ODROID-H2

ODROID-H4, ODROID-H4+ and ODROID-H4 Ultra

Introduction

Modern 4-Core 4-Thread or 8-Core 8-Thread x86 64-bit single board computer with large memory capacity and advanced IO ports.

- Intel® Core™ i3 Processor or Intel® Processor N97 has a base clock of 2GHz and a boost clock of up to 3.8GHz with 6MB Smart Cache by Intel7 Lithography.
- Up to 48GB Single-channel Memory (DDR5 PC5-384000 4800MHz)
- One DDR5 1.1V SO-DIMM slot, up to 48GB
- PCIe 3.0 x 4 lanes for one M.2 NVMe storage
- 2 x 2.5Gbit Ethernet ports
- 4 x SATA 3.0 ports
- SSE4.2 accelerator (SMM, FPU, NX, MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, AES)
- Intel UHD Graphics 24 EUs(H4 Ultra:32 EUs) Turbo 1.2GHz(H4 Ultra:1.25GHz)
- HDMI 2.0 and DP 1.2 multiple video outputs
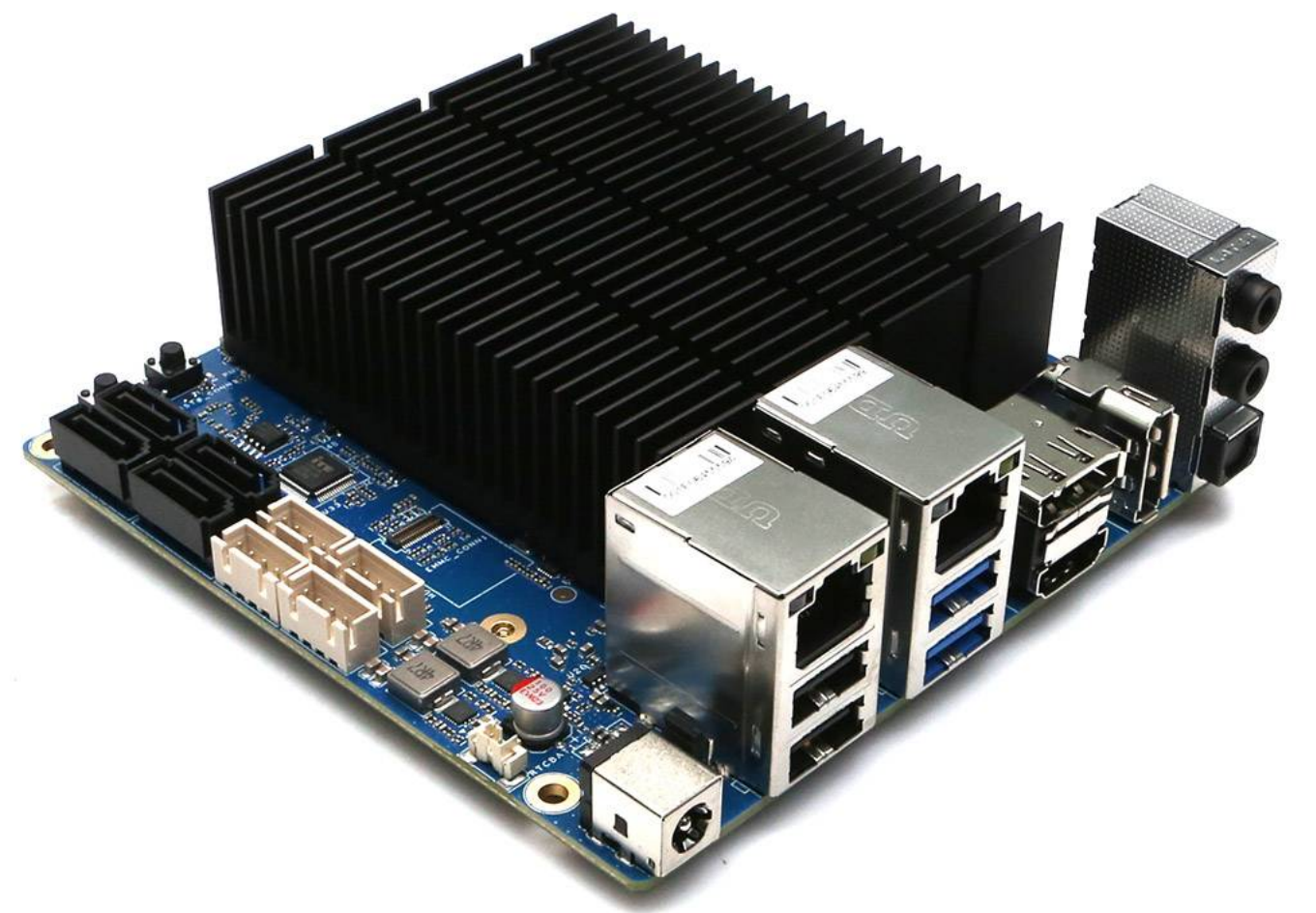
	H4	**H4+**	**H4 Ultra**	**H3**	**H3+**
Processor					
CPU	Intel® Processor N97	Intel® Processor N97	Intel® Core™ i3 Processor N305	Celeron N5105	Pentium Silver N6005
Code name	Alder Lake-N	Alder Lake-N	Alder Lake-N	Jasper Lake	Jasper Lake
Lithography	10 nm (Intel 7)	10 nm (Intel 7)	10 nm (Intel 7)	10 nm (Intel 7)	10 nm (Intel 7)
Microarchitecture	Gracemont	Gracemont	Gracemont	Tremont	Tremont
Cores / Threads	4C4T	4C4T	8C8T	4C4T	4C4T
TDP	12W	12W	15W	10W	10W
Base Frequency (GHz)	2.0	2.0	1.8	2.0	2.0
Burst Frequency (Single Thread) (GHz)	3.6	3.6	3.8	2.9	3.3
Burst Frequency (Multi Thread) (GHz)	2.9	2.9	3.0	2.6	2.8
Memory					
Max. Memory address space (GB)	48	48	48	64	64
Max. Memory Speed (MT/s)	4800	4800	4800	2933	2933
Display					
DP 1.4 4K/60Hz	2	2	2	1	1

	H4	H4+	H4 Ultra	H3	H3+
HDMI 2.0 4K/60Hz	1	1	1	1	1
IGP (INTEL UHD Graphics)					
Base Frequency (MHz)	500	500	500	450	450
Burst Frequency (MHz)	1200	1200	1250	800	900
Execution Units	24	24	32	24	32
PCIe (via NVMe adapter)					
Generation	Gen 3	Gen 3	Gen 3	Gen 3	Gen 3
Lanes	4	4	4	4	4
Max Transfer Rate (GT/s)	8	8	8	8	8
Max Throughput x4 (GB/s)	3.94	3.94	3.94	3.94	3.94
USB					
2.0	2 ports	2 ports	2 ports	2 ports	2 ports
3.0	2 ports	2 ports	2 ports	2 ports	2 ports
Ethernet					
2.5GbE	1 port	2 ports	2 ports	2 ports	2 ports
SATA III	**None**	4 ports	4 ports	2 ports	2 ports
NVMe	PCIe Gen 3 x4	PCIe Gen 3 x4	PCIe Gen 3 x4	PCIe Gen 3 x4	PCIe Gen 3 x4
IO Expansion ports	I2C x 2	I2C x 2	I2C x 2	I2C x 2	I2C x 2
	USB 2.0 x 3	USB 2.0 x 3	USB 2.0 x 3	USB 2.0 x 3	USB 2.0 x 3
	UART x 2	UART x 2	UART x 2	UART x 1	UART x 1
	HDMI-CEC x 1	HDMI-CEC x 1	HDMI-CEC x 1	HDMI-CEC x 1	HDMI-CEC x 1
	Ext. Power Button x 1	Ext. Power Button x 1	Ext. Power Button x 1	Ext. Power Button x 1	Ext. Power Button x 1
Optional Cooling Fan	92 mm, standard PC 4-pin for 12V fan	92 mm, standard PC 4-pin for 12V fan	92 mm, standard PC 4-pin for 12V fan	92 mm, standard PC 4-pin with 12V fan	92 mm, standard PC 4-pin for 12V fan
Dimensions	120x120mm (4.7×4.7 in)	120x120mm (4.7×4.7 in)	120x120mm (4.7×4.7 in)	110x110mm (4.3×4.3 in)	110x110mm (4.3×4.3 in)
Power Supply	15V x 4A = 60W or 19V x 7A = 133W	15V x 4A = 60W or 19V x 7A = 133W	15V x 4A = 60W or 19V x 7A = 133W	15V x 4A = 60W or 19V x 7A = 133W	15V x 4A = 60W or 19V x 7A =133W
Security (TPM 2.0)	fTPM enabled Windows 11 compatible Attestation ready and Storage ready	fTPM enabled Windows 11 compatible Attestation ready and Storage ready	fTPM enabled Windows 11 compatible Attestation ready and Storage ready	fTPM enabled Windows 11 compatible Attestation ready and Storage ready	

	H4	**H4+**	**H4 Ultra**	**H3**	**H3+**
Hardkernel H-series cases	DIY assembly Satin black PCB with gold lettering One new case is glossy royal blue.	DIY assembly Satin black PCB with gold lettering One new case is glossy royal blue.	DIY assembly Satin black PCB with gold lettering One new case is glossy royal blue.	DIY assembly Satin black PCB with gold lettering One new case is glossy royal blue.	
Certifications	FCC/CE/KC/RoHS	FCC/CE/KC/RoHS	FCC/CE/KC/RoHS	FCC/CE/KC/RoHS	FCC/CE/KC/RoHS

Installation

Hardware

- Connect the backup battery to the board. The backup battery is packaged with the ODROID-H4, and it will maintain BIOS settings as well as the Real Time Clock on the board.
- Install DDR5 memory cards as desired up to 48GB (1 x 48GB). ODROID-H4 only supports single channel memory
- Connect any additional peripherals such as a display monitor, keyboard, and mouse. ODROID-H4 doesn't support a PS-2 type keyboard or mouse. Only USB keyboard and mouse are supported.
- For desktop like use, a display device can be connected with HDMI and/or DisplayPort. Operating system support is required for dual/triple display use.
- Single or dual ethernet (10/100/1000Mbps/2500Mbps) cables can be connected for network support via on-board **Intel I226-V** NIC chipset.
- Finally, connect the DC power adapter to the DC jack at the rear side of the ODROID-H4. For high performance computing and/or multiple storage devices, at least a DC 15V/4A power adapter is strongly recommend.
- For more detailed installation requirements, please refer to the hardware specification. Also, it is strongly recommended to install and keep the ODROID-H4 in a secure hardware case to protect it from environmental hazards.

Entering BIOS menu

- At the very first boot after the ODROID-H4 hardware is assembled, the BIOS will be entered immediately. You can set hardware configuration options and save them. The BIOS settings will be maintained until the backup battery is disconnected or discharged.
- You can use the **DEL** key while booting to enter the BIOS manually.
- **The very first booting process might take up to 3 minutes**.

The first boot needs a long post process to start the BIOS due to a long period of checking the RAM timing parameters.
Once the configuration is stored into the backup memory in the SoC, it boots quickly.
If you disconnect the backup coin battery for a while, you will meet the very slow booting process again.

Operating system

- No operating system license or installation media are included in the ODROID-H4 package. This implies that you must purchase the license of the operating system you wish to install or download a free operating system such as Debian or Ubuntu.
- In order to install an operating system, you will need an installation media such as a USB stick or CD/DVD. These can be purchased at a store or downloaded from the website of the provider and written to a USB stick or CD/DVD media.
- To install from CD/DVD media, you have to connect a USB CD/DVD drive to a USB host port on ODROID-H4. Installation media will need to be created using another computer and the appropriate software.

Burning an operating system to USB stick

- This section assumes that you will install an operating system from a USB stick and are going to burn an operating system image to the USB stick on another computer. There are various software depending on operating system, but this section uses a popular burning software called "Etcher" that supports multiple operating systems and is easy to use.
- You can download the "Etcher" software from its official site and install it in your computer. Then, open "Etcher" once the installation is completed.
- Before burning an installation image, you must have the image as a file on your computer. If not, you must purchase or download the image from the provider. For example, you can download the Ubuntu image from Official Canonical Ubuntu images. We tested Ubuntu 22.04 LTS images. Ubuntu 22.04(ubuntu-22.04-desktop-amd64.iso) had newer Linux Kernel with improved video drivers and it gave us better GPU performance.

Flash Ubuntu to your USB stick

- Open Etcher.
- Click "Select Image" button and select the downloaded OS image.
- Etcher selects a USB stick to flash automatically. If not, or if you want to use a different drive, click "Change" and select one.
- Click the "Flash" button to start the flashing and verification process.
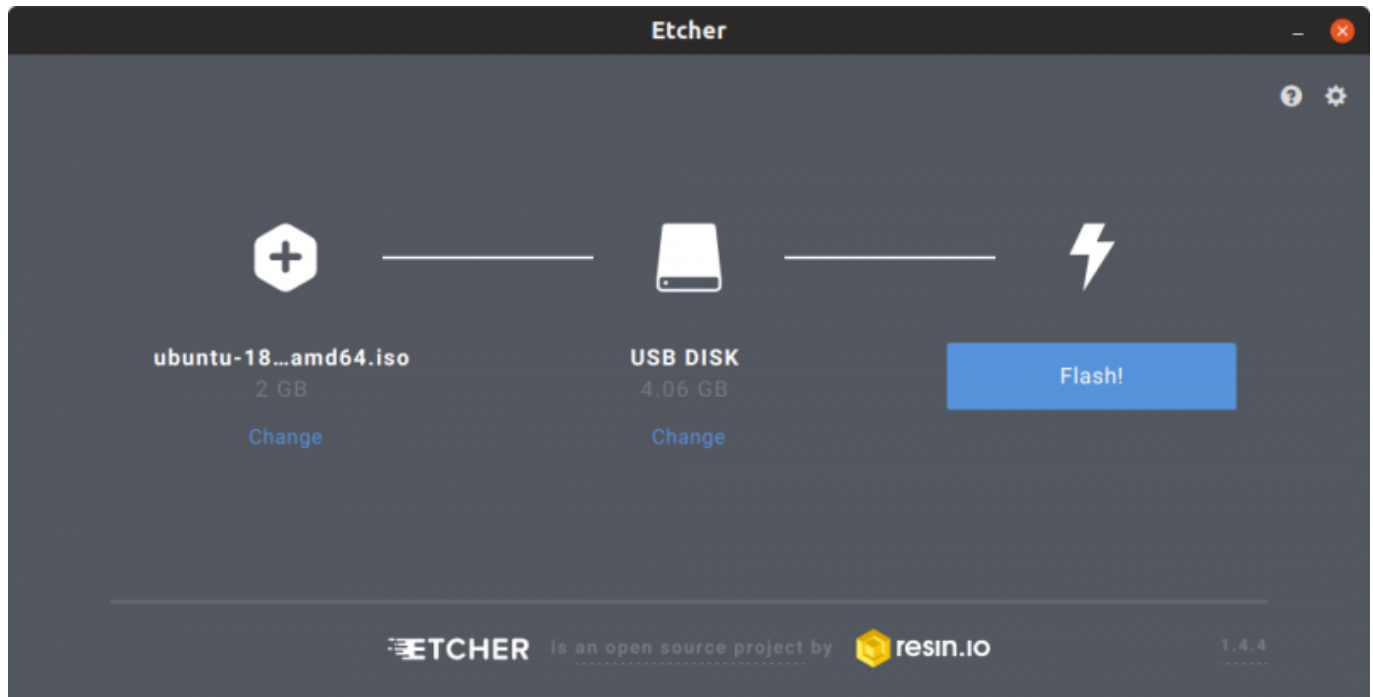
Installing an operating system from an installation media

- The instruction in this section can be used to install an operating system from a USB stick or CD/DVD media or when you want to switch an operating system installed on storage attached to the ODROID-H4 while changing the boot priority.
- The procedure to install an operating system varies depending on the operating system, but it's no different between a regular personal computer and the ODROID-H4. Therefore, you may also need to contact the operating system provider if you encounter any installation failures.
- After installing an operating system is completed, the operating system will eventually ask you to remove the installation media from the ODROID-H4 and reboot. On the next boot, if everything is fine, the operating system you have installed will appear.

Installable boot media on the ODROID-H4

- The ODROID-H4 series can have multiple storage devices that an operating system can be installed on. These storage devices can be connected to the ODROID-H4 at the same time and an operating system can be installed and select to use during booting.

1. eMMC (Embedded Multimedia Card)
2. SATA HDD/SSD drive #1 (Only for H4+ and H4 Ultra)
3. SATA HDD/SSD drive #2 (Only for H4+ and H4 Ultra)
4. SATA HDD/SSD drive #3 (Only for H4+ and H4 Ultra)

5. SATA HDD/SSD drive #4 (Only for H4+ and H4 Ultra)
6. M.2 NVMe

- The major difference between these storage devices is the I/O bandwidth. One is slower or faster than others because of the different hardware bus or interface specifications.

Selecting an installation media on boot

- The BIOS on the ODROID-H4 always tries to load bootable images from the storage as configured in the BIOS. For example, you can set SATA port 2 to load the operating system rather than SATA port 1 by setting this order in the BIOS.
- In order to boot a USB stick or CD/DVD removable drive, you can enter the BIOS and change the boot priority.
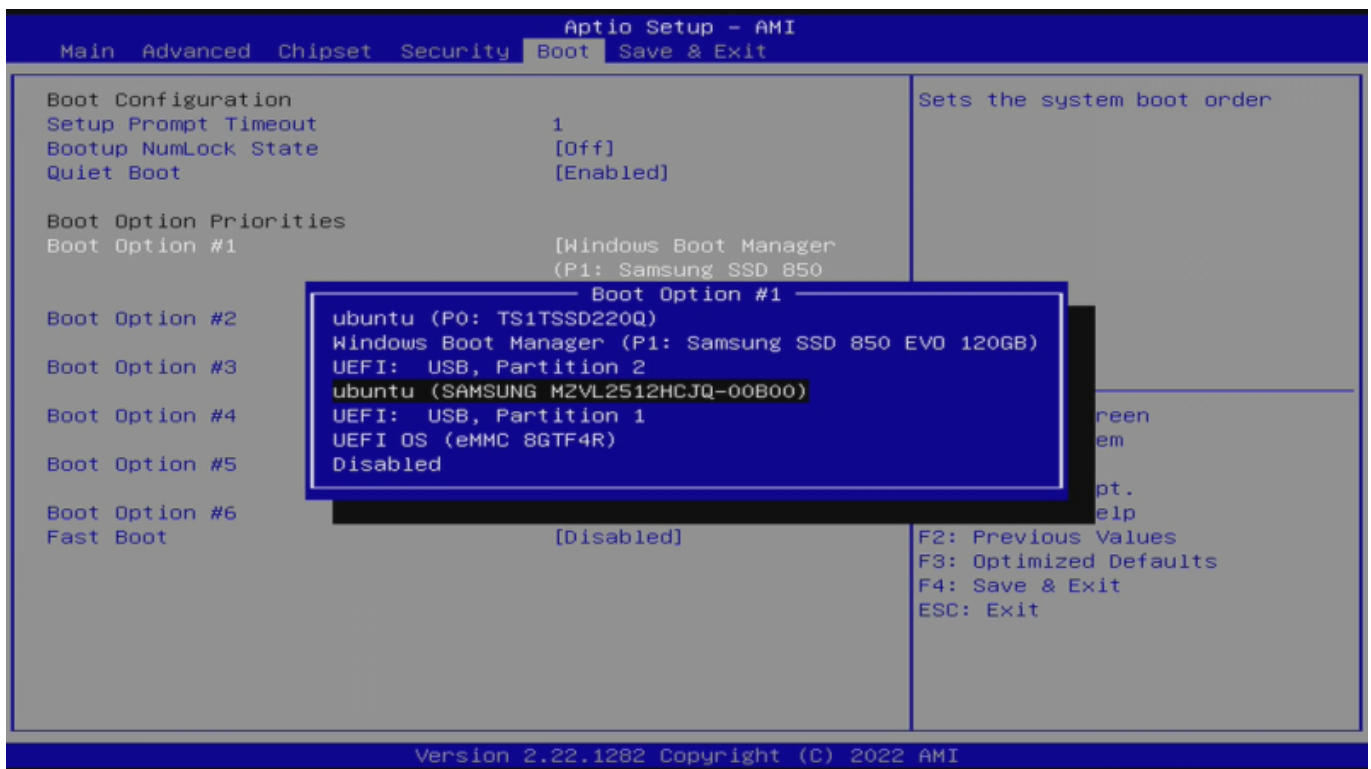
- Instead of entering the BIOS menu to select a boot device, the "F7" key can be used at power on or reboot. This will present a menu with the list of connected storage devices and you can select one of them to boot from.

Hardware

Specifications

- specifications

Board Layout & Dimensions

- board_layout
- board_dimensions

ODROID-H4 Schematic and Full Intel@ N305 Datasheets

- ODROID-H4 Schematics (PDF format)
- Intel@ N305 datasheet

ODROID-H4 BIOS

- ODROID-H4 BIOS Release
- How to update ODROID-H4's BIOS
- eMMC Connection Check in BIOS
- Serial Port Console Redirection on ODROID-H4

Applications notes

- Auto Start Of System When Power Applied
- The external power switch

- How to Control FAN Speed via CPU Temperature
- How to Install ODROID-VU(5/7/7+) Touch Screen Driver
- DKMS Device Driver for WiFi Modules
- I2C 20x4 LCD
- I2C
- Four Internal SATA Drives
- Add more SATA ports
- Pulse-Eight NUC CEC Adapter with H4
- UART
- How To Enable Wake On LAN

Official Products (Compatible peripherals)

ODROID-H4/H4+/H4 Ultra

https://www.hardkernel.com/shop/odroid-h4/

Memory

Samsung DDR5 SO-DIMM 8GB

https://www.hardkernel.com/shop/samsung-8gb-ddr5-5600-so-dimm/

Samsung DDR5 SO-DIMM 16GB

https://www.hardkernel.com/shop/samsung-16gb-ddr5-5600-so-dimm/

Samsung DDR5 PC5-38400 SO-DIMM 32GB

https://www.hardkernel.com/shop/samsung-32gb-ddr5-5600-so-dimm/

eMMC

eMMC modules with Samsung chipset
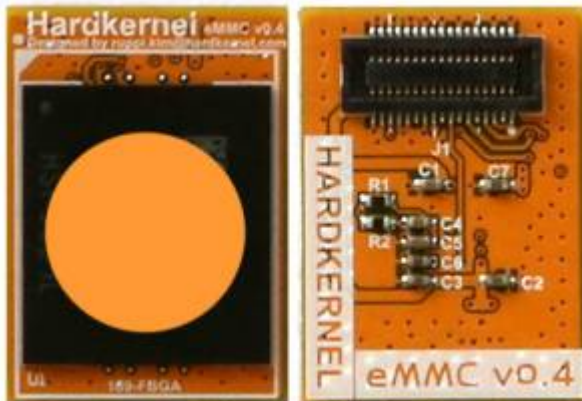
- 8GB eMMC Module H4

https://www.hardkernel.com/shop/8gb-emmc-module-h2//

- 16GB eMMC Module H4

https://www.hardkernel.com/shop/16gb-emmc-module-h2//

- 32GB eMMC Module H4

https://www.hardkernel.com/shop/32gb-emmc-module-h2/

- 64GB eMMC Module H4

https://www.hardkernel.com/shop/64gb-emmc-module-h2/

- 128GB eMMC Module H4

https://www.hardkernel.com/shop/128gb-emmc-module-h2-2/

- 256GB eMMC Module H4

https://www.hardkernel.com/shop/256gb-emmc-module-h3-h2/

Net Card

H4/H3/H2 Net Card

https://www.hardkernel.com/shop/h3-h2-net-card-2/
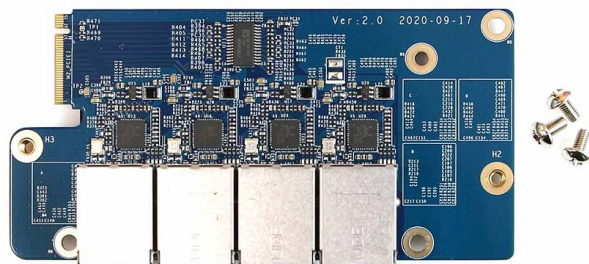
Case

Case Type 1 (for minimal system. No Netcard, no space for SATA storage)

https://www.hardkernel.com/shop/odroid-h4-case-type-1/
Drawings in DXF formant :

odroid-h4_type1.zip

Case Type 2 (Space for Net Card, no space for SATA storage.)

https://www.hardkernel.com/shop/odroid-h4-case-type-2/
Drawings in DXF formant :

odroid-h4_type2.zip

Case Type 3 (Space for Net Card and space for 4 x 2.5" SATA drives (max. 15mm thick).)

https://www.hardkernel.com/shop/odroid-h4-case-type-3/
Drawings in DXF formant :

odroid-h4_type3.zip

Case Type 4 (Space for Net Card and 4 x 3.5" SATA drives)

https://www.hardkernel.com/shop/odroid-h4-case-type-4/
Drawings in DXF formant :

odroid-h4_type4.zip

ODROID H4 Mini-ITX Kit

https://www.hardkernel.com/shop/h4-mini-itx-kit/

Drawings in DXF formant :

mini-itx.zip

Power Supply

15V/4A 60Watt Power Supply Unit

- US plug

https://www.hardkernel.com/shop/15v-4a-power-supply-us-plug/

- EU plug

https://www.hardkernel.com/shop/15v-4a-power-supply-eu-plug/

- Asia/Korea plug

https://www.hardkernel.com/shop/15v-4a-power-supply-asia-korea-plug-copy/

- UK plug

https://www.hardkernel.com/shop/15v-4a-power-supply-uk-plug/

- Australia plug

https://www.hardkernel.com/shop/15v-4a-power-supply-australia-plug/

19V/7A 133Watt Power Supply Unit

https://www.hardkernel.com/shop/19v-7a-power-supply/

Cable

SATA Data and Power Cable(200mm)

https://www.hardkernel.com/shop/sata-data-and-power-cable/

SATA Data and Power Cable(250mm)

https://www.hardkernel.com/shop/sata-data-and-power-cable250mm/

Ethernet Cable CAT6

https://www.hardkernel.com/shop/ethernet-cable-cat6/

HDMI 1.4 Cable (Type A-A) for Full-HD

https://www.hardkernel.com/shop/hdmi-1-4-cable-type-a-a/

High Speed 4K HDMI 2.0 Cable (Type A-A)

https://www.hardkernel.com/shop/high-speed-4k-hdmi-2-0-cable-type-a-a/

Fan

92x92x25mm DC Cooling Fan w/ PWM, Speed Sensor (Tacho)

https://www.hardkernel.com/shop/92x92x25mm-dc-cooling-fan-w-pwm-speed-sensor-tacho/

92x92x15mm DC Cooling Fan w/ PWM, Speed Sensor (Tacho)

https://www.hardkernel.com/shop/92x92x15mm-dc-cooling-fan-w-pwm-speed-sensor-tacho/
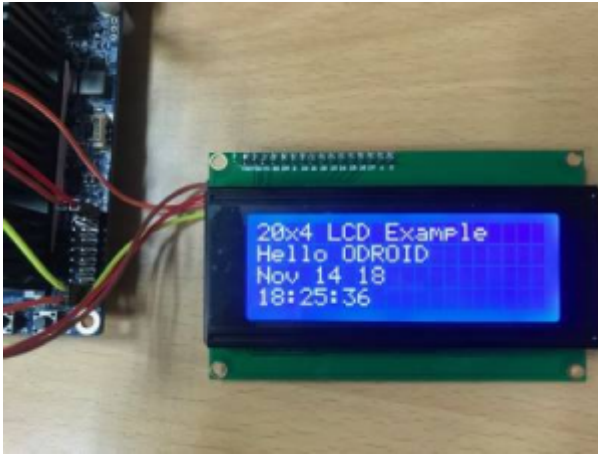
Accessories

VESA Mount kit for Case Type 1

https://www.hardkernel.com/shop/vesa-mount-kit/

LED Power Button for Case Type 1~4

https://www.hardkernel.com/shop/led-power-button/

I2C 20×4 LCD Module

https://www.hardkernel.com/shop/i2c-lcd-module/

WiFi Module 5BK

https://www.hardkernel.com/shop/wifi-module-5bk/

USB GPS Module

https://www.hardkernel.com/shop/usb-gps-module/

Weather Board 2

https://www.hardkernel.com/shop/weather-board-2/

RTC/BIOS Backup Battery(Spare part)

https://www.hardkernel.com/shop/rtc-backup-battery/

The only thing to grab the battery on the board is a 2mm pitch 2pin connector.
So it could be made annoying by unintended moving it around.
Especially, when attaching or detaching some modules or cases.
Furthermore, the battery has wrapped in a black plastic material that could be scratched off by hitting against the fan blades.
Use double-sided adhesive tape like these pictures to avoid those by fixing it to the audio panel. It is a simple but efficient solution.

From:

<https://wiki.odroid.com/> - **ODROID Wiki**

Permanent link:

<https://wiki.odroid.com/odroid-h4/start>

Last update: **2024/08/22 10:26**