

CMOS image sensor with high dynamic-range for time-resolved fluorescence with Europium

www.imms.de/d4024a



OVERVIEW

IMMS offers application-specific CMOS image sensors based on their lock-in pixel platform that has been optimized for time-resolved fluorescence application with long decay times such as Europium.

No optical filters are required to distinguish between excitation and emission light which enables miniaturized and flat assembly as well as lower material/production costs.

The pixels provide a multi-excitation mode to accumulate light-induced charge during multiple excitation cycles which results a very high dynamic range. Number and size of the pixels can be fully customized.

The image acquisition process is fully programmable and controlled by an internal sequencer. The image sensors provide an I²C interface for configuration and image data as well as a UART and QSPI for fast image data readout.

PERFORMANCES OF THE IMAGER

Dye decay time > 1 μ s

Time resolution 20 ns

Frame rate 24 fps

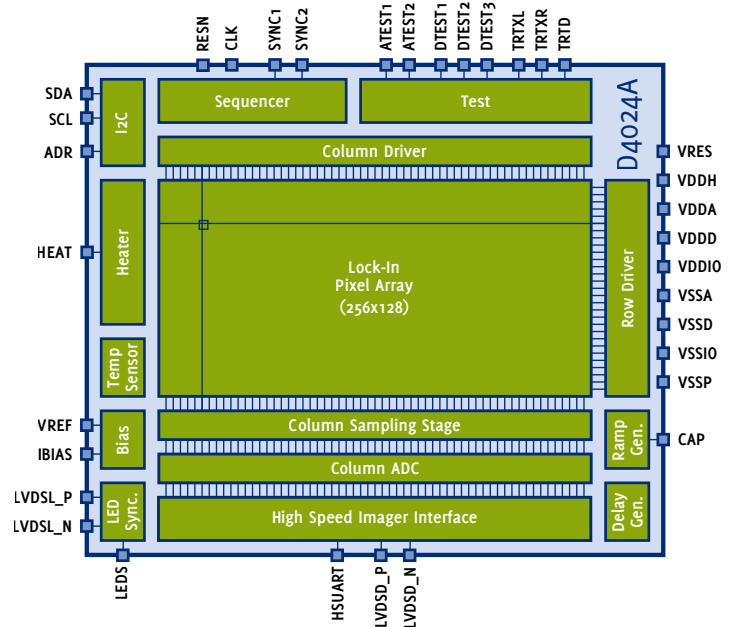
Pixel fill factor 59 %

Photo diode dark current 200 e⁻/s

Charge conversion gain 27 μ V/e⁻

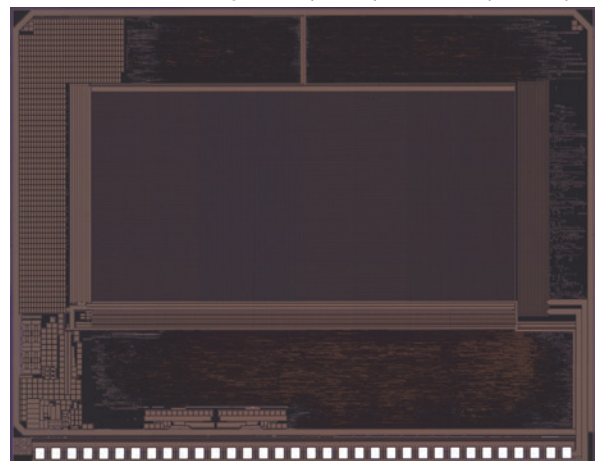
Full-well capacity 53 ke⁻

BLOCK DIAGRAM D4024A



CHIP PHOTO D4024A

D4024A: 256 x 128 pixels, pixel size 10 μ m x 10 μ m

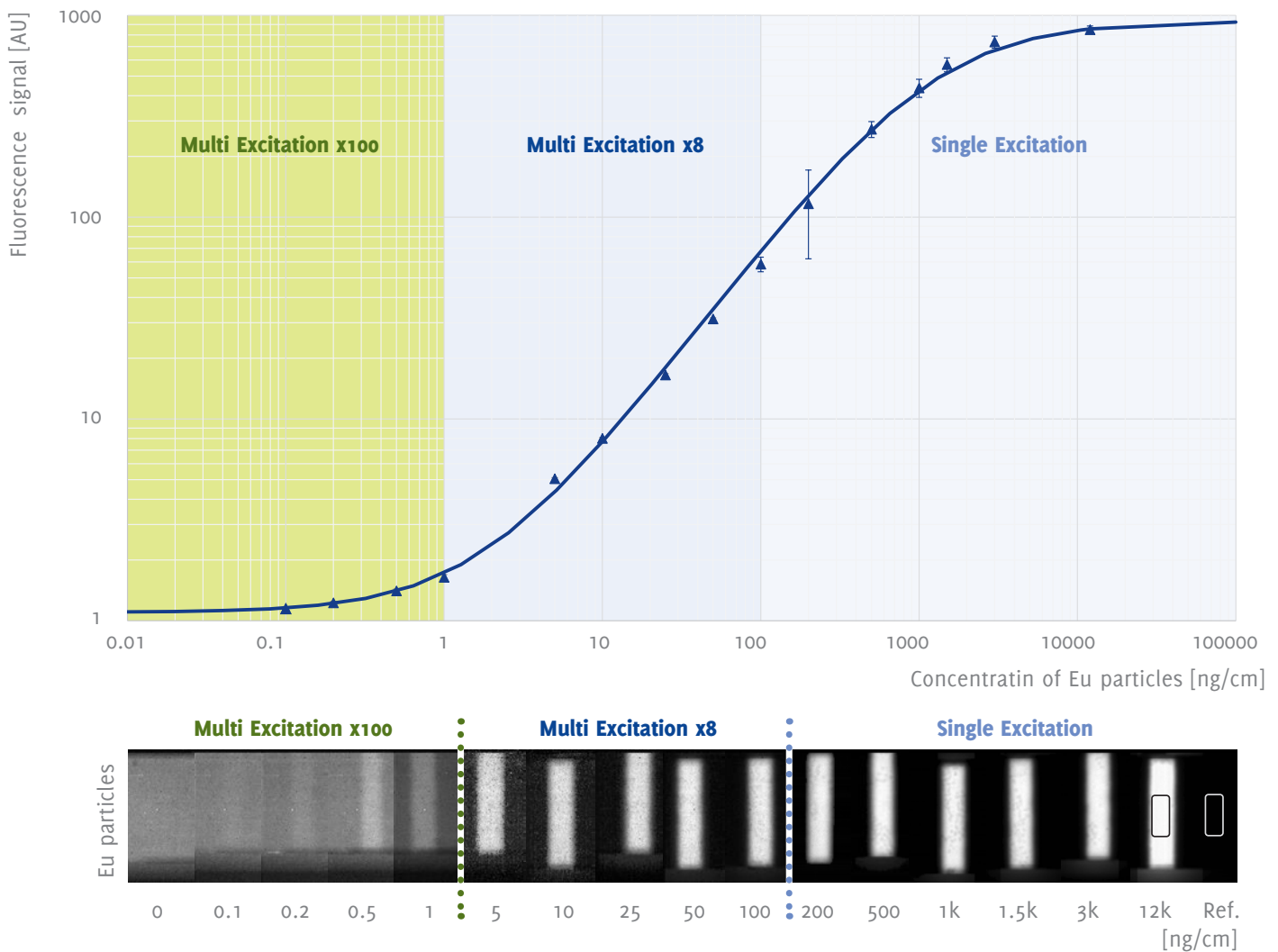
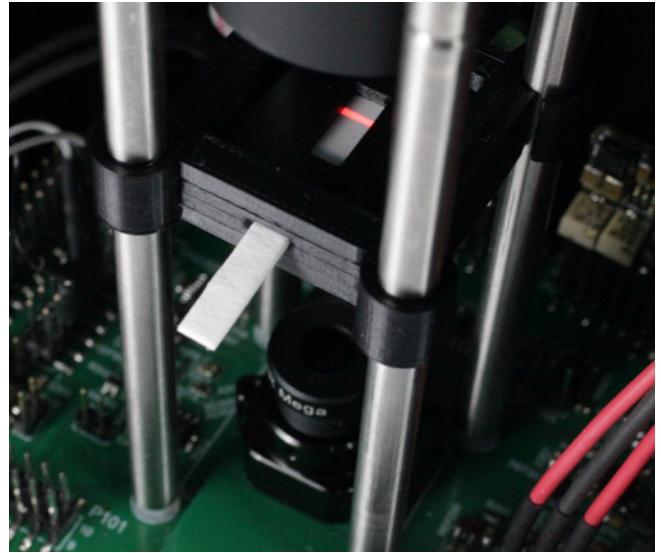


EVALUATION WITH LATERAL-FLOW TEST STRIPS

Europium-based lateral-flow test strips were used for an application-oriented evaluation of the imager. The strips were excited with a UV-LED and no optical filters have been used.

TEST STRIPS WITH LINES OF DEFINED CONCENTRATIONS OF EUROPIUM PARTICLES

Detection dynamic range	5.1
Limit of Detection	0.1 ng/cm
Coefficient of variation	1.8 % (run-to-run, 8-fold)



HUMAN C-REACTIVE PROTEIN (HCRP) LATERAL-FLOW ASSAYS WITH EUROPIUM-CONJUGATES

Detection dynamic range	3.6
Limit of Detection	0.05 ng/ml
Coefficient of variation	20 % (run-to-run, 11-fold)

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