Thermoeye Inc.

THERMOEYE

# TMC256

User Manual

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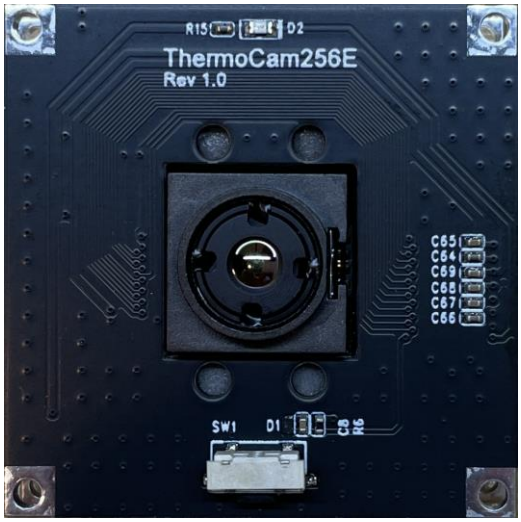
Revision

| Version | Date | Contents |
|---|---|---|
| 0.1 | SEP.12.2023 | Draft |
| 1.0 | OCT.12.2023 | 1st Release |
| 1.1 | OCT.17.2023 | Modified Camera, Frame, CameraInfo Class<br>Added Troubleshooting |
| 1.2 | OCT.31.2023 | Added Product Specifications |
| 1.3 | NOV.06.2023 | Split ThermoCamSDK C# API into a separate document |
| 1.4 | NOV.30.2023 | Added ROI List, Add, Remove, Remove All |
| 1.5 | JAN.08.2024 | Fix typos |
| 1.6 | JAN.18.2024 | Modified product name<br>Modified product specification<br>Added Noise Filtering |
| 1.7 | MAR.07.2024 | Modified Software Update<br>Added Turbo / DeepGreen Color Map |
| 1.8 | JUN.03.2024 | Added display for Network Adapter IP |

# Chapter

# 1. Hardware

## 1.1. Top Layout




## 1.2. Bottom Layout

## 2. Product Specification

| Model | | TMC256B | TMC256E |
|---|---|---|---|
| Sensor | | Uncooled VOx Microbolometer | |
| Spectral Range | | 8㎛ ~ 14㎛ | |
| Resolution | | 256 X 192 | |
| Pixel Pitch | | 12㎛ | |
| NETD | | ≤50mK @25℃, F# 1.0, 25Hz | |
| Frame Rate | | 25Hz | |
| FOV | | 56 ° x 42 ° | |
| Measure Range | High Gain | -15℃ ~ 150℃ | |
| | Low Gain | 50℃ ~ 550℃ | |
| Accuracy | High Gain | ±2℃ or ±2% | |
| | Low Gain | ±5℃ or ±5% | |
| Interface | | USB-HS | Ethernet |
| Protocol | | UVC, CDC ACM | TCP, UDP, RTSP, RTP |
| Operating Temperature | | -10℃ ~ 80℃ | |
| Power | | USB DC5V | PoE(802.3af) DC12V |
| Size | | 38mm x 38mm | |

# 3. Installation

Connect the camera device to a Windows PC via Ethernet or USB cable and check the connection status with the ThermoCamSDK.

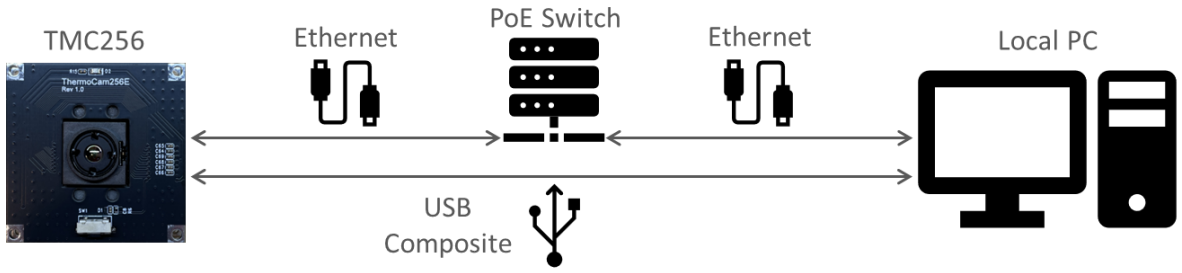
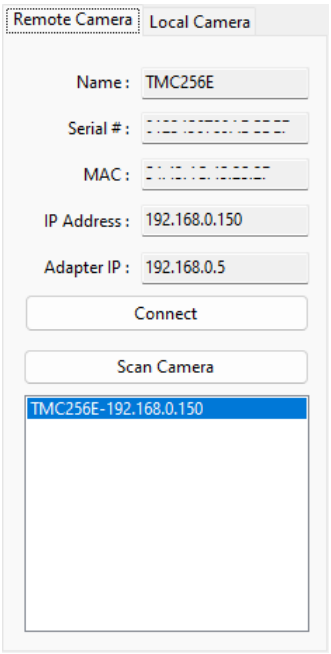



**Figure 1. System Configuration Diagram**

## 2.1. Ethernet

Connect the camera device and a network switch that supports PoE(Power of Ethernet) with an RJ-45 Ethernet cable. And the LED will turn on when it boots up normally.

When you run the ThermoCamSDK on a PC connected to the network, you can find connectable camera devices on the network and view the device list and product information on the **Remote Camera** tab, as shown below.




The default network settings for your device are:

- IP Assignment: Static
- IP Address: 192.168.0.150
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.0.1
- Main DNS Server: 164.124.101.2
- Sub DNS Server: 168.126.63.1
- Protocol and Port:
UDP (15000), RTSP/TCP (554), RTP/UDP (50000-51000)

Network settings can be changed on the **Network** tab after connecting with the camera device.

**Figure 2. Ethernet Connection**

## 2.2. USB

Connect the camera device and a PC with an USB cable. And the LED will turn on when it boots up normally.

When you run the ThermoCamSDK on your PC, you can find connectable camera devices and view the device list and product information in the **Local Camera** tab, as shown below.

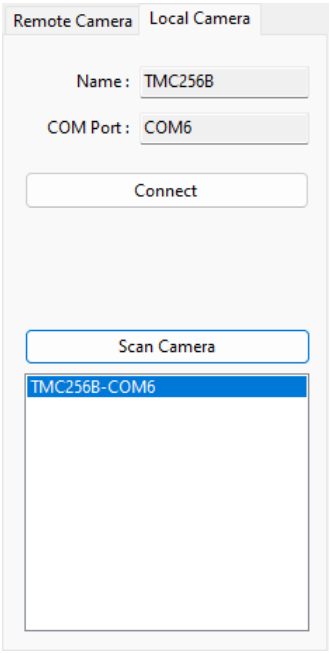


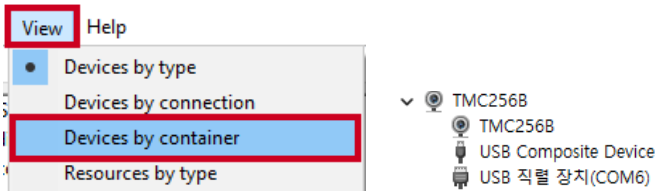

**Figure 3. USB Connection**

You can also view the connection information in the Windows Device Manager.

USB connection is possible using the product name and COM port number of the camera device.

The COM port number might change each time you connect the camera device with a USB cable.

If you change the display to "View ⇨ Devices by container" from the menu in Device Manager, you can see the USB camera product name and COM port number included with the camera device at a once.




## 2.3. Factory Reset

If the product malfunction occurs due to incorrect settings, you can perform a factory reset using the button on the side of the device.

If you press and hold the button for more than 15 seconds, the LED will blink rapidly to indicate the start of the factory reset. If you release the button at this time, the factory reset will proceed with a restart.

## 2.4. LED indication for each camera operation status

| Indication | Operation | Status |
|---|---|---|
| ● | On | Idle after a normal boot |
| ○○●○●○○ | Repeat 2 short blinks during bootup | Unable to boot due to abnormal firmware |
| ○○●○●○●○○ | Repeat 3 short blinks during bootup | A problem with the camera sensor |
| ●○○●○○●○○ | Blinking every 1 seconds during video playback | Playing a live video |
| ●○●○●○●○● | Fast blinking when the reset button is pressed for more than 15 seconds | When you release the button you were holding, the factory reset will begin. |

**Table 1. LED Indication**

# 3. ThermoCamSDK GUI

User can view the video playback and temperature values from camera device, and it provides the UI needed to inquire and set information.

## 3.1. Screen Layout

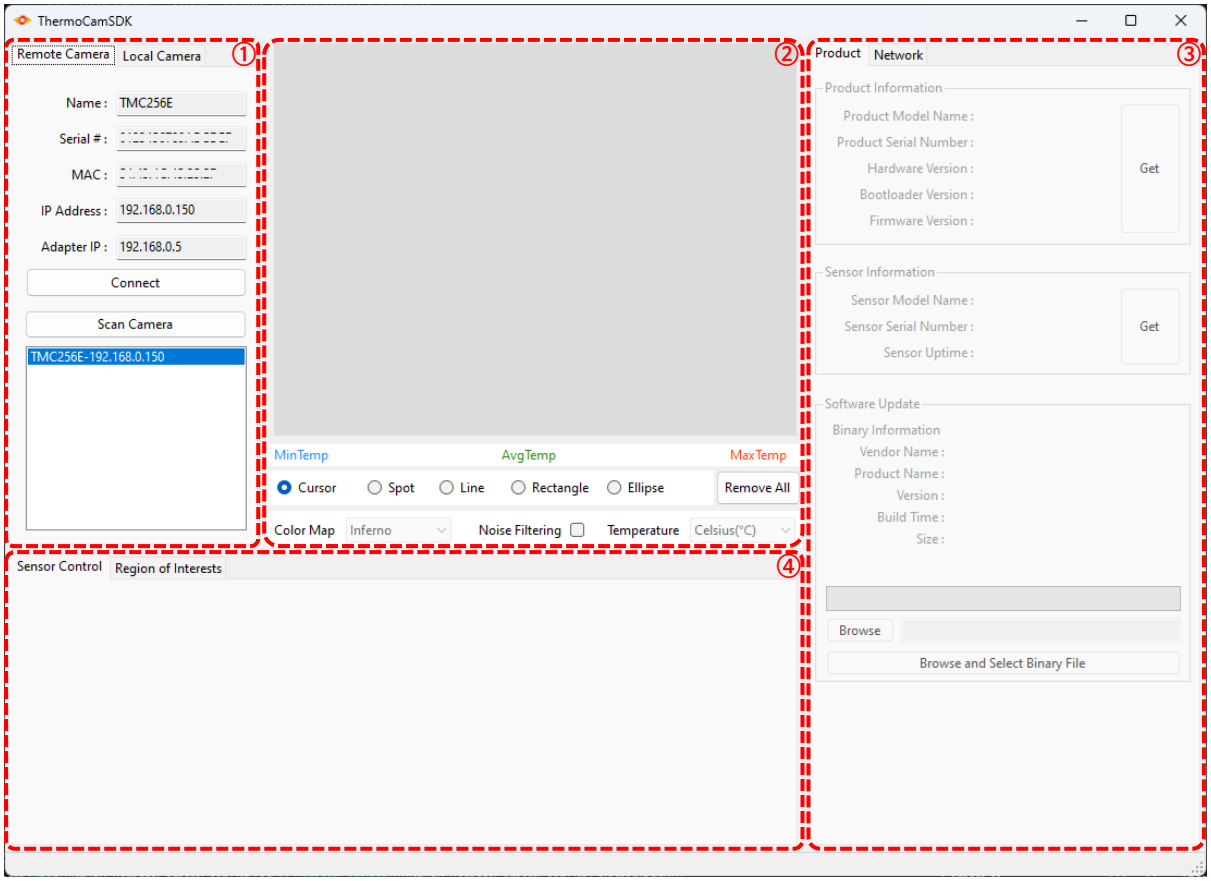



**Figure 4. Screen Layout**

① Scan Camera Devices & Connection Panel

Get connectable device information via Remote Camera (Ethernet Network) / Local Camera (USB), Connection

② Video Playback & Temperature Information Panel

Play live streaming video, Display the highest / average / lowest raw data values & temperatures within an image frame, Add / Remove ROIs, Color Map, Enhance image quality, Change temperature units

③ Inquiry Product Information & Setting Panel

View camera product and thermal sensor information, Software update, Inquire / Set ethernet network information

④ Thermal Sensor Control & ROI Lists Management Panel

Control thermal sensor specific features, Add / Remove ROIs

## 3.2. Remote Camera

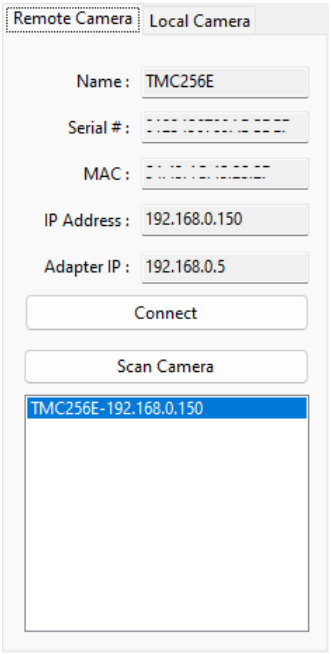



**Figure 5. Remote Camera**

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: Product name
- Serial Number: Product unique 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

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

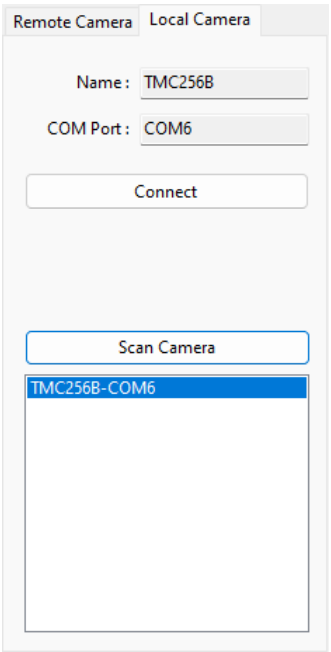



**Figure 6. Local Camera**

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

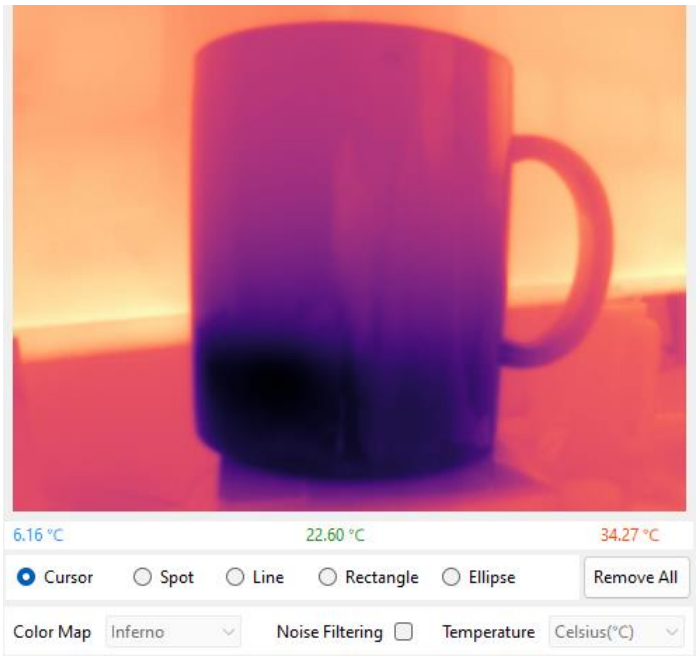



**Figure 7. Video Playback & Temperature Information**

Once the connection with the device is established, the camera transmits the image frame information captured in real time in raw data format. The ThermoCamSDK 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.

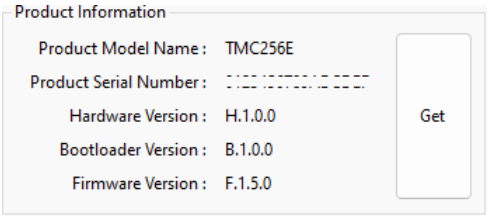



Figure 8. Product Information

- Product Model Name: Product model name
- Product Serial Number: Product unique 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.

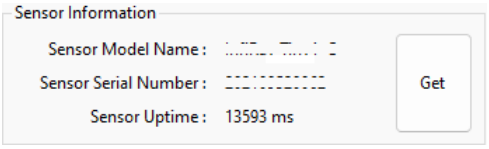



Figure 9. Sensor Information

- Sensor Model Name: Sensor model name
- Sensor Serial Number: Sensor unique number
- Sensor Uptime: 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 ThermoCamSDK to verify that the device can connect, and check new version information on Product Information.

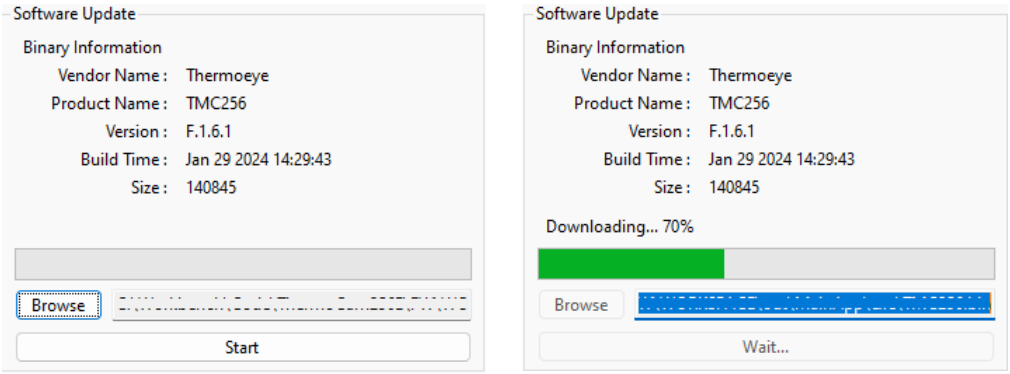



Figure 10. Software Update

## 3.8. 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.

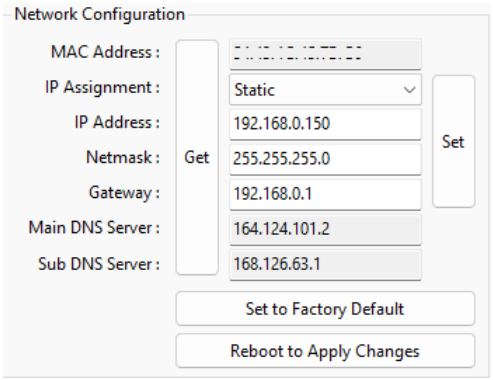



**Figure 11. Network Configuration**

- 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

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.

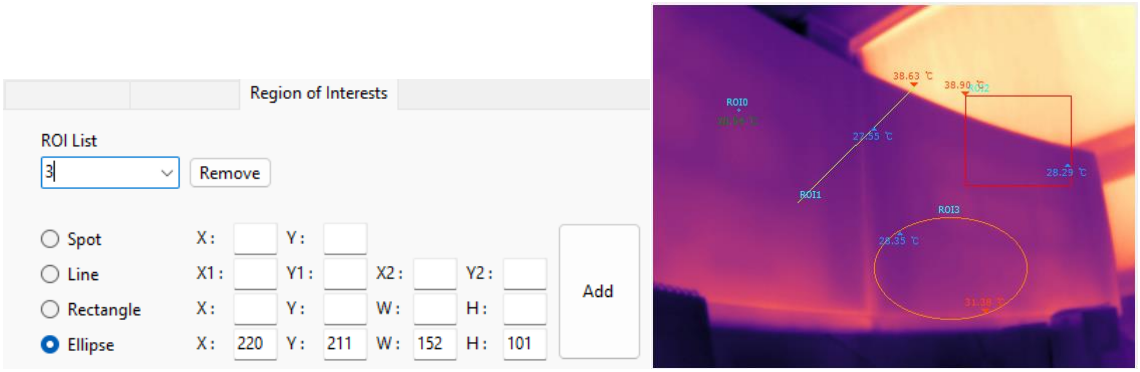



**Figure 12. Region of Interests**

## 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.