title	keywords
What is the MAIX-III AXera-Pi?	MAIX-III, AXera-Pi, Maix3, Sipeed, ax620a, axera, sipeed, AI, model, maixhub

If you want to share this AI development board with other students, please use the only portal " wiki.sispeed.com/m3axpi".

>> To purchase, please click here to go directly to the Taobao product link <<<

In 2021, the major domestic original chip manufacturers have lit up their own Linux edge AI chips.

But in the market of AI development board, before the Raspberry Pi (Raspberry Pi), after the Nvidia (Jetson Nano) and other foreign veterans strongly besieged the domestic Linux AI development board, before the domestic similar products, whether price or experience, are beaten to the ground.

Today's players within a thousand dollars are Amlogic A311D, Horizon X3, Rexchip RV1126, Kanzhi K510, Allwinner V85X, Crystal CR182x and other domestic chips, looks and feels like there are many choices?

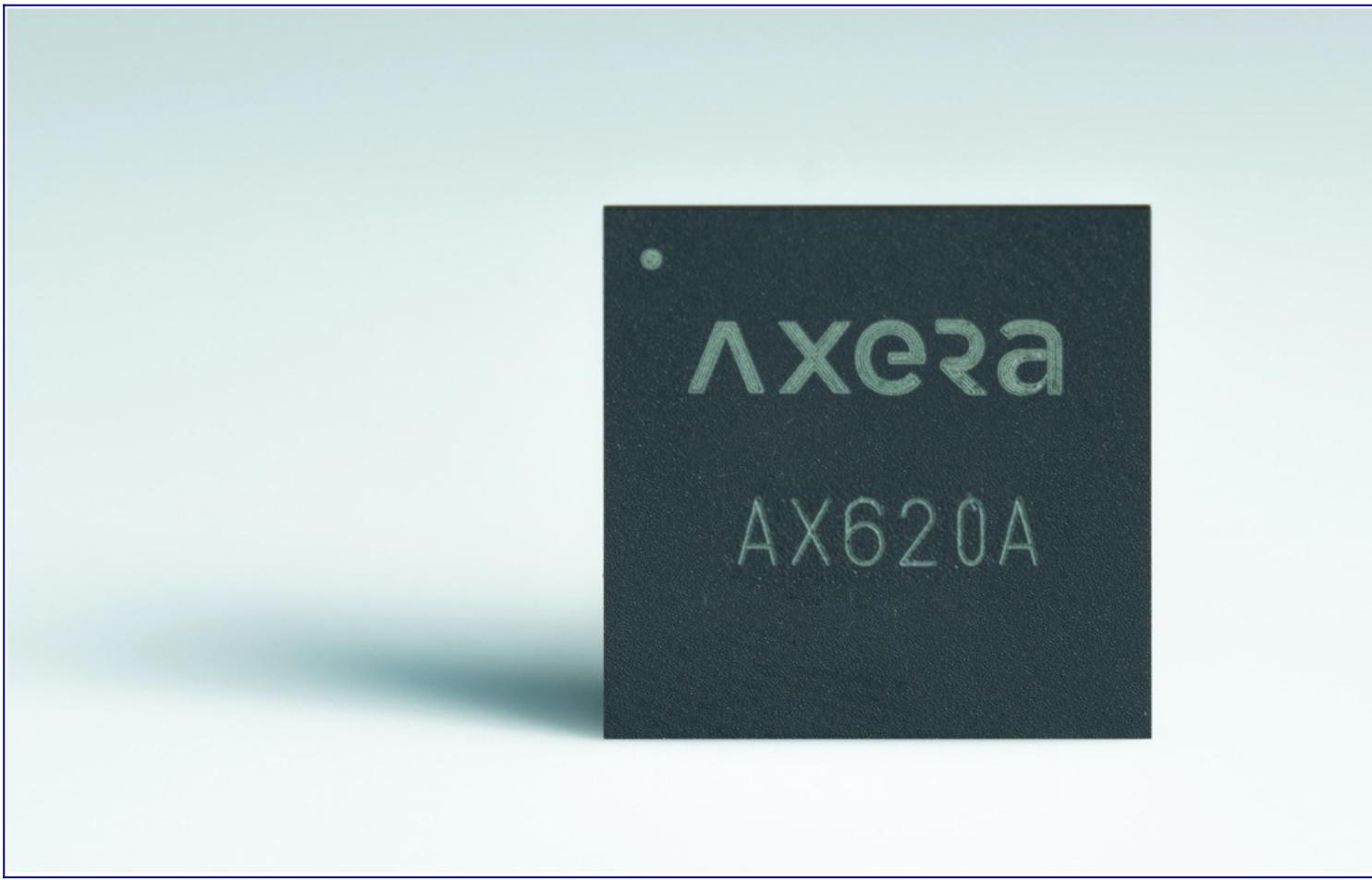
However, they are either too little information (closed information), low energy efficiency ratio, too expensive, ecologically barren, difficult to develop, too poor visual effects exist in a variety of problems.

It's really hard to have an edge AI board that can satisfy developers!!!

But now! These problems may not be a problem anymore!

It's time to bring out our new round of contestants!

Two and a half years of practice (not), a 3.6TOPs@INT8 large computing power low-power super night chip has finally come to the MAIX-III Linux AI series!



The AX620A is a high-capacity, high-efficiency, low-power AI SoC with a quad-core Cortex A7 @ 1Ghz CPU, a high-capacity NPU of 3.6TOPs@INT8, a 4K@30fps ISP, and a VPU that supports H.264

and H.265 encoding. The AX620A also supports 32bit LPDDR4x, EMMC v5.1 / SPI Flash, up to 6 MIPI inputs and up to 4 workstations, multiple sub-streams, 1 Gigabit Ethernet, 1 USB2.0, and 2 MIPI DSI/CSI outputs. With the large computing power and excellent image quality processing capability, AX620A can realize more AI functions and bring the best AI experience! (from official)

Products

It actually exhibited at the World AI Conference 2022 as early as early September ~ (it looked like this at the time)

Finally, in 20221001, the development board with AX620A was released, officially named: **MAIX-III AXera-Pi**, or **m3axpi** for short in the following content!

So, what does it bring?

- Too little information? The documentation teaches you everything from out-of-the-box to development, from embedded Linux development to AI model development guides!
- Poor energy efficiency ratio? Quad-core A7 can be brought up by a USB3.0! Say goodbye to your external power supply and heat sink!
- Difficult to develop? Support debian11 system built-in SDK compile directly on board! White whoring online AI model training until deployment!!!
- No ecology? SIPEED has content on LINUX, RISCV, AIOT, FPGA, MCU and other embedded fields ！ ！ ！ ！

- Camera effect is too poor? The main chip AI ISP night vision enhancement! Superb day-to-night images tuned by the original manufacturer himself for you ！ ！ ！ ！ ！
- Too expensive? From the core + backplane + screen + camera + card + case bracket a total of RMB **579**! (Roar ！ ！ ！ ！ ！ ！)

Product Features

Say so much useless, or hurry up to pull out the stuff, let everyone see what it is!

Image Effect

Night view enhancement effect

<iframe src="//player.bilibili.com/player.html?aid=561523949&bvid=BV1Ee4y1v7iF&cid=860676576&page=1" scrolling="no" border="0" frameborder="no" framespacing="0" allowfullscreen="true" style="max-width:640px; max-height:480px;"> </iframe>

Exhibition darkroom site

<iframe src="//player.bilibili.com/player.html?aid=430541632&bvid=BV1iG41137tx&cid=831645988&page=1&t=83.6" scrolling="no" border="0" frameborder="no" framespacing="0" allowfullscreen="true" style="max-width:640px; max-height:480px;"> </ iframe>

AI Application Live Shot

<iframe src="//player.bilibili.com/player.html?aid=773227207&bvid=BV1B14y1Y7A4&cid=837154353&page=1" scrolling="no" border="0" frameborder="no" framespacing="0" allowfullscreen="true" style="max-width:640px; max-height:480px;"> </iframe>

AI Eco

Great computing power super multi-counter!

Click here >>> "View AX620A Algorithm Support List" <<<< Wow!

The following table shows the ranking of NPU algorithm performance from high to low for AI motherboards (single motherboard only, too expensive for a full set) that are currently on sale for $1,000 (commodity prices are subject to market fluctuations, so please correct me if you find the table data too outrageous).

Chip	Products	Price	CPU	RAM	NPU
Amlogic A311D	Khadas VIM3	¥850.00	Quad-Core ARM Cortex-A73@2.2GHz Dual-Core ARM Cortex-A53@1.8GHz	2GB	5TOPs
Horizon X3	Rising Sun Faction	¥499.00	Quad-core ARM Cortex-A53@1.2GHz	2GB	5TOPs
Acuity AX620A	MAIX-III AXera-Pi	¥399.00	Quad-core ARM Cortex-A7@1.0GHz	2GB	3.6TOPs

Chip	Products	Price	CPU	RAM	NPU
Kanji K510	K510 CRB-KIT Lite	¥699.00	Dual-core RISCV 64-bit 800Mhz	512MB	3TOPs
Rexchip RV1126	EASY EAI Nano	¥328.00	Quad-core ARM Cortex-A7@1.5GHz	1GB	2TOPs
Allwinner V85X	Allwinner V853 Single Motherboard	¥973.00	Single-core ARM Cortex-A7@1.2GHz	512MB	1TOPs

Lots of ready-made models!

Before you get the board, you can go to the MaixHub model library to find the model you need. You can select `AX-Pi` in the filtering options to find models that can run on the `AXera-Pi.`

算子列表

Conv
- Conv
- DepthwiseConv
- TransposedConv
- GroupConv
- DilatedConv
- FullyConnected
- MatMul

Pooling
- MaxPool2D
- AvgPool2D
- ROIAlign

Elemwise
- Add/Sub/Mul/Div/Compare
- Abs/Exp/Log/Power/Sqrt

Reduce
- Sum/Mean
- Max/ArgMax/Softmax

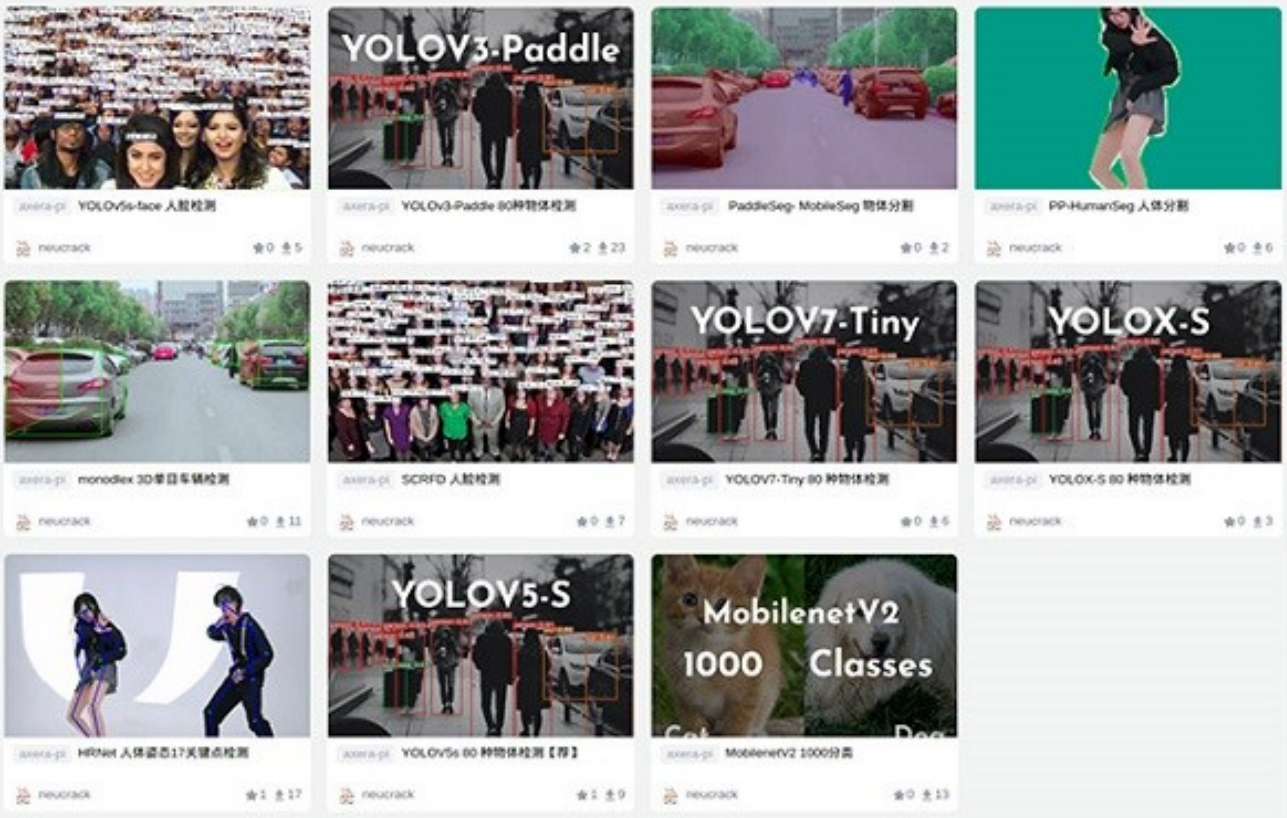
Sequence
- LSTM/GRU

Tensor Manipulation
- Reshape/Transpose
- Concat/Slice/Split/Reverse
- Padding
- Depth2Space (PixelShuffle)
- Space2Depth (PixelUnshuffle)
- Gather/Scatter
- Cast/Clip/Squeeze/Unsqueeze

Activation Functions
- Swish/Tanh/Sigmoid
- Relu/PReLU/LeakyRelu/GeLU/SiLU

Normalization
- BatchNorm/InstanceNorm/LayerNorm
- GroupNorm/L2Norm
- LRN

CV
- Bilinear
- Area Resize
- ColorSpaceConvertion
- Warp Affine/Perspective
- Grid Sample (Remap)



Models can also be found in the AXERA-TECH/ax-samples repository. Model resources are also pre-built in the board system, and subsequent model updates will be available here "ax-models", while AX-Samples will be constantly updated with the most popular, useful and interesting sample code, and currently has the following list of model support.

- Object Classification
  - MobileNetv1
  - MobileNetv2
  - MobileOne-s0
  - ResNet18
  - ResNet50
  - Others.....
- Object Detection
  - PP-YOLOv3
  - YOLOv3
  - YOLOv3-Tiny
  - YOLOv4
  - YOLOv4-Tiny
  - YOLOv4-Tiny-3l
  - YOLOv5s
  - YOLOv5-Lite (original model)
  - YOLOv7-Tiny
  - YOLOv8s
  - YOLOX-S
  - YOLO-Fastest-XL
  - NanoDet
- Human Type Detection
  - YOLO-Fastest-Body
- Face Detection
  - scrfd
  - YOLOv5-Face (original model)
- Face segmentation
  - Face_Parsing
- Obstacle detection (sweeper scene)
  - Robot-Obstacle-Detect
- UAV view object detection
  - YOLOv5s_visdrone
- 3D monocular vehicle inspection
  - Monodlex
- Key points of the human body
  - HRNet
  - AX-POSE-PPL
  - HandPose

- Body segmentation
  - PP-HumanSeg
- Semantic segmentation
  - PP-Seg
- Traditional CV Operation
  - CropResize
- Pipeline Example
  - NV12 -> CropResize -> NN(Classification)

To run the model on the board, see "Deploying the Model to the Maix-III AXera-Pi Development Board".

A rich community resource!

The following is the content contributed by the community developers, you are also welcome to contribute Oh! (Directly throw the group can be oh!)

- Ai Xin Pai - AI Shimmering full-color night vision - unboxing experience
- First Experience with Acuity AX620A NPU
- Lovecore AX620A deploys yolov5 6.0 model
- ubuntu22.04 build AX620A official routine development environment
- AX620A running yolov5s self-training model full process record (windows)
- MAIX-III AXera-Pi Aixipai Development from Scratch [1] Unboxing and Testing

- MAIX-III AXera-Pi Development from Scratch [2] Development Deployment
- MAIX-III AXera-Pi Development from Scratch [3] Model Conversion and Deployment
- MAIX-III AXera-Pi Aixipai Development from Scratch [4] Video Inference and Push Flow
- Small Hands Wisdom Lao Xu -- AI Edge Computing Platform - Aixin Yuanzhi AX620A Aixinpad Unboxing
- HonestQiao -- Silicon Speed MAIX-III AXera-Pi Unboxing
- A domestic "3.6TOPS@INT8" visual AI development board
- Domestic AI Development Boards Review | MAIX-III AXera-Pi Hands-on YOLOv5s Real-Time Target Detection
- [AXPI] How to use Rndis on M1/M2 Mac
- [m3axpi] YOLOv5 Training to Deployment Full Process
- [m3axpi] YOLOv8 Training to Deployment Full Process

Product-related columns include

- MAIX-III AXera-Pi Series Article (1): Next Generation 3.6T Vision AI Board Launched
- MAIX-III AXera-Pi Article Series (2): Rich and Versatile AI Applications
- MAIX-III AXera-Pi Series Article (3): Debian System & Unboxing Case
- MAIX-III AXera-Pi Series Article (4): Unboxing & Product Appearance
- MAIX-III AXera-Pi Series Article (5): Unboxing & Burning Boot Linux Systems
- MAIX-III AXera-Pi Series Article (6): Unboxing & Logging in to Linux
- MAIX-III AXera-Pi Series Article (7): Unboxing & Configuring the Network

Product-related news items are.

- The Dawn of AI ISP - Big Talk Imaging
- 2022 World Artificial Intelligence Conference Launch: Aixin Yuanzhi Releases AI-ISP "Aixin Smart Eyes®" China.com
- Aixin Yuanzhi AX620A and Baidu Flying Paddle Complete Level I Compatibility Testing Open Source Ecology Construction Goes Further
- AI visual new power × Ember full color "black" technology
- AXera-Pi™ debuts at ICCAD and accelerates the construction of the open source ecology of Aixin Yuanzhi
- Next Generation Kaldi - Real-time Speech Recognition on the Embedded Side

AI communities that are linking are

- sipeed maixhub.com

Train the model online!

Now the new version of MaixHub is online! The following is an illustration of the maixhub online training model process.

m3axpi does not support the previous generation m2dock sweep deployment, only local upload file deployment is an option.

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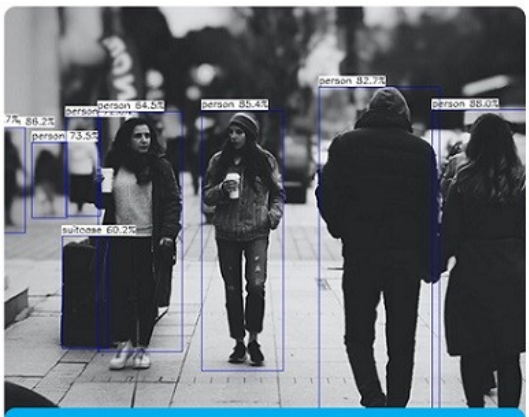
Share interesting models!

After you deploy successfully you will have a copy of the model file and the code or program that will run the model. You can share these files to [the MaixHub model repository] and we can share and learn and grow together! (Please start your show)

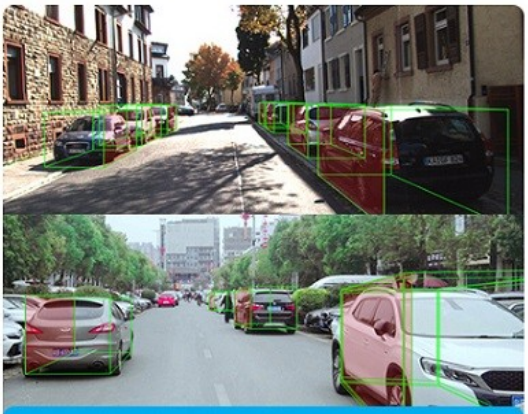
Numerous unboxing cases

Deadline for update: 20221205

SCRFD



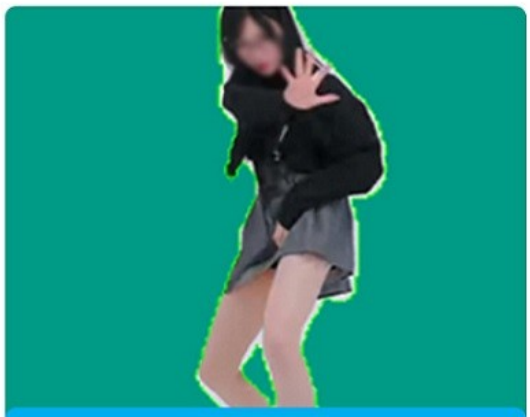
YOLOv7-TINY



MONODLEX

PADDLE-MOBILESEG

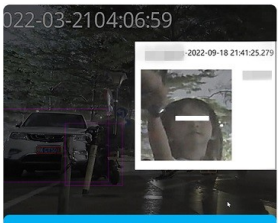
HRNET



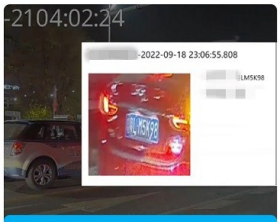
PP-HumanSeg

YOLOv5s

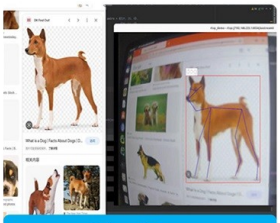
YOLOv5s-seg



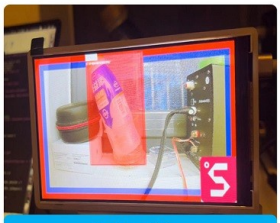
Human face detection



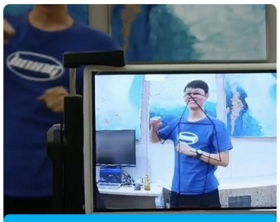
LPRNet



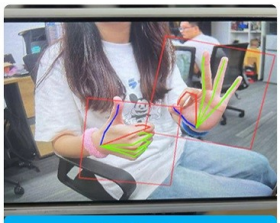
Animal-Pose



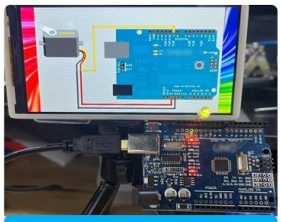
Python API



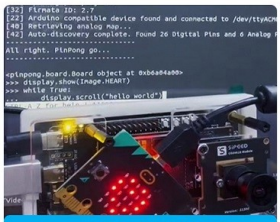
AX-POSE-PPL



PalmDetection



Program Arduino With Python



Program Microbit With Python

USB camera

LVGL7 UI

Linux Development

High cost performance and energy efficiency ratio

Don't get all fancy. Here are the typical AI development products that are currently (20221014) ranked in the market in terms of sales, **commodity prices are subject to change at any time, if you have questions, you can check or point out and correct**. (Low cost 38 board camera and chip original super expensive development board have been removed)

AI Development Boards	The main contents of the whole family bucket package	Approximate price (20221013)
NVIDIA JETSON NANO development board	4GB motherboard, aluminum case (with fan), 5V4A power supply, dual-band wireless network card, 64G USB flash drive, IMX279 camera, HDMI cable + network cable, 7-inch touch screen + stand	¥2129.00
Raspberry Pi Raspberry Pi 4B	4GB motherboard, seven-inch touch screen + stand, 64G U disk, heat sink, HDMI cable + network cable, 5V3A power supply, acrylic case (with fan), 500w USB camera, getting started instruction manual	¥1439.00
Khadas vim3 IoT a311d (currently not selling well online, but very typical)	VIM3 (4GB+32G) Development Board, Case, Heatsink, Fan, 30W Power Supply, HDMI Cable	¥1399.00
Xunwei RK3568 development board Rexchip	Commercial grade 2G+16G, 7" MIPI screen, OV5695 camera, (not with power supply)	¥1380.00
EASY EAI Nano AI development board Rexchip Micro RV1126	1GB single motherboard, 200w binocular camera (gc2xxx), 5" ips screen, antenna, speaker, copper column, 2A power supply	¥799.00
Abel Intelligence Sunrise X3 Pie Development Board	2GB motherboard, Gu Yueju course, WIFI antenna, aluminum case, gc4663 camera, 32G U disk, 5V3A switching power supply, HDMI cable	¥769.00
Sipeed M3AXPI Linux AI Shimmering Night Vision Aixipai	2GB single motherboard, 400w gc4653 camera, 5" ips screen, case, data cable, 32G TF card, online model training service, vibrant open source community	¥579.00

Think about why some products are sold so expensive, sales are still so good? What is the reason?

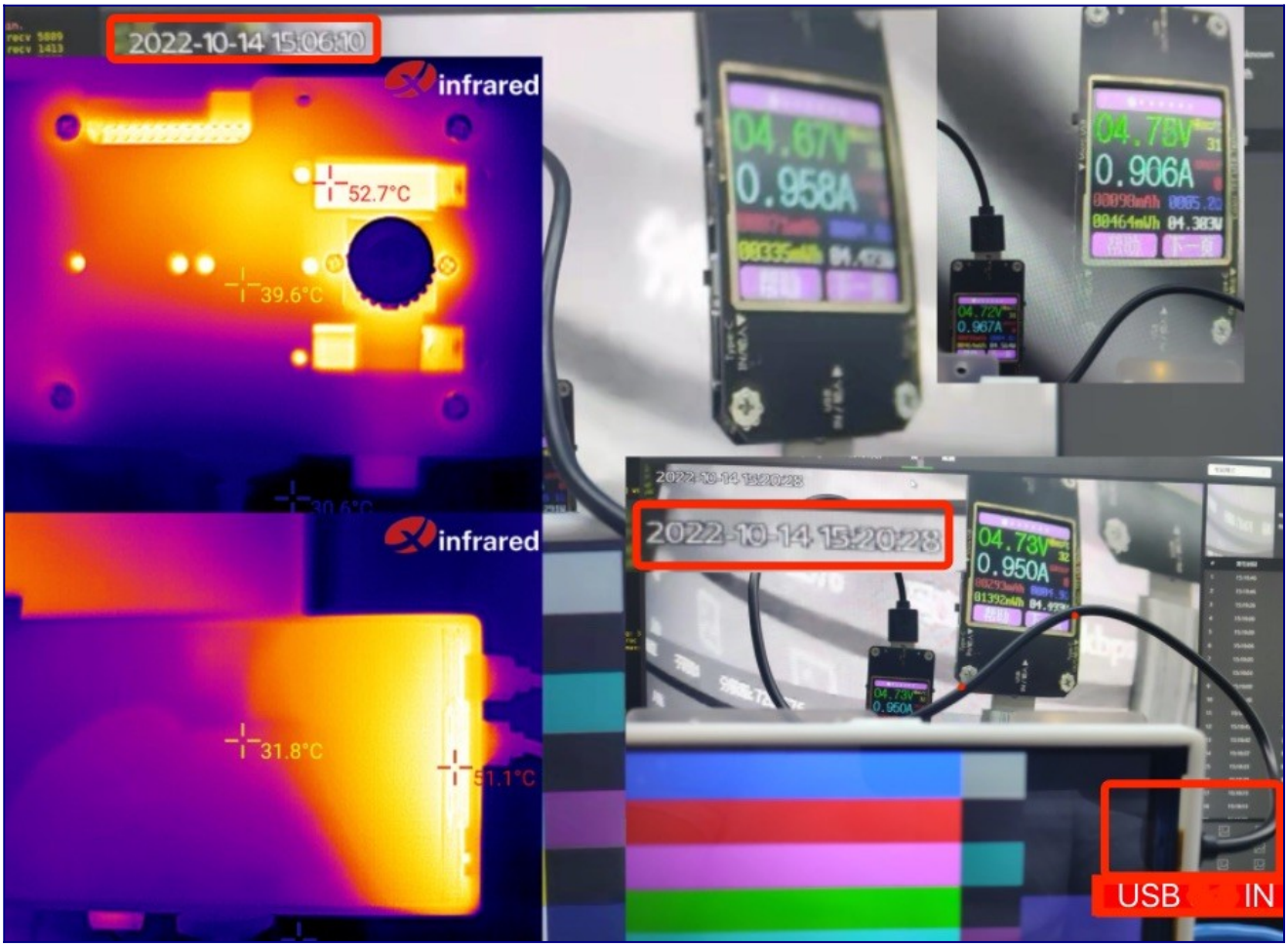
In addition to the quality and functionality of these products, they also have to support the image of cost-effective products by virtue of their own community ecology, software support, rich materials, open source code, user reputation, and other features.

> The author here believes that the so-called value for money is not the pursuit of the lowest price of the product, but in the mainstream price range of similar products in the market, selected community user groups can accept the price, and then in this positioning to try to make the best results of the product.

As you can see from these typical products, the m3axpi package does not come with a heatsink, fan, or external power supply, which is another feature of the m3axpi package, "high energy efficiency.

Yes, this product does not require a heatsink/fan, nor does it require an external 2A power supply to boot the system, nor do you need to find an hdmi cable and monitor.

To an actual measurement of the temperature and power consumption, note that the use of USB3.0 port to power Oh.



> From the actual test results, this power consumption and temperature control is quite good, with USB3.0 5V@1A to carry the work of the base board, core board, WIFI, Ethernet, camera, 5-inch screen.

debian-based system development

Provide debian11 Linux system, support SD card boot DD burn system, easy for users to start out of the box, and support Python API programming to develop AI applications.

1. Burning method. WIKI AXera-Pi_Burning System
2. Tutorial: WIKI AXera-Pi must see to get started
3. Python Programming: ax_pipeline_api (contributed by Community Big Brother Mouse)
4. Development Notes: [maixpy3 axpi] About Aixin ax620a porting debian11 system this thing

5. Development Notes: [maixpy3 axpi] Editing and releasing debian images and cross-compiling programs on PC

Open BSP SDK source code

Provide all kinds of development source code, provide API development documentation, SDK development methods and other instructions, details can be found in Preparing C/C++ programming.

ax-sample

The development and evaluation of typical AI models are provided by AICL for use by experienced AI developers or students who just want to dabble with the models, without any hardware peripheral related content.

1. Example projects examples
2. Object Detection PP-YOLOv3
3. Human Segmentation PP-HumanSeg
4. Semantic Segmentation PP-Seg

libmaix

SIPEED provides a unified embedded development environment in embedded platform, mainly with camera, screen, vision, image processing, deployment Pipeline related live routines, suitable for students who just started embedded linux development.

1. Test the screen display
2. Display the camera to the screen
3. Camera + yolov5 model + screen

axpi_bsp_sdk

The bsp development kit used in the commercialization of the chip, here mainly provides the original development materials of the chip, such as uboot, linux, msp, sample, rtsp, ipcdemo and other engineering code, this part is gradually open source, you can get the code for commercial evaluation from here, such as ipcdemo such a program, but these codes will be very complex and highly coupling, suitable for experienced peers for the purpose of commercial landing.

1. Development Documentation docs
2. Framework applications ipcdmeo
3. Peripheral verification sample

ax-pipeline

AX-Pipeline is developed by Aixin. The project is based on AXera-Pi to demonstrate the software calling methods of ISP, image processing, NPU, encoding, display and other functional modules, which is convenient for community developers to quickly evaluate and secondary develop their own multimedia applications.

1. Fast compilation Simple cross-platform compilation based on cmake.
2. How to replace your own trained yolov5 model
3. How to deploy your own additional models
4. How to adjust the image orientation
5. ModelZoo Some supported or to be supported models and descriptions of some models.

Reasons for choosing M3AXPI

> Why should I choose M3AXPI? Let this video answer all your questions!

The video briefly describes the advantages of M3AXPI over M2DOCK, and there are many examples of actual use and eggs!

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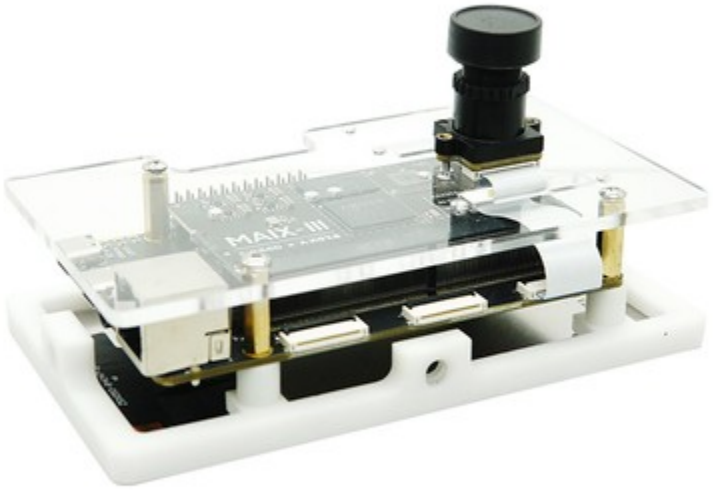
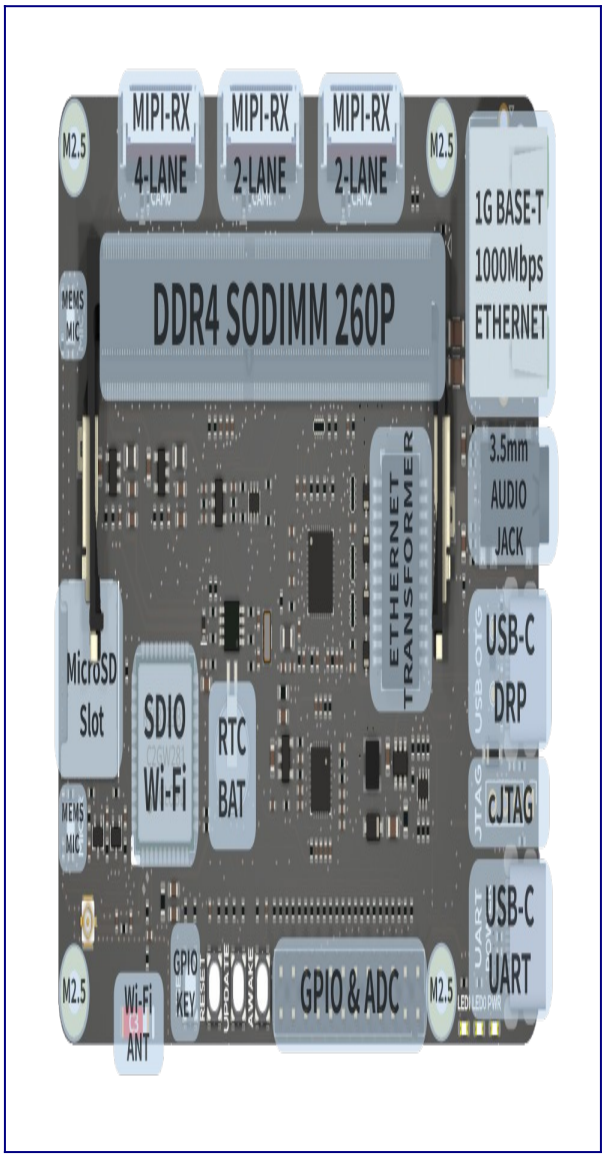
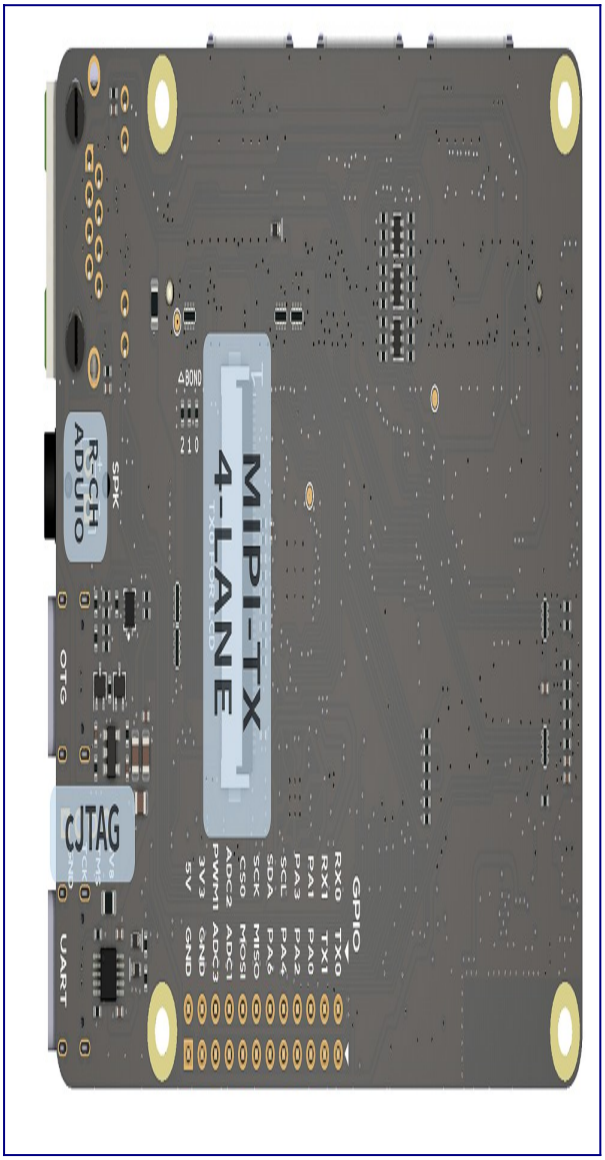
Hardware Parameters


MAIX-III


MAIX-III
SiPEED x AX01a
AX620A AI SoC
AI-ISP 4K@30fps
14.4TOPS@INT4
3.6 TOPS@INT8

Hardware labeling diagram





Core board parameters

Projects	Parameters
CPU	Quad-A7 @ 1.0 Ghz (Quad-core A7)
NPU	14.4Tops@int4, 3.6Tops@int8
ISP	4K@30fps
Codec format	H.264, H.265
Video Encoding	4K@30fps
Video Decoding	1080P@60fps
Ethernet	Supports dual RGMII / RMII interface mode Ethernet

Projects	Parameters
Display output	MIPI DSI 4 Lane, supporting up to 4K@30FPS
DRAM	2GB LPDDR4X 3733Mhz
Storage	Optional 16GB EMMC (default is TF card boot)
IO Lead Out	DDR4 SODIMM 260P Gold Finger Full IO Pinout

Base plate parameters

Projects	Parameters
Camera input	(Default single camera) Support up to 3 cameras: 1 MIPI4-LANE + 2 MIPI2-LANE
Screen Output	Supports up to 4-LANE MIPI DSI screens
SD Slot	Boot from SD card by default
Recording input	Two MEMS MICs on board with dual microphone noise cancellation
Audio Output	3.5MM headphone jack Supports stereo input and MIC input
Network Interface	Gigabit Ethernet (ETH) and 2.4GHZ WI-FI onboard antenna support
USB Interface	1xUSB2.0HS support OTG or HOST function, 1xUSB-UART system serial port
Other Resources	1x user button, 3x system buttons, 1x RTC clock, 2x LED
External Interface	CJTAG pinout, you can connect the corresponding debugger, pinout 2x12 row of pins, four M2.5 screw positioning holes

Hardware Resources Summary Links

- Product Specification
- Principle diagram
- Point Map
- Model files
- Size Chart
- GC4653 Camera Reference User Manual

Camera at a glance

- Low gc4653 400w basic experience version.

- High quality os04a10 400w night view enhanced version.

Camera Replacement FAQ

Frequently Asked Questions (FAQ)

- AI Services http://maixhub.com
- Online document http://wiki.sipeed.com
- Exchange Community http://bbs.sipeed.com
- Open Source Organization http://github.com/sipeed
- AXERA Technical Exchange Group: (139953715) dedicated to AI ISP technical exchange
- Lychee MaixPy3 AI exchange group: (756313869) to the product out of the box white answer questions

Q & A Please go to Maix-III Series AXera-Pi Frequently Asked Questions (FAQ) for more information.