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CPU Report

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After scouring the internet and finding some of the most expensive CPUs on the market, we decided to analyze the Intel® Core™ i7-8850H Processor. As avid Apple fans, we wanted to learn more about the computer that we work so closely with on a day to day basis. We also wanted to get to know more about the computer that sends us to the Apple store every few weeks for a repair.

The 8th generation Intel Core i7 processor has a retail price of $395, and is mainly used for personal computers or tablets. It has six cores and twelve threads, with a processor base frequency of 2.60 GHz and a **maximum turbo frequency** is 4.30 GHz. The CPU cache size is 9 MB using the Intel Smart Cache. The Intel Smart Cache allows all of the cores of the machine to dynamically share access to the last level cache. The Smart Cache benefits programmers as there are more opportunities to share data between threads that are running on separate cores - this allows for programs to run more efficiently. Another benefit of the Smart Cache comes into play if one of the cores idle during execution time - the other core can take the data from the shared cache and continue with the intended process. In comparison to a regular per-core cache system, the cache miss rate decreases when the cache space is divided equally between the cores. Many thought that the name "Smart Cache" was just another marketing technique by Intel, however it proved to truly be smarter than the other cache systems on the market.

The Intel Core i7 processor is generally used for higher end desktops and laptops. Apple uses this specific CPU for the 2018 MacBook Pro 15-inch model, and the i9 is used for the more powerful 15-inch MacBook Pro.

Intel® Core™ i7-8850H Processor is based on the Coffee Lake microarchitecture and is the successor to Kaby Lake. Coffee Lake was introduced in 2017 and is manufactured on a **14 nm (nanometer) lithography process**. This processor is one of Intel's most mature 14 nm semiconductors since its release in 2014. Coffee Lake is revolutionary for Intel because it features one of the first mass produced, main market hexa core processors from Intel. Attached below is a diagram image of an Intel Hexacore processor:
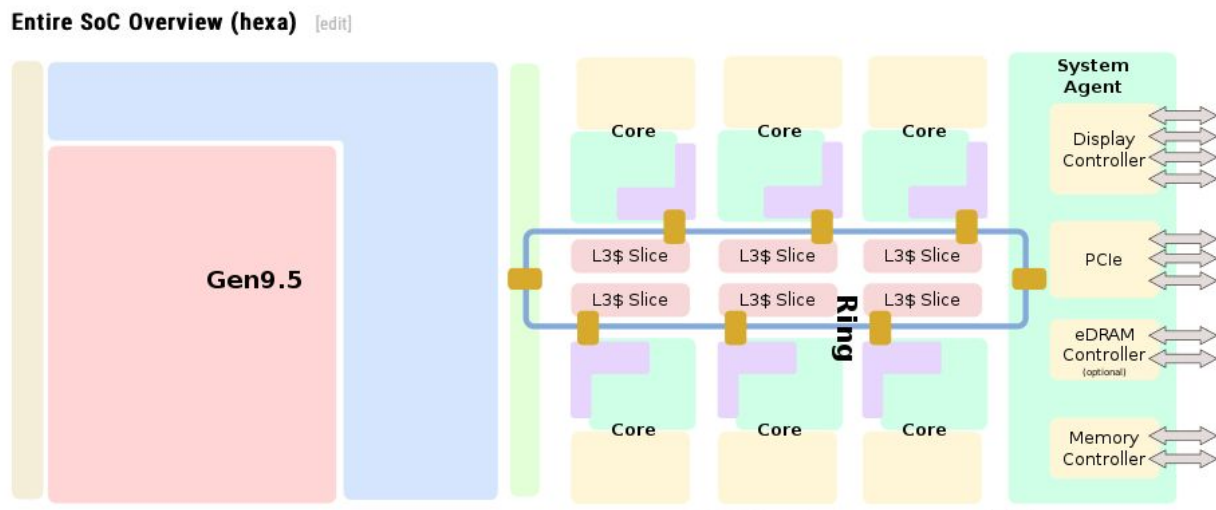
Oddly enough, none Intel i5 - i9 processors include Error correcting code with the exception of the Intel core i3. One advantage that the Intel i5 - i9 processors have compared to the Intel i3 is that they have **TBT(Turbo Boost Technology).** Other major architectural differences from the previous generation (Kaby Lake) include 50% more cores, 6 from 4, and larger last level cache (up to 12 MiB from 8 Mib). The memory hierarchy is designed to first access L0, L1I, L1D, L2, and then L3 caches, and then uses the side cache before it accesses

the system DRAM. There is also an S series of the processor which focuses mostly on higher end products aside from computer such as transactional retail terminals, security systems, and health care systems. Most variations of the S series offer 8 cores and up to 16 threads with an average base frequency of 3.3 GHz. Much of the development and R&D for the next generation of processors happens at Intel's Israel's **Wafer Fab.**
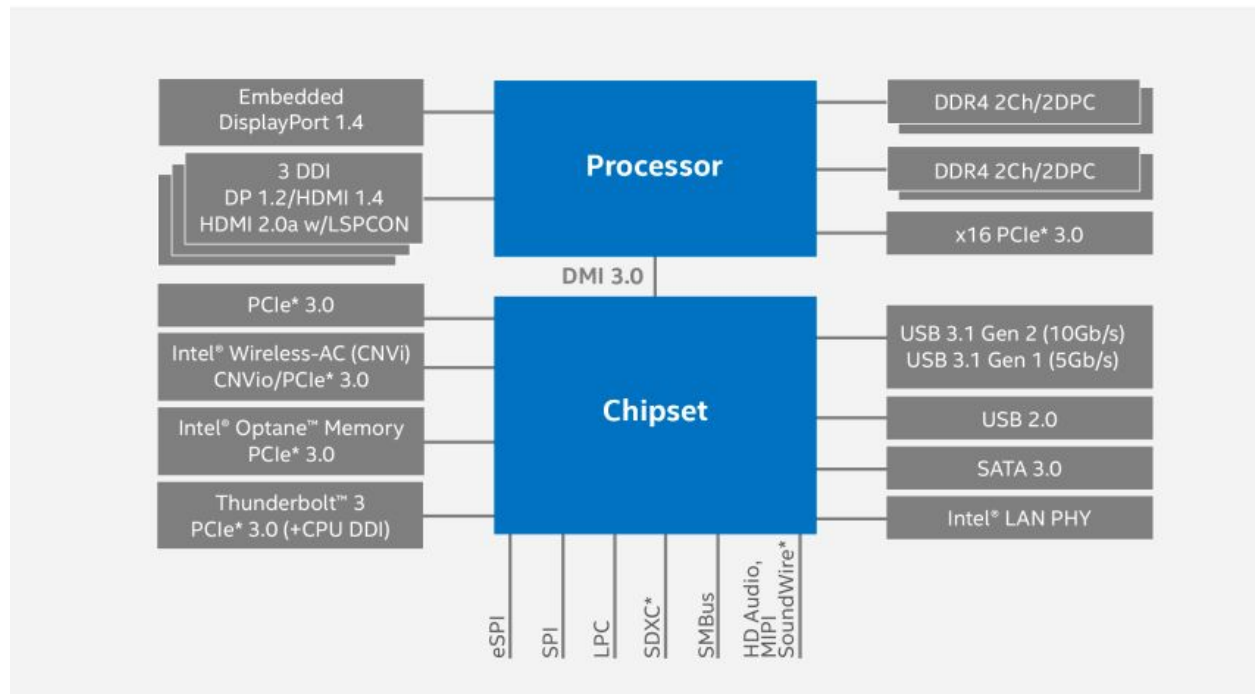
The website versus.com gave the Intel Core i7-8850H a very detailed review which considered the general information, benchmarks, performance, features, and memory and used these statistics to compare it to the average and best CPUs on the market. After analyzing each of these aspects, the Intel Core i7 was given a numeric score of eighty-one out of one hundred. One of the reasons that this CPU received "points off" was due to its memory capabilities. The Intel Core i7 has two memory channels, which is quite low compared to eight memory channels of the Qualcomm Snapdragon 8cx (the best one in the market in terms of memory channels).

The Intel Core i7 does not support **ECC memory**, unlike others, however this is not an essential component for a personal computer.

Notebook Check, another renowned technology blog, reviewed the Intel i7 CPU and focused on these same aspects. Since Intel increased the number of cores by two, the performance speed was greatly increased, which makes it more suitable for the demands of games and applications. The Notebook Check did address the change in power consumption, which had not been touched on by other reviews that we had referenced. The Intel i7-8550H consumes about 45 watts of power, although it can be brought down to 35 watts. This means that it is only suitable for larger laptops with efficient cooling systems. This is one of the reasons why this CPU is only found in the 15-inch model of Apple's MacBook Pro.

Technical City reviewed the Intel i7-8550H Core Processor from a gaming aspect, and compared it to other CPUs on the market that are used for the same purposes. Our CPU received a performance score of 100/110, with the Intel Core i9-8950HK dominating the market with a 109.71/110. Fortnite, a popular game at the moment, is compatible with the i7. The minimum requirement for the game to be played is a COre i3-530 CPU. This proves that the Core i7-8550H supports Fornite, along with many other games, however an Intel i9-9900KS processor would be the reigning champion for gaming CPUS.

Glossary:

14 nanometer - also known as 14 nm, is the successor to the 22 nm node. IT is a lithography process in the semiconductor manufacturing process. All 14 nanometer nodes use field-effect transistor technology and was created by Samsung Electronics in 2014. The 14 nm is currently being replaced by the 10 nm node technology node.

ECC Memory - ECC Memory stands for Error Correcting Code. This is a method of detecting and correcting any single-bit memory errors that may occur.

Lithography Process - is the printing process that is used to modify wafers in the production of semiconductors and is incorporated when adding transistors to the wafers.

Maximum Turbo Frequency : Maximum single core processing frequency at which the core is able to processing under the Intel Turbo Boost technology.

Turbo Boost Technology - Microprocessor technology developed by Intel that essentially enables temporary higher performance by automatically increasing the processor clock frequency.

Wafer Fab - A Semiconductor processing facility that turns wafers into integrated circuits. Home to the lithography process.

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