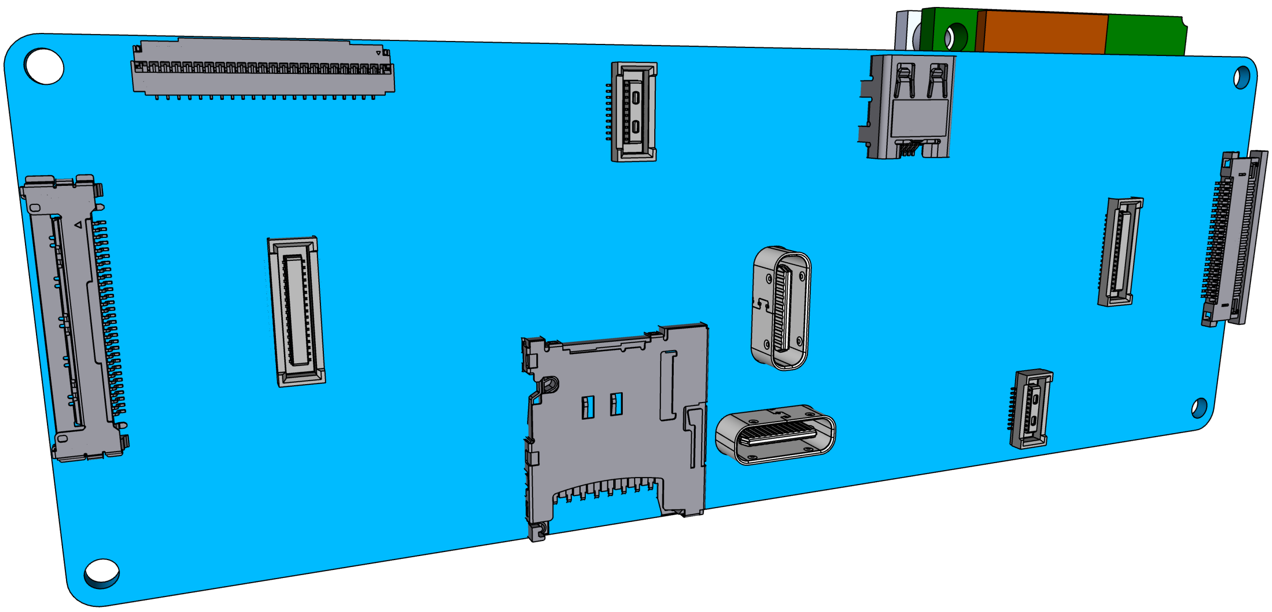
Bridge Board 909c

The 909c 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.

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

- B2B sound/I2C connectors
- Mux chips shutdown mode
- Should there be Boot origin switches like EVK? (4 bits? EVK)
- 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

Difference from revision B

- The PD Controller is no longer on the bridge board
- The Power module connects to the bridge board to provide dual USB-C
- Two 20 pin sound connectors
- Only 1 alternative CSI connector for each side
- No Alt USB breakouts on bridge board
- No Alt mode on bridge board
- No I2C breakouts on bridge board
- Only m.2 Key B (no Key E)

Core Components

- SB-UCM-iMX8PLUS System-on-Module
- 2 * Hirose DF40HC(3.0)-100DS-0.4V mated height 3.0mm
- 2 * Hirose DF40-50DS-0.4V mated height 1.5mm Mouser - JLCPCB socket
- M.2 key B connector H4.20mm Amphenol ICC 10128793001RLF
- 2 * Hirose DF40C-34DS-0.4V (Mouser
- 1 * microSD card slot (suggested Molex 5031821852) push-push, compact. Mouser, Molex
- 1 * CBTL04083 Multiplexer Switch ICs 3.3V CH 2:1 - Mouser
- 2 * PCA9555 I/O Expander
- 1 * TS5USBC410 Dual 2:1 USB 2.0 Mux/DeMux Switch. Mouser

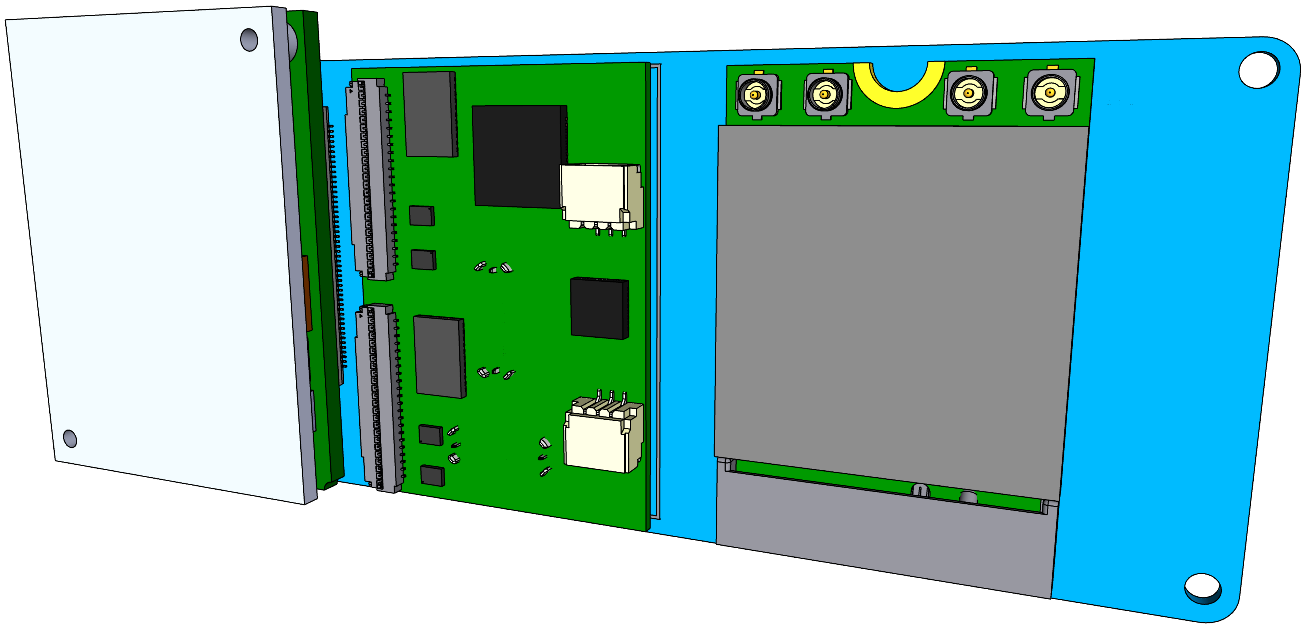
Dev. Connectors

- 1 * MicroHDMI (suggested Molex 46765-1301) Mouser Molex
- 1 * Molex 22PIN 0.5mm pitch 54548-2271
- 1 * I-PEX 30PIN 0.4mm pitch 20525-030E-02
- 1 * 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))
- 2 * Hirose DF40-20DS-0.4V mated height 1.5mm Mouser - JLCPCB socket

Other Components

Connectors placed on the board are,

- PI6CG18200 clock
- 1 * 24C08 Carrier-board EEPROM. Mouser
- 1 * TSM-120-01-F-DV Samtec 2*20 pins surface mounted .100 (Smiley model) Mouser
- SuperSpeed MUX PI5USB30213A may be an option intead of CBTL04083
- Alternate USB 2.0 Mux/DeMux Mouser JLCPCB part
- 5 * TXB0108 voltage shifters 3.3V to 1.8V



The back of the board connects for SB-UCM-iMX8PLUS, T-USB module and M.2 Key B module. 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. Voltages needed are 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.

According to the UCM-IMX8PLUS Referene Guide the Supply Voltage is 3.45V to 4.4V. VSOM from the Power module provides this level.

System Power

The system power is driven by the T-USB module via the two 50 pin connectors. There is no need to power the board from other connectors than USB-C.

From it 5V0, 3V3, 2V8, and 1V8 are derived. 5V is stepped up from VSOM. These should not be mixed with the VIN_5V and VIN_3V3 on the T-USB module connector.

- m.2 connectors are based on 3V3 and 1V8
- Sound is based on 3V3 or 1V8
- Cameras are 1V8, 2V8 and 3V3
- HDMI can supply 5V / 50 mA

- HDMI signal level is 5V
- Debug connector 5V

So there are in total two uses of 5V

1. HDMI supply and signal (50 mA) from upregulated VSOM
2. 5V supply (100 mA) to T-USB module which is externally supplied.
3. Debug connector (directly connected with VIN_5V soldering pad)

VIN_5V is optional and separate from the power on the board. It is supplied from the soldering pad/point.

Physical T-USB Connection Establishment

When connecting the T-USB module to the Bridge Board VSOM is provided over multiple pins on both connectors. The bridge board can draw a limited current from individual pins, but must only drive the System Module with power when all VSOM pins are connected. This allows for avoiding damage or strange behavior, if the power module is partially inserted.

Stages of insertion are,

- No VSOM pins connected
- At least one VSOM pin is connected
- VSOM Pins from both connectors connected
- All VSOM pins connected (including VSOM_LOCK)

When at least one pin is connected the Bridge Board can power components that are low power and always-on. It should provide VCC_RTC to the System Module from the T-USB module whenever it is plugged in or the VCC_RTC pad.

The 801/909 board must short LDO_3V3 to SPI_3V3 on the connector to provide power to the flash on the power module.

When pins from both connectors are supplying VSOM the Bridge Board should raise BOTH_VSOM. The Power Module delivers VSOM to one of the pins dependent on BOTH_VSOM.

The locking mechanism of the backplate is also used to drive one of the VSOM connectors, named VSOM_LOCK, which prevent from the system activating until locked in place

As the first step in the detachment of the power module the physical unlock button must be pressed which raises PMIC_STBY_REQ. The next step is to turn the back plate which will disconnect the conditional VSOM_LOCK pin.

This requires logic on the 801/909 board.

Logic on Bridge board

The T-USB module is inserted onto the bridge board. As this gets inserted the bridge board must detect it and enable power as connection is established.

a) If at least one VSOM pin on both connectors is high, BOTH_VSOM is raised high by the bridge board. b) Directly connect VCC_RTC on T-USB connectors, soldering pad and System Module. c) If all 10 VSOM and VSOM_LOCK pins are supplying power, use it to power the System Module d) If all 10 VSOM and

VSOM_LOCK pins are supplying power, deliver upregulated 5V e) If all 10 VSOM and VSOM_LOCK pins are supplying power, deliver power to m.2 modules f) If some VSOM pins are powered deliver it to always running IMU on bridge board(not on 909c).

The module connectors have pins that are used for different setups. Not all should be connected to the 909 board.

VIN_3V3 and VIN_5V can be supplied externally via a soldering pad for experimental purposes.

Camera CSI Connectors

CSI connectors

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

The 22 pin and 30 pin CSI connectors are intended to be used without a daughter board and instead a separate i.MX8 development board is used. 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.

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		

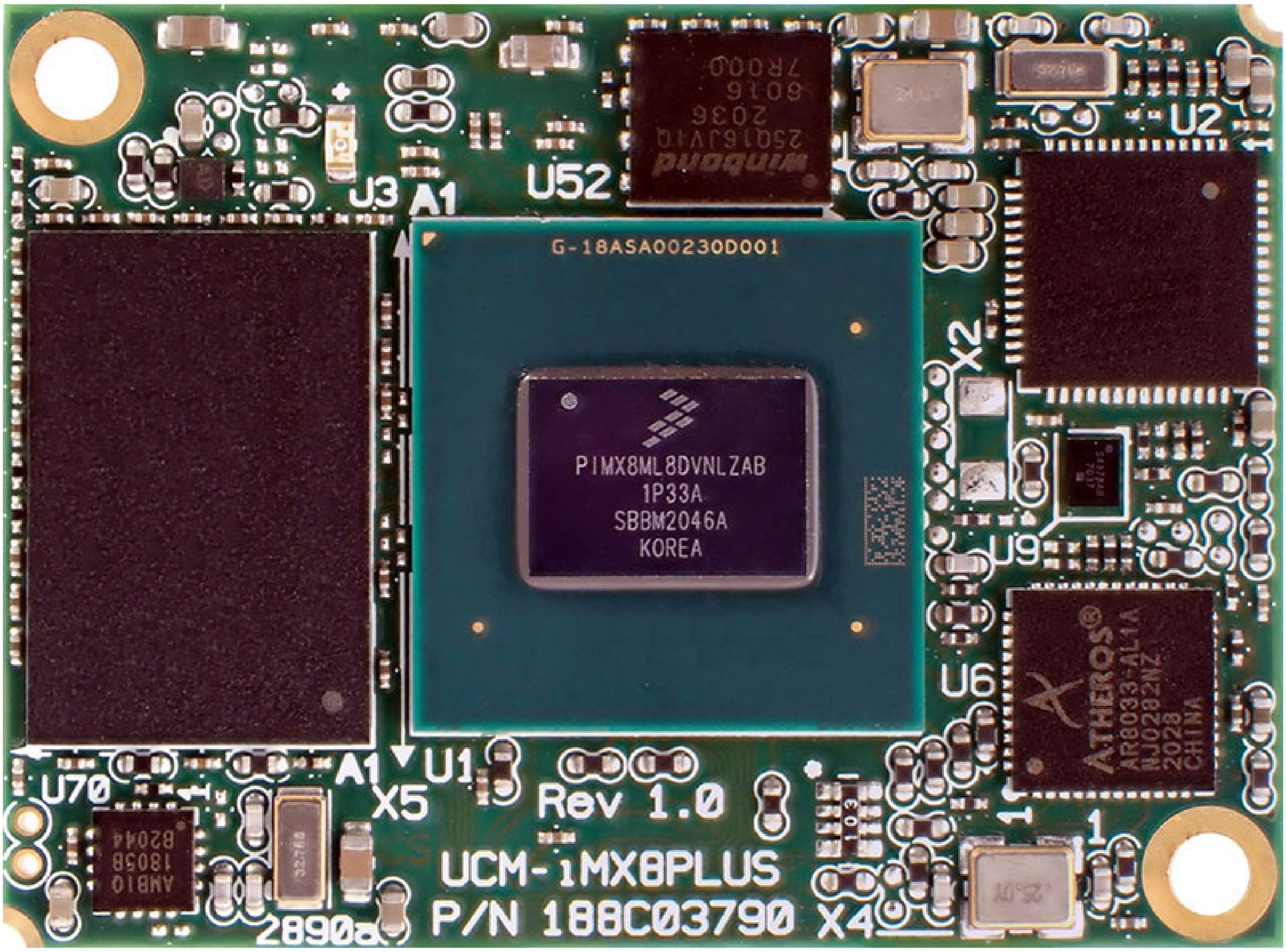
Connecting the SB-UCM-iMX8PLUS SoM

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

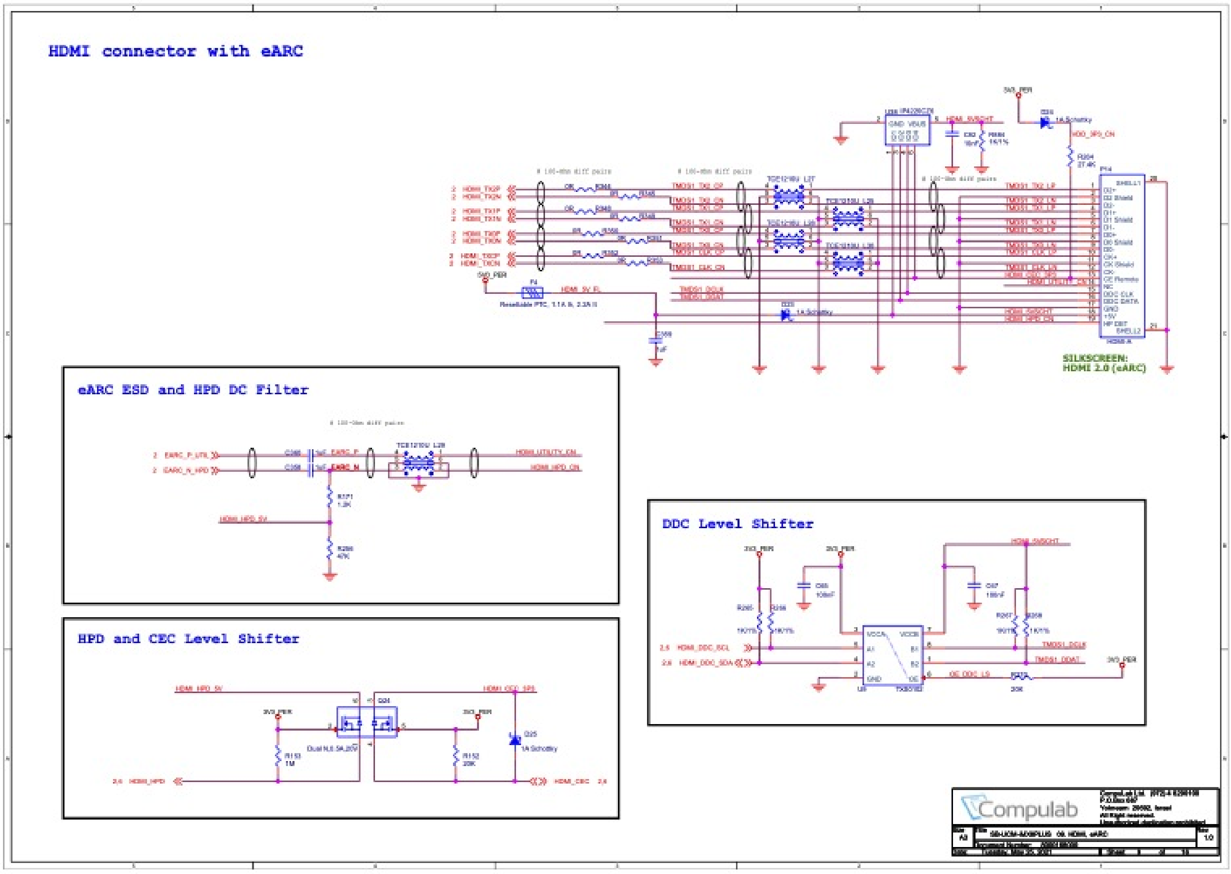
- 2 * Hirose 100 pin connectors are used to connect the SoM daughter board

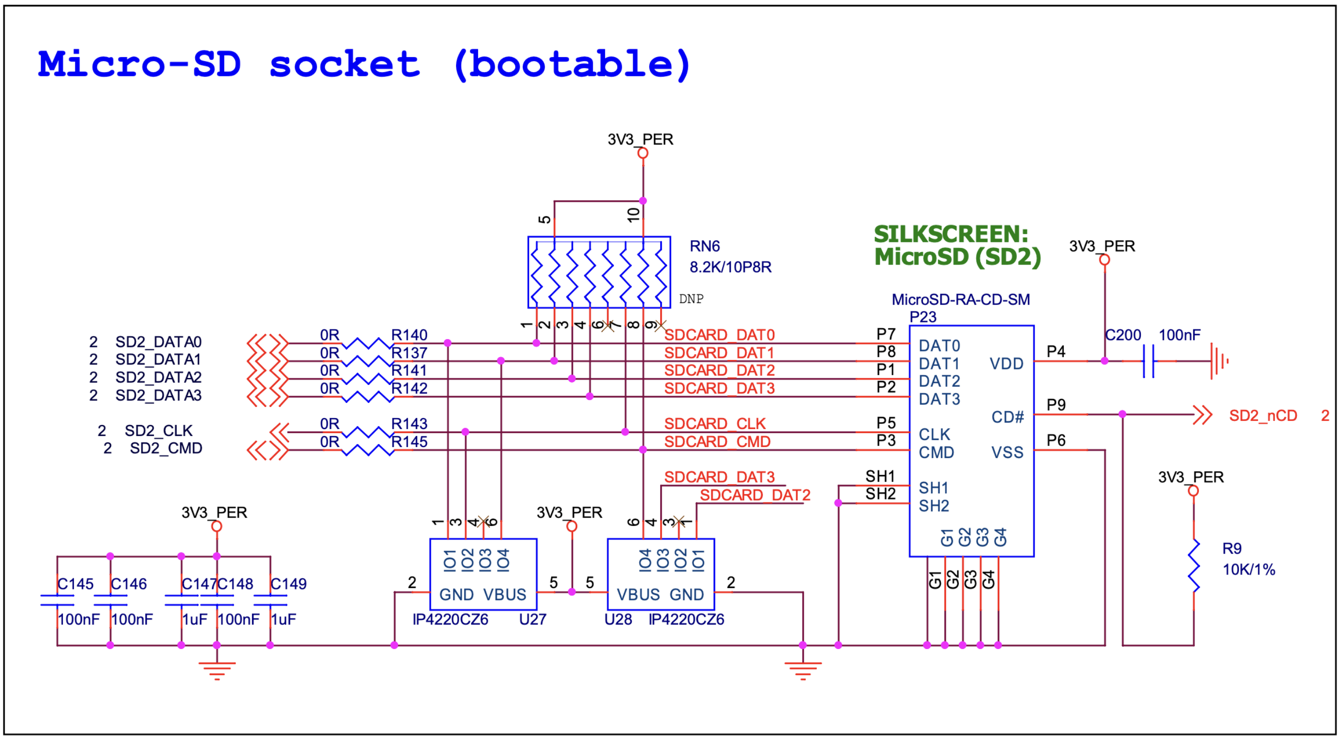


MicroSD, MicroHDMI, M.2 key B & Debug Breakout

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. Also, there will be no fastening screw for the m.2 board.

Debugging Breakout connector

See end of this document for pinouts.

T-USB Module Data Connection

The T-USB module connects two USB-C connectors to the board via multiplexers and a Power Delivery Controller. USB Data is routed over the 50 pins data connector as well as the M.2 Expansion connector. The Host USB connection is multiplexed between thw two.

T-USB connector 3.0 data mapping

Two USB 2.0/3.0 connections are provided by the T-USB module. T-USB module 50 pin connectors supply/consume:

- USB1 v2 / v3 data
- USB2 v2 / v3 data
- LVDS data pairs
- UART 1/2/3/4
- I2C SYS/3
- GPIO4_IO19, GPIO1_IO0, GPIO1_IO1
- SYS_RST_PMIC / POR_B_3P3 / PMIC_ON_REQ / PMIC_STBY_REQ / PWRBTN / ALT_BOOT / QSPI_BOOT_EN_3P3
- VCC_RTC

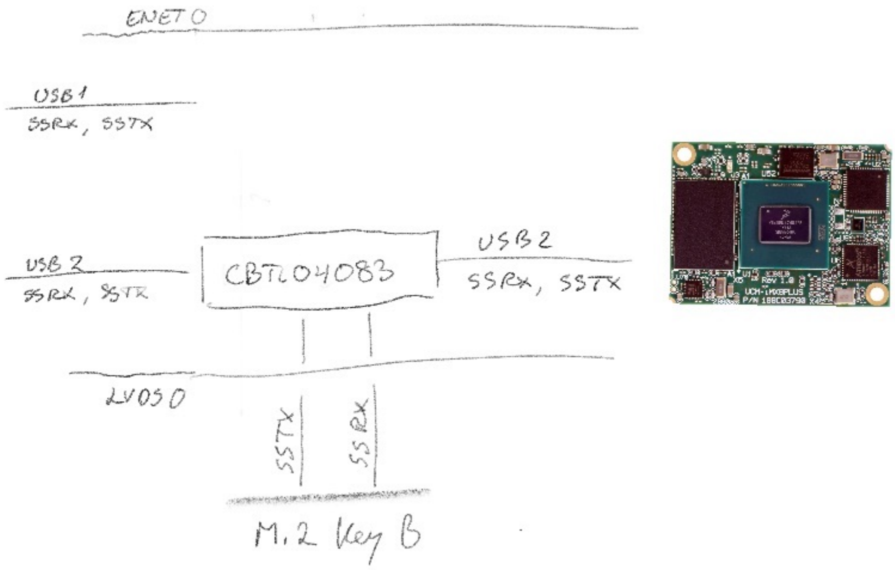
T-USB module 50 pin connectors not connected:

- SPI
- SWD

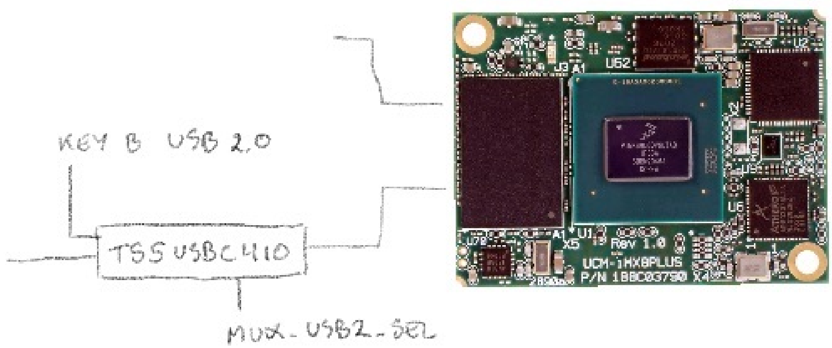
Multiplexing USB

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

The USB 3.0 superspeed Host/USB2 from the SoM are multiplexed using CBTL04083 and controlled by MUX_USB3_SEL pins.



The USB 2.0 Host/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	T-USB

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

Two expanders are placed on the bridge board and a third is on the Power Module.

The development board uses a single Expander. The 909 and 801 uses 2x 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	
EX0.3	

Expander	Connected to
EX0.4	IMU_IRQ - Motion Controller
EX0.5	IMU_RESETN - Motion Controller
EX0.6	IMU_MODE - Motion Controller
EX0.7	
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 to map Camera interrupts.

The development board uses a single Expander. The 909 and 801 uses 2x 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,

The 3 pins for each Alt. Mode controller determines how signals are mapped to USB-C high speed lines. Refer to the datasheet for HD3SS460 for full truth table. The regular USBSS setup is chosen by POL=L, AMSEL=M, EN=H.

Expander	Connected to
EX2.0	
EX2.1	
EX2.2	
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)

Expander	Connected to
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	

I/O Expander to cover m.2 Expander

SYS I2C addresses

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	PI6CG18200	PCIe clock generator
0x6A	BQ24250	LiPO Battery Charger
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
0x28	BHI260AP	Motion Engine

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 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.

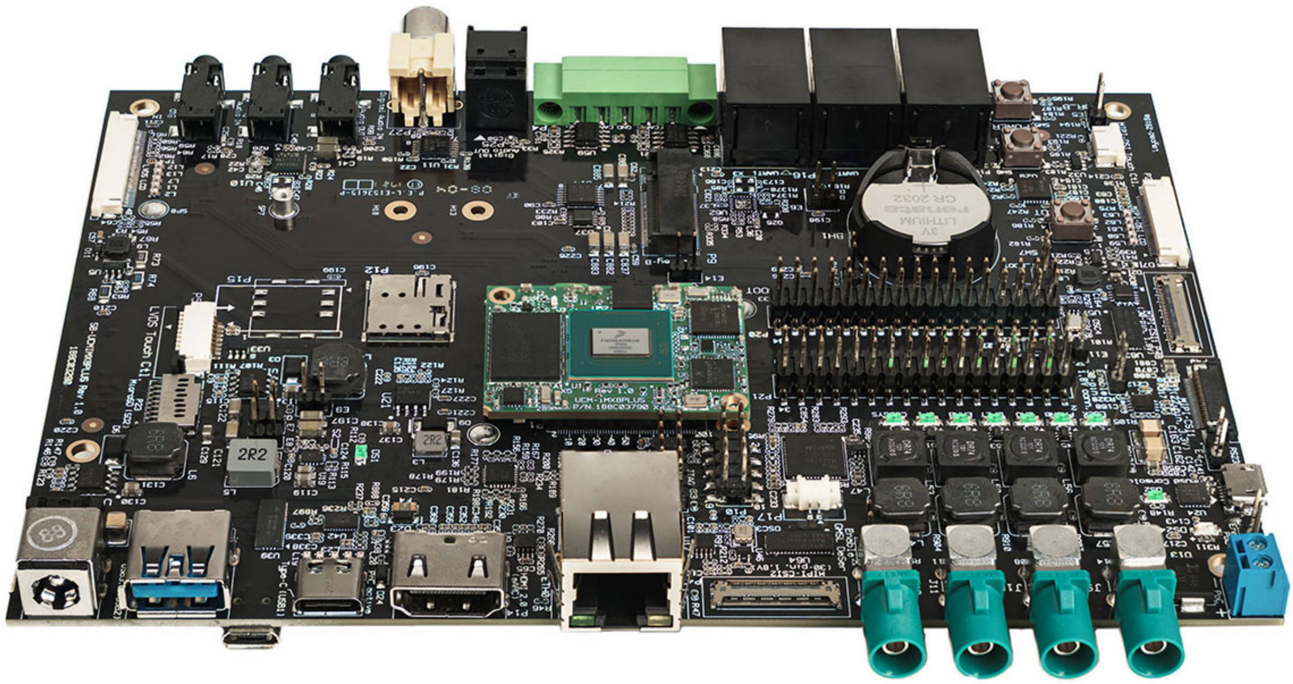
- Ensure that all V_SOM and GND power pins are connected.
- Major power rails - V_SOM and GND must be implemented by planes, rather than traces. Using at least two planes is essential to ensure the system signal quality because the planes provide a current return path for all interface signals.
- It 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

909c Connector Pinouts

Debugging Breakout connector

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

No.	Pin	Description	Voltage
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	
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)	

No.	Pin	Description	Voltage
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	

50 pin B2B connectors

Two connectors tie the daughterboard to the bridge board. Both are of a 50 pin Highrose B2B type.

- JLCPCB plug
- JLCPCB socket

default height 1.5mm

Connector 1: High Speed Data Connector 2: PD Controller, Debug, USB 2.0

Power	Max Current	Pins
VSOM	3.0 A	9
GND	3.0 A	9
VCC_RTC	600 mA	2
VIN_3V3	300 mA	1
VIN_5V	600 mA	2
LDO_3V3	300 mA	1

Connector 1 high-speed data, close to Alt Mode Breakout connectors

- 6 * GND
- 7 * VSOM

One side

Pin	Code	Type	Details	Voltage	Misc
1	VSOM	Power	Main power for board 3.45V - 4.5V		Conn. detect
2	USB1_RX_DP	USB	USB1 RX D+		
3	USB1_RX_DN	USB	USB1 RX D-		

Pin	Code	Type	Details	Voltage	Misc
4	GND	Power	Ground		
5	USB1_TX_DP	USB	USB1 TX D+		
6	USB1_TX_DN	USB	USB1 TX D-		
7	GND	Power	Ground		
8	USB1_RX_DP	USB	USB2 RX D+		
9	USB1_RX_DN	USB	USB2 RX D-		
10	GND	Power	Ground		
11	USB1_TX_DP	USB	USB2 TX D+		
12	USB1_TX_DN	USB	USB2 TX D-		
13	GND	Power	Ground		
14	T_USB_O_ALT_EN	AltMode	Exposed EX3		
15	T_USB_O_ALT_POL	AltMode	Exposed EX3		
16	T_USB_O_ALT_AMSEL	AltMode	Exposed EX3		
17	T_USB_H_ALT_EN	AltMode	Exposed EX3		
18	T_USB_H_ALT_POL	AltMode	Exposed EX3		
19	T_USB_H_ALT_AMSEL	AltMode	Exposed EX3		
20	GND	Power	Ground		
21					
23					
24	PWR_CHARGE	Battery	Internal charge current for testing		
25	BAT_STAT	Battery	Internal charging status for testing		

TODO remove EX3 exposure

Other side

Pin	Code	Type	Details	Voltage
50	LVCLK+	LVDS	LVDS CLK+	
49	LVCLK-	LVDS	LVDS CLK-	
48	VSOM	Power	Main power for board 3.45V - 4.5V	
47	LVD0+	LVDS	LVDS D0+	

Pin	Code	Type	Details	Voltage
46	LVD0-	LVDS	LVDS D0-	
45	VSOM	Power	Main power for board 3.45V - 4.5V	
44	LVD1+	LVDS	LVDS D1+	
43	LVD1-	LVDS	LVDS D1-	
42	VSOM	Power	Main power for board 3.45V - 4.5V	
41	LVD2+	LVDS	LVDS D2+	
40	LVD2-	LVDS	LVDS D2-	
39	VSOM	Power	Main power for board 3.45V - 4.5V	
38	LVD3+	LVDS	LVDS D3+	
37	LVD3-	LVDS	LVDS D3-	
36	VSOM	Power	Main power for board 3.45V - 4.5V	
35				
34				
20	GND	Power	Ground	
32				
31				
30	BAT_LDO	Battery	4.9V 50mA LDO for STAT LED	
28				
27				
26	VSOM	Power	Main power for board 3.45V - 4.5V	

Could also take in HDMI or PCIe lanes

Connector 2 PD controller, close to power connectors

- 2 * VSOM, 3 * GND, 1 * VCC_RTC, 1 * VIN_3V3
- 1 * VSOM, 1 * GND, 1 * VCC_RTC, 2 * VIN_5V, 1 * LDO_3V3

One side

Pin	Code	Type	Details	Voltage	Misc
1	VSOM	Power	Main power for board 3.45V - 4.5V		Conn. detect
2	GND	Power	Ground		

Pin	Code	Type	Details	Voltage	Misc
3	USB1_DP	USB	USB1 D+		
4	USB1_DN	USB	USB1 D-		
5	GND	Power	Ground		
6	USB2_DP	USB	USB2 D+		
7	USB2_DN	USB	USB2 D-		
8	GND	Power	Ground		
9	SWD_CLK	Debug	PD Controller GPIO12		
10	SWD_DAT	Debug	PD Controller GPIO13		
11	BOTH_VSOM	Enable	Signal from bridge board that VSOM is connected on both sides		
12	EX0_nINT	IRQ	Interrupt signal (GPIO4_IO19)		P21.30
13	EX_OH_nINT	IRQ	Interrupt signal (GPIO1_IO0)		P20.12
14	EX_T_nINT	IRQ	Interrupt signal (GPIO1_IO1).		P20.14
15	VSOM_LOCK	Power	Main power for board 3.45V - 4.5V, if mechanical lock shorted		Mech. lock
16	SYS_RST_PMIC	Reset	PMIC reset input pin. Internally pulled up with LDO1 power rail. Once low, PMIC performs reset.		P10.9
17	POR_B_3P3	Reset	Power On reset output pin. Open drain output requiring external pull up resistor.		P10.7
18	PMIC_ON_REQ	Reset	PMIC ON input from Application processor. When high, the device starts power on sequence.		P10.5
19	PMIC_STBY_REQ	Reset	Standby mode input from Application processor. When high, device enters STANDBY mode.		P10.3
20	VCC_RTC	Power	Low power mode supply		
21	PWRBTN	Boot	Power button trigger		
22	ALT_BOOT	Boot	Alternate boot		
23	QSPI_BOOT_EN_3P3	Boot	SPI boot		P21.18
24	BAT_CE#	Charger	Charge Enable Active-Low Input. Connect CE to a high logic level to place the battery charger in standby mode.		

Pin	Code	Type	Details	Voltage	Misc
25	PD_VIN_EN		Enable VIN_5V/3V3 from PWR_SYS (TBD)		

Other side

Pin	Code	Type	Details	Voltage	Misc
50	RESERVED		No Connect		
49	GND	Power	Ground		
48	UART1_TXD	UART	P1.72 UART1 Tx		P20.9
47	UART1_RXD	UART	P1.19 UART1 Rx		P20.11
46	UART2_TXD	UART	UART2 Tx		P20.1
45	UART2_RXD	UART	UART2 Rx		P20.3
44	UART3_TXD	UART	P1.61 UART3 Tx		P20.2
43	UART3_RXD	UART	P1.21 UART3 Rx		P20.4
42	UART4_TXD	UART	UART4 Tx		P20.8
41	UART4_RXD	UART	UART4 Rx		P20.10
40	I2C SCL	I2C	P1.99 SYS SCL		P21.7
39	I2C SDA	I2C	P1.97 SYS SDA		P21.5
38	I2C3 SCL	I2C	Stem SCL		P21.2 ?
37	I2C3 SDA	I2C	Stem SDA		P21.4 ?
36	VCC_RTC	Power	Low power mode supply		
35	LDO_3V3	Power	Supply for SPI Flash. Current 50 mA	3.3V	
34	SPI_3V3	Power	Power to the flash chip. Bridge connects to VIN_3V3	3.3V	
33	SPI_CS	PD	Programming/External flash directly	3.3V	
32	SPI_CLK	PD	Programming/External flash directly	3.3V	
31	SPI_MISO	PD	Programming/External flash directly	3.3V	
30	SPI_MOSI	PD	Programming/External flash directly	3.3V	
29	VIN_3V3		Supply for TPS64988 circuitry and I/O. Current 50 mA	3.3V	

Pin	Code	Type	Details	Voltage	Misc
28	VIN_5V	Power	System 5V power source (PPHV1, PPHV2, PP1_CABLE, PP2_CABLE). 500 mA.	5V	
27	VIN_5V	Power	System 5V power source (PPHV1, PPHV2, PP1_CABLE, PP2_CABLE). 500 mA.	5V	
26	VSOM	Power	Main power for board 3.45V - 4.5V		Conn. detect

RPI FPC 22 pins

On the left(CSI1) side.

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	
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	

Pin	Code	Type	Details	Voltage
22	VCC	Power	3.3V Power Supply	

NVIDIA FPC 30 pins

On the right(CSI2) side.

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-	
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-	

Pin	Code	Details
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	
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

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

Sound connector 20 pins

There are two connectors that provide the same signals.

The Sensors on these expansion triggers interrupt via EX_OH_nINT (GPIO1_IO0).

Pin	Code	Function	Description
1	GND		
2	SAI5_MCLK	SAI5_MCLK	Master Clock

Pin	Code	Function	Description
3	SPK_BCLK	SAI5_TXC	I2S BCLK / SCK
4	SPK_LRCLK	SAI5_TXFS	I2S LRCLK
5	SPK_DATA0	SAI5_TXD0	I2S DATA
6	SPK_DATA1	SAI5_TXD1	I2S DATA
7	SPK_DATA2	SAI5_TXD2	I2S DATA
8	SPK_DATA3	SAI5_TXD3	I2S DATA
9	VIN	1V8 / 3V3	Power at signal level
10	3V3	3V3	Power
11	MIC_BCLK	SAI5_RXC	I2S BCLK / SCK
12	MIC_LRCLK	SAI5_RXFS	I2S LRCLK
13	MIC_DATA0	SAI5_RXD0	I2S DATA
14	MIC_DATA1	SAI5_RXD1	I2S DATA
15	MIC_DATA2	SAI5_RXD2	I2S DATA
16	MIC_DATA3	SAI5_RXD3	I2S DATA
17	SCL	I2C3_SCL	I2C
18	SDA	I2C3_SDA	I2C
19	GPIO1_IO0	EX_OH_nINT	Interrupt pin
20	GND	GND	Power

A future bigger/alternate connector would include:

- SCLK
- MISO
- MOSI
- ECSPI2_SS0
- CAN1_RX / CAN1_TX
- CAN2_RX / CAN2_TX
- PWM1..3
- VCC_RTC / Suspended Power
- 5 * GPIO

Soldering Pads

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

Pin	Function

Pin	Function
VSOM	Output or Input
VCC_RTC	Power input RTC battery
VIN_5V	T-USB System 5V
VIN_3V3	T-USB System 3.3V
PD_VIN_EN	T-USB pin PD_VIN_EN Breakout
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 and Other Expansion Slots

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