

MiniPIX

EDU

Model No.: MNXTXE-XPx210520



General features

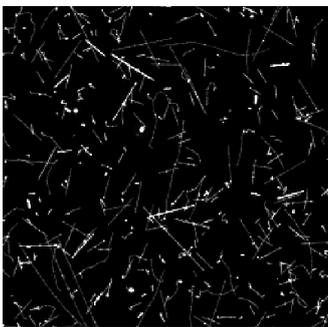


Illustration of single particle sensitivity of Timepix detector. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of an airplane. No noise (clean zero) is seen in the dark regions.

The **MiniPIX EDU** is miniaturized and low power solution of radiation camera with single particle counting (or particle tracking) detector Timepix. The standard **MiniPIX EDU** system incorporates single Timepix detector (256 x 256 pixels with pitch of 55 μm) with 300 or 500 μm thick silicon. It uses USB 2.0 interface capable of reading up to 45 frames per second (with exposure time of 1 ms). The Timepix detector is energy sensitive which brings a new dimension to radiographic images. The device can also visualize many kinds of ionizing radiation particles (beta, alpha, cosmic radiation, etc.). The **MiniPIX EDU** device is controlled via USB interface. The major operating systems are supported (MS Windows, Mac OS and LINUX).

The **MiniPIX EDU** is an ideal device for physics classes where students can literally “see” the radiation surrounding us.

Main Features

- Readout chip type..... Timepix
- Pixel size¹..... 55 x 55 μm^2
- Sensor resolution..... 256 x 256 pixels
- Dynamic range in one frame²..... 11 810
- Sensor material..... 300, 500 μm Si
- Dark current..... none
- Interface USB 2.0 (High-Speed)
- Maximum frame rate..... 45 fps
- Dimensions 88,9 x 21 x 10 mm
- Weight..... 30 g

¹ 55 x 110 μm^2 at the edges and 110 x 110 μm^2 at the corners

² i.e. counter depth. Dynamic range of final picture is theoretically unlimited. Maximal counting freq. per pixel is 1 MHz

Device parameters

Operation 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	IP30		

¹ With temperature stabilization – see the paragraph below.

External temperature stabilization

Temperature stabilization of the device is strongly recommended for consistent results. Attaching a Peltier cooling or cooling plate at the back of the detector should serve the purpose. The temperature should be set to 22 °C.



The device will automatically shut down after chip or CPU temperature exceeds 55°C.

Electrical specification

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

Symbol	Parameter	Min	Typ	Max	Units	Comment
V_{CC}	Supply Voltage	4,4	5,0	5,25	V	Comply with USB 2.0
I_{CC}	Chip active			500	mA	Comply with USB 2.0
P1	Power consumption			2,5	W	
V_{BIAS}	Bias Voltage	3		200	V	

Performance characteristics of Timepix

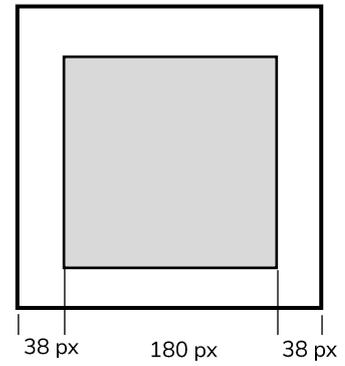
Symbol	Parameter	Min	Typical	Max	Units	Comment
f	Frame-rate			45	fps	with USB 2.0 Host
T_{READ}	Frame Readout Time ¹		22		ms	

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

Performance limitations

MiniPIX EDU has some minor limitations compared to the standard **MiniPIX BASIC**.

- No sensor stability or pixel response patterns are evaluated.
- Quality of the chip will be evaluated only in the central area (50% of the full sensor area).
- One column of bad pixels is allowed in the central area.
- Bad pixel clusters of up to 20 pixels are allowed (except column).
- Overall, 1 % of bad pixels in the central area (324 pixels) is allowed, including a bad column if any.
- Quality criteria for 300 μm and 500 μm thick Si sensors are the same.
- **MiniPIX EDU** comes with Pixet Basic software, which has limited functionality compared to Pixet Pro.
- In Pixet Basic in the imaging mode there is a watermark in the bottom left corner - the ADVACAM company logo.



Evaluated sensor area of **MiniPIX EDU**

Sensor parameters

$T_A = 25\text{ }^\circ\text{C}$

Symbol	Parameter	Si		Units	Comment
	Thickness	300	500	μm	
σ	Energy threshold step	0,1		keV	
σ	Energy resolution in full spectral mode (σ @ 23 keV)	1,9		keV	
σ	Energy resolution in full spectral mode (σ @ 60 keV)	1,8		keV	
	Pixel size ¹	55 x 55		μm^2	

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

Modes and types of readout chip operation

Type	Mode	Counter depth	Description
Frame (reading all pixels)	Tracking	13bit/frame	1 output image: Sum of all Energies deposited in given pixel in keV
	Imaging	13bit/frame	1 output image: Number of Events per pixel

Device description



USB connector

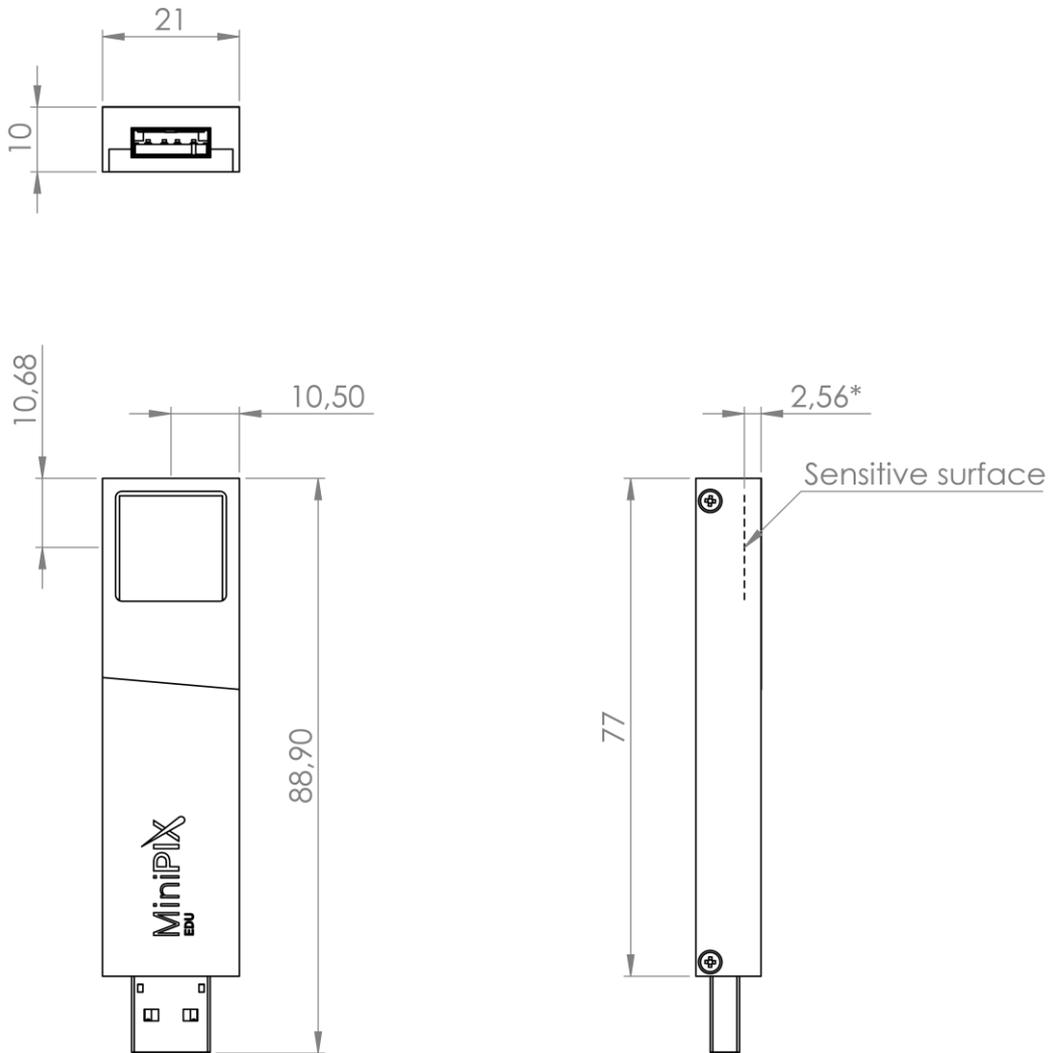
USB type A, Standard USB 2.0 High-Speed

Certificates

MiniPIX EDU 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



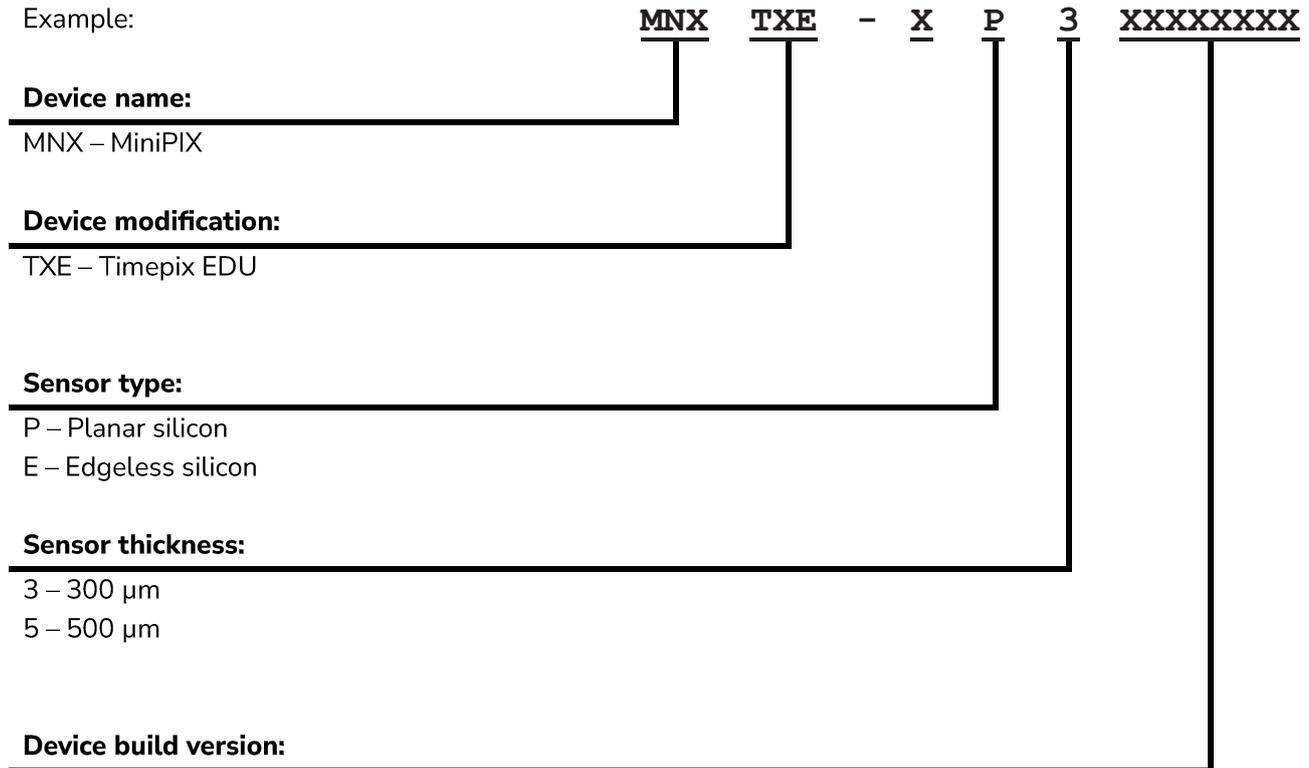
All dimensions are in mm.

* Sensitive surface distance from top of the box may vary depending on actual 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



Instructions for safe use



Do not touch sensor surface!

To avoid malfunction or damage to your **MiniPIX EDU** please obey 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 environmental impact.

Release history

Date (YY/MM/DD)	Changes	Changed by
20/06/10	Mechanical dimensions	
20/08/20	Added Edgeless Sensor	
21/07/09	New version	
22/01/04	EDU parameters update	
24/01/10	EDU – Pixet Basic update	J. Baborák
24/04/16	Datasheet revision, modes updated, added watermark info	J. Baborák
24/05/24	New graphic style of the document	J. Baborák, P. Bloudek
24/06/12	Warning sign change	J. Baborák
25/12/18	New graphic style of the document, rebranding	P. Bloudek

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