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United States Automotive Electronics and Software Market Assessment, By Components [Electronic Control Units/Domain Control Units, Sensors, Software, Power Electronics, Harness Systems, Other Electronics Components], By With-In Vehicle Application [Advance Driver Assistance Systems, Powertrain, Infotainment, Safety Systems, Others], By Sales Channel [OEM, Aftermarket], By Vehicle Type [Internal Combustion Engine, Hybrid Vehicle, Electric Vehicle], By Region, Opportunities and Forecast, 2016-2030

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Abstracts

The United States Automotive Electronics and Software Market size was valued at USD 74.62 billion in 2022 which is expected to reach USD 151.21 billion in 2030 with a CAGR of 9.23% for the forecast period between 2023 and 2030. Automotive Electronics form an important segment of the United States automotive industry which represented 3% of the country's GDP in 2022. The United States Automotive Electronics and Software Market encompasses the design, development, manufacturing and selling of vehicles. United States' annual production of automobiles in 2022 was 13.75 million vehicles. The United States automotive industry has been consistently growing and is driven by innovation and diversification and manufacturers are constantly reinventing to provide the customers advanced automotive electronic systems. The automotive industry has seen a drastic shift from being reliant on mechanical parts, to increasing adoption of electronic components and systems.

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Consumers are increasingly seeking vehicles with advanced features, connectivity, and enhanced safety systems and rapid advancements in technology, particularly in areas like autonomous driving, electric vehicles, and connectivity, have created new opportunities for automotive electronics and software systems. Manufacturers are incorporating advanced sensors, cameras, radar systems, and communication modules to enable these technologies. This has revolutionized our interaction and driving experience with vehicles, with increased safety and security, enhanced engine and transmission performance, improved driver comfort and offering internet-integrated multimedia and entertainment.

Furthermore, the adoption of automotive electronics has been driven by technological advancements, declining costs of electronic sensors, emission standards and automotive policies, and increasing public demand for better and technologically advanced vehicles.

Emission Policies Build the Need for Increased Automotive Efficiency

The United States automotive electronics and software market has experienced growth in response to the implementation of automotive emission laws in the country. The United States has implemented several policies and regulations to address automotive environmental emissions. One key policy is the Corporate Average Fuel Economy (CAFE) standards, which set fuel efficiency targets for vehicles. The goal of CAFE standards is to reduce greenhouse gas emissions and improve fuel efficiency.

Additionally, the Environmental Protection Agency (EPA) has established emission standards for vehicles, known as the Tier 3 standards. These standards aim to reduce harmful air pollutants emitted by vehicles, such as nitrogen oxides (NOx) and particulate matter. Hence, to comply with these emission regulations, automakers have increasingly turned to advanced automotive electronics and software technologies. Electronic systems play a crucial role in monitoring and controlling various aspects of a vehicle's performance, including engine emissions, fuel injection, exhaust treatment, and hybrid or electric powertrain systems.

For example, both California and federal laws mandate On-Board Diagnostic (OBD) mandates for light-duty vehicles, and these requirements are progressively extending to cover a wider range of heavy-duty engines. OBD regulations are essential in guaranteeing adherence to emission standards by setting precise criteria for monitoring specific emission system components, like catalytic converters, or the levels of emissions during vehicle usage. If a problem is detected, the OBD system promptly

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notifies the driver or operator through indicators, such as a malfunction indicator light on the vehicle's dashboard. These regulations are intended to improve emission control and facilitate timely detection and resolution of issues related to vehicle emissions.

Semiconductor Shortage Affects Automotive Supply Chain

The United States Automotive Electronics market is heavily reliant on semiconductors, as these components are crucial for the functioning of various electronic systems in vehicles. The shortage of semiconductors due to COVID-19 pandemic has resulted in supply chain disruptions, affecting the production capacity of automakers worldwide. With limited semiconductor availability, many automakers have been forced to reduce or halt production, leading to a decrease in vehicle inventories and impacting sales.

The semiconductor shortage had a substantial impact on several major car manufacturers in the United States. For instance, General Motors (GM) suffered a significant reduction in production, leading to billions of dollars in lost revenue. Similarly, Ford also had to implement production cuts and temporarily shut down plants due to the shortage. Toyota and Honda encountered comparable challenges in their operations. To address the situation, automakers have been collaborating closely with semiconductor suppliers to ensure a stable supply and prioritize essential components for their most popular vehicles. Additionally, efforts are underway to diversify the supply chain and decrease reliance on a limited group of semiconductor manufacturers as a solution to mitigate the effects of the shortage.

Government’s New regulation benefits the Market

Governments play a crucial role in the automotive electronics and software market by establishing regulations, policies, and standards that shape the industry. They are responsible for ensuring the safety, efficiency, and sustainability of vehicles, as well as promoting innovation and competitiveness.

In August 2022, the Creating Helpful Incentives to Produce Semiconductors and Science Act (CHIPS) was passed with the goal of tackling the semiconductor shortage in the United States Automotive Electronics Market and promoting domestic semiconductor manufacturing. This act plans to allocate USD 280 billion over the next decade to boost U.S. competitiveness, drive innovation, and strengthen national security by encouraging investments in domestic semiconductor production capacity.

As a result of this initiative, major automotive manufacturers are making significant

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progress towards achieving advanced autonomy in vehicles. Notably, several prominent companies have already achieved SAE Level 2 driver support systems, such as Tesla's Autopilot featuring 'Full Self-Driving' capability, Audi's Traffic Jam Assist, GM's Super Cruise, BMW's Extended Traffic Jam Assistant, Ford's Blue Cruise, and Hyundai's autonomous driving package, among others. Consequently, these initiatives are anticipated to foster market growth.

Adoption of Electric Vehicles Drives the Market Growth

Electric vehicles rely heavily on advanced electronic components and systems for their operation, and the increasing adoption of EVs has driven the demand for automotive electronics and software, particularly in areas such as electric powertrains, regenerative braking systems, and energy management systems. Furthermore, integration of electric vehicles with emerging technologies like artificial intelligence (AI) and the Internet of Things (IoT) further drives the demand for advanced automotive electronics and software. EV market accounted for 6% of the market share in the United States and the government aims EV to make up 50% of new car sales 2030 under its Build Back Better agenda. Tesla continues to emerge as the United States electric car market leader in terms of sales, however Ford, GM and Hyundai are scaling up this EV battle by launching their own EV such as Mustang Mach -E, Chevy Bolt EV, and Hyundai IOnIQ-5.

Growing trend of Autonomous, Connected, Electric, and Smart-Shared-Mobility

United States is seeing a growing trend of autonomous, connected, electric, and smart vehicles which indicates a transition towards cleaner and more technologically advanced transportation. Autonomous vehicles rely on advanced technologies like augmented reality, artificial intelligence, and smart navigation, enabling them to operate with little or no driver intervention. Connected vehicles utilize communication technologies for vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-cloud (V2C) communication. Electrified vehicles leverage cutting-edge battery charging and storage technologies. Shared mobility services have also been implemented, enabling passengers to share rides with strangers. With increasing investments, government initiatives, and consumer awareness, the market for these vehicles is expected to further expand in the coming years.

Automotive manufacturers are increasingly providing digital enhancements to improve the functionality and features of their vehicles. For example, Tesla offers additional downloadable extras, including Premium Connectivity and Acceleration Boost, which

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come with added fees. Tesla also presents the option for customers to upgrade to Full Self-Driving Capability at a planned price. German premium brands like Audi and BMW are also expanding their digital upgrade offerings, such as advanced exterior digital lighting systems and over-the-air map updates. These upgrades enable car owners to personalize their driving experience and access new features through software updates, offering greater convenience and flexibility. Additionally, Ford Motor Company is collaborating with leading technology companies like Qualcomm Technologies and has announced that its new F-Series Super Duty truck will be powered by Qualcomm Technologies' Snapdragon® 5G Modem-RF, positioning Ford to be part of the connected vehicle revolution.

In September 2022, Harman International, the Samsung subsidiary traditionally known for its expertise in audio entertainment technology, acquired Caaresys, an Israel based company that uses radar sensing to monitor vehicle passengers partnered with leading OEMs and provides a mass production solution for cabin monitoring including vital signs sensing, passenger localization and Child Presence Detection (CPD).

Impact of COVID-19

The United States automotive electronics and software market experienced a significant impact as a result of the COVID-19 pandemic. The implementation of measures to control the spread of the virus, such as lockdowns and travel restrictions, caused a sharp decline in automobile demand. Manufacturing plants were temporarily closed, disrupting the supply chain, and causing delays in production. In May 2022, the country’s automotive sales dropped by 29% compared to the same period in 2021, reflecting the challenges faced by the industry. The pandemic also disrupted global supply chains that the automotive market relied on, resulting in shortages of specific components. These shortages further contributed to production delays and increased costs for automotive electronics and software manufacturers. The market faced a period of uncertainty and adjustment as it navigated the challenges posed by the pandemic.

Impact of Russia-Ukraine War

The conflict between Russia and Ukraine had a disruptive effect on oil and gas supplies, highlighting the risks associated with heavy reliance on fossil fuels for energy. As a result, many countries are now actively seeking alternative energy sources and technologies. There is a growing demand for hybrid and battery-powered vehicles that offer both economic benefits and reduced carbon emissions, providing a solution to fluctuating fuel prices.

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Furthermore, the ongoing global semiconductor shortage has added to the challenges faced by the country’s automotive electronics and software market. The shortage has affected the supply chain, impacting the availability of crucial components for electronic devices, including vehicles. Some of these components, such as purified neon gas and palladium metal, are sourced from Russia and Ukraine. Additionally, Russia's significant share in class 1 nickel, a key element in Lithium-ion batteries, further highlights the potential impact on the production of electric vehicles.

Key Players Landscape and Outlook

Key players are heavily investing in R&D and diversifying the features their automobile offers to attract more customers. Automotive manufacturers are exploring alternative suppliers for semiconductors and electronic components, both domestically and internationally. This helps reduce dependence on a single source and ensures a more stable supply chain. To get an edge over the competitors’ automotive manufacturers are collaborating with software and electronics manufacturers to provide Hi-Tech solutions.

For instance, Mercedes-Benz’s SAE Level 3 autonomous driver assist system ‘DRIVE PILOT’ that debuted in Germany in May of 2022, became the first automaker to be certified for autonomous driving in entire state of California and Nevada in United States.

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