



We are the link
between the real and
the digital world.

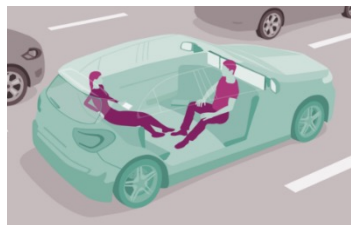
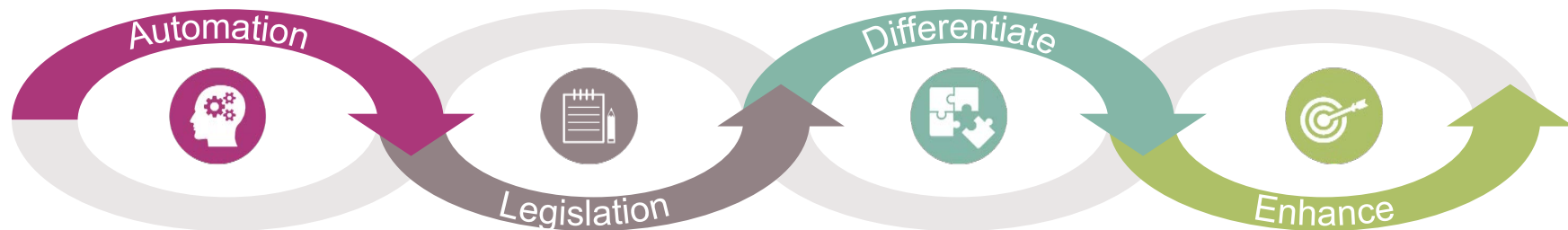
Radar & 3D Camera technologies for in-cabin sensing



Respiration rate and heart rate monitoring using Infineon's AURIX™ microcontroller & XENSIV™ radar MMIC



In-Cabin Sensing: Enhance occupant comfort and safety



New HMI

- › Gesture control

Enhanced Comfort

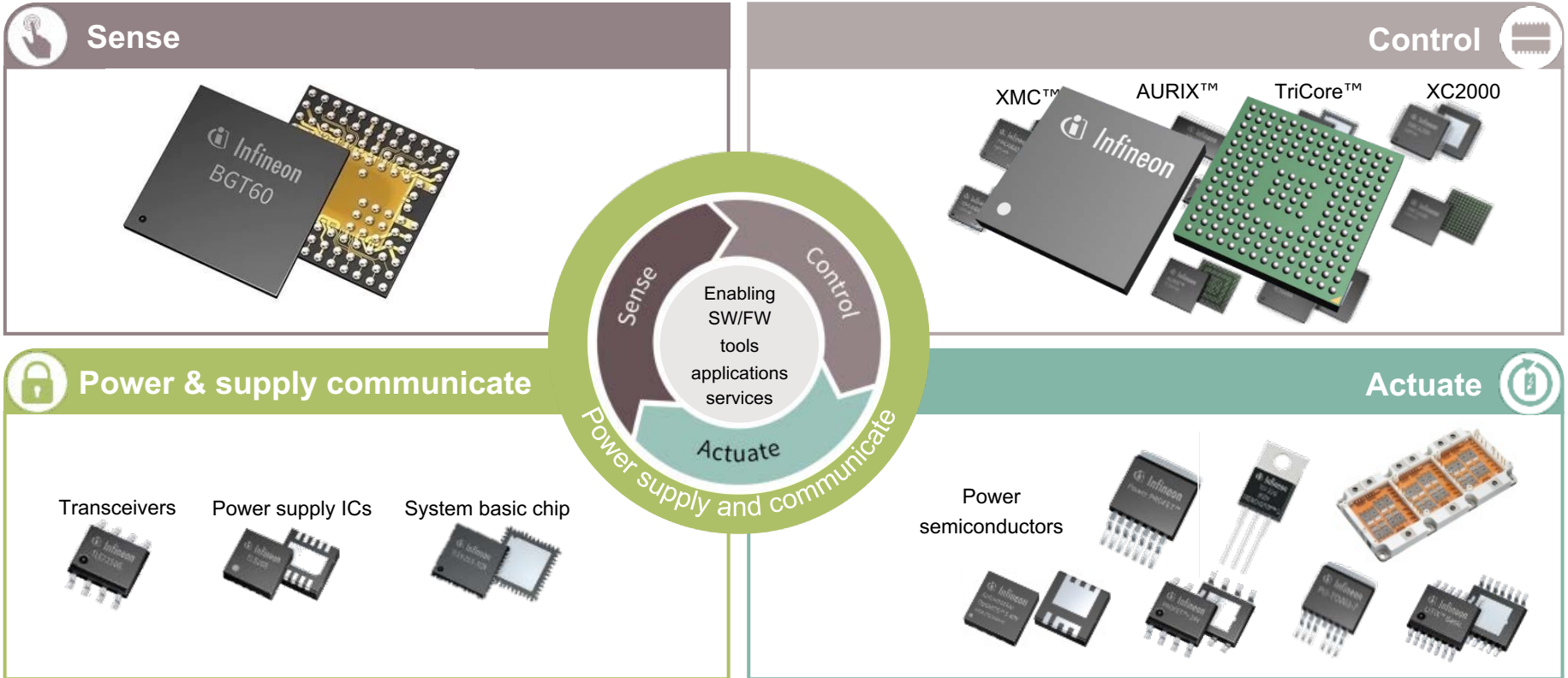
- › Gesture control 2.0: finger tracking + voice command
- › Driver & passenger tracking
- › Intentional interior lighting
- › Dual display: driver or passenger specific information

Increased Passive Safety

- › Driver availability for L2+, L3, L4
 - Hands on steering wheel
 - Driver out of position
- › Occupant detection and classification: removal of seat weight sensing mat
- › Smart Airbag: adapt pressure or switch-off depending on
 - Head position to airbag
 - Baby seat
 - Object on seat/ carried by passenger
- › Fasten seat belt detection
- › Child presence detection
- › Intrusion Detection
- › Personalization, Air Quality



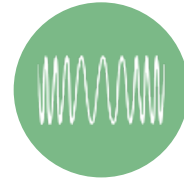
Infineon's offerings



60GHz Ultra-wideband Cognitive Radar: key features for occupancy sensing and gesture sensing applications



Designed for ultra-short range applications



Highly agile modulation generation



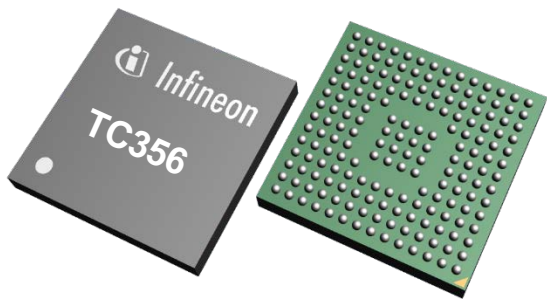
Ultra-low power transceiver with automatic power modes



Simple interface application processor

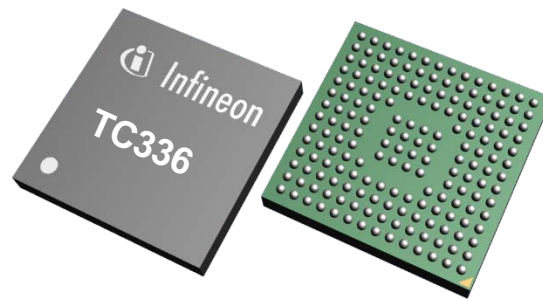
Scalable performance for cost optimized development

TC356



- › Suitable for advanced Radar processing
- › Increased performance and memory

TC336



- › Ideal for child presence detection
- › Lower cost variant

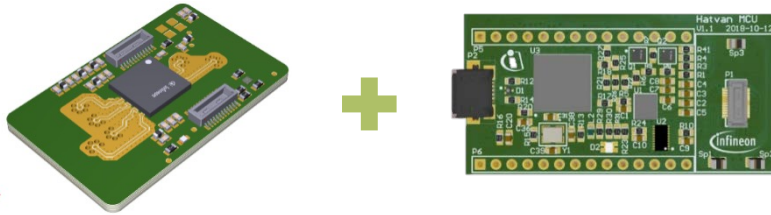
Low effort and investment to develop scalable solutions

- › Standard package across portfolio
- › Same safety architecture
- › EVITA Full security available across portfolio
- › Pin and software compatible

All devices qualified and ready for production by Q1 2021

Modular ecosystem for sensor evaluation and application development for Infineon's 60GHz offerings

BGT60ATR24C Evaluation Platform



Learn & evaluate radar sensor

**Available
Now**

Develop PC based MVP

BGT60ATR24C+AURIX™ Demo Platform



**Available
Q4/2020**

Develop with system solution

Embedded Processing

Graphical
User
Interface

Application
Notes

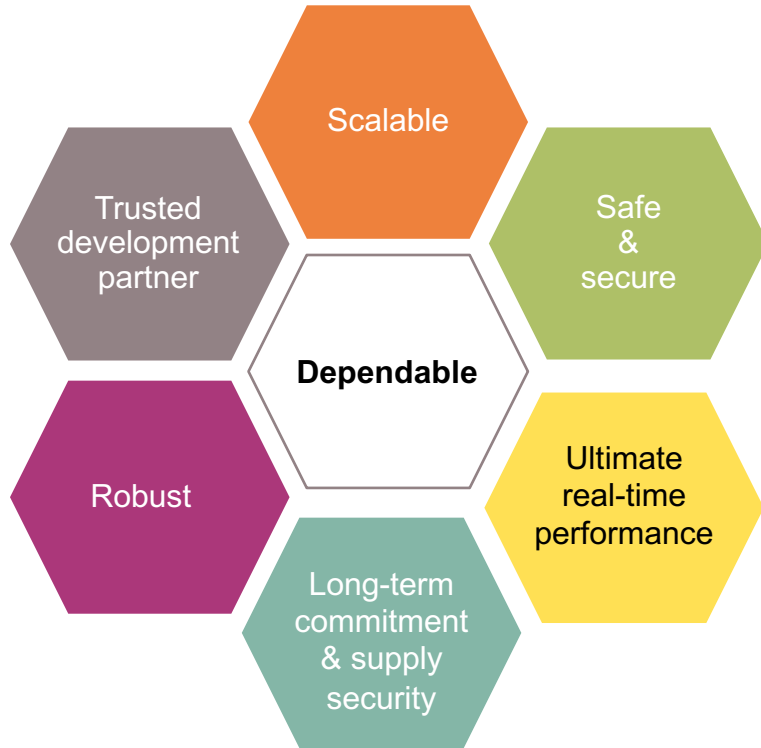
Communi-
cation
Library

Firmware

Pre-
processing
Software

Altium
Gerber
Schematics

ICMS with Infineon



Best in class AURIX™ family concept further improved and continued with the 3rd generation TC4xx family

Advanced 60 GHz MMIC with proven track record and solid roadmap

Dependability is **more than a set of technical features** and system properties

Robustness of an architecture has a strong **fundament in product and engineering quality**

Constant **innovation in safety and security technologies** is important for highly dependable MCU families

Technical and commercial scalability is a key advantage in dynamic markets



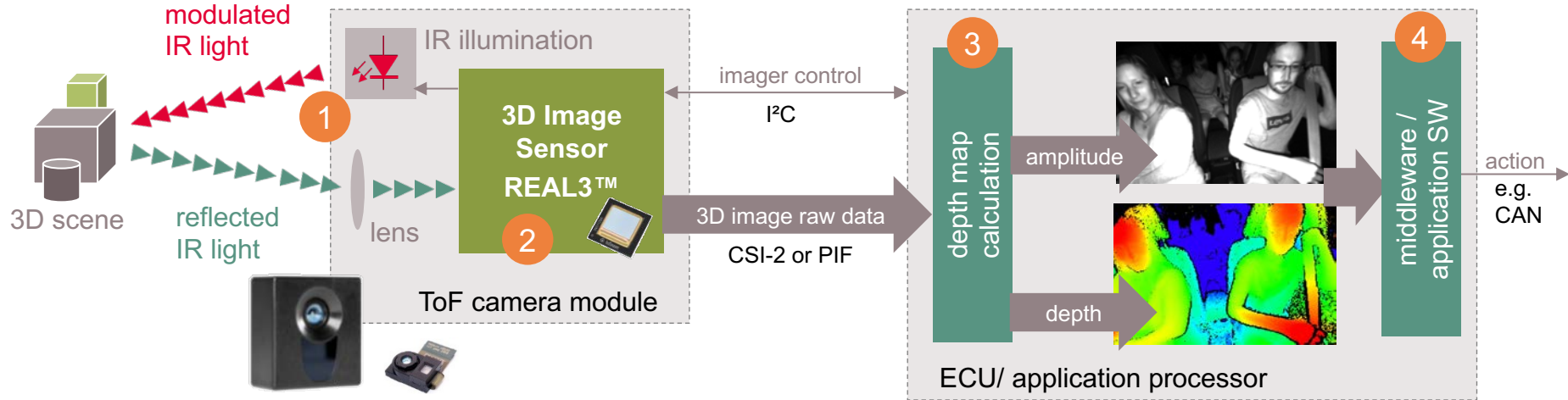
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In-Cabin Sensing based on Time-of-Flight (ToF)



Indirect Time-of-Flight (ToF) principle

Depth and amplitude is measured in every pixel



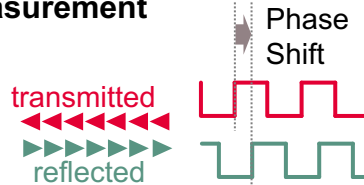
1

Active illumination

- › Modulated near infrared light
- › 850 or 940nm

2

Distance measurement in every pixel



3

Processing

- › Depth map calculation
- › Calibration data
- › Post processing



High quality depth map

4

Application algorithms

In-Cabin Sensing Use-Case Example

- › Reference Camera
"pico Monstar" used
 - 100k pxl resolution
 - FOV: 100° x 85°
- › Rearview mirror positioning
- › Sunny Day



Enhance Comfort & User Experience

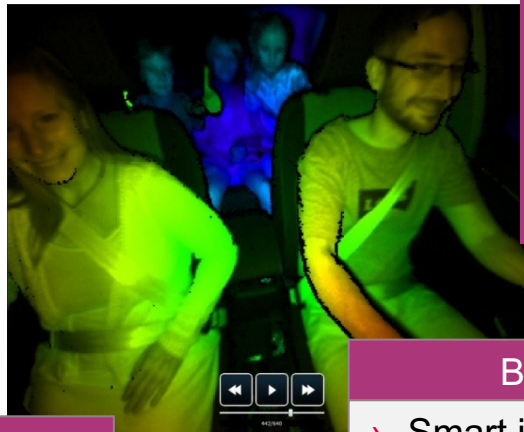
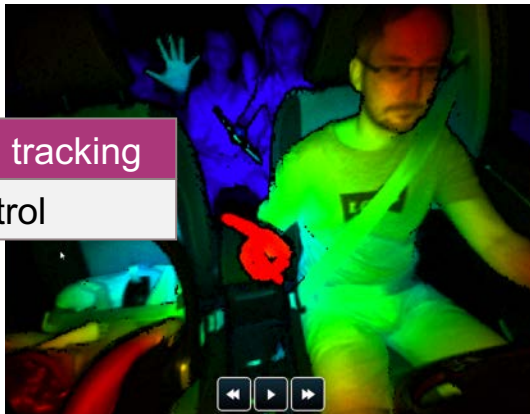
Head tracking

- › Optimized audio, HUD and 3D displays

▶ Enable new and less distractive HMI:
"the driver becomes a passenger"

Finger & hand tracking

- › Gesture control



Occupant detection & classification

- › Automatic preference settings
- › Distinguish between driver and passenger: optimize content of infotainment system

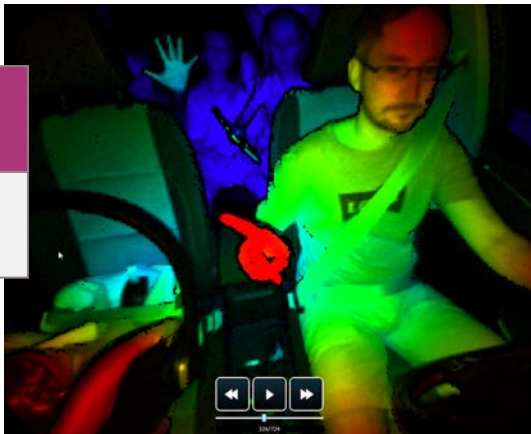
Body tracking

- › Smart interior lighting: illuminate only the scene or knobs the occupant is heading to

Increase Passenger Safety & Reduce System Cost

Seat occupancy detection

- › Smart Airbag: "switch-off"



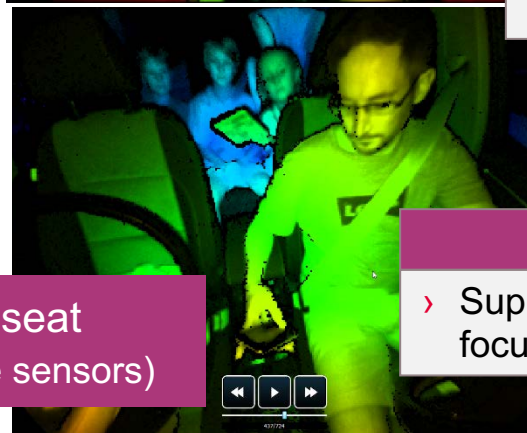
Imaging

- › Seat belt detection



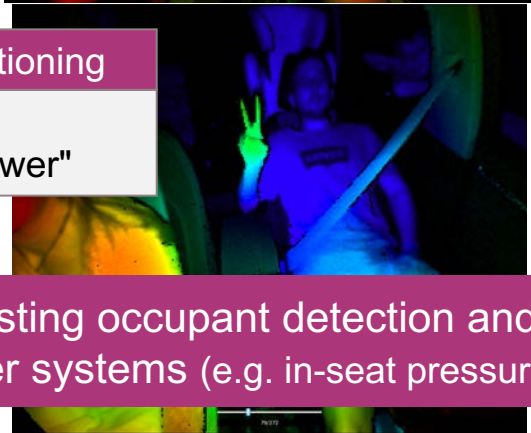
Hand tracking

- › Hands on steering wheel



Seat & head positioning

- › Smart Airbag: "adjust airbag power"

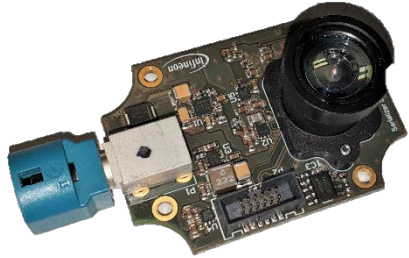


Driver distraction

- › Support DMS which only focus on drivers face

▶ Remove existing occupant detection and seat belt reminder systems (e.g. in-seat pressure sensors)

Next generation automotive ToF imager in development – Become nearly as small as for mobile phones!



[Generation 1]

IRS1125A

100k pixel (CIF)

1/2" (8mm) image circle

in mass production



[Next Generation]

IRS2877A

in development
SOP Q4 2022

* mobile phone reference
module example

- › Massive size reduction: 1/4" (4mm) image circle
- › Increased resolution: up to VGA
- › 5th generation of pixel technology
- › Reduced BoM: Higher level of integration & functionality
- › Future Proof: Functional Safety use-cases





Part of your life. Part of tomorrow.