Soho Enterprise

Innovation for Innovators

Camera Module Product Line-up

Mar.2022(Rev.01)

双峰エンタープライズ株式会社

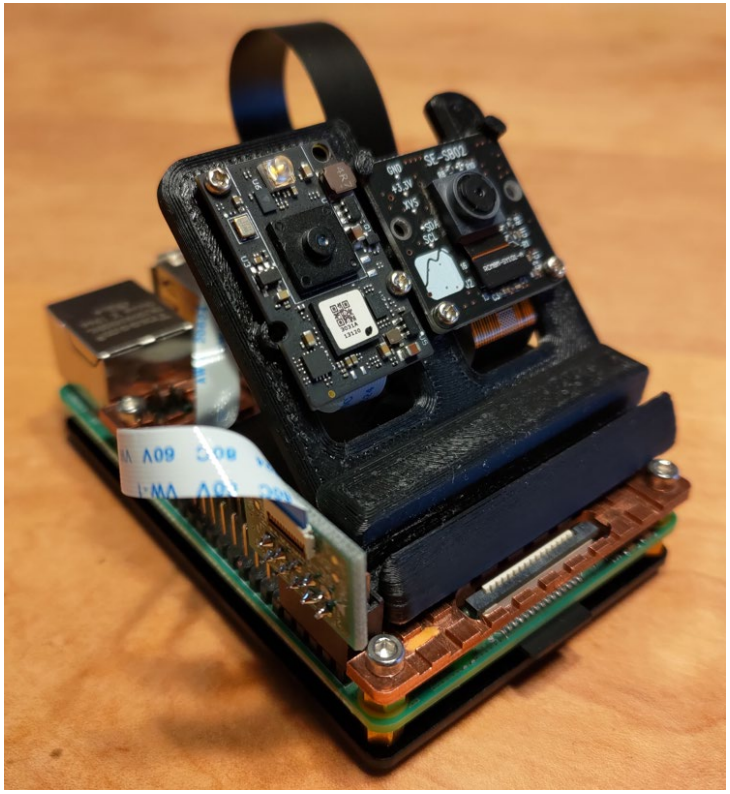
Soho Enterprise Ltd.

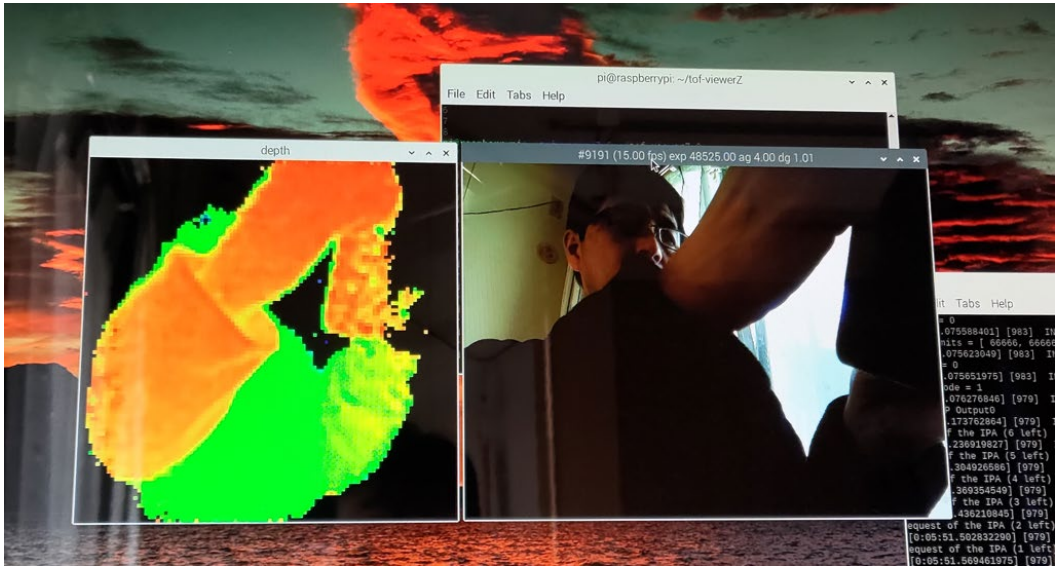
Jan. 2022 New Release

RGB-D evaluation Kit “SE-RGBD-EVK”

OPNOUS ToF system=OPNS3031A + SE camera board

Soho Enterprise
Innovation for Innovators



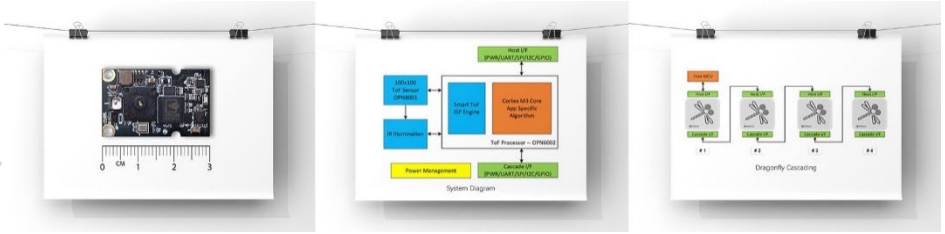


OPNOUS社製品情報
http://www.opnous.com/jp
http://www.opnous.com/jp/product/index/id/142.html

RGBカメラは弊社SEカメラボードのラインアップから選択可能です。
Ex. SE219FFW, SE219FE160, SE327MBD, …

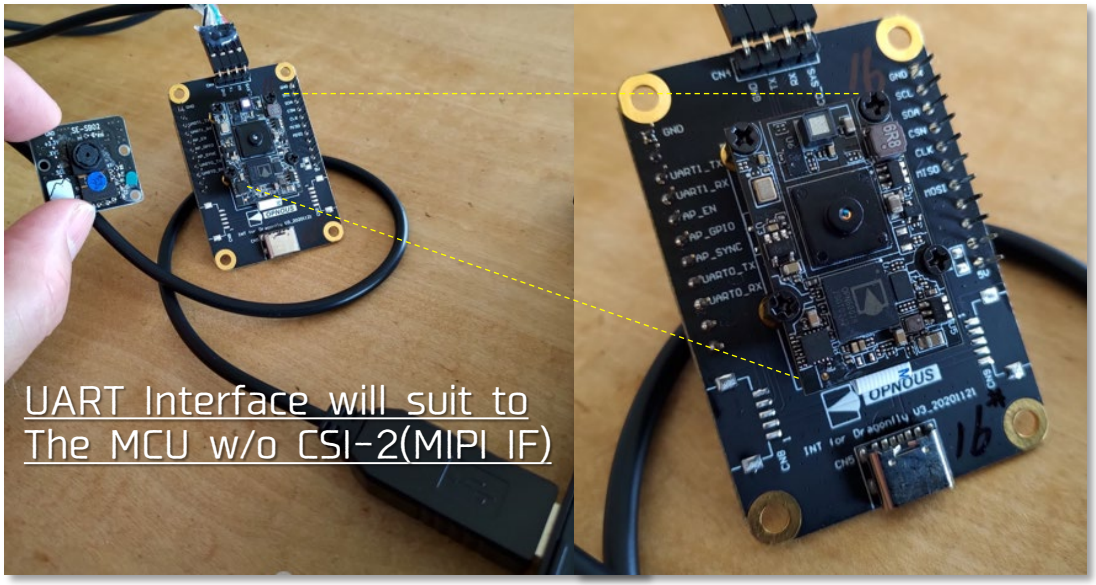
2021.5 New Release ③

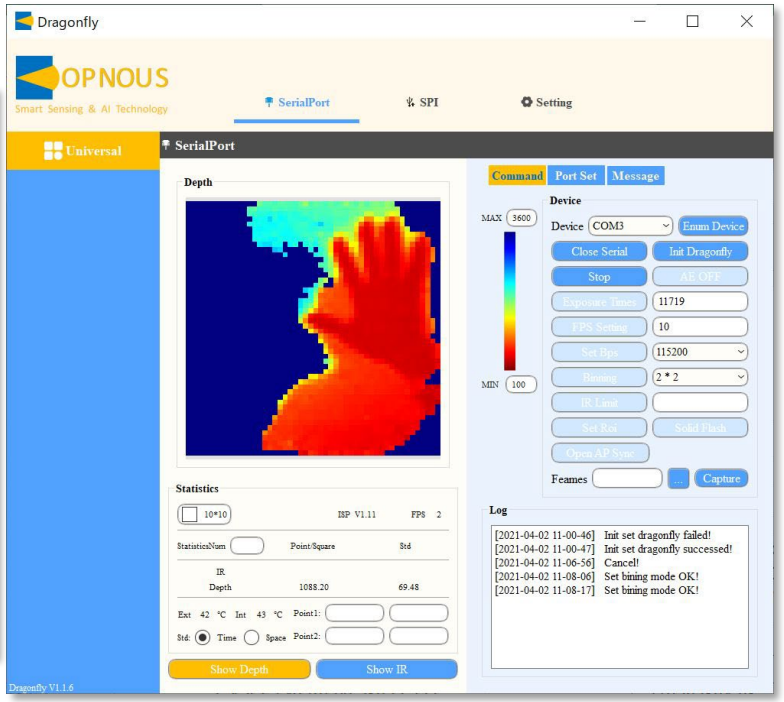
OPNOUS Dragonfly Demo Kit
Stand alone depth solution



OPNOUS
SMART SENSING & AI TECHNOLOGY

IR wave length (nm)	850 or 940
ToF resolution	Max 100 x 100
FoV (degree, H x V)	70 x 70
Accuracy	2%, typical
Frame rate (FPS)	up to 60
Power supply (V)	5
Communication Interface	UART/I2C/SPI/GPIO
Size (mm^3)	30 x 19 x 3.98





2021.6 New Release ④

Full HD High Sensitivity Camera w/ Sony IMX327

“SE327MBD” with M12 Lens.

Soho Enterprise
Innovation for Innovators

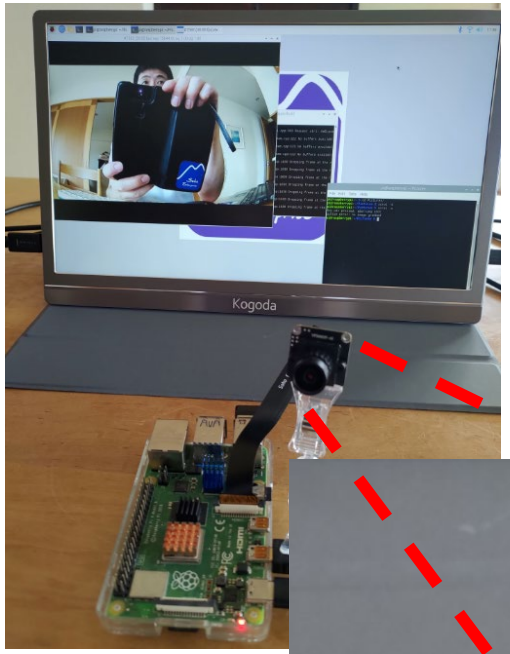
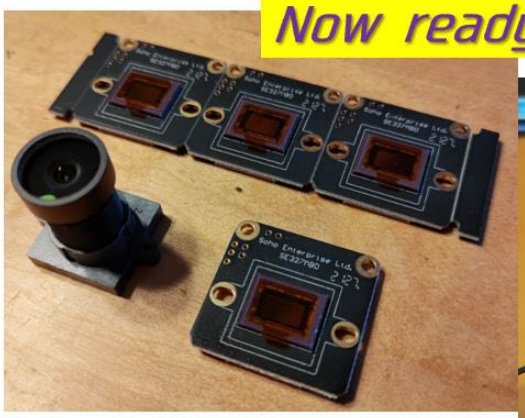
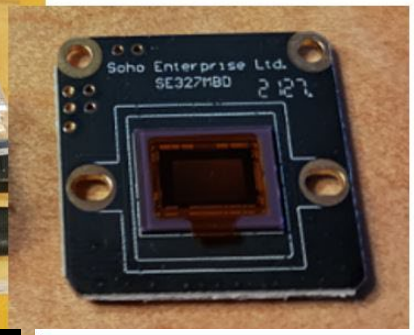


Image developed by libcamera (Raspi4)

Sony IMX327 Camera Board w/ M12 Lens Mount : SE327MBD

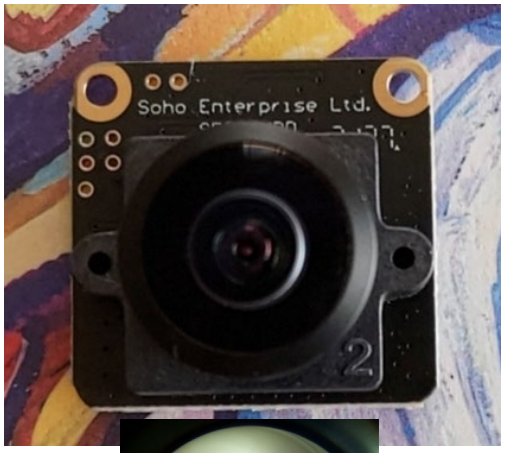
Now ready for Sample delivery!





- 1920x1080 Full HD with 30fps on Raspi.
- Excellent Image Quality by 2.9um□ pixel
- Various Lens can be applied

SE327MBD + Entaniya VR220



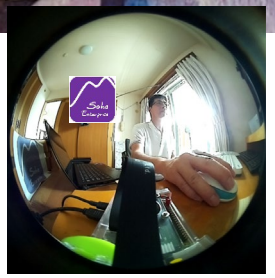
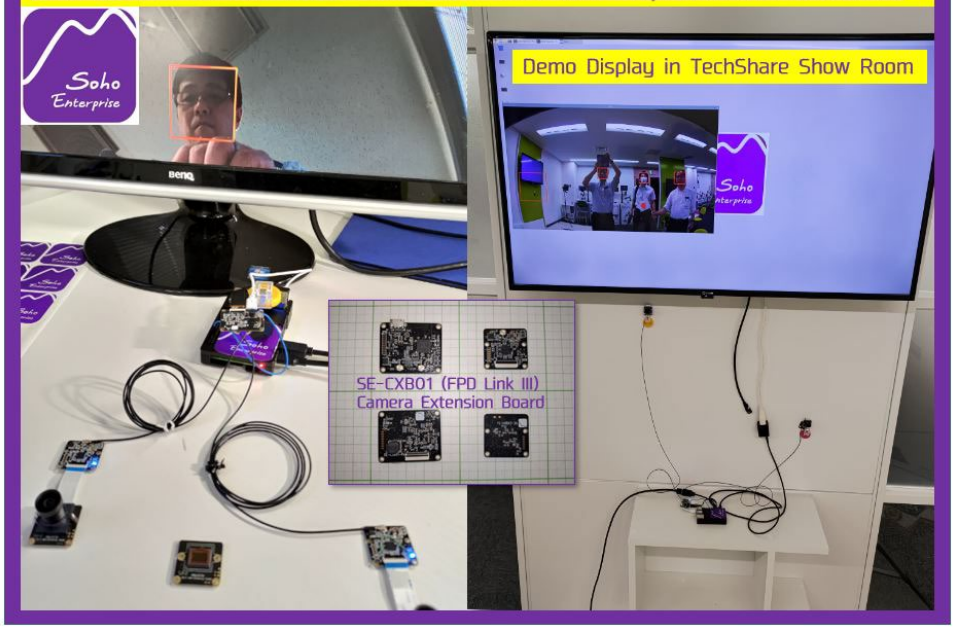


Image developed by libcamera

Full HD 30fps, FoV(D)=140°

SE327MBD + SE-CXB01(FPD Link III) + libcamera + OpenCV(face detection)

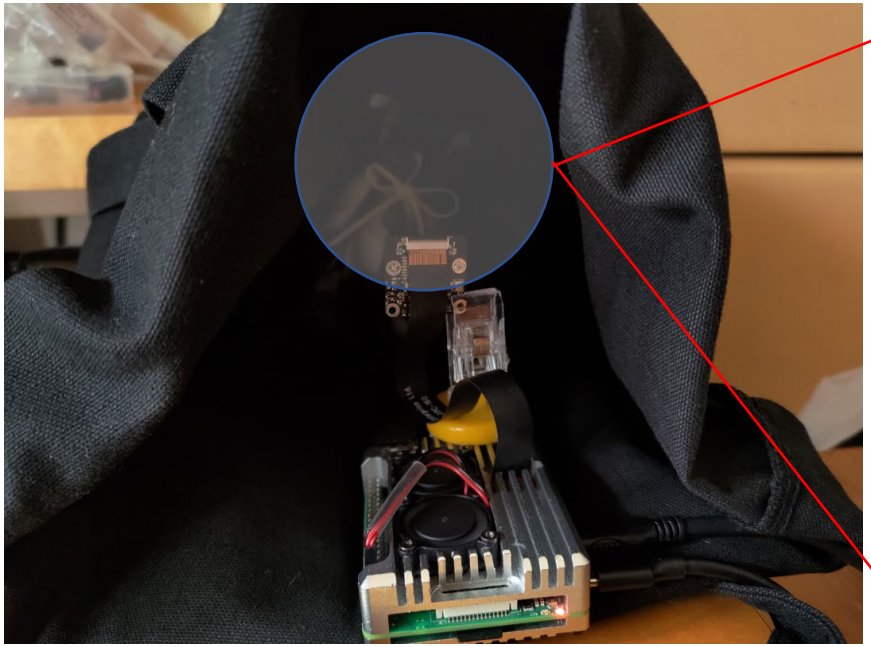


SE327MBD High Conversion Gain Mode

Captured by in-house RAW capture App.

(※Short exposure time, No gain applied to see the difference.)

Soho Enterprise
Innovation for Innovators



Low Conversion Gain (Standard)

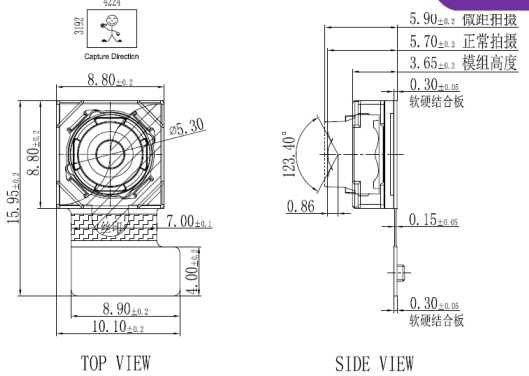
High Conversion Gain

2021.6 New Release ①

Tiny 4K camera on RaspberryPi

“SE258AF120” Lens Module of FoV(D)=120° with VCM Focus Driver

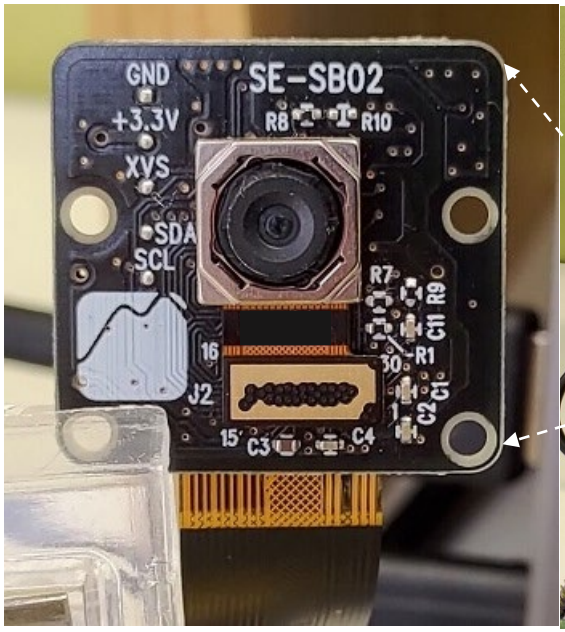
Almost the same size to IMX219 module



IMX258 is the 13Mpix 1.12um pixel Sensor from Sony.
We have made the imx258.c camera driver, libcamera related files, and now we can see the image processed by ISP.
We will implement the focus driver command soon.

Many lens option including SE258PKG will be launched soon.

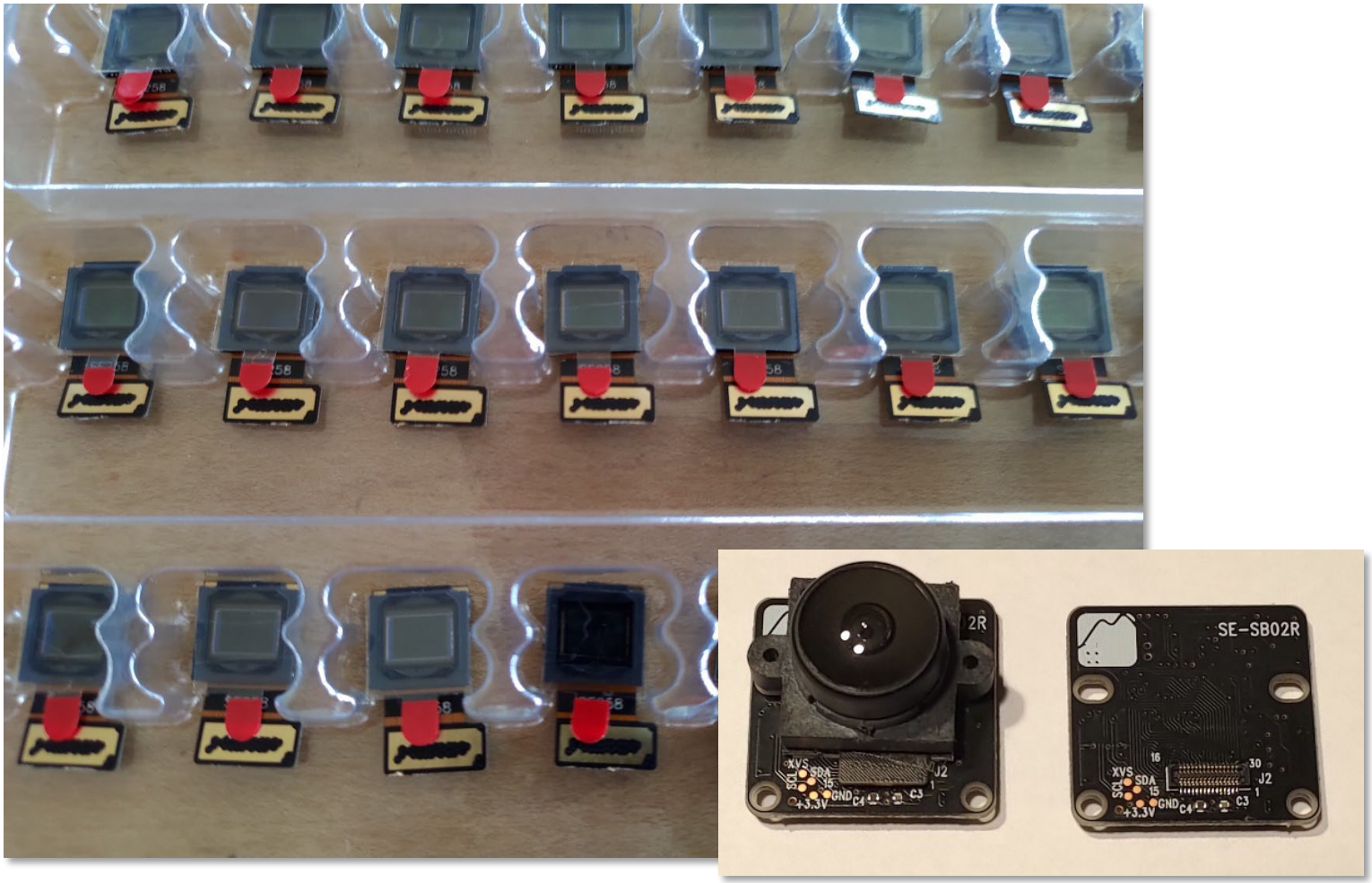
SE258AF120-00-CB02



2021.6 New Release ②

Tiny 4K camera on RaspberryPi

“SE258PKG-01” Lens-less module w/ cover glass

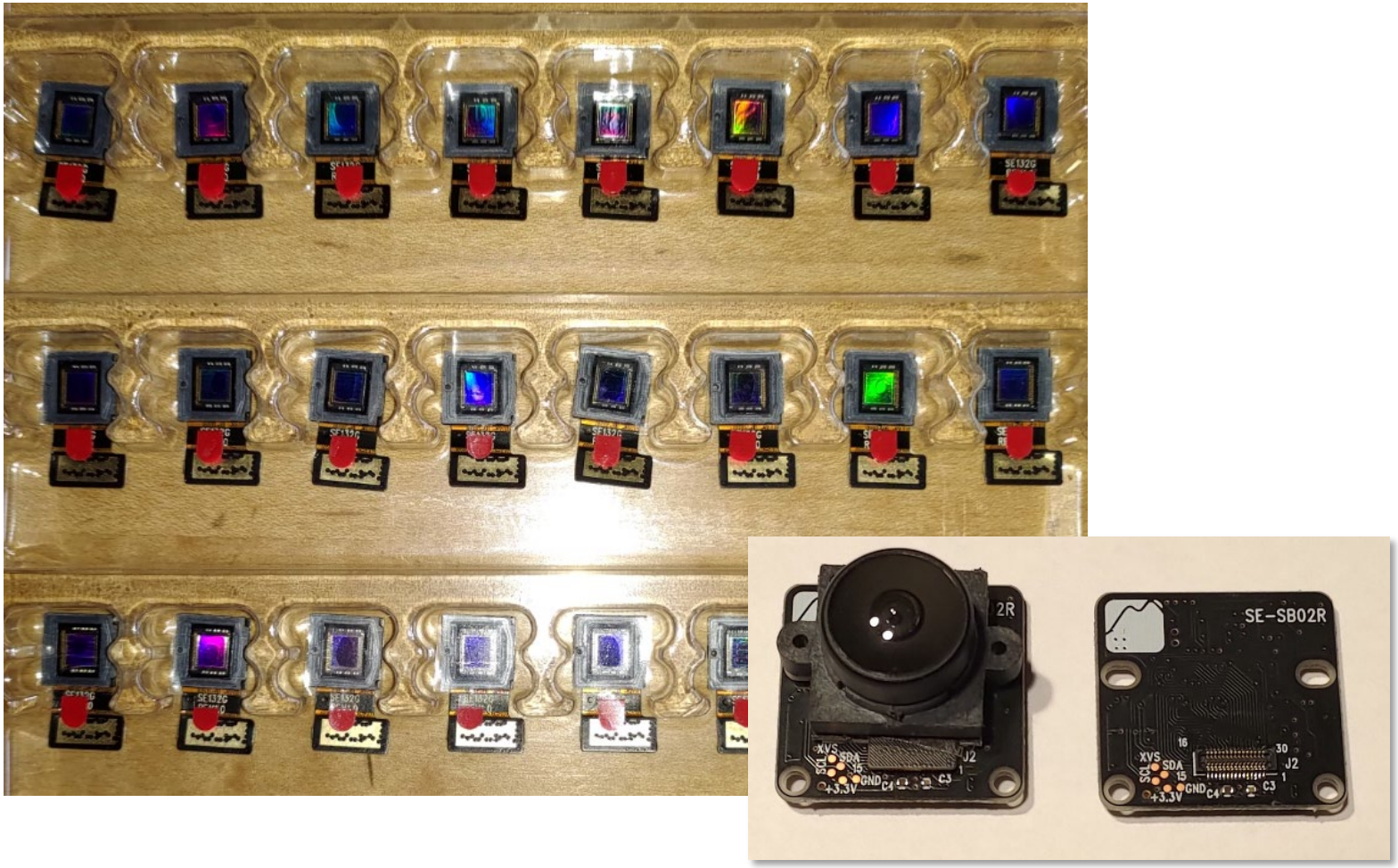


Many of M12(or other size) lens option can be attached by SE-SB02R

2021.6 New Release ③

1.3Mpix Global Shutter sensor module

“SE132GSPKG-01” Lens-less module w/ cover glass

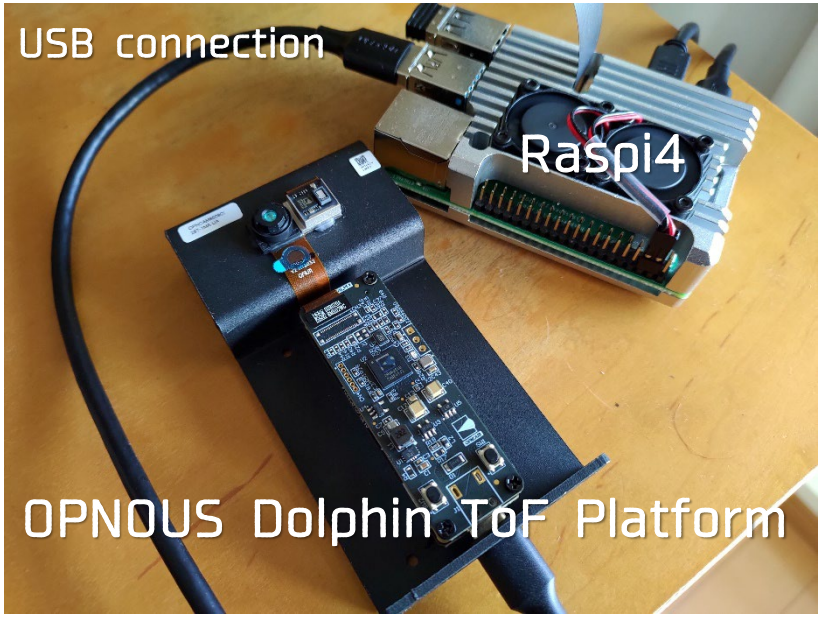


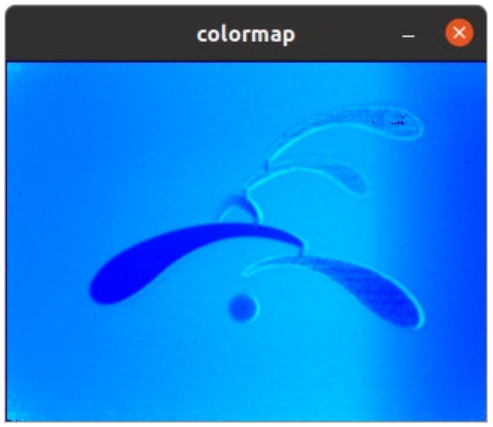
Many of M12(or other size) lens option can be attached by SE-SB02R

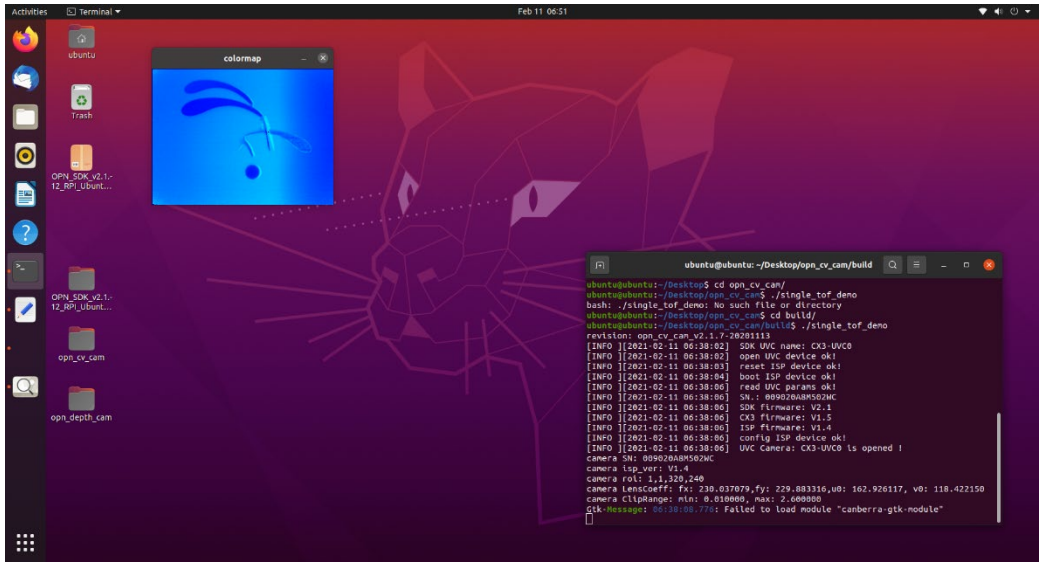
OPNOUS ToF Solution with high-speed ISP ASIC on Raspi4 Ubuntu20.04

Dolphin ToF Platform is working on RaspberryPi4 (OS: Ubuntu20.04)
On board ISP realizes “easy to launch the ToF solution” on the most popular SBC.

MIPI camera version is also available.

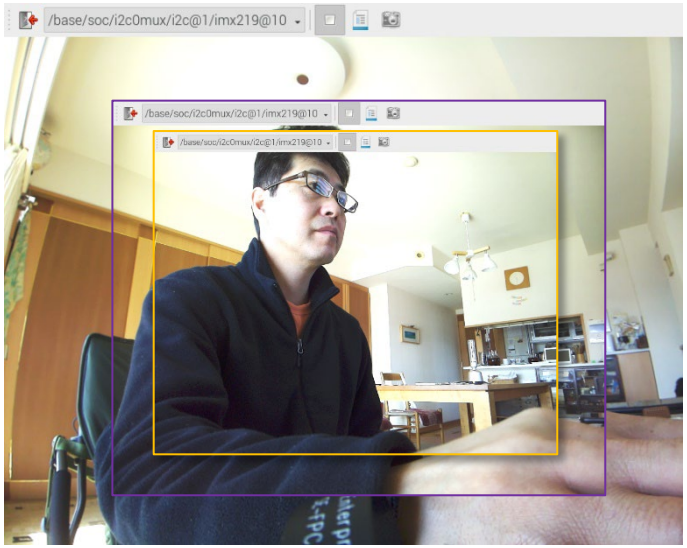


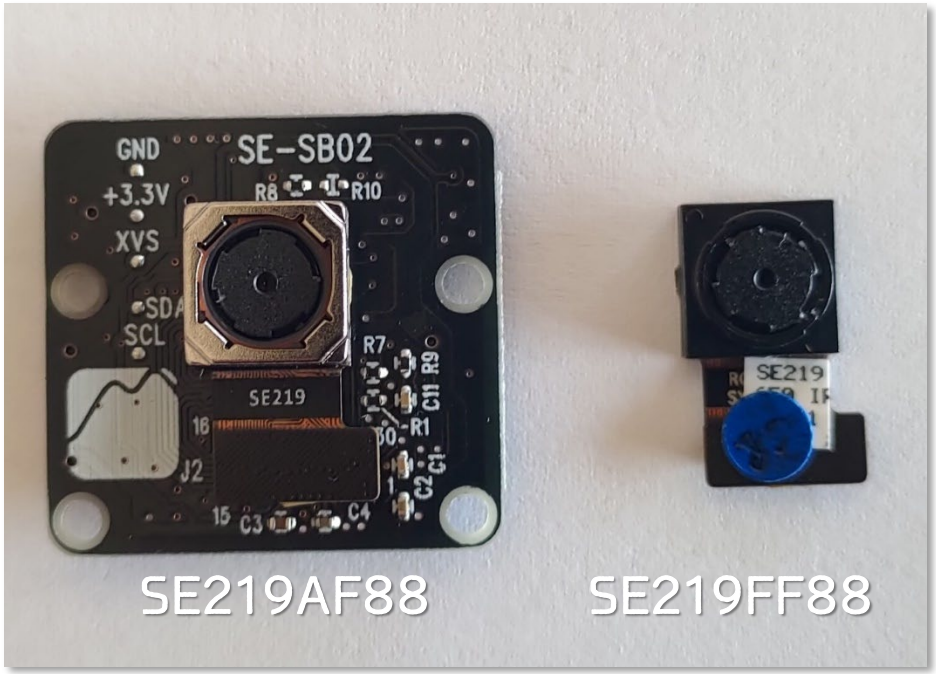


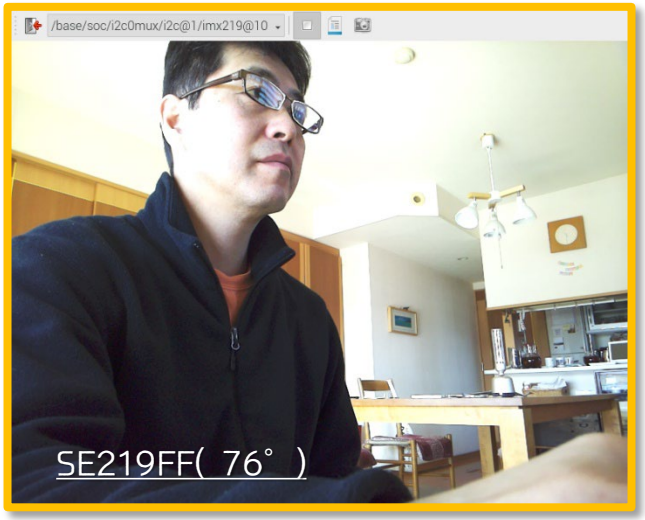


2021.2 New Release ①

SE219FF88 & SE219AF88
FoV(D)=88degree wide angle module

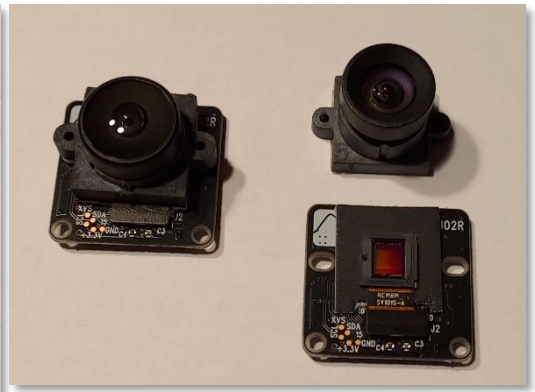


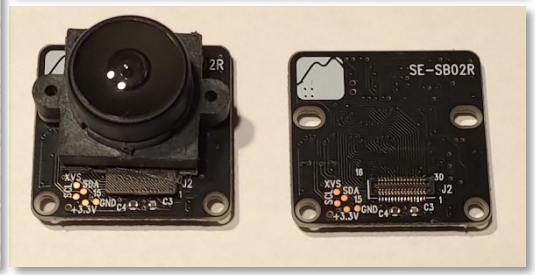




2021.2 New Release ②

SE219PKG-00/01
and SE-SB02R M12 lens holder attachable camera board

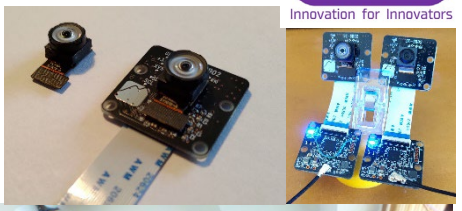


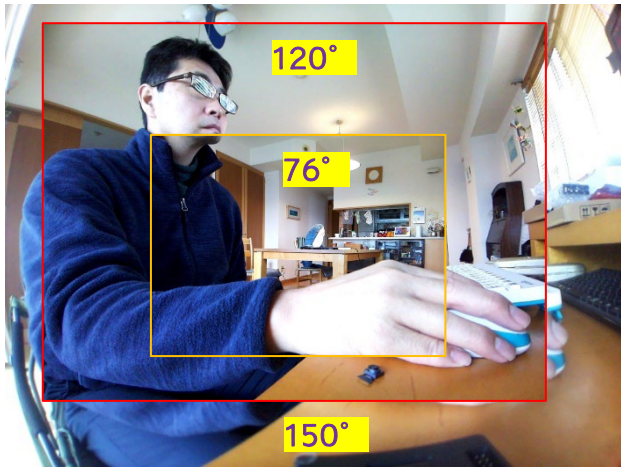


SBC向け小型レンズモジュール：SE219シリーズ　画角比較

Soho Enterprise
Innovation for Innovators

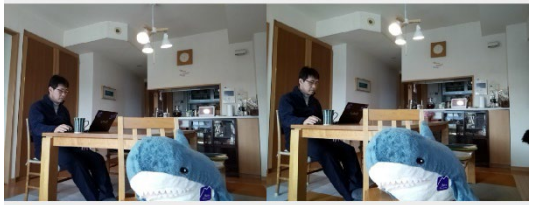
新たに対角150°の広角モジュール「SE219FF150-00」が
ラインアップに加わりました。





SBC向け小型レンズモジュール：SE219シリーズ
ステレオ３Dカメラ応用例

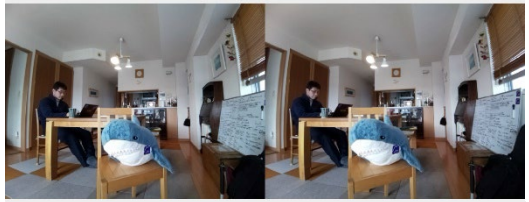
76°



Base Line 65mm

Base Line 85mm

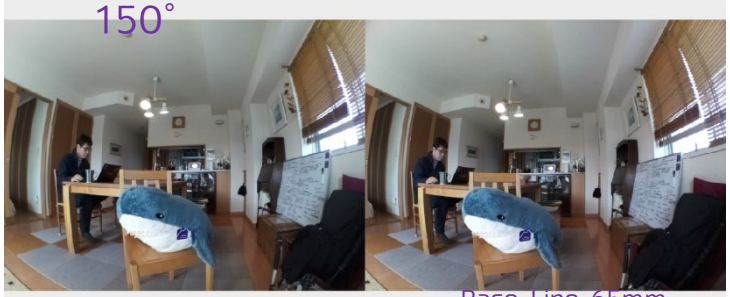
120°



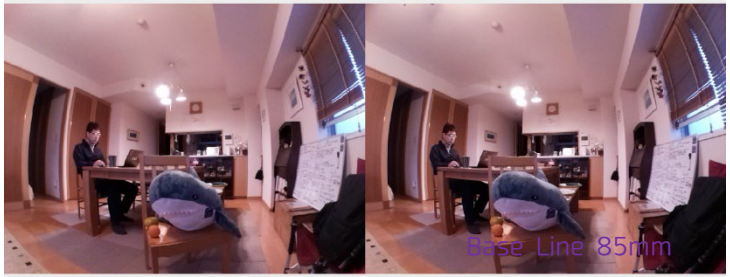
Base Line 65mm

Base Line 85mm

150°



Base Line 65mm



Base Line 85mm

160°

Base Line 65mm

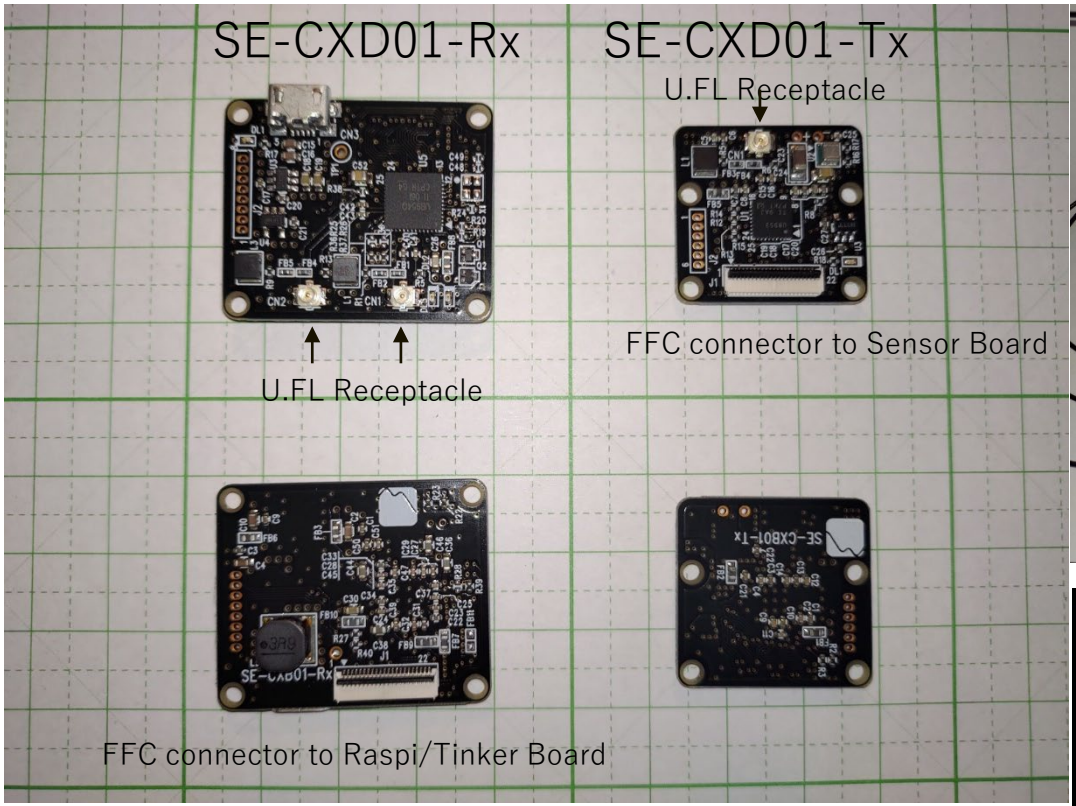
Base Line 85mm

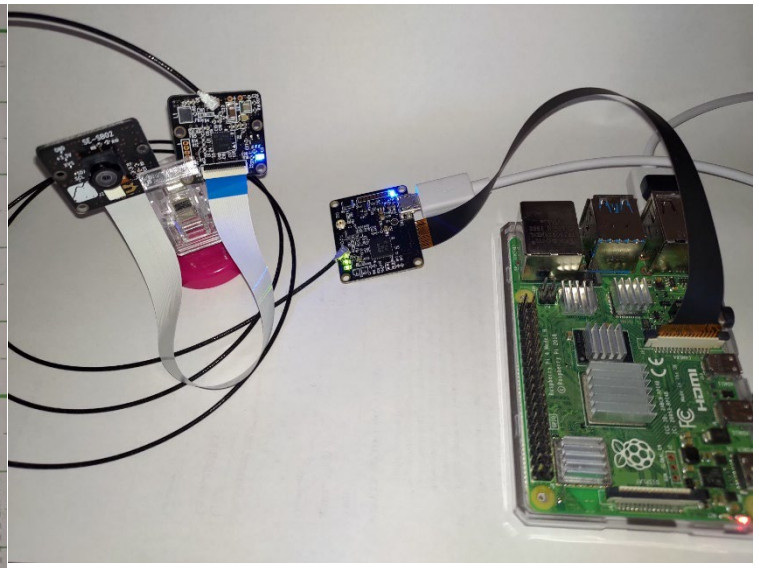
187°

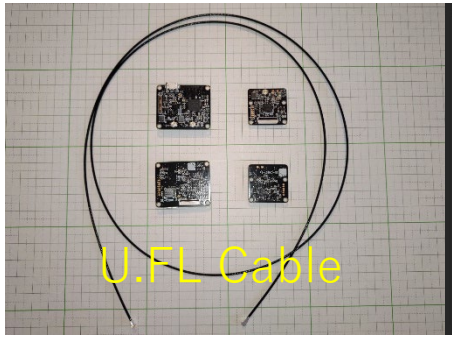
Base Line 65mm

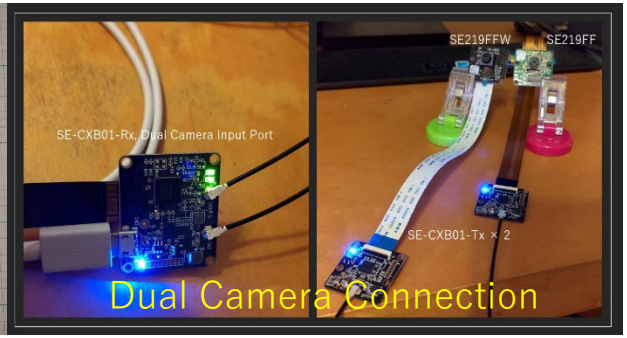
Base Line 85mm

SE-CXB01-Tx/Rx FPD LINK III MIPI EXTENTION BOARD

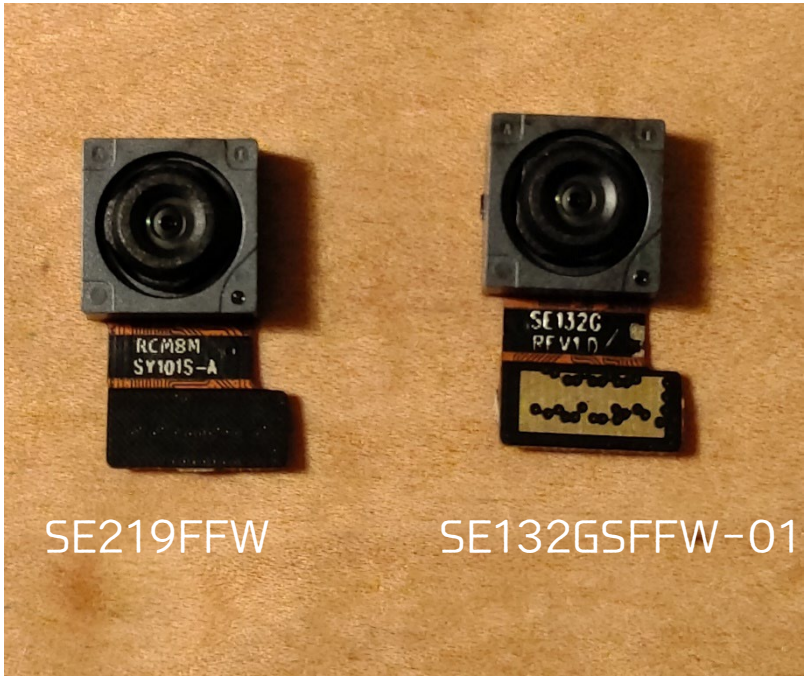


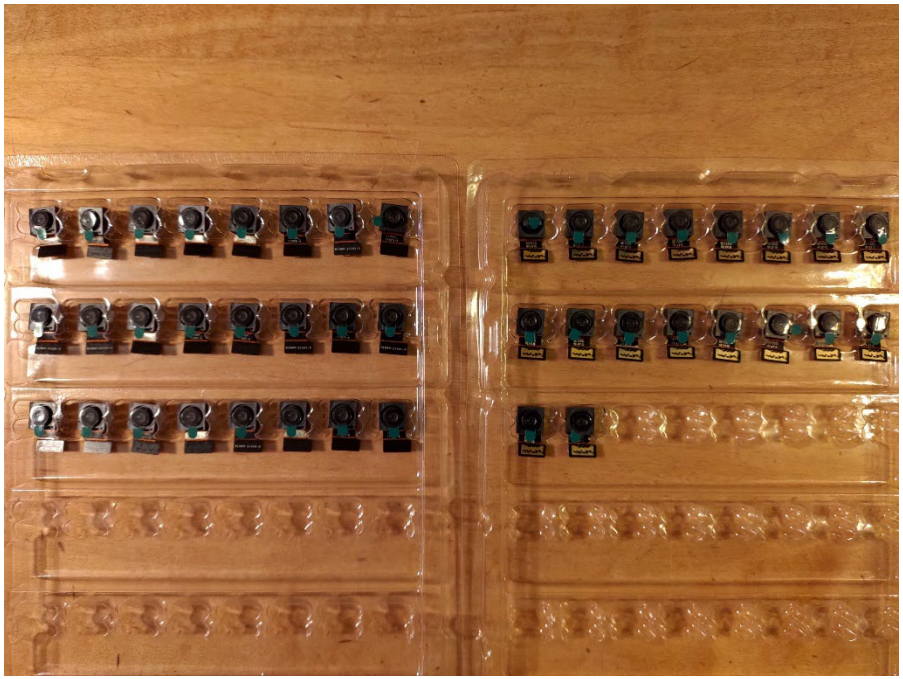






SE219FFW-00/01 and SE132GSW-01
FoV=120° 品のサンプル出荷開始



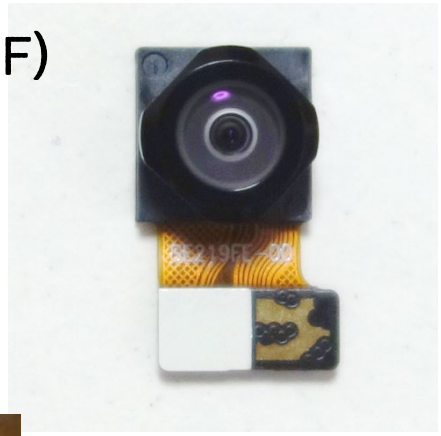


FoV(Field of View) comparison SE219FF & FE219FFW

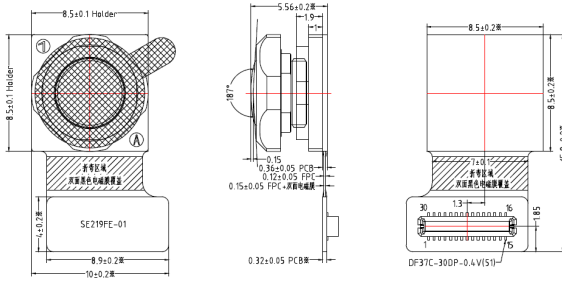
重ねて
比較

Vision System向けイメージセンサーモジュール
SE219FE-00-CB (w/ IRCF), SE219FE-01-CB (w/o IRCF)

あのIMX219が(x, y)投影サイズそのままにFoV=187°の
魚眼カメラになりました。
しかも厚みは6㎜以下。狭い場所に仕込むことができます。
従来製品(対角76°)に対し圧倒的な情報量の画像取得が可能です。



バンダイ様の人気商品
ガシャポンのザクヘッドに
ぴったり収まります。



chip 1 stop An Arrow Company
Physical Computing Lab by TechShare
にて販売中！

Soho Enterprise Ltd.

Fish Eye Camera Board w/ 8Mpix CIS for Single Board Computers

■SE219FE-00/01-CB

■**Ultra Wide View Angle: FoV =187° ±3°**
Suitable for wide angle image recognition usage in AIoT area.

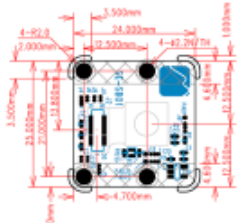
■ **Adopted the most mature image sensor for SBC.**
Sony IMX219PQH5-C

■ **Camera Driver with AE/AWB functions for "tinker board" is available.**
Processed in Embedded HW ISP, Full Size 20fps/FHD 30fps

■ **w/ IRCF(-00), w/o IRCF(-01) modules are available**

■ **Extensivity:**
FFC connector for MIPI CSI-2 4 lane connection for faster fps.

■ **Ready for use**
No need remodeling the module to get wide FoV

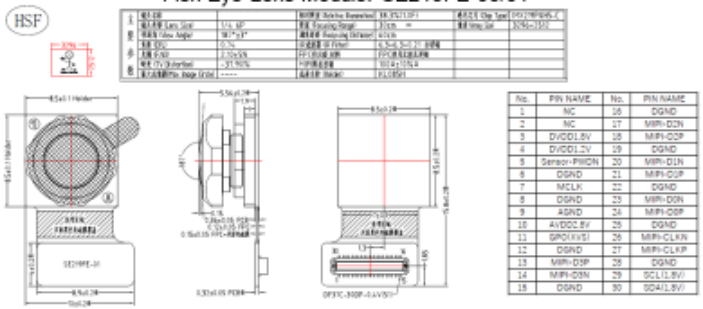


Board Dimension

■**Assumed application cases**

- ○Look down monitoring with few blind spots
- ○VR Stereo Vision
- ○Wide vision for Robots, AI speaker, any others
- ○Monitoring wildlife ecology, harm to agriculture
- ○Home-use video monitoring & recording
- ○360° monitoring on drones, robot cars, etc.
- ○Sports camera for tennis, volleyball, badminton, etc.

Fish Eye Lens Module: SE219FE-00/01



No.	PIN NAME	No.	PIN NAME
1	NC	16	DGND
2	NC	17	MIPI-D2N
3	DVDD1.8V	18	MIPI-D2P
4	DVDD1.2V	19	DGND
5	Sensor-PWDN	20	MIPI-D1N
6	DGND	21	MIPI-D1P
7	MCLK	22	DGND
8	DGND	23	MIPI-D0N
9	AGND	24	MIPI-D0P
10	AVDDC.8V	25	DGND
11	SPO(XVS)	26	MIPI-CLKN
12	DGND	27	MIPI-CLKP
13	MIPI-D3P	28	DGND
14	MIPI-D3N	29	SCL(1.8V)
15	DGND	30	SDA(1.8V)

Same (x, y) form factor & compatible pin assignment w/ the module on Raspberry Camera V2.1

Ver. 1.1.0

Key Specifications SE219FE-00/01-CB

Image Sensor	Product Code: IMX219PQH5-C	Manufacturer	Sony Back-side illuminated CMOS image sensor
		Pixel size	1.12um x 1.12um
		Active Image Area	3280 x 2464 8Mpix
		Optical Size	Type 1/4 Diagonal 4.60mm
		Operation Temperature	-20~60°C Function guarantee -20~60°C Performance guarantee
		Storage Temperature	-30~80°C
Module	Lens	Configuration	Type 1/4, 6P
		FoV	187° ±3°
		F No.	2.10±5%
		Focus range	30cm ~ Infinity, Adjusted at 60cm when shipped.
	Connector	30pin	Compatible w/ Raspi Camera v2.1 module
	Size	8.5mm*8.5mm*5.56mm	Lens Holder size. Same (x, y) size to Raspi module
	Weight	0.4g	
	Power Supply	Analog	2.8V±0.2V
		Digital	1.2V±0.12V
		IO	1.8V±0.18V
Board	Size	25mm* 24mm	Almost same size and compatible position for screw holes with RaspberryPi camera V2.1.
	Connector	1.0mm pitch 15pin	For Tinker board, RaspberryPi
		0.5mm pitch 22pin	RaspberryPi0, Raspi compute module, etc.
	Output	I/O Format	Support MIPI CSI-2 2lane and 4 lane
		Maximum speed	Full size: 30fps, FHD: 60fps, 720P: 180fps (MIPI 4 lane mode)
	Power Supply	3.3V±0.3V	Generate Analog 2.8V by on-board LDO
			Generate Digital 1.2V by on-board DD-converter.
			Generate Analog 1.8V by on-board LDO
			Generate AF 2.8V by on-board optional LDO

Why are the SE camera boards suitable for AIoT vision processing applications?

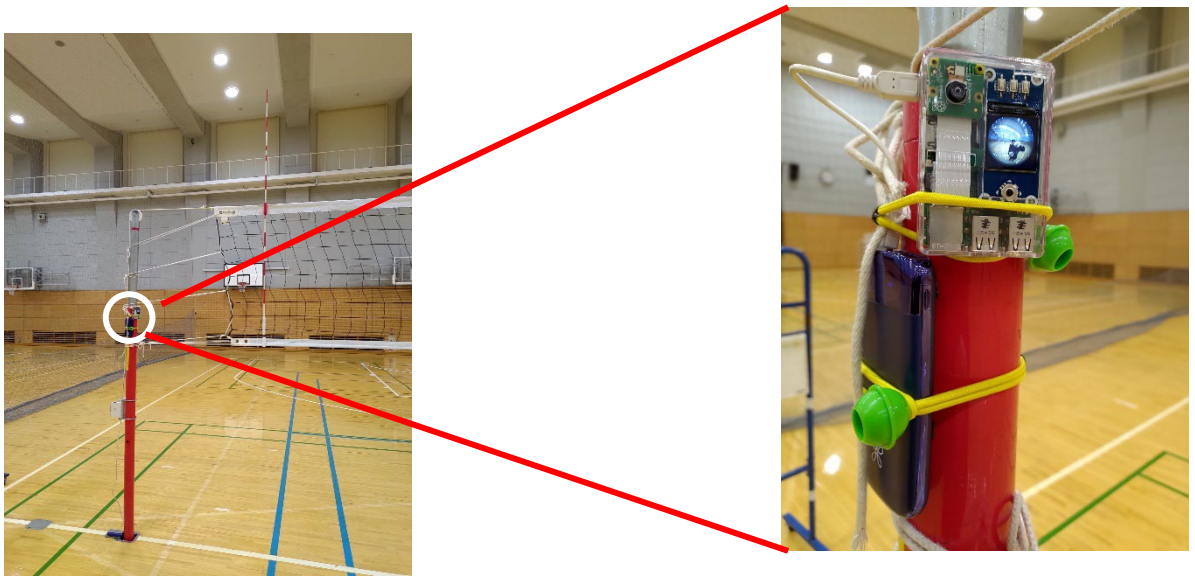
1. ***Good image quality***
   The SE camera series uses a high-quality Sony image sensors of better SNR.
2. ***Ready to use on tinker board and other SBCs***
   Camera drivers are ready. Easy to customize for PoC prototyping
3. ***Variety of Options***
   Wide variety of options for resolution, global shutter, wide FoV lens, focus driver, etc.
4. ***Low Latency, RAW image***
   Suitable for real-time autonomous control system
5. ***Affordable for everyone***
   Pricing that individuals can purchase from a single item in line with the corporate philosophy of *helping to create open innovation.*

■**Further Information:**
https://soho-enterprise.com/
https://www.visionproc.org/index.php

Ver. 1.1.0

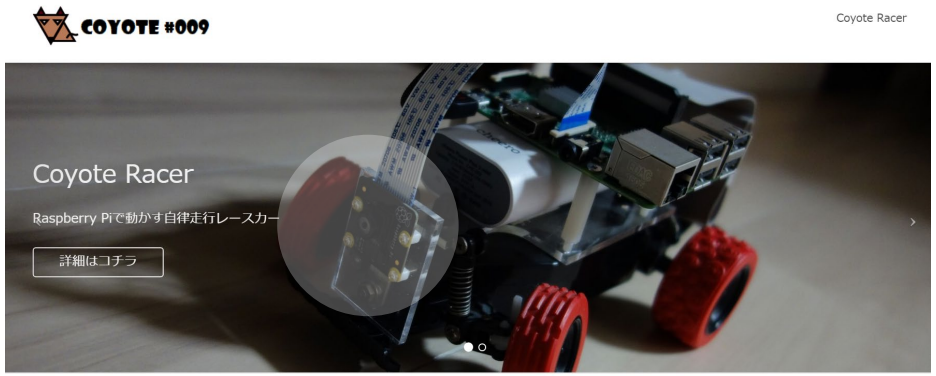
魚眼カメラ応用事例：detect_cat（アプリSW配布中。）

魚眼カメラ応用事例：**魚眼スポーツカム**



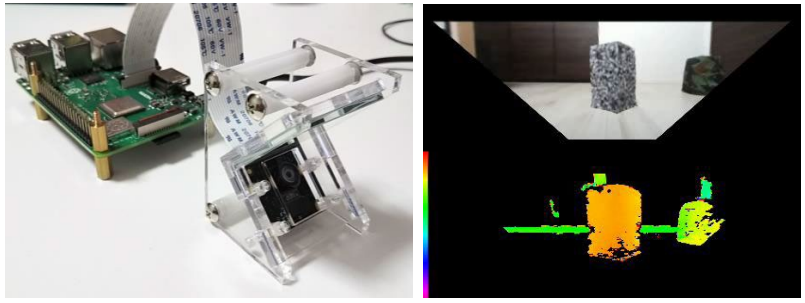
広角レンズモジュールのVision Processing適用事例

認識系アプリ

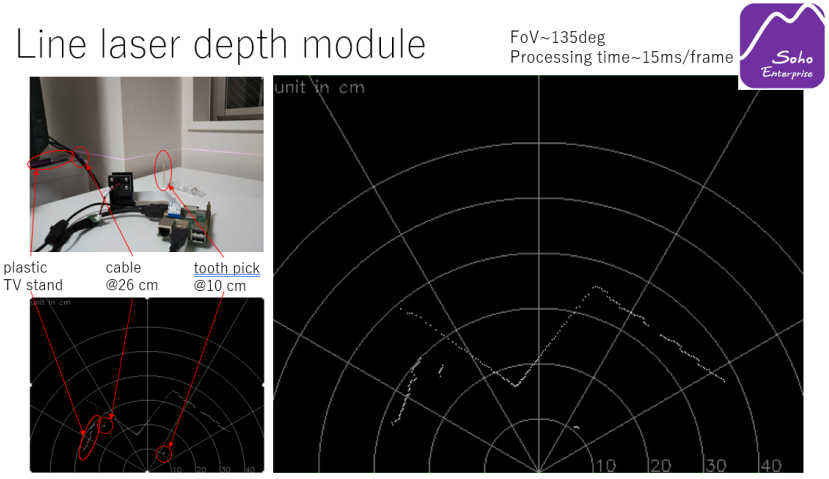


CQ出版社 Interface
2020年3月号に特集記事掲載→

測距系アプリ



超広角応用ステレオ測距

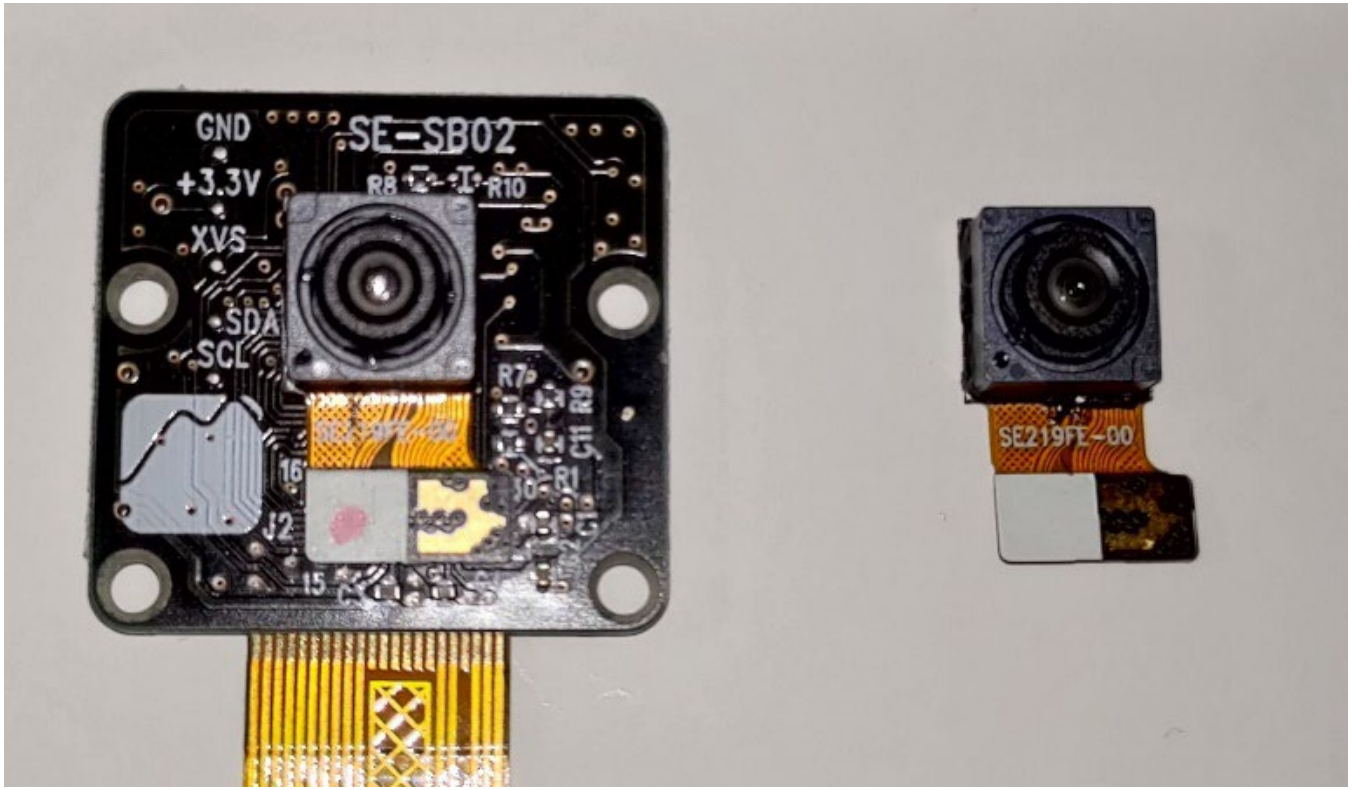


ラインレーザー＋単眼ステレオ測距
132°広角レーザーとの組み合わせ

FoV=120°固定フォーカスカメラ

SE219FFW-00-CB (w/ IRCF), SE219FFW-01-CB (w/o IRCF)

想定適用例：広角3D動画、顔認識、ドアホン、見守り監視、自律移動ロボットのセンシングなど

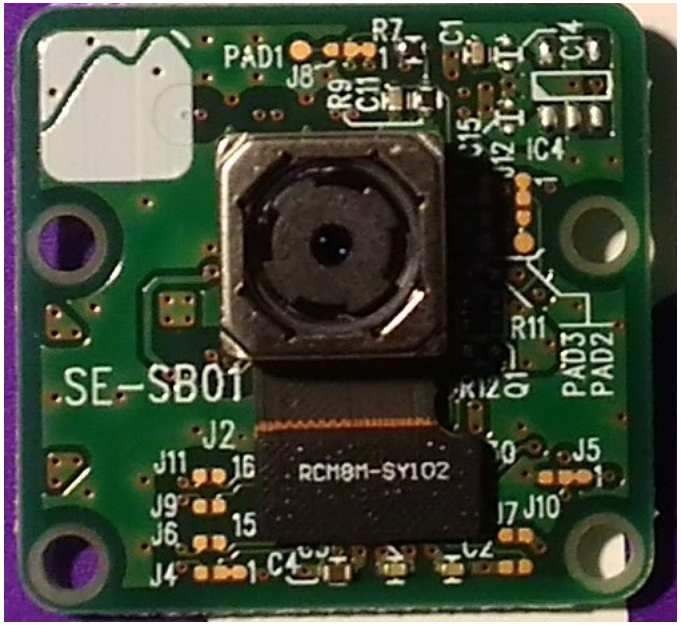


Vision System向けイメージセンサーモジュール

SE219AF-00-CB (w/ IRCF), SE219AF-01-CB (w/o IRCF)

想定適用例：AR/VRゴーグル用カメラ、スマートグラス、ウェアラブルカメラ

FoV=76°、待望のフォーカスドライバ内蔵のIMX219カメラモジュール
3㎝～無限遠(要調整）でフォーカス合わせが可能。
シャープなイメージのマクロ撮影において特に性能を発揮
Tinker BoardのカメラドライバーにAF機能実装検討中



FoV=160° 魚眼カメラ
SE219FE160-00-CB (w/ IRCF), SE219FE160-01-CB (w/o IRCF)

想定適用例：広角3D動画、ドアホン、見守り監視、自律移動ロボットのセンシングなど。

SE Camera Board Series Product Brochure

Soho Enterprise Ltd.

Fish-Eye lens nodule w/ 8Mpix CIS for Single Board Computers

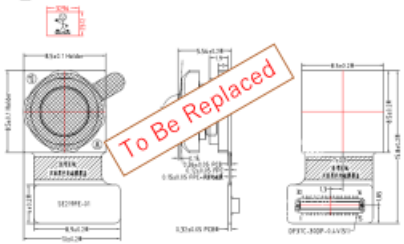
■SE219FE160-00/01

■**Ultra Wide View Angle: FoV −160° ±TBD°**
Suitable for wide angle image recognition usage in AIoT area.

■ **Adopted the most mature image sensor for SBC.**
Sony IMX219PQH5-C

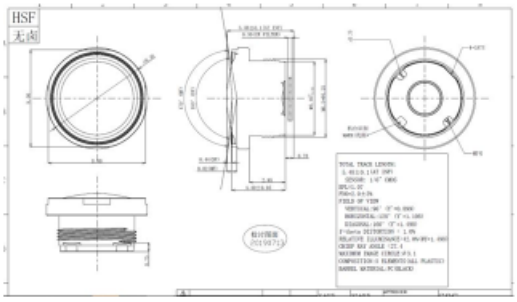
■ **w/ IRCF(-00), w/o IRCF(-01) modules are available**

■ **Extensivity:**
FFC connector for MIPI CSI-2 4 lane connection for faster fps.



Pin Assignment

No.	PIN NAME	No.	PIN NAME
1	NC	16	DGND
2	NC	17	MIPI-D0N
3	DVDD1.8V	18	MIPI-D0P
4	DVDD1.2V	19	DGND
5	Sensor-PWDN	20	MIPI-D1N
6	DGND	21	MIPI-D1P
7	MCLK	22	DGND
8	DGND	23	MIPI-D2N
9	AGND	24	MIPI-D2P
10	AVDD2.8V	25	DGND
11	GPIO/VSYNC	26	MIPI-CLKN
12	DGND	27	MIPI-CLKP
13	MIPI-D3P	28	DGND
14	MIPI-D3N	29	SCL/1.8V/
15	DGND	30	SDA/1.8V/



Imaging area
&
Image circle

■**Assumed application cases**
- ○Look down monitoring with few blind spots
- ○VR Stereo Vision
- ○Wide vision for Robots, AI speaker, any others
- ○Monitoring wildlife ecology, harm to agriculture
- ○Home-use video monitoring & recording

Ver. 0.1.0

SE Camera Board Series Product Brochure

Key Specifications SE219FE-00/01-CB

Image Sensor	Product Code: IMX219PQH5-C	Manufacturer	Sony Back-side illuminated CMOS image sensor
		Pixel size	1.12um x 1.12um
		Active Image Area	3280 x 2464 8Mpix
		Optical Size	Type 1/4 Diagonal 4.60mm
		Operation Temperature	-20~60°C Function guarantee -20~60°C Performance guarantee
		Storage Temperature	-30~80°C
Module	Lens	Configuration	Type 1/6, 5P
		FoV	160° ±(TBD)°
		F No.	2.0±5%
		Focus range	30cm ~ Infinity, Adjusted at 60cm when shipped.(TBD)
	Connector	30pin	Compatible w/ Raspi Camera v2.1 module
	Size	8.5mm*8.5mm*TBDmm	Lens Holder size. Same (x, y) size to Raspi module
	Weight	0.4g(Tentative)	
	Power Supply	Analog	2.8V±0.2V
		Digital	1.2V±0.12V
		IO	1.8V±0.18V
Board (option)	Size	25mm* 24mm	Almost same size and compatible position for screw holes with RaspberryPi camera V2.1.
	Connector	1.0mm pitch 15pin	For Tinker board, RaspberryPi
		0.5mm pitch 22pin	RaspberryPi0, Raspi compute module, etc.
	Output	I/O Format	Support MIPI CSI-2 2lane and 4 lane
		Maximum speed	Full size: 30fps, FHD: 60fps, 720P: 180fps (MIPI 4 lane mode)
	Power Supply	3.3V±0.3V	Generate Analog 2.8V by on-board LDO
			Generate Digital 1.2V by on-board DD-converter.
			Generate Analog 1.8V by on-board LDO
			Generate AF 2.8V by on-board optional LDO

Why are the SE camera boards suitable for AIoT vision processing applications?

1. ***Good image quality***
   The SE camera series uses a high-quality Sony image sensors of better SNR.
2. ***Ready to use on tinker board and other SBCs***
   Camera drivers are ready. Easy to customize for PoC prototyping
3. ***Variety of Options***
   Wide variety of options for resolution, global shutter, wide FoV lens, focus driver, etc.
4. ***Low Latency, RAW image***
   Suitable for real-time autonomous control system
5. ***Affordable for everyone***
   Pricing that individuals can purchase from a single item in line with the corporate philosophy of *helping to create open innovation.*

■**Further Information:**
https://soho-enterprise.com/
https://www.visionproc.org/index.php

Ver. 0.1.0

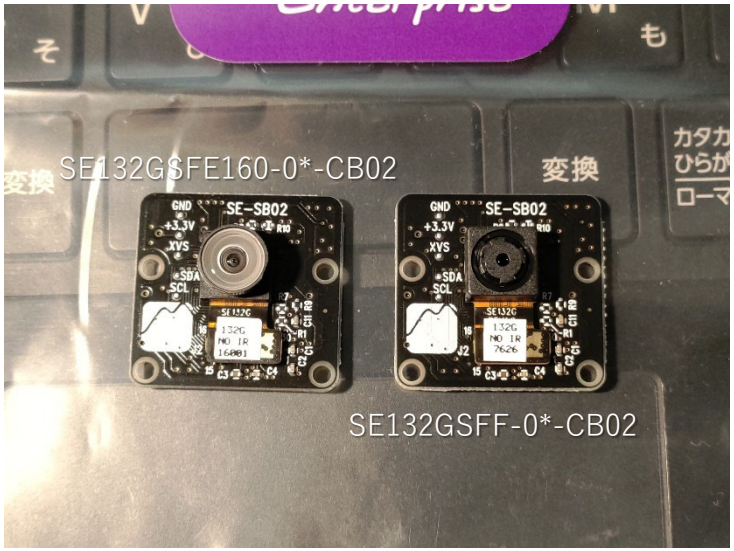
New Release
Vision System向けイメージセンサーモジュール

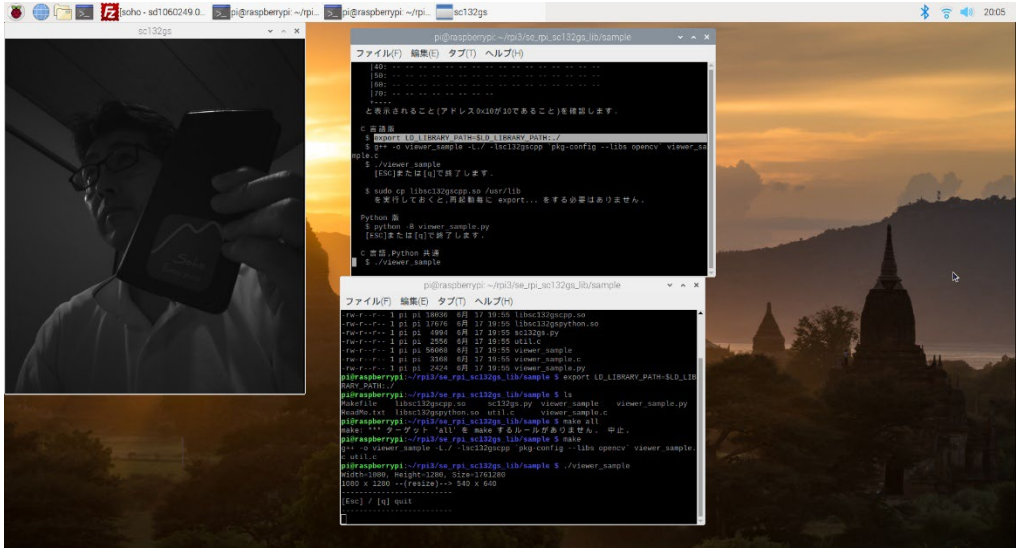
SE132GSFF-00/01-CB02
SE132GSFE160-00/01-CB02

中国SMARTSENS TECHNOLOGY社の最新Global Shutter Image Sensorをモジュール化しました。

最高品質の台湾TSMC社で製造される裏面照射型イメージセンサーです。
画素サイズ2.7um, 1,080x1,280=1.3Mpixel
SE219シリーズと同じ光学サイズ1/4”型で豊富なレンズバリエーションが用意できます。

・120fpsの高速撮像
・赤外領域の感度が向上
・RaspberryPiとの接続を確認済み
・FoV=120°、150度°187°等計画中



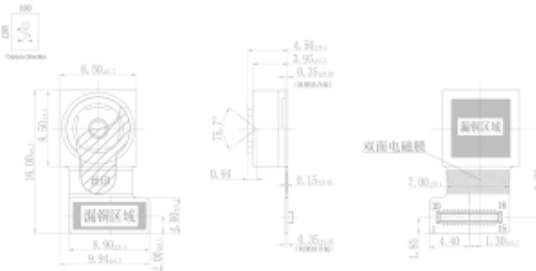


Soho Enterprise Ltd.

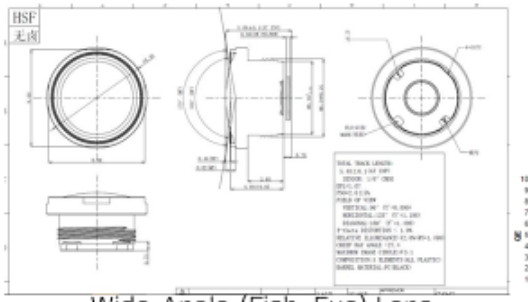
Fish-Eye lens module w/ 1.3Mpix Global Shutter CIS for SBCs

■SE132GSFF/FFW/FE160/PKG-01

- **Many of lens option**
- **Adopted the best-in-class global shutter CMOS image sensor of BSI.**
  Smartsens SC132GS
- **Customized Optical Filters (IRCF, BPF) will be available**
- **Extensivity:**
  MIPI CSI-2 4 lane connection for faster fps.

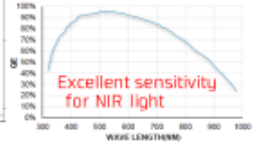


No.	PIN NAME	No.	PIN NAME
1	LED-STROBE	16	DGND
2	TRIGS	17	MIPI-D2N
3	DVDD1.8V	18	MIPI-D2P
4	DVDD1.2V	19	DGND
5	SENSOR-PDWN	20	MIPI-D1N
6	DGND	21	MIPI-D1P
7	MCLK	22	DGND
8	DGND	23	MIPI-D0N
9	AGND	24	MIPI-D0P
10	AVDD2.8V	25	DGND
11	TRIGL/FSYNC	26	MIPI-CLKN
12	DGND	27	MIPI-CLKP
13	MIPI-D3P	28	DGND
14	MIPI-D3N	29	SCL(1.8V)
15	DGND	30	SDA(1.8V)



Wide Angle (Fish-Eye) Lens

Imaging area
& Image circle



■**Assumed application cases**
- ○Wide vision for Robots of autonomous driving
- ○3D sensing with NIR structured light

Ver. 0.9.3

Key Specifications SE132GSFE160-00/01

Image Sensor	Product Code: SC132GS	Manufacturer	Smartsens Back-side illuminated, Global Shutter
		Pixel size	2.7um x 2.7um
		Active Image Area	1080 x 1280 1.3Mpix
		Optical Size	Type 1/4 Diagonal 4.53mm
		Operation Temperature	-40~85℃ Function guarantee -20~60℃ Performance guarantee
		Maximum Frame Rate	120fps
Module	Lens	Configuration	Type 1/6, 5P
		FoV	160° ±(TBD)°
		F No.	2.0±5%
		Focus range	30cm ~ Infinity, Adjusted at 60cm when shipped.(TBD)
	Connector	30pin	Compatible w/ Raspi Camera v2.1 module
	Size	10.5*10.5*6.3mm(TBD)	Lens Holder size. 8.5 * 8.5 * 6.3mm by COB
	Weight	0.4g(Tentative)	
	Power Supply	Analog	2.5V±0.1V
		Digital	1.2V±0.06V
		IO	1.8V±0.1V
Board (option)	Size	25mm* 24mm	Almost same size and compatible position for screw holes with RaspberryPi camera V2.1.
	Connector	1.0mm pitch 15pin	For Tinker board, RaspberryPi
		0.5mm pitch 22pin	RaspberryPi0, Raspi compute module, etc.
	Output	I/O Format	Support MIPI CSI-2 2lane and 4 lane
		Maximum speed	Full size: 120fps (MIPI 4 lane mode)
	Power Supply	3.3V±0.3V	Generate Analog 2.8V by on-board LDO
			Generate Digital 1.2V by on-board DD-converter.
			Generate Analog 1.8V by on-board LDO
			Generate AF 2.8V by on-board optional LDO

Why are the SE camera boards suitable for AIoT vision processing applications?

1. *Good image quality*
   The SE camera series uses a high-quality image sensors of better SNR.
2. *Ready to use on tinker board and other SBCs*
   Camera drivers are ready. Easy to customize for PoC prototyping
3. *Variety of Options*
   Wide variety of options for resolution, global shutter, wide FoV lens, focus driver, etc.
4. *Low Latency, RAW image*
   Suitable for real-time autonomous control system
5. *Affordable for everyone*
   Pricing that individuals can purchase from a single item in line with the corporate philosophy of *helping to create open innovation.*

■**Further Information:**
https://soho-enterprise.com/
https://www.visionproc.org/index.php

Ver. 0.9.3

OPNOUS Full Product

OPNOUS
Smart Sensing & AI Technology

GENERAL DESCRIPTION

OPN8001/8008/8018 are Time-of-Flight (ToF) imaging sensors for 3D sensing covering 100x100 / QVGA (320x240) / VGA (640x480) level matrix sensing resolutions. The 3D sensing is realized upon 850 nm and 940 nm NIR wave length with an industry leading accuracy. The power consumption achieves the lowest power level in the industry, which benefit many portable and energy saving applications. OPN8001/8008/8018 are developed as key products of OPNOUS ToF solutions for a broad range of applications.

GENERAL DESCRIPTION

The OPN7007 is a smart VCSEL laser diode driver with high performance and high efficiency, which is optimized for Time of Flight (ToF) camera application. It is embedded with configurable current limit function to output specific peak current for illumination. A 12-bits ADC is also integrated for eye protection and temperature monitoring. The OPN7007 supports I²C interface configuration.

FUNCTIONAL DESCRIPTION

OPN6001 is a high performance, low power, low cost application processor dedicating for TOF sensor. It is embedded with a sophisticated TOF DSP to converting the TOF raw data to easy-use distance and IR data. With a novel self-learning engine, it also automatically tunes lights and sensors to get best image with different scenarios. A 200MHz ARM Cortex-M3 processor is also integrated to handle system controlling and various applications. It can support up to 2 TOF sensors simultaneously with MIPI CSI2 interface, merge different sources and transmit the data to Host AP by 12bit DVP, 4bit QSI or MIPI CSI2 interface.

FUNCTIONAL DESCRIPTION

The OPNE8008B is our Evaluation Kit for the QVGA OPN8008D Time-of-Flight (ToF) Sensor. This Evaluation Kit is fully assembled and tested camera system designed for the evaluation of the OPN8008D QVGA ToF Sensor, which provides all necessary hardware to operate OPN8008D, including both the camera lens and illumination. It can be directly connected to a PC for real-time visualization and recording of depth map data, while allowing direct access to many configuration settings. The system is fully controllable by an intuitive GUI on a PC.

GENERAL DESCRIPTION

Opnous provides a series of Time-of-Flight (ToF) imaging modules fitting for a broad range of 3D sensing applications. These 3D sensing modules are realized upon 850 nm and 940 nm NIR wave length with an industry leading accuracy. The power consumption achieves the lowest power level in the industry, which benefit many portable and energy saving applications.

GENERAL DESCRIPTION

Hawk 3D ToF platform consists of OPNOUS ToF sensor OPN8008, VCSEL driver OPN7007 and ToF ISP OPN6001. It has built-in high performance, low power consumption ToF signal processing features -- auto-exposure(AE), high dynamic range(HDR), spatial and temporal de-noise and multi-device interference immunity. Hawk 3D ToF platform provides an easy-to-integrate ToF 3D vision solution for mid and long range applications.

Hawk 3D ToF platform can connect to host computer via USB 3.0 UVC protocol. Its SDK supports Windows and Ubuntu on x86 architecture.

GENERAL DESCRIPTION

Dolphin 3D ToF platform consists of OPNOUS ToF camera module and ToF ISP chip OPN6001. Dolphin has built-in high performance, low power consumption ToF signal processing features -- auto-exposure(AE), high dynamic range(HDR), spatial and temporal de-noise and multi-device interference immunity.

Dolphin 3D ToF platform can connect to embedded application processor via MIPI interface or to computer via USB 3.0 UVC protocol. Dolphin SDK supports Windows and Ubuntu on x86 architecture and embedded Linux on embedded ARM processors.

Dolphin 3D ToF platform provides an easy-to-integrate ToF 3D vision solution for 3D applications within 5-meter range, such as facial recognition, machine vision, SLAM, 3D re-construction, AR/VR, etc.