RESTAR FRAMOS TECHNOLOGIES

RESTAR FRAMOS SUPPORTS UTILIZATION OF SONY´S LATEST SWIR SENSOR TECHNOLOGY

Short Wavelength Infra-Red (SWIR), refers to a type of infrared light generally in the range of range of 0.9 – 2.5 µm. SWIR imaging requires specific optical and electronic components to transmit and detect these wavelengths. There are numerous advantages of combining SWIR imaging with visible light captures, specifically for surveillance, quality control, and other applications.

COMMON SWIR APPLICATIONS

Quality assessment and sorting of products

Material contamination detection

Semiconductor inspection

Temperature estimation

Remote observation

NEW SENSWIR™ SENSORS

Sony Semiconductor Solutions has launched four image sensors that includes both the visible and SWIR ranges in captured images. The IMX990 and IMX991 sensors utilize one of the industry's smallest 5µm pixel size of any InGaAs based sensor and leverage Sony's original SenSWIR™ technology and offer SXGA 1/2-type and VGA 1/4-type images. The IMX992 and IMX993, on the other hand, utilize an even smaller pixel size of 3.5µm to provide larger image resolutions. The IMX992 QSXGA 1/1.4-type image size and the IMX993 QXGA 1/1.8-type are being made available by Sony´s partner and vision expert, RESTAR FRAMOS.

EXTENDING THE VISIBLE SPECTRUM

A single camera equipped with the SenSWIR™ technology can now cover both visible and the SWIR spectrum in a single image, which previously required separate cameras.

This results in:

- Lower system costs
- Less intensive image processing and accelerated inspection times
- Significant Increase of the scope of inspections

RESTAR FRAMOS's industry and product experts are available to support customers with the integration of image sensors into their applications and projects. In addition, RESTAR FRAMOS provides a broad range of support services for development, customization, and sensor logistics.

CAPTURING WAVELENGTHS UP TO 1.7 µm

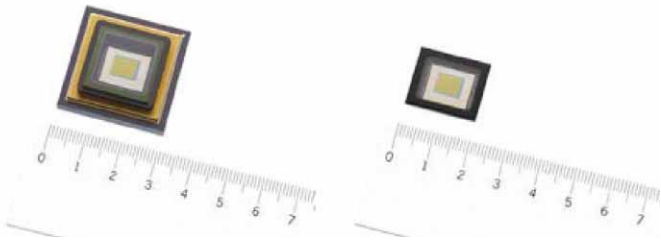
The spectral response of all these sensors is between 0.4 – 1.7 µm allowing them to detect and see into the SWIR spectrum while not compromising sensitivity within the visible one.

The IMX990 1.34 MP sensor has a 1296 x 1032 active pixel array that can stream at 130 fps @ 8 bits, 120 fps @ 10 bits and 70 fps @ 12 bits. The IMX991 0.34 MP sensor, with its 656 x 520 active pixel array, streams at 250 fps @ 8 bits, 240 fps @ 10 bits and 130 fps @ 12 bits.

The IMX992 5.3 MP, with its 2592 × 2056 pixel array, and the IMX993 3.2 MP, 2080 × 1544 pixel array, benefit from a faster data interface which enables them to output these larger images at more than 120 fps and 150 fps @ 10 bits respectively. These transfer speeds increase with smaller resolutions.

The Sony SenSWIR™ technology utilizes a copper-to-copper connection enabling a finer pixel pitch and smaller pixels. As a result, they can be incorporated into smaller, high-resolution cameras needed for more precise inspection systems.

The smaller pixel size of these images combined with Sony's sensor stacking technology enable a very compact design for their packages, thereby reducing the costs for similarly designed SWIR based cameras.



Ceramic PGA package with integrated thermoelectric cooling

Ceramic LGA package

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**
IMX992	**All-pixel readout**	**2592(H)×2056(V)**	**8**	**130**
			10	**120**
			12	**70**
IMX993	**All-pixel readout**	**2080(H)×1544(V)**	**8**	**170**
			10	**150**
			12	**90**

Sibel Yorulmaz-Cokugur, RESTAR FRAMOS sensor expert, states: *"Sony's InGaAs based sensors are unique in the marketplace. Their small pixel size and stacked layer design creates very compact SWIR-based camera designs. Markets that can benefit from these sensors include those who target Machine Vision for inspection, selection, sorting or hyperspectral/multispectral cameras."*

FEATURES

- ***Industry's smallest pixel, at 3.5-5.0 µm***

The combination of smaller pixel sizes that can see both visible and SWIR wavelengths in one image promises to expand SWIR sensing applications. These sensors' higher resolutions offer more precision in inspections, while the smaller cameras that can be built with these sensors afford greater freedom in installations.

- ***Broad spectrum (0.4–1.7 µm) from a single sensor***

Inspections that once required multiple cameras to capture both visible and SWIR wavelengths can now be performed within a single image. This capability expands both the type of objects that can be inspected and the types of inspection that can be done. Overall system costs can be reduced by using only one camera, increasing image processing and inspection throughput.

- ***Pure digital output***

Unlike traditional SWIR sensors with their analog data outputs, these sensors feature only CMOS logic, digital outputs making them simpler to design into new cameras. In some cases, they can leverage existing CMOS sensor layouts and designs to speed up their development times into new products. No need to tune and calibrate analog components with each camera build.

Under visible light

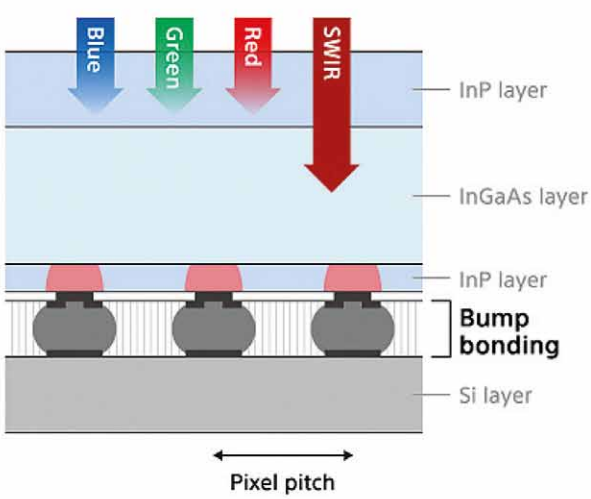
Under SWIR imaging conditions

THE SECRET BEHIND SONY'S SENSWIR™ TECHNOLOGY

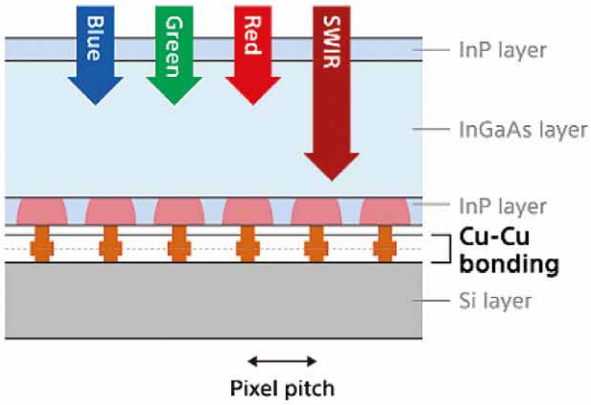
The back side illuminated (BSI) stacked structure of the Sony SWIR sensor has a thin layer of structural InP that covers the InGaAs pixels. In other vendor's sensors, typically, a thick layer is applied to the surface which absorbs all but the longer wavelengths of light, thus making the sensor insensitive for the visible light spectrum.
In contrast, the thin InP layer on Sony SWIR sensors ensures that it can provide high quantum efficiencies across all the supported wavelengths, from the visible through to the SWIR ranges, specifically within the 0.4 µm to 1.7 µm wavelengths.

Sony's pixel design and process technology, for thin InP layers, reduces the impact on the incident light improving transmission of visible wavelengths that can then be detected in the InGaAs pixel layer (along with SWIR photons).

The pixel wells are connected to the readout circuitry through Cu-Cu connections that help deliver high quality images in a compact design. One additional feature provided by the stacked design is real-time optical black (OPB) dark level information which eliminates the need for external dark current correction (DCC), simplifying camera designs.



Bump bonding



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RESTAR FRAMOS Technologies GmbH | Mehlbeerenstr. 2 | 82024 Taufkirchen | Germany
| +49 89 541 9200 60 | info@restarframos.com