What is the most powerful single-board computer (SBC) today?

Single board computers are complete computers with components built to fit on a single circuit board, making them suitable for embedded applications and prototyping etc.

Most SBCs aren't really designed with power in mind, but with a lot of focus on cost and size, but there are a few options that are considered quite powerful for their size. So what is the most powerful single-board computer (SBC) today?

1. Raspberry Pi 4 Model REMOVED

Released in June 2019, the Raspberry Pi 4 Model B is currently the Raspberry Pi company's most powerful single-board computer. It has some notable upgrades compared to the previous Raspberry Pi Model 3B+. This product can be difficult to find in the market due to high demand from manufacturers and hobbyists, but at the official price point, Raspberry Pi 4B is still a great SBC.

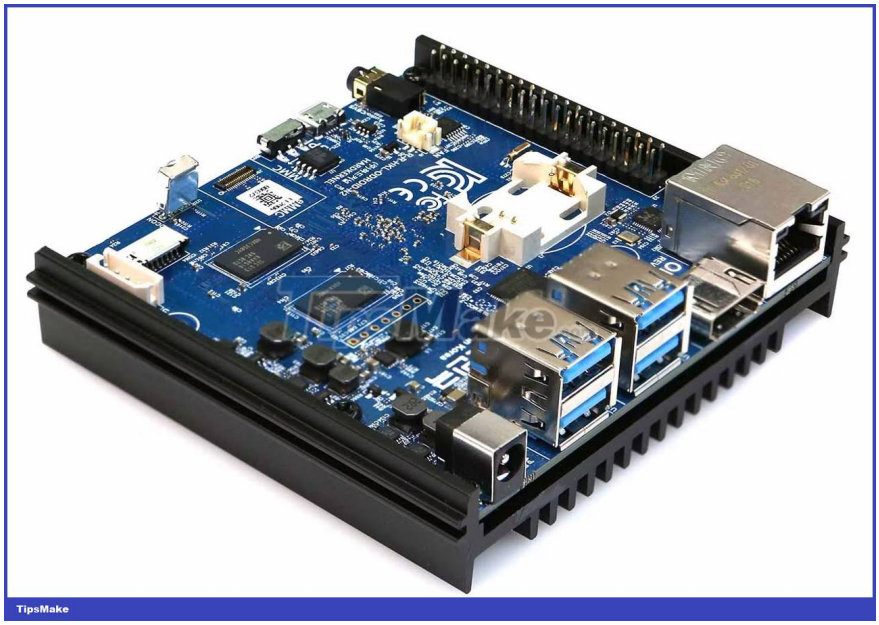
The Raspberry Pi 4 Model B comes with a quad-core processor clocked at 1.5GHz and offers 4 different RAM capacities ranging from 1GB to 8GB. It can run two 4K displays at the same time and the 40-pin GPIO header allows this SBC to be used for electronics and embedded development.

In addition to low cost and quite powerful, Raspberry Pi 4 Model B also has a fairly low power consumption. The biggest advantage of Raspberry Pi 4 is its after-sales support and large community, which is huge when compared to any other SBC.

Raspberry Pi 4: Key Specifications:

Processor	Broadcom BCM2711 SoC with Cortex-A72 64-bit @1.5GHz
Memory	1GB, 2GB, 4GB or 8GB RAM
Gate	40-pin GPIO connector, 2 x micro-HDMI (up to 4K@60Hz), 2 x USB 3.0, 2 x USB 2.0, 2-lane Display Port MIPI DSI, 2-lane MIPI CSI camera port, microSD card slot
Connect	Wireless IEEE 802.11ac 2.4 GHz and 5.0 GHz, Bluetooth 5.0, BLE, Gigabit Ethernet
Source	5V/3A power via USB-C and GPIO ports; capable of Power over Ethernet (PoE)

2. Odroid-N2+



Odroid-N2+ is a 2020 upgrade from Hardkernel's original Odroid-N2. The Odroid-N2+ is a direct competitor to the Raspberry Pi 4B and has a number of improved features that make it a more efficient but also more expensive board. The Odroid-N2+ is larger in size than the Raspberry Pi 4 and contains an eMMC socket for more on-board memory.

Available in 2GB and 4GB RAM versions, the Odroid-N2+ is based on the 6-core Amlogic S922X system-on-chip featuring a quad-core Cortex-A73 @2.4GHz and a dual-core Cortex-A53 @2.0GHz. A large metal heatsink is integrated into the case to minimize throttling and optimize performance. In addition, it has a Mali-G52 GPU (graphics processing unit).

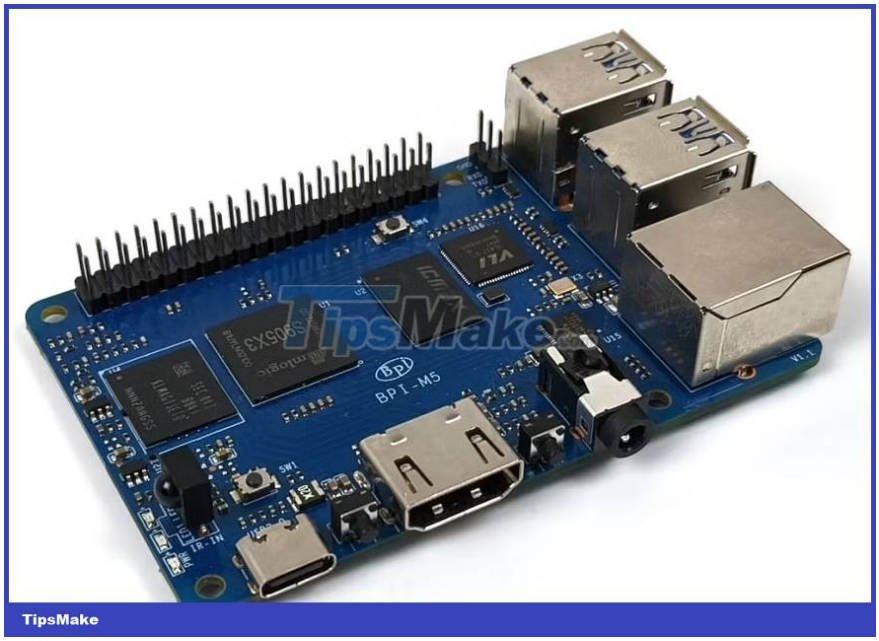
At $83 for the 4GB RAM version, the Odroid-N2+ has a good performance-to-cost ratio. Along with the microSD card slot, there is also a socket for storing the eMMC module.

The biggest downside is that the Odroid-N2+ lacks WiFi and Bluetooth onboard, so you'll need to use a dongle to add wireless connectivity. USB 3.0 ports also have the same single root hub, which can cause issues with data transfer speeds.

Main specifications of Odroid-N2+:

Processor	System-on-chip Amlogic S922X 6-core with quad-core Cortex-A73 @2.4GHz and dual-core Cortex-A53 @2.0GHz; GPU Mali-G52
Memory	2GB or 4GB RAM
Gate	40-pin GPIO connector, 1 x HDMI 2.0 (up to 4K@60Hz), 4 USB 3.0 ports, 1 x USB 2.0 OTG, eMMC module socket, microSD card slot
Connect	No Wi-Fi or Bluetooth on board, Gigabit Ethernet
Source	12V/2A via DC power jack

3. Banana Pi M5



Banana Pi M5 is a single-board computer released in 2020 by the Banana Pi team and aimed to compete with the Raspberry Pi 4 Model B. It has the same dimensions as the Raspberry Pi 4 and the specifications are similar, but there are a few difference.

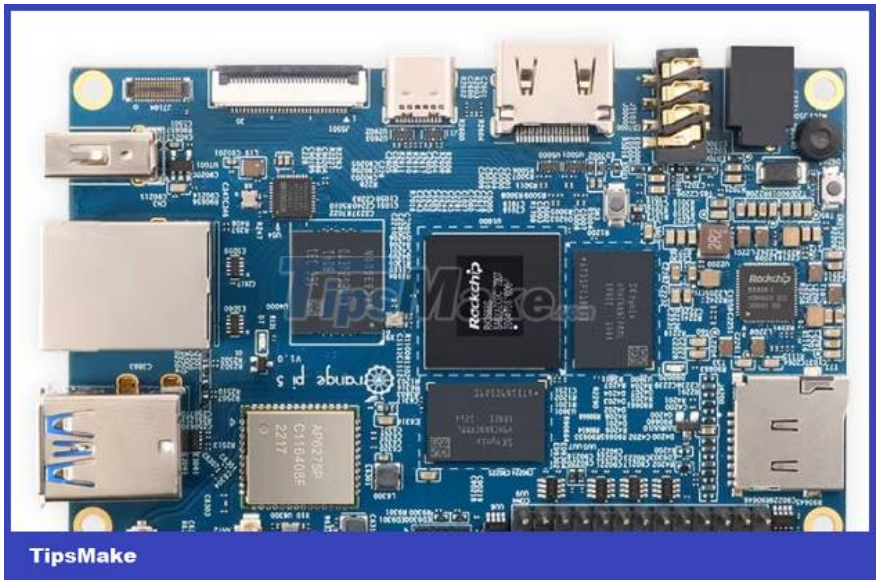
Along with a microSD card slot, the Banana Pi M5 benefits from 16GB of on-board eMMC storage. The reset, power, and U-boot switches are also a welcome addition and can be useful. Unlike the Raspberry Pi 4's mix of USB 2.0 and 3.0 ports, the Banana Pi M5 has four USB 3.0 ports.

One big downside is that there's no WiFi or Bluetooth on board, so you'll need to use an external module to add wireless connectivity. The processor is also older and less powerful than the Raspberry Pi 4B and other SBCs featured here.

Key specifications of Banana Pi M5:

Processor	Amlogic S905X3 quad core with Cortex-A53 @2.0GHz; GPU Mali-G31 MP2 @600MHz
Memory	4GB RAM
Gate	40-pin GPIO connector, 1 x HDMI 2.1 (up to 4K@60Hz), 3.5mm jack, 4 x USB 3.0, microSD card slot
Connect	Gigabit Ethernet; no WiFi or Bluetooth on board
Source	5V/3A via USB-C

4. Orange Pi 5



The Orange Pi 5 is an impressive single-board computer based on the powerful 64-bit, 8-core RK3588S system-on-chip and powerful Mali-G610 GPU. This is also an NPU (Neural Processing Unit) which makes it suitable for AI applications.

Orange Pi 5 uses the big.LITTLE architecture to deliver a combination of low power consumption and high performance depending on which of the two main processors is used. It can output video at up to 8K@60fps, which is an improvement over the Raspberry Pi 4 and most other SBCs. Alternatively, the USB-C port can be used as DisplayPort, while two of the three MIPI connectors can be used as display outputs.

One of the biggest downsides is that its GPIO header has only 26 pins compared to the 40 pins found on most SBCs. Also, there's no WiFi or Bluetooth on board, so you may need to use the M.2 slot to add an expansion module for wireless connectivity, instead of the SSD.

Orange Pi 5: Key Specifications:

Processor	Rockchip RK3588S 64-bit 8-core processor with 4-core A76+ (2.4GHz) and 4-core A55 (1.8GHz); GPU Mali-G610; 6 TOPS NPU
Memory	4GB, 8GB, 16GB or 32GB DDR4 RAM
Gate	26-pin GPIO connector, HDMI 2.1 (up to 8K@60Hz), 1 x USB 3.0 Type-A, 2 x USB 2.0 Type-A, USB-C 3.1 with DisplayPort 1.4, M.2 socket expansion slot M- KEY, 3 x MIPI connectors for camera or monitor, microSD card slot
Connect	Gigabit Ethernet; no WiFi or Bluetooth on board
Source	5V/3A via USB-C

5. Khadas Edge2

This SBC uses the same 8-core Rockchip RK3588S system-on-chip as the Orange Pi 5. It also has the same powerful GPU and 6 TOPS NPU. However, the Khadas Edge2 has a few notable differences, such as more RAM, built-in WiFi and Bluetooth, embedded storage, and better official support.

Along with the sleek design, the key advantages of Khadas Edge2 include 32GB or 64GB of eMMC storage onboard. An optional IO module sold separately adds even more storage and connectivity options. Edge2's Embedded OS Wizard, OOWOW, makes setup a breeze.

The downsides of the Khadas Edge2 include the lack of onboard Ethernet and a microSD card slot. Unlike other SBCs, Edge2 lacks a standard GPIO header, instead, there are two 30-pin edge IO connectors on the underside. The IO module adds 16 standard GPIO pins.

Edge2 is also the most expensive SBC on the list: The base model is $100 more expensive than the Orange Pi 5. Both boards feature on the list of top ARM SBCs with over 8 CPU cores.

Key Specifications of Khadas Edge2:

Processor	Rockchip RK3588S 64-bit 8-core processor with 4-core A76+ (2.4GHz) and 4-core A55 (1.8GHz); GPU Mali-G610; 6 TOPS NPU
Memory	8GB or 16GB LPDDR4 RAM
Gate	HDMI 2.1 (up to 8K@60Hz), 1 x USB-C (Power Delivery only), 1 x USB-C (3.1, Display Port 1.4 and Power Delivery), 1 x USB 2.0, 1 x USB 3.0, 2 x inputs 30-pin IO connector, 3 MIPI CSI connectors, 2 MIPI DSI connectors, 7 x pogo pad

Connect	Bluetooth 5.0, WiFi 6 IEEE 802.11 ax/ac/a/b/g
Source	5V/3A via USB-C

And the most powerful single-board computer is…

Khadas Edge2 is the most powerful ARM-based single-board computer you can buy right now. With an 8-core processor, up to 16GB of RAM and 32GB of eMMC storage, as well as built-in WiFi and Bluetooth, it packs a lot of power in a board that weighs just 25g and measures 82.0 x 57 ,5 x 5.7 mm.

Next on the list is the Orange Pi 5 with the same SoC as the Khadas Edge2, then the Odroid N2+, then the Raspberry Pi 4 Model B. Banana Pi M5 ranks last, but the more powerful Banana Pi M6 model will be released in year 2023.

If you're looking for alternative SBCs, be sure to go through this list of Raspberry Pi alternatives worth considering.

Strength is not everything

The Raspberry Pi 4 Model B is a very popular board that strikes a balance between price and functionality, but it has been slowly overtaken by newer boards in terms of power. These boards are perfect when you need something that delivers a little extra power for heavy computing tasks.

However, you should note that poor software support and a smaller user community are major downsides to some of the options on this list, which is where the Raspberry Pi shines. As always, your specific use case should take precedence over compelling specs.