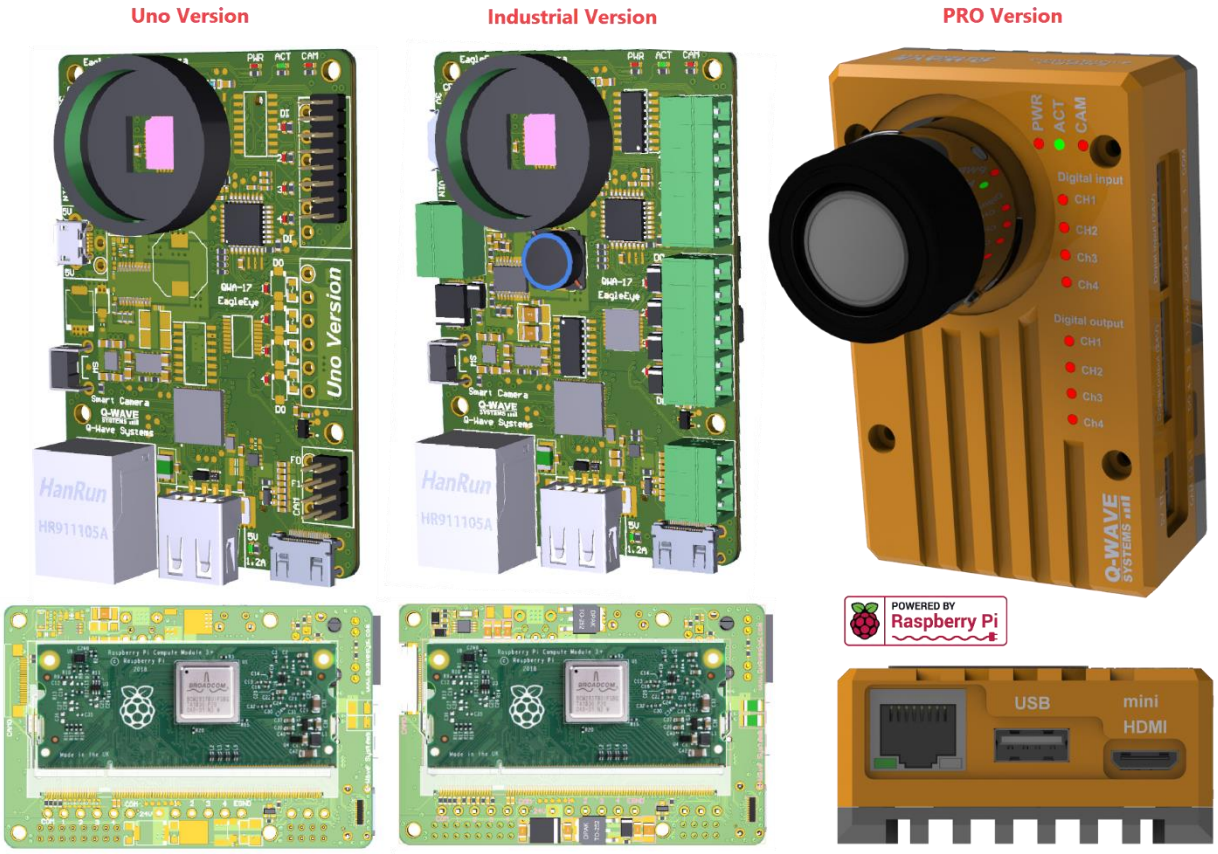
EagleEYE Smart Camera



https://github.com/QWaveSystems/QwaveSmartCamera_EagleEYE

Product Datasheet

Developer Manual

Getting Start Guide

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

Revision History

Revision	Date	Comment	Editor
A 1.0.0	22/11/2019	Initial version	Amornthep Phunsin

Order Part Number

Product	P/N	Price USD/THB
EagleEYE Uno Board	EY-UNO	
EagleEYE Industrial Board	EY-IND	
Full Size Heat-sink	EY-HSK	
EagleEYE Uno+ Heat sink+"CM3+ 32GB"	EY-UNO-32	
EagleEYE Industrial+ Heat sink+"CM3+ 32GB"	EY-IND-32	
EagleEYE Pro "CM3+ 32GB"	EY-PRO-32	
EagleEYE Pro Developer Kit - Raspberry Pi CM3+ 32GB - EagleEYE Flasher CM3+ board - x1 Power supply 24V 2A - x5 Lens CS mount 4/6/8/12/5-50mm - x1 RGB 40 LEDS (WS2812) - x1 mini HDMI to HDMI cable 1m - x1 LAN 100Mbps cable 1m - x1 USB 2.0 hub 3 port Slim version - x1 USB 2.0 WiFi 2.4GHz 802.11b/g/n (150Mbit/s) - x1 Din rail clipper	EY-PRO-KIT	
EagleEYE Uno Developer Kit - Raspberry Pi CM3+ 32GB - EagleEYE Flasher CM3+ board - x1 Power supply 5V 2.5A (micro USB) - x5 Lens CS mount 4/6/8/12/5-50mm - x1 RGB 40 LEDS (WS2812) - x1 mini HDMI to HDMI cable 1m - x1 LAN 100Mbps cable 1m - x1 USB 2.0 hub 3 port Slim version - x1 USB 2.0 WiFi 2.4GHz 802.11b/g/n (150Mbit/s)	EY-UNO-KIT	

Target Application

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

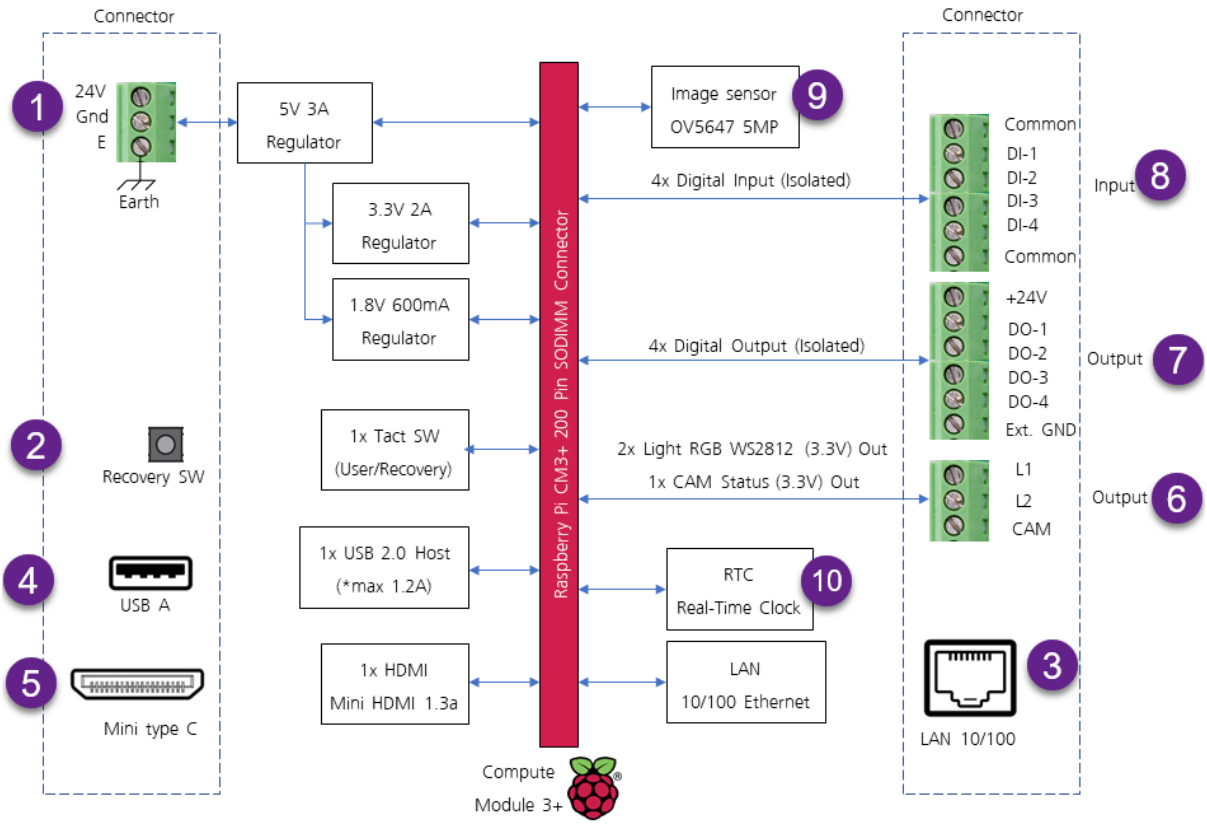
- Embedded vision
- industrial machine vision application
- Prototype computer vision algorithm
- Image processing analysis
- AI vision machine learning
- Drones navigation systems
- Robots vision, AGV (Automated Guided Vehicles)
- ADAS (Advanced Driver Assistance System)

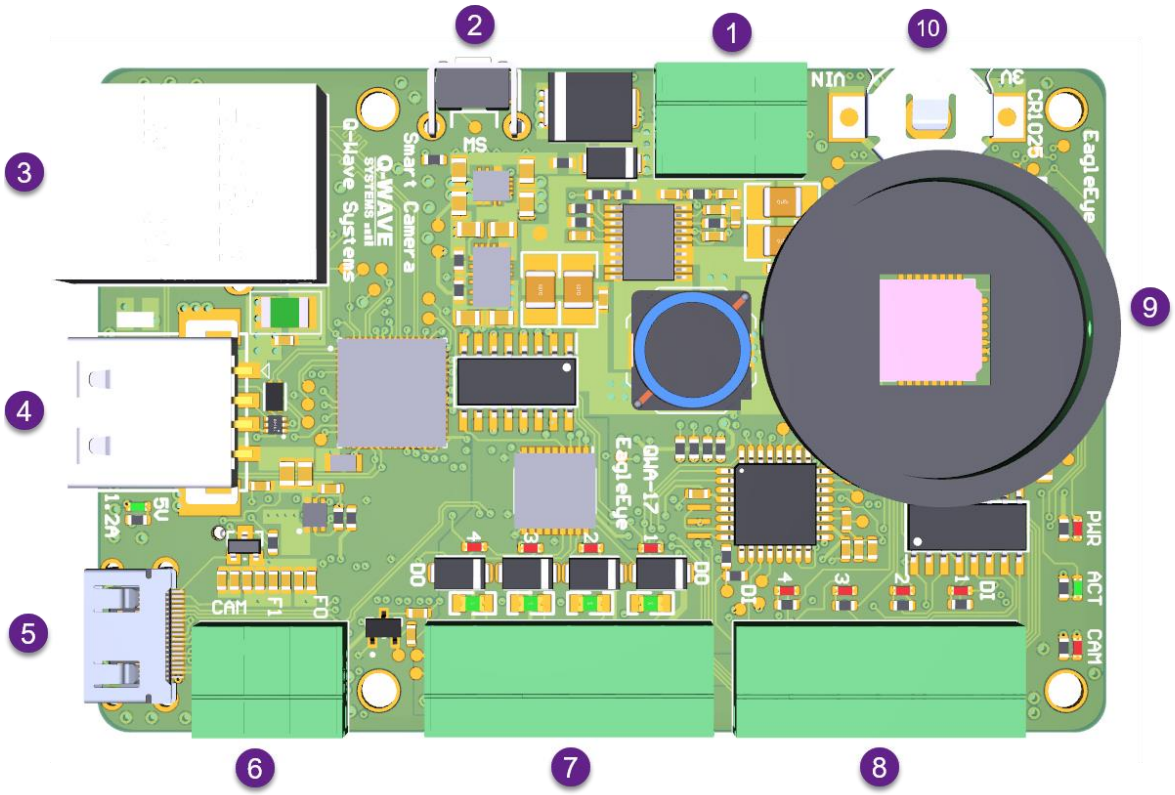
Product Specification

Specification	Industrial/Pro Version	Uno Version
CPU	Raspberry Pi Compute Module 3+ (CM3+) via SODIMM connector, CPU Broadcom BCM2837B0 1.2GHz quad core cortex-A53 processor, 1GB LPDDR2 RAM, eMMC 8GB/16GB/32GB flash	
Camera Sensor	5MP OV5647 1/4inchs CMOS RAW image sensor (CSI-2)	
Camera Resolution	QSXGA 2592x1944 (max), Video QVGA 320x240 @120fps (max)	
Lens Configuration	CS mount lens	
Video Output	1x Mini HDMI Port (HDMI V1.3a)	
Networking	1x 10/100M Ethernet	
USB Host	1x USB 2.0 host port up to 1.2A	
Camera Status	1x 3.3V Output (CAM)	
Light RGB Output	2x 3.3V Output (L1,L2) *Required external +5V 3A (RGB WS2812)	
Thermal Solution	Full size heat-sink (98x61mm)	
RTC	Real-Time clock onboard	-
HW Watchdog	Yes (onboard MCU)	-
Voltage Input	12V-24V Input (*min 25W)	5V 3A Input via uUSB
Circuit Protection	Polarity protection, Short circuit, Over voltage/current, Thermal shutdown	-
Temperature Range	-20 C – +85 C	0 C – +45 C
Digital Input	4x Isolated 4 Channel 24V input	4x 3.3V via GPIO header
Digital Output	4x Isolated 4 Channel 24V Output (Required external +24V supply)	4x 3.3V via GPIO header (*50mA total)
Dimension (W/L/H)	Board size 85x56x19.5mm	Board size 85x56x19.5mm
Weight	-	-
Dimension(heatsink)	with heat-sink 98x61x31mm	with heat-sink 98x61x28mm
Power Consumption	25W (max)	15W (max)
Software	Standard Raspbian OS, OpenCV, C++ and Python	

Block Diagram

EagleEYE Industrial version



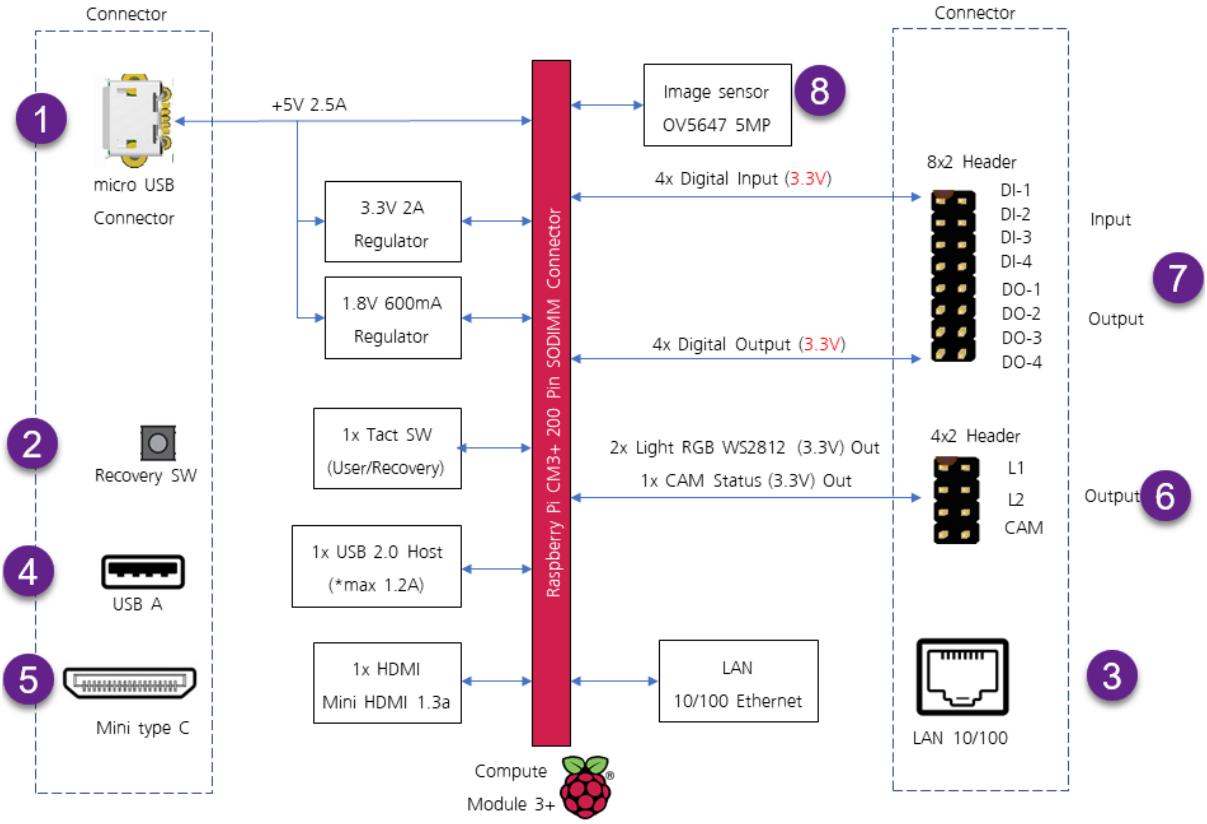


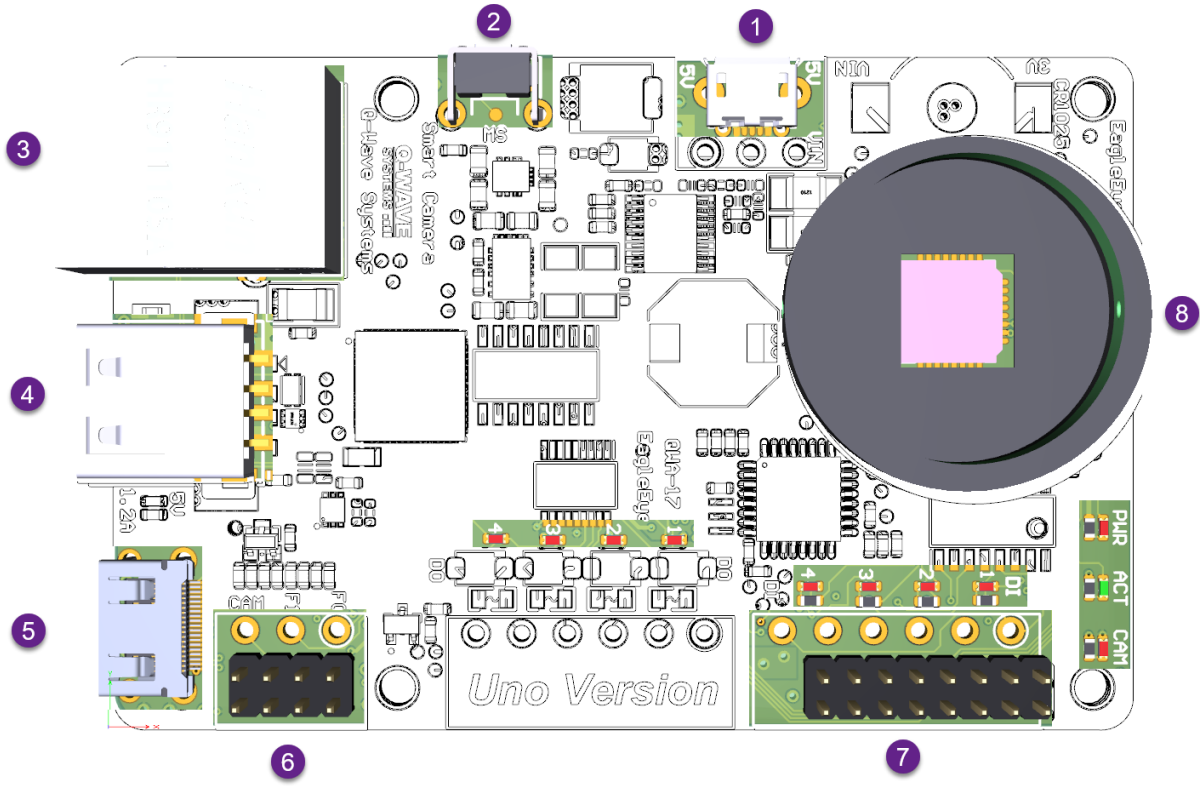
Pro Version (Industrial Version + Enclosure+ Heat-sink)

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

EagleEYE Uno version

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com





Raspberry Pi Compute Module 3+ (CM3+) Specification

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

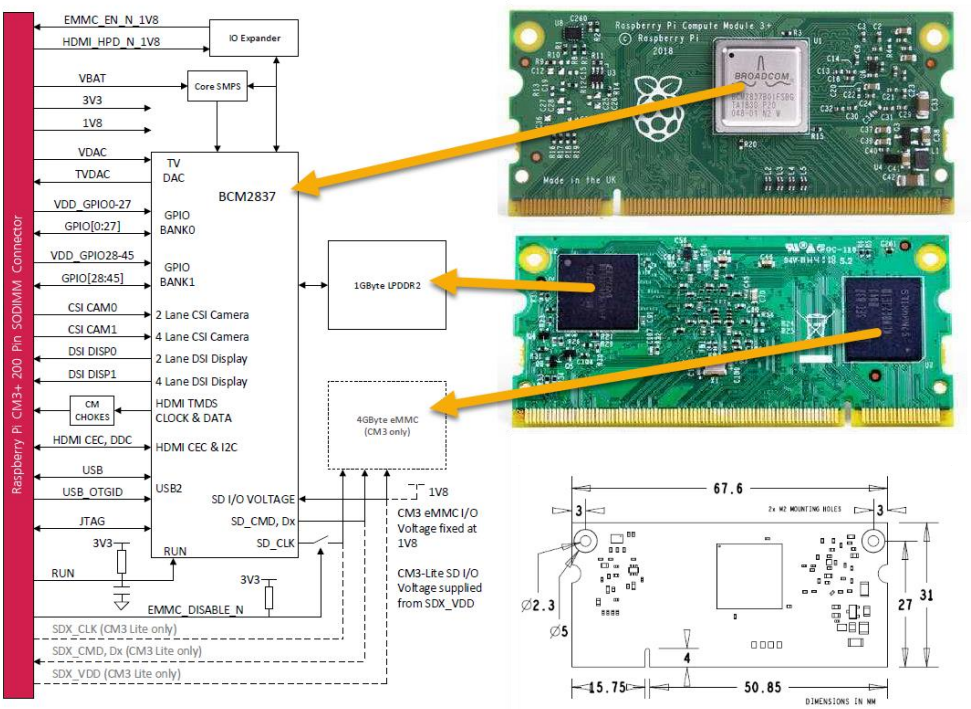
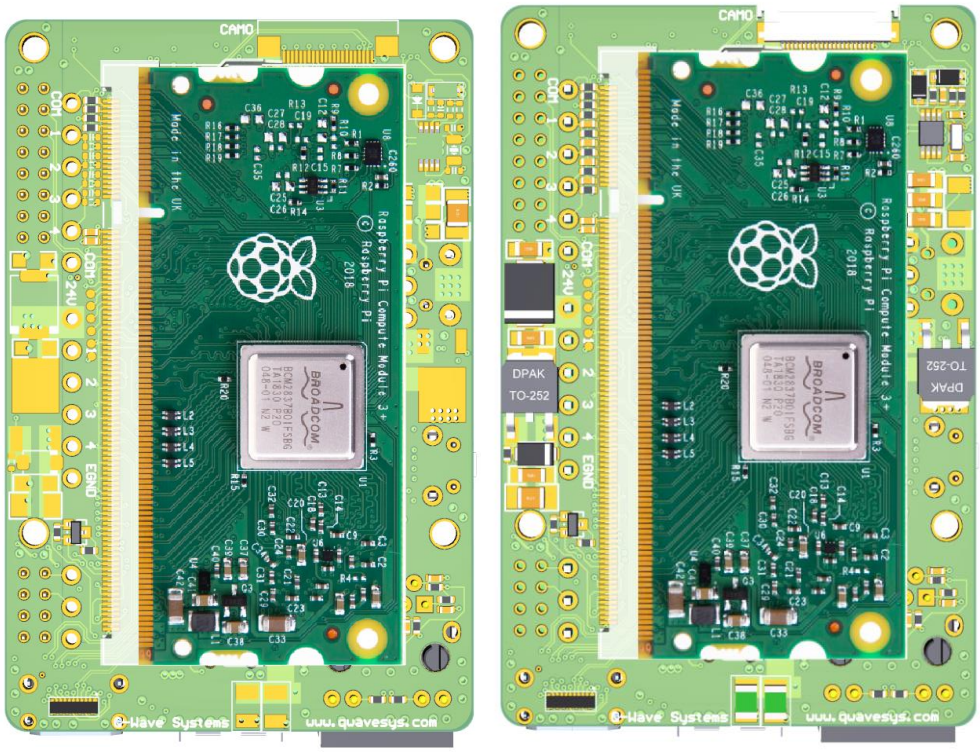


Figure 2: CM3/CM3L Block Diagram

Figure 4: CM3 and CM3L Mechanical Dimensions

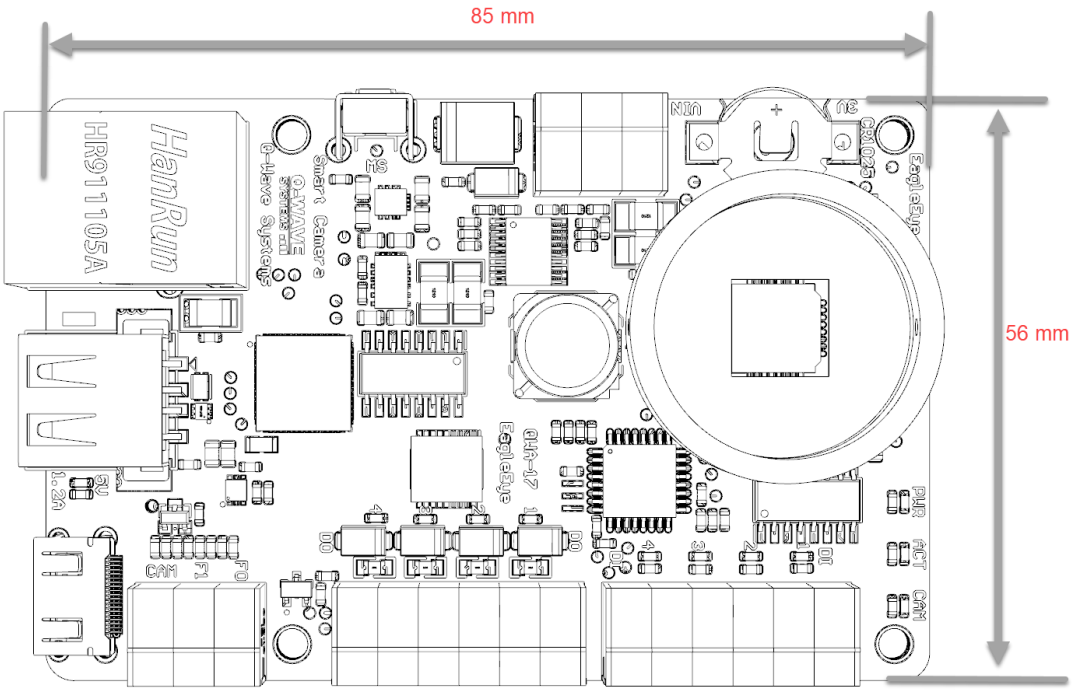
EagleEYE and Raspberry Pi CM3+ Interface Board view



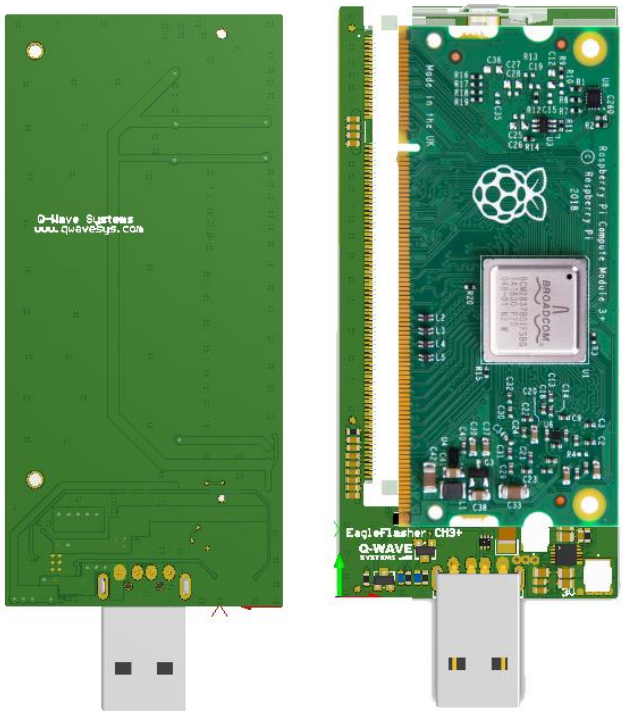
Left (Uno), Right (Industrial)

Dimension

Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com



Update OS via EagleEYE Flasher CM3+ board



Power Supply Connection Diagram

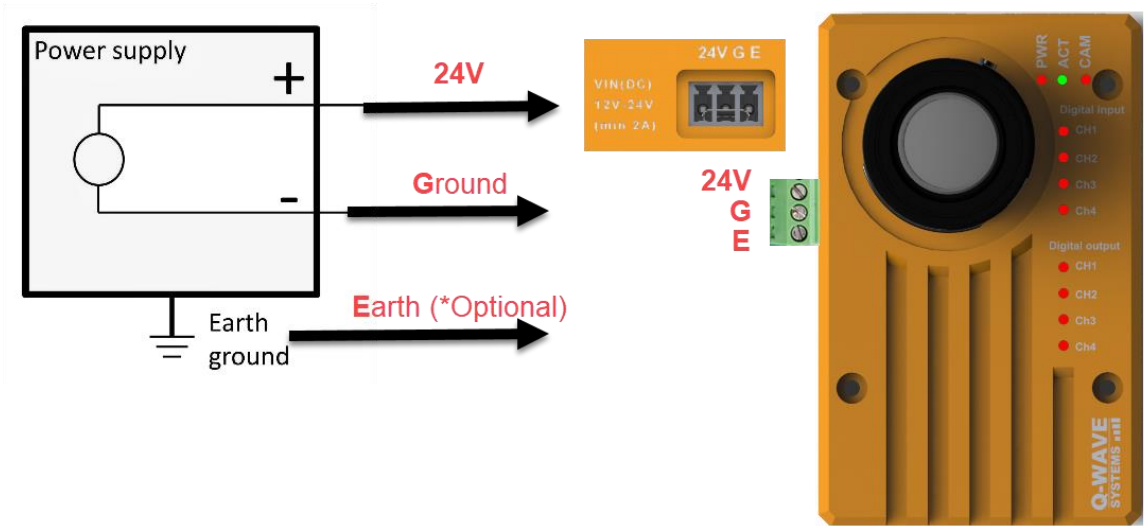
Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

Industrial/Pro version:

Power Requirement: 25W Power supply

Vin support range: 5.5V-35V

Typical: 12V or 24V (2A)

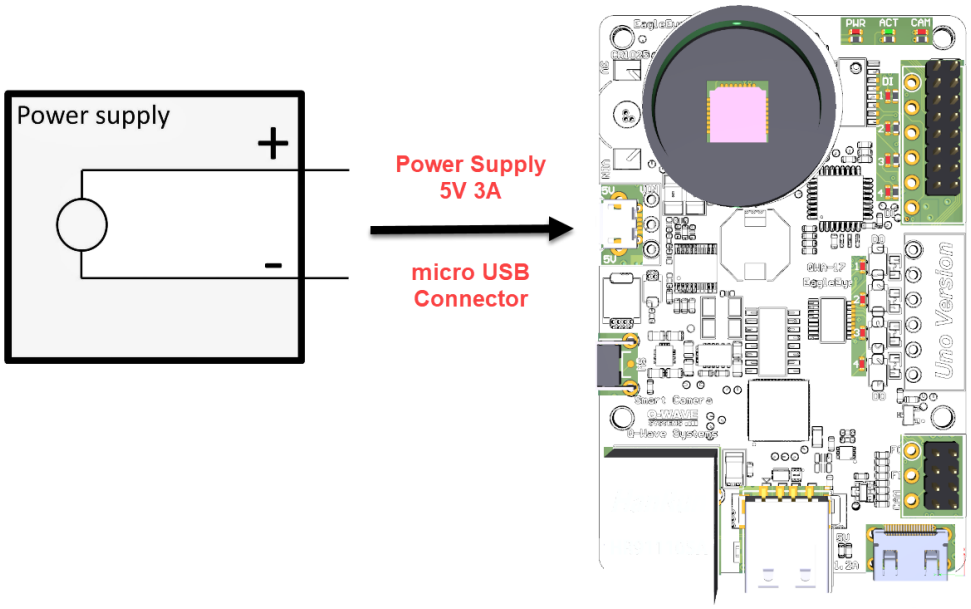


Uno version:

Power Requirement: 15W Power supply

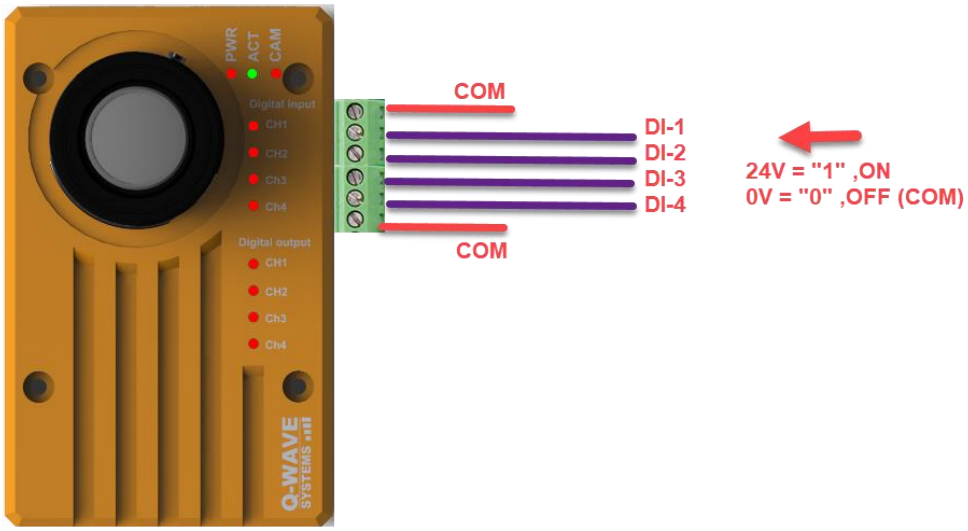
Vin support range: 4.75V-5.25V

Typical: 5V 3A

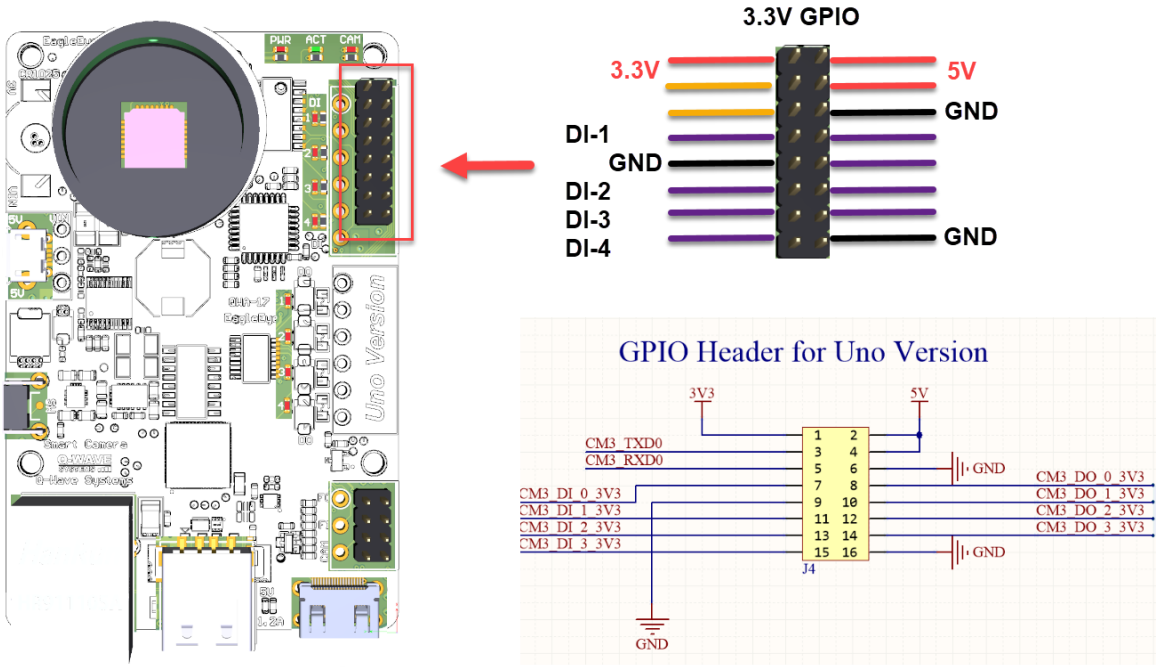


Digital Input Connection Diagram

Industrial/Pro version: Digital Input 4 CH Isolate

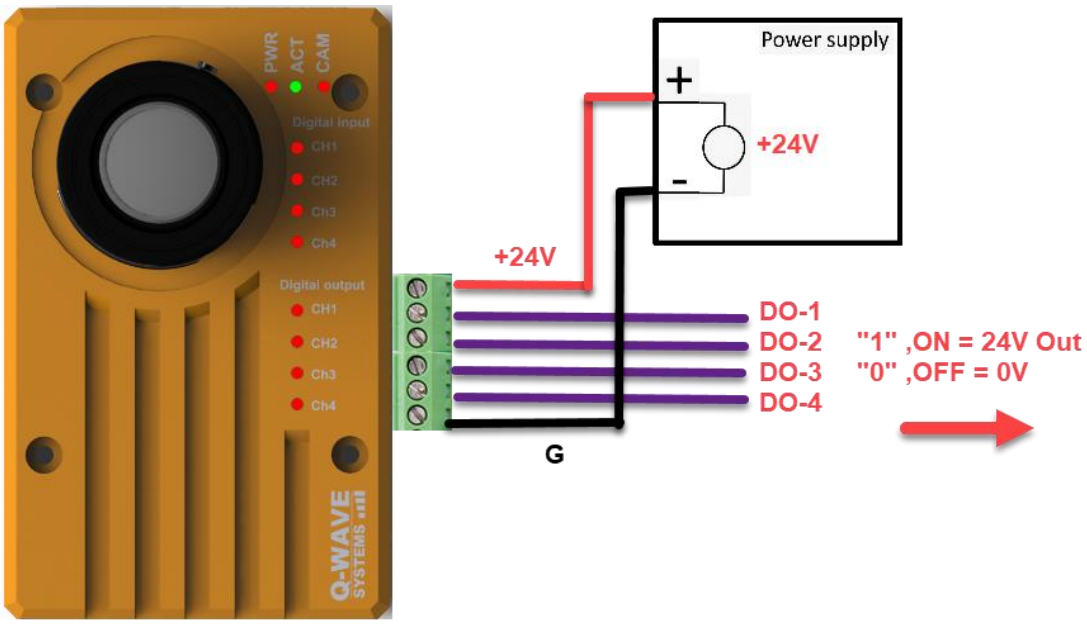


Uno version: 3.3V Input Only

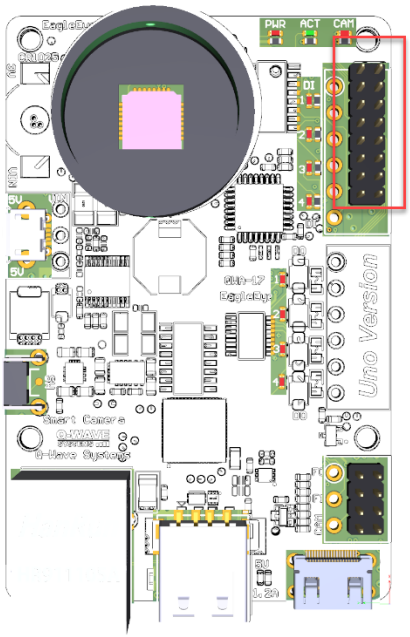


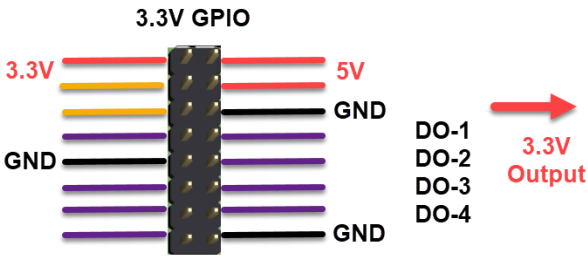
Digital Output Connection Diagram

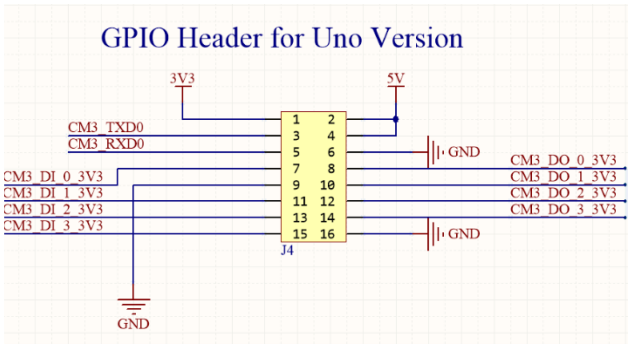
Industrial/Pro version: Digital Output 4 CH Isolate



Uno version: 3.3V Output Only (*total 50mA max)







CAM status and Light Source Output: RGB (WS2812) Connection Diagram

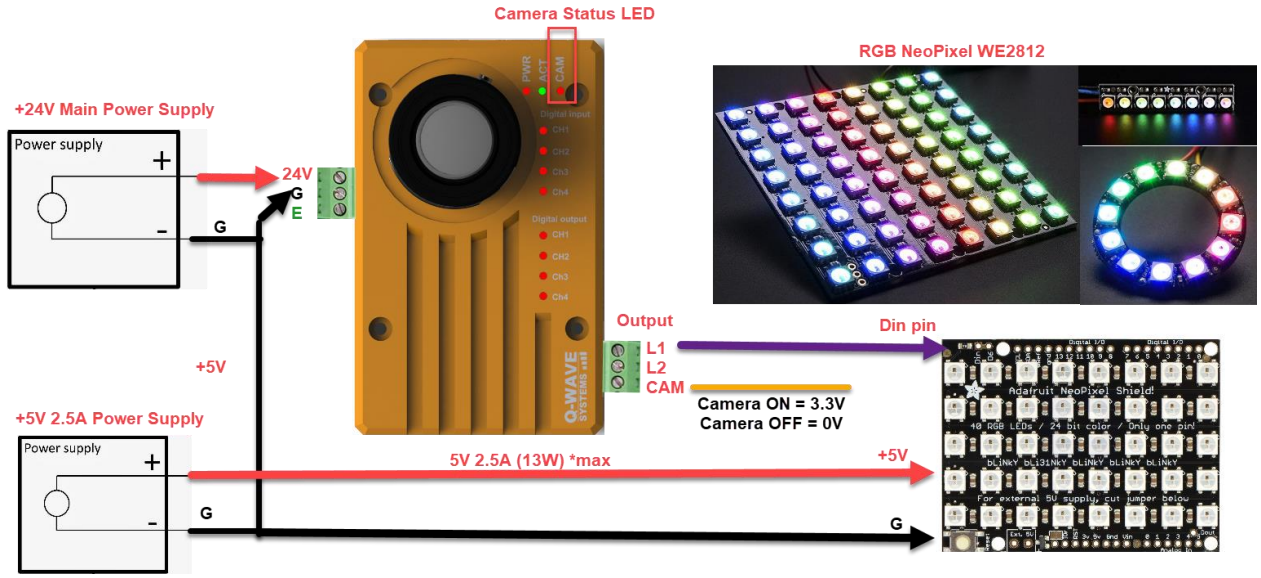
CAM: 3.3V Output. If camera is ON this pin = 3.3V. If camera is OFF = 0V

L1: 3.3V Output (RGB WS2812)

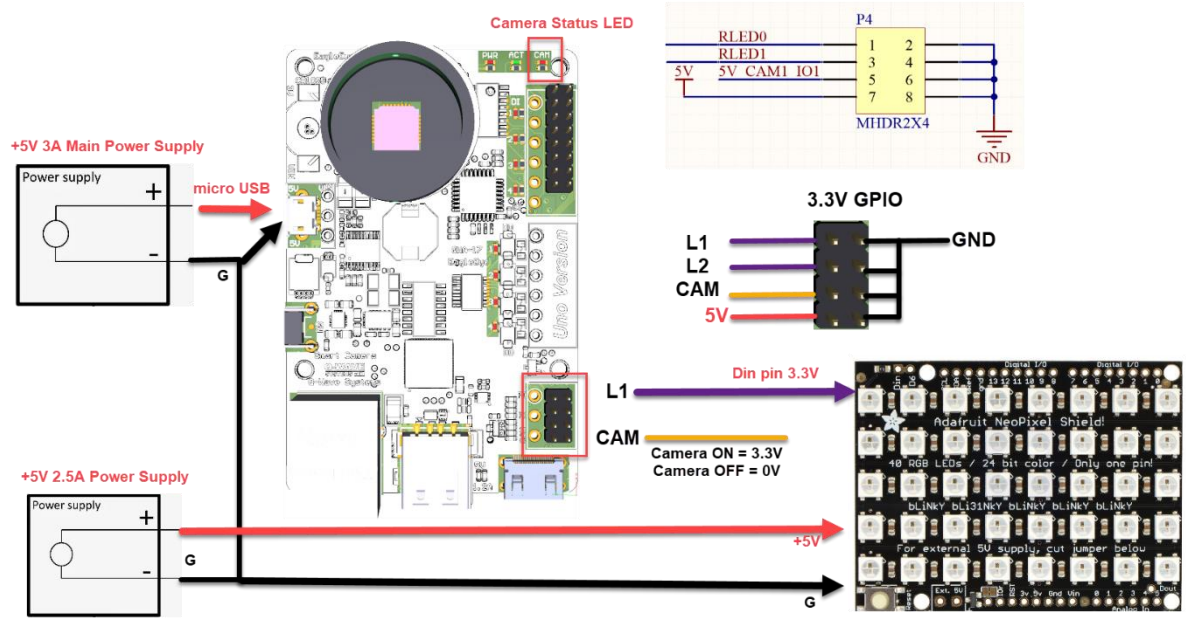
L2: 3.3V Output (RGB WS2812)

***L1 and L2 can NOT use both at the same time.

Industrial/Pro version: 3.3V Output



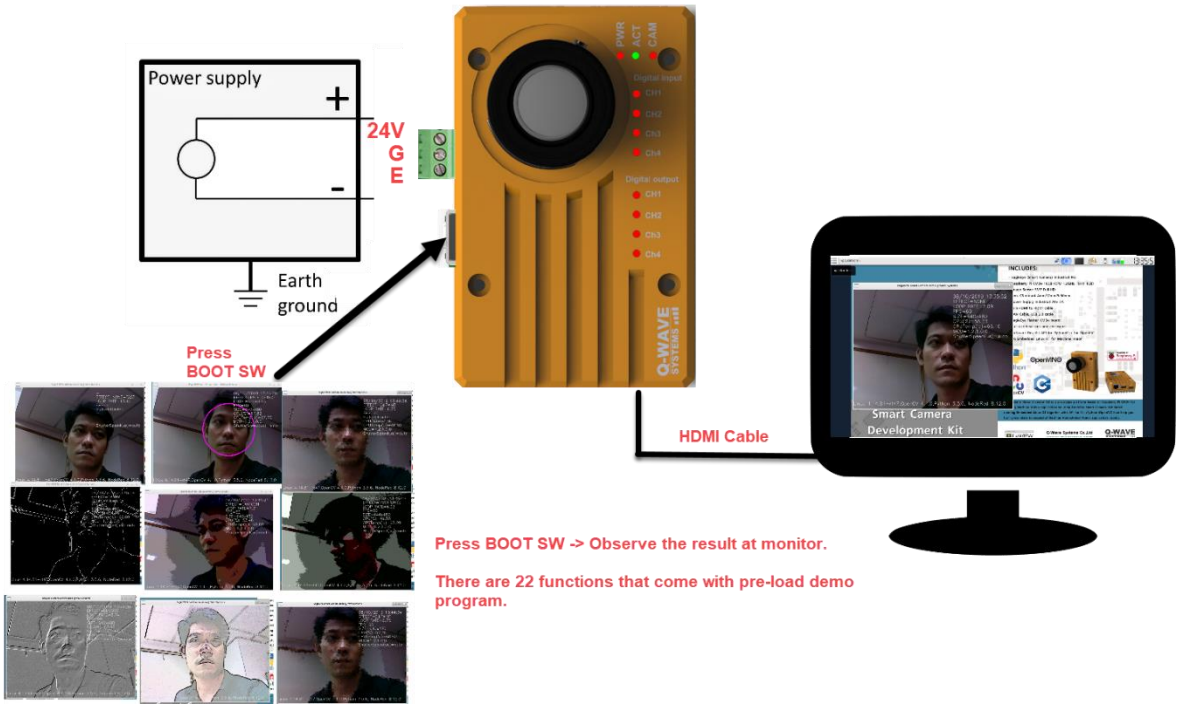
Uno version: 3.3V Output



Getting Start Guide: Connect to HDMI monitor

Once received Smart Camera you can experience with shipped demo program by connect power supply (+24V for Industrial/Pro version or +5V USB for Uno version) then connect HDMI cable to monitor. The boot period will be around 15s-20sec for the first time.

The "ACT" (Green) LED blinking indicated that the board is running normally.
The "PWR" (Red) LED indicated that power supply status.
The "CAM" (Red) LED indicated that camera ON/OFF status.

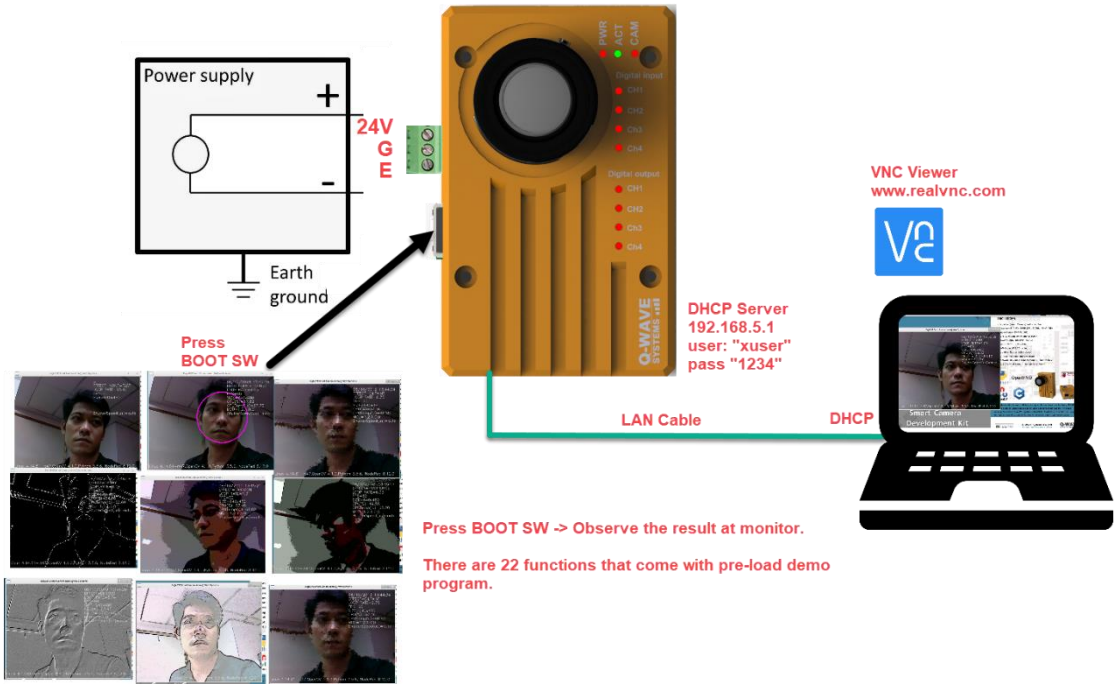


The demo program will be continually read "BOOT SW" status, Once button has pressed the effect will change accordingly, There will be 22 effect display at monitor screen.

At the screen will also display version of pre-load software, library and etc.. for examples.

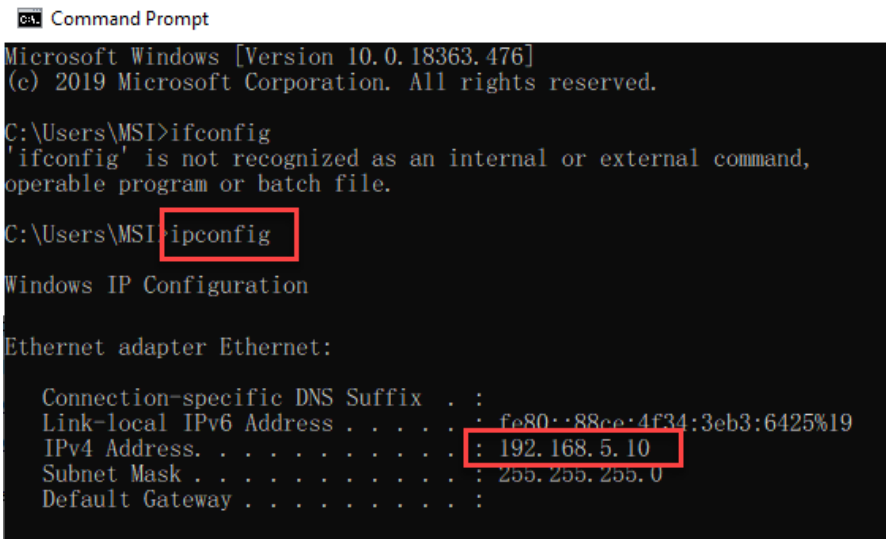
- Linux Kernel version: 4.14.81
- OpenCV: 4.1.0
- Python: 3.5.6
- NodeRed: 8.12.0

Getting Start Guide: Connect PC via LAN cable and using VNC viewer.



Smart Camera has setup to be “DHCP server and fix IP address to 192.168.5.1”, Once connect board to PC via LAN cable, The PC will received IP address from Smart Camera for example 192.168.5.xx.

(*Optional) Open command prompt windows, then type “ipconfig” command to check current IP address on ethernet port.

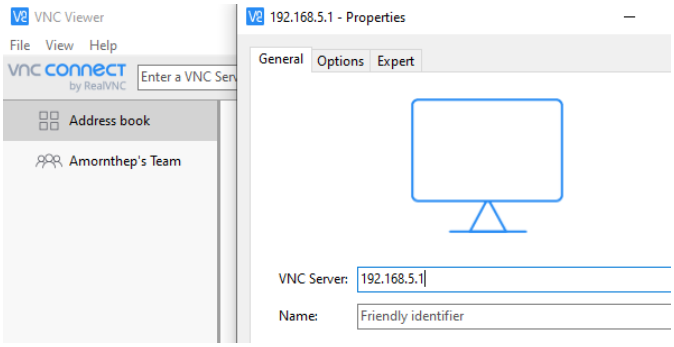


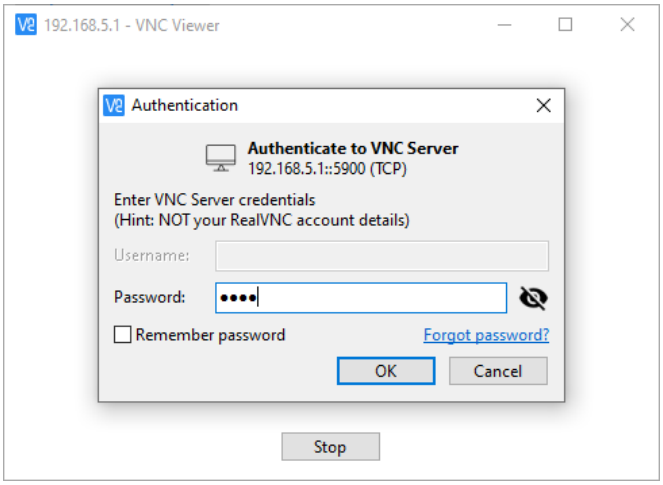
Open “VNC Viewer” Connect to Smart Camera using following info.

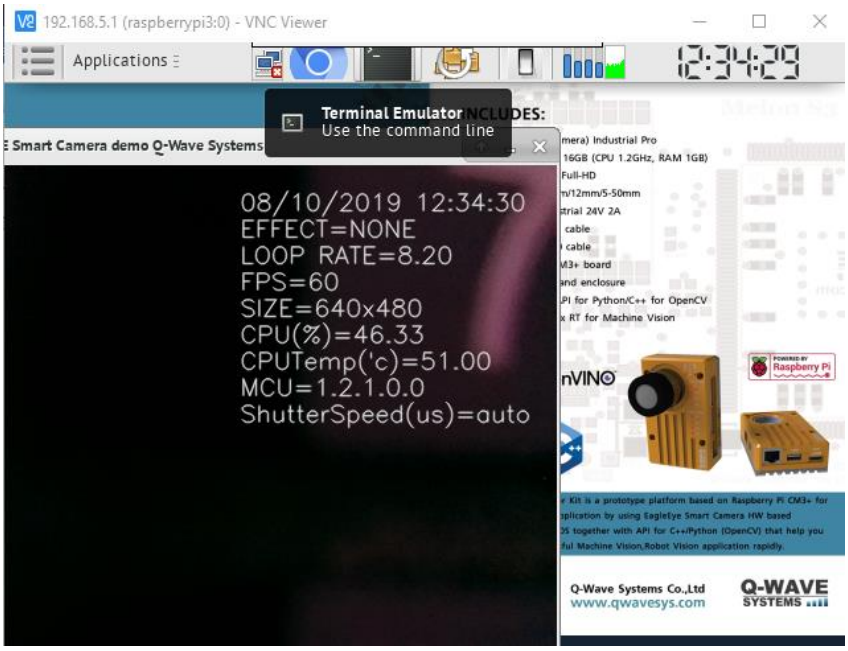
IP Address: “192.168.5.1”

User: “xuser”

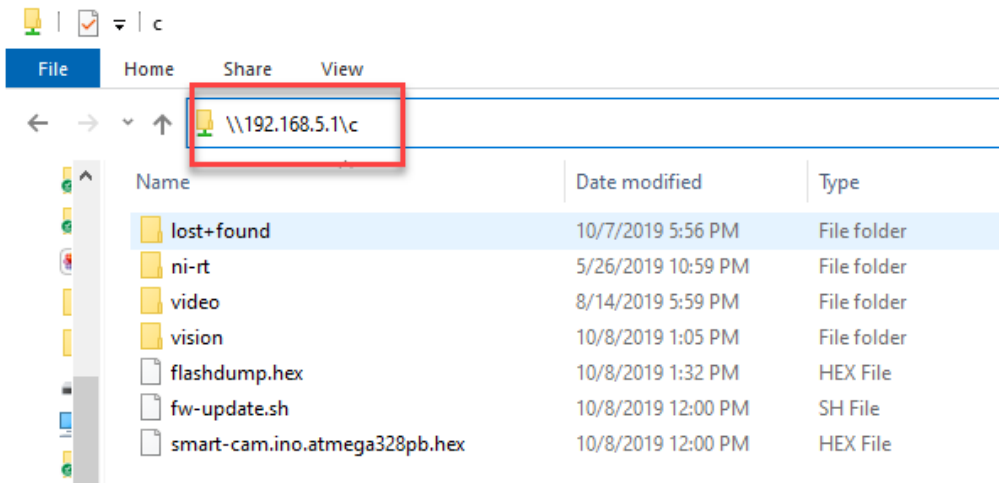
Pass “1234”







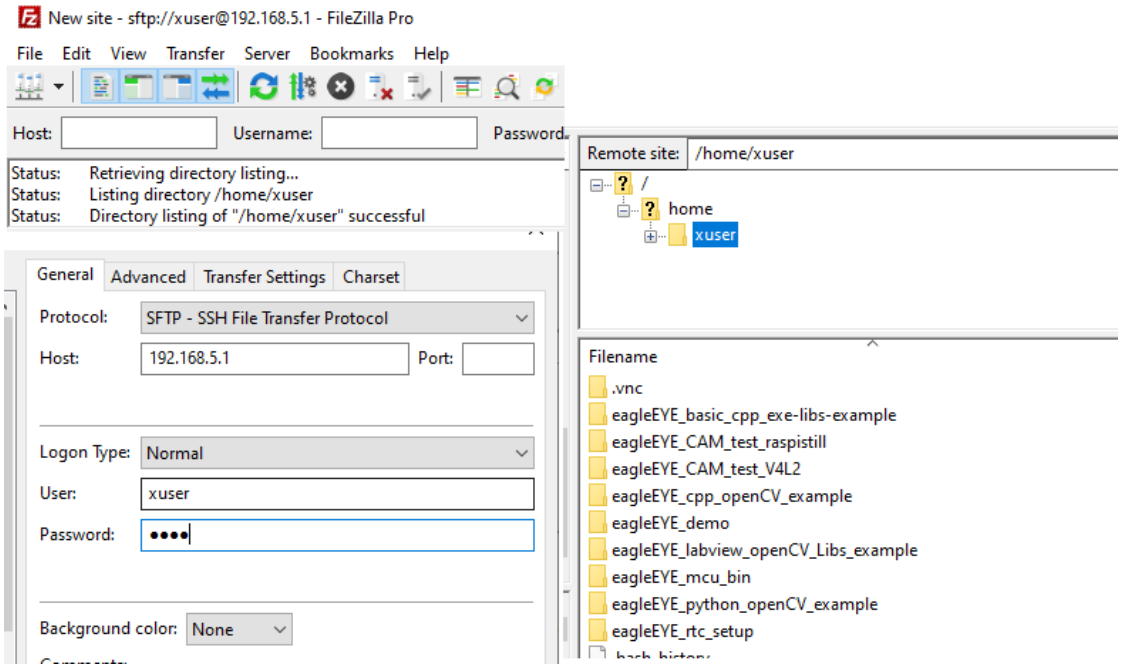
Getting Start Guide: File transfer using Network shared drive.



Getting Start Guide: File transfer using FTP software.

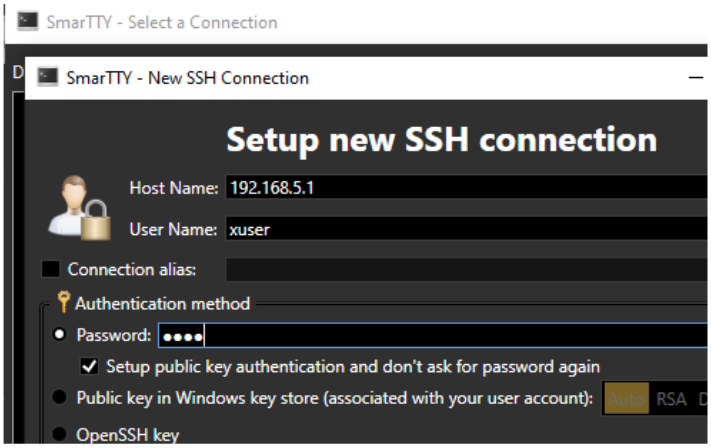
The default home directory for xuser is "/home/xuser"

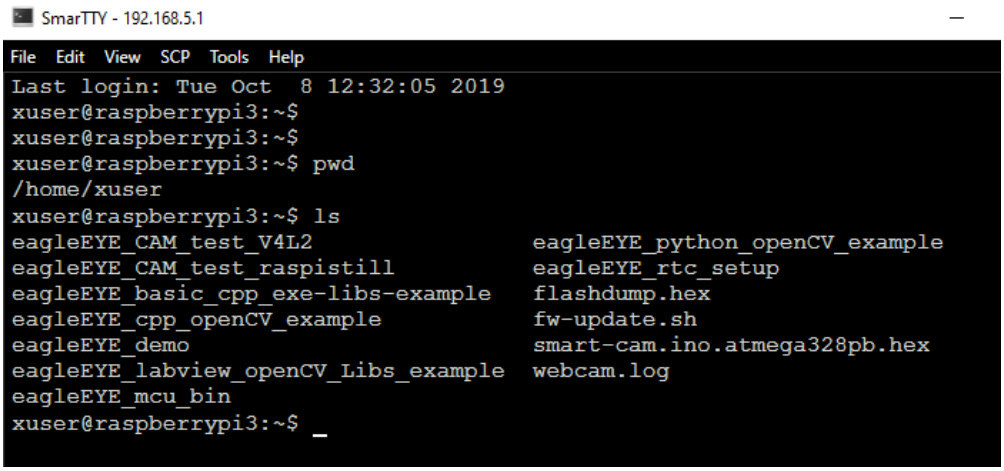
Protocol: "SFTP"
Host: "192.168.5.1"
User: "xuser" or "root"
Pass: "1234" , There is NO password for root user.



Getting Start Guide: Remote SSH.

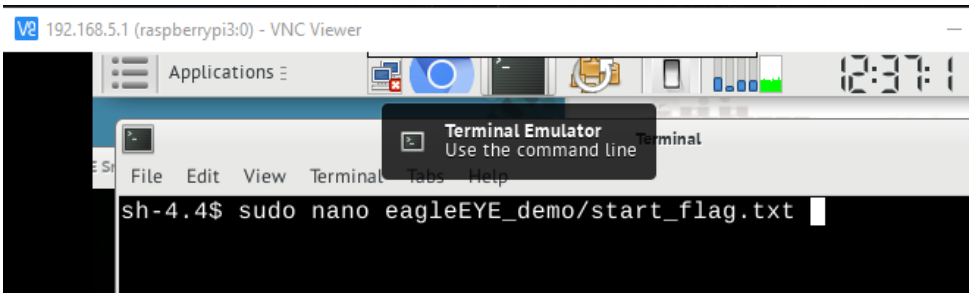
Host Name: “192.168.5.1”
User Name: “xuser” , or “root”
Password: “1234” , There is NO password for root user.





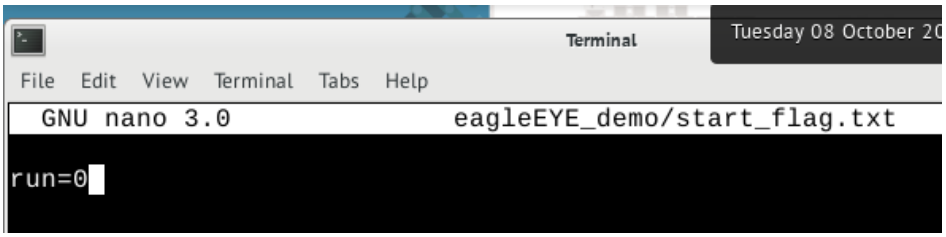
Getting Start Guide: Turn OFF start-up demo program.

Open “Terminal Emulator”, > “sudo nano eagleEYE_demo/start_flag.txt”

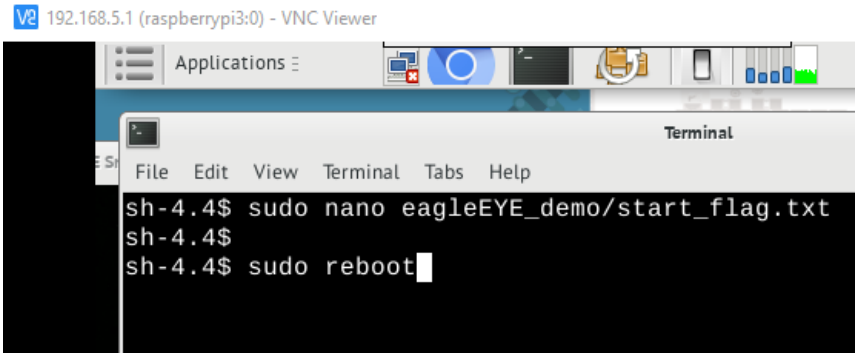


Edit text file to > “run=0”

Press “Ctrl+X” to exit and then press “Shift+Y” enter to save the file.

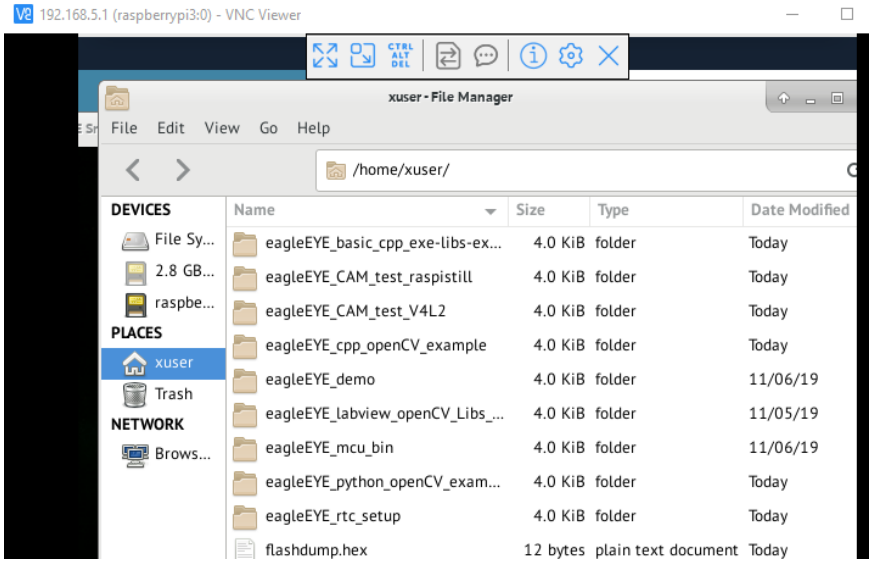


Using “sudo reboot” for reboot the board. After next boot the demo program will be not running anymore. From now you can write you own program to access the camera.



Getting Start Guide: Examples files.

All example file located at “/home/xuser”



Getting Start Guide: Test camera using V4L2

> cd eagleEYE_CAM_test_V4L2

> sudo ./V4L2_cam_ON.sh *for Turn ON camera

> sudo ./V4L2_cam_OFF.sh *for Turn OFF camera

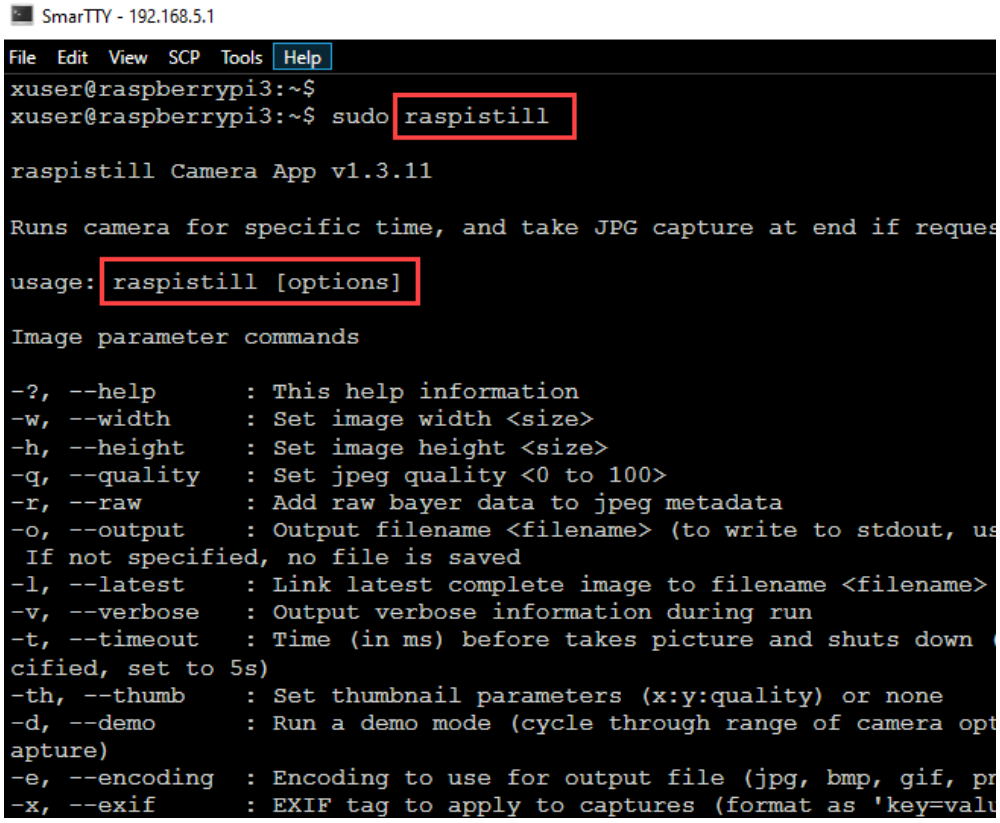
Getting Start Guide: Test camera using raspistill

> cd eagleEYE_CAM_test_raspistill

> sudo ./raspistill_15sec.sh

Raspistill camera application 1.3.11
command line tool for capturing still photographs with the camera module.

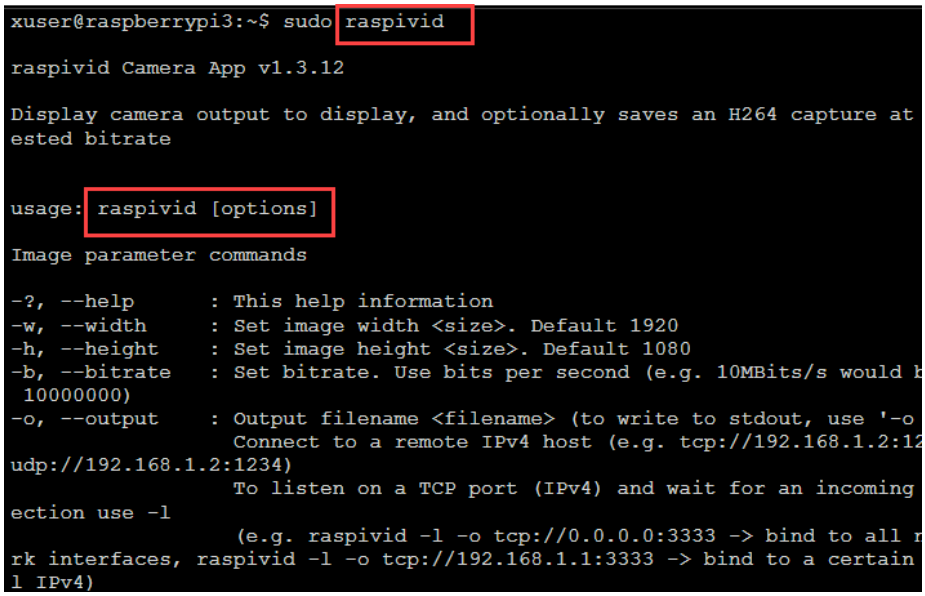
https://www.raspberrypi.org/documentation/usage/camera/raspicam/raspistill.md
https://elinux.org/Rpi_Camera_Module#RaspiStill



raspistill camera app v1.3.11

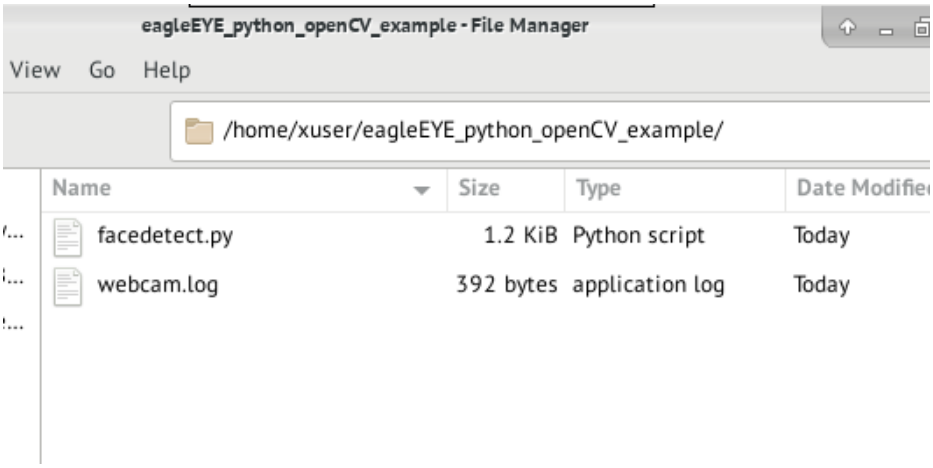
Raspivid camera application 1.3.12
command line tool for capturing video with the camera module

https://www.raspberrypi.org/documentation/usage/camera/raspicam/raspivid.md
https://elinux.org/Rpi_Camera_Module#RaspiVid



Raspisvid camera app v1.3.12

Getting Start Guide: Python 3.5.6 face detect app using OpenCV 4.1.0

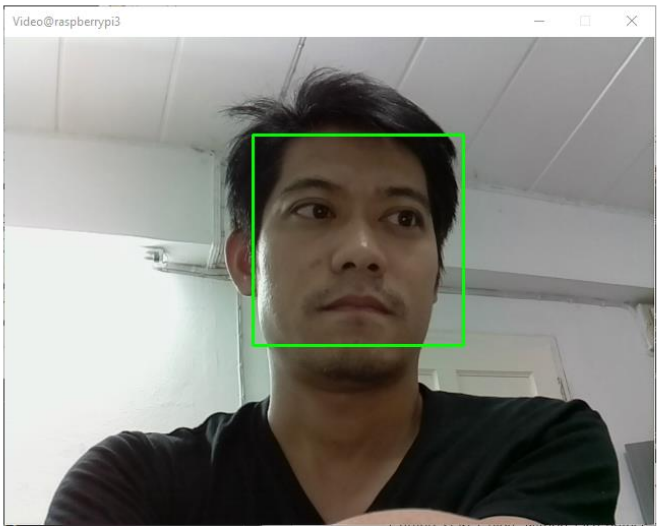


> cd eagleEYE_python_openCV_example

> sudo python3 facedetect.py

**press Ctrl+c to terminate the program

```
xuser@raspberrypi3:~$
xuser@raspberrypi3:~$ cd eagleEYE_python_openCV_example/
xuser@raspberrypi3:~/eagleEYE_python_openCV_example$
xuser@raspberrypi3:~/eagleEYE_python_openCV_example$
xuser@raspberrypi3:~/eagleEYE_python_openCV_example$
xuser@raspberrypi3:~/eagleEYE_python_openCV_example$ ls
facedetect.py
xuser@raspberrypi3:~/eagleEYE_python_openCV_example$ sudo python3 facedetect.p
y
libGL error: No matching fbConfigs or visuals found
libGL error: failed to load driver: swrast

(python3:1303): dbind-WARNING **: 12:40:56.645: Error retrieving accessibility
 bus address: org.a11y.Bus.Error: Failed to execute child process ?/usr/bin? (
Permission denied)
```



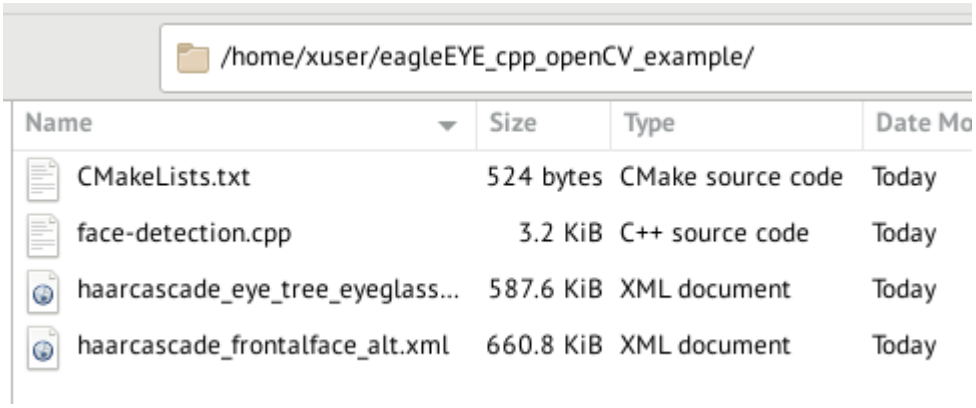
Using nano or others text editor to view/edit the source code.

> sudo nano facedetect.py

**press Ctrl+x to exit from nano editor.

```
  GNU nano 3.0                        facedetect.py

import cv2
import sys
import logging as log
import datetime as dt
from time import sleep

cascPath = "/c/vision/haarcascade_frontalface_alt.xml"
faceCascade = cv2.CascadeClassifier(cascPath)
log.basicConfig(filename='webcam.log',level=log.INFO)

video_capture = cv2.VideoCapture(0)
anterior = 0

while True:
    if not video_capture.isOpened():
        print('Unable to load camera.')
        sleep(5)
        pass

    # Capture frame-by-frame
    ret, frame = video_capture.read()
```

Getting Start Guide: Face detect app using C++ and OpenCV 4.1.0



> cd eagleEYE_cpp_openCV_example

> mkdir build

> cd build

> cmake ..

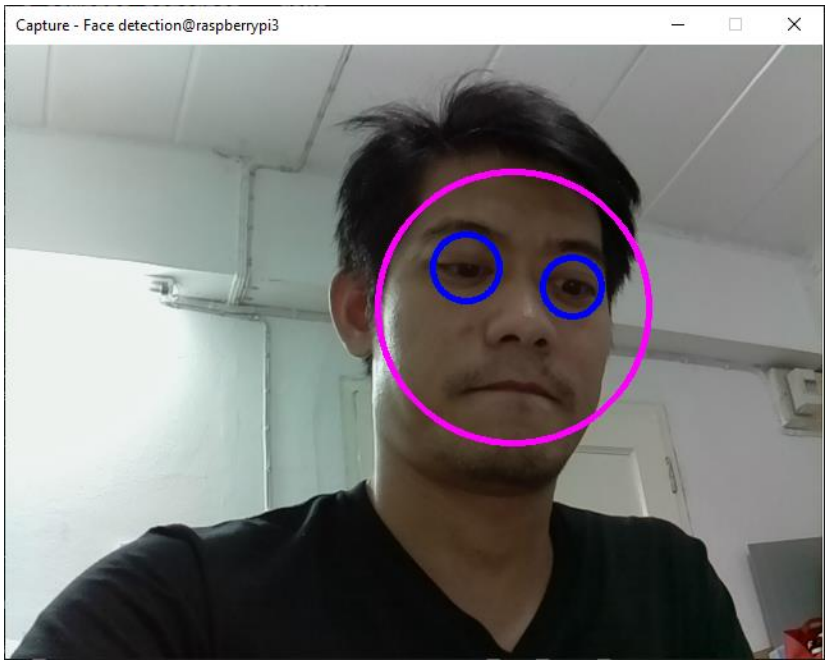
> make

```
xuser@raspberrypi3:~$ cd eagleEYE_cpp_openCV_example/
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example$ ls
CMakeLists.txt      haarcascade_eye_tree_eyeglasses.xml
build               haarcascade_frontalface_alt.xml
face-detection.cpp
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example$ ls
CMakeLists.txt      haarcascade_eye_tree_eyeglasses.xml
face-detection.cpp  haarcascade_frontalface_alt.xml
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example$ mkdir build
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example$ cd build
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example/build$ cmake ..
-- The C compiler identification is GNU 8.2.0
-- The CXX compiler identification is GNU 8.2.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Found OpenCV: /usr (found version "4.1.0")
-- Configuring done
-- Generating done
-- Build files have been written to: /home/xuser/eagleEYE_cpp_openCV_example
uild
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example/build$ make
Scanning dependencies of target face-detection
[ 50%] Building CXX object CMakeFiles/face-detection.dir/face-detection.cpp.
[100%] Linking CXX executable face-detection
[100%] Built target face-detection
xuser@raspberrypi3:~/eagleEYE_cpp_openCV_example/build$ _
```

Run the program “face-detection”

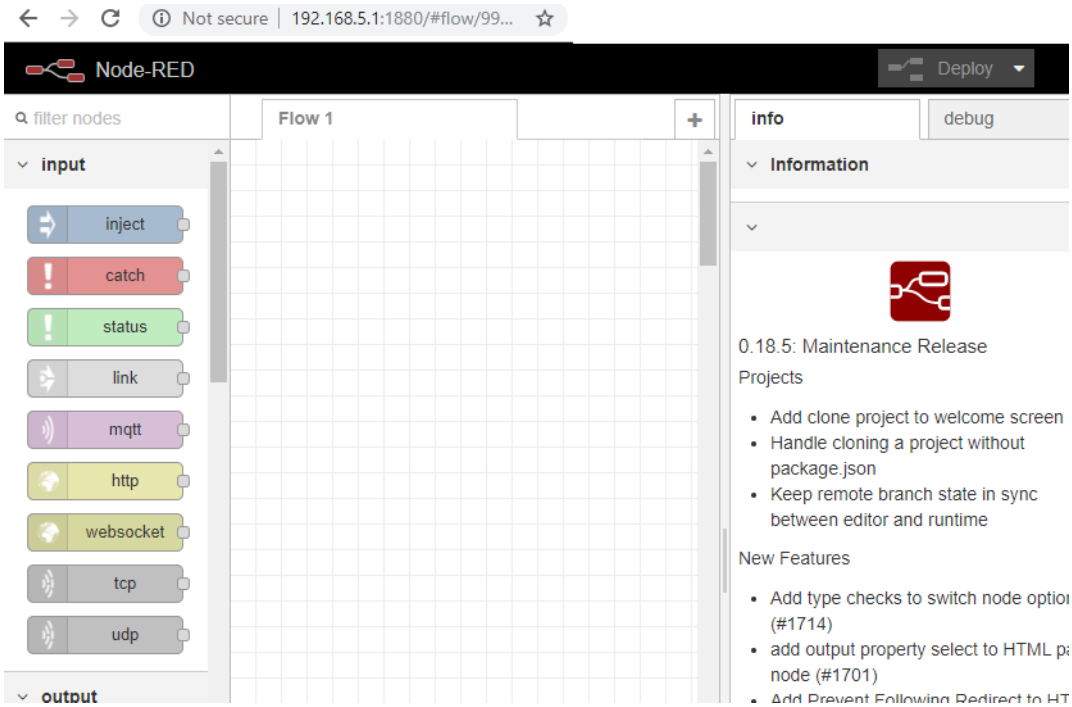
> sudo ./face-detection

**press Ctrl+c to terminate the program

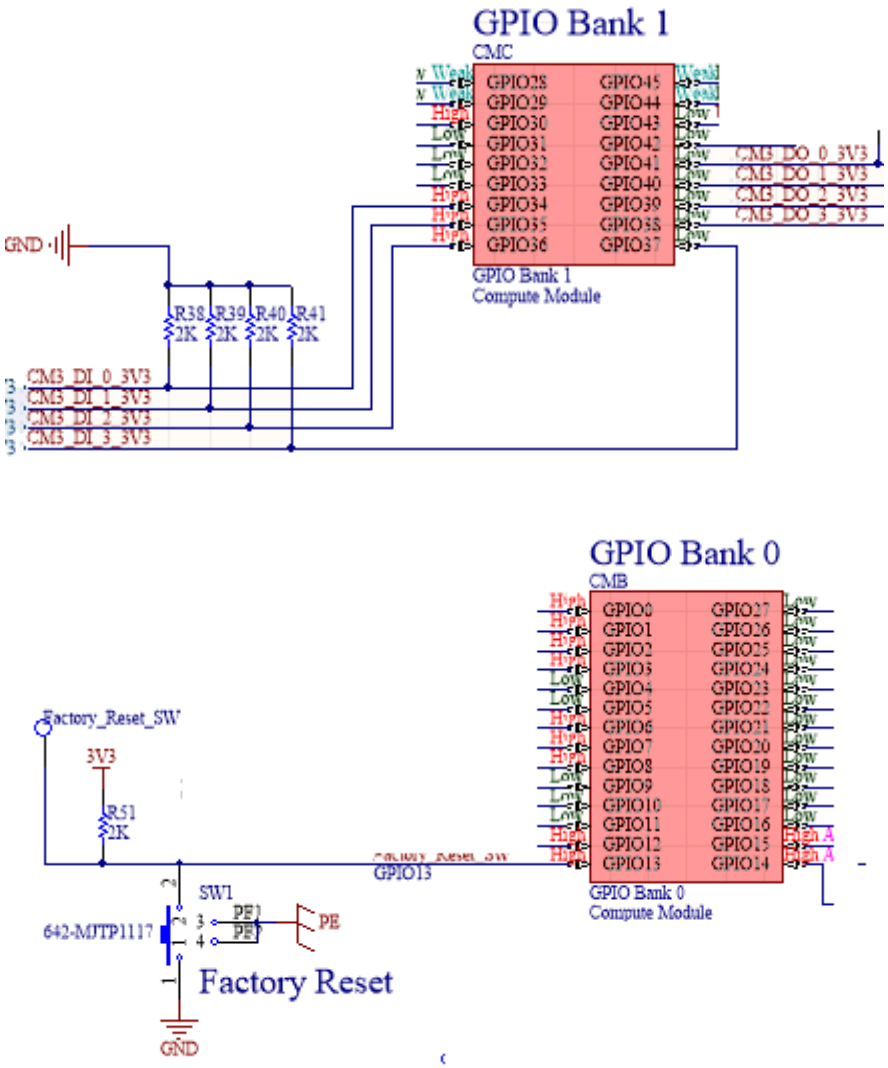


Getting Start Guide: Using NodeRed program

At remoted PC, Open web browser for example "Google Chrome" goto this link "http://192.168.5.1:1880/"



Getting Start Guide: GPIO access.

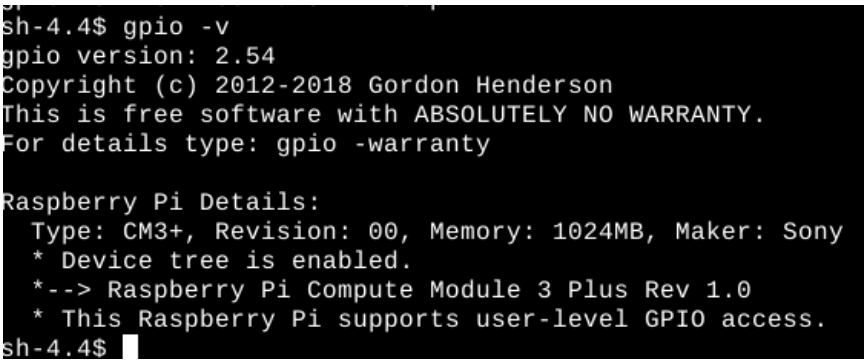


DI-1 = GPIO34 (Input)
DI-2 = GPIO35 (Input)
DI-3 = GPIO36 (Input)
DI-4 = GPIO37 (Input)

DO-1 = GPIO41 (Output)
DO-2 = GPIO39 (Output)
DOI-3 = GPIO38 (Output)
DO-4 = GPIO37 (Output)

BOOT SW = GPIO13 (Input)

Using WiringPi: The GPIO utility for testing



Example: Turn ON/OFF DO-1 (GPIO41) using GPIO utility

> gpio mode 41 out

> gpio write 41 1

> gpio write 41 0

More detail please refer this link.

http://wiringpi.com/the-gpio-utility/

Getting Start Guide: using LabVIEW 2017 with Smart Camera EagleEYE

Evaluation Version can be download from this link

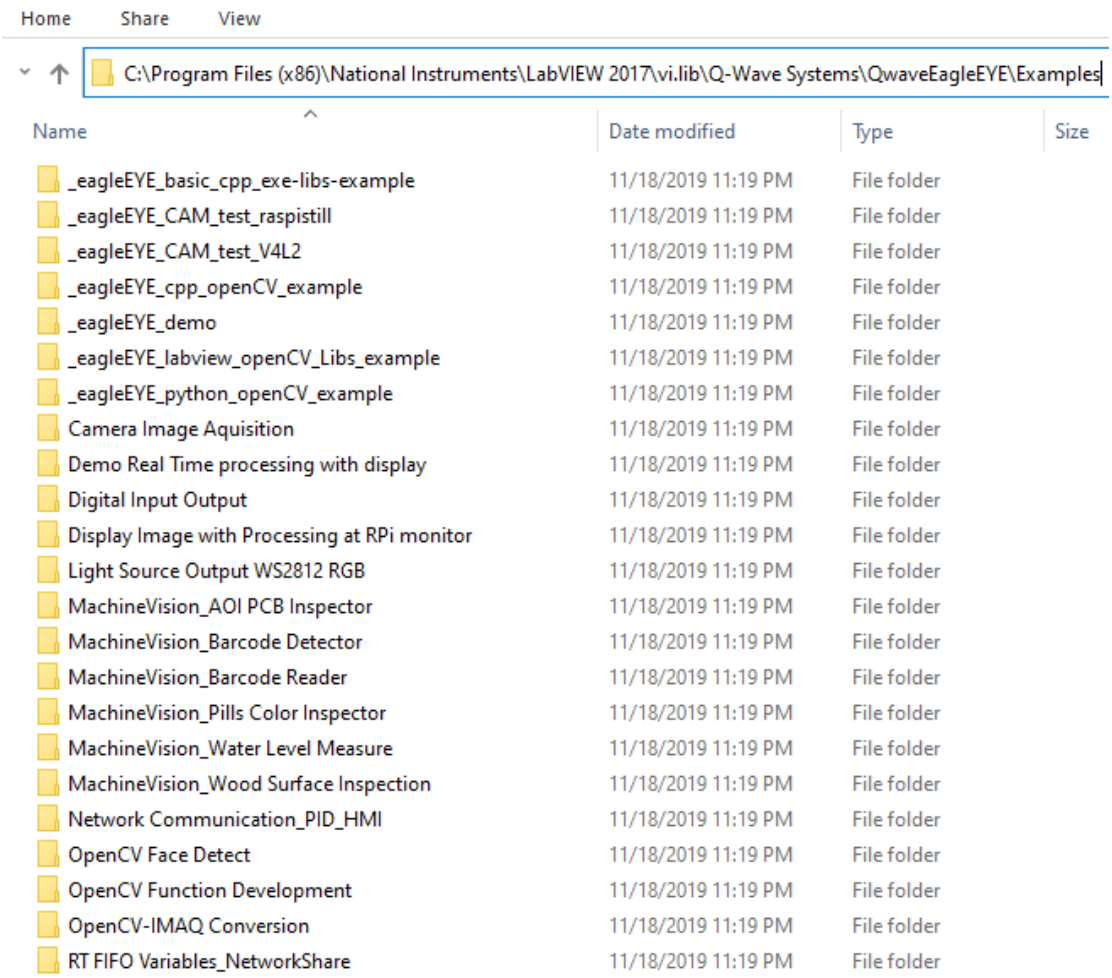
https://ntsolutionscorp-my.sharepoint.com/:f:/g/personal/amornthep_ntsolutionscorp_onmicrosoft_com/Ev_nLw7BrMlDk6TOlYmZCZABtenswqpb-SiGfaAtMhFJkA?e=2tENE2

Requirement software

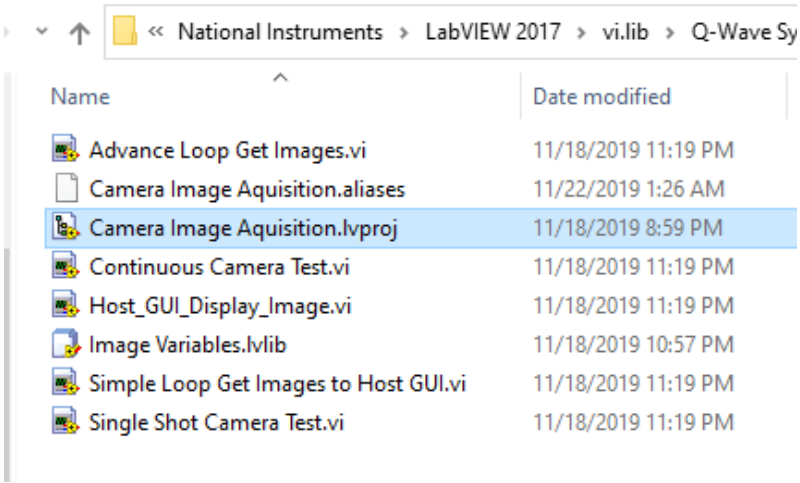
LabVIEW 2017 (32bit)
LabVIEW Real-Time module 2017 (32bit)
LabVIEW Vision Development SP1 2017 (32bit)
q_wave_systems_lib_qwaveeagleeye-1.0.0.x.vip

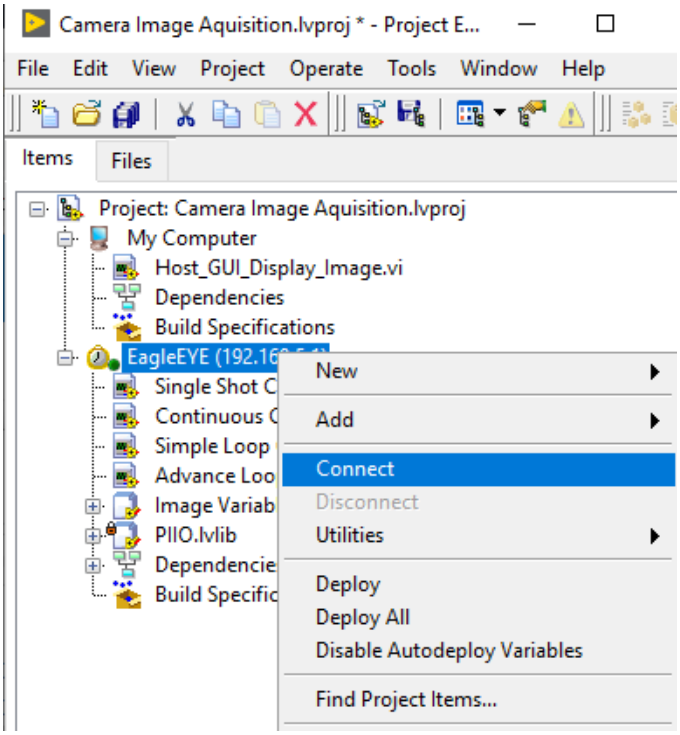
After installed “q_wave_systems_lib_qwaveeagleeye-1.0.0.x.vip”,

The examples located at “C:\Program Files (x86)\National Instruments\LabVIEW 2017\vi.lib\Q-Wave Systems\QwaveEagleEYE\Examples”

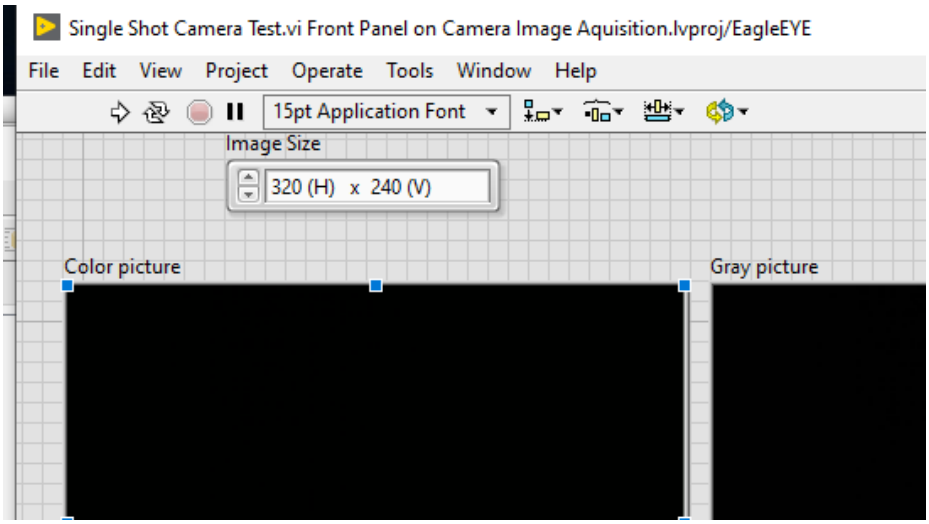


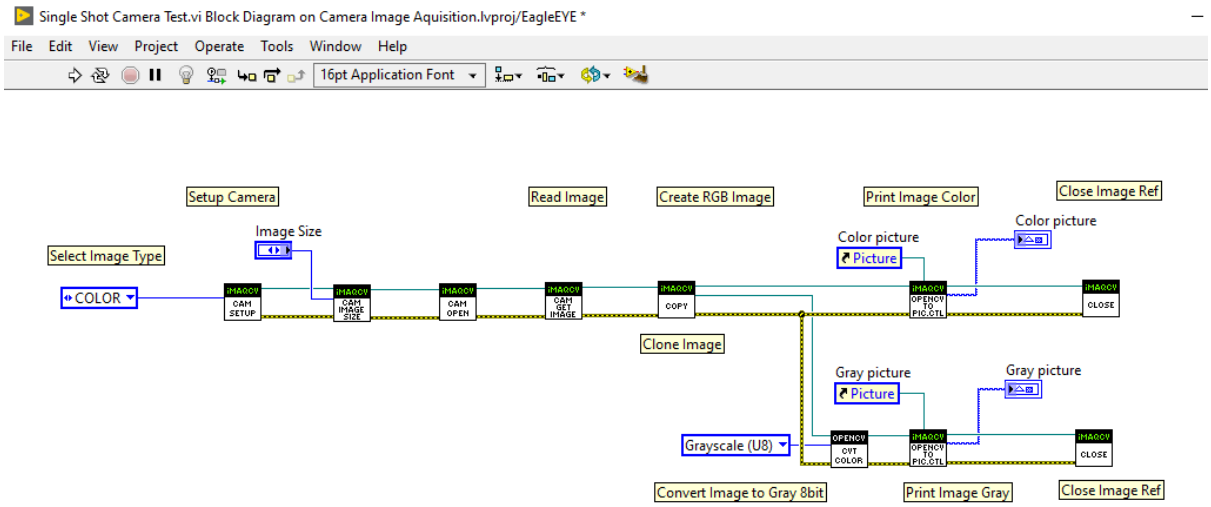
Test acquired image from camera, Open "Camera Image Acquisition\Camera Image Aquisition.lvproj"



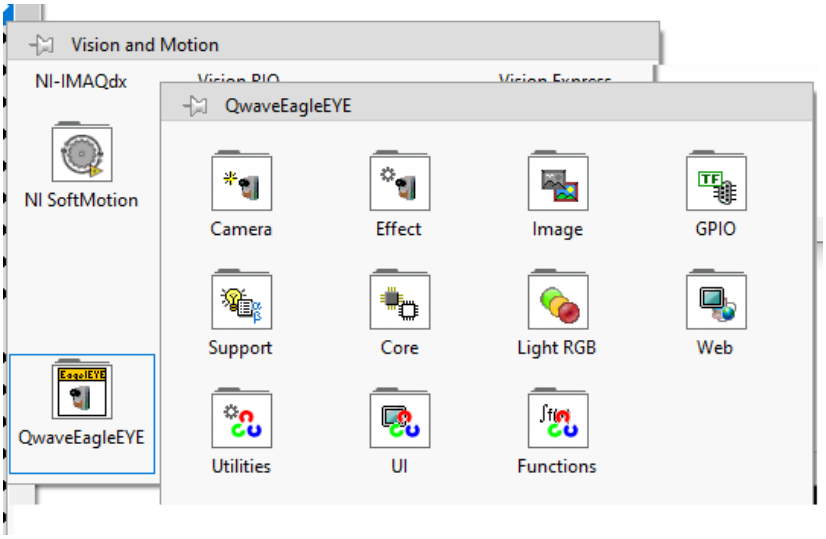


Run “Single Shot Camera Test.vi”





The EagelEYE library are located at "Vision and Motion\QwaveEagleEYE" pallet.

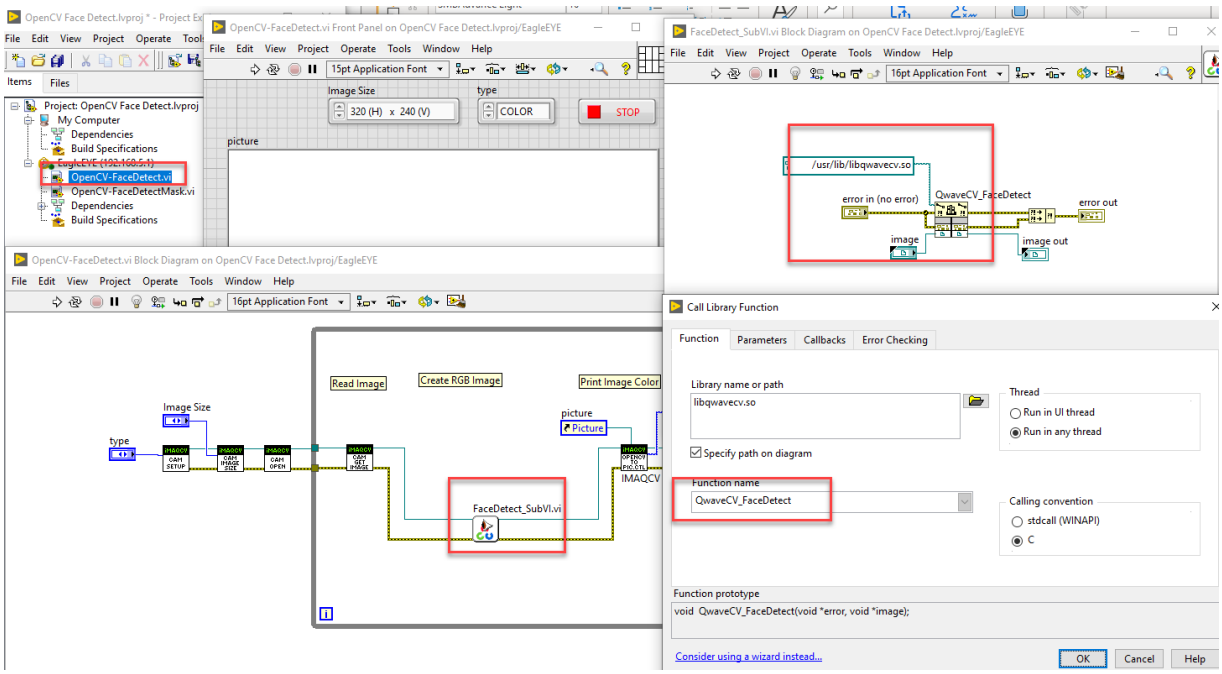


Getting Start Guide: using LabVIEW 2017 and OpenCV function development.

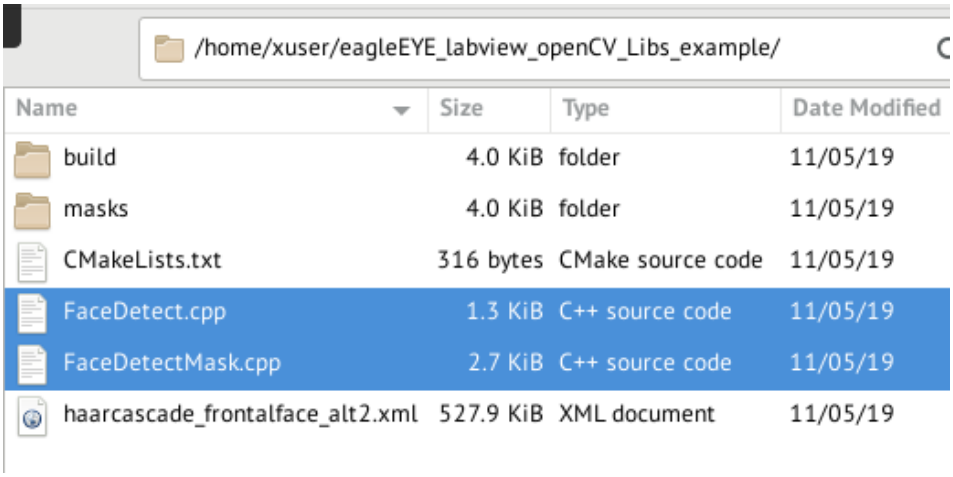
Open "OpenCV Face Detect\ OpenCV Face Detect.lvproj"

Name	Date modified	Type
masks	11/18/2019 11:19 PM	File folder
FaceDetect.cpp	10/25/2018 2:14 PM	C++ Source File
FaceDetect_SubVI.vi	11/18/2019 11:19 PM	LabVIEW Instrume..
FaceDetectMask.cpp	11/20/2018 3:57 PM	C++ Source File
FaceDetectMask_SubVI.vi	11/18/2019 11:19 PM	LabVIEW Instrume..
haarcascade_frontalface_alt2.xml	10/25/2018 2:07 PM	XML Document
Learn OpenCV by Examples- Face Detection usi...	11/21/2018 12:38 AM	Internet Shortcut
Learn OpenCV by Examples- Putting a mask on ...	11/21/2018 12:37 AM	Internet Shortcut
OpenCV Face Detect.aliases	11/22/2019 1:33 AM	ALIASES File
OpenCV Face Detect.lvproj	11/18/2019 11:09 AM	LabVIEW Project
OpenCV-FaceDetect.vi	11/18/2019 11:19 PM	LabVIEW Instrume..
OpenCV-FaceDetectMask.vi	11/18/2019 11:19 PM	LabVIEW Instrume..

Navigated to "OpenCV-FaceDetect.vi"



The source code for C++ function is "FaceDetect.cpp" or "FaceDetectMask.cpp"



Name	Size	Type	Date Modified
build	4.0 KiB	folder	11/05/19
masks	4.0 KiB	folder	11/05/19
CMakeLists.txt	316 bytes	CMake source code	11/05/19
FaceDetect.cpp	1.3 KiB	C++ source code	11/05/19
FaceDetectMask.cpp	2.7 KiB	C++ source code	11/05/19
haarcascade_frontalface_alt2.xml	527.9 KiB	XML document	11/05/19

Steps to build share library “libqwavecv.so”

> cd eagleEYE_labview_openCV_Libs_example

> mkdir build

> cd build

> cmake ..

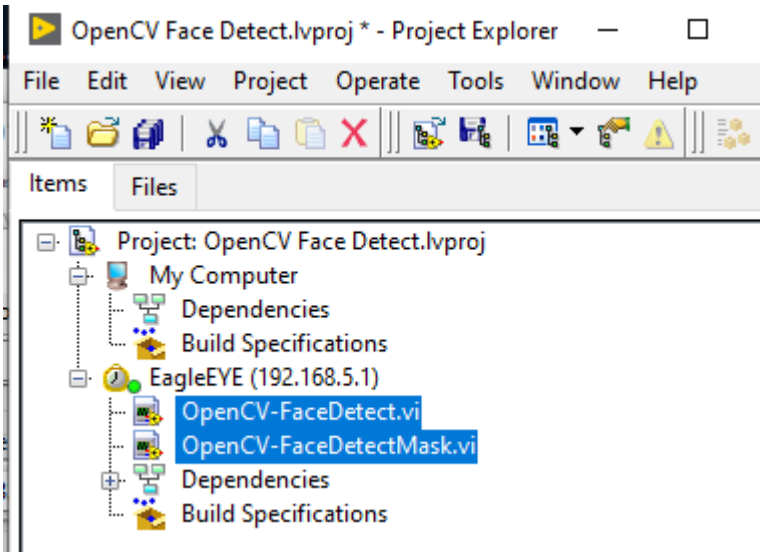
> make

> sudo make install

*The library located at “usr/lib/libqwavecv.so”

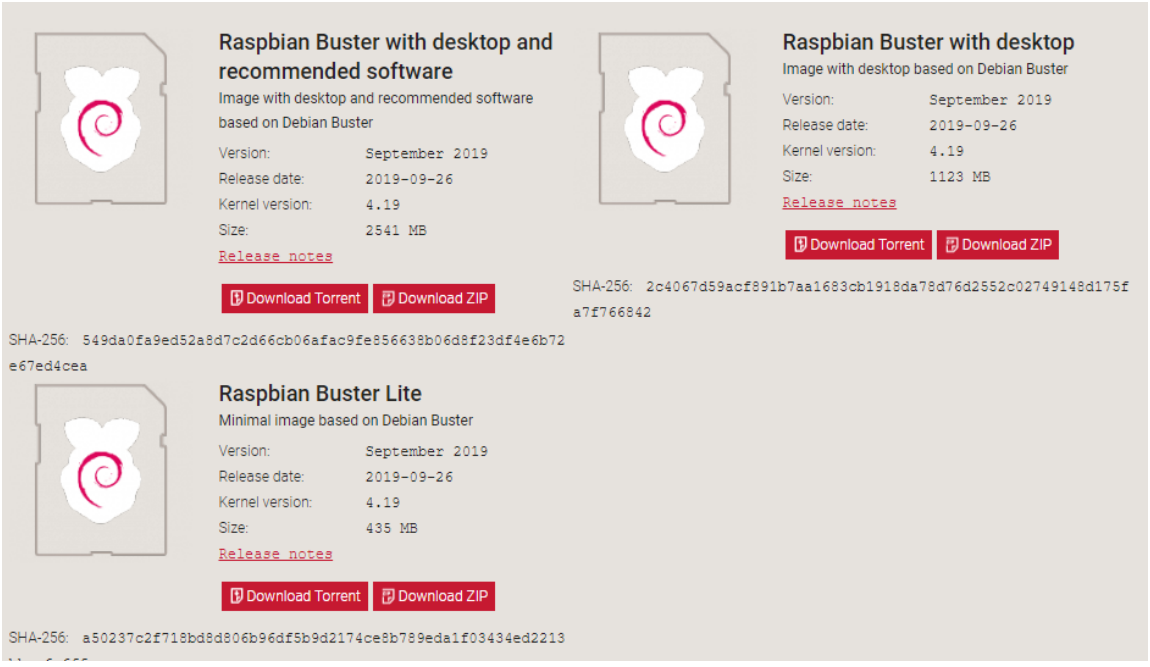
```
/home/xuser
xuser@raspberrypi3:~$ cd eagleEYE_labview_openCV_Libs_example/
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example$ ls
CMakeLists.txt  FaceDetectMask.cpp  haarcascade_frontalface_alt2.xml
FaceDetect.cpp  build               masks
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example$ mkdir build
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example$ cd build
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example/build$ cmake ..
-- The C compiler identification is GNU 8.2.0
-- The CXX compiler identification is GNU 8.2.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Found OpenCV: /usr (found version "4.1.0")
-- Configuring done
-- Generating done
-- Build files have been written to: /home/xuser/eagleEYE_labview_openCV_Libs_
example/build
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example/build$ make
-- Configuring done
-- Generating done
-- Build files have been written to: /home/xuser/eagleEYE_labview_openCV_Libs_
example/build
Scanning dependencies of target qwavecv
make[2]: Warning: File '../FaceDetect.cpp' has modification time 2453571 s in
the future
[ 33%] Building CXX object CMakeFiles/qwavecv.dir/FaceDetect.cpp.o
[ 66%] Building CXX object CMakeFiles/qwavecv.dir/FaceDetectMask.cpp.o
[100%] Linking CXX shared library libqwavecv.so
make[2]: warning:  Clock skew detected.  Your build may be incomplete.
[100%] Built target qwavecv
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example/build$ sudo make ins
tall
-- Configuring done
-- Generating done
-- Build files have been written to: /home/xuser/eagleEYE_labview_openCV_Libs_
example/build
Scanning dependencies of target qwavecv
make[2]: Warning: File '../FaceDetect.cpp' has modification time 2453538 s in
the future
[ 33%] Building CXX object CMakeFiles/qwavecv.dir/FaceDetect.cpp.o
[ 66%] Building CXX object CMakeFiles/qwavecv.dir/FaceDetectMask.cpp.o
[100%] Linking CXX shared library libqwavecv.so
make[2]: warning:  Clock skew detected.  Your build may be incomplete.
[100%] Built target qwavecv
Install the project...
-- Install configuration: ""
-- Installing: /usr/lib/libqwavecv.so
xuser@raspberrypi3:~/eagleEYE_labview_openCV_Libs_example/build$
```

Run the "OpenCV-FaceDetect.vi" or "OpenCV-FaceDetectMask.vi"

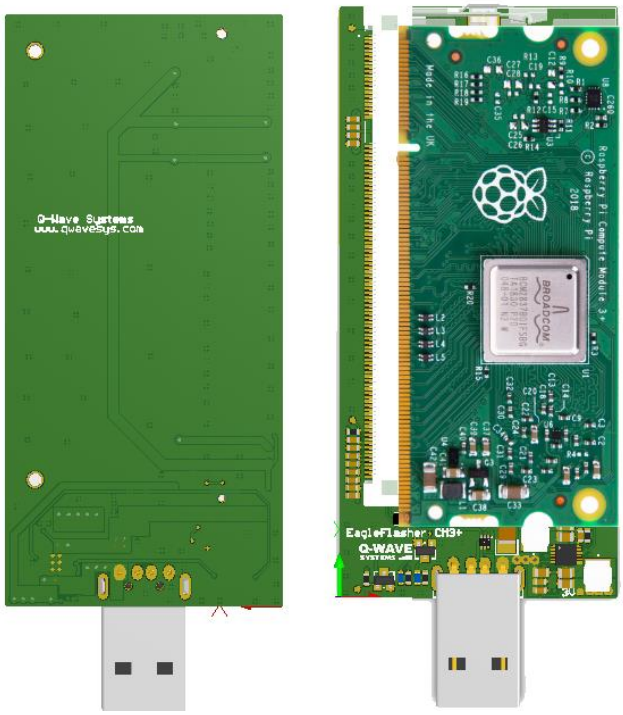


Getting Start Guide: Install or upgrade the Raspbian OS.

The latest Raspbian located at this link.
https://www.raspberrypi.org/downloads/raspbian/



In order to write the image to CM3+, the "EagleEYE Flasher CM3+ board" is required.



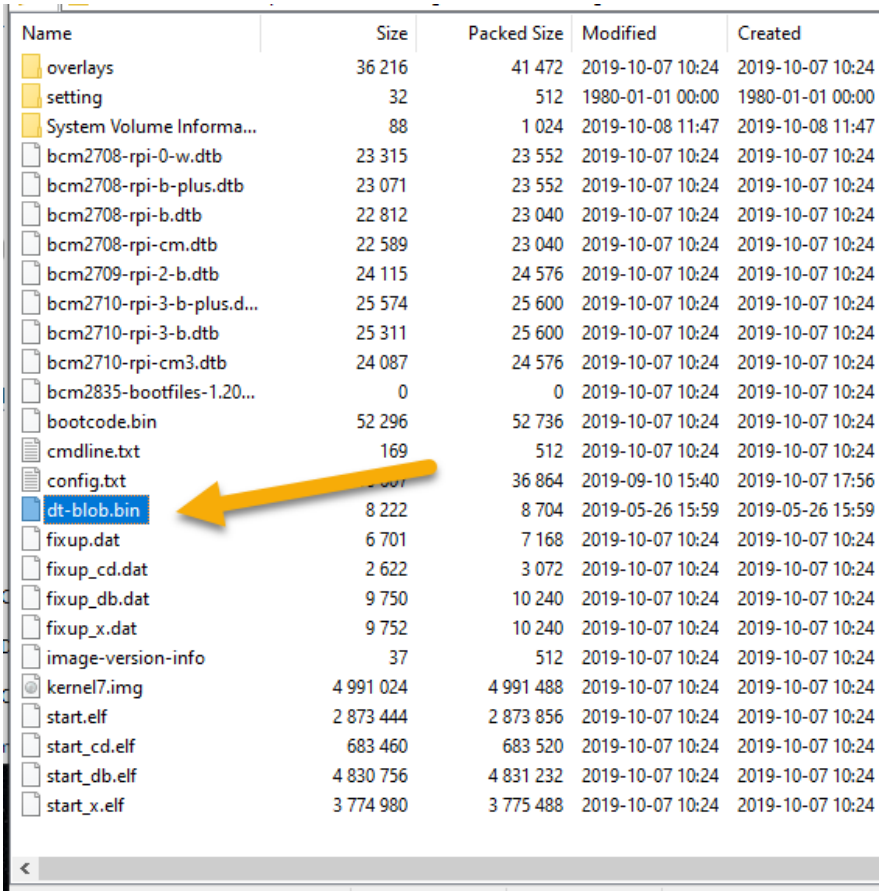
Please download the "rpiboot" software. Follow instruction as this link

https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md

https://github.com/raspberrypi/usbboot/blob/master/win32/rpiboot_setup.exe

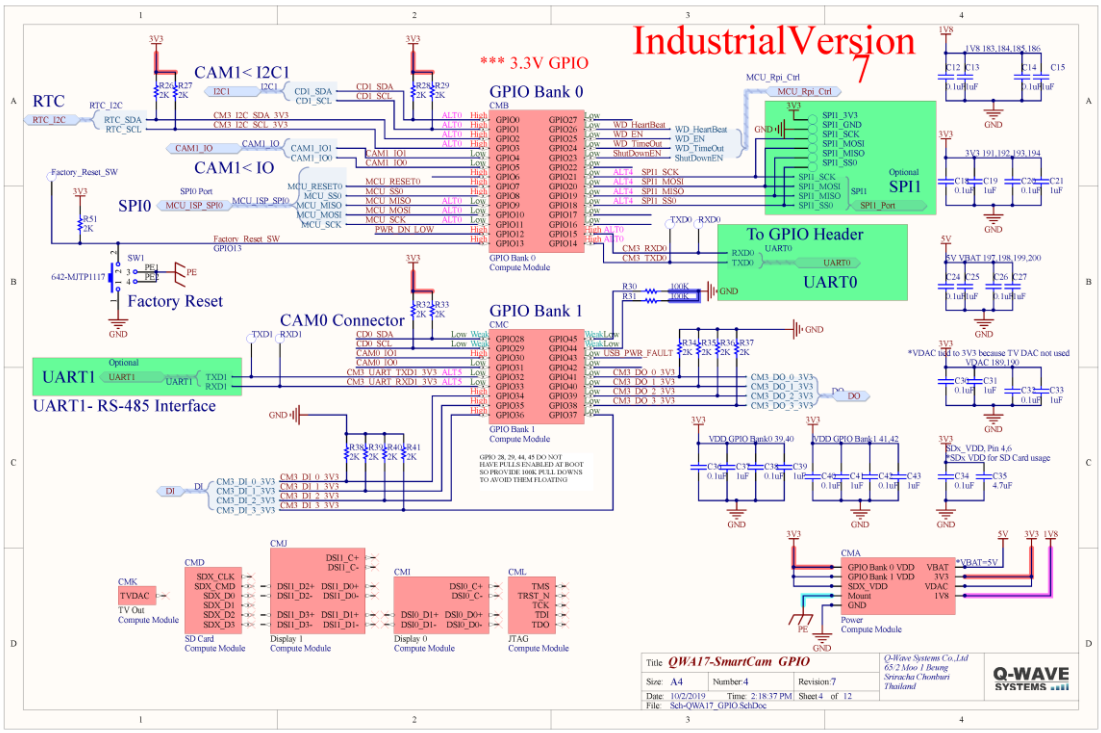
The Smart Camera EagleEYE: camera driver "dt-blob.bin" is required. After write the latest image to CM3+ the "dt-blob.bin" file must be copy to boot location below.

https://github.com/QWaveSystems/QwaveSmartCamera_EagleEYE/blob/master/Linux%20Camera%20Driver/dt-blob.bin

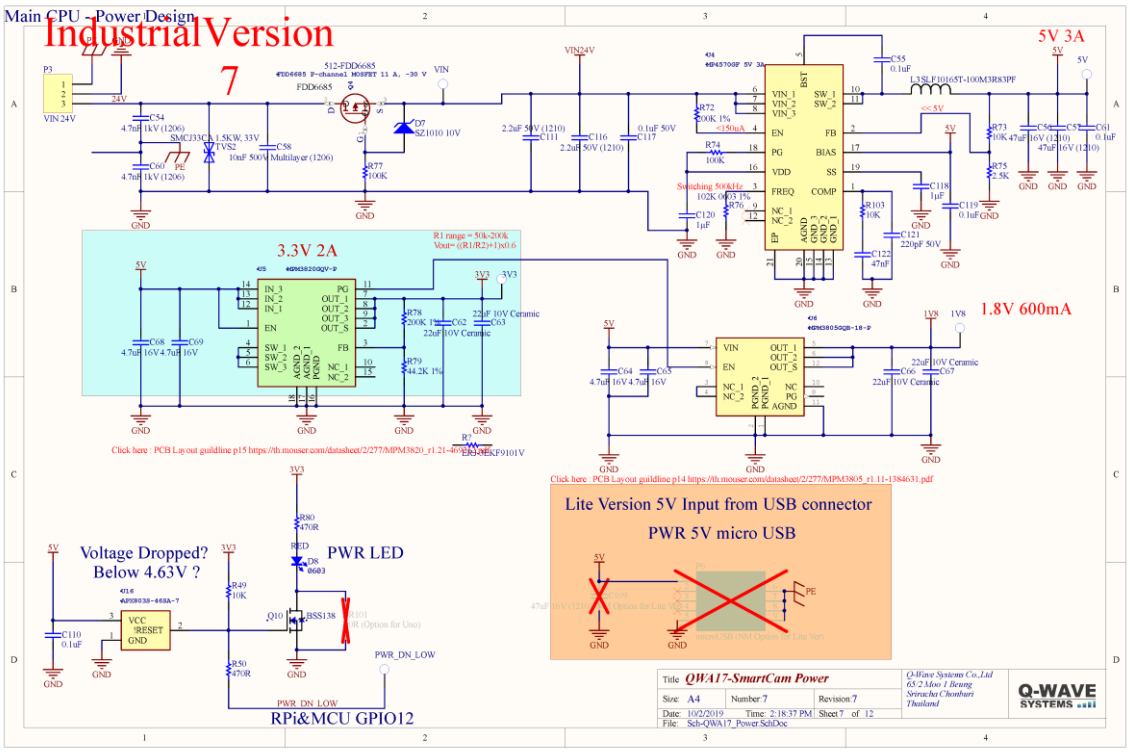


Name	Size	Packed Size	Modified	Created
overlays	36 216	41 472	2019-10-07 10:24	2019-10-07 10:24
setting	32	512	1980-01-01 00:00	1980-01-01 00:00
System Volume Informa...	88	1 024	2019-10-08 11:47	2019-10-08 11:47
bcm2708-rpi-0-w.dtb	23 315	23 552	2019-10-07 10:24	2019-10-07 10:24
bcm2708-rpi-b-plus.dtb	23 071	23 552	2019-10-07 10:24	2019-10-07 10:24
bcm2708-rpi-b.dtb	22 812	23 040	2019-10-07 10:24	2019-10-07 10:24
bcm2708-rpi-cm.dtb	22 589	23 040	2019-10-07 10:24	2019-10-07 10:24
bcm2709-rpi-2-b.dtb	24 115	24 576	2019-10-07 10:24	2019-10-07 10:24
bcm2710-rpi-3-b-plus.d...	25 574	25 600	2019-10-07 10:24	2019-10-07 10:24
bcm2710-rpi-3-b.dtb	25 311	25 600	2019-10-07 10:24	2019-10-07 10:24
bcm2710-rpi-cm3.dtb	24 087	24 576	2019-10-07 10:24	2019-10-07 10:24
bcm2835-bootfiles-1.20...	0	0	2019-10-07 10:24	2019-10-07 10:24
bootcode.bin	52 296	52 736	2019-10-07 10:24	2019-10-07 10:24
cmdline.txt	169	512	2019-10-07 10:24	2019-10-07 10:24
config.txt		36 864	2019-09-10 15:40	2019-10-07 17:56
dt-blob.bin	8 222	8 704	2019-05-26 15:59	2019-05-26 15:59
fixup.dat	6 701	7 168	2019-10-07 10:24	2019-10-07 10:24
fixup_cd.dat	2 622	3 072	2019-10-07 10:24	2019-10-07 10:24
fixup_db.dat	9 750	10 240	2019-10-07 10:24	2019-10-07 10:24
fixup_x.dat	9 752	10 240	2019-10-07 10:24	2019-10-07 10:24
image-version-info	37	512	2019-10-07 10:24	2019-10-07 10:24
kernel7.img	4 991 024	4 991 488	2019-10-07 10:24	2019-10-07 10:24
start.elf	2 873 444	2 873 856	2019-10-07 10:24	2019-10-07 10:24
start_cd.elf	683 460	683 520	2019-10-07 10:24	2019-10-07 10:24
start_db.elf	4 830 756	4 831 232	2019-10-07 10:24	2019-10-07 10:24
start_x.elf	3 774 980	3 775 488	2019-10-07 10:24	2019-10-07 10:24

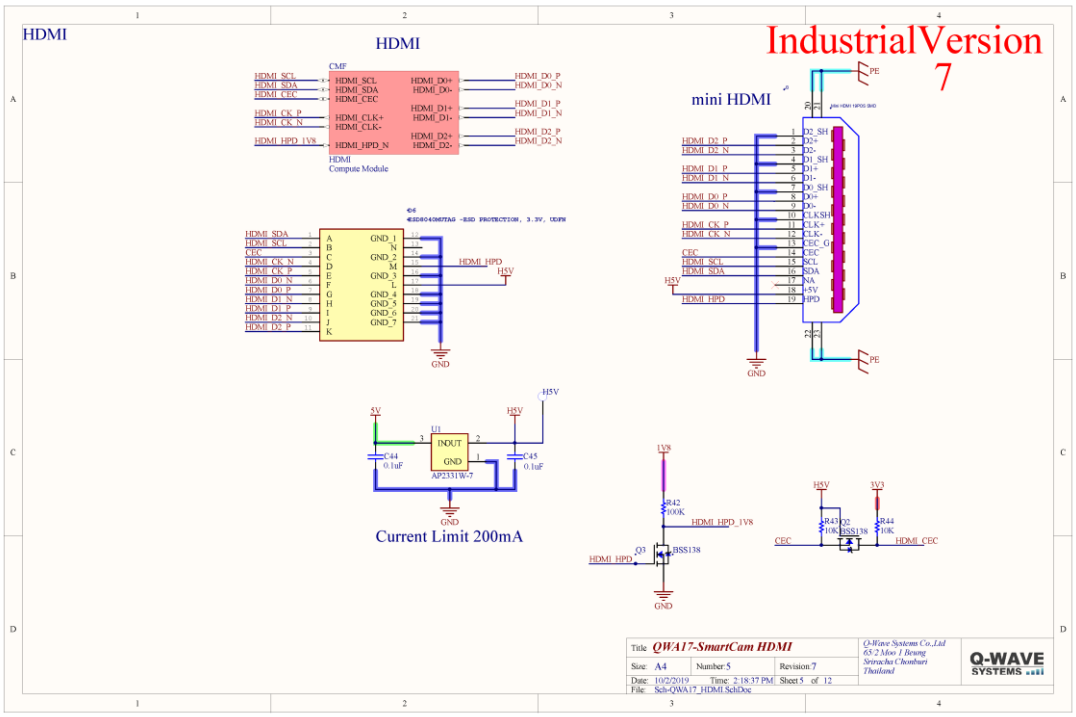
HW Design Schematics: GPIO



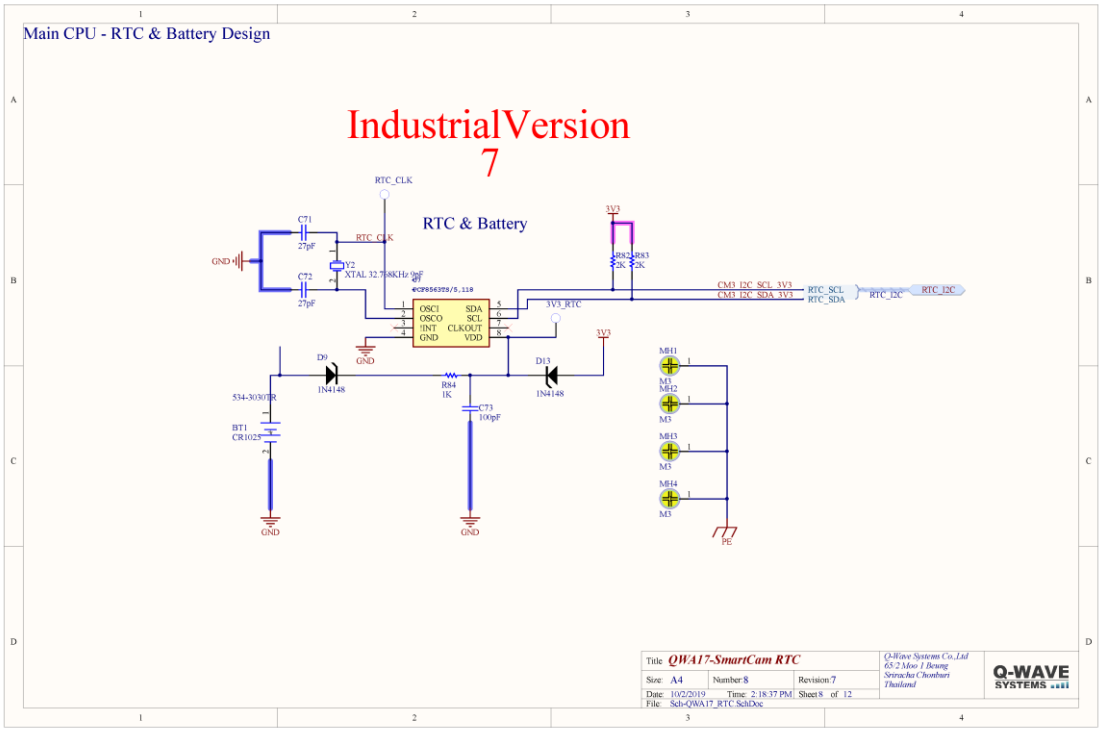
HW Design Schematics: Power Supply



HW Design Schematics: HDMI Display

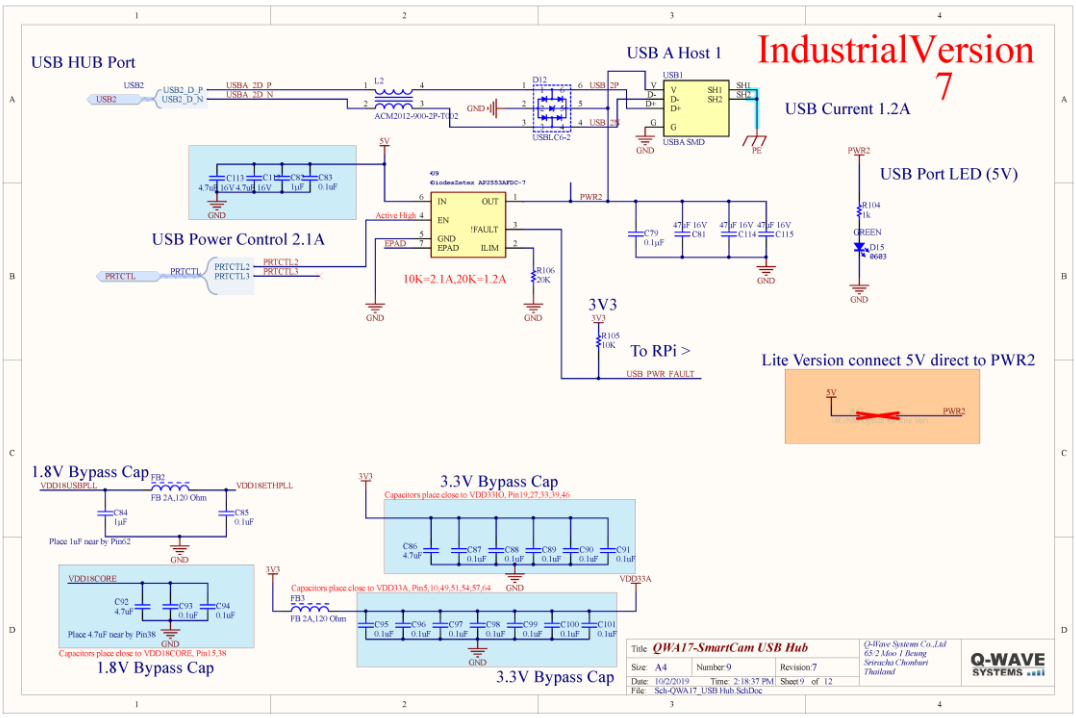


HW Design Schematics: Real-Time Clock

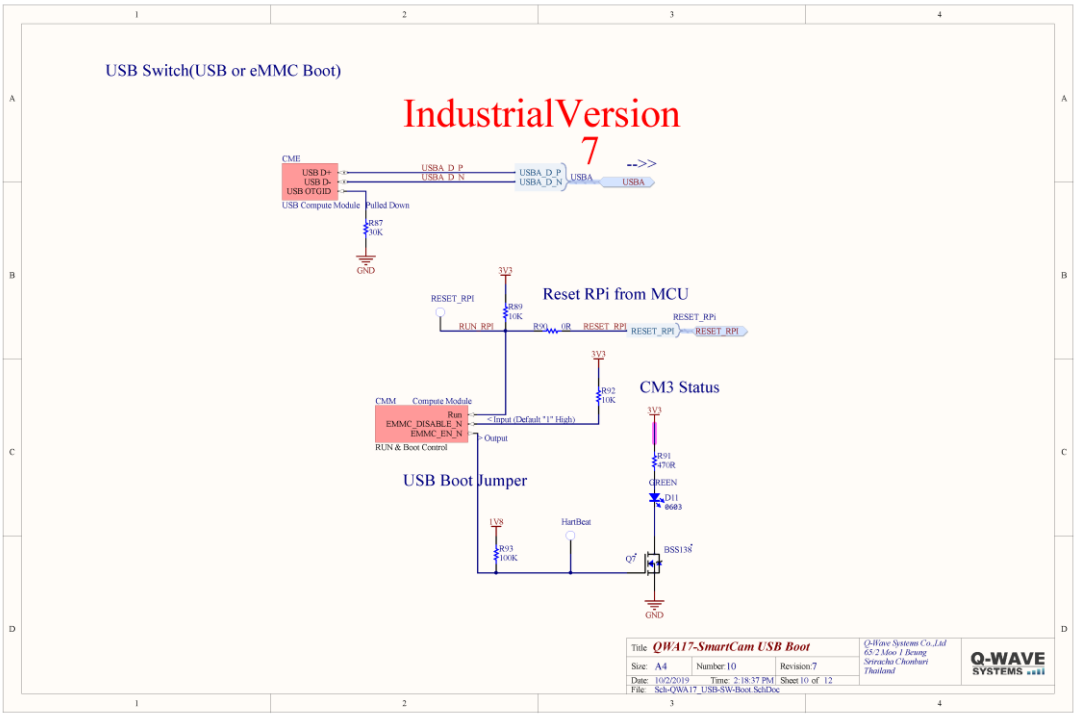


Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

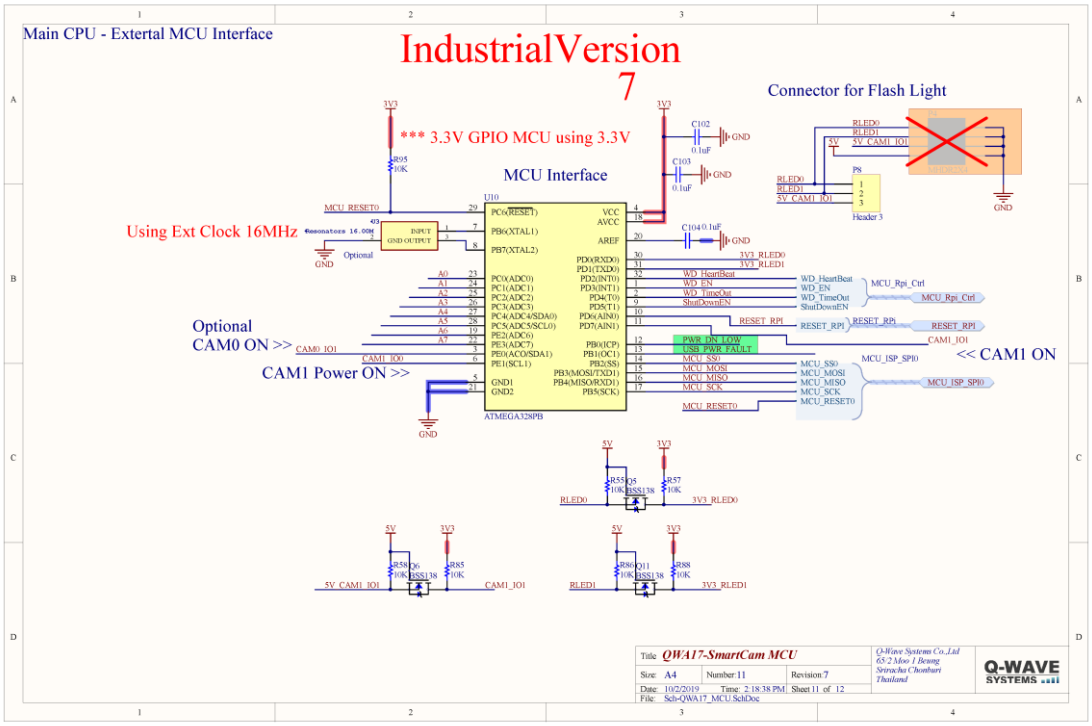
HW Design Schematics: USB host



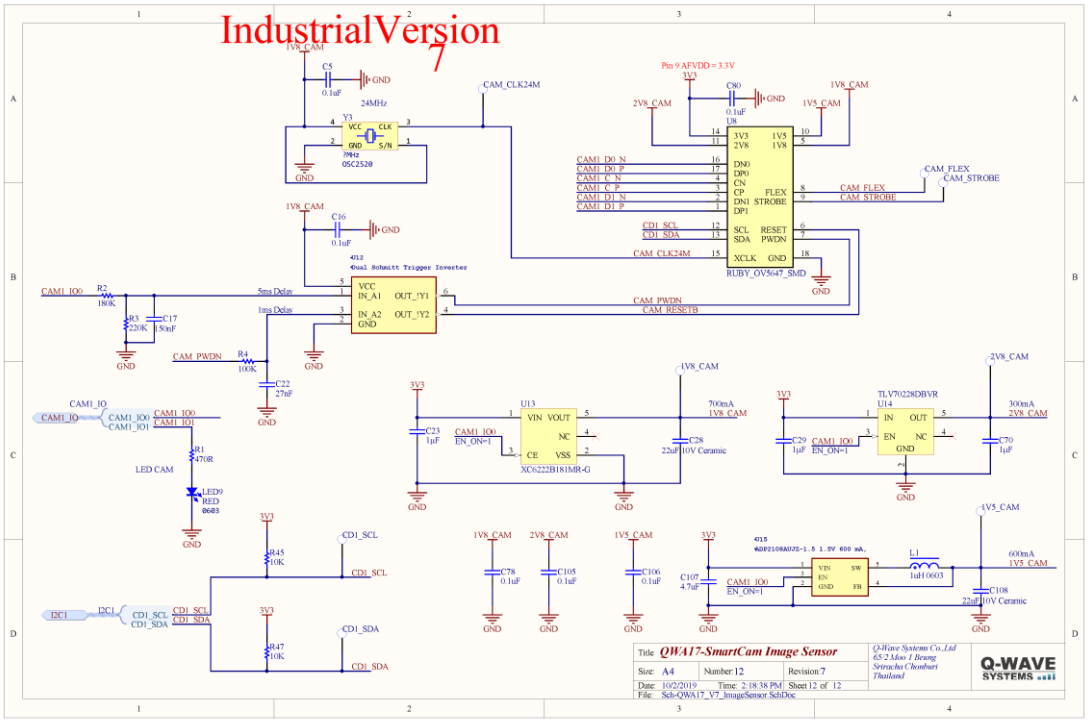
HW Design Schematics: eMMC Boot



HW Design Schematics: MCU Interface



HW Design Schematics: Image Sensor Interface



Q-Wave Systems Co.,Ltd 65/2 Moo1 Bung Sriracha Chonburi 20230 Thailand,
Email : amornthep@qwavesys.com

HW Design Schematics: Bill of Material (BOM)

Bill of Materials

QWA17-SmartCam

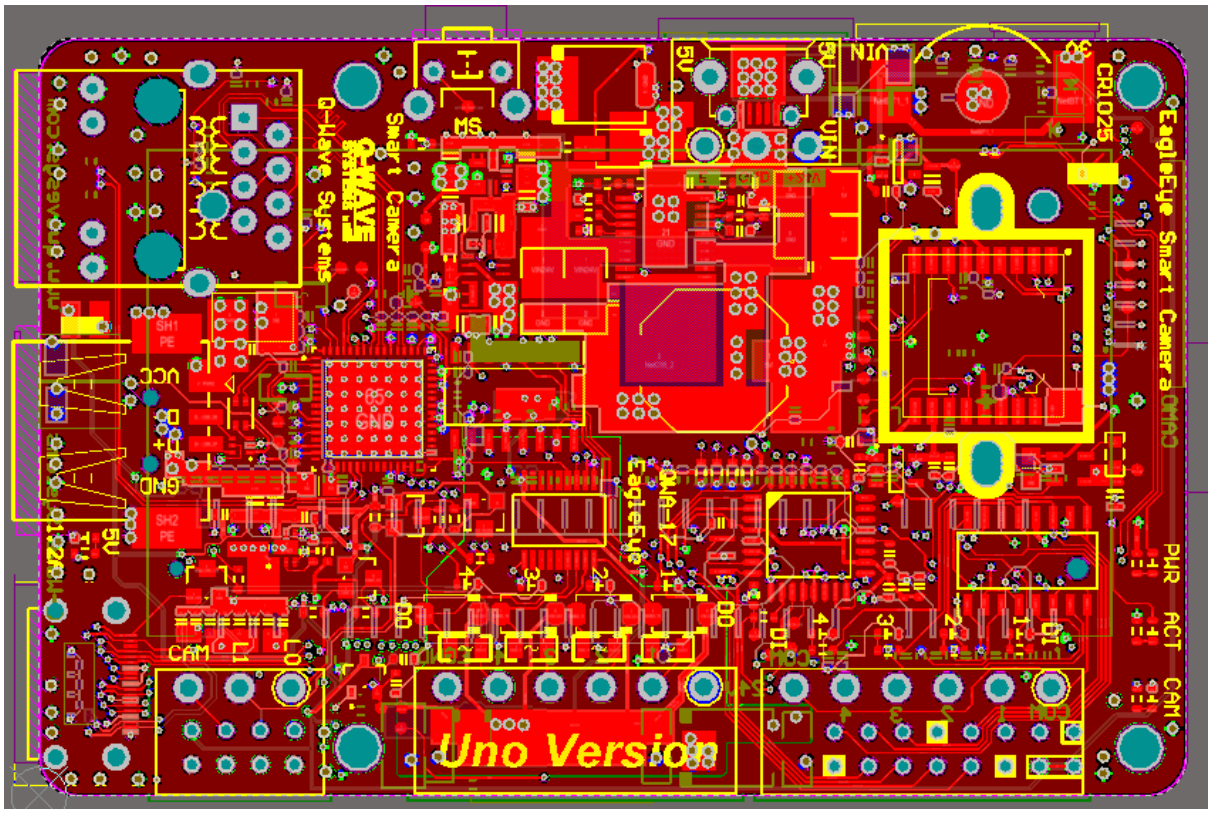
Source Data From: QWA17_EagleEye_V7.PrjPcb
Project: QWA17_EagleEye_V7.PrjPcb
Variant: Industrial

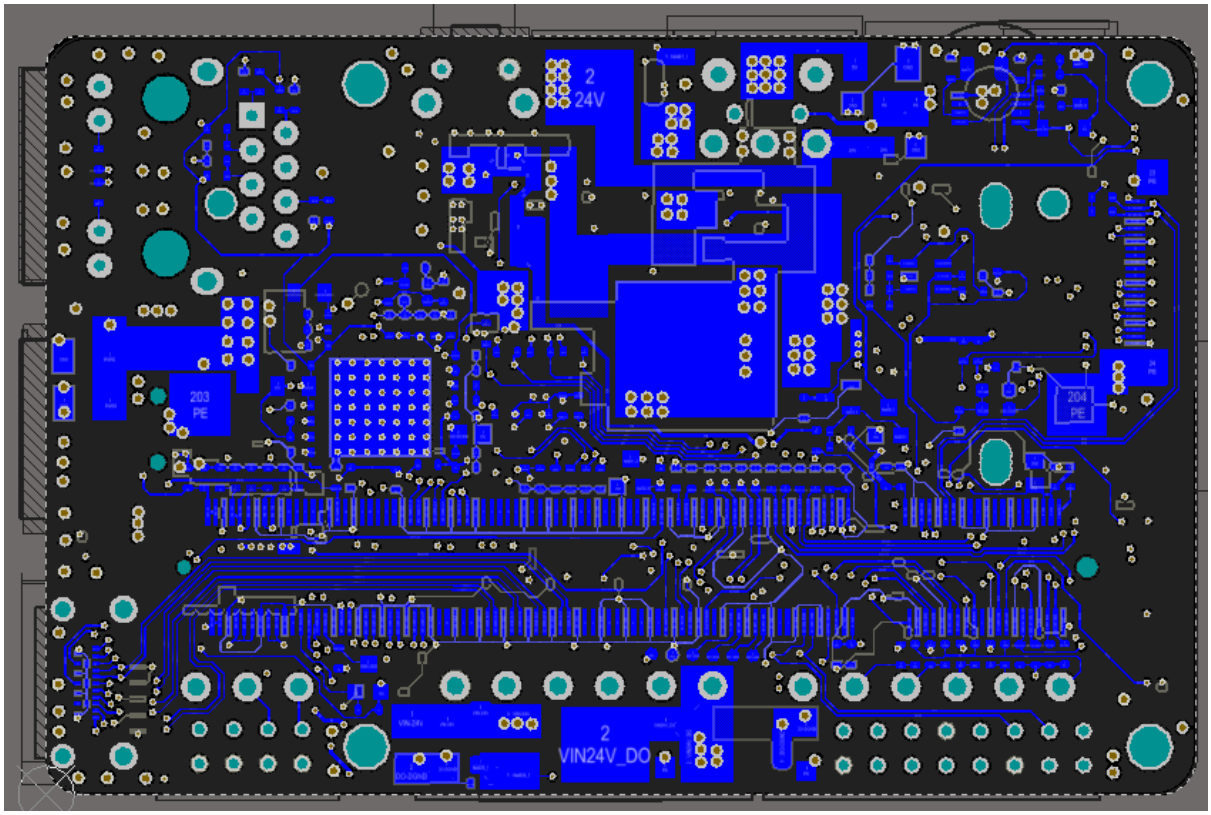
Creation Date: 10/2/2019 2:33:29 PM
Print Date: 20-Nov-19 9:24:06 AM

Footprint	Comment	LibRef	Designator	Description	Quantity
TEST_POINT	1V5_CAM	TEST_POINT	1V5_CAM	Test Point	1
TEST_POINT	1V8	TEST_POINT	1V8	Test Point	1
TEST_POINT	1V8_CAM	TEST_POINT	1V8_CAM	Test Point	1
TEST_POINT	2V8_CAM	TEST_POINT	2V8_CAM	Test Point	1
TEST_POINT	3V3	TEST_POINT	3V3	Test Point	1
TEST_POINT	3V3_RTC	TEST_POINT	3V3_RTC	Test Point	1
TEST_POINT	5V	TEST_POINT	5V	Test Point	1
TEST_POINT	5V_PWR3	TEST_POINT	5V_PWR3	Test Point	1
SOIC127P700	TLP292-4(V4-LA	TLP292-4(V4-LA	B1, B2	Transistor Output Optocouplers 4ch Transis	2
SOP65P640X	TBD62783AFNG	TBD62783AFNG	B3	Gate Drivers DMOS Transistor Array 7-CH,	1
3030TR	CR1025	Battery	BT1	Coin Cell Battery Holders SM COIN CELL E	1
CAP_0603	0.1?F	Cap Semi	C1, C2, C3, C4, C79	0.1?F ?5% 50V Ceramic Capacitor X7R 060	5
CAP_0603	0.1uF	Cap Semi	C5, C12, C14, C16, C18, C20, C24, C26,	0.1?F ?5% 50V Ceramic Capacitor X7R 060	44
CAP_0603	104	Cap Semi	C6	0.1?F ?5% 50V Ceramic Capacitor X7R 060	1
CAP_0603	105	Cap Semi	C7	1?F ?5% 50V Ceramic Capacitor X7R 0603	1
C 1206	4.7nF 1kV (1206	Cap	C8, C11, C54, C60	4.7nF 1kV (1206) GRM31BR73A472KW01L	4
C 1210	10uF 50V (1210)	Cap	C9	10uF 50V Ceramic Capacitor X5R 1210	1
C 1206	0.33uF 50V (120	Cap	C10	0.33uF 50V Ceramic Capacitor X5R 1206	1
CAP_0603	1uF	Cap Semi	C13, C15, C19, C21, C25, C27, C31,	1?F ?5% 50V Ceramic Capacitor X7R 0603	12
CAP_0603	150nF	Cap Semi	C17	150nF 16VCeramic Capacitor X7R 0603	1
CAP_0603	27nF	Cap Semi	C22	27nF 16VCeramic Capacitor X7R 0603	1
CAP_0603	1?F	Cap Semi	C23, C29, C70, C82, C84, C118, C120	1?F ?5% 50V Ceramic Capacitor X7R 0603	7
CAP_0805	22uF 10V Ceram	Cap	C28, C62, C63, C66, C67, C108	22uF 10V Ceramic	6
TEST_POINT	TXD0	TEST_POINT	TXD0	Test Point	1
TEST_POINT	TXD1	TEST_POINT	TXD1	Test Point	1
Diodes_AP23	IC_Diodes_AP23	IC_Diodes_AP23	U1	IC LOAD SWITCH SC59	1
_LAN9514	LAN9512I-JZX	CMP-1537-00002	U2	USB 2.0 Hub and 10/100 Ethernet Controlle	1
CSTNE16M0V	Resonators 16.0	CSTNE16M0VH3	U3	CSTNE16M0VH3C000R0	1
SOP65P640X	MP4570GF 5V 3	MP4570GF-Z	U4	MP4570GF-Z	1
MPM3820GQ	MPM3820GQV-F	MPM3820GQV-F	U5	MPM3820GQV-P VIN 6V, 1.2 MHz, 2A	1
MPM3805GQ	MPM3805GQB-1	MPM3805GQB-1	U6	MPM3805GQB-18-P 6V 4MHz 600mA	1
SOT65P490X1	PCF8563TS/5,11	PCF8563TS_5,1	U7	REAL TIME CLOCK, 5.5V, I2C, TSSOP-8	1
RUBY_OV564	RUBY_OV5647_	RUBY_OV5647_	U8	RUBY_OV5647_SMD	1
SON65P201X	DiodesZetex AP2	AP2553AFDC-7	U9	Power Distribution 2.1A Precision ADJ 5.5V	1
LQFP_P0.8_3	ATMEGA328PB	ATMEGA328PB_	U10		1
SOT95P275X1	Dual Schmitt Trig	NL27WZ14DTT1(	U12	NL27WZ14DTT1G	1
TORX-SOT-25	XC6222B181MR-	CMP-0659-00001	U13	High Speed LDO Regulator, 700 mA, 1.8V	1
DBV0005A_M	TLV70228DBVR	CMP-0394-00508	U14	Single Output LDO, 300 mA, Fixed 2.8 V O	1
SOT95P280X1	ADP2108AUJZ-1	ADP2108AUJZ-1	U15		1
SOT95P230X1	APX803S-46SA-7	APX803-46SAG-	U16	APX803S-46SA-7	1
USB-A/S_B	USBA SMD	USBA SMD	USB1	UMRA04FTWNY-03	1
TEST_POINT	USB3_DN	TEST_POINT	USB3_DN	Test Point	1
TEST_POINT	USB3_DP	TEST_POINT	USB3_DP	Test Point	1
TEST_POINT	USB3_GND	TEST_POINT	USB3_GND	Test Point	1
TEST_POINT	VDD18CORE	TEST_POINT	VDD18CORE	Test Point	1
TEST_POINT	VDD18ETHPLL	TEST_POINT	VDD18ETHPLL	Test Point	1
TEST_POINT	VDD18USBPLL	TEST_POINT	VDD18USBPLL	Test Point	1
TEST_POINT	VDD33A	TEST_POINT	VDD33A	Test Point	1
TEST_POINT	VGQ1	TEST_POINT	VGQ1	Test Point	1
TEST_POINT	VIN	TEST_POINT	VIN	Test Point	1
TEST_POINT	VIN-24V	TEST_POINT	VIN-24V	Test Point	1
XT_2016_4	XTAL 25MHz XR	XTAL_2016_4P	Y1	Crystal Oscillator	1
XT_3215_2	XTAL 32.768KHz	XTAL	Y2	Crystal Unit 32.768KHz ?20ppm, 9pF	1
XT_2520_4	FJ2400002	OSC_2520_4P	Y3	Crystal Oscillator 24MHz	1
					331

Approved **Notes**

HW Design Schematics: PCB Layout





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