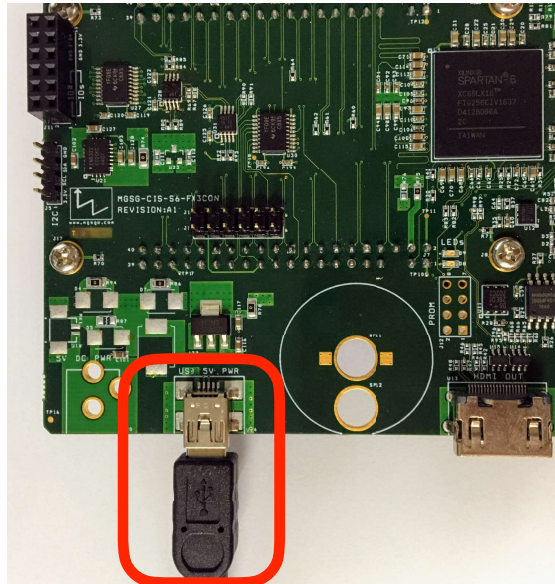


Figure 3.1.1 M-CIS-S6-FX3CON USB 전원 케이블 연결

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

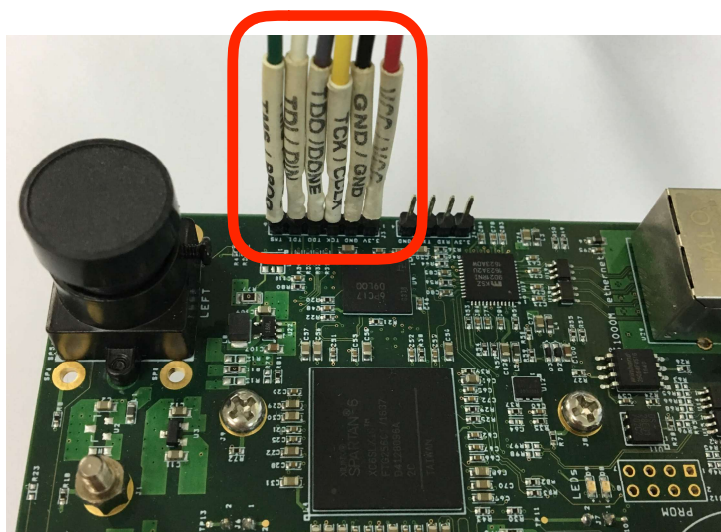


Figure 3.1.2 M-CIS-S6-FX3CON Xilinx JTAG cable(미포함) 연결

- Xilinx Spartan6/Cypress FX3 개발툴
 - 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>
- Xilinx ISE14.7를 이용한 bit file 생성

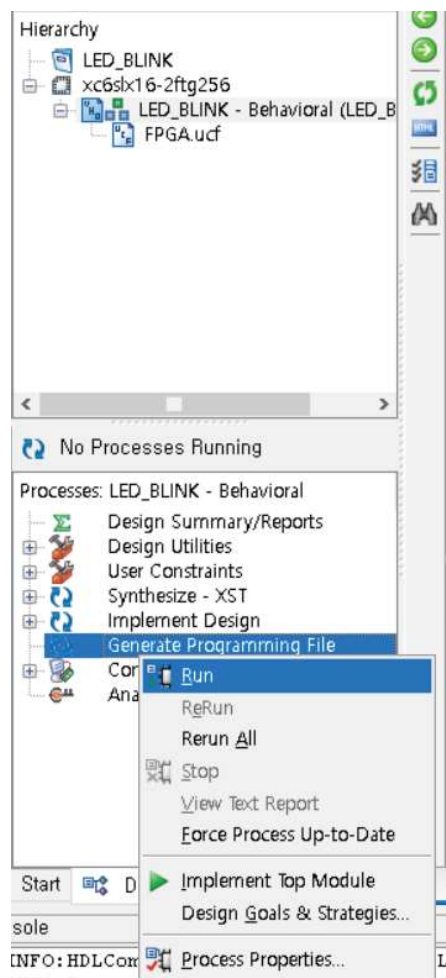


Figure 3.1.3 Xilinx ISE14.7를 이용한 bit file 생성

- Xilinx JTAG과 iMPACT를 이용한 Spartan6 FPGA에 bit file 다운로드

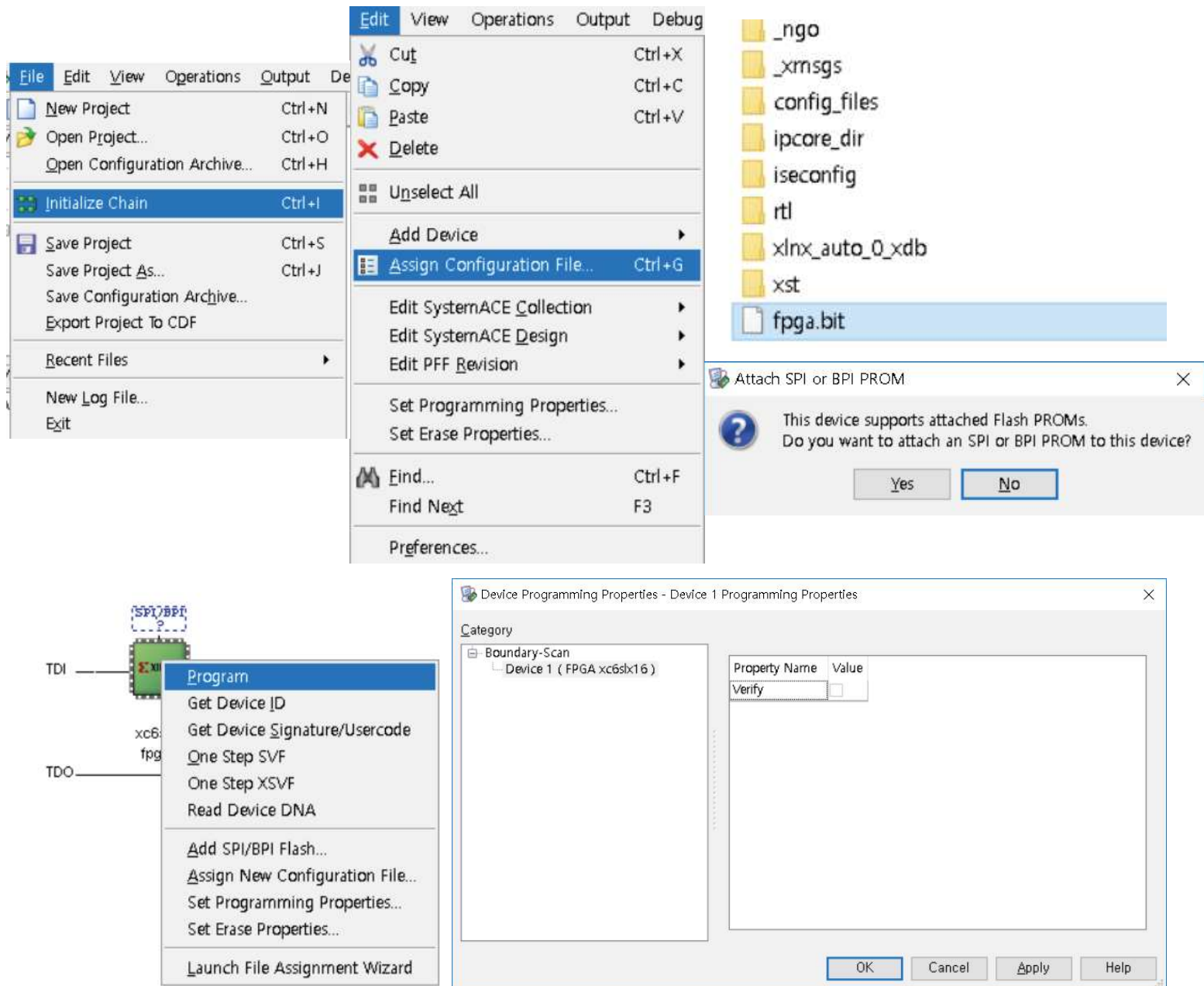


Figure 3.1.4 Xilinx JTAG과 iMPACT를 이용한 Spartan6 FPGA에 bit file 다운로드

- iMPACT를 이용한 64MB FPGA boot flash(W25Q64FVSSIG) MCS파일 생성

The figure illustrates the process of generating a 64MB FPGA boot flash MCS file using iMPACT. The process is divided into three main steps:

- Step 1. Select Storage Target:** The user selects 'Configure Single FPGA' under the 'SPI Flash' category in the 'Storage Device Type' list.
- Step 2. Add Storage Device(s):** The user specifies a 'Storage Device (bits)' of 64M and adds the device to the list.
- Step 3. Enter Data:** The user enters the following data:

General File Data	Value
Checksum Fill Value	FF
Output File Name	PROM
Output File Location	5_25YNC_2560x720_LRseparate

Flash/PROM File Property	Value
File Format	MCS
Add Non-Configuration Data Files	No

Additional screenshots show the 'Add Device' dialog boxes, a file explorer view showing the 'fpga.bit' file, and the 'Generate File...' option in the iMPACT menu.

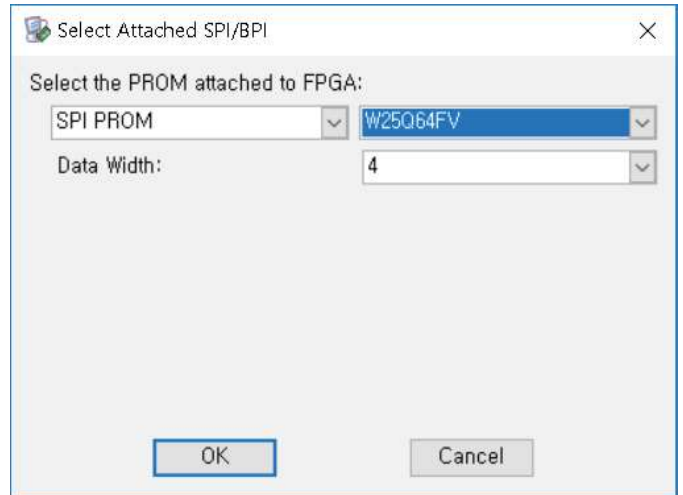
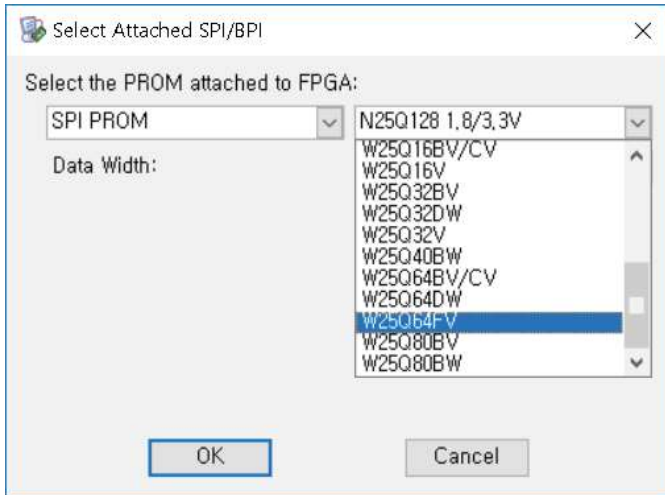
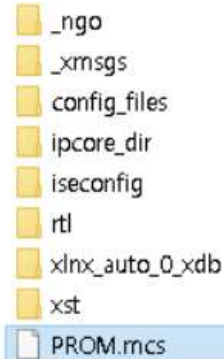
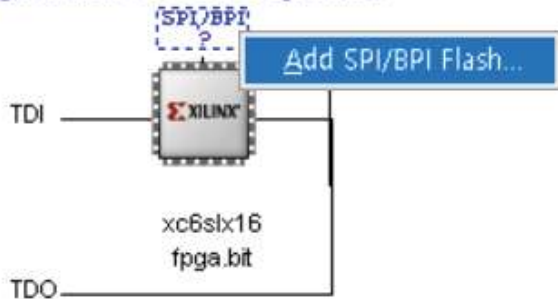
A diagram shows the hardware connection: a 64M SPI PROM is connected to a Xilinx xc6slx16 fpga.bit device.

The final result is a blue box indicating 'Generate Succeeded'.

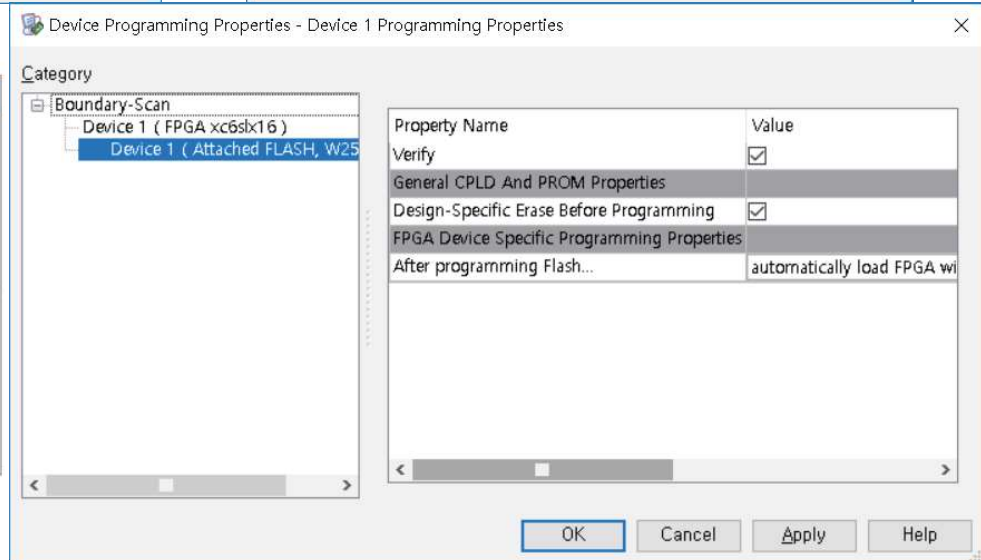
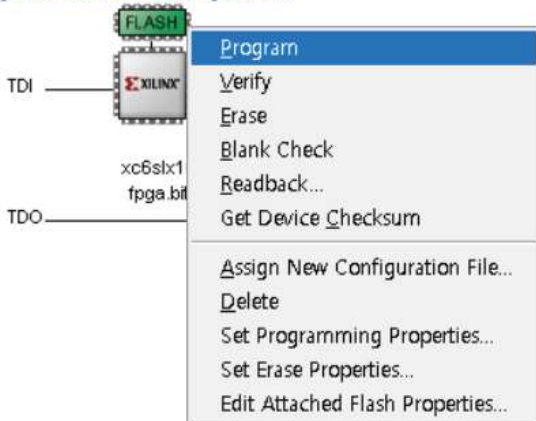
Figure 3.1.5 iMPACT를 이용한 64MB FPGA boot flash(W25Q64FVSSIG) MCS파일 생성

- iMPACT를 이용한 64MB FPGA boot flash(W25Q64FVSSIG) MCS파일 다운로드

Right click device to select operations



Right click device to select operations



Program Succeeded

Figure 3.1.6 iMPACT를 이용한 64MB FPGA boot flash(W25Q64FVSSIG) MCS파일 다운로드

3.2 LED blink 예제

- LED_BLINK : LED D8, D9가 번갈아가면서 켜지는 예제
- FPGA N11 핀 출력이 low(0V) 일때, D8 LED 켜짐
- FPGA T11 핀 출력이 high(3.3V) 일때, D9 LED 켜짐

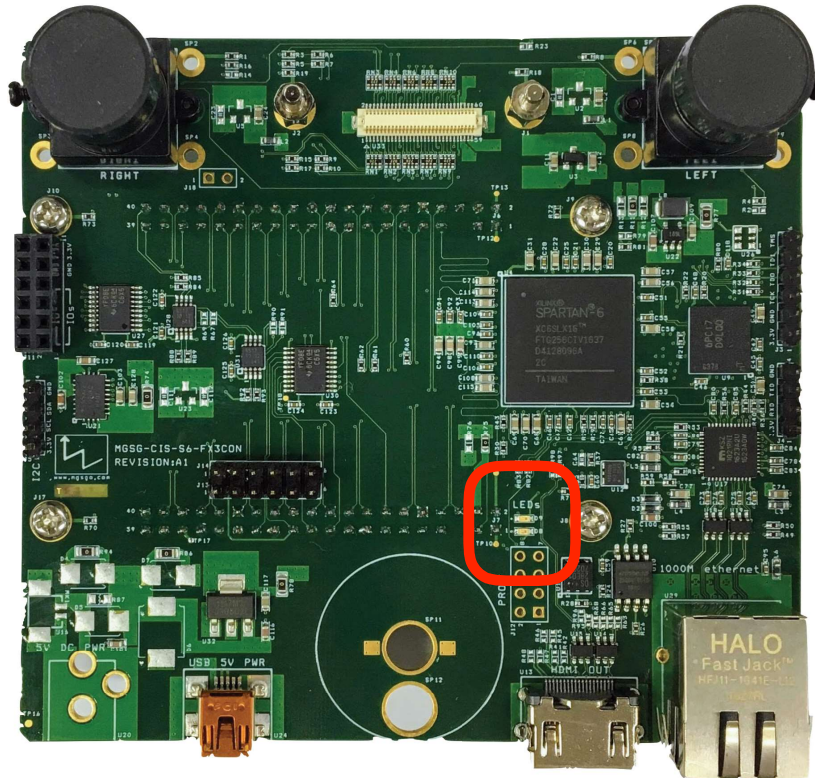


Figure 3.2.1 M-CIS-S6-FX3CON 보드의 LED D8/D9 위치

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

- UVC_CIS_BYPASS_LEFT_1280x720 : UVC(Universal Video Class) 카메라 예제, 이미지센서 1개 사용
- M-CIS-S6-FX3CON는 AN75779(Cypress FX3 UVC example)에서 MT9M114 센서보드처럼 동작할 수 있다
- AN75779 : <https://www.cypress.com/documentation/application-notes/an75779-how-implement-image-sensor-interface-using-ez-usb-fx3-usb>
- AN75779 코드 수정 없이 사용 가능함
- **CYUSB3KIT-003 보드 미포함**
- CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3

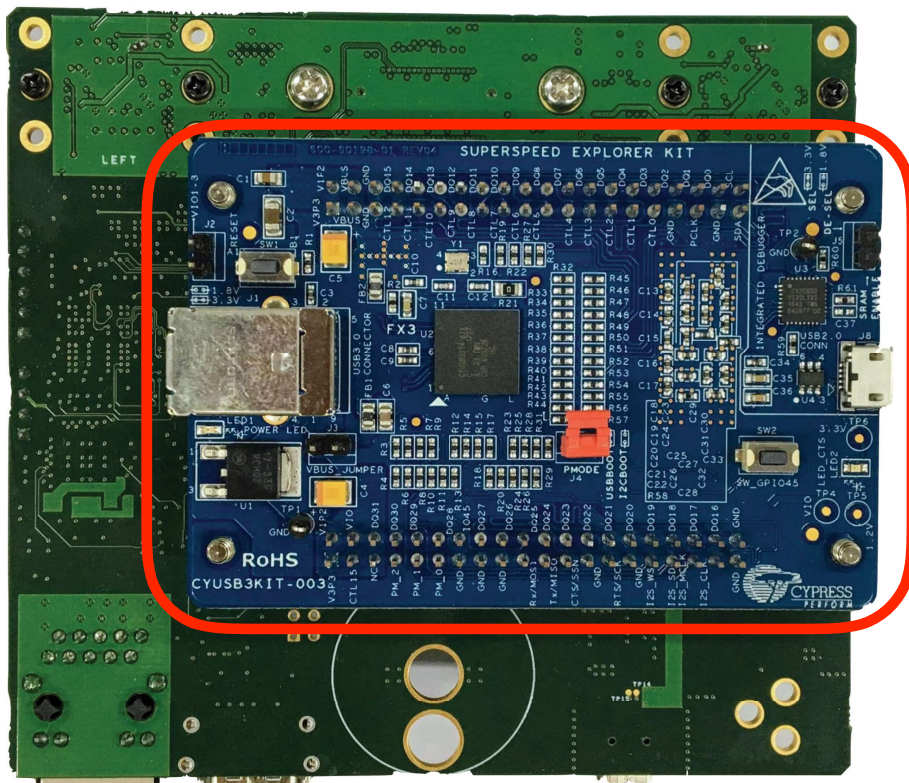


Figure 3.3.1 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결(모든 점퍼 OFF, PMODE J4제외)

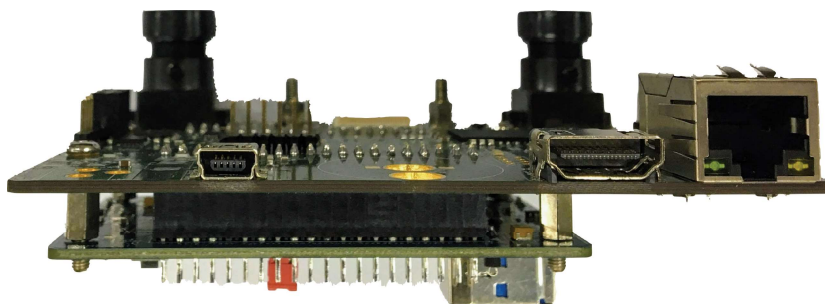


Figure 3.3.2 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결

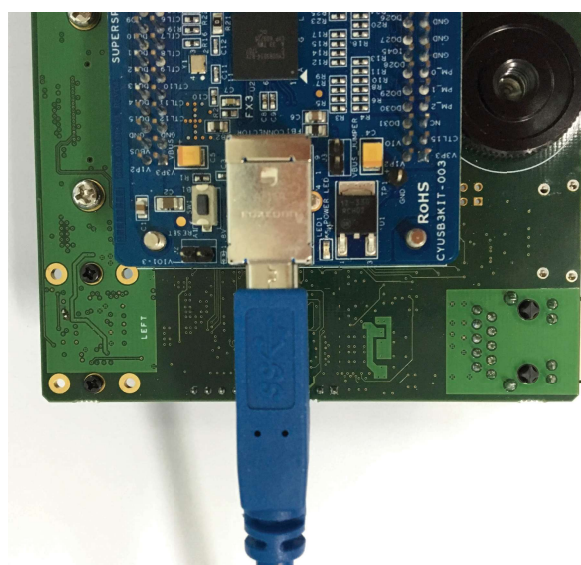


Figure 3.3.3 CYUSBKIT-003(미포함) USB3.0 cable 연결

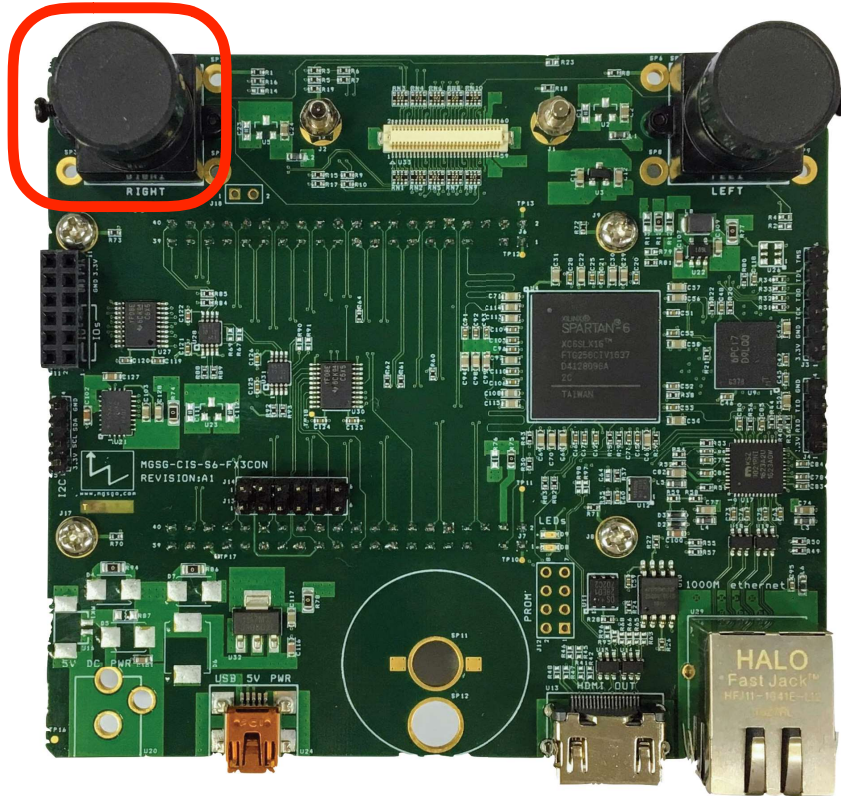


Figure 3.3.4 MT9M114 CMOS 이미지센서와 렌즈

3.4 USB3.0 UVC single CIS (AN75779, 2560x720@30fps) 예제

- UVC_CIS_LEFT_RIGHT_2560x720 : UVC(Universal Video Class) 카메라 예제, 이미지센서 2개 사용
- M-CIS-S6-FX3CON는 AN75779(Cypress FX3 UVC example)에서 MT9M114 센서보드처럼 동작할 수 있다
- AN75779 : <https://www.cypress.com/documentation/application-notes/an75779-how-implement-image-sensor-interface-using-ez-usb-fx3-usb>
- AN75779 코드 수정
 - GPIF bus 폭 : 8bit ==> 16bit
 - 영상 해상도@속도 : 1280x720@30fps ==> 2560x720@30fps
- CYUSB3KIT-003 보드 미포함
 - CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3

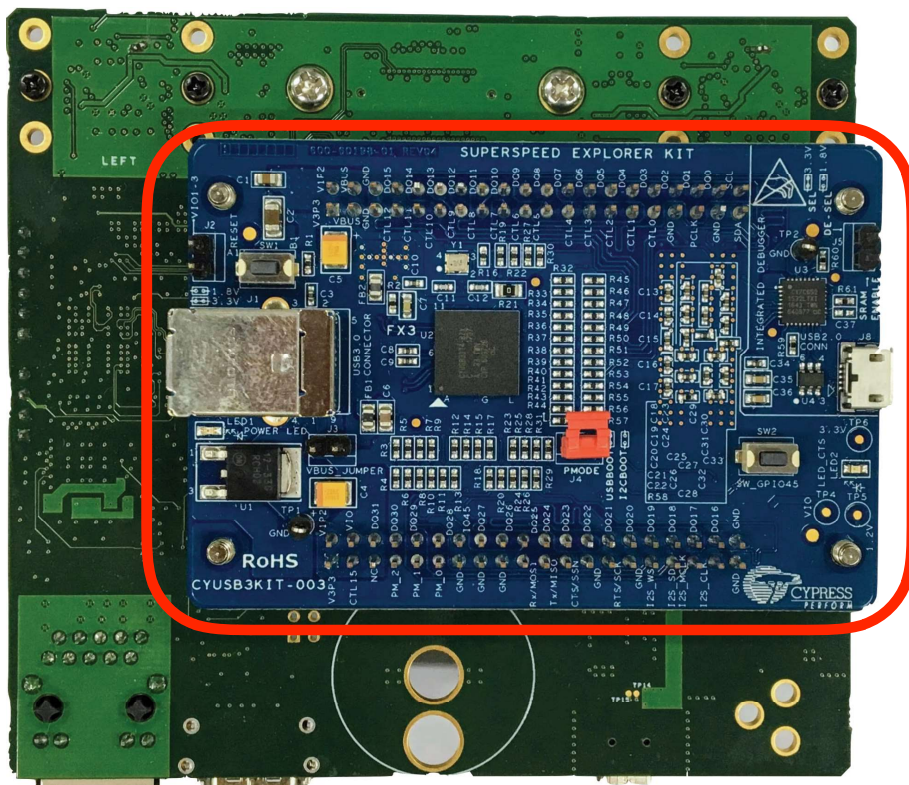


Figure 3.4.1 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결(모든 점퍼 OFF, PMODE J4제외)

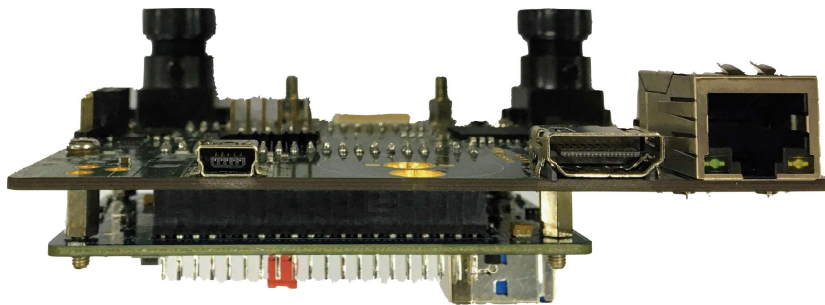


Figure 3.4.2 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결

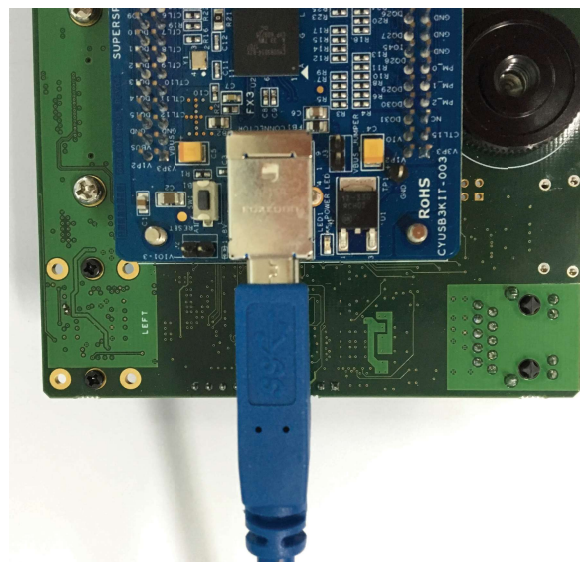


Figure 3.4.3 CYUSBKIT-003(미포함) USB3.0 cable 연결

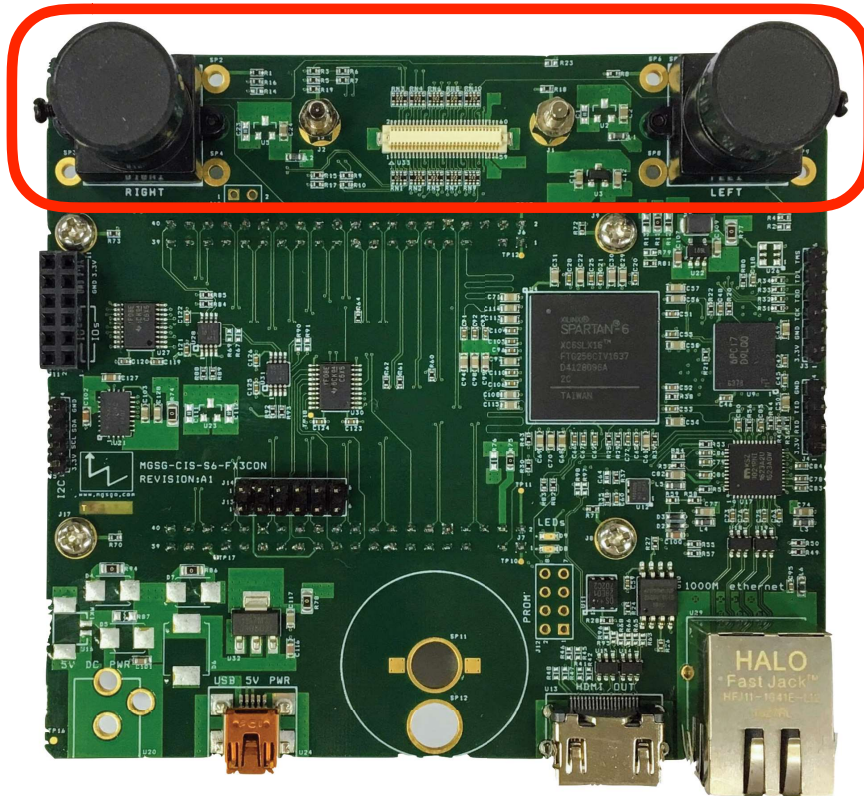


Figure 3.4.4 MT9M114 CMOS 이미지센서와 렌즈

3.5 Configuring an FPGA over FX3(use AN84868) 예제

- CONFIG_FPGA_OVER_FX3 : AN84868(Configuring FPGA example)에서 FX3가 Spartan6 FPGA를 mode slave serial로 configuration 하는 예제
- AN84868 : <https://www.cypress.com/documentation/application-notes/an84868-configuring-fpga-over-usb-using-cypress-ez-usb-fx3>
- FPGA를 configuration하는 데 필요한 binary 파일은 LED blink 예제를 사용한다
- CYUSB3KIT-003 보드 미포함
- CYUSBKIT-003 kit link : https://www.cypress.com/products/ez-usb-fx3-superspeed-usb-30-peripheral-controller#tabs-0-bottom_side-3

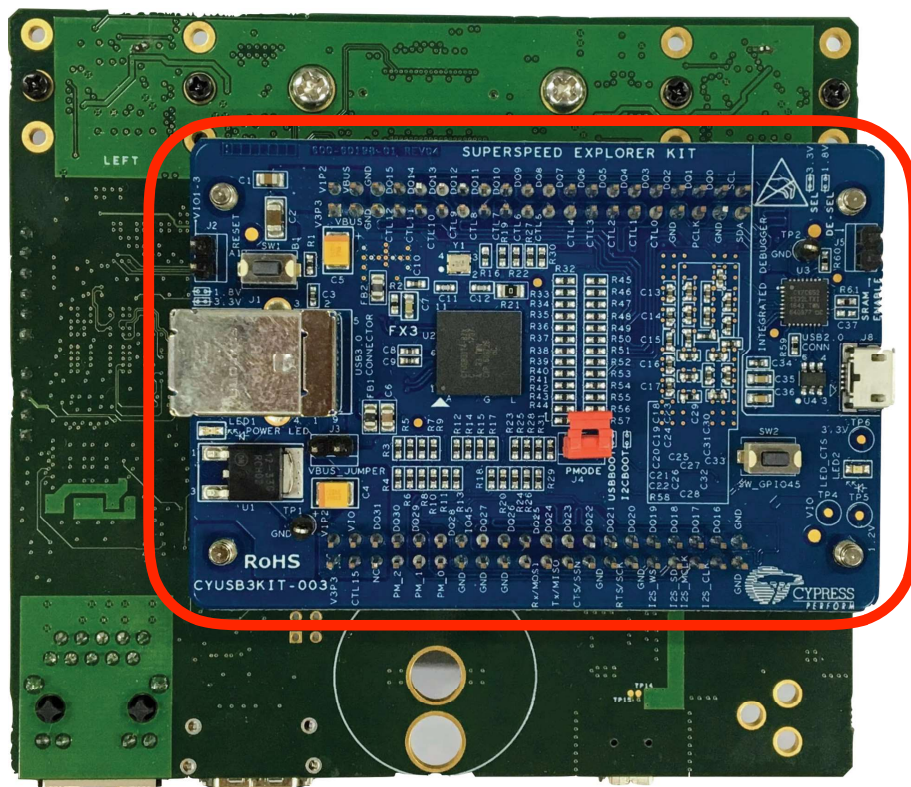


Figure 3.5.1 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결(모든 점퍼 OFF, PMODE J4제외)

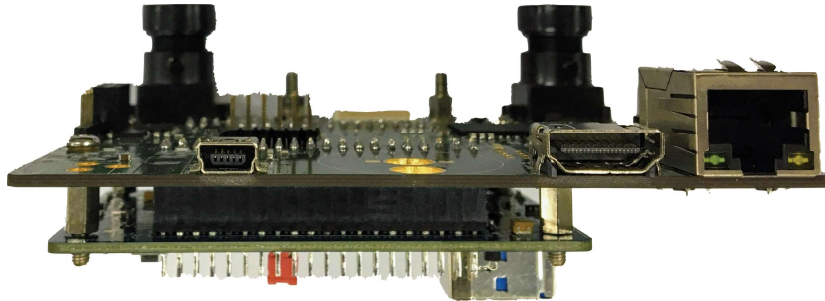


Figure 3.5.2 M-CIS-S6-FX3CON 과 CYUSBKIT-003(미포함) 연결

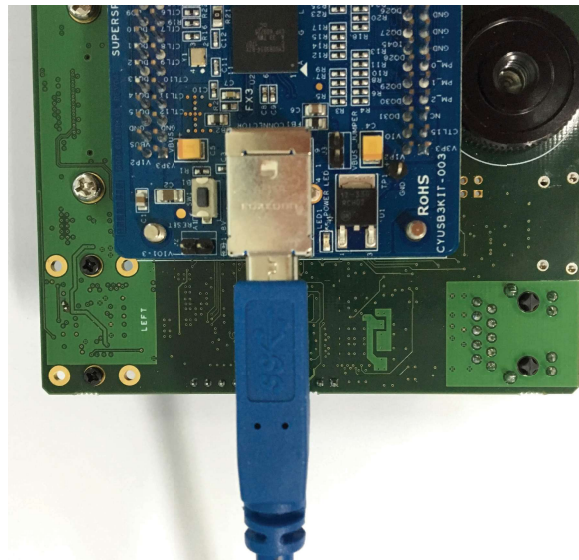


Figure 3.5.3 CYUSBKIT-003(미포함) USB3.0 cable 연결

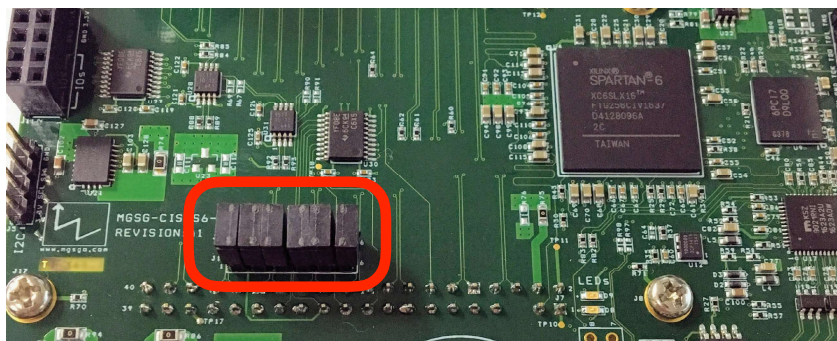


Figure 3.5.4 AN84868 예제를 위한 M-CIS-S6-FX3CON J14 점퍼연결

3.6 HDMI(TMDS) video 출력 예제

- HDMI_TMDS_VIDEO_OUT : Spartan6 FPGA에서 TMDS_33 IO를 이용하여 TMDS 신호를 출력하는 예제
- Xilinx UG381(https://www.xilinx.com/support/documentation/user_guides/ug381.pdf)
- HDMI 커넥터로 출력되는 TMDS 신호 최대속도 : 1280x720@60Hz or 1920x1080@30Hz
- HDMI HOT plug detect voltage 출력 미지원, HDMI CEC/I2C(DDC) 제어 미지원
- HDMI 케이블 **미포함**

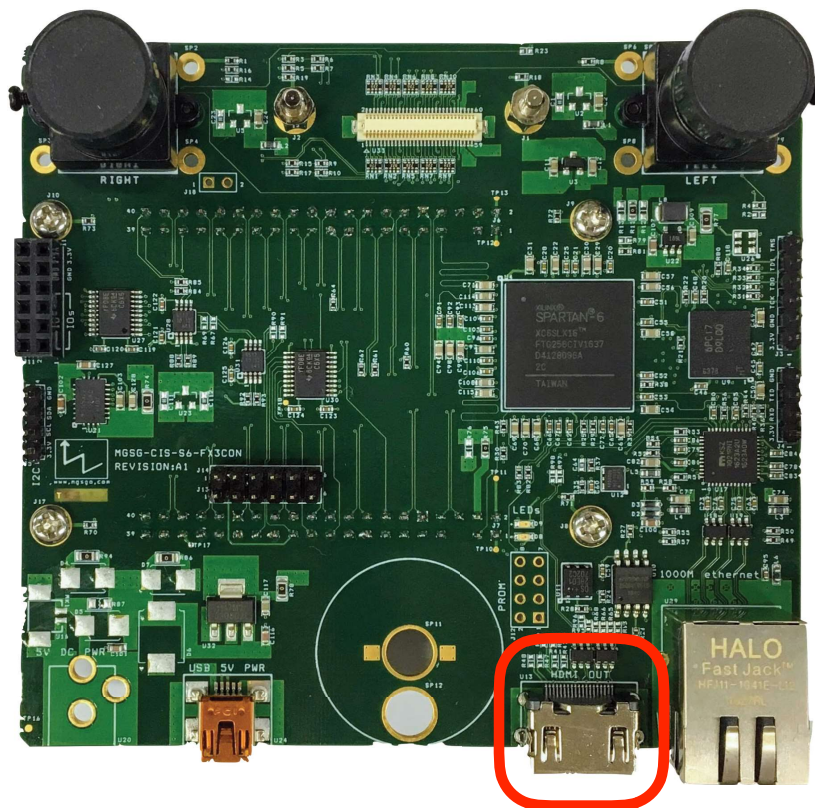


Figure 3.6.1 M-CIS-S6-FX3CON HDMI 출력 포트

3.7 Gigabit ethernet(1000M) UDP throughput test 예제

- GIGABIT_UDP_THROUGHPUT_TEST_BINARY : Gigabit ethernet MAC/UDP stack을 이용한 UDP 출력 테스트 (bit 파일 제공)
- 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 케이블 **미포함**
 - 1Gbps 연결을 위해서 CAT5E 혹은 그 이상의 케이블을 사용해야함
 - PC LAN card와 직접 연결할 경우 cross 케이블 사용해야함

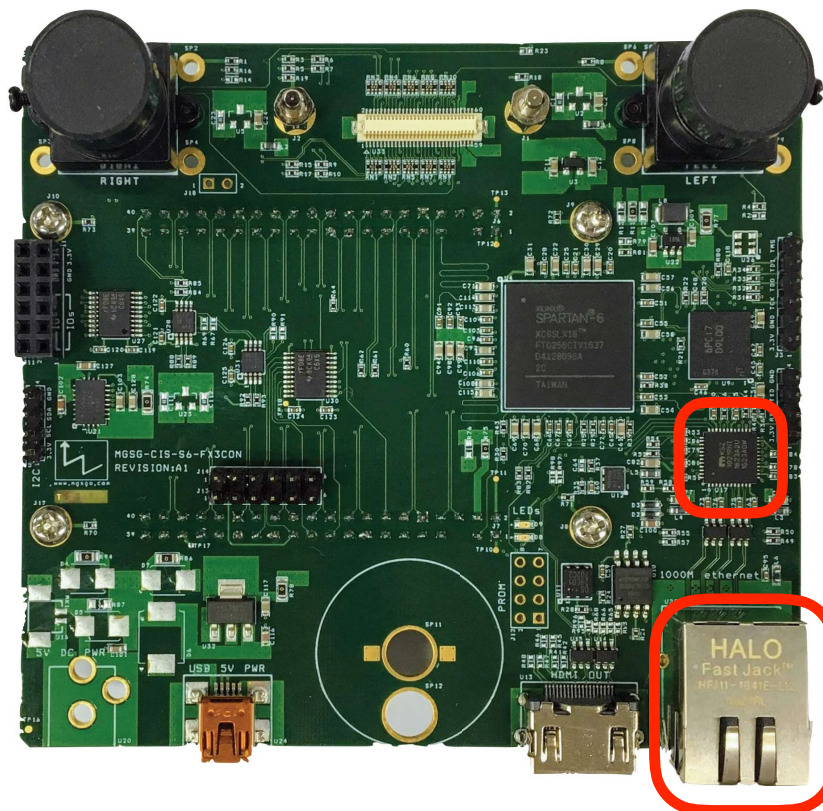


Figure 3.7.1 M-CIS-S6-FX3CON Ethernet port(RJ45)와 PHY IC(KSZ9021)

3.8 Xilinx MIG를 이용한 LPDDR test 예제

- LPDDR_MIG_TRAFFIC : Xilinx MIG(UG388)를 이용한 200MHz 에서 작동하는 LPDDR write/read 예제
- https://www.xilinx.com/support/documentation/user_guides/ug388.pdf
- LPDDR part number : MT46H32M16LFBF-5 IT:C

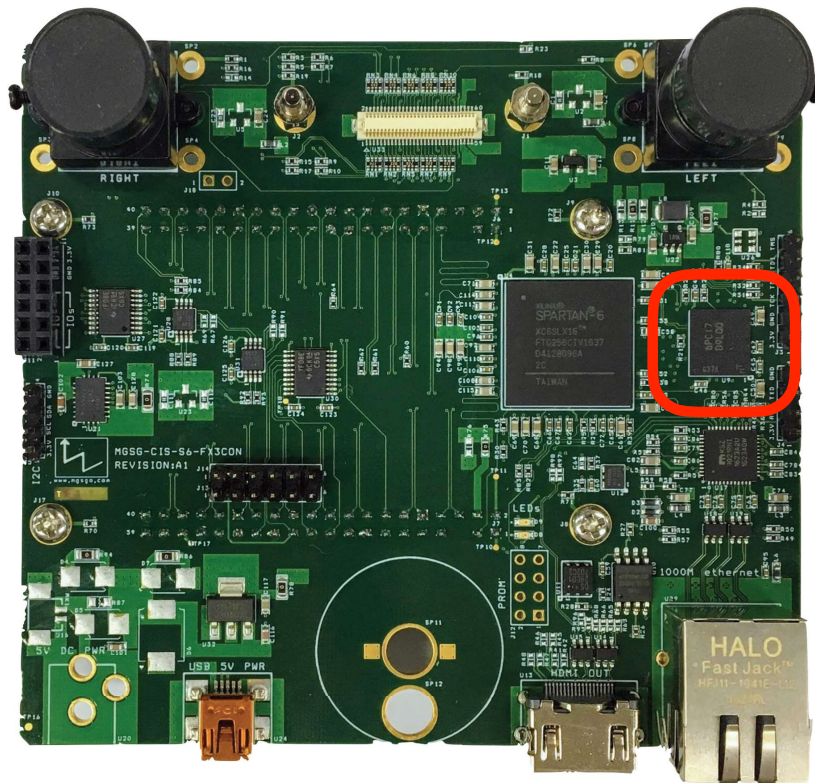


Figure 3.8.1 M-CIS-S6-FX3CON LPDDR memory

3.9 SHA-1 EEPROM 제어 예제

- SHA1_AUTHENTICATION : SHA-1 EEPROM 제어 예제(AVNET reference design 필요함)
 - DS28E01 reference design(S6LX16 PicoBlaze SHA-1 Authentication Design)
 - <https://www.avnet.com/shop/us/products/avnet-engineering-services/aes-s6ev-lx16-g-3074457345630217084/>
 - XAPP780(DS2432를 사용할 경우)
 - https://www.xilinx.com/support/documentation/application_notes/xapp780.pdf

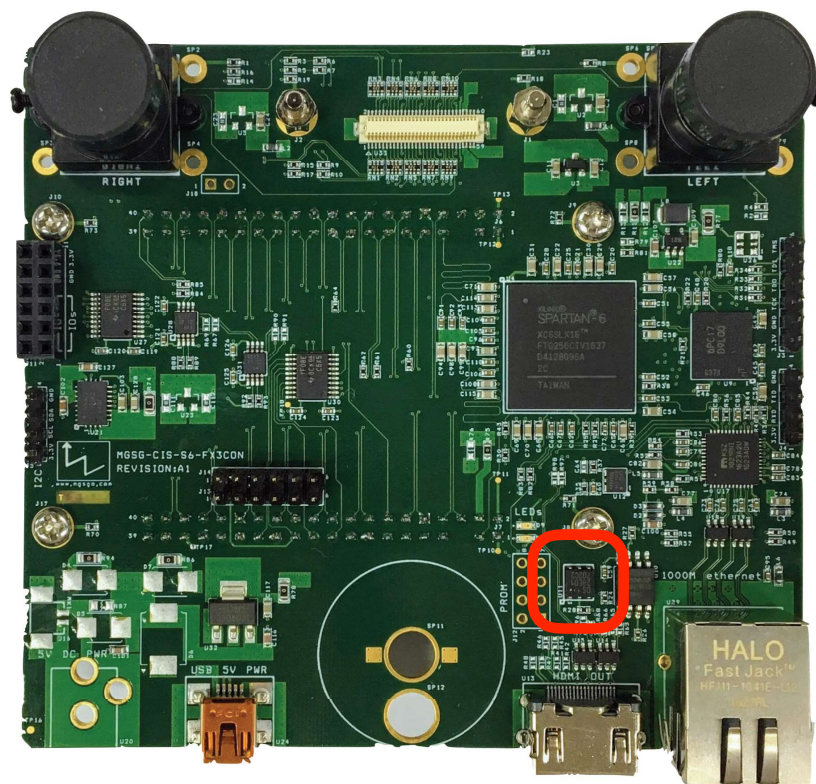


Figure 3.9.1 SHA-1 IC(DS28E01)

4. Support

4.1 구매 지원

각 유통업체를 통해서 구매 가능

4.2 기술지원

Contact to msgg_opensource@gmail.com

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