



TRANSFORM – LATEST NEWS

The Concept

TRANSFORM
Trusted European SiC Value Chain for a greener Economy

TRANSFORM is an R&D project aiming to build a complete and competitive supply chain in EUROPE for Power electronics (PE) based on SiC semiconductor technology.

SiC average growth potential on high voltage power applications until 2027



www.sic-transform.eu

- SiC based power electronics plays an important role in economic sovereignty of Europe
- Innovations in substrate technology, advanced devices, AIT and packaging technologies in a complete European supply chain: High quality, high reliability, secured volume supply.

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Technical Objectives and the Consortium

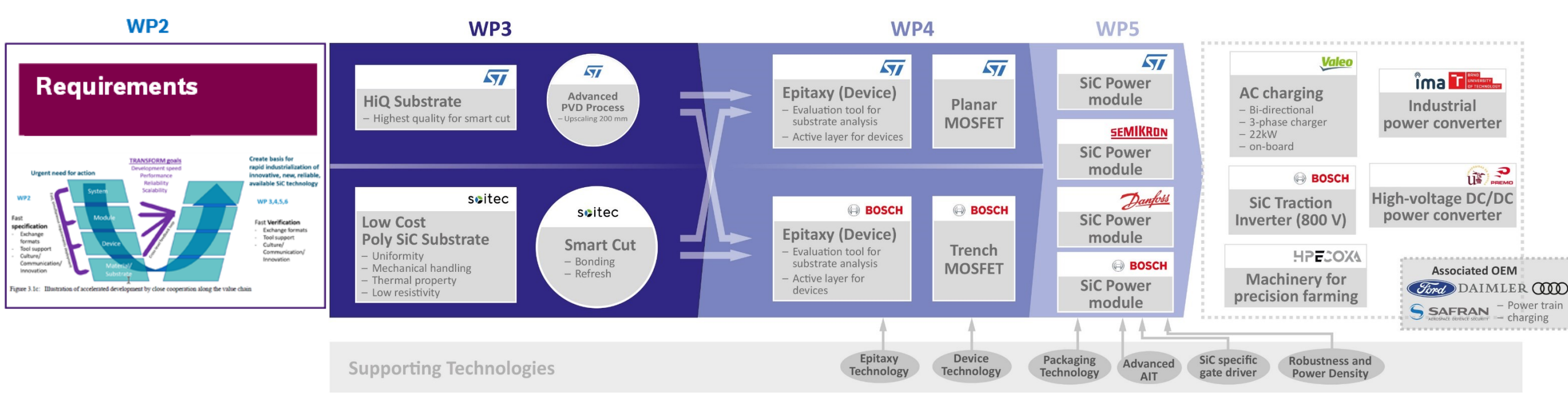
- Substrate**
 - Develop SMART Cut™ pilot line for 150 mm, sampling of 200 mm
 - Develop high-Q bulk-SiC wafer in terms of defect density, resistivity, scale up to 200 mm
 - Quality at device and system level, preparing for industrial ramp-up
- Device**
 - Develop high volume manufacturing equipment for SiC (200 mm)
 - Develop planarMOS and trenchMOS technologies with enhanced performance, capable to use the new substrate technology
- Module & System**
 - Develop assembly and interconnect technologies based on Cu for SiC
 - Develop high density packaging
 - Optimize design and architecture for SiC based power electronic systems to increase energy efficiency and reduce the total cost of ownership (TCO)
- Demonstr.**
 - Prove applicability of European SiC technology in demonstrators for different application domains.
- Req'ts and Rel.**
 - Develop model-based system engineering to ensure collaboration along the supply chain
 - Develop digital twins and lifetime models on component and system level



- Whole supply chain is represented by 33 partners from 7 EU states
- 4 RTOs, 6 Universities, 6 SMEs and 17 industrial partners

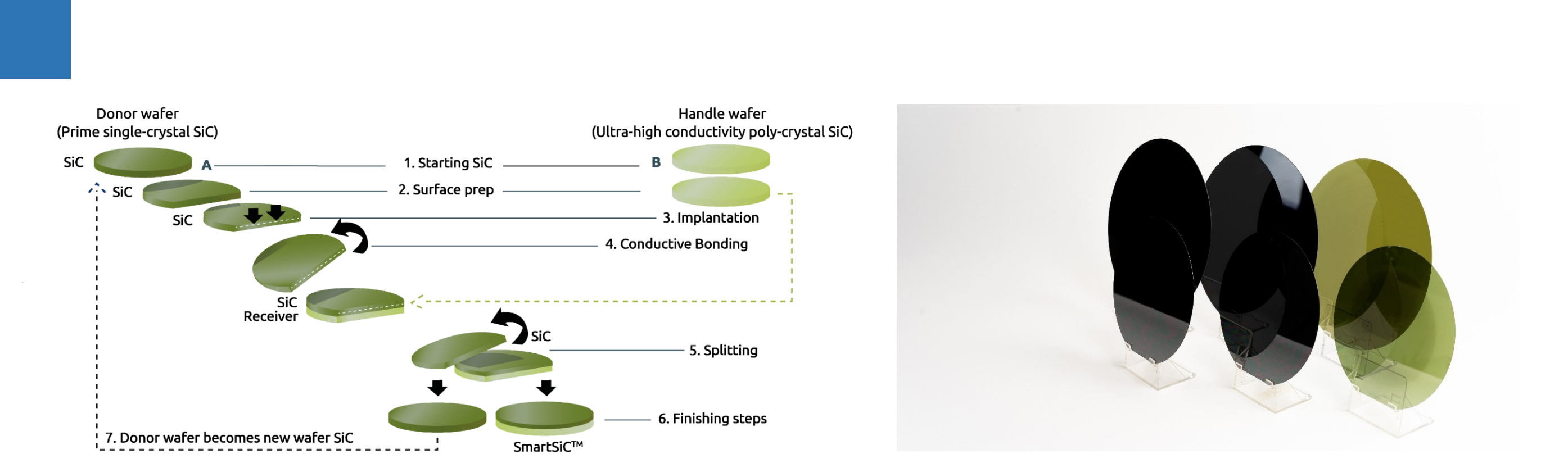
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Supply Chain



- Supply chain is cast into a work package structure
- Requirements engineering is based on all use cases
- New substrate technology will be benchmarked with std. wafers along the supply chain

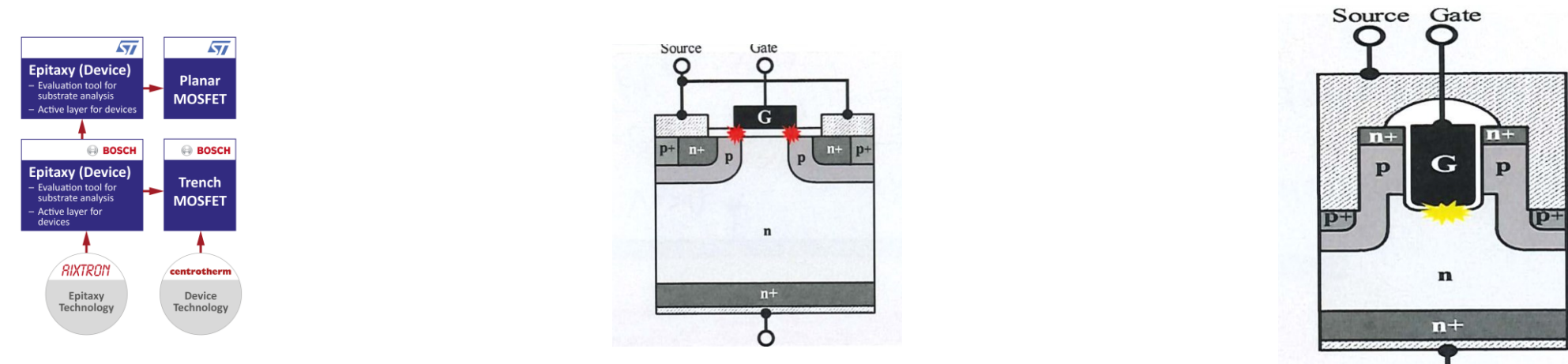
SmartSiC™ Substrate Technology



- Combine best in class high quality 4H-SiC crystal & ultra low resistivity poly SiC handle wafer creating an EPI ready product
- LATEST NEWS:**
 - 150 mm Prototypes are delivered to Bosch and ST for device production
 - 200 mm Smart Cut™ technology has been demonstrated

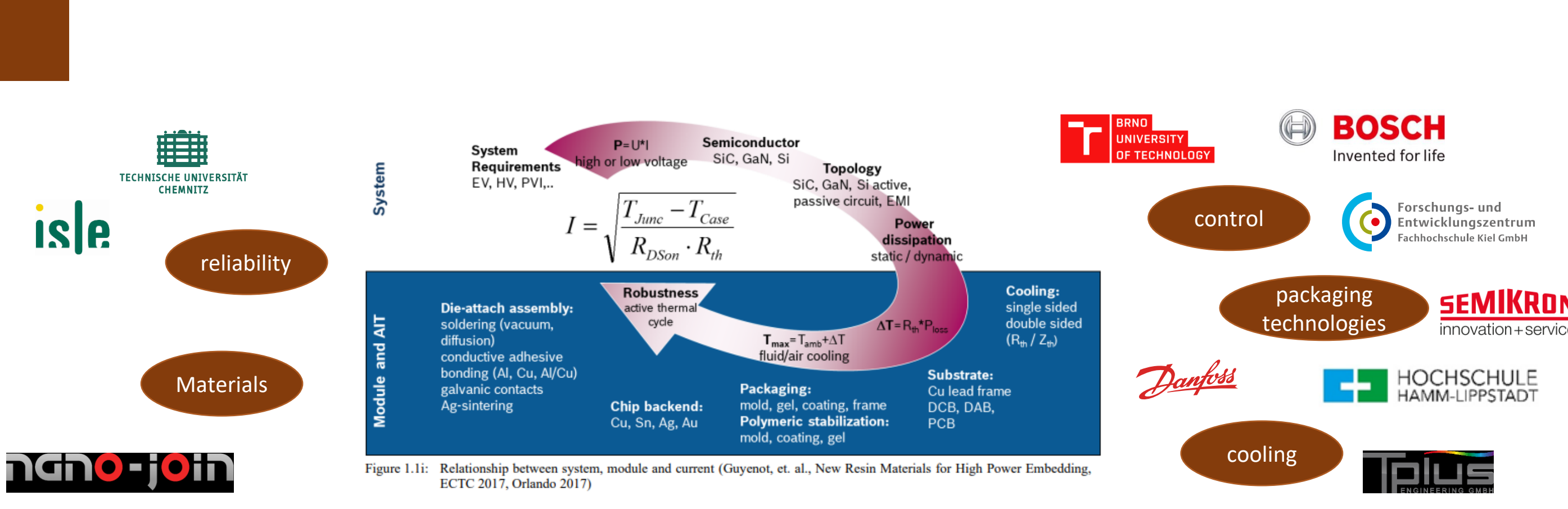
Device Technology

Device Technology on Std. and Smart Cut™ Substrates



- Optimize and validate key process steps first for 150 mm then for 200 mm technology
- Improvement of the industrial CVD process on 150/200 mm for cost, yield, reliability
- Two technology paths: planar MOS and trench MOS
- LATEST NEWS:**
 - FAB-OUT of devices Smart Cut™ Substrates 01/2023:
 - PlanarMOS at ST, TrenchMOS at Bosch

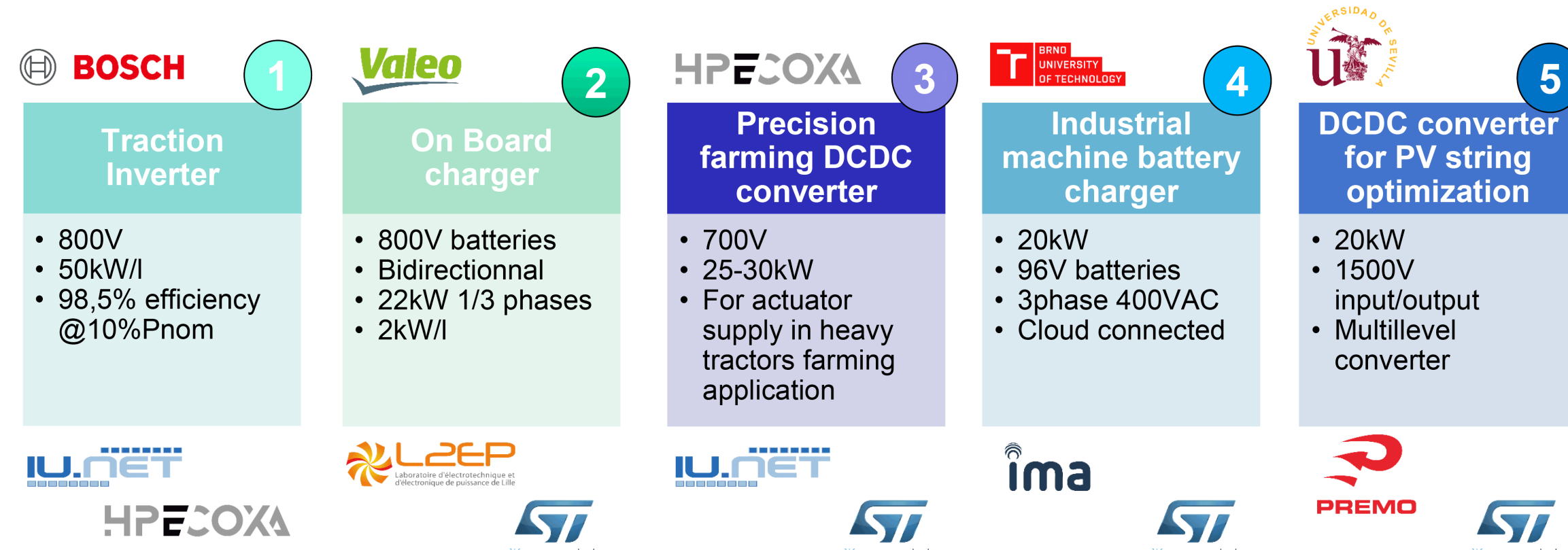
System Integration



- New materials, processes and interfaces for optimized SiC module integration
- LATEST NEWS:**
 - First concept of drivetrain inverter developed incl. gate drive and cooling optimization
 - Novel AIT demonstrators ready for performance and reliability testing

Technology Demonstrators

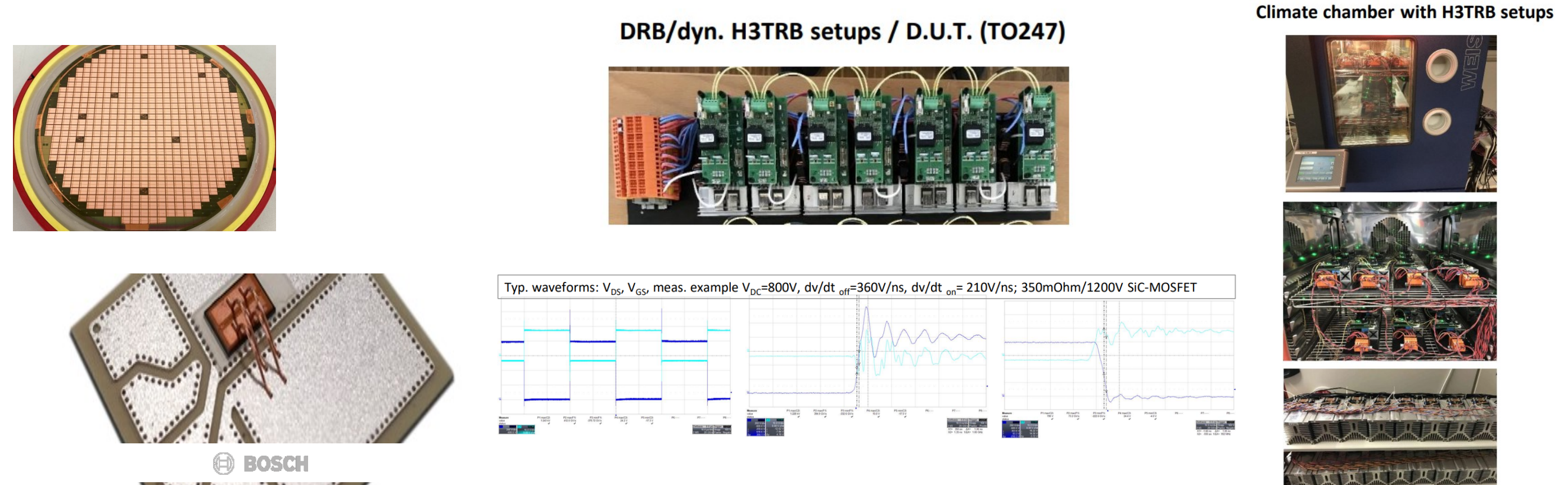
Use Cases in TRANSFORM



- SiC component benefits and Smart Cut™ substrate technology to be demonstrated through one inverter and 4 converters in the application areas of Automotive, Smart-Power-Grid, Agriculture machineries, as well as industrial machinery
- LATEST NEWS:**
 - Hardware designs have been completed.

Reliability and Robustness Validation

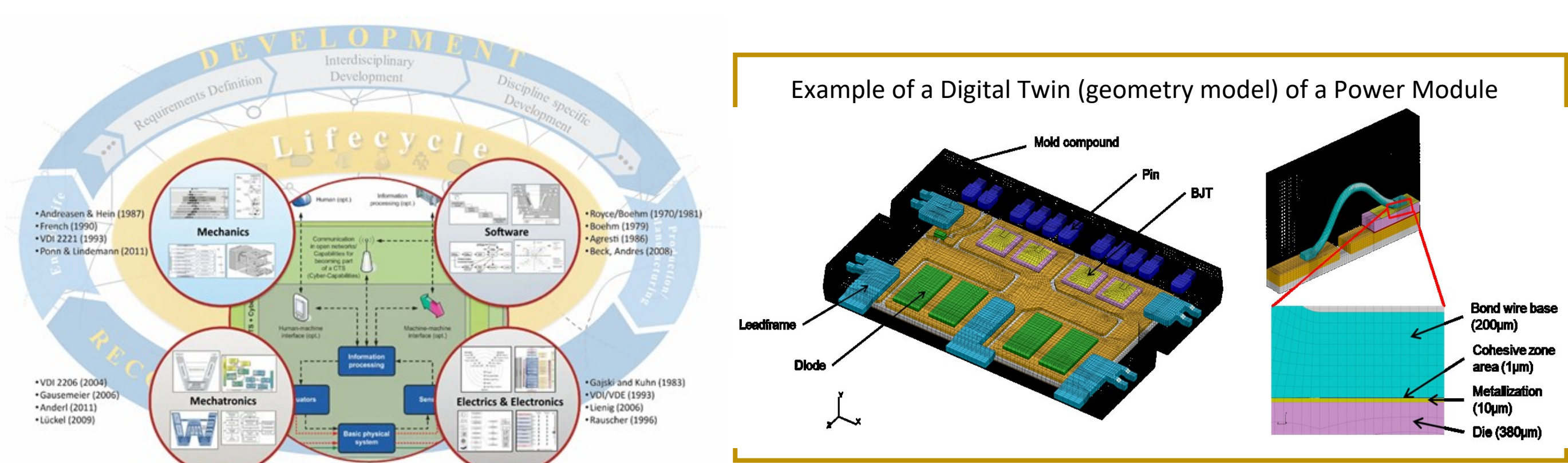
Reliability, Lifetime and Safe-Operating Area



- Further development of reliability test methods for SiC-MOSFETs
- Evaluation of new AIT for improving the reliability and robustness
- LATEST NEWS:**
 - First Cu AIT test vehicles and development of dynamic reliability tests for fast switching SiC

Model Based System Engineering and Digital Twins

SiC Value Chain, Components



- Holistic model-based approach to support engineering collaboration of new SiC value creation networks along the systems lifecycle
- LATEST NEWS:**
 - Digital Twins for component and module level are built up and are ready for validation.

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Visit our web-page at:
<https://sic-transform.eu/>
and send us an e-mail for further discussion about our project, ideas, etc.
office@sic-transform.eu

- Related Projects**
- ECSEL REACTION (<http://www.reaction-ecsel.eu/>)
 - ECSEL R3-PowerUP (<https://r3powerup.eu/>)
 - ECSEL WinSiC4AP (<https://www.winsic4ap-project.org/>)
 - H2020 CHALLENGE (<http://h2020challenge.eu/>)
 - H2020 DRIVEMODE (<http://drivemode-h2020.eu/>)
 - IPCEI Microelectronics (<https://www.ipcei-me.eu/>)

PLEASE CONTACT US IF YOU HAVE QUESTIONS OR TO DISCUSS HOW WE CAN COLLABORATE ALONG THE SiC VALUE CHAIN