

# 가시광+LWIR 동축광학계 설계 규격

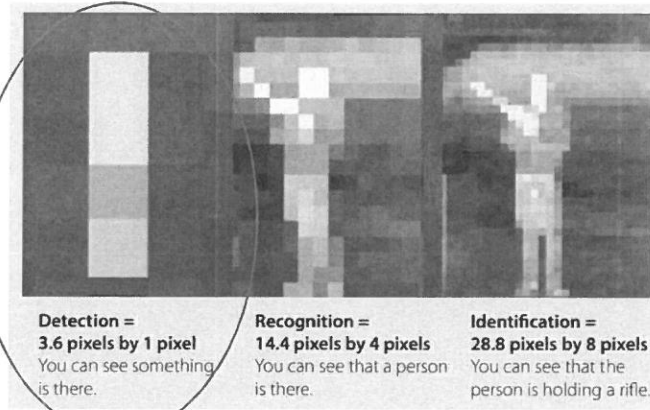
2021. 04. 01

한국산업기술대 산학협력단 & 비오에스

Specification Table

구분	LWIR	Visible
Fno.	1.1	1.4
Sensor Resolution	640 x 480	1945x1097
Active Area Resolution	640 x 480	1280 x 768
Wavelength	8000~14000	430~660
EFL	17mm	11.25mm
Lens Construction	3GM	8G +1 Prism
Distortion	<1%	
Object Distance	1 ~ 500m	
Depth of Field	10 ~ 500m	
FOV	20.5(V) x 35.7(H) x 40.6(D)	

## Detection Level

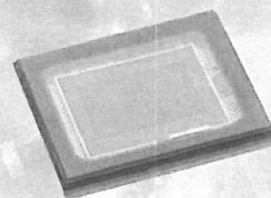


- 500m 거리에서 1.8m x 0.5m 인체를 3.6pixel x 1pix로 인식함  
(사람 유무 인식 정도의 감지 수준)

# SONY

## IMX385LQR

Diagonal 8.35 mm (Type 1/2) Approx. 2.13M-Effective Pixel  
Color CMOS Image Sensor



### CMOS Image Sensor for Industrial Applications that Realizes High Sensitivity Approximately Twice That of the Existing Product

Sony Semiconductor Solutions Corporation has developed the CMOS image sensor "IMX385LQR" for industrial applications. This new image sensor realizes high sensitivity approximately twice that of the existing product (IMX185LQJ)\*1.

The IMX385LQR pursues picture quality at low illuminance most needed by cameras for industrial applications and mounts pixels with a sensitivity of 2350 mV, which is the highest sensitivity among Sony image sensors for industrial applications\*2. In addition, SNR1s of 0.13 lx\*3, which is the highest performance among Sony Full HD-compatible image

sensors for industrial applications, is achieved by mounting an internal programmable gain amplifier and high conversion gain pixels. Superior performance as an image sensor for industrial applications is further achieved by combining HDR (High Dynamic Range) technology with technology that improves sensitivity in the near-infrared light region.

\*1: See the New Product Information released in August 2013.

\*2: As of January 2017 (based on in-house research)

\*3: Low illuminance performance index advocated by Sony for image sensors for industrial applications

- High sensitivity characteristics using a new-generation 3.75  $\mu\text{m}$  pixel (Sensitivity improved to approximately twice that of the existing product)
- Overwhelming low illuminance performance of SNR1s: 0.13 lx
- DOL-HDR function
- Versatile interface (Low-voltage LVDS serial, MIPI CSI-2)

### Exmor

\*Exmor is a trademark of Sony Corporation. The Exmor is a version of Sony's high performance CMOS image sensor with high-speed processing, low noise and low power dissipation by using column-parallel A/D conversion.

### Overwhelming low illuminance performance

Cameras for industrial applications are required to produce color images with high picture quality even in dark conditions. High sensitivity characteristics of 2350 mV, which is approximately twice that of the existing Type 1/2 Full HD product (IMX185LQJ) with the same 3.75  $\mu\text{m}$  pixel size have been achieved by mounting a new pixel with the highest sensitivity among Sony image sensors for industrial applications.

In addition, mounting high conversion rate pixels achieved SNR1s of 0.13 lx, which is the highest performance among Sony Full HD-compatible image sensors for industrial applications.

Furthermore, combination with technology for improving sensitivity in the near infrared light region also improves picture quality under near-infrared LED lighting.

### DOL-HDR function

The IMX385LQR supports a DOL (digital overlap) -type HDR function. This function uses a method that outputs the data for three frames with different storage times line by line instead of

frame by frame, enabling improvement of picture quality especially under low illuminance when compared to the existing multiple exposure HDR function.

### Versatile interface

The IMX385LQR is equipped with two different types of output interface (low-voltage LVDS serial, MIPI CSI-2) to meet the diverse needs of customers. The low-voltage LVDS serial interface has a maximum output data rate of 445.5 Mbps/ch,

and the number of output channels can be selected from 1 ch, 2 ch, or 4 ch. The MIPI CSI-2 interface has a maximum output data rate of 742.5 Mbps/lane, and the number of output lanes can be selected from 1 lane, 2 lanes, or 4 lanes.

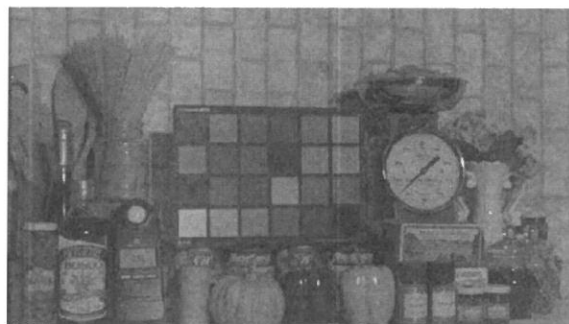
### <Photograph 1> Sample Images at high illuminance

Condition: 450 lx F2.0 (ADC12 bit mode, 30 frame/s, Internal gain: 0 dB)



### <Photograph 2> Sample Images at low illuminance

Condition: 1 lx F2.0 (ADC12 bit mode, 30 frame/s, Internal gain 30 dB + High conversion efficiency mode)



<Table 1> Device Structure

Item		IMX385LQR
Output image size		Diagonal 8.35 mm (Type 1/2) aspect ratio 16:9
Number of effective pixels		1945 (H) × 1097 (V) approx. 2.13M pixels
Unit cell size		3.75 μm (H) × 3.75 μm (V)
Optical blacks	Horizontal	Front: 4 pixels, rear: 0 pixels
	Vertical	Front: 16 pixels, rear: 0 pixels
Input drive frequency		37.125 MHz, 74.25 MHz
Output Interface		Sub-LVDS (444.5 Mbps / ch, Max. 4 ch) MIPI CSI-2 (742.5 Mbps / lane Max. 4 lane)
Package		128-pin LGA
Supply voltage V <sub>DD</sub> (Typ.)		3.3 V / 1.8 V / 1.2 V

<Table 2> Image Sensor Characteristics

Item		Value	Remarks
Sensitivity (F5.6)	Typ.	2350 mV	1/30s accumulation
Saturation signal	Min.	1210 mV	T <sub>j</sub> = 60 °C

<Table 3> Basic Drive Mode

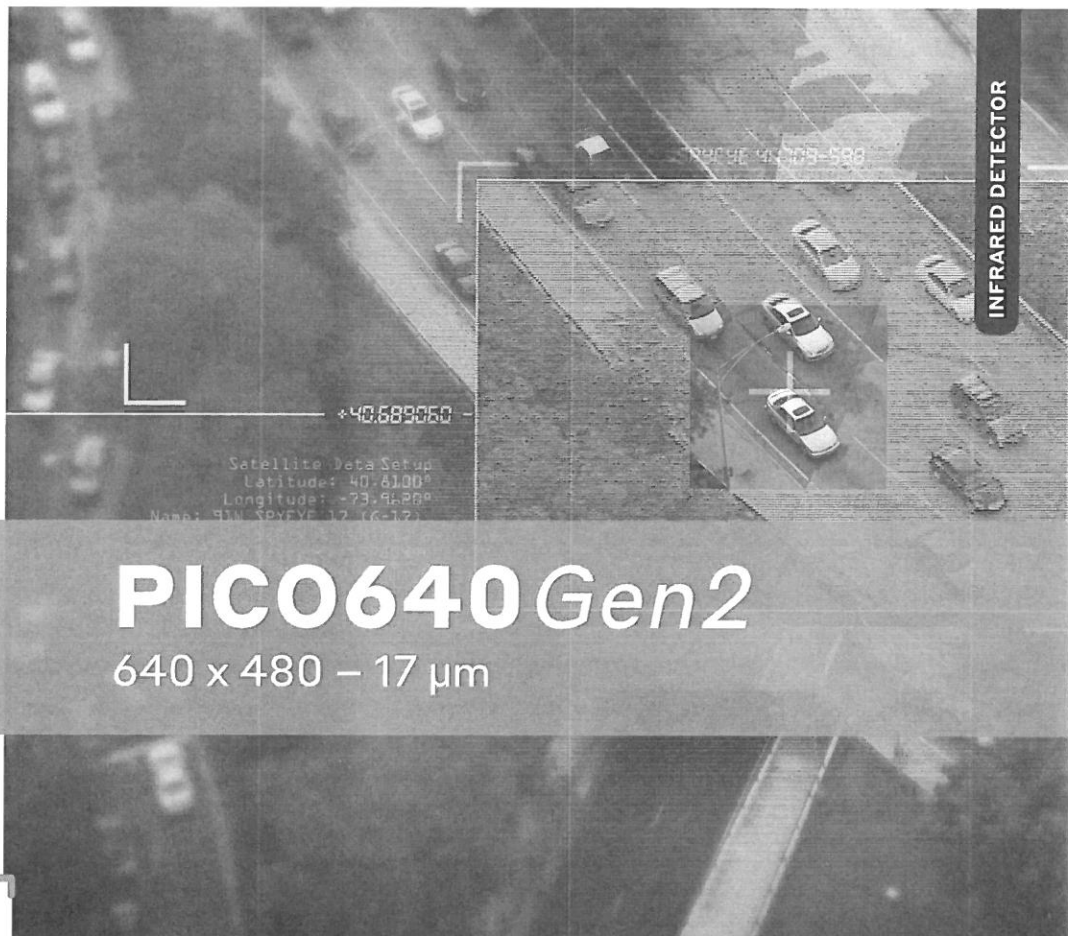
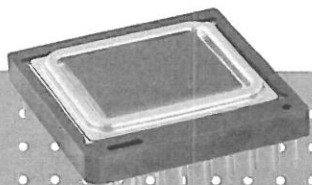
Drive mode	Recommended number of recording pixels	Frame rate [frame/s]	ADC [bit]
All-pixel scan (12 bit)	1920 (H) × 1080 (V)	60	12
All-pixel scan (12 bit)	1920 (H) × 1080 (V)	30	12
All-pixel scan (10 bit)	1920 (H) × 1080 (V)	120	10
All-pixel scan (10 bit)	1920 (H) × 1080 (V)	60	10
All-pixel scan (10 bit)	1920 (H) × 1080 (V)	30	10

<Table 4> HDR Drive Mode

Drive mode	Recommended number of recording pixels	Frame rate (through synthesis) [frame/s]	ADC [bit]
All-pixel scan (12 bit) DOL *1 2F sequential control	1920 (H) × 1080 (V)	30	12
All-pixel scan (10 bit) DOL *1 3F sequential control	1920 (H) × 1080 (V)	30	10

\*1 There are restrictions on the storage time setting values when using DOL.

\*Sony reserves the right to change products and specifications without prior notice.



# PICO640 Gen2

640 x 480 – 17  $\mu$ m

The thermal image sensor Pico640 Gen2 is a versatile product.

Built on proven technology, it limits development costs and shorten time to market.

## DESIGNED TO ANSWER ALL YOUR NEEDS



ENHANCED IMAGE QUALITY



PROVEN RELIABILITY



SEAMLESS INTEGRATION

DEFENSE



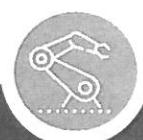
LEISURE



SURVEILLANCE



INDUSTRY



ORDERING REFERENCE: PICO640-046 / PICO640-046+

DESIGNED TO ANSWER ALL YOUR NEEDS

## PICO 640Gen2

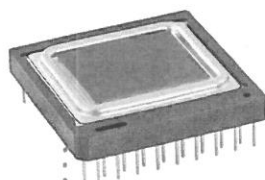


IMAGE QUALITY



RUGGEDIZED  
FOR HARSH  
ENVIRONMENT



RELIABLE



SEAMLESS  
INTEGRATION



LOW POWER  
CONSUMPTION

### ENHANCED IMAGE QUALITY

Sharp contrast	<ul style="list-style-type: none"> <li>Thermal sensitivity &lt; 50 mK (f/1, 300K, 30Hz)</li> <li>Thermal sensitivity &lt; 40 mK (f/1, 300K, 30Hz) (Pico640+)</li> <li>Extended operating temperature [-40°C; +85°C]</li> </ul>
Fluid and smooth image	<ul style="list-style-type: none"> <li>Frame rate up to 120Hz</li> <li>Thermal time constant &lt; 12 ms</li> </ul>
High uniformity	<ul style="list-style-type: none"> <li>Array operability &gt; 99.5 %</li> <li>Array operability ≥ 99.8 % (Pico640+)</li> </ul>

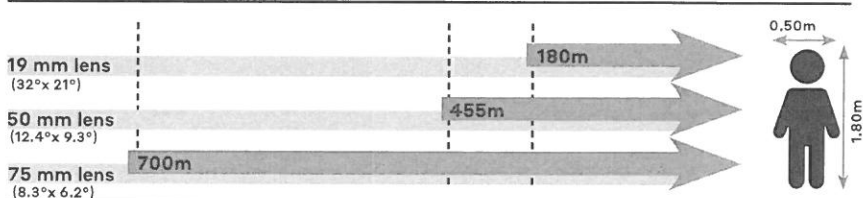
### PROVEN RELIABILITY

	<ul style="list-style-type: none"> <li>Standards MIL810 – MIL883</li> <li>Thermal Weapon Sight (TWS) qualified (Pico640+)</li> </ul>
Product availability and exportability	<ul style="list-style-type: none"> <li>Products designed and manufactured in Europe</li> </ul>
Product delivery to our customers	<ul style="list-style-type: none"> <li>On-time order deliveries &gt; 95%</li> <li>Guaranteed 10 years against vacuum loss</li> </ul>

### SEAMLESS INTEGRATION

Product platform	<ul style="list-style-type: none"> <li>Full access to sensor features (I<sup>2</sup>C)</li> <li>External frame synchronization capability</li> </ul>
Simplified image processing	<ul style="list-style-type: none"> <li>TECless, Shutterless compatible</li> <li>Single gain table and predictable offset management</li> </ul>
Battery optimization	<ul style="list-style-type: none"> <li>Low power consumption &lt; 130 mW</li> </ul>

### Recognition distances for human measuring 1.80 m x 0.50 m



Range for Johnson's criteria, target deltaT = 2K, perfect atmospheric and optics transmissions, theoretical square pixel.



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Ref. 06/2020/01-Device a lab pictures-Printed in France  
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