

Circular economy as an opportunity: From Research collaboration to Infineon's security solutions

Josef Haid, Distinguished Engineer Security System Architectures
Wolfgang Dettmann, Vice President R&D Funding
25 September 2023

public

Speaker



Dr. Wolfgang Dettmann

Vice President R&D Funding Infineon Technologies AG

Dr. Wolfgang Dettmann, studied physics at the Technical University Munich and obtained his Ph.D. in the area of biophysics in 1999 there. In 2000 he joined Infineon and is responsible for collaborative projects on European and national level since 2009. In 2015 he started internal PhD programs to strengthen academic partnerships. Dettmann is heading the Infineon R&D funding organization since October 2020.

On a European level, Dettmann is active in several roles contributing his technical expertise and serving several boards like in the technology expert group of AENEAS, collaborative projects in the EUREKA, as well as in the associations and European Technology Platforms EPoSS and EGVIAfor2ZERO.

His technical focus areas are ECS (electronic component systems) for sensor technologies, electric mobility, energy efficiency and sustainability.

Copyright © Infineon Technologies AG 2023. All rights reserved.

Speaker



Dr. Josef Haid

Distinguished Engineer Security System Architectures Infineon Technologies AG

Dr. Josef Haid studied Electrical Engineering and received his PhD degree in 2003 from Graz University of Technology, Austria.

He started his professional career at austriamicrosystems and joined Infineon in 2004 as a concept engineer for security controllers.

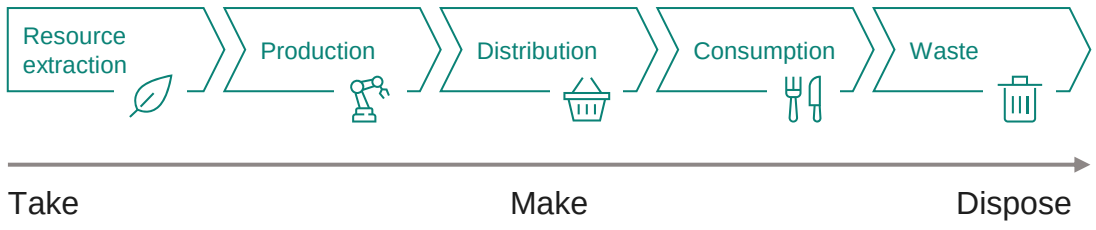
In the following years Dr. Haid held different leading positions in concept engineering and technical marketing for contactless security controllers used in payment and government ID applications. As a Distinguished Engineer he is leading the expansion of hardware security into embedded devices for IoT, industrial, and consumer electronics.

Copyright © Infineon Technologies AG 2023. All rights reserved.

Introduction to Circular Economy

From linearity towards circularity: Circular Economy

Linear model



Circular model



The circular economy is a model which aims to **keep values as long as possible in the cycle** – along the entire value chain

Characteristics of the linear model

- Resources are extracted, manufactured, used and disposed
- 17% of e-waste is properly recycled per year[1]

Characteristics & Advantages

Short description of what it is and why it's so important

- Waste needs to be reduced to a minimum
- Sustain existing materials to extend value to a maximum
- Circular economy is about closing the linear model and enabling small cycles focusing on the 6Rs

[1] https://www.statista.com/topics/3409/electronic-waste-worldwide/#topicOverview

Copyright © Infineon Technologies AG 2023. All rights reserved.

From linearity towards circularity: Circular Economy

Circular model



The circular economy is a model which aims to **keep values as long as possible in the cycle** – along the entire value chain

Moving towards a circular economy is crucial for Infineon along three dimensions

- Production
- Supply chain
- Innovative products

Examples of how Infineon is contributing to Circular Economy

- Refurbish — Link
- Recycle — Link
- Reuse — Link

Copyright © Infineon Technologies AG 2023. All rights reserved.

Collaborative research project on EECONE – European ECOsystem for green Electronics



EECONE Introduction

EECONE – European ECOsystem for green Electronics

- Microelectronics as one of the key enabling technologies in Europe
- Joint Undertaking Key Digital Technologies as a tri-partite partnership:
  - EU, Memberstates & private side (Associations with industrial, research and academic partners)
  - EU & national funding plus same amount of own engagement from the private side
- Focus Topic in the KDT JU 2022 Call
- Parallel ongoing work in the associations behind the KDT JU - further calls for sustainability proposed
- White paper EPoSS working group on Green ECS – July 2023

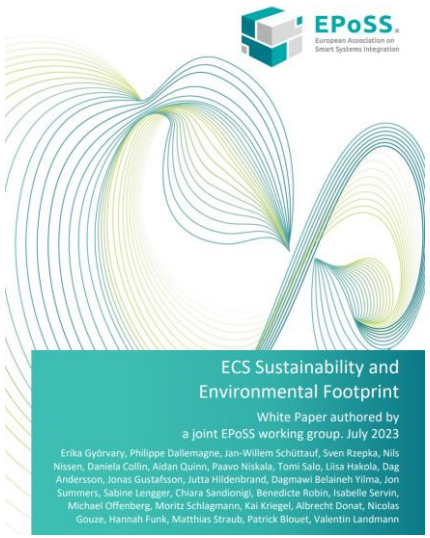
KDT JU
KEY DIGITAL TECHNOLOGIES JOINT UNDERTAKING

KDT ED 2022.76

Call 2022-2 Topic 2: Focus topic on Ecodesigned smart electronic systems supporting the Green Deal objectives (RIA)

Specific conditions	
Indicative budget	The total indicative EU budget for the topic is EUR 20 million.
Type of Action	RIA
Technology Readiness Level	Targeted TRL at end of project is 4

This call relates to the third general objective of the KDT-JU: ensure that components and systems technologies address Europe's societal and environmental challenges that can be realized by establishing and strengthen sustainable and resilient ECS value chains supporting the Green Deal.

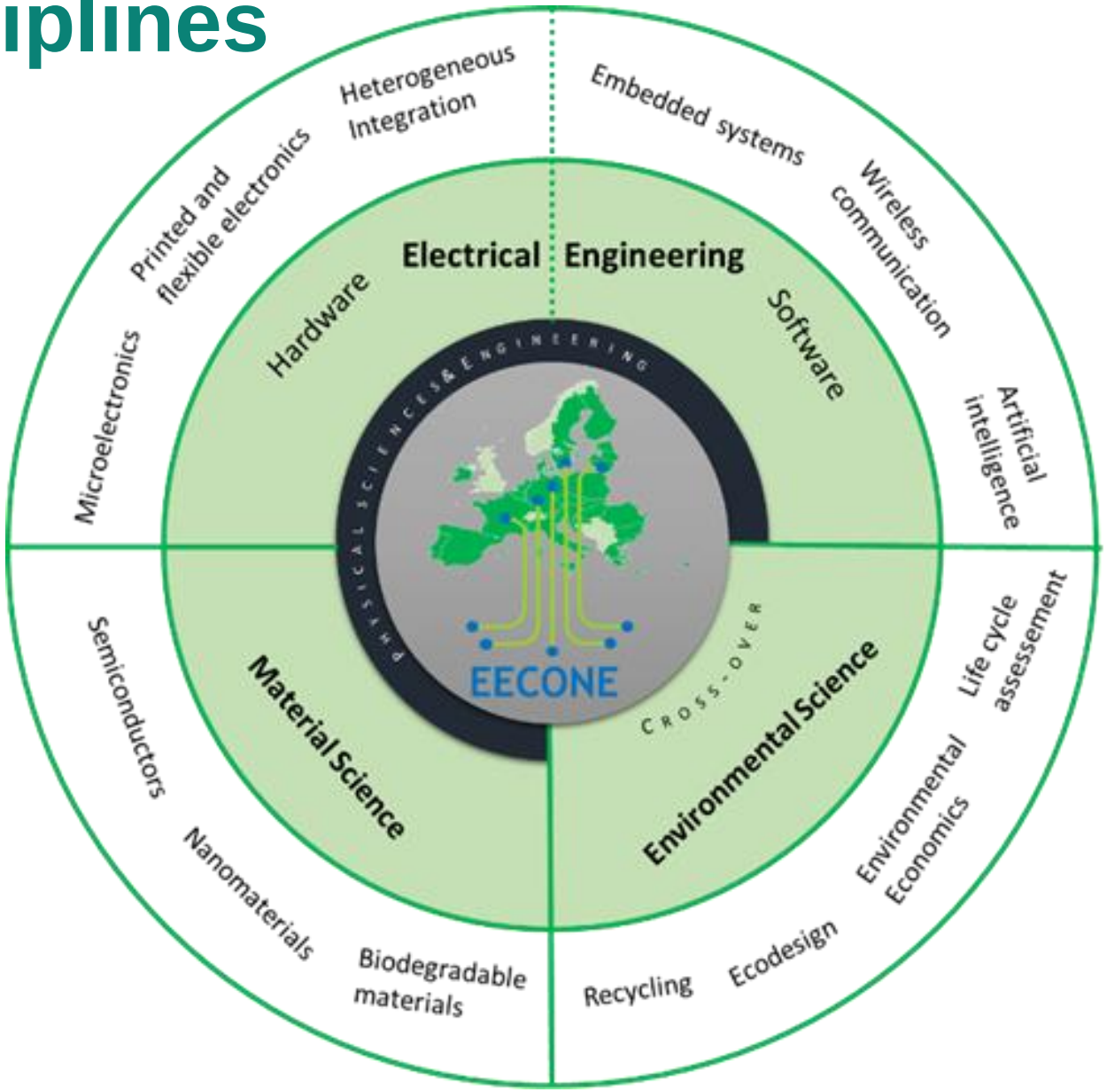


EECONE Overview

- **EECONE is a collaborative research project by around 50 partners from 16 EU countries!**
- **Achieving circularity in the electronics industry is challenging:**
  due to the requirement to involve the whole value chain, from raw material suppliers to consumers, the complex material background and supply chain, as well as the multitude of interests,

- The **environmental impact arising from e-waste** can be reduced by working in three principal areas:
  - Increase product lifetime by application of Ecodesign guidelines to decrease the volume of e-waste.
  - Reduction and replacement of materials to decrease the impact of e-waste.
  - Improved circularity, by re-use, recycling, and waste valorisation of materials/elements from electronic products.
- Crucially, the entities that make up EECONE **represent all parts of the value chain**.
  EECONE's approach is **interdisciplinary,** covering the social, economic, technological, and policy aspects.

EECONE Disciplines



EECONE Objectives and Ambition

- **EECONEs vision is to develop and embed solutions to managing the end of life of Electronic Components and Systems (ECS) at the very beginning – that is in the product or process design.**
- Its goal is **to move toward a zero-waste electronic industry.**
- EECONE will be **fully guided by the "6R concept"** (Reduce, Reliability, Repair, Reuse, Refurbish, Recycle).
- Crucially, in addition to higher collection rates, and improvement of recycling processes to enable usable mineral fractions, **it is also necessary to link the manufacturing process with the recycling process** to avoid design decisions which inhibit efficient recycling processes.

- Objective 1: **Define green ECS:** Create clear, simple, open tools to define and design ECS for circularity.
- Objective 2: **Make green ECS:** Provide innovative techniques for reducing, repairing, reusing, refurbishing, recycling to decrease e-waste and boost circularity in a new generation of electronics.
- Objective 3: **Showcase green solutions:** Demonstrate innovation potential, usability, and versatility of the green solution along the value chain in 10 Use-Cases.
- Objective 4: **Building consciousness:** Create an ecosystem empowering the 6R ECS generation

EECONE – Research Areas

1. *More sustainable printed circuitry from earth-abundant elements; minimising e-waste from printed electronics.*
2. *Printed IC packaging enabling sustainable, ultra-thin, minimal e-waste ICs*
3. *PCB reliability, miniaturisation and new materials*
4. *In PCB-based power electronics: easy removal; modular design and highly standardised components, subparts and parts*
5. *SmartSiC ®, a new engineered substrate for power electronic components*
6. *IoT solutions based on green energy harvesting and storage*
   New eco-materials improving Li-ion battery recycling process
7. *High-reliability magnetic components for the automotive sector: Design for recyclability, minimise e-waste, and take advantage of second life materials.*
8. *In the monitoring of remaining useful life of critical components by creating an online monitor of residual functional/residual value*
9. *LCA-based EoL management of ICT equipment with concurrent minimization of environmental impacts over multiple indicators*
10. *in AI management for lifetime increase of electronics, extended lifetime*
11. *Eco-design tools including full impact assessments*

EECONE – at the beginning!

- EECONE is a major opportunity to create a **E**uropean **ECO**system for gree**N** **E**lectronics and to position Europe as a role model for low environmental impact electronics and moving closer to a zero-waste electronic industry

- **EECONE** – started on July 1st, face-to-face Kick-off Meeting in Toulouse – September 20th & 21st

- Different value chains and research communities are brought together to tackle the challenge!

- Working group on green ECS in the EPoSS association – continuous engagement by academia, research institutes & industry to drive the topic further!

Security enabling Circular Economy

European regulations

Battery Regulation: 2020/0353 (COD)

Available since January 2023.

- Replaceable rechargeable batteries
- CE marking indicates compliance with the regulations
- Battery Passport for batteries > 2KWh today



Proposal for Right to Repair directive: 2023/0083 (COD)

The EU Parliament acted in favor of improving consumers' right to repair and facilitating the development of a circular economy. Proposal available since 22 March 2023

- Force manufacturers to design products which last longer and are repairable
- R2R during and after guarantee
- Enabling electronic devices to be repaired by end-users



Proposal for Ecodesign Sustainable Product Regulation: 2022/0095 (COD)

(Repealing 2009/125/EC).
Regulation Ecodesign requirements for sustainable products

- This regulation seeks to achieve a high level of protection for the environment by reducing the potential environmental impact of energy-related products
- Optimize the environmental performance of products while maintaining their functional qualities
- Digital Product Passport



Copyright © Infineon Technologies AG 2023. All rights reserved.

How can Infineon help?

Circular Economy

Green deal

- Battery
- Right to repair
- Ecodesign

Impact OEMs

- Counterfeits, safety, performance
- Counterfeits, safety, performance
- Sustainable products, Digital Product Passport

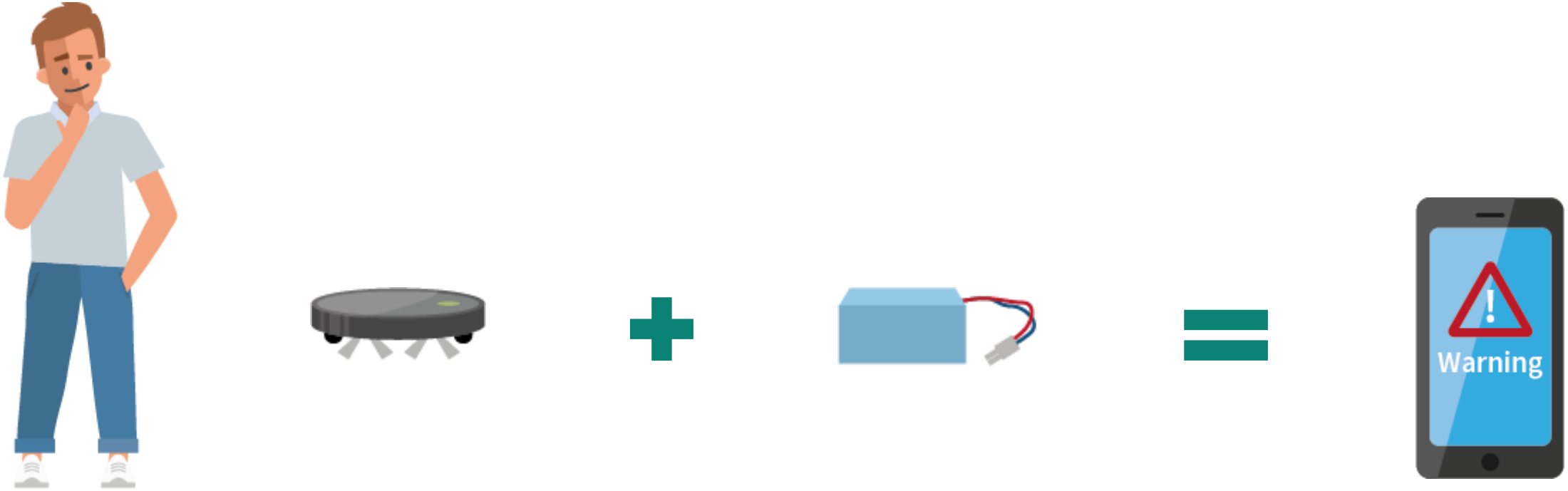
Infineon can help

- Authentication, secured counters & storage
- Authentication
- Secured storage



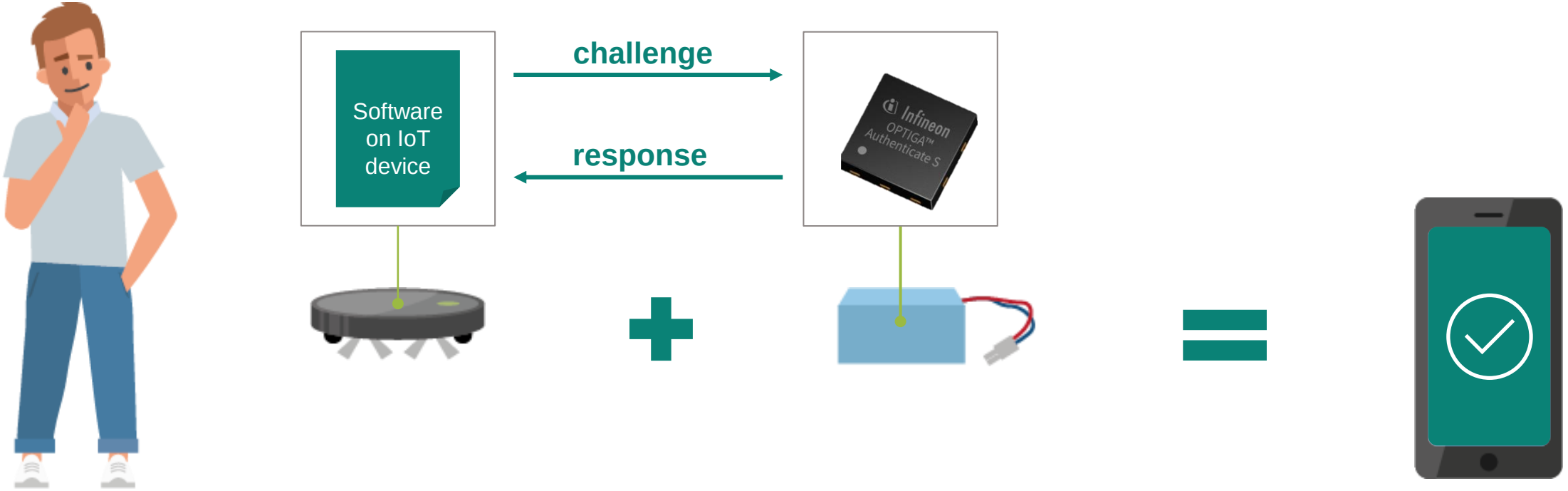
Copyright © Infineon Technologies AG 2023. All rights reserved.

How does it work?



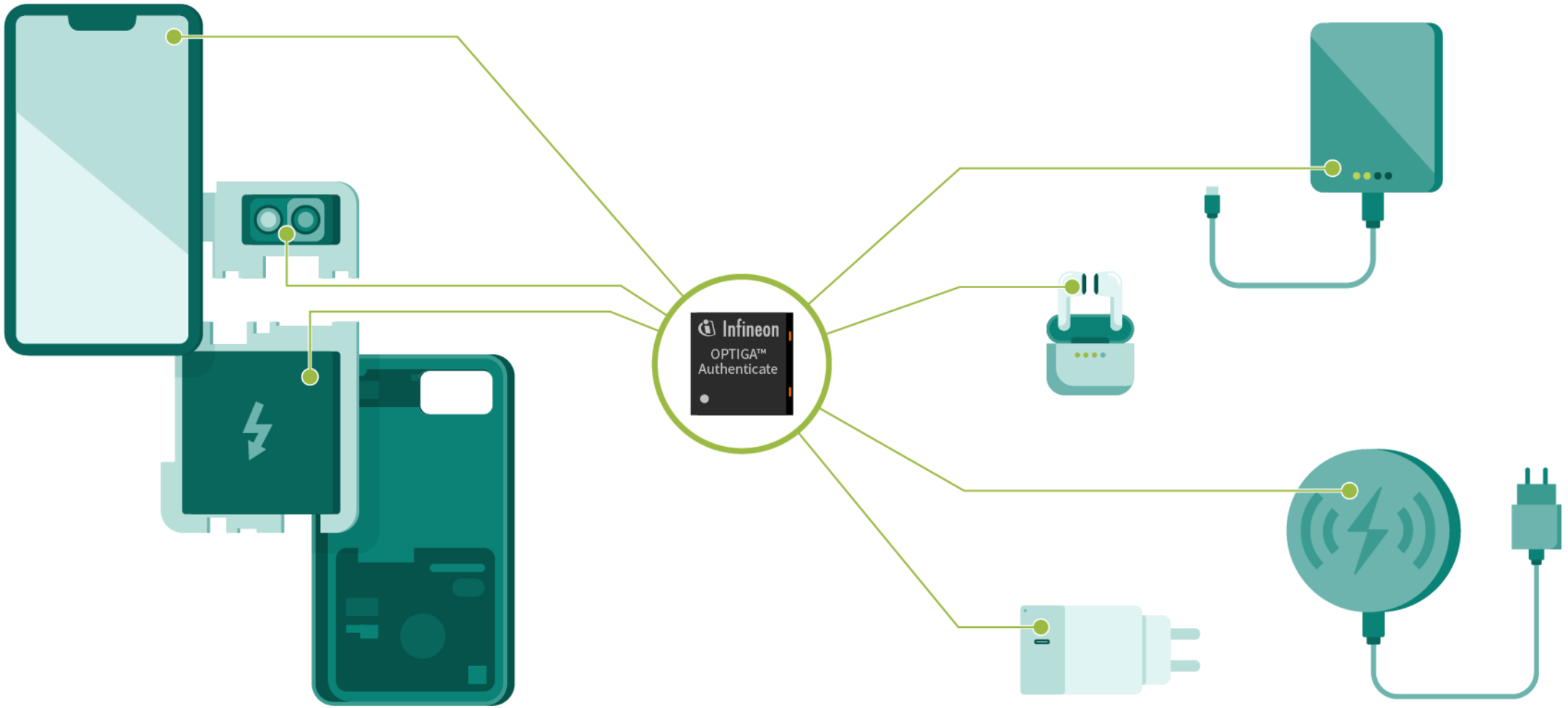
Copyright © Infineon Technologies AG 2023. All rights reserved.

How does it work?



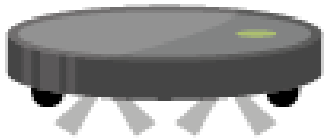
Copyright © Infineon Technologies AG 2023. All rights reserved.

Mobile device parts that can be authenticated with OPTIGA™ Authenticate solutions



Copyright © Infineon Technologies AG 2023. All rights reserved.

Authentication process



Attempting to connect



The host

Requests unique certificate from the client

Verifies that the certificate is genuine, extracts the trust anchor public key and uses it to generate a unique challenge for the client

Uses the public key to check the response from the client

Correct response:
Successfully authenticated

Incorrect response:
Warning and failure

challenge

response

The client

Provides the unique digital certificate

Uses the private key to generate a response to the challenge and sends it back to the host

Copyright © Infineon Technologies AG 2023. All rights reserved.

Key take-aways

Importance of circular economy

For Infineon, an overall sustainable approach is crucial, and circular economy plays an important role in many different aspects reaching from our own manufacturing and products to enabling customer solutions.

Cross-industry collaboration

We can only achieve a circular economy – from design and use and all the way to recycling - by working together. Infineon is pleased to drive collaboration with our partners along the value chain in dedicated research.

Supporting customers

Infineon`s OPTIGA™ Authenticate solutions support device manufacturers to address one of the key challenges of the new regulations in an easy and cost-efficient way – namely the proof of the genuineness of products and replaceable parts.

Creating trust

OPTIGA™ Authenticate creates transparency and trust for manufacturers and consumers alike as they can rely on the authenticity and quality of devices and spare parts.

Copyright © Infineon Technologies AG 2023. All rights reserved.

Please find more information on our press newsroom:

EECONE: https://www.infineon.com/cms/en/about-infineon/press/press-releases/2023/INFXX202309-152.html

OPTIGA™ Authenticate: https://www.infineon.com/cms/en/about-infineon/press/press-releases/2023/INFXX202309-153.html

Questions or further information requests:

Ulrike.Mittereder@infineon.com

or

Fabian.Schiffer@infineon.com


Infineon