

PastLS1 Qseven carrier board for Rakun LS1



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1 GENERAL

1.1 ABOUT THIS DOCUMENT

This document defines the hardware architecture of the RakunLS1 Qseven module.

1.2 REVISION HISTORY

Revision	Date	Notes
1.0	8. June 2015	Initial version
1.1	20. August 2015	Major rewrite, pinouts added

Table 1.1: Revision history

2 INTRODUCTION

2.1 DEVICE OVERVIEW

PastLS1 is Qseven carrier board that in addition to standard Qseven features supports additional interfaces provided by Borea RakunLS1 Qseven module.

RakunLS1 module can be strictly Qseven compliant or can be configured to expose Freescale QorIQ specific interfaces. In such RakunLS1 module configurations modified carrier board must be used to fully utilize module interfaces.

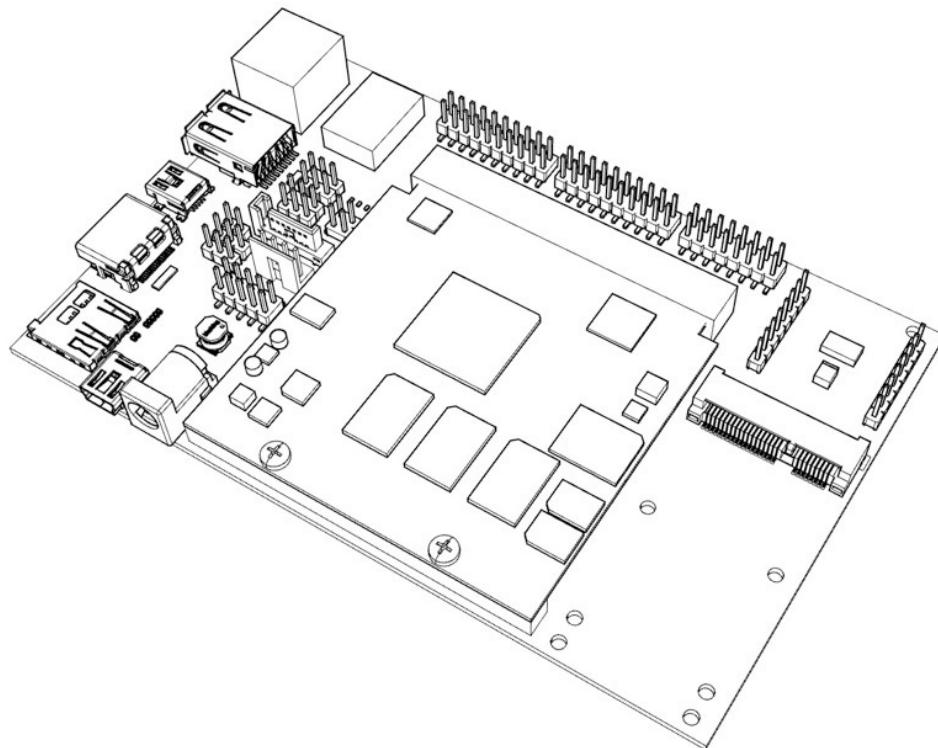


Illustration 2.1: PastLS1

2.2 FEATURES

Qseven slot

Supports Qseven standard 2.0 + additional proprietary pins used for QorIQ specifics, present on a RakunLS1 board.

Ethernet Interfaces

10/100/1000Mb/s Ethernet port, IEEE1588

- 2x RGMII ports (multiplexed with GPIOs and other interfaces) available on pin headers
- 2x SGMII ports available on debug connectors
- Ethernet add-on board for RGMII ports available. Supports 1000BaseT and 1000BaseX

USB Interfaces

Single USB port. Works as:

- USB 3.0 routed to USB 3.0 connector or

- USB 2.0 routed to USB 3.0 connector or
- USB 2.0 routed to mPCIe slot or
- USB OTG routed to USB OTG connector

SATA

SATA 3.0 with power connector 5V

HDMI Interface

HDMI 1.3

SD card

MicroSD slot. Rakun supports booting from SD

PCIe InterfaceMiniPCIe slot with PCIe 0 lane from Qseven and USB
Normal, half and extended size supported**UARTs**Four 16450/16650 compatible UARTs with FIFOs. CMOS levels interfaces. Two of them can be routed to the USB2UART converter.
Two additional QUICCEngine UART interfaces.**Debug console**USB to UART converter implemented on board for easier PC connectivity
UART1 or UART2 from Qseven can be routed to the console**GPIO**Two GPIO connectors with 26 GPIO signals available
GPIO1 interface is multiplexed with RGMII, CAN, USB2
GPIO2 interface is multiplexed with RGMII, IEEE1588, PWM**QUICCEngine**Two UCCs, supporting TDM, HDLC, Bisync, UART, Transparent ...
QE interface is multiplexed with I2S, S/PDIF, GPIO, HDMI.**MikroBUS**

MikroBus module slot for extension purposes (SPI, UART, I2C). Allows connecting many of the shelf extension boards.

Aux SerDes

Remaining three SerDes lanes from Qseven (Lane 0 is used for PCIe) are available on auxiliary testing connectors. SATA type connectors. Available interfaces:

- Up to 3x PCIe
- Additional SATA
- 2x SGMII

Power Supply

5V DC, 2A Input

Onboard regulators for 1.5V and 3.3V.

Typical power consumption depends on application. Power consumption without USB, Qseven board and miniPCIe board: 8mA.

Physical

Physical Dimensions: 143 × 92 mm.

Environment

Storage: -65°C to +150°C

Operation: -40°C to +85°C

Humidity: 5% to 90% Non-Condensing

Electrostatic Discharge Tolerance: 2kV

Pb free, ROHS compliant

3 INSTALLATION GUIDE

Before start, perform the steps described below. Check figure 7.1 for the position of connectors and figure 5.1 for the position of jumpers.

1. Attach RakunLS1 and (optionally) PHYBoard add-on as shown in figure below:

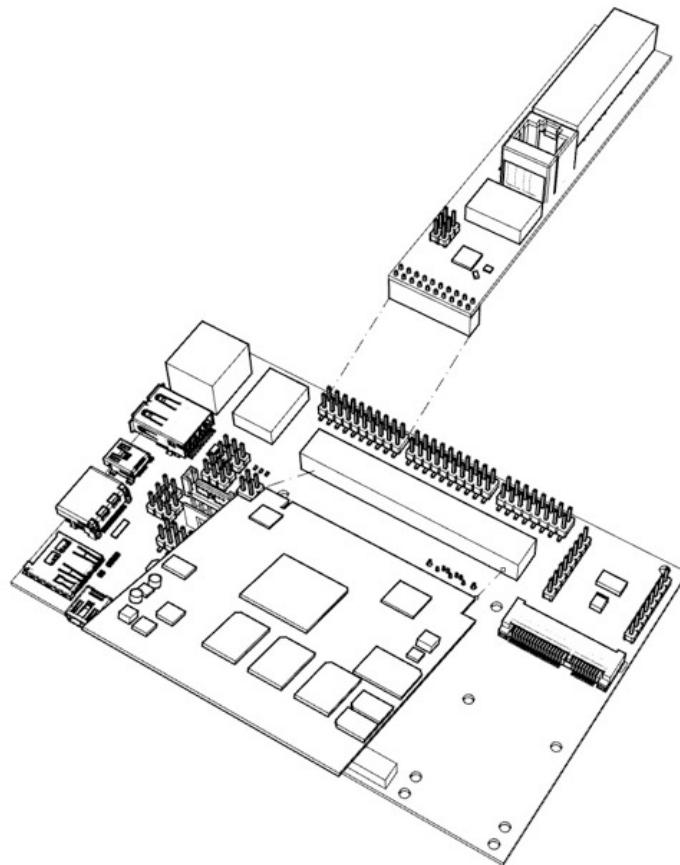


Illustration 3.1: Installation

2. Check presence of the following jumpers:

Jumper	Setting	Function
P13	1 – 2	USB is connected to USB connectors
P12	1 – 2	USB is connected to USB connectors
P11	1 – 2	USB is connected to USB3.0 connector
P8	1 – 2	USB is connected to USB3.0 connector
P15	1 – 2	SD Boot
P16	2 – 3	Console is UART2
P17	2 – 3	Console is UART2

Table 3.1: Default jumper positions

3. Install uSD card with boot image to uSD slot.
4. Attach PC to Console connector with USB cable. Start terminal application on PC. Set it to 115200 kb/s, 8 bit, no parity, one stop bit (115200 8N1).
5. Optionally attach Ethernet, HDMI, USB.

6. Connect external 5V power supply to DC power jack.
7. RakunLS1 will boot from SD card. There will be u-boot prompt in the terminal.

4 ARCHITECTURE

4.1 BLOCK DIAGRAM

Block diagram of the device is shown in figure below:

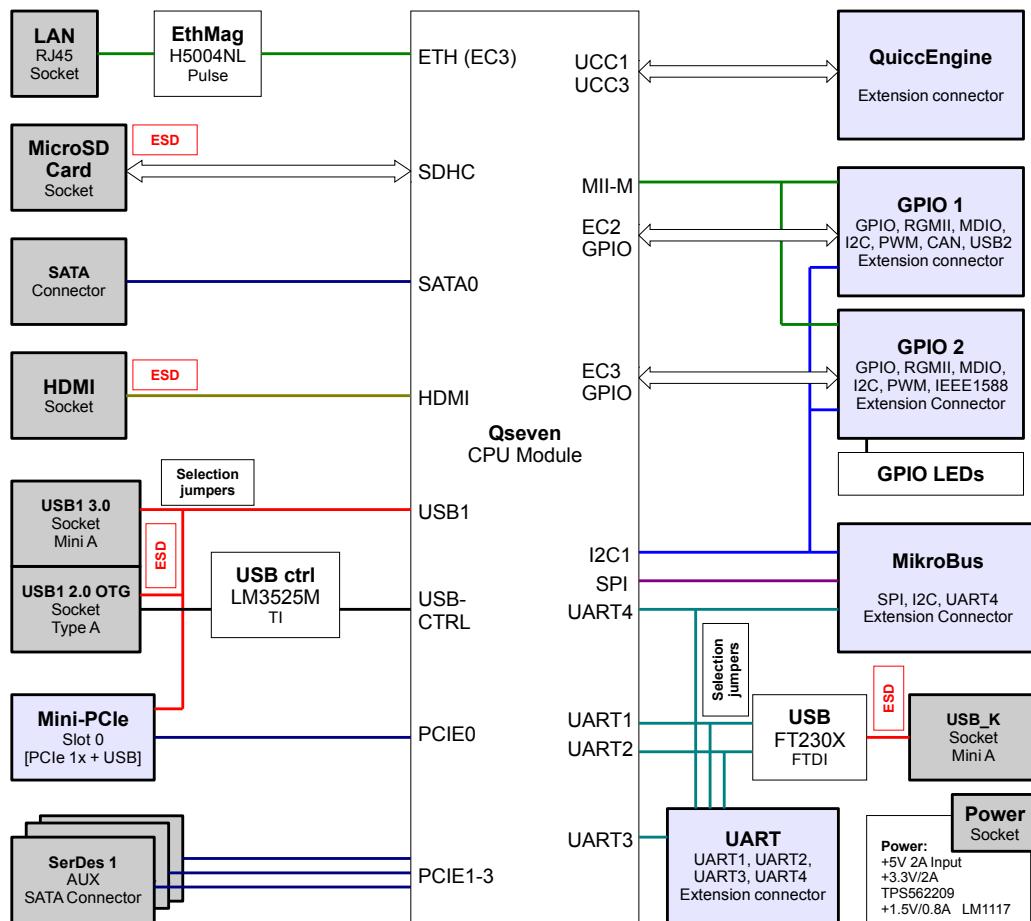


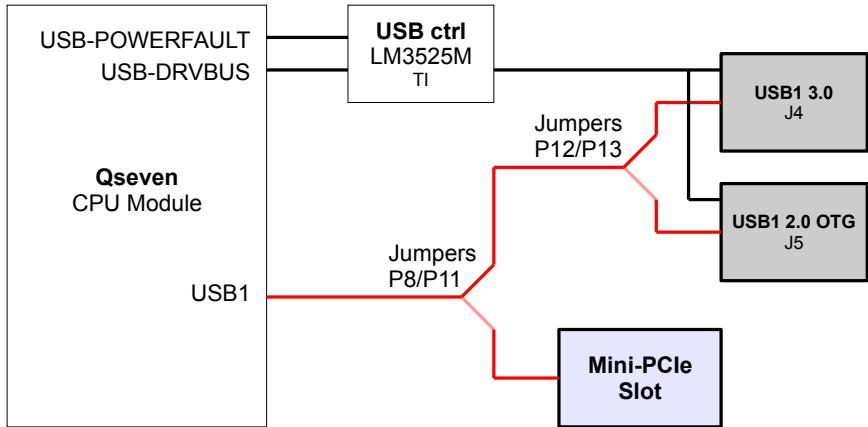
Illustration 4.1: Block diagram

Design of the PastLS1 is very straightforward and requires little explanation. Pinouts of the interfaces' connectors are provided in chapter 4. Everything apart from USB and UART is connected straightforward between Qseven module and I/O connectors. USB and UART have more options.

Qseven module RakunLS1 has multiplexed I/O pins. This means several interfaces are available on the same pins. Consequently, several interfaces are available on **GPIO1/EC3**, **GPIO2/EC2** and **QE** connectors. For details, see chapter 6.

4.2 USB CONNECTION

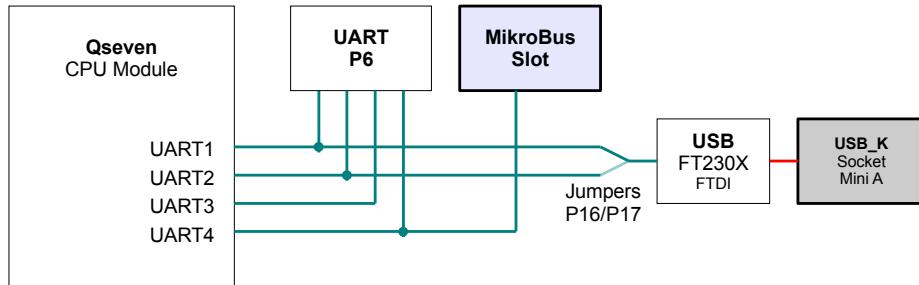
USB connection is shown in figure below.

*Illustration 4.2: USB connection*

USB interface from the Qseven module can be linked to three separate interfaces: USB3.0 connector, USB OTG connector and miniPCIe slot. Switching is done via jumpers.

4.3 UART CONNECTION

UART connection is shown in figure below:

*Illustration 4.3: UART connection*

All UART signals are accessible on UART extension connector P6. UARTs can be used either as 4 independent null-modem UARTs (RX-TX only; UART1-4) or 2 independent UARTs with handshake signals (RX, TX, RTS, CTS; UART1-2). UART 1 or UART2 can be routed to FTDI UART-USB converter for easier console access.

5 JUMPERS

Position of jumpers on the board is shown in figure below:

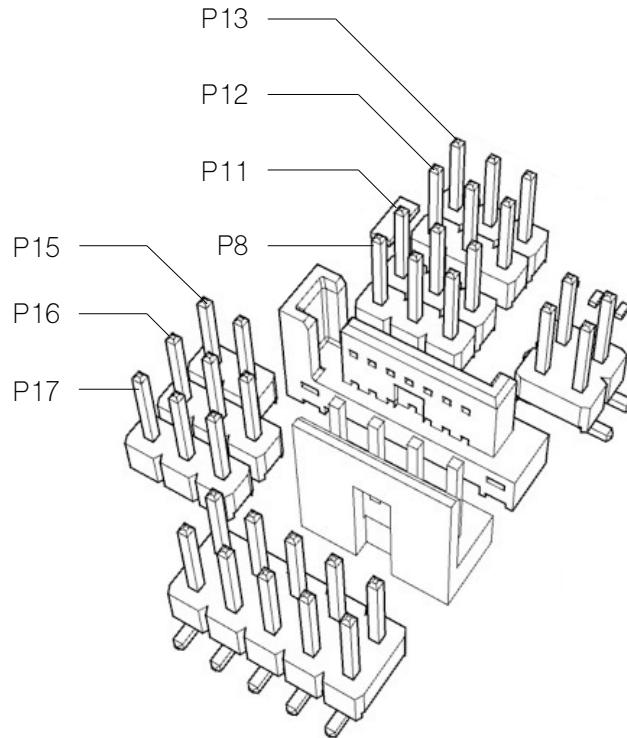


Illustration 5.1: Position of jumpers

5.1 BOOT SELECT JUMPER P15

Jumper P15 selects the boot source.

Jumper P15 is 2-pin jumper.

P15	
Setting	Function
1 – 2 ON	Boot source is SD card (Default jumper placement)
1 – 2 OFF	Boot source is QSPI NOR flash

Table 5.1: Boot select jumper P15

5.2 USB DIRECTION JUMPERS P8 AND P11

Jumpers P8 and P11 select direction for the USB bus. It can be connected to the USB connectors or to the PCIe slot. Jumpers P8 and P11 must always be set up in the same way.

Jumpers P8 and P11 are 3-pin jumpers.

P8 and P11	
Setting	Function
1 – 2	Qseven board's USB interface is connected to the USB connector (Default jumpers placement)
2 – 3	Qseven board's USB interface is connected to the PCIe slot

Table 5.2: *USB direction jumpers P8 and P11*

5.3 USB MODE JUMPERS P12 AND P13

Jumpers P12 and P13 select mode of operation, when USB bus is connected to the USB connectors. USB mode of operation can be USB3.0 or USB2.0 OTG. These two modes are available on separate USB connectors J4 and J5 respectably. Jumpers P12 and P13 must always be set up in the same way.

Jumpers P12 and P13 are 3-pin jumpers.

This setting has no meaning when USB bus is connected to the PCIe slot.

P12 and P13	
Setting	Function
1 – 2	USB bus is in USB3.0 mode, connected to the J4 connector (Default jumpers placement)
2 – 3	USB bus is in USB2.0 OTG mode, connected to the J5 connector

Table 5.3: *USB mode jumpers P12 and P13*

5.4 UART TO USB SELECTION JUMPERS P16 AND P17

Jumpers P16 and P17 select the UART interface that is connected to the UART to USB converter FT230. This device provides serial console on USB connector J7 for easy connection to the PC. Jumpers P16 and P17 must always be set up in the same way.

Jumpers P16 and P17 are 3-pin jumpers.

P16 and P17	
Setting	Function
1 – 2	UART1 is used for serial console
2 – 3	UART2 is used for serial console (Default jumpers placement)

Table 5.4: *UART to USB selection jumpers P16 and P17*

6 LED INDICATORS

Board comprises three LED indicators.

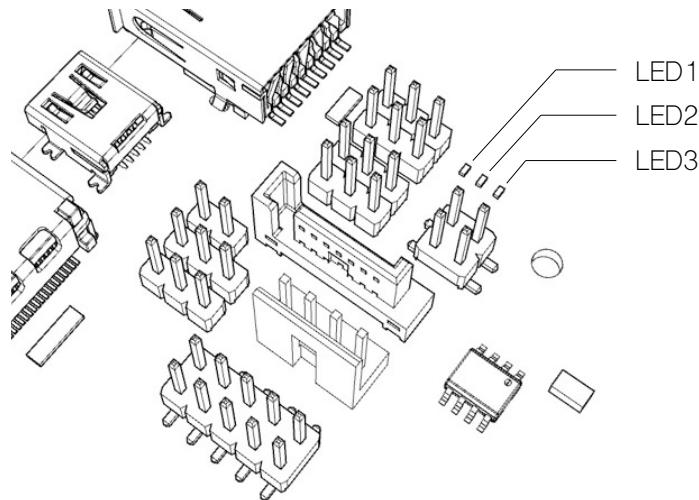


Illustration 6.1: LED indicator

They are connected to the GPIO pins.

LED	Signal	Note
LED1	GPIO3_17	Active high
LED2	GPIO3_18	Active high
LED3	GPIO3_19	Active high

Table 6.1: LED indicators

7 CONNECTOR DETAILS

Connectors present on the board are shown in figures below:

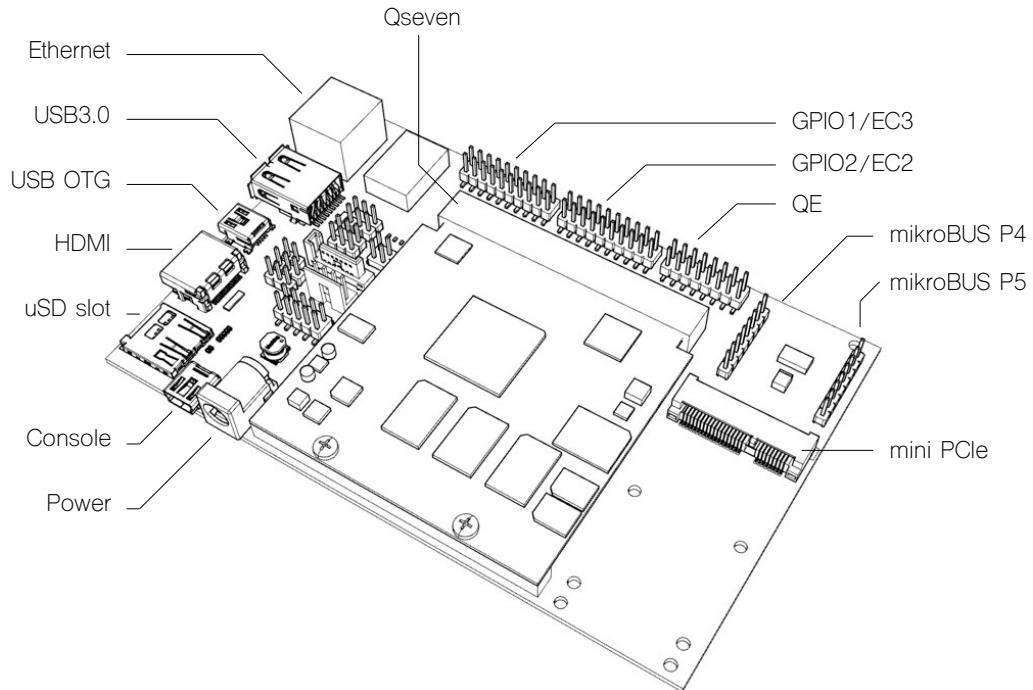


Illustration 7.1: Position of connectors

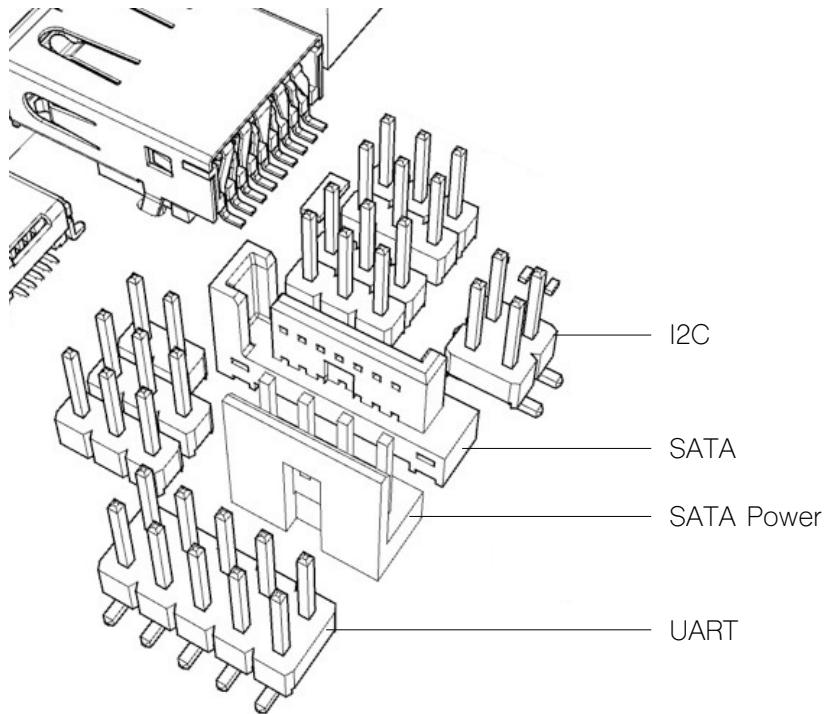


Illustration 7.2: Position of connectors

7.1 QSEVEN CONNECTOR P7

Supports Qseven standard 2.0 and additional proprietary pins used for QorIQ specifics.

Connector Type	AS0B326-S78N-7F
Connector Manufacturer	Foxconn

Table 7.1: Qseven edge connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	GND	-	2	GND	-
3	ETH_MDI3-	Bidir	4	ETH_MDI2-	Bidir
5	ETH_MDI3+	Bidir	6	ETH_MDI2+	Bidir
7	LINK100#	In	8	LINK1000#	In
9	ETH_MDI1-	Bidir	10	ETH_MDI0-	Bidir
11	ETH_MDI1+	Bidir	12	ETH_MDI0+	Bidir
13	NC	-	14	ACT#	In
15	NC	-	16	NC	-
17	NC	-	18	SUS_S3#	In
19	NC	-	20	PWRBTN#	Out
21	SLP_BTN#	Out	22	NC	-
23	GND	-	24	GND	-
25	GND	-	26	PWGIN	Out
27	NC	-	28	RSTBTN#	Out
29	SATA_TX+	In	30	NC	-
31	SATA_TX-	In	32	NC	-
33	NC	-	34	GND	-
35	SATA_RX+	Out	36	NC	-
37	SATA_RX-	Out	38	NC	-
39	GND	-	40	GND	-
41	NC	-	42	SD_CLK	In
43	SD_CD#	Out	44	NC	-
45	SD_CMD	In	46	SD_WP	Out
47	NC	-	48	SD_DATA1	Bidir
49	SD_DATA0	Bidir	50	SD_DATA3	Bidir
51	SD_DATA2	Bidir	52	SD_DATA5	Bidir
53	SD_DATA4	Bidir	54	SD_DATA7	Bidir
55	SD_DATA6	Bidir	56	USB1_DRVBUS	In
57	GND	-	58	GND	-
59	UCC1_RTSB_TXEN	In	60	I2C1_SCL	Bidir
61	NC	-	62	I2C1_SDA	Bidir
63	UCC1_CTSB_RXDV	Out	64	SMB_ALERT#	Out
65	UCC1_RXD	Out	66	I2C2_SCL	Bidir
67	UCC1_TXD	In	68	I2C2_SDA	Bidir

Pin	Signal	Direction	Pin	Signal	Direction
69	NC	-	70	WDTRIG#	Out
71	NC	-	72	WDOUT	In
73	GND	-	74	GND	-
75	NC	-	76	NC	-
77	NC	-	78	NC	-
79	NC	-	80	NC	-
81	USB1_TX-	In	82	USB1_RX-	Out
83	USB1_TX+	In	84	USB1_RX+	Out
85	NC	-	86	USB1_PWRFAULT	Out
87	NC	-	88	NC	-
89	NC	-	90	NC	-
91	USB1_VBUS	Out	92	USB1_ID	Bidir
93	USB1_D-	Bidir	94	NC	-
95	USB1_D+	Bidir	96	NC	-
97	GND	-	98	GND	-
99	EC3_GTX_CLK125	Out	100	EC3_RXD0	Out
101	EC3_RX_DV	Out	102	EC3_RXD1	Out
103	EC3_TX_EN	In	104	EC3_RXD2	Out
105	EC3_GTX_CLK	In	106	EC3_RXD3	Out
107	EC3_TXD0	In	108	EC3_RX_CLK	Out
109	EC3_TXD1	In	110	EC2_RX_DV	Out
111	EC3_TXD2	In	112	EC2_RXD0	Out
113	EC3_TXD3	In	114	EC2_RXD1	Out
115	EC2_TX_EN	In	116	EC2_RXD3	Out
117	GND	-	118	GND	-
119	EC2_GTX_CLK	In	120	NC	-
121	EC2_GTX_CLK125	Out	122	NC	-
123	EC2_TXD0	In	124	EC2_RX_CLK	Out
125	EC2_TXD1	In	126	MDIO_OUT	Bidir
127	EC2_TXD3	In	128	MDC_OUT	In
129	EC2_TXD2	In	130	EC2_RXD2	Out
131	TMDS_CLK+	In	132	UART2_RTS#	In
133	TMDS_CLK-	In	134	UART2_CTS#	Out
135	GND	-	136	GND	-
137	TMDS_L1+	In	138	NC	-
139	TMDS_L1-	In	140	NC	-
141	GND	-	142	GND	-
143	TMDS_L0+	In	144	UART2_SOUT	In
145	TMDS_L0-	In	146	UART2_SIN	Out
147	GND	-	148	GND	-
149	TMDS_L2+	In	150	HDMI_CTRL_DAT	Out

Pin	Signal	Direction	Pin	Signal	Direction
151	TMDS_L2-	In	152	HDMI_CTRL_CLK	In
153	HDMI_HPD#	Out	154	NC	-
155	PCIE_CLK_REF+	In	156	NC	-
157	PCIE_CLK_REF-	In	158	PCIE_RST#	In
159	GND	-	160	GND	-
161	PCIE3_TX+	In	162	PCIE3_RX+	Out
163	PCIE3_TX-	In	164	PCIE3_RX-	Out
165	GND	-	166	GND	-
167	PCIE2_TX+	In	168	PCIE2_RX+	Out
169	PCIE2_TX-	In	170	PCIE2_RX-	Out
171	UART1_SOUT	In	172	UART1_RTS#	In
173	PCIE1_TX+	In	174	PCIE1_RX+	Out
175	PCIE1_TX-	In	176	PCIE1_RX-	Out
177	UART1_SIN	Out	178	UART1_CTS#	Out
179	PCIE0_TX+	In	180	PCIE0_RX+	Out
181	PCIE0_TX-	In	182	PCIE0_RX-	Out
183	GND	-	184	GND	-
185	UCC1_CDB_RXER	Out	186	UCC3_RTSB_TXEN	In
187	UCC1_CLK09	Out	188	UCC3_CDB_RXER	Out
189	UCC1_CLK10	Out	190	UCC3_CLK11	Out
191	NC	-	192	UCC3_CLK12	Out
193	NC	-	194	UCC3_CTSB_RXDV	Out
195	UCC3_RXD	Out	196	UCC3_TXD	In
197	GND	-	198	GND	-
199	SPI_MOSI	In	200	SPI_CS0#	In
201	SPI_MISO	Out	202	SPI_CS1#	In
203	SPI_CLK	In	204	JTAG_TRST#	Out
205	NC	-	206	NC	-
207	JTAG_TCK	Out	208	JTAG_TDI	Out
209	JTAG_TDO	In	210	JTAG_TMS	Out
211	VCC	-	212	VCC	-
213	VCC	-	214	VCC	-
215	VCC	-	216	VCC	-
217	VCC	-	218	VCC	-
219	VCC	-	220	VCC	-
221	VCC	-	222	VCC	-
223	VCC	-	224	VCC	-
225	VCC	-	226	VCC	-
227	VCC	-	228	VCC	-
229	VCC	-	230	VCC	-

Table 7.2: Qseven edge connector pinout

7.2 POWER SUPPLY CONNECTOR SW1

Power supply connector is standard DC jack 2.5/6.4 mm. External power supply is 5V 2A.

Connector Type	694108301002
Connector Manufacturer	Wurth Electronic

Table 7.3: Power supply connector type

Pin	Signal	Direction	Note
1	+ 5V	-	2A
2	GND	-	
3	GND	-	

Table 7.4: Power supply connector pinout

7.3 ETHERNET CONNECTOR CON1

10/100/1000Mb/s Ethernet port on standard RJ45.

Connector Type	RJHSE-5085
Connector Manufacturer	AMP

Table 7.5: Ethernet connector type

Pin	Signal	Direction
1	MX0_P	Bidir
2	MX0_N	Bidir
3	MX1_P	Bidir
4	MX2_P	Bidir
5	MX2_N	Bidir
6	MX1_N	Bidir
7	MX3_P	Bidir
8	MX3_N	Bidir

Table 7.6: Ethernet connector pinout

Default behavior of LEDs:

LED	Signal	Meaning
Left (green)	LINK1000#	OFF: Link established, speed 1000Mb/s ON: Speed 10/100Mb/s (also no link)
Right (green)	ACT#	OFF: no link ON: link up Blink: traffic

Table 7.7: Ethernet LEDs

7.4 MICRO SD CARD CONNECTOR J1

Connector Type	693071010811
Connector Manufacturer	Wurth Electronic

Table 7.8: Micro SD card connector type

Pin	Signal	Direction	Note
1	DATA2	Bidir	Pullup
2	DATA3	Bidir	Pullup
3	CMD	Out	Pullup
4	VDD	-	
5	CLK	Out	Pullup
6	GND	-	
7	DATA0	Bidir	Pullup
8	DATA1	Bidir	Pullup
9	CD	In	
10	CD	In	Pullup

Table 7.9: Micro SD card connector pinout

7.5 I2C CONNECTOR P3

I2C bus is available on this connector. Power and GND is available also for easier expansion.

Connector Type	61030421121
Connector Manufacturer	Wurth Electronic

Table 7.10: I2C connector type

Pin	Signal	Direction	Note
1	3.3V	In	
2	I2C1_SDA	In	
3	I2C1_SCL	Out	
4	GND	Out	

Table 7.11: I2C connector pinout

7.6 SATA CONNECTOR J6

J6 supports SATA3.0.

Connector Type	67491-3010
Connector Manufacturer	Molex

Table 7.12: SATA connector type

Pin	Signal	Direction	Note
1	GND	-	
2	SATA1_TX_P	Bidir	
3	SATA1_TX_N	Bidir	
4	GND	-	
5	SATA1_RX_N	Bidir	
6	SATA1_RX_P	Bidir	
7	GND	-	
8			
9			

Table 7.13: SATA connector pinout

7.7 SATA POWER CONNECTOR P18

This is power supply for external SATA disk drive. 5V power only.

Connector Type	171825-4
Connector Manufacturer	TE Connectivity

Table 7.14: SATA power connector type

Pin	Signal	Direction	Note
1	+5V	-	
2	GND	-	
3	GND	-	
4			

Table 7.15: SATA power connector pinout

7.8 HDMI CONNECTOR P1

HDMI 1.3 connection.

Connector Type	685119134923
Connector Manufacturer	Wurth Electronic

Table 7.16: HDMI connector type

Pin	Signal	Direction	Note
1	TDMS_L2_P	Out	
2	GND	-	
3	TDMS_L2_N	Out	
4	TDMS_L1_P	Out	
5	GND	-	
6	TDMS_L1_N	Out	
7	TDMS_L0_P	Out	
8	GND	-	
9	TDMS_L0_N	Out	
10	TDMS_CLK_P	Out	
11	GND	-	
12	TDMS_CLK_P	Out	
13			
14			
15	HDMI_CTRL_CLK	Out	Pullup
16	HDMI_CTRL_DAT	Bidir	Pullup
17	GND	-	
18	+5V	-	
19	HDMI_HPD#	In	

Table 7.17: HDMI connector pinout

7.9 USB 3.0 HOST CONNECTOR J4

USB connector J4 is a high speed USB3.0 connector. It works in host mode only.

Connector Type	692122030100
Connector Manufacturer	Wurth Electronic

Table 7.18: USB 3.0 connector type

Pin	Signal	Direction	Note
1	VBUS	Out	
2	USB1_D-	-	
3	USB1_D+	Out	
4	GND	Out	
5	USB1_RX_N	-	
6	USB1_RX_P	Out	
7	GND	Out	
8	USB1_TX_N	-	
9	USB1_TX_P	Out	

Table 7.19: USB 3.0 connector pinout

7.10 USB OTG CONNECTOR J5

USB connector J5 is a mini USB connector. It works in OTG mode, it can be either host or a slave.

Connector Type	651305142821
Connector Manufacturer	Wurth Electronic

Table 7.20: USB OTG connector type

Pin	Signal	Direction	Note
1	VBUS	-	
2	USB1_D-	Bidir	
3	USB1_D+	Bidir	
4	USB1_ID	In	
5	GND	-	

Table 7.21: USB OTG connector pinout

7.11 MINI PCI-E CONNECTOR P2

This is standard miniPCIe slot with USB and I2C. It can be used for attaching the WiFi module etc.

Connector Type	48338-0052
Connector Manufacturer	Molex

Table 7.22: Mini PCIe connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	WAKE#	Out	2	+3.3V	-
3	NC	-	4	GND	-
5	NC	-	6	+1.5V	-
7	NC	-	8	NC	-
9	GND	-	10	NC	-
11	PCIE_CLK_N	Out	12	NC	-
13	PCIE_CLK_P	Out	14	NC	-
15	GND	-	16	NC	-
17	NC	-	18	GND	-
19	NC	-	20	NC	-
21	GND	-	22	PCIE_RST#	Out
23	PCIE0_RX_N	In	24	+3.3V	-
25	PCIE0_RX_P	In	26	GND	-
27	GND	-	28	+1.5V	-
29	GND	-	30	I2C1_SCL	Bidir
31	PCIE0_TX_N	Out	32	I2C1_SDA	Bidir
33	PCIE0_TX_P	Out	34	GND	-
35	GND	-	36	USB_PCIE_N	Bidir
37	GND	-	38	USB_PCIE_P	Bidir
39	+3.3V	-	40	GND	-
41	+3.3V	-	42	NC	-
43	GND	-	44	NC	-
45	NC	-	46	NC	-
47	NC	-	48	+1.5V	-
49	NC	-	50	GND	-
51	NC	-	52	+3.3V	-

Table 7.23: Mini PCIe connector pinout

7.12 QUICC ENGINE CONNECTOR P10

Signals from RakunLS1 QUICC Engine interface are present in this connector. There are multiple functionalities available on these pins due to multiplexed CPU interfaces.

Connector Type	61031621121
Connector Manufacturer	Wurth Electronic

Table 7.24: QUICC Engine connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	UCC1_CLK09 BRGO2 SAI3_RX_BCLK FTM4_QD_PHA GPIO4_19	In Out Bidir In Bidir	2	+3.3V	-
3	UCC1_CLK10 BRGO3 SAI3_RX_SYNC FTM4_QD_PHB GPIO4_20	In Out Bidir In Bidir	4	UCC1_TXD TDMA_TXD SAI3_TX_DATA FTM4_CH5 GPIO4_11	Out Out Out Bidir Bidir
5	UCC1_RTSB_TXEN TDMA_TSYNC SAI3_TX_SYNC FTM4_CH4 GPIO4_12	In In Bidir Bidir Bidir	6	UCC1_RXD TDMA_RXD SAI3_RX_DATA FTM4_CH7 GPIO4_09	In In In Bidir Bidir
7	UCC1_CTSB_RXDV TDMA_RSYNC SAI3_TX_BCLK FTM4_CH6 GPIO4_10	Out In Bidir Bidir Bidir	8	UCC1_CDB_RXER TDMA_RQ EXT_AUDIO_MCLK1 FTM4_CH3 GPIO4_13	In Out In Bidir Bidir
9	UCC3_CDB_RXER TDMB_RQ SPDIF_EXTCLK SAI4_RX_BCLK FTM4_EXTCLK GPIO4_18	In Out Bidir Bidir Bidir Bidir	10	UCC3_CTSB_RXDV TDMB_RSYNC SPDIF_PLOCK SAI4_TX_BCLK FTM4_CH1 GPIO4_15	Out In Bidir Bidir Bidir Bidir
11	UCC3_RXD TDMB_RXD SPDIF_IN SAI4_RX_DATA FTM4_CH2 GPIO4_14	In In In In Bidir Bidir	12	UCC3_RTSB_TXEN TDMB_TSYNC SPDIF_SRCLK SAI4_TX_SYNC FTM4_FAULT GPIO4_17	Out In Bidir Bidir In Bidir
13	UCC3_TXD TDMB_TXD SPDIF_OUT SAI4_TX_DATA FTM4_CH0 GPIO4_16	Out Out Out Out Bidir Bidir	14	UCC3_CLK11 BRGO4 SAI4_RX_SYNC FTM8_CH0 GPIO4_21	In Out Bidir Bidir Bidir
15	GND	-	16	UCC3_CLK12 BRGO1 FTM8_CH1 GPIO4_22	In Out Bidir Bidir

Table 7.25: QUICC Engine connector pinout

7.13 GPIO1/EC3 CONNECTOR P9

Signals from RakunLS1 EC3 interface are present in this connector. There are multiple functionalities available on these pins due to multiplexed CPU interfaces.

Connector Type	61032021121
Connector Manufacturer	Wurth Electronic

Table 7.26: GPIO1/EC3 connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	GND	Bidir	2	EC3_TXD3 TSEC_1588_ALARM_OUT2 FTM3_CH7 GPIO3_28	Out Out Bidir Bidir
3	EC3_TXD2 TSEC_1588_ALARM_OUT1 FTM3_CH6 GPIO3_29	Out Out Bidir Bidir	4	EC3_TXD1 TSEC_1588_CLK_OUT FTM3_CH5 GPIO3_30	Out Out Bidir Bidir
5	EC3_TXD0 TSEC_1588_PULSE_OUT2 FTM3_CH4 GPIO3_31	Out Out Bidir Bidir	6	EC3_TX_EN FTM3_CH1 GPIO4_00	Out Bidir Bidir
7	EC3_GTX_CLK FTM3_CH0 GPIO4_01	Out Bidir Bidir	8	EC3_GTX_CLK125 USB2_DRVVBUS GPIO4_02	In Out Bidir
9	EC3_RXD3 FTM3_FAULT GPIO4_03	In In Bidir	10	EC3_RXD2 FTM3_EXTCLK GPIO4_04	In In Bidir
11	EC3_RXD1 TSEC_1588_PULSE_OUT1 FTM3_CH3 GPIO4_05	In Out Bidir Bidir	12	EC3_RXD0 TSEC_1588_TRIG_IN2 FTM3_CH2 GPIO4_06	In In Bidir Bidir
13	EC3_RX_CLK TSEC_1588_CLK_IN FTM3_QD_PHA GPIO4_07	In In In Bidir	14	EC3_RX_DV TSEC_1588_TRIG_IN1 FTM3_QD_PHB GPIO4_08	In In In Bidir
15	I2C1_SCL	Bidir	16	MDIO	Bidir
17	I2C1_SDA	Bidir	18	MDC	Out
19	GND	-	20	+3.3V	-

Table 7.27: GPIO1/EC3 connector pinout

7.14 GPIO2/EC2 CONNECTOR P14

Signals from RakunLS1 EC2 interface are present in this connector. There are multiple functionalities available on these pins due to multiplexed CPU interfaces.

Connector Type	61032021121
Connector Manufacturer	Wurth Electronic

Table 7.28: GPIO2/EC2 connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	GND	Bidir	2	EC2_TXD3 CAN4_TX USB2_D7 FTM2_CH5 GPIO3_15	Out Out Bidir Bidir Bidir
3	EC2_TXD2 CAN3_TX USB2_D6 FTM2_CH7 GPIO3_16	Out Out Bidir Bidir Bidir	4	EC2_TXD1 USB2_D5 FTM2_CH3 GPIO3_17	Out Bidir Bidir Bidir
5	EC2_TXD0 USB2_D4 FTM2_CH2 GPIO3_18	Out Bidir Bidir Bidir	6	EC2_TX_EN USB2_STP FTM2_FAULT GPIO3_19	Out Out In Bidir
7	EC2_GTX_CLK USB2_CLK FTM2_EXTCLK GPIO3_20	Out In In Bidir	8	EC2_GTX_CLK125 USB2_PWRFAULT GPIO3_21	In In Bidir
9	EC2_RXD3 CAN4_RX USB2_D3 FTM2_CH4 GPIO3_22	In In Bidir Bidir Bidir	10	EC2_RXD2 CAN3_RX USB2_D2 FTM2_CH6 GPIO3_23	In In Bidir Bidir Bidir
11	EC2_RXD1 USB2_D1 FTM2_CH1 GPIO3_24	In Bidir Bidir Bidir	12	EC2_RXD0 USB2_D0 FTM2_CH0 GPIO3_25	In Bidir Bidir Bidir
13	EC2_RX_CLK USB2_DIR FTM2_QD_PHA GPIO3_26	In In In Bidir	14	EC2_RX_DV USB2_NXT FTM2_QD_PHB GPIO3_27	In Bidir In Bidir
15	I2C1_SCL	Bidir	16	MDIO	Bidir
17	I2C1_SDA	Bidir	18	MDC	Out
19	GND	-	20	+3.3V	-

Table 7.29: GPIO2/EC2 connector pinout

7.15 MIKROBUS CONNECTOR P4+P5

MikroBUS slot can be used for attaching number of mikroBUS compatible add-on boards. For more information, see Appendix B.

Connector Type	2x 61300811821
Connector Manufacturer	Wurth Electronic

Table 7.30: Microbus connector type

P4			P5		
Pin	Signal	Direction	Pin	Signal	Direction
1	UBUS_AN	In	1	UBUS_PWM (GPIO3_25)	In
2	UBUS_RST (GPIO3_24)	Out	2	UBUS_INT (GPIO3_22)	In
3	SPI_CS0	Out	3	UART4_RX	In
4	SPI_CLK	Out	4	UART4_TX	Out
5	SPI_MISO	In	5	I2C1_SCL	Bidir
6	SPI_MOSI	Out	6	I2C1_SDA	Bidir
7	+3.3V	-	7	+5V	-
8	GND	-	8	GND	-

Table 7.31: Microbus connector pinout

7.16 UART CONNECTOR P6

Four UARTs are present on this connector. Two of them (UART1, UART2) can be routed to the USB2UART converter FT230Q.

Connector Type	61031021121
Connector Manufacturer	Wurth Electronic

Table 7.32: UART connector type

Pin	Signal	Direction	Note
1	UART1_SIN	In	Pullup
2	UART2_SIN	In	Pullup
3	UART1_SOUT	Out	
4	UART2_SOUT	Out	
5	GND	-	
6	GND	-	
7	UART1_RTS# (UART3_SOUT)	Out	
8	UART2_RTS# (UART4_SOUT)	Out	
9	UART1_CTS# (UART3_SIN)	In	Pullup
10	UART2_CTS# (UART4_SIN)	In	Pullup

Table 7.33: UART connector pinout

7.17 DEBUG CONSOLE CONNECTOR J7

This is mini USB connector for easy PC connection (serial console or terminal). UART1 or UART2 can be routed to onboard USB2UART converter.

Connector Type	65100516121
Connector Manufacturer	Wurth Electronic

Table 7.34: Debug console connector type

Pin	Signal	Direction	Note
1	VBUS	-	FTDI chip is supplied from this pin
2	USB1_D-	Bidir	
3	USB1_D+	Bidir	
4	NC	-	
5	GND	-	

Table 7.35: Debug console connector pinout

7.18 AUX SERDES CONNECTORS J8, J2, J3

The remaining PCIe lanes 1, 2 and 3 from CPU module are available on debug connectors. Lane 0 is connected to the mini PCIe slot.

Connector Type	67491-3010
Connector Manufacturer	Molex

Table 7.36: AUX SerDes connector type

Connector J8:

Pin	Signal	Direction	Note
1	GND	-	
2	PCIE1_RX_P	Bidir	
3	PCIE1_RX_N	Bidir	
4	GND	-	
5	PCIE1_TX_P	Bidir	
6	PCIE1_TX_N	Bidir	
7	GND	-	
8	NC	-	
9	NC	-	

Table 7.37: AUX SerDes 1 connector pinout

Connector J2:

Pin	Signal	Direction	Note
1	GND	-	
2	PCIE2_TX_P	Bidir	
3	PCIE2_TX_N	Bidir	
4	GND	-	
5	PCIE2_RX_N	Bidir	
6	PCIE2_RX_P	Bidir	
7	GND	-	
8	NC	-	
9	NC	-	

Table 7.38: AUX SerDes 2 connector pinout

Connector J3:

Pin	Signal	Direction	Note
1	GND	-	
2	PCIE3_TX_P	Bidir	
3	PCIE3_TX_N	Bidir	
4	GND	-	
5	PCIE3_RX_N	Bidir	
6	PCIE3_RX_P	Bidir	
7	GND	-	
8	NC	-	
9	NC	-	

Table 7.39: AUX SerDes 3 connector pinout

8 APPENDIX A: PHYBOARD ADD-ON BOARD

PHYBoard is an add-on board for PastLS1. It attaches to the EC2 and/or EC3 slots and provides additional Ethernet connectivity on that port.

PHYBoard comprises:

- Ethernet PHY Qualcomm Atheros AR8033, connected to PastLS1 with RGMII bus
- Ethernet RJ45 connector and MDI transformer
- Optical SFP cage
- Activity and Speed LEDs

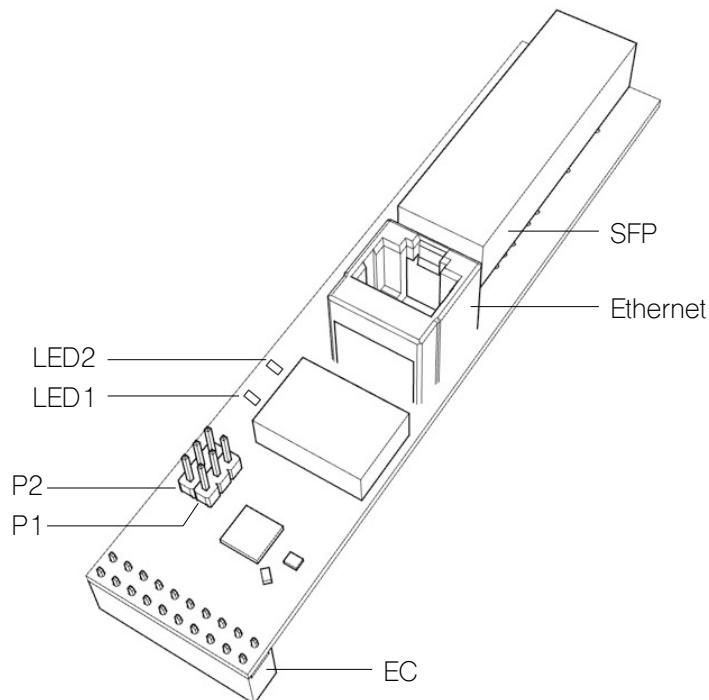


Illustration 8.1: PHYBoard add-on

8.1 ARCHITECTURE

Block diagram of PHYBoard add-on board is shown in figure below:

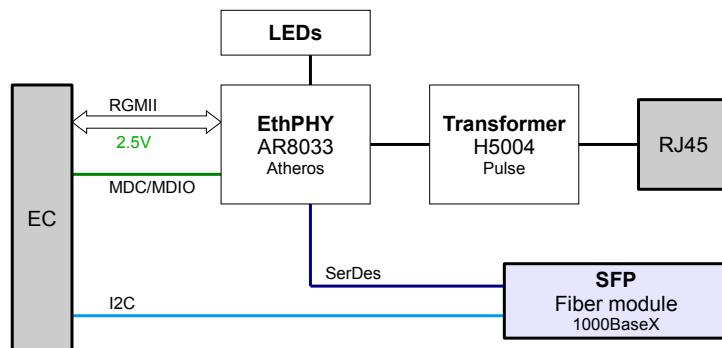


Illustration 8.2: Block diagram of PHYBoard

8.2 JUMPERS

8.2.1 ETHERNET MODE JUMPER P1

Mode jumper selects mode of operation for Ethernet PHY. Mode of operation can be Copper Ethernet (connector P5) or Fiber Ethernet (SFP cage).

Jumpers P1 is 3-pin jumper.

P1	
Setting	Function
1 – 2	Fiber interface
2 – 3	Copper interface (Default jumpers placement)

Table 8.1: Ethernet mode selection jumper P1

8.2.2 ADDRESS JUMPER P2

Jumpers P16 and P17 select the UART interface that is connected to the UART to USB converter FT230. This device provides serial console on USB connector J7 for easy connection to the PC. Jumpers P16 and P17 must always be set up in the same way.

Jumpers P16 and P17 are 3-pin jumpers.

P2	
Setting	Function
1 – 2	UART1 is used for serial console
2 – 3	UART2 is used for serial console (Default jumpers placement)

Table 8.2: UART to USB selection jumpers P16 and P17

8.3 LED INDICATORS

Board comprises 2 LED indicators. Default behavior of LEDs are as follows

LED	Signal	Meaning
LED1 (white)	LINK1000#	OFF: Speed 10/100Mb/s (also no link) ON: Link established, speed 1000Mb/s
LED2 (white)	ACT#	OFF: no link ON: link up Blink: traffic

Table 8.3: Ethernet LEDs

8.4 CONNECTOR DETAILS

8.4.1 EC CONNECTOR P4

This connector is used to connect PHYBoard to the PastLS1. On PastLS1, EC2 and EC3 can be used for this connection. Interfaces used are power, RGMII, MDIO and I2C.

Connector Type	61302021821
Connector Manufacturer	Wurth Electronic

Table 8.4: EC connector type

Pin	Signal	Direction	Pin	Signal	Direction
1	GND	-	2	EC2_TXD3	In
3	EC2_TXD2	In	4	EC2_TXD1	In
5	EC2_TXD0	In	6	EC2_TX_EN	In
7	EC2_GTX_CLK	In	8	EC2_GTX_CLK125	Out
9	EC2_RXD3	Out	10	EC2_RXD2	Out
11	EC2_RXD1	Out	12	EC2_RXD0	Out
13	EC2_RX_CLK	Out	14	EC2_RX_DV	Out
15	I2C1_SCL	Bidir	16	MDIO	
17	I2C1_SDA	Bidir	18	MDC	In
19	GND	-	20	+3.3V	-

Table 8.5: EC connector extended pinout

8.4.2 ETHERNET CONNECTOR P5

10/100/1000Mb/s Ethernet port on standard RJ45.

Connector Type	615008138021
Connector Manufacturer	Wurth Electronic

Table 8.6: Ethernet connector type

Pin	Signal	Direction
1	MX0_P	Bidir
2	MX0_N	Bidir
3	MX1_P	Bidir
4	MX2_P	Bidir
5	MX2_N	Bidir
6	MX1_N	Bidir
7	MX3_P	Bidir
8	MX3_N	Bidir

Table 8.7: Ethernet connector pinout

9 APPENDIX B: MIKROBUS SLOT

The mikroBUS standard defines mainboard sockets and add-on boards used for interfacing MCU mainboards with integrated circuits and modules (add-on boards), enabling easy hardware expandability.

The standard specifies the physical layout of the mikroBUS pinout, the communication and power supply pins used, the size and shape of the add-on boards, the positioning of the mikroBUS socket on the mainboard, and finally, the silkscreen marking conventions for both the add-on boards and sockets.

MikroBUS is an open standard, created by company MikroElektronika. It can be downloaded from:

<http://download.mikroe.com/documents/standards/mikrobus/mikrobus-standard-specification-v200.pdf>

For more information about mikroBUS, check <http://www.mikroe.com/mikrobus>.

There is a plethora of available add-on boards, called Clicks. For more information, check

<http://www.mikroe.com/click>.

I2C Isolator click	MPU 9DOF click	tRF click	8x8 B click	THERMO click
Unique ID click	GPS3 click	SpeakUp click	Bluetooth2 click	OPTO click
Fingerprint click	IR eclipse click	CC3000 click	4-20 mA R click	IrDA2 click
ETH WIZ click	Illuminance click	STEPPER click	Compass click	Accel click
Rotary B Click	HTU21D click	DC MOTOR click	GYRO click	WiFi Plus Click
AlphaNum R click	OLED C click	PROTO click	IR click	GPS Click - L10
nRF S click	OLED W click	CapSense click	GSM2 click	CAN SPI click 5V
AlphaNum G click	OLED B click	Joystick click	GPS2 click	CAN SPI click 3.3V
Camera click	UV click	Altitude click	RELAY click	LightHz click
GNSS click	MOTION click	Color click	OSD click	RS485 click 3.3V
EXPAND 2 click	LIN HALL click	FRAM click	DALI Click	BEE click
THERMO2 click	UNI HALL click	Proximity click	IrThermo click 3.3V	ETH Click
RTC3 Click	Bi Hall click	Thunder click	IrThermo click 5V	Bluetooth Click
HDC1000 click	LDC1000 click	RFid click	8x8 G click	GPS Click
Tilt click	Hydrogen click	Fiber Opt click 3.3V	nRF T click	EXPAND click
Flame Click	BLE P click	Fiber Opt click 5V	nRF C click	SHT11 click
Rotary G Click	Thumbstick click	ccRF click	GSM Click	DAC Click
GSM3 click	Methane Click	Adapter click	8x8 Y click	RTC2 click
DHT22 click	Air quality click	FM click	8x8 R click	RTC Click
BLE2 click	LPG click	EVE Click	4-20 mA T click	Buzz Click
WiFi3 Click	Hall current click	BarGraph click	USB SPI click	MP3 Click
WiFi2 Click	CO click	Light click	USB UART click	RS485 click 5V
NFC Tag click	Alcohol click	Pressure click	7seg click	DIGI POT click
ccRF2 click	RS232 click	FTDI click	EEPROM Click	ADC click
PS/2 click	MPU IMU click	Current click	Flash Click	microSD click

Table 9.1: Currently available Click boards from Mikroelektronika

