

# MiniPIX

BASIC Flex

Model No.: MNXTXF-XP524060017



## General features

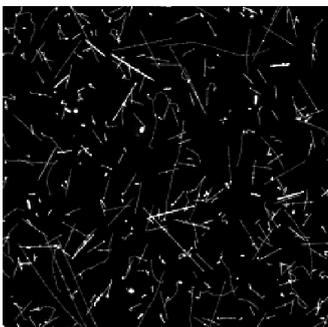


Illustration of single particle sensitivity of Timepix detector. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of an airplane. No noise (clean zero) is seen in the dark regions.

The **MiniPIX BASIC Flex** is miniaturized and low power solution of radiation camera with single particle counting (or particle tracking) detector Timepix. The standard **MiniPIX BASIC Flex** system incorporates single Timepix detector (256 x 256 pixels with pitch of 55  $\mu\text{m}$ ) with 500  $\mu\text{m}$  Si sensor. 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 BASIC Flex** 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 BASIC Flex** 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<sup>1</sup>. 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<sup>2</sup>..... 55 x 55  $\mu\text{m}^2$
- Sensor resolution..... 256 x 256 pixels
- Dynamic range in one frame<sup>3</sup>..... 11 810
- Sensor material..... 500  $\mu\text{m}$  Si
- Dark current..... none
- Interface ..... USB 2.0 (High-Speed)
- Maximum frame rate..... 55 fps
- Dimensions ..... see page 6
- Weight..... 77 g

<sup>1</sup> The device is not certified dosimeter. 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 with this device.

<sup>2</sup> 55 x 110  $\mu\text{m}^2$  at the edges and 110 x 110  $\mu\text{m}^2$  at the corners

<sup>3</sup> 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 <sup>1</sup>	0-50	°C	
$\Phi$	Humidity	< 80	%	Not condensing
IP	IP rating without cover	IP10		

<sup>1</sup> With temperature stabilization – see the paragraph below.

### Vacuum operation

ADVACAM detectors can be vacuum compatible on request. Contact [support@advacam.cz](mailto:support@advacam.cz) for more information.



- In case of vacuum operation, operate only with air pressure lower than  $10^{-3}$  Pa.
- The device will automatically shut down after chip or CPU temperature exceeds 55 °C.
- Intended for dust free indoor use.
- Make sure to disconnect the device from power during pumping down or venting the vacuum chamber!
- 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 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.

### Electrical specification

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

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

Typical bias voltage source for sensor diode	Si	Units
Thickness	500	$\mu$ m
$V_{BIAS}$	150	V

## Performance characteristics of Timepix

Symbol	Parameter	Min	Typical	Max	Units	Comment
f	Frame-rate			55	fps	with USB 2.0 Host
T <sub>READ</sub>	Frame Readout Time <sup>1</sup>		19		ms	

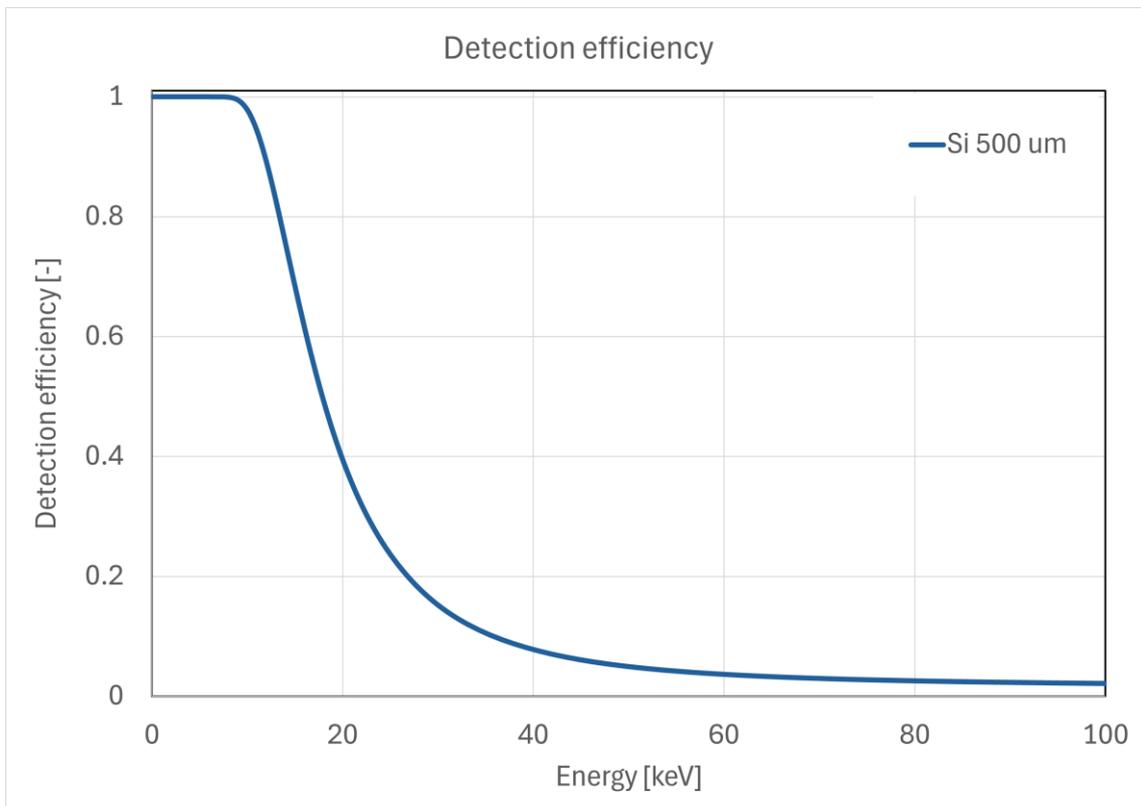
<sup>1</sup> During Readout time (or Dead time), no signal is collected from the sensor.

## Sensor parameters

T<sub>A</sub> = 25 °C

Symbol	Parameter	Si	Units	Comment
	Thickness	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 <sup>2</sup>	55 x 55	µm <sup>2</sup>	

<sup>2</sup> 55 x 110 µm at the edges and 110 x 110 µm at the corners



## Modes and types 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

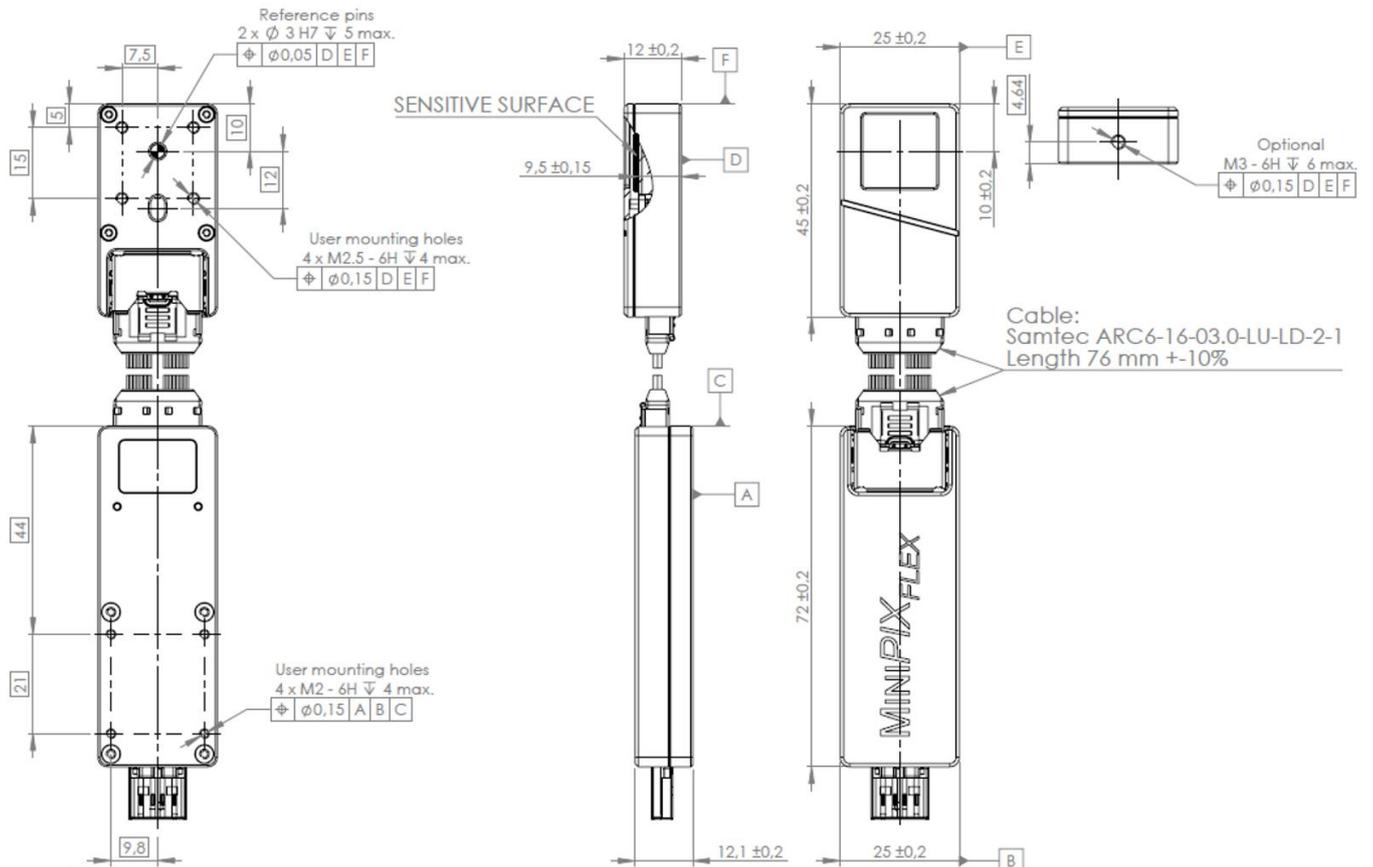
## Device description



### USB connector

USB type A, Standard USB 2.0 High-Speed

## Mechanical dimensions



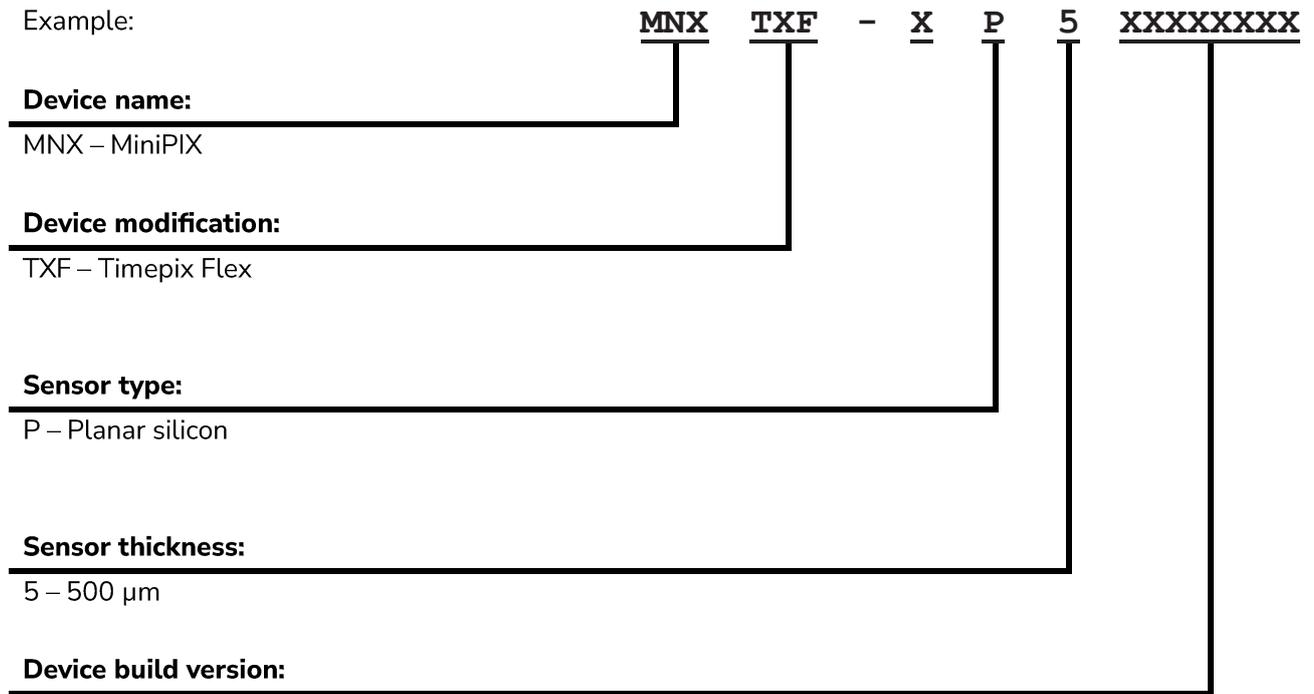
All dimensions are in mm.

\* 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 BASIC Flex** 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
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
25/06/12	CdTe version removed (invalid option for this product)	J. Baborak
26/03/02	New graphic style of the document, rebranding	P. Bloudek

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