Chapter 4 Toward Further Growth

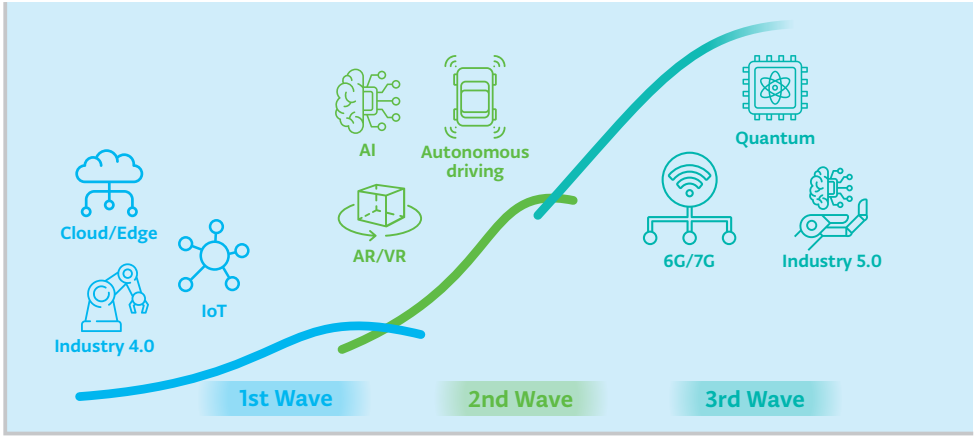
Medium- to Long-term Outlook

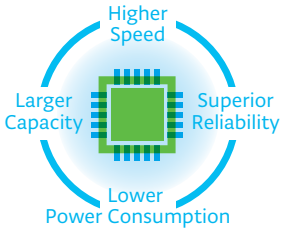
Evolution of Technology and Future of Semiconductors

In recent years, the information and communication technology industry has been driven by the evolution of electronic devices and network infrastructure, while internet services and platform businesses utilizing IoT and Cloud/Edge computing have grown rapidly as the "1st Wave." Now, with the shift to the era of artificial intelligence (AI), which utilizes the vast amount of data accumulated through such services and data generated daily, we are entering the "2nd Wave," which is driven technologically by applications that require advanced computing, such as the practical application of generative AI, AR/VR and autonomous driving. As a result, the demand for semiconductors is increasing and the semiconductor market is forecast to reach approximately US$1 trillion by around 2030.

Computing demands will continue to expand in the future, and the sophistication of the communication infrastructure needed to process such large amounts of data will also accelerate. Quantum computing, the practical application of 6G/7G communication and Industry 5.0, which utilizes self-learning AI robots, will create the next "3rd Wave" of technological innovation. Along with growth in the semiconductor market, related industries including manufacturing equipment, are also expected to show strong growth.

Semiconductor Market Outlook

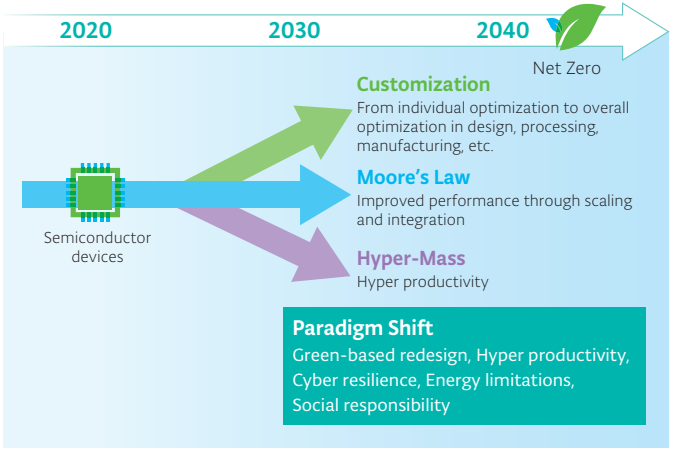




While the semiconductor industry holds significant growth potential, there is an issue of the increase in electric power consumption in computing. If power consumption continues to grow exponentially at the current pace, the demand may exceed the supply, causing power shortages worldwide in the near future. In addition, increases in power consumption will also lead to more greenhouse gas emissions, leading to concerns about the impact on global environmental preservation. For the sustainable development of a digital society, lower power consumption of semiconductors is essential in addition to higher semiconductor speed, larger capacity and superior reliability.

It is thought that semiconductors, which support the lives of people, are expected to evolve in more diverse ways, going forward. The performance of semiconductors has improved through scaling and integration, but the demand for further performance improvement for the realization of computer technology that can process vast amounts of data at higher speeds and with lower power consumption is increasing. In addition, with the diversification of applications and services, it is necessary to optimize semiconductor design, manufacturing technology and the entire system according to the application. Furthermore, because larger capacity data traffic and their processing and analysis require an enormous number of semiconductors, it is necessary to reduce the cost of semiconductors through economies of scale in order to realize a world in which everyone can enjoy the benefits of computer technology.

Various paradigm shifts in the market are expected to happen in the medium term. The key to value creation in the future for semiconductor production equipment manufacturers will be to solve the technological and cost challenges of scaling and integration, to quickly propose the best solutions to meet the diverse needs of customers and to provide manufacturing methods that achieve extremely high productivity and optimize environmental impact.

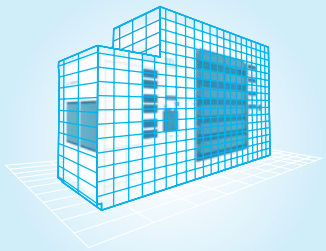


Medium- to Long-term Outlook

Development of Semiconductor Production Equipment

Toward the US$1 trillion sized era and beyond in the semiconductor market, semiconductor manufacturing needs to solve issues such as cost and time for development and production in addition to advanced technology for device structures and integration. Furthermore, with the expansion of semiconductor manufacturing locations, there will be a need to strengthen global technical support systems after equipment installation. In such a situation, it is considered important for an equipment manufacturer to provide solutions based on digital transformation (DX) that makes full use of AI and digital technology.

A key in equipment development in the future will be virtualization technology in cyber space that integrates various simulations. Currently, verification using real prototypes is common practice, requiring a lot of resources and labor, however, prototypes utilizing virtualization technology allow optimal design to be completed quicker with less effort. Remote operations are an effective approach to increasing the efficiency of semiconductor production equipment installation and maintenance. By using AR glass to accurately understanding the state of the equipment and performing repairs, adjustments and the changing of parts using on-site robots, it becomes possible to provide timely and appropriate support regardless of location or time.



Prototypes Utilizing Virtualization Technology

Remote Operation

Aiming to Be a Company Filled with Dreams and Vitality

The world continues to push firmly ahead with implementing information and communication technology (ICT) as well as taking action to realize decarbonization in order to build a strong and resilient society in which economic activities do not stop under any circumstances.

Utilizing our expertise as a semiconductor production equipment manufacturer and all management resources including employees who create and fulfill company values, Tokyo Electron continues to create high-value-added leading-edge equipment and technical services. And to surely assume our roles and responsibilities in society, we will help realize a balance between digitalization and global environment preservation through our contribution to technological innovation in semiconductors.

We will continue to work hard to expand medium- to long-term profit and to continuously enhance our corporate value, leading to the practice of our Corporate Philosophy through the realization of our Vision, and will meet the expectations of all stakeholders surrounding the Company.