Leaders

Build Future-Ready SEMICONDUCTOR TITANS For India's High-Tech Ascent To Global SEMICONDUCTOR LEADERSHIP

Steve Sanghi of Microchip Technology speaks with Dr Satya Gupta from VLSI Society of India, sharing his insights into the future of chip technology and the key challenges and opportunities for India in becoming a semiconductor product nation.

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SG: Could you start by sharing some background on Microchip's journey and where it stands today?

SS: Microchip Technology began as a modest division of General Instruments in the late 1980s, struggling financially and valued at around $10 million. After I joined in 1988, we raised $10.5 million in venture capital, and over the next three decades, we scaled Microchip to $8 billion revenue and a market valuation of $44 billion. We now operate globally, with large manufacturing fabs and a diverse portfolio, especially in microcontrollers and FPGAs, which serve defence, automotive, and consumer markets. Through cycles of technological and economic challenges, Microchip has maintained a steady growth trajectory.

SG: What global technology and business trends do you see shaping the semiconductor industry in the next five to seven years?

SS: Several trends are set to dominate. Artificial intelligence (AI) is seeing exponential growth, driven by companies like Nvidia. Beyond AI, there are six key trends: electric vehicles, autonomous driving, data centre expansion, 5G, Internet of

Things (IoT), and sustainability. All these areas demand a range of semiconductor innovations, from high-performance GPUs to chiplets and 3D packaging. Technology and business trends drive each other, fuelling the semiconductor industry's rapid expansion.

SG: How do you view the geopolitical landscape in semiconductors, especially with recent supply chain disruptions and self-reliance efforts by many countries post-Covid?

SS: The supply chain issue is a result of the USA-China tension. Countries are now focused on building domestic capabilities to reduce dependency, leading to fragmented manufacturing and supply chain models. The US has invested $52 billion through the CHIPS Act, while Europe and other nations are implementing similar policies. This localisation effort is primarily driven by strained US-China relations, not just Covid-related disruptions. If geopolitical concerns with China were resolved, the global semiconductor supply chain could remain collaborative.

Steve Sanghi GSA Award

SG: What impact will China's pivot to mid-range manufacturing have on mid-tier semiconductor companies like Microchip?

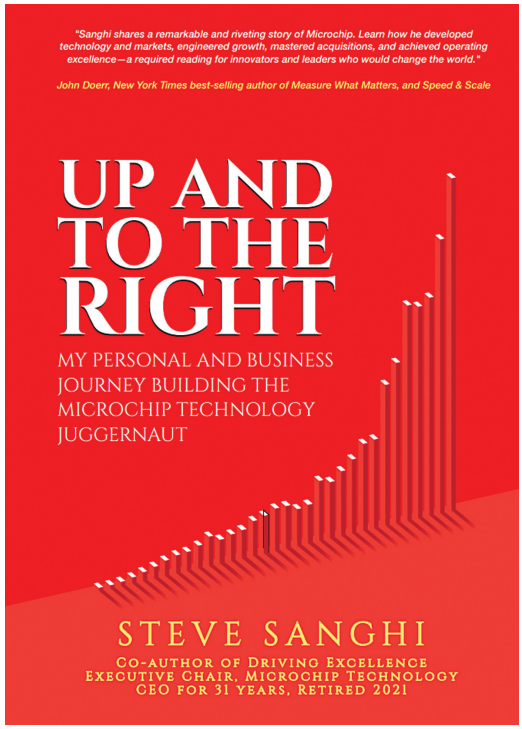
SS: China has responded to its limited access to advanced manufacturing technology by focusing on mid-range capabilities, building significant capacity for trailing-edge technologies. We are seeing many Chinese startups entering the market, especially in commodity products, which could bring some competition. However, about half of Microchip's business in China involves Western firms manufacturing there, which are now shifting operations to countries like Vietnam and Thailand. Around 5% of our China business is at risk of local competition, but Microchip's diverse portfolio and quality-driven approach should mitigate significant impact.

SG: How do you see emerging technologies, like chiplets and 3D packaging, affecting the cost-sensitive sub-$10 chip market?

SS: Chiplets and 3D packaging are advantageous but expensive, so they are currently more viable for high-end applications, such as data centres and AI processors. As adoption grows, prices may drop, gradually making these technologies accessible to mid-range markets. However, they are unlikely to penetrate low-cost microcontrollers and analogue chips because the price reduction would still be insufficient to support such low-margin products.

SG: RISC-V has gained popularity, especially among enthusiasts and educational institutions, but has yet to make a major commercial impact. How do you see it evolving?

SS: RISC-V has gained momentum, with many major companies now working on RISC-V projects. A significant milestone was when NASA selected RISC-V architecture for its next-generation space processors. While RISC-V was once an alternative among many architectures, it is now positioned to compete with ARM, primarily due to ARM's licensing fees and other restrictions. RISC-V offers an open-source model, which we expect to gain substantial traction in the coming years. Microchip has integrated RISC-V selectively in



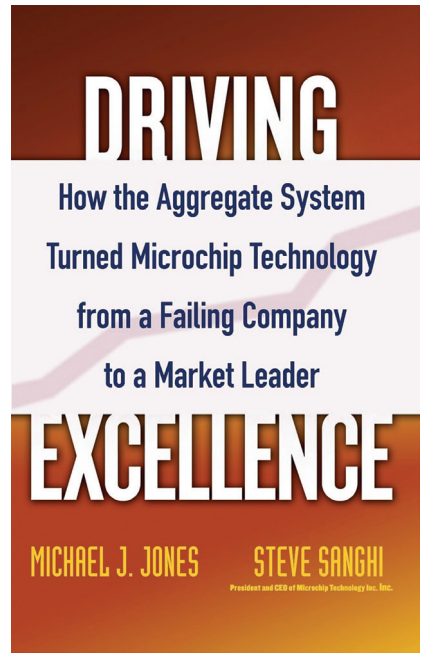
many of its products and expects it will become a significant component of our portfolio over time.

SG: India recently launched the India Semiconductor Mission with extensive incentives for semiconductor manufacturing. How would you assess India's progress so far?

SS: India's policy, including a 50% incentive for project costs, marks a promising start, but semiconductor manufacturing requires long-term commitment and consistency, often spanning decades. Policies must be stable and resilient to changes in government or economic shifts to attract foreign investment. The latest initiatives are more thoughtful than previous efforts, and the government's openness to adjusting policies based on industry feedback shows promise. However, establishing a semiconductor ecosystem that includes raw material supply chains and local support industries is crucial for India's success in semiconductor manufacturing.

SG: How do you see India's potential in compound semiconductors like gallium nitride (GaN) and silicon carbide (SiC), especially considering the demand for power applications in electric vehicles (EVs), renewables, and others?

SS: Compound semiconductors like GaN and SiC hold great promise, especially for high-power applications. Although GaN and SiC fabs require a smaller initial investment than silicon, the technology itself is challenging to master. However, with India's growing EV market, this could be a viable opportunity if Indian companies can overcome technical hurdles and gain customer trust. Global companies have faced challenges with compound semiconductors, so India should start small, focusing on local demand, and aim to build expertise gradually.



SG: With government support for the fabless ecosystem, what types of semiconductor products should Indian companies focus on for commercial viability?

SS: India's fabless ecosystem has two paths: one, innovate to address unmet global needs, or two, design products that cater to India's domestic market and gradually expand. An example of innovation is Microchip's early success with programmable microcontrollers, which enabled customer flexibility. Indian companies might initially focus on products with local demand, such as power management ICs for solar inverters, and later scale these products to international markets as they establish credibility.

SG: Turning to academic research, what advice would you offer to Indian institutions aiming to support India's semiconductor ambitions?

SS: Universities should bridge the gap between academic research and industry application. Too often, universities focus on theoretical research aimed at publications and patents, whereas industry needs applied research that drives commercialisation. Sponsoring specific projects aligned with industry needs could enhance research relevance and lead to more direct commercial applications. Collaboration with industry, especially in design-focused research, will help produce commercially viable results.

SG: What is your recipe for building a company in India that could one day rival global giants like Microchip or MediaTek?

SS: Building a semiconductor giant requires long-term consistency, resilience, and a commitment to quality and reliability over decades. It starts with leadership at the top, paired with dedicated engineers and skilled labour. Consistency in policy and industry support is crucial, and fostering talent through training and collaboration with industry will help lay the foundation. My hope is that India can create a globally competitive semiconductor company within the next few decades—one with the tenacity to endure cycles of growth and recession alike.

SG: Any closing thoughts for those working towards India's semiconductor ambitions?

SS: India has made significant strides in a brief time, and people like yourself, the VLSI Society, and institutions are all contributing to a promising ecosystem. My advice is to celebrate these accomplishments but remain aware of the room for improvement, much like how I encouraged my children to aim high but stay grounded. With continued dedication, India's semiconductor sector will have a strong foundation for success. My best wishes for VLSI Society for the upcoming 38th VLSI Design conference in January 2025 which Microchip is supporting as an anchor company. EFY

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