ADVACAM
Imaging the Unseen

MINIPIX

Datasheet

Model No.: MNXTXS-XPx181116
MNXTXS-XPx210520

General features

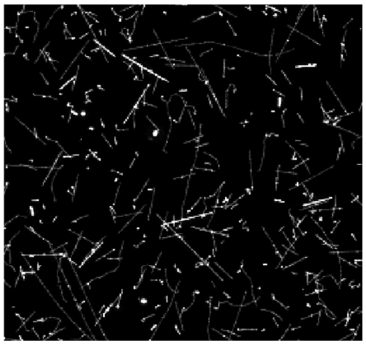


Illustration of single particle sensitivity of Timepix3 device. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of airplane. No noise (clean zero) is seen in dark regions.

The **MINIPIX** is miniaturized and low power solution of radiation camera with single particle counting (or particle tracking) detector Timepix. The standard **MINIPIX** system incorporates single Timepix detector (256 x 256 pixels with pitch of 55 µm) with sensor according to customer preference (standardly 300 µm thick silicon). It uses USB 2.0 interface capable to read up to 55 frames per second (with exposure time of 1 ms). The Timepix detector is energy sensitive which brings a new dimension to radiographic images.

The **MINIPIX** device is controlled via USB interface. The major operating systems are supported (MS Windows, Mac OS and LINUX). The complex software PIXet Pro used for detector operation is provided for free.

Several **MINIPIX** devices connected to single, or several computers can be operated together forming the radiation monitoring network. The whole group is accessed using advanced application allowing setting of alarm levels for different radiation types, performing data logging and calculating various statistics, protocols and charts. Such network can serve as long time monitor of environment[1]. Several other devices developed in IEAP CTU in Prague and produced by ADVACAM s.r.o. company can be also integrated into such monitoring network.

Example of the radiation monitoring network based on the first version of **MINIPIX** is operated in ISS (International Space Station). This network was installed by common effort of NASA, University of Houston and IEAP CTU in Prague. Devices and software was developed by IEAP CTU in Prague.

Main features

- Readout chip type ..... Timepix
- Pixel size[2] ..... 55 x 55 µm
- Sensor resolution ..... 256 x 256 pixels
- Dynamic range in one frame[3] 11 810
- Sensor material ..... 100, 300, 500 µm Si, 1 mm CdTe
- Dark current ..... none
- Interface ..... USB 2.0 (High-Speed)
- Maximum frame rate ..... 55 fps
- Dimensions ..... 88,9 x 21 x 10 mm
- Weight ..... 30 g

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

[2] 55 x 110 µm at the edges and 110 x 110 µm at the corners

[3] i.e., counter depth. Dynamic range of integrated picture is theoretically unlimited. Maximal counting freq. per pixel is 1 MHz.

Device parameters

Operating conditions

Symbol	Parameter	Value	Units	Comment
T_a	Operating ambient temperature range [1]	0-50	°C	
Φ	Humidity	< 85	%	Not condensing
IP	IP rating with cover	IP40		
IP	IP rating without cover	IP10		

[1] With temperature stabilization – see the paragraph below.

Vacuum operation

Advacam detectors can be vacuum compatible on request. Contact support@advacam.cz for more information.

- In case of vacuum operation, 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!
- The device will automatically shut down after chip or CPU temperature exceeds 55 °C.
- A direct connection to the host device is required for maximum performance. Connecting via a USB hub may negatively affect the performance and stability of the device.

External temperature stabilization

Temperature stabilization of the device required. Attach the back of the device to a water-cooled plate or to a Peltier module. The temperature should be set to 22 °C.

Electrical specification

T_{dev} = 22 °C, USB voltage V_{CC} = 4,8 V

Symbol	Parameter	Min	Typical	Max	Units	Comment
V_{CC}	Supply Voltage	4,0	5,0	5,5	V	Comply with USB 2.0
I_{CC2}	Chip active			500	mA	Comply with USB 2.0
P1	Power Dissipation			2,5	W	

Typical bias voltage source for sensor diode	Si				CdTe		Units
Thickness	100	300	500	1000[1]	1000	2000[1]	µm
V_{BIAS} [2]	50	150	150	200	-300 to -500	-500	V

[1] Customized product

[2] Positive for Si sensors, negative for CdTe. Typical values

Performance characteristics of Timepix

Symbol	Parameter	Min	Typical	Max	Units	Comment
f	Frame-rate			55	fps	with USB 2.0 Host
T_{READ}	Frame Readout Time[1]		19		ms	

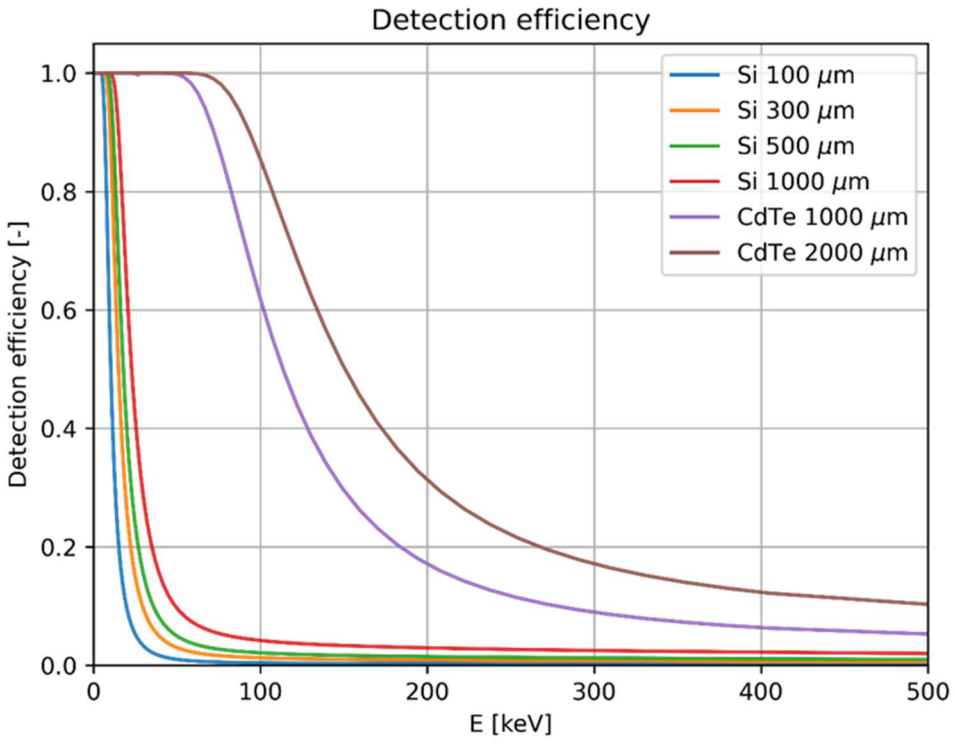
[1] During Readout time (or Dead time), no signal is collected from the sensor.

Sensor parameters

T_A = 25 °C

Symbol	Parameter	Si			Units	Comment
	Thickness	100	300	500	µm	
σ	Energy resolution in full spectral mode (σ @ 60 keV)	1,2-3,5			keV	Valid for standard calibration @22 °C
	Typical detectable energy range for X-rays	5 to 60			keV	See chart below
	Pixel size[2]	55 x 55			µm²	

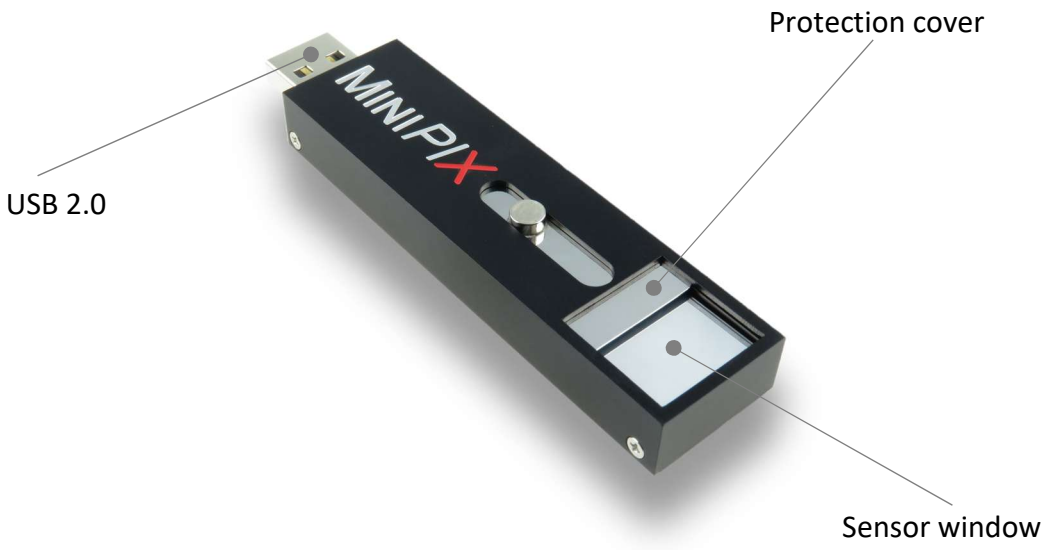
[2] 55 x 110 µm at the edges and 110 x 110 µm at the corners



Modes of readout chip operation

Type	Mode	Dynamic range	Description
Frame (reading all pixels)	Event	11810/frame	1 output image: Number of Events per pixel
	ToT	11810/frame	1 output image: Sum of all Energies deposited in given pixel (Time Over Threshold)
	ToA	11810/frame	1 output image: Time of arrival of first event in given pixel

Device description



USB connector

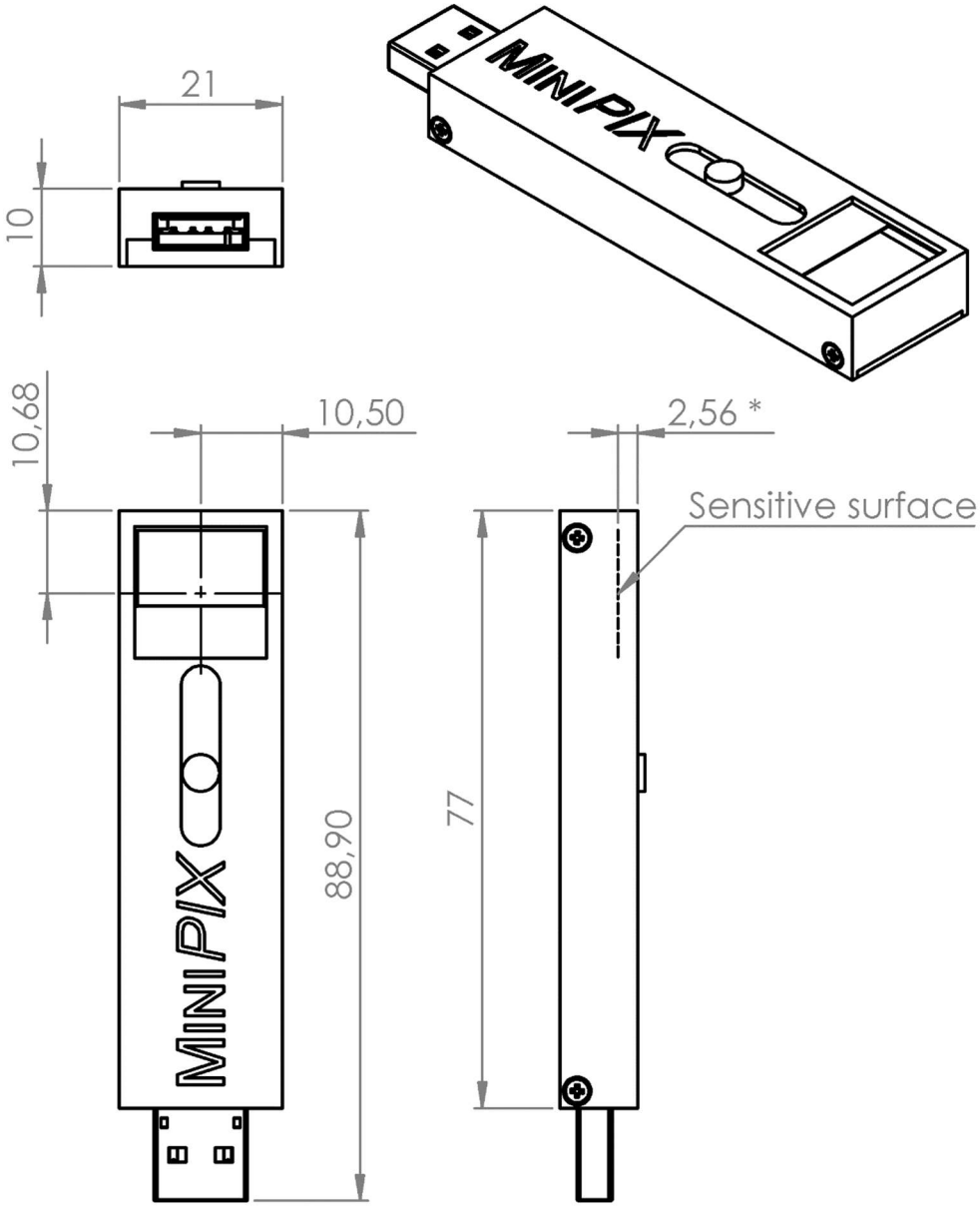
USB type A, Standard USB 2.0 High-Speed.

Certificates

MINIPIX has been tested by certification authority (Electrotechnical testing institute EZÚ) according to following standards:

Standard number	Name
EN 61000-6-2:05	Electromagnetic compatibility (EMC) - Immunity standard for industrial environments
EN 61000-6-4:07+A1:11	Electromagnetic compatibility (EMC) - Emission standard for industrial environments

Mechanical dimensions



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

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

Model number codes

Example: **MNX TXS - X P 3 XXXXXXXX**

Device name:
MNX – MiniPIX

Device modification:
TXS – Timepix Standard

Sensor type:
P – Planar silicon

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

Device build version:

Instructions for safe use

Do not touch the sensor surface!

To avoid malfunction or damage to your **MINIPIX** 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.
- The maximum USB cable length is 2 m.
- Thermal stabilization of the device is necessary. Recommended temperature is 22 °C.
- A direct connection to the host device is required for maximum performance. Connecting via a USB hub may negatively affect the performance and stability of the device.
- 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.

Release history

Date (YY/MM/DD)	Changes	Changed by
21/08/12	New version	
23/02/22	Updated	
24/07/01	Datasheet revision, new graphic style of the document	J. Baborák, P. Bloudek
24/07/22	Minor format changes	J. Baborak
24/09/11	Temp. stabil. paragraph corrected	J. Baborak
25/05/12	Sensor parameters and logo updated	J. Baborak

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