ARMXY EMBEDDED

COMPUTER DATASHEET

ARMxy BL440 Series

Version History

Version	V1.0	2024-10-19	Initial Release	

Contents

1. Overview

The ARMxy series ARM embedded computer BL440 series is an industrial-grade ARM controller with flexible I/O configuration. It is designed based on the Rockchip RK3576J/RK3576 processor, featuring a quad-core ARM Cortex-A72, a quad-core ARM Cortex-A53, and a single-core ARM Cortex-M0, with a clock speed of up to 2.1G/2.2GHz. The device comes with various RAM and ROM configurations, including 16/32/64GByte eMMC and 2/4/8GByte LPDDR4X. It supports a wide range of I/O interfaces and integrates a built-in 6TOPS NPU for deep learning applications. The BL440 series is widely used in industrial control, edge computing, AIoT, artificial intelligence, communication management, AGV robots, machine vision inspection, robotics, industrial IoT gateways, energy storage systems, automation control, and railway transportation.

The BL440 series ARM embedded computer provides 1 to 3 optional RJ-45 network ports, including 2x10/100/1000M adaptive network ports and 1x10/100M network port. It also features 2xUSB3.2, 1 optional HDMI2.1, 1 optional X-series I/O board, and 2 optional Y-series I/O boards, offering rich interfaces for communication, PWM output, pulse counting, and data acquisition and control. Additionally, it supports 4K@120fps H.265 video encoding and 8K@30fps H.265 video decoding. The device is equipped with a Mini PCIe interface, supporting Bluetooth, Wi-Fi, 4G, and 5G module communication.

The BL440 series supports operating systems such as Linux-6.1.115, Linux-RT-6.1.115, Ubuntu 22.04. It also supports Docker containers, Node-Red, and graphical interface development tools like Qt-5.15.11. Moreover, it is compatible with the BLIoTLink for built-in gateway features. Remote access and maintenance can be achieved through the BLRAT remote access tool, and QuickConfig for quick configuration, system management. The device also supports Node-Red for rapid IoT application development.

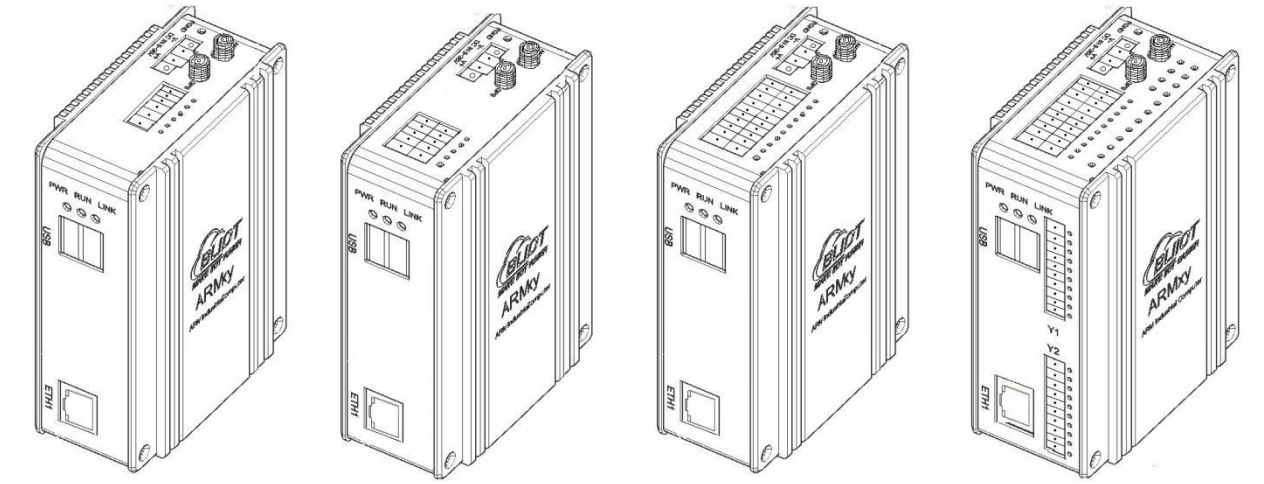
Designed with professional electrical performance and verified through high and low-temperature testing, the BL440 series ARM embedded computer can operate stably and reliably under harsh electromagnetic interference conditions and temperatures ranging from -40°C to 85°C. It supports DIN35 rail mounting, making it suitable for various industrial application environments.

2. Typical Application Areas

- Industrial Control
- Energy Storage Systems (EMS/BMS)
- AIoT & Artificial Intelligence
- Smart Manufacturing
- Communication Management Unit
- AGV Robots
- Machine Vision
- Edge Computing
- Motion Control
- Robotics
- Rail Transit
- Smart Devices

3. Software and Hardware Specifications

Exterior Structure and Dimensions of Product with 1 Ethernet Port:



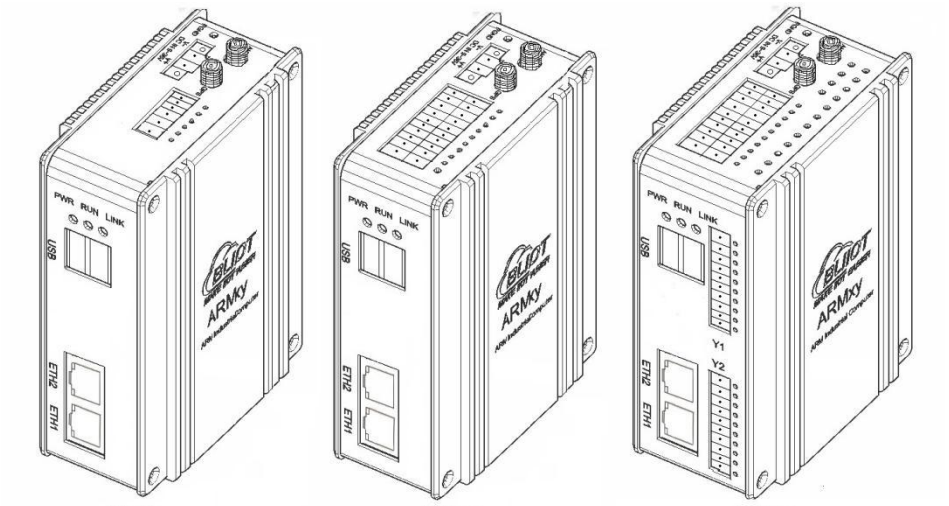
Basic
42*83*110mm

C Type
42*83*110mm

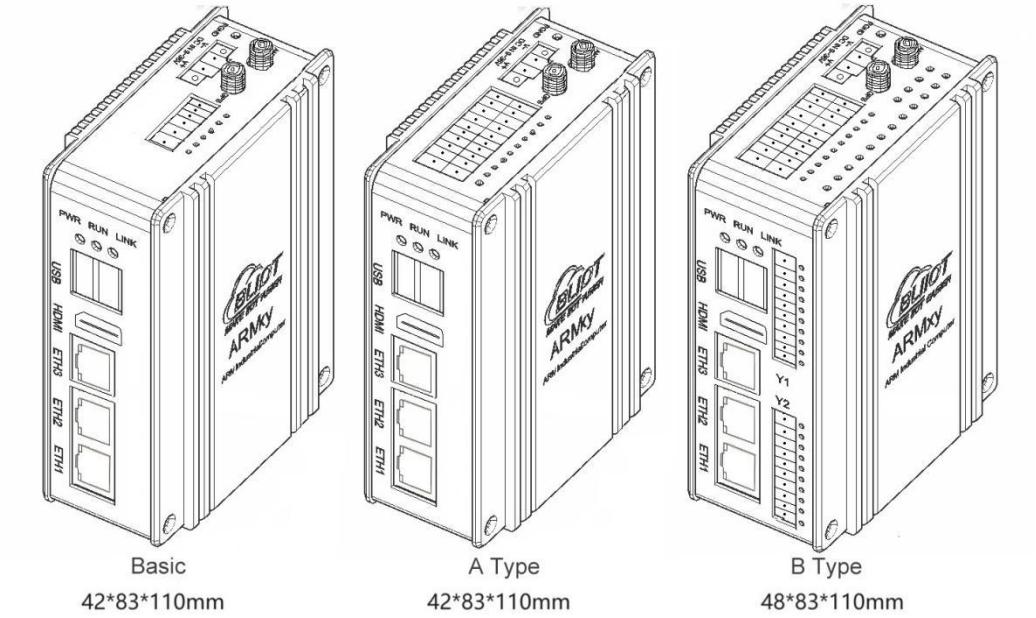
A Type
42*83*110mm

B Type
48*83*110mm

Exterior Structure and Dimensions of Product with 2 Ethernet Ports:



Exterior Structure and Dimensions of Product with 3 Ethernet Ports:



Hardware	Parameters
CPU	Rockchip RK3576J/RK3576, 64-bit, 8nm
	4xARM Cortex-A72 RK3576J Clock Speed: Normal Mode 1.6GHz, Overdrive Mode 2.1GHz RK3576 Clock Speed: 2.2GHz Note: To ensure the longevity of the processor and meet the requirements of a wider range of industrial applications, our company has set the default maximum frequency of the RK3576J/RK3576 processor's Cortex-A72 cores to 1.6 GHz.
	4x ARM Cortex-A53

	RK3576J Clock Speed: Normal Mode 1.4GHz, Overdrive Mode 1.9GHz RK3576 Clock Speed: 2.0GHz Note: To ensure the longevity of the processor and meet the requirements of a wider range of industrial applications, our company has set the default maximum frequency of the RK3576J/RK3576 processor's Cortex-A53 cores to 1.4 GHz.
	1xARM Cortex-M0, Clock Speed: 400MHz
	NPU: 6TOPS Supports INT4/INT8/INT16/FP16/BF16/TF32 Supports deep learning frameworks: TensorFlow, PyTorch, Caffe, MXNet
	GPU: Mali-G52 MC3 Supports OpenGL ES 1.1/2.0/3.2, OpenCL 2.0, Vulkan 1.1
	ISP: Supports 16MP ISP Supports HDR, 3A, CAC, 3DNR, 2DNR, and more
	Encoder: Supports 4K@60fps H.265/H.264
	Decoder: Supports 8K@30fps/4K@120fps H.265, 4K@60fps H.264
ROM	16/32/64GByte eMMC
RAM	2/4/8GByte LPDDR4X
ETH	RJ-45 Interface: 1 to 3 ports, 2x10/100/1000M, 1x10/100M adaptive network port, ESD Level 3, EFT Level 3
USB	2x USB3.2 HOST(USB1, USB2), supports high-speed 5Gbps, ESD Level 3
HDMI	1x HDMI2.1, Supports up to 4K@120fps
I/O Slot	X series I/O board slot: 1, X series I/O board, support RS485, CAN, RS232, RS422, DI, DO, GPIO, etc; Y series I/O board slot: 2, Y series I/O board, support RS485, CAN, RS232, RS422, DI, DO, Relay output, AI, AO, PT100, PT1000, TC, etc.
LED	1x power indicator light
	2x user-programmable indicator light
PCIe M.2	NVMe Protocol 2230/2242
Mini PCIe	1, Supports Bluetooth, Wi-Fi, 4G module, etc.
SIM Slot	1 slot, NANO
Antenna	2, For 4G/Wi-Fi/GPS
Debug	1x Micro USB debug port
SD Slot	1
Reset	1 reset button

Watchdog	Onboard independent hardware watchdog
Power	Rated DC 24V, supports wide voltage range of 12-24VDC Equipped with reverse polarity protection and overcurrent protection 2-pin terminal block with screw terminals
Grounding	1-pin GND terminal
Installation	DIN35 rail mounting, wall mounting
Material	Aluminum alloy casing + stainless steel
Dimensions	110x83x42mm or 110x83x48mm

Software	Parameters
Kernel	Linux-6.1.115, Linux-RT-6.1.115
File System	Buildroot-2024.02 (Linux-6.1.115, Linux-RT-6.1.115) Ubuntu 22.04
GUI development tool	Qt-5.15.11

4. Software Ecosystem

Category	Software	Type	Highlights
Industrial Communication & Protocols	IGH EtherCAT Master	Open Source	Supports real-time EtherCATmaster for high-precision motion control and synchronized I/O.
Data Acquisition Edge Processing	BLIoTLink	Proprietary	Data acquisition and protocol conversion, supporting multiple protocols and API-based secondary development.
	Node-RED	Open Source	Low-code logic orchestration tool,supporting visual flow design and custom nodes.
	Vnode	Open Source	Lightweight edge computing node,suitable for high-efficiency data pipeline processing.
Industrial Control & Execution	OpenPLC	Open Source	Open-source PLC, suitable for simple logic control and local automation.

	CODESYS Runtime	Licensed	Industrial control platform, supporting full IEC61131-3 programming and motion control.
	Beremiz	Open Source	Open-source IEC61131-3 compliant PLC integrated development environment for machine automation,providing tools to create HMI.
	NexPLC	Proprietary	Next-generation industrial control and operation & maintenance integrated platform, supporting cloud-based collaboration.
Visualization & Monitoring	FUXA	Open Source	Lightweight web-based SCADA, suitable for rapid configuration and small to medium monitoring projects.
	Ignition	Open Source	Enterprise-level industrial platform,supporting integrated SCADA, MES, and IoT deployment.
	Grafana	Open Source	Professional time-series data visualization and analytic dashboards, supporting multiple data sources.
Communication &Middleware	Nginx/Apache	Open Source	Web portal for exposing and securely managing edge services.
AI / Machine Vision	YOLOv5/8 OpenCV	Open Source	Complete edge AI vision stack, supporting object detection and image prepossessing.
	TensorFlow Lite, PyTorch Mobile	Open Source	Lightweight AI model inference frameworks, supporting edge-side intelligent analysis.
Remote Operation & Maintenance Management	BLRAT	Proprietary	Secure remote operation & maintenance channel, supporting remoted evice debugging and maintenance.
	QuickConfig	Proprietary	Graphical gateway configuration and management tool, supporting one-click deployment and monitoring.
Development & Support Environment	Python, C/C++, Node.js, Java	Open Source	Multi-language development support, suitable for diverse development scenarios and performance requirements.
	Python 3, Node.js	Open Source	Provides standard runtime, supporti

			ng scripting and containerized applications.
	Docker, Kubernetes(K3s)	Open Source	Supports application containerization and cluster management, enabling micro services architecture.
	API Documentation, Deployment Guides, Sample Projects	Proprietary / Open Source	Provides comprehensive technical documentation and typical scenario examples.
System & Security	OpenSSL	Open Source	Provides communication encryption and secure tunneling to ensure data transmission security.
	iptables	Open Source	Kernel-level firewall for network protection.
	Encryption Chip Demo	Proprietary	Encapsulates SHA-256 encryption and authentication algorithms.
	Wireshark, tcpdump	Open Source	Network protocol analysis for security monitoring.
	Prometheus + Grafana	Open Source	System resource monitoring and alerting, supporting visualized operation & maintenance.

5. Product Selection

The ARMxy series ARM embedded controllers adopt a flexible design concept, allowing users to customize ROM and RAM combinations by choosing different System-on-Module(SOM) boards as needed. Additionally, various X and Y boards can be selected to achieve diverse IO configurations, catering to the requirements of different application scenarios.

Product naming convention

Host Model Number - SOM Model Number - X Board Model Number - Y1 Board Model Number - Y2 Board Model Number

For example, if we had a specific product configuration:

BL440-SOM440-X10

Means 1 Ethernet port, 16GB eMMC storage, LPDDR4X is 2GByte, and 2 RS485

If you need to add Wi-Fi, then you would append "W" to the host model number.

For example: BL440W-SOM440-X10

If you need to add a 4G module, you would append "L" to the host model number.

For example: BL440L-SOM40-X10

ARMxy BL440 Model List

Model	ETH	USB	HDMI	X I/O board	Y I/O board	Dimensions
BL440	1x10/100/1000M	2	X	1x6PIN	X	42x83x110mm
BL440A	1x10/100/1000M	2	X	1x20PIN	X	42x83x110mm
BL440B	1x10/100/1000M	2	X	1x20PIN	2	48x83x110mm
BL440C	1x10/100/1000M	2	X	1x10PIN	X	42x83x110mm
BL441	2x10/100/1000M	2	X	1x6PIN	X	42x83x110mm
BL441A	2x10/100/1000M	2	X	1x20PIN	X	42x83x110mm
BL441B	2x10/100/1000M	2	X	1x20PIN	2	48x83x110mm
BL442	2x10/100/1000M, 1x10/100M	2	1	1x6PIN	X	42x83x110mm
BL442A	2x10/100/1000M, 1x10/100M	2	1	1x20PIN	X	42x83x110mm
BL442B	2x10/100/1000M, 1x10/100M	2	1	1x20PIN	2	48x83x110mm

ARMxy BL440 SOM Model List

You can select the appropriate ROM, RAM, and temperature grade based on your requirements.

Model	MCU	Clock Speed	Kernel	NPU	eMMC	LPDDR4X	Temperature
SOM440	RK3576J	2.1GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	16GByte	2GByte	-40~85°C
SOM441	RK3576J	2.1GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	32GByte	4GByte	-40~85°C
SOM442	RK3576J	2.1GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	64GByte	8GByte	-40~85°C
SOM443	RK3576	2.2GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	32GByte	2GByte	0~80°C

SOM444	RK3576	2.2GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	32GByte	4GByte	0~80°C
SOM445	RK3576	2.2GHz	4 x A72 + 4 x A53 + 1 x M0	6TOPS	64GByte	8GByte	0~80°C

X Series I/O Board Model List

You can select the appropriate X series I/O board based on your requirements, ensuring that the number of pins on the X series I/O board is compatible with the industrial computer's casing.

Note: The CAN bus supports only CAN-FD functionality; standard CAN functionality is not supported.

Model	RS232/RS485	CAN	DI	DO	GPIO	PIN
X10	2	x	x	x	x	6PIN
X11	x	2	x	x	x	6PIN
X12	1	1	x	x	x	6PIN
X13	x	x	2	2	x	6PIN
X14	x	x	4	x	x	6PIN
X15	x	x	x	4	x	6PIN
X16	x	x	x	x	4	6PIN
X20	4	x	x	x	x	10PIN
X21	3	1	x	x	x	10PIN
X22	2	2	x	x	x	10PIN
X23	4	x	4	4	x	20PIN
X24	3	1	4	4	x	20PIN
X25	2	2	4	4	x	20PIN
X26	2	x	8	4	x	20PIN
X27	1	1	8	4	x	20PIN
X28	2	x	12	x	x	20PIN
X29	1	1	12	x	x	20PIN
X30	x	x	x	x	16	20PIN

Y Series I/O Board Model List

You can select the appropriate Y series I/O board based on your requirements, as the Y series I/O modules are compatible with all Y slots. When the Y63 is selected, you can not ch

oose second Y-series I/O board.

Model	Description	Model	Description
Y01	4xDI+4xDO(NPN)	Y41	4xAO, 0~20mA/4~20mA
Y02	4xDI+4xDO(PNP)	Y43	4xAO, 0~5V/0~10V
Y11	8xDI(NPN)	Y46	4xAO, ±5V/±10V
Y12	8xDI(PNP)	Y51	2xRTD, 3-Wire PT100
Y13	8xDI(Dry Contact)	Y52	2xRTD, 3-Wire PT1000
Y21	8xDO(PNP)	Y53	2xRTD, 4-Wire PT100
Y22	8xDO(NPN)	Y54	2xRTD, 4-Wire PT1000
Y24	4xDO(Relay)	Y56	Resistance Measurement
Y31	4xAI, Single-ended, 0~20mA/4~20mA	Y57	Voltage Measurement
Y33	4xAI, Single-ended, 0~5V/0~10V	Y58	4xTC
Y34	4xAI, Differential, 0~5V/0~10V	Y63	4xRS485 or RS232
Y36	4xAI, Differential, ±5V/±10V	Y95	4xPWM Output(NPN) + 4xPulse Counter Input
Y37	4xIEPE	Y96	4xPWM Output(PNP) + 4xPulse Counter Input

Ordering Notes

Y01: DI channels support dry contacts or NPN-type wet contact sensors.

Y02: DI channels support dry contacts or PNP-type wet contact sensors.

Y58: Supports thermocouples of types J, K, T, E, R, S, B, and N

6. Electromagnetic Compatibility Testing

Test	Item	Standard	Level	Condition	Result	Remarks
Electromagnetic Emission	Conducted Emission	GB/T 9254 Class A/ CISPR 32 Class A	Class A	150 kHz - 30 MHz	PASS	Complies with limits for general industrial environments
	Radiated Emission	GB/T 9254 Class A/ CISPR 32 Class A	Class A	30 MHz - 1 GHz	PASS	Complies with limits for general industrial environments

Immunity Testing	ESD	GB/T 17626.2/IEC 61000-4-2	Level III	Contact discharge: ±4 kV; Air discharge: ±8 kV	PASS	—
	Radiated RF Immunity	GB/T 17626.3/ IEC 61000-4-3	Level III	Field strength: 10 V/m, 80 MHz – 1 GHz	PASS	—
	EFT	GB/T 17626.4/ IEC 61000-4-4	Level III	Power lines: 2 kV; Signal lines: 1 kV	PASS	—
	Surge	GB/T 17626.5/ IEC 61000-4-5	Level III	Differential mode: 2 kV; Common mode: 4 kV	PASS	—
	Voltage Dips and Interruptions	GB/T 17626.11/ IEC 61000-4-11	Level III	Voltage dip: 70% for 500 ms; Complete interruption: 10 ms	PASS	—
	Power Frequency Magnetic Field Immunity	GB/T 17626.8/ IEC 61000-4-8	Level III	Test intensity: 30 A/m, 50 Hz	PASS	—

7. Environmental Suitability Testing

Test Item	Standard	Level	Condition	Result	Remarks
Low-Temperature Startup & Operation	GB/T 2423.1-2008/IEC 60068-2-1	N/A	Ambient temperature: +40°C, device starts and operates normally	Compliant	Meets basic low-temperature startup requirements for industrial environments.
High-Temperature Startup & Operation	GB/T 2423.2-2008/IEC 60068-2-2	N/A	Ambient temperature: +85°C, device starts and operates normally	Compliant	Meets basic high-temperature startup requirements for industrial environments.
Constant Damp Heat	GB/T 2423.3-2016/IEC 60068-2-78	N/A	Ambient temperature: +40°C, relative humidity: 85%, powered operation for 48 hours	Compliant	Ensures stable operation in humid environments.
Sinusoidal Vibration	GB/T 2423.10-2019/IEC 60068-2-6	N/A	Frequency range: 5 Hz to 500 Hz, acceleration: 2g, 10 cycles per axis (3 axes)	Compliant	Validates vibration resistance during transportation and installation.
Free Fall	GB/T 2423.7-2018/IEC 60068-2-	N/A	With packaging: Free fall from 0.8 meters, 1 drop	Compliant	Ensures impact resistance during

	31		per face (6 faces total)		transportation.
IP	GB/T 4208-2017/IEC 60529	IP30	Dust protection: Prevents entry of solid foreign objects ≥2.5mm in diameter	Compliant	Meets industrial environmental protection requirements.

After undergoing fundamental environmental adaptability testing, the device fully complies with the basic requirements of the Chinese GB/T national standards and corresponding IEC standards, demonstrating stable operation in standard industrial environments.

The following results ensure the device meets a wide range of industrial application scenarios:

- Low/High-Temperature Tests: Validates the device's operational capability under basic industrial environmental conditions.
- Vibration and Free Fall Tests: Ensures reliability during transportation and installation.
- IP Test: Complies with fundamental protection requirements for industrial environments.

8. Packing List

- One ARM embedded controller
- One set of DIN35 mounting brackets
- Ubuntu file system
- Pressure-free terminal blocks configured according to selected accessories
- When purchasing Wi-Fi and 4G modules, antennas for Wi-Fi and 4G modules will be included.

9. Technical Support & Services

◆ Provide system firmware images, file system images, kernel driver source code, and a variety of demo programs.

◆ Offer a comprehensive platform development kit and introductory tutorials to save software organization time and simplify application development.

◆ Provide a rich set of development examples for reference to simplify application development, including:

✓ Linux, Linux-RT, Qt Application Development Examples

✓ BLIoTLink Industrial Protocol Data Collection and Cloud Platform Integration Development Case

✓ BLRAT Remote Access Usage Case

✓ Node-Red IoT Application Development Case

✓ Docker Container Technology, MQTT Communication Protocol Examples

✓ Baremetal (Bare-Metal), RT-Thread (RTOS) Development

- ✓ Inter-Processor Communication Example between Cortex-A53 and Cortex-M0 Cores
- ✓ GUI Development Tool Qt-5.15.11 Software Development Kit
- ✓ Debian, Ubuntu, and Android Operating System Demonstration Examples
- ✓ Debian-based ROS Operating System Demonstration Example
- ✓ IgH EtherCAT Master, CAN Development Examples
- ✓ 4G/5G/Wi-Fi/Bluetooth Development Examples
- ✓ NPU, ISP, and OpenCV Development Example
- ✓ X Board, Y Board, and Other Peripheral Driver Programs
- ✓ Assistance with Product Customization and Development
- ✓ Customized Research and Development (R&D) and Manufacturing
- ✓ Provide Long-Term After-Sales Service

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