PRESS RELEASE

LETI SAYS NEW FDSOI LIGHT-SENSING TECHNIQUE CAN MAKE TRANSISTORS FAR MORE SENSITIVE TO VISIBLE LIGHT

In IEDM 2016 Presentation, Institute's Team Demonstrates Potential Sensing Advantages of Integrating Photodiodes below Buried Oxide

SAN FRANCISCO – Dec. 7, 2016 – Leti, an institute of CEA Tech, has developed a new light-sensing device that integrates photodiodes below the buried oxide (BOX) of FDSOI transistors, making the transistors very sensitive to visible light.

In this work, photodiodes were co-integrated in the SOI substrate, replacing conventional FDSOI transistor backgate. This device architecture may lead not only to very small pixels with maximized fill factor, but also to more complex light-detection functions, due to complementary effects observed depending on diode polarity and FET type.

Presented today during IEDM 2016 in the paper, "Extending the Functionality of FDSOI N- and P-FETs to Light Sensing", the innovative device architecture uses capacitive coupling, which doesn't necessarily require an electrical connection between the transistor and the diode. Leti said preliminary results show that sensitivity in the visible spectrum is already better than 0.1pW/µm2, with a wide dynamic range (seven orders of magnitude, i.e. similar to most advanced CMOS image sensors).

"FDSOI is a very versatile technology that already has been shown to be 'faster, cooler, and simpler' than FinFET, and which also may become smarter for More than Moore applications such as imaging," said Lina Kadura, who presented the paper. "In fact, it may be smarter for sensing generally, because FDSOI transistors can be considered as very small footprint probes that are sensitive to the electric potential below the BOX."

In addition to embedding more light-sensing functionality in circuits, potential future applications include leveraging pixel size in image sensors.

In other results of the study, Leti demonstrated for the first time that SRAM cell characteristics can be controlled by light illumination. Leti also said that with capacitive coupling, light absorption in the diode integrated below the BOX leads to light-induced voltage-threshold (VT) shift of the transistor above the BOX, which means that forward optical back-biasing and reverse optical back-biasing are possible, depending on the diode polarity. In addition, the response of the system is logarithmic with light illumination, similar to the response of human vision.

About Leti (France)

As one of three advanced-research institutes within the CEA Technological Research Division, Leti serves as a bridge between basic research and production of micro- and nanotechnologies that improve the lives of people around the world. It is committed to creating innovation and transferring it to industry. Backed by its portfolio of 2,800 patents, Leti partners with large industrials, SMEs and startups to tailor advanced solutions that strengthen their competitive positions. It has launched 59 startups. Its 8,500m² of new-generation cleanroom space feature 200mm and 300mm wafer processing of micro and nano solutions for applications ranging from space to smart devices. With a staff of more than 1,900, Leti is based in Grenoble, France, and has offices in Silicon Valley, Calif., and Tokyo. Follow us on www.leti.fr/en and @CEA_Leti.

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