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Microprocessor Market Assessment, By Architecture [Application Specific Integrated Circuit Processor, Complex Instruction Set Computer, Reduced Instruction Set Computer, Digital Signal Processor, Superscalar Microprocessor, Others], By Industry [Consumer Electronics, Networking and Communication, Automotive and Transportation, Industrial, Medical Systems, Aerospace and Defense, Others], By Region, Opportunities and Forecast, 2017-2031F

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Abstracts

Global microprocessor market size was valued at USD 109.48 billion in 2023, expected to reach USD 184.13 billion in 2031, with a CAGR of 6.44% for the forecast period between 2024 and 2031. The microprocessor market is thriving due to a surge in demand for high-performance computing and increased use of IoT, 5G, and AI applications, propelling the market growth. Ongoing advancements in energy efficiency and semiconductor technology play a significant role while market competition and continuous innovation push the market forward. Consequently, the microprocessor market is steadily growing, providing the essential processing power for modern computing and emerging technologies.

The increasing popularity of electric vehicles and the integration of autonomous driving features in the automotive industry have a substantial impact on driving the growth of the microprocessor market. EVs and self-driving vehicles rely on advanced microprocessors for tasks like processing sensor data, enabling artificial intelligence

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capabilities, and managing connectivity. As these technologies become widespread, the demand for high-performance microprocessors, including central and graphics processing units, continues to soar. These microprocessors enhance vehicle safety, efficiency, and user experience. The expanding EV and autonomous vehicle market underscores the significance of robust and efficient computing solutions in the automotive sector, thereby propelling the growth of the microprocessor market.

For instance, in May 2023, MIPS partnered with Siemens Digital Industries Software to expedite time-to-market and enhance software development for the MIPS eVocore P8700 RISC-V multiprocessor. The collaboration empowers system-on-chip developers to validate their systems using MIPS CPUs on Siemens' Veloce proFPGA platform, promoting early hardware-software codesign. The eVocore P8700, known for its scalability and high performance, is particularly relevant in applications like autonomous driving and ADAS.

Growth Fueled by Rising Demand for Consumer Electronics

Due to their speed, compact size, and easy maintenance, microprocessors are vital components of consumer electronics like desktops, PCs, smartphones, tablets, and servers. Capable of handling 3 billion activities per second and performing complex calculations, these devices are favored in the growing consumer electronics sector, especially for smartphones and tablets, thereby driving market growth. The gaming industry, which has notably surged during the pandemic, significantly impacted the microprocessor market. Gaming consoles and handhelds are integral to the gaming industry and contribute to the demand for microprocessors.

Despite PCs consisting of pricier processors and GPUs than portable devices, the extended PC lifecycle boosts overall demand for smartphones, which offer quick technology upgrades compared to slower desktop PC replacements. Also, the growth of 5G network is expected to accelerate smartphone and wearable device adoption, creating the demand for microprocessors worldwide, including in Europe and Asia-Pacific. For instance, global smartphone subscriptions are forecasted to grow from 6,260 million in 2021 to 7,790 million by 2028.

Enhanced Connectivity Accelerates Demand for Microprocessor Market

The microprocessor market experiences growth due to the expanding connectivity facilitated by the internet, social media, and interconnected devices. The increasing prevalence of online interactions, social networking, and the Internet of Things

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necessitates advanced microprocessors for efficient data processing, instantaneous communication, and network administration. These microprocessors enable smooth connectivity and data exchange across diverse devices. As the world becomes more intertwined, the demand for microprocessors in networking and communications remains upward, making them a critical element in supporting the ever-evolving digital environment and driving market growth.

For instance, in October 2023, AMD introduced Ryzen Threadripper PRO 7000 WX-Series processors, targeting professionals, with a maximum of 96 cores, and Ryzen Threadripper 7000 Series processors, created for enthusiasts with a maximum of 64 cores.

In January 2022, Intel MobileEye unveiled EyeQ Ultra, a specialized system-on-chip (SoC) designed explicitly for autonomous driving vehicles. The SoC, boasting an impressive 176 tera operations per second, showcased the power of its advanced EyeQ architecture.

Environmental Concerns Contributing to the Microprocessor Market

Environmental concerns are propelling the microprocessor market. As the world focuses on reducing carbon emissions and energy consumption, manufacturers prioritize microprocessor technologies that offer better performance with less power. Hence, there is a strong inclination towards energy-efficient microprocessors that minimize power usage and heat production, aligning with global sustainability objectives. These energy-efficient processors are essential for eco-friendly computing practices and are in high demand across various sectors, including data centers, IoT devices, and mobile computing. With businesses and consumers seeking environmentally responsible solutions, the market for energy-efficient microprocessors is on the rise, playing a pivotal role in sustainable technology and market expansion.

In June 2023, AMD announced an extension of its collaboration with Amazon Web Services to introduce Amazon EC2 M7a instances featuring 4th Gen AMD EPYC processors. The partnership enhances cloud performance for a wide range of applications.

North America Dominates Microprocessor Market

North America's dominance in the microprocessor market is attributed to several key factors. The region houses major semiconductor industry players, such as Intel and

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AMD, renowned for producing cutting-edge microprocessors. These companies invest heavily in research and development, fostering innovation and ensuring their products remain at the forefront of technological advancements.

Furthermore, North America benefits from a robust ecosystem that includes leading technology firms, universities, and research institutions collaborating to push the boundaries of microprocessor capabilities. The collaborative environment fosters the exchange of ideas and accelerates the development of next-generation processors. The region's strong focus on emerging technologies, including artificial intelligence, autonomous vehicles, and the Internet of Things, has propelled the demand for high-performance microprocessors. North American companies are well-positioned to cater to these evolving market needs, further solidifying their dominance.

Additionally, favorable government policies, a skilled workforce, and a mature infrastructure for semiconductor manufacturing contribute to North America's supremacy in the microprocessor sector. As the demand for advanced computing solutions continues to rise globally, North America's leadership in microprocessor technology is likely to persist, driving innovation and shaping the future of digital technology.

Government Initiatives are Supplementing the Microprocessor Market Growth

Government efforts are expected to support the microprocessor market, which is of paramount importance globally. In the United States, these initiatives are spearheaded by the Office of Science and Technology Policy (OSTP) and the National Science and Technology Council (NSTC). They offer guidance to the President on scientific and technological matters, facilitate policy coordination among federal agencies, and devise research and development strategies.

Specialized committees, including the Select Committee on Artificial Intelligence and the Subcommittee on Machine Learning and Artificial Intelligence, are dedicated to advancing AI and machine learning, both reliant on advanced microprocessors. These governmental endeavors aim to uphold the United States' leadership in technology, fostering innovation and encouraging collaboration between the public and private sectors.

For instance, in June 2023, Texas allocated USD 1.4 billion for microchip research and manufacturing, establishing the Texas Semiconductor Innovation Fund to drive investment, job creation, and federal support through the CHIPS Act for domestic

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semiconductor production. The move leverages Texas' strong semiconductor industry ecosystem, thereby driving the demand for microprocessors.

Impact of COVID-19

The COVID-19 pandemic accelerated the growth of integrated logic circuits in microprocessors. It was driven by the increased demand for computing devices, resulting in a surge in demand for microprocessors in laptops, smartphones, data centers, high-speed networks, and multimedia tools. Global sales of integrated logic circuits in 2020 increased by 6.8%, mainly spurred by the COVID-19 pandemic. Moreover, the overall sales of integrated logic circuits rose by almost 19.66% in 2021 and 8.7% in 2022.

The COVID-19 pandemic resulted in a massive chip shortage in the microprocessor market, along with its long-term consequences, such as viral outbreaks, labor shortages, and geopolitical uncertainty. The pandemic led to major price increases, long queues, and production disruptions in various industries, including automotive and mobile phones. The lead time from order to shipment of chips increased from three to four months before the pandemic to a year or longer during the pandemic in 2021 and 2022.

The COVID-19 pandemic triggered a crisis for microchips and integrated logic circuits, disrupting the supply chain and manufacturing activities. The global lockdown led to a sudden drop in microprocessor manufacturing, while the demand for silicon chips rose due to increased usage of 5G phones, gaming systems, and other IT equipment. The surge in demand, coupled with the closure or reduction of production in the automotive industry, led to an integrated logic circuit shortage. Besides it, the pandemic had a mixed impact on the microprocessors market, with disruptions in the supply chain and manufacturing activities, but a subsequent increase in remote work, online learning, and digitalization, thereby driving the demand for microprocessors.

Impact of Russia-Ukraine War

The conflict between Russia and Ukraine had a significant ripple effect on the microprocessor industry. This strife resulted in a halt in the importation of crucial items for the IT sector in Russia, leading to a scarcity of processors and other components for both client computers and server equipment. Additionally, the war disrupted the supply of specific raw materials essential for integrated logic circuit production, presenting substantial challenges for chipmakers and consumers alike. According to Reuters in

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March 2023, approximately 45% to 54% of the world's integrated logic circuit-grade neon, vital for chip-making lasers, originated from two Ukrainian companies, Ingas and Cryoin. However, these firms ceased operations due to intensified attacks by Russian forces on Ukrainian cities, resulting in civilian casualties and critical infrastructure destruction.

The cessation cast a shadow over global chip output, strained by increased demand for cellphones during the pandemic. Moreover, the conflict prompted companies to devise contingency plans and explore alternative material sources, potentially influencing long-term investments in neon recycling technologies. The war's impact on raw material costs, supply chain disruptions, and general uncertainty will continue to affect chipmakers and consumers. The conflict has worsened existing integrated logic circuit supply chain issues and exacerbated the ongoing chip shortage, with potential enduring consequences contingent upon the conflict's duration. Consequently, the Russia-Ukraine conflict has profoundly and multifariously affected the integrated logic circuit industry, influencing supply chains, raw material availability, and the broader chip scarcity predicament.

Key Players Landscape and Outlook

In the highly competitive microprocessor market, industry leaders play a pivotal role. Major players such as Intel Corporation, NVIDIA Corporation, Qualcomm Technologies, Inc., Taiwan Semiconductor Manufacturing Company Limited, and Samsung Electronics Co., Ltd are central to shaping this dynamic landscape. These companies are at the forefront of driving innovation, influencing technological advancements, and setting industry standards. They offer cutting-edge products catering to diverse applications, ranging from personal computing to artificial intelligence and mobile devices. As the market transforms, these key players are poised to mold its future by leading in research, development, and meeting the increasing demand for high-performance microprocessors.

In October 2023, NVIDIA and Foxconn joined forces to establish AI factories and systems to advance the AI industrial revolution. Foxconn will integrate NVIDIA technology to create data centers that support manufacturing, AI-driven electric vehicles, robotics, and other applications.

In July 2023, TSMC established a global research and development center in Taiwan, specializing in advanced semiconductor tech, materials, and transistor structures, indirectly influencing the microprocessor market through technological progress.

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