THERMOEYE

TmSDK Manual

Revision

Version	Date	Contents
0.1	Aug.28.2024	Draft
1.0	Sep.10.2024	Added C#
1.1	Jan.24.2025	Support ubuntu 20.04 and aarch64 architecture.
1.2	Apr.8.2025	Support Android. Provide the library as an installation package.
1.3	May.29.2025	Change TmSDK download and installation instructions.
1.4	Jun.30.2025	Change directory structure.
1.5	Feb.6.2026	Add the TMC160I and TMC384G Support new model naming convention. Add splash screen on/off configuration.

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1. Introduction

TmSDK is a development kit required to control TMC series cameras.

This document describes how to set up the TmSDK development environment across various platforms and programming languages.

1.1. Download TmSDK

TmSDK can be downloaded from the following GitHub repository:

https://github.com/thermoeye/tmsdk

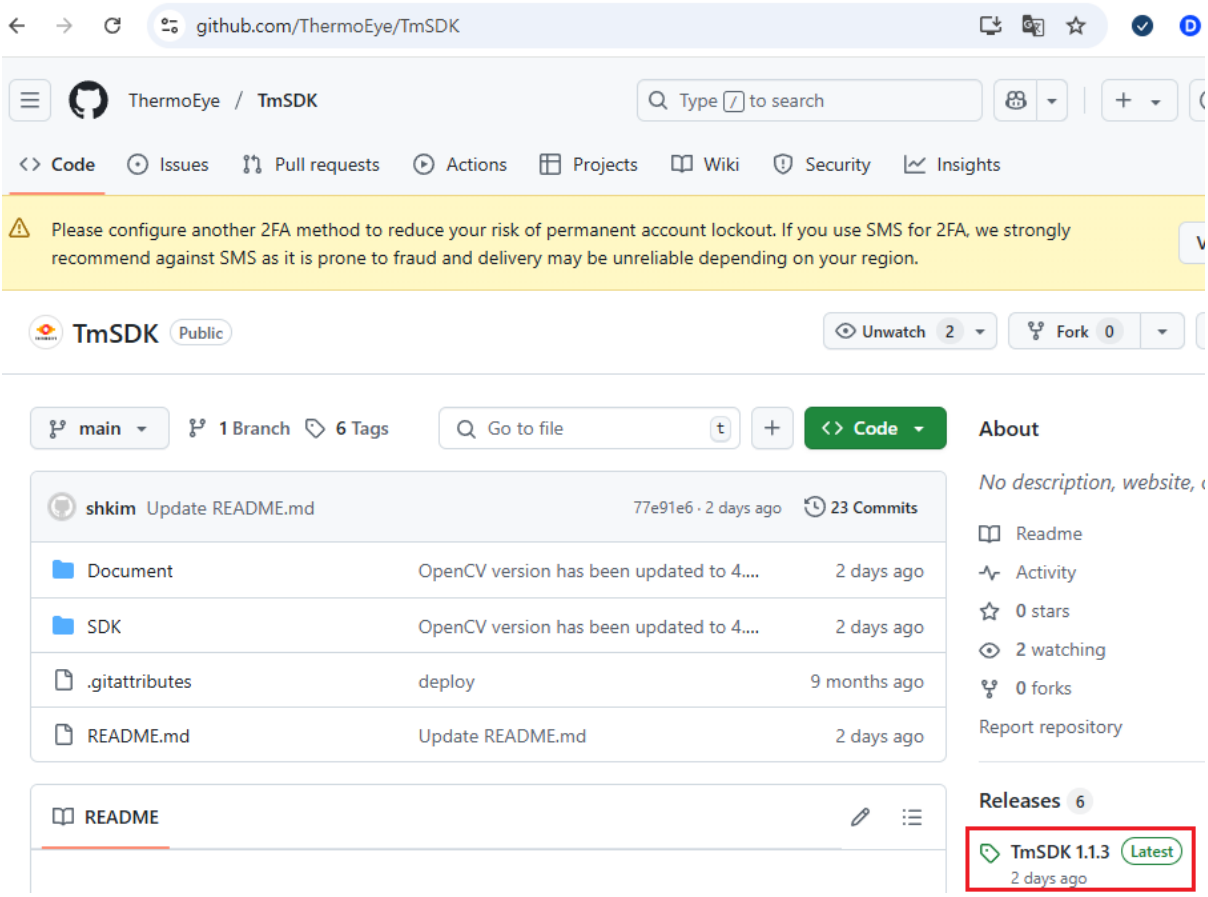


Figure 1. Thermoeye GitHub

1.2. SDK Directory Structure

```
├─Document                    ; API Documentation and User Manual
│  └─API
│      ├─Android               ; Android API
│      ├─Cpp                   ; C++ API
│      ├─CSharp                ; C# API
│      └─Python                ; Python API
└─examples                    ; TmSDK sample code
    ├─Android                 ; Java application for android
    ├─Linux                   ; Qt5-based C++ application for Linux
    ├─Python                  ; Python application
    └─Windows
        ├─TmWinDotnet         ; C# application for Windows
        └─TmWinQt             ; Qt5-based C++ application for Window
```

Figure 2. TmSDK directory structure

1.3. How to Access API Documentation

Open any **.html** file located in the Document/API directory using a web browser to view the API documentation.

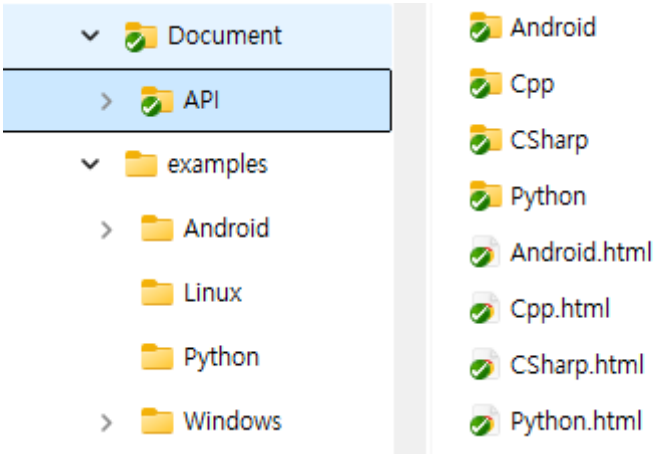


Figure 3. API document

2. Development Environment

This document provides setup instructions for C++, C#, and Python development environments on Windows and Linux.

2.1.Windows C++

Provide a C++ development environment using Qt5 on Windows.

Requirement:

Windows 10 or 11

Visual Studio 2022

Qt5.14.2

2.1.1. Install TmSDK

You can download the **TmSDK-2.0.0-lib-windows.msi** file from the URL below and run it to install TmSDK. **Once the installation is complete, please restart Windows.**

https://github.com/thermoeye/tmsdk/releases/tag/2.0.0

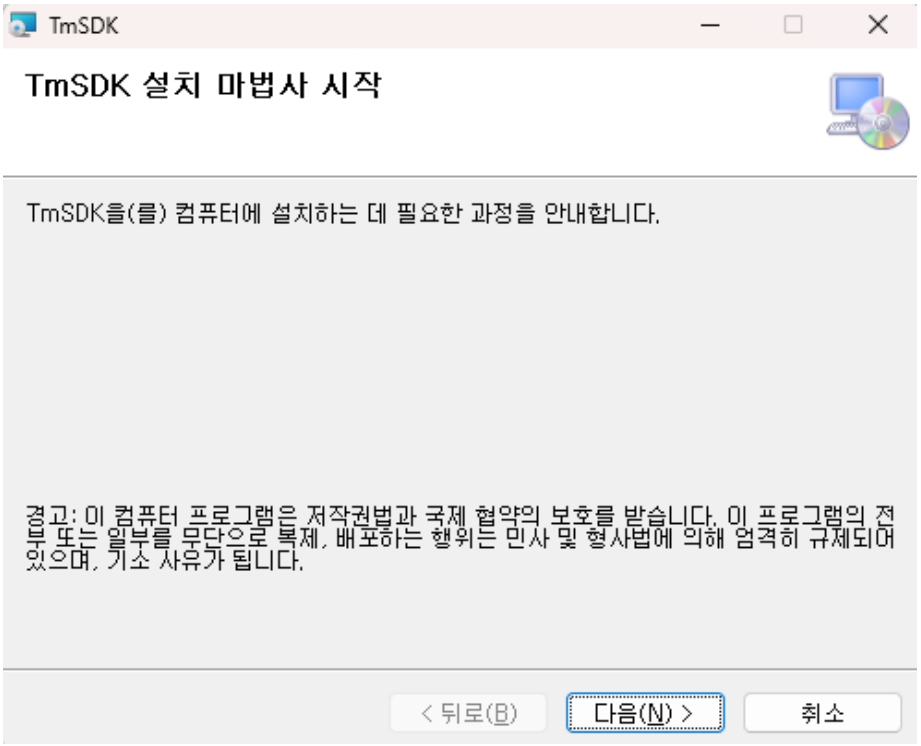


Figure 4. Install TmSDK

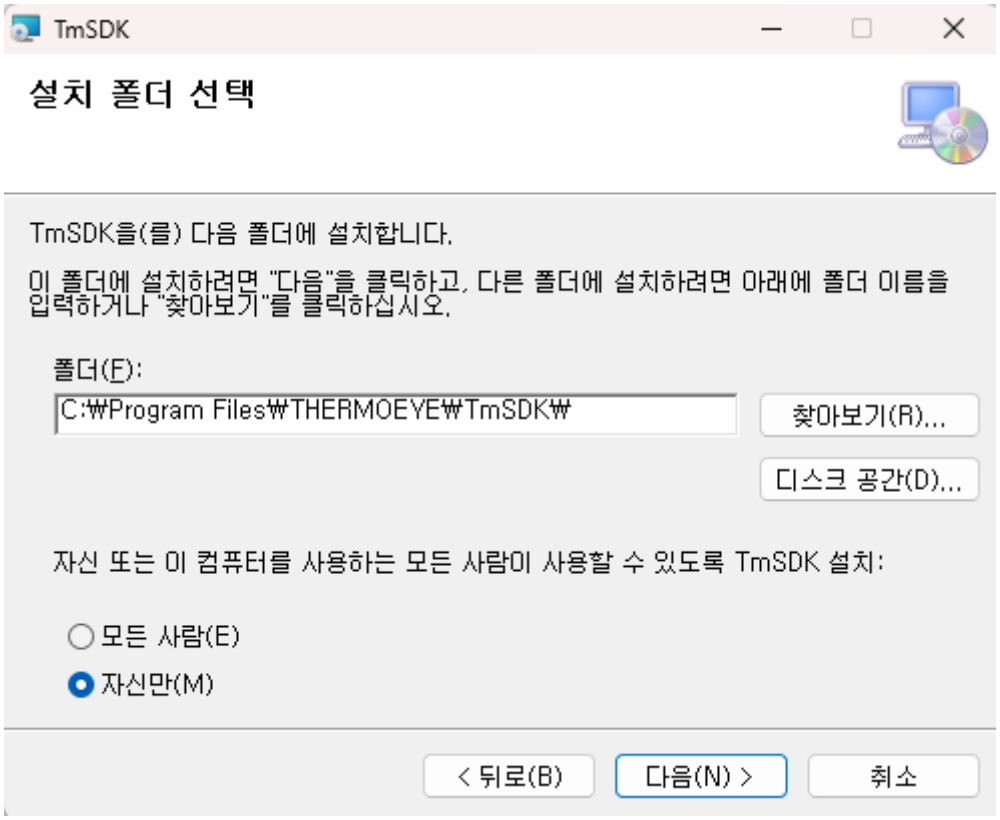


Figure 5. Select Install Path

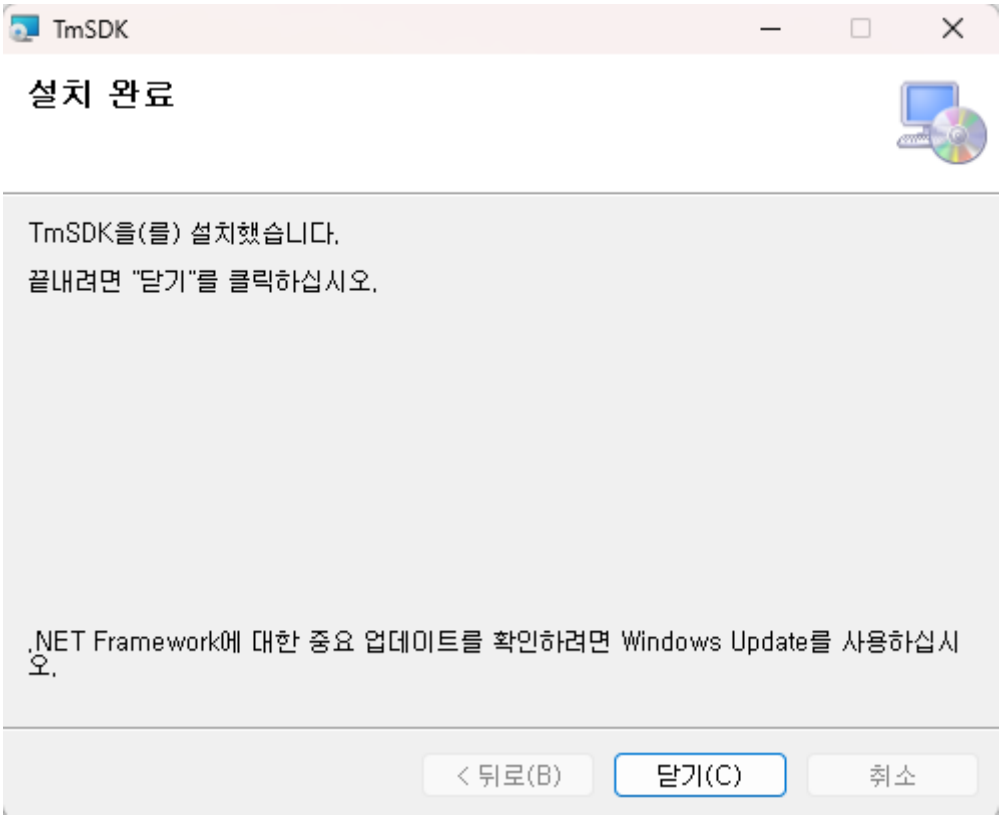


Figure 6. Complete Installation

2.1.2. Install Qt5

The GUI of the TmSDK C++ example code has been developed using the Qt library. To run the example code, please download and install the Qt library by following the instructions below.

- Download Qt5.14.2

Download: https://download.qt.io/archive/qt/5.14/5.14.2

Name	Last modified	Size	Metadata
Parent Directory		-	
submodules/	31-Mar-2020 09:27	-	
single/	31-Mar-2020 10:10	-	
qt-opensource-windows-x86-5.14.2.exe	31-Mar-2020 10:18	2.3G	Details
qt-opensource-mac-x64-5.14.2.dmg	31-Mar-2020 10:16	2.6G	Details
qt-opensource-linux-x64-5.14.2.run	31-Mar-2020 10:14	1.2G	Details
md5sums.txt	31-Mar-2020 10:32	207	Details

Figure 7. Qt5 download page

- Install Qt5

  After running the downloaded installation file, select **MSVC 2017 64-bit** and **Qt Creator 4.11.1**, then click the **Next** button to install Qt.

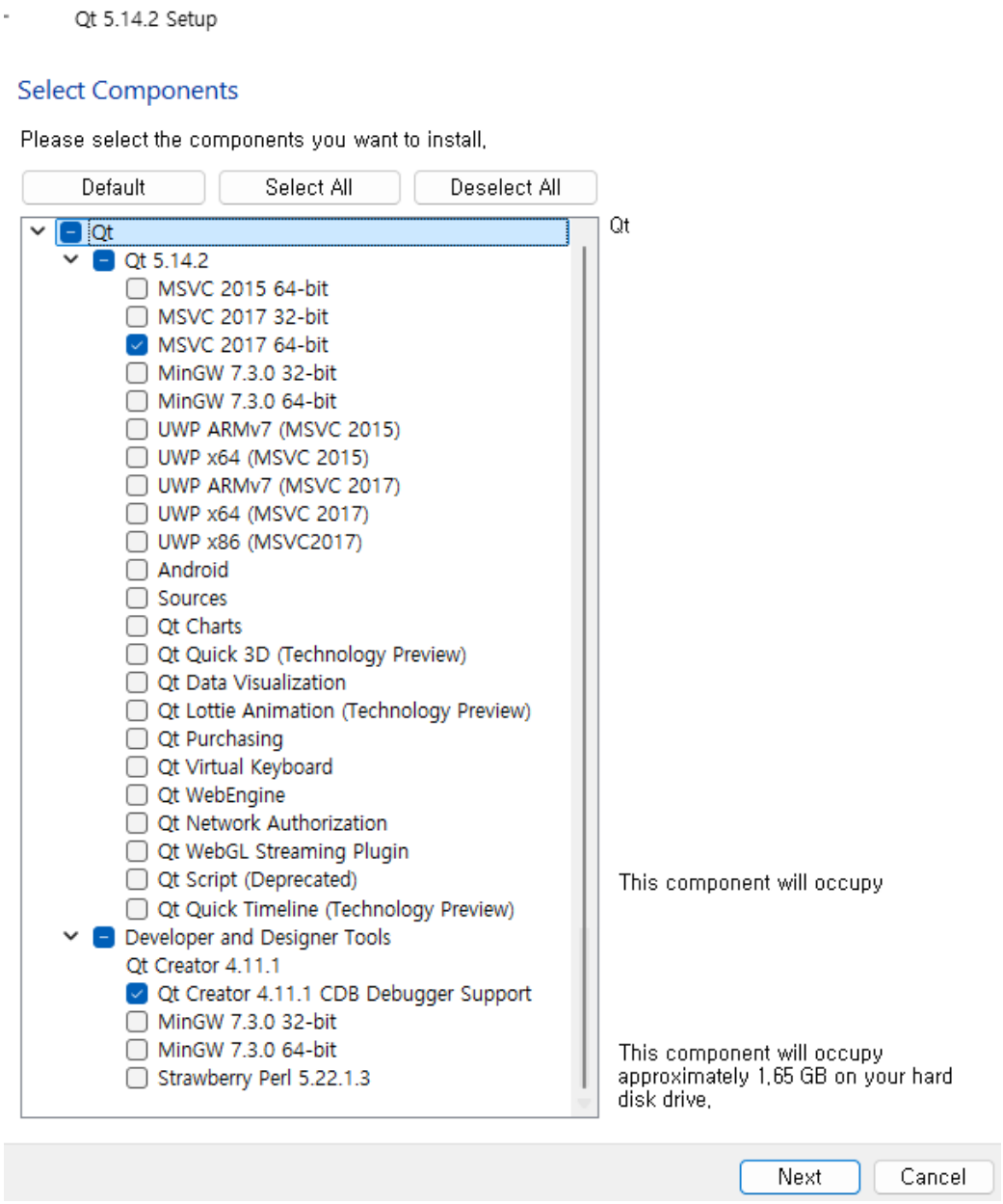


Figure 8. Install Qt5.14.2

- Register environment variables

  To compile the project with the Qt library in Visual Studio, please register the installed Qt path as an environment variable.

  QMAKESPEC = C:₩Qt₩Qt5.14.2₩5.14.2₩msvc2017_64₩mkspecs₩win32-msvc

  QT_LIBS = C:₩Qt₩Qt5.14.2₩5.14.2₩msvc2017_64₩lib

  QTDIR = C:₩Qt₩Qt5.14.2₩5.14.2₩msvc2017_64

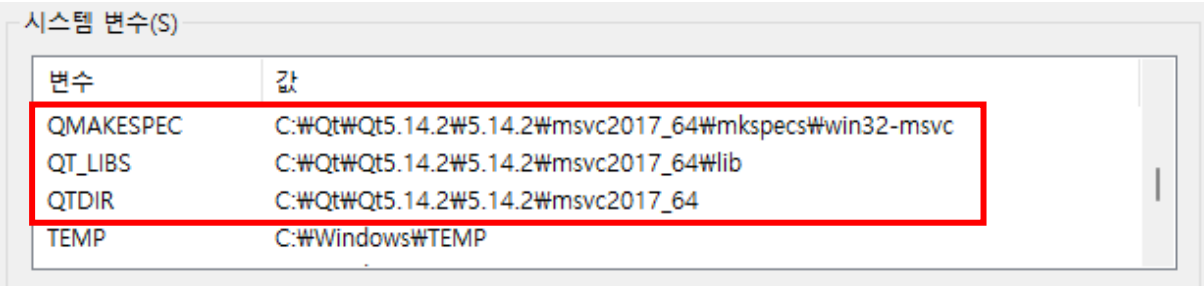


Figure 9. System variables for qt5

Add C:₩Qt₩Qt5.14.2₩5.14.2₩msvc2017_64₩bin to **PATH** variable.

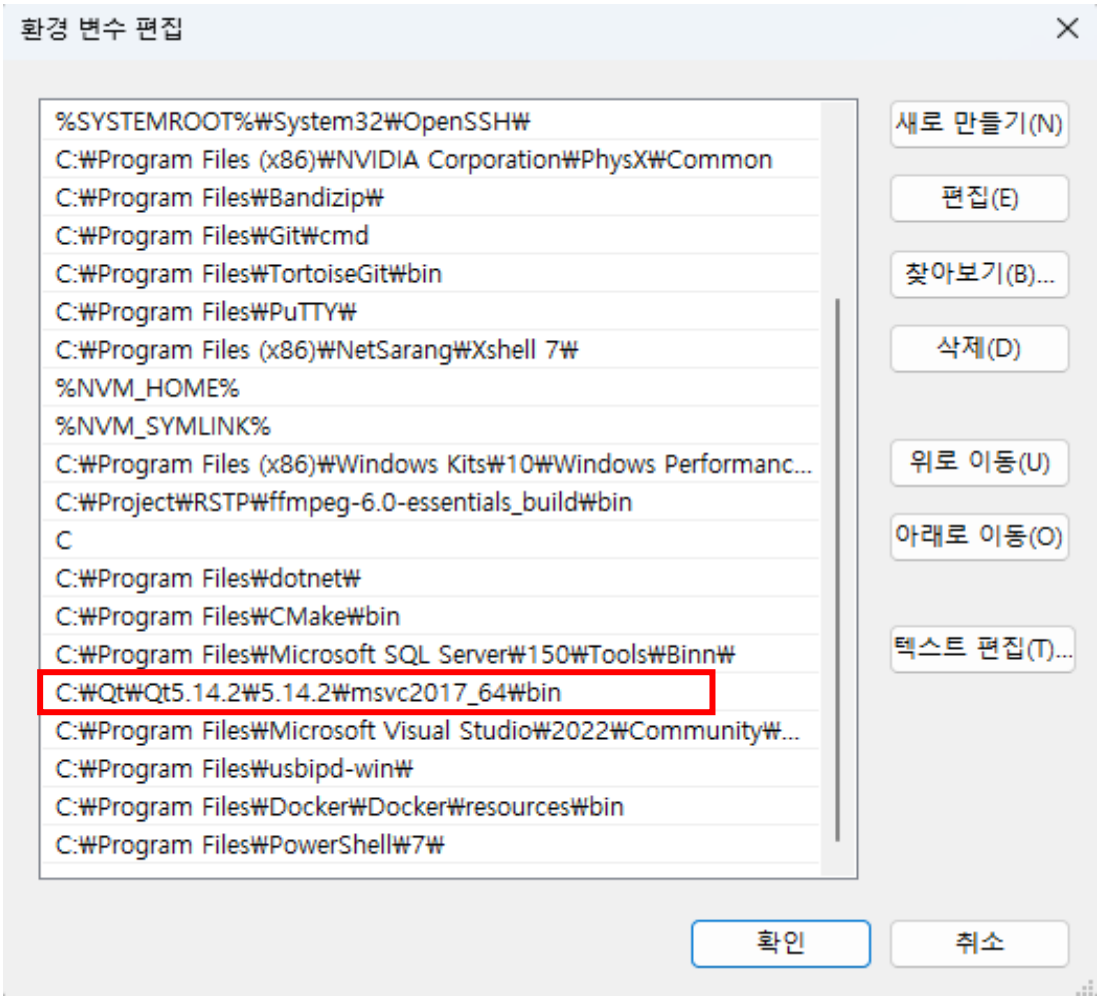


Figure 10. PATH variable

- Add Qt Visual Studio Tools to Visual Studio

  Open the examples₩Windows₩TmWinQt₩TmWinQt.sln file in Visual Studio. From the Menu Bar, go to **Extensions 〉 Manage Extensions**. After clicking, search for and install **Qt Visual Studio Tools.** Restart Visual Studio to install Qt Visual Studio Tools.

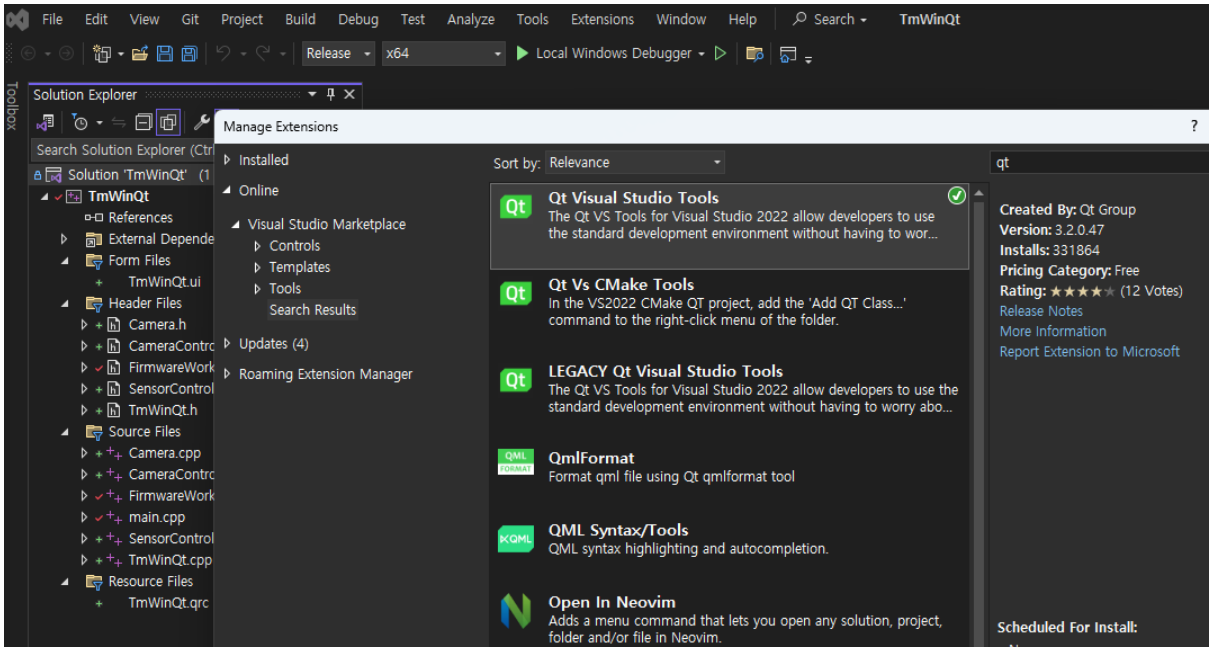


Figure 11. Qt Visual Studio Tools

- Add Qt Version

  If the Qt extension tool is installed in Visual Studio, you must register the previously installed Qt5. As shown in the figure below, click **Extensions 〉 Qt VS Tools 〉 Qt Versions** from the menu bar and register the installed Qt5.

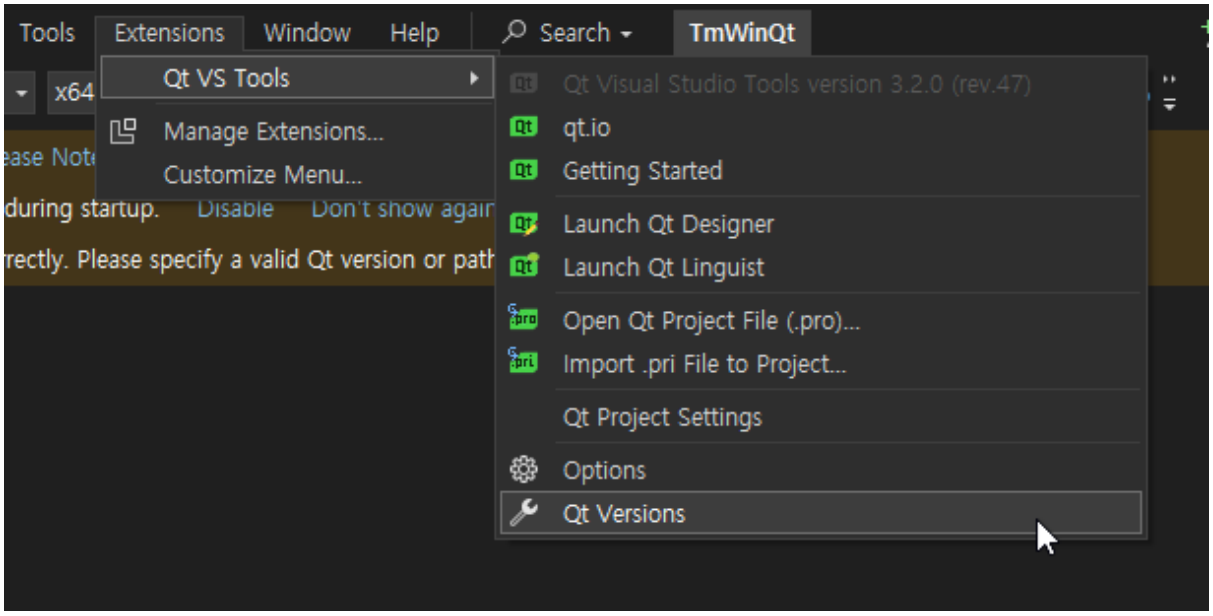


Figure 12. Qt Versions

Click **Add New Qt Version** and set the qmake path for Qt5.

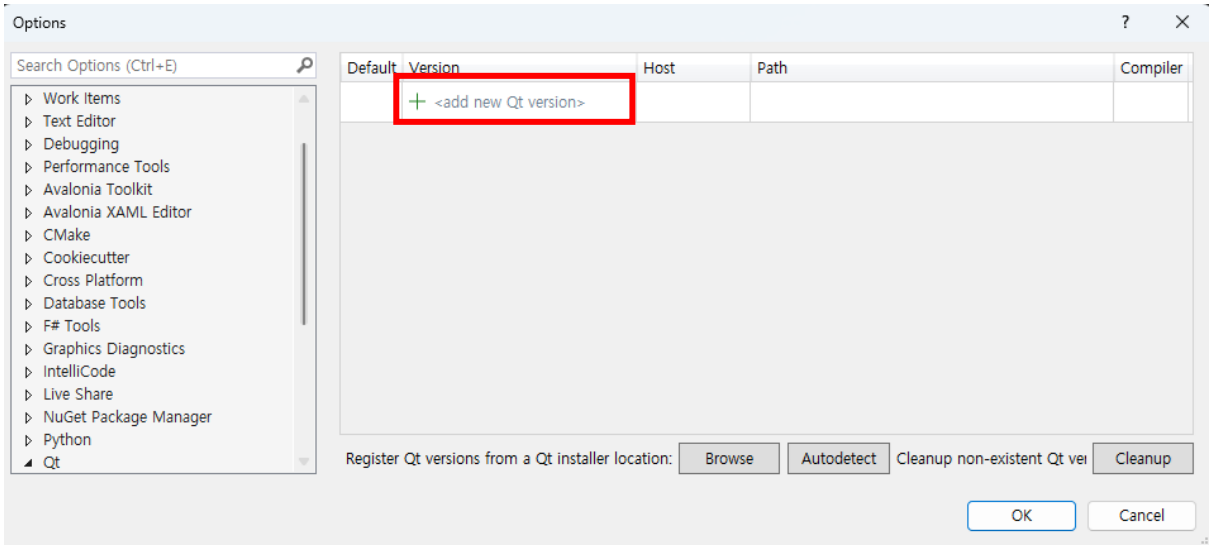


Figure 13. Add New Qt version

You can find **qmake.exe** in the directory: C:₩Qt₩Qt5.14.2₩5.14.2₩msvc2017_64₩bin.

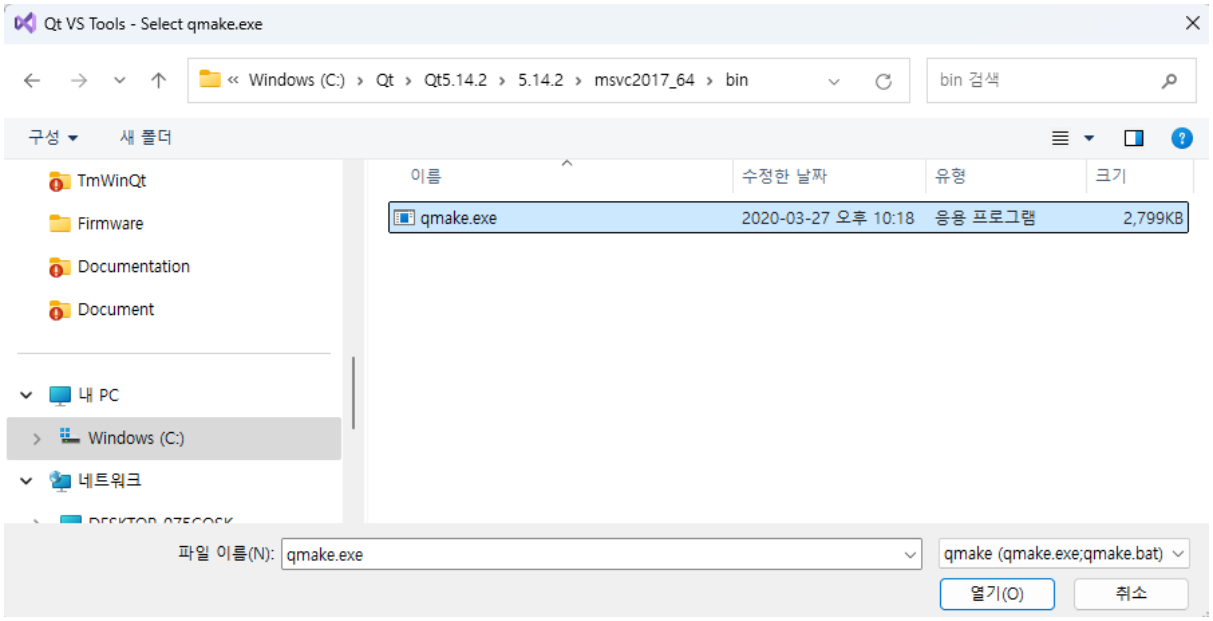


Figure 14. Select qmake

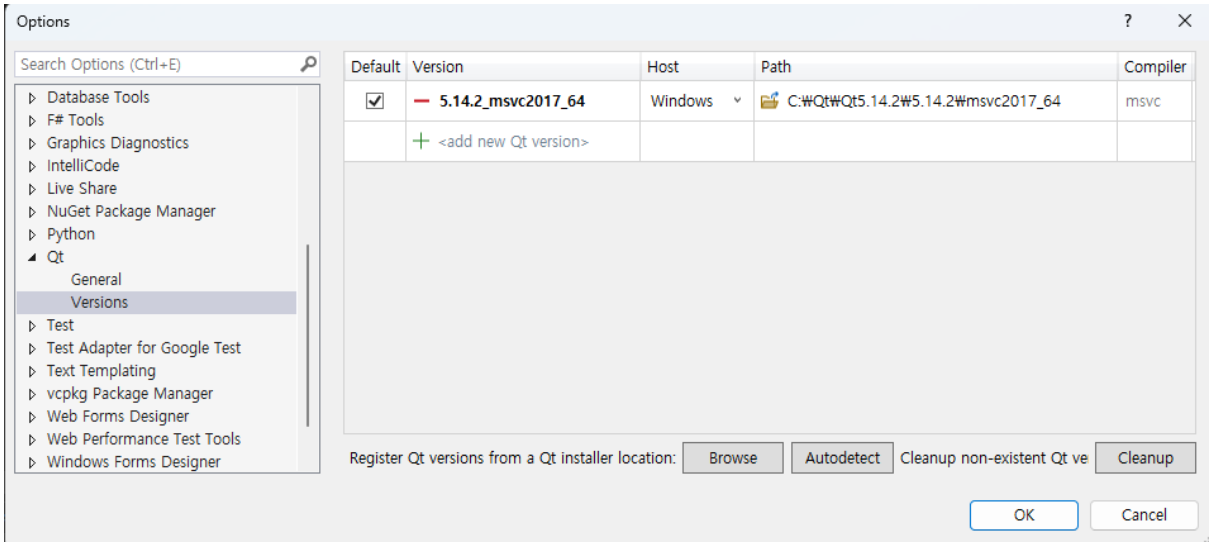


Figure 15. Added new qt version

Qt5 has been registered. Verify that the registered Qt5 is correctly applied to the project. In Visual Studio, right-click the TmWinQt project and select “Properties”. Under “Configuration Properties”, select “Qt Project Settings”, and then check the Qt compiler version in the Qt Installation field.

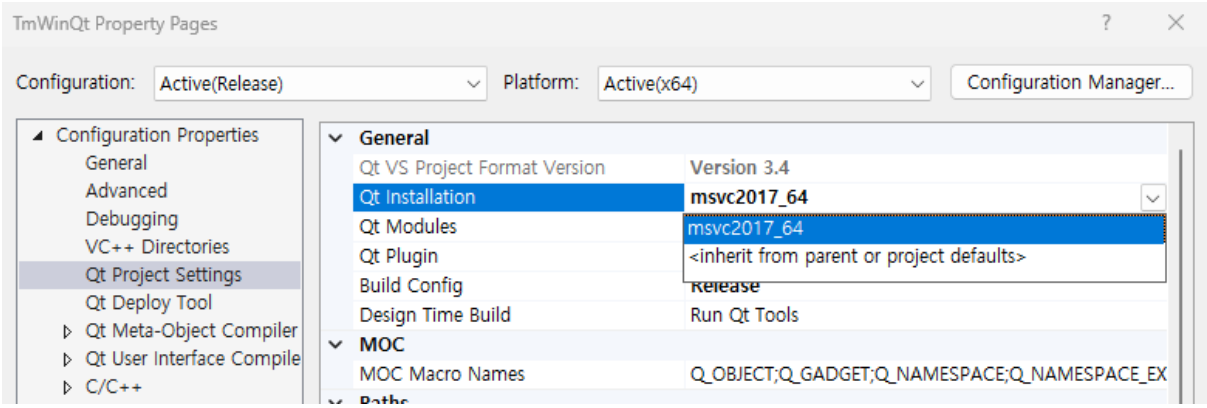


Figure 16. Check qt version of TmWinQt project

2.1.3. Build TmWinQt

Build TmWinQt to obtain **TmWinQt.exe** in build₩x64₩Release.

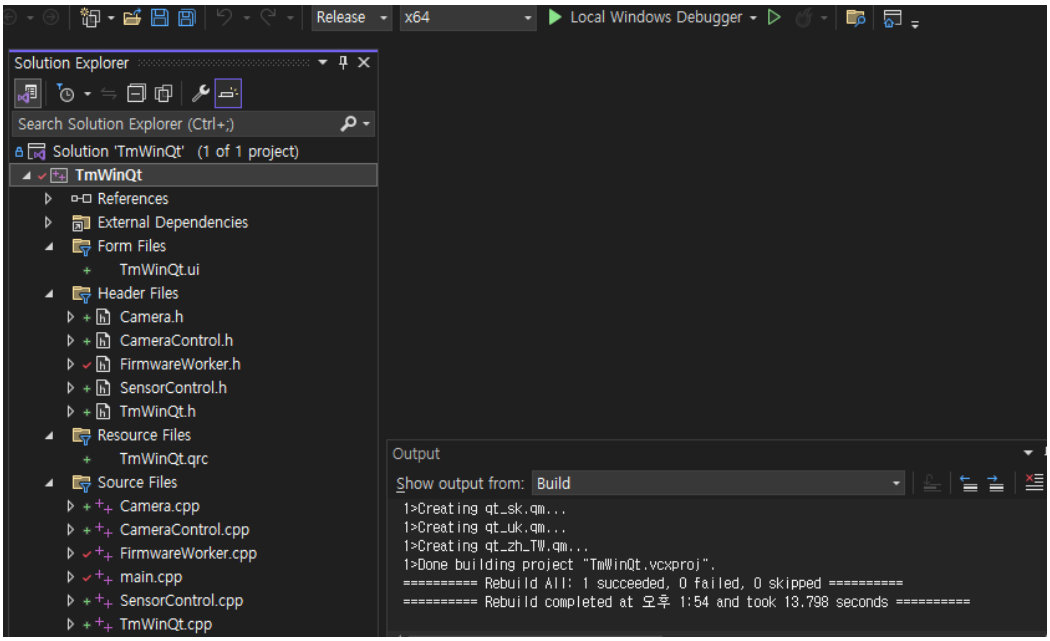


Figure 17. Build TmWinQt

2.1.4. Run TmWinQt

When the Windows security prompt appears, click "Allow"

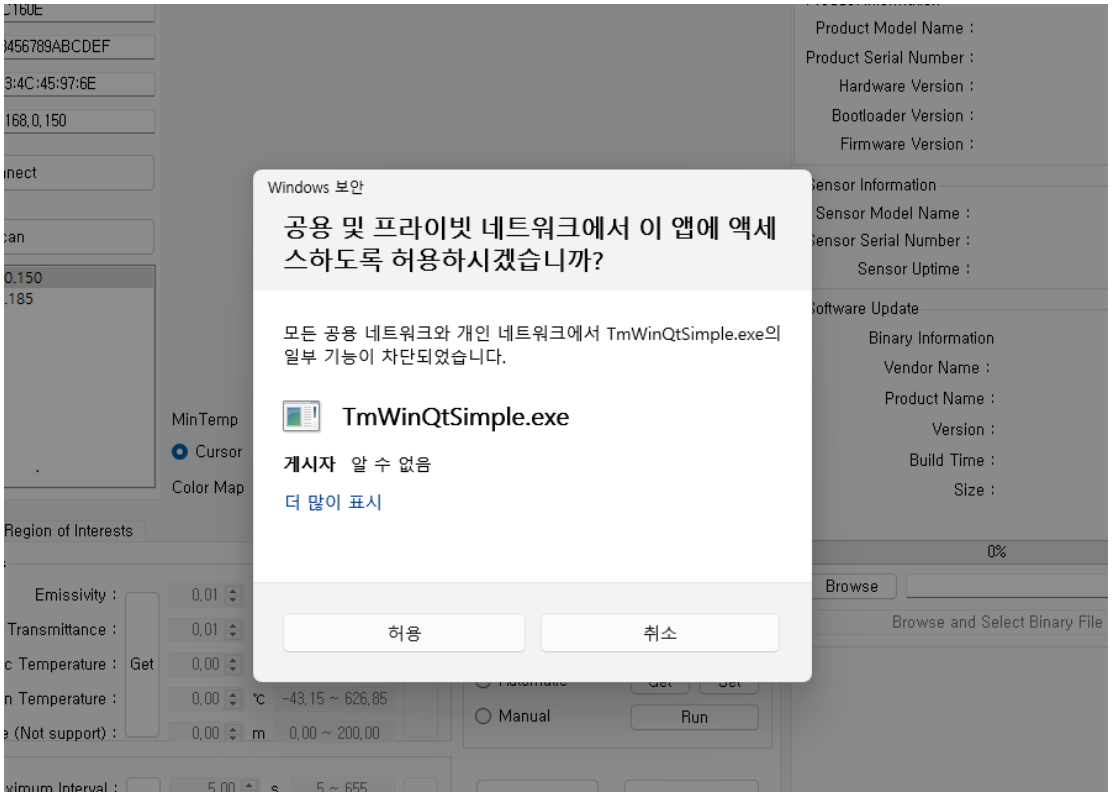


Figure 18. Windows security prompt

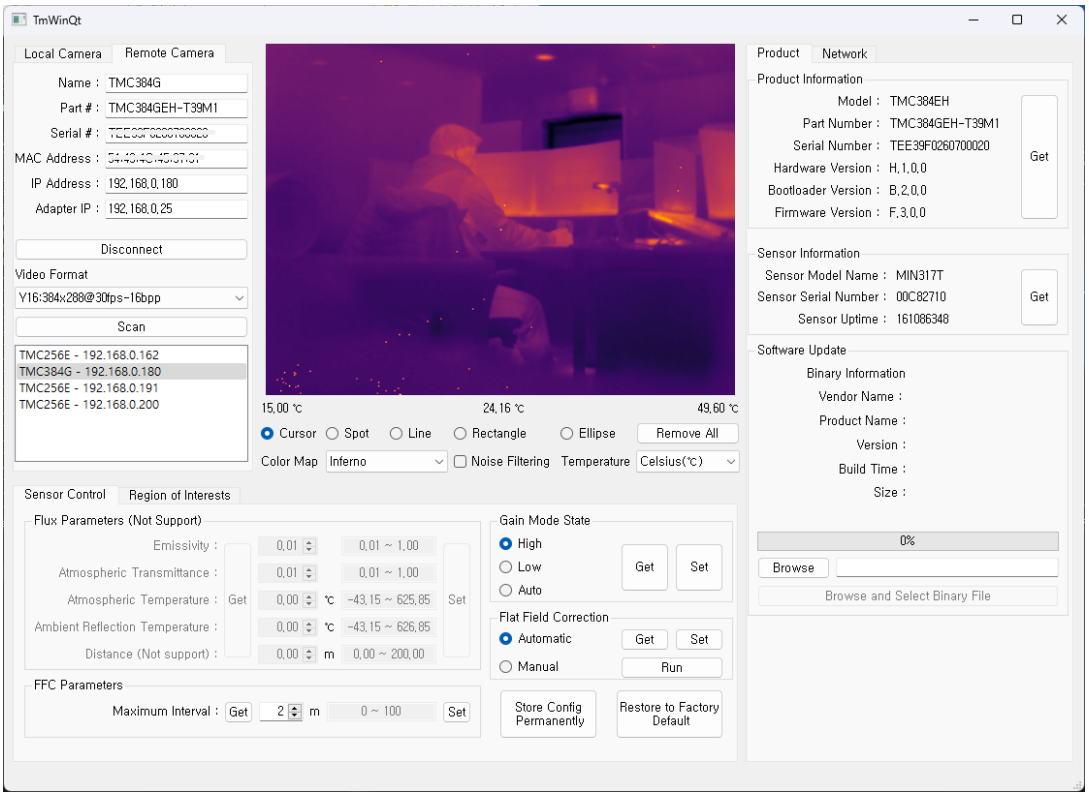


Figure 19. Run TmWinQt

2.2. Windows C#

Requirement:

Windows 10 or 11

Visual Studio 2022

2.2.1 Install TmSDK

Refer to 2.1.1 Install TmSDK

2.2.2 Build TmWinDotNet

Open the TmWinDotNet.sln file located in examples₩Windows₩TmWinDotNet using Visual Studio.

Build TmWinDotNet to obtain **TmWinDotNet.exe** in build₩x64₩Release.

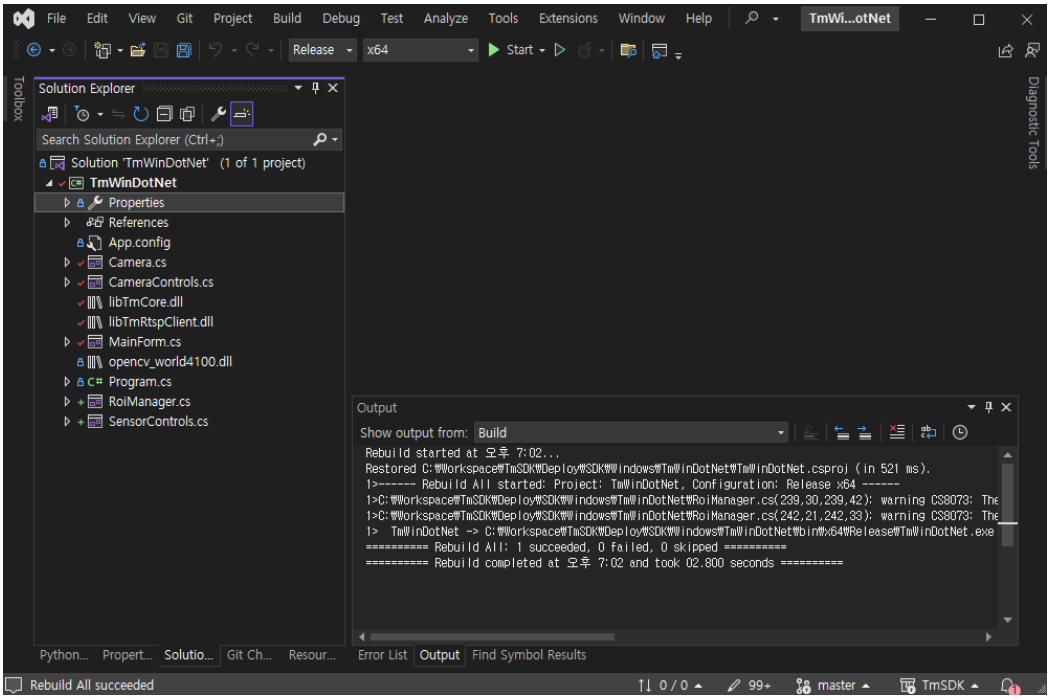


Figure 20. Build TmWinDotNet

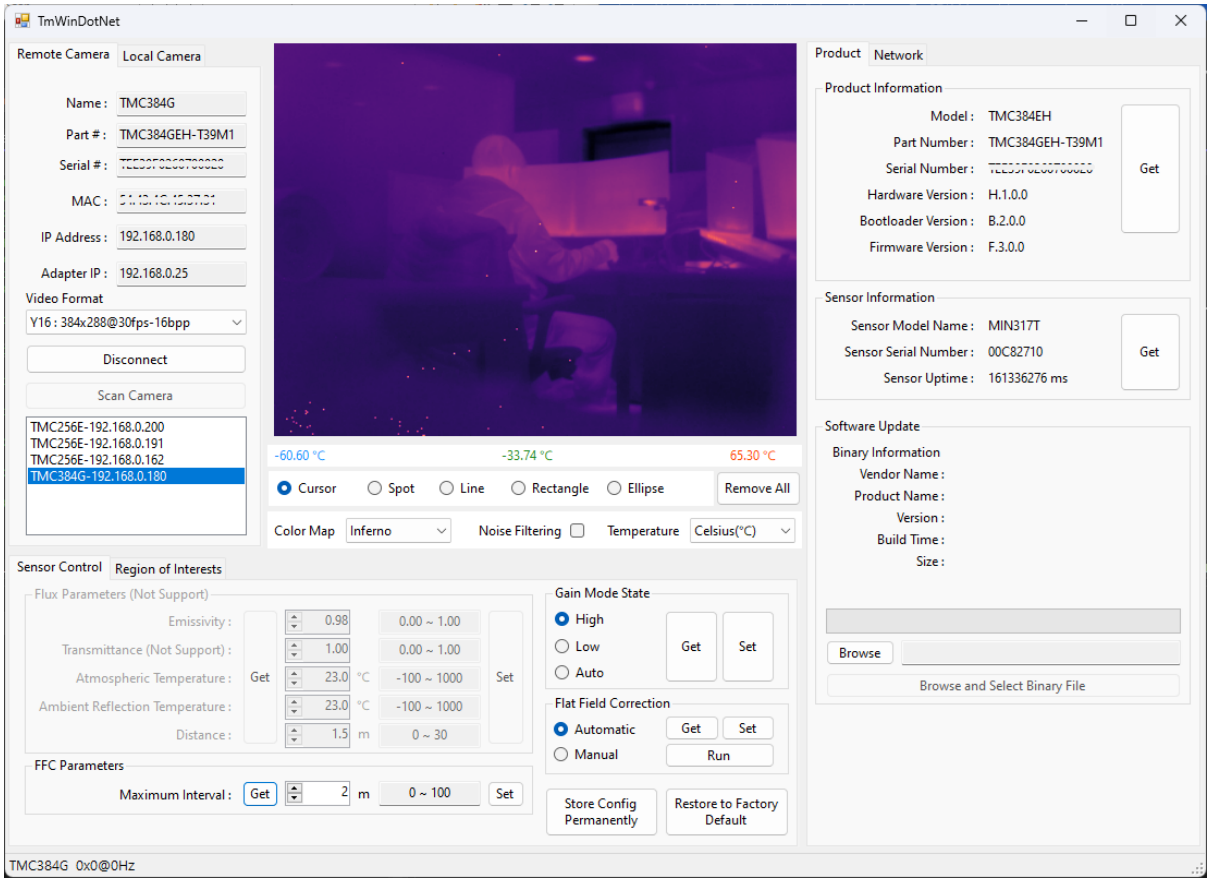


Figure 21. Run TmWinDotNet

2.3. Windows Python

Requirement:

Windows 10 or 11

Python 3.9 or higher.

2.3.1. Install Python

- Download Python

https://www.python.org/downloads/windows/

- Install Python

When installing, check Add python.exe to PATH and proceed with the installation.

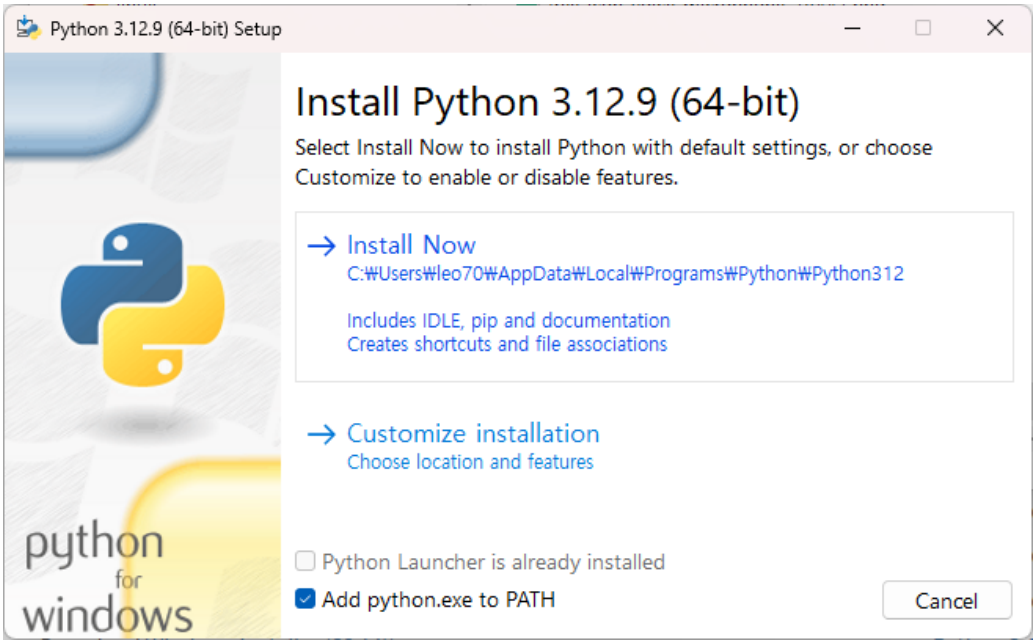


Figure 22. Install Python

2.3.2. Install TmSDK

Refer to 2.1.1 Install TmSDK

2.3.3. Install Packages

Install the required Python packages using the pip command as shown below.

```
> pip install pyqt5
> cd <path_to_sdk>
> pip install TmSDK-1.1.4-py3-none-win_amd64.whl
```

2.3.4. Run TmPython

```
> python TmPython.py
```

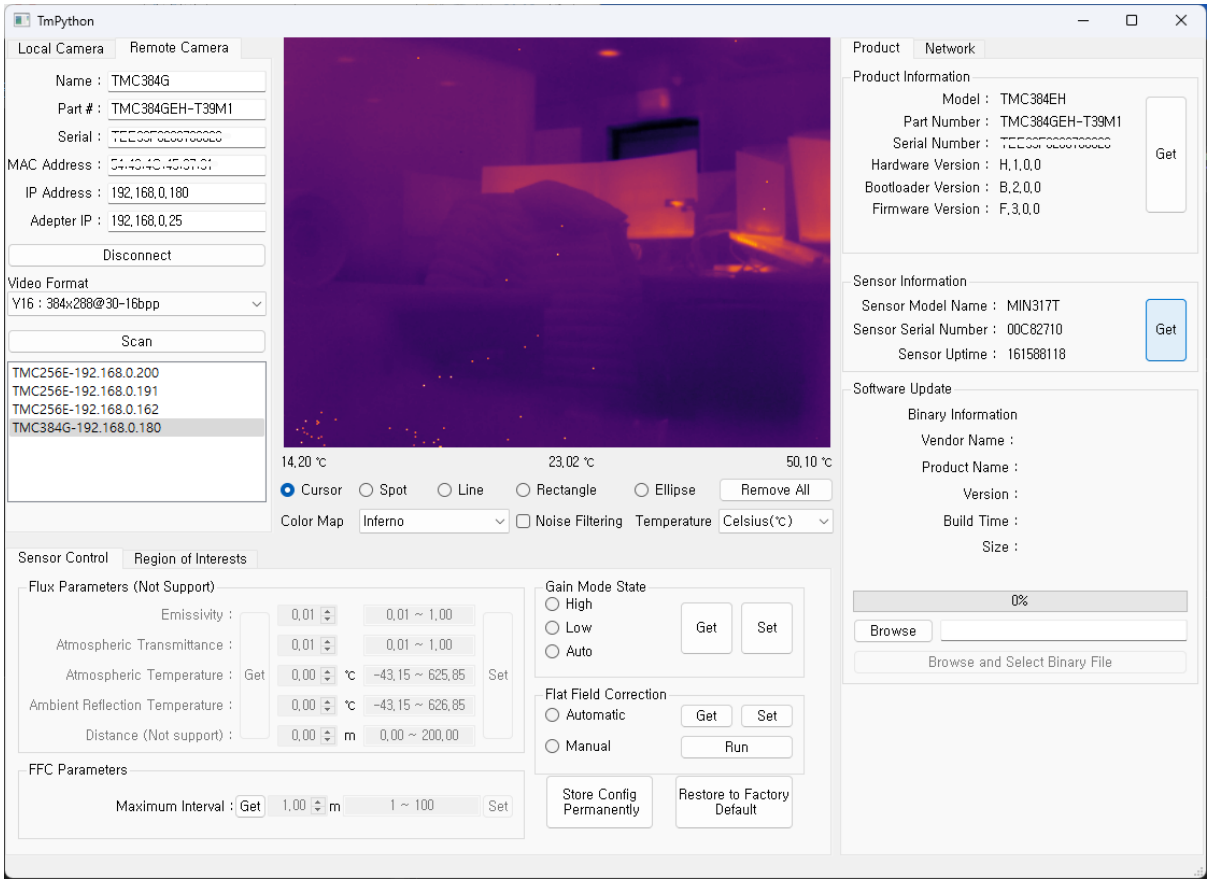


Figure 23. Run TmPython

2.4. Linux C++

Requirement:

Ubuntu 20.04 or later

Gcc-11

Qt5.14.2

It is recommended to run on a physical Linux machine rather than a virtual machine.

2.4.1. Install packages

You can install the necessary packages by running the **install_pkg_TmLinux.sh** file located in the **⟨path_to_sdk⟩/examples/Linux/** directory.

- Install packages

```
$ cd <path_to_sdk>/examples/Linux
$ chmod 777 install_pkg_TmLinux.sh
$ ./install_pkg_TmLinux.sh
```

- Contents of the install_pkg_TmLinux.sh file

```
#!/bin/sh
# install gcc-11, g++-11
sudo add-apt-repository ppa:ubuntu-toolchain-r/test
sudo apt-get install -y gcc-11 g++-11
sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-11 110 --slave
/usr/bin/g++ g++ /usr/bin/g++-11

# install Qt5
sudo apt install -y qtbase5-dev mesa-common-dev qtcreator libudev-dev
```

- Grant permission to access tty device file

  To control the camera without errors, access permission to the device is required. After connecting the USB camera to the PC, grant user access permission using the command below.

```
$ ls –l /dev/ttyACM0
crw-rw---- 1 root dialout 4, 73 Aug  5 14:21 /dev/ttyACM0
$ sudo usermod -a -G dialout $USER
```

2.4.2. Install TmSDK

Download the installer that matches your Linux version from the URL below and install TmSDK:

https://github.com/thermoeye/tmsdk/releases/tag/2.0.0

To install TmSDK on Ubuntu, navigate to the directory containing the downloaded .deb and run:

```
$ cd <path_to_sdk>
$ sudo dpkg -i TmSDK-2.0.0-lib-ubuntu_22.04-amd64.deb
(Reading database ... 222386 files and directories currently installed.)
Preparing to unpack TmSDK-2.0.0-lib-ubuntu_22.04-amd64.deb ...
Unpacking tmsdk (2.0.0) over (1.2.0) ...
Setting up tmsdk (2.0.0) ...
Processing triggers for libc-bin (2.35-0ubuntu3.6) ...
```

2.4.3. Build TmLinux

To build the example code, run **qmake** to generate a **Makefile**. After the Makefile is generated, run **make** to build the example code. Once the build is complete, the **TmLinux** executable will be created.

```
$ cd <path_to_sdk>/examples/Linux/
$ qmake TmLinux.pro
$ make
```

2.4.4. Run TmLinux

```
$ ./TmLinux
```

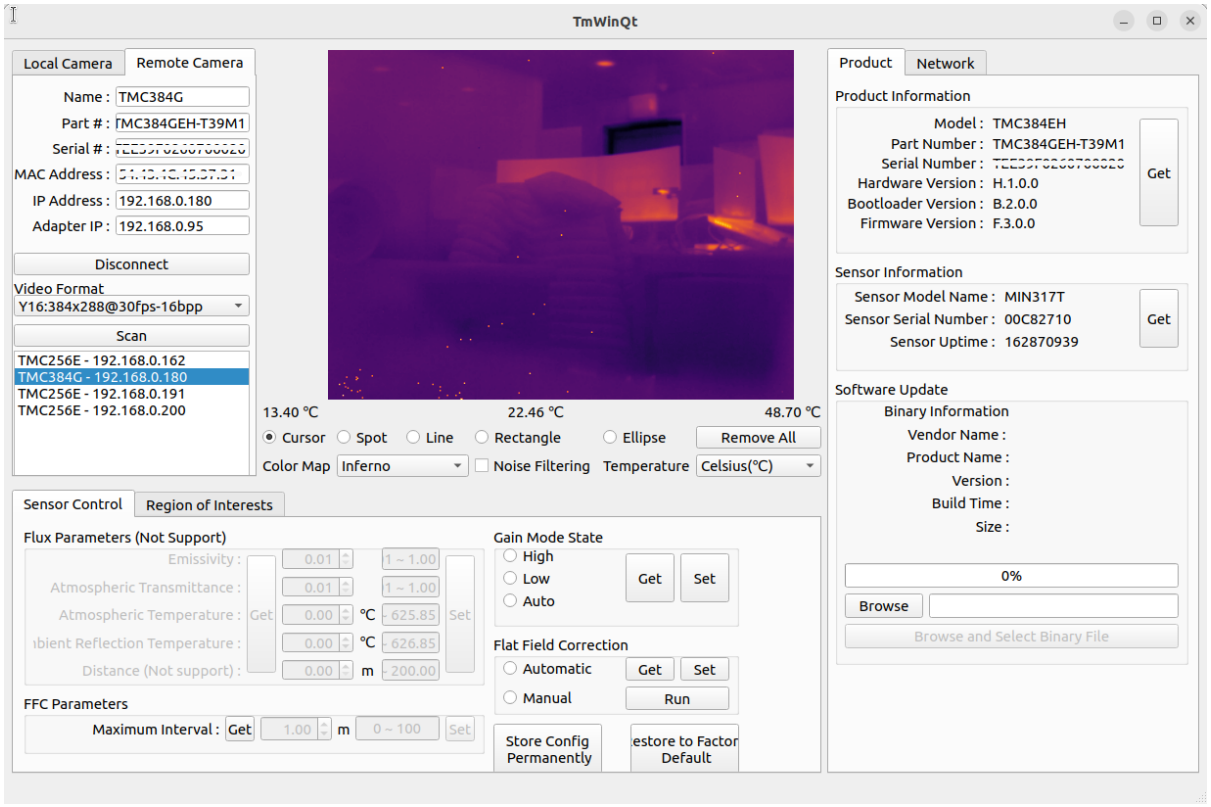


Figure 24. Run TmLinux

2.5. Linux Python

Requirement:

Ubuntu 20.04 or later

PyQt5

Python 3.9 or higher

It is recommended to run on a physical Linux machine rather than a virtual machine.

2.5.1. Install python3

If Python is not installed, install it using the following command. If you already have Python 3.9 or later installed, you only need to install the Python virtual environment package (venv).

- Install packages

```
sudo apt install python3
sudo apt install python3-pip
sudo apt install python3.12-venv
```

2.5.2. Install TmSDK

Download the installer that matches your Linux version from the URL below and install TmSDK:

https://github.com/thermoeye/tmsdk/releases/tag/2.0.0

Install TmSDK using dpkg on Ubuntu. Navigate to the downloaded SDK directory and run command:

```
$ cd <path_to_sdk>
$ sudo dpkg -I TmSDK-2.0.0-lib-ubuntu_22.04-amd64.deb
(Reading database ... 222386 files and directories currently installed.)
Preparing to unpack TmSDK-2.0.0-lib-ubuntu_22.04-amd64.deb ...
Unpacking tmsdk (2.0.0) over (1.2.0) ...
Setting up tmsdk (2.0.0) ...
Processing triggers for libc-bin (2.35-0ubuntu3.6) ...
```

```
$ python3 -m venv tmsdk
$ source tmsdk/bin/activate
(tmsdk)$ pip install TmSDK-1.1.4-py3-none-manylinux2014_x86_64.whl
(tmsdk)$ pip install PyQt5
```

If the PyQt5 installation hangs, please follow the steps below.

```
(tmsdk)$ deactivate
$ rm tmsdk -rf
$ python3 -m venv --system-site-packages tmsdk
$ sudo apt update
$ sudo apt install python3-pyqt5
$ source tmsdk/bin/activate
(tmsdk)$ pip install TmSDK-1.1.4-py3-none-manylinux2014_x86_64.whl
```

2.5.3. Run TmPython

```
(tmsdk)$ python3 ./TmPython.py
```

2.6. Android

Requirement:

Android-24 or later

Android Studio.

2.6.1. Install Android Studio

Download: https://developer.android.com/studio

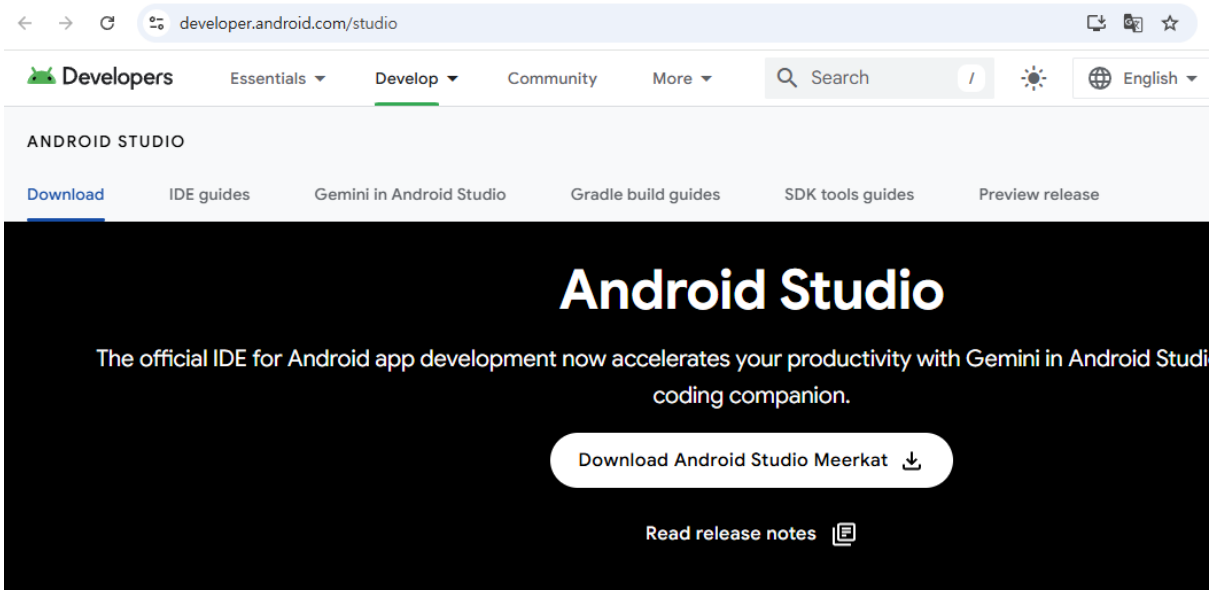


Figure 25. Download Android Studio

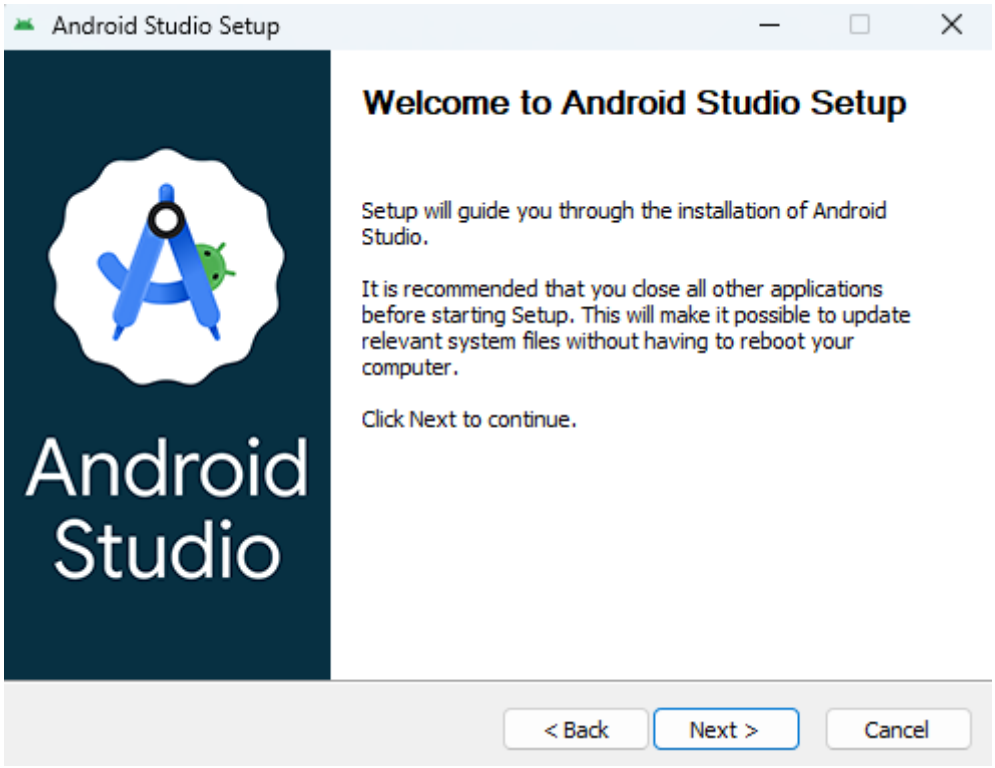


Figure 26. Install Android Studio

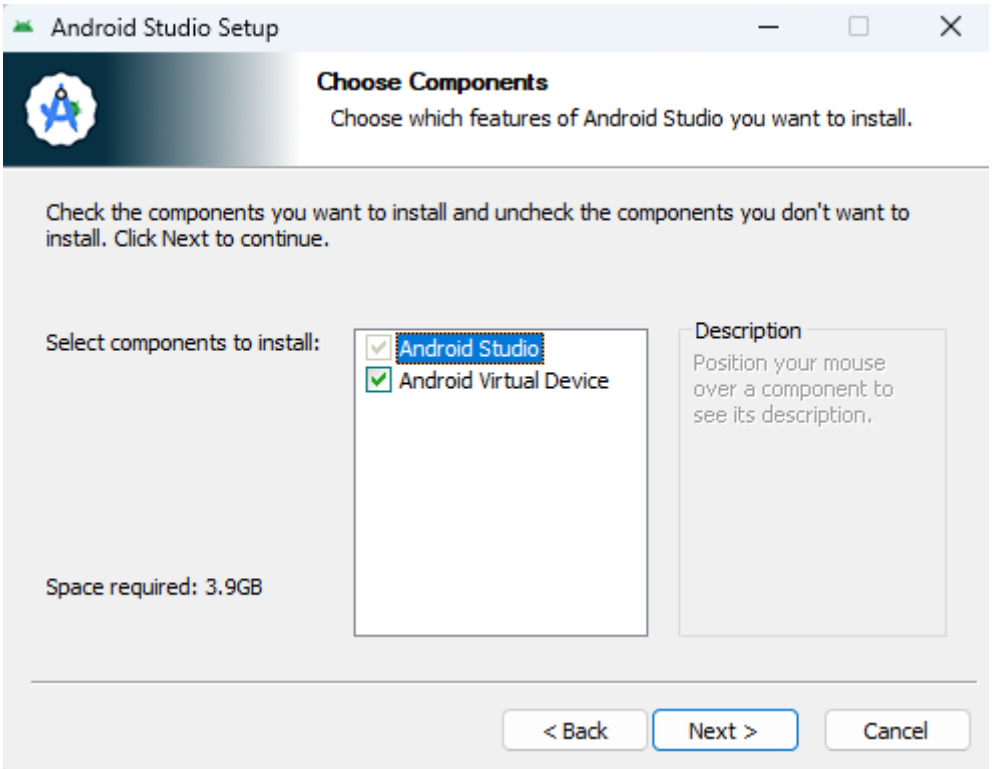


Figure 27. Choose Components

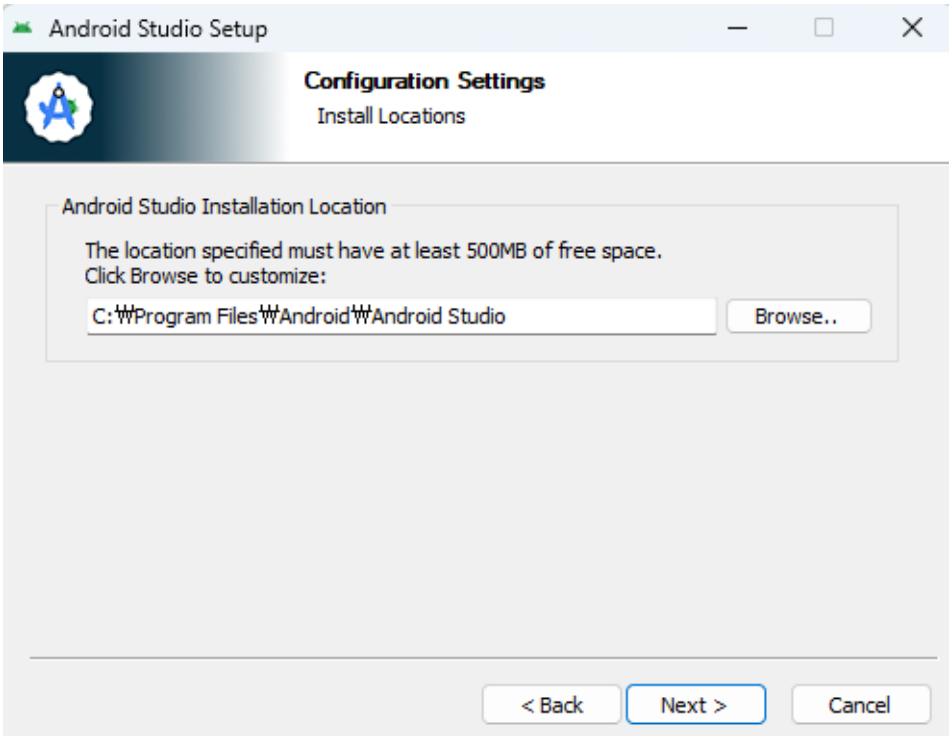


Figure 28. Install Locations

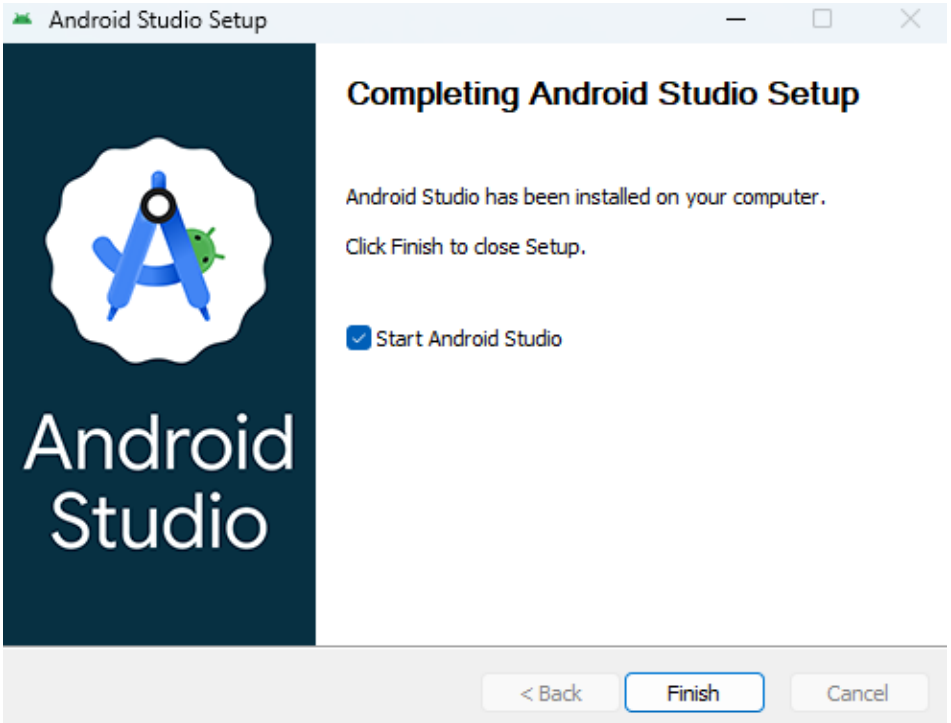


Figure 29. Complete Android Studio Setup

2.6.2. Open Android Project

Launch Android Studio and open the Android project located in **examples₩Android.**

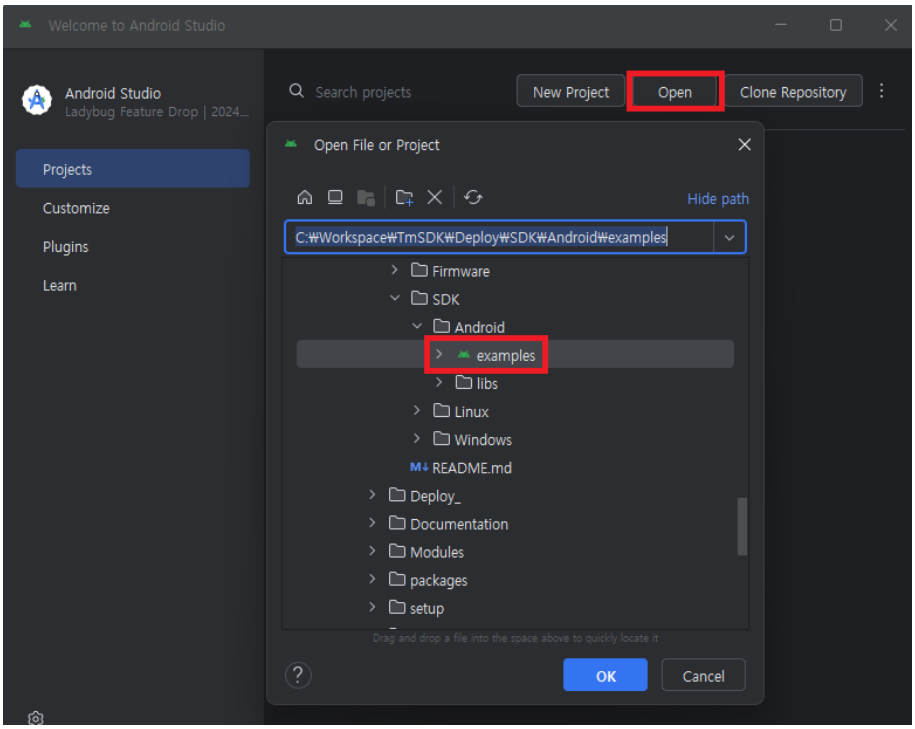


Figure 30. Open android project

2.6.3. Setup android device

To enable Developer Mode on your Android device, go to **Settings→About tablet or About phone→Software information**, then tap **Build number** several times. Once Developer Mode is activated, go to **Settings→Developer options** and enable **USB debugging.**

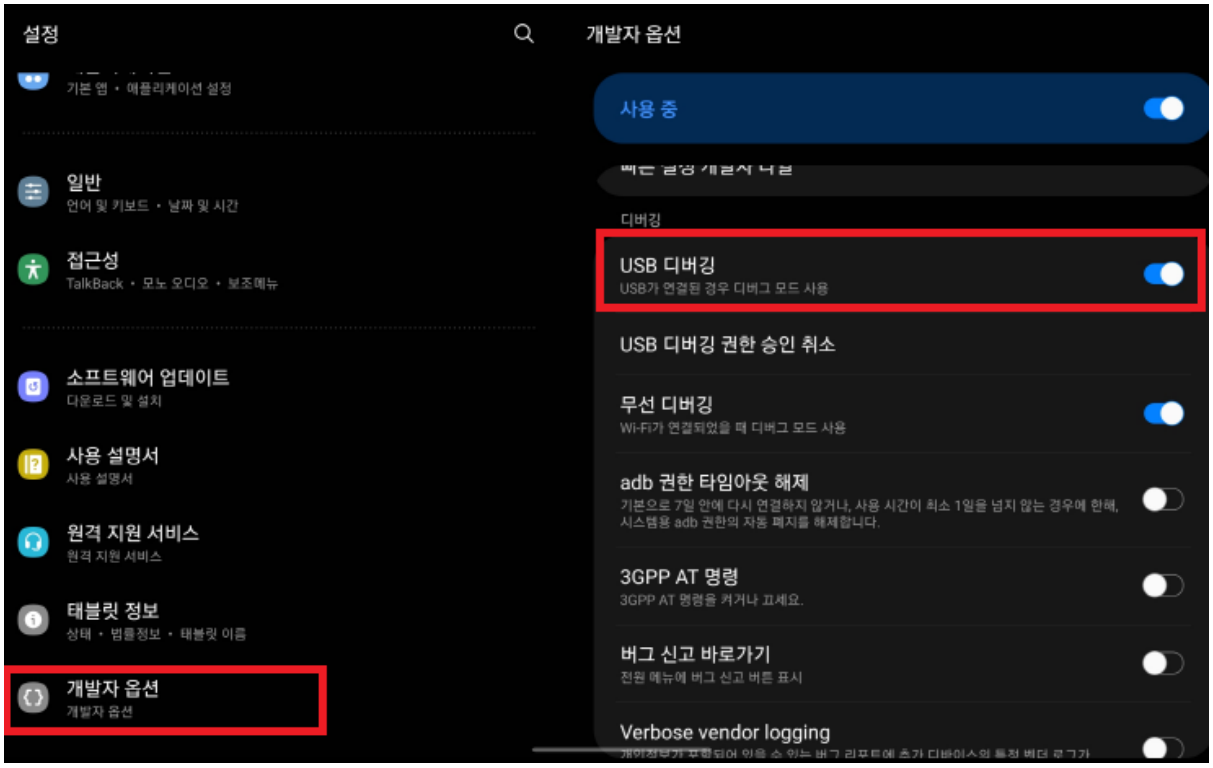


Figure 31. Setup android device

2.6.4. Build and run Project

Build the Android project by selecting **'Make Project'** from the menu bar. After connecting your Android device to the PC, run the app by clicking **'Run App'** to launch it on the device.

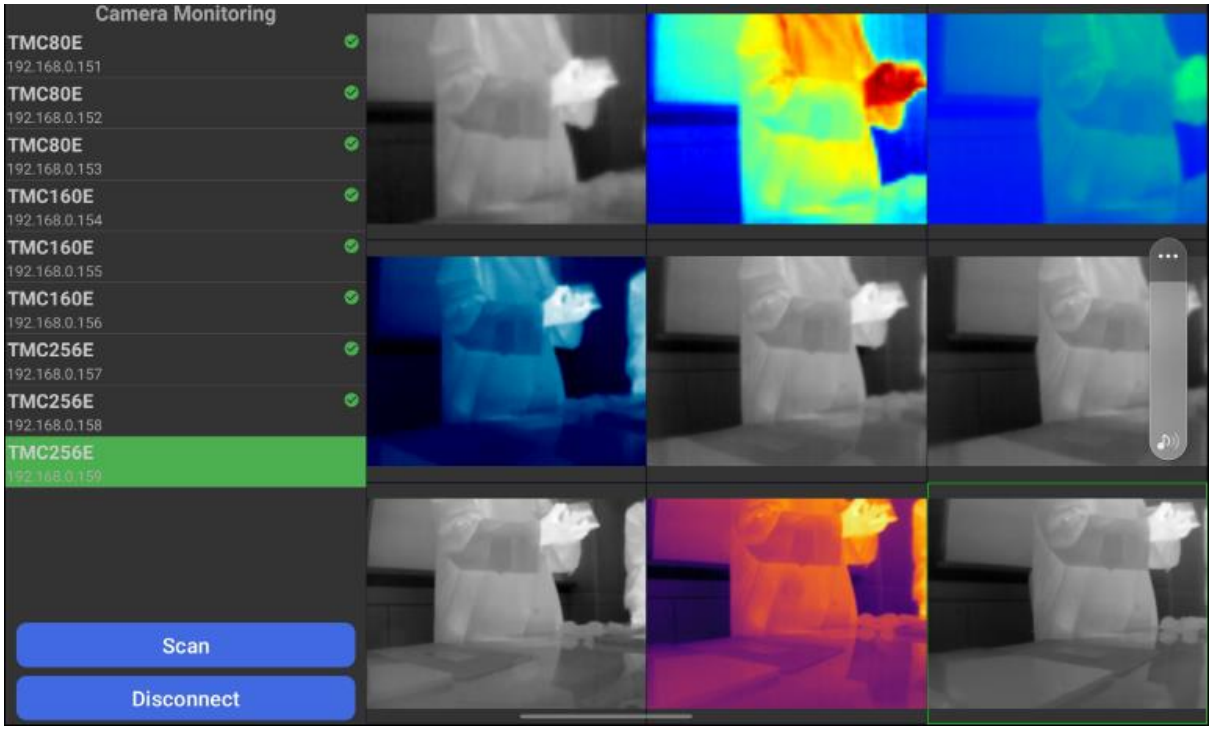


Figure 32. Run Android

3. TmSDK GUI

The GUI provides video playback, temperature visualization, device information, and configuration features.

3.1. Screen Layout

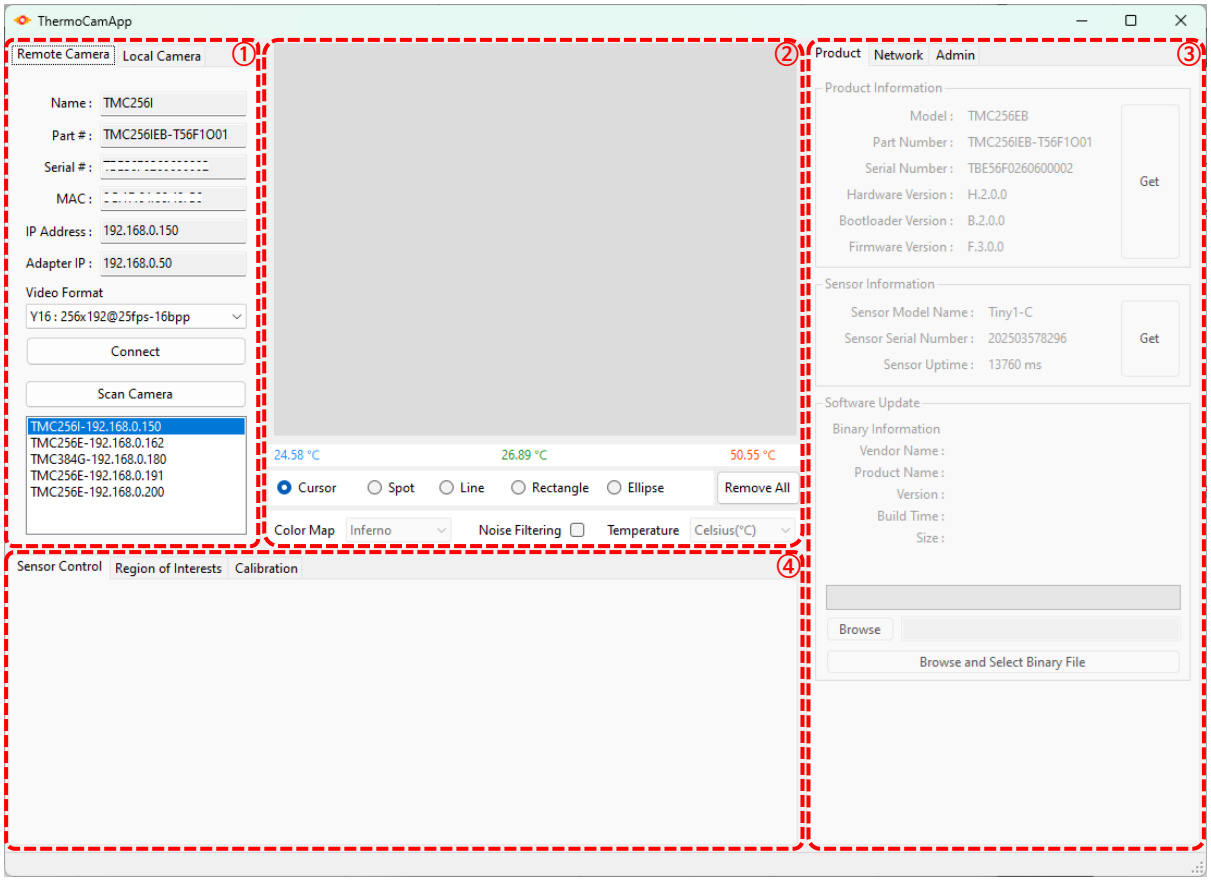


Figure 33. Screen Layout

① Device discovery and connection

view connectable device information and connection function of Remote Camera(Ethernet Network) / Local Camera(USB)

② Video playback and temperature display

Real-time streaming video playback, display of highest/average/lowest raw data values and temperature within the image frame, ROI addition/deletion, color map, image quality improvement, and temperature unit change functions.

③ Product and sensor information

Camera product information, thermal imaging sensor information inquiry, software update, Ethernet network information inquiry and setting function

④ Sensor control and ROI management

Various control functions for thermal imaging sensor, and the ability to add and delete ROI lists

3.2. Remote Camera

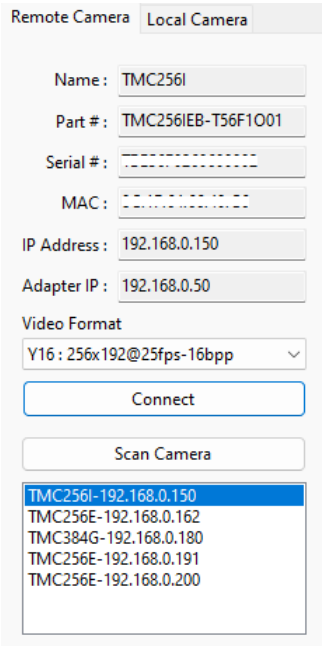


Figure 34. Remote Camera

The **Scan Camera** button allows you to search for connectable camera devices via ethernet network by manually and displays them in the list below. When you select a device from the search list, the details of that device are displayed above the Connect button, as shown below.

- Name: Device name
- Part #: Product identification number
- Serial #: Product production number
- MAC Address: Unique identifier assigned to a network interface
- IP Address: IP address assigned to the device
- Adapter IP: Local network adapter IP address to which the device is connected
- Video Format: Video formats supported by the device

The **Connect** button allows you to initiate a connection with the selected device and play the video after a few moments. The Local Camera connection is disabled at that time.

The **Disconnect** button allows you to stop the video and disconnect from the device.

3.3. Local Camera

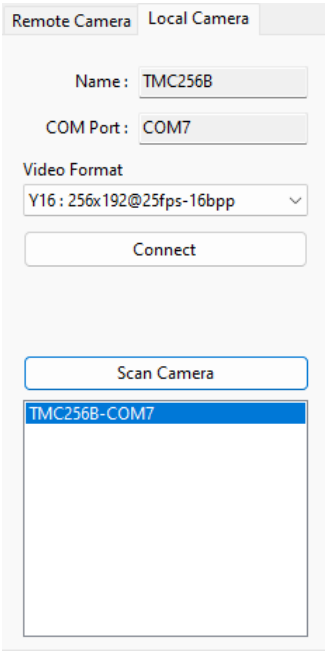


Figure 35. Local Camera

The **Scan Camera** button allows you to search for connectable camera devices via USB by manually and displays them in the list below. When you select a device from the search list, the details of that device are displayed above the Connect button, as shown below.

- Name: Product name
- COM Port: Port name of serial communication interface

The **Connect** button allows you to initiate a connection with the selected device and play the video after a few moments. The Remote Camera connection is disabled at that time.

The **Disconnect** button allows you to stop the video and disconnect from the device.

3.4. Video Playback & Temperature Information

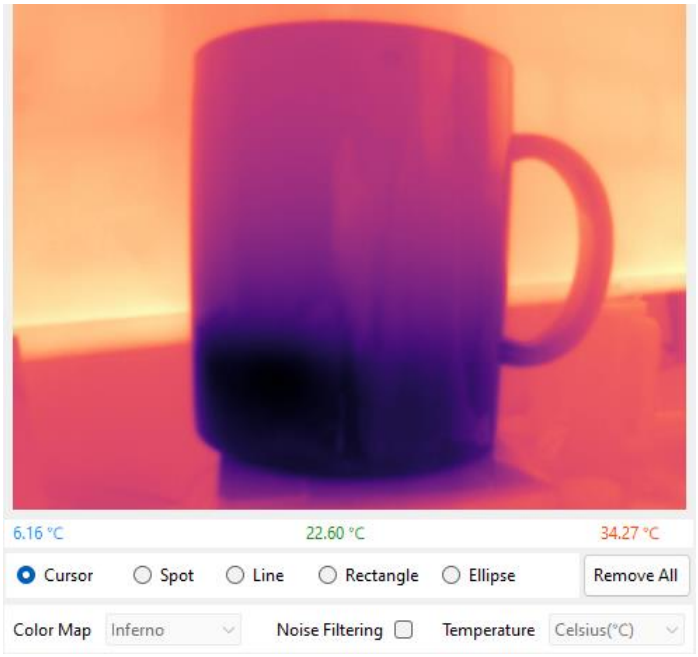


Figure 36. Video Playback & Temperature Information

Once the connection with the device is established, the camera transmits the image frame information captured in real time in raw data format. The TmSDK on the PC converts the received raw data into video images by the Thermoeye protocol and displays them. The color sense of the video is controlled by the **Color Map** menu at the bottom left, where you can select one of the following: Grayscale / Autumn / Bone / Jet / Winter / Rainbow / Ocean / Summer / Spring / Cool / Hsv / Pink / Hot / Parula / Magma / Inferno / Plasma / Viridis / Cividis / Twilight / TwilightShifted / Turbo / DeepGreen.

Below the video image displays the highest / average / lowest temperatures within the image frame. The temperature unit can be selected from Raw / Celsius (℃) / Fahrenheit (℉) / Kelvin (K) through the **Temperature** menu on the bottom right.

The **Noise Filtering** check box allows you to improve the image quality of the playback video.

You can also set an ROI within the video to show the highest/average/lowest temperatures. You can set multiple regions by selecting different ROI types: Spot / Line / Rectangle / Ellipse. You can remove all ROIs with the **Remove All** button. Detailed ROI list management can be done in the Region of Interests tab of the bottom Thermal Sensor Control and ROI List Management panel.

3.5. Product Information

The **Get** button allows you to check the product information of the connecting device.

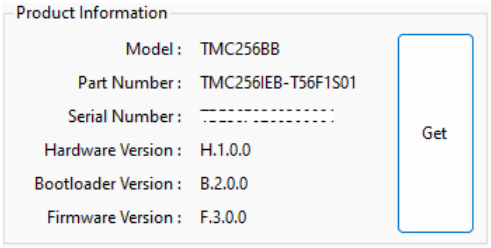


Figure 37. Product Information

- Model: Model name
- Part Number: Product identification number
- Serial Number: Product production number
- Hardware / Bootloader / Firmware Version: Hardware and software version information

3.6. Sensor Information

The **Get** button allows you to check the thermal sensor information of the connecting device.

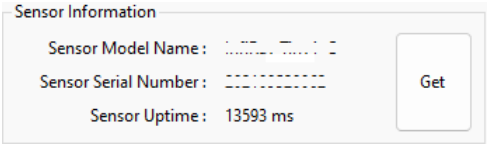


Figure 38. Sensor Information

- Sensor Model Name: Sensor model name
- Sensor Serial Number: Sensor unique number
- Sensor Uptime: 센서의 Sensor operating time

3.7. Software Update

The **Browse** button allows you to select a firmware binary file for device to update.

It will then display the version information contained in the firmware binary, and if the file is updateable for the connecting device, the **Start** button will be enabled and pressing it will start the download to the device.

After a while, the device will automatically restart when the download is complete, and the LED will turn on again when normal operation is complete after update.

Then restart the TmSDK GUI to verify that the device can connect, and check new version information on Product Information.

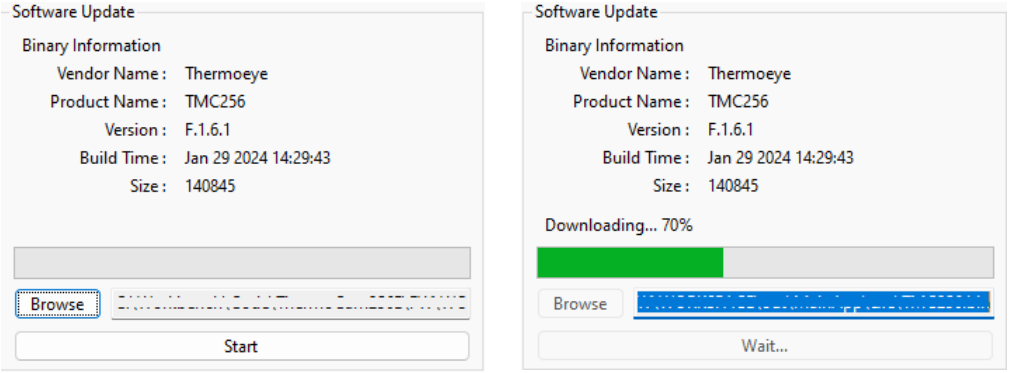


Figure 39. Software Update

3.8. Network Configuration

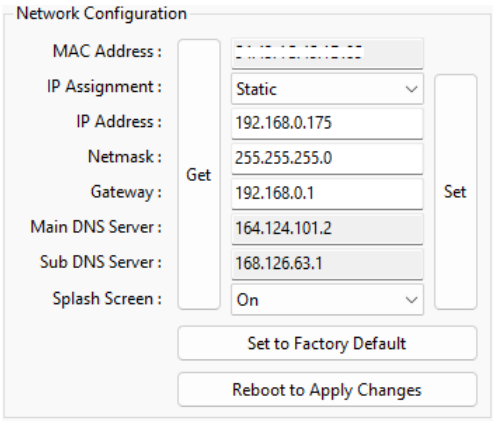


Figure 40. Network Configuration

The **Get** button allows you to check the network information set up on device.

The **Set** button allows you to store the configuration you want to change. Then, you need to restart the device by pressing the **Reboot to Apply Changes** button to operate with the new configuration.

The **Set to Factory Default** button allows you to restore the network information to factory default configuration. Then, you need to restart the device by pressing the **Reboot to Apply Changes** button to operate with the new configuration.

- MAC Address: Unique identifier assigned to a network interface
- IP Assignment: IP assignment method (Static / DHCP)
- Netmask : Subnet mask address
- Gateway: Gateway address
- Main DNS Server: Main DNS server address
- Sub DNS Server: Sub DNS server address
- Splash Screen: Logo image displayed when the device is initially connected

Each address can only support IPv4 format.

When changing configuration, you should contact your network administrator or Internet service provider for additional considerations, such as unique IP bands, the presence of a DHCP server, firewalls, and port forwarding, depending on your network system configuration and

protocols.

3.9. Region of Interests

You can view the list of set ROIs in the Video Playback and Temperature Information panel and add / remove them.

ROI List enumerates the list of set ROIs and the **Remove** button allows you to delete the selected ROI.

You can select a desired ROI from Spot / Line / Rectangle / Ellipse and enter arbitrary coordinates, and press the **Add** button. Then added ROI will be displayed on the video image and added it to the ROI List.

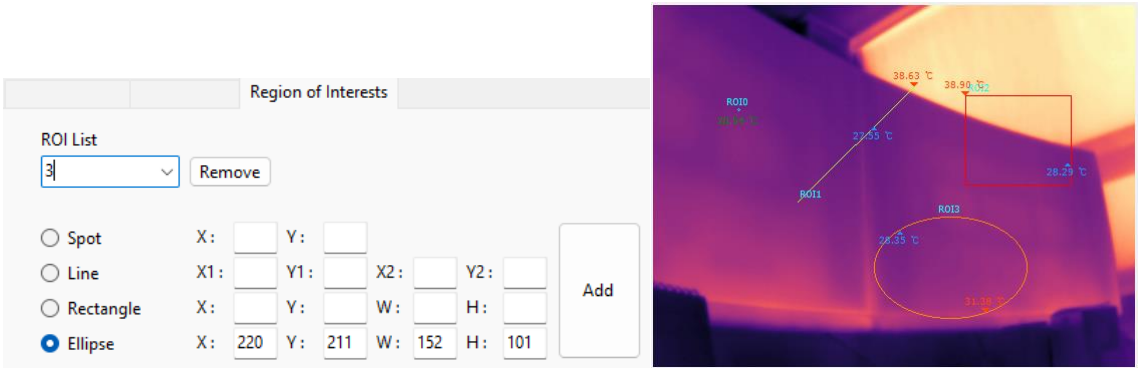


Figure 41. Region of Interests

3.10. Sensor Control

Thermal sensor control feature is available separately by product specification.

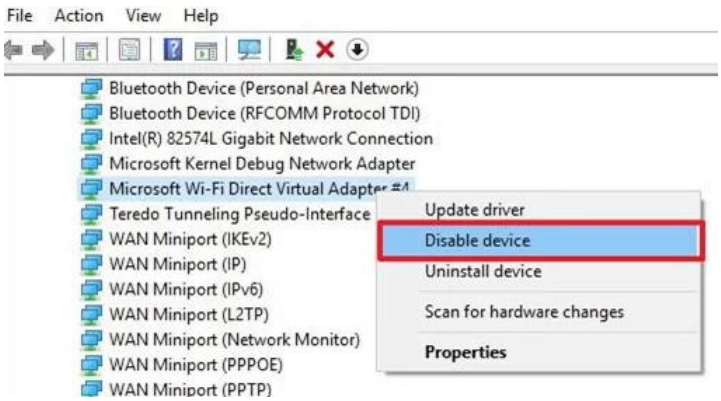
Please contact the Thermoeye for more information.

4. Troubleshooting

Please refer to this if you encounter any problems during product installation or SDK development.

4.1. Scan Camera is not working on Remote Camera

If you execute Scan Camera to find a Remote Camera connected to PoE on a PC equipped with Wi-Fi wireless adapter, but you cannot find any device, please set all of **Microsoft Wi-Fi Direct Virtual Adapter** devices to **Disable device** on the network adapter in the PC's Device Manager as follows.



5. Support

Thermoeye Inc. operates service channels to keep your camera running at all times. If you discover a problem with your camera, please get in touch with us for technical support.

- ✓ Website: www.thermoeye.co.kr
- ✓ E-mail: help@thermoeye.co.kr
- ✓ Tel: +82-70-4489-6196
- ✓ Head Office: 307, Research Building 3, 70, Yuseong-daero 1689 beon-gil, Yuseong-gu, Daejeon, Republic of Korea
- ✓ Seoul R&D: 4~5F, 169 Sadang-ro, Dongjak-gu, Seoul, Republic of Korea

Please visit the Thermoeye Github to download detailed product manuals and SDK for application development.

- ✓ https://github.com/thermotye/tmsdk

6. Glossary

Term	Difinition
CDC ACM	USB Communication Device Class - Abstract Control Model
COM port	USB serial COMmunication port
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
FOV	Field Of View
IP	Internet Protocol
LED	Light-Emitting Diode
MAC	Media Access Control
NEDT	Noise Equivalent Differential Temperature
NETD	Noise Equivalent Temperature Difference
PoE	Power over Ethernet
ROI	Region Of Interest
RTSP	Real-Time Streaming Protocol
RTP	Real-time Transport Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
USB	Universal Serial Bus
USB-HS	USB High Speed
UVC	USB Video device Class
VOx	Vanadium Oxide