

Deutsche Bank

ADAS conference

London, 21 June 2016



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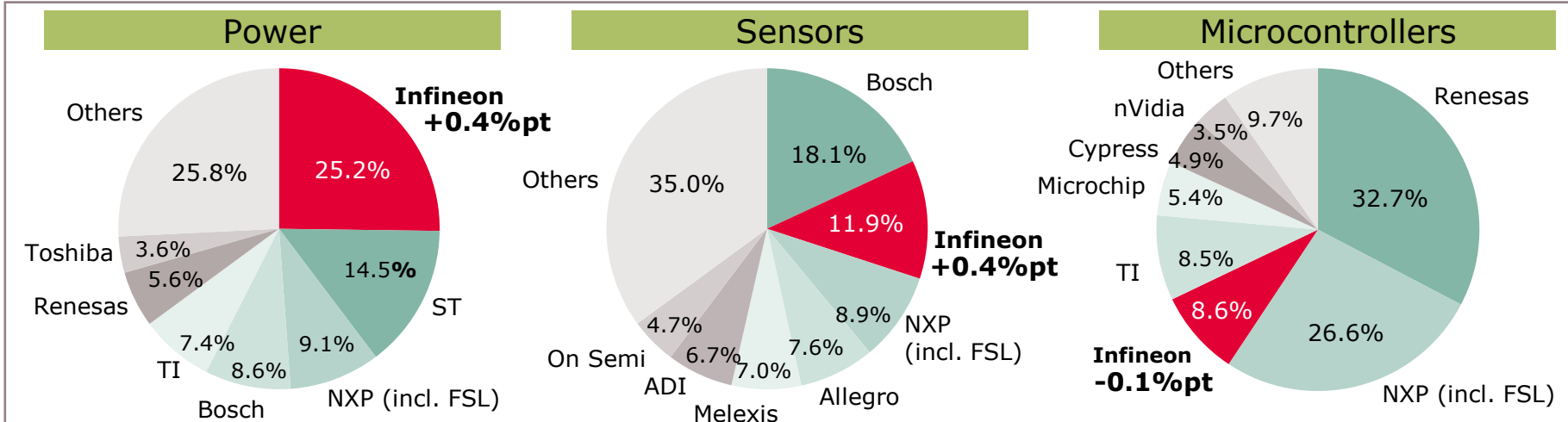
System leadership with most balanced portfolio in the market



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



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

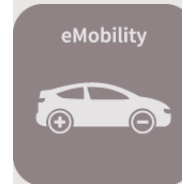
ADAS/Autonomous driving

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



xEV/eMobility

- › Mandated CO₂ reductions make electrification of powertrain inevitable



- › Advanced connectivity is driven by making the car part of the Internet
- › The car will be fully connected (V2I, V2V, in-vehicle)



Car Security



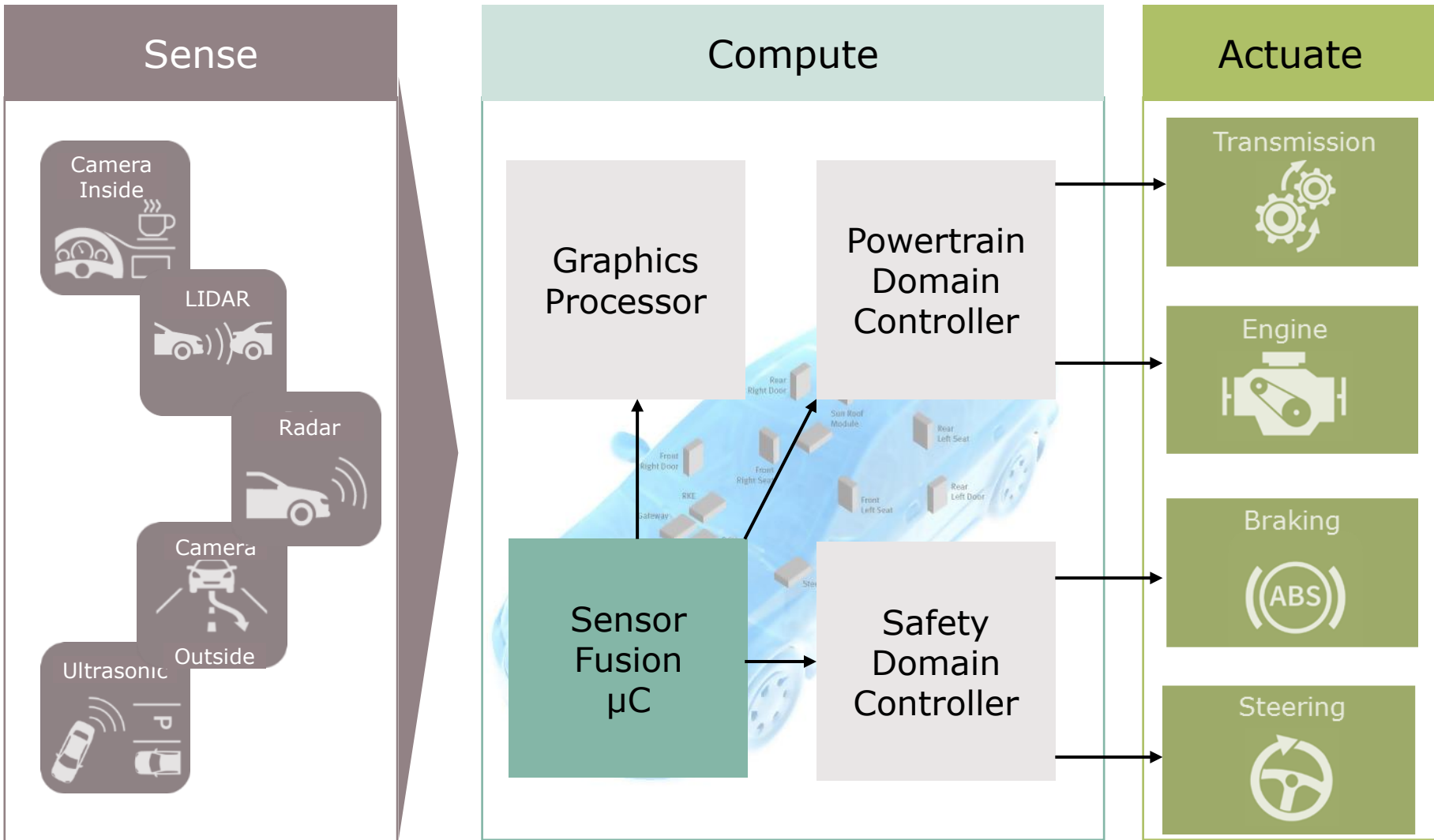
- › Increased connectivity and software content increase risk exposure to hackers
- › Internal/external connectivity must be secured

Connectivity

Advanced security

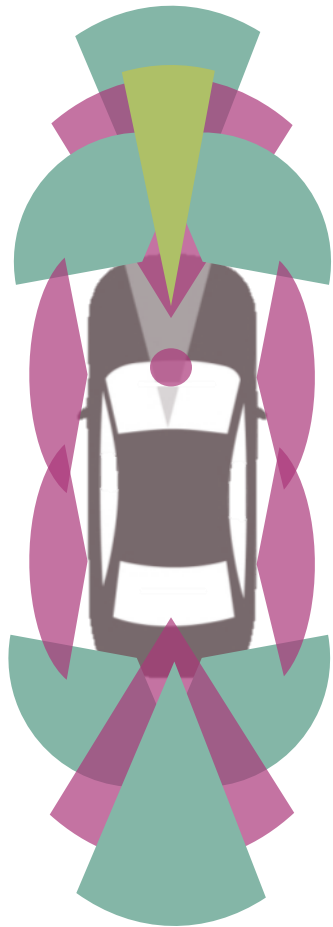
ADAS system overview

Sense Compute Actuate



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

Sense



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)

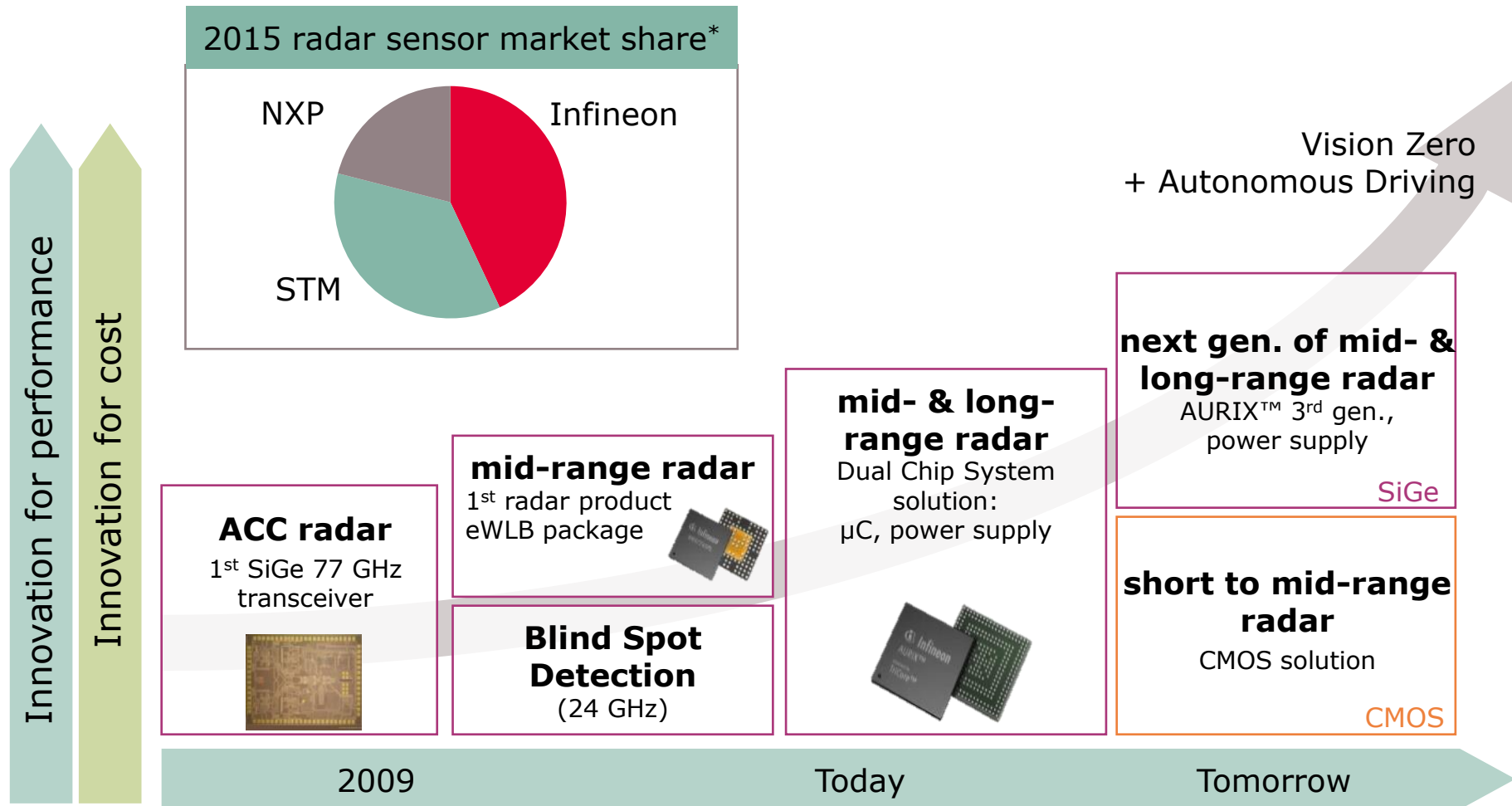
■ Radar ■ Camera ■ Lidar

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

Infineon market leader in radar; 20m sensor chips sold; ~50% CAGR₁₆₋₂₁ based on design wins



Sense



* Source: IHS, "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

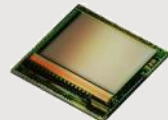
- > Most robust detection of head position, head orientation and eye closure
- > Observe the state of the driver and passengers
- > Optimize head-up displays and augmented reality to driver's head position



Kostal camera system



REAL3™ sensor



Front collision warning

- > 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.



Infineon safe &
secure µC



Secure μ Cs from Infineon offer the required safety and necessary scalability

Compute

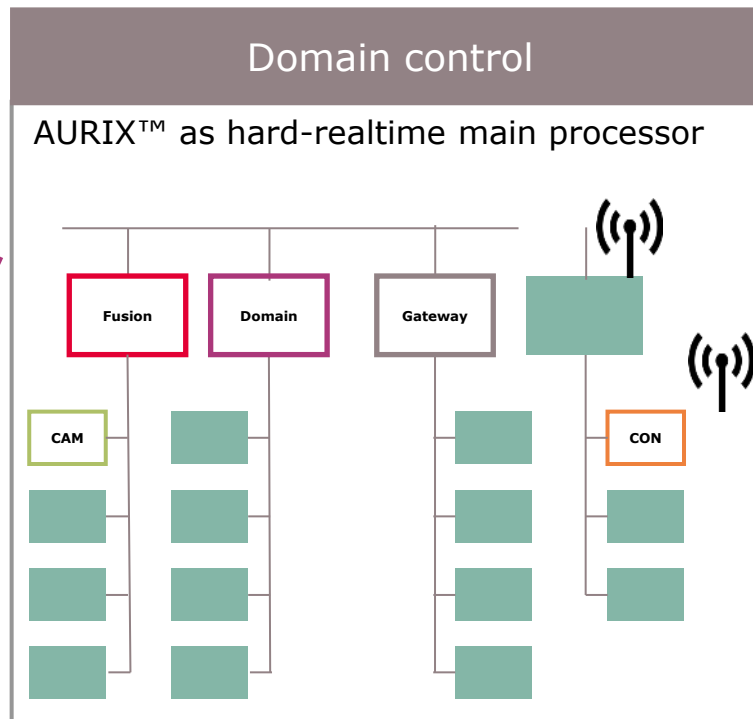
Sensor fusion

AURIX™ as main or host controller

Radar & camera

AURIX™ as main* or host controller

* for radar



Connectivity gateway

AURIX™ as hard-realtime main controller

Always-on connectivity

AURIX™ as host controller



Safety



Security



Automotive Quality

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

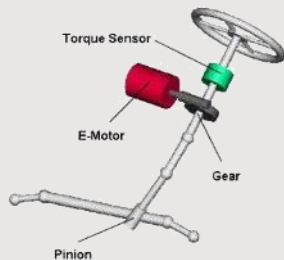
Sense

Compute

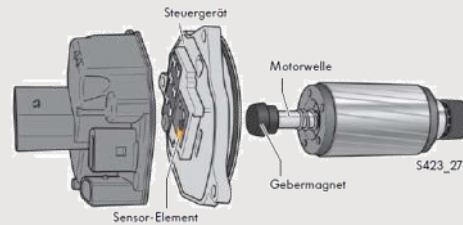
Actuate

P2S example: electric power steering

System



Electric motor

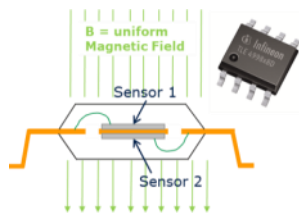


Courtesy: ZF Lenksysteme

Electronic control unit



Sense



2 independent dies

Compute



multicore

Actuate



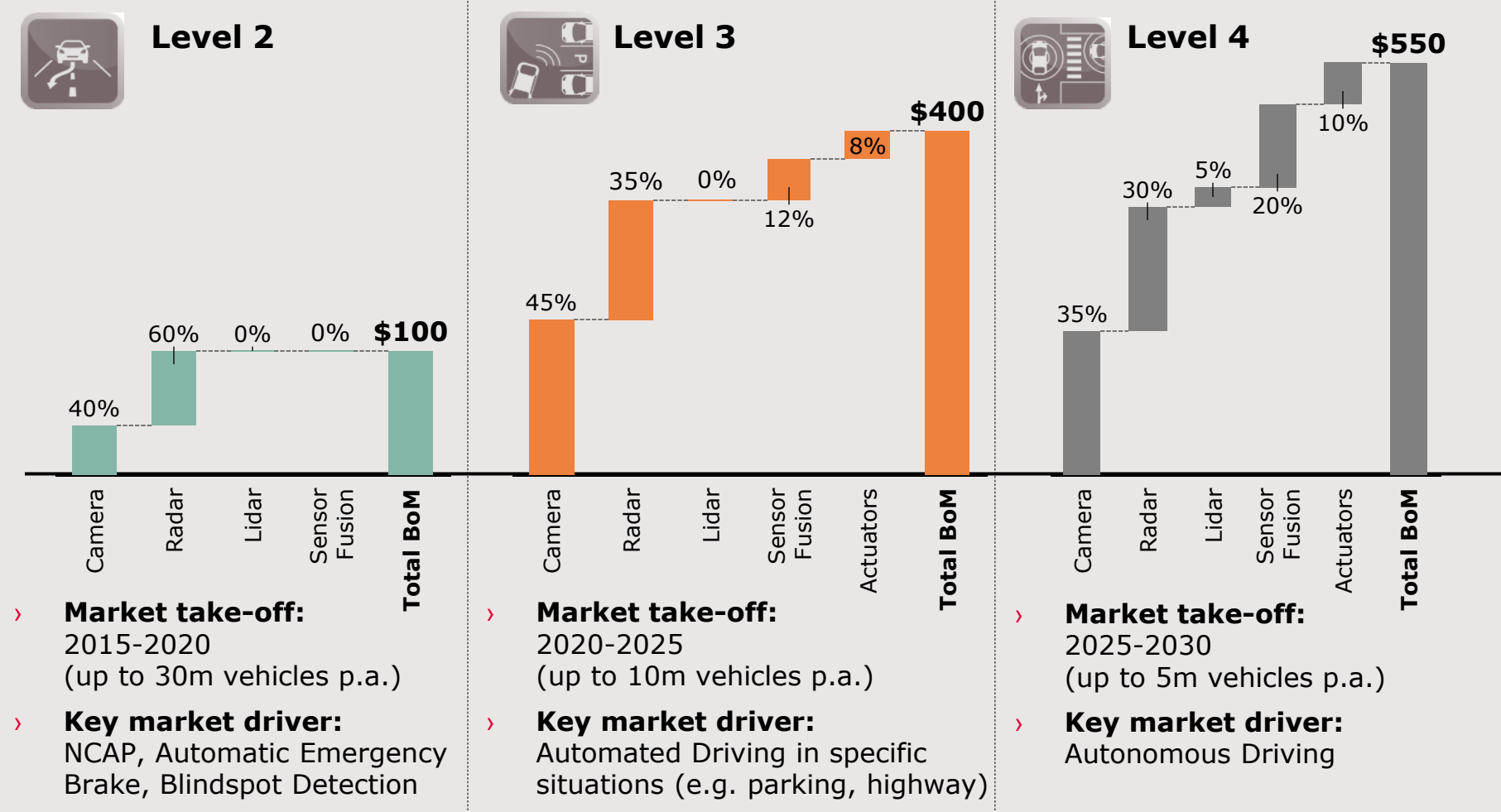
multi-phase control

Safe power supply

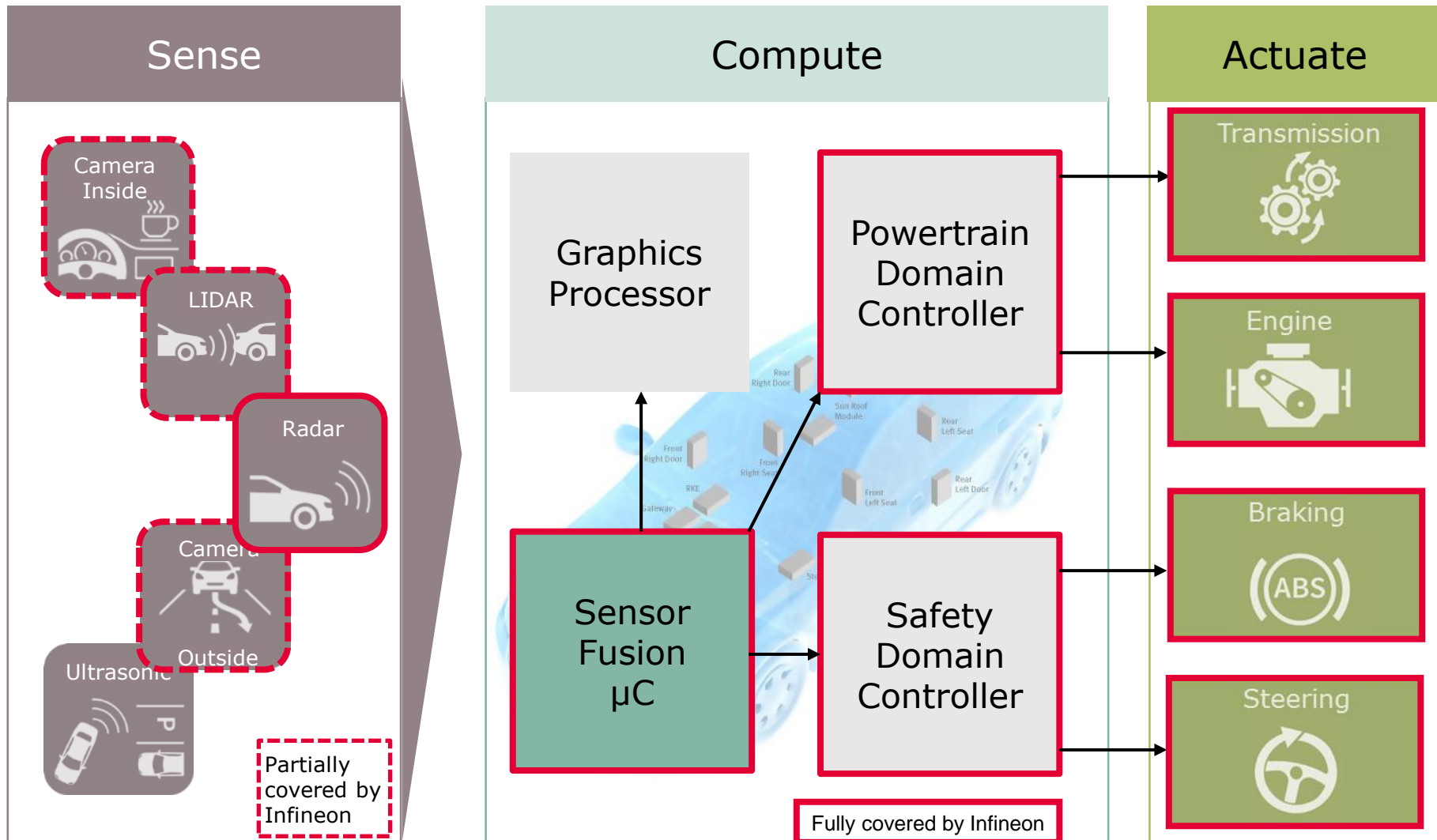
Infineon with 100% BoM coverage

ADAS semi growth driven by radar and camera sensor modules

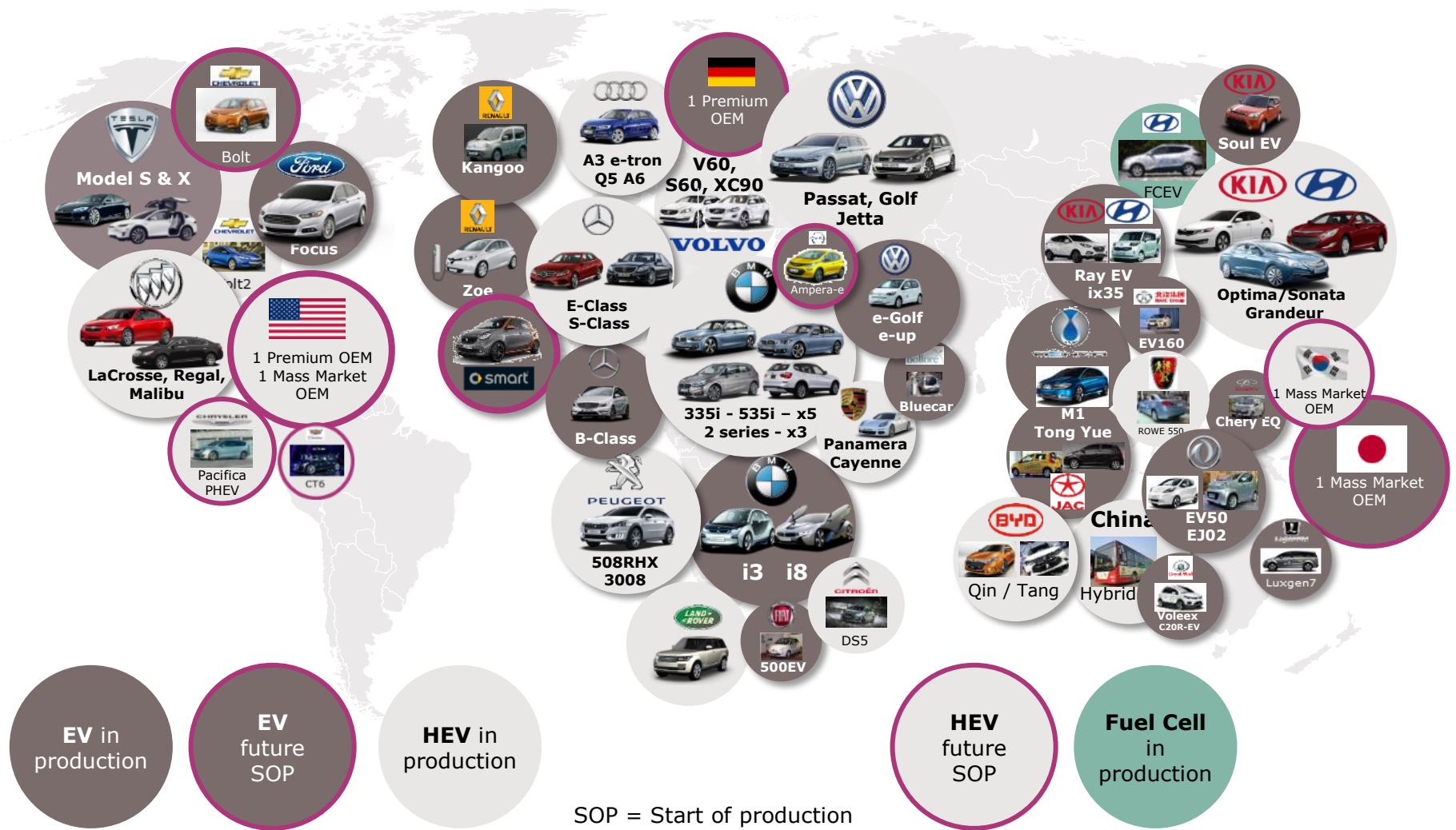
Average ADAS semiconductor content per level of automation



ADAS system chipset coverage by Infineon

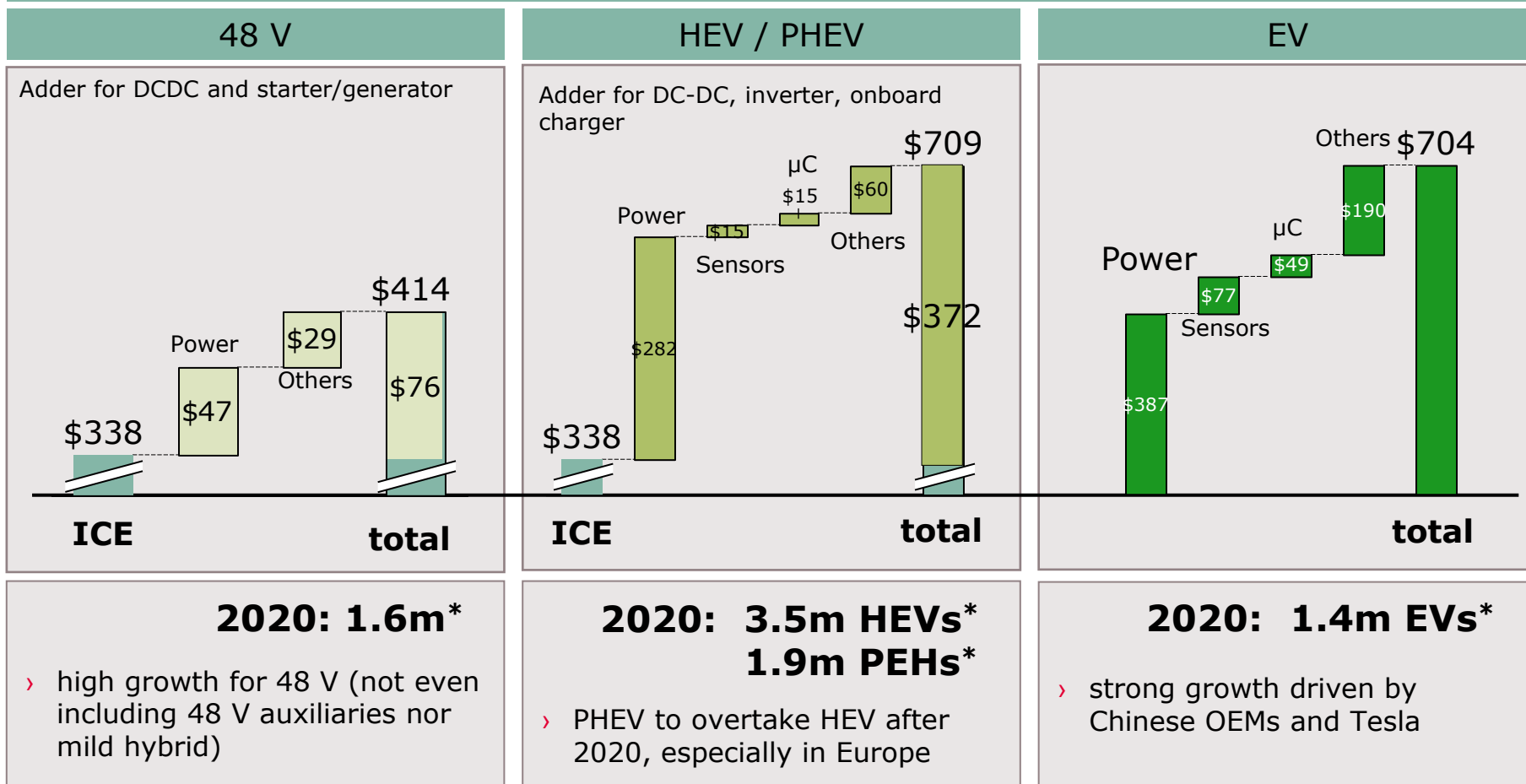


Infineon is well positioned globally to benefit over-proportionally from xEV boom



xEV growth driven by power semis

Average xEV semiconductor content by degree of electrification



* expected number of vehicles; source: IHS, "Alternative Propulsion Forecast", January 2016

#1 semi supplier of German premium OEMs

Powered by Infineon

> \$500 semiconductor content

Non-power

22%

78%

Power



740e

Plug-in hybrid

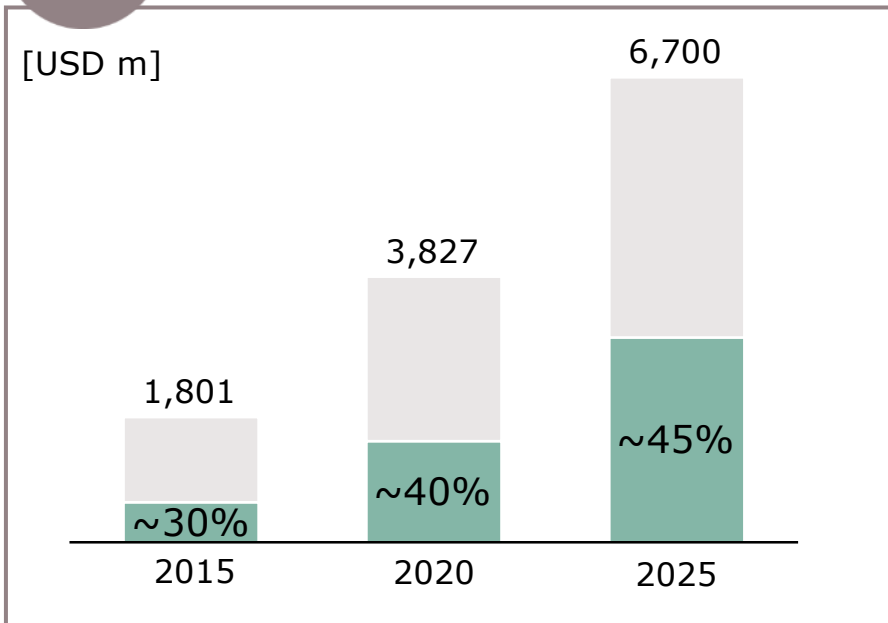
Courtesy: BMW

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

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



ADAS/autonomous driving semiconductor market

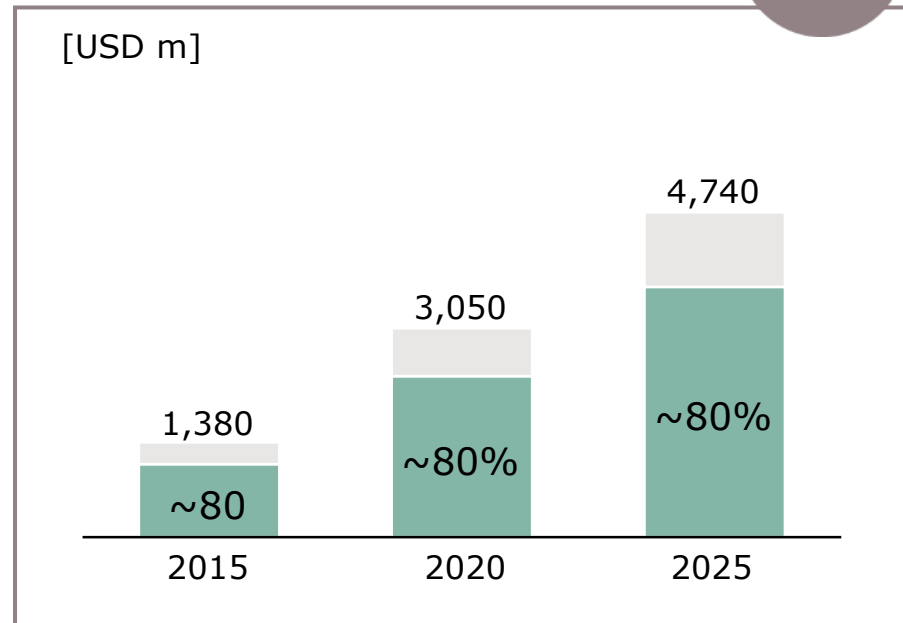


- › higher market coverage driven by radar penetration, AURIX™ penetration and actuators

Source: IHS, Strategy Analytics, Infineon



xEV/electro-mobility semiconductor market



- › high market coverage already in 2015 will be kept with ramp-up of new power products (e.g. HybridPACK™ DSC and SiC MOSFETs)

Addressed by Infineon

Not addressed by Infineon

ADAS, CO₂ 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

CO₂ reduction



Courtesy: BMW

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

Advanced safety



Courtesy: Audi

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

Comfort, premium



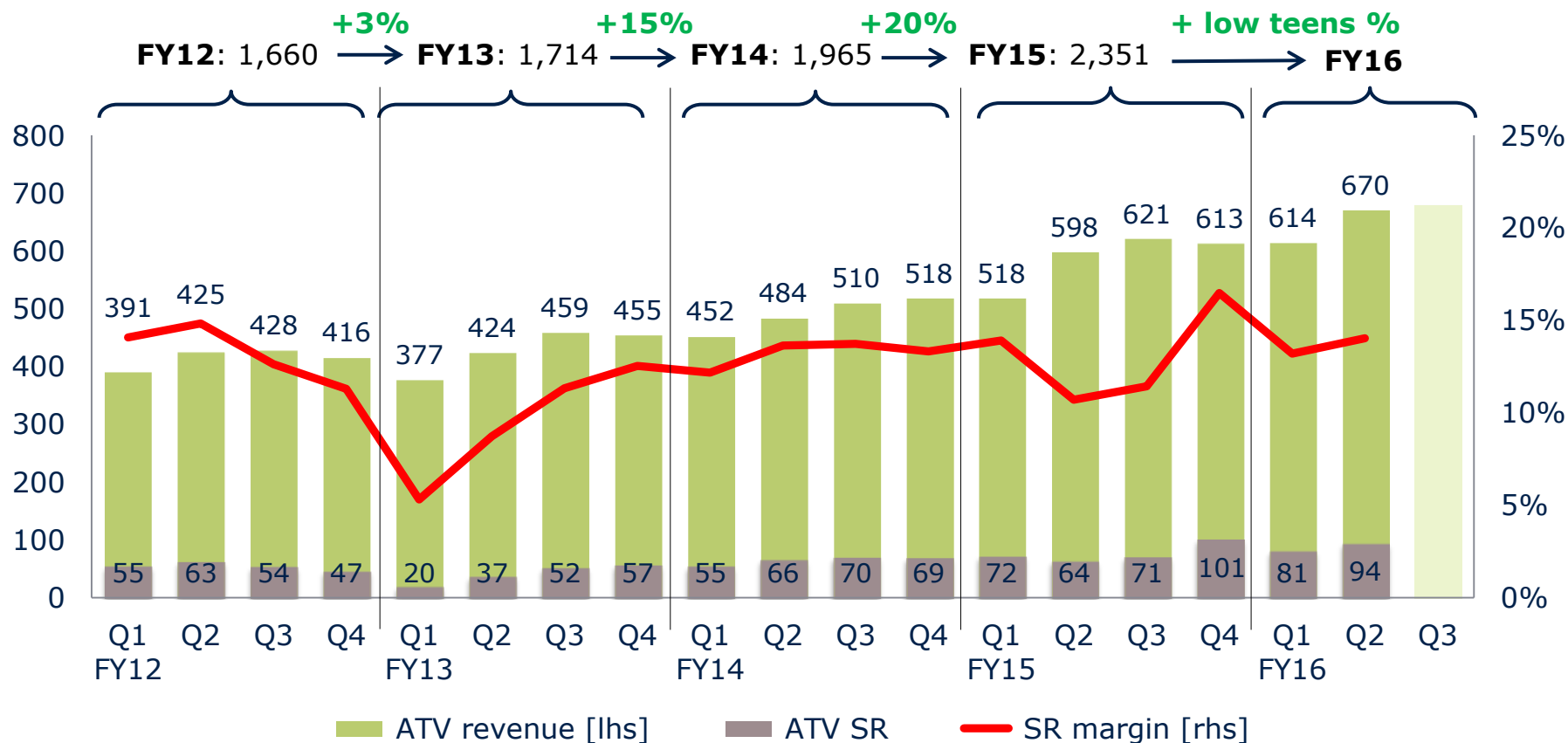
- › Premium cars are early adopters of high-end comfort and safety features
- › Trickle down to mid-range

~8% p.a. through-cycle growth

Infineon automotive financials at a glance

Revenue and segment result development

[EUR m]



Infineon as best positioned semi player to overall benefit from two biggest megatrends



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

Infineon ADAS

- #2** automotive semiconductor
- #1** power semiconductors
- #2** sensor semiconductors
- #3** microcontrollers
- #1** xEV semiconductors

Infineon ADAS



1. Infineon is the market leader for radar
2. Infineon develops camera solutions (e.g. driver monitoring, safety and security in front collision warning)
3. AURIX™ as ADAS market reference for safety and security applications (e.g. camera, sensor fusion)





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