

MiniPIX⁺

SPRINTER

Preliminary Datasheet

Model No.: MNXT2S-Xxx



General features

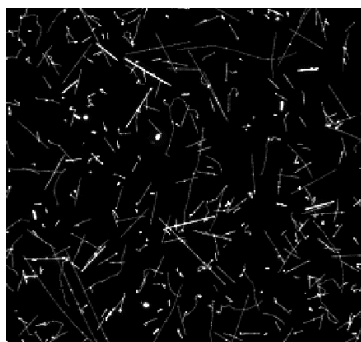


Illustration of single particle sensitivity of Timepix2 detector. The tracks of different particles of radiation background (mostly muons and few protons) were recorded in 5 minutes on board of an airplane. No noise (clean zero) is seen in the dark regions.

The MiniPIX SPRINTER 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 high-energetic particle tracking for space applications¹. This energy-sensitive detector also brings a new dimension to radiographic images. The MiniPIX SPRINTER device utilizes a USB 2.0 interface, allowing for reading of up to 99 frames per second. The signal-to-noise ratio exceeding 1000 enables crystal-clear X-ray images with low noise².

The MiniPIX SPRINTER device controlled via a USB interface is compatible with major operating systems: MS Windows, Mac OS and Linux. The software PIXet Pro for detector operation, offering comprehensive functionality and ease of use, is supplied with the device. With its miniaturized size, low power consumption, and advanced Timepix2 detector technology, the MiniPIX SPRINTER is an efficient and effective solution for various radiation detection applications (imaging, XRD, XRF, particle tracking, space radiation monitoring, electron microscopy, science, education, etc.).

Main features

- Readout chip type.....Timepix2
- Pixel size³55 x 55 μm
- Sensor resolution256 x 256 pixels
- Counter bit depth10/ 14 bit
- Sensor material.....300, 500 μm Si, 1000 μm CdTe
- Dark current.....none
- Interface.....USB 2.0 (High-Speed)
- Maximum frame rate.....up to 99 fps
- Dimensions80 x 21 x 14 mm
- Weight.....37 g

¹ 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.

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

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

Device parameters

Operating conditions

Symbol	Parameter	Value	Units	Comment
T _a	Operating ambient temperature range ¹	0-50	°C	
Φ	Humidity	< 80	%	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 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

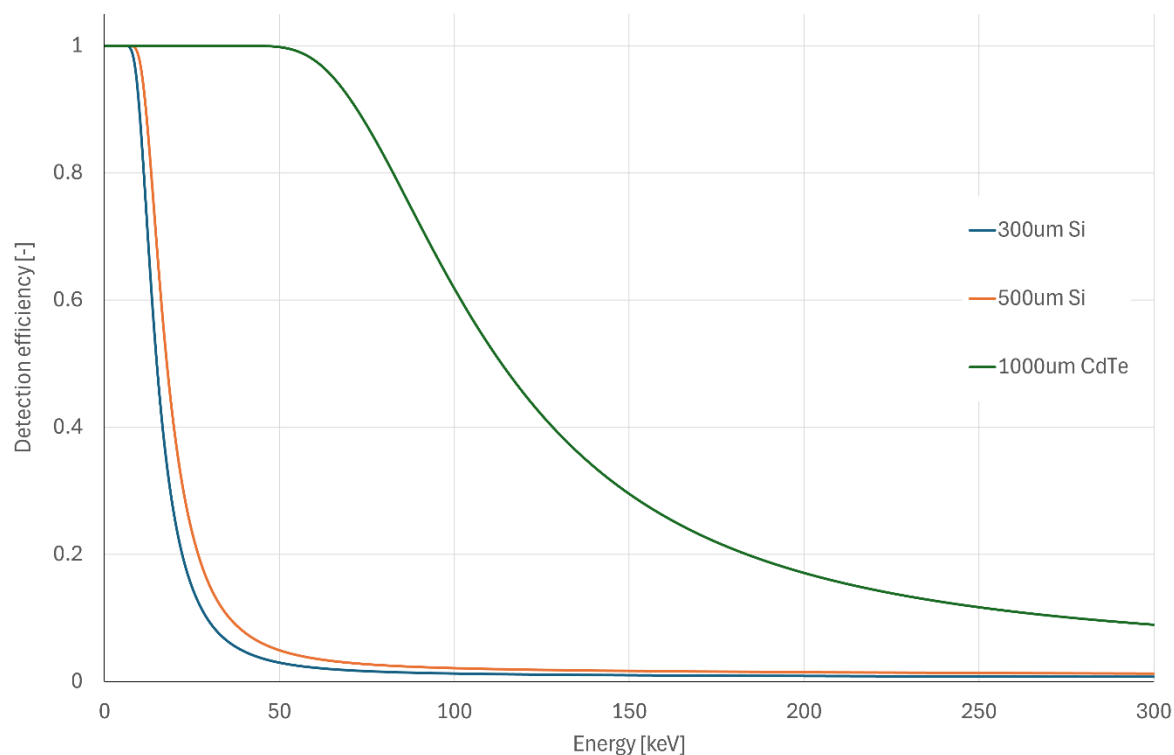
Symbol	Parameter	Min	Typ	Max	Units	Comment
V _{cc}	Supply voltage	4,5	5,0	5,25	V	
I _{cc2}	Chip active		550	1000 *	mA	
P1	Power consumption		2,75	5	W	
V _{BIAS Si}	Bias voltage for Si sensors	5	150	200	V	Depends on sensor thickness
V _{BIAS CdTe}	Bias voltage for CdTe sensors	-200	-450	-500	V	

* Tentative

Sensor parameters

T_{dev} = 22 °C

Symbol	Parameter	Si		CdTe	Units	Comment
	Sensor thickness	300	500	1000	μm	
σ	Energy resolution of energy discrimination threshold (σ @ 8 keV)	0,4 ¹		TBD	keV	
	Minimum energy threshold	5,0		6,0	keV	
σ	Energy resolution in full spectral mode (σ @ 8 keV)	0,9 ¹		TBD	keV	
σ	Energy resolution in full spectral mode (σ @ 23 keV)	1,3 ¹		TBD	keV	
σ	Energy resolution in full spectral mode (σ @ 60 keV)	2,0 ¹		TBD	keV	
	Typical detectable energy range for X-rays	5 to 60		8 to 400	keV	See chart below
	Pixel size ²	55		55	μm	

¹ Typical values² 55 x 110 μm at the edges and 110 x 110 μm at the corners

Modes and types of readout chip operation

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

Counter bit depth

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

An overview of operation modes (default cases are highlighted) together with maximum achievable frame rates is presented in the table below. Actual frame rate might decrease due to detected particle flux, software or processing being run simultaneously with the measurement, saving the data during the measurement, performance of the computer itself.

Mode	Counter depth	Maximum frame rate
Counts	14 bits	64 fps
	10 bits - high frame rate	99 fps
Energy	14 bits	65 fps
Energy + Time	10 + 18 bit	30 fps

Device description

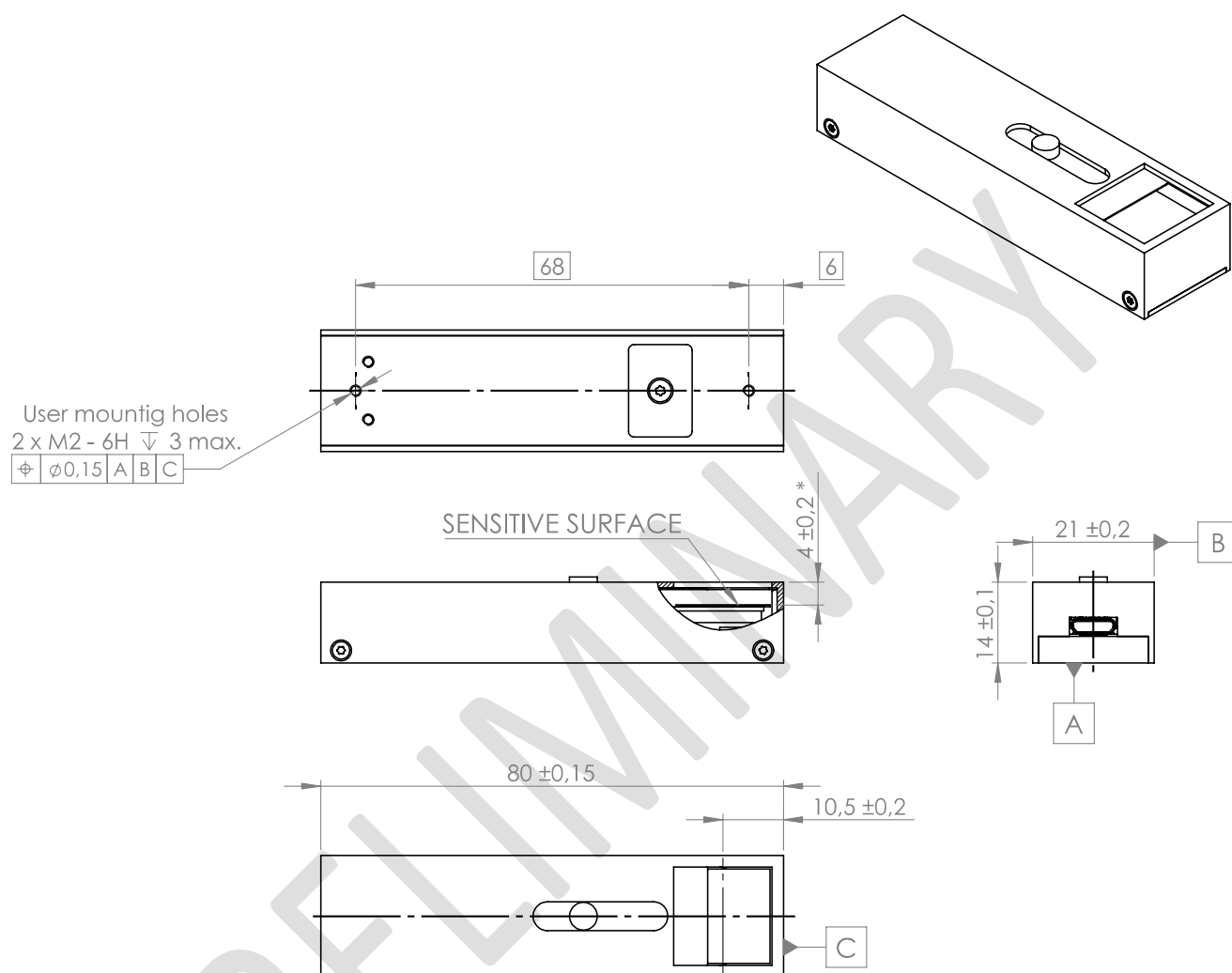


USB connector

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 μ m sensor thickness.



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

Model number codes

Example:	MNX	T2S	-	X	P	3	23110016	
Device name:								
MNX – MiniPIX								
Device modification:								
T2S – Timepix2 Standard								
Sensor type:								
P – Planar silicon C – CdTe								
Sensor thickness:								
3 – 300 µm 5 – 500 µm A – 1000 µm								
Device build version:								
XXXXXXXX								



Instructions for safe use



Do not touch the sensor surface!

To avoid malfunction or damage to your MiniPIX SPRINTER 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
23/04/25	First draft (MNXT2S-Xxx211214)	
23/11/28	Preliminary datasheet (MNXT2S-Xxx)	D. Doubravová
24/04/15	Datasheet revision – SPRINTER case	J. Baborák
24/05/24	New graphic style of the document	J. Baborák, P. Bloudek
24/06/24	USB hub warning added	J. Baborák
24/07/22	Minor format changes	J. Baborák
25/04/28	Si 100 um version removed	J. Baborák
25/09/22	CdTe sensor, Energy+Time mode added	J. Baborák
25/10/16	Detector images and logo changes	P. Bloudek

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