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SPAD 23 Red

Advanced detector for red fluorescence imaging

DESCRIPTION

SPAD 23 Red is a detector array with 25 square packed single-photon avalanche diodes (SPADs) with increase sensitivity in the red wavelengths. It features both the capability of direct photon counting and photon time tagging to enable a wide range of single-photon detection applications.

KEY BENEFITS

Ideal point detector

SPAD 23 Red is the ideal solution for a confocal scanning setup. Each pixel can act as a virtual pinhole, increasing resolution and contrast.

Wide detection spectra and low noise

Our single-photon detectors are fabricated in a state-of-the-art CMOS process and offer an ultra-low dark count rate of less than 50 cps. Microlenses enhance the detection with a peak detection efficiency of over 60%.

High timing resolution

Real-time processing of photon events occurs in a field-programmable gate array. The detector can process up to 300 Mcps over the whole array. Time-to-digital converters per pixel enable a fine timing resolution down to 20 ps with at a maximum photon flux of 70 Mcps.

Plug and play

The system requires just a 5V power adapter and USB3 cable to run. For full flexibility, 4 additional control lines can be connected to the SMA connectors. The SM1 optical port, the M2.5 and the M4 screw mounting positions offer a flexible integration into an existing optical setup.

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APPLICATIONS

Confocal microscopy

The SPAD 23 Red boosts light collection, driving innovation in confocal scanning microscopy. This advancement delivers sharper, brighter images while providing precise insights into molecular functions, interactions, and red fluorescence environments.

Applications:

Image scanning microscopy (ISM), fluorescence lifetime imaging (FLIM), fluorescence correlation spectroscopy (FCS), stimulated emission depletion microscopy (STED)

Why SPAD arrays?

- Achieve super-resolution with a standard confocal microscope
- Increase light collection
- Increase imaging speed
- Reduce background noise

Quantum information

Temporal photon correlations and photon number resolving (PNR) enable probing of quantum properties of light, with reliable measurements of second and third order photon correlations, as well as quantum random number generation for unbreakable encryption.

Applications:

Antibunching and coincidence correlation, quantum random number generation

Why SPAD arrays?

- Simplify setup with single-chip multi-channel detector
- Increase data rate with detector parallelization
- Photon number resolving (PNR) detection

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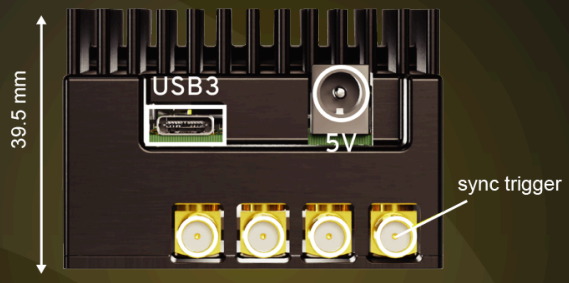
OPERATING CONDITIONS & TECHNICAL SPECIFICATIONS

RECOMMENDED OPERATING CONDITIONS

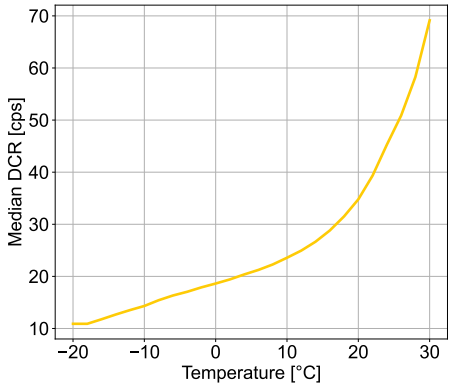
SYMBOL	PARAMETER	MIN	MAX	UNIT
Operating voltages				
V_{ex}	SPAD excess bias	3	5	V
Environment				
T	Temperature	-55	35	°C



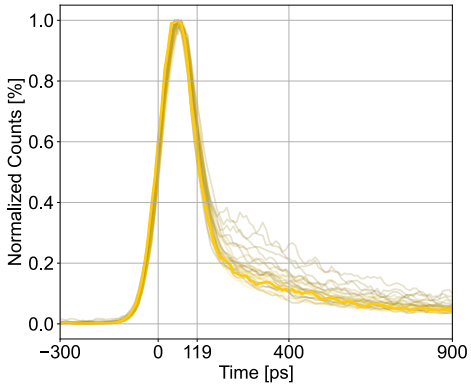
TYPICAL TECHNICAL SPECIFICATIONS

PARAMETER	CONDITIONS	TYP
Peak detection efficiency	V_{ex} = 5 V	62% @ 620 nm
Wavelength window with PDE > 35%	V_{ex} = 5 V	520-820 nm
Fill factor		>80%
Median dark count rate	V_{ex} = 5 V T = 20 °C	<100 cps
Number of noisy pixels with DCR> 1 kcps	V_{ex} = 5 V	1
Dead time	V_{ex} = 5 V	42 ns
Timing jitter	V_{ex} = 5 V	<120 ps
Afterpulsing	V_{ex} = 5 V	0.3%
Total crosstalk	V_{ex} = 5 V	16%
Maximum count rate per pixel		12.5 Mcps
Time-tagging resolution		20 ps

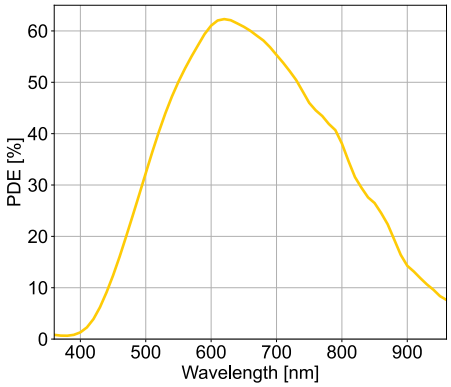
PERFORMANCE CHARACTERISTICS



Median DCR over temperature.



Excellent timing jitter with a FWHM of <120 ps.



Photon detection efficiency.

SYSTEM INTEGRATION

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

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

Your sales partner:

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