

AUTONOMOUS DRIVING PACKAGING

ECTC, LAS VEGAS, NV
29 MAY 2019

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NXP FELLOW, PACKAGE INNOVATION



Business Opportunity: Automotive Global Megatrends



Autonomy

+ \$150 Level 2
+ \$600 Level 3
+ \$1200 Levels 4&5



Electrification

+ \$400 Hybrid
+ \$450 Full Electric



Connectivity

+ \$100 Premium Experience

Safe and Secure Mobility – More than tripling semi value per car
From \$380 in 2018

1. Source: Strategy Analytics, NXP
2. Semi content based on 2020 price levels

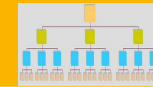
Innovation is Everywhere!

Sense



- Camera: Deep learning, multi-focal, high-definition mapping
- Radar: 24-81GHz, MIMO, Metalmaterials
- LiDAR: Mechanical, InGaAs, MEMS, solid state

Architecture



- Module redundancy
- Centralized processing
- Security

Think



- Artificial intelligence
- Reinforcement learning
- Behavioral / imitation cloning

Connectivity



- Power and data distribution
- Telematics / OTA
- Middleware and operating systems

Act



- Vehicle control
- Propulsion domain
- Chassis management (steering, suspension, braking)

Business Model



- Partnership / joint venture
- Mergers and acquisitions
- New entrants / start-ups as catalysts

Electrification



- Range
- Battery development and longevity
- Charging infrastructure

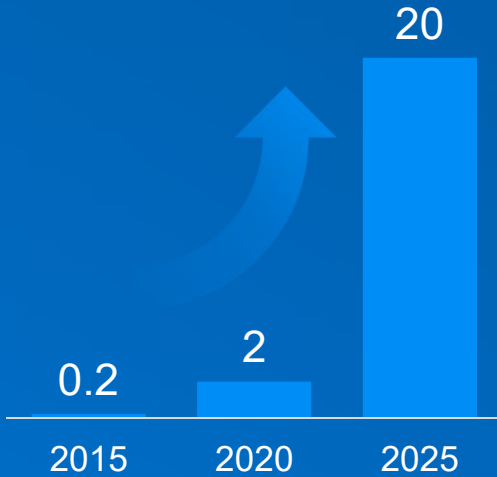
Mobility Experience



- "Passenger aware"
- RoboTaxi
- Autonomous vehicle subscription

Megatrends Drive Exponential Performance Requirement

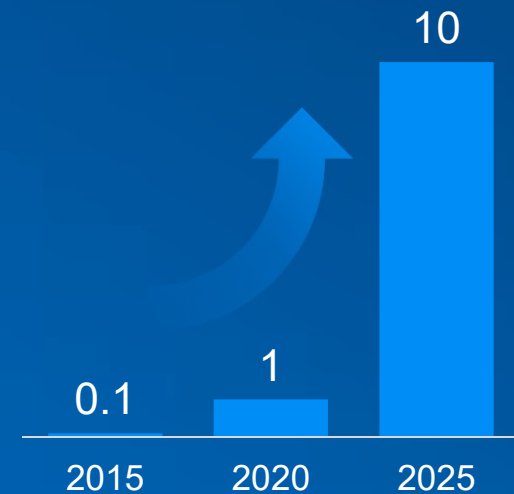
Data Generation
(TeraByte per hour)



Compute Performance
(TFLOPS)



Network Bandwidth
(GigaBit per Second)



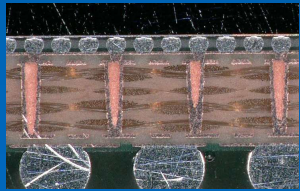
- Dramatically more sensors
- Higher precision

- ADAS & autonomy
- e-Cockpit

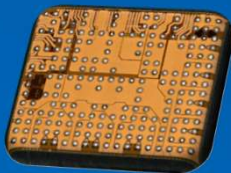
- Loads of data (on & off board)
- Real-time distributed applications

Advanced Packaging Fueling Autonomous Driving

Increased Functionalities



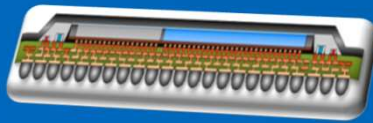
FCBGA



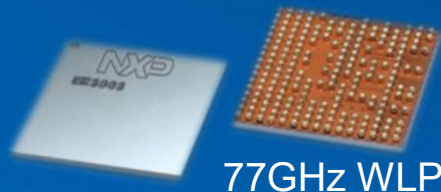
WLP



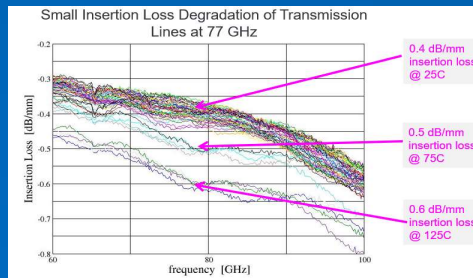
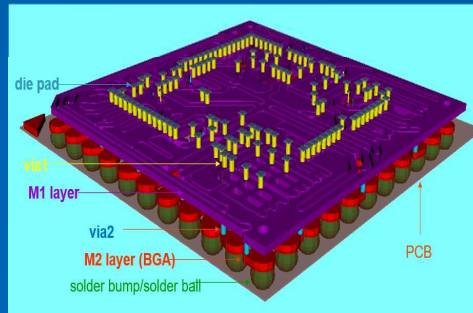
2D, 2.5D and 3D heterogeneous integration



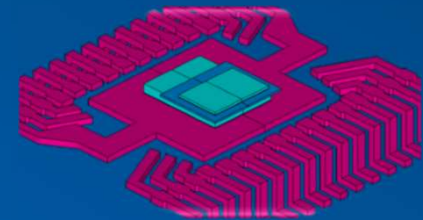
Higher Frequencies



77GHz WLP



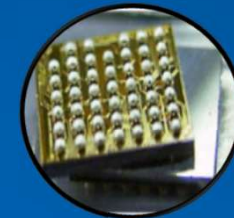
Higher Power



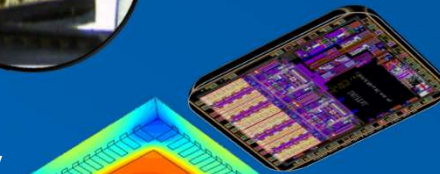
Innovative Stress Isolation



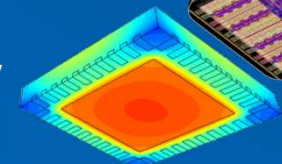
Advanced Analog



High Power WLCSP



Increased current density and power





SECURE CONNECTIONS
FOR A SMARTER WORLD