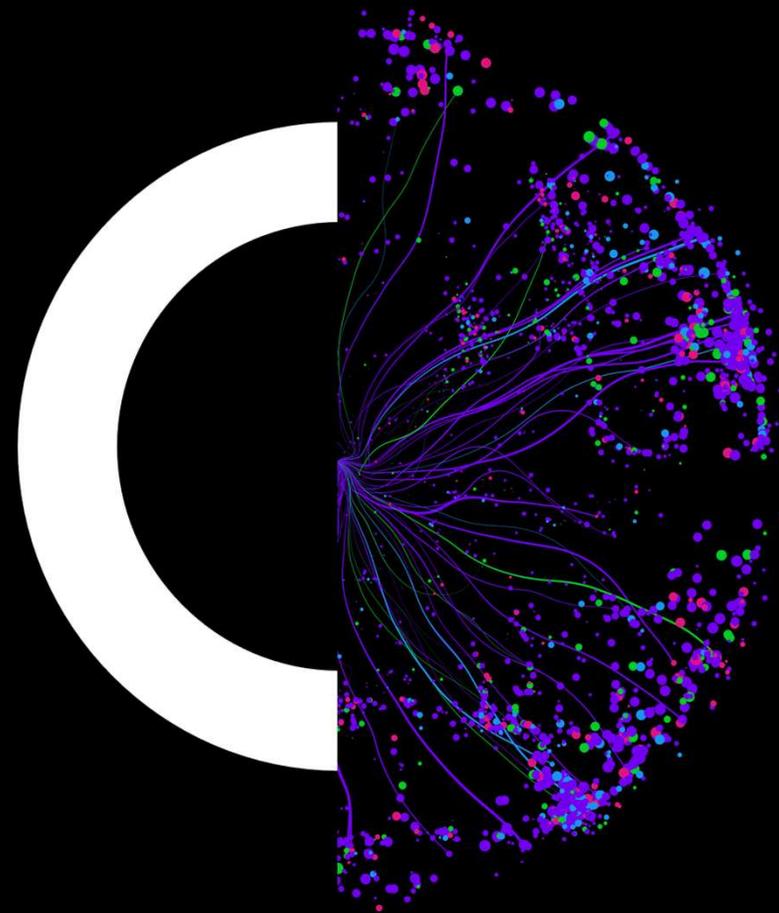


STRADVISION PRODUCT BRIEF



Company Overview



INTRODUCTION

STRADVISION provides deep-learning based vision perception software (SVNet) using camera sensors for various applications in the automotive industry

- Foundation in 2014
- SVNet is STRADVISION's lean and flexible AI software product running on various SoCs
- The first SOP (start of production) of vehicle models running SVNet was in China in 2019

VISION

The leading AI-inspired perception company.

MISSION

We empower everything to perceive intelligently.

Who We Are



01

Deep learning-based vision perception software using camera sensors

02

Foundation in 2014

03

Partnership with 13+ OEMs

04

Being deployed on 35+ Vehicle Models

05

167+ US patents from 500+ patents in Deep Neural Network

06

Available on 30+ SoC platforms

07

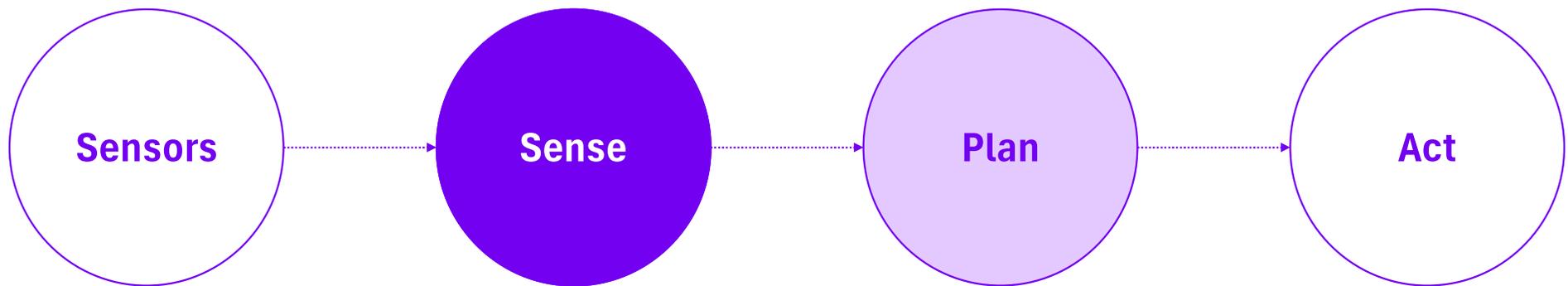
75% of employees are engineers in data, algorithm, and AI

08

Global offices: San Jose / Detroit / Düsseldorf / Shanghai / Seoul / Dongtan / Pohang / Tokyo

Overview

Vision perception for active safety driving features



**VARIOUS & PRACTICAL VISION PERCEPTION INTELLIGENCE FOR ALL AUTOMOTIVE APPLICATIONS
WITH HIGH ACCURACY PERFORMANCE ON LIGHT & VERSATILE PLATFORMS**

Strategy –Trustworthy Vision AI Provider



Provide the lean (low computing power) and versatile (flexible applications) **VISION AI** software as modular solutions and empower automotive players to build their own customized system at low cost

Perceive Environments Using Camera Sensors



Automotive Tailored Quality and Maturity

SPICE/Cyber Security/Functional Safety/FMEA ready with ample experience in vehicle series production

Cost Effective Technology

Using the least computing power – saving your money and power consumption in semiconductors

Transparent and Flexible Approaches

Tight and supportive collaborations with solution owners by defining challenges and how to solve them together

State-of-the-art Technology

e.g. knowledge distillation to adopt the latest technology within the least lead time

Strategy - 3D Perception



Why 3D Perception? Because Final Outputs are Defined in VCS

The Challenge



Better Accuracy

Much more accurate representation encompasses all the essential elements necessary for driving, including the positions, orientation, distances, velocities of moving objects, static objects, lanes, road edges, as well as traffic signs and lights.



Less Complexity

Conventional deep learning models demand substantial effort to maintain and enhance performance due to **the intricate conversion process between ICS and VCS**



Higher Scalable

In the SDV, there exists the challenge of intricate software integration and a **constant competition for ARM resource allocation among multiple software stacks.**

Furthermore, there is **an evolutionary gap between ARM and Neural Processing Unit (NPU)** technologies. Therefore, it is advisable to capitalize on this emerging trend.

The Approach

**Network outputs in VCS
(No ICS-VCS conversion)**

More DL / Less Post processing

Detection error reduce by 10%, detection stability increase by 30%

ARM resource usage decrease up to 70%

Post-processing code complexity reduce by 50%

The Solution

3D Perception approach

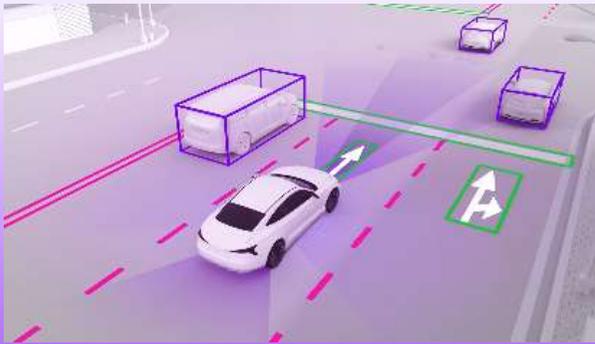


PRODUCT OVERVIEW



SVNet : Cutting Edge AI Technology

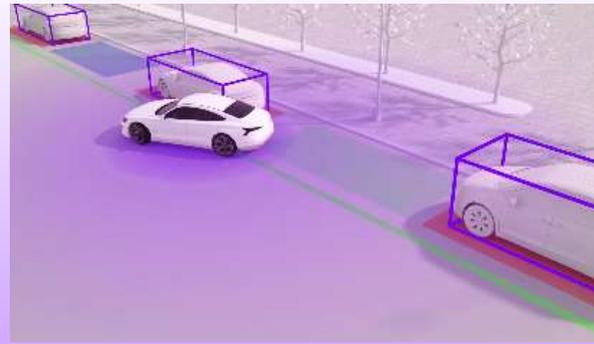
SVNet is the core technology that powers our product lineup, including **FRONT VISION**, **SURROUND VISION**, and **MULTI VISION**. It delivers deep learning-based perception software to recognize and classify various objects captured by camera data.



FRONT VISION

FRONT VISION detects various elements on the road utilizing the input from the front-facing-camera.

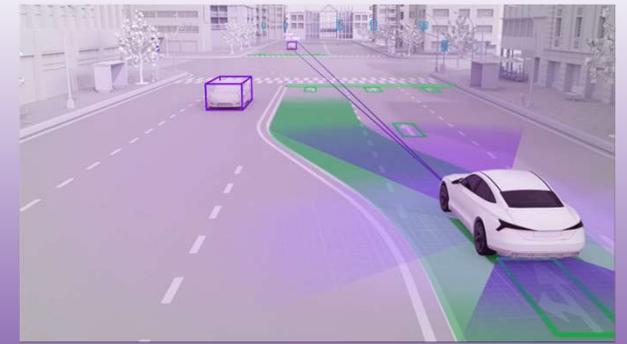
It enables users to develop autonomous driving features with different levels of autonomy, ranging from fundamental ADAS features required by Euro GSR/NCAP regulations to autonomous driving features of L2/2+ level above.



SURROUND VISION

SURROUND VISION detects a wide range of objects around the vehicle from surround view camera images as an input.

With its highly accurate perception outputs, it enables users to develop safety features such as blind spot monitoring system as well as automatic parking assistance features that can work even in the challenging scenarios.



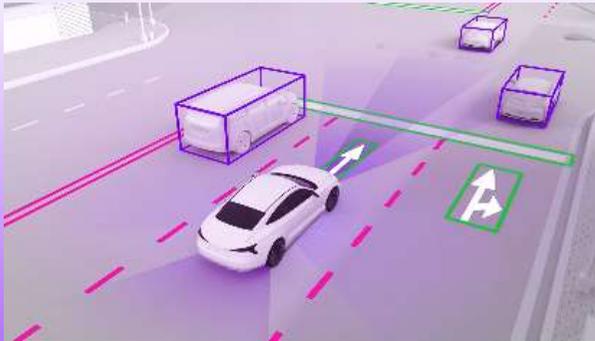
MULTI VISION

MULTI VISION utilizes a combination of front, rear, side, and surround-view (fish-eye) cameras, to provide comprehensive object information around the vehicle in both a public road and parking lot environments.

It enables L3 or above ADAS and autonomous driving features in different operational design domain (ODD).

PRODUCT OVERVIEW

FRONT VISION



FRONT VISION

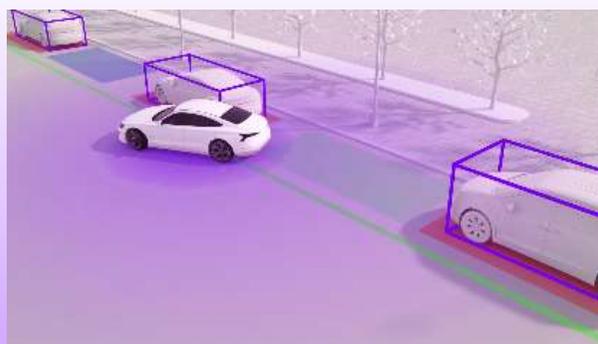
FRONT VISION detects various elements on the road utilizing the input from the front facing-camera.

It enables users to develop autonomous driving features with different levels of autonomy, ranging from fundamental ADAS features required by Euro GSR/NCAP regulations to autonomous driving features of L2/2+ level above.

	LITE 	STANDARD 	ADVANCED 	IMMERSIVE 
SAFETY LEVEL	EU GSR/NCAP (L0-1)	Safety assist (L2)	Safety assist (L2+)	AR & Dynamic map
PRODUCT DESCRIPTION	FRONT VISION LITE provides vision perception features tailored for supporting development of essential L0~L1 ADAS features, ensuring compliance with EU GSR, NCAP	FRONT VISION STANDARD supports the development of premium L2 ADAS features by offering perception features with enhanced accuracy and expanded coverage of environmental conditions (ODD, Operational Design Domain).	FRONT VISION ADVANCED utilizes high-resolution(8MP) images to provide high accuracy vision perception features over extended distance, enabling L2+ ADAS capabilities.	FRONT VISION IMMERSIVE features pixel-level object information and distance estimation, empowering users to generate realistic graphics for augmented reality navigation system and to develop a dynamic update system for high-definition maps in autonomous driving applications.
APPLICATION FEATURES	<ul style="list-style-type: none"> - FCW (Forward Collision Warning) - AEB (Automatic Emergency Braking) - LDW (Lane Departure Warning) - LKA (Lane Keeping Assist) - ISA (Intelligent Speed Assist) - HBA (High Beam Assist) 	<ul style="list-style-type: none"> - (All features included in the Lite variant) - ACC (Adaptive Cruise Control) - HWA (Highway Assist) - TJA (Traffic Jam Assist) - AFS (Adaptive Front-lighting System) 		<ul style="list-style-type: none"> - Augmented Reality Navigation - Dynamic Map Service
PERCEPTION FEATURES	VD/PD, LD/RBD, TSR, LSD, RMD, SOD, SCENE	LITE + TLR, FSD, REP/RSE	STANDARD + Far detection range	STANDARD + DM/SS,
CAMERA	FFC(2MP, 100HFOV) x1	FFC(2MP, 100HFOV) x1	FFC(8MP, 120HFOV) x1	FFC(2MP, 100HFOV) x1
PLATFORMS	2 TOPS, 4 KDMIPS, 24 FPS R-car V3H2.1	4 TOPS, 4 KDMIPS, 30 FPS R-car V4M	8 TOPS, 10 KDMIPS, 30 FPS R-car V4M	8 TOPS, 8 KDMIPS, 30 FPS R-car V4M

PRODUCT OVERVIEW

SURROUND VISION



SURROUND VISION

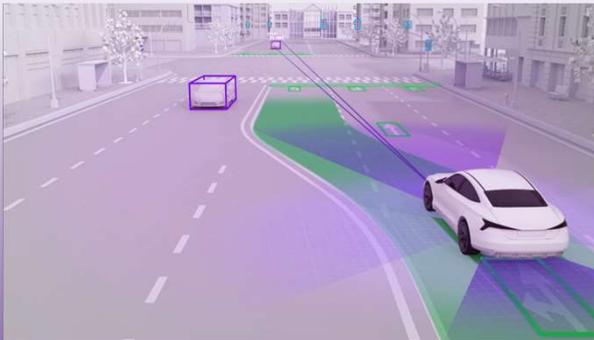
SURROUND VISION detects a wide range of objects around the vehicle from surround view camera images as an input.

With its highly accurate perception outputs, it enables users to develop safety features such as blind spot monitoring system as well as automatic parking assistance features that can work even in the challenging scenarios.

	LITE	STANDARD	VISUALIZATION
SAFETY LEVEL	EU GSR (L0-1)	Parking assist (L2)	SVM Viewing (Infotainment)
PRODUCT DESCRIPTION	SURROUND VISION LITE offers fundamental vision perception features essential for supporting L0~L1 ADAS features required by EU GSR regulations such as detecting pedestrians within blind spots around a vehicle.	SURROUND VISION STANDARD supports Automatic Parking Assist (APA) and remote parking functionalities across diverse operational design domains (ODD) by delivering reliable parking slot detection, even in challenging conditions. This includes identifying parking slots with obscured lines and those delineated by sidewalk blocks.	SURROUND VISION VISUALIZATION offers a wide range of visualization features for a premium Surround View Monitoring System (SVM), featuring a 3D view with adjustable camera angles and 3D transparent view.
APPLICATION FEATURES	<ul style="list-style-type: none"> - BSIS (Blind Spot Information System) - MOIS (Moving-off Information System) - eMirror 	<ul style="list-style-type: none"> - APA (Automatic Parking Assist) - Remote Parking 	<ul style="list-style-type: none"> - 2D SVM (Surround View Monitor) - 3D SVM (Surround View Monitor)
PERCEPTION FEATURES	VD/PD, FSD	VD/PD, SOD, GOD/FSD, PSD	VIS
CAMERA	SVC(4x 3MP 190HFOV) x4	SVC(4x 3MP 190HFOV) x4	SVC(4x 3MP 190HFOV) x4
PLATFORMS	4 TOPS, 6 KDMIPS, 15 FPS R-car V4M	8 TOPS, 15 KDMIPS, 15 FPS R-car V4M/H	90 GFLOPS, 24 FPS R-car V4M/H

PRODUCT OVERVIEW

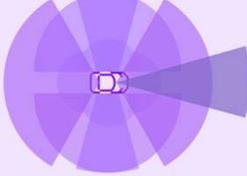
MULTI VISION



MULTI VISION

MULTI VISION utilizes a combination of front, rear, side, and surround-view (fish-eye) cameras, to provide comprehensive object information around the vehicle in both a public road and parking lot environments.

It enables L3 or above ADAS and autonomous driving features in different operational design domain (ODD).

	ADVANCED 	PREMIUM 
SAFETY LEVEL	L2+/L3 Pilot Driving, L3 Memory Parking	L3+ Autonomous Driving, L4 AVP
PRODUCT DESCRIPTION	MULTI VISION ADVANCED provides vision perception features to support high-performance L2+/L3 autonomous driving and parking capabilities within a single integrated ECU known as the DCU (Domain Control Unit)	MULTI VISION PREMIUM provides vision perception features to support L3+/L4 autonomous driving and parking capabilities even in the most challenging operational design domain (ODD).
APPLICATION FEATURES	L3: ALKS(LCA), HWP, TJP + APA, HZP, AVP, 3D Viewing - HWP (Highway Pilot) - TJP (Traffic Jam Pilot) - ALKS (Automated Lane Keeping Assist) - M-AVP (Memory-based Automatic Valet Parking) - PLAD (Parking Lot Autonomous Driving)	L3 features with higher stability & accuracy at wider ODD coverage - Full AVP (Autonomous Valet Parking)
PERCEPTION FEATURES	FFC: VD/PD, LD/RBD, TSR/TLR, FSD, LSD, RMD, GOD/SOD, SCENE, VO/VP, PSD RLC: VD/PD, LD/RBD, FSD, GOD/SOD, PSD SVC: VD/PD, LD/RBD, RMD, GOD/SOD, PSD, FSD, VO/VP, VIS	MC: VD/PD, LD/RBD, TSR/TLR, FSD, LSD, RMD, GOD/SOD, SCENE, VO/VP, PSD SVC: VD/PD, LD/RBD, GOD/SOD, PSD, FSD, VO/VP, VIS
CAMERA	6V <ul style="list-style-type: none"> 8MP FFC(Front Facing Camera), 120HFOV x1 8MP RLC(Rear Looking Camera), 120HFOV x1 3MP SVC(Surround View Camera), 190HFOV x4 (Fisheye) 	11V <ul style="list-style-type: none"> 8MP FFC(Front Facing Camera), 30 & 120HFOV x2 8MP RLC(Rear Looking Camera), 120HFOV x1 8MP SLC(Side Looking Camera), 120HFOV x4 3MP SVC(Surround View Camera), 190HFOV x4 (Fisheye)
PLATFORMS	32 TOPS, 40 KDMIPS, 30 FPS R-car V4H	100+ TOPS, 80 KDMIPS, 30 FPS R-car X5H

PRODUCT OVERVIEW



PRODUCT LINE SPECIFICATION SUMMARY

FRONTVISION	LITE	STANDARD	ADVANCED	IMMERSIVE
	L0-1 EU GSR, EuroNCAP	L2, Safety assist	L2+, Safety assist	IVI, Dynamic Map
CAMERA SYSTEM	1V(Vision-only) FFC(2MP, 100HFOV)x1	1V-5R FFC(2MP, 100HFOV)x1	1V-5R FFC(8MP, 120HFOV)x1	1V(Vision-only) FFC(2MP, 100HFOV)x1
RESOURCE / SOC	2 TOPS, 4 KDMIPS, 24 FPS R-car V3H2.1	4 TOPS, 4 KDMIPS, 30 FPS R-car V4M	8 TOPS, 10 KDMIPS, 30 FPS R-car V4M	8 TOPS, 8 KDMIPS, 30 FPS R-car V4M
SYSTEM APPLICATION	FCW/AEB, LKA, ISA, HBA	LITE + ACC, HWA, TJA, AFS		AR, Dynamic Map
PERCEPTION FEATURE	VD/PD, LD/RBD, TSR, LSD, RMD, SOD, SCENE	LITE + TLR, FSD	STANDARD w/ Far detection range	STANDARD + DM/SS, RSE/REP, VO/VP

SURROUNDVISION	LITE	STANDARD	VISUALIZATION
	L0-1 EU GSR, eMirror	L2 Parking assist	IVI, Visualization
CAMERA SYSTEM	4V(Vision-only) SVC(3MP 190HFOV)x4	4V-12USS SVC(3MP 190HFOV)x4	4V(Vision-only) SVC(3MP 190HFOV)x4
RESOURCE / SOC	4 TOPS / R-car V4M	8 TOPS / R-car V4M	3D GPU 90 GFLOPS / R-car V4H
SYSTEM APPLICATION	BSIS, MOIS, eMirror	APA	SVM Viewing
PERCEPTION FEATURE	VD/PD, LD/RBD	VD/PD, SOD, GOD/FSD, PSD, SF	VIS

MULTIVISION	ADVANCED	PREMIUM
	L2+/L3 Pilot Driving, L3 Memory Parking	L3+ Autonomous Driving & L4 AVP
CAMERA SYSTEM	6V-5R-12USS FFC(8MP, 120HFOV)x1 + RLC(8MP, 120HFOV)x1 + SVC(3MP 190HFOV)x4	11V(Vision-only)-12USS FFC(8MP, 30/120HFOV)x2 + RLC(8MP, 120HFOV)x1 + SLC(2MP, 120HFOV)x4 + SVC(3MP 190HFOV)x4
RESOURCE / SOC	32 TOPS / R-car V4H FFC x1, RLC x1, SVC x4	100+ TOPS / R-car X5H FFC x2, RLC x1, SLC x4, SVC x4
SYSTEM APPLICATION	L3: ALKS, HWP, TJP + APA, HZP, PLAD, Viewing	L3 features with higher stability & accuracy at wider ODD coverage
PERCEPTION FEATURE	FFC: VD/PD, LD/RBD, TSR/TLR, FSD, LSD, RMD, GOD/SOD, SCENE, VO/VP RLC: VD/PD, LD/RBD SVC: VD/PD, LD/RBD, RMD, GOD/SOD, PSD, FSD, SF/PPC, VO/VP, VIS	FFC: VD/PD, LD/RBD, TSR/TLR, FSD, LSD, RMD, GOD/SOD, SCENE, VO/VP RLC/SLC: VD/PD, LD/RBD, RMD, SCENE SVC: VD/PD, LD/RBD, GOD/SOD, PSD, FSD, SF/PPC, VO/VP, VIS

FEATURE STRUCTURE	
ROAD OBJECT	VD (Vehicle Detection & Recognition)
	PD (Pedestrian Detection & Recognition)
	LSD (Light Source Detection & Recognition)
	TSR (Traffic Sign Detection & Recognition)
	TLR (Traffic Light Detection & Recognition)
	GOD (General Object Detection)
ROAD SURFACE	SOD (Static Object Detection & Recognition)
	LD (Lane Detection & Recognition)
	RBD (Road Boundary Detection & Recognition)
	RMD (Road Marking Detection & Recognition)
	FSD (Free Space Detection)
	REP (Road Elevation Profile)
ENVIRONMENT	RSE (Road Slope Estimation)
	PSD (Parking Space Detection)
	SCENE (Scene Classification)
GEOMETRY	SS (Semantic Segmentation)
	DM (DepthMap)
	VO (Visual Odometry)
VISUALIZATION	VP (Visual Positioning)
	SF (Sensor Fusion)
	VIS (Visualization)

PRODUCT OVERVIEW

SOC PLATFORM LANDSCAPE



AD LEVEL	L0 / L1	L2/L2+		L2+ / L3		L3 / L3+
PRODUCT LINE	FrontVision			SurroundVision	MultiVision	
	Lite	Standard	Advanced	Standard/Visualization	Advanced	Premium
CAMERA SYSTEM	FFC(2MP) x1	FFC(2MP) x1	FFC(8MP) x1	SVC(3MP) x4	FFC(8MP) x1, RLC(8MP) x1, SVC(3MP) x4	FFC(8MP)x2 + RLC(8MP)x1 + SLC(8MP)x4 + SVC(3MP)x4
	3.7 TOPS R-car V3H2.1	17 TOPS R-car V4M		34 TOPS R-car V4H	34 TOPS R-car V4H	60-2000TOPS R-car X5H
Compute Processing Power	4x A53 (9.2K DMIPS) 5x CVe v1.1 32thr CNN-IP v2 (3.7 TOPS)	4x A76 (27.2K DMIPS) 4x CVe v2.1 32thr (0.9 TOPS) CNN-IP v3 (14.7 TOPS) DSP (1.6TOPS) GPU (50 GFLOPS)		4x A76 (50K DMIPS) 4x CVe v2.1 32thr (1.2 TOPS) CNN-IP v3 (29.5 TOPS) DSP (3.2TOPS) GPU (150 GFLOPS)	4x A76 (50K DMIPS) 4x CVe v2.1 32thr (1.2 TOPS) CNN-IP v3 (29.5 TOPS) DSP (3.2TOPS) GPU (150 GFLOPS)	32x core (800K DMIPS) GP-DSP (6 TOPS) NPU (400 TOPS) GPU (17 TFLOPS)
SYSTEM APPLICATION	FCW/AEB, LKA, ISA, HBA	FCW/AEB, LKA, ISA, HBA/AFS, ACC, HWA, TJA		APA	L2+/L3 Pilot Driving, Memory Parking	L3+/L4 Autonomous Driving & AVP

**VISION AI FOR ALL
STRADVISION**



Thank You

SEOUL OFFICE
363 Gangnam-daero, Seocho-gu, Seoul 06621, Korea

DETROIT OFFICE
1050 Wilshire Drive, Suite 345, Troy, MI 48084, USA

DÜSSELDORF OFFICE
Necklenbroicher Str. 52-54, 40667 Meerbusch-Büderich,
Germany

TOKYO OFFICE
4F, Shimizu Building, 8-14-18, Nishishinjuku, Shinjuku City,
Tokyo 160-0023, Japan

SHANGHAI OFFICE
280 Hongjing Rd, Minhang Qu, Shanghai Shi 200335, China