ECS 2024 GHENT BELGIUM 5-6 December

Sensors and Devices

iRel40

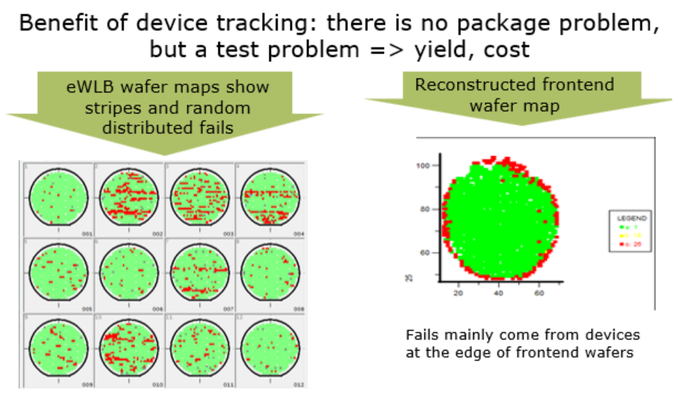
Intelligent Reliability along the value chain

Challenges and objectives

Reliability is a major enabler for European products and promotes sustainability. Objectives of iRel40 were improving reliability along the **value chain chip-package-board/system** through modeling and simulation, through deepened understanding based on physics of failure, using new materials and designs for reliability, implementing real-time feedback in production lines, enhancing test methods, developing predictive algorithms and the use of all available data to learn faster through AI and ML.

Technical results

- Results from **34 use cases** and **more than 200 test vehicles** were shared
- The usage of **digital twin** methods and behavioral models during the early stages of a design phase enables the virtual examination of different operational or environmental conditions
- Earlier recognition of possible issues regarding the reliability of later products can be used as starting point for **virtual investigation** of improvements (e.g. cost reduction for changes, early design decision)
- In general **equipment data are more relevant** than pure process data (related to failure rate)
- **Preassembly** (dicing & grinding) **is crucial** to reach reliable packaged dies
- **Impact in one domain has impact in other domain** (Single Device Tracking overall manufacturing domains applying AI)
- **Avoid human dependent triggering** of corrective actions
- **Importance of materials and material data** (e.g. purity of package materials)
- **Artificial intelligence, machine learning** methodologies and good data quality are important enablers.



Impact

13 EU countries

78 partners

34 use cases

> 200 test vehicles

New Products
70
developed

New Processes
60
developed

New Methods
155
developed

Process Time
> 10
times faster

Form Factor
> 50%
reduction in volume while keeping automotive reliability

Fabs
> 15
reliability results entered into more than 15 fabs in Europe (wafer, chip, package, module/board)

iRel40 intelligent Reliability 4.0

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iRel40 is building bridges

iRel40 Dissemination

- **> 100 publications** in international journals and conferences
- **> 100 presentations** at international conferences and workshops
- ***iRel40 book*** published in Q3 2024 based on out-standing collaborations; more than 40 iRel40 experts contributed.

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