Infineon, enabling MEMS mirror based Lidar
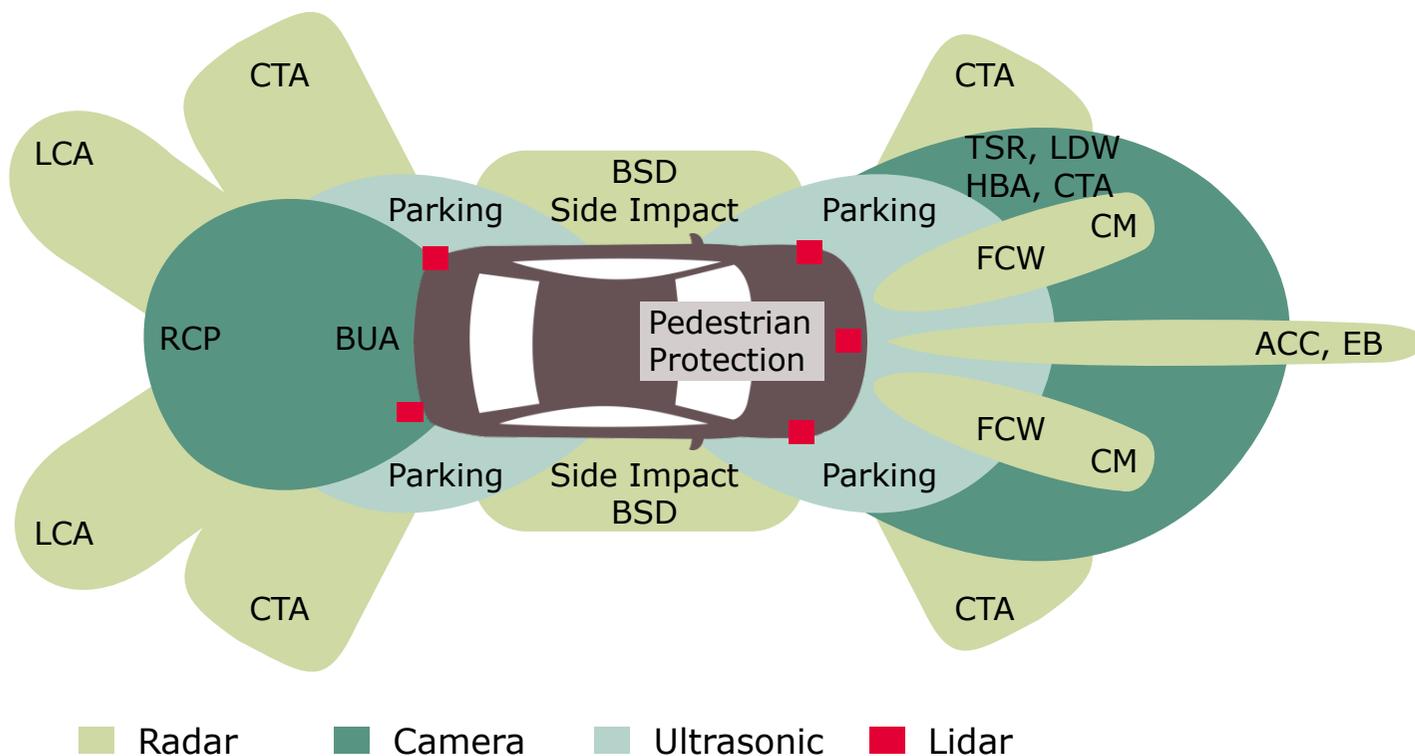
Erik Wilbrink

DVN - Synergies of Lidar and Automotive Lighting
20 November 2018

- restricted -

ADAS L3 and AD L4/L5 require 3 different sensor technologies

CTA

LCA

BSD
Side Impact

Parking

Parking

CTA

TSR, LDW
HBA, CTA

CM

FCW

RCP

BUA

Pedestrian
Protection

ACC, EB

LCA

Parking

Side Impact
BSD

Parking

FCW

CM

CTA

CTA

LIDAR increases
environmental
sensing reliability

Lidar

Radar

Camera

■ Radar ■ Camera ■ Ultrasonic ■ Lidar

Together with Camera and Radar, Lidar will be a key sensor.

The long range Lidar challenge towards AD……
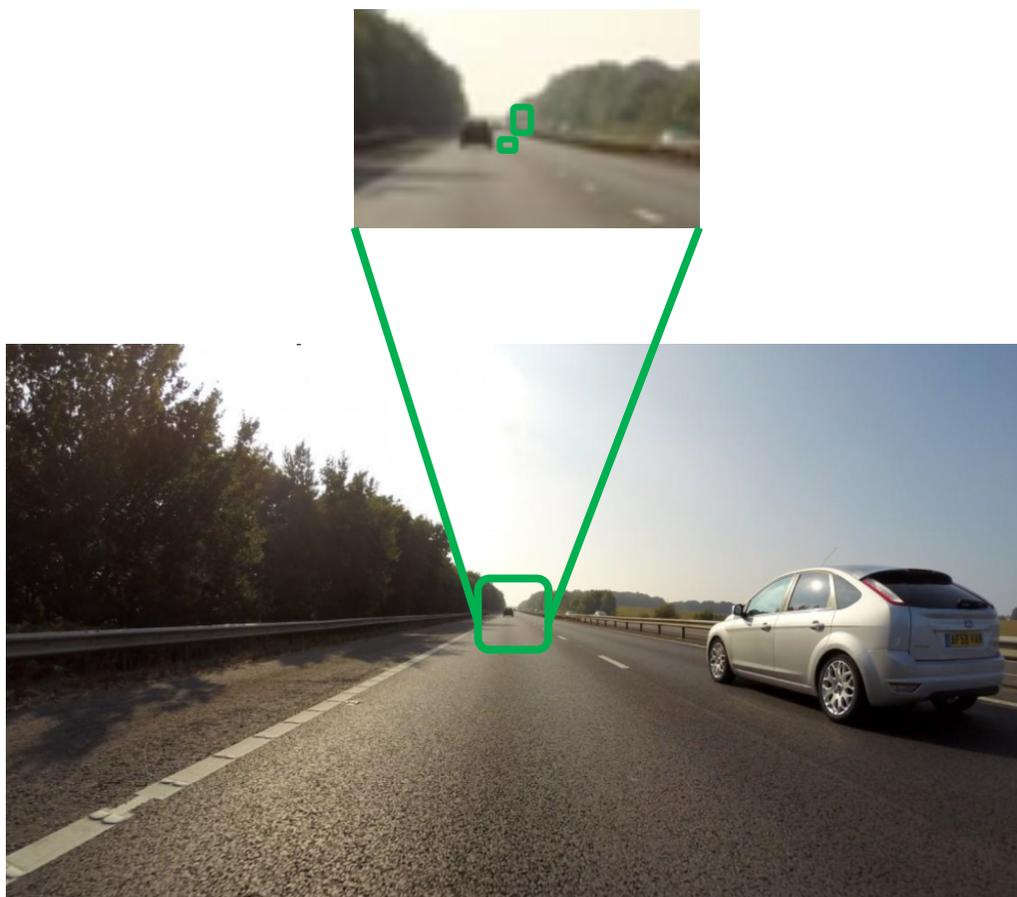
› Key use cases, detect:
  - small object @ ~100m
  - pedestrian @ ~200m with
  - reflectivity of 10-40% in a
  - HFOV of 120° (with different FOV/range zones) in
  - full sun light (100 KLux) and
 - high background illumination (albedo 50%)

and…
› automotive qualified
› small form factor
› seamless integration in the car
› competitive price

Meet all these Lidar requirements at the same time…

› Make sure to optimize the power on the object:

  – low divergence of the laser beam

  – within eye safety limits (905nm vs 1550nm; 1D vs 2D scanning)

› Capture meaningful data:

  – frame rate 25Hz (1D vs 2D scanning)

  – H and V resolution of <0.2°

› Repeat the measurements to enable robustness and long range:

  – high pointing stability of laser scanner (<0.01°)

  – 1D vs 2D scanning

› Make sure you have a sensitive detector:

  – amount of photons received scales by range[4] (detect @ 200m instead of @ 100m → 16x less photons)

  – reduce ambient noise from sunlight and background illumination

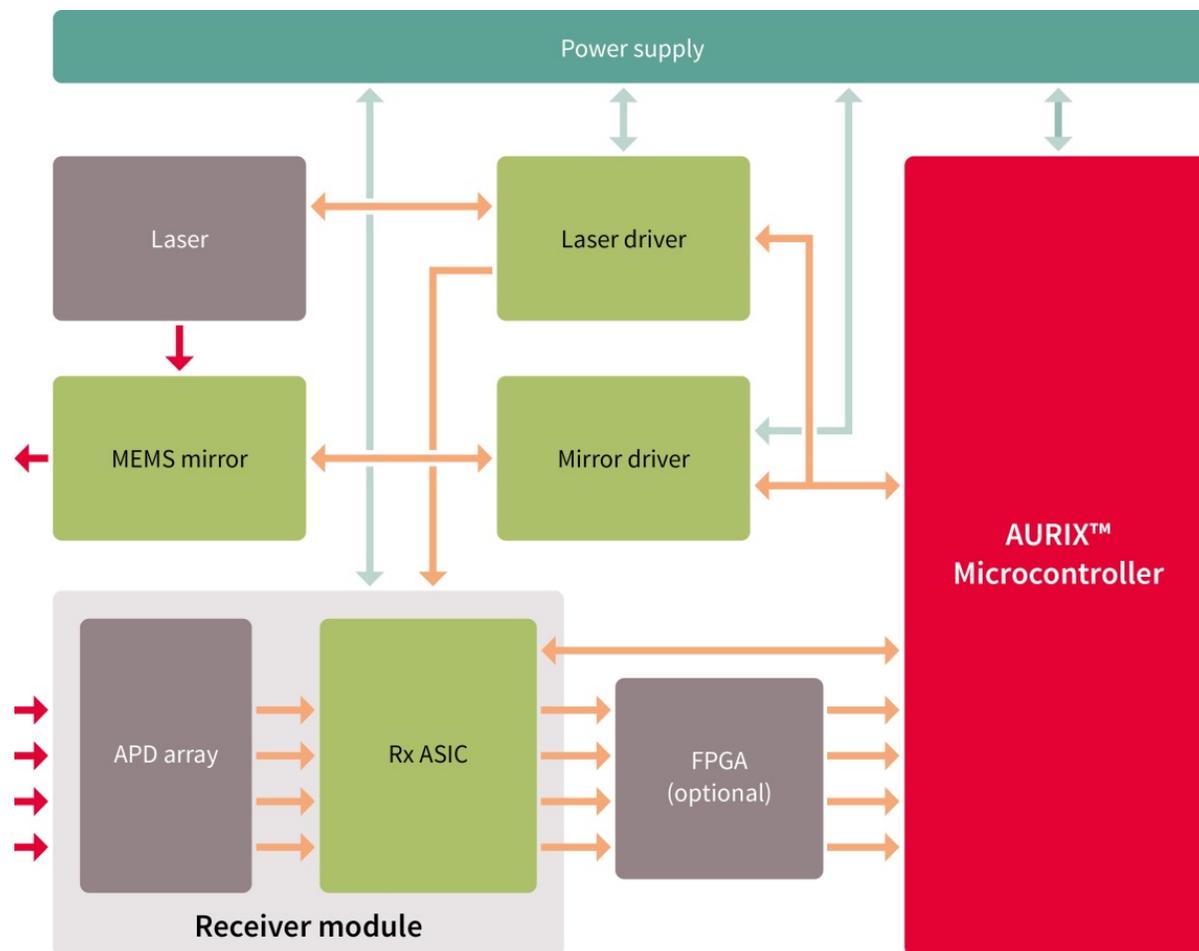# Infineon's 1D MEMS mirror scanning Lidar architecture
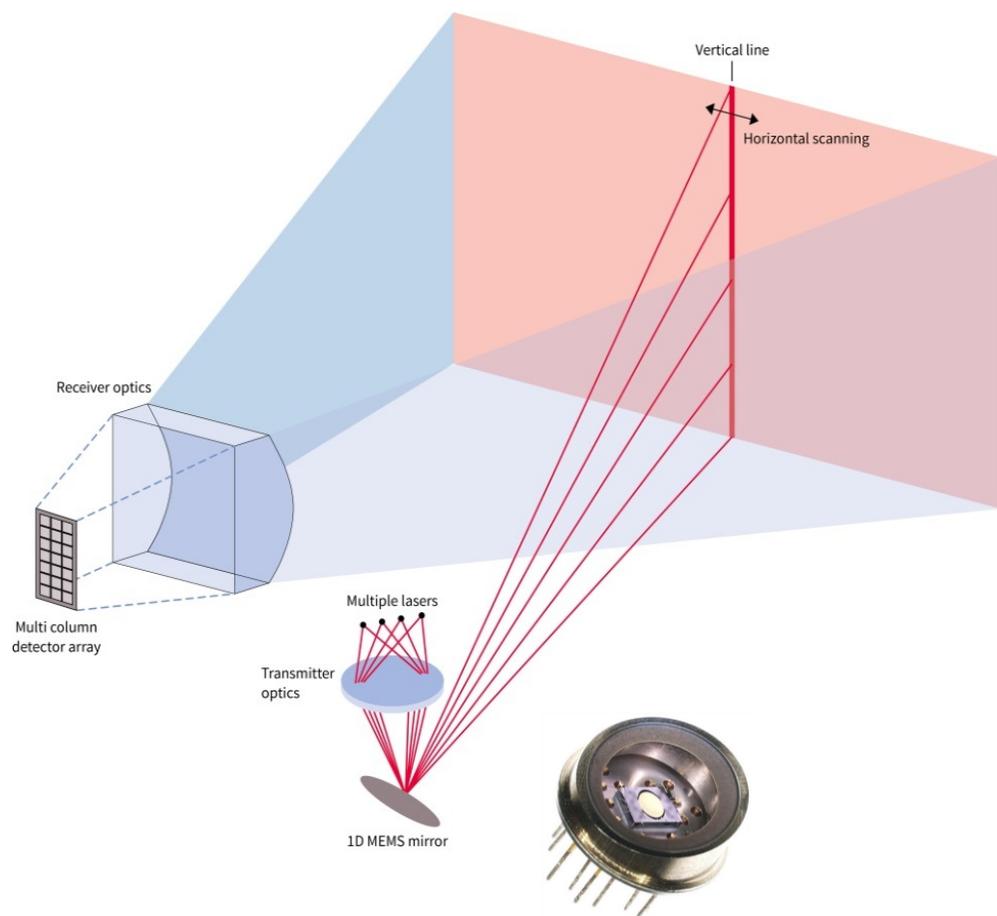
› Multiple lasers emit light toward the MEMS mirror to project a vertical line

› 1D MEMS mirror scans a vertical line horizontally
  - +/-15° mechanically
  - optical HFOV 60°
  - larger than 60° HFOV (for instance 120°) is possible with post scan optics

› MEMS mirror driver
  - controls the actuation of the mirror
  - monitors the status and angle of the mirror

› 2D static receiver looking at the complete FOV
  - activate columns to reduce ambient noise

› RX-chain detects reflected signal and has a modular architecture for maximum flexibility

Infineon's Lidar solution: block diagram and chip set

Infineon's chip set offering

› Enabling an automotive qualified, solid state, long range Lidar system
› Supporting SOP 2020+
› With a BOM <EUR 200

Infineon's Lidar demonstrator

Power supply

Laser

Laser driver

MEMS mirror

Mirror driver

APD array

Rx ASIC

FPGA (optional)

Receiver module

AURIX™ Microcontroller

Synergies of Lidar and automotive lighting

› Lighting is an enabler for AD:

  – signaling on the car

  – focusing of light

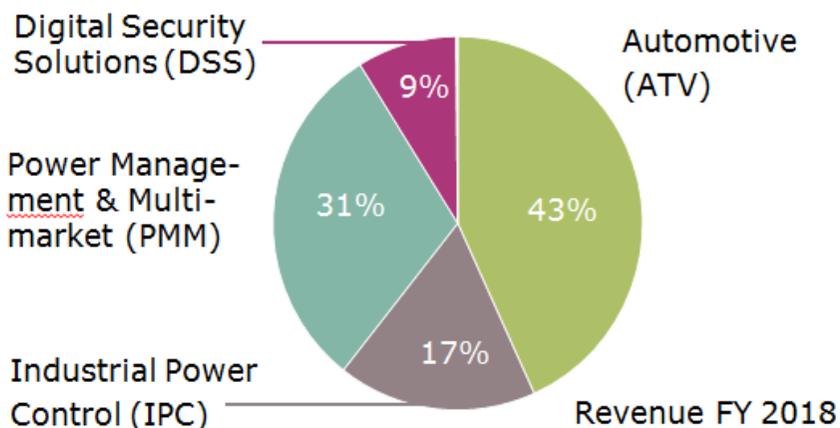 – projection on the road

Lidar

head light

cleaning

› Sensors can enhance lighting performance

› Lighting systems enable physical integration of sensors

  – Seamless integration as part of vehicle design

  – Sensor cleaning (optics) by lighting cleaning systems

  – Area which is treated with more caution by users
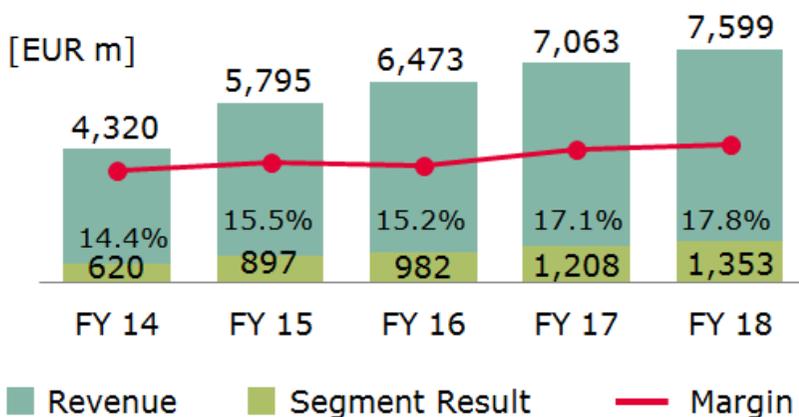
Infineon at a glance

Business Segments

Digital Security Solutions (DSS): 9%
Power Management & Multi-market (PMM): 31%
Industrial Power Control (IPC): 17%
Automotive (ATV): 43%

Revenue FY 2018

Employees

41,100 employees worldwide (as of Sept. 2018)

Americas 3,900 employees
Europe 17,400 employees
Asia/Pacific 18,800 employees

35 R&D locations
17 manufacturing locations

Financials

[EUR m]

	FY 14	FY 15	FY 16	FY 17	FY 18
Revenue	4,320	5,795	6,473	7,063	7,599
Margin	14.4%	15.5%	15.2%	17.1%	17.8%
Segment Result	620	897	982	1,208	1,353

■ Revenue　■ Segment Result　— Margin

Market Position

Automotive	Power	Security ICs
# 2	# 1	# 1
Strategy Analytics, April 2018	IHS Markit, Technology Group, September 2018	ABI Research October 2018

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infineon