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The future of lidar in autonomous mobility — interview with RoboSense

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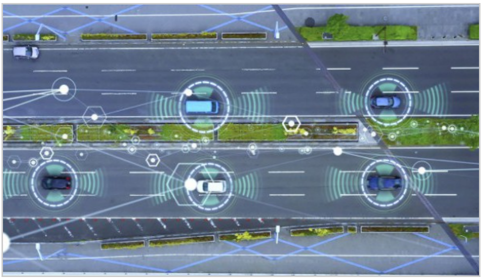
Q&A with RoboSense



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Light detection and ranging (lidar) technology is quickly redefining what is possible in autonomous driving and robotics, offering a powerful new way to map the world. By sending out laser pulses and measuring how long they take to bounce back, lidar builds high-resolution, 3D models of its surroundings — vital data that helps vehicles and robots see, understand and move through the world safely.

In recent years, the technology has made huge strides. The development of proprietary lidar chips has boosted both performance and affordability, pushing the industry closer to large-scale deployment. Companies like RoboSense are leading the charge, earning automotive-grade certifications for fully integrated lidar systems — a major step toward bringing the technology into everyday use. With sharper resolution and stronger resistance to interference, today's lidar sensors are more reliable than ever, capable of performing well in rain, fog or bright sunlight.

The timing could not be better. Lidar is shifting from a high-end add-on to a must-have feature in intelligent vehicles. As governments around the world prepare new safety regulations for autonomous driving, demand for lidar is expected to surge — especially as Level 3 automated cars begin to hit the market.

To gain deeper insight, Owen Chen, senior principal analyst at S&P Global, engaged with Mark Qiu, CEO of RoboSense.

Key takeaways:

- **Proprietary chip development**: RoboSense has developed fully proprietary lidar chips, which have achieved automotive-grade certification and mass production. This self-development is intended to enhance performance and reduce costs, creating a competitive advantage in the lidar market.
- **Lidar's increasing importance**: The company anticipates that lidar will become a critical component in intelligent driving systems. We expect upcoming regulations to mandate lidar in certain vehicle categories, positioning it as an essential technology for safety in autonomous

driving.

- **International market growth**: RoboSense is targeting international markets for expansion, particularly in regions like North America and Europe. The company has secured design wins with several overseas original equipment manufacturers and is adapting its strategies based on regional market needs.
- **Integration of technologies**: The CEO highlighted that the future of autonomous driving is likely to involve a combination of vision-based and lidar technologies, rather than an exclusive focus on one approach. This integration aims to enhance the overall safety and reliability of autonomous driving systems.

The following is an edited transcript of the conversation.

S&P Global Mobility: RoboSense recently announced that its fully proprietary core lidar chips have passed automotive-grade certification. As CEO, how do you explain the strategic significance of the company's long-term commitment to chip self-development to the global market? What core barriers has this established for RoboSense in global competition?

Mark Qiu: Chip self-development is the core embodiment of RoboSense's role as an industry rule-maker and a constant leader in technological innovation. The competition in lidar will ultimately be determined at the chip level — without full-stack proprietary chip capabilities, relying solely on assembly or off-the-shelf chips makes it nearly impossible to break through the dual bottlenecks of performance and cost. RoboSense began pursuing chip-based development as early as 2017, foreseeing that the trend toward digitalization and "chipization" would drive lidar to make a leap comparable to the evolution from film to digital cameras. This transformation is not merely a technological upgrade, but a fundamental paradigm shift for the entire industry. Digital lidar follows Moore's Law, continuously enhancing performance while achieving structural optimization in cost.

This strategy creates a technological barrier, making us the only company in the world with fully proprietary digital lidar chips — covering transmission, reception, and processing — that have also met automotive-grade certification standards. For example, the proprietary single photon avalanche diode (SPAD)-SoC chip integrates receiving and processing functions onto a single chip, directly outputting digital point clouds, and enabling the lidar to achieve a "generational lead" in terms of resolution, anti-interference capability, and size.

We have launched the 520-beam lidar, the highest beam count among all mass-produced lidars in the industry, which directly reflects our technological advantage. This lidar has been adopted by several leading OEMs' flagship models and is recommended to consumers as a core intelligent safety feature, such as in the IM LS9 and Zeekr 9X. This strongly demonstrates the market's recognition of our digital technology approach.

How do chip capabilities specifically enhance the product's cost competitiveness? We have noticed that RoboSense's lidar has entered the sub-150,000 renminbi vehicle market. Furthermore, Level 2/Level 2+ assisted driving is rapidly popularizing in China, and L3 policies are gradually becoming clearer. What changes do you think the role of lidar will undergo in the next two to three years?

Digitization is the ultimate form of lidar evolution, representing a revolutionary leap comparable to the transition from film to digital cameras. By achieving high integration through proprietary chips, we have significantly reduced the number of components and assembly processes, opening new paths for further cost reduction of lidar and directly promoting the increase in lidar penetration. It is no longer rare for vehicles in the 150,000 renminbi or even 100,000 renminbi range to be equipped with lidar. In mid-to-high-end models where intelligence is a key feature, there is already a trend toward standardizing lidar across the entire series; this, combined with the cost advantages brought by digitization, is pushing lidar to become the most critical safety necessity in intelligent driving systems.

Over the next two to three years, lidar is expected to gain more widespread recognition as a cornerstone of safety. This shift is primarily based on two key drivers:

1. Policy mandates: The national standard "Safety Requirements for Combined Driving Assistance Systems of Intelligent and Connected Vehicles," to be released in 2025, includes lidar in the mandatory standard system for the first time. This new national standard sets clear performance requirements for scenarios like generic obstacle recognition and tunnel light-dark transitions, making 192-beam the new baseline for Level 2+.

2. Accelerated Level 3 deployment: It is an industry consensus that Level 3 autonomous driving requires heterogeneous redundancy in the perception system. In practice, Level 3-targeted vehicles must be equipped with multiple lidars. We believe that a configuration of "a primary lidar with over 500-beam complemented by multiple blind-spot lidars" will be the entry standard for Level 3.

How does RoboSense view growth opportunities in markets outside China? Will you adopt differentiated strategies for different regions, for example, focusing more on the robo-taxi market in the US while prioritizing cooperation with OEMs in Europe?

Overseas markets are a key growth area for RoboSense. We anticipate that mainstream overseas OEMs will widely deploy high-level intelligent driving in the next two years, and there is significant potential in both the Level 4 and robotics markets. The proportion of overseas revenue is expected to increase significantly.

The company has already secured design wins from eight overseas and joint venture brands, covering key markets including Japan, North America and Europe. This includes exclusive supply partnerships with two leading Japanese OEMs, as well as orders from premium European luxury brands.

Leveraging our combination solution of the thousand-beam lidar EM4 and the fully solid-state lidar E1, we have secured design wins from traditional high-end luxury brands and new electric pickup truck makers in Europe. Given market trends and the advantages of our digital products, the overseas market is poised for significant growth.

The regional variations we currently observe fundamentally stem from the different priorities for lidar application scenarios in various countries and regions. We are highly confident in the global competitiveness of our products.

As one of the earliest companies to achieve automotive-grade mass production of lidar, how does RoboSense respond to rapidly evolving market competition?

RoboSense's core advantage in the market lies in its technology system, which underpins our ability to be first in achieving automotive grade lidar mass production, launching fully solid-state lidar at scale, and now leading the industry into the digital era.

We compete through technological differentiation and large-scale production delivery, rather than single-product rivalry, shifting the market from price-driven competition to a contest of comprehensive capabilities.

First, we have always believed that the final competition in lidar lies at the chip level. As early as 2017, we established our chip research and development (R&D) team, and each product generation aligns with market demand and development trends. Take the EM platform as an example: its digital architecture makes 192-beam lidar a standard configuration, while competitors remain constrained by the physical limits of traditional analog architectures. This chip-level leadership imposes at least a two-year R&D gap for latecomers.

Second, we leverage extensive mass-production experience to establish automotive-grade delivery barriers. By early 2025, we had delivered over one million automotive-grade lidar units, accumulating deep knowledge in technology maturity and reliability — capabilities that are difficult for latecomers to replicate in the short term.

Third, future competition will focus on performance breakthroughs and the democratization of technology through new products. In both areas, we are already delivering ultra-high-beam lidar exceeding 500-beams with expanding customer adoption. Our 192-beam products and solutions have become the entry-level standard for the next generation of intelligent vehicles, earning broad industry recognition and attracting customers who had not previously adopted our products.

In summary, by leveraging our technological system advantage, we drive the industry forward in terms of technology and quality, while securing a clear competitive edge in the market.

Alongside discussions on pricing, there is frequent debate over vision-only versus lidar-based approaches. Elon Musk has many global supporters. What do you envision for the future of these various technological approaches?

I do not think these technological approaches should be seen as opposing choices. The real focus is on finding the right balance between safety and efficiency.

The vision-only approach relies heavily on large amounts of data and smart algorithms. It can be more cost-effective in good lighting conditions. Lidar, however, can actively measure 3D distances and avoids the limitations that cameras face in low light, backlight, rain or fog. It provides a reliable layer of safety. Especially at Level 3 and above, lidar helps reduce accident risks system-wide, protecting both drivers and OEMs.

We are also seeing that regulations are helping build industry consensus. For Level 3 and higher vehicles, most mainstream OEMs are now using a setup with a high-performance main lidar plus multiple blind-spot lidar. Our EM4/EMX + E1 combos fit this approach perfectly.

We believe that the future will not see technological approaches in opposition, but rather in integration. Lidar's accurate distance measurements can enhance the training efficiency and inference reliability of vision algorithms, helping OEMs achieve safer and more cost-effective technological iteration.

Lidar pricing has attracted significant attention, perhaps even excessive attention. How do you see the market's complex expectations about their decline?

The decline in lidar pricing is an inevitable outcome of technological innovation, but what deserves greater attention is the value enhancement it brings. The decrease in price is not simply a matter of "price cuts," but rather a restructuring of cost architecture driven by breakthroughs in chip-level and system-level integration. This technology-driven cost optimization is essentially enabling high-end technologies to evolve from luxury goods to mass-market products, accelerating the widespread adoption of intelligent driving.

The market's focus on price reflects lidar's transition from an optional feature to a core necessity. As Level 3 policies are now implemented, safety has become a primary requirement, making lidar the foundational safety technology for intelligent vehicles. In the future, competition will shift from price to value. Blindly pursuing low costs may lead to compromised performance, especially as policies and regulations continue to raise the safety bar. As the industry matures, the public's perception of lidar will increasingly shift back to its fundamental role in safety, allowing for a sustainable balance between cost and efficiency.

Do you think lidar shipments for the robotics sector will eventually surpass those for automotive applications? When do you expect this shift to occur?

Yes, we believe the robotics sector will ultimately become ten times larger than the automotive lidar market — and its growth could exceed expectations. The explosive momentum we are already seeing in RoboSense's lidar for robotics business has begun to validate this trend.

In the second quarter of 2025, our lidar sales for robotics surged by 631.9% year over year. Notably, robotic applications are characterized by high diversity, universal demand for perception capabilities and a faster pace of technology adoption and iteration.

To date, our lidar products have been adopted by over 3,200 robotics customers worldwide, covering a range of applications including industrial automation, warehouse logistics, autonomous delivery, lawn mowing robots and embodied intelligence. In the fast-growing lawn mower and logistics vehicle categories, we have already established partnerships with most leading players. For example, we recently signed a 1.2 million-unit lidar supply agreement for lawn-mowing robots with Mammotion.

We anticipate that by 2026, our lidar shipment ratio between the automotive and robotics sectors will reach a 1:1 balance. We are continuing to scale up our investment to maintain our leadership position in this high-potential market.

High-tech industries often face cyclical fluctuations in capital and market conditions. Looking back on RoboSense's development, how do you think the company has navigated these cycles? And looking ahead, how will RoboSense build stronger growth momentum and operational resilience?

The lidar industry is still in a stage of rapid growth following its early emergence. Our revenue has maintained steady growth, and the gross margin has risen for six consecutive quarters. The core driver behind this momentum lies in the combined effects of the widespread adoption of intelligent driving and the explosive growth of the robotics industry, together fueling continuous market expansion.

We believe the key to withstanding broader capital and market cycles lies in the depth of technological accumulation. Through our proprietary development of the SPAD-SoC chip and other core technologies, we have not only significantly enhanced product performance but also established a solid competitive edge in emerging sectors. By consolidating our automotive foundation, igniting the "second growth curve" in robotics, and continuously investing in chip and ecosystem development, RoboSense is now on a clear, high-growth trajectory driven by both technology and market demand — ensuring long-term momentum and business resilience.

Beyond commercial success, what core value do you hope RoboSense will ultimately create for the transportation industry and society at large? When people look back on the popularization of lidar in the future, what role will RoboSense play in that history?

RoboSense’s mission is "Safer world, Smarter life." In the field of intelligent driving and transportation, we aim to establish lidar as the “safety baseline” — providing reliable 3D perception that surpasses the limits of human vision and serving as an indispensable safety redundancy in Level 3 and above autonomous driving systems. By doing so, we strive to reduce traffic accidents and enhance the efficiency of intelligent mobility. This pursuit of safety is also extending to broader fields such as industrial automation and embodied robotics.

At the technological level, RoboSense has evolved from a lidar hardware supplier into the creator of the “eyes of robots” — offering core technologies in perception, decision-making and manipulation for the robotics industry. We are accelerating the commercialization of AI-powered robotics across a wide range of industries, driving the arrival of a human-robot symbiotic society.

On a societal level, we hope that our values — innovation, perfection, simplicity and pragmatism — will help make the world a better place, enabling more developers to easily access our technologies and build a smarter future for all humankind.

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