

NEWS RELEASE

Hamamatsu Photonics has developed an InGaAs area image sensor for hyperspectral cameras capable of detecting short-wavelength-infrared light up to 2.55 μm which is the world's longest wavelength detectable by this type of area image sensor.

We start accepting product orders from July 1, 2019.

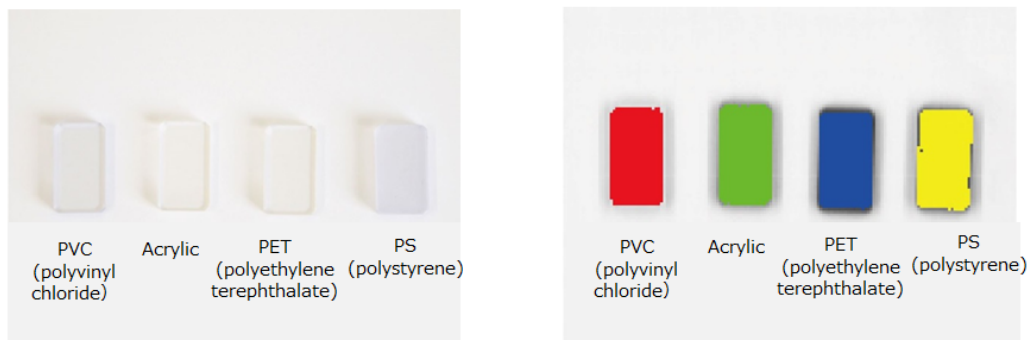
June 6, 2019
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By applying compound opto-semiconductor manufacturing technology fostered in-house over many years, we designed and developed a new area image sensor *G14674-0808W* made of indium gallium arsenide (InGaAs) capable of detecting short-wavelength-infrared light up to 2.55 μm (micrometers or one millionth of a meter) which is the world's longest wavelength detectable by this type of area image sensor. Installing this new InGaAs area image sensor into hyperspectral cameras for plastic recycling will boost the plastic recycling rate since hyperspectral cameras can screen and sort plastics containing flame-retardant resin to separate them out from other plastics, which has been extremely difficult up till now. We start accepting product orders from domestic and overseas industrial camera manufacturers on July 1 (Monday), 2019.

This new InGaAs area image sensor will be on display at the *IMAGE SENSING SHOW 2019* held in Pacifico Yokohama (Nishi-ku, Yokohama, Japan) for 3 days from June 12 (Wed) to June 14 (Fri), where domestic and overseas manufacturers and experts in image processing devices and sensing technology gather to show off and check out new technology.

<About hyperspectral cameras>

Unlike ordinary cameras, hyperspectral cameras capture images by finely separating the light reflected from an object into a spectrum and obtaining the light intensity at each wavelength. Examining their spectral information in detail allows visualizing the differences between plastic materials and ingredients contained in food that are impossible to find with ordinary cameras. Hyperspectral cameras are currently in use for plastic recycling and food inspection applications.



Imaging examples of plastic materials
captured with ordinary camera (left) and hyperspectral camera (right)

<Product overview>

This product is an area image sensor designed for hyperspectral cameras. It consists of an InGaAs photosensitive area that converts light into electrical signals and a signal readout integrated circuit.

Currently, most hyperspectral cameras intended for plastic recycling applications use an InGaAs area image sensor that detects short-wavelength-infrared light up to 1.7 μm . But it can be nearly impossible for these cameras to sort out plastics containing flame-retardant resin from other general plastics. This has created demand for area image sensors that detect short-wavelength-infrared light up to 2.5 μm which is a wavelength well absorbed by flame-retardant resin.

Hamamatsu Photonics has developed and produced a wide variety of InGaAs area image sensors optimized for industrial applications including currently available devices with a large number of pixels able to detect short-wavelength-infrared light up to 1.7 μm . To also enhance the productivity of compound opto-semiconductors and supply them to the market more effectively, we started up operation of Building No. 3 at our Miyakoda Factory site last year. This time, by utilizing equipment newly installed in the Miyakoda Factory Building No. 3, we were able to optimize the InAs and GaAs composition ratio and fully reviewed the

manufacturing process for the photosensitive area. This work successfully reduced defects in the manufacturing process that have been serious issues up to now and led to developing an InGaAs area image sensor capable of detecting short-wavelength-infrared light up to 2.55 μm which is the world's longest wavelength detectable by this type of area image sensor. We also designed and produced totally in-house a circuit optimized for the new InGaAs area image sensor that minimizes the dark current^(*) generated in the photosensitive area and boosts the signal readout speed.

Installing this new InGaAs area image sensor into hyperspectral cameras allows capturing sharp images of plastics containing flame-retardant resin widely used in home appliances to sort them out from general plastics at high speeds. These properly screened and sorted plastics are used to produce high-purity recyclable materials and increase the plastic recycling rate, leading to reductions in the amount of non-recycled plastics that ultimately end up as useless waste in landfills. Hyperspectral cameras are also promising tools for diagnosing deterioration in concrete structures and for identifying tablet pharmaceuticals. To cover a wide range of applications, we will at the same time start accepting product orders for other InGaAs area image sensors with different spectral response ranges. We will also start accepting product orders for detection heads from October 2019 for easy evaluation of our InGaAs area image sensor performance characteristics.

We will continue to design and improve the photosensitive area to deliver area image sensors capable of detecting infrared light at even longer wavelengths.

* Dark current: Electric current generated in a dark state with no light incident on the image sensor. Dark current causes unwanted image noise.

<Main product features>

1. InGaAs area image sensor capable of detecting short-wavelength-infrared light up to 2.55 μm which is the world's longest wavelength detectable by this type of area image sensor

Utilizing equipment newly installed in our Miyakoda Factory Building No. 3, we optimized the composition ratio of InAs and GaAs contained in the InGaAs photosensitive area and meticulously reviewed and rethought the photosensitive area manufacturing process. The result is a successful elimination of defects in the photosensitive area and development of an InGaAs area image sensor capable of detecting short-wavelength-infrared light up to 2.55 μm which is the world's longest wavelength detectable by this type of area image sensor.

2. Reduced dark current in photosensitive area

We designed and produced in-house a circuit optimized for the new InGaAs area image sensor and succeeded in employing a circuit design that brings to nearly zero the difference between voltages applied to electrodes in the photosensitive area. This minimizes the dark current generated in the photosensitive area.

3. Improved signal readout speed

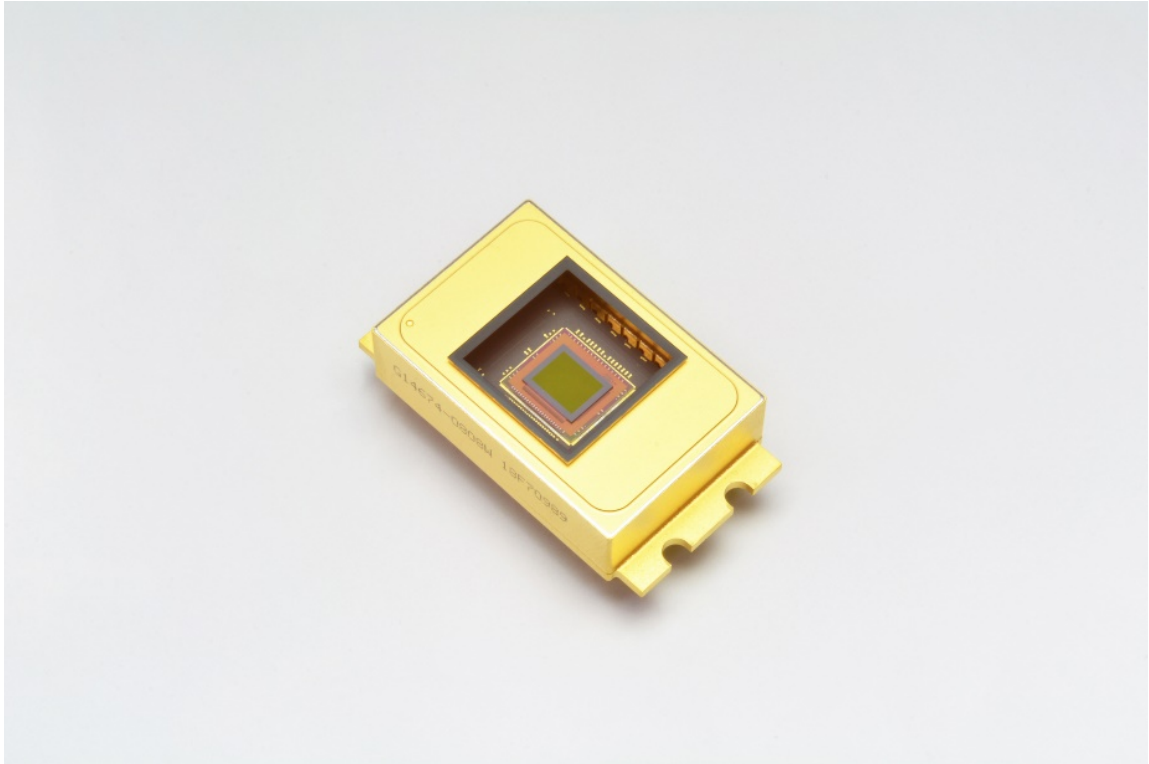
To shorten the path for transmitting electrical signals, we also miniaturized the circuit that we designed, produced and optimized in-house for the new InGaAs area image sensor. This shorter signal path increases signal readout speed to more than twice that of current products.

●Main specifications

Parameter	G14674-0808W	Unit
Number of pixels	320x256	ch
Pixel pitch	20	μm
Cooling	2-stage thermoelectric cooling ($T_{\text{chip}} = -20^{\circ}\text{C}$)	-
Spectral response range	1.7 to 2.55	μm
Dark current	30	μA
Frame rate	500	fps
Partial readout	Yes	-

●Date to start accepting product orders: July 1 (Monday), 2019

●Sales target: 30 units per year in first year and 300 units per year after 3 years



InGaAs area image sensor G14674-0808W