Semiconductors

Wide-bandgap semiconductors – SiC/GaN: Powering the next wave of AI infrastructure

OUTPERFORM (Maintain)

China Semiconductors Sector

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We believe the wide-bandgap semiconductor sector, led by silicon carbide (SiC) and gallium nitride (GaN), is entering a new, multi-year growth phase. While automotive electrification remains a key secular driver, a structural new demand frontier is emerging: the power redesign of AI data centers. The transition from legacy 54V DC to 800V high-voltage direct current (HVDC) architecture, essential for next-generation, high-power AI racks, is physically and economically enabled by SiC and GaN. The evolution positions these materials from performance enhancers into critical infrastructure components, creating a durable investment theme. **We expect companies with scale, technology leadership in 8-inch wafers, certified automotive pipelines, and system-level solution expertise to be key beneficiaries.**

- **Robust market growth.** According to TrendForce, the SiC power device market reached ~US$3.4bn (12% YoY) in 2024, with automotive accounting for >70% of demand; the GaN device market grew 43% YoY to US$388mn (43% YoY) in 2024. We expect sustained market expansion of SiC and GaN, driven by rising penetration (automotive/renewable energy) and new application demand (AI data centers).
- **AI data centers, a structural demand frontier.** AI rack power scaling towards 1MW is making legacy power architecture inefficient, due to special limits, copper crisis, and efficiency constraints. The industry is shifting to 800V HVDC, a transition physically and economically enabled by SiC and GaN. This unlocks a multi-layered ecosystem opportunity, improving power usage effectiveness (PUE) by up to 5%, cutting total cost of ownership (TCO) by up to 30%, and enabling scalability beyond 1MW racks.
- **Supply chain in aggressive expansions:** We see the industry is racing to scale 8-inch wafer production (and eyeing 12-inch) to drive down costs and accelerate adoption. This has led to significant ASP erosions in SiC substrates/epitaxial wafers. However, we see this as a structural cost-curve reset, not a typical cyclical adjustments, which will accelerate adoption and broaden the addressable market. We expect the SiC market to reach a new price equilibrium in 2026.
- **Diverging competitive landscapes:**
  - **SiC: specialization drives scale and cost reduction.** The SiC supply chain has evolved with a more clear division of labor across substrates, epitaxy, and devices. This specialization allows for focused expertise and capital investment at each stage, facilitating rapid capacity expansion and aggressive cost reduction. We see Chinese players rapidly gaining share in substrates/epitaxy sectors, while global power semiconductor giants dominate the device market, leveraging high technical barriers, established customer relationships, and the long, stringent qualification cycles inherent to the automotive industry.
  - **GaN: vertical integration as a strategic advantage.** Integrated device manufacturers (IDMs) offers closer process and design co-optimization for performance and reliability, and enable better supply chain resilience. This is important as the industry navigates the planned exit of TSMC (the leading GaN foundry with 41% market share in 2024) from GaN foundry production by 2027. We maintain a positive outlook on InnoScience (2577 HK, BUY, TP: HK$49), the pure-play GaN leader (#1 with 30% share, based on TrendForce data). We project the company's revenue to grow at a 55.2% CAGR from 2024-2027E, driven by industry tailwinds, strategic positioning and collaboration with global partners like NVIDIA. Potential risks include 1) slower-than-expected GaN penetration, 2) supply chain disruptions, and 3) IP litigations.

A transition from enabling technologies to critical components

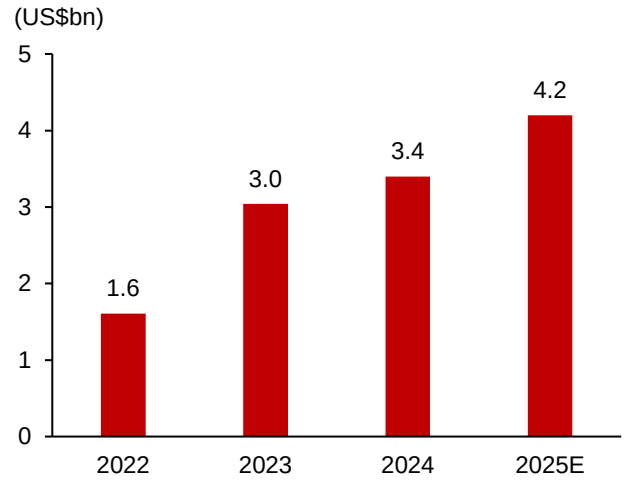
The wide-bandgap semiconductor industry, led by silicon carbide (SiC) and gallium nitride (GaN), is at a pivotal strategic inflection point, in our view. While SiC has been in development for decades, its adoption crossed into the mainstream in 2018 when Tesla's Model 3, powered by STMicroelectronics' SiC MOSFETs, disrupted the automotive power electronics landscape. Similarly, GaN, foundational to LED technology since the 1990s, achieved commercial scale through the fast-charging revolution post-2018. Today, both technologies are at another inflection point, driven by surging power and efficiency demands of AI data centers, positioning these wide-bandgap semiconductors as critical enablers of next-generation infrastructure and creating their next major growth vector.

Automotive remains the key application

The global SiC power device market reached an estimated US$3.4bn in 2024 (12% YoY), and is expected to reach US$4.2bn (24% YoY) in 2025E, per TrendForce. This growth is fueled by the industry's transition from 6-inch to 8-inch wafers for critical cost reduction, coupled with sustained demand from automotive, renewable energy, and emerging AI data center applications.

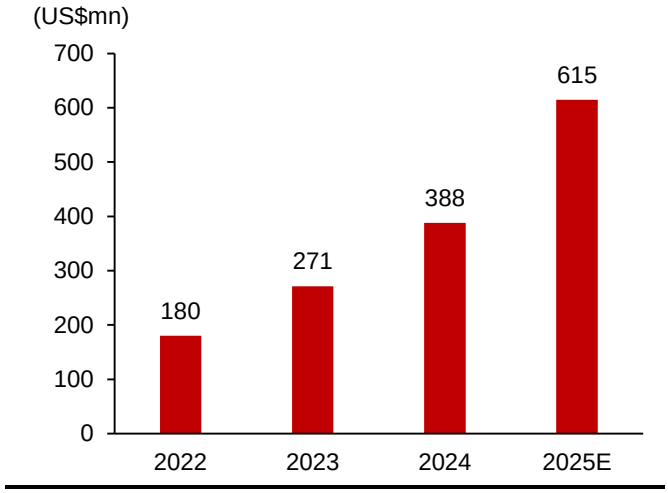
The global GaN power device market delievered significant 43% YoY growth to US$388mn in 2024, and is expected to reach US$615mn (59% YoY) in 2025E per TrendForce. We expect accelerated growth in the upcoming years, driven by the industry's pursuit of energy efficiency, the need for miniaturization, and supportive policy tailwinds.

Figure 1: SiC device market reached US$3.4bn in 2024



Source: TrendForce, CMBIGM

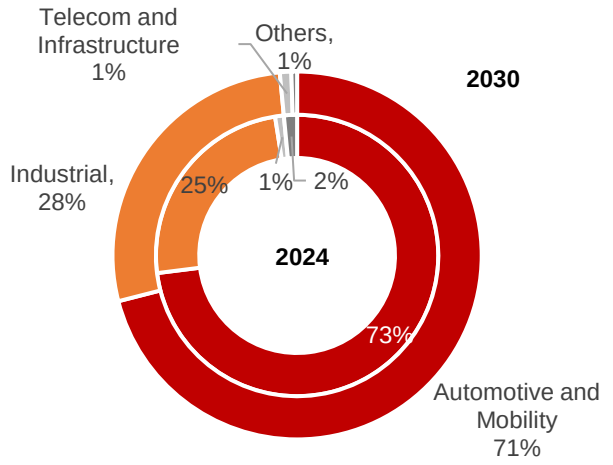
Figure 2: Global GaN power device market reached US$388mn in 2024



Source: TrendForce, CMBIGM

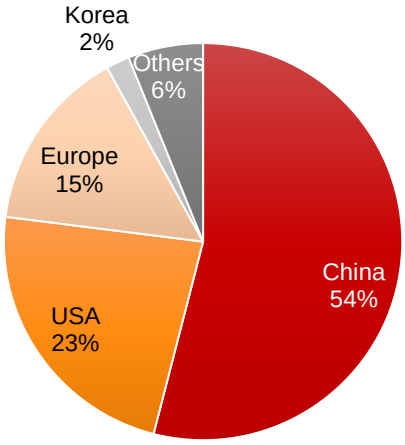
Automotive remains the dominant end-market for SiC power devices, accounting for over 70% of the total market from 2024 through 2030 per Yole. This structural demand is creating a powerful tailwind for the SiC supply chain (substrates, epitaxial wafers and devices). Benefiting from faster capacity build-out and a critical geographical advantage, i.e., proximity to the world's largest EV market, China players are rapidly expanding their market share in the upstream supply chain.

Figure 3: Automotive remains the largest application market of power SiC devices



Source: Yole, CMBIGM

Figure 4: China accounted for over 50% market share in SiC BEV market in 2024



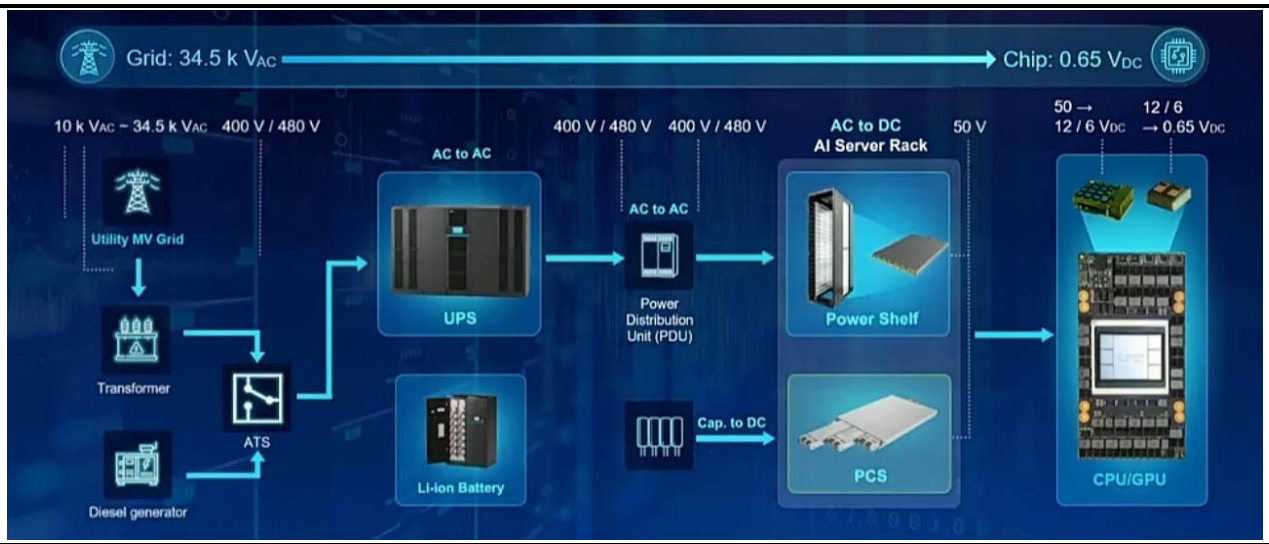
Source: Yole, CMBIGM

AI emerges as new growth frontier

The explosive growth of artificial intelligence is driving a fundamental redesign of power architecture within AI data centers (AIDCs) and AI factories.

As AI rack power surges from 200 kW toward 1 MW, legacy 54V DC in-rack power standard approach hits physical and economic walls: 1) Space limitation: power distribution alone would consume up to 64U of rack space at MW scale, crowding out compute hardware. 2) Copper crisis: delivering 1 MW at low voltage requires ~200 kg of copper busbar per rack. At AI data centers scale, this balloons into a prohibitive half a million tons of copper, resulting in a massive cost and logistics barrier. 3) Efficiency drain: the legacy chain of multiple AC/DC conversions incurs significant energy loss and introduces unnecessary points of failure, undermining both PUE and reliability.

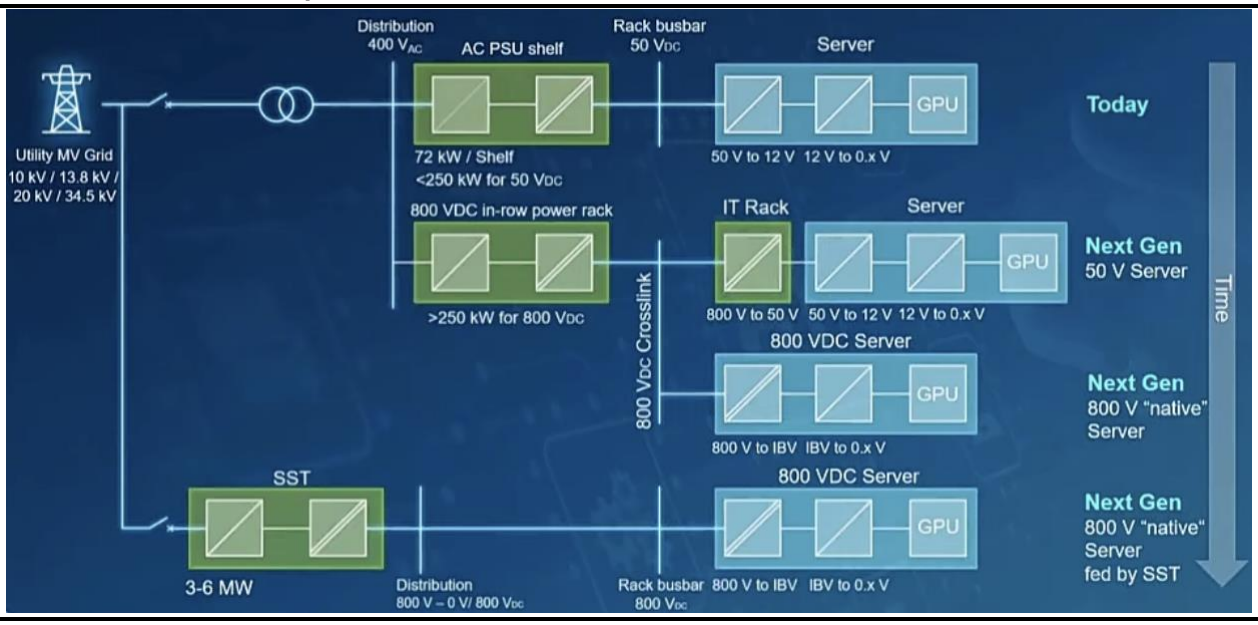
Figure 5: Conventional AC distributed data center infrastructure



Source: Delta, CMBIGM

The industry is poised for a transition to an 800V high-voltage direct current (HVDC) architecture, such as Nvidia's Kyber rack-scale systems (targeted for 2027). This simplifies power delivery from grid to chip.

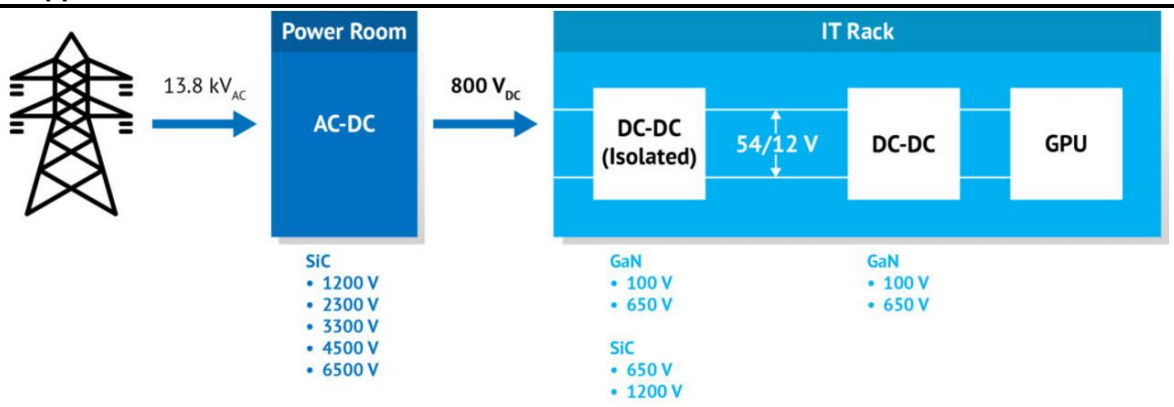
Figure 6: 800VDC transition plan



Source: Delta, CMBIGM

SiC and GaN are complementary technologies critical to this transition, acting as high-frequency, highly efficient electronic switches within power supply units (PSUs), i.e., GaN-based power factor correction (PFC) and SiC MOSFETs.

Figure 7: Application of SiC/GaN in new 800V HVDC architecture

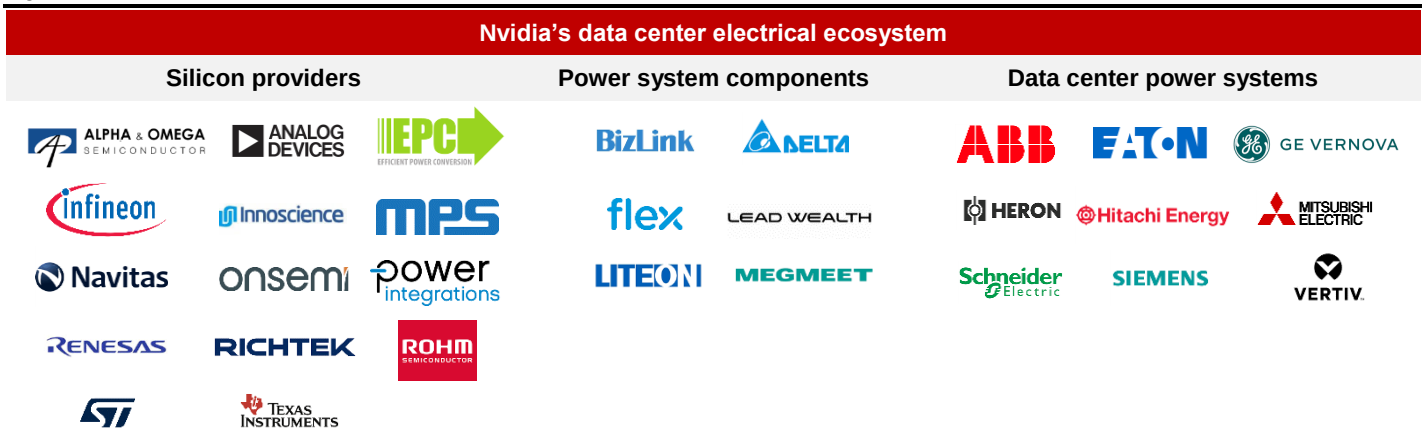


Source: Navitas, Yole, CMBIGM

The transition delivers compelling ROI: enhanced PUE by up to 5%, significant cost savings (reducing copper use by ~45% and TCO by up to 30%), and unlocked scalability (supporting rack power from 100kW to beyond 1MW).

A mature ecosystem from semiconductor providers (Infineon, STMicroelectronics, Navitas, InnoScience) to global data center infrastructure giants (Eaton, Schneider Electric, Vertiv) is poised to deploy this transition.

Figure 8: Nvidia and partners innovate from grid-to-chip with power delivery design: 800 VDC infrastructure for Kyber AI factories

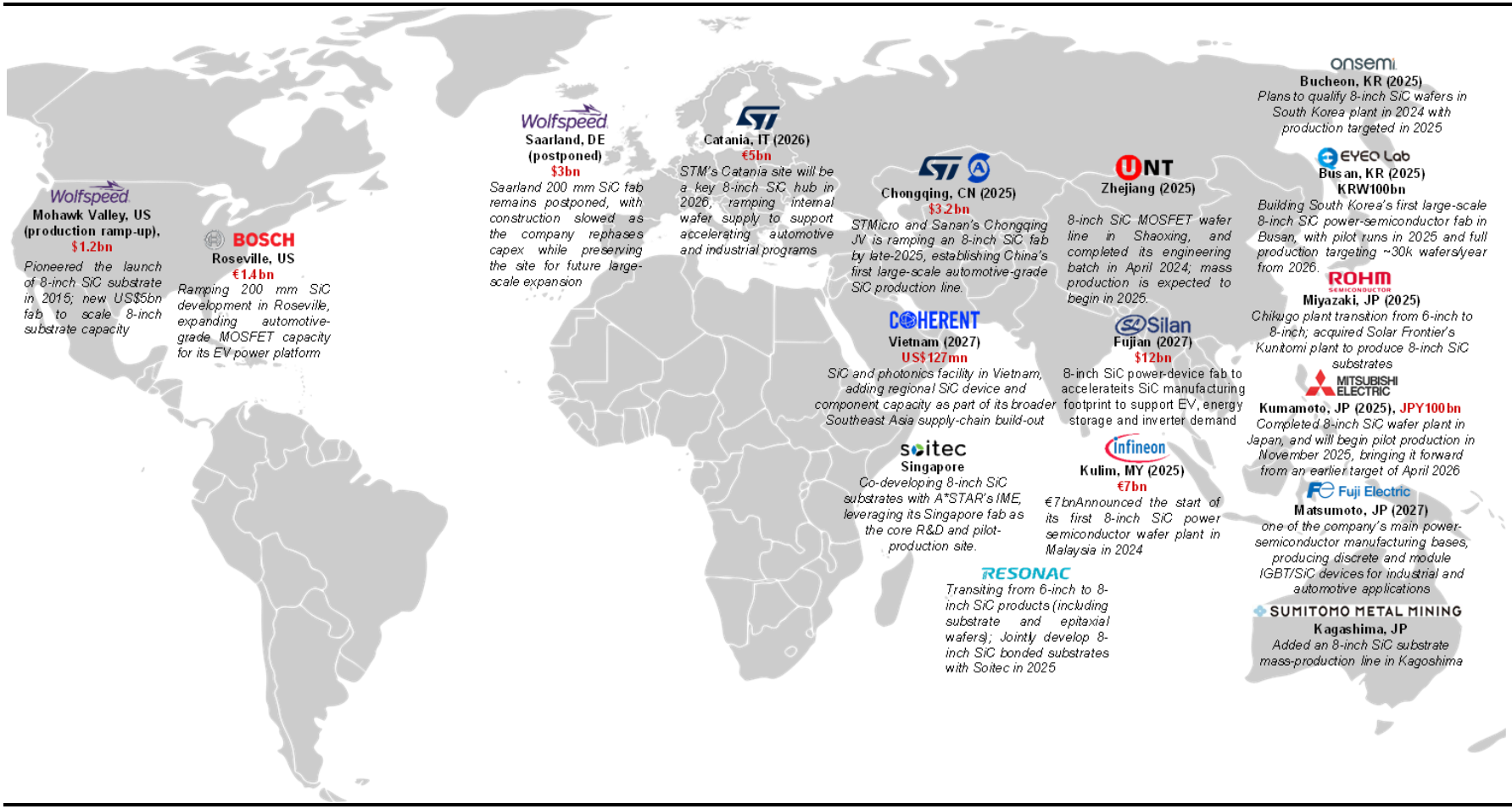


Source: Nvidia, CMBIGM

Supply chain's capacity race

The entire SiC/GaN supply chain is in aggressive investment mode, marked by capacity expansion and strategic M&A. Global SiC players are accelerating 8-inch plans and eyeing on 12-inch. GaN leader InnoSicence is ramping its 8-inch production (13kwpm capacity by 1H25). **This scaling is essential to drive down cost.**

Figure 9: Global 8-inch SiC wafer fab investment (both existing and planned capacity)



Source: TrendForce, Semiconductor-today, company filings, CMBIGM

Figure 10: GaN supply chain developments (key players)

Company	Business model	Development on GaN
InnoScience	IDM	Largest GaN manufacturer globally by capacity, with 8-inch GaN-on-Si capacity reaching ~13k wafers per month by 1H25. Its portfolio spans GaN ICs, modules, and discrete devices across 15–1200V platforms.
Navitas	Fabless	Developed all its GaN power ICs in-house, pioneering monolithic GaN-on-Si integration since 2018 under its GaNFast platform
EPC	Fabless	Developed all its GaN technology in-house and was the first company to commercialize enhancement-mode GaN-on-silicon (eGaN) FETs
Infineon	IDM	Acquired GaN Systems for US$830mn, marking the largest deal in the power GaN sector to date. Through this move, Infineon gains GaN Systems' packaging and high-power expertise, auto-grade designs, and R&D.
Power Integration	Fabless	Developed its GaN tech entirely in-house and launched its first GaN ICs in 2018. The company's GaN-on-sapphire platform now spans 1,250V and 1,700V devices, enabling 800V DC architectures
Renesas	IDM	Acquired Transphorm (GaN IDM) for US$339 in 2024; developed 4th-gen 650V GaN FET in 2025; partners with Polar Semiconductor to produce 8-inch GaN devices in the U.S.

Source: Company data, Yole, TrendForce, CMBIGM

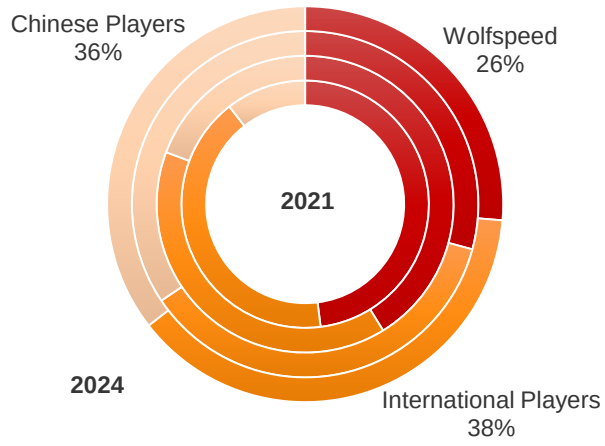
The SiC industry is experiencing a profound structural cost curve reset. Aggressive capacity growth has dragged substrate/epitaxial wafer ASP significantly, pressuring marginal producers but making SiC cost-competitive against silicon IGBTs. **We believe this will accelerating SiC's adoption and expect price to stabilize in 2026.**

Competitive dynamics

SiC supply chain: diverging landscapes

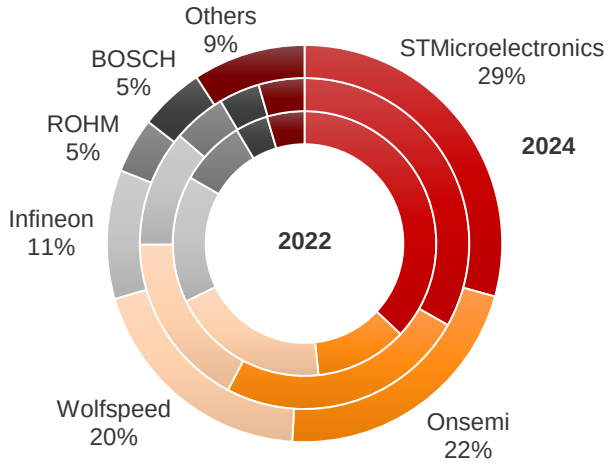
In the materials segment (substrate/epitaxial wafer), Chinese manufacturers are rapidly gaining market share through aggressive capacity expansion and rapid technology catch-up, leveraging cost and geographical advantages in the world's largest EV market. The device market leadership remains firmly with global IDMs (STMicroelectronics, onsemi, and Infineon), due to deep application expertise and automotive qualification moats. We expect the winners will be those with scale, leading 8-inch yields, and certified automotive pipelines.

Figure 11: SiC substrate (N-type) market share



Source: Yole, CMBIGM

Figure 12: SiC device market share

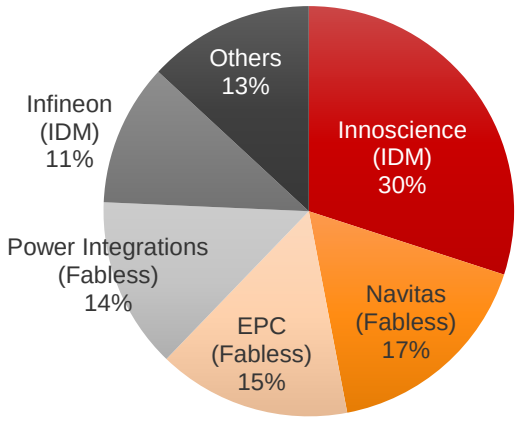


Source: Yole, CMBIGM

GaN supply chain: the rise of IDMs

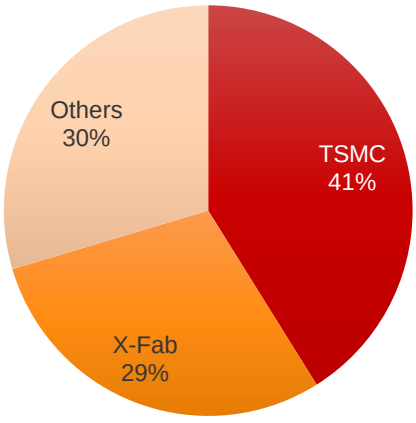
The market is concentrated, with the top five players holding nearly 80% share. The IDM model holds strategic advantages in process-design co-optimization and supply chain resilience.

Figure 13: Market share of GaN power devices (2024)



Source: Yole, CMBIGM

Figure 14: Market share of GaN foundries (2024)



Source: TrendForce, CMBIGM

The supply chain resilience is critical given TSMC's (#1 in GaN foundry market with 41% share) planned exit from the GaN foundry market by July 2027, which is forcing key fabless

players (i.e., Navitas, consuming 50%+ of TSMC's GaN volume per TrendForce) into complex foundry migration strategies (from TSMC to PSMC and GlobalFoundries). **The change in foundry suppliers suggests less resilience in GaN's fabless model.**

Future industry leaders will be characterized by: 1) technology & scale leadership (8-inch wafer mass production and yield improvement to win the cost-down curve), 2) vertical Integration or deep alliance models, and 3) system-level solution expertise.

Maintain a positive outlook on InnoScience. Founded in 2017, InnoScience has rapidly scaled to become the world's leading pure-play GaN company (#1 with 30% share in 2024). It achieved an industry milestone by pioneering mass production of 8-inch GaN-on-Si wafers and operates two 8-inch fabs with a combined capacity of 13k wafers per month (as of 1H25). Its revenue is well-diversified across the value chain: wafers (34% of 2024 sales), chips & ICs (44%), and modules (22%). We project the company's revenue to grow at a 55.2% CAGR from 2024-2027E, driven by industry tailwinds, strategic positioning and collaboration with global partners like NVIDIA. Key risks: Slower-than-expected GaN penetration, 2) supply chain disruptions, and 3) IP litigations.

Figure 15: Peers table

			Mkt Cap	P/E (x)			EPS (US$)			GPM%		
Company	Ticker	Rating	(US$mn)	FY25E	FY26E	FY27E	FY25E	FY26E	FY27E	FY25E	FY26E	FY27E
Domestic peers												
Times Elec	**688187 CH**	NR	8,381	15.8	13.7	12.4	0.43	0.50	0.55	33.0	33.0	32.0
San'an Opto	**600703 CH**	NR	9,238	137.7	59.5	47.1	0.01	0.03	0.04	14.3	16.3	16.8
Yangjie	**300373 CH**	NR	4,907	27.4	22.5	18.8	0.33	0.40	0.48	34.2	34.5	34.7
Wuxi NCE	**605111 CH**	NR	2,008	28.4	22.7	20.1	0.17	0.21	0.24	35.3	35.4	35.4
Starpower	**603290 CH**	NR	3,424	45.0	31.9	24.9	0.32	0.45	0.57	28.4	28.9	30.1
Jiangsu Jiejie	**300623 CH**	NR	3,132	35.0	27.7	23.1	0.11	0.14	0.16	35.0	36.0	35.0
CR Micro	**688396 CH**	NR	10,017	77.6	54.8	40.4	0.10	0.14	0.19	26.6	28.0	29.4
Silan Micro	**600460 CH**	NR	6,589	80.8	44.9	32.8	0.05	0.09	0.12	20.3	21.6	22.5
InnoScience	**2577 HK**	BUY	8,677	N/A	N/A	N/A	(0.128)	(0.087)	0.005	10.6	21.7	29.8
			Avg.	***56.0***	***34.7***	***27.4***	***0.2***	***0.2***	***0.3***	***26.4***	***28.4***	***29.5***
Overseas peers												
Diodes	**DIOD US**	NR	2,172	40.3	23.5	15.2	1.16	1.99	3.08	31.2	32.5	34.8
NXP	**NXPI US**	NR	54,198	18.3	15.6	13.1	11.77	13.76	16.43	56.8	58.0	59.4
STM	**STM US**	NR	21,496	39.0	21.8	12.5	0.62	1.11	1.92	33.8	35.5	38.6
Onsemi	**ON US**	NR	20,714	22.1	17.6	12.8	2.33	2.93	4.03	38.2	39.5	43.3
Infineon	**IFX GY**	NR	54,445	24.3	22.2	16.3	1.70	1.87	2.56	39.7	40.3	42.7
			Avg.	***28.8***	***20.1***	***14.0***	***3.5***	***4.3***	***5.6***	***39.9***	***41.2***	***43.8***

Source: Bloomberg consensus as of 3 Dec, 2025; forecasts for InnoScience are CMBIGM estimates

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