PRESS RELEASE

X-FAB Makes Major Enhancements to its 180 nm APD and SPAD Devices with Boosted Photon Detection Performance and Increased Active Area

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X-FAB Silicon Foundries, the specialty foundry for analog/mixed-signal and optoelectronic solutions, has just introduced its latest generation of avalanche photodiode (APD) and single-photon avalanche diode (SPAD) devices.

Leveraging its proven automotive-qualified 180 nm XH018 high-voltage process, X-FAB's new APDs and SPADs benefit from innovative architectural modifications, with substantial improvements in performance exhibited compared with the company's earlier devices (which were initially announced back in mid-2019). Consequently, they can be used in situations where there are light level challenges involved. However, footprint compatibility with the previous generation has been retained. This means that a simple and convenient upgrade path is assured, with no additional engineering work being required.

One of the areas in which the boost in performance is most noticeable is in relation to the photon detection probability (PDP). There is a 42% PDP figure for incident light at 405 nm, while further up the spectrum in the near-infrared (NIR) frequencies the improvement is as much as 150%, with a 5% PDP being demonstrated at 850 nm. An afterpulsing probability of 0.9% has been achieved which represents a 70% reduction compared to the first-generation devices. The dark count rate (DCR) is only 13 counts/s/µm². The fill factor (the percentage of these sensors' surface area that is active) which can now be supported has almost doubled – reaching 33%. *

As breakdown voltage characteristics can vary from device to device, an exact determination is necessary to ensure that good APD/SPAD performance is maintained. For this reason, X-FAB has incorporated a trigger diode – which allows precise, real-time on-chip breakdown voltage detection without an external light source. Active quenching circuitry is included – through which the rate at which the SPAD devices recover can be accelerated, allowing them to be made ready for further light detection. The new SPADs offer better application adaptation due to their size flexibility (in terms of both width and length). First-time-right design is supported by complete device models for the SPAD and APD devices. The behavior of the new built-in trigger diodes is included in the model.

"Thanks to the combination of elevated PDP and competitive DCR levels, we are presenting the market with APD/SPAD solutions that have impressive signal integrity characteristics, which will directly benefit our customers for applications like computer tomography and fluorescence detection within the medical sector,

as well for time-of-flight and LiDAR in industrial and automotive systems," states Detlef Sommer, Business Line Manager for Opto Technologies at X-FAB. "These advanced optoelectronic elements are valuable additions to the X-FAB design kit, broadening the selection of interoperable assets based on the XH018 process that can be made use of."

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About X-FAB

X-FAB is the leading analog/mixed-signal and MEMS foundry group manufacturing silicon wafers for automotive, industrial, consumer, medical and other applications. Its customers worldwide benefit from the highest quality standards, manufacturing excellence and innovative solutions by using X-FAB's modular CMOS and SOI processes in geometries ranging from 1.0 µm to 130 nm, and its special SiC and MEMS long-lifetime processes. X-FAB's analog-digital integrated circuits (mixed-signal ICs), sensors and micro-electro-mechanical systems (MEMS) are manufactured at six production facilities in Germany, France, Malaysia and the U.S. X-FAB employs about 3,800 people worldwide. www.xfab.com

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Note*

All measured parameters cited here are for a device with a 10 µm diameter optical active area operated with passive quenching at room temperature and with 2 V excess bias.

Acronyms

APD	Avalanche Photodiode
DCR	Dark Count Rate
PDP	Photon Detection Probability
SPAD	Single-Photon Avalanche Photodiode