

# iRel40

## Intelligent Reliability 4.0

[www.irel40.eu](http://www.irel40.eu)

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ACKNOWLEDGMENT: THIS PROJECT HAS RECEIVED FUNDING FROM THE ECSEL JOINT UNDERTAKING (JU) UNDER GRANT AGREEMENT NO 876659. THE JU RECEIVES SUPPORT FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME AND GERMANY, AUSTRIA, SLOVAKIA, SWEDEN, FINLAND, BELGIUM, ITALY, SPAIN, NETHERLANDS, SLOVENIA, GREECE, FRANCE, AND TURKEY. IN ADDITION, GERMANY INCLUDING THE FREE STATES OF SAXONY AND THURINGIA, AUSTRIA, BELGIUM, FINLAND, FRANCE, ITALY, THE NETHERLANDS, SLOVAKIA, SPAIN, SWEDEN, AND TURKEY PROVIDE NATIONAL FUNDING.

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“Intelligent Reliability 4.0”  
has the ultimate goal  
of improving reliability of electronic  
components and systems by reducing  
failure rates along the entire  
value chain.

Innovation Action funded by the ECSEL  
Joint Undertaking and National Authorities



## Project Overview

The Europe-wide research initiative “Intelligent Reliability 4.0” (iRel40) aims to improve the reliability of electronic systems and micro-/nanoelectronic components. Coordinated by Infineon Technologies AG, 75 research and industrial partners from 13 countries are joining their forces to achieve this goal.

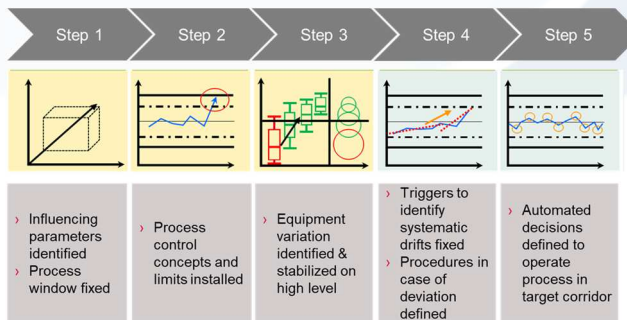
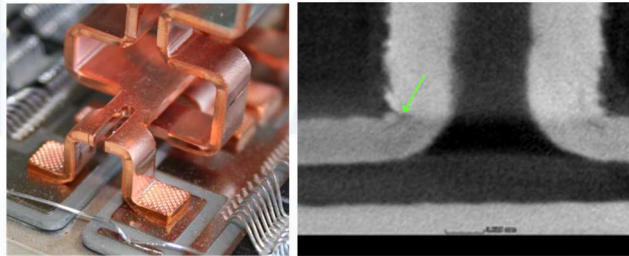
Today, the reliability concepts are at the doorstep of major changes, moving from stress-based and knowledge-based to application-based approaches. This is strongly supported by the current development of machine learning, digital twin-supported diagnostics or prognostics, and health monitoring. The partners in iRel40 are paving the road towards these reliability approaches and drive new concepts based on physics of degradation.

Based on current and expected changes in the reliability concepts, the iRel40 project has defined “Five key research & development areas for reliability”: i) Multi-scale & multi-physics simulations for physics of degradation; ii) AI-based control systems in advanced production; iii) Smart sensing and big data analysis; iv) Reliable materials and reliability testing; v) Prognostics and health management digital twin for condition monitoring. All activities of the iRel40 project are associated with these five R&D areas aiming at the common ultimate goal of improving the reliability of electronic components and systems by reducing failure rates along the entire value chain.

## First results

During the project, we have already achieved outcomes related to data science (e.g. artificial intelligence models applied to production data, machine learning approaches, anomaly detection), digitization (e.g. digital twins), as well as new test methods and processes for driving reliability. We showed results from semiconductor and IC design topics like conditional burn-in or reliability assessment in IC design, to application-related topics like big data streaming applied to electro-motors, and applying algorithms for fault detection in in-wheel technology.

Selected technical innovations and results achieved during the project runtime so far are described in detail in project newsletters (<https://www.irel40.eu/news>). In these newsletters we present the technical achievements to improve reliability along the whole value chain starting from chip/semiconductor and IC related topics, continuing with preassembly and package/board-related topics, and finally to application-related topics.



Example of conceptual approach to push semiconductor backend production into auto mode process stabilization routine.

## Impact of iRel40

iRel40 is strengthening the European industrial competitiveness of electronic components and systems for transport and mobility, digital industry and energy applications by improving reliability along the whole value chain.

Reliability is a key enabler for bringing European electronic products into the market. Understanding reliability along the whole value chain by a coherent and collaborative chip, package, and board/system approach will lead to reliable systems/subsystems.

In iRel40 more than 30 Industrial Pilots and Application Use Cases are carried out along the value chain from wafer to board/system, enabling innovations and new business opportunities for the ECS industry.

## Key Facts

**Partners:** 75 from 13 European countries

**Budget:** 101.8 Mio €

**JU Funding:** 24.5 Mio €

**National Funding:** 22.9 Mio €

**Project Duration:** May 1<sup>st</sup>, 2020 - 30<sup>th</sup> April 2023

**Coordinator:** Infineon Technologies AG

