WayPonDEV NanoPi M6

FriendlyElec NanoPi M6 Computer Mini Router User Manual

Model: NanoPi M6 (4GB Metal Case)

1. INTRODUCTION AND OVERVIEW

The FriendlyElec NanoPi M6 is an open-source mini router and smart gateway device designed for various applications including IoT development, NAS network storage, smart home gateways, and cloud servers. It is built around the powerful Rockchip RK3588S System-on-Chip (SoC), offering high performance and extensive connectivity options.

This device supports advanced multimedia capabilities, including 8K video decoding and encoding, making it suitable for high-definition media applications. Its compact design and rich hardware resources provide flexibility for both enthusiasts and developers.

2. PACKAGE CONTENTS

Verify that all items listed below are included in your package:

- 1x FriendlyElec NanoPi M6 Computer Mini Router (4GB Metal Case)
- 1x 20W PD Power Supply
- 1x 3.5 inch HD LCD Screen (if applicable to your specific model variant)

3. PRODUCT FEATURES

The NanoPi M6 is equipped with advanced hardware components to deliver robust performance:

- **SoC:** Rockchip RK3588S, featuring a quad-core ARM Cortex-A76 (up to 2.4GHz) and quad-core Cortex-A55 CPU (up to 1.8GHz).
- **GPU:** Mali-G610 MP4, supporting OpenGLES 1.1, 2.0, 3.2, OpenCL up to 2.2, and Vulkan 1.2.
- **VPU:** 8K 60fps H.265/VP9 decoder, 8K 30fps H.264 decoder, 4K 60fps AV1 decoder, and 8K 30fps H.264/H.265 encoder.
- **NPU:** 6TOPs, with support for INT4/INT8/INT16/FP16.
- **RAM:** 64-bit LPDDR5 at 2400MHz (available in 4GB, 16GB, 32GB configurations).
- **Storage:** eMMC module socket (HS400 mode) and microSD slot (SDR104 mode) for boot and storage.
- **Networking:** 1x Native Gigabit Ethernet port.

- **USB:** 1x USB 3.0 Type-A and 2x USB 2.0 Type-A ports.
- **M.2 Connectors:** 1x M.2 M-Key (PCIe 2.1 x1 for SSDs) and 1x M.2 E-Key (PCIe 2.1 x1 and USB2.0 Host for Wi-Fi & BT modules).
- **Video Output:** 1x Standard HDMI output (compatible with HDMI2.1, HDMI2.0, HDMI1.4, up to 7680x4320 60Hz), 2x 4-lane MIPI-DSI.
- **Audio:** 1x 3.5mm jack for stereo headphone output, 1x 2.0mm PH-2A connector for analog microphone input.
- **GPIO:** 30-pin 2.54mm header for SPI, UARTs, I2Cs, SPDIFs, PWMs, and GPIOs.
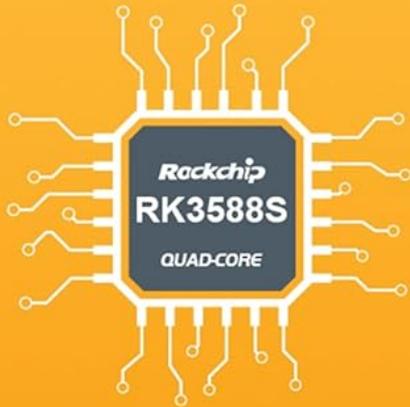- **Buttons:** MASK, Reset, Recovery, Power.

Figure 3.1: Front view of the NanoPi M6, showing USB, Ethernet, HDMI, and power ports.

Figure 3.2: Rear view of the NanoPi M6, highlighting the power button and system indicator LEDs.
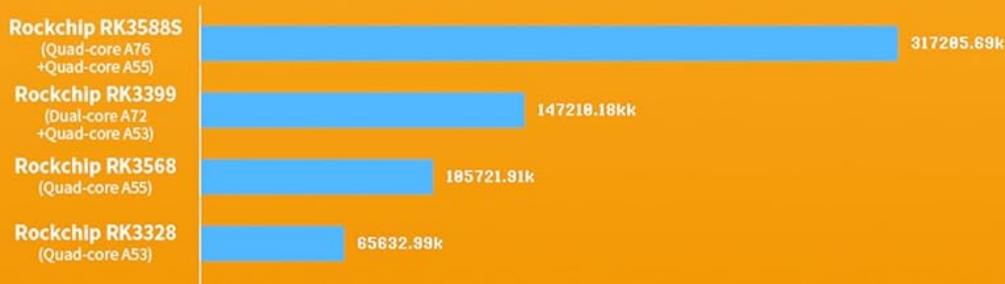
Rockchip *QUAD-CORE* SoC

Powerful Performance

Rockchip RK3588S
Quad-core ARM Cortex-A76 + Quad-core Cortex-A55 CPU
8GB LPDDR4X RAM / 32GB eMMC

Supports **hardware acceleration** with **AES** enabled encryption and decryption

Comparison of Popular SoC's AES Encryption Performances

SoC	Performance
Rockchip RK3588S (Quad-core A76 +Quad-core A55)	317205.69k
Rockchip RK3399 (Dual-core A72 +Quad-core A53)	147210.18kk
Rockchip RK3568 (Quad-core A55)	105721.91k
Rockchip RK3328 (Quad-core A53)	65632.99k

※¹ The 'numbers' are in 1000s of bytes per second processed.
※² **RK3328/RK3568 Test command:** openssl speed -evp aes-256-gcm
  RK3399 Test command: taskset 0x10 openssl speed -evp aes-256-gcm
  RK3588 Test command: taskset 0x40 openssl speed -evp aes-256-gcm

Supports decoding video streams of 8K video steams, presenting realistic images

The RK3588S CPU has internal Mali-G610 GPU and 2D/3D hardware acceleration components. It supports decoding video streams of 8K@60fps H.265/AVS2/VP9, 8K@30fpsH.264/AV1, 8K@30fpsH.265/H.264 and 1080P@60fps VP8/AVS1/AVS1+/MPEG-4.

Figure 3.3: Detailed diagram of the Rockchip RK3588S SoC, showcasing its quad-core CPU, GPU, and hardware acceleration capabilities.

Running Android TV 12
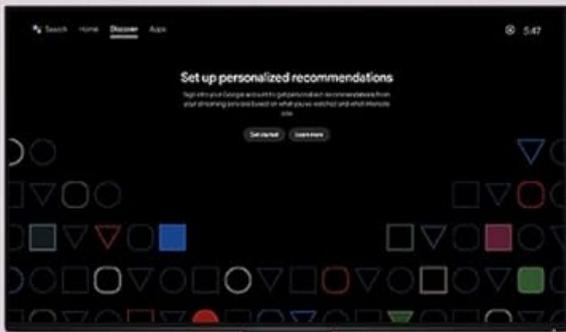
Running Android TV 12

Playing H.265 8K@60P video

Running Debian

Running Debian Bullseye Desktop

Hardware-accelerated Video Decoding

Running Ubuntu

Running Ubuntu 22.04 LTS Desktop   **Hardware-accelerated Video Decoding**

Figure 3.4: Internal view of the NanoPi M6 board, indicating the locations of the eMMC socket, M.2 E-Key, and M.2 M-Key connectors.

4. SETUP

The NanoPi M6 offers multiple options for operating system installation:

4.1 Option 1: Installing an OS With a Cable

This method is generally preferred by developers. It requires a USB Type-A to male cable and a personal computer.

1. Connect the NanoPi M6 to your computer using a USB Type-A to male cable.
2. Follow the specific instructions provided in the official FriendlyElec Wiki for flashing the OS image via USB.

4.2 Option 2: Installing an OS Via a Web Browser

This method is often preferred by regular users and requires a TF card and a web browser.

1. Insert a prepared TF card with the necessary bootloader files into the NanoPi M6.
2. Power on the device and access the web interface from a computer connected to the same network.
3. Use the eMMC Tools within the web interface to upload and flash the OS image to the internal eMMC module.

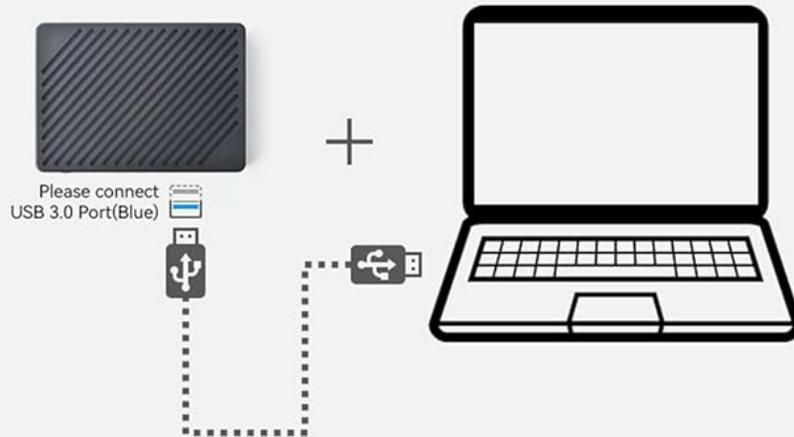### 4.3 Option 3: Installing an OS With a Card Only

This option is suitable for users who intend to install an OS directly onto a TF card for the NanoPi M6 boards. An LCD or HDMI display is optional for monitoring the installation progress.

1. Prepare a TF card with the desired OS image using an image writing tool on a computer.
2. Insert the prepared TF card into the NanoPi M6's microSD slot.
3. Connect the power supply (PD/DC 6-20V) to the NanoPi M6. The device will boot from the TF card.

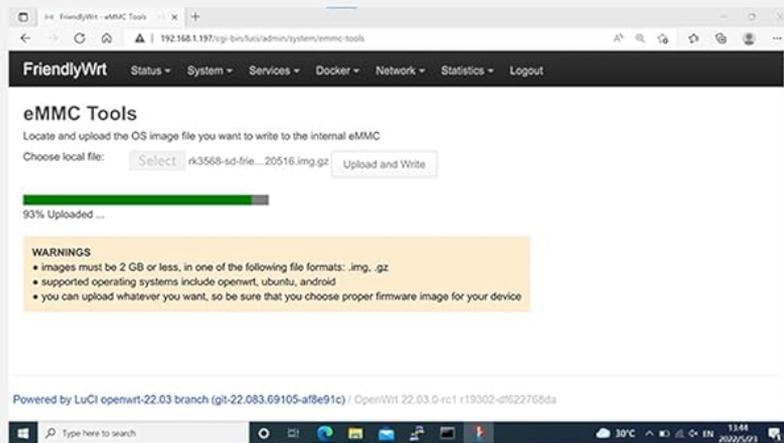# Support Multiple Options of System Installation

Three options of system installation are applicable to the NanoPi M6:

Option 1: Installing an OS With a Cable

Please connect USB 3.0 Port(Blue)

This might be preferred by developers. A USB type-A male-to-male cable and a PC are needed.

Option 2: Installing an OS Via a Web Browser

This might be preferred by regular users. A TF card and a web browser are needed.

Option 3: Installing an OS With a Card Only

PD/DC 6–20V

This might be preferred by those that need to install an OS for a batch of NanoPi M6 boards.
A TF card is needed. An LCD or HDMI is optional for watching the installation progress.

Figure 4.1: Visual representation of the three primary methods for installing an operating system on the NanoPi M6.

5. OPERATING INSTRUCTIONS

The NanoPi M6 supports a variety of operating systems, offering flexibility for different applications:

- **FriendlyWrt:** A custom system based on OpenWrt, ideal for router and network gateway applications.
- **Android:** Enables the device to function as a media center or smart display.
- **Debian**/**Ubuntu:** Provides a full desktop Linux experience for development and general computing tasks.

After installing your chosen operating system, connect the NanoPi M6 to a display via HDMI, and attach a keyboard and mouse to the USB ports for initial setup and interaction. For headless operation (without a display), you can access the device via SSH over the network.

5.1 Software Applications

The NanoPi M6 is compatible with various software tools and platforms, including Docker, which allows for easy deployment and management of containerized applications. This enables the creation of diverse solutions such as:

- WordPress for web hosting.
- Home Assistant for smart home automation.
- Jellyfin/Emby for media servers.
- Nextcloud for personal cloud storage.
- GitLab for code management.
- Minecraft Server for gaming.
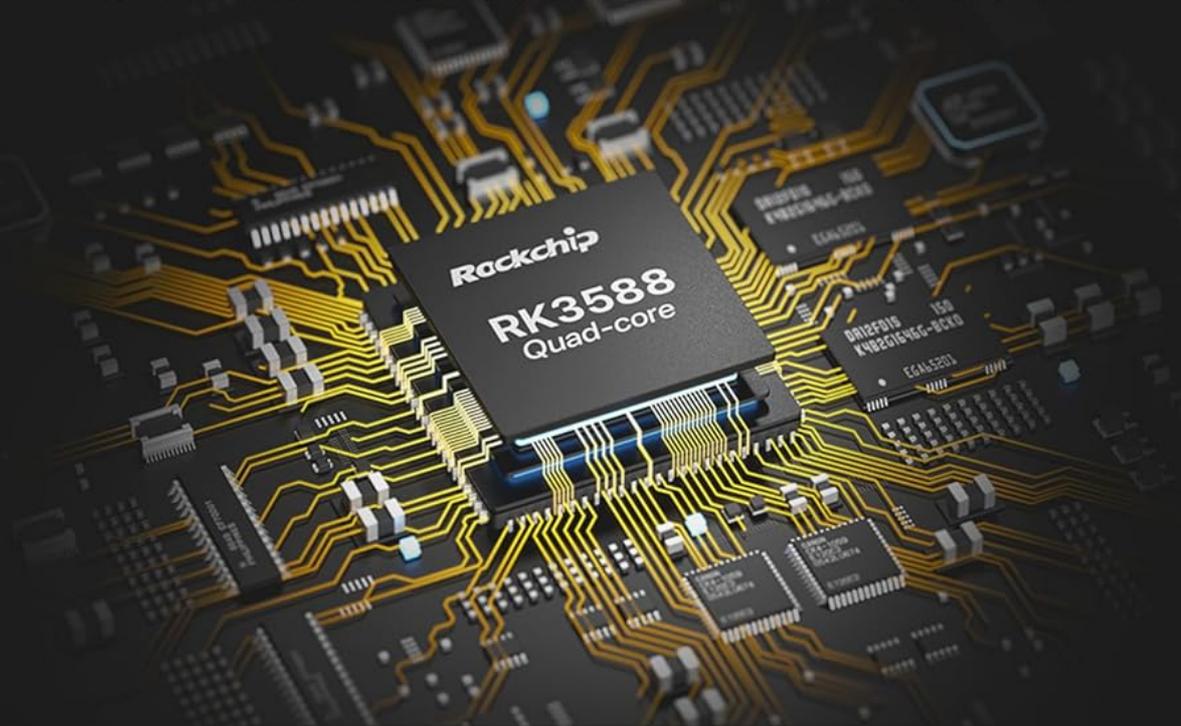
Figure 5.1: Examples of the NanoPi M6 running Android TV 12, Debian Bullseye, and Ubuntu 22.04 LTS, demonstrating its versatility.

NanoPi M6

Rockchip RK3588S | 4/16/32GB RAM | Gbps Ethernet Port | Support 8K
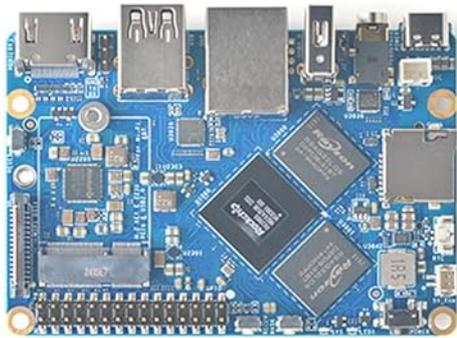
Bare board: Weight 52g

NanoPi M6 LCD Combo: Weight 275g

Rockchip RK3588S
Quad-core A76
& Quad-core A55

64-bit RAM
LPDDR5@2400MHz

eMMC Socket
x 1

Gbps
Ethernet

HDMI 2.1
Can play H.265 8k@60P etc

Linux
w/ Kernel 6.1

UbuntuCore/Desktop
w/ GPU&VPU accelerated

Debian Desktop
w/ GPU&VPU accelerated

USB-C Power In
PD/DC 6V~20V

USB 3.0

Built-in docker

Docker is a light software utility that can package an application and its dependencies in a virtual container that can run on any Linux server. "Docker Hub" is the world's largest library and community for container images and allows you to create, manage, and deliver your container applications. Most "ARM64" applications can be run seamlessly on FriendlyWrt via Docker.

WordPress
Transform your site into almost anything

Home Assistant
Awaken your home

Jellyfin
The Free Software Media System

Nextcloud
A safe home for all your data

GitLab
Create, review and deploy code together

Matomo
Extensible analytics platform

Emby
Take your Media anywhere

Cloud Torrent
Easy to use remote torrent client

Minecraft Server
Multiplayer Server for Minecraft

Figure 5.2: Overview of Docker support on the NanoPi M6, illustrating a range of compatible applications for various uses.

6. SPECIFICATIONS

Detailed technical specifications for the NanoPi M6 (4GB Metal Case) are provided below:

Feature	Specification
Package Dimensions	4.72 x 3.15 x 1.57 inches
Item Weight	10.6 ounces
ASIN	B0DDPZ24K6
Item Model Number	4GB Metal Case
Date First Available	August 20, 2024
Manufacturer	WayPonDEV
RAM Memory Installed Size	4 GB
Total USB Ports	3
Resolution (Max)	7680x4320 (8K)
Maximum Memory Speed	2400 MHz
Operating System Support	FriendlyWrt, Android, Debian, Ubuntu
CPU Model	Cortex A76 / A55 (RK3588S)
CPU Speed	Up to 2.4 GHz
Graphics Coprocessor	Mali-G610 MP4
Personal Computer Design Type	Mini PC
Model Name	NanoPi M6 OpenWRT Computer Mini Router

7. MAINTENANCE

To ensure the longevity and optimal performance of your NanoPi M6, consider the following maintenance guidelines:

- **Keep Clean:** Regularly clean the device to prevent dust accumulation, especially around ventilation areas. Use a soft, dry cloth.
- **Proper Ventilation:** Ensure the device is placed in a well-ventilated area to prevent overheating. Avoid blocking any vents.
- **Power Supply:** Always use the provided 20W PD Power Supply or a compatible power source that meets the specified voltage and current requirements (PD/DC 6-20V).
- **Software Updates:** Keep your operating system and installed software up to date to benefit from the latest features, security patches, and performance improvements.
- **Handle with Care:** Avoid dropping the device or exposing it to excessive shock, vibration, or extreme temperatures.

8. TROUBLESHOOTING

If you encounter issues with your NanoPi M6, consider these basic troubleshooting steps:

- **No Power:** Ensure the power supply is correctly connected and functioning. Try a different power outlet.
- **No Display Output:** Verify that the HDMI cable is securely connected to both the NanoPi M6 and the display. Check the display's input source.
- **Network Connectivity Issues:** Check Ethernet cable connections. If using Wi-Fi (with an M.2 module), ensure the module is correctly installed and drivers are loaded.
- **OS Not Booting:** Confirm that the OS image is correctly flashed to the eMMC or TF card. Ensure the boot order is correctly configured if booting from TF card.
- **Peripheral Not Detected:** Ensure USB devices are properly connected. Try different USB ports.
- **System Unresponsive:** Press the Reset button to restart the device. If the issue persists, perform a power cycle (disconnect and reconnect power).

For more detailed troubleshooting or specific technical support, refer to the official FriendlyElec Wiki or community forums.

9. WARRANTY AND SUPPORT

The NanoPi M6 is manufactured by WayPonDEV. For product support, documentation, and community resources, please refer to the official FriendlyElec Wiki and forums.

- **Official Wiki:** wiki.friendlyelec.com/wiki/index.php/NanoPi_M6#Get_Started
- **Community Forum:** forum.youyeetoo.com/

For any after-sales inquiries or specific issues not covered in this manual or the wiki, please contact WayPonDEV directly through their seller page on Amazon or other relevant support channels.