RISC-V of Samsung
in the age of 5G and AI

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RISK of Samsung

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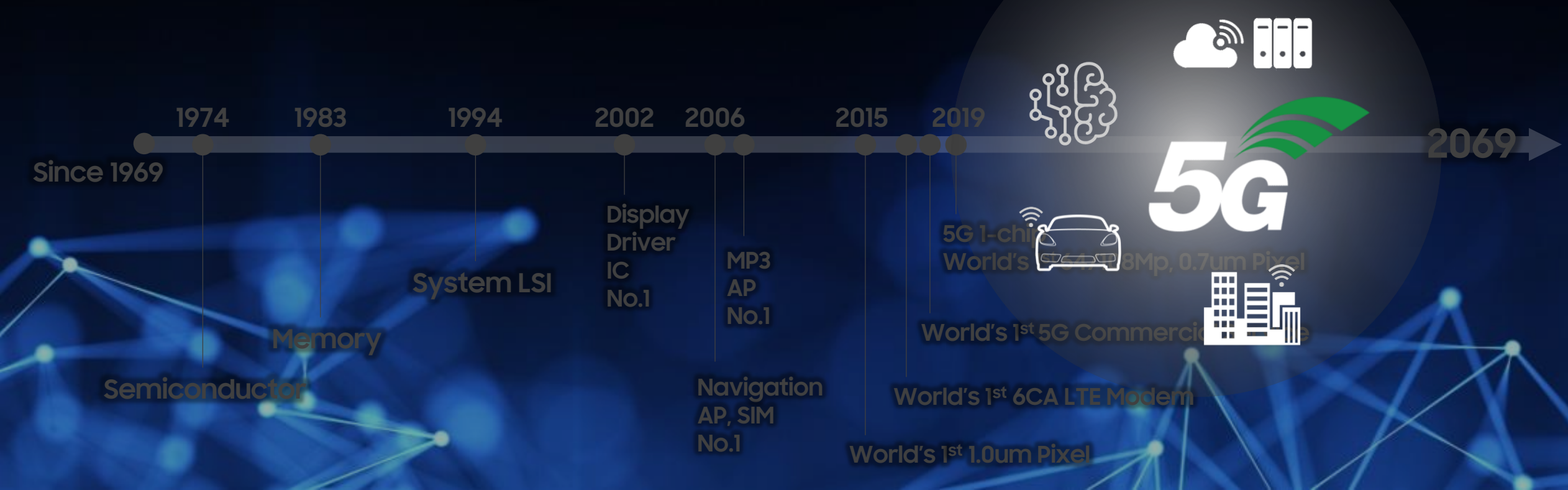
RISK of Samsung in the age of 5G and AI



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RISC-V of Samsung
in the age of 5G and AI

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Samsung Electronics

Consumer Electronics

Visual Display

Digital Appliances

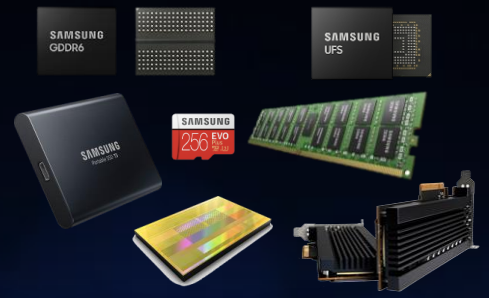
IT & Mobile

Mobile Communications

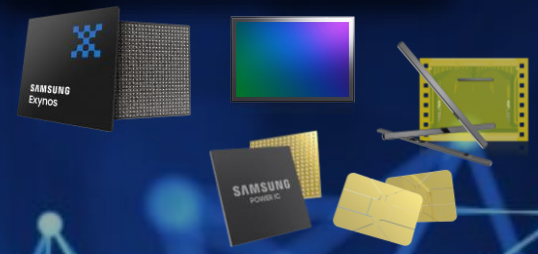
Networks

Device Solution

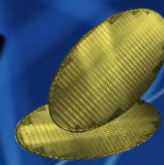
Memory



System LSI



Foundry



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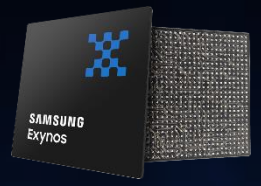
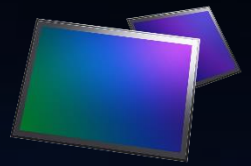
System LSI

Unique Fabless
with Wide Range of Products

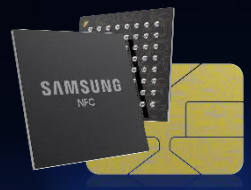


SoC
AP/Modem/RF/
Connectivity

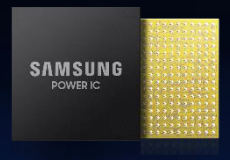


CMOS
Image Sensor

Display Driver IC
Touch Controller



NFC/eSE/SIM
Banking/ID



Power
Management IC

DTV SoC

Mobile Devices

Consumer Devices

Automotive

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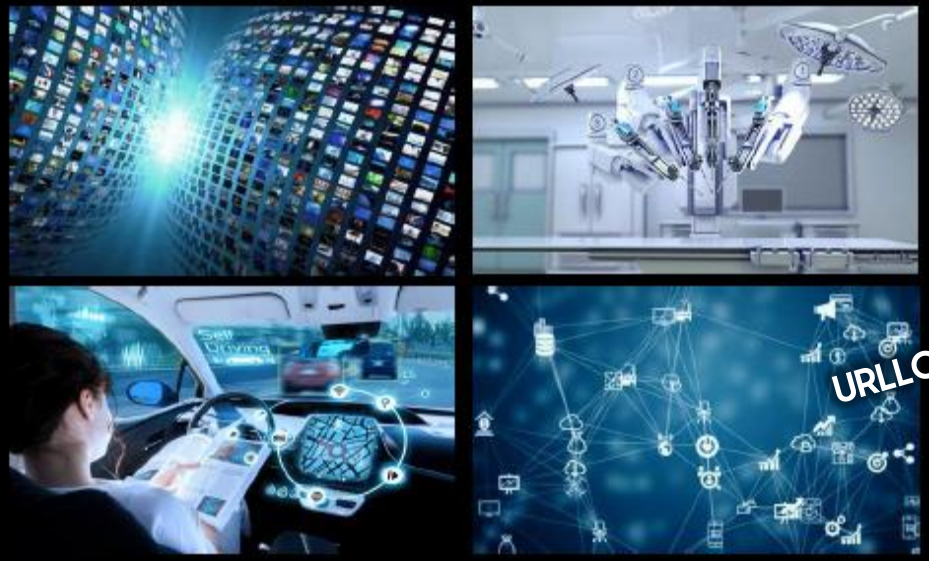
Age of 5G

The Mass Connected Era

Inspires creativity to all connected dots



5G

2018 3GPP 5G NR Phase 1 Standard Release

2019 Commercial Device & Service Release

2020 5G NR Commercialization

Enhanced Mobile Broadband

URLLC Ultra Reliable & Low Latency

Massive Machine Type Communication

Throughput & Latency

5G Mobile Subscriptions to Reach 1 Billion by 2023

(Ericsson Mobility Report, Nov.2017)

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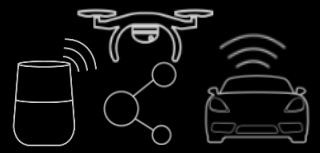
Cellular Modem

600 million+
Exynos Modems have been commercialized
in **150 Countries**



5G NR Rel.15 Compliant
Multi-mode 5G Chipset Series

5G New Radio

Exynos Modem 5100
FR1 2Gbps, FR2 6Gbps

Exynos Modem 5123
FR1 5.1Gbps, FR2 7.35Gbps
SA/NSA, EN-DC

Exynos 980
5G 1 Chip SOC
FR1 2.55Gbps~ 3.55Gbps
SA/NSA, EN-DC

2009	2014	2017	2018	2019	2020
Released World 1st Commercial LTE Modem	300Mbps Carrier Aggregation	1Gbps LTE Cat.16	1.2Gbps LTE Cat.18	2Gbps LTE Cat.18	
	LTE Advanced	LTE Advanced Pro			
	Exynos Modem 300/303	Exynos 8895 Exynos Modem 359	Exynos 9810 Exynos 9610	Exynos 9820	
			CDMA		

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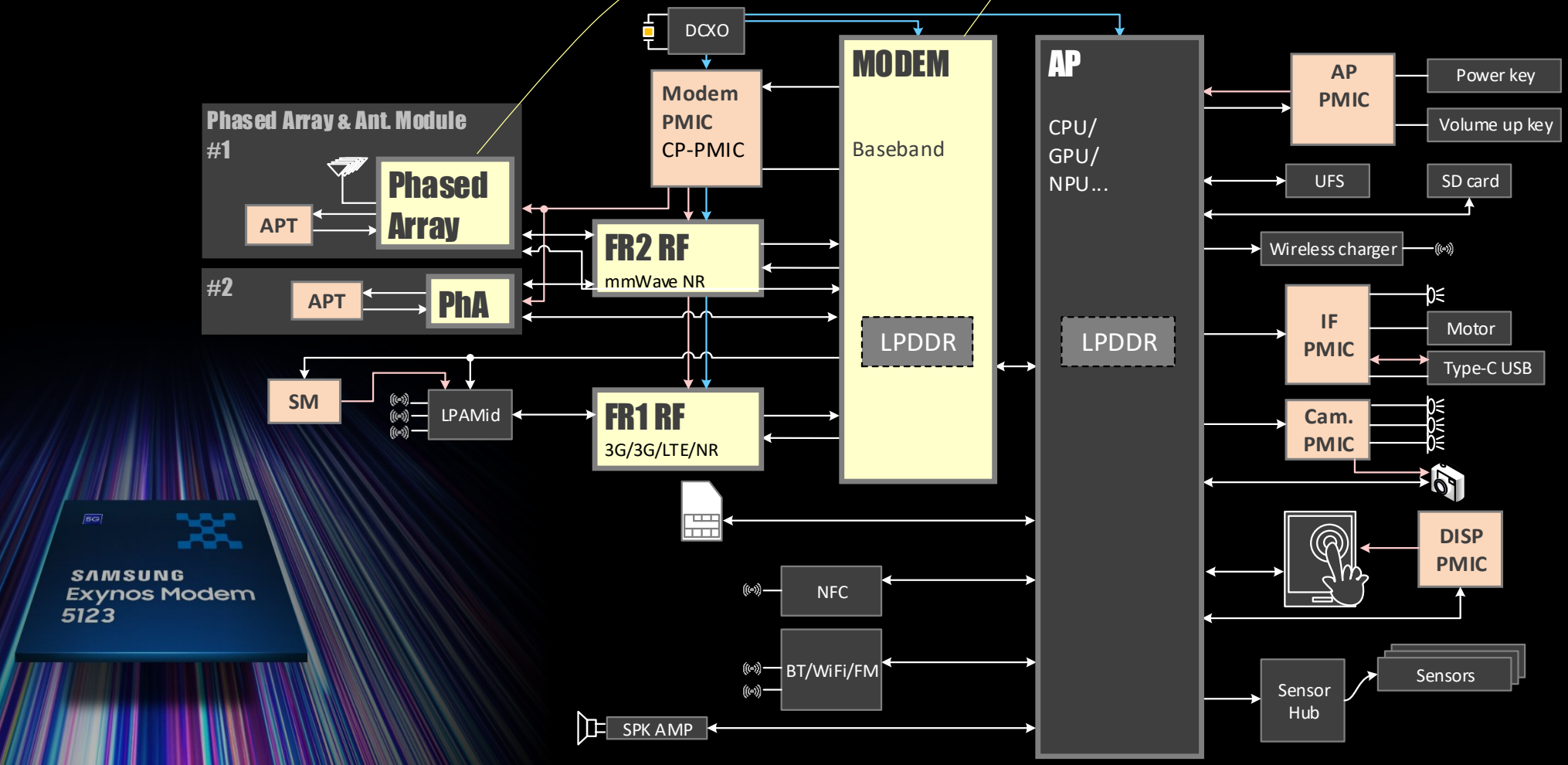
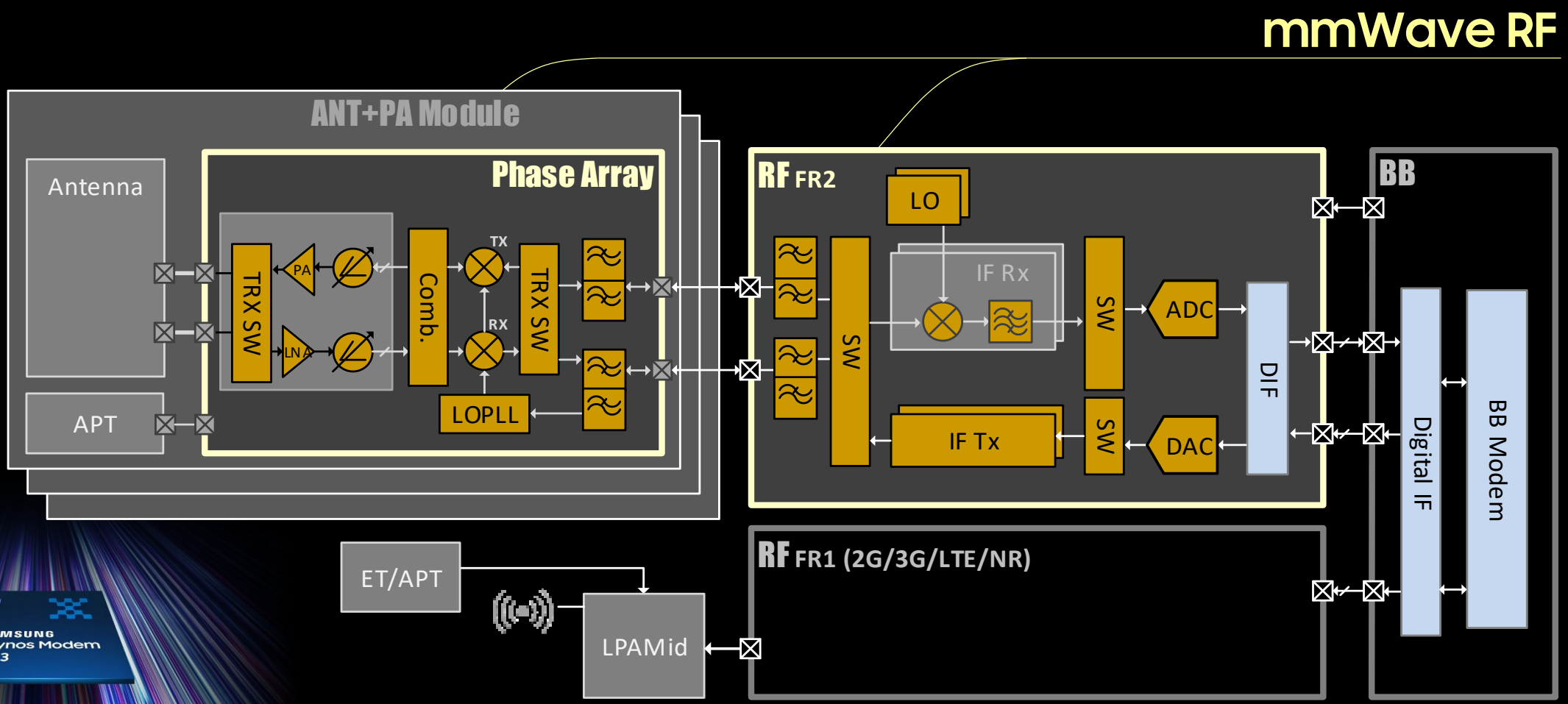
Exynos System

5G Modem System



Exynos RF System



RISC-V in 5G

RISC-V in mmWave RF

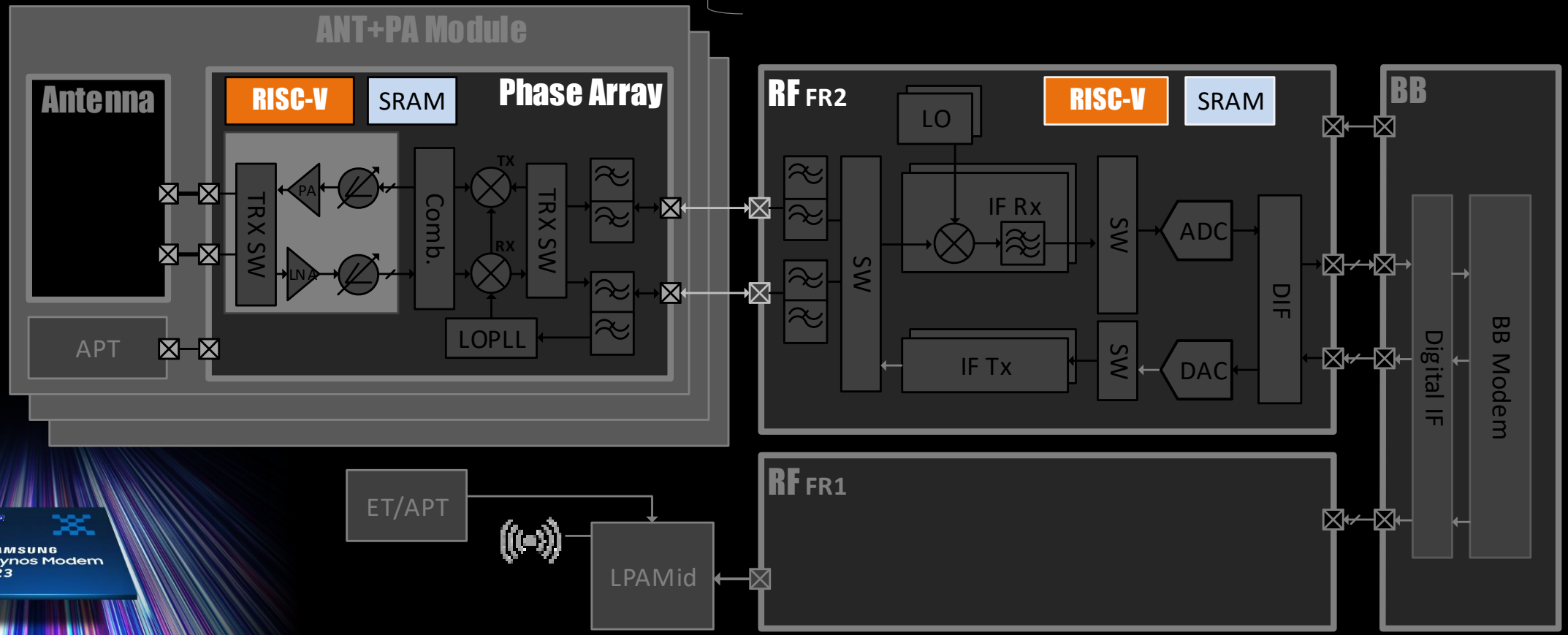
[2017] The 1st RFIC test chip was taped out
- Offset calibration

[2018] The 1st generation (center / phased array) RFICs were taped out

[2018] The 1st multiple band phased array RFIC was taped out in 2018.

[2019] The 2nd center RFIC were taped out

[2020] Plan to adopt in the flagship mobile devices in 2020.



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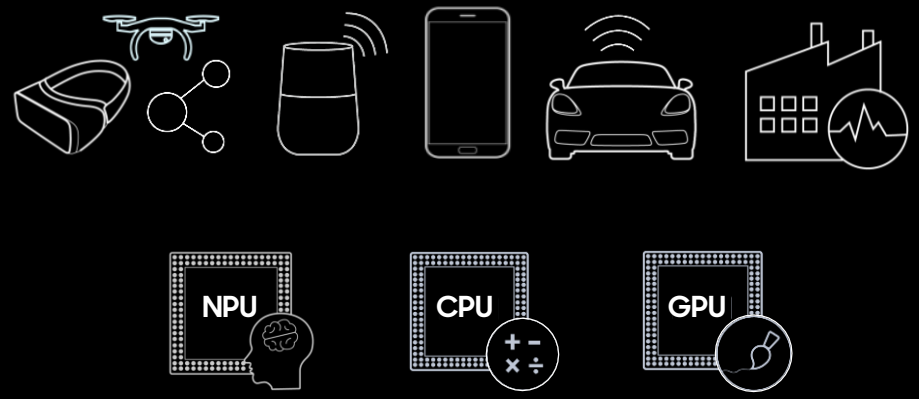
Age of AI

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



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AI Accelerator

Exynos for Device Intelligence

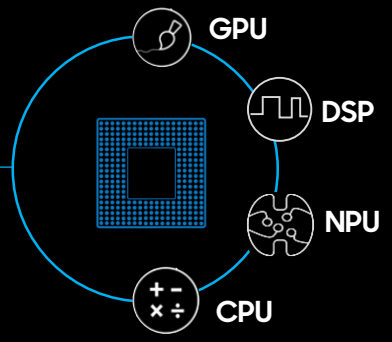
Neural Processing Unit

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

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Intelligent Camera

Powered by ISOCELL image sensors

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

*DVS : Dynamic Vision Sensor
*ToF : Time-of-Flight

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RISC-V in Sensors

Competitiveness

Scalable and Flexible design options
Open Source ISA
Matured core designs available
SW eco built-up

Image Sensor IC
- Large variant of requirements based on applications
  - Different resolution, frames, pre-processing, precisions, etc.
  - Development of large number of line-ups in parallel
  - Development environment and base HW/SW design must be unified, regardless of varying requirements and specifications
- RISC-V base environment with base ISA, additional project-dedicated features with applicable extensions

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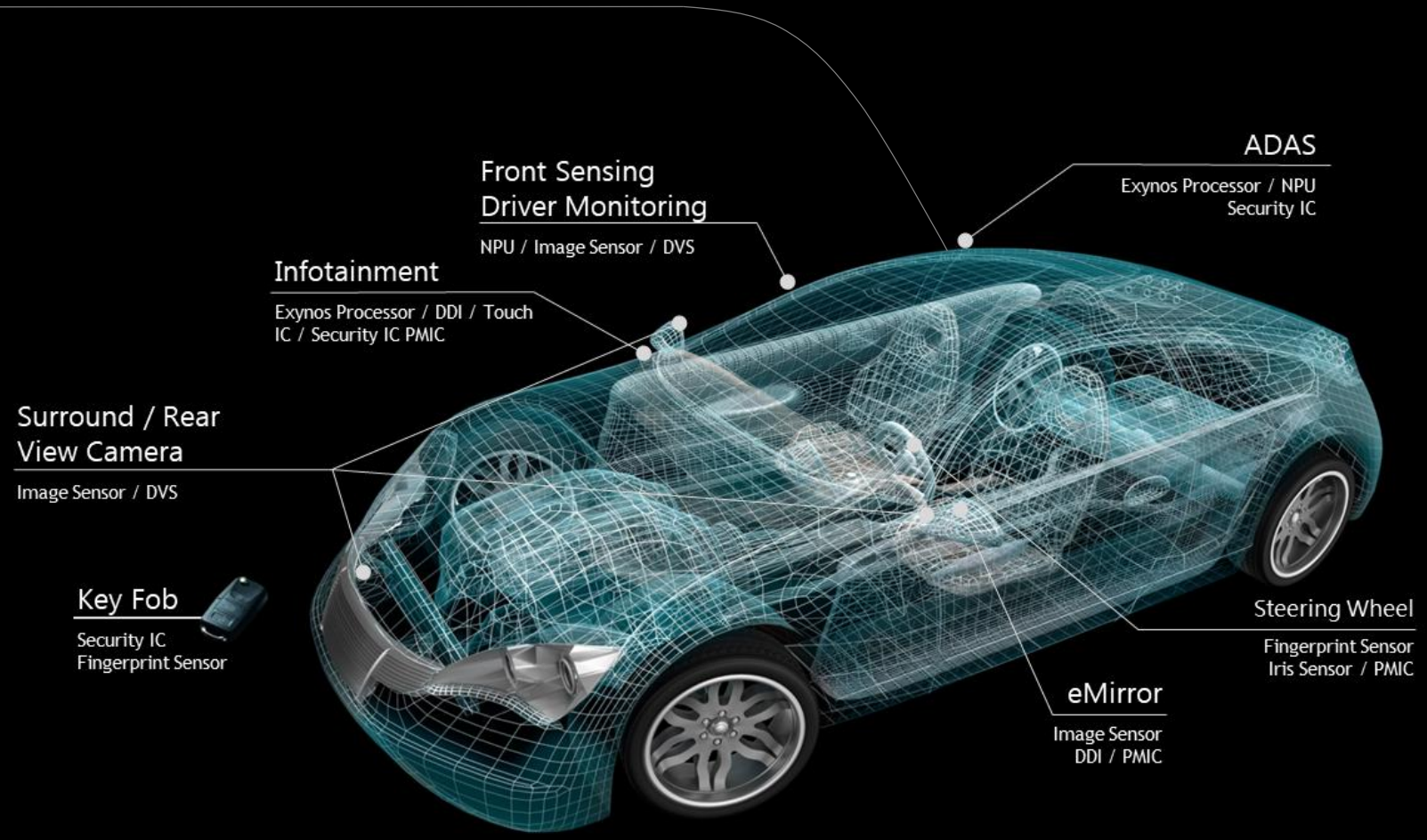
Intelligent Driving Experience

AI accelerated SOC and Sensors

Exynos Auto for Infotainment
Exynos Modem for Telematics
Exynos Auto for ADAS
ISOCELL Image Sensor



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RISC-V of Samsung

5G Modem RF

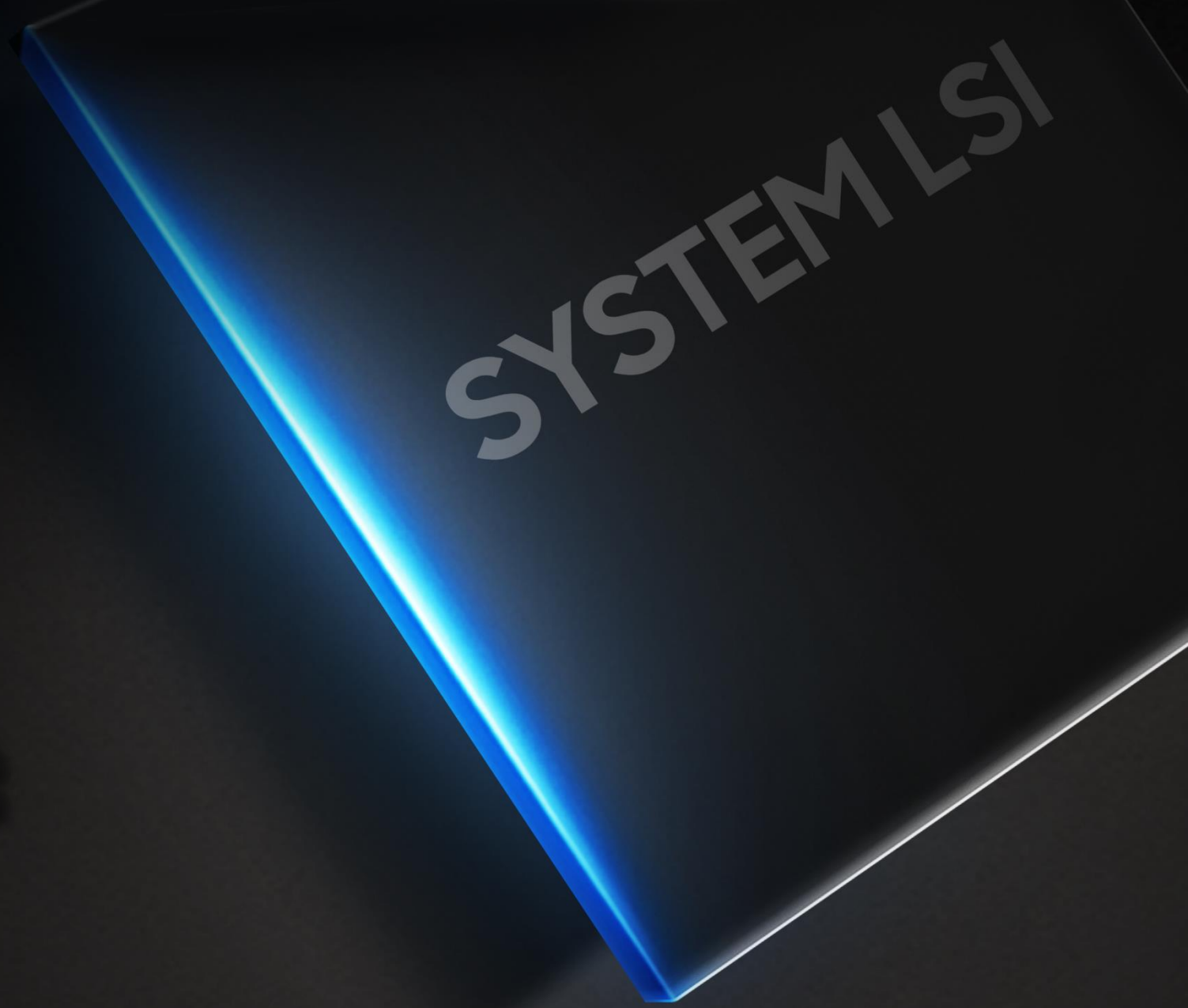
AI Image Sensor

MOBILE

AI Computing and Control
RF Calibration and Control
Security Management

AUTOMOTIVE

AI Computing and Control
Security Management
Safety Island



Next Generation System Architect

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