

| Exynos 990

Next-level intelligence

The next-level of intelligence is coming. With the Exynos 990, a mobile processor designed with a powerful AI processing capability, mobile experiences will evolve to meet the new aspects of mobility in the era of AI. Featuring a dual-core neural processing unit (NPU), the Exynos 990 processor delivers faster and efficient machine learning performance. When combined with the advanced image processing technologies, AI enables the camera to produce a pro-grade photography thru intelligent optimization. The Exynos 990 processor can be paired with the 5G cellular modem to deliver hyper-fast mobile broadband speed for the era of live. To offer an experience that's like a computer, a gaming console, and a television on a mobile device, the Exynos 990 incorporates a powerful octa-core CPU, a cutting-edge GPU, an advanced display and a video subsystem that delivers unmatched performance to suit the next-level smartphone.



SAMSUNG
Exynos
990

AI

Inspiring intelligence

Enjoy the full measure of artificial intelligence on the go. A powerful neural processing unit (NPU) and digital signal processor (DSP) are built into the Exynos 990 for the next-level of on-device artificial intelligence. The Exynos 990, featuring dual-core neural processing unit (NPU) and improved digital signal processor (DSP), can perform up to approx. fifteen trillion operations per second (TOPS).¹ This allows smartphone to offer richer mobile experiences with diverse intelligent features including intelligent camera, virtual assistant and extended reality. The Exynos 990 processor designed for AI will take smartphone's capabilities to the next level.

Camera

Intelligent camera evolved

The pro-grade camera gets upgraded with added intelligence. Machine learning capability of the NPU automatically detects objects in the scene allowing the image signal processor (ISP) to generate and apply specific camera settings tailored to that subject. For instance, when the NPU detects a face in the frame, it enables the ISP to automatically provide the best settings for the lighting condition and the person's skin tone. In addition, the ISP features advanced algorithms to reduce noise, improve texture and edge artifact, and perform better local tone mapping for ultimate image quality. The Exynos 990 supports up to six individual sensors including an ultra-high 108Mp image sensor and is able to process three sensors concurrently for fuller multi-camera experiences.

* The depicted device is a fictitious creation.
No simulation of any real product is intended.



5G Solutions

Hyper-fast

Stream and download at hyper-fast speed in 5G. The Exynos 990 processor brings incredibly fast mobile broadband in the palm of your hand when paired with the next generation 5G technology, the Exynos Modem 5123. The modem supports blazingly fast download speed of up to 7.35Gbps in mmWave and 5.1Gbps in sub-6GHz setting with up to 8x carrier aggregation.² For uncompromised performance in 4G LTE mode, it supports up to 3Gbps of downlink speed and up to 422Mbps of uplink speed.² The modem also supports E-UTRA-NR Dual Connectivity (EN-DC) which combines LTE and 5G connectivity to maximize mobile downlink speed.





Computing

New-level performance

Do more with faster computing. The Exynos 990 processor features the 5th generation custom CPU for ultimate computing power required for the complex use cases in the 5G era. The tri-cluster CPU, featuring the 5th generation custom CPU, delivers up to 20% enhanced performance than its predecessor.³ Combined with the Cortex-A76 dual-core and the Cortex-A55 quad-core, the Exynos 990 processor delivers optimal performance and better power efficiency for seamless mobile experiences that lasts. Furthermore, the Exynos 990 supports LPDDR5 memory's data rates of up to 5,500 megabits per second (Mb/s) for wider memory bandwidth than its predecessor with LPDDR4x.² It enables a smartphone to efficiently transfer massive amount of data needed for 5G communication, AI applications, graphically demanding games, ultra-high resolutions videos, and more.

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Gaming

Lag-free gaming

Compete better with mind blowing graphics. The Exynos 990, packed with Arm Mali™ G77 MP11 GPU, offers ultimate 3D graphics processing for a realistic and immersive gaming experience. The Exynos 990 delivers improved graphic performance or power efficiency by up to 20 percent thanks to the new GPU architecture.³ The Valhall architecture is a new super scalar engine that delivers another leap in performance density and energy efficiency. Furthermore, combined with powerful CPU and LPDDR5 support, the Exynos 990 enables seamless gaming experience without lags and faster loading speed so you can jump right into your favorite game and start leveling up in no time.

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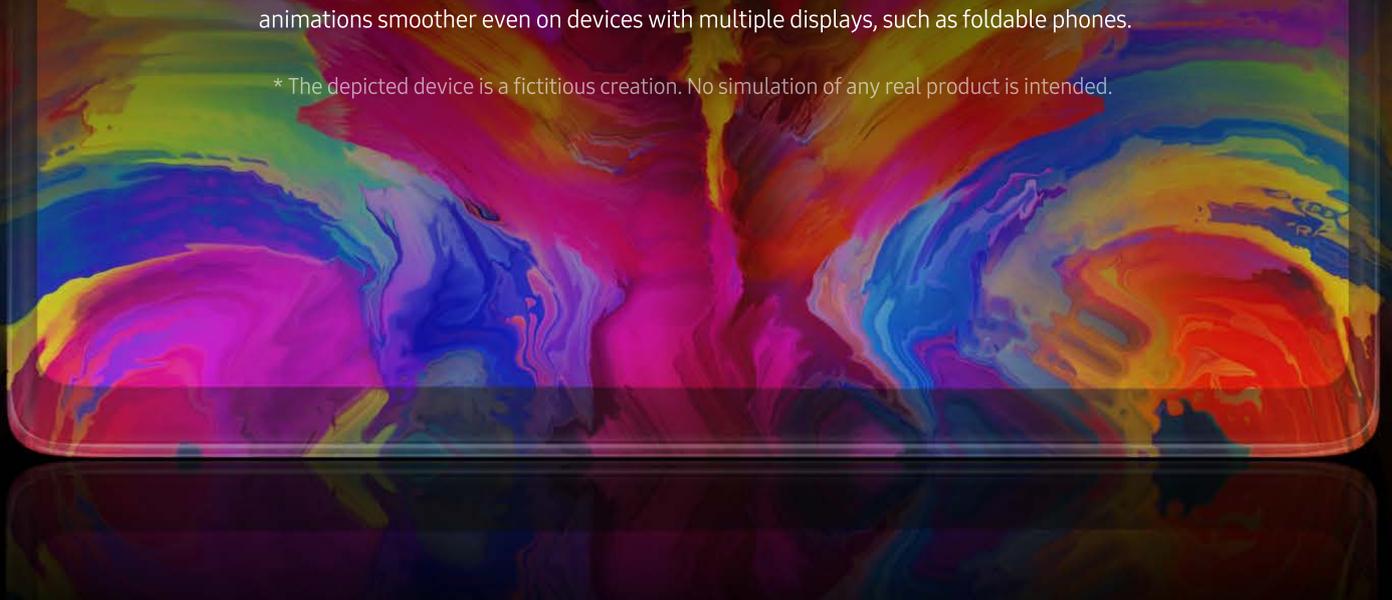


Multimedia

New dimension

Film your moment like a motion picture. The Exynos 990 features an advanced multi-format codec that supports encoding and decoding of 8K UHD video at 30 frames per second (fps). With a bandwidth compression technology, the required bandwidth for transferring encoded and decoded data can be drastically reduced resulting in better power efficiency. In addition, perceptual video coding algorithm improves the video quality by optimizing certain parts of an image frame that are deemed to be more sensitive to the viewer based on human's visual cognitive characteristics. By utilizing NPU's AI capabilities, you can make your videos more creative or stylish with added special effects such as bokeh for movie-like depth of field. Last but not least, in addition to 10-bit video and HDR display support, the processor also features a 120Hz refresh-rate display driver which makes games come alive by reducing screen tearing and makes animations smoother even on devices with multiple displays, such as foldable phones.

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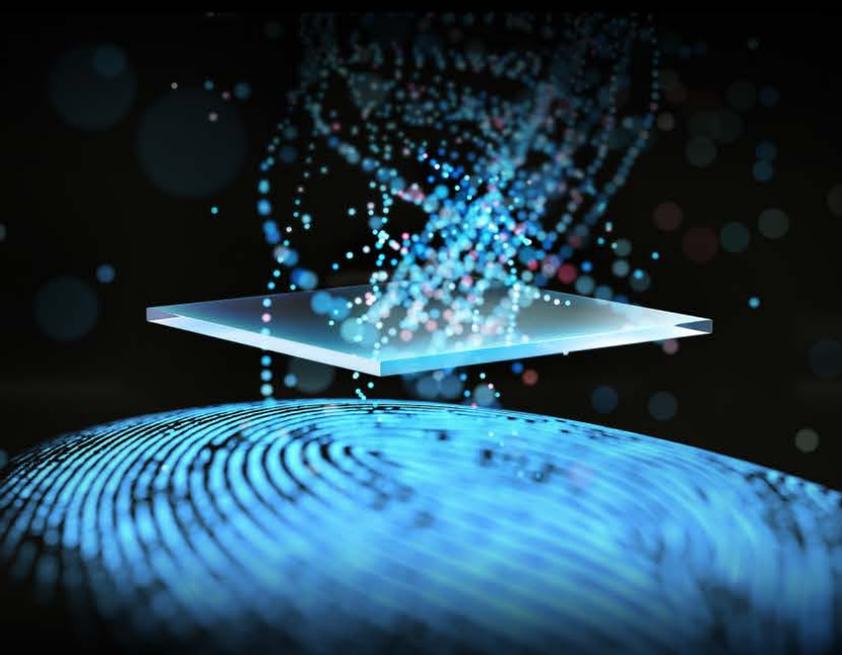


Security

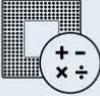
Built-in vault

To keep user's information safe and secure, the Exynos 990 features a new architecture and cutting-edge technologies for enhanced security. The memory protection technologies, such as a DRAM encryption engine, are upgraded to protect data safer with faster processing speed. Along with Physically Unclonable Function (PUF) that generates a unique key based on the physical properties of each chip, the newly added integrated secure element (ISE) layer stores and handles personal data separately from the OS environment.

* Images are simulated for illustration purposes only.



Spec

 <p>CPU Dual-core (Custom CPU) + Dual-core (Cortex®-A76) + Quad-core Cortex®-A55</p>	 <p>GPU Mali™-G77 MP11</p>	 <p>NPU Dual-core NPU</p>	 <p>Process 7nm EUV</p>	 <p>Display WQXGA (3840x2400), 4K UHD (4096x2160), (4K @60Hz, QHD+ @120Hz)</p>
 <p>Storage UFS 3.0, UFS 2.1</p>	 <p>Memory LPDDR5</p>	 <p>Camera Single-camera 108MP Dual-camera 24.8MP+24.8MP</p>	 <p>Video 8K 30fps or 4K UHD 120fps encoding and decoding with 10-bit HEVC(H.265), H.264, VP9</p>	

1) Based on Samsung's internal test results.
 2) Based on Samsung's internal test results. Actual performance may vary depending on device and user environment.
 3) Based on Samsung's internal test results compared to the Exynos 9820.

About Samsung Electronics Co., Ltd.

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