
MINIPIX *EDU*

Datasheet

Model No.: MNXTXE-XPx200421
MNXTXE-XPx210520



General features



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 to read 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.

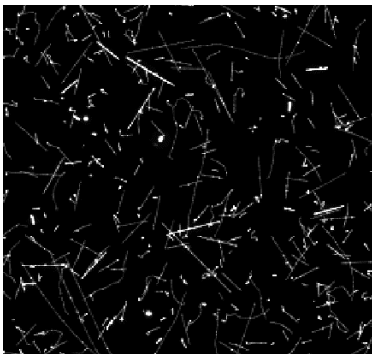


Illustration of single particle sensitivity of Timepix device. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of airplane. No noise (clean zero) is seen in dark regions.

Main Features

- Readout chip type Timepix
- Pixel size 55 x 55 μm
- Sensor resolution 256 x 256 pixels
- Dynamic range in one frame¹ 11 810
- Dark current none
- Interface USB 2.0 (Full-Speed)
- Maximum frame rate 45 fps
- Dimensions 88.9 x 21 x 10 mm
- Weight 30 g

¹ Dynamic range of final picture is theoretically unlimited; the only limiting factor is exposure time.

Device parameters

Operating conditions

Parameter	Value	Units	Comment
Operating temperature range	0-55	°C	
Humidity	<80	%	Not condensing
Altitude	<2000	m	Above sea level
Pressure range	>80	kPa	Atmospheric operation
	<1	Pa	Vacuum operation*
IP rating	IP30		With the cover on

***Warning:** Disconnect the device from power during pumping down or venting the vacuum chamber!

Location: Intended for indoor use, dust free.

Electrical Specification

T_A = 25°C, USB voltage V_{CC} = 4.8V

Symbol	Parameter	Min	Typ	Max	Units	Comment
V _{CC}	Supply Voltage	4.4	5.0	5.25	V	Comply with USB 2.0
I _{CC2}	Chip active			500	mA	Comply with USB 2.0
P ₁	Power Dissipation			2.5	W	
Bias Voltage Source for Sensor Diode						
V _{BIAS}	Bias Voltage	3		200	V	

Performance characteristics of Timepix

Symbol	Parameter	Min	Typ	Max	Units	Comment
f	Frame-rate			45	fps	with USB 2.0 Host
T _{READ}	Frame Readout Time ²		22		ms	

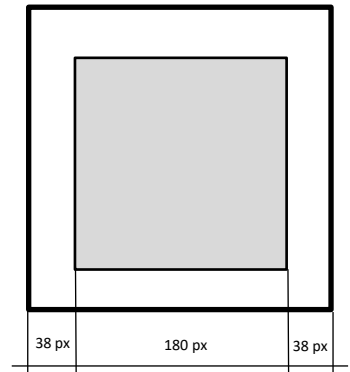
² During Readout time (or Dead time), no charge is collected from the sensor.



Performance limitations

MINIPIX_{EDU} has some minor limitations compared to the standard **MINIPIX**.

- 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 bad column if any)
- Quality criteria for 500 μm and 300 μm thick Si sensors are the same



Evaluated sensor area of **MINIPIX_{EDU}**

Sensor parameters

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

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	55		μm	

Modes of readout chip operation

Type	Mode	Precision	Description
Frame (reading all pixels)	Event	13bit/frame	1 output image: Number of Events per pixel
	ToT	13bit/frame	1 output image: Sum of all Energies deposited in given pixel (Time Over Threshold)
	ToA	13bit/frame	1 output image: Time of arrival of first event in given pixel

Device description



USB connector

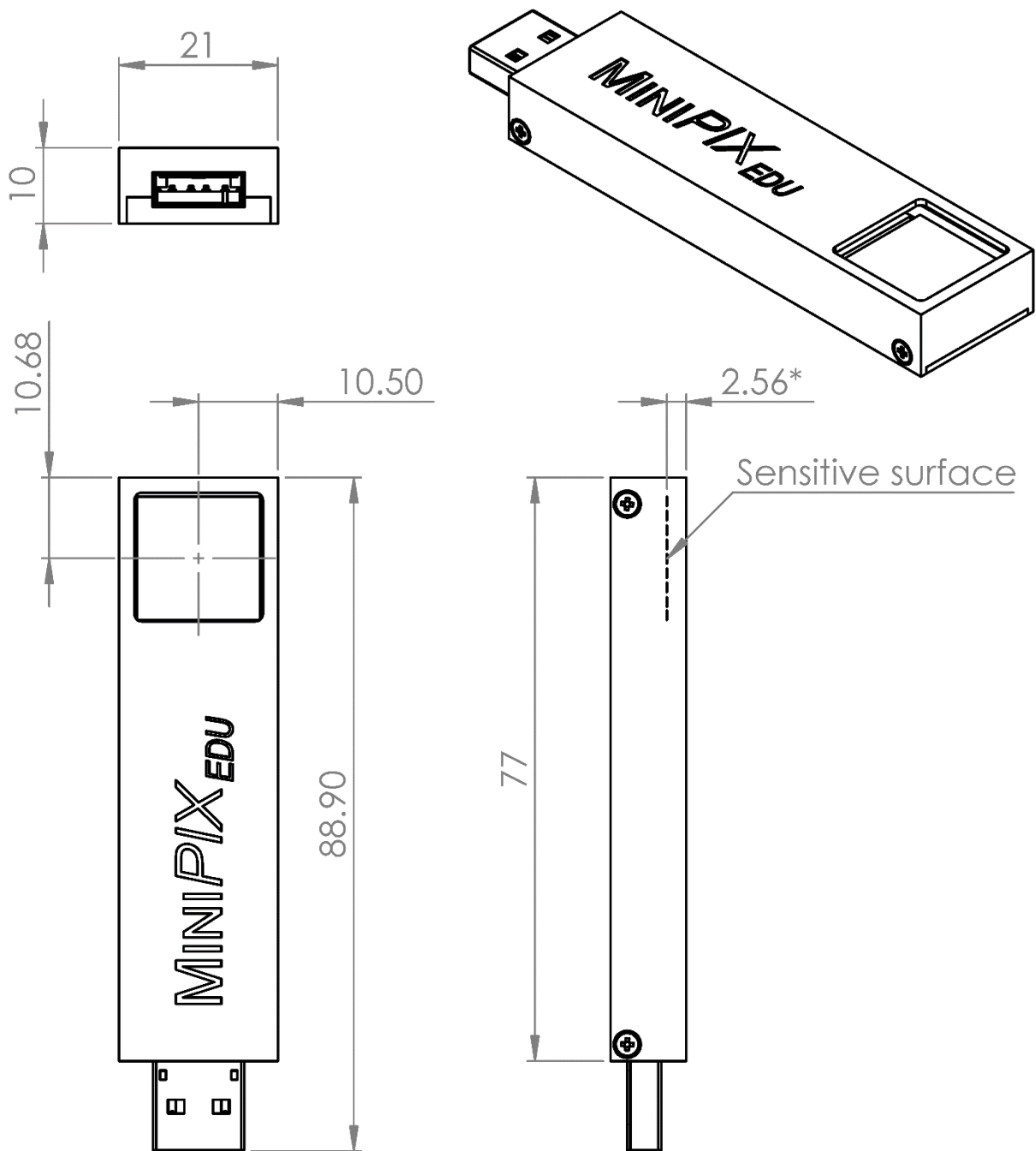
USB type A, Standard USB 2.0 Full-Speed.

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 is for 300 µm sensor thickness.

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



Model Number Codes

Example:

MNX TXE - X P 3 210520

Device name:

MNX – MiniPIX

Device modification:

TXE – Timepix Edu

Sensor type:

P – Planar silicon
E – Edgeless silicon

Sensor thickness:

1 – 100 μm
3 – 300 μm
5 – 500 μm

Device version date:

YY MM DD

Release history

Date	Changes
04/01/22	EDU parameters update
20/06/10	Mechanical dimensions
20/08/20	Added Edgeless Sensor
21/07/09	New version



Warning

Do not touch sensor surface!

Instructions for safe use

To avoid malfunction or damage to your **MINIPIX_{EDU}** 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 3m
- 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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