

Sony SenSWIR IMX990 / IMX991 Sensor Spec

As manufacturers in various industries continue to seek higher productivity, there is growing interest in sensing both in the visible spectrum and beyond it, at SWIR wavelengths.

In IMX990 and IMX991, SenSWIR technology has enabled Sony to overcome challenges in pixel miniaturization to offer sensors that are compact, high-resolution, and capable of imaging from the visible spectrum to SWIR wavelengths. IMX990 and IMX991 are global shutter sensors with a digital output allowing for many features and functionality in industrial camera applications such as ROI and Trigger Mode

The advances in performance and functionality introduced by the IMX990 and IMX991 pave the way for the development of SWIR industrial cameras and inspection equipment for a diverse range of applications such as inspection, identification, and measurement.

* IMX990-AABJ/IMX991-AABJ and IMX990-AABA/IMX991-AABA (incorporating a thermoelectric cooling element) were launched in October 2021.

Features

Higher resolution and smaller systems from the industry's smallest pixels, at 5 μm

Advantages of the sensors promise to expand SWIR sensing applications. The sensors' higher resolution offers higher inspection precision, and smaller cameras afford greater freedom in installation.

Broad imaging (0.4–1.7 μm) from a single sensor that extends to the visible spectrum

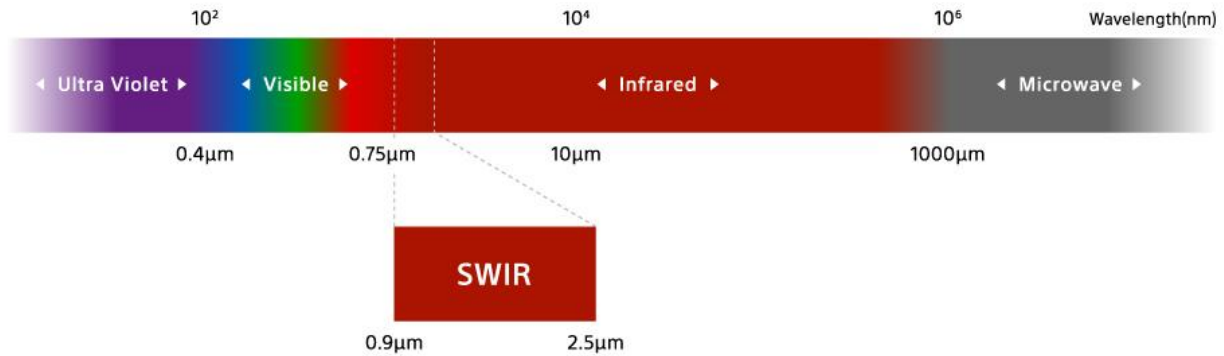
Inspection that once required multiple cameras to cover visible and SWIR wavelengths can now be performed with a single unit. Such broad coverage expands both the type of objects that can be inspected and the type of inspection available. System costs can be reduced, and faster image processing can increase throughput.

Enhanced capabilities from digital output

Unlike the analog output that most SWIR sensors are limited to, the sensors also feature digital output, for performance on the level of current industrial CMOS sensors. Analog sensors require developers to implement an ADC or other functionality for industrial equipment on the camera. In contrast, the new sensors already include this functionality, which saves time and effort in camera development and makes it easier to develop versatile cameras.

A closer look at SWIR

SWIR, Short Wavelength Infra-Red, refers to a type of infrared light. SWIR wavelengths generally lie in the range of 0.9–2.5 μm . Though in the infrared spectrum, they are near wavelengths of visible light. IMX990 and IMX991 sensors cover SWIR wavelengths up to 1.7 μm . Imaging by the sensors also extends to wavelengths of visible light, which has proven difficult for conventional SWIR sensors to capture.



Specifications

Table 1 - Device structure

Item	IMX990-	IMX990-	IMX991-	IMX991-
	AABA-C	AABJ-C	AABA-C	AABJ-C
Image size	8.2 mm diagonal (1/2-inch type)		4.1 mm diagonal (1/4-inch type)	
Effective pixels	1296 (H) × 1032 (V),		656 (H) × 520 (V),	

		approx. 1.34 megapixels	approx. 0.34 megapixels
Unit cell size		5 μ m (H) \times 5 μ m (V)	
Optical black	Horizontal direction	front 0 pixels, rear 96 pixels	
	Vertical direction	front 12 pixels, rear 0 pixels	
Input drive frequency		37.125MHz/74.25MHz/54MHz	
Power supply	Pixel	2.2V、1.2V	
	Analog	3.3V、2.2V	
	Digital	1.2V	
	Interface	1.8V	
Shutter mode		Global shutter	

Output interface		SLVS (2ch/4ch)			
Package	Thermoelectric cooling element	Included	-	Included	-
	Dimensions	30.0mm (H) × 30.0mm (V)	20.0mm (H) × 16.8mm (V)	30.0mm (H) × 30.0mm (V)	20.0mm (H) × 16.8mm (V)

Table 2 - Imaging characteristics

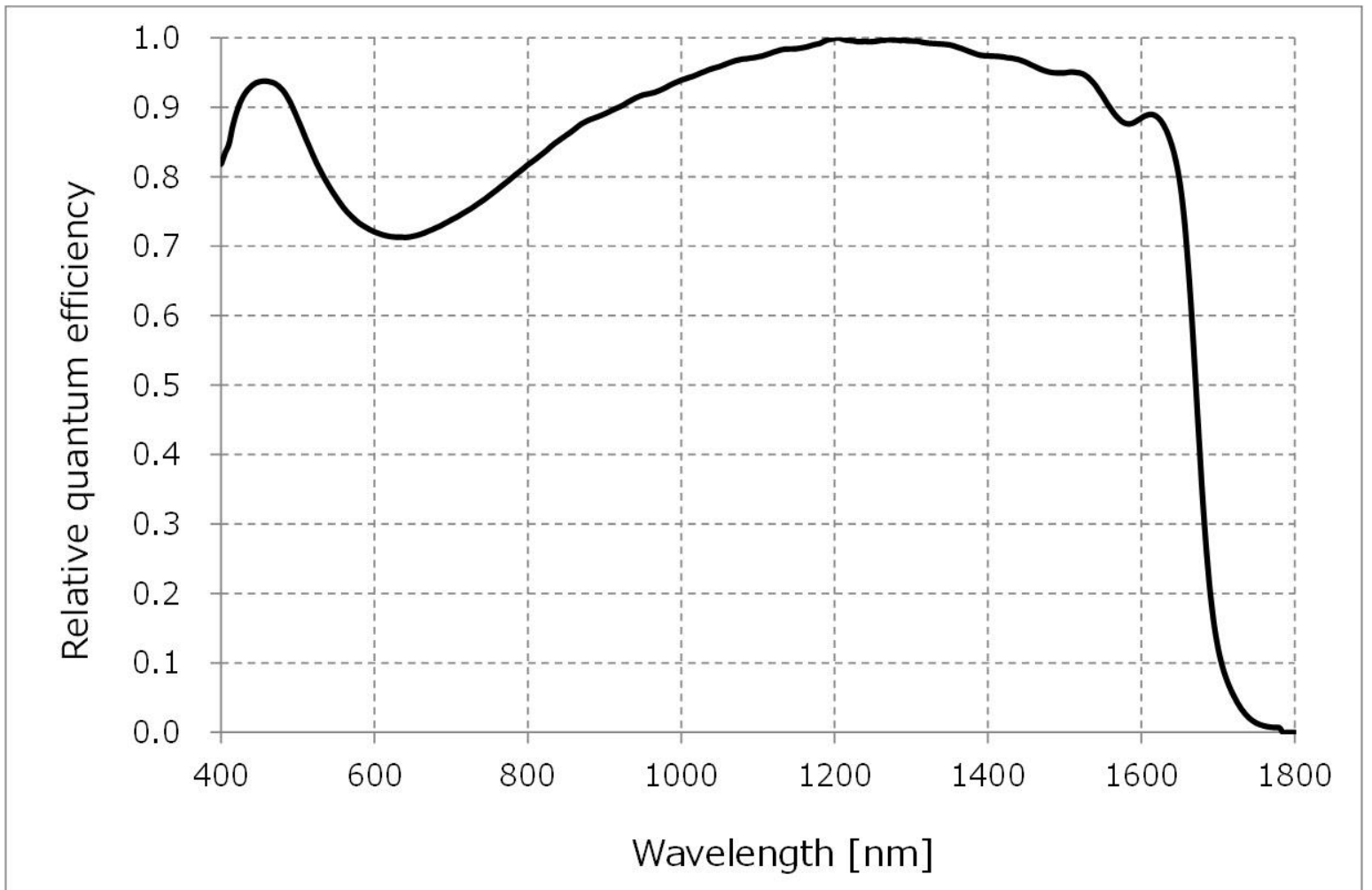
Item	IMX990	IMX991	Notes
Sensitivity	121mV	121mV	F8、 1/30 sec. accumulation
Saturation signal	360mV	360mV	

Quantum efficiency	>75%	>75%	$\lambda=1200\text{nm}$
Operability*1	>99.5%	>99.5%	

*Measurement conditions: $T_j=15^\circ\text{C}$, all-pixel readout mode

*1: Operability: percentage of pixels free of defects

Relative quantum efficiency of IMX990/IMX991



* Data may vary depending on conditions and the environment.

Table 3 Basic drive mode

Model	Drive mode	Recommended recording pixels	ADC [bit]	Frame rate (max.) [fps]
IMX990	All-pixel readout	1280(H)×1024(V)	8	130
			10	120
			12	70
IMX991	All-pixel readout	640(H)×512(V)	8	250
			10	240
			12	130

Sony's SWIR technology



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