



# **EX8029 Datasheet**

**eSP870 Camera Module with patterned IR Illuminator**

**Revision 1.0**  
**January 10, 2017**



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## Revision History

Rev	Date	Comments
1.0	January 10, 2017	Initial release.

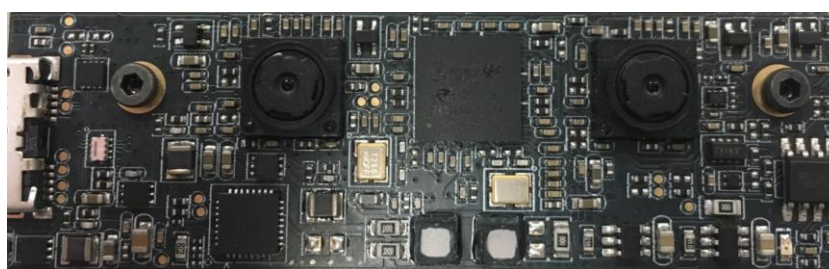


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# 1 Introduction

This document contains technical information of the dual sensor camera module with Etron eSP870 depth-map camera controller and patterned IR illuminator. The module can provide either or both color video and/or depth-map video streams. eSP870 depth-map controller is compliant to UVC1.1 and USB3.0 standard. Therefore, the module requires no specific drivers and provides high bandwidth for video transmission. The camera module can be integrated into applications involving gesture control, body gaming, and 3D scanning. The camera module is also a demonstration of the eSP870 reference design for its compact size and flexible form factor.



**Figure 1. 3cm Baseline Module**

**Table 1. Key Parameters**

Parameter	Description
Controller	eSP870U
IR pattern illuminator wavelength	850nm +/-10 nm
IR pattern illuminator number of features	>10,000
Video Resolution	Please refer to Table 4 on page 8.
Lens	1LS1022G by AOET
Image Sensor	OV9714 by OVT
Power Source	USB bus power (5V/900mA by USB3.0; 5V/500mA by USB2.0)
PC Connection	USB3.0 & USB2.0
PID (Product ID)	0568
VID (Vender ID)	1e4e
Power Source	USB Connector
Power Voltage	+5V
Operating Current With Patterned IR Illuminator	≲350mA
Operating Current Without Patterned IR Illuminator	≲280mA
Suspend Current	≲15mA

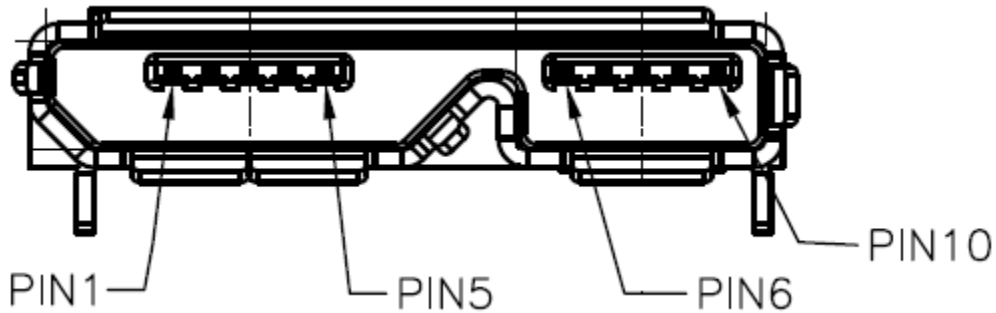
Note:

Operating current is measured under below criteria.

1. Image output is delivered by YUV format at USB3.0.
2. Depth-map resolution: VGA at 30fps.

### 1.1 Pin Information of USB3.0 Connector

Pin assignments and pin descriptions of USB3.0 micro B type connector are listed below.



**Figure 2. Connector Drawing**

**Table 2. Pin Descriptions**

Pin No.	Signal	Description	Mating Sequence
1	VBUS	Power	Second
2	D-	USB differential pair	Third
3	D+		
4	ID(GND)	Slave device ID	Second
5	GND	Ground for signal return	Second
6	StdA_SSRX-	SuperSpeed receiver differential pair	Last
7	StdA_SSR+		
8	GND_DRAIN	Ground for signal return	
9	StdA_SST-	SuperSpeed receiver differential pair	
10	StdA_SST+		
Shell	Shield	Connector metal shell	First

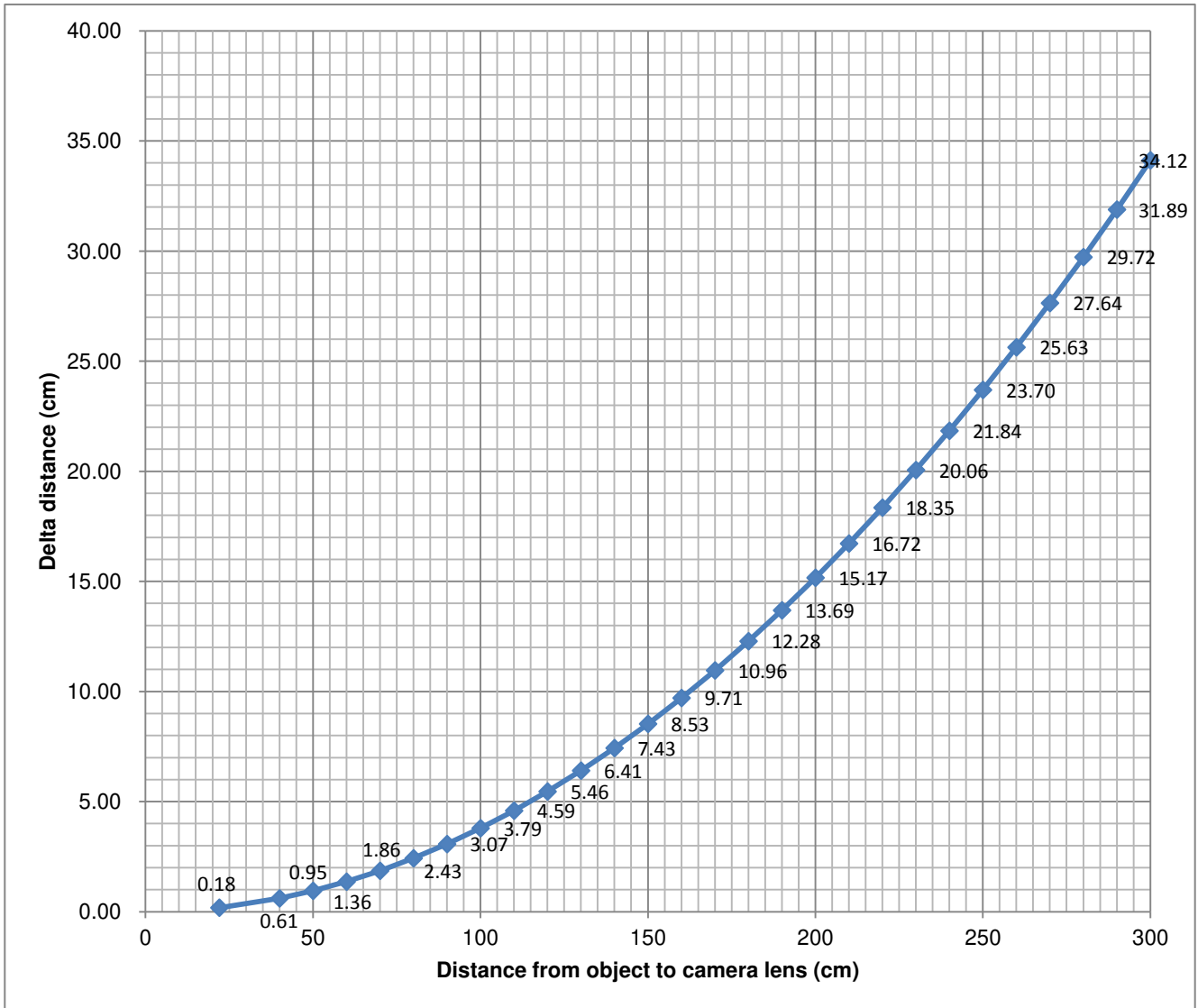
### 1.2 Ordering Information

**Table 3. Available Part Number**

Part Number	Description
eAP87003B	eSP870 Camera Module with patterned IR Illuminator

### 1.3 Depth Accuracy

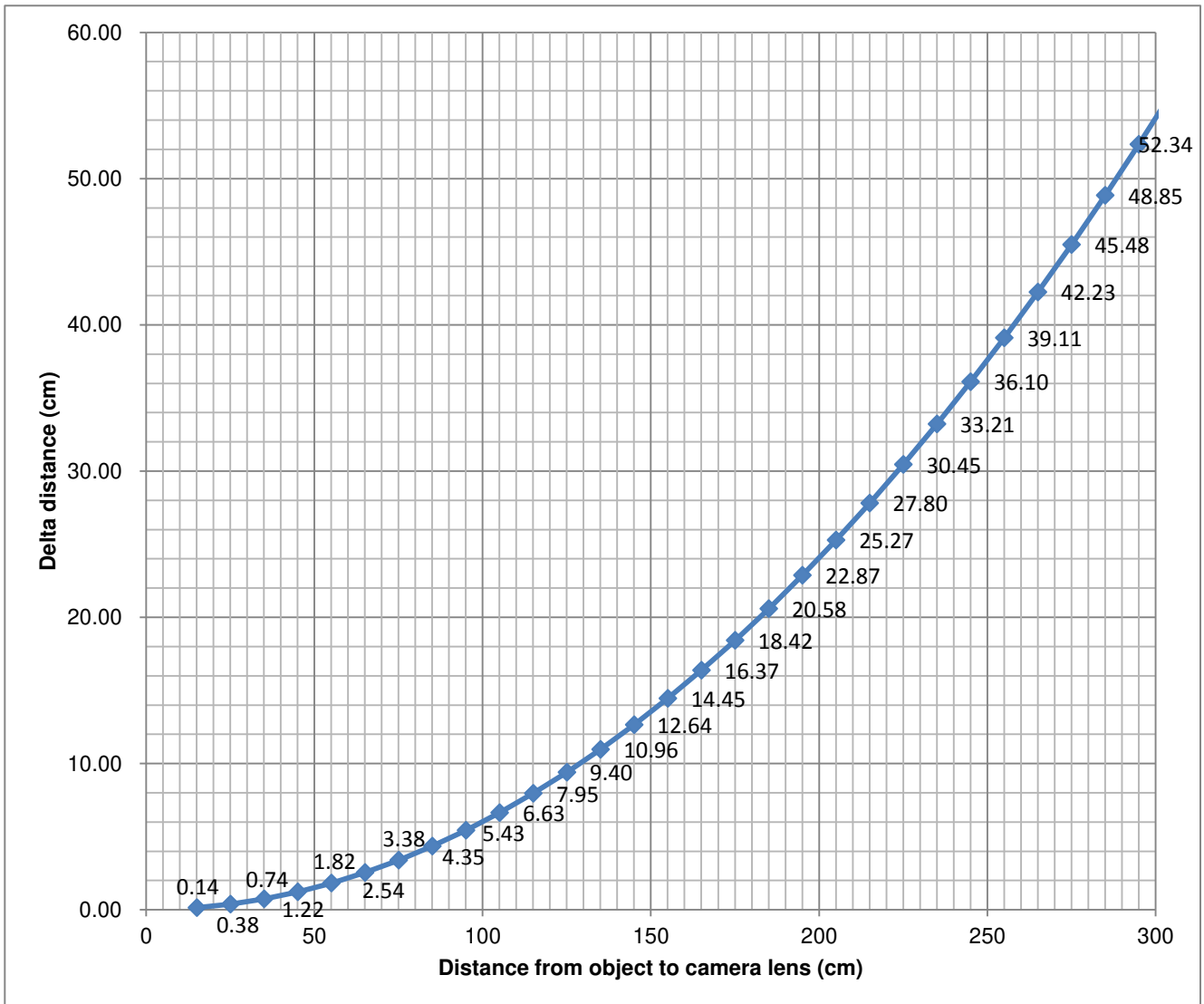
Depth accuracy is the minimum difference of distance at which the movement of same target can be distinguished and leads to at least 1 pixel difference of disparity on sensor plane. This is the meaning of the blue trend in the figures below.



**Figure 3. Depth Accuracy Chart of 3cm Baseline (Depth resolution: 640x480)**

Note:

1. Delta Distance means absolute value of the difference between distance of two locations of a measured object while it moves away from or moves forward to the camera module.
2. The accuracy shown above is a theoretical calculation based on perfect lighting condition and component specification. It is subject to change and would be downgraded in a real scenario.
3. The chart is generated based on below hardware configuration.
  - Lens: 1LS1022G by AOET
  - Sensor: OV9714 by OVT
4. Depth resolution of this figure: 640x480



**Figure 4. Depth Accuracy Chart of 3cm Baseline (Depth resolution: 640x400)**

Note:

1. Delta Distance means absolute value of the difference between distance of two locations of a measured object while it moves away from or moves forward to the camera module.
2. The accuracy shown above is a theoretical calculation based on perfect lighting condition and component specification. It is subject to change and would be downgraded in a real scenario.
3. The chart is generated based on below hardware configuration.
  - Lens: 1LS1022G by AOET
  - Sensor: OV9714 by OVT
4. Depth resolution of this figure: 640x400



## 2 Video Output

**Table 4. Video Output**

Mode	Denotation	Interface & Compression	EP1 Color (2D or 3D)		EP2 (Depth-map)		Comment
			Video Resolution	YUV (fps)	Video Resolution	Bitmap Frame Rate	
1	L' + D	USB 3.0	640x400	90/60/30	640x400	90/60/30	
2	L' + D	USB 3.0	640x480	30	640x480	30	[1]
3	L' + R' + D	USB 3.0	1280x400	90/60/30	640x400	90/60/30	Calibration
4	L' + R' + D	USB 3.0	640x240	90/60/30	320x240	90/60/30	[1], Calibration
5	L' + D	USB 3.0	320x240	90/60/30	320x240	90/60/30	[1]
6	L + D	USB 3.0	800x600	30	640x480	30	[1]
7	L + R + D	USB 3.0	1600x600	30	640x480	30	[1]
8	L + R + D	USB 3.0	800x300	90/60/30	320x240	90/60/30	[1]
9	L + R	USB 3.0	2560x720	30	-	-	
10	L + R	USB 3.0	1280x400	90/60/30	-	-	
11	L' + R'	USB 3.0	1280x480	30	-	-	
12	L(R)	USB 3.0	1280x720	60/30	-	-	[1], Default
13	D	USB 3.0	-	-	640x400	90/60/30	
14	D	USB 3.0	-	-	640x480	30	[1]
15	D	USB 3.0	-	-	320x240	90/60/30	[1]
16	L' + D	USB 2.0	640x480	15	640x480	15	[1]
17	L' + D	USB 2.0	640x400	15	640x400	15	
18	L' + D	USB 2.0	320x240	60/30	320x240	60/30	[1]
19	L' + R' + D	USB 2.0	640x240	30	320x240	30	
20	L + D	USB 2.0	800x600	15	640x480	15	[1]
21	L + R + D	USB 2.0	1600x600	5	640x480	5	[1]
22	L + R	USB 2.0	2560x720	5	-	-	
23	L + R	USB 2.0	1280x480	15	-	-	
24	L' + R'	USB 2.0	1280x480	15	-	-	
25	L(R)	USB 2.0	1280x720	10	-	-	Default
26	D	USB 2.0	-	-	640x400	30	
27	D	USB 2.0	-	-	640x480	30	[1]
28	D	USB 2.0	-	-	320x240	90/60/30	[1]
29	L' + D	USB 2.0 / MJPEG	640x480	30	640x480	30	[1]
30	L' + D	USB 2.0 / MJPEG	640x400	30	640x400	30	
31	L' + D	USB 2.0 / MJPEG	320x240	90/60/30	320x240	90/60/30	[1]
32	L' + R' + D	USB 2.0 / MJPEG	640x240	90/60/30	320x240	90/60/30	[1]
33	L + D	USB 2.0 / MJPEG	800x600	30	640x480	30	[1]
34	L + R + D	USB 2.0 / MJPEG	1600x600	30	640x480	30	[1]
35	L + R	USB 2.0 / MJPEG	2560x720	30	-	-	
36	L' + R'	USB 2.0 / MJPEG	1280x480	30	-	-	
37	L(R)	USB 2.0 / MJPEG	1280x720	30	-	-	

1. [1] Rectified FOV will be about 20% less after rectification.

2. L' means Rectified Left. D means Depth.

### 3 Key Parameters of Image Sensor

Table 5. Key Parameters of OV9714

<b>Vendor</b>	OVT	
<b>Model</b>	OV9714	
<b>Active Array Size</b>	1296 x 812	
<b>Power Supply</b>	Core	1.5VDC $\pm$ 5%
	Analog	2.6 ~ 3.0V
	I/O	1.7 ~ 3.0V
<b>Power Requirement</b>	Active	35mA
	Standby	30uA
	XSHUTDOWN	5uA
<b>Temperature Range</b>	Operating Temperature	-30°C to 85°C junction temperature
	Stable Image Temperature	0°C to 50°C junction temperature
<b>CRA</b>	28.7°	
<b>Pixel Size</b>	3.0 x 3.0um	
<b>Optical Size</b>	1/4"	
<b>Output format</b>	12-bit RGB RAW	

Note:

These values are subject to change based on real scenarios.

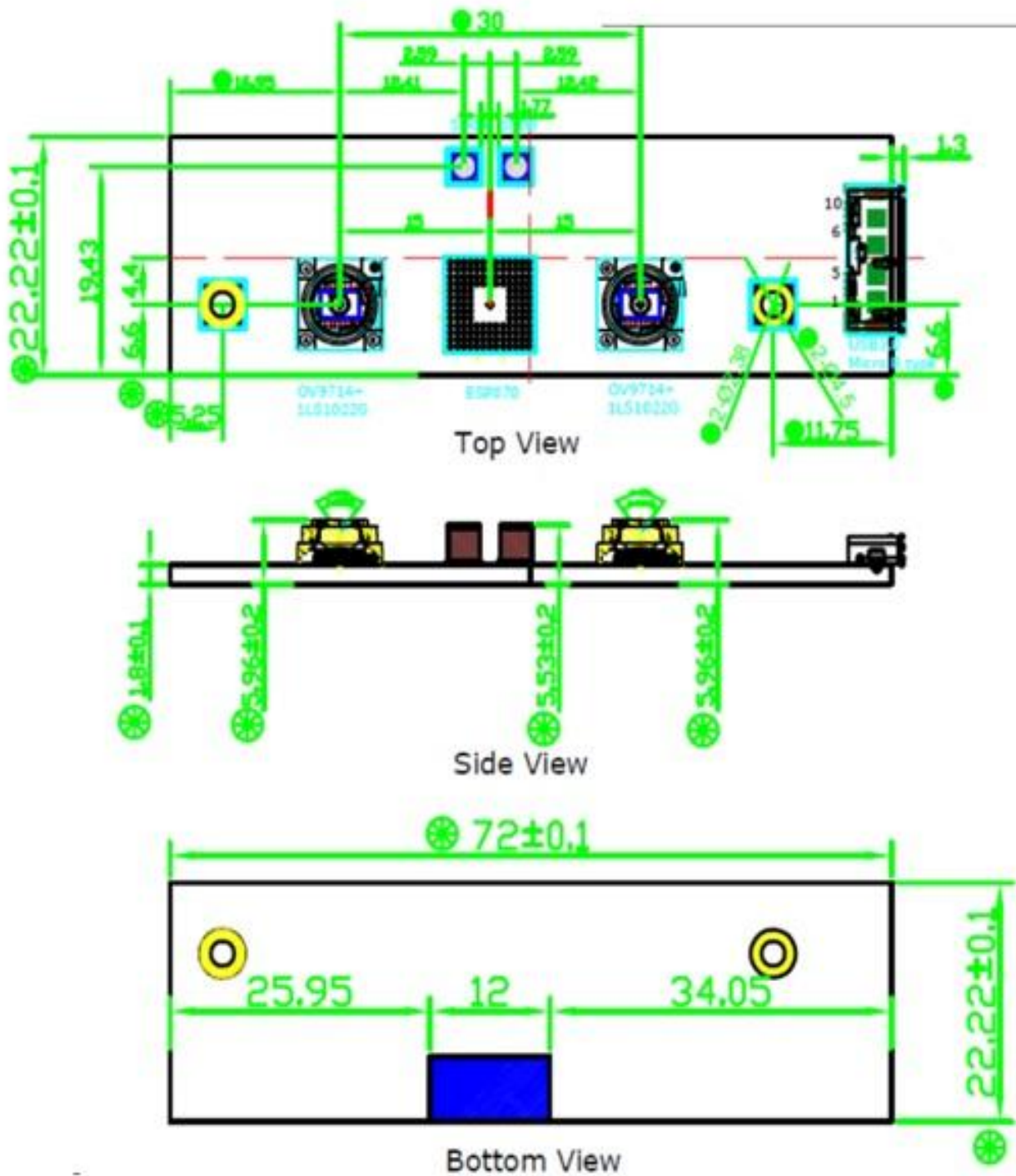
## 4 Key Parameters of Lens

**Table 6. Key Parameters of 1LS1022G**

<b>Vendor</b>	AOET	
<b>Model</b>	1LS1022G	
<b>FOV (Field of View)</b>	Vertical	42.0°
	Horizontal	63.2°
	Diagonal	71.4° ± 3%
<b>FNO</b>	2.8 ± 5%	
<b>Mount Dimension</b>	M6 x P0.35 mm	
<b>TV-Distortion</b>	≤ 1.5%	
<b>EFL (Effective Focal Length)</b>	3.11mm	
<b>CRA</b>	30°	
<b>Optical Size</b>	1/4"	
<b>Wavelength (normal cut filter)</b>	T abs>90%	430nm ~ 630nm
	T50%	650 ± 10nm
	T abs<3%	695nm ~ 1080nm

**Table 7. Spectrum Specification of IR Cute Filter**


## 5 Module Dimensions





## 6 Reference Documents

<b>Image IC</b>	Etron eSP870 datasheet revision 2.4 or above
<b>Sensor</b>	OmniVision OV9714 datasheet revision 1.0 or above
<b>Lens</b>	AOTE 1LS1022G datasheet