Think Automotive Dependability.
Think Infineon.

Bill Stewart (Senior Director, Vehicle Automation & Chassis)
December 2020

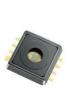# We shape the future of mobility with microelectronics enabling clean, safe, smart cars

Clean

› Clean combustion engines
› Efficient energy management
› Electrified drivetrain

Safe

› Occupant and pedestrian protection
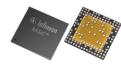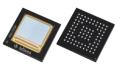› Collision avoidance
› Advanced driver assistance

Smart

› Individual convenience
› Secure connectivity, data integrity and privacy

Infineon has industry's broadest product portfolio covering entire range of auto applications
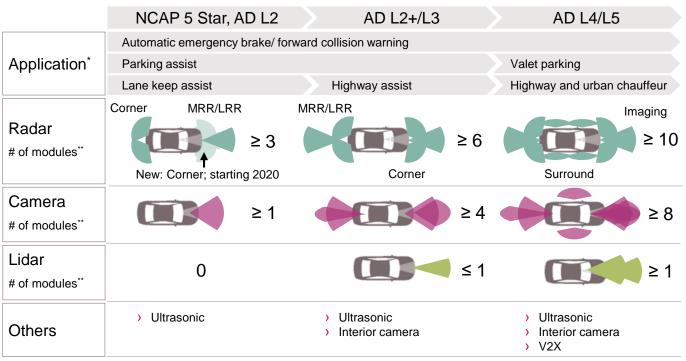
Body	Cluster/ Infotainment	Chassis	Powertrain	ADAS/AD

Sensors (magnetic, pressure, radar, current, 3D ToF, TrueTouch®, CapSense®)

MCU (Embedded Power ICs, PSoC™, Traveo™) | **MCU (AURIX™)**

Memory (NOR Flash, SRAM, nvSRAM, F-RAM)

Power (MOSFETs, IGBTs, modules, driver ICs, power ICs, LDOs, PMICs, USB Type-C PD)

Connectivity (USB) | **Connectivity (Wi-Fi, BT, BLE)**

Application examples

Body	Cluster/Infotainment	Chassis	Powertrain	ADAS/AD
› HVAC	› instrument cluster	› braking	› engine management	› speed control
› door control	› in-cabin entertainment	› steering	› transmission	› emergency braking
› pumps	› touch control	› stability program	› main inverter	› blind spot detection
› seat adjustment	› in-cabin charging	› suspension	› auxiliaries	› sensor fusion

Increased sensor requirements drive the content in the next five years and beyond

More sensors required for any next level of automation

	NCAP 5 Star, AD L2	AD L2+/L3	AD L4/L5
Application*	Automatic emergency brake/ forward collision warning		
	Parking assist		Valet parking
	Lane keep assist	Highway assist	Highway and urban chauffeur
Radar # of modules**	Corner / MRR/LRR — ≥ 3 — New: Corner; starting 2020	MRR/LRR — ≥ 6 — Corner	Imaging — ≥ 10 — Surround
Camera # of modules**	≥ 1	≥ 4	≥ 8
Lidar # of modules**	0	≤ 1	≥ 1
Others	› Ultrasonic	› Ultrasonic › Interior camera	› Ultrasonic › Interior camera › V2X

* Source: VDA (German Association of the Automotive Industry); Society of Automotive Engineers
** market assumption

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

"*We're Building Self-Driving Technology You Can Trust.*"

Argo.ai Website Headline

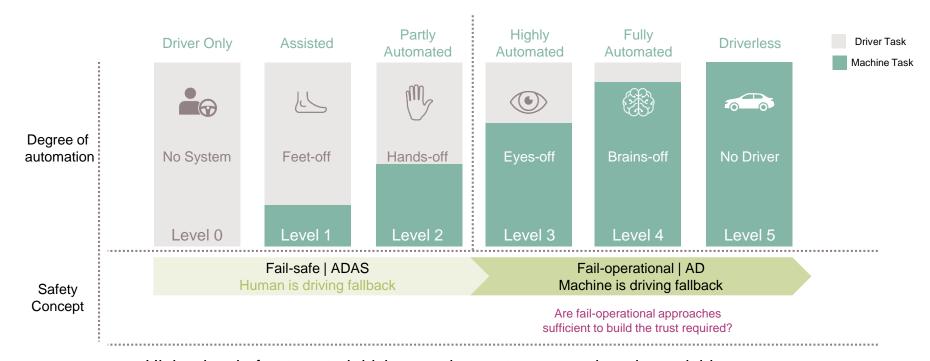# Dependability is the key driver for the megatrend automated driving

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

Driver Only	Assisted	Partly Automated	Highly Automated	Fully Automated	Driverless

Driver Task / Machine Task

Degree of automation

No System	Feet-off	Hands-off	Eyes-off	Brains-off	No Driver
Level 0	Level 1	Level 2	Level 3	Level 4	Level 5

Safety Concept

Fail-safe | ADAS
Human is driving fallback

Fail-operational | AD
Machine is driving fallback

Are fail-operational approaches sufficient to build the trust required?

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

Source: Barclays Research & Infineon

Dependable systems are highly available and secure systems, increasing the need for more 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

Automation			
	Lower levels (ADAS, <L2)	Higher levels (AD, ≥L2+)	Higher levels (AD, ≥L3+)

Failure

System enters safe mode | System continues safety critical tasks | High availability in all conditions
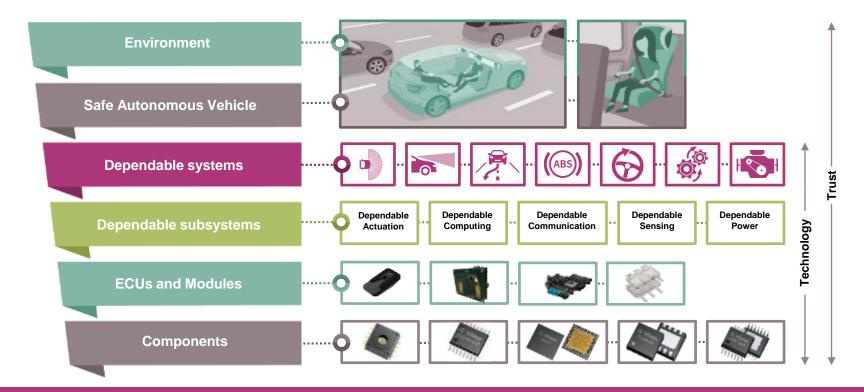
System

Reliable, robust, safe, secure | **Fail safe** + available | **Fail operational +** highly available

Dependability is part of Infineon's cultural mindset with system understanding as one of its key ingredients

| Environment |
| Safe Autonomous Vehicle |
| Dependable systems |
| Dependable subsystems |
| ECUs and Modules |
| Components |

Dependable subsystems: Dependable Actuation · Dependable Computing · Dependable Communication · Dependable Sensing · Dependable Power
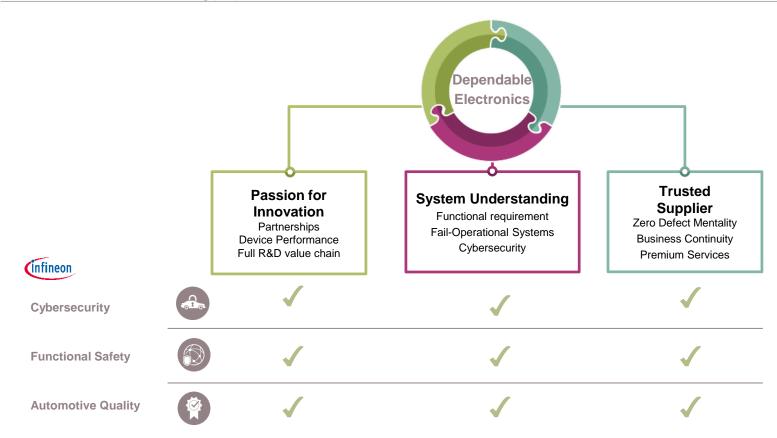
Trust

Technology

Infineon leverages a deeply embedded system thinking

Infineon's dependable electronics
We offer technology you can trust

Dependable Electronics

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 ✓ ✓ ✓

Part of your life. Part of tomorrow.

For more information on each topic please click on the respective image below

Infineon Automotive Dependability

Dependable Electronics

Infineon Automotive Dependability

Infineon Automotive Quality

Infineon Functional Safety

Infineon Cybersecurity