Semiconductors

China's ADAS/AD players are set to gain ground at accelerated pace

OUTPERFORM (Initiation)

We expect the market size of ADAS/AD solutions in China to grow from RMB33bn in 2024E to RMB101bn by 2028E, representing a 32% CAGR over 2024-28E. Looking ahead, we believe Chinese suppliers of ADAS/AD solutions are well-positioned to gain market share. In particular, we see meaningful upside for local players such as Horizon Robotics (9660 HK) and Black Sesame (2533 HK), who are ready to scale along the market. **Initiate coverage on Horizon Robotics (9660 HK) and Black Sesame (2533 HK) with BUY ratings.**

- **We expect China's ADAS/AD market to grow at a 32% CAGR from 2024-28E. Key growth drivers include: 1) accelerating adoption volumes, and 2) rising ASPs.** The AD market is expected to expand at a faster pace, with a 41% CAGR during the same period, driven by higher adoption of mid-range to high-end AD solutions. By 2030E, we expect the penetration of smart vehicles in China to reach 98% (vs. 29% in 2020), driven by 1) increasing market share of Chinese OEMs, who are more proactive in equipping vehicles with autonomous capabilities; 2) growing consumer acceptance supported by safety and efficiency benefits; and 3) favourable regulatory policies. At the same time, AD system unit value is expected to increase, reflecting the growing demand for higher processing power to support advanced features across various driving scenarios (e.g., ~US$1 per 1TOP, per our estimate).
- **We believe domestic solution providers are set to gain share, supported by the "smart driving equality" trend among Chinese OEMs, rising demand for high-performance computing chips, and accelerated supply chain localization.** As smart driving becomes a standard feature, competition will center around enhanced user experience and lower cost, requiring substantial R&D investment. While leading automakers may have the financial capacity to pursue full-stack, in-house AD development, small- and mid-sized OEMs will increasingly rely on third-party solutions to keep pace. We believe these OEMs will favour domestic suppliers due to their cost-effective yet competitive product offerings.
- **Initiate coverage on Horizon Robotics (9660 HK, BUY, TP: HK$8.9), and Black Sesame (2533 HK, BUY, TP: HK$28.2), two leading domestic AD solution providers.** Horizon stands out as an integrated AD solutions company with strong software-hardware synergy, while Black Sesame specializes in chip design, offering high-performance computing and cross-domain SoCs. Both companies may face near-term profitability pressures, and we expect their NP to break even by 2027E, driven by economies of scale and operating leverage. **Key risks include**: 1) slower industry adoption, 2) intensifying competition, 3) geopolitical uncertainty in chip manufacturing.

Valuation table

Name	Ticker	Rating	Mkt Cap (US$ mn)	TP (LC)	Upside/ Downside	P/E (x) FY26E	P/E (x) FY27E	P/S (x) FY26E	P/S (x) FY27E	ROE (%) FY26E	ROE (%) FY27E
Black Sesame	2533 HK	BUY	1,534.9	28.20	49%	nm	nm	8.5	5.3	(0.3)	(0.3)
Horizon Robotics	9660 HK	BUY	8,350.4	8.90	52%	nm	nm	12.9	8.3	(0.1)	(0.1)

Source: Company data, Factset, CMBIGM estimates.

China Semiconductors Sector

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Investment thesis

Accelerating ADAS/AD penetration and industry-wide "smart driving equality" position China's AD players for long-term leadership

In this decade, the automotive industry has been going through electrification and then has evolved to the current stage of intelligence. In recent years, we have observed a significant acceleration in the adoption of ADAS/AD solutions designed to enhance driving safety, although the vast majority of passenger vehicles (PVs) remain at or below L2+. At present, vehicles with AD solutions can achieve conditional automation (e.g., NOA on highways and urban roads), with the long-term goal remaining full automation (L5) where vehicles can independently operate under any conditions without human intervention.

We expect ADAS/AD penetration to rise to 98% by 2030E, from 29% in 2020 and 56% in 2024. Key drivers include the following. 1) Increasing market share of Chinese OEMs in China's smart vehicle market, who are more proactive in equipping vehicles with ADAS/AD systems. Chinese OEMs are leading the market by promoting "smart driving equality" this year, exemplified by BYD's "God's Eye" announcement in Feb 2025. 2) Higher consumer acceptance for ADAS/AD solutions due to safety and efficiency considerations. 3) More ADAS/AD choices and continuous iterations of products have made the advanced driving solutions more cost-effective and improved product commercialization.

Suppliers of ADAS/AD solutions will be key beneficiaries. We estimate **the market size of ADAS and AD solutions to increase from RMB33bn in 2024E to RMB101bn by 2028E (32% 2024-28E CAGR)**. Advanced AD market will likely grow at a higher 2024-28E CAGR of 41%, from RMB24bn in 2024 to RMB94bn in 2028E. **This is driven by 1) significant volume acceleration and 2) ASP increase.**

There are three types of participants on the market: 1) Suppliers that specialize in AD: Representatives include Mobileye (MBLY US, NR), Nvidia (NVDA US, NR), Horizon Robotics (9660 HK, BUY), and Black Sesame (2533 HK, BUY). **2) General-purpose hardware manufacturers serving multiple end-markets**: Hi-Silicon (private company), Qualcomm (QCOM US, NR), Texas Instruments (TXN US, NR), and Renesas (6723 JT, NR). **3) Auto OEMs that develop in-house solutions**.

Driven by the "smart driving equality" trend, we think better user experience (i.e., end-to-end "E2E") **and lower costs will be the key focuses of competition among ADAS/AD solution providers in 2025 and beyond**. This requires significant R&D investment.

We expect the technology gap among industry players to widen, as only leading players can sustain full-stack in-house R&D. Their financial strength, technical depth, and data advantage will reinforce their dominance over time. **Small and medium-sized auto makers will rely on third-party solutions to keep up their smart driving offering. We hold a very positive view on domestic ADAS/AD solution providers, such as Horizon Robotics and Black Sesame.**

In terms of competitive landscape, Horizon Robotics leads the domestic ADAS market, while the domestic AD market remains heavily dominated by foreign players. Looking forward, we think Chinese suppliers will gain share and have higher growth, considering 1) increasing market share of China's OEMs, who are more proactive in adopting automation solutions, 2) Chinese OEMs are more inclined to choose domestic suppliers due to their cost-effectiveness and deepened collaborations, 3) product expansion and higher compute capability offered by domestic suppliers, and 4) the semiconductor localization trend.

Initiate coverage on Horizon Robotics (9660 HK, BUY, TP: HK$8.9) and Black Sesame (2533 HK, BUY, TP: HK$28.2)

We initiate coverage on Horizon Robotics and Black Sesame, two emerging Chinese technology leaders in the fast-growing domestic AD sector. Both companies are well-positioned to capitalize on the increasing penetration of ADAS/AD capabilities in the world's largest automotive market, with differentiated strategic focuses. Horizon Robotics offers an integrated AD solution with strong software-hardware synergy, while Black Sesame stands out as a chip-centric AD player with leading capabilities in high-performance and cross-domain SoC design.

- **Horizon Robotics (9660 HK, BUY, TP at HK$8.9).** As a market leader with a 7.2% share of domestic ADAS/AD market by value in 2024 based on our estimate, Horizon Robotics is set to benefit from three structural drivers: (1) broader ADAS/AD penetration expanding the addressable market, (2) rising adoption of higher-level autonomy functions driving ASP uplift, and (3) continued share gains. We forecast its revenue to grow at a 52% CAGR from 2024 to 2027E, reaching RMB8.4bn in 2027E. **Our TP is based on 21.5x 2030E P/E (close to peers' 2025E average P/E of 21.6x),** assuming the company achieves a consistent margin profile and steady operations (capacity utilization, supply chain stability, diverse customer base, etc.) in 2030E. We give Horizon Robotics a higher valuation multiple because of its market leading position and more diverse customer profile.

- **Black Sesame (2533 HK, BUY, TP at HK$28.2).** We see Black Sesame as a key beneficiary of the accelerating adoption of AD and cross-domain auto SoC integration shift, specifically by its strength in high-performance chip design. Its upcoming A2000 chip delivers over 250 TOPS. **Per our estimate, Black Sesame accounted for 1.4% share of domestic ADAS/AD market by value in 2024.** We forecast a 64% revenue CAGR from 2024E to 2027E, driven by increasing content per vehicle and new design wins. **Our TP is based on 18x 2030E P/E (15% discount to sector leader Horizon Robotics),** aligned with our expectation of normalized earnings by 2030E.

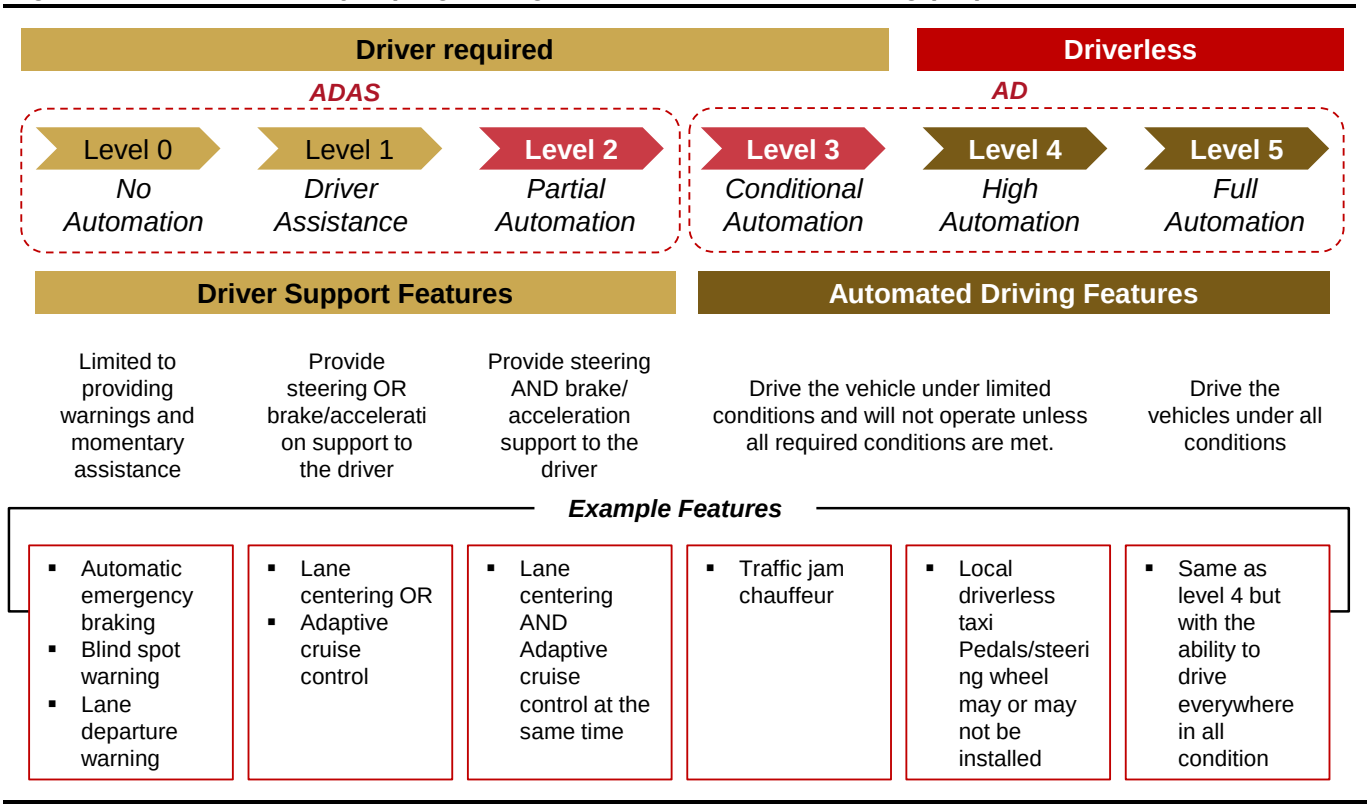
Global ADAS/AD market size projected to grow by 61% CAGR over 2024–28E, per CIC

Advanced driving assistance system (ADAS) and automated driving (AD) solutions

ADAS/AD technology refers to the application that involves advanced software and hardware aimed at achieving higher levels of automation. It can be classified into six levels (L0-L5), with the goal of enabling fully autonomous vehicles that operate without human intervention under L5, per F&S.

- **No automation (L0)**: limited to providing warnings and momentary assistance.
- **Advanced driving assistance system ("ADAS") (L1-L2)**: refers to systems designed to assist human drivers in various driving tasks, such as lane departure warnings, lane centering, adaptive cruise control, and automatic emergency braking. ADAS typically relies on simpler sensor setups, such as cameras and radar, with relatively lower processing power and software complexity.
- **Automated driving ("AD") (L3-L5)**: including features like NOA ("Navigation on Autopilot") offering conditional automation, such as lane changes, interchange navigation, and highway exits. As AD systems evolve, they are expected to handle complex urban scenarios and challenging road conditions. AD systems require more advanced sensors, greater processing power, and sophisticated algorithms compared to ADAS.

Figure 1: Vehicle autonomy is progressing towards autonomous driving (AD)



Source: SAE International, Frost & Sullivan, CMBIGM

At present, vehicles with AD solutions can achieve conditional automation (e.g., NOA on highways and urban roads), with the long-term goal remaining full automation (L5) where vehicles can independently operate under any conditions without human intervention.

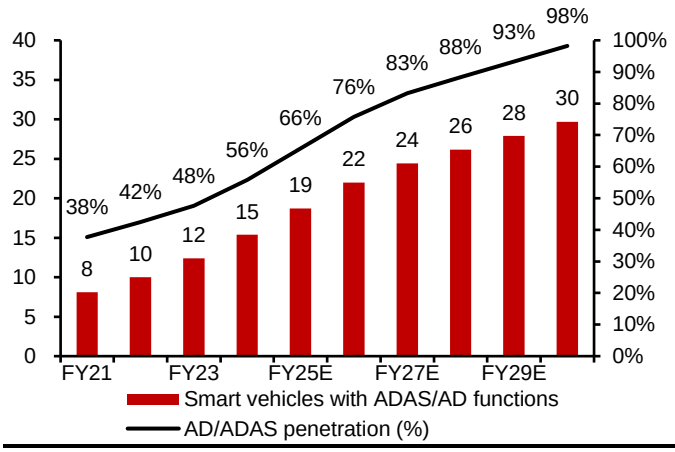
Significant acceleration in the adoption of ADAS/AD solutions in recent years

In recent years, we have observed a significant acceleration in the adoption of ADAS/AD solutions (although the vast majority of PVs remain at or below L2+), as these solutions are designed to enhance driving safety by reducing human errors and accidents, leveraging comprehensive sensing capabilities to enable instantaneous responses.

Looking ahead, we expect this penetration growth to accelerate. China Insights Consultancy (CIC) forecasts that by 2030E, approx. 97% of PVs worldwide will be equipped with ADAS/AD solutions, up from 46% in 2020 and 68% in 2024, driven by 1) the ongoing trend of auto electrification, 2) the growing recognition of the need for AD capabilities, 3) decreasing sensor costs, and 4) the implementation of favorable government policies.

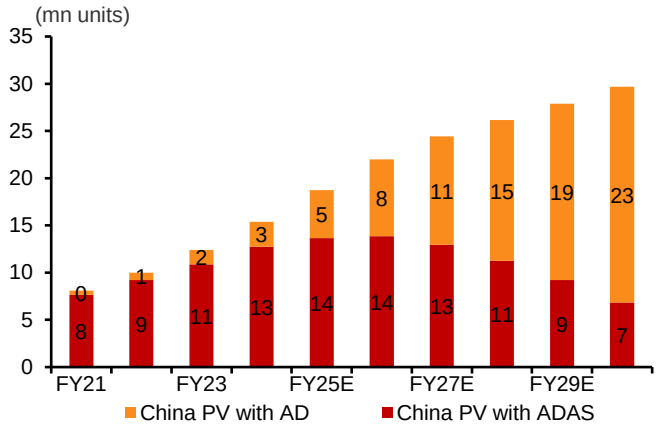
China will experience similar penetration growth during the same period. We estimate ADAS/AD penetration to be 98% by 2030E from 29% in 2020 and 56% in 2024. Chinese OEMs are leading the market by promoting "smart driving equality" this year. **In Feb 2025, BYD announced its "God's Eye" plan**, aiming to equip all of its upcoming fleet with AD solutoins, furthering its efforts in democratizing AD for all. We believe more OEMs, especially NEV OEMs, to follow BYD's steps, accelerating AD penetration in China.

Figure 2: Sales volume of smart vehicles with ADAS/AD functions and ADAS/AD penetration %



Source: CIC, CMBIGM estimates

Figure 3: Sales volume of China PVs with AD functions and with ADAS functions



Source: CIC, CMBIGM estimates

Key growth drivers include:

- **Increasing market share of Chinese OEMs in China's smart vehicle market.** We believe Chinese OEMs are more proactive in equiping vehicles with ADAS/AD systems. On March 18, 2025, Chery Automobile unveiled its comprehensive intelligent strategy, marking a major push into global smart driving. The strategy centers around the Falcon smart driving system, set to be deployed across all Chery Group brands by 2025, including three tiers (Falcon 500/700/900) supporting features from basic NOA to L3 autonomous driving. Geely as China's second largest auto OEM also announced plans to integrate its AI-powered G-Pilot system into all of its brands, e.g., Galaxy, Zeekr, Lynk, etc.

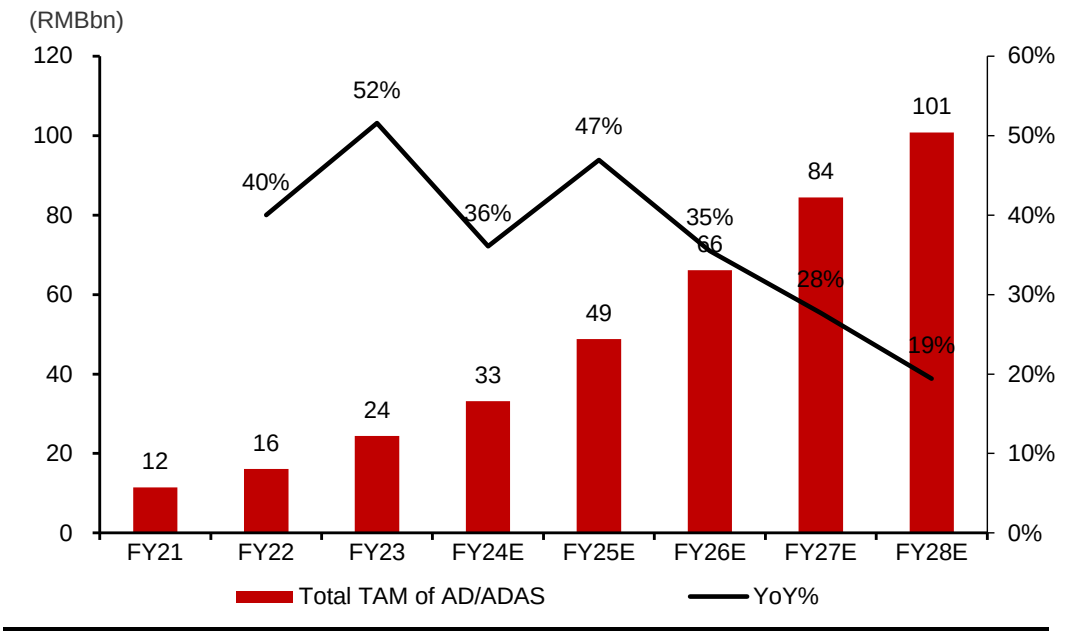
- **Higher consumer acceptance for ADAS/AD solutions due to safety and efficiency considerations, as well as more favorable policies.** Commuters in China are estimated to spend over 80 minutes per day on the road, per CIC. There is a growing demand for smart vehicles with autonomous driving features that can free up time and boost productivity for drivers and passengers. Meanwhile, more advanced driving automation technologies are expected to reduce human errors and achieve higher safety standards.

- **More ADAS/AD choices and continuous iterations of products have made the advanced driving solutions more cost-effective and improved product commercialization.**

China's ADAS/AD market is expected to grow at 32% 2024-28E CAGR

This TAM encompasses both hardware and software components of the solutions. We project ADAS/AD markets to grow at a 32% CAGR over 2024–28E. Our forecast methodology is through multiplying the est. ADAS/AD-related content value per vehicle with the est. number of vehicles equipped with ADAS/AD functions.

Figure 4: Market size for ADAS/AD solutions, China



Source: CIC, CMBIGM estimates

Key drivers of the market are: 1) volume acceleration and 2) ASP increase.

- The penetration of ADAS and AD solutions in China has accelerated in recent years (38% in 2021 vs. 56% in 2024E, per our estimate) and is expected to continue to rise (to 98% in 2030E). The sales volume of smart vehicles that are equipped with ADAS/AD systems is projected to reach 30mn by 2030E (15mn in 2024), per our estimate, with AD solutions expected to become mainstream, accounting for over 70% of the driving automation solutions by 2030E. With evolution towards full automation, higher compute capacity is required and there could be more than one chips being integrated within a single solution package.

- Greater value added by AD solutions with larger processing capacity to facilitate more advanced features under all driving scenarios, as well as to provide system redundancy. According to our estimate, mid-range solutions of Horizon Robotics are estimated to be ~US$100 per product, while high-end solutions are expected to be 5x, reaching US$500 per product.

Competitive landscape

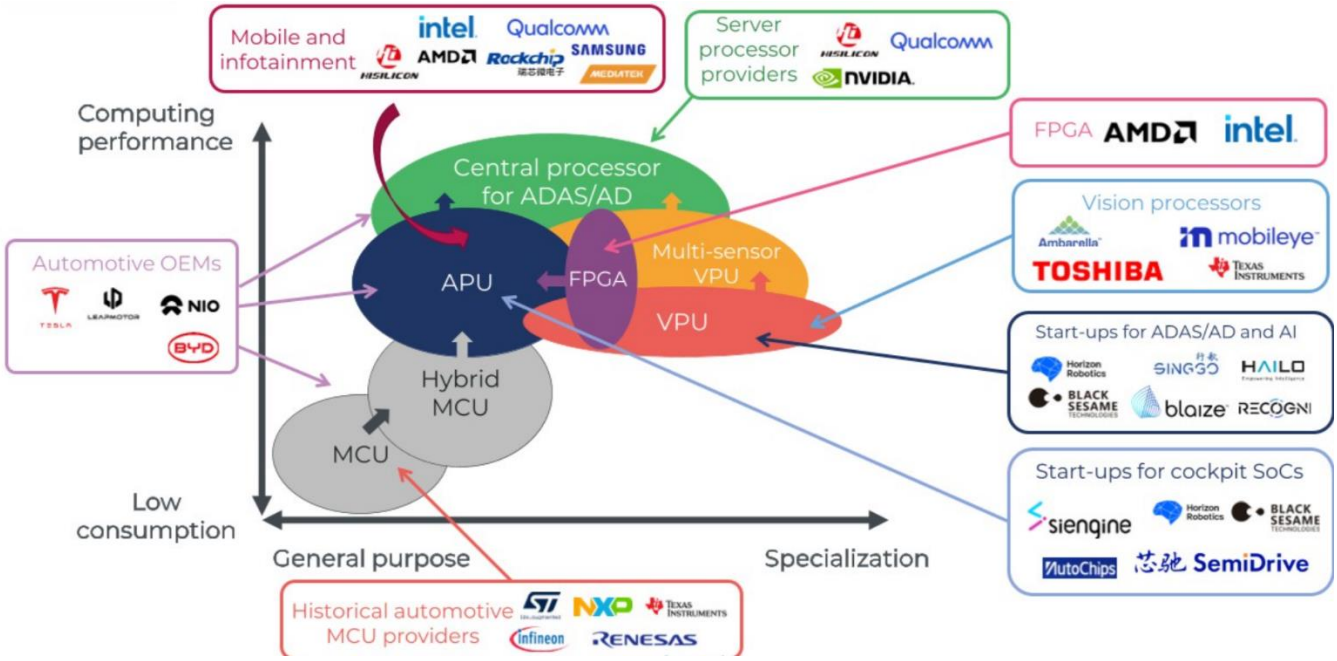
The AD solutions market consists of three types of participants:

- **Suppliers that specialize in AD**: Representatives include Mobileye (MBLY US, NR), Nvidia (NVDA US, NR), Horizon Robotics, and Black Sesame.

- **General-purpose hardware manufacturers serving multiple end-markets**: Hi-Silicon (private company), Qualcomm (QCOM US, NR), Texas Instruments (TXN US, NR), and Renesas (6723 JT, NR).

- **Auto OEMs that develop in-house solutions**: Tesla's Full Self-Driving (FSD) system is a prime example of an OEM taking control of its AD technology, enabling the company to create a proprietary system fully integrated with its vehicles' hardware and software. However, companies that take the step to build AD solution in-house are not included in the calculation of TAM of AD solution providers.

Figure 5: Key participants of the automotive compute and infotainment processors market



Source: Yole, CMBIGM

Driven by the "smart driving equality" trend, we think better user experience (i.e., end-to-end "E2E") **and lower costs will be the key focuses of competition among ADAS/AD solution providers in 2025 and beyond.** We see E2E is trending. However, this requires 1) more R&D investments to keep the technology advantages, 2) stronger engineering capabilities to achieve shorter time-to-market, and 3) higher computing power demand to support data analysis.

We forecast the technology gap among these suppliers will be wider in the following years. Only the leaders have the financial ability to support full-stack in-house R&D in autonomous driving development. Their advantages of financial capabilities, technology and data sufficiency will strengthen over time. **Small and medium-sized auto makers will rely on third-party solutions to keep up their smart driving offering.**

Nvidia's leadership in AD is largely attributed to its deep proficiency in GPU architecture, AI acceleration, and HPC. The company's upcoming Thor AD SoCs (System on Chip), which integrate the Blackwell GPU architecture, offer substantial compute power for real-time AI inference, sensor fusion, and neural network acceleration, ensuring Nvidia's continued dominance. Mobileye, similarly, benefits from significant capital investment and advanced chip manufacturing capabilities from its

parent company Intel, resources that we see domestic players currently lack. Semiconductor powerhouses like Nvidia, with its deep expertise in HPC (high-performance computing), are positioned to remain key players in the long run.

Figure 6: Comparison of mainstream AD SoCs on market

Chip	A1000	A1000 L	A1000 Pro	A1000 Pro	A2000	J2	J3	J5	J6 Pro	Tegra Xavier	Tegra Orin
SoC provider	Black Sesame	Black Sesame	Black Sesame	Black Sesame	Black Sesame	Horizon Robotics	Horizon Robotics	Horizon Robotics	Horizon Robotics	Nvidia	Nvidia
Launch time	06-2020	06-2020	04-2021	04-2021	04-2024	08-2019	09-2020	05-2021	04-2024	01-2018	12-2019
Process node	16nm	16nm	16nm	16nm	7nm	28nm	16nm	16nm	N/A	12nm	7nm
Computing power (INT8, TOPS)	58	16	106+	106+	256	4	5	N/A	560	30	254
Power consumption	18W	15W	25W	25W	NA	2W	2.5W	30W	NA	30W	45W
No. of camera channel	16	8	20	20	NA	2	6	16	NA	8	16
ASIL	ASIL-B	ASIL-B	N/A	N/A	NA	N/A	N/A	ASIL-B	ASIL-D	ASIL-B	ASIL-B
AEC-Q100	AEC-Q100 Grade 2	AEC-Q100 Grade 2	AEC-Q100 Grade 2	AEC-Q100 Grade 2	NA	AEC-Q100 Grade 2	AEC-Q100	AEC-Q100 Grade 2	NA	N/A	AEC-Q100
Number of CPU cores	11	11	11	11	NA	2	5	8	18	8	N/A

Source: F&S, CIC, company data CMBIGM.

We expect Chinese AD solution providers to gain share and outpace peers, driven by: 1) rising market share of local OEMs, who lead in adopting automation; 2) stronger preference for domestic suppliers given cost advantages and deeper partnerships; 3) expanding product portfolios with higher compute performance; and 4) supportive policies and accelerating localization of semiconductor supply chains.

Domestic players like Horizon Robotics and Black Sesame are delivering cost-effective AD solutions as the industry shifts toward higher autonomy. With L3 functionality typically requiring 50+ TOPS, hardware performance is becoming a key differentiator. Both firms offer competitive high-compute SoCs: Horizon's J6P (560 TOPS) and Black Sesame's A2000 (250 TOPS), against global leaders like Nvidia's Thor (2,000 TOPS).

Figure 7: Comps table

Company	Ticker	Mkt Cap (US$mn)	Price (LC)	P/E (x) FY25E	P/E (x) FY26E	P/S (x) FY25E	P/S (x) FY26E	Revenue YoY% FY25E	Revenue YoY% FY26E	NPM (%) FY25E	NPM (%) FY26E
Horizon Robotics	9660 HK	9,528	5.82	-	-	19.4	12.9	46.4	71.7	-61.7%	-12.6%
Black Sesame	2533 HK	1,537	18.34	-	-	13.8	8.5	79.8	66.9	-116%	-38.5%
			Average	***-***	***-***	***16.6***	***10.7***	***63.1***	***69.3***	***-88.6%***	***-25.6%***
Mobileye	MBLY US	10,025	12.35	42.3	28.4	5.7	4.8	6.4	17.9	13.6%	16.4%
Nvidia	NVDA US	2,737,680	112.20	24.9	19.9	21.1	13.4	114.2	56.4	56.5%	54.7%
Qualcomm	QCOM US	153,292	138.60	11.9	11.4	3.5	3.4	11.4	3.8	30.2%	30.1%
AMD	AMD US	154,811	95.29	20.7	15.4	4.9	4.1	23.2	20.0	23.7%	26.5%
NXP	NXPI US	43,529	171.63	14.5	12.1	3.6	3.3	-4.3	10.1	25.0%	26.9%
TI	TXN US	137,561	151.18	28.1	22.5	8.1	7.3	8.9	10.3	29.3%	34.3%
Renesas	6723 JT	21,168	1670.50	8.6	6.9	2.2	2.0	7.6	12.0	22.5%	25.3%
			Average	***21.6***	***16.7***	***7.0***	***5.5***	***23.9***	***18.6***	***28.7%***	***30.6%***

Source: Company data, Bloomberg, CMBIGM estimates
Note: earnings estimates for Horizon Robotics and Black Sesame are CMBI estimates; earnings estimates for peers are Bloomberg consensus; data as of 16 Apr close

25 Apr 2025

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Horizon Robotics (9660 HK)

An integrated autonomous driving solution leader

Horizon Robotics is a leading provider of ADAS/AD solutions for passenger vehicles, integrating hardware, software and algorithms. Key offerings include Horizon Mono (J2/J3), Horizon Pilot (J3/J5) and Horizon SuperDrive (J6P). Given 1) the ongoing trend of auto electrification, 2) the growing recognition of AD solution demand, and 3) favourable gov't policies, we estimate the global ADAS/AD market to expand from RMB12bn in 2021 to RMB101bn in 2028E. As a leader in a rising market (7.2% share in domestic ADAS/AD market in 2024, per our estimate), the company's revenue surged from RMB467mn in 2021 to RMB2,384mn in 2024. Looking forward, we expect its revenue to reach RMB8.4bn in 2027E (52.2% 2024-27E CAGR), driven by 1) increasing penetration of ADAS/AD and a growing TAM, 2) further adoption of advanced AD technology and a higher ASP, and 3) market share gains with increasing shipments. We project the company to reach breakeven in profitability in 2027E. **Initiate at BUY with TP at HK$8.9 based on 21.5x 2030E P/E.**

- **Product Solutions will drive growth from 2025 onward.** The company has two segments: Auto Solutions (97% of 2024 sales) and Non-auto Solutions. 1) In Auto Solutions, License and Service led revenue in 2024 (71% of segment sales), but with software-hardware integration trending, Product Solutions sales should surpass software by 2025E, growing at a 105% 2024-28E CAGR on our estimates. 2) Non-auto Solutions (33%) is not a current focus, yet it could become a second growth driver as other AI applications (e.g., humanoids) scale up.
- **Horizon Robotics is poised to gain share with its 1) pioneering software-hardware co-optimization approach, 2) cost-effective offerings, and 3) a robust customer and ecosystem network.** The company held 7.2% ADAS/AD market share domestically in 2024, per our estimate. Its current customers include Li Auto, BYD, Chang'an, Chery, etc. It also delivered 2.9mn product solutions in 2024 (7.7mn cumulatively), per mgmt. We project its shipments to reach 4.3mn (50% YoY) in 2025E with broader customers. Low-end solutions led (~80% of shipments) in 2024, while mid-range to high-end products to dominate (est. 70%+ of total shipments) by 2028E, boosting average ASP. The company also plans to roll out its most advanced AD solution "Horizon SuperDrive (HSD)" in 2H25 featuring its most powerful AD processor Journey 6P, boasting 560+ TOPS of compute power.
- **Initiate at BUY with TP of HK$8.9.** We project sales to grow at a 50.4% 2024-30E CAGR from RMB2,384mn in 2024 to RMB8,407mn/ RMB27,603mn in 2027E/30E. We believe the company is on track to achieve NP breakeven in 2027 and reach 32.5% NPM in 2030E. Our TP is HK$8.9, based on 21.5x 2030E P/E (close to peers' 2025E P/E avg. of 21.6x), given the business will be in a more stable status in 2030E (WACC at 12.0% and RMB/HKD at 1.07). Key risks include: 1) slower industry growth, 2) rising competition, 3) escalating geopolitical issues revolving chip fabrication.

BUY (Initiate)

Target Price	**HK$8.90**
Up/Downside	**58.9%**
Current Price	**HK$5.60**

China Semiconductors

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Stock Data

Mkt Cap (HK$ mn)	62,025.0
Avg 3 mths t/o (HK$ mn)	591.8
52w High/Low (HK$)	NA/NA
Total Issued Shares (mn)	11075.9

Source: FactSet

Shareholding Structure

SAIC QIJUN I HLDG LTD	9.3%
GIL TRUST LIMITED	8.1%

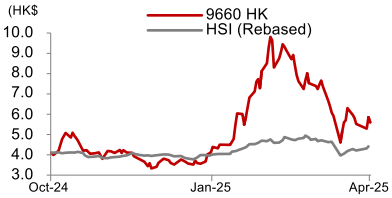
Source: HKEx

Share Performance

	Absolute	Relative
1-mth	-22.7%	-17.6%
3-mth	27.6%	16.8%
6-mth	40.4%	31.9%

Source: FactSet

12-mth Price Performance



Source: FactSet

Earnings Summary

(YE 31 Dec)	FY23A	FY24A	FY25E	FY26E	FY27E
Revenue (RMB mn)	1,552	2,384	3,574	5,381	8,407
YoY growth (%)	71.3	53.6	50.0	50.5	56.2
Gross margin (%)	70.5	77.3	65.2	59.6	57.0
Net profit (RMB mn)	(6,739.0)	2,346.5	(2,216.0)	(1,398.2)	336.0
EPS (Reported) (RMB)	(2.50)	0.51	(0.17)	(0.11)	0.03
P/S (x)	37.6	24.5	16.3	10.8	6.9
ROE (%)	na	na	(20.1)	(14.3)	3.5

Source: Company data, Bloomberg, CMBIGM estimates

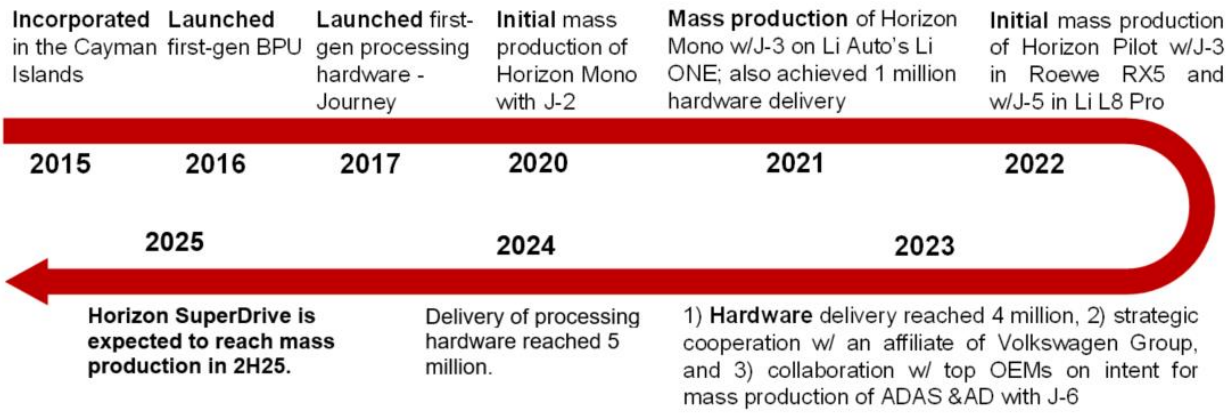
Company Overview

An integrated autonomous driving solution leader

Horizon Robotics is a leading provider of ADAS and AD solutions for passenger vehicles, integrating algorithms, purpose-built software and processing hardware. The company was founded in 2015 and went public on HKEX in 2024 with an IPO price at HK$3.99.

The company offers a comprehensive portfolio of ADAS and AD solutions, i.e., **Horizon Mono (Journey 2 or Journey 3 chips), Horizon Pilot (Journey 3 or Journey 5 chips) and Horizon SuperDrive (Journey 6).** Horizon Mono and Horizon Pilot achieved mass production in 2020 and 2022. **We expect the latest SuperDrive series to reach mass production in 2H25.**

Figure 8: Horizon Robotics' milestones and future roadmap



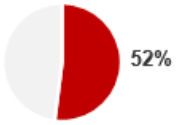
Source: Company data, CMBIGM

Integrated AD & ADAS solutions, with Journey series chips embedded, catered to all sorts of scenarios

The company provides a robust and versatile portfolio of ADAS and AD solutions, including **Horizon Mono, Horizon Pilot, and Horizon SuperDrive**, tailored to address diverse customer requirements. These solutions cater to mainstream assisted driving (L2) and advanced AD (Level 2+ in compliance with China's regulatory framework).

Figure 9: Horizon Mono/Pilot/SuperDrive comparison

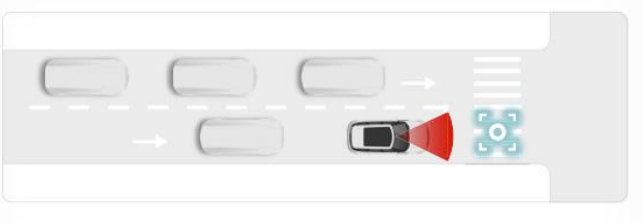
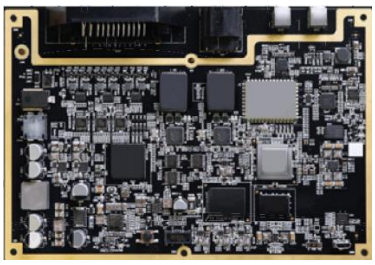
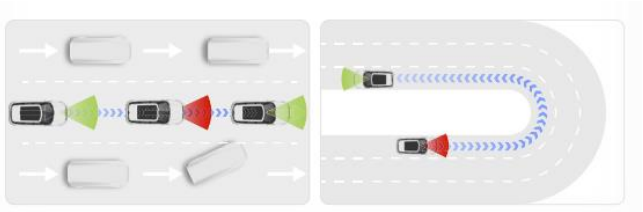
	Horizon Mono	Horizon Pilot	Horizon SuperDrive
Positioning	Active safety ADAS	Highway NOA	Urban NOA for all
Launch time[1]	2019	2021	2024
Revenue generation since	2021	2022	2024[2]
Initial mass production	2021	2022	2H25
Typical sensor set	Up to 8MP front view camera	Cameras and radars[3]	Cameras, radars and LiDAR[4]
Selective functions and highlights	Mainstream ADAS functions, including AEB, IHB, ACC, LCC, ICA, TJA and more	Enhanced active safety and comfort functions, including automatic ramp on/off, autonomous merge in and exit during traffic congestion, automated lane change, highway auto-pilot, APA, VPA and more	Smooth and human-like AD functions in all urban, highway and parking scenarios
Power consumption	J3: 2.5W	J5: 30W	N/A

Processor embedded	Journey 2 or Journey 3	Journey 3 or Journey 5	Journey 6
Customers	has been the choice of 200+ OEM car models*	has been the choice of 25+ car models*	
Segment sales contribution (2023)			

Source: Company data, CMBIGM. *As of 31 December 2023.
Note: (1) Refers to the initial release time, which does not indicate the completion of start of production (SOP) or mass production.
(2) Expected timing, which is subject to change with actual development and production progress.
(3) Typical sensor set of Horizon Pilot includes 11 camera(s) including front camera(s) of 8.3MP, side camera(s) of 2.5MP, surround camera(s) of 2.9MP, rear camera(s) of 2.5MP; and five millimeter wave radars and 12 ultrasonic radars.
(4) Typical sensor set of Horizon SuperDrive is expected to include 11 camera(s) of 8.3MP, 3.0MP and 2.5MP, three millimeter wave radars, 12 ultrasonic radars and one LiDAR.

- **Horizon Mono:** This active safety ADAS solution is designed to enhance driving safety and comfort. It supports essential safety features such as Automatic Emergency Braking (AEB) and Intelligent High Beam (IHB) to ensure passenger and road-user protection, alongside comfort-oriented functions like Adaptive Cruise Control (ACC) and Traffic Jam Assist (TJA) to elevate the driving experience. **Horizon Mono currently integrates Journey 2 or Journey 3 processing hardware.** According to the company, Horizon Mono can reach a successful rate of 90% for common traffic sign recognition in China, 95% for speed limit traffic sign in the EU and 98% for speed limit traffic sign in pan-European countries, Southeast Asia and South America. As of 2023, Horizon Mono had been adopted by over 200 OEM car models, including SAIC's MAXUS, Chery's iCAR, Lynk & Co 07 EM-P, etc.

Figure 10: Horizon Mono functionalities

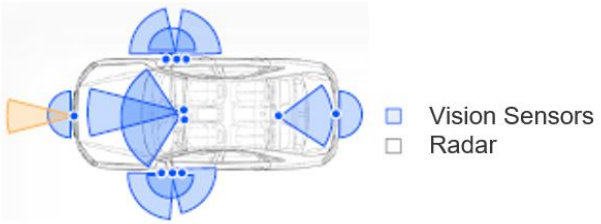
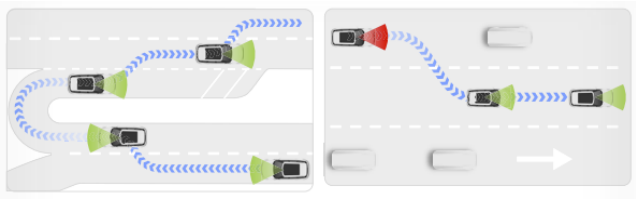
Solutions	Illustration of selected functions
A typical sensor configuration	Automatic emergency braking
	
ADAS algorithm and software + processing hardware	Adaptive cruise control
	

Source: Company data, CMBIGM

- **Horizon Pilot:** Positioned as its NOA solution, Horizon Pilot delivers safe and efficient driving experience for extended commutes. Beyond advanced active safety features, it enables sophisticated autonomous functionalities, including automatic ramp-on/off, autonomous merging and exiting, automated lane changes, and highway autopilot. It also offers parking innovations such as Auto Parking Assist (APA) and Automated Valet Parking Assist (VPA). **Horizon Pilot is powered by Journey 3 or Journey 5 processing hardware**, ensuring high performance and reliability. As of 2023 year-end,

Horizon Pilot had been used to power over 25 car models, including Li Auto Li L9 Pro, a flagship six-seat family SUV.

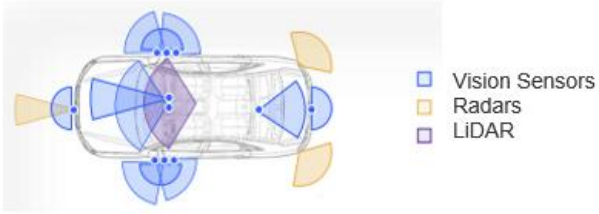
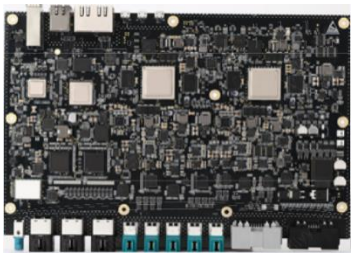
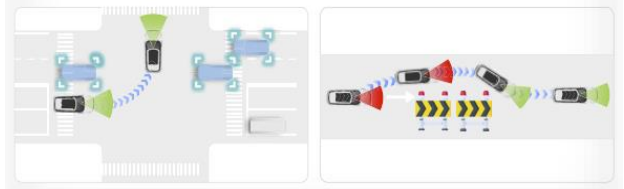
Figure 11: Horizon Pilot functionalities

Solutions	Illustration of selected functions	
A typical sensor configuration	Automatic Ramp on/off	Automated Lane Change
		
ADAS algorithm and software + processing hardware	Auto Parking Assist	Valet Parking Assist
		

Source: Company data, CMBIGM

- **Horizon SuperDrive:** Representing the company's most advanced AD solution, Horizon SuperDrive is designed to deliver smooth, human-like AD across urban, highway, and parking scenarios. It is engineered to handle complex road conditions with precision and an assertive yet interactive driving style. Key features include seamless obstacle avoidance, gentle braking, dynamic speed control, and smooth execution of unprotected left turns, among others. **Powered by its latest Journey 6 processing hardware**, Horizon SuperDrive sets a new benchmark for advanced AD systems.

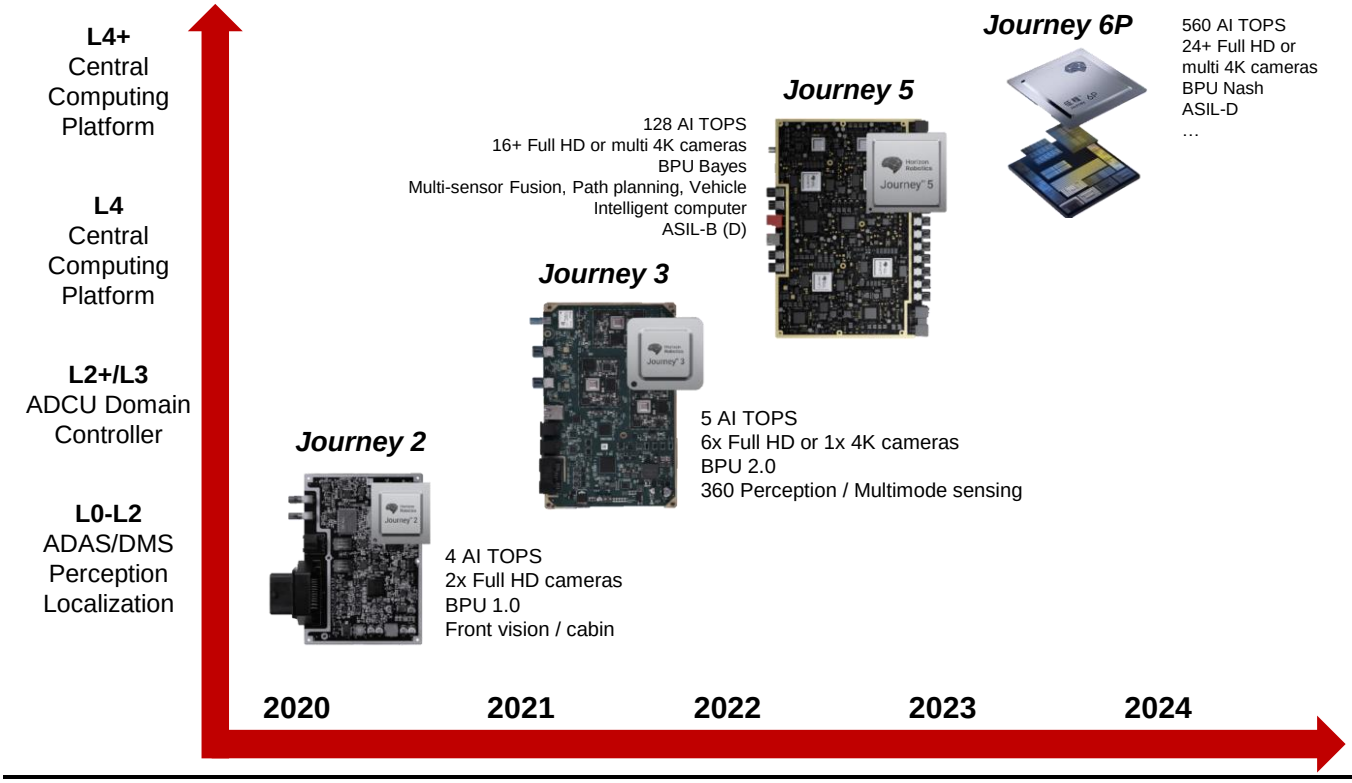
Figure 12: Horizon SuperDrive functionalities

Solutions	Illustration of selected functions	
A typical sensor configuration	Lane Change Cut-in	Assertive Interaction at Roundabout
		
ADAS algorithm and software + processing hardware	Unprotected Left Turn	Smooth Obstacle Bypass
		

Source: Company data, CMBIGM estimates

The latest Journey 6 suite AD processor: Launched in April 2024, the **Journey 6** processing hardware is built on the company's next-generation BPU architecture, **Nash**. Journey 6 supports advanced mainstream algorithms like BEV Transformer and enables full-stack processing for ADAS and AD tasks, including perception, planning, decision-making, and control. It delivers improved performance and power efficiency compared to its predecessors, setting a new benchmark in auto computing.

Figure 13: The company's AI processor roadmap



Source: Company data, CMBIGM

The Journey 6 series, comprising six versions, i.e., Journey 6B, 6L, 6E, 6M, 6H, and 6P, are designed to cater to various intelligent driving scenarios, balancing performance and cost. Journey 6B, targeting the entry-level market, offers a cost-effective active safety solution and features a 17-million-pixel front-view perception system developed with Sony, along with partnerships with Bosch, Denso, and others. For the mid-range market, Journey 6M delivers urban driving solutions, while Journey 6E excels in highway NOA with superior user experience. With over 50 ecosystem partners, Horizon Robotics had rolled out pre-mass production products based on Journey 6M and 6E by 2Q24, accelerating adoption across markets. We expect the latest SuperDrive series will reach mass production in 2H25.

Figure 14: Horizon Robotics' latest Journey 6 suite AI processors

Features	J6B	J6L	J6E	J6M	J6H	J6P
						
GPU performance	10+ TOPS		80 TOPS	128 TOPS		560 TOPS
CPU	20k+ DMIPS		100k DMIPS	137k DMIPS		410k DMIPS
User scenario	Optimal cost-effectiveness	Seamless integration of AP and AD	Best-in-class NOA solution	Most cost-effective solution for urban mobility	Advanced solution for urban vehicle autonomy	All-scenario AD solution

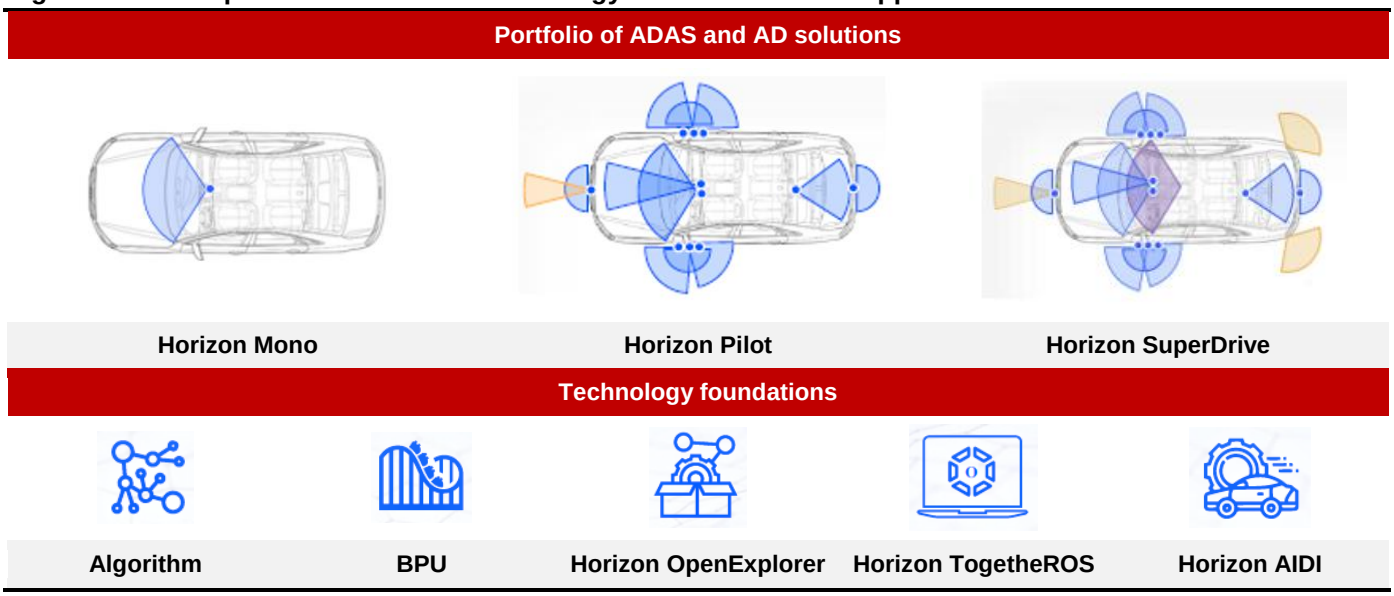
Source: Company data, CMBIGM

Competitive advantages

A comprehensive stack of technology foundations and pioneering software-hardware co-optimization approach

Horizon Robotics' competitive edge stems from its pioneering software-hardware co-optimization approach. By seamlessly integrating advanced algorithms with customized processing hardware, the company achieves unparalleled system-level performance in ADAS/AD solutions. This unique synergy sets the company apart from competitors and positions it as a leader in the rapidly evolving auto tech landscape.

Figure 15: A comprehensive stack of technology foundations that support ADAS/AD solutions



Source: Company data, CMBIGM

Key strengths of the software-hardware co-optimization strategy:

1) **Superior system performance:** Seamless integration and optimal efficiency tailored for AD solutions.
2) **AD democratization:** Their highly efficient solutions, with low power consumption and low latency, are produced at affordable costs, paving the way for widespread adoption of AD technology across diverse markets.
3) **Accelerated development with an open platform:** An open platform, equipped with development tools, base models, and frameworks, empowers customers to quickly develop customized applications, cutting both development time and costs.

Key pillars driving long-term growth:

1) **Robust R&D capabilities:** With over 1,000 software developers focused on algorithms, the company leads the AD algorithm development at all fronts.
2) **Capitalizing on domestic AD democracy:** The company benefits from the growing adoption of AD solutions in China, exemplified by BYD's "God's Eye" initiative, which aims to democratize AD technology across all vehicle price levels.
3) **Strategic advantage from semi-localization scheme:** The company is well-positioned to leverage the long-term trend of semi-localization in the AD solutions market, enhancing its cost-effectiveness and market share.

A growing customer base and ecosystem partnerships

The company's distinctive solutions and open-platform approach have secured a growing customer base and ecosystem partnerships. Operating as a tier-two supplier, it collaborates with OEMs directly and through tier-one suppliers to implement integrated ADAS and AD solutions in mass-produced vehicles. As of Oct 2024, its solutions have been chosen by 27 OEMs (covering 42 brands) for over 285 vehicle models, priced between RMB86,800 and RMB429,800, and **all top ten Chinese OEMs by sales volume have adopted its solutions for passenger vehicles, per CIC.**

The company has achieved cumulative design-wins for 44/101/210/ 275 vehicle models in 2021/2022/2023/1H24, respectively, with over 100 new design-wins in 2023 alone. As of December 31, 2023, Horizon Mono had been the choice of over 200 OEM car models and Horizon Pilot had been the choice of over 25 OEM car models.

The company has also laid out plans for its overseas footprint. It has a long history of partnering with established leaders in the industry. According to company data, key existing collaborations include working with Volkswagen via the Carizon joint venture, Aptiv for integrated hardware-software solutions, Bosch and Denso for mass production with next-generation hardware, Continental on a joint venture for L2+ AD and parking systems, and ZF on high-performance computing platforms, with the first ZF solution launching in 2024, according to CIC.

Specifically, the company plans to further and deepen its partnership with Bosch on developing its next generation of MPC 4, leveraging its Lite Journey 6 model 6B SoC, according to the company.

Figure 16: Horizon Robotics' strong customer base and ecosystem networks

Source: Company data, CMBIGM

Business segement analysis and financial forecast

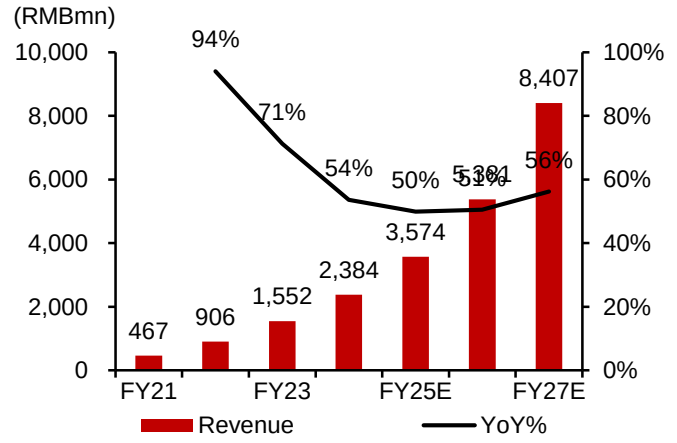
As a market leader in a rising market (7.2% domestic ADAS/AD market share in 2024, per our estimate), Horizon Robotics' revenue increased significantly from RMB467mn in 2021 to RMB2,384mn in 2024. Looking forward, **we forecast its revenue to reach RMB8.4bn in 2027E (52% 2024-27E CAGR), driven by 1) increasing penetration of ADAS/AD bringing a bigger TAM, 2) the trend of adopting "high-level" AD features for a higher ASP, and 3) market share gains from higher shipment volumes.**

The company has two business segments, Automotive Solutions and Non-auto Solutions.

- **Automotive Solutions segment** (97% of total revenue in 2024): **1) Product Solutions**: combining the company's self-developed processing hardware with proprietary algorithms and software; and **2) License and Services**, which the company licenses its customers with a right to use its algorithms and software.

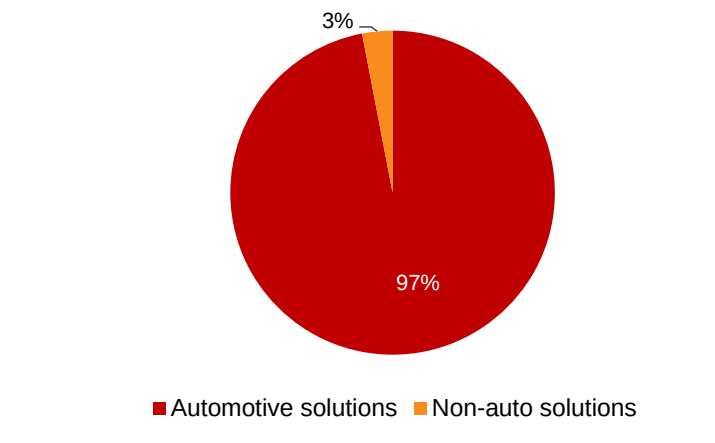
- **Non-auto Solutions business** (3% of total revenue in 2024) is not the company's priority at present. However, we think this segment will be Horizon Robotics' second growth engine when humanoids are mass-produced.

Figure 17: Revenue to reach RMB8.4bn in 2027E (52.2% 2024-27E CAGR)



Source: Company data, CMBIGM estimates

Figure 18: Automotive Solutions segment contributed 97% of total revenue in 2024



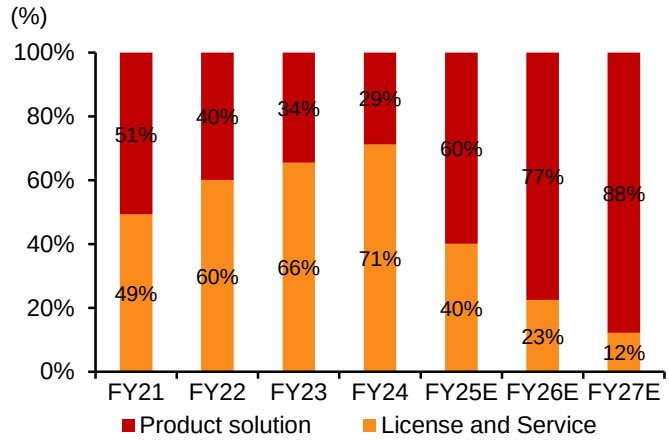
Source: Company data, CMBIGM

Within the Automotive Solution segment, sales from Product Solutions (29% of segment revenue in FY24) and License and Services (71%) sales were RMB664mn and RMB1,647mn, respectively. We forecast that its **Product Solutions revenue will exceed software sales in 2025E and grow at a 105% 2024-28E CAGR to become the main revenue driver.** In 2027E, Product Solutions and License and Services sales are expected to be RMB7.3bn and RMB1.0bn in 2027E, respectively, per our estimation.

The growth of Product Solution's revenue hinges on two key drivers: 1) rising SoC shipments and 2) rise in average ASP. Horizon Robotics delivered 2.9mn Product Solutions in 2024. We project the shipments to reach 4.3mn (+50% YoY) in 2025E, along with customer base expansion. Of the Product Solutions delivered, low-end solutions accounted for the majority (~80% of total shipments) in 2023/24, per our estimation. We expect the mid-range and high-end products to take higher shares in the following years (est. 70%+ by volume in 2028E), leading to a higher average ASP. The company's License and Service sales contribution is projected to decrease, considering the company's future products will fully integrate the License and Services business into its hardware offerings.

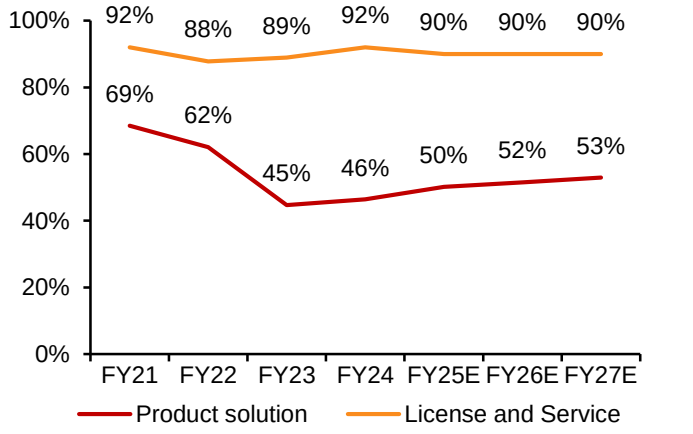
GPMs of Product Solutions and License and Services were 46.4% and 92.0%, respectively, in 2024. We expect GPM of Product Solutions to gradually rise above 50% and higher in the coming years on economies of scale, while GPM of License and Services to maintain at current level. However, **overall segmental GPM should gradually decline due to higher revenue contribution from Product Solutions.**

Figure 19: Product Solutions revenue expected to exceed software sales in 2025 and grow at 105% 2024-28E CAGR, per our estimates



Source: Company data, CMBIGM estimates.

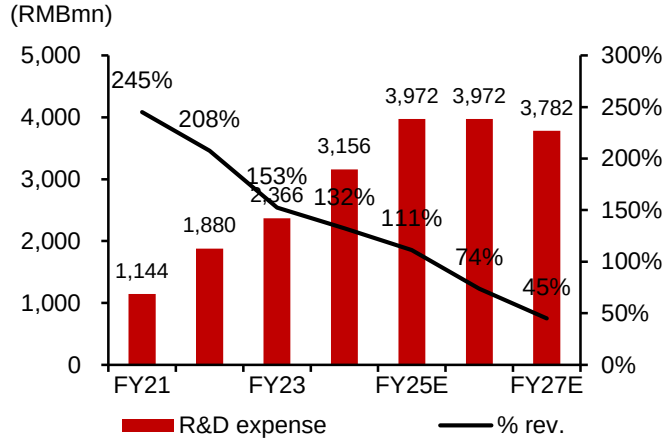
Figure 20: GPM of Product Solutions is expected to improve in the coming years while that of Licence and Services to stabilize at ~90%



Source: Company data, CMBIGM estimates.

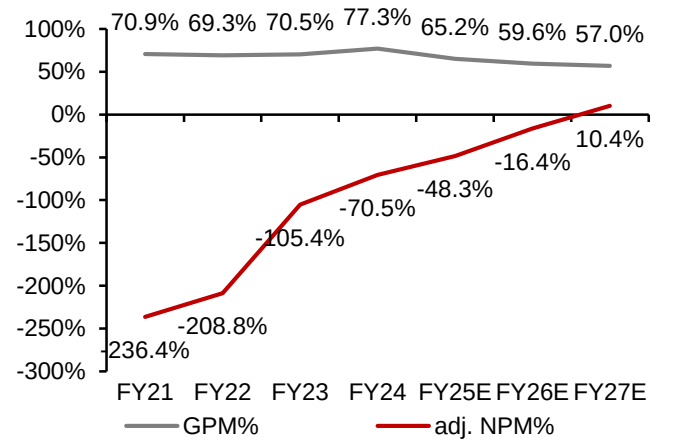
We expect to see R&D expenses to increase from RMB3.2bn in FY24 to RMB4.0bn in FY26E, and then decline to RMB3.8bn in FY27E, driven by continued investment in ramping up the production of its latest hardware. Overall R&D expense ratio will decline from 132% in 2024 to 45% in 2027E, due to operating leverage. **We expect the company's net profit to turn positive in FY27E (GPM: 57.0%, NPM: 10.4%).**

Figure 21: R&D expenses to grow in 2025/26E



Source: Company data, CMBIGM estimates

Figure 22: Net profit to turn positive in 2027E



Source: Company data, CMBIGM estimates

Figure 23: Company's financials breakdown by segment

RMBmn	FY21	FY22	FY23	FY24	FY25E	FY26E	FY27E
Revenue by segment							
Automotive Solutions	**410**	**801**	**1,470**	**2,312**	**3,495**	**5,290**	**8,293**
YoY%		*95%*	*84%*	*57%*	*51%*	*51%*	*57%*
%	*88%*	*88%*	*95%*	*97%*	*98%*	*98%*	*99%*
Non-auto Solutions	**57**	**105**	**81**	**72**	**79**	**91**	**114**
YoY%		*85%*	*-22%*	*-12%*	*10%*	*15%*	*25%*
%	*12%*	*12%*	*5%*	*3%*	*2%*	*2%*	*1%*
Revenue	**467**	**906**	**1,552**	**2,384**	**3,574**	**5,381**	**8,407**
YoY%		*94%*	*71%*	*54%*	*50%*	*51%*	*56%*
Automotive Solutions							
Product Solutions	**208**	**319**	**506**	**664**	**2,095**	**4,100**	**7,281**
YoY%		*53%*	*59%*	*31%*	*215%*	*96%*	*78%*
%	*51%*	*40%*	*34%*	*29%*	*60%*	*77%*	*88%*
Shipments (mn units)	**1.0**	**1.5**	**2.1**	**2.9**	**4.3**	**6.6**	**7.8**
YoY%		*50%*	*41%*	*37%*	*50%*	*52%*	*18%*
ASP per unit (RMB)	**208**	**213**	**239**	**229**	**486**	**626**	**939**
YoY%		*2%*	*12%*	*-4%*	*110%*	*29%*	*50%*
License and Services	**202**	**482**	**964**	**1,647**	**1,400**	**1,190**	**1,012**
YoY%		*138%*	*100%*	*71%*	*-15%*	*-15%*	*-15%*
%	*49%*	*60%*	*66%*	*71%*	*40%*	*23%*	*12%*
Automotive Solutions revenue	**410**	**801**	**1,470**	**2,312**	**3,495**	**5,290**	**8,293**
YoY%		*95%*	*84%*	*57%*	*51%*	*51%*	*57%*
Key metrics							
Revenue	**467**	**906**	**1,552**	**2,384**	**3,574**	**5,381**	**8,407**
YoY%		*94.1%*	*71.3%*	*53.6%*	*50.0%*	*50.5%*	*56.2%*
Gross profit	**331**	**628**	**1,094**	**1,841**	**2,330**	**3,206**	**4,791**
YoY%		*89.6%*	*74.3%*	*68.3%*	*26.6%*	*37.6%*	*49.5%*
Gross margin%	*70.9%*	*69.3%*	*70.5%*	*77.3%*	*65.2%*	*59.6%*	*57.0%*
Selling expenses	**-211**	**-299**	**-327**	**-410**	**-469**	**-533**	**-613**
YoY%		*41.2%*	*9.6%*	*25.2%*	*14.5%*	*13.5%*	*15.1%*
expense ratio%	*-45.3%*	*-33.0%*	*-21.1%*	*-17.2%*	*-13.1%*	*-9.9%*	*-7.3%*
Admin expenses	**-319**	**-374**	**-443**	**-638**	**-561**	**-612**	**-682**
YoY%		*17.2%*	*18.6%*	*43.8%*	*-11.9%*	*9.0%*	*11.4%*
expense ratio%	*-68.3%*	*-41.3%*	*-28.6%*	*-26.8%*	*-15.7%*	*-11.4%*	*-8.1%*
R&D expenses	**-1,144**	**-1,880**	**-2,366**	**-3,156**	**-3,972**	**-3,972**	**-3,782**
YoY%		*64.4%*	*25.9%*	*33.4%*	*25.9%*	*0.0%*	*-4.8%*
expense ratio%	*-245.0%*	*-207.6%*	*-152.5%*	*-132.4%*	*-111.1%*	*-73.8%*	*-45.0%*
Net profit attri. to shareholders (IFRS)	**-2,061**	**-8,719**	**-6,739**	**2,347**	**-2,216**	**-1,398**	**336**
YoY%		*323.0%*	*-22.7%*	*-134.8%*	*-194.4%*	*-36.9%*	*-124.0%*
NPM%	*-441.7%*	*-962.8%*	*-434.3%*	*98.4%*	*-62.0%*	*-26.0%*	*4.0%*
Net profit (non-IFRS)	**-1,103**	**-1,891**	**-1,635**	**-1,681**	**-1,727**	**-885**	**875**
YoY%		*71.4%*	*-13.5%*	*2.8%*	*2.7%*	*-48.8%*	*-198.8%*
NPM%	*-236.4%*	*-208.8%*	*-105.4%*	*-70.5%*	*-48.3%*	*-16.4%*	*10.4%*

Source: Company data, CMBIGM estimates

Valuation and risks statement

Target price of HK$8.9 per share based on 21.5x 2030E P/E

We believe the company is on track to achieve stable operations by 2030E, at which point a valuation multiple of 21.5x P/E would be justifiable (peers' avg FY25E P/E is 21.6x). This derives a total equity value of HK$117.0bn when we discount it back to FY25E, with WACC at 12.0% and RMB/HKD at 1.07.

Figure 24: Horizon Robotics' valuation

Valuation	2023	2024	2025E	2026E	2027E	2028E	2029E	2030E
(RMBmn)								
Key metrics								
Revenue	**1,552**	**2,384**	**3,574**	**5,381**	**8,407**	**12,767**	**19,631**	**27,603**
YoY%	*71%*	*54%*	*50%*	*51%*	*56%*	*52%*	*54%*	*41%*
Gross profit	**1,094**	**1,841**	**2,330**	**3,206**	**4,791**	**7,124**	**10,830**	**15,120**
YoY%	*74%*	*68%*	*27%*	*38%*	*49%*	*49%*	*52%*	*40%*
GPM%	*70.5%*	*77.3%*	*65.2%*	*59.6%*	*57.0%*	*55.8%*	*55.2%*	*54.8%*
Net profit attri. to shareholders	**-6,739**	**2,347**	**-2,216**	**-1,398**	**336**	**1,739**	**5,016**	**8,959**
YoY%	*-23%*	*-135%*	*-194%*	*-37%*	*-124%*	*418%*	*188%*	*79%*
NPM%	*-434.3%*	*98.4%*	*-62.0%*	*-26.0%*	*4.0%*	*13.6%*	*25.6%*	*32.5%*
P/E (x)								**21.5x**
WACC								**12.0%**
RMB/HKD								**1.07**
Equity value (HK$mn)			**116,942**					**192,610**
Shares outstanding (mn)			13,200					
TP (HK$)			**HK$8.9**					

Source: Company data, CMBIGM estimates.

Figure 25: Comps table

Company	Ticker	Mkt Cap (US$mn)	Price (LC)	P/E (x) FY25E	P/E (x) FY26E	P/S (x) FY25E	P/S (x) FY26E	Revenue YoY% FY25E	Revenue YoY% FY26E	NPM (%) FY25E	NPM (%) FY26E
Horizon Robotics	9660 HK	9,257	5.82	-	-	19.4	12.9	46.4	71.7	-62%	-12.6%
Black Sesame	2533 HK	1,427	18.34	-	-	13.8	8.5	79.8	66.9	-116%	-38.5%
			Average	***-***	***-***	***16.6***	***10.7***	***63.1***	***69.3***	***-89%***	***-25.6%***
Mobileye	MBLY US	10,025	12.35	42.3	28.4	5.7	4.8	6.4	17.9	13.6%	16.4%
Nvidia	NVDA US	2,737,680	112.20	24.9	19.9	21.1	13.4	114.2	56.4	56.5%	54.7%
Qualcomm	QCOM US	153,292	138.60	11.9	11.4	3.5	3.4	11.4	3.8	30.2%	30.1%
AMD	AMD US	154,811	95.29	20.7	15.4	4.9	4.1	23.2	20.0	23.7%	26.5%
NXP	NXPI US	43,529	171.63	14.5	12.1	3.6	3.3	-4.3	10.1	25.0%	26.9%
TI	TXN US	137,561	151.18	28.1	22.5	8.1	7.3	8.9	10.3	29.3%	34.3%
Renesas	6723 JT	21,168	1670.50	8.6	6.9	2.2	2.0	7.6	12.0	22.5%	25.3%
			Average	***21.6***	***16.7***	***7.0***	***5.5***	***23.9***	***18.6***	***28.7%***	***30.6%***

Source: Company data, Bloomberg, CMBIGM estimates
Note: earnings and NPM estimates for Horizon Robotics and Black Sesame are CMBI estimates; earnings estimates for peers are Bloomberg consensus; data as of 16 Apr close

Key catalysts for Horizon Robotics include: 1) Larger-than-expected shipments of AD processors driven by higher adoption of the company's Product Solutions, 2) faster-than-expected penetration of NEVs among all PVs, and 3) higher adoption of AD tech among global auto OEMs and Tier-1 suppliers.

Potential risks include:

1) IPO lock-up expiry and early investors may choose to cash out their investments, adding pressure on the share price;
2) Slower-than-expected production ramp-up of new products;
3) Escalating geopolitical issues affecting chip fabrication;
4) Slower-than-expected adoption of AD technology;
5) Heightened competition from other global/domestic AD solution providers.

Appendix

Key management

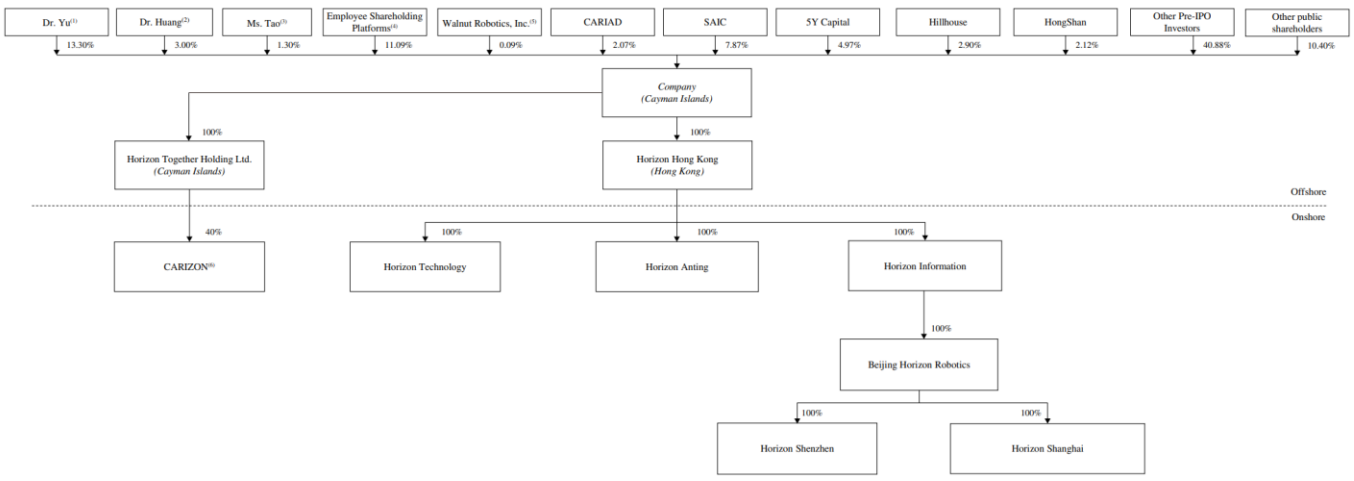
Figure 26: Horizon Robotics' executive directors

Name	Position	Description	Prior experience
Yu Kai	Chairman of the Board, executive director and CEO	In charge of overall strategic and business development	Dr. Yu Kai is a globally recognized scientist with 25 years of experience in computer engineering, having published over 100 papers cited more than 30,000 times. Before founding the company, he was deputy head of Baidu Research, where he initiated China's first autonomous driving project in 2013. Dr. Yu also held key R&D roles at Siemens and NEC in Germany and the U.S. for 12 years and was an adjunct faculty member at Stanford University.
Huang Chang	Executive director and CTO	In charge of overall R&D work	Dr. Huang Chang is a leading researcher in computer engineering with over 20,000 academic citations and more than 80 international patents. He has held significant roles, including chief R&D architect at Baidu Inc. from 2014 to 2015, principal architect of Baidu USA LLC from 2012 to 2014, researcher at NEC Laboratories America from 2010 to 2012, and postdoctoral researcher at the University of Southern California from 2007 to 2010.
Tao Feiwen	Executive director and COO	In charge of operations and management (inclu. financial matters)	Ms. Tao Feiwen has extensive experience leading international technology companies. Before founding the company, she worked at Baidu USA LLC and later at Baidu Inc.'s headquarters in China from 2012 to 2016. She also worked in the sales and operations team at Google from 2011 to 2012 and served as a senior analyst at Foote, Cone and Belding Limited from 2009 to 2011.
Chen Liming	Executive director and president	In charge of overall management with a strategic focus on supply chain and quality assurance	Dr. Chen Liming is a respected automotive technologist and industry leader with about 30 years of experience in strategy development, management, and sustainable business growth. Before joining the company, he held senior positions at Bosch Group, including application manager, engineering director, and vice president. From 2012 to 2021, he was senior vice president and regional president of Bosch's chassis systems control division in China, responsible for P&L and overall management.

Source: Company data, CMBIGM

Shareholding structure

Figure 27: Horizon Robotics' shareholding structure post-IPO



Source: Company data, CMBIGM

Financial Summary

INCOME STATEMENT	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Revenue	**906**	**1,552**	**2,384**	**3,574**	**5,381**	**8,407**
Cost of goods sold	(278)	(457)	(542)	(1,244)	(2,175)	(3,616)
Gross profit	**628**	**1,094**	**1,841**	**2,330**	**3,206**	**4,791**
Operating expenses	**(2,760)**	**(3,125)**	**(3,986)**	**(4,774)**	**(4,811)**	**(4,670)**
Selling expense	(299)	(327)	(410)	(469)	(533)	(613)
Admin expense	(374)	(443)	(638)	(561)	(612)	(682)
R&D expense	(1,880)	(2,366)	(3,156)	(3,972)	(3,972)	(3,782)
Others	(207)	12	218	229	306	407
Operating profit	**(2,132)**	**(2,031)**	**(2,144)**	**(2,444)**	**(1,606)**	**121**
Other income	97	159	376	228	208	215
Other expense	(6,690)	(4,872)	4,119	0	0	0
EBIT	**(8,725)**	**(6,744)**	**2,351**	**(2,216)**	**(1,398)**	**336**
Income tax	4	5	(5)	0	0	0
After tax profit	**(8,720)**	**(6,739)**	**2,347**	**(2,216)**	**(1,398)**	**336**
Minority interest	(1)	(0)	0	0	0	0
Net profit	**(8,719)**	**(6,739)**	**2,347**	**(2,216)**	**(1,398)**	**336**

BALANCE SHEET	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Current assets	**8,804**	**13,538**	**17,196**	**15,698**	**14,780**	**15,719**
Cash & equivalents	6,609	11,360	15,371	13,640	12,498	12,925
Restricted cash	1,204	710	0	0	0	0
Receivables	421	541	679	692	782	968
Inventories	364	791	585	914	1,112	1,464
Prepayment	206	137	534	451	387	363
Other current assets	0	0	27	0	0	0
Non-current assets	**1,092**	**2,336**	**3,183**	**3,365**	**3,502**	**3,699**
PP&E	221	433	774	1,001	1,217	1,435
Right-of-use assets	258	217	212	183	169	171
Intangibles	319	303	320	341	310	242
Financial assets at FVTPL	69	81	630	589	565	600
Other non-current assets	224	1,301	1,248	1,251	1,242	1,251
Total assets	**9,895**	**15,874**	**20,379**	**19,064**	**18,282**	**19,419**
Current liabilities	**27,151**	**40,252**	**1,278**	**1,491**	**1,626**	**1,883**
Short-term borrowings	0	0	15	15	15	15
Payables	282	552	321	526	695	919
Other current liabilities	26,756	39,624	621	630	595	629
Lease liabilities	51	52	72	72	72	72
Contract liabilities	63	25	249	249	249	249
Non-current liabilities	**182**	**287**	**7,186**	**7,385**	**7,354**	**7,359**
Long-term borrowings	13	113	393	592	560	566
Other non-current liabilities	170	174	6,794	6,794	6,794	6,794
Total liabilities	**27,334**	**40,539**	**8,464**	**8,876**	**8,980**	**9,242**
Share capital	0	0	0	0	0	0
Capital surplus	146	146	34,088	34,088	34,088	34,088
Retained earnings	(18,832)	(25,571)	(22,791)	(25,007)	(26,405)	(26,069)
Other reserves	1,248	760	617	1,105	1,618	2,157
Total shareholders equity	**(17,438)**	**(24,665)**	**11,914**	**10,187**	**9,301**	**10,176**
Minority interest	(0)	(0)	1	1	1	1
Total equity and liabilities	**9,895**	**15,874**	**20,379**	**19,064**	**18,282**	**19,419**

CASH FLOW	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Operating						
Profit before taxation	**(8,725)**	**(6,744)**	**2,351**	**(2,216)**	**(1,398)**	**336**
Depreciation & amortization	293	357	365	461	561	672
Change in working capital	(245)	(938)	284	(106)	(105)	(371)
Others	7,119	5,581	635	839	563	609
Net cash from operations	**(1,557)**	**(1,745)**	**3,635**	**(1,021)**	**(379)**	**1,246**
Investing						
Capital expenditure	(549)	(454)	(718)	(554)	(565)	(614)
Acquisition of subsidiaries/ investments	(71)	(1,453)	69	0	0	0
Others	406	1,240	(39,035)	(127)	(167)	(211)
Net cash from investing	**(215)**	**(667)**	**(39,683)**	**(681)**	**(732)**	**(825)**
Financing						
Net borrowings	13	100	294	199	(31)	5
Proceeds from share issues	255	7,189	33,942	0	0	0
Others	(55)	(70)	5,997	(228)	0	0
Net cash from financing	**212**	**7,219**	**40,233**	**(29)**	**(31)**	**5**
Net change in cash						
Cash at the beginning of the year	8,050	6,609	11,360	15,371	13,640	12,498
Exchange difference	118	(56)	(174)	0	0	0
Others	(1,559)	4,807	4,185	(1,731)	(1,143)	426
Cash at the end of the year	**6,609**	**11,360**	**15,371**	**13,640**	**12,498**	**12,925**

GROWTH	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Revenue	94.1%	71.3%	53.6%	50.0%	50.5%	56.2%
Gross profit	89.6%	74.3%	68.3%	26.6%	37.6%	49.5%

PROFITABILITY	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Gross profit margin	69.3%	70.5%	77.3%	65.2%	59.6%	57.0%
Operating margin	(235.4%)	(130.9%)	(90.0%)	(68.4%)	(29.8%)	1.4%
Return on equity (ROE)	na	na	na	(20.1%)	(14.3%)	3.5%

GEARING/LIQUIDITY/ACTIVITIES	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Current ratio (x)	0.3	0.3	13.5	10.5	9.1	8.3

VALUATION	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
P/E	ns	ns	10.3	ns	ns	206.8

Source: Company data, CMBIGM estimates. Note: The calculation of net cash includes financial assets.

25 Apr 2025

CMB International Global Markets | Equity Research | Initiation

Black Sesame (2533 HK)

A leading auto-grade high-performance chip designer

Black Sesame is a leading provider of auto-grade computing SoCs and SoC-based intelligent vehicle solutions in China. The company offers two auto-grade SoC product lines: Huashan (AD-focused) and Wudang (cross-domain compute). Riding the tailwind of AD market expansion (TAM to grow at a 41% 2024-28E CAGR, per our estimate), we project the company's revenue to grow from RMB474mn in FY24 to RMB2,098mn in FY27E at a CAGR of 64.2%, driven by 1) increasing penetration of ADAS/AD, 2) growing shipments of SoC-based solutions with new customers onboard, and 3) a rising ASP from chip performance enhancement (more contribution from its high-end product line, e.g., A2000 and Wudang series). With growing operating leverage, **we project Black Sesame to reach an inflection point in profitability in 2027E. Initiate at BUY with TP of HK$28.2, based on 18x 2030E P/E.**

- **SoC-based product solution remain the key growth driver.** AD products and solutions segment contributed 92% of total revenue in 2024, while the rest came from Intelligent imaging solutions (8%). Within its AD products and solutions segment, we estimate SoC-based solutions contributed ~70% of FY24 revenue, while Algorithm-based solutions contributed ~20% of FY24 revenue, respectively. We expect the company's SoC-based solutions to power its future revenue growth (64.2% CAGR FY24-27E) due to 1) faster and broader adoption from passenger vehicle and 2) enhanced value from integrated software-hardware SoC packages.
- **Black Sesame excels in hardware design, with product offerings in both high-performance computing and cross-domain SoC solutions** (the first in the industry to integrate AD, smart cockpit, body control and other computational domains). Black Sesame held 7.2% market share in high-computing power AD SoC shipment domestically in 2023, per F&S. The company's current customers include Geely, Dongfeng, FAW, etc. As of March 31, 2024, Black Sesame shipped a total of 156k+ units of SoC products (A1000/A1000L) as of 1Q24 cumulatively. We project the shipments to grow 131%/69% in 2025/26E (for PVs + commercial vehicles), due to customer base expansion. We expect to see an uptick in average ASP driven by increasing shipments of the A2000/C1200 product series, which have higher ASPs and could contribute more to the overall sales from 2025 onwards (est. to account for 60%+ of total sales in 2028E).
- **Initiate at BUY with TP of HK$28.2.** We project the company's revenue to grow at a 52.5% 2024-30E CAGR, from RMB474mn in 2024E to RMB2,098mn/RMB5,959mn in 2027E/30E. We believe the company is on track to achieve NP breakeven in 2027 and deliver a 26.6% NPM in 2030E. Our TP is HK$28.2, based on 18x 2030E P/E (15% discount to sector leader Horizon Robotics), considering the company could reach a more stable state of operation by 2030E (WACC at 11.5% and RMB/HKD at 1.07). Potential risks include: 1) slowdown in industry adoption of ADAS/AD solutions, 2) intensified competition, 3) geopolitical risks around chip fabrication.

BUY (Initiate)

Target Price	**HK$28.20**
Up/Downside	**49.0%**
Current Price	**HK$18.92**

China Semiconductors

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Stock Data

Mkt Cap (HK$ mn)	11,910.1
Avg 3 mths t/o (HK$ mn)	534.8
52w High/Low (HK$)	NA/NA
Total Issued Shares (mn)	629.5

Source: FactSet

Shareholding Structure

NORTHERN LIGHT VEN FD	8.1%
SHAN	7.0%

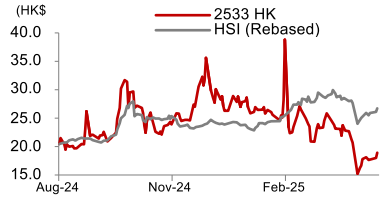
Source: HKEx

Share Performance

	Absolute	Relative
1-mth	-13.8%	-8.2%
3-mth	-28.5%	-34.5%
6-mth	-16.3%	-21.3%

Source: FactSet

12-mth Price Performance



Source: FactSet

Earnings Summary

(YE 31 Dec)	FY23A	FY24A	FY25E	FY26E	FY27E
Revenue (RMB mn)	312	474	813	1,322	2,098
YoY growth (%)	88.8	51.8	71.4	62.6	58.7
Gross margin (%)	24.7	41.1	46.2	50.6	50.5
Net profit (RMB mn)	(4,855.1)	313.3	(957.7)	(485.0)	3.2
EPS (Reported) (RMB cents)	(6,840.00)	(340.00)	(152.14)	(77.05)	0.51
P/S (x)	35.8	23.6	13.8	8.5	5.3
ROE (%)	na	na	(71.4)	(34.6)	0.3

Source: Company data, Bloomberg, CMBIGM estimates

Company Overview

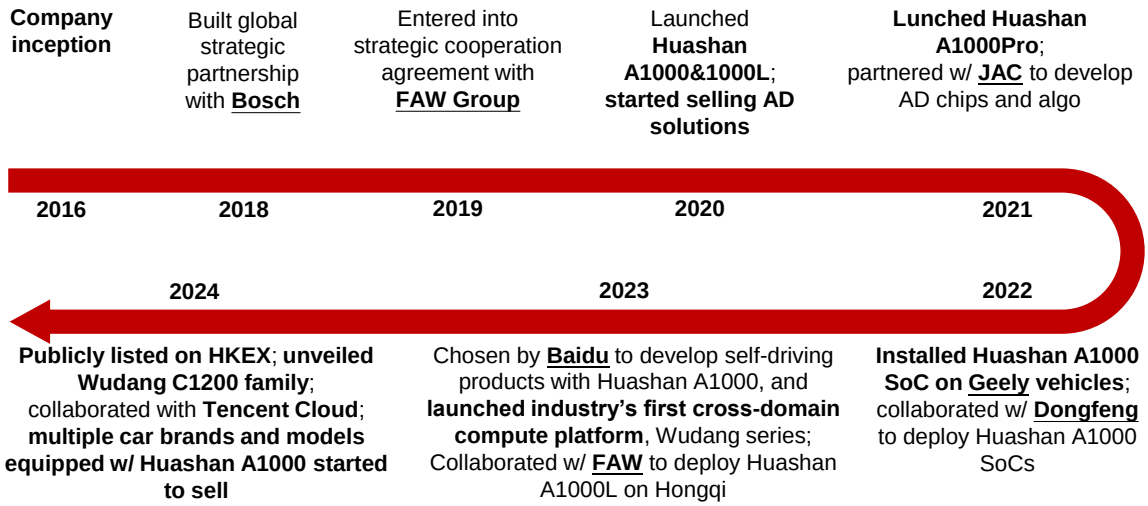
A leading chip-focused AD player

Black Sesame (2533 HK) is a leading provider of automotive-grade computing SoCs and SoC-based intelligent vehicle solutions. As a key player in China's AD market, it is distinguished by several industry-first achievements:

- Among the earliest to mass-produce high-performance AD SoCs (A1000 in 2022)
- The first in China to introduce AD SoCs exceeding 100 TOPS (A1000 Pro in April 2021)
- The pioneer in launching an automotive-grade cross-domain computational SoC in China (Wudang Series in April 2023)

Founded in 2016, Black Sesame was listed on the HKEX in 2024 under Chapter 18C and was added to the Southbound Stock Connect in Dec 2024. Classified as a Tier 2 supplier, Black Sesame has built strong industry partnerships, collaborating with over 49 OEMs and Tier 1 suppliers, including FAW Group, Dongfeng, JAC, HYCAN, ECARX, Baidu, Bosch, ZF Group, and Marelli as of 1Q24, according to F&S. The company had secured design wins for mass production of its SoCs across 23 vehicle models from 16 automakers and Tier 1 suppliers as of 1Q24.

Figure 28: Black Sesame' milestones



Source: Company data, CMBIGM.

Comprehensive SoC-based product offerings

Black Sesame 1) engages in **semiconductor design (computing SoCs + cross-domain SoCs)** and 2) offers **SoCs-based intelligent vehicle solutions**. Computing SoCs are imbedded with in-house developed intellectual property (IP) cores (image signal processor, or ISP, and neural processing unit, or NPU modules), while the Intelligent Imaging solutions are empowered by AI imaging algorithms.

Figure 29: Black Sesame's key edges

Business	Products/solutions	Function
Semiconductor design	Computing SoCs imbedded with in-house developed IP cores (ISP and NPU modules)	ISP responsible for reception of camera inputs and optimization of video quality NPU responsible for accelerated inference of AI algorithms for computer vision (i.e., machine learning, deep learning, facial identification, dynamic range control and de-noising), improving computational efficiency
Intelligent Imaging solutions	AI imaging algorithms	Enhance the image quality, enrich information, and strengthen image interpretation and recognition Support parallel access to multi-camera imaging systems (simultaneously process vast quantities of video and image content).

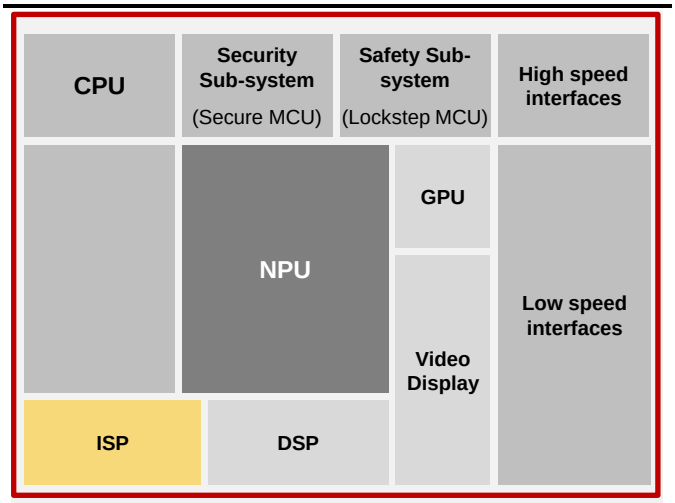
Source: Company data, CMBIGM

The company provides two series of automotive-grade SoCs: **Huashan** (focusing on AD) and **Wudang** (targeting cross-domain computation).

The Huashan Series:

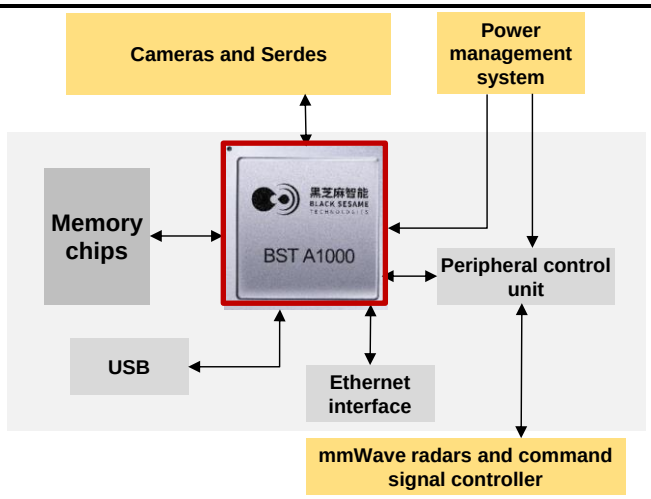
- **A1000** (58 TOPS computing power) was launched in June 2020 with mass-production in 2022. It is the first high-computing power AD SoC with proprietary IP cores developed and launched in China, according to F&S.
- **A1000L** (16 TOPS) was also launched in June 2020 and mass-produced in 2022, designed for L2 and L2+ AD.
- **A1000 Pro** (106+ TOPS) was launched in April 2021 for L3 AD. It is the first AD SoC with over 100 TOPS computing power developed and launched in China, per F&S.
- ****Latest A2000** (250+ TOPS) is built using 7nm FFC (FinFET Compact) auto process and will support a neural network accelerator with next-generation algorithms, per F&S.

Figure 30: Illustration of the internal architecture of Huashan A1000 SoCs



Source: Company data, CMBIGM
Note: CPU – Central Processing Unit, MCU –Micro Control Unit, NPU – Neutral Processing Unit, GPU – Graphic Processing Unit, ISP – Image Signal Processor, DSP – Digital Signal Processor

Figure 31: Illustration of the external system architecture of Huashan A1000 SoCs



Source: Company data, CMBIGM

Meanwhile, the **Wudang series**, launched in April 2023, is an industry-first cross-domain compute platform, integrating AD, smart cockpit, body control, and other computing domains, according to F&S.

Figure 32: Black Sesame's auto-grade SoCs products

Source: Company data, CMBIGM

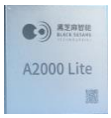
Figure 33: Black Sesame's auto-grade SoCs products

	Huashan				Wudang
SoC offerings	A1000	A1000 L	A1000 Pro	A2000	C1200 Family
Launch time	06-2020	06-2020	04-2021	12-2024	04-2023
Mass production	2022	2022	Expected in 2024	Expected in 2026	Expected in 2025
Automation level	L2+/L3	L2/L2+	L3/L4	L3/L3+	L2+
Process node	16nm	16nm	16nm	7nm	7nm
Computing power (INT8,TOPS)	58	16	106+	250+	-
Power consumption	18W	15W	25W	-	-
No. of camera channels	16	8	20	-	-
ASIL	ASIL-B	ASIL-B	N/A	ASIL-B	-
AEC-Q100	AEC-Q100 Grade 2	AEC-Q100 Grade 2	AEC-Q100 Grade 2	-	-
No. of CPU cores	11	11	11	-	-
Auto OEMs' selection for factory-installation on certain vehicle models	Including FAW Group, Dongfeng, Geely, JAC and HYCAN	Including BAIC	N/A	N/A	N/A

Source: F&S, CIC, company data, CMBIGM

Black Sesame's next-gen AD chips, the A2000 series, will include three variants: **A2000 Lite, A2000, and A2000 Pro**. The A2000 products offer different levels of vehicle autonomy for OEMs to select from, with the Pro version targeting L3 and beyond.

Figure 34: Black Sesame' latest A2000 products

Variants	A2000 Lite	A2000	A2000 Pro
			
CPU	N/A	20k+ DMIPS	N/A
Market focus	Focus on urban intelligent driving	Support full-scenario general-purpose intelligent driving	Designed for advanced full-scenario applications

Source: Company data, CMBIGM

Looking ahead, the company aims to develop its next-generation SoC in 2025, which we expect to follow a similar timeline as previous iterations. We anticipate Black Sesame's newly announced Wudang C1200 (launched in Nov 2023) and Huashan A2000 SoCs (launched in Dec 2024) will require 1-3 years for gradual design wins, followed by mass production starting a year after.

The company has also introduced its proprietary NPU structure "Jiushao", which was designed as the computational core for its high-performance AI chips, notably the A2000 family. According to the company, Jiushao NPU has achieved the industry's highest safety levels, critical for AD. Some other key features include its large-core architecture, mixed precision support, hardware acceleration, three-layer memory architecture, etc.

■ SoC-based intelligent solutions

In addition to SoC products, Black Sesame has developed a suite of hardware platforms and AD solutions to fully leverage the potential of auto-grade SoCs, including 1) intelligent driving systems, 2) safety systems, and 3) V2X solutions. The company sells AD support software either on a standalone basis or a bundle with its SoCs.

Regarding software, the entire development cycle is expected to be significantly shorter than hardware development cycle. **Typically, it takes just one quarter to complete the solution adaptation phase following algorithm development, with another quarter required to initiate mass production.** This streamlined process allows for faster deployment and implementation, enabling quicker turnaround times from concept to full-scale production.

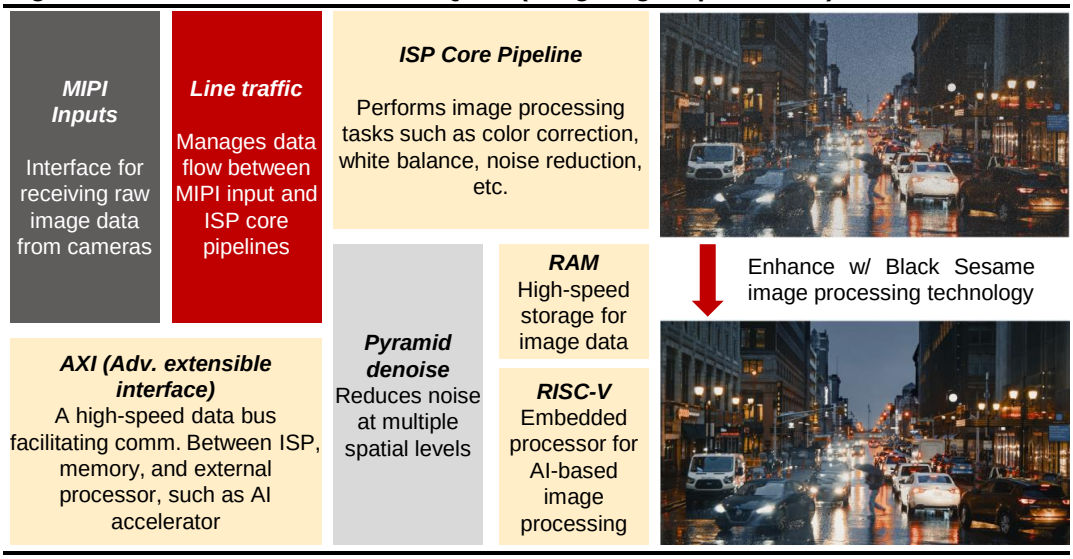
Figure 35: Black Sesame's main AD solutions

AD Solutions	Function	Autonomous level	SoC
Best Drive (AD solutions)	**Drive Eye** for visual perception and display	L1/L2 ADAS	1 * A1000
	Drive Sensing for integrated solutions	L2+	1 * A1000L/A1000 + 1 * MCU
	Drive Brain for L3 domain control	L3	2-4 * A1000
	Drive Turing for next-generation autonomous driving	-	1 * A2000
Patronus (add-on adaptive safety system)	ADAS & Driving Recording		
	DMS (Driver Monitoring System)		
	BSD (Blind Side Detection)		
	Surrounding View & Monitoring		
Best Road (V2X edge computing solution)	Vehicle and objective perception		
	License plate perception		
	Radar-camera fusion		
FAD (Development/testing)	Built on Huashan series Provides flexible development/testing services to trial clients		
Huashan-SOM	Based on A1000 SoCs, integrating memory, storage, power management and interface Enable clients to develop products for end customers, covering auto, robotics and other edge computing applications		

Source: Company data, CMBIGM

Black Sesame also provides advanced intelligent imaging solutions, embedding its proprietary IP algorithms into sensors and ISP chips. These solutions are specifically designed for high-end consumer electronics manufacturers and intelligent electronic providers, enabling them to enhance intelligent perception and content optimization, particularly under extreme conditions, through cutting-edge algorithms. The service offering includes one-off licensing fees and bundled products featuring camera compact modules, delivering an integrated, end-to-end solution that empowers device manufacturers to push the boundaries of image quality and computational efficiency.

Figure 36: Black Sesame's NeuralIQ ISP (image signal processor)



Source: Company data, CMBIGM

Competitve advantages

An all-in-one solution provider with strong capability in SoC design

Black Sesame excels in hardware design. Its A1000 product is the first SoC for L2+/L3 with ASIL-B/AEC-Q100 Grade 2 certification in China, per F&S. The company was also the first in China to introduce AD SoCs exceeding 100 TOPS (A1000 Pro in April 2021).

The company not only provides computing SoC solutions, but **also offers cross-domain SoC solutions (the first in the industry to integrate AD, smart cockpit, body control and other computational domains)**, to cover more diverse and sophisticated demands for advanced functionalities of intelligent vehicles. Black Sesame has successfully completed the tape-out of C1200 and begun providing prototypes to potential customers.

Figure 37: Black Sesame's auto-grade SoC products

	Huashan				Wudang
SoC offerings	A1000	A1000 L	A1000 Pro	A2000	C1200 Family
Computing power (INT8,TOPS)	58	16	106+	250+	-
Note	The first SoC for L2+/L3 with ASIL-B/AEC-Q100 Grade 2 certification in China; with the highest energy efficiency ratio in China at launch time	-	The first AD SoC with >100 TOPS computing power launched in China; support up to 20 channels of HD camera inputs (the most among peers in China)	-	A cross-domain SoC, that integrates AD, smart cockpit, body control and other computational functionalities

Source: F&S, company data, CMBIGM

In China, the cockpit SoC market was valued at RMB10bn in 2023, and is projected to reach RMB19.4bn by 2028E with a CAGR of 14.1%, per F&S. We believe as the auto industry pursues more advanced automotive electrical/electronic architecture (EEA), cross-domain collaboration has emerged as a significant trend, involving integrating different functional domains to create more cohesive and efficient systems. A prominent example is the fusion of AD and intelligent cockpit domains.

We see three key drivers for this trend: 1) cost reduction as fewer components lower production expenses, 2) enhanced compute power as centralized systems optimize resource allocation, and 3) improved communication as streamlined interactions between domains boost efficiency. **We think Black Sesame will be a key beneficiary of this trend.**

Widespread customer recognition

Leveraging its product quality and widespread customer recognition, Black Sesame had secured design wins for 23 vehicle models across 16 auto OEMs and Tier 1 suppliers as of Mar 2024. **Mass production of its Huashan A1000/A1000L SoCs commenced in 2022 with cumulative shipments exceeding 156k units by Mar 2024**, demonstrating robust market adoption.

The company's customer base also showed remarkable growth, expanding from 45 customers in 2021 to 85 in 2023, with 21 active customers in 3M24. As of Mar 2024, the company had established partnerships with 49+ leading auto OEMs and Tier 1 suppliers, including FAW Group, Dongfeng, JAC, Hycan, ECARX, Baidu, Bosch, ZF Group, Marelli, etc..

Figure 38: Black Sesame's strong customer base and ecosystem networks

Source: Company data, CMBIGM.

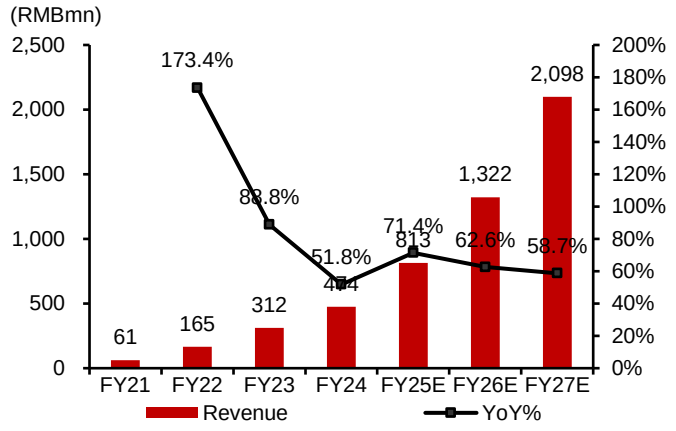
Business segment analysis and financial forecast

Black Sesame operates two main business segments: 1) AD Products and Solutions, which accounted for approximately 92% of 2024 revenue, and 2) Intelligent Imaging Solutions, estimated to contribute the remaining 8%. The AD Products and Solutions segment has been the company's core revenue driver in recent years and is expected to maintain its dominant position, supported by rising adoption of AD technologies and continuous improvements in chip performance.

Within this segment, we project SoC-based solutions to contribute 77% of total revenue in 2024E. We forecast strong momentum to continue, with SoC revenue expected to **grow by 95%/74%/66% YoY in 2025E/26E/27E**, driving its share of the AD segment sales to **81%/86% and 90%,** respectively. In contrast, we expect the algorithm-based solutions to see a declining revenue contribution, falling to an estimated 23% of AD segment revenue in 2024E, **with more moderate growth of 8%/16%/16% YoY in FY25/26E/27E.**

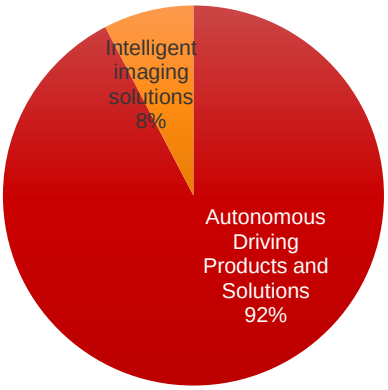
Meanwhile, the Intelligent Imaging Solutions business, though smaller in scale, is expected to grow steadily at **33%/16%/16% YoY in FY25/26E/27E**, serving as a complementary revenue stream alongside the company's core hardware offerings.

Figure 39: Revenue to reach RMB2.1bn in 2027E (64.2% 2024-27E CAGR)



Source: Company data, CMBIGM estimates

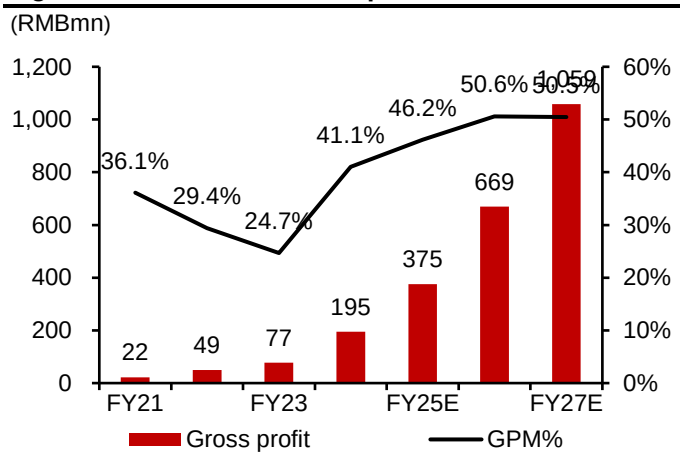
Figure 40: Automotive Solutions segment contributed 92% of total revenue in 2024



Source: Company data, CMBIGM estimates.

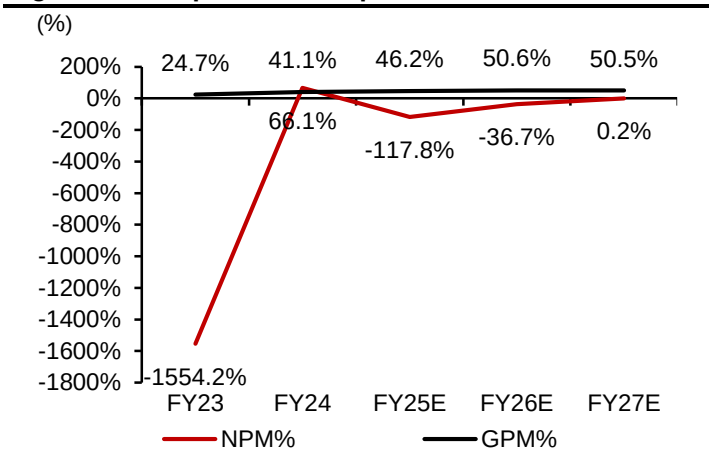
We expect its GPM to gradually increase in the next two years, reaching ~50% from 41.1% in FY24 to 46.2%/50.6%/50.5% in FY25E/26E/27E. We expect the company's AD solutions segment GPM to gradually reach ~50% in FY26E, while the Intelligent imaging solutions segment GPM to normalize at ~65% in FY25E and onwards.

Figure 41: Overall GPM is expected to remain stable



Source: Company data, CMBIGM estimates

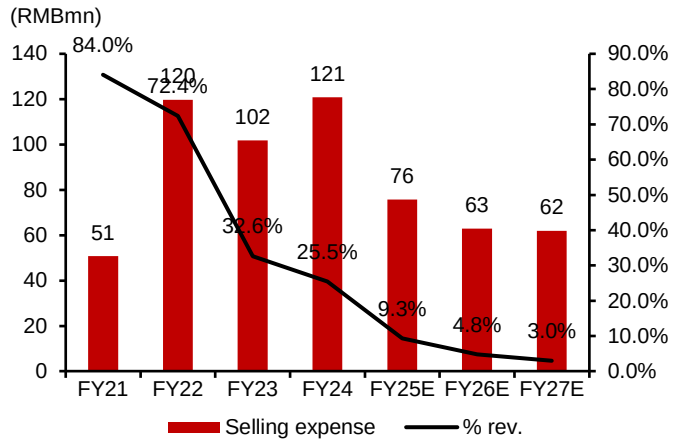
Figure 42: Net profit to turn positive in 2027E



Source: Company data, CMBIGM estimates

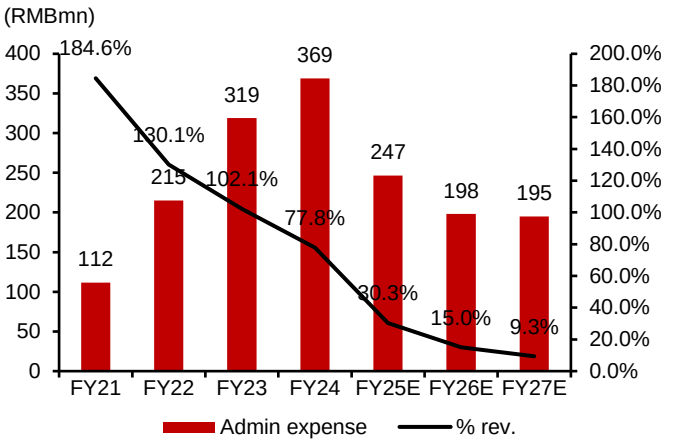
We believe the company's selling expenses peaked in FY24 and could gradually decline in the following years. Similarly, we believe admin expenses also peaked in FY24 and will see a declining trend in the next few years.

Figure 43: Selling expenses and % of revenue



Source: Company data, CMBIGM estimates

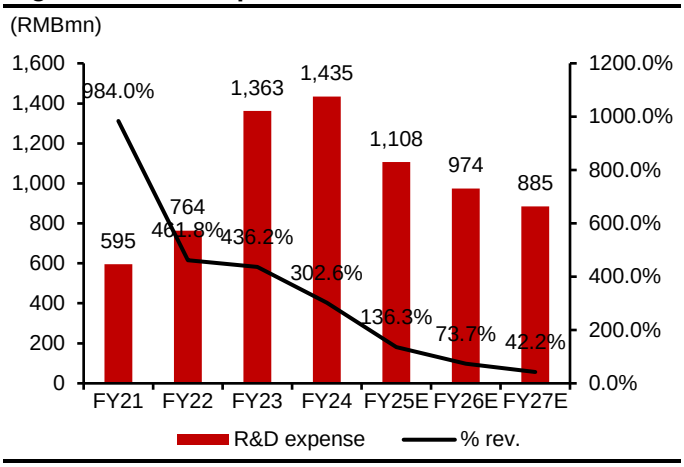
Figure 44: Admin expenses and % of revenue



Source: Company data, CMBIGM estimates

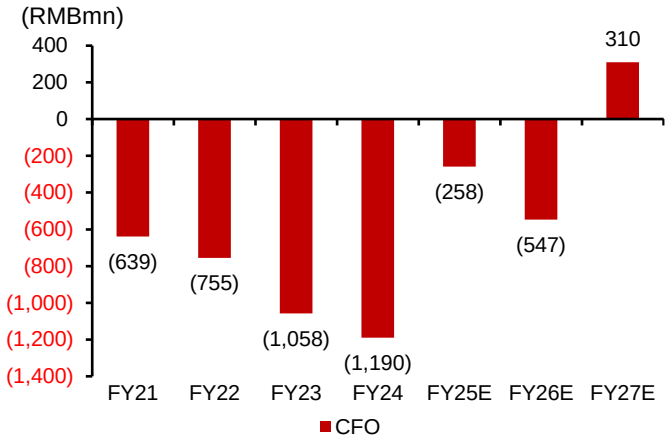
We think the company's R&D expenses will gradually decline starting in FY25E, and its operating cash flow to turn positive in FY27E.

Figure 45: R&D expenses and % of revenue



Source: Company data, CMBIGM estimates

Figure 46: Operating cash flow



Source: Company data, CMBIGM estimates

Figure 47: Company's financials by segment

RMBmn	FY21	FY22	FY23	FY24	FY25E	FY26E	FY27E
Revenue by segments							
AD Products and Solutions	**34**	**142**	**276**	**438**	**765**	**1,266**	**2,034**
YoY%		*315%*	*94%*	*58%*	*75%*	*66%*	*61%*
%	*57%*	*86%*	*88%*	*92%*	*94%*	*96%*	*97%*
Intelligent imaging solutions	**26**	**23**	**36**	**36**	**48**	**56**	**64**
YoY%		*-12%*	*56%*	*1%*	*33%*	*16%*	*16%*
%	*43%*	*14%*	*12%*	*8%*	*6%*	*4%*	*3%*
Revenue	**61**	**165**	**312**	**474**	**813**	**1,322**	**2,098**
YoY%		*173%*	*89%*	*52%*	*71%*	*63%*	*59%*
AD Products and Solutions							
SoC-based solutions	**2**	**85**	**194**	**336**	**654**	**1,139**	**1,887**
YoY%		*5187%*	*127%*	*74%*	*95%*	*74%*	*66%*
%	*5%*	*60%*	*70%*	*77%*	*81%*	*86%*	*90%*
Shipment (mn units)		**0.01**	**0.10**	**0.31**	**0.72**	**1.22**	**1.86**
YoY%			*924%*	*218%*	*131%*	*69%*	*52%*
Algorithm-based solutions	**33**	**57**	**83**	**102**	**110**	**127**	**147**
YoY%		*74%*	*45%*	*23%*	*8%*	*16%*	*16%*
%	*95%*	*40%*	*30%*	*23%*	*14%*	*10%*	*7%*
AD Products/Solutions revenue	**34**	**142**	**276**	**438**	**765**	**1,266**	**2,034**
YoY%		*315%*	*94%*	*58%*	*75%*	*66%*	*61%*
Key metrics							
Revenue	**61**	**165**	**312**	**474**	**813**	**1,322**	**2,098**
YoY%		*173%*	*89%*	*51.8%*	*71.4%*	*62.6%*	*58.7%*
Gross profit	**22**	**49**	**77**	**195**	**375**	**669**	**1,059**
YoY%		*122.3%*	*58.6%*	*152.4%*	*92.8%*	*78.2%*	*58.2%*
margin%	*36.1%*	*29.4%*	*24.7%*	***41.1%***	***46.2%***	***50.6%***	***50.5%***
Selling expenses	**-51**	**-120**	**-102**	**-121**	**-76**	**-63**	**-62**
YoY%		*135.5%*	*-14.9%*	*18.6%*	*-37.3%*	*-17.0%*	*-1.4%*
expense ratio%	*-84.0%*	*-72.4%*	*-32.6%*	*-25.5%*	*-9.3%*	*-4.8%*	*-3.0%*
Admin expenses	**-112**	**-215**	**-319**	**-369**	**-247**	**-198**	**-195**
YoY%		*92.7%*	*48.2%*	*15.6%*	*-33.2%*	*-19.6%*	*-1.6%*
expense ratio%	*-184.6%*	*-130.1%*	*-102.1%*	*-77.8%*	*-30.3%*	*-15.0%*	*-9.3%*
R&D expenses	**-595**	**-764**	**-1,363**	**-1,435**	**-1,108**	**-974**	**-885**
YoY%		*28.3%*	*78.3%*	*5.3%*	*-22.8%*	*-12.1%*	*-9.1%*
expense ratio%	*-984.0%*	*-461.8%*	*-436.2%*	*-302.6%*	*-136.3%*	*-73.7%*	*-42.2%*
Net profit (IFRS)	**-2,357**	**-2,754**	**-4,855**	**313**	**-958**	**-485**	**3**
YoY%		*16.9%*	*76.3%*	*-106.5%*	*-405.7%*	*-49.4%*	*-100.7%*

Net margin%	*-3894.8%*	*-1664.6%*	*-1554.2%*	***66.1%***	***-117.8%***	***-36.7%***	***0.2%***
Net profit (non-IFRS)	**-614**	**-700**	**-1,254**	**-1,304**	**-743**	**-378**	**103**
YoY%		*14.1%*	*79.1%*	*4.0%*	*-43.0%*	*-49.2%*	*-127.3%*
Net margin%	*-1014.1%*	*-423.3%*	*-401.5%*	***-275.0%***	***-91.4%***	***-28.6%***	***4.9%***

Source: Company data, CMBIGM estimates
Note: 2024 SoC-based solutions and Algorithm-based solutions revenues are our estimates.

Valuation and key risks

Target price of HK$28.2 per share based on 18x 2030E P/E

We believe the company's business operations will reach a stable status by 2030E, during which a P/E multiple of 18x should be justifiable (15% discount to sector leader Horizon Robotics), in our view. This derives a total equity value of HK$17.7bn when we discount it back to FY25E, with WACC at 11.5% and RMB/HKD at 1.07.

Figure 48: Black Sesame's valuation

Valuation	2023	2024A	2025E	2026E	2027E	2028E	2029E	2030E
(RMBmn)								
Valuation								
Revenue	**312**	**474**	**813**	**1,322**	**2,098**	**3,158**	**4,542**	**5,959**
yoy%	*89%*	*52%*	*71%*	*63%*	*59%*	*51%*	*44%*	*31%*
Gross profit	**77**	**195**	**375**	**669**	**1,059**	**1,590**	**2,284**	**2,994**
yoy%	*59%*	*152%*	*93%*	*78%*	*58%*	*50%*	*44%*	*31%*
GPM%	*24.7%*	*41.1%*	*46.2%*	*50.6%*	*50.5%*	*50.4%*	*50.3%*	*50.2%*
Net profit	**-4,855**	**313**	**-958**	**-485**	**3**	**261**	**765**	**1,586**
yoy%	*76%*	*-106%*	*-406%*	*-49%*	*-101%*	*8069%*	*193%*	*107%*
NPM%	*-1554.2%*	*66.1%*	*-117.8%*	*-36.7%*	*0.2%*	*8.3%*	*16.8%*	*26.6%*
P/E								**18.0x**
WACC								**11.5%**
RMB/HKD								**1.07**
Equity value (HK$mn)			**17,721**					**28,542**
Shares outstanding (mn)			629					
TP (HK$)			**28.2**					

Source: Company data, CMBIGM estimates

Figure 49: Comps table

Company	Ticker	Mkt Cap (US$mn)	Price (LC)	P/E (x) FY25E	P/E (x) FY26E	P/S (x) FY25E	P/S (x) FY26E	Revenue YoY% FY25E	Revenue YoY% FY26E	NPM (%) FY25E	NPM (%) FY26E
Horizon Robotics	9660 HK	9,257	5.82	-	-	19.4	12.9	46.4	71.7	-61.7%	-12.6%
Black Sesame	2533 HK	1,427	18.34	-	-	13.8	8.5	79.8	66.9	-116%	-38.5%
			Average	***-***	***-***	***16.6***	***10.7***	***63.1***	***69.3***	***-88.6%***	***-25.6%***
Mobileye	MBLY US	10,025	12.35	42.3	28.4	5.7	4.8	6.4	17.9	13.6%	16.4%
Nvidia	NVDA US	2,737,680	112.20	24.9	19.9	21.1	13.4	114.2	56.4	56.5%	54.7%
Qualcomm	QCOM US	153,292	138.60	11.9	11.4	3.5	3.4	11.4	3.8	30.2%	30.1%
AMD	AMD US	154,811	95.29	20.7	15.4	4.9	4.1	23.2	20.0	23.7%	26.5%
NXP	NXPI US	43,529	171.63	14.5	12.1	3.6	3.3	-4.3	10.1	25.0%	26.9%
TI	TXN US	137,561	151.18	28.1	22.5	8.1	7.3	8.9	10.3	29.3%	34.3%
Renesas	6723 JT	21,168	1670.50	8.6	6.9	2.2	2.0	7.6	12.0	22.5%	25.3%
			Average	***21.6***	***16.7***	***7.0***	***5.5***	***23.9***	***18.6***	***28.7%***	***30.6%***

Source: Company data, Bloomberg, CMBIGM estimates
Note: earnings estimates for Horizon Robotics and Black Sesame are CMBI estimates; earnings estimates for peers are Bloomberg consensus; data as of 16 Apr close

Key catalysts for Black Sesame include: 1) Faster-than-expected adoption of the company's AI processors by auto OEMs and Tier 1 suppliers, 2) Newly-formed cross-industry partnership, 3) faster-than-expected penetration of NEVs among all PVs.

Potential risks may include:

1) Certain Insiders and early investors may cash out their investments with the expiry of the lock-up period, adding pressure on the share price;
2) Slower-than-expected production ramp-up of new products;
3) Escalating geopolitical issues affecting chip fabrication;
4) Slower-than-expected adoption of AD technology;
5) Heightened competition from other global/domestic AD solution providers.

Appendix

Key management:

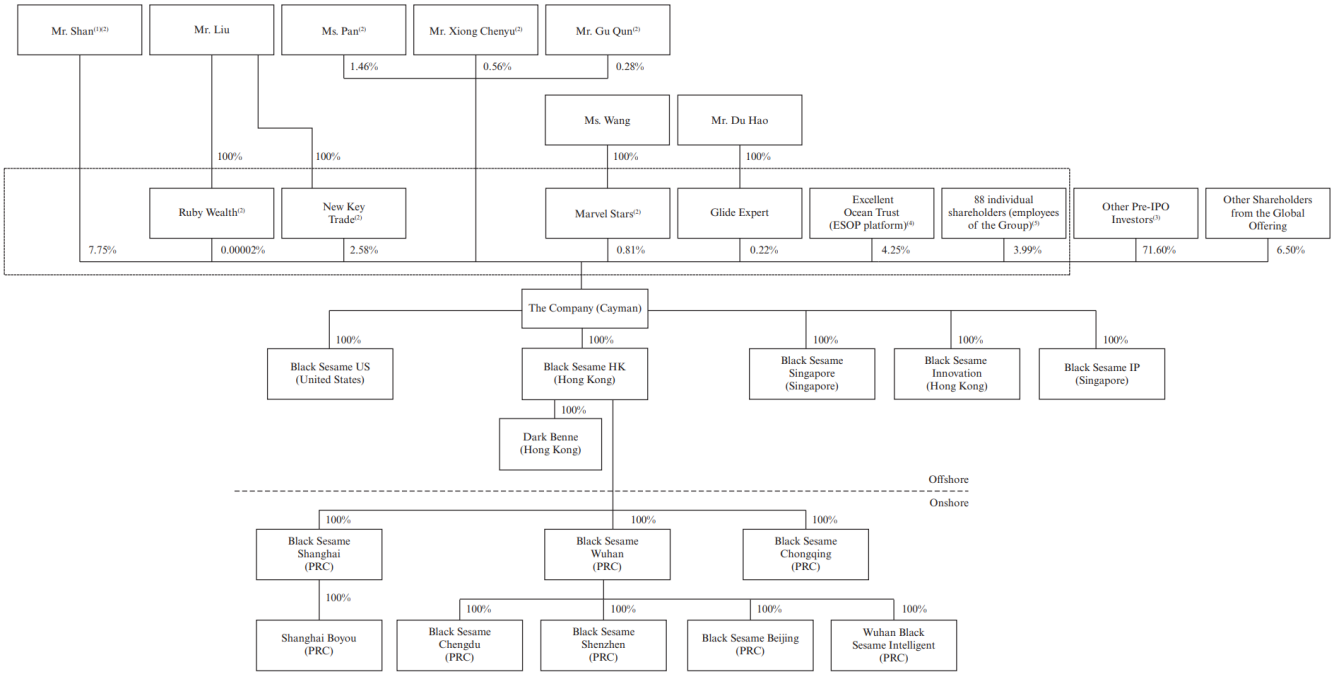
Figure 50: Black Sesame's management profile

Name	Position	Description	Prior experience
Shan Jizhang	Founder, chairman of the board, executive director and CEO	Overseeing the overall business development and formulating objectives and strategies in relation to the management and operation of the company	Mr. Shan Jizhang co-founded the Group in 2016 and holds directorships in various subsidiaries. With over 20 years of experience in the semiconductor industry, Mr. Shan previously worked at OmniVision Technologies Inc. as vice president of software engineering from 1997 to 2016, leading R&D in core areas. He is the inventor of more than 100 patents related to visual perception and automotive technology.
Liu Weihong	Founder, executive director and president	Overseeing sales and marketing and business development of the company	Mr. Liu Weihong has over 20 years of experience in the automotive industry, gaining substantial expertise and insights. Before joining the Group in 2016, he served as the president of the Asia Pacific region at Chassis Brakes International (Suzhou) Co., Ltd. (now known as Hitachi Astemo Braking Systems (Suzhou) Co.) from 2012 to 2016, where he was responsible for strategy, operations, business development, restructuring, and mergers and acquisitions.
Zeng Daibing	Executive director and chief system officer	Overseeing the R&D of chip architecture, chip implementation and underlying software	Mr. Zeng Daibing has over 23 years of experience in research and development and software management of chips, with expertise in the mass production process of chips. Prior to joining the Group, he worked at Shenzhen Sanechips Technology Co., Ltd., a subsidiary of ZTE Corporation, from July 2000 to July 2018. His last position at Sanechips was as a management personnel.

Source: Company data, CMBIGM

Shareholding structure:

Figure 51: Black Sesame's shareholding structure post-IPO



Source: Company data, CMBIGM

Financial Summary

INCOME STATEMENT	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Revenue	**165**	**312**	**474**	**813**	**1,322**	**2,098**
Cost of goods sold	(117)	(235)	(280)	(437)	(652)	(1,039)
Gross profit	**49**	**77**	**195**	**375**	**669**	**1,059**
Operating expenses	**(1,101)**	**(1,774)**	**(1,949)**	**(1,380)**	**(1,185)**	**(1,092)**
Selling expense	(120)	(102)	(121)	(76)	(63)	(62)
Admin expense	(215)	(319)	(369)	(247)	(198)	(195)
R&D expense	(764)	(1,363)	(1,435)	(1,108)	(974)	(885)
Others	(2)	9	(24)	50	50	50
Operating profit	**(1,053)**	**(1,697)**	**(1,754)**	**(1,005)**	**(516)**	**(33)**
Other expense	(1,701)	(3,158)	2,067	47	31	36
EBIT	**(2,754)**	**(4,855)**	**313**	**(958)**	**(485)**	**3**
Minority interest	0	0	0	0	0	0
Net profit	**(2,754)**	**(4,855)**	**313**	**(958)**	**(485)**	**3**

BALANCE SHEET	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Current assets	**2,021**	**1,641**	**2,101**	**2,941**	**2,619**	**3,017**
Cash & equivalents	982	1,298	1,448	2,164	1,627	1,810
Receivables	125	165	258	232	456	464
Inventories	73	71	68	219	210	417
Prepayment	134	98	151	151	151	151
Financial assets at FVTPL	706	8	175	175	175	175
Non-current assets	**132**	**280**	**216**	**160**	**90**	**16**
PP&E	55	99	80	51	12	(36)
Right-of-use assets	33	51	48	48	47	47
Intangibles	17	75	39	7	(21)	(47)
Financial assets at FVTPL	0	21	13	18	15	17
Other non-current assets	26	35	36	36	36	36
Total assets	**2,153**	**1,920**	**2,317**	**3,101**	**2,709**	**3,033**
Current liabilities	**8,613**	**12,923**	**951**	**1,237**	**1,223**	**1,444**
Short-term borrowings	13	0	473	316	415	387
Payables	190	308	462	433	320	569
Other current liabilities	8,386	12,589	0	0	0	0
Lease liabilities	18	19	15	15	15	15
Contract liabilities	6	7	0	473	473	473
Non-current liabilities	**46**	**91**	**273**	**273**	**273**	**273**
Long-term borrowings	0	0	201	201	201	201
Other non-current liabilities	46	91	72	72	72	72
Total liabilities	**8,659**	**13,014**	**1,224**	**1,511**	**1,496**	**1,718**
Share capital	0	0	0	1,240	1,240	1,240
Retained earnings	(6,592)	(11,447)	(11,168)	(12,126)	(12,611)	(12,608)
Other reserves	86	354	12,261	12,476	12,583	12,683
Total shareholders equity	**(6,506)**	**(11,094)**	**1,093**	**1,590**	**1,212**	**1,316**
Minority interest	0	0	0	0	0	0
Total equity and liabilities	**2,153**	**1,920**	**2,317**	**3,101**	**2,709**	**3,033**

CASH FLOW	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec (RMB mn)						
Operating						
Profit before taxation	**(2,754)**	**(4,855)**	**313**	**(958)**	**(485)**	**3**
Depreciation & amortization	50	87	112	119	127	136
Change in working capital	(125)	73	(73)	244	(450)	(146)
Others	2,075	3,638	(1,543)	336	261	317
Net cash from operations	**(755)**	**(1,058)**	**(1,190)**	**(258)**	**(547)**	**310**
Investing						
Capital expenditure	(71)	(134)	(76)	(76)	(76)	(76)
Acquisition of subsidiaries/ investments	0	(10)	2	0	0	0
Others	(662)	690	(150)	23	29	24
Net cash from investing	**(733)**	**547**	**(223)**	**(52)**	**(47)**	**(52)**
Financing						
Net borrowings	(14)	(12)	674	(156)	98	(28)
Proceeds from share issues	915	854	905	1,240	0	0
Share repurchases	(5)	0	0	0	0	0
Others	(93)	(32)	(27)	(47)	(31)	(36)
Net cash from financing	**804**	**809**	**1,552**	**1,037**	**67**	**(64)**
Net change in cash						
Cash at the beginning of the year	1,553	982	1,298	1,448	2,164	1,627
Exchange difference	112	18	10	(10)	(10)	(10)
Others	(683)	298	139	726	(527)	194
Cash at the end of the year	**982**	**1,298**	**1,448**	**2,164**	**1,627**	**1,810**

GROWTH	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Revenue	173.4%	88.8%	51.8%	71.4%	62.6%	58.7%
Gross profit	122.3%	58.6%	152.4%	92.8%	78.2%	58.2%

PROFITABILITY	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Gross profit margin	29.4%	24.7%	41.1%	46.2%	50.6%	50.5%
Operating margin	(636.4%)	(543.2%)	(369.8%)	(123.6%)	(39.0%)	(1.6%)
Return on equity (ROE)	na	na	na	(71.4%)	(34.6%)	0.3%

GEARING/LIQUIDITY/ACTIVITIES	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
Current ratio (x)	0.2	0.1	2.2	2.4	2.1	2.1

VALUATION	2022A	2023A	2024A	2025E	2026E	2027E
YE 31 Dec						
P/E	ns	ns	ns	ns	ns	3,499.7

Source: Company data, CMBIGM estimates. Note: The calculation of net cash includes financial assets.

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