Think Automotive Dependability. Think Infineon.
Dependable electronics are the foundation for trust

"Delivering self-driving cars at scale isn’t just about winning the tech race, it’s about winning the tech race and the trust race."

Dan Ammann, CEO, Cruise, July 2019

"Designing automated vehicles that people trust is just as important as the technology required to make them work"

Intel – "A Matter of Trust" Whitepaper

"Developing a self-driving system built on trust."

Argo.ai Website Headline with Ford and VW Investors
Dependability is the key driver for the megatrend automated driving

Technology + Trust = Autonomous Driving

**Dependability** definition | n.
The quality of being trustworthy or reliable; trust in safety
Automated driving systems are fueling the need for trust

Higher level of automated driving require trust; trust requires dependable systems

Source: Barclays Research & Infineon
Autonomous driving functions require highly available systems which require dependable electronics.

**High Availability** | Ensure high availability beyond critical operations; a safe and secure system, that operates in all conditions.

**Fail-Operational** | Mitigate potentially hazardous effects by ensuring critical operations in the event of a failure.

**Fail-Safe** | In the event of a failure, system enters safe state.

- Lower levels (ADAS, <L2)
- Vehicle enters safe mode
- Reliable, robust, safe, secure
- Higher levels (AD, ≥L3)
- Vehicle continues safety critical tasks
- Fail safe + available
- Higher levels (AD, ≥L4+)
- High availability in all conditions for extended time
- Fail operational + highly available
Trust requires dependable systems which are always available

Dependable systems require **secure** systems, which always **sense**! always **compute**! always **act**! are always **connected**! are always **powered**!
But also, the increasing number of functionalities drive the need for dependable electronics

**Dependable systems**

› …not only avoid and **mitigate** potentially **hazardous effects** (functional safety)

› …but also enable safe & secure autonomous **driving under all conditions** (secure high availability)

› … are **key to overcome** the ever **increasing number** of more functionality in cars
We deliver dependable electronics which enable systems that are the foundation for trust.

Secure dependable systems, which always sense, always compute, always act, are always connected, are always powered!

- **Dependable Actuation**
- **Dependable Computing**
- **Dependable Communication**
- **Dependable Sensing**
- **Dependable Power**

**Robustness**
Degree to which a system continues to function with invalid inputs or in stressful environments.

**Reliability**
Probability that a system performs requested functions under stated conditions when required.

**Availability**
Probability that the system is operating properly when a failure occurs.

**Safety**
Ensures the absence of Unreasonable Risk.

**Security**
Ensures the protection of the system from its environment.

- **Infineon Automotive Quality**
- **Infineon Functional Safety**
- **Infineon Cybersecurity**

- Operational Excellence
- Passion for Innovation
- System Understanding

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Infineon is Automotive Dependability

Dependable Electronics

- Infineon Automotive Quality
- Infineon Functional Safety
- Infineon Cybersecurity

Dependable Partner through Premium Service

- Operational Excellence
- Passion for Innovation
- System Understanding
Quality beyond the standards with a Zero Defect mindset
Our competitive advantage: Differentiating as quality leader

**Our path**
We do what we promise.
That's quality made by Infineon.

**Our aspiration**
Zero defect regarding the committed
› functionality
› reliability
› time
› volume & cost

**Our foundation**
International standards such as ISO 9001, IATF 16949, AS 9100, IEC 17025
We go beyond the standards to better fit the real application requirements

Highly engineered products to target Zero Defect over 15+ years of product life time

Infineon’s zero defect mindset for an extended lifetime

Selected measures
› Zero delamination process
› Extended stress for reference products > Q100/101
› Smarter screening in production
Infineon Zero Defect Mentality
We Do what we promise

We reduced our ppm rate significantly to sub ppm levels

We produce 24/7/365 and deliver Zero Defect for all but the last 3 seconds of a year

Most of our 8Ds are closed in less than 14 days

Regional network of failure analysis labs and strong localized competencies

Zero delamination approach

90% of our products are already Zero Defect
Infineon is your trusted advisor to make Functional Safety easy.
With our strong Functional Safety experience we provide building blocks for integrating safety features

**ProSIL™** products support a safety use case

<table>
<thead>
<tr>
<th>Customer use case</th>
<th>System Integration Efforts</th>
<th>System Integration Documentation</th>
<th>Safety Feature Description</th>
<th>Infineon Label</th>
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<tr>
<td>Design with safety product to develop its own safety system</td>
<td>Use case specific</td>
<td>Use case specific</td>
<td>Product with diagnostic or safety features</td>
<td>ProSIL</td>
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<tr>
<td>Hardware integration using products developed with Infineon</td>
<td>Medium</td>
<td>Safety App. Note</td>
<td>Safety analyses and customer documentation supporting ISO26262 system integrations</td>
<td>ISO 26262 ready</td>
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<tr>
<td>automotive processes</td>
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<td>Product developed according to ISO26262 process with required documentation</td>
<td>ISO 26262 compliant</td>
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<td>System designed around Infineon components developed specifically for safety relevant applications</td>
<td>Low</td>
<td>Safety Manual</td>
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Agile thinking and approach to innovation builds upon trust to adopt new technology

Infineon safety objectives

› **Development** of products in compliance to ISO26262

› **Innovative solutions** for safety critical applications

› Future rising requirements of ISO26262 compliant components with increasing complexity

› **Efficient development processes in place** to design ISO26262 conform products

We have a track record of successful safety solutions, allowing you to focus on your own value-add.
Infineon's Functional Safety approach

- ISO26262 compliant development flow for our products
- Fitted functional safety documentation
- Robust Safety Mechanisms across components
- Global support footprint simplifying the integration of safety features
- Embedded software for functional safety
- Broad ecosystem with an extensive partner network
Next Level of Scalable & Agile Security Beyond the Standards
A dependable communication in an interconnected system has security as an integral part.

No Safety without security

› Security is a mandatory precondition for Safety
› Safety is the most important asset to be protected
› A dependable architecture is secure and safe

Security is an architecture property

› A secure EE-architecture is always built around a certified root-of-trust
› Hardware/Software co-design is key for a strong protection scheme
› Appropriate security is required on all layers of the EE-architecture

Security is a moving target

› Security erodes over time
› Always be ahead of the attacker’s capabilities
› Crypto-agility is a must – the right hardware is an enabler for this

Security needs cooperation

› Security by obscurity is not sustainable
› Security standards allow transparent risk management over the complete lifecycle
› Incident management processes across the whole supply chain have to be established
We offer the most scalable automotive cybersecurity portfolio, meeting the right level of security.

- **Discrete security controller**: Hardware trust anchor + software + tamper resistance
  - e.g. Infineon OPTIGA™ TPM & SLS37 V2X HSM

- **Integrated HSM***: Separated and protected run-time environment
  - E.g. Infineon AURIX™ & TRAVEO II HSM

- **Trusted execution environment**: Separation of "secure" and "normal" world in one CPU

- **Host**: Pure software protection

*HSM = Hardware Security Module
Trusted advisor in security

- Most scalable security product offering in automotive
- 30+ years experience in security
- Hardware and software security expertise
- Partnership program including software and tool vendors for security
- Security by Design
- Trusted Advisor in security - standardization

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Dependable Partner through Premium Service
Premium Services: operational excellence, quality, sales support, application support, R&D and distribution

We are the number 1 partner in the fast changing automotive world

- **Operational Excellence**
  - We provide expert quality analysis and support close to our customers
  - Consultative & trusted advisor product selection support
  - System & product technical experts to assist customer R&D teams
  - Project management support, safe launch & APQP

- **Passion for Innovation**
  - Operational excellence and automotive quality covering the full product lifecycle process

- **System Understanding**
  - Disaster and risk management operations & logistics planning

- **Global customer support and distribution**
  - Rigorous capacity planning & tight supply management processes
    - Continuously investing for reacting quickly to add future capacity
    - Digitized monthly short, mid & long term (5 year horizon) capacity planning
    - Standardized tight supply management system (integrated in planning system landscape)
    - Dedicated CLM organization

- **Fast T2M**
  - Distribution is a key for Infineon growth supporting over 35k customers all over the world
Operational excellence
We continuously increase our supply chain robustness

› High volume factories including 300mm and multi-site manufacturing **secures your supply**
› Fully digitized End-to-End planning, short-term and long-term infrastructure preparation including a new 300mm factory in Villach **secures your growth**
› Regional distribution & customer logistic centers offer close proximity and fast response
› The tight supply management across all factories is digitized and **seamlessly integrated** into our **order management system**
› Our comprehensive Business Continuity Management ensures fast and agile response to potential threats
› Our **logistical excellence** is proven and honored by various awards
Passion for innovation
Infineon has long track record as innovation leader

› We develop technologies, packages and testing procedures, and processes as well as tooling in R&D for functional safety specifically for automotive use cases

› We run a global network of 20+ own development centers providing access to broad skilled engineering resources

› We cover the full R&D value chain from chip design, technology development, manufacturing and dedicated design tooling, enabling full project ownership

› We are innovation leader with a track record of many successful newly introduced product categories

› Worldwide collaborations with leading universities and research institutes to early identify technical trends and develop competences
Dependability is part of Infineon's cultural mindset with system understanding as one of its key ingredients.

Infineon leverages a deeply embedded system thinking.
The interactions of increasing functions require a partner offering premium services in addition to dependable electronics.

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<th>Application Type</th>
<th>Examples</th>
<th>Application Needs</th>
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<tr>
<td>Convenience</td>
<td><img src="image1" alt="Seat" /> <img src="image2" alt="Infotainment" /> <img src="image3" alt="Power Lift Gate" /> <img src="image4" alt="Power Folding Seat" /></td>
<td><img src="image5" alt="Superior Customer Experience" /></td>
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<tr>
<td>Safety</td>
<td><img src="image6" alt="Autonomous driving" /> <img src="image7" alt="Main Inverter" /> <img src="image8" alt="Electric Power steering" /> <img src="image9" alt="Central Gateway" /></td>
<td><img src="image10" alt="Freedom from unacceptable risk" /></td>
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- Quality
- Cyber-security
- Functional Safety
- Innovative Technology
- Operational Excellence
- Application Understanding

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- Dependable Electronics
- Dependable Partner
Two Examples of Infineon's dependable solution:

**Fail-operational Electric Power Steering and Radar Sensors**

- **Electric power steering**
  - Result: Robust, redundant system which provides fail-operational functionality

- **AURIX Hardware Security Module (HSM) and Access to Infineon Security Ecosystem**
- **Safety Software including MCAL Drivers and Reference Examples**
- **ISO26262 Compliant Semiconductors: Microcontroller, Power Supply, Sensors**
- **Zero Defect Products: MOSFET ppm rate of less than 0.1 for example**
- **Robust Safety Mechanisms Ensure Interoperability Across Components**
- **Safety Documentation: At Component and Chipset level**
- **Integration Support: Access to Experts with in-depth Product and Application Understanding**

- **Radar**
  - Result: High performance, reliable environmental sensing

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Infineon Functional Safety | Infineon Automotive Quality | Infineon Cybersecurity

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Infineon's dependable electronics
We offer technology you can trust

Passion for Innovation
Partnerships
Device Performance
Full R&D value chain

System Understanding
Functional requirement
Fail-Operational Systems
Cybersecurity

Trusted Supplier
Zero Defect Mentality
Business Continuity
Premium Services

Cybersecurity

Functional Safety

Automotive Quality

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We deliver dependable electronics which enable systems that are the foundation for trust.
Part of your life. Part of tomorrow.
For more information on each topic please click on the respective image below.