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# SAMSUNG SYSTEM LSI



Investor Presentation

2020

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**SAMSUNG STRATEGY**

**KEY TAKEAWAYS**

# Financial Highlights

## At the Heart of Mobile Innovation



1/3

Global Smartphones  
Powered by  
ISOCELL Image Sensors

\* TSR, Dec. '19



5G

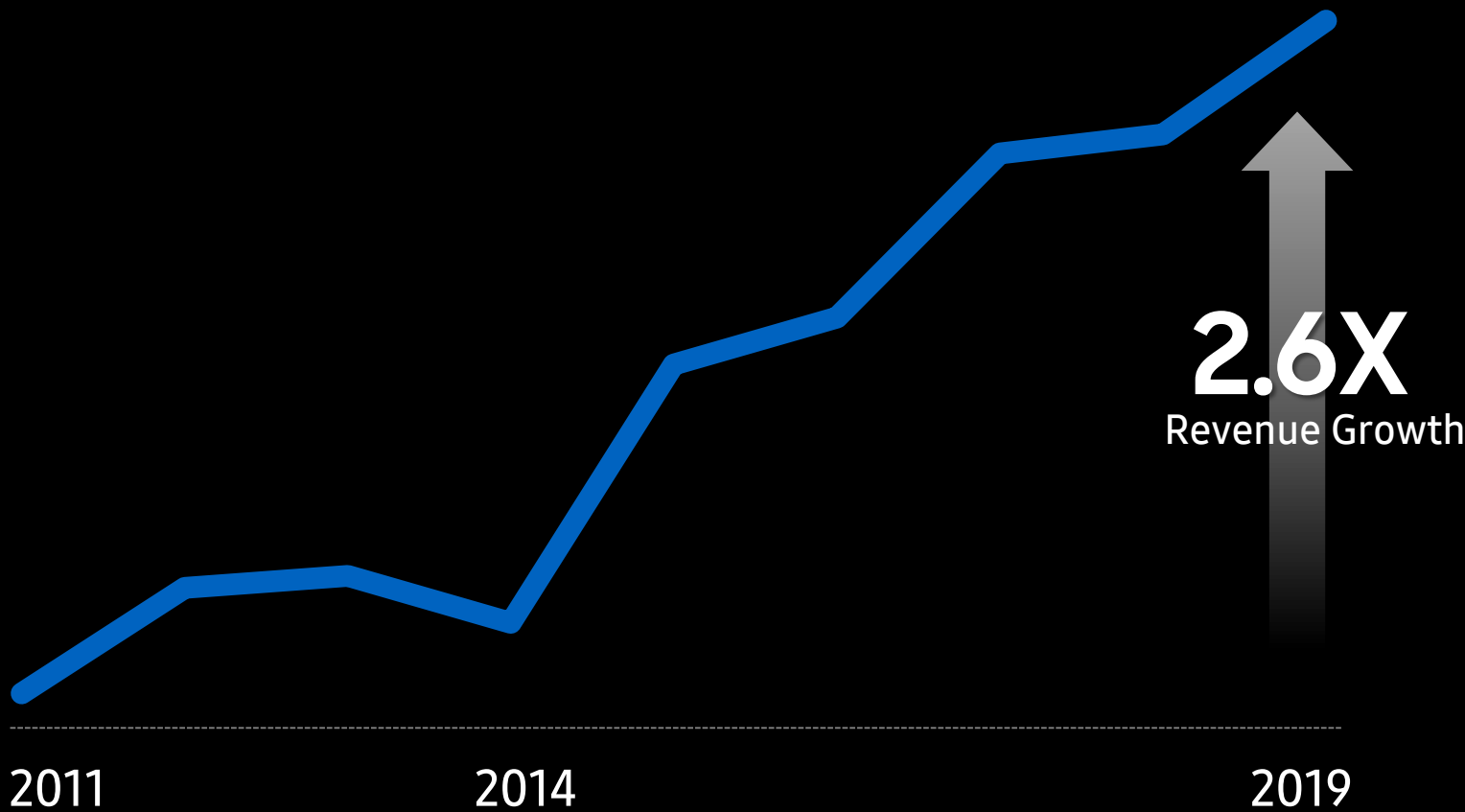
Leading Provider  
of 5G Modem  
& 5G Mobile SOC



1/2

60% of Global Mobile Displays  
Featured with  
System LSI's OLED Driver ICs

\* IHS, 2019

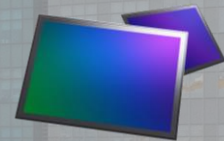




# Business Portfolio



Exynos Processor  
Modem/RF/Connectivity



ISOCELL  
Image Sensor



Mobile DDI  
Touch Controller



NFC/eSE  
Fingerprint Sensor



SIM/eSIM  
Banking/ID



Power  
Management IC

Mobile Devices



Automotive



IT / Consumer Devices





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# Technologies for the Next Decade

5G Network

On-device Intelligence

Mobile Camera

Smart Mobility

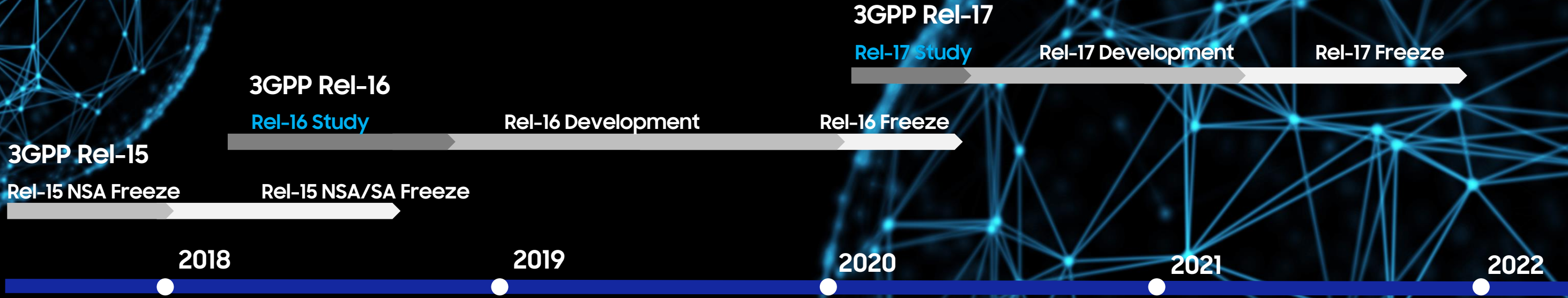
toward

# Intelligent Connectivity



# 5G Network

## 5G for Everyone



### 5G Phase 1

- Commercial service rollout
- Non standalone network
- Combination of 4G LTE and 5G NR

### 5G Phase 2

- Mass Market 5G devices with various 5G chipsets
- Standalone network deployment
- Global adoption of mmWave
- NR-V2X, Industrial IoT

# Intelligence on the Devices

## Smarter Future Powered by AI

Artificial Intelligence (AI) is playing an increasingly prominent role in our day to day lives and it promises to transform the technological landscape. Complex algorithms and processes, such as machine learning and deep learning, are driving the transformation, boosting the need for more powerful on-device AI solutions.



Personalization



Privacy / Security



Rapid Response



Availability

---

Personal Assistant



Next-level Photography



ADAS / AD



Real-time Translation





# Mobile Camera

## Ultra-high Resolution

64 and 108Mp mobile image sensors

## Small and Slim

Packs in ultrafine ~0.7um sized pixels

## Intelligent Camera

Scene-Adaptive HDR Processing,  
Face Detection/Recognition, Fast AF

# Mobile Camera Technical Trend

## Multiple Cameras

More front and rear facing cameras

## DSLR-like Performance

High light sensitivity, super zoom, slow-mo

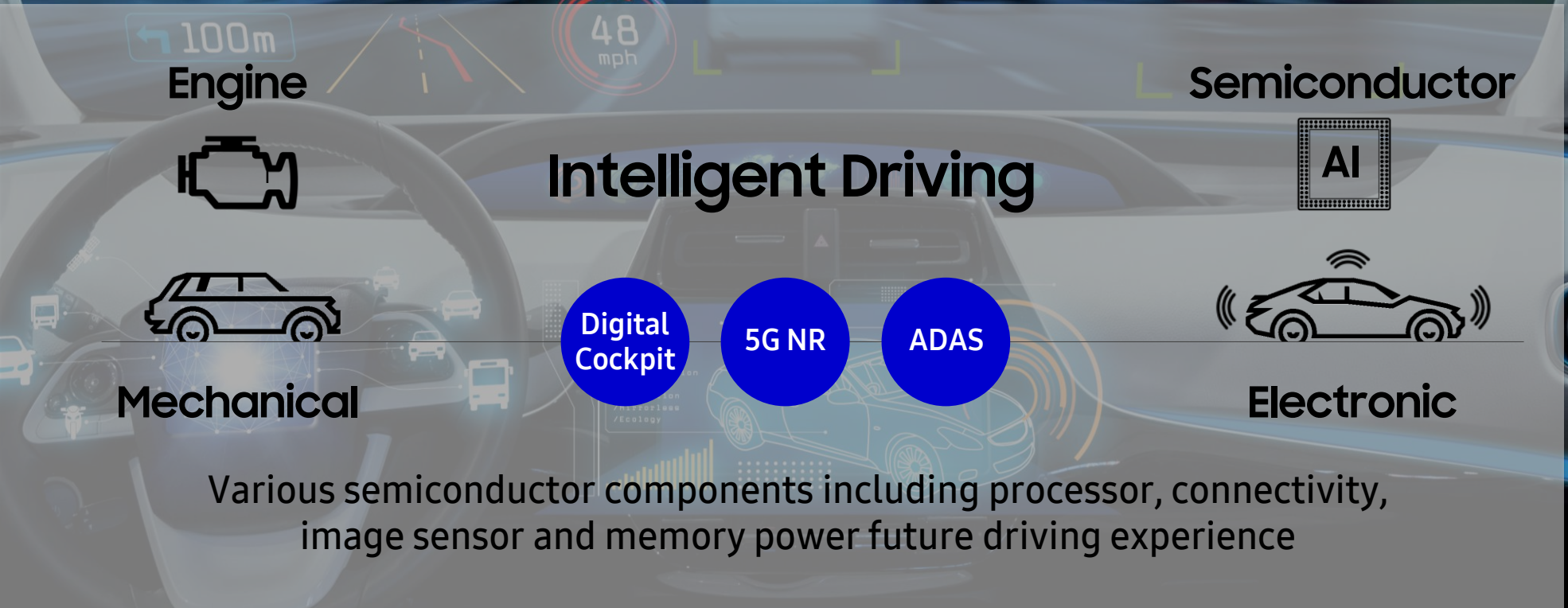
## 3D Depth Sensing

DVS, ToF for Game/VR/AR



# Smart Mobility with IC Technology

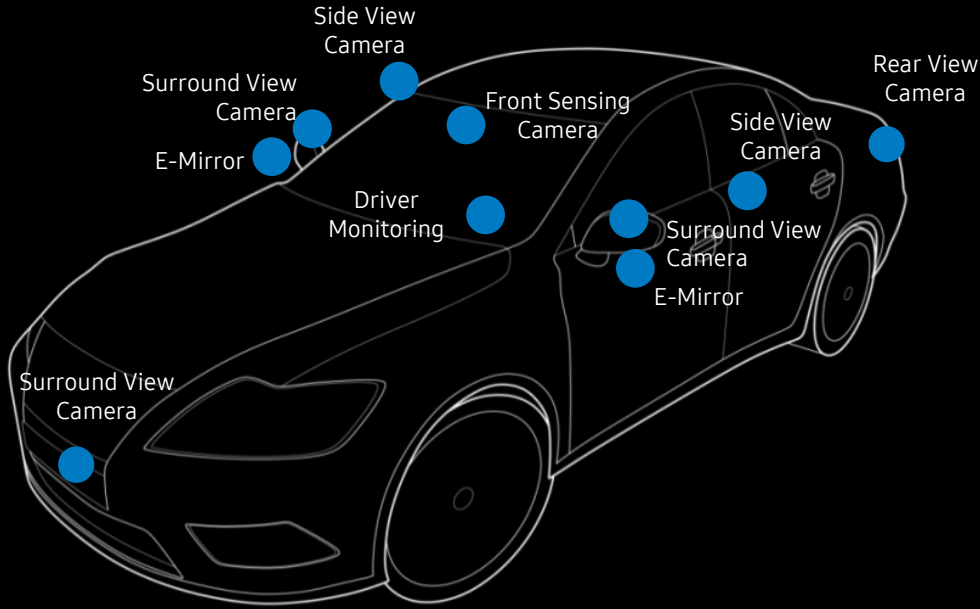
## Innovation in Automotive Industry



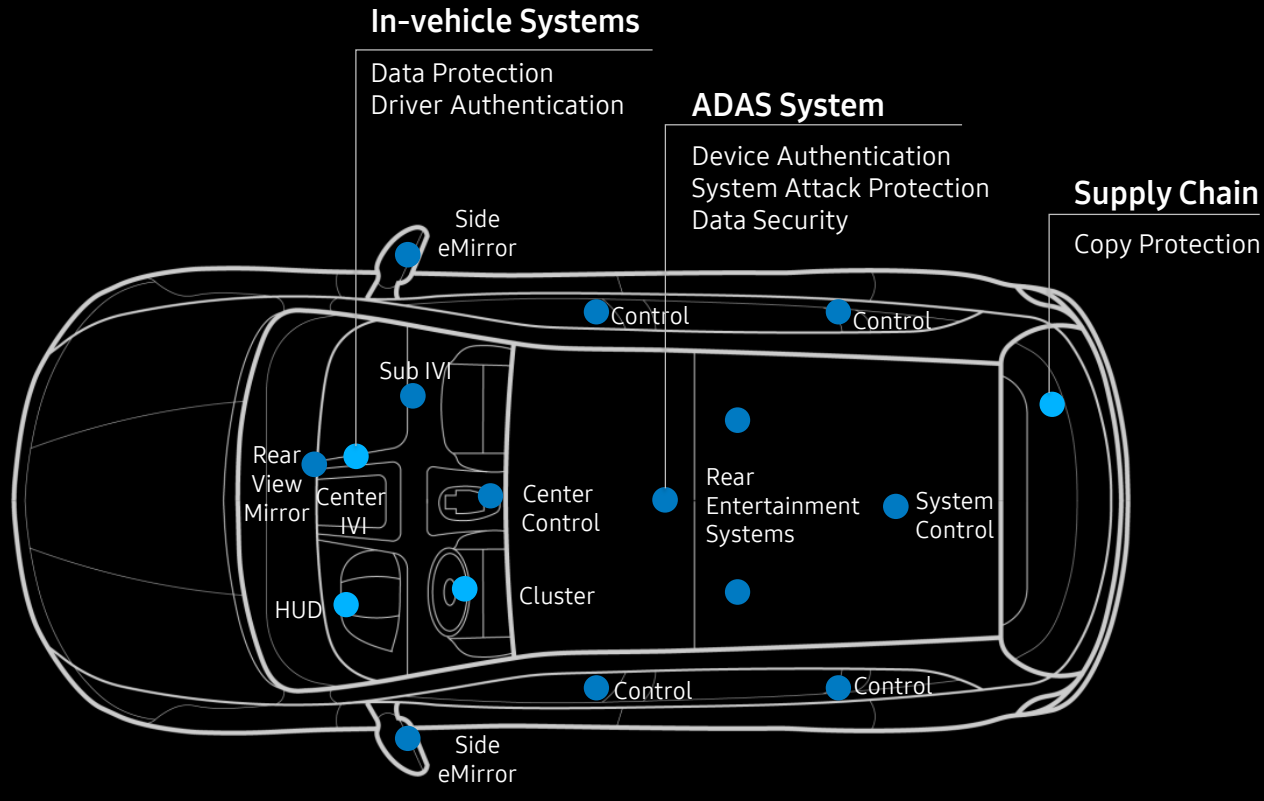


# Enriched Systems in Future Mobility

## Cameras, Displays and Security Systems for the Future Mobility



Cameras for ADAS/Autonomous Driving



Displays and Security Systems for Driving, System Control and In-vehicle Entertainment

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# Strategy for the Growth

## Innovation to Bring Ideas to Life

### Total Solution

Integrated, extended portfolio  
Hardware & software capability

### Technical Leadership

Leading technologies for 5G/AI/Sensor  
Technology on leading-edge process

### Market Shaper

Close collaboration with ecosystem partners  
Pioneering future market



# Solutions for Mobile Devices

## Advanced IC Portfolio for Mobile Innovation



**ISOCELL Image Sensor**

Super resolution, sub-micron sensors for front / rear cameras  
Motion & depth sensor



**Exynos Processor**

Mobile processors  
LTE/5G modems & RF ICs  
Connectivity  
Supply modulator



**Power Management IC**

PMIC for mobile processor,  
UFS memory, OLED display,  
Wireless charger, USB Type-C PDIC



**NFC / Secure Element**

Mobile payment  
Data security solution



**Touch Controller**

Low power, high sensitive



**OLED Display Driver IC**

Bezel-less full screen



**Fingerprint Sensor**

Fingerprint sensor on display



**Reference Designs**

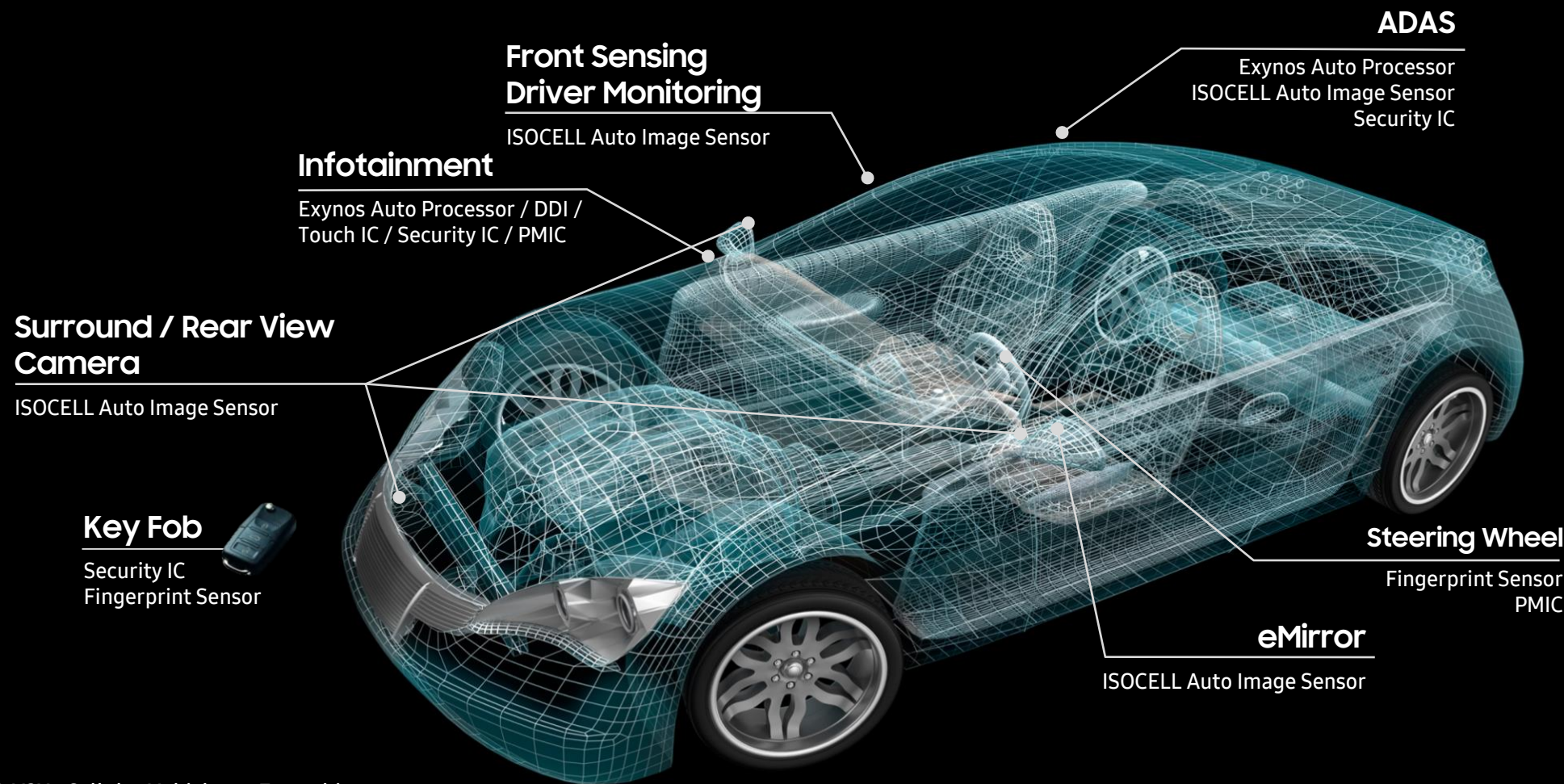
Optimized platform design





# Solutions for Mobility

## Transforming the Driving Experience with IC Technologies



**Exynos Auto**  
Processors and modem solution for infotainment, telematics and ADAS system

**ISOCELL Auto**  
High sensitive, high resolution image sensors with embedded security

**Security**  
Safe and highly reliable security solutions to protect personal data and privacy

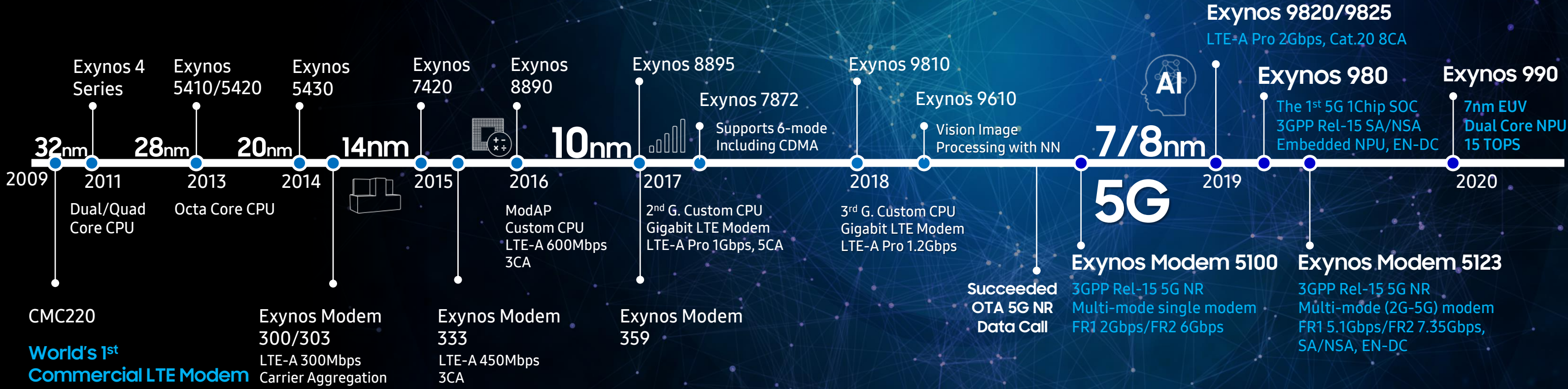
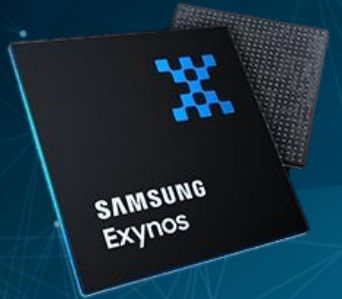
**Display**  
Display driver ICs, Touch Controllers for integrated cockpit system

\* C-V2X : Cellular Vehicle-to-Everything



# Exynos Processor

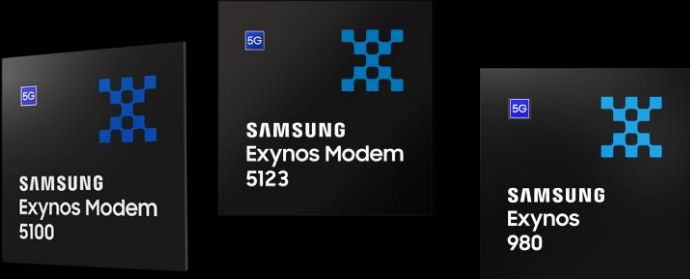
## Path of the Innovation





# Exynos 5G Processor

## Unlocking the future of 5G with Exynos



**Hyper-fast**  
Up to 7.35Gbps\*  
\* Based on FR2 (mmWave)



**Compliant with**  
3GPP 5G NR Rel-15



**Global spectrum**  
covers FR1 & FR2



**Ready for 5G Phase 2**  
supporting NSA & SA



**Technologies for speed**  
256 QAM, 4x4 MIMO, EN-DC



**Full 5G chipset**  
Modem, RF IC, ET, PMIC



# Making 5G into a Reality

## 5G Smartphones powered by Exynos

5G Commercial Service Launch



Dec. 2018

5G Mobile Hot Spot  
Smartphone Prototype

The 1<sup>st</sup> 5G Smartphone



Feb. 2019

Galaxy S10 5G



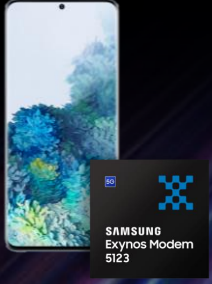
Aug. 2019

Galaxy Note10+



Dec. 2019

Vivo X30/Pro



Feb. 2020

Galaxy S20

# 5G





# Exynos for Device Intelligence

## An Intelligent Powerhouse

Powerful hardware architecture

Integrated hardware & software design

Efficient deep learning algorithms

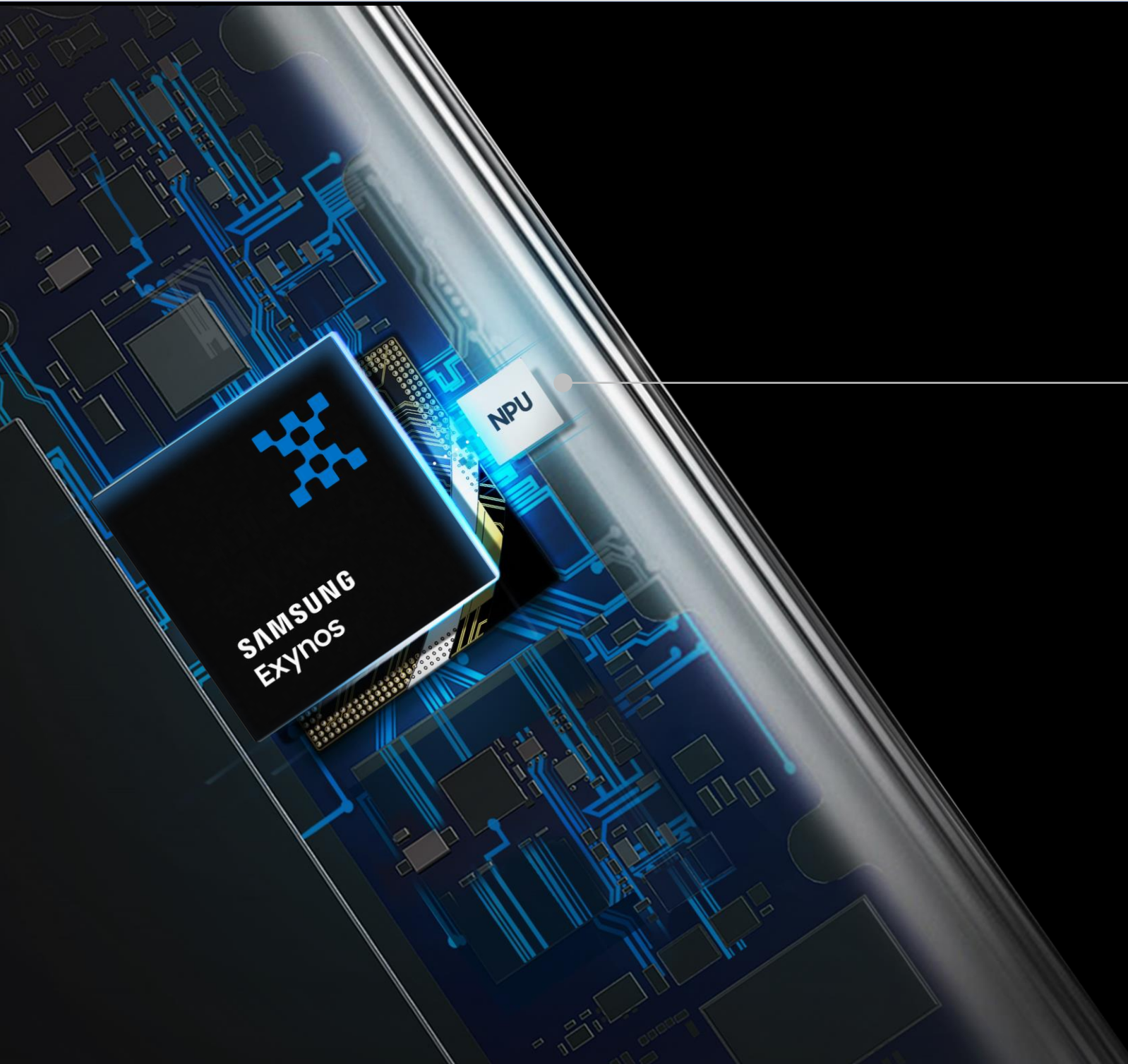
Neural Processing SDK

Deep learning frameworks

TensorFlow | Caffe | Caffe2 | PyTorch | Android NN API | ONNX

Software architecture & tools

Compiler | Conversion tools | Pre-trained models | Library



# Exynos Auto for Mobility



## Driving the Future of Mobility

**In-vehicle Infotainment**  
**Exynos Auto V**

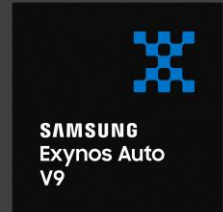
Powerful Processor  
for Intelligent Multi-screen  
Infotainment Platform

**ADAS System**  
**Exynos Auto A**

Intelligent Processor  
for ADAS System

**Telematics**  
**Exynos Auto T**

LTE & 5G Modems  
for Telematics System  
Low Latency, C-V2X



### Exynos Auto V9

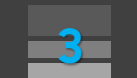
A Processor to Power the Next Generation  
In-vehicle Infotainment System



Supports 6 Displays &  
12 Cameras in 1 Chip



Embedded  
NPU



Tri-cluster  
GPU



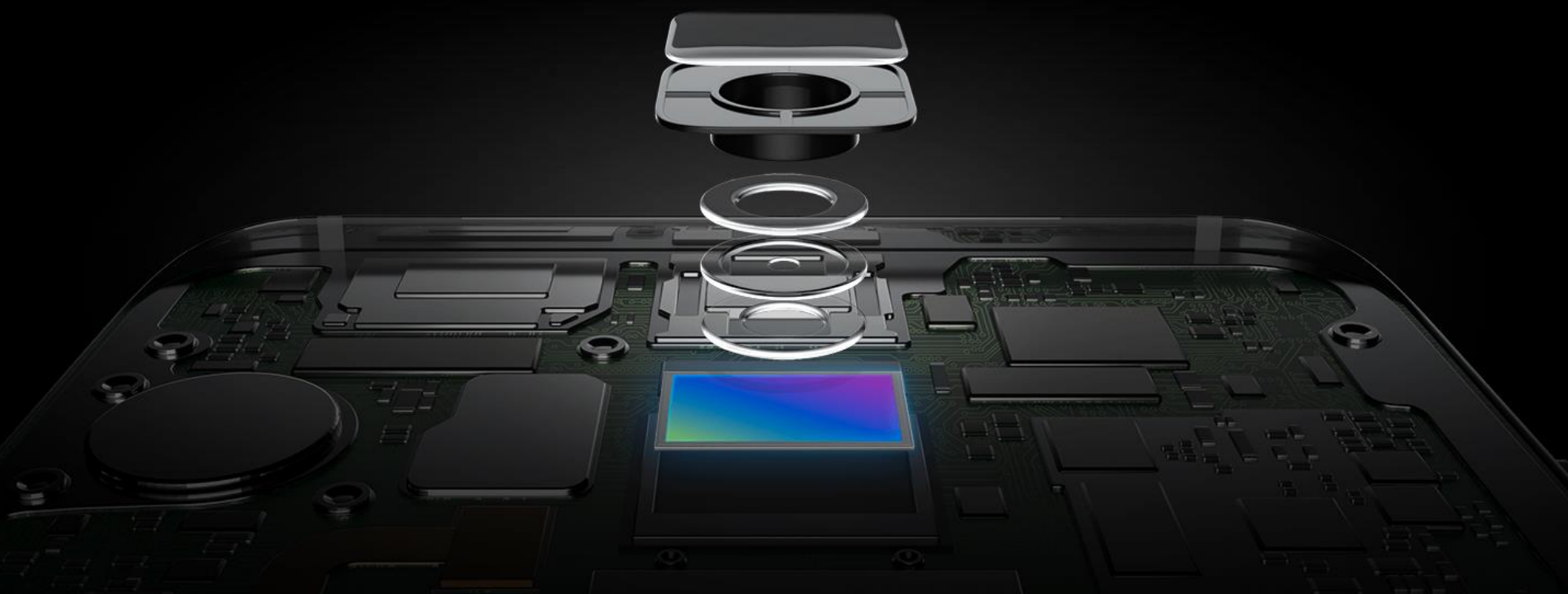
Safety  
System



# ISOCELL Image Sensor

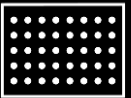
## SAMSUNG ISOCELL

Image sensors to redefine mobile photography



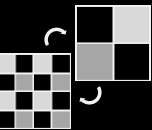
### ISOCELL Plus

Upgraded Pixel Isolation Technology  
Better Low Light Sensitivity, Higher Color Fidelity  
Fit for Realizing High-resolution with Sub-micron Pixel



### Super Resolution Sub-micron Pixel

0.7um & 0.8um Fine Pixels  
to Integrate up to 108 Megapixel



### Hybrid Pixel Algorithm

Tetracell / Nonacell Technology  
Hybrid pixel algorithms to enable  
clear and bright photos at any time



### Smart ISO

Intelligent ISO level selections  
depending on light environment

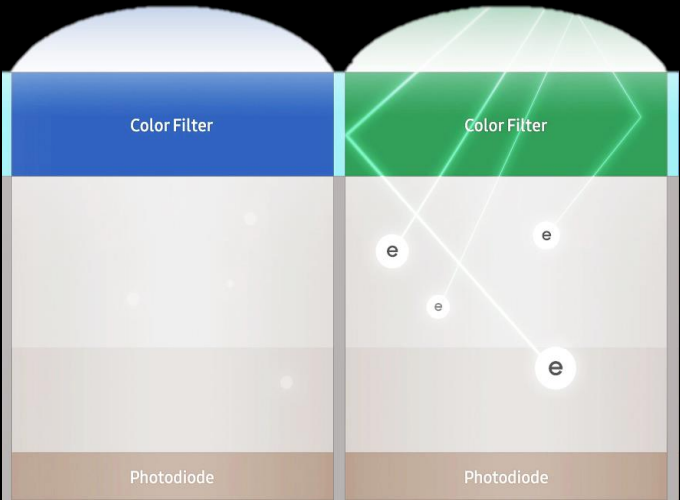
# ISOCELL Plus Pixel Technology

## Remarkable color accuracy and balance

An advanced pixel isolation technology that minimizes optical loss and cross-talk by placing a barrier around each pixel



ISOCELL Plus





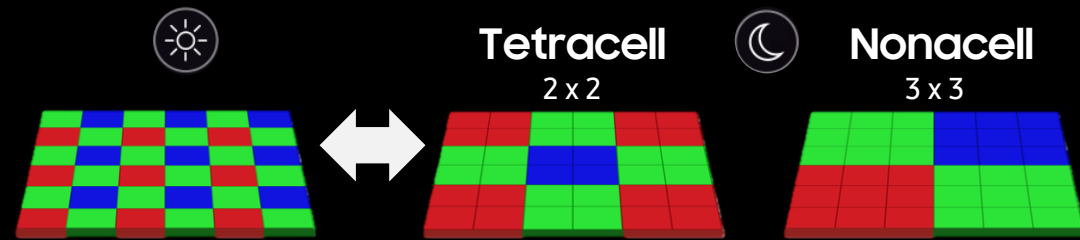
# Advanced Image Sensor Technologies

## Super Resolution, Sub-micron Pixel

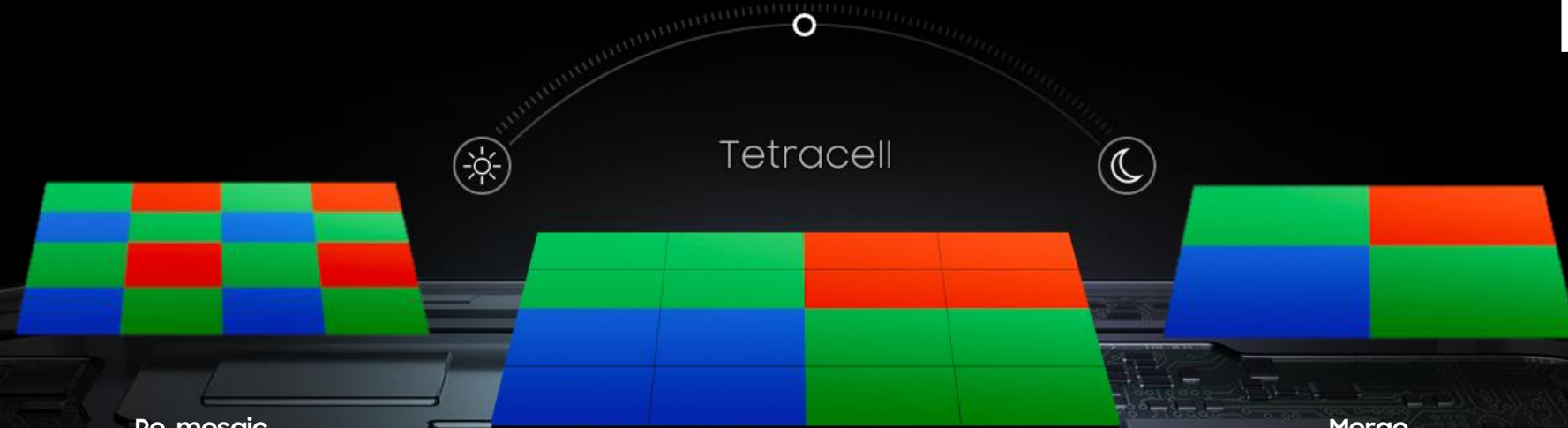
Super resolution in a tiny sensor enabled by ISOCELL Plus pixel technology



# Advanced Image Sensor Technologies



Small pixels for detail  
big pixels for brightness



Tetracell and Nonacell technologies  
Hybrid pixel merging and remosaic solutions  
that enable bright photos in low-light  
and detailed photos in day light

Re-mosaic  
Algorithm

More Details with  
Super Resolution

Merge  
Four Neighboring Pixels

Brighter Images with  
Big-pixel like Performance

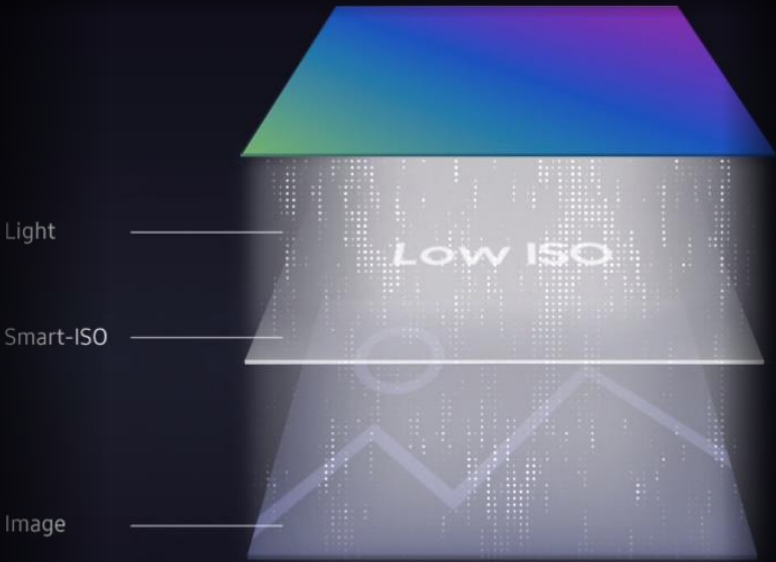


# Advanced Image Sensor Technologies

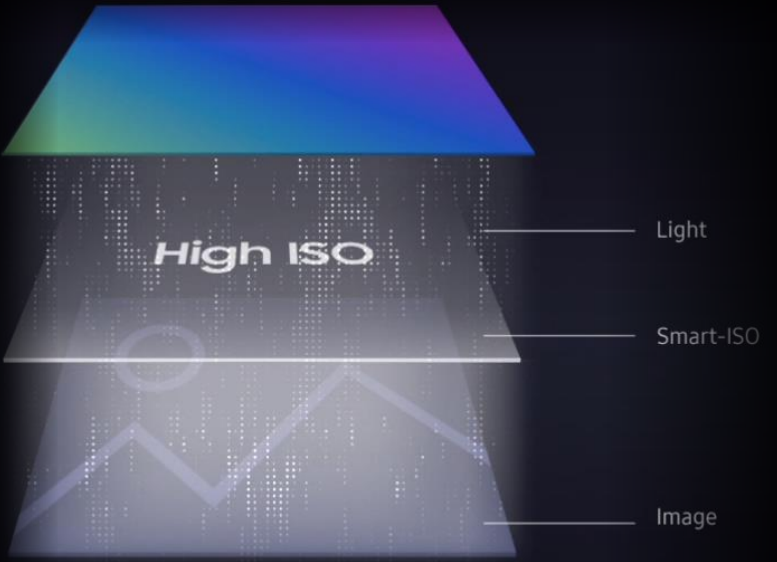
## Smart-ISO

Intelligent ISO caters to variable environments

Low ISO  
in bright environments

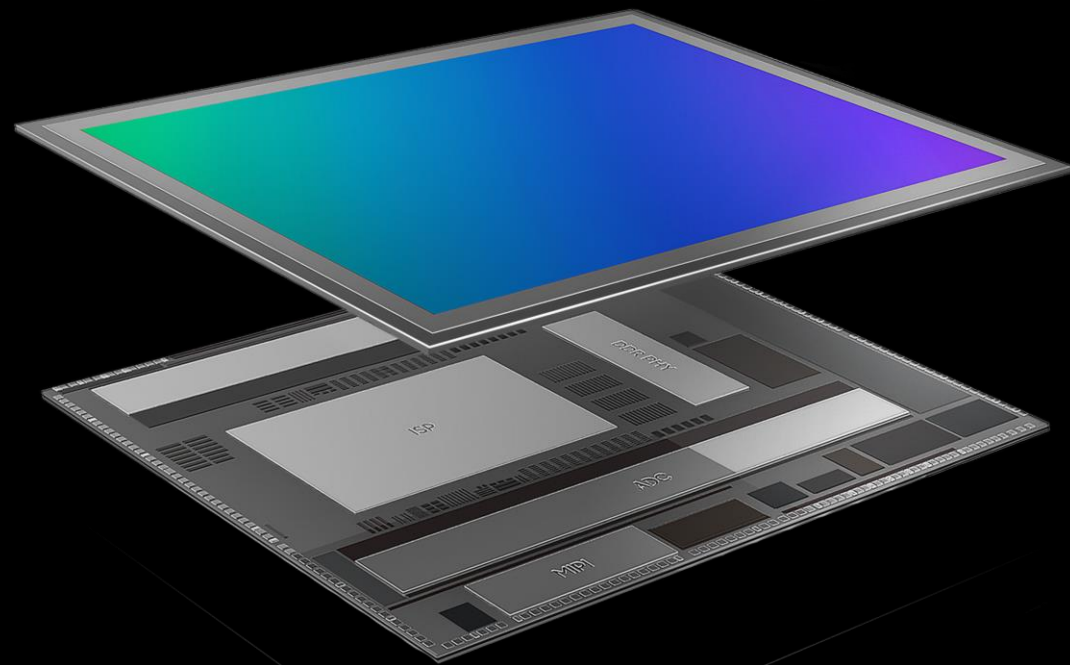


High ISO  
for low-lit settings



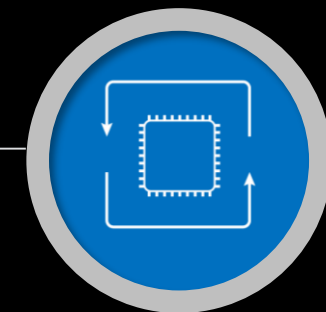
# Process & Service Competency

## Stunning Mobile Images with ISOCELL



### Advanced Node

28nm based Image Sensors



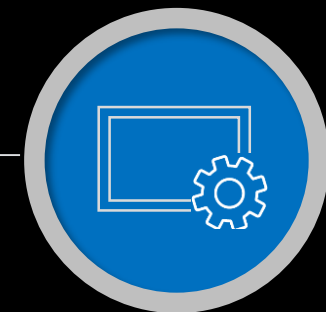
### Unique Pixel Technology

Various Pixel Technologies and Algorithm for Superior Image Quality with Small Pixel



### Design Service

Hardware and Software Integrated Solution  
Custom Sensor Design



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# KEY TAKEAWAYS





- ✓ Samsung has maintained the position as a key supplier of mobile processors, image sensors and display driver ICs.
- ✓ Innovations in semiconductor technologies will be the key driver in various new applications that adopts AI/Deep Learning, 5G NR network, and smart mobility.
- ✓ Samsung's System LSI business provides integrated total solutions for mobile, and is now on the path to be a key player in the field of 5G, autonomous mobility, and device intelligence.



Samsung's System LSI Business  
**Possibilities Beyond Components**

Meet Samsung System LSI

-  [www.samsung.com/semiconductor](http://www.samsung.com/semiconductor)  
[www.samsung.com/Exynos](http://www.samsung.com/Exynos)  
[www.samsung.com/ISOCELL](http://www.samsung.com/ISOCELL)
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-  WeChat – Exynos, ISOCELL

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