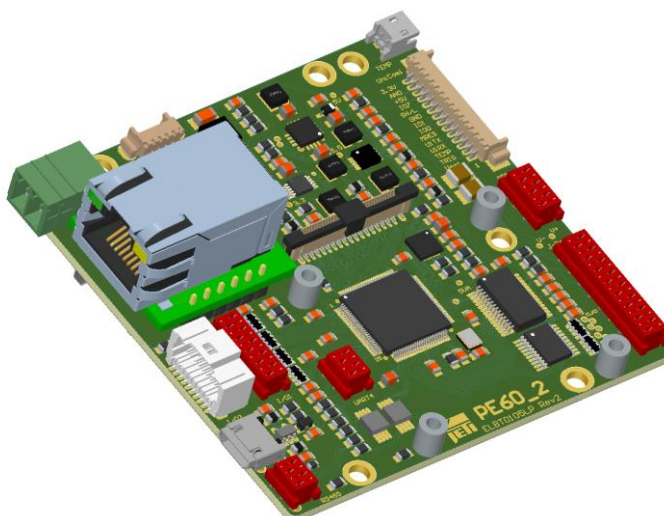


PE60_2 High Speed Spectrometer Electronics

The **PE60_2** spectrometer electronics is a versatile powerful 32-bit microprocessor-based operation platform.

It can control several CMOS, NMOS, CCD and InGaAs linear imaging arrays and supports useful additional functions.

It's ideally featured for process control, high-speed applications, multichannel readout and IOT.



Advanced features:

- 252-MHz, 415-DMIPS core MCU with 2 MB flash program memory, 512 kB RAM and floating-point unit
- Possibility of in field programming by integrated bootloader via the communication interfaces, which allows easy updating of firmware
- Firmware, that can be used in general application or user specific OEM applications in spectroscopy.
- SCPI like control syntax for setting operation parameters, configuration, measurement, data format, endianness, etc.
- 16 bit 10 MS/s ADC with programmable offset correction and gain
- Power supply via USB, external 5V, or optional external 7-28V with automatic switch over
- Multichannel- and 2D readout mode for supported sensors

Interfaces:

- USB 2.0 High Speed communication interface (USB CDC class)
- 10/100 Mbit/s TCP/IP, Ethernet MAC interface
- SPI master or slave communication interface with up to 50 Mbit/s, mode 0, 1, 2 or 3 (application specific OEM solution)
- LV-TTLUART communication interface 8N1, up to 25Mbps (pre-defined 3 000 000, 921 600, 230 400, 115 200 or 38 400 bit/s)
- RS485 Interface with up to 2.5Mbps
- Digital trigger input LV-TTL
- Shutter/lamp control output LV-TTL
- 5V periphery supply output (from USB/USB-Charger with up to 300/1000 mA)
- 8 GPIO Pins, 3 Analog Inputs (12Bit, 18Msps)
- Output for JETI's high speed piezo-shutter
- JETI-Port connects to various detached imaging array boards

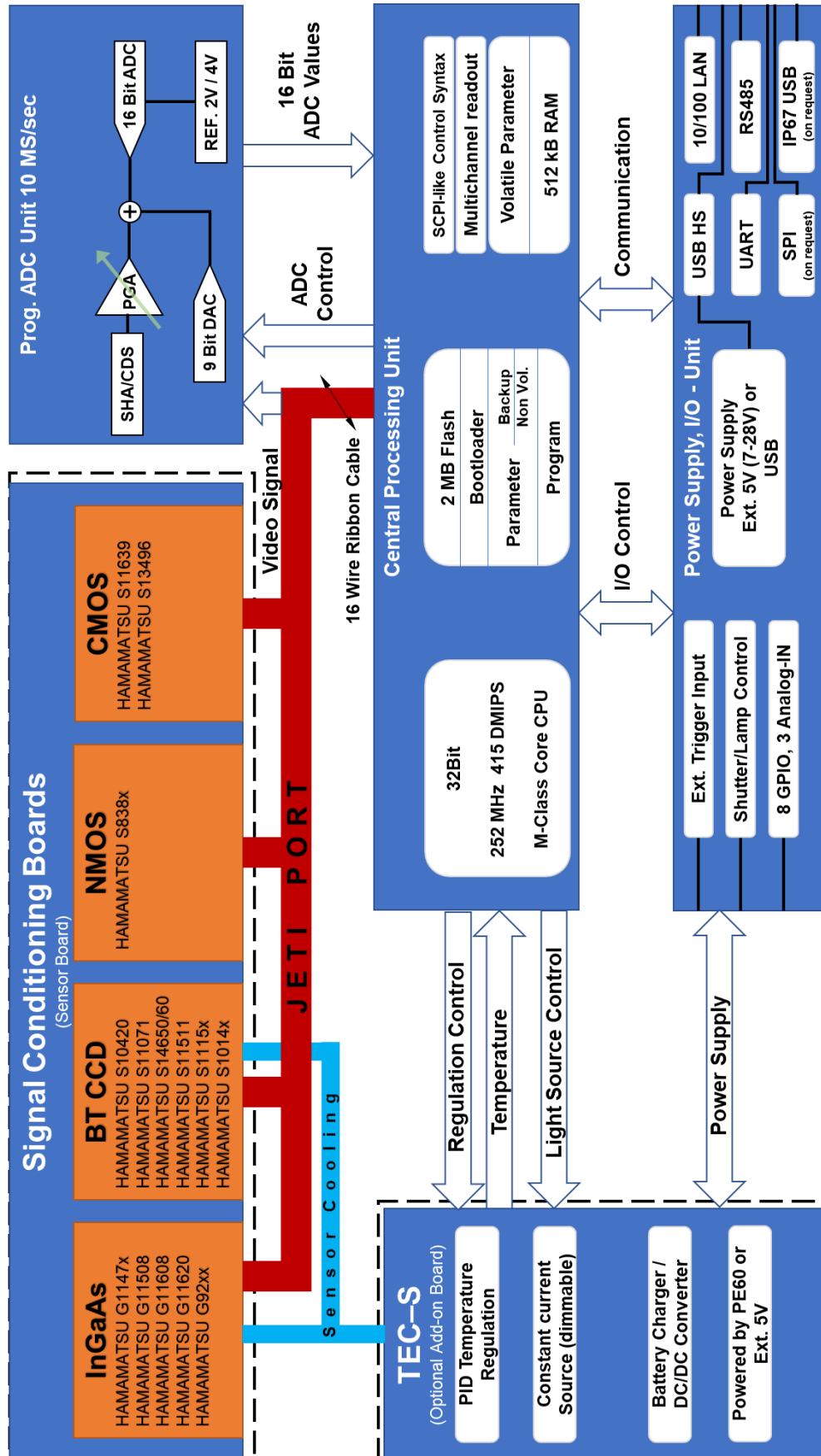
Optional functionality on Add-on boards:

- JETI's TEC boards can be attached to enable temperature regulation for Peltier cooled Sensors
- Other complex periphery could be supported using the 34-Pin processor Interface

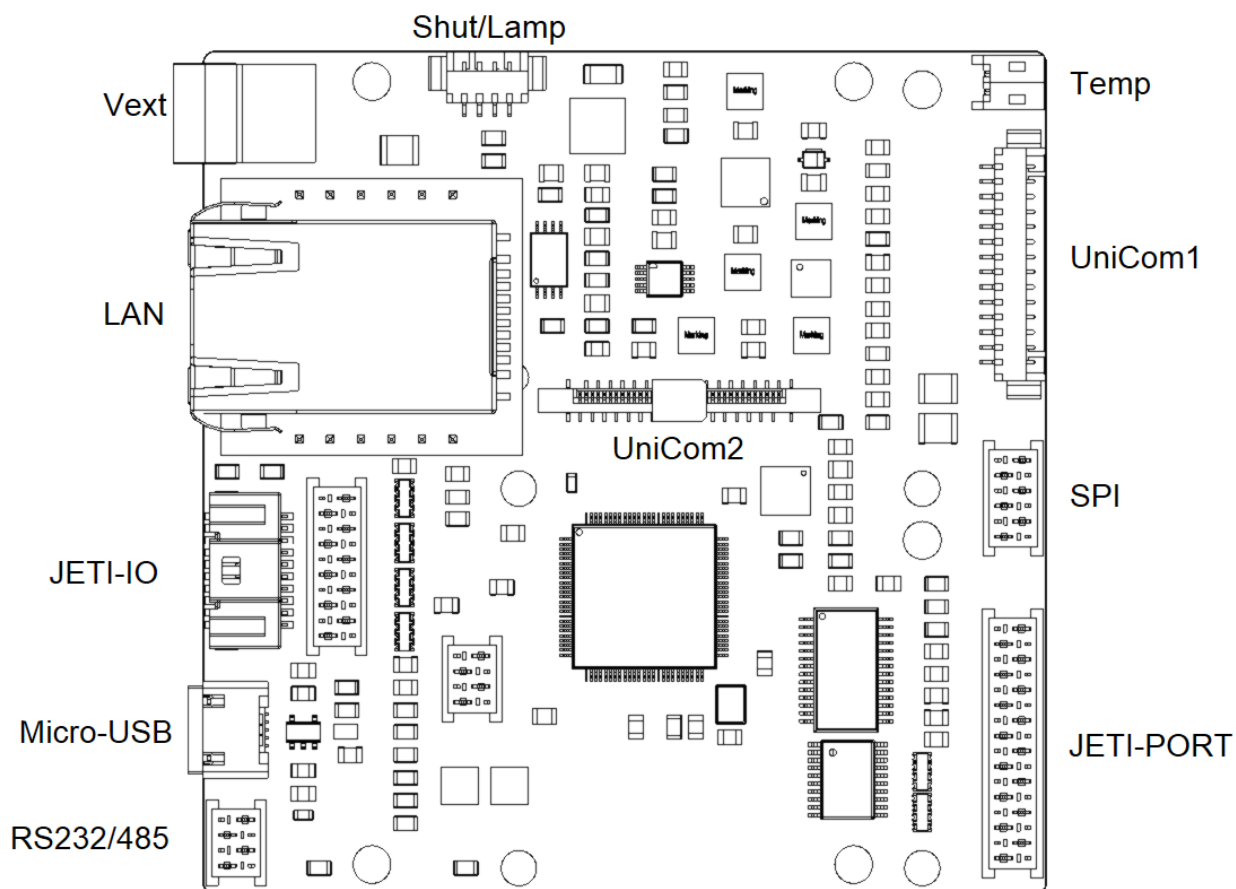
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1. Block Diagramm



2. Connectors



3. Signals

Pin	Name	Signal	Value	Min	Typ	Max	Unit
1	+5V_Out	Power (OUT)	Voltage	4.5	+5 V (Vext) or VUSB	5.5	V
			Current	0	50	100(1000)	mA
2	TRIG	Input*	Low	-0.3	0	0.5	V
			High	2.2	3.3	5.5	V
3	SHUT/LAMP	Output	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
4	U1CTS#	Input*	Low	-0.3	0	0.5	V
			High	2.2	3.3	5.5	V
5	U1RX	Input*	Low	-0.3	0	0.5	V
			High	2.2	3.3	5.5	V
6	U1TX	Output	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	
7	Vext	Power (IN)	Voltage	4.75(7)	5.0	5.25(28)	V
			Power	5-	15		W
8	GND	Power GND	Voltage		0		V
9...12	GPIO0...3	GPI*/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
13	SPI1-SS	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
14	SPI1_MOSI	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
15	SPI1_MISO	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
16	SPI1_CLK	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
17	SCL1	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
18	SDA1	I/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
19	U2RX	Input	Low	0	-	0.5	V
			High	2.2	-	5.5	V

Pin	Name	Signal	Value	Min	Typ	Max	Unit
20	U2TX	Output	Low	0	-	0.5	V
			High	2.2	-	3.3	V
21	GND	Power GND	Voltage	-	0	-	V
22	OUT D+	USB-Signal	Low	0	-	0.5	V
			High	2.2	-	3.3	V
23	OUT D-	USB-Signal	Low	0	-	0.5	V
			High	2.2	-	3.3	V
24	VUSB	Power (IN)	Voltage	4.4	5.0	5.25	V
			Current	-		500	mA
25	Vext	Power (IN)	Voltage	4.75(7)	5.0	5.25(28)	V
			Power	5-	15		W
26	TEMP	Analog Input	Voltage	0	-	3.3	V
			Resist.		10k NTC		Ω
27...30	GPIO4...7	GPI/O	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V
31	+3.3V	Power (OUT)	Voltage	3.2	3.3	3.4	V
			Power		100	300	mA
32	MRES#	Reset Input*	Low	-0.3	0	0.5	V
			High	2.2	3.3	5.5	V
33	AN0	Analog Input	Voltage	-0.3	0-3.3	3.6	V
34	GND	Power GND	Voltage	-	0	-	V

Denotes low active signal *5V tolerant Input

4. Interfaces

4.1. High-Speed 2.0 USB Interface

4.1.1. USB-Power

The USB communication port can be used for powering the PE60_2 electronics, provided it's connected to an active USB hub capable to draw up to 500 mA current at 4.4V - 5.25V.

Configuration with higher current need should be external powered.

Passive USB hubs do not provide sufficient power. In this case, the electronics has to be powered externally.

The OR gated low drop out power circuitry switches automatically over to USB powering or external power, which voltage is ever higher.

4.1.2. USB Configuration

The USB 2.0 High Speed communication is performed by a USB CDC Class virtual serial port.

The transmission speed of 115 200 bit/s is necessary to fit the virtual serial COM-port protocol. The protocol settings are 8N1 (8 bit data, no parity, 1 stopbit) and no handshake.

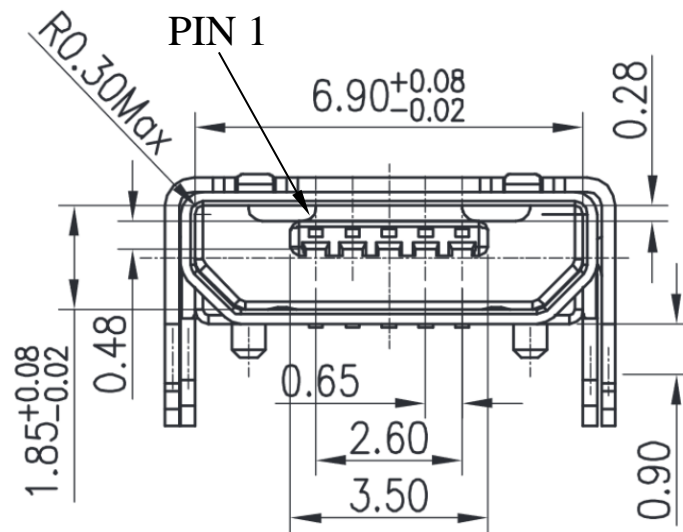
Data transfer will be done with USB high speed (480Mbit/s) independent of the virtual com port speed settings. The effective data rate can reach up to 130Mbit/s.

Users program or the OS must provide enough communication queue memory in case of huge amount of data to be transmitted at once.

USB drivers are already included in Windows 10 and actual Linux Distributions by default.

Drivers for Windows 7 and 8/8.1 are available from JETI.

4.1.3. USB Pinout



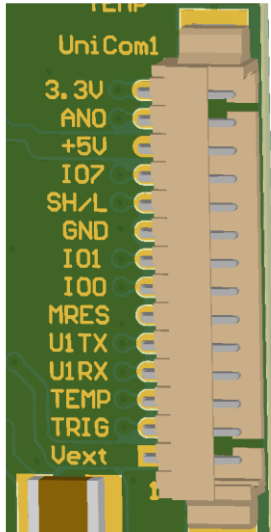
The connector in use is a micro USB 2.0 Type B receptacle connector with SMT and THT components for maximal stability.

4.1.4. USB Signals

Pin-Nr.	Description	Signal	Level	Min	Typ	Max	Unit
1	USB Power	VUSB		4.7	-	5.5	V
2	Differential Data -	USB D-	Low	0	-	0.4	V
			High	2.4	3.3	5.5	
3	Differential Data +	USB D+	Low	0	-	0.4	V
			High	2.4	3.3	5.5	
4	USB OTG Signal	USB ID	Not used, PE60_2 is always device				
5	USB GND	USB GND		-	0	-	V

4.2. LV TTL UART Interface

The LV TTL UART interface provides an easy to use serial interface for direct communication with embedded hosts, bridging the hard- or software effort for other serial interfaces.



The UART Signals are available on pins 4,5, and six of the UniCom2 Connector, or Pins 4 and 5 of the UniCom1 Connector when no flow Control is necessary.

The following transmission speeds are pre-defined:

3 000 000 bit/s,

921 600 bit/s,

230 400 bit/s,

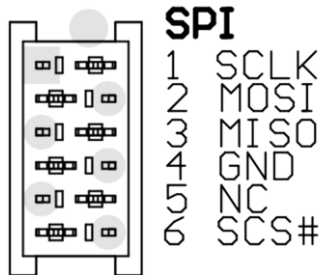
115 200 bit/s,

38 400 bit/s.

Higher speeds are possible on request.

The protocol settings are 8N1 (1 startbit, 8 bit, no parity, 1 stopbit) and no handshake. Up to 25Mbps is possible on request.

4.3. SPI Interface



The SPI Interface is intended to operate periphery modules in SPI-slave mode 0.

The transmission speed can be up to 50 Mbit/s.

The connector is a 6pin WR-MM 690367180672 THT component of wuerth-electronics.

4.4. General Purpose Input/Output-Pins (GPIO's)

The eight provided GPIO Pins provide direct access to the micro-controller and are configure and controllable by firmware commands.

Accessible functions are:

- Digital Input with pull-up
- Digital Input with pull-down
- Digital Input floating
- Digital Output

Refer to the “Specfirm Firmware Operation Instructions” for more Information.

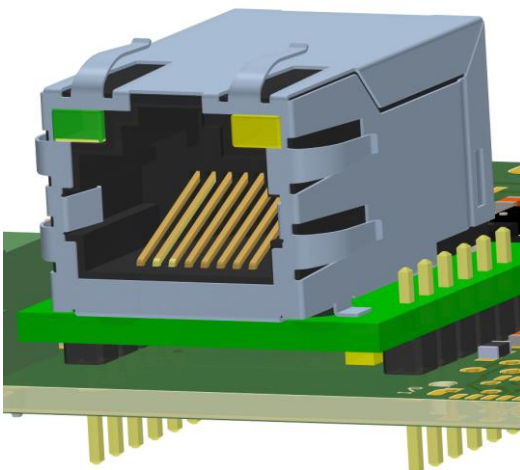
The following GPIO pins are available:

GPIO	Hardware Pin UniCom1	Hardware Pin UniCom2
GPIO0	7	9
GPIO1	8	10
GPIO2		11
GPIO3		12
GPIO4		27
GPIO5		28
GPIO6		29
GPIO7	11	30

GPIO0...3 tolerate up to 5V GPIO 4...7 only 3.3V input voltage. The maximum output current is specified with 25mA at 3.3V.

GPIO3 can be configured as a second external Trigger input in addition to the main “TRIG” Signal

4.5. Ethernet/LAN

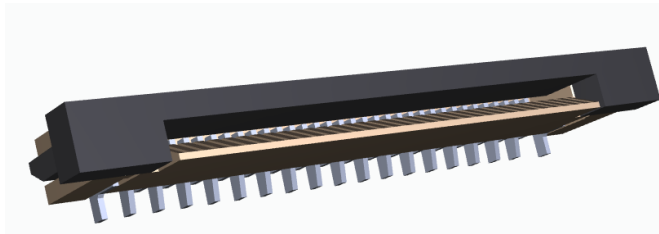


The complete Ethernet/LAN-Module is pluggable with RJ45-connectors and can reach up to 20Mbit/s real data rate.

The Module supports:

- 10/100 Base TX
- Half/full duplex operation
- Hardware Internet protocols: TCP, IPv4, UDP, ICMP, ARP, PPPoE, IGMP
- Hardware Ethernet protocols: DLC, MAC
- IEEE 802.3/802.3u

4.6. Universal Interface

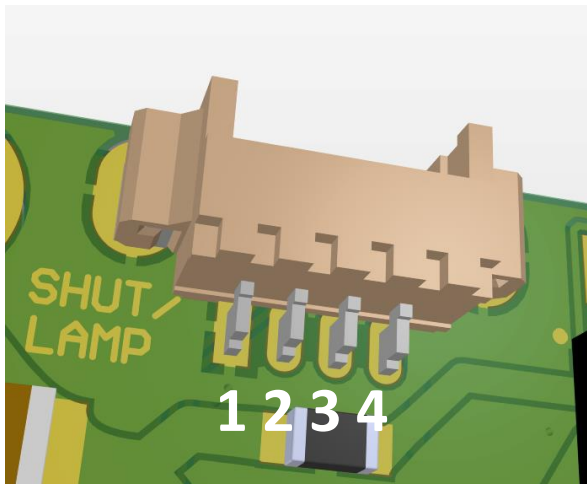


All Signals mentioned in Chapter 2 are available on the 34Pin P-UniCom connector. It enables a 34-Pin 0.5mm pitch FPC-Cable connection for a universal connection to customer equipment or Jeti add-on boards. It is

established on our different electronic platforms for easy interchangeability.

If only some of the signals are needed, it is possible to use a decreased range (e.g. Pin 1-16) with a reduced FPC-Cable Pin count.

4.7. Shutter/Lamp Connector



The PE60_2 Electronics supports firmware generated Shutter/Lamp output signals for control of peripheral hardware with the following pinout. Please refer to “OP_Firmware_Commands_Specfirm_PE60.pdf” for more information’s. The connector is a 4pin WR-WTB 653104131822 SMD component with 1.25mm pitch of wuerth-electronics.

Pin-Nr.	Description	Signal	Level	Min	Typ	Max	Unit
1	GND	Power GND	Voltage	-	0	-	V
2	Shutter/Lamp Output	Shut/Lamp	Low	0	-	0.4	V
			High	2.4	3.3	3.5	
3	GPIO7 (Shut/Lamp enable)	GPIO7	Low	0	-	0.4	V
			High	2.4	3.3	5.5	
4	+5V_Out	Power (OUT)	Voltage	4.5			+5 V (Vext) or VUSB

5. Power Supply

5.1. USB-powered

The USB communication port can be used for powering the PE60_2 electronics, provided it's connected to an active USB hub capable to draw up to 500 mA current at 4.4V - 5.25V.

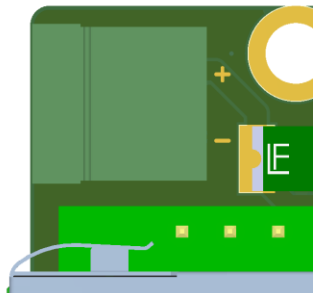
Configuration with higher current need should be external powered.

Passive USB hubs do not provide sufficient power. In this case, the electronics has to be powered externally.

The OR gated low drop out power circuitry switches automatically over to USB powering or external power, which voltage is ever higher.

5.2. 5V external supply

Beside the standard USB power supply which is described above, an external voltage source can be applied to the P-Vext2 connector with the polarity marked on the board.



	Voltage Range	Current	Ripple
minimum requirements	4.5V-5.5V	1A	≤200mV
recommended	4.75V-5.25V	≥1.5A	≤100mV

Exceeding the recommended voltage range and ripple may increase the noise of the video signal but should still work if it fulfills the minimum requirements.

5.3. 7-28V external supply

This Option includes a 5V fixed output voltage dc/dc step down regulator with up to 2.5A output current. The converter allows to use the electronics with supply voltages between 7V and 28V and provides a sufficient low output voltage ripple (typ. 10mV) and a peak efficiency up to 95%.

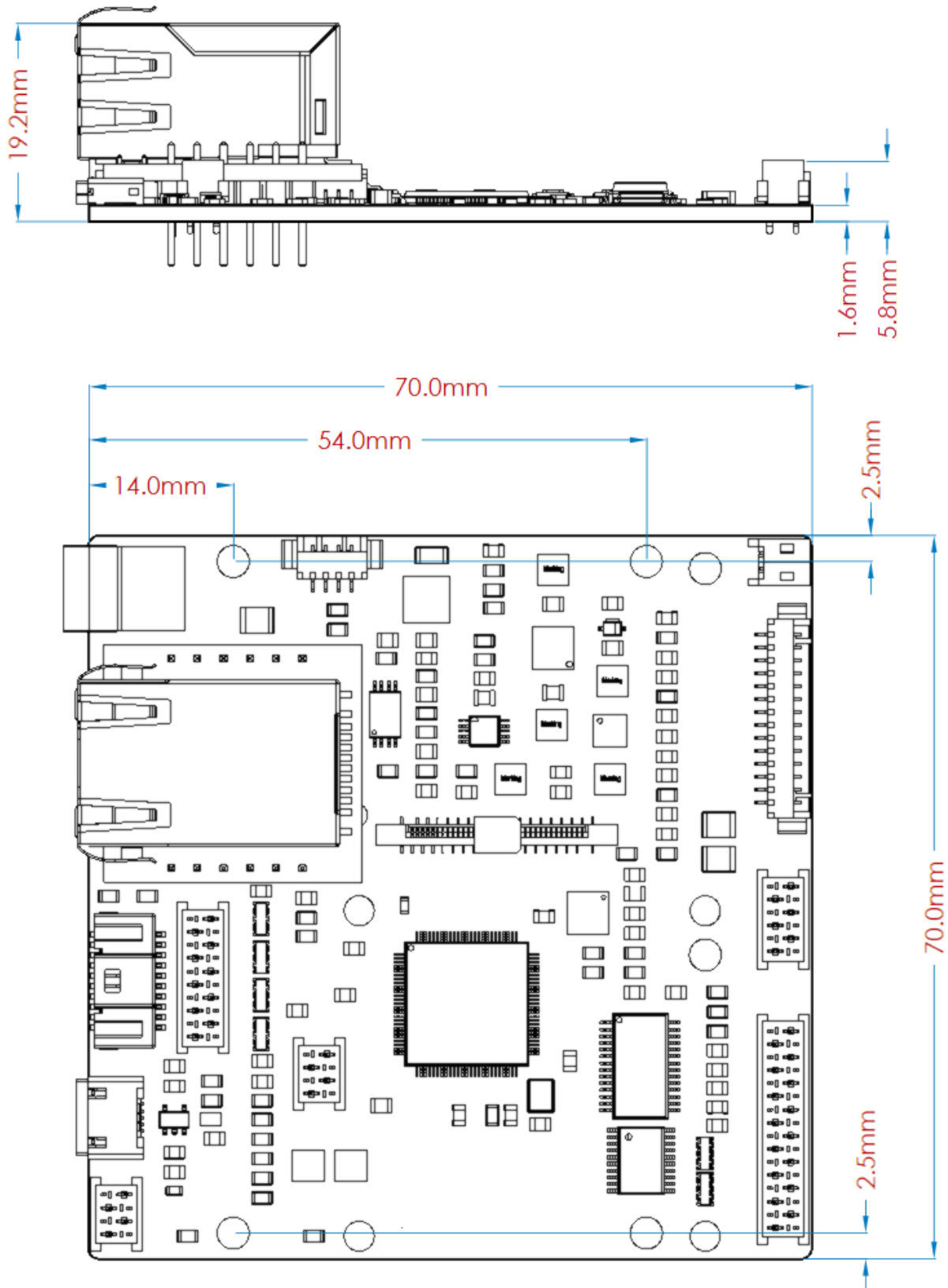
	Voltage Range	Power	Ripple
recommended	7V - 28V	≥15W	≤100mV

6. Firmware Update Feature

The firmware implemented bootloader allows infield updates of the firmware using the serial interfaces. For proper operation, it is recommended to use only the USB-Interface.

For the necessary tool “SFProg” or if you have any questions concerning technical problems please contact the JETI-support: support@jeti.com

7. Dimensional Drawing (all Units in mm)



8. Orderinformation

8.1. Available Sensors on PE60_2 Electronics

PE60_2 Variant	S1115x LAN	S10420/ S11510	S11071 multichannel	S1014x cooled	G11620
Order ID	EBG0228	EBG0244	EBG0252	EBG0246	planned
Sensor*	S1115x-02	S10420/ S11510	S11071	S1014x	G11620-D
Ethernet	✓	✗	✗	✓	✗
USB	✓	✓	✓	✓	✓
SPI	✓	✓	✓	✓	✓
RS422/485	✗	✗	✗	✗	✗
I ² C	✗	✗	✗	✗	✗
UART	✓	✓	✓	✓	✓
7-28V Supply	✗	✗	✓	✓	✗
Spectrometer RU60 compatible	✓	(✓)	(✓)	✗	(✓)
Shutter/Lamp	✓	✓	✓	✓	✓
TEC-Interface	✗	✗	✗	✓	✗

*on remote PCB, connected via 16pol flat ribbon cable

Please contact us for other configurations (e.g. other Sensors).

Send your order to: sales@jeti.com

9. Service

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15-July-20