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COMPOUNDS & ADVANCED SILICON

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Oxide epi for photonic integration on silicon

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Gallium production • SDI buys PRP Opto • Polar Light raises €5m

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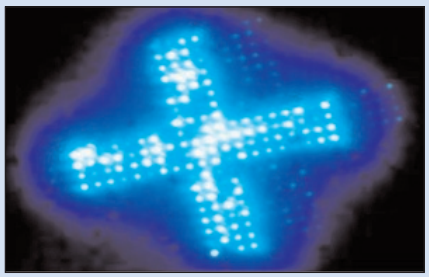
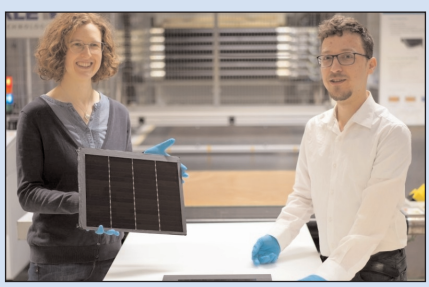
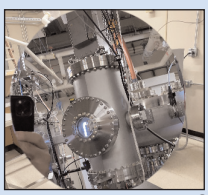


p42 Polar Light Technologies has produced its first series of nano-scale LEDs, illustrating the flexibility of its patented pyramidal architecture.

p50 Tampere University spin-off VEXLUM has secured €10m in funding to scale its chip manufacturing and laser technology.



p62 Fraunhofer ISE has achieved record efficiencies for tandem photovoltaic modules.



Cover image: La Luce Cristallina has launched its new CMOS-compatible oxide pseudo-substrate, enabling high-quality, epitaxial strontium titanate films to be grown directly on 200mm silicon and SOI wafers using standard semiconductor tools. **p36**

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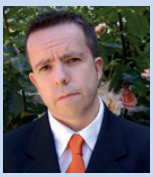

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***Semiconductor Today* covers the R&D and manufacturing of compound semiconductor and advanced silicon materials and devices** (e.g. GaAs, InP and SiGe wafers, chips and modules for microelectronic and optoelectronic devices such as RFICs, lasers and LEDs in wireless and optical communications, etc).

Regular issues contain:

- news (funding, personnel, facilities,
- technology, applications & markets);
- feature articles (technology, markets,
- regional profiles);
- conference reports;
- event calendar and event previews;
- suppliers' directory.

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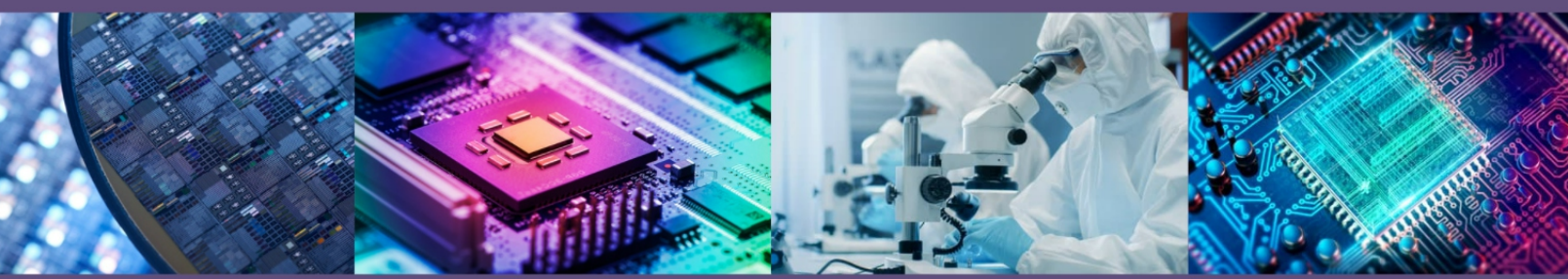
csconnected

THE WORLD'S FIRST COMPOUND SEMICONDUCTOR CLUSTER



CSconnected is home to the world's first regional ecosystem based on the manufacture of compound semiconductor enabled hardware, located in south Wales

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news

CSA Catapult report highlights growth and scale-up opportunities for UK photonics companies

UK targets photonic integrated circuits for data centers, quantum & 6G

Investment in scale up, manufacturing and supply chains, could lead to significant growth and acceleration for UK companies developing photonic integrated circuits (PICs), according to a new report 'Unlocking the Future with Photonic Integrated Circuits' by the UK's Compound Semiconductor Applications (CSA) Catapult (a not-for-profit center of excellence established by Innovate UK in 2018, specializing in the measurement, characterization, integration and validation of compound semiconductor technology spanning power electronics, advanced packaging, radio frequency and microwave, and photonics applications).

The global PIC sector is forecasted to surge at a compound annual growth rate (CAGR) of 24% from $3.9bn in 2024 to $54.5bn by 2035. This rapid market expansion is anticipated in data centers and telecoms and in quantum technologies (56.1% CAGR) and sensing (47.5% CAGR).

According to the Photonics Leadership Group, the UK's photonics sector currently contributes £18.5bn to the economy and supports over 84,000 jobs, making it one of the most productive manufacturing industries in the country.

The UK is the second largest photonics producer in Europe and ninth globally, accounting for about 2.25% of a £850bn global market. Most UK firms export more than half of their output, and foreign investment continues to flow into the sector due to its reputation for innovation and skills.

To secure long-term leadership in PICs the UK should:

- Invest in scale-up, manufacturing and supply chain capacity — establish pilot and production facilities and strengthen domestic supply chains to bridge the gap between research and industrial deployment, enhancing the UK's technological sovereignty.
- Embed PICs within national AI and quantum strategies — position PICs as a core enabler of the UK's 10-year compute roadmap and national quantum programs.
- Strengthen integration and prototyping capabilities — expand, co-design, packaging and validation services to reduce adoption risk and accelerate innovation.
- Develop specialist talent pipelines – expanding training, apprenticeships and fellowships to address gaps in photonic design, packaging and testing.
- Promote cross-sector adoption and international collaboration — showcase PIC applications across telecoms, data centers, healthcare and quantum, while fostering global partnerships to secure market competitiveness.

"Photonic integrated circuits are a critical part of modern digital infrastructure. If the UK acts now to build capability and capacity, it can secure long-term leadership to support the fast-growing markets in AI hardware, quantum and 6G," says CSA Catapult's chief technology officer Nick Singh.

"CSA Catapult can support UK photonics companies by combining our design expertise with integrated prototyping services; we want to be a key enabler of the UK's photonics supply chain," he adds. "Our focus on manufacturability, scalability and convergence ensures that emerging PIC technologies can transition more effectively from research to industrial deployment."

www.csa.catapult.org.uk/wp-content/uploads/2026/01/Photonic-Integrated-Circuits-Report.pdf
www.photonicsuk.org

European photonic chip industry risks losing advantage without decisive action

Steering Committee of CEOs urges priority in revision of EU Chips Act

Europe has a leading position in photonic chip technology, it is reckoned. But, without targeted investment and action, the European Union (EU) risks losing its advantage as the global competition intensifies with large investments elsewhere.

A European photonic chip industry Steering Committee consisting of CEOs from eight companies (Almae Technologies, Ligentec, PHIX, PhotonDelta, SMART Photonics, Soitec, VLC Photonics and XFab) plus photonic chip industry accelerator PhotonDelta of Eindhoven, the Netherlands (which connects and collaborates with an ecosystem of photonic chip technology organizations worldwide) — with input from more than 80 European photonic chip organizations — are calling on Europe to act. In a white paper, the industry urges, among other things, for priority in the upcoming revision of the EU Chips Act, a better innovation, investment and business climate, and targeted public and private investments.

The European photonic chip industry is rapidly gaining traction and the market for integrated photonics is expected to grow by over 350% in the next five years to about €65bn by 2031.

Competition from the USA and Asia, among others, is growing rapidly and threatens to overtake the nascent European industry. In the run-up to the revision of the EU Chips Act, it is crucial to take action to maintain Europe's lead, secure strategic autonomy, and support the economy's future growth engine. This urgency also aligns with the warnings in the 2024 Draghi report that, without investment and decisiveness, Europe will fall behind and the EU will lose its strategic and economic relevance.

Lessons from the past: importance of targeted investments

Europe has been at the forefront of emerging technologies before, such as semiconductor production in the 1970s and solar energy in the 2000s, only to lose out to Asia and the USA. Without action, the same threat looms for photonic chips today, it is warned. The 2023 European Chips Act was a much-needed first step to support the photonic chip ecosystem by establishing a manufacturing pilot line, but was lacking any investments into scaling this European industry. Now, Europe must invest in order to scale up this sector and remain indispensable, avoiding dependency on other non-European countries. This is underlined by today's geopolitical situation and the relevance of photonic chip technology for Europe's strategic autonomy.

Call to action: Europe leads the way — the European photonic chip industry recommends

Several concrete steps are needed to ensure that the European photonic chip industry continues to grow into a leading position. In the white paper, the eight European CEOs from the sector put forward a shared industry perspective and make a number of concrete recommendations:

- In the planned revision of the Chips Act (Chips Act 2.0), establish a special program with subsidies and initiatives focused specifically on the photonic chip industry. For example, the EU can accelerate demand for European photonic chips by stimulating cooperation between European companies, coordinated procurement for large projects and backing 'buy European' initiatives.
- Provide a strong foundation for industrialization and upscaling. Targeted investments in open-access foundries enable faster scale-up for small businesses without requiring them to invest in production facilities. In addition, strengthen public-private partnerships to close the gap between fundamental research and industry.
- A better innovation, investment and business climate is needed for the European photonic chip industry. To this end, the EU must simplify regulations and make access to funding more accessible for scale-ups and SMEs. Focus on talent development to stimulate innovation and retain critical knowledge.

"Photonic chips are essential to Europe's broad-based sustainable, digital and competitive future," says PhotonDelta's CEO Eelko Brinkhoff. "Without targeted investments and strategic recognition, such as the Chips Act 2.0, we risk losing our lead to global competitors. That is why we call on government, industry, and knowledge institutions to join forces. Now is the time to show vision, decisiveness and European leadership," he adds.

"We are busy scaling up manufacturing technology for photonic chips and making this available to all fabless companies," notes SMART Photonics' CEO Johan Feenstra. "The potential benefit of this to Europe is enormous. But, to really accelerate, we require concrete action and a strong drive to scale up and industrialize. If we only focus on pilot lines and research, we risk missing the boat. We must take action and put photonic chip technology at the heart of Europe's industry and innovation policy," he adds.

"We pioneered PIC research and SME access in Europe 15 years ago," says VLC Photonics' CEO Iñigo Artundo. "But with AI's rise, Europe has lost high-volume manufacturing to US and Asian silicon photonics foundries and are now losing software, testing and packaging to global outsourced semiconductor assembly and test (OSAT) organizations. End-user adoption is also lagging," he adds. "Urgent, focused support is essential if Europe wants to remain a key player. Integrated photonics is no longer emerging; it's a critical semiconductor technology in a booming market."

www.photondelta.com

Vertical gallium nitride could transform high-voltage power electronics and support UK Net Zero ambitions, says CSA Catapult

Report focuses on GaN-on-GaN architecture

A new white paper published by the UK's Compound Semiconductor Applications (CSA) Catapult sets out how the country could take a leading role in the next major shift in power electronics, as demand surges for smaller, faster and more energy-efficient high-voltage systems.

Established in 2018 by government agency Innovate UK, CSA Catapult is a not-for-profit center of excellence that specializes in the measurement, characterization, integration and validation of compound semiconductor technology spanning power electronics, advanced packaging, radio frequency and microwave, and photonics applications.

The new report focuses on vertical gallium nitride (GaN), particularly the GaN-on-GaN architecture, which has the potential to significantly outperform existing silicon-based devices. Instead of carrying current across the surface as in common lateral GaN devices, vertical GaN conducts current straight through the thickness of the device. Using a GaN-on-GaN design reduces the number of defects, handles heat better, and allows the device to support higher voltages and power. This makes power systems smaller, lighter and more reliable. Vertical GaN also switches on and off faster with less energy loss, which improves overall efficiency.

Electric vehicle charging networks, renewable energy installations and power-hungry data centers are all expanding at pace. Power electronics sit at the heart of all these systems, and even modest efficiency gains can translate into major energy and carbon savings at scale.

Early projections suggest that the high-power GaN device market could reach $1.5bn within five years, with vertical GaN expected to capture an increasing share as the technology matures. Compact GaN power adapters delivering hundreds of watts are already reaching the market, while next-generation GaN-based systems in data centers could reduce electricity use by up to 10%, cutting costs and emissions. In electric vehicles, more efficient GaN inverters and chargers could support faster charging, longer range and lighter systems.

The report highlights how the UK is well placed to capitalize on this opportunity. Research at universities including Cardiff, Swansea and Coventry sits alongside a strong compound semiconductor supply chain, with companies such as IQE and Cambridge GaN Devices already active in the space. Major automotive, aerospace and energy companies also provide further pull-through for advanced power electronics technologies.

As vertical GaN moves from research into real-world deployment, CSA Catapult is playing a key role in helping industry to bridge that gap. Through its power electronics expertise, testing and benchmarking capability, and collaborative R&D programs, the Catapult is supporting organizations to assess performance, address reliability challenges and accelerate routes to market.

The report sets out the benefits and practical steps needed to turn UK capability into global leadership, but this is just the start of the conversation for industry, policy-makers and researchers alike, it notes.

"Vertical GaN provides an exciting opportunity for UK organizations to deliver cleaner, more efficient power electronics that directly support national priorities around energy security, productivity and decarbonization," says CSA Catapult's chief technology officer Nick Singh. "CSA Catapult will convene industry and academia to bring this new technology to life. We will not only be able to compete better on the global stage, but we can give the UK a strategic advantage."

www.csa.catapult.org.uk/gan-report

CSconnected announces £1m final call for Supply Chain Development Programme

The South Wales-based compound semiconductor cluster CSconnected has announced the fourth and final funding round of its £1m Supply Chain Development Programme, which is delivered in partnership with Cardiff Capital Region (CCR) to accelerate the expansion of the compound semiconductor supply chain, with the aim of driving job creation, stimulating economic growth, and strengthening the UK's strategic position in advanced semiconductor manufacturing.

Supported by the Strength in Places Fund (UK Research and Innovation) and Cardiff Capital Region, CSconnected is the world's first compound semiconductor cluster, and unites leading companies, research institutions, and government partners to drive innovation, economic growth, and global leadership in semiconductor technology.

For this fourth funding call, CSconnected is encouraging applications from companies based in and around South Wales, as well as organizations across the wider UK that support the compound semiconductor sector. This opens the door for a range of UK-based businesses to participate and contribute to one of the UK's most critical technology ecosystems.

The call aims to support existing and potential suppliers and buyers of the core organizations of the CSconnected Cluster.

The programme supports individual projects of up to £100,000 in grant value, with a maximum intervention rate of 50%, equivalent to a total project cost of £200,000. Micro-companies remain eligible for a 70% intervention rate for grants up to £30,000. Projects must be led by a UK-registered limited company, run for between six and nine months, and demonstrate clear benefits to the South Wales region where CSconnected is headquartered.

"This final funding round is building on the success of the projects in the programme so far that are improving resilience and capacity within the UK's semiconductor ecosystem," notes CSconnected's managing director Howard Rupprecht. "We are inviting more companies across the UK to build and strengthen their strategic supply chain partnerships with the compound semiconductor cluster in South Wales."

Current projects are equipping suppliers with new production line capabilities, enhancing throughput, validating new products and services to improve design efficiencies, and utilizing UK suppliers to onshore manufacturing processes.

Among the businesses already benefiting from the programme is KuasaSemi, which specializes in advanced power semiconductor design. Their participation illustrates the tangible impact the fund is having on UK capability and regional collaboration, reckons CSconnected.

"Being part of the Supply Chain Development Programme has significantly accelerated our technical progress and helped us build a stronger UK capability in advanced power semiconductor design," comments KuasaSemi's co-founder & director David Mawby. "The support has not only enabled key milestones but also opened new relationships across the South Wales cluster, strengthening collaboration and future innovation."

All proposals must be supported by a primary cluster organization and will be awarded as Minimum Financial Assistance (MFA) subsidies under the Subsidy Control Act 2022, with recipients receiving quarterly payments in advance.

The funding round closes on 17 April. For prospective applicants, CSconnected will host an online webinar on 11 March outlining the aims of the final round, eligibility criteria and application process, and including examples of previous successful projects, alongside practical guidance on preparing a strong submission.

In addition, CSconnected will host an in-person supply chain event to spotlight the compound semiconductor supply chain across South Wales and the wider UK. The event will provide an opportunity for potential applicants to hear about sector challenges, make connections with the primary cluster organizations, as well as the wider UK supply chain.

www.eventbrite.co.uk/e/final-1m-funding-round-for-csconnected-supply-chain-development-programme-tickets-1983782343391
www.csconnected.com/projects/projects/csconnected-supply-chain-development-programme

Skyworks' continuing revenue growth in Broad Markets counteracts seasonal decline in Mobile

December-quarter revenue, gross margin and non-GAAP earnings all exceed forecast

For its fiscal first-quarter 2026 (ended 2 January), Skyworks Solutions Inc of Irvine, CA, USA (which manufactures analog and mixed-signal semiconductors) has reported revenue of $1.035bn, down 5.9% on $1.1bn last quarter and 3.1% on $1.068bn a year ago. However, it beat the $0.975–1.025bn forecast, driven by upside in both Mobile and Broad Markets.

Comprising 62% of total revenue, Mobile product revenue was higher than expected (compared with the expected low- to mid-teens sequential decline), due to continued healthy sell-through and strong operational execution on new product launches at Skyworks' largest customer (which comprised about 67% of total company revenue).

Broad Markets revenue grew for an eighth consecutive quarter, up 4% sequentially and 11% year-on-year (better than the expected mid- to high-single-digit growth), driven by growth across edge IoT, data-center and cloud infrastructure, and automotive. Broad Markets remains a key growth engine for the company, growing faster than the corporate average. "Our products are designed into high-growth areas across a wide range of end-markets, including connected vehicles, enterprise infrastructure, satellite communications, data-center networking, and emerging edge AI applications," says CEO & president Phil Brace. "This breadth supports durability and reduces reliance on any single program," he adds.

"We delivered results above our expectations for the fourth consecutive quarter, with outperformance across revenue, gross margin, and non-GAAP earnings," remarks Brace.

On a non-GAAP basis, gross margin was 46.6%, up slightly on 46.5% both last quarter and a year ago.

Operating expenses were $230m, at the low end of the guidance range, reflecting disciplined cost control while continuing to invest in priority growth areas.

Net income is down $258.3m ($1.60 per diluted share) a year ago and $263.7m ($1.76 per diluted share) last quarter to $232.2m ($1.54 per diluted share, although this is $0.14 above the expected $1.40).

We delivered results above our expectations for the fourth consecutive quarter, with outperformance across revenue, gross margin, and non-GAAP earnings

Operating cash flow was $395.5m (up from just $200m last quarter). Capital expenditure was $56.5m. Free cash flow was hence $339m (free cash flow margin of 32.7%), up from just $144m (13.1% margin) last quarter. During the quarter, Skyworks paid $106m in quarterly dividends.

Cash and cash equivalents consequently rose from $1.161bn to $1.55bn, whereas debt remains about $1bn, "maintaining a strong balance sheet and ample flexibility to support strategic and financial priorities," says chief financial officer & senior VP Philip Carter.

Business highlights of fiscal Q1/2026 are cited as:

- advanced Wi-Fi 7 design wins supporting enterprise access points, networking, and home connectivity platforms with customers including Comcast, Verizon, and TP-Link;
- expanded automotive connectivity programs, broadening in-vehicle infotainment and 5G module deployments with Volkswagen, BYD, and other leading OEMs;
- strengthened Skyworks' 5G position in premium Android smartphones, including Samsung's Galaxy S26;
- announced the industry's first highly integrated Wi-SUN/LoRaWAN RF front-end modules (FEM) for smart home and smart city applications; and
- unveiled next-generation isolation solutions for high-voltage AI server power supplies and advanced electric vehicle (EV) architectures.

March-quarter outlook: further year-on-year growth in Broad Markets to counteract seasonal dip in Mobile

For fiscal second-quarter 2026 (to end-March quarter), Skyworks expects revenue to fall to $875–925m, with Mobile down 20% sequentially (consistent with historical seasonality) and Broad Markets flat sequentially but up by high-single-digits year-on-year (rising to 44% of total revenue).

Reflecting seasonally lower volume, gross margin is expected to fall to 44.5–45.5%.

Operating expenses should be $230–240m, as the firm continues to fund key R&D initiatives while maintaining tight control over discretionary spending.

At the $900m mid-point of the revenue range, diluted earnings per share is expected to fall to $1.04.

Skyworks' board of directors has also declared a cash dividend of $0.71 per share, payable on 17 March, to stockholders of record at the close of business on 24 February.

Trends in Mobile and Broad Markets

In Mobile, smartphone replacement cycles, while still lengthy, are beginning to shorten. "This trend is driving increased unit growth, as consumers upgrade more frequently, especially with the rise of new AI-capable devices and more integrated features," says Brace.

"At our top customer, we successfully defended key mobile sockets and gained content where architecture changes created opportunities," he adds. "We remain bullish on the long-term drivers of RF content supported by accelerated replacement cycles coupled with rising RF complexity tied to AI-driven workloads, and higher performance requirements."

Regarding Broad Markets, in edge IoT, Wi-Fi 7 momentum continues to build, supported by bandwidth-intensive applications in the home and workplace. "Wi-Fi 7's higher throughput, lower latency and reliability position it as an important enabler as AI inference move closer to the edge. Design-win activity remains strong, backlog is healthy, and we're already engaged with customers on early Wi-Fi 8 programs, positioning us well for the next cycle," says Brace.

"Automotive demand remains solid, driven by increased connectivity across tele-matics, infotainment and software-defined vehicle architectures. Our pipeline is broad, global and aligned with long-cycle platforms across multiple OEMs and tiers, giving us good visibility into fiscal 2026," he adds.

"In data center and infrastructure, demand signals are improving across our customer base, supported by increasing design-win activity. Timing and power-management content is expanding as the ecosystem transitions to next-generation 800G and emerging 1.6Tb architectures. We are seeing higher activity particularly with cloud and networking customers that require tighter timing accuracy, improved power performance, and better synchronization across high-bandwidth systems," Brace continues.

Broad Markets continues to expand its reach across a more diversified set of customers while consistently delivering margins above the corporate average. The demand drivers across these end markets are long-cycle and multi-year, positioning the business well as we move into fiscal 2026

"Broad Markets continues to expand its reach across a more diversified set of customers while consistently delivering margins above the corporate average. The demand drivers across these end markets are long-cycle and multi-year, positioning the business well as we move into fiscal 2026 and beyond."

www.skyworksinc.com

Qorvo's quarterly revenue grows 8.4% year-on-year

For its fiscal third-quarter 2026 (ended 27 December 2025), Qorvo Inc of Greensboro, NC, USA has reported revenue of $993m, down 6.2% on $1058.5m last quarter but up 8.4% on $916.3m a year ago, and above the mid-point of the $985m±$50m guidance range.

"Revenue primarily reflects strength at our largest customer [Apple, which comprised 53% of revenue]," says president & CEO Bob Bruggeworth. "Each of our operating segments grew revenue year-over-year, with notable strength in automotive components, consumer and enterprise Wi-Fi, defense & aerospace, base-station, and power management."

By business segment, revenue was:

- Advanced Cellular Group (ACG) $690.8m, down 11.1% on last quarter's $777m due to typical seasonality (with a low double-digit decline for Android revenue), but up 8.8% on $635.1m a year ago. At Qorvo's largest customer, content gains on their ramping platform helped to support double-digit revenue growth.
- Connectivity & Sensors Group (CSG) $111.3m, up 4.1% on $106.9m last quarter and 1.6% on $109.5m a year ago, despite divesting the MEMS-based Sensing Solutions business.
- High-Performance Analog (HPA) $190.9m, up 9.3% on last quarter's $174.6m and 11.2% on $171.7m a year ago, with continuing double-digit year-on-year growth being driven by defense & aerospace (HPA's largest business) supported by increasing content and rising defense spending (by both the USA and allies, boosted by Qorvo's expanding position in high-priority programs). Also, infrastructure business is benefiting from the transition to DOCSIS 4.0 (which has increased content requirements), where Qorvo is a leading supplier of broadband amplifiers.

"Revenue, non-GAAP gross margin and non-GAAP EPS all compared favorably to guidance," notes chief financial officer Grant Brown. "We continue to execute on cost and productivity initiatives to structurally enhance our gross and operating margins."

On a non-GAAP basis, gross margin was 49.1%, down from 49.7% last quarter but up on 46.5% a year ago, and above the 47–49% guidance. This is due to improved portfolio mix and operational actions, specifically portfolio management, exiting low-margin businesses, pricing strategy, and factory consolidation.

"Within our factory network, we closed our Costa Rica facility in December a few months ahead of schedule and have transitioned to external partners. Transfer of SAW filter production to Greensboro, North Carolina, and Richardson, Texas remains on track," says Bruggeworth. "We will be able to operate more efficiently with reduced capital intensity and we will continue to differentiate our products with onshore manufacturing of GaAs, GaN, BAW, SAW, and advanced multichip modules."

Operating expenses have been cut to $239.9m, from $273.5m last quarter and $248.4m a year ago. This is due mainly to R&D spending being reduced from $183.5m last quarter to $163m. Marketing & selling expenses have been cut from $52.5m to $43.8m, while general & administrative expenses have fallen from $33.2m to $29m.

Net income was $203.2m ($2.17 per diluted share, exceeding the $1.65–$2.05 guidance), down from $208.3m ($2.22 per diluted share) last quarter but up on $152.8m ($1.61 per diluted share) a year ago.

Operating cash flow was $265.4m (up from $214.1m a year ago). Capital expenditure was $28.5m. Free cash flow was hence $236.9m.

During the quarter, cash and cash equivalents rose from $1103.3m to $1318.5m (almost doubling from $769.4m a year ago). Long-term debt remains about $1549m, with no near-term maturities.

Net inventory has been reduced to $530m, down sequentially by $75m and $111m lower than the $641m at the end of fiscal 2025.

Outlook

For Q4/2026 (to end-March), Qorvo expects revenue to fall by $70m year-on-year from $869.5m to $800m±$25m, reflecting continued momentum in HPA offset mainly by the pivot from lower-margin mass-tier Android business (leading to an unseasonal decline in Android revenue) as well as a smaller impact from Qorvo's strategic exits and divestitures, plus normal seasonal decline at Qorvo's largest customer Apple. (The total revenue loss from exiting low-margin Android business is expected to be $150–200m for full-year fiscal 2026.)

Gross margin for Q4/2026 is expected to fall slightly sequentially to 48–49%. However, it continues to improve on a year-on-year basis (by a similar amount as in fiscal Q3, and up from 45.9% a year earlier). "This improvement is a direct result of multiple initiatives," notes Brown. "We've actively managed our product portfolio and pricing strategies to reduce exposure to mass-tier Android 5Gs. We've positioned the company to benefit from growth in D&A, which is margin accretive, divested or exited margin-dilutive businesses, and we continue to manage factory costs aggressively as we have consolidated our manufacturing footprint."

"We are reducing exposure to lower-margin segments while continuing to serve Android's high-value and premium and flagship tiers," says Bruggeworth. "We expect the improvement in product mix to support a higher gross margin in ACG," he adds.

Operating expenses should rise only slightly to $240–250m. "With ongoing OpEx reduction efforts, we expect to deliver expanding operating margins in ACG on the healthier revenue mix," says Bruggeworth. Diluted earnings per share (EPS) is expected to fall to $1.20±$0.15.

For full-year fiscal 2027, Qorvo expects a mid-single-digit decline in revenue year-on-year, by $300m, due mostly to the intentional resizing and strategic exit from the low-

margin Android segment, accelerated by the impact of memory pricing and availability constraints on mass-tier Android OEM build plans.

While revenue from Apple should be roughly flat in fiscal 2027, ACG segment revenue should fall, due to the $300m cut in Android revenue. However, the improved product mix should support higher gross margin.

CSG's revenue will be roughly flat year-on-year, as organic growth is counteracted by the divestiture of the MEMS-based Sensing Solutions unit.

HPA revenue is expected to continue its double-digit growth trajectory, as defense & aerospace (D&A) and data-center market exposure expands. D&A revenue should be about $500m (surpassing Android revenue, a shift in the portfolio that reflects both the strategic resizing of Android business and continued growth in HPA). Qorvo also cites ongoing opportunities in adjacent infrastructure, satellite and radar domains.

Both the business mix (as the margin-accretive HPA segment becomes a larger percentage of the total) and the increasingly favorable product mix (within each business segment) position Qorvo to deliver full-year fiscal 2027 gross margin exceeding 50% and EPS approaching $7 per share, reckons Bruggeworth. "These outcomes reflect continued OpEx discipline, a structurally improved portfolio mix, and our sustained commitment to innovation and operations excellence," he adds.

Outlook by business segment

In ACG: "We supply a diverse portfolio of high-performance discretes, tuners, ET PMICs, and integrated modules to our largest customer, not all of which have been awarded on the upcoming platforms," notes Bruggeworth. "For our ET PMICs, increasing internal modem adoption provides a multi-year structural tailwind as platforms transition away from third-party modems. With regard to integrated modules, on the ultra-high-band PAD [power amplifier duplexer], we received lower share in the upcoming phone models than last year and we expect our ultra-high-band PAD revenue to decline year-over-year." However: "As a placement, we have demonstrated success across multiple generations. We remain confident in our highly differentiated technology and our ability to compete effectively over subsequent generations," he adds.

"In our largest customers' cellular-enabled iPads, we were awarded the high-band PAD. Representing a product and technology milestone and new content for Qorvo on that platform. The win gives us the opportunity to demonstrate capability and execute at scale on that platform consistent with our long-term investment strategy. Qorvo enjoys broad participation across smartphone OEMs, and we are not seeing signs of memory pricing or memory availability impacting the flagship and premium tiers."

In CSG, "We're on track with an automotive ultra-wideband program with a leading automotive tier-one," says Bruggeworth. "We received our first production orders during December. This program will span multiple years and support multiple OEMs. We continue to see expansion of our engagements across the automotive customer base. Use-cases for Qorvo's automotive ultra-wideband technology include secure access, digital key, child presence detection, and short-range radar sensing. We are supplying both our ultra-wideband and Wi-Fi 7 solutions in collaboration with multiple tier-one manufacturers of network access points. We're seeing strong customer demand and initial deployments include hospitals, factories and other enterprises requiring ultra-precision indoor navigation, and location awareness. Our Wi-Fi portfolio is broadly represented in flagship smartphones, fiber gateways, mesh networks, client devices, and SATCOM ground terminals. And we continue to expand our Wi-Fi, FEM [front-end module], and filter portfolio to enable higher-bandwidth lower-latency interconnected networks. We delivered first Wi-Fi 8 samples during December, and customer engagement in Wi-Fi 8 is increasing. Next fiscal year, it is one of multiple initiatives we are undertaking to improve CSG's profitability."

In the HPA segment, Qorvo continues to see multi-year tailwinds in D&A data-center power and infrastructure markets. "In D&A, the passage of the fiscal 2026 NDAA [US National Defense Authorization Act] includes top priorities, such as Golden Dome, the F47 fighter, and the Navy's next-generation fighters, warships, and drones. Qorvo is a beneficiary of new platforms, upgrade cycles, RF content growth, and increases in defense spending," says Bruggeworth. "As an example, Golden Dome is a multi-layer defense system that requires significant RF content." For the full fiscal year 2027, sales in D&A markets are expected to total approximately $500m.

"In power management, our strategic emphasis on PMICs for enterprise-class SSDs has been met with continued data-center growth where customer demand has been very strong. During the quarter, we taped out our first chip for our next-generation enterprise SSD platform. Other power opportunities for Qorvo include AESA radars, drones, robotics, wearables, and smartphones. There is strong interest globally in Qorvo's AESA solutions combining our FEMs, beam-form ASICs, power management, and power control."

"In infrastructure markets, there are increased content requirements in DOCSIS 4.0 systems that align well with our amplifier and control portfolios. Qorvo is a leading supplier of broadband amplifiers for DOCSIS 4.0 and we are well positioned with all major suppliers. We are also a market leader in small-signal receive and transmit components used across the RF chain of 5G radio access networks. While these products have historically been deployed in terrestrial 5G infrastructure, we are increasingly seeing the same RF building blocks adopted in adjacent applications, such as drones and low Earth orbit [LEO] satellite communications including direct-to-cell satellite architectures," he adds.

www.qorvo.com

UK–Bulgaria collaboration developing Green Silicon Carbide wafer factory

Co-operation boosting innovation, investment and skills, strengthening supply chains, and supporting Bulgaria's tech sector

Under the UK–Bulgaria Strategic Partnership, the UK Science and Technology Network (STN) and the Department for Business and Trade (DBT) have connected UK expertise with Bulgaria's ambitions under the EU Chips Act 2023 and its fast-growing auto electronics sector. The Science and Technology Network has served as a bridge between government, academia and industry in the UK and Bulgaria — strengthening mutual understanding and unlocking opportunities for collaboration.

The collaboration is targeted at creating opportunities for innovation, investment and skills development, strengthening bilateral ties and supporting Bulgaria's efforts to position itself as a competitive player in Europe's semiconductor and automotive technology landscape.

Bulgaria is a gateway to Eastern markets and a key manufacturing hub in Southeast Europe. The country now produces about 80% of the sensors used in European cars and hosts R&D centers and smart factories (e.g. Melexis in Sofia, Sensata and Schneider Electric in Plovdiv).

The electronics sector is projected to grow from about €2.3bn in 2023 to €2.7bn by 2028, representing a compound annual growth rate of 2.9%. Bulgaria's automotive industry comprises around 380 companies employing over 80,000 people and contributes more than 10% to Bulgaria's GDP, making it a key driver of economic growth.

Development of UK–Bulgaria collaboration on semiconductors

A roundtable in Sofia in 2024 hosted by British Embassy Sofia brought together UK and Bulgarian government, academia, and industry leaders to discuss opportunities. STN followed this up by organizing a study visit to Scotland in March 2025, where Bulgarian stakeholders saw the UK's factories and training models first-hand.

Finally, a UK trade mission to Bulgaria in November 2025 showcased the country's growing semiconductor ecosystem, including both Bulgarian innovators and global players investing in the Bulgarian market, attracting UK innovators to explore partnerships.

Resulting activities

As a result of the series of activities, STN has facilitated:

- development of a €350m investment Green Silicon Carbide wafer factory, delivering £10.5m UK export wins and advancing next-generation materials;
- a research memorandum of understanding (MoU) between Glasgow and Sofia Universities, enabling joint projects and talent exchange;
- an industry MoU between TechWorks UK and Bulgaria's BASEL, strengthening sector ties.

The next phase will focus on launching the Green Silicon Carbide factory in Bulgaria, deepening R&D partnerships, and expanding skills initiatives.

By linking UK compound semiconductor expertise with Bulgaria's manufacturing capacity, STN reckons that it has helped to create the foundation for developing longer-term collaboration potential in both R&D and opportunities for business investment. Highlights of partnering are listed as:

- Supply chain security: Diversifying production within Europe strengthens supply chain resilience and mitigates geopolitical risks.
- Innovation acceleration: Co-located R&D hubs and factories create an ecosystem for rapid prototyping and commercialization of next-generation materials like silicon carbide.
- Talent pipeline: Joint training programs and academic exchanges will help to close the skills gap in a sector facing global shortages.
- Help facilitate supportive policy frameworks that can advance international partnerships.

www.gov.uk/world/organisations/uk-science-and-technology-network

Altum RF renews ISO 9001:2015 certification

Altum RF (which designs RF, microwave and millimeter-wave semiconductors) has successfully renewed its ISO 9001:2015 certification. Valid through 2029, the firm says its renewal highlights its ongoing commitment to quality, reliability and excellence across its global operations, including its headquarter and design center in Eindhoven, The Netherlands and the design center in Sydney, Australia.

"This achievement reflects our continued dedication to maintaining and improving our processes in line with the latest quality standards and customer expectations," says managing director Niels Kramer. "Renewing our ISO 9001:2015 certification marks another important milestone in our strategic growth and reinforces our position as a trusted supplier of advanced semiconductor solutions."

The certification was awarded by TÜV Nord Nederland, part of the TÜV NORD GROUP, which operates in more than 70 countries.

www.altumrf.com

SemiQ partners with distributor NAC Semi across North America

Demand creation services include dedicated FAE support

SemiQ Inc of Lake Forest, CA, USA — which designs, develops and manufactures silicon carbide (SiC) power semiconductors and 150mm SiC epitaxial wafers for high-voltage applications — has announced a distribution agreement with global electronic component design services and distribution company NAC Semi (NAC Group Inc) of Clearwater, FL, USA.

The partnership accelerates the adoption of SemiQ's SiC technology across North America markets, providing engineers with streamlined access to high-efficiency power modules, MOSFETs, and Schottky diodes.

SemiQ's portfolio, which it claims is noted for its ruggedness and reliability in demanding environments, integrates seamlessly into NAC Semi's specialized focus on power conversion, electric vehicles (EV) and industrial electrification.

"Partnering with NAC Semi significantly strengthens our ability to support our global customer base as they design next-generation power systems," says SemiQ's president Timothy Han. "NAC's deep technical expertise, FAE [field application engineering] support, and focus on demand creation align perfectly with SemiQ's high-performance, reliable silicon carbide technologies for electrification, energy efficiency, and high-voltage applications."

NAC Semi bridges the gap between catalog houses and large fulfillment distributors by offering 'demand creation' services, including dedicated FAE support. By adding SemiQ to its line card, NAC Semi enhances its ability to provide comprehensive SiC solutions for applications such as EV charging stations, solar inverters, and high-voltage power supplies.

"SemiQ's reputation for high-quality, reliable SiC devices perfectly complements our existing power semiconductor offerings," comments Channing Applegarth, vice president at NAC Semi. "Adding these MOSFETs and modules to our line card gives our customers a more complete SiC solution to accelerate innovation in these vital and fast-growing high-power markets."

www.nacsemi.com

SemiQ debuting SiC power solutions for AI data centers and high-power infrastructure at APEC

QSiC Gen3 line featuring 1200V SOT-227, S3 half-bridge, B2T1 six-pack, and B3 full-bridge packages on display

In booth #1451 at the IEEE Applied Power Electronics Conference (APEC 2026) at the Henry B Gonzalez Convention Center, San Antonio, TX, USA (22–26 March), silicon carbide (SiC) power semiconductor and 150mm SiC epitaxial wafer manufacturer SemiQ is debuting its latest silicon carbide module advances.

The modules have been designed to deliver compact and efficient solutions for active front ends (AFE) and the high-performance compressor units used in advanced data-center cooling systems.

The new lineup has been engineered to meet the rising power and thermal demands of AI-driven data centers, high-power industrial, and electric vehicles (EV) applications.

Product highlights

Visitors to the booth can see the SemiQ's latest QSiC Gen3 SiC modules, which feature a 30% reduction in specific on-resistance (R_{ONsp}) and turn-off energy losses (E_{OFF}) versus its previous generations. These modules significantly reduce cooling complexity and switching losses for EV charging stations, energy storage systems, and industrial motor drives.

Additional showcased advances include:

- S3 modules: this family includes a 608A half-bridge module with an ultra-low 2.4mΩ R_{DSon} and a junction-to-case thermal resistance (R_{JC}) of just 0.07°C/W;
- SOT-227 modules: featuring five modules with R_{DSon} values of 7.4mΩ, 14.5mΩ and 34mΩ, optimized for server power supplies, battery chargers and PV inverters;
- B2T1 six-pack modules: spanning an R_{DSon} range of 19.5–82mΩ designed to minimize parasitics in motor drives and advanced AC–DC converters;
- B3 full-bridge modules: delivering up to 120A with R_{DSon} as low as 8.6mΩ, these modules maximize power density for high-voltage DC–DC systems.

"These SiC technologies directly address the challenges faced by those implementing AI infrastructure," says president Dr Timothy Han. "By improving efficiency, and addressing the escalating power demands of data centers across key application areas, we are expanding the potential for AI to scale sustainably."

www.apec-conf.org

www.semiq.com/module-packages

Wolfspeed's soft demand for EV application offset by 50% quarterly revenue growth for AI data-center application

Annualized OpEx cut by $200m and CapEx down by 90%

For its fiscal second-quarter 2026 (to end-December 2025), Wolfspeed Inc of Durham, NC, USA — which makes silicon carbide (SiC) materials and power semiconductor devices — has reported revenue of $168m, down 14.6% on $196.8m last quarter and 6.9% on $180.5m a year ago.

The drop followed accelerated customer purchases in fiscal Q1 (as certain customers built up inventory by placing orders from the 150mm-wafer Durham fab prior to its planned closure at year-end).

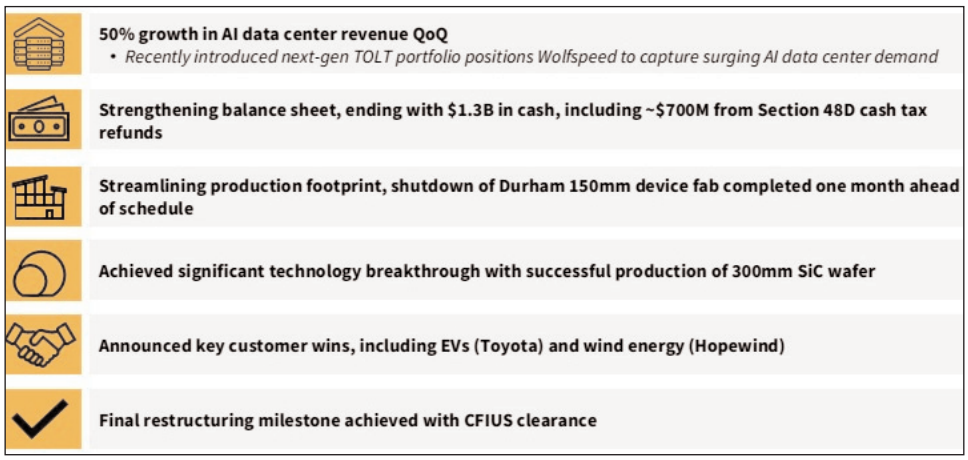
Also, certain customers pursuing second-sourcing of products during Wolfspeed's bankruptcy process. After filing for Chapter 11 bankruptcy protection on 30 June, Wolfspeed emerged from Chapter 11 on 29 September.

In addition, in line with others in the industry, Wolfspeed has experienced ongoing softness in demand for applications including electric vehicles (EVs) that it expects will continue through fiscal 2026.

Materials Products revenue has fallen by 44% from $89.7m a year ago to $50.2m, driven largely by a tightening demand environment and increased competition in the market.

Power Products revenue has grown by 30% from $90.8m a year ago to $118.3m. This includes some of the last-time-buy shipments from the 150mm-wafer Durham fab ahead of its shutdown at the end of November, a month ahead of schedule. The 200mm-wafer Mohawk Valley Fab in Marcy, NY (opened in April 2022) contributed $76m, as the remaining production shifted from Durham.

"The revenue tracking is a mix between a weaker automotive market and fast-growing mid- to high-voltage revenue. This is linked to the good traction in AI and data-center space," notes chief financial officer Gregor van Issum. "We are also continuing to diversify our end-markets, particularly in mid- and high-voltage verticals like AI data centers, where we generated 50% sequential quarterly revenue growth [doubling over the last three quarters]," says CEO Robert Feurle. This reflects a "modest but expanding part of the firm's business with meaningful long-term potential".



On a non-GAAP basis, gross margin has gone from +2% a year ago and –26% last quarter to –34%. However, this was impacted by $39m in fresh-start accounting charges after emerging from bankruptcy ($23m of which is related to a one-time step-up in fair value of inventory, which was fully recognized within cost of revenue during the quarter), as well as a recurring $60m increase related to amortization for intangible assets, plus $14m of costs related to specific inventory reserves, and $48m of under-utilization costs. Closure of the Durham 150mm fab device s at the end of November benefitted gross margins by $5m.

Net loss is up from $122.6m ($0.95 per diluted share) a year ago to $159.3m ($6.11 per diluted share).

Strengthening balance sheet

"During the quarter, we took decisive actions to strengthen our balance sheet," notes van Issum. "First, we maximized the value of our [Section] 48D Advanced Manufacturing Tax Credit, receiving approximately $700m ahead of schedule. We used some of the proceeds to retire approximately $175m of outstanding [first lien] debt, an important step to reduce our leverage and interest expense. In addition, approximately 1.5 million shares have been converted from our second-lien convert, resulting in a debt reduction of approximately $18m. Together, this forms a first step to further improve our balance sheet post-emergence and will deliver $25m in annual interest savings."

"Next, we drove strong working capital improvements [contributing about $89m, partially offset by final liability management payments of $64m] by proactively aligning production with the current demand environment, leading to a reduction in inventory and improving our receivables position," continues van Issum.

"Lastly, we significantly improved operating cash flow performance [from –$195.1m a year ago to –$42.6m] by reducing operating expenses by $200m on an annualized basis [streamlining R&D to focus exclusively on high-return programs in the highest-growth markets] and capital expenditures by more than 90% compared to the same quarter last year [from about $400m to just $31m]," he adds. All capital expenditures were

limited to previously committed investments.

After fresh-start accounting applied due to emergence from Chapter 11, Wolfspeed recorded a $1.1bn gain, which reflects about $3.7bn in debt forgiveness, offset by about $2.6bn of net adjustments to assets, primarily property, plant and equipment (PPE).

Overall, free cash flow improved from –$598.1m a year ago and $99.6m last quarter to +$627.1m.

During the quarter, cash, cash equivalents and short-term investments rose from $926m to $1.292bn, providing financial flexibility to execute on the firm's self-funded business plan post-emergence.

Supported by improved liquidity measures and liability management payments of $64m, net debt at quarter-end was about $600m, with annual cash interest expense reduced by about 60%.

The reduction in property, plant and equipment (PP&E), partially offset by the step-up in intangibles, will result in a net reduction in ongoing depreciation & amortization expense of about $30m per quarter, which will be fully realized as inventory turns.

Business outlook

For its fiscal third-quarter 2026 (to end-March), Wolfspeed expects revenue to fall to $140–160m. The drop is due primarily to the accelerated customer purchases in fiscal first-half 2026 (building up inventory from the Durham fab prior to its closure at calendar year-end), certain customers pursuing second-sourcing of products during Wolfspeed's bankruptcy process, and the ongoing weaker EV demand.

Driven by ongoing operational actions, gross margin should improve quarter-over-quarter, but remain negative. "We will continue to see benefits going forward as we focus on our 200mm device manufacturing in Mohawk Valley [as utilization increases, following closure of the 150mm Durham fab]," notes van Issum.

Operating expenses should be flat to slightly down sequentially, and $200m lower year-on-year, as management remains focused on controlling operating costs through actions that have already been implemented.

"We remain committed to a disciplined capital allocation strategy and driving CapEx further down over time as prior commitments start to fall off," says van Issum.

"We are concentrating in a few key areas: strict financial discipline, advancing our technology leadership, and driving operational excellence," says Feurle. "A central theme across these three priorities is diversifying our revenue base in key verticals where I believe we can extend our leadership position, particularly in mid- to high-voltage applications." To accomplish this, Wolfspeed has broadened its go-to-market strategy by organizing it around four verticals that it believes will drive growth in our business in the near- to mid-term: automotive, industrial energy (including AI data centers and grid), aerospace & defense, and materials.

"Automotive remains a core market despite muted EV demand due to a mix of macro and structural factors, which include higher interest rates in the US and Europe, elimination of certain government incentives in the US, excess supply across the market, and intensifying competition globally, including China," says Feurle. "While these headwinds are creating a softer demand environment in the near term, silicon carbide remains a foundational technology for EV and other platforms. Despite weaker near-term demand, our portfolio is aligned with OEMs that produce efficiency, range and power density. A great example of this is our recently announced partnership with Toyota to power the onboard charging systems for their battery electric vehicles. Thanks to the efforts of our leadership team that is strengthening our relationship with the top global EV OEMs, we are now sampling across several key strategic programs," he adds.

"While the automotive end market remains volatile in the near term, we are encouraged by the growing momentum in key strategic areas such as AI data centers and other industrial and energy applications," says van Issum.

"During Q2, we continue to fortify our sales, marketing, and product teams, adding experienced leaders with deep semiconductor knowledge and strong customer relationships," says Fuerle. "These hires are already helping us extend our reach into emerging power device opportunities." Key customer wins include Hopewind (to support its high-performance industrial and renewable energy inverters).

In particular, Wolfspeed's recently introduced next-generation TOLT portfolio is expected to position the firm to capture surging AI data-center demand. "These emerging opportunities represent meaningful long-term growth drivers, but they will take time to scale and offset the continued softness in EVs," cautions van Issum.

"While the near-term demand picture remains dynamic, two trends remain clear. First, electrification is happening across new markets every day. Second, voltages will continue to increase, necessitating more power density and increased energy efficiency," notes Feurle.

"In materials, we demonstrated our capabilities in 300mm SiC wafer production, a critical step towards entering emerging markets beyond power devices. One example is optical-grade silicon for next-generation AR/VR systems," he adds.

"We now have the team and structure in place to navigate near-term demand dynamics and execute with discipline as we scale for long-term growth," reckons Feurle.

"We are building a stronger, more resilient Wolfspeed. With an improved financial foundation, experienced leadership team, and our vertically integrated platform, we are strategically positioned to drive long-term growth and value," Feurle concludes.

www.wolfspeed.com

Wolfspeed adds VP of sales for EMEA

Wolfspeed Inc of Durham, NC, USA has appointed Stefan Steyerl as vice president of sales, EMEA (Europe, Middle-East & Africa). Effective 1 March, he will develop and execute the regional sales strategy, driving adoption of silicon carbide solutions across automotive, industrial and energy markets as Wolfspeed accelerates the adoption of silicon carbide technology to expand its market footprint and deliver revenue growth across the region.

Steyerl has more than 25 years of experience in the semiconductor industry, with a track record of building high-performance teams and achieving revenue growth across global markets. Most recently, he was VP of sales for EMEA at Allegro MicroSystems, where he developed and executed regional go-to-market strategies and strengthened executive-level customer relationships. Prior to that, he held senior leadership roles at Analog Devices, overseeing sales and marketing for automotive and industrial sectors with revenue responsibility exceeding $750m globally. Steyerl holds a degree in electrical engineering from the Technical University of Munich.

"Stefan's deep industry expertise and leadership experience will be instrumental as Wolfspeed accelerates the global transition to silicon carbide," says Matthias Buchner, senior VP global sales & chief marketing officer. "His appointment reinforces our commitment to supporting customers in EMEA with innovative solutions that drive efficiency and sustainability."

Steyerl joins Wolfspeed as it sharpens its focus on product innovation and device production as key pillars in its efforts to drive the industry transition to silicon carbide solutions. His appointment supports the firm's go-to-market objectives of broadening its customer base across high-growth, diversified end-markets, including AI data centers, renewable energy, industrial power systems, and electric vehicles (EVs).

"We're uniquely positioned to help customers across EMEA unlock the full potential of electrification by delivering high-performance, energy-efficient solutions that support their growth objectives," says Steyerl.

www.wolfspeed.com

AI accelerates manufacturing efficiency and operations

Wolfspeed is expanding its use of US-based Snowflake Inc to accelerate manufacturing efficiency and operational excellence as it scales production to meet growing demand.

After bringing together factory, supply chain and enterprise data on a single, governed platform, Wolfspeed is now deploying AI across its operations to improve cost, quality, speed and workforce readiness. Wolfspeed says that this marks a major step in its vision to operate as a fully AI-integrated manufacturing enterprise.

Wolfspeed is embedding Snowflake Cortex AI directly into day-to-day manufacturing and business decisions by applying intelligence — including specialized AI agents — across operations, supply chain, finance, and market analysis. By breaking down silos between operational and enterprise systems, teams gain a shared, real-time view of performance across the business. This foundation should enable faster decisions, more efficient manufacturing cycles, and improved productivity from the factory floor to the executive suite, it is reckoned.

The transformation has enabled the rollout of predictive and generative AI agents powered by Snowflake Intelligence and Cortex AI, including:

- **WolfGPT**, Wolfspeed's internal generative AI platform built on Snowflake Intelligence, which helps teams analyze manufacturing performance, predict issues before they occur, and accelerate training in complex chip fabrication environments;
- **dozens of specialized AI agents** deployed across manufacturing, quality, supply chain, finance, and corporate analytics, enabling faster access to trusted data and institutional knowledge; and
- **improved decision making during critical manufacturing events**, enabling teams to spend more time on analysis and action and less time reconciling data across tools.

"Manufacturing at this scale depends on making the right decisions faster, with confidence," says Priya Almelkar, senior VP & chief information officer at Wolfspeed. "By applying AI across our operations, we're giving teams better visibility into what's happening on the factory floor and across the business so they can act earlier, work more safely, and deliver higher-quality outcomes. Ultimately, this helps us bring even greater value to our customers," he adds.

"Wolfspeed is showing what it looks like when AI moves out of experimentation and onto the factory floor," comments Baris Gultekin, vice president of AI at Snowflake. "By unifying their manufacturing, supply chain, and enterprise data on Snowflake, Wolfspeed has built a trusted foundation where AI agents can operate in real time to help teams predict issues, resolve problems faster, and make higher-impact decisions at scale," he adds. "This is exactly how enterprises turn AI into a competitive advantage."

Wolfspeed reckons that this transformation positions it at the forefront of semiconductor innovation, using AI not only to improve operations but also to create a predictive, data-driven ecosystem that accelerates innovation and strengthens long-term competitiveness.

www.snowflake.com

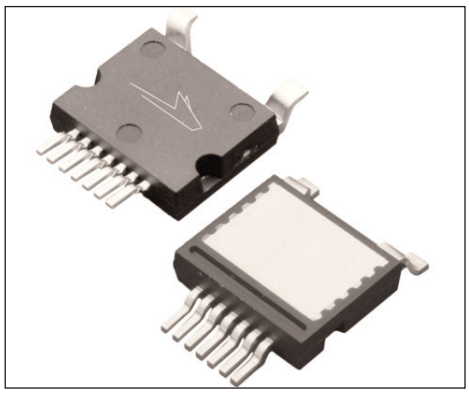
Wolfspeed unveils TOLT package portfolio

Higher power density and thermal performance to address surging AI data-center demand

Wolfspeed has introduced its new TOLT package portfolio, which enables maximum power density in a power supply for data-center rack applications.

Built on Wolfspeed's Gen 4 MOSFET technology, the TOLT (TO-Leaded, Top-Side Cooled) package is engineered to release heat from the top side of the package, making cooling far more efficient. This enables firms to build smaller, more reliable power systems that support the rising demands of AI data centers.

"AI is pushing data-center OEMs to be incredibly strategic about the size and total efficiency of their



power systems," notes Guy Moxey, vice president of Wolfspeed's Industrial & Energy business. "Our TOLT product family offers a straightforward path to delivering higher-density, thermally optimized power systems capable of sustaining the demands of AI data centers, and Wolfspeed's Gen 4 technology helps these systems run cooler, more efficiently, and more reliably."

Wolfspeed's 650V TOLT products are available in a variety of on-resistances (R_{DSON}).

TOLT joins the previously released U2 portfolio as the second of three Wolfspeed top-side cooled package families, aimed at one of the fastest-growing industry segments.

More details on the third top-side-cooled portfolio from Wolfspeed will be shared in second-half 2026.

CFIUS clears Wolfspeed issuance of equity to Renesas as part of court-approved restructuring

Renesas's vice president of finance Aris Bolisay joins board

Wolfspeed Inc of Durham, NC, USA — which makes silicon carbide (SiC) materials and power semiconductor devices — says that the Committee on Foreign Investment in the United States (CFIUS) has formally cleared its issuance of equity to Renesas Electronics America Inc, completing a key component of Wolfspeed's restructuring agreement with its lender group in support of its Chapter 11 process.

"CFIUS clearance represents the final milestone in the execution of our prepackaged restructuring," says CEO Robert Feurle. "With this phase behind us, Wolfspeed is fully focused on broadening and diversifying our customer base, expanding our leadership in SiC power devices, and scaling with discipline across our global manufacturing footprint," he adds. "These actions position Wolfspeed to capture long-term growth while operating with sharper commercial execution and capital efficiency."

As a pre-petition creditor of Wolfspeed, Tokyo-based Renesas agreed to convert its outstanding unsecured loan into a combination of equity and secured convertible debt as part of the court-approved restructuring plan. Following CFIUS clearance, Renesas will also receive a seat on Wolfspeed's board of directors, and has appointed Aris Bolisay, who serves as Renesas's vice president of finance.

Due to Renesas acquiring a substantial equity position in a US semiconductor manufacturer and the right to appoint a member of Wolfspeed's board, the transaction required review and clearance by the CFIUS. With this authorization secured, the escrowed shares are now cleared for release to Renesas.

In conjunction with clearing the final milestone and the Renesas equity release, Wolfspeed will also release the remaining 2% allocation of common stock to its legacy pre-petition equity holders. This distribution represents the final tranche of the 5% equity recovery granted to shareholders under the court-approved restructuring plan. The initial 3% was distributed on the plan's effective date in September, with the remaining 2% held in escrow pending receipt of CFIUS and other regulatory approvals. With CFIUS clearance obtained, the full equity recovery will be complete.

Total share count update

Following the completion of these equity issuances, Wolfspeed's total shares of common stock outstanding will increase to about 45.1 million. This reflects the issuance of 16,852,372 shares to Renesas, the final 2% equity recovery to be distributed to pre-petition shareholders, representing 871,287 shares, and about 1.5 million shares issued pursuant to prior conversions of the company's second lien convertible notes. This total excludes any shares that may be issued in the future under the company's convertible notes, warrants, management incentive compensation plan or long-term incentive compensation plan.

www.renesas.com
www.wolfspeed.com

Infineon's silicon carbide power MOSFETs selected for Toyota's new bZ4X model

CoolSiC MOSFETs integrated into on-board charger & DC/DC converter

Infineon Technologies AG of Munich, Germany says that CoolSiC silicon carbide power MOSFETs have been adopted in the new bZ4X model of the world's largest automaker, Toyota of Tokyo, Japan. Integrated into the on-board charger (OBC) and DC/DC converter, the silicon carbide MOSFETs leverage the material's advantages of low losses, high thermal resistance and high-voltage capability to help to extend the driving range and reduce the charging time.

"Silicon carbide enhances the range, efficiency and performance of electric vehicles and is therefore a very important part of the future of mobility," says Peter Schaefer, executive VP & chief sales officer Automotive at Infineon. "With our dedication and our commitment to innovation and zero-defect quality, we are well positioned to meet the growing demand for power electronics in electromobility," he reckons.

Infineon's CoolSiC MOSFETs feature a unique trench gate structure that reduces normalized on-resistance and chip size, enabling reductions in both conduction and switching losses to contribute to higher efficiency in automotive power systems. In addition, optimized parasitic capacitance and gate threshold voltage enable unipolar gate drive, contributing to the simplification of drive circuits for automotive electric drive-train and supporting high-density, high-reliability design for OBC and DC/DC converters.

www.infineon.com/coolsic

MACOM promotes distinguished technology fellow Jessen to senior VP, advanced GaN technology

VP corporate development & investor relations Ferranti promoted to senior VP

MACOM Technology Solutions Inc of Lowell, MA, USA (which designs and makes RF, microwave, analog and mixed-signal and optical semiconductor technologies) has promoted two senior leaders within the organization to the senior vice president level. The promotions further strengthen and expand the management team, with a focus on executing strategic corporate initiatives to grow and better serve its diverse customer base, as well developing advanced semiconductor technologies.

Stephen Ferranti promoted to senior VP corporate development & investor relations

Ferranti joined MACOM in 2016 and has recently served as MACOM's VP, corporate development & investor relations. He has broad-based experience in corporate development, marketing and growth strategies, capital structure and risk management and investor relations. Ferranti has managed and will continue to oversee MACOM's strategic acquisition initiatives.

He has previous experience as a Wall Street sell-side analyst. Prior to that, he has semiconductor industry technical experience at two leading hardware companies.

Ferranti earned his Bachelor of Science in Mechanical Engineering from the University at Buffalo, his Master of Science in Mechanical Engineering from Binghamton University, and his MBA in Finance from Southern Methodist University.

Dr Gregg Jessen promoted to senior VP, advanced GaN technology

Jessen joined MACOM in 2022 and has recently served as a distinguished fellow of technology. He has extensive R&D leadership experience in advanced microelectronics, with a demonstrated history of developing RF GaN-on-SiC technology and emerging electronic materials for device and MMIC applications.

Prior to him joining MACOM, Jessen served as director of the Microelectronics Center Foundry at BAE Systems, where he was also elected as an engineering fellow. Prior to that he was a fellow at the Air Force Research Laboratory in the Subsystems and Components Division, leading the development of mm-wave GaN transistor and MMIC technology for radar, communications and electronic warfare applications.

Jessen earned his B.S. in engineering physics from Wright State University and his M.S. and Ph.D. in electrical engineering from The Ohio State University. He has authored or co-authored more than 100 journal articles and conference papers, with over 7000 citations. Jessen currently serves as associate editor-in-chief for IEEE Electron Device Letters.

"These promotions reflect the hard work and dedication of two prominent contributors and our ongoing focus on driving innovation and strategic growth and development," says president & CEO Stephen G. Daly.

www.macom.com

Infineon's 2026 edition of GaN Insights eBook highlights adoption in power electronics

New markets include AI, robotics and quantum computing

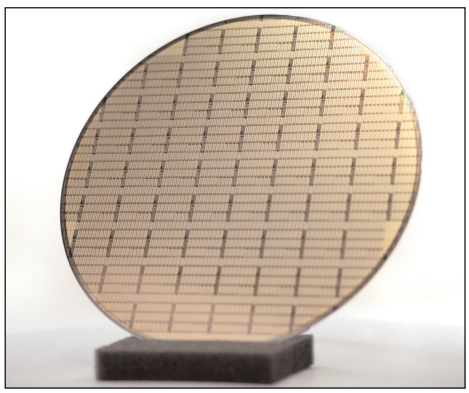
Infineon Technologies AG of Munich, Germany has published the 2026 edition of its annual GaN Insights, focusing on GaN gallium nitride (GaN) technology, its applications and future prospects, as the increasing adoption of GaN power solutions is driving a significant transformation in the power electronics industry.

"GaN has become a market reality that has gained traction across various industries," notes Johannes Schoiswohl, head of the GaN Systems business line. "We are committed to delivering value to our customers quickly and efficiently. Our product-to-system approach, combined with our leading manufacturing expertise and a broad GaN portfolio, enables us to provide our customers with the solutions they need to succeed in the market," he adds. "We strive to maintain Infineon's position as a trusted partner that can help our customers navigate the complexities of GaN technology and unlock its full potential."

Yole Group's 'Power GaN 2025' report forecasts that the GaN power semiconductor market will grow by 400% from 2025 to almost $3bn by 2030. This rapid growth is driven by significant production ramps, which began in 2025, broadening GaN adoption across multiple industries and enabling its penetration into new applications. In fact, TrendForce's '2025 Global GaN Power Device Market Analysis' forecasts a compound annual growth rate (CAGR) of 44% from 2025 to 2030, with revenue projections of $920m in 2026. This represents 58% growth over 2025, according to Yole's 'Power GaN 2025' report.

Advancements in GaN product innovation

In 2026, designers are expected to uncover new uses of GaN bidirectional switches (BDS) beyond solar inverters and EV on-board



chargers. Infineon's high-voltage bidirectional GaN switches feature what is claimed to be a revolutionary common drain design with a double-gate structure, leveraging proven gate injection transistor (GIT) technology. This unique architecture enables the use of the same drift region to block voltages in both directions, resulting in a significantly reduced die size compared to conventional back-to-back arrangements. For instance, utilizing Infineon's CoolGaN BDS, which operates up to 1MHz, solar microinverters deliver 40% more power in the same-sized inverter while reducing system costs.

GaN technology expanding into new applications

GaN is expanding into various industries, including AI data centers, robotics, electric vehicles, renewable energy, and emerging fields such as digital health and quantum computing. In the data-center market, GaN-based power supplies with new topologies are achieving higher-than-ever efficiencies and power densities, reducing power losses by up to 30% and enabling the deployment of more efficient and compact data-center architectures. GaN-based motor drives used in humanoid robots can be 40% smaller in size and increase fine movement control.

Infineon's GaN

Infineon's portfolio of power semiconductors spans silicon (Si), silicon carbide (SiC), and GaN solutions. The firm says that its integrated device manufacturing (IDM) strategy and system expertise provide technologies accommodating the evolving needs of industries. Empowered by 300mm GaN wafer manufacturing, its GaN products are claimed to demonstrate exceptional performance leading to application advantages. For instance:

- The new CoolGaN Transistor 650V G5 generation of products have figures-of-merit (the product of conduction loss and switching loss) 30–40% better than others in the industry, substantially increasing system performance and design degrees of freedom.
- CoolGaN Transistor MV G5 products have monolithically integrated a Schottky diode, resulting in 15% lower losses and >10% lower device temperature, translating to reduced size and cost with higher efficiency and reliability.
- Bolstering its position as the world's leader in automotive semiconductors, Infineon's new CoolGaN Automotive 100V product meets the rigorous requirements of the AEC-Q101 standard to address the application shift from 12V to 48V systems in the newest generations of automobile architectural designs.

With a broad portfolio of over 50 GaN products, offering both discrete and highly integrated solutions, spanning voltages from 40V to 700V targeted for consumer, industrial and automotive applications, Infineon says that it provides an extensive set of solutions spanning a wide range of power applications.

Available on Infineon's website, the GaN Insights eBook explores the existing state of GaN technology, products, their applications, and the opportunities and challenges that lie ahead.

www.infineon.com/gated/infineon-gan-insights-2026_d54cb389-1f49-44dd-92b2-a2a5e0afee1c

Navitas unveils fifth-generation silicon carbide Trench-Assisted Planar MOSFET technology

Improved performance, reliability and robustness for AI data enters, grid and energy infrastructure, and industrial electrification

Navitas Semiconductor Corp of Torrance, CA, USA — which provides GaNFast gallium nitride (GaN) and GeneSiC silicon carbide (SiC) power semiconductors — has launched its 5th-generation GeneSiC technology platform. The High Voltage (HV) SiC Trench-Assisted Planar (TAP) MOSFET technology is said to be a significant technological leap over previous generations and will deliver a 1200V line of MOSFETs. It complements Navitas' ultra-high-voltage (UHV) 2300V and 3300V technologies from the 4th-generation GeneSiC platform, extending Navitas' technology for AI data centers, grid and energy infrastructure, and industrial electrification.

The 5th-generation MOSFET platform features Navitas' most compact TAP architecture yet, combining the ruggedness of a planar gate with what is claimed to be best-in-class performance figures of merit, enabled by a trench structure in the source region while also elevating the efficiency and life-time reliability for high-voltage power electronics.

The 5th-generation platform is said to achieve a new benchmark in power conversion through a 35% improved $R_{DS,ON}$ x Q_{GD} figure of merit (FoM), compared to the previous-generation 1200V technology. This improvement significantly slashes switching losses, allowing for cooler operation and higher frequency of operation in demanding power stages.

High-speed switching is further fortified by ~25% improvement to the Q_{GD}/Q_{GS} ratio. When paired with a stable high-threshold-voltage specification ($V_{GS,TH}$ ≥3V), this technology ensures immunity against parasitic turn-on, providing a robust and predictable gate drive even in high-noise environments.

The 5th-generation technology is said to deliver significant improvement in dynamic performance by optimizing the $R_{DS(ON)}$ x E_{OSS} characteristic while also integrating a 'soft body-diode' technology to further enhance system stability by minimizing electromagnetic interference (EMI) and ensuring smoother commutation during high-speed switching cycles.

Qualification of this generation to AEC-Plus grade (exceeding AEC-Q101 and JEDEC standards for reliability testing) ensures long-term stability and durability for AI data-center, energy and grid infrastructure applications. Key reliability benchmarks include the following:

- extended stress testing: 3x longer duration for static high-temperature, high-voltage testing (HTRB, HTGB, and HTGB-R);
- advanced switching reliability testing: dynamic reverse bias (DRB) and dynamic gate switching (DGS) to represent stringent fast-switching application mission-profiles;
- industry-leading stability: lowest $V_{GS,TH}$ shift over extended switching stress periods for stable long-term efficiency;
- extreme gate oxide reliability: extrapolated gate-oxide failure time exceeding 1 million years at operating V_{GS} at 18V and 175°C;
- enhanced cosmic-ray resilience: exceptionally low FIT (failure in time) rates, ensuring mission-critical reliability in high-altitude and high-uptime environments.

"Our customers are redefining the boundaries of power conversion in AI data centers and energy infrastructure, and Navitas is marching along with them in every step of the way," says Paul Wheeler, VP & general manager of Navitas' SiC business unit. "Significant technological improvements in our 5th-generation GeneSiC technology underscore Navitas' commitment to delivering industry-leading performance and reliability in silicon carbide MOSFETs."

A white paper on the Trench-Assisted Planar technology is available for free download from the Navitas site.

Navitas will be announcing new products in this 5th-generation technology platform during the coming months.

www.navitassemi.com

Navitas unveils 10kW DC–DC platform delivering 98.5% efficiency for 800VDC next-gen AI data centers

High-power-density full-brick DC–DC platform leverages the latest 650V and 100V GaNFast FETs

Navitas Semiconductor Corp of Torrance, CA, USA — which provides GaNFast gallium nitride (GaN) and GeneSiC silicon carbide (SiC) power semiconductors — has unveiled a 10kW DC–DC power platform delivering up to 98.5% peak efficiency and 1MHz switching frequency, enabling what is said to be unprecedented power density to support the rapid, large-scale expansion of next-generation AI data centers.

The all-GaN 10kW 800V–to–50V DC–DC platform employs 650V and 100V GaNFast FETs in a three-level half-bridge architecture with synchronous rectification to deliver 98.5% peak efficiency and 98.1% full load efficiency in a full-brick (61mm x 116mm x 11mm) package, achieving 2.1kW/in^3 power density.

The resulting production-oriented platform supports 800V–to–50V and ±400V–to–50V architectures at 10kW,

integrating auxiliary power and control to simplify adoption and enable high–power-density module designs for next-generation HVDC AI data centers. See Navitas' White paper on 'Redefining Data Center Power: GaN and SiC Technologies for Next-Gen 800V$_{DC}$ Infrastructure'.

"The design platform enables the transition to HVDC data-center power infrastructure, supporting the future power requirements of AI workloads that will demand between 100- and even 1000-times more compute per query," says president & CEO Chris Allexandre. "Navitas continues to redefine what's possible in AI data-center power, with the 10kW DC–DC solution giving breakthrough efficiency, power density, and scalability to allow faster and cooler operation while making them more sustainable," he claims.

The 10kW DC–DC platform is being evaluated by key data-center customers through collaborative development and will make its debut in the Navitas booth (#2027) at the IEEE Applied Power Electronics Conference and Exposition (APEC 2026) in San Antonio, TX, USA (22–26 March).

www.apec-conf.org
www.navitassemi.com/

Vishay launches 1200V SiC MOSFET power modules in SOT-227 packages

Increased power efficiency for medium- to high-frequency applications in automotive, energy, industrial and telecom systems

Discrete semiconductor and passive electronic component maker Vishay Intertechnology Inc of Malvern, PA, USA has introduced five new 1200V MOSFET power modules designed to increase power efficiency for medium- to high-frequency applications in automotive, energy, industrial and telecom systems.

The Vishay Semiconductors VS-SF50LA120, VS-SF50SA120, VS-SF100SA120, VS-SF150SA120 and VS-SF200SA120 feature the firm's latest-generation silicon carbide (SiC) MOSFETs in the industry-standard SOT-227 package.

Offered in single switch and low-side chopper configurations, each new power module features a SiC MOSFET integrated with a soft body diode offering low reverse recovery. The result is reduced switching losses and increased efficiency for solar inverters; off-board chargers for electric vehicles (EV); SMPS, DC/DC converters, UPS, and HVAC systems; large-scale battery storage systems; and telecom power supplies.

The compact SOT-227 package allows the devices to serve as drop-in replacements for competing solutions in existing designs, enabling the adoption of one of the newest SiC technologies without the expense of changing PCB layouts.

The molded package also offers electrical insulation up to 2500V for 1 minute, lowering costs by eliminating the need for additional insulation between the component and heatsink.

The power modules provide continuous drain current from 50A to 200A and low on-resistance down to 12.1mW. The RoHS-compliant devices deliver high-speed switching with low capacitance and offer a high maximum operating junction temperature of +175 °C.

Samples and production quantities are available now, with lead times of 13 weeks.

www.vishay.com

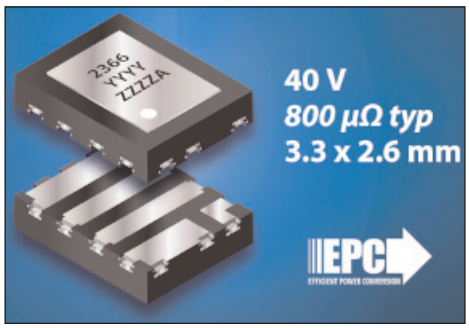
EPC launches seventh-generation eGaN power transistor

40V EPC2366 device enters mass production, while 25V and 15V transistors sampling

Efficient Power Conversion Corp (EPC) of El Segundo, CA, USA — which makes enhancement-mode gallium nitride on silicon (eGaN) power field-effect transistors (FETs) and integrated circuits for power management applications — has started volume production of the EPC2366, the first of its seventh-generation (Gen 7) eGaN family of power transistors.

The EPC2366 is claimed to deliver up to 3x better performance than equivalent silicon MOSFETs. With a typical on-resistance ($R_{DS(on)}$) of 0.8mΩ and a highly optimized $R_{DS(on)}$ x Q_G figure of merit (FoM) <12mΩ*nC, it simultaneously cuts conduction and switching losses while improving thermal performance. Engineered for high-efficiency, high-density power systems, the device is said to excel in synchronous rectification, high-density DC–DC conversion, AI server power supplies, and advanced motor drives.

The EPC2366 supports drain-to-source voltages up to 40V and transient



voltages up to 48V, with continuous drain currents up to 88A and pulsed currents of 360A, making it suitable for the most demanding power systems.

The device is thermally optimized for high power density due to its small 3.3mm x 2.6mm PQFN package with a thermal resistance from the junction to the case of 0.6°C/W.

"The 40V, EPC2366 is the first of this family to enter mass production," notes CEO & co-founder Alex Lidow. "However, EPC is sampling seventh-generation 25V and 15V transistors now and expects more mass-production transitions in the first half of 2026."

To accelerate design-in and evaluation, EPC also offers the EPC90167 half-bridge evaluation board, which integrates two EPC2366 transistors in a low-parasitic layout with support for standard PWM drive signals and flexible input modes, providing engineers with a reference platform to assess performance in real-world applications.

The EPC2366 is now in volume production and available for ordering through EPC's global distribution channels and direct sales, enabling customers to scale designs for data-center power supplies, synchronous rectification stages, motor drives, and other high-density power conversion use-cases.

The EPC2366 eGaN FET is priced at $1.56 each at 3000 units per reel. The EPC90167 development board is priced at $211.65/each.

Both the EPC2366 and EPC90167 demonstration board are available for immediate delivery from distributor Digi-Key Corp.

www.epc-co.com/epc/products/

UCSB's James Buckwalter inducted as senior member of the US National Academy of Inventors

Honored for work on high-speed and high-frequency ICs integrating CMOS with III-Vs

University of California Santa Barbara (UCSB) electrical and computer engineering professor James Buckwalter has been inducted as a senior member of the US National Academy of Inventors (NAI) for his work advancing the high-speed and high-frequency integrated circuit technologies that underpin modern wireless communication systems, citing his "remarkable achievements as an academic inventor and a rising leader in his field".

Buckwalter designs ICs operating at the radio frequency and millimeter-wave frequencies used in 5G networks, satellite communications, radar systems and emerging sensing technologies. His work bridges fundamental circuit innovation with real-world deployment, enabling faster data transmission, lower power consumption and more efficient wireless infrastructure.

By advancing circuit architectures that integrate CMOS with III-V materials, Buckwalter's work helps to push the limits of speed, efficiency and scalability in next-generation communication systems. His patented technologies contribute directly to innovations in wireless connectivity, sensing and high-performance electronics.

Buckwalter joins a network of 945 senior members worldwide. "These innovators come from a variety of fields and disciplines, translating their technologies into tangible impact," comments NAI founder & president Paul R. Sanberg.

The induction ceremony will take place at NAI's annual conference in June at the Loews Hollywood Hotel in Los Angeles.

www.ece.ucsb.edu/people/faculty/james-buckwalter
www.academyofinventors.org/

Renesas licenses EPC's low-voltage eGaN technology to complement its 650V+ portfolio

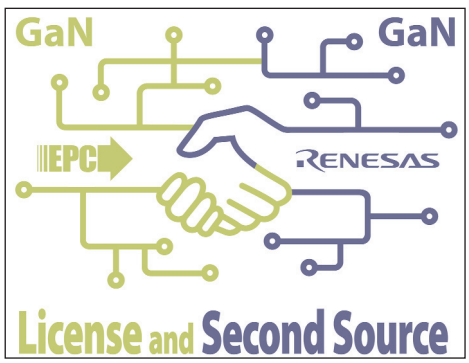
Renesas to second-source EPC devices, as firms collaborate on internal wafer fabrication

Efficient Power Conversion Corp (EPC) of El Segundo, CA, USA — which makes enhancement-mode gallium nitride on silicon (eGaN) power field-effect transistors (FETs) and integrated circuits for power management applications — has announced a comprehensive licensing agreement with Renesas Electronics Corp of Tokyo, Japan, a global supplier of semiconductor solutions and high-voltage GaN transistors.

Renesas will gain access to EPC's proven low-voltage eGaN technology and its established supply chain ecosystem, accelerating the adoption of high-performance GaN solutions across a broad range of markets. EPC and Renesas will collaborate over the next year to establish internal wafer fabrication capabilities for these products. In addition, Renesas will second-source several of EPC's GaN devices that are already in mass production, enhancing supply chain resilience for customers.

As power electronics designers push for higher efficiency, greater power density and lower carbon footprints, the physical limits of silicon increasingly constrain performance and miniaturization. Compared with silicon, GaN transistors offer higher efficiency, faster switching speeds, and significantly smaller form factors. EPC says that these advantages are reshaping power conversion architectures across applications ranging from consumer electronics to AI data centers. The alliance expands customer access to GaN technology while providing increased supply assurance through qualified second sourcing.

"Together, EPC and Renesas are forming a global alliance to deliver state-of-the-art power efficiency — cutting costs in AI data centers and enhancing autonomous systems," says EPC's CEO Alex Lidow.



Renesas, a multi-billion-dollar semiconductor company with global sales, marketing and manufacturing capabilities, recently completed its acquisition of Transphorm to strengthen its high-voltage GaN portfolio. Its GaN technology is said to excel in applications such as AC–DC power supplies, EV chargers, solar inverters, and industrial motor drives, delivering high reliability even in harsh operating environments. The addition of EPC's low-voltage eGaN expertise allows Renesas to offer what is claimed to be one of the industry's most comprehensive GaN power portfolios, spanning low- to high-voltage applications and further accelerating the GaN revolution.

"Expanding our business into low-voltage GaN allows us to serve the fastest-growing power segments," says Rohan Samsi, VP, GaN business division at Renesas. "This agreement with EPC complements our established high-voltage 650V+ portfolio and enables us to capitalize on high-volume markets such as AI power architectures from 48V down to 12V and 1V, as well as client computing and battery-operated applications."

www.renesas.com
www.epc-co.com

VIS licenses TSMC's 650V and 80V GaN technology

Vanguard foundry offers dual-substrate GaN across high & low voltage

Specialty IC foundry service provider Vanguard International Semiconductor Corp (VIS) of Hsinchu Science Park, Taiwan has signed a technology licensing agreement with Taiwan Semiconductor Manufacturing Company Ltd (TSMC) for high-voltage (650V) and low-voltage (80V) gallium nitride (GaN) technologies. This will help VIS to accelerate the development and expansion of next-generation GaN power technologies for applications such as data centers, automotive electronics, industrial control, and energy management, which are key areas that demand high-efficiency power conversion.

Through the licensing agreement, VIS will expand its GaN-on-Si technology into high-voltage applications and offer a comprehensive GaN-on-Si platform for power applications. Combined with its existing GaN-on-QST technology platform, the firm will become the only foundry in the world capable of offering power GaN technologies on both silicon and QST substrates, it is reckoned. VIS will support complete product solutions covering low voltage (<200V), high voltage (650V) and ultra-high voltage (1200V), strengthening its technology roadmap for high-efficiency power conversion.

VIS says that it is building a comprehensive portfolio of power GaN technologies ranging from 15V to 1200V, providing customers with more flexible and competitive options. Leveraging the TSMC technology license, VIS aims to develop a power GaN technologies platform that seamlessly integrates with its existing platforms. The technology will be validated on VIS' mature 8-inch manufacturing line to ensure process stability and high yield. Development activities are expected to start in early 2026, with production scheduled for first-half 2028.

"This technology licensing agreement not only underscores the engagement and ongoing collaborative efforts between VIS and TSMC but also represents our continued commitment to advancing a comprehensive power GaN product portfolio and strengthening our strategic position in compound semiconductors," says VIS' president Dr John Wei. "Through this collaboration, we will accelerate our support for customers in high-performance power conversion applications, enabling the semiconductor power technology to move into the next generation and helping realize a future of green energy and intelligent technologies."

www.tsmc.com
www.vis.com.tw

ROHM licenses TSMC's GaN process technology for Hamamatsu fab

End-to-end, in-house production from 2027 to meet demand for applications such as AI servers and EVs

Japan-based ROHM Semiconductor has decided to integrate its own development and manufacturing technologies for GaN power devices with the process technology of foundry Taiwan Semiconductor Manufacturing Company Ltd (TSMC), with which ROHM has an ongoing partnership, to establish an end-to-end production system within the ROHM Group. Licensing TSMC GaN technology will strengthen its supply capability to meet growing demand for GaN in applications such as AI servers and electric vehicles, ROHM reckons.

Since they offer excellent high-voltage and high-frequency performance (helping to improve efficiency and reduce size in a wide range of applications), GaN power devices are already used in consumer products such as AC adapters. But adoption is also expanding in high-voltage applications such as power units for AI servers and on-board chargers for electric vehicles (EVs), and demand is expected to continue growing.

ROHM began developing GaN power devices at an early stage and established a mass-production system for 150V GaN at ROHM Hamamatsu in March 2022. In the mid-power range, ROHM has built its supply structure while advancing external collaborations. TSMC has been a key partners in this effort: ROHM adopted a 650V GaN process in 2023, and in December 2024 the two companies partnered on automotive GaN, further deepening their collaboration.

This latest integration represents an evolution of that partnership, says ROHM. Under a newly concluded license agreement, TSMC's process technology will be transferred to ROHM Hamamatsu. ROHM aims to establish production in 2027 to meet expanding demand in applications such as AI servers.

Upon completion of the technology transfer, ROHM and TSMC will conclude their automotive GaN partnership. At the same time, the two firms will continue to strengthen collaboration for higher-efficiency and more compact power supply systems.

www.tsmc.com
www.rohm.com

NEC develops high-efficiency compact power amplifier module for sub-6GHz band in 5G base-station radio units

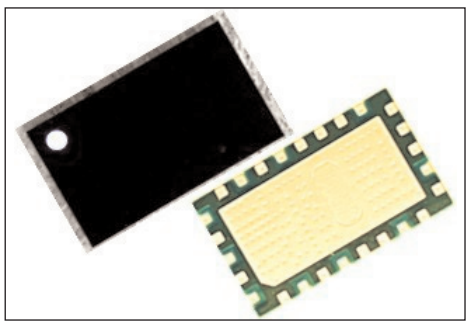
Contributing to power savings in 5G networks and reducing operational costs for telecom carriers

Tokyo-based NEC Corp has developed a high-efficiency, compact power amplifier module (PAM) for the sub-6GHz band, designed for integration into 5G base-station radio units (RUs).

PAMs power consumption accounts for about 75% of the total power consumed by an RU. By integrating this high-efficiency PAM into RUs, NEC aims to reduce device power consumption and size, contributing to overall power savings in 5G networks and reduced operational costs for telecommunication carriers.

NEC plans to incorporate this PAM into new RUs scheduled for release in first-half 2026 and also envisions a global deployment of the PAM as a standalone product, including its application in base stations from other manufacturers.

The PAM achieves both high efficiency and compactness, which has been challenging until now says NEC, by integrating the firm's strengths in high-efficiency circuit design technology using gallium nitride (GaN) devices, high-density mounting technology, and simulation expertise related to load modulation methods. Specifically, it achieves a high power-added efficiency (PAE) of 50%, indicating the proportion of supplied DC power that can be used for amplifying radio signals. This results in a 10% reduction in power consumption compared to conventional PAMs. Furthermore, it has a compact form factor of 10mm x 6mm.



NEC's new power amplifier module.

Since 5G networks utilize higher-frequency bands compared to 4G, the coverage area of a single RU is narrower. So, to ensure comprehensive coverage across wide areas and even behind buildings, more RUs need to be deployed. By integrating this PAM into RUs, NEC aims to reduce the power consumption of individual RUs, contributing to overall power savings in 5G networks and lowering operational costs for telecommunication carriers.

NEC is showcasing the new PAM at MWC Barcelona 2026 (MWC2026) on 2–5 March, highlighting the PAM's features, high-efficiency operation, energy-saving effects, and increased design flexibility for equipment.

Some of the technologies used in the new device were obtained from a grant program (JPJ012368G50801) by Japan's National Institute of Information and Communications Technology (NICT).

www.nec.com

Atomera's GaN-on-silicon concept advances to PowerAmerica proposal stage

Mears Silicon Technology improves GaN material quality

Semiconductor materials and technology licensing company Atomera Inc of Los Gatos, CA, USA says that its concept paper on gallium nitride on silicon (GaN-on-Si) technologies has been accepted to move to the proposal stage as part of a PowerAmerica Institute Initiated Proposal (IIP) to advance wide-bandgap (WBG) power semiconductor technology.

The paper, which proposes a collaboration with other industry and scientific partners, details Atomera's Mears Silicon Technology (MST) improvements in GaN material quality compared with GaN films formed on standard silicon.

Approval at the proposal stage would make the project eligible for funding from PowerAmerica, enabling Atomera to further refine and scale GaN-on-Si manufacturing with MST. This approach targets improved GaN manufacturing processes with higher wafer-level yield and device-level performance for power electronics.

"Compound semiconductors, and GaN specifically, are important for the continued advancement of wide-bandgap semiconductors," says CEO Scott Bibaud. "One of the major challenges is low yield numbers, making it very expensive and inefficient to manufacture. At Atomera, we're working diligently to improve wafer-level yield with MST and to reduce die cost for more widespread adoption of GaN."

The mission of PowerAmerica is to accelerate the commercialization and adoption of WBG power semiconductor technologies that enable electronic components to be smaller, faster and more efficient than comparable devices made from silicon. Atomera says that participation in this program underscores its commitment to innovation and collaboration with leading industry and academic partners.

www.poweramericainstitute.org
www.atomera.com

HexaTech launches 3-inch aluminium nitride substrate

Expansion from 2-inch a step on path to high-volume production of high-voltage and high-frequency electronic devices on 100mm AlN

HexaTech Inc of Morrisville, NC, USA (a subsidiary of Stanley Electric Co Ltd of Tokyo, Japan) has announced the immediate production release of its new 3-inch (76.2mm)-diameter single-crystal aluminium nitride (AlN) substrate product.

Three-inch diameter substrates are seen as a key transition milestone toward the realization of 100mm-diameter material, supporting future high-volume production of AlN-based high-voltage and high-frequency electronic devices.

"With this 3-inch launch, HexaTech continues to build on its history of delivering AlN material with industry-leading structural and surface quality, retaining the same macroscopic defect-free performance we have been producing for many years with our existing 2-inch platform," says R&D manager Dr Rafael Dalmau.

"HexaTech continues to drive increased value by delivering superior quality alongside reduced price per unit area to our customers," says Gregory Mills, VP of business development. This accelerating trend will enable our customers to quickly transition from device research into production," he adds.

"With our strategic focus on substrate diameter expansion, this launch is once again demonstrating HexaTech's commitment to deliver our customers the market-leading AlN substrate solution," says CEO John Goehrke.

HexaTech's 2-inch and 3-inch diameter products are available now with standard lead times.

www.hexatechinc.com
www.stanley.co.jp/e

Coherent launches bondable diamond solutions for thermal management

Precisely controlled surface roughness, flatness, coatings and preparation enable direct bonding

Materials, networking and laser technology firm Coherent Corp of Saxonburg, PA, USA has launched its bondable diamond solutions for thermal management: a diamond solution engineered with a specialized surface finish that enables direct bonding to semiconductor die for electronic and optoelectronic applications. By eliminating or dramatically reducing thermal interface resistance, bondable diamond significantly improves device cooling performance.

Coherent says that its bondable diamond features precisely controlled surface roughness, flatness, coatings and preparation, enabling direct bonding to semiconductor materials including silicon, silicon carbide, gallium nitride, aluminium gallium nitride, gallium arsenide, and indium phosphide. Bonding solutions may also incorporate high-thermal-conductivity interlayers and metallic coatings to meet customer requirements.

Conventional thermal spreaders rely on thermal interface materials

(TIMs), whose thermal resistance limits overall performance. Direct bonding — enabled by Coherent's bondable diamond through fusion, hybrid, or metallic bonding — reduces interface thermal resistance by up to 99% and can be implemented on die sizes up to 100mm square.

Coherent says that it uniquely combines production-scale diamond growth, world-class surface finishing, advanced coating technologies, and deep semiconductor process expertise. This vertically integrated capability enables the design and manufacture of high-performance, high-yield bondable diamond thermal spreaders at scale.

"As one of the world's largest producers of technical diamond since 2010, and a pioneer in diamond fabrication and coating, Coherent is uniquely positioned to deliver breakthrough thermal performance through processes tailored to our customer needs," says Steve Rummel, senior VP, Engineered Materials business group at Coherent.

Coherent says that it partners closely with customers to solve complex thermal and process-integration challenges on die sizes up to 100mm. Bondable diamond can be combined with other Coherent materials, including solutions from Coherent Ceramics, and may incorporate features such as conductive elements, vias, channels, and optical structures. Coherent is actively collaborating with customers now to develop materials, coatings and bonding processes compatible with their device fabrication workflows.

www.Coherent.com

Nitride Global, USLLC and Axiom Space awarded NASA SBIR grant

Phase II of project to develop prototype PVD reactor for in-space AlN crystal growth

Nitride Global Inc of Wichita, KS, USA says that — along with its partners United Semiconductors LLC (USLLC) of Los Alamitos, CA, USA (which since 2005 has been supplying the US defense sector and national laboratories with critical substrates) and Axiom Space Inc of Houston, TX, USA — it has been selected for a NASA-funded Small Business Innovation Research (SBIR) grant 'Physical Vapor Deposition Reactor Design and Validation for In-Space Manufacturing of Aluminum Nitride Single Crystals'. The project will advance the development of a next-generation physical vapor deposition (PVD) reactor for producing high-purity aluminium nitride (AlN) crystals in micro-gravity, a key step toward enabling large-scale space-based semiconductor manufacturing.

The ultrawide-bandgap (UWBG) semiconductor AlN has superior thermal conductivity, operating temperature range, radiation resistance and electrical breakdown strength compared to silicon carbide (SiC) and gallium nitride (GaN). However, terrestrial AlN crystal growth faces challenges such as high dislocation densities, point defects and size limitations that hinder its widespread adoption in high-performance power electronics and optoelectronic applications.

Micro-gravity provides a unique environment to overcome these barriers by:

- eliminating thermal convection, ensuring uniform mass flux and reducing defects;
- minimizing thermal gradients, decreasing stress-induced dislocations; and
- accelerating seed development, enabling the production of ultra-high-purity AlN substrates that could advance wafer quality by multiple generations in months rather than decades.

During Phase I, the project team — led by USLLC — developed and tested a proof-of-concept PVD reactor capable of achieving a crystal growth temperatures of 2800–3200°C while operating at only 250–400W and weighing less than 700g. The compact system demonstrated feasibility for integration within the International Space Station (ISS) environment, where power, size and thermal constraints are significant.

In Phase II, the consortium will develop and validate a flight-ready reactor prototype for deployment aboard the ISS. Objectives include:

- refining reactor design to meet ISS mid-deck locker integration requirements;
- conducting AlN crystal growth optimization through modeling and empirical testing; and
- completing NASA's Safety Review and securing payload integration approval for future on-orbit experiments.

The enhanced system will also serve as a high-temperature materials research platform, supporting studies of silicon carbide, oxide crystals, and other advanced materials relevant to in-space manufacturing and next-generation semiconductor technologies.

"This collaboration represents a major step toward realizing the vision of in-space semiconductor fabrication," says Nitride Global's CEO Mahyar Khosravi. "By harnessing the advantages of micro-gravity and advanced thermal systems engineering, we aim to help establish the US as a leader in ultra-high-performance material production for both terrestrial and orbital applications."

The project aligns with NASA's broader goals of fostering sustainable, commercial in-space manufacturing, advancing R&D of AlN-based semiconductors for extreme space environments, and leveraging low-Earth orbit (LEO) platforms such as the ISS and future Axiom Space stations to accelerate technology readiness for Earth and beyond.

www.nitrideglobal.com
www.unitedsemiconductorsllc.com
www.axiomspace.com

EIB backs Europe's first gallium production investment with €90m for METLEN

Project strengthens EU supply of critical raw materials

The European Investment Bank (EIB) has approved €90m in financing to multi-national industrial and energy firm METLEN Energy & Metals S.A. of Athens, Greece — which operates the only vertically integrated bauxite, alumina and primary aluminium production unit in the European Union (EU) with privately owned port facilities — supporting strategic investments at the company's historic Aluminium of Greece industrial complex in Central Greece. The financing is aimed at strengthening the European Union's supply of bauxite and gallium, two critical raw materials essential for Europe's green and digital transitions.

The project includes the modernization of bauxite mining operations (a key input for aluminium production) and the development of a new gallium production facility, marking a step towards reinforcing Europe's strategic autonomy in critical raw materials.

The investment is fully aligned with the objectives of the European Critical Raw Materials Act (CRMA) and contributes to reducing the EU's reliance on imports, while improving the resilience and sustainability of European industrial value chains.

"This investment is a landmark for Europe's industrial and strategic autonomy," states EIB vice-president

Yannis Tsakiris. "By supporting METLEN, the EIB is backing Europe's first EIB-financed gallium production project, strengthening the security of supply of critical raw materials that are indispensable for the green and digital transitions," he adds. "It is a clear example of how European financing can support industrial innovation, regional development and climate action at the same time."

The EIB financing is provided under the REPowerEU framework, supporting investments that enhance Europe's industrial competitiveness and energy transition.

The investments will be implemented at two sites in Central Greece:

- METLEN's bauxite mining operations in the Parnassus–Giona area, and
- the firm's alumina and aluminium industrial complex (Aluminium of Greece) in Agios Nikolaos, Viotia, where the new gallium production facility will be developed.

The project is expected to contribute to job creation and retention, support regional cohesion, and reduce the environmental footprint of mining and processing activities through the deployment of more sustainable and modern industrial practices.

METLEN is a major industrial firm active in the energy and metals sectors, with a strong presence in Greece and internationally. Through its Metallurgy Sector, it is one of the European Union's leading vertically integrated aluminium producers and, and the largest bauxite producer.

"METLEN demonstrates that it can play a leading role in shaping a resilient, green and competitive European industry," says METLEN's executive chairman Evangelos Mytilineos. "With the financing of the EIB, we confirm the strategic importance of our investment for Europe," he adds. "We are implementing a landmark project that decisively strengthens Europe's self-sufficiency in critical raw materials by bringing gallium into industrial production within the European Union for the first time, while reinforcing regional cohesion and Greece's industrial base."

This operation represents the third financing by the EIB to METLEN, further strengthening the long-standing cooperation between the two institutions.

www.metlengroup.com

Snow Lake extends option agreement for Mound Lake Gallium Project

Extension with Canadian Uranium Corp coincides with US proclamation on adjusting imports of processed critical minerals

Canada-based nuclear fuel cycle and critical minerals company Snow Lake Resources Ltd (trading as Snow Lake Energy) has reached an agreement with Canadian Uranium Corp to extend the existing option agreement with respect to the Mound Lake Gallium Project, situated north of Thunder Bay, Ontario, Canada.

The agreement coincides with the US Administration's Proclamation 'Adjusting Imports of Processed Critical Minerals and Their Derivative Products into the United States' issued on 14 January, with its focus on ensuring that the USA has sufficient domestic mining and processing of critical minerals to reduce import reliance on foreign countries.

Highlights include:

- a one-year extension of the underlying option agreement;
- the Mound Lake area is highly prospective for lithium, cesium and tantalum (LCT) deposits, including a variety of rare earths and gallium;
- historical work on Mound Lake has confirmed gallium values ranging from 50ppm to 110ppm in a series of grab samples obtained during Canadian Uranium's field program in 2023;
- the US imports 100% of its gallium requirements, as gallium is an essential component of many military and defense applications.

"As our primary focus remains the development of our nuclear fuel cycle business, we continue to pursue our ongoing strategy of opportunistically acquiring interests in North American-based critical minerals projects that hold the potential to assist in building domestic North American critical minerals supply chains," says CEO Frank Wheatley. "Mound Lake fits nicely into that strategy, at modest cost, as historical work on Mound Lake has demonstrated the potential for gallium, as well as a variety of other rare-earth elements and LCT deposits," he adds. "As the US Administration continues to advance it policies to ensure sufficient domestic mining and processing of critical minerals to ensure US national security, including gallium, we feel the potential of Mound Lake is worth exploring as a possible solution to US requirements."

Gallium as a critical mineral

Considering that China controls about 98% of global gallium supply, gallium is classified as a critical mineral by the USA, Canada, Australia and the European Union. The US imports 100% of its gallium requirements. Gallium is typically produced as a by-product from smelting other critical minerals, such as aluminium and zinc, and its importance is due to its use in semiconductors, integrated circuits, high-performance radar, smartphones, electric vehicles, laptops, together with a variety of military applications.

US Administration Proclamation

The US Administration issued the Proclamation on 14 January in response to the Section 232 investigation into the effect of imports of processed critical minerals on US national security. The conclusion of the investigation was that imports of processed critical minerals did pose a US national security risk and the Proclamation is intended to outline steps that the US Government will take to address those risks.

The Proclamation specifically mentions gallium as critical to satellite systems that underpin the US military and defense apparatus. Steps to reduce these risks include negotiating agreements with respect to imports of critical minerals, price floors and other trade-restricting measures as appropriate.

Mound Lake Gallium Project

Mound Lake is an early-stage exploration project consisting of 243 single-cell unpatented mineral claims covering over 4800 hectares in the Thunder Bay mining district of Ontario. Historic exploration work on the northern part of Mound Lake, near the contact between the Mound Lake Pluton and meta-sedimentary country rocks, has demonstrated consistent, elevated gallium values, plus elevated levels of other critical metals, including beryllium, lithium and rubidium.

A total of 12 bedrock grab-samples collected during Canadian Uranium's 2023 field program returned gallium values exceeding 50ppm, with the highest result measuring 110.5ppm. By way of comparison, gallium values in fertile granites and pegmatites typically peak at ~90ppm, while average gallium values in the earth's crust are ~19ppm. Over 70% of the grab samples from Mound Lake returned gallium values above average crustal values.

Further exploration will be prioritized in the northern regions of Mound Lake, which may include further detailed analysis and mapping to identify potential targets for follow-up investigation and possible drilling.

Mound Lake extension agreement

The agreement extends the terms and conditions of the underlying option agreement for an extra year. This extension provides Snow Lake with the flexibility to plan additional exploration work on Mound Lake as part of Snow Lake's 2026 exploration and development programs on its portfolio of critical minerals projects in North America. The underlying option agreement provides that Snow Lake can earn up to an 80% stake in Mound Lake via a combination of exploration expenditures and cash payments over two years.

www.snowlakeenergy.com

Nimy ships high-grade gallium ore from Western Australia to M2i in USA

Mining exploration company Nimy Resources Ltd of Perth, Western Australia has shipped its first high-grade gallium ore consignment from its Block 3 gallium deposit at the Mons Project in Western Australia to the USA under the collaboration agreement with US-listed company M2i Global, which specializes in the development and execution of a complete global value supply chain for critical minerals.

The ore will be analysed to determine the optimum processing pathway to make it suitable for use in the US defence and national securities industries. This ore will be sent to selected academic institutions and a defence industrial base company, which will determine the refining processes required to produce the desired product for their needs. As part of this, it intends to establish a critical mineral reserve, creating a resilient supply chain that addresses the global shortage of essential minerals and metals.

Nimy says that this milestone process step supports future Western gallium supply chain security, linking the resource to developing processing capability in the USA.

With a large JORC (Australasian Joint Ore Reserves Committee)-compliant resource of 2700t of contained gallium, Nimy has already established critical scale, showing that Block 3 at the Mons Project can be a significant supplier to western markets that are desperately trying to source non-Chinese gallium.

The focus is now on metallurgical work, including determining the optimum processing routes to prepare Nimy's gallium for the desired end uses.

The analysis that will be conducted on this shipment of ore by various groups as part of the M2i arrangement is expected to provide valuable information as Nimy considers development and offtake options.

"Distributing the material to leading academic institutions and defence industrial base companies for refining analysis will accelerate our path to commercial production," believes Nimy's managing director Luke Hampson. "With ongoing expansion programs and a near-term JORC-compliant resource, Nimy is well positioned to deliver reliable gallium supply to support global semiconductor and defence needs."

www.m2i.global
www.nimy.com.au

Volta closes $2.8m oversubscribed & upsized private placement

Mineral exploration firm Volta Metals of Toronto, Canada (which owns, has optioned and is currently exploring a critical minerals portfolio of rare-earths, gallium, lithium, cesium, and tantalum projects in Ontario) has closed an oversubscribed and upsized non-brokered private placement yielding gross proceeds of $2,810,508. The offering consisted of 12,219,601 common shares issued on a 'flow-through' basis (an FT share) at a subscription price of $0.23 per FT share.

Proceeds will be used foreligible 'Canadian exploration expenses' that will qualify as 'flow-through critical mineral mining expenditures', as defined in the Income Tax Act (Canada) on or before 31 December. The firm will initiate a second-phase drill program to further explore its recently acquired Springer advanced Rare Earth and Gallium Deposit and explore its Aki Critical Minerals Project. All qualifying expenditures have been renounced in favour of subscribers of the FT units with an effective date not later than 31 December 2025.

As in every financing that the firm has completed to date, whereby certain directors and officers have participated (increasing insiders' holdings), a director of the firm acquired an aggregate of 87,000 FT shares under the offering. Such participation constitutes a 'related party transaction' within the meaning of Multilateral Instrument 61-101 — Protection of Minority Security Holders in Special Transactions (MI 61-101). The firm relied on an exemption from the formal valuation and minority shareholder approval requirements provided under MI 61-101 pursuant to sections 5.5(a) and 5.7(1)(a) of MI 61-101, on the basis that the participation in the offering by such director does not exceed 25% of the fair market value of the company's market capitalization.

In connection with the closing of the offering, Volta paid commissions to certain finders an aggregate of $163,560 in cash and 711,132 finder warrants. Each finder warrant entitles the holder to purchase one common share at an exercise price of $0.23 per finder warrant share for a period of 24 months from the closing of the offering. The securities issued and issuable under the offering are subject to a statutory hold period in Canada of four months and one day from the closing date of the offering in accordance with applicable Canadian securities laws. The closing of the offering is subject to the receipt of all required regulatory approvals, including the approval of the Canadian Securities Exchange (CSE).

"This financing represents the largest amount Volta has raised, at the highest share price and with the fastest closing to date," notes Volta's CEO Kerem Usenmez. "The strong investor response validates our strategy, and the capital raised positions Volta to accelerate exploration and unlock additional value at the Springer deposit while continuing to reduce project risk."

www.voltametals.ca.

Supra launches to secure US supply of gallium, scandium and other critical minerals

UT Austin spinout developing proprietary platform to recover critical minerals from waste streams

Amid mounting concerns about US critical mineral and rare-earth element supply chains, Supra Elemental Recovery Inc has launched as a spinout from the University of Texas at Austin, focused on selectively recovering high-purity critical minerals from waste streams. The firm is initially targeting elements such as gallium (Ga) and scandium (Sc).

The USA is currently 100% import-dependent for both gallium and scandium. China dominates the critical minerals market through capital-intensive and environmentally hazardous refining processes. Supra says that it has developed a non-toxic approach in which dissolved industrial waste is pumped through proprietary, reusable, sponge-like cartridges that selectively capture and release critical minerals in sequence. Early results indicate up to 100 times greater selectivity and speed compared to incumbent refining methods, enabling higher purity and lower costs.

"Every year, billions of dollars worth of critical minerals are trapped in domestic waste streams, from industrial byproducts and mine tailings to electronic waste," says co-founder & CEO Katie Ullmann Durham. "By profitably recovering these elements, we can secure the inputs needed for America's advanced manufacturing future," she adds.

Rare earths are notoriously difficult and expensive to refine at high purity, notes co-founder & chief operating officer Jordan Sessler. "We're making this easier and more affordable by applying advances in supramolecular chemistry, materials science, and fluid dynamics to build a versatile platform technology. By refining multiple elements from multiple sources, we believe we can deliver much-needed supply chain resilience."

Supra's technology builds on federally supported research conducted at the University of Texas at Austin. The technology is also being validated for additional elements, including cobalt, lithium and lanthanides used in batteries, magnets, and other common electronics.

In conjunction with its launch, Supra has also announced the close of an oversubscribed $2m pre-seed round, led by Crucible Capital, with participation from the UT Seed Fund, Climate Capital, Portmanteau Ventures, and Pew Protection Trust. The funding will support continued technology development and preparation for commercial pilots, expected in 2026.

"The key to restoring America's rare-earth leadership is building refining capacity, the bottleneck standing between domestic raw resources and secure supply," comments Meltem Demirors, founder & general partner at Crucible Capital. "Supra is building this exact capability with a proprietary new approach."

Supra seeks companies interested in supplying feedstock, purchasing critical minerals, or exploring partnerships.

www.getsupra.com

5N+ gains $18.1m US grant to boost Ge production

Utah facility to increase recovery of Ge from industrial residues and mining by-products over next 48 months to 20 metric tons per year

Specialty semiconductor and performance materials producer 5N Plus Inc (5N+) of Montréal, Québec, Canada has been awarded a US$18.1m grant by the US Government to expand capabilities and increase capacity to recycle and refine germanium at its St. George, Utah facility, to feed optics and solar germanium crystal supply chains.

In support of the US government's Immediate Measures to Increase American Mineral Production Executive Order, the award will enable 5N+ to gradually increase its capabilities to recover germanium from industrial residues and mining by-products over the course of the next 48 months. In time, it should enable 5N+ to valorize up to 20 metric tons of high-purity germanium per year. Combined with its existing sourcing capabilities, this will position the firm to meet rapidly growing demand for germanium-based technological applications in the USA.

"This award reinforces our unique leadership position as a trusted partner with the sourcing, refining and manufacturing expertise to supply high-purity specialty semiconductors to key customers for mission-critical applications," says president & CEO Gervais Jacques.

5N+ manufactures and customizes high-purity, dislocation-free, electrically uniform and space-qualified germanium wafers, which are vital for infrared optics, night-vision systems, surveillance windows, electro-optical/infrared (EOIR) applications and solar cells powering commercial and national security satellites.

www.5nplus.com

Riber's full-year 2025 revenue falls by 2% to €40.3m, but second-half up 7% year-on-year

For full-year 2025, molecular beam epitaxy (MBE) system maker Riber of Bezons, France has reported revenue of €40.3m, down 2% on 2024's €41.2m. However, second-half 2025 revenue was €29.5m (up 7% on second-half 2024's €27.4%), whereas first-half 2025 revenue was just €10.7m (down 22% on first-half 2024's €13.7m).

This reflects both continued strong activity in production systems and the gradual ramp-up of ROSIE (Riber Oxide on SIlicon Epitaxy), the new MBE platform dedicated to silicon photonics.

MBE systems revenues was €30.9m for full-year 2025, stable compared with 2024's €31m. This corresponds to the invoicing of 12 machines, including nine production systems, as well as the delivery of the first ROSIE platform. The first two ROSIE systems were ordered in 2025, confirming growing industrial interest in MBE solutions compatible with 300mm production lines.

Services & Accessories revenue was €9.4m, down 8% on 2024's €10.2m, due mainly to budgetary restrictions in the USA, but showed a recovery in second-half 2025 (up 8.5%).

Of total revenue for full-year 2025 (compared with 2024), Asia comprised 39.7% (down from 57.3%), while Europe comprised 45.1% (up from 35.7%) and North America 15.2% (up from 7.1%), reflecting increased diversification of the markets served.

Order book grows by 24%

Despite a very high level of deliveries at year-end, the order book at end-December 2025 was €26.9m, up 24% from €21.7m at end-2024.

MBE Systems orders grew by 22% from €16.7m to €20.3m (comprising six systems, including four production machines and one ROSIE platform). This does not include the order announced on 19 January for a production system in Japan, scheduled for delivery this year. Services & Accessories orders grew by 31% 31% from €5m to €6.6m.

Riber notes that certain commercial opportunities, totaling €4m, were subject to export license refusals during 2025.

Return to annual revenue growth expected for 2026

Riber says that, against a backdrop of large-scale investment programs in artificial intelligence, data infrastructure and quantum technologies, it is benefiting from a pioneering technological positioning at the core of the semiconductor value chain.

For 2026, Riber expects:

- continued strong demand, driven by the need for MBE production systems for quantum dot lasers used in data centers;
- the industrialization and gradual ramp-up of the ROSIE platform, which it describes as a breakthrough technology for silicon-based integrated photonics, addressing high-potential markets. In 2026, the manufacturing of ROSIE 2 (the dual-chamber version) as well as the availability — in the framework of the partnership with the Denmark-based Novo Nordisk Foundation Quantum Computing Programme (NQCP, launched by the Novo Nordisk Foundation in collaboration with the Niels Bohr Institute at the University of Copenhagen) — of the first samples of barium titanate (BTO)/strontium titanate (STO) thin films on silicon wafers for the scientific and industrial community, will represent a key milestone in Riber's technological roadmap.

Given the visibility from the order book, and subject to obtaining the export licenses required to materialize the identified opportunities in its systems and services businesses, the firm targets revenue growth in 2026.

www.riber.com

QD Laser orders Riber MBE 6000

Riber has received an order for an MBE 6000 production system from Japan's QD Laser Inc, which was founded in 2006 after collaboration between Fujitsu Laboratories Ltd and the University of Tokyo and specializes in developing, manufacturing and commercializing quantum dot lasers and advanced optoelectronic devices.

Due to ship in 2026, the system will be optimized for the epitaxial synthesis of gallium arsenide-based quantum dots tailored for optical datacom.

The latest order is Riber's third MBE 6000 project within a month dedicated to the production of quantum dot-based epiwafers for the datacom sector, confirming the MBE 6000 platform as a reference industrial solution for these high-value applications, in line with the increasing production-scale requirements of the datacom market.

Quantum dot growth is sensitive to epitaxial growth conditions, notably temperature uniformity and deposition rate stability. The MBE 6000 is said to meet these requirements by combining an optimized chamber design, advanced control software and highly reliable key components, enabling precise, stable and reproducible control of growth parameters.

QD Laser is a long-standing and strategic customer of Riber. The first production system was delivered in 2008, and it was among the first companies to qualify Riber's ABI 1000 cell, recognized for its control of the stability, uniformity and reproducibility of gallium or indium deposition, while offering double the loading capacity compared with standard effusion cells.

www.qdlaser.com/en

Veeco and imec develop 300mm-compatible process to enable integration of barium titanate on silicon photonics

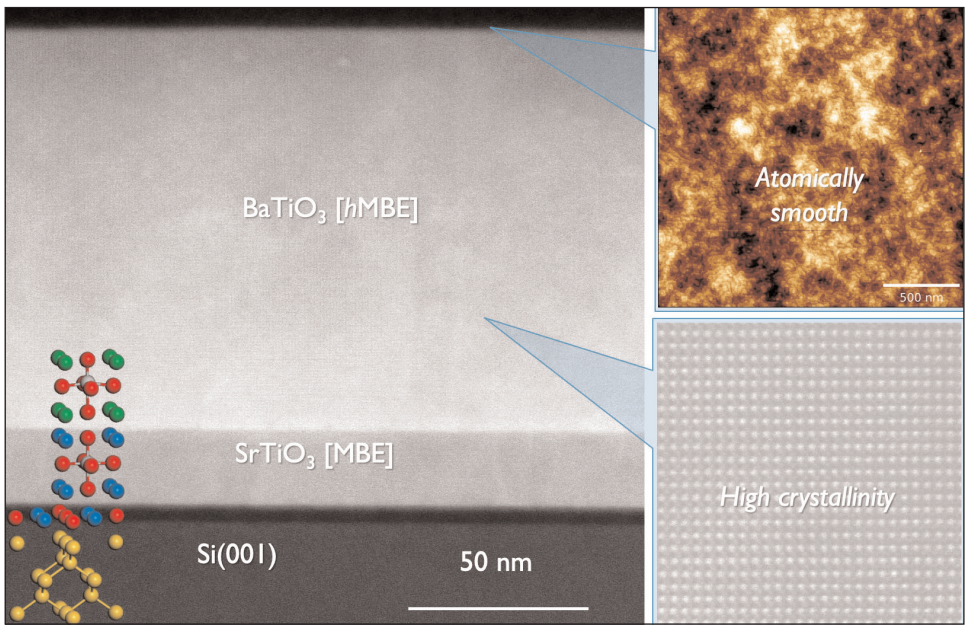
First-of-its-kind MBE solution for $BaTiO_3$ epitaxy on silicon to accelerate datacom and quantum computing applications

Epitaxial deposition and process equipment maker Veeco Instruments Inc of Plainview, NY, USA and nanoelectronics research center imec of Leuven, Belgium have collaboratively developed a 300mm high-volume manufacturing compatible process that enables the integration of barium titanate ($BaTiO_3$ or BTO) on a silicon photonics platform.

BTO is a promising material with unique electro-optical properties that can be used for high-speed and low-power light modulation in emerging applications such as high-speed optical transceivers, quantum computing, light detection & ranging (LiDAR), and AR/VR applications. Historically, approaches to integrate BTO have struggled to meet the desired cost targets to make it viable for high-volume manufacturing.

Veeco has now delivered its first molecular beam epitaxy (MBE)-based cluster system, marking a milestone in Veeco's and imec's partnership and their dedication to enhance silicon photonics platform capabilities. The new 300mm platform is designed for the epitaxy of $BaTiO_3$ single-crystalline thin films on silicon, available with both solid and hybrid MBE solutions. With the integration of these alternative growth techniques, the system will be capable of BTO-on-Si deposition with improved repeatability and at a lower cost than classical MBE methods, it is reckoned.

The optical transceiver market for datacoms is expected to grow to $13.1bn in 2030, up from $2.9bn in 2024. However, to alleviate the trade-offs of existing silicon modulator technologies, including high power consumption, performance (speed, drive voltage) and area, the introduction of novel electro-optic materials like BTO into silicon photonics will be crucial. At present, there is no commercially available production-compatible solution for manufacturing these materials.



Cross-sectional transmission electronic microscopy image of the BaTiO3/SrTiO3/Si(001) heterostructure with high-resolution micrograph and atomic force micrograph images in inset.

In partnership with Veeco, imec says that it is now addressing this industry need to develop scaled solutions that allows the integration of materials such as $BaTiO_3$ and $SrTiO_3$ onto a 300mm silicon platform.

"Over the past four years, imec and Veeco have collaborated on developing alternative techniques for $BaTiO_3$-on-Si and benchmarking both material and electro-optic properties towards defining a strategy for advancing large-scale manufacturing solutions," says imec's scientific director Clement Merckling.

"With the introduction of Veeco's first-of-its-kind MBE solution, we are expanding our capabilities for heterogeneous integration of beyond-Si electro-optic materials, strengthening our R&D offering for current and new partners with an interest in exploring and prototyping next-generation silicon photonics technology," adds Joris Van Campenhout, imec fellow and Optical I/O program director.

"This partnership with imec is a monumental step forward for the MBE industry, datacom and quantum computing production," reckons Matthew Marek, senior director of marketing for Veeco's MBE product line. "The historic view of MBE processing has been that it is slow and expensive; however, new hardware developments that our team validated in partnership with imec bring MBE into a cost-effective domain that is suitable for semiconductor fabs," he adds.

"We are excited about the work underway between our two organizations to demonstrate a repeatable, high-volume BTO production process. We anticipate this effort will help us achieve our shared goal to unlock BTO photonic modulator breakthroughs for a better and greener future."

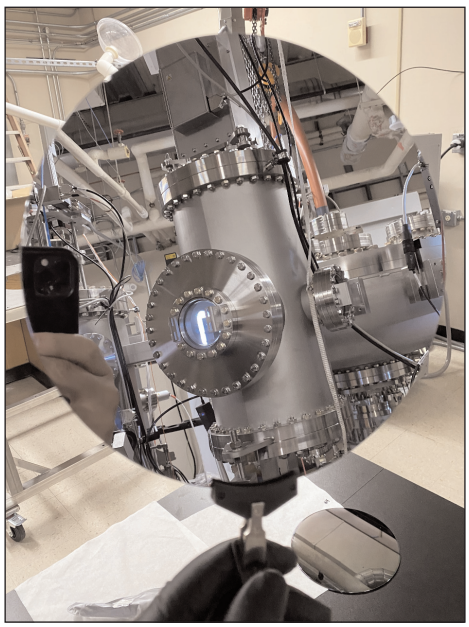
www.imec-int.com

La Luce Cristallina launches CMOS-compatible oxide pseudo-substrate

Enabling high-quality epitaxial strontium titanate films to be grown on 200mm silicon and SOI wafers

La Luce Cristallina of Austin, TX, USA — which manufactures silicon-integrated high-performance materials for silicon photonics, focused on barium titanate ($BaTiO_3$) materials — has launched its new CMOS-compatible oxide pseudo-substrate, enabling high-quality, epitaxial strontium titanate ($SrTiO_3$) films to be grown directly on 200mm silicon and silicon-on-insulator (SOI) wafers. This platform bridges the gap between academic oxide research and commercial manufacturing, facilitating the development of advanced oxide devices using standard semiconductor tools. The solution supports superconducting RF electronics, ultra-low-loss RF components, single-photon detectors, quantum sensing, advanced computing architectures and other emerging applications aligned with silicon photonics and heterogeneous integration.

Researchers often rely on small, costly single-crystal $SrTiO_3$ substrates that are incompatible with standard fabrication facility workflows. La Luce Cristallina says that its pseudo-substrate platform eliminates these bottlenecks by aligning with foundry-driven roadmaps for heterogeneous integration, co-packaged optics, wafer-level prototyping and next-generation photonics, enabling manufacturing scalability. The solution delivers large-area wafers, high-quality



epitaxial films (with thicknesses ranging from 4nm to 50nm) and standard CMOS tool compatibility.

"Our new CMOS-compatible oxide pseudo-substrate brings high-performance oxide electronics out of the lab and onto industry-standard silicon wafers, unlocking scalable devices for RF components and quantum applications," says chief technology officer & co-founder Agham Posadas. "By improving cost and scalability while eliminating CMOS tooling incompatibilities, we can help customers across the silicon photonics ecosystem accelerate innovation."

La Luce Cristallina says that its wafer-scale approach significantly expands usable area while maintaining film quality, supporting numerous applications across diverse, growing markets. The RF components market is forecasted to grow from $50bn to $91.19bn by 2030, bolstered by the defense and sensing sectors, 5G deployments and satellite communications. Amid strong government funding, the quantum technologies market (including sensing, detection and superconducting electronics) is projected to grow at a compound annual growth rate (CAGR) of 41.8% to $20.2bn by 2030.

The platform can support oxide electronics research for universities, national laboratories and commercial R&D teams that were previously constrained by substrate availability. La Luce Cristallina currently serves customers across integrated photonics research, quantum computing and other advanced electronics sectors.

"La Luce Cristallina's CMOS-compatible oxide pseudo-substrate removes one of the biggest barriers to scaling oxide electronics," comments Ron Kelly, CEO of Ambature Inc. "By enabling high-quality strontium titanate films on 200mm silicon wafers using standard semiconductor tools, La Luce Cristallina is helping companies like Ambature move advanced RF and quantum technologies from research environments toward real-world systems."

www.lalucecristallina.com

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Oxford Instruments teams with AOI to boost InP-based opto device manufacturing

AOI expanding US capacity to support demand for optical transceivers in AI data centers

UK-based plasma processing solutions provider Oxford Instruments has announced a plasma equipment supply agreement with Applied Optoelectronics Inc (AOI) of Sugar Land, TX, USA (a designer and manufacturer of optical and hybrid fibre-coaxial networking products for AI data-centers, cable TV and broadband fiber access networks) for several etch and deposition cluster systems.

The agreement will support AOI's expansion and technical advances in indium phosphide (InP) for optoelectronic device manufacturing, as it rapidly scales to increase production capacity within the USA.

As AOI undergoes a significant growth phase, it is upgrading its production capabilities to meet increasing demand for high-performance InP optoelectronic devices. Oxford Instruments' plasma etch and deposition processing systems will play a key role in this transformation by supporting AOI with fully automated 3–4–6-inch capable production systems for InP processes.

"AOI is expanding its US manufacturing capacity in Texas to support demand for our optical transceivers in AI data centers, and key suppliers like Oxford Instruments will help us continue to upgrade our fully automated production line," says Fred Chang, senior VP & North American general manager at AOI. "With our combined technology, we can speed the processing of multiple wafer sizes, ranging from 3- to 6-inches, while improving overall quality and reducing costs," he adds.

Oxford Instruments' team at Photonics West 2026.

"AOI has been a valued long-term partner, and we are thrilled to have earned their trust as the chosen supplier for their production expansion and technology upgrades. Our unique high-temperature electrostatic chuck (ESC) design, which enables advanced processing capabilities, was a key factor in their decision," says Emiel Thijssen, VP of sales and business development USA, Oxford Instruments Plasma Technology. "AOI also conducted an extensive vendor qualification process, including a visit to our brand-new purpose-built manufacturing facility in Bristol, UK, where we received high praise for our technology and production capabilities," he adds. "We are also investing significantly to ensure we continue to deliver world-class service capability in the Texas region, focusing on the availability of spares and expanding our field service and process engineering teams, to support the rapid expansion of leading manufacturers in the region such as AOI."

www.ao-inc.com
https://plasma.oxinst.com

Singulus receives follow-on order for TIMARIS micro-LED deposition system

Customer expanding production capacities in the US

Singulus Technologies AG of Kahl am Main, Germany (which makes production equipment for the optical disc and solar sectors) has received a follow-on order for a TIMARIS deposition system for the production of micro-LEDs. Following the commissioning of a first system of this type by the customer, the firm is now expanding its existing production capacities in the USA.

The TIMARIS platform is designed for high-precision deposition processes and meets the increasing demands of industrial micro-LED manufacturing processes. Due to its modular design, the system can be flexibly adapted to different process and production requirements.

"This new order underscores the competitiveness of our technology in the micro-LED environment," says board member Lars Lieberwirth. "Our continuous development activities in the semiconductor sector are thus paying off in concrete terms," he adds. "Market studies confirm this development. Analysts at the Yole Group expect the first commercial micro-LED displays to go into production in 2025. This means that the technology is evolving from a pure future expectation to industrial reality."

www.singulus.de

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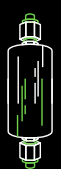
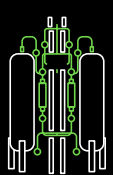
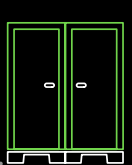


Point-of-Use Purifiers



Frame-Mounted Purifiers



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KAIST-led team develops high-efficiency, ultra-high-resolution red micro-LED display

Monolithic 3D-integrated red micro-LED display on silicon uses AlInP/GaInP epilayers to achieve 1700PPI

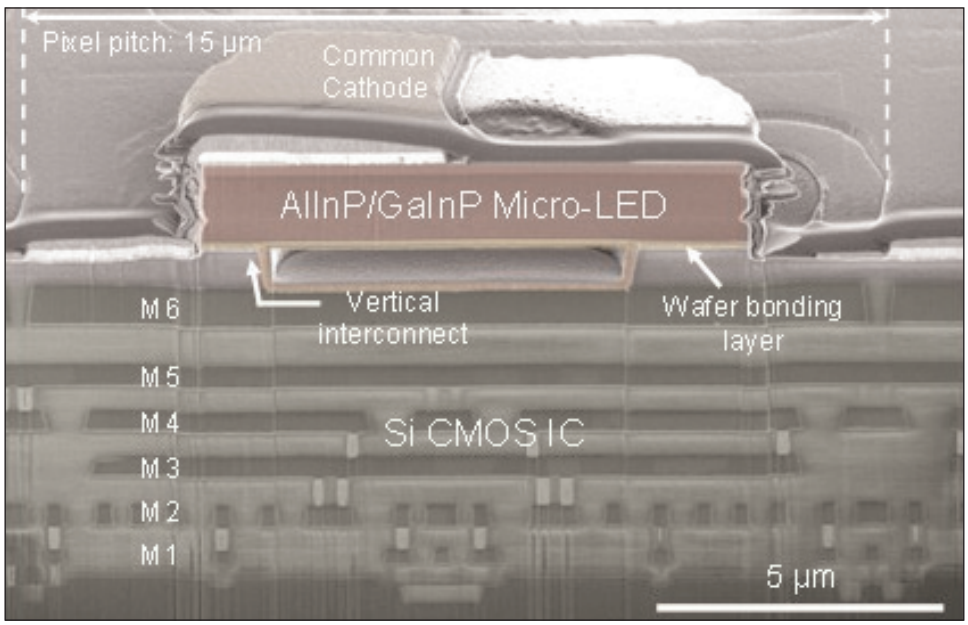
Korea Advanced Institute of Science and Technology (KAIST) has demonstrated a high-efficiency, ultra-high-resolution red micro-LED display, paving the way for displays that can deliver visuals even sharper than reality.

A research team led by professor Sanghyeon Kim of the School of Electrical Engineering, in collaboration with professor Dae-Myeong Geum of Inha University, compound semiconductor manufacturer QSI, and microdisplay/SoC design company Raontech, has developed red micro-LED display technology that achieves ultra-high resolution while significantly reducing power consumption (Park et al, 'A Monolithic Three-Dimensional Integrated Red Micro-LED Display on Silicon Using AlInP/GaInP Epilayers', Nature Electronics, 20 January; DOI: 10.1038/s41928-025-01546-4).

Using this technology, the team demonstrated a 1700 pixel-per-inch (PPI)-class ultra-high-resolution micro-LED display — approximately 3–4 times higher than the resolution of existing flagship smartphone displays — capable of delivering truly 'reality-like' visuals even in VR and AR devices.

Micro-LEDs are self-emissive displays that surpass OLEDs in brightness, lifetime and energy efficiency, but they have faced two major technical challenges. The first is the efficiency degradation of red micro-LEDs, which becomes severe as pixel sizes shrink due to increased energy leakage. The second is the limitation of conventional transfer processes, which rely on mechanically locating and placing microscopic LEDs one by one, making ultra-high-resolution fabrication difficult and increasing defect rates.

The research team addressed both challenges simultaneously.



First, they adopted an AlInP/GaInP quantum-well structure, enabling highly efficient red micro-LEDs with minimal energy loss even at very small pixel sizes. The quantum-well/barrier structure acts as an energy barrier, confining electrons and holes within the quantum-well layer, preventing carrier leakage. By adopting quantum wells with higher hole concentration, the research team effectively reduced energy loss as pixel sizes decreased, enabling brighter and more efficient red micro-LEDs.

Also, instead of transferring individual LEDs, the researchers employed a monolithic three-dimensional (3D) integration technique, stacking the LED layers directly on top of the driving circuitry. This approach minimizes alignment errors, reduces defect rates, and enables stable fabrication of ultra-high-resolution displays. The team also developed a low-temperature process to prevent damage to the underlying circuitry during integration.

KAIST claims that this achievement is particularly significant because it demonstrates a fully functional, ultra-high-resolution and highly quantum-efficient red micro-LED display, widely regarded as the most difficult component to realize. The technology is expected to find broad applications in next-generation displays where pixel granularity must be virtually imperceptible, including AR/VR smart glasses, automotive head-up displays (HUDs), and ultra-compact wearable devices.

"This work simultaneously solves the long-standing challenges of red pixel efficiency and circuit integration in micro-LEDs," says Kim. "We will continue to advance this technology toward practical commercialization as a next-generation display platform."

The study was led by Dr Juhyuk Park of the KAIST Institute of Information Electronics as first author. The research was supported by the National Research Foundation of Korea Basic Research Program (2019), the Display Strategic Research Laboratory Program (currently ongoing), and the Samsung Future Technology Incubation Center (2020-2023).

www.kaist.ac.kr

Violumas launches 255nm, 265nm and 275nm LEDs in mid-power, high-power, and high-density packages

More UVC intensity in next-gen UV LEDs

Violumas Inc of Fremont, CA, USA, a provider of high-power UV LED solutions and inventor of 3-PAD LED technology, has released its next-generation 255nm, 265nm and 275nm LEDs in both SMD and COB configurations.

The radiant flux of the new 275nm and 265nm LEDs has increased by 10–30% from the previous generation, to achieve 65mW (255nm), 130mW (265nm) and 145mW (275nm) in compact, single-emitter packages of 5.2mm x 5.2mm.

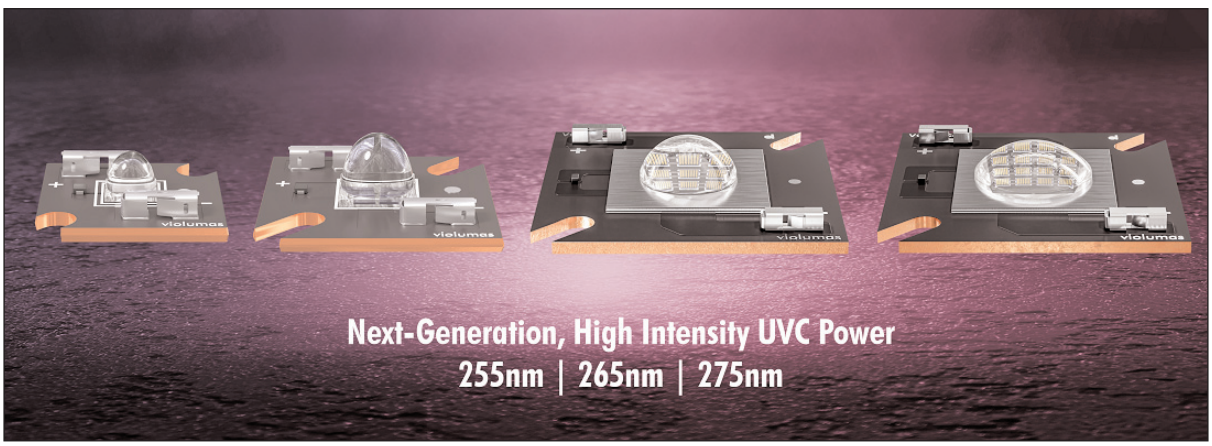
The new UVC LEDs are also available in 4-LED, 9-LED, and 16-LED chip-on-board (COB) configurations and provide what is claimed to be unrivaled levels of power for any UVC application. Each LED is encapsulated with a single, high-transmission fused silica lens that allows for long-term, stable performance over time. A selection of 30°, 60°, 90°, 120° and 135° optics is available to accommodate a wide variety of UVC applications.

The next-generation LEDs are also featured in Violumas' VioBeam-1X1 ultra-narrow-beam LED, which features a unique 10deg fused silica optic for far-field and focused illumination.

The integrated thermal structure (3-PAD) in every Violumas LED achieves what is claimed to be industry-leading thermal resistance values, which is critical for more reliable, compact and long-lasting UVC LED systems. It also allows Violumas UVC LEDs to withstand a nominal driving current of 700mA per LED chip, at which the LED maintains >70% of its original intensity after 10,000 hours of continuous operation.

With continual development of high-performance UVC LEDs, Violumas aims to accelerate industry adoption in high-power applications such as water disinfection, air purification, spectroscopy, and curing.

www.violumas.com



ams OSRAM and Meizhi settle patent disputes over LEDs used in Spider Farmer luminaires

Meizhi to source horticulture LEDs from ams OSRAM

ams OSRAM GmbH of Premstaetten, Austria and Munich, Germany and Shenzhen Meizhi Optoelectronics Technology Co Ltd have settled the pending LED-related patent disputes in the USA and Germany, resolving the proceedings before the US District Court for the District of Massachusetts and the Regional Court of Duesseldorf, Germany.

ams OSRAM filed the proceedings asserting various LED patents in the US and Germany relating to LED components used in horticultural lighting systems, specifically Spider Farmer luminaires.

The parties have agreed on reasonable commercial terms, including Meizhi sourcing horticulture LEDs from ams OSRAM. Further terms and details of the settlement are confidential, but it is said that both sides are satisfied with the result.

"This settlement marks an important step forward and reflects our commitment to protecting innovation while building constructive, long-term partnerships," says Dieter Boss, vice president Intellectual Property at ams OSRAM. "We welcome the opportunity to work with Meizhi in a commercially collaborative way that supports the continued growth and advancement of high-quality LED technologies."

ams OSRAM had already filed several complaints against the unauthorized use of its proprietary LED technology in certain horticultural lighting systems in 2025. Is says that, by taking these steps, it is safeguarding not only its own interests but also those who leverage their innovations — customers, partners and stakeholders who value fair market conditions. ams OSRAM adds that it will persist with vigilant market monitoring and will take necessary legal action as warranted.

www.ams-osram.com

Polar Light raises €5m+ funding to accelerate micro-LED commercialization

Total funding reaches €13m as firm prepares for product launches

Polar Light Technologies AB — which stems from research by founder professor Per-Olof Holtz and his team at Linköping University (with support from Sweden's innovation agency Vinnova) — has closed a €5m+ funding round led by J2L Holding AB, with participation from STOAF, Almi Invest and Butterfly Ventures .

The additional funds will advance the rollout of Polar Light's initial products, all based on its unique micro-LED architecture. This uses pyramidal structures grown without etching, enabling full RGB on a single epiwafer.

"Last May, we unveiled our first micro-LED display prototype. Today's funding announcement gives us the required runway to bring our first products to market," says CEO Oskar Fajerson.

"Micro-LED represents the future beyond LCD and OLED, with vast market potential. Our initial focus will be on small purpose-built HUD displays, followed swiftly by applications in smart glasses and wearables," he adds.

"Polar Light Technologies is the global leader in developing the next-generation micro-LED technology that will power tomorrow's display applications," comments J2L Holding's CEO Johan Lindh. "As the market begins to scale, Polar Light is well positioned to lead the way with innovations that make micro-LED displays easier to produce and far more accessible to integrate."

In 2025, Polar Light demonstrated its first public prototype at Display Week and showed an updated display at MicroLED Connect in September.

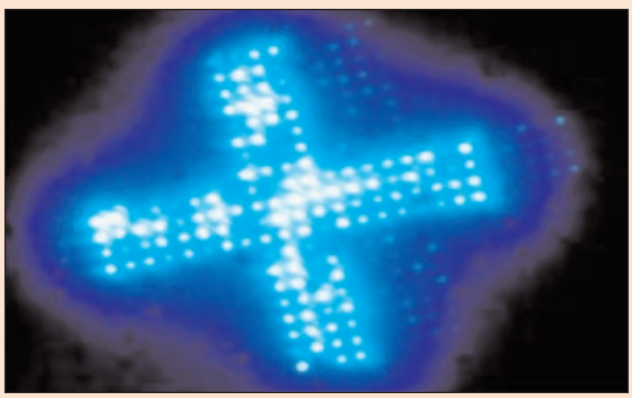
www.polar-light-technologies.com/technology-2

Polar Light achieves nano-scale LED, paving way to next-generation micro-LED/nano-LED devices

Pyramidal, bottom-up (etch-free) architecture in single material enables monolithic RGB displays

At SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January), Polar Light Technologies AB — which stems from research by founder professor Per-Olof Holtz and his team at Linköping University (with support from Sweden's innovation agency Vinnova) — has announced that it has produced its first series of nano-scale LEDs. The firm says that this illustrates the flexibility of its patented pyramidal architecture, developed without requiring the traditional etching process.

Over the last several months, Polar Light has produced a series of electrically excited indium gallium nitride (InGaN) nano-LEDs, measuring 500nm and smaller, which are built using the same monolithic architecture as Polar Light's existing micro-LED platform. This new process enables the firm to scale its technology to significantly smaller dimensions without compromising performance or efficiency.



"Reaching nano-LED scale without sacrificing LED performance or production capability is a major milestone for the industry," claims CEO Oskar Fajerson. "Nano-LEDs, in combination with our roadmap toward monolithic RGB, will enable the next generation of ultra-small, monolithic full-color displays."

In spring 2025, Polar Light demonstrated its first public prototype at Display Week. In January 2026, the firm announced a new €5m+ funding round that will enable the firm to bring its first products to market in late 2026.

www.spie.org/conferences-and-exhibitions/photonics-west
www.polar-light-technologies.com

ALLOS and Ennostar partner on 200mm GaN-on-Si LED epiwafers for micro-LED volume production

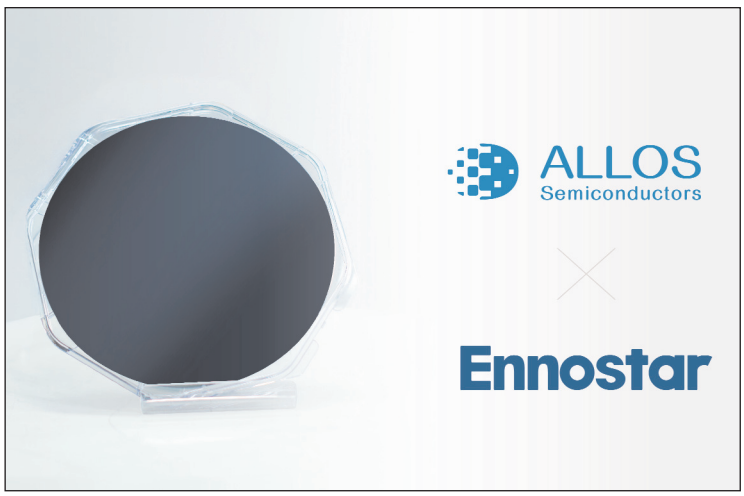
Partnership paves way for 300mm GaN-on-Si LED epiwafers, enabling integration with logic

ALLOS Semiconductors GmbH of Dresden, Germany — which provides 200mm and 300mm gallium nitride on silicon (GaN-on-Si) epiwafers focused on micro-LED applications, as well as licensing IP and transferring the technology — and Ennostar Corp of Hsinchu, Taiwan (a provider of integrated optoelectronic solutions, specializing in R&D and manufacturing III–V materials) have announced a strategic partnership to bring 200mm GaN-on-Si LED epiwafers for micro-LED applications into volume production. The collaboration is said to represent a milestone in establishing a silicon fab-compatible supply chain for micro-LED products.

ALLOS will hence be able to deliver its GaN-on-Si epiwafers at the volumes required by its customers, supporting their transition into micro-LED volume production. Ennostar takes on the role of ALLOS' manufacturing partner for 200mm GaN-on-Si LED epiwafers. With what is claimed to be one of the world's largest LED manufacturing infrastructures and expertise in high-end LED technologies (including micro-LEDs), Ennostar is reckoned to be uniquely positioned for the partnership. In addition to manufacturing, Ennostar will also contribute its LED-related technologies to further enhance product performance.

"With Ennostar we work with the best possible partner to provide our customers with a high-quality and scalable supply of epiwafers," says ALLOS' co-founder & CEO Burkhard Slischka. "Together we can offer the industry's best combination of highest LED efficiency and superior on-wafer and wafer-to-wafer yields for micro-LED chip manufacturing," he adds.

"This partnership delivers competitive GaN-on-Si micro-LED solutions and provides a scalable production pathway compatible with standard silicon foundry processes," says Ennostar's president Dr Terry Tang. "By partnering with ALLOS, we can now address the 200mm GaN-on-Si LED epiwafer segment alongside our existing market-leading micro-LED solutions, offering a uniquely comprehensive value proposition to the rapidly evolving micro-LED industry."



ALLOS says that its epiwafer products are engineered to meet the stringent requirements of micro-LED applications, including uniformity, elimination of micro-defects, and optimized driving currents. Designed for compatibility with standard silicon fabs, the epiwafers are available with a thickness of 725µm and conform to silicon industry cleanliness and contamination standards.

GaN-on-Si epiwafers from ALLOS.

By combining ALLOS' proprietary buffer and n-GaN layers with Ennostar's LED layer technologies, the resulting GaN-on-Si LED epiwafers are claimed to deliver brightness and energy efficiency on a par with conventional GaN-on-sapphire solutions.

"We share our customers' vision that using standard silicon fabs for micro-LED manufacturing will unlock the yield and cost efficiencies needed to make mass production of micro-LEDs economically viable," says Slischka on ALLOS' business strategy. "Through our partnership with Ennostar, we can now quickly scale up epiwafer production with increasing demand for micro-LED products."

The partnership also paves the way for 300mm GaN-on-Si LED epiwafers, enabling efficient integration with 300mm logic wafers — essential, for example, to enable ultra-fast and energy-efficient optical interconnects between AI processors and memory chips using micro-LED light sources. ALLOS has already demonstrated 300mm capability since 2020 and continues to refine the technology with lead customers.

www.allos-semiconductors.com
www.ennostar.com

Luminus leverages APC partnership to enhance energy-efficient LED lighting solutions

LEDs combine with SiC power semiconductors to yield energy savings and system efficiency

Luminus Devices Inc of Sunnyvale, CA, USA — which designs and makes LEDs and solid-state technology (SST) light sources for illumination markets —and APC Electronics (APC-E) of Bend, OR, USA — which designs and manufactures wide-bandgap power semiconductor products — have teamed up to deliver energy-efficiency gains for the global LED lighting industry. This exclusive collaboration pairs Luminus' high-brightness LED products with APC-E's silicon carbide (SiC) power semiconductors, enabling customers to build system architectures that maximize luminaire power efficiency, thus reducing operational costs and environmental impact.

The partnership between Luminus LEDs and APC-E SiC power semiconductors targets lighting system optimization. While Luminus delivers light-emitting devices such as the latest MP-5050 P series with luminous efficacy as high as 244 lumens per watt, APC-E's proprietary SiC technology eliminates the efficiency losses that traditionally occur in power conversion stages. Switching a LED luminaire power supply design from traditional silicon to APC-E SiC components can reduce power supply weight and volume by 50% in 200W systems and improve system efficiency as much as 15% in very high-power (1000W) applications from street lighting, high-mast, high-bay, stadium, as well as industrial applications such as UV curing and horticulture. Even lower-power applications such as 100W fixtures can significantly benefit from the efficiency gains of SiC, and with SiC market prices having decreased by ~25% annually during the past few years, the low cost of SiC components makes the switch from silicon or even gallium nitride (GaN) to SiC especially attractive in today's market, it is reckoned. Together, the complementary LED and APC-E SiC technologies from Luminus create end-to-end solutions that fundamentally transform how customers think about lighting performance, the firm adds.

"Luminus has established a leading reputation for LED efficacy, quality of light and reliability since our first generation of COBs in 2013," claims CEO Mark Pugh. "When paired with APC-E's SiC power devices, we're helping our customers take their systems to new levels of efficiency, which not only reduces energy usage and helps the environment but also enables rebates and other local government incentives," he adds. "This partnership with APC-E brings value to our existing illumination customers and will expand widely into other industries in the coming years as they leverage unique, elegant solutions for demanding applications across industrial power supplies, data centers, EVs [electric vehicles], and medical systems."

The Luminus + APC-E combination makes it easier to design energy-efficient systems with critical opto-electronic and power components, all available through one channel, thanks to Luminus's global sales and distribution network.

APC-E's SiC MOSFETs eliminate tail current and reduce switching losses, while shrinking complementary passive components. These solutions enable compact luminaire power supply designs with lower capacitance and reduced on-state resistance compared to legacy systems.

APC-E's SiC Schottky barrier diodes (SBDs) feature low forward voltage with reduced capacitive charge, minimizing reverse recovery losses. These are suitable for power factor correction (PFC) stages, on-board chargers, and EV charging applications — markets that are experiencing explosive demand.

Luminus Devices is the exclusive worldwide sales channel and go-to-market partner for APC Electronics. Through this strategic collaboration, customers worldwide gain access to SiC power semiconductor solutions through Luminus' established regional representatives and distribution network, ensuring rapid local support, accelerated delivery timelines, and seamless integration with Luminus' LED product lines

www.apowerc2.com
www.luminus.com

SDI buys PRP Optoelectronics for £9.3m

SDI Group plc (which acquires and develops companies that design and manufacture specialist products for use in lab equipment, industrial & scientific sensors and industrial & scientific products) has acquired PRP Optoelectronics Ltd of Swindon, UK for £9.3m, excluding £2.8m of acquired net cash. The total consideration comprises £11.3m in cash paid on completion; and £0.8–0.9m of deferred cash, subject to working capital completion accounts (to be paid to the sellers after completion).

The cash consideration will be funded from SDI's revolving credit facility with HSBC UK Bank. As at end-January, SDI had cash of about £1.1m, bank debt of £19.4m and £5.5m of undrawn bank facility. In addition, it exercised £6m of its accordion option in early February, with £9m remaining unexercised.

With 33 staff, PRP designs and manufactures custom high-performance micro-LEDs, LED light engines and monolithic LED arrays, delivering precision illumination spanning infrared through to ultraviolet, for applications in the avionics, defence and industrial sectors. With complete in-house capabilities (from semiconductor wafer processing to final system assembly), PRP can deliver bespoke solutions for demanding applications such as avionics displays, thermal imaging and water and air purification systems. For full-year 2025, revenue was £5.99m and EBIT was £1.54m. Net assets (including cash) is £4.43m.

The firm serves a critical and technical niche, particularly in the aerospace & defence markets, where its products are essential components in programs including the Eurofighter Typhoon, General Dynamics F-16 and Lockheed Martin F-22 Raptor. Supported by long-term agreements, there is said to be long-term revenue visibility, with a stable, blue-chip customer base and revenues primarily linked to overseas end-markets.

PRP's managing director Kevin Peart and technical director Sam Cox (the majority shareholders) will remain with the business in a full-time capacity.

PRP will join the SDI Group's Industrial & Scientific Sensors division, extending SDI's footprint into the resilient and lucrative aerospace & defence sector.

Also, PRP's LED micro-displays for optical systems and UV purification products add a complementary offering to SDI, strengthening its footprint across the specialist end-markets occupied by both Graticules Optics and MPB Industries.

"The acquisition of PRP is a significant milestone for SDI, marking our entry into the avionics markets. The business boasts a range of products in a very particular niche, which have applications across multiple sectors, including in aviation and on platforms including the General Dynamics F-16 and Airbus A320 among others," notes SDI Group's CEO Stephen Brown. "PRP is a profitable business, with strong revenue visibility and an international customer base which meets our key acquisition criteria."

www.prpopto.com
www.sdigroup.com

III-V Epi exhibits at Photonics West

III–V Epi Ltd of Glasgow, Scotland, UK — which provides a molecular beam epitaxy (MBE) and metal-organic chemical vapor deposition (MOCVD) service for custom compound semiconductor wafer design, manufacturing, test and characterization — showcased its specialist, low-volume, fast-turnaround, III-V epitaxy manufacturing services at SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January).

III-V Epi says that its focus on speed to market; specialist knowledge of MBE and MOCVD manufacturing processes; and expertise in both gallium arsenide (GaAs) and indium phosphide (InP) material systems makes it the ideal supply partner for a wide range of commercial and academic projects. It serves a variety of high-growth semiconductor and photonics markets, where manufacturing speed is key, but high consumer volumes are not required. Chief technical officer professor Richard Hogg is available at Photonics West to discuss projects, applications and answer questions.

"III-V Epi expedites manufacture of MBE and MOCVD epitaxial structures for semiconductor and photonics devices with more moderate production volume needs," says director Calum McGregor. "This includes markets, such as defence, security and evolving quantum technologies where, despite their often-critical nature, the need for small and medium volumes makes their production a low priority for suppliers absorbed in high-volume, consumer markets.

III-V Epi services include specialist design, test, metrology and characterization; also an essential part of bringing innovative, collaborative photonics projects and devices to market quickly and efficiently," he adds.

"III-V Epi also provides invaluable expertise in both GaAs and InP material systems, using MBE and MOCVD manufacturing processes," McGregor continues. "Many new and emerging computing, communications, space, fintech, healthcare, and defence markets favour GaAs for manufacturing flexibility, where we have valuable know-how. We also have extensive InP experience, widely used in datacoms, telecoms, AI and HPC."

www.spie.org/conferences-and-exhibitions/photonics-west

NUBURU activates Q1 production ramp for 40 high-power blue laser systems

NUBURU Inc of Centennial, CO, USA has activated its first-quarter 2026 structured production ramp through its operating subsidiary Lyocon S.r.l., following a previously awarded contract valued at about $850,000. Acquired in January, Lyocon is the core industrial platform for NUBURU's reactivated blue-laser business.

The order consists of 40 high-power 450nm blue laser systems for Dutch agritech automation company Trabotyx, including 24 units of 100W systems and 16 units of 200W systems.

The principal manufacturing and delivery cycle is scheduled for first-quarter 2026 and represents the first fully structured production cadence under NUBURU's reactivated blue-laser industrial platform.

Industrial execution supporting defense platform strategy

While deployed within the agritech vertical, the order provides operational validation of Lyocon's scalable 450nm high-power laser architecture — a core technological pillar of NUBURU's broader non-kinetic and directed-energy strategy.

The platform enables:

- concentrated energy delivery in compact configurations;
- modular scalability between 100W and 200W systems;
- high-precision targeting capability;
- integration within automated and AI-driven operational systems.

Importantly, the Q1/2026 production ramp establishes a repeatable manufacturing framework, strengthening supply chain readiness, quality control standardization, assembly throughput, and deployment discipline.

Commercial deployments in civilian markets provide performance validation and industrial scale that are strategically relevant to mission-critical and security-oriented applications, says NUBURU.

As the firm continues to build its integrated Defense & Security ecosystem, structured industrial output serves as a measurable step in reinforcing operational discipline and revenue reactivation.

"This Q1/2026 production ramp reflects disciplined execution under our transformation strategy," says Dario Barisoni, co-CEO of NUBURU and executive director of Lyocon. "Structured manufacturing cycles are foundational to building credible non-kinetic and directed-energy capabilities. Delivering under repeatable industrial programs strengthens our operational foundation and supports the progressive expansion of our Defense & Security platform," he adds.

"Following a rigorous validation phase with the customer in 2025, we are now executing under a defined production program," says Lyocon executive director Paola Zanzola. "The flexibility between 100W and 200W configurations underscores the modularity of our architecture and its suitability for advanced automated systems. This delivery cycle represents an important operational milestone for Lyocon."

www.lyocon.com

NUBURU completes first tranche of preferred equity restructuring

NUBURU has completed the first tranche of a preferred equity restructuring transaction that simplifies its capital structure and reduces legacy balance-sheet overhang.

This resulted in the restructuring and effective elimination of about $8.4m of Series A convertible preferred stock liabilities, representing about 844,938 shares of Series A preferred stock, and about 40% of the firm's outstanding Series A preferred liabilities, without any cash redemption by the company.

First Tranche

A third-party investor acquired 844,938 shares of the Series A convertible preferred stock from an existing preferred stockholder and then exchanged those shares with NUBURU for pre-funded common stock purchase warrants with a nominal exercise price.

The related preferred stock liabilities were hence eliminated and converted into equity-classified instruments, materially reducing preferred stock overhang while preserving liquidity.

Potential additional tranche

NUBURU aims to complete an additional restructuring transaction involving about 450,000 shares of Series A convertible preferred stock in the near future. Any such additional tranche would be subject to further agreement with the investor and satisfaction of applicable conditions. There can be no assurance that any additional tranche will be completed.

Balance-sheet simplification and strategic context

This first-tranche restructuring follows other balance-sheet actions undertaken by NUBURU in 2025, including negotiated settlements of certain legacy accounts payable. These actions reflect management's continued focus on addressing historical capital structure complexity while maintaining liquidity to support the ongoing transformation plan.

NUBURU continues to evaluate strategic initiatives and acquisitions across defense, security and critical-infrastructure-related technologies, subject to regulatory approvals, market conditions, and financing availability.

www.nuburu.net

NUBURU completes Lyocon acquisition

NUBURU has completed its acquisition of Lyocon S.r.l., an Italian laser-technology company specializing in the design, manufacturing and integration of high-power blue laser systems for industrial applications, with established operations, customers and recurring revenues. The transaction was completed through Nuburu Subsidiary Inc.

The acquisition marks the formal re-establishment of NUBURU's core blue laser industrial business, transitioning the firm from a technology-development phase into a fully operational, revenue-generating industrial platform serving a defined segment of the global industrial laser market.

An operating industrial business with customers, revenues and market adoption

Lyocon operates an established blue laser manufacturing and integration business with active commercial deployments and long-standing customer relationships. Its systems are currently used across multiple industrial verticals, including advanced and additive manufacturing (particularly for copper and reflective metals), precision welding and surface treatment, electronics and power-component manufacturing, and selected precision-agriculture and industrial processing applications.

Through this acquisition, NUBURU consolidates technology ownership, manufacturing capability, and commercial execution under a unified industrial platform, re-establishing its presence as an industrial photonics company with real operations and market traction.

Participation in a $20bn+ global industrial laser market

Lyocon's operations are focused on a specialized segment of the global industrial laser market — estimated by industry research to exceed $20bn — where blue laser technology offers structural performance advantages over traditional infrared solutions. These advantages are particularly pronounced in applications involving copper, reflective metals, and advanced materials critical to electrification, automation, and next-generation manufacturing.

Dual-use optionality anchored in a civil industrial base

Building on Lyocon's commercial footprint, NUBURU intends to pursue a disciplined dual-use strategy, extending blue laser applications from civil and commercial markets into future defense and national security use cases. Any such expansion is expected to be pursued selectively and incrementally, following continued scaling and validation of the civil industrial business.

Strengthening NUBURU's defense and security platform

The acquisition of Lyocon further strengthens NUBURU's internal photonics capabilities across its broader defense and security ecosystem. Blue laser technologies are increasingly relevant in next-generation defense applications, including advanced manufacturing, hardened electronics, power systems, sensing, and precision components used in autonomous, aerial, and protected platforms.

This industrial capability is strategically complementary to NUBURU's defense and security initiatives, including Tekne and the company's previously announced drone-focused industrial initiative currently under evaluation. By re-establishing an internal, operational blue laser platform through Lyocon, NUBURU enhances its ability to design, evaluate and potentially integrate photonics-based solutions across its defense and security roadmap over time.

Public industrial validation at SPIE Optics & Photonics

As further validation of its operational status, Lyocon is participating in the exhibition at SPIE Optics & Photonics 2026 in San Diego, CA, USA (23–27 August), presenting its technology under the NUBURU trademark. The exhibition features live systems, industrial applications, and commercial solutions, highlighting the company's return to active market engagement.

Lyocon governance

Following completion of the transaction, the governance of Lyocon, the acquired operating subsidiary, has been restructured to support industrial execution and integration within the NUBURU group:

- Dario Barisoni — chairman & executive director;
- Alessandro Zamboni — director;
- Paola Zanzola — executive director.

This governance structure is designed to ensure continuity of operations, accelerate execution of the commercial plan, and support integration. The governance and board composition of NUBURU Inc remain unchanged.

"This acquisition marks a decisive turning point. With Lyocon, we are integrating a fully operational industrial business with customers, revenues, and manufacturing capability," notes Dario Barisoni, co-CEO of NUBURU and chairman & executive director of Lyocon. "This is not a restart of R&D — it is the establishment of a scalable, revenue-oriented industrial platform anchored in blue laser technology. "The transaction reflects discipline and alignment. Our focus is on execution, operational scale-up, and long-term value creation," he adds.

"The current business plan reflects a realistic and conservative ramp of the commercial business, based on existing customers and validated applications," says Lyocon's executive director Paola Zanzola. "At the same time, the platform we are building is inherently dual-use, creating meaningful optionality that we intend to pursue only once the industrial base is fully scaled and mature."

Following its acquisition by Nuburu Subsidiary Inc, Lyocon operates as a fully consolidated operating subsidiary within the NUBURU group and represents the core industrial platform for NUBURU's reactivated blue-laser business.

www.lyocon.com

Nuvoton releases high-power 1W 379nm UV laser diode

Nuvoton Technology Corp Japan of Kyoto, Japan has begun mass production of its KLC330FL01WW high-power ultraviolet semiconductor laser (379nm, 1.0W), which delivers what is claimed to be industry-leading optical output in a 9.0mm-diameter CAN package (TO-9).

Applications include: maskless lithography, resin curing, marking, 3D printing, biomedical, and alternative light sources for mercury lamps etc.

Through a proprietary device structure and advanced high-heat-dissipation packaging technology, it achieves short wavelength, high output power, and long lifetime — three elements previously considered difficult for ultraviolet semiconductor lasers. As a result, it can contribute to fine patterning and improved production throughput in maskless lithography for advanced semiconductor packaging (in which multiple chips are densely integrated to optimize performance and power efficiency).

Features of the new product:

1.0W-class optical output at 379nm, contributing to fine patterning and improved production throughput in maskless lithography for advanced semiconductor packaging.

As demand grows for information processing capabilities driven by the evolution of artificial intelligence (AI), there is increasing need for higher performance from semiconductors than ever before. On the other hand, as the miniaturization of transistors approaches its physical and economic limits, semiconductor back-end package technologies and advanced semiconductor packaging, which allow integration by arranging multiple semiconductor chips side by side or stacking them vertically, have been attracting attention.

In advanced packaging, the mainstream method for forming wiring connections between multiple chips has been exposure technology using the i-line (365nm) of the mercury spectrum and photomasks (master masks of circuits). On the other hand, there has been growing interest in recent years in maskless lithography technology, which directly exposes (draws) wiring patterns based on design data without using photomasks.

This technology is considered to reduce the time and cost associated with the design and production of photomasks. Furthermore, because it is possible to directly imprint wiring patterns to match the surface shape of the target for drawing, alignment and correction are easier, and application to advanced semiconductor packages is currently under consideration.

As one of the key light sources in maskless lithography, semiconductor lasers have faced increasing demands for shorter wavelengths closer to the i-line (365nm) and higher output, in order to enable finer wiring and improve equipment throughput. To meet these requirements, Nuvoton says that it has leveraged over 40 years of experience in laser design and manufacturing to develop and commercialize an ultraviolet semiconductor laser with a wavelength of 379nm and an output of 1.0W.

Improved heat dissipation of UV lasers through a proprietary device structure and packaging technology, suppressing device degradation from self-heat generation and UV light and contributing to extended lifetime of optical equipment.

Ultraviolet semiconductor lasers generally suffer from significant heat generation caused by low wall-plug efficiency (WPE), and a tendency for device degradation caused by ultraviolet light, making stable operation at high output levels above 1.0W difficult to achieve. To address this, Nuvoton took a dual approach by focusing on both a device structure that enhances wall-plug efficiency (WPE) and a high-thermal-conduction package technology that effectively dissipates heat, enabling the firm to develop a product that combines short wavelength, high output, and long lifetime: a 1.0W ultraviolet (379nm) device. As a result, Nuvoton is contributing to extending the lifetime of optical devices that utilize ultraviolet light.

- Device structure to enhance WPE

As well as optimizing the emission layer and optical guide layer, Nuvoton has adopted a proprietary structure that precisely controls the doping profile. By reducing light absorption loss and operating voltage, this allows electrical energy to be converted into light more efficiently.

- High-thermal-conduction package technology that efficiently dissipates heat.

In addition to adopting a submount made of high-thermal-conductivity materials, the package materials have been revised to reduce thermal resistance. As a result, rises in device temperature are suppressed, allowing for stable operation at high output.

Expanded lineup of mercury lamp replacement solutions, enhancing flexibility in product selection to suit different applications.

The new product has been added to the Nuvoton's lineup of ultraviolet (379nm), violet (402nm) and indigo (420nm) semiconductor laser-based alternatives designed to replace the i-line (365nm), h-line (405nm) and g-line (436nm) emission lines of mercury lamps, providing customers with a new choice. With this addition, customers can flexibly select products according to application, installation environment, and required performance, increasing the freedom of system design.

The new product was showcased at SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January), and is being exhibited at OPIE'26 (OPTICS & PHOTONICS International Exhibition) at Pacifico Yokohama, Japan (22–24 April)

www.spie.org/conferences-and-exhibitions/photonics-west
www.opie.jp
www.nuvoton.co.jp/en

Phlux wins Prism Award for Sensors at Photonics West

Sheffield spin-off recognized for Aura family of 1550nm Noiseless InGaAs APD sensors

Phlux Technology — which was spun off from the University of Sheffield in 2020 to design and make 1550nm avalanche photodiode (APD) infrared (IR) sensors — has won the SPIE Prism Award for its Aura family of 1550nm Noiseless InGaAs APD sensors. The award was presented at a gala dinner during SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January).

The sensors are said to be 12x more sensitive than traditional indium gallium arsenide (InGaAs) APDs, a performance boost that eluded the IR sensor industry for over 20 years. The improvement was achieved by adding an antimony alloy into the compound semiconductor manufacturing process, which dramatically reduced the noise generated in the avalanche

amplification process and also produced other enhancements including dynamic range improvements, fast recovery in the presence of large signals, and better temperature stability. Noiseless InGaAs patented technology is the result of eight years of research at the University of Sheffield.

Available in 30µm, 80µm and 200µm versions, for a given laser power the sensors extend the range of IR systems by up to 50%. Optionally, significantly lower laser power can be used while maintaining system range. This approach cuts system costs by up to 40% and size and weight by up to 30%. Currently, the sensors' primary applications are professional laser range finders, fiber-optic test equipment (OTDRs), long-distance LiDAR, and free-space optical communications. At 1550nm eye-safe operation assured, which is a great advantage over 905nm IR systems, enabling extended system range because higher-power lasers can be used without introducing risk.

"This is a crowning moment for our team after five years of relentless effort in technical innovation and product commercialization," says CEO Ben White.

www.phluxtechnology.com

Vexlum raises €10m to scale VECSEL laser manufacturing

Funding to speed adoption in quantum, semiconductor & space sectors

To scale its proprietary semiconductor chip manufacturing and laser technology operations in Finland, VEXLUM — which was spun off from Tampere University of Technology's Optoelectronics Research Centre in 2017 — has secured €10m in funding, consisting of €6m in equity investment led by Kvanted (a Nordic venture capital firm focused on industrial technology), with participation from Finnish state-owned Tesi (Finnish Industry Investment Ltd) and the EIC Fund, alongside a €2.4m grant from the EIC Accelerator, and a €1.6m loan from Nordea.

Vexlum's semiconductor-based vertical-external-cavity surface-emitting laser (VECSEL) technology addresses a critical bottleneck: the lack of compact, cost-effective, high-power laser sources at precise wavelengths. Applications such as atomic clocks and quantum computers, as well as next-generation semiconductor metrology and free-space optical communication technology, all rely heavily on lasers.

Now, Vexlum is expanding its manufacturing capabilities in Finland to ensure quality and speed as it responds to strong market demand following the introduction of several product lines.

"Securing and scaling our semiconductor fabrication infrastructure is critical for the market's evolution. It allows us to ensure that the laser quality and reliability meet our customers' stringent requirements," says CEO & co-founder Jussi-Pekka Penttinen. "We are moving beyond boutique production to industrial-scale capability. This funding allows us to bring our semiconductor manufacturing into a new, expanded facility here in Tampere and scale our capacity to meet the demand from the quantum, semiconductor, and space sectors."

Vexlum utilizes molecular beam epitaxy of III-V materials including gallium arsenide, indium phosphide and gallium antimonide to produce

laser wafers for specific wavelengths.

"Tampere has emerged as a leading hub for optoelectronics and III–V semiconductor technology, building on a strong foundation of world-class academic research and a proven ability to translate it into industrial innovation," says chairman & co-founder Mircea Guina. "This investment round represents a decisive step in scaling our ambitions, securing a leading position for Tampere and Finland in the advanced semiconductor industry."

The financing represents a significant milestone for the Nordic deep-tech ecosystem, standing as potentially the largest seed round ever raised by a photonics company in the region, it is reckoned. The funding will drive Vexlum's growth strategy, which is aiming for €100m in revenue by 2030.

Kvanted sees Vexlum as a prime example of the Tampere region's deep-tech engineering prowess in laser technology. "We are investing in a semiconductor manufacturer that has cracked the code on scaling high-power, precise wavelengths for the world's most difficult problems," comments Axel Ahlström, founding partner at Kvanted.

Currently a major supplier for trapped-ion quantum computers, Vexlum's ability to manufacture lasers across diverse wavelengths allows it to power solutions far beyond quantum labs. For example, the technology is also being developed to make satellite optical communications more reliable, to enable next-generation optical atomic clocks that aim to redefine the precision of timekeeping, and for other uses where specific laser colors are needed.

"The quantum ecosystem has taught us that extreme precision is only valuable if it can be delivered reliably and at scale. We are now taking those hard-won lessons and applying them to the broader photonics landscape," says Penttinen. "Whether for satellite communications or semiconductor metrology, we are proving that the rigorous architecture developed for quantum computers is the same engine needed to drive the next generation of industrial innovation."

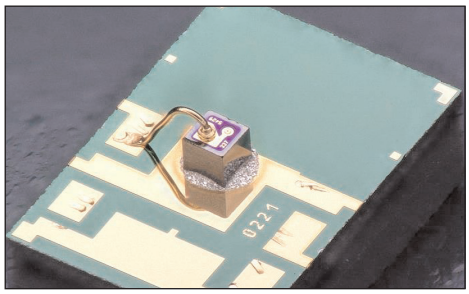
www.vexlum.com

Coherent and Quside demo verifiable entropy for quantum-safe encryption

Solution relies on Coherent's VCSELs and Quside's quantum random number generation technology

Materials, networking and laser technology firm Coherent Corp of Saxonburg, PA, USA and quantum technology company Quside have reached a milestone in hardware-based security with the demonstration of a mass-manufacturable quantum entropy source. This shows that fast, verifiable quantum entropy — an essential foundation for secure digital systems — can be embedded at scale, supporting next-generation security architectures across a wide range of applications.

The solution relies on Coherent's vertical-cavity surface-emitting laser (VCSEL), manufactured at scale on 6" wafers, and Quside's quantum random number generation technology. For the first time, runtime entropy verification from a single VCSEL delivers high-quality, observable randomness suitable for cryptographic key generation, secure communications, and emerging quantum-safe and crypto-agile systems. Therefore, quantum-grade security primitives can now move beyond niche



deployments into mainstream processors, secure elements, and hardware roots of trust.

"VCSEL technology has already demonstrated its reliability and scalability across data centers, sensing, and high-volume optical systems," says Coherent's chief strategy officer Dr Giovanni Barbarossa. "This collaboration shows how mature photonic manufacturing platforms can enable entirely new security functions while meeting the cost, reliability and scale requirements needed for broad market adoption," he adds.

"Security systems are only as strong as the randomness they rely on," notes Quside's CEO & co-founder Dr Carlos Abellán. "What makes this milestone unique is not only that the entropy is generated through quantum processes, but that it is fast, verifiable and mass manufacturable by relying on volume-proven 6" VCSEL production. This moves locally verified quantum entropy technology into practical, deployable infrastructure."

At SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January), Coherent and Quside are presenting a live demonstration of the technology alongside development kits. Attendees can explore how the solution can be integrated into next-generation secure designs, from silicon to system level, to meet growing demand in entropy generation and verification.

With manufacturing-ready components and established production processes, Coherent and Quside say they are paving the way towards high-volume commercial deployment of quantum entropy solutions designed for real-world, large-scale secure infrastructure.

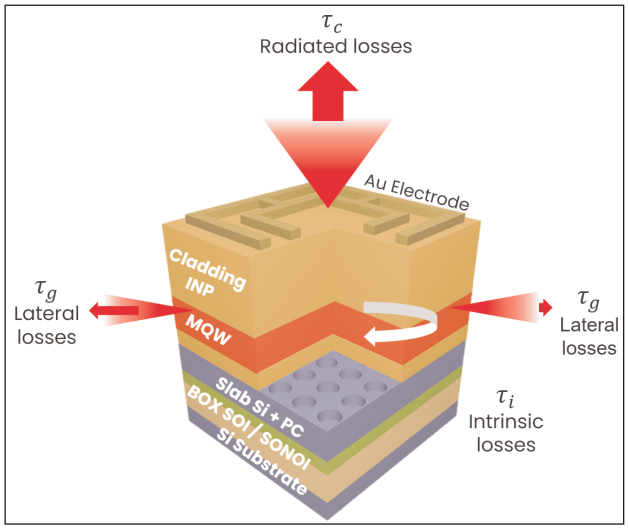
www.spie.org/conferences-and-exhibitions/photonics-west
www.coherent.com

CEA-Leti advances silicon-integrated quantum cascade lasers for mid-IR photonics

New hybrid laser architectures demonstrate three credible paths toward compact, scalable mid-IR photonic systems

At SPIE Photonics West 2026 in The Moscone Center, San Francisco, CA, USA (20–22 January), micro/nano-technology R&D center CEA-Leti of Grenoble, France is presenting new research highlighting major progress in the integration of quantum cascade lasers (QCLs) with silicon photonic platforms for mid-infrared (MIR) applications.

The paper 'Advanced Architectures for Hybrid III–V/Silicon Quantum Cascade Lasers: Toward Integrated Mid-Infrared Photonic Platforms' compares three complementary hybrid laser architectures that collectively advance the practicality, flexibility and scalability of MIR photonics.



III-V/Si photonic crystal surface-emitting QCL & micro-resonator ring. Credit: Alexis Holb.

Toward 'Smaller, More Robust, and More Manufacturable MIR Systems'

Mid-infrared light plays a critical role in technologies such as gas sensing, chemical spectroscopy, biomedical diagnostics, and security, because many molecules exhibit strong absorption signatures in this spectral region. Despite the technology's importance, MIR photonic systems remain large, costly and difficult to manufacture at scale. Integrating MIR light sources directly onto silicon photonic platforms offers a path toward smaller, more robust and more manufacturable systems — bringing mid-infrared photonics closer to the level of integration in the near-infrared.

Three architectures, three integration strategies

In its Photonics West presentation, CEA-Leti demonstrated and compared three distinct hybrid III-V/silicon QCL architectures, each addressing a different integration challenge:

● *Hybrid Distributed Feedback QCL on Silicon-on-Nothing-on-Insulator with Adiabatic Coupling*

This approach enables robust single-mode emission around 4.3µm with efficient optical power transfer from the III–V active region into silicon waveguides. High-index-contrast silicon photonics provide precise feedback and light routing, making this architecture well suited for scalable photonic integrated circuits targeting spectroscopy and chemical sensing.

● *Hybrid QCL with an External Silicon DBR Cavity*

In this configuration, optical gain and optical feedback are decoupled: the III-V material provides amplification, while wavelength selection and feedback are implemented in silicon using distributed Bragg reflector (DBR) cavities. This separation offers enhanced design flexibility and opens a clear path toward tunable and multi-functional MIR sources for advanced spectroscopic and sensing systems.

● *Ultra-Compact QCL Micro-Sources Based on Photonic Crystals & Micro-Rings*

Miniature light sources in these devices achieve footprints below 100µm^2 by leveraging strong optical confinement and resonant effects. The resulting extreme miniaturization enables dense on-chip integration and supports new system architectures where size, power consumption, and integration density are critical.

From passive platform to active host

Collectively, results show that silicon photonics can play an active role in mid-infrared laser systems. By combining adiabatic optical coupling, silicon-based feedback and cavity engineering, and ultra-compact laser concepts, CEA-Leti establishes several viable integration pathways rather than a single one-size-fits-all solution.

The work highlights how different architectures trade off stability, flexibility and footprint, providing designers with a practical toolkit for MIR photonic systems.

"By combining quantum cascade lasers with silicon photonics, we are bringing mid-infrared sources closer to the level of integration and scalability that silicon platforms have already achieved in the near-infrared," says Alexis Hobl, presenter and lead author of the paper.

Looking ahead

Future work will focus on further improving optical coupling efficiency, fabrication robustness, and thermal and electrical management, as well as integrating additional on-chip photonic functions such as filters, multiplexers and interferometric circuits. Demonstrating wafer-scale reproducibility and packaging-ready designs will be key milestones on the path toward fully integrated mid-infrared photonic systems.

Also contributing to the project are L'Institut des Nanotechnologies de Lyon (INL), III–V Lab, and Fraunhofer Applied Solid State Physics IAF.

www.leti.fr

LIGENTEC and X-FAB expand integrated photonics collaboration

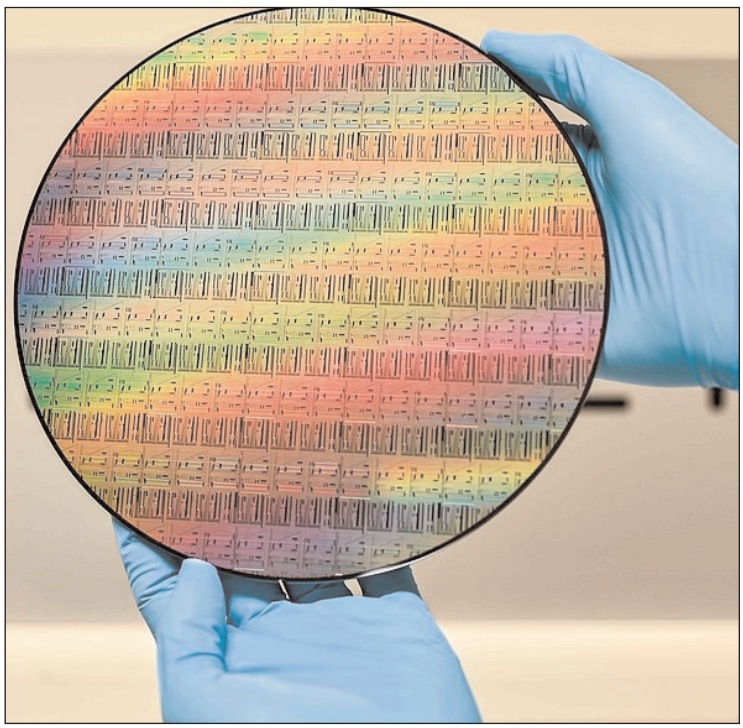
TFLN-on-SiN and TFLN-on-SOI to be scaled on X-FAB 200mm foundry

LIGENTEC SA of Lausanne, Switzerland — which provides silicon nitride (SiN) and silicon-on-insulator (SOI) platforms with heterogeneous integration of thin-film lithium niobate (TFLN) and III-V materials — and analog/mixed-signal and specialty foundry X-FAB Silicon Foundries SE of Tessenderlo, Belgium have expanded their collaboration to further strengthen their integrated photonics offering and streamline customer access to advanced photonic technologies. The announcement marks the next step in aligning their portfolios to address growing demand across communication, computing, quantum and sensing markets.

As part of this expansion, the partners will jointly bring X-FAB's XPH90 silicon photonics technology to market through its integration into LIGENTEC's broader photonics platform portfolio, creating a unified ecosystem spanning both SOI and established low-loss silicon nitride (SiN) technologies. LIGENTEC will serve as the primary customer interface, providing a streamlined and coherent entry point to both high-bandwidth SOI solutions and its established low-loss SiN platform.

Together, these platforms address a wide range of application requirements, from high-speed, high-volume datacom and telecom to advanced computing, quantum and sensing systems. The SiN technology continues to gain significant traction and expands capabilities across multiple markets, while SOI adds a dedicated solution for bandwidth- and integration-driven datacom and telecom applications.

A central pillar of the collaboration is the industrialization of heterogeneous integration technologies across both the SiN and SOI platforms, addressing the integration of key active and passive building blocks, including lasers, optical amplifiers, high-speed modulators, and photodetectors. A particular focus will be placed on thin-film lithium niobate (TFLN) technologies, enabling advanced electro-optic capabilities for high-performance, next-generation communication and signal-processing systems.



A 200mm wafer with photonic integrated circuits.

To support this vision, the partners will invest in scaling high-speed TFLN-on-SiN and TFLN-on-SOI within the X-FAB foundry ecosystem on 200mm wafer technologies. This step supports a clear path from advanced R&D to industrial-scale production and strengthens Europe's position in next-generation photonic integration.

Through this unified go-to-market approach, customers are expected to benefit from a broader and more coherent technology portfolio, early engagement at the system and application level, and a reliable transition from prototyping to volume manufacturing. The collaboration further reinforces the partners' ambition to build a robust, industrial-scale supply chain for integrated photonic technologies.

"Our collaboration with LIGENTEC to co-develop and co-market XPH90 SOI technology alongside their low-loss silicon nitride platform is a powerful response to the market's need for versatile, scalable photonics," says X-FAB's CEO Rudi De Winter. "By fostering this heterogeneous integration, particularly with thin-film lithium niobate, we are providing the essential building blocks for quantum computing and the next generation of telecommunications and data communications systems. This collaboration reinforces our commitment to developing a robust, industrial-scale high-volume European photonics supply chain," he adds.

"Our goal has always been to offer a seamless transition from prototyping to volume production," says LIGENTEC's CEO Thomas Hessler. "By expanding our partnership with X-FAB, we are giving our customers early access to a broader technology stack that now includes X-FAB's XPH90 SOI technology, as well as high-volume thin-film lithium niobate (TFLN) integration. This technology enables cutting-edge performance and helps our partners stay at the forefront of innovation in sensing, connectivity and computing applications."

www.ligentec.com
www.xfab.com

PhotonDelta launches Global Photonics Engineering Contest at PIC Summit USA

Prize of up to €2m investment and €100,000 in services to be announced in August

Photonic chip industry accelerator PhotonDelta of Eindhoven, the Netherlands (which connects and collaborates with an ecosystem of photonic chip technology organizations worldwide) has launched its second global engineering contest in collaboration with SIEMENS company Wevolver (a global knowledge and community platform for engineers and tech companies) to stimulate the creation of new applications for photonic chips that tackle global challenges.

PhotonDelta is a non-profit organization supporting an end-to-end value chain in the Netherlands for photonic chips that designs, develops and manufactures innovative solutions. Leveraging funding from the National Growth Fund of the Netherlands alongside strategic investments, PhotonDelta is committed to facilitating the growth of startups, the creation of new photonic chip applications, and the development of infrastructure and talent.

The contest builds on the success of last year's competition, which saw Massachusetts Institute of Technology (MIT) spin-off Perceptra of Oakland, CA, USA triumph with its photonic chip-based Raman sensor for real-time chemical monitoring. Perceptra received €1.2m in investments from PhotonDelta, together with access to up to €50,000 worth of services to help bring the concept into reality. The firm will open an R&D facility in the Netherlands to scale photonic sensing for chemical monitoring.

Launched on 19 January at the PIC Summit USA 2026 in Sunnyvale, CA, USA, the Global Photonics Engineering Contest is a competition for innovative ideas for photonic chip-based solutions that address some of the world's most pressing societal and technical challenges, from combating climate change and advancing healthcare to addressing energy sustainability challenges. The second edition of the contest focuses on photonic chip-based applications within communication and computing, imaging, sensing and wireless.

Engineers and startups are invited to submit concepts and designs that have the capacity to revolutionize fields such as healthcare, autonomous vehicles, AI and agriculture by, for example, enabling advanced sensors for earlier diagnostics, safer infrastructure, or more efficient food production. The ultimate goal of the contest is to discover future applications in segments that are yet to be invented.

The winner receives up to €100,000 worth of technology services to bring their idea to life as well as consideration for pre-seed funding of up to €2m by PhotonDelta. In addition, the winner will receive two tickets including flights and hotel and the opportunity to present on the main stage at PIC Summit Europe 2026 in Eindhoven, the Netherlands (3–4 November).

Industry partners including Aluvia Photonics, Bright Photonics, Epiphany, Ligentec, LioniX International, PHIX Photonics Assembly, SMART Photonics, XIVER and imec are joining forces to transform the winning idea into reality.

Organized by PhotonDelta, PIC Summit USA sees more than 500 leaders and 30 exhibitors from the global photonic chip and semicon industry gathering to discuss a range of key topics impacting the sector. A key focus will be debating optical and photonic architectures for AI-scale computing and next-generation data-center connectivity. The 25 featured speakers include: Arista Networks' founder & chief architect Andy Bechtolsheim; Lightmatter's founder & CEO Nicholas Harris; NVIDIA's director of networking Ashkan Seyedi; and Celestial AI's founder & CEO David Lazovsky.

"There is no better place to launch this contest than at PIC Summit USA, which sees more than 500 leading industry figures come together to help drive the photonics industry forward," says PhotonDelta's CEO Eelko Brinkhof. "There will be vigorous debates across a range of issues, with a special focus on the role of photonic chips within AI-scale computing and next-generation data-center connectivity," he adds.

"Last year's Global Photonics Engineering Contest saw scores of highly innovative and exciting entrants. We are delighted to build on this success and launch an expanded contest aimed at discovering and supporting an even wider array of potentially game-changing applications for photonic technology."

The contest is open to startups, established companies, engineers, researchers, students, and academic organizations working on innovative photonic chip applications.

Submissions will be open until the 19 June. The winner and runners-up will be announced in August.

Contest entries will be judged on the level of innovation, technical and commercial feasibility, and how effectively the design addresses current industry challenges. Participants are required to submit detailed descriptions of their projects, including team information and supporting visuals or videos. A jury panel of experts from the photonic chip industry will review the submissions.

www.photondelta.com
www.picsummitusa.com
www.picsummiteurope.com

Texas Semiconductor Innovation Fund grants Coherent $14m to accelerate scaled production of InP wafers

$154m investment establishing first 6-inch indium phosphide fab

Texas governor Greg Abbott has announced that a Texas Semiconductor Innovation Fund (TSIF) grant of $14,076,031 has been extended to materials, networking and laser technology firm Coherent Corp of Saxonburg, PA, USA to accelerate scaled production of indium phosphide (InP) wafers in Sherman, TX. The project represents more than $154m in capital investment.

"This $154m investment by Coherent to establish the world's first 6-inch InP wafer fabrication plant in Sherman is testament to Texas' leadership in semiconductor manufacturing and the technologies of tomorrow," says Abbott.

Coherent cites applications of InP technology in photonics and high-speed connectivity solutions such as datacoms, telecoms, artificial intelligence (AI) interconnects, advanced sensing, and 6G wireless and satellite communications networks.

The Sherman facility will serve as a strategic consolidation point for the Coherent's North American semiconductor operations, streamlining activities currently spread across the USA and scaling InP wafer production.

"Coherent Corp is honored to receive this grant from the Texas Semiconductor Innovation Fund and appreciates the support of Governor Abbott, the Texas Economic Development & Tourism Office, and the Texas Semiconductor Innovation Consortium executive committee," says Coherent's Semiconductor Devices executive VP Beck Mason. "This grant accelerates the establishment of the world's first 6-inch indium phosphide wafer factory in Texas — a major milestone as we scale operations, grow our Texas workforce, and strengthen the US supply chain for photonics technologies powering data centers, AI, telecommunications, and other advanced connectivity applications," he adds.

"This positions Sherman as a hub for advanced photonics and AI technologies," comments representative Shelley Luther.

Abbott signed the Texas CHIPS Act into law in 2023 to establish the Texas Semiconductor Innovation Fund (TSIF, a grant program focusing on research, design and manufacturing) as well as the Texas Semiconductor Innovation Consortium (TSIC). These programs, administered by the Texas CHIPS Office, a division within the Governor's Texas Economic Development & Tourism Office, are designed to leverage Texas' investments in the semiconductor industry, encourage semiconductor-related companies to expand in the state, further develop the expertise and capacity of Texas institutions of higher education, and maintain the state's position as the nation's leader in semiconductor manufacturing.

www.Coherent.com

Photon Design showcases simulation tool innovations

At SPIE Photonics West 2026 in San Francisco, CA, USA (20–22 January), photonic simulation CAD software developer Photon Design Ltd of Oxford, UK highlighted its latest innovations, HAROLD (QD), MT-FIMMPROP and EPIPPROP. The firm's simulation tools will also be featured in academic presentations and commercial demonstrations elsewhere at the show.

Photon Design's EME simulators enable rapid, 3D simulations with minimal processing overheads. A standard laptop PC will take only minutes to process EME simulations where industry-standard, FDTD-based simulations would take many hours, often utilizing expensive cloud resources.

"The HAROLD (QD) simulator is used to design epitaxy structures in quantum dot lasers. QD lasers are essential to the development of next-generation data centers, AI and HPC applications, due to their high-temperature reliability, modulation, data transmission, heat reduction, and power efficiency benefits," says CEO Dr Dominic Gallagher. "Next we have the new Multi-Topology (MT)-FIMMPROP simulator, which supports the native design of pioneering TFLN, Mach–Zehnder modulators, essential for high-data-rate photonics applications. Finally, the updated EPIPPROP simulator streamlines the design of arrayed waveguides (AWGs), with a slot waveguide option for polarization-sensitive applications coming soon," he adds.

Photon Design's FIMMPROP simulation tool was feature in Aalto University's Dr Paul Verrinder's presentation 'Regrowth-free, monolithic integration platform on GaAs using vertical twin waveguides', where it simulates a gallium arsenide, near-970nm, monolithic platform used for developing active-to-passive coupling tapers between vertically separated waveguides.

FIMMWAVE has also been used by Photonect's CEO Dr Juniyali Nauriyal for developing laser-assisted, fiber-to-chip optical interconnect technology, demonstrated at the Nextcorps LUMINATE booth. By eliminating epoxy, highly efficient coupling is achieved, with FIMMWAVE simulated losses below half a dB per facet, at 1310nm, when coupling to third-party, photonic devices.

www.photond.com

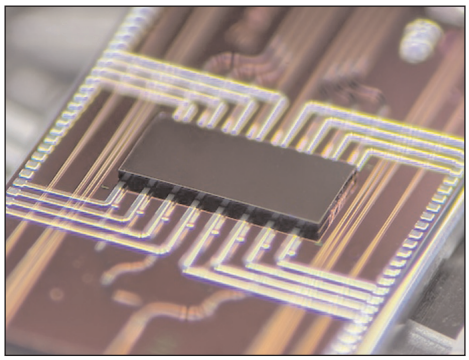
Photon Bridge demos >30mW laser output per color at wafer scale on silicon photonics

Cost-effective wafer-scale manufacturing validated for next-generation CPO architectures

Photonic integration company Photon Bridge of Eindhoven, The Netherlands has announced wafer-scale validation of its heterogeneous photonics platform for multi-wavelength light engines. The firm demonstrated single-channel output power exceeding 30mW at the silicon chip edge facets in continuous-wave operation at room temperature. The demonstrated power levels meet per-channel requirements for next-generation 1.6T and 3.2T co-packaged optical engines, enabling reduced fiber count and improved rack-level energy efficiency.

While traditional non-muxed ELS solutions deliver one color per fiber with high-power 250mW lasers, Photon Bridge's platform achieves comparable aggregate per fiber output by combining multiple wavelengths on a single fiber. By integrating lasers and multiplexing on a single silicon photonics interposer, the platform reduces fiber count, simplifies assembly and improves thermal efficiency.

The milestone validates a fully integrated architecture in which lasers and wavelength filters reside on a single silicon photonic integrated circuit (PIC), eliminating discrete micro-optics and simplifying assembly. Leveraging established commercial III–V and 200mm silicon photonics foundries, the platform enables scalable and cost-effective deployment in next-generation AI-driven CPO systems.



Photon Bridge multi-wavelength light engines enable cost-effective next-generation CPO architectures.

Unlike conventional III–V-on-silicon approaches that depend on tight manufacturing tolerances and complex test flows, Photon Bridge's platform is designed for volume production. A simplified silicon photonics process and OSAT-compatible assembly reduce III–V laser integration time by up to 80x. Initial wafer-scale testing demonstrated robust III–V–silicon interface connectivity, with more than 92% of interconnections meeting performance specifications.

"Delivering more than 30mW from a single integrated channel at wafer scale validates both the power handling and manufacturability of our platform," says CEO Paul Marchal. "The architecture scales to 8, 16 or 32 wavelengths per fiber and can extend across multiple fibers to achieve significantly higher aggregate output power, without driving individual lasers to extreme power densities," he adds. "With scalability demonstrated, we are now focused on industrialization and customer qualification for high-volume deployment."

The platform is designed to scale to quantum dot laser technology, offering the potential for isolator-free operation and further simplifying system-level design for high-density optical engines.

Photon Bridge is exhibiting in booth 757 at the Optical Fiber Communication Conference & Exposition (OFC 2026) in Los Angeles, CA, USA (17–19 March).

www.ofcconference.org
www.photonbridge.com/

Ayar Labs names Sankara Venkateswaran as VP of engineering

Former Intel networking silicon leader joins to scale co-packaged optics for hyperscale AI infrastructure

Silicon photonics-based chip-to-chip optical connectivity firm Ayar Labs of San Jose, CA, USA — which is pioneering co-packaged optics (CPO) for AI scale-up — has appointed Sankara Venkateswaran as vice president of engineering. He joins at a pivotal stage as the company scales its solution for mass production to support hyperscale AI workloads.

"Sankara brings deep expertise in network acceleration silicon that perfectly complements our leadership in co-packaged optics," says CEO & co-founder Mark Wade. "His track record building world-class engineering teams makes him the ideal leader to help us advance CPO deployment and meet the massive scaling demands of AI infrastructure."

Venkateswaran will lead Ayar Labs' engineering organization, developing its TeraPHY optical engines, overseeing architecture, design, and product execution. With experience delivering end-to-end silicon products for networking controllers, he brings a disciplined focus on efficiency, predictability and quality, which are critical to serving hyperscale customers who require production-grade silicon that integrates seamlessly into advanced packaging flows.

"Co-packaged optics is rapidly moving from early innovation to infrastructure necessity," says Venkateswaran. "Ayar Labs is uniquely positioned to lead at the forefront of this transition. My focus is on delivering the most performant, compatible, and manufacturing-ready CPO solution for AI scale-up to overcome the bandwidth and power limitations of copper."

Venkateswaran has more than 26 years of experience delivering mobile, compute, networking, and infrastructure silicon products, with engineering and leadership roles at Atheros, Qualcomm, and Intel. He led multiple product programs and contributed to successful tape-outs across a range of leading-edge process nodes and foundries. At Intel, he served as VP of foundational networking silicon engineering, leading global teams developing Ethernet controllers and networking SoCs for hyperscale and enterprise customers under aggressive timelines.

His appointment builds on Ayar's momentum — including recent partnerships with Alchip and GUC — as the company scales its co-packaged optics solution for high-volume deployment. The firm says it continues to lead the transition from traditional copper interconnects to a scalable CPO solution that delivers higher performance at lower power and cost.

www.ayarlabs.com

Lumentum's quarterly revenue grows 65% year-on-year to $665.5m

Record pump laser, EML chip and transceiver revenues drive growth

For its fiscal second-quarter 2026 (ended 27 December 2025), Lumentum Holdings Inc of San Jose, CA, USA (which designs and makes photonics products for optical networks and lasers for industrial and consumer markets) has reported record revenue (for the second consecutive quarter) of $665.5m (towards the top of the $630–670m guidance range). This is up 24.7% from $533.8m last quarter and up 65.5% on $402.2m a year ago, driven by cloud and AI business, yielding high double-digit gains in both core and new product lines.

Components revenue grows 68.3% year-on-year

Components segment revenue was $443.7m (66.7% of total revenue), up 17% on $379.2m last quarter and 68.3% on $263.7m a year ago. Growth is fueled by broad-based demand across laser chips, laser assemblies, and aligned subsystems going primarily into inter-data-center DCI (data-center interconnects) and long-haul applications.

Highlights included:

- Laser chip business (serving cloud transceiver customers) yielded another quarterly record in electro-absorption modulated laser (EML) shipments, led by 100G lane speeds. This was bolstered by a ramp-up for 200G-lane-speed devices, which now comprise about 5% of unit volume but 10% of Datacom laser chip revenue, indicating a meaningful uplift in average selling price (ASP). 200G is projected to rise to 25% of the product mix by end-2026, further boosting ASPs and gross margin.
- Components supporting optical links ranging from inter-campus DCI to longer-reach topologies saw sustained momentum. "Shipments of our narrow-linewidth laser assemblies grew for the eighth consecutive quarter, a clear proof point of robust market demand and our successful manufacturing expansion," says president & CEO Michael Hurlston.
- The long-haul portfolio saw gains, with both coherent components and aligned subsystem products growing both sequentially and year-on-year.
- Pump lasers achieved another quarterly record, supporting not only long-haul terrestrial and subsea networks but also new scale-across architectures, with revenue in this product line surging over 90% year-on-year.
- 3D sensing grew modestly, following a new smartphone launch and some incremental share gains.

Systems revenue grows 60.1% year-on-year

Systems segment revenue was $221.8m (33.3% of total revenue), up 43.5% on $154.6m last quarter and 60.1% on $138.5m a year ago. This was due mostly to record cloud transceiver shipments (growing by about $50m sequentially, outperforming the legacy cloud-like run-rate) as Lumentum leveraged its expanded manufacturing capacity at its facility at the Nava Nakorn Industrial Estate in Pathum Thani, near Bangkok, Thailand. "We have moved past the production volatility seen in earlier calendar 2025 and are now on a sustainable growth trajectory," notes Hurlston. "We have focused on time to market in the business and have greatly improved our execution through the design cycle. As a result, we are now in the lead pack of transceiver suppliers as customers transition their networks to 1.6T speeds," he adds. "We are also improving the profitability of our transceiver business, with better yields and lower scrap rates."

Also, the ramp-up of optical circuit switch (OCS) shipments exceeded the targeted $10m quarterly run-rate a quarter ahead of the scheduled fiscal Q3/2026, as manufacturing readiness proceeds ahead of plan, indicating faster-than-expected market ramp and execution. "This outperformance is a direct result of the seamless collaboration between our engineering and operations teams, proving our ability to scale complex technology at pace," says Hurlston. Customer demand for OCS is intensifying, he adds.

"As our cloud-related business continues to accelerate, we see a different dynamic in the industrial end-market," notes Hurlston. "Shipments remained roughly flat sequentially. This performance reflects the persistent cyclical softness we continue to see in the broader industrial market. With that said, we have an increasing design-win funnel for our newly introduced PicoBlade Compact line of products."

Profitability and EPS exceed guidance

On a non-GAAP basis, gross margin has risen further, from 32.3% a year ago and 39.4% last quarter to 42.5%. This was driven by improved manufacturing utilization across most product lines, increased pricing on select products, and a shift in product mix to higher-speed devices (driven mainly by the ramp-up in data-center laser chips).

There have been rises in selling & general administrative expenses from $35.9m a year ago and $41.5m last quarter to $45m, and in R&D spending from $62.4m a year ago and $69m last quarter to $69.9m, in order to support expanding cloud opportunities.

Overall operating expenses have hence risen from $98.3m a year ago and $110.5m last quarter to $114.9m. However, as a proportion of revenue they have fallen from 24.4% and 20.7% to 17.3%, respectively.

"While continuing to invest in critical R&D programs serving cloud and AI customers, we have maintained the rigorous cost controls

necessary to optimize our business model," says executive VP & chief financial officer Wajid Ali.

Operating income has risen from $31.7m a year ago (operating margin of just 7.9%) and $99.8m (18.7% margin) last quarter to $167.7m (25.2% margin, well above the forecasted 20–22%), driven mainly by revenue growth in components products.

Likewise, net income has risen from $30m ($0.42 per diluted share) a year ago and $86.4m ($1.10 per diluted share) last quarter to $143.9m ($1.67 per diluted share, well above the forecasted $1.30–1.50).

"Profitability and EPS expanded well beyond prior guidance, demonstrating the leverage of our business model," says Hurlston.

Capital expenditure was $84m, primarily for expanding manufacturing capacity to support cloud and AI segment growth.

During the quarter, cash, cash equivalents, and short-term investments rose by $33.5m, from $1121.8m to $1155.3m, while working capital rose from $516.6m to $600.5m. The firm held $1155.3m in debt.

"Our results continue to highlight the strength of our roadmaps for both optical components and systems, which make us mission-critical to the world's AI leaders," says Hurlston. "Virtually every AI network is powered by Lumentum technology, either through our direct hyperscaler partnerships or as the critical component supplier that enables our network equipment manufacturer customers." Inventory has hence been increased by $39m sequentially to support the expected growth in cloud and AI revenue.

March-quarter outlook

"While we previously projected crossing $750m in quarterly revenue by mid-2026, we now expect to comfortably surpass that milestone next quarter," notes Hurlston.

For fiscal third-quarter 2026 (ending 27 March), Lumentum forecasts revenue growth of 65% year-on-year to another record of $780–830m. About two-thirds of the sequential increase in revenue will be driven by the Components portfolio, such as 200G EMLs supported by further expansion of high-margin, high-speed transceivers (as 1.6T network transitions accelerate) and advanced laser products, reflecting broad-based strength across cloud applications. The remaining third of the sequential increase will stem from Systems, driven by the continued ramp of high-speed transceivers and additional contributions from OCS.

Fueled by greater-than-expected orders for 1.6T transceivers (for which margins are significantly better than 800G transceivers), operating margin should rise to 30–31%. Diluted earnings per share is expected to increase to $2.15–2.35.

Cloud transceivers, OCS and CPO to drive future growth

"We previously identified three primary catalysts for Lumentum's future growth: cloud transceivers, optical circuit switches (OCS), and co-packaged optics (CPO)," says Hurlston. "The vast majority of this growth is still ahead of us, and we have increased confidence as to the timing and magnitude of the ramps. While our Q2 results and Q3 guidance reflect meaningful contributions from cloud transceivers, we are only just beginning to unlock the massive potential of OCS and CPO."

About two-thirds of the sequential increase in revenue will be driven by the Components portfolio, such as 200G EMLs supported by further expansion of high-margin, high-speed transceivers (as 1.6T network transitions accelerate) and advanced laser products

Fueled by intensifying customer demand extending now across three primary customers, OCS order backlog has surged well above $400m, accelerating shipments into late calendar 2026, with most expected to ship in second-half 2026 (compared with the previously expected $100m). "We are scaling rapidly to meet extraordinary customer demand," says Hurlston.

"Turning to CPO, we have secured an additional multi-$100m purchase order for ultra-high-power [UHP] lasers that support optical scale-out applications… deliverable in first-half calendar 2027 [compared with expected CPO revenue of just $50m in calendar Q4/2026]," says Hurlston. "Meanwhile, we continue to execute on the initial orders we have discussed previously and remain firmly on track for material shipment inflection of UHP chips in the second half of this calendar year," he adds.

"Furthermore, we have established a clear line of sight into the broader external light source (ELS) market, which would enable us to participate more holistically than as a standalone laser chip supplier. By expanding into pluggable external light source modules, we would dramatically increase our serviceable market [and offer 2–2.5 times the revenue content compared to individual laser sales]. In addition, the ELS allows us to diversify our customer base, as several new partners adopting next-generation scale-out architectures are looking for more turnkey solutions," continues Hurlston.

"We have built significant momentum through our leadership in cloud transceiver, OCS, and scale-out CPO. Now, a fourth growth driver is taking shape, one poised to be a generational game-changer for the industry: optical scale-up. Today, data-center architectures have a clear divide. Optical links handle scale-out networking, connecting relatively longer links within the data center. Conversely, copper links dominate scale-up connectivity, referring to the ultra-short-reach high-speed paths within a single rack or a cluster. While copper has ►

long been the gold standard for scale-up for simplicity and cost, it is hitting a physical wall. An industry pivot is underway to bypass the scaling limits of copper. By late calendar 2027, we would expect our first scale-up CPO shipments replacing longer copper connections. We are already deeply embedded in design-in cycles for this, leveraging our ultra-high-power lasers and external light source modules. As we look into the not-so-distant future, it is only right to assume that optics begins to capture more and more of the connectivity, eventually subsuming copper. In response to these demand projections, we have initiated proactive capacity planning."

"Given the sheer magnitude of the scale-up optics market, we are carefully assessing our projected wafer output plans," says Hurlston.

Lumentum has confirmed a persistent supply/demand imbalance for EML devices, with demand outpacing supply by about 30%, despite increasing manufacturing capacity by 20% in the December quarter.

"We have front-loaded our 40% expansion target [which had been planned to take three quarters: December, March, and June], delivering on over half of that this past quarter," says Hurlston. "We are scaling rapidly through precision tool optimization and yield gains. This execution will help to ensure that additional [indium phosphide wafer fab] capacity comes online as planned over the next two quarters and beyond [achieving better than the targeted 40% increase in Lumentum's fab in Sagamihara, Japan]. We now have line of sight to a significant block of additional capacity through the next four quarters [calendar second-half 2026 into early 2027], both through current activities in Sagamihara and better utilization of our Caswell, UK, and Takao, Japan fabs."

All incremental capacity for EMLs is covered under long-term agreements (LTAs) through to the end of calendar 2027, enabling pricing discipline and capacity allocation to committed customers. "We are in active negotiations with leading customers to offset our capital requirements in exchange for long-term supply assurances," says Hurlston. Customer requests for more committed capacity have enabled Lumentum to pursue incremental pricing optimization, with LTAs protecting from frequent price renegotiations seen in prior years.

Alongside the scale-ups at its existing sites in Caswell in the UK and Sagamihara and Takao in Japan, to address ongoing shortages amid accelerating bookings, Lumentum's capacity expansion efforts now include potential new fabs or acquisitions.

Lumentum reckons that its strategic focus on external light source modules and long-term agreements positions it to capture additional value in evolving AI and data-center markets.

www.lumentum.com

Lumentum showcases ultrafast and UV laser platforms for precision manufacturing

Photonics West exhibit includes VCSELs supporting 3D sensing

At SPIE Photonics West 2026 in San Francisco (20–22 January), Lumentum showcased high-power ultrafast, UV, and 3D sensing laser solutions designed to meet the growing precision, throughput and reliability demands of advanced manufacturing and sensing applications.

Lumentum demonstrated how its latest laser and photonic innovations are driving new levels of precision, scalability and integration across advanced manufacturing applications.

Featured products included:

- PicoBlade Core — Lumentum's latest ultrafast laser platform delivers up to 150W of average power with sub-12ps pulses and integrated multi-wavelength output in a compact, unified design. It enables high-throughput, precision micro-machining for printed circuit boards, battery cells, solar cells, and consumer electronics applications. The platform is available in NIR, Green and UV wavelengths.
- NQ-Series — The newest addition to Lumentum's nanosecond-pulsed laser portfolio, the NQ-Series delivers up to 500µJ pulse energy of UV light at rates up to 60kHz. Designed for high-throughput micro-machining, the NQ-Series brings what is claimed to be exceptional beam quality and reliability to address next-generation processing challenges.
- 3D sensing VCSELs — Lumentum offers a broad portfolio of vertical-cavity surface-emitting laser (VCSEL) solutions supporting 3D sensing across a wide range of industrial and consumer applications. Scalable, high-volume manufacturing is said to ensure consistent performance, high reliability and power efficiency for use cases including depth sensing, object detection, and driver assistance systems.

"Manufacturers are being pushed to achieve tighter tolerances while simultaneously increasing throughput and uptime," says Matt Philpott, VP of business development. "Our latest ultrafast and nanosecond-pulsed laser platforms are designed to address that challenge directly— combining higher average power, precise pulse control, and proven reliability to enable scalable, production-ready micro-machining across demanding applications."

www.spie.org/conferences-and-exhibitions/photonics-west

Tower and Scintil make available first heterogeneously integrated DWDM lasers for AI infrastructure

Manufacturing of SHIP technology on silicon photonics platform at multi-site global foundry targets next gen hyperscale AI infrastructure

Specialty analog foundry Tower Semiconductor Ltd of Migdal Haemek, Israel and Scintil Photonics of Grenoble, France (a fabless firm developing and commercializing silicon photonic integrated circuits with integrated lasers for AI data centers) have announced availability of the world's first heterogeneously integrated dense wavelength division multiplexing (DWDM) laser sources for AI infrastructure using Scintil's SHIP (Scintil Heterogeneous Integrated Photonics) technology.

SHIP leverages Tower's high-volume silicon photonics platform and combines it with heterogeneous integration of monolithic laser sources, capable of meeting the most demanding DWDM technical requirements for AI. DWDM lasers are an essential component of co-packaged optics (CPO)-based next-generation AI infrastructure that aims to deliver ever-growing bandwidth density, ultra-low tail latency, and lower energy per bit, while improving GPU utilization and hyperscaler ROI needed in the agentic AI era.

"The scale-up networking opportunity is about to increase significantly as these server interconnects move to multi-rack CPO. Scale-up networking will consume an increasing portion of AI networking's $200bn 2030 market as the market moves towards optical architectures, reducing the constraints on beachhead and copper bandwidth limitations per GPU/XPU," says Alan Weckel, founder & technology analyst at 650 Group LLC. "Manufacturing and foundry to vendor alignment is the key to unlocking the CPO market to ensure the reliability and volumes that hyperscalers need to hit their AI goals," he adds.

Scintil's SHIP technology has been validated on Tower's silicon photonics platform. LEAF Light is the industry's first DWDM-optimized, intelligent external laser source fabricated with SHIP. Tower's multi-site silicon photonics manufacturing footprint is said to provide resilient capacity and supply continuity aligned with hyperscale deployment needs. This positions the partnership for high-volume hyperscale deployment with the capacity flexibility and supply continuity required at scale.

The collaboration supports customer evaluations for DWDM CPO programs, establishing a defined path from qualification to volume manufacturing.

"Next-generation AI infrastructure demands optical interconnects that deliver more bandwidth per fiber at lower power per bit," says Scintil's CEO Matt Crowley. "DWDM co-packaged optics meets that bar. LEAF Light brings the DWDM laser source technology; Tower's SiPho platform brings the manufacturing scale. With SHIP now validated on Tower's production lines, customers have a path from evaluation to millions of units per month," he adds.

"We deeply value our long-term partnership with Scintil, and are excited to bring this revolutionary monolithic DWDM laser technology to market to enable next generations of scale-up architectures," says Dr Ed Preisler, VP & general manager of Tower's RF business unit. "Scintil's platform complements our PH18M platform already in mass production for optical transceivers at our facilities worldwide."

As AI data-center growth accelerates, hyperscalers need networking solutions that reduce power, improve utilization, and scale with the next generation of models. DWDM CPO, with higher bandwidth density, lower energy per bit, and ultra-low tail latency, are where the industry is heading. It is claimed that LEAF Light is the first production-ready DWDM laser source that uses heterogeneous integration to monolithically integrate active lasers and established silicon photonics on a single chip.

At the Optical Fiber Communication Conference and Exposition (OFC 2026) in Los Angeles, CA, USA (17–19 March), Scintil is exhibiting in booth #5537. Tower is exhibiting its silicon photonics (SiPho) platform and RF & HPA technology offerings in booth #2221. Representatives from both companies will be available for meetings during the event.

www.ofcconference.org
www.scintil-photonics.com
www.towersemi.com

Fraunhofer ISE achieves record efficiencies for tandem photovoltaic modules

Efficiencies of 34.2% for III–V germanium and 31.3% for III–V silicon PV modules

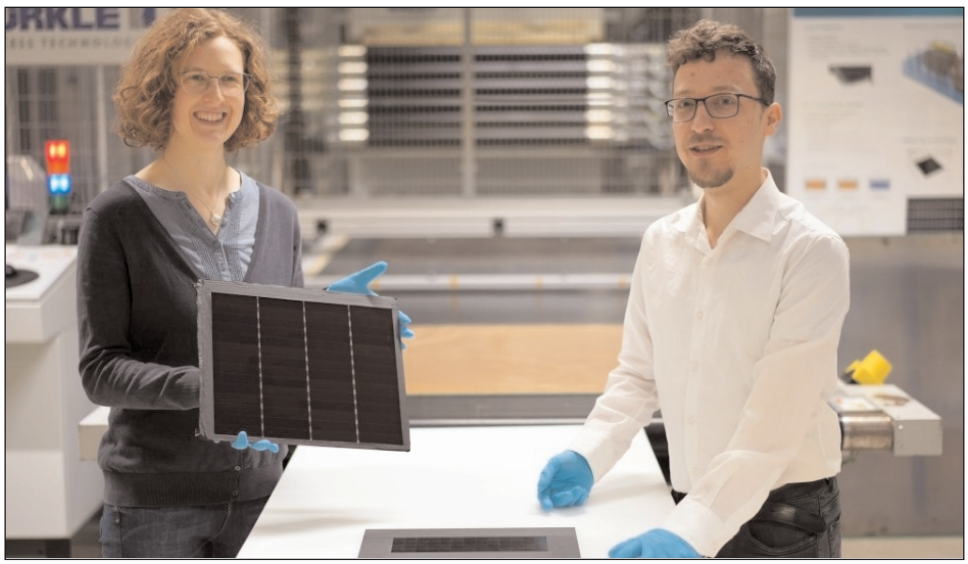
Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany has constructed two tandem photovoltaic modules with record efficiencies:

- A III–V germanium PV module with an efficiency of 34.2%, incorporating solar cells from AZUR SPACE Solar Power GmbH of Heilbronn, Germany and anti-reflection structures from temicon GmbH, is claimed to be the world's most efficient solar module.
- A III–V silicon PV module has achieved an efficiency of 31.3%, setting a record in its class, and is based on established, cost-effective silicon technology.

"Both tandem PV technologies have the potential to fill application gaps between conventional, cost-effective ground-mounted and rooftop systems on the one hand, and high-performance but more expensive space solar cells on the other," says Fraunhofer ISE's director professor Andreas Bett. "III–V in tandem with silicon as a more affordable option, III–V on germanium as a slightly more efficient alternative, are both interesting technology routes for integrated PV applications wherever space is limited."

A few years ago, Fraunhofer ISE achieved a new efficiency record for silicon-based solar cells with a III–V silicon solar cell reaching 36.1%. As part of the research project Mod30plus, they have now, for the first time, realized small-scale production of these solar cells, adapted for interconnection with shingle technologies. A module produced by the research team in this way, measuring 218cm^2, has now achieved record efficiency of 31.3%.

A 833cm^2 tandem module with an efficiency of 34.2% was built by a second research team at Fraunhofer ISE as part of the Vorfahrt project. It consists of triple III–V germanium cells, which the project coordinator AZUR SPACE Solar Power further developed for the new module technology. For this purpose, the solar cell manufacturer adapted its triple solar cell technology to the terrestrial solar spectrum, so that it can now be produced in comparable quantities and in the same wafer formats as space solar cells. temicon further improved the module's efficiency through a stochastic surface structure transferred onto the glass surface using nano-imprint, which minimizes reflection losses at this interface of the record module.



Project manager Dr Laura Stevens shows a III-V germanium PV module with a record efficiency of 34.2%. Leonhard Böck is a member of the project team and played a key role in developing the III-V silicon PV module with 31.3% efficiency that lies in front of him. (© Fraunhofer ISE/photo: Jacob Forster.)

Conventional silicon solar cells cannot exceed a physical efficiency limit of 29.4%; currently commercially available PV modules already have efficiencies around 24%. "That is why we are conducting intensive research to replace single solar cells with multiple solar cells in modules," says Fraunhofer ISE scientist and Vorfahrt project leader Dr Laura Stevens. "The fact that we achieved a world record with the III-V germanium module shows the great potential in combining multiple semiconductors," she adds.

"Tandem photovoltaics is one of the fastest-growing research fields in solar research today," says Mod30plus project leader Dr Jonas De Rose.

Cooperation partners involved in the further development of the III–V silicon solar cell into a module include: III/V-Reclaim, AZUR SPACE Solar Power GmbH, ICB GmbH & Co KG, Karlsruhe Institute of Technology (KIT), LPKF Laser & Electronics SE, PROTAVIC INTERNATIONAL, as well as SUNSET Energietechnik GmbH. In addition to AZUR SPACE Solar Power GmbH and temicon GmbH, the III-V-on-germanium world-record module also involved GOCHERMANN SOLAR TECHNOLOGY Ltd & Co KG, Audi AG, and Elektra Solar GmbH. Both research projects were funded by the German Federal Ministry for Economic Affairs and Energy.

www.azurspace.com
www.ise.fraunhofer.de/en/research-projects/mod30plus.html

First Solar licenses Oxford PV's patents for US markets

Deal advances First Solar's next-gen perovskite device development

Cadmium telluride (CdTe) thin-film photovoltaic (PV) module maker First Solar Inc of Tempe, AZ, USA has announced a patent licensing agreement that gives it access to existing issued patents and currently pending patent applications of Oxford Photovoltaics Ltd (Oxford PV), which was founded in 2010 by professor Henry Snaith as a spin-off from the University of Oxford.

The UK-based firm operates a multi-faceted business model that combines manufacturing with strategic licensing, aligned with its mission to make perovskite PV mainstream. Oxford PV manufactures and commercializes perovskite-on-silicon tandem solar cells and modules in Brandenburg, Germany, and is pursuing expansion into high-volume manufacturing as part of its long-term growth strategy.

The non-exclusive license paves the way for First Solar, the largest solar manufacturer in the Western Hemisphere and the world's largest producer of thin-film solar technology, to continue advancing its development of PV solar devices employing a perovskite semiconductor for potential applications in the US utility-scale, commercial and industrial and residential markets. The scope of the license covers the potential manufacturing and distribution of such products in the USA and excludes crystalline silicon semiconductors.

"This agreement allows us to continue pursuing viable pathways to manufacturing and commercializing thin-film–perovskite products that could meet our long-term goal of serving all addressable markets," says First Solar's CEO Mark Widmar. "This agreement reflects the confidence we have in our R&D team's progress in developing an efficient, stable and manufacturable perovskite device, while aligning with our long-standing positions on respecting and safeguarding intellectual property rights."

First Solar says that it has spent over $2bn on thin-film R&D, which includes a focus on perovskites. Its investments include a new perovskite development line at its campus in Perrysburg, Ohio, that produces small-form-factor modules featuring a perovskite semiconductor, allowing First Solar to meet key internal milestones in its perovskite development program, including initial-stage efficiency, stability and manufacturability objectives.

Oxford PV claims to hold the strongest global patent portfolio for perovskite solar technologies. "Strong intellectual property frameworks are essential to supporting innovation at scale across the solar industry," says Oxford PV's CEO David Ward. "We welcome First Solar's ongoing commitment to a perovskite-based PV future. Agreements like this, building on earlier industry validation, reflect growing confidence in perovskite-based photovoltaics — the next generation of solar technology we have been developing for over a decade — and support its advancement in the US market."

www.oxfordpv.com
www.firstsolar.com

5N Plus to increase space solar cell production capacity by 25% in 2026

Expansion follows increases of 35% in 2024 and 30% in 2025

Specialty semiconductor and performance materials producer 5N Plus Inc (5N+) of Montréal, Québec, Canada has announced plans by its subsidiary AZUR SPACE Solar Power GmbH of Heilbronn, Germany, to expand solar cell production capacity by an additional 25% in 2026. The new capacity, expected to gradually come online starting in second-half 2026, will add to capacity increases of 30% in 2025 and 35% in 2024.

"With the acceleration of AI adoption and the growing appetite for connectivity, our clients are planning ahead and securing products to support future satellite programs and space missions," says 5N+'s CEO Gervais Jacques. "In this dynamic environment, their trust in our capacity to deliver innovative and high-quality advanced devices is reflected in a maxed-out backlog and robust project pipeline that now warrants additional capacity, in line with the disciplined approach that has served us well."

AZUR has a track record of expanding operations with limited new investments, taking advantage of available onsite physical space to meet growing demand. With each capacity increase program, the team has also accelerated the process of bringing new equipment and capacity online. Over the past three years, capacity has increased in all AZUR departments, from epitaxy to cell production, assembly and testing. Over the next year, the firm expects to reach its 25% target by investing in both back-end and front-end operations, including through process optimization and additional automation.

"As we enter the year with strong momentum, this positions us well to solidify our leadership, execute on growth initiatives and continue developing the products our customers need," says Jacques.

www.azurspace.com
www.5nplus.com

Ascent Solar reflects on 2025 commercial progress, industry partnerships & solar PV efficiency improvements

Production schedule to deliver on orders for array deployments in Q1

Ascent Solar has commented on the commercial progress, industry partnerships and solar PV efficiency improvements it achieved in 2025, as the leadership team looks ahead to continued corporate growth in 2026.

"Over the last year, we've seen where the market is headed and positioned our thin-film solar offerings accordingly," says CEO Paul Warley. "The defense industry has displayed an increasing demand for efficient, readily available technologies; we have made ourselves an ideal provider by offering a highly efficient product, produced in the United States, that is ready for rapid delivery," he adds. "We expect to maintain this momentum throughout the year by meeting with more potential partners and achieving even greater efficiency milestones. Our thin-film product is uniquely qualified to withstand the rigors of space and other punishing environments; as the market demand grows, we expect increased sales and revenue in 2026."

Key company milestones and achievements included:

- initiating new strategic partnerships and teaming agreements with NovaSpark, Emtel Energy, CisLunar Industries, Defiant Space, Star Catcher Industries, NOVI Space, and more, to meet mutually beneficial commercial goals in the defense industry and beyond;
- establishing rapid product delivery capabilities to meet the swift needs of civil and defense space missions;
- advancing its thin-film PV product's capabilities, including its space-based power-beaming abilities, marine environment durability, hydrogen production through field-based hydrolyzers, and more;
- closing a private placement of up to $5.5m; and
- partnering with the Georgia Institute of Technology to apply thin-film technology to unmanned aerial vehicle (UAV) wings for a demonstration aiming to enable continuous flight for ocean monitoring via sea plane vehicles.

Ascent's leadership aims to build upon this positive business momentum in 2026 via:

- beginning the year with an aggressive production schedule to deliver on existing orders for array deployments planned for Q1/2026;
- CEO Paul Warley conducted business travel to Europe in January to liaise with strategic players to establish potential partnerships and customer relationships;
- developing and delivering UAV arrays for European partners in first-half 2026;
- further advancing the efficiency of the company's CIGS thin-film technology;
- continued advanced environmental testing through Q1/2026 to quantify performance in the extremes of space, including radiation and atomic oxygen resilience testing; and
- further building upon the partnerships established in 2025 to meet mutually beneficial goals.

www.AscentSolar.com

Ascent Solar closes up to $25m private placement

CIGS PV firm raises $10m upfront, with up to $15m of potential proceeds upon full exercise of warrants

Ascent Solar Technologies Inc of Thornton, CO, USA — which designs and makes lightweight, flexible copper indium gallium diselenide (CIGS) thin-film photovoltaic (PV) panels that can be integrated into consumer products, off-grid applications and aerospace applications — has closed its private placement for the purchase and sale of 1,818,182 shares of common stock (or pre-funded warrants in lieu thereof), series A warrants to purchase up to 1,818,182 shares and short-term series B warrants to purchase up to 909,091 shares at a purchase price of $5.50 per share (or per pre-funded warrant in lieu thereof) and accompanying warrants priced at-the-market under Nasdaq rules.

The series A warrants and the short-term series B warrants have an exercise price of $5.50 and are exercisable immediately upon issuance. The series A warrants will expire five years from the effective date of the Resale Registration Statement, and the short-term series B warrants will expire 18 months from the effective date of the Resale Registration Statement.

H.C. Wainwright & Co. acted as the exclusive placement agent for the offering.

Gross proceeds were about $10m, prior to deducting placement agent's fees and other offering expenses payable by the company. The potential additional gross proceeds from the series A warrants and the short-term series B warrants, if fully exercised on a cash basis, will be about $15m. No assurance can be given that any of the series warrants will be exercised, or that the company will receive cash proceeds from the exercise of the series warrants. The firm intends to use the net proceeds for general working capital needs.

www.AscentSolar.com

Ascent Solar developing CIGS PV modules generating multiple times more power for space beaming

Firm to present program results at space industry conferences later this year

Ascent Solar Technologies Inc of Thornton, CO, USA – which designs and makes lightweight, flexible copper indium gallium diselenide (CIGS) thin-film photovoltaic (PV) panels that can be integrated into consumer products, off-grid applications and aerospace applications – has announced plans to continue development of distributed power receiving products in 2026 to account for growing demand for space-based energy-beaming technologies.

These development efforts include both internally funded R&D as well as continued Collaborative Agreement Notice program work with the NASA Marshall Spaceflight Center and Glenn Research Center, which is on schedule to successfully conclude this spring. Ascent Solar plans to present the results of these development programs at select space industry conferences to be announced later this year.

Ascent says that these solar module technology advancements are uniquely enabled by in-house manufacturing capabilities at its 5MW production facility, which allows for its commercial-off-the-shelf CIGS PV products to be further optimized to receive both sunlight as well as more distributed power from a number of transmission sources and providers such as Star Catcher Industries.

Our thin-film solar offerings will better enable profitable operations for space industry providers in emerging markets that require substantial amounts of on-orbit power, like space data centers or in-space manufacturers

Ascent further plans for continued technology progression through partnerships like that with Cislunar Industries that stand to effectively enable spacecraft to generate and utilize multiple times more power with a solar array of any given size.

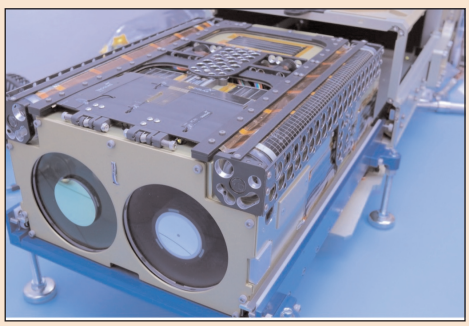
"Through the increased efficiency in power-beaming capabilities that Ascent's product developments will achieve, our thin-film solar offerings will better enable profitable operations for space industry providers in emerging markets that require substantial amounts of on-orbit power, like space data centers or in-space manufacturers," says CEO Paul Warley. "Ascent has already built relationships and completed deliveries to multiple companies within these burgeoning industries. As these nascent market segments continue to grow, we expect to be a major technology solutions provider in the space."

www.AscentSolar.com

PV blankets to power NOVI AI N-1 ATLAS spacecraft

Ascent Solar says that its previously delivered solar blankets have been integrated into the N-1 ATLAS spacecraft of NOVI Space Inc of Arlington, VA, USA (a space AI infrastructure & compute firm that develops and operates AI-powered satellites with their TRL-9 edge computing technology), which is scheduled to fly on the SpaceX Falcon 9 Transporter-16 launch in March.

NOVI's spring mission will demonstrate GENIE (Geospatial Ecosystem for Near Real-Time Information at the Edge), its flagship open-access, multi-sensor, edge-compute platform designed to provide low-cost, low-latency Earth observation data and real-time geospatial intelligence.



Integration of Ascent's flexible CIGS array allows for a tightly rolled configuration that minimizes the stowed volume. N-1 ATLAS, the toaster-sized hyperspectral imaging spacecraft, will generate 150W, an amount of power typically seen on larger spacecraft at higher costs. It is reckoned that NOVI will recognize compounded savings across its planned constellation by partnership with Ascent.

"Our partnership with NOVI has evolved quickly over the last year, in large part due to our rapid manufacturing capabilities in a domestic facility, enabling Ascent to quickly supply product to customers looking for immediate solutions," says Ascent Solar's CEO Paul Warley. "Through this partnership with NOVI, we're achieving lower costs on faster timelines, driving major reductions in mass and volume compared to tr additional silicon solar arrays," he adds. "Our solutions are also more durable and sustainable, which reduces space debris risks while improving efficiency for spacecraft operators."

www.novispace.ai

Investment, not subsidy: could semiconductors unlock the UK's productivity problem?

Howard Rupprecht of CSconnected argues that government investment into high-value manufacturing can catalyse private capital and create 'sticky' jobs.

The UK government's October 2024 Budget delivered a clear signal: semiconductors matter. The investment announcement into Wales's compound semiconductor cluster marked Westminster's recognition of its strategic importance as the world's only integrated compound semiconductor supply chain, not only offering leading research and laboratory space, but also the established manufacturing infrastructure to scale UK sovereign resilience within this growing, globally competitive industry, which is predicted to exceed $1 trillion by 2030.

As countries worldwide scramble to compete in the component technologies so critical to numerous ambitions, from net zero to EVs, from communications to quantum, the UK is one of the few countries with the infrastructure and talent to compete. And it is hubs such as the South Wales cluster — offering established manufacturing facilities managed by international businesses such as Vishay and KLA, alongside scaling businesses — that not only help to keep production from going overseas, but typically employ two to three times more people than fabless and IP companies elsewhere in the UK.

"Manufacturing has developed a bad name over the past few decades as Government subsidies into the sector have often been seen as a bailout to an ailing sector. This couldn't be further from the truth when it comes to advanced tech clean manufacturing, such as compound semiconductors," says CSconnected's managing director Howard Rupprecht. "Government investment in high-value manufacturing capabilities drives tomorrow's economy. This type of strategic government investment unlocks private capital, creates sticky jobs, and builds sovereign capability. That's investment, not subsidy."

Fuelling the technologies of tomorrow

Compound semiconductor materials such as gallium nitride (GaN), silicon carbide (SiC), indium phosphide (InP), and gallium arsenide (GaAs) are foundational to critical systems driving decarbonisation, connectivity, and computing efficiency. In electric vehicles, power electronics built on SiC and GaN deliver efficiency gains that extend range and reduce charging times. In telecommunications, they underpin 5G and 6G networks, photonics, and sensing technologies. In data centres, they improve AI infrastructure energy efficiency as computational demands surge.

South Wales brings together advanced materials research, epitaxy, pilot fabrication and commercial manufacturing within a single, concentrated geography. The cluster supports 150mm and 200mm wafer processing across wide-bandgap power devices, RF technologies and photonics, with capability spanning GaN platforms, SiC device development, and InP-based optical and quantum components. This depth of capability — securing technologies and supply chains where domestic strength translates into strategic advantage — helps to position the UK competitively in a growing global market.

Resilience: why local capability reduces national risk

The pandemic and subsequent geopolitical tensions exposed the fragility of just-in-time global supply chains. When borders closed and shipping fractured, countries with domestic manufacturing capability maintained production, whilst those reliant on distant suppliers faced delays and shutdowns.

South Wales offers a rare asset in the sovereign resilience race: an integrated compound semiconductor ecosystem spanning research and development, prototyping, and high-volume manufacturing. This vertical integration reduces dependence on overseas fabrication and shortens the pathway from research to market. Critically, it creates 'sticky' infrastructure — capital-intensive facilities that cannot easily be relocated. The Newport Wafer Fab facility — which has been operational since 1982 and is now owned by Vishay Intertechnology following their recent acquisition

and £250m investment announced in March 2025 — exemplifies this permanence and the continued confidence that global players have in the region.

In an era of supply chain uncertainty, embedded industrial capability is a strategic asset, providing continuity when global systems falter.

How to maximize government investment

Any government investment is significant, but its impact will depend on deployment. Strategic targeting can remove specific bottlenecks currently constraining growth.

First, skills development. The global semiconductor industry faces a talent shortage of 250,000 to 300,000 people by 2030. South Wales has a structural advantage through Cardiff and Swansea universities, yet demand outstrips supply. An investment that accelerates skills programs would have an immediate effect.

Furthermore, many SMEs lack the capability to supply to semiconductor manufacturing. Targeted funding through programmes such as CSconnected's Supply Chain Development Programme can bring local suppliers to the required standards, strengthening the cluster and capturing more value locally.

Lastly, enabling infrastructure. Public investment in shared infrastructure (advanced prototyping facilities, cleanrooms, testing capabilities) de-risks private investment decisions and accelerates commercialisation. Government investment is the catalytic funding that unlocks multiples of private capital.

Case study: how private investment follows capability

Vishay Intertechnology's £250m investment into Newport Wafer Fab, announced in March 2025, demonstrates how public support can bolster private investment commitments. The facility represents the UK's largest semiconductor manufacturing site, directly supporting over 500 high-skilled jobs and indirectly sustaining hundreds more across the regional supply chain. The investment will boost production at the state-of-the-art factory, where it will make advanced silicon carbide semiconductors, which are integral to EV production and clean energy technologies.

The national opportunity: double down on the industries with the biggest return

Similarly, KLA Corp's expansion in South Wales — announced last year and supported by £6.25m from Cardiff Capital Region and £750,000 from Newport City Council — has created a new 237,000ft^2 manufacturing and R&D facility at Imperial Park employing 750 people. The expansion takes place within a region that has invested for over a decade in research capability,

The evidence: a cluster already delivering economic impact.

shared infrastructure and skills development. Over the past decade, more than £850m has been invested in research, pilot fabrication, manufacturing and innovation facilities across the region, creating over 1250 high-skilled jobs. The lesson is clear: strategic public investment creates the conditions where private capital will follow.

So, how can this help Britain's productivity problem? It is now well documented that output per worker has stagnated for over a decade, with wage growth lagging behind peer economies, and the gap with competitors continuing to widen. With government investment funds under pressure, any investment of public money must be evidence-based, aiming to scale further what is already working.

Clean manufacturing offers productivity gains that are difficult to replicate in services. A semiconductor fab can double output without doubling headcount through automation. And design and manufacturing facilities typically employ two to three times more people than fabless or intellectual property companies. These high-skill roles in process engineering, materials science, and advanced manufacturing offer well-above-average wages, and rewarding, future-proof careers.

South Wales has already seen the impact of this model. The compound semiconductor cluster has supported over 3000 jobs across the Welsh economy, delivered gross value-added of £350m, and has exports totalling £466m, strengthening the UK's trade position.

This is performance, not potential. The cluster is delivering measurable economic return today, which will only be multiplied tomorrow with the right investment commitments from the government.

Public investment builds confidence and certainty

This type of public investment will provide certainty. Private companies make long-term capital commitments when they are confident that the ecosystem will endure. Government investment signals stability and reduces political risk, particularly for multi-national corporations evaluating where to locate advanced manufacturing.

It helps retain and attract global players. Semiconductor manufacturing is a globally competitive market. Companies such as Vishay and MicroLink Devices could locate facilities anywhere. They chose South Wales because the ecosystem works: skills, suppliers, research capability, and infrastructure align. Sustaining that advantage requires continued investment.

It accelerates commercialisation and scale-up. The UK has historically struggled to help startups scale effectively domestically, with many businesses relocating for later-stage growth where incentives are stronger. Edwards Vacuum has announced significant manufacturing expansion in the USA, supported by CHIPS Act incentives, illustrating how government policy can influence where advanced manufacturing capacity is built. Public investment in translational infrastructure, prototyping facilities, and scale-up support can help to ensure that UK innovation generates UK economic value and that growth happens domestically.

If the UK is serious about productivity, the fastest route is to scale what is already delivering. South Wales could serve as a national testbed for what effective cluster investment looks like: targeted, evidence-based, and focused on removing constraints. The model is replicable. The returns are measurable. The opportunity is immediate.

How the UK can convert momentum into national advantage

2026 presents a rare alignment: global demand for compound semiconductors is accelerating, the UK possesses a functioning, integrated cluster with proven capability, and the government has signalled intent through their budget investment announcement. The question now is execution and ambition.

Investment can be transformative if deployed strategically, removing skills bottlenecks, strengthening supply chains, and de-risking private investment. But the larger opportunity extends beyond Wales. The UK must provide the competitive conditions that keep innovative companies here through their entire growth journey.

Other nations are not waiting. The USA has committed hundreds of billions through the CHIPS Act, and the European Union through the European Chips Act. The UK does not need to match these figures, but it does need a coherent strategy that plays to domestic strengths.

South Wales demonstrates what is possible when research excellence, manufacturing capability, and public support align. The semiconductor cluster is not a regional curiosity. It is a national asset, and treating it as such could unlock productivity gains that extend far beyond one industry or one region. ■

www.csconnected.com/projects/projects/csconnected-supply-chain-development-programme

***Author**: Howard Rupprecht, managing director, CSconnected*

Howard Rupprecht was appointed managing director of CSconnected in March 2024. With over 35 years of experience in the global electronics and semiconductor sectors, he combines deep technical expertise with strategic insight into investment, supply chain development, and stakeholder engagement.

Rupprecht's career began in electronics manufacturing at Lucas Electronics, before moving into international sales, marketing and business development for advanced production equipment in Silicon Valley. He later held senior leadership roles at VTT Technical Research Centre of Finland, where he specialized in technology commercialization and ran the Micronova R&D fab, Northern Europe's largest semiconductor research facility.

Returning to the UK, Rupprecht joined Rockley Photonics to build semiconductor supply chain capabilities and now supports cluster growth at CSconnected—helping to attract investment, promoting local, regional and national economic impact, and raising awareness of the semiconductor industry's importance.

The CSconnected compound semiconductor cluster

CSconnected is a not-for-profit organisation focused on expanding the South Wales compound semiconductor industry. As the world's first compound semiconductor cluster, CSconnected brings together a unique community of academic institutions, prototyping facilities, and global high-volume manufacturing capabilities.

The Cluster fosters cutting-edge research, innovation and global leadership, positioning Wales and the UK to compete globally in critical sectors such as 5G communications, autonomous and electric vehicles, advanced medical devices, sustainable technology and next-generation consumer electronics.

www.csconnected.com

Continuous-wave AlGaN UV-A laser diode

Ohio State University researchers report record-low 6kA/cm^2 threshold current density at 360nm wavelength.

Ohio State University in the USA has claimed the first demonstration of continuous-wave (CW), electrically pumped aluminium gallium nitride (AlGaN) ultraviolet-A (UV-A, 315–400nm) laser diodes grown monolithically by plasma-assisted molecular beam epitaxy (PAMBE) [Arnob Ghosh et al, Journal of Lightwave Technology, published online 14 January 2026].

UV laser diodes and LEDs are being developed for a wide range of potential deployments: air and water purification, disinfection, sterilization, fluorescence-based biological detection, microfabrication, and various biotechnology processes. Optoelectronic UV sources offer many advantages related to compact size, relatively high energy efficiency, and reduced manufacturing cost. The applications prefer CW over pulsed-mode operation.

The researchers comment: "It is worth noting that most of the previously reported results were obtained under pulsed conditions, whereas this work was performed under CW operation, representing more

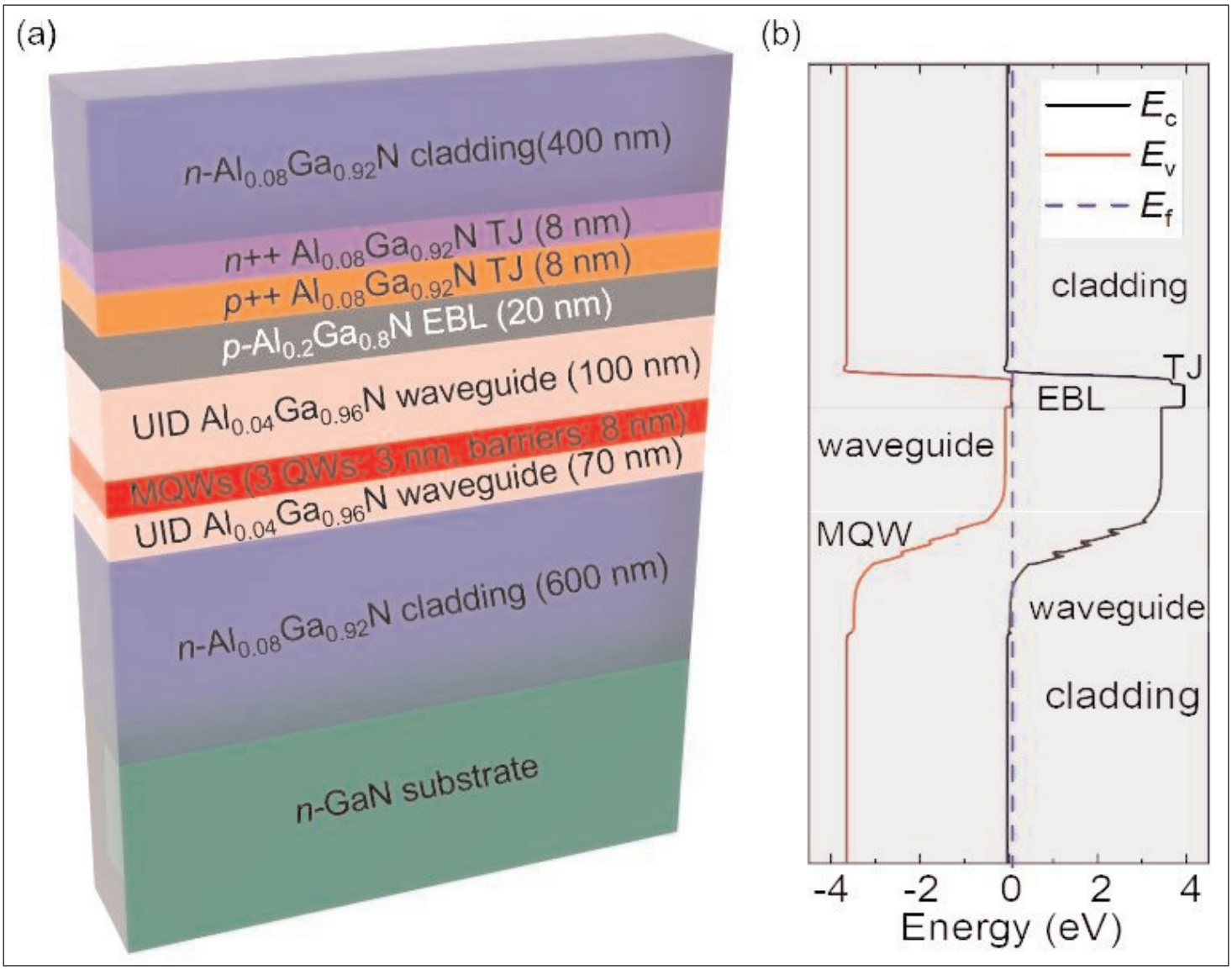


Figure 1. (a) Cross-sectional schematic of designed planar UV-A AlGaN laser structure, and (b) corresponding energy-band diagram in thermal equilibrium.

stringent and practically relevant operating conditions."

A leading disadvantage of AlGaN alloy semiconductor material is the difficulty in achieving hole injection, since conventional p-doping with magnesium has low carrier concentration efficiency. The OSU device used a transparent buried tunnel junction (TJ) enabling hole injection into the quantum-well active region, despite the top cladding being composed of n-type AlGaN.

The team explains: "The device structure features a transparent homojunction tunnel junction to enhance hole injection, along with a narrow-ridge, index-guided asymmetric waveguide design that significantly improves optical confinement while minimizing absorption losses from the substrate."

The researchers plan in future work to optimize design and growth on low-dislocation, high-Al-content AlGaN or AlN substrates to extend emission into the shorter-wavelength, and even more challenging, UV-B (280–315nm) and UV-C (100–280nm) spectral regions.

The epitaxial material for the laser diode was grown on c-plane free-standing GaN substrates (Figure 1). The structure included an electron-blocking layer (EBL) to suppress electron overflow from the active region. The tunnel junction for hole injection into the multiple quantum wells (MQWs) consisted of thin heavily doped layers of p^{++}- and n^{++}-type AlGaN.

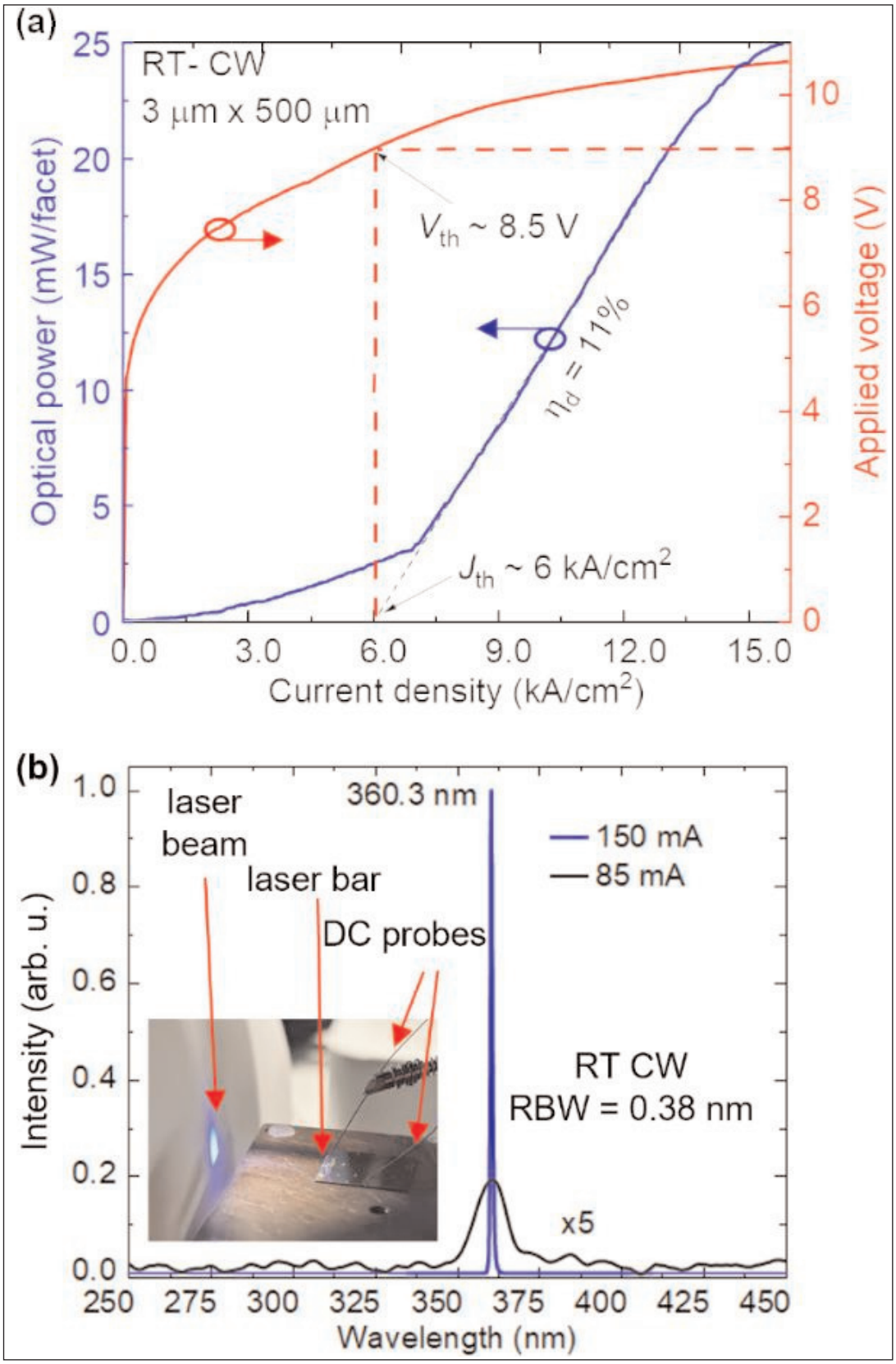


Figure 2. (a) Light output power–current–voltage (L–I–V) characteristics of Fabry–Pérot laser, and (b) emission spectra at below- and above-threshold with emission profile inset. Spectrometer resolution bandwidth (RBW) was 0.38nm.

The layer thicknesses were carefully designed to ensure a high optical confinement factor at the MQW. In particular, a thick bottom cladding was designed to compensate for the relatively high refractive index of the n-GaN substrate, which otherwise would tend to pull the optical mode downward, resulting in increased parasitic absorption in the substrate. The waveguide

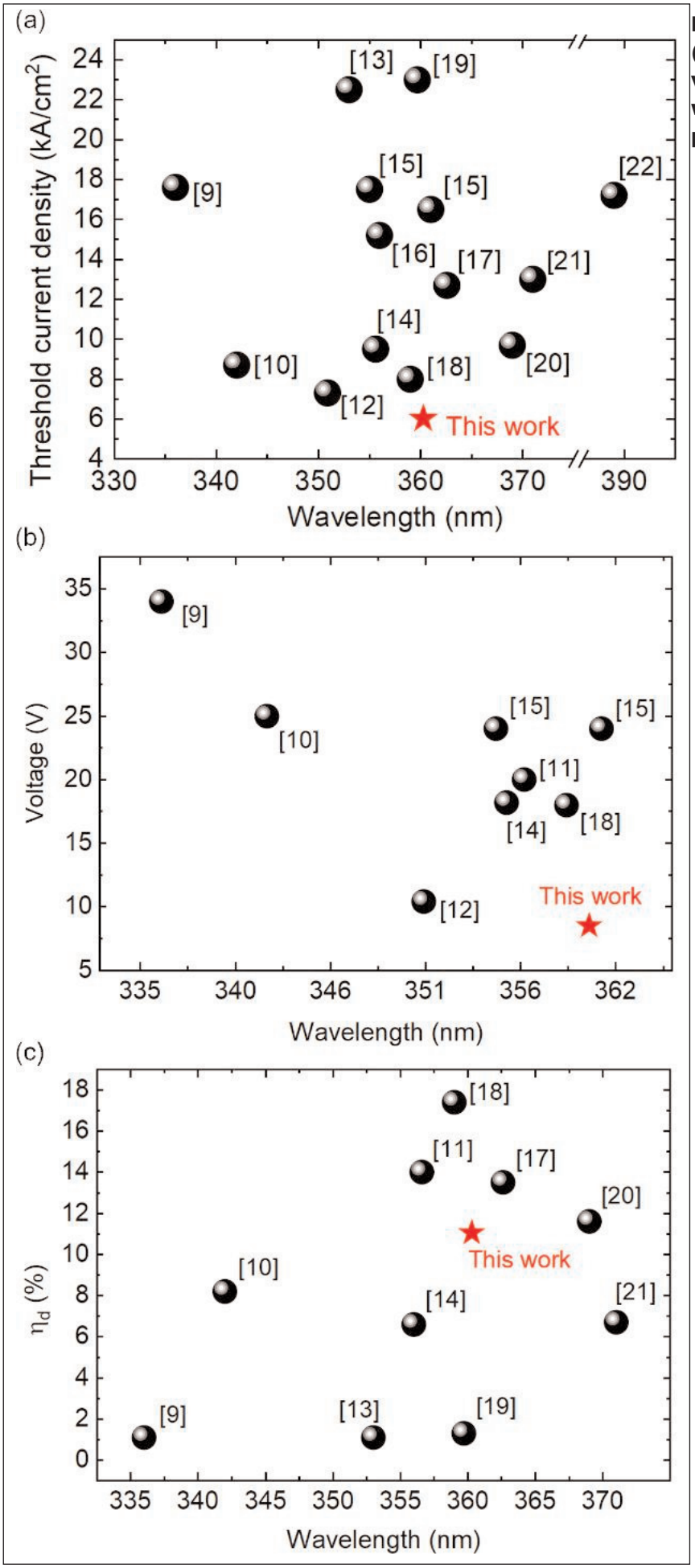


Figure 3. Benchmark comparisons of (a) threshold current density, (b) operating voltage and (c) η_d of presented CW device with other reported UV-A laser diodes under pulsed-mode operation.

thicknesses were also chosen with this in mind.

The researchers comment: "This configuration effectively redirects the optical field away from the lossy GaN substrate and improves mode overlap with the QWs."

The material was fabricated into 3μm-wide ridge waveguide lasers. The cleaved cavity length was 500μm. The ridge was formed by inductively coupled plasma reactive-ion etching (ICP-RIE) to a depth of 420nm. The ridge was designed to enhance lateral confinement of the optical field in the QW region.

The ohmic top-side contacts were applied to the n-AlGaN cladding, consisting of annealed titanium/aluminium/nickel/gold.

The lasers were also passivated with plasma-enhanced chemical vapor deposition (PECVD) silicon dioxide. The bottom contact metals were the same as for the top side, applied after thinning the device to 140μm. Nickel/gold contact pads were also formed. The characterization tests were on unpackaged devices without optical coatings of the facets.

The lasers, in CW operation, achieved 6kA/cm^2 threshold current density (J_{th}) at 8.5V forward bias (Figure 2). The total differential external quantum efficiency (DEQE, η_d) was 11%.

The team comments: "The η_d is expected to improve significantly with the incorporation of dielectric mirror coating on the facets and proper thermal management via packaging."

The subthreshold (85mA) peak wavelength was 361nm with 8nm full-width at half maximum (FWHM). Above threshold (150mA), the wavelength was 360.3nm (0.5nm FWHM, close to resolution limit).

The researchers compared the performance of their CW UV-A laser diode with reports of pulse-mode performance in the engineering literature (Figure 3): "The data clearly demonstrate that this work achieved a record low threshold voltage and current density, primarily attributed to the implementation of a homojunction TJ and an improved cavity design." ■

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Distributed polarization-doped green laser diodes

Including a doped electron-blocking layer reduces laser threshold current and increases slope efficiency.

Researchers based in China have improved the performance of green (500–565nm) laser diodes with distributed polarization-doped (DPD) p-type aluminium gallium nitride (AlGaN) cladding [Fangzhi Li et al, J. Appl. Phys., v139, p034501, 2026].

Green laser diodes are sought particularly to fill the 'green gap' for efficient laser displays. Other applications using green lasers include underwater communication, and atomic clocks.

The team from Suzhou Institute of Nano-tech and Nano-bionics, Suzhou GaN Bright Optoelectronics Technology Co Ltd, and Sichuan University, improved both from their previous work and in comparison with a device using a conventionally doped AlGaN/GaN superlattice cladding layer.

The DPD uses a graded AlGaN composition between the waveguide and p-GaN contact layers. The variation in the charge polarization of the chemical bonds creates holes that can be injected to recombine in the active photon-producing region, in this case two quantum wells of indium gallium nitride (InGaN) for green light.

The DPD structure has been effective in enhancing the performance of deep ultraviolet (sub 300nm wavelength) laser diodes, where conventional magnesium (Mg) p-type doping has much lower effectiveness for AlGaN than for pure GaN. The team's previous work using an AlGaN DPD upper cladding did reduce the threshold current, but suffered from a very low slope efficiency. The slope efficiency measures the increase in light output power relative to increases in injection current.

The new structure included a p-doped electron-blocking layer (EBL), boosting the slope efficiency for a slight increase in threshold.

The researchers used metal-organic chemical vapor deposition (MOCVD) on c-plane free-standing GaN substrate to produce their laser diode structures (Figure 1). Magnesocene (Cp_2Mg) and silane (SiH_4) were used as the p- and n-type doping sources, respectively. While the cladding layers were intentionally p-doped in the conventional laser diode A, the graded claddings for laser diodes B and C were not. Laser diode C was found by secondary-ion mass spectroscopy (SIMS) to have magnesium (Mg) contents of about $5x10^{18}/cm^3$, due to the MOCVD memory effect from the preceding p-AlGaN EBL, according to simulations.

The p-contact layers were coated with transparent conductive indium tin oxide (ITO), which the team used to enhance the optical field confinement on the p-type side of the laser diodes. The 200nm ITO layer was also expected to improve optical field confinement on the p-side of the laser diodes, pushing the peak intensity towards the n-side.

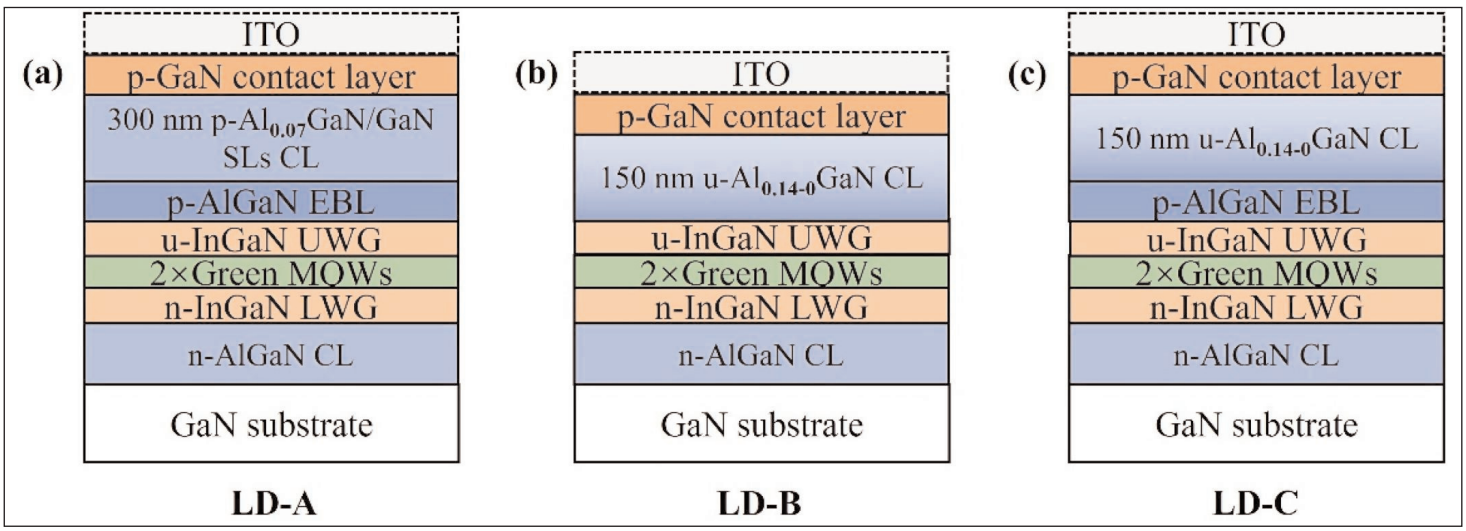

Figure 1. Epitaxial structure of three green laser diodes, (a) conventional green laser diode using 300nm p-$Al_{0.07}GaN_{0.93}$/GaN superlattice (SL) cladding layer (CL), (b) structure using graded u-AlGaN CL without electron-blocking layer (EBL), (c) laser diode using graded u-AlGaN CL and EBL.

Table 1. Hall measurement results of p-CL types.

CL types	Thickness	Bulk resistivity	Hole mobility	Hole concentration
p-$Al_{0.07}Ga_{0.93}N$/GaN SLs with EBL	300nm	0.96Ω-cm	7.72cm^2/V-s	8.38x10^{17}/cm^3
graded u-$Al_{0.15-0.02}$GaN without EBL	150nm	1.66Ω-cm	9.83cm^2/V-s	2.23x10^{17}/cm^3
graded u-$Al_{0.14-0}$GaN with EBL	150nm	0.967Ω-cm	8.71cm^2/V-s	7.41x10^{17}/cm^3

The researchers performed Hall measurements to assess the hole transport properties of the p-type cladding layers (Table b). Without the EBL, the graded cladding layer had an increased resistivity due to a severe reduction in hole concentration, not compensated by the increase in mobility. Including the p-doped EBL marginally increases the bulk resistivity while improving the mobility over the conventional SL structure with a slight drop in hole concentration.

The researchers comment: "Unintentionally doped Mg acceptors can significantly reduce the resistivity of graded AlGaN cladding layers, which helps reduce the operating voltage of laser diodes."

The team comments on simulated optical loss rates: "Unionized Mg acceptors are the main cause for internal loss in laser diodes, so in LD-B and LD-C with lower Mg doping concentrations, the internal loss is lower, 2.10/cm and 2.44/cm, respectively. LD-A has the highest Mg doping concentration, so its internal loss is also the highest, reaching 2.97/cm."

In the previous work, the researchers reported that the LD-B structure suffered from severe reduction in

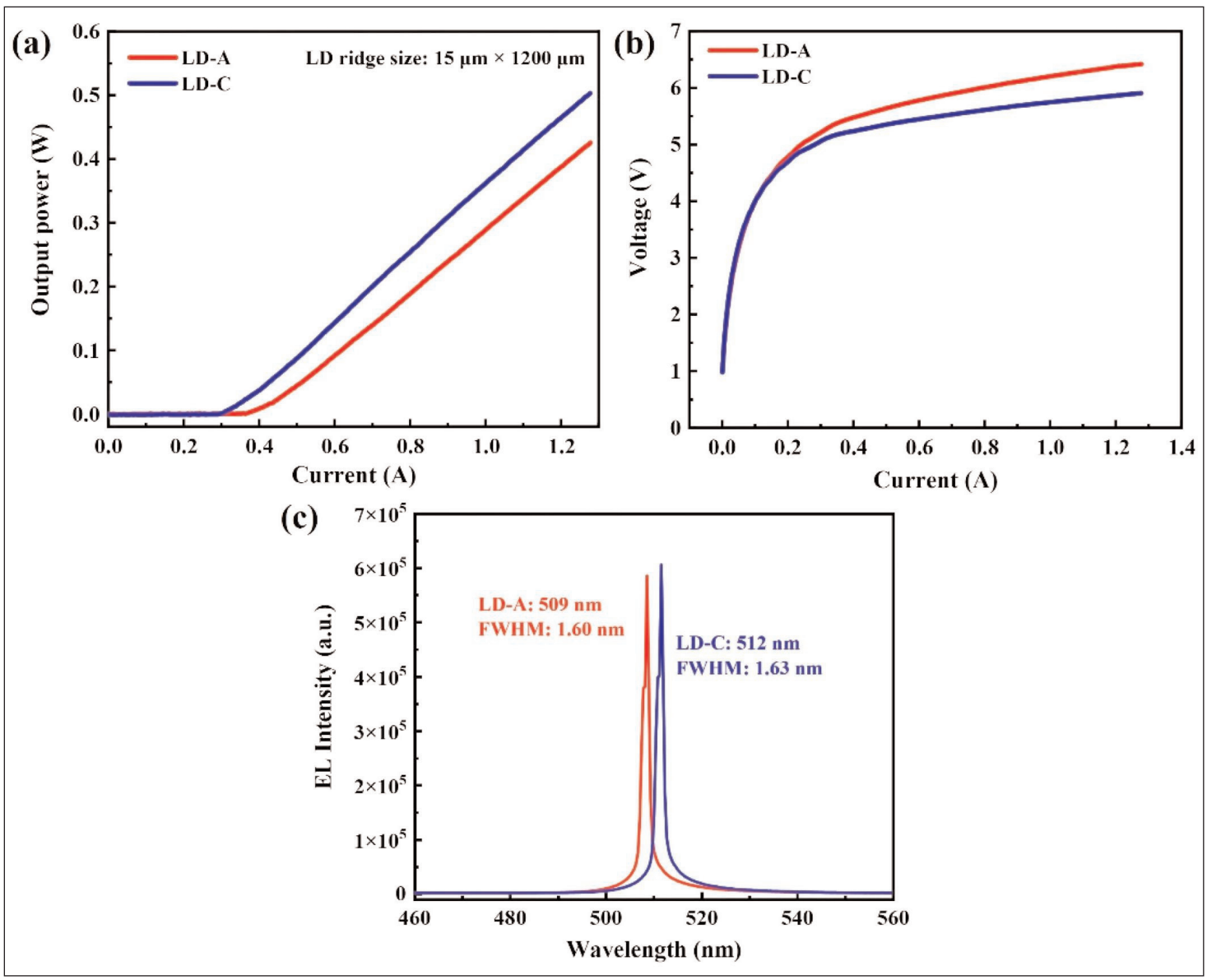

Figure 2. (a) Optical power–current curves of LD-A and LD-C chips measured under pulse operation, (b) current–voltage characteristics, and (c) lasing spectra.

Table 2. Threshold and slope efficiencies. Result for B is from previous report from group.

LD-	Threshold current density	Slope efficiency
A	2.28kA/cm^2	0.49W/A
B	1.7kA/cm^2	0.07W/A
C	1.83kA/cm^2	0.54W/A

slope efficiency, measured at just 0.07W/A. The team's simulations suggest that this was due mainly to electron overflow into the p-type region, rather than contributing to photon generation in the multiple quantum well region.

The absence of the EBL also results in "the disadvantage of high operating voltage, which is attributed to the abnormally low injection efficiency," the team comments, adding: "Some reports suggest that the low injection efficiency is caused by the polarization charges at the sharp interface between the InGaN upper waveguide and AlGaN cladding layer, which hinders hole transport."

The researchers fabricated laser diodes based on the conventional and C epitaxial structures (Figure 2). The peak lasing wavelengths were at 509nm and 512nm for LD-A and -C, respectively.

LD-C under pulsed injection achieved lower threshold currents, and higher slope efficiency, (along with lower operating voltage, according to Figure 2) than LD-A (Table d). LD-B did achieve a slight lowering of the threshold from LD-C, but at the cost of much reduced slope efficiency, previously mentioned. ■

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Micro-LED reaches make-or-break phase as first production lines ramp at AUO

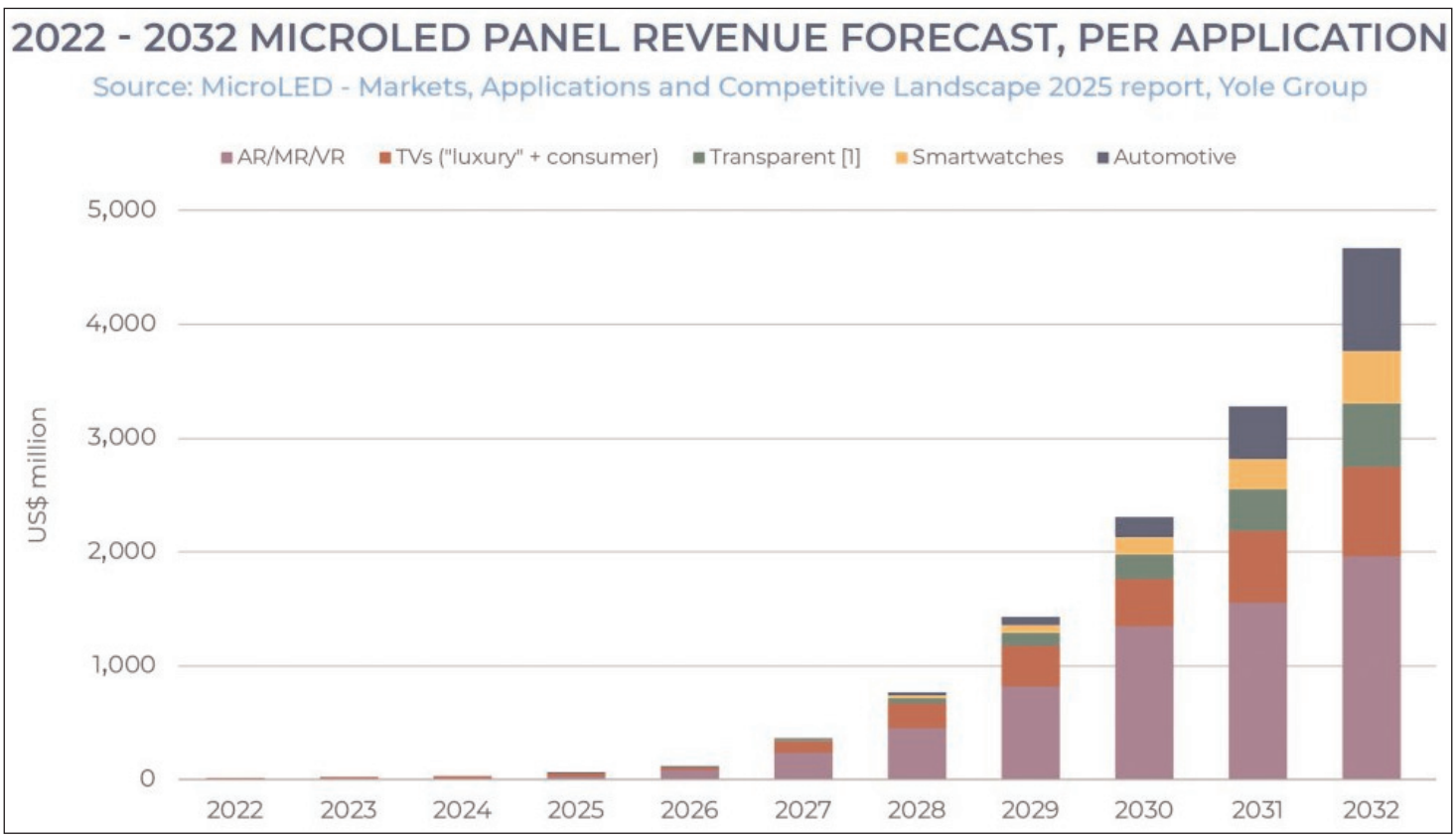
Supply chains and process choices are becoming clearer, says Yole, but a lack of standardization and manufacturing maturity remain major bottlenecks.

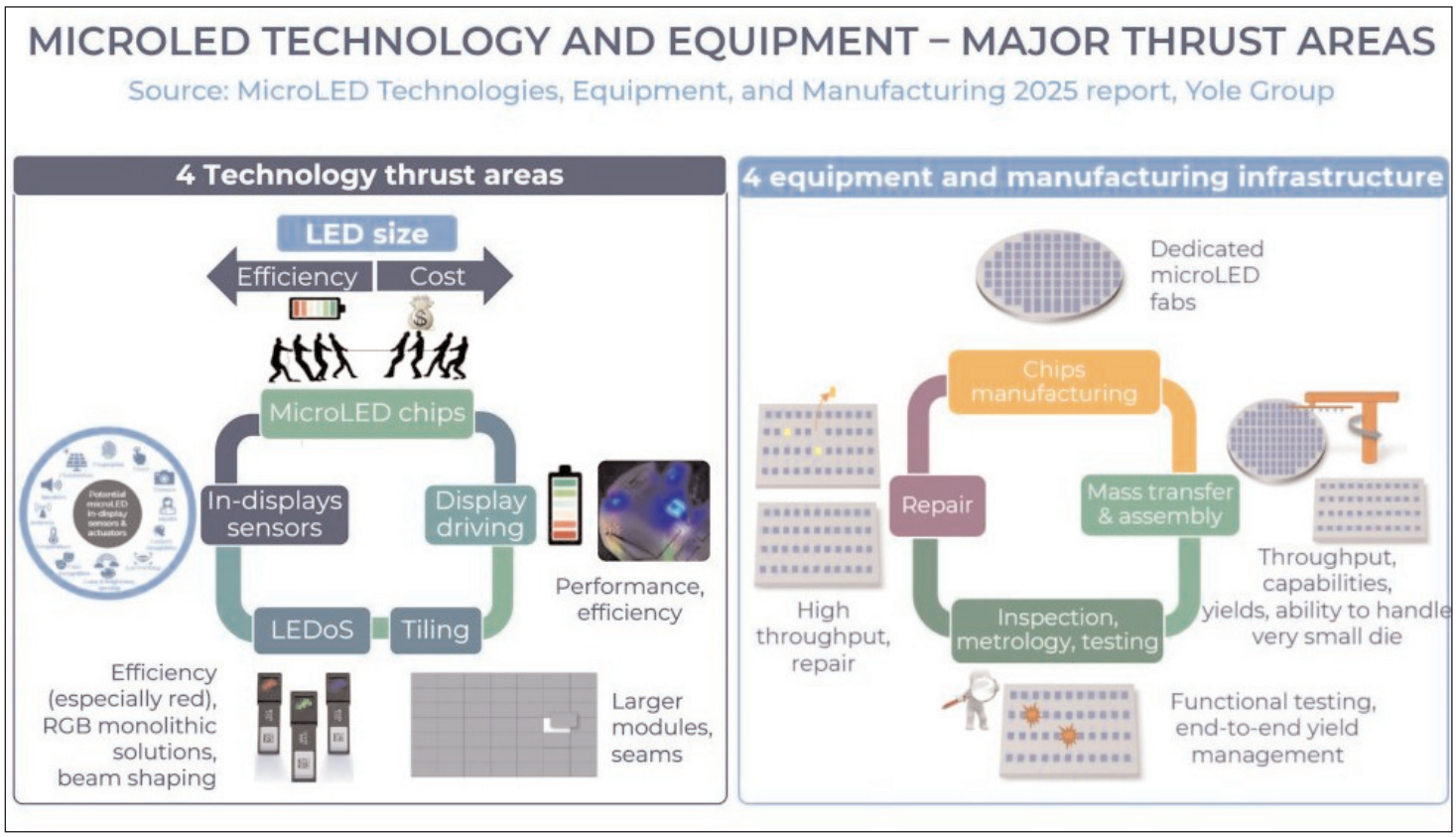
At a time when production lines begin to ramp and the technology enters a pivotal make-or-break phase, market analyst firm Yole Group has released two strategic reports: MicroLED Markets, Applications, and Competitive Landscape 2025 and MicroLED Technologies, Equipment, and Manufacturing 2025.

The micro-LED industry is transitioning from hype to reality. After years of development, the first commercial displays (Garmin's smartwatch and Sony-Honda Afeela's automotive exterior display) will enter low-volume production in 2025, manufactured on AUO's G4.5 line. This moment represents a critical test: the industry must prove that yields, manufacturability and costs can converge toward a viable commercial path beyond niche B2B and LED-on-silicon applications.

"Micro-LED has progressed enough to exist without depending on a single flagship product," notes Raphaël Mermet-Lyaudoz PhD, technology & market analyst in Photonics and Display. "The momentum is returning in 2025, supported by a clearer understanding of strengths, limitations, and realistic timelines." Specifically, funding for startups and small-companies is rising again, up 20% in 2025 to more than US$425m.

Yet the challenges remain significant. Micro-LED must match OLED's cost while delivering differentiating performance, a demanding requirement that intensifies pressure on die efficiency at small pixel sizes,





mass-transfer yields and throughput, repair strategies, and TFT-backplane limitations. Although investments in fabs and pilot lines continue, decision-makers remain cautious as processes and tools are still maturing.

The industry also faces a structural bottleneck: a lack of process standardization. Today, most micro-LED display makers pursue unique architectures that require customized equipment that is costly and complex. While some equipment suppliers, including Hardram, Coherent, Contrel, and PlayNitride, continue to develop new generations of tools, others have stepped back due to uncertain prospects and daunting development challenges.

"Micro-LED supply chains are becoming clearer, with stronger alignment between chip makers and panel makers," says Eric Virey PhD, principal analyst, Display. "However, strategic questions remain, particularly around foundry models, CoC/CoC2 assembly distribution, and the maturity of large-stage, high-throughput tools," he adds.

Meanwhile, LED-on-Silicon (LEDoS) is emerging as the most promising volume driver, fueled by AI-accelerated demand for augmented reality (AR) glasses and high-performance micro-displays. China leads the charge with JBD as the only player shipping in volume, while Sitan, Saphlux, Hongshi, Innovision, and Raysolve scale new fabs. Outside China, alliances are forming around Porotech, PlayNitride, Micledi, Mojo Vision, Aledia and others, each pursuing distinct architectures, materials, and manufacturing strategies.

Micro-LED is also attracting growing interest for optical interconnects in data centers and high-performance computing, supported by major stakeholders such as TSMC, Intel, NVIDIA, and Microsoft, notes Yole. Startups, including Avicena and Hyperlume, have raised significant funding to accelerate development in this emerging field.

Micro-LED is entering a decisive phase, one defined by cautious investment, advancing supply chain alignment, and a growing focus on manufacturability over the long term, concludes Yole. ■

www.yolegroup.com/product/report/microled-2025

Metal-modulated cubic GaN epitaxy

Process enables improved morphology and phase purity in red-light-emitting samples.

Researchers based in Germany and the UK report on metal-modulated epitaxy (MME) cubic indium gallium nitride (c-InGaN) growth with a view to red light emission [Silas A. Jentsch et al, J. Appl. Phys., v138, p225702, 2025]

The team, from Justus-Liebig-University Giessen and Paul-Drude-Institut für Festkörperelektronik in Germany, Cambridge University in the UK, and Paderborn University in Germany, comments that its results "demonstrate the potential of MME-grown cubic InGaN for efficient red emission and underline its relevance for future micro-LED applications."

Cubic III–nitrides have a metastable zincblende crystal structure. The more usual hexagonal symmetry III–N structure is wurtzite. A potential advantage of cubic material is the absence of the internal electric fields that arise in hexagonal symmetry structures from the charge polarization of the chemical bonds.

The researcher explain the attraction of c-InGaN: "The more severe intrinsic challenges in conventional III–nitride semiconductors in the wurtzite crystal structure are the internal polarization fields. These invoke the quantum-confined Stark effect (QCSE) in InGaN active media. This leads to the spatial separation of electrons and holes which, in turn, results in reduced recombination rates and more implicitly enhanced non-radiative decay. The QCSE becomes more pronounced with increasing indium content."

The researchers suggest that cubic III–nitrides could cover a similar light wavelength range as hexagonal material, but could also encroach more successfully into to the longer-wavelength ranges of red light, competing with phosphide semiconductors, materials based on aluminium indium gallium phosphide (AlInGaP) alloys. For normal-size LEDs, these are far more efficient than any InGaN LED reported. However, phosphide LEDs suffer from severe efficiency reductions as the LEDs are reduced to the micro/nano-level needed for the micro-displays used in virtual/augmented-reality (VR/AR) applications.

Nitride LEDs have a far better size-scaling impact on efficiency.

The metastability of c-InGaN is the fly in the ointment, complicating potential growth processes. The researchers comment: "MME growth leads to significantly improved structural properties and enables stable red emission with consistent optical performance across all studied InGaN layer designs, highlighting its suitability for further exploration in high-indium-content quantum structures."

The c-InGaN with up to 34% indium content was grown by plasma-assisted molecular beam epitaxy (PAMBE) on commercial 3C polytype silicon carbide (3C-SiC) on silicon substrate (Figure 1). A conventional growth (CG) scheme was compared with MME where the Ga and In were supplied alternately, rather than together.

The c-InGaN layers were grown on 600nm-thick c-GaN templates with 8nm cubic aluminium nitride (c-

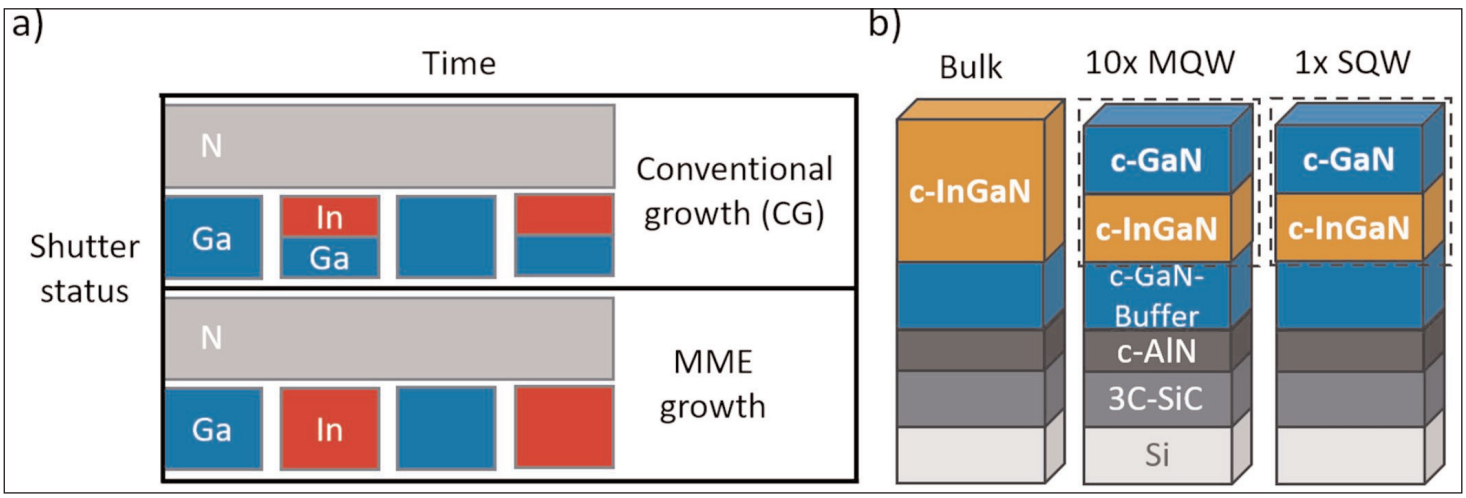


Figure 1. (a) Shutter timing for conventional and metal-modulated growth of InGaN/GaN QWs. (b) Sample structure on common buffer/substrate stack: bulk InGaN layer, InGaN/GaN 10-period MQW, and SQW.

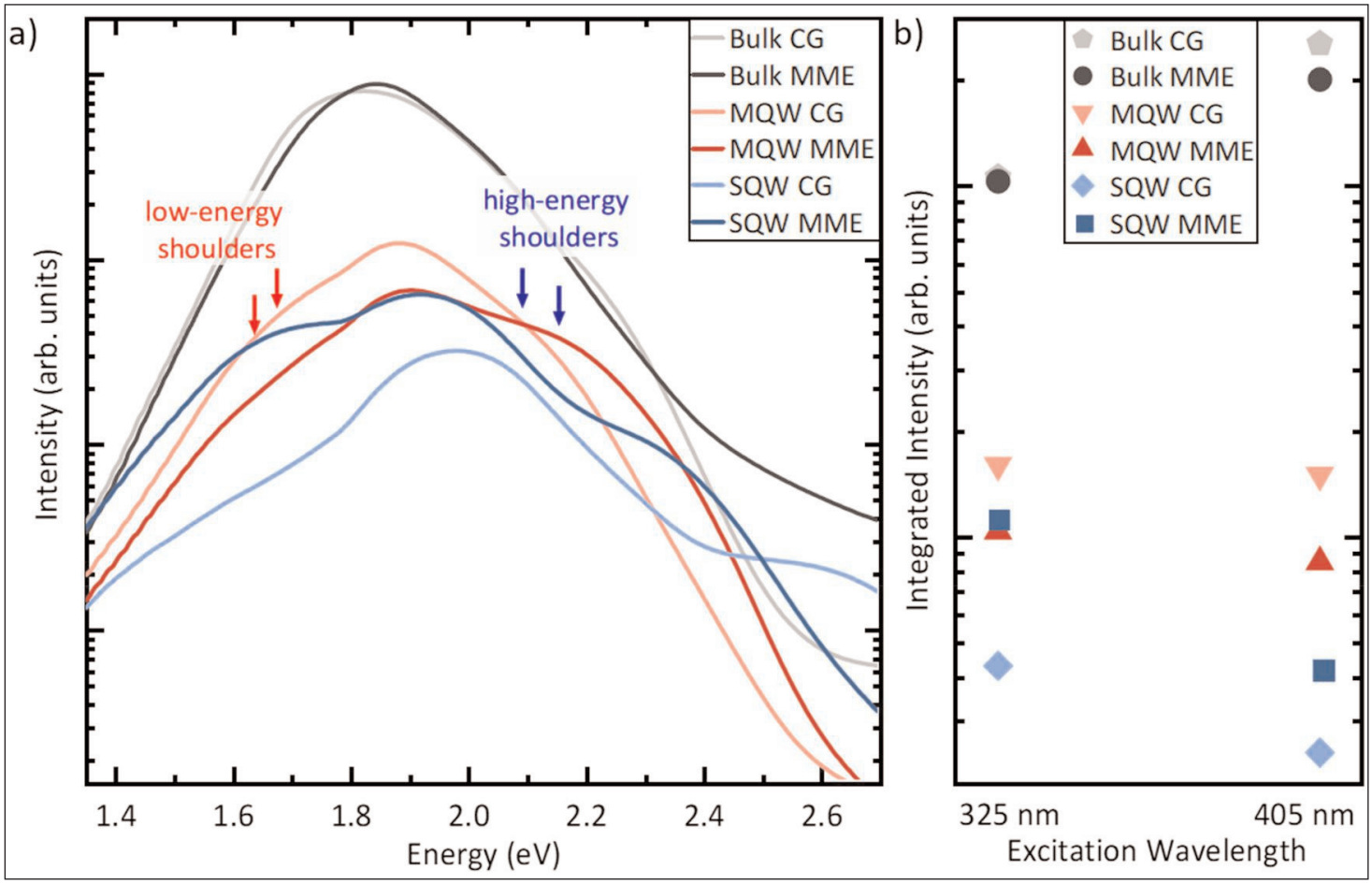


Figure 2. (a) Room-temperature PL spectra of all six samples on logarithmic scale. Selected high- and low-energy shoulders indicated by blue and red arrows, respectively. (b) Integrated PL intensity with 325nm and 405nm excitation wavelengths.

Table 1. Overview of six samples investigated.

Sample	x(In)	Thickness (well/barrier) (nm)	PL emission energy 290K (eV)	Roughness (nm)	Out-of-plane strain (10^{-3})	Hexagonal inclusions (%)
Bulk CG	0.28	253	1.82	11.5	7	3
Bulk MME	0.28	245	1.85	9	10.8	0
MQW CG	0.32	209 (12/10)	1.89	3.1	23.9	4
MQW MME	0.33	216 (12/10)	1.91	2.5	20.9	0
SQW CG	0.32	22 (12/10)	1.98	2.5	31.9	0
SQW MME	0.34	26 (15/11)	1.92	1.4	34.3	0

AlN) buffer on the substrate. The nitrogen component came from an RF plasma source.

Three growth scenarios were implemented: bulk c-InGaN, alongside 10-period multiple quantum wells (MQWs), and single quantum wells (SQWs). The bulk material was grown at 600°C, while the QWs were grown at the lower temperature of 565°C.

The researchers explain: "The lower growth temperatures for the quantum well structures cause higher indium incorporation. This compensates for the blue-shift caused by quantum confinement and compressive strain in order to achieve red emission."

A range of material characteristics were extracted from the resulting samples (Table b). One advantage of the MME method was the elimination of hexagonal crystal structure inclusion during growth, as determined by reciprocal space mapping from high-resolution x-ray analysis. Also, the surface roughnesses were reduced. The 1.82–1.98eV photoluminescence (PL) energy range corresponds to a wavelength range of 681–626nm. This verges on the red range of 625–750nm.

The team comments: "MME remains effective for achieving red emission despite the challenges associated with higher indium incorporation >35% in MME growth, such as pore formation in bulk layers and the onset of InN formation at lower temperatures."

The spectral performance of the samples under PL showed the highest intensity for the bulk samples (Fig-

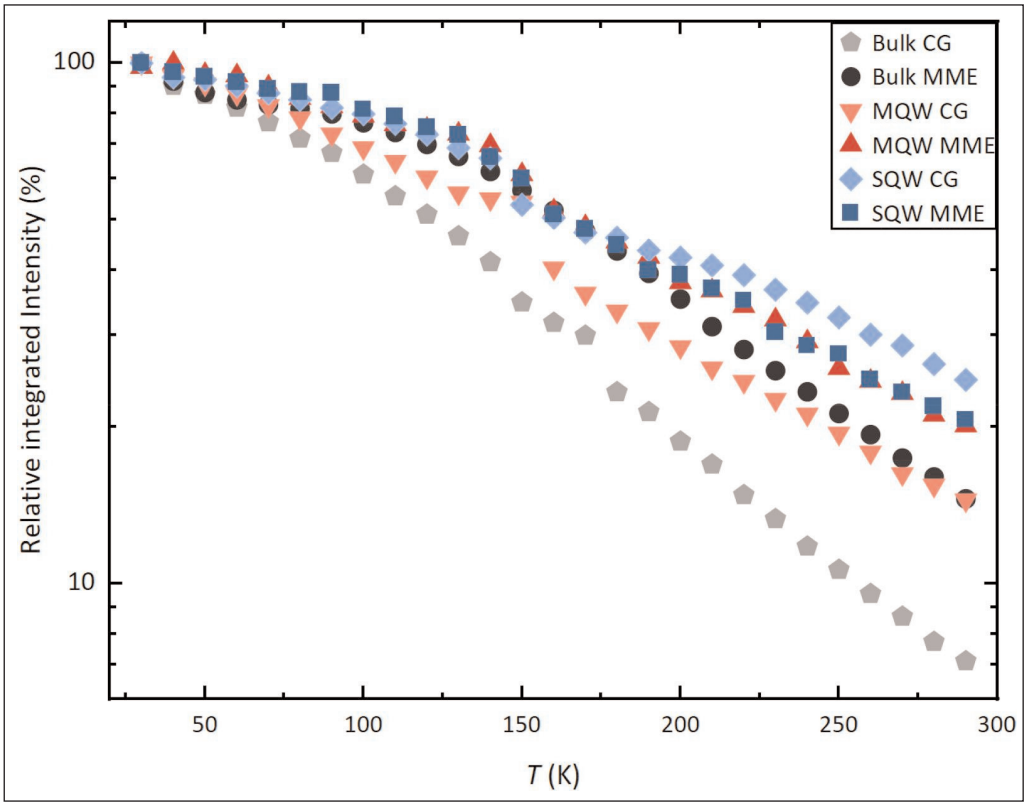


Figure 3. Relative, spectrally integrated PL intensity of main emission peak for all six samples versus temperature, normalized to respective intensity at 30K.

ure 2). The researchers comment: "While QW structures are, in principle, expected to provide enhanced radiative efficiency due to carrier confinement, the observed PL intensity of the bulk layers in our cubic InGaN samples exceeds that of the QW structures by one to two orders of magnitude."

The team points to three factors contributing to this behavior:

1. The QWs were relatively thick, reducing the confinement effect.
2. The well/barrier interfaces introduced non-radiative recombination centers, reducing light output.
3. The effective active volume of QWs is much less than that of bulk material.

A further observation was that the MME MQW and SQW samples showed similar intensity levels overall. This was explained by the absorption of 325nm excitation (3.81eV) in the c-GaN barrier layers, exceeding the bandgap of around 3.3eV. The 325nm excitation was unable to effectively penetrate more than the top QW of the MQW structure.

Reducing the excitation energy to 3.06eV (405nm), below the bandgap, separated the SQW and MQW intensities. "As expected, the MQWs outperform the SQWs by up to about an order of magnitude for in-well pumping," the researchers comment.

The MME QW samples showed broader spectra with pronounced shoulders on the low- and high-energy sides of the main peaks for the SQW and MQW structures, respectively. The corresponding full widths at half maximum (FWHM) were 460meV and 430meV. On the basis of this, and micro-cathodoluminescence mapping studies, the team suggests a model of potential barriers around pit-like depressions mainly caused by thinner well thickness and lower indium content at the pit's side-walls, which spatially and energetically separate the recombination pathways for the peaks.

The researchers comment: "The emission energy stability under varying excitation is also observed for all other samples studied and represents a significant advantage of cubic InGaN structures. It highlights the absence of internal polarization fields and the resulting lack of the quantum-confined Stark effect."

The researchers also studied the integrated intensity behavior of the main peaks of the samples, excluding any shoulders (Figure 3). This behavior gives an indication of the effects of non-radiative recombination.

The researchers comment: "Non-radiative recombination centers are considered less active at cryogenic temperatures as the excited carriers do not relax toward them across the disordered potential landscape. The excited carriers gain thermal energy by increasing lattice temperature and can then increasingly access these centers. This leads to a reduction in radiative efficiency, the so-called 'thermal quenching'."

The bulk and MQW MME samples maintain higher integrated intensities over the CG materials at higher temperatures.

A change in slope at around 150K is associated with a switch in the main quenching mechanism from recombination at non-radiative defects at low temperature to a steeper slope for thermionic emission of carriers from the InGaN well into the GaN barrier.

The researchers report: "The strongest high-temperature quenching is observed in the bulk layers, which renders thermionic escape from InGaN into GaN as the dominant quenching pathway for temperatures above 150K unlikely. An alternative explanation is the thermal dissociation of excitons, since the exciton binding energy decreases with increasing quantum well thickness. This leads to a stronger temperature-induced quenching in bulk-like samples consistent with our observations." ■

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Reducing wafer bow in GaN-on-QST growth

Growth pressure modification allows thicker drift layers needed for 1200V-and-beyond vertical devices on silicon.

Imec in Belgium and Aixtron SE in Germany have reported that modifying the growth pressure during metal-organic chemical vapor (MOCVD) can reduce wafer bowing of 200mm-diameter wafers aimed at vertical gallium nitride (GaN) high-voltage devices [Kwang Jae Lee et al, Appl. Phys. Lett., v127, p241902, 2025]. Wafer bowing makes large-area device fabrication difficult, if not impossible.

Vertical devices aimed at high voltage ratings 1200V and beyond need to include thick drift layers to reduce the electric field below its critical breakdown value. Increased thickness heteroepitaxy tends to increase wafer bowing due to the different stresses in the epitaxial layers of different composition and the underlying substrate. Stress, in addition, tends to generate defects such as micro-cracks or slip lines. The wafer bow problem also becomes more critical as the wafer diameter increases.

The researchers used Qromis substrate technology (QST) wafers aimed at GaN epitaxy for high-voltage applications. The US fabless company Qromis supplies commercial 200mm wafers through partnerships with substrate foundries.

The Imec/Aixtron team comments: "The use of standard 200mm Si(111) to grow such thick GaN stacks is extremely challenging due to high risk of wafer breakage and delamination. The QST substrates with Si(111) top layer are available primarily in 200mm and in early research phase for 300mm diameter, and they consist of a poly-crystalline AlN core, which makes these substrates mechanically robust and well suited for device processing with very low risk on wafer breakage."

The pressure modification implemented by the Imec/Aixtron team introduced sufficient build up of compressive stress during the high-temperature GaN growth that compensated for the tendency to tensile stress during cooldown.

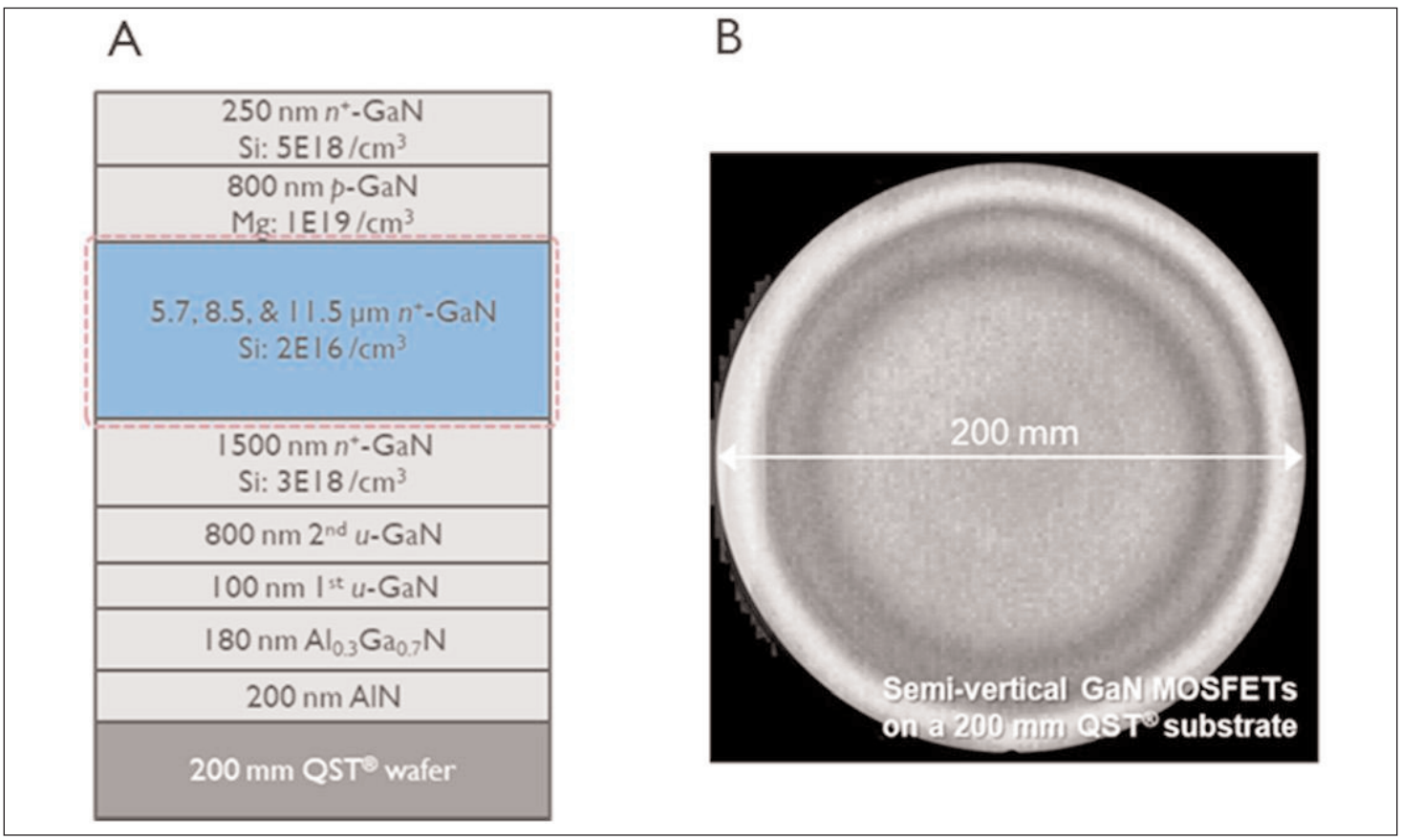

Figure 1. (a) Epitaxial stack scheme aimed at vertical GaN MOSFETs, (b) CAMTEK top-view optical image after stack growth on 200mm QST wafer.

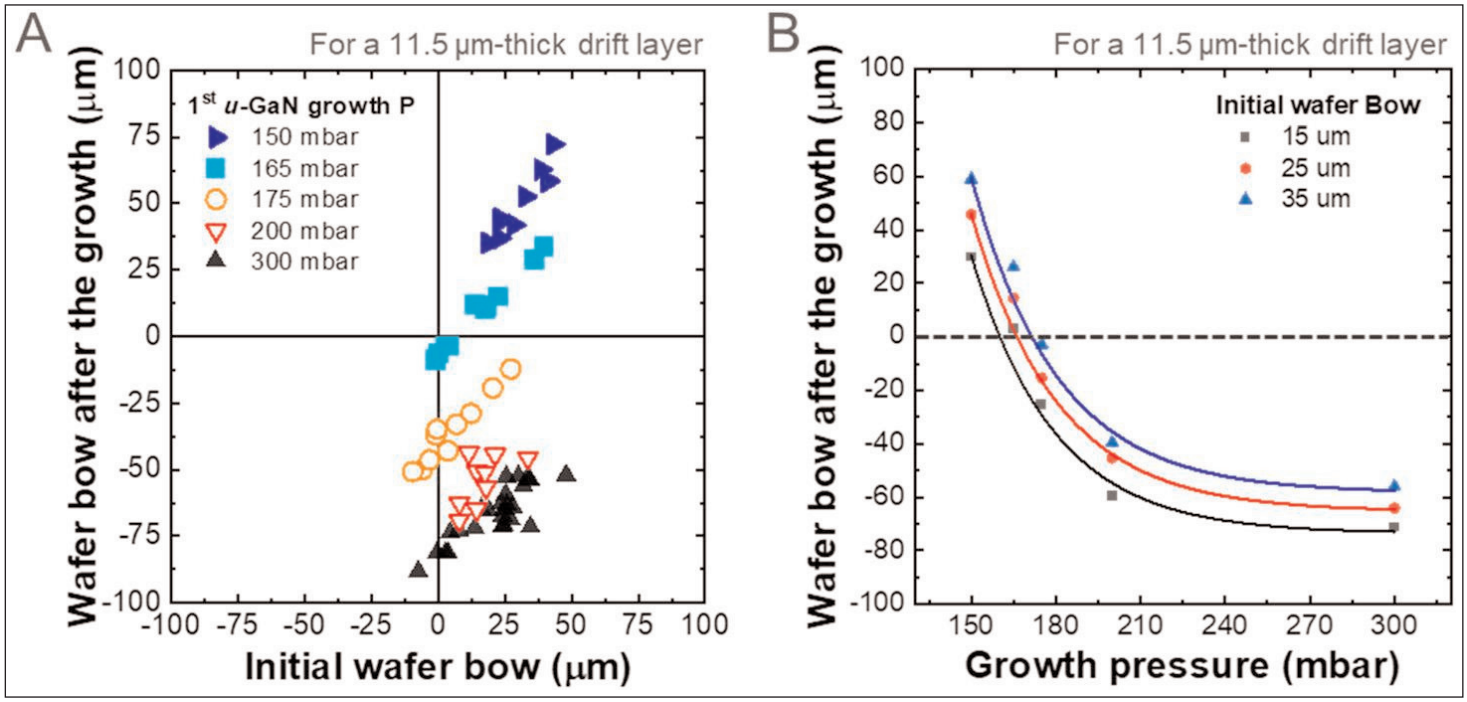

Figure 2. (a) Post-epitaxy wafer bow versus initial wafer bow for 11.5µm drift layer for different 1st u-GaN pressures. (b) Post-epitaxy wafer bow versus 1st u-GaN growth pressure.

The researchers comment: "This method is a crucial advancement for GaN vertical device development, enabling for so-far unreached wafer bow control during MOCVD processing, accommodating wider thickness variations in the drift layer and enabling large-area processing."

For applications for 1200V and beyond, vertical device structures "offer multiple advantages including maintaining a compact device footprint, achieving higher breakdown voltages, supporting greater current-handling capacity, and delivering superior switching and dynamic performance," according to the team.

Presently, vertical device development mainly uses bulk or freestanding GaN substrates. Such substrates are very expensive and much smaller (150mm diameter at most) than what is available for silicon. The small size adds to the expense of device fabrication.

The researchers used Aixtron's G5+ C Planetary Reactor to grow GaN layers on five 200mm QST wafers in each run (Figure 1). The team studied the effect of reducing the growth pressure of the first undoped GaN (1st u-GaN) layer from 300mbar down to 150mbar. The second u-GaN layer was grown at 300mbar in all samples.

The researchers used Gen II QST wafers, which have much lower convex initial bowing (0–50µm) relative to Qromis' Gen I product (>100µm). Gen I wafers needed complex buffer designs, involving superlattices, to compensate for the initial bowing. Using Gen II substrates enabled a much simpler transition between the Si(111) surface of the QST wafer to the GaN layers with aluminium nitride (AlN) nucleation and AlGaN alloy buffer.

The researchers first studied 5.7µm, 8.5µm, to 11.5µm drift layers to be grown with crack-free and mirror-like surfaces with 300mbar first u-GaN layers on Gen II QST wafers. However, as the drift layer thickness increased the bow after growth also increased. At 11.5µm the wafer bow was about –85µm.

On QST wafers with zero wafer bow the final bowing could be reduced to flatness if the 1st u-GaN layer was grown at 165mbar (Figure 2).

The researchers comment: "At 150mbar, the net bow change (post–pre-Epitaxy wafer bow) shifts to positive values (compared to 300mbar), demonstrating that the net bow change can be altered from concave to convex and vice-versa simply by adjusting the growth pressure of the 1st u-GaN layer."

The team studied in-situ reflectance measurements during the 1st u-GaN growth to assess the growth modes. At 300mbar the reflectance behavior was that of three-dimensional growth, rather than the desired two-dimensional layer-by-layer mode.

"On the other hand," the researchers report, "the 1st u-GaN grown at 150mbar exhibits a consistent in-situ reflectance intensity from the outset, indicating that the GaN growth maintains throughout a two-dimensional (2D) growth mode."

Raman spectroscopy analysis gave calculated residual stress in vertical GaN stacks with 11.5µm drift layers of 0.047GPa (tensile) and –0.024GPa (compressive) for 300mbar and 150mbar 1st u-GaN pressures, respectively.

The researchers add: "It was found that there is no impact on crystalline quality or the background impurity concentration within the u-GaN and the critical drift layer region." ■

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Author: Mike Cooke

Increasing 2DEG density with aluminium nitride barriers

Researchers claim a record two-dimensional electron gas sheet density of $1.3x10^{14}cm^2$ for AlN/GaN structures.

University of Michigan at Ann Arbor in the USA has reported the experimental demonstration of a record room-temperature 2DEG sheet density exceeding $1x10^{14}cm^2$ in a single-channel AlN/GaN heterostructure grown by plasma-assisted molecular beam epitaxy (PAMBE), using a 9nm-thick AlN barrier [Shubham Mondal et al, Appl. Phys. Lett., v127, p243505, 2025].

The researchers see their work as potentially leading to high-performance, thermally robust, and aggressively scaled devices for millimeter-wave power amplifiers, RF front-end modules, and wide-bandgap electronic applications. The team adds: "For practical device implementations, dielectric integration (e.g. Al_2O_3 or HfO_2) and optimized interface engineering provide a more robust and reliable design window for AlN/GaN HEMTs."

Typical lateral HEMT structures engineer a two-dimensional electron gas (2DEG) channel by growing undoped GaN and adding a barrier layer, usually aluminium gallium nitride (AlGaN). Alternative barriers such as indium- (InAlN) or scandium- (ScAlN) AlN alloys offer higher mobility but at the expense of much lower 2DEG carrier density.

The researchers comment: "In contrast, AlN/GaN exhibits the largest spontaneous and piezoelectric polarization difference among III–nitrides, supporting record-high 2DEG density and strong confinement when strain is well managed."

Strain and spontaneous charge-related polarization differences between the channel and barrier layers creates a potential well for the electrons near the barrier/channel layer interface.

The researchers used a high-resistivity GaN-on-sapphire template on which 100nm GaN was re-grown along with a variable-thickness AlN barrier. The GaN template layer was vanadium-doped to achieve high resistivity.

The heterostructure was capped with GaN to protect the AlN from degradation processes in the atmosphere, such as oxidation to which Al-containing material is particularly prone.

The growth method was 600°C PAMBE under metal-rich conditions for improved coalescence and surface planarization. The team explains: "The excess metal enhances adatom mobility, fostering lateral growth and smoother film surfaces."

The researchers used van der Pauw Hall-effect measurements to extract the 2DEG carrier density, mobility and sheet resistance (Figure 1). For all the samples the trend in mobility was downwards from $925.2cm^2$/V-s as the barrier thickness increased from 3nm.

The maximum 2DEG density was obtained in the 9nm-barrier sample: $1.3x10^{14}cm^2$. The researchers comment: "This record value arises from optimized MBE growth featuring precise strain control and an atomically sharp GaN/AlN interface."

The lowest sheet resistance, combining the density and mobility trends, was 166Ω/❑, obtained for the

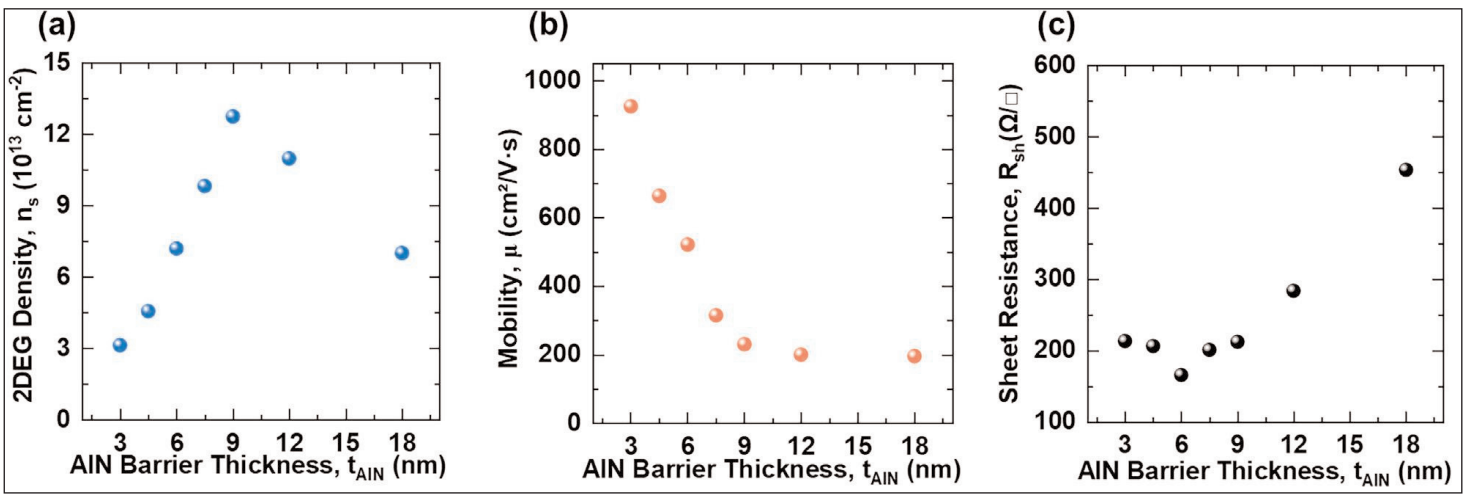

Figure 1. Plots of room-temperature van der Pauw Hall measurements: (a) 2DEG density (n_s), (b) mobility (μ), and (c) sheet resistance (R_{sh}) versus AlN barrier thickness (tAlN).

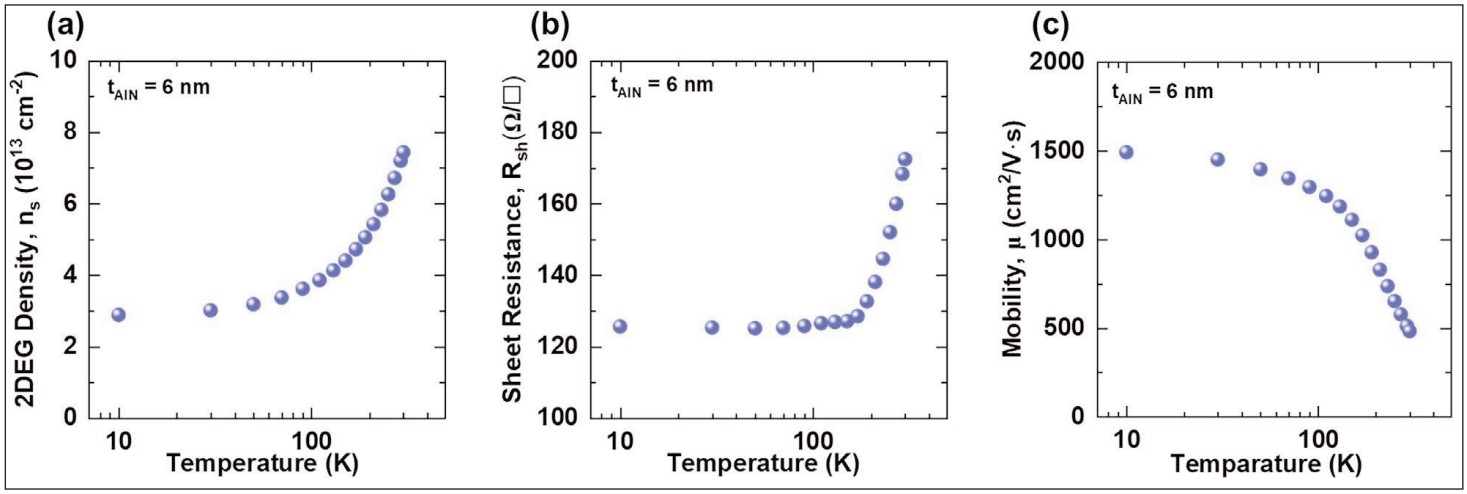

Figure 2. Temperature-dependent Hall-effect measurements for 6nm AlN barrier sample: (a) n_s, (b) μ, and (c) R_{sh} for range 10–300K.

6nm-barrier sample, "comparable to the uppermost-performing values reported for AlN/GaN hetero-structures," according to the team. The sheet resistance is inversely proportional to the mobility and 2DEG carrier density.

One factor impacting sheet resistance in the 9nm-barrier sample was the appearance of cracks, indicating partial strain relaxation. The 6nm sample achieved a $7.8x10^{13}cm^2$ 2DEG density.

The team comments: "The formation of cracks can be minimized by further optimizing growth parameters and/or through strain engineering such as selective-area epitaxy, such that the exceptionally high 2DEG density can be fully exploited in next-generation HEMTs, such as Fin-HEMTs as well as multi-channel devices."

Theoretical considerations suggest the critical thickness for strain relaxation to occur for AlN on GaN is around 6.5nm. The researchers add: "It should be noted that surface-roughness-induced dislocations can develop at thicknesses well below the theoretically predicted critical values, contributing to the wide range of critical thicknesses reported in the literature. However, by carefully tuning our epitaxial growth conditions, we were able to preserve the structural integrity of the AlN barrier even beyond the critical thickness. This enables the formation of a record-high 2DEG density at the AlN/GaN interface."

Three main scattering components are used to explain mobility reduction: collisions between the carriers through the Coulomb force, carrier-polar optical

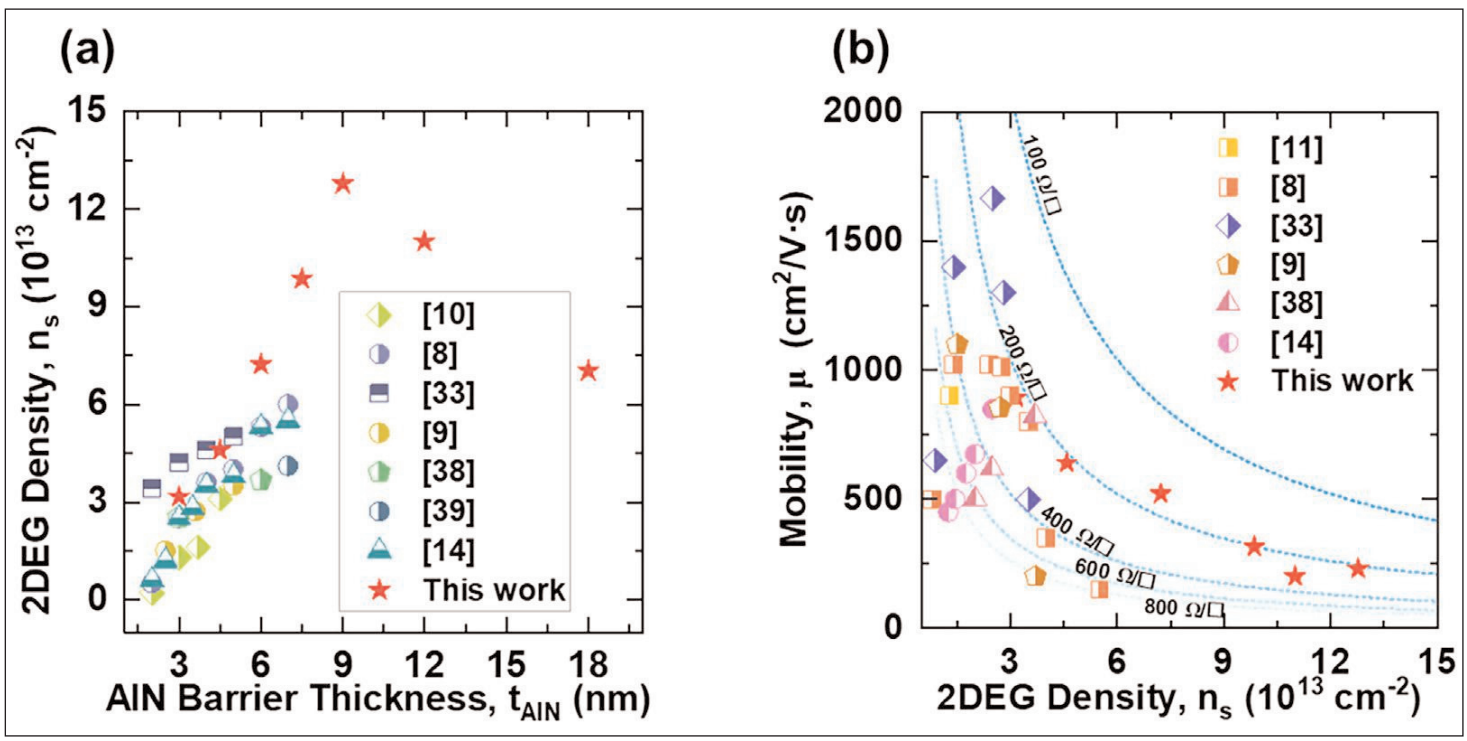

Figure 3. Benchmarks against previous reports: (a) 2DEG density versus AlN barrier thickness; (b) sheet resistance versus 2DEG density.

phonon collisions, and carrier collisions with rough interfaces (not helped by cracks). The surface roughness from 2μmx2μm area atomic force microscopy (AFM) was 0.28nm for 9nm barriers, and 0.21nm for 6nm. The surface roughness is presumably reflective of interface roughness.

I note that there appears to be a downwards kink between the 6nm and 7.5nm mobility measurements, suggesting the enhancement of a collision mechanism, such as interface scattering. The downward mobility trend between the thinnest 3nm barrier and 9nm is explained by the increased carrier density increasing the Coulomb scattering rate. The researchers comment: "Increasing the AlN barrier thickness beyond 6nm results in partial relaxation and 2DEG localization near relaxation-induced defects, causing enhanced carrier scattering and elevated R_{sh}."

The researchers also studied the Hall effect at low temperature (Figure 2). The sheet resistance at 300K was 175Ω/❑. The extracted parameters show almost constant performance up to around 100K, when temperature-dependent factors come into play.

The finite 2DEG density at low temperature suggests that carrier freeze-out does not occur, indicating that "2DEG in AlN/GaN is polarization-induced rather than donor-supplied, and contributions from buffer conduction or unintentional silicon incorporation are negligible".

The increased carrier density at higher temperatures is attributed to "lattice contraction and corresponding modifications in piezoelectric polarization, P_{PZ}, and band alignment"

The researchers comment: "These observations highlight the robustness of carrier transport and confirm the suitability of the device for reliable operation in cryogenic electronic and quantum applications."

The researchers also report benchmark comparisons with previous reports of AlN barrier/GaN heterostructures (Figure 3). The team comments: "These findings clearly demonstrate that it is possible to realize exceptionally high 2DEG densities without compromising sheet resistances in AlN/GaN heterostructures." ■

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Japan's NTT reports the first RF operation of AlGaN transistors with Al-content over 0.75

Expanding applications of AlN from power conversion to post-5G wireless communications

At the 71st IEEE International Electron Devices Meeting (IEDM 2025) in San Francisco on 10 December, Japan's NTT Inc of Tokyo, Japan presented what it claims is the first amplification of millimeter-wave high-frequency signals used in wireless communications in aluminium nitride (AlN)-based transistors (Kawasaki et al, 'First RF Operation of AlGaN-channel Polarization-Doped FETs with Average Al-content Over 0.75'). It has achieved this by designing a low-resistance structure.

With further development toward higher output power, improvements in wireless communication services (such as expanded coverage areas and higher communication speeds) are expected in the post-5G era. NTT claims to have been first in the world to develop AlN as a semiconductor. Due to its excellent semiconductor properties, AlN is expected to be applied to power devices used in power conversion.

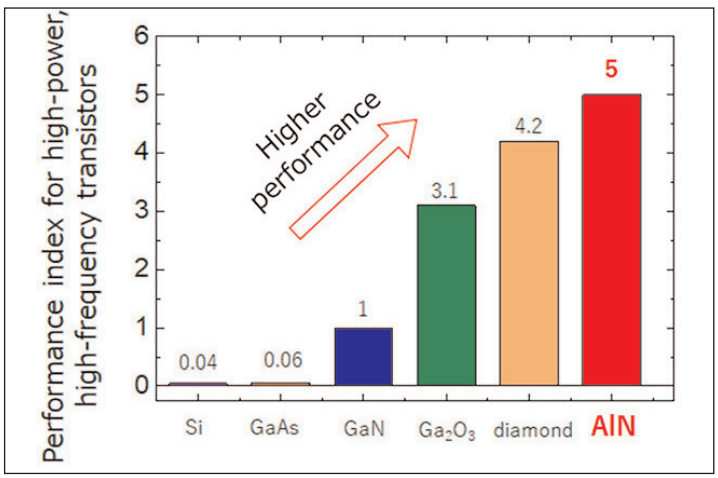

Figure 1. Predicted high-power, high-frequency transistor-performance index of semiconductor materials based on material properties. Johnson's figure of merit (normalized to GaN).

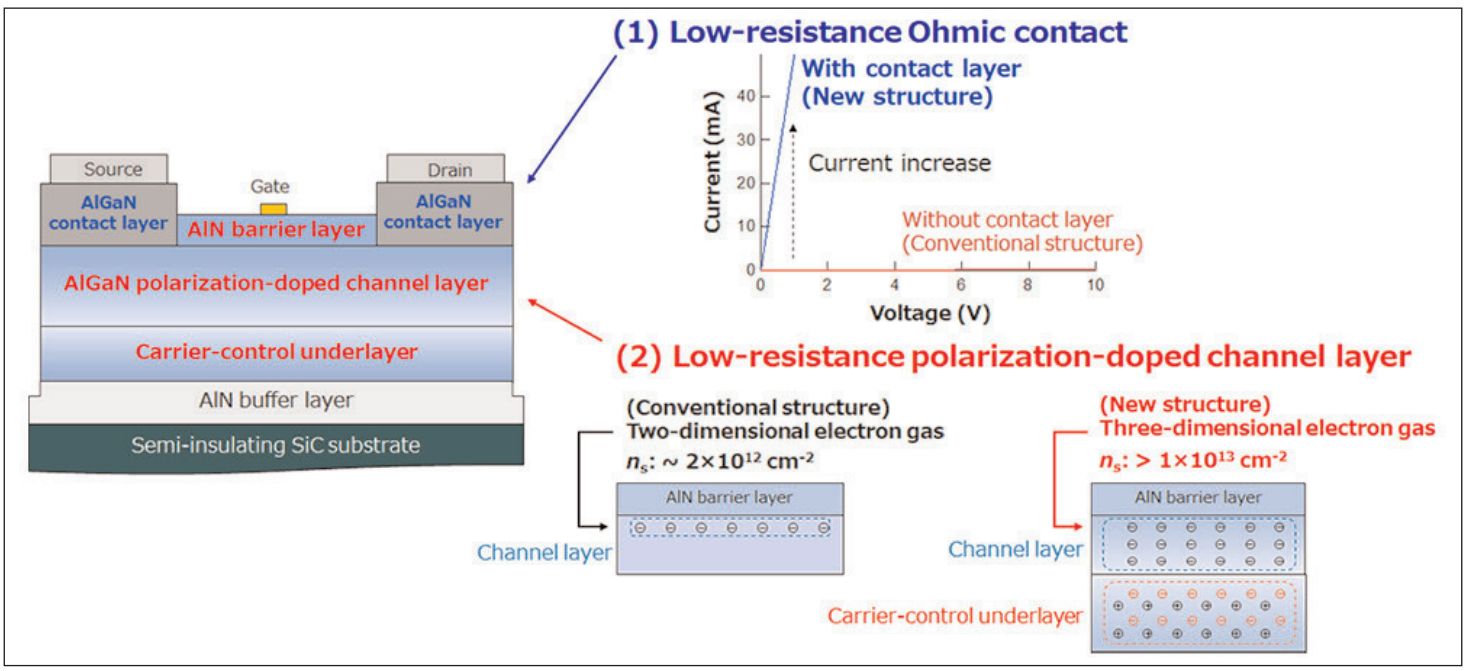

Figure 2. Schematic of the AlN-based transistor and key technical features.

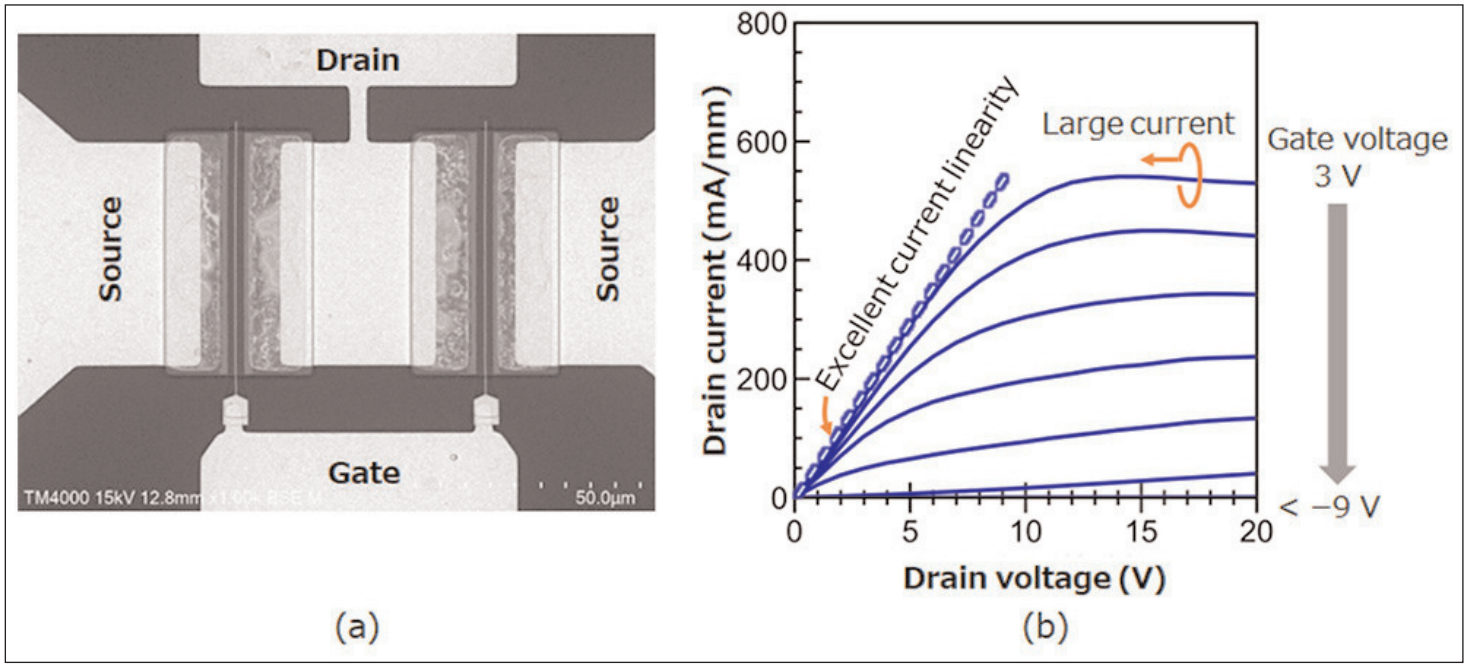

Figure 3. (a) Top-view scanning electron microscope image of the AlN-based transistor (Al composition: 85%), and (b) drain current–voltage characteristics as the gate voltage varied from +3V to –9V.

However, issues that have hindered high-frequency signal amplification in AlN-based transistors include high contact resistance and high channel resistance. These problems have been overcome by NTT designing a contact layer that reduces the energy barrier at the electrode-semiconductor interface and a channel structure that generates a high electron concentration. High-frequency operation of AlN-based transistors for wireless communication has hence been demonstrated for the first time, indicating the potential for AlN to expand its range of applications, from not only power devices but also wireless-communication devices.

Technology developments

To achieve high-frequency operation of AlN-based transistors, NTT developed the following two technologies (Figure 2).

(1) Low-resistance Ohmic contact using an AlGaN contact layer

In conventional structures where electrodes are formed directly on the AlGaN channel layer, increasing the Al composition raises the energy barrier between the electrode and semiconductor, making it difficult to obtain Ohmic contact and limiting the drain current. To reduce this energy barrier, NTT developed a technique to form an AlGaN contact layer with graded Al composition between the electrode and channel layer. This enables the reduction in the Ohmic contact resistance.

(2) Low-resistance channel via polarization-doped structure

In conventional AlGaN channel structures with uniform Al composition, the two-dimensional electron gas (2DEG) formed at the interface between the AlN barrier layer and AlGaN channel layer is used as the current path. However, in high-Al-content AlGaN, the reduction in 2DEG density leads to increased channel resistance and limited drain current.

The energy barrier for confining the electron gas within the channel is also low, making it difficult to achieve a high on/off current ratio. NTT developed a polarization-doped channel structure in which an AlGaN channel layer with graded Al composition is sandwiched between an AlN barrier layer and charge-control underlayer, enabling the formation of a high-density three-dimensional electron gas within the channel layer. This significantly reduces the channel resistance.

Research results

Using these technologies to reduce Ohmic contact resistance and channel resistance, NTT fabricated AlN-based transistors in the high-Al-composition range (Al compositions of 78%, 85% and 89%). Even in the Al-composition region above 75%, where drain current had previously been severely limited, NTT confirmed large drain current and excellent current linearity in the linear region of the transistor.

As one example, the transistor with 85% Al composition exhibited a high drain current exceeding 500mA/mm and high on/off ratio exceeding 10^9 (Figure 3).

With these improvements in transistor performance, NTT succeeded, for the first time it is claimed, in achieving RF power amplification above 1GHz in AlN-based transistors with Al composition exceeding 75%. The transistor with 85% Al composition also achieved a maximum frequency of oscillation (f_{max}) of 79GHz in the millimeter-wave band (30–300GHz) — the

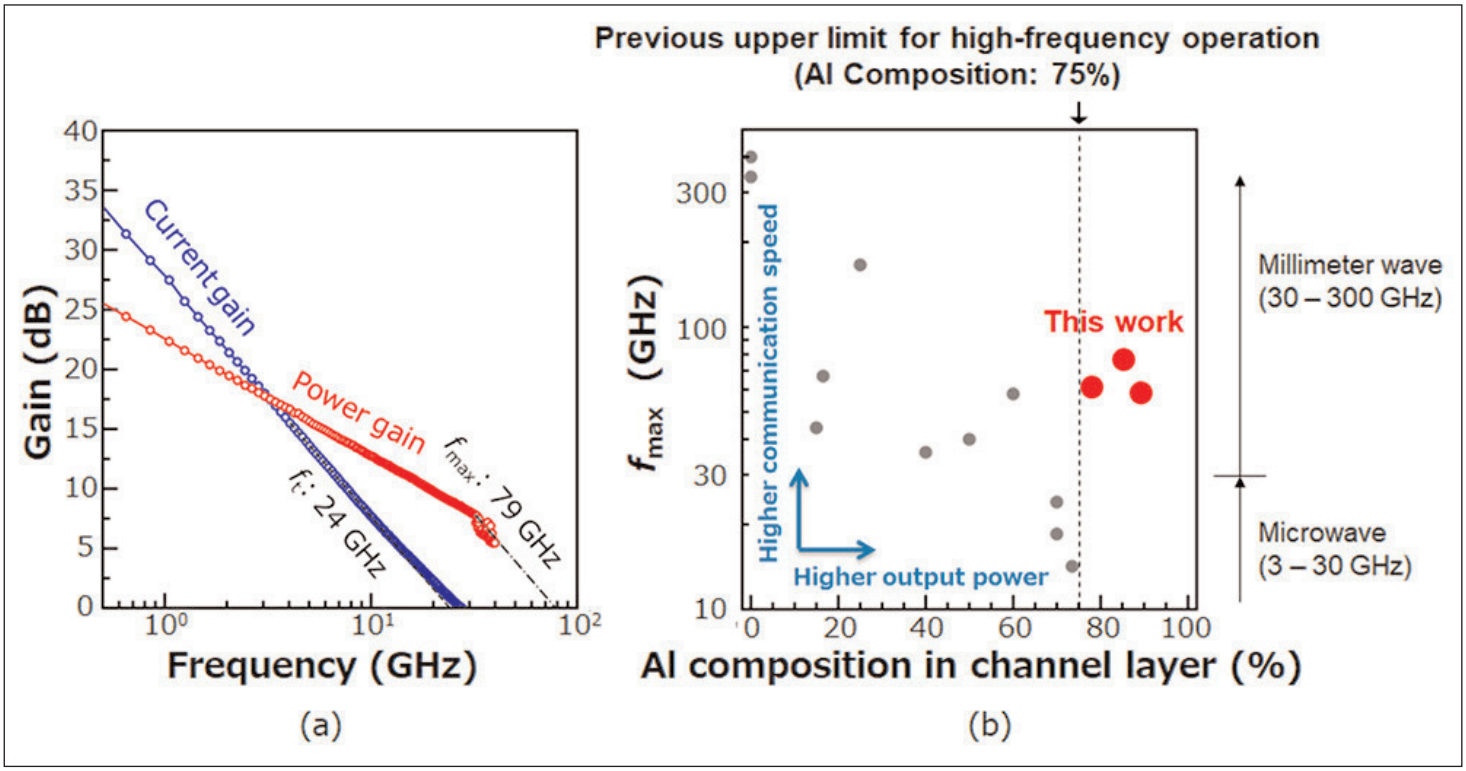

Figure 4. (a) High-frequency characteristics of the AlN-based transistor (Al composition: 85%), and (b) trend of f_{max} as a function of the Al composition in AlN-based transistors.

highest among AlN-based transistors reported to date (Figure 4).

Since higher Al composition is advantageous for achieving higher output power in high-frequency transistors, the structure proposed provides a design guideline for achieving the intrinsic potential of AlN, representing an important advancement toward the application of AlN-based high-power, high-frequency transistors, NTT reckons.

Future outlook

Going forward, NTT aims to design device structures capable of higher-current and high-voltage operation to demonstrate high power output of these high-frequency transistors and to continue R&D on the practical implementation of AlN-semiconductor technology from power conversion to wireless communications. ■

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Imec presents record WSe_2-based 2D-pFETs for extending logic technology roadmap

Collaboration with TSMC yields I_{max} up to 690μA/μm; partnership with Intel yields improved fab-compatible modules for source/drain contact formation and gate stack integration, with reduced EOT.

At the 71st IEEE International Electron Devices Meeting (IEDM 2025) in San Francisco, CA, USA (6–10 December), nanoelectronics research center imec of Leuven, Belgium, presented what it claims is breakthrough performance of (with I_{max} as high as 690μA/μm) for p-type FETs with monolayer tungsten diselenide (WSe_2) channels, and improved fab-compatible modules for source/drain contact formation and gate stack integration.

These results, achieved through collaborations with leading semiconductor manufacturers, are said to mark a significant advance for 2D-material based technology, which is considered to be a promising long-term option for extending the logic technology roadmap.

Replacing silicon conduction channels with atomically thin layers made of 2D transition-metal dichalcogenides (MX_2) promises to enable ultimate gate and channel length scaling, while maintaining good electrostatic channel control and high carrier mobility.

Crucial milestones to be achieved include high-quality 2D-material layer deposition, gate stack integration, low-resistance source/drain contact formation, and 300mm fab integration. Also, while most efforts focus

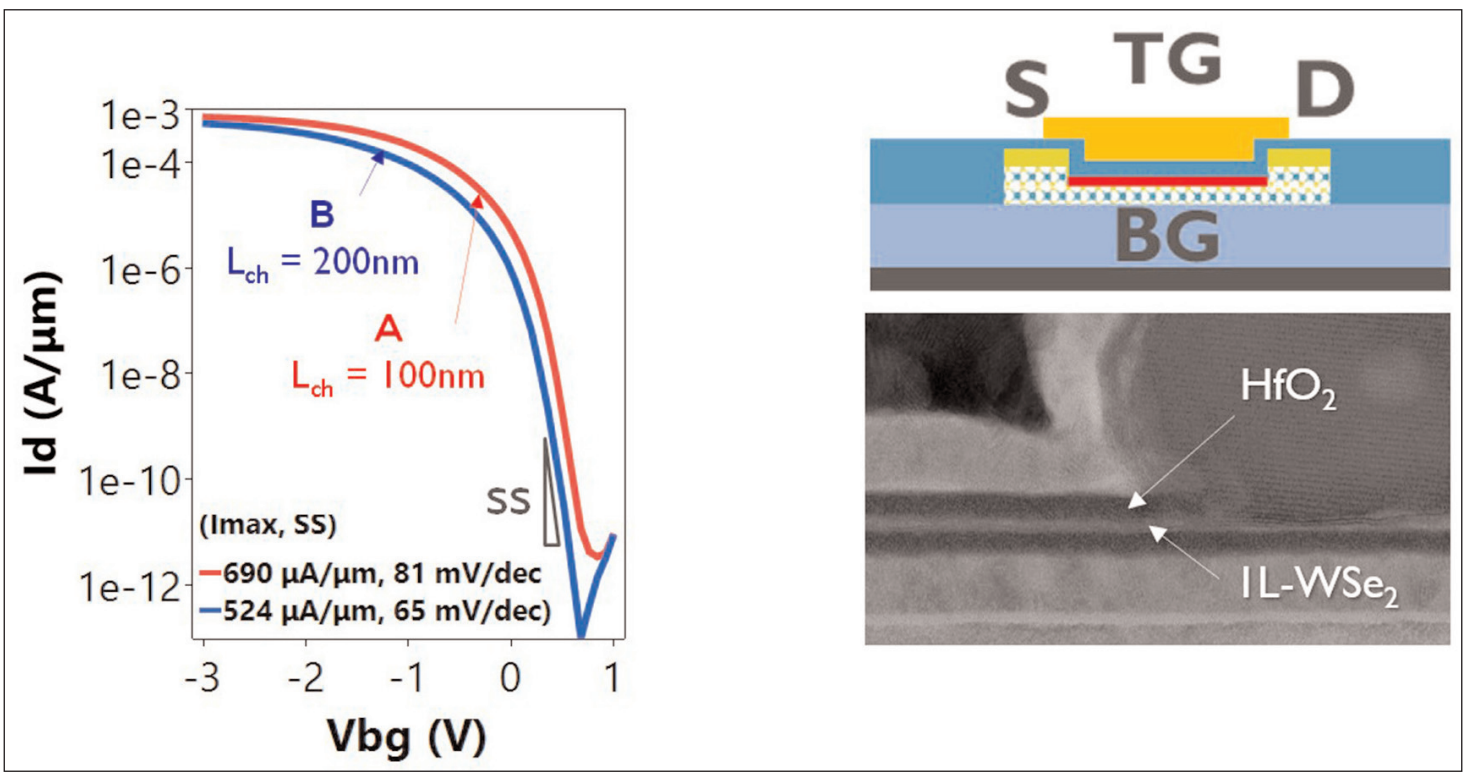

Figure 1. (Left) Transfer curves of 2D-pFET devices using defect-passivated synthetically created bi-layer WSe_2 films, with best device showing I_{max} = 690μA/μm; (right) TEM cross-section of finalized dual-gated 2D pFET (L_{ch}=channel length TG=top gate; BG=back gate; S=source; D=drain; IL=interlayer), in collaboration with TSMC.

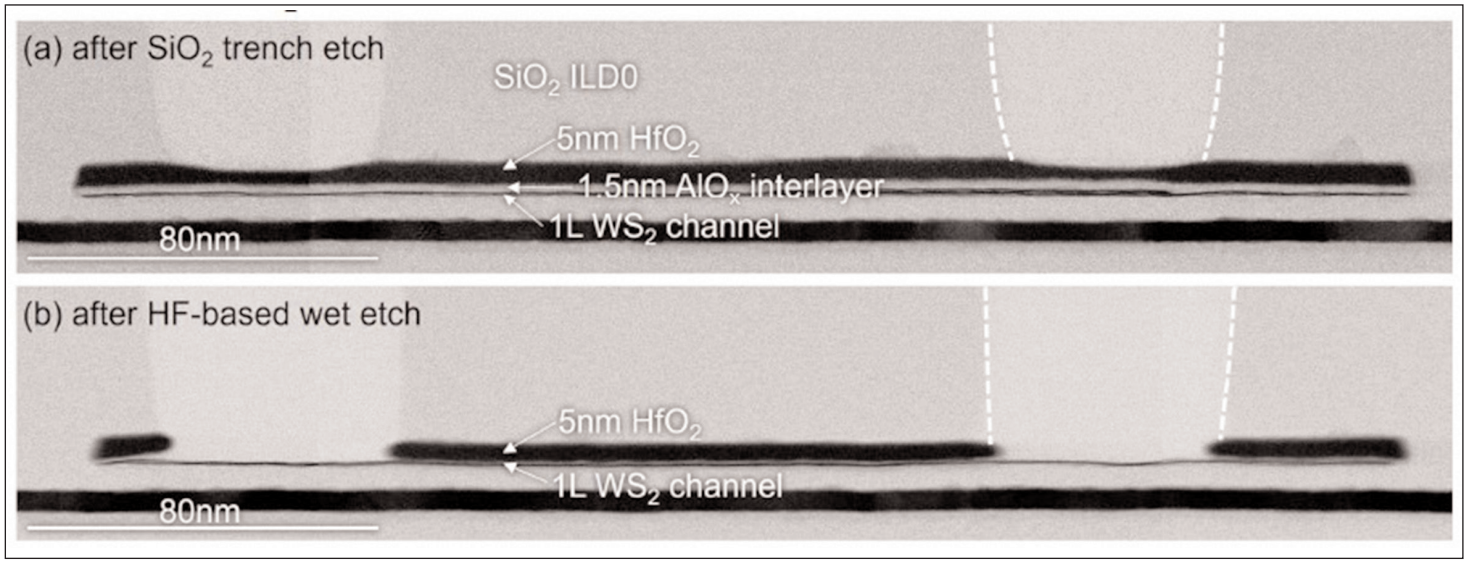

Figure 2. (a) Trench dry etch into SiO_2; (b) dry and wet etch selectively stopping on the monolayer WS_2 channel, also causing AlOx interlayer lateral removal along the full channel length (in collaboration with Intel).

on improving n-type devices (with channels made of WS_2 or MoS_2), more fundamental work is needed on p-type devices, which require different channel materials (such as WSe_2).

"At 2025 IEDM, we show in two separate presentations how in-depth collaborations with leading semiconductor manufacturers within imec's core CMOS Industrial Affiliation Program (IIAP) have enabled breakthroughs in the performance of 2D-material-based devices," says Gouri Sankar Kar, VP R&D compute and memory device technologies at imec. "In both partnerships, combining high-quality 2D material layers provided by the manufacturer with imec's optimized contact and gate modules played a key role in pushing the technology beyond state of the art," he adds.

"Depositing the top-gate HfO_2 dielectric on top of a MX_2 channel requires an additional seed layer to support HfO_2 nucleation and growth," continues Gouri Sankar Kar. "For nFETs, this is solved by creating an AlOx interfacial layer, but this approach is challenging for pFETs due to the different characteristics of the WSe_2 channel material as compared to its n-type counterparts."

"In partnership with TSMC, we started with a synthetic bilayer of WSe_2, which was formed by subsequently transferring two high-quality WSe_2 monolayers from TSMC on our substrates. We then oxidized the top WSe_2 monolayer, converting it into an interfacial layer that successfully supported the deposition of the HfO_2 gate oxide. This fab-compatible lab-based integration approach resulted in record performance of our dual-gated pFETs."

Another presentation highlights the collaboration between imec and Intel in developing 300mm-manufacturable modules for source/drain contacts and gate stack integration, for n-type (WS_2 and MoS_2) and p-type (WSe_2) 2D-FETs. "The key innovation consists in applying a selective oxide etch process on Intel's high-quality 2D material layers, that were capped with an interfacial AlO_x layer, a HfO_2 layer and a SiO_2 layer," says Gouri Sankar Kar. "The oxide etch process allowed the formation of fab-compatible damascene-style top contacts — a world first," he claims. "In addition, during the vertical contact etch process, the interfacial AlO_2 layer was simultaneously etched laterally, removing AlO_2 from the channel region. This significantly lowered the top gate's EOT [equivalent oxide thickness], benefitting the gate's transfer characteristics."

This research was funded by the imec IIAP Exploratory Logic program, the 2D-PL pilot line project through Horizon Europe (101189797) and Horizon 2020 (952792) grant agreements.

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Tel: +44 (0) 1698 722072
www.cstglobal.uk

Kulicke & Soffa Industries
1005 Virginia Drive,
Fort Washington,
PA 19034,
USA
Tel: +1 215 784 6000
Fax: +1 215 784 6001
www.kns.com

Palomar Technologies Inc
2728 Loker Avenue West,
Carlsbad, CA 92010,
USA
Tel: +1 760 931 3600
Fax: +1 760 931 5191
www.PalomarTechnologies.com

PI (Physik Instrumente) L.P.
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MA 01501, USA
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Fax: +1 508-832-0506
www.pi.ws
www.pi-usa.us

TECDIA Inc
2700 Augustine Drive, Suite 110,
Santa Clara, CA 95054,
USA
Tel: +1 408 748 0100
Fax: +1 408 748 0111
www.tecdia.com

17 Assembly/packaging foundry

Quik-Pak
10987 Via Frontera,
San Diego, CA 92127, USA
Tel: +1 858 674 4676
Fax: +1 8586 74 4681
www.quikicpak.com

18 Chip foundry

CST Global Ltd
4 Stanley Boulevard, Hamilton International Technology Park,
Blantyre, Glasgow, G72 0BN,
UK
Tel: +44 (0) 1698 722072
www.cstglobal.uk

United Monolithic Semiconductors
Route departementale 128,
BP46, Orsay, 91401,
France
Tel: +33 1 69 33 04 72
Fax: +33 169 33 02 92
www.ums-gaas.com

19 Facility equipment

RENA Technologies NA
3838 Western Way NE,
Albany, OR 97321, USA
Tel: +1 541 917 3626
www.rena-na.com

Vacuum Barrier Corporation
4 Barton Lane, Woburn, MA 01801,
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20 Facility consumables

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401 Airport Rd, Elkton,
MD 21921-4236,
USA
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Fax: +1 410 506 8749
www.gore.com

21 Computer hardware & software

Crosslight Software Inc
121-3989 Henning Dr.,
Burnaby, BC, V5C 6P8,
Canada
Tel: +1 604 320 1704
Fax: +1 604 320 1734
www.crosslight.com

Semiconductor Technology Research Inc
10404 Patterson Ave.,
Suite 108, Richmond,
VA 23238,
USA
Tel: +1 804 740 8314
Fax: +1 804 740 3814
www.semitech.us

22 Used equipment

Brumley South Inc
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Fax: +1 770 808 8308
www.ClassOneEquipment.com

23 Services

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1484 Highland Avenue,
Cheshire, CT 06410,
USA
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Fax: +1 203-250-7389
www.riff-co.com

TECDIA Inc
2700 Augustine Drive, Suite 110,
Santa Clara,
CA 95054 ,
USA
Tel: +1-408-748-0100
Fax: +1-408-748-0111
Contact Person: Cathy W. Hung
www.tecdia.com

24 Resources

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1346 The Alameda,
7140 San Jose, CA 95126, USA
Tel: +1 408 289 9555
www.alshuktz.com

SEMI Global Headquarters
San Jose, CA 95134,
USA
Tel: +1 408 943 6900
www.semi.org

Yole Développement
69006 Lyon,
France
Tel: +33 472 83 01 86
www.yole.fr

event calendar

If you would like your event listed in *Semiconductor Today*'s Event Calendar, then please e-mail all details to the Editor at mark@semiconductor-today.com

15–19 March 2026
OFC 2026 (Optical Fiber Communication Conference and Exhibition)
Los Angeles Convention Center, Los Angeles, CA, USA
E-mail: custserv@optica.org
www.ofcconference.org

22–26 March 2026
IEEE Applied Power Electronics Conference and Exposition (APEC 2026)
San Antonio, TX, USA
E-mail: apec@apec-conf.org
www.apec-conf.org

25–27 March 2026
SEMICON China 2026
Shanghai New International Expo Centre
E-mail: semichina@semi.org
www.semiconchina.org

22–24 April 2026
OPIE'26 (OPTICS & PHOTONICS International Exhibition)
Pacifico Yokohama, Japan
E-mail: event@optronics.co.jp
www.opie.jp

28–30 April 2026
29th annual Components for Military & Space Electronics conference & exhibition (CMSE 2026)
Renaissance Los Angeles Airport Hotel, CA, USA
E-mail: info@tjgreenllc.com
www.tjgreenllc.com/cmse

3–8 May 2026
SID Display Week 2026
Los Angeles, CA, USA
E-mail: registration@sid.org
www.displayweek.org

17–21 May 2026
2026 Conference on Lasers & Electro-Optics (CLEO)
Charlotte, NC, USA
E-mail: info@cleoconference.org
www.cleoconference.org

24–28 May 2026
WOCSDICE–EXMATEC 2026: 49th Workshop on Compound Semiconductor Devices and Integrated Circuits (WOCSDICE)
20th Expert Evaluation and Control of Compound Semiconductor Materials and Technologies (EXMATEC)
Gdansk, Poland
E-mail: we2026@unipress.waw.pl
https://wocsdice-exmatec-2026.syskonf.pl/

26–29 May 2026
IEEE 76th Electronic Components and Technology Conference (ECTC 2026)
JW Marriott & Ritz-Carlton Grande Lakes Resort, Orlando, FL, USA
E-mail: borabal@ieee.org
www.ectc.net

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31 May–4 June 2026
International Power Electronics Conference (IPEC-Nagasaki 2026- ECCE Asia)
Dejima Messe Nagasaki,
Nagasaki, Japan
E-mail: ipec2026@or.knt.co.jp
www.ipec2026.org

7–12 June 2026
2026 IEEE/MTT-S International Microwave Symposium (IMS 2026)
Boston, MA, USA
E-mail: exhibits@horizonhouse.com
www.ims-ieee.org/about-ims/past-and-future-ims

9–11 June 2026
PCIM 2026 (Expo & Conference on Power Electronics, Intelligent Motion, Renewable Energy and Energy Management)
Nuremberg, Germany
E-mail: pcim_visitors@mesago.com
www.mesago.de/en/PCIM/main.htm

14–18 June 2026
2026 IEEE/JSAP Symposium on VLSI Technology & Circuits
Hilton Hawaiian Village,
Honolulu, HI, USA
E-mail: vlsi@vlsisymposium.org
www.vlsisymposium.org

21–24 June 2026
84th Device Research Conference (DRC 2026)
University of Michigan in Ann Arbor,
Ann Arbor, MI, USA
E-mail: deviceresearchconference@gmail.com
https://2026.deviceresearchconference.org

28 June – 1 July 2026
ALD/ALE 2026: AVS 26th International Conference on Atomic Layer Deposition (ALD 2026), featuring the 13th International Atomic Layer Etching Workshop (ALE 2026)
Tampa, FL, USA
E-mail: della@avs.org
https://ald2026.avs.org

20–21 July 2026
Global Summit on Optics, Photonics and Laser Technologies (GPOL 2026)
Paris, France
E-mail: optics@intellimeetings.org
https://optics.intelliglobalconferences.com

23–27 August 2026
SPIE Optics & Photonics 2026
San Diego, CA, USA
E-mail: customerservice@spie.org
www.spie.org/conferences-and-exhibitions/optics-and-photonics

26–28 August 2026
PCIM Asia Shenzhen 2026 (International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management)
Shenzhen, China
E-mail: pcimasia@china.messefrankfurt.com
https://pcimasia-shanghai.cn.messefrankfurt.com

30 August – 3 September 2026
21st International Conference on Defects Recognition, Imaging and Physics in Semiconductors (DRIP21)
Warsaw, Poland
E-mail: info@drip21.pl
www.drip21.pl

4–9 September 2026
29th European Microwave Week (EuMW 2026)
ExCel, London, UK
E-mail: eumwreg@itnint.com
www.eumweek.com

14–18 September 2026
Energy Conversion Congress & Expo Europe (ECCE Europe 2026)
Valencia, Spain
E-mail: info@ecce-europe.org
https://ipec2026.org/ecce-europe/

4–8 October 2026
IEEE Energy Conversion Congress & Expo (ECCE 2026)
Vancouver, British Columbia, Canada
E-mail: info@ieee-ecce.org
www.ieee-ecce.org/2026

13–15 October 2026
SEMICON West 2026
Moscone Center, San Francisco, CA, USA
E-mail: semiconwest@semi.org
www.semiconwest.org

19–21 October 2026
Global Photonics, Optics and Lasers Conference (GPOLC2026)
Radisson Blu Hotel, Dubai Deira Creek, Dubai, UAE
E-mail: gpolc2026@synergiasummits.com
https://gpolc2026.synergiasummits.com

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