



SPAD **Lambda** (λ)

A high-performance single-photon linear array

DESCRIPTION

SPAD Lambda (λ) is a photon-counting linear array with time gating and time tagging. The core of the detector is a SPAD array with 320×1 pixels. Photon counting with up to 555'000 frames per second and zero readout noise is achieved. Nanosecond time gating is coupled with 17 ps gate phase shift. Time tagging with 20 ps resolution and 130 ps FWHM precision is available.

KEY BENEFITS



Linear detection array

SPAD Lambda (λ) features a single line with 320 single-photon detectors. This form factor is suitable for spectral applications that require high-speed, low light performance and/or single photon timing.



High tagging and gating

The sensor features both time tagging and time gating to study time varying signals of interest, this offers the most flexible approach to filter out unwanted signal while still preserving the arrival information of single-photons.



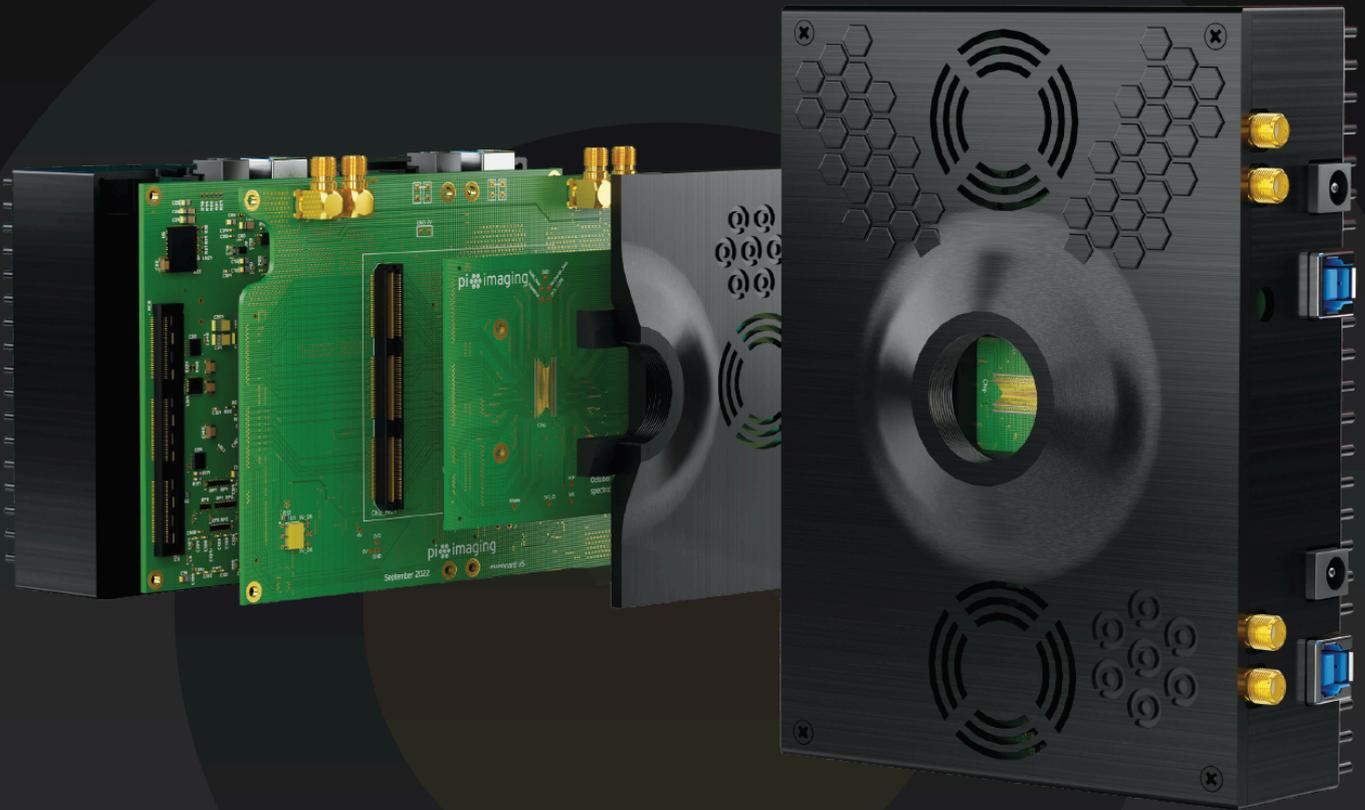
Wide detection spectra and low noise

Our single-photon detectors are fabricated in a state-of-the-art CMOS process and offer a low dark count rate of less than 250 cps. Microlenses enhance the detection with a peak detection efficiency of over 45%.



Plug and Play

The system requires just a 5V power adapter and two USB3 cables to run. For full flexibility, 4 additional control lines can be connected to the SMA inputs. The industry standard C/CS-mount optical port and the M4 mounting positions offer a flexible integration into any optical setup.



APPLICATIONS

Fluorescence lifetime imaging (FLIM)

SPAD Lambda (λ) increases the overall photon throughput compared to point scanned detection systems from the typical 10 Mcounts per second to 4 Gcounts per second.

Why SPAD Lambda (λ)?

- Simplify FLIM setup
- Increase FLIM frame rate

Flow cytometry

SPAD Lambda (λ) enables 320 spectral channels with shot noise limited SNR and integration times down to 1.8 μ s.

Why SPAD Lambda (λ)?

- Simplify multichannel detection
- Improve signal to noise ratio

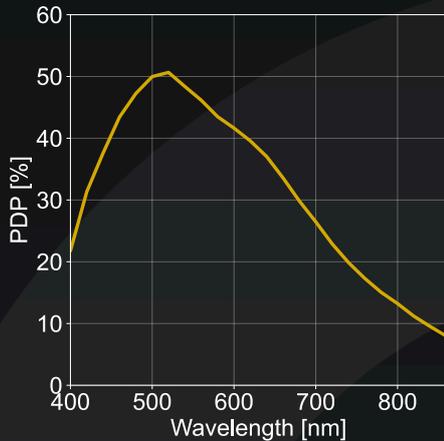
TECHNICAL SPECIFICATIONS

SPAD Alpha	
Sensor resolution	320 x 1 pixels
Pixel pitch	29 μ m
Wavelength range	400 to 900 nm
Peak photon detection probability	50% at 250 nm
Frame rate (max.)	555'000 fps
Dead time	10 ns
Timing jitter	130 ps FWHM
Time-tagging resolution	20 ps
Minimum exposure / gate width	4 ns
Minimum gate shift	17 ps
Crosstalk	2%
Optical mount	C-mount

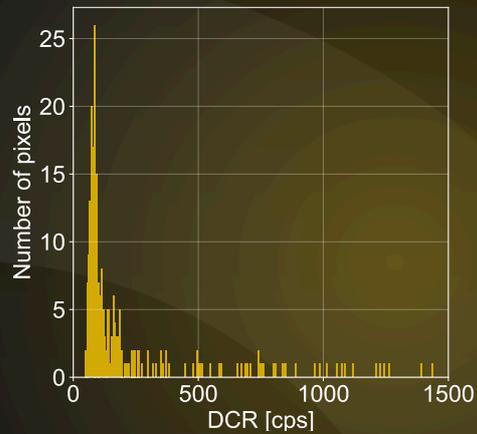
PARAMETER AT ROOM TEMPERATURE	MIN.	TYP.	MAX.
Median DCR	-	250 cps	350 cps
Percentage of pixels with >10 kcps	-	5%	8%
Fill factor with microlenses for collimated light	75%	80%	-
Average timing jitter	-	120 ps FWHM	150 ps FWHM

PERFORMANCE CHARACTERISTICS

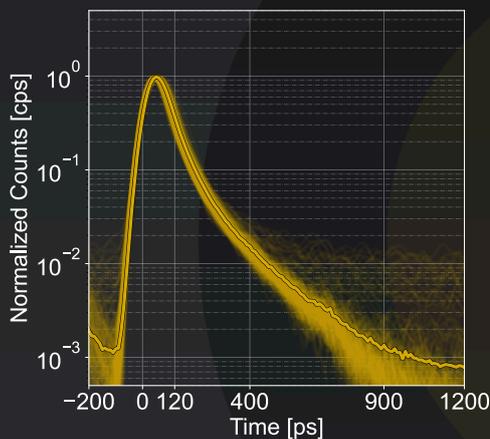
Photon detection probability



Dark count rate histogram



Timing jitter



SYSTEM INTEGRATION

A system overview is shown on the right. For operation, only a 5 V power supply and two USB3 connections are required.

The software provides functionalities for photon-counting, time-gating and time-tagging modes. It can be accessed through TCP/IP for easy integration into LabVIEW, MATLAB, Python or C++.



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