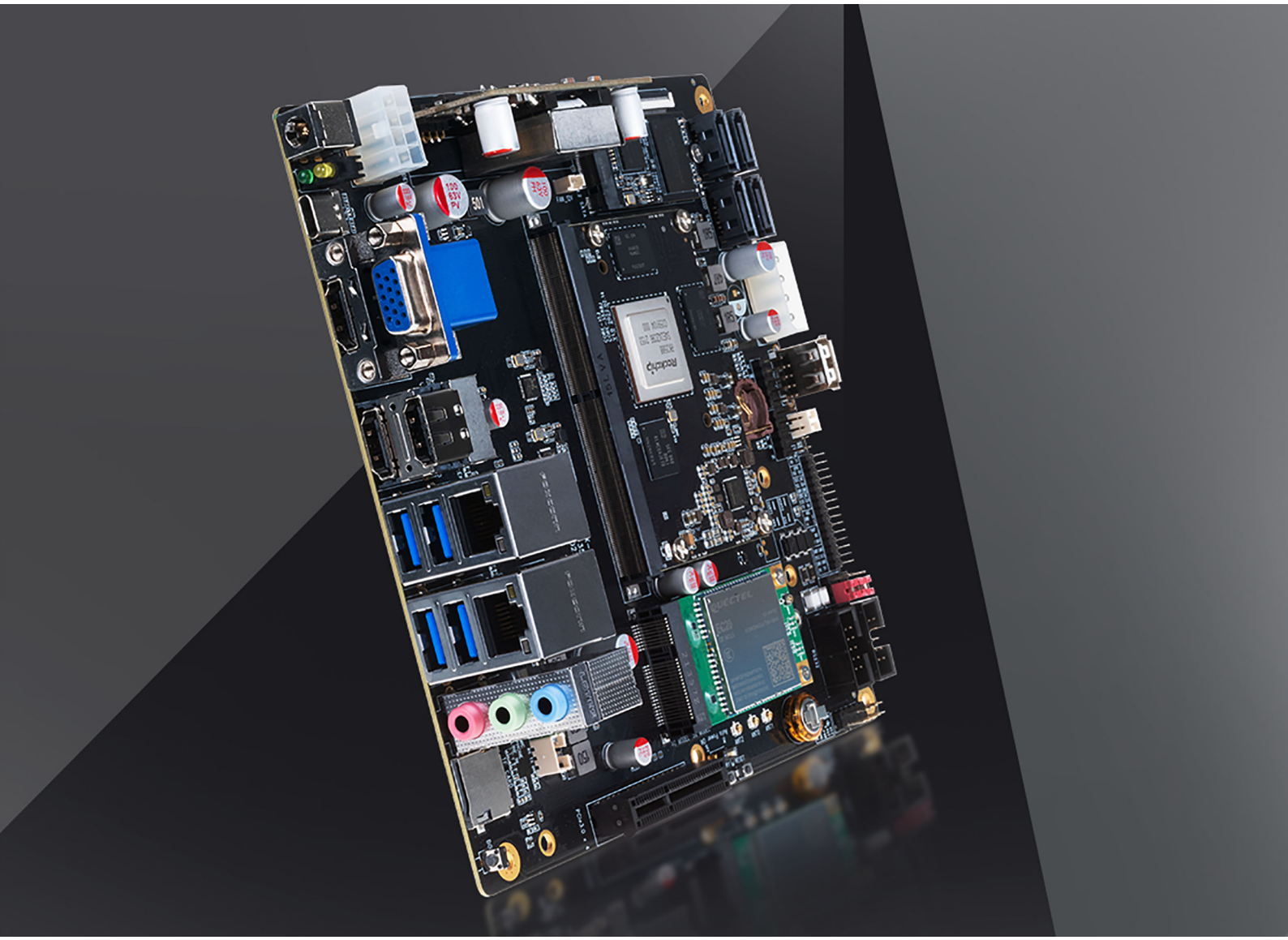
ITX-3588J V1.3

8K AI Mini-ITX Mainboard

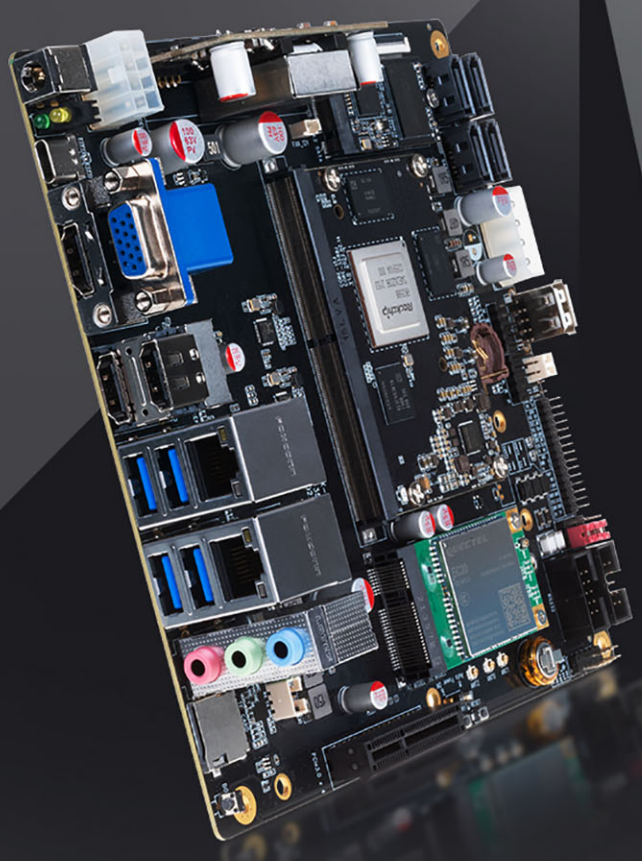


T-CHIP INTELLIGENCE TECHNOLOGY CO.,LTD.

www.t-firefly.com

Update history

Version	Date	Details
V1.0	2022-03-17	Initial version
V1.1	2022-06-13	Update Mainboard V1.1
V1.3	2023-05-08	Update Mainboard V1.3
V1.3	2024-04-15	Update ATX Power Supply description



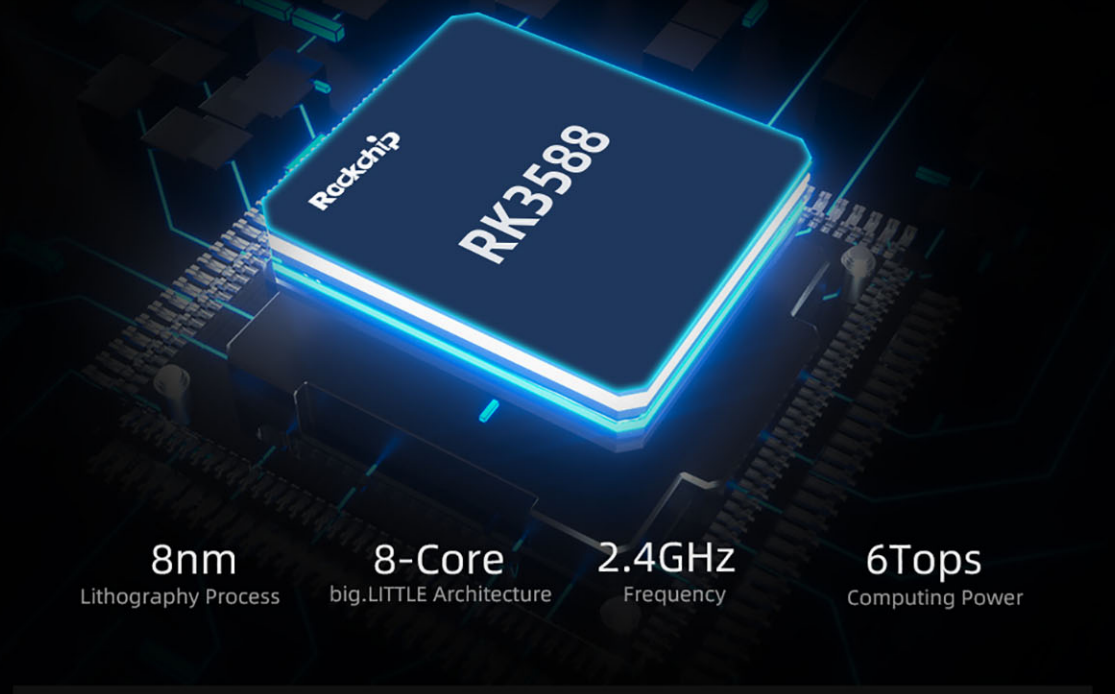
ITX-3588J

8K AI Mini-ITX Mainboard

Powered by Rockchip RK3588 new-gen 8-core 64-bit processor, the mainboard can be configured with up to 32GB RAM. Capable of 8K video encoding and decoding, it provides abundant interfaces supporting multiple hard disks, Gigabit Ethernet, WiFi6, 5G/4G expansion and a variety of video input and output. It supports different power supply ways and various operating systems. This mainboard can be used in ARM PC, edge computing, cloud server, smart NVR and other fields.

New-gen AIoT SoC RK3588

RK3588 is Rockchip's new-gen flagship AIoT SoC with 8nm lithography process. Equipped with 8-core 64-bit CPU, it has frequency up to 2.4GHz. Integrated with ARM Mali-G610 MP4 quad-core GPU and built-in AI acceleration NPU, it provides 6Tops computing power and supports mainstream deep learning frameworks. The powerful RK3588 can deliver more optimized performance in various AI application scenarios.



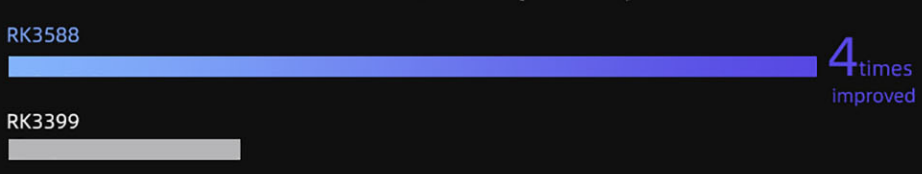
8nm
Lithography Process

8-Core
big.LITTLE Architecture

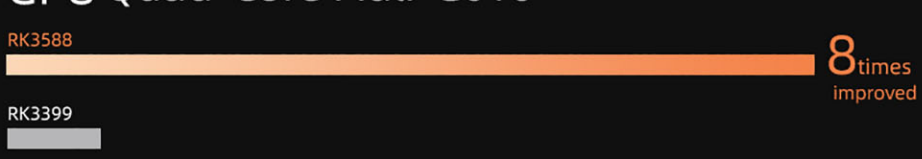
2.4GHz
Frequency

6Tops
Computing Power

CPU 8-Core A76+A55, Frequency 2.4GHz



GPU Quad-Core Mali-G610



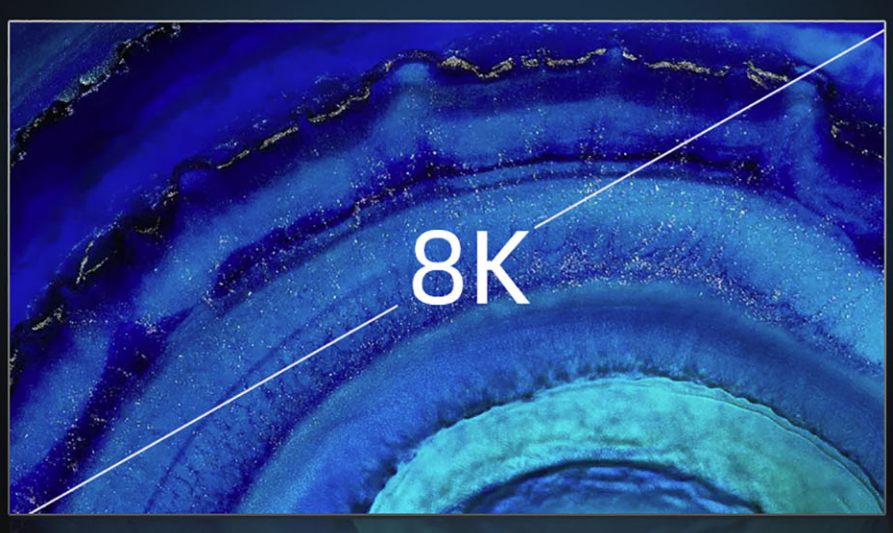
NPU 6Tops Computing Power

Supports INT4/INT8/INT16 mixed operation; supports frameworks such as TensorFlow / MXNet / PyTorch / Caffe

TensorFlow Caffe mxnet

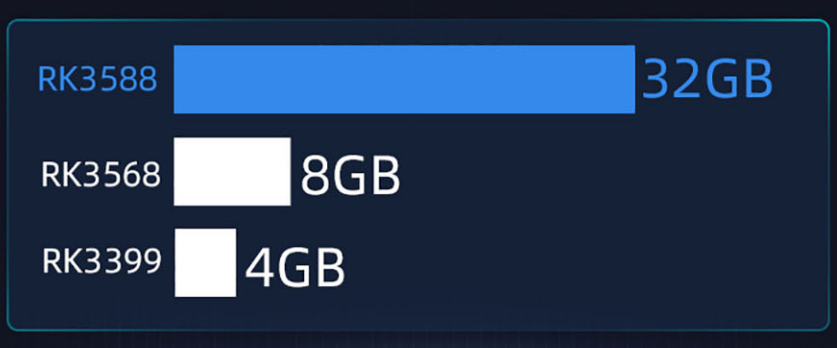
8K video encoding and decoding

The mainboard supports 8K@60fps H.265/VP9 video decoding and 8K@30fps H.265/H.264 video encoding, and also supports encoding and decoding simultaneously — achieves up to 32-channel 1080P@30fps decoding and 16-channel 1080P@30fps encoding. The strong video encoding and decoding capability makes 8K HD display and delicate picture quality available.



Super-large 32GB RAM

Up to 32GB of super-large RAM can be configured, which exceeds the limit of the previous RAM and delivers a faster response speed. It can meet the application requirements of products with large RAM and large storage.

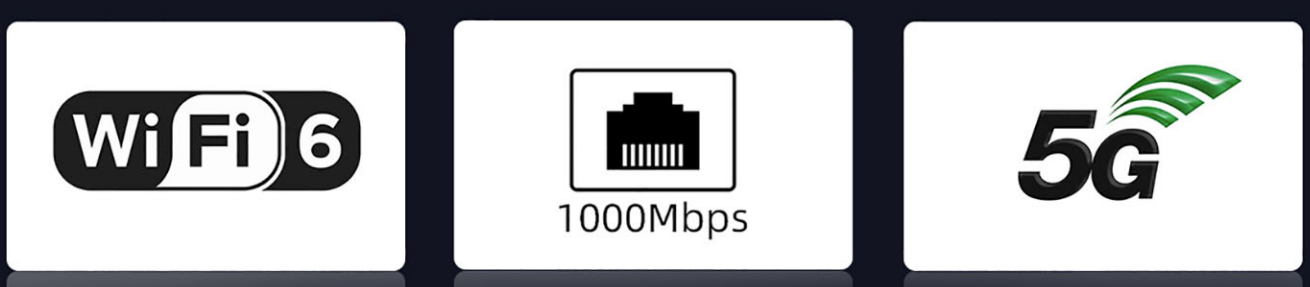


Multi-channel input and output

With HDMI 2.1/MIPI-DSI/DP1.4/VGA multi-channel video output and HDMI RX2.0/MIPI-CSI video input interfaces, it supports multi-channel 8K video output and 4K video input — up to four-screen output with different displays can be achieved. The integrated 48MP ISP with HDR&3DNR supports dual MIPI-CSI camera input.

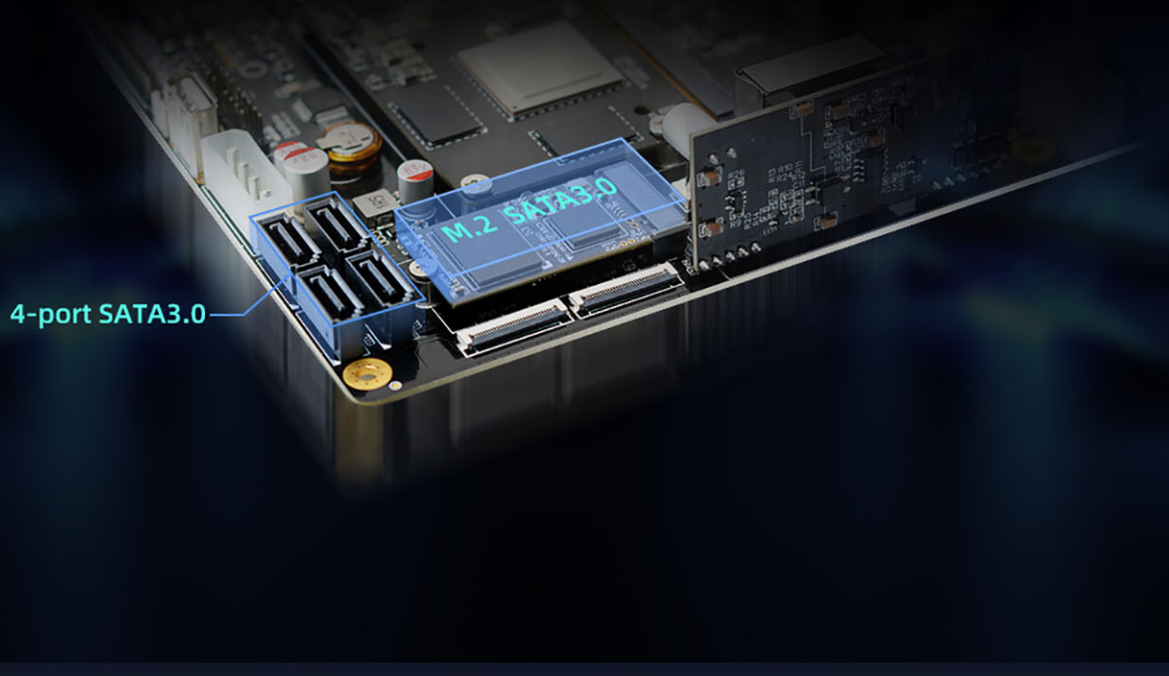
Strong network communication capability

With on-board dual GbE RJ45, 2.4GHz/5GHz dual-band WiFi 6 (802.11ax), Bluetooth 5.0, and 5G/4G LTE expansion supported, it makes network communication have a higher speed.



Multiple hard disks, Massive capacity

The 4-port SATA3.0 interface can be connected with multiple 2.5"/3.5" SSD/HDD at the same time. The high-speed on-board M.2 SATA3.0 interface supports M.2 2242 SSD. They make it a reality that the device can be easily expanded with TB storage capacity.

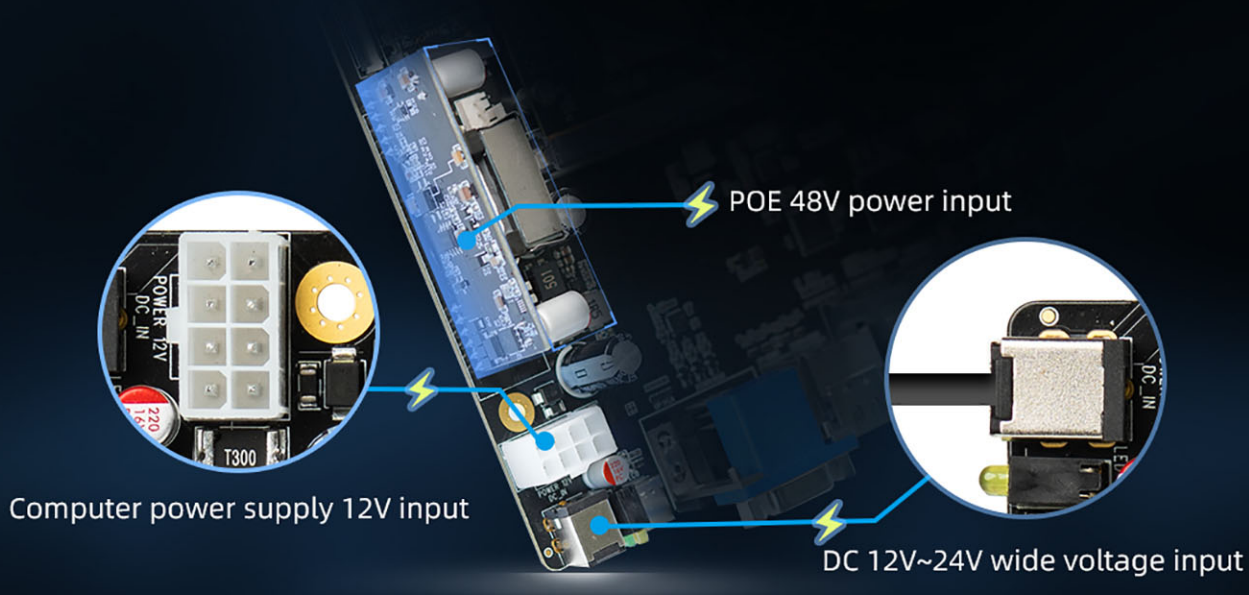


PCIe3.0 with high-speed transmission

The standard on-board PCIe3.0 (4 Lane) interface, with a per-lane data rate of 8Gbps, its 4-lane data rate can reach up to 32Gbps. Featuring blazing-fast and stable transmission, it can be used to expand with standard PCIe3.0 devices.

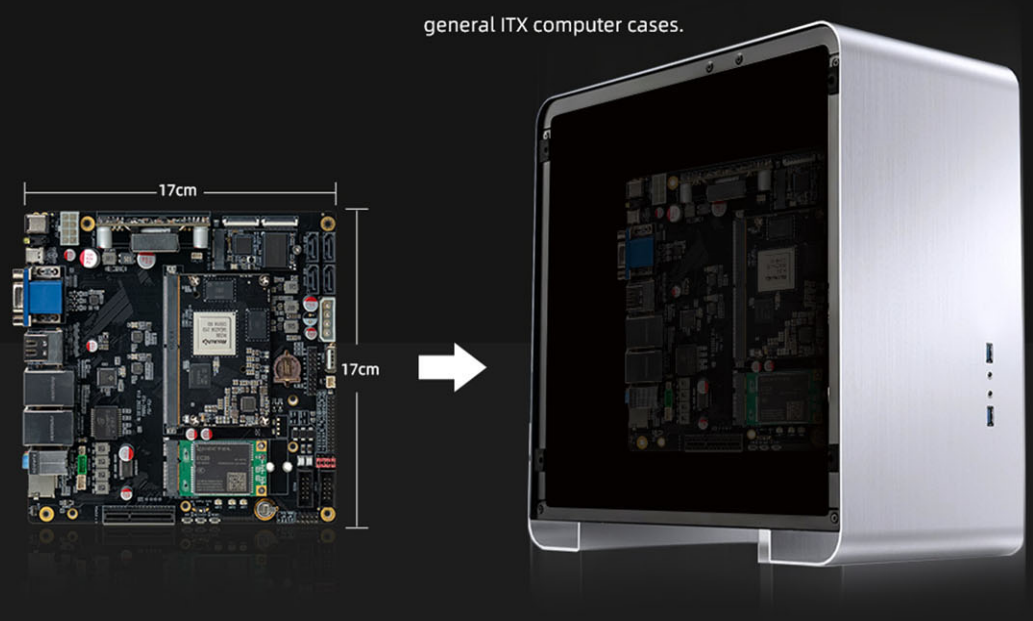
Various power supply ways

A variety of power supply ways are provided: 1) Computer power supply 12V input (standard ATX power interface - 8Pin); 2) DC 12V~24V wide voltage input; 3) POE 48V power input (up to 60W). Various ways meet different application scenarios, flexible and convenient.



Standard Mini-ITX mainboard

With standard Mini-ITX mainboard size 17cm×17cm and standard interfaces, the mainboard is suitable for general ITX computer cases.



Supports various operating systems

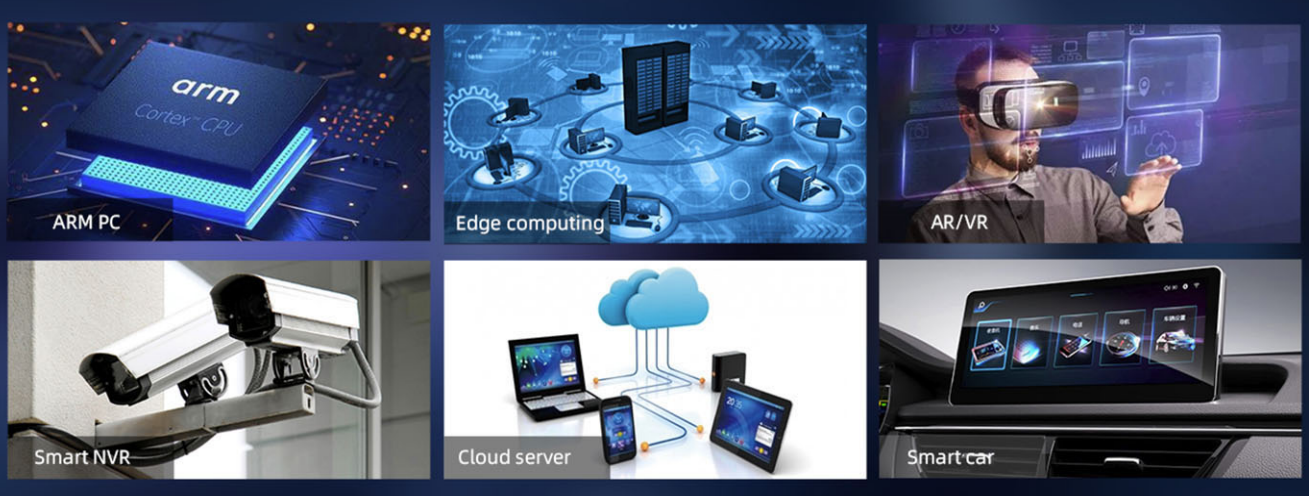
Android 12.0, Ubuntu Desktop version and Server version, Debian11, Buildroot, Kylin and UOS are supported. And it supports RTLinux, delivering excellent real-time performance. Also, UEFI Boot is available. The stable and reliable operation provides a safe and stable system environment for product research and production.

Abundant resources

SDK, tutorials, tech docs and dev tools are provided, making development simpler and more convenient.

A wide range of applications

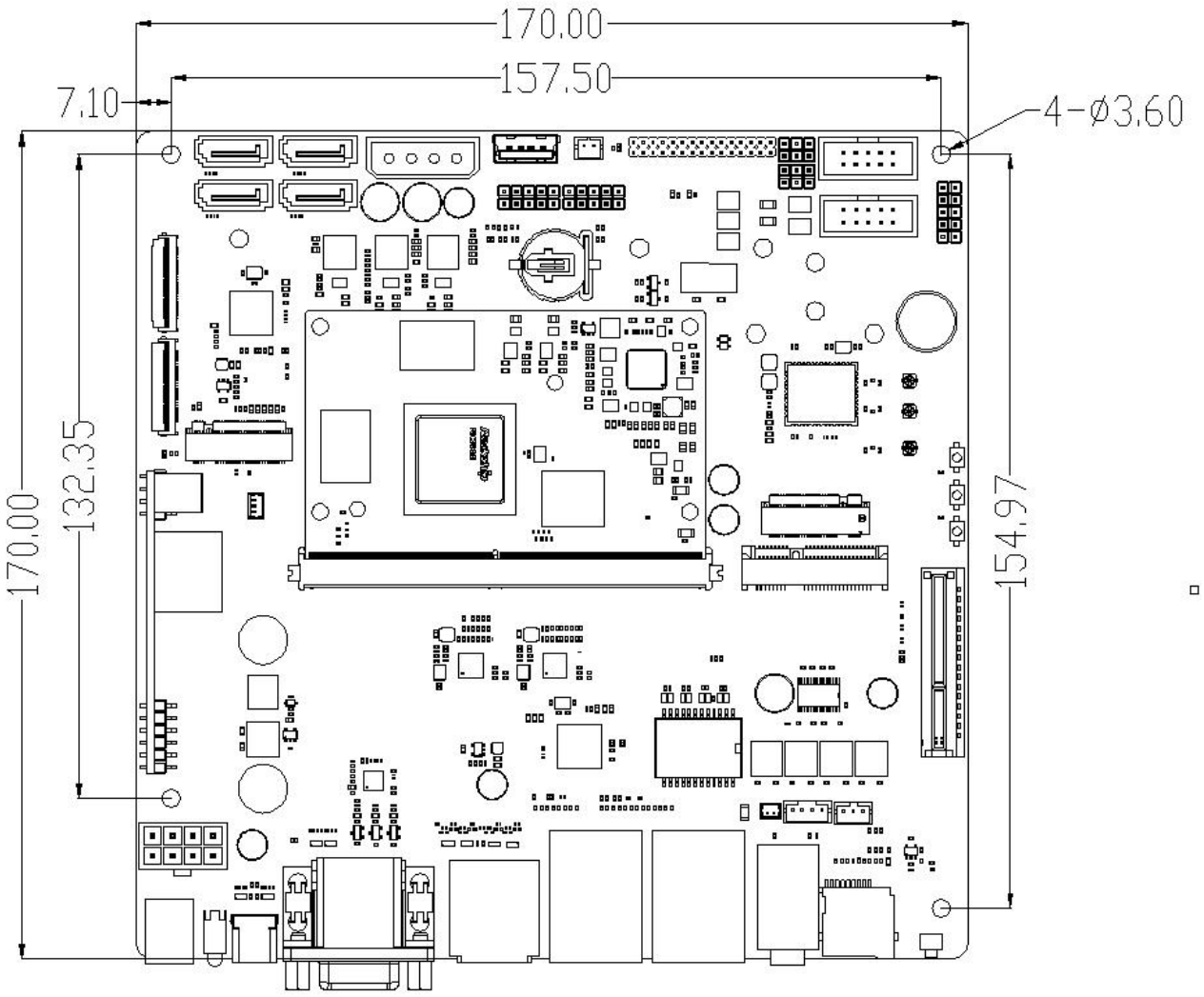
The mainboard can be used in ARM PC, edge computing, cloud server, smart NVR, smart video wall, AR/VR, smart car and other fields.

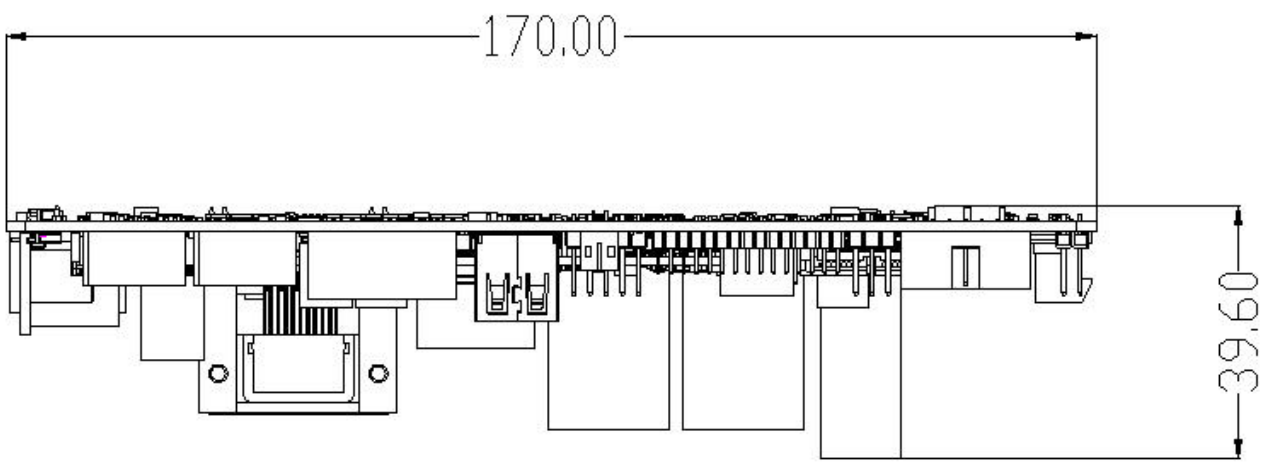


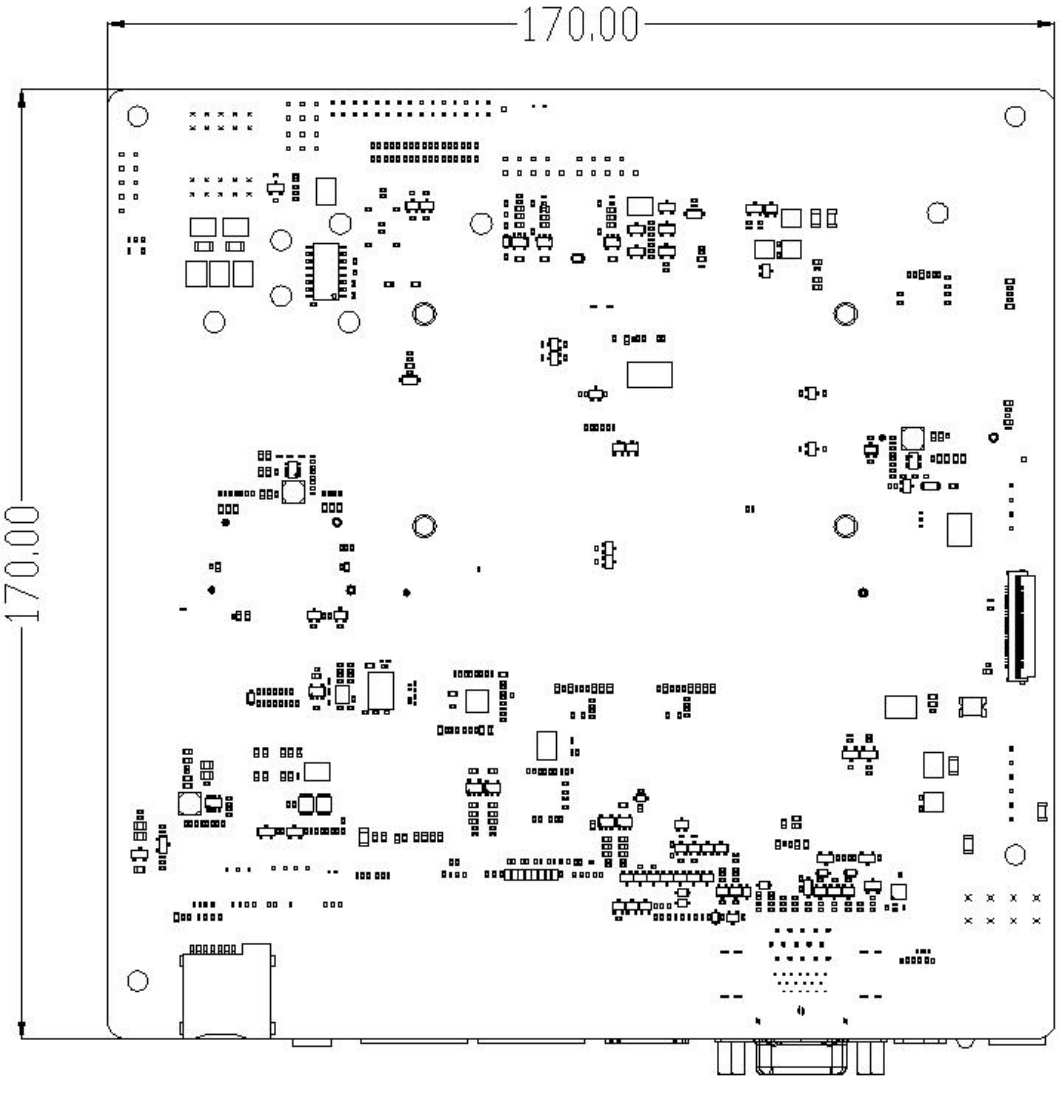
Technical parameters

Basic	
SOC	RockChip RK3588
CPU	8-core 64-bit (4×Cortex-A76+4×Cortex-A55) , 8nm lithography process, frequency up to 2.4GHz
GPU	ARM Mali-G610 MP4 quad-core GPU Supports OpenGL ES3.2 / OpenCL 2.2 / Vulkan1.1, 450 GFLOPS
NPU	NPU computing power is up to 6 TOPS, Supports INT4/INT8/INT16 mixed operation, Supports framework switching of TensorFlow / MXNet / PyTorch / Caffe / etc.
ISP	Integrated 48MP ISP with HDR&3DNR
VPU	Video decoding: 8K@60fps H.265/VP9/AVS2 8K@30fps H.264 AVC/MVC 4K@60fps AV1 1080P@60fps MPEG-2/-1/VC-1/VP8 Video encoding: 8K@30fps encoding, Supports H.265 / H.264 * Achieves up to 32-channel 1080P@30fps decoding and 16-channel 1080P@30fps encoding
RAM	4GB/8GB/16GB 64bit LPDDR4/LPDDR4x/LPDDR5 (Up to 32GB optional)
Storage	16GB/32GB/64GB/128GB eMMC
Storage Expansion	1 × M.2 SATA3.0, can expand with 2242 SATA3.0 SSD, 4 × SATA3.0, can expand with 4 pcs of SATA3.0 SSD/HDD
Hardware	
Wireless	2.4GHz/5GHz dual-band WiFi6, Bluetooth 5.0, supports 5G/4G LTE expansion
Ethernet	2 × 1000Mbps (RJ45) , one supports POE power supply, max output 60w
Video input	1 × HDMI-IN (4K@60fps) , supports HDCP 2.3 1 × MIPI-CSI (1×4lanes or 2×2lanes)
Video output	1 × HDMI2.1 (8K@60fps or 4K@120fps) 1 × HDMI2.0 (4K@60fps) 2 × MIPI-DSI (4K@60fps) 1 × DP1.4 (8K@30fps, Multiplexed with USB 3.0) 1 × VGA display output * Up to four screens can be displayed at the same time, and four screens can be displayed differently (for details, please refer to the official website technical case)
Audio	Audio output: 1 × Speaker output (Support left and right channels, 10W-8Ω D class) 1 × Phone output 2 × HDMI audio output 1 × DP audio output Audio input: 1 × Line-In input 1 × MIC input 1 × HDMI audio input
PCIE	1 × PCIe3.0 (4Lane) , can expand with standard PCIe3.0 devices
SATA	1 × M.2 interface (SATA3.0) , 4 × standard SATA3.0 interface
USB	4 × USB3.0 (Limit 1A) 1 × USB-C (USB3.0 / DP1.4) (Limit 2A) 4 × USB2.0 (3 of them are pins) (Limit 500mA)
Power	Various power supply ways: DC 9-24V input (DC 5.5×2.1mm) Computer power supply 12V input (standard ATX power interface - 8Pin) POE 48V power input (up to 60W)
Other Interfaces	1×RS485 , 1×RS232, 8×GPIO, 4×I2C, 1×SPI, 3×ADC, 1×Debug, 2×UART (either-or RS485, RS232) , 1×Heating (12V) , 1×Fan (12V/3P-1.25mm)
Software	
OS	Android: Android 12.0 Linux: Ubuntu Desktop, Ubuntu Server, Debian11, Buildroot, RTLinux, Kylin Linux, UOS. Supports UEFI Boot
General	
Size	17cm×17cm (Mini-ITX) , suitable for general ITX computer cases
Weight	About 300g (not including peripherals)
Heat Dissipation	Heat sink installation hole pitch: 45mm
Power Consumption	Idle: ≈1.35W (12V/110mA) Normal: ≈4.8W (12V/400mA) Max: ≈20W (12V/1700mA)
Environment	Operating Temperature: -20℃-60℃, Storage Temperature: -20℃-70℃, Storage Humidity: 10%-80%RH (non-condensing)

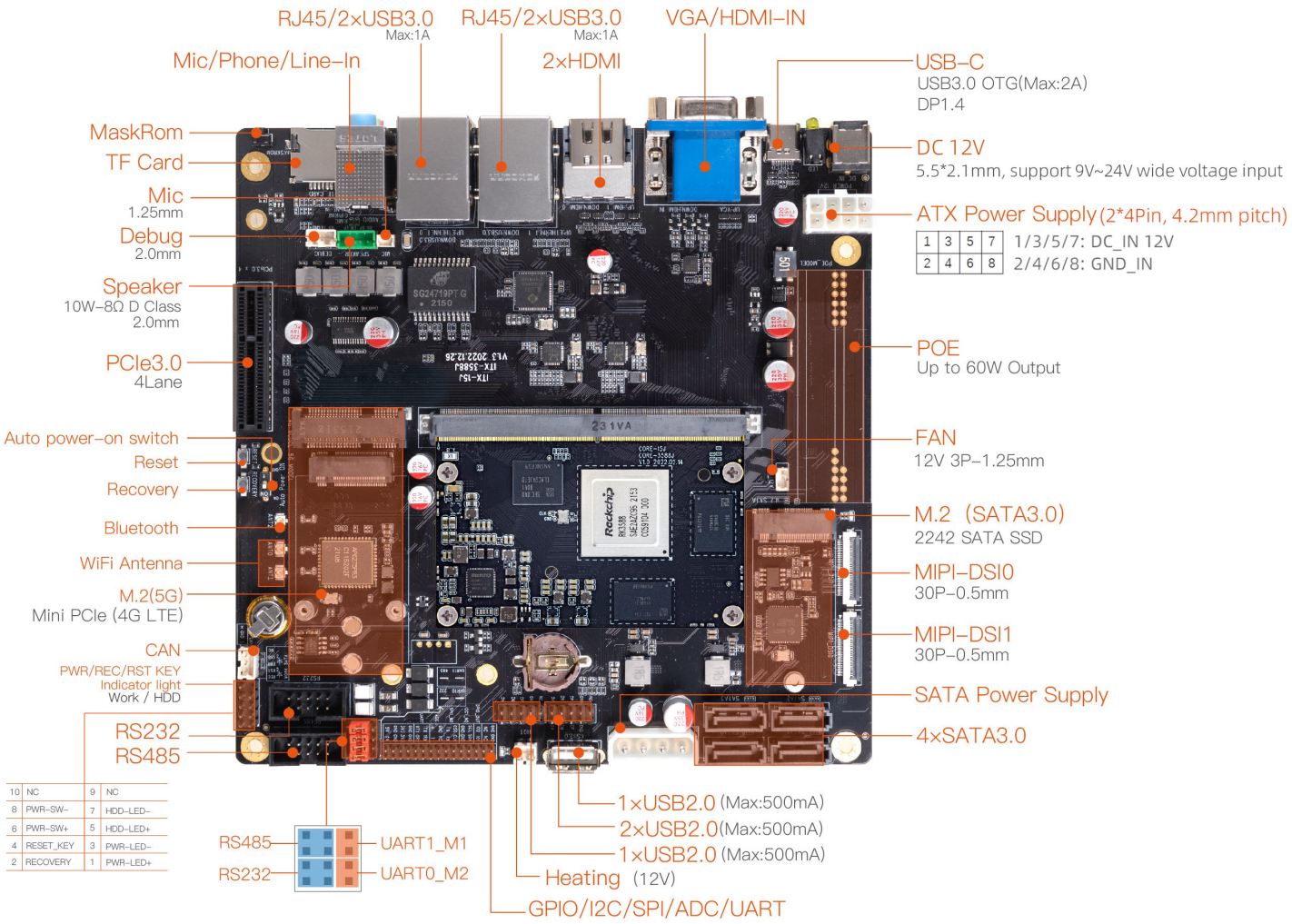
Dimension

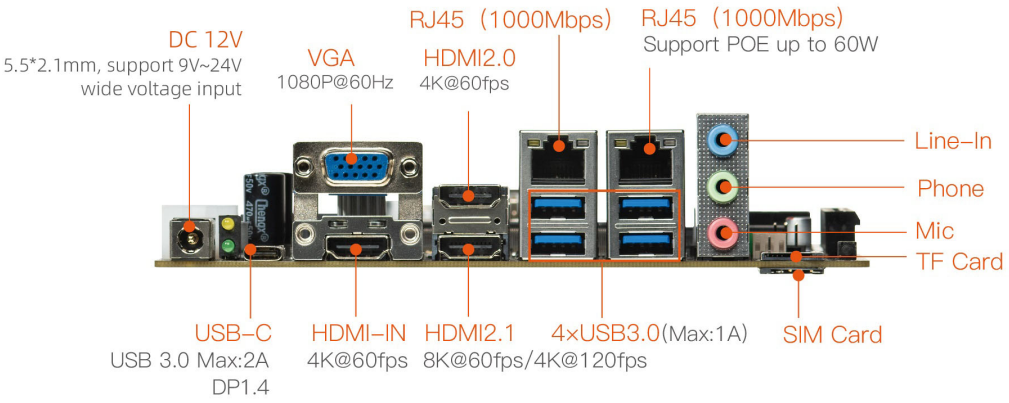

170.00
157.50
7.10
4-Ø3.60
170.00
132.35
154.97

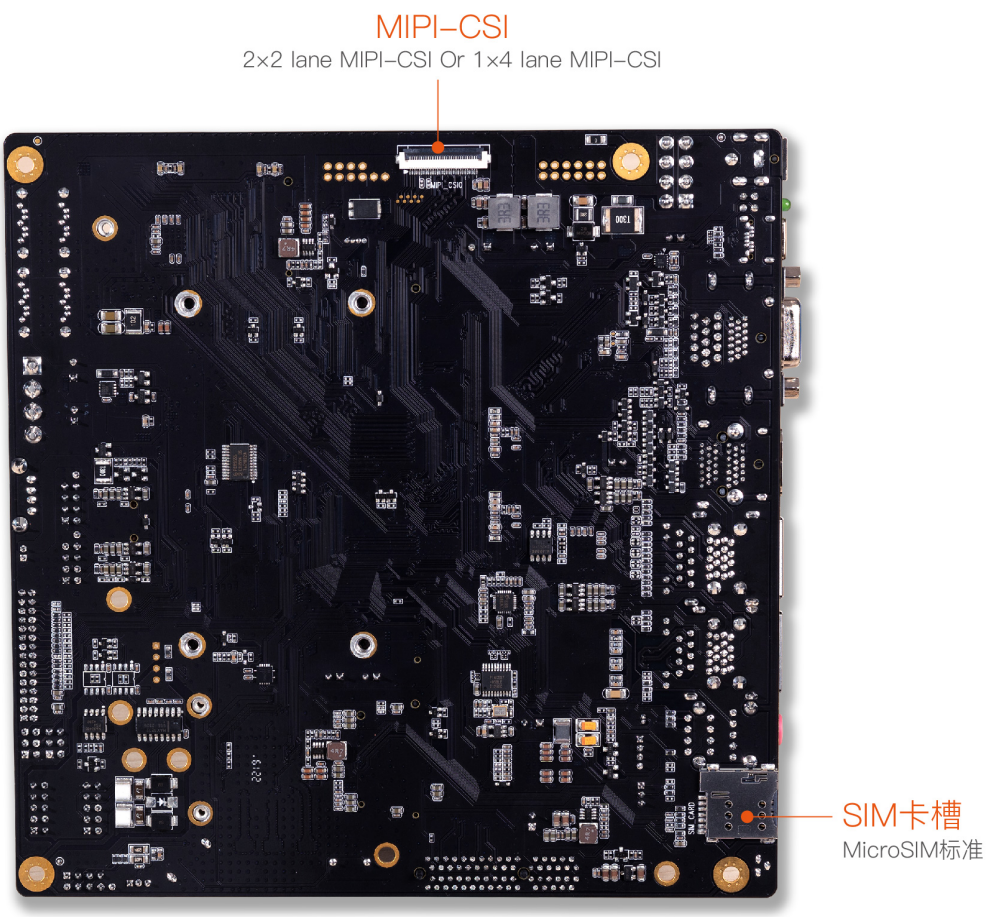

170.00
39.60


170.00
170.00

Interface Description

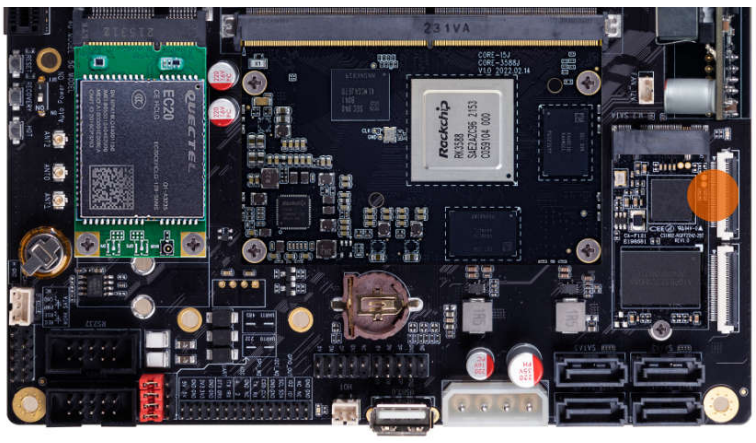






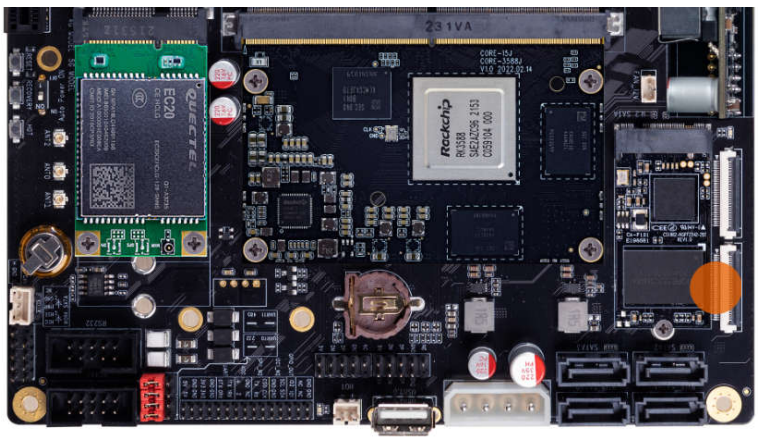
Interface Definition

1、MIPI_Display_Interface 30 PIN 0.5 Pitch (J17)



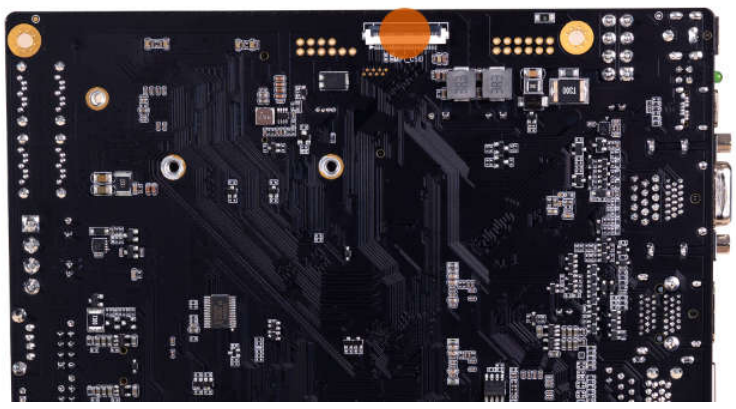
NO.	Definition	Level/V	NO.	Definition	Level/V
1	VCC5V0_SYS (5.5V Output)	5.0V	16	MIPI_DPHY1_TX_D0P	1.8V
2	VCC5V0_SYS (5.5V Output)	5.0V	17	MIPI_DPHY1_TX_D0N	1.8V
3	VCC5V0_SYS (5.5V Output)	5.0V	18	GND	
4	GND		19	MIPI_DPHY1_TX_D1P	1.8V
5	I2C_ID2 Input 【M Board pull up resistance 10K】	3.3V	20	MIPI_DPHY1_TX_D1N	1.8V
6	VCC3V3_SYS (3.3V Output)	3.3V	21	GND	
7	I2C6_SDA_M0 【M Board pull up resistance 2.2K】	3.3V	22	MIPI_DPHY1_TX_CLKP	1.8V
8	I2C6_SCL_M0 【M Board pull up resistance 2.2K】	3.3V	23	MIPI_DPHY1_TX_CLKN	1.8V
9	LCD1_PWR_EN 【I2C To GPIO】	3.3V	24	GND	
10	TP1_INT【GPIO3_A6】	3.3V	25	MIPI_DPHY1_TX_D2P	1.8V
11	LCD_BL_EN【GPIO4_C6】	1.8V	26	MIPI_DPHY1_TX_D2N	1.8V
12	PWM11_M3【GPIO3_D5】	3.3V	27	GND	
13	LCD1_RST 【GPIO2_C3】 【M Board pull up resistance 10K】	3.3V	28	MIPI_DPHY1_TX_D3P	1.8V
14	TP1_RESET_L 【GPIO2_B5】 【M Board pull up resistance 10K】	3.3V	29	MIPI_DPHY1_TX_D3N	1.8
15	GND		30	GND	

2、MIPI_Display_Interface 30 PIN 0.5 Pitch (J16)



NO.	Definition	Level/V	NO.	Definition	Level/V
1	VCC5V0_SYS (5.5V Output)	5.0V	16	MIPI_DPHY0_TX_D0P	1.8V
2	VCC5V0_SYS (5.5V Output)	5.0V	17	MIPI_DPHY0_TX_D0N	1.8V
3	VCC5V0_SYS (5.5V Output)	5.0V	18	GND	
4	GND		19	MIPI_DPHY0_TX_D1P	1.8V
5	I2C_ID Input 【M Board pull up resistance 10K】	3.3V	20	MIPI_DPHY0_TX_D1N	1.8V
6	VCC3V3_SYS (3.3V Output)	3.3V	21	GND	
7	I2C1_SDA_M2 【M Board pull up resistance 2.2K】	3.3V	22	MIPI_DPHY0_TX_CLKP	1.8V
8	I2C1_SCL_M2 【M Board pull up resistance 2.2K】	3.3V	23	MIPI_DPHY0_TX_CLKN	1.8V
9	LCD0_PWR_EN 【I2C To GPIO】	3.3V	24	GND	
10	TP0_INT_L【GPIO3_C0】	3.3V	25	MIPI_DPHY0_TX_D2P	1.8V
11	LCD0_BL_EN【GPIO2_C4】	3.3V	26	MIPI_DPHY0_TX_D2N	1.8V
12	PWM12_M1【GPIO4_B5】	3.3V	27	GND	
13	LCD0_RST 【GPIO2_B4】 【M Board pull up resistance 10K】	3.3V	28	MIPI_DPHY0_TX_D3P	1.8V
14	TP0_RST_L 【GPIO3_C1】	3.3V	29	MIPI_DPHY0_TX_D3N	1.8V
15	GND		30	GND	

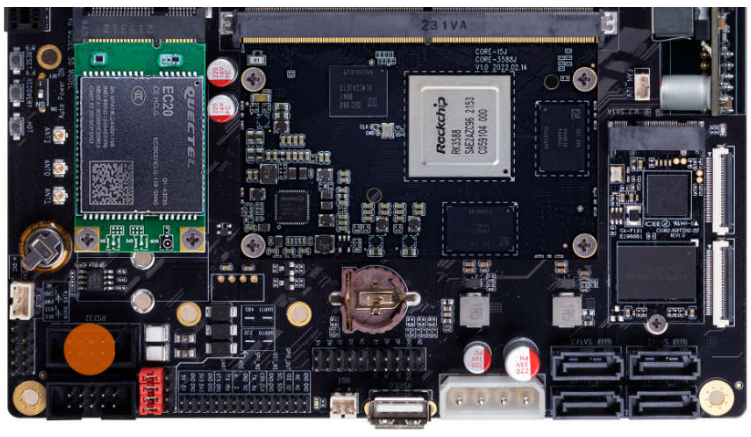
3、MIPI_Camera_Interface 30 PIN 0.5 Pitch (J18)



(Back of the Mainboard)

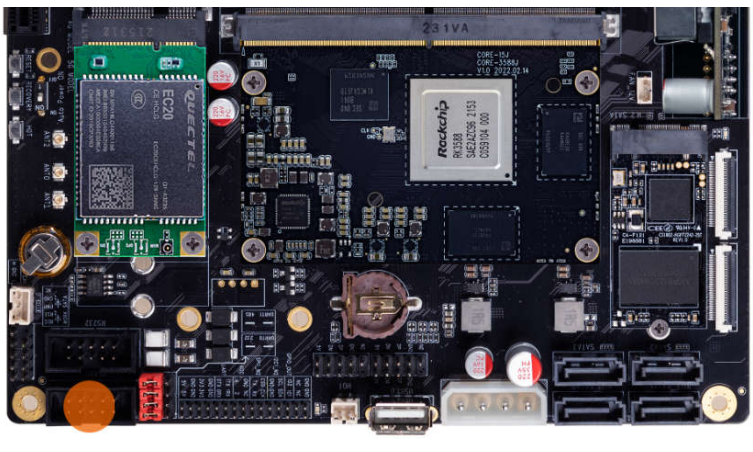
NO.	Definition	Level/V	NO.	Definition	Level/V
1	I2C3_SDA_M0 【M Board pull up resistance 2.2K】	1.8V	16	GND	
2	I2C3_SCL_M0 【M Board pull up resistance 2.2K】	1.8V	17	MIPI_CSI0_RX_CLK0P	1.8V
3	MIPI_CAM3_PDN【GPIO1_A7】	1.8V	18	MIPI_CSI0_RX_CLK0N	1.8V
4	RESET0_CAM【GPIO1_B0】	1.8V	19	GND	
5	GND		20	MIPI_CSI0_RX_D2P	1.8V
6	MIPI_CAM3_CLKOUT【GPIO1_D6】	1.8V	21	MIPI_CSI0_RX_D2N	1.8V
7	MIPI_CAM4_PWREN 【GPIO1_B1】	1.8V	22	GND	
8	MIPI_CAM3_PWREN 【GPIO1_B2】	1.8V	23	MIPI_CSI0_RX_D3P	1.8V
9	MIPI_CAM4_CLKOUT【GPIO1_D7】	1.8V	24	MIPI_CSI0_RX_D3N	1.8V
10	GND		25	GND	
11	MIPI_CSI0_RX_D0P	1.8V	26	MIPI_CSI0_RX_CLK1P	1.8V
12	MIPI_CSI0_RX_D0N	1.8V	27	MIPI_CSI0_RX_CLK1N	1.8V
13	GND		28	GND	
14	MIPI_CSI0_RX_D1P	1.8V	29	VCC5V0_SYS (5.5V Output)	5.0V
15	MIPI_CSI0_RX_D1N	1.8V	30	VCC5V0_SYS (5.5V Output)	5.0V

4、RS232_Interface 10 PIN 2.54mm Pitch (J31)



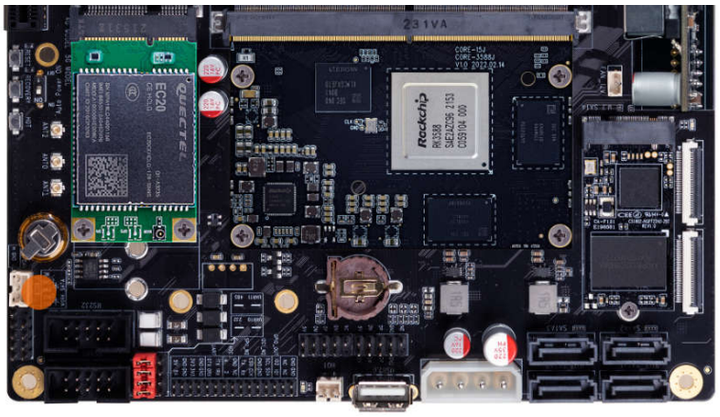
NO.	Definition	Level/V	NO.	Definition	Level/V
1	NC		6	NC	
2	RS232_RXD0	±10V	7	NC	
3	RS232_TXD0	±10V	8	NC	
4	NC		9	NC	
5	GND		10	NC	

5、RS485_Interface 10 PIN 2.54mm Pitch (J32)



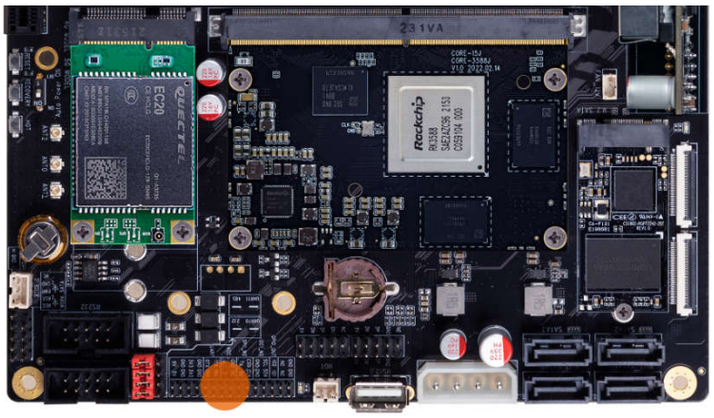
NO.	Definition	Level/V	NO.	Definition	Level/V
1	RS485_A	3.3V	6	NC	
2	RS485_B	3.3V	7	NC	
3	NC		8	NC	
4	NC		9	NC	
5	GND		10	NC	

6、CAN 3PIN 2.0mm Pitch wafer（WHITE）(J14)



NO.	Definition	Level/V	NO.	Definition	Level/V
1	CANH	5V	3	CANL	5V
2	CAN_VSS				

7、30PIN 2.0mm Pitch（J30）



NO.	Definition	Level/V	NO.	Definition	Level/V
1	VCC5V0_SYS (5.0V Output)	5.0V	2	VCC5V0_SYS (5.0V Output)	5.0V
3	GND		4	GND	
5	VCC3V3_SYS (3.3V Output)	3.3V	6	VCC3V3_SYS (3.3V Output)	3.3V
7	GND		8	GND	
9	UART0_RX_M2	3.3V	10	UART0_TX_M2	3.3V
11	UART1_RX_M1	1.8V	12	UART1_TX_M1	1.8V
13	ADC2	1.8V	14	ADC4	1.8V
15	ADC6	1.8V	16	GND	
17	SPI1_MISO_M2(GPIO1_D0)	1.8V	18	SPI1_MOSI_M2(GPIO1_D1)	1.8V
19	SPI1_CLK_M2(GPIO1_D2)	1.8V	20	SPI1_CS0_M2(GPIO1_D3)	1.8V
21	GND		22	GND	
23	I2C1_SDA_M2 (pull up resistance 2.2K)	3.3V	24	I2C1_SCL_M2 (pull up resistance 2.2K)	3.3V
25	GPIO1(FromPCA9555)	3.3V	26	GPIO2(FromPCA9555)	3.3V
27	CAN1_TX_M1	3.3V	28	CAN1_RX_M1	3.3V
29	GND		30	GND	

T-CHIP TECHNOLOGY

Create Value for Customers
Pursue Sustainable Development

About us

T-CHIP focuses on R&D, design, production and sale of open source intelligent hardware, AI, IoT and audio product, and provides the whole solution of intelligent hardware products. T-CHIP is a Independent Design House officially authorized by RockChip and its strategic partner. We have been working closely with RockChip and contributing to embedded electronic industry for over 15 years. “Create Value for Customers, Pursue Sustainable Development” is our philosophy. We hope to achieve win-win development and move together for a shared future

Our Brands

Firefly

Firefly is an open source brand in 2014. “Make technology more simple, Make life more intelligent” is its philosophy. We promote intelligent upgrades in the industries of new technology, intelligent hardware, AI, AIOT, and digital audio product, and build a more open and professional platform for intelligent hardware technology

Stationpc

Station PC is a new brand in 2020, consisting of the core geek members. We create entertainment products for new generation of people with innovative spirit through exploration of pan-entertainment. “More Entertainment, More Free Creation” is its philosophy. We aim at making everyone enjoy themselves and awakening interesting souls with more extreme product experience

T-Chip Intelligent Technology
Website: www.t-firefly.com
E-mail: sales@t-firefly.com
Service: service@t-firefly.com
PostCode: 528400
Address: 2101, Hongyu Building, #57 Zhongshan 4Rd, Zhongshan, Guangdong

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Make life more intelligent

186 8811 7175
400-151-1533