

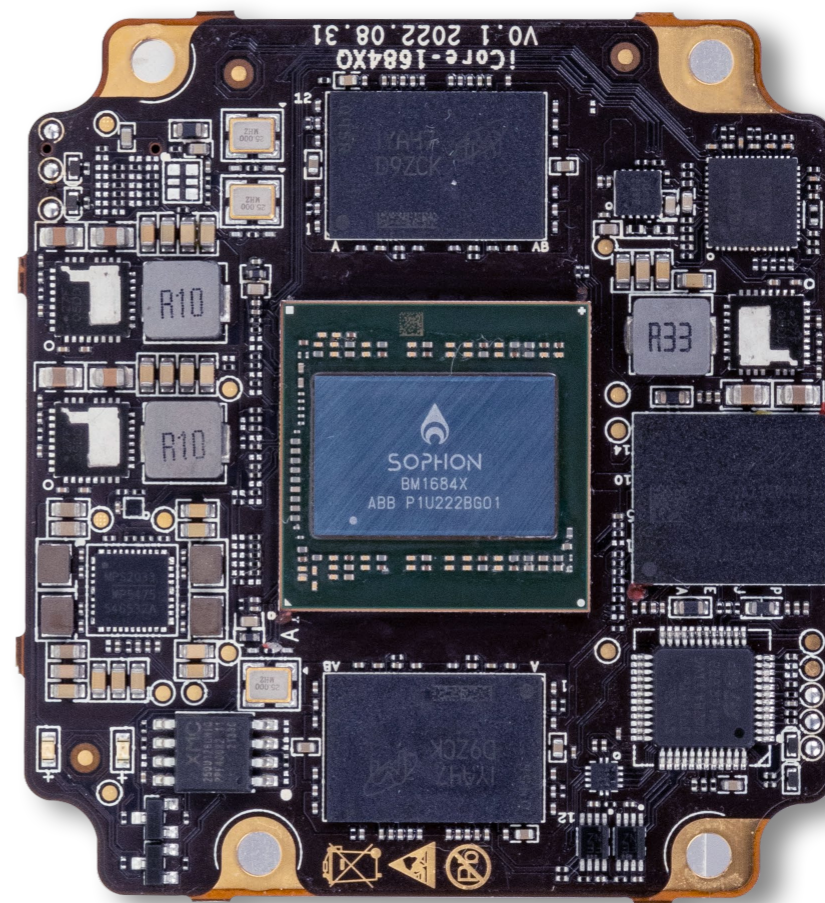


# iCore-1684XQ

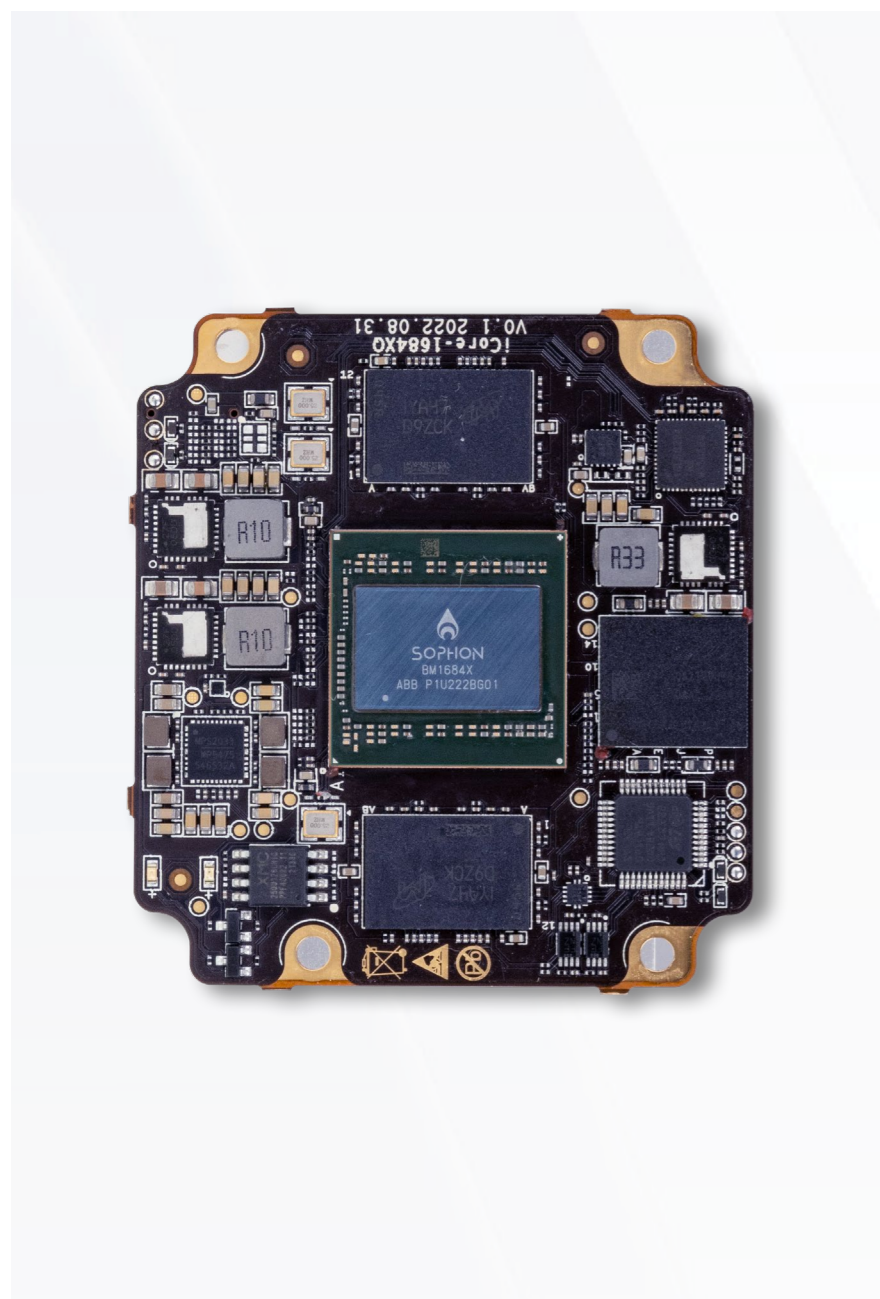
八核高算力AI核心板

V0.1 2024-3-19

天启智能科技

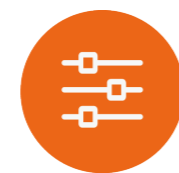


# 产品特点 Product features



## 32T 超高性能计算能力

SOPHON AI 处理器BM1684X  
32TOPS (INT8) 峰值算力  
16TFLOPS (FP16/BF16) 算力  
2TFLOPS (FP32) 高精度算力



## 丰富的扩展接口

核心板BTB接口, 拥有PCIe3.0、GMAC、SDIO3.0、I2C、PWM、UART、GPIO接口, 易集成入各类边缘嵌入式产品, 加速产品落地



## 高吞吐量, 高能效比

基于INT8量化Batch4实测数据, 相对于业界主流智算模组平台, 拥有更高的吞吐量和能效比



## 多路视频 AI 处理性能

32路H.265/H.264 1080p@25fps视频解码, 32路H.265/H.264 1080P@25fps高清视频全流程处理(解码+AI分析), 12路H.265/H.264 1080p@25fps视频编码



## 开放SDK, 一站式AI工具包

SOPHON SDK 一站式深度学习开发工具包支持 Caffe/TF/Pytorch/Mxnet/Paddle、主流网络模型与自定义算子开发支持 Docker 容器化, 算法应用快速部署



## 广泛的应用场景

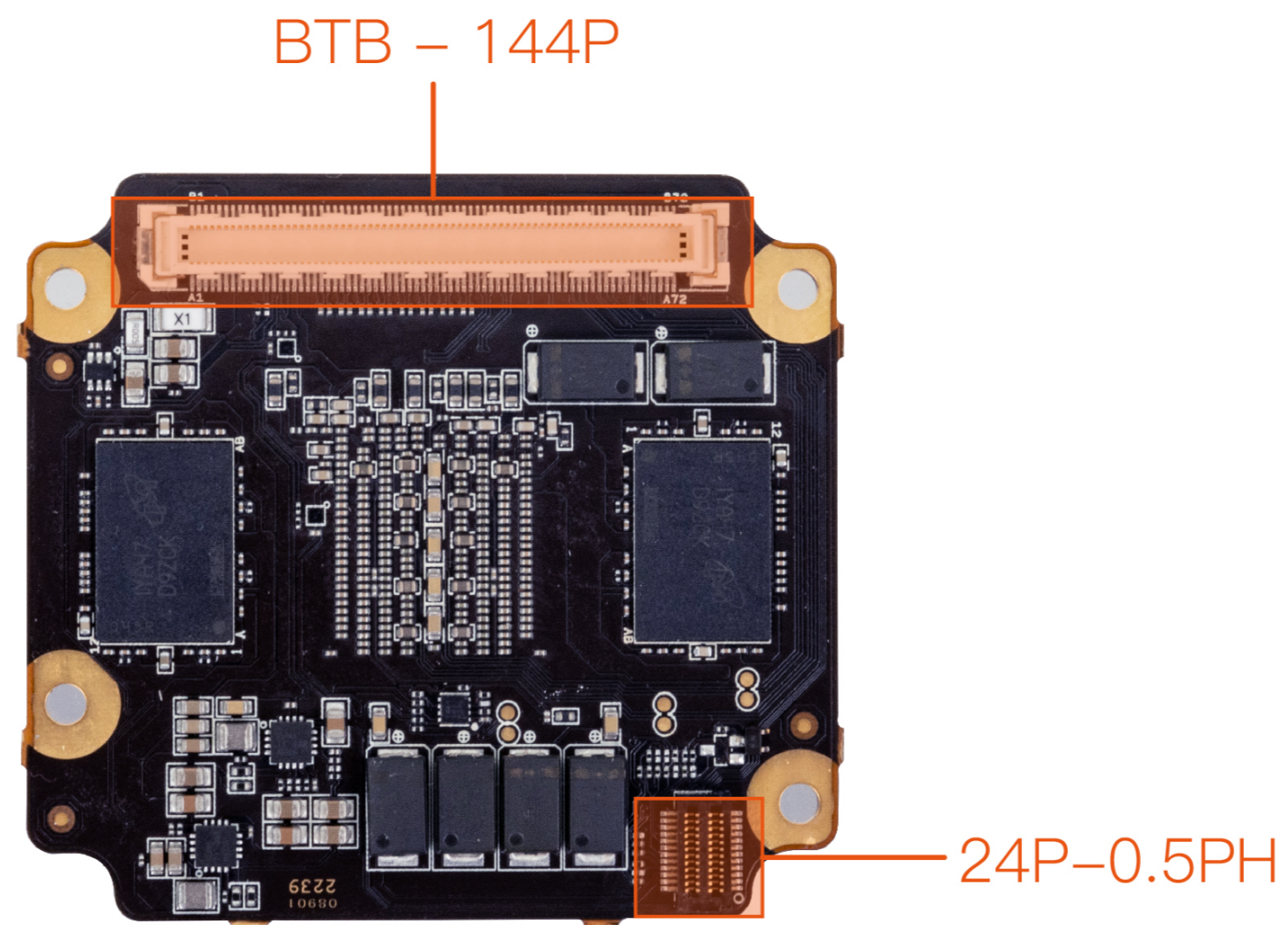
高效适配市场上AI算法, 为视觉计算、边缘计算、通用算力服务、智能安防、智慧城市、智慧金融等行业进行AI赋能



# 规格参数 Specifications

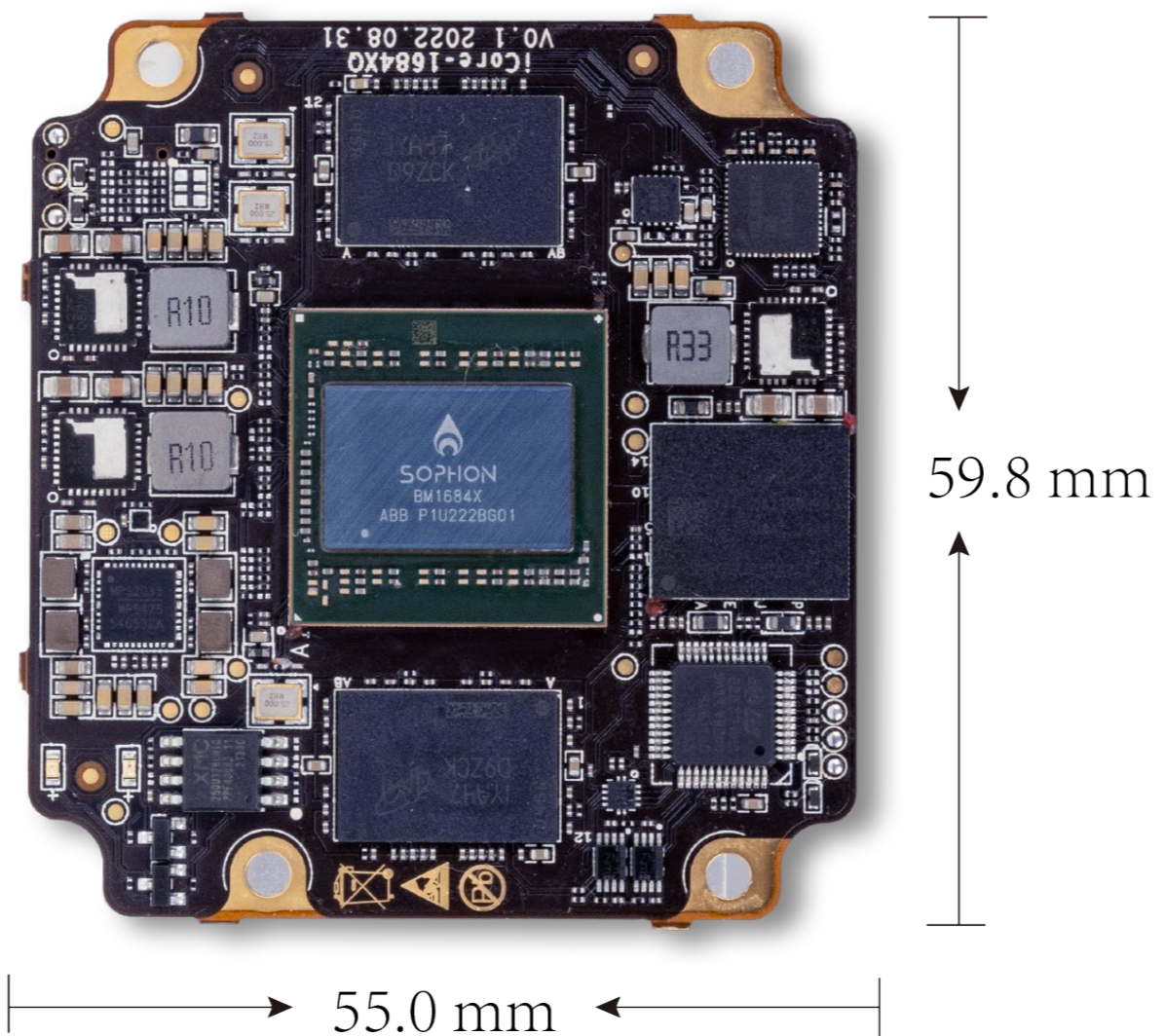
类 型	主要参数
SOC	SOPHON BM1684X
CPU	集成高性能八核ARM A53, 12nm工艺制程, 主频高达2.3GHz
TPU	内置张量计算模块TPU, 算力高达 :32TOPS (INT8)、16TFLOPS (FP16/BF16)、2TFLOPS (FP32) 支持TensorFlow / Caffe / PyTorch / Paddle / ONNX / MXNet / Tengine / DarkNet等主流编程框架
编解码	支持32路H.265/H.264 1080p@25fps 视频解码、32路1080P@25fps高清视频全流程处理(解码+AI分析), 支持 12 路H.265/H.264 1080p@25fps 视频编码
内存	16GB LPDDR4x
存储	64GB eMMC、128MB SPI Flash
以太网	集成双路GMAC, 可扩展双路1000Mbps以太网
接口	PCIe3.0 PHY (x4 RC+EP)、2*I2C、2*UART、1*PWM、1*SDMMC、GPIO
电源	12V/3A
系统	Linux系统
接口类型	BTB接口
尺寸	55mm*59.8mm
功耗	Noram1:18W(12V/1.5A), Max:33.6W(12V/2.8A)
环境	工作温度: -20°C- 60°C、存储温度: -20°C- 70°C、存储湿度: 10%~90%RH (无凝露)

# 接口描述 Interface description



- |         |       |      |
|---------|-------|------|
| PCIe3.0 | SDMMC | I2C  |
| PWM     | UART  | GPIO |

# 产品尺寸 Dimension





# 接口定义 Interface definition

Notes1:  
 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 = Low Level H = High level”

PIN	iCORE-1684XQ pin definition	BM1684X Pin NO.	Pad type	IO Pull	Function for Main BOARD (SM7-SBASE-EN4)	Defual function description	IO Power domain
A1	PCIE_12V		P		PCIE_12V	Power Input: 12V +/-5%	12V
A2	PCIE_12V		P		PCIE_12V		12V
A3	PCIE_12V		P		PCIE_12V		12V
A4	PCIE_12V		P		PCIE_12V		12V
A5	PCIE_12V		P		PCIE_12V		12V
A6	PCIE_12V		P		PCIE_12V		12V
A7	PCIE_12V		P		PCIE_12V		12V
A8	GND		G		GND	GND	
A9	GND		G		GND	GND	
A10	GND		G		GND	GND	
A11	GND		G		GND	GND	
A12	B1_SYS_RST_MCU				RESET_KEY	System Reset Input, Active L	3.3V
A13	MCU_PB15		I/O		TCA6416_INT	TCA6416_INT Input, Active L	3.3V
A14	MCU_PB10/I2C2_SCL		I/O		TCA6416_SCL	TCA6416_SCL(core board pull up resistor 4.7K)	3.3V
A15	MCU_PB11/I2C2_SDA		I/O		TCA6416_SDA	TCA6416_SDA(core board pull up resistor 4.7K)	3.3V



# 接口定义 Interface definition

A16	VDDIO33		P		PCIE_3.3V	3.3V Output ( Max: 500mA)	3.3V
A17	UART1_TX/GPIO87	B29	I/O	Up	UART1_TX	UART1_TX (core board series resistance 33R)	1.8V
A18	UART1_RX/GPIO88	D30	I/O	Up	UART1_RX	UART1_RX	1.8V
A19	GND		G		GND	GND	
A20	B1_PCIE_TX0_N	BH13			NC	NC(core board series capacitance 220nF)	
A21	B1_PCIE_TX0_P	BG13			NC	NC(core board series capacitance 220nF)	
A22	GND		G		GND	GND	
A23	B1_PCIE_TX1_N	BH15			NC	NC(core board series capacitance 220nF)	
A24	B1_PCIE_TX1_P	BG15			NC	NC(core board series capacitance 220nF)	
A25	GND		G		GND	GND	
A26	B1_PCIE_TX2_N	BH17			NC	NC(core board series capacitance 220nF)	
A27	B1_PCIE_TX2_P	BG17			NC	NC(core board series capacitance 220nF)	
A28	GND		G		GND	GND	
A29	B1_PCIE_TX3_N	BH19			NC	NC(core board series capacitance 220nF)	
A30	B1_PCIE_TX3_P	BG19			NC	NC(core board series capacitance 220nF)	
A31	GND		G		GND	GND	
A32	RC_PCIE_TX3_N	BH39			NC	NC(core board series capacitance 220nF)	
A33	RC_PCIE_TX3_P	BG39			NC	NC(core board series capacitance 220nF)	



# 接口定义 Interface definition

A34	GND		G		GND	GND	
A35	RC_PCIE_TX2_N	BH41			NC	NC(core board series capacitance 220nF)	
A36	RC_PCIE_TX2_P	BG41			NC	NC(core board series capacitance 220nF)	
A37	GND		G		GND	GND	
A38	RC_PCIE_TX1_N	BH43			RC_PCIE_TX1_N	RC_PCIE_TX1_N (core board series capacitance 220nF)	
A39	RC_PCIE_TX1_P	BG43			RC_PCIE_TX1_P	RC_PCIE_TX1_P (core board series capacitance 220nF)	
A40	GND		G		GND	GND	
A41	RC_PCIE_TX0_N	BH45			RC_PCIE_TX0_N	RC_PCIE_TX0_N (core board series capacitance 220nF)	
A42	RC_PCIE_TX0_P	BG45			RC_PCIE_TX0_P	RC_PCIE_TX0_P (core board series capacitance 220nF)	
A43	GND		G		GND	GND	
A44	PCIE_REFCLK0_P	BH29			PCIE_REFCLK0_P	PCIE_REFCLK0_P	
A45	PCIE_REFCLK0_M	BG29			PCIE_REFCLK0_N	PCIE_REFCLK0_N	
A46	GND		G		GND	GND	
A47	PCIE_REFCLK1_M	BJ36			PCIE_REFCLK1_N	PCIE_REFCLK1_N	
A48	PCIE_REFCLK1_P	BK36			PCIE_REFCLK1_P	PCIE_REFCLK1_P	
A49	GND		G		GND	GND	
A50	SDIO_DAT2	BJ8	I/O		SDIO_DAT2	SDIO_DAT2	3.3V





# 接口定义 Interface definition

A51	SDIO_DAT0	BH8	I/O		SDIO_DAT0	SDIO_DAT0	3.3V
A52	SDIO_DAT3	BJ7	I/O		SDIO_DAT3	SDIO_DAT3	3.3V
A53	SDIO_DAT1	BK8	I/O		SDIO_DAT1	SDIO_DAT1	3.3V
A54	SDIO_CD_X	BG6	I/O	Up	SDIO_CD_X	TF Card Det Input ,Active L	1.8V
A55	SDIO_PWR_EN/GPIO42	BH6	I/O	N.A	SDIO_PWR_EN	SDIO_Power_EN Output, Active H	3.3V
A56	SDIO_CMD	BK7	I/O		SDIO_CMD	SDIO_CMD	3.3V
A57	SDIO_CLK	BG8	I/O		SDIO_CLK	SDIO_CLK	3.3V
A58	PWM0/GPIO75	A44	I/O		FAN_PWM	FAN_PWM (PWM0 Output)	1.8V
A59	FAN0/GPIO77	A45	I/O		FAN_TACH	FAN_TACH Input, Active L	1.8V
A60	GND		G		GND	GND	
A61	RGMI11_IRQ/GPIO72	D17	I/O	Down	RGMI11_IRQ	RGMI11_INT Input, Active L	1.8V
A62	RGMI11_RXD0	A14	I/O		RGMI11_RXD0	RGMI11_RXD0	1.8V
A63	RGMI11_RXD2	A15	I/O		RGMI11_RXD2	RGMI11_RXD2	1.8V
A64	GND		G		GND	GND	
A65	RGMI11_TXC	C17	I/O		RGMI11_TXCLK	RGMI11_TXCLK	1.8V
A66	RGMI11_TXCTRL	E18	I/O		RGMI11_TXCTRL	RGMI11_TXCTRL	1.8V
A67	RGMI11_TXD1	B17	I/O		RGMI11_TXD1	RGMI11_TXD1	1.8V
A68	RGMI11_TXD0	B18	I/O		RGMI11_TXD0	RGMI11_TXD0	1.8V



# 接口定义 Interface definition

A69	RGMI11_TXD2	A17	I/O		RGMI11_TXD2	RGMI11_TXD2	1.8V
A70	RGMI11_TXD3	C18	I/O		RGMI11_TXD3	RGMI11_TXD3	1.8V
A71	RGMI11_MDIO	E17	I/O		RGMI11_MDIO	RGMI11_MDIO	1.8V
A72	RGMI11_MDC	D15	I/O		RGMI11_MDC	RGMI11_MDC	1.8V
PIN	iCORE-1684XQ pin definition	BM1684X Pin NO.	Pad type	IO Pull	Function for Main BOARD (SM7-SBASE-EN4)	Defual function description	IO Power domain
B1	PCIE_12V		P		PCIE_12V	Power Input: 12V +/-5%	12V
B2	PCIE_12V		P		PCIE_12V		12V
B3	PCIE_12V		P		PCIE_12V		12V
B4	PCIE_12V		P		PCIE_12V		12V
B5	PCIE_12V		P		PCIE_12V		12V
B6	PCIE_12V		P		PCIE_12V		12V
B7	GND		G		GND	GND	
B8	GND		G		GND	GND	
B9	GND		G		GND	GND	
B10	GND		G		GND	GND	
B11	RGMI10_RXCTRL	D23	I/O		RGMI10_RXCTRL	RGMI10_RXDV_CRS	1.8V
B12	RGMI10_RXD0	C23	I/O		RGMI10_RXD0	RGMI10_RXD0	1.8V
B13	RGMI10_IRQ/GPIO56	A18	I/O	Down	RGMI10_IRQ	RGMI10_INT Input, Active L	1.8V



# 接口定义 Interface definition

B14	RGMIIO_RXC	C21	I/O		RGMIIO_RXC	RGMIIO_RXCLK	1.8V
B15	RGMIIO_RXD2	B23	I/O		RGMIIO_RXD2	RGMIIO_RXD2	1.8V
B16	RGMIIO_RXD1	A23	I/O		RGMIIO_RXD1	RGMIIO_RXD1	1.8V
B17	RGMIIO_RXD3	B21	I/O		RGMIIO_RXD3	RGMIIO_RXD3	1.8V
B18	GND		G		GND	GND	
B19	RGMIIO_TXC	A20	I/O		RGMIIO_TXC	RGMIIO_TXCLK	1.8V
B20	RGMIIO_TXD0	D20	I/O		RGMIIO_TXD0	RGMIIO_TXD0	1.8V
B21	RGMIIO_TXCTRL	B20	I/O		RGMIIO_TXCTRL	RGMIIO_TXCTRL	1.8V
B22	RGMIIO_TXD2	C20	I/O		RGMIIO_TXD2	RGMIIO_TXD2	1.8V
B23	RGMIIO_TXD1	A21	I/O		RGMIIO_TXD1	RGMIIO_TXD1	1.8V
B24	RGMIIO_TXD3	D21	I/O		RGMIIO_TXD3	RGMIIO_TXD3	1.8V
B25	RGMIIO_MDIO	E20	I/O		RGMIIO_MDIO	RGMIIO_MDIO	1.8V
B26	RGMIIO_MDC	E23	I/O		RGMIIO_MDC	RGMIIO_MDC	1.8V
B27	RGMIIO_RST/GPIO76	B44	I/O	Down	PHY_RST0	RGMIIO_Reset Output,Active L	1.8V
B28	GND		G		GND	GND	
B29	B1_PCIE_RX0_N	BK12			NC	NC	
B30	B1_PCIE_RX0_P	BJ12			NC	NC	
B31	GND		G		GND	GND	



# 接口定义 Interface definition

B32	B1_PCIE_RX1_N	BK14			NC	NC	
B33	B1_PCIE_RX1_P	BJ14			NC	NC	
B34	GND		G		GND	GND	
B35	B1_PCIE_RX2_N	BK16			NC	NC	
B36	B1_PCIE_RX2_P	BJ16			NC	NC	
B37	GND		G		GND	GND	
B38	B1_PCIE_RX3_N	BK18			NC	NC	
B39	B1_PCIE_RX3_P	BJ18			NC	NC	
B40	GND		G		GND	GND	
B41	RC_PCIE_RX3_P	BJ38			NC	NC	
B42	RC_PCIE_RX3_N	BK38			NC	NC	
B43	GND		G		GND	GND	
B44	RC_PCIE_RX2_P	BJ40			NC	NC	
B45	RC_PCIE_RX2_N	BK40			NC	NC	
B46	GND		G		GND	GND	
B47	RC_PCIE_RX1_P	BJ42			RC_PCIE_RX1_P	RC_PCIE_RX1_P	
B48	RC_PCIE_RX1_N	BK42			RC_PCIE_RX1_N	RC_PCIE_RX1_N	
B49	GND		G		GND	GND	



# 接口定义 Interface definition

B50	RC_PCIE_RX0_P	BJ44			RC_PCIE_RX0_P	RC_PCIE_RX0_P	
B51	RC_PCIE_RX0_N	BK44			RC_PCIE_RX0_N	RC_PCIE_RX0_N	
B52	GND		G		GND	GND	
B53	UART2_TX/GPIO89	C30	I/O	Up	UART2_TX	UART2_TX (core board series resistance 33R)	1.8V
B54	UART2_RX/GPIO90	E30	I/O	Up	UART2_RX	UART2_RX	1.8V
B55	I2C2_SCL/GPIO84	E41	I/O		I2C2_SCL	I2C2_SCL	1.8V
B56	I2C2_SDA/GPIO83	D41	I/O		I2C2_SDA	I2C2_SDA	1.8V
B57	PCIEE_RST_X	C26			PCIEE_RST_X	PCIEE_RST_X	3.3V
B58	PCIER_RST_X	C24			PCIER_RST_X	PCIER_Reset Output Active L (core board pull up resistance 4.7K)	3.3V
B59	GPIO7/IIC_ADDR2	B26	I/O		GPIO7	GPIO7	1.8V
B60	GND		G		GND	GND	
B61	RGMI11_RST/GPIO31	C27	I/O		RGMI11_RST	RGMI11_Reset Output, Active L	1.8V
B62	RGMI11_RXCTRL	B15	I/O		RGMI11_RXCTRL	RGMI11_RXCTRL	1.8V
B63	RGMI11_RXC	B14	I/O		RGMI11_RXC	RGMI11_RXC	1.8V
B64	RGMI11_RXD1	C15	I/O		RGMI11_RXD1	RGMI11_RXD1	1.8V
B65	RGMI11_RXD3	C14	I/O		RGMI11_RXD3	RGMI11_RXD3	1.8V
B66	GND		G		GND	GND	
B67	GPIO30/DBG_IIC_SDA	A36	I/O	N.A	GPIO30	GPIO30	1.8V




# 接口定义 Interface definition


B68	GPIO29/DBG_IIC_SCL	D9	I/O	N.A	GPIO29	GPIO29	1.8V
B69	GPIO5/IIC_ADDR0	A26	I/O		GPIO5	GPIO5	1.8V
B70	GPIO6/IIC_ADDR1	B27	I/O		GPIO6	GPIO6	1.8V
B71	UART0_RX/GPIO86	C29	I/O	Up	UART0_RX	UART0_RX (System Debug)	1.8V
B72	UART0_TX/GPIO85	D29	I/O	Up	UART0_TX	UART0_TX (System Debug)	1.8V




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