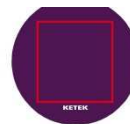# KETEK GmbH Munich - Germany

Silicon Sensors

realized by KETEK

- Short Product Overview -

27th of March 2012

KETEK
Creative Detector Solutions

Contact:
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http://www.ketek.net/

KETEK at a Glance

- Medium size, family-owned enterprise

- Number of employees: **55**

- Company based in **Munich, Germany**

- Major product lines:
  SDD-Modules, Detector Electronics, Complete Systems

- New product:
  SiPM-Modules

KETEK SDD X-Ray Detectors

KETEK Silicon Drift Detectors
X-ray detectors for XRF, TXRF, EDX

- Sizes from **7 – 100 mm²** active area

- Energy resolutions down to **121eV** (Mn Kα)

- Peak to Background **> 10.000**

- Vacuum types with high thermal budget: **ΔT>75K**

- No detector fluorescence lines

- State of the art product in the analytic market

VITUS H30
40mm² SDD chip; 30mm² active area; multi-layer collimator; **8µm Be window**
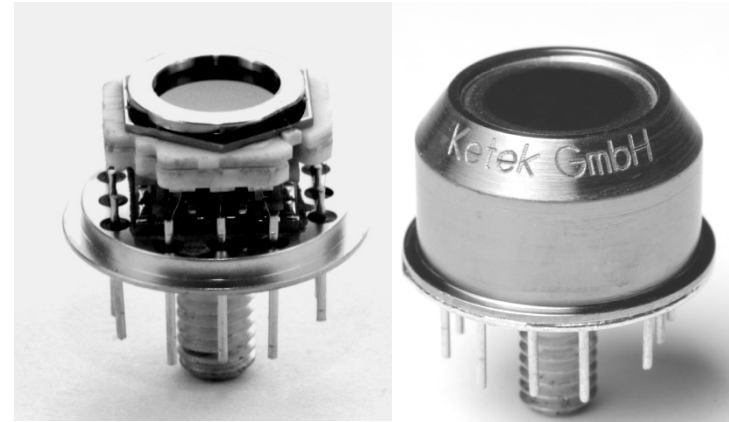
VITUS H50
65mm² SDD chip; 50mm² active area; multi-layer collimator; **12.5µm Be window**

KETEK
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KETEK SiPM Low Level Light Sensors

PM3350
3 x 3mm² active area; 50 µm microcell type; peak wavelength 420 nm; plastic package

KETEK Silicon Photomultipliers
- Fast Single Photon Counting -

- High PDE up to **60 %** for 50µm cell type

- Optimized for **blue light sensitivity**

- Low dark rate and low cross talk

- Huge bias voltage range of stable operation

- Extremely **low temperature coefficient**

PM1150 Single Photon Spectrum
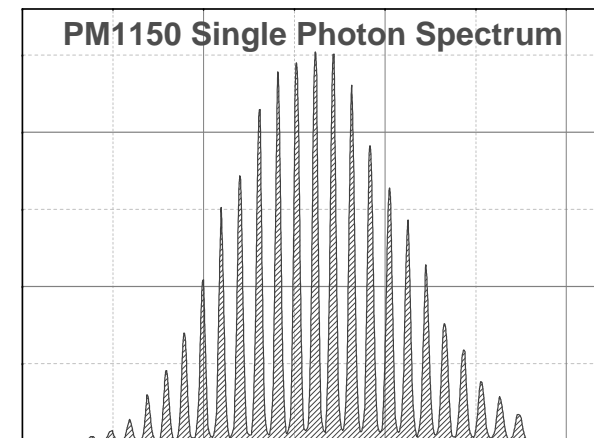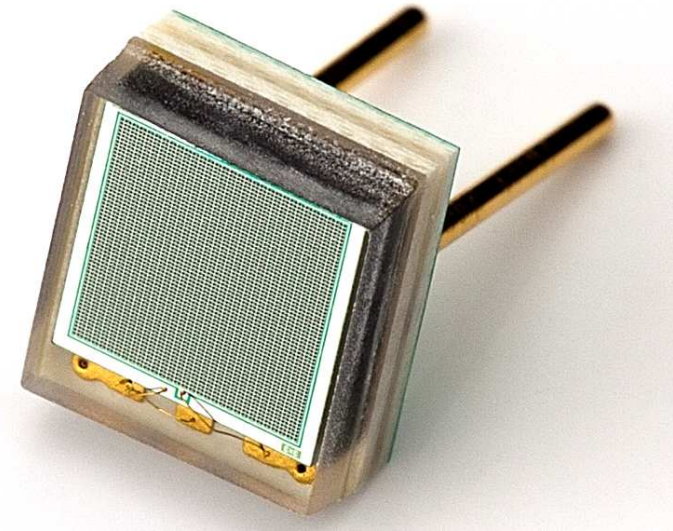
Basic Construction of the KETEK Microcell

Section of KETEK Basic Microcell
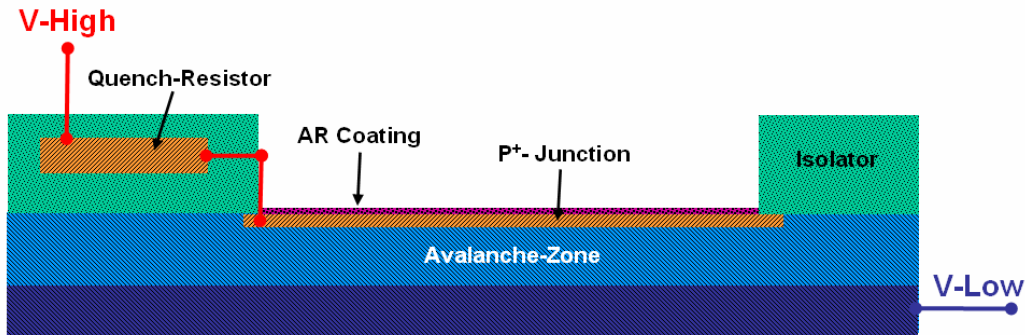
- Silicon **P on N structure** with high Geiger efficiency

- **Shallow entrance window** with high quantum efficiency

- Optimized **geometrical fill factor**

$\Rightarrow$ **High photon detection efficiency**

- Available in two technologies -

KETEK Standard Technology

- Technology optimized for **maximum GE**

- Devices with very **high PDE**

- Particularly suitable for small microcells and small active area

KETEK Trench Technology

- Technology with improved optical barrier and low-RC readout

- Devices with **low crosstalk** and **improved timing**

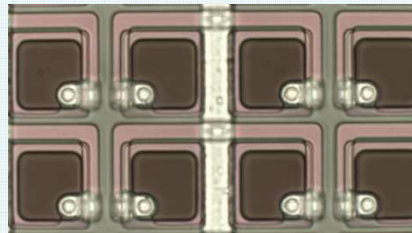- Particularly suitable for large microcells and large area devices

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KETEK SiPM Microcell Sizes

- Microcell sizes from 15µm up to 100µm realized

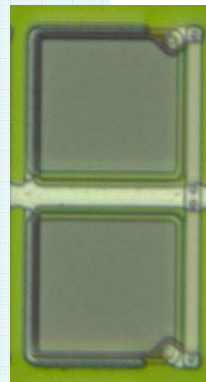- Geometrical efficiency up to 75% (depending on microcell size)
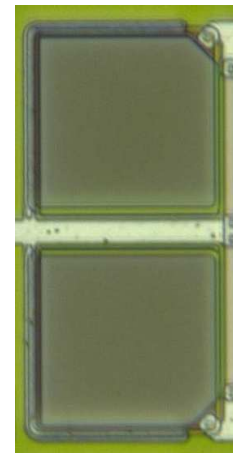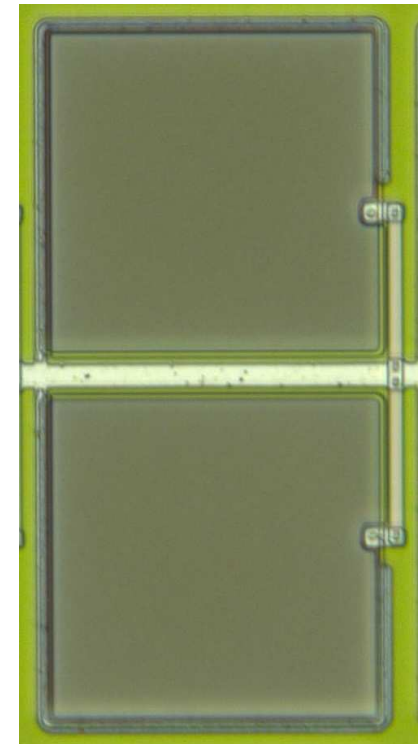
- **Standard type: 50µm**
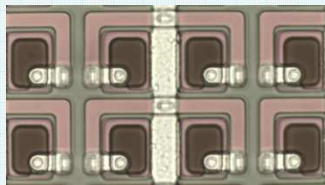
15 µm	**20 µm**	**50 µm**	**60 µm**	**100 µm**
GE 30%	GE 40%	GE 60%	GE 68%	GE 75%

High Dynamic Detection Range

High Photon Detection Efficiency

KETEK
Creative Detector Solutions

PM3350 Trench Technology Type

Active Area: 3.0 mm x 3.0 mm
Cell Pitch: 50 µm
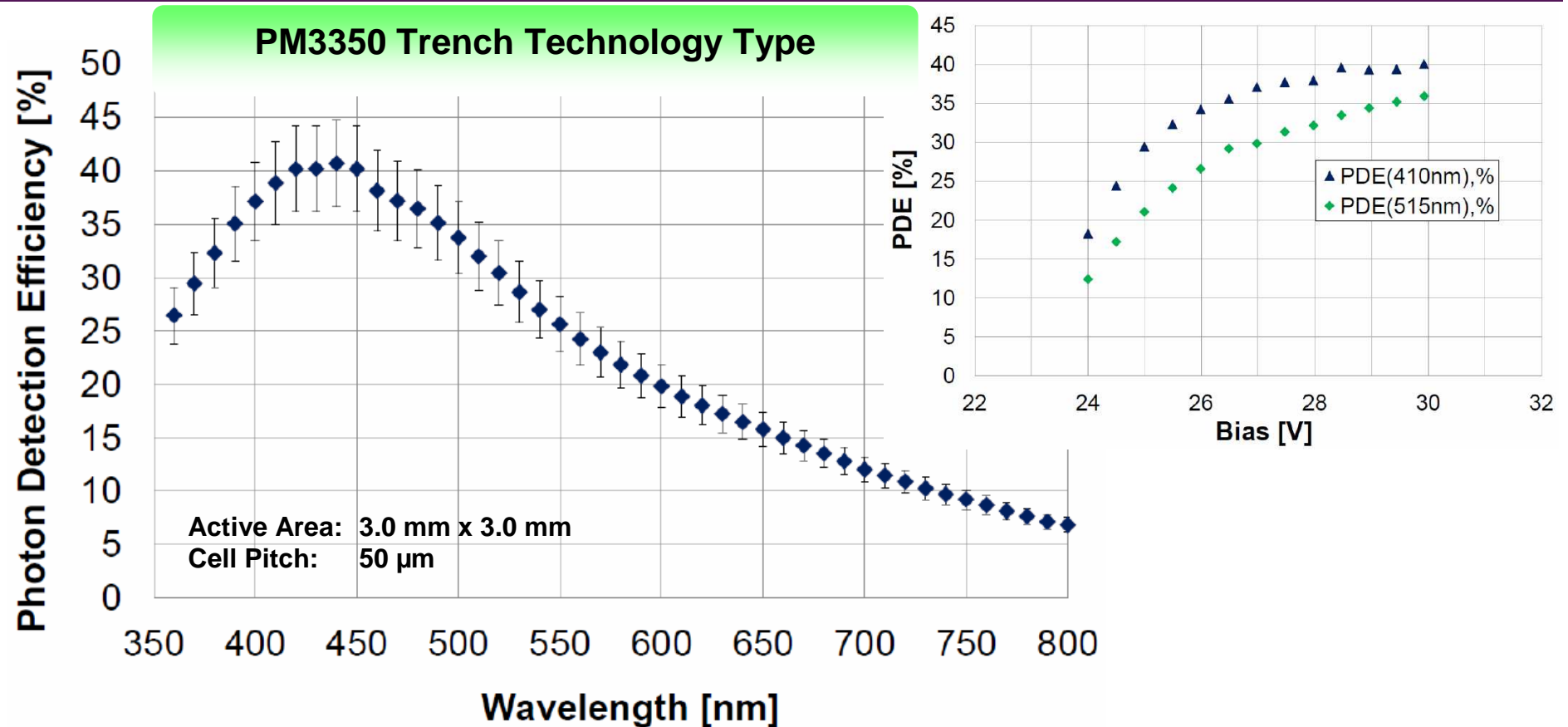
- Measurements performed by CERN / Iouri Musienko

- PDE is not affected by crosstalk and afterpulsing

- Optimized for **blue light sensitivity**

- **40%** PDE for blue light
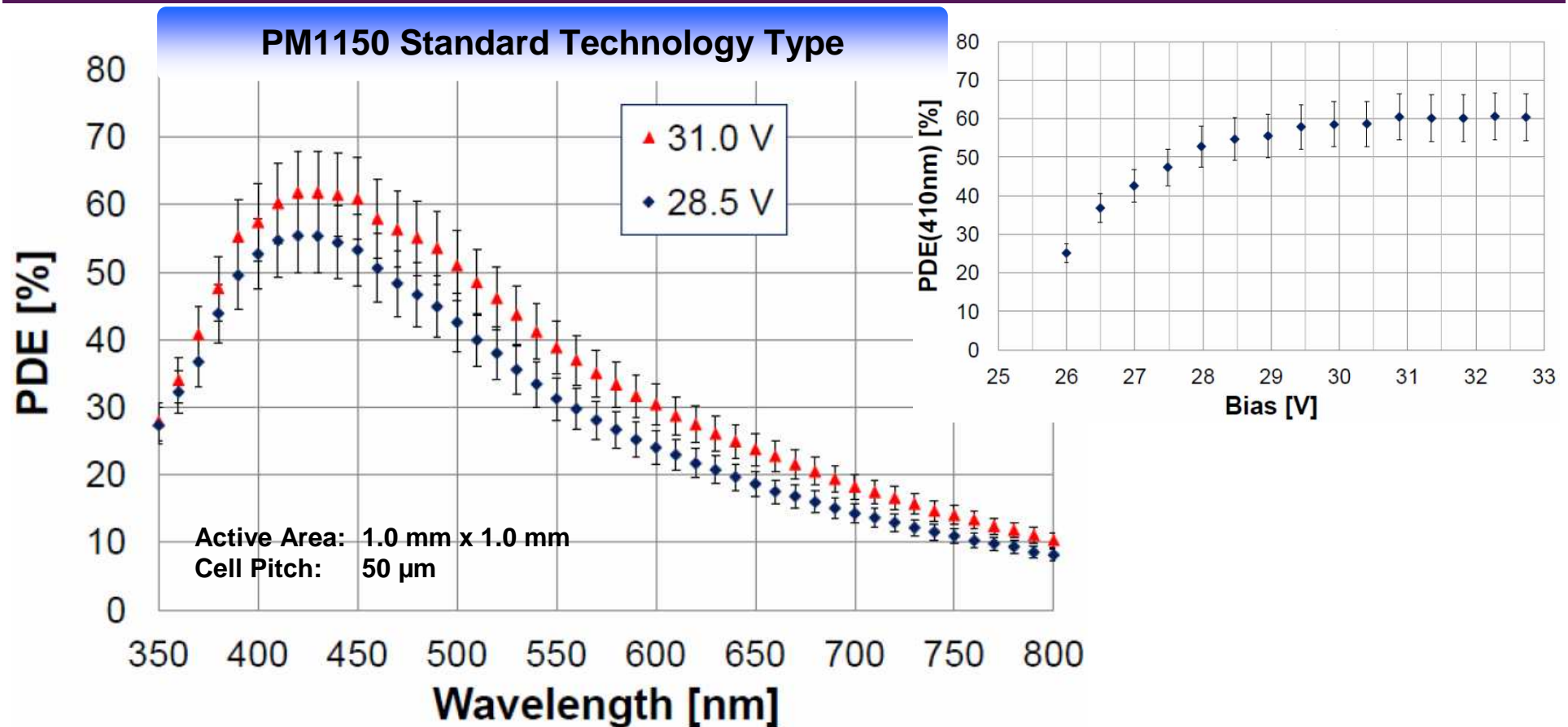
PM1150 Standard Technology Type

Active Area: 1.0 mm x 1.0 mm
Cell Pitch: 50 µm

- Measurements performed by CERN / Iouri Musienko

- PDE is not affected by crosstalk and afterpulsing

- Optimized for **blue light sensitivity**
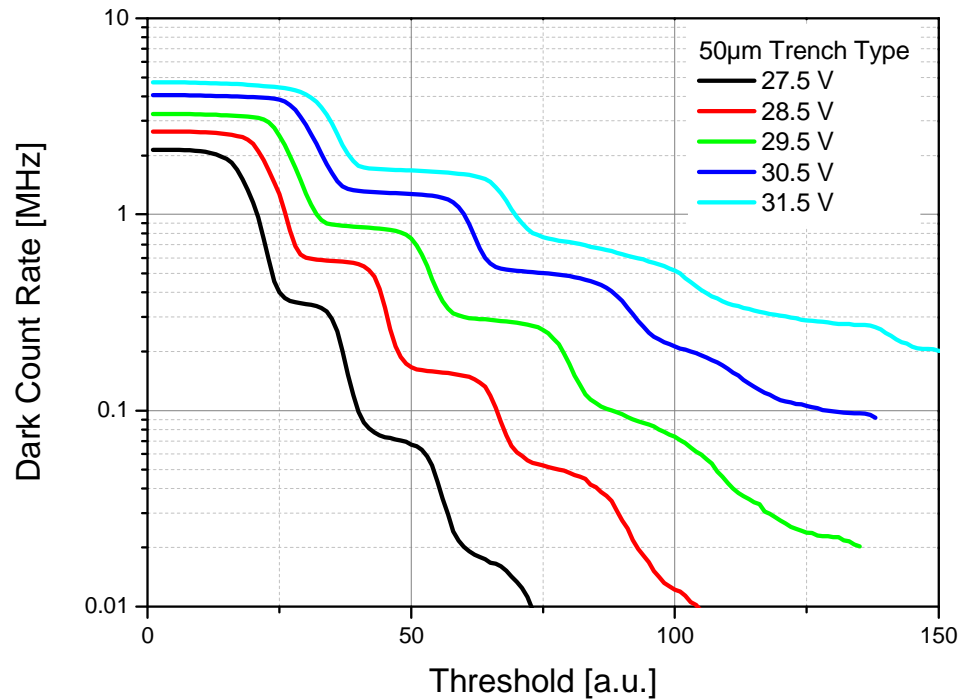
- **60%** PDE for blue light
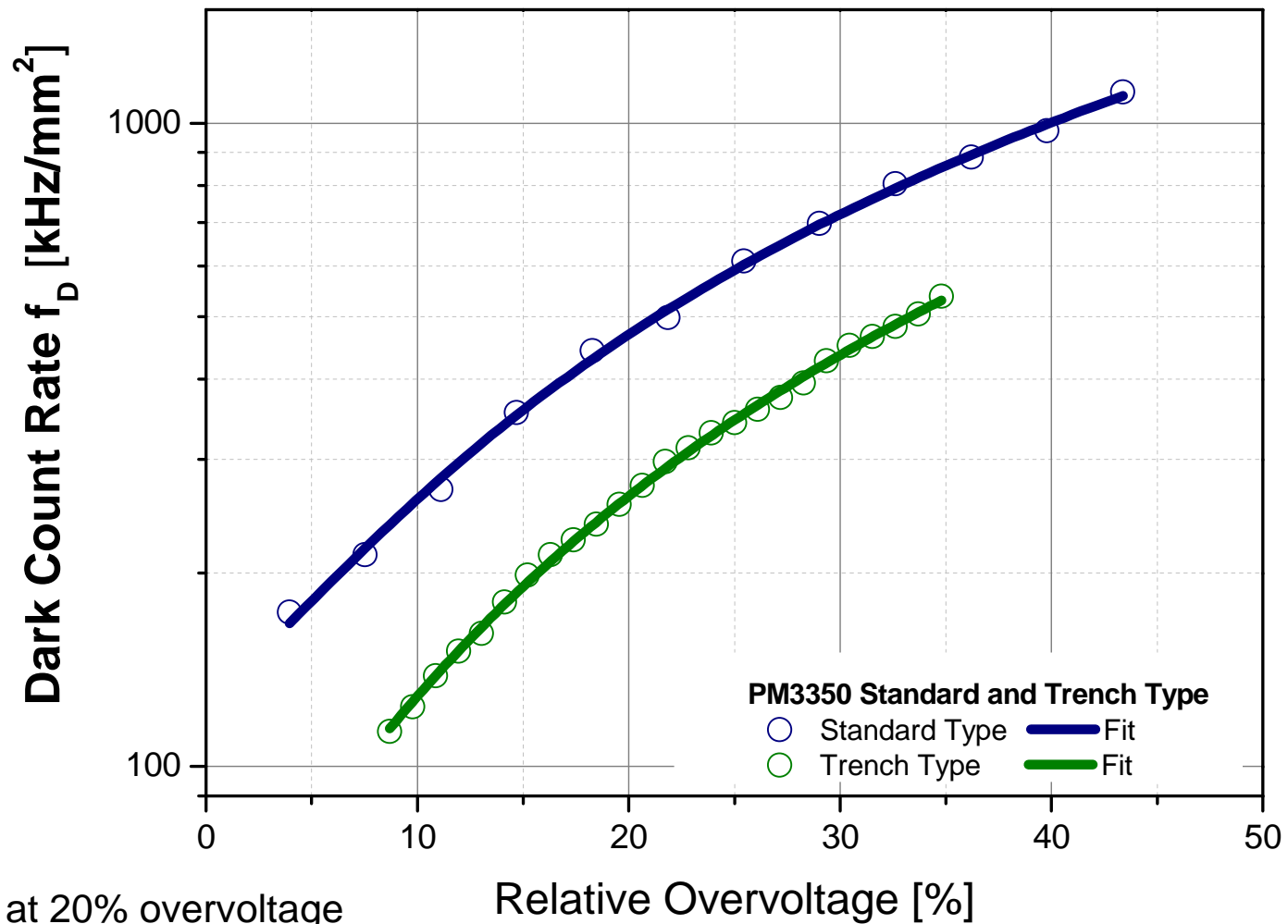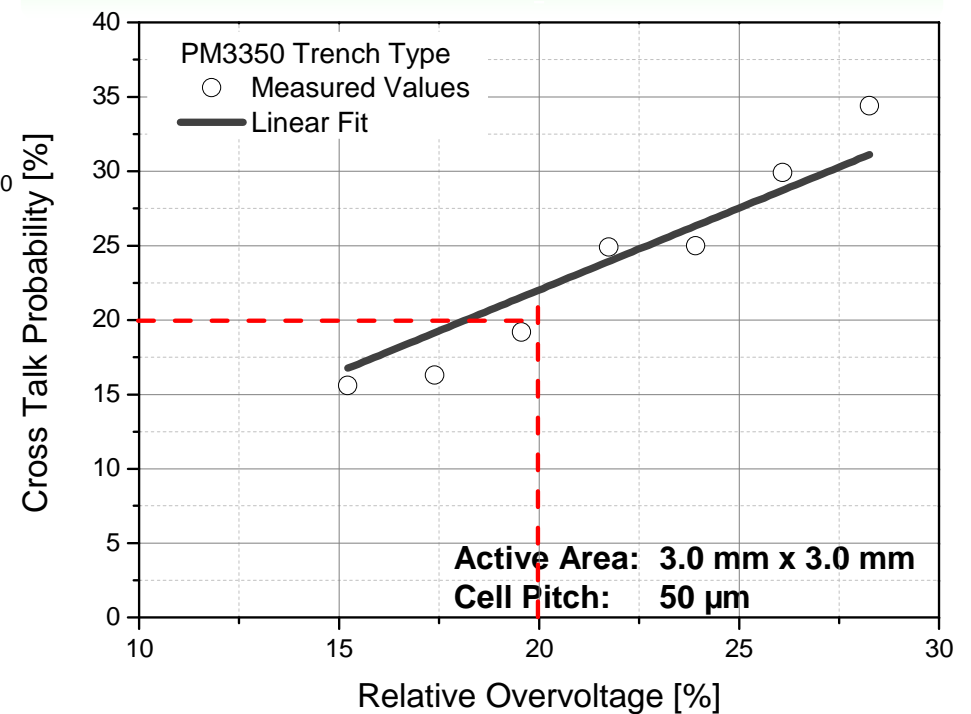
Dark count rate at 20% overvoltage

- standard technology $\leq$ **500 kHz/mm^2**

- trench technology $\leq$ **300 kHz/mm^2**
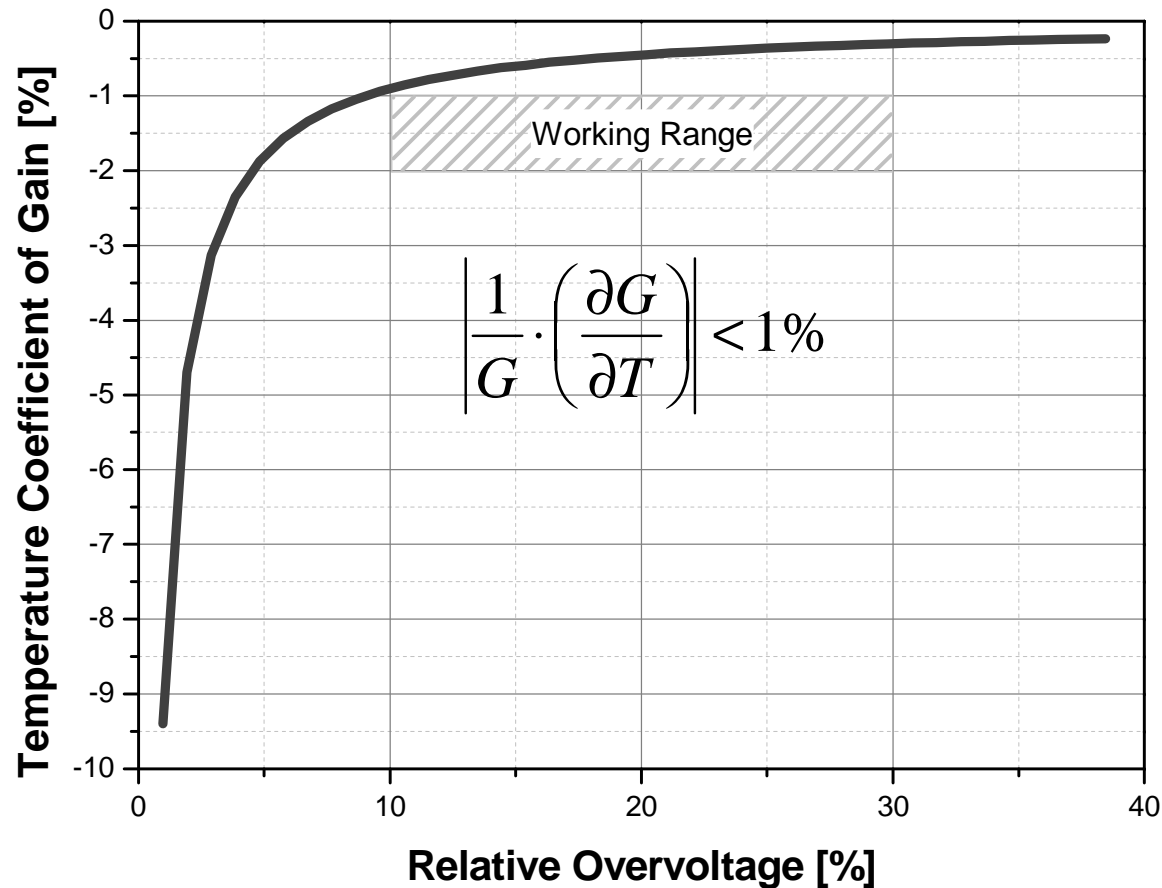
PM3350 Trench Technology Type

- PM3350 trench type encapsulated

- Crosstalk evaluation based on dark rate versus threshold measurement

- **20% crosstalk probability** at 20% overvoltage

Temperature Coefficient of the Gain

- Low temperature coefficient of break down voltage (~ **22 mV/°C**)

- Operation at high overvoltage (~ **20%**)

$\Rightarrow$ **Low temperature coefficient of gain (<1%)**

	Active Area [mm]	Cell Pitch [µm]	Standard	Trench
PM11 SMD	1.2 x 1.2	50 µm	X	X
	1.2 x 1.2	75 µm	---	X
	1.2 x 1.2	100 µm	---	X
PM22 SMD	2.0 x 2.0	50 µm	X	X
	2.0 x 2.0	100 µm	---	X
PM33 Pin SMD	3.0 x 3.0	50 µm	X	X
	3.0 x 3.0	60 µm	X	X
	3.0 x 3.0	75 µm	X	X
PM66 - Pin	6.0 x 6.0	60 µm	---	X

PM3350 - Pin

3 x 3mm² active area; 50 µm cell type; peak wavelength 420 nm; plastic package

Bias with negative Voltage

Signal Out

0.9±0.1

4.3±0.1

0.4±0.1

Pin Position

Active Area

3.8±0.1