UBS ADAS tour
Infineon Automotive

Munich, 22 June 2016

Jochen Hanebeck
Division President Automotive (ATV)

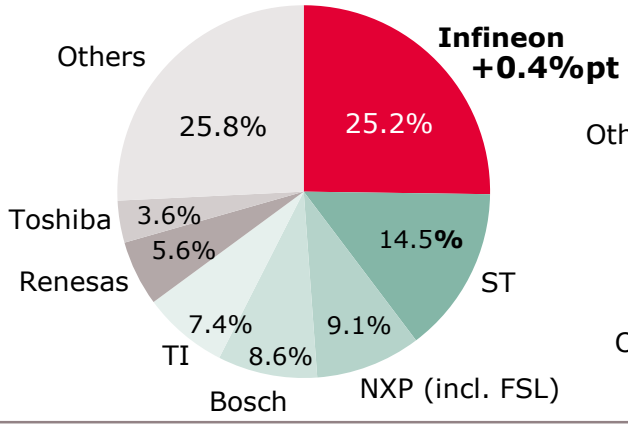
System leadership with most balanced portfolio in the market

Global market shares

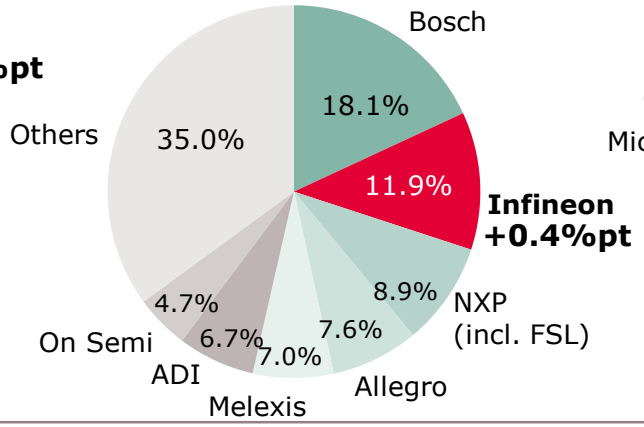
		2014	Delta	2015
1	NXP (incl. FSL)	13.3%	+0.9%	14.2%
2	**Infineon**	**10.5%**	**-0.1%**	**10.4%**
3	Renesas	12.0%	-1.7%	10.3%
4	STMicro	7.8%	-0.1%	7.7%
5	TI	6.1%	+0.9%	7.0%
6	Bosch	6.2%	-0.8%	5.4%

Market shares by product category

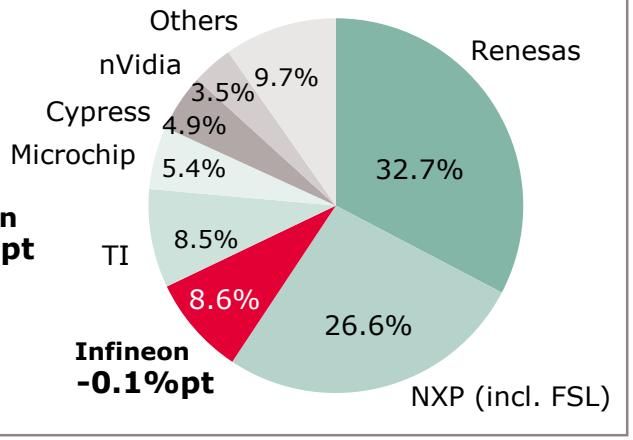
Power



Sensors



Microcontrollers



Source: Strategy Analytics, Vendor Ranking 2015 April 2016 (for company revenue 2015 & 2014)

Four megatrends are shaping the automotive market, significantly increasing the semi content per vehicle

ADAS/Autonomous driving

- From ADAS to semi-automated and finally autonomous driving
- Every world region is striving for "0-accident"

xEV/eMobility

- Mandated CO_2 reductions make electrification of powertrain inevitable

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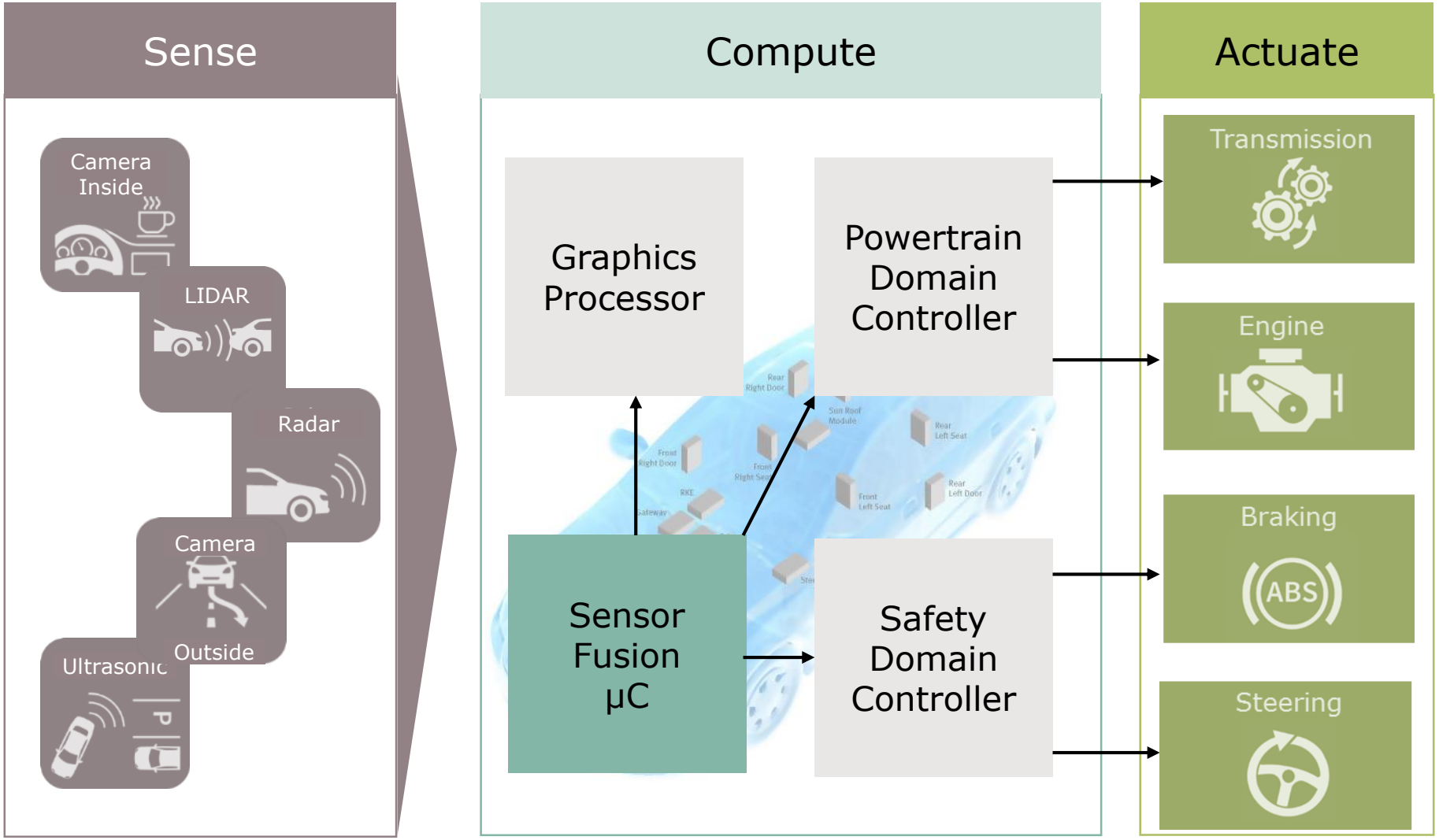
Connectivity

- Increased connectivity and software content increase risk exposure to hackers
- Internal/external connectivity must be secured

Advanced security

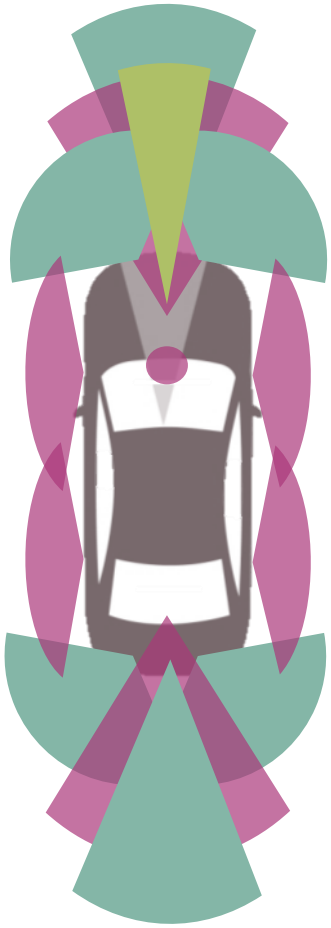
ADAS system overview

Sense | Compute | Actuate



More sensors required for each automation level – sensor "cocoon" in level 4/5

Sense



Radar Camera Lidar

Sensor technologies	2015 Euro-NCAP*	2018 Euro-NCAP*	Level 2	Level 3	Level 4/5
Front looking camera	0.5	1	1	1	1
Front looking radar	0.5	1	1	1	1
Front looking lidar	–	–	–	–	1
Surround camera	–	–	–	–	4
Corner radar	–	2	2	4	4
Surround radar	–	–	–	–	6
Rear looking camera	–	–	–	1	1
Rear looking radar	–	–	–	–	1
Driver monitoring Camera	–	–	–	1	1
V2X sensor	–	–	–	–	1
Parking aid	Up to 12 ultrasonic sensors per car				
Automated parking	Potential future replacement by RF CMOS radar				

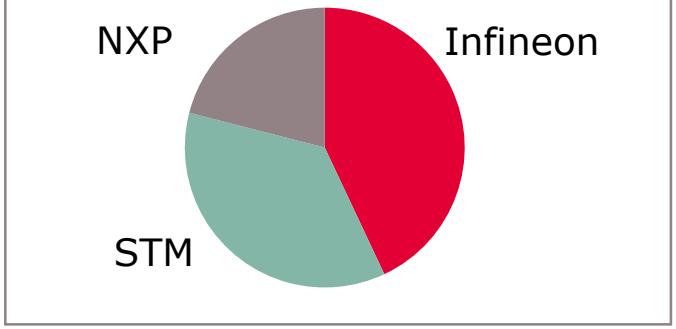
Up to 12 SiGe radars per vehicle (24/77 GHz)

* Euro-NCAP is focusing on collision avoidance, requirements are increasing over time

Infineon market leader in radar; 20m sensor chips sold; ~50% $CAGR_{16-21}$ based on design wins

Sense

2015 radar sensor market share*



Innovation for performance

Innovation for cost

Vision Zero
+ Autonomous Driving

ACC radar
1st SiGe 77 GHz transceiver

mid-range radar
1st radar product
eWLB package

Blind Spot Detection
(24 GHz)

mid- & long-range radar
Dual Chip System solution +
power supply

next gen. of mid- & long-range radar
AURIX™ 3rd gen.,
power supply
SiGe

short to mid-range radar
CMOS solution
CMOS

2009 | Today | Tomorrow

* Source: IHS Inc., "Advanced Driver Assistance Applications Sensor Market Database – H2 2015", February 2016

Depending on test cases, AEB will be either BiCMOS or CMOS

Sense

	SiGe BiCMOS	CMOS (< 40 nm)
77 GHz performance	excellent	ok
f_{max}	> 400 GHz	> 300 GHz
Noise	1x	2x .. 3x
System-on-chip capabilities	good	excellent
77 GHz automotive-qualified product	in high volume production	not yet available

Application			
	ACC, Highway Assist	AEB	Parking Assist, Blind Spot Detection

- Today, SiGe is state of the art.
- Beyond 2020, CMOS will find its sweet spot in 360° applications.

Infineon's automotive offering in ADAS camera systems

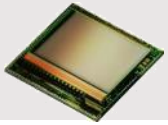
Sense | Compute

Driver monitoring

- Most robust detection of head position, head orientation and eye closure
- Observe the state of the driver and passengers
- Optimize head-up displays and augmented reality to driver's head position

Kostal camera system

REAL3™ sensor



Front camera

- AURIX™ microcontroller is today the reference for safety allowing ASIL-D systems
- The safe & secure microcontroller is represented in most of today's camera systems
- OEMs prefer software on AURIX™

Image processor e.g.

MOBILEYE

+

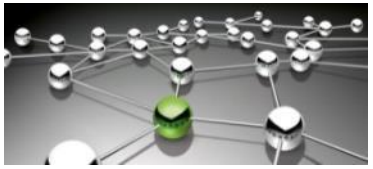
Infineon safe & secure µC

Secure µCs from Infineon offer the required safety and necessary scalability

Compute

Sensor fusion

AURIX™ as main or host controller



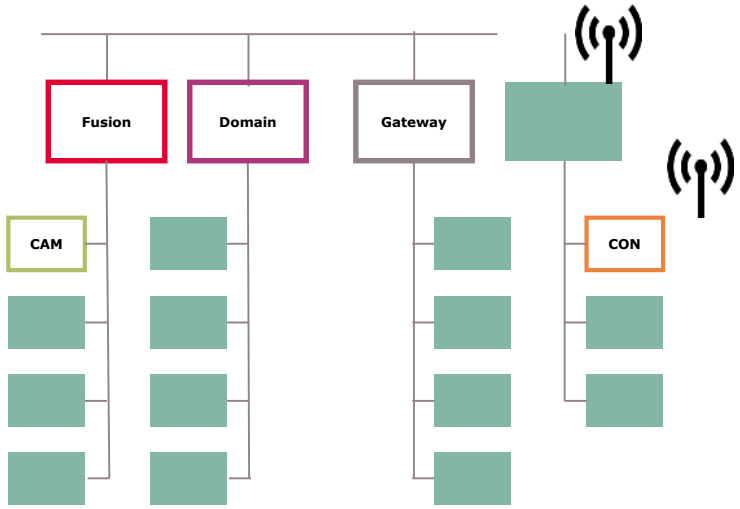
Radar & camera

AURIX™ as main* or host controller

* for radar

Domain control

AURIX™ as hard-realtime main processor



Safety Security Automotive Quality

Connectivity gateway

AURIX™ as hard-realtime main controller

Always-on connectivity

AURIX™ as host controller

Infineon AURIX™ microcontrollers make autonomous driving reliable

Compute

The central driver assistance ECU ("zFAS*") is the core of future systems for piloted driving for Audi

Key components from Infineon, designed for reliability:

- AURIX™ controller as decision maker and interface to the car architecture
- DC-DC – safety system supply

Strategic cooperation with TTTech to enable zFAS* based architecture and position Infineon as leading supplier

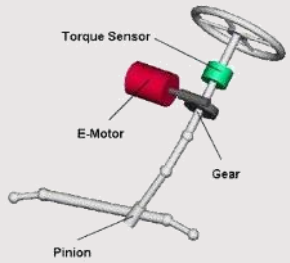
* zFAS = zentrales Fahrerassistenzsystem

30%+ higher BoM on fail operational systems in level 3-compliant vehicles

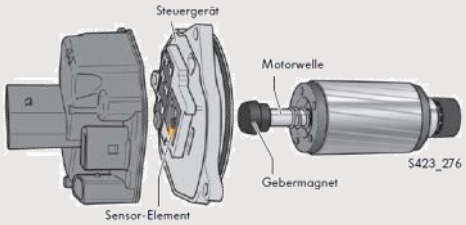
Sense | Compute | Actuate

Electric power steering as an example for Infineon's P2S* approach

System



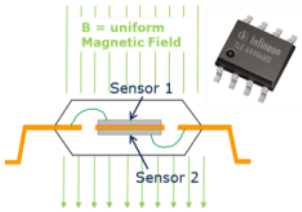
Electric motor



Courtesy: ZF Lenksysteme

Electronic control unit

Sense



2 independent dies

Compute

multicore

Actuate

multi-phase control

Safe power supply

Infineon with 100% BoM coverage

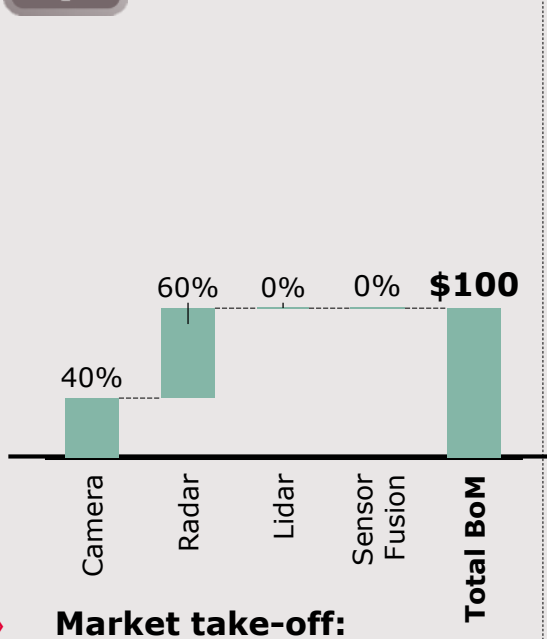
*Product to System (P2S): The shift from product thinking to system understanding is the core element of Infineon's strategy.

ADAS semi growth driven by radar and camera sensor modules

Sense | Compute | Actuate

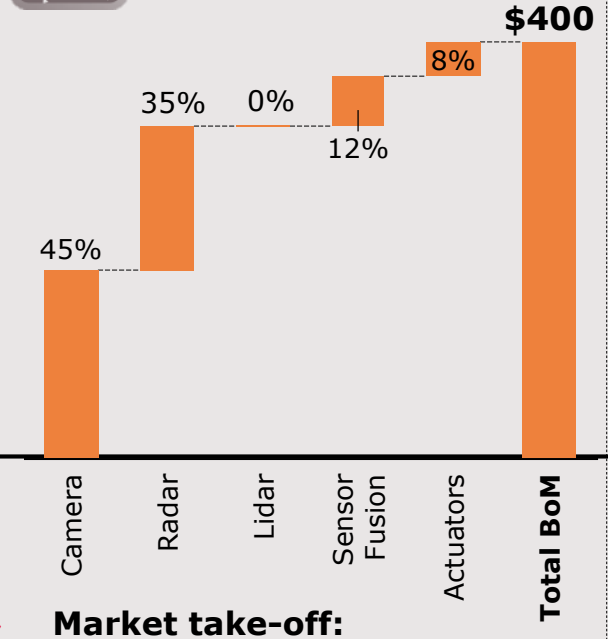
Average ADAS semiconductor content per level of automation

Level 2



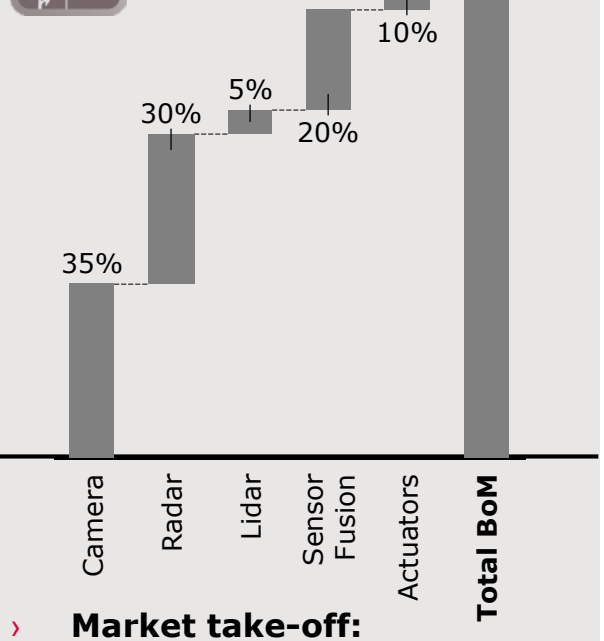
- **Market take-off:** 2015-2020 (up to 30m vehicles p.a.)
- **Key market driver:** NCAP, Automatic Emergency Brake, Blindspot Detection

Level 3



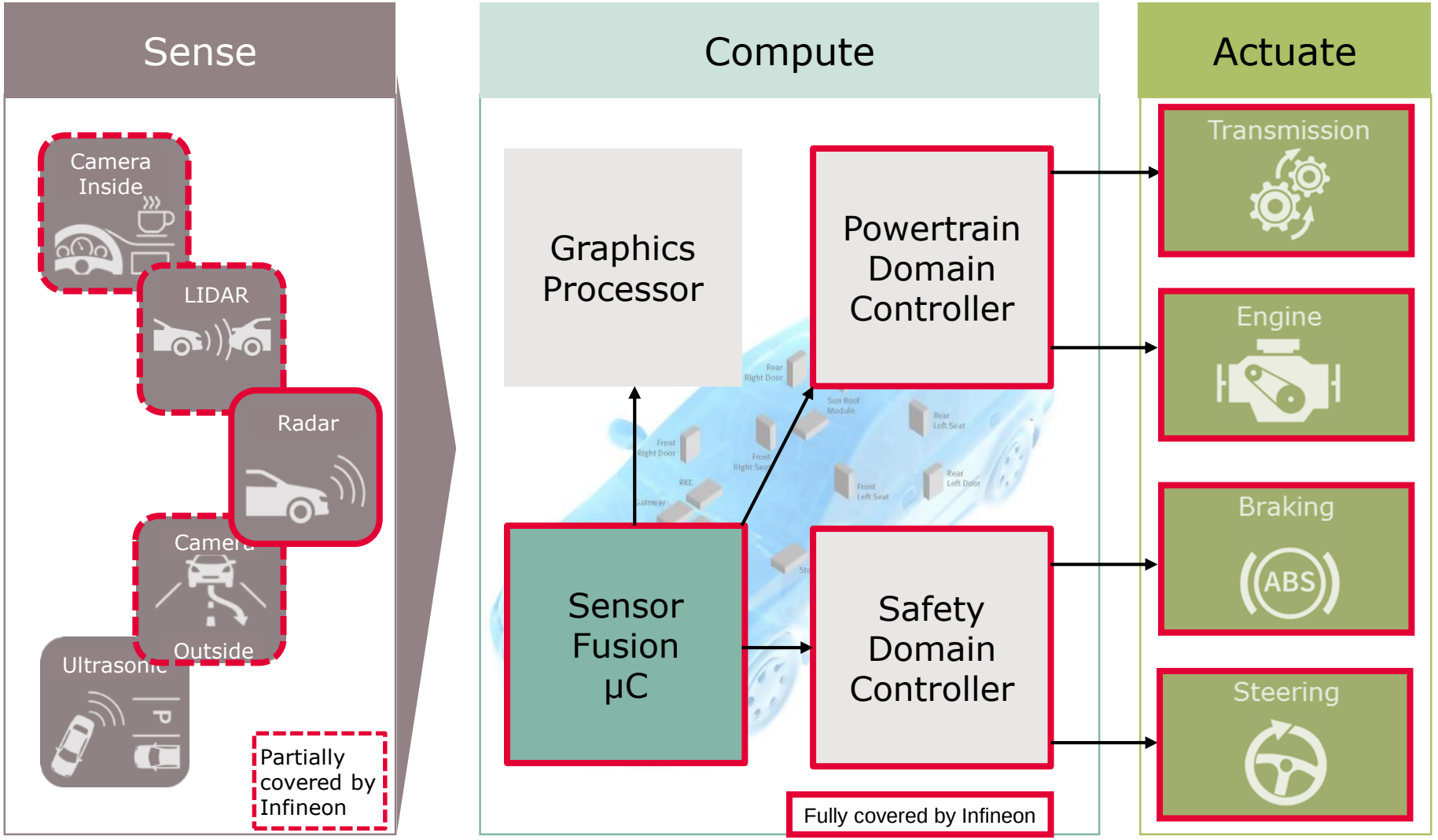
- **Market take-off:** 2020-2025 (up to 10m vehicles p.a.)
- **Key market driver:** Automated Driving in specific situations (e.g. parking, highway)

Level 4



- **Market take-off:** 2025-2030 (up to 5m vehicles p.a.)
- **Key market driver:** Autonomous Driving

ADAS system chipset coverage by Infineon



Four megatrends are shaping the automotive market, significantly increasing the semi content per vehicle

ADAS/Autonomous driving

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xEV/eMobility

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Connectivity

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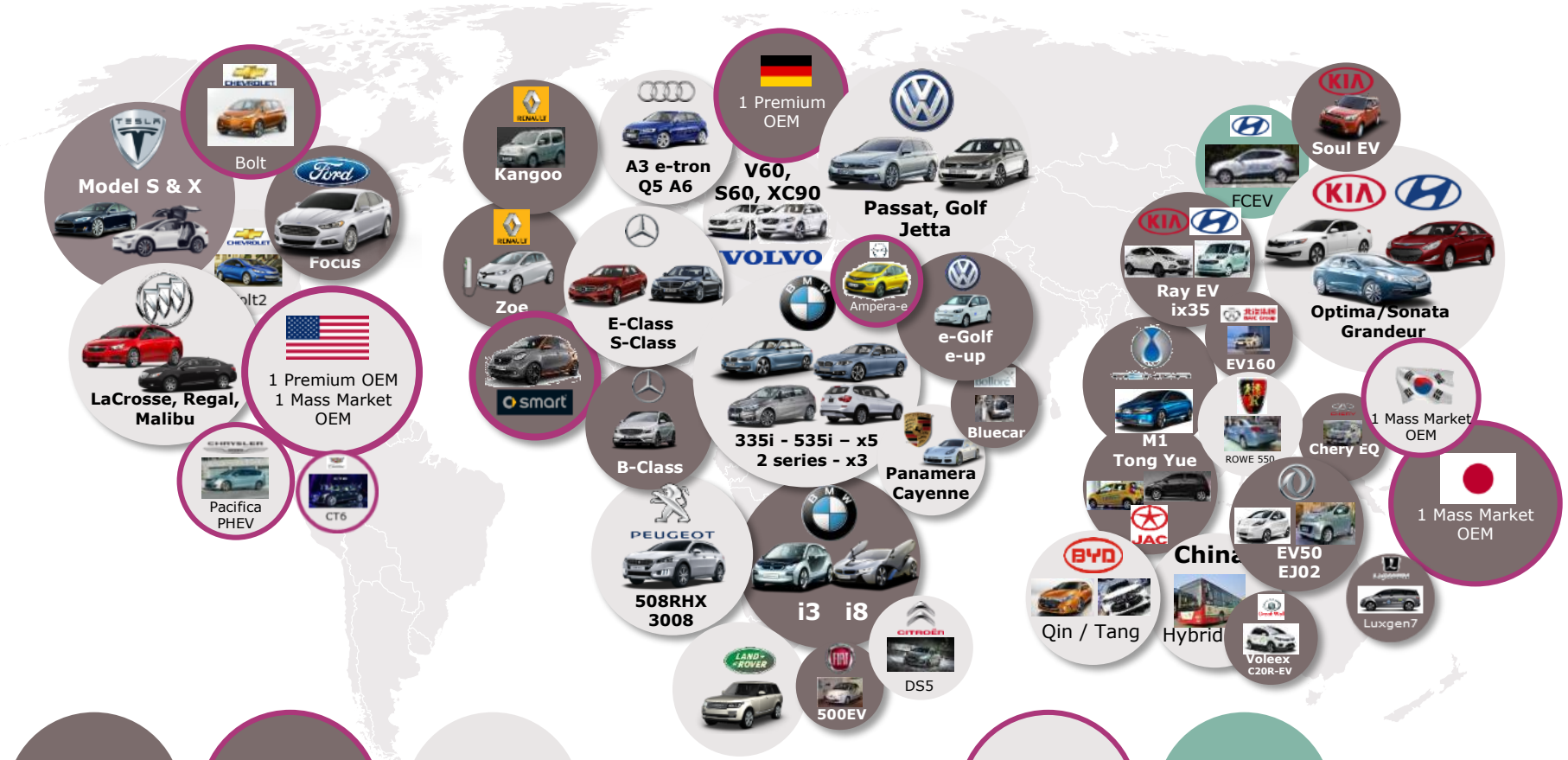
Advanced security

Infineon is well positioned globally to benefit over-proportionally from xEV boom



EV in production

EV future SOP

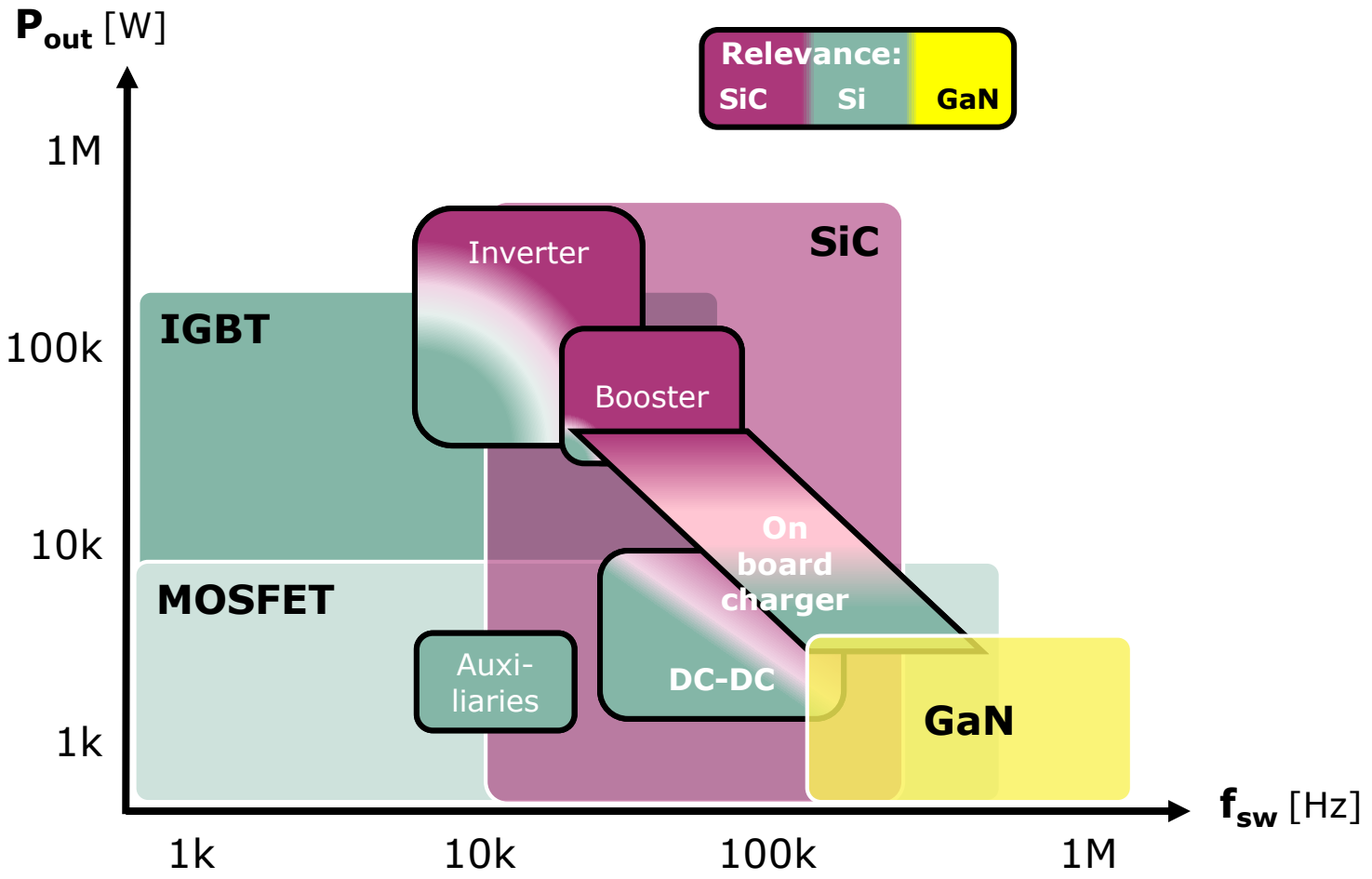
HEV in production

HEV future SOP

Fuel Cell in production

SOP = Start of production

We will experience a shift from Si IGBT to SiC MoSFET



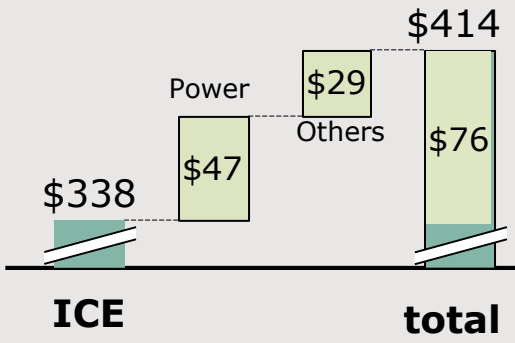
Independently from the voltage class, HEV subsystems are not in the sweet spot of GaN technology

xEV growth driven by power semis

Average xEV semiconductor content by degree of electrification

48 V

Adder for DCDC and starter/generator

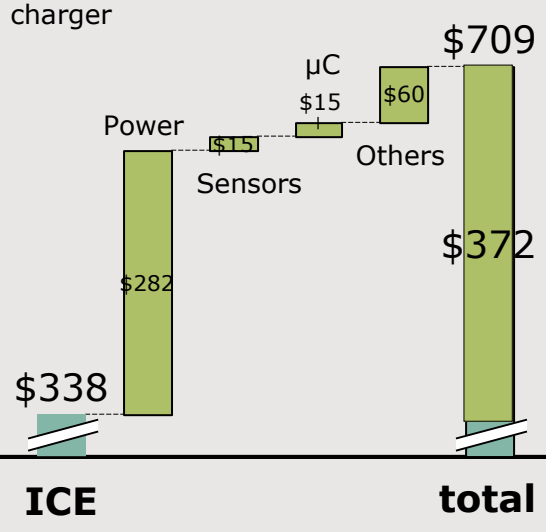


2020: 1.6m*

› high growth for 48 V (not even including 48 V auxiliaries nor mild hybrid)

HEV / PHEV

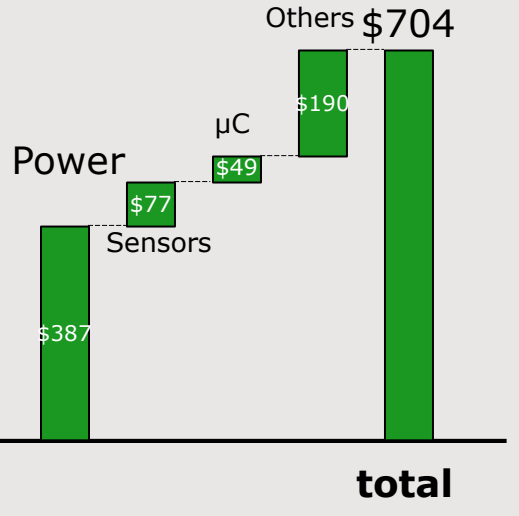
Adder for DC-DC, inverter, onboard charger



2020: 3.5m HEVs* 1.9m PEHs*

› PHEV to overtake HEV after 2020, especially in Europe

EV



2020: 1.4m EVs*

› strong growth driven by Chinese OEMs and Tesla

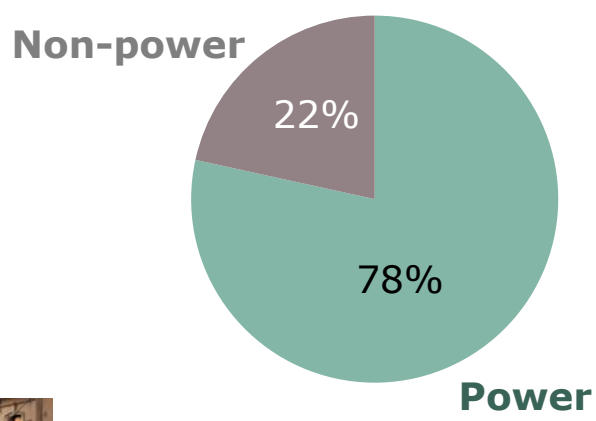
*Source: IHS Alternative Propulsion Forecast - Jan 16, expected number of vehicles

#1 semi supplier of German premium OEMs

Powered by Infineon

> $500 semiconductor content

Courtesy: BMW



740e

Plug-in hybrid

The expected big expansion of PHEV model line-up from premium OEMs will boost Infineon revenues

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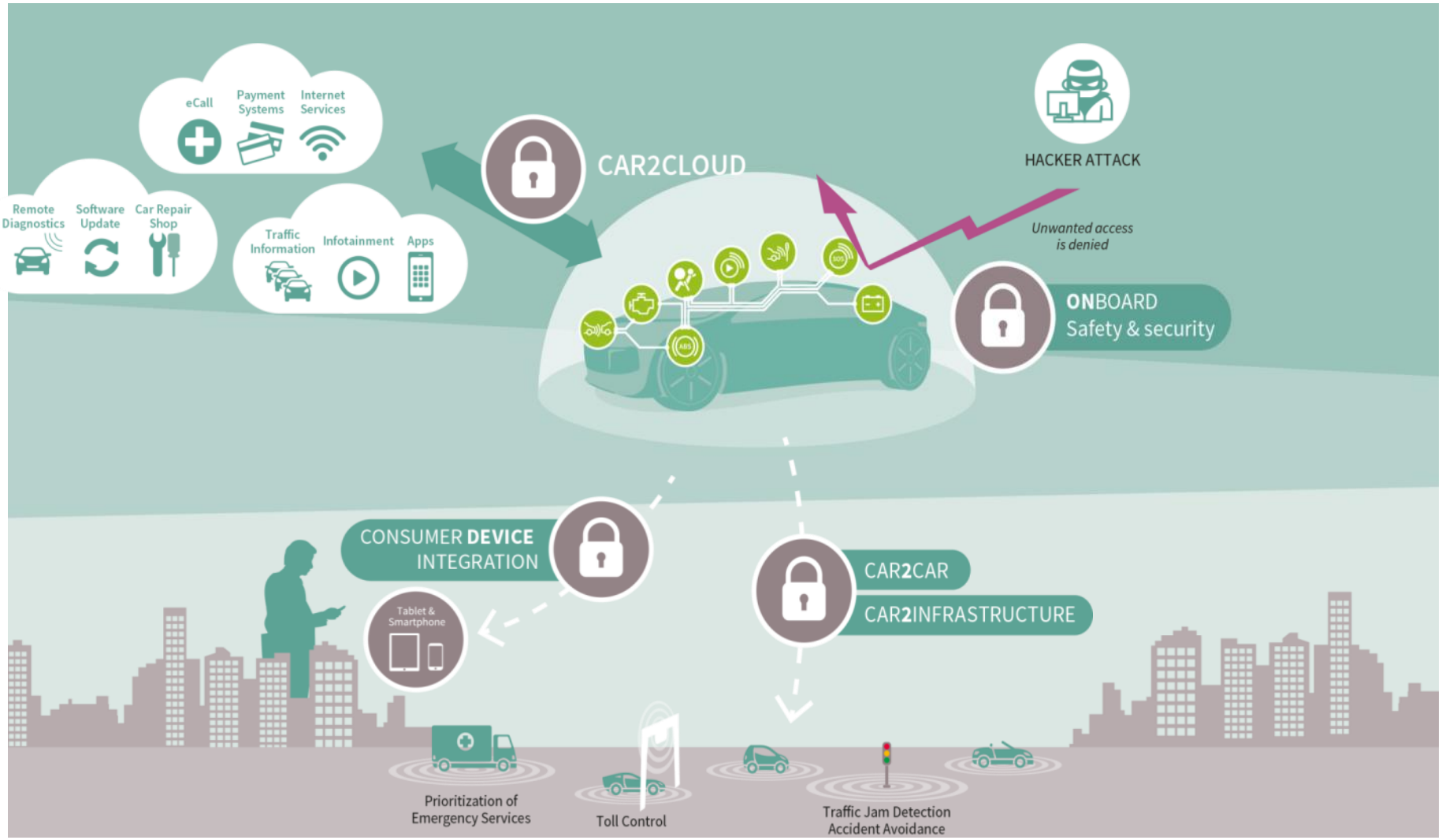
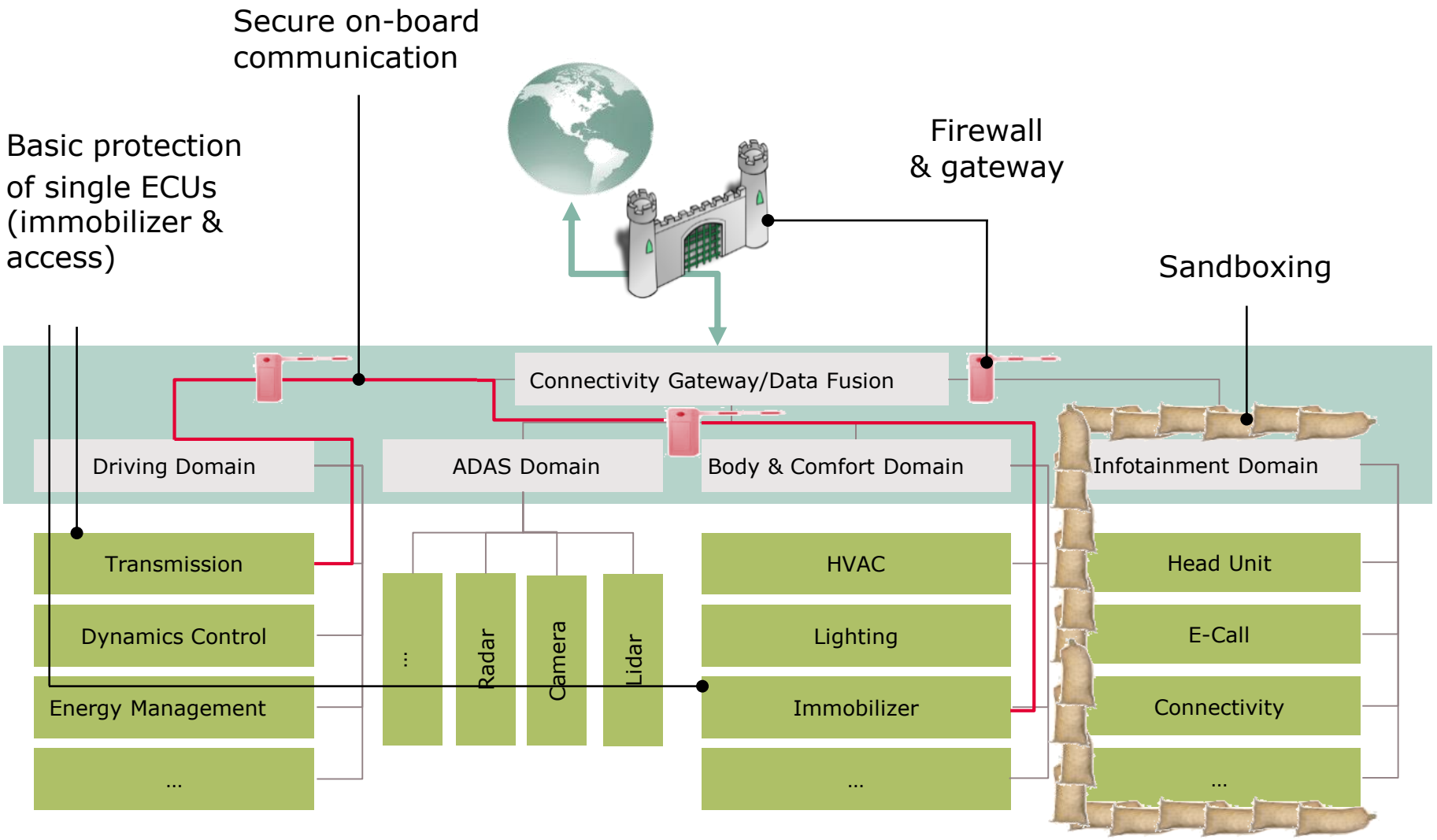
Advanced security

The connected car and move to open systems offer many use cases for our customers



Various security tools have to be added on the way to a secure architecture



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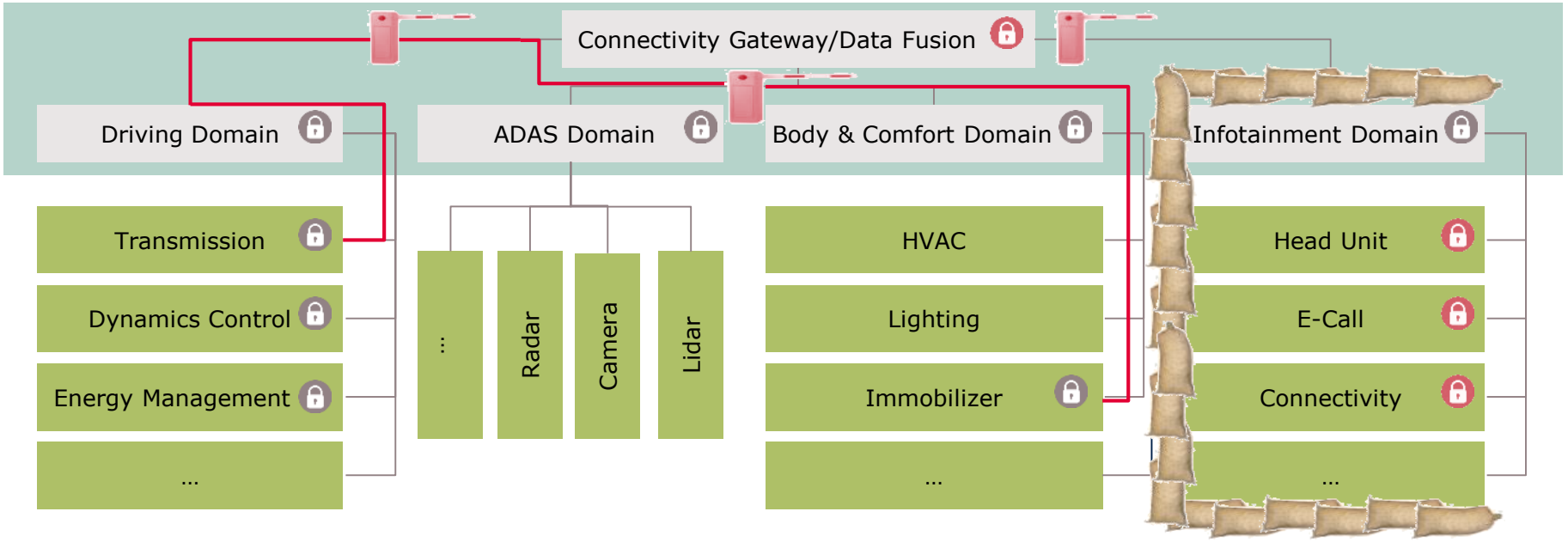


Trust anchors

Protected Execution Environments hosting

- Key storage and related cryptographic operation
- Security applications

Integrated on MCU

- High speed
- Secure onboard communication
- Logical security

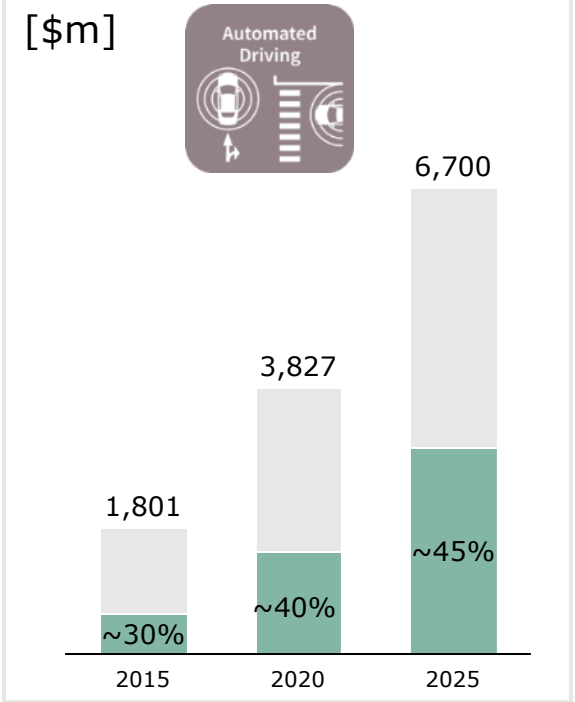
Discrete Security Controller

- External communication
- Protecting high value
- By certified hardware security

Enabling the root of trust for internal and external communication

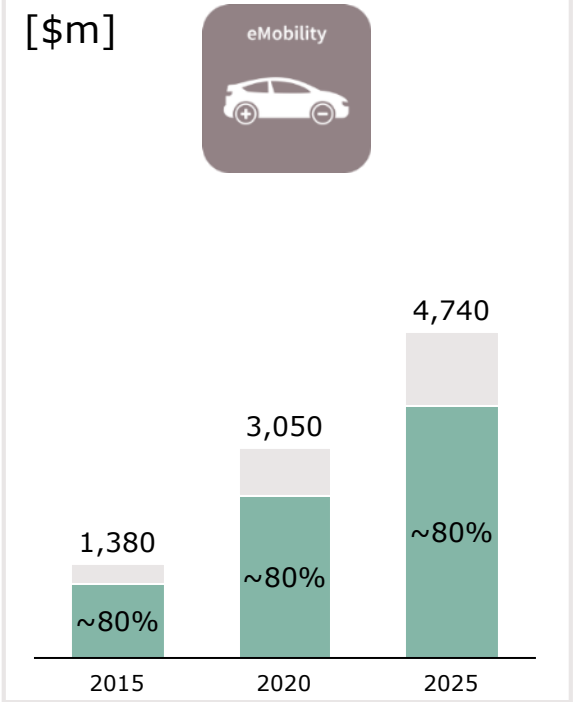
Infineon is ideally positioned to benefit most from megatrends ADAS, xEV, and security

ADAS/autonomous driving semi market



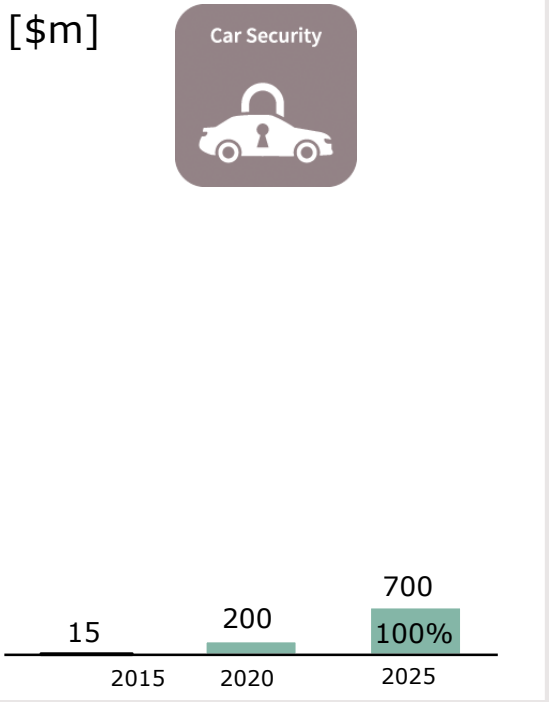
Higher market coverage driven by radar penetration, AURIX™ penetration and actuators

xEV/e-mobility semi market



High market coverage already in 2015 will be kept with ramp-up of new power products

Security



Key enabler for secure connectivity

Source: IHS, Strategy Analytics, Infineon internal estimations

Addressed by Infineon | Not addressed by Infineon

ADAS, CO_2 reduction and adoption of premium features drive Infineon growth

Vehicle production

- ~2% growth p.a.
- Further growth in Western Europe, China, and ASEAN
- Electro-mobility gaining momentum, especially in China

Drivers for semiconductor content per car

CO_2 reduction

- Driven by legislation
- Improvements of ICE (e.g. electric steering, electric pumps and motors)
- Adoption of EV/HEV

Advanced safety

- Current: crash avoidance
- Next: assisted driving
- Future: autonomous driving

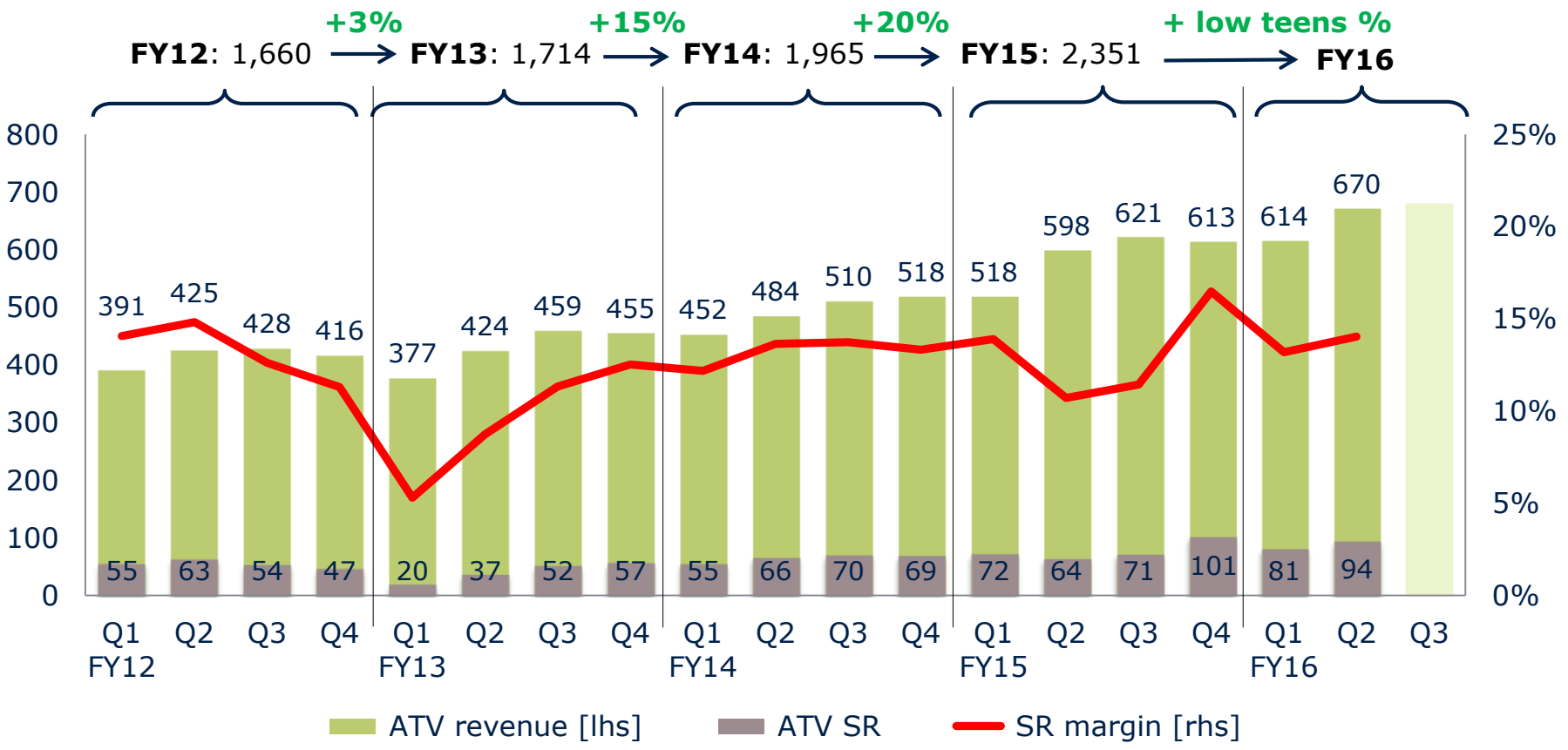
Comfort, premium

- Premium cars are early adopters of high-end comfort and safety features
- Trickling down to mid-range

~8% p.a. through-cycle growth

Infineon automotive financials at a glance

Revenue and segment result development



Infineon automotive is excellently positioned in the top growth applications of today

Automotive market

- 50% of Infineon automotive market growth driven by ADAS/xEV
- Infineon addresses
  - up to 80% of xEV BoM and
  - 40% of ADAS BoM
  - 100% of security

Infineon automotive

#2	automotive semiconductor
#1	power semiconductors
#2	sensor semiconductors
#3	microcontrollers

Infineon´s value proposition

1. Infineon enables assisted, automated and autonomous driving by a system approach covering sense, compute, and actuate

2. Our products are based on technologies which enhance xEV cost–performance

3. Infineon provides innovative products for a secure car architecture and thus offers an appropriate level of protection

Part of your life. Part of tomorrow.

Infineon