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IRISHIELD™-USB BO 2121 HARDWARE DEVELOPER'S MANUAL



Document

Change Record

This page records any updates and revisions made to the IriShield™-USB BO 2121 Hardware Developer's Manual.

Doc ver.	Date	Change Description
1.0	12 th Jul 2013	The first release of IriShield™-USB Binocular camera
1.1	29 th Nov 2013	Hardware specifications update
1.2	07 th Jan 2014	Update power management / IR filter part code change
1.3	13 th Aug 2014	Update Memory Warranty
1.4	15 th Dec 2017	Update the length of assembly cable
1.5	21 st Mar 2018	Update power management
1.6	12 th Apr 2018	Update camera description
1.7	21 st Aug 2019	Update Camera Mechanical Drawing

Note

The information contained herein is provided solely for the purpose of assisting customers to understand how to operate and integrate IriTech's hardware and software and is not to be released, reproduced, or used for any other purpose without written permission of IriTech, Inc.

IriTech reserves the right to make changes on this hardware and software with the intent to improve its functionalities. Information and specifications contained in this document are subject to change without prior notice and do not represent a commitment on part of IriTech.

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1. Preface

1.1 Purpose of this Document

This Hardware Developer's Manual provides detailed information useful for integrating the IriShield™-USB BO 2121 into customer solutions, including hardware specifications, component technology and component assembly.

1.2 Intended Reader

This document is written for hardware engineers and systems architects responsible for designing and building complete biometrics solutions. Readers of this manual are assumed to be familiar with basic engineering, electronics and biometrics concepts. There is no presumed knowledge about any aspect of the IriShield™-USB BO 2121.

1.3 Other Documentation

For additional information about this product, refer to the following documents:

- IDDK 2000 API Reference Manual for C_C++ – a detailed listing of the Application Programming Interface (API)
- IriShield-USB and IriShield-UART SW Developer's Manual.pdf – a user guide for using IriShield's software package

1.4 Contact Information

If you have any questions or experience any problems using this hardware, please contact:

Phone: +1.703.877.2135 (USA)
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Email: collaboration@iritech.com

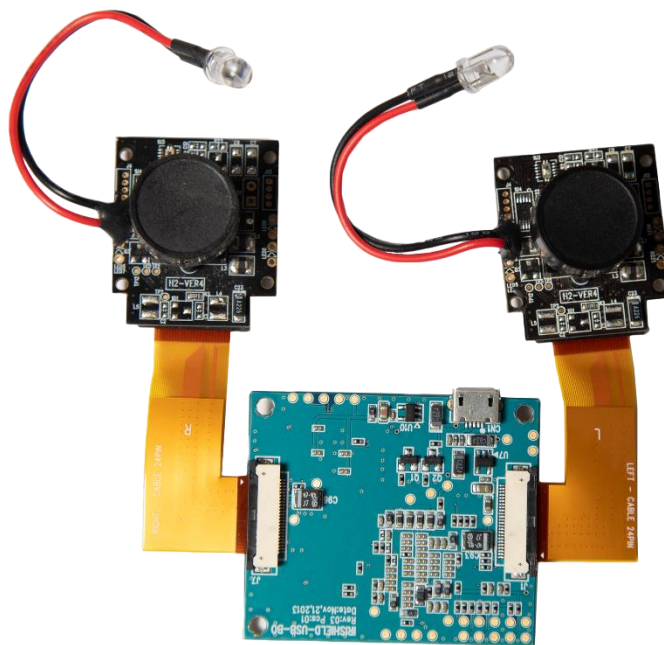
Your feedback is important for us to help and provide you with the most accurate and highest quality information. If you have any comments about this documentation, please email us. Include the version of this document and the section that pertains to your comments.

2. Introduction

IriShield™-USB BO 2121 is a revolutionary, binocular design that delivers the highest quality autocapturing iris acquisition with an ease of use never achieved by older camera systems. The system offers contactless, fast, standards-compliant iris acquisition in a small form factor that is easy to house in a variety of packages. IriShield™-USB includes an embedded CPU that enables on-board computing for automated quality-based iris image capturing, recognition, and verification without taxing the computing power of the host PC. IriShield™-USB provides a PKI-based security infrastructure which creates a self-generated RSA-2048bit key and generates a random one-time AES-256bit key for each session. As a result, this camera can operate with nearly any host PC or mobile computing device. With its USB interface, compact design, and sophisticated, easy-to-integrate accompanying software, IriShield™-USB represents an unprecedented value for iris biometrics identification.

3. Key Features

- All-in-one Iris Identification camera in an ultra-compact size
- Top quality, fast, auto-capture and cost-effective iris recognition camera
- Automatic, easy-to-use, and light-weight
- Built-in Real-time Quality Evaluator and Automated Iris Acquisition
- Proven leading algorithms for template generation and comparison
- Single USB cable connection to host PC (both Power supply and Data)
- Powerful SDK for easy software development
- Safest for eyes: Safe infrared illumination at less than 2% of the LED Eye Safety Standard Regulation
- Ready to be integrated with IriTech's enterprise software
- Easy hardware integration



4. Warnings and Precautions

IriShield™-USB includes sensitive electronics and optics. It is possible for the IriShield™-USB device to be damaged if the following precautions are not followed:

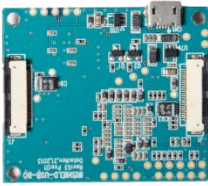
- Clean regularly to remove dust, but do not use any cleaning solutions. Only wipe the device with a smooth cloth or towel. Keep the lens free of dust and dirt by using a special cloth to avoid scratching on the optics.
- Do not allow water to leak into the device
- Do not operate the device in humid conditions where condensation may enter the device.
- Do not operate the device in places where temperatures are beyond or below the given range.
- Do not place the device next to heating equipment.
- Do not place magnets near the device.
- Do not apply voltage or currents beyond the given range.
- Do not use the device for any purposes beyond those specified.
- Do not disassemble components from the boards.
- Do not alter the wiring or board design.
- Do not drop the device or cause sudden impact and mechanical stresses.
- Handle the electronics with proper anti-static protection and techniques to prevent microchips from being shorted out.

Any damage to the device caused by these activities will void the warranty.

5. Product Inventory

Item		Quantity
Standard	IriShield™-USB BO Board	1
	15cm Camera Module	2
	FPCB Cable	2
	130 mm Ass’y Cable	1
	15Φ IR-Filter	2
	Software Package	1
Option	Micro USB Cable	1

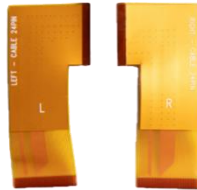
STANDARD



IriShield-USB BO Board



Camera Module



FPCB Cable



Software Package

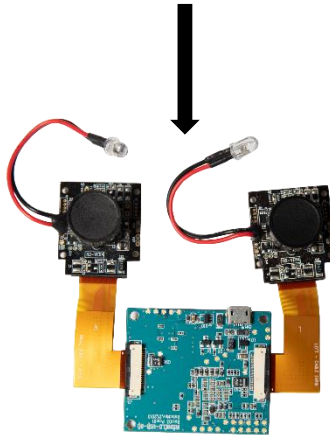
STANDARD



IR-Filter



Ass'y Cable



OPTION



Micro USB cable

* Software Package can be downloaded from IriTech’s Website.

* Additional cost applies for parts offered as option.

6. Hardware Specifications

- **Mechanical Size**

- IriShield™-USB BO Board: Main board (details from page 9)
47 x 40 x 6.9 mm (1.8 x 1.6 x 0.3 in)
- Camera Module: specialized iris camera module (details in page 15)
31 x 27 x 23.3 mm (1.2 x 1.1 x 0.9 in)
※ Details for alignment of IR LED on Camera module: page 19
- FPCB Cable: Interface cable between IriShield™-USB BO board and camera module (details in page 12)
41 x 21 x 0.3 mm (1.6 x 0.8 x 0.01 in)
- 130mm Ass’y Cable: Communication cable with host (details in page 10)
140 x 5.4 x 2.8 mm (5.5 x 0.2 x 0.1 in)
- 15 Φ IR-Filter: Band pass filter to remove visible light reflection in iris image
15 x 15 x 1.1 mm (0.6 x 0.6 x 0.04 in)
※ Should be assembled in front of camera module (details from page 17)

- **Power Requirements**

Required Voltage	Vin	
	Min	Max
Recommend	Single USB Power (DC +5V ± 5%)	
Absolute	3.4V	6V

- Infinite loops are one of the most common problem that plagues developers. They can occur in any programming language, in any application and in any coding style. If infinite loop occurs, it can be solved by turning off/on the power switch. We strongly recommend installing switching circuit or power control switch to fix the problem.

- **Power Management**

Mode	Current	Description
Active	MAX 430mA	Fully operating
Standby	MAX 80mA	Standby Mode
Sleep	MAX 60mA	Sleep Mode

- **Environmental**

- -20°C to +60°C Storage
- 0°C to +50°C Operating

- **Camera Description**

Image Resolution:	ISO Standard 19794-6 (2005 & 2011), (640 x 480 pixels, 8bit Grayscale), Full support of K1, K2, K3, K7
Sensor Resolution:	VGA
Pixel Density:	Normally greater than 210 pixels across iris diameter
Focal Distance:	13.75 ~ 15.25 cm (5.4 ~ 6.0 in) from the front of camera Lens.
Optimal Distance:	14.5 cm (5.7 in), Focal depth = 1.5 cm (0.6 in)
Field of View (FOV):	About 3.3 x 2.4 cm at 14.5 cm (1.3 x 0.9 in at 5.7 in)

- **Memory**

- 64 MB NAND Flash Memory
- 128 MB Mobile DDR SDRAM

- **External Connection**

1 USB Connection (supports USB 2.0)

- **Compliance**

- Eye safety (IEC 62471:2006-07)
- RoHS

- **Memory Warranty**

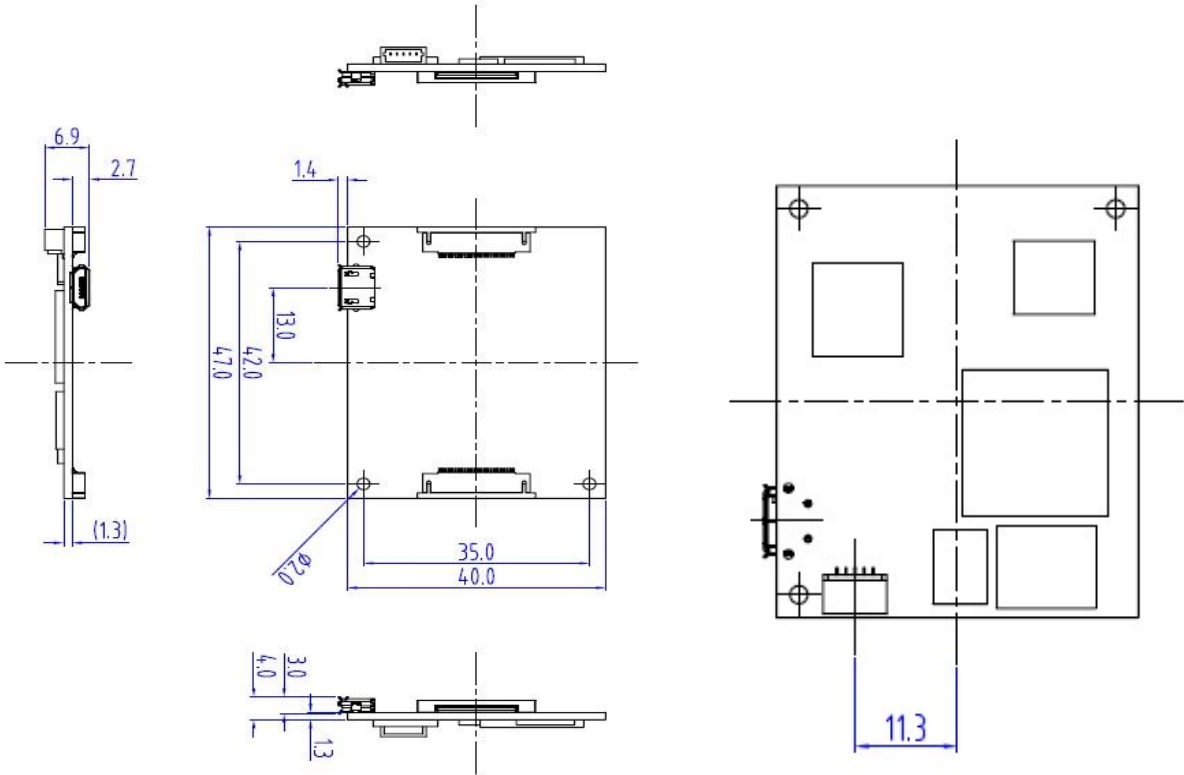
Iris images will be stored inside the memory of device. This memory is warranted for storing and deleting up to 100,000 cycles. Therefore, if the count of stored/deleted images exceeds 100,000 cycles, the device will be out of warranty.

Program, erase endurance cycles

Parameters	Min	Unit
Program/erase cycles per block	100,000	Cycles

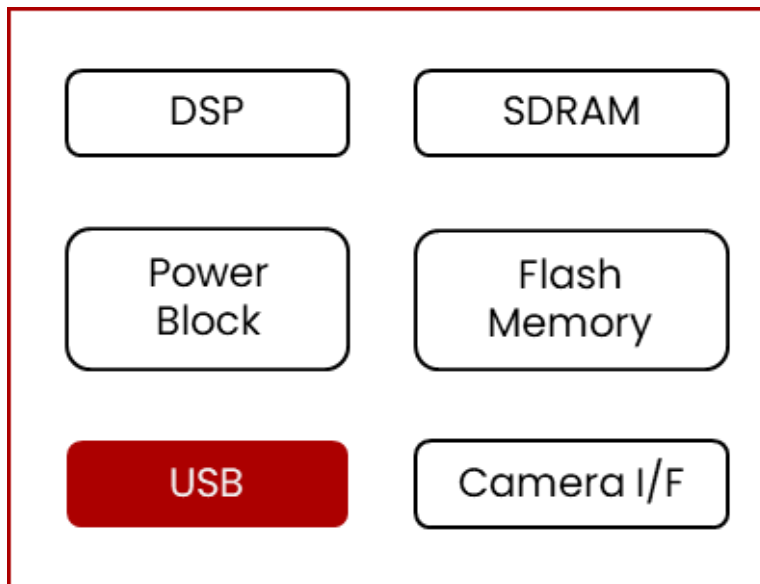
7. Irishield™-USB BO BOARD

7.1 Mechanical Drawing

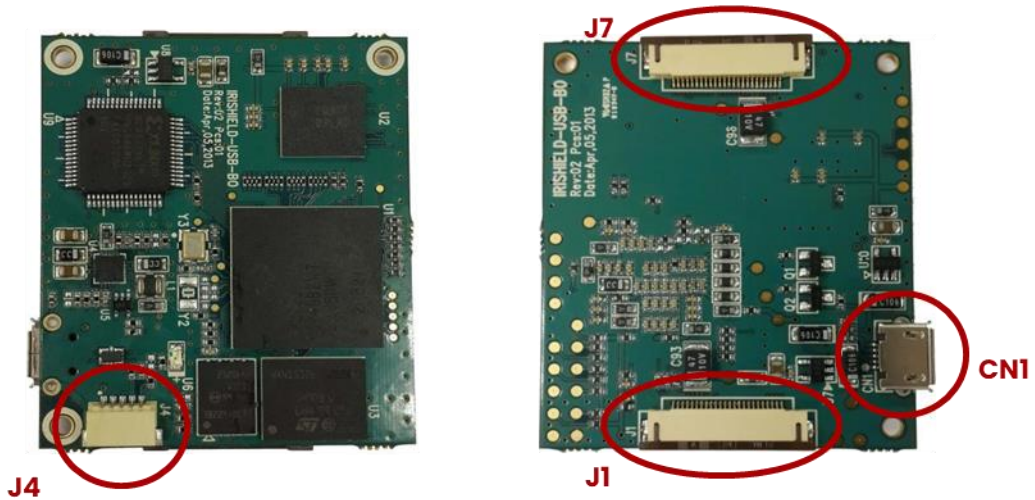


Note: All dimensions are in millimeters.

7.2 Functional Block Diagram



7.3 Connector and Ass'y Cable Interfaces



- **USB Connector**
 Location: J4 (on top of Irishield™-USB BO Board)
 1.0mm pitch, 5 pin connector
 Manufacturer: CVILUX CORPORATION
 Part Number: CII105MIHR0-LF

Pin number	Signal
1	VUSB+
2	D-
3	D+
4	GND
5	NC

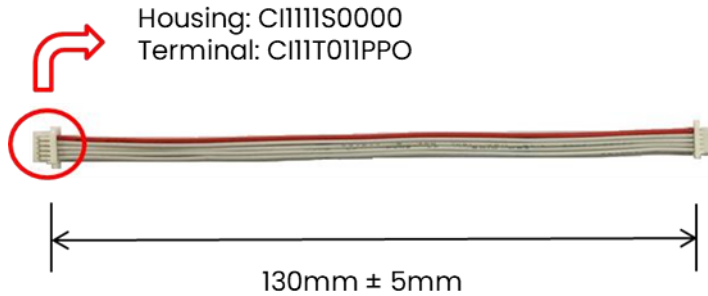
- **130mm Ass'y Cable**

Location: From J4 to Host

1.0mm pitch, 5 pin cable

Housing and Terminal Manufacturer: CVILUX CORPORATION

Part Number: Housing (C11105S0000), Terminal (C111T011PP0)



- **FPC Connector**

Location: J1, J7 (on bottom of IriShield™-USB BO Board)

0.5mm pitch, 24 pin connector

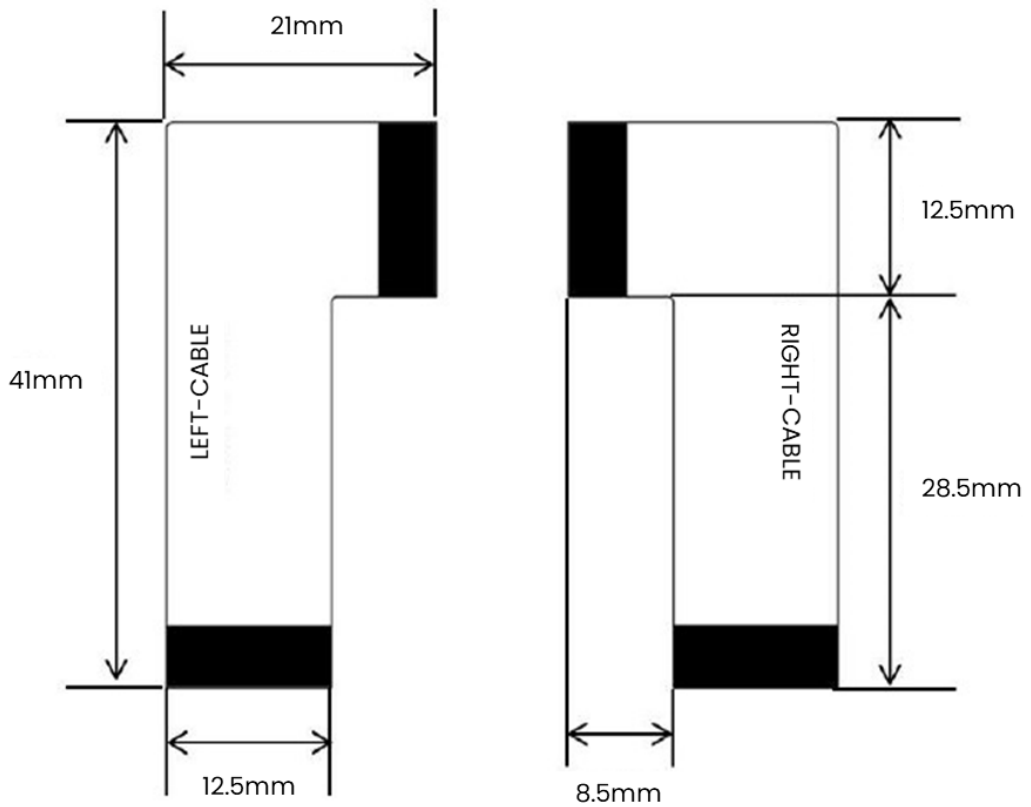
Manufacturer: YEONHO ELECTRONICS

Part Number: 05003HR-24B02S

Pin number	Signal
1	GND
2	HSYNC
3	VSYNC
4	CIPWM
5	PCLK
6	POWER (3.3V)
7	POWER (3.3V)
8	I2CSDA
9	MCLK

10	I2CSCL
11	DATA0
12	DATA1
13	DATA2
14	DATA3
15	GND
16	DATA4
17	DATA5
18	DATA6
19	DATA7
20	RESET
21	GPIO1
22	GPIO2
23	GPIO3
24	GPIO4

- FPCB Cable



- USB Connector

Location: CNI (on bottom of IriShield™-USB BO Board)

0.65mm pitch, 5 pin connector

Manufacturer: MAIN SUPER ENTERPRISES CO. LTD.

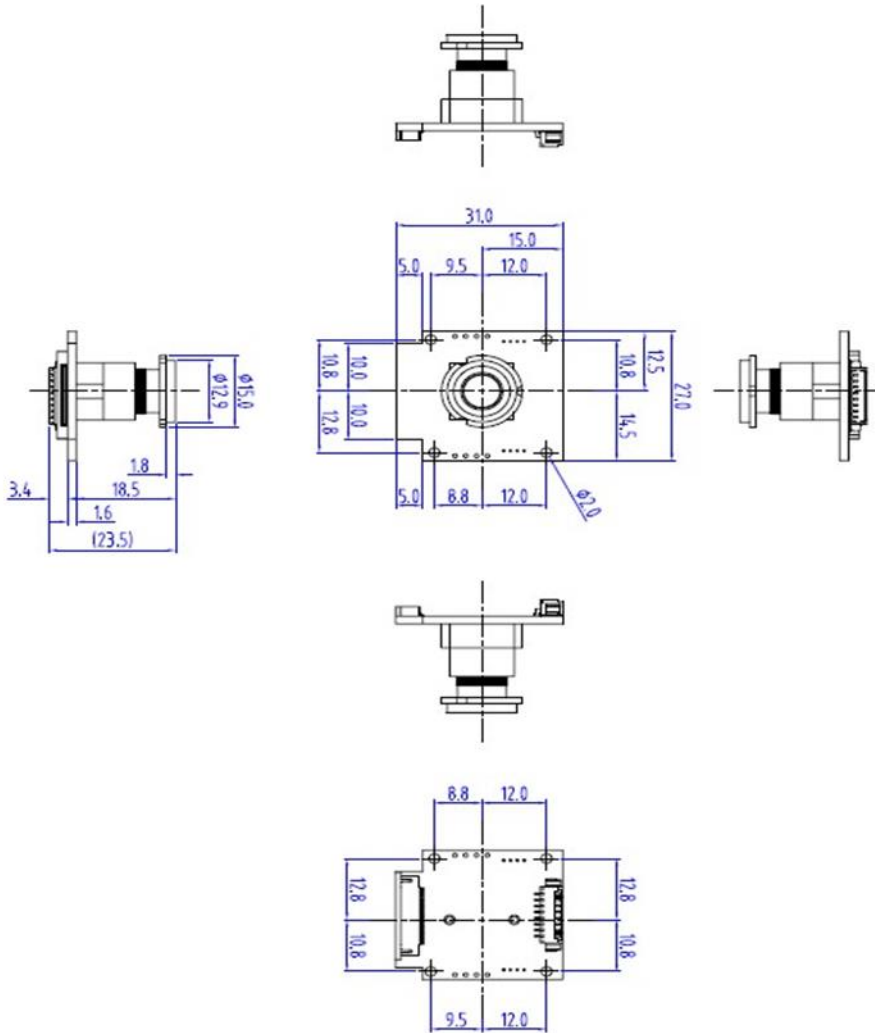
Part Number: 000010801-00012

Pin number	Signal
1	VUSB+
2	D-
3	D+
4	NC (shield cable with GND)
5	GND

7.4 Camera Interface



7.5 Camera Mechanical Drawing



Note: All dimensions are in millimeters.

- *Note: When you design the case, make sure to make some space between the camera lens and the case because there is a tolerance of around 3mm in the height of the camera module.*

7.6 IR-LED Specifications and Mechanical Drawing

- IR-LED Specifications

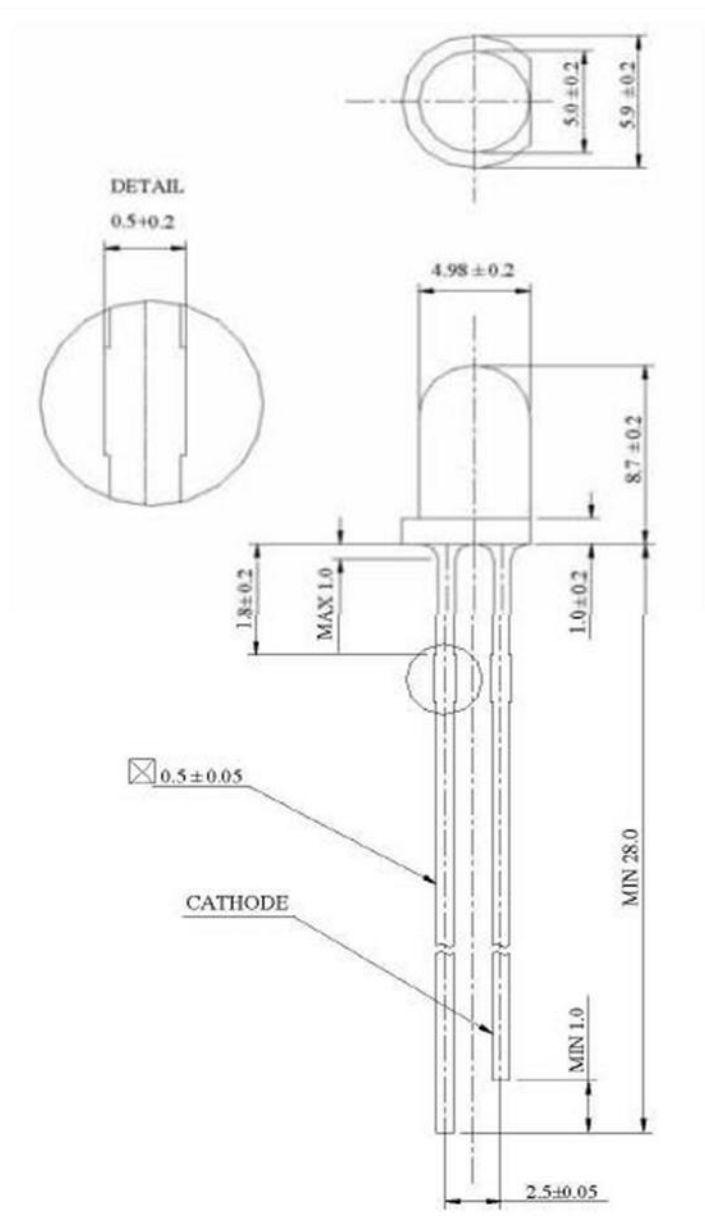
Peak wavelength: $\lambda_p = 810 \text{ nm}$

Angle of half intensity: $\phi = \pm 15^\circ$

Manufacturer: U-JIN LED

Part Number: ULI-81036A-30IRP

- Mechanical Drawing



Note: All dimensions are in millimeters.

8. IR Filter

IR Filter enables only infrared light to penetrate into the camera by filtering out visible light.

- *Note: Camera should be in a dark space. Make sure visible lights do not penetrate into the camera when you attach the IR filter on your case.*
- **Location (Example)**

Place the IR Filter on the camera as shown below.



- **Availability**

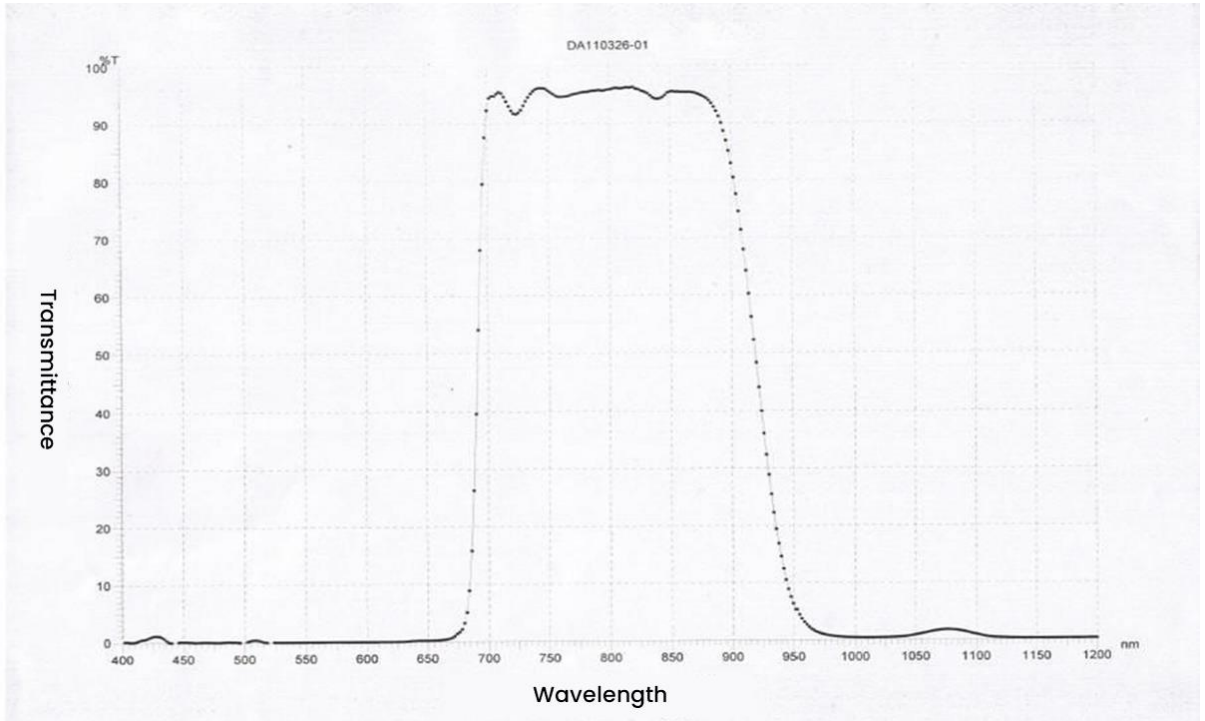
The following types of IR Filter have been used in other products.

Part Code	Size	Thickness	Drawing
0F01-000001	9Φ	0.7mm	
0F01-000002	39.60*15.60	0.7mm	
0F01-000003	32.20Φ	0.7mm	
0F01-000005	15.00Φ	1.1mm	

Specifications of IR Filter that can be modified are as follows. Additional cost applies for this tooling.

- Thickness: 0.55mm, 0.7mm, 1.1mm
- Shape: Circle, Quadrangle, etc.
- Size: ~ 300Φ (Circle), ~ 340mm*290mm (Quadrangle)

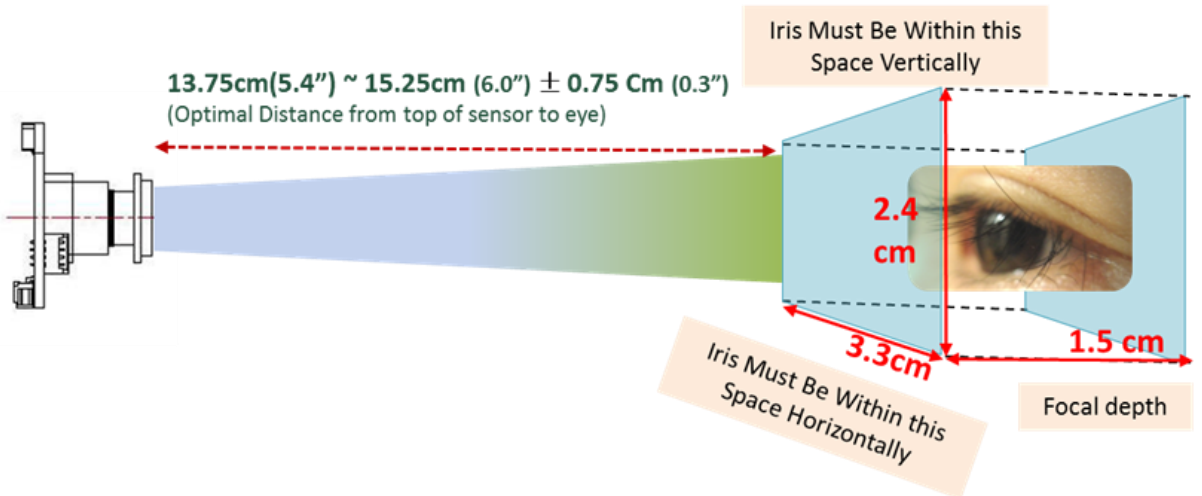
- **Recommend Band Pass Filter Specifications**
 - Tavg < 5% @ 400~680nm
 - Tavg > 90% @ 720~880nm
 - Tabs > 90% @ 790~830nm (Tabs > 87% @ 720~790nm and 830~880nm)
 - Tavg < 5% @ 820~1200nm
- **Spectral Spectral Characteristics Graph**



9. Capture Volume

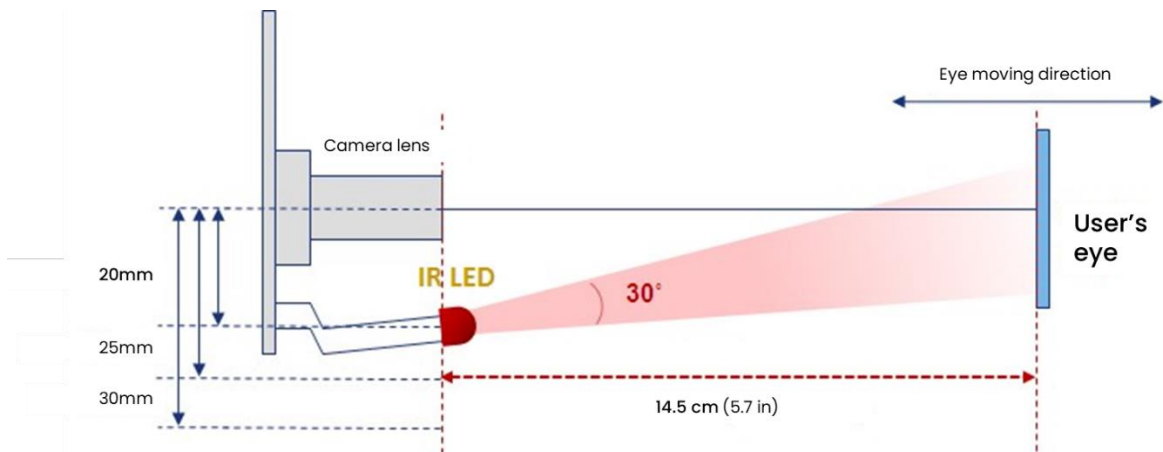
Parameter	Focal Depth	Horizontal	Vertical
Range	1.5 cm (0.6 in)	3.3 ± 0.1 cm (1.3 in)	2.4 ± 0.1 cm (0.9 in)

Volume: 11.9 cm³ at 13.75 ~ 15.25 cm range



❖ The optimal distance for best image is 14.5 cm (5.7 in) from the front of camera Lens.

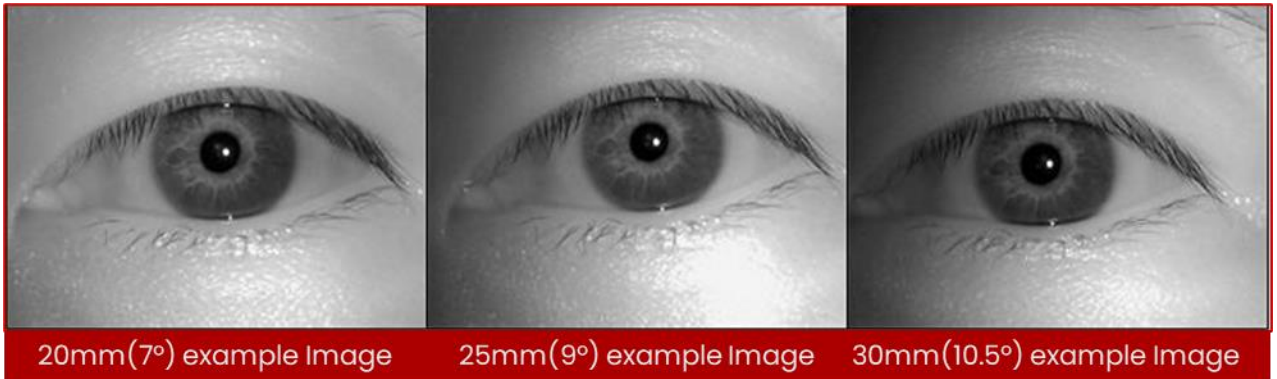
10. Aligning the Illumination Source



The camera relies upon infrared light to generate high-quality images. Infrared is invisible to the human eye. Because the infrared LED light source on the evaluation unit is malleable, it is possible to bend the infrared LED in such a way that it cannot properly illuminate the subject, making it difficult to accurately capture images.

If the infrared LED is bent, adjust the infrared LED to ensure the eye is illuminated at about 13 cm (5.1 inches) away from the front of camera mirror. The best position for the infrared LED is about 20 mm (3/4 in) from the center of the camera and aimed at a slight angle toward the camera.

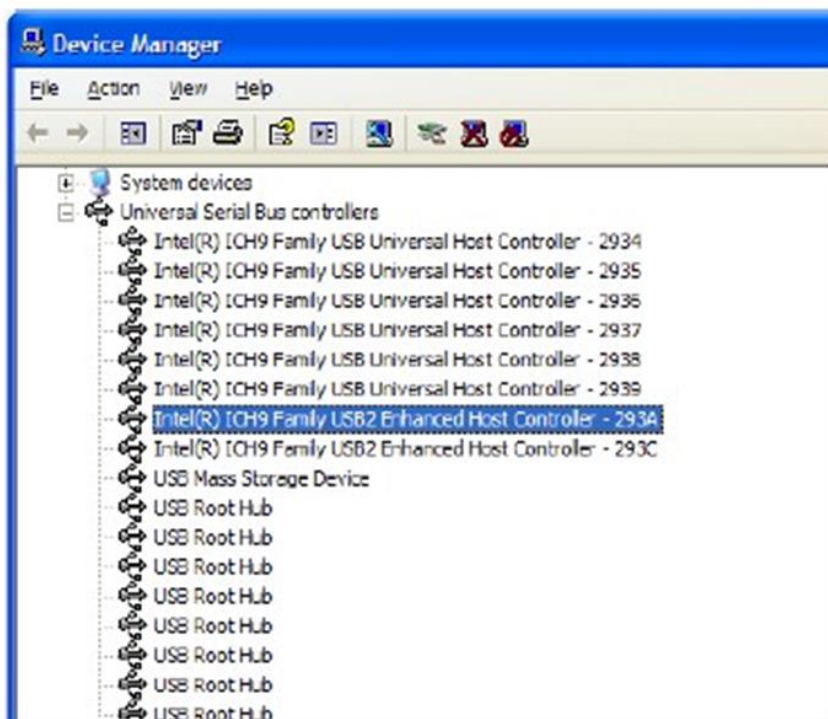
Examples of Image Brightness with Infrared LED at Different Placements



11. Conditions for Using USB

11.1 Using USB 2.0

- IriShield™-USB camera should be used with the accompanied USB cable supplied by IriTech.
- The PC must be equipped with a USB 2.0 Host Adapter and a USB 2.0 port.
- You can verify the above conditions in the Device Manager provided by MS Windows. If there is “Standard Extension PCI2 USB”, “Enhanced”, or “USB 2.0” listed in the Universal Serial Bus controllers, it means the PC supports USB 2.0.



To access the Device Manager

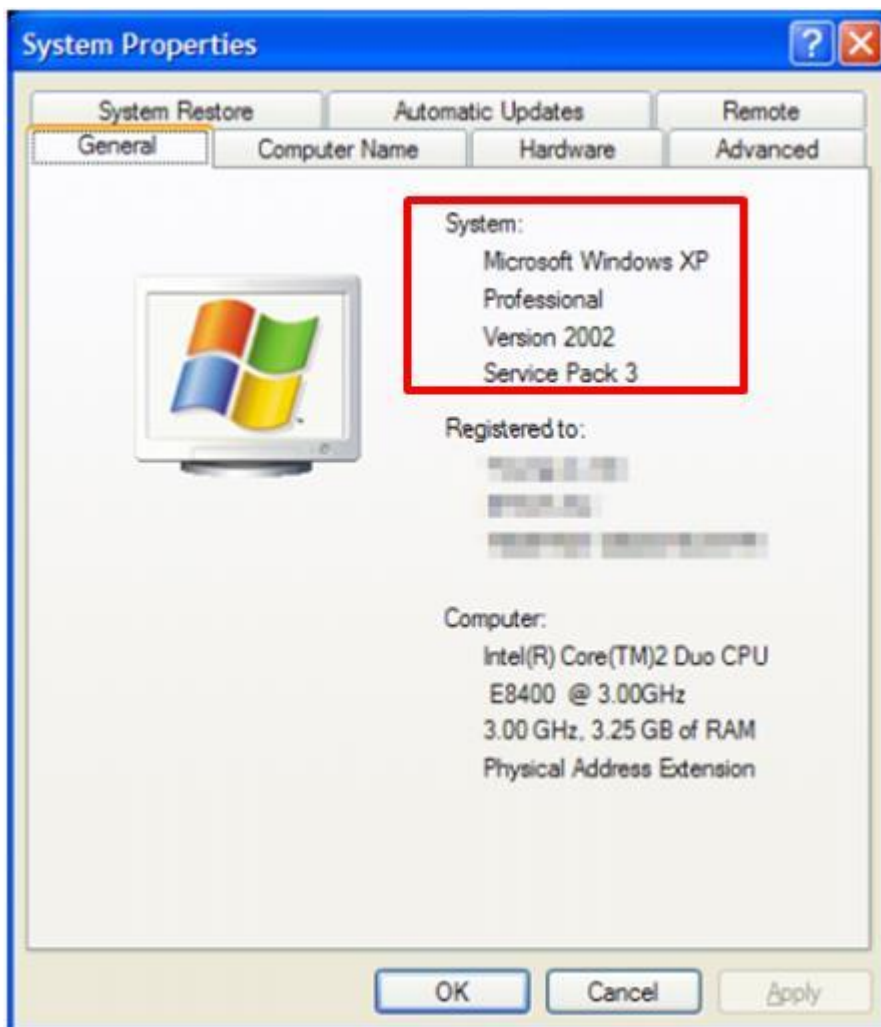
(MS Windows XP)

1. Click "Start" button on the taskbar.
2. Right-click on "My Computer" and choose "Properties" at the bottom.
3. Click "Hardware" tab.
4. Click "Device Manager" button.

(MS Windows 7)

1. Click "Start" button on the taskbar.
2. Right-click on "My Computer" and choose "Properties" at the bottom.
3. Click "Device Manager" on the left pane.

- Operating systems that support USB 2.0 include MS Windows Server 2003, MS Windows XP, and MS Windows 7. You can verify whether your operating system has the correct service pack by checking System Properties. For Windows XP, the Service Pack version should be Service Pack 2 or later versions. Please contact IriTech if other operating systems need be supported.



12. Legal Notice

12.1 Warranty Terms

Commonly applied to entire Iris Cameras & Modules supplied by IriTech	
Warranty Length	1 Year Limited: Parts & Labor, Mail in or Carry in
Hardware Technical Support	1 Year
Software Support	90 days
Website	http://www.irittech.com
Service Phone Number	+1 703 877 2135 (United States) +82 2 872 3812 (Korea)

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- ANY EQUIPMENT OR COMPONENTS THAT WERE NOT INCLUDED IN YOUR PRODUCT AS ORIGINALLY SOLD TO YOU.
- NORMAL WEAR AND TEAR.
- COSMETIC DAMAGE THAT DOES NOT AFFECT FUNCTIONALITY.
- PRODUCTS WHERE THE IRITECH SERIAL NUMBER IS MISSING, ALTERED, OR DEFACED.

To obtain warranty service:

- You must assist IRITECH in diagnosing issues with your product and follow IRITECH's warranty processes.
- You must obtain warranty service from IRITECH or an authorized service center specified by IRITECH. IRIECH will not reimburse you for service performed by others.
- You may be required to deliver and retrieve your product to and from IRITECH or an authorized service facility specified by IRITECH at your expense. When sending a product to IRITECH or the authorized service facility specified by IRITECH, you must deliver the

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