

Current Trends of Development

Emphasis on Mobility

Microchips have downsized from hundreds of nanometers in the 1970s to the cutting-edge 2 nm today through decades of advances in manufacturing and design rather than a single “miracle.” This was driven by photolithography improvements—most recently extreme ultraviolet (EUV) lithography—that allow finer patterns to be etched onto silicon, along with new transistor architectures such as FinFETs and now Gate-All-Around nanosheets that prevent current leakage at atomic scales. Engineers also adopted new materials like high-k dielectrics, optimized chip layouts using advanced software, and began stacking components in 3D to pack more transistors into the same space.

Edge Computing

Moore’s Law, the principle that transistor density doubles every two years, fueled dramatic improvements in chip efficiency and speed from the 1960s through the 2010s.

AI

GPUs, originally designed for graphics, are now widely used for training AI models. FPGAs, which can be reconfigured after fabrication, and ASICs, which are hardwired for specific algorithms, are increasingly used for inference tasks. Each type has different trade-offs in efficiency, flexibility, and speed. Benchmarking studies show that AI chips can be 10 to 1,000 times faster and more efficient than CPUs, depending on the application, with ASICs offering the highest specialization.

Digital divide

U.S. companies dominate chip design, while Taiwan and South Korea lead in fabrication and the Netherlands, Japan, and the United States lead in manufacturing equipment. China, by contrast, remains behind in GPUs and FPGAs and has only begun making progress in AI ASICs. Many Chinese firms still rely on U.S. software and Taiwanese fabrication.

Future Developments

Quantum Computing

Decentralization

Speed

Connectivity

Revision #4

Created 15 September 2025 03:47:13 by Jayden

Updated 17 September 2025 04:03:26 by Michael