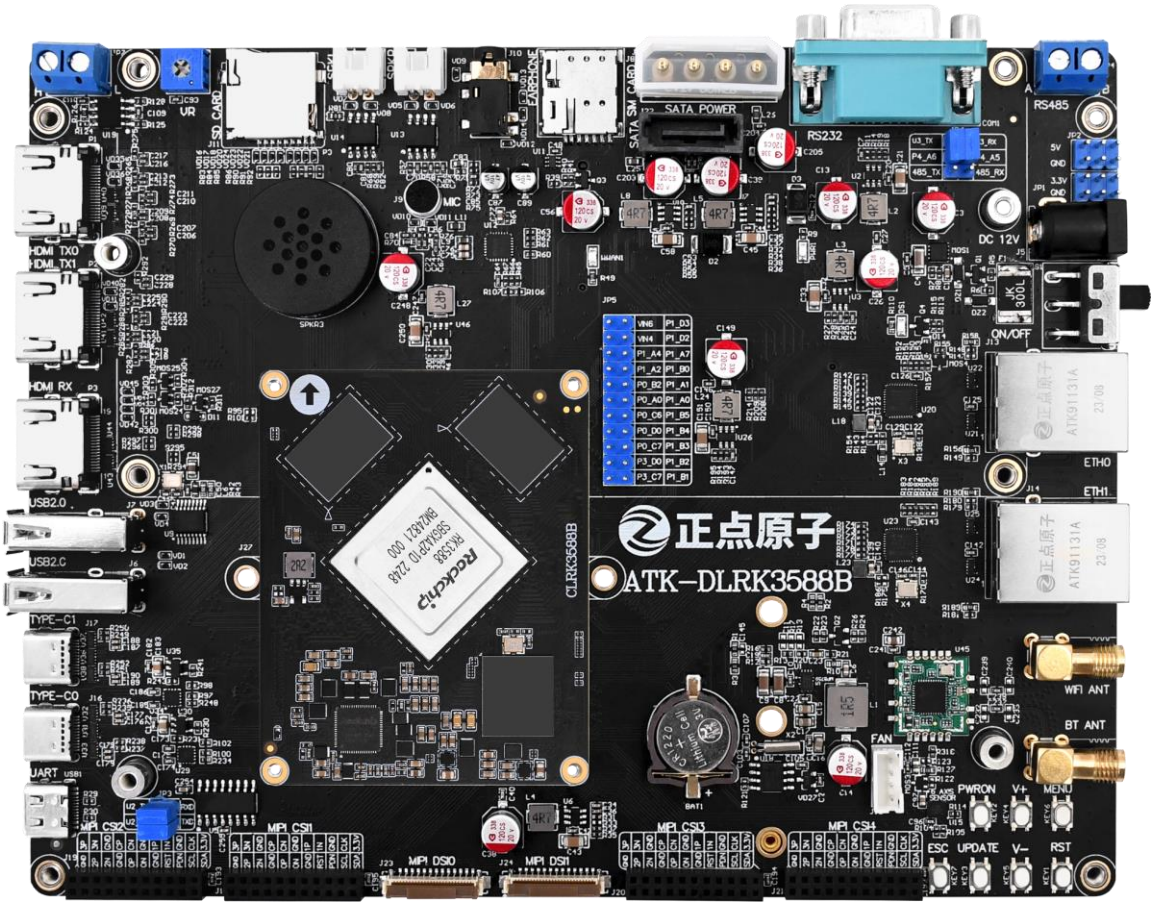
# ATK-DLRK3588B

## Development Board Specification

## V1.1



ALIENTEK

**1. Shopping:**

TMALL: https://zhengdianyuanzi.tmall.com

TAOBAO: https://openedv.taobao.com

**2. Download**

Address: http://www.openedv.com/docs/index.html

**3. FAE**

Website : www.alientek.com

Forum : http://www.openedv.com/forum.php

Videos : www.yuanzige.com

Fax : +86 - 20 - 36773971

Phone : +86 - 20 - 38271790

# Disclaimer

The product specifications and instructions mentioned in this document are for reference only and subject to update without prior notice; Unless otherwise agreed, this document is intended as a product guide only, and none of the representations made herein constitutes a warranty of any kind. 

In order to get the latest version of product information, please regularly visit the download center or contact the customer service of Taobao ALIENTEK flagship store. Thank you for your tolerance and support.

Revision History:

| Version | Version Update Notes | Responsible person | Proofreading | Date |
|---|---|---|---|---|
| V1.0 | release officially | ALIENTEK Linux Team | ALIENTEK Linux Team | 2024.04.01 |
| V1.1 | Delete the descriptions related to CAN | ALIENTEK Linux Team | ALIENTEK Linux Team | 2025.04.10 |

# Catalogue

# Chapter 1. Overview of Development Board

## 1.1 Introduction to the ATK-DLRK3588B Development Board

The ATK-CLRK3588B development board is a high-performance development board meticulously developed by the ALIENTEK team based on the RK3588 chip from Rockchip. It features a 8-core flagship processor from Rockchip, consisting of 4 Cortex-A76 cores and 4 Cortex-A55 cores, with a maximum operating frequency of up to 2.4GHz (due to the process issue of the RK3588 chip, the actual maximum operating frequency is determined by the actual frequency of the used chip). It also includes an independent NEON coprocessor. It is equipped with a 6.0TOPS independent NPU and supports deep learning frameworks such as TensorFlow, Caffe, Tflite, Pytorch, Onnx NN, Android NN, etc. It also has a built-in hardware video codec and supports H.264, VP9: 8K@30fps, H.265, AVS2: 8K@60fps, AV1: 4K@60fps video decoding; it also supports H.264/H.265 8K@30fps video encoding. The development board has three options for memory: 4G LPDDR4X + 32G EMMC, 8G LPDDR4X + 64G EMMC, and 16G LPDDR4X + 128G EMMC, meeting the needs of most development capacities.

The development board consists of a core board and a base board. It has abundant peripheral resources and is equipped with 2 gigabit Ethernet ports, RS232, 2 RS485, 2 USB2.0 HOST, 2 MIPI DSI screen interfaces, 4 MIPI CSI camera interfaces, 2 HDMI output interfaces, 1 HDMI input interface, SATA hard drive interface, 5G interface, PCIE WIFI&BT interface, and a built-in WIFI and Bluetooth dual module. For more detailed peripherals, please refer to Chapter 3.3.

The development board provides rich development documents and software resources, covering teaching areas such as Linux system development, Android system development, and HarmonyOS development, with software resources being open. Enterprise customers can directly purchase the core board for their own product development. ALIENTEK provides comprehensive and complete SDK to assist enterprise customers in their product development. To improve the development efficiency and shorten the development cycle of enterprise users, ALIENTEK has specially compiled a series of materials that are used in each development stage for core board users, including schematics, base board design materials, mechanical structure, component packaging, connector specifications, factory system image source code, compiler, software packages, etc., to facilitate enterprise users' development.

The ATK-CLRK3588B core board currently available for sale by ALIENTEK is in a board-to-board (BTB) interface form. The base board, screen accessories, and camera accessories are all of commercial grade.

Download the materials

Download Center: http://www.openedv.com/docs/boards/arm-linux/index.html

## 1.2 Application Areas

Equipped with the AI visual processor RK3588, with a NPU computing power of up to 6.0 TOPS, it supports multi-channel video encoding and decoding, and can efficiently achieve detection and recognition. It can be applied in lightweight AI scenarios, such as license plate recognition, face detection, face tracking, image classification, etc.

The application scope of RK3588:

- AI edge artificial intelligence development and learning platform, audio and video encoding and decoding development and learning.

- Industrial Internet of Things gateway, NVR storage, high-end industrial control tablet, industrial inspection, industrial control box, edge computing, etc.
- Smart recognition (car recorders, smart locks, smart gates, unmanned supermarkets, access control and attendance, etc.)
- Multimedia field (smart office, game interaction, digital campus, live streaming, network cameras, etc.)
- Human-computer interaction (intelligent self-service terminals, multi-channel video, information collection, etc.)

# Chapter 2. Chip Resource Parameters

## 2.1 Parameters of RK3588 Chip

The summary table of the main resources of the RK3588 main control chip is as follows:

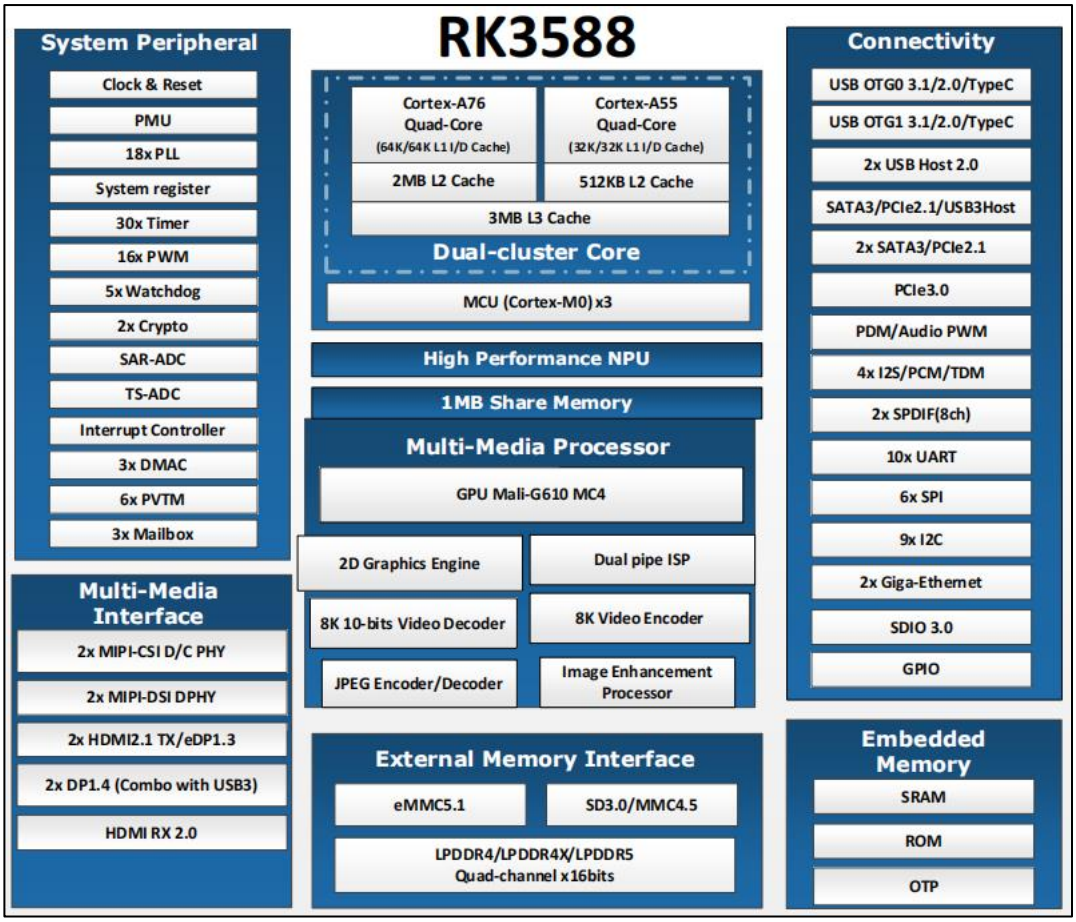



Figure 2.1-1 Chip resources

For specific detailed parameters, please refer to the data sheet of the RK3588 chip.

| RK3588 Main control chip resources | |
|---|---|
| Processor | Four-core Cortex-A76 + four-core Cortex-A5 |
| GPU | ARM GPU (Mali-G610 MC4) supports OpenGL ES 1.1/2.0/3.1/3.2, OpenCL 1.1/1.2/2.0 and Vulkan 1.1/1.2. It incorporates a high-performance 2D graphics accelerator module and an image enhancement processor. |
| NPU | 6.0 TOPS computing power, tri-core architecture, supports int4/int8/int16/FP16/BF16/TF32 |
| ISP | 2×ISP (ISP0/ISP1), supports HDR, 2DNR, 3DHR<br>Supports 48M: 8064×6048 @ 15fps<br>Supports 32M: 6528×4898 @ 30fps<br>Supports 16M: 4672×3504 @ 30fps |
| Video decoder | ■ H.264、VP9：8K@30fps (7680x4320)<br>■ H.265、AVS2： 8K@60fps (7680x4320) |

| | |
|---|---|
| | ■ AV1 : 4K@60fps (3840x2160) |
| Video encoder | ■ H.264、H.265：8K@30fps |
| JPEG decoder | Maximum support: 35535×65535<br>Supports YUV400/YUV411/YUV420/YUV422/YUV440/YUV444<br>Highest resolution: 1080P @ 280fps, 560 million pixels per second |
| JPEG encoder | Maximum support: 8192x8192 (67 megapixels)<br>Maximum speed: 90 million pixels per second |
| Video input interface | Support two MIPI DC (DPHY/CPHY) combinations<br>Each MIPI DPHY V1.2, with 4 channels, with a maximum speed of 2.5 Gbps per channel<br>Each MIPI CPHY V1.1, with 3 channels, with a maximum speed of 2.5 Gbps per channel |
| | Support four MIPI CSI DPHYS<br>Each MIPI DPHY V1.2 has 2 channels, with a maximum speed of 2.5 Gbps per channel<br>Support 2 DPHYS to form a 4-channel system |
| | Support for MIPI camera combination<br>2 MIPI DCPHY + 4 MIPI CSI DPHY (2 channels), a total of 6 camera inputs<br>2 MIPI DCPHY + 1 MIPI CSI DPHY (2 channels), a total of 5 camera inputs<br>2 MIPI DCPHY + 2 MIPI CSI DPHY (4 channels), a total of 4 camera inputs |
| | Support DVP interface<br>8/10/12/16-bit standard DVP interface, with maximum data input rate of 150 MHz<br>Support BT.601/BT.605 and BT.1120 VI interfaces |
| | Supports HDMI RX interface<br>HDMI 2.0 mode: 3.4Gbps ~ 6Gbps<br>HDMI 1.4 mode: 250Mbps ~ 3.4Gbps<br>Supports HDCP 2.3 and HDCP 1.4 |
| Display output interface | Support HDMI/EDP TX<br>Support two HDMI/EDP TX interface combinations, but both cannot work simultaneously<br>HDMI TX supports a resolution of 7680×4320@60Hz, supports bandwidths of 3, 6, 8, 10 and 12 Gbps, and supports HDCP 2.3<br>EDP TX supports a 4K@60Hz resolution, supports bandwidths of 1.62 Gbps, 2.7 Gbps and 5.4 Gbps, and supports HDCP 1.3 |
| | Support DP TX<br>Support 2 DP TX 1.4a interfaces, capable of connecting to USB3.1 Gen1<br>Each interface supports 1/2/4 channels<br>Supports resolution of 7680×4320@30Hz<br>Supports HDCP2.3 and HDCP1.3 |
| | Supports MIPI DSI<br>Supports 2 MIPI DPHY 2.0 or CPHY 1.1 interfaces<br>The DPHY supports 4 data channels, with the maximum data rate of each |

| | |
|---|---|
| | channel being 4.5 Gbps<br>CPHY supports 3 data channels, with the maximum data rate for each channel being 2.0 Gbps.<br>It supports a maximum resolution of 4K @ 60Hz. |
| | Supports BT.1120 output<br>Supports RGB format (up to 8bit), data speed up to 150MHz<br>Supports up to 1920×1080 @ 60Hz |
| Audio interface | Supports 8 lanes I2S0/I2S1, 2 lanes I2S2/I2S3<br>Supports TX and RX, audio resolution ranging from 16 to 32 bits, with the maximum sampling rate of 192 KHz |
| | Support SPDIF0/SPDIF1<br>Support 2×16-bit audio data storage<br>Support 16/20/24-bit linear PCM transmission and non-linear PCM transmission |
| | Support PDM0/PDM1<br>The audio resolution is 16 to 24 bits, and the maximum sampling rate is 192 KHz. |
| SDIO interface | Complies with SDIO 3.0 protocol<br>4-bit data bus width |
| Ethernet interface | Support two GMAC, with data transmission rates of 10/100/1000M<br>Support RGMII/RMII interface output<br>Support full-duplex or half-duplex |
| USB 3.1 Gen1 | Supports USB 3.1 Gen1, equivalent to USB 3.2 and USB 3.0, with the maximum data rate of 5 Gbps<br>2 USB 3.1 OTGs, shared with DP TX (USB3OTG_0 and USB3OTG_1)<br>1 USB 3.1 HOST, shared with PIPE PHY2 (USB3OTG_2) |
| USB 2.0 HOST | Supports two USB 2.0 HOSTs<br>Supports high-speed (480Mbps), full-speed (12Mbps), and low-speed (1.5Mbps) modes |
| PCIE 2.1 interface | Three PCIE 2.1 controllers, sharing the same resources with SATA 3.0 and USB 3.1 controllers<br>Each PCIE 2.1 interface supports 1 lane |
| SATA interface | Three SATA controllers, shared with PCIE 2.1 and USB3.1 controllers<br>Each SATA interface supports one port and has a maximum data rate of 6 Gbps |
| PCIE 3.0 interface | Supports 4-channel PCIE 3.0<br>The maximum data rate supported is 8 Gbps<br>Supports 4 combination modes:<br>1×4 lanes, 2×2 lanes,<br>4×1 lanes, 1×2 lanes + 2×1 lanes |
| SPI | 5 SPI controllers<br>Each controller supports two chip select outputs<br>Supports serial master, serial slave modes, and is software-configurable |
| I2C | 9 I2C master controllers<br>Supporting 7-bit and 10-bit address modes |

| | |
|---|---|
| | The data transmission rate in the fast mode is 400K bits per second. |
| UART | 10 UART interfaces<br>Built-in 2 64-bit FIFOs, supporting TX and RX transmission<br>The maximum baud rate is 4 Mbps<br>Supports automatic flow control mode |
| PWM | 16 on-chip PWMs<br>Among them, PWM3, PWM7, PWM11 and PWM15 can be used for infrared applications |
| ADC | 8 SARADCs<br>Support 12-bit resolution, with a sampling rate of up to 1MS/S |
| Package | FCBGA1088L |

Note: These are the parameter values of the chip data manual resources, not the available resource parameter values of the core board.

# Chapter 3. Product Specifications

## 3.1 Appearance of the Development Board and Shipping List

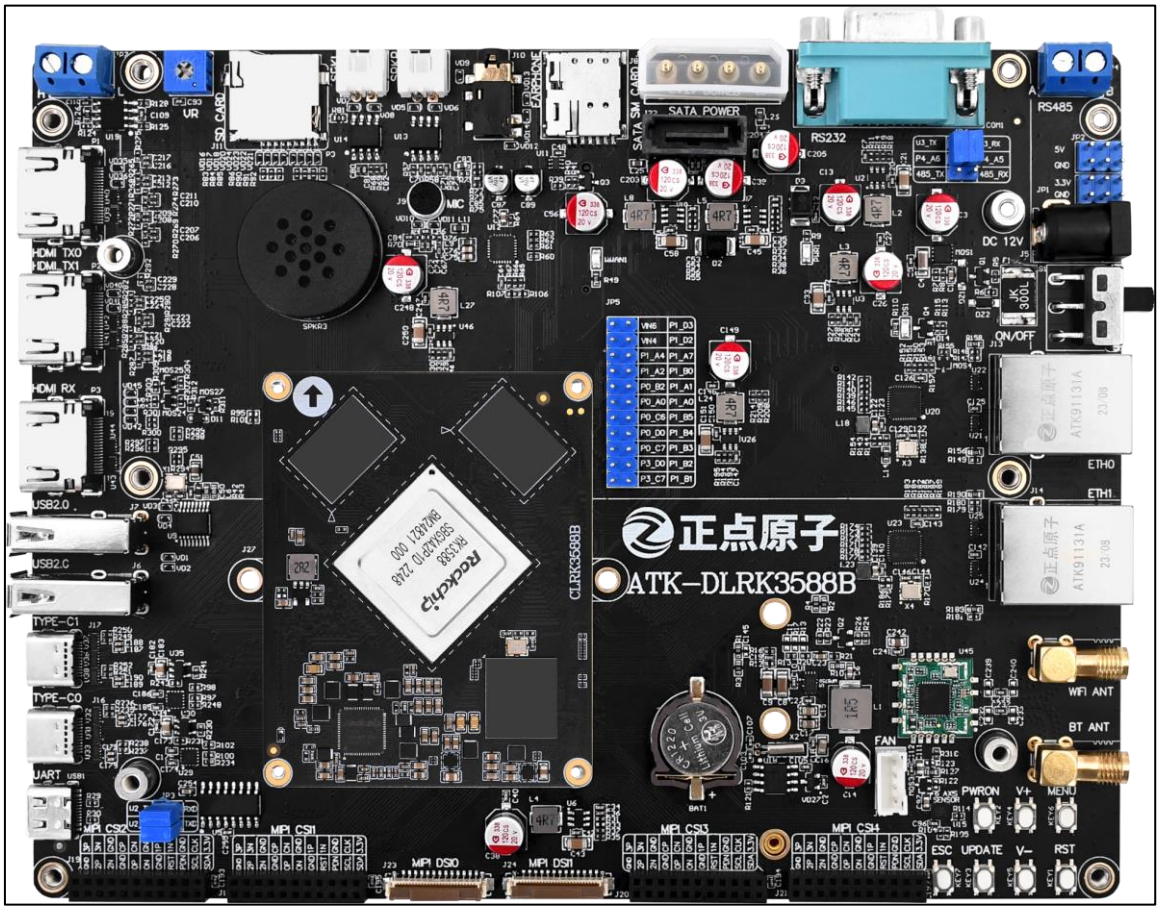



Figure 3.1-1 The front appearance of the development board

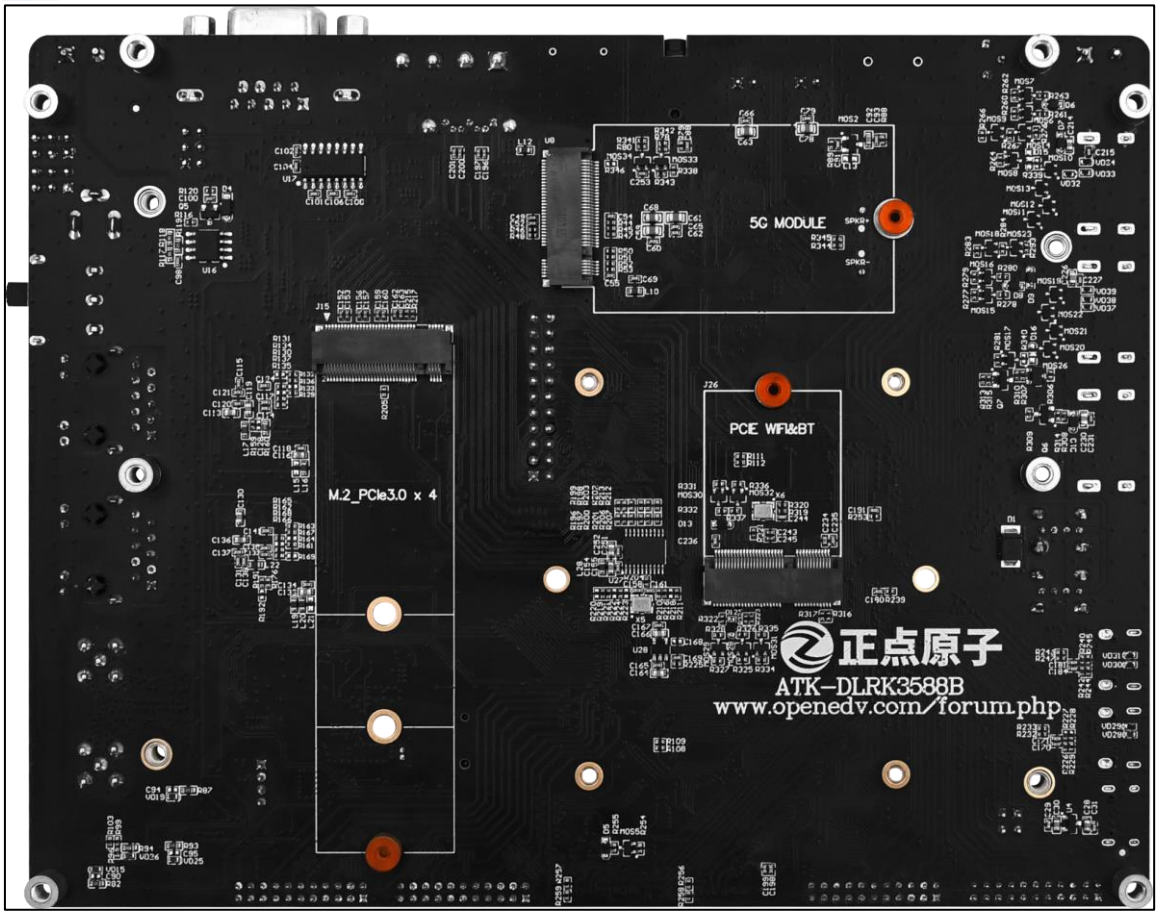



Figure 3.1-2 Backside appearance of the development board

## 3.2 Mechanical dimensions of the development board

The external dimensions of the development board are 180mm * 140mm. The image below is from the "ATK-DLRK3588B Mechanical Dimensions Chart.pdf" on the data disk. The design of the board fully considers humanized design and combines the years of development board design experience of ALIENTEK. After multiple improvements, this design was finally determined.

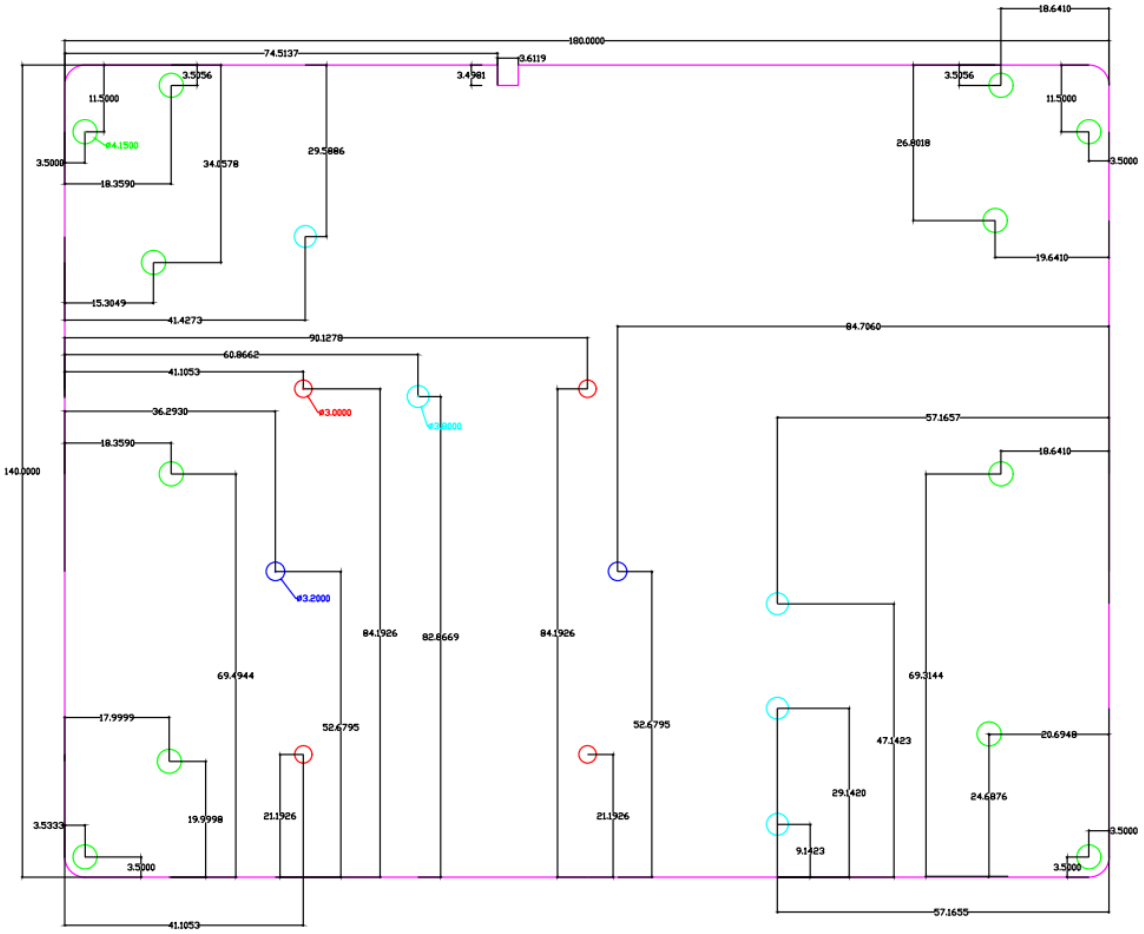



Figure 3.2-1 Mechanical dimensions of the development board

## 3.3 Peripheral Resources of the Development Board

The base board of the ATK-DLRK3588B development board is rich in resources. Most of the internal resources can be verified on this development board. At the same time, it is equipped with a variety of expanded interfaces and functional modules, making the entire development board look very grand.

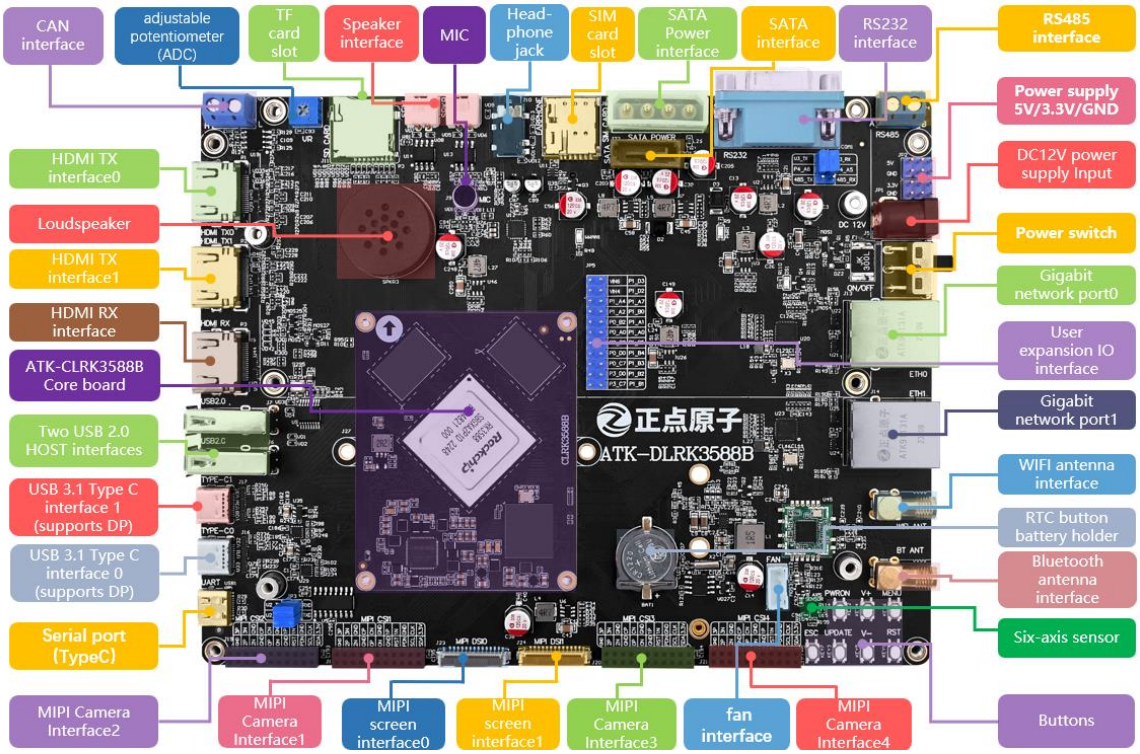



Figure 3.3-1 Front resource diagram of the ATK-DLRK3588B development board

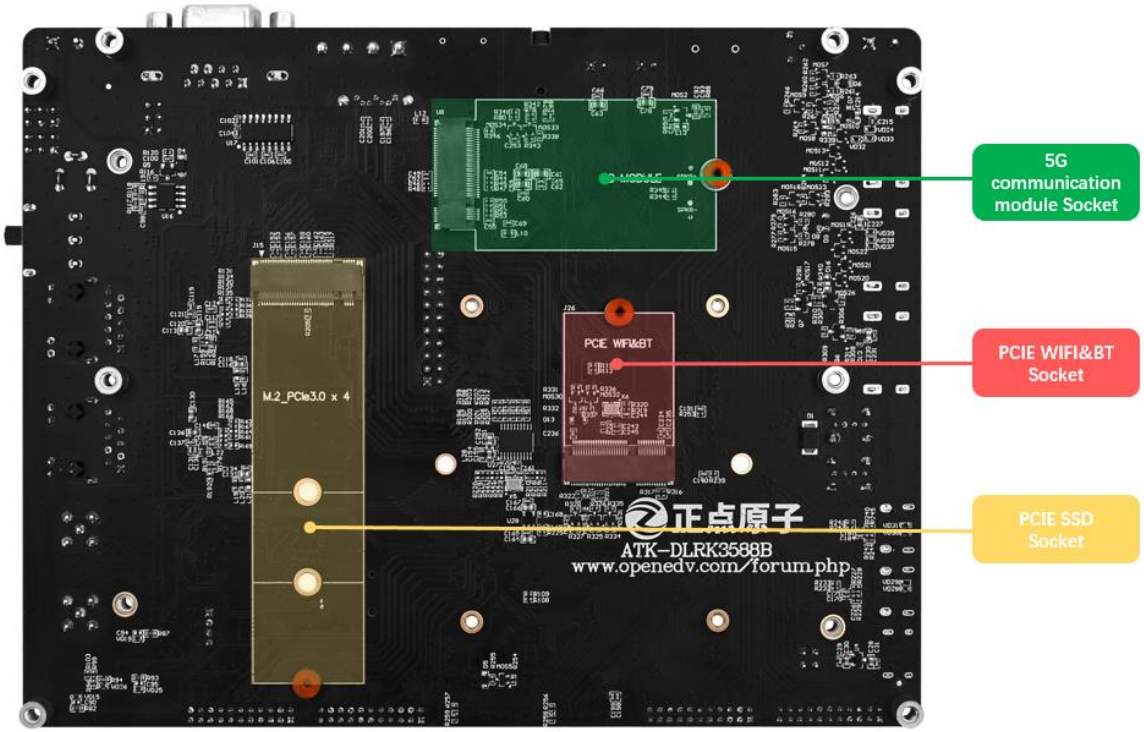



Figure 3.3-2 Backside resource diagram of the ATK-DLRK3588B development board

The summary table of the main resources of the RK3588 main control chip is as follows:

| ATK-DLRK3588B Motherboard peripheral resources | | |
|---|---|---|
| Size | 180mm*140mm | |
| Operating System | Linux/android | |
| Main control chip | CPU | Four-core Cortex-A76 + four-core Cortex-A5 |
| Storage | ROM | × 1, 32/64/128GB EMMC |
| | RAM | × 2, 4/8/16GB LPDDR4X |
| | TF card slot | × 1 |
| Human-computer interaction | Power indicator light (blue) | × 1 |
| | Status indicator light (yellow) | × 1 |
| | Function buttons | × 6 |
| | Reset button | × 1 |
| | Adjustable potentiometer | × 1 |
| | MIPI screen interface | × 2 |
| | HDMI RX interface | × 1 |
| | HDMI TX interface | × 2 |
| | STAT interface | × 1 |
| Download/Debug | Debugging serial port (Typec) | × 1 |
| | USB3.1 Typec interface | × 2 |
| Wired communication | USB2.0 HOST | × 2 |
| | Serial port selection interface (Connector + jumper) | × 2 |
| | Heat dissipation fan interface | × 1 |
| | RS232 interface | × 1 |
| | RS485 interface | × 1 |
| | Gigabit network port | × 2，10/100/1000M RGMII |
| Wireless communication | 5G communication module socket | × 1 |
| | PCIE WIFI&BT socket | × 1 |
| | PCIE SSD socket | × 1 |
| | WIFI antenna interface | × 1 |
| | BT antenna interface | × 1 |
| | SIM card slot | × 1 |
| | Six-axis sensor | × 1 |
| Module interface | MIPI camera interface | × 4 |
| | On-board user expansion IO interface | × 1，2×11P |
| | Built-in MIC | × 1 |
| | Headphone interface | × 1 |
| | Speaker interface | × 1 |
| | Small speaker (speaker) | × 1 |

| | | |
|---|---|---|
| Power | 5V output interface | × 3 |
| | 3.3V output interface | × 3 |
| | DC power input interface (DC12V) | × 1 |
| | RTC backup battery holder (With CR1220 battery socket) | × 1，AT8563T |
| | Power switch | × 1 |

The features of the base board of the ALIENTEK ATK-DLRK3588B development board include:

1. Rich interfaces. The board provides about ten standard interfaces, which makes it convenient for conducting experiments and development of various peripherals.

2. Flexible design. It adopts the form of core board + base board, and many resources on the board can be flexibly configured to meet the usage requirements under different conditions. The base board is equipped with one group of 2×11P 2.54mm spacing pin headers, with 20 IO + 2 ADC input pins, which greatly facilitates expansion and usage.

3. Abundant resources. The board is equipped with high-performance audio codec chip, six-axis sensor, gigabit network card and various interface chips, meeting various application needs.

4. Humanized design. Each interface is marked with silk-screen printing, making it clear to use; some commonly used peripherals are marked with large silk-screen printing for easy search; the interface position is designed reasonably, making it convenient to use.

## 3.4 Software resources of the development board

The factory-provided Linux system software resources are as shown in the following table:

| Types | Description | Note |
|---|---|---|
| U-Boot | The version is 2017.09 | Provide source code |
| Linux Kernel | The version is 5.10 | Provide source code |
| Buildroot | The version is 2021.11 | Provide source code |
| Qt5 | The version is 5.15.8 | Provide source code |
| Cross compiler | aarch64-buildroot-linux-gnu | For compiling the root file system and upper-layer applications |
| | gcc-arm-10.3-2021.07-x86_64-aarch64-none-linux-gnu | For compiling U-Boot and Linux Kernel |
| System burn method | Upper computer programming/programming upload | Provide a user guide |
| MIPI LCD driver | MIPI DSI driver | Provide source code |
| Touch | GT9xx capacitive screen touch screen (only available at ALIENTEK) | Provide source code |
| Network | The Gigabit Ethernet PHY is YT8531 | Provide source code |
| USB HOST | Two USB HOST 2.0 interfaces | Provide source code |
| 4G/5G module | Supports Quectel 5G module RM500U, Quectel 4G module EM05, Fibocom FG132-GL | Provide source code |

| | | |
|---|---|---|
| PMIC | RK806-1 power management chip | Provide source code |
| Function button | ADC realizes 4 function keys | Provide source code |
| UPDATE button | Upgrade function | Provide source code |
| RESET button | Reset function | Provide source code |
| PWRON button | Hibernation function | Provide source code |
| External RTC | AT8563 RTC chip | Provide source code |
| Six-axis sensor (I2C) | SH3001，I2C interface | Provide source code |
| TF card/EMMC | SDMMC driver | Provide source code |
| LED | GPIO | Provide source code |
| Audio | Power chip RK809 has built-in audio | Provide source code |
| USB WIFI&BT | RTL8733BU, supports WIFI6 | Provide source code |
| Serial port | USB debugging serial port, RS232, RS485 | Provide source code |
| USB 3.1 TypeC | Supports OTG function | Provide source code |
| ADC | ADC driver | Provide source code |
| MIPI CSI | Support IMX415, IMX335 and OV13850 | Provide source code |
| PWM | LCD PWM backlight | Provide source code |
| HDMI | Two HDMI outputs and one HDMI input | Provide source code |
| PCIE WIFI&BT | E_KEY socket interface | Provide source code |
| PCIE SSD | M_KEY socket interface | Provide source code |
| SATA | Supports SATA hard drives | Provide source code |

Table 3.1.1 Factory-installed Linux system software resources for the development board

That's all for the software resources of the PSoC4 ATK-DLRK3588B development board. We will continue to update the software resources.

## 3.5 Adapter modules

The following accessories can all be purchased on the ALIENTEK store.
https://zhengdianyuanzi.tmall.com

| | |
|---|---|
| MIPI camera | IMX415 |
| MIPI screen | 5.5-inch 1080×1920, 5.5-inch 720×1080, 10.1-inch 800×1280 |
| Baseboard connector (connected to the main board) | DF40C-100DS-04V(51) |
| Other accessories | USB serial port converter three-in-one module (RS232, RS485, TTL), USB Type-C cable |
| Core board cooling | Development board cooling fan kit (included by default) |

# Chapter 4. Development documents

The ALIENTEK provided the development board ATK-DLRK3588B with a wealth of development documents and system source code software resources, covering areas such as Linux system development manuals, Linux driver development guides, and QT development experimental documentation. All software resources are available for free download through Baidu Netdisk.

## 4.1 Download of Materials

Development Board Materials Download Center:
http://www.openedv.com/docs/boards/arm-linux/index.html

## 4.2 Data Description

First-level directory of the cloud storage data:

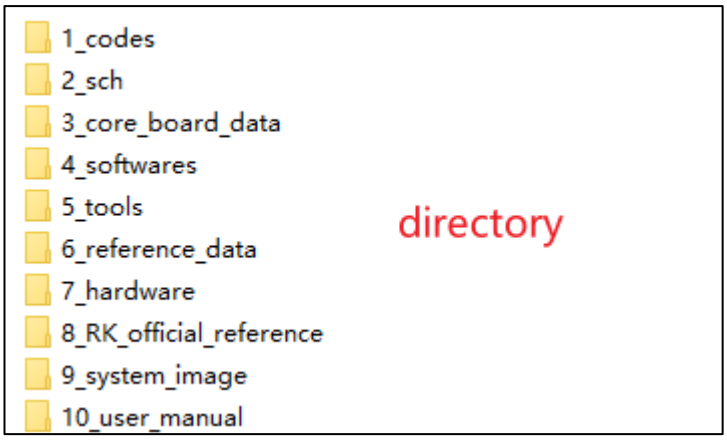



Figure 4.2-1 Primary directory of online disk contents

The materials are very abundant. Due to space limitations of this document, they cannot be listed one by one. Please download the online disk contents for further reference.

The document materials are continuously updated. Please use the latest online disk address to download the materials.

# Chapter 5. Precautions and maintenance

**Notes**

- Do not plug and unplug peripheral modules with power!
- Before using the product, please carefully read this manual and related development manuals, and pay attention to the applicable matters of the platform.
- Follow all instructions and warnings on the product.
- Please use this product in a cool, dry and clean place.
- Please keep the product dry. If any liquid splashes or soaks, power off immediately and let dry thoroughly.
- Do not use organic solvents or corrosive liquids to clean the product.
- Do not use or store this product in dusty, dirty and messy environment.
- If not used for a long time, please package this product, pay attention to moisture-proof and dust-proof.
- Pay attention to the ventilation and heat dissipation of the product during use to avoid component damage caused by excessive temperature during operation.
- Do not use this product in alternating hot and cold environment to avoid dew damage to components.
- Do not treat this product roughly, drop, knock or shake violently may damage the line and components.
- Pay attention to anti-static when using this product.
- FPC flexible cable is fragile, when plugging cable, pay attention to check whether the metal at both ends of the cable is misplaced and falling off.
- All products have passed the product test before shipment. Please use the development board corresponding to the ALIENTEK for power on test for the first time.
- Do not repair or disassemble the company's products by yourself. If the product fails, please contact the company in time for maintenance.
- Unauthorized modification or use of unauthorized parts may damage the product, the resulting damage will not be repaired.

# Chapter 6. After sales service

## 6.1 Terms of after-sales service

1). After receiving the goods, please open them in front of the express, and sign after acceptance. If you find that the goods are less after signing, take photos in time and contact the seller's customer service to explain the situation within 15 days. If the feedback is lack of goods after 15 days, we will not reissue the goods. Other reasons notwithstanding).

2). 15 days -1 month: we are responsible for the return freight repair of product problems. Human factors damage expensive main chip or LCD screen, touch screen. The buyer needs to pay the cost and one time shipping fee, no maintenance fee.

3). 1-3 months: the problem of the product itself (non-human factors), we are responsible for the delivery of the past freight maintenance. If the main chip is burned out and the LCD screen and touch screen are damaged, the buyer needs to pay the cost, and the maintenance fee is not charged.

4) After 3 months: the buyer shall bear the return freight and the cost of chip, LCD screen and touch screen. No service charge.

## 6.2 After-sales Support

Technical support: Contact the customer service to obtain the group number.

QQ group: ALIENTEK Rockchip Communication group

ALIENTEK RK3588 Technical Support Group (order number required)

Taobao shop: ALIENTEK flagship store

Forum: http://www.openedv.com/forum.php