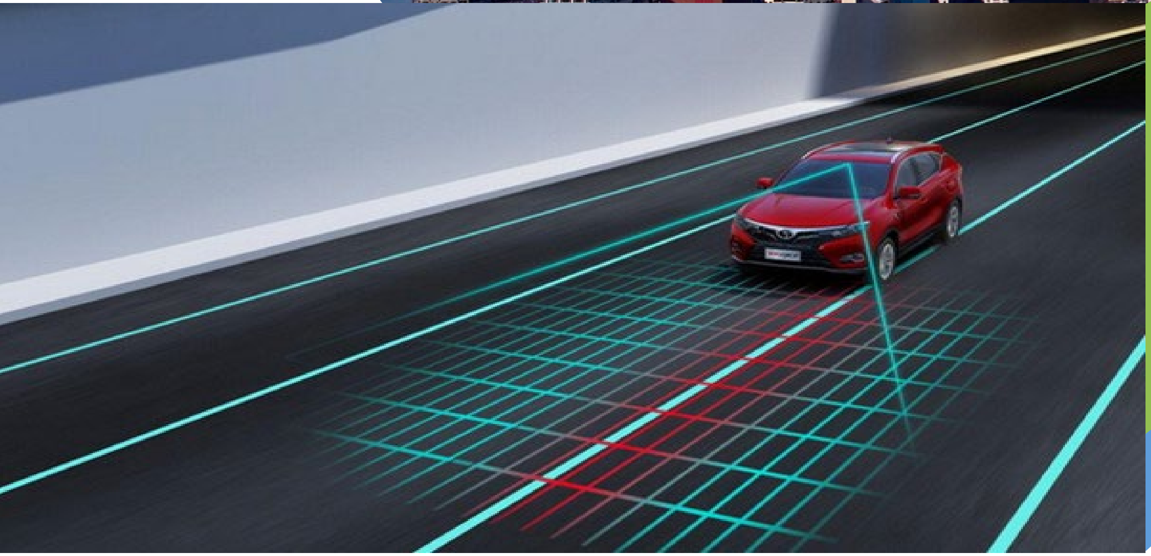

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China New Energy Vehicle Power Electronics Industry Report, 2021

June 2021

Abstract

As the electric vehicle market is developing rapidly, new energy vehicle power electronics see a lucrative development opportunity

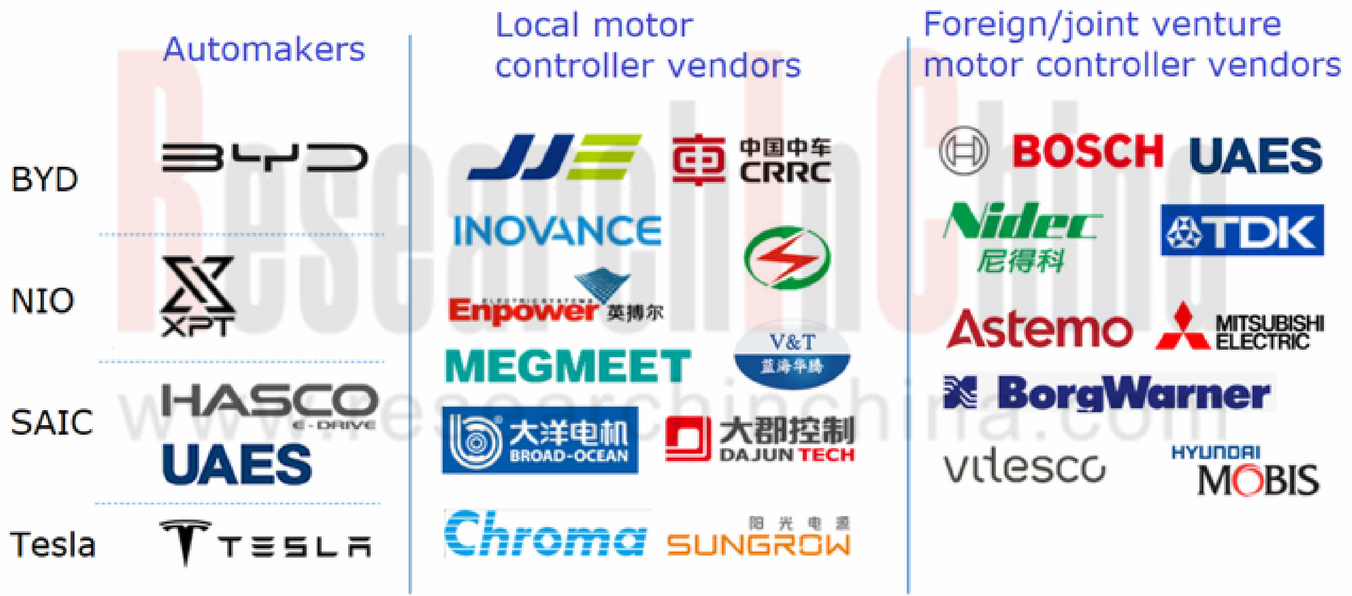
According to EV Sales, the global electric vehicle sales volume soared by 249% year-on-year to 392,000 units in April 2021. As the electric vehicle market is developing rapidly, new energy vehicle power electronics see a lucrative development opportunity. New energy vehicle power electronics generally include motor controllers (including inverters) and automotive power supplies (automotive chargers and DC/DC).

I. Motor Controller Market

1. BYD leads the highly competitive motor controller market

Benefiting from the rapid development of China's local new energy vehicle brands, Chinese local motor controller vendors led by BYD have obvious advantages in the motor controller market. In 2020, BYD still ranked first with a market share of 13.6%; among the top 10 companies, 7 are Chinese local vendors, except two foreign companies Tesla and Nidec as well as UAES, a Sino-foreign joint venture.

Major Companies in Chinese Motor Controller Market



Source: ResearchInChina

Abstract

2. Motor controllers are developing towards integration and high voltage

Electronic control is developing towards integration, and three-in-one drive system will become the mainstream

Motor controllers gradually develop from a single function to multi-functional integration, and the integration of motors and electronic control has become a major trend, among which three-in-one electric drive system will become the mainstream. In 2020, China's passenger car three-in-one electric drive system shipments exceeded 500,000 sets, accounting for about 37% of motor controller shipments.

At present, most companies still focus on two-in-one electric drive system, and companies including Bosch, BYD, Inovance, and JJE have launched three-in-one electric drive system. In 2020, Tesla, BYD, XPT and Nidec together accounted for 82.1% of the total sales volume.

- The DriveONE three-in-one electric drive system launched by Huawei has the peak power density of 3kW/kg, marking the highest level in the industry, higher than Bosch eAxle which boasts 1.67 kW/kg. In the future, with the efforts of local vendors represented by Huawei and BYD, the gap between local companies and international vendors will gradually narrow.

Representative Three-in-one Electric Drive System of Enterprises

	Representative products	Features	Production time
Inovance	The third-generation e-Axle powertrain	It realized for the first time the high integration of MCU, motor and gearbox in one housing	2020
JJE	JJE-EDM3000F	The total weight of the system is reduced by nearly 10% to 95kg. The rotational speed increases by 33%. The cost drops by 10%-15%	2019
Bosch	eAxle	Output power: 50-300kW. Torque: 1,000-6,000Nm. The maximum speed of the motor: 16,000rpm	2019
ZF	Electric Axle Drive	Rotational speed: 21,000rpm	2018
Shanghai Edrive	Three-in-one system	Exported to India in 2020, available in 3,000 Kanger vehicles	2018
BorgWarner (Delphi)	iDM	Compared with eDM, it has more obvious advantages in performance, integration, size, weight, and cost, with more flexible customization	2020
BYD (FinDreams Powertrain)	three-in-one electric drive system	The efficiency of the motor controller can hit up to 98%, and the overall efficiency of the drive assembly system can reach 88%	2018
XPT	XPT EDS	Peak rotational speed: 15,000rpm	2018
Huawei	DriveONE three-in-one electric drive system	3kW/kg ultra-high density: size and weight are 10% less than counterparts in the industry; Z-direction space ≤300mm; more flexible vehicle layout. 88% NEDC efficiency: 4% higher than the industry; longer cruising range.	2020
Continental (Vitesco)	The third-generation electric drive system	Weight: less than 80KG	2019

Source: ResearchInChina

Abstract

Huawei's DriveONE Three-in-one Electric Drive System

SiC motor controllers are expected to replace IGBTs

As the core components of motor controllers, IGBT modules account for about 45% of the total cost. In 2020, the global new energy vehicle IGBT module market valued approximately USD850 million. However, high-priced automotive IGBT modules have severely compressed the profit margins of electronic control companies and even automakers.

Compared with silicon-based IGBT power devices, SiC power devices feature advantages such as smaller size, lower weight, higher power density, longer cruising range, less controller loss, better thermal conductivity, and higher temperature resistance. Therefore, vendors represented by Delphi and BYD have begun to deploy SiC motor controllers which are expected to replace IGBTs in the future.

SiC Motor Controller Layout of Enterprises

Enterprise	Product/Project	Progress
Inovance	The new 240kW powertrain electric drive system adopts new high-voltage SiC technology	Displayed at the 2021 Shanghai Auto Show
	A new generation of motor controllers use 800V SiC technology, with the maximum peak power of 275kw	
V&T	V&T and BYD jointly developed the key technology of SiC MOSFET chips and modules	V&T has completed the design of SiC automotive motor controllers and is testing products
BYD	The fourth-generation three-in-one power system uses SiC technology	Launched in 2020 as the first domestic mass-produced SiC power three-in-one product
JJE	High-power automotive SiC controller	Released in November 2020
Hefei E-Power Technology	EC60 series SiC controller	Released in October 2020
Continental (Vitesco)	Continental (Vitesco) cooperated with ROHM to develop SiC electric vehicle drive	Vitesco is already developing and testing SiC technology in an 800V inverter concept to confirm the efficiency potential of the technology. It plans the start of production of the first 400V SiC inverter as of 2025
BorgWarner (Delphi)	800V SiC inverter	Mass production in 2019

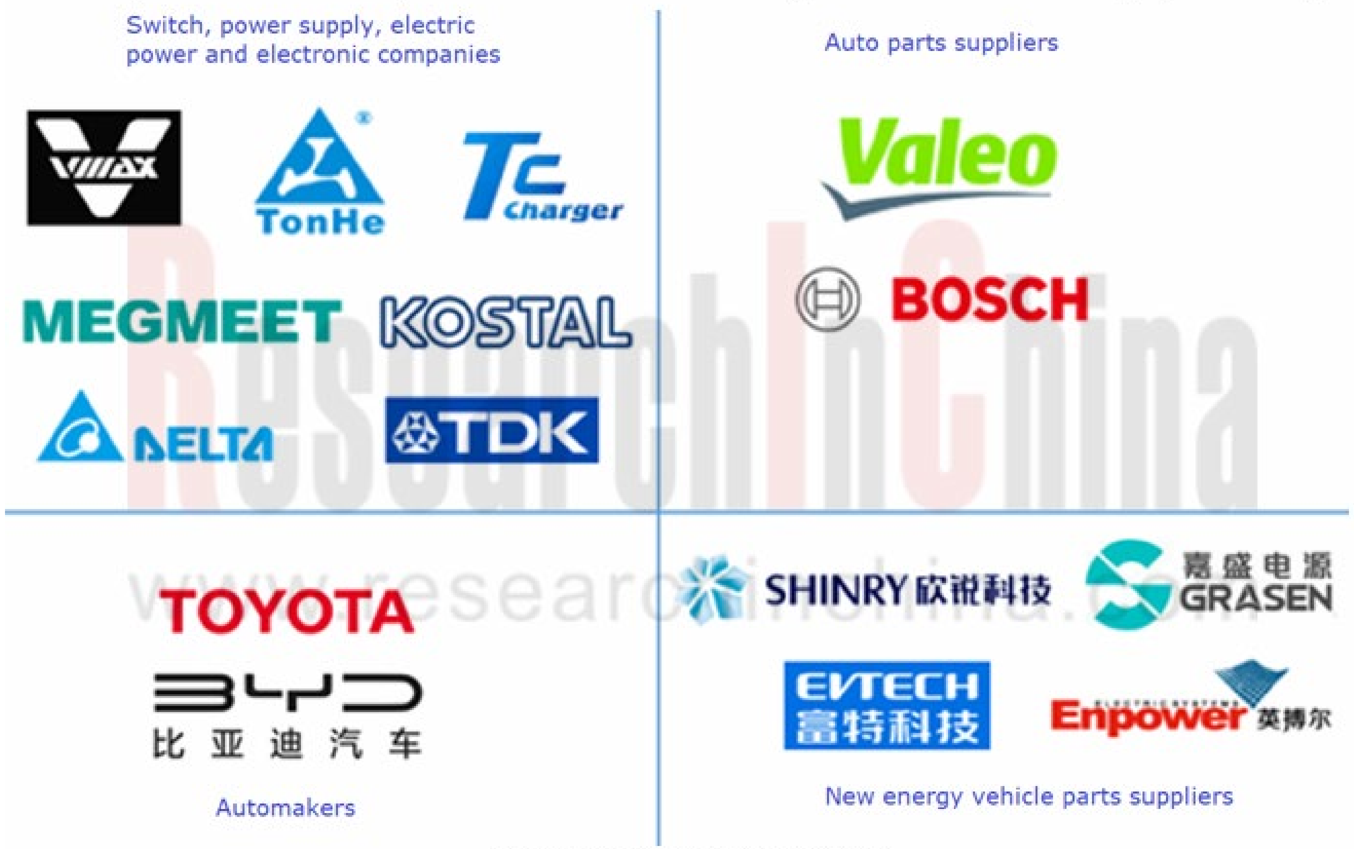
Source: ResearchInChina

Abstract

II. Automotive Power Supply Market

In Chinese new energy vehicle power supply market, there are mainly four types of players:

Competitive Landscape of China's New Energy Vehicle Power Supply Industry



Source: ResearchInChina

Foreign-funded companies mainly target joint venture automakers, while local companies support independent brands. Thanks to the relatively higher sales volume of local new energy vehicles, local companies have a certain advantage in the automotive power supply market. In 2020, there were 6 local companies among the top 10 companies in Chinese new energy vehicle charger OBC market, with the combined market share of 66%.

At present, automotive power supply products are mainly developing towards integration, high power, and bidirectional style.

(1) Integration: By integrating DC/DC, OBC, motors, electronic control devices, etc., the space occupied by the automotive power supply can be reduced, the size of the circuit board, the assembly cost as well as the BOM and PCB cost can be lowered.

(2) High-power: With longer cruising range and higher electrified capacity of electric vehicles, high power like 10kW, 20kW or more will become the mainstream, which is mainly accomplished by the three-phase AC technology. At present, BYD and Shinry have already deployed in this field.

(3) Bidirectional style: Bidirectional DC/DC features high efficiency, small size, and low cost. At the same time, it can also output battery power to the outside, effectively improving power utilization. Two-way automotive chargers can output the electric energy of the battery to realize vehicle-to-vehicle, vehicle-to-load, and vehicle-to-grid charging.

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