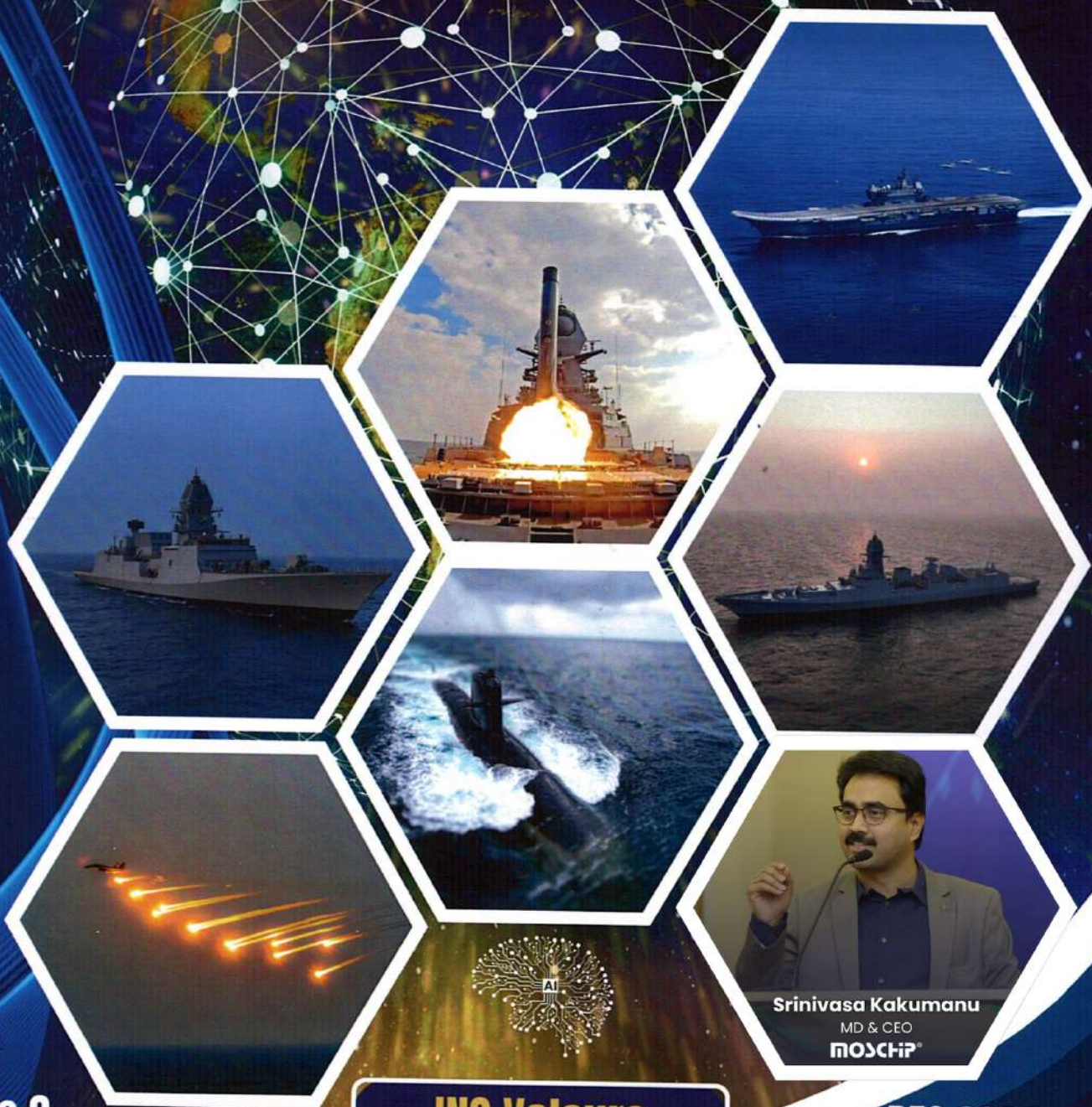




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SEMICONDUCTOR TRENDS AND TECHNOLOGIES POWERING THE DIGITAL WORLD

Mr. Srinivasa Rao Kakumanu, CEO and MD MosChip Technologies

1. INTRODUCTION

(a) In the age of digital transformation, semiconductors have emerged as the cornerstone of innovation, fuelling advancements across industries and reshaping how we live, work, and connect. These intricate chips are driving the technologies that define consumer devices, autonomous vehicles, AI systems, IoT devices, and cloud computing. As the digital world evolves, so do the trends and technologies within the semiconductor industry, pushing the boundaries of possibilities. From the rise of AI-optimized chips to advancements in power efficiency and the shift towards smaller nodes, semiconductors are setting the stage for a smarter, more connected future.

(b) According to the latest forecast by Gartner, Inc., global semiconductor revenue is anticipated to grow by 14% in 2025, reaching a total of USD 717 billion. The market is expected to witness a robust growth of 19% in 2024, culminating in revenues of USD 630 billion. These projections reflect the ongoing demand dynamics and technological advancements driving the semiconductor industry. Let's dive into the exciting world of semiconductor trends and technologies that will define the future.

2. SEMICONDUCTORS ACCELERATING AI AND MACHINE LEARNING CAPABILITIES

(a) AI and ML are no longer just buzzwords—they are pivotal in driving innovation by automating complex tasks, enhancing decision-making processes, and unlocking insights that were once beyond reach. At the core of this transformation are semiconductors, particularly specialized AI chips

such as GPUs, TPUs, and custom-built architectures, which are pushing the boundaries of computational performance. These chips are engineered to accelerate compute-heavy tasks like deep learning model training, natural language processing, and real-time data analytics, becoming integral to various sectors.

(b) A critical development in AI's evolution is the rise of Edge AI. Traditional AI workloads, which were previously processed in centralized cloud servers, are now being moved closer to the data source—directly onto edge devices like sensors, smartphones, and cameras. This shift significantly reduces latency, enabling faster and more reliable decision-making in real-time. This translates the industry into designing chips optimized for low-power, high-performance AI computations that can handle local data processing in resource-constrained environments, crucial for applications in IoT, smart cities, and industrial automation.

(c) Semiconductors are also advancing with AI-optimized chip designs that integrate machine learning algorithms directly into their architecture. This results in chips that are more adept at handling specific AI workloads with enhanced processing power, optimized energy usage, and greater adaptability to dynamic AI tasks. These AI-optimized semiconductors are key to meeting the growing demand for autonomous systems and edge-based AI applications.

3. TRANSFORMING CONNECTIVITY WITH 5G AND 6G

(a) The digital landscape is experiencing a significant evolution driven by the advent of 5G and the impending 6G era. These next-generation networks are poised to fundamentally transform connectivity paradigms for both enterprises and individuals, amplifying collaboration and innovation. The semiconductors are crucial for delivering the essential speed, reliability, and scalability that underpin advanced connectivity solutions. They facilitate high-throughput data transfers and support ultra-low latency networks, which are vital for the seamless operation of our increasingly interlinked environments.

(b) Semiconductors are pivotal in advancing connectivity and networking architectures, serving as the foundational hardware that underpins high-performance networks. Specialized chipsets and networking devices facilitate accelerated data transfer, increased bandwidth, and low-latency communication by leveraging advanced processing architectures and efficient power management. These features are essential for modern technologies such as 5G, IoT, and Edge Computing. By delivering the computation power necessary for real-time data processing and adaptive network management, semiconductors play a critical role in enhancing the scalability, reliability, and overall performance of next-generation connectivity solutions. This capability enables industries and data centers to meet the growing demands of digital transformation initiatives, driving innovations and ensuring seamless global connectivity.

4. EXPANDING THE IoT SECTOR WITH SMART SEMICONDUCTORS

(a) The IoT is revolutionizing how devices connect and communicate, and at the center of this transformation are semiconductors! As the IoT landscape expands, the need for cutting-edge, efficient, secure components and custom IoT solutions is soaring. Enter low-power chips, that empower everything from sleek wearables to smart home gadgets and advanced industrial automation, allowing them to run seamlessly for extended periods without guzzling power.

(b) As IoT applications increase, the demand for low-power microcontrollers will intensify. These MCUs are designed to deliver reliable performance with minimal energy consumption, enabling devices

to run longer on battery power and operate seamlessly in remote or battery-operated environments.

(c) Specialized connectivity chips will also see increased demand, driven by the need for robust communication in IoT ecosystems. With technologies like Bluetooth Low Energy (BLE), Zigbee, and LoRaWAN becoming more prevalent, semiconductors will play a crucial role in ensuring efficient, low-latency data transmission between connected devices. These chips will need to be designed for higher bandwidths, extended ranges, and enhanced scalability to support the growing number of IoT devices in diverse environments.

5. REVOLUTIONISING TRANSPORTATION SYSTEMS

(a) The evolution of mobility solutions showcases the expanding influence of semiconductors in reshaping not just transportation but how we interact with technology in our everyday lives. Autonomous systems are the best example of this transformation. These systems, powered by high-performance semiconductors, are rapidly gaining traction across various sectors. The ability of semiconductors to process vast amounts of data from an array of sensors, cameras, and radars enables real-time decision-making that's critical for reducing human error and improving operational efficiency. Whether it's smart transportation systems, robotics, or logistics networks, semiconductors are playing a crucial role in making these autonomous systems not only a possibility but a reality.

(b) Electric systems are another area where semiconductor innovation is driving massive change. From high-efficiency power management to battery monitoring and energy recovery solutions, semiconductors are fundamental to the adoption of more sustainable energy solutions. These chips ensure that electric systems, whether in vehicles, industrial equipment, or renewable energy grids, are running efficiently and sustainably. With global environmental concerns escalating, the semiconductor industry's contributions to green technology are helping pave the way for energy-efficient, low-emission systems that are essential for a sustainable future.

6. THE FUTURE OUTLOOK

(a) The semiconductor industry is gearing up to tackle some of the most exciting and challenging

technological frontiers. With AI and machine learning continuing their meteoric rise, semiconductors will enable smarter, faster, and more efficient systems. The growing importance of edge AI and AI-optimized chip designs will refine the balance between power and performance, making these innovations even more accessible and efficient. The world is getting faster, and so are semiconductors by bridging super-speed connectivity to every corner of the globe.

(b) If we zoom into the future, it's clear that the semiconductor industry is not just keeping up with technological advances, it's driving them. From AI-powered innovations to connectivity solutions, semiconductors are the foundation that supports every leap forward. The world is getting smarter, more connected, and more sustainable, and semiconductors will continue to play the leading role in making it all happen.

(c) MosChip® not only witnesses this transformation, but actively helps businesses in shaping it. With a rich legacy in delivering next-gen semiconductor and product engineering solutions, we empower industries to thrive in this rapidly evolving technological landscape. Whether it's for advancing AI capabilities, enabling ultra-fast connectivity, or providing smart solutions for IoT and mobility, MosChip provides engineering solutions encompassing end-to-end silicon design, verification, systems, software, along with IP services, Turnkey ASIC and Product Engineering Services. It has developed and shipped millions of connectivity ICs and has an excellent track record of first-time-right silicon of 200+ SoC tape-outs.

ABOUT THE AUTHOR



Mr. Srinivasa Kakumanu, commonly known as "KS," possesses an extensive professional background spanning over 30 years within the Semiconductor industry. His notable accomplishments include the co-founding of First Pass Semiconductors Pvt Ltd, a prominent VLSI design services organization established in December 2010. Throughout his illustrious career, KS has played a key role in leading numerous ASIC tape-outs across the Communication, Networking, Consumer, and Computing sectors. Under KS's leadership, First Pass experienced significant growth, evolving into a thriving organization boasting more than 210 employees by FY18. This remarkable journey culminated in the acquisition of First Pass by MosChip in July 2018, all while maintaining a profitable trajectory since inception. Following the acquisition, KS assumed the role of heading the Semiconductor Business Unit at MosChip, steering it to remarkable heights. Under his leadership, the Business Unit expanded from a team of 200+ engineers with a revenue of approximately 25+ crores in FY19 to a formidable force of 800+ engineers, achieving a revenue of more than 200 cr. He holds a B.E degree in E.C.E from the University College of Engineering, Osmania University, Hyderabad, India. KS maintains his commitment to professional education by actively teaching Digital Design and Physical Design at MosChip Institute of Silicon Systems Pvt Ltd, a training institute he co-founded, which was subsequently acquired by MosChip in July 2018. His international experience includes a seven-year tenure in the United States between 2000 and 2007, where he contributed to TTM Inc. and Ikanos Communications.



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