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# Title: Past & existing EU-International cooperation

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Léo Saint-Martin, DECISION	ICOS WP2 leader	22/12/2023




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## Executive Summary

### 1 Overview

#### 1.1 Purpose


The purpose of this deliverable is to identify cooperation between the EU and Taiwan, Japan, South Korea, China, US, India and Singapore. The existing cooperation between the EU and these leading semiconductor countries is identified in this document and also the planned cooperation is described.

The first section describes the intergovernmental agreements between countries and regions. The second section describes the various agreements between European semiconductor companies and the target countries or organizations.

#### 1.2 Definitions

Term	Definition
ICOS	International Cooperation On Semiconductors
ATP	Assembly, Test, and Packaging
TTC	Trade and Technology Council
WG	Working Group
MOU	Memorandum of Understanding
MOC	Memorandum of Cooperation
WP	Work Package
SiC	Silicon Carbide
EUV	Extreme ultraviolet lithography



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## 1.3 Partnerships between countries and regions

### 1.3.1 Introduction

In this section of the deliverable we describe the key semiconductor and microelectronic partnerships between countries. Some of these have been ongoing for some time but a lot are quite recent and we believe that many have been triggered by responding to the global shortages and resulting factory closures during the coronavirus pandemic from early 2020 onwards. These events dramatically exposed the vulnerabilities in the semiconductor supply chain and the vital role of chips in modern economies. The information here was crosschecked with a recent report on technology partnerships by Hess and Kleinhans<sup>1</sup>.

### 1.3.2 India


In the various crucial stages of the chip production value chain, including product development, design, fabrication, ATP (assembly, test, and packaging), and support, India currently excels primarily in the design domain. However, the country faces the need to build manufacturing capabilities from the ground up to establish a comprehensive presence across all phases.

The following are the key agreements between India and other regions and countries:

Agreements	Date Signed
<b>EU-India Strategic Partnership: A Roadmap to 2025</b>	July 2020
<b>EU-India Trade and Technology Council</b>	Feb 2023
<b>US-India Commercial Dialogue</b>	March 2000
<b>Memorandum of Understanding “Semiconductor Supply Chain and Innovation Partnership”</b>	March 2023
<b>Japan-India Semiconductor Supply Chain Partnership</b>	July 2023
<b>U.S.-India initiative on Critical and Emerging Technology (iCET)</b>	May 2022

<sup>1</sup> Chip Diplomacy Analysis of technology partnerships, Julia Hess and Jan-Peter Kleinhans, Oct 2023



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## EU-India Strategic Partnership: A Roadmap to 2025

Cooperation on research and innovation is a cross-cutting and integral part of the EU-India Strategic Partnership as reflected in the Roadmap 2025.<sup>2</sup> which includes some 20 actions on research and innovation including health research, digital technologies, green technologies, polar sciences, as well as on mobility of scientists and strengthening the innovation dimension of the partnership through connecting start-ups. Cooperation on research and innovation with India takes place through the EU's research and innovation framework Programme Horizon Europe (2021-2027) based on calls of proposals open to participation of non-EU countries. Most topics in Horizon Europe are open for cooperation with India and certain topics target or encourage the participation of Indian entities. However, in most cases Indian participants are not automatically eligible for funding by Horizon Europe and must bring their own funding to the projects.

## EU-India Trade and Technology Council


The EU and India have set up the Trade and Technology Council (TTC) as a coordination platform to address key trade, trusted technology and security challenges<sup>3</sup>. The TTC is a key forum to deepen the strategic partnership on trade and technology between the two partners. Geostrategic challenges have reinforced the EU and India's common interest in ensuring security, prosperity and sustainable development based on shared values. The TTC will help increase EU-India bilateral trade, which is at historical highs, with €120 billion worth of goods traded in 2022. In 2022, €17 billion of digital products and services were traded. The TTC was launched in February 2023 and three Working Groups were set up. The most relevant Working Group (WG) for the semiconductor industry is *WG1: Strategic technologies, digital governance and digital connectivity*. This WG will work jointly on areas of mutual interest such as digital connectivity, Artificial Intelligence, 5G/6G, high performance and quantum computing, semiconductors, cloud systems, cybersecurity, digital skills and digital platforms.

<sup>2</sup> [https://www.eeas.europa.eu/sites/default/files/eu-india\\_strategic\\_partnership\\_a\\_roadmap\\_to\\_2025\\_0.pdf](https://www.eeas.europa.eu/sites/default/files/eu-india_strategic_partnership_a_roadmap_to_2025_0.pdf)

<sup>3</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_2728](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_2728)





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## US-India Commercial Dialogue

The Commercial Dialogue is “part of ongoing efforts to strengthen the U.S.-India Comprehensive Global Strategic Partnership, develop inclusive and fair trade and investment policies, and leverage the interests of the private sector in pursuing new market opportunities that advance prosperity in both countries”<sup>4</sup>. On March 10<sup>th</sup> 2023 India and the United States signed a Memorandum of Understanding (MoU) that will pave the way for creating a Semiconductor Sub-Committee under this Commercial Dialogue. The aim of this MOU is to identify opportunities for growth and challenges to address to ensure that U.S. and Indian semiconductor industries develop stronger connections, complementary ecosystems, and a more diverse supply chain for semiconductors.

## Japan-India Semiconductor Supply Chain Partnership

In October 2023 India’s cabinet has approved a Memorandum of Cooperation (MoC) between India and Japan on the Japan-India Semiconductor Supply Chain Partnership – signed July 2023. The MoC is for a term of five years from the date of signature by the two countries. Per the government’s press release on October 25, building upon ongoing initiatives such as the India-Japan Digital Partnership (IJDP) and India-Japan Industrial Competitiveness Partnership (IJICP), the MoC will expand and enhance collaboration within the realm of the electronics ecosystem.


## U.S.-India initiative on Critical and Emerging Technology (iCET)

The Initiative on Critical and Emerging Technologies is a framework agreed upon by India and the U.S. for cooperation on critical and emerging technologies in areas including artificial intelligence, quantum computing, semiconductors and wireless telecommunication. It was announced in May 2022 and launched in January 2023 to strengthen their strategic partnership and drive technology and defence cooperation.

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<sup>4</sup> <https://www.commerce.gov/news/press-releases/2023/03/joint-statement-india-us-commercial-dialogue>



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### 1.3.3 South Korea

Semiconductors are vital to the South Korean economy, with chips accounting for 18.7% of the country's exports in 2022. A major government initiative is the K-Belt National Chip Plan which has total incentives of \$55-65\$ over 3 years and has the aim to attract \$B 450 cumulative investments by 2030.

Agreements	Date Signed
<b>ROK – EU Digital Partnership</b>	Nov 2022
<b>United States - Korea Supply Chain and Commercial Dialogue (“SCCD”)</b>	May 2022


#### **ROK – EU Digital Partnership**

The Republic of Korea – EU Digital Partnership was announced jointly by President von der Leyen and President Yoon on 28 November 2022<sup>5</sup>.

The first council meeting was in June 2023 and resulted in an agreement to work on semiconductors, High Performance Computing (HPC) and Quantum technology, 5G and beyond, platform economy, artificial intelligence (AI) and cybersecurity.

During the meeting they decided to create the ROK-EU Forum for Semiconductor Researchers that intends to promote research in complementary areas. A Quantum expert group will also be established to work on standards and research.

<sup>5</sup> [https://ec.europa.eu/commission/presscorner/detail/en/statement\\_22\\_7232](https://ec.europa.eu/commission/presscorner/detail/en/statement_22_7232)

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## United States – Republic of Korea Supply Chain and Commercial Dialogue (“SCCD”)

US and Korea signed a Memorandum of Understanding to launch the United States - Korea Supply Chain and Commercial Dialogue (“SCCD”) on May 21, 2022<sup>6</sup>. It aims to strengthen the international competitiveness of both U.S. and Korean industries and foster collaboration between U.S. and Korean companies as they explore mutually beneficial business opportunities in the United States, Korea, and global markets. In particular, the countries agreed to strengthen their efforts under the SCCD to foster supply chain resilience in the field of Semiconductors, collaborate on Robotics & Additive Manufacturing, and increase Export Controls cooperation.

### 1.3.4 Japan


In 2021 and 2022 the Japanese government set aside more than 1 trillion yen (close to US\$7 billion) for semiconductor manufacturing plants. This commitment reaffirms Japan’s efforts to revitalise its domestic semiconductor industry, reduce its dependence on other countries for critical goods and build a resilient supply chain.

Agreements	Date Signed
Japan-EU Digital Partnership	July 2023
Japan-U.S. Commercial and Industrial Partnership (JUCIP)	Nov 2021
Japan–Netherlands MOC	June 2023
Japan-India Semiconductor Supply Chain Partnership	July 2023
UK-Japan Semiconductors Partnership	May 2023

### Japan-EU Digital Partnership

At the first Japan-EU Digital Partnership Council meeting on 3 July 2023, the EU and Japan signed a Memorandum of Cooperation on semiconductors, paving the way for in-depth cooperation in research and development; an early warning mechanism of

<sup>6</sup> <https://www.commerce.gov/news/press-releases/2023/04/united-states-korea-supply-chain-and-commercial-dialogue-ministerial>

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critical disruptions in the semiconductors supply chain; and cooperating on advanced skills for the semiconductor industry.

### **Japan-U.S. Commercial and Industrial Partnership (JUCIP)**

On November 15, 2021, the US and Japan announced the establishment of the US-Japan Commercial Industrial Partnership (JUCIP)<sup>7</sup> “to strengthen the competitiveness, resiliency, and security of both economies; to address shared global challenges such as climate change; and to achieve prosperity and maintain a free and fair economic order.” JUCIP will engage in activities in several areas including: Private sector investment and cooperation; Digital and advanced technology innovation; and Supply chain resiliency for vital industries.

### **Japan – Netherlands MOC**

Japan and the Netherlands signed a Memorandum of Cooperation on semiconductor policies in June 2023<sup>8</sup>. Under the agreement, Japanese and Dutch governments will facilitate private and public sector cooperation on semiconductor and related technologies such as photonics, sharing information on policies, and also share the significance of research projects at the Japanese government-backed next-generation chipmaker Rapidus Corp and promote tie-up among research labs.

### **UK-Japan Semiconductors Partnership**

In May 2023, the UK’s Department for Science, Innovation and Technology (DSIT) and Japan’s Ministry of Economy, Trade and Industry (METI) agreed on a framework for collaboration in semiconductor technologies<sup>9</sup>. The partnership will include research and development cooperation and a skills exchange between Japan and the UK.

### **Japan-India Semiconductor Supply Chain Partnership**


Described in section 1.4.2

<sup>7</sup> <https://www.commerce.gov/news/press-releases/2021/11/joint-statement-between-department-commerce-secretary-gina-raimondo-and>

<sup>8</sup> [https://www.meti.go.jp/english/press/2023/0621\\_002.html](https://www.meti.go.jp/english/press/2023/0621_002.html)

<sup>9</sup> [UK-Japan Semiconductors Partnership: joint statement - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/uk-japan-semiconductors-partnership-joint-statement)



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### 1.3.5 Singapore

Agreements	Date Signed
<b>EU-Singapore Digital Partnership</b>	Dec 2022

The EU-Singapore Digital Partnership announced in December 2022 will enable both partners to work together on critical areas such as semiconductors, trusted data flows and data innovation, digital trust, standards, digital trade facilitation, digital skills for workers, and the digital transformation of businesses and public services.

### 1.3.6 Other Alliances


Agreements	Date
<b>EU-US Trade and Technology Council</b>	June 2021
<b>The CHIP 4 Alliance</b>	Met Feb 2023
<b>The Quadrilateral Security Dialogue (Quad)</b>	2017
<b>Japan-ROK-US trilateral partnership</b>	Met August 2023

#### EU-US Trade and Technology Council

The EU-US Trade and Technology Council serves as a forum for the United States and European Union to coordinate approaches to key global trade, economic, and technology issues and to deepen transatlantic trade and economic relations based on these shared values. It was established during the EU-US Summit on 15 June 2021 in Brussels<sup>10</sup>.

#### The CHIP 4 Alliance

<sup>10</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/eu-us-trade-and-technology-council\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/eu-us-trade-and-technology-council_en)

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The Chip 4 alliance is an aspirational technology partnership between the **United States, South Korea, Japan, and Taiwan** focused on diversifying semiconductor supply chains. Senior officials met for the first time in February 2023.

### **The Quadrilateral Security Dialogue (Quad)**

The Quad is an international informal arrangement between the **United States, Australia, India, and Japan**. It is an initiative to forge deeper economic and security ties among partners in the Indo-Pacific and consists of working groups on a variety of issues, including technological innovation and supply chain resilience. It was first established in 2007 until 2008 and then re-established in 2017.

### **Japan-ROK-US trilateral partnership**


President Biden welcomed Japanese Prime Minister Kishida and Republic of Korea (ROK) President Yoon to a historic trilateral summit at Camp David in August 2023. The meetings produced a Statement of Principles and a Joint Statement that promised a regular schedule of trilateral annual meetings between leaders<sup>11</sup>. Cooperation between Washington, Seoul, and Tokyo will cover a wide range of issues including supply chain resilience, particularly on semiconductors and batteries, as well as on technology security and standards, clean energy and energy security, biotechnology, critical minerals, pharmaceuticals, artificial intelligence (AI), quantum computing, and scientific research.

## **1.4 Breakdown of industry activity**

### **1.4.1 Introduction**

Implementation of the technology partnerships described in the previous section often relies on the private sector, so in this section we have looked at the current and more recent partnerships between EU industrial stakeholders and the various countries targeted in this deliverable.

<sup>11</sup> <https://www.whitehouse.gov/briefing-room/statements-releases/2023/08/18/the-spirit-of-camp-david-joint-statement-of-japan-the-republic-of-korea-and-the-united-states>

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## 1.4.2 Bosch

### **Bosch in India**

Bosch set-up its manufacturing operation in 1951, which has grown over the years to include 16 manufacturing sites, and seven development and application centres.

Robert Bosch Engineering and Business Solutions (RBEI) in 2008 (Software).

Bosch set up its Research & Technology Centre in Bengaluru in 2014.

Bosch Centre for Artificial Intelligence (BCAI) in 2017.

Robert Bosch Centre for Data Science and Artificial Intelligence at the Indian Institute of Technology Madras (2019).

### **Bosch in Japan**

Development of a new research and development facility in Yokohama planned, with the aim of completing construction in September 2024. Investment of around 250M€.

### **Bosch in Malaysia**


Bosch opens €350m semiconductor test plant in Malaysia (August 2023)

## 1.4.3 STMicroelectronics

### **STMicroelectronics in South Korea**

STMicroelectronics has worked with Hyundai Autron to outfit and open a joint development lab in Seoul, Korea. The Autron-ST Development Lab (ASDL) will provide solutions for eco-friendly vehicles, with a focus on powertrain controllers.



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## **STMicroelectronics in Singapore**

"Lab-in-Fab" R&D line : Partnership announced in 2020 between A\*STAR's IME and ULVAC, a leading Japanese manufacturing-tool vendor. to setup and operate a 200mm R&D line focused on Piezo MEMS technology within ST's existing manufacturing facility in Singapore.

## **STMicroelectronics in China**

China's Sanan Optoelectronics and STMicroelectronics NV agreed to jointly invest \$3.2 billion in a Chongqing factory to produce silicon carbide devices semiconductor devices for electric vehicles (June 2023).

## **STMicroelectronics in India**

Foxconn Technology Group is collaborating with STMicroelectronics NV to submit a joint bid for constructing a (40nm) semiconductor manufacturing plant in India (Sept 2023)

### 1.4.4 Infineon

#### **Infineon in Malaysia**

Infineon to build the world's largest 200-millimeter SiC Power Fab in Kulim, Malaysia at a cost of over €5 Billion (announced Aug 2023)

#### **Infineon in Vietnam**

Infineon Technologies and VinFast, Vietnam's global smart electric car maker, announced the creation of the VinFast–Infineon Competence Centre (VICC) to jointly engage in the early development phase of next-generation smart mobility solutions (announced Oct 2022)

#### **Infineon in South Korea**


Infineon signed an MOU with South Chungcheong Province, Korea to install and operate the Renewable Energy Technology Centre (tentative name) within the Chungnam Knowledge Industry Centre located in Cheonan. (June 2023)

### 1.4.5 ASML

#### **ASML in Taiwan**





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Taiwan Government gives ASML the green light to invest (US\$313 million) to set up a plant in Linkou District, New Taipei (August 2023)

### **ASML in Japan**

ASML plans to set up a base in Japan's northern island of Hokkaido to support production at a chip plant for Japanese start-up Rapidus (Sept 2023)

### **ASML in South Korea**

ASML plans to build a 16,000-square-meter facility in the Seoul suburb of Hwaseong city, South Korea with an investment of \$181 million. Operations are expected to begin in the second half of 2024. (Nov 2022)

ASML opens global EUV training center in S. Korea (May 2023)

## 1.4.6 Other Companies

### **NXP Semiconductors in India**

NXP Semiconductors opens Systems and Silicon Innovation lab at Bengaluru campus, India (Jan 2023)

### **AMD in India**

AMD has plans to invest up to €380 million in India over the next five years, with the aim to establish its largest design facility in Bengaluru.


### **AMS OSRAM in Malaysia**

As a result of a collaborative agreement between Malaysian Investment Development Authority (MIDA), AMS OSRAM embarked on the construction of its first state-of-the-art and fully automated 8-inch microLED manufacturing facility in Kulim, Malaysia (2022)

### **Rapidus, IBM and imec in Japan**

Imec has signed a Memorandum of Cooperation (MOC) with Japan's newly formed semiconductor champion Rapidus Corp.



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Rapidus has also announced a partnership with IBM Research to develop IBM's 2nm technology in fabs that Rapidus plans to build in Japan (announced Dec 2022). IMEC, IBM and Rapidus will collaborate on this 2nm goal.

### **Simmtech and Air Liquide**

Simmtech and Air Liquide are currently engaged in discussions with the Indian government to initiate their operations in India.

## **1.5 Horizon 2020 and Horizon Europe projects**

In this final section we looked at European research projects involving partners from China, India, South Korea and Japan. A search was carried out using the following search terms "Semiconductor, microelectronics, nanoelectronics" which generated the following results:

### **Japan**

H2020: GaN based devices (2 Japanese partners) + 4 MSCA projects

HEU: 1 MSCA project

### **India**

H2020: 1 ECSEL project called AI4CSM with Infineon India

### **China**

H2020: 3 MSCA projects, 3 ICT projects (IOT – Huawei, nanomaterials, communications)


### **South Korea**

H2020: 4 ICT projects (DRAM, Internet of Food, IOT, Nanomaterials), FET (Quantum)

### **Taiwan**

H2020: 2 MSCA, 2 ECSEL (AI for Industry, Automated driving), 1 ICT (Quantum)



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## 1.6 Conclusion

Semiconductors are at the forefront of technological innovation, and R&D requires significant resources. Countries and regions often collaborate to share research facilities, expertise, and resources to advance semiconductor technologies collectively. Collaboration can also facilitate the exchange of skilled professionals and researchers, helping to address shortages of specialized knowledge and talent in this industry. Building partnerships in the semiconductor sector helps countries diversify their supply chains. Dependence on a single country or region for semiconductor manufacturing can pose risks, as demonstrated by disruptions in the supply chain, such as those caused by the covid crisis recently but could also be because of geopolitical reasons. This document has provided details of the intergovernmental and interregional partnerships that are ongoing and also describes the initiatives that the European semiconductor industry stakeholders are engaged with or are planning in countries outside the EU, particularly in the Far East.

