ADVACAM
Imaging the Unseen

MINIPIX TPX2

Datasheet

Model No.: MNXT2S-Xxx211214

General features

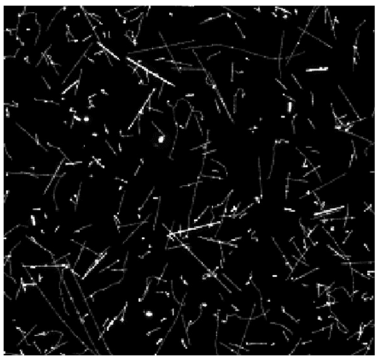


Illustration of single particle sensitivity of Timepix2 device. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of airplane. No noise (clean zero) is seen in dark regions.

The **MINIPIX$_{TPX2}$** is a miniaturized and low-power radiation camera solution that incorporates a single Timepix2 detector with a sensor of customer preference (typically 300 µm thick silicon). The detector features 256 x 256 pixels with a pitch of 55 µm and is capable of single particle counting or particle tracking. The **MINIPIX$_{TPX2}$** utilizes a USB 2.0 interface, allowing for reading of up to 99 frames per second. The energy-sensitive Timepix2 detector brings a new dimension to radiographic images and now also features a new measurement modality - adaptive gain. Adaptive gain helps to improve performance in high-intensity use cases, increasing the dynamic range of the device, and making it an even more versatile and powerful tool for radiation detection.

The **MINIPIX$_{TPX2}$** device is controlled via a USB interface and is compatible with major operating systems such as MS Windows, Mac OS, and LINUX. The system includes free software, PIXET PRO, for detector operation, offering comprehensive functionality and ease of use. With its miniaturized size, low power consumption, and advanced Timepix2 detector technology, the **MINIPIX$_{TPX2}$** is an efficient and effective solution for various radiation detection applications (imaging, XRD, particle tracking etc.)

Main Features

- Readout chip type Timepix2
- Pixel size ..... 55 x 55 µm*
- Sensor resolution ..... 256 x 256 pixels
- Counter bit depth ..... 10/ 14/ 18 bit
- Dark current ..... none
- Interface ..... USB 2.0 (Full-Speed)
- Maximum frame rate ..... 99 fps
- Dimensions ..... 88.9 x 21 x 10 mm
- Weight ..... 30 g

* 55 x 110 µm at the edges and 110 x 110 µm at the corners

[1] **MINIPIX$_{TPX2}$** is not certified dosimetric device. It serves as the first level indicator and monitor of radiation fields allowing identification of a radiation type. Radiation protection of people cannot be based on measurements of **MINIPIX$_{TPX2}$**.

[2] Dynamic range of final picture is theoretically unlimited; the only limiting factor is exposure time.

Device parameters

Operating conditions

Symbol	Parameter	Value	Units	Comment
TA	Ambient Temperature Range	0-50	°C	
Φ	Humidity	<80	%	Not condensing
	Altitude	<2000	m	Above sea level
IP	IP rating	IP40		With cover

Electrical Specification

T_A = 25°C, USB voltage V_{CC} = 4.8V

Symbol	Parameter	Min	Typ	Max	Units	Comment
V_{CC}	Supply Voltage	4.0	5.0	5.5	V	
I_{CC2}	Chip active		500	700	mA	
P1	Power Dissipation		2.5	3.5	W	
Bias Voltage Source for Sensor Diode						
V_{BIAS}	Bias Voltage	3		200	V	

Performance characteristics

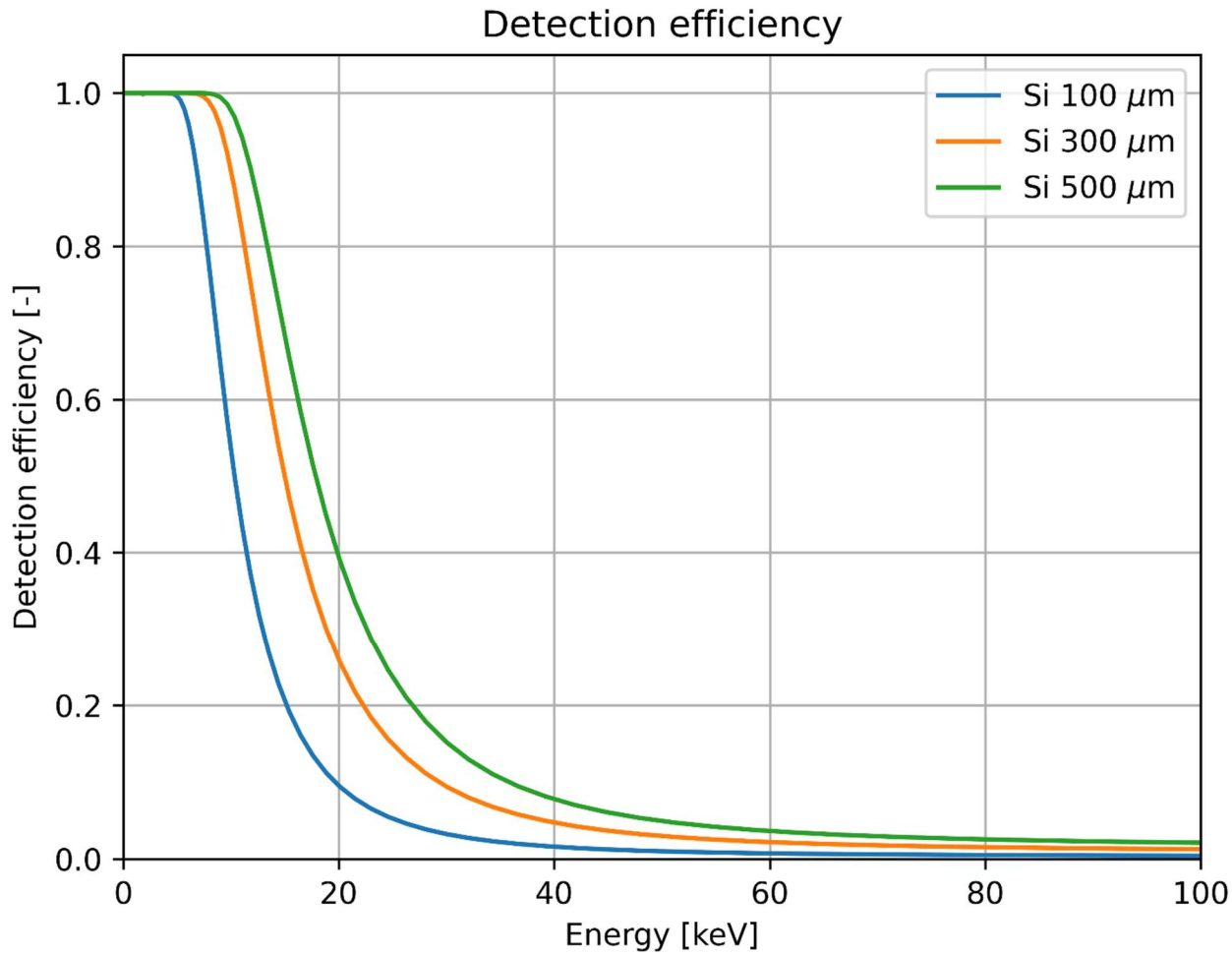
Symbol	Parameter	Min	Typ	Max	Units	Comment
f	Frame-rate			99	fps	with USB 2.0 Host
T_{READ}	Frame Readout Time[3]		19		ms	

[3] During Readout time (or Dead time), no charge is collected from the sensor.

Sensor parameters

T_A = 25°C

Symbol	Parameter	Si			Units	Comment
	Thickness	100	300	500	µm	
σ	Energy resolution of energy discrimination threshold (σ @ 8 keV)	0.36			keV	
σ	Energy resolution in full spectral mode (σ @ 8 keV)	0.6			keV	
σ	Energy resolution in full spectral mode (σ @ 23 keV)	0.9			keV	
σ	Energy resolution in full spectral mode (σ @ 60 keV)	1.4			keV	
	Typical detectable energy range for X-rays	5 to 60			keV	See chart below
	Pixel size	55			µm	



Modes and types of readout chip operation

The detector is frame-based: The data from all the pixels are read out after the acquisition time is over.

Modalities:

- Integral measurement:
  During the acquisition, recorded data is integrated and outputted as a single frame.

- First hit measurement:
  This mode disregards events that take place in the same pixel during the acquisition time, in order to minimize pile-ups.

- Counter bit Depth:
  Different counter-bit depths can be chosen for certain measurement modes. This enables tailoring the performance for higher frame rates, or better resolution.

Combinations of operation modes and measurement modalities (default cases are highlighted):

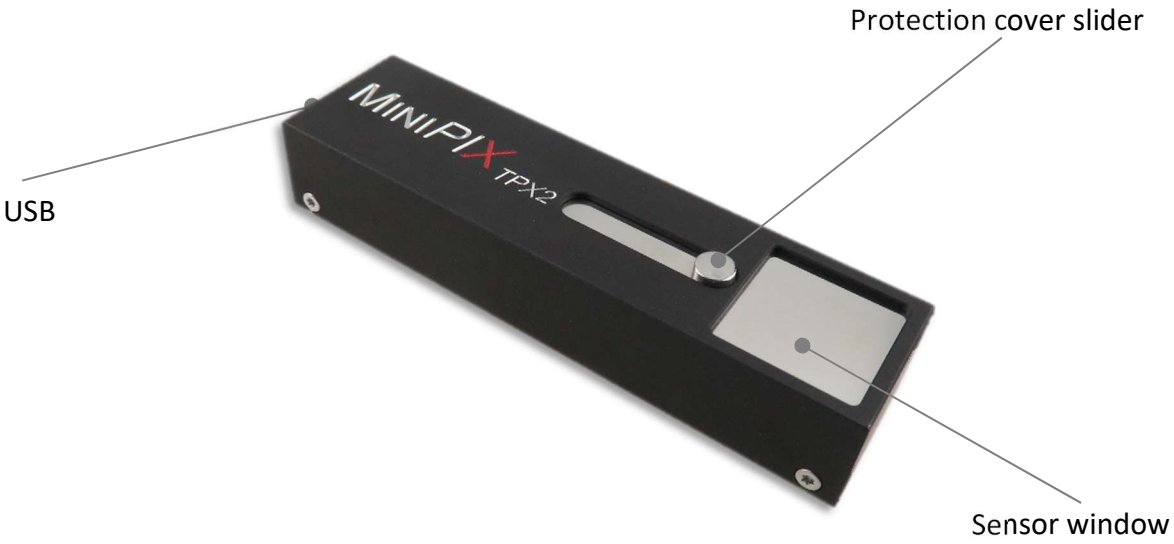
Mode	Counter Depth	Energy measurement	Frame Rate
Counts	14 bits	N/A	64 fps
	10 bits - high frame rate		99 fps
Energy	14 bits	Integrated energy	65 fps
		1st hit measurement	
Time	14 bits	N/A	65 fps
	10 bits - high frame rate		98 fps
Counts + Energy	10 bits (Energy) / 4 bits (Counts)	Integrated energy	61 fps
		1st hit measurement	
Energy + Time	14 bits (Energy) / 14 bits (Time)	Integrated energy	32 fps
		1st hit measurement	
	10 bits (Energy) / 18 bits (Time)	Integrated energy	34 fps
		1st hit measurement	

Vacuum Operation

Advacam detectors are vacuum compatible out of the box. Operate only with air pressure lower than 10^{-3}Pa. Intended for dust-free indoor use.

Make sure to disconnect the device from power during pumping down or venting the vacuum chamber!

Device description



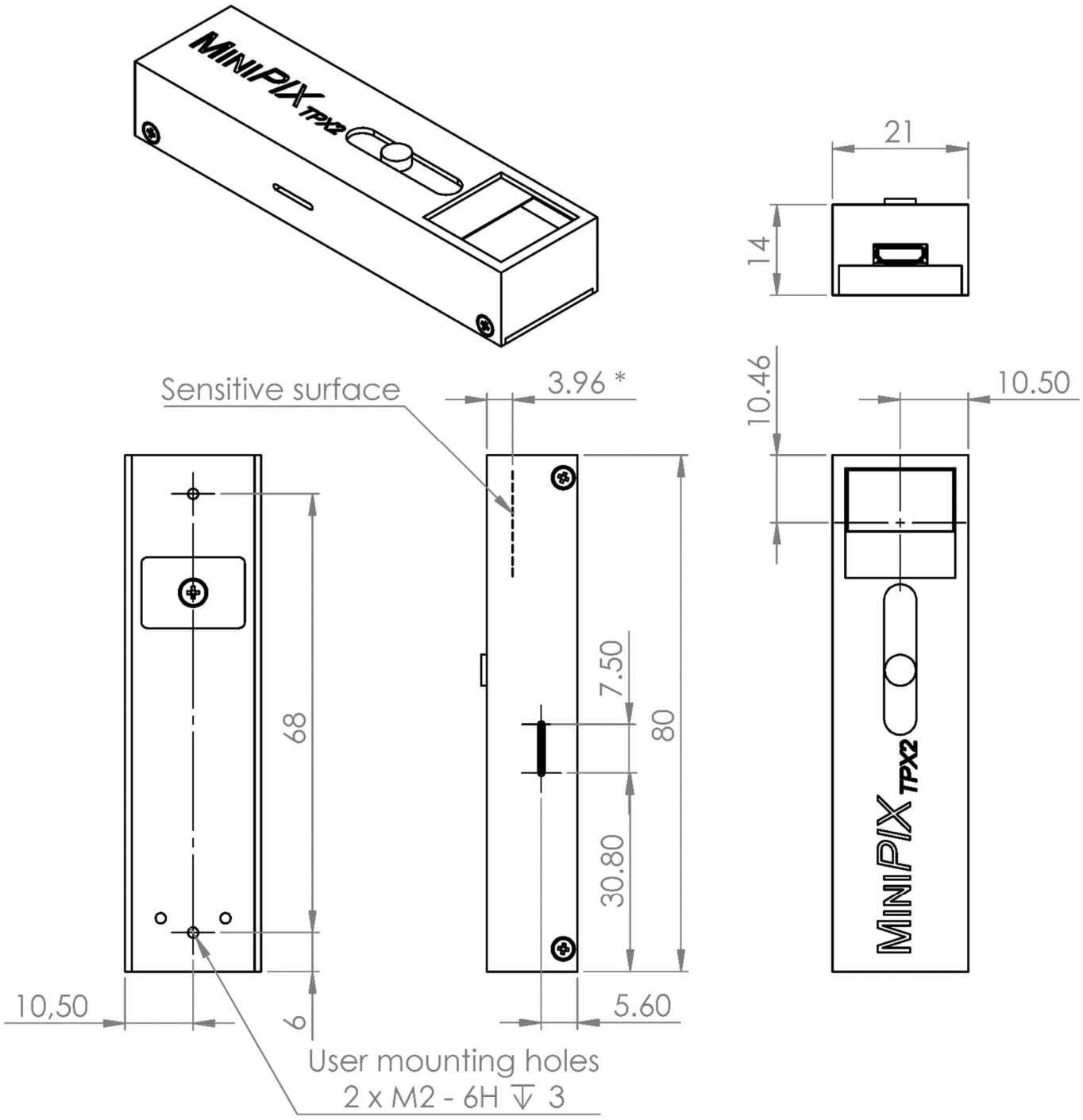
USB connector

USB type Micro-B, Standard USB 2.0 High-Speed.

The USB cable length should be less than 2m!

For longer connections, a repeater or active cable is suggested.

Mechanical dimensions



All dimensions are in mm.
* Sensitive surface distance from top of the box is for 300 µm sensor thickness.

Extreme care must be taken when removing protecting cover and handling the **MINIPIX TPX2** without the protecting cover. The warranty does not apply to mechanical damage of the sensor and wirebonds.

Model Number Codes

Example: **MNX T2S - X P 3 210520**

Device name:
MNX – MiniPIX

Device modification:
T2S – Timepix Standard

Sensor type:
P – Planar silicon

Sensor thickness:
1 – 100 µm
3 – 300 µm
5 – 500 µm

Device version date:
YY MM DD

Release history

Date	Changes
25/04/2023	New version

Warning

Do not touch sensor surface!

Instructions for safe use

To avoid malfunction or damage to your **MINIPIX**$_{TPX2}$ please observe the following:

- Do not expose to water or moisture.
- Do not disassemble. Wire-bonding connection may be irreversibly damaged.
- Do not insert any object into the sensor window.
- Maximum USB cable length is 2m
- The protection provided by this product may be impaired if it is used in a manner not described in this document

Disposal:

Do not dispose these instruments as unsorted municipal waste. Please use separate collection facility to contact the supplier from which the instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environment impact

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