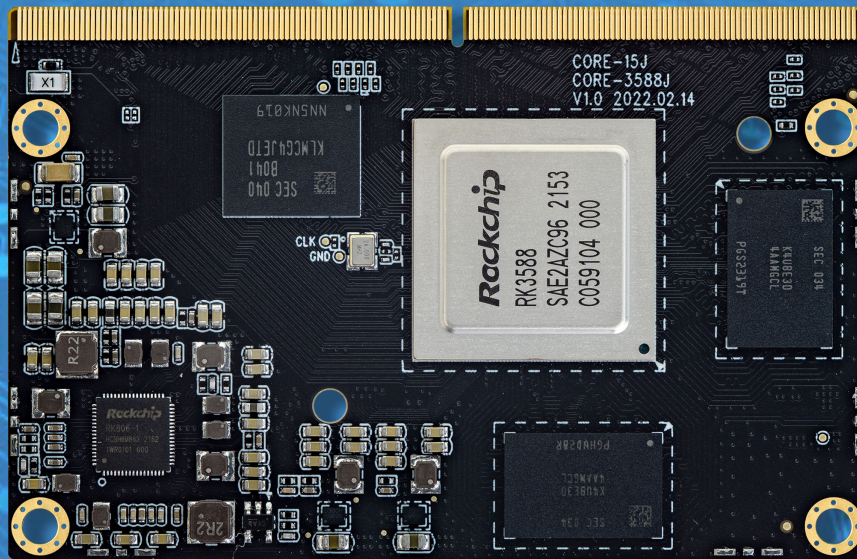


# Core-3588J

8K AI Core Board

V1.0



T-CHIP INTELLIGENCE TECHNOLOGY CO.,LTD.

[www.t-firefly.com](http://www.t-firefly.com)

## | Update history

Version	Date	Details
V1.0	2022-03-22	initial version

Firefly

# | Directory

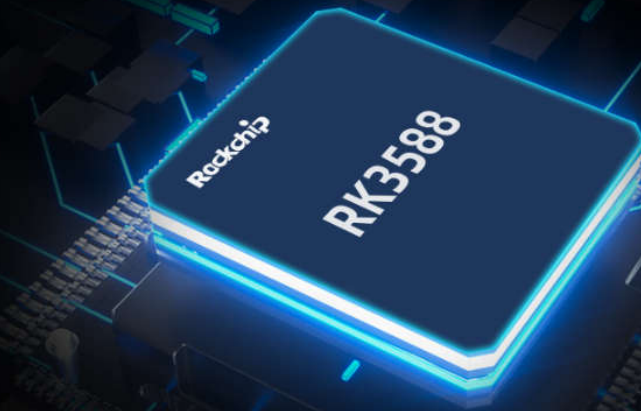
1. Overview.....	4
2. Technical Parameter.....	8
3. Dimensions.....	9
4. Interface definition.....	10
5. About us .....	12

# Overview

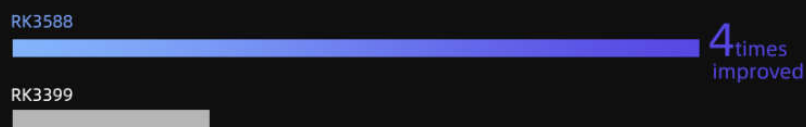
Powered by Rockchip RK3588 new-gen 8-core 64-bit processor, the core board can be configured with up to 32GB RAM. Capable of 8K video encoding and decoding, it provides abundant interfaces supporting multiple hard disks, Gigabit Ethernet, WiFi6, 5G/4G expansion and a variety of video input and output. It also supports various operating systems. This core board 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.



### CPU 8-Core A76+A55, Frequency 2.4GHz



### GPU Quad-Core Mali-G610



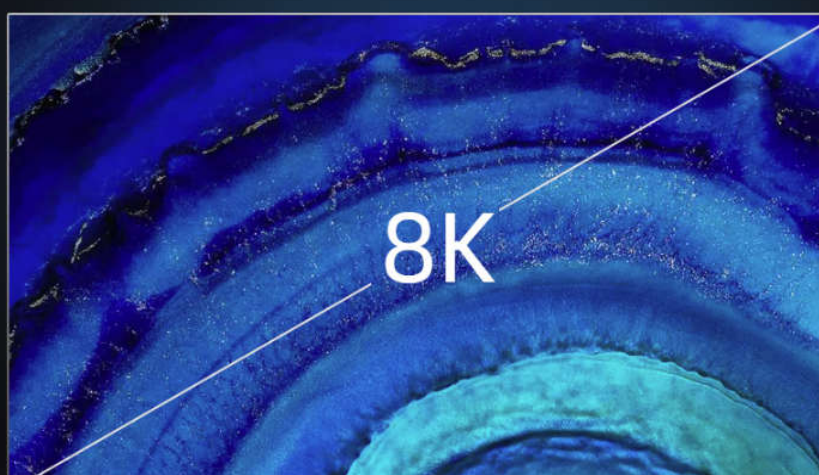
### NPU 6Tops Computing Power

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



## 8K video encoding and decoding

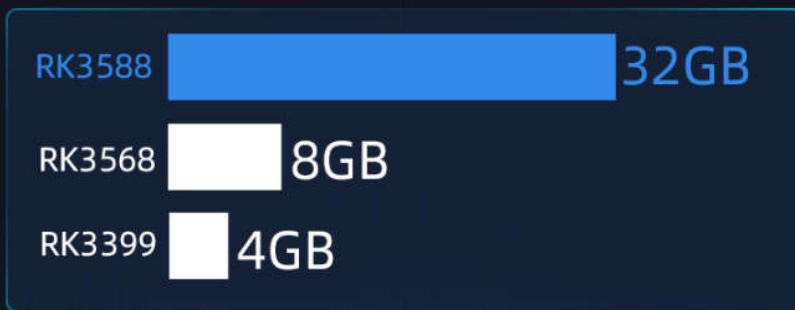
The core board supports 8K@60fps H.265/VP9 video decoding and 8K@30fps H.265/H.264 video encoding, and also supports encoding and decoding simultaneously — achieves up to 32-channel 1080P@30fps decoding and 16-channel 1080P@30fps encoding. The strong video encoding and decoding capability makes 8K HD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



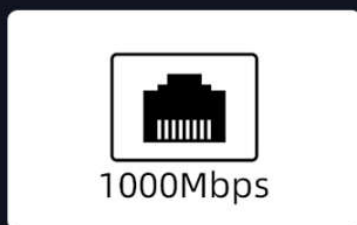
# Multi-channel input and output

With HDMI 2.1/eDP1.3/MIPI-DSI/DP1.4/BT.1120 multi-channel video output and HDMI RX2.0/MIPI-CSI/DVP video input interfaces, it supports multi-channel 8K video output and 4K video input — up to seven-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

Integrated with PCIe3.0/GMAC/SDIO3.0/USB3.0, it can be extended to multi-channel Gigabit Ethernet, WiFi 6/Bluetooth, 5G/4G LTE, enabling network communication have a higher speed.



# Multiple hard disks, Massive capacity

It supports expansion of multiple PCIe3.0/SATA3.0 SSD/HDD mass storage devices at the same time, making it a reality that the device can be easily expanded with TB storage capacity.





# More interfaces for more possibilities

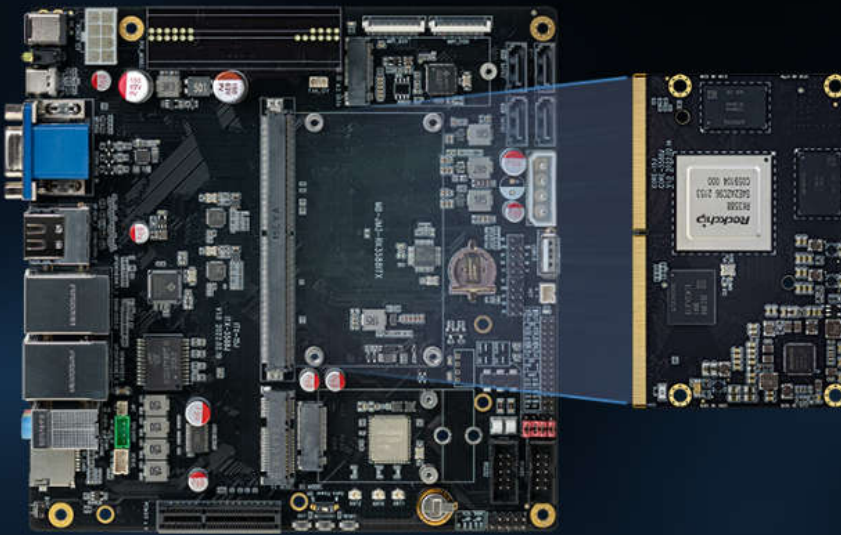
It's equipped with PCIE3.0, SATA3.0, I2S, I2C, CAN, UART, SPDIF, SDIO3.0, MIPI-CSI, MIPI-DSI, USB3.0, USB2.0, SPI, GPIO and other expansion interfaces.



- PCIE 3.0
- SATA 3.0
- UART
- CAN
- SPDIF
- SDIO 3.0
- GPIO
- MIPI-DSI
- MIPI-CSI
- USB 3.0

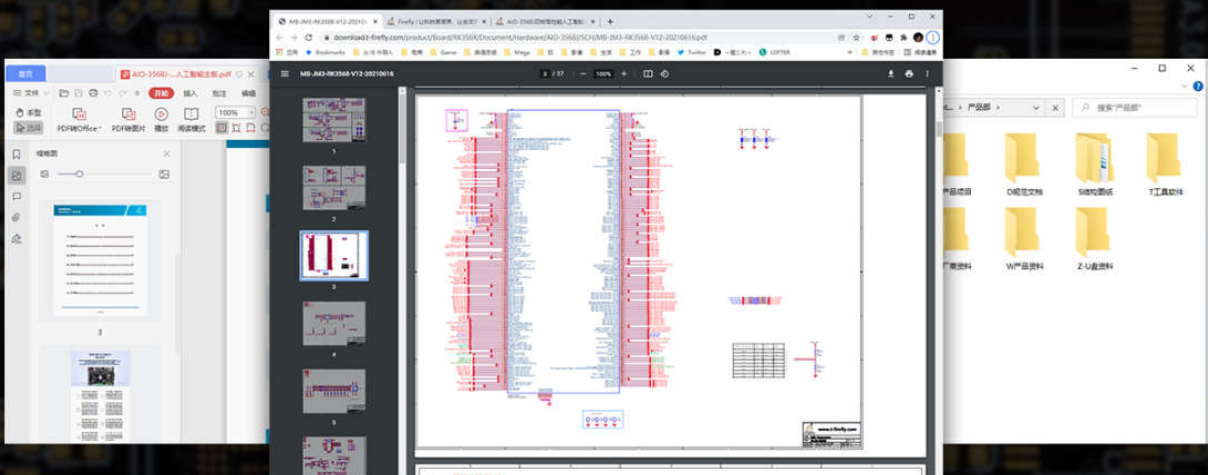
# High-performance ITX mainboard

The core board, with standard MXM3.0-314P interface, which is small in size, can be combined with a backplane to form a complete high-performance ITX mainboard with richer expansion interfaces, which can be directly applied to various smart products to accelerate the product development process.



# Backplane reference design is provided

Backplane reference design and complete technical information are provided, so users can efficiently proceed secondary development to quickly create independent and controllable products.



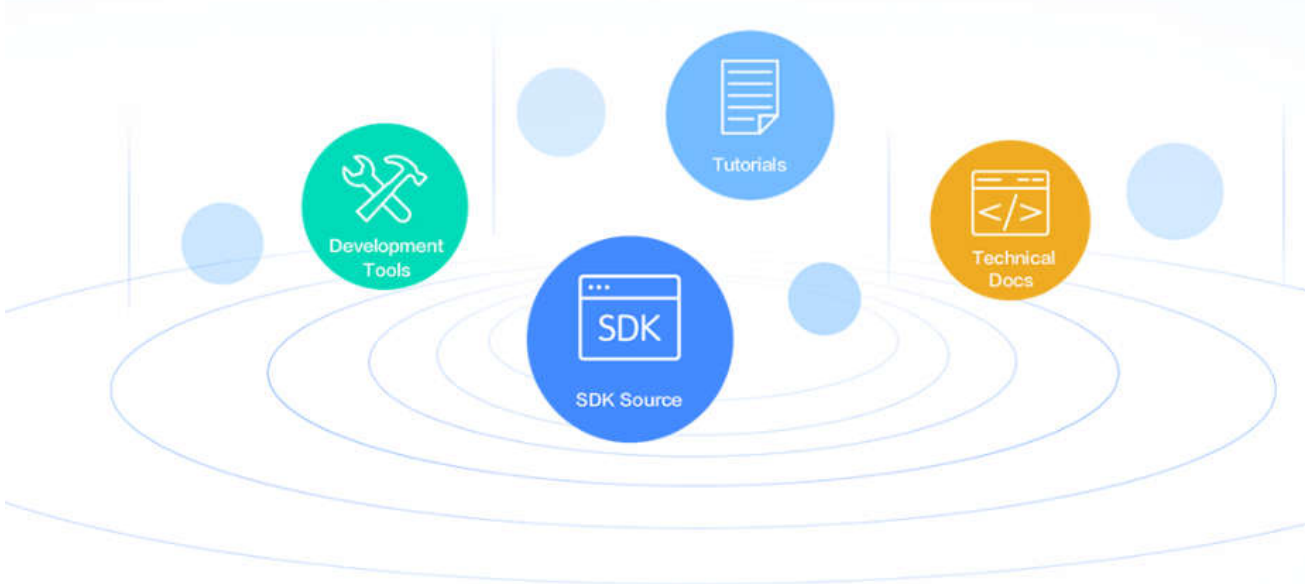
# Supports various operating systems

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 core board can be used in edge computing, cloud server, ARM PC, smart NVR, intelligent cockpit, smart video wall, AR/VR, high-end tablet, multi-lens camera, smart car and other fields. The core board can be used in edge computing, cloud server, ARM PC, smart NVR, intelligent cockpit, smart video wall, AR/VR, high-end tablet, multi-lens camera, smart car and other fields.





## Technical parameters

### Basic Specifications

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

### Hardware Specifications

Network	Integrated with PCIe3.0/GMAC/SDIO3.0/USB3.0, it can be extended to multi-channel Gigabit Ethernet, WiFi 6/Bluetooth, 5G/4G LTE
Display	Video output: 2 × HDMI2.1 ( 8K@60fps or 4K@120fps, Combo with eDP ( 4k@60fps ) ) 2 × MIPI-DSI ( 4K@60fps ) 2 × DP1.4 ( 8K@30fps, multiplexed with USB3.0 ) 1 × BT.1120 ( 1080@60fps )  Video input: 1 × HDMI-IN ( 4K@60fps ) , supports HDCP 2.3 1 × MIPI CSI ( 4 lanes ) or 2×MIPI CSI ( 2 lanes ) 2 × MIPI DC ( 4-lane DPHY v2.0 or 3-lane CPHY V1.1 ) 1 × DVP camera (up to 150MHz input data)  * Supports multi-channel 8K video output and 4K video input, up to seven-screen output with different displays
Audio	2 × 8-channel I2S 2 × 2-channel I2S 2 × SPDIF 2 × 8-channel PDM (supports multi-MIC array) 1 × Dual-channel digital audio codec (16-bit DAC) 1 × VAD
PCIE	PCIe3.0 (2×2 lanes, 1×4 lanes, 4×1 lane) 3 × PCIE2.0(1 lane)
SATA	3 × SATA3.0
USB	3 × USB3.0, 4 × USB2.0 Host 2 × USB2.0 OTG
Power	4V (error±5%)
Other Interfaces	9 × I2C, 10 × UART, 5 × SPI, 7 × ADC , 16 × PWM , 1 × SDMMC, GPIO

### OS/Software

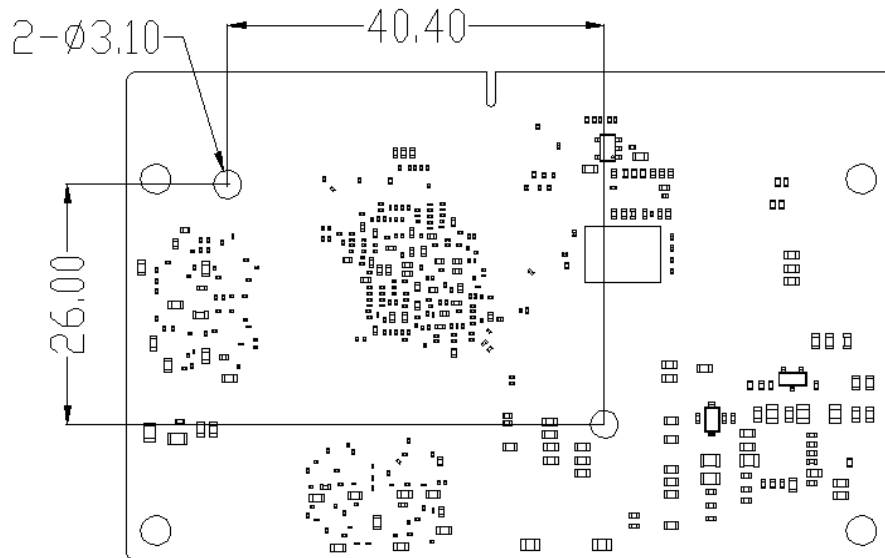
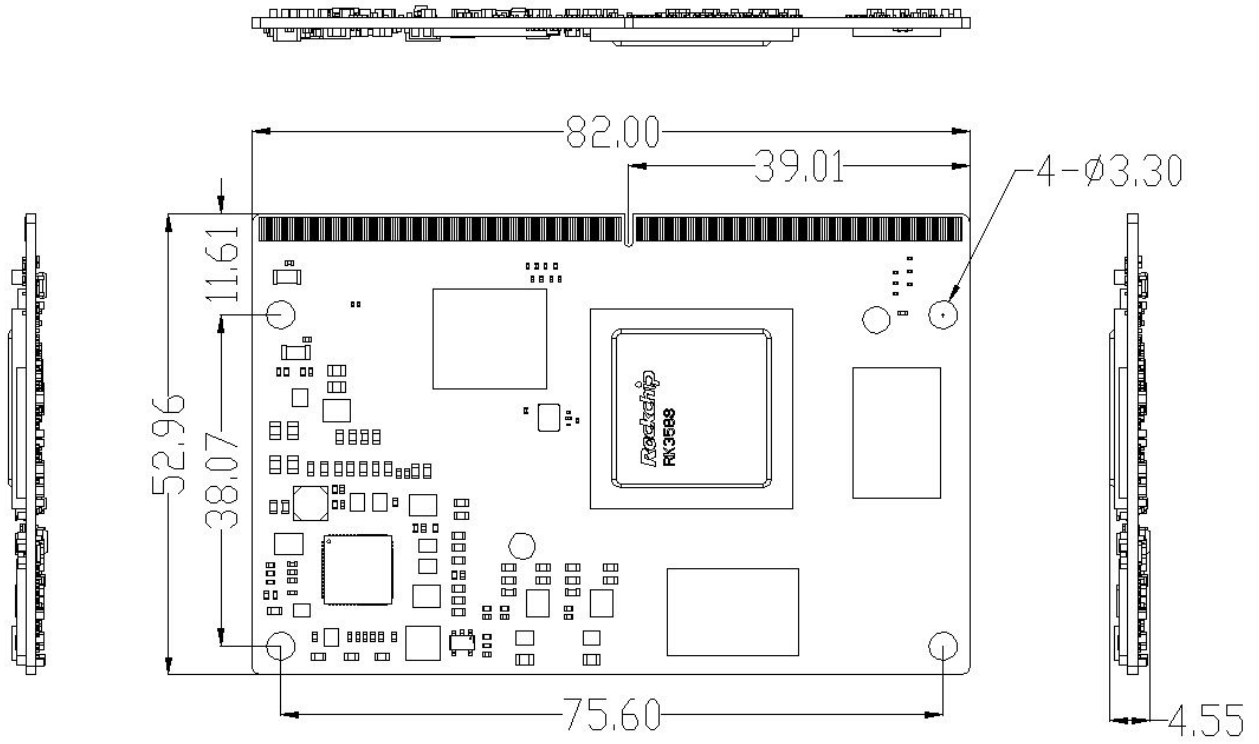
OS	Android: Android 12.0 Linux: Ubuntu Desktop, Ubuntu Server, Debian11, Buildroot, RTLinux, Kylin Linux, UOS. Supports UEFI Boot
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### General

Size	82 mm × 53 mm
Interface Type	MXM3.0 ( 314 PIN, 0.5mm pitch)
PCB	10-layer design, immersion gold technology
Heat Dissipation	Heat sink installation hole pitch: 45mm
Power Consumption	Idle: ≈1.35W (4V/338mA) Typical: ≈4.8W (4V/1200mA) Max: ≈20W (4V/5000mA)
Environment	Operating Temperature: -20°C-60°C Storage Temperature: -20°C-70°C Storage Humidity: 10%-90%RH(non-condensing)



# Dimensions

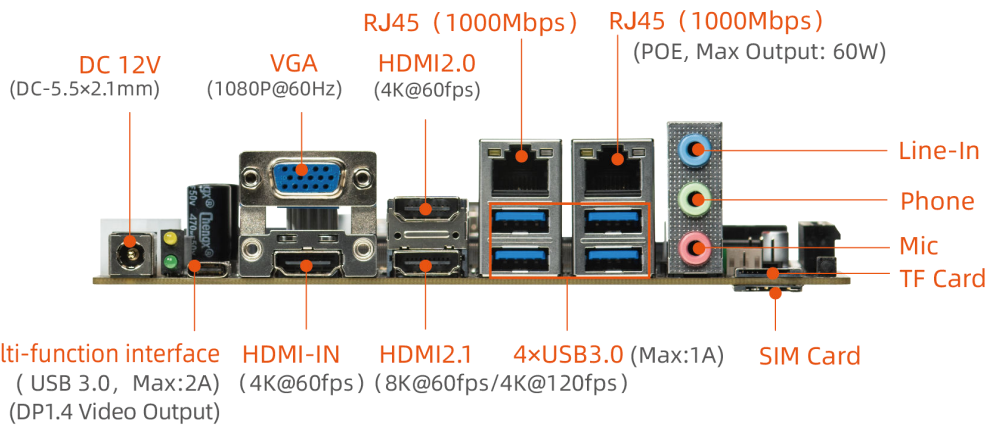
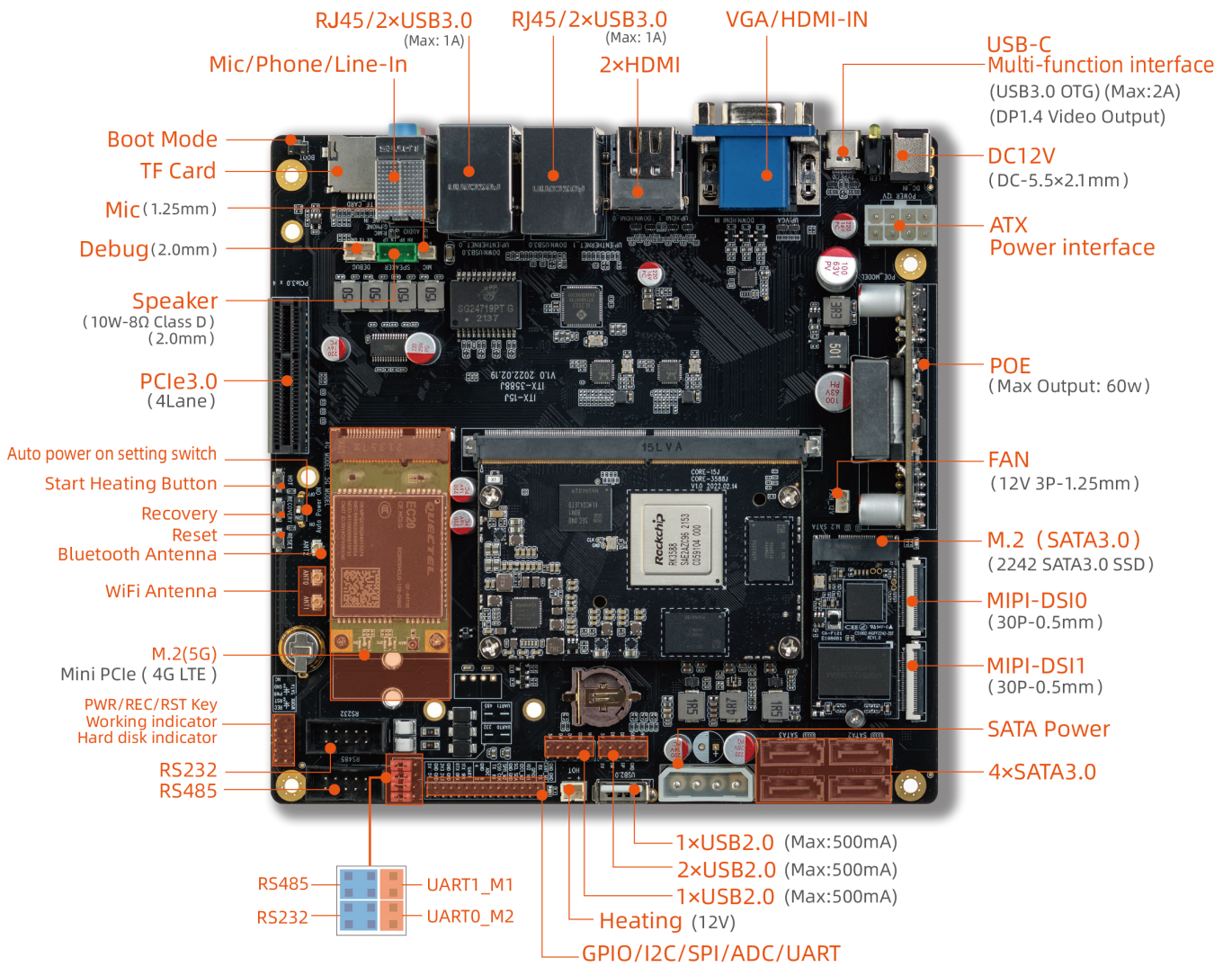




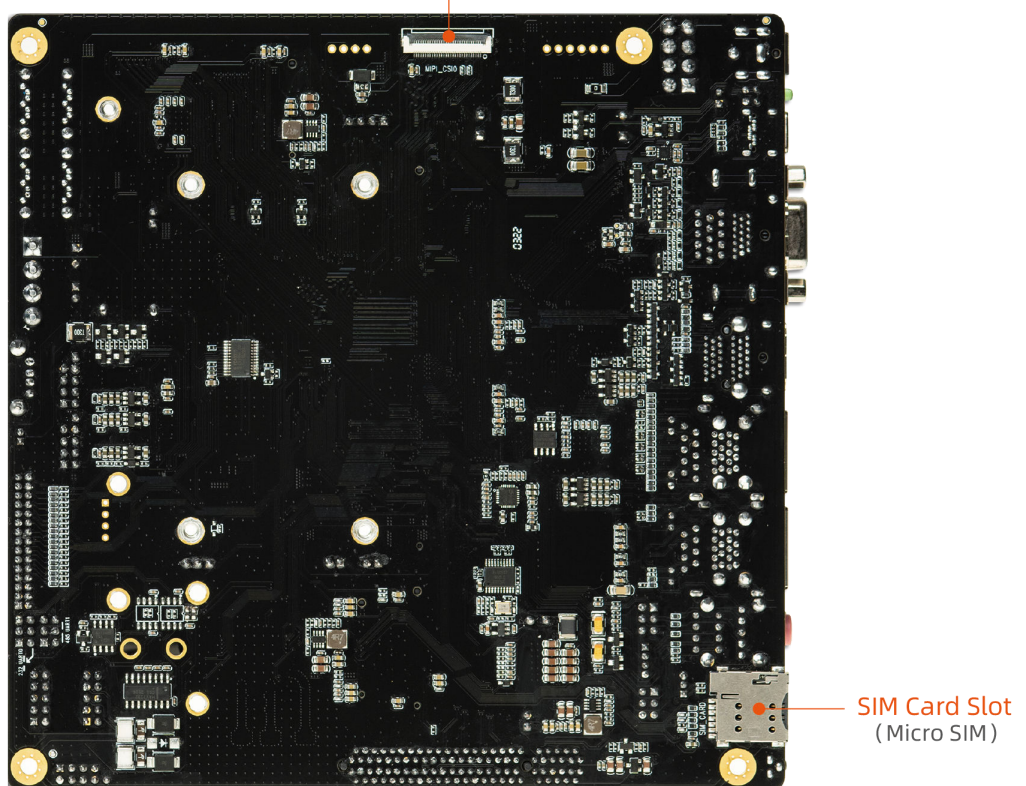




# Interface Description



**MIPI-CSI**  
 (2x2 lane MIPI-CSI Input / 1x4 lane MIPI-CSI Input)





## | About us

T-Chip Intelligent Technology (Zhongshan) Co., Ltd. , established in 2005, has more than ten years of technological product research and development capabilities, and has nearly 100 patents and software copyrights. As a national high-tech enterprise, we focus on the research and development, production and sales of open source smart hardware, Internet of Things, and digital audio products, while also provide overall solutions with smart hardware products.

T-Chip is an IDH (Independent Design House) officially authorized by Rockchip in Fuzhou, and also a strategic partner of Rockchip, with a close cooperative relationship for more than 10 years.

Firefly is a brand established by T-Chip, with open source community and online store. Firefly products include core boards, mainboards, embedded computers, cluster servers, development kits and other products. Currently, we have more than 100,000 users, including more than 10,000 enterprise users such as Arm, Google, Baidu, Tencent and Alibaba.

Firefly team has more than 70 R&D members, with excellent research and development capabilities of schematic design, PCB layout, board mass production, embedded development, system development, application development and so on. We accelerate the research and development process for many technology entrepreneurs and start-ups, and provide professional technical services.

Make technology simpler, Make life smarter - is the idea of Firefly team. We hope that through Firefly's open source products and technical services, the research and development of various technological products will become efficient and simple, and intelligent technology can be integrated into life.

Firefly is committed to providing enterprise customers with long-term stable and reliable industrial products and services, and continuously creating value for customers.

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