

# Next-Generation Automotive Computing Market 2026-2036: ADAS, AI In-Cabin Monitoring, Centralization, and Connected Vehicles

<https://marketpublishers.com/r/N4E6B0FDB2F7EN.html>

Date: November 2025

Pages: 992

Price: US\$ 1,750.00 (Single User License)

ID: N4E6B0FDB2F7EN

## Abstracts

The automotive computing market stands at an inflection point, transforming from traditional embedded controllers into sophisticated AI-powered platforms rivaling datacenter infrastructure. This evolution, driven by autonomous driving's computational demands and software-defined vehicle architectures, represents one of the semiconductor industry's fastest-growing segments.

Autonomous vehicles demand unprecedented computational power. A Level 2+ system processing camera feeds, radar returns, and sensor fusion requires 30-100 TOPS (Tera Operations Per Second) of AI inference capability. Level 3 conditional automation doubles this requirement to 100-250 TOPS through redundant processing paths mandated by safety regulations. Level 4 robotaxis push boundaries further, consuming 250-1,000+ TOPS across multiple System-on-Chips handling perception, prediction, planning, and control simultaneously. This exponential scaling—basic Level 2 systems managing with 5-20 TOPS just five years ago—propels compute platform evolution.

Beyond raw performance, automotive computing must satisfy constraints foreign to consumer electronics. Functional safety certifications (ISO 26262 ASIL-B through ASIL-D) require provable reliability and fault tolerance. Operating temperature ranges spanning -40°C to +105°C, vibration tolerance across millions of cycles, and 15+ year operational lifetimes distinguish automotive-grade silicon from consumer chips optimized for 2-3 year replacement cycles. Power consumption becomes critical in electric vehicles where every watt of compute drains driving range—Level 4 systems drawing 400-600 watts can reduce range by 7-10%, necessitating liquid cooling and aggressive power management.

Nvidia dominates high-performance autonomous computing with its Drive platform, supplying Mercedes, Volvo, Lucid, and numerous Chinese OEMs. The Orin SoC (254 TOPS) captures the L2+/L3 market, while the forthcoming Thor (2,000 TOPS, 2025-2026 production) targets Level 4 applications. Nvidia's competitive moat combines hardware performance with comprehensive software stacks—CUDA compatibility, simulation tools (Omniverse), and perception libraries enabling rapid customer development. Qualcomm challenges Nvidia in mid-tier segments with Snapdragon Ride platforms. The SA8295P (30 TOPS) wins design sockets in BMW, GM, Stellantis, and Renault vehicles, leveraging Qualcomm's automotive connectivity expertise (integrating 5G modems, V2X, WiFi) into unified platforms. Qualcomm's strategy emphasizes cost-effectiveness and power efficiency over absolute performance, positioning for mass-market L2/L2+ deployments where Nvidia's premium pricing proves prohibitive.

Mobileye (Intel) pursues vertical integration, bundling EyeQ SoCs with proprietary perception software and REM crowdsourced mapping. The EyeQ6 (34 TOPS) and upcoming EyeQ Ultra (176 TOPS) target L2+ through L3 systems, with 40+ OEM partnerships including Volkswagen, Nissan, and Geely. Mobileye's installed base exceeds 100 million vehicles, providing data advantages for AI training and map generation, though closed ecosystem alienates OEMs seeking flexible software development.

Regional dynamics reshape competition. Chinese players capture domestic market share amid U.S. export restrictions on advanced AI chips. Horizon's Journey 5 (96 TOPS) powers XPeng, Li Auto, and SAIC vehicles, while geopolitical considerations drive Chinese OEMs toward indigenous compute solutions. This balkanization threatens industry consolidation, potentially creating incompatible regional ecosystems. Tesla's custom FSD Computer exemplifies vertical integration's extreme—proprietary neural network accelerators optimized specifically for Tesla's perception algorithms, manufactured by Samsung on 7nm process nodes. While serving only Tesla vehicles, the approach demonstrates performance and cost advantages from co-designing hardware and software, influencing OEM strategies toward custom silicon (GM's Cruise chips, Mercedes partnerships with Nvidia for semi-custom designs).

The computing market bifurcates into distinct tiers. Mass-market L2 systems standardize on 30-60 TOPS solutions costing \$200-400 per vehicle, emphasizing integration and power efficiency. Premium L3 platforms consume \$800-1,500 in compute hardware, incorporating redundancy and higher performance. Commercial L4 robotaxis justify \$3,000-5,000 compute investments through operational revenue, though costs must decline toward \$1,500-2,500 for economic viability at scale.

Consolidation appears inevitable as development costs (multi-billion dollar per-generation chip design, software ecosystem maintenance) limit sustainable competitors to 4-6 global players plus regional champions. The winners will master not just silicon performance but ecosystem richness—simulation environments, developer tools, middleware, and AI training pipelines transforming automotive computing from component supply into platform competition analogous to mobile computing's iOS versus Android dynamics. By 2030, automotive computing platforms may determine vehicle differentiation more than mechanical engineering, fundamentally restructuring century-old industry value chains.

"Next-Generation Automotive Computing Market 2026-2036: ADAS, AI In-Cabin Monitoring, Centralization, and Connected Vehicles" provides an authoritative analysis of the next-generation automotive computing ecosystem, projecting market evolution from 2026 through 2036 across all major technology domains reshaping vehicle development. This report dissects the technological, regional, and competitive dynamics driving this transformation across Advanced Driver Assistance Systems (ADAS), autonomous driving (SAE Levels 0-5), in-cabin monitoring systems, software-defined vehicle architectures, and connected vehicle technologies.

The report delivers granular forecasts and strategic analysis across five critical market segments. ADAS and autonomous driving technologies receive comprehensive treatment spanning sensor suites (cameras, radar, LiDAR), perception and sensor fusion architectures, compute platforms requiring 30-1,000+ TOPS (Tera Operations Per Second) depending on autonomy level, and regional deployment dynamics. Detailed analysis reveals China's acceleration toward Level 2+ dominance with urban Navigation on Autopilot (NOA) systems, Europe's regulatory-driven ADAS adoption mandating features like Automatic Emergency Braking and Driver Monitoring Systems by 2024-2025, and North America's profitable but slower-growth trajectory focused on highway pilot applications.

In-cabin monitoring systems constitute a rapidly emerging market by 2030, driven by regulatory mandates (EU General Safety Regulation, China GB standards) and autonomous driving requirements. The report analyzes Driver Monitoring Systems (DMS) and Occupant Monitoring Systems (OMS) technology evolution from legacy steering torque sensors to advanced AI-powered camera and radar solutions delivering gaze tracking, drowsiness detection, and comprehensive cabin safety monitoring. Market forecasts cover NIR cameras, visible light systems, ToF sensors, radar-based monitoring, and emerging multi-modal approaches across all autonomy levels.

Software-Defined Vehicle (SDV) architectures represent the fundamental restructuring of automotive electrical/electronic systems, transitioning from 100+ distributed ECUs to centralized zone-based computing. The report's SDV maturity model (Levels 0-4) benchmarks major OEMs including Tesla, BYD, XPeng, Nio, Mercedes-Benz, BMW, and Volkswagen against architectural evolution criteria: computing centralization, over-the-air update capabilities, service-oriented architectures, and feature monetization strategies. Market sizing covers central compute platforms, zone controllers, automotive Ethernet infrastructure, hypervisors, containerization, and connected services generating \$30-50 billion annual recurring revenue by 2035.

LiDAR, radar, and camera technologies receive detailed technical and market analysis, including 4D imaging radar emergence, solid-state LiDAR cost trajectories (targeting \$200-500 by 2027-2030), and sensor fusion architectures. The report identifies Chinese LiDAR manufacturers (Hesai, RoboSense, Livox, Seyond) capturing 60%+ global market share through aggressive pricing and domestic OEM partnerships. Connected vehicle and V2X technologies forecasts track C-V2X chipset adoption, infrastructure deployment across China's 28,000+ roadside units, and autonomous vehicle coordination applications.

Regional market dynamics receive comprehensive treatment with decade-long forecasts (2026-2036) for the United States, China, Europe, and Japan covering vehicle sales by SAE level, ADAS feature penetration rates, sensor adoption curves, and revenue projections. The analysis reveals China's structural advantages in ADAS development—integrated hardware-software ecosystems, aggressive OTA deployment, cost-optimized domestic supply chains, and supportive regulatory frameworks—positioning Chinese OEMs for global technology leadership by 2028-2030.

### **Report Contents include:**

#### Technology Analysis:

SAE Level 0-5 autonomous driving systems with 20-year deployment forecasts

Multi-sensor fusion architectures: early, late, and mid-level fusion strategies

ADAS processor market sizing: front cameras, central computing,

radar/LiDAR processing

LiDAR technology comparison: MEMS, solid-state flash, FMCW systems

4D imaging radar capabilities vs. traditional radar and LiDAR

In-cabin sensing: DMS/OMS hardware and AI software evolution

End-to-end neural network architectures vs. modular pipelines

Software-defined vehicle maturity models and OEM benchmarking

#### Market Forecasts (2024-2036):

Global vehicle sales by SAE automation level

ADAS feature adoption by region: ACC, LKA, AEB, automated parking

Sensor volumes and revenues: cameras, radar, LiDAR, ultrasonics

Automotive processor shipments and wafer production requirements

In-cabin monitoring system penetration and technology mix

LiDAR-equipped vehicle forecasts for passenger cars and robotaxis

Connected vehicle and V2X chipset markets

Central compute platform and zone controller revenues

OTA software update and subscription service markets

#### Regional Market Analysis:

United States: state-by-state L2+/L3 adoption patterns, regulatory landscape

China: tier-city penetration forecasts, domestic vs. foreign OEM strategies

Europe: EU General Safety Regulation impact, Euro NCAP protocol evolution

Japan: market challenges, non-Japanese brand penetration, aging demographics

#### Competitive Landscape:

300+ company profiles across OEMs, Tier-1 suppliers, semiconductor vendors, software providers

OEM ADAS strategies

Tier-1 supplier analysis

Computing platforms

LiDAR suppliers: Chinese dominance vs. Western players

Software-defined vehicle leaders: architecture evolution, middleware, OTA platforms

#### Strategic Business Intelligence:

Liability frameworks across autonomy levels by jurisdiction

ADAS subscription and feature-on-demand business models

Fleet learning and data monetization strategies

V2X deployment challenges and funding mechanisms

Autonomous vehicle coordination technologies

Generative AI applications: in-vehicle assistants, design workflows, digital twins

SDV feature monetization: subscriptions, unlocks, data services, in-

vehicle commerce

**Companies covered in this report include:**

5GAA, 7invenu, Acconeer, Actronika, ADASTEC, Aeva, AEye, AiDEN, Aidin Robotics, AION, Aisin, Aito, Algolux, Alibaba Group, Allwinner Technology, Alphabet, Alps Alpine, Amazon, Ambarella, AMD, Amf, ams OSRAM, Analog Photonics, Apollo, Apple, Aptiv, Arbe, Arcfox, Argo, ARM, Arriver, Artosyn, Aryballe, Athos Silicon, Audi, Aumovio, AUO, Aurora, AutoChips, Autocrypt, Autotalks, Autox, Avatr, AWS, Baidu, Baraja, Beijing Morelite Semiconductor, Beijing Surestar Technology, Black Sesame Technologies, Blaize, Blickfeld, BMW, BOS, Bosch, Broadcom, BYD, Cambricon, CardioID, Cariad, CEA Liten, Celestica, Cepton Technologies, Chery, Cipia, Cohda Wireless, Coherent, Commsignia, Continental, Cruise, Daimler, DeepMap, Delphi, Dena, Denso, Desay SV, Didi, DJI, Dongfeng Lantu Automobile, EasyMile, EcarX, Eckhardt Optics, Eeasy.Tech, Efinix, Emotion3D, Epicnpoc, Ethernovia, Excelitas Technologies, Eyeris, Fabrinet, Faurecia, FCA, Five, ForcIOT, Ford, Foxconn, Fujitsu, Geely, General Motors, Geo Semiconductor, Google, Great Wall, Guangshao Technology, Hailo, Halo, Hamamatsu Photonics, Harman, HAVAL, Hella, Hesai, HiRain, HiSilicon, Hitronics Technologies, Honda, Hongoi, Hongqi Auto, Horizon Robotics, Huawei, Human Design Group, Hypersen Technologies, Hyundai Mobis, IM Motors, Imagination Technologies, Infineon, InnovationLab, Innoviz Technologies, Intel, Iridian Spectral Technologies, Jabil, Jaguar, Jetour, Joyson Safety Systems, Jungo Connectivity, Kalray, Kneron, Koito, Kyocera, Laser Components, Lattice Semiconductor, Leapmotor, LeddarTech, LeiShen Intelligent System, Leonardo, Lexus, LG, LG Innotek, Li Auto, Lidwave, Livox, Lotus, Lumentum, Lumibird, Luminar, Lumotive, Luxeed, Lyft, Magna, Mahindra, Marelli, Marvell, MAXUS, Mediatek, Melexis, Meller Optics, Mercedes-Benz, Micro Photon Devices, Microchip, Microsoft, MIPS, Mitsubishi Electric, Mobileye, Momenta, Monumo, Morningcore, Motional, Movento, Murata, Myant, NavInfo, Navtech, Navya, Next2U, Nextcore, Nikon, NIO, Nissan, Nuance, NVIDIA, NXP, OEwaves, Ommatidia LiDAR, OmniVision, ON Semiconductor, OpenAI, Ophir, Oplatek, Oppo, OQmented, Ottopia, Ouster, Panasonic, Phantom Auto, PIX Moving, Pointcloud, Polestar, Pontosense, Pony.AI, PreAct Technologies, Preciseley Microtechnology, Prophesee, PSA, PSSI, Qcraft, Quadric, Qualcomm, Quantel Laser, Quantum Semiconductor International (QSI), Quectel, Recogni, Renault Nissan, Renesas, Rivian, Robosense, Rockchip, Rolling Wireless, SAIC-GM-Wuling Automobile, Samsung, Sanmina, SaverOne, Scantinel Photonics, Seeing Machines, SemiDrive, Seminex, Senseair, SenseTime, Seres Automotive, Seyond, Siengine, SiLC Technologies, SiMa.ai, Singgo, Skywater, Smart Eye, Softkinetic, Sony, Steerlight, Stellantis, STMicroelectronics,

Subaru, Tacteron, TCL Technology, Telechips, Teledyne FLIR, Teraxion, Tesla, Texas Instruments, Thorlabs, Tobii, Toshiba, Toyota, TriEye, TriLumina (Lumentum), Trumpchi, TSMC, Uhnder, Ultraleap, Unieke, UNISOC, Unity, Untether AI, Valeo, Vayyar, Veoneer, VeriSilicon, Videantis, Visionox, Visteon, Volkswagen, Volvo, Voyant Photonics, Vsora, WaveSense, Waymo, Webasto, WeRide, WEY, WHST, Wideeye, Woven Planet, XenomatiX, XFAB, Xiaomi, Xilinx, XPeng, Xperi, Zeekr, Zelostech, Zenseact, ZF Friedrichshafen, Zoox, and ZTE.

## Contents

### 1 EXECUTIVE SUMMARY

- 1.1 Market Overview
- 1.2 Key Technology Trends
  - 1.2.1 Centralization Dominates Architecture Evolution
  - 1.2.2 Chinese Ecosystem Disruption
  - 1.2.3 L2+ Emerges as Critical Middle Ground
  - 1.2.4 In-Cabin Sensing Regulatory Wave
  - 1.2.5 Software Defining Value
  - 1.2.6 Chiplet Technology Promises Flexibility
- 1.3 Regional Market Dynamics

### 2 ENABLING TECHNOLOGIES: LIDAR, RADAR, CAMERAS, INFRARED

- 2.1 Connected Vehicles
- 2.2 Localization
- 2.3 AI and Training
- 2.4 Teleoperation
- 2.5 Cybersecurity
- 2.6 Autonomous Vehicle Sensors
  - 2.6.1 Autonomous Driving Technologies
  - 2.6.2 The Primary Three Sensors - Cameras, Radar, and LiDAR
  - 2.6.3 Sensor Performance and Trends
    - 2.6.3.1 Radar Evolution
    - 2.6.3.2 LiDAR Evolution
  - 2.6.4 Robustness to Adverse Weather
  - 2.6.5 Evolution of Sensor Suite From Level 1 to Level 4
  - 2.6.6 What is Sensor Fusion?
    - 2.6.6.1 Fusion Architectures
    - 2.6.6.2 Fusion Challenges and Research Frontiers
- 2.7 Autonomy and Electric Vehicles
  - 2.7.1 EV Range Reduction
  - 2.7.2 The Vulnerable Road User Challenge in City Traffic
  - 2.7.3 Pedestrian Risk Detection
    - 2.7.3.1 Risk Assessment Factors
    - 2.7.3.2 Multi-Modal Risk Fusion
  - 2.7.4 Recommended Sensor Suites For SAE Level 2 to Level 4 & Robotaxi

#### 2.7.4.1 Key Evolutionary Trends

### 2.8 Cameras

- 2.8.1 Technical Specifications
- 2.8.2 Placement Optimization
- 2.8.3 AI Processing Pipeline
- 2.8.4 Limitations and Failure Modes
- 2.8.5 IR Cameras
  - 2.8.5.1 Short-Wave Infrared (SWIR)

### 2.9 Radar

- 2.9.1 Technical Specifications
- 2.9.2 Advantages Over LiDAR
- 2.9.3 Limitations
- 2.9.4 Future Trajectory

### 2.10 LiDAR

- 2.10.1 LiDAR Fundamentals
- 2.10.2 LiDAR Scanning Mechanisms
  - 2.10.2.1 Mechanical Spinning Systems
  - 2.10.2.2 MEMS Mirror Scanning
  - 2.10.2.3 Solid-State Flash LiDAR
  - 2.10.2.4 Frequency-Modulated Continuous Wave (FMCW)
- 2.10.3 Automotive LiDAR Performance
- 2.10.4 Key Advantages
- 2.10.5 Limitations
- 2.10.6 Future Outlook

## **3 AUTONOMOUS DRIVING AND ADAS**

### 3.1 SAE Levels of Driving Automation (L0-L5)

- 3.1.1 Key Distinctions Between Levels
- 3.1.2 Level 2, Level 2+, and Level 3 Definitions

### 3.2 Summary of Privately Owned Autonomous Vehicles

- 3.2.1 Level 0 - No Automation
- 3.2.2 Level 2+ - Enhanced Partial Automation
- 3.2.3 Level 2 (Partial Automation)
- 3.2.4 Level 2+ (Enhanced Partial Automation)
  - 3.2.4.1 Chinese L2+ Market Leadership
  - 3.2.4.2 L2+ Emergence as De Facto Category
  - 3.2.4.3 L2+ Regulatory Evolution
  - 3.2.4.4 L2+ Market Penetration Forecast

- 3.2.4.5 Level 2+ Could Be Long-Term Middle Ground
- 3.2.4.6 L2+ Technology Improving Rapidly (Closing Gap with L3):
- 3.2.4.7 Tesla's L2+ Strategy Validating Approach:
- 3.2.4.8 Economic Pressure Favoring L2+
- 3.2.5 Level 3 - Conditional Automation
  - 3.2.5.1 Current ODD Limitations (2024-2025)
  - 3.2.5.2 Why L3 Deployment is Limited (2024-2025)
  - 3.2.5.3 Biggest Barriers to L3 or L4 - Liability
- 3.2.6 Level 4 - High Automation
- 3.2.7 Level 5 - Full Automation
- 3.3 Roadmap of Autonomous Driving Functions in Private Cars
  - 3.3.1 Historical Evolution (2000-2024)
  - 3.3.2 Current State (2024-2025)
  - 3.3.3 Roadmap by Region (2024-2036)
    - 3.3.3.1 North America
    - 3.3.3.2 Europe
    - 3.3.3.3 China
    - 3.3.3.4 Japan
- 3.4 L2 and L2+ Autonomous Driving Systems and Brands
  - 3.4.1 System Technology
    - 3.4.1.1 Chinese L2+ Systems
- 3.5 ADAS Features
  - 3.5.1 AEB (Automatic Emergency Braking)
  - 3.5.2 Luxury ADAS Features: CC/ACC (Cruise Control / Adaptive Cruise Control)
  - 3.5.3 LDW/LKA/LCA (Lane Departure Warning / Lane Keep Assist / Lane Change Assist)
  - 3.5.4 BSM/BSD (Blind Spot Monitoring/Detection)
  - 3.5.5 Signal Recognition (TSR - Traffic Sign Recognition)
  - 3.5.6 Rear/360° Parking (Cameras)
  - 3.5.7 Auto Parking (Automated Parking Assist)
- 3.6 Overview of ADAS Market Trends
  - 3.6.1 Major Developments 2023-2022
  - 3.6.2 Year-on-Year Increase in SAE Level 2 Adoption
  - 3.6.3 China's Dominance
  - 3.6.4 Europe's Regulatory-Driven Growth
  - 3.6.5 US Market Dynamics
  - 3.6.6 High Levels of Autonomy Means More Sensors per Vehicle:
  - 3.6.7 LiDAR is for Level 3 and the Chinese Market:
    - 3.6.7.1 LiDAR Market Forecast Implications

- 3.7 L2+/L3 Feature Adoption Forecast by Region
  - 3.7.1 Global L2+/L3 Feature Adoption Forecast
    - 3.7.1.1 United States
    - 3.7.1.2 China
    - 3.7.1.3 Europe
    - 3.7.1.4 Japan
- 3.8 Global Vehicle Sales and Peak Car by SAE Level: 2022-2045
- 3.9 SAE Level Evolution
  - 3.9.1 L0/L1 (No/Minimal ADAS) - Regulatory Extinction
  - 3.9.2 L2 (Combined ACC + LKA) - Peak and Plateau
  - 3.9.3 L2+ (Hands-Off, Eyes-On) - Rapid Growth to Mainstream
  - 3.9.4 L3 (Conditional Automation) - Premium Niche to Mainstream
  - 3.9.5 L4+ (High/Full Automation) - Emerging Personal Vehicles
  - 3.9.6 Peak Car Analysis - Developed vs. Emerging Markets
  - 3.9.7 Implications for ADAS Market
- 3.10 Comparison of Multi-Sensor and Pure Vision Solutions
- 3.11 End-to-End (E2E) Architecture
  - 3.11.1 Traditional Modular Pipeline vs. End-to-End Architecture
  - 3.11.2 Advantages of E2E
  - 3.11.3 Challenges of E2E
  - 3.11.4 Deployment of End-to-End Models in Vehicles
  - 3.11.5 Why Most OEMs Not Adopting E2E
- 3.12 Sensor suite for ADAS cars
  - 3.12.1 Evolution of Sensor Suite From Level 1 to Level 4
  - 3.12.2 Cost Implications
  - 3.12.3 Sensors and Their Purpose
  - 3.12.4 Sensor Complementarity (Why Multi-Sensor Fusion)
  - 3.12.5 Evolution of Sensor Suites from Level 1 to Level 4
  - 3.12.6 Sensor Count Trends
  - 3.12.7 Camera Systems
  - 3.12.8 Typical Sensor Suite for ADAS Passenger Cars - Camera and Radar
    - 3.12.8.1 Integrated Front-View Cameras
    - 3.12.8.2 Regulatory Drivers for Camera ADAS
    - 3.12.8.3 Performance Trends
    - 3.12.8.4 External Cameras for Autonomous Driving
  - 3.12.9 Radar Systems
    - 3.12.9.1 Front Radar Applications
    - 3.12.9.2 The Role of Side Radars
    - 3.12.9.3 Front and Side Radars per Car

- 3.12.9.4 Total Radars per Car for Different SAE Levels
- 3.12.9.5 4D Imaging Radar - Next Generation
- 3.12.10 LiDAR Systems
  - 3.12.10.1 LiDAR Deployment
  - 3.12.10.2 Automotive LiDAR Players by Technology
  - 3.12.10.3 LiDAR Cost Trajectory and Mass-Market Viability
- 3.13 Market Challenges and Evolution
  - 3.13.1 China's Top 4 LiDAR Manufacturers Dominate 2024 Market
    - 3.13.1.1 Why Chinese LiDAR Dominance?
  - 3.13.2 ADAS Tier 1 Suppliers Facing Unprecedented Challenges
    - 3.13.2.1 Tier-1 Strategic Responses
    - 3.13.2.2 Market Outlook - Tier-1 Consolidation
- 3.14 Autonomous Vehicle Adoption and Revenue Forecasts by Region
  - 3.14.1 United States: 2022-2045
  - 3.14.2 China: 2022-2044
  - 3.14.3 Europe (EU + UK + EFTA): 2022-2044
  - 3.14.4 Japan: 2022-2044
- 3.15 Regional Dynamics
  - 3.15.1 China's Dominance Accelerating
  - 3.15.2 US Market - Profitable but Slower Growth
  - 3.15.3 Europe - Regulatory Leadership, Technology Lag
  - 3.15.4 Japan - Falling Behind
  - 3.15.5 Rest of World - Emerging Opportunity
- 3.16 Passenger ADAS Vehicle Market Readiness
  - 3.16.1 ADAS Feature Deployment in US
  - 3.16.2 ADAS Feature Deployment in China
    - 3.16.2.1 China ADAS Ecosystem
    - 3.16.2.2 China L2+ / NOA Solution Providers/Suppliers
    - 3.16.2.3 Tier-1 Suppliers (Traditional + Pivoting to Software)
    - 3.16.2.4 Chinese OEMs - L2+ / NOA Development Timeline
    - 3.16.2.5 Chinese OEMs - L2+ / NOA Development
    - 3.16.2.6 Chinese OEMs - Analysis of Sensor Configurations for NOA
  - 3.16.3 ADAS Feature Deployment in EU
  - 3.16.4 ADAS Feature Deployment in Japan
- 3.17 Global OEM Analysis

## **4 IN-CABIN MONITORING**

### 4.1 An Overview of DMS and OMS Systems Within In-Cabin Monitoring

- 4.1.1 Driver Monitoring Systems (DMS)
- 4.1.2 Occupant Monitoring Systems (OMS)
  - 4.1.2.1 OMS Technology Landscape
  - 4.1.2.2 Radar Emerging as Key OMS Technology
- 4.1.3 DMS vs. OMS - Market Segmentation
- 4.1.4 Integration Trends
- 4.2 Trends of In-Cabin Sensing
  - 4.2.1 Regulatory Mandates Driving Mass Adoption
    - 4.2.1.1 European Union
    - 4.2.1.2 China
    - 4.2.1.3 United States
  - 4.2.2 Transition from Hands-On Detection to Camera-Based DMS
  - 4.2.3 AI and Machine Learning Transforming Capability
    - 4.2.3.1 Emerging AI Capabilities (2024-2026)
  - 4.2.4 Expansion to Full Cabin Monitoring (OMS)
  - 4.2.5 Integration with ADAS and Autonomous Systems
  - 4.2.6 Cost Reduction Through Scale and Integration
- 4.3 What is a Driver Monitoring System (DMS)?
  - 4.3.1 Core DMS Functions
  - 4.3.2 DMS Technology Stack
    - 4.3.2.1 Hardware Components
    - 4.3.2.2 Software Stack
  - 4.3.3 Why Does the Driver Need Monitoring?
    - 4.3.3.1 The Human Factor in Traffic Safety
    - 4.3.3.2 Specific Driver Impairment Types
    - 4.3.3.3 The Automation Paradox
    - 4.3.3.4 L3 Takeover Challenge
    - 4.3.3.5 Consumer Acceptance and Benefits
    - 4.3.3.6 Regulatory Mandates
- 4.4 Current Technologies for Interior Monitoring System (IMS)
  - 4.4.1 Technology Classification
  - 4.4.2 Primary Technology Categories
    - 4.4.2.1 Camera-Based Systems:
  - 4.4.3 Driver Monitoring System (DMS)
    - 4.4.3.1 NIR Camera-Based DMS (Dominant Technology)
    - 4.4.3.2 Visible Light Camera-Based DMS (Declining Technology):
    - 4.4.3.3 Steering Torque Sensor-Based DMS (Legacy Technology):
    - 4.4.3.4 Capacitive Steering Wheel DMS
    - 4.4.3.5 Hybrid/Multi-Modal DMS (Emerging Technology)

## 4.5 In-Cabin Sensing for Autonomous Cars

### 4.5.1 Level-Specific In-Cabin Sensing Requirements

4.5.1.1 Level 2+ (Hands-Off, Eyes-On) - High Monitoring Intensity

4.5.1.2 Level 3 (Conditional Automation) - Critical Monitoring Intensity

4.5.1.3 Level 4 (High Automation) - Reduced but Shifted Monitoring

4.5.1.4 Level 5 (Full Automation) - Passenger Monitoring Only

## 4.6 Evolution of DMS Sensor Suite From SAE Level 1 to Level 4

### 4.6.1 Key Technology Transitions

## 4.7 Emerging Technologies in In-Cabin Sensing

### 4.7.1 Printed Sensors for Smart Cockpits

4.7.1.1 Human-machine interface (HMI) design + printed sensor integration

4.7.1.2 Printed Electronics for Automotive

4.7.1.3 Software to Integrate Smart Cockpit Components

4.7.1.4 Localized Haptics on Cockpit Screens

4.7.1.5 Mid-Air Haptics for Automotive

4.7.1.6 Digital Olfaction for Automotive Use Cases

### 4.7.2 Alternate Eye Movement Tracking Technologies

4.7.2.1 Eye-Tracking for DMS

4.7.2.2 Eye-Tracking Sensor Categories

4.7.2.3 Eye-Tracking Using Cameras with Machine Vision

### 4.7.3 Event-Based Vision for Eye-Tracking

4.7.3.1 Eye-Tracking Benefits

4.7.3.2 Event-Based Vision: Pros and Cons

4.7.3.3 Importance of Software for Event-Based Vision

4.7.3.4 Eye Tracking with Laser Scanning MEMS

4.7.3.5 Capacitive Sensing of Eye Movement

### 4.7.4 Brain Function Monitoring

4.7.4.1 Brain Function Monitoring Technologies

4.7.4.2 Trends in Brain Measurement Technology for Cognitive Workload Monitoring

4.7.4.3 Magnetoencephalography

4.7.4.4 Brain Function Monitoring in the Automotive Space

4.7.4.5 Cardiovascular Metrics

### 4.7.5 Case Studies and Real World Examples of In-Cabin Sensing Applications

4.7.5.1 BMW iX and X5

4.7.5.2 GM's Super Cruise

4.7.5.3 Polestar 3 Driver Monitoring System

4.7.5.4 Jaguar Land Rover

4.7.5.5 Audi FitDriver

4.7.5.6 MAXUS MIFA 9: DMS + Dual OMS

- 4.7.5.7 Trumpchi GS8
- 4.7.5.8 Jetour Dashing X90
- 4.7.5.9 Haval - F7
- 4.7.5.10 Wey - VV6
- 4.7.5.11 Subaru's DMS
- 4.7.5.12 Ford - BlueCruise Technology
- 4.7.5.13 Tesla - IR-Based DMS
- 4.7.5.14 Tesla In-Cabin Radar
- 4.7.5.15 Nissan - ProPilot 2.0
- 4.7.5.16 Toyota and Lexus
- 4.7.5.17 XPeng Motors
- 4.7.5.18 Nio ET7 - DMS and OMS Cameras
- 4.7.5.19 Li Auto L9 - 3D ToF Camera
- 4.7.5.20 Li Auto - 2D IR Camera for DMS
- 4.7.5.21 AION
- 4.7.5.22 Hongqi Auto - Capacitive Steering Wheels + Fatigue Detection Cameras

#### 4.8 In-Cabin Sensing market forecasts

- 4.8.1 Yearly Volume and Market Size of In-Cabin Sensors
- 4.8.2 Forecast by In-Cabin Sensor Type
- 4.8.3 Market Share by In-Cabin Sensor Type
- 4.8.4 Market Share by In-Cabin Imaging Technology
- 4.8.5 Hands-On Detection (HOD) Sensor Forecast
- 4.8.6 Regional In-Cabin Sensing Forecasts
- 4.8.7 Addressable Market by Region (2025-2045)
- 4.8.8 Addressable Market by SAE Level (2025-2036)

## 5 SOFTWARE-DEFINED VEHICLES (SDV)

### 5.1 What is a Software-Defined Vehicle?

- 5.1.1 Core Characteristics of Software-Defined Vehicles
- 5.1.2 SDV Market Drivers
- 5.1.3 SDV Value Chain Transformation
- 5.1.4 OEM Strategic Imperative
  - 5.1.4.1 Three Strategic Archetypes

### 5.2 SDV Architecture Evolution

- 5.2.1 Phase 1: Distributed ECUs (Legacy, Pre-2015)
- 5.2.2 Phase 2: Domain Controllers (2015-2025)
- 5.2.3 Phase 3: Zonal Architecture (2023-2030 Transition)
  - 5.2.3.1 Phase 4: Central Compute (2028-2040 Vision)

- 5.2.4 Key Enabling Technologies
  - 5.2.4.1 Centralized Computing Architecture
  - 5.2.4.2 Over-the-Air (OTA) Update Capability
  - 5.2.4.3 Service-Oriented Architecture (SOA)
  - 5.2.4.4 High-Performance Computing Platforms
  - 5.2.4.5 Connectivity (Always-On Cloud Connection):
- 5.2.5 Automotive Ethernet - High-Speed Backbone
  - 5.2.5.1 Time-Sensitive Networking (TSN) - Critical Extension
  - 5.2.5.2 Automotive Ethernet Market Sizing
- 5.2.6 Hypervisors
  - 5.2.6.1 Automotive Hypervisor Requirements
  - 5.2.6.2 Hypervisor Market Sizing
- 5.2.7 Containerization - Application Portability
  - 5.2.7.1 Containers vs. VMs
  - 5.2.7.2 Automotive Container Technologies
  - 5.2.7.3 Container Use Cases in Automotive
  - 5.2.7.4 Kubernetes for Vehicles
  - 5.2.7.5 Critical Success Factors for SDV Transformation
- 5.3 Software-Defined Vehicle Level Guide
  - 5.3.1 SDV Maturity Model - Five Levels
  - 5.3.2 SDV Level Chart: Major OEMs Compared
  - 5.3.3 Regional SDV Leadership Patterns
  - 5.3.4 SDV Level 0: Hardware-Defined Vehicle
  - 5.3.5 SDV Level 1: Connected Vehicle - Detailed Analysis
    - 5.3.5.1 Key Enabler: Telematics Control Unit (TCU)
    - 5.3.5.2 Connected Services Enabled
    - 5.3.5.3 Limited OTA Update Capability
    - 5.3.5.4 Architecture Begins to Evolve
  - 5.3.6 SDV Level 2: Domain Controlled Vehicle
    - 5.3.6.1 Extended OTA Capability
    - 5.3.6.2 AUTOSAR Adaptive Platform
  - 5.3.7 SDV Level 3: Centralized Software-Defined Vehicle
    - 5.3.7.1 The Zonal Architecture Transformation
    - 5.3.7.2 Central Compute Platform Architecture
    - 5.3.7.3 Dramatic Wiring Reduction
    - 5.3.7.4 Full Vehicle OTA - All Systems Updatable
    - 5.3.7.5 Third-Party App Ecosystem (Emerging):
  - 5.3.8 SDV Level 4: Fully Software-Defined Vehicle
    - 5.3.8.1 The Ultimate SDV Vision

- 5.3.8.2 Minimal Hardware Architecture - Central Supercomputing
- 5.3.8.3 Computing Power Trajectory
- 5.3.8.4 Hardware Abstraction Benefits
- 5.3.8.5 Continuous AI/ML Model Updates
- 5.3.8.6 Cloud-Edge Continuum - Hybrid Computing
- 5.3.8.7 Vehicle as Edge Node in Smart City
- 5.3.8.8 Extreme Personalization - AI-Driven
- 5.3.8.9 Business Model Evolution
- 5.3.8.10 Level 4 Market Status (2024-2025)
- 5.3.8.11 Forecast - Level 4 Adoption
- 5.4 SDV Market Size and Forecast
  - 5.4.1 Geographic Distribution
  - 5.4.2 China
    - 5.4.2.1 Drivers
    - 5.4.2.2 SDV Business Models
    - 5.4.2.3 Challenges
  - 5.4.3 United States
    - 5.4.3.1 US Market Segmentation
    - 5.4.3.2 Drivers and Barriers
    - 5.4.3.3 SDV Business Models:
  - 5.4.4 Europe
    - 5.4.4.1 OEM Strategies
    - 5.4.4.2 European Regulatory Framework
    - 5.4.4.3 European Market Fragmentation
    - 5.4.4.4 SDV Revenue Models
    - 5.4.4.5 European SDV Outlook - 2030 and Beyond
  - 5.4.5 Japan
    - 5.4.5.1 OEM SDV Strategies
  - 5.4.6 SDV Sub-Market Detailed Forecasts
    - 5.4.6.1 Central Compute Platform Market
    - 5.4.6.2 Connected Services Market
    - 5.4.6.3 Subscription vs. One-Time Purchase Models
    - 5.4.6.4 Consumer Acceptance Analysis
    - 5.4.6.5 E/E Architecture Hardware Market - Zone Controller
    - 5.4.6.6 Zone Controller Technology Evolution
    - 5.4.6.7 OTA Software Update Market
    - 5.4.6.8 Software Platform & Middleware Market
  - 5.4.7 Notable Failures and Cautionary Tales
- 5.5 Personalization and User Profiles

- 5.5.1 Multi-Dimensional Personalization
- 5.5.2 Driver Recognition Technologies
- 5.5.3 Privacy Considerations
- 5.5.4 Business Value of Personalization
- 5.6 Autonomous Driving Improvement via Fleet Learning
  - 5.6.1 Fleet Learning Architecture
  - 5.6.2 Economic Model of Fleet Learning
  - 5.6.3 Chinese OEM Fleet Learning Competition
  - 5.6.4 Regulatory and Ethical Considerations
- 5.7 Vehicle-to-Everything (V2X) Integration
  - 5.7.1 V2X Technology Overview
  - 5.7.2 V2X Technology Standards - Competing Approaches
  - 5.7.3 Economic Impact Analysis
  - 5.7.4 V2X and Autonomous Driving Synergies
  - 5.7.5 Privacy and Security Concerns
  - 5.7.6 V2G Technology
  - 5.7.7 Barriers to V2G Adoption
  - 5.7.8 V2G Forecast
- 5.8 SDV Feature Layer
  - 5.8.1 SDV Software Stack Architecture
  - 5.8.2 Feature Definition and Categorization
  - 5.8.3 Feature Development Lifecycle in SDV
  - 5.8.4 Feature Monetization Models
  - 5.8.5 Monetization Strategy Evolution
  - 5.8.6 Feature Dependency Mapping
- 5.9 Generative AI for Software-Defined Vehicles
  - 5.9.1 What is Generative AI?
    - 5.9.1.1 Core Technologies
  - 5.9.2 In-Vehicle Generative AI
    - 5.9.2.1 Smart Cockpit
    - 5.9.2.2 Spike the Personal Assistant (AWS & BMW)
    - 5.9.2.3 A Personalized Digital Assistant (AWS)
  - 5.9.3 Generative AI for Automakers
    - 5.9.3.1 Vizcom (Powered by Nvidia)
    - 5.9.3.2 Microsoft - AI for Automotive
    - 5.9.3.3 Digital Twins and Simulated Autonomy
  - 5.9.4 SDV-Related Regulations
- 5.10 SDV Competitive Landscape
  - 5.10.1 Tier 1: Technology Leaders

- 5.10.2 Tier 2: Transitioning Incumbents
- 5.10.3 Tier-1 Supplier Landscape
- 5.10.4 Semiconductor Suppliers
- 5.10.5 Tech Companies Entering Automotive
- 5.10.6 Business Model Evolution

## I would like to order

Product name: Next-Generation Automotive Computing Market 2026-2036: ADAS, AI In-Cabin Monitoring, Centralization, and Connected Vehicles

Product link: <https://marketpublishers.com/r/N4E6B0FDB2F7EN.html>

Price: US\$ 1,750.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

[info@marketpublishers.com](mailto:info@marketpublishers.com)

## Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/N4E6B0FDB2F7EN.html>