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# SAMSUNG SYSTEM LSI



Investor Presentation

2019

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BUSINESS UPDATE

MARKET OPPORTUNITIES

SAMSUNG STRATEGY

KEY TAKEAWAYS

# Financial Highlights

## At the Heart of Mobile Innovation

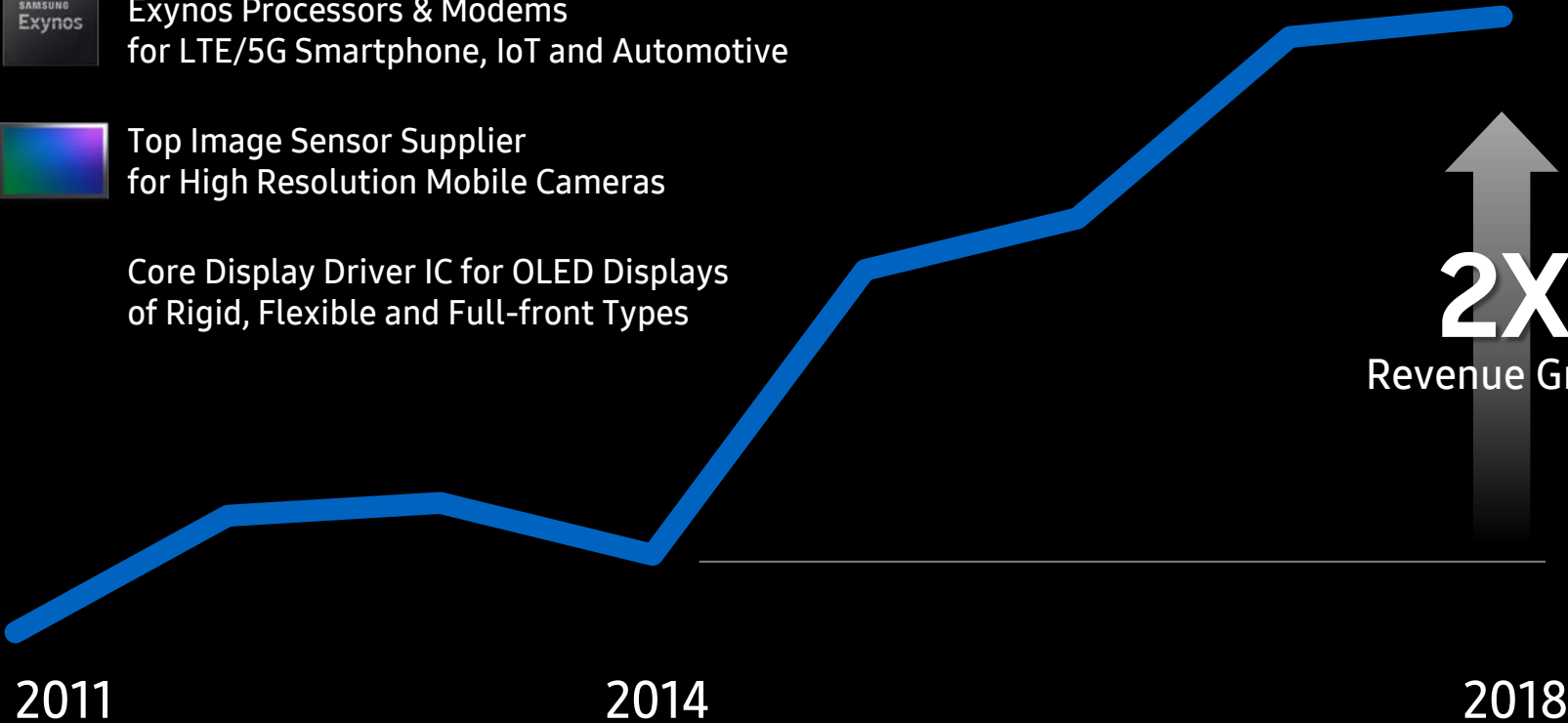


Exynos Processors & Modems  
for LTE/5G Smartphone, IoT and Automotive



Top Image Sensor Supplier  
for High Resolution Mobile Cameras

Core Display Driver IC for OLED Displays  
of Rigid, Flexible and Full-front Types

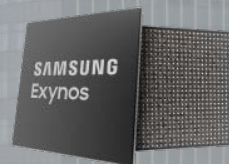


**1/3** Global Smartphones  
Featured by ISOCELL Image Sensors

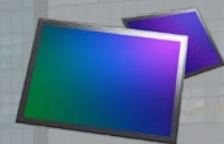
**1/2** Chinese Smartphones  
Featured by ISOCELL Image Sensors

**1/2** Global Mobile Displays  
Featured by System LSI's OLED Driver ICs

# Business Portfolio



Exynos Processor  
Modem/RF/Connectivity



ISOCELL  
CMOS Image Sensor



Mobile DDI  
Touch Controller



NFC/eSE  
Fingerprint Sensor



SIM/eSIM  
Banking/ID



Power  
Management IC

## Communication Devices



## Internet of Things



## Automotive



## Consumer Devices



# Making 5G a Reality



Dec. 2018

5G Commercial Service Launch  
with 5G Mobile Hot Spot  
and Smartphone Prototype



Feb. 2019

Galaxy S10 5G  
5G Smartphone Released

# 5G



SAMSUNG

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# Technologies for the Next



## AI / Deep Learning

Machine Intelligence  
on Various Devices

## 5G Network

High Speed, Low Latency,  
Massive Number of Connections

## Smart Mobility

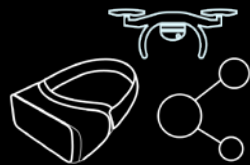
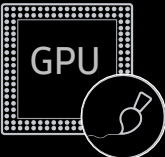
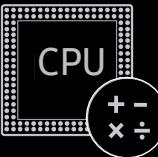
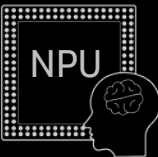
ADAS Driving Assisted  
Cars, Drones and more



# Intelligence on the Devices

## AI/Deep Learning through the Industries

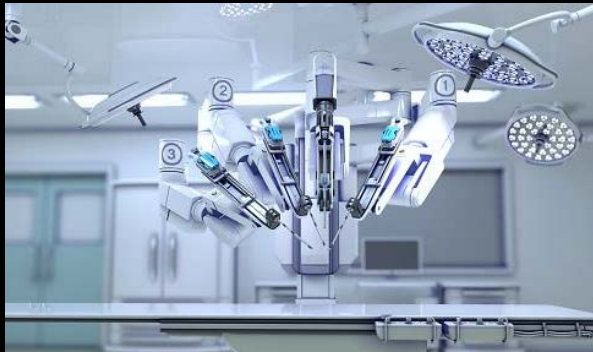
On-device Intelligence combining with 5G, IoT brings the innovation in everyday life and services, which is enabled by advanced semiconductor technologies



# 5G Network

## The Mass Connected Era

Inspires creativity to all connected dots



# 5G

Enhanced Mobile Broadband  
Ultra Reliable & Low Latency  
Massive Machine Type Communication

2018	2019	2020
3GPP 5G NR Phase 1 Standard Release	Commercial Device & Service Release	5G NR Commercialization

### 5G Mobile Subscriptions to Reach 1 Billion by 2023

(Ericsson Mobility Report, Nov.2017)

# Enhanced Mobile Cameras

## Ultra-high Resolution

More Pixels in a Small Sensor

## Small and Slim

Tiny Camera Fit for Full Front Display

## Intelligent Camera

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

## Multiple Cameras

Dual, Triple and Quad Cameras  
for Various User Scenarios

## High Light-sensitivity

Bright and Clear Image under Low Light

## 3D Depth Sensing

DVS, ToF for Game, VR/AR



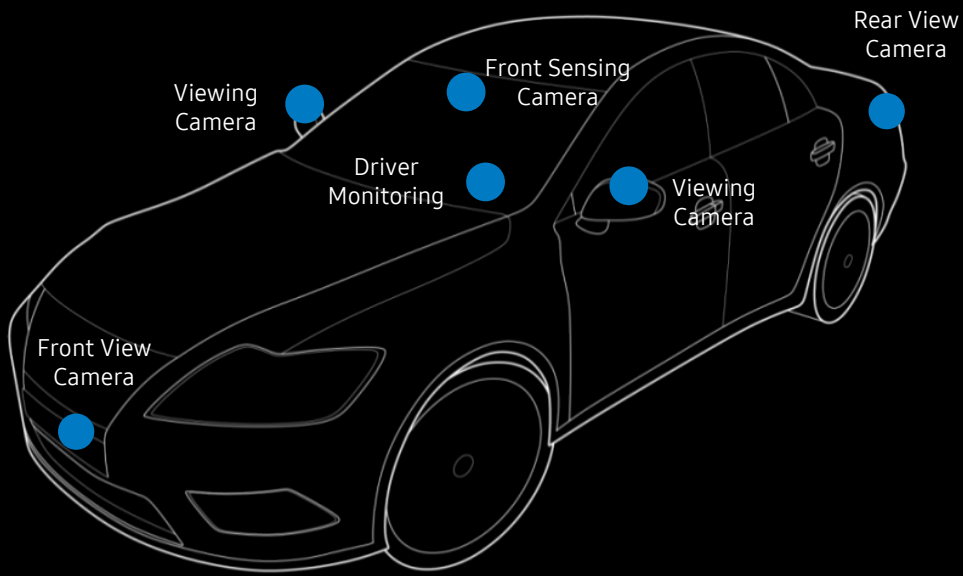
# Future Mobility with IC Technology

## Innovation in Automotive Industry

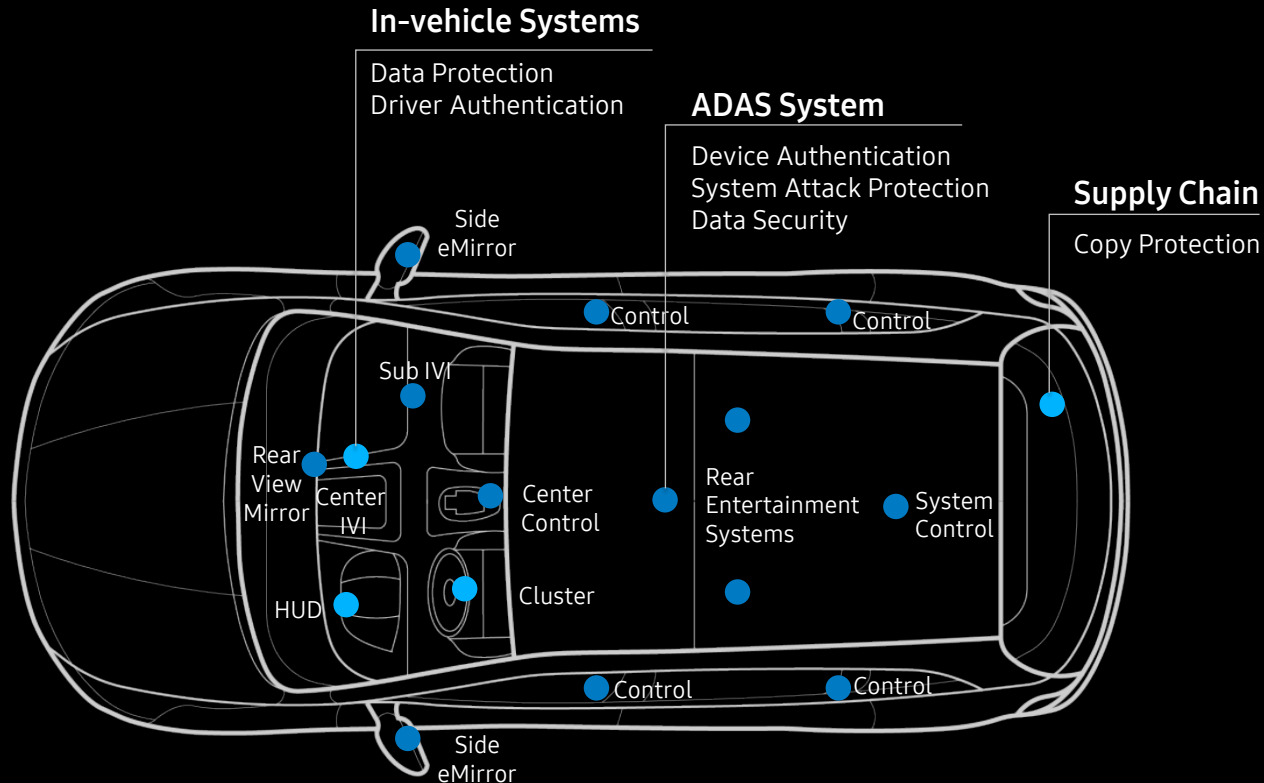


# Enriched Systems in Future Mobility

## 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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KEY TAKEAWAYS

# Strategy for the Growth

## Innovation to Bring Ideas to Life

### Total Solution

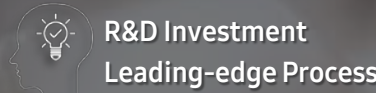
Integrated and Extended Portfolio



Hardware Software

### Technical Leadership

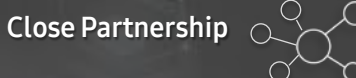
Advanced Technologies for Components & Platform



Reference Platform System Design

### Leading Market

Collaboration with Ecosystem



Future Market & Technical Research

# Solution for Mobile Devices

## Samsung's advanced component solutions for mobile innovation

### ISOCELL Image Sensor

CMOS Image Sensor  
for Multi Cameras in Front / Rear



### Iris Scanning Sensor Motion & Depth Sensor



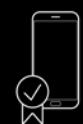
### Exynos Processor

Mobile Processor  
LTE/5G Modem  
RF IC  
Connectivity  
Supply Modulator



### Reference Designs

Optimized Platform  
Designed with Samsung Products



### NFC / Secure Element

Mobile Payment / Security



### Touch Controller

Low Power, High Sensitive



### OLED Display Driver IC

Bezel-less Full Screen



### Fingerprint Sensor

Fingerprint Sensor on Display



### Power Management IC

PMIC for Mobile Processor,  
UFS Memory, OLED Display,  
Wireless Charger, USB Type-C PDIC



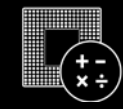


# Solution for Internet-of-Things

Safely connecting the wireless world



## Exynos i



IoT Processors with On-chip Security Solution  
and Connectivity

## ISOCELL



Image Sensor Solution for Sensing and Recognition  
Dynamic Vision Sensor

## Security

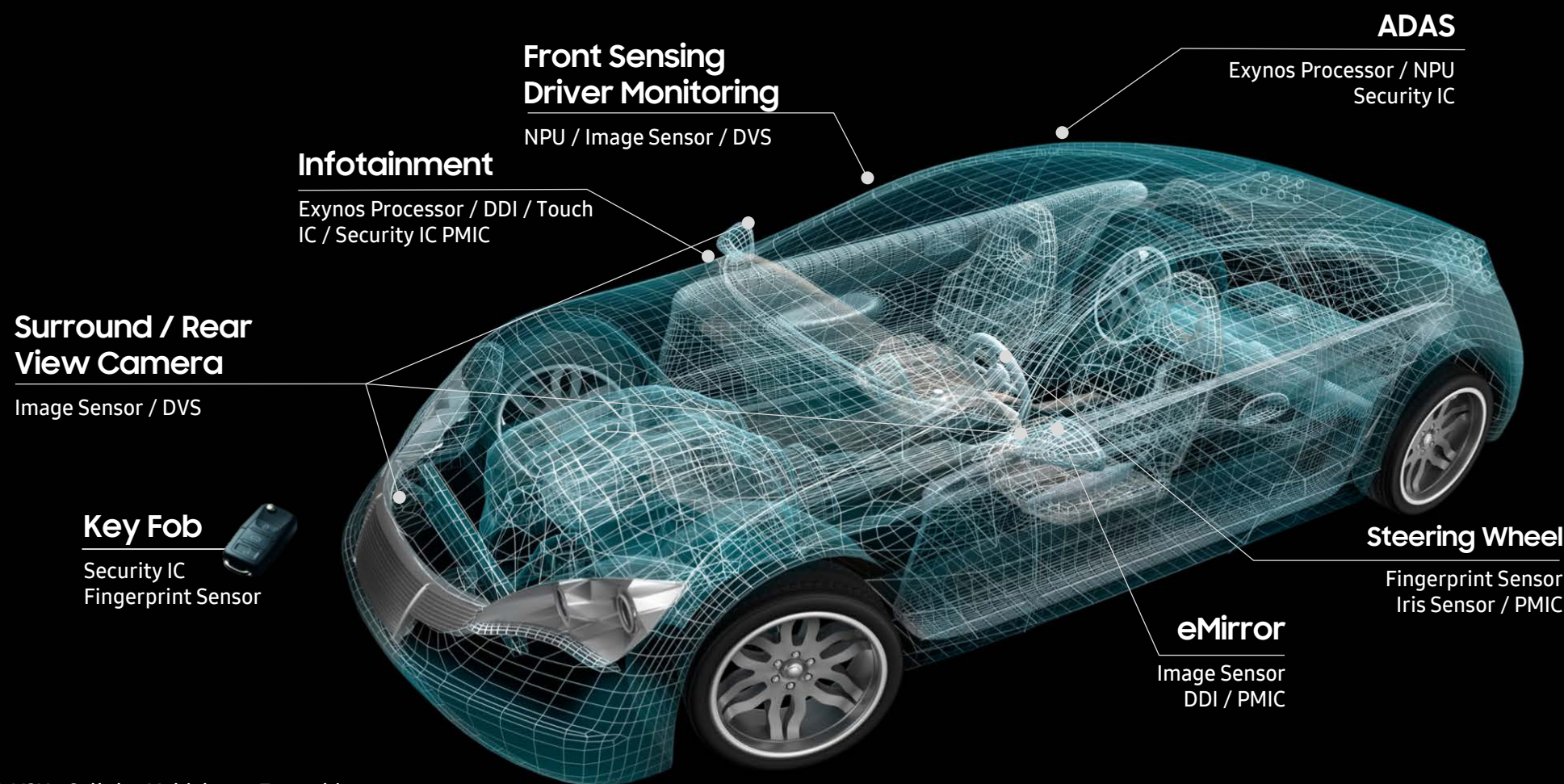


NFCs, Secure Elements for Data Protection  
Secure Storage of Key & Credentials,  
Authentication and Crypto Operation

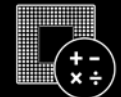
# Solution for Mobility

## Transforming the Driving Experience with IC Technologies

ADAS, Infotainment System, Telematics and Autonomous Driving Solutions



### ExynosAuto



Processors and NPUs for IVI, Cluster, ADAS System  
Modems for Telematics System

### ISOCELL



High Sensitive and High Resolution Image Sensors  
with Embedded Security

### Security



Safe and Reliable Security Solutions for  
Automotive Systems and Personal Information

### Display



Display Driver ICs, Touch Controllers

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

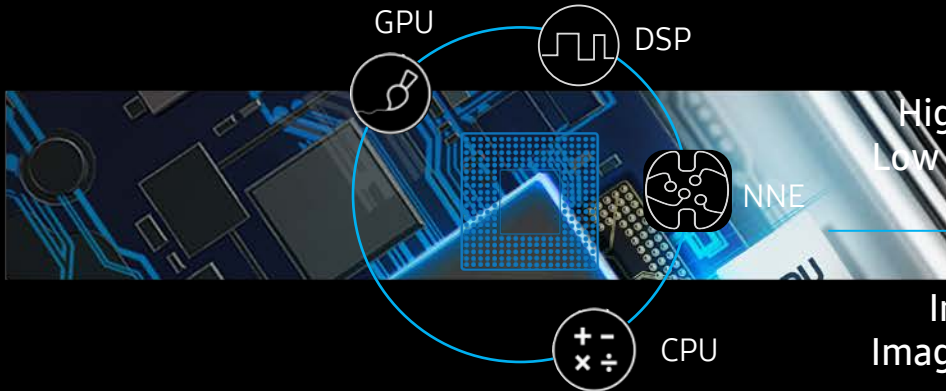
# Exynos Processor

## Path of Innovation



# Exynos for Device Intelligence

## Neural Processing Unit An Intelligent Powerhouse



High Performance,  
Low Power Processing

Flexible and Scalable  
Architecture

Android NN API,  
Caffe2, Tensorflow-lite

Intelligent  
Image Processing

Face/Object/Voice  
Recognition

IoT/Machine  
Learning

Smart  
Mobility



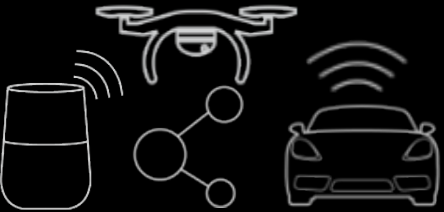
\* NNE (Neural Network Engine)

# Exynos Modem for 5G Era

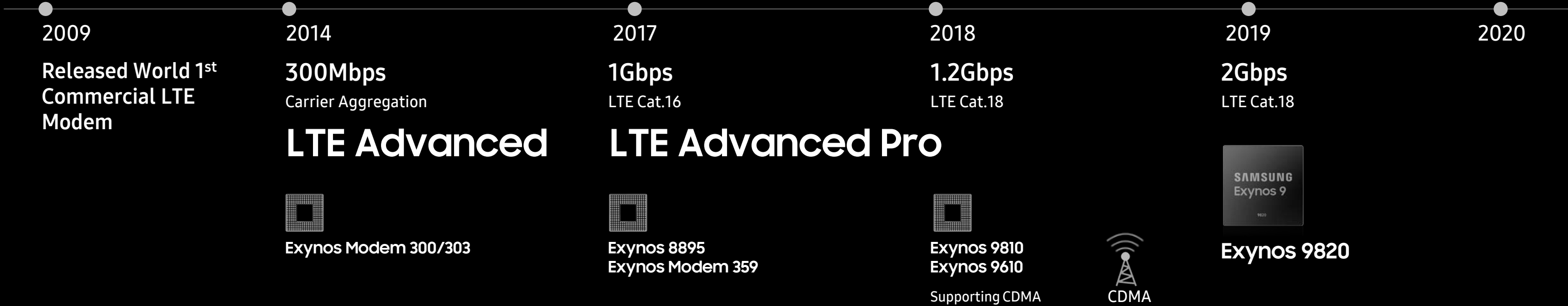
**600 million+**  
Exynos Modems Has Commercialized  
in **150 Countries**



**Exynos Modem 5100**  
5G NR Rel.15 Compliant  
Multi-mode Single Chip Modem

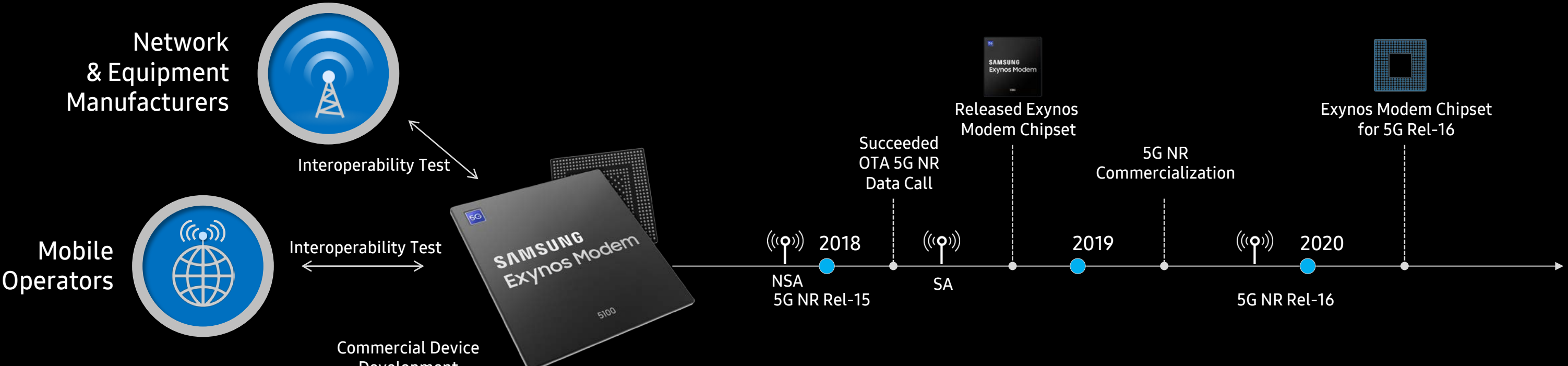


**5G New Radio**  
2Gbps (Sub-6GHz), 6Gbps (mmWave)



# Exynos Modem for 5G Era

## Milestone to Bring 5G



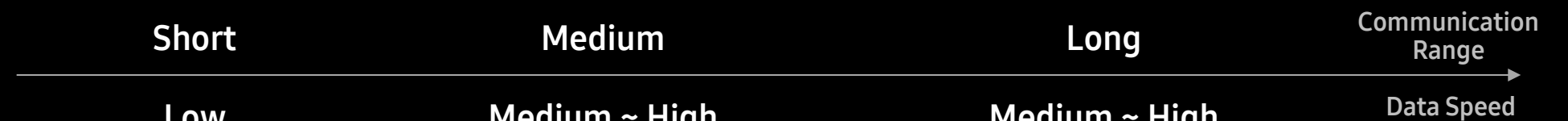
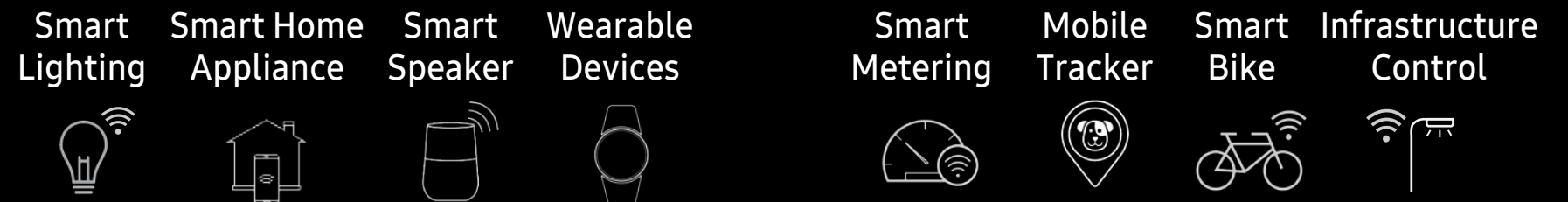
### Exynos Modem 5100

<b>Compatibility</b>  Compliant with 3GPP 5G NR Rel-15	<b>Global Bands</b>  Sub-6GHz 2GHz mmWave 6GHz	<b>Multi-mode</b>  Single Modem for Every Network	<b>5G Chipset</b>  Modem with RF IC, ET, PMIC
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# Exynos i Series for IoT

## Integrated IoT Solutions

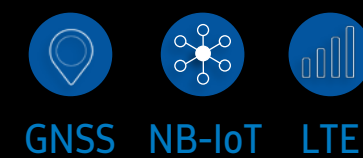
Enhanced Performance  
 Ultimate Power Efficiency  
 On-chip Security Sub-system & PUF



Exynos i T100



Exynos i T200



Exynos i S111

# Exynos Auto Series for Mobility

## Integrated Mobility Solutions



### In-vehicle Infotainment

#### Exynos Auto V

Powerful Processors for Intelligent Multi-screen Infotainment Platform

### ADAS System

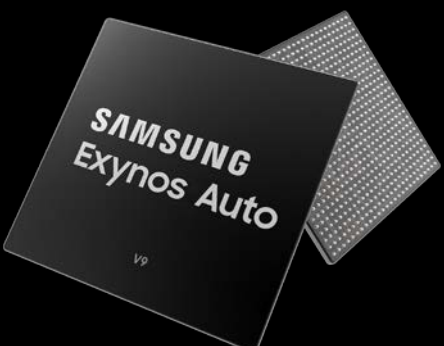
#### Exynos Auto A

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

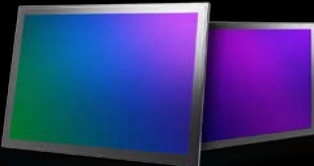
- 6** Displays
- 12** Cameras
- 3** Tri-cluster GPU
- NPU
- Safety ASIL B



# Image Sensor Solutions for Camera

## SAMSUNG ISOCELL

Image Sensors Capturing Moments Anytime through Unique Pixel Technologies



Bright

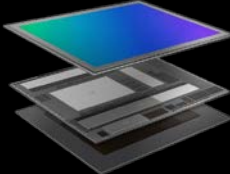
Fast

Slim

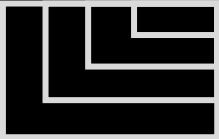
Multi



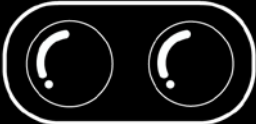
Tetracell Smart WDR



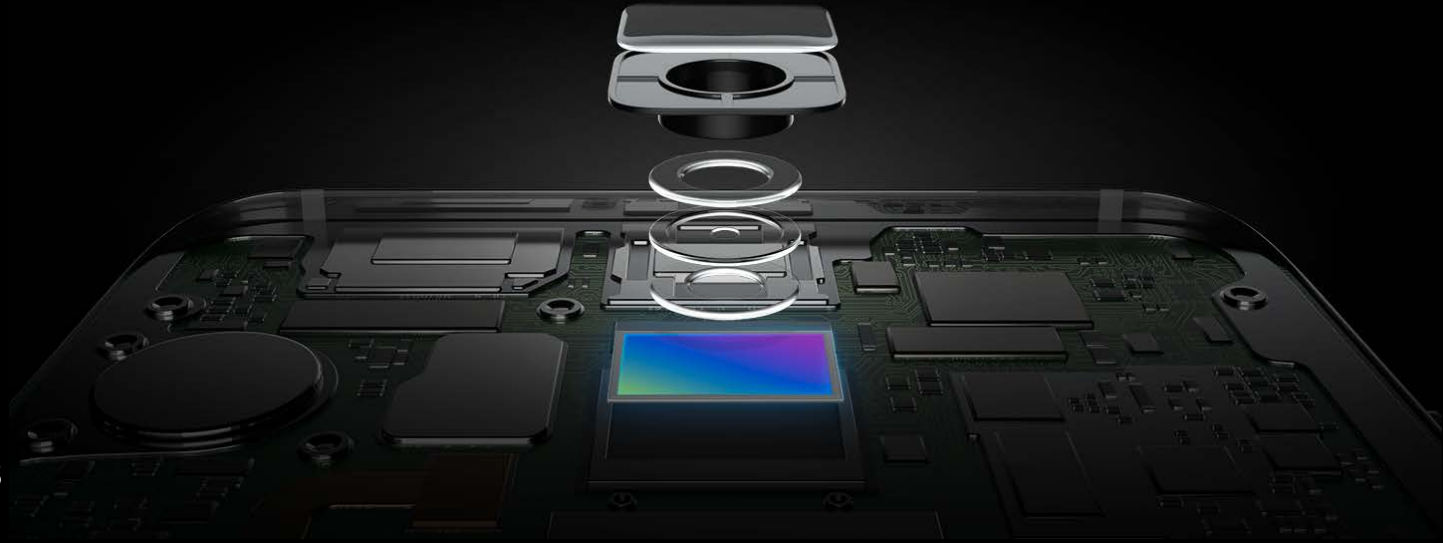
DUAL PIXEL Fast Readout Sensor



Sub-micron Small Pixel



Multi Camera Solutions for Zoom, Depth Sensing, LLS



\* WDR (Wide Dynamic Range), LLS (Low Light Shooting)

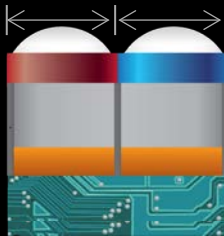
# ISOCELL Image Sensor

## SAMSUNG ISOCELL Technologies that Redefine Mobile Camera



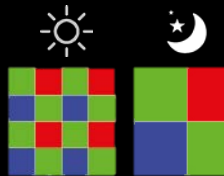
### ISOCELL Plus

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



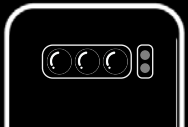
### Sub-micron Small Pixel

0.8um 64Mega Pixel  
Small and Super Resolution Sensor



### Hybrid Pixel Conversion

Tetracell – Remosaic Technology  
Clear and Bright Images Any Time



### Multi Camera Solution

Total Solution for Out-focus, Low Light Shooting

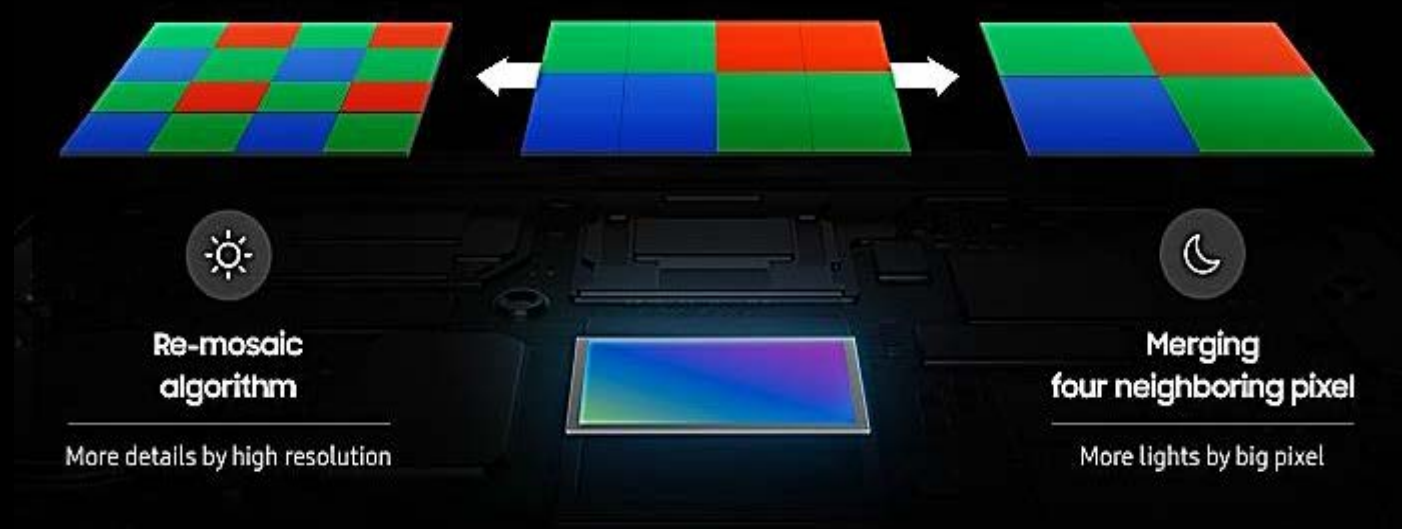
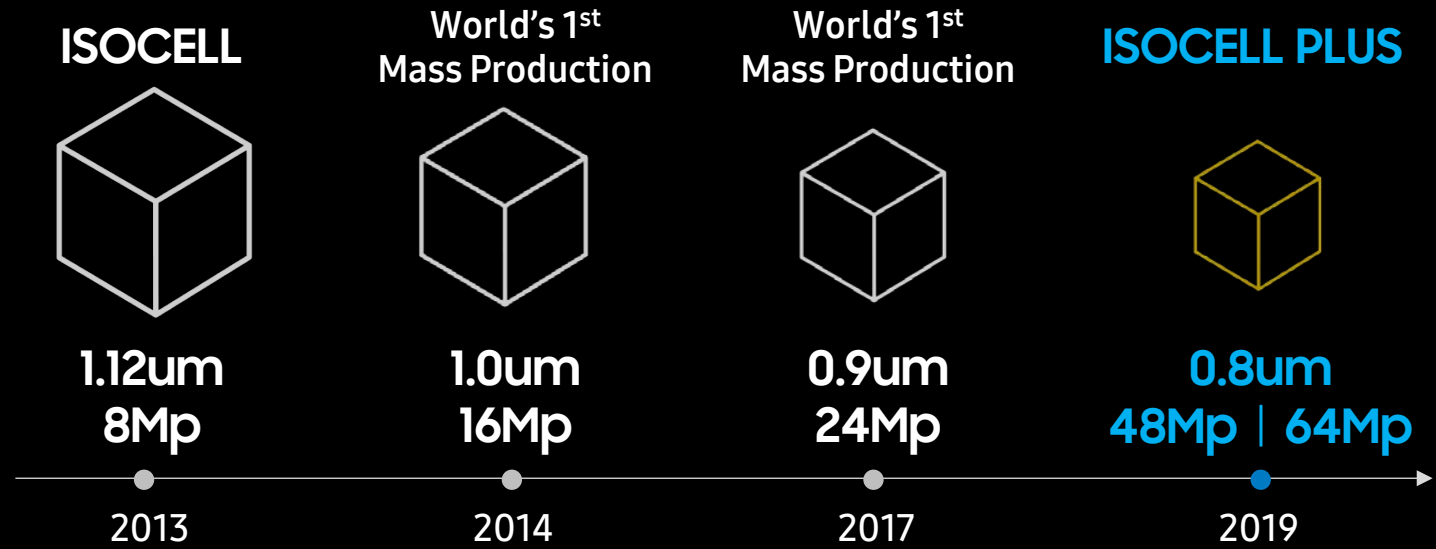
# Advanced Image Sensor Technologies

## Sub-micron Pixel

Less Size, More Pixels  
Super Resolution within a Tiny Sensor  
Powered by ISOCELL Plus Pixel Technology

## Tetracell Technology

Hybrid Pixel Merging & Remosaic Algorithm  
Super Resolution Ensures High Quality Images  
after Pixel-merging Algorithm



# Multi Camera Solution

## Mix and Match Multi Camera Solutions

Various sensor combinations in Dual, Triple and Quad Cameras which enable DSLR-like photo experiences such as greater light sensitivity, depth effects and sharper brightness in all conditions



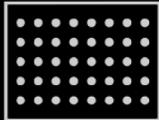
Out Focus



LLS



Optical Zoom



High Resolution



Depth Sensing

\* LLS : Low Light Shooting

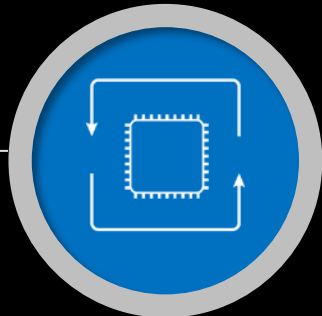


# Process & Service Competency

## Stunning Mobile Images with ISOCELL

### Advanced Node

28nm based Image Sensors



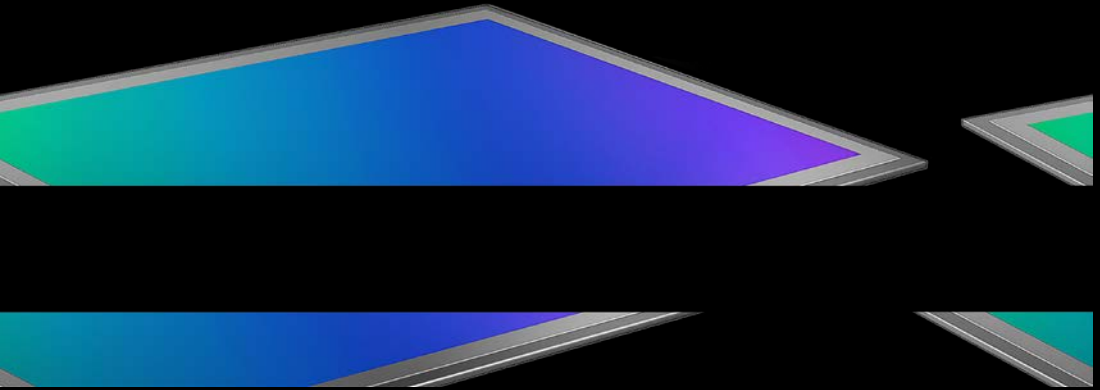
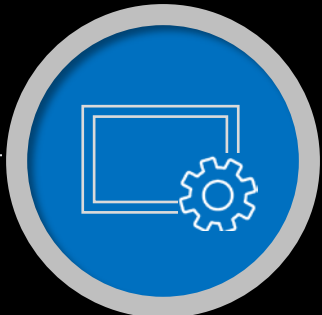
### ISOCELL Pixel Technology

Superior Image Quality with Small Pixel  
Unique Pixel Technologies



### Design Service

Hardware and Software Integrated Solution  
Custom Sensor Design



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KEY TAKEAWAYS

# 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 System LSI is a provider of integrated total solution for mobile. On top of that, System LSI is now on the path to be a key player for 5G and autonomous mobility, and is investing for future device intelligence.

Samsung System LSI

# Possibilities Beyond Components

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Integrated  
Solutions








Silicon  
Technologies



# SAMSUNG

Follow System LSI

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- |  |  |
|--|--|
|  <a href="http://www.samsung.com/semiconductor">www.samsung.com/semiconductor</a>   |  <a href="http://www.youtube.com/SamsungExynos">www.youtube.com/SamsungExynos</a>   |
|  <a href="http://www.samsung.com/Exynos">www.samsung.com/Exynos</a>                 |  <a href="http://www.instagram.com/SamsungExynos">www.instagram.com/SamsungExynos</a>   |
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