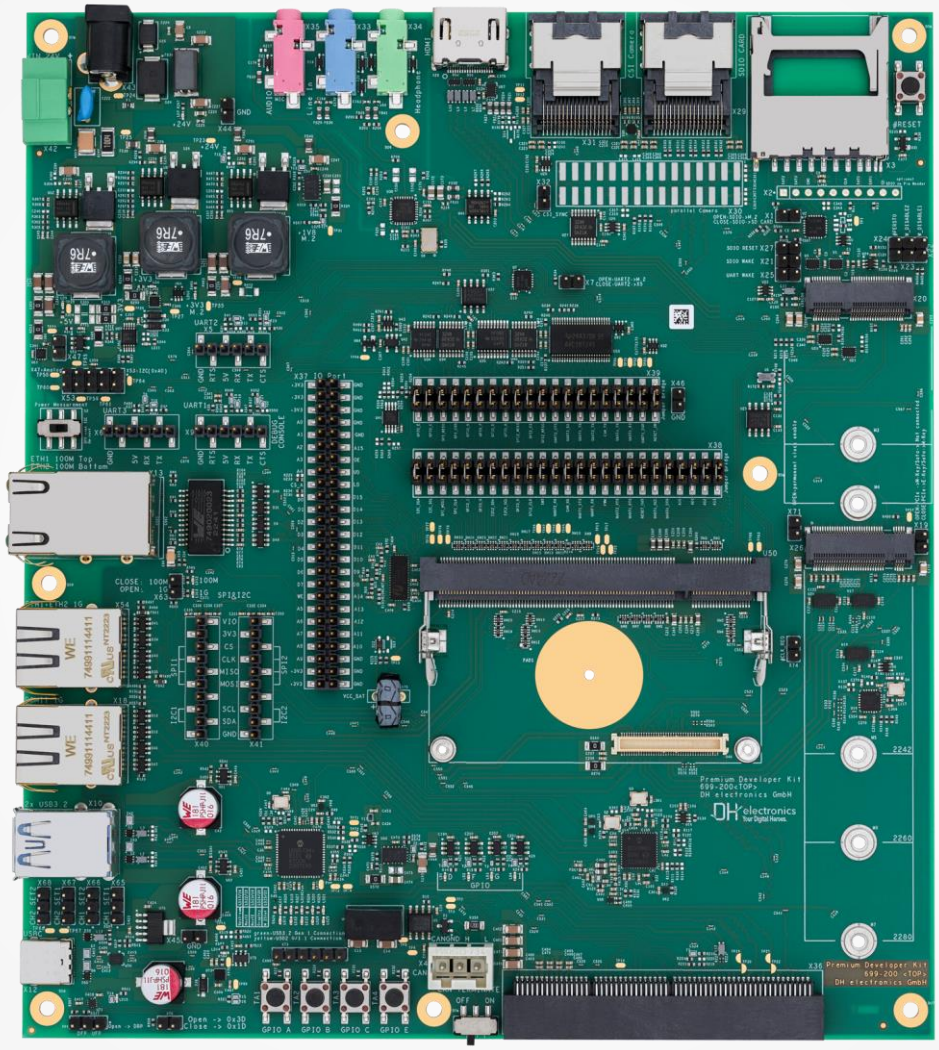
DHCOM PDK3

User manual



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History

Version	Date	Description or changes	Name
R01	2024-03-26	First version	MA

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1 Introduction

The DHCOM Premium Developer Kit 3 (PDK3) is a general development board for computer modules compliant with the DHCOM standard. A flexible extension interface also allows a touch-screen and a separate expansion board to be connected. This modular system offers a wide range of applications for the user. By selecting the appropriate DHCOM standard module, the required system performance is scalable. The customary board support packages for Linux based on Yocto are available. The user can fully concentrate on developing applications. Here too, DH electronics is able to support customers with its extensive know-how and user-friendly development environments for DHCOM platforms. As a one-stop provider, DH electronics would also be pleased to supply, upon request, a customised, ready-to-ship solution.

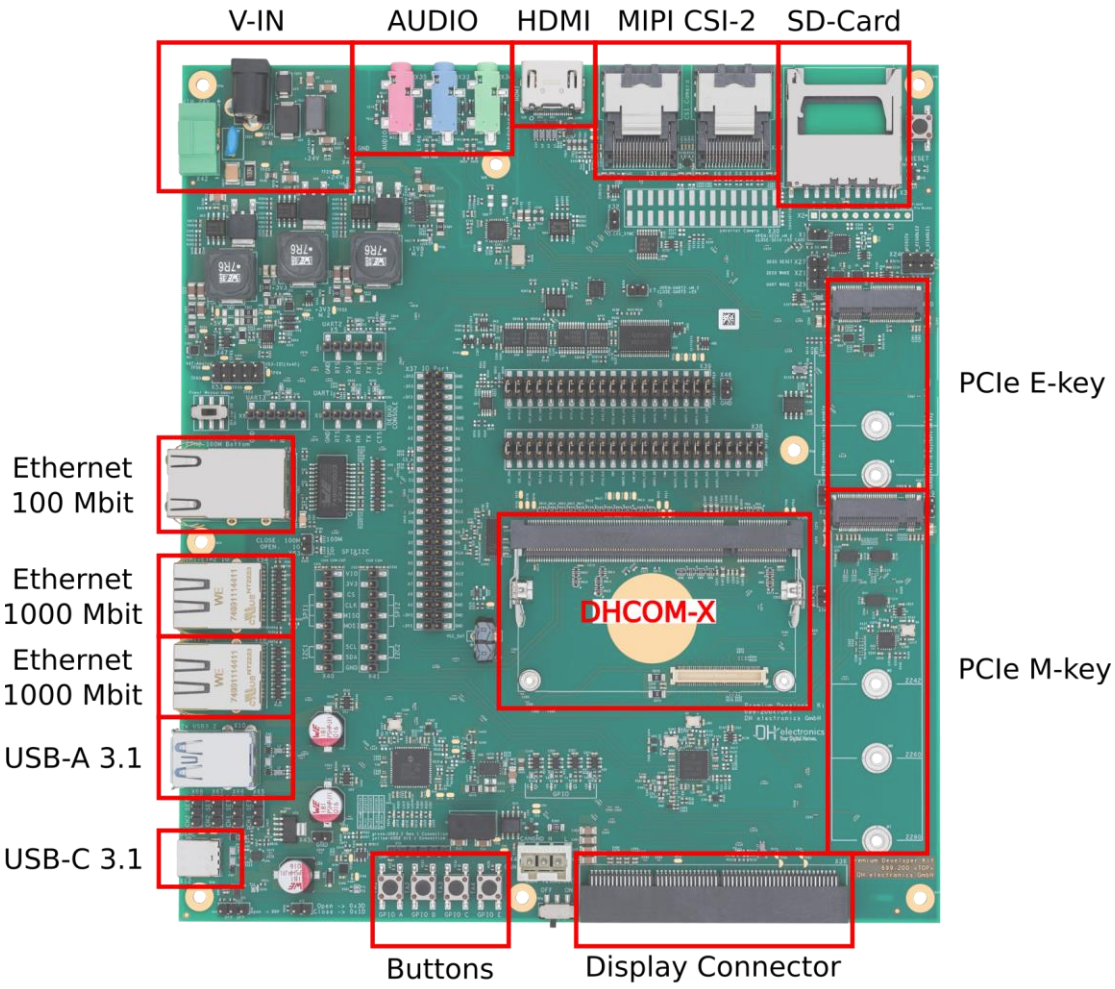


Figure 1 PDK3 Interface Overview

1.1 Main features

- DHCOM standard compliant
- BSPs for Linux (Yocto)
- 2x Ethernet 10/100Mbit (depending on connected DHCOM)
- 2x Ethernet 1Gbit (depending on connected DHCOM)
- 2x USB Host 3.0 (depending on connected DHCOM, otherwise USB2.0)
- 1x USB-C 3.0 (depending on connected DHCOM)
- 1x RS232 (Full Function)
- 1x UART (Tx / Rx / RTS / CTS)
- 1x UART (Tx / Rx)
- 1x CAN-FD
- 2x I2C
- 2x SPI
- SD/MMC card interface, 4Bit SDIO
- Standardized TFT-LC-Display Interface (up to 24Bit)
- 4-wire resistive touch-screen
- HDMI 2.0 Interface
- 2x MIPI CSI-2 camera interface
- M.2 E-key socket
- M.2 M-key socket
- Audio Codec SGTL5000:
    - Microphone IN
    - Stereo line IN
    - Stereo headphone OUT
- 10 Bit BT.656 camera interface
- 1x Interrupt highest priority
- 1x Battery connection for date and time back-up
- 4 I/O Port LEDs
- 4 Push Buttons
- Memory Interface
- Power Supply by voltage terminal or power jack

1.2 Block diagram

Figure 2 PDK3 Block diagram

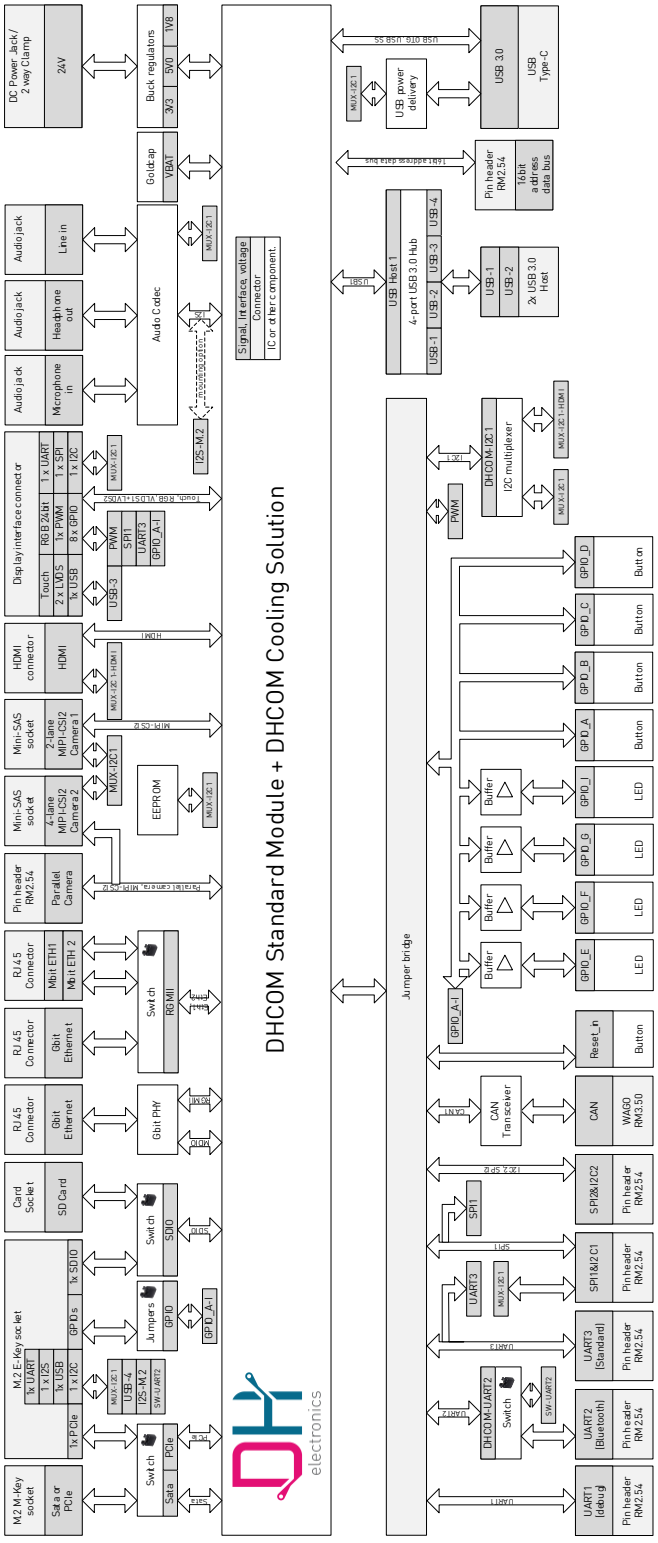


Figure 2 PDK3 Block diagram

2 Interfaces

The following subsections describe all of the interfaces of the PDK3 board. Figure 3 Overview of the interfaces serves as an overview for the subsections that follow.

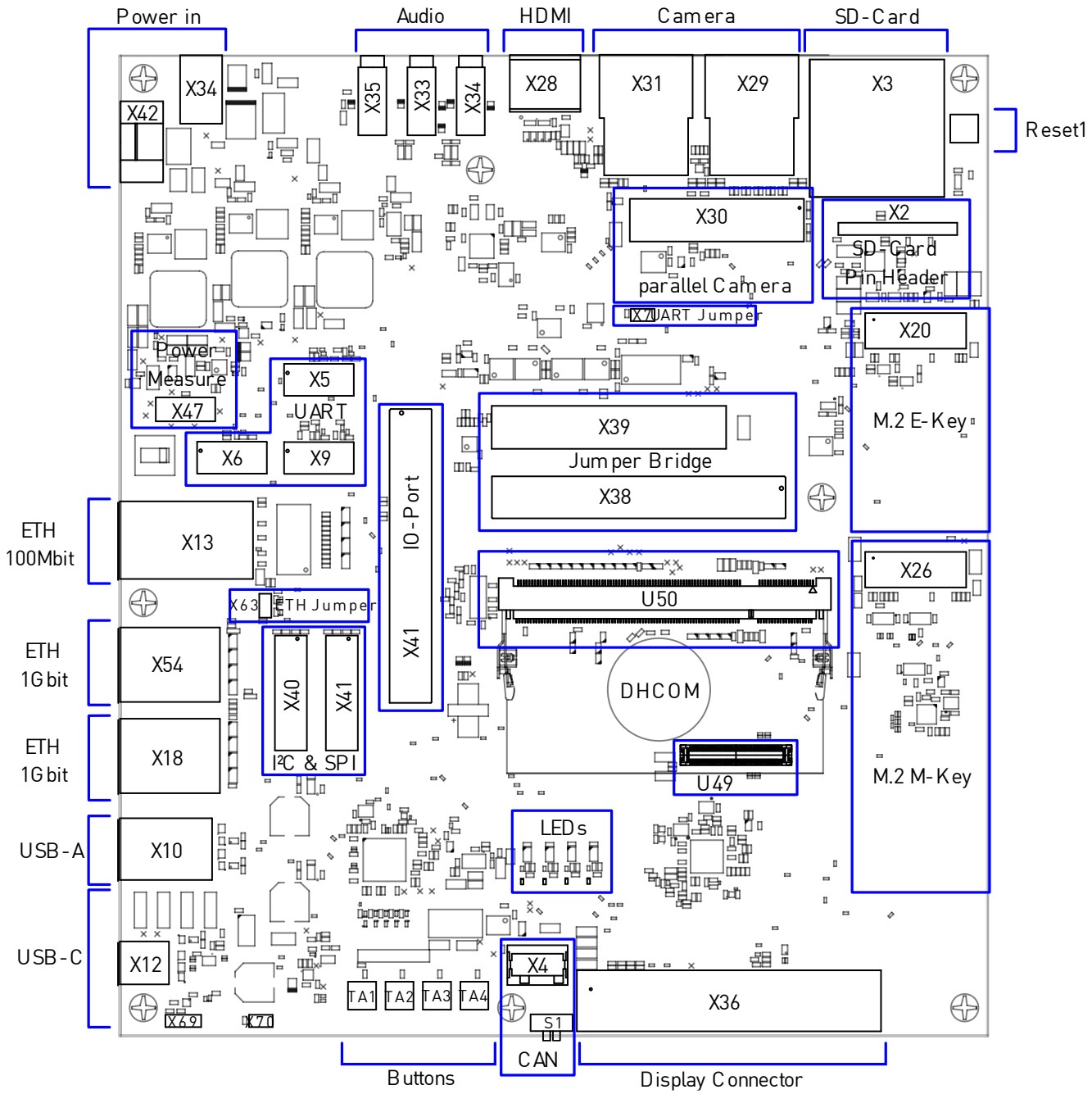


Figure 3 Overview of the interfaces

Connector Name	Description
X3	SD Card Slot
X2	SD Card header, RM2.54
X4	CAN Interface
X5	UART2 TTL
X6	UART3 TTL
X9	UART1 TTL, RM2.00
X10	Dual USB Host 3.0 (type A)
X12	USB-C
X69	USB-C mode jumper
X70	USB-C Controller address jumper
X36	Display-connector
X13	Dual RJ45 100MBit Ethernet interface
X63	Ethernet jumper bridge 100MBit – 1GBit
X54	RJ45 GBit Ethernet interface (onboard)
X18	RJ45 GBit Ethernet interface (RGMII)
U20	M.2 E-key socket
U26	M.2 M-key socket
X28	HDMI 2.0 connector
X31	CSI Camera Connector
X29	CSI Camera Connector
X34	Headphone output, audio jack
X33	Line in, audio jack
X35	Mic in, audio jack
X38	Jumper bridge, RM2.54
X39	Jumper bridge, RM2.54
X40	SPI1 & I²C1, RM2.54
X41	SPI2 & I²C2, RM2.54
X42	Power clamp
X34	Power jack
X47	Header Pin for current measurement of the DHCOM standard module
U50	DHCOM, SODIMM 200 connector type 2.5V
U49	DHCOM-X, Molex connector
RESET1	Reset-Button
TA1/TA2/TA3/TA4	Buttons controlled by GPIOs
LEDs	LEDs controlled by GPIOs

Table 1: Connectors

2.1 DHCOM (U50)

Any DHCOM standard module can be plugged into the SODIMM-200 connector.

Pin number	Pin name	Power domain
1	Microphone In (or I2S_RXFS)	VDDA
3	Microphone GND	VDDA
5	Line-In Left (or I2S_RXD)	VDDA
7	Line-In Right (or I2S_RXC)	VDDA
9	VSSA (Audio Supply GND)	VDDA
11	Headphone GND (or I2S_TXFS)	VIO
13	Headphone Left (or I2S_TXC)	VDDA
15	Headphone Right (or I2S_TXD)	VDDA
17	GND1	Vin
19	GND2	Vin
21	RESET_IN	VIO
23	UART3_RX	VIO
25	UART3_TX	VIO
27	CAN_TX	VIO
29	CAN_RX	VIO
31	UART2_CTS	VIO
33	UART2_RTS	VIO
35	UART2_RX	VIO
37	UART2_TX	VIO
39	VCC_IN2	Vin
41	VCC_IN4	Vin
43	GND3	Vin
45	GND4	Vin
47	GND5	Vin
49	LC_R2	
51	LC_R3	Vdisp
53	LC_R4	Vdisp
55	LC_R5	Vdisp
57	LC_R6	Vdisp
59	LC_R7	Vdisp
61	LC_G2	Vdisp
63	LC_G3	Vdisp
65	LC_G4	Vdisp
67	LC_G5	Vdisp
69	LC_G6	Vdisp
71	LC_G7	Vdisp
73	LC_B2	Vdisp
75	LC_B3	Vdisp
77	LC_B4	Vdisp
79	LC_B5	Vdisp
81	LC_B6	Vdisp
83	LC_B7	Vdisp

Pin number	Pin name	Power domain
2	Analog Input 3	VDDA
4	Analog Input 2	VDDA
6	Analog Input 1	VDDA
8	Analog Input 0	VDDA
10	VDDA (Audio Supply VCC)	VDDA
12	TSPX	VDDA
14	TSMX	VDDA
16	TSMY	VDDA
18	TSPY	VDDA
20	RESET_OUT	VIO
22	UART1_DTR	VIO
24	UART1_CTS	VIO
26	UART1_RTS	VIO
28	UART1_DSR	VIO
30	UART1_DCD	VIO
32	UART1_RX	VIO
34	UART1_TX	VIO
36	UART1_RI	VIO
38	VCC_IN1	Vin
40	VCC_IN3	Vin
42	VCC_IN5	Vin
44	VCC_IN6	Vin
46	Vdisp_OUT	Vdisp
48	GPIO_W (or CIF_D0)	Vcam
50	GPIO_V (or CIF_D1)	Vcam
52	GPIO_U (or CIF_D2)	Vcam
54	GPIO_T (or CIF_D3)	Vcam
56	GPIO_S (or CIF_D4)	Vcam
58	GPIO_R (or CIF_D5)	Vcam
60	GPIO_Q (or CIF_D6)	Vcam
62	GPIO_P (or CIF_D7)	Vcam
64	GPIO_O (or CIF_D8)	Vcam
66	GPIO_N (or CIF_D9)	Vcam
68	GPIO_M (or CIF_VSYNC)	Vcam
70	GPIO_L (or CIF_MCLK)	Vcam
72	GPIO_K (or CIF_PCLK)	Vcam
74	GPIO_J (or CIF_HSYNC)	Vcam
76	LC_R0	Vdisp
78	LC_R1	Vdisp
80	LC_G0	Vdisp
82	LC_G1	Vdisp
84	LC_B0	Vdisp

Pin number	Pin name	Power domain
85	LC_EN	Vdisp
87	LC_VSYNC	Vdisp
89	LC_HSYNC	Vdisp
91	LC_PCLK	Vdisp
93	LVDS_TX2+	LVDS
95	LVDS_TX2-	LVDS
97	LVDS_CLK+	LVDS
99	LVDS_CLK-	LVDS
101	GND6	Vin
103	SD_CLK	VIO
105	SD_DETECT	VIO
107	SD_D1	VIO
109	SD_D3	VIO
111	GND7	Vin
113	A0	Vsysbus
115	A1	Vsysbus
117	A2	Vsysbus
119	A3	Vsysbus
121	A4	Vsysbus
123	A5	Vsysbus
125	A6	Vsysbus
127	A7	Vsysbus
129	CS_B	Vsysbus
131	CS_D	Vsysbus
133	WE	Vsysbus
135	D0	Vsysbus
137	D1	Vsysbus
139	D2	Vsysbus
141	D3	Vsysbus
143	D4	
145	D5	Vsysbus
147	D6	Vsysbus
149	D7	Vsysbus
151	INT_HIGHEST_PRIORITY	VIO
153	GND8	Vin
155	SPI2_CS0	VIO
157	SPI2_CLK	VIO
159	SPI2_MISO	VIO
161	SPI2_MOSI	VIO
163	GPIO_D	VIO
165	GPIO_F	VIO
167	GPIO_G	VIO
169	USB_HOST2_D+	USB
171	USB_HOST2_D-	USB
173	GPIO_H	VIO
175	GPIO_I	VIO
177	SPI1_CS0	VIO

Pin number	Pin name	Power domain
86	LC_B1	Vdisp
88	LVDS_TX0+	LVDS
90	LVDS_TX0-	LVDS
92	LVDS_TX1+	LVDS
94	LVDS_TX1-	LVDS
96	LVDS_TX3+	LVDS
98	LVDS_TX3-	LVDS
100	GPIO_PWM	VIO
102	Vcam_OUT	Vcam
104	SD_CMD	VIO
106	SD_D0	VIO
108	SD_D2	VIO
110	Vsysbus_OUT	Vsysbus
112	A8	Vsysbus
114	A9	Vsysbus
116	A10	Vsysbus
118	A11	Vsysbus
120	A12	Vsysbus
122	A13	Vsysbus
124	A14	Vsysbus
126	A15	Vsysbus
128	CS_A	Vsysbus
130	CS_C	Vsysbus
132	CS_E	Vsysbus
134	OE	Vsysbus
136	D8	Vsysbus
138	D9	Vsysbus
140	D10	Vsysbus
142	D11	Vsysbus
144	D12	Vsysbus
146	D13	Vsysbus
148	D14	Vsysbus
150	D15	Vsysbus
152	VIO_OUT	VIO
154	GPIO_A	VIO
156	GPIO_B	VIO
158	I2C2_CLK	VIO
160	I2C2_DATA	VIO
162	GPIO_C	VIO
164	GPIO_E	VIO
166	USB_OTG_VBUS	USB
168	USB_OTG_ID	USB
170	USB_OTG_D+	USB
172	USB_OTG_D-	USB
174	USB_PWR_STAT	VIO
176	USB_PWR_EN	VIO
178	USB_HOST_D+	USB

Pin number	Pin name	Power domain
179	SPI1_CLK	VIO
181	SPI1_MISO	VIO
183	SPI1_MOSI	VIO
185	GND9	Vin
187	nETH2_LINK_LED	VIO
189	nETH2_SPEED_LED	VIO
191	ETH2_TXD-	Ethernet
193	ETH2_TXD+	Ethernet
195	ETH2_RXI-	Ethernet
197	ETH2_RXI+	Ethernet
199	GND10	Vin

Pin number	Pin name	Power domain
180	USB_HOST_D-	USB
182	I2C1_CLK (HDMI_DDC_CLK)	VIO
184	I2C1_DATA (HDMI_DDC_DATA)	VIO
186	nETH1_LINK_LED	VIO
188	nETH1_SPEED_LED	VIO
190	ETH1_TXD-	Ethernet
192	ETH1_TXD+	Ethernet
194	ETH_VIO_SWITCHED	VIO
196	ETH1_RXI-	Ethernet
198	ETH1_RXI+	Ethernet
200	VCC_BAT	Vbat

Table 2 DHCOM Pin Description

2.1.1 DHCOM power supply voltage

It is possible to choose the supply voltage for the DHCOM standard module:

- If the resistors R310 and R312 are placed, the module is supplied by 3,3VDD (3.3 Volts) (default)
- If the resistors R309 and R311 are placed, the module is supplied by 5,0VDD (5 Volts).

Beware: Do not place R310, R312 **AND** R309, R311 at the same time. This will destroy the development board.

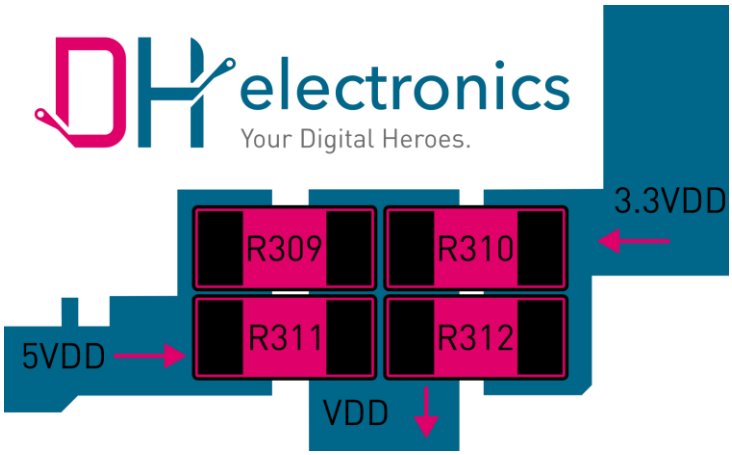


Figure 4 DHCOM Power Supply

2.1.2 DHCOM current consumption measurement (X47)

The PDK3 offers the possibility to measure the power consumption of the DCHOM standard module.

If you want to measure the power consumption follow these instructions:

- Measure the supply voltage of the DHCOM standard module
- Measure the voltage on header X47
- P_dhcom = (voltage on X43 / 2) * supply voltage of the DHCOM

Example:

Supply voltage of the DHCOM = 3,31V

Voltage on X47 = 0,94

P_dhcom = (0,94/2)*3,31 = 1,56Watt

X47 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	PWR	1
Output Voltage	OUT	PWR	2

Table 3: Power measurement connector

2.2 DHCOM-X (U49)

Some DHCOM modules support the DHCOM-X standard. The DHCOM-X standard provides additional high-speed interfaces.

Pin number	Pin name	Voltage level	Pin number	Pin name	Voltage level
1	RGMII_RXCLK	Vrgmii	2	RGMII_TXCLK	Vrgmii
3	RGMII_RXD0	Vrgmii	4	RGMII_TXD0	Vrgmii
5	RGMII_RXD1	Vrgmii	6	RGMII_TXD1	Vrgmii
7	RGMII_RXD2	Vrgmii	8	RGMII_TXD2	Vrgmii
9	RGMII_RXD3	Vrgmii	10	RGMII_TXD3	Vrgmii
11	RGMII_RX_CTL	Vrgmii	12	RGMII_TX_CTL	Vrgmii
13	RGMII_MDIO	Vrgmii	14	RGMII_MDC	Vrgmii
15	RGMII_RST	Vrgmii	16	RGMII_REFCLK	Vrgmii
17	RGMII_WOL_INT	3V3	18	RGMII_INT	3V3
19	GND	Vin	20	VCC_RGMII_OUT	Vrgmii
21	SATA_RX+	Sata	22	GND	Vin
23	SATA_RX-	Sata	24	SATA_TX+	Sata
25	GND	Vin	26	SATA_TX-	Sata
27	PCIE_RX+		28	GND	Vin
29	PCIE_RX-	PCIe	30	PCIE_REFCLK+	PCIe
31	PCIE_TX+	PCIe	32	PCIE_REFCLK-	PCIe
33	PCIE_TX-	PCIe	34	PCIE_WAKE	3V3
35	GND	Vin	36	GND	Vin
37	CSI_CLK+	CSI	38	CSI_D0+	CSI
39	CSI_CLK-	CSI	40	CSI_D0-	CSI
41	GND	Vin	42	CSI_D1+	CSI
43	HDMI_CLK+ or DP_Lane3+	HDMI	44	CSI_D1-	CSI
45	HDMI_CLK- or DP_Lane3-	HDMI	46	GND	Vin
47	HDMI_D2+ or DP_Lane2+	HDMI	48	HDMI_D0+ or DP_Lane0+	HDMI
49	HDMI_D2- or DP_Lane2-	HDMI	50	HDMI_D0- or DP_Lane0-	HDMI
51	HDMI_CEC_IN	2V5	52	HDMI_D1+ or DP_Lane1+	HDMI
53	GND	Vin	54	HDMI_D1- or DP_Lane1-	HDMI
55	LVDS2_CLK+	LVDS	56	HDMI_HPD or DP_HPD	2V5
57	LVDS2_CLK-	LVDS	58	GND	Vin
59	LVDS2_TX2+	LVDS	60	LVDS2_TX0+	LVDS
61	LVDS2_TX2-	LVDS	62	LVDS2_TX0-	LVDS
63	LVDS2_TX3+	LVDS	64	LVDS2_TX1+	LVDS
65	LVDS2_TX3-	LVDS	66	LVDS2_TX1-	LVDS
67	GND	Vin	68	GND	Vin
69	USB_SS_TX1+	USB	70	USB_SS_TX2+	USB
71	USB_SS_TX1-	USB	72	USB_SS_TX2-	USB
73	USB_SS_RX1+	USB	74	USB_SS_RX2+	USB
75	USB_SS_RX1-	USB	76	USB_SS_RX2-	USB
77	USB_SS_INT	USB	78	*reserved*	-
79	VCC_IN7	Vin	80	VCC_IN8	Vin

Table 4 DHCOM-X Pin Description

2.3 RESET

2.3.1 Reset In

The Reset Button on the top right side of the PDK3 causes a complete power cycle reset. The Reset Button Signal is not routed directly to the DHCOM. A Voltage Supervisor U31 holds the DHCOM in Reset as long as Power Supply Voltage is not raised over 2,63V The Voltage Supervisor also has an input for the Reset Button. After U31 the Reset Signal is routed through a level shifter to translate the Reset Signal to the correct IO Voltage of the connected DHCOM. After the level Shifter the Reset Signal can be accessed on the Jumper Bridge. Figure 5 Reset In Routing gives a good overview about the RESET_IN routing.

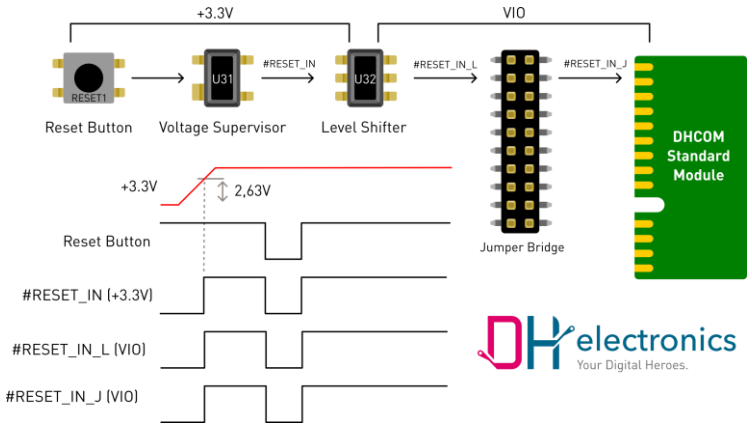


Figure 5 Reset In Routing

2.3.2 Reset Out

Reset_Out gives the DHSOM the opportunity to reset the peripherals on the PDK3. The reset signal is used both as a low active (#RESET_OUT) and as a high active (RESET_OUT) on the PDK3. Figure 6 Reset Out Routing shows the schematic flow of the RESET_OUT signal.

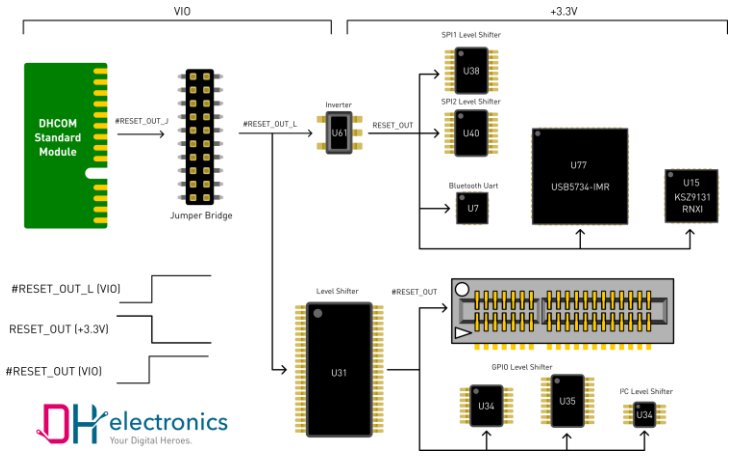


Figure 6 Reset Out Routing

2.4 SD Card slot (X3)

The PDK3 provides a 4-Bit Push-Pull SD Card Slot X3 for data storage. Figure 7 SDIO Routing X7 shows an overview of the signal routing of the SDIO interface.

X3 Pin Description	Pin Name	IO Type	Pin Number
SD data line	SD_DAT3	IO	1
SD command line	SD_CMD	IO	2
Ground	GND	PWR	3
Supply voltage	+3V3	PWR	4
SD bus clock	SD_CLK	O	5
Ground	GND	PWR	6
SD data line	SD_DAT0	IO	7
SD data line	SD_DAT1	IO	8
SD data line	SD_DAT2	IO	9
SD card detection	SD_CD	I	10
SD write protection	SD_WP	I	11
Supply voltage	+3V3	PWR	12

Table 5: SD Card interface

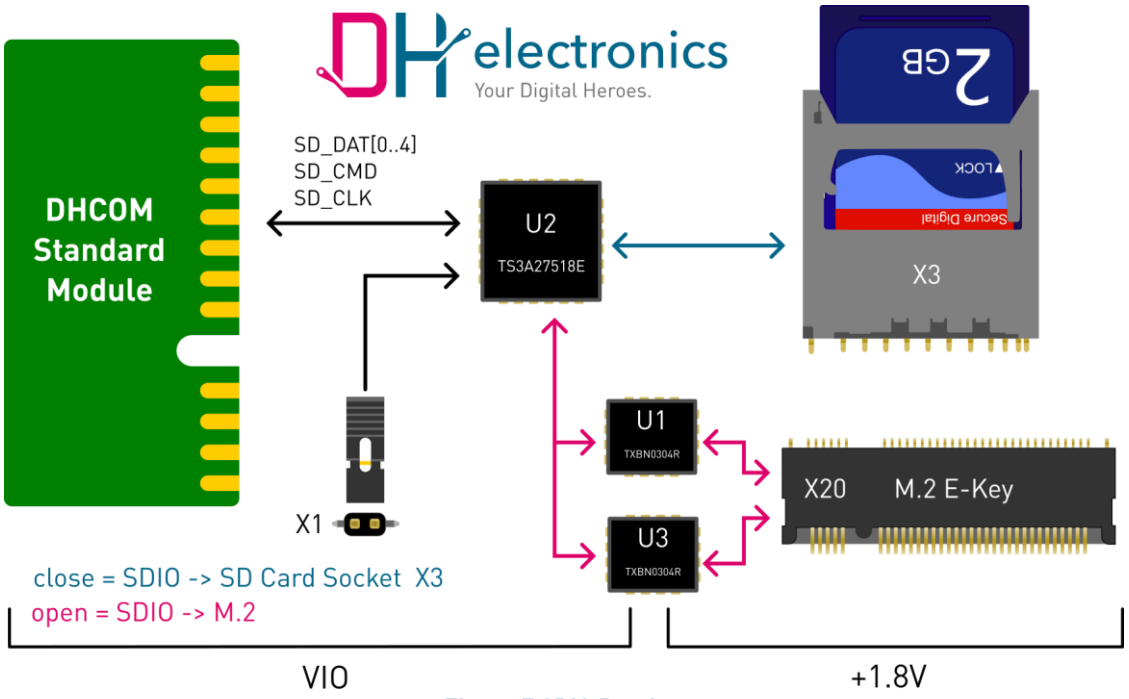


Figure 7 SDIO Routing

2.5 SD Card header (X2)

(Grid dimension: 2,54 mm)

The PDK3 provides a 4-Bit Push-Pull SD Card Slot X2 for data storage.

X2 Pin Description	Pin Name	IO Type	Pin Number
SD data line	SD_DAT2	IO	1
SD data line	SD_DAT3	IO	2
SD command line	SD_CMD	IO	3
Ground	GND	PWR	4
Supply voltage	+3V3	PWR	5
SD bus clock	SD_CLK	O	6
SD data line	SD_DAT0	IO	7
SD data line	SD_DAT1	IO	8
SD card detection	SD_CD	I	9
SD write protection	SD_WP	I	10

Table 6: SD Card signals on male header

The SD Card interface is supplied by a separate power supply. Per default the voltage is 3.3 V.
The PDK3 offers a level shifter for the SD Card signals. Because of this you don't have to consider the signal voltage of the SD Card interface of the DHCOM Standard Module. By default X2 is not populated.

2.6 CAN Interface (X4)

The PDK3 offers the connector X4 for CAN communication. Onboard is a galvanically isolated CAN-FD transceiver that meets the specifications of the ISO 11898 standard.

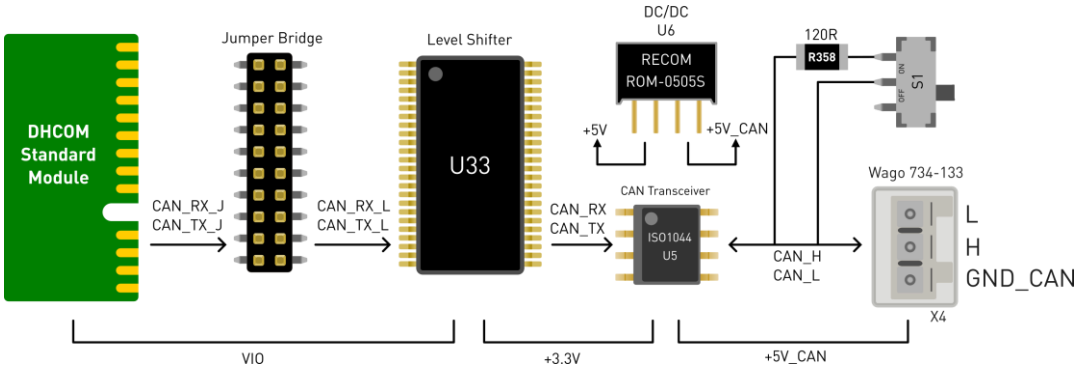


Figure 8 CAN Routing

Counterpart: X5 = Wago # 2734-103

X5 Pin Description	Pin Name	IO Type	Pin Number
CAN Ground	GND_CAN	PWR	1
CAN transmit data line	CAN_H	IO	2
CAN receive data line	CAN_L	IO	3

Table 7: CAN interface

S1 offers the possibility to connect an 120Ω Termination Resistor.

S1 Condition	Function
off	Termination off
on	120Ω Termination active

Table 8: CAN Termination S1

2.7 UART Interface (X9, X5, X6)

The DHCOM Premium Developer Kit supports three UARTs, a Full Function UART1, a Bluetooth UART2 and a Standard UART3. All UARTs are only with TTL voltage level available. To connect UART´s with your host PC you can connect a TTL to USB cable (e.g. FTDI TTL-232R-3V3). By default, the U-Boot and Linux console is available on the serial console UART interface.

2.7.1 UART1 (serial console UART)

UART1 connector X9

(Grid dimension: 2,54 mm)

X9 Pin Description	Pin Name	IO Type	Pin Number	IO Type	Pin Name	Description
Ground	GND	PWR	1	PWR	+3V3	Supply voltage
UART1 request to send	UART1_RTS	O	2	O	UART1_DTR	UART1 data terminal
Not connected (+5V available)	VCC	PWR	3	I	UART1_DSR	UART1 data set ready
UART1 receive data line	UART1_RX	I	4	I	UART1_DCD	UART1 data carrier
UART1 transmit data line	UART1_TX	O	5	I	UART1_RI	UART1 ring indicator
UART1 clear to send	UART1_CTS	I	6	PWR	GND	Ground

Table 9: UART1 TTL X9 Pin Assignment

2.7.2 UART2

In order to connect UART2 to X5, jumper X7 must be closed!

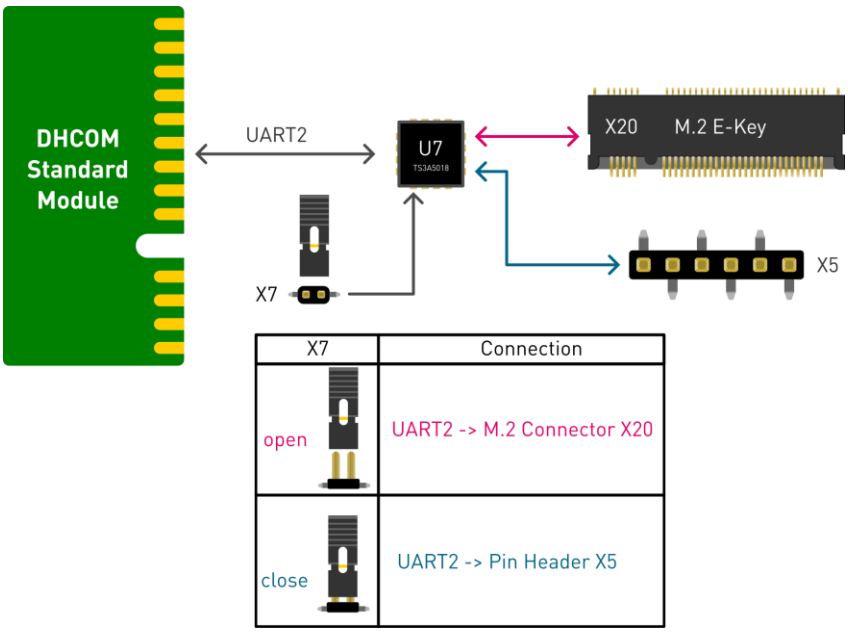


Figure 9 UART2 Routing

X7 Condition	Function
open	UART2 connected to M.2 slot
Closed (default)	**UART2 connected to X5**

Table 10 UART 2 Switch X7

UART2 connector X5

(Grid dimension: 2,54 mm)

X5 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	PWR	1
UART2 request to send	UART2_RTS	O	2
Not connected (+5V available)	VCC	PWR	3
UART2 receive data line	UART2_RX	I	4
UART2 transmit data line	UART2_TX	O	5
UART2 clear to send	UART2_CTS	I	6

Table 11: UART2 TTL X5 Pin Assignment

2.7.3 UART3

UART3 only supports a RX and a TX data line.

UART3 connector X6

(Grid dimension: 2,54 mm)

X6 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	PWR	1
Not Connected		O	2
Not Connected (+5V available)	VCC	PWR	3
UART3 receive data line	UART2_RX	I	4
UART3 transmit data line	UART2_TX	O	5
Not Connected		I	6

Table 12: UART3 TTL X6 Pin Assignment

2.8 USB

The PDK uses a 4 port USB 3.0 hub to offer up to 4 USB Hosts as well as a shared Host / OTG port. A USB 3.0 connection is only possible if the DHCOM also supports USB 3.0.

2.8.1 Dual USB-A 3.0 Host (X10)

Two USB 3.0 hosts are routed to the dual USB Host type A socket X13.

X10 Pin Description	Pin Name	IO Type	Pin Number
Power supply Host 1	USB_A_+5V	PWR	1
Host1 data1 -	USB_A_D-	IO	2
Host1 data1 +	USB_A_D+	IO	3
Host1 Ground	GND_A	PWR	4
USB 1 Receive Data -	USB_A_SSRX-	IO	5
USB 1 Receive Data +	USB_A_SSRX+	IO	6
Ground	GND_A_DRAIN	PWR	7
Host 1 Transmit Data -	USB_A_SSTX-	IO	8
Host 1 Transmit Data +	USB_A_SSTX+	IO	9
Power supply Host B	USB_B_+5V	PWR	10
Host 2 data1 -	USB_B_D-	IO	11
Host 2 data1 +	USB_B_D+	IO	12
Host1 Ground	GND_B	PWR	13
Host 2 Receive Data -	USB_B_SSRX-	IO	14
Host 2 Receive Data +	USB_B_SSRX+	IO	15
Ground	GND_B_DRAIN	PWR	16
Host 2 Transmit Data -	USB_B_SSTX-	IO	17
Host 2 Transmit Data+	USB_B_SSTX+	IO	18

Table 13: USB Host interface

2.8.2 USB-C 3.0 (X12)

The USB OTG interface is routed to the USB-C socket X12.

X12 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	PWR	A1
SuperSpeed Transmit +1	SSTXp1	IO	A2
SuperSpeed Transmit -1	SSTXn1	IO	A3
Power Supply	VBUS	PWR	A4
Configuration Channel 1	CC1	IO	A5
Transmit +1	Dp1	IO	A6
Transmit -1	Dn1	IO	A7
not connected	SBU1	NC	A8
Power Supply	VBUS	PWR	A9
SuperSpeed Receive -2	SSRXn2	IO	A10
SuperSpeed Receive +2	SSRXp2	IO	A11
Ground	GND	PWR	B1
SuperSpeed Transmit +2	SSTXp2	IO	B2
SuperSpeed Transmit -2	SSTXn2	IO	B3
Power Supply	VBUS	PWR	B4
Configuration Channel 2	CC2	IO	B5
Transmit +2	Dp2	IO	B6
Transmit -2	Dn2	IO	B7
not connected	SBU2	NC	B8
Power Supply	VBUS	PWR	B9
SuperSpeed Receive -1	SSRXn1	IO	B10

X12 Pin Description	Pin Name	IO Type	Pin Number
SuperSpeed Receive +1	SSRXp1	IO	B11
Shield	SHLD1	-	S1
Shield	SHLD2	-	S2
Shield	SHLD3	-	S3
Shield	SHLD4	-	S4

Table 14: USB-C interface

It is possible to use the USB-C port in different modes. Table 155 describes changing the mode depending on the jumper setting of X69.

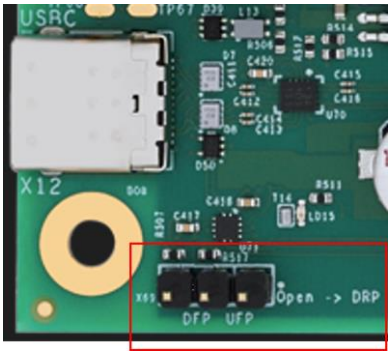


Figure 10 USB-C Modes

X69 Pin Description	Mode	Explanation
Open (default)	**DRP Mode**	**Dual Role**
1+2	UFP Mode	Device
2+3	DFP Mode	Host

Table 15 USB-C Modes

it is also possible to change the I²C address of the USB-C controller PTN5150AHX Table 166 describes changing the mode depending on the jumper setting of X70.

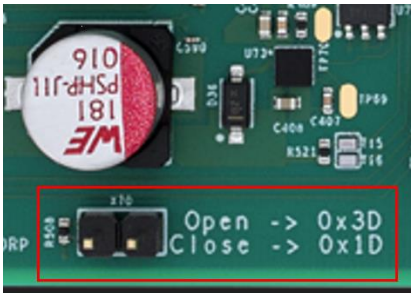


Figure 11 USB-C I²C address switch

X70 Pin Description	I²C address (7-bit)
Open (default)	**0x3D**
Close	0x1D

Table 16 USB-C Controller address switch

2.8.3 USB Host on Display-connector

One USB host is routed to the display interface. See more information in the chapter “Display-connector”.

2.9 Display-connector

Pin number	Pin name	IO Type	Pin number	Pin name	IO Type
1	GND	PWR	2	GND	PWR
3	+24V	PWR	4	+24V	PWR
5	+24V	PWR	6	+24V	PWR
7	GND	PWR	8	GND	PWR
9	GND	PWR	10	GND	PWR
11	+5V	PWR	12	+5V	PWR
13	GND	PWR	14	GND	PWR
15	+3V3	PWR	16	+3V3	PWR
17	VIO	PWR	18	VIO	PWR
19	VDISP	PWR	20	VDISP	PWR
21	GND	PWR	22	GND	PWR
23	LC_R0	O	24	LC_R1	O
25	LC_R2	O	26	LC_R3	O
27	LC_R4	O	28	LC_R5	O
29	LC_R6	O	30	LC_R7	O
31	*Not available*		32	*Not available*	
33	LC_G0	O	34	LC_G1	O
35	LC_G2	O	36	LC_G3	O
37	LC_G4	O	38	LC_G5	O
39	LC_G6	O	40	LC_G7	O
41	LC_B0	O	42	LC_B1	O
43	LC_B2	O	44	LC_B3	O
45	LC_B4	O	46	LC_B5	O
47	LC_B6	O	48	LC_B7	O
49	LC_EN	O	50	LC_VSYNC	O
51	LC_HSYNC	O	52	LC_PCLK	O
53	GND	PWR	54	GND	PWR
55	TSPX		56	TSMX	
57	TSPY		58	TSMY	
59	GND	PWR	60	GND	PWR
61	GPIO_A	IO	62	GPIO_B	IO
63	*Not available*		64	*Not available*	
65	GPIO_C	IO	66	GPIO_D	IO
67	GPIO_E	IO	68	GPIO_F	IO
69	I2C_SDA	IO	70	I2C_SCL	O
71	STD_TX	O	72	STD_RX	I
73	SPI_CLK	O	74	SPI_CS0	O
75	SPI_MOSI	O	76	SPI_MISO	I
77	PWM	O	78	*Not connected*	
79	BL_EN	IO	80	GPIO_I	IO
81	GND	PWR	82	GND	PWR
83	USB_H_D1+	IO	84	Reset_Out	O

Pin number	Pin name	IO Type
85	USB_H_D1-	IO
87	GND	PWR
89	GND	PWR
91	LVDS_TX1+	O
93	LVDS_TX1-	O
95	GND	PWR
97	LVDS_TX3+	O
99	LVDS_TX3-	O
101	GND	PWR
103	LVDS2_TX0+	
105	LVDS2_TX0-	
107	GND	PWR
109	LVDS2_TX2+	
111	LVDS2_TX2-	
113	GND	PWR
115	LVDS2_CLK+	
117	LVDS2_CLK-	
119	GND	PWR

Pin number	Pin name	IO Type
86	*Not connected*	
88	GND	PWR
90	GND	PWR
92	LVDS_TX0+	O
94	LVDS_TX0-	O
96	GND	PWR
98	LVDS_TX2+	O
100	LVDS_TX2-	O
102	GND	PWR
104	LVDS_CLK+	O
106	LVDS_CLK-	O
108	GND	PWR
110	LVDS2_TX1+	
112	LVDS2_TX1-	
114	GND	PWR
116	LVDS2_TX3+	
118	LVDS2_TX3-	
120	GND	PWR

2.9.1 Information about the display connector

The display interface uses a unified display interface pin out. To connect your display with the DHCOM Premium Developer Kit 3 you should take a look on the DH website or ask for our support.

DH electronics GmbH uses a Display Interface Board (DIB) to connect a display to the DHCOM Premium Developer Kit.

The following interfaces are on the Display-connector available:

- +24V supply voltage (max. 800mA)
- +5V supply voltage (max. 500mA)
- +3V3 supply voltage (max. 300mA)
- 24 Bit RGB
- 8 GPIOs
- 1 x I²C
- 1 x UART3
- 1x SPI1
- 1 x USB Host DP3
- 2 x LVDS

Beside the display connector for the used display there can be a backlight controller, a touch controller or similar devices on the Display Interface Board depending on the requested functionality.

2.9.2 Mechanical information about the Display Interface Board (DIB)

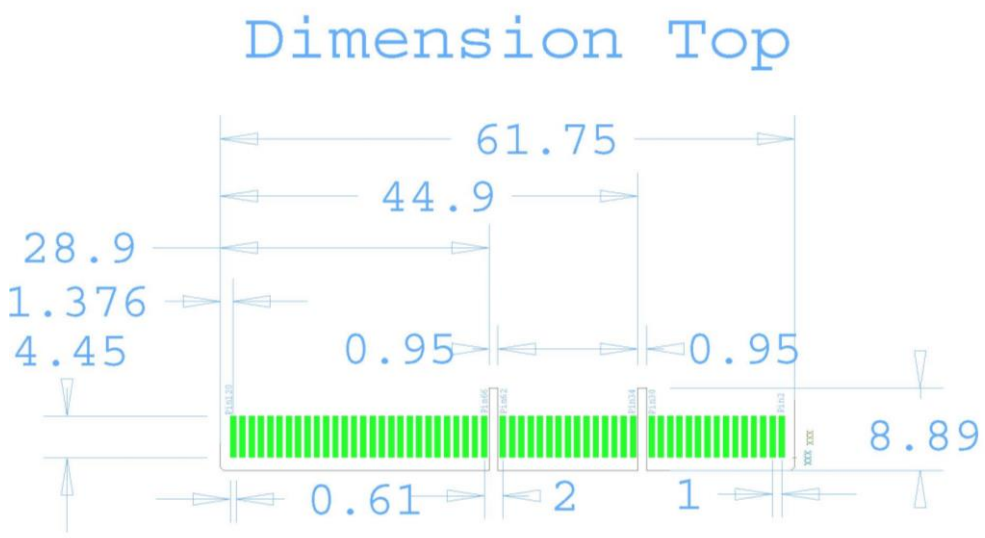


Figure 12 Display Interface Dimension Top

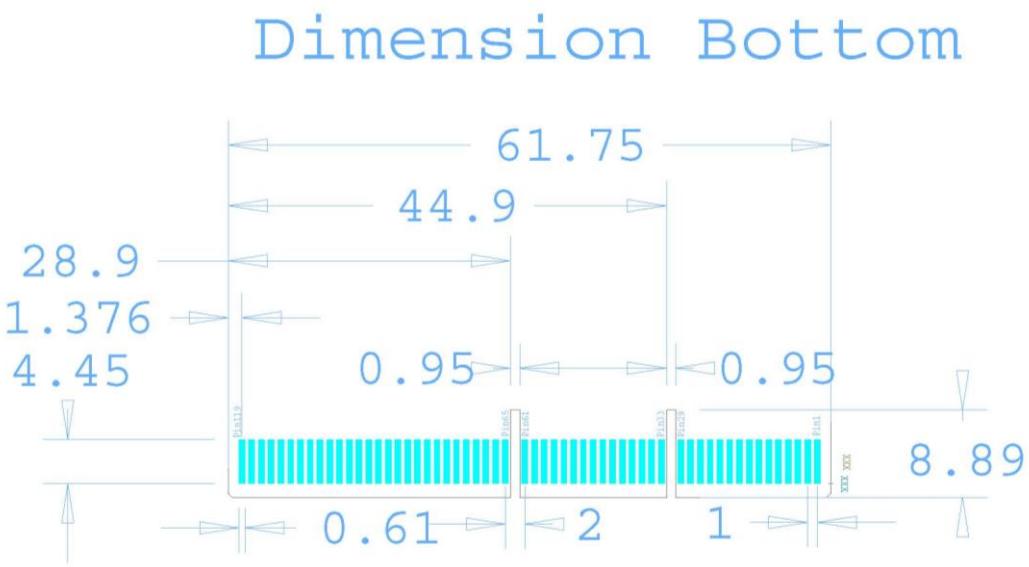


Figure 13 Display Interface Dimension Bottom

Additional information:

- The thickness of the DIB has to be 1.5mm.
- We recommend to use gold-plated pins.
- It is not necessary to chamfer the edge connector.
- Samtec MEC1-160-02-L-D-RA1-SL connector used on PDK3 side.

2.10 Ethernet

2.10.1 Switch between 100Mbit & 1Gbit Interface

There is the possibility to do a quick switch between 100MBit and 1GBit. Table 177 describes changing the Connection depending on the jumper setting of X63. You can also tell which interface is currently active by whether LD12 or LD13 is lit.

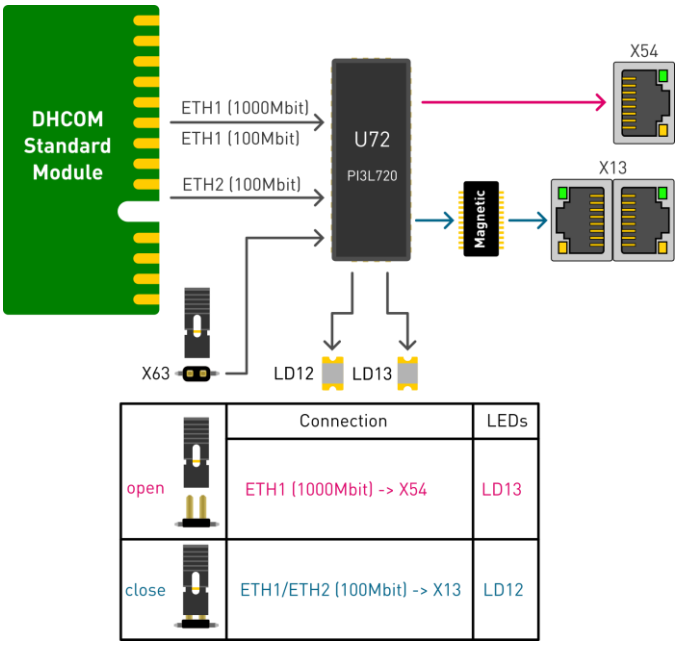


Figure 14 Ethernet Routing

X63 Pin Description	Connection
Open (default)	**1Gbit (X54)**
Close	100Mbit (X13)

Table 17 X63 Pin Description

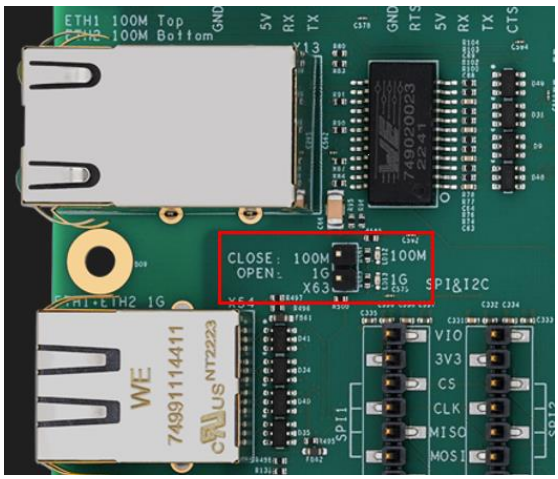


Figure 15 X63 Ethernet Interface Switch

2.10.2 Dual RJ45 MBit Ethernet interface

The PDK3 offers the connector X13 for two RJ45 ports for 10/100 Ethernet. Depending on the used DHCOM Standard Module you can use one or both ports. The Ethernet Port 1 is found on the upper Ethernet port connection.

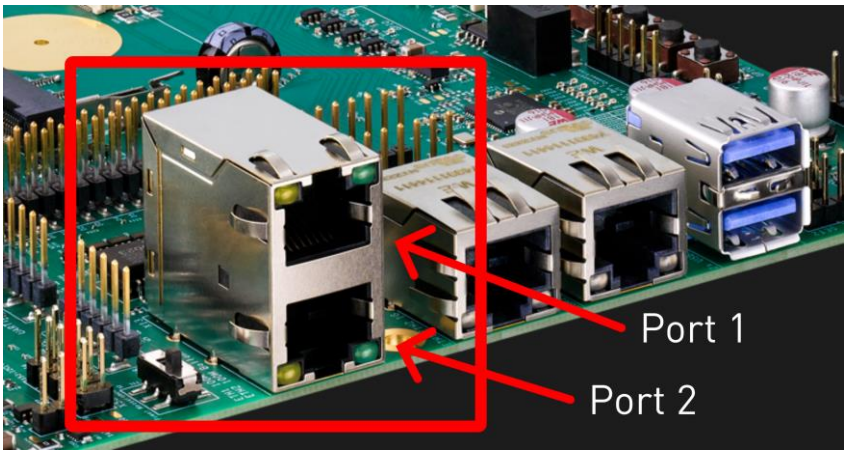


Figure 16 Dual RJ45 100MBit Ethernet Connector

Dual RJ45 Ethernet connector X13

X13 Pin Description	Pin Name	IO Type	Pin Number
Port 2: Ethernet TX +	A_TP0+	O	1
Port 2: Ethernet TX -	A_TP0-	O	2
Port 2: Ethernet RX +	A_TP1+	I	3
Not connected	A_TP2+	-	4
Not connected	A_TP2-	-	5
Port 2: Ethernet RX -	A_TP1-	I	6
Not connected	A_TP3+	-	7
Not connected	A_TP3-	-	8
Port 1: Ethernet TX +	B_TP0+	O	9
Port 1: Ethernet TX -	B_TP0-	O	10
Port 1: Ethernet RX +	B_TP1+	I	11
Not connected	B_TP2+	-	12
Not connected	B_TP2-	-	13
Port 1: Ethernet RX -	B_TP1-	I	14
Not connected	B_TP3+	-	15
Not connected	B_TP3-	-	16
Port 2: Link LED PD	Pull Down	PWR	17
Port 2: Link LED	ETH2_LINK	O	18
Port 2: Speed LED	ETH2_SPEED100	O	19
Port 2: Speed LED PU	Pull Up (+3V3)	PWR	20
Port 1: Link LED PD	Pull Down	PWR	21
Port 1: Link LED	#ETH1_Link_AKT	O	22
Port 1: Speed LED	#ETH1_SPEED100	O	23
Port 1: Speed LED PU	Pull Up (+3V3)	PWR	24
Shield	SHLD1	-	25

X13 Pin Description	Pin Name	IO Type	Pin Number
Shield	SHLD2	-	26
Shield	SHLD3	-	27
Shield	SHLD4	-	28

Table 18: Dual Ethernet

2.10.3 RJ45 GBit Ethernet Interface

The PDK3 offers the possibility to set up to 2x 1GBit connections. Whether the 1GBit interface is supported and can be used or not depends on the DHCOM modules used in each case. Just modules with the DHCOM-X interface support the GBit Ethernet interface. A detailed description can be found in the respective DHCOM module User Manual.

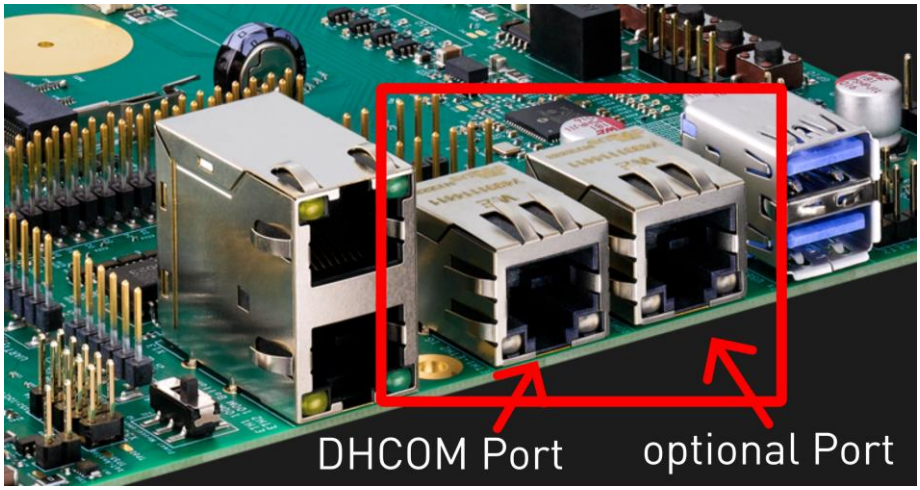


Figure 17 Gbit Ethernet Connectors

X54 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	IO	1
GBit Ethernet 1 Data A +	ETH1_A+	IO	2
GBit Ethernet 1 Data A -	ETH1_A-	IO	3
GBit Ethernet 1 Data B +	ETH1_B+	IO	4
GBit Ethernet 1 Data C +	ETH1_B-	IO	5
GBit Ethernet 1 Data C -	ETH1_C+	IO	6
GBit Ethernet 1 Data B -	ETH1_C-	IO	7
GBit Ethernet 1 Data D +	ETH1_D+	IO	8
GBit Ethernet 1 Data D -	ETH1_D-	IO	9
Shield	SHIELD1	-	10
Ethernet 1 LED2	Pull Up (+3V3)	PWR	11
Ethernet 1 LED2	ETH1_LED2	I	12
Ethernet 1 LED1	Pull Up (+3V3)	PWR	13
Ethernet 1 LED1	ETH1_LED1	I	14
Shield	SHIELD2	PWR	15
Shield	SHIELD2	PWR	16

Table 19 Gbit Ethernet 1

2.10.4 Optional Second Gbit Ethernet interface

If the module supports two Gigabit Ethernet interfaces with RGMII, the second interface is implemented via the Ethernet Phy KSZ9131RNXI on the PDK3.

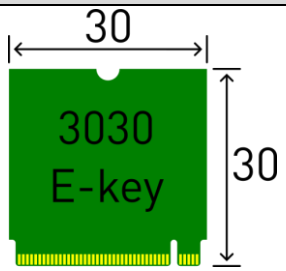
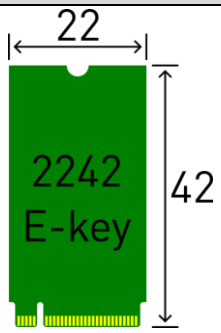
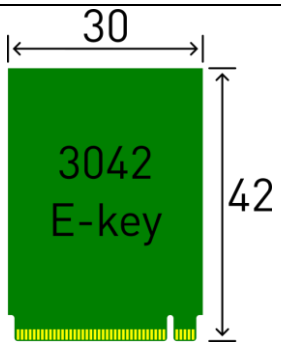
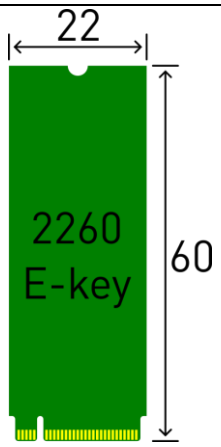
RJ45 GBit Ethernet connector X18

X18 Pin Description	Pin Name	IO Type	Pin Number
Ground	GND	IO	1
GBit Ethernet Data A +	ETH1_A+	IO	2
GBit Ethernet Data A -	ETH1_A-	IO	3
GBit Ethernet Data B +	ETH1_B+	IO	4
GBit Ethernet Data C +	ETH1_B-	IO	5
GBit Ethernet Data C -	ETH1_C+	IO	6
GBit Ethernet Data B -	ETH1_C-	IO	7
GBit Ethernet Data D +	ETH1_D+	IO	8
GBit Ethernet Data D -	ETH1_D-	IO	9
Shield	SHIELD1	-	10
Ethernet LED2	Pull Up (+3V3)	PWR	11
Ethernet LED2	ETH1_LED2	I	12
Ethernet LED1	Pull Up (+3V3)	PWR	13
Ethernet LED1	ETH1_LED1	I	14
Shield	SHIELD2	PWR	15
Shield	SHIELD2	PWR	16

Table 20 optional GBit Ethernet

2.11 M.2

The PDK3 offers the possibility of expansion with M.2 modules. Both an M.2 E-key and an M.2 M-key slot are available for this. Please see the table below to see which form factors are supported. Whether the full range of interfaces is available depends on the DHCOM module used. Just modules with the DHCOM-X interface for example, support the PCI express interface. A detailed description can be found in the respective DHCOM core module User Manual. Because you have the option of using different sizes of M.2 modules, the PDK comes with special nuts and screws. In the PDK itself, M3 solder nuts for all M.2 module sizes are already soldered.

M.2 E-key		M.2 M-key	
3030		**2242**	
3042		**2260**	

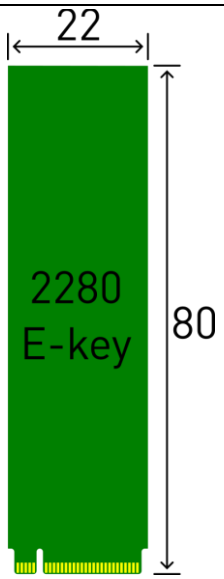
		2280	

Table 21 M.2 Form factor

Due to the different modules and their interfaces, the PDK3 has the option of wiring the PCIe Express interface or Sata interface differently.

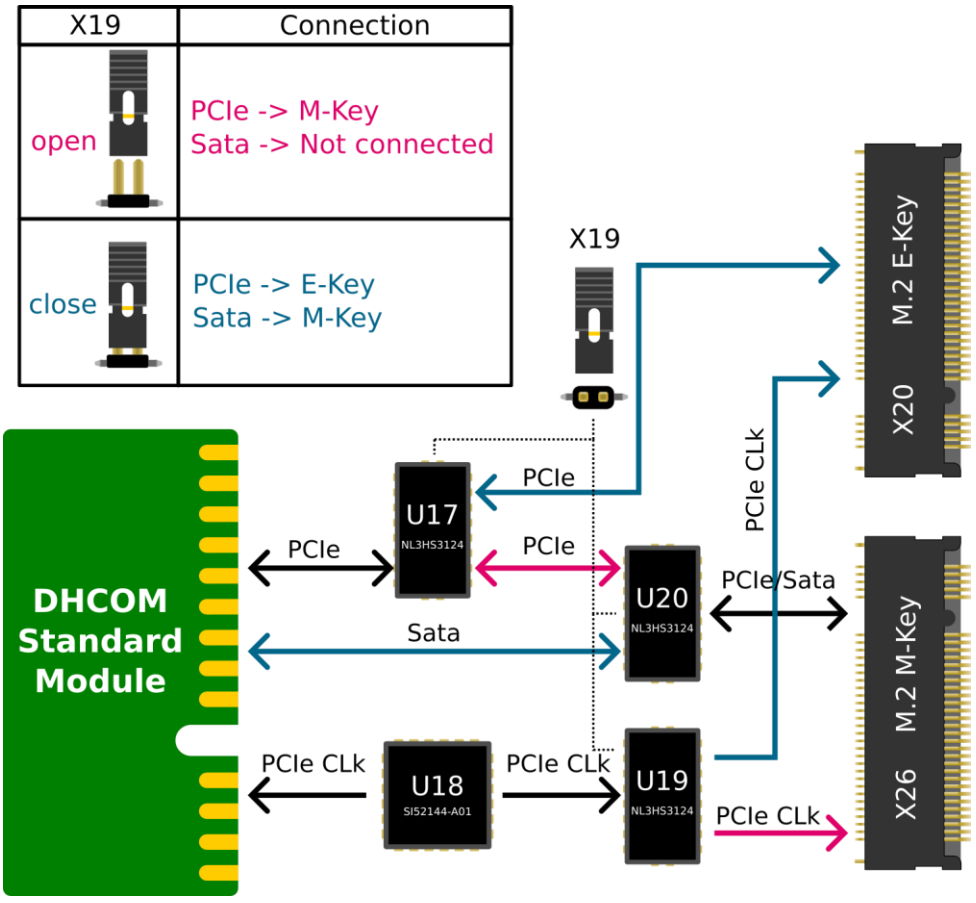


Figure 18 M.2 interface switch overview

Depending on the jumper setting of X19, the two M.2 slots X20 and X26 are assigned as follows.

X19 Pin Description	Connection
Open (default)	**PCIe -> M-Key / Sata -> Not connected**
Close	PCIe -> E-Key / Sata -> M-key

Table 22 M.2 interface switch

2.11.1 M.2 M-key

X26 Pin Description	Pin Name	IO Type	Pin Number	Pin Number	IO Type	Pin Name	Description
Ground	GND	PWR	1	2	PWR	+3,3V-M	Power Supply
Ground	GND	PWR	3	4	PWR	+3.3V-M	Power Supply
Not connected	PER_N3	-	5	6	-	NC2	*Not connected*
Not connected	PER_P3	-	7	8	-	NC3	*Not connected*
Ground	GND	PWR	9	10	-	DAS/#DSS	*Not connected*
Not connected	PET_N3	-	11	12	PWR	+3,3V-M	Power Supply
Not connected	PET_P3	-	13	14	PWR	+3,3V-M	Power Supply
Ground	GND	PWR	15	16	PWR	+3,3V-M	Power Supply
Not connected	PER_N2	-	17	18	PWR	+3,3V-M	Power Supply
Not connected	PER_P2	-	19	20	-	NC4	Uart Wake
Ground	GND	PWR	21	22	-	NC5	Uart Receive Data
Not connected	PET_N2	-	23	24	-	NC6	Uart Transmit Data
Not connected	PET_P2	-	25	26	-	NC7	Uart Clear to Send
Ground	GND	PWR	27	28	-	NC8	Uart Ready to Send
Not connected	PER_N1	-	29	30	-	NC9	*Not connected*
Not connected	PER_P1	-	31	32	-	NC10	*Not connected*
Ground	GND	PWR	33	34	-	NC11	*Not connected*
Not connected	PET_N1	-	35	36	-	NC12	*Not connected*
Not connected	PET_P1	-	37	38	-	DEVSLP	*Not connected*
Ground	GND	PWR	39	40	-	NC13	*Not connected*
M2M-PER-N0-SATA-B+	PER_N0/SATA_B	BI	41	42	-	NC14	*Not connected*
M2M-PER-P0-SATA-B-	PER_P0/SATA_B-	BI	43	44	-	NC15	*Not connected*
Ground	GND	PWR	45	46	-	NC16	*Not connected*
M2M-PET-N0-SATA-A-	PET_N0/SATA_A-	BI	47	48	-	NC17	*Not connected*
M2M-PET-N0-SATA-A+	PET_N0/SATA_A+	BI	49	50	-	#PERST/NC	#PERST0
Ground	GND	PWR	51	52	O	#CLKREQ/NC	M2M_#CLK_REQ
M2M-CLK-	REFCLK_N	O	53	54	O	#PEWAKE/N	PCIe_WAKE
M2M-CLK+	REFCLK_P	O	55	56	-	NC18	*Not connected*
Ground	GND	PWR	57	58	-	NC19	*Not connected*
Not connected	NC1	-	67	68	O	(32K)SUSCLK	32.768kHz-M
Pullup	PEDET	O	69	70	PWR	+3.3V-M	Power Supply
Ground	GND	PWR	71	72	PWR	+3.3V-M	Power Supply
Ground	GND	PWR	73	74	PWR	+3.3V-M	Power Supply
Ground	GND	PWR	75				

Table 23 M.2 M-key

2.11.2 M.2 E-key

X20 Pin Description	Pin Name	IO Type	Pin Number	Pin Number	IO Type	Pin Name	Description
Ground	GND	PWR	1	2	PWR	+3,3V-M	Power Supply
Not connected			3	4	PWR	+3.3V-M	Power Supply
Not connected			5	6	O	#LED1	Status LED 1
Not connected: 0R to GND			7	8	O	I2S_SCK	I2S Serial Clock
Ground	GND	PWR	9	10	O	I2S_WS	I2S Word select
PCIe Clock Lane -	PCIe_CLK-	O	11	12	O	I2S_DOUT	I2S Digital Out
PCIe Clock Lane +	PCIe_CLK+	O	13	14	I	I2S_DIN	I2S Digital IN
Ground	GND	PWR	15	16	O	#LED2	Status LED 2
Not connected			17	18	PWR	GND	Ground
Not connected			19	20	O	#UART_WAKE	Uart Wake
Ground	GND	PWR	21	22	I	UART_RXD	Uart Receive Data
			23				
Ground	GND	PWR	33	32	O	UART_TXD	Uart Transmit Data
M2E-PET_P0	PET_P0	O	35	34	I	UART_CTS	Uart Clear to Send
M2E-PET_N0	PET_N0	O	37	36	O	UART_RTS	Uart Ready to Send
Ground	GND	PWR	39	38	-	VEN_DEF1	*Not connected*
M2E-PER_P0	PER_P0	I	41	40	-	VEN_DEF2	*Not connected*
M2E-PER_N0	PER_N0	I	43	42	-	VEN_DEF3	*Not connected*
Ground	GND	PWR	45	44	-	COEX3	*Not connected*
M2E-CLK+	REFCLK_P	O	47	46	-	COEX_RXD	*Not connected*
M2E-CLK-	REFCLK_N	O	49	48	-	COEX_TXD	*Not connected*
Ground	GND	PWR	51	50	O	SUSCLK	32.768kHz Clock
M2E_#CLK_REQ	#CLK_REQ	I	53	52		#PERST0	
PCIe_WAKE	#PE_WAKE	I	55	54		#W_DISABLE2	
Ground	GND	PWR	57	56		#W_DISABLE1	
Not connected	PET_P1	-	59	58		I2C_DAT	
Not connected	PET_N1	-	61	60		I2C_CLK	
Ground	GND	PWR	63	62		#ALERT	
Not connected	PER_P1	-	65	64		Reserved	
Not connected	PER_N1	-	67	66		UIM_SWP/#PE	
Ground	GND	PWR	69	68		UIM_PWR_SNK	
Not connected	REFCLK_P		71	70		UIM_PWR_SRC	
Not connected	REFCLK_N		73	72	PWR	+3.3V-M	
Ground	GND	PWR	75	74	PWR	+3.3V-M	

Table 24 M.2 E-key

The PCIe clock signal of the i.MX6 module has a too big jitter for PCIe 2.0. If you want to use PCIe 2.0 or higher with the DHCOM i.MX6-module, you have to use another PCIe clock signal.

Because of this there is an additional clock generator placed on the PDK3. You will get further information from DH electronics GmbH.

2.12 HDMI

The PDK3 offers the possibility to use the HDMI interface. Whether the HDMI interface is supported and can be used or not depends on the DHCOM core modules used in each case. Just modules with the DHCOM-X interface support the HDMI interface. A detailed description can be found in the respective DHCOM core module User Manual.

HDMI connector (X28)

X28 Pin Description	Pin Name	IO Type	Pin Number
TDMS Data Line 2 +	TDMS_D2+	O	1
Ground	TDMS_D2_SHLD	PWR	2
TDMS Data Line 2 -	TDMS_D2-	O	3
TDMS Data Line 1 +	TDMS_D1+	O	4
Ground	TDMS_D1_SHLD	PWR	5
TDMS Data Line 1-	TDMS_D1-	O	6
TDMS Data Line 0 +	TDMS_D0+	O	7
Ground	TDMS_D0_SHLD	PWR	8
TDMS Data Line 0 -	TDMS_D0-	O	9
TDMS Clock Line +	TDMS_CLK+	O	10
Ground	TDMS_CLK_SHLD	PWR	11
TDMS Clock Line -	TDMS_CLK-	O	12
CEC-Interface	CEC	BI	13
Not connected	HEAC/Utility	-	14
I2C Serial Clock	I2C_SCL	O	15
I2C Serial Data	I2C_SDA	IO	16
Ground	CC-GND	PWR	17
Power Supply	+5V	PWR	18
Hot Plug Detect	HDMI_HPD	I	19
Shield	SHIELD_0	-	20
Shield	SHIELD_1	-	21
Shield	SHIELD_2	-	22
Shield	SHIELD_3	-	23

Table 25: HDMI

2.13 MIPI CSI-2

The PDK3 offers the possibility to use two MIPI CSI-2 interfaces with two data channels and one clock channel. Whether the MIPI interface is supported and can be used or not depends on the DHCOM core modules used in each case. Just modules with the DHCOM-X interface support the MIPI interface. A detailed description can be found in the respective DHCOM core module User Manual.

The two Camera interfaces are connected to iPass Connector System via the Molex Connector Part Number: 0757830132

X31 Pin Description	Pin Name	IO Type	Pin Number	Pin Number	IO Type	Pin Name	Description
Ground	GND	PWR	A1	B1	PWR	GND	Power Supply
Clock Lane -	CSI_CLK-	OUT	A2	B2	IN	CSI_D0-	Data Lane 0-
Clock Lane +	CSI_CLK+	OUT	A3	B3	IN	CSI_D0+	Data Lane 0+
Ground	GND	PWR	A4	B4	PWR	GND	Power Supply
Power Supply	+1.8V	PWR	A5	B5	IN	CSI_D1-	Data Lane 1-
Power Supply	+1.8V	PWR	A6	B6	IN	CSI_D1+	Data Lane 1+
Ground	GND	PWR	A7	B7	PWR	GND	Power Supply
Not connected	+12V	PWR	A8	B8	OUT	CSI_MCLK	Master Clock
Not connected	+12V	PWR	A9	B9	OUT	CSI_#RESET	Reset Out
Sync	CSI_SYNC	IN	A10	B10	BI	I2C_SDA_1V8	Serial Data (1V8)
Power Down	CSI_#PWDN	OUT	A11	B11	OUT	I2C_SCL_1V8	Serial Clock (1V8)
Ground	GND	PWR	A12	B12	PWR	GND	Power Supply
Power Supply	+3.3V	PWR	A13	B13	IN	CSI_D2-	Data Lane 2-
Power Supply	+3.3V	PWR	A14	B14	IN	CSI_D2+	Data Lane 2+
Ground	GND	PWR	A15	B15	PWR	GND	Power Supply
Power Supply	+5V	PWR	A16	B16	IN	CSI_D3-	Data Lane 3-
Power Supply	+5V	PWR	A17	B17	IN	CSI_D3+	Data Lane 3+
Ground	GND	PWR	A18	B18	PWR	GND	Power Supply
Shield	-	SLD	SH1	SH6	SLD	-	Shield
Shield	-	SLD	SH2	SH5	SLD	-	Shield
Shield	-	SLD	SH3	SH4	SLD	-	Shield

Table 26 MIPI CSI2

X29 Pin Description	Pin Name	IO Type	Pin Number	Pin Number	IO Type	Pin Name	Description
Ground	GND	PWR	A1	B1	PWR	GND	Power Supply
Clock Lane -	CSI2_CLK-	OUT	A2	B2	IN	CSI2_D0-	Data Lane 0-
Clock Lane +	CSI2_CLK+	OUT	A3	B3	IN	CSI2_D0+	Data Lane 0+
Ground	GND	PWR	A4	B4	PWR	GND	Power Supply
Power Supply	+1.8V	PWR	A5	B5	IN	CSI2_D1-	Data Lane 1-
Power Supply	+1.8V	PWR	A6	B6	IN	CSI2_D1+	Data Lane 1+
Ground	GND	PWR	A7	B7	PWR	GND	Power Supply
Not connected	+12V	PWR	A8	B8	OUT	CSI_MCLK	Master Clock
Not connected	+12V	PWR	A9	B9	OUT	CSI2_#RESET	Reset Out
Sync	CSI2_SYNC	IN	A10	B10	BI	I2C_SDA_1V8	Serial Data (1V8)
Power Down	CSI2_#PWDN	OUT	A11	B11	OUT	I2C_SCL_1V8	Serial Clock (1V8)
Ground	GND	PWR	A12	B12	PWR	GND	Power Supply
Power Supply	+3.3V	PWR	A13	B13	IN	CSI2_D2-	Data Lane 2-
Power Supply	+3.3V	PWR	A14	B14	IN	CSI2_D2+	Data Lane 2+
Ground	GND	PWR	A15	B15	PWR	GND	Power Supply
Power Supply	+5V	PWR	A16	B16	IN	CSI2_D3-	Data Lane 3-
Power Supply	+5V	PWR	A17	B17	IN	CSI2_D3+	Data Lane 3+
Ground	GND	PWR	A18	B18	PWR	GND	Power Supply
Shield	-	SLD	SH1	SH6	SLD	-	Shield
Shield	-	SLD	SH2	SH5	SLD	-	Shield
Shield	-	SLD	SH3	SH4	SLD	-	Shield

Table 27 MIPI CSI

2.14 Audio

The PDK3 is equipped with the audio codec SGTL5000 from Freescale. The audio signals are routed to the audio jacks available on the PDK3.

Headphone out (X34)

(3,5mm audio jack green)

X34 Pin Description	Pin Name	IO Type	Pin Number
Headphone ground	Headphone GND	PWR	1
Headphone out left	Headphone Left	O	2
Headphone out right	Headphone Right	O	3
Not connected			10

Table 28: Headphone out

Line In (X33)

(3,5mm audio jack blue)

X33 Pin Description	Pin Name	IO Type	Pin Number
Audio ground	Audio GND	PWR	1
Line in left	Line-In Left	I	2
Line in right	Line-In Right	I	3
Not connected			10

Table 29: Line in

Microphone In (X35)

(3,5mm audio jack pink)

X35 Pin Description	Pin Name	IO Type	Pin Number
Microphone ground	Microphone GND	PWR	1
Microphone in	Microphone In	I	2
Not connected			3
Not connected			10

Table 30: Microphone in

Overview audio jack

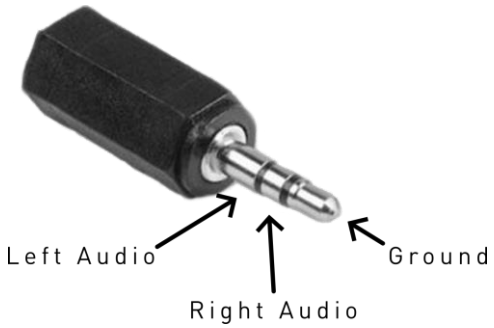


Figure 19 audio jack

If a DHCOM module has an own audio codec or you want to use your own audio codec on a separate pcb it is possible to tap the signals before the audio codec on the PDK3. Therefore it is necessary remove the resistors R212, R213, R214 and R215.

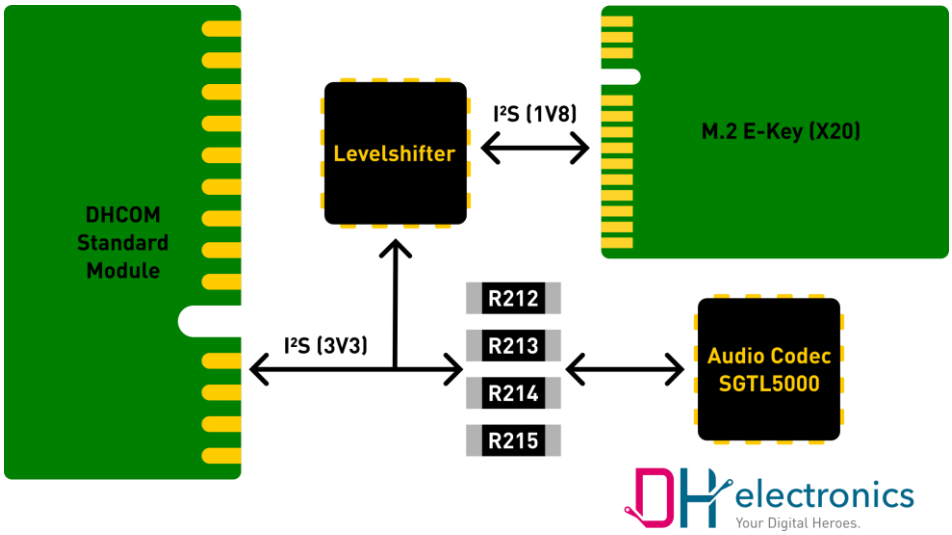


Figure 20 Audio Signal Routing

2.15 Jumper Bridge

With the DHCOM Premium Developer Kit 3 you have the possibility to configure which signals from the SODIMM-200 connector will be transmitted to the peripheral devices and which won't.

E.g.: If you don't want to connect the UART3 data lines with the UART3 connectors you have to open the Jumpers for the UART3 Interface and no signals will be routed from the SODIMM-200 connector to the UART3 connector.

For standard use all signals are jumpered. With this configuration you can use all available interfaces. It is possible to design a printed board and connect this to the Jumper-Field in order to get access to the different functions (e.g. RS485-interface, I²C-ADC ...).

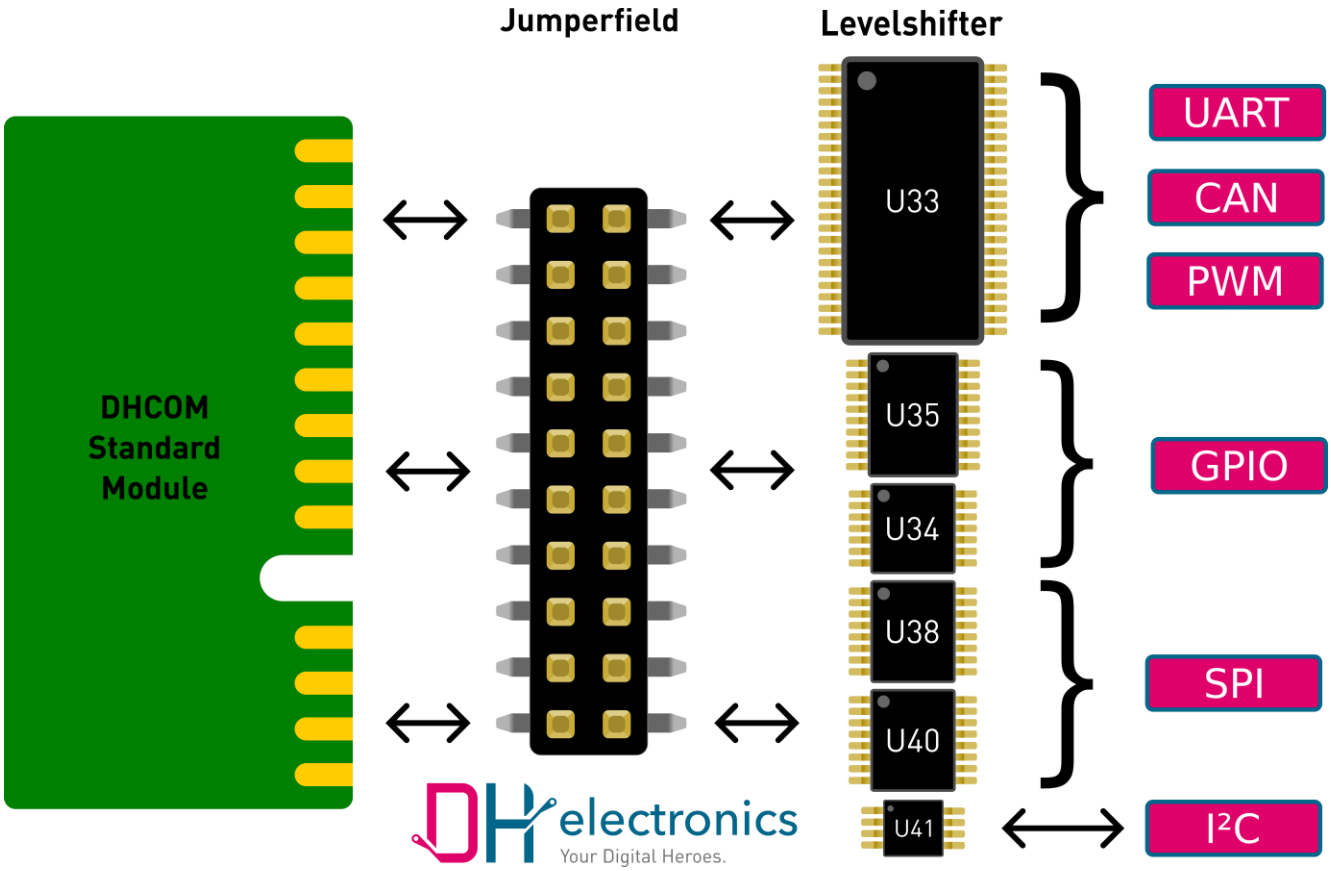


Figure 21 Jumperbridge

Jumper X38

(Grid dimension: 2,54 mm)

Pin Name (from SODIMM)	Pin Number	Pin Number	Pin Name (to periph-
AD3_J	2	1	*Not connected*
AD2_J	4	3	*Not connected*

Pin Name (from SODIMM)	Pin Number	Pin Number	Pin Name (to periph-
AD1_J	6	5	*Not connected*
AD0_J	8	7	*Not connected*
UART1_DTR_J	10	9	TP80
UART1_DCD_J	12	11	TP79
#RESET_OUT_J	14	13	#RESET_OUT_L
UART1_RTS_J	16	15	UART1_RTS_L
UART2_RTS_J	18	17	UART2_RTS_L
PWM_J	20	19	PWM_L
UART1_RX_J	22	21	UART1_RX_L
UART1_CTS_J	24	23	UART1_CTS_L
CAN_RX_J	26	25	CAN_RX_L
UART2_RX_J	28	27	UART2_RX_L
#INT_J	30	29	#INT_L
SPI2_CLK_J	32	31	SPI2_CLK_L
GPIO_D_J	34	33	GPIO_D_L
I2C2_SCL_J	36	35	I2C2_SCL_L
I2C2_SDA_J	38	37	I2C2_SDA_L
GPIO_G_J	40	39	GPIO_G_L
GPIO_I_J	42	41	GPIO_I_L
SPI_CLK_J	44	43	SPI_CLK_L
SPI_MOSI_J	46	45	SPI_MOSI_L
I2C_SCL_J	48	47	I2C_SCL_L
I2C_SDA_J	50	49	I2C_SDA_L

Table 31: Jumper bridge X38

Note: The signals coming from the SODIMM-200 connector are ending with "_J" (J for Jumper).

Jumper X39

(Grid dimension: 2,54 mm)

Pin Name (from SODIMM)	Pin Number	Pin Number	Pin Name (to peripherals)
#RESET_IN_J	2	1	#RESET_IN_J

Pin Name (from SODIMM)	Pin Number	Pin Number	Pin Name (to peripherals)
UART1_DSR_J	4	3	TP82
UART1_RI_J	6	5	TP81
UART3_TX_J	8	7	UART3_TX_L
CAN_TX_J	10	9	CAN_TX_L
UART2_TX_J	12	11	UART2_TX_L
UART1_TX_J	14	13	UART1_TX_L
UART3_RX_J	16	15	UART3_RX_L
UART2_CTS_J	18	17	UART2_CTS_L
SPI2_MISO_J	20	19	SPI2_MISO_L
SPI2_CS_J	22	21	SPI2_CS_L
SPI2_MOSI_J	24	23	SPI2_MOSI_L
GPIO_A_J	26	25	GPIO_A_L
GPIO_B_J	28	27	GPIO_B_L
GPIO_F_J	30	29	GPIO_F_L
GPIO_H_J	32	31	GPIO_H_L
SPI0_CS0_J	34	33	SPI0_CS0_L
SPI_MISO_J	36	35	SPI_MISO_L
GPIO_C_J	38	37	GPIO_C_L
GPIO_E_J	40	39	GPIO_E_L

Table 32: Jumper bridge X39

Note: The signals coming from the SODIMM-200 connector are ending with "_J" (J for Jumper).

2.16 Parallel Camera connector

It is possible to connect a 10 bit CMOS image sensor with connector X30 to the DHCOM Premium Developer Kit3.

If the DHCOM GPIOs GPIO_A to GPIO_I are not enough it is possible to use the Camera Interface Pins as GPIOs. The numbers of available GPIOs increases from 9 GPIOs to 23 at most. The number of additional available GPIOs is depending on if the Camera Interface is available on the DHCOM module and how many data lines are available.

In order to be able to use the parallel camera interface, the resistors shown in Figure 21 must be removed and the pin strip X30 must be fitted.

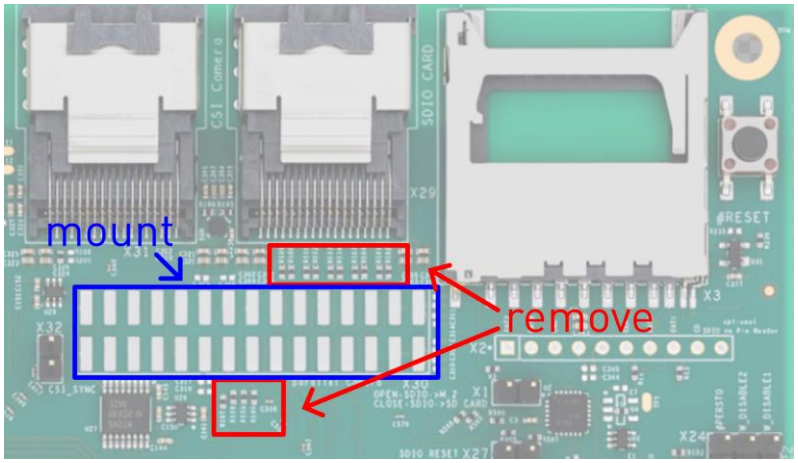


Figure 22 parallel Camera Connector changes

Camera Interface X30

(Grid dimension: 2,54 mm)

Pin Description X30	Pin Name	IO Type	Pin Number	Pin Number	IO Type	Pin Name	Description
Supply voltage	+3V3	PWR	1	2	PWR	+5V	Supply voltage
Ground	GND	PWR	3	4	PWR	GND	Ground
camera data 0 or GPIO W	CIF_D0 or GPIO_W	I	5	6	I	CIF_D1 or GPIO_V	camera data 1 or GPIO V
camera data 2 or GPIO U	CIF_D2 or GPIO_U	I	7	8	I	CIF_D3 or GPIO_T	camera data 3 or GPIO T
camera data 4 or GPIO S	CIF_D4 or GPIO_S	I	9	10	I	CIF_D5 or GPIO_R	camera data 5 or GPIO Q
camera data 6 or GPIO Q	CIF_D6 or GPIO_Q	I	11	12	I	CIF_D7 or GPIO_P	camera data 7 or GPIO P
camera data 8 or GPIO O	CIF_D8 or GPIO_O	I	13	14	I	CIF_D9 or GPIO_N	camera data 9 or GPIO N
camera line synch or GPIO J	CIF_HSYNC or GPIO_J	O	15	16	O	CIF_VSYNC or GPIO_M	camera frame synchroniza-tion or PGIO M
Camera master clock or GPIO L	CIF_MCLK or GPIO_L	O	17	18	I	CIF_PCLK or GPIO_K	camera pixel clock or GPIO K
Camera supply voltage	Vcam	PWR	19	20	PWR	VIO	IO supply voltage
I²C data line	I2C_SDA	IO	21	22	IO	I2C_SCL	I²C clock line
Not Connected			23	24	I	SPI_MISO	SSP receive data line
Slave select signal	SPI_CS0	O	25	26	O	SPI_MOSI	SSP transmit data line
Not Connected			27	28	IO	SPI_CLK	SPI clock line
Ground	GND	PWR	29	30	PWR	GND	Ground

Table 33: parallel Camera interface

2.17 SPI & I²C

The DHCOM Premium Developer Kit3 offers two Serial Peripheral Interface (SPI) Ports and two I²C Ports. The board provides two connectors, each with a SPI and an I²C Port.

SPI & I²C Interface #1 X40

(Grid dimension: 2,54 mm)

X40 Pin Description	Pin Name	IO Type	Pin Number
IO supply voltage	VIO	PWR	1
Supply voltage	+3V3	PWR	2
Slave select signal	SPI_CS0	O	3
SPI clock line	SPI_CLK	O	4
SSP receive data line	SPI_MISO	I	5
SSP transmit data line	SPI_MOSI	O	6
Not connected			7
I²C clock line	I2C_SCL	O	8
I²C data line	I2C_SDA	IO	9
Ground	GND	PWR	10

Table 34: SPI1 & I2C1 connector

SPI & I²C Interface #2 X41

(Grid dimension: 2,54 mm)

X41 Pin Description	Pin Name	IO Type	Pin Number
IO supply voltage	VIO	PWR	1
Supply voltage	+3V3	PWR	2
Slave select signal 2	SPI2_CS	O	3
SPI2 clock line	SPI2_CLK	O	4
SSP2 receive data line	SPI2_MISO	I	5
SSP2 transmit data line	SPI2_MOSI	O	6
Not connected			7
I²C2 clock line	I2C2_SCL	O	8
I²C 2data line	I2C2_SDA	IO	9
Ground	GND	PWR	10

Table 35: SPI2 & I2C2 connector

2.18 GPIOs

The following diagram shows the available GPIOs and their different functionality.

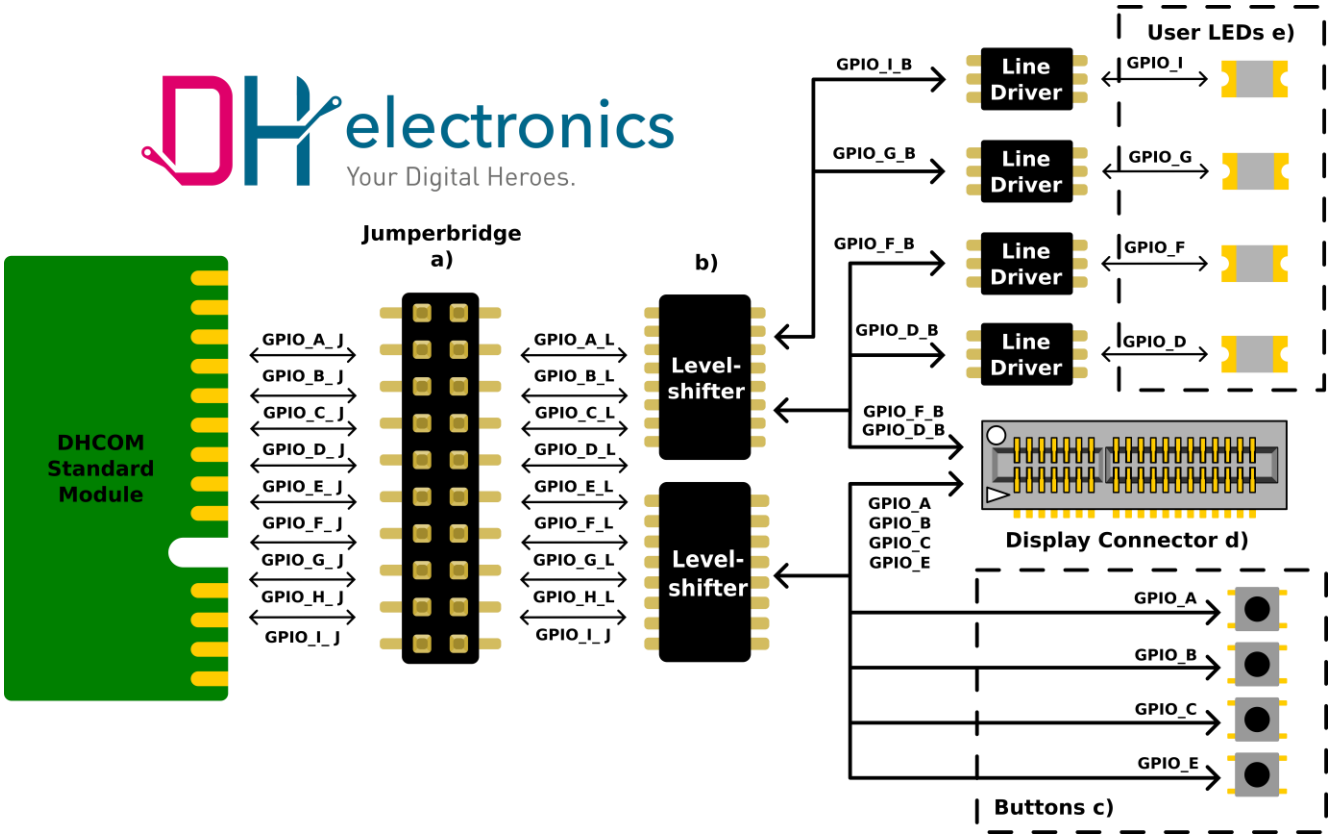


Figure 23 GPIO routing

a) First in order to ensure interoperability the GPIO signals are routed to the jumper bridges.
b) From the jumper bridges the GPIO signals are connected to the levelshifter.
c) From the levelshifter the GPIOs A, B, C and E are routed to the Buttons.
d) From the levelshifter the GPIOs A, B, C, D, E, F are connected to the display connector.
e) The GPIOs B, D, G and I are routed after the line drivers to the LEDs.

2.19 Power supply

The voltage supply for the PDK3 is 24V ±10%. Board regulators generate three supply voltages:

- 1,5V/700mA
- 3,3V/5A
- 5V/5A

The power consumed by the PDK3 largely depends on the core module used and the peripherals connected to the USB ports.

The PDK3 supply voltage is connected either to the 2-way connector X43 or to the connector X42. The pin assignments of both connectors are shown in the following figures:

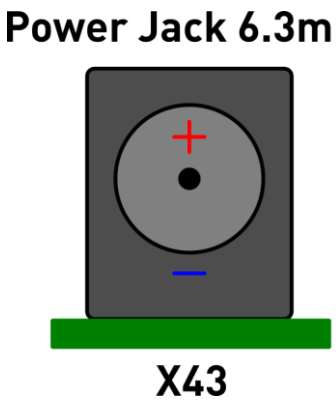


Figure 24 Power Jack X43

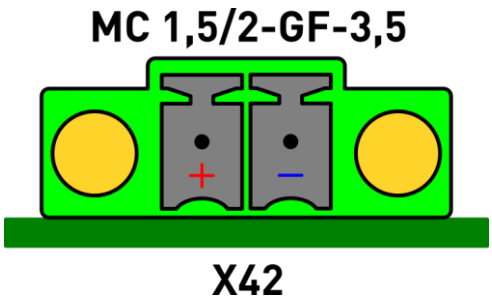


Figure 25 Power Connector X42

The following Phoenix plugs may be used as connectors for the voltage supply connector X42:

- Art. No.: 1847055 (MC 1,5/ 2-STF-3,5)
- Art. No.: 1840366 (MC 1,5/ 2-ST-3,5)
- Art. No.: 1863152 (MCVR 1,5/ 2-ST-3,5)

2.20 Goldcap

A goldcap for backing up the time and date information is connected to the battery pin of the DHOCM.

Depending on the used DHCOM the goldcap is able to back up the time and date information for 2 weeks after full charging the goldcap.

2.21 Cooling concept

DHCOM core modules with high end CPUs like i.MX8MPlus must be preserved from thermal damage if they are running at full load. The DHCOM Standard cooling concept uses the following techniques to solve the heat problem:

- Heat dissipation from the cpu core to the inner layers of the baseboard

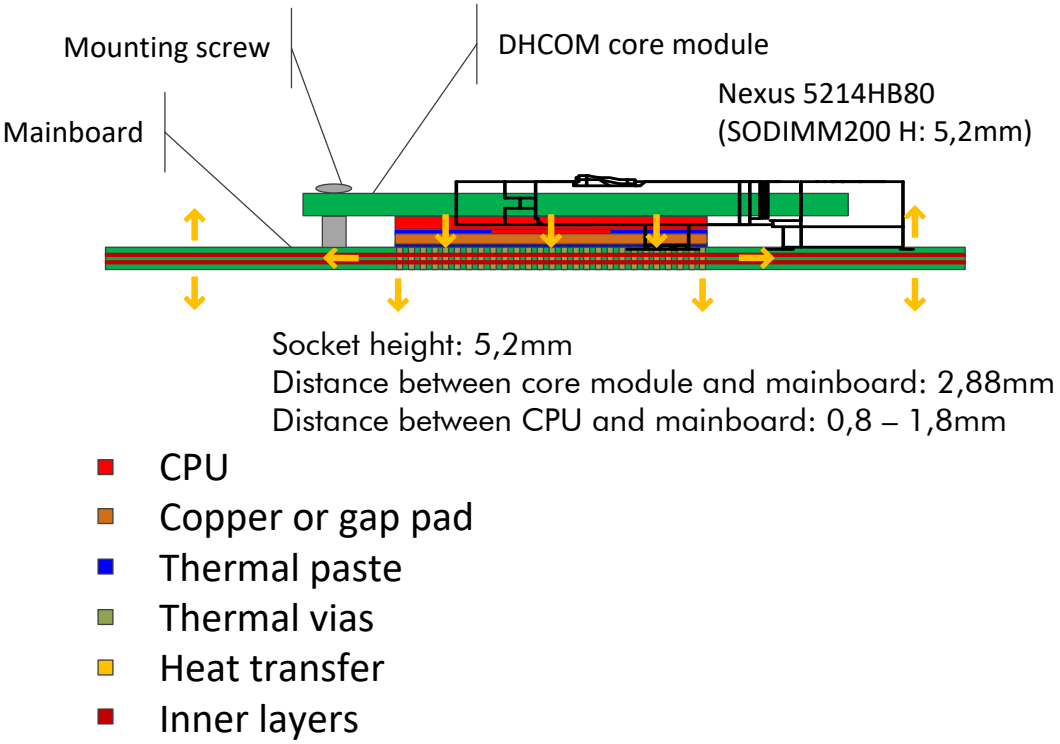


Figure 26 Cooling concept - dissipation into the inner layer

- Heat dissipation from the cpu core to a heat sink on the backside of the baseboard

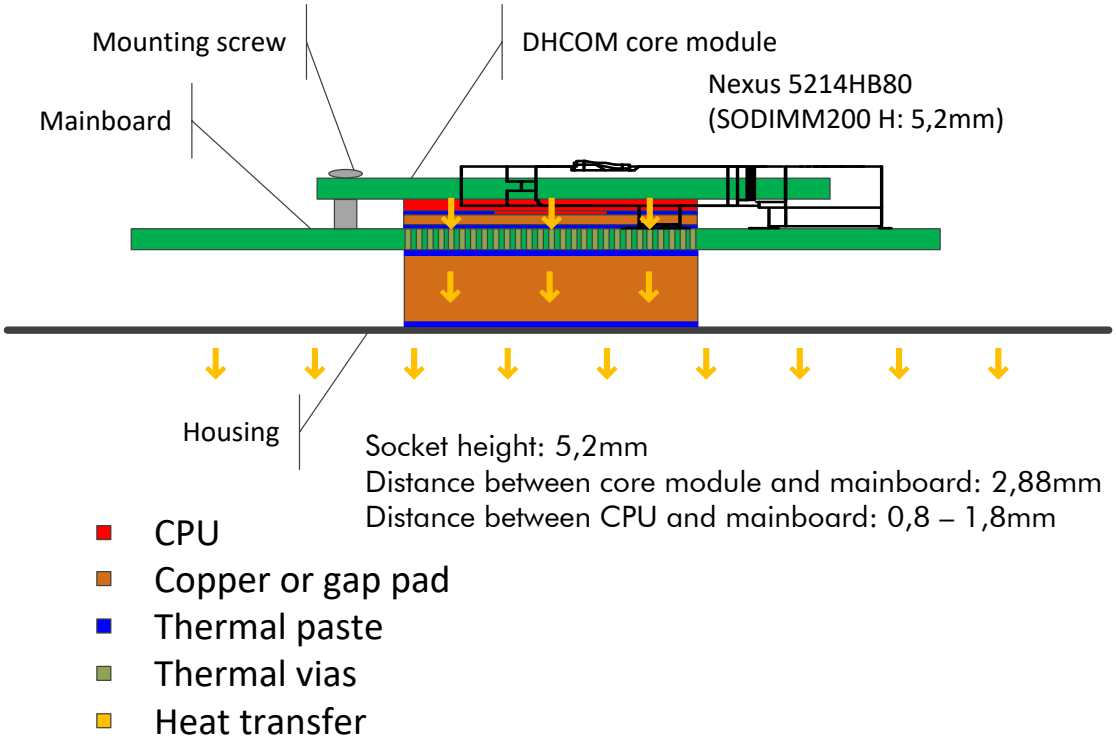


Figure 27 Cooling concept - dissipation on the rear of the carrier board

The PDK3 has a non-covered copper area on the top and the bottom side to contact the cpu core with a low thermal resistance to the PDK3. A detailed description which DHCOM module requires a special cooling can be found in the respective DHCOM core module User Manual.

3 Mechanical system

3.1 Dimensions

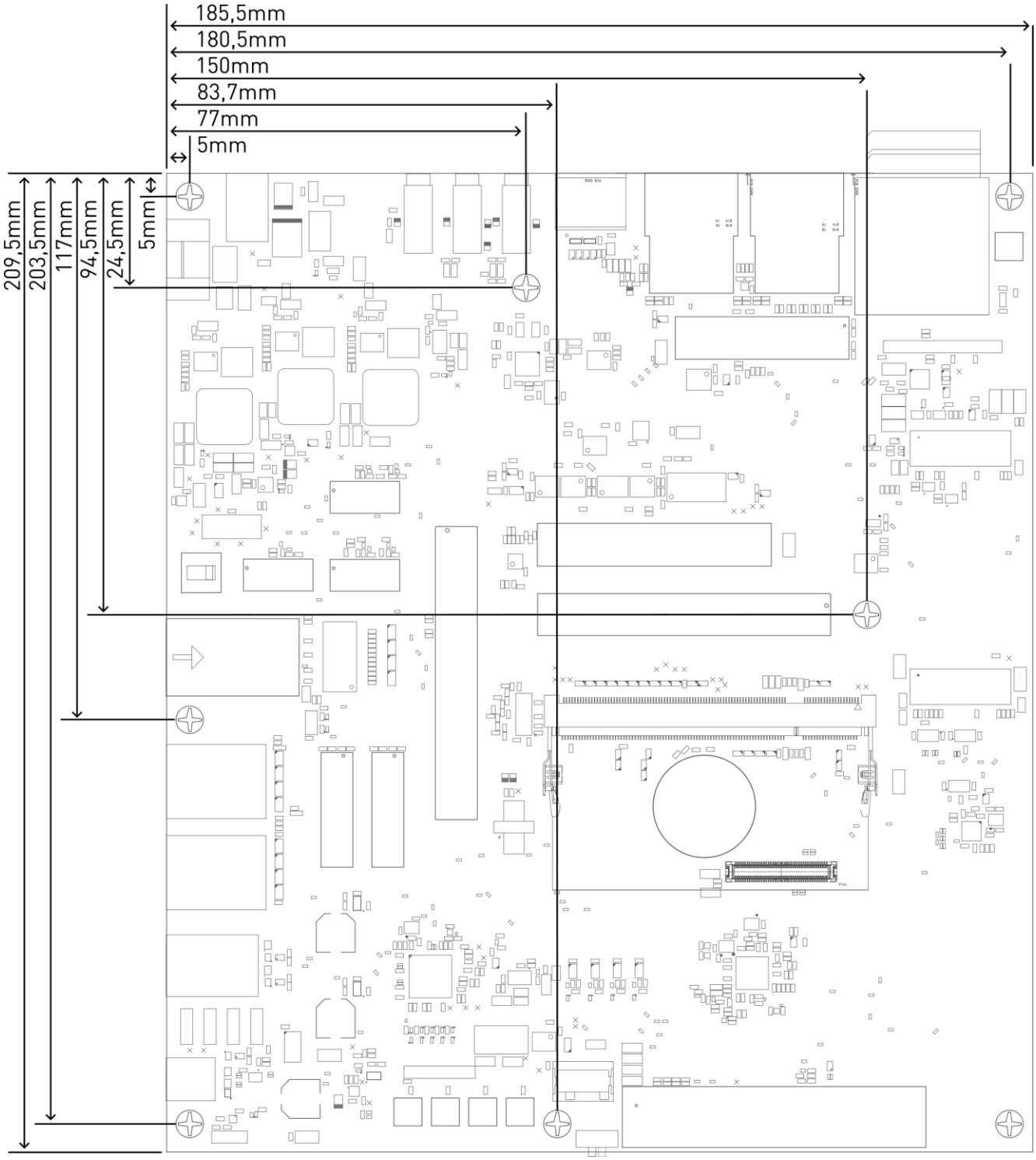


Figure 28 mechanical dimensions

4 Electrical and thermal parameters

Description	Min	Type	Max	Unit
Voltage supply DHCOM PDK3 (X23 or X24)	21,6V	24V	26,4V	VDC
On Board 5V voltage supply			5	A
On Board 3,3V voltage supply			5	A
On Board 1,5V voltage supply			0,7	A

Table 36: electrical parameters

Description	Min	Type	Max	Unit
Ambient temperature range	0		50	°C

Table 37: temperature range