

# **PFAS in the semiconductor industry**

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# ESIA Members



**BOSCH**



# The voice of the semiconductor industry in Europe

Represent the interests of the European-based semiconductor industry and advocate for its international competitiveness

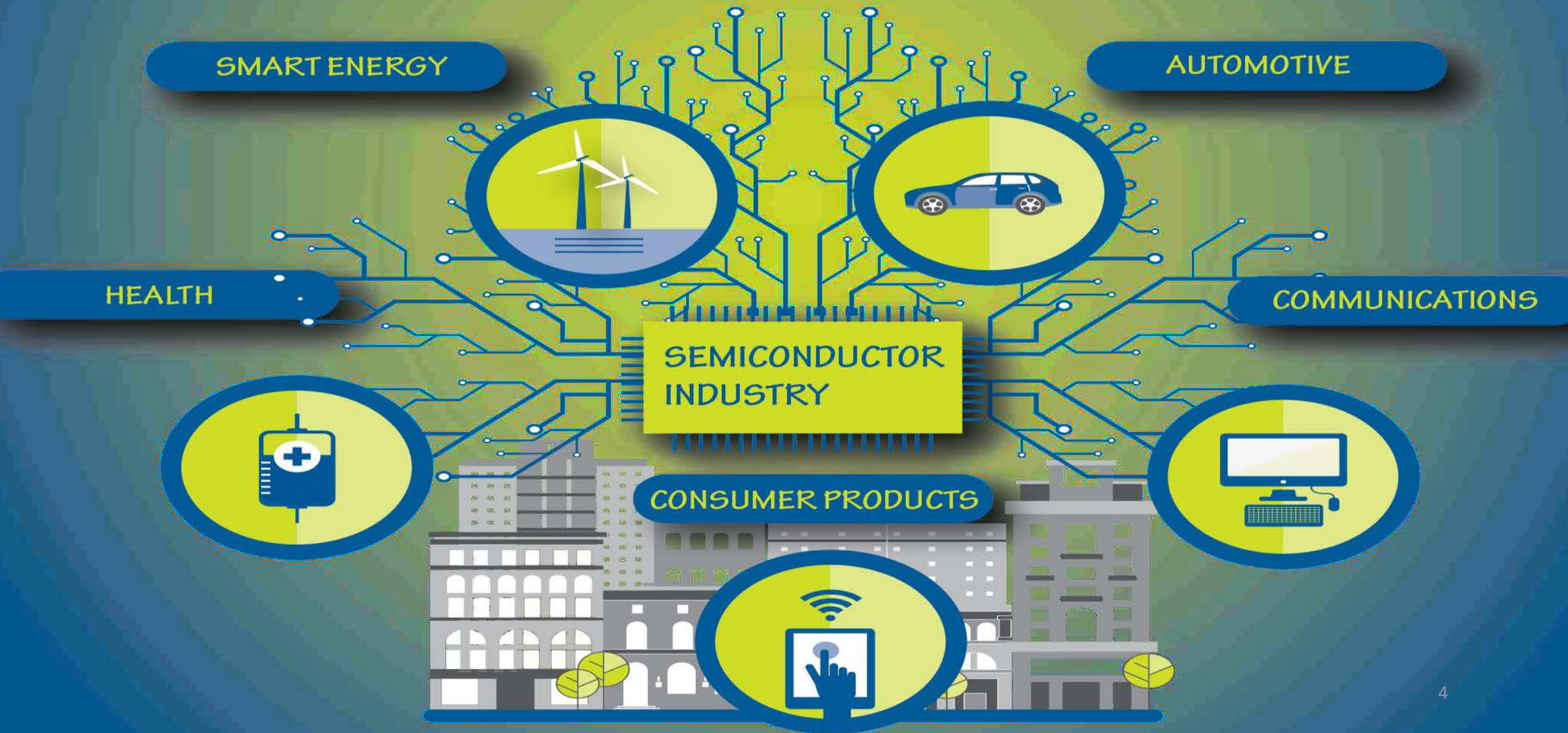
- most R&D-intensive sector
- highly-developed global supply chain
- fierce competition & price fluctuation
- short innovation cycles
- multiplier for growth, electronics boost innovation
- global market estimated at \$ 556 billion in 2021 (+26.2% yoy)
- Europe strongest market for automotive (29%)

## EU

- ca. 10% of global market
- direct employment 200.000
- indirect up to 1.000.000
- ESIA is member of the World Semiconductor Council (WSC)



# Semiconductors enable sustainable solutions



**The European semiconductor industry delivers innovative solutions to societal challenges**

**These solutions depend on the use and availability of specialty materials and chemicals**

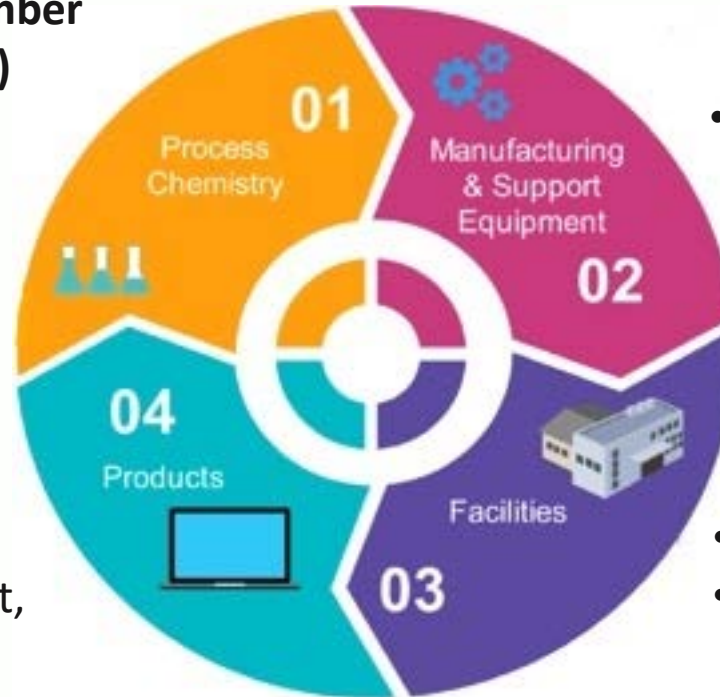
A worker in a white cleanroom suit and mask stands next to a KUKA robotic arm in a cleanroom environment. The worker is holding a small purple object. The background shows various industrial equipment and a clean, sterile floor.

**The most complex and sophisticated  
manufacturing process in the world,  
incorporating a strictly controlled and  
safe production environment**

**500**  
manufacturing steps

# PFAS use by the semiconductor industry

- Constituent of specialty process chemistry formulations (photolithography, chamber cleaning/etching, and other mixtures)
- Direct criticality
- > 13 types of distinct uses / material functionalities



- Fluoropolymers in articles (component, wire, cables, printed circuit boards, batteries, insulators, capacitors, etc.)

- Semiconductor manufacturing equipment
  - Heat Transfer Fluids
  - Various articles tubing lining orings
- Chemical distribution systems

- Factory infrastructures
- Water purification, air treatment

# PFAS use by the semiconductor industry

- Photolithography Specialty chemicals
  - PFAS are present as
    - surfactants
    - resin constituent
  - Those chemicals have specific characteristics
    - to react with UV light
    - prepare the semiconductor circuits
    - specificity for specific devices
- Etchant
  - to induce changes in the semiconductor structure

# PFAS use by the semiconductor industry

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- Refrigerant
  - Replacement for phased out chemicals with extremely high GWP
  - Now these are included in the scope of PFAS as well
- PFAS related substances in the assembly process
  - Glue in packaging
- PFAS - other uses
  - Anti-corrosion chemical in pipelines and exhaust systems
  - Fire Fighting Foams

# EU restriction

## Challenges and impacts

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- PFAS containing specialty formulations are a prerequisite for semiconductor manufacturing in Europe
- Industry transitioned from PFOA & PFOS to short-chain PFAS specialty formulations (process chemistries)
- Industry will remove PFHxA according to regulatory timeline
- Industry concerns
  - Broad current draft scope of EU restriction
  - Global industry sector with a global supply chain

# Questions?

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Thank you for your attention!

<http://www.eusemiconductors.eu/>

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