

Japan's Semiconductor Strategy and Implications for Korea



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In June 2021, the Japanese government announced a new growth strategy that included plans to promote semiconductor manufacturing. Japan's semiconductor strategy can be summarized as the establishment of an advanced domestic semiconductor foundry, miniaturization of next-generation semiconductor manufacturing process and development of 3D package technology, strengthening of design and development of next-generation advanced semiconductors related to digital transformation (DX), and green innovation of semiconductor technology.

First, the Japanese government recognized the absence of a promising global foundry as its biggest weakness hindering semiconductor competitiveness and chose the strategy of attracting Taiwanese TSMC. This strategy seemed to have paid off when, in June 2021, TSMC officially announced that it plans to build a new semiconductor plant in Japan's Kumamoto prefecture. Furthermore, the Japanese government amended the so-called "5G Promotion Act" in December 2021, paving the way for

the government to provide subsidies for the TSMC Kumamoto semiconductor plant. TSMC's Kumamoto plant, which is scheduled to begin operations in December 2024, will have a circuit line width of 22 to 28 nm, producing semiconductors used in calculations necessary for image sensors.

Second, the Japanese government has decided to promote advanced logic semiconductor technology development projects that develop micro-processing technology for the pre-process stage and 3D package technology for the post-process stage. Regarding pre-process technology development, the National Institute of Advanced Industrial Science and Technology (AIST) formed the Advanced Semiconductor Manufacturing Technology Consortium at the end of March 2021, in which three Japanese semiconductor manufacturing equipment and materials companies (TEL, SCREEN, and Canon) are participating, and Intel, TSMC, and USJC are listed as supporting members. And, in the development of post-process 3D package technology, TSMC received a subsidy of 18.5 billion yen from the Japanese government and opened the Japan 3D IC R&D Center in Tsukuba city in November 2021.

Third, the Japanese government is promoting three projects as part of its R&D program of advanced logic semiconductors related to digital transformation: the post 5G information system-related semiconductor technology development project, the next-generation green data center technology development project, and the next-generation automotive computing technology development. To promote these projects, the Japanese government has designated the University of Tokyo and AIST as centers for AI chip design, Tokyo Institute of Technology as the center for RISC-V design, and the University of Tohoku as a focal point for spintronics logic semiconductor development.

Fourth, the Japanese government plans to intensively foster power and optoelectronic semiconductors to promote green innovation in semiconductor technology. In relation to power semiconductor technology, the Japanese government will focus on development of "innovative materials" such as silicon carbide (SiC), gallium nitride (GaN), and gallium oxide (Ga₂O₃).

The United States and Japan held the "Economic 2+2" (foreign and economic ministers) meeting in July 2022, during which they agreed to establish a tentatively-named "Next Generation Semiconductor Manufacturing Technology Development Center" in Japan by the end of 2022, and to launch mass-production of state-of-the-art semiconductors with a circuit line width of 2 nm in 2025. The Japanese government will engage AIST, RIKEN, and the University of Tokyo as R&D bases in the above-mentioned semiconductor technology development center, and

utilize the facilities and professional manpower of the U.S. government's National Semiconductor Technology Center (NSTC), which will be established in accordance with the National Defense Authorization Act of 2021. The Japanese government plans to invest 1 trillion yen in R&D expenses over the next 10 years for U.S.-Japan semiconductor joint research. And, in the United States, President Biden signed the CHIPS and Science Act in August 2022, which stipulates subsidies of \$52 billion for semiconductor production and R&D in the United States. Furthermore, the Japanese government is planning to expand cooperation with semiconductor manufacturing companies in countries that "share values," such as Taiwan and Korea.

As is well known, cooperation in the semiconductor sector between Korea and Japan has not made any progress since Japan's export controls in July 2019. However, with the launch of a new Korean government in May 2022 that places importance on future cooperation with Japan, cooperation between Korea and Japan in the so-called economic security field, including semiconductors, is expected to emerge as a new cooperation agenda. However, the agreement in the above-mentioned "Economic 2+2" meeting between the U.S. and Japan suggests that it will put a significant pressure on the Korean government as competition intensifies in the semiconductor sector between Korea and Japan in the future. **KIEP**