919 Smiley

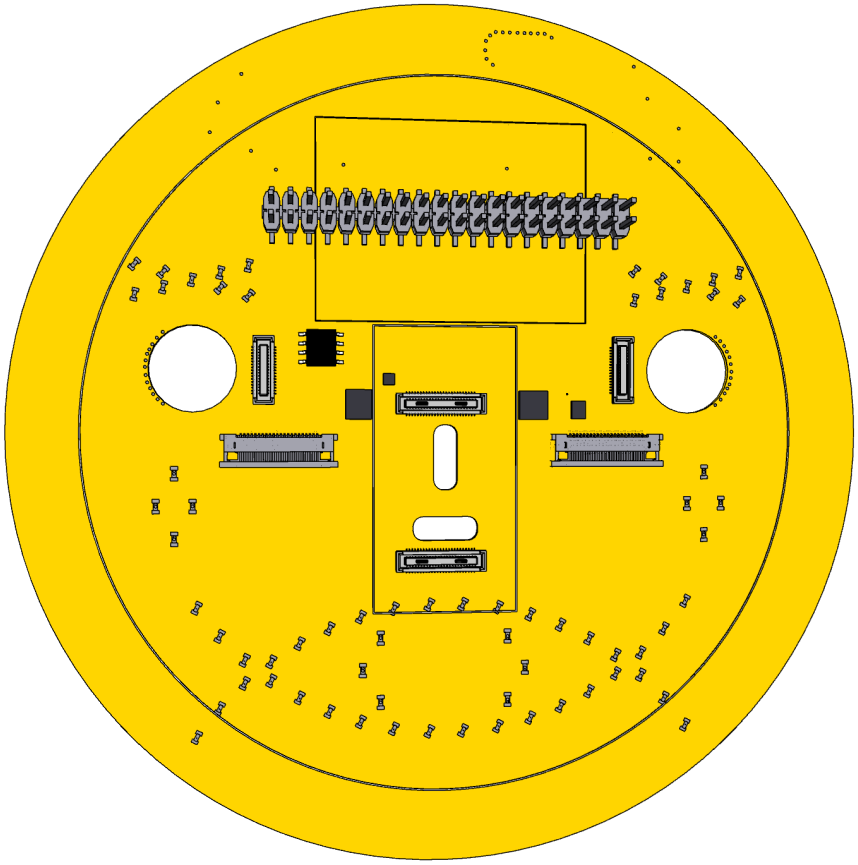
Face board used to face the user and bridge daughterboards.

It contains a Bosch Sensortech 32 bit RISC processor that monitors 3D movement using a gyroscope and accelerometer. It communicates with the Host MCU via the Stem I2C bus (I2C3 for the MCU daughterboard). It exposes system control signals via the SYS I2C GPIO Expander 0. Sensors on camera modules are available via Master 2 & 3. A second chip is optional BMM150 to provide a magnetometer to get richer movement data.

Connectors are present to support attachement of two camera modules.

A LED matrix driver controls 120 LEDs producing expressions on the front of the board. The LEDs are 1mm long and embedded in the board in order to create a diffused light.

To support using the 919 module without an attached power module terminals for a battery is supported that powers the always on part such as the Bosch Sensortech.



Components

- 1 * Bosch Sensortech BHI260AP - Mouser
- 1 * NOR Flash 8M QSPI IS25WP080D-JNLE ISSI SOIC-8 - Mouser
- 1 * IS31FL3730 8x8 matrix output
- 1 * PCA9555 I/O Expander HVQFN24 package
- 1 * TXB0108YZPR2 8-Bit Bidirectional Voltage-Level Shifter with Auto Direction Sensing and +/-15-kV ESD Protect 20-DSBGA -40 to 85 - Mouser

- ? * Kingbright APHHS1005SYCK 1mm x 0.5mm yellow
- Würth 150040YS73220 1mm x 0.5mm yellow

Connectors placed on the board are,

- 2 * Molex 22PIN 0.5mm pitch 54548-2271
- 2 * Hirose DF40C-34DS-0.4V (Mouser)
- 1 * TE Connectivity 45PIN 0.3MM 571-4-2328724-5 FPC 3-2328724-5 $0.41

Alt Components

- LP5036 36 LED driver - Mouser
- Optional BMM150 Magnotometer
- Bosch Sensortech BHI160B - Mouser
- Würth 710-150040RS73220 1mm x 0.5mm red
- Würth 710-150040VS73220 1mm x 0.5mm green
- Würth 150040YS73240 1mm x 0.5mm yellow
- Bivar SM0402YC 1mm x 0.5mm yellow
- Lumex SML-LX0402SYC-TR 1mm x 0.5m yellow
- ROHM SML-P12YTT86R 1mm x 0.6nn yellow

Articles

- Led PCB Circuit Board
- Uncovering PCB Embedded Components
- Practical steps for creating embedded components with side-emitting LEDs
- Efficient LED Blinking for Embedded Systems
- Embedding of Passive Components into Flex PCB
- LED module design considerations for an aluminium board
- Led Bar array with stm32f103 microcontroller
- APA102 2020 RGB LED source
- Novel control strategy for synchronous PWM on a matrix converter
- Adafruit 16x9 Charlieplexed PWM LED Matrix Driver - IS31FL3731
- https://community.bosch-sensortec.com/t5/MEMS-sensors-forum/BNO055-vs-BHI260AB-fusion-accuracy/td-p/24263

Camera connectors

Two sets of camera connectors are on the board for left and right sides respectively. The 22 pin connector allows a Development board to be connected with a Raspberry Pi Zero compatible flex cable. The 34 pin connector allows attachment of a 201 Camera Module made for it. Signals will be transferred directly between the two connectors using voltage shifters

The power supplied to the 34 pins connector can be driven by the 22 pin connector or the T-USB Power Module. These are down-regulated to 3V3, 2V8 and 1V8 from 3.7V - 5V. This downregulation can be shared between Left and Right.

The 1.8V driving the Sensor I/O of the 201 modules

Power

The board can be powered by 1.8V via a directly attached battery which is down regulated. The self power input will power the Motion Engine and camera sensors with 1.8V. This can be used to run the board in an always on mode

that records movement while disconnected.

When the Power module is connected it supplies VSOM which powers the MotionEngine, LED Matrix driver and camera modules. VSOM is down regulated from around 4V to 1V8, 2V8 and 3V3.

Voltage pins are

- Self powered 2V+ input
- Always on 1V8 output
- Powered 1V8 output
- Powered 3V3 output
- VSOM output

Is it possible to support both 5V in and out on the GPIO pins? 5V input would be downregulated to 4V if power module isn't connected. 5V output would be upregulated VSOM.

T-USB Power connectors

The T-USB power module is connected using two 50 pin connectors.

The connectors have detection pins that triggers the power over VSOM. Power must only be drawn from the power module when the connectors are fully inserted.

Physical Connection Establishment

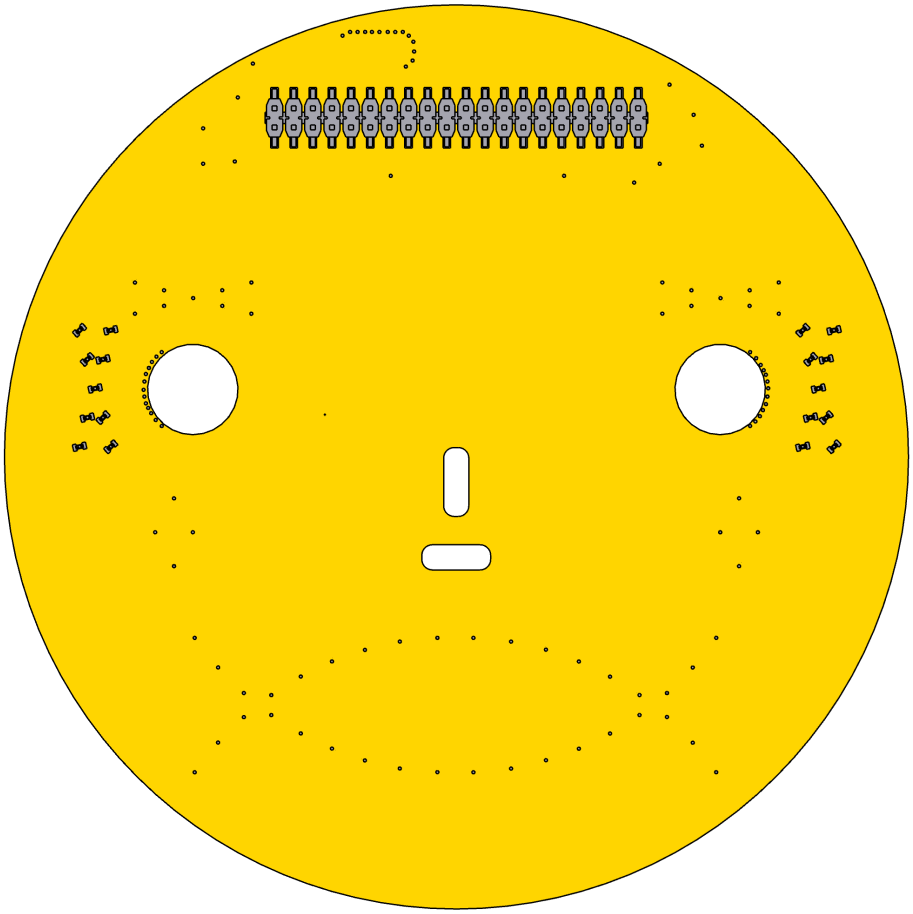
When connecting the T-USB module to the Bridge Board VSOM must be supplied only when the module is fully inserted. This is done by responding to pins on both connectors being shorted by the bridge board side.

- Delayed VSOM enable
- Power down button / physical detect
- CONN_EN pins are powered when the connectors are fully inserted
- Only denable when all CONN_EN get signal
- When detaching a lock is pressed to detach all modules

LED layout

LEDs are laid out as eyebrows and a mouth. They are connected to the multiplexer as 7 sets of 9 LEDs (7x9 mode).

1. Brow x 2
2. Eye sides x 2 (reverse of brow signal)
3. Smile x 2
4. Sad x 2 (reverse of smile signal)
5. Cheeks, split 4 left 4 right.
6. O x 6 (reverse of cheeks)



Numbering of individual LEDs are from top-left to right. The eyebrow sets are doubled up with the eye side using reverse polarity. The eye sides get signals from VIAs close to the eye hole.

The smile if formed by a left side and a right. LED numbering starts in the middle. A sad smile uses the same multiplexer banks but with reverse polarity.

LEDs are marked with identifiers on the connector side, but not on the front side.

LED Matrix driver

The LEDs are controlled via a IS31FL3730 chip connected to SOM via I2C3 and MotionEngine via Host I2C. Vias around nose and hair

It can be driven by 2.7V - 5.5V I/O can be up to Vcc+0.3V

I2C3 breakout Power breakout

Connecting IS31FL3730 on I2C3

I2C3 on sound connector?

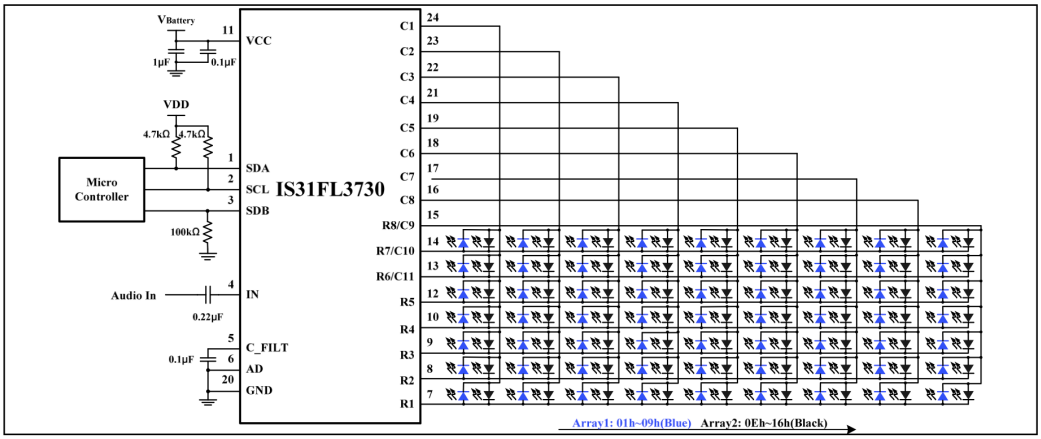


Figure 2 Typical Application Circuit Dual 7×9

LED mounting

Most LEDs are mounted by embedding them into the board. The PCB being 1mm thick a recess is made to fit the LED of 0.4mm. In the center a 0.4mm hole is drilled to let through light.

MotionEngine I2C Sensor

The BOSCH sensor includes an embedded processor communicating via I2C. It boots from a 1MB flash chip. It runs and communicates on is 1.8V.

https://www.mouser.ch/ProductDetail/Bosch-Sensortec/BHI260AP?qs=T94vaHKWudTEPTnGI%252BTy9w%3D%3D

BHI260AB I2C modes support 3.4 Mbit/s. Put on SYS or 3 ? HSCX + HSDX. i.MX 8 can only do 400KHz.

Power comes from any of the SOM lines via the two 50 pins connectors. Isolate them and down regulate to 3.3V.

Host I2C is I2C3 on the CPU side. Master I2C 2 is I2C6 on the CPU side, Right CAM CSI2 SCCB & Ambient Light. Master I2C 3 is I2C5 on the CPU side, Left CAM CSI1 SCCB & Laser Scan. Master is is free for SPI communication.

Sensor linux driver source - https://github.com/BoschSensortec/BHY2-Sensor-API

? Event interrupts vs GPIO ? Timers ? Aux IMU I2C

Pin	Pad		to
1	M3SDA	Left CSI1 I2C SDA	SOM I2C5
2	M3SCL	Left CSI1 I2C SCL	SOM I2C5
3	HOSTBOOT	System Control	EX0
4	QSPI_D0	Flash	Flash chip
5	QSPI_CLK	Flash	Flash chip
6	VREG	Supply	1.8V
7	VDDIO	Supply	1.8V ?
8	QSPI_D3	Flash	Flash chip
9	RESETN	System Control	EX0.
10	HIRQ	Host I2C IRQ	SOM I2C3 / EX0

Pin	Pad		to
11	HSDX	Host I2C SDA	SOM I2C3
12	VDDIO	Supply	
13	M2SCX	Right CSI2 I2C SCL	SOM I2C6
14	QSPI_CSN	Flash	Flash chip
15	QSPI_D1	Flash	Flash chip
16	MCSB3	GPIO / Chip Select 3	Breakout
17	GND	Supply	
18	MCSB2	GPIO / Chip Select 2	Breakout
19	MCSB4	GPIO / Chip Select 4	Breakout
20	QSPI_D2	Flash	Flash chip
21	OCSB	IMU Auxiliary	BMM150
22	ASCX	IMU Auxiliary	BMM150
23	JTAG_CLK	Debug	Breakout
24	JTAG_DIO	Debug	Breakout
29	M1SCX	Master 1 I2C SCL	Breakout
30	ASDX	IMU Auxiliary	BMM150
32	HDSO	I2C Address selector	LOW
33	HSCX	Host I2C SCL	SOM I2C3
37	M2SDI	GPIO	M2SDI
38	MCSB1	GPIO / Chip Select 1	Breakout
39	ASCX	IMU Auxiliary	BMM150
43	M1SDI	GPIO SPI Master 1	Breakout
44	M1SDX	Master 1 I2C SDA	Breakout

Address

HSDO is LSB selecting 0x28 or 0x29 = LOW by default (can be overridden)

QSPI Flash

Pads are reserved on the board for a 1MByte flash chip connected vis QSPI

- CLK
- CSN
- D0..D3

It supports,

- Quad SPI / QPI modes

- 0.5 - 8 MBytes supported

I assume the voltage is 1.8V. Winbond is apparently a tested example.

I/O Expander 0

Expander #0 combines control signals.

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	
EX0.3	CTL_INT_1
EX0.4	CTL_INT_2 / IMU_IRQ
EX0.5	CTL_RESET / IMU_RESETN
EX0.6	IMU_MODE
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

Front facing GPIO header

The GPIO header is made to be compatible with RPi expansion hardware. It has fewer GND pins which are mapped to GPIO or receiving pins.

Features:

- Spare GPIOs
- SPI Image Boot
- Power 5V / 3V3 / 1V8 / RTC
- SPI / SAI7 I2S Out
- Stem and System I2C
- UART1 / UART3

- PWM1..3

Left side	Function	Pin	Pin	Function	Right side
	3V3	1	2	5V	
I2C3_SDA / GPIO5_IO19	SDA 3	3	4	5V	
I2C3_SCL / GPIO5_IO18	SCL 3	5	6	GND	
ETH0_MDI2P / SAI7_TX_SYNC	SAI7 SYNC	7	8	TxD	UART1 TxD / GPIO5_IO23
	GND	9	10	RxD	UART1 RxD / GPIO5_IO22
EX_OH_nINT / GPIO1_IO0	GPIO1_IO0	11	12	GPIO1_IO1	GPIO1_01 / EX_T_nINT
EX0_nINT / GPIO4_IO19	GPIO4_IO19	13	14	GPIO2_IO19	
	GPIO2_IO8	15	16	GPIO4_IO16	
Powering suspended	VCC_RTC	17	18	GPIO4_IO17	
ECSPI2_MOSI / GPIO5_IO11	MOSI	19	20	GND	
ECSPI2_MISO / GPIO5_IO12	MISO	21	22	GPIO1_IO19	TD2
ECSPI2_MOSI / GPIO5_IO10	SCLK	23	24	SPI CE0	ECSPI2_SS0 / GPIO5_IO13
	GPIO2_IO9	25	26	QSPI BOOT	QSPI_BOOT_EN_3P3
SYS I2C	SYS SDA	27	28	SYS SCL	SYS I2C
UART3_TXD / GPIO5_IO27	UART3_TXD	29	30	GPIO5_IO26	UART3_RXD / GPIO5_IO26
GPIO5_IO4	PWM2	31	32	PWM3	GPIO5_IO3
GPIO5_IO5	PWM1	33	34	CAN1_RX	GPIO4_IO25 (RPi GND)
UART2_RXD / GPIO5_IO24	GPIO5_IO24	35	36	CAN1_TX	GPIO4_IO22
UART2_TXD / GPIO5_IO25	GPIO5_IO25	37	38	CAN2_RX	GPIO4_IO27
	GND	39	40	CAN2_TX	GPIO4_IO26

Back facing GPIO header

Left side	Function	Pin	Pin	Function	Right side
	3V3	1	2	VSOM	VSOM when fully connected
I2C3_SDA / GPIO5_IO19	SDA 3	3	4	VSOM	VSOM when fully connected
I2C3_SCL / GPIO5_IO18	SCL 3	5	6	GND	
IMU Host SDA / MOSI	HSDX	7	8	JTAG_CLK	IMU JTAG
	GND	9	10	JTAG_DIO	IMU JTAG
IMU Host SCL / SCK	HSCX	11	12	SWD_CLK	PD SWD
IMU nINT	GPIO4_IO19	13	14	SWD_DAT	PD SWD
IMU Host MISO / ADR0	HSDO	15	16	HCSB	IMU Select I2C / SPI

Left side	Function	Pin	Pin	Function	Right side
Powering suspended	VCC_RTC	17	18	GPIO4_IO17	
IMU M1SDX	MOSI	19	20	GND	
IMU M1SDI	MISO	21	22	GPIO	IMU MCSB2
IMU M1SCK	SCLK	23	24	SPI CE0	IMU MCSB1
	GPIO2_IO9	25	26	GPIO	IMU MCSB3
SYS I2C	SYS SDA	27	28	SYS SCL	SYS I2C
		29	30	GPIO5_IO26	IMU MCSB4
LED IN	LED_AUDIO	31	32		GPIO5_IO3
LED C_FILT	LED_FILTER	33	34		
T-USB 50 pins LDO	BAT_LDO	35	36		GPIO4_IO22
T-USB 50 pins	LDO_3V3	37	38		
T-USB 50 pins	SPI_3V3	39	40		

8 available GPIO pins

3D Model libraries

https://kicad.github.io/packages3d/

Wiring

Signal	801 T-USB	BHI260AB	IS31FL3730	SOM / MCU	PCA9555	CAM connectors	Breakout
I2C3 SDA		Host IF	I2C3 SDA	I2C3 SDA			
I2C3 SCL		Host IF	I2C3 SCL	I2C3 SCL			
SYS SDA				SYS SDA	SDA 3V3		
SYS SCL				SYS SCL	SCL 3V3		
I2C5 SDA		Master 3		I2C5 SDA		Left SCCB	
I2C5 SCL		Master 3		I2C5 SCL		Left SCCB	
I2C6 SDA		Master 2 SDX		I2C6 SDA		Right SCCB	

Signal	801 T-USB	BHI260AB	IS31FL3730	SOM / MCU	PCA9555	CAM connectors	Breakout
I2C6 SCL		Master 2 SCX		I2C6 SCL		Right SCCB	
SPI SCK		M1SCK					SPI SCK
SPI MOSI		M1SDX					SPI MOSI
SPI MISO		M1SDI					SPI MISO
EX0_nINT					nINT		
EX0.2							
EX0.3							
EX0.4		BN_H_INTN				IMU_IRQ	
EX0.5		RESETN				IMU_RESETN	
EX0.6		HOSTBOOT				IMU_MODE	
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	
		JTAG_CLK					JTAG_CLK
		JTAG_DIO					JTAG_DIO
			IN				LED_AUDIO
			C_FILT				LED_FILTER
		MCSB1					GPIO
		MCSB2					GPIO
		MCSB3					GPIO
		MCSB4					GPIO
		M1SCX					M1SCX
		M1SDX					M1SDX

Signal	801 T-USB	BHI260AB	IS31FL3730	SOM / MCU	PCA9555	CAM connectors	Breakout
		M1SDI					M1SDI
Signal Level			3.3V		3.3V		
Standalone 1V8		Consumes				VCC_1V8	
VCC_SOM	Supplies		Consumes				VCC_SOM
Powered 3V3						AF_VDD	
Powered 1V8		Consumes				DOVDD + VCC_1V8	
Powered 2V8						AVDD_2V8	

919 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	
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	

No.	Pin	Description	Voltage
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)	
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	

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
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

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	2.7 A	9
GND	2.7 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 SoM

- 5 * GND
- 6 * VSOM

One side

Pin	Code	Type	Details	Voltage
1	CONN_EN	Enable	Signal + / GND to inform the T-USB board of being connected	
2	USB1_RX_DP	USB	USB1 RX D+	
3	USB1_RX_DN	USB	USB1 RX D-	
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

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+	
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				
33	VSOM	Power	Main power for board 3.45V - 4.5V	
32				
31				
30	BAT_LDO	Battery	4.9V 50mA LDO for STAT LED	
28				
27				
26	CONN_EN	Enable	Signal + / GND to inform the T-USB board of being connected	

Could also be HDMI or PCIe

Connector 2 PD controller, away from SoM

- 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

Pin	Code	Type	Details	Voltage	Misc
1	CONN_EN	Enable	Signal + / GND to inform the T-USB board of being connected		
2	GND	Power	Ground		
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	VSOM	Power	Main power for board 3.45V - 4.5V		
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	Power	Main power for board 3.45V - 4.5V		
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.		
25	PD_VIN_EN		Enable VIN_5V/3V3 from PWR_SYS (TBD)		

Other side

Pin	Code	Type	Details	Voltage	Misc
50	VSOM	Power	Main power for board 3.45V - 4.5V		
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	
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	CONN_EN	Enable	Signal + / GND to inform the T-USB board of being connected		

RPI FPC 22 pins

Pin	Code	Type	Details	Voltage
1	GND	Power	Ground	

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

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	
19	CSI_RX_CLKP	Camera	MIPI_CSI_RX_CLK+	1.8V
18	CSI_RX_CLKN	Camera	MIPI_CSI_RX_CLK-	1.8V