Computer Architecture and Embedded Systems
Semester Assignment

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1 AMD Ryzen 7 5700G Overview

The AMD Ryzen 5700G(Figure 1) is a modern processor that has been designed to offer a range of advanced features and functions that are essential for demanding applications. In this report, we will explore the various technologies and features of the Ryzen 5700G in more detail, and compare it to other modern processors to understand its position in the market.

Figure 1: AMD Ryzen 7 5700G with Radeon Graphics 3.80 GHz

CPU Architecture: The Ryzen 5700G is based on the Zen 3 architecture, which is the latest and most advanced architecture from AMD. The Zen 3 architecture has been designed to offer improved performance, power efficiency, and IPC (Instructions per Clock) compared to its previous generations. One of the key improvements of the Zen 3 architecture is the reduction of inter-core latency, which allows for faster communication between cores, resulting in improved performance. Additionally, the Zen 3 architecture has also been optimized to offer better energy efficiency, which helps to reduce power consumption and extend battery life in mobile devices.

Manufacturing Process: The Ryzen 5700G is manufactured using the 7nm process node, which is a leading-edge process technology that offers high density and power efficiency compared to larger node sizes. The smaller node size allows for more transistors to be packed into the same area, enabling higher performance and lower power consumption. Furthermore, the 7nm process node also enables the integration of more complex and advanced features into the processor, such as high-speed memory controllers and integrated graphics.

Cores and Threads: The Ryzen 5700G has 8 cores and 16 threads, providing high processing power for demanding applications. The high core count allows for efficient processing of multi-threaded applications, such as video editing, content creation, and gaming. The 16 threads provide additional processing power, enabling faster completion of tasks and reducing wait times. Additionally, the Ryzen 5700G supports multi-threading, which allows multiple threads to be processed simultaneously, improving overall performance.

Clock Speed: The base clock speed of the Ryzen 5700G is 3.8 GHz, and it can boost up to 4.6 GHz with its Precision Boost technology. The fast clock speed allows for quick completion of tasks and improved performance, especially in demanding applications. The Precision Boost technology enables the processor to automatically adjust its clock speed based on the workload, providing the optimal balance between performance and power consumption.

Cache: The Ryzen 5700G has a large cache memory of 32 MB, providing fast access to frequently used data. The cache memory acts as a buffer between the processor and the main memory, reducing the number of trips to the main memory and improving performance. A larger cache memory provides more space for frequently used data, which can result in improved performance, especially in applications that rely heavily on data access.

Integrated Graphics: The Ryzen 5700G has an integrated GPU, the AMD Radeon Graphics, which allows for basic graphic capabilities without the need for a separate GPU. The integrated GPU provides a cost-effective solution for basic graphics requirements, such as display output and basic gaming. Additionally, the integrated GPU can also reduce power consumption, as it eliminates the need for a separate GPU, which can consume a significant amount of power.

Multithreading: The Ryzen 5700G supports multithreading, allowing multiple threads to be

processed simultaneously, improving overall performance. Multithreading enables the processor to divide a single task into multiple smaller tasks, which can be processed in parallel, reducing the completion time of the task. This technology is particularly useful in applications that can benefit from parallel processing, such as video editing, content creation, and gaming.

Virtualization: The Ryzen 5700G supports virtualization, allowing multiple operating systems to run on a single physical machine. Virtualization enables multiple operating systems to run on a single machine, providing a more flexible and cost

To sum up, the AMD Ryzen 5700G is a 7nm desktop processor based on the Zen 3 architecture. It has 8 cores and 16 threads and is designed for gaming, content creation, and productivity. The processor has a base clock speed of 3.8 GHz and a boost clock speed of 4.6 GHz. It also supports overclocking and has a TDP of 65W. The Ryzen 5700G has a built-in graphics card, the AMD Radeon Vega 8, which provides decent graphics performance for basic gaming and multimedia tasks. The Ryzen 5700G supports DDR4 memory and has a maximum memory capacity of 128 GB. It is compatible with the AM4 socket and supports PCIe 4.0. The Ryzen 5700G is a good option for users looking for a budget-friendly processor that offers good performance for both gaming and productivity tasks. More informations can be found in [AMD].

2 Characteristics, Pros, Cons

Characteristic	**Description**
Architecture	Zen 3
Process_Technology	7nm
Cores	8
Threads	16
Base_Clock_Speed	3.8 GHz
Boost_Clock_Speed	4.6 GHz
Overclocking	Supported
TDP	65W
Integrated Graphics	AMD Radeon Vega 8
Graphics_Frequency	1500 MHz
Graphics_Stream Processors	8
Memory_Support	DDR4
Maximum_Memory Capacity	128 GB
Memory_Channels	2
Socket_Compatibility	AM4
PCIe_Support	PCIe 4.0
Instructions_Sets	AVX2, AVX, FMA3, SSE4.2, SSE4.1, SSE3, SSE2, SSE, MMX
Transistor_Count	26.8 billion
Die_Size	336.5 mm2

Table 1: AMD Ryzen 7 5700G characteristics table

2.1 Pros

- **Good Performance:** The Ryzen 5700G offers good performance for both gaming and productivity tasks, with its 8 cores and 16 threads and high clock speeds.
- **Integrated Graphics:** The built-in AMD Radeon Vega 8 graphics card provides decent graphics performance for basic gaming and multimedia tasks, saving users the cost and hassle of purchasing a separate graphics card.
- **Affordable:** The Ryzen 5700G is a budget-friendly option compared to other high-end processors, making it accessible to more users.
- **Overclocking Support:** The Ryzen 5700G supports overclocking, allowing users to increase its performance to meet their specific needs.

- **Compatible with AM4 Socket:** The Ryzen 5700G is compatible with the AM4 socket, making it easier for users to upgrade their systems without having to purchase a new motherboard.

2.2 Cons

- **Limited Graphics Performance:** While the integrated graphics card is decent for basic tasks, it may not be sufficient for demanding gaming and multimedia tasks. Users may need to purchase a separate graphics card to meet their needs.

- **Limited PCIe Support:** The Ryzen 5700G only supports PCIe 4.0, which may limit its compatibility with certain high-end components and accessories.

  Limited Maximum Memory Capacity: The Ryzen 5700G has a maximum memory capacity of 128 GB, which may not be sufficient for some users with demanding memory requirements.

  Higher TDP: The 65W TDP of the Ryzen 5700G is higher than some other processors, which may result in a slightly higher energy consumption and more heat production.

Overall, the AMD Ryzen 5700G is a good option for users who are looking for a budget-friendly processor that offers good performance for both gaming and productivity tasks. However, users should consider the limitations of the integrated graphics, limited PCIe support, and higher TDP before purchasing the Ryzen 5700G[sto], [tom].

3 Use Cases

The AMD Ryzen 5700G is a versatile processor that is suitable for various use cases, including gaming, content creation, and productivity.

Gaming: The Ryzen 5700G's high clock speeds and 8 cores and 16 threads provide good performance for gaming. Its integrated graphics card, the AMD Radeon Vega 8, provides decent graphics performance for basic gaming and multimedia tasks. However, users who are looking for high-end gaming performance may need to purchase a separate graphics card [teca],[jud].

Content Creation: The Ryzen 5700G's high core count and good performance make it suitable for content creation tasks such as video editing and 3D rendering. Its fast clock speeds and support for AVX2 and FMA3 instruction sets help speed up the processing of multimedia content[tecb].

Productivity: The Ryzen 5700G's fast clock speeds and high core count make it suitable for demanding productivity tasks such as data analysis, coding, and scientific simulations. Its support for multiple instruction sets, including SSE4.2 and SSE4.1, helps speed up computationally intensive tasks[tecb].

In conclusion, the AMD Ryzen 5700G is a good option for users who are looking for a versatile processor that provides good performance for a variety of tasks, including gaming, content creation, and productivity.

4 Comparison with Intel Core i_7 12^{th} Gen Alder Lake

- Architecture: AMD Ryzen 7 5700G is based on the Zen 3 architecture, while Intel Core i7 12th Gen is based on the Alder Lake architecture.

- Core/Thread count: Ryzen 7 5700G has 8 cores and 16 threads, while Intel Core i7 12th Gen has 8 cores and 16 threads.

- Base/Boost clock speed: Ryzen 7 5700G has a base clock speed of 3.8 GHz and boost clock speed of 4.6 GHz. Intel Core i7 12th Gen has a base clock speed of 2.7 GHz and boost clock speed of 4.9 GHz. TDP (Thermal Design Power): Ryzen 7 5700G has a TDP of 65W, while Intel Core i7 12th Gen has a TDP of 28W.

- Graphics: Ryzen 7 5700G has integrated AMD RDNA 2 graphics, while Intel Core i7 12th Gen has integrated Intel Xe graphics.

- Manufacturing process: Ryzen 7 5700G is manufactured using 7nm process, while Intel Core i7 12th Gen is manufactured using 10nm SuperFin process.

In conclusion, the Ryzen 7 5700G offers higher clock speeds, higher TDP and improved graphics compared to Intel Core i7 12th Gen, but also consumes more power. Intel Core i7 12th Gen, on the other hand, offers a more efficient manufacturing process, lower TDP and better integrated graphics. The best choice depends on the specific requirements and priorities of the user[bena],[benb].

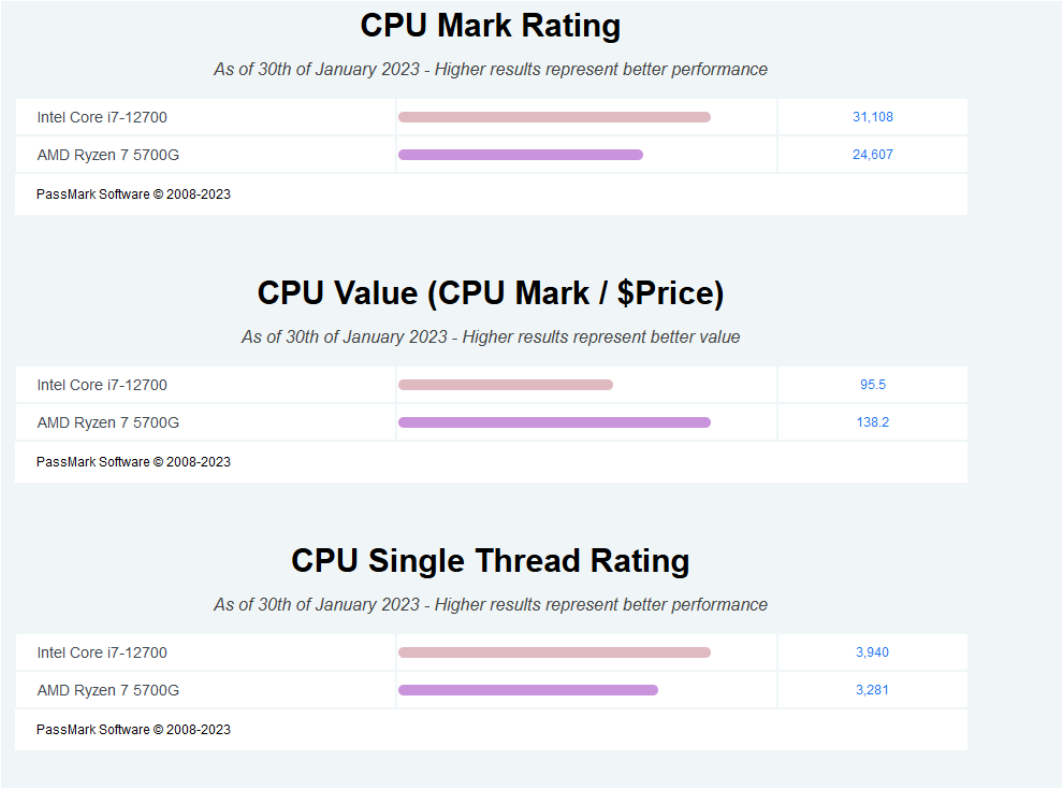

Figure 2: User's Benchmarks on the two processors

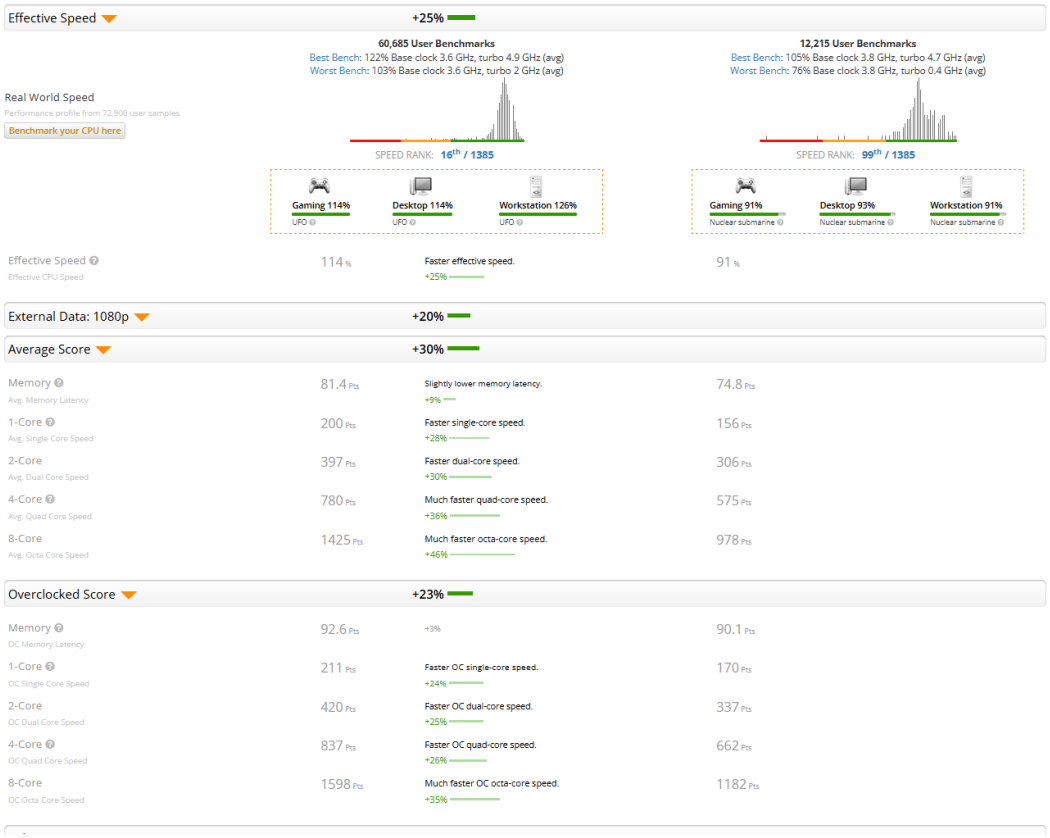

Figure 3: Head to head benchmarks on the two processors

5 Conclusion

In conclusion, the AMD Ryzen 7 5700G is a high-performance desktop processor that offers several advantages over its competitors. It features a Zen 3 architecture, 8 cores, 16 threads, a base clock speed of 3.8 GHz, and a boost clock speed of 4.6 GHz. Additionally, it has integrated AMD RDNA 2 graphics and is manufactured using a 7nm process.

With its impressive performance and features, the Ryzen 7 5700G is a solid choice for demanding tasks such as gaming, content creation, and demanding software applications. Its high TDP of 65W may be a concern for some users, but it is offset by its fast clock speeds and integrated graphics.

Overall, the Ryzen 7 5700G is a strong performer that offers a great balance of performance and efficiency, making it a top choice for many users looking for a high-performance processor.

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