

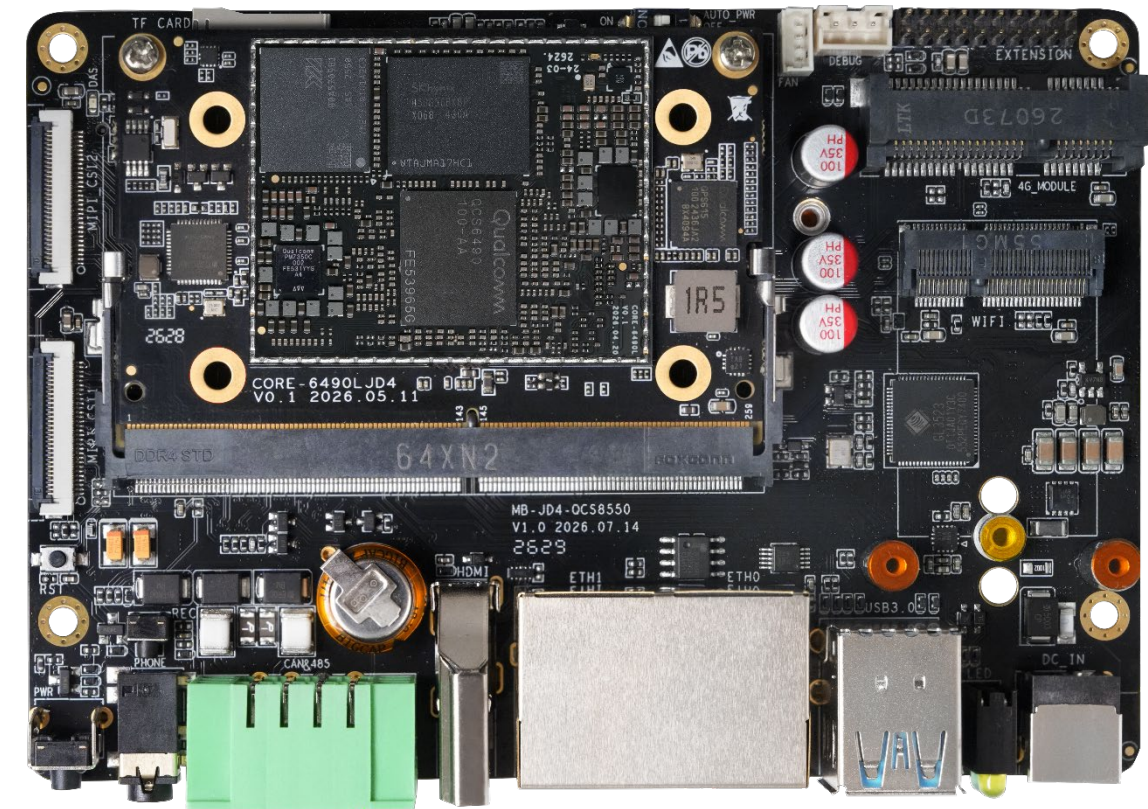


AIO-6490JD4

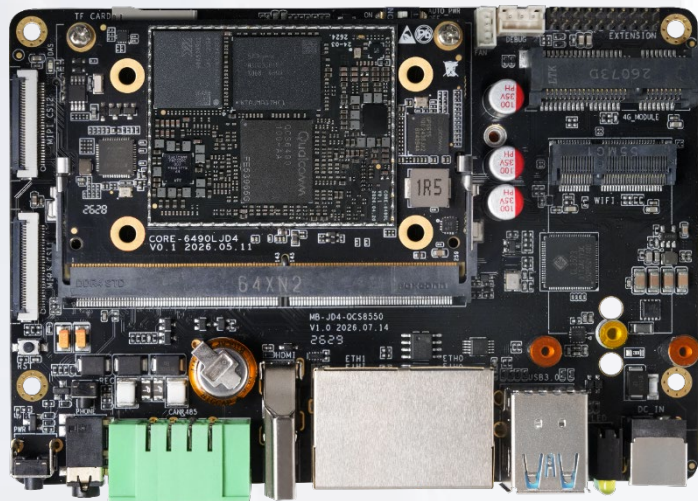
Qualcomm QCS6490 Motherboard

V0.1 2026-10-9

FIREFLY TECHNOLOGY



Product features



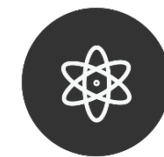
Octa-core Heterogeneous Processor QCS6490

Adopts Qualcomm QCS6490 octa-core 64-bit heterogeneous processor, built on ARM architecture with advanced 6nm process technology and a clock frequency up to 2.7 GHz, delivering powerful support for high-performance computing and multi-task processing.



4K Video Encoding and Decoding

Supports 4K@60fps H.265/H.264/VP9 video decoding, 4K@30fps H.265/H.264 video encoding, and concurrent processing of 4K decoding and 1080P encoding.



Integrated Adreno 643 GPU

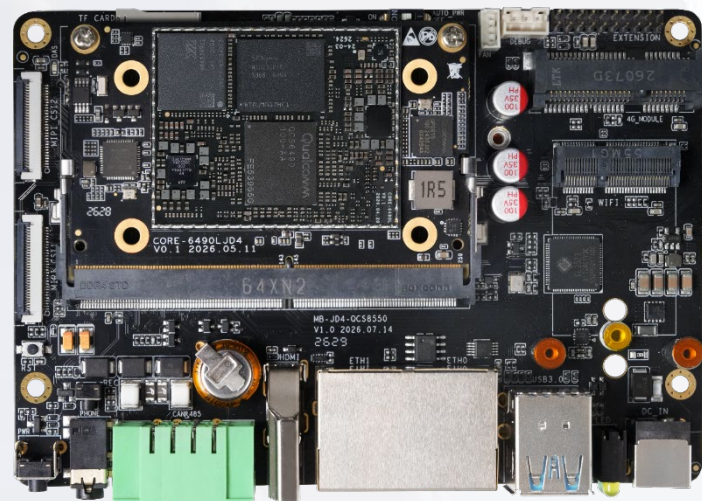
Comes with integrated Adreno 643 GPU, supporting OpenGL ES 3.2, Vulkan 1.x, OpenCL 2.0 and DX FL12 graphics APIs. It efficiently handles tasks such as graphics rendering and image processing to meet visualization display requirements for edge scenarios.



Built-in 12 TOPS NPU

Comes with built-in 12 TOPS NPU, supporting mixed computation of INT4/INT8/INT16/FP16. It enables intelligent data processing, speech recognition and image analysis to satisfy edge computing AI application requirements for most terminal devices.

Product features



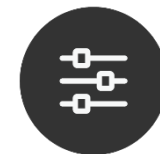
Supports 3-Channel Camera Input

It is equipped with 3-channel on-board MIPI-CSI interfaces to enable simultaneous image capture from three cameras for multi-vision scenarios. Fitted with HD video output interface, it supports up to 4K@30Hz video output to meet high-definition display requirements.



Comprehensive Software Ecosystem

Built upon the Qualcomm Linux software stack, it features native compatibility with the Ubuntu system. It comes with the built-in QNN inference framework and supports mainstream deep-learning frameworks including TensorFlow, PyTorch, MXNet, Keras and Caffe.



Rich Expansion Interfaces

It features expansion interfaces including PCIe 3.0, USB 3.0, MIPI-CSI, HD, Mini PCIe and M.2 to meet peripheral expansion requirements for diverse scenarios.



Wide Range of Application Scenarios

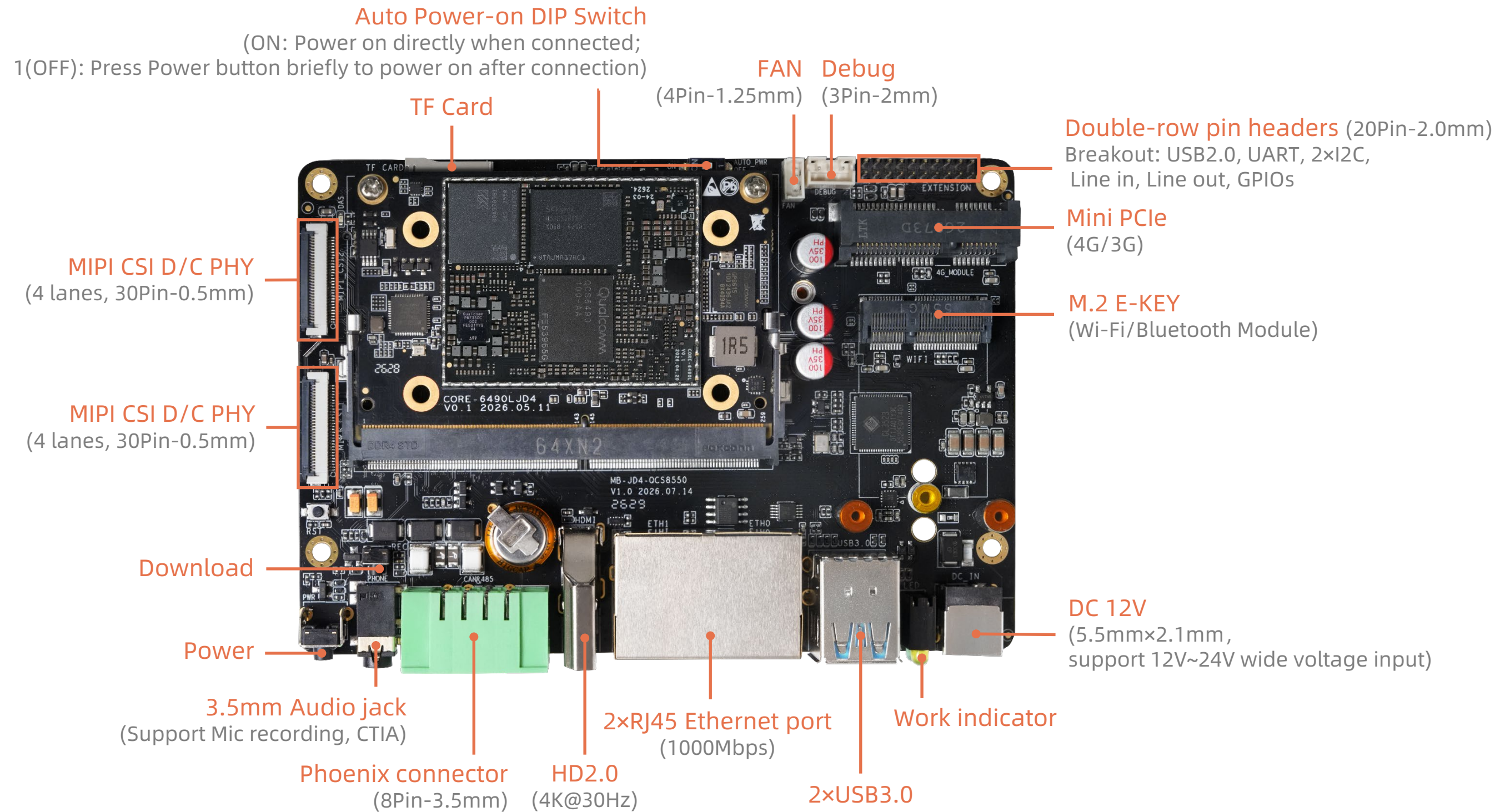
Widely applicable to edge computing, private deployment of end-side large models, robots, industrial visual inspection, intelligent security, vehicle multi-camera perception, smart retail and other industry sectors.

Specifications



Specifications		
Basic Specifications	SOC	Qualcomm QCS6490
	CPU	Qualcomm Kryo CPU: Octa-core 64-bit processor (1×Kryo Prime 2.7GHz + 3×Kryo Gold 2.4GHz + 4×Kryo Silver 1.9GHz), built on advanced 6nm process, max frequency up to 2.7GHz
	GPU	Adreno 643 GPU, supports OpenGL ES 3.2, Vulkan 1.x, OpenCL 2.0, DX FL12
	NPU	Hexagon 770 NPU, 12 Dense TOPS
	ISP	Spectra 570L ISP, Zero Shutter Lag (ZSL) mode: 64MP / 36MP+22MP / 3×22MP @30fps, Non-Zero Shutter Lag (non-ZSL) mode: 192MP
	Codec	Video Decoding: 1×4K@60fps/2×4K@30fps/4×1080P@60fps (H.265/HEVC, H.264/AVC, VP9) Video Encoding: 1×4K@30fps/4×1080P@60fps (H.265/HEVC, H.264/AVC) Video Concurrency: 1080P@60fps decoding + 1080P@60fps encoding / 4K@30fps decoding + 1080P@30fps encoding
	RAM	4GB/8GB LPDDR5
	Storage	64GB eMMC
	Storage expansion	1 × M.2 M-KEY (supports expansion of PCIe NVMe SSD, compatible with 2242/2260/2280 form factors), 1 × TF Card
	Power Supply	DC 12V (5.5mm × 2.1mm, support 12V~24V wide voltage input)
	Power Consumption	Normal: 4.8W(12V/400mA), Max: 12W(12V/1000mA), Min(Sleep): 1.32W(12V/110mA)
	OS	Qualcomm Linux, Ubuntu
	Software Support	Supports private deployment of ultra-large-parameter models under Transformer architecture, including large language models such as Deepseek-R1, Gemma, Llama, Qwen and Phi series. Supports QNN AI inference framework and multiple deep-learning frameworks: TensorFlow, TensorFlow Lite, PyTorch, MXNet, Keras, Caffe.
	Dimension	122.89mm × 85.04mm × 31.55mm
	Weight	Without heatsink: 123g; With heatsink: 171g
	Environment	Operating Temperature: -20°C ~ 60°C, Storage Temperature: -20°C ~ 70°C, Operating Humidity: 10% ~ 90%RH (No condensation)
Interface Specifications	Network	Ethernet: 2 × RJ45(1000Mbps) Wi-Fi: Extend Wi-Fi/Bluetooth module through M.2 E-KEY (2230), supporting 2.4GHz/5GHz dual band Wi-Fi6 (802.11a/b/g/n/ac/ax) and Bluetooth 5.2 4G: Extend 4G LTE via Mini PCIe (Shared with 5G) 5G: Extend 5G via M.2 B-KEY (Shared with 4G, not mounted by default)
	Video Input	3 × MIPI-CSI (D-PHY v1.2/C-PHY v1.2, 4Lane, 30Pin-0.5mm), enables simultaneous acquisition from 3 cameras
	Video Output	1 × HD2.0 (Up to 4K@30Hz)
	Audio	1 × 3.5mm Audio jack (Supports MIC recording, American standard CTIA)
	USB	2 × USB3.0 (Max: 1A), 1 × Type-C (Flash)
	DIP switch	1 × Auto Power-on DIP Switch (ON: Power on directly when connected; 1(OFF): Press Power button briefly to power on after connection) 1 × Type-C function selection(ON: Debug; 1(OFF): Flash)
	Button	1 × Download, 1 × Power
	Other interfaces	1 × FAN (4Pin-1.25mm), 1 × SIM Card, 1 × Debug (3Pin-2mm), 1 × Double-row pin headers (20Pin-2mm): USB2.0, UART, 2 × I2C, Line in, Line out, GPIO 1 × Phoenix connector (8Pin-3.5mm): 1 × RS485, 1 × RS232, 1 × CAN 2.0

Interface description



Interface description



3.5mm Audio jack
(Support Mic recording, CTIA)

HD2.0
(4K@30Hz)

2×USB3.0
(Max: 1A)

Work indicator

Power

2×RJ45 Ethernet port
(1000Mbps)

Type-C
(Flash)

DC 12V
(5.5mm×2.1mm, support 12V~24V wide voltage input)

Phoenix connector (8Pin, 3.5mm Pitch)

232-TX	GND	CANH	485A
232-RX	GND	CANL	485B

M.2 B-KEY
(Expand 5G, shared with 4G, not populated by default)

SIM Card

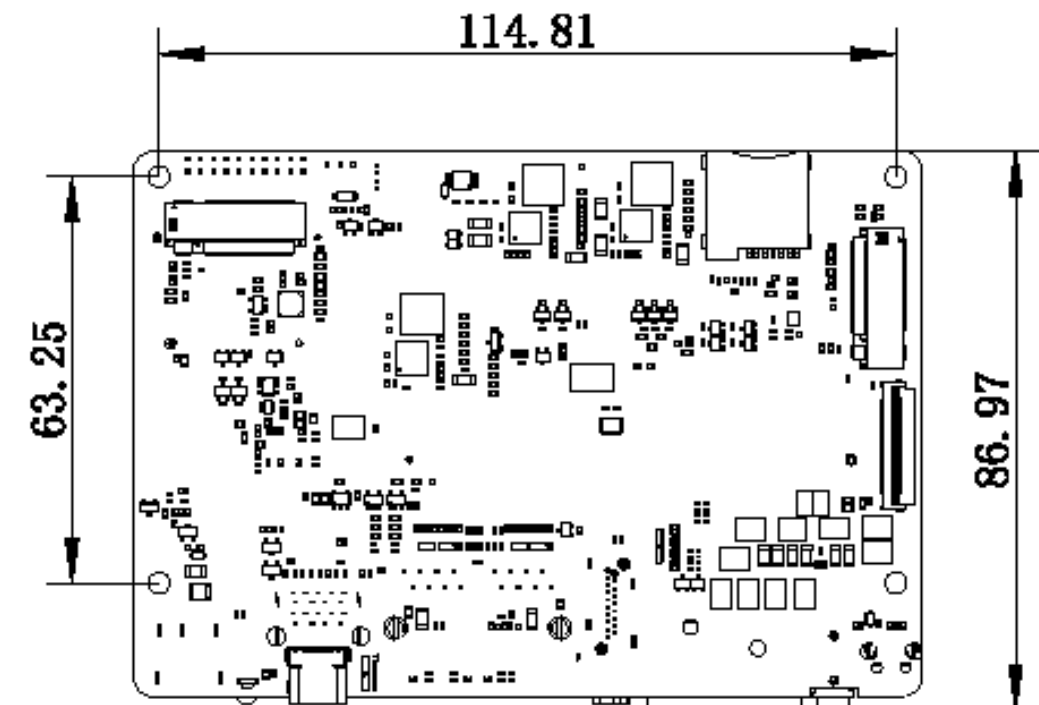
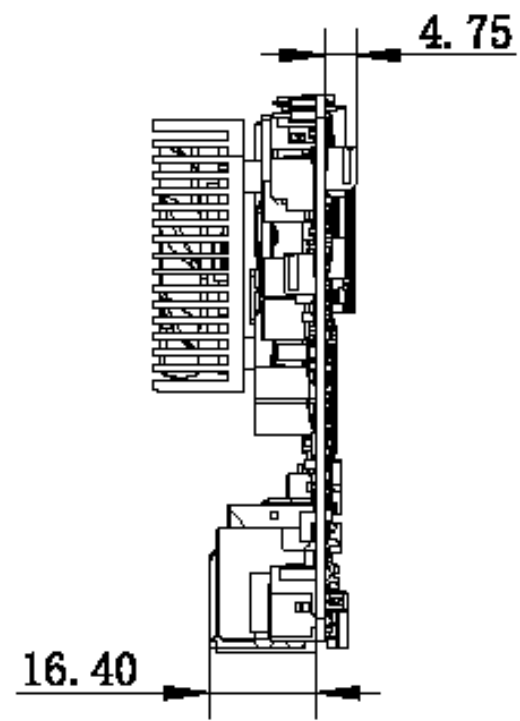
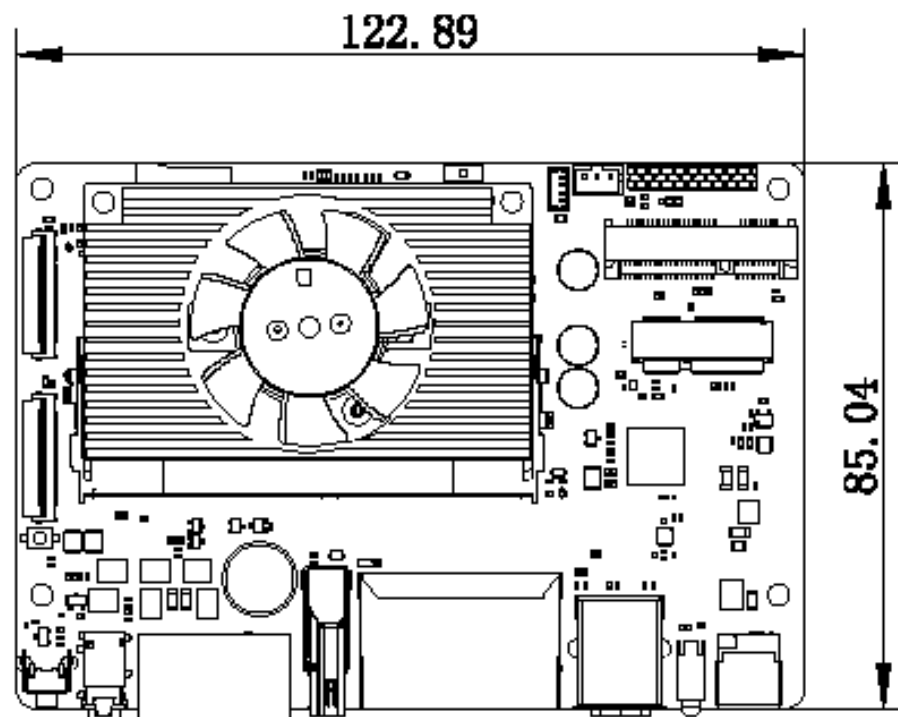
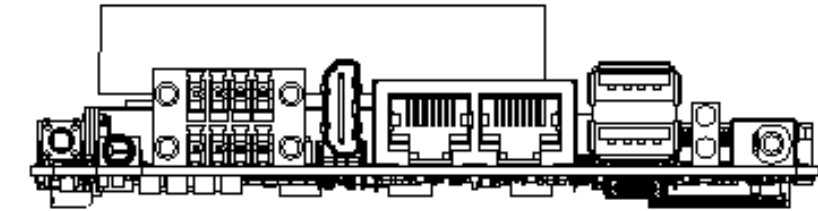
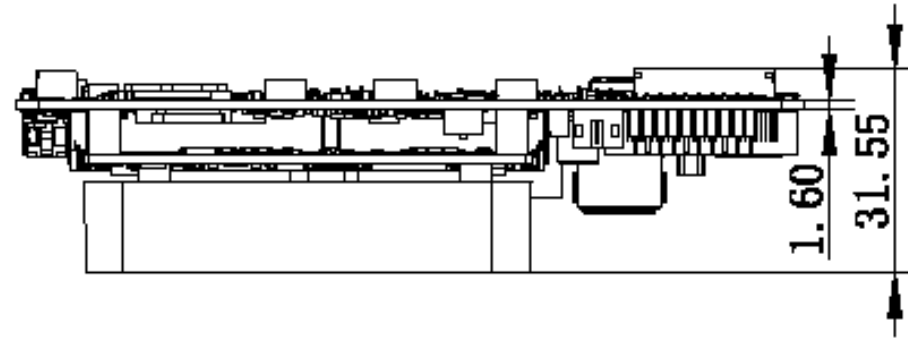
M.2 M-KEY
(Expand PCIe NVMe 2242/2260/2280 SSD)

MIPI CSI D/C PHY
(4 lanes, 30Pin-0.5mm)

Type-C
(Flash)

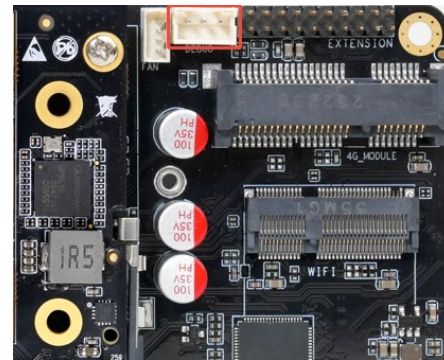
Type-C function selection
(ON: Debug; 1(OFF): Flash)

Dimension



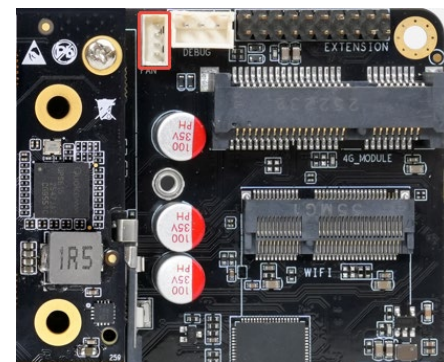
Interface definition

1. (J19) DEBUG: 3PIN 2.0mm pitch wafer socket



NO.	Definition	Power/V	NO.	Definition	Power/V
1	UART0_RXD_3V3	3.3	3	GND	
2	UART0_TXD_3V3	3.3			

2. (J6) FAN: 4PIN 1.25mm pitch wafer socket

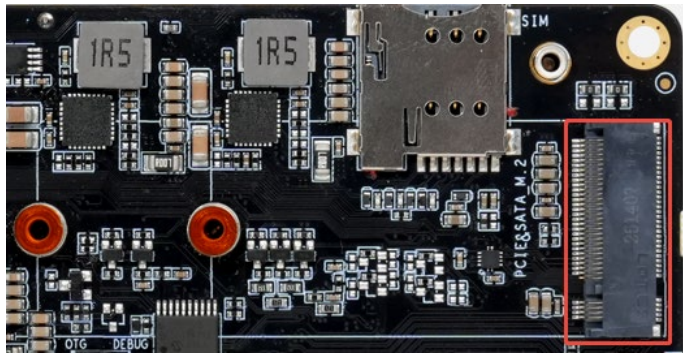


NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	FAN+ (5V Output)	5
3	FAN_TACH 【PWR_GPIO1/UART7_TX】	3.3	4	PWM1_CONN1 Output 【GPIO114】 [pull up resistor10K]	3.3

Interface definition



3. (U4) M.2 PCIE/SATA M-KEY



NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	VCC3V3_PCIE (3.3V Output)	3.3
3	GND		4	VCC3V3_PCIE (3.3V Output)	3.3
5	NC		6	NC	
7	NC		8	NC	
9	GND		10	DAS/DSS [pull up resistor10K]	3.3
11	NC		12	VCC3V3_PCIE (3.3V Output)	3.3
13	NC		14	VCC3V3_PCIE (3.3V Output)	3.3
15	NC		16	VCC3V3_PCIE (3.3V Output)	3.3
17	NC		18	VCC3V3_PCIE (3.3V Output)	3.3
19	NC		20	NC	
21	GND		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	GND		28	NC	



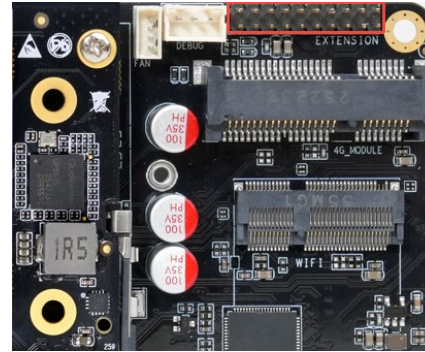
Interface definition

29	CON_DS0_PCIE0_RX1_M		30	NC	
31	CON_DS0_PCIE0_RX1_P		32	NC	
33	GND		34	NC	
35	CON_DS0_PCIE0_TX1_M (Series capacitor 100nF)		36	NC	
37	CON_DS0_PCIE0_TX1_P (Series capacitor 100nF)		38	DEVSLP [pull up resistor10K]	3.3
39	GND		40	NC	
41	CON_DS0_PCIE0_RX0_P	-	42	NC	
43	CON_DS0_PCIE0_RX0_M	-	44	NC	
45	GND		46	NC	
47	CON_DS0_PCIE0_TX0_M (Series capacitor 100nF)	-	48	NC	
49	CON_DS0_PCIE0_TX0_P (Series capacitor 100nF)	-	50	PCIE0_RESET_N	3.3
51	GND		52	PCIE0_CLKREQB_N (GPIO42)	3.3
53	CON_DS0_PCIE0_REFCLK_M	-	54	PCIE_WAKE	3.3
55	CON_DS0_PCIE0_REFCLK_P	-	56	NC	
57	GND		58	NC	
67	NC		68	NC	
69	GND		70	VCC3V3_PCIE (3.3V Output)	3.3
71	GND		72	VCC3V3_PCIE (3.3V Output)	3.3
73	GND		74	VCC3V3_PCIE (3.3V Output)	3.3
75	GND				



Interface definition

4. (J15) Double-row pin header EXTENSION INTERFACE 2*10PIN

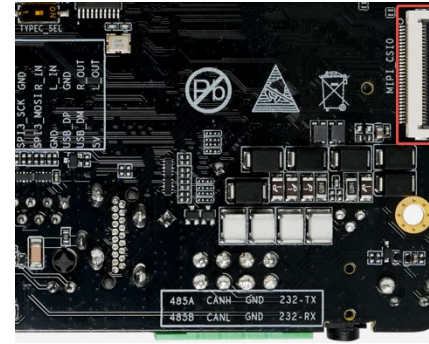


NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC5V0_SYS (5.0V OUTPUT)	5.0 (MAX:500mA)	2	LOUT2 (40mW from ES8390)	3.3
3	USB_HOST0_DM	-	4	ROUT2 (40mW from ES8390)	3.3
5	USB_HOST0_DP	-	6	GND	
7	GND		8	LIN1 (to ES8390) (Series capacitor 1uF)	3.3
9	NFC_ESE_SPI_CLK	1.8	10	RIN1 (to ES8390) (Series capacitor 1uF)	3.3
11	NFC_ESE_SPI_CS_N	1.8	12	GND	
13	SM_GPIO_176_I2S2_WS (MIPI_DSI1_N3/I2S2_WSI/GPIO125/UART3_RX)	1.8	14	I2C_HUB0_SCL_3V3_GPIO21 (GPIO190) (Pull-up resistor 4.7K)	3.3
15	SM_GPIO_175_I2S2_CLK (MIPI_DSI1_P3/I2S2_SCLK/GPIO124/UART3_TX)	1.8	16	I2C_HUB0_SDA_3V3_GPIO20 (GPIO189) (Pull-up resistor 4.7K)	3.3
17	I2C_HUB0_SCL_3V3_GPIO206 (CAM_XLR0 / GPIO69) (Pull-up resistor 4.7K)	3.3	18	HMT_BLE_UART_TX(GPIO105)	
19	I2C_HUB0_SDA_3V3_GPIO206 (CAM_XLR1 / GPIO70) (Pull-up resistor 4.7K)	3.3	20	HMT_BLE_UART_RX(GPIO106)	



Interface definition

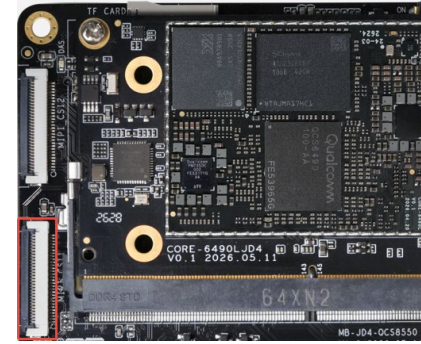
5. (J7) MIPI CSI0 30PIN 0.5mm pitch



NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM0_I2C_SDA 【GPIO184】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM0_I2C_SCL 【GPIO128】 Pull-up resistor 2.2K	1.8	17	CSI0_NC_CLK_P	-
3	NFC_ESE_SPI_MOSI 【GPIO77】	1.8	18	CSI0_A0_CLK_M	-
4	CAM0_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI0_C1_LN2_P	-
6	CAM_MCLK0 【GPIO46】	1.8	21	CSI0_A2_LN2_M	-
7	SM_GPIO_45_UART_RFR 【PWR_GPIO187】	1.8	22	GND	
8	CAM0_RESET_H 【Extended IO】	1.8	23	CSI0_B2_LN3_P	-
9	CAM_MCLK0 【GPIO46】	1.8	24	CSI0_C2_LN3_M	-
10	GND		25	GND	
11	CSI0_B0_LN0_P	-	26	NC	-
12	CSI0_C0_LN0_M	-	27	NC	-
13	GND		28	GND	
14	CSI0_A1_LN1_P	-	29	VCC_CSI1 (5.0V OUTPUT)	5.0
15	CSI0_B1_LN1_M	-	30	VCC_CSI1 (5.0V OUTPUT)	5.0

Interface definition

6. (J13) MIPI CSI1 30PIN 0.5mm pitch

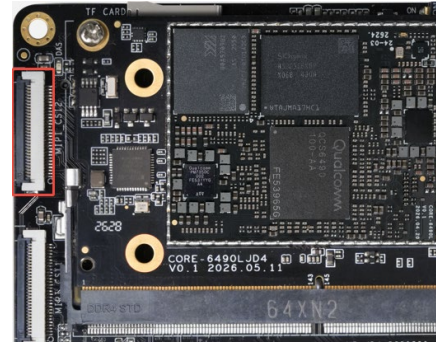


NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM1_I2C_SDA 【GPIO64】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM1_I2C_SCL 【GPIO65】 Pull-up resistor 2.2K	1.8	17	CSI7_NC_CLK_P	-
3	NFC_ESE_SPI_MISO 【GPIO76/CAM4_PWDN0】	1.8	18	CSI7_A0_CLK_M	-
4	CAM1_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI6_B0_LN0_P	-
6	CAM_MCLK1 【GPIO47】	1.8	21	CSI6_C0_LN0_M	-
7	CAM4_PWDN 【PWR_GPIO5】	1.8	22	GND	
8	CAM1_RESET_H 【Extended IO】	1.8	23	CSI6_A1_LN1_P	-
9	CAM1_MCLK 【GPIO47】	1.8	24	CSI6_B1_LN1_M	-
10	GND		25	GND	
11	CSI7_B0_LN0_P	-	26	CSI6_NC_CLK_P	-
12	CSI7_C0_LN0_M	-	27	CSI6_A0_CLK_M	-
13	GND		28	GND	
14	CSI7_A1_LN1_P	-	29	VCC_CSI2 (5.0V OUTPUT)	5.0
15	CSI7_B1_LN1_M	-	30	VCC_CSI2 (5.0V OUTPUT)	5.0



Interface definition

7. (J16) MIPI CSI2 30PIN 0.5mm pitch

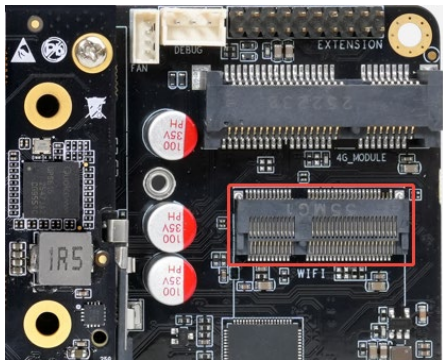


NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM2_I2C_SDA 【GPIO62】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM2_I2C_SCL 【GPIO63】 Pull-up resistor 2.2K	1.8	17	CSI1_NC_CLK_P	-
3	CAM_MCLK2 【GPIO51/CAM5_PWDN0】	1.8	18	CSI1_A0_CLK_M	-
4	CAM2_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI1_C1_LN2_P	-
6	CAM2_MCLK 【GPIO50】	1.8	21	CSI1_A2_LN2_M	-
7	CAM5_PWDN 【GPIO80】	1.8	22	GND	
8	CAM2_RESET_H 【Extended IO】	1.8	23	CSI1_B2_LN3_P	-
9	CAM2_MCLK 【GPIO50】	1.8	24	CSI1_C2_LN3_M	-
10	GND		25	GND	
11	CSI1_B0_LN0_P	-	26	NC	-
12	CSI1_C0_LN0_M	-	27	NC	-
13	GND		28	GND	
14	CSI1_A1_LN1_P	-	29	VCC_CSI3 (5.0V OUTPUT)	5.0
15	CSI1_B1_LN1_M	-	30	VCC_CSI3 (5.0V OUTPUT)	5.0

Interface definition



8. (U16) M.2 Module E-KEY



NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	WIFI_3V3 (3.3V Output)	3.3
3	HUB_USB3_DP	-	4	WIFI_3V3 (3.3V Output)	3.3
5	HUB_USB3_DM	-	6	NC	
7	GND		8	NC	
9	NC		10	NC	
11	NC		12	NC	
13	NC		14	NC	
15	NC		16	NC	
17	NC		18	GND	
19	NC		20	BT_M2_WAKE_AP (PWR_GPIO2)	3.3
21	NC		22	NC	
23	NC		32	NC	
33	GND		34	NC	
35	SOM_PCIE1_TX0_P (Series capacitor 100nF)	-	36	NC	



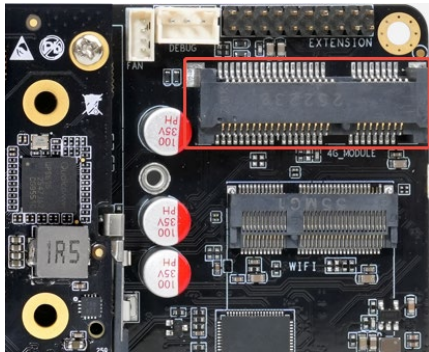
Interface definition

37	SOM_PCIE1_TX0_M (Series capacitor 100nF)	-	38	AP_M2_WAKE_BT (Extended IO)	3.3
39	GND		40	NC	
41	SOM_PCIE1_RX0_P	-	42	NC	
43	SOM_PCIE1_RX0_M	-	44	NC	
45	GND		46	NC	
47	SOM_PCIE1_REFCLK_P	-	48	NC	
49	SOM_PCIE1_REFCLK_M	-	50	32KOUT_WIFI (GPIO176)	3.3
51	GND		52	PCIE1_RESET_N (GPIO43)	3.3
53	PCIE1_CLK_REQ_N (GPIO45)	-	54	BT_DISABLE_L (GPIO61)	3.3
55	PCIE_WAKE (GPIO41)	-	56	WIFI_DISABLE_L (GPIO79)	3.3
57	GND		58	NC	
59	SOM_PCIE1_TX1_P (Series capacitor 100nF)	-	60	NC	
61	SOM_PCIE1_TX1_M (Series capacitor 100nF)		62	NC	
63	GND		64	NC	
65	SOM_PCIE1_RX1_P		66	NC	
67	SOM_PCIE1_RX1_M		68	NC	
69	GND		70	NC	
71	NC		72	WIFI_3V3 (3.3V Output)	3.3
73	NC		74	WIFI_3V3 (3.3V Output)	3.3
75	GND				

Interface definition



11. (U21) MINI PCIe 4G



NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		2	VCC3V5_4G (3.5V Output)	3.5
3	NC		4	GND	
5	NC		6	NC	
7	NC		8	UIM_PWR	1.8
9	GND		10	UIM_DAT	1.8
11	NC		12	UIM_CLK	1.8
13	NC		14	UIM_RST	1.8
15	GND		16	NC	
17	NC		18	GND	
19	NC		20	NC	
21	GND		22	4G_RESET Pull-up resistor 10K	3.8
23	NC		24	NC	
25	NC		26	GND	
27	GND		28	NC	

Interface definition

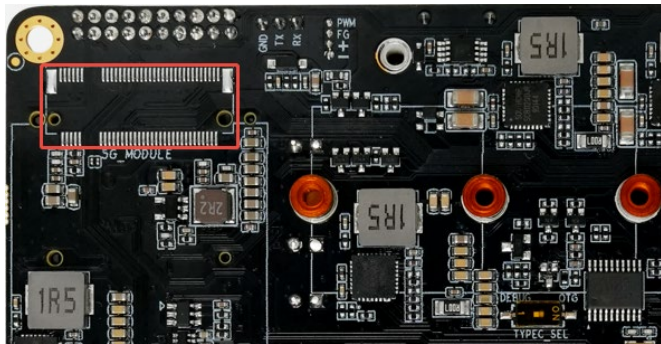


29	GND		30	NC	
31	NC		32	NC	
33	NC		34	GND	
35	GND		36	HUB_USB4_DM	-
37	GND		38	HUB_USB4_DP	-
39	VCC3V5_4G (3.5V Output)	3.5	40	GND	
41	VCC3V5_4G (3.5V Output)	3.5	42	NC	
43	GND		44	SIM_DET	1.8
45	NC		46	NC	
47	NC		48	NC	
49	GND		50	GND	
51	NC		52	VCC3V5_4G (3.5V Output)	3.5

Interface definition



12. (U26) 5G NGFF-M.2-B-KEY (Defult:NC)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		2	VCC3V8_4G (3.5V Output)	3.5
3	GND		4	VCC3V8_4G (3.5V Output)	3.5
5	GND		6	FUL_CARD_POWER_OFF# Pull-up resistor 10K	3.5
7	HUB_5G_USB2_DP	-	8	NC	
9	HUB_5G_USB2_DM	-	10	NC	
11	GND		20	NC	
21	NC		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	GND		28	NC	
29	HUB_USB4_SSRXN	-	30	UIM_RST	1.8
31	HUB_USB4_SSRXP	-	32	UIM_CLK	1.8
33	GND		34	UIM_DAT	1.8
35	HUB_USB4_SSTXN (Series capacitor 100nF)	-	36	UIM_PWR	1.8
37	HUB_USB4_SSTXP (Series capacitor 100nF)	-	38	NC	



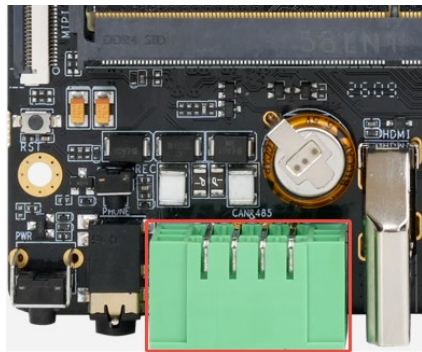
Interface definition

39	GND		40	NC	
41	NC		42	NC	
43	NC		44	NC	
45	GND		46	NC	
47	NC		48	NC	
49	NC		50	NC	
51	GND		52	NC	
53	NC		54	NC	
55	NC		56	NC	
57	GND		58	NC	
59	NC		60	NC	
61	NC		62	NC	
63	GND		64	NC	
65	NC		66	SIM_DET	1.8
67	4G_RESET	3.5	68	NC	
69	NC		70	VCC3V5_4G (3.5V Output)	3.5
71	GND		72	VCC3V5_4G (3.5V Output)	3.5
73	GND		74	VCC3V5_4G (3.5V Output)	3.5
75	NC				

Interface definition



13. (J3) RS485/RS232/CAN 2*4PIN 3.5mm pitch (GREEN)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	RS485_A		2	RS485_B	5.0
3	CAN_H	-	4	CAN_L	-
5	GND		6	GND	
7	RS232_TXD_1	-	8	RS232_RXD_1	-



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