

Intel Core i9-10900K Review: Named the best gaming CPU on the market

Although the technology is considered to be somewhat outdated, i9-10900K still fulfills its mission: serving gamers better than any CPU on the market.

Last week, Intel officially launched the 10th generation of Core i, codenamed Comet Lake-S, the CPU series for their most successful mainstream users. Indeed, with the rise of AMD Ryzen from the beginning of 2017, the market's expectations for Chipzilla are huge every time they launch a new generation of CPU.

So, knowing that Comet Lake-S is manufactured on the 14nm + process, users and technology circles are quite disappointed, especially when rival AMD Ryzen 3000 series is manufactured on TSMC's 7nm process from last year. Although Intel's transistor density is always superior to TSMC or Samsung, the gap of 14nm and 7nm is quite difficult to fill.

However, to talk about performance, Intel Core i 10000 series in general or Intel Core i9-10900K in particular are still formidable. While the multi-core performance is a bit inferior to the Ryzen 9 3900X because of the fewer cores, the i9-10900K's gaming performance is still the best on the market. Even thanks to the high clock speed, i9-10900K also surpassed R9 3900X in some tests. Of course, these improvements also come with a lot of tradeoffs, which will be further elaborated later in the review.



In this review, the Core i9-10900K CPU comes packaged in a test suite for the media, or press kit. Images of retail product packaging can easily be found on Google. Intel's signature blue press kit and logo and product name: Core 10. The press kit includes the Core i9-10900K and i5-10600K (to be evaluated in a separate article).



Despite using the all-new LGA 1200 socket, the size of the 10th generation Core i CPUs is almost no different from the Coffee Lake CPUs using the LGA 1151 socket. The most recognizable point is probably the design of the IHS heatsink, introduced by Intel, is a bit thicker and a great help for cooling the CPU. Despite the same chip size, the i9-10900K CPU has up to 10 cores, nearly double the number of the next i7-8700K.



One of the appreciated features of the new socket generation is that despite the small change in size, the CPU heatsinks for LGA 115x socket CPUs are still fully compatible. As a result, users wishing to upgrade the machine will not have to think about the cost of buying a new heat sink or even buying a new CPU water block if playing custom water cooling.



Test configuration:

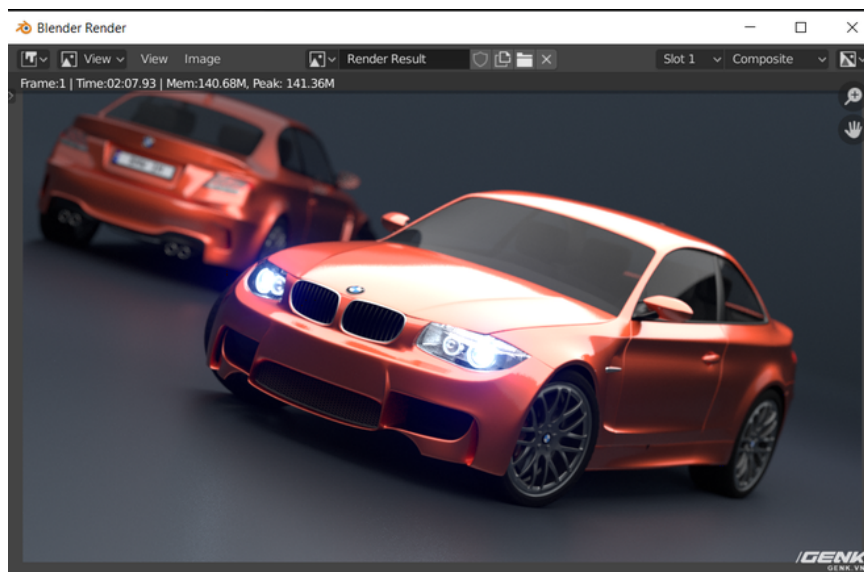
- CPU: Intel Core i9-10900K
- RAM: Corsair Vengeance LPX 2x16GB 3200MHz CL16
- Mainboard: Gigabyte Z490 AORUS Master
- VGA: EVGA RTX 2080 Super XC Ultra Hybrid
- NVMe: Samsung PM981 1TB
- Cooling CPU: Arctic Liquid Freezer II 240mm
- PSU: Corsair SF750

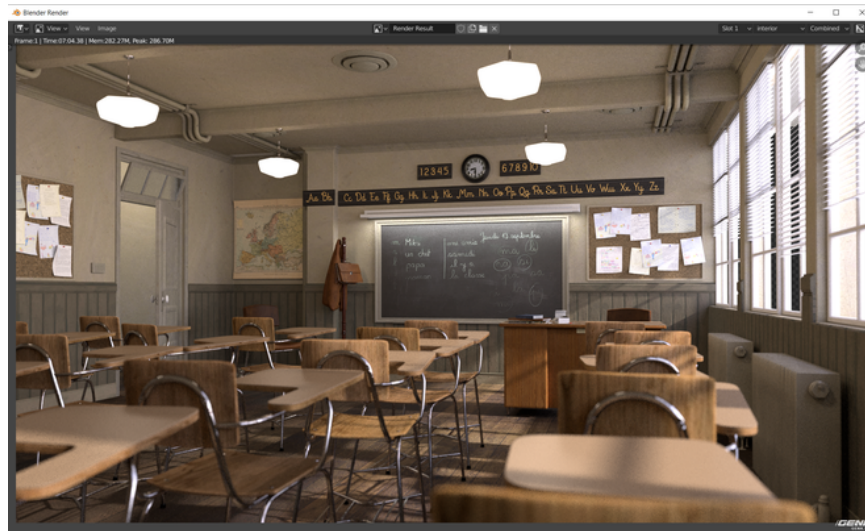
In the test configuration, the Gigabyte Z490 AORUS Master motherboard was chosen by having a super 16-phase VRM array with 2 8-pin EPS power pins, ensuring the voltage for the i9-10900K top CPU. In addition, AIO radiator sized 240mm radiator and thickness above 30mm will be the minimum for this CPU.

Your System		Your System	
Processor	Intel Core i9-10900K CPU	Processor	Intel Core i9-10900K CPU
Cores x GHz	10 Cores, 20 Threads @ 3.7 GHz	Cores x GHz	10 Cores, 20 Threads @ 3.7 GHz
OS	Windows 10, 64 Bit, Professional Edition (build 18363)	OS	Windows 10, 64 Bit, Professional Edition (build 18363)
GFX Board	GeForce RTX 2080 SUPER/PCIe/SSE2	GFX Board	GeForce RTX 2080 SUPER/PCIe/SSE2
Info		Info	

Ranking		Ranking	
CPU (Single Core)	Details		
1. 10C/20T @ 3.7 GHz, Intel Core i9-10900K CPU	527	1. 48C/96T @ 2.7 GHz, Intel Xeon Platinum 8168 CPU	16536
2. 4C/8T @ 4.2 GHz, Intel Core i7-7700K CPU	476	2. 60C/120T @ 2.8 GHz, Intel Xeon CPU E7-4890 v2	12986
3. 16C/32T @ 3.4 GHz, AMD Ryzen Threadripper 1950X 16-Core P	400	3. 16C/32T @ 3.4 GHz, AMD Ryzen Threadripper 1950X 16-Core P	6670
4. 48C/96T @ 2.7 GHz, Intel Xeon Platinum 8168 CPU	379	4. 10C/20T @ 3.7 GHz, Intel Core i9-10900K CPU	6491
5. 8C/16T @ 3.4 GHz, AMD Ryzen 7 1700X Eight-Core Processor	378	5. 8C/16T @ 3.4 GHz, AMD Ryzen 7 1700X Eight-Core Processor	3455
6. 4C/8T @ 2.6 GHz, Intel Core i7-6700HQ CPU	359	6. 12C/24T @ 2.7 GHz, Intel Xeon CPU E5-2697 v2	3225
7. 4C/8T @ 2.3 GHz, Intel Core i7-4850HQ CPU	298	7. 12C/24T @ 2.66 GHz, Intel Xeon CPU X5650	2705
8. 4C @ 3.3 GHz, Intel Core i5-3550 CPU	283	8. 4C/8T @ 4.2 GHz, Intel Core i7-7700K CPU	2420
9. 2C/4T @ 2.3 GHz, Intel Core i5-5300U CPU	280	9. 4C/8T @ 2.6 GHz, Intel Core i7-6700HQ CPU	1647
10. 12C/24T @ 2.7 GHz, Intel Xeon CPU E5-2697 v2	255	10. 4C/8T @ 2.3 GHz, Intel Core i7-4850HQ CPU	1509
11. 60C/120T @ 2.8 GHz, Intel Xeon CPU E7-4890 v2	197	11. 4C @ 3.3 GHz, Intel Core i5-3550 CPU	1059
12. 12C/24T @ 2.66 GHz, Intel Xeon CPU X5650	191	12. 2C/4T @ 2.3 GHz, Intel Core i5-5300U CPU	541

When tested, the single-core and multi-core performance of the i9-10900K will be measured using Cinebench R20, a popular testing tool with easy-to-understand numbers and a comparison table. As can be seen, the single-core performance of i9-10900K is still the strongest in the market. Its multi-core performance, on the other hand, is somewhat inferior due to having up to 2 cores / 4 threads compared to rivals in the price range.





Continuing to be the 3D rendering performance through Blender application with 2 most common tests today: BMW and Classroom. In both tests, the render time was 02'07 "and 07'04" respectively, only about 10% inferior to the opponent while losing 20% multiplier / thread. It can be seen that IPC is still something that makes Intel proud, to fill in some differences in cores and threads.

11 958 in Time Spy v1.0

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Graphics score		CPU score	
Graphics test 1	73.85 FPS	CPU test	48.82 FPS
Graphics test 2	67.89 FPS		

5 484 in Time Spy Extreme v1.0

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Graphics score		CPU score	
Graphics test 1	33.72 FPS	Average simulation time per frame	50.7 ms
Graphics test 2	30.97 FPS		

wPrime Benchmark v2.10

wPrime HWBOT.ORG

Scores

1024M - 63.878 sec (*)

Upload Score
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Load Score OK

JetStream2

JetStream 2 is a JavaScript and WebAssembly benchmark suite focused on the most advanced web applications. It rewards browsers that start up quickly, execute code quickly, and run smoothly. For more information, read the [in-depth analysis](#). Bigger scores are better.

176.631

Score

GENK

AIDA64 GPGPU Benchmark

- GPU: nVIDIA GeForce RTX 2080 SUPER (TU104)
1830 MHz, 3072 cores, 48 CUs, Driver 432.00
- CPU: Intel Core i9-10900K (Comet Lake-S)
3700 MHz, 10 cores, 20 threads



	GPU	x64 CPU
Memory Read	12308 MB/s	47262 MB/s
Memory Write	12246 MB/s	48041 MB/s
Memory Copy	407993 MB/s	46656 MB/s
Single-Precision FLOPS	12067 GFLOPS	1566 GFLOPS
Double-Precision FLOPS	371.3 GFLOPS	783.1 GFLOPS
24-bit Integer IOPS	11978 GIOPS	701.9 GIOPS
32-bit Integer IOPS	11978 GIOPS	702.0 GIOPS
64-bit Integer IOPS	2824 GIOPS	97.89 GIOPS
AES-256	32189 MB/s	55831 MB/s
SHA-1 Hash	100156 MB/s	14045 MB/s
Single-Precision Julia	3778 FPS	519.6 FPS
Double-Precision Mandel	105.7 FPS	273.6 FPS

AIDA64 v6.25.5400 (c) 1995-2020 FinalWire Ltd.

Save

Results

Start Benchmark

Close
GENK
GENK.VN

1425

Single-Core Score

11603

Multi-Core Score

Geekbench 5.1.1 Tryout for Windows x86 (64-bit)

Result Information

Upload Date	May 23 2020 02:48 PM
Views	1

System Information

System Information	
Operating System	Microsoft Windows 10 Pro (64-bit)
Model	Gigabyte Technology Co., Ltd. Z490 AORUS MASTER
Motherboard	Gigabyte Technology Co., Ltd. Z490 AORUS MASTER
Processor Information	
Name	Intel Core i9-10900K
Topology	1 Processor, 10 Cores, 20 Threads
Identifier	GenuineIntel Family 6 Model 165 Stepping 5
Base Frequency	3.70 GHz
Maximum Frequency	5.10 GHz
Package	Socket 1200 LGA
Codename	Comet Lake
L1 Instruction Cache	32.0 KB x 10
L1 Data Cache	32.0 KB x 10
L2 Cache	256 KB x 10
L3 Cache	20.0 MB x 1
Memory Information	
Size	32.00 GB
Frequency	1599 MHz
Type	DDR4 SDRAM
Channels	2

GENK

24 329 in Fire Strike v1.21

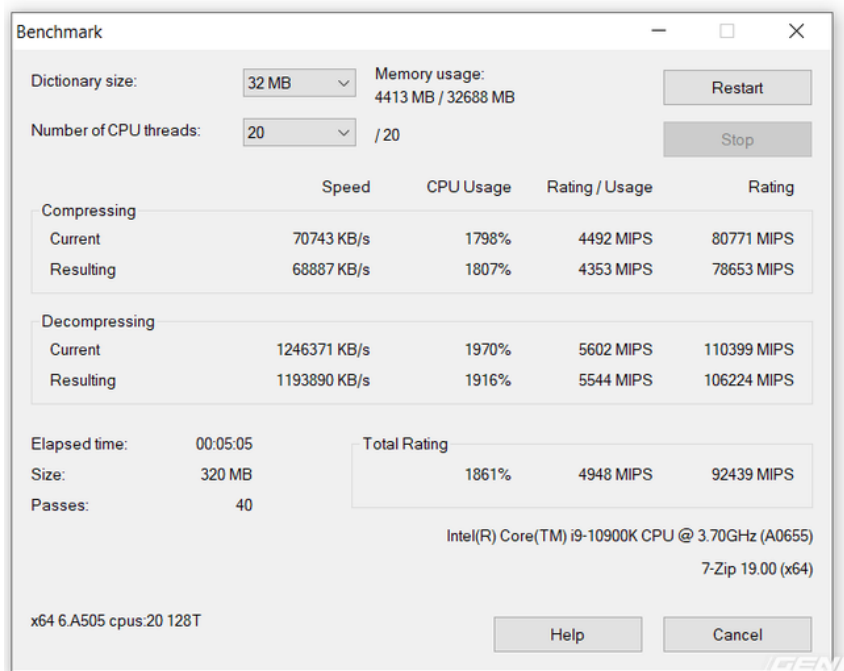
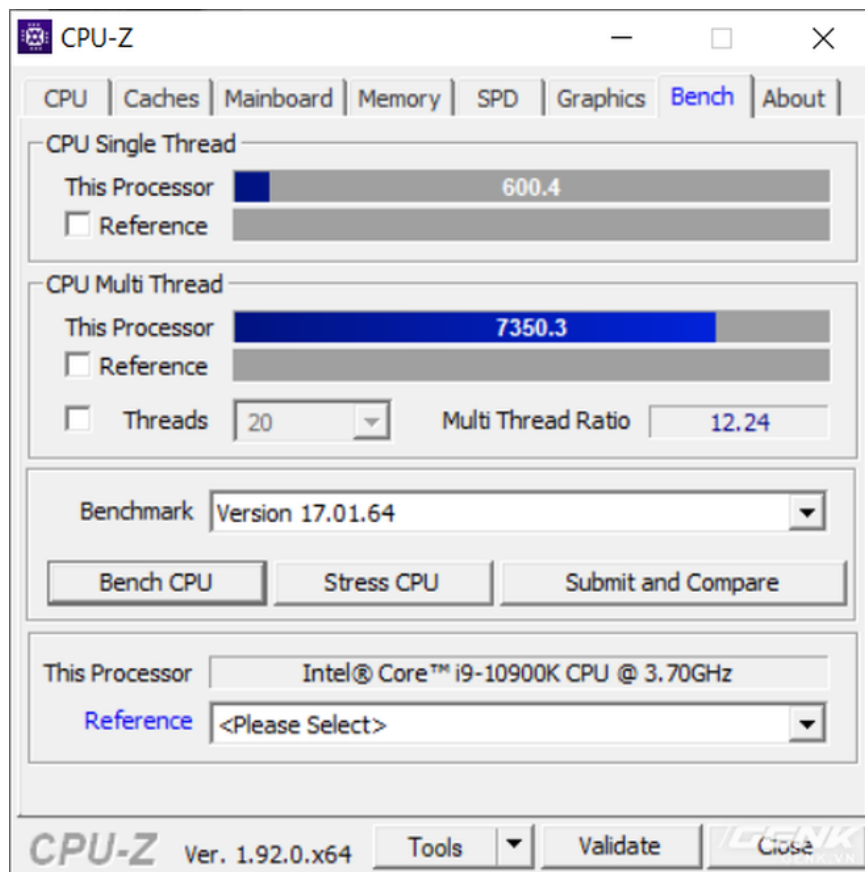
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SAVE

VALIDATE AND COMPARE RESULT ONLINE

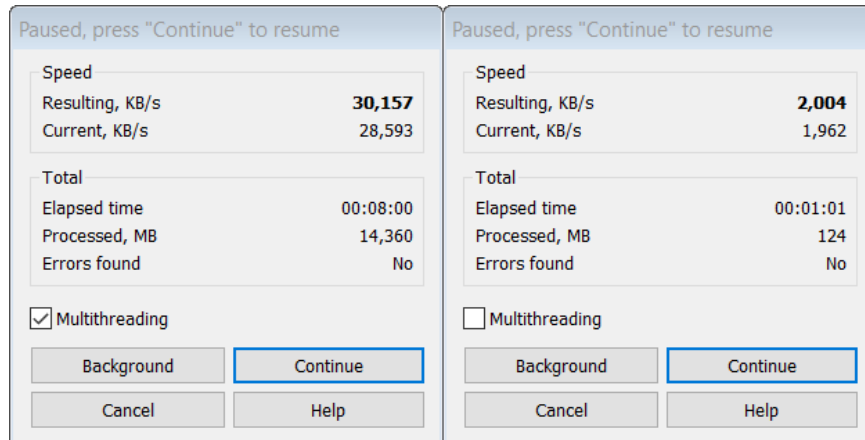
Graphics score		Physics score		Combined score	
28 505		30 644		10 101	
Graphics test 1	139.19 FPS	Physics test	97.35 FPS	Combined test	46.99 FPS
Graphics test 2	111.70 FPS				

GENK



In other tests such as 3DMark Timespy, Firestrike, 7-zip, Mozilla Kraken, Jetstream v2, . the score of i9-10900K is quite equal, with worse points than the opponent despite having less than 2 cores 4 streams. This disadvantage

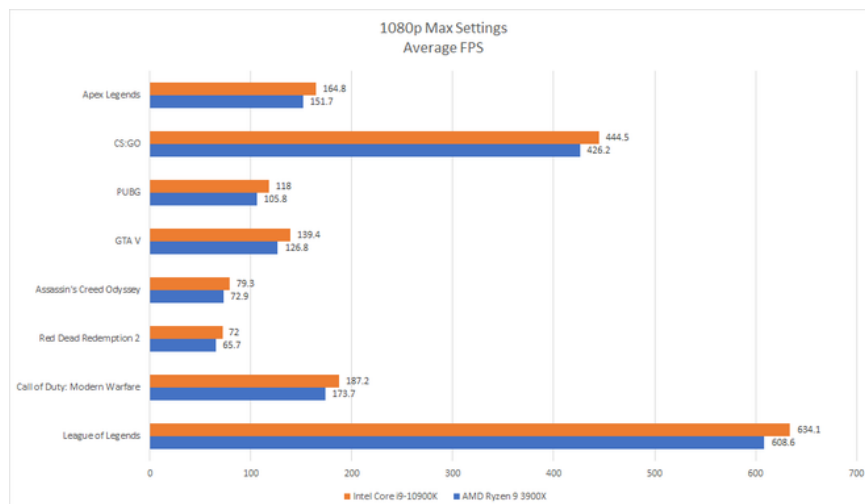
also leads to scores such as CPU-Z losing to the opponent by 20%.

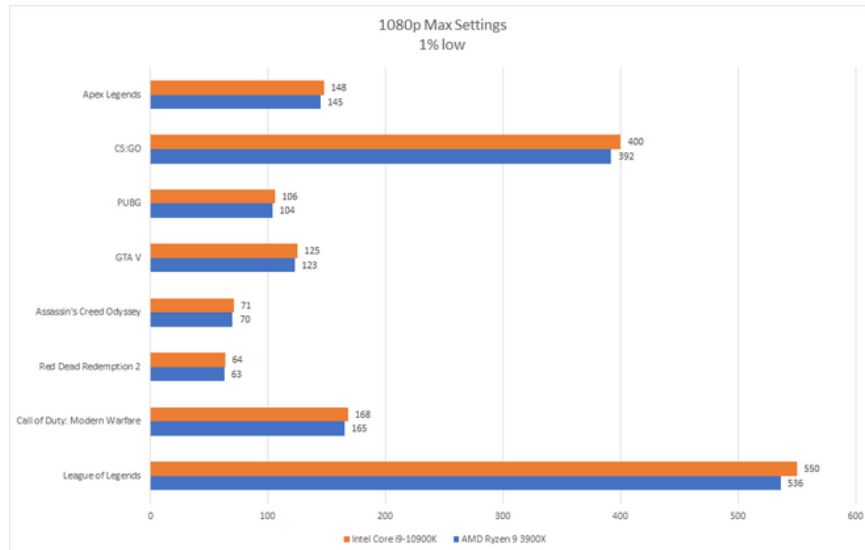


In fact, the above figures only represent the pure power of the CPU. So what about the actual test? Take for example the built-in benchmark tool of WinRAR, the file packer / extractor used by most PC users. Core i9-10900K gives single and multiple cores scores nearly double that of the competition. The culprit of this extremely unexpected score is that the architecture of WinRAR or many of the applications on the market today are not compatible with Ryzen's microarchitecture with threads that can be placed in different complex kernel clusters. . Therefore, many users still subjectively assess that using Intel, the task processing or the actual user experience is always smoother.

So is Intel's claim of Core i9-10900K the "strongest gaming CPU" realistically true? The answer will certainly be encapsulated in one word "Yes". For tech enthusiasts, having multiple cores / threads is always what they aim for. However, the actual experience, especially the game, is sometimes not proportional to the multiplier / thread.

Because of the limited availability of components, today's review only has the RTX 2080 Super GPU to pair with the i9-10900K. Even when powered by just one near-peak GPU instead of the RTX 2080 Ti, the Core i9-10900K easily proves its market leader in gaming CPUs. At first glance, 2020, but running the game at 1080p with the test configuration in the article does not seem appropriate, but in fact, playing games at low resolution will create more work for the CPU so that it can radiate. shining.





As can be seen, in most of the games tested, Core i9-10900K is always marginally better than the opponent, especially at the low 1%, showing the lowest frame rate of 1%. The high minimum number of frames will help the game experience always smooth, instead of the average number of FPS but fluctuating continuously, causing the experience to be not smooth. The ideal condition is always a 1% low FPS number above the screen's scan frequency. High clock speeds, high IPC as well as thorough product testing with many different types of applications, especially the game, have contributed to a much smoother gaming experience than the competition.

CPU [#0]: Intel Core i9-10900K: DTS				
Core 0	31 °C	26 °C	88 °C	51 °C
Core 1	40 °C	26 °C	81 °C	49 °C
Core 2	33 °C	26 °C	88 °C	51 °C
Core 3	32 °C	27 °C	85 °C	50 °C
Core 4	29 °C	25 °C	88 °C	50 °C
Core 5	31 °C	26 °C	85 °C	50 °C
Core 6	30 °C	26 °C	86 °C	50 °C
Core 7	30 °C	26 °C	85 °C	49 °C
Core 8	31 °C	27 °C	81 °C	50 °C
Core 9	31 °C	26 °C	82 °C	51 °C
CPU Package	36 °C	28 °C	93 °C	57 °C
Core Max	40 °C	27 °C	88 °C	57 °C
CPU Package Power	42.585 W	6.793 W	284.518 W	36.453 W

In terms of temperature and power consumption, indeed squeezing the 14nm process to the limit also causes inadequacies. First, inserting 10 cores into the same silicon base as well as opening the multiplier so that the CPU can boost up to 4.9 GHz and even up to 5.3 GHz with Intel Verlocity Thermal Boost technology if equipped Terrible heat dissipation.

Therefore, during the test, there are times when the temperature can rise up to 93 degrees Celsius but right after that it returns to an average of 50-60 degrees Celsius. It must also be recognized Intel and its engineering team. have researched and made the right decision on how to laminate silicon substrates and increase IHS thickness to optimize heat dissipation. However, power consumption is also a problem due to physical limitations. At times, the CPU's own power consumption can reach 250-300W. To serve the overclocking needs, the auxiliary configuration for i9-10900K will certainly be a PSU with a real capacity of about 750W or more.

To sum up, the Core i9-10900K still shows the true performance with the name "best gaming CPU on the market" that Intel gave it. Despite being very close to the physical limit of the 14nm process, Intel still knows how to surpass competitors in areas where it has an advantage. In addition, Intel CPU performance in general is not affected too much by the RAM clock.

Although Comet Lake-S is flawed when it does not support the latest PCIe 4.0 standard, Intel 400 series motherboards on the market today are "PCIe 4.0 Ready", ready to be activated with the next generation Core i . For the individual writer, i9-10900K in particular and Intel Core 10 in general are hinged CPUs to create momentum for Intel to build its unique position in the market for CPUs for general-purpose desktops, especially when AMD is also slowing down in terms of cores / threads on its Ryzen CPUs, including the Ryzen 4000 that is rumored to be released this year. If your main need is gaming, Intel Core i Gen 10 is still the best choice, just remember to invest a little cool to take advantage of the CPU's capacity.

Advantages:

- The best gaming performance on the market
- The temperature is controlled very well thanks to small improvements but makes a big difference
- High frequency beat the loss of the number of cores / streams
- Not affected by too much RAM clock

Defect:

- The 14nm semiconductor technology has lifespan up to 5 years of age
- Maybe quite expensive electricity
- Can investor attention on radiator

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