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Automotive Cockpit Domain Controller Research Report, 2023

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Research on cockpit domain controllers: various forms of products are mass-produced and mounted on vehicles, and product iteration speeds up.

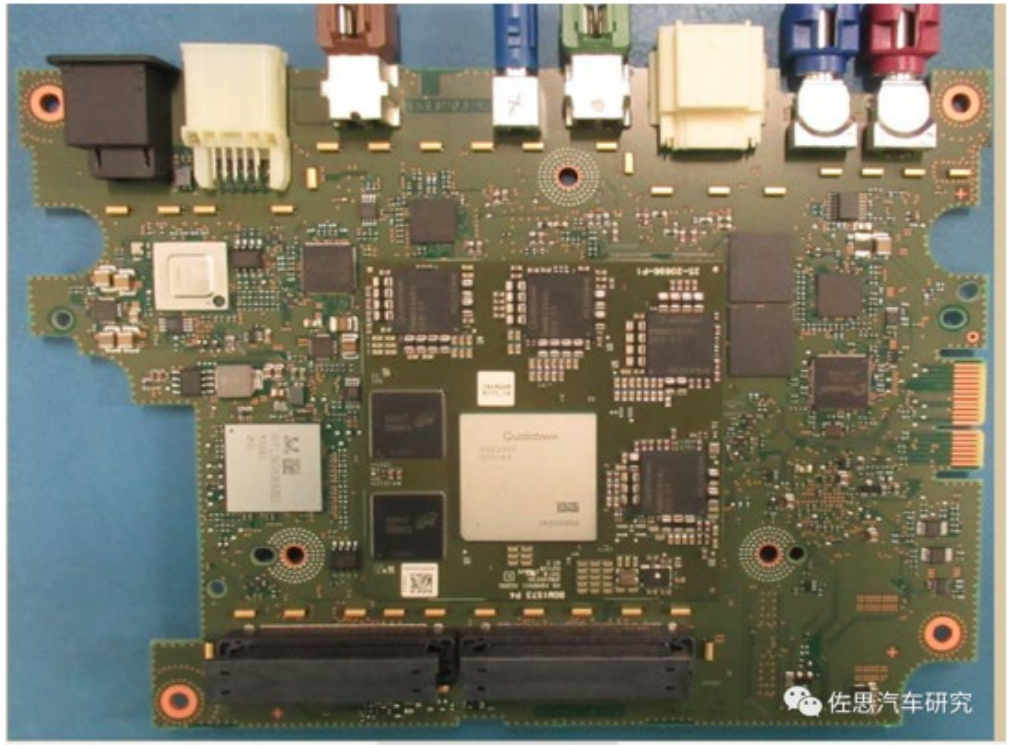
Both quality and quantity have been improved, and the iteration of cockpit domain controller products has been accelerated.

In the past two years, the mass production and adoption of cockpit domain controller products has speeded up, especially the Qualcomm 8155-based cockpit domain controller products installed in models of emerging carmakers, independent brands and even some joint venture brands in China. In 2022, the installations of Qualcomm 8155-based cockpit domain controller products in China totaled about 850,000 sets, a figure to be higher in 2023.

As new cockpit SoC products come out, cockpit domain controller products offer constant upgrades as well. At the time of mass production of Qualcomm 8155-based cockpit domain controller products, high-performance cockpit domain controller products based on Qualcomm 8295 and other chips are also production-ready. As well as Tier 1 suppliers working hard on layout, some OEMs have announced that they will unveil models with Qualcomm 8295-based cockpit domain controllers, including 2023 New Mercedes-Benz E-Class, Jidu Auto, Leapmotor and Great Wall.

New Mercedes-Benz E-Class is the first production model to use SA8295P, and it is also a flagship model of Mercedes-Benz. In the future, the S-Class will also pack SA8295P. The SA8295P-based cockpit hardware system is code-named CIVIC (Central In-Vehicle Infotainment Computer), supplied by Bosch, and will be produced in quantities in 2023.

Multimedia Board (MMB) with Mercedes-Benz Cockpit Domain Controller CIVIC



To lower cost and improve efficiency, cockpit domain controllers evolve to cross-domain integration such as "cockpit-parking integration" and "cockpit-driving integration".

Cockpit Tier 1 suppliers are no longer content to conventional IVI modules and cockpit domain control systems, as "cockpit-parking integration" and "cockpit-driving integration" are becoming mainstream. The ever higher computing power of SoCs allows cockpit domain controllers to support access to perception units. A typical example is 5*Camera+12*USS+Radar, a solution that supports L1/L2 entry-level driving assistance and automated parking and further reduces R&D and BOM costs while providing high performance.

According to the functions integrated, the cockpit domain controller product solutions evolve in the following forms:

The first form is cockpit domain controller products mainly integrating cockpit functions. This is also the prevailing form for intelligent cockpits at present and for some time to come. With improving computing power, performance, and interfaces, cockpit main control SoCs integrate ever more cockpit functions. They evolve from one chip supporting two screens to currently one chip supporting multiple screens and multiple systems, and even integrate such functions as voice, DMS, OMS, HUD, and gesture interaction. For example, Neusoft's intelligent cockpit domain controller adopts the modular design and development model, and is the first platform product. Since 2019, its controllers have been installed in multiple models of Hongqi, Chery, Hengchi Auto, and Great Wall Motor.

Recently there have emerged cockpit domain controller products based on dual high-compute chips to answer the needs for entertainment experiences like 3D engine and large games, amid the increasing demand for cockpit entertainment experience functions. Based on dual Qualcomm 8155 or AMD chips, quite a few companies like Visteon, Megatronix, PATEO CONNECT+ and ECARX have created cockpit domain controller products that meet high demand for entertainment, and some of them have products mass-produced and mounted on car models such as Buick L8 Century, Li Auto L9 and Lotus.

Visteon's Cockpit Domain Controller Based on Dual 8155

Yuanfeng Technology's Cockpit-Parking Integrated Solution

The second form is cockpit-parking integrated controllers. With higher computing power and on the basis that the cockpit performance is guaranteed, the controllers integrate parking function that evolves from AVM to multiple capabilities (e.g., APA and AVP). The companies that make layout include Yuanfeng Technology, ECARX, Foryou Group and Bosch.

In 2022, Yuanfeng Technology's team developed the Cockpit-Parking Integrated Solution 1.0, an intelligent cockpit platform that uses a Qualcomm 8155 SoC to support the deployment and use of 4 cameras, multiple screens and 12 ultrasonic radars, and integrates the capability baseline of Intelligent Cockpit 1.0 and Super Park 1.0 (AVM+APA). Wherein, the Super Park 1.0 delivers a parking space recognition accuracy of 97% and a parking success rate of 95%, covers more than 180 types of mainstream parking spots, and supports head-in parking; for unconventional parking spaces, the custom AR parking allows users to deal with in stride.

Yuanfeng Technology's Cockpit-Parking Integrated Solution 1.0 was first mounted on Hycan A06 in late 2022. By 2024, there will be 6 models packing the solution to be marketed.

The capabilities of Yuanfeng Technology's Cockpit-Parking Integrated Solution 2.0 will also be developed, and delivered via OTA updates. The Cockpit-Parking Integrated Solution 2.0 will deploy a vehicle voice GPT model, build in a more realistic and easy-to-use 3D UI, and upgrade to lane-level high-definition navigation; the Super Park 2.0 will further optimize AVM/APA performance, reducing the average parking time to less than 35s, increasing the parking success rate to 97%, and upgrading the AVP function.

Meanwhile, Yuanfeng Technology will announce its cockpit-driving-parking integrated solution in 2024. In addition to the capability baseline of Intelligent Cockpit 2.0 and Super Park 2.0, this solution will add multiple ADAS functions in rigid demand, such as ACC, LCC, AEB, and BSD.

Source: Yuanfeng Technology

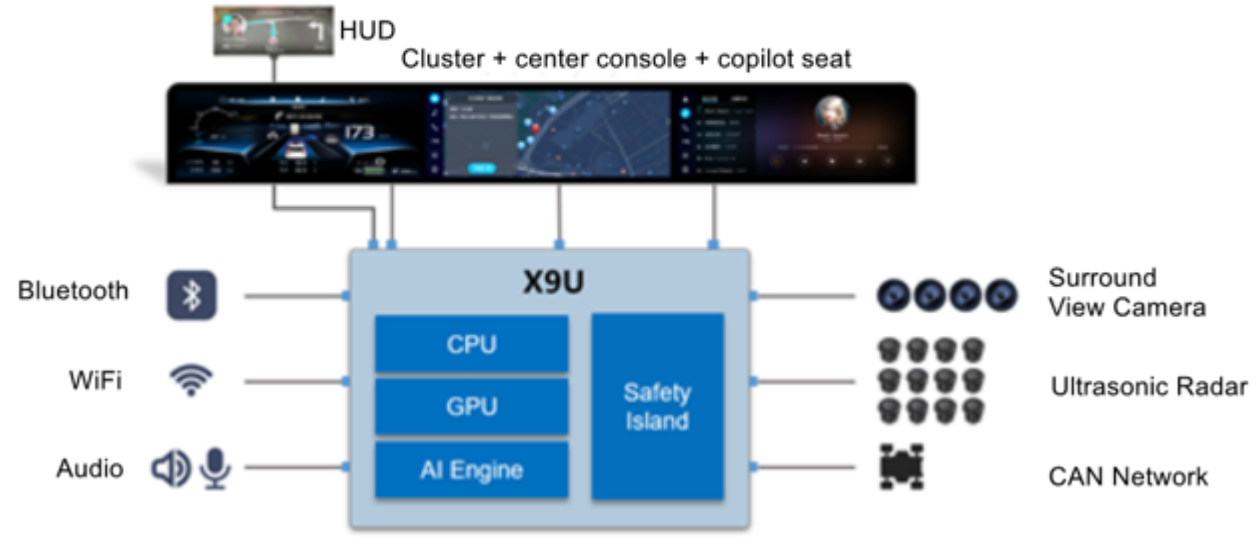
SemiDrive introduced its cockpit-parking integrated solution based on X9U

SemiDrive, an all-scenario automotive chip vendor, has also introduced its cockpit-parking integrated solution based on X9U, a high-performance automotive processor. In this solution, a single chip can enable the integration of intelligent cockpit, 360-degree surround view and parking functions, and provide users with better driving experience at a lower system BOM cost on the premise that the safety is ensured.

SemiDrive X9U, a powerful high-performance automotive processor with CPU compute of up to 100KDMIPS, supports up to 10 HD display outputs, and covers conventional intelligent cockpit functions such as HUD, cluster, center console, electronic rearview mirror, and co-pilot seat entertainment. Moreover the high-performance GPU of X9U can process 4-channel HD surround view cameras in real time, and allows for stitching and rendering of 360° panoramic surround views. In addition, the high-performance AI accelerator built in X9U is used for parking space recognition and obstacle detection to enable fast efficient parking assist.

Configuration of Cockpit-parking Integrated System - SemiDrive High Performance Automotive Processor X9U

Configuration of Cockpit-parking Integrated System (X9U)



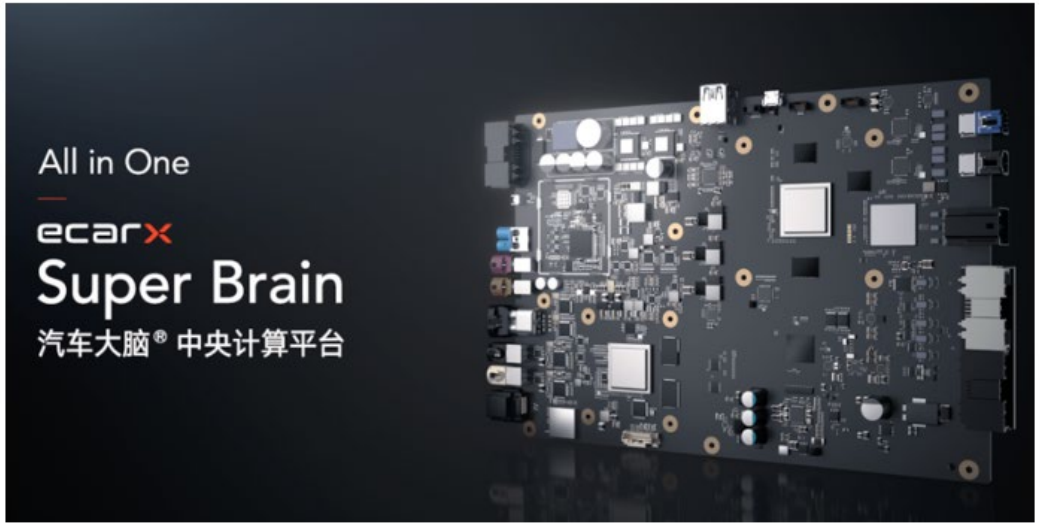
Source: SemiDrive

Multi-domain fusion controllers and cockpit-driving integrated central computing platform products

The third form is multi-domain fusion controllers. They enable the integration of some ADAS functions, gateway or body functions with the cockpit domain. A typical example is PATEO CONNECT+'s next-generation Qualcomm 8295-based multi-domain fusion cockpit product which allows for integration of the cockpit domain with multiple domains including automated driving assistance/ADAS, gateway/body, 5G communication, intelligent lighting, and vehicle intelligence (smart doors/interiors).

Neusoft creates next-generation intelligent cockpit platforms based on Qualcomm 8295 for multi-ECU and multi-domain integrations, and offers comprehensive upgrades in intelligent cockpit computing power, configuration, entertainment, safety, functions, and hardware. It has also developed and released the Neusoft C(5) Vehicle HMI Platform. The pluggable, scalable hardware architecture design not only enhances computing power but also enables intelligent cooperation between vehicle multi-domain functions. The software implements the scene engine via the SOA, providing users with immersive and personalized scene experience.

The fourth form is cockpit-driving integrated central computing platform products. Yuanfeng Technology, Desay SV, PATEO CONNECT+, Zongmu Technology, NavInfo and ECARX among others all make layout. For example, ECARX Super Brain, the central computing brain of ECARX, integrates Longying No.1 and Black Sesame A1000 chips, vehicle control MCU and ultrahigh-speed inter-process communication to enable cockpit-driving integration. The platform supports mainstream intelligent driving solutions (3R1V, 5R6V and 5R10V, realizing NOA, etc.) on the market to meet the needs of different vehicles, cutting down vehicle R&D cost by 15% and BOM cost by 20%.



Source: ECARX

The supply is localized, as cockpit domain controllers based on China's local chips enters a period of mass production.

In the trend for supply chain localization, in recent two years both OEMs and Tier 1 suppliers have been vigorously deploying local cockpit products. Their cockpit domain controller products based on local chips go into volume production the most quickly, and multiple products are about to be spawned and applied in 2023. Typical solutions include SemiDrive X9 Series-based cockpit domain controllers, SiEngine Longying No.1, Huawei Kirin IVI module, and AutoChips AC8015 integrated light cockpit solution.

Among them, the SemiDrive X9 Series-based solutions are one of the fastest-growing cockpit products in China. SemiDrive X9 Series leads in production progress among Chinese cockpit chips. The X9 Series-based models of automakers like SAIC, Chery and Changan have been mass-produced and launched on market. The X9 Series has been designated for dozens of models.

Chinese and foreign Tier 1 suppliers including Desay SV, Foryou Group, PATEO CONNECT+, Neusoft, Autolink and Denso have announced the launch of SemiDrive X9 Series-based cockpit domain controller products, some of which are scheduled to be mass-produced and installed in vehicles in 2023.

Summary on Cockpit Domain Controller Products based on SemiDrive X9 Series Chips

Partner	Product	Description	SOP Plan
Banma Zhixing	Full-stack Cockpit-driving-parking Integrated Solution	• X9 Series chips + AliOS Cyber • The cockpit, driving and parking scenarios share the same chips, sensors and domain controllers, facilitating the integration of cockpit and intelligent driving.	~2024
Desay SV	Localized Intelligent Cockpit Domain Controller Platform—DS06C	• SemiDrive X9SP + Android 12 + QNX7.1 + hardware isolated solution	~2023H2
Foryou General Electronics (ADAYO)	Cockpit Domain Controller (SemiDrive Solution)	• SemiDrive X9HP + QNX + Android	2023
Denso Kotei Automotive Electronics	X9U Cockpit Platform	• SemiDrive X9U + hardware isolated solution • Enable 7-screen interaction	-
Autolink	Cockpit Domain Controllers based on Local Chips	• Compatible with X9HP and X9SP + Autolink Autosee OS intelligent cockpit system • Enable cockpit-parking integrated applications, multimodal voice interaction, multi-screen interaction, etc.	Released in 2023
PATEO CONNECT+	Localized Intelligent Cockpit Domain Controller	• SemiDrive X9HP/X9H	-
BICV	X9U Intelligent Cockpit	• SemiDrive X9U	-
Lan-You Technology	X9H-based Cockpit Domain Controller	• SemiDrive X9H + Lan-You terminal-cloud integrated cockpit system • Enable 4 screens and 9 cameras	-
Arraymo	6th Generation Intelligent Cockpit Domain System - FusionEX6.0	• SemiDrive X9 Series + ArcherMind operating system	-
Phoenix Auto Intelligence	Intelligent Cockpit Solution	• SemiDrive X9 Series + TINNOVE OpenOS	-
COOKOO.AI	ACU3xx Series Intelligent Cockpit Domain Controllers	• SemiDrive X9HP/X9SP + built-in MCU up to ASIL-B functional safety level • Drive 5 screens and 9 digital cameras	-

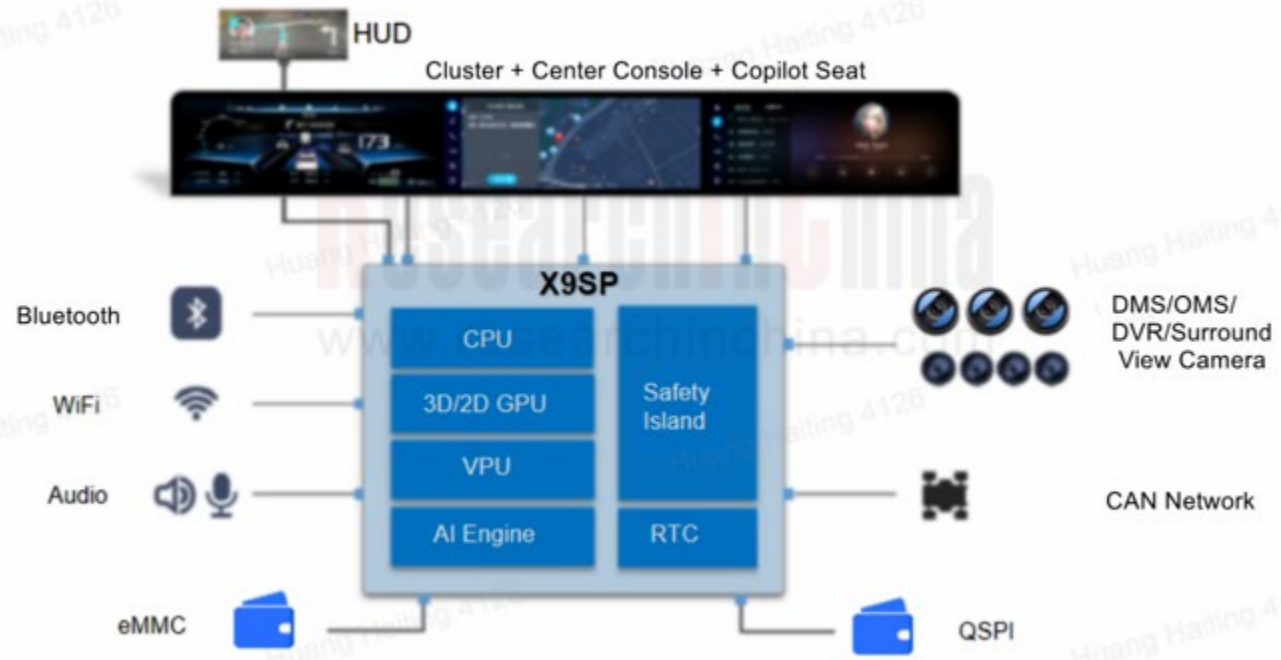
Source: ResearchInChina

SemiDrive released X9SP

In April 2023, SemiDrive released X9SP, its latest-generation all-scenario cockpit chip. Compared with the previous-generation product X9HP, X9SP offers 2 times higher CPU performance and 1.6 times higher GPU performance, with the computing power of CPU and GPU up to 100K DMIPS and 220G FLOPS, respectively. Furthermore, X9SP integrates a new NPU, with AI compute of 8TOPS. A single X9SP supports multiple HD display screens (e.g., LCD cluster, center console navigation, co-pilot seat entertainment, HUD and intelligent rearview mirror), and abundant application scenarios (e.g., 360-degree surround view, parking assist, DMS, voice recognition, gesture recognition, game interaction and HD movies).

At the Auto Shanghai, SemiDrive signed a strategic cooperation agreement with Desay SV. DS06C, a X9SP-based cockpit domain controller, made its global debut. The volume production of this chip is projected to start in the second half of 2023.

Block Diagram of SemiDrive X9SP-based Cockpit Solution



Source: SemiDrive

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