

# Semiconductor

## CES 2024 wrap up

At Consumer Electronics Show (CES) 2024, leading tech giants including Nvidia, AMD, Intel, and Qualcomm unveiled their latest offerings, signaling a competitive race to launch AI-centric products for consumer use. These new releases are set to enhance the capabilities of upcoming AI-integrated smartphones and PCs amid other applications, launching later this year. We anticipate these innovations will spark consumer interest, encouraging purchases or upgrades, and contribute to healthy shipment growth, continuing the momentum from the seasonal restocking observed in the second half of 2023.

We expect the CES 2024 will positively affect consumers' expectation for AI PC/notebooks. However, we believe the driving force for consumers to purchase/upgrade may depend on killer applications either for corporate (e.g., Microsoft may add new AI button on its new surface notebook) or entertainment (gaming/video editing, etc.). In addition, the selling price may also affect the adoption rate. Despite a pullback on share prices in the first week of 2024, Nvidia closed at a record high of US\$522.53 on 8 Jan (up 6.43% as of market close), while AMD and Intel's share prices rose to US\$146.18 (up 5.48%) and US\$48.45 (up 3.33%).

### Nvidia: new "Super" GPUs, AI-powered gaming, etc

- At CES 2024, Nvidia unveiled a significant mid-generation refresh of its s, introducing three new "Super" models: **the GeForce RTX 4080 Super, RTX 4070 Ti Super, and RTX 4070 Super**. These new GPUs replace their predecessors at similar prices, with RTX 4080 Super launching at a reduced price of US\$999, compared to the original RTX 4080's US\$1,199.
- Additionally, Nvidia gave a glimpse of *Half-Life 2* running with **ray tracing**, a project developed with community modders, suggesting a near-complete remaster rather than a simple RTX upgrade. A highlight of Nvidia's presentation was the beta release date for RTX Remix, set for 22 Jan. This tool allows users to add ray tracing to their favorite games, although it may take time to test its usability.
- Nvidia's focus at CES 2024 heavily leaned towards AI, showcasing how its GPUs are powering local generative AI applications. These include a chatbot trainable with local documents and image generation software that creates visuals from written descriptions. Additionally, Nvidia demonstrated AI-powered NPCs (non-player characters) in games, capable of dynamic conversations, although the demo appeared to rely on basic text-to-speech technology. ([link](#))

### AMD: unveiling next-gen CPU and GPU for all purposes

- AMD showcased its Ryzen 8000-series desktop processors, headlined by the US\$329 Ryzen 7 8700G. This chip boasts eight Zen 4 cores, 16 threads, a 5.1GHz boost clock, Radeon 780M integrated graphics with RDNA 3 architecture, and an XDNA neural processing unit (NPU) for AI-enhanced applications. It significantly outperforms Intel's Core i7-14700K in games like *Hitman 3* and *Dota 2*.
- AMD also introduced the Ryzen 5 8600G with six Zen 4 cores and 12 threads, alongside an NPU and a 760M integrated GPU, priced at US\$229. The lineup includes the budget-friendly Ryzen 5 8500G and Ryzen 3 8300G. The latter aimed at pre-built systems. Additionally, AMD announced new Zen 3-based processors, including the Ryzen 7 5700X3D and Ryzen 7 5700, as well as

**OUTPERFORM**  
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the Ryzen 5 5600GT and 5500GT, all featuring integrated Radeon graphics. These new AMD processor series, both 8000 and 5000, will be available from 31 Jan. ([link](#))

- In terms of graphic cards, AMD announced the Radeon RX 7600 XT desktop GPU ([link](#)), an addition to its Radeon RX 7000 series. Priced at US\$329 and set to be available on 24 Jan, the RX 7600 XT is US\$60 more expensive than its non-XT version but promises enhanced performance for 1440p gaming, a step up from the RX 7600's focus on high refresh rate 1080p gaming. AMD positions the RX 7600 XT as a competitor to Nvidia's RTX 4060 GPU.

#### **Intel: revolutionizing computing with 14<sup>th</sup> gen core processors for gaming and efficiency**

- Intel announced its 14<sup>th</sup> Gen Core processor lineup at CES 2024, including the HX-series mobile processors, the 65W and 35W desktop processors, and the Core U mobile processor Series 1 family exhibited Intel's continuous commitment for enhanced computing performance on both mobile and desktop stations. The flagship mobile processor is designed for gamers, creators, and professionals who require powerful and portable computing solutions, while the desktop series offers processors that cater to mainstream desktop users and businesses across various markets. The Core U mobile processor Series 1 family aims at thin-and-light systems, balancing efficiency and performance for mainstream mobile users. ([link](#))
- Intel's release may invigorate the PC market, particularly in the gaming and high-performance segments. The new processors may drive the development of more powerful and efficient laptops and desktops, meeting the growing demand for advanced computing in various sectors. Overall, Intel's new processors are designed to cater to a broad spectrum of computing needs, from high-end gaming and creation to mainstream productivity and mobile efficiency.

#### **Qualcomm: Snapdragon Digital Chassis leads the charge in connected & AI-driven vehicles**

- At CES 2024, Qualcomm Technologies made significant strides in automotive technology with its Snapdragon Digital Chassis portfolio, signaling a new era in connected and AI-enabled vehicles. This comprehensive suite has already been implemented in over 350mn vehicles, showcasing its strong momentum in next-generation digital cockpits, connected car technologies, and advanced driver assistance systems.
- **Connectivity and AI are at the forefront of Qualcomm's innovations.** The Snapdragon Auto Connectivity Platform is a testament to this, enhancing vehicle safety and intelligence through a range of technologies including LTE, 5G, and vehicle-to-everything communications. In parallel, the Snapdragon Cockpit Platform is redefining the automotive cockpit experience, enabling immersive, intuitive, and sophisticated in-vehicle experiences through enhanced graphics, multimedia, and AI capabilities.
- **The company is also making headway in autonomous vehicle technology with the Snapdragon Ride Platform.** This platform comprises an advanced automated driving system-on-chip (SoC) family that supports safety and automated driving functions with AI-enhanced solutions. The Snapdragon Ride Flex SoC, designed for centralized computing, is significant for modern vehicle architectures, enabling various functions, such as digital cockpit, ADAS, and automated driving (AD) within the vehicle to coexist on a single SoC. ([link](#))

Figure 1: Nvidia’s newly launched GPUs specs vs. existing tech

	Launched during CES 2024			Sep 2022	Dec 2023	Sep 2022
	RTX 4080 Super	RTX 4070 Ti Super	RTX 4070 Super	RTX 4090	RTX 4090D	RTX 4080
<b>Performance</b>	Ada Lovelace: 52 Shader TFLOPS	Ada Lovelace: 44 Shader TFLOPS	Ada Lovelace: 36 Shader TFLOPS	Ada Lovelace: 82 Shader TFLOPS	Ada Lovelace: 73 Shader TFLOPS	Ada Lovelace: 48 Shader TFLOPS
<b>CUDA Cores</b>	10240	8448	7168	16384	14592	9728
<b>Tensor Cores</b>	320	264	224	512	456	304
<b>Foundry</b>	TSMC	TSMC	TSMC	TSMC	TSMC	TSMC
<b>Process size</b>	5nm	5nm	5nm	5nm	5nm	5nm
<b>Memory</b>	16GB GDDR6X	16GB GDDR6X	12GB GDDR6X	24GB GDDR6X	24GB GDDR6X	16GB GDDR6X
<b>Bandwidth</b>	716.8 GB/s	716.8 GB/s	504.2 GB/s	1000 GB/S	1000 GB/S	716.8 GB/S
<b>Price</b>	US\$999	US\$799	US\$599	US\$1599	US\$1599	US\$1199

Source: Techpowerup, CMBIGM

Figure 2: AMD’s new RX 7600 XT is set to compete with Nvidia’s RTX 4060

	Launched during CES 2024	May 2023	Nov 2022
	AMD Radeon RX 7600 XT	Nvidia RTX 4060	Radeon RX 7900 XT
<b>Performance</b>	RDNA 3.0: 45 TFLOPS	Ada Lovelace: 15 Shader TFLOPS	RDNA 3.0: 103 TFLOPS
<b>CUDA Cores</b>	2048	3072	5376
<b>Tensor Cores</b>	NA	96	NA
<b>Foundry</b>	TSMC	TSMC	TSMC
<b>Process size</b>	6nm	5nm	5nm
<b>Memory</b>	16GB GDDR6	8GB GDDR6	20GB GDDR6
<b>Bandwidth</b>	288 GB/S	272 GB/s	800 GB/S
<b>Price</b>	US\$329	US\$299	US\$899

Source: Techpowerup, CMBIGM

Figure 3: AMD’s latest launch at CES 2024

**AMD RYZEN™ 8000 G-SERIES PROCESSORS**  
FOR ENTRY GAMING AND PRODUCTIVITY SYSTEMS

<b>AMD Ryzen™ 7 8700G</b> with AMD Ryzen™ AI
8-Core / 16-Thread   5.1 GHz MAX BOOST   24MB Cache   65W TDP   AMD Radeon™ 780M Graphics
<b>AMD Ryzen™ 5 8600G</b> with AMD Ryzen™ AI
6-Core / 12-Thread   5.0 GHz MAX BOOST   22MB Cache   65W TDP   AMD Radeon™ 760M Graphics
<b>AMD Ryzen™ 5 8500G</b>
6-Core / 12-Thread   5.0 GHz MAX BOOST   22MB Cache   65W TDP   AMD Radeon™ 740M Graphics
<b>AMD Ryzen™ 3 8300G</b> (only in partner systems)
4-Core / 8-Thread   4.9 GHz MAX BOOST   12MB Cache   65W TDP   AMD Radeon™ 740M Graphics

AVAILABLE JANUARY 31<sup>st</sup>

Source: AMD, CMBIGM

Figure 4: AMD product performance

**THE FASTEST DESKTOP PC PROCESSOR GRAPHICS IN THE WORLD**

Only AMD can power this kind of next-gen, small form factor desktop gaming with built-in graphics

**SMOOTH FULL-HD GAMING IN SMALL FORM FACTORS**

Game	Core i7-14700K	Ryzen 5 8600G	Ryzen 7 8700G
Far Cry 6	1.0x	1.1x	2.0x
F1 2022	2.0x	2.3x	2.3x
Borderlands 3	2.3x	2.5x	2.2x
Cyberpunk 2077	2.7x	2.8x	2.9x
Final Fantasy 14	3.2x	3.3x	3.4x
Bio 2	3.4x	3.4x	4.0x

Average Frame Rates, 1080p low detail settings (unless otherwise specified), up to

Source: AMD, CMBIGM

Figure 5: AMD’s product offering

MORE CHOICE FOR AMD DESKTOP PLATFORMS IN 2024										
Processor	Cores/Threads	Platform	Frequency	Cache	Architecture	PCIe*	DRAM	TDP	Graphics	Ryzen AI
AMD RYZEN™ 9 7950X3D	16 / 32	AM5	~5.7 / 4.2 GHz	144MB	"Zen 4"	GEN 5	DDR5	120W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 9 7950X	16 / 32	AM5	~5.7 / 4.5 GHz	80MB	"Zen 4"	GEN 5	DDR5	170W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 9 7900X3D	12 / 24	AM5	~5.6 / 4.4 GHz	140MB	"Zen 4"	GEN 5	DDR5	120W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 9 7900X	12 / 24	AM5	~5.6 / 4.7 GHz	76MB	"Zen 4"	GEN 5	DDR5	170W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 9 7900 / 7945 PRO	12 / 24	AM5	~5.4 / 3.7 GHz	76MB	"Zen 4"	GEN 5	DDR5	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 7 7800X3D	8 / 16	AM5	~5.0 / 4.2 GHz	104MB	"Zen 4"	GEN 5	DDR5	120W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 7 7700X	8 / 16	AM5	~5.4 / 4.5 GHz	40MB	"Zen 4"	GEN 5	DDR5	105W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 7 8700G	8 / 16	AM5	~5.1 / 4.2 GHz	24MB	"Zen 4"	GEN 4	DDR5	65W	RADEON™ 780M GRAPHICS	YES
AMD RYZEN™ 7 7700 / 7745 PRO	8 / 16	AM5	~5.3 / 3.8 GHz	40MB	"Zen 4"	GEN 5	DDR5	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 7600X	6 / 12	AM5	~5.3 / 4.7 GHz	38MB	"Zen 4"	GEN 5	DDR5	105W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 8600G	6 / 12	AM5	~5.0 / 4.3 GHz	22MB	"Zen 4"	GEN 4	DDR5	65W	RADEON™ 760M GRAPHICS	YES
AMD RYZEN™ 5 7600 / 7645 PRO	6 / 12	AM5	~5.1 / 3.8 GHz	38MB	"Zen 4"	GEN 5	DDR5	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 8500G	6 / 12	AM5	~5.0 / 3.5 GHz	22MB	2x "Zen 4" + 4x "Zen 4c"	GEN 4	DDR5	65W	RADEON™ 740M GRAPHICS	YES
AMD RYZEN™ 5 8300G	4 / 8	AM5	~4.9 / 3.4 GHz	12MB	1x "Zen 4" + 3x "Zen 4c"	GEN 4	DDR5	65W	RADEON™ 740M GRAPHICS	YES
AMD RYZEN™ 5 7500F	6 / 12	AM5	~5.0 / 3.7 GHz	38MB	"Zen 4"	GEN 5	DDR5	65W	N/A	N/A
AMD RYZEN™ 9 5950X	16 / 32	AM4	~4.9 / 3.4 GHz	72MB	"Zen 3"	GEN 4	DDR4	105W	N/A	N/A
AMD RYZEN™ 9 5900X	12 / 24	AM4	~4.8 / 3.4 GHz	70MB	"Zen 3"	GEN 4	DDR4	105W	N/A	N/A
AMD RYZEN™ 7 5800X3D	8 / 16	AM4	~4.5 / 3.4 GHz	100MB	"Zen 3"	GEN 4	DDR4	105W	N/A	N/A
AMD RYZEN™ 7 5700X3D	8 / 16	AM4	~4.1 / 3.0 GHz	100MB	"Zen 3"	GEN 4	DDR4	105W	N/A	N/A
AMD RYZEN™ 7 5800X	8 / 16	AM4	~4.7 / 3.8 GHz	36MB	"Zen 3"	GEN 4	DDR4	105W	N/A	N/A
AMD RYZEN™ 7 5700X	8 / 16	AM4	~4.6 / 3.4 GHz	36MB	"Zen 3"	GEN 4	DDR4	65W	N/A	N/A
AMD RYZEN™ 7 5700G / 5750G PRO	8 / 16	AM4	~4.6 / 3.8 GHz	20MB	"Zen 3"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 7 5700	8 / 16	AM4	~4.6 / 3.7 GHz	20MB	"Zen 3"	GEN 3	DDR4	65W	N/A	N/A
AMD RYZEN™ 5 5600X	6 / 12	AM4	~4.6 / 3.7 GHz	35MB	"Zen 3"	GEN 4	DDR4	65W	N/A	N/A
AMD RYZEN™ 5 5600	6 / 12	AM4	~4.4 / 3.5 GHz	35MB	"Zen 3"	GEN 4	DDR4	65W	N/A	N/A
AMD RYZEN™ 5 5600GT	6 / 12	AM4	~4.6 / 3.6 GHz	19MB	"Zen 3"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 5600G / 5650G PRO	6 / 12	AM4	~4.4 / 3.9 GHz	19MB	"Zen 3"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 5500GT	6 / 12	AM4	~4.4 / 3.6 GHz	19MB	"Zen 3"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 5500	6 / 12	AM4	~4.2 / 3.6 GHz	19MB	"Zen 3"	GEN 3	DDR4	65W	N/A	N/A
AMD RYZEN™ 5 4600G / 4650G PRO	6 / 12	AM4	~4.2 / 3.7 GHz	11MB	"Zen 2"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 5 4500	6 / 12	AM4	~4.1 / 3.6 GHz	11MB	"Zen 2"	GEN 3	DDR4	65W	N/A	N/A
AMD RYZEN™ 3 4300G / 4350G PRO	4 / 8	AM4	~4.0 / 3.8 GHz	6MB	"Zen 2"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD RYZEN™ 3 4100	4 / 8	AM4	~4.0 / 3.8 GHz	6MB	"Zen 2"	GEN 3	DDR4	65W	N/A	N/A
AMD RYZEN™ 5 3600	4 / 8	AM4	~4.0 / 3.8 GHz	6MB	"Zen 2"	GEN 3	DDR4	65W	N/A	N/A
AMD RYZEN™ 3 3200G	4 / 8	AM4	~4.0 / 3.6 GHz	6MB	"Zen"	GEN 3	DDR4	65W	RADEON™ GRAPHICS	N/A
AMD ATHLON™ 3000G	2 / 4	AM4	~3.5 GHz	5MB	"Zen"	GEN 3	DDR4	35W	RADEON™ GRAPHICS	N/A

Source: AMD, CMBIGM

Figure 6: Qualcomm’s Snapdragon Digital Chassis

**Foundation**  
of the software-defined vehicle

**Broadest**  
portfolio in market, uniquely positioned to serve the automotive industry, spanning all vehicle tiers and including specialty mobility platforms

**Mixed-criticality**  
workloads supported by combining digital cockpit and advanced driver assistance systems on Snapdragon Ride E2/E3 SoC, resulting in lower cost and faster design cycles

**Innovating**  
Faster design and development cycles  
New monetization opportunities  
Expanded category of services deployed via cloud for future-proofing

**350M+** vehicles on road using Snapdragon Digital Chassis solutions

**#1** in telematics and wireless car connectivity

**12M+** vehicles using Snapdragon Ride™ perception stack

**20+** years driving automotive innovation

**40M+** vehicles using Snapdragon Cockpit

**75+** Models based globally with Snapdragon Digital Chassis™ solution in 2023, driving rich and immersive experiences

Source: Qualcomm, CMBIGM

Figure 7: Snapdragon Auto Connectivity

**CONNECTIVITY**

- Modem-RF Systems (e5G)
- Precise Positioning
- C-V2X
- Wi-Fi 7
- Powerline Communication
- Telematics Application Framework
- Satellite Communication

Advanced Location, Safety Applications, Smart Transportation, Immersive Experiences, Ubiquitous Connectivity, EV Charging

Source: Qualcomm, CMBIGM

Figure 8: Qualcomm’s Snapdragon Ride Platform

**Complete AD Stack**  
Features validated for up to Level 3  
Architecture scales to Level 4

**Modular Architecture**  
Perception, Maps, Localization, Advanced AI Predictor and planner

**5th Gen CV / perception product**  
Advanced 360° camera CV (3D)  
Low-level Multi-modal perception

**SoCs, BSP & Middleware**

**AD Cloud & Workbench**  
Data simulation factory  
Reprocessing / OT / Data ML Ops

**Apps**  
ADAS/AD feature bundles

**Core Technology**  
Environment Model, Localization & Maps, Vehicle Guidance (prediction & control)

**Backend Infrastructure and Services**  
Map, Shadow Mode and Active Learning, Data-Centric AI Framework (Ground Truth 2.0 & Auto Annotation), Data and Simulation Factory

**SoCs, BSP & Middleware**

Source: Qualcomm, CMBIGM

Figure 9: Qualcomm’s Snapdragon Ride Platform

**Snapdragon Ride Flex SoC**  
A unified automotive SoC architecture for mixed criticality workloads

Combines cockpit, driver monitoring, driver assistance and automated driving functions on the same SoC

Central compute and software defined vehicle-ready architecture

- Infotainment Digital life Personalization
- Cluster Surround view Driver monitoring
- Safety domain Instant-on
- Computer vision Automated driving
- Sensor fusion Drive policy Maps
- Networking OTA Cybersecurity

Source: Qualcomm, CMBIGM

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