OZM-0684-10

Dual-cam 3D FR Module Specification

Rev2.0 July 14, 2022

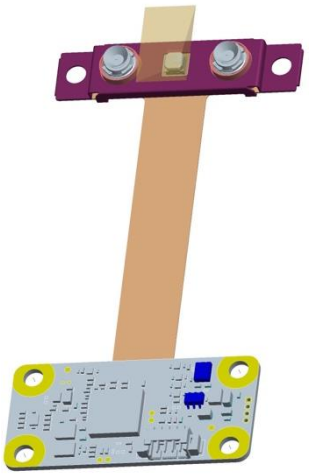
Description of revision	Date	Revision
Release	Apr, 2022	Rev1.0
	July 14, 2022	Rev2.0

Table of Content

1. Product Introduction

The 3D facial recognition module is based on AI chip platform with low power consumption, low cost and high security. With the help of powerful AI performance and fast response speed of RTOS, the module can complete facial recognition and unlock within 1.2s since cold start.

Leveraging powerful performance of AI chip, this module makes full use of the infrared human face information and wider spectral information of visible light, for face recognition, face comparison and liveness detection. And at the same time through the parallax of feature points, the dual-camera calculate the depth information of the human face. Finally fusion algorithm match all information with original data. Only after all the information is matched successfully, can the authentication pass. The false rate is only under 1:100000. The module not only can well adapt to indoor and outdoor lighting environment, but also can effectively prevent attacks from a variety of materials of photos, videos and 3D masks.



Applications:

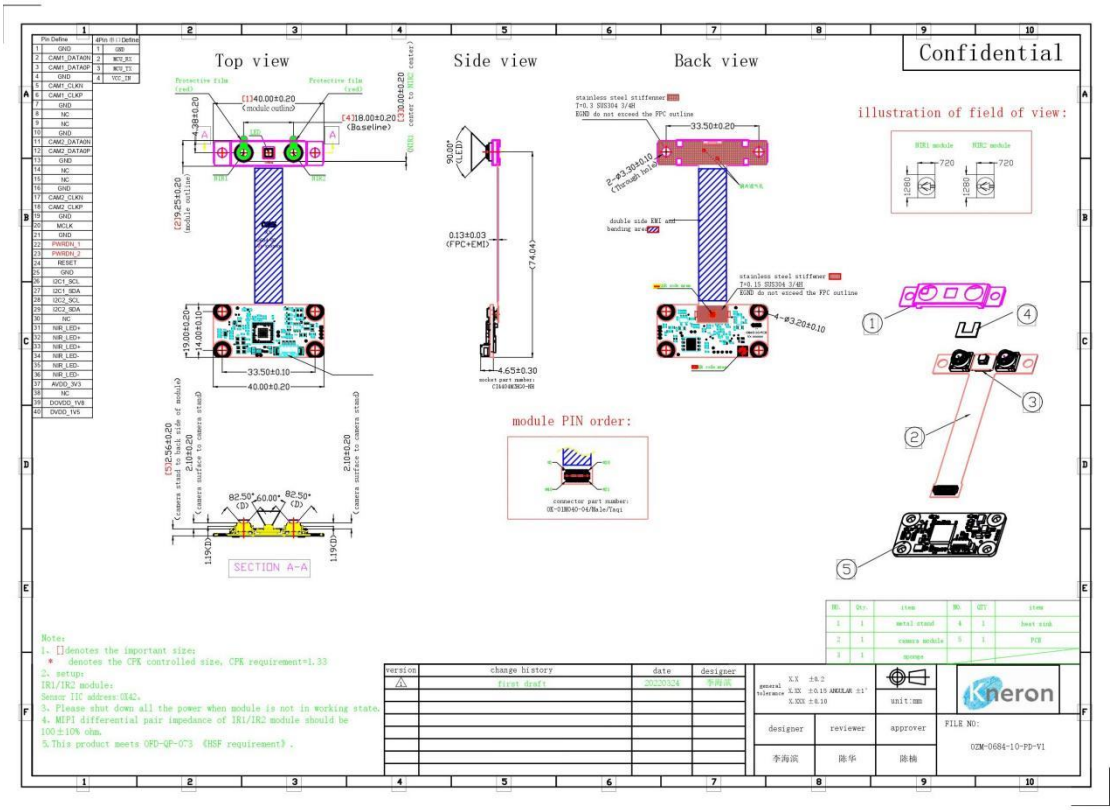
Smart lock

Access control

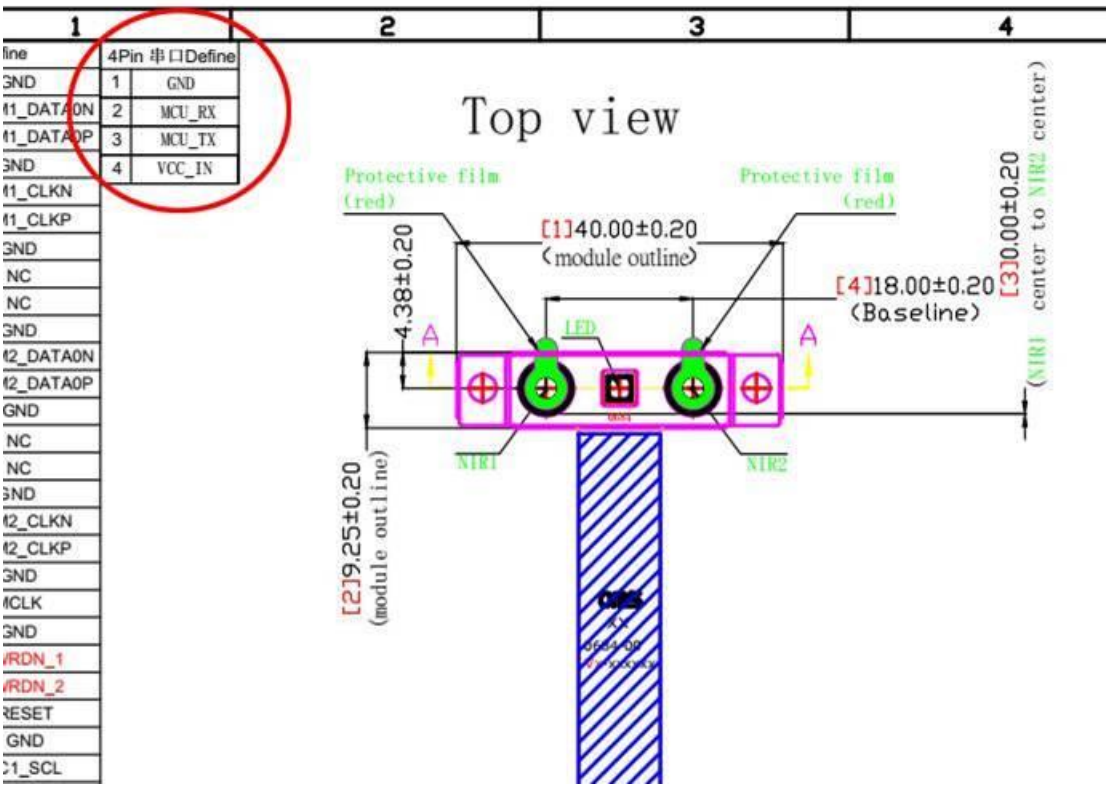
Facial recognition terminal

2. Product Composition

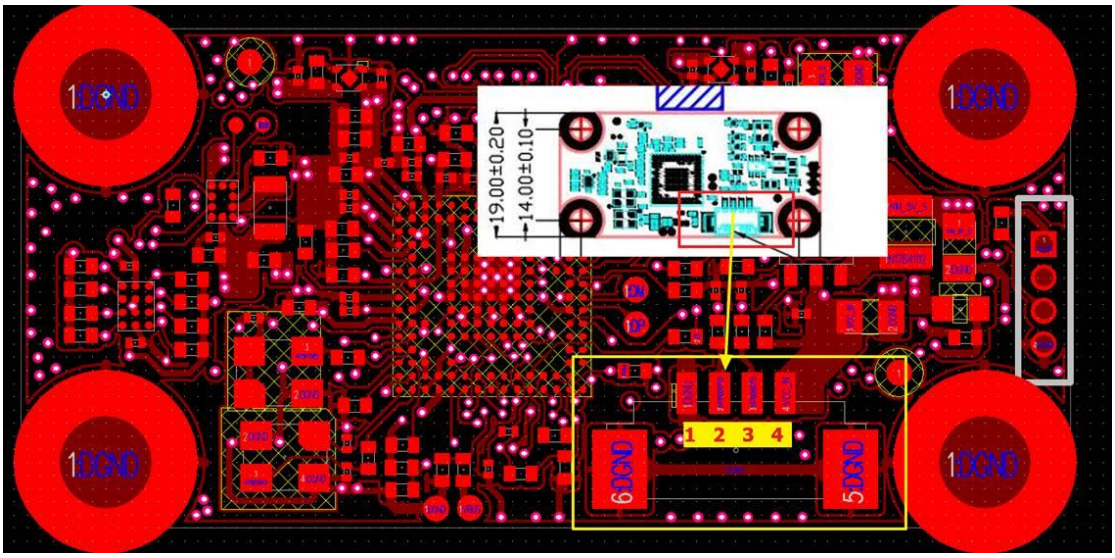
2.1 Module Structure



UART pin define:



Pin1 of UART pins:

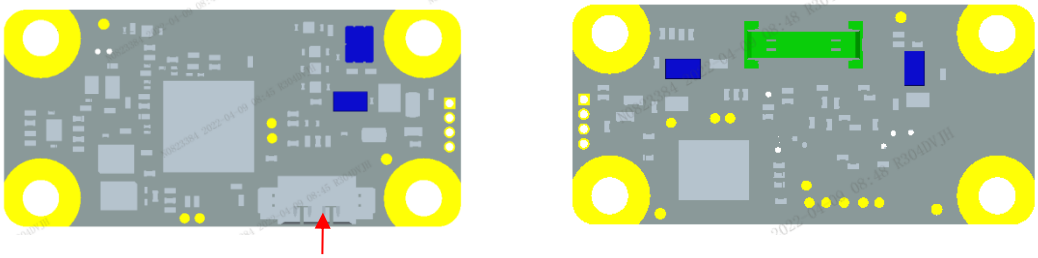


2.2 Key Components

Name	Key components	
PCB	Flash	**256Mb**
	Driver	1A，IIC
	LDO/DCDC	4 Channel/2A
		300mA /3.3V
	Level conversion chip	4Bit-Open Drain
Camera	NIR1 camera	Resolution 1280*720
		DFOV 82.5°* H74.5°* V46.3°
	NIR2 camera	Resolution 1280*720
		DFOV 82.5°* H74.5°* V46.3°
	Light source	850nm@1.5W

3. Product Dimensions

3.1 Board appearance

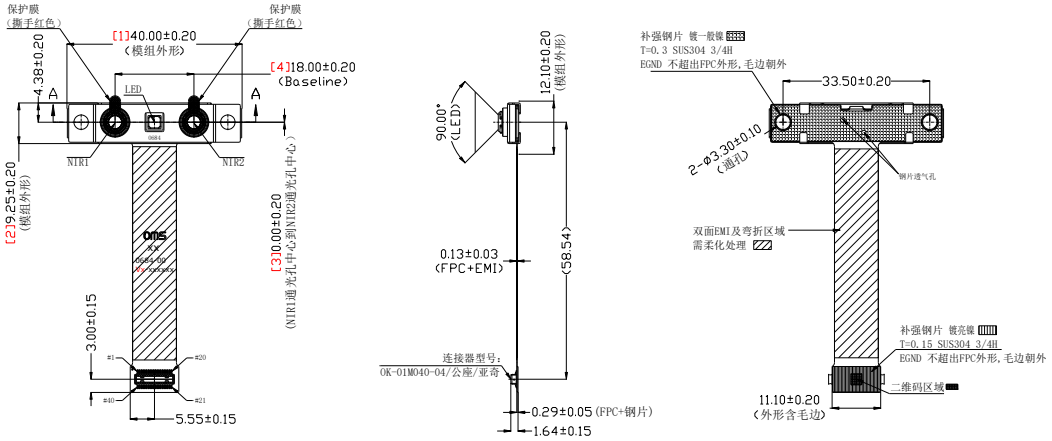


3.2 Board dimensions

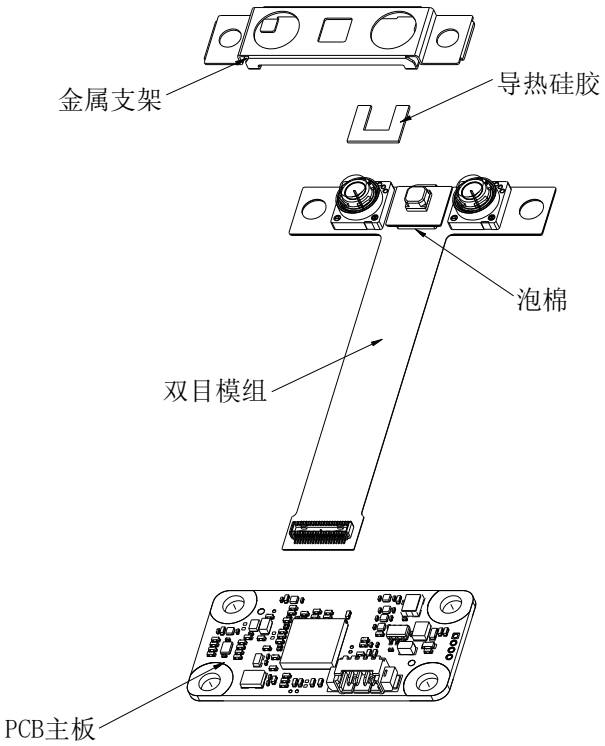
Length*width: 40*19mm

3.3 Camera dimensions

Top view　　Side view　　Back view



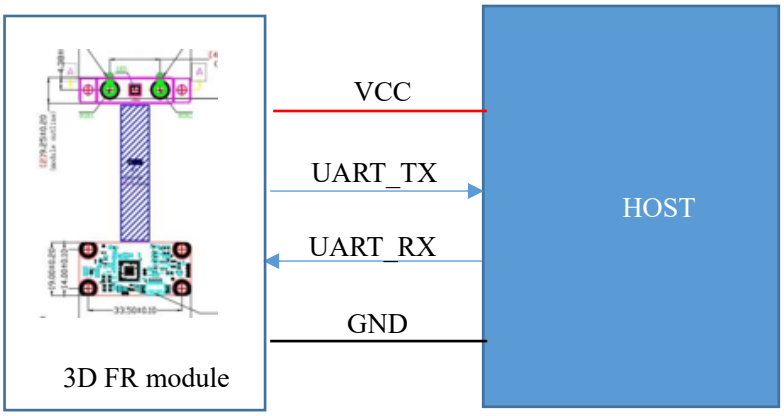
3.4 Module structure decomposition


金属支架
导热硅胶
泡棉
双目模组
PCB主板

4. Product parameters

Item	Description
CPU	Cotex-M4@200MHZ (system control)
Cotex-M4@250MHZ (AI co-processor)	
NPU	Max 300MHZ
SRAM	512KB
DRAM	32MB/64MB
Communication Interface	UART
Input Power	4.5~10V@2A
Max enrolled faces	100
Distance of recognition	0.4~0.9m（optimal 0.5m）
Height of recognition	1.2~2.1m
Time of recognition	≤1.2S
Liveness detection rate	>99%
Facial recognition rate	＞99.9%@FAR＜0.0001%
Remote enrollment	YES
Average power consumption	<700mW
Work temperature	-25℃ ~ 60℃
Storage temperature	-40℃ ~ 85℃

5. Interfaces and PIN definitions



The interface between the module and the main control is defined in above figure, which is plug-plug mode. Two of the four lines are power supply lines, and the lock control is responsible for the power supply. The power supply voltage range is 4.5-10 v, the peak power supply current is 600mA @ 5V and the sleep mode power consumption is 12 uA@5-10V. The other two are UART communication lines, which are connected to the module's UART communication interface. Interface schematic diagram is shown in chapter 2.

5.1. Error handling

The UART of the module can send out heartbeat commands once every one second. If the module does not work for unknown reasons (interference, ESD, etc.), the user can simply let the module's input power VCC, PIN pin 1, power down for a period of time and then power up again, it should be noted that this means that the VCC provided by the user can be controlled.

5.2. PIR sensor.

If the user's project has more stringent power consumption requirements, the PIR sensor can be connected to the user's main control (mcu or others), which is a "proximity sensing" sensor that will send a trigger signal to the main control when it detects a person approaching. Then main control will power on the face module to do face recognition or registration. After the face module

is finished, the face module will be powered down again. This can reduce the standby power consumption of the face module.

6. Mechanic considerations

This chapter describes the mechanic considerations of the 2D FR module.

6.1 Angle of camera module

In order to be able to include specific human heights, please refer to bellow picture, a lock angle need to be specified. To make the calculation evaluation easier, we provide a calculator. Please refer to appendix a.

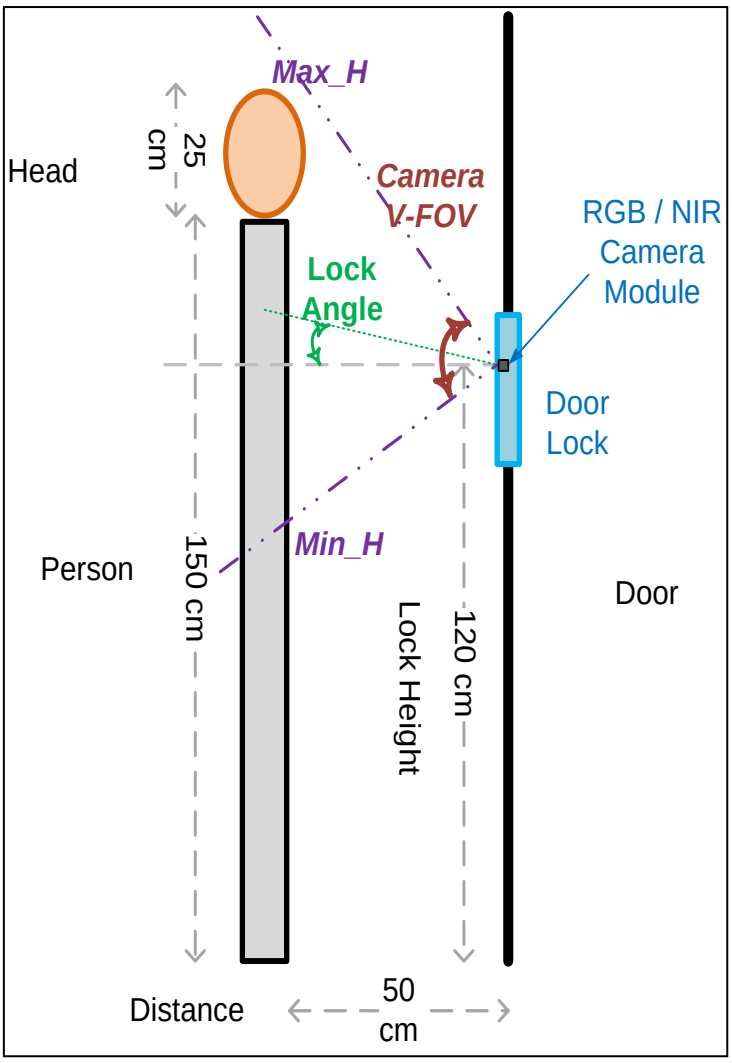


Figure- Lock angle need to be specified to fit certain human height.

Users only need to input the

1. Distance between human and door lock (default=50cm)
2. Lock Height (default=120cm)

3. Lock angle (default =25 degree)
4. V-FOV (vertical field of view) of two cameras (for LW3D module, V-FOV=64.4 and 61.28 degree)

In the calculator. It will output the supported human height. (by using these default values, the supported height is 115~193cm)

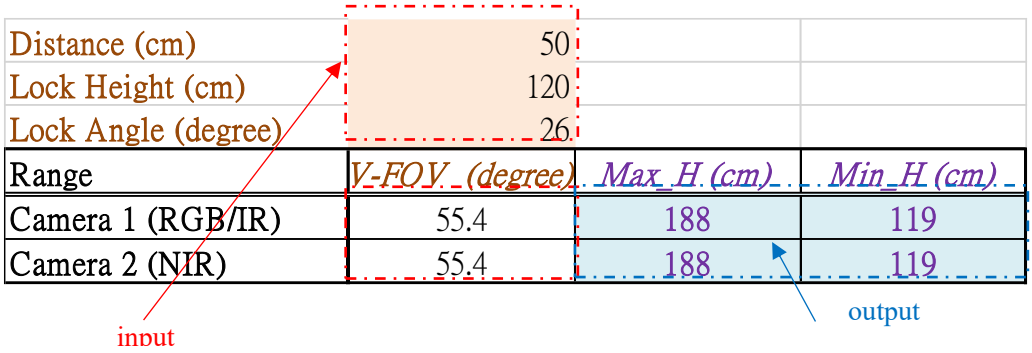


Figure- calculator inputs and outputs

6.2 Cover lens on top of LED and camera

There normally have two types of cover lens, PMMA and glass. Transmittance is the key. Please ensure that the light transmission is over 90% in the corresponding wavelength band, e.g. 850nm, 940nm and the visible band.

Scratch protection on the cover lens also need to be considered.

6.3 The opening window of LED

The opening window of LED need to be considered carefully. If this window too small, we will see a noisy, blurry and ringing artifacts after adding smart lock housing.

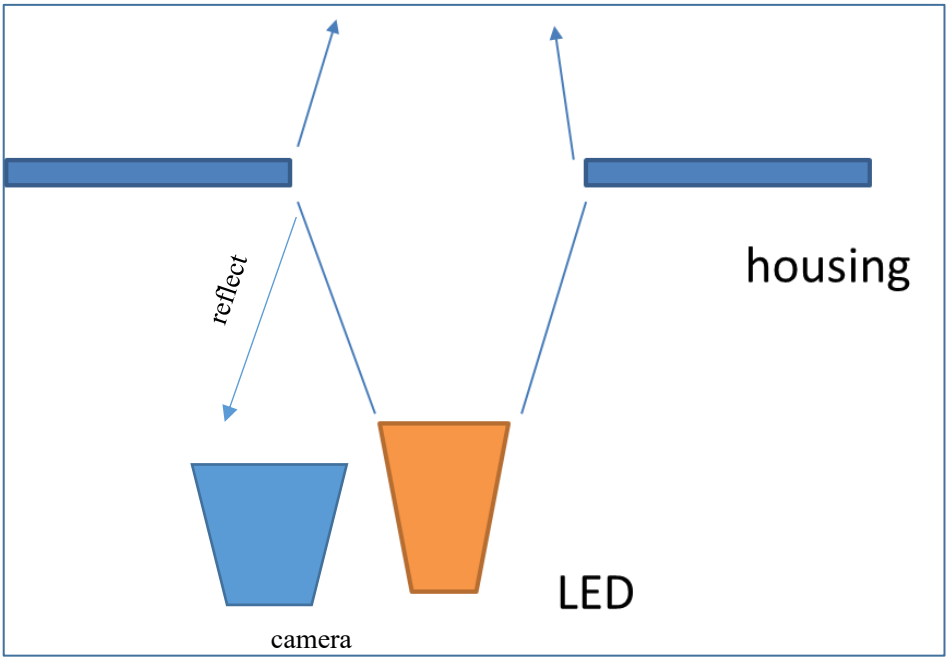


Figure – small opening would cause refraction of light

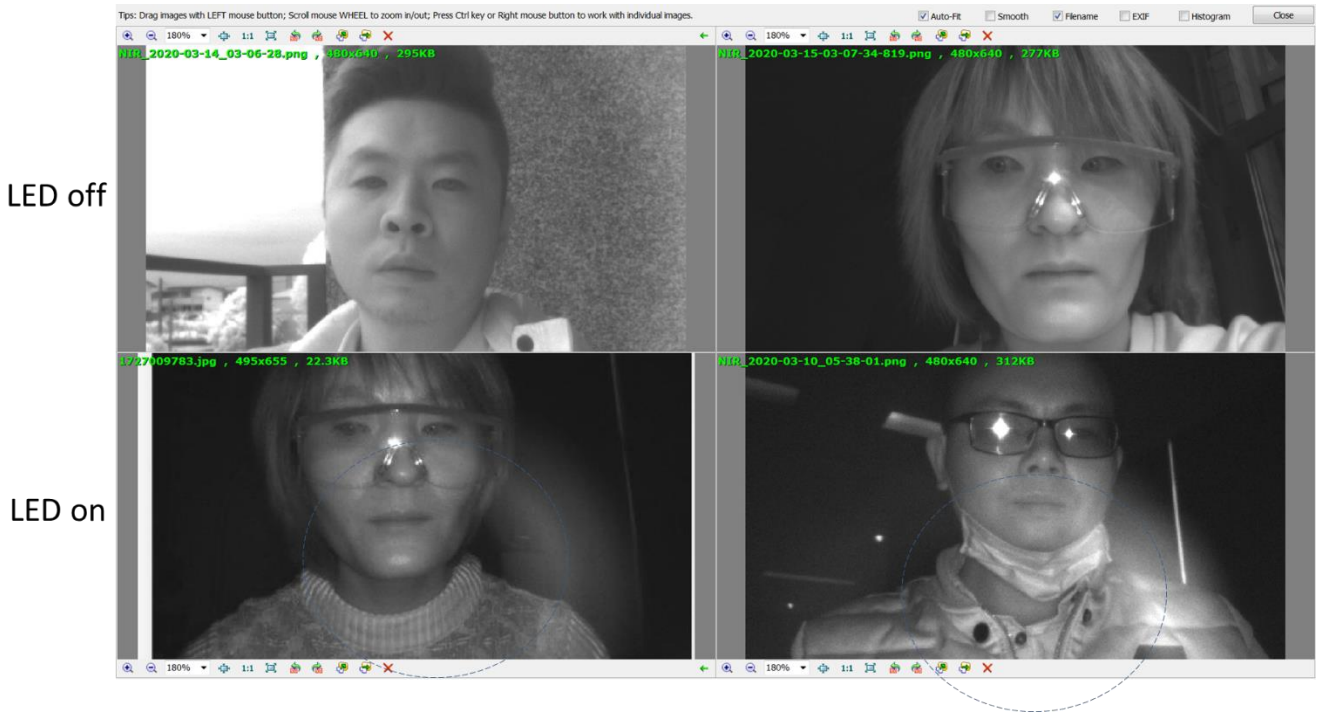


Figure – NIR images, we can see a ring if we turn on the LED

6.4 The opening window of cameras

The opening window of camera also need to be taken good care. A bad camera opening design will cause a bad image we got from camera. Some area will be blocked. Designers need to make sure cover will not block any camera visions.

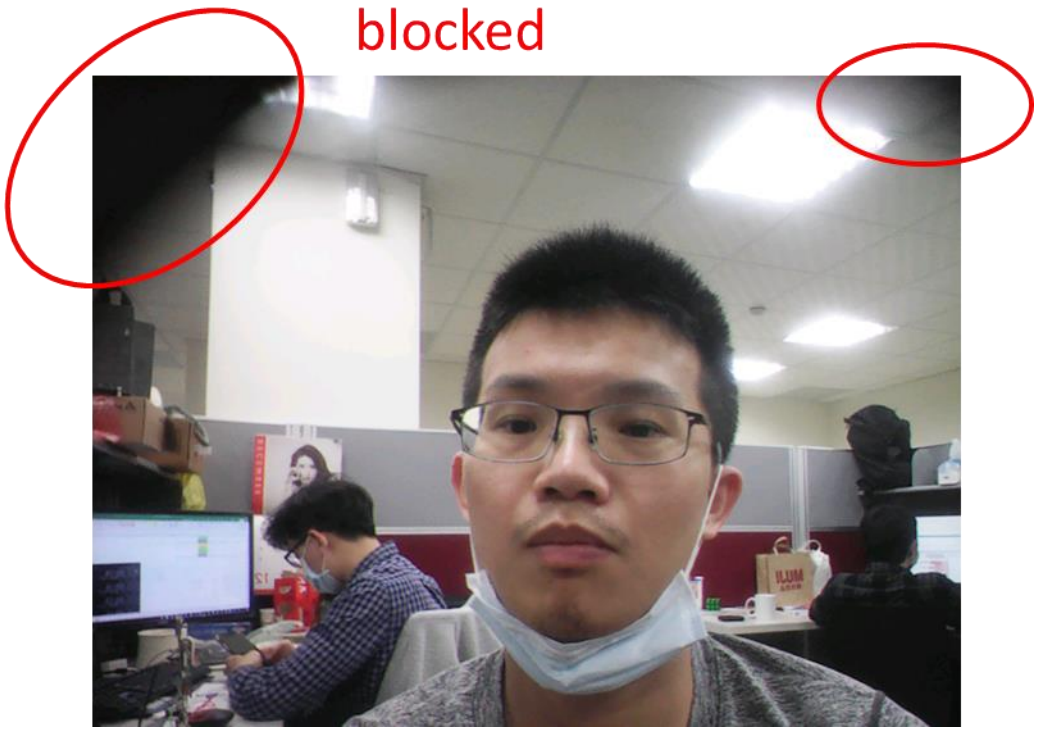


Figure 1 – image corners are blocked.

It is important to double check images from camera when engineers finish the mechanic parts assembly.

6.5 Distance between camera module and housing/cover lens

Similar to what we described in chapter3.2 and 3.3, we want the cover to not reflect light from the LEDs and not block the view of the camera. We would like the distance between the cover and the camera to be as small as possible. Please refer to bellow picture:

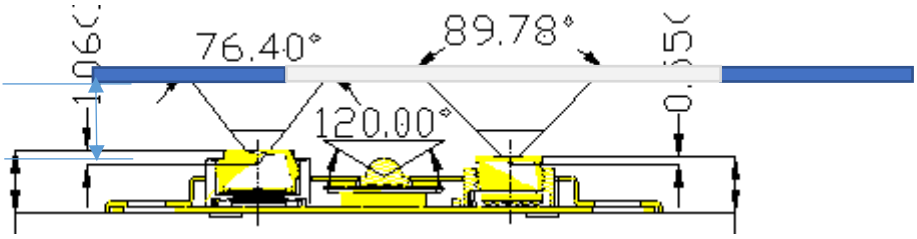
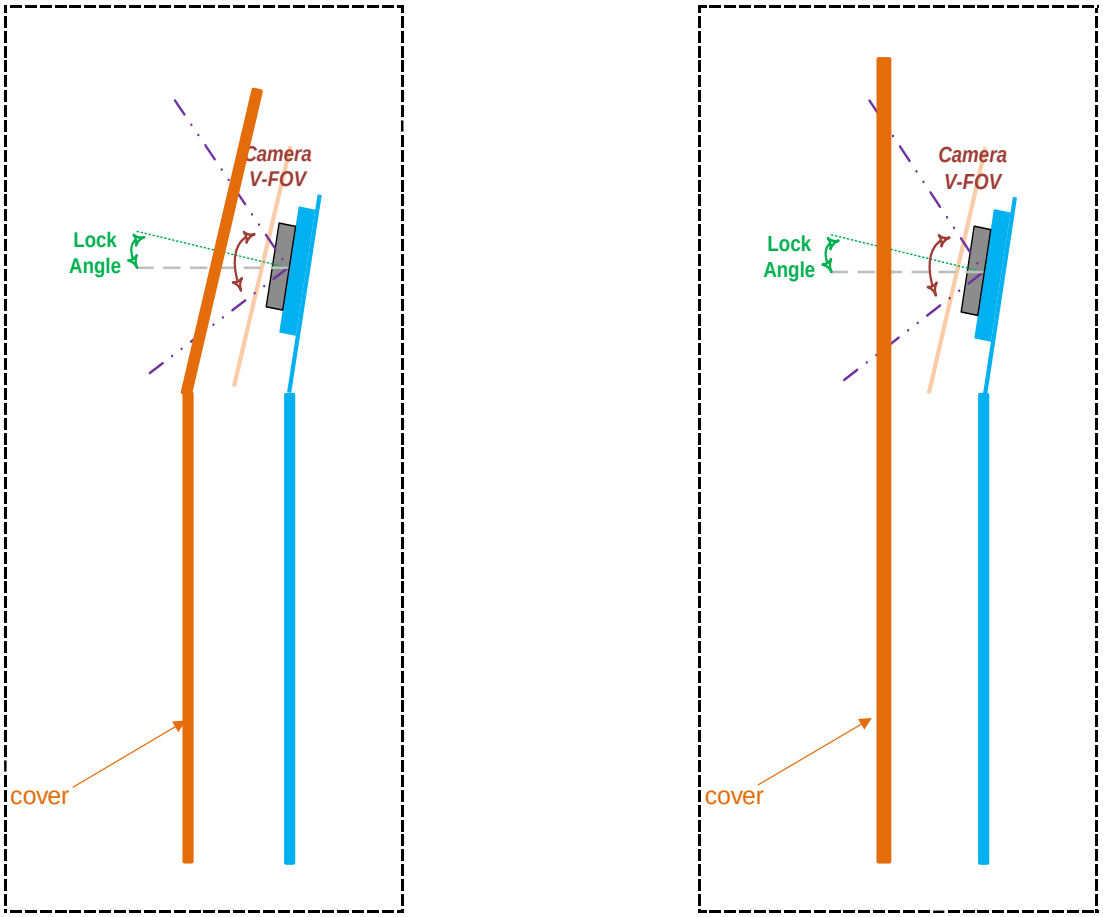


Figure - distance between camera module and cover, A, need to be as small as possible.

We would suggest the distance A should be <=0.5mm

6.5 Flat cover case

For the case that the cover is flat not bended as shown in bellow picture:



Cover is attached on top of camera module

cover is flat and not attach on camera module

Figure - the case on the right side: cover is flat, not bended.

In order to make sure it can fit to the window opening on the cover and no LED interference

on the camera, we would suggest to make a conical shaped light shield. As show in below picture:

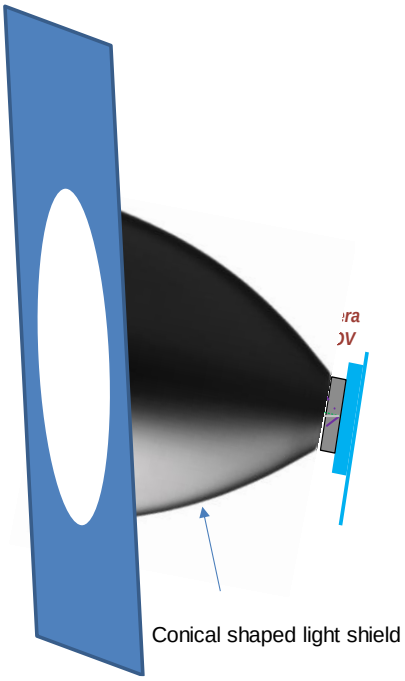
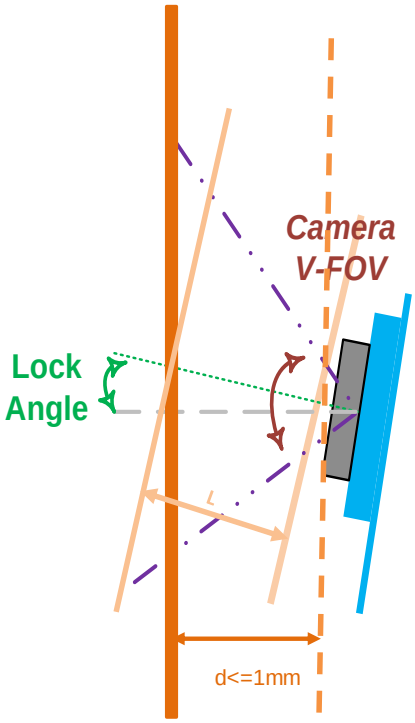


Figure -Conical shaped light shield

We would recommend that the distance between camera and cover (L) should be as small as possible. The vertical distance between cover and camera module should be smaller than 1mm. User can get lock angle from Chapter2.



7. Appendix

a. View_range_calculator.xls

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