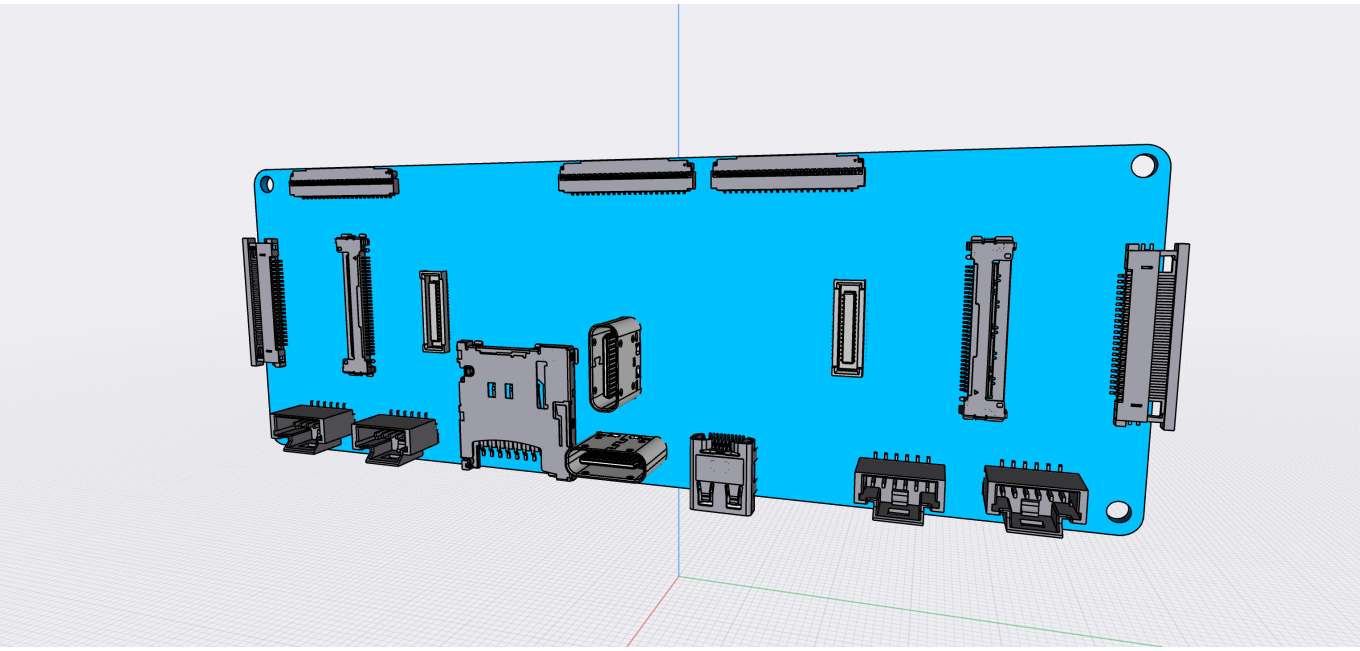
Bridge Board 909b

The 909b is a Bridge Board version made for testing and experiementation with the Ziloo attachments without attaching the SB-UCM i.MX8 board or directly attaching it. The setup enables connecting a Compulab SB-UCM-iMX8PLUS, DART-MX8M-PLUS Evaluation Kit or I-Pi SMARC IMX8M Plus development board. Not all the 909 connectors will be mounted on the 801 production bridge board that mounts the i.MX8 board.

The board provides two key features: Dual USB connectivity for Webcam, Internet, Display & Power + MIPI CSI Stereo Camera. Alt. Mode, HDMI and extra MIPI CSI connectors are not intended for the production board.

Of note in design,

- Some of the UCM-iMX8M-Plus carrier board interface pins are multifunctional. Up to 4 functions (ALT modes) are accessible through each multifunctional pin.
- All of the UCM-iMX8M-Plus digital interfaces operate at 3.3V voltage levels unless noted otherwise.
- RGMII ENET1 signals operate at 1.8V voltage level
- SD/SDIO port #2 can be configured to operate at 3.3V or 1.8V voltage levels. Voltage level is controlled by SoC pin GPIO1_IO04.



Open points

- Which GPIO receives interrupt
- Plan I2C addresses and which bus is used
- Stem I2C compress GPIO iMX and others, also on I2C3
- Correctly crossing RX/TX signal lines
- Mux chips shutdown mode
- Switch to CBTL04083 USB 3.0 mux
- Should there be Boot origin switches like EVK? (4 bits? EVK)
- Power LED & Indicator LEDs for M.2 expansions

- Adding second m.2 connector with mounting screw holder glued on
- Second stage designing a 909 Smiley Board
- Optional connectors debug uart / jtag
- Connection option for Varscite board instead of Compulab
- Annotations and Logo on the board
- TEST The Mux pin configurations

Core Components

- SB-UCM-iMX8PLUS System-on-Module
- 2 * Hirose DF40HC(3.0)-100DS-0.4V mated height 3.0mm
- M.2 key B connector H4.20mm Amphenol ICC 10128793001RLF
- M.2 key E connector H4.20mm Amphenol ICC 10128794001RLF
- 2 * Hirose DF40C-34DS-0.4V (Mouser
- 2 * Hirose USB-C CX80B1-24P
- 1 * microSD card slot (suggested Molex 5031821852) push-push, compact. Mouser, Molex
- 1 * TPS65988 Dual Port USB Type-C® and USB PD Controller, Power Switch, and High-Speed Multiplexer. Mouser
- 2 * CBTL04083 Multiplexer Switch ICs 3.3V CH 2:1 - Mouser
- 2 * HD3SS460 4 x 6 Channels USB Type-C Alternate Mode MUX. Connected to T-USB Host. Mouser. Dock Eval Kit
- 2 * push buttons (RESET / POWER)
- 3 * PCA9555 I/O Expander
- 6 * TS5USBC410 Dual 2:1 USB 2.0 Mux/DeMux Switch. Mouser
-

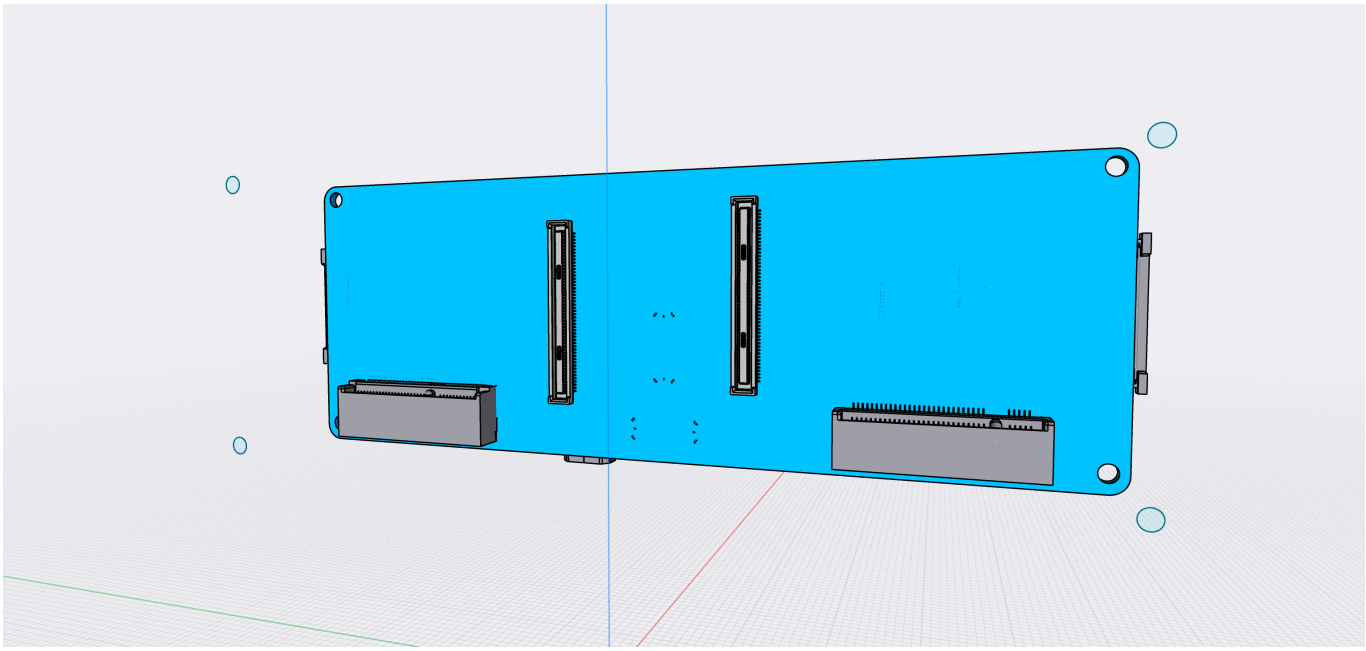
Dev. Connectors

- 1 * MicroHDMI (suggested Molex 46765-1301) Mouser Molex
- 2 * Molex 22PIN 0.5mm pitch 54548-2271
- 2 * I-PEX 30PIN 0.4mm pitch 20525-030E-02
- 3 * TE Connectivity 45PIN 0.3MM 571-4-2328724-5 FPC 3-2328724-5 $0.41 ProductDetail/Hirose-Connector/DF40C-34DS-04V51?qs=vcbW%252B4%252BSTIpg26DsEbj1iQ%3D%3D))
- 4 * 6 pin Molex 5044490607

Other Components

Connectors placed on the board are,

- 1 * 24C08 Carrier-board EEPROM. Mouser
- 1 * TSM-120-01-F-DV Samtec 2*20 pins surface mounted .100 (Smiley model) Mouser
- SuperSpeed MUX PI5USB30213 may be an option intead of CBTL04083



Connectors for SB-UCM-iMX8PLUS, M.2 Key B, M.2 Key E. The SB-UCM-iMX8PLUS is the center of the board and receives all signals.

Power supply, CSI, I2S & I2C

The USB-C connectors can supply power, as can the 30 pins and 22 pins CSI connectors. The 34 pins connector outputs CSI, I2S, I2C, Power and control pins. The 6 pins connector ouputs I2S/I2C and Power. Voltages needed are 5V, 3V3, 2V8, 1V8. 2V8 is only needed for the camera module.

In the specific case of CSI connectors being used without an i.MX8 module attached, the CSI input connectors must supply power, if no USB connector does.

Pads on the board must be provided for attaching RTC battery.

If no connected USB plug connected provides power, the board would have to be a power source. This is not a role that the board will currently handle, but it should be possible to solder on the pieces needed. Pads on the board must be provided for 5-20V PP_HV1/PP_HV2 directly connected to the PD Controller. The TPS65988 seems to have support for powering exclusively via VBUS from USB, with System 5V/3.3V for backup. Provide Pads on the board for System 3.3V and System 5V connected to the PD Controller

According to the UCM-IMX8PLUS Referene Guide the Supply Voltage is 3.45V to 4.4V. This fits with charging/discharging of a LiPO battery, which will be supported in the future. While 5V is relevant for power supply via USB, the board has no need for 5V level.

PD Controller

Handling USB Connector

The two USB ports may power the board. The powering is negotiated and handled by by TPS65988 (in future TPS65994AE). They also deliver data lanes which are multiplexed between the two USB busses on the i.MX8 module, m.2 connectors and T-USB alt connectors. This allows further development of alt mode connectivity.

Power regulators receive power from USB connectors and supply the board with power.

If one USB port delivers power to the board, the other one can consume power.

See I/O expanders for control pins connected to PD Controller.

Power supply TI chipset

Dual Port USB Type-C® and USB PD Controller with Integrated Source and Sink Power Path Supporting USB3 and Alternate Mode

The TPS65988 is a highly integrated stand-alone Dual Port USB Type-C and Power Delivery (PD) controller providing cable plug and orientation detection for a single USB Type-C connector. Upon cable detection, the TPS65988 communicates on the CC wire using the USB PD protocol. When cable detection and USB PD negotiation are complete, the TPS65988 enables the appropriate power path and configures alternate mode settings for external multiplexers. The TPS65988 integrates fully managed power paths with robust protection for a complete USB-C PD solution. The TPS65988 also enables the appropriate power path and configures alternate mode settings for external multiplexers.

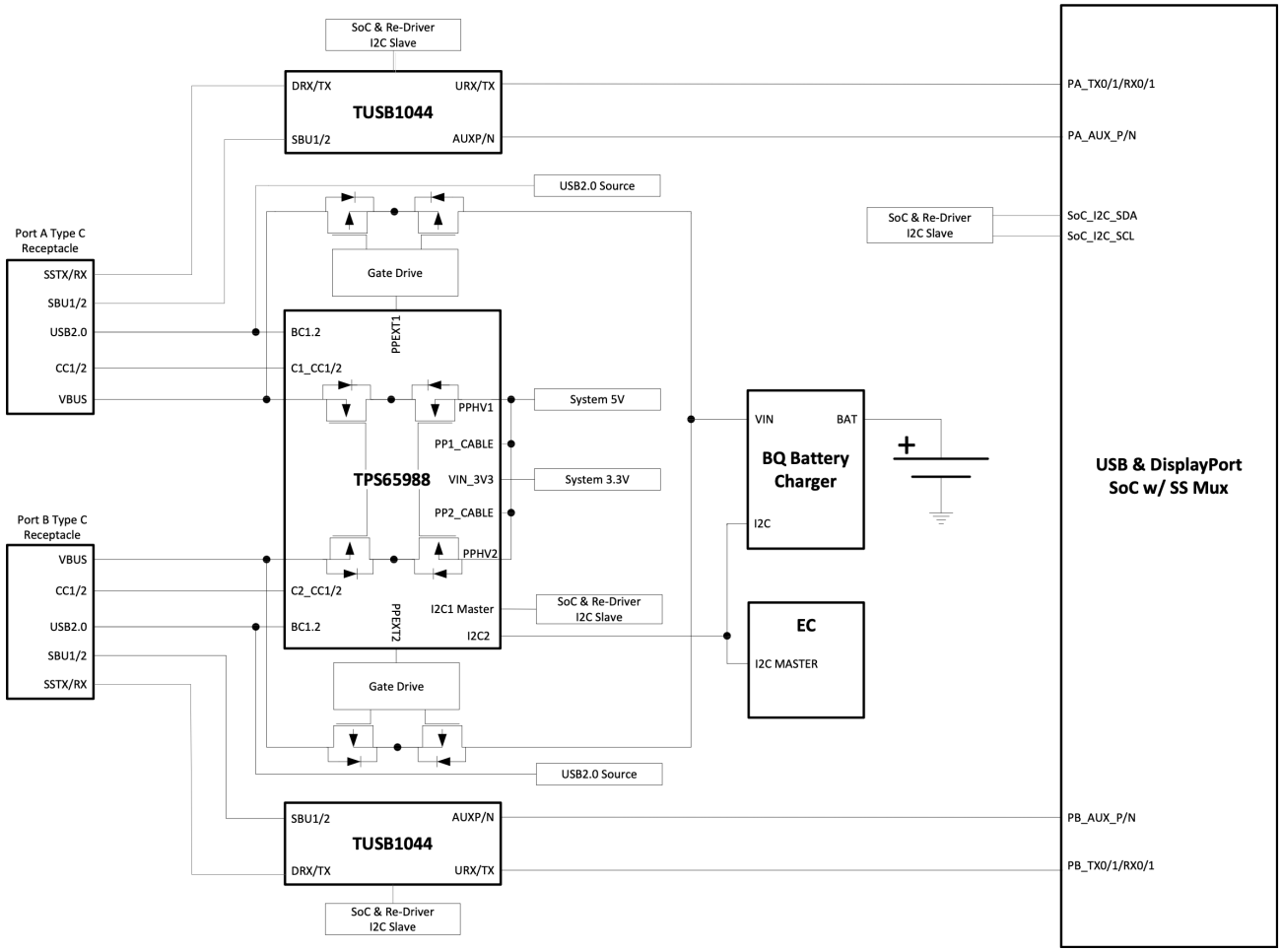


Figure 9-10. TPS65988 and SoC & Redriver I2C

Further information is found in the TPS65988 datasheet including reference implementation advice. The documents also include layout diagrams for the reference board. See 11.3 Stack-Up and Design Rules for advice on using 8-layer stacku-up PCB.

A minimal version of this setup should be placed on the 909 to handle power. I.E. No TUSB1044

The I2C Port 1 is connected to the SYS I2C. I2C Port 2 is for I2C3 stem. The I2C Port 3 is for Peripherals which so far are not identified. The I2C Port 1 & 2 interrupts are connected to I/O Expander Zero. (EX0.3 EX0.4)

The 45 pin debug connector and T-USB alt connectors can be used to test the chipset and USB devices attached.

Connect push buttons for power/reset

Simple push buttons should be wired up to trigger reset or power off during press.

Camera CSI Connectors

CSI connectors

The CSI connectors data lanes are connected directly together for each side. It is only possible to connect a left and a right camera module at a time.

30 pin CSI connectors are intended to be used without a daughter board and instead a separate i.MX8 development board is used. The 22 pin connectors are connected directly to the equivalent lines on the 30 pins, and a likewise meant for an external development board or for testing alternate camera modules. The CSI lanes on 34 pins connector is connected directly to the equivalent lines on the 30 pins. This assumes that a camera is connected to either a 34 pins connector or a 22 pins connector, not both. If a i.MX8 daughter board is used rather than development board the CSI lines from the daughter board must be connected to the 34 pin camera module connectors. i.MX8 CSI1 is used for left module, CSI2 is used for right module.

The two 34 pin CSI connectors are wired to run in sync via the STROBE pin.

If power isn't connected over the USB-C plugs, the camera modules should be powered over the MIPI CSI connectors. In this case it should be possible to use either the 22 pin connectors or the 30 pin connectors for inputting the signal and power. This means that the 22 pin connectors can be used to input or output MIPI CSI lanes.

SCCB for CSI1 is connected to I2C5 voltage shifted. SCCB for CSI2 is connected to I2C6 voltage shifted.

I2C / I2S connectors

The I2C/I2S connectors sends the power from USB-C connectors away from the board as regulated 5V and 3V3/1V8.

Otherwise they carry specific I2S or I2C signals

Connector	Power	Signal	Domain
Left SCCB	1.8V	CSI1 SCCB / I2C5	Camera module signals
Right SCCB	1.8V	CSI2 SCCB / I2C6	Camera module signals
Microphone	1.8V	SAI5_RX_DATA0	Camera module signals
Speaker	3.3V	SAI5_TX_DATA0	SoM signals

Connector	Power	Signal	Domain

For the two camera modules the SCCB signals are broken out with a six pin connector, in the corner, next to the CSI connectors. INT is connected to ATT_INT on the Camera Module connector. The signal level for SCCB is 1.8V, and hence second voltage pin is also 1V8.

The microphone signals from the 34 pins connectors are broken out in the 6 pins connector next to the left camera connector. The signal level for Microphone I2S connector is 1.8V.

Next to the right camera connector the SAI5 OUT SPEAKER is broken out as a 6 pins connector.

The 6 pin connector is described at the end of the document.

Microphone I2S mapping (SAI5)

The microphone I2S mapping is done by using AL2 mode for the SAI3 pads to get SAI5 signals. Multiplexed Signal Pins. The microphones on the 6 pins and 34 pins connector use SAI5_RX_DATA0.

Misc pin	SoM pin	i.MX pad	Functionality	ALT	On 6 pin connector
11	P1.26	SAI3_TXD	SAI5_RX_DATA3	ALT2	
17	P1.28	SAI3_RXD	SAI5_RX_DATA0	ALT2	DATA
15	P1.30	SAI3_MCLK	SAI5_MCLK	ALT2	
19	P1.32	SAI3_RXC	SAI5_RXC	ALT2	BCLK
23	P1.34	SAI3_RXFS	SAI5_RX_SYNC	ALT2	LRCLK
13	P1.36	SAI3_TXC	SAI5_RX_DATA2	ALT2	
21	P1.38	SAI3_TXFS	SAI5_RX_DATA1	ALT2	

Speaker I2S mapping (SAI5)

ENET1 are mapped as SAI5 and brought out as speaker 6 pins connector. Multiplexed Signal Pins.

Misc pin	SoM pin	i.MX pad	Functionality	On 6 pin connector
15	P1.30	SAI3_MCLK	SAI5_MCLK	ALT2
	P2.53	ENET1_RX_CTL	SAI5_TXFS	ALT
	P2.55	ENET1_RXC	SAI5_TXC / BCLK	ALT
	P2.60	ENET1_TD0	SAI5_TXD0	ALT
	P2.63	ENET1_TD2	SAI5_TXD2	ALT
	P2.65	ENET1_TD3	SAI5_TXD3	ALT
	P2.76	ENET1_nRST IO24	SAI5_TXD1	ALT

CAN1 / CAN2 mapping Soldering Pads

CAN1 and CAN2 brought out as soldering pads. Multiplexed Signal Pins.

Misc pin	SoM pin	i.MX pad	Functionality	ALT
8	P1.33	CAN2_TX		
10	P1.49	CAN2_RX		
12	P1.51	CAN1_RX		
14	P1.53	CAN1_TX		

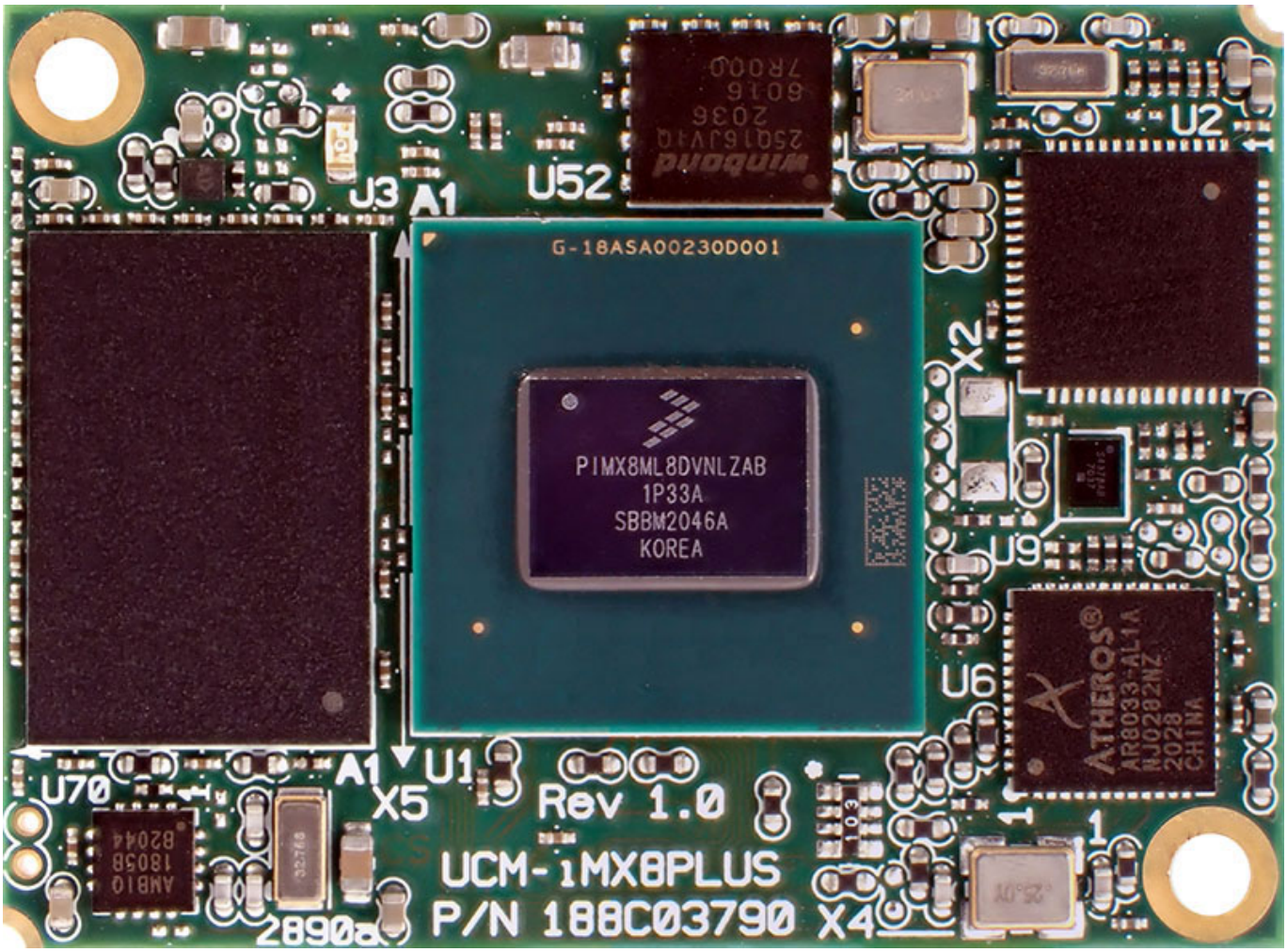
Connecting the SB-UCM-iMX8PLUS SoM

The daughter board clicks into the two Hirose 100pin board-to-board connectors.

For further details see Product Page.

The CSI1 & CSI2 are wired from the 100pin connectors to relevant CSI connectors. The CSI1 lanes are connected to Left CSI. The CSI2 lanes are connected to Right CSI. The USB1 and USB2 data will be connected to multiplexers The 45 pins Debug connector will break out many additional signal lines

- 2 * Hirose 100 pin connectors are used to connect the SoM daughter board



Booting

The board can boot from eMMC / SD or USB.

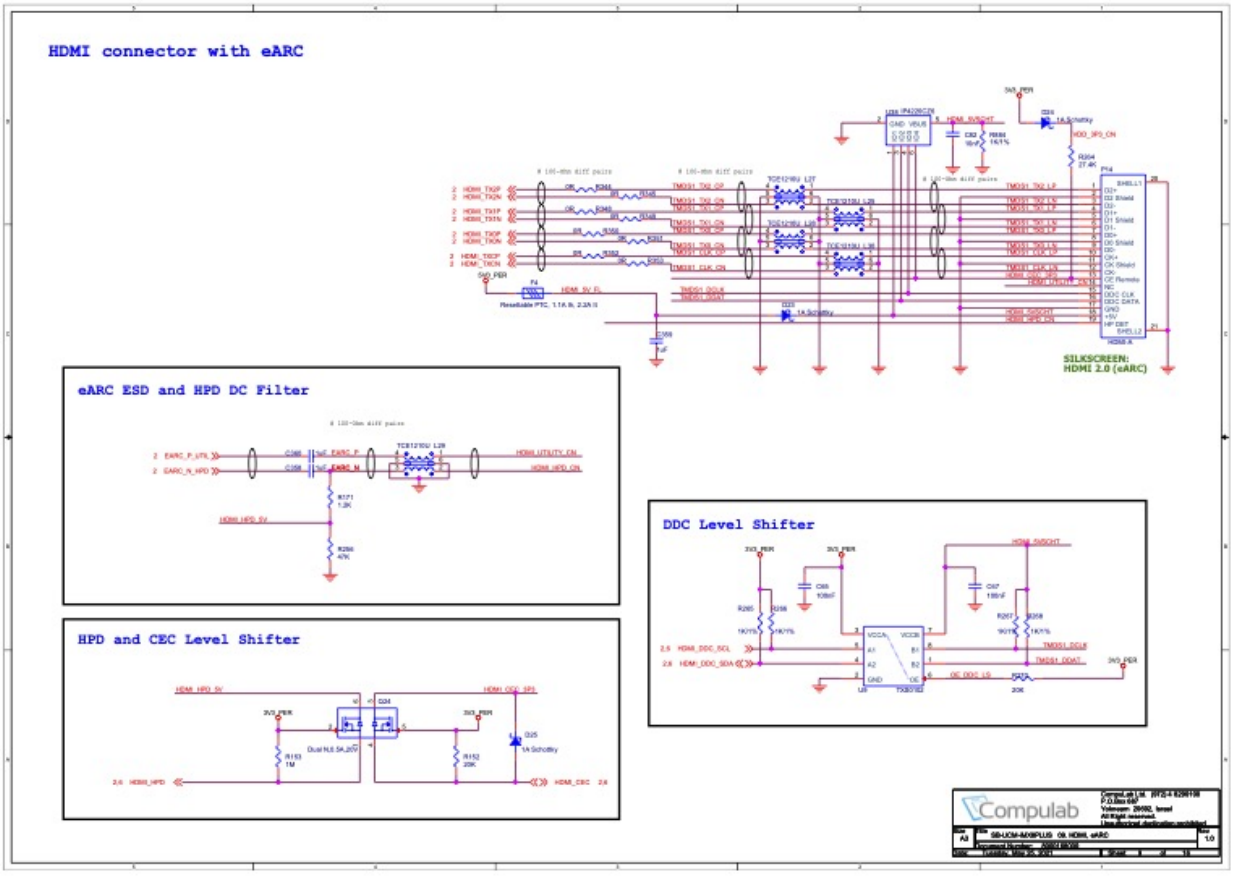
The board has push buttons for POWER and RESET.

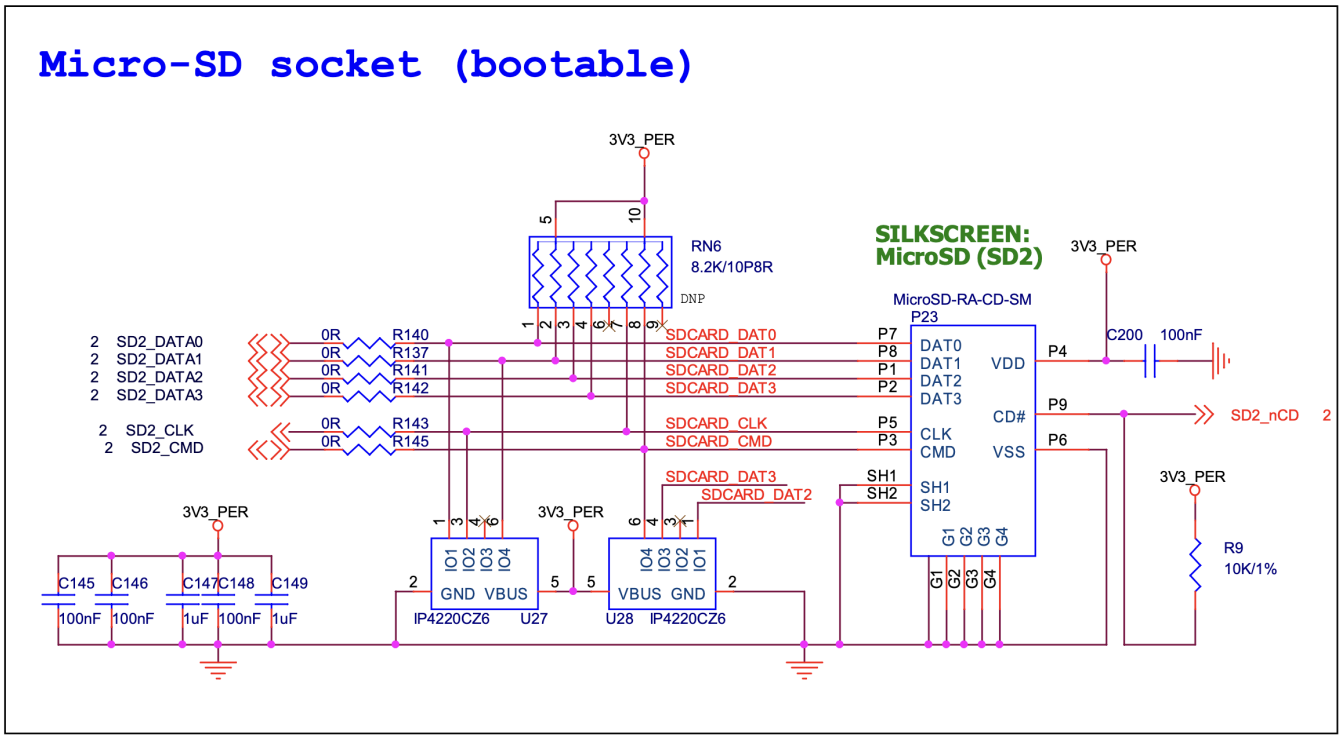
The board has a power LED

MicroSD, MicroHDMI, M.2 key B & Debug Breakout

The MicroHDMI connector is connected to the HTMI_TX*, HDMI_DDC_*, HDMI_CEC, HDMI_HPD pins from the i.MX8 module.

The MicroSD connector is connected to SD2_DATA*, SD2_CLK, SD2_CMD, SD2_nCD on the i.MX8 module.





M.2 Key B

See EXPANSION document for more information.

Note that some pins are connected to I/O Expander 2 meant for USB2 and Key B.

Debugging Breakout connector

See end of this document for pinouts.

T-USB Data and M.2 Key E Expansion

Data is routed primarily over the two USB-C connectors, but it is also available over Breakout connectors as well as the two M.2 Expansion connectors.

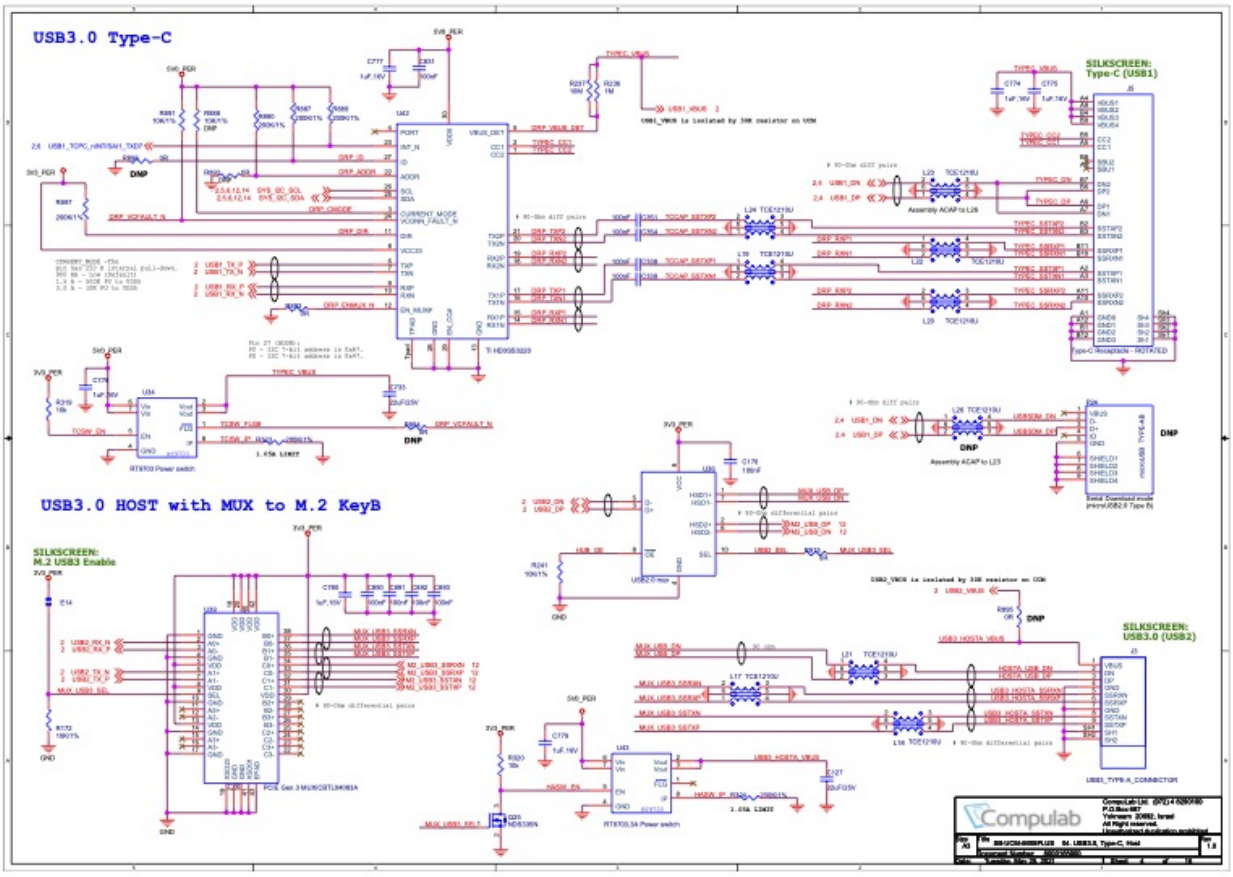
T-USB connector 3.0 data mapping

Two USB-C connectors are arranged in a T shape and the normal way to use it is with a combined connector attached. This means that the wires will normally be connected in a particular orientation. The system takes advantage of this by detecting when both USBs are connected in the normal arrangement.

The USB-C signal lines from the T-USB connector is managed by the Multiplexing chipsets around the PD Controller. The USB-C signal lines for the OTG connector in T-USB come from USB1(OTG cabable 2.0 & 3.0). The SBU1/SBU2 are connected to AUX-/AUX+ pins on the T-USB OTG alt connector. The USB 3.0 superspeed data pairs and SBU1/SBU2 are passed from USB-C connectors to HD3SS460.

The Host USB-C connector is similarily connected. The HD3SS460 chips are controlled over I2C by the MCU using SYS I2C.

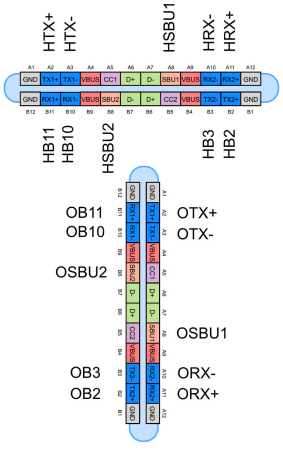
One side of the RX/TX pins are carried to the T-USB alt connector, and not connected to USB1 signals. (Should the side be muxed?)



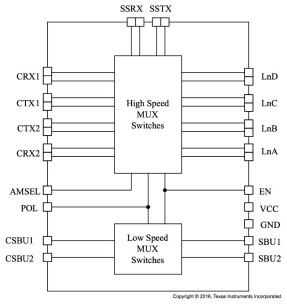
The USB connectors are named H (Host) and O (OTG). Host is the top of the T, OTG is the vertical base. To specify a specific pin H or O is prefixed I.E. OTX1+, HSBU2.

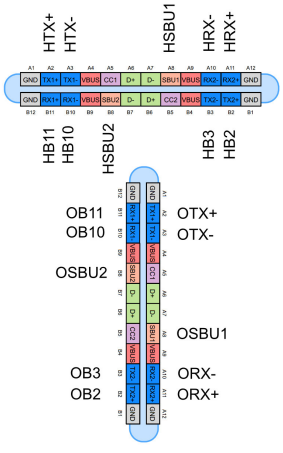
Where possible data pins are not combined but carried through individually.

The GND/VBUS pins are connected to the power charging circuit as normal. The system should accept charging power from either connector.



T-USB plugged in combo





DisplayPort over Host USB

No.	Pin	Usage	OTG connect to..	Host connect to..
1	A1	GND		
2	A2	TX1+		HD3SS460
3	A3	TX1-		HD3SS460
4	A4	VBUS		
5	A5	CC1	TPS65988	TPS65988
6	A6	D+	65988 & MCU	65988 & MCU
7	A7	D-	65988 & MCU	65988 & MCU
8	A8	SBU1		HD3SS460
9	A9	VBUS	65988 & Regs	65988 & Regs
10	A10	RX2-		HD3SS460
11	A11	RX2+		HD3SS460
12	A12	GND		
13	B1	GND		
14	B2	TX2+		HD3SS460
15	B3	TX2-		HD3SS460
16	B4	VBUS	65988 & Regs	65988 & Regs
17	B5	CC2	TPS65988	TPS65988
18	B6	X+	65988 & MCU	65988 & MCU
19	B7	X-	65988 & MCU	65988 & MCU
20	B8	SBU2		HD3SS460
21	B9	VBUS	65988 & Regs	65988 & Regs
22	B10	RX1-		HD3SS460
23	B11	RX1+		HD3SS460
24	B12	GND		

The USB Type-C connector has 24 pins. Figures 1 and 2, respectively, show the pins for the USB Type-C receptacle and plug.

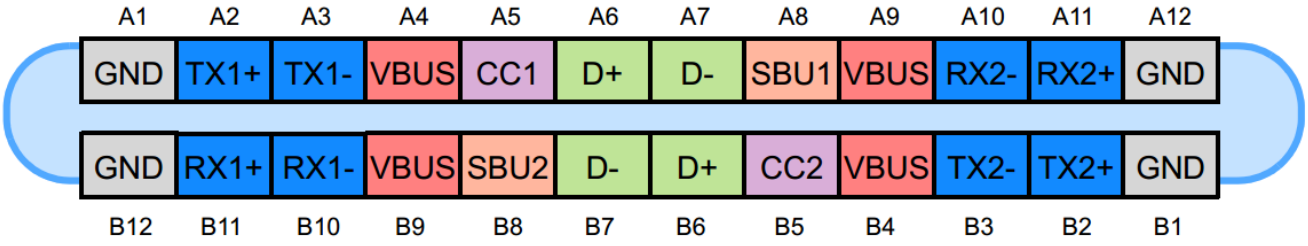


Figure 1. The USB Type-C receptacle. Image courtesy of Microchip.

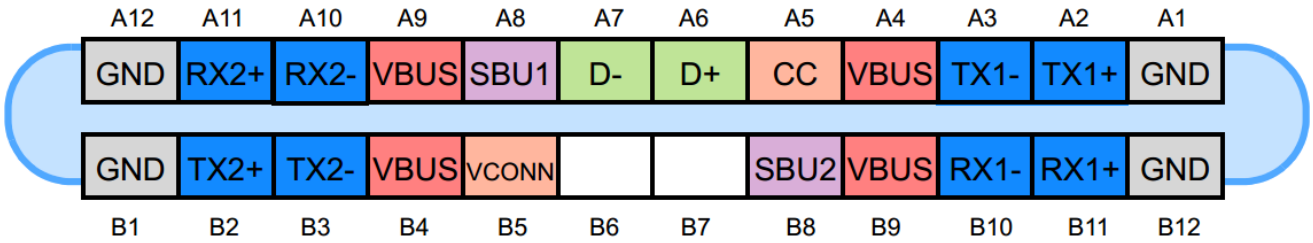


Figure 1. The USB Type-C plug. Image courtesy of Microchip.

For later revision

Only **one side** of the connectors are connected to the matching USB connector that leads to the Dev Board.

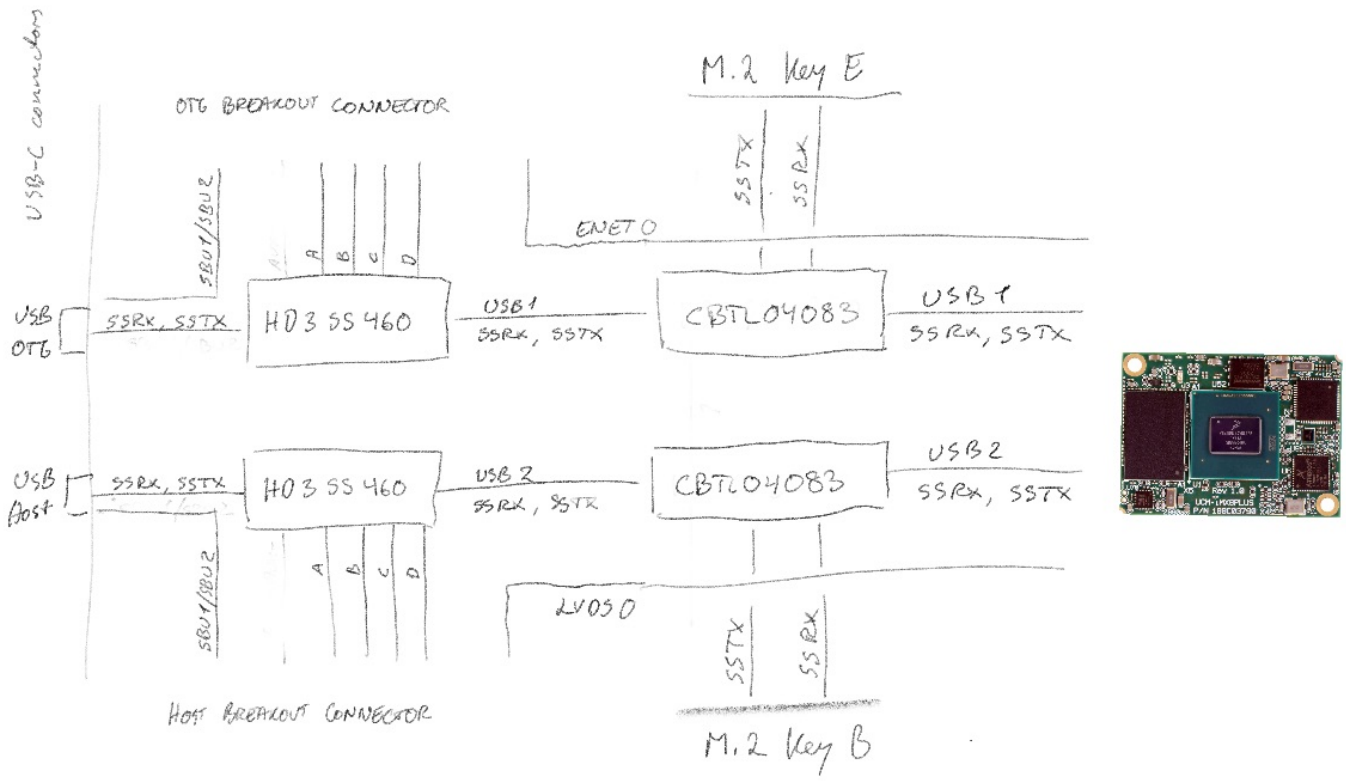
The following pins are connected to the extras connector: TX2+, TX2-, SBU1, SBU2, RX-, RX1+, DX+, DX-

The following pins are treated as normally USB-C connection pins: A1-A7, A9-A12, B5.

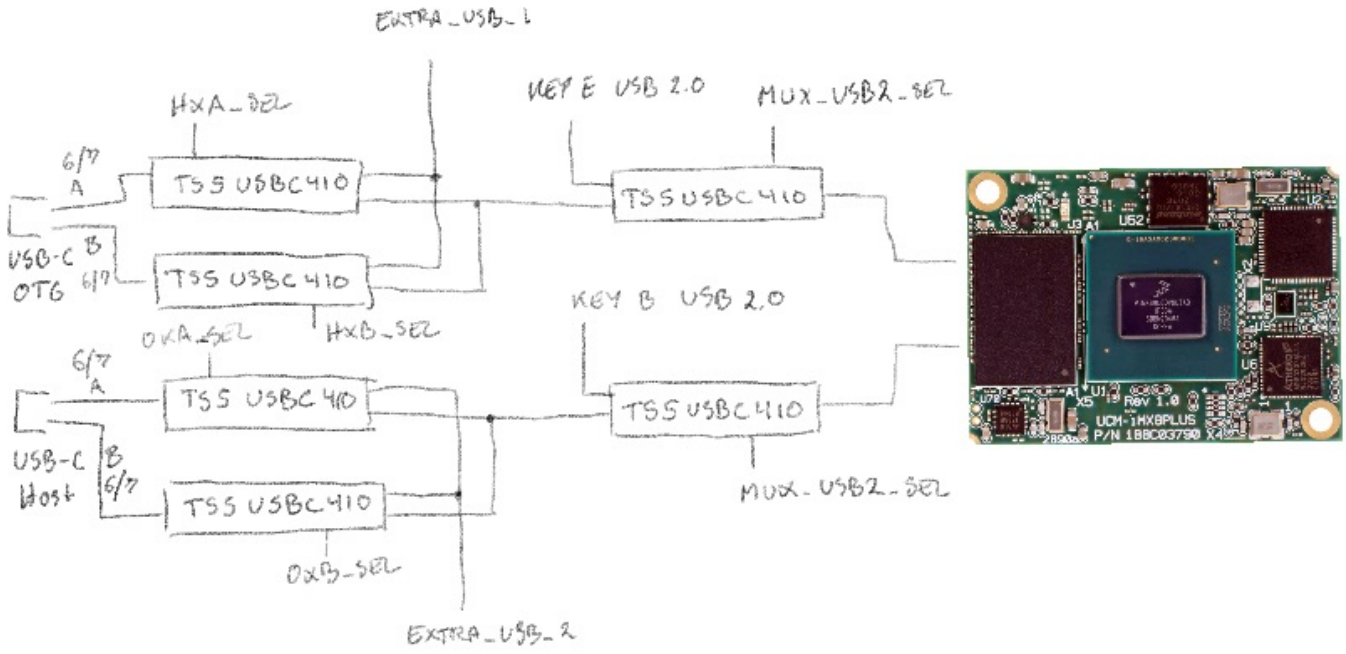
Multiplexing USB

The i.MX8 has two USB busses. USB1(supports OTG) and USB2(Host mode only).

The USB 3.0 superspeed USB1/USB2 from the SoM are multiplexed using CBTL04083 and controlled by MUX_USB3_SEL pins. The USB-C connector Alt. mode is managed by HD3SS460. The default(SEL = low?) state is to connect USB2 to USB-C plug via HD3SS460.



The USB 2.0 USB1/USB2 from the SoM are multiplexed using TS5USBC41 and controlled by MUX_USB2_SEL pins. The USB-C connector USB 2.0 signals(A/B 6/7) are managed separately and multiplexed using TS5USBC41. This allows routing an Extra USB 2.0 signal selectively via the Debug Breakout connector.



SEL	Connect to
High	m.2
Low	USB-C via HD3SS460

Key E

See EXPANSION document for more information.

I2C EEPROM

Add an EEPROM like 24C08 present on the UCM carrier board.

Wiring and Connecting

The board can be used in different ways

1. Adding a daughterboard, two OV2735 camera modules and connecting a USB cable with power.
2. Adding a daughterboard, two RPi camera modules and connecting a USB cable with power.
3. Use the board to connect two OV2735 camera modules to Compulab SB-UCM-iMX8PLUS
4. Use the board to connect two OV2735 camera modules to I-Pi SMARC IMX8M Plus

Signal voltage level

- 201 Camera Module uses 1.8V signals
- IMX477 sensor uses 1.8V for signals
- Does RPi cam module level shift the signals?
- UMC iMX8PLUS module uses 3.3V for signals by default
- UMC iMX8PLUS module RGMII ENET1 signals operate at 1.8V voltage level
- iMX8M plus is documented to use VDD_MIPI_1P8 power group for CSI1 & CSI2
- iMX8M plis is documented to use VDD_HDMI_1P8 power group for HDMI
- NVCC_SAI1_SAI5 power group?
- What will the I2C 5+6 power group be?
- USB 1 & 2 uses VDD_USB_3P3 power group
- Signal voltage PD Controller?

Required distances/location

- Camera module distance 70mm
- USB-C connectors cannot be moved
- Board size can only be increased to save cost
- Holes in the corners should be the regular sort for mounting.
-

I/O Expanders

The development board uses a single Expander. The 909 and 801 uses 4x PCA9555 to control more states
The system expander input triggers interrupt via EX0_nINT (GPIO4_IO19).

This first expander, which is also on the dev. board maps,

Expander	Connected to
EX0.0	mPCIe_PERST on M2 Key B
EX0.1	mPCIe_PERST on M2 Key E
EX0.2	

Expander	Connected to
EX0.3	PD_CTL_INT_1
EX0.4	PD_CTL_INT_2
EX0.5	PD_CTL_RESET
EX0.6	LVDS_TOUCH_INT
EX0.7	LVDS_TOUCH_RESET
EX0.8	CSI1_PWR_DWN_B
EX0.9	LEFT_CAM_RESET
EX0.10	LEFT_ATT_INT
EX0.11	LEFT_ATT_XSHUT
EX0.12	CSI2_PWR_DWN_B
EX0.13	RIGHT_CAM_RESET
EX0.14	RIGHT_ATT_INT
EX0.15	RIGHT_ATT_XSHUT

I/O Expander like Compulab Carrier Board

The development board uses a single Expander. The 909 and 801 uses 3x PCA9555 to control more states.

The EX1 expander input triggers interrupt via EX_OH_nINT (GPIO1_IO0). The pins relate to USB1 OTG and M.2 Key E.

The EX1 expander allows controlling T-USB maps,

Expander	Connected to
EX1.0	USB_O_ALT_EN
EX1.1	USB_O_ALT_POL
EX1.2	USB_O_ALT_AMSEL
EX1.3	MUX_USB2_SEL
EX1.4	MUX_USB3_SEL
EX1.5	COEX4
EX1.6	DEV_WLAN_WAKE
EX1.7	ALERT / I2C_IRQ
EX1.8	GPIO3 on 65988 (HPD1)
EX1.9	LED / DAS / DSS

Expander	Connected to
EX1.10	W_DISABLE2#
EX1.11	W_DISABLE1#
EX1.12	UART WAKE
EX1.13	SDIO WAKE
EX1.14	LED2#
EX1.15	

The development board uses a single Expander. The 909 and 801 uses 3x PCA9555 to control more states.

The EX2 expander input triggers interrupt via EX_OH_nINT (GPIO1_IO0). The pins relate to USB2 Host and M.2 Key B.

The EX2 expander allows controlling T-USB maps,

Expander	Connected to
EX2.0	USB_H_ALT_EN
EX2.1	USB_H_ALT_POL
EX2.2	USB_H_ALT_AMSEL
EX2.3	MUX_USB2_SEL
EX2.4	MUX_USB3_SEL
EX2.5	M2B_PWROFF
EX2.6	RESET#
EX2.7	ALERT / I2C_IRQ
EX2.8	GPIO4 on 65988 (HPD2)
EX2.9	LED / DAS / DSS
EX2.10	W_DISABLE_2#
EX2.11	W_DISABLE#
EX2.12	DEVSLP 3V3
EX2.13	
EX2.14	CONFIG_1
EX2.15	

SYS I2C addresses

Address	Chipset	Description

Address	Chipset	Description
0x20	PCA9555	16 bit expander EX0
0x21	PCA9555	16 bit expander EX1/USB1
0x22	PCA9555	16 bit expander EX2/USB2
0x23	PCA9555	16 bit expander EX3/T-USB daughterboard
0x54..0x57	EEPROM	
0x68 0x6A	PI6CG18200	PCIe clock generator
0x70 0x71	TPS65988	PD Controller Port 1 / SYS
0xD2/D3	RTC	AM1805 real time clock (RTC)

i.MX I2C3 adresses

Address	Chipset	Description
0x7E 0x7F	TPS65988	PD Controller Port 2

I2S (SAI5) 4 channel microphone input mapping

One lane goes to the 34 pins camera connectors

The full 4 lanes are available on the debug connector and M.2 Key B.

Signal Interrupt(INT) pins

Various chips have internal state changes that should cause interrupts by the SoM(CPU). It is essential that inputs are flagged so communication can be reliable.

On the reference board these are triggered via USB1_TCPC_nINT(P1.60) It is used for USB-C orientation changes and I/O Expander 0 inputs.

Events that we want to catch

- T-USB OTG plug events
- T-USB Host plug events
- PD Controller state changed
- Camera sensors input ready
- I/O Expander input ready
- m.2 connectors
- PCIe

Interrupts from the PD Controller are input to I/O Expander 0 (or 3). It in turn triggers an interrupt on EX0_nINT or EX_T_nINT.

Interrupts from the Left and right cameras interrupt signal(ATT_INT) is connected to I/O Expander 0. It in turn triggers an interrupt on EX0_nINT.

Direct/Indirect interrupt triggers

Chip	Chip pin	SoM pin	Description
PDA9555 EX 0	INT	EX0_nINT	Original Expander - P1.60
PDA9555 EX 1	INT	EX_OH_nINT	USB1 OTG and M.2 Key E - P1.59
PDA9555 EX 2	INT	EX_OH_nINT	USB2 Host and M.2 Key B - P1.59
PDA9555 EX 3	INT	EX_T_nINT	Separate T-USB module Expander - P1.98
PCIe m.2 Key B	WAKE#	PCIE_WAKE_B	m.2 Key B - P2.52
PCIe m.2 Key B	CLKREQ#	PCIE_CLKREQ_B	m.2 Key B - P2.90
Left Sensors	ATT_INT	-	Left Camera Module sensors
Right Sensors	ATT_INT	-	Right Camera Module sensors
PD I2C 1	PD_CTL_INT_1	-	PD Controller
PD I2C 2	PD_CTL_INT_2	-	PD Controller

8.1 Carrier Board Design Guidelines

APPLICATION NOTES from UCM-iMX8M-Plus Reference guide.

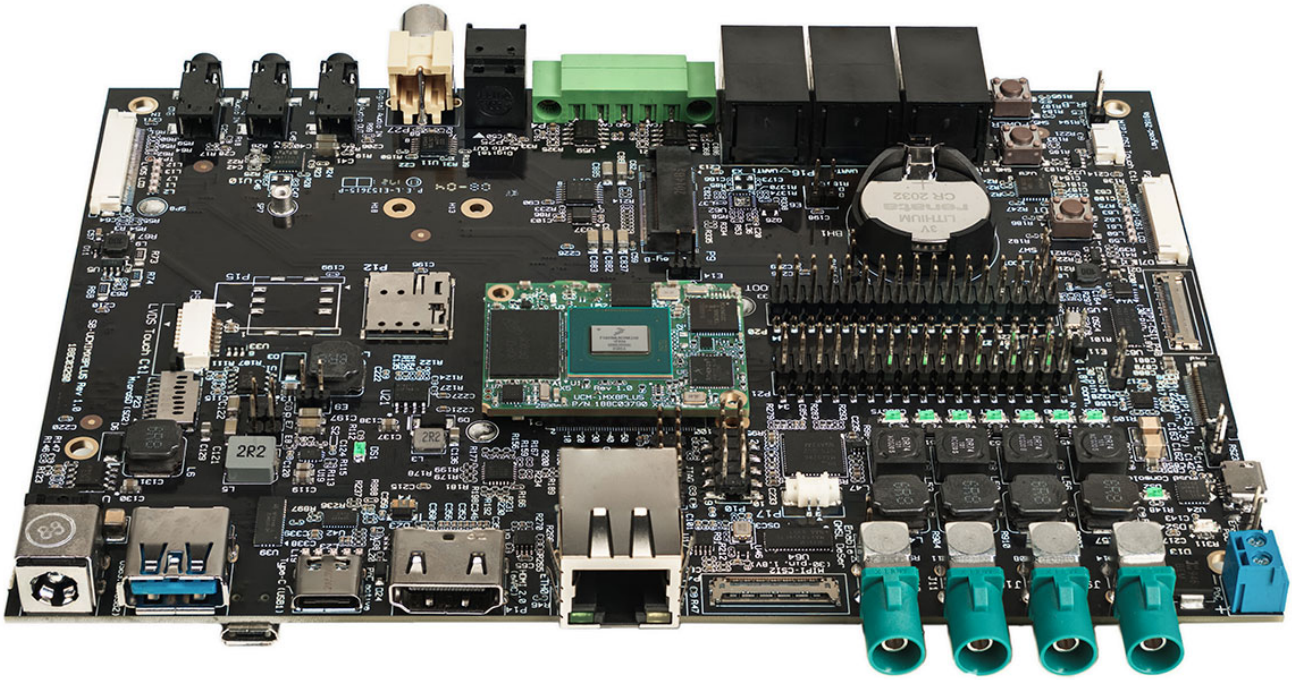
- Ensure that all V_SOM and GND power pins are connected.
- Major power rails - V_SOM and GND must be implemented by planes, rather than traces. Using at least two planes is essential to ensure the system signal quality because the planes provide a current return path for all interface signals.
- It is recommended to put several 10/100uF capacitors between V_SOM and GND near the mating connectors.
- Except for a power connection, no other connection is mandatory for UCM-iMX8M-Plus operation. All power-up circuitry and all required pullups/pulldowns are available onboard UCM-iMX8M-Plus.
- If for some reason you decide to place an external pullup or pulldown resistor on a certain signal (for example - on the GPIOs), first check the documentation of that signal provided in this manual. Certain signals have on-board pullup/pulldown resistors required for proper initialization. Overriding their values by external components will disable board operation. For details please refer to section Error! Reference source not found..
- You must be familiar with signal interconnection design rules. There are many sensitive groups of signals. For example:
- PCIe, Ethernet, USB and more signals must be routed in differential pairs and by a controlled impedance trace.
- Audio input must be decoupled from possible sources of carrier board noise.
- The following interfaces should meet the differential impedance requirements with manufacturer tolerance of 10%:
- USB2.0: DP/DM signals require 90 ohm differential impedance.
- All single-ended signals require 50 ohm impedance.
- PCIe TX/RX data pairs and PCIe clocks require 85 ohm differential impedance.
- Ethernet, MIPI-CSI and MIPI-DSI signals require 100 ohm differential impedance.

- The carrier board interface connectors provide 3mm mating height. Bear in mind that there are components on the bottom side of UCM-iMX8M-Plus. It is not recommended to place any components underneath the UCM-iMX8M-Plus module.
- Refer to the SB-UCMIMX8PLUS carrier board reference design schematics.
- It is recommended to send the schematics of the custom carrier board to Compulab support team for review.

V_SOM is recommended between 3.45 and 4.4 volt, typical 3.7

for more information see UCM i.MX8 PLUS Reference Guide

Connecting the SB-UCM-iMX8PLUS carrier board



For further details see Product Page.

- 2 * I-PEX connector directly between UCM carrier board and bridge board
- 45 pins connected to Inbetween breakout boards
- 10 pins power connector to Inbetween breakout boards
- USB-C connector to Inbetween breakout boards
- USB-A connector to Inbetween breakout boards
- HDMI female to Inbetween breakout boards

909b Connector Pinouts

Debugging Breakout connector

No.	Pin	Description	Voltage
1	5V	Board Power 5V	

No.	Pin	Description	Voltage
2	3V3	Board Power 3.3V	
3	VIN	USB Power input direct	
4	GND	GND	
5	UART2_RX	Debug UART2 RX	
6	UART2_TX	Debug UART2 TX	
7	GND	GND	
8	UART4_RX	Debug UART4 RX	
9	UART4_TX	Debug UART4 TX	
10	GND	GND	
11	TDI	JTAG	
12	TMS	JTAG	
13	TCK	JTAG	
14	RTCK	NC? JTAG	
15	TDO	JTAG	
16	RESET	SYS_RST_PMIC SoM	
17	PWRBTN	Power Button SoM	
18	QSPI_BOOT_EN_3P3	FLEXSPI BOOT	
19	ALT_BOOT	PB_ALT_BOOT	
20	MIC_BCLK / SCK	I2S Mic Bit clock line (RXC) P1.32	1.8V
21	MIC_WS / LRCLK	I2S Mic Word clock line (RXFS) P1.34	1.8V
22	MIC_SDATA1	I2S Mic data 1 P1.28	1.8V
23	MIC_SDATA2	I2S Mic Input data 2 P1.38	1.8V
24	MIC_SDATA3	I2S Mic Input data 3 P1.36	1.8V
25	MIC_SDATA4	I2S Mic Input data 4 P1.26	1.8V
26	ECSPI2_MISO	SPI2 MISO	
27	ECSPI2_SCLK	SPI2 Clock	
28	ECSPI2_SS0	SPI2 SS0	
29	ECSPI2_MOSI	SPI2 MOSI	
30	L_CAM_FSIN	Left Frame sync input	
31	L_CAM_STROBE	Left Frame sync output	

No.	Pin	Description	Voltage
32	L_EXTCLK	Left External Clock Input (MCLK)	
33	L_ATT_XSHUT	Left Attached Shutdown	
34	L_RESET	Left Camera Reset	
35	L_PWRDN	Left Camera Shutdown	
36	R_CAM_FSIN	Right Frame sync input	
37	R_CAM_STROBE	Right Frame sync output	
38	R_EXTCLK	Right External Clock Input (MCLK)	
39	R_ATT_XSHUT	Right Attached Shutdown	
40	R_RESET	Right Camera Reset	
41	R_PWRDN	Right Camera Shutdown	
42	SYS_SCL	System I2C SCL	
43	SYS_SDA	System I2C SDA	
44	I2C3_SCL	Stem/3 I2C SCL	
45	I2C3_SDA	Stem/3 I2C SDA	

T-USB alt mode connectors

These connectors(only on the 909 model) enables experimentation with alternate modes and directional pins.

Host ALT

Pin	Code	Description
1	3V3	
2	SBU2	Host AUX+ / SBU2
3	SBU1	Host AUX- / SBU1
4	3V3	
5	HA+	Host A+
6	HA-	Host A-
7	3V3	
8	HB+	Host B+
9	HB-	Host B-
10	3V3	

Pin	Code	Description
11	HC+	Host C+
12	HC-	Host C-
13	3V3	
14	HD+	Host D+
15	HD-	Host D-
16	GND	
17		
18		
19	GND	
20	HX+	Host Extra 2.0 D+
21	HX-	Host Extra 2.0 D-
22	HXA_SEL	Select Host Extra A6/A7
23	HXB_SEL	Select Host Extra B6/B7
24	GND	
25	LVCLK+	LVDS CLK+
26	LVCLK-	LVDS CLK-
27	GND	
28	LVD0+	LVDS D0+
29	LVD0-	LVDS D0-
30	GND	
31	LVD1+	LVDS D1+
32	LVD1-	LVDS D1-
33	GND	
34	LVD2+	LVDS D2+
35	LVD2-	LVDS D2-
36	GND	
37	LVD3+	LVDS D3+
38	LVD3-	LVDS D3-
39	GND	
40	TOUCH_INT	LVDS TOUCH INT EX0.6

Pin	Code	Description
41	TOUCH_RST	LVDS TOUCH Reset EX0.7
42	I2C SCL	SYS SCL
43	I2C SDA	SYS SDA
44	UART3_TXD	P1.61 UART3 Tx
45	UART3_RXD	P1.21 UART3 Rx

OTG ALT

Pin	Code	Description
1	3V3	
2	SBU2	OTG AUX+ / SBU2
3	SBU1	OTG AUX- / SBU1
4	3V3	
5	OA+	OTG A+
6	OA-	OTG A-
7	3V3	
8	OB+	OTG B+
9	HB-	OTG B-
10	3V3	
11	OC+	OTG C+
12	OC-	OTG C-
13	3V3	
14	OD+	OTG D+
15	OD-	OTG D-
16	GND	
17		
18		
19	GND	
20	OX+	OTG Extra 2.0 D+
21	OX-	OTG Extra 2.0 D-
22	OXA_SEL	Select OTG Extra A6/A7

Pin	Code	Description
23	OXB_SEL	Select OTG Extra B6/B7
24	GND	
25		
26		
27	GND	
28	TR1+	ETH0 TR 1+
29	TR1-	ETH0 TR 1-
30	GND	
31	TR2+	ETH0 TR 2+
32	TR2-	ETH0 TR 2-
33	GND	
34	TR3+	ETH0 TR 3+
35	TR3-	ETH0 TR 3-
36	GND	
37	TR4+	ETH0 TR 4+
38	TR4-	ETH0 TR 4-
39	GND	
40	ETH0_LED_ACT	LED_ACT
41	ETH0_LINK-LED_10_100	ETH0_LINK-LED_10_100
42	I2C SCL	P1.99 SYS SCL
43	I2C SDA	P1.97 SYS SDA
44	UART1_TXD	P1.72 UART1 Tx
45	UART1_RXD	P1.19 UART1 Rx

Compress GPIO with expander and stem I2C (wire I2C3 ?)

I2S / I2C 6 pins connector

Breaking out individual I2C/I2S busses adds common power. This is used for SCCB, Sound out and Sound in.

SCCB connector for Left/Right Camera modules.

No.	Pin	Description

No.	Pin	Description
1	1V8	Power at signal level 1.8V
2	GND	GND
3	INT	I2C Interrupt
4	SCL	I2C SCL
5	SDA	I2C SDA
6	5V	Board power 5V

Speaker / Microphone connector

No.	Pin	Description
1	1V8 / 3V3	Power at signal level 1.8V / 3.3V
2	GND	GND
3	BCLK	I2S BCLK / SAI5_TXC / SAI5_RXC
4	LRCLK	I2S LRCLK / SAI5_TXFS / SAI5_RXFS
5	DATA	I2S DATA / SAI5_TX0 / SAI5_RX0
6	5V	Board power 5V

Max. Current per pin 1.0A

RPI FPC 22 pins

Pin	Code	Type	Details	Voltage
1	GND	Power	Ground	
2	CAM_D0_N	Data	MIPI Data Lane 0 Negative	
3	CAM_D0_P	Data	MIPI Data Lane 0 Positive	
4	GND	Power	Ground	
5	CAM_D1_N	Data	MIPI Data Lane 1 Negative	
6	CAM_D1_P	Data	MIPI Data Lane 1 Positive	
7	GND	Power	Ground	
8	CAM_CK_N	Data	MIPI Clock Lane Negative	
9	CAM_CK_P	Data	MIPI Clock Lane Positive	
10	GND	Power	Ground	
11	CAM_D2_N	Data	MIPI Data Lane 2 Negative	

Pin	Code	Type	Details	Voltage
12	CAM_D2_P	Data	MIPI Data Lane 2 Positive	
13	GND	Power	Ground	
14	CAM_D3_N	Data	MIPI Data Lane 3 Negative	
15	CAM_D3_P	Data	MIPI Data Lane 3 Positive	
16	GND	Power	Ground	
17	CAM_IO0	Power	Power Enable	
18	CAM_IO1	LED	LED Indicator	
19	GND	Power	Ground	
20	SCL	I2C	I2C SCL	
21	SDA	I2C	SCCB serial Interface data IO	
22	VCC	Power	3.3V Power Supply	

NVIDIA FPC 30 pins

The connector is an I-PEX type 20525-030E-02 with 0.4mm pitch & 30 pins. Data pins are 1.8V level.

Pin	Code	Details
1	CAM_3V3	3.3V Power Input
2	CAM_3V3	
3	CAM_1V8	1.8V Power Input
4	GND	
5	GND	
6	PWR DWN	PWRDN on 34pin
7	I2C SCL	
8	I2C SDA	
9	GND	
10	CSI D2-	
11	CSI D2+	
12	TRIGGER	
13	MCLK	EXTCLK on 34pin
14	Reserved	
15	CSI D1-	

Pin	Code	Details
16	CSI D1+	
17	GND	
18	GND	
19	CSI D0-	
20	CSI D0+	
21	RESET	RESET on 34pin
22	GND	
23	Reserved	
24	CSI CLK-	
25	CSI CLK+	
26	GND	
27	CSI D3-	
28	CSI D3+	
29	Flash	
30	Reserved	

Refs

- https://www.leopardimaging.com/product/accessories/cables/faw-1233-03/
- https://www.mouser.com/datasheet/2/233/LI-TX1-CB-6CAM_datasheet-1395894.pdf
- https://connecttech.com/ftp/pdf/ASG006_Spacely.pdf
- https://www.i-pex.com/product/cabline-ca

Ziloo Camera Module 34 pin connector

Just to be clear: All CSI lanes are laid out on one side of the connector with GND between.

Pin 1 is indicated on the board by a dot.

Toward thin part with microphone and other sensors

Pin	Code	Type	Details	Voltage
1	AF_VDD	Power	Reserved for Autofocus	3.3V
2	AVDD_2V8	Power	Analog, Max 500mA	2.8V
3	DOVDD	Power	Power for I/O circuit, Max 500mA	1.8V
4	VCC_1V8	Power	1.8V ,MAX 200mA	1.8V
5	GND	Power	GND	

Pin	Code	Type	Details	Voltage
6	CAM_FSIN	I/O	Frame sync input	
7	CAM_STROBE	I/O	Frame sync output	
8	EXTCLK	Input	External Clock Input (MCLK)	
9	ATT_INT	Output	Interrupt Attached Sensor, Active L	1.8V?
10	ATT_XSHUT	Input	Attached Sensor XSHUTDOWN	1.8V
11	Reserved	AF/PWM	PWM Motor control (NC)	
12	I2C_SCL	I/O	I2C?_SCL(pullup resistor 2.2K)	1.8V
13	I2C_SDA	I/O	I2C?_SDA(pullup resistor 2.2K)	1.8V
14	BCLK / SCK	I2S	Bit clock line	1.8V
15	WS / LRCLK	I2S	Word clock line	1.8V
16	SDATA1	I2S	Input data 1	1.8V
17	SDATA2	I2S	Input data 2 (NC)	1.8V

Towards image sensors

Pin	Code	Type	Details	Voltage
34	AGND	Power	Analog ground	
33	RESET	Input	Camera Reset, Active Low (RSTB)	
32	PWRDN	Input	Camera Power Down	
31	Reserved			
30	Reserved			
29	-		GND	
28	CSI_RX_D0P	Camera	MIPI_CSI_RX_D0+	1.8V
27	CSI_RX_D0N	Camera	MIPI_CSI_RX_D0-	1.8V
26	-		GND	
25	CSI_RX_D1P	Camera	MIPI_CSI_RX_D1+	1.8V
24	CSI_RX_D1N	Camera	MIPI_CSI_RX_D1-	1.8V
23	-		GND	
22	CSI_RX_D2P	Camera	MIPI_CSI_RX_D2+	1.8V
21	CSI_RX_D2N	Camera	MIPI_CSI_RX_D2-	1.8V
20	-		GND	

Pin	Code	Type	Details	Voltage
19	CSI_RX_CLKP	Camera	MIPI_CSI_RX_CLK+	1.8V
18	CSI_RX_CLKN	Camera	MIPI_CSI_RX_CLK-	1.8V

Soldering Pads

A number of connections should be broken out on the board as soldering pads (no through hole)

Pin	Function
VSOM	Output or Input
VCC_RTC	Power input RTC battery
PP_HV1	PD Controller power
PP_HV2	PD Controller power
VIN_5V	PD Controller System 5V for PP1_CABLE, PP2_CABLE
VIN_3V3	PD Controller System 3.3V
GND	
P1.33	CAN2_TX
P1.49	CAN2_RX
P1.51	CAN1_RX
P1.53	CAN1_TX
SAI5_TXC	I2S Speaker Bit clock line (BCLK/SCK) P2.55
SAI5_TXFS	I2S Speaker Word clock line (WS/LRCLK) P2.53
SAI5_TXD0	I2S Speaker data 1 P2.60
SAI5_TXD1	I2S Speaker data 2 P2.76
SAI5_TXD2	I2S Speaker data 3 P2.63
SAI5_TXD3	I2S Speaker data 4 P2.65

M.2 B, E and Other Expansion Slots

See `EXPANSION.pdf` / `EXPANSION.md`