Wonrabai Luckfox Pico Pro

Wonrabai Luckfox Pico Pro RV1106G2 Linux Micro Development Board User Manual

Introduction

The Wonrabai Luckfox Pico Pro is a cost-effective micro Linux development board based on the Rockchip RV1106G2 chip. This highly integrated SoC is designed for AI-related applications, featuring a single-core ARM Cortex-A7 32-bit core with integrated NEON and FPU. It includes a built-in NPU supporting INT4/INT8/INT16 mixed operations, offering up to 0.5 TOPs computing power, and a third-generation ISP3.2 for advanced image processing. The board is equipped with 128MB DDR3L memory and a variety of interfaces for versatile development.

Key Features

- **Processor:** Single-core ARM Cortex-A7 32-bit core with NEON and FPU.
- **Neural Processing Unit (NPU):** Rockchip 4th generation NPU supporting INT4, INT8, and INT16 hybrid quantization, with 0.5 TOPS (INT8) and up to 1.0 TOPS (INT4) computing power.
- **Image Signal Processor (ISP):** Third-generation ISP3.2 supporting 5-Megapixel input at 30fps (Max), with HDR, WDR, and multi-level noise reduction.
- **Video Encoding:** Powerful encoding performance with intelligent encoding mode and adaptive stream saving, reducing bit rate by over 50%.
- **Memory:** Built-in 16-bit DRAM DDR3L (128MB for Pro version).
- **Integrated Components:** Built-in POR, audio codec, and MAC PHY.
- **Interfaces:** MIPI CSI, GPIO, UART, SPI, I2C, USB 2.0 Host/Device, 10/100M Ethernet.

Product Overview and Dimensions

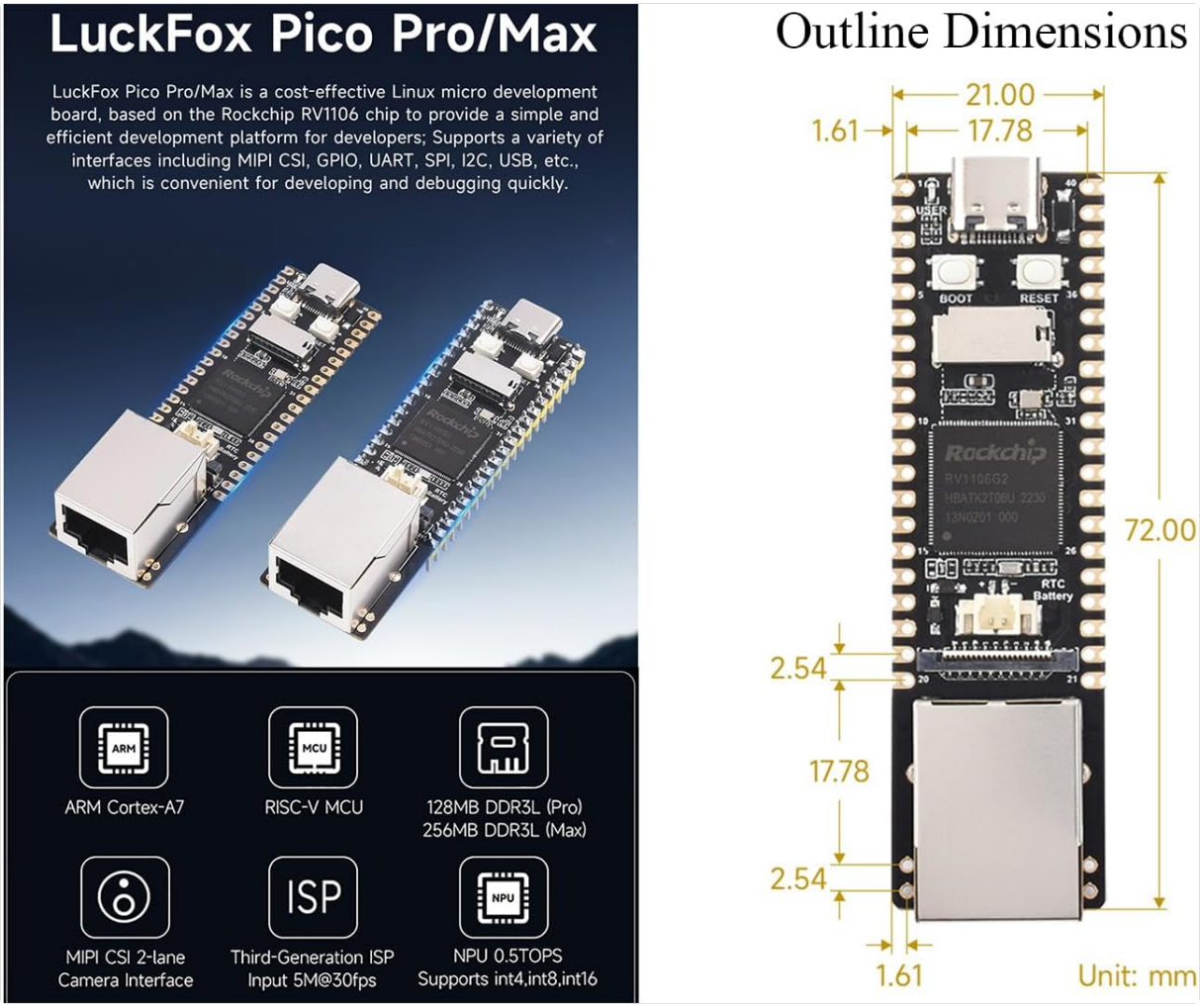

Figure 1: Overview of the Luckfox Pico Pro/Max development board, highlighting its compact size and key integrated features such as ARM Cortex-A7, RISC-V MCU, 128MB DDR3L, MIPI CSI, ISP, and NPU. The image also displays the board's outline dimensions in millimeters, showing a length of 72.00mm and a width of 21.00mm.

Board Versions and Pinheader Options

Figure 2: This image illustrates the different versions of the Luckfox Pico boards. It shows the Luckfox Pico Pro (RV1106G2, 128MB memory) and Luckfox Pico Pro M (with pre-soldered yellow header), alongside the Luckfox Pico Max (RV1106G3, 256MB memory) and Luckfox Pico Max M (with pre-soldered yellow header). This manual focuses on the Luckfox Pico Pro.

Highly Integrated Performance

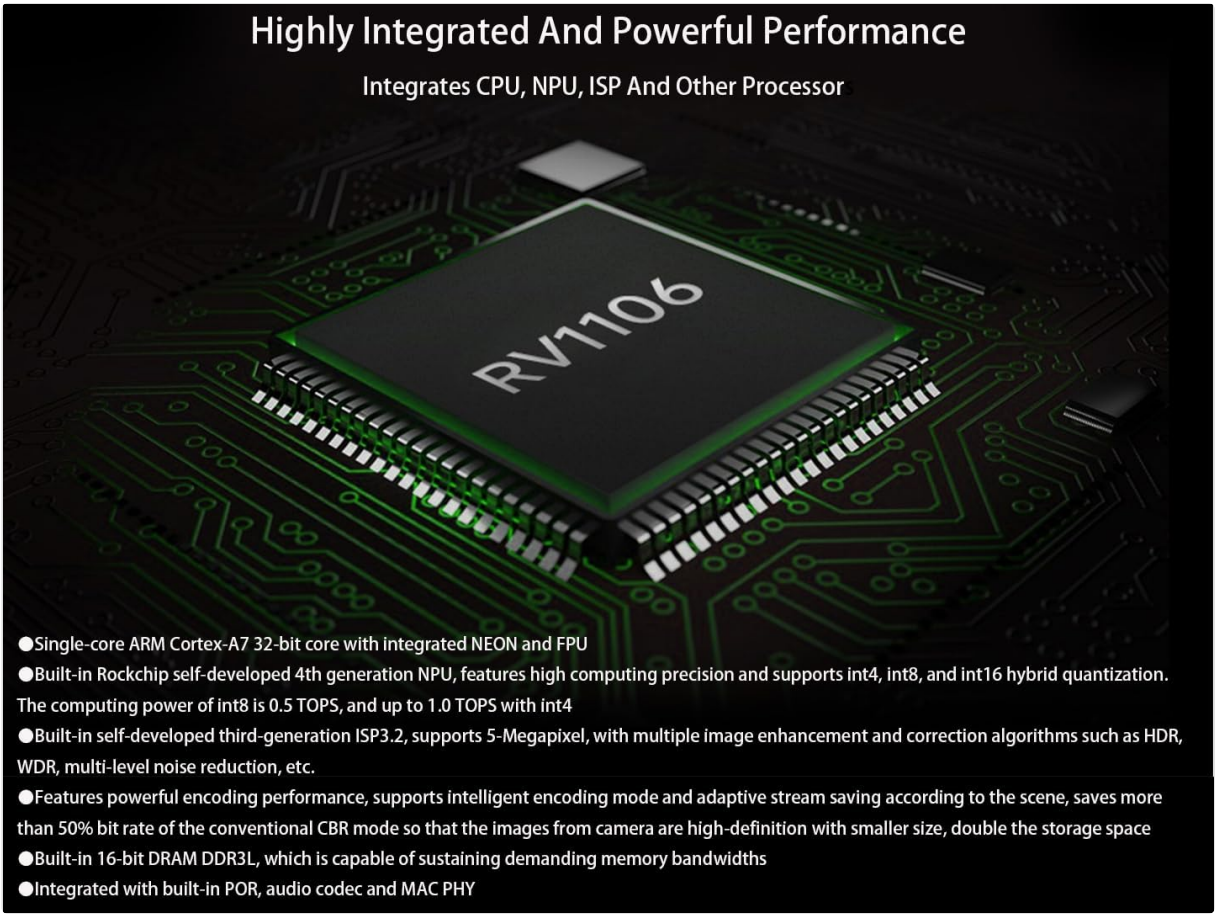

Figure 3: A close-up view of the Rockchip RV1106 chip, emphasizing its highly integrated architecture that combines CPU, NPU, ISP, and other processors for powerful and efficient performance in a compact form factor.

SLC NAND Flash

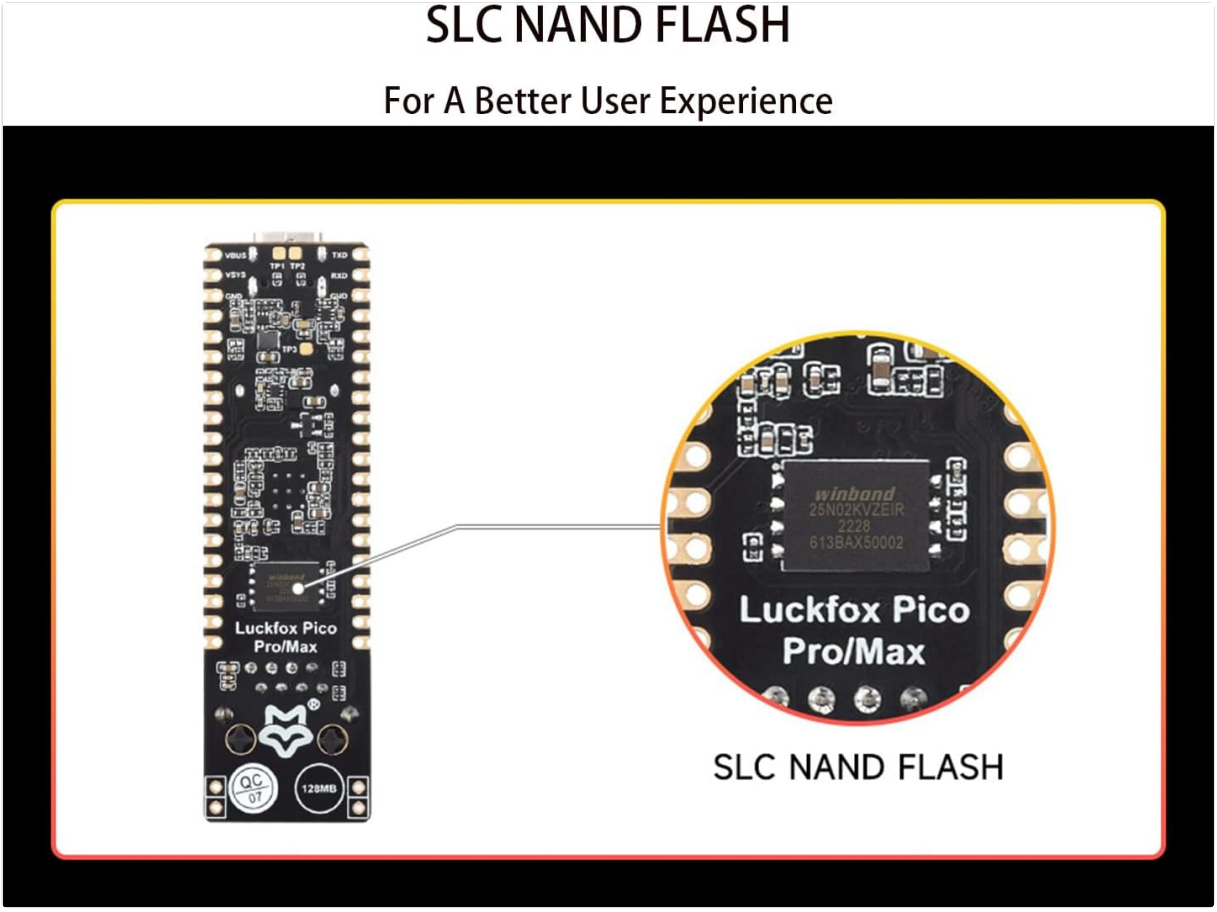

Figure 4: This image shows the Luckfox Pico Pro/Max board with a magnified view of the SLC NAND Flash component, which contributes to a better user experience by providing reliable and fast storage.

Setup Guide

Board Components Overview

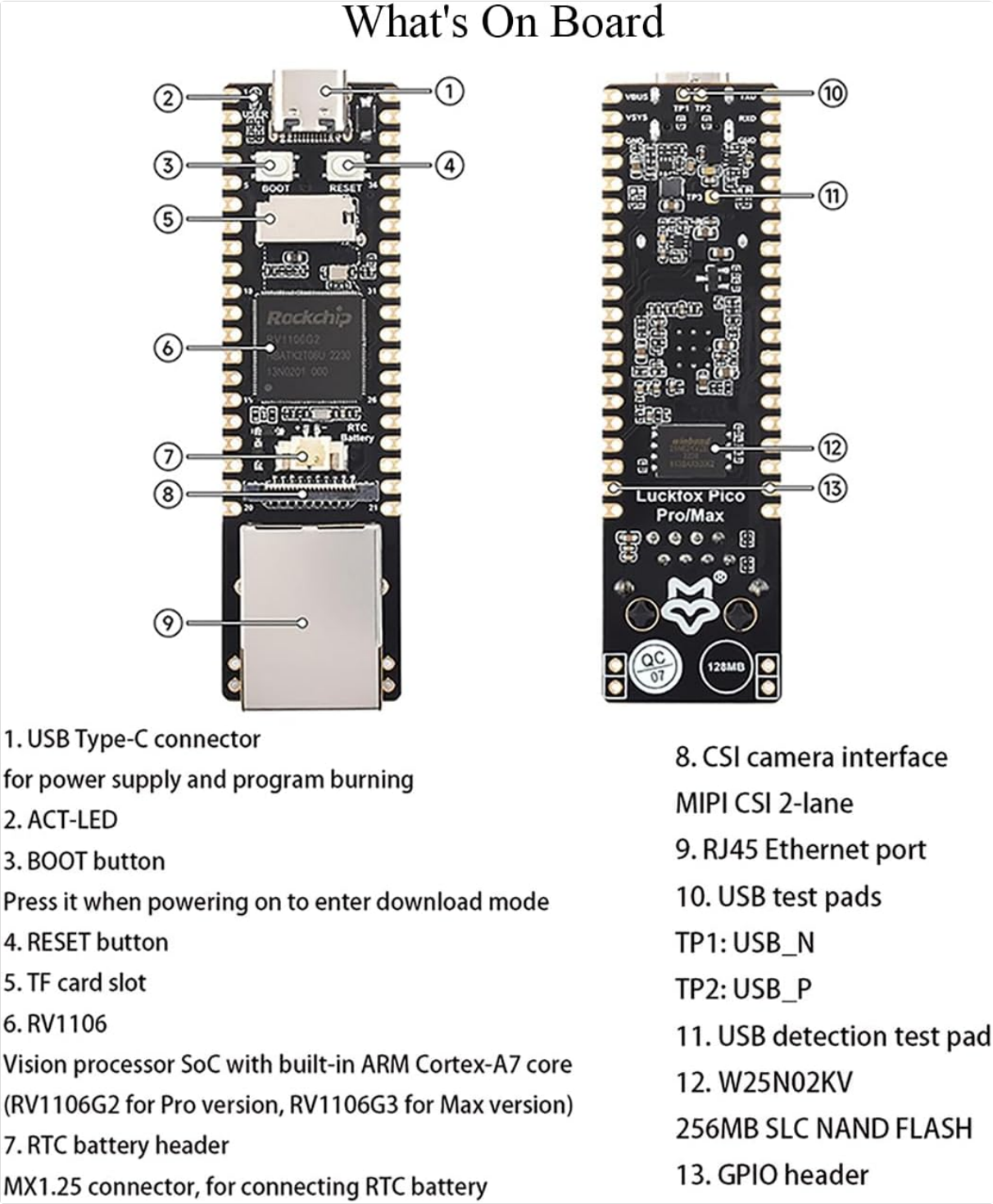

Figure 5: Detailed diagram of the Luckfox Pico Pro board, labeling key components for setup and development. This includes the USB Type-C connector, ACT-LED, BOOT button, RESET button, TF card slot, Rockchip RV1106G2 processor, RTC battery header, CSI camera interface, RJ45 Ethernet port, USB test pads, USB detection test pad, W25N02KV 256MB SLC NAND Flash, and GPIO header.

1. **Power Supply:** Connect the board via the USB Type-C connector for power supply.
2. **Operating System:** The board runs Linux. Refer to the official online tutorials for flashing the

operating system if not pre-installed.

3. **Entering Download Mode:** To enter download mode for programming, press the BOOT button while powering on the device.
4. **Storage:** Insert a TF card into the TF card slot for additional storage or OS booting.
5. **Connectivity:** Utilize the RJ45 Ethernet port for network connectivity and the USB Type-C connector for USB Host/Device functions.
6. **Camera Connection:** Connect a MIPI CSI camera to the CSI camera interface.
7. **GPIO Usage:** The GPIO header provides 26 GPIO pins for various peripheral connections. Refer to the pin definition section for details.

Pin Definition

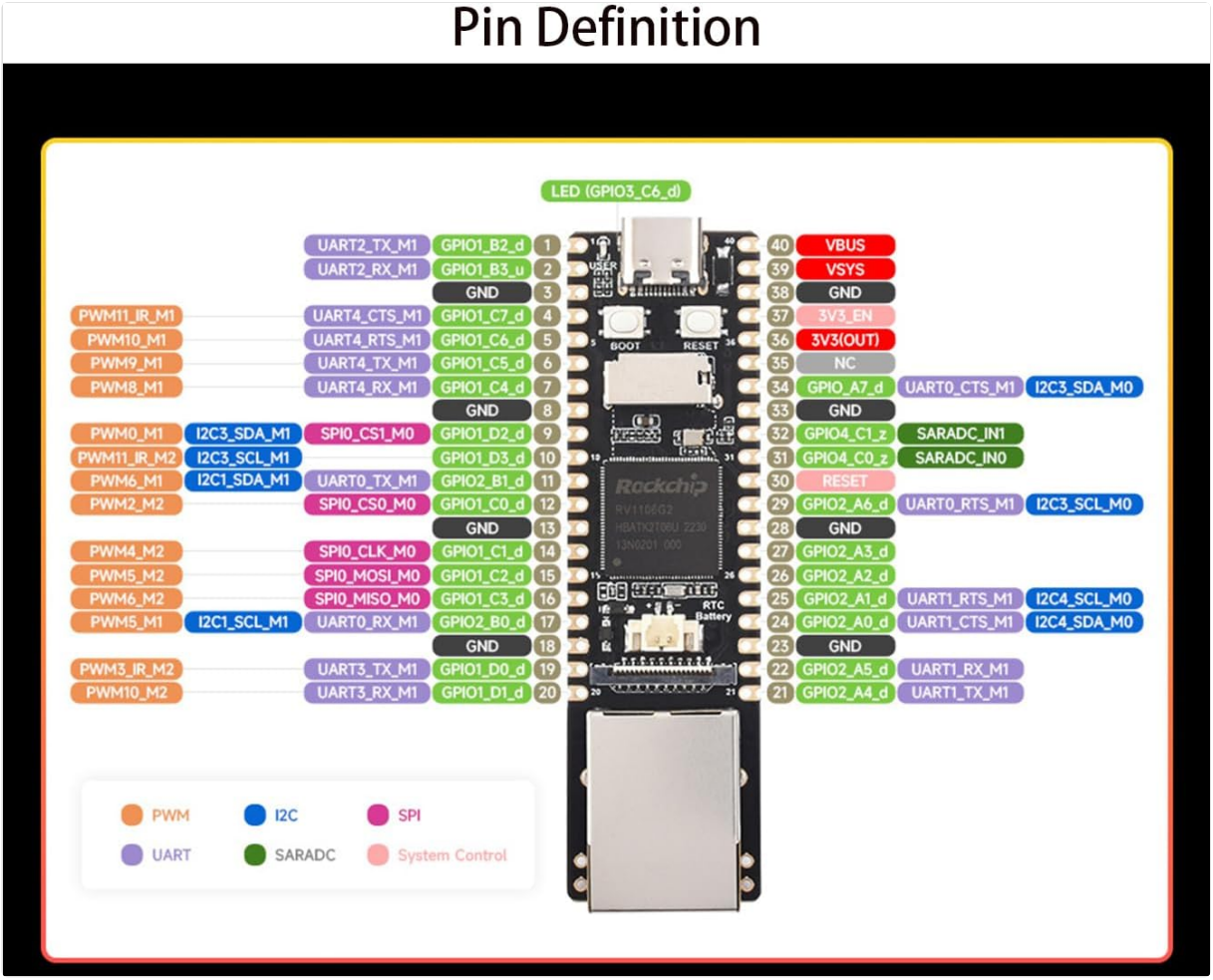

Figure 6: Comprehensive pin definition diagram for the Luckfox Pico Pro, illustrating the layout and functions of each pin on the GPIO header. This includes pins for PWM, I2C, SPI, UART, and SARADC, crucial for connecting and controlling external components.

Operating Instructions

The Luckfox Pico Pro operates on a Linux environment, offering a flexible platform for various applications. Once powered, the ACT-LED will indicate activity. Developers can interact with the board via serial console, SSH over Ethernet, or USB. The integrated NPU and ISP enable advanced AI and vision processing tasks.

Development and Application

- **Software Development:** Utilize the Linux environment for custom application development. Refer to the official online development resources for SDKs and toolchains.
- **AI Applications:** Leverage the NPU for accelerating machine learning inferences, supporting various quantization levels.
- **Vision Processing:** The ISP allows for high-quality image capture and processing from connected MIPI CSI cameras, suitable for surveillance, robotics, and other vision-based projects.
- **Peripheral Interfacing:** Use the GPIO, UART, SPI, and I2C interfaces to connect and control sensors, actuators, and other external hardware.

Application Examples

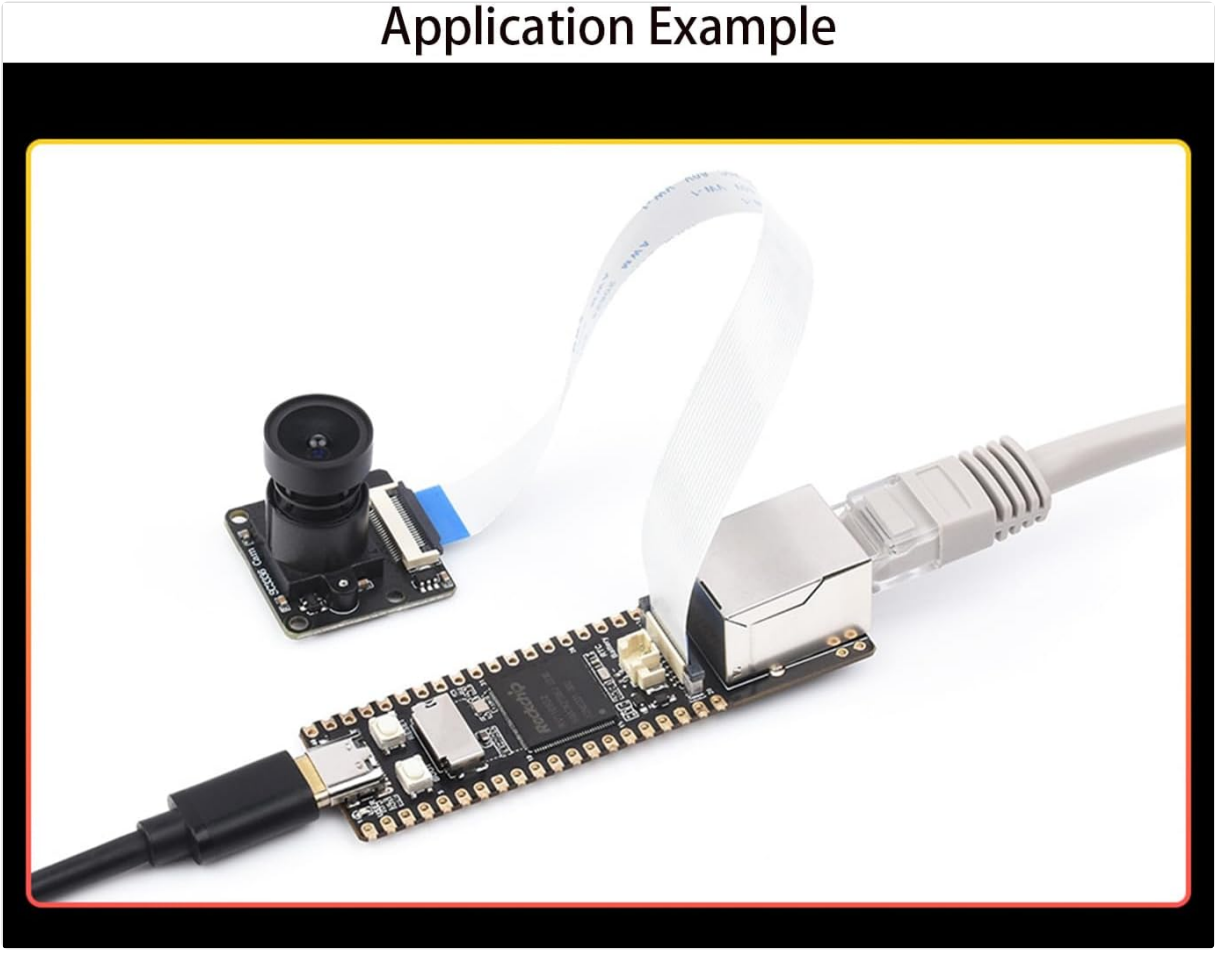

Figure 7: An example application setup showing the Luckfox Pico Pro connected to a camera module via MIPI CSI and to an Ethernet cable, demonstrating its capability for vision and network-enabled projects.

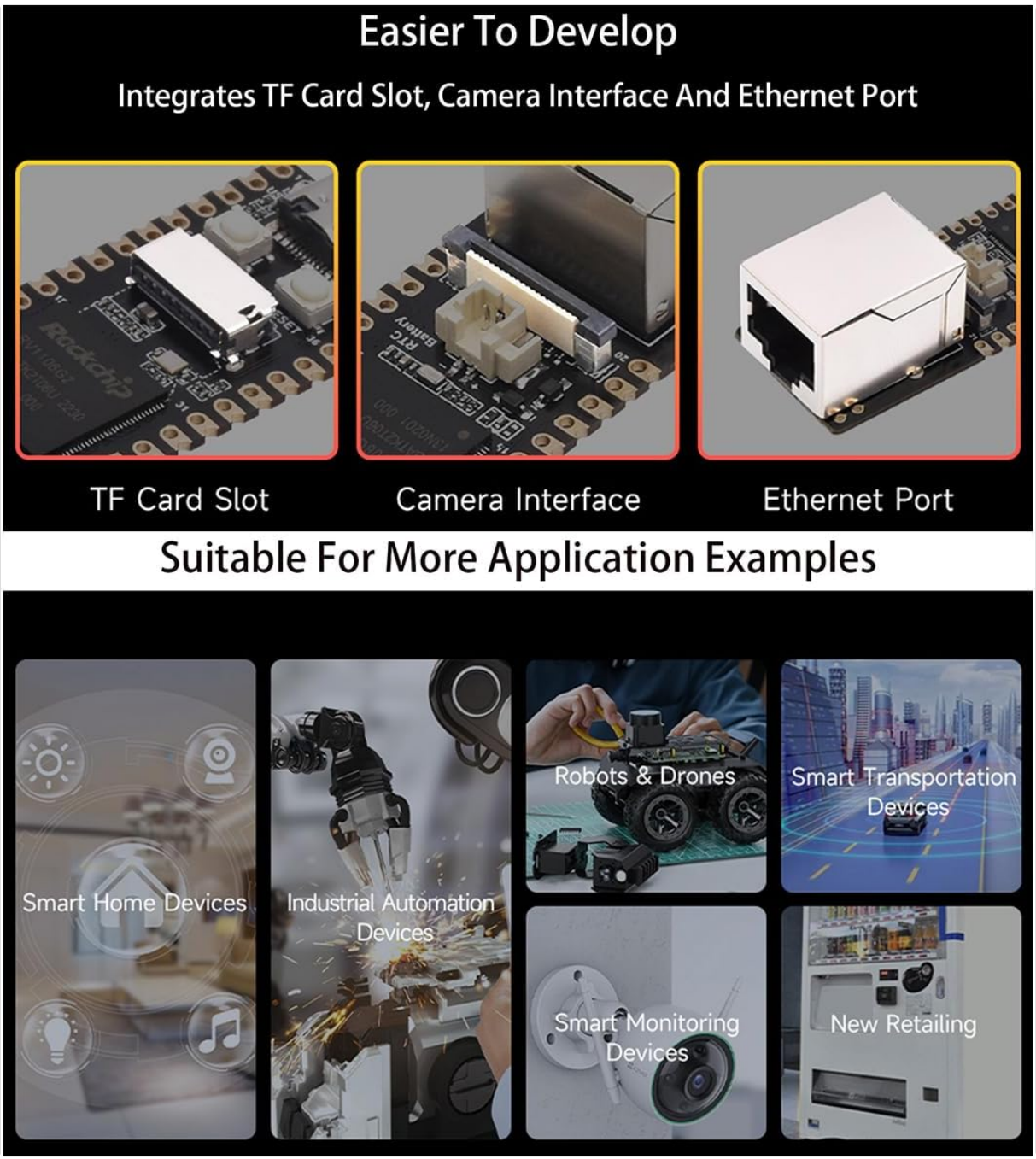

Figure 8: This image highlights the ease of development with integrated TF card slot, camera interface, and Ethernet port. It also showcases various application examples such as Smart Home Devices, Industrial Automation, Robots & Drones, Smart Transportation Devices, Smart Monitoring Devices, and New Retailing, illustrating the board's versatility.

Maintenance

- **Environmental Conditions:** Operate the board within recommended temperature and humidity ranges to ensure optimal performance and longevity.
- **Cleaning:** Keep the board free from dust and debris. Use a soft, dry brush or compressed air for cleaning. Avoid liquids.
- **Handling:** Handle the board by its edges to prevent damage to components and electrostatic discharge.
- **Firmware Updates:** Regularly check for and apply firmware or operating system updates from official sources to ensure security and access to new features.

Troubleshooting

- **Board Not Powering On:** Ensure the USB Type-C cable is securely connected and the power source is adequate. Try a different cable or power adapter.
- **No OS Boot:** Verify that the TF card is properly inserted and contains a valid, bootable operating system image. Re-flash the OS if necessary.
- **Network Connectivity Issues:** Check the Ethernet cable connection. Ensure network settings are correctly configured in the operating system.
- **Peripheral Not Detected:** Confirm that the peripheral is correctly wired to the appropriate pins (GPIO, I2C, SPI, UART) and that the necessary drivers or software configurations are in place.
- **System Instability:** Ensure adequate cooling if the board is under heavy load. Check for power supply fluctuations. Review recent software changes or installations.

Specifications

Feature	Detail
Brand	Wonrabai
Model Name	Luckfox Pico Pro
CPU Model	Cortex A7 (Rockchip RV1106G2)
NPU	0.5 TOPS (INT8), up to 1.0 TOPS (INT4)
ISP	Input 5M @30fps (Max)
RAM Memory Installed Size	128 MB DDR3L
Operating System	Linux
Connectivity Technology	Ethernet (10/100M), GPIO (26 pins), I2C, USB (2.0 Host/Device), SPI, UART, MIPI CSI (2-lane)
Compatible Devices	Camera
Total USB Ports	1 (Type-C)
Item Weight	0.02 Pounds

Warranty and Support

Warranty: For any questions or issues regarding your Luckfox Pico Pro, please feel free to send a message to Wonrabai Electronics via the Amazon messaging system. The manufacturer provides support for product-related inquiries.
Online Resources: Additional online tutorials and development resources are available. Please refer to the link provided with your product documentation or search for "Luckfox Pico Pro RV1106G2" on official Wonrabai support channels for the latest information and community support.