



Technology Insights...

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Research, Analysis, Strategy, Insight

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"...AMD is pushing the boundaries on x86 chip design with its new family of products. While initially targeted at desktops, we expect to see mobile devices come to market within 3-6 months sporting similarly aggressive performance. And this family offers a glimpse into what can be expected from the next generation of server-based chips. Overall, AMD continues to aggressively push the limits for its chips, and offers a highly competitive family of products....."

AMD Pushes the Envelope with Ryzen 7000

Recently, AMD announced its Ryzen 7000 series, the latest product family in its battle to stay one step ahead in x86 processors. While targeted at desktops, this new offering provides a glimpse of where AMD is going soon in its data center and mobile device world as well. There has been a lot of coverage of the speeds and feeds for these chips. But for this analysis, let's look at some of the ramifications for this design that go beyond just raw speeds and feeds.

Promoting the "Halo" effect in Gaming

AMD especially touted its advantages in high end, overclocked chips targeted at gamers and extreme creatives. Clearly leading the messaging around the new family with gaming-centric and creative-centric chips gives them the ability to push the edge on performance and capture the gaming "halo". Desktops is where the creatives and gamers are at their most demanding, and this is squarely where the 7000 series is targeted, even though the family includes lesser performing chips for general purpose devices. This is an important market for AMD to be in a leadership position.

It's not just about gaming

Built on AMD's new Zen 4 architecture, the 7000 series supports both PCIe 5 and DDR5 in its top of the line chips (lower end devices may not support the highest speed memory). AMD is claiming a single core performance gain of 29%, and single threaded processing is still at the heart of a myriad of workloads, including some for gaming. And in a nod to the new reality of increasing amounts of AI and ML processing being included at the PC level, the new devices include the extra wide AVX 512 instruction set support to enable a broad array of AI inference applications (an area that AMD has been behind).

Updating the Socket

The new family is also employing a new AM5 socket configuration which significantly increases the number of pins available from the SoC (1718) and has more headroom with up to 230W socket power delivery. The expanded pin count is significant as it increases the amount of I/O available and especially support for multiple PCIe5 and DDR5 lanes, although actual support for both is optional on the mother board designs in order to enable lower cost and smaller versions. Increasing the number and speed of I/O lanes is critical in many of the new applications requiring multiple memory modules, increasing numbers of high speed display connections, and fast multi-GB network connections. AMD took pains to insure that older AM4 designed coolers would work with the new AM5 socket so there should be plenty of chip cooler options available at launch, which is a critical component for OEM PC designs. And the AM5 is also planned to be supported through at least 2025 offering some longevity in design.

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Chipelets and SoCs

The new chips are built using AMD chiplet technology that allows it to reuse some components that don't require the leading edge monolithic design reserved for the primary performance-pushing processes. Chiplets are the future of many complex SoC designs, including through the use of other manufacturers components, so AMD focusing on this aspect of design is important for this and future devices.

Process Leadership

The 7000 family is built on a 5nm process, which AMD claims to be the first desktop processor to be built at that process node (in the x86 family of processors anyway). This is currently leading edge manufacturing at its primary chip fab, TSMC (we expect next gen 4nm/3nm to come next in 2023/24). Node leadership is critical in staying ahead of the competition that is having some challenges in getting to the same leading edge process.

Architecture advances

The new devices are built on the latest Zen 4 architecture which offers 62% lower power requirements for the same level of performance as the previous Zen design, or it can be tuned to offer 49% more performance for the same power. These are key metrics for enabling OEMs to optimize designs, as most systems built for specific workloads often have design parameters that must meet certain power requirements. Indeed, with these enhancements, lower power 65W chips can now achieve much improved performance over previous generation chips, while also maintaining a smaller footprint. The majority of desktop machines, and indeed other devices for industrial designs, signage, etc., are very concerned with form factor and an ability to keep the power down while boosting performance. The new Zen 4 architecture does just that.

Maintaining pricing

The product is priced from \$299 for the lower end Ryzen 5 version, up to \$699 for the extreme version Ryzen 9. It's about equivalent to pricing of the previous chip generation, so customers will be getting more bang for the buck, but at similar price points. It remains to be seen how competitive this pricing will be longer term as Intel grows more price conscious, even as it raises prices on some devices. Finally, for extreme users, the new Ryzen family offers an overclocking option with AMD EXPO Technology. This high end Ryzen 9 7950X priced at \$699 is targeted at extreme gaming needs deploying 16 cores and 32 threads, and having a TDP of 170 Watts, so it's not for mainstream machines.

Bottom Line: AMD is pushing the boundaries on x86 chip design with its new family of products. While initially targeted at desktops, we expect to see mobile devices come to market within 3-6 months sporting similarly aggressive performance. And this family offers a glimpse into what can be expected from the next generation of server-based chips. Overall, AMD continues to aggressively push the limits for its chips, and offers a highly competitive family of products. While the chip market has always been one of leapfrogging results from competitors, it will not be easy in the short term for the competition to exceed the performance metrics that AMD has established.

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