



Core-1688JD4

| 16T算力AI核心板

V1.0 2024-12-9

天启智能科技



产品特点 Product features



32T INT4 / 16T INT8 算力

SOPHON AI 处理器 BM1688
32T@INT4峰值算力、16T@INT8峰值算力、
4T@FP16/BF16算力、0.5T@FP32算力



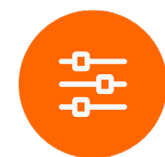
强大的ISP图像处理性能

支持 6 路 sensor 输入视频，支持宽动态、
阴影校正、镜头畸变校正、紫边校正、
Bayer 降噪、3D 降噪、3A、去雾、动态对
比度增强等图像处理功能



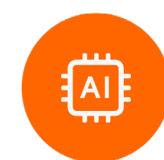
支持大型语言模型的私有化部署

支持 Transformer 架构下超大规模参数模
型的私有化部署，如Gemma-2B、
LlaMa2-7B、Qwen1.5-1.8B等大型语言模
型。支持Docker容器化管理技术



丰富的扩展接口

拥有MIPI-CSI、MIPI-DSI、HDMI2.0、
PCIe3.0、SATA3.0、USB3.0、USB2.0、
SDIO、I2C、I2S、SPI、UART、CAN、
PWM、ADC、GPIO等扩展接口



多路视频AI处理性能

16路H.265/H.264 1080P@30fps视频解码
10路H.265/H.264 1080P@30fps视频编码
1080P@480fps JPEG 编解码



强大的网络通讯能力

核心板已板载以太网PHY芯片，可通过MDI
接口引出2路千兆以太网，可通过SDIO接口
扩展 WiFi/蓝牙，可通过USB3.0/USB2.0扩
展 5G/4G无线网



支持多种深度学习框架

支持CNN、RNN、LSTM等传统网络架构
支持多种深度学习框架，如TensorFlow、
PyTorch、PaddlePaddle、ONNX、Caffe
等，并支持自定义算子开发



广泛的应用场景

高效适配市场上所有AI算法，广泛应用于：
智算服务器、边缘智算盒、工控机、专业智
能网络摄像机、AIOT 等类型产品，为各行
业进行 AI 赋能

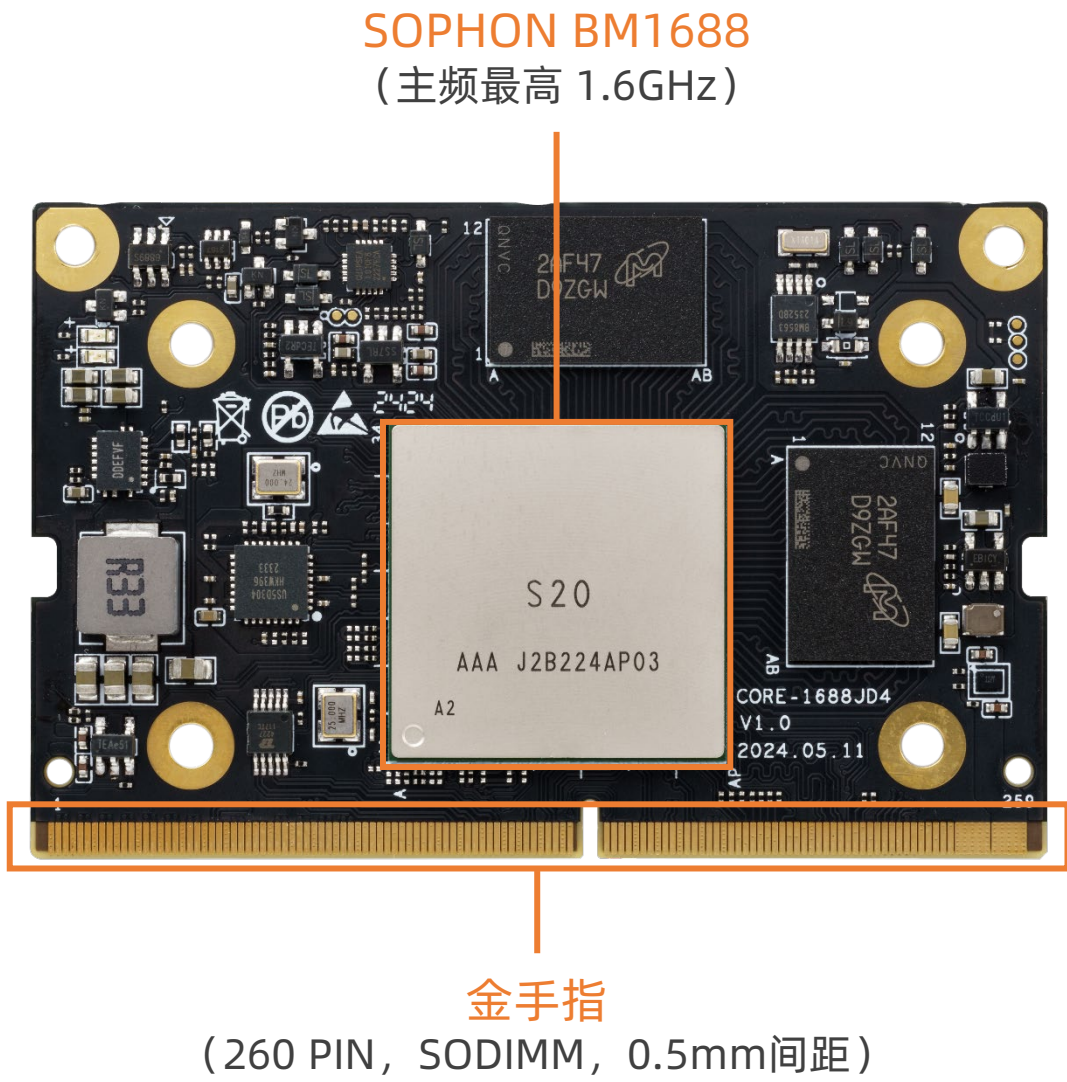
规格参数 Specifications



规格参数		
基本参数	SOC	SOPHON BM1688
	CPU	八核64位 ARM Cortex-A53 @ 1.6GHz
	TPU	内建 SOPHGO 神经网络加速引擎 TPU，32T@INT4峰值算力、16T@INT8峰值算力、4T@FP16/BF16算力、0.5T@FP32算力
	ISP	支持分时复用处理至多 6 路 sensor 输入视频，支持最大的宽度为 4608 (non-tile mode) 及 8192 (tile mode) 支持 Sensor 自带宽动态和 2 帧宽动态，最大性能支持：12M@30 HDR 或 8K@15 SDR 或 16M@30 SDR 支持 RGB-IR、AI ISP接口、3A（AE/AWB/AF，3A 的控制用户可调节） 支持固定模式噪声消除、坏点校正、阴影校正、镜头畸变校正、紫边校正、Bayer 降噪、3D 去噪、图像边缘增强、去雾、动态对比度增强、图像视频 Mirror、Flip 等功能
	编解码	视频解码：H.265/H.264 解码（最大性能：1920×1080@480fps 或 8192×4320@30fps） 视频编码：H.265/H.264 编码（最大性能：1920×1080@300fps 或 8192×4320@15fps） 图片编解码：支持 JPEG/MJPEG Baseline 编解码（JPEG 编解码能力：480张/秒@1080P，最大分辨率为32768×32768）
	内存	8GB LPDDR4（4GB/8GB/16GB 可选）
	存储	32GB eMMC（32GB/64GB/128GB/256GB 可选）
	系统	Linux OS（Ubuntu）
	软件支持	· 支持Transformer架构下超大规模参数模型的私有化部署，如Gemma-2B、LlaMa2-7B、ChatGLM3-6B、Qwen1.5-1.8B等大型语言模型 · 支持CNN、RNN、LSTM等传统网络架构，支持多种深度学习框架，包括TensorFlow、Pytorch、PaddlePaddle、Caffe和ONNX · 支持自定义算子开发 · 支持Docker容器化管理技术
	电源	5V（电源误差 ± 5%）
	功耗	典型功耗：6.5W (5V/1300mA)，最大功耗：20W (5V/4000mA)
	接口	金手指（260 PIN，SODIMM，0.5mm间距）
	尺寸	69.6mm × 45.0mm
	环境	工作温度：-20℃ ~ 60℃ 存储温度：-20℃ ~ 70℃ 存储湿度：10% ~ 90%RH（无凝露）
接口参数	网络	2 × 千兆以太网（提供MDI接口引出，核心板已板载以太网PHY芯片），可通过SDIO接口扩展 WiFi6/蓝牙5.2，可通过USB3.0/USB2.0扩展5G/4G
	视频输入	最大支持 6 路视频输入，包括 1 路 8L、两路 8L+4L、三路 4L、六路 2L 等多种组合，支持最大分辨率为 8192×3840 支持MIPI-CSI/subLVDS/HiSPI 支持TTL (RAW8/RAW10/RAW12/RAW16)，最大分辨率为 1920×1080 支持BT (BT.601/ BT.656/ BT.1120)，最大分辨率为 1920×1080 支持 SONY、OnSemi、OmniVision 等高清 CMOS sensor 支持高动态范围（最高2 frame HDR）输入、主流 CMOS 电平热成像传感器
	视频输出	1 × HDMI2.0（最大输出能力 4K(4096×2160)@60fps） 1 × MIPI-DSI（2.5G bps/lane，最多 4 lanes，最大输出能力 1440P(2560×1440)@60fps） 1 × LVDS（Bit Rate: 1.6G bps/lane, 最多 1 link，最大输出能力 720P(1280×720) @60fps）
	音频	集成 Audio CODEC, 支持 16-bit 音源/语音 输入和输出 支持两路双声道麦克风输入、支持两路双声道麦克风输出（需要外挂功放才能推动喇叭） 支持以 I2S/PCM/TDM 接口连接外部 Audio CODEC, I2S 模式最高支持 4 声道立体声输入 内建 Audio PLL 支持 MCLK 输出
	SATA/PCIe	2 × PCIe3.0/SATA3.0高速接口： 1) 可配置为 2-Lane PCIe3.0 RC/EP + 2-Lane PCIe3.0 RC/EP 2) 可配置为 2-Lane PCIe3.0 RC/EP + 2 × SATA Gen3
	USB	2 × USB3.0/USB2.0 Host/Device
	SDIO	2 × SD3.0/SDIO3.0（支持 1-bit/4-bit 模式）
	I2C	11 × I2C (1 no die domain)
	UART	9 × UART (1 no die domain)
	CAN	2 × CAN 2.0（支持 CAN2.0 A/B ISO11898、CAN FD 1.1）
	PWM	20 × PWM（支持最高 50MHz (100MHz/2) 输出，最低约 0.093Hz (100MHz/(2^30-1)))
	ADC	5 个 单端 ADC (2 no die domain)
	其他接口	4 × SPI、3 × I2S、209 × GPIO（17 no die domain）、IR

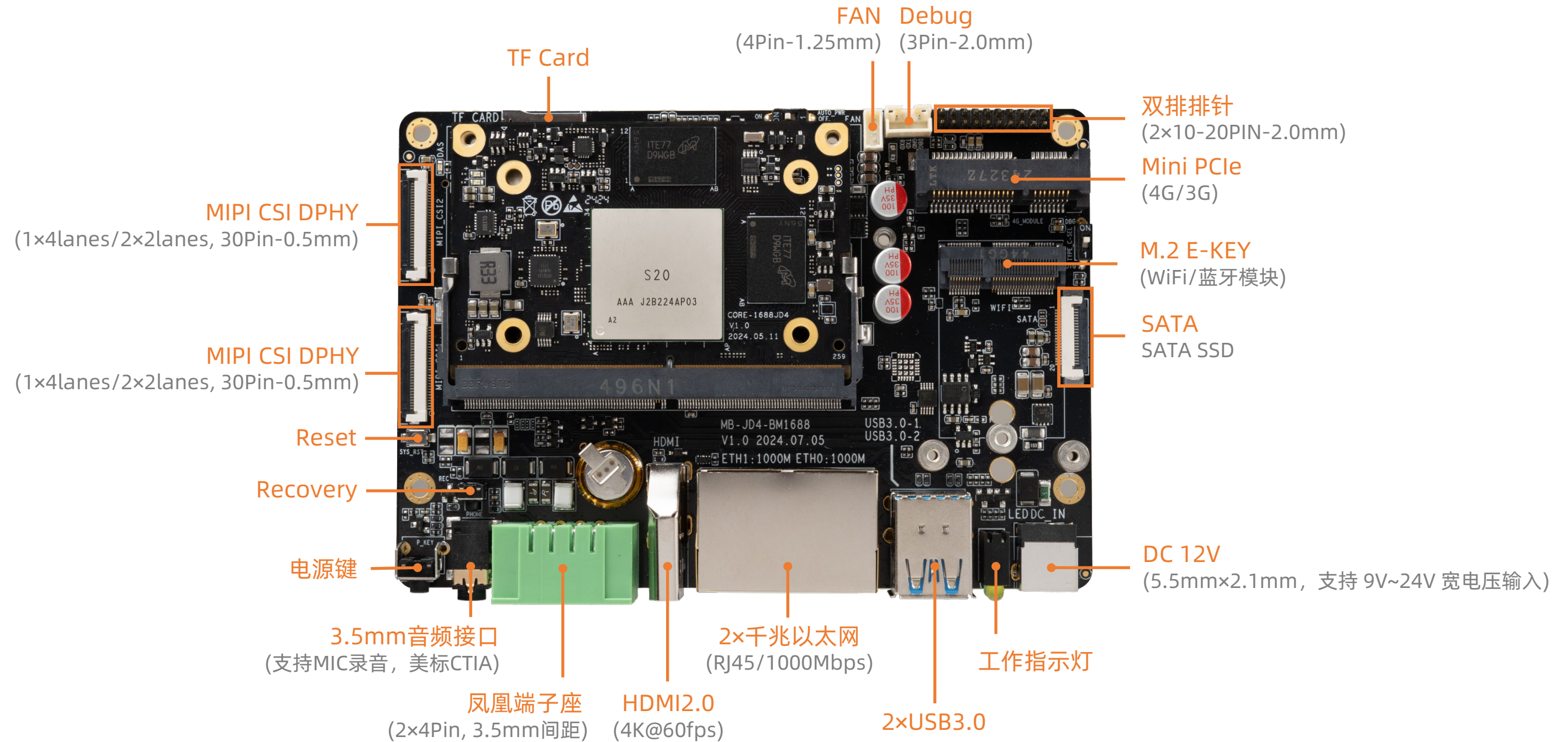


核心板接口描述 Core board Interface description



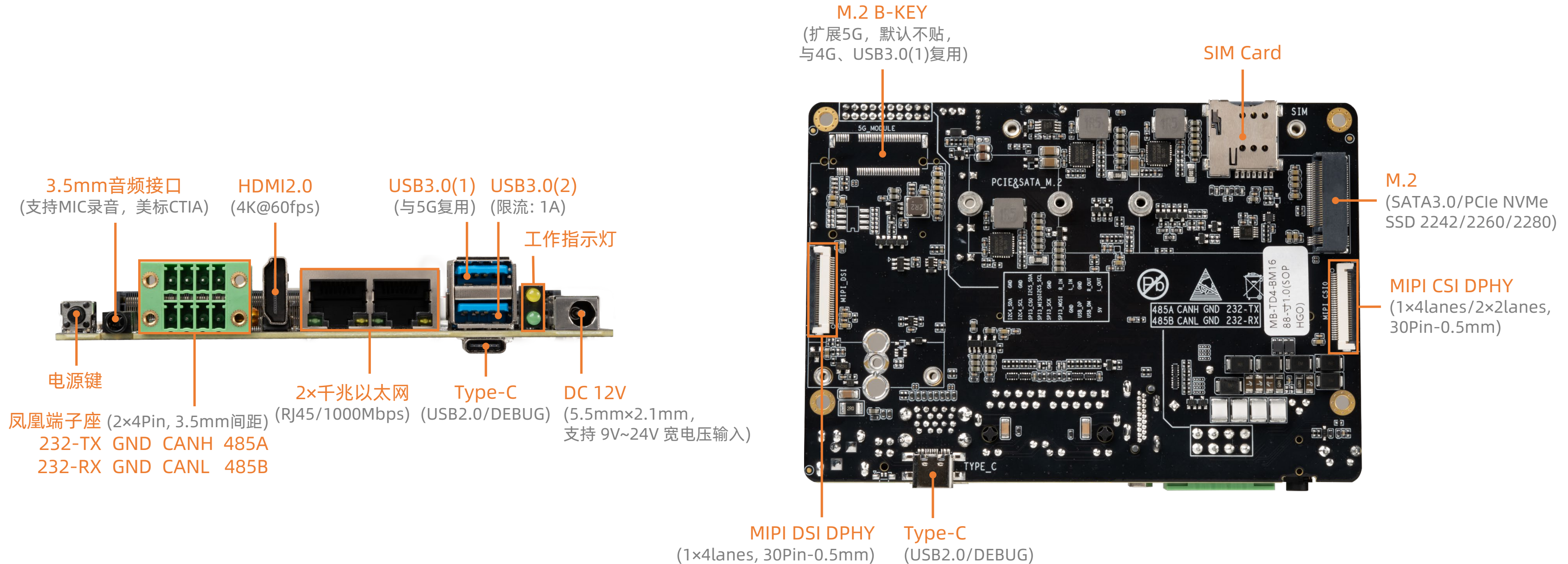


主板接口描述 Mainboard Interface description

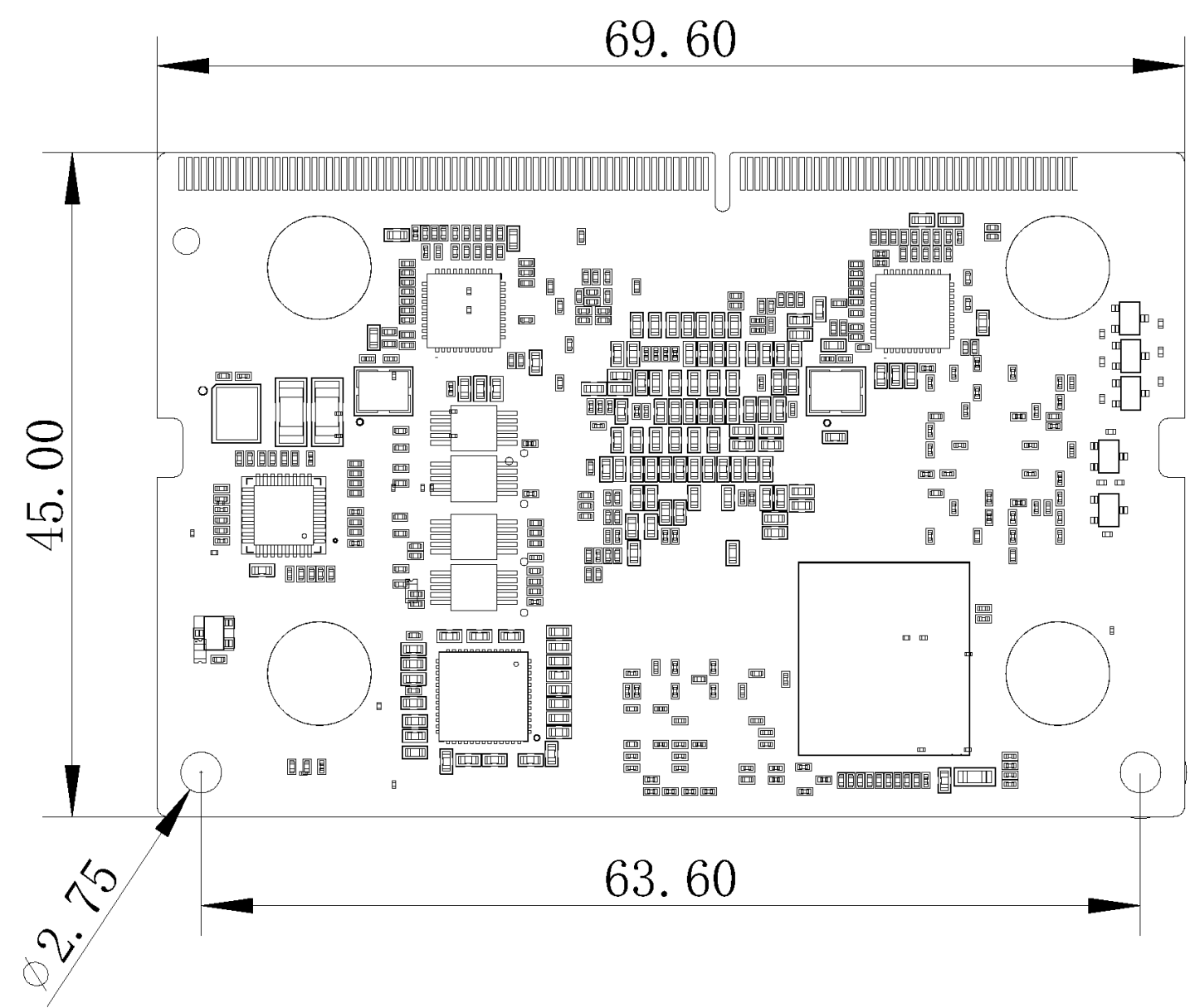




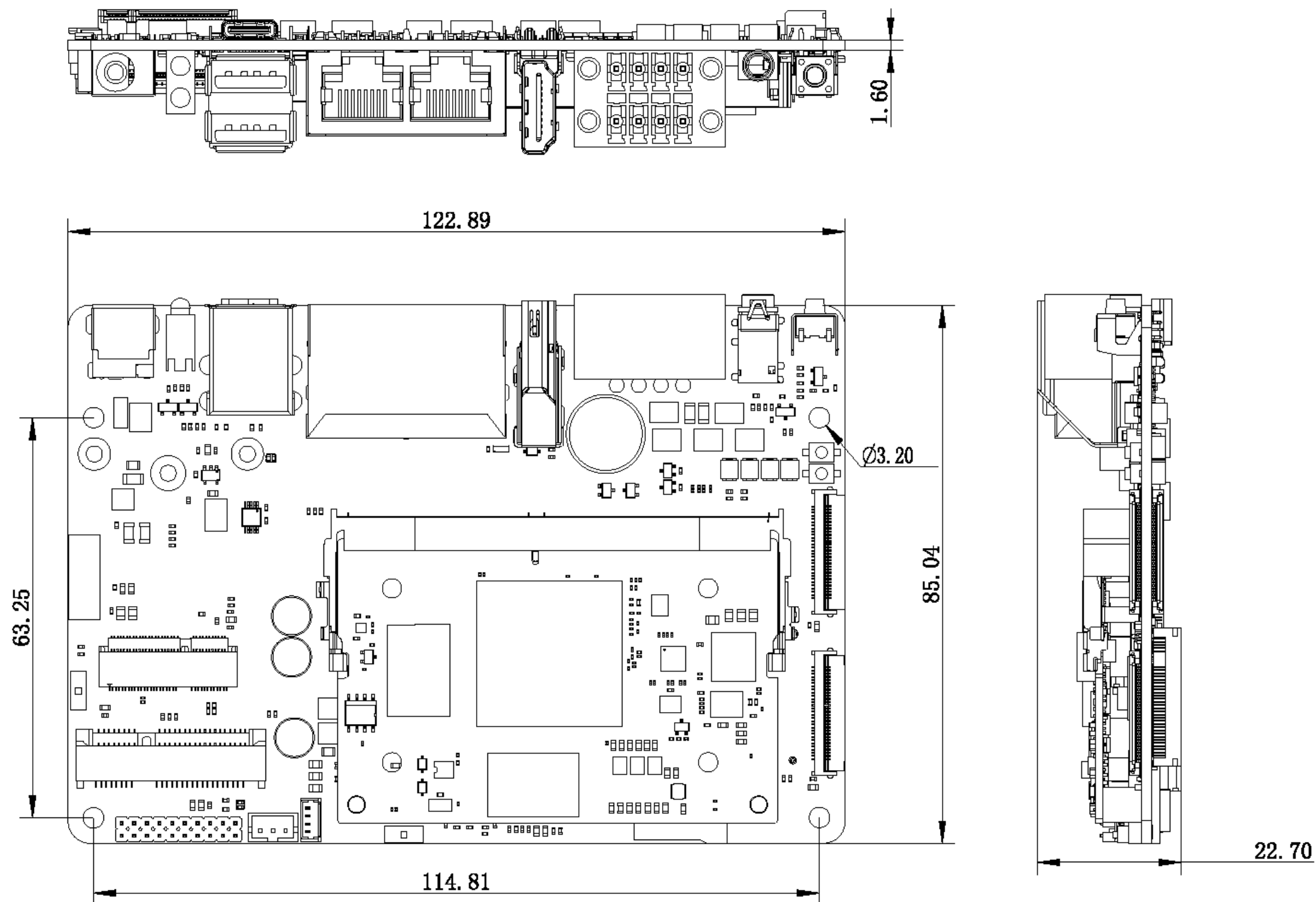
主板接口描述 Mainboard Interface description



核心板尺寸 Core board Dimension



主板尺寸 Mainboard Dimension





接口定义 Interface definition

① : Pad types: I = input, O = output, I/O = input/output (bidirectional) , G= Ground ,
P = power supply , DOWN = Internal pull down , UP = Internal pull UP L = Lowe Level H = High level"

PIN	CORE-1688JD4 pin definition	BM1688 Pin NO.	Pad type	IO Power domain	IO Pull	Function for Main BOARD (MB-JD4-BM1688)	Defual function description
1	GND		G			GND	GND
3	MIPI_CSI_3N / VI2_D[3] / VI1_D[12] / GPIO145 / DEBUG_7 / VI0_D[20] / IIC1_SCL	B34	I/O	-		CSI1_D0_N	CSI1_D0_N
5	MIPI_CSI_3P / VI2_D[2] / VI1_D[13] / GPIO144 / DEBUG_6 / VI0_D[19] / IIC1_SDA	B33	I/O	-		CSI1_D0_P	CSI1_D0_P
7	GND		G			GND	GND
9	MIPI_CSI_5N / VI2_D[7] / VI1_D[8] / GPIO149 / DEBUG_11 / VI0_D[24] / CAM_MCLK1	A31	I/O	-		CSI1_CLK_N	CSI1_CLK_N
11	MIPI_CSI_5P / VI2_D[6] / VI1_D[9] / GPIO148 / DEBUG_10 / VI0_D[23] / CAM_MCLK0	B31	I/O	-		CSI1_CLK_P	CSI1_CLK_P
13	GND		G			GND	GND
15	MIPI_CSI_4N / VI2_D[5] / VI1_D[10] / GPIO147 / DEBUG_9 / VI0_D[22]	A32	I/O	-		CSI1_D1_N	CSI1_D1_N
17	MIPI_CSI_4P / VI2_D[4] / VI1_D[11] / GPIO146 / DEBUG_8 / VI0_D[21]	B32	I/O	-		CSI1_D1_P	CSI1_D1_P
19	GND		G			GND	GND
21	MIPI_CSI_9N / VI1_D[3] / GPIO157 / DEBUG_19 / VI0_D[12] / IIC2_SCL	C29	I/O	-		CSI3_D0_N	CSI3_D0_N
23	MIPI_CSI_9P / VI1_D[2] / GPIO156 / DEBUG_18 / VI0_D[13] / IIC2_SDA	D29	I/O	-		CSI3_D0_P	CSI3_D0_P
25	GND		G			GND	GND
27	MIPI_CSI_11N / VI1_D[7] / GPIO161 / DEBUG_23 / VI0_D[8] / CAM_MCLK1 / CAM_VS1	C28	I/O	-		CSI3_CLK_N	CSI3_CLK_N
29	MIPI_CSI_11P / VI1_D[6] / GPIO160 / DEBUG_22 / VI0_D[9] / CAM_MCLK0 / CAM_HS1	D28	I/O	-		CSI3_CLK_P	CSI3_CLK_P
31	GND		G			GND	GND
33	MIPI_CSI_10N / VI1_D[5] / GPIO158 / DEBUG_21 / VI0_D[10] / IIC4_SCL / CAM_VS0	A28	I/O	-		CSI3_D1_N	CSI3_D1_N
35	MIPI_CSI_10P / VI1_D[4] / GPIO158 / DEBUG_20 / VI0_D[11] / IIC4_SDA / CAM_HS0	B28	I/O	-		CSI3_D1_P	CSI3_D1_P
37	GND		G			GND	GND



39	USB1_RX0M	A23		-		USBSS1_RX_N	USBSS1_RX_N
41	USB1_RX0P	B23		-		USBSS1_RX_P	USBSS1_RX_P
43	GND		G			GND	GND
45	USB1_TX0M	B22		-		USBSS1_TX_N	USBSS1_TX_N
47	USB1_TX0P	C22		-		USBSS1_TX_P	USBSS1_TX_P
49	GND		G			GND	GND
51	MIPI_CSI_15N / GPIO169 / DEBUG_31 / VIO_D[3]	C26	I/O	-		CSI5_D0_N	CSI5_D0_N
53	MIPI_CSI_15P / GPIO168 / DEBUG_30 / VIO_D[2]	D26	I/O	-		CSI5_D0_P	CSI5_D0_P
55	GND		G			GND	GND
57	I2S0_SDI1 / PWM3 / GPIO3 / UART6_RX / SPI0_SCK / KEY_ROW3 / CAM_VS1	AK6	I/O	1.8V		NC	GPIO3 (NC)
59	MIPI_DSI0_N1 / VO0_D17 / CAM_MCLK3 / GPIO177 / I2C6_SCL / VO1_D17	B9	I/O	1.8V		GPIO177	GPIO177
61	GND		G			GND	GND
63	HDMI_N2	AP2	O	-		HDMI_TX2N	HDMI_TX2N
65	HDMI_P2	AP3	O	-		HDMI_TX2P	HDMI_TX2P
67	GND		G			GND	GND
69	HDMI_N1	AN1	O	-		HDMI_TX2N	HDMI_TX2N
71	HDMI_P1	AN2	O	-		HDMI_TX2P	HDMI_TX2P
73	GND		G			GND	GND
75	HDMI_N0	AM1	O	-		HDMI_TX0N	HDMI_TX0N
77	HDMI_P0	AM2	O	-		HDMI_TX0P	HDMI_TX0P
79	GND		G			GND	GND
81	HDMI_CLKN	AL1	O	-		HDMI_TXCN	HDMI_TXCN



83	HDMI_CLKP	AL2	O	-		HDMI_TXCP	HDMI_TXCP
85	GND		G			GND	GND
87	PWR_GPIO11	F28	I/O	1.8V		PWR_GPIO11	PWR_GPIO11
89	IIC5_SDA / KEY_ROW2 / TC906_JTAG0_TRST_X / GPIO103 / UART6_TX / SPI3_SDO	L6	I/O	1.8V		SPI3_MOSI	SPI3_MOSI
91	IIC5_SCL / KEY_ROW3 / TC906_JTAG0_SRST_X / GPIO104 / UART6_RX / SPI3_SCK	M6	I/O	1.8V		SPI3_SCK	SPI3_SCK
93	IIC4_SCL / KEY_ROW1 / TC906_JTAG0_TMS / GPIO102 / UART5_RX / SPI3_SDI	K6	I/O	1.8V		SPI3_MISO	SPI3_MISO
95	IIC4_SDA / KEY_ROW0 / TC906_JTAG0_TCK / GPIO101 / UART5_TX / SPI3_CS_X	K5	I/O	1.8V		SPI3_CS0	SPI3_CS0
97	PWR_GPIO4	F17	I/O	1.8V		SPI3_CS1	SPI3_CS1
99	UART4_TX / SD2_1_CLK / GPIO91 / UART1_RTS / SPI3_SCK / IIC8_SDA / KEY_ROW0	R6	I/O	1.8V		UART4_TXD	UART4_TXD
101	UART4_RX / SD2_1_CMD / GPIO92 / UART1_CTS / SPI3_SDO / IIC8_SCL / KEY_ROW1	M5	I/O	1.8V		UART4_RXD	UART4_RXD
103	UART4_RTS / GPIO93 / UART3_RTS / SPI3_SDI / IIC9_SDA / KEY_ROW2	V6	I/O	1.8V		UART4_RTS	UART4_RTS
105	UART4_CTS / GPIO94 / UART3_CTS / SPI3_CS_X / IIC9_SCL / KEY_ROW3	P6	I/O	1.8V		UART4_CTS	UART4_CTS
107	GND		G			GND	GND
109	USB0_DM0	A19		-		USB0_D_N	USB0_D_N
111	USB0_DP0	B19		-		USB0_D_P	USB0_D_P
113	GND		G			GND	GND
115	USB1_DM0	B20		-		USB1_D_N	USB1_D_N (default USB1)
117	USB1_DP0	C20		-		USB1_D_P	USB1_D_P N (default USB1)
119	GND		G			GND	GND
121	USB2_DN(Options)	B20	I/O	-		USB2_DN(Options)	USB2_DN (Options) --GPIO178=H
123	USB2_DP(Options)	C20	I/O	-		USB2_DP(Options)	USB2_DP (Options) --GPIO178=H
125	GND		G			GND	GND



127	SD1_PWR_EN / PWM1 / GPIO68 / CAM_MCLK1 / CAM_VS2	C3	I/O	1.8V		GPIO68	GPIO68
129	GND		G			GND	GND
131	PCIE1_RX0_N	AD2	I	-		PCIE1_RX0_N	PCIE1_RX0_N
133	PCIE1_RX0_P	AD3	I	-		PCIE1_RX0_P	PCIE1_RX0_P
135	GND		G			GND	GND
137	PCIE1_RX1_N	AB2	I	-		PCIE1_RX1_N	PCIE1_RX1_N
139	PCIE1_RX1_P	AB3	I	-		PCIE1_RX1_P	PCIE1_RX1_P
141	GND		G			GND	GND
143	CAN0_RX / WG0_D1 / GPIO106 / UART2_CTS / PWM3 / CAM_VS2	C1	I/O	3.3V		CAN0_RX	CAN0_RX
145	CAN0_TX / WG0_D0 / GPIO105 / UART2_RTS / PWM2 / CAM_HS2	C2	I/O	3.3V		CAN0_TX	CAN0_TX
147	SARADC1	K4	I	1.8V		ADC1	ADC1 INPUT
149	UART1_RTS / GPIO85 / UART5_TX	G3	I/O	1.8V		UART5_TX	UART5_TX
151	UART1_CTS / GPIO86 / UART5_RX	C12	I/O	1.8V		UART5_RX	UART5_RX
153	GND		G			GND	GND
155	PCIE0_RX1_N / SATA_RX1_N	AF2	I	-		PCIE0_RX1_N / SATA_RX1_N	PCIE0_RX1_N / SATA_RX1_N
157	PCIE0_RX1_P / SATA_RX1_P	AF3	I	-		PCIE0_RX1_P / SATA_RX1_P	PCIE0_RX1_P / SATA_RX1_P
159	GND		G			GND	GND
161	USB0_RX0M	B16	I	-		USBSS0_RX_N	USBSS0_RX_N
163	USB0_RX0P	C16	I	-		USBSS0_RX_P	USBSS0_RX_P
165	GND		G			GND	GND
167	PCIE0_RX0_N / SATA_RX0_N	AH2	I	-		PCIE0_RX0_N / SATA_RX0_N	PCIE0_RX0_N / SATA_RX0_N
169	PCIE0_RX0_P / SATA_RX0_P	AH3	I	-		PCIE0_RX0_P / SATA_RX0_P	PCIE0_RX0_P / SATA_RX0_P



171	GND		G			GND	GND
173	PCIE0_EP_CLK_N	AE1	O	-		PCIE0_EP_CLK_N	PCIE0_EP_CLK_N In/Out
175	PCIE0_EP_CLK_P	AE2	O	-		PCIE0_EP_CLK_P	PCIE0_EP_CLK_P In/Out
177	GND		G			GND	GND
179	PCIE1_L0_WAKEUP_X SATA0_DEVSLP GPIO44 CAN1_RX UART2_RX I2C7_SCL	AK3	I/O	3.3V		PCIE_WAKE*	PCIE_WAKE*
181	PCIE1_L0_RESET_X GPIO43 CAN1_TX UART2_TX I2C7_SDA	AL4	I/O	3.3V		PCIE1_RST*	PCIE1_RST*
183	PCIE0_L0_RESET_X / GPIO40	AH6	I/O	3.3V		PCIE0_RST*	PCIE0_RST*
185	SD1_CMD / PWM16 / GPIO63 / SPI2_SDI / I2C4_SCL / CAM_VS0	E5	I/O	3.3V		I2C4_SCL	I2C4_SCL
187	SD1_CLK / PWM15 / GPIO62 / SPI2_SDO / I2C4_SDA / CAM_HS0	E4	I/O	3.3V		I2C4_SDA	I2C4_SDA (Core board series resistance 33R)
189	SD1_D1 / PWM18 / GPIO65 / UART7_TX / I2C5_SCL / CAM_VS1	E6	I/O	3.3V		I2C5_SCL	I2C5_SCL
191	SD1_D0 / PWM17 / GPIO64 / SPI2_CS_X / I2C5_SDA / CAM_HS1	D4	I/O	3.3V		I2C5_SDA	I2C5_SDA
193	I2S0_SDO / PWM4 / GPIO4 / UART7_TX / CAM_HS2	AL6	I/O	1.8V		I2S0_DOUT	I2S0_DOUT
195	I2S0_SDI0 / PWM2 / GPIO2 / UART6_TX / SPI0_SDO / KEY_ROW2 / CAM_HS1	AK7	I/O	1.8V		I2S0_DIN	I2S0_DIN
197	I2S0_WSI / PWM1 / GPIO1 / UART5_RX / SPI0_SDI / KEY_ROW1 / CAM_VS0	AL7	I/O	1.8V		I2S0_FS	I2S0_FS
199	I2S0_SCLK / PWM0 / GPIO0 / UART5_TX / SPI0_CS_X / KEY_ROW0 / CAM_HS0	AL8	I/O	1.8V		I2S0_SCLK	I2S0_SCLK
201	GND		G			GND	GND
203	MIPI_DSI1_P0 / I2S1_SCLK / GPIO185 / UART1_TX / SPI1_SDI / I2C8_SDA	AN4	I/O	1.8V		DSI_D0_P	DSI_D0_P
205	MIPI_DSI1_N0 / I2S1_WSI / GPIO186 / UART1_RX / SPI1_SDO / I2C8_SCL	AP4	I/O	1.8V		DSI_D0_N	DSI_D0_N
207	MIPI_DSI1_P1 / I2S1_SDI / GPIO187 / UART1_RTS / SPI1_SCK / I2C9_SDA	AN5	I/O	1.8V		DSI_D1_P	DSI_D1_P
209	MIPI_DSI1_N1 / I2S1_SDO / GPIO188 / UART1_CTS / SPI2_CS_X / I2C9_SCL	AP5	I/O	1.8V		DSI_D1_N	DSI_D1_N
211	I2S0_MCLK / PWM5 / GPIO5 / UART7_RX / CAM_VS2	AK8	I/O	1.8V		I2S0_MCLK	I2S0_MCLK
213	GPIO128 / VO0_D7 / UART4_RX / IIC0_SCL / VO1_D7	AC5	I/O	3.3V		CAM_I2C_SCL	I2C0_SCL (Core board pull up resistance 4.7K)



215	GPIO184 / VO0_CLK / UART4_TX / IIC0_SDA / VO1_CLK	AB6	I/O	3.3V		CAM_I2C_SDA	I2C0_SDA (Core board pull up resistance 4.7K)
217	UART1_RX / DBG_I2C_SDA / GPIO84	F3	I/O	3.3V		NC	MODULE_ID (Core board pull down resistance 1K)
219	SD0_D0 / PWM9 / DEBUG_3 / GPIO56 / SPI0_SCK / SPI3_CS_X / I2C2_SDA	E19	I/O	3.3V		SDMMC_DAT0	SDMMC_DAT0
221	SD0_D1 / PWM10/ DEBUG_4 / GPIO57 / SPI3_SCK / SPI0_CS_X / I2C2_SCL	D23	I/O	3.3V		SDMMC_DAT1	SDMMC_DAT1
223	SD0_D2 / PWM11 / DEBUG_5 / GPIO58 / SPI0_SDI / I2C3_SDA	E17	I/O	3.3V		SDMMC_DAT2	SDMMC_DAT2
225	SD0_D3 / PWM12 / DEBUG_6 / GPIO59 / SPI0_SDO / I2C3_SCL	E18	I/O	3.3V		SDMMC_DAT3	SDMMC_DAT3
227	SD0_CMD / PWM8 / DEBUG_2 / GPIO55 / SPI3_SDI / I2C1_SCL	D21	I/O	3.3V		SDMMC_CMD	SDMMC_CMD
229	SD0_CLK / PWM7 / DEBUG_1 / GPIO54 / SPI3_SDO / I2C1_SDA	E21	I/O	3.3V		SDMMC_CLK	SDMMC_CLK (Core board series resistance 33R)
231	GND		G			GND	GND
233	PWR_SAR0 / I2S2_MCLK / PWR_GPIO0 / CAM_MCLK1 / UART3_RTS	F22	I/O	5.0V		SHUTDOWN_REQ	SHUTDOWN_REQ (Core board pull up resistance 4.7K)
235	RTC_BAT		P	3.0V		RTC_BAT	RTC_BAT INPUT
237	POWER_EN		I	5.0V		POWER_EN	POWER_EN INPUT, Active H
239	RSTN	K1	I	3.3V		SYS_RESET*	SYS_RESET INPUT, Active L (Core board pull up resistance 10K)
241	GND		G	GND		GND	GND
243	GND		G	GND			
245	GND		G	GND			
247	GND		G	GND			
249	GND		G	GND			
251	VDD5V0_IN		P	5.0V		VCC5V0_IN	Input Voltage 5.0V +/-5%
253	VDD5V0_IN		P	5.0V			



255	VDD5V0_IN		P	5.0V			
257	VDD5V0_IN		P	5.0V			
259	VDD5V0_IN		P	5.0V			
PIN	CORE-1688JD4 pin definition	BM1688 Pin NO.	Pad type	IO Power domain	IO Pull	Function for Main BOARD (MB-JD4-BM1688)	Defual function description
2	GND		G			GND	GND
4	MIPI_CSI_0N / VI2_D[8] / GPIO139 / DEBUG_1	E34	I/O	1.8V		CSI0_D0_N	CSI0_D0_N
6	MIPI_CSI_0P / VI2_CLK0 / GPIO138 / DEBUG_0	E33	I/O	1.8V		CSI0_D0_P	CSI0_D0_P
8	GND		G			GND	GND
10	MIPI_CSI_2N / VI2_D[1] / GPIO143 / DEBUG_5	C34	I/O	1.8V		CSI0_CLK_N	CSI0_CLK_N
12	MIPI_CSI_2P / VI2_D[0] / GPIO142 / DEBUG_4	C33	I/O	1.8V		CSI0_CLK_P	CSI0_CLK_P
14	GND		G			GND	GND
16	MIPI_CSI_1N / VI2_D[10] / GPIO141 / DEBUG_3	D34	I/O	1.8V		CSI0_D1_N	CSI0_D1_N
18	MIPI_CSI_1P / VI2_D[9] / GPIO140 / DEBUG_2	D33	I/O	1.8V		CSI0_D1_P	CSI0_D1_P
20	GND		G			GND	GND
22	MIPI_CSI_6N / VI1_D[14] / GPIO151 / DEBUG_13 / VI0_D[25] / CAM_MCLK3 / CAM_VS0	A30	I/O	1.8V		CSI2_D0_N	CSI2_D0_N
24	MIPI_CSI_6P / VI1_CLK0 / GPIO150 / DEBUG_12 / VI0_CLK1 / CAM_MCLK2 / CAM_HS0	B30	I/O	1.8V		CSI2_D0_P	CSI2_D0_P
26	GND		G			GND	GND
28	MIPI_CSI_8N / VI1_D[1] / GPIO155 / DEBUG_17 / VI0_D[14] / CAM_VS2	A29	I/O	1.8V		CSI2_CLK_N	CSI2_CLK_N
30	MIPI_CSI_8P / VI1_D[0] / GPIO154 / DEBUG_16 / VI0_D[15] / CAM_HS2	B29	I/O	1.8V		CSI2_CLK_P	CSI2_CLK_P
32	GND		G			GND	GND
34	MIPI_CSI_7N / VI1_D[16] / GPIO153 / DEBUG_15 / VI0_D[27] / CAM_VS1	C30	I/O	1.8V		CSI2_D1_N	CSI2_D1_N
36	MIPI_CSI_7P / VI1_D[15] / GPIO152 / DEBUG_14 / VI0_D[26] / CAM_HS1	D30	I/O	1.8V		CSI2_D1_P	CSI2_D1_P



38	GND		G			GND	GND
40	MIPI_CSI_12N / GPIO163 / DEBUG_25 / VIO_D[16] / CAM_MCLK3 / CAM_VS2	A27	I/O	1.8V		CSI4_D0_N	CSI4_D0_N
42	MIPI_CSI_12P / GPIO162 / DEBUG_24 / VIO_CLK0 / CAM_MCLK2 / CAM_HS2	B27	I/O	1.8V		CSI4_D0_P	CSI4_D0_P
44	GND		G			GND	GND
46	MIPI_CSI_14N / GPIO167 / DEBUG_29 / VIO_D[1]	A26	I/O	1.8V		CSI4_CLK_N	CSI4_CLK_N
48	MIPI_CSI_14P / GPIO166 / DEBUG_28 / VIO_D[0]	B26	I/O	1.8V		CSI4_CLK_P	CSI4_CLK_P
50	GND		G			GND	GND
52	MIPI_CSI_13N / GPIO165 / DEBUG_27 / VIO_D[18]	C27	I/O	1.8V		CSI4_D1_N	CSI4_D1_N
54	MIPI_CSI_13P / GPIO164 / DEBUG_26 / VIO_D[17]	D27	I/O	1.8V		CSI4_D1_P	CSI4_D1_P
56	GND		G			GND	GND
58	MIPI_CSI_16N / GPIO171 / VIO_D[5]	A25	I/O	1.8V		CSI5_D1_N	CSI5_D1_N
60	MIPI_CSI_16P / GPIO170 / VIO_D[4]	B25	I/O	1.8V		CSI5_D1_P	CSI5_D1_P
62	GND		G			GND	GND
64	MIPI_CSI_17N / GPIO173 / VIO_D[7] / CAM_MCLK5	C25	I/O	1.8V		CSI5_CLK_N	CSI5_CLK_N
66	MIPI_CSI_17P / GPIO172 / VIO_D[6] / CAM_MCLK4	D25	I/O	1.8V		CSI5_CLK_P	CSI5_CLK_P
68	GND		G			GND	GND
70	GBE1_MDIO_P		I/O	-		GBE1_MDIO_P	GBE1_MDIO_P (To Ethernet Transformer)
72	GBE1_MDIO_N		I/O	-		GBE1_MDIO_N	GBE1_MDIO_N (To Ethernet Transformer)
74	GBE1_MDI1_P		I/O	-		GBE1_MDI1_P	GBE1_MDI1_P (To Ethernet Transformer)
76	GBE1_MDI1_N		I/O	-		GBE1_MDI1_N	GBE1_MDI1_N (To Ethernet Transformer)
78	GND		G			GND	GND
80	GBE1_MDI2_P		I/O	-		GBE1_MDI2_P	GBE1_MDI2_P (To Ethernet Transformer)



82	GBE1_MDI2_N		I/O	-		GBE1_MDI2_N	GBE1_MDI2_N (To Ethernet Transformer)
84	GBE1_MDI3_P		I/O	-		GBE1_MDI3_P	GBE1_MDI3_P (To Ethernet Transformer)
86	GBE1_MDI3_N		I/O	-		GBE1_MDI3_N	GBE1_MDI3_N (To Ethernet Transformer)
88	47K Resistance pull-up 3V3			3.3V	UP	HDMI0_TX_ON_H	HDMI0_TX_ON_H (H:HDMI2.0 ; L:HDMI2.1)
90	GBE1_LED_LINK		I/O	3.3V		PHY1_CFG_EXT	PHY1_CFG_EXT
92	GBE1_LED2_ACT		I/O	3.3V		PHY1_CFG_LDO1	PHY1_CFG_LDO1
94	MIPI_DSI0_N0 / VO0_D15 / CAM_MCLK1 / GPIO175 / I2C5_SCL / VO1_D15	AB10	I/O			HDMITX0_CEC	HDMITX0_CEC
96	HDMI_HPD	AK5	I	5.0V		HDMITX0_HPDIN	HDMI_HPD INPUT, Active H (Core board series resistance 1.2K)
98	HDMI_DDC_SDA / GPIO71	B2	I/O	1.8V		HDMI_DDC_SDA	HDMI_DDC_SDA (Core board pull up resistance 4.7K)
100	HDMI_DDC_SCL / GPIO72	B1	I/O	1.8V		HDMI_DDC_SCL	HDMI_DDC_SCL (Core board pull up resistance 4.7K)
102	GND		G			GND	GND
104	PWM2 / KEY_COL2 / SD2_0_D0 / GPIO77 / UART6_TX / SPI1_SDO / IIC4_SDA / CAM_HS1	D8	I/O	1.8V		SPI1_MOSI	SPI1_MOSI
106	PWM3 / KEY_COL3 / SD2_0_D1 / GPIO78 / UART6_RX / SPI1_SCK / IIC4_SCL / CAM_VS1	E10	I/O	1.8V		SPI1_SCK	SPI1_SCK (Core board series resistance 33R)
108	PWM1 / KEY_COL1 / SD2_0_CMD / GPIO76 / UART5_RX / SPI1_SDI / IIC3_SCL / CAM_VS0	E9	I/O	1.8V		SPI1_MISO	SPI1_MISO
110	PWM0 / KEY_COL0 / SD2_0_CLK / GPIO75 / UART5_TX / SPI1_CS_X / IIC3_SDA / CAM_HS0	E8	I/O	1.8V		SPI1_CS0	SPI1_CS0 (Core board series resistance 33R)
112	PWR_SPINOR_SDO / CAM_MCLK5 / PWR_GPIO5 / IIC2_SCL	F23	I/O	1.8V		SPI1_CS1	SPI1_CS1
114	CAM_XLR0 / GPIO69	F9	I/O	1.8V		CAM0_PWDN	CAM0_PWDN
116	CAM_MCLK0 / GPIO46	F8	I/O	1.8V		CAM0_MCLK	CAM0_MCLK
118	CAM_MCLK4 / GPIO50 / IIC8_SDA	D7	I/O	1.8V		GPIO50	GPIO50
120	CAM_XLR1 / GPIO70	G10	I/O	1.8V		CAM1_PWDN	CAM1_PWDN



122	CAM_MCLK1 / GPIO47	E7	I/O	1.8V		CAM1_MCLK	CAM1_MCLK
124	PWR_SPINOR_WP_X / CAM_MCLK2 / PWR_GPIO2 / UART7_RX / IIC1_SDA	F18	I/O	1.8V		PWR_GPIO2	PWR_GPIO2
126	SD1_CD_X / PWM14 / GPIO61 / CAM_MCLK0 / CAM_HS0	D3	I/O	1.8V		GPIO61	GPIO61
128	PWM4 / CAN1_TX / SD2_0_D2 / GPIO79 / UART4_TX / IIC5_SDA / CAM_HS2	D9	I/O	1.8V		GPIO79	GPIO79
130	PWM5 / CAN1_RXD / SD2_0_D3 / GPIO80 / UART4_RX / IIC5_SCL / CAM_VS2	D10	I/O	1.8V		GPIO80	GPIO80
132	GND		G			GND	GND
134	PCIE1_TX0_N	Y3	O	-		PCIE1_TX0_N	PCIE1_TX0_N
136	PCIE1_TX0_P	Y2	O	-		PCIE1_TX0_P	PCIE1_TX0_P
138	GND		G			GND	GND
140	PCIE1_TX1_N	AA2	I	-		NC	NC
142	PCIE1_TX1_P	AA1	I	-		NC	NC
144	GND		G			GND	GND
146	SARADC2	L4	I	1.8V		SARADC2	ADC2 Input
148	MIPI_DSI0_P4 / VO0_D22 / GPIO182 / CAM_HS1 / I2C9_SDA / VO1_D22	A6	I/O	1.8V		GPIO182	GPIO182
150	MIPI_DSI0_N4 / VO0_D23 / GPIO183 / CAM_VS1 / I2C9_SCL / VO1_D23	B6	I/O	1.8V		GPIO183	GPIO183
152	GND		G			GND	GND
154	PCIE0_TX1_N / SATA_TX1_N	AJ1	O	-		PCIE0_TX1_N / SATA_TX1_N	PCIE0_TX1_N / SATA_TX1_N
156	PCIE0_TX1_P / SATA_TX1_P	AJ2	O	-		PCIE0_TX1_P / SATA_TX1_P	PCIE0_TX1_P / SATA_TX1_P
158	GND		G			GND	GND
160	PCIE1_EP_CLK_N	AC1	O	-		PCIE1_EP_CLK_N	PCIE1_EP_CLK_N
162	PCIE1_EP_CLK_P	AC2	O	-		PCIE1_EP_CLK_P	PCIE1_EP_CLK_P
164	GND		G			GND	GND



166	USB0_TX0M	A17	O	-		USBSS0_TX_N	USBSS0_TX_N
168	USB0_TX0P	B17	O	-		USBSS0_TX_P	USBSS0_TX_P
170	GND		G			GND	GND
172	PCIE0_TX0_N / SATA_TX0_N	AG1	O	-		PCIE0_TX0_N / SATA_TX0_N	PCIE0_TX0_N / SATA_TX0_N
174	PCIE0_TX0_P / SATA_TX0_P	AG2	O	-		PCIE0_TX0_P / SATA_TX0_P	PCIE0_TX0_P / SATA_TX0_P
176	GND		G			GND	GND
178	PWR_BUTTON1 / PWR_GPIO8	F27	I	1.8V		MOD_SLEEP*	MOD_SLEEP* INPUT, Active L
180	PCIE1_L0_CLKREQ_IN_X SATA1_DEVSLP GPIO45	AK4	I/O	3.3V		PCIE1_CLKREQ*	PCIE1_CLKREQ* (Core board pull up resistance 4.7K)
182	PCIE0_L0_CLKREQ_IN_X / GPIO42 / UART2_CTS / I2C4_SCL	AH5	I/O	3.3V		PCIE0_CLKREQ*	PCIE0_CLKREQ* (Core board pull up resistance 4.7K)
184	GBE0_MDIO_N		I/O	-		GBE0_MDIO_N	GBE0_MDIO_N (To Ethernet Transformer)
186	GBE0_MDIO_P		I/O	-		GBE0_MDIO_P	GBE0_MDIO_P (To Ethernet Transformer)
188	GBE0_LED_LINK		I/O	3.3V		PHY0_CFG_EXT	PHY0_CFG_EXT
190	GBE0_MDI1_N		I/O	-		GBE0_MDI1_N	GBE0_MDI1_N (To Ethernet Transformer)
192	GBE0_MDI1_P		I/O	-		GBE0_MDI1_P	GBE0_MDI1_P (To Ethernet Transformer)
194	GBE0_LED2_ACT		I/O	3.3V		PHY0_CFG_LDO1	PHY0_CFG_LDO1
196	GBE0_MDI2_N		I/O	-		GBE0_MDI2_N	GBE0_MDI2_N (To Ethernet Transformer)
198	GBE0_MDI2_P		I/O	-		GBE0_MDI2_P	GBE0_MDI2_P (To Ethernet Transformer)
200	GND		G			GND	GND
202	GBE0_MDI3_N		I/O	-		GBE0_MDI3_N	GBE0_MDI3_N (To Ethernet Transformer)
204	GBE0_MDI3_P		I/O	-		GBE0_MDI3_P	GBE0_MDI3_P (To Ethernet Transformer)
206	SD0_CD_X / PWM6 / DEBUG_0 / GPIO53 / IIC0_SDA	D17	I/O	1.8V		GPIO53	GPIO53



208	PWR_SPINOR_HOLD_X / I2S1_MCLK / PWR_GPIO1 / PWR_SAR1 / UART7_TX / UART3_CTS	E22	I/O	1.8V		PWR_GPIO1	PWR_GPIO1
210	CLK_32K_OUT		O	3.3V		32KOUT_WIFI	32.768KHz OUTPUT TO WIFI
212	IIC2_SCL / TC906_JTAG0_TDI / GPIO100 / UART3_RX	H5	I/O	1.8V		GPIO100	GPIO100
214	FORCE_RECOVERY*	G28	I/O	1.8V		FORCE_RECOVERY*	FORCE_RECOVERY*
216	CAM_MCLK5 / GPIO51 / IIC8_SCL	G9	I/O	1.8V		GPIO51	GPIO51
218	SD0_PWR_EN / PWM13 / DEBUG_7 / GPIO60 / IIC0_SCL	D19	I/O	1.8V		GPIO60	GPIO60
220	MIPI_DSI1_N4 / I2S2_SDO / GPIO127 / WG1_D0 / SPI3_SDO / I2C3_SCL	AP8	I/O	1.8V		I2S2_DOUT	I2S2_DOUT
222	MIPI_DSI1_P4 / I2S2_SDI / GPIO126 / WG1_D1 / SPI3_SDI / I2C3_SDA	AN8	I/O	1.8V		I2S2_DIN	I2S2_DIN
224	MIPI_DSI1_N3 / I2S2_WSI / GPIO125 / UART3_RX / SPI3_CS_X / SPI1_CS_X	AP7	I/O	1.8V		I2S2_FS	I2S2_FS
226	MIPI_DSI1_P3 / I2S2_SCLK / GPIO124 / UART3_TX / SPI2_SCK / SPI3_SCK	AN7	I/O	1.8V		I2S2_SCLK	I2S2_SCLK
228	A53_JTAG0_TCK / I2S1_WSI / DEBUG_9 / GPIO112 / UART2_RX / SPI1_SDI / IIC6_SCL / PWM9	F1	I/O	1.8V		GPIO112	GPIO112
230	A53_JTAG0_TMS / I2S1_SDO / DEBUG_11 / GPIO114 / UART2_CTS / SPI1_SCK / IIC7_SCL / PWM11	D1	I/O	1.8V		GPIO114	GPIO114
232	MIPI_DSI1_N2 / I2S2_MCLK / GPIO190 / UART2_RX / SPI2_SDO / I2C1_SCL	AP6	I/O	1.8V		I2C1_SCL	I2C1_SCL
234	MIPI_DSI1_P2 / I2S1_MCLK / GPIO189 / UART2_TX / SPI2_SDI / I2C1_SDA	AN6	I/O	1.8V		I2C1_SDA	I2C1_SDA
236	DEBUG_UART0_TX / GPIO81	H3	I/O	1.8V		UART0_TXD	Debug_UART0_TXD
238	DEBUG_UART0_RX / GPIO82	H4	I/O	1.8V		UART0_RXD	Debug_UART0_RXD
240	SLEEP/WAKE	F31	I	5.0V		SLEEP/WAKE	SLEEP/WAKE
242	GND		G	GND		GND	GND
244	GND		G	GND			
246	GND		G	GND			
248	GND		G	GND			
250	GND		G	GND			



252	VDD5V0_IN		P	5.0V		VCC5V0_IN	Input Voltage 5.0V +/-5%
254	VDD5V0_IN		P	5.0V			
256	VDD5V0_IN		P	5.0V			
258	VDD5V0_IN		P	5.0V			
260	VDD5V0_IN		P	5.0V			



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