

# Tech specs

The Commodore 64 Ultimate has two type of specifications, the real hardware specifications and the programmed specifications.

The 'Commodore 64' part is powered by [FPGA hardware](#).

Fundamentally, an FPGA-based Commodore 64 is a hardware recreation of the original computer.

The FPGA is programmed with the exact logic of the C64's CPU, video, sound, and I/O chips, so it behaves just like the 1982 hardware—even though the underlying chip is far more powerful.

For the user, the experience is indistinguishable from using a real C64: the same keyboard, ports, video output, and timing, allowing original software to run unchanged.

The being said, the actual hardware has more resources than an original C64 ever had available.

Because of that, the C64U has configuration options that the original did not have, 'Comfort of life' options. You can easily switch between PAL or NTSC video output, and have the ability to simulate original hardware, like a Commodore datasette or floppy drive, allocate more RAM or even increase the clock speed.

You **are not** going to run Windows or something like this on the C64U <sup>1)</sup> but it can behave as an extremely souped up original Commodore 64.

## Hardware specs

- **Core:** AMD Xilinx Artix-7 FPGA
- **Memory:** 128MB DDR2 RAM (16 MB system, 16 MB REU, 16 MB GeoRAM (soon), remaining MB RAM Disk), 16MB NOR flash
- **Video:**
  - 1080p @ 50Hz (PAL) or 60Hz (NTSC)
  - HDMI-certified
  - Virtually Zero-lag
  - DVI-compatible via HDMI
  - Analog via DIN-8: CVBS, S-Video, or RGB
- **Audio:**
  - 2 × SID sockets (6581/8580) with auto voltage and filter detection
  - UltiSID octal core FPGA SID emulation
  - SID-TAP header
  - On board piezo speaker for disk sounds and more
- **Controls:**
  - Rocker switch (power, reset, menu, freeze)
- **Storage & Compatibility:**
  - Operating System: Standard Commodore 64 or GEOS
  - USB thumbdrives: FAT, FAT32, exFAT
  - File formats: .D64, .D71, .D81, .G64, .T64, .TAP, .PRG, .ROM, and more

- Commodore 64 ROMs will be included under license or via guided ROM setup on first boot
- ISO-9660 image support
- Integrated Ultimate-II+ functionality with tape emulation and DMA loader
- **Keyboard:**
  - 66-key mechanical
  - Gateron Pro 3.0 55g switches (PTFE-free non-toxic lubed)
  - Original C64 layout and shapes
  - N-Key Rollover (NKRO): Press multiple keys at once - every one registers. No missed inputs.
- **Macros:**
  - Run long commands with a single keystroke.
- **Lighting:**
  - 70 RGB LEDs
    - Only Starlight and Founders edition. The basic edition has also the headers and software for it
  - Case and keyboard lighting thoughtfully integrated into motherboard and configurable via menu
  - Adjustable patterns, speeds, brightness

## Connections

- **USB:** 3 × USB-A 2.0, 1 × USB-C
  - **The USB ports can reach up to about 10 MB/s.**
- One of the USB-A ports is internal. Only the top internal one works
  - The internal USB-C port is used for the keyboard
  - Note: these ports are intended for use with mass storage devices only. It has been reported that USB keyboards do work. Other devices **do not** work with USB (like mouse, gamepad, joystick)
- **MicroSD:**
  - Internal slot (card sold separately)
    - **The SD card is working in 1-bit SPI mode at 25 Mbps (3.125 MB/s), thus this more than 3x slower than USB.**
- **Display Output:**
  - HDMI Video & Audio (1080p/16:9 compatible monitor req., cable included)
  - 8-pin DIN (CVBS, S-Video, or RGB via optional cable)



Although a stereo audio jack may physically accept a 3.5 mm headphone plug, using it this way is not recommended and **may potentially damage the device**. It is advised to treat this connector strictly as a **line-out** and use a headphone amplifier between the device and your headphones.

- **Audio:**
  - 3.5 mm stereo audio jack

- Optical S/PDIF
- **Networking:**
  - Ethernet (100 Mbps)
    - **Due to the software overhead, it can reach about 600 kB/s (4.8 Mbps) over TCP.**
  - Wi-Fi (built-in)
    - **The connection between the WiFi module and the FPGA is limited to 5 Mbit/s. Together with TCP overhead, it reaches about 300 kB/s.**



**DB-9 joystick/paddle ports** not all devices that have a DB-9 connector and work fine are advised to be used. Some devices are wired in a way that can damage your C64.

- **Expansion & Peripherals:**
  - Cartridge port (>99% compatible)
  - Datasette port (6-pin edge connector)
  - Disk drive port (6-pin IEC DIN)
  - 2 × DB-9 joystick/paddle ports
  - User port (26-pin internal, adapter sold separately)
- **Power:** 12V DC

fundamentals

<sup>1)</sup>

For those who want to run Windows on a C64 PC see [C64X in the Commodore.net store](#)

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