

The Electronics business of Merck operates as EMD Electronics in the U.S. and in Canada.

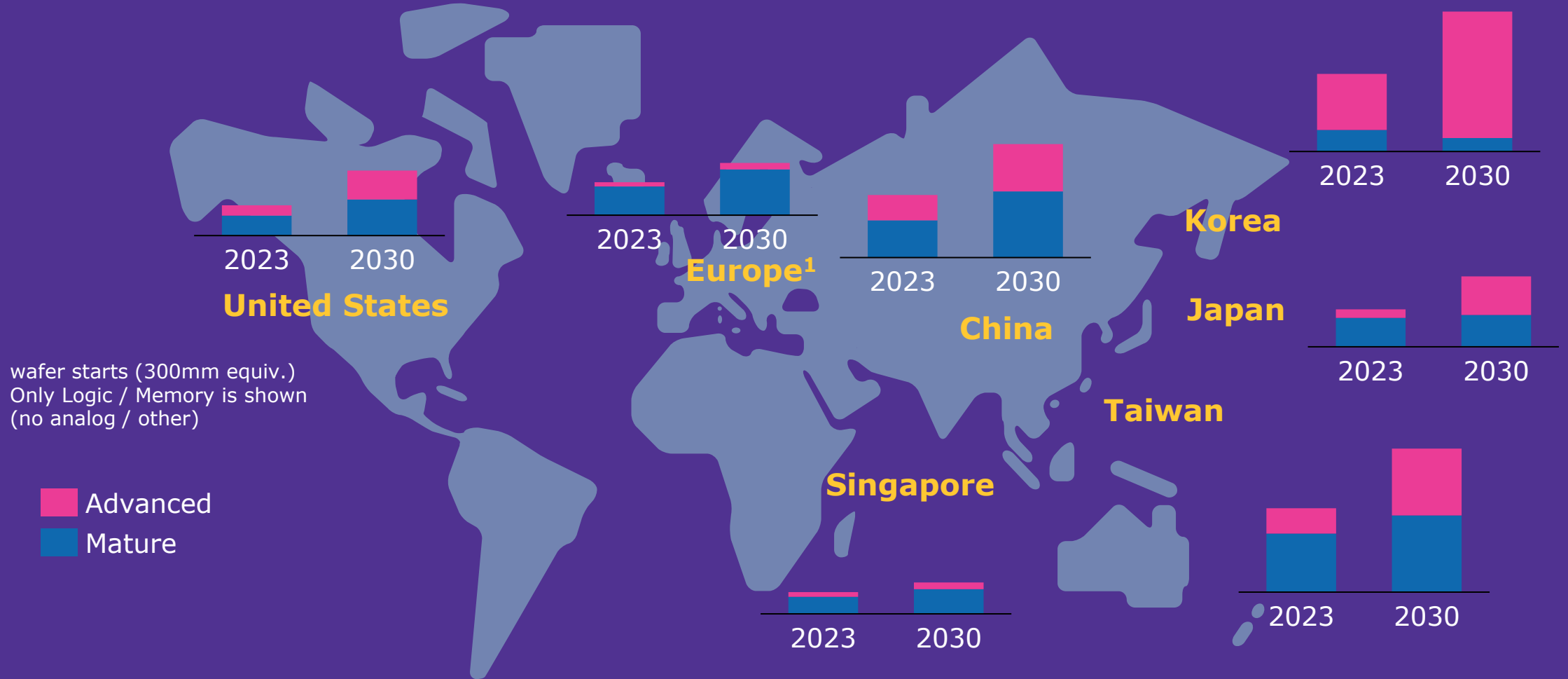
Supply Chain Collaboration and Resilience: Building and Enabling the European Ecosystem

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Electronics business of Merck



MERCK

There are 7 regions with an established semiconductor ecosystem



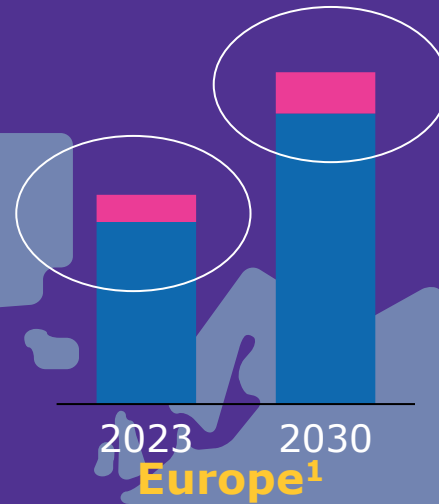
1) Europe including Israel

Merck KGaA, Semicon Europe 2024

Source: SEMI, Merck analysis

Currently, the European chip production is mainly based on mature nodes. Will this change?

Currently the advanced nodes in Europe are mainly supplied through US



Key question: Will there be an ecosystem around the advanced semiconductor industry in Europe?

wafer starts (300mm equiv.)
Only Logic / Memory is shown
(no analog / other)

Advanced
Mature

1) Europe including Israel

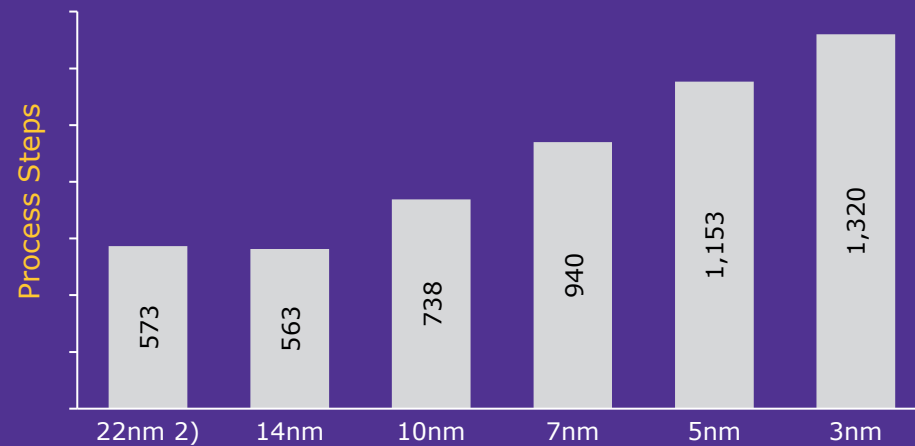
Merck KGaA, Semicon Europe 2024

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Advanced Chips (e.g. for AI) have very different requirements for the ecosystem

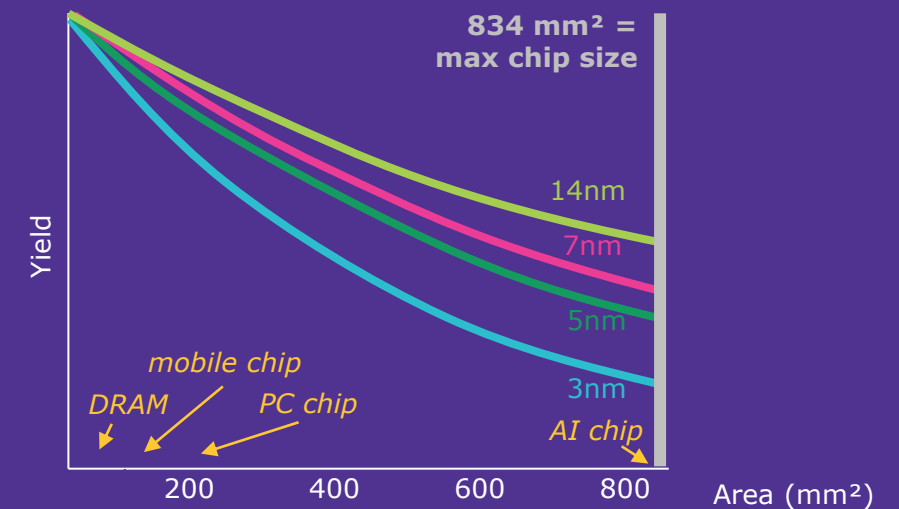
With each node the process steps and the material requirements are increasing¹

Shown: FinFET logic nodes



More materials
Advanced materials

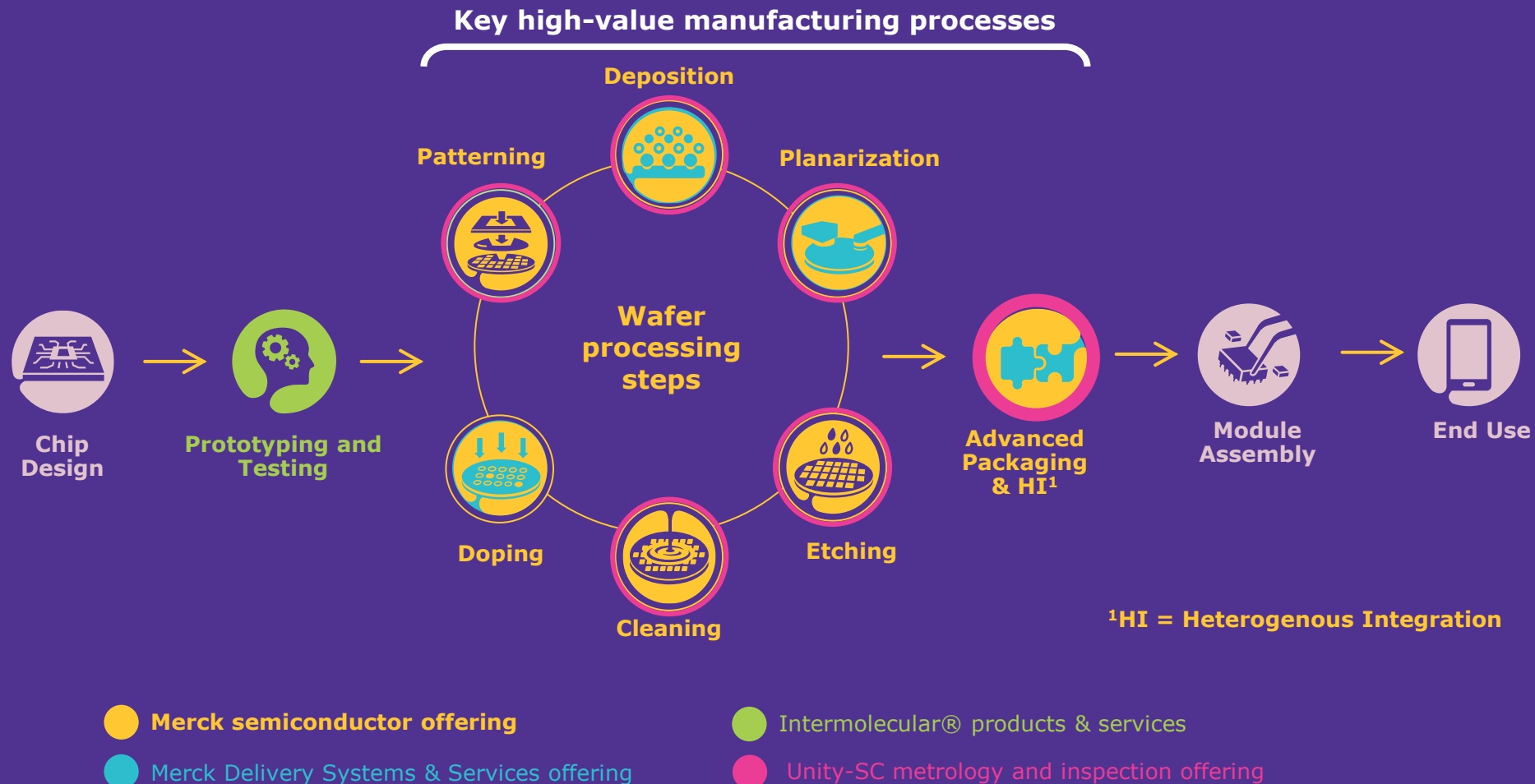
Especially for AI the yield challenges increase³



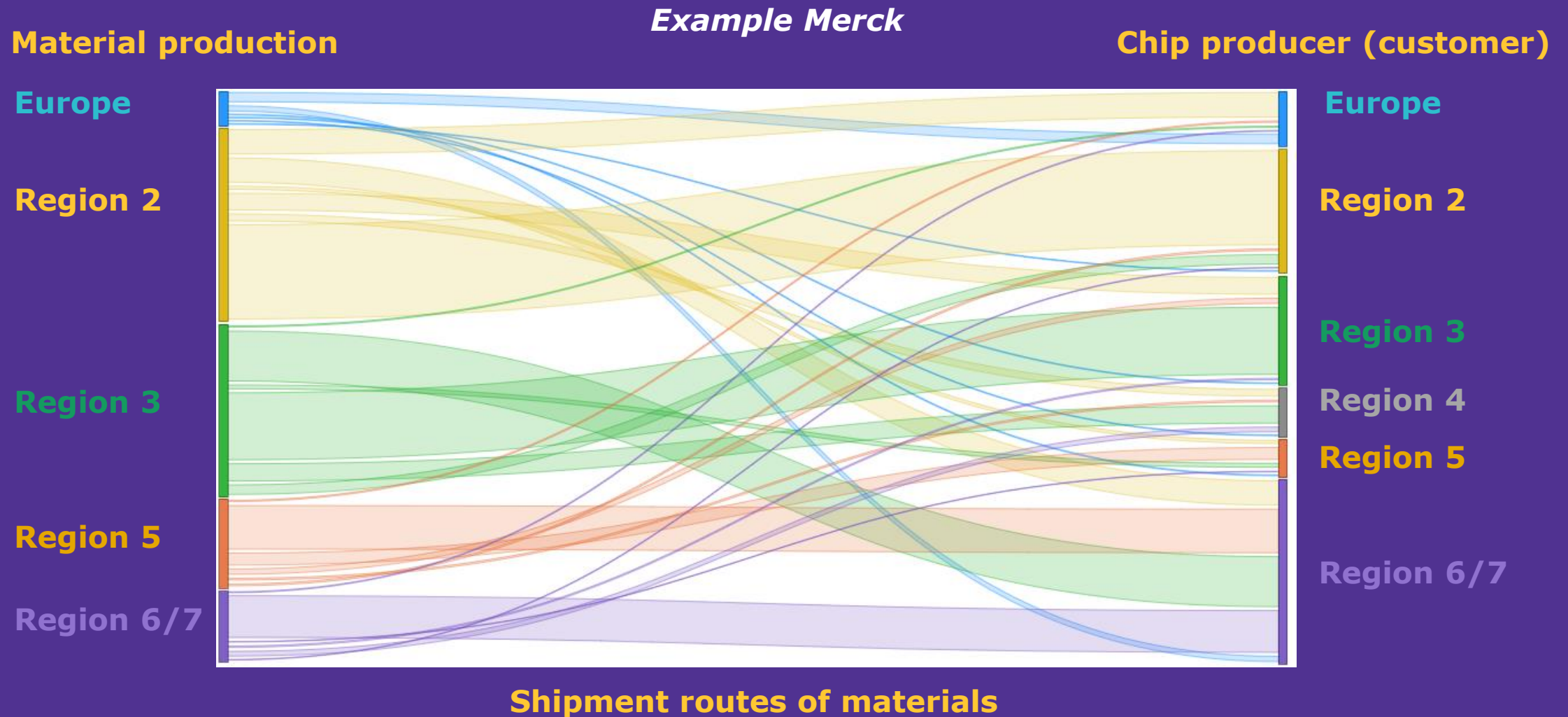
Material batch to batch consistency
Material intelligence
Better material delivery

Advanced material supply is an essential element for an advanced semiconductor ecosystem

Merck is the materials company with one of the broadest materials portfolios, addressing nearly all key manufacturing steps



Material production in all relevant regions, but volumes distributed worldwide; Europe with the smallest production footprint



Current challenges in Europe from a material supplier perspective

- ➔ Lack of scale of advanced semi industry (3% of adv. node capacity)
- ➔ Fragmented approach instead of a clear focus on strengths
- ➔ CIP¹ gap: understanding of critical parameters
- ➔ Talent focus (gap in adv. semiconductor processing)
- ➔ Cost gap (operation / investments)
- ➔ Regulatory complexity
- ➔ Speed gap (e.g. for permissions, ...)

Localization requires a critical mass to ensure competitive costs and to enable differentiated solutions

1) CIP: Continuous improvement



To close the gaps, efforts from all players across the value chain are necessary. Merck is working to address the material challenges

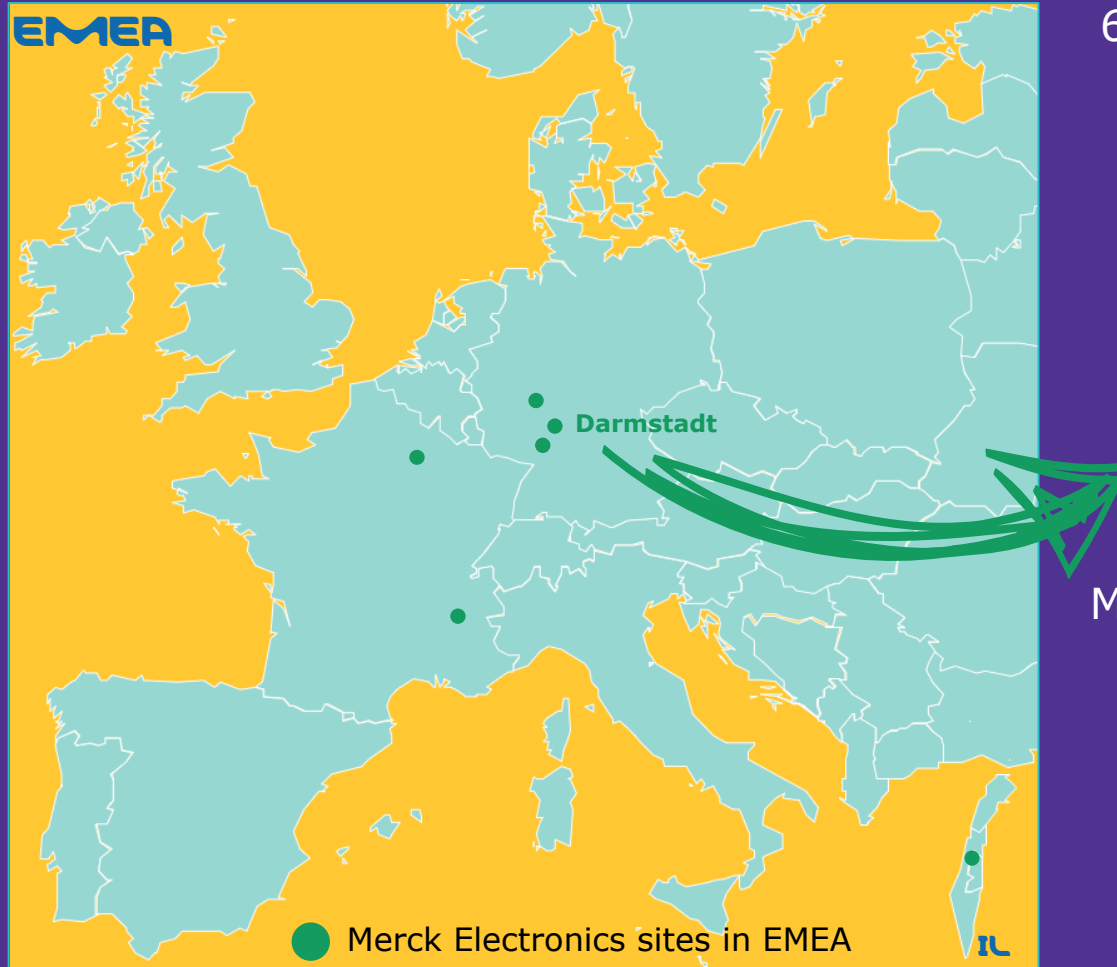
Priorities



Sequence



Merck already has a very strong foundation in Europe with experience in supplying the semiconductor industry worldwide



6 Merck sites in Europe in the semiconductor business



Main site Darmstadt covers full value chain:

- Material research center (more than 80 scientists)
- Engineering and upscaling (50 engineers/scientists)
- Best-in-class analytical competence center (180 Scientists with 20 labs)
- Production plants in Europe addressing key material classes (lithography, CMP, thin films, ...) as well as metrology

To expand the European ecosystem, Merck is contributing to key European initiatives (examples)



Semiconductor-X develops new **digital twin technologies** to digitally represent the critical planning segment of semiconductor supply and value chain, adapting the Gaia-X/Catena-X architecture

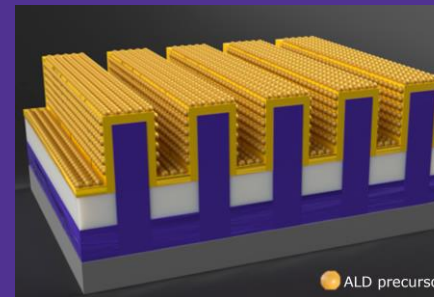


With the recent acquisition of UnitySC, we extend our **Optronics** capabilities in Europe, entering **metrology and inspection**. By combining advanced microscopy, interferometry and spectroscopy technologies across a wide range of wavelengths, we enable chip makers to optimally ramp and control their process yields, and get to market faster.



We are addressing the **PFAS challenge** in by developing PFAS-free photoacid generators that meet stringent performance standards, enhancing yield and efficiency in i-line and KrF resist applications .

We are pioneering the development of **sustainable etch and clean gases** that achieve >90% reduction in total emissions compared to state-of-the-art gases.



With metal-organic chemistry, we are enabling key technologies such as **atomic layer deposition** (ALD). Our tailored **precursors** are actively expanding the range of materials that can be deposited with atomic precision, which is essential for every modern computer chip today.

Summary

- **Europe** wants to become an ecosystem for **advanced semiconductors** but is **currently mainly focused on mature nodes**.
- To become an advanced ecosystem player, several **gaps need to be closed** in the next years.
- For advanced semiconductors, **materials play a very important role** and are an essential component of the ecosystem.
- **Efforts** from all players **along the value chain** will be required, **Merck** is contributing to close the gaps for **materials and material related solutions**.
- With already strong capabilities in Semiconductor R&D and production, **Merck builds up capabilities & capacities** and contributes strongly to the European ecosystem.

SEMICON EUROPA



Abstract

AI, autonomous driving, and smart manufacturing are among the leading trends for digital transformation, with semiconductors being integral to these advancements. The EU has the potential to revitalize its semiconductor industry, but this can only be achieved through the development of a comprehensive ecosystem and by harnessing the strengths of local players in the value chain. Merck, a leading materials and equipment supplier based in Germany, has been an innovative and transformative partner for semiconductor players worldwide. We have applied our Materials Intelligence to unlock next-generation chips by combining our expertise in chemistry, physics and science with AI solutions.

In this talk, we will explore the areas that require the collective attention of EU semiconductor players today to ensure our mutual growth and success in the future. This includes fostering closer collaboration across the value chain, expanding production capacity, strengthening supply chain resilience, and nurturing materials innovation to align with future technology roadmaps.