Intel Core i9-12900K review: Powerful, no competition

Intel's Core i9-12900K is a premium product that doesn't even have a competitor from AMD.

The 12th generation of Intel processors proved to be a significant leap for the silicon giant. After a few years of lagging behind AMD, Intel has regained its lead. Intel's Core i9-12900K is a premium product that doesn't even have a competitor from AMD. It's better and faster than AMD's flagship processors. Let's evaluate the Intel Core i9-12900K through the following article!

Who is Intel Core i9-12900K suitable for?

This processor is probably the best choice if:

1. You want a high-end CPU with great all-round performance
2. You are a gamer and you live and especially care about your PC's frames per second
3. You intend to build a high-performance computer that is more powerful than anything you can achieve with an AMD processor.
4. If you have the necessary budget to buy this processor and accept the higher power consumption. The price of this processor is now nearly 20 million dong!

Hardware Specifications

Core i9-12900K is one of Intel's high-end Alder Lake desktop processors. In fact, it's second only to the Intel Core i9-12600KS, which can boost frequencies up to 5.50GHz. i9-12900K has a maximum speed of up to 5.20GHz, comes with 16 cores and 24 threads, 30MB Intel Smart Cache and integrated Intel UHD Graphics 770 chip.

Like all other 12th Gen Intel Alder Lake processors, this processor also comes with different core types, some built for high performance and others built for performance. energy saving. Out of the total 16 cores of the i9-12900K, 8 are P-cores (performance cores) running at the standard frequency of 3.2GHz and can be boosted to 5.1GHz. The remaining 8 cores are cores built for efficiency, also known as E-cores. They run at a slower clock speed of 2.4GHz and can reach a maximum speed of 3.9GHz.

P-cores are used for demanding tasks such as games and performance-demanding applications, while E-cores are used for less demanding tasks and jointly aim to deliver capabilities. Excellent multitasking. The P-cores are also the only ones with HyperThreading technology. Therefore, even though the Intel Core i9-12900K processor has 16 cores, only 8 of them double in number of threads.

The unorthodox architecture based on two different sets of cores means that software needs to be involved to benefit the most from what they can do. While 12th Gen CPUs work well with Windows 10 or Linux distributions, they unleash maximum performance only in Windows 11. At least, for now, it's the only operating system that knows when to need it. dealing with P-cores and when to use E-cores.

In terms of memory, the Intel Core i9-12900K supports up to 128GB of DDR4 or DDR5 RAM in dual-channel. However, support is exclusive, meaning you won't find motherboards with DIMM slots for both DDR4 and DDR5. You will only find motherboards that support DDR4 or DDR5, so choose carefully before spending money on a processor. However, if you're considering a high-end Intel Core i9-12900K, you'll probably also want a high-end motherboard, so look for one that comes with DDR5, not DDR4.

The Intel Core i9-12900K is built to support PCI Express 5.0 and 4.0. There are 20 PCIe lanes split between the graphics card (x16) and the NVMe SSD (x4). Or they can also be split into two cards running on 8 lanes (x8) and an SSD on 4 lanes (x4).

As for power consumption, you probably already know that Intel no longer specifies the TDP (Thermal Design Power) spec. Honestly, TDP is never a good indicator of real power requirements. For the Intel Core i9-12900K, the PBP value is 125W, while the MTP is 241W!

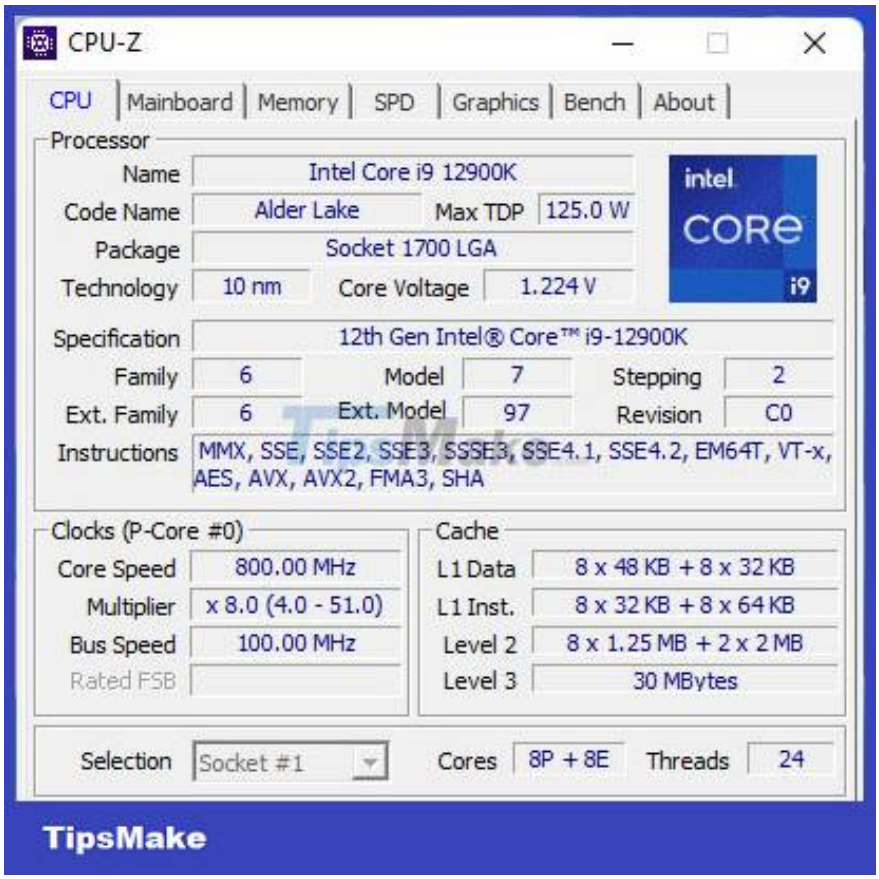
Performance in benchmarks and games

The Intel Core i9-12900K processor has been tested on a PC using the following hardware and software:

1. Motherboard: Gigabyte Z690 Aorus Master
2. RAM: Kingston Fury Beast DDR5-6000 32 GB
3. Graphics Card: ASUS ROG Strix Radeon RX 6650 XT OC Edition (8 GB, PCIe 4.0)
4. Memory: Kingston Fury Renegade SSD (2 TB, PCI-Express 4.0)
5. Power supply: ASUS ROG Thor 850 W Platinum
6. Operating system: Windows 11 Pro version 21H2 Build 22000.675

To get a better picture of the level of performance that Intel Core i9-12900K delivers, the article compared it with AMD Ryzen 9 5900X (up to 4.80GHz, 12 cores, 24 threads).

Starting with the CPU-Z single-threaded performance test, the benchmarks for the Intel Core i9-12900K have an astounding 824 points, far ahead of the 654 points achieved by the AMD Ryzen 9 5900X. The i9-12900K is 26% faster in a single thread.



In the CPU-Z multi-threaded benchmark, once again, the Intel Core i9-12900K scores a huge 11426 points! Although it has fewer cores than the AMD Ryzen 9 5900X, it is proven to be 23% faster in multi-threaded mode.

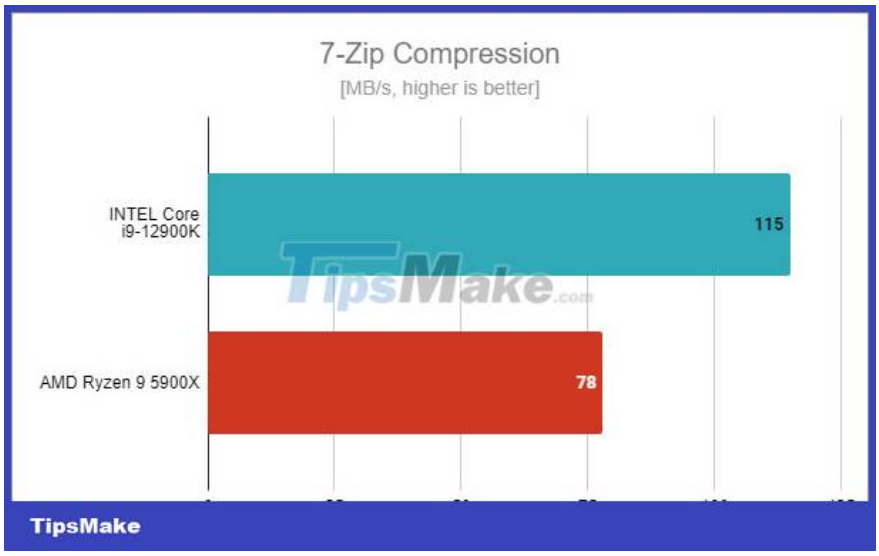
Moving on to the rendering benchmark, in Cinebench R23, the Intel Core i9-12900K scored for all cores of 27146 points. That's an amazing result: the i9-12900K is 33% faster than the AMD Ryzen 9 5900X.

In Blender, a popular rendering standard, the Intel Core i9-12900K achieved an average score of 378 points. This number is 19.6% higher than the 316 points of the AMD Ryzen 9 5900X.

Next, let's move on to PCMark 10, which is a great benchmark of computer performance in everyday tasks like web browsing, online meetings, office work, and digital content creation. On a computer equipped with the Intel Core i9-12900K, the score achieved was excellent (9476 points), which equates to a 13% increase in performance compared to a computer with an AMD Ryzen 9 5900X.

Next, JetStream 2, a series of tests specifically designed to benchmark web browsing. Intel Core i9-12900K 22% faster than Ryzen 9 5900X!

In 7-Zip, the Intel Core i9-12900K achieved a compression speed of 115MB/s. i9-12900K performs much better than AMD Ryzen 9 5900X (up to 47% faster)!



The only surprise was when looking at the decompression speed measured in 7-Zip. While still excellent, the Intel Core i9-12900K is 12% slower than the AMD Ryzen 9 5900X in this test…

Moving on to the game aspect. The first is a synthetic benchmark that measures the processor's gaming performance: 3DMark CPU Profile. The Intel Core i9-12900K achieved an all-core score of 11705 points, 14% higher than the AMD Ryzen 9 5900X CPU!

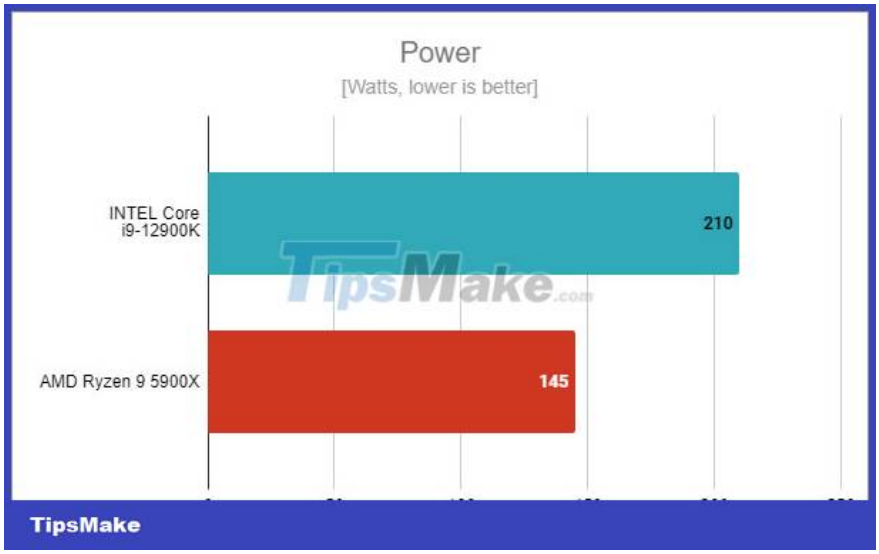
In Shadow of the Tomb Raider, using the Intel Core i9-12900K, the measured frame rate was 258 fps, 8.8% more than the AMD Ryzen 9 5900X.

In Metro Exodus, still a very hardware demanding game these days, it's clear that the graphics card has taken a toll on both CPUs. Both test computers only achieved about 143 ~ 144 frames per second.

In Assassin's Creed Valhalla, the Intel Core i9-12900K displayed fewer frames per second than the AMD Ryzen 9 5900X.

To see how hot the Intel Core i9-12900K is, the article used the AIDA64 stability tests. The maximum temperature reached by the processor is very high: 96 degrees Celsius (~205 degrees Fahrenheit). If you intend to buy this processor, make sure to retrofit a powerful cooling solution.

Finally, the maximum amount of power consumed by the Intel Core i9-12900K is calculated. On the test computer, the Intel Core i9-12900K power consumption has reached 210W, higher than what AMD's Ryzen 9 5900X claims, but still below the official specifications.



Advantages

1. One of the best high-end processors
2. Going beyond 5GHz, reaching 5.20GHz
3. Has 16 cores and 24 threads combined for class-leading multi-threaded performance
4. Supports PCI Express 5.0 and 4.0
5. Works with both fast DDR4 and DDR5 memory

Defect

1. Consume a lot of power
2. Very hot, so a powerful cooling solution will be required

Conclusion

Intel Core i9-12900K is one of the best processors available today. It surpasses AMD's top performing desktop processors, and the price is also really competitive. If you want to build a high-end computer and are ready to invest in a new motherboard, as well as DDR5, then the Intel Core i9-12900K is probably the best choice for you. The Intel Core i9-12900K is extremely suitable for all PC enthusiasts, gamers, and professionals who can afford it.

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