WIDEPIX®

FITPIX Kit

Version 1.0

Datasheet

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General description

FITPIX is traditional interface with speed of up to 100 frames per second for Medipix/Timepix detector(s). It can control and read data from up to 8 Medipix/Timepix detectors connected in daisy chain. There is variety of Medipix/Timepix detector carriers and adapter cards with detectors organized in different orientations and geometries.

In connection with motherboard with single Timepix radiation imaging detector with sensor according to customer preference (standardly 300 µm thick silicon) it creates device usable in many experiments including X-ray imaging, particle tracking and radiation monitoring.

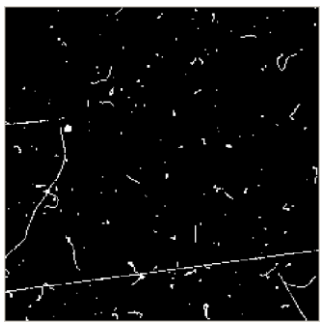


Illustration of single particle sensitivity of Timepix device. The tracks of different particles of normal radiation background were recorded in 10 minutes. No noise (clean zero) is seen in dark regions.

The system can be extended attaching further Timepix detector layers forming a particle tracker or multilayer imager. The system can be used in imaging applications (e.g. X-ray or neutron radiography) as well as for radiation monitoring where its ability to recognize individual particles, sort them to several basic groups (X-rays, electrons, alphas etc.) and measure their energies is utilized with great advantage. If more than single detector layer is used then also direction of particles can be often determined. The system can be adapted for operation in vacuum.

The maximal frame-rate decreases with number of stacked detector layers. Whole device is connected to the computer via single USB 2.0 cable. All major operating systems are supported (MS-Windows, MacOS, Linux)

Main Features

- Readout chip type Timepix
- PC Interface USB 2.0 (Hi-Speed)
- Maximum frame rate 100fps
- Dimensions 131.0 x 51.0 x 19.3mm
- Weight 128 g

Device Parameters

Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units	Comment
T_A	**Temperature Range**	0	50	70	°C	
Φ	**Humidity**			60	%	Not condensing

Electrical Specification

T_A = 25°C, USB voltage V_{CC} = 4.8V

Symbol	Parameter	Min	Typ	Max	Units	Comment
USB V_{CC}	**Supply Voltage**	4.0	5.0	6.0	V	Comply with USB 2.0
USB I_{CC}	**Supply Current**					
USB I_{CC1}	Chip active			500	mA	Comply with USB 2.0
P_1	**Power Dissipation**			2.5	W	
I/O Conn. Input CMOS (pin 4,6,8,10)						
V_{INL}	Voltage Low	0		1.15	V	
V_{INH}	Voltage High	2.15		3.3	V	
I/O Conn. Input LVDS (pin 3,5,7,9)						
V_{IN}	Voltage range	0		2.5	V	
V_{INDIFF}	Differential Voltage	250		600	mV	
Bias Voltage Source for Sensor Diode						
V_{BIAS}	Bias Voltage	3		100	V	
I_{BIAS}	Bias Current (V_{BIAS} = 5V)			10	mA	
	Bias Current (V_{BIAS} = 30V)			5	mA	
	Bias Current (V_{BIAS} = 100V)			1	mA	

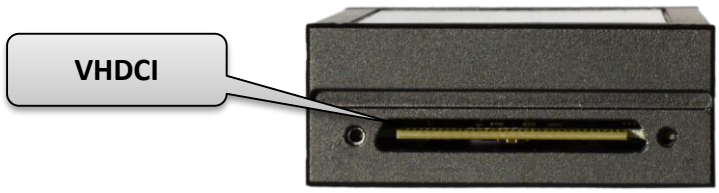
Performance Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Comment
f	**Frame Rate**			100	fps	with USB 2.0 Host
T_{READ}	**Frame Readout Time**[1]		N x 10		ms	N – number of layers

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

Device description

Front view



Rear view

VHDCI connector

VHDCI-68 is a standard connector used in Timepix motherboard. Pinout was defined by Medipix Colaboration and allows serial mode communication with Timepix chips.

1	GND	**18**	Gnd	**35**	+3.3V	**52**	+2.2V VDDD
2	Enable In P	**19**	Gnd	**36**	Enable In N	**53**	+2.2V VDDD
3	Fclock In P	**20**	Gnd	**37**	Fclock In N	**54**	+2.2V VDDLVDS
4	Data In P	**21**	Gnd	**38**	Data In N	**55**	+2.2V VDDLVDS
5	NC	**22**	Gnd	**39**	NC	**56**	+2.2V VDDLVDS
6	NC	**23**	Gnd	**40**	NC	**57**	An In A1
7	DAC out 1	**24**	Pbus Acces	**41**	DAC out 2	**58**	Polarity
8	DAC out 3	**25**	NC	**42**	DAC out 4	**59**	P/S
9	NC	**26**	Shutter	**43**	Gnd	**60**	Reset
10	Enable Tpulse	**27**	M1	**44**	+2.2V VDDA	**61**	M0
11	NC	**28**	DAC out 5	**45**	Ext DAC In	**62**	DAC out 6
12	Gnd	**29**	DAC out 7	**46**	An In N2	**63**	DAC out 8
13	Gnd	**30**	+3.3V	**47**	An In N4	**64**	SCL
14	Gnd	**31**	Gnd	**48**	+2.2V VDDA	**65**	SDA
15	Gnd	**32**	Data Out P	**49**	+2.2V VDDA	**66**	Data Out N
16	Gnd	**33**	Fclock Out P	**50**	+2.2V VDDD	**67**	Fclock Out N
17	Gnd	**34**	Enable Out P	**51**	+2.2V VDDD	**68**	Enable Out N

+5VDC connector

Supplementary power (via standard 2.1mm power connector) is **not necessary** when using with one timepix chip. Configurations with two or more chips require additional power.

USB connector

USB type mini B, Standard USB 2.0 Hi-Speed.

I/O Digital connector

I/O Digital connector is designed for trigger and synchronization purposes.

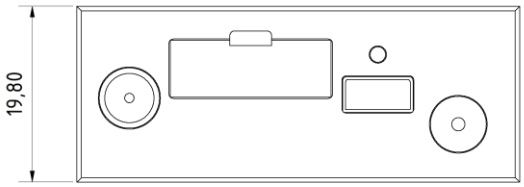
1	GND		**2**	+5V	
3	Reserved	LVDS0P (2.5V)	**4**	Reserved	CMOS 0-5V
5	Reserved	LVDS0N (2.5V)	**6**	Reserved	CMOS 0-5V
7	Reserved	LVDS1P (2.5V)	**8**	Reserved	CMOS 0-5V
9	Reserved	LVDS1N (2.5V)	**10**	Reserved	CMOS 0-5V

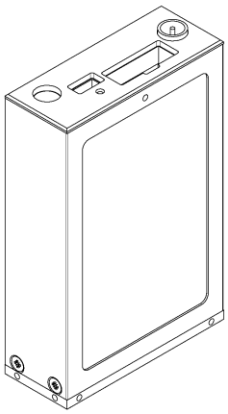
LEMO connector

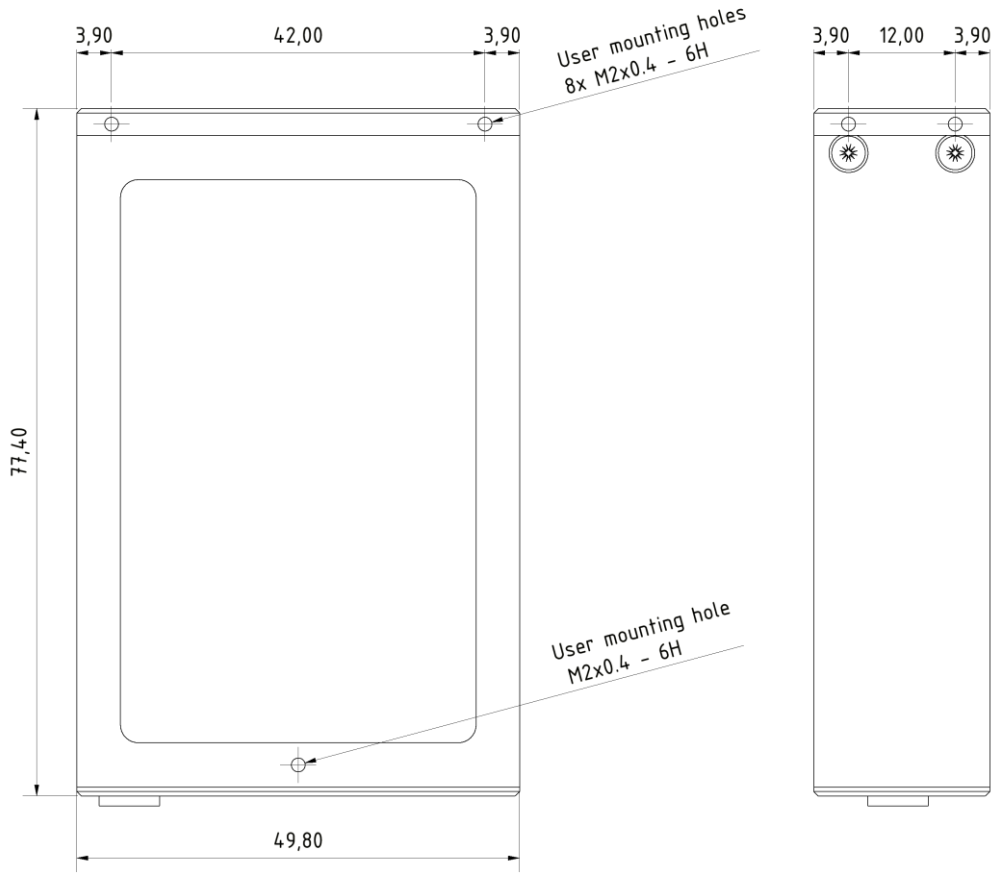
LEMO is a standard connector used in Timepix motherboard. It provides bias voltage for sensor.

Mechanical Dimensions

FITPIX

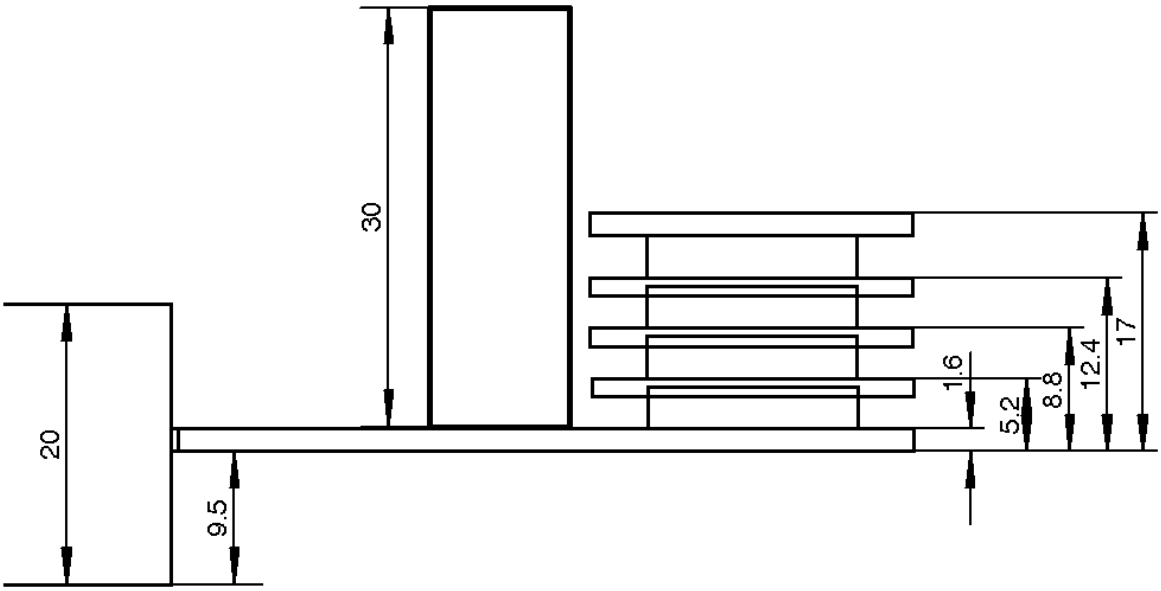


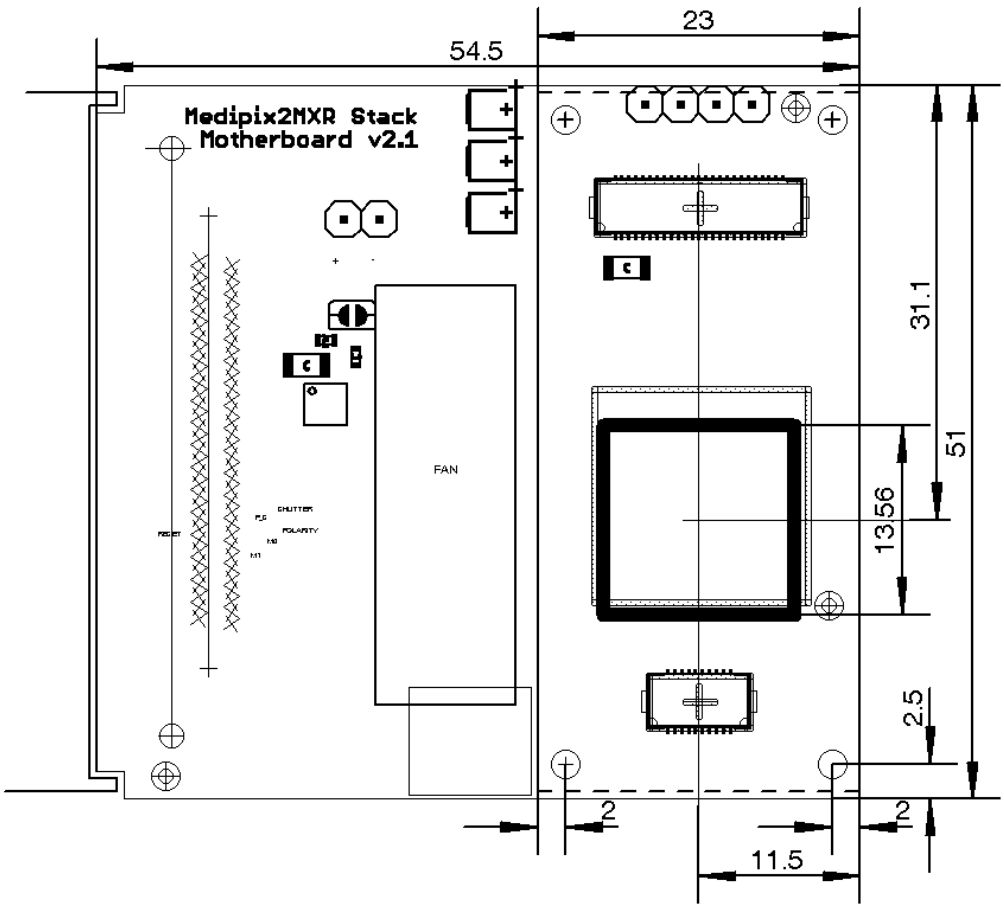




All dimensions are in mm

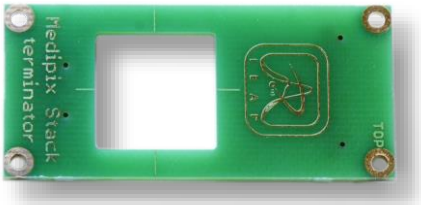
Motherboard + 3 layers + terminator



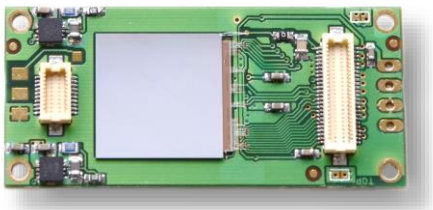


Stack layer dimensions are 23x50
All dimensions are in mm

Basic Accessories



Stack Terminator



Stack Layer with Timepix

FitPIX

Stack Motherboard

Flash memory

USB Cable

LEMO Cable

Configuration Examples

Single detector for Vacuum
(Single layer of 256 x 256 pixels, speed of 100 frames per second with additional heat sink)

Variable Stacked detector 90deg
(Up to 4 layers of 256 x 256 pixels, speed of 100 frames per second divided by number of layers)

Variable Stacked detector
(Up to 4 layers of 256 x 256 pixels, speed of 100 frames per second divided by number of layers)

Warning

- **Do not touch sensor surface!**
- **Use only with approved bias voltage source delivering high impedance output! (I.e. with FITPIX High voltage output).**

Instructions for safe use

To avoid malfunction or damage to your **FITPIX Kit** please observe the following

- Do **not** expose to water, moisture.
- Disassemble with extreme care. Wire-bonding connection may be irreversibly damaged.
- Extreme care must be taken when handling unprotected stack layer, especially when removing terminator. **Warranty does not apply to mechanical damage of the sensor and wirebonds**.
- Temperature of Timepix chip in multilayer stack may rise above specified range if not properly cooled. For cooling use motherboard with fan or external ventilator.

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