RK3588 core board

RK3588核心板

目录

一、产品概述

RK3588 核心板是一款由贝启科技自主研发的基于瑞芯微 RK3588 AI 芯片的智能核心板， 该核心板性能强劲、接口丰富，可以广泛应用于 ARM 电脑、AR/VR、智能座舱、智慧大屏、边缘计算、高端 IPC、NVR、行业高端平板等应用场景。

贝启科技提供 Linux Debian、Linux Ubuntu、Android 等操作系统 SDK，并可支持适配鸿蒙操作系统、Linux 国产操作系统。

该核心板尺寸仅仅 85mm×50mm，可以方便的嵌入到各类设备中。

该核心板目前已开放预订，量少，预购从速！

二、产品优势

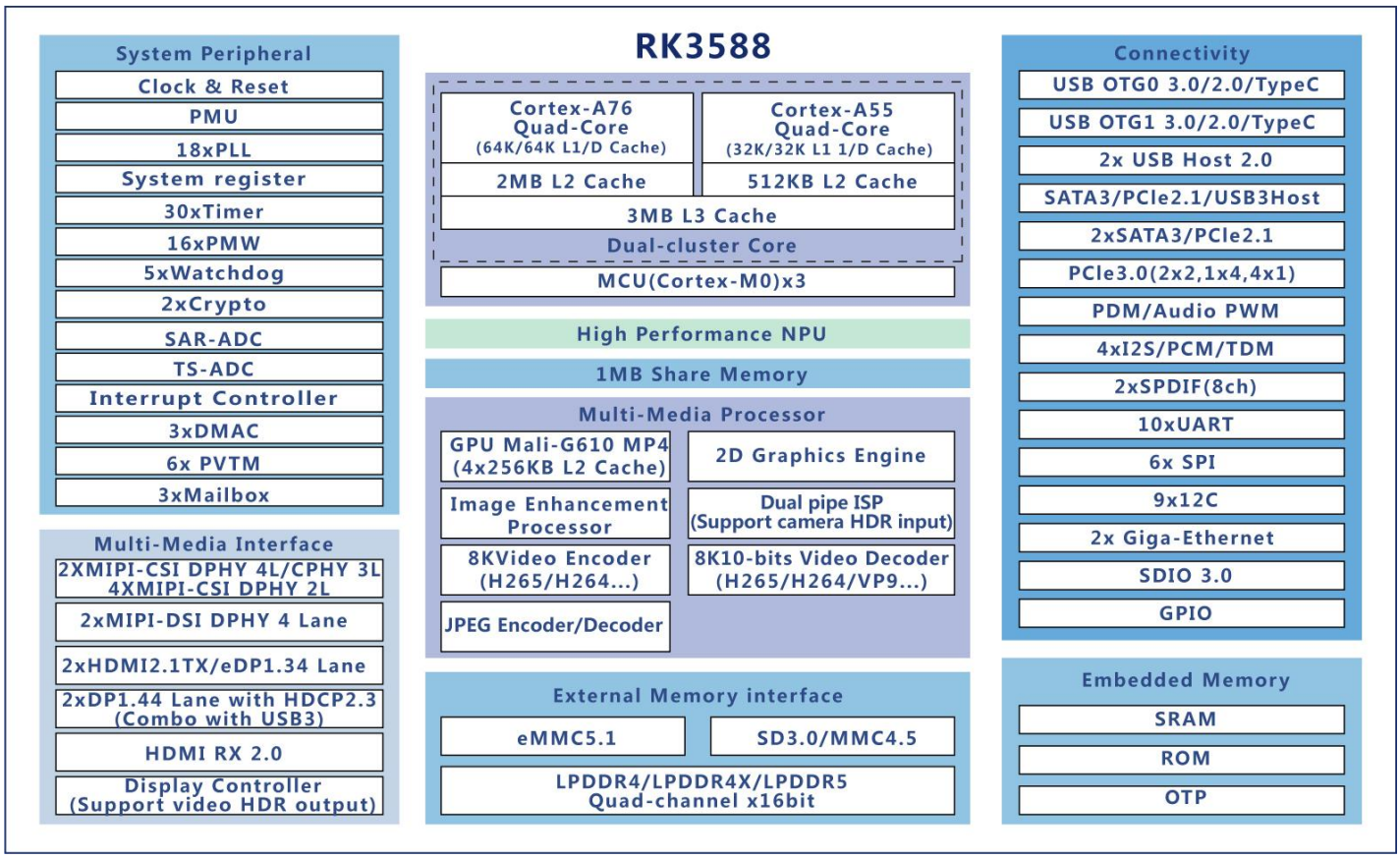
1.搭载 RK3588 高性能 SOC，集成了四核 Cortex-A76 和四核 Cortex-A55，主频高达 2.4G

2.算力高达 6Tops，支持 INT4/INT8/INT16/FP16 运算，满足大多数人工智能模型的算力需求

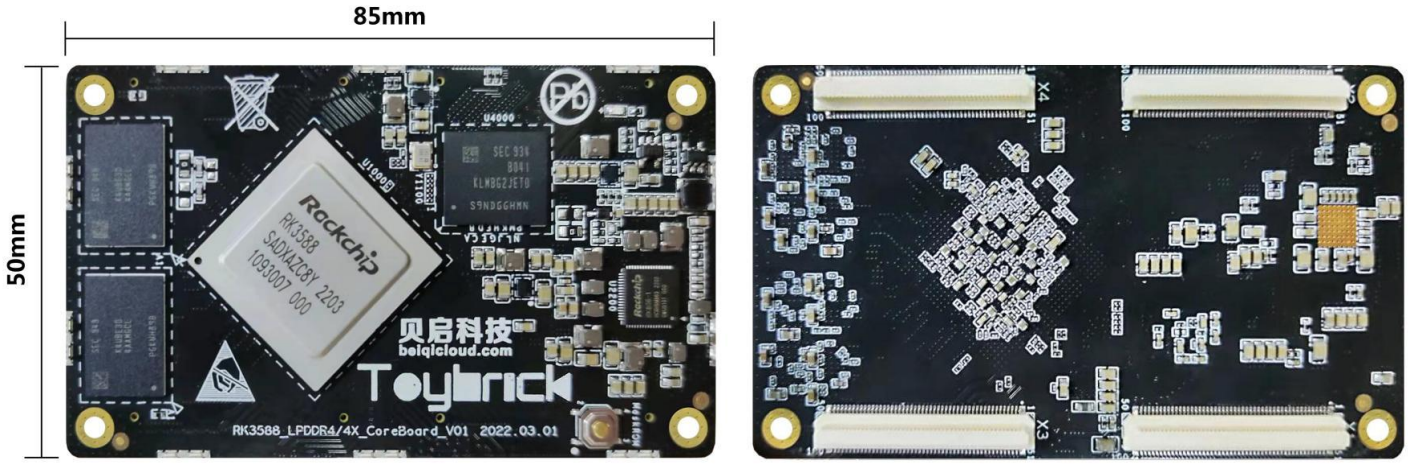
3.强大的编解码能力，最高支持 8K@60fps

4.丰富的接口类型，满足行业应用开发需求

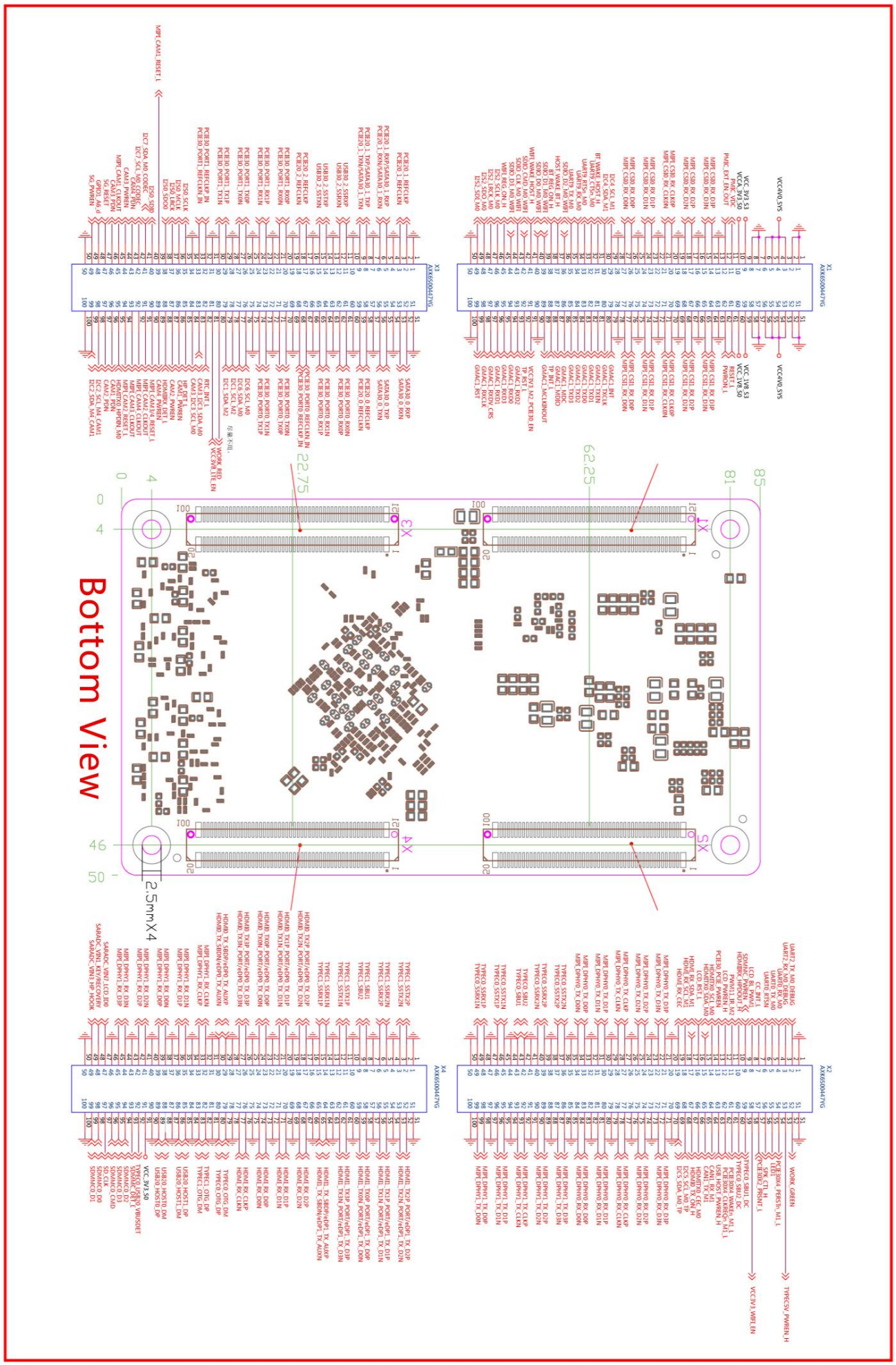
三、芯片架构


RK3588
System Peripheral
Clock & Reset
PMU
18xPLL
System register
30xTimer
16xPMW
5xWatchdog
2xCrypto
SAR-ADC
TS-ADC
Interrupt Controller
3xDMAC
6x PVTM
3xMailbox
Multi-Media Interface
2XMIPI-CSI DPHY 4L/CPHY 3L 4XMIPI-CSI DPHY 2L
2xMIPI-DSI DPHY 4 Lane
2xHDMI2.1TX/eDP1.34 Lane
2xDP1.44 Lane with HDCP2.3 (Combo with USB3)
HDMI RX 2.0
Display Controller (Support video HDR output)
Cortex-A76 Quad-Core (64K/64K L1/D Cache)
Cortex-A55 Quad-Core (32K/32K L1 1/D Cache)
2MB L2 Cache
512KB L2 Cache
3MB L3 Cache
Dual-cluster Core
MCU(Cortex-M0)x3
High Performance NPU
1MB Share Memory
Multi-Media Processor
GPU Mali-G610 MP4 (4x256KB L2 Cache)
2D Graphics Engine
Image Enhancement Processor
Dual pipe ISP (Support camera HDR input)
8KVideo Encoder (H265/H264...)
8K10-bits Video Decoder (H265/H264/VP9...)
JPEG Encoder/Decoder
External Memory interface
eMMC5.1
SD3.0/MMC4.5
LPDDR4/LPDDR4X/LPDDR5 Quad-channel x16bit
Connectivity
USB OTG0 3.0/2.0/TypeC
USB OTG1 3.0/2.0/TypeC
2x USB Host 2.0
SATA3/PCIe2.1/USB3Host
2xSATA3/PCIe2.1
PCIe3.0(2x2,1x4,4x1)
PDM/Audio PWM
4xI2S/PCM/TDM
2xSPDIF(8ch)
10xUART
6x SPI
9x12C
2x Giga-Ethernet
SDIO 3.0
GPIO
Embedded Memory
SRAM
ROM
OTP

四、产品参数


85mm
50mm
Rockchip
RK3588
贝启科技
beiqicloud.com
Toybrick
RK3588_LPDDR4/4X_CoreBoard_V01 2022.03.01

五、引线分配



六、规格参数

特性/功能/接口	详细说明
主控芯片	Rockchip RK3588
中央处理器(CPU)	ARM Cortex-A76×4+ARM Cortex-A55×4，主频高达 2.4GHz
图形处理器(GPU)	G610 GPU 支持 OpenGLES 1.1, 2.0, and 3.2, OpenCL up to 2.2 and Vulkan1.2 专有 2D 硬件加速引擎
神经网络处理器(NPU)	6.0TOPs
视频编解码	支持 8K 视频解码 Decoder 支持 8K 视频编码 Encoder 支持高质量 JPEG 编解码
运行内存	4GB LPDDR4，最大支持 32GB
机身存储	16GB/32GB/64GB/128GB/256GB eMMC
电源管理芯片	Rockchip RK806-1
操作系统	Ubuntu20.04/Android12 支持适配国产 Linux 操作系统 支持适配 OpenHarmony 鸿蒙操作系统
系统升级	支持通过 USB 本地升级
显示输出接口	2×4 Lanes MIPI DSI
	2x HDMI2.1 TX/2×eDP1.3 4 Lane
	2x DP1.4 4 Lane with HDCP2.3
视频输入接口	4x MIPI-CSI DPHY 4L
以太网接口	2×RGMII（内置 2 个 GMAC，最多支持两路千兆以太网）
PCIe3.0	1×4 Link PCIe3.0 or 2×2 Link PCIe3.0 or 4×1 Link PCIe3.0
PCIe2.1/SATA3.3	3xPCIe2.1/3x SATA3.3
Type-C	2× USB OTG0 3.0/2.0/TypeC
USB2.0 Host	2×USB2.0 Host
模拟音频接口	1×Speaker OUT（1.3W）
	1×Headphone OUT
	2×Mic IN
数字音频接口	1×I2S（8ch）
SDIO3.0	1×SDIO3.0
SDMMC	1×SDMMC
ADC	8×ADC 模数转换器
PWM	脉宽调制
UART	9×UART,其中 UART1 为 DEBUG 专用调试串口
SPI	2×SPI
I2C	3×I2C
GPIOs	提供多组 GPIO 可供使用，具体请参考核心板引脚描述
供电	5V/3.3V
结构尺寸	长×宽×厚：85mm×50mm 连接器组合高度：4mm

七、引脚描述

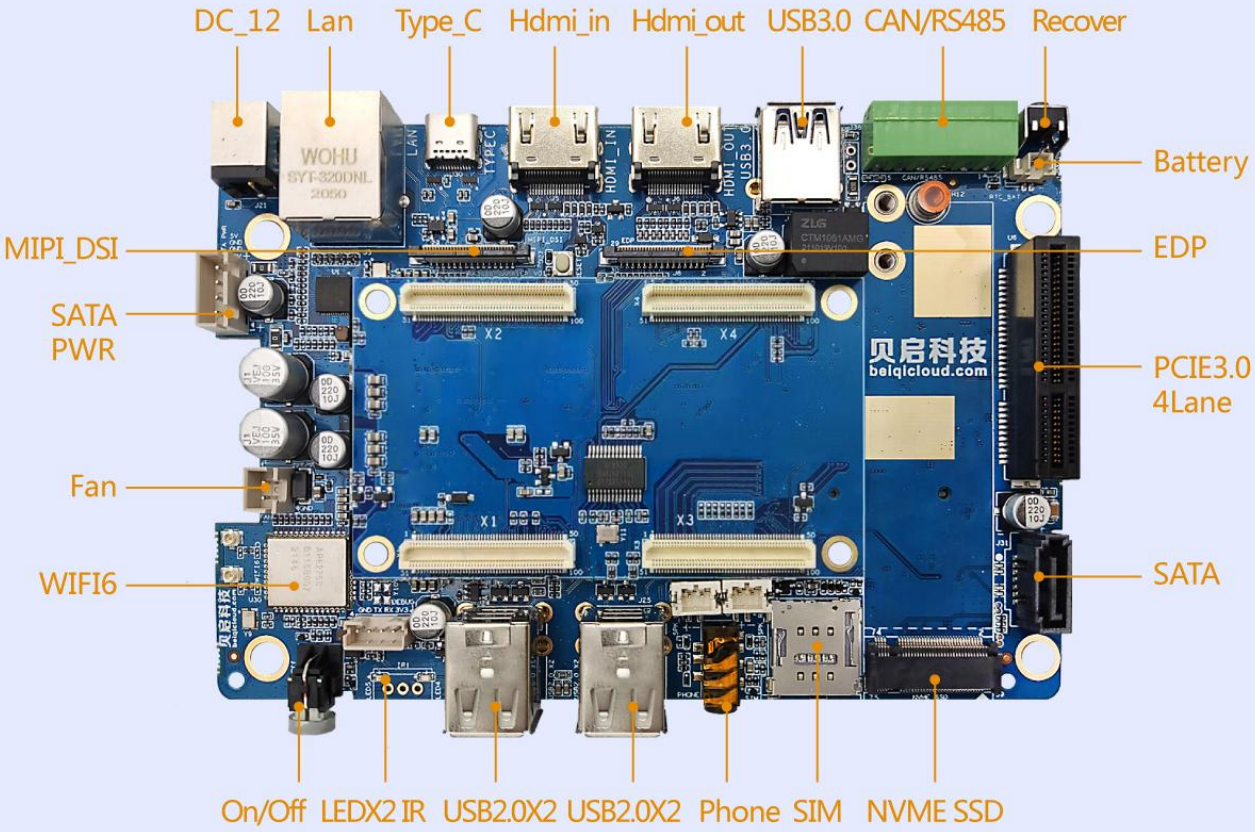
X1 AXK6S00447YG		Description			X1 AXK6S00447YG		Description		
PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull	PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull
1	Gnd				51	Gnd			
2	Gnd				52	Gnd			
3	VCC4V0_SYS				53	VCC4V0_SYS			
4	VCC4V0_SYS				54	VCC4V0_SYS			
5	VCC4V0_SYS				55	VCC4V0_SYS			
6	VCC4V0_SYS				56	VCC4V0_SYS			
7	Gnd				57	Gnd			
8	Gnd				58	Gnd			
9	VCC_3V3_S3				59	VCC_1V8_S3			
10	VCCA_3V3_S0				60	VCC_1V8_S0			
11	PMIC_VDC				61	RESET_L			
12	PMIC_EXT_EN_OUT				62	PWRON_L			
13	Gnd				63	Gnd			
14	MIPI_CSI0_RX_D3P				64	MIPI_CSI1_RX_D3P			
15	MIPI_CSI0_RX_D3N				65	MIPI_CSI1_RX_D3N			
16	Gnd				66	Gnd			
17	MIPI_CSI0_RX_D2P				67	MIPI_CSI1_RX_D2P			
18	MIPI_CSI0_RX_D2N				68	MIPI_CSI1_RX_D2N			
19	Gnd				69	Gnd			
20	MIPI_CSI0_RX_CLK0P				70	MIPI_CSI1_RX_CLK0P			
21	MIPI_CSI0_RX_CLK0N				71	MIPI_CSI1_RX_CLK0N			
22	Gnd				72	Gnd			
23	MIPI_CSI0_RX_D1P				73	MIPI_CSI1_RX_D1P			
24	MIPI_CSI0_RX_D1N				74	MIPI_CSI1_RX_D1N			
25	Gnd				75	Gnd			
26	MIPI_CSI0_RX_D0P				76	MIPI_CSI1_RX_D0P			
27	MIPI_CSI0_RX_D0N				77	MIPI_CSI1_RX_D0N			
28	Gnd				78	Gnd			
29	I2C4_SCL_M1				79	GMAC1_INT			
30	I2C4_SDA_M1				80	GMAC1_TXCLK			
31	BT_WAKE_HOST_H				81	GMAC1_TXEN			
32	UART9_CTSn_M0				82	GMAC1_TXD1			
33	UART9_RTSn_M0				83	GMAC1_TXD0			
34	UART9_RX_M0				84	GMAC1_TXD2			
35	UART9_TX_M0				85	GMAC1_TXD3			
36	SDIO_D2_M0_WIFI				86	GMAC1_MDC			
37	HOST_WAKE_BT_H				87	GMAC1_MDIO			
38	BT_REG_ON_H				88	TP_INT_L			
39	SDIO_D1_M0_WIFI				89	GMAC1_MCLKINOUT			
40	SDIO_D0_M0_WIFI				90	Gnd			
41	WIFI_WAKE_HOST_H				91	VCC3V3_M2_PCIE30_EN			
42	SDIO_CMD_M0_WIFI				92	TP_RST_L			
43	SDIO_CLK_M0_WIFI				93	GMAC1_RXD2			
44	SDIO_D3_M0_WIFI				94	GMAC1_RXD0			
45	WIFI_REG_ON_H				95	GMAC1_RXD3			
46	I2S2_SCLK_M0				96	GMAC1_RXD1			
47	I2S2_LRCK_M0				97	GMAC1_RXDV_CRS			
48	I2S2_SDO_M0				98	GMAC1_RXCLK			
49	I2S2_SDI_M0				99	GMAC1_RST			
50	Gnd				100	Gnd			

X2 AXK6S00447YG		Description			X2 AXK6S00447YG		Description		
PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull	PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull
1	Gnd				51	Gnd			
2	UART2_TX_M0_DEBUG				52	WORK_GREEN			
3	UART2_RX_M0_DEBUG				53	TYPEC5V_PWREN_H			
4	UART0_RX_M0				54	PCIE30X4_PERSTn_M1_L			
5	UART0_TX_M0				55	LED1			
6	UART0_RTSN				56	SPK_CTL_H			
7	CC_INT_L				57	PCIE30X2_PRSNT_L			
8	LCD_BL_PWM1				58	VCC3V3_WIFI_EN			
9	SDMMC_PWREN				59	TYPEC0_SBU1_DC			
10	HDMIIRX_HPDOUT_H				60	TYPEC0_SBU2_DC			
11	PWM11_IR_M2				61	PCIE30X4_WAKEn_M1_L			
12	LCD_PWREN_H				62	PCIE30X4_CLKREQn_M1_L			
13	PCIE30_PCIE_PWREN				63	USB_HOST_PWREN_H			
14	HDMITX0_SCL_M0				64	CAN1_RX_M1			
15	HDMITX0_SDA_M0				65	CAN1_TX_M1			
16	LCD_RST_L				66	HDMITX0_CEC_M0			
17	HDMI_RX_SDA_M1				67	HDMI0_TX_ON_H			
18	HDMI_RX_SCL_M1				68	I2C5_SCL_M0_TP			
19	HDMI_RX_CEC				69	I2C5_SDA_M0_TP			
20	Gnd				70	Gnd			
21	MIPI_DPHY0_TX_D3P				71	MIPI_DPHY0_RX_D3P			
22	MIPI_DPHY0_TX_D3N				72	MIPI_DPHY0_RX_D3N			
23	Gnd				73	Gnd			
24	MIPI_DPHY0_TX_D2P				74	MIPI_DPHY0_RX_D2P			
25	MIPI_DPHY0_TX_D2N				75	MIPI_DPHY0_RX_D2N			
26	Gnd				76	Gnd			
27	MIPI_DPHY0_TX_CLKP				77	MIPI_DPHY0_RX_CLKP			
28	MIPI_DPHY0_TX_CLKN				78	MIPI_DPHY0_RX_CLKN			
29	Gnd				79	Gnd			
30	MIPI_DPHY0_TX_D1P				80	MIPI_DPHY0_RX_D1P			
31	MIPI_DPHY0_TX_D1N				81	MIPI_DPHY0_RX_D1N			
32	Gnd				82	Gnd			
33	MIPI_DPHY0_TX_D0P				83	MIPI_DPHY0_RX_D0P			
34	MIPI_DPHY0_TX_D0N				84	MIPI_DPHY0_RX_D0N			
35	Gnd				85	Gnd			
36	TYPEC0_SSTX2N				86	MIPI_DPHY1_TX_D3P			
37	TYPEC0_SSTX2P				87	MIPI_DPHY1_TX_D3N			
38	Gnd				88	Gnd			
39	TYPEC0_SSRX2P				89	MIPI_DPHY1_TX_D2P			
40	TYPEC0_SSRX2N				90	MIPI_DPHY1_TX_D2N			
41	Gnd				91	Gnd			
42	TYPEC0_SBU2				92	MIPI_DPHY1_TX_CLKP			
43	TYPEC0_SBU1				93	MIPI_DPHY1_TX_CLKN			
44	Gnd				94	Gnd			
45	TYPEC0_SSTX1N				95	MIPI_DPHY1_TX_D1P			
46	TYPEC0_SSTX1P				96	MIPI_DPHY1_TX_D1N			
47	Gnd				97	Gnd			
48	TYPEC0_SSRX1P				98	MIPI_DPHY1_TX_D0P			
49	TYPEC0_SSRX1N				99	MIPI_DPHY1_TX_D0N			
50	Gnd				100	Gnd			

X3 AXK6S00447YG		Description			X3 AXK6S00447YG		Description		
PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull	PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull
1	Gnd				51	Gnd			
2	PCIE20_1_REFCLKP				52	SATA30_0_RXP			
3	PCIE20_1_REFCLKN				53	SATA30_0_RXN			
4	Gnd				54	Gnd			
5	PCIE20_1_RXP/SATA30_1_RXP				55	SATA30_0_TXP			
6	PCIE20_1_RXN/SATA30_1_RXN				56	SATA30_0_TXN			
7	Gnd				57	Gnd			
8	PCIE20_1_TXP/SATA30_1_TXP				58	PCIE20_0_REFCLKP			
9	PCIE20_1_TXN/SATA30_1_TXN				59	PCIE20_0_REFCLKN			
10	Gnd				60	Gnd			
11	USB30_2_SSRXP				61	PCIE30_PORT0_RX0N			
12	USB30_2_SSRXN				62	PCIE30_PORT0_RX0P			
13	Gnd				63	Gnd			
14	USB30_2_SSTXP				64	PCIE30_PORT0_RX1N			
15	USB30_2_SSTXN				65	PCIE30_PORT0_RX1P			
16	Gnd				66	Gnd			
17	PCIE20_2_REFCLKP				67	PCIE30_PORT0_REFCLKN_IN			
18	PCIE20_2_REFCLKN				68	PCIE30_PORT0_REFCLKP_IN			
19	Gnd				69	Gnd			
20	PCIE30_PORT1_RX0P				70	PCIE30_PORT0_TX0N			
21	PCIE30_PORT1_RX0N				71	PCIE30_PORT0_TX0P			
22	Gnd				72	Gnd			
23	PCIE30_PORT1_RX1P				73	PCIE30_PORT0_TX1N			
24	PCIE30_PORT1_RX1N				74	PCIE30_PORT0_TX1P			
25	Gnd				75	Gnd			
26	PCIE30_PORT1_TX0P				76	I2C6_SCL_M0			
27	PCIE30_PORT1_TX0N				77	I2C6_SDA_M0			
28	Gnd				78	I2C1_SCL_M2			
29	PCIE30_PORT1_TX1P				79	I2C1_SDA_M2			
30	PCIE30_PORT1_TX1N				80	WORK_RED			
31	Gnd				81	VCC3V8_LTE_EN			
32	PCIE30_PORT1_REFCLKP_IN				82	RTC_INT_L			
33	PCIE30_PORT1_REFCLKN_IN				83	CAM3_I2C3_SDA_M0			
34	Gnd				84	CAM3_I2C3_SCL_M0			
35	I2S0_SCLK				85	HP_DET_L			
36	I2S0_MCLK				86	CAM1_PWREN			
37	I2S0_LRCK				87	CAM2_PWREN			
38	I2S0_SDO0				88	HDMIIRX_DET_L			
39	MIPI_CAM1_RESET_L				89	CAM4_PWREN			
40	I2S0_SDI0				90	MIPI_CAM3/4_RESET_L			
41	I2C7_SDA_M0_CODEC				91	MIPI_CAM2_CLKOUT			
42	I2C7_SCL_M0_CODEC				92	MIPI_CAM4_CLKOUT			
43	CAM4_PDN				93	MIPI_CAM3_CLKOUT			
44	CAM3_PWREN				94	MIPI_CAM2_RESET_L			
45	MIPI_CAM1_CLKOUT				95	HDMITX0_HPDIN_M0			
46	CAM3_PDN				96	CAM1_PDN			
47	5G_RESET				97	CAM2_PDN			
48	GPIO1_A6_d				98	I2C2_SCL_M4_CAM1			
49	5G_PWREN				99	I2C2_SDA_M4_CAM1			
50	Gnd				100	Gnd			

X4 AXK6S00447YG		Description			X4 AXK6S00447YG		Description		
PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull	PIN	Core board pin definition	Defual function description	IO Power domain	Pad type IO Pull
1	Gnd				51	Gnd			
2	TYPEC1_SSTX2P				52	HDMI1_TX2P_PORT/eDP1_TX_D2P			
3	TYPEC1_SSTX2N				53	HDMI1_TX2N_PORT/eDP1_TX_D2N			
4	Gnd				54	Gnd			
5	TYPEC1_SSRX2N				55	HDMI1_TX1P_PORT/eDP1_TX_D1P			
6	TYPEC1_SSRX2P				56	HDMI1_TX1N_PORT/eDP1_TX_D1N			
7	Gnd				57	Gnd			
8	TYPEC1_SBU1				58	HDMI1_TX0P_PORT/eDP1_TX_D0P			
9	TYPEC1_SBU2				59	HDMI1_TX0N_PORT/eDP1_TX_D0N			
10	Gnd				60	Gnd			
11	TYPEC1_SSTX1P				61	HDMI1_TX3P_PORT/eDP1_TX_D3P			
12	TYPEC1_SSTX1N				62	HDMI1_TX3N_PORT/eDP1_TX_D3N			
13	Gnd				63	Gnd			
14	TYPEC1_SSRX1N				64	HDMI1_TX_SBDP/eDP1_TX_AUXP			
15	TYPEC1_SSRX1P				65	HDMI1_TX_SBDN/eDP1_TX_AUXN			
16	Gnd				66	Gnd			
17	HDMI0_TX2P_PORT/eDP0_TX_D2P				67	HDMI_RX_D2P			
18	HDMI0_TX2N_PORT/eDP0_TX_D2N				68	HDMI_RX_D2N			
19	Gnd				69	Gnd			
20	HDMI0_TX1P_PORT/eDP0_TX_D1P				70	HDMI_RX_D1P			
21	HDMI0_TX1N_PORT/eDP0_TX_D1N				71	HDMI_RX_D1N			
22	Gnd				72	Gnd			
23	HDMI0_TX0P_PORT/eDP0_TX_D0P				73	HDMI_RX_D0P			
24	HDMI0_TX0N_PORT/eDP0_TX_D0N				74	HDMI_RX_D0N			
25	Gnd				75	Gnd			
26	HDMI0_TX3P_PORT/eDP0_TX_D3P				76	HDMI_RX_CLKP			
27	HDMI0_TX3N_PORT/eDP0_TX_D3N				77	HDMI_RX_CLKN			
28	Gnd				78	Gnd			
29	HDMI0_TX_SBDP/eDP0_TX_AUXP				79	TYPEC0_OTG_DM			
30	HDMI0_TX_SBDN/eDP0_TX_AUXN				80	TYPEC0_OTG_DP			
31	Gnd				81	Gnd			
32	MIPI_DPHY1_RX_CLKN				82	TYPEC1_OTG_DP			
33	MIPI_DPHY1_RX_CLKP				83	TYPEC1_OTG_DM			
34	Gnd				84	Gnd			
35	MIPI_DPHY1_RX_D1N				85	USB20_HOST1_DP			
36	MIPI_DPHY1_RX_D1P				86	USB20_HOST1_DM			
37	Gnd				87	Gnd			
38	MIPI_DPHY1_RX_D0N				88	USB20_HOST0_DM			
39	MIPI_DPHY1_RX_D0P				89	USB20_HOST0_DP			
40	Gnd				90	Gnd			
41	MIPI_DPHY1_RX_D2N				91	VCC_3V3_S0			
42	MIPI_DPHY1_RX_D2P				92	TYPEC0_USB20_VBUSDET			
43	Gnd				93	SDMMC_DET_L			
44	MIPI_DPHY1_RX_D3N				94	SDMMC0_D2			
45	MIPI_DPHY1_RX_D3P				95	SDMMC0_D3			
46	Gnd				96	SDMMC0_CMD			
47	SARADC_VIN7_LCD_ID0				97	SD_CLK			
48	SARADC_VIN1_KEY/RECOVERY				98	SDMMC0_D0			
49	SARADC_VIN3_HP_HOOK				99	SDMMC0_D1			
50	Gnd				100	Gnd			

八、主板接口信息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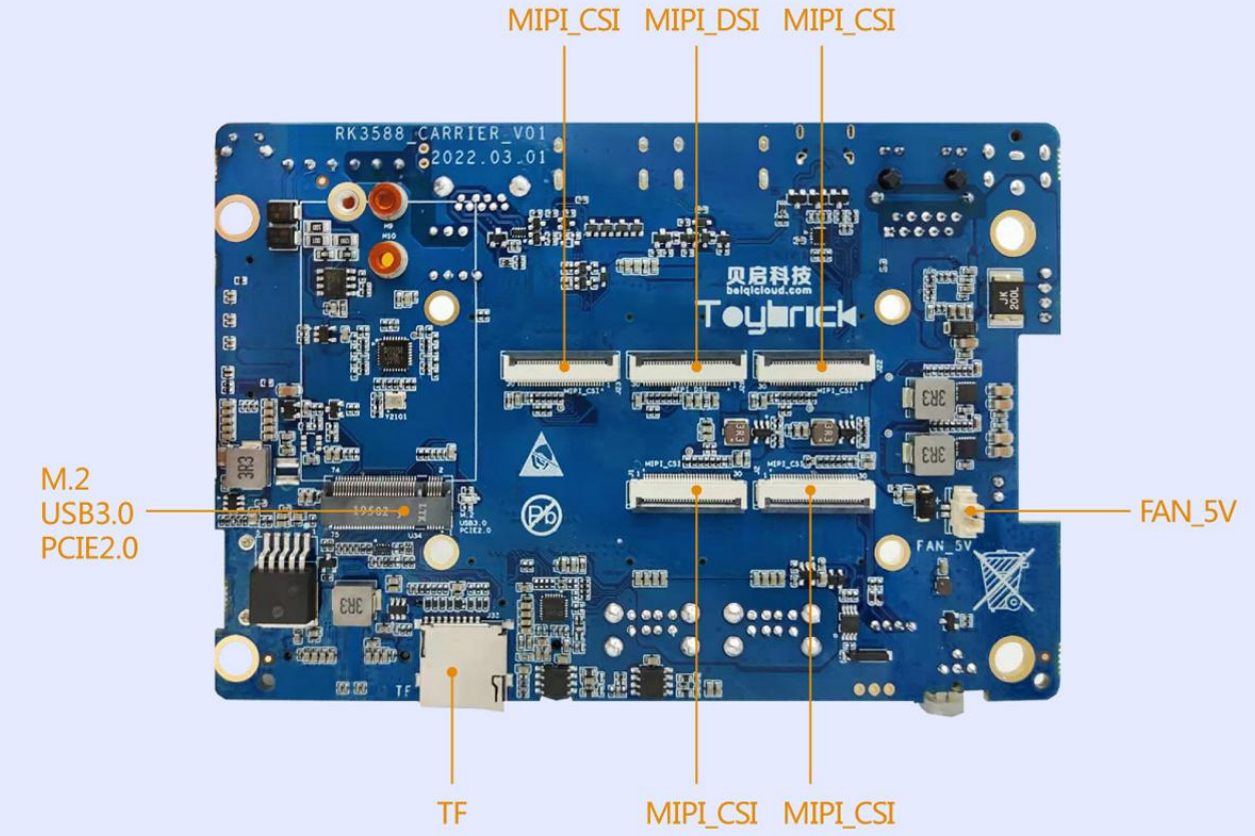
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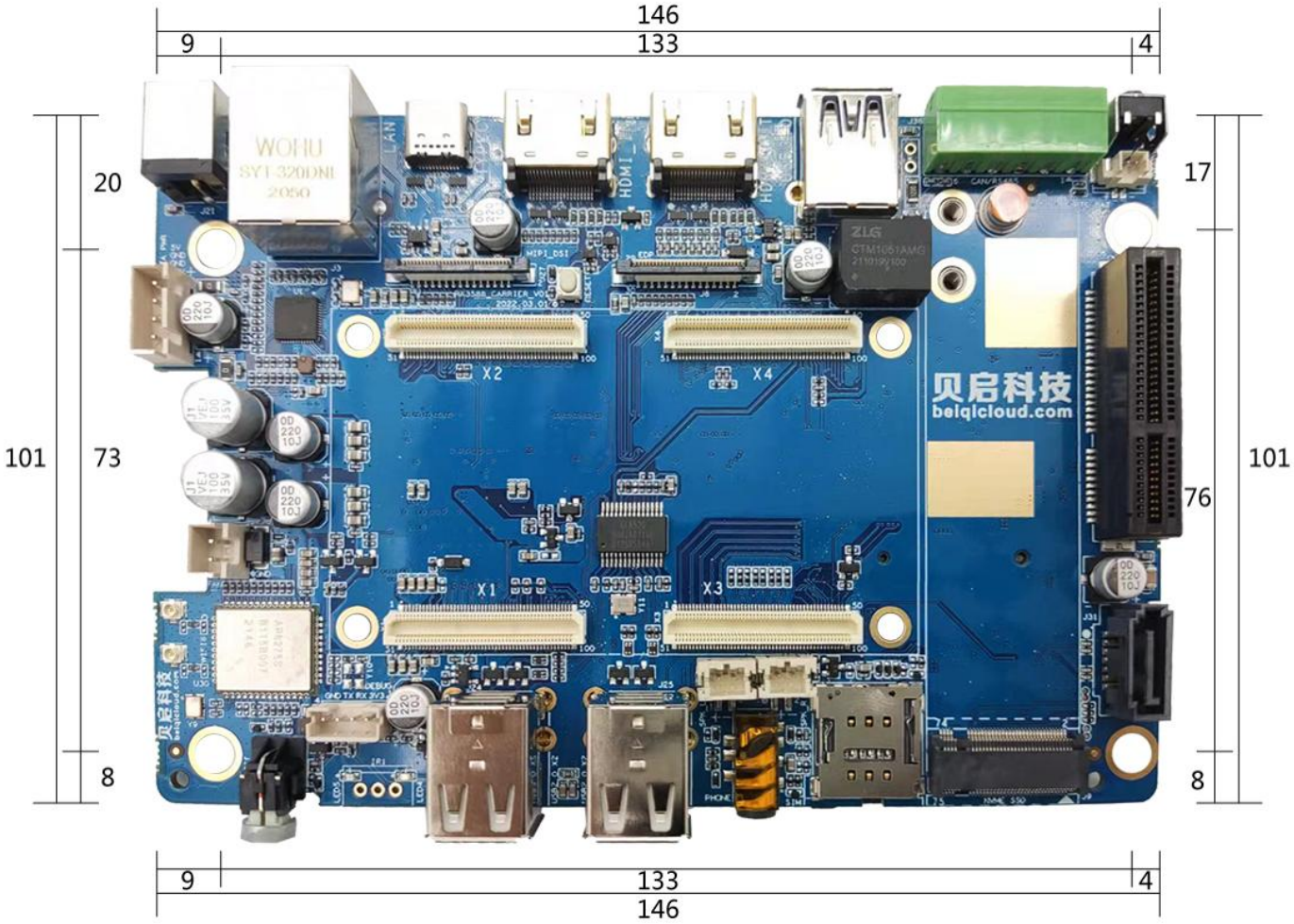
TF
MIPI_CSI
MIPI_CSI

九、主板产品参数


146
9
133
4
20
17
101
73
76
101
8
8
9
133
4
146
X1
X2
X3
X4
贝启科技
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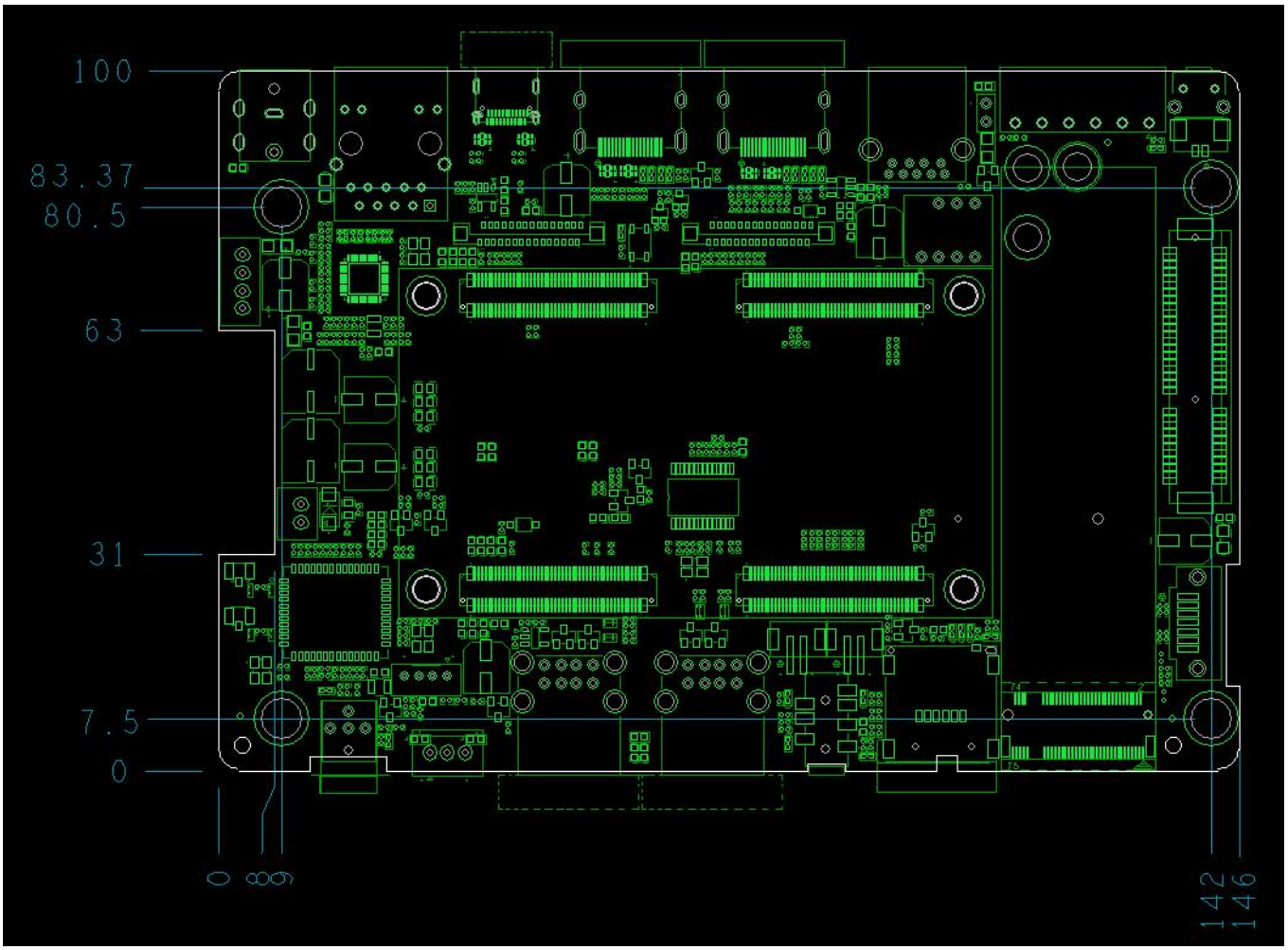
100
83.37
80.5
63
31
7.5
0
142
146

十、主板规格参数

功能/模块	详细参数
SoC	RK3588
RAM	4GB LPDDR4，最大支持 32GB
ROM	16GB/32GB/64GB/128GB/256GB eMMC
神经网络处理器(NPU)	6.0TOPs
AI 算力	6.0 TOPs 支持通过 M.2 扩展算力
PCIe	M.2 22*80（PCIe3.0 2Lanes） PCIE X2（PCIe3.0 2Lanes） M.2 30*52 （PCIe2.1 1Lane/USB3.0）
网络	千兆以太网/WiFi6/5G
显示	HMDI/eDP/MIPI×2/DP（TypeC）
触控	支持 TP 接口
Camera	4 Lanes MIPI CSI*4
视频输入	HDMI IN
Audio	MIC/Phone/喇叭接口
USB	USB3.0*2/USB2.0*4/TypeC
RTC	支持
TF 卡座	支持
SIM 卡座	支持
其它接口	IR-RX/RS485/LED/Debug
电源输入	DC12V 5.5×2.5mm
支持寒武纪思元 220 M.2 边缘智能加速卡	
AI 算力计算棒	寒武纪 MLU200 加速卡

Email: liujw@beiqicloud.com

Tel: 18606919996