I200DK_Product Specification

Rev. 0.2

[USB Type]

Rev.	Date	Change	Author
0.1	2024/04/02	• Initial version	J.A CHOI
0.2	2024/08/06	• Updated 3. General Specification • Updated 10. Multi Camera Sync • Added Appendix A. Application Notes	J.A CHOI

Contents

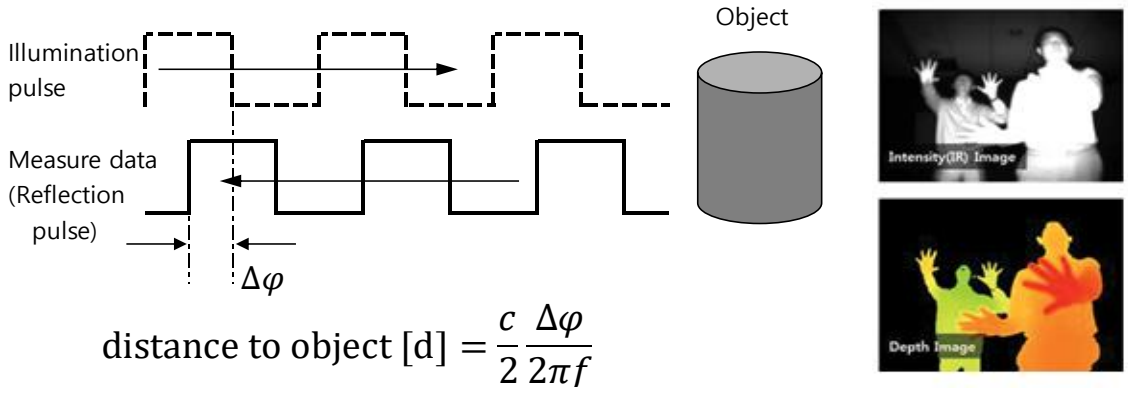
Figures

Tables

1. Introduction

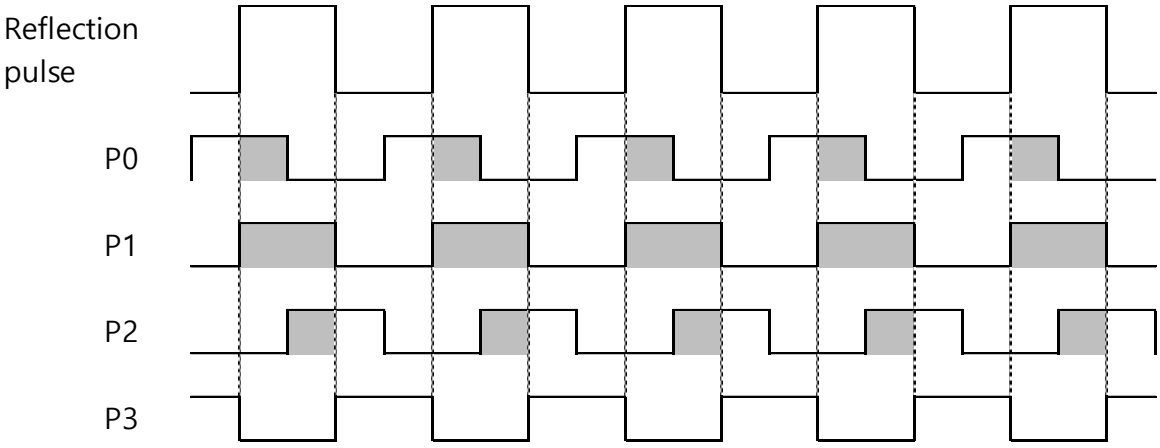
1.1. ToF 3D camera technology overview

3D time-of-flight (ToF) cameras illuminate an object or a scene with a modulated light source and observe the light reflected from the object. This is achieved via a laser diode illuminator and a receiver. The phase shift between the emitted light and reflected light is measured and translated to distance. This camera can measure an object's distance by pixel unit.



$$\text{distance to object [d]} = \frac{c}{2}\frac{\Delta\varphi}{2\pi f}$$

Figure 1. Principles of indirect Time of Flight



A0 is digital value measured at the P0 photogate $\varphi = tan^{-1}(\frac{A_1 - A_3}{A_0 - A_2})$

Figure 2. ToF demodulation using 4-phase sampling

2. Precautions

2.1. Safe Usage Instructions

	CAUTION
	Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

	CAUTION
	Static Sensitive Devices. Not to be handled by unauthorized personnel.

3. General Specification

3.1. Specification

ToF Sensor		
Resolution	VGA(640x480) ※ HVGA(640x240) Twin-ToF-Pixel	
Frame rate	5, 10, 15 fps	
ToF Illumination		
VCSEL	940nm, 4W x 1ea	
ToF module Optics		
FOV (H x V)	90°(H) x 68°(V)	
Measurement Range		
w/o sunlight	~7m @ 15fps	
w sunlight	~3m @ 15fps	
Accuracy (w/o sunlight)		
0.25m ~ 1.0m	< ±1cm	※ Measurement condition - Target : flat screen of >70 % reflectivity - Target area : 7x7 central pixels - Number of data acquisition : 10 frames - Ambient illumination : normal indoor - Ambient temperature : 23 ~ 25℃
1.0m ~ 7.0m	< ±1% by distance	
Data Interface		
USB type	USB 3.0 Type-C	
Power		
Input	DC 5V / 3A	
Power consumption	Average 2.5W	
Environment		
Temperature	Operating Temperature : -5 ~ 55℃ Storage Temperature : -20 ~ 70℃	
Rel. humidity	Operating Rel. Humidity : 5 ~ 95% Storage Rel. Humidity : 5 ~ 95%	
Mechanics		
Dimensions	52.00 x 25.30 x 35.49 (mm)	
Weight	42g	
Software		
Operating System	Windows/Linux/Android/ROS1/ROS2	

Certification	
Conformity	KC, CE, FCC
Laser safety	IEC 60825-1 : 2014 Class 1

Table 1. Information of general specification

4. Features

4.1. Hardware

- VGA 3D iToF Camera
- 940nm, 4W VCSEL
- USB 3.0 Interface
- Multi Camera Sync

4.2. Software

- F/W Update through I2C or USB
- Operating system
  - 64-bit Windows 10 (recommended)
  - Ubuntu 18.04/20.04/22.04
- Package
  - ToF Viewer (Windows only)
  - C++/Python SDK
  - Sample code

5. Electrical Specifications

5.1. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
DC Power	4.75	5	5.25	V
Operating Temperature	-5	-	55	℃
Operating Humidity	5	-	95	%
Storage Temperature	-20	-	70	℃
Storage Humidity	5	-	95	%

Table 2. Recommended Operating Conditions

5.2. Power Consumption

Parameter	Average	Max.	Units
Active mode	2.5	15	W

Table 3. Power Consumption

6. Software (SDK)

6.1. CubeEye SDK application

- SDK Manual
  - Refer to '/release/doc/html/index.html' of SDK from http://www.cube-eye.co.kr/old/en/#/support/main.asp?sub=download
- Installation
  - Refer to 'How to Install' section

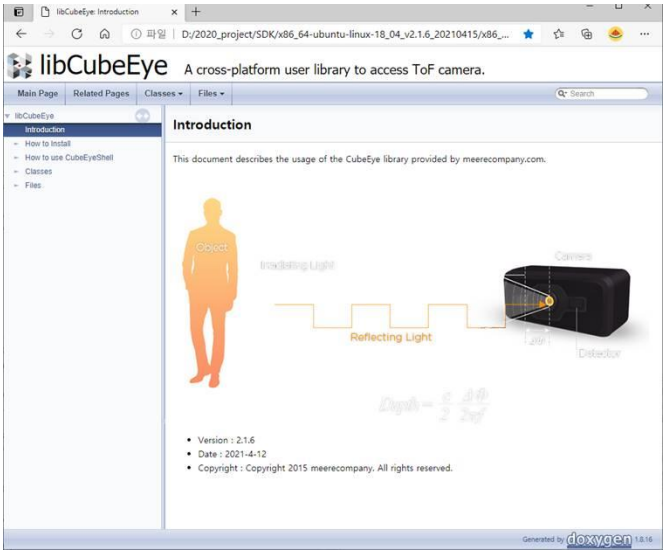


Figure 3. How to Install

- CubeEyeShell
  - Refer to 'How to use CubeEyeShell'

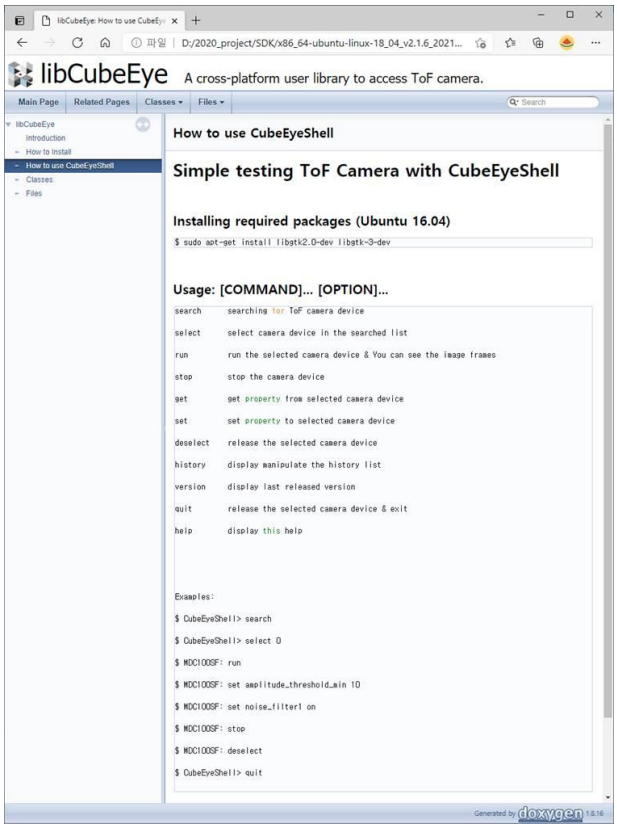


Figure 4. How to CubeEyeShell

7. System Integration

7.1. System level block diagram

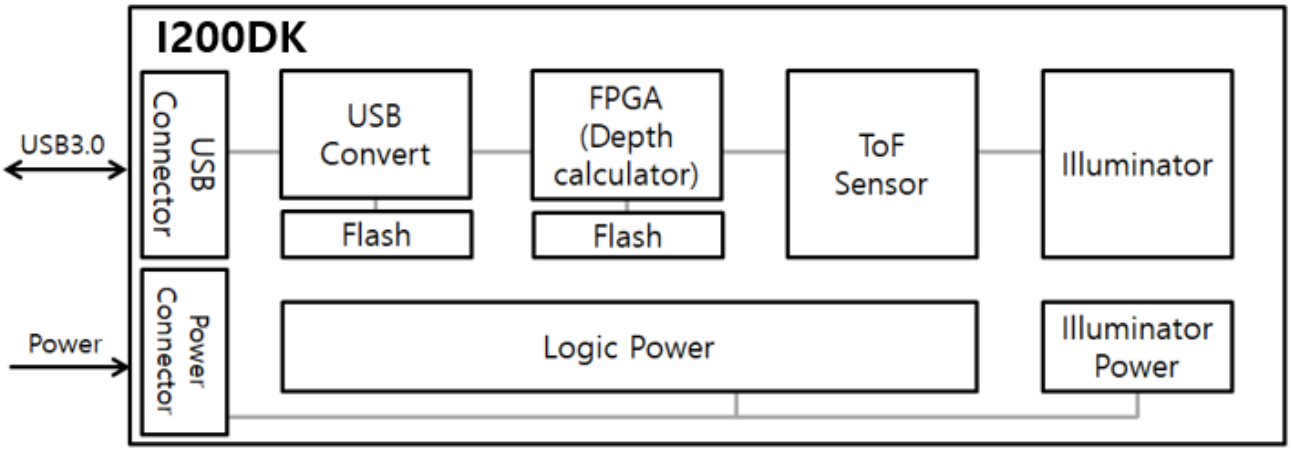


Figure 5. System block diagram

8. Mechanical Drawings

8.1. Module Drawing

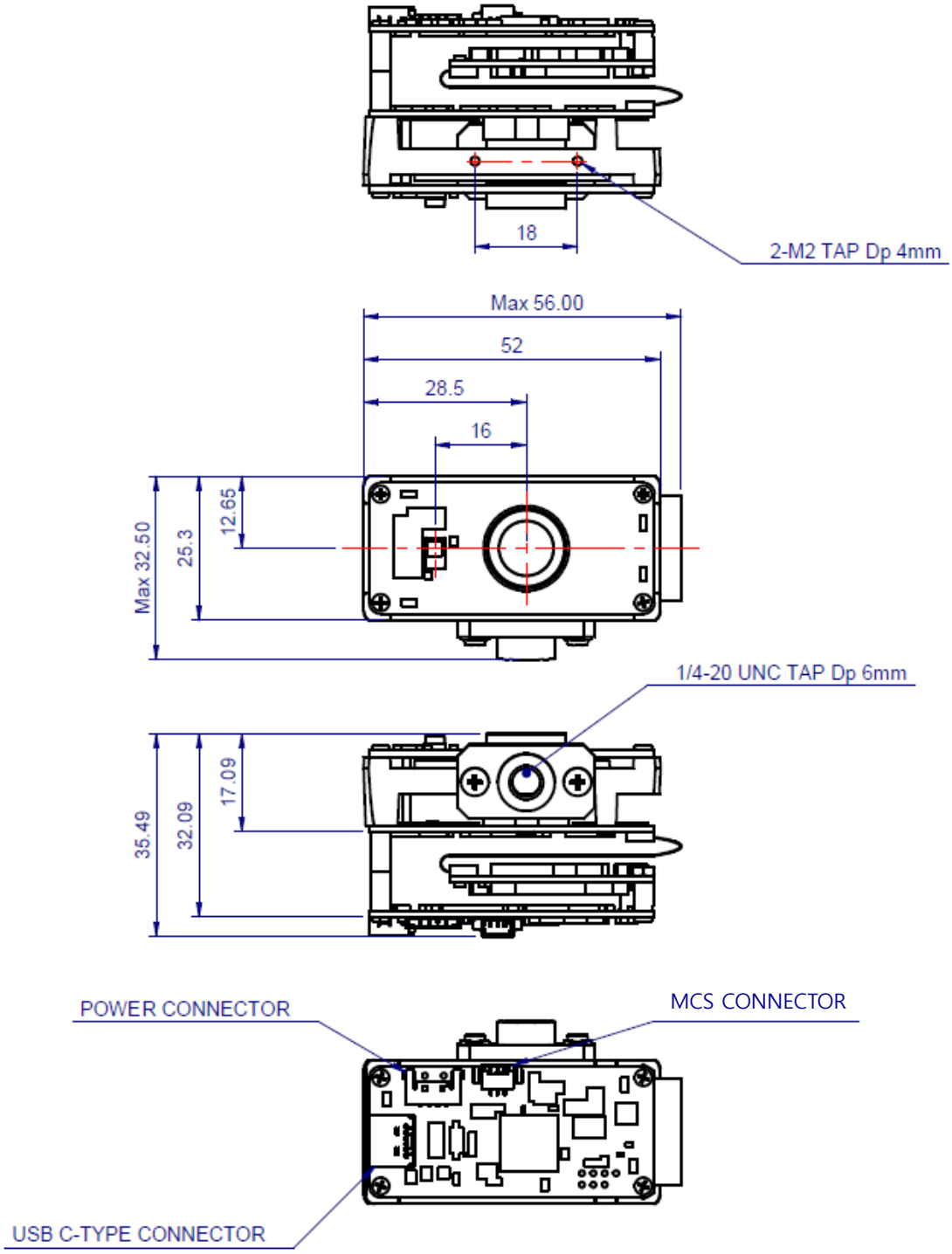


Figure 6. Module Drawing

9. Optical Specifications

9.1. Field of View

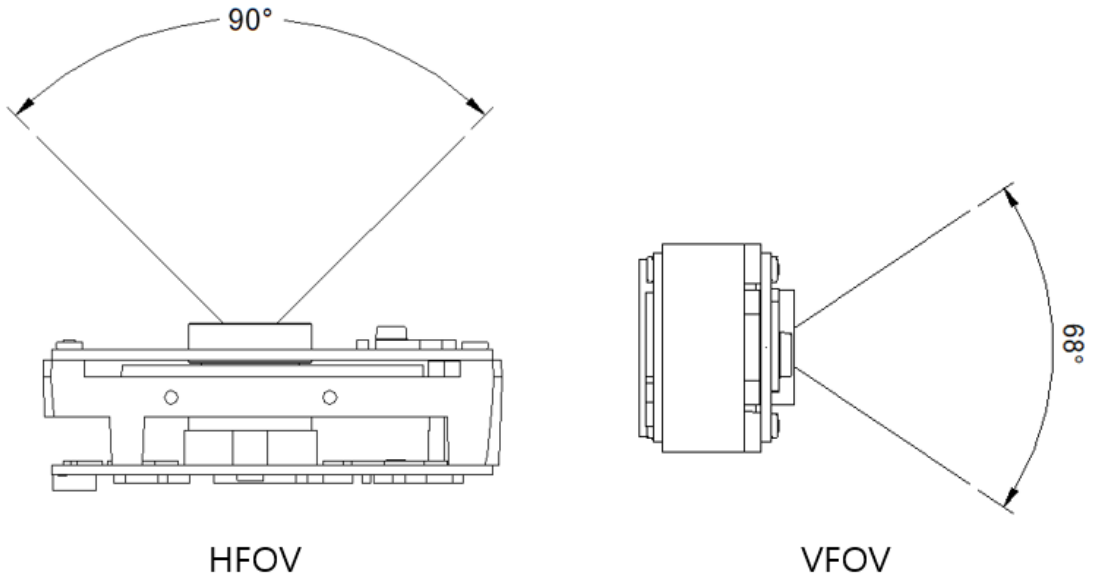


Figure 7. Field of View

9.2. Physical zero plane (for ToF camera module)

The origin of the coordinate system is define as the below figure shows:

1. X coordinate locates 12.65mm from the bottom edge of the heatsink.
2. Y coordinate locates 28.5mm from the left edge of the heatsink.
3. Z coordinate locates 1.48mm from the top edge of the heatsink.

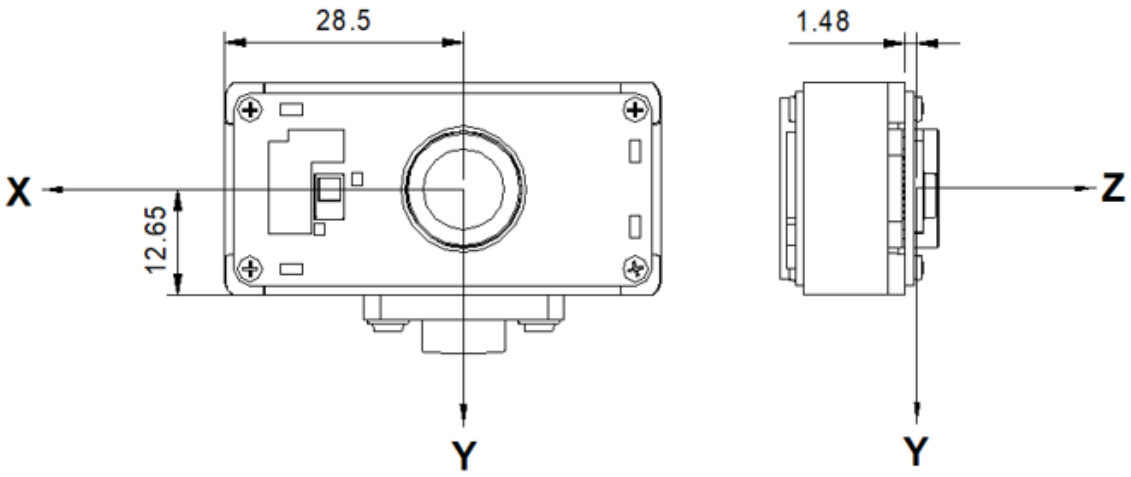


Figure 8. Physical zero plane

9.3. Cover Glass Ass'y Guide

When using the cover glass, it is recommended to place it as close to the lens as possible. It is necessary to place a light barrier between LENS - VCSEL to minimize light spread.

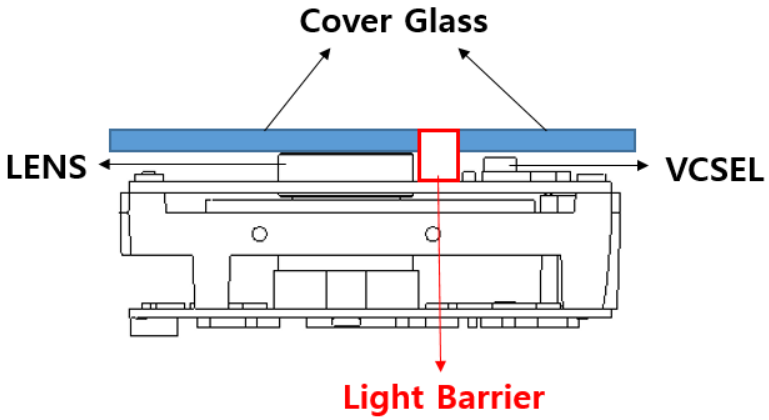


Figure 9. Cover glass Ass'y guide

10. Multi Camera Sync

10.1. Multi Camera Sync

Cube-Eye I200D supports a hardware sync input for multi camera configuration.

To synchronize multiple cameras, you must connect a Multi Camera Sync connector.

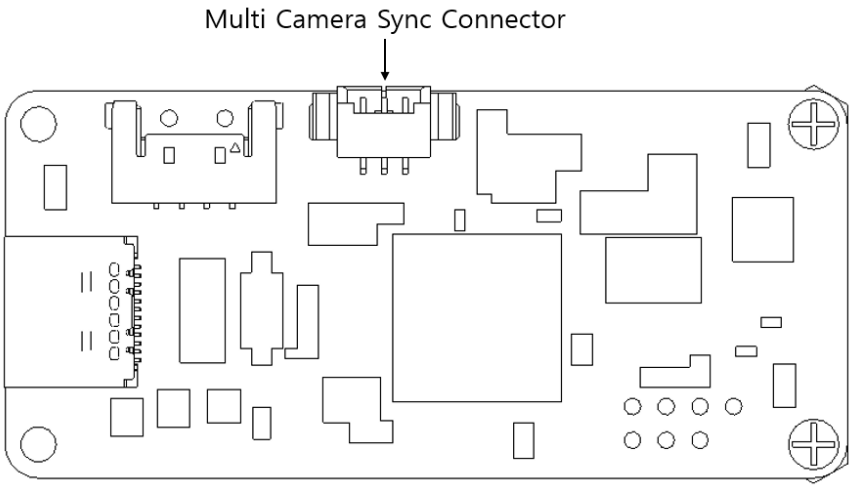


Figure 10. Multi Camera Sync

* Note.

To use the multi camera sync, please refer to Appendix A.2. Multi Camera Sync Guide.

11. Accessories & Connection

11.1. Accessories

- Adaptor + AC power cable (selected by country)
- DC Jack converter cable
- USB 3.0 Cable (A to C type)

Figure 11. USB type Accessories

11.2. Cable Connection

- USB 3.0 Bridge Board – Cable connection

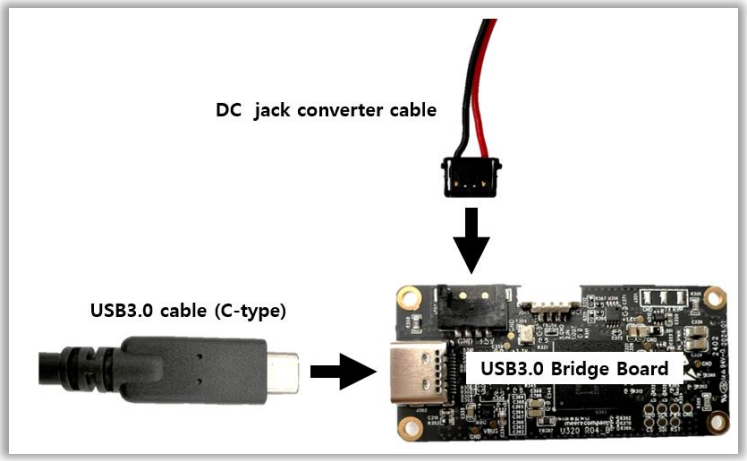


Figure 12. USB 3.0 Bridge Board Cable Connection

12. Package

12.1. Package Materials

Item	Description	Picture
Camera Module	• I200DK Camera Module	
Power Adaptor	• Power Adaptor (5V/5A)	
AC Power Cable	• AC Power Cable to connect the adaptor with the cord • Length: 1.8m (select by Country)	
DC Jack converter Cable	• Converter Cable to connect DC Jack of Power Adaptor and 4p connector of the camera module	
USB Cable	• USB 3.1 C-type to USB 3.0 A-type cable • Length: 1m	

Table 4. Package Materials

Appendix A. Application Notes

A.1. Quick Guide

Quick Guide

A.2. Multi Camera Sync Guide

Multi Camera Sync Guide

A.3. CubeEye Viewer Guide

CubeEye Viewer Guide

A.4. I200D Viewer Configuration Manual

I200D Viewer Configuration Manual

A.5. Firmware Update Tool User Guide

Firmware Update Tool User Guide