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COMPOUNDS & ADVANCED SILICON

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Plessey Semiconductors acquired by Halo Labs

Qorvo closing Greensboro fab • BAE boosts chip production • Skyworks consolidating Woburn fab into Newbury Park

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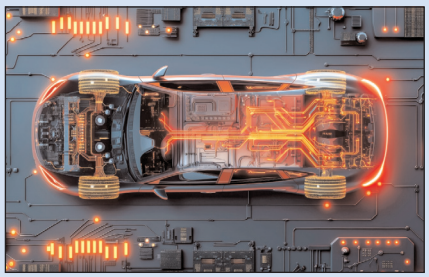
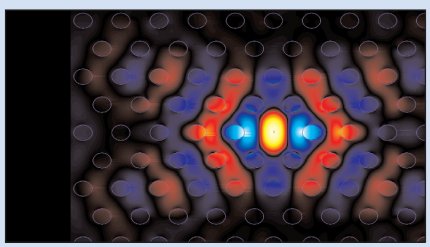


p11 onsemi's EliteSiC M3e technology is powering an 800V drive platform featured in select models of Xiaomi's YU7 electric SUV.

p12 Coherent has inaugurated its new $127m manufacturing facility in Nhon Trach Industrial Park, Vietnam, which will produce silicon carbide and optics products.



p35 Photon Design is providing a PCSEL and PCL design solution for laser designers, using a combination of its HAROLD and OmniSim simulation tools.

Cover image: Micro-LED maker Plessey Semiconductors of Plymouth, UK has been acquired by London-based Haylo Labs, which has been established by Haylo Ventures to focus specifically on the micro-LED, optical compute, and interconnect sectors. **p36**

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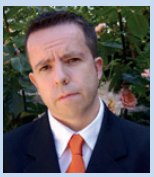

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***Semiconductor Today* covers the R&D and manufacturing of compound semiconductor and advanced silicon materials and devices** (e.g. GaAs, InP and SiGe wafers, chips and modules for microelectronic and optoelectronic devices such as RFICs, lasers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

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

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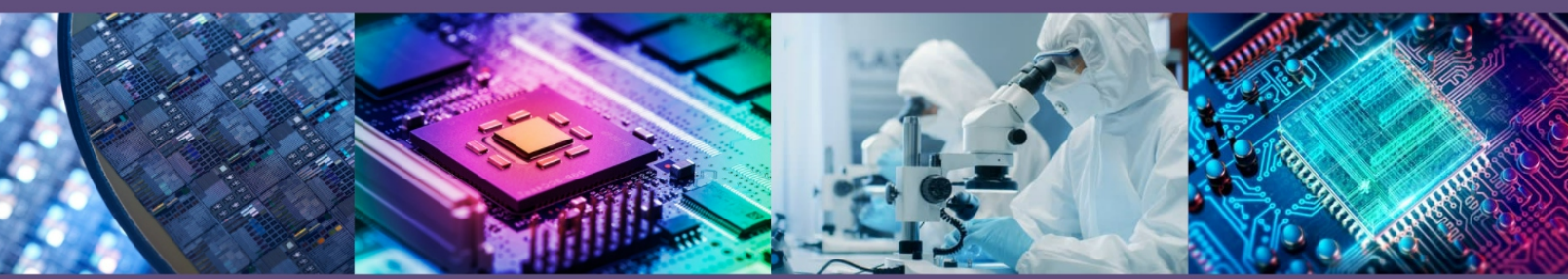

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news

Qorvo quarterly profits grow year-on-year as it sheds low-margin business

North Carolina fab to close as SAW filter production transfers to Texas

For its fiscal first-quarter 2026 (ended 28 June 2025), Qorvo Inc of Greensboro, NC, USA (which provides core technologies and RF solutions for mobile, infrastructure and defense applications) has reported revenue of $818.8m, down 5.8% on $869.5m last quarter and 7.7% on $886.7m a year ago. However, it well exceeds the $750–800m guidance, driven by broad-based demand.

"The momentum we are seeing in both revenue and bookings is being driven primarily by robust underlying demand and meaningful content expansion," says senior VP & chief financial officer Grant Brown.

About 41% of revenue came from Qorvo's largest customer (in four product categories: antenna tuners, high-performance filters and switches, integrated modules and envelope tracking power management), with continued strong unit volumes across existing platforms and more than 10% year-on-year content growth on the ramping platform.

By business segment, Qorvo's total revenue comprised:

- **Advanced Cellular Group** (ACG) $571.2m, down 1.6% on last quarter's $580.3m and 11.1% on $642.3m a year ago, as Qorvo continues to shift away from lower-margin mass-tier Android 5G business. Specifically, Android revenue fell 18% year-on-year to about $240m, with China-based Android revenue down 29% to just under $100m. "While we've seen limited tariff-related inventory buffering at a few customers, we believe these effects are modest and secondary to the underlying demand drivers and Qorvo-specific content growth reflected in our outlook," says Brown.
- **Connectivity & Sensors Group** (CSG) $110.2m, down 4.1% on $114.9m a year ago but up 8.8% on last quarter's $101.3m. "We supported Wi-Fi access points and flagship smartphones with Wi-Fi 7 front ends while also aligning with market-leading chipset providers to develop next-generation solutions for Wi-Fi 8," says president & CEO Bob Bruggeworth. "CSG is also leveraging our ultra-wideband and Matter portfolio to scale new use cases and diversify revenue." Qorvo was awarded an ultra-wideband design win for a leading automotive OEM based in Japan and secured an ultra-wideband win in support of the world's leading EV manufacturer. For automotive asset tracking, Qorvo was selected to supply an automotive OEM based in South Korea with ultra-wideband tags (which enable OEMs to enhance operational efficiencies as cars are manufactured and transported). In consumer markets, Qorvo secured a Wi-Fi 7 design win in augmented reality glasses. This is a growth category, and Qorvo is also supplying Wi-Fi 6 and Wi-Fi 7 FEMs for a leading US-based supplier of AR glasses and VR goggles.
- **High-Performance Analog** (HPA) $137.4m, down 26.9% on last quarter's $187.9m but up 6.1% on $129.5m a year ago, due to durable year-on-year growth in defense & aerospace (HPA's largest business) being supported by increasing content and sharply rising defense spending (by both the USA and allies, boosted by Qorvo's expanding position in high-priority programs). Additionally, infrastructure business is benefiting from the industry's transition to DOCSIS 4.0, where Qorvo is a leading supplier of broadband amplifiers.

On a non-GAAP basis, gross margin was 44%, up on 40.9% a year ago, and at the top end of the 42–44% guidance. "We have actively managed our product portfolio and pricing strategies to reduce our exposure to mass-tier Android 5G," says Brown. "We have positioned the company to benefit from growth in defense & aerospace, which is margin-accretive given the high-mix, low-volume nature of the business. We've divested or exited margin-dilutive businesses.
And finally, we continue to manage manufacturing costs aggressively while consolidating our factory footprint," he adds.

"Since last year, we have exited base-station PAMs [power amplifier modules], divested our silicon carbide business [comprising $30m of annual revenue], pivoted from legacy [low-margin] Android programs [comprising $150–200m of annual revenue], ramped higher-value product categories, begun a sales process related to our MEMS force-sensing business [which is incurring about $5m of operating expenses per quarter] and pursued a broad set of actions to optimize our global factory network," notes Bruggeworth. "Most recently, we transitioned gallium arsenide (GaAs) wafer production from our [underloaded] Greensboro, North Carolina fab to our Hillsboro, Oregon fab."

Operating expenses in fiscal Q1/2026 were $251.8m, reduced from $264.5m a year ago, due mainly to R&D expenses being cut from $174.9m to $165.1m.

Net income is up on $83.5m ($0.87 per diluted share) a year ago to $86.5m ($0.92 per diluted share, far exceeding the $0.50–0.75 guidance).

During the quarter, operating cash flow was $182.9m (more than doubling from $81.1m a year ago). Capital expenditure was $37.5m. Free cash flow was hence $145.4m (more than tripling from $42.9m a year ago).

During the quarter, cash and equivalents rose by $144.3m, from $1021.2m to $1165.5m. The firm has $1.549bn of long-term debt outstanding and no near-term maturities.

Net inventory balance was $638m, a slight reduction on $641m last quarter and a decrease of $89m from $727m a year ago.

"We are undertaking a broad set of initiatives to structurally enhance profitability, and we are already seeing the positive effects of these strategic actions," notes Bruggeworth.

Outlook: margins to be boosted by closure of fab in Greensboro

For fiscal second-quarter 2026 (to end-September 2025), Qorvo expects revenue of $1.025bn±$50m. "We expect sequential growth and margin expansion to be supported by increases in Qorvo content and unit volumes in large customer programs," says Bruggeworth. Gross margin should grow to 48–50% (at the mid-point, a 200 basis-point improvement on 47% a year previously).

Providing an additional tailwind to margin, last quarter Qorvo decided to close its packaging, assembly & test facility in Costa Rica, which will be completed in early calendar 2026 as the firm moves production and completes the sale of the facilities.

"To build on this, we are announcing the closure of our Greensboro fab [in North Carolina] and transfer of our SAW [surface acoustic wave] filter production to our Richardson, Texas fab," says Bruggeworth.

"The closure of a wafer fab requires more time than the closure of a packaging, assembly & test location, and we currently expect the associated cost efficiencies to benefit non-GAAP gross margin beginning late in fiscal 2027," says Brown. "To transfer our SAW filter production out of North Carolina, we have begun to bring up a new production line in our Texas location and we'll be working closely with customers to ensure a seamless transition," he adds.

Operating expenses in fiscal Q2/2026 will rise to $265m±3%, reflecting higher incentive-based compensation, given the expected outperformance during the first half of the fiscal year, foreign exchange (FX) headwinds related to the weak US dollar, and the impact of tariffs. Operating expenses also include $5m from start-up of the SAW filter line in Texas. Diluted earnings per share should rise to $2.00±$0.25.

"For fiscal Q2, our guidance reflects strong execution and demand across multiple end markets while factoring in our current views on macroeconomic and geopolitical dynamics," notes Brown.

"These improvements demonstrate the actions being undertaken across our product portfolio, business segments, and manufacturing footprint that will enable us to improve profitability as we advance through fiscal 2026 and into fiscal 2027," says Brown.

For full-year fiscal 2026, Qorvo expects OpEx from start-up costs for the Texas SAW line of $10–20m, with minimal expense continuing into fiscal 2027.

www.qorvo.com

Sivers Semiconductors appoints Heine Thorsgaard as CFO

New CFO to be responsible for global finance, investor relations and IT operations

Sivers Semiconductors AB of Kista, Sweden (which supplies RF beamformer ICs for SATCOMs and photonic lasers for AI data centers) has appointed Heine Thorsgaard as its new chief financial officer (CFO), effective 1 September, responsible for global finance, investor relations and IT operations.

Since 2018, Thorsgaard has been CFO of Napatech, which sells high-speed, programmable network interface cards designed for real-time network performance management, cybersecurity, and data center.

"Heine brings a tremendous amount of relevant experience for our future ambition, in the areas of strategic finance, operational excellence, M&A, investor relations, fundraising and financing. He has a proven track record as a phenomenal business partner," comments Sivers Semiconductors' CEO Vickram Vathulya.

"We thank Lottie Saks for all her efforts and contributions over the last five years, both on the Sivers board and subsequently as our CFO," he adds. During the transition period, Saks will ensure a smooth transition to the new CFO.

"The company's innovative technologies and increasing customer traction position it strongly for scalable and sustainable value creation," believes Thorsgaard.

"I look forward to making a meaningful impact by leveraging my experience to support strategic execution, drive future growth, and contribute to long-term success for our shareholders."

Prior to Napatech, Thorsgaard had a CFO and financial executive leadership career across the IT, technology and professional services sectors, with exposure to Europe and the USA, for over 15 years.

He has a PhD and Masters degree in finance from Copenhagen University and a Masters degree in international business from Roskilde University.

www.sivers-semiconductors.com

Skyworks's June-quarter revenue, gross margin and EPS exceed guidance

Woburn fab to be consolidated into Newbury Park to optimize manufacturing utilization, fixed costs and efficiency

For its fiscal third-quarter 2025 (ended 27 June), Skyworks Solutions Inc of Irvine, CA, USA (which manufactures analog and mixed-signal semiconductors) has reported revenue of $965m, up 5% on $953.2m last quarter and 7% on $905.5m a year ago. This exceeds the $920–960 guidance, fueled by an upside in the Mobile segment and sustained strength across the Broad Markets segment.

- **Mobile product** revenue grew 1% sequentially (outperforming an expected low-single-digits seasonal decline) and 8% year-on-year (comprising 62% of total revenue), driven by stronger sell-through at Skyworks' top customer plus new product launches in Android.

Skyworks' largest customer (Apple) accounted for about 63% of total revenue (down from 66% in the March quarter and as much as 72% in the December 2024 quarter).

- **Broad Markets** product revenue (edge IoT, automotive, industrial, infrastructure, and cloud) grew for a sixth consecutive quarter, by 2% sequentially and 5% year-on-year (comprising 38% of total revenue). This reflects stronger end-demand (particularly in Wi-Fi 7 and automotive connectivity) and further inventory normalization across key verticals.

"We're encouraged by the momentum in Mobile and steady strength across our Broad Markets, driven by long-term growth trends in edge IoT, automotive and data center," notes CEO & president Phil Brace.

Business highlights during the quarter included:

- securing 5G content across premium Android smartphones, including a flagship model from Samsung Galaxy;
- capturing new automotive programs with global OEMs such as BYD, Ford, Geely and Nissan, spanning 5G telematics and in-vehicle infotainment systems;
- expanding momentum in Wi-Fi 7 with increased design activity across cable, retail and enterprise access points;
- unveiling the industry's first single-chip ultra-low jitter clocks supporting simultaneous Ethernet and PCI Express outputs for AI data-center applications.

On a non-GAAP basis, gross margin has grown further, from 46% a year ago and 46.7% last quarter to 47.1% (exceeding the 46–47% guidance), driven by product mix and ongoing cost discipline.

Aligned with Skyworks' long-term product roadmap, operating expenses have increased further, from $197m a year ago and $223m last quarter to $230m. "We remain disciplined with spend, balancing investment in future growth with prudent cost management," notes interim chief financial officer Rob Schriesheim.

Net income has risen further, from $195.1m ($1.21 per diluted share) a year ago and then $196.8m ($1.24 per diluted share) last quarter to $200.4m ($1.33 per diluted share, exceeding the $1.24 guidance).

Operating cash flow has risen from $273.5m a year ago to $314.1m (amounting to $1.1bn year-to-date). So, despite capital expenditure rising from $24.4m a year ago to $61m, free cash flow was still a healthy $253m (26% of revenue) — up on $249.1m a year ago — amounting to $962m year-to-date. "Over the past two years, our free cash flow has benefited from effective working capital management, as we've reduced inventory levels," says Schriesheim. "While end-demand signals [in Mobile] remain solid, we are actively monitoring the channel and are maintaining a disciplined approach to inventory," adds Brace.

During the quarter, Skyworks returned $430m to shareholders (consisting of $104m in dividends and $330m in share repurchases). Over the past two quarters, the firm has returned more than $1bn to shareholders, supported by strong the free cash flow and disciplined working capital management.

During the quarter, cash and cash equivalents hence fell by $201.9m, from $1387.8m to $1185.9m, and debt remained about $995m, "maintaining a strong balance sheet and ample flexibility to support our strategic and financial priorities," says Schriesheim.

Dividend increase

The board of directors has declared a cash dividend of $0.71 per share of common stock (a 1% increase on fiscal Q3's $0.70 per share), payable on 16 September to stockholders of record at the close of business on 26 August.

September-quarter outlook

For its fiscal fourth-quarter 2025 (to end-September), Skyworks expects revenue to grow to $1–1.03bn.

Mobile product revenue should see mid-single-digit sequential growth, due to "healthy sell-through, lean channel inventories and solid order visibility".

Broad Markets product revenue should grow sequentially for a seventh consecutive quarter, with year-on-year trends accelerating and continued strength in bookings, backlog, and channel sell-through.

Reflecting the stable product mix and ongoing cost discipline, gross margin should be steady at 46.5–47.5%.

Operating expenses are expected to rise to $235–245m, although this is due to the September quarter including a 14th week (which adds about $7m). Skyworks says that it continues to fund key R&D initiatives

while maintaining tight control over discretionary spending.

Diluted earnings per share should rise to $1.40 for fiscal Q4/2025.

Manufacturing facility consolidation

"We see further opportunities to expand margins over time as we execute on our manufacturing efficiency roadmap," says Schriesheim.

"We are taking action to optimize our manufacturing footprint with the planned closure of our Woburn [Massachusetts] manufacturing facility [the location of Skyworks' former headquarters] and the consolidation of operations into our Newbury Park [California] site," announces Brace. "This move is designed to drive higher fab utilization, lower fixed costs, and improve overall efficiency in the future," he adds. "As our product mix shifts toward more advanced, higher-value content, this consolidation positions us to expand gross margins over time while reinvesting in next-generation technologies and maintaining the scale and technical capability required to serve our premium customers at the highest levels."

Long-term growth outlook

"[In Mobile], we see multiple drivers of long-term RF content growth, including opportunities from internal modem adoption, higher RF complexity with AI features, and a larger addressable footprint within the smartphone. At the same time, we'll continue to deliver more performance in smaller form factors, enabling richer features within current sockets," says Brace. "Smartphone replacement cycles remain historically long, now averaging over four years, even as our top customer maintains a record installed base. The first wave of AI-capable phones is reaching scale, and early demand signals are encouraging. As AI capabilities become more intuitive and integrated, we believe this could drive an inflection in upgrade cycles, leading to a potential tailwind to volumes and content over time. Our deep RF expertise, strong customer relationships, and advanced manufacturing put us in a strong position to lead through this next phase," he believes.

"Broad Markets continue to gain momentum, driven by new customer engagements across edge IoT and automotive. We are seeing stronger order flow, healthy book-to-bill levels and lean channel inventory," Brace continues.

"In edge IoT, Wi-Fi 7 adoption is accelerating across consumer, enterprise and industrial applications. These systems demand faster speeds and ultra-low latency, translating to greater RF complexity. Looking ahead, we're already investing in Wi-Fi 8 to support the next wave of performance."

"Automotive remains a key growth driver for Skyworks, supported by long-design cycles that offer greater visibility and more durable revenue streams. As vehicles become more software-defined and connected, the need for secure wireless links continues to grow — from 5G telematics to over-the-air updates and infotainment, all of which increase our content opportunity."

"In traditional data center and infrastructure, business activity is rebounding as inventory normalizes. Meanwhile, accelerating AI workloads are driving upgrades to 800G and 1.6TB switches, increasing demand for our precision-timing solutions."

"Altogether, Broad Markets is becoming a stronger, more resilient growth engine for Skyworks. In aggregate, this is a $1.5bn [annual revenue] business with a double-digit long-term growth profile and gross margins above the corporate average – a core part of our portfolio that we believe remains underappreciated relative to its scale and contribution," Brace concludes.

www.skyworksinc.com

Altum RF announces sales rep deal with RF Alliance

Expanded coverage spans New York, New Jersey & East Pennsylvania

Altum RF of Eindhoven, The Netherlands (which designs RF, microwave and millimeter-wave semiconductors) has announced a sales representative agreement with RF Alliance, covering customers in New Jersey, New York and east Pennsylvania. Founded in 2005 with headquarters in West Milford, NJ, RF Alliance specializes in technical knowledge and support of RF, microwave, mmWave, frequency-control and analog components. As an international company, with strategic partnerships and office locations worldwide to support its growing product portfolio, Altum RF has expertise and relationships across various RF markets and applications including telecoms, satellite, test & measurement, defense and aerospace markets.

"This collaboration strengthens our ability to deliver comprehensive support — including design-in assistance for RF systems — to customers across New Jersey, New York and eastern Pennsylvania," says Altum RF's CEO Greg Baker. "With their proven expertise in the RF industry, we're confident RF Alliance will provide valuable guidance and support throughout every stage of the sales process, from design-in through production ramp-up and ongoing production," he adds.

"As an emerging leader in the RF industry, Altum RF is expanding its product portfolio to meet evolving market and customer demands," says RF Alliance's president Jim DeRaffele. "Their use of advanced, innovative technologies results in compelling, differentiated solutions for the rapidly growing microwave and millimeter-wave markets."

www.altumrf.com

Wolfspeed appoints Bret Zahn as general manager of Automotive business

Former GM of onsemi's Automotive Traction Solutions unit to lead development and execution of automotive product roadmap

Wolfspeed Inc of Durham, NC, USA — which makes silicon carbide (SiC) materials and power semiconductor devices — has appointed Bret Zahn as VP & general manager of its Automotive business as it continues to enhance its leadership team amid its strategic expansion in high-growth markets.

Wolfspeed says the appointment reflects its continued commitment to enabling the next generation of electric vehicles (EVs) through silicon carbide solutions. Zahn will report to chief business officer Cengiz Balkas, and will be based in Durham.

Zahn will lead the development and execution of Wolfspeed's automotive product roadmap, aligning with the rapidly evolving needs of global EV makers and tier-1 suppliers. Working closely with engineering, R&D, and commercial teams, he will be responsible for driving innovation that meets the increasing demand for power efficiency, performance and scalability in electric mobility.

"The automotive industry is at an inflection point, and Wolfspeed is at the heart of the transformation," reckons CEO Robert Feurle. "Our silicon carbide solutions are already powering some of the world's most advanced EVs. Under Bret's leadership, we will deepen our partnerships with global automakers and deliver the next wave of innovation to expand our product offerings and meet the evolving needs of our customers."

As the transition to electrified transportation accelerates, SiC has emerged as a foundational technology for extending driving range, increasing energy efficiency, and reducing charging times, notes the firm. Wolfspeed reckons that its investment in vertically integrated, US-based SiC manufacturing — including its 200mm Mohawk Valley Fab and materials facility in North Carolina — positions it to meet automotive demand and offers a secure and scalable supply chain for customers.

Zahn has 35 years of global engineering and business management experience across various technology sectors. Previously he was VP & general manager of the Automotive Traction Solutions (ATS) business unit at onsemi, encompassing both SiC and IGBT bare die and power module sales, growing that business from IGBT-only revenue in 2020 to both IGBT and SiC revenue at the close of 2024. Wolfspeed reckons that his proven ability to navigate complex business structures and lead cross-functional teams will be instrumental as it seeks to capitalize on opportunities within the automotive sector.

"I am excited to join Wolfspeed during this transformative period and contribute to its mission of delivering advanced solutions in the automotive market," says Zahn.

www.wolfspeed.com

onsemi collaborating with NVIDIA to accelerate transition to 800V power solutions for next-gen AI data centers

Effort sets foundation for high-voltage systems, boosting efficiency and power density

Intelligent power and sensing technology firm onsemi of Scottsdale, AZ, USA says that it is working with NVIDIA of Santa Clara, CA, USA to support the transition to 800V direct current (V_{DC}) power architectures, which is driving significant gains in efficiency, density and sustainability for next-generation AI data centers.

At the core of this shift is a new power distribution system, which must distribute a massive amount of power with minimal losses during each voltage conversion. Onsemi says that its intelligent power portfolio is playing a critical role in enabling the next generation of AI data centers by delivering high-efficiency, high-density power conversion across every stage of the power journey — from high-voltage AC/DC conversion at the substation to precise voltage regulation at the processor level.

At the core of this shift is a new power distribution system

Leveraging decades of innovation in both silicon and silicon carbide (SiC) technologies, onsemi provides solutions for solid-state transformers, power supply units, 800V_{DC} distribution, and core power delivery, all integrated with intelligent monitoring and control. onsemi reckons that this breadth and depth of capability makes it one of the few companies able to meet the demanding power requirements of modern AI infrastructure with scalable, physically realizable designs.

www.onsemi.com
www.nvidia.com

onsemi and Schaeffler expand collaboration with new EliteSiC-based PHEV platform

Traction inverter to use onsemi's EliteSiC for longer driving range and enhanced reliability in plug-in hybrid EVs

Intelligent power and sensing technology firm onsemi of Scottsdale, AZ, USA has expanded its existing multi-year collaboration with Germany-based motion technology company Schaeffler (formerly Vitesco Technologies) through a new design win that leverages onsemi's next-generation EliteSiC product line of silicon carbide MOSFETs. The onsemi solution will power Schaeffler's traction inverter for a leading global automaker's plug-in hybrid electric vehicle (PHEV) platform.

EliteSiC technology is claimed to offer significantly lower conduction losses and superior short-circuit robustness, enabling a compact, thermally efficient inverter design that enhances overall system performance. The silicon carbide-based solution offers the lowest on-state resistance to provide the highest peak power compared with other SiC solutions in its class, onsemi adds. These benefits allow Schaeffler to deliver a traction inverter system that achieves measurable benefits to the end customer, including:

- longer driving range, enabled by higher energy conversion efficiency;
- enhanced reliability, for consistent operation with lower maintenance;
- optimized form factor, allowing greater flexibility in vehicle design.

"The traction inverter is at the heart of every electrified drivetrain, and onsemi's EliteSiC solution plays a vital role in achieving the efficiency and performance targets that our customer demands," says Christopher Breitsameter, head of Business Division Controls at Schaeffler.

As automakers increasingly prioritize energy efficiency and performance, the industry is turning to more advanced hybrid architectures even in cost-sensitive EV platforms, a market traditionally dominated by silicon-based insulated-gate bipolar transistors (IGBTs). The role of onsemi's silicon carbide in this transition positions the firm to enable Schaeffler to deliver an EV system that meets stringent performance and packaging requirements.

"As the exclusive silicon carbide supplier for this program, onsemi continues to strengthen its position as a trusted innovation partner for leading global automotive players," says Simon Keeton, group president, Power Solutions Group, onsemi. "Our industry-leading silicon carbide semiconductor technology delivers unmatched efficiency, thermal performance, and power density — key enablers for next-generation electric powertrain systems, not only for battery electric vehicles but also for plug-in hybrid platforms."

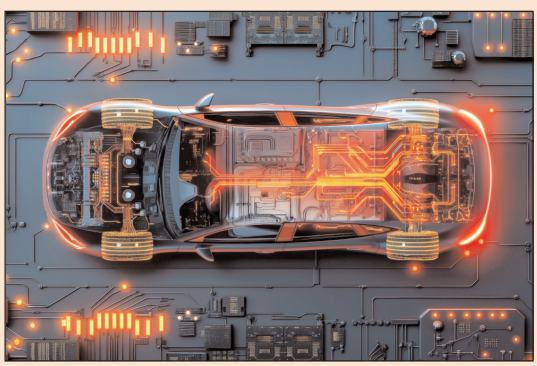
www.schaeffler.com/en/group
www.onsemi.com/products/discrete-power-modules/silicon-carbide-sic

onsemi's EliteSiC technology powering 800V drive platform in Xiaomi SUVs

EliteSiC M3e integrated into traction inverter of select YU7 electric SUV models

onsemi says that its EliteSiC M3e silicon carbide (SiC) technology is powering an 800V drive platform featured in select YU7 electric sport utility vehicle (SUV) models made by China-based Xiaomi. The EliteSiC M3e platform features what is claimed to be superior performance and efficiency, enabling automakers to design smaller, lighter and more robust traction systems for electric vehicles (EV).

By integrating EliteSiC M3e technology into the traction inverter, the platform can achieve better performance and power density



while reducing overall system cost and unlocking longer range for drivers, onsemi says.

With what is said to be the lowest on-resistance in the industry, EliteSiC technology also boosts peak power delivery within a smaller footprint to enable faster acceleration for vehicles without any sacrifice in efficiency and range, it adds.

"EliteSiC technology delivers industry-leading efficiency, power density and thermal performance, enabling the development of electric vehicles with longer range, faster acceleration and greater reliability," says Simon Keeton, group president of onsemi's Power Solutions Group.

www.xiaomiev.com

Coherent inaugurates $127m factory in Vietnam

Nhon Trach 1 Factory in Dong Nai province to manufacture silicon carbide and optics products

Materials, networking and laser technology firm Coherent Corp of Saxonburg, PA, USA has inaugurated its new $127m manufacturing facility in Nhon Trach Industrial Park, Dong Nai province, southern Vietnam, which will produce precision-engineered materials and photonics components used in applications spanning smartphones and electric vehicles to advanced medical devices.

"Vietnam is actively developing key strategic industries, including semiconductors," said Vietnam's Deputy Prime Minister Nguyen Chi Dung at the opening ceremony. "Today's event is a concrete step in implementing the Joint Statement on upgrading Vietnam–US relations to a Comprehensive Strategic Partnership. Coherent is expected to make a meaningful contribution to Vietnam's emergence as a key link and future hub in the global semiconductor supply chain," he added.

Coherent entered Vietnam in 2005, establishing its first factory at VSIP1 Industrial Park in former Binh Duong province, specializing in thermoelectric coolers, technical ceramics, wafers, advanced optics, and laser services. In the late 2010s, Coherent expanded to the north, and in 2019 inaugurated a facility at Yen Phong Industrial Park (IP) in Bac Ninh province.

In 2023, Coherent met with Dong Nai provincial leaders to propose three high-tech projects at Nhon Trach 1 & 2 IPs, including silicon carbide, semiconductor manufacturing, advanced optics, and the M-Cubed project for measurement, testing and semiconductor component production. With nearly $1bn in registered capital, the projects are expected to generate more than $1.2bn annually. In 2024, Dong Nai authorities issued investment certificates for all three projects.

Deputy Prime Minister Dung and Coherent executive VP Gary Kapusta (centre left) at the opening of the Dong Nai plant. Photo: VGP.

"This new facility is designed with scalability, flexibility and sustainability at its core, to meet the rising global demand for advanced technologies," said Gan YC, director of Nhon Trach 1 Factory. "It plays a pivotal role in enhancing our capabilities in silicon carbide and optics, both essential to the transformation of industrial systems, high-speed communications, and data-center infrastructure. Equipped with smart manufacturing systems and a high-quality local workforce, the factory strengthens our supply chain, reduces lead times, and brings us closer to key markets across Asia. This is not merely a factory, it is a strategic platform for innovation, growth, and long-term competitiveness," he added.

Inauguration of the new factory is a significant step forward in Coherent's global growth strategy, believes Nguyen Minh Man, general director of Coherent Vietnam (Dong Nai). "It reinforces our long-term commitment to Southeast Asia, a vital region for advanced manufacturing, technological innovation, and talent development," he adds.

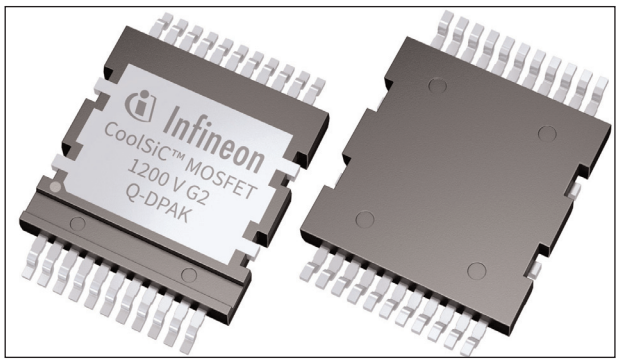
www.Coherent.com

Infineon launches CoolSiC MOSFETs 1200V G2 in Q-DPAK package

Single switch and a dual half-bridge configurations enable higher power density for industrial applications

Infineon Technologies AG Munich, Germany has launched the CoolSiC MOSFETs 1200V G2 in a top-side-cooled (TSC) Q-DPAK package. Delivering what is said to be optimized thermal performance, system efficiency and power density, the new devices were specifically designed for demanding industrial applications that require high performance and reliability, such as electric vehicle chargers, solar inverters, uninterruptible power supplies, motor drives, and solid-state circuit breakers.

The new CoolSiC 1200V G2 technology offers significant improvements over the previous generation, enabling up to 25% lower switching losses for equivalent $R_{DS(on)}$ devices, increasing system efficiency by up to 0.1%. Utilizing Infineon's improved .XT die attach interconnection technology, the G2 devices achieve more than 15% lower thermal resistance and an 11% reduction in MOSFET temperature compared with G1 family products. $R_{DS(on)}$ values ranging from 4mΩ to 78mΩ, along with a broad product portfolio, enable designers the flexibility to optimize system performance for their target applications. Furthermore, the new technology supports overload operation up to a junction temperature (T_{vj}) of 200°C and features high robustness against parasitic turn-on, ensuring reliable operation under dynamic and demanding conditions.



The CoolSiC MOSFETs 1200V G2 in a top-side-cooled Q-DPAK package.

The CoolSiC MOSFETs 1200V G2 are available in two Q-DPAK configurations: a single switch and a dual half-bridge. Both variants are part of Infineon's broader X-DPAK top-side-cooling platform. With a standardized package height of 2.3mm across all TSC variants — including Q-DPAK and TOLT — the platform offers design flexibility and enables customers to scale and combine different products under a single heatsink assembly. This design flexibility simplifies advanced power system development, making it easier for customers to customize and scale their solutions.

The Q-DPAK package enhances thermal performance by enabling direct heat dissipation from the device's top surface to the heatsink. This direct thermal path delivers significantly better heat transfer efficiency than traditional bottom-side-cooled packages, enabling more compact designs. Additionally, the Q-DPAK package layout design allows for minimized parasitic inductance, which is critical for higher switching speeds. This enhances system efficiency and reduces voltage overshoot risk. The small footprint of the package supports compact system designs, while its compatibility with automated assembly processes simplifies manufacturing, ensuring cost efficiency and scalability.

The CoolSiC MOSFET 1200V G2 in Q-DPAK single switch and dual half-bridge package variants are available now.

www.infineon.com/coolsic-mosfet-discretes

BAE Systems boosts chip production for mission-critical defense programs using US CHIPS Act funding

Microelectronics Center in Nashua, New Hampshire to be modernized

BAE Systems Inc (which develops and services electric propulsion technology at its facilities in Endicott, NY, USA and Rochester, UK) says that its investment to modernize its Microelectronics Center (MEC) in Nashua, New Hampshire, supported in part by the US CHIPS Act, will purchase new, more efficient manufacturing tools to significantly increase production capacity, speed delivery, and reduce costs for Department of Defense chip production for the US Air Force, Army, Navy, and Marines. The modernization is expected to unlock major efficiencies in US defense production.

BAE Systems' MEC is a 110,000ft^2, Department of Defense (DoD)-accredited chip fabrication and foundry facility that produces technology for DoD applications. It develops semiconductor technologies beyond those available commercially to meet demanding military requirements and is one of few domestic defense-centric 6-inch gallium arsenide (GaAs) and gallium nitride (GaN) high-electron-mobility transistor (HEMT) wafer foundries.

The modernization of the MEC is regarded as a vital investment in US national security and will support mission-critical DoD and aerospace programs — from next-generation aircraft and satellites to secure communications. BAE Systems' investment will also create skilled manufacturing jobs.

www.baesystems.com

MACOM completes transfer of Research Triangle Park GaN-on-SiC fab

Fab bought from Wolfspeed in December 2023 transferred six months ahead of schedule

MACOM Technology Solutions Inc of Lowell, MA, USA (which designs and makes RF, microwave, analog and mixed-signal and optical semiconductor technologies) has assumed full operational control of the wafer fabrication facility in Research Triangle Park, NC, that it purchased from Wolfspeed Inc of Durham, NC in December 2023.

The fab produces gallium nitride on silicon carbide (GaN-on-SiC) process technologies for use in RF power devices and monolithic microwave integrated circuits (MMICs). Products manufactured at this site are typically used in telecommunication system infrastructure and defense electronics. The facility is an accredited United States Department of Defense Trusted Foundry.

"Transfer is occurring approximately 6 months ahead of schedule," says president & CEO Stephen G. Daly. "Our leadership and management team are focused on opportunities to improve the fab's performance and key operational metrics."

www.macom.com

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Navitas powering Xiaomi's 90W next-gen GaN charger

NV9580 GaNSense Control power IC used on primary side and NV9701 synchronous rectification controller IC on secondary side

Gallium nitride (GaN) power IC and silicon carbide (SiC) technology firm Navitas Semiconductor Corp of Torrance, CA, USA says that its GaNSense Control ICs are to power the next-generation 90W GaN charger of China's Xiaomi.

Claimed to be the world's smallest 90W charger, the ultra-compact, high-power-density form factor measures just 34mm x 45mm x34mm and weighs only 65g — about half the size and a third the weight of typical GaN chargers.

The charger integrates Navitas' NV9580 GaNSense Control power IC on the primary side and the NV9701 synchronous rectification controller IC on the secondary side. The GaNSense Control family combines fourth-generation GaN power with high-frequency control functionality. It provides all the benefits of a monolithically integrated GaN power FET and GaN drive, plus a controller and protection features in a single surface-mount package for high-density, high-efficiency chargers, adapters and auxiliary power designs.

GaNSense Control ICs are said to deliver the highest-frequency operation to minimize system size and weight. Integrated features such as lossless current sensing, high-voltage start-up, and elimination of the V_{DD} inductor reduce component count and increase system efficiency. With transient voltage breakdown up to 800V and no PCB hotspots, Navitas' GaNSense Control ICs deliver what is claimed to be best-in-class efficiency in the smallest form factor.

"The launch of Xiaomi's 90W GaN charger marks a new milestone in our long-standing collaboration with Xiaomi," says Charles Zha, senior VP & APAC general manager. "Combining the innovation of GaNSense Control ICs and Xiaomi's leading system expertise, we have delivered a new benchmark for ultra-portable fast-chargers," he adds. "Navitas will continue our partnership with Xiaomi to continue future innovations with our GaN technology."

www.navitassemi.com

Navitas' cuts losses in Q2/2025 despite revenue still being down year-on-year

Focus on AI data centers and energy infrastructure for future growth

For second-quarter 2025, gallium nitride (GaN) power IC and silicon carbide (SiC) technology firm Navitas Semiconductor Corp of Torrance, CA, USA has reported revenue of $14.49m, down on $20.47m a year ago but up slightly on $14m last quarter.

On a non-GAAP basis, gross margin was 38.5%, down on 40.3% a year ago but up on 38.1% last quarter.

Operating expenses have been cut further, from $21.5m a year ago and $17.2m last quarter to $16.1m.

Net loss has been cut, from $12.05m ($0.07 per share) a year ago and $11.2m ($0.06 per share) last quarter to $9.8m ($0.05 per share).

Market, customer and technology highlights during the quarter are cited as follows:

- NVIDIA selected Navitas for development collaboration to support next-generation 800V data centers, leveraging Navitas' full portfolio of GaN and SiC across three power conversation stages.

Stage 1: Solid-state transformers (SSTs) are expected to replace low-frequency transformers (LFTs), leveraging Navitas' ultrahigh-voltage (UHV) SiC to improve the efficiency and robustness of the power grid, creating a $0.5bn/year SiC market potential by 2030.

Stage 2: 800V DC/DC can leverage Navitas' high-voltage GaN and SiC, combined with the firm's new 80–200V GaN to support the highest efficiency and density with a $1bn/year GaN and SiC market potential by 2030.

Stage 3: 48V DC/DC to power AI processors can utilize Navitas' new 80–200V GaN to support highest efficiency and density in this $1.2bn/year market potential by 2030.

Development timeline: For each stage, initial customer evaluations are complete with final engineering samples expected in Q4/2025; anticipate final supplier selections and system designs completed in 2026 in advance of volume production in 2027.

- Partnership with Taiwan-based Powerchip Semiconductor Manufacturing Co (PSMC) for manufacturing 200mm (8") 180nm GaN will support plans for higher levels of integration, with expected lower costs and greater capacity, including to support our roadmap and growth goals for AI data centers.
- $97m of net cash proceeds were generated from the sale of common shares, which will provide additional capital to support development and growth expectations primarily for AI data centers and related energy infrastructure markets. During the quarter, cash and cash equivalents hence grew from $75.1m to $161.2m.
- Navitas is sharpening its focus within mobile, consumer and appliances to serve the high-end premium segments, which are expected to reduce revenue dependence on these sectors, improve margins over time, and enable increased focus and investment in AI data centers and energy infrastructure sectors without an increase in near-term operating expenses.
- In high-end mobile GaN charger applications, Xiaomi and Navitas announced the world's smallest and fastest charger to date, delivering 90W in the size of a typical 12W silicon-based charger.

"We are sharpening our focus on AI data centers and energy infrastructure, built on our collaboration with NVIDIA and other leaders in the sector," notes CEO & co-founder Gene Sheridan. "We raised $100m in additional capital through the sale of approximately 20 million common shares and announced a new 8", lower-cost GaN foundry relationship for expanded capacity, both of which support our plans to address this fast-growing market."

"We were successful in creating an all-new market for GaN mobile chargers over the past five years, and now we intend to create an even bigger new market encompassing both GaN and SiC for AI data centers and related, critically needed energy infrastructure. We estimate that GaN and SiC technologies can support a 100x increase in server rack power capacity for AI data centers and an expanded $2.6bn market potential by 2030."

Third-quarter outlook

Due largely to China tariff risks and the more selective mobile strategy, for Q3/2025 Navitas expects revenue to fall to $10m±$0.5m. Gross margin should be roughly flat, at 38.5% ±50 basis points. Operating expenses should be cut further, to about $15.5m.

www.navitassemi.com

Beijing court denies Innoscience appeal against EPC

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 —says that the Beijing IP Court has denied the appeal filed by China-based gallium nitride-on-silicon (GaN-on-Si) power solutions firm Innoscience (Suzhou) Technology Co Ltd, reaffirming the validity of EPC's Chinese Patent No. ZL201080015425.X, 'Compensated gate MISFET and method for fabricating the same'.

Two of EPC's patents covering enhancement-mode GaN FETs and their fabrication had been challenged by Innoscience in China. The China National Intellectual Property Administration (CNIPA) validated both in April and May 2024, but Innoscience requested reconsideration of the decision concerning the compensated-gate patent.

"EPC's innovations in GaN power devices reflect nearly 20 years of research and development," notes EPC's CEO & co-founder Alex Lidow. "We welcome the Beijing IP Court's decision as confirmation of the strength of our intellectual property."

EPC says that it continues to benefit from a decision by the US International Trade Commission, which ruled that Innoscience infringed EPC's intellectual property. That ruling, which remains in full force and effect, led to an exclusion order barring the importation of infringing Innoscience products into the USA.

www.epc-co.com
www.innoscience.com

Munich District Court rules in favor of Infineon in patent-infringement case against Innoscience

Decision bars Innoscience from manufacturing, selling or marketing infringing products in Germany, and levies damages

Infineon Technologies AG of Munich, Germany says that the Munich District Court (Landgericht München I) has ruled in favor of it in a first instance patent infringement case alleging the unauthorized use of its patented gallium nitride (GaN) technologies by InnoScience.

The court found that Infineon's patent was infringed by GaN products that Innoscience is offering in Germany. The decision in particular prohibits Innoscience from manufacturing, selling or marketing the infringing products in Germany. It also requires Innoscience to pay damages to Infineon.

Infineon says that the decision underscores the value of its contributions to GaN technology and its ongoing commitment to ensuring fair competition in the market. "The ruling is a testament to the strength of Infineon's intellectual property and confirms Infineon's commitment to vigorously defend its intellectual property against infringements," says Johannes Schoiswohl, senior VP & head of Infineon's GaN Systems business line.

Infineon says it is continuously strengthening its position as an integrated device manufacturer (IDM) in the GaN market with a broad IP portfolio comprising about 450 GaN patent families.

www.innoscience.com
www.infineon.com

Innoscience collaborating with NVIDIA on 800VDC power architecture for AI data centers

InnoScience (Suzhou) Technology Holding Co Ltd — which manufactures gallium nitride on silicon (GaN-on-Si) power chips on 8" silicon wafers — says that, with large AI models and high-performance computing placing higher demands on power supply systems, it is collaborating with NVIDIA of Santa Clara, CA, USA to jointly promote the large-scale implementation of an $800V_{DC}$ power architecture in AI data centers.

NVIDIA's $800V_{DC}$ architecture is the latest generation of power systems specifically designed to efficiently power future megawatt-scale computing infrastructure. Compared with traditional 54V power systems, the $800V_{DC}$ architecture offers significant advantages in system efficiency, heat dissipation and reliability, enabling it to support a 100x to 1000x increase in AI computing power.

Innoscience says that its third-generation GaN devices offer exceptional high frequency, high efficiency and high power density. They provide NVIDIA's $800V_{DC}$ architecture with a full-link GaN power supply solution, from 800V input to GPU terminals, spanning 15V to 1200V. With the deep integration of $800V_{DC}$ power architecture and GaN technology, AI data centers can achieve a quantum leap from kilowatts to megawatts in the coming years, it is reckoned, ushering in an era of more efficient, reliable and greener AI computing.

www.innoscience.com

Innoscience and United Electronics establish joint lab to develop GaN power electronics systems for EVs

InnoScience (Suzhou) Technology Holding Co Ltd — which manufactures gallium nitride on silicon (GaN) power chips on 8" silicon wafers — and China's largest tier-1 automotive supplier United Automotive Electronic Systems Co Ltd (UAES, a joint venture established in 1995 by China's Zhonglian Automotive Electronics Co Ltd and Germany's Robert Bosch GmbH) have established a joint laboratory to develop advanced power electronics systems for new energy vehicles using the advantages of GaN technology in size, weight, and efficiency. The two parties held an unveiling ceremony at UAES (Suzhou R&D Center).

"This cooperation will strengthen the cooperation between the two parties, including senior management," says United Electronics deputy general manager Dr Xiaolu Guo. "We have developed a high-power-density on-board charger based on GaN," he adds. "We look forward to continuing to strengthen our cooperation through this laboratory, boosting the innovation of GaN OBC solution."

UAES is a "global leader in automotive electronics and a technology leader in wide-bandgap power device applications," comments Innoscience's CEO Dr Jingang Wu. "Innoscience has developed the industry's highest-performance and highest-reliability GaN process, covering a voltage range from 15V to 1200V, and has the world's largest 8-inch production capacity," he claims. "We look forward to working with UAES to fully leverage our strengths in GaN and contribute to GaN-based electric vehicle technology innovation."

www.uaes.com

Innoscience launches new SolidGaN devices, boosting power efficiency by 50%

Diverse packaging options and integrated protection features enable high-frequency, high-efficiency power system

InnoScience has launched four new 700V SolidGaN devices (ISG6123TA, ISG6123TP, ISG6124TA, and ISG6124TP) that adopt industry-standard TOLL and TOLTP high-power packages, offering compatibility with both traditional controllers and motor driver applications, and streamlining design and simplifying adoption across various applications.

As power demands continue to surge, power systems are evolving rapidly, with server supplies scaling up from 2kW to 6kW, PV inverters pushing for 99% efficiency, and on-board chargers (OBC) now targeting over 3.3kW/L in power density. For engineers, this translates into increased system complexity, challenging thermal management, and reliability concerns. The ISG612x SolidGaN series addressed these challenges with high-frequency switching, superior power density, and robust thermal performance, enabling compact, reliable and high-efficiency GaN-based power systems, says InnoScience.

Building a 'seamless replacement' GaN ecosystem

Innoscience notes that 10–24V wide gate drive compatibility supports SiC/IGBT controllers with ease.

Also, due to a pin-to-pin compatible design, TP and TA package versions share functionally identical pinouts for effortless migration.

In addition, an integrated low-dropout (LDO) and gate clamp mitigates V_{gs} surge risks and eliminates the need for external gate clamp circuitry.

Performance breakthrough

Regarding dV/dt robustness, the ability to withstand up to 100V/ns, plus a 0.5Ω Miller clamp for robust gate stability, removes the need for additional clamping circuitry.

With zero reverse recovery (Q_{rr}=0), switching losses are reduced by up to 40%.

Thermal resistance is an exceptional 0.480.48ºC/W for the TOLT package (ISG6124TP) and 0.46ºC/W for the TOLL package (ISG6123TA).

Application advantage upgrade

The new devices are suitable for 1–6kW high-power applications including server power supplies, HVAC systems, and industrial power systems.

Also, compared with traditional silicon solutions, efficiency is improved by 1–2% and power density is increased by up to 50%.

SolidGaN vs traditional solutions

In competitive benchmarking, InnoScience lists the following features:

- 3x the switching frequency, enables up to 2MHz operation for SolidGaN, versus 650kHz for comparable silicon carbide (SiC) devices;
- 50% increase in power density (based on test data);
- up to 60% size reduction, due to simplified driver and protection circuitry integration.

The ISG612X family now includes eight models, offering broad flexibility in packaging, simplified design and performance, says Innoscience.

www.innoscience.com

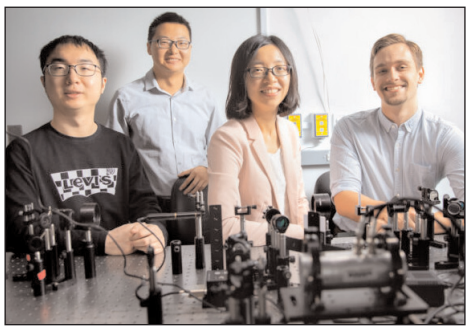
DARPA Director's Fellowship award for Cornell's Tian

Extra $500,000 for temperature mapping of active GaN RF devices

Zhiting Tian, a professor in Cornell University's Sibley School of Mechanical and Aerospace Engineering, has been selected as the recipient of the Defense Advanced Research Projects Agency (DARPA) Director's Fellowship Award, a selective award given annually to the top performers in the DARPA Young Faculty Award pool.

As a recipient of the Director's Fellowship, she receives an additional year of funding to continue her DARPA research. The additional year will provide $500,000 in funding, bringing the total for the project over three years to $1m.

Tian's initial DARPA Young Faculty Award was granted in 2023 for her project 'Transient, nanoscale temperature mapping of active RF devices', which tackles the problem of how to create temperature maps of active radio frequency (RF) devices accurately and in real-time. Additional funding will allow Tian and her group to continue their work on this important process.



Zhiting Tian and her lab students.

RF modules are a key part of defense-related communications and operations. A current limitation on RF devices is the inability of gallium nitride (GaN) to perform well under the large power output densities required for longer-range communications, as they get too hot.

Having in-situ temperature maps of active RF devices will help researchers to understand where to focus their efforts to make GaN and other semiconductors more reliable and efficient at the larger power output densities required.

"Government support is crucial. It allows us to take on bold and hard projects like this one that are high-risk, high-reward, and won't be possible otherwise," says Tian. Her research group has more than 20 postdocs, Ph.D., Masters and undergraduate students, and the additional year of funding from the DARPA Director's Fellowship will allow her to continue to train the next generation of engineers and researchers.

Tian, who joined the Sibley School faculty in 2018, has previously received an NSF CAREER Award (2017), an Office of Naval Research (ONR) Young Investigator Award (2018), a NASA Early Stage Innovations Award (2021), an Air Force Office of Scientific Research Young Investigator Award (2021), and the Presidential Early Career Award for Scientists and Engineers (2025). She was elected a member of the American Society of Mechanical Engineers (ASME) in 2019.

www.engineering.cornell.edu/people/zhiting-tian

Wales Tech Week 2025 adds Vishay as Gold Partner

Partnership follows £250m investment in its acquired Newport fab

Discrete semiconductor and passive electronic component maker Vishay Intertechnology Inc of Malvern, PA, USA has partnered with Wales Tech Week 2025 at the International Convention Centre (ICC) Wales in Newport (24–26 November).

In March 2024, Vishay Intertechnology acquired a factory in Newport, making it the home of the UK's largest semiconductor manufacturing facility. The partnership with Wales Tech Week follows an announcement earlier this year that there will be a £250m investment in the Newport facility, which specializes in silicon carbide semiconductors. This cash injection will directly support over 500 skilled jobs in Wales, while indirectly supporting hundreds more in the wider supply chain, says the firm.

"Compound semiconductors play a vital role in the world around us and we're delighted that a world-leading company such as Vishay Intertechnology has partnered with Wales Tech Week to help showcase some of the cutting-edge work that they do, in what is such an important industry," says Avril Lewis MBE, managing director of Wales Tech Week organiser. Technology Connected. "Their recently announced investment shows the confidence that they have in the manufacturing potential of Wales, and it's great to see the South Wales Semiconductor Cluster continuing to grow and attract international interest and recognition."

"When Vishay acquired Newport Wafer Fab last year, we wanted to take advantage of the global growth opportunity in compound semiconductors," notes Roy Shoshani, executive VP, chief operating officer – semiconductors & chief technical officer, Vishay Intertechnology. "We knew we would benefit from Wales's track record in innovation, its highly skilled and committed workforce, and the spirit of collaboration within the South Wales Compound Semiconductor Cluster. As Gold Sponsors of Wales Tech Week 2025, we're excited to showcase Wales's expertise in semiconductors on the world stage."

Wales Tech Week 2025 is free to attend, with the summit exploring the themes of Tech for People, Tech for the Planet, and Tech for Performance.

www.walestechweek.com
www.newportvishay.co.uk

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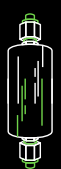
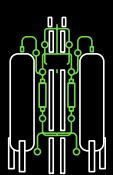
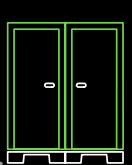


Point-of-Use Purifiers



Frame-Mounted Purifiers



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Aehr enters quarterly loss as revenue falls 23%

Total addressable market and customer base diversifying order book beyond silicon carbide

For fiscal fourth-quarter 2025 (ended 30 May), semiconductor production test and reliability qualification equipment supplier Aehr Test Systems of Fremont, CA, USA has reported revenue of $14.1m, down 23% on $18.3m last quarter and 15% on $16.6m a year ago. Full-year revenue fell by 10.9% from $66.2m in fiscal 2024 to $59m in fiscal 2025.

On a non-GAAP basis, full-year operating expenses have risen from $20.2m in fiscal 2024 to $23.2m for fiscal 2025. However, quarterly operating expenses have been cut from $6.3 last quarter to $5.4m.

Quarterly net loss was $0.25m ($0.01 per diluted share), compared with net income of $2m ($0.07 per diluted share) last quarter and $24.7m ($0.84 per diluted share) a year ago. Full-year net income fell to $4.6m ($0.15 per diluted share) from $35.8m ($1.21 per diluted share) in fiscal 2024.

Cash used in operating activities was $7.4m for fiscal 2025 (compared with cash generation of $1.76m in fiscal 2024). During the quarter, total cash, cash equivalents and restricted cash fell further, from $31.4m to $26.5m.

Order bookings were $11.1m, up from $4m a year ago. Order backlog (as of 30 May) was $15.2m, up from $7.3m a year ago. Effective backlog (including bookings since 30 May) is $16.3m.

"Fiscal 2025 was a transformative year for Aehr Test Systems, marked by significant progress on our strategic initiatives to expand our total addressable market, diversify our customer base, and enhance our product portfolio," says president & CEO Gayn Erickson. "We expanded into new markets for test and burn-in, including artificial intelligence processors for both wafer and package level, gallium nitride power semiconductors, data storage devices, and silicon photonics integrated circuits for optical chip-to-chip communication, unlocking substantial growth opportunities beyond our concentration in silicon carbide last fiscal year," he adds.

"A major milestone was the successful launch and adoption of our first production wafer-level burn-in (WLBI) system specifically for artificial intelligence (AI) processors. This breakthrough validates the feasibility and cost benefits of WLBI testing for high-power AI devices, attracting strong interest from leading processor companies considering high-volume adoption," Erickson continues.

"One of these companies has asked us to move forward with an evaluation for wafer-level testing of one of their current high-volume processors. Based on their feedback, we believe that, if this evaluation is successful, they intend to transition to high-volume production wafer-level testing, which would represent a significant opportunity for Aehr. We also expect to move to evaluation phases with additional AI companies during this fiscal year and believe we can capture a meaningful share of the total production burn-in market for AI processors with our FOX WLBI systems and proprietary WaferPak Contactors.

"We also expanded into packaged-part qualification and production burn-in for AI processors this year through the acquisition of Incal Technology, enabling us to offer both wafer-level and packaged-part reliability burn-in and test solutions. Since the acquisition, we've achieved record shipments of packaged-part burn-in (PPBI) systems and secured a major hyperscaler as our first production AI customer in this space. This customer is one of the premier large-scale data-center hyperscalers that is developing its own AI processors and significantly expanding this capacity. They have indicated plans to ramp this device over the next year and have already begun discussing their next-generation processors with us to ensure we can meet their production capacity needs. Aehr is the only company on the market that offers both a WLBI and a PPBI system for both qualification and production burn-in of AI processors.

"In gallium nitride (GaN) power semiconductors, we secured the first production order from a leading automotive semiconductor supplier for our FOX-XP high-power multi-wafer production system with high voltage for volume production of GaN devices. We are in discussions and engagements with multiple other potential new GaN customers, highlighting the growing adoption of WLBI for GaN devices and signaling future opportunity as this market expands.

"GaN offers a wider range of applications than silicon carbide and is poised for significant growth in the next decade. While about 70% of silicon carbide's largest market segment is for electric vehicles (EVs) and EV charging infrastructure, GaN is more diverse and not focused on a single application. With more uses, there are more potential customers and a larger market for GaN compared to silicon carbide.

"We are also making significant progress in the hard disk drive market. This past year, our lead customer began ordering multiple FOX-CP solutions for burn-in and stabilization of new devices in hard disk drives, representing follow-on orders to the first production order we received from them back in 2019. This customer is one of the top suppliers of data storage devices worldwide. In addition to the multiple systems we have in backlog, they have indicated they will be purchasing additional

systems both in the short term and over time.

"We saw solid momentum in the silicon photonics market this year with the adoption of optical chip-to-chip communication and optical network switching. Several companies, including AMD, Nvidia, Intel, TSMC and GlobalFoundries, have announced product roadmaps for devices that utilize optical chip-to-chip communication. We have several customers in this market, including the largest supplier of silicon photonics integrated circuits in the market. We have seen a significant number of new WaferPak designs from our installed base of systems for new designs that they use for qualification and development work on their FOX wafer-level test and burn-in systems. We also now offer a new system with higher-power 3500W per wafer configuration to meet the needs of new high-power wafers for optical I/O and chip-to-chip communication devices. This is also available as an upgrade to our FOX-NP systems for low-volume production and product qualification, as well as our FOX-XP nine-wafer production systems. This system can also be configured with our new integrated WaferPak Auto aligner, which provides fully hands-free factory automation of silicon photonics integrated circuit wafers. We expect to see not only revenue from system upgrades and WaferPaks but also for incremental FOX-XP system and WaferPak orders to meet the capacity needs of the silicon photonics market this year… We see this as a significant market opportunity for our products.

"While the silicon carbide market growth has slowed due to a slower growth in EVs, we remain confident in its long-term opportunity for Aehr and our leadership in WLBI solutions for this sector. EVs are still growing significantly worldwide, and we believe the silicon carbide market continues on a robust long-term growth trajectory. Demand for silicon carbide remains significantly driven by battery EVs, but silicon carbide devices are also gaining traction in other markets, including power infrastructure, solar, and various industrial applications. This quarter, we shipped our first high-voltage configuration of the FOX-XP, which can test 18 wafers simultaneously, extending the capabilities of our proven nine-wafer high-voltage configuration. We believe we are well-positioned in the silicon carbide market with our industry-leading solution for WLBI.

"We are also collaborating with a global leader in flash memory to demonstrate our FOX-XP platform for high-volume production wafer-level test and burn-in of flash memory wafers, aiming to provide a competitive, cost-effective alternative to traditional testing methods. New technologies in NAND are driving new requirements for WLBI to address the manufacturing and negative yield implications of testing these NAND devices at the package or system level, and we believe our FOX WLBI solution is positioned to be a very competitive low-cost alternative to packaged-part or alternative wafer-level test and burn-in solutions for this market.

"Looking ahead, we are well-positioned to capitalize on strong demand across various semiconductor applications. The strategic investments we made this past year have built the infrastructure and capacity needed for significant growth, and we plan to boost our research and development efforts to add more capabilities and resources for our expanding customer base," says Erickson. "Nearly all the opportunities and market verticals we serve will experience order growth in fiscal 2026. The one exception may be silicon carbide, as customer forecasts for this market are back-half loaded, with stronger growth expected in our fiscal 2027.

"While we remain confident in Aehr's long-term growth prospects, we continue to experience some timing-related delays in order placements due to tariff-related uncertainty, particularly in our first quarter. Accordingly, we are maintaining our cautious approach and are not reinstating specific guidance beyond what we have already stated, which is that we anticipate order growth across all our segments this fiscal year with the possible exception of silicon carbide. Overall, we are very optimistic about our growth opportunities in the diverse markets we serve and our ability to meet increasing demand."

www.aehr.com

Kyma and Novel Crystal collaborate on Ga_2O_3 epi

Aim is to accelerate commercialization of Ga_2O_3 devices for high-voltage power electronics

Kyma Technologies of Raleigh, NC, USA and Novel Crystal Technology Inc (NCT) of Sayama, Saitama, Japan are collaborating to develop gallium oxide (Ga_2O_3) epiwafers, aiming to accelerate the commercialization of Ga_2O_3 devices for high-voltage power electronics applications including electric vehicles, renewable energy, aerospace, and industrial systems.

Gallium oxide offers significant advantages over traditional silicon and other wide-bandgap materials such as silicon carbide (SiC) and gallium nitride (GaN), including a higher breakdown electric field and the potential for lower production costs. However, an industry bottleneck remains the limited availability of device-grade Ga_2O_3 epiwafers with consistently low defects and scalable production methods.

By combining NCT's expertise in producing high-quality bulk Ga_2O_3 substrates with Kyma's epi growth capabilities, the firms aim to develop processes to produce large-area (150mm-diameter) epiwafers suitable for multi-kV-level power devices.

Kyma and NCT have already worked together for many years (see HVPE-Based Gallium Oxide Epiwafer Development). Now, Kyma's epi services on NCT substrates (up to 100mm diameter) are available for sale to the broader R&D community. These epiwafers are expected to enable a new generation of power semiconductor devices that deliver higher efficiency and performance in demanding applications. For on-going power device development work, the technical teams at Kyma and NCT will be collaborating closely, including on specific customer requirements.

"Our partnership leverages the best of both companies' technologies to push the boundaries of Ga_2O_3 epiwafer production," says Kyma's president & CEO Heather Splawn. "Novel Crystal Technology manufactures the best Ga_2O_3 substrates in the world, and we are thrilled that Kyma can now offer our unique epi growth on those substrates to our customers," she adds.

"We are excited to work with Kyma Technologies to further develop high-quality Ga_2O_3 epitaxial wafers," NCT's president & CEO Akito Kuramata. "Together, we aim to accelerate the adoption of Ga_2O_3 devices worldwide, supporting critical industries and technology sectors."

www.novelcrystal.co.jp/eng/
www.kymatech.com

Alcoa exploring gallium project in Western Australia

JDA with Japan Australia Gallium Associates JV between Sojitz and the Japan Organization for Metals and Energy Security

Alcoa of Australia Ltd (a subsidiary of Alcoa Corp, which provides bauxite, alumina and aluminium products) has announced a joint development agreement (JDA) with Japan Australia Gallium Associates Pty Ltd (JAGA) — a Perth-based joint venture formed in March between Sojitz Corp and Japan Organization for Metals and Energy Security (JOGMEC) — to explore the feasibility of a gallium project to be co-located at one of Alcoa's operating alumina refineries in Western Australia.

Australia and the USA have both recognized gallium as a critical mineral. Additionally, Japan has identified gallium as one of 35 minerals important to national security.

Currently, gallium production is concentrated in China, with market controls introduced in 2023 heightening global interest in alternative supply chains.

Alcoa of Australia president Elsabe Muller says the JDA partners are assessing the potential for a co-located facility to expand global supply of gallium as an existing by-product of the alumina refining process in Western Australia.

"This opportunity could deliver additional value from our established operations and further demonstrate how Alcoa's long-standing mineral processing capabilities can be significant in supporting state, national and global objectives in technology and national defense," says Muller. "We welcome the opportunity to work with the JAGA partners, including Sojitz, who has considerable connection with mid-stream gallium refiners and manufacturers and would be an offtake customer in the project."

The project has the potential to introduce supply options for Japanese semiconductor production critical to global downstream processing and manufacturing, says Osamu Matsuura, resources & recycling divisional chief operating officer at Sojitz Metals.

Subject to further commercial agreements and regulatory approvals, the JDA partners are targeting a final investment decision by the end of 2025 and to begin production in 2026. Alcoa's participation in the JDA is not expected to have a material impact on its financial position or results of operations.

www.alcoa.com
www.jogmec.go.jp/english

CSA Catapult highlights solid-state transformers for a more flexible and intelligent energy grid

UK can lead new grid tech to reduce blackouts and provide smarter energy supply

Solid-state transformers (SSTs) that use power electronics and high-frequency components to convert and control electricity are extremely useful for integrating renewable energy sources and energy storage systems into the grid, as well as managing surges and disturbances, reducing the likelihood of blackouts. In April, a major blackout occurred across Spain and Portugal, disrupting power for more than 10 hours and causing economic losses of an estimated $1.6bn.

Energy grids can be made smarter, more reliable and less prone to blackouts by using compound semiconductors such as silicon carbide (SiC) and gallium nitride (GaN), which are the material of choice for this application as they can handle higher voltages, operate at higher frequencies, and perform better at higher temperatures, notes a new report by UK-based Compound Semiconductor Applications (CSA) Catapult.

Established in 2018 by government agency Innovate UK, CSA Catapult is a not-for-profit center of excellence with labs and offices across the UK 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 reckons that, due to its expertise in power electronics and compound semiconductors, the UK is well placed to lead in solid-state transformer technology.

Even though SSTs are still a nascent technology, the market is projected to grow at a double-digit compound annual growth rate (CAGR) through to 2030. Similarly, the market for SiC power devices is expected to grow at a CAGR of more than 20% over the same period. The total global investment in power grid technology was projected to peak at nearly $400bn in 2024, while global spending on renewables hit a record $735bn in 2023.

In the UK alone, there are over 500,000 substations that could benefit from new SST upgrades. Between 2020 and 2023, over 100,000 traditional dielectric transformers were sold in the UK, generating over £90m in revenue.

Compared with traditional transformers, SSTs are much smaller and lighter, better at regulating voltage, and more flexible — they can also convert between AC and DC electricity and help to send electricity back into the grid. Outside of the energy grid, SSTs can also be used to manage power in EV chargers, data centers, and electric rail, marine and aerospace applications.

SSTs can modernize EV charging by providing compact, efficient systems that support high-power, ultrafast charging solutions and a seamless link into renewable energy sources.

Global companies are already developing SiC-based SSTs that can achieve up to 96.5% efficiency and reduce carbon footprint by 40%, weighing up to 70% less.

The report estimates that 300,000–800,000 EV chargers could be installed in the UK by 2030, providing a market opportunity of between £570m and over £4.5bn.

To overcome the hurdles facing the commercial development of SSTs, the report calls for more coordination between academia, industry and government, improved funding and regulatory frameworks, and the development of large-scale pilot projects to test the technology in the real world.

"As the energy landscape evolves and we introduce more renewables into the grid, SSTs have the potential to modernize our infrastructure and transform the way we move electricity around the system," says CSA Catapult's chief technology officer Nick Singh. "Their ability to integrate seamlessly with distributed energy resources, bidirectional power flow, and real-time monitoring will place them at the heart of smart grids and create a whole host of new and advanced applications," he adds. "The UK is in a strong position to take this technology forward with a flourishing power electronics and compound semiconductor ecosystem that is needed to take this technology from concept into real-world applications."

www.csa.catapult.org.uk

AXT's Q2 revenue constrained by slower-than-expected China export permitting

Order backlog of $10m to yield growth in Q3 as permitting accelerates

For second-quarter 2025, AXT Inc of Fremont, CA, USA — which makes gallium arsenide (GaAs), indium phosphide (InP) and germanium (Ge) substrates and raw materials — has reported revenue of $18m, down 7.2% on $19.4m last quarter and 35.5% on $27.9m a year ago. This is below the guidance of $20–22m provided on 1 May, but at the top end of the revised guidance of $17.5–18m issued on 9 July.

Of total revenue in Q2 (compared with a year previously), the proportion from the Asia Pacific region has risen further from 78% to 90%, while Europe has fallen further from 17% to 9% and North America has dropped from 5% to just 1%.

"The China government imposed trade restrictions on export of GaAs in August of 2023 and our InP in February of 2025. These regulations explicitly seek to restrict the export of materials used for military applications and require that we file an export permit for every customer orders," says CEO Dr Morris Young. "We typically hear back on initial applications with 45 business days, and repeat applications are often processed faster. We found the permitting process in Q2 for GaAs to be slower than we typically see over the last two years," he adds. "The delays in Q2 resulted in our being able to ship less material outside of China than we had anticipated. About half of our revenue shortfall in Q2 was the result of this factor."

By product category:

- InP revenue was $3.6m (more than halving from $7.7m a year ago but down only slightly on $3.8m last quarter), primarily from passive optical networks (PONs) and data-center applications in China.
- GaAs revenue has fallen further, from $9.1m a year ago and $6.7m last quarter to $6.2m. "Demand in China was sluggish in Q2, and customers are taking a more cautious approach to ordering and holding inventory," notes Young. "Despite a lackluster environment, we were pleased to be able to grow our wireless business in China during the quarter."
- Germanium substrate revenue was $1.5m, almost halving from $2.9m a year ago but rebounding from just $0.6m last quarter, driven by satellite solar cell applications in China. "This market is highly price sensitive, and we continue to be very selective in the business opportunities we choose to support as the sharp rise in germanium raw material pricing in the last several years has severely constrained gross margins."

"Our substrate revenue increased in Q2 from the prior quarter, though the increase was less than we had expected as a result of longer processing times for GaAs export permits, coupled with some sluggishness in the demand environment in China, which also affected our raw material business," says Young.

Revenue was $6.7m from the two consolidated raw material joint ventures: BoYu (which makes high-temperature pyrolytic boron nitride crucibles and pBN-based tools for organic light-emitting diodes) and JinMei (which supplies high-purity materials including gallium and germanium, as well as InP poly and other materials). This was down about 19% on $8.3m last quarter and $8.2m a year ago.

On a non-GAAP basis, gross margin was 8.2%, down on 27.6% a year ago but a rebound from –6.1% last quarter. "We took a more measured approach to market expansion and we were able to service a portion of the customer opportunity, while executing effectively at modestly higher production levels. The adjustment we made in our approach, along with the strong focus from our manufacturing organization on yield and efficiency, allowed us to drive meaningful improvements in gallium arsenide gross margins," says Young.

"We also saw healthy growth in AI-related demand for InP in China," Young continues." We were granted our first permit for InP in late June, and we were able to ship nearly $700,000 of material for our non-China backlog in InP in Q2."

Operating expenses in Q2/2025 were $7.6m, cut from $8.5m last quarter and $8.9m a year ago, due to R&D spending falling by $1.25m. "Given the difficult climate, we have been working hard to hold OpEx down," notes chief financial officer Gary Fischer.

Net loss is $6.4m ($0.15 per share), up from $0.8m ($0.02 per share) a year ago but cut from $8.2m ($0.19 per share) last quarter.

During the quarter, cash and cash equivalents and investments fell by $3.1m, from $38.2m to $35.1m.

Net inventory was down by about $300,000 to $80.1m. "This continues to be a focus for us, and we expect to bring it down further in quarters to come," says Fischer.

"We continue to be highly focused on driving continued improvement, including further recovery in Q3," he adds.

"The pace of permits in the month of July has improved meaningfully, mostly on smaller orders, but this improvement is good news, and we do expect gallium arsenide revenue to grow sequentially," says Young.

"Although, the process for InP has been a bit slower than we expected as well, we have received additional permits in July and expect to see more over the coming months," he adds. "Based on the pace so far, we're taking a conservative view of the timing of larger permits in Q3. We don't believe that any of our InP sales go into military applications. So, we feel we are in a good position

to realize millions of dollars of sales backlog once we navigate the permit process."

"In addition, germanium substrates permits for sales outside of China have been difficult to obtain. Therefore, in Q3, we expect to see our [germanium] sales come down again, and we may remain at lower-level rate through the second half of the year."

Raw material revenue is expected to be roughly flat in Q3/2025.

In total, Q3/2025 revenue should grow sequentially to $19–21m, including a modest contribution from InP and GaAs for customers outside of China. "Although the export permit process has been slower than we would like to be, we are making progress against a backlog of more than $10m in customer orders for GaAs and InP substrates," says Young. "Within China, we continue to optimize the emerging opportunities to grow our business in strategic applications for both InP and GaAs" says Fischer. "We're also encouraged to see growth in strategic applications within China, including InP for AI-related data-center connectivity and GaAs for wireless devices," notes Young.

"We expect our margins to improve again and to be in the low- to mid-teens," he adds. Net loss in Q3/2025 should be cut further, to $0.11–0.13.

"Our competitive positioning continues to be enhanced by superior product performance in key specifications such as low etch pit density (EPD), and we are working diligently to support the next-generation technology requirements of our global customer base," says Young.

"While the recent geopolitical environment present a near-term headwind for our business, we are also taking advantage of some of the unique opportunities," he adds.

"The cloud and data-center connectivity market in China is accelerating. And, in an effort to promote innovation and reduce dependency on foreign suppliers, we're seeing a significant effort to develop a domestic source of EML [electro-absorption modulated lasers] and silicon photonics-based lasers. We estimate that China data-center optical interconnect market is currently around a third of the global market. However, most of the optical devices for these interconnects are sourced from outside of China, and applications for indium phosphide substrate within China remain focused on PON business only. Further, laser manufacturers in China are developing an appreciation for the critical benefit of low-EPD material in high-speed interconnect devices, both in the traditional PON market and in the new data-center market. As a result, our sales of indium phosphide within China are increasing. In Q2, we nearly doubled our revenue for indium phosphide within China, and our revenue for AI-related applications in China also are increasing, although the revenue base is small, and we expect to continue to grow in Q3," says Young.

"The total addressable market (TAM) for the data-center market in China remains small at this moment, but we expect to see significant growth over the next few years as the PON laser providers expand their portfolio to include EML and silicon photonic solutions. Broadly speaking, we expect to grow our total indium phosphide revenue by 30% or more in Q3 as a result of growth in applications for PON, data-center connectivity and various InP-based sensors," he adds.

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AXT appoints ex-director Leblanc as board member

Jesse Chen made chair of Audit Committee

AXT has appointed Leonard J. Leblanc as a member of its board to fill the vacancy due to the passing of Christine Russell. He will serve as a Class III director with a maximum term expiring on 29 July 2027, or until his successor is duly elected and qualified.

LeBlanc previously served as a director from April 2003 to December 2021 and was also a director emeritus in 2022.

From February 2001 to September 2003, was acting chief financial officer and VP of corporate development for privately held applications software company Ebest Inc. From August 1998 to January 2000 LeBlanc was the executive VP & CFO of customer relationship management software and solution firm Vantive Corp. From March 1996 to July 1997, he was the executive VP of finance and administration & CFO at internet search & navigation firm Infoseek Corp. From September 1993 to December 1994, he was senior VP, finance & administration of GTECH Corp, a manufacturer of lottery equipment and systems. From May 1987 to December 1992, he was executive VP, finance & administration and CFO of electronic design automation software firm Cadence Design Systems Inc.

LeBlanc served on the board of directors and as chairman of the audit committee of optical manufacturing solutions and optical networking component provider Oplink Communications Inc from 2000 to 2009 and as chairman of the board from 2006 to 2009. From November 2009 to November 2010, he was a consultant to Oplink.

LeBlanc has B.S. and M.S. degrees from the College of Holy Cross, and an M.S. degree in finance from George Washington University.

AXT's board has also appointed Jesse Chen as chair of the Audit Committee. He is currently an independent director, lead director, chair of the Nominating and Governance Committee, and a member of both the Audit Committee and Compensation Committee.

Aixtron's revenue grows 22% in Q2/2025, driven by AI

For second-quarter 2025, deposition equipment maker Aixtron SE in Herzogenrath, near Aachen, Germany has reported revenue of €137.4m, up 4.2% on €131.8m a year ago and 22% on €112.5m in Q1.2025. This is near the upper end of the guidance range of €120–140m, reflecting a strong performance in a generally soft market environment.

Demand in the optoelectronics segment continues to gain momentum, fueled by growing requirements for datacom lasers, particularly for AI data centers. The G10 product series remains a key driver: The G10-AsP metal-organic chemical vapor deposition (MOCVD) system has been firmly established as the new tool of record in the laser market, and a major SiC volume order from China was won and fulfilled by shipping the G10-SiC CVD system. The gallium nitride (GaN) and silicon carbide (SiC) power segments remain soft, with demand mostly driven by Asian customers.

Product mix boosts gross margin, but counteracted by expense for staff cut

Gross margin has fallen slightly from 37% in first-half 2024 to 36% in first-half 2025. However, this includes one-off expenses in the mid-single-digit Euro range related to the implemented personnel reduction in the operations area. Adjusted for this, gross margin rose to 38% due to improved product mix.

R&D expense cut boosts profits

Operating expenses have been cut from €36.3m in Q2/2024 to €32.2m in Q2/2025. R&D spending was reduced by 24% from €47.5m in first-half 2024 to €36m in first-half 2025 due to reduced external contract work and consumables costs. Strong exchange rate changes led to expenses from exchange rate valuation rising from €1.9m in first-half 2024 to €4.6m in first-half 2025.

Operating profit (EBIT) has risen from €22.8m (EBIT margin of 9%) to €26.9m (EBIT margin of 11%) in first-half 2025. However, adjusted for the one-off expenses from personnel reduction, EBIT margin was about 13%, due mainly to the improved product mix and lower R&D expenses. Net profit has risen from €22m in first-half 2024 to €24.3m in first-half 2025.

Strong boost to free cash flow

Cash flow from operating activities grew significantly from €20.2m in Q2/2024 to €50m in Q2/2025, driven mainly by continued reduction in inventories, by €120m from €447.9m to €327.9m. Due to the improved operating cash flow and much lower capital expenditure, free cash flow hence improved by €127.6m from –€56.5m in first-half 2024 to €71.1m in first-half 2025.

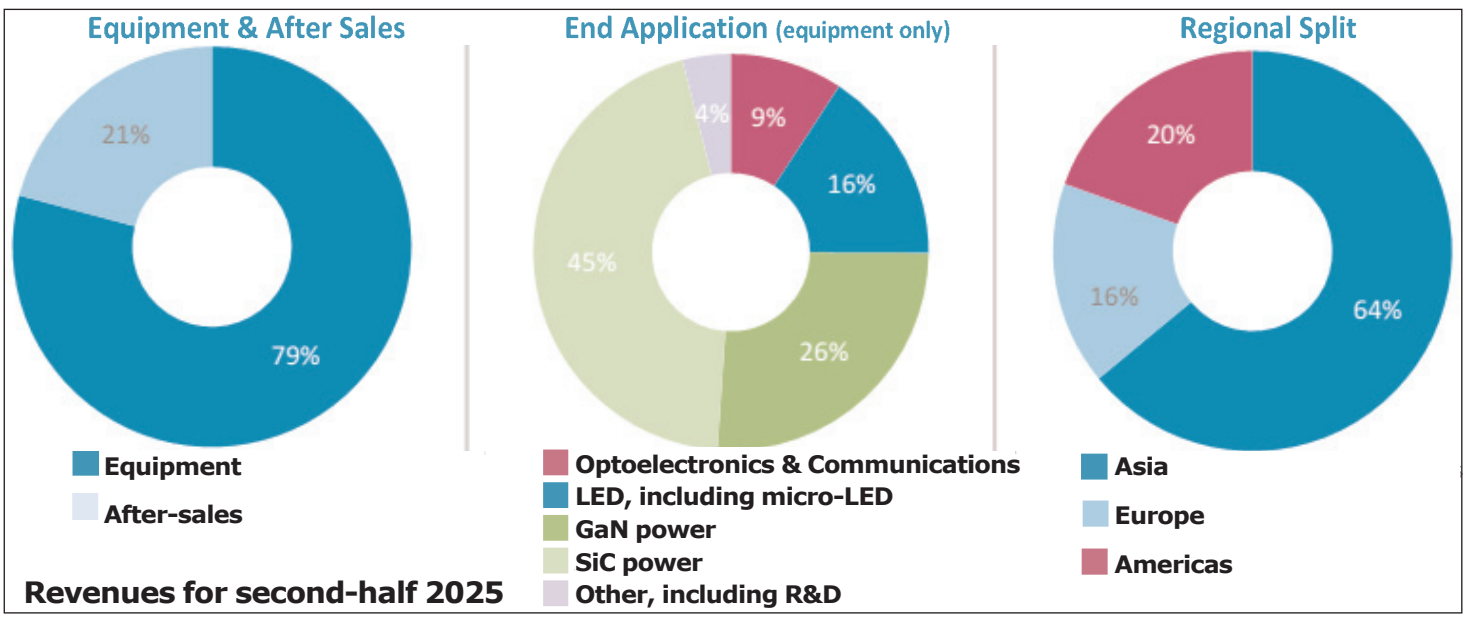
"Continuation of the positive trend in our free cash flow underlines that we are progressing as planned," says chief financial officer Dr Christian Danninger. "We are further reducing working capital, driven by ongoing inventory optimization. Rebuilding our strong cash position remains a key priority to ensure full strategic flexibility."

At the end of June, following a dividend payment of €16.9m, cash and cash equivalents (including other current financial assets) were €114.8m, up from €64.6m at the end of June. The equity ratio rose from 83% to 87%, underscoring Aixtron's strong financial position.

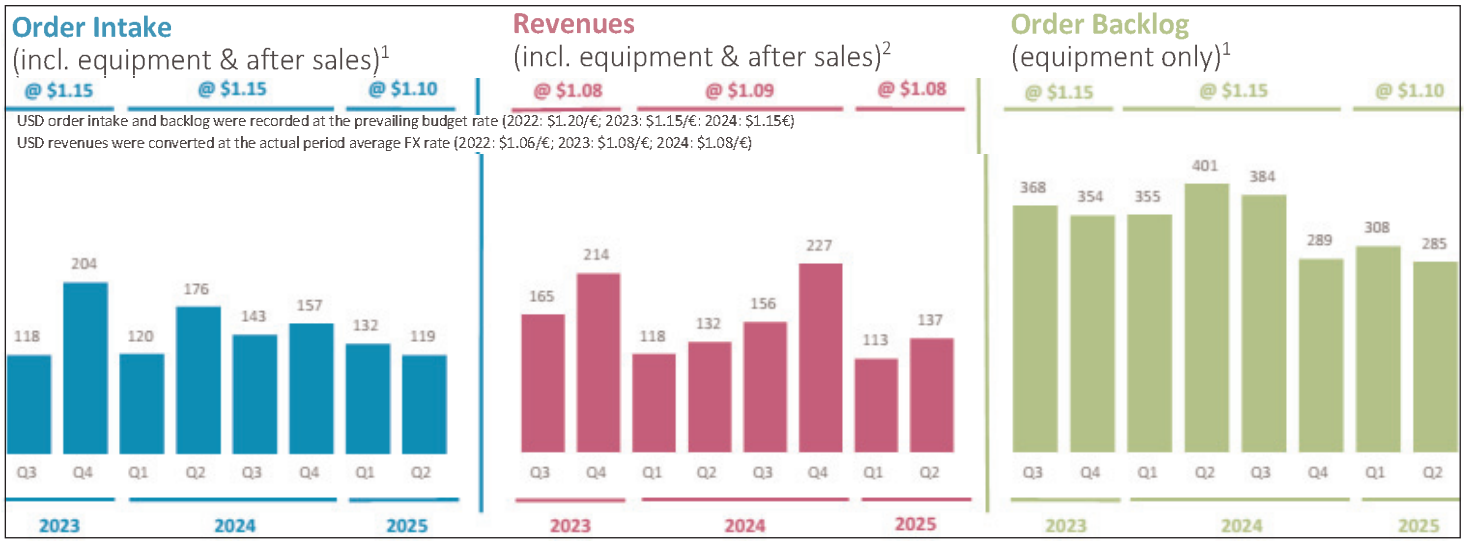
Order intake and order backlog

Q2/2025 order intake was €118.5m, down 10.4% on €132.2m in Q1 and 32.6% on €175.7m a year ago. However, SiC tool demand particularly benefited from the transition from 150mm to 200mm wafers, as well as from the need for higher-productivity tools in response to the increasing cost sensitivity of customers. One large volume order for G10-SiC from China was received and completed in first-half 2025. Order intake in first-half 2025 was €250.7m, down 15% on first-half 2024's €296m, as expected.

At the end of June, equipment order backlog was €284.6m, down from €400.6m a year previously



Revenues for second-half 2025



but almost unchanged from €289.3m at the end of 2024.

"Our strategy of targeting diverse, uncorrelated end markets continues to prove its value," believes CEO Dr Felix Grawert. "While the SiC and GaN power electronics markets have not reached the turning point, we are seeing continued momentum in the datacom laser market. Our G10-AsP tool has firmly established itself as the tool of record, with volume orders coming from many of the leading laser manufacturers," he adds. "Although a broader market recovery has yet to take shape, our strong execution keeps us firmly on track."

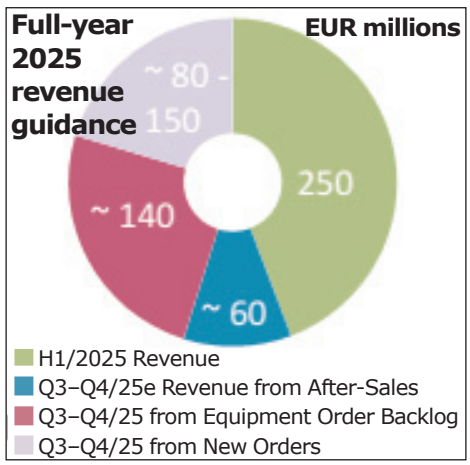
Full year guidance confirmed

For third-quarter 2025, Aixtron expects revenues of €110–140m.

Based on market development, tariffs and a 1.10 US$/EUR budget rate, Aixtron confirms February's full-year guidance of revenue of €530–600m, gross margin of 41–42% and EBIT margin of 18–22%.

This includes one-off expenses in a mid-single-digit Euro range related to the implemented personnel reduction in the operations area. This should yield annualized savings in the mid-single-digit Euro range, corresponding to an improvement in gross margin and EBIT margin of about 1 percentage point.

N.B. An average $/€ exchange rate of 1.20 in second-half 2025 could cut full-year gross margin and EBIT margin by about 1 percentage point.



Aixtron CCS system chosen for 2D materials-based photonic device pilot line at Cambridge Graphene Centre

The UK's University of Cambridge has purchased an Aixtron CCS Close Coupled Showerhead system for 2D materials for its photonics and optoelectronics R&D.

The system enables wafer-scale growth of layered 2D materials, allowing integration with silicon photonics to produce highly efficient and high-speed optical data communication devices.

"2D layers offer enormous opportunities in photonics, optoelectronics and nanoelectronics," says Aixtron's CEO Dr Felix Grawert.

The CCS system is in a 200mm configuration and is being installed at the Cambridge Graphene Centre, to be used for the UK's Layered Materials Research Foundry (LMRF). The LMRF will focus its research on graphene and other layered materials to deliver, at a pilot scale to end users, a fully integrated silicon photonics platform.

Aixtron's CCS was chosen for the pilot line as it is the only platform allowing seamless process transfer and scaling to 300mm and high-volume manufacturing of layered materials. It also brings manufacturing-level features to the lab scale. This is due to proprietary full-wafer temperature control via the ARGUS temperature mapping system, as well as precise precursor delivery and control using Aixtron's concentration monitor Epison.

"For many years, we have worked closely with Aixtron, which has allowed us to advance our research and development in layered materials," says professor Andrea Ferrari, director of the Cambridge Graphene Centre. "Aixtron's CCS system will be used to deposit layered materials for optical transceivers and modulators which will be used for high-speed data applications like 5G/6G as well as optical interconnects and switches for next-generation energy-efficient AI hardware."

www.aixtron.com

Veeco's Q2 revenue, operating income and EPS all exceed guidance, but constrained by tariffs

China drops from 42% to 17% of revenue, while Asia Pacific rises from 36% to 59%

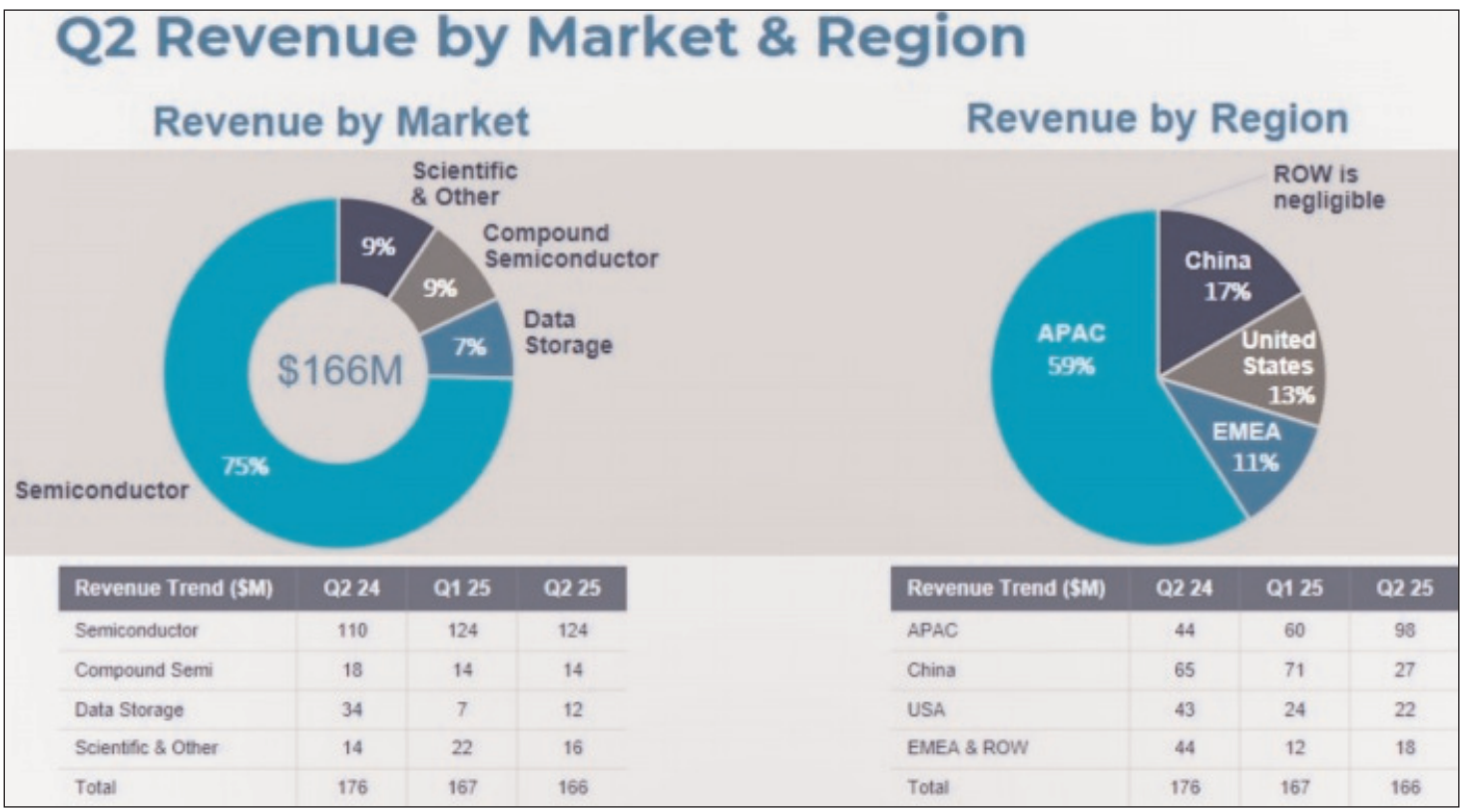
For second-quarter 2025, epitaxial deposition and process equipment maker Veeco Instruments Inc of Plainview, NY, USA has reported revenue of $166.1m, down slightly on $167.3m last quarter and down 6% on $175.9m a year ago, but exceeding the $135–165m guidance.

"In our guidance for the quarter, we took into consideration the then imposed substantial import tariffs in China for goods manufactured in the USA. We reported certain China customers were delaying shipments due to the tariffs, and the midpoint of our guidance range assumed $15m of shipments would be delayed outside the quarter," says chief financial officer John Kiernan. "During the second quarter, as the tariff rate was significantly reduced, customers accepted the majority of shipments that were previously delayed," he adds. "The delay in tariff shipments was a one-time thing in Q2 that right now has been totally resolved."

By region, China still plunged from $71m in Q1 to just $27m in Q2 (shrinking from 42% to 17% of total revenue). The Asia Pacific (excluding China) has grown further, from just $44m (25% of total revenue) a year ago to $60m (36% of revenue) in Q1 and now $98m (59% of revenue) in Q2, led by sales in Taiwan and Southeast Asia for advanced packaging as well as ion beam deposition for EUV mask blanks. The USA has almost halved from $43m (24% of revenue) a year ago to $24m (15% of revenue) in Q1 and $22m (13% of revenue) in Q2. Europe, Middle-East & Africa (EMEA) and the rest of the world (RoW) has rebounded from just $12m (7% of revenue) in Q1 to $18m in Q2 (11% of revenue), although this is still down on $44m (14% of revenue) a year ago.

Revenue growth has been fueled by rapid expansion of high-performance computing and AI technologies:

- The Semiconductor segment (Front-End and Back-End, as well as EUV Mask Blank systems and Advanced Packaging) contributed $123.9m (representing 75% of total revenue), flat sequentially but up 13% on $109.9m (63% of total revenue) a year ago. Growth is led by strong performance for wet processing and lithography systems for advanced packaging applications (driven by growing demand from AI by a broad base of customers, including leading foundries and OSATs) and ion beam deposition systems for EUV mask blanks applications, together with continued demand for laser spike annealing systems (with shipments to leading customers supporting gate-all-around and high-bandwidth memory applications).



Revenue Trend ($M)	Q2 24	Q1 25	Q2 25
Semiconductor	110	124	124
Compound Semi	18	14	14
Data Storage	34	7	12
Scientific & Other	14	22	16
Total	176	167	166

Revenue Trend ($M)	Q2 24	Q1 25	Q2 25
APAC	44	60	98
China	65	71	27
USA	43	24	22
EMEA & ROW	44	12	18
Total	176	167	166

- The Compound Semiconductor segment (Power Electronics, RF Filter & Device applications, and Photonics including specialty, mini- and micro-LEDs, VCSELs, laser diodes) contributed $14.2m (9% of total revenue), down on $18.2m (10% of total revenue) a year ago but level with last quarter.
- The Data Storage segment (equipment for thin-film magnetic head manufacturing) contributed $12.4m (7% of revenue), down on $34m (19% of total revenue) a year ago but almost doubling from just $6.7m last quarter.
- The Scientific & Other segment (research institutions and other applications) contributed $15.7m (9% of revenue), down from $22.4m last quarter but up on $13.8m (8% of revenue) a year ago.

On a non-GAAP basis, gross margin was 42.6%, down on 43.7% a year ago but up from 41.7% last quarter, and exceeding the expected 40–42%, favorably impacted by higher volume and improved product mix but impacted by about 100 basis points from tariffs.

Operating expenses were $47.6m, up on $45.5m last quarter but cut from $48.6m a year ago.

Net income has fallen further, from $25.4m ($0.42 per diluted share) a year ago and $22.2m ($0.37 per diluted share) last quarter to $21.5m ($0.36 per diluted share), but exceeding the guidance of $7–20m ($0.12–0.32 per diluted share).

Operating cash flow was $9m. Capital expenditure was $3m. During the quarter, cash & short-term investments rose hence from $353m to $355m, up on $305m a year ago.

Strengthening the balance sheet, Veeco retired all $25m of its convertible senior notes due in 2027, issuing 1.6 million shares of common stock and $5m of cash. Long-term debt has been cut from $250m to $225m.

Also during the quarter, Veeco entered into an amendment to its revolving credit facility, increasing the size from $225m to $250m and extending the maturity to June 2030.

"Both of these actions provide greater financial flexibility and liquidity as we focus on our key growth drivers for the business," says Kiernan.

September-quarter guidance and outlook

For third-quarter 2025, Veeco expects revenue of $150–170m. Gross margin should be 40–42%, which assumes an impact of 100 basis points from tariffs.

"We've seen increased costs from tariffs on imported materials," says Kiernan. "That said, we are actively working with our global supply chain partners to mitigate these impacts. Our teams are focused on cost containment, sourcing flexibility and operational efficiency to help offset potential headwinds."

We are seeing encouraging signs of growth for applications in GaN power, solar and photonics. These emerging opportunities are expected to begin contributing to revenue growth in 2026

With operating expenses rising to $48–49m, net income is expected to drop slightly to $12–21m ($0.20–0.35 per diluted share).

"In the Semiconductor market, we continue to see growth potential in 2025, particularly in leading-edge investments driven by AI and high-performance computing. These trends are expected to support significant demand with growth in gate-all-around and advanced packaging technologies," says Kiernan. "Beyond 2025, our outlook remains strong, supported by our differentiated product portfolio across laser annealing, ion beam deposition, wet processing and lithography," he adds.

"While we expect revenue in the Compound Semiconductor market to decline in 2025 compared to 2024, we are seeing encouraging signs of growth for applications in GaN power, solar and photonics. These emerging opportunities are expected to begin contributing to revenue growth in 2026," says Kiernan.

"Over the last few years in MOCVD, in particular, we've had a concerted effort to upgrade our product lines, specifically in 300mm GaN-on-silicon and in the batch arsenide-phosphide tools," says CEO Bill Miller.

"The 300mm GaN-on-silicon [MOCVD] evaluation system we have in the field is progressing well. We're competitive from a productivity and cost-of-ownership standpoint while maintaining excellent process performance, meeting the customer's specification. Assuming success, the plan would be to have this drive pilot-line business for us starting in 2026… then ramping to high volume in 2027 and beyond," he adds.

"In the arsenide-phosphide toolset, we're working with a number of customers, for example, in low-earth-orbit solar activity. There's some opportunities there: micro-LED and indium phosphide applications in the data center. So we're working with a number of customers, and some of the feedback we're receiving is that we're really differentiated on performance with a lower cost of ownership for our customers."

"In the Data Storage market, system revenue is declining year-over-year. However, our service revenue has increased, reflecting higher customer utilization. While it is too early to predict customer capacity additions for 2026, we are encouraged by increased engagement and commercial discussions around future requirements," he adds.

"We continue to see strong demand in the Scientific market for our research-driven applications, particularly in quantum computing. This segment is expected to deliver growth in 2025, supported by ongoing investment in advanced scientific innovation," Kiernan concludes.

www.veeco.com

Riber's first-half revenue falls 22% year-on-year to €10.7m

Full-year revenue to exceed €40m, down only slightly on 2024

For first-half 2025, molecular beam epitaxy (MBE) system maker Riber S.A. of Bezons, France has reported revenue of €10.7m, down 22% on €13.7m in first-half 2024.

The firm reiterates that its business activity is subject to seasonal trends, with revenue structurally lower in the first half of the year.

MBE Systems revenues fell 17% year-on-year from €9.4m to €7.8m, reflecting the delivery schedule agreed with customers for systems on order in 2025. This corresponds to the delivery of three machines, including two production systems, compared with three production systems in the same period last year.

Services & Accessories revenue fell 31% from €4.3m to €3m, due primarily to a temporary decline in research-related orders, particularly in the USA, against a backdrop of tighter budgets in universities and research laboratories.

Of total revenue, 70% came from Asia, 15% from Europe and 13% from North America.

Order book falls 23% year-on-year

Riber says that, despite ongoing geopolitical tensions and regulatory constraints, it maintained strong commercial momentum in first-half 2025.

Riber secured five new system orders, including the first order for ROSIE, its new 300 mm silicon photonics platform, which recently entered its industrialization phase.

The MBE Systems order book fell by 25% year-on-year, from the high base of €30.2m at end-June 2024 to €22.5m at end-June 2025. This includes nine systems, of which six are production machines. The drop is due mainly to the denial of two export licenses, representing €4m in unbooked orders, and longer license approval timelines, which delayed the booking of already-identified orders.

The Services & Accessories order book is down by 11% from €5.8m to €5.2m.

The total order book is therefore down 23% from €36m at end-June 2024 to €27.7m at end-June 2025.

Full-year outlook

Riber expects order intake to improve in second-half 2025, driven by major global investment programs in the semiconductor industry.

It should also benefit from the ramp-up of its ROSIE (Riber Oxide on SIlicon Epitaxy) platform, a new technology for silicon-based integrated photonics. After signing a strategic partnership with the Denmark-based Novo Nordisk Foundation Quantum Computing Programme (NQCP) and the first unit sale, Riber aims to leverage growing interest from both research institutions and industrial players for solutions compatible with silicon fabrication lines.

While short-term momentum in research-related services & accessories remains uncertain, the systems business is expected to remain broadly stable in 2025.

Given the order book for delivery this year and the upcoming business opportunities, full-year revenue should exceed €40m in 2025, down only slightly on 2024's €41.2m.

www.riber.com

Wave Photonics launches PDK Management Platform to integrate foundry PDKs with EDA tools

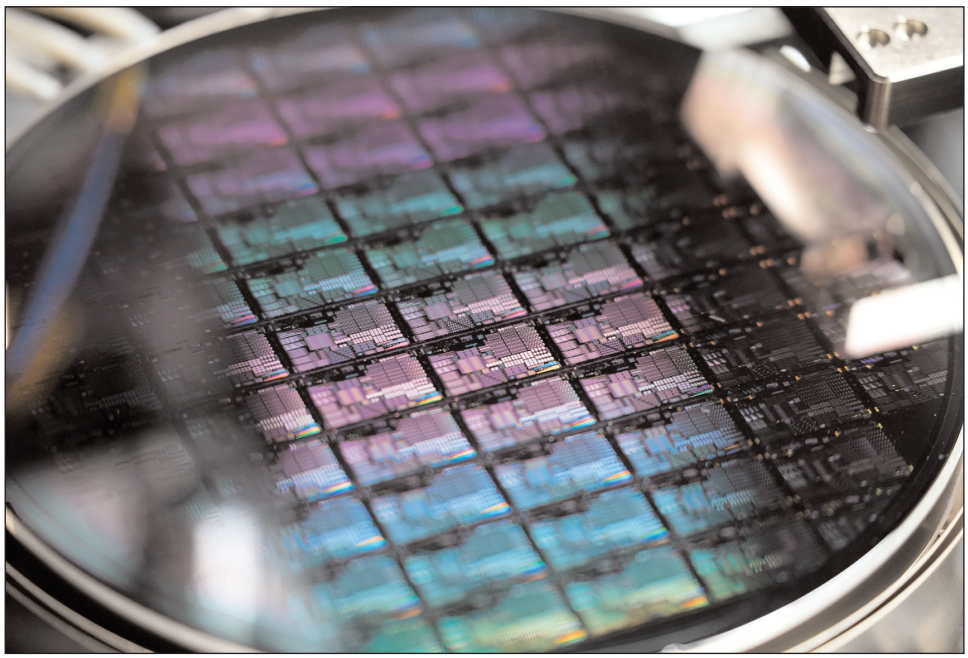
Silicon photonics rapid prototyping foundry CORNERSTONE becomes first adopter

Wave Photonics of Cambridge, UK (which was founded in May 2021 and develops design technology to drive the advancement and mass adoption of integrated photonics) has launched its PDK Management Platform to integrate foundry process design kits (PDKs) with leading electronic design automation (EDA) tools, provide ready-calculated SParameters for circuit simulation, and provide easy access for designers.

The platform reduces repetitive work involved in mapping PDKs to multiple EDA tools, allowing teams to focus on higher-value work. Photonic integrated circuit (PIC) designers can plug PDKs into the EDA tool of their choice with no extra setup required.

Launched with the first foundry adopter CORNERSTONE, the platform integrates PDKs into all major EDA tools with no manual setup required. Key features include:

- built-in compatibility with Wave Photonics' EDA partners Luceda Photonics (IPKISS), Cadence Design Systems (Virtuoso), Siemens (L-Edit Photonics), and the open-source GDSFactory, with functionality for Synopsys (OptoCompiler) and Latitude Design Systems (PIC Studio) coming soon;
- automated generation of S-parameters that work out-of-the-box with EDA/circuit simulation tools;
- IP management through built-in blackboxing feature and non-disclosure agreement (NDA) tracking, enabling controlled access and protecting the confidentiality of process data;
- automated documentation and version control that provides designers with up-to-date documentation and helps to avoid PDK mixups and accidental cross-use of conflicting PDKs.



Foundries can upload their PDKs directly to the platform. The platform then automatically generates S-parameters (which can use Wave Photonics' fabrication models for improved accuracy), produces documentation, and packages the PDK for integration into EDA tools. Each packaged PDK is hosted on the platform with its metadata, enabling version tracking. Fine-grained access controls and NDA tracking features allow foundries to manage distribution and maintain confidentiality of the process data. Once PDK access Press Release 2 is granted to the designers, designers can download the PDK and design immediately using their preferred EDA tool.

Once PDK access Press Release 2 is granted to the designers, designers can download the PDK and design immediately using their preferred EDA tool

Silicon photonics rapid prototyping foundry CORNERSTONE is using the platform to manage and distribute its PDKs efficiently across a global base of designers. Users can access the completely open-source CORNERSTONE PDK for each EDA tool at cornerstone.wavephotonics.com.

"We're excited to collaborate with Wave Photonics to bring our PDKs to a wider range of PIC design platforms. Together, we're building a more connected ecosystem that simplifies access, strengthens PDK management, and accelerates the development of next-generation photonic devices," says CORNERSTONE's PDK manager Dr Emre Kaplan.

"For designers, there is a lot of repetitive work required to access, set up, and get S-Parameters for a PDK, and maintaining and updating the PDK for different tools can be a burden for fabs," notes Wave Photonics' CEO James Lee. "With our EDA partners, we'd already built a solution to this for our PDKs and decided to offer this as a service to foundries so they can improve the designer experience and focus their efforts on high-value work and customer support."

www.wavephotonics.com

k-Space hires new sales director

Heidi Olson to support growth in semiconductor & PV industries and build out presence in glass manufacturing, solar & industrial markets

k-Space Associates Inc of Dexter, MI, USA — which produces thin-film metrology instrumentation and software — has recruited Heidi Olson as its new sales director, supporting its global growth in the semiconductor and photovoltaics industries and continuing to build out its presence in the glass manufacturing, solar and industrial markets.

"We have previously worked with her as a component supplier to k-Space, so we have experienced firsthand her proven track record in sales," comments CEO Darryl Barlett.

New sales director Heidi Olson.

"Add to this her technical expertise in optics and nanofabrication, and we are confident she is the right fit for k-Space."

Olson has previously served as a senior business development manager and technical sales engineer, demonstrating her ability to drive growth and cultivate client relationships.

Olson has an M.S. in Optics from the University of Central Florida, and a B.S. in Physics with a minor in mathematics from the University of Wisconsin – La Crosse.

All k-Space sales staff have a background in science or engineering.

www.k-space.com

k-Space's RHEEDSim software available for labs and classrooms

k-Space's new kSA RHEEDSim reflection high-energy electron diffraction (RHEED) simulation software is now available for both labs and classrooms.

"Almost immediately after launching kSA RHEEDSim, we heard from many of our customers asking for a version to support both their research teams and students," notes CEO Darryl Barlett.

kSA RHEEDSim for Labs supports up to six simultaneous users. kSA RHEEDSim for Classrooms supports up to 50 simultaneous users.

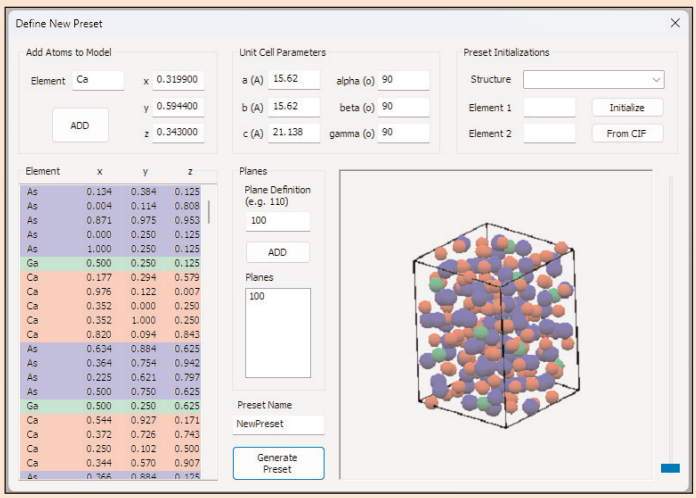
kSA RHEEDSim is also available as a fully integrated software add-on with the kSA 400 analytical RHEED system.

RHEED at your fingertips

With kSA RHEEDSim, users can click to select the crystal surface and experimental parameters. The software renders the predicted pattern based on a kinematic, single scattering electron beam diffraction model.

kSA RHEEDSim can simulate any crystal surface that can be defined by a periodic 2D surface lattice. Simulation possibilities range from basic simulated RHEED patterns of common structures, to complex patterns produced by reconstructions or complex surfaces, to dynamic simulations of changing phenomena, offering a resource for researchers and a teaching tool for students.

Also, with kSA 400 (claimed to be the world's leading analytical RHEED system), it is said to be easy to compare your experimental RHEED patterns with the simulated RHEED patterns, and to track the behavior of RHEED under changing conditions.



Powered by experience

k-Space says that kSA RHEEDSim is part of its ongoing commitment to help advance research using RHEED.

Additional feature highlights of kSA RHEEDSim include the following:

- visualize the 2D surface structure relative to the incident electron beam, enabling the user to see it update live as parameters are changed;
- visualize the 3D crystal structure for predefined or generated presets;
- define new surfaces to simulate from bulk crystal data loaded from CIF files or generated manually;
- overlay simulation output with other RHEED image data;
- approximate the effect of surface reconstruction.

www.k-space.com/rheed_simulation_software_for_classrooms/

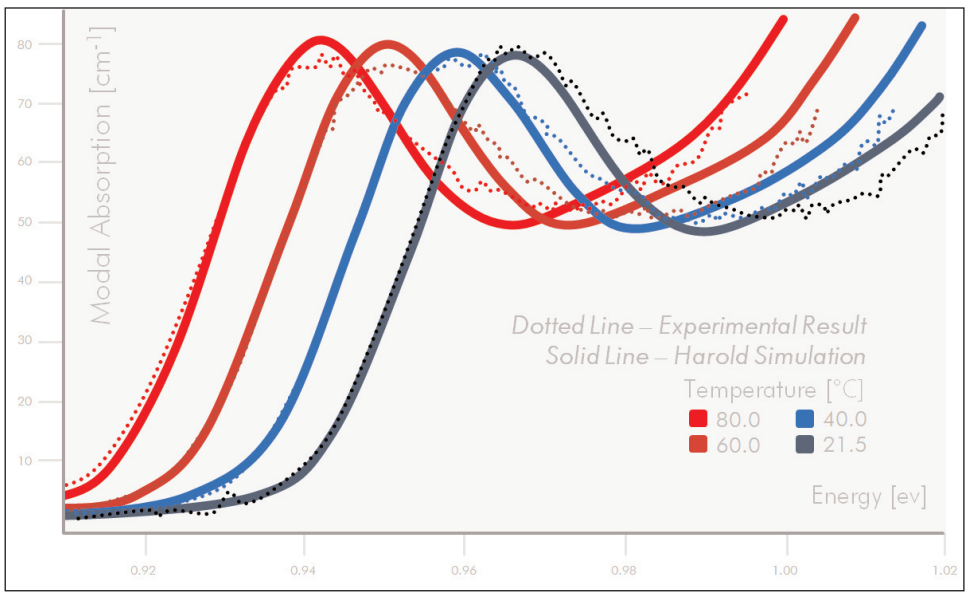
Photon Design's HAROLD quantum dot laser simulator available as a release candidate for customer evaluation

Module enables modelling of epitaxial structure, including dot size and distribution

Photonic simulation CAD software developer Photon Design Ltd of Oxford, UK says that the quantum dot (QD) module for its HAROLD laser simulation tool is now available as a release candidate for customer evaluation.

The HAROLD module enables engineers to model a quantum dot laser's epitaxy structure, including dot size and distribution. Its eight-band K.P.-based modeller predicts laser gain and absorption spectra, reliably matching the results of beta-sample quantum dot lasers in recent field tests.

"The HAROLD quantum dot simulator is at the forefront of quantum dot laser design. QD lasers operate reliably at higher temperatures than existing lasers, with superior modulation and data transmission performance, and heat and power savings. They also bring practical, silicon-based manufacturing benefits," notes CEO Dr Dominic Gallagher. "Quantum dot lasers are expected to play a critical role in many, next-generation laser applications, including supporting the move to optical architectures within data centers, AI and HPC," he adds.



"The HAROLD quantum dot laser simulator is a release candidate which we are inviting customers to test and evaluate," continues Gallagher. "It is a development of Photon Design's long-established and well-respected HAROLD, a mature simulation platform with an established library of material systems available to designers. When released, the HAROLD quantum dot module will have seamless integration into Photon Design's PICWAVE simulator, giving engineers a full, three-dimensional, time-evolving quantum dot laser model."

www.photond.com

Photon Design providing PCL & PCSEL design software

HAROLD & OmniSim simulation tools combine for crystal laser design

Photon Design is now providing a photonic-crystal surface-emitting laser (PCSEL) and photonic crystal laser (PCL) design solution for laser designers, by using a combination of its HAROLD and OmniSim simulation tools. Existing HAROLD users can add OmniSim to begin designing crystal lasers.

PCSELs and PCLs are rapidly becoming the first choice of laser for high-power, coherent applications in fast-growing markets, such as optical communications, sensing, and material processing, says the firm. They have complex crystal structures that are challenging to model. However, that is now possible, entirely within Photon Design's simulation tool portfolio.

"Engineers designing PCSELs and PCLs can use Photon Design's HAROLD to simulate gain spectra in epitaxy structures. OmniSim, our FDTD (finite-difference time domain)-based, dynamic gain modeler, then simulates pulsed laser light propagation, over time, through the laser crystal lattice, including the effect of power," notes CEO Dr Dominic Gallagher.

"OmniSim's Dynamic Gain modeller is new. Its Band Analyser provides band diagrams for photonic crystals, enabling designers to tune the laser structure to the desired wavelength, optimizing the lattice, atoms and cavities in the structure using our Kallistos simulator," he adds. "Finally, active FDTD simulations provide the operating wavelength and linewidth of the laser, which our Q-factor calculator produces at up to 85% quicker than the conventional, Fourier-transform method, with equivalent levels of accuracy."

Plessey Semiconductors acquired by Haylo Labs

Over £100m to be invested over next five years to scale manufacturing capacity

Plessey Semiconductors Ltd of Plymouth, UK — which develops embedded micro-LED technology for augmented-reality and mixed-reality (AR/MR) display applications — has been acquired by London-based Haylo Labs, which has been established by Haylo Ventures (a venture operator founded in 2023 to build and scale deep-tech businesses) to focus specifically on the micro-LED, optical compute, and interconnect sectors.

Haylo Labs has committed to investing over £100m in the UK over the next five years to scale manufacturing capacity and grow the workforce in Plymouth and beyond.

The global micro-LED market is forecast to grow from £2.7bn ($3.7bn) in 2024 to over £592bn ($800bn) by 2034, driven by demand across augmented reality (AR) and virtual reality (VR), automotive displays, premium consumer electronics (such as VR headsets and smart glasses) and optical computing. This comes at a pivotal moment for the sector, where these technologies are becoming embedded in everyday products, driving demand for advanced, ultra-efficient displays and optical computing units to unprecedented levels.

Founded in 1956 and with a 270-strong team, Plessey Semiconductors has developed a fully integrated platform capable of designing, manufacturing and engineering next-generation display technologies entirely in-house. This end-to-end control, combined with a strong intellectual property portfolio, positions Plessey to scale micro-LEDs from laboratory innovation to high-volume production, the firm reckons.

Plessey's acquisition by Haylo Labs is expected to strengthens the UK's position in immersive computing and next-generation technology.

"Plessey has built the world's most advanced micro-LED platforms, with the highest efficiency to date, and is one of the only facilities in the world that can offer customers an end-to-end design and manufacturing facility with technology and talent that surpasses rivals anywhere globally," reckons Haylo Labs' chief executive & co-founder David Hayes. "This acquisition is not just about backing British innovation — it's about unlocking its global potential in one of the fastest-growing markets over the next decade," he adds.

"This important investment in Plessey will secure Plymouth's position as a global leader in manufacturing some of the most advanced and in-demand technology in the world," comments Rebecca Smith MP, Member of Parliament for South West Devon.

The processes and tools used to fabricate micro-LEDs can also be repurposed to create optical processing units (OPUs), which are suited to performing the complex mathematical calculations required by AI operations that currently consume vast amounts of energy. Optical computing units (OCUs) represent a new generation of light-based chips that are faster, cooler and more energy-efficient than existing silicon devices. Plessey says that it is committed to leveraging its expertise to develop real-world optical computing solutions at scale.

"This acquisition is about enabling the future of AI-powered devices that are lightweight, energy-efficient, and wearable in the real world," says Haylo Labs' co-founder Claire Valoti. "The UK has the opportunity to lead, not follow, the next wave of global computing. Our investment will fuel innovation and expand the local talent pool, creating opportunities at a time when skilled jobs in advanced manufacturing are critically needed."

"The Haylo Labs acquisition will accelerate Plessey's commercial scaling, bringing transformative micro-LED and optical computing technologies to the global market," says Plessey Semiconductors' chief executive Keith Strickland. "We are focused on expanding our manufacturing footprint here in Plymouth and strengthening our engineering talent pool," he adds. "This investment underscores our commitment to sustainable growth and innovation in the UK."

www.plesseysemiconductors.com/products/microleds

San'an Optoelectronics and Inari to acquire Lumileds

Transaction expected to close by Q1/2026

LED chip maker San'an Optoelectronics of Xiamen City, Fujian Province, China and Malaysia-based outsourced semiconductor assembly & test (OSAT) service provider Inari Amertron Berhad have entered into a definitive agreement to acquire Netherlands-based LED product and lighting maker Lumileds Holding B.V. and its European and Asian subsidiaries (Lumileds International).

With about 3300 staff in over 15 countries in Europe, China, Malaysia and Singapore, Lumileds provides LED solutions for automotive lighting (headlights and taillights), displays, illumination, smartphone (flash LEDs) and other premium/niche lighting applications. Revenue in 2024 was about $600m.

"This transaction is the next step of our ongoing transformation," says Lumileds International's CEO Steve Barlow. "As the LED industry evolves and continues to mature, I am confident that Lumileds International will continue to be successful and accelerate its growth under the new ownership."

The transaction is expected to close by first-quarter 2026, subject to customary closing conditions including shareholder approval and regulatory reviews in various jurisdictions.

The transaction is valued at $239m in cash, notes the LED industry demand and supply database of market research firm TrendForce. San'an would indirectly own 74.5% of Lumileds, helping it to gain entry into the international cross-licensing patent alliance led by Nichia, ams OSRAM, Cree LED, Lumileds, and Toyoda Gosei, it adds.

TrendForce notes that Lumileds ranks among the world's top seven LED packaging companies. It ranks third in automotive lighting LED revenue, behind only ams OSRAM and Nichia. In smartphone flash LEDs, it is part of Apple's supply chain, ranking just below Nichia. For premium and niche lighting, it is seventh globally.

www.sanan-e.com/en
www.lumileds.com

ams OSRAM sells Entertainment & Industry Lamps business to Ushio for €114m

First divestment under deleveraging plan targeting proceeds over €500m

ams OSRAM of Premstaetten, Austria and Munich, Germany has sold its Entertainment and Industry Lamps (ENI) business to Ushio Inc of Tokyo, Japan for €114m (on a cash-and-debt-free basis) as the first divestment under its deleveraging plan. Net deal proceeds will be determined upon final closing accounts at the date of the transaction closing, which is expected by the end of March 2026 (subject to typical closing procedures).

ENI's product portfolio ranges from specialty lamps for infrastructure and cinema applications to light sources for semiconductor wafer fabrication equipment (WFE). The profitable ENI business delivered revenues of about €170m in 2024.

"After the successful extension of the revolving credit facility and the placement of additional senior notes, we deliver today the first result of our accelerated deleveraging plan in terms of executing divestment options," says ams OSRAM's CEO Aldo Kamper. "We are further streamlining our portfolio towards our core markets," he adds.

On 30 April, ams OSRAM announced its accelerated, comprehensive plan to reach its target leverage ratio of net-debt/adjusted EBITDA below 2, consisting of various, complementary elements. Amongst these are an improving free-cash-flow performance based on execution of its strategic efficiency program 'Re-establish the Base', structural growth in the core semiconductor business, the disposal of its 8-inch-Kulim facility (eliminating its sale & leaseback liability), as well as the consideration of strategic options for various additional assets (e.g. divestments) with the goal to generate proceeds well above €500m.

"With Ushio, we have found the perfect new home for our sophisticated, high-end specialty lamps niche-business," believes Kamper. About 500 staff will transition to Ushio.

Established in 1964, Ushio has about 6000 staff, manufacturing and selling lamps, lasers, light-emitting diodes, and other light sources in the ultraviolet, visible and infrared bands of the spectrum along with optical and imaging equipment incorporating these devices. Specifically, the firm provides light units, equipment, systems and services through developing new light sources and developing and applying proprietary optical technology, serving multiple industrial segments. Numerous Ushio products in the industrial process field (which encompasses the manufacturing of semiconductors, flat-panel displays, electronic components and other products, and in the visual imaging field, characterized by digital projectors, illumination, and other products) have large market shares. In recent years, Ushio's operations have expanded to the life-science field, most notably medical applications and the environment.

www.ams-osram.com
www.ushio.co.jp

ams OSRAM doubles UV-C LED efficiency to 10.2%

New UV-C LEDs to be available from late 2026

ams OSRAM of Premstaetten, Austria and Munich, Germany has evaluated a new UV-C LED emitting at a wavelength of 265nm, with a lifespan exceeding 20,000 hours, that delivers over 10% efficiency at 200mW power, as validated by Germany's National Metrology Institute Physikalisch-Technische Bundesanstalt (PTB). With these specifications, the UV-C LED can replace conventional mercury discharge lamps in the future.

Eliminating pathogens on surfaces, in liquids or in the air is crucial for safeguarding human health and the environment — in everyday life and across various industries. Residue-free disinfection using energy-rich UV-C radiation is playing an increasingly important role in this context.

Alongside UV-C LEDs, radiation sources primarily include low-pressure and medium-pressure discharge lamps. Due to their mercury content, these lamps pose health and environmental risks during production, operation and disposal. The demand for more sustainable alternatives, such as UV-C LEDs, is therefore steadily increasing. So far, however, their efficiency has not yet matched traditional technology to fully compete with established mercury vapor lamps across all applications.

"We are increasingly focusing our research and development efforts on sustainable products. As a leading LED manufacturer, our goal is to unlock and continuously enhance UV-C LED technology to enable an ever-growing number of applications," says Dr Ulrich Steegmueller, senior VP research & development at ams OSRAM's Opto Semiconductors business unit. "To this end, the company is working on multiple technological advancements in the areas of epitaxy, as well as chip and package design," he adds.

"The company recently succeeded in optimizing the extraction of UV-C radiation from the LED, thereby increasing the radiation output available for applications. The LED achieved wall-plug efficiency (WPE) of 10.2%, while also delivering a long lifespan of more than 20,000 hours. ams OSRAM has thus managed to nearly double the previous LEDs' WPE of around 5.3% — with all other conditions remaining unchanged."

In addition to enhanced optical performance, ams OSRAM has also demonstrated that the samples tested exhibit a lifespan as long as that of high-power LEDs currently available on the market.

The new UV-C LEDs are expected to be available from late 2026 and will complement the existing product portfolio for advanced UV-C lighting solutions.

www.ams-osram.com/de/applications/industrial/uv-c-disinfection-treatment

Q-Pixel launches Q-Transfer for micro-LED manufacturing

Order-of-magnitude improvement in yield to over 99.9995%

Micro-LED display startup Q-Pixel Inc of Los Angeles, CA, USA has debuted Q-Transfer technology, which directly addresses the pixel transfer challenge long faced by the micro-LED display industry.

The low yield of conventional mass transfer processes (<99.99%) leads to prohibitively high repair and manufacturing costs and remains a major barrier for scaling micro-LED displays towards mass production. As a result, only limited high-end micro-LED products are currently available on the market.

Q-Transfer is said to radically improve micro-LED transfer yield while maintaining high resolution and alignment accuracy, enabling the production of large-area high-quality micro-LED displays, used for wearables, mobile devices, and transparent displays, at affordable prices.

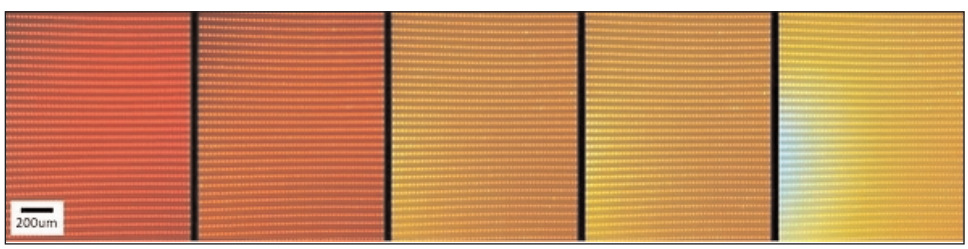
By implementing its patented Q-Transfer process, Q-Pixel has demonstrated color display prototypes using its tunable polychromatic micro-LEDs (TP-microLEDs). These displays consist of 10μm pixels at over 500 pixel per inch (PPI) densities and, most notably, zero missing pixels in the transfer process for > 99.9995% transfer yield — more than an order-of-magnitude improvement over existing transfer approaches.

"Q-Pixel's patented Q-Transfer process revolutionizes micro-LED manufacturing, providing a simple, cost-effective approach for the display industry to achieve future generations of displays," comments Nick Kepler, chief operating officer of semiconductor incubator Silicon Catalyst. "Q-Transfer unlocks the potential of micro-LEDs to break into display markets beyond just the AR/VR market, enabling a launch into the wider market of smartwatches, smartphones and other large-area devices," he adds.

"Q-Pixel has made astounding progress since joining the Silicon Catalyst Ventures portfolio," notes Dr Shih-Wei Sun, founding managing director of Silicon Catalyst Venture Fund, and former CEO of United Microelectronics Corp (UMC). "Q-Pixel continues to push the known boundaries of display technology with their impressive results, and we strongly support Q-Pixel's vision of delivering next-generation display products," he adds.

"The debut of our Q-Transfer display technology marks a new milestone in Q-Pixel's micro-LED display technology portfolio," says Q-Pixel's Dr J. C. Chen, CEO & co-founder. "Q-Pixel's technical achievements include world records for highest-resolution color active-matrix display (6800PPI), highest-resolution full-color display (10000PPI), and world's smallest full-color pixel (1μm) diameter."

www.quantum-pixel.com



Prototype panel demonstration of Q-Pixel's proprietary micro-LED transfer process (Q-Transfer) using 10μm tunable polychromatic LED (TP-LED) pixels, yielding >500PPI displays with zero missing pixels (>99.9995% yield).

Mississippi State University researcher earns $550,000 NSF CAREER award

Five-year project to research copper halide LEDs

A Mississippi State University faculty member has earned a US National Science Foundation (NSF) CAREER award to develop the next generation of energy-efficient, transparent and environmentally friendly LED lighting.

Mahesh K. Gangishetty, an MSU assistant professor with appointments in both the Department of Chemistry and the Department of Physics and Astronomy, has been awarded the five-year, $550,000 grant to support innovative research into new types of light-emitting diodes made from safer, earth-abundant materials — specifically ternary copper halides.

His goal is to create LEDs that are not only highly efficient and long-lasting but also capable of emitting a full spectrum of colors while remaining clear and transparent.

Gangishetty says the research could help to pave the way for technologies like see-through phones and TV screens, car windshield displays, virtual-reality and augmented-reality interfaces and even window lighting that doubles as décor.

"This project will help us better understand the fundamental origin of light emissions in copper halides and control their emission at both the molecular and device levels," he says. "The outcomes of this proposal not only enhance our understanding of these emerging materials but also help in building next-generation displays and lighting technologies for the future."

Mahesh K. Gangishetty (Photo by Beth Wynn).

Unlike many existing LEDs, which rely on expensive rare-earth metals or toxic materials, copper halides offer more accessible and safer alternatives. They are also highly stable and can be processed easily by solution-based techniques, which could reduce manufacturing costs and enhance the feasibility of large-scale fabrication.

The project also includes a strong educational and outreach component. Gangishetty's team will collaborate with 4-H youth leaders and Mississippi K-12 schools to introduce students, especially those in rural areas, to careers in semiconductors, electronics and robotics. Hands-on experiments and interactive activities will help young learners to explore the science behind lighting technologies and inspire future engineers and materials scientists.

"Chemistry has a rich history of its faculty receiving NSF CAREER awards, which is a testament to the environment in the department allowing these talented faculty to flourish," says Carl Lovely, head of the Department of Chemistry. "Our undergraduate students taking classes in chemistry are exposed to instructors that are at the frontier of science, which in turn allows them to inform students of the latest trends in science as well as fundamentals."

Funded through NSF's Faculty Early Career Development Program, the award supports early-career faculty who demonstrate the potential to serve as academic role models and lead cutting-edge research and education initiatives in their fields.

https://gangishettylab.chemistry.msstate.edu

UCSB's Chris Van de Walle receives Welker Award

Recognition for development and application of computational methods to elucidate properties of interfaces, defects, doping, polarization and loss mechanisms

Chris Van de Walle, a distinguished professor in the Materials Department of University of California Santa Barbara (UCSB), has received the 2025 Heinrich Welker Award in recognition of his "development and application of computational methods to elucidate the properties of interfaces, defects, doping, polarization and loss mechanisms in compound semiconductors."

Established in 1976, the Welker Award recognizes outstanding research in the area of III–V compound semiconductors. Past awardees include UCSB Nobel laureate Herbert Kroemer, dean of engineering Umesh Mishra, and laser expert Larry Coldren.

"For decades, he has contributed one significant finding after another, repeatedly contributing new understanding of key fundamental phenomena that affect performance of compound semiconductors, especially in the area of LED efficiency," comments Mishra. "His theoretical investigations are reflected in any number of advanced electronic technologies that are taken for granted today but have been enabled by his research."

Van de Walle accepted the award at a ceremony in Banff, Canada, in conjunction with the 51st International Symposium on Compound Semiconductors (ISCS) and the 36th International Conference on Indium Phosphide and Related Materials (IPRM).

Chris Van de Walle.

His achievements in computational physics and materials have previously been recognized with honors such as the Materials Theory Award from the Materials Research Society (MRS) and the Aneesur Rahman Prize for Computational Physics from the American Physical Society (APS). The Welker Award recognizes Van de Walle's impact on materials technology.

"My work is fundamental in nature and, while I have always put great emphasis on making connections to actual materials and real-world applications, it wasn't evident that this impact would be readily recognized," says Van de Walle. "Receiving the Welker Award provides a wonderful confirmation that my efforts, enabled by many great students and postdocs, have been fruitful."

Early in his career, Van de Walle developed a model that is still widely used for predicting heterojunction band offsets. In the 1990s he started making seminal contributions to the understanding of doping and defects in electronic materials. He challenged conventional wisdom by showing that impurities, rather than native defects, were responsible for unintentional doping of wide-bandgap semiconductors such as gallium nitride and zinc oxide. He subsequently addressed causes of efficiency loss in light emitters by developing accurate methods for calculating Auger–Meitner and Shockley–Read–Hall recombination. He has also been applying these techniques to understand and predict spin qubits and single-photon emitters for quantum information science.

Repeatedly recognized in Clarivate Analytics' annual list of 'Highly Cited Researchers', Van de Walle is a fellow of MRS, APS, the Institute of Electrical and Electronics Engineers, the American Vacuum Society (AVS), and the American Society for the Advancement of Science. He is a member of the National Academy of Engineering and has received the APS David Adler Award, the AVS Medard W. Welch Award, the John Bardeen Award from the Minerals, Metals & Materials Society, and a Vannevar Bush Faculty Fellowship.

www.materials.ucsb.edu

BluGlass highlights progress in June quarter

Improved visible laser performance showcased at ICNS; first order secured from Indian Government

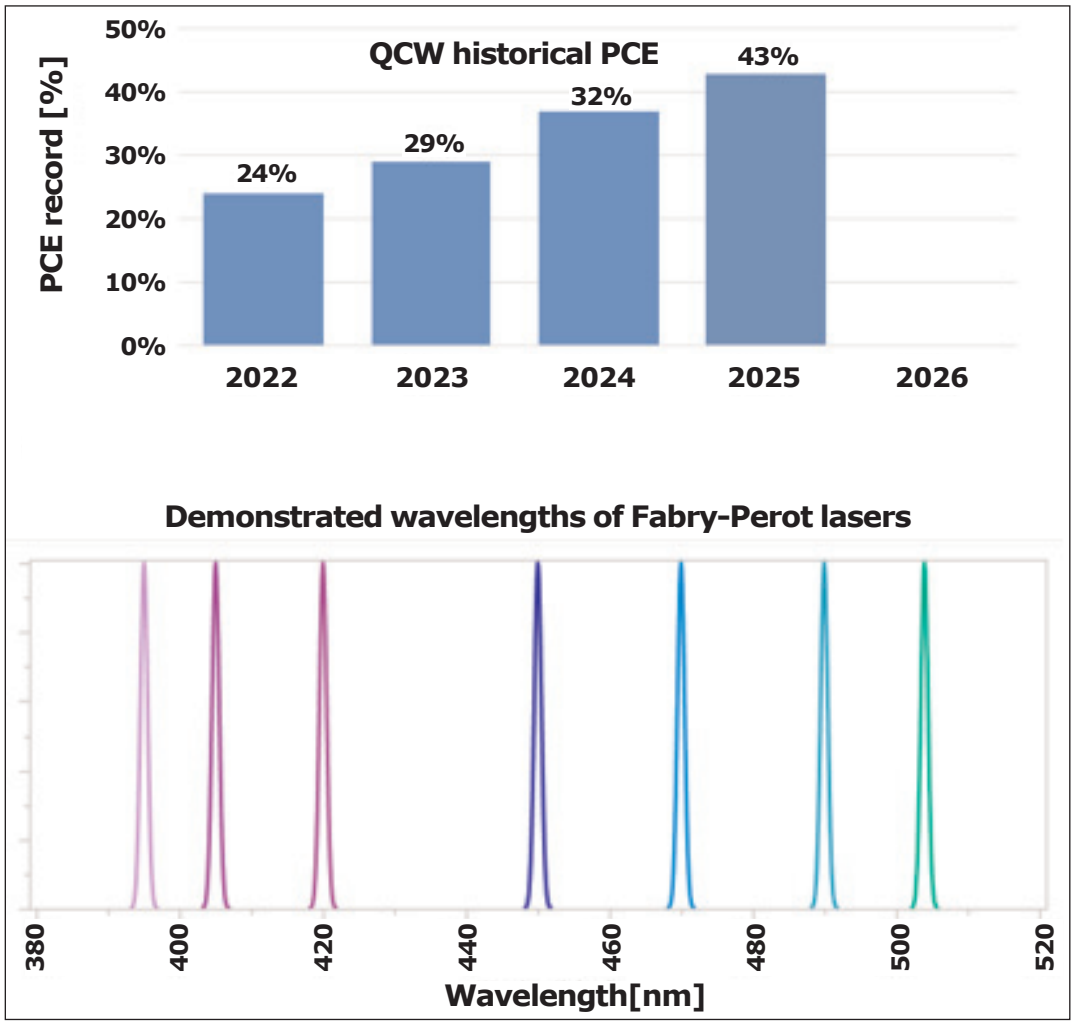
BluGlass Ltd of Silverwater, Australia — which develops and makes gallium nitride (GaN) blue laser diodes based on its proprietary low-temperature, low-hydrogen remote-plasma chemical vapor deposition (RPCVD) technology — has issued a quarterly report on its fiscal Q4/2025 (to end-June).

"BluGlass continued to strengthen its industry recognition during the quarter, securing its first order [worth AUS$230,000] from the Indian Government and being authorized as an approved supplier," notes CEO Jim Haden. "India is rapidly building its photonics capability with increased investment in cutting-edge research, such as the Solid-State Physics Laboratory. Our partnership with the Indian Government builds on our established development work with the US Department of Defense, and continued conversion of our US$100m project pipeline. While these opportunities are in various stages of maturity, we are continuing to progress technical evaluations and negotiations in line with our long-term project-to-product strategy," he adds.

"In parallel, we've made significant technical progress across our product portfolio [showcased in mid-July at the International Congress on Nitride Semiconductors (ICNS-15) in Malmö, Sweden]. We've improved the power conversion efficiency [PCE] of our multi-mode GaN lasers by 16%, approaching our fiscal year 2026 target of 43% CW PCE ahead of schedule. Power conversion efficiency is critical for customers, increasing device longevity and reducing operational costs. Encouragingly, this now brings us in line with several of our large competitors, who have taken many years or decades to reach this PCE performance standard. We believe we can further improve this metric over the coming year. Other technical enhancements include extending our wavelength capabilities with demonstrated aquamarine (488nm) and light green (504nm) wavelengths, as well as improved capabilities of our single-frequency distributed feedback (DFB) lasers," Haden continues.

"Technical advancements support our conversations with new and prospective defence, quantum and biotech customers, offering advanced precision and tunability in visible wavelengths. Quantum advancements are being underpinned by stimulated light interaction with unique materials, down to the atomic scale, requiring specific wavelengths, and tunability — to target individual atomic interactions. Our modelling collaboration with UCSB [University of California, Santa Barbara] and NCSU [North Carolina State University] is accelerating our development in this domain, enabling us to leverage the world-class skills, capability and expertise of our Microelectronics Commons partner to improve the quality and repeatability of our DFB lasers."

www.bluglass.com.au



BluGlass' power conversion efficiency (PCE) development over time (top) and the firm's demonstrated laser wavelength portfolio (bottom).

NUBURU hits first milestone in Tekne acquisition with initial stake and launch of US joint venture

Joint venture tasked with $7.5m in contracts, Americas market expansion and co-development of new defense technologies

NUBURU Inc of Centennial, CO, USA — which was founded in 2015 and developed and previously manufactured high-power industrial blue lasers — has successfully executed the first milestone under the phased acquisition plan for Tekne S.p.A. established following formal notice received from the Italian government under the 'Golden Power' framework.

Through its new subsidiary Nuburu Defense, the firm secured an initial equity stake equal to the maximum interest permitted under current Golden Power regulatory thresholds (3%) and agreed to an action plan that, by utilizing the Luxembourg investment vehicle TCEI, will pave the way to a controlling interest in Tekne.

This step serves as the foundation for the launch of a US-based defense 80/20 joint venture between Nuburu Defense and Tekne, aimed at being immediately operational with three primary mandates:

- deliver an initial US$7.5m backlog of Tekne special vehicle contracts outside Italy, while managing sales to non-Italian clients across Tekne's pipeline;
- manufacture, assemble and market Tekne's proven product lines for the Americas;
- develop new defense-tech solutions, integrating Tekne's licenses with NUBURU's blue laser platform to create proprietary IP for allied markets.

"This joint venture transforms the phased acquisition plan into a revenue-generating reality," says NUBURU's executive chairman Alessandro Zamboni. "We can now execute contracts, expanding Tekne's reach into the Americas, and laying the groundwork for co-developed technologies that can shape the future of allied defense."

As part of the broader phased plan, the binding agreement signed between NUBURU and Tekne's shareholders — which provides for Nuburu Defense's path from minority stake to an eventual 70% controlling interest in Tekne — includes commitments to finance up to €40m in Tekne's working capital needs over the next 12 months, also supported by Supply@ME Capital Plc's inventory monetization platform and potential further additional investors through the platform.

A renewed Golden Power notification will be filed to progress to majority ownership in compliance with Italian requirements.

To bolster execution, NUBURU has engaged Anthony Sinnott, a retired US Marine Corps officer and former US Department of Defense (DoD) senior advisor, as a strategic consultant. Sinnott has extensive operational, NATO and Fortune 500 leadership experience, including service on Tekne's board.

Together, these steps advance NUBURU's Defense & Security Hub strategy — uniting Tekne's deployed Tactical Bubble systems and defense vehicle expertise with NUBURU's blue laser technology and its confirmed upcoming acquisition of the Software-as-a-Service startup focused on operational resilience, which allows for an expanded offering from Nuburu Defense.

www.teknespa.it
www.nuburu.net

TriEye and LITEON partner on VCSEL-powered SWIR sensing and imaging

TriEye's SWIR sensor combined with LITEON's 1135nm VCSEL

TriEye Ltd of Tel Aviv, Israel — which claims to have pioneered the first CMOS-based shortwave infrared (SWIR) sensing technology — and optoelectronic and power management firm LITEON Technology of Hsinchu, Taiwan have partnered to deliver a vertical-cavity surface-emitting laser (VCSEL)-powered SWIR sensing and imaging solution.

The partnership has led to the development of a technology demonstrator that combines TriEye's SWIR sensor with LITEON's 1135nm VCSEL. Adopting high-volume, scalable manufacturing strategies, the products are said to provide cost-effective solutions for both consumer and industrial market demands.

The system highlights the capabilities of the TES200, TriEye's CMOS-based SWIR image sensor, which is said to have high sensitivity and resolution. Designed to enable SWIR imaging in various industries, including industrial machine vision, robotics and consumer electronics, the product is reckoned to represent a step forward in mass-market SWIR imaging technology.

LITEON is introducing its LTPE-3532**OX high-power 1135nm VCSEL array, a complementary solution that optimizes SWIR system performance. With additional eye safety compared with existing solutions, the new VCSEL is expected to broaden the scope of applications in imaging, sensing, robotics and datacom across multiple industries.

"Our 1135nm VCSEL combined with TriEye's exceptional SWIR sensor marks a significant advancement in the realm and scale of imaging and illumination solutions," claims Sander Su, who is the general manager of LITEON Technology's Optoelectronics Product Solution (OPS) strategic business unit (SBU). "This partnership is more than just a technological achievement; it represents our shared vision of innovating for a more eye-safe and efficient future in consumer, industrial, automotive and robotics applications," he adds.

"We are proud to add another VCSEL partner to our SWIR imaging ecosystem. Expanding the ecosystem makes SWIR sensing more accessible than ever," says TriEye's CEO Avi Bakal.

The TES200 and LTPE-3532**OX are available in sample quantities.

https://optoelectronics.liteon.com
www.TriEye.tech

Alpes Lasers unveils GLIDER widely tunable mid-IR laser source for solid and liquid spectroscopy

Tuning range up to 6µm, using up to four user-selected laser chips, within total spectral range of 3–13µm, with up to 1W of peak power

Alpes Lasers SA of St-Blaise, Switzerland — an engineering firm pioneering advanced light sources, especially quantum cascade lasers (QCLs) — has launched the GLIDER, its most versatile and powerful widely tunable laser source to date. Designed for fast mid-infrared spectroscopy, the GLIDER delivers what is claimed to be exceptional performance across a wide range of applications, from advanced research to industrial discovery.

The GLIDER combines external cavity technology with a rugged, application-oriented design, making it suitable for both liquid- and solid-phase spectroscopy.

Based on an external cavity design, the GLIDER is a monolithic all-in-one light source that requires no assembly, alignment or external drivers. It is powered by interband cascade lasers (ICL) or quantum cascade lasers (QCL) chips in an external cavity, enabling users to access an unmatched tuning range up to 6µm (850cm^{-1}) — using up to four user-selected laser chips — within a total spectral range of 3–13µm, with up to 1W of peak power.

Due to its high brightness and fast acquisition capabilities, the GLIDER is said to offer a superior alternative to traditional Fourier transform infrared (FTIR) systems — especially in situations where fast-flowing processes or large sample areas need to be monitored in real time. Its laser-based power output allows for better signal-to-noise performance and time-resolved measurements that are out of reach for conventional broadband sources.

A fiber output option is also available, making the GLIDER suitable for applications requiring remote measurements or in-situ chemical reaction monitoring via a probe — further extending its flexibility in laboratory or industrial settings.

The GLIDER also comes with a controller providing a web-based graphical user interface, allowing full access to all system functionalities through a convenient and intuitive platform.

"With its fast scanning capabilities, rich software interface, and modular chip-based design, it is tailored for scientists and engineers who demand flexibility, precision, and speed," says sales engineer Mickael Nehlig.

www.alpeslasers.ch/glider

OKI develops Tiling crystal film bonding

Technology enables heterogeneous integration of optical semiconductors onto 300mm silicon wafers

Tokyo-based Oki Electric Industry Co Ltd has developed Tiling crystal film bonding (CFB) technology using its proprietary CFB technology. The technology enables the heterogeneous integration of small-diameter optical semiconductor wafers onto 300mm silicon wafers, previously not possible due to wafer size restrictions, and will contribute to the advancement of rapidly growing photonics–electronics convergence technology. OKI aims to achieve early commercialization through collaboration with partner companies and universities.

Rapid advances in artificial intelligence (AI) in recent years has fueled growing demand for data centers, making it a serious social issue to suppress increases in power consumption while expanding data processing capabilities. One solution to such a challenge currently drawing attention is technologies that achieve high-density, high-speed transmission, and low power consumption, applying photonics–electronics convergence technology that combines electronic and optical circuits. In particular, the heterogeneous integration of optical semiconductors onto silicon wafers is expected to improve performance still further by enabling the integration of silicon photonics with optical semiconductors.

Nevertheless, heterogeneous integration presents various technical challenges. For example, while silicon photonics use large-diameter 200mm (8-inch) or 300mm (12-inch) silicon wafers, optical semiconductor wafers such as indium phosphide (InP) wafers are typically smaller 50mm (2-inch) to 100mm (4-inch) compound semiconductor wafers due to the difficulty of achieving epitaxial growth. Additionally, silicon optical waveguides require nanoscale roughness control, which in turn requires heterogeneous integration processes that avoid causing damage.

The Tiling CFB technology developed by OKI overcomes this disparity in wafer sizes and allows heterogeneous integration without causing damage. The technology allows for 52 repeated tiling operations over the entire surface of a 300mm silicon wafer using a single 2-inch InP wafer, enabling efficient use of InP-based materials. The InP wafer can be reused as-is after transfer to allow material recycling and reuse, helping to reduce the environmental burden. Placement accuracy is about ±1μm, with an angular accuracy of ±0.005°. This high accuracy, when combined with OKI's proprietary 3D intersecting waveguide silicon photonics technology, realizes high-efficiency optical coupling between optical semiconductors and silicon waveguides.

In a demonstration, a sacrificial layer and InP-based crystal films functioning as optical semiconductors were epitaxially grown on a 2-inch InP wafer, then separated into individual elements. A protective structure to prevent chemical attack when etching the sacrificial layer and a support structure for batch transfer were formed on each element. This enabled the InP-based crystal films to be successfully batch-transferred to an intermediate transfer substrate without erosion. Batch transfer to an intermediate transfer substrate is carried out to protect the silicon wafer from damage during the subsequent removal process, as removing the protective structure and support structure on the intermediate transfer substrate prevents damage to the silicon wafer during the removal process. The unique design of the intermediate transfer substrate ensures that the InP-based crystal films do not peel off, maintain adhesion during the process of removing the protective structure and support structure, and are easily transferred during the transfer process.

Furthermore, by repeatedly transferring crystal films from the intermediate transfer substrate using a CFB stamp, OKI has established Tiling CFB technology that enables tiling over the entire surface of a 300mm silicon wafer. The CFB stamp has a structure capable of selectively transferring only the crystal films required, and repeated transfer enables efficient tiling. The capacity to repeatedly transfer lower-density arrays of crystal films required for the device from a high-density array of crystal films arranged on the intermediate transfer substrate allows effective use of materials without waste. Measuring 30mm x 30mm, the CFB stamp used in this demonstration completed 52 transfers onto the entire surface of a 300mm silicon wafer in about 10 minutes, sufficient for commercial production.

OKI says that the demonstration proved the feasibility of Tiling CFB technology in the transfer from 2-inch wafers to 300mm silicon wafers. The technology can also be adapted as necessary to allow use with 3- or 4-inch InP wafers and 200mm silicon wafers. Since it can also be applied with existing optical semiconductor products, it should help to improve performance by permitting transfer to high heat-dissipation substrates and productivity by allowing the use of larger wafer sizes.

OKI reckons that Tiling CFB technology can also contribute to the advancement of photonics–electronics convergence technology and reduced environmental burden. The firm plans to strengthen collaboration with device makers to achieve early commercialization of the technology.

www.oki.com

HieFo unveils HOT25 specialty DFB laser chip for OTDR systems

Output of 300mW at 1310nm and 25°C

Indium phosphide (InP)-based optical communications device developer and manufacturer HieFo Corp of Alhambra, CA, USA (formed from management buy-out of the chips business and wafer fabrication operations of Emcore Corp in May 2024) has announced the commercial release of its new HOT25 specialty distributed feedback (DFB) laser chip, engineered specifically for optical time-domain reflectometer (OTDR) applications in fiber-optic test & measurement equipment. HieFo says that, like most other products in its portfolio, the OTDR product is the result of an in-house R&D project without relying on any legacy technology from Emcore.

Optimized for use at 25°C, the HOT25-01-1310 delivers high output power of 300mW at a wavelength of 1310nm, suiting OTDR applications. Designed with a 1mm cavity length and leveraging HieFo's proprietary low-noise laser architecture, the chip is built to meet the demanding needs of high-resolution OTDR systems while ensuring reliable field performance.

HieFo says that, compared with other OTDR laser chips on the market, the HOT25 chip has compact size (250μm width x 1000μm length x 100μm thickness) and advanced performance, achieving the same high output with a significantly shorter 1mm chip length, demonstrating superior efficiency and thermal management.

Moreover, most competing OTDR chips use FP (Fabry–Pérot) lasers that emit multiple wavelengths simultaneously. In contrast, the HOT25 is a true DFB laser that operates at a single wavelength with narrow linewidth. So, while conventional FP lasers are limited to time-of-flight (ToF) detection, HieFo's single-wavelength DFB laser supports frequency-modulated continuous wave (FMCW) coherent detection. This allows more precise and longer-range OTDR measurements, unlocking new applications in coherent OTDR systems.

Other key features are listed as:

- excellent spectral purity, with >50dB side-mode suppression ratio (SMSR);
- low relative intensity noise of $-145dB/Hz^{1/2}$;
- RoHS compliant and robust under operating conditions from 0°C to 50°C.

The HOT25 laser chip is available now for immediate sampling and volume orders.

www.hiefo.com

Ranovus' $100m investment to develop and scale optical semiconductor manufacturing in Ontario

Invest Ontario Fund providing grant of up to $2m

Invest Ontario is supporting an investment of over $100m by Ranovus Inc of Ottawa, Ontario, Canada (which develops and manufactures multi-terabit photonics interconnect solutions for data-center and communications networks) to develop and scale optical semiconductors that are powering the next generation of artificial intelligence (AI) infrastructure. The project will expand Ranovus' manufacturing facility in Ottawa and create 125 new jobs, more than doubling the existing workforce.

As AI continues to evolve and permeate industries, there is growing demand for data centers purpose-built to handle the intensive computational workloads required to train and run AI and machine learning systems. Ranovus' investment will increase domestic production of critical hardware used in these data centers, strengthening Ontario's semiconductor supply chain and global presence in the sector.

The firm's technology is tailored for data centers focused on AI and machine learning (ML), significantly reducing latency and power consumption. Co-packaged optics interconnect solutions enable the next generation of AI/ML workloads in data centers and communication networks. With its expertise and track record in optoelectronic subsystem development and commercialization, Ranovus says that it is driving innovation in the AI compute industry. Its portfolio of IP cores — including multi-wavelength quantum dot laser technology and advanced digital and silicon photonics integrated circuits — is said to set new benchmarks for power efficiency, size and cost in optical interconnect solutions. Ranovus' Odin platform is designed to optimize data-center architectures for AI/ML and communications applications.

Through the expansion, Ranovus is also bringing previously outsourced manufacturing capacity back to Ontario. By developing and commercializing its technologies in Ontario, Ranovus is expected to help the province to lead the advancement of AI with sovereign compute capabilities built and scaled at home.

The investment also marks Invest Ontario's first project in this strategic sector. It will be supported with a grant of up to $2m through the Invest Ontario Fund, subject to reaching a definitive agreement.

www.investontario.ca
www.ranovus.com

AOI chooses ClassOne's Solstice S8 system for gold plating and metal lift-off on indium phosphide

System to help meet rising demand from AI data-centers

ClassOne Technology of Kalispell, MT, USA (which manufactures electroplating and wet-chemical process systems for ≤200mm wafers) is providing its Solstice S8 single-wafer processing system to Applied Optoelectronics Inc (AOI) of Sugar Land, TX, USA, a designer and manufacturer of optical components, modules and equipment for fiber access networks in the Internet data-center, cable TV broadband, fiber-to-the-home (FTTH) and telecom markets. The system will further strengthen AOI's capabilities for producing optoelectronic components that power high-speed data and communications infrastructure.

Optimized to address increased demand from AOI's artificial intelligence (AI) data-center customers, the fully automated Solstice S8 will be configured for gold (Au) electroplating and single-wafer metal lift-off (MLO) processes on 3- and 4-inch indium phosphide (InP) substrates as a base for growing optoelectronic devices such as laser diodes and optical transceivers.

As generative AI and high-speed data processing drive exponential growth in optical interconnect requirements, AOI is scaling its production to meet market needs. "The rapid ramp in demand from AI-driven data centers has made it essential for us to scale production efficiently while maintaining the highest possible device performance," says Stephen Hu, deputy director of wafer and chip production at AOI. "ClassOne's Solstice S8 offers both the throughput and the process uniformity we need to support this growth with confidence," he adds.

"The Solstice S8 is engineered for high-volume compound semiconductor processing, and its flexibility and automation make it ideal for critical steps like gold plating and metal lift-off on InP substrates," says ClassOne's CEO Byron Exarcos.

www.ao-inc.com
www.classone.com

Lumentum's June-quarter revenue and EPS exceed raised guidance

Outperformance driven by strong execution and robust AI-based cloud demand

For its fiscal full-year 2025 (ended 28 June), Lumentum Holdings Inc of San Jose, CA, USA (which designs and makes optical and photonic products for optical networks and lasers for industrial and consumer markets) has reported revenue of $1645m, up 21% on $1359.2m in fiscal 2024.

Specifically, Cloud & Networking segment revenue rose by 30% from $1084.9m to $1410.8m. Industrial Tech segment revenue fell by 14.6% from $274.3m to $234.2m.

Fiscal fourth-quarter 2025 revenue was $480.7m, up 13.1% on $425.2m last quarter and 55.9% on $308.3m a year ago. This exceeds early June's raised guidance range of $440–470m.

"We executed exceptionally well in meeting robust demand across our portfolio of cloud products supporting AI data centers," says president & CEO Michael Hurlston. "The outperformance was broad-based across our cloud-focused business, with particular strength in components, specifically EML [electro-absorption modulated laser] chips, pump lasers, and narrow-linewidth laser assemblies for data-center interconnect [DCI], as well as 800G modules."

Cloud & Networking segment revenue was hence $424.1m (88.2% of revenue), up 16.1% on $365.2m last quarter and 66.5% on $254.7m a year ago, led by exceptional hyperscale cloud strength. Specifically, cloud module revenue surpassed the 50% quarter-on-quarter growth target (accounting for about half of total revenue growth), with shipments to all three announced hyperscale customers. Record EML revenue nearly doubled from the fiscal Q4/2024 baseline, ahead of plan. Revenue from narrow-linewidth lasers (critical components for ZR and ZR+ modules) for DCI applications grew for a sixth consecutive quarter (with demand outpacing supply and expected to do so through the rest of fiscal 2026). Lumentum also saw sequential growth in shipments of other coherent components for long-haul data transmission, as well as in pump lasers for subsea terrestrial transmission, supported by robust cloud investment. It also continued shipments of ultrahigh-power lasers for co-packaged optics (CPO) solutions (prior to a broader ramp expected in calendar second-half 2026). The firm also achieved the first revenue from optical circuit switches (OCS) — with shipments to two customers, with a third committed for deployment in calendar-year 2026 — and accelerated in-house production for ramp-up in 2026.

Industrial Tech segment revenue was $56.6m (11.8% of revenue), down 5.7% on $60m last quarter but up 5.6% on $53.6m a year ago, with 3D sensing applications following seasonal patterns. Ultrafast laser demand was steady and at near record levels, driven primarily by strong demand from a leading tool supplier supporting high-volume solar cell manufacturing. Lumentum has also launched PicoBlade Core ultrafast laser platform, which enables infrared, green and ultraviolet wavelengths within a compact form factor for industrial micro-machining applications.

On a non-GAAP basis, quarterly gross margin has risen further, from 27.8% a year ago and 35.2% last quarter to 37.8%, raising full-year gross margin from 30.2% in fiscal 2024 to 34.7% for fiscal 2025. This was driven by improvements in product mix (as a result of increased datacom laser shipments) and by manufacturing utilization.

Reflecting annual employee cash incentives tied to company performance, along with ongoing investments to scale operations in support of expanding cloud opportunities, quarterly operating expenses have risen further, from $101.4m a year ago and $103.4m last quarter to $109.3m (comprising SG&A expense of $41.7m and R&D expense of $67.6m). However, as a proportion of revenue, this has been cut from 32.9% a year ago and 24.3% last quarter to 22.7%.

Cloud and networking segment profit margin has risen further,

$ in millions	Q4 FY25	Q3 FY25	Q4 FY24
Revenue	**$480.7**	**$425.2**	**$308.3**
Cloud & Networking	424.1	365.2	254.7
Industrial Tech	56.6	60.0	53.6
Segment Profit (Loss)			
Cloud & Networking	23.6 %	20.0 %	10.1 %
Industrial Tech	6.0 %	4.3 %	(0.4) %

from 10.1% a year ago and 20% last quarter to 23.6%, due to higher revenue and favorable product mix.

Due to stringent cost initiatives, Industrial Tech segment profit margin has continued to rise, from 4.3% last quarter to 6% (despite lower revenue), up from just 0.4% a year ago.

Operating income has hence risen from $46.1m (operating margin of 10.8%) last quarter to $72.3m (15% operating margin), compared with an operating loss of $15.8m (–5.1% operating margin) a year ago. Full-year operating income was hence $160.1m (operating margin of 9.7%) for fiscal 2025, an improvement from an operating loss of $7.6m (–0.6% operating margin) in fiscal 2024.

Quarterly net income has risen from $40.9m ($0.57 per diluted share) last quarter to $63.3m ($0.88 per diluted share) for fiscal Q4/2025 (above the raised guidance), compared with $8.9m ($0.13 per diluted share) a year ago. Full-year net income has hence risen from $29.8 ($0.44 per diluted share) in fiscal 2024 to $146.4m ($2.06 per diluted share) for fiscal 2025.

In fiscal Q4, capital expenditure (CapEx) was $59m (up on $24m a year ago) focused on manufacturing capacity for cloud customers. Cash flow from operations for fiscal full-year 2024 was $24.7m.

During the quarter, total cash, cash equivalents and short-term investments rose by $10.4m, from $866.7m to $877.1m.

Inventory levels increased sequentially to support the expected growth in cloud and networking revenue.

September-quarter outlook

For fiscal first-quarter 2026 (to end-September 2025), Lumentum expects revenue to grow to a record $510–540m, driven by sequential growth in the Cloud & Networking segment (with strong growth across the portfolio of products addressing cloud and AI applications), as Industrial Tech segment revenue will be roughly flat (with a modest decline in industrial lasers offset by a seasonal uptick in 3D sensing). Operating margin should rise to 16–17.5%. Diluted earnings per share should increase to $0.95–1.10.

"We just received the largest single purchase commitment in company history for our ultra-high power lasers, and we have already announced additional investment in our US-based indium phosphide wafer fab to support it. Our investments in this facility will position us for a significant revenue ramp in CPO by 2026," says Hurlston.

"Our wafer fab expansion is progressing on schedule, enabling us to support higher volumes of EMLs and other indium phosphide-based devices, including CW lasers and coherent components," says Hurlston. "Recently, we received a substantial order for 200Gb/s-lane-speed EML chips, which we expect to fill in December. Overall, we expect 2026 to be a breakout year for laser chip sales of both 100Gb/s and 200Gb/s lane speeds," he adds.

"While our manufacturing capacity for narrow-linewidth laser assemblies continues to ramp, demand is outpacing supply and is expected to do so through the rest of fiscal 2026," says Hurlston.

Supply constraints persist in EML capacity and narrow-linewidth lasers, with management actively expanding fab capability and noting that pricing power should become a more meaningful factor as capacity ramps.

"We are positioning ourselves for longer-term growth, particularly in three significant areas: cloud modules, optical circuit switching, and co-packaged optics," says Hurlston.

"We expect continued strong demand for our AI data-center and long-haul solutions, giving us confidence in surpassing $600m in quarterly revenue by June 2026 or earlier [with gross margin of at least 40% and operating margin above 20%, as per the long-term financial model outlined in April, through a combination of high-value products and disciplined cost management]," concludes Hurlston.

www.lumentum.com

Ultra-high-power laser production expansion in San Jose

UHP lasers for co-packaged optics targeted at AI infrastructure

Lumentum is to fund a major capacity expansion of its US-based semiconductor facility.

As essential components in co-packaged optics (CPO) platforms, Lumentum's indium phosphide (InP)-based ultra-high-power (UHP) lasers are designed and manufactured at its Rose Orchard Way facility in San Jose. Backed by decades of experience in high-power telecom lasers, the UHP laser supports low-power, highly resilient optical networking systems that are foundational to modern AI data centers.

The commitment to expanding domestic manufacturing "supports a robust AI infrastructure supply chain," says president & CEO Michael Hurlston.

Lumentum is working with NVIDIA on advanced networking technologies for AI infrastructure. "With AI transforming every industry, the demand for high-performance, energy-efficient optical interconnects is growing rapidly," notes Gilad Shainer, senior VP, networking, at NVIDIA. "NVIDIA is working closely with industry innovators like Lumentum to deliver improved power efficiency and network resiliency for the AI factories of the future."

www.lumentum.com

Rocket Lab expands US investments for national security programs and semiconductor manufacturing

Investments supported by $23.9m from CHIPS and Science Act

Launch services and space systems company Rocket Lab Corp of Long Beach, CA, USA (the parent company of space power provider SolAero Technologies Corp) is boosting its US investments to expand semiconductor manufacturing capacity and provide supply chain security for space-grade solar cells and electro-optical sensors for national security space missions. The investments are supported by a $23.9m award through the US Department of Commerce, as part of the CHIPS and Science Act.

In a strategic response to the increasing demand for a robust domestic supply chain of space-grade solar cells and electro-optical sensors for spacecrafts and satellites, Rocket Lab's capital investments over the next five years are expected to strengthen its market position as a leading satellite manufacturer, components supplier, and end-to-end mission provider for commercial and national security space missions. Rocket Lab is one of only two companies in the USA that specialize in the production of high-efficiency, radiation-hardened, space-grade compound semiconductors.

The investment builds on Rocket Lab's existing US expansion plans for its space systems products alongside a $275m acquisition of electro-optical payload provider Geost of Tucson, Arizona and northern Virginia. Combined, these multi-hundred million-dollar investments are expected to strengthen America's semiconductor industrial base and invigorate industry innovation for US commercial and national security satellite missions.

Through these investments, Rocket Lab expects to:

- double production capacity of compound semiconductors and space-grade solar cells, from 20,000 wafers to nearly 35,000 wafers per month;
- provide US-based spacecraft manufacturers and the wider aerospace industry with access to domestically produced, advanced semiconductor and electro-optical technologies;
- expand its ability to rapidly deliver integrated spacecraft systems purpose-built for US national security; and
- drive economic growth in California, Colorado, Maryland, New Mexico, Mississippi, Arizona and northern Virginia, as it expands its US-based headcount to more than 2000 staff.

"Our leadership in American-made semiconductor technologies is built upon more than 25 years of engineering and manufacturing excellence in New Mexico," says Brad Clevenger, Rocket Lab's vice president of Space Systems. "These latest investments will expand that production capacity, strengthen supply chains, create new jobs, and develop economic opportunities across the states where we operate," he adds.

www.chips.gov
www.rocketlabusa.com/

5N Plus scales up and expands critical materials supply agreement with First Solar

Delivery of CdTe to be raised by 33% for 2025–2026 then 25% for 2027–2028; delivery of CdSe to start in 2026

Specialty semiconductor and performance materials producer 5N Plus Inc (5N+) of Montreal, Québec, Canada has entered into a new and expanded supply agreement with cadmium telluride (CdTe) thin-film photovoltaic (PV) module maker First Solar Inc of Tempe, AZ, USA including revised terms to the contract period underway (2025–2026) to reflect increased semiconductor compound volume commitments, as well the terms for the subsequent contract period (2027–2028), also reflecting increased volumes.

Under the new contract terms, 5N+ will increase its production and delivery of CdTe by 33% for the 2025–2026 period compared to initial levels, and by an additional 25% for the subsequent term 2027–2028 period.

In addition, starting in 2026, 5N+ will begin to produce and deliver cadmium selenide (CdSe) to First Solar, another critical material utilized in their PV solar panel manufacturing.

5N+ says that the new agreement reflects the strength of its long-standing collaboration with First Solar and supports their growing semiconductor supply needs as they scale their US manufacturing capacity with a strategic focus on using critical materials sourced from American sources or allied nations. As the leading American solar power generation technology manufacturer, it is reckoned that First Solar is well positioned to support economic growth, digital infrastructure expansion, and accelerating electrification in the USA with American-made technology. The firm has four operating factories in Ohio and Alabama, and a fifth expected to begin commercial production in second-half 2025. As First Solar ramps up its domestic production, it expects to achieve 14GW of American manufacturing capacity in 2026.

"At a time when the security of critical materials supply chains are under intense scrutiny, we're pleased to reinforce our position as a trusted partner, with the expertise, supply chain and capacity to deliver the advanced materials this critical and growing sector depends on," says 5N+'s president & CEO Gervais Jacques.

"Our ability to meet this significant increase in volume with minimal additional investment is a direct result of our manufacturing flexibility and the recent expansion of our semiconductor compound production and recycling capabilities in Canada and Germany," he adds.

"Access to secure critical materials supply chains supports our growth strategy, making 5N+ a valued long-time partner," comments First Solar's chief supply chain officer Mike Koralewski. "They have consistently demonstrated the ability to scale production capacity while maintaining the highest quality standards. Crucially, they continue to support our efforts to onshore production of critical minerals."

www.firstsolar.com
www.5nplus.com

Strain-relaxed bulk InGaN enables wavelength-stable red LEDs

Blue-shift in wavelength constrained to 6.2nm between 1mA and 100mA injection current.

Peking University in China and Saudi Arabia's King Abdullah University of Science and Technology (KAUST) have claimed the first use of high-indium-content red phase-separated bulk indium gallium nitride (InGaN) as the active region for red light-emitting diodes (LEDs) [Zuojian Pan, Optics Express, v33, p27245, 2025]. The structures achieved wavelength-stable red InGaN LED performance with just 6.2nm blue-shift between 1mA and 100mA injection current. At this preliminary stage, the efficiencies were less than impressive, at around 0.3%.

The bulk InGaN was grown at 800°C, around 100°C higher than usual for high-indium-content InGaN quantum wells typically used for red LEDs. The indium incorporation at higher-temperature growth was enabled by an underlying multiple quantum well (MQW) region grown at low temperature, resulting in spontaneous trench structures that relaxed the strain in the subsequent bulk InGaN. Along with enabling higher indium incorporation, the material underwent phase separation into high- and low-indium-content regions.

The team comments: "To the best of our knowledge, this study presents a new epitaxial strategy for red InGaN LEDs."

The researchers see their work as feeding into the recent interest in red InGaN micro-LEDs. These devices have reached efficiencies around 5%, and could challenge the more established aluminium gallium indium phosphide (AlGaInP) devices, which suffer more efficiency impacts at the micro-scale. Also, with the established green and blue InGaN LEDs, red InGaN could offer full-color display operation, particular if wavelength-stability is achieved.

The researchers used metal-organic vapor phase epitaxy (MOVPE) on sapphire to prepare InGaN LED material samples (Figure 1). Although the structures contained green MQWs, unusually the active red-light-emission material was the bulk InGaN grown on top.

The pure GaN layers were grown with trimethyl-Ga, while the precursor for the InGaN- and MQW-containing material was triethyl-Ga. The carrier gases were also changed: hydrogen for the bulk GaN, and nitrogen for the InGaN/MQWs.

The unintentionally-doped (u) buffer and n-type silicon-doped contact layers were 1 μm and 2μm, respectively. The MQW region consisted of six 2.5nm InGaN wells separated by GaN (3nm cap, 7nm barrier). The growth system heater temperature for the well and cap was 850°C and 760°C for samples A (characterization reference) and B (red LED), respectively.

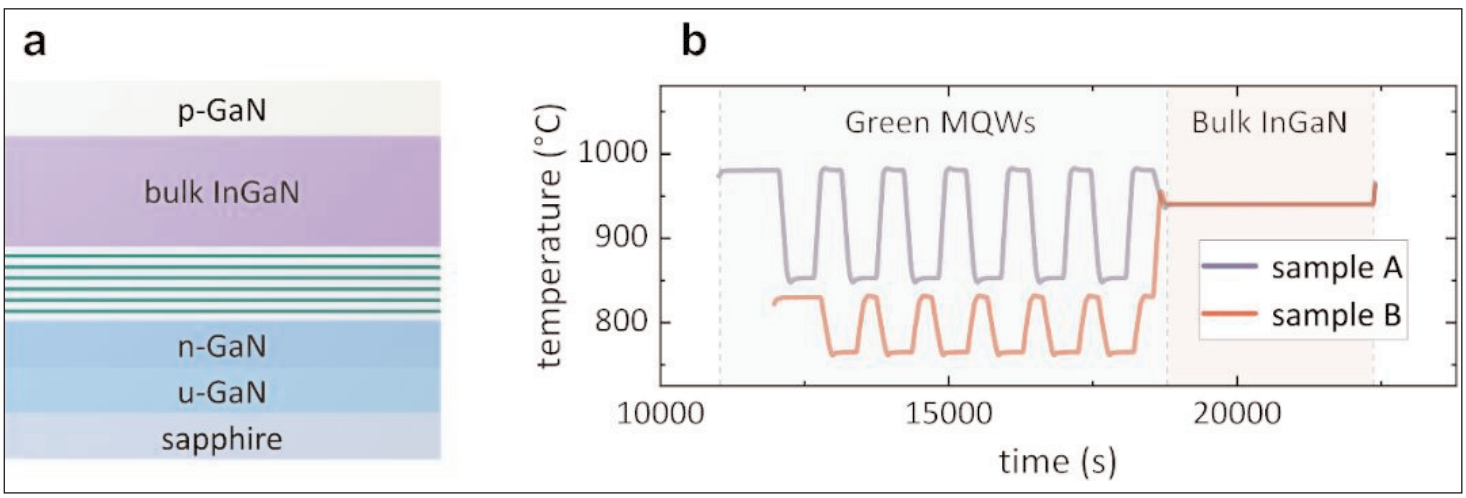


Figure 1. (a) LED structure based on bulk InGaN active region. (b) Heater temperature profiles during growth stages from green MQWs to bulk InGaN for samples A and B.

The barriers were grown at the corresponding higher temperatures of 980°C and 830°C. Emission wavelength of the green MQWs was equalized for the two samples by adjusting the In/Ga ratio of the precursors.

The bulk InGaN was grown at 940°C in both samples with a high In/Ga precursor ratio to maximize indium incorporation, as needed for long-wavelength red light emission. The bulk InGaN also had a graded silicon-doping profile designed to reduced LED turn-on voltages.

The p-type layers consisted of 920°C magnesium-doped GaN, 1050°C more heavily doped GaN, and 810°C doped InGaN contact layers.

SEM inspection after the MQW and bulk InGaN growth steps showed dramatically different surface morphologies (Figure 2). Sample B had a high density of trench structures (about 5.6×10^9/cm^2 and 4.9×10^9/cm^2 before/after bulk InGaN layer, respectively), while sample A presented a smooth surface punctuated with a few V-pits that grow in size during the bulk InGaN growth. The bulk InGaN rough surface of sample B had almost no continuous c-plane.

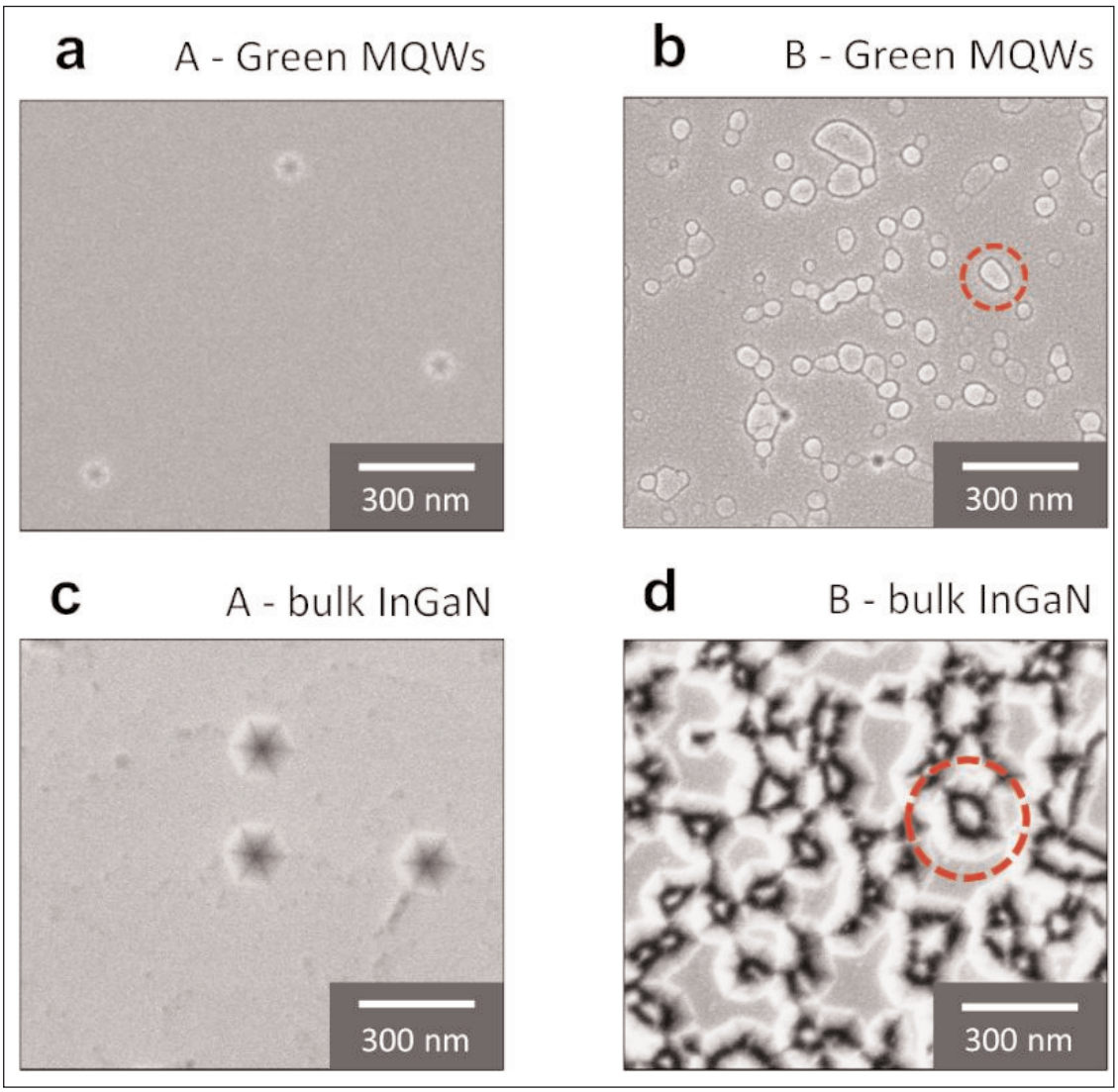


Figure 2. Scanning electron microscope (SEM) images of samples A and sample B after growth interruptions of green MQWs (a and b, respectively), and of bulk InGaN (c and d). Red dashed circles in (b) and (d) show corresponding locations of trench structures on green MQW and bulk InGaN surfaces.

The researchers comment: "In sample B, both the green QWs and QBs are grown at low temperatures. The reduced QW growth temperature promotes the formation of indium-rich clusters, while the low-QB growth temperature restricts the migration of Ga adatoms. The combination between indium-rich clusters and the limited Ga adatom mobility result in the formation of high-density trench structures."

X-ray analysis showed that the bulk InGaN in sample A had an indium content of 8.5% and the strain was relaxed by about 3%. The B sample contained 11.9% indium, and strain relaxation was around 96%. The team explains: "The deep and densely distributed trenches facilitate strain relaxation in the bulk InGaN layer. Under a relaxed strain state, the strain energy required for In–N bond formation decreases, thereby promoting indium incorporation."

The x-ray study also suggested that the range of indium compositions and strain state was wider in sample B than in sample A.

STEM showed that the indium content also varied within local bulk InGaN regions, increasing from 11.3% at the base to 23.2% at the top (Figure 3). The researchers comment: "This trend is attributed to the upward extension of V-pits, which gradually enhances strain relaxation, resulting in a compositional pulling effect. Consequently, the top region of the bulk InGaN in sample B exhibits a higher indium content and greater strain relaxation, making it more susceptible to phase separation."

Cathodoluminescence from a 10kV electron beam showed different spectral profiles for the two samples.

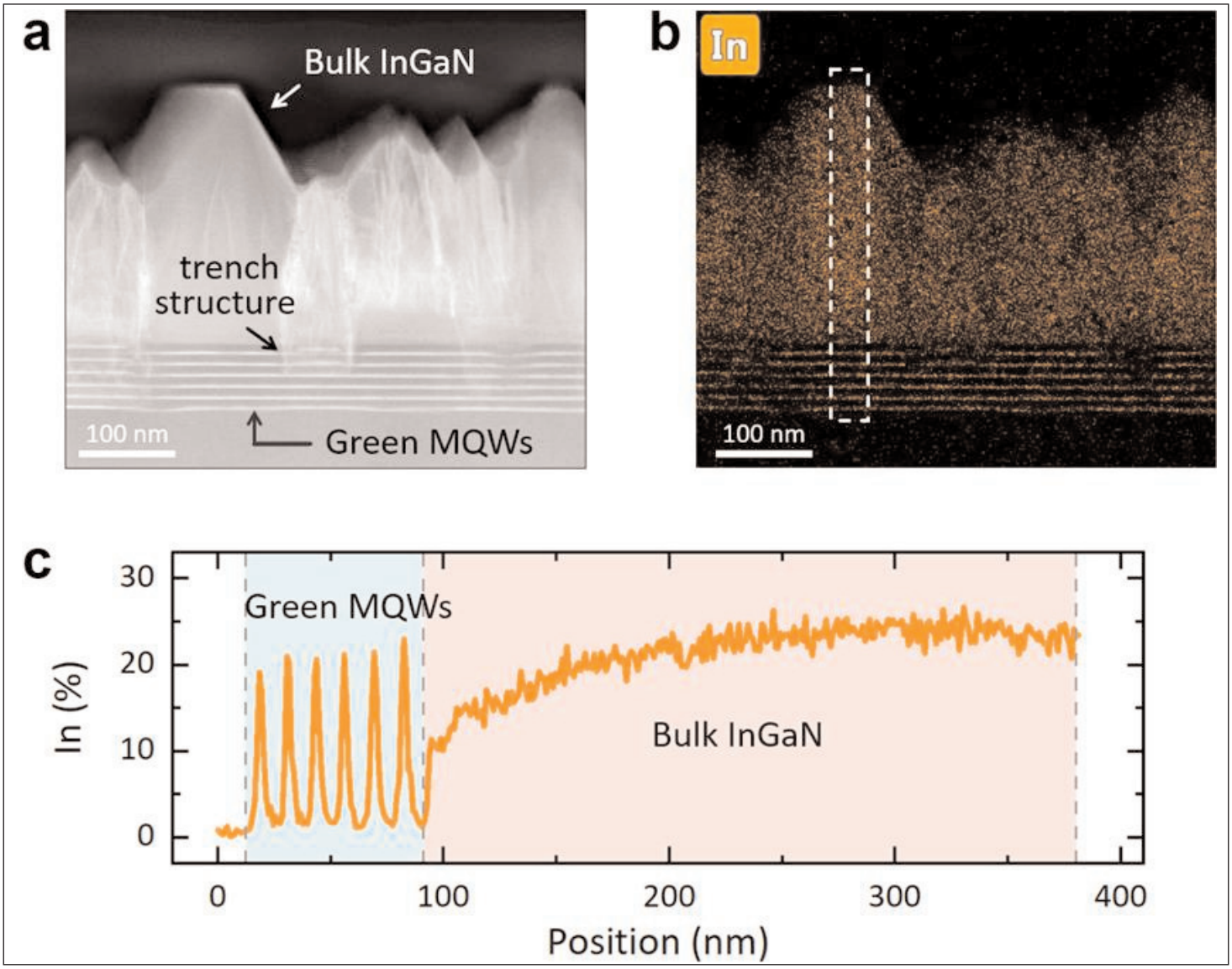


Figure 3. Scanning transmission electron microscope analysis (STEM). (a) High-angle annular dark-field (HAADF) image, (b) Indium elemental map obtained by combining STEM with energy-dispersive x-ray spectroscopy (EDX), and (c) indium composition profile along white dashed box in (b).

A had two peaks at 392nm (violet) and 506nm (green), associated with the strained bulk InGaN and green MQWs, respectively. B had three peaks: 443nm (blue-violet), 501nm and 635nm (red). The 501nm corresponded to the MQW structure, while the outer peaks were associated with low- and high-indium-content phase-separated regions of the bulk InGaN. The lower indium content naturally resulted in shorter-wavelength emission. The short-wavelength bulk InGaN emissions were little more than blips on the presented spectra. In sample B, the red 635nm-long wavelength peak was marginally higher than the 501nm green emission.

Observing that the 800°C bulk InGaN growth temperature is much higher than that typical for red InGaN QWs, the team comments: "The red emission at 635nm corresponds to an indium content exceeding 30%, which is unlikely to result from direct indium incorporation at 800°C. In a strain-relaxed state, InGaN tends to undergo phase separation, forming high-indium and low-indium phases. Therefore, the red emission most likely originates from phase separation in the bulk InGaN, rather than direct indium incorporation."

The phase separation is thought to encourage carrier localization, enabling higher radiative recombination efficiency and longer carrier lifetimes. "The high-indium (>30%) red phase likely forms three-dimensional (3D) nanostructures, similar to quantum dots," the team writes. "These regions, with narrower bandgaps than the surrounding low-indium phase, create potential wells for carrier localization."

Electroluminescence (EL) studies were performed on sample B using indium balls as contacts (Figure 4). The peak wavelength was found to have much reduced variation, compared with MQW-based LEDs. The peak blue-shifted just 6.2nm between 1mA and 100mA injection, decreasing from 648.6nm to 642.4nm.

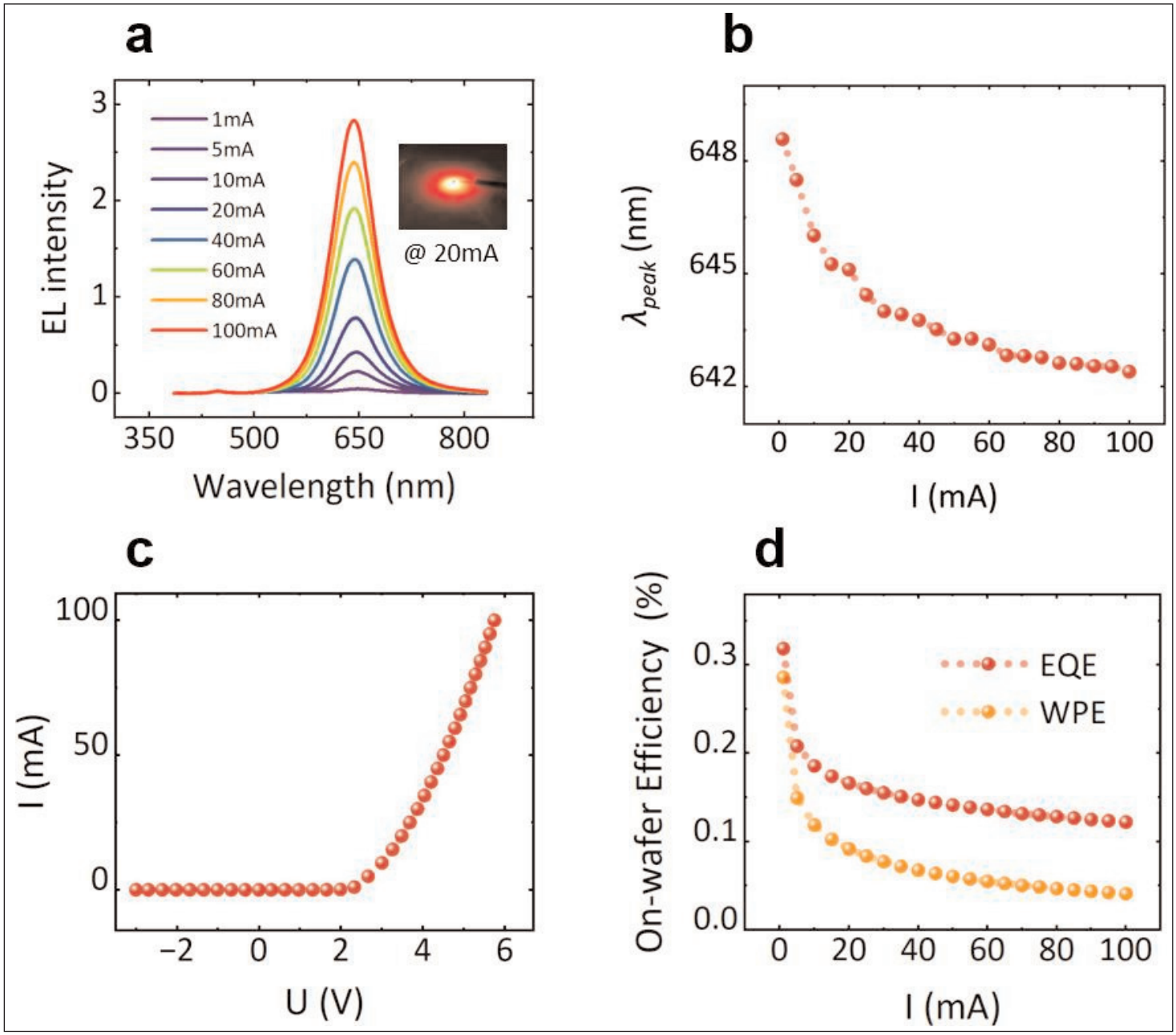


Figure 4. Sample B's electroluminescence (EL) performance: (a) EL spectra with corresponding EL image inset. (b) Peak wavelength variation with current. (c) Current (I)–voltage (U) curve. (d) On-wafer external quantum efficiency (EQE) and wall-plug efficiency (WPE) versus injection current.

MQW LEDs typically suffer blue-shifts of more than 30nm in wavelength.

InGaN QWs are usually in a highly strained state, reducing tendencies to phase separation. The strain also tends to enhance local electric fields due to the charge polarization of the chemical bonds of III–nitride semiconductors. These electric fields change as the current injection increases, Stark-shifting the energy levels and hence the emission wavelength to give the 'quantum-confined Stark effect' (QCSE).

The researchers comment: "In this study, high-density trench structures are intentionally introduced to promote strain relaxation in bulk InGaN, thereby facilitating phase separation and forming a high-indium red phase. Under strain-relaxed conditions, the polarization field is significantly reduced in the red phase, resulting in the observed minor wavelength shift."

The threshold voltage was around 3.2V. The peak external quantum efficiency (EQE) and wall-plug efficiency (WPE) at 1mA were 0.32% and 0.29%, respectively. The efficiency droop at higher current injection is blamed on the usual suspects, "Auger recombination and/or carrier overflow".

The team laments: "Inhomogeneous phase separation and the limited volume of the red phase may lead to low carrier injection efficiency, ultimately resulting in a low EQE. Further structural optimization is necessary to enhance the efficiency." ■

https://doi.org/10.1364/OE.566890

Author: Mike Cooke

N-polar deep recess E-mode GaN HEMTs

Researchers achieve record-breaking frequency performance at 75nm gate length.

University of California Los Angeles (UCLA) and University of Michigan Ann Arbor in the USA claim record-breaking small-signal performance for enhancement-mode N-polar deep recess (NPDR) gallium nitride (GaN) high-electron-mobility transistors (HEMTs) [Oguz Odabasi et al, IEEE Electron Device Letters published online 3 July 2025]. In particular, a high 122GHz f_T cut-off frequency enabled a high 9.1GHz-μm f_TxL_G figure of merit despite the short 75nm gate length (L_G).

The team sees the device structure as promising for high-frequency, high-power applications. The researchers view the advantages of N-polar GaN as including "intrinsic back-barrier properties, better scalability in gate-to-channel distances, and easier formation of high-quality ohmic contacts".

The deep recessing enables enhancement-mode/normally-off operation with 0V gate potential representing the off-state. This avoids the risks of "gate bias failures and unintentional activation, particularly in high-voltage applications". Other advantages of normally-off devices include fail-safety and simpler drive circuit topologies. The team sees potential deployment for power delivery systems in data server and graphics environments.

The NPDR GaN HEMT material was grown by plasma-assisted molecular beam epitaxy (PAMBE), on an N-polar on-axis GaN substrate (Figure 1). The use of an N-polar requires the AlGaN barrier to be below rather than above, as for Ga-polar structures, the GaN channel layer. Unlike for HEMT material grown by metal-organic chemical vapor deposition (MOCVD), the AlGaN was not silicon-doped.

The ohmic source and drain electrodes consisted of MBE n^+-GaN regrown without recessing. The device was isolated by a combination of mesa etching and ion implantation.

The deep recess for the gate was achieved by atomic layer etching through a hard mask consisting of plasma-enhanced CVD silicon dioxide, and then wet etching to remove plasma damage. The recess left 5nm of GaN between the gate foot and AlGaN back-barrier.

The hard mask was also used to enable a self-aligned gate deposition process. The gate dielectric was 250°C plasma-enhanced atomic layer deposition hafnium silicate (HfSiO), using a silicon dioxide/hafnium dioxide ratio of 3:2. The gate metal was platinum/gold. The metal for the source/drain contacts was titanium/gold.

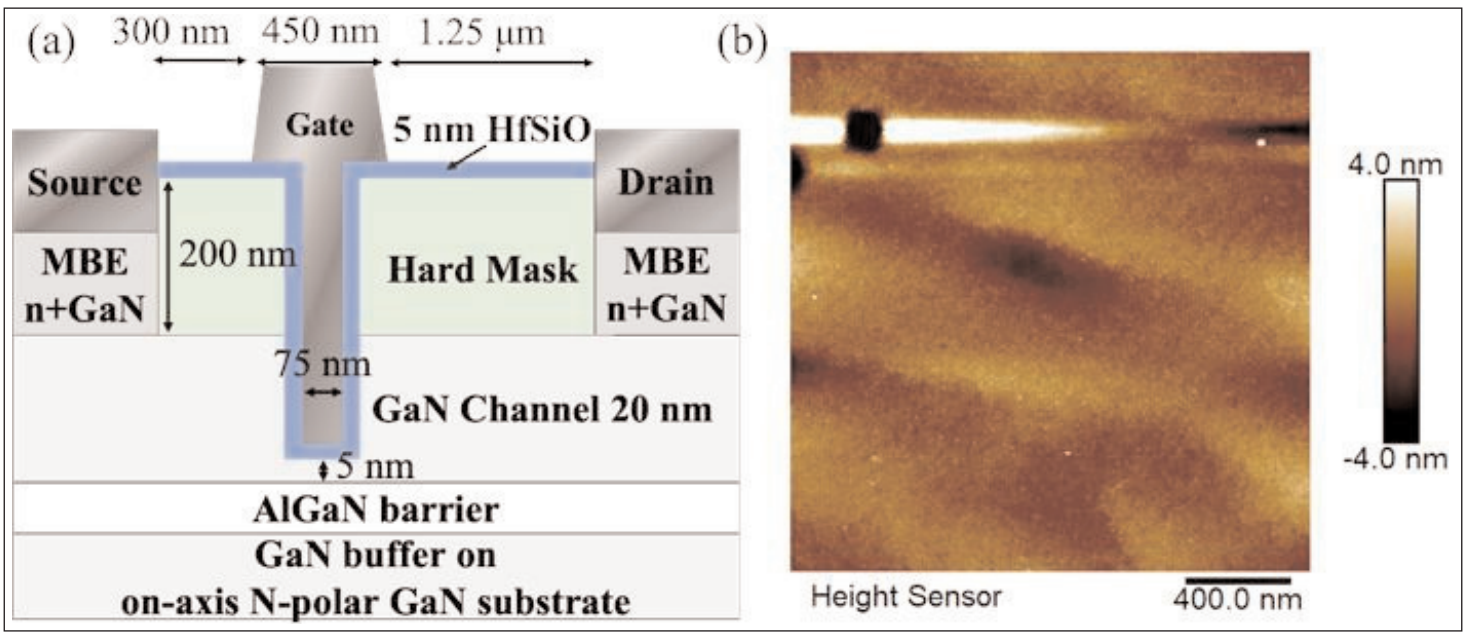


Figure 1. (a) Device schematic, and (b) surface atomic force microscope scan of recessed gate region after ALE and wet etching.

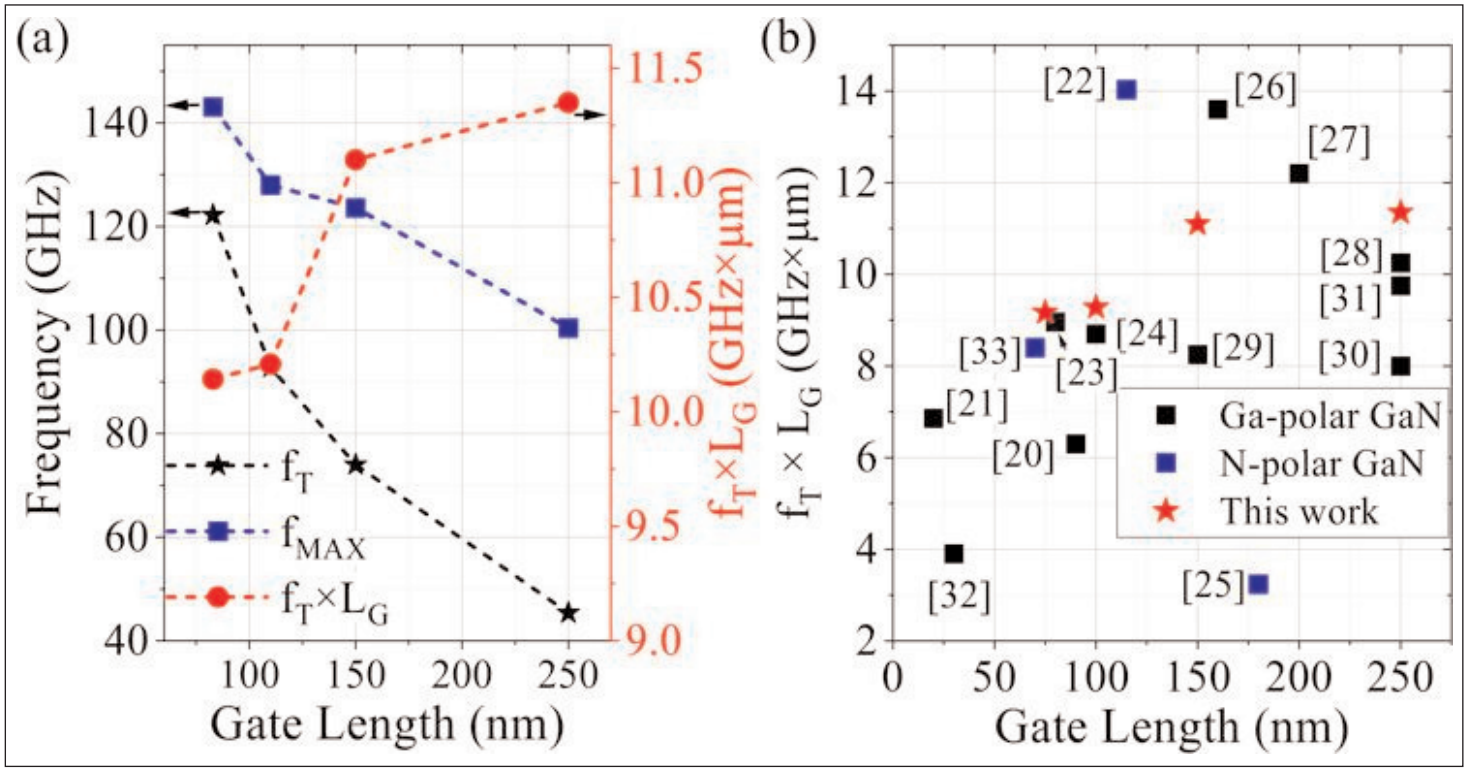


Figure 2. (a) Small-signal results with different gate lengths, and (b) benchmarking of fTxLG of enhancement-mode AlGaN/GaN HEMTs.

The HEMT featured a 75nm gate base length (L_T), 450nm 'T' top, and 300nm source–gate and 2μm gate–drain distances. The device gate width was 100μm.

In DC operation at +4V gate potential, the peak saturation drain current density was 1.5A/mm, and the knee voltage was 2V. The device threshold was +0.8V, giving an enhancement/normally-off operation mode. The peak transconductance was 550mS/mm at +1.5V gate potential and 3V drain bias.

The team reports: "A gate leakage current of less than 10nA/mm indicates the effective current blocking of the HfSiO gate dielectric. The off-state drain current is ~100μA/mm, due to high buffer leakage. The origin is unknown for now, and will be reduced by further optimizing the epitaxial design."

The forward-bias gate breakdown was at 6V gate potential and 0V drain. The three-terminal off-state breakdown voltage was around 30V.

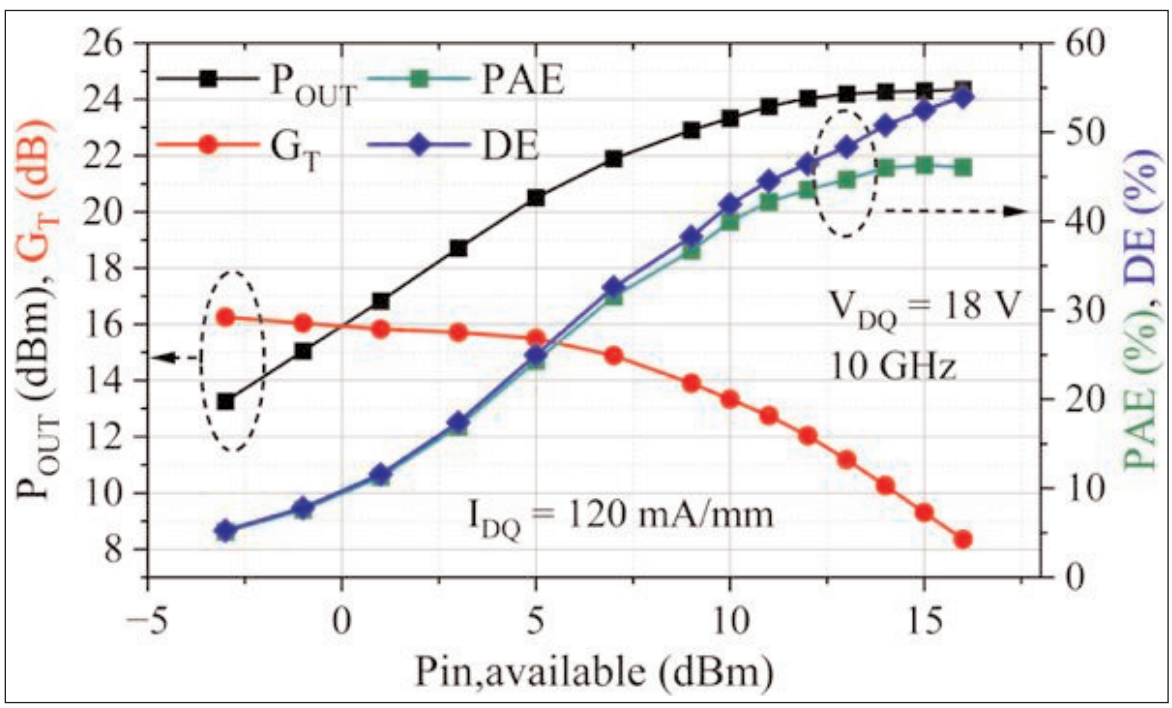


Figure 3. Load-pull results.

Pulsed stressing at 15V followed by measurement at 8V drain bias showed 21% current collapse, seen as "relatively low" by the team. The researchers comment: "Although the dispersion can be further reduced, this work is a significant step toward simplifying the barrier structure compared to the standard MOCVD N-polar GaN HEMTs, which require a combination of composition grading and Si-doping."

The extrapolated cut-off (f_T) and maximum oscillation (f_{MAX}) frequencies from small-signal measurements were 122GHz and 145GHz, respectively (Figure 2). The 75nm device had a f_TxL_T figure of merit of 9.1GHz-µm. Longer gate lengths enable better channel control and hence higher figures of merit.

Commenting on the benchmark comparison with other works, the team writes: "The device with 75nm LG showed the highest performance compared to devices with similar L_T. Devices with other gate lengths in this work also demonstrated top-tier performance. It is worth noting that few enhancement-mode devices in the comparison could support load-pull measurements."

The researchers performed a Maury passive load-pull study at 10GHz with the quiescent drain voltage (V_{DQ}) and current (I_{DQ}) at 18V and 120mA/mm, respectively, while the quiescent gate potential (V_{GQ}) was +3V (Figure 3).

The team reports: "With higher V_{DQ}, lower-than-expected V_{GQ} was used, possibly due to drain-induced barrier lowering."

The output power density was 2.7W/mm, while the drain efficiency (DE) and power-added efficiency (PAE) were 55% and 46%, respectively.

The researchers comment: "A high off-state drain leakage current was observed in these devices and may have contributed to the lower-than-expected efficiency values. Nevertheless, successful load-pull measurements demonstrated impressive results for enhancement-mode operation." ■

https://doi.org/10.1109/LED.2025.3585597

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ScAlN ferroelectric AlGaN HEMT opportunities

Potential for future reconfigurable multi-function, memory, and high-temperature applications.

University of Michigan, Ann Arbor, and Sandia National Laboratories in the USA have reported the use of scandium aluminium nitride (ScAlN) ferroelectric in aluminium gallium nitride (AlGaN) high-electron-mobility transistors (HEMTs) [Jiangnan Liu et al, Appl. Phys. Lett., v126, p253505, 2025].

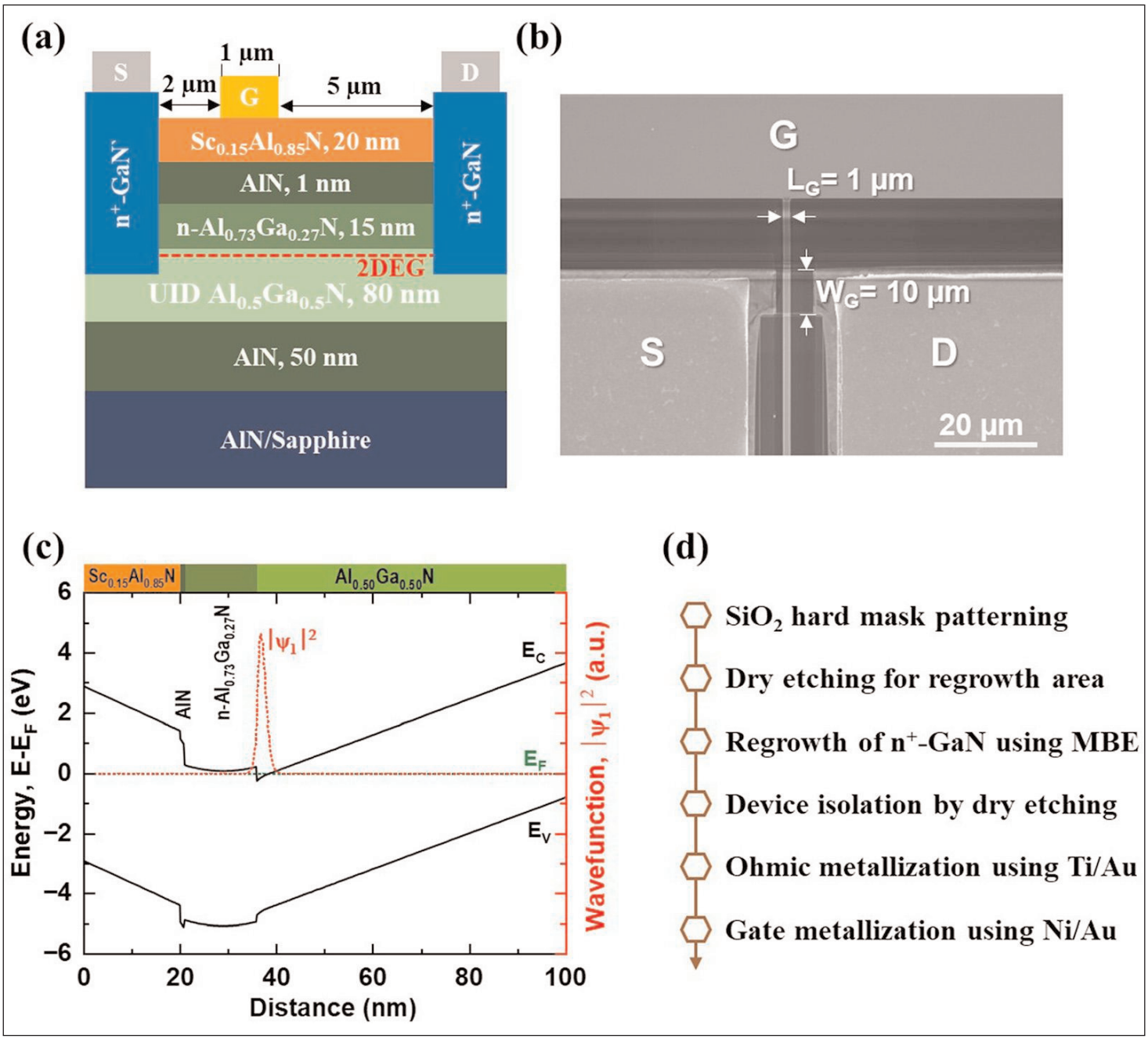

Figure 1. (a) ScAlN/AlGaN HEMT scheme and (b) top-view scanning electron microscope image of device. (c) Energy-band diagram and ground-state wavefunction. Solid black curve, dotted green curve, and red dotted curve represent conduction- and valence-band energies, Fermi level, and wavefunction, respectively. (d) Fabrication process flow.

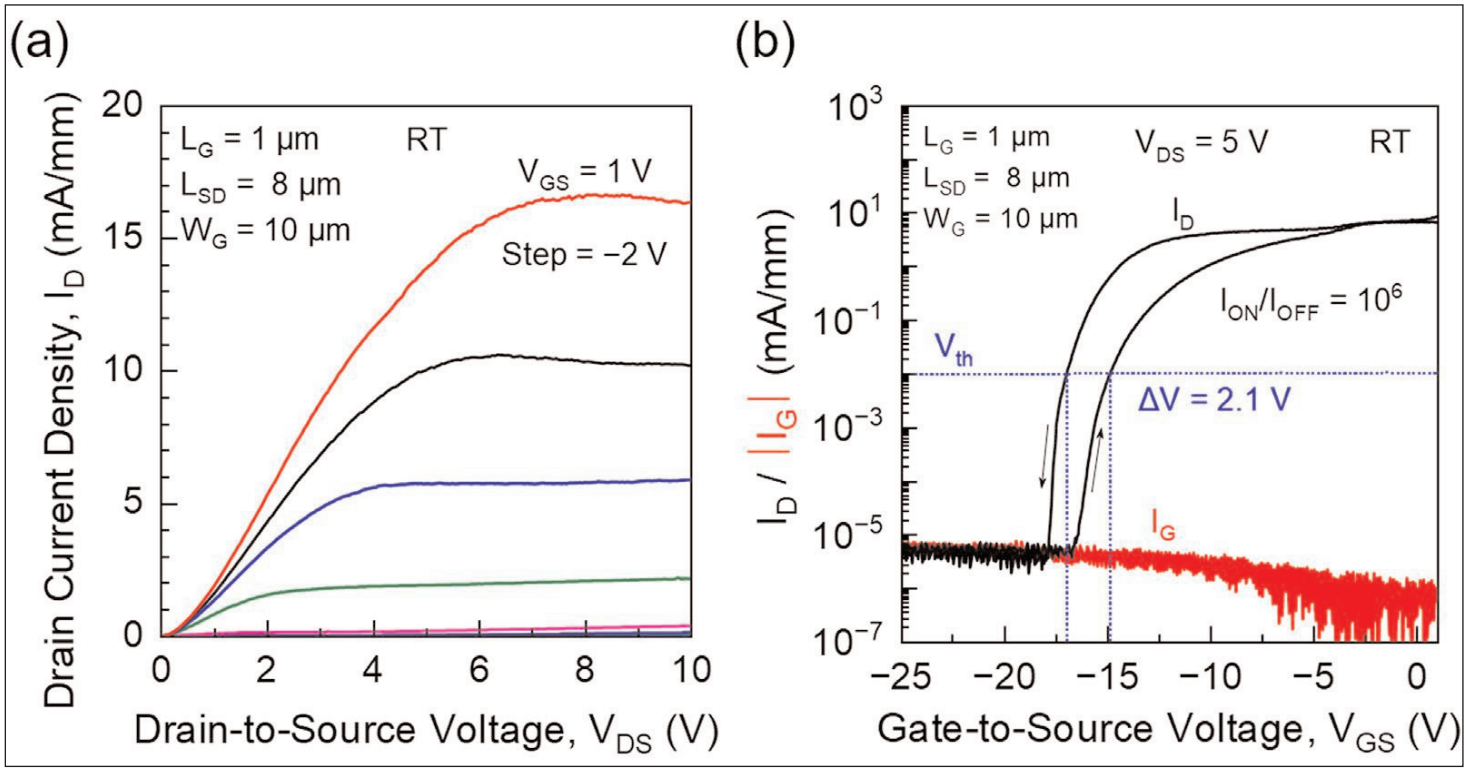

Figure 2. (a) Static characteristics of fabricated ScAlN/AlGaN HEMT at room temperature (RT). (b) Transfer curves (black curve) and gate leakage current (red curve), at 5V drain bias. Threshold voltage (V_{th}) defined at 0.01mA/mm. Vertical blue dotted lines indicate forward and backward V_{th}.

The researchers see potential for next-generation non-volatile, reconfigurable power applications and high-temperature memory applications.

The incorporation of Al into the GaN channel material in HEMTs widens the bandgap, increasing the critical breakdown electric field and saturation carrier velocity. These features should enable efficient, high-gain power amplifiers, and high-temperature electronic applications, based on enhanced mm-wave and terahertz (THz) performance.

The researchers see potential for next-generation non-volatile, reconfigurable power applications and high-temperature memory

The breakdown field for $Al_{0.5}Ga_{0.5}N$ is estimated at more than 10MV/cm, and the saturation velocity at more than $1.5x10^7$cm/s, which could deliver power gain and density enhancements. Barriers to realizing these potentials include the typical offenders of poor ohmic contacts, lack of matching dielectric materials, and current collapse.

The III–nitride material for the HEMT (Figure 1) was grown by metal-organic chemical vapor deposition (MOCVD) on AlN/sapphire substrate, followed by molecular beam epitaxy (MBE) for the ScAlN. The MOCVD material also had a GaN cap to protect the Al-containing layers from oxidation during transfer to the MBE equipment. The material was heated to 800°C in the MBE system to remove the GaN cap before the ScAlN deposition.

The structure enabled electron accumulation into a two-dimensional electron gas (2DEG) near the n-$Al_{0.73}Ga_{0.27}N/Al_{0.5}Ga_{0.5}N$ interface. The material was metal-polar, including the ScAlN ferroelectric layer. The researchers calculate that the ScAlN enhanced the 2DEG electron carrier density from around $4.5x10^{12}/cm^2$ for the III–nitride material without ScAlN to about $2x10^{13}/cm^2$ with, due to strong polarization and large conduction-band discontinuity effects.

The HEMTs were fabricated with selective-area regrowth of n^+-GaN source (S) and drain (D) contacts, using dry etch and MBE. The metal electrodes consisted of titanium/gold (Ti/Au) for the source and drain, and of nickel/gold for the Schottky gate (G). Although the S/D specific contact resistivity of 1.57mΩ-cm^2 was relatively high, blamed on poor interface quality between regrown and epitaxial material structure, the team believes that "the reverse graded layer approach presents a promising method to further improve contact resistivity."

The gate length (L_G) was 1µm. The gate was asymmetrically placed with 2µm L_{GS} and 5µm L_{GD}. The gate width (W_G) was 10µm.

The maximum drain current at 1V gate potential and 5V drain bias was 16.3mA/mm (Figure 2). The on/off current ratio was in the order of 106 between 1V and −25V, respectively. The gate leakage was 5.53nA/mm in the off-state. "This result indicates that the off-state current is limited by the gate current. The polarization-driven modulation enhances gate

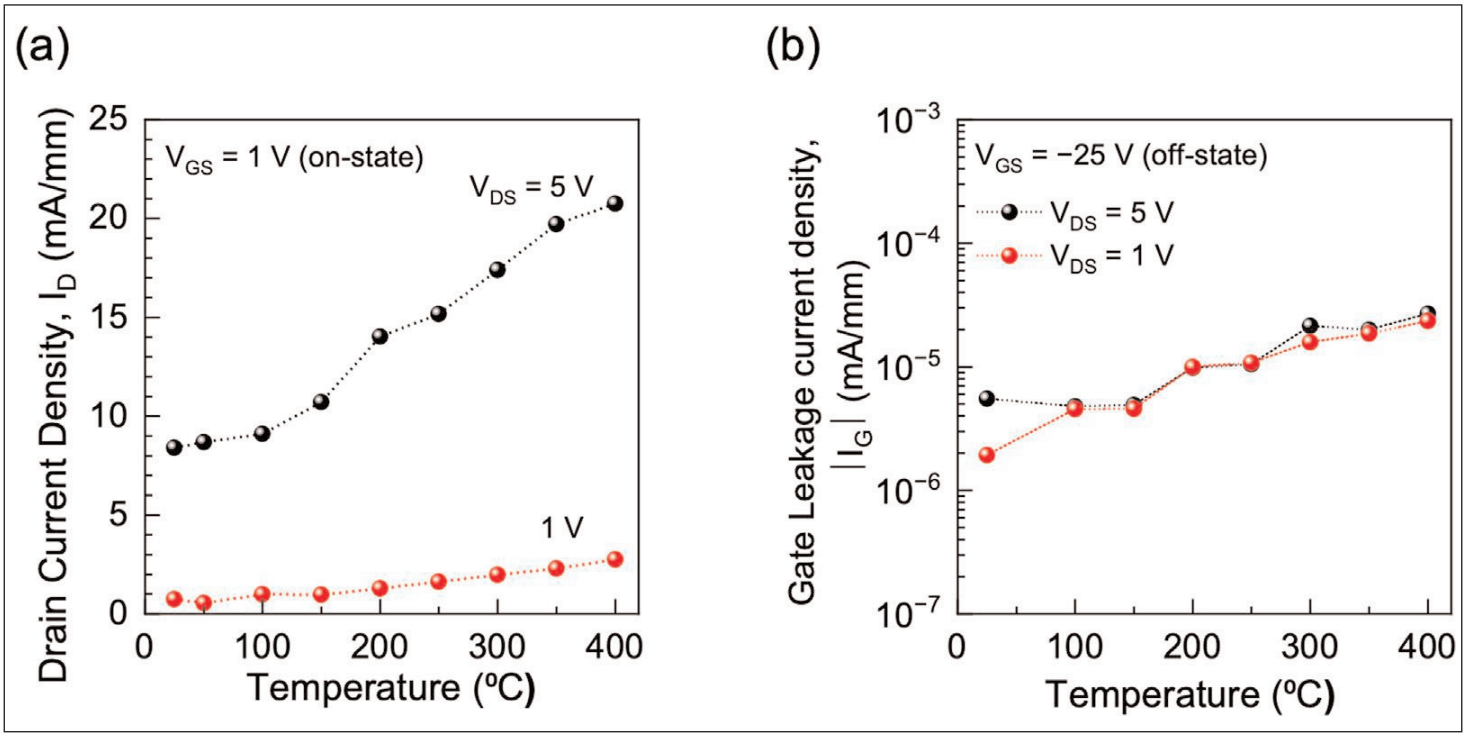

Figure 3. Variations in drain current (a) and gate leakage current (b) with temperature for different V_{DS}.

control and improves subthreshold swing (SS)," the researchers comment.

The current flow shows a counter-clockwise hysteresis loop. The V_{th} gap between the up- and downward V_{GS} sweeps was 2.1V. The researchers say that this indicates that ScAlN/AlGaN HEMTs are promising candidates for next-generation memory applications. Reducing the drain bias to 1V increased the gap to 6.4V, due to a large V_{th} shift in the down-sweep.

The team reports: "An increase in off-state current, which corresponds to gate leakage current increase (I_G = 1.93x10^{6}mA/mm for V_{DS} = 1 and 5.53x10^{6}mA/mm for V_{DS} = 5V) under high V_{DS} bias, indicates that electrons are captured/trapped in the barrier layers. This trapping effect results in a positive shift in V_{th} when V_{GS} is swept from positive to negative.

It is noted that at lower drain bias voltages, the trapping/de-trapping effects have a reduced influence on the counterclockwise hysteresis, which is primarily governed by ferroelectric charge coupling."

The measured subthreshold swing was lower during the down-sweeps: 65mV/decade and 104mV/decade for 1V and 5V drain biases, respectively. The corresponding values in the forward sweeps were 219V/decade and 333mV/decade.

This increase in leakage current may be attributed to the thermal excitation of carriers and enhanced tunneling effects at higher temperatures. Despite this, the device maintains its functional integrity in the on-state, demonstrating its potential for high-temperature applications

The lower SS measured under backward gate-bias sweeps originated from electric field polarization in the ScAlN, facilitating the depletion of the 2DEG, according to the researchers, who add: "The tunable V_{th} and low SS exhibit great potential for future memory devices and multi-functional transistors."

The threshold gap also increased with increasing ΔV_{GS} step during the sweeps. The team explains: "This is because the backward scan leads to a sharp 2DEG depletion originating from the ScAlN switching and the smaller V_{GS} step will increase the total poling time, reducing the hysteresis here."

The researchers also performed measurements at temperatures up to 400°C (Figure 3). The maximum drain current increased with temperature by 3.75x and 2.47x for 400°C over RT for drain biases of 1V and 5V, respectively. The increasing drain current suggests "thermally activated carrier transport at elevated temperatures, possibly due to thermionic emission over the n^+-GaN/$Al_{0.50}Ga_{0.50}N$ heterobarrier," according to the researchers. Over the same temperature interval the gate leakage also increased by an order of magnitude (i.e. around 10x).

The team comments: "This increase in leakage current may be attributed to the thermal excitation of carriers and enhanced tunneling effects at higher temperatures. Despite this, the device maintains its functional integrity in the on-state, demonstrating its potential for high-temperature applications." ■

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Improving mobility in InAs quantum wells on GaAs substrate

Surface smoothing to reduce step bunching could enable less expensive, superior alternative for quantum information and other applications.

Researchers in Germany have reported improved mobility in indium arsenide (InAs) quantum wells (QWs) on gallium arsenide (GaAs) substrates, particularly at cryogenic temperatures less than 120K, from a surface smoothing technique used during molecular beam epitaxy (MBE) [A. Aleksandrova et al, Appl. Phys. Lett., v126, p232109, 2025]. The team from Humboldt-Universität zu Berlin, Institut Kurz GmbH, and Paul-Drude-Institut für Festkörperelektronik, comment: "With the introduction of the surface smoothing, GaAs substrates thus replace InP substrates as a less-expensive and superior alternative."

The researchers see their achievements as particularly interesting for quantum information processing. They explain: "Nanowires of InAs host Majorana zero modes, which are created by the strong spin–orbit coupling, in semiconductor–superconductor heterostructures. A pair of Majorana zero modes can realize a robust qubit for quantum computation that is immune to local perturbations. Thereby, the electronic coupling at the semiconductor–superconductor interface can be barrier-less since electrons are accumulated at the surface of InAs. In assembling a large number of qubits to build a quantum computer, defining narrow channels lithographically in heterostructures is far more practical than using epitaxially grown nanowires."

Majorana zero modes refer to quantum theoretical quasi-particle constructs that are zero-energy, zero-charge quasi-particles with spin-½. In superconducting systems, these Majorana zero modes can arise as combinations of electrons and holes.

The team also suggests that their technique could benefit conventional electronic systems by boosting electron mobility in high-frequency wireless communication systems using InAs QW transistor structures.

The smoothing tackles lattice-matching problems that arise in InAs QW structures on GaAs, as opposed to indium phosphide (InP) or gallium antimonide (GaSb) substrates. The InAs mismatch with GaAs is 6.7%, compared with 3.1% and −0.6% for InP and GaSb, respectively. The buffer layer material between the

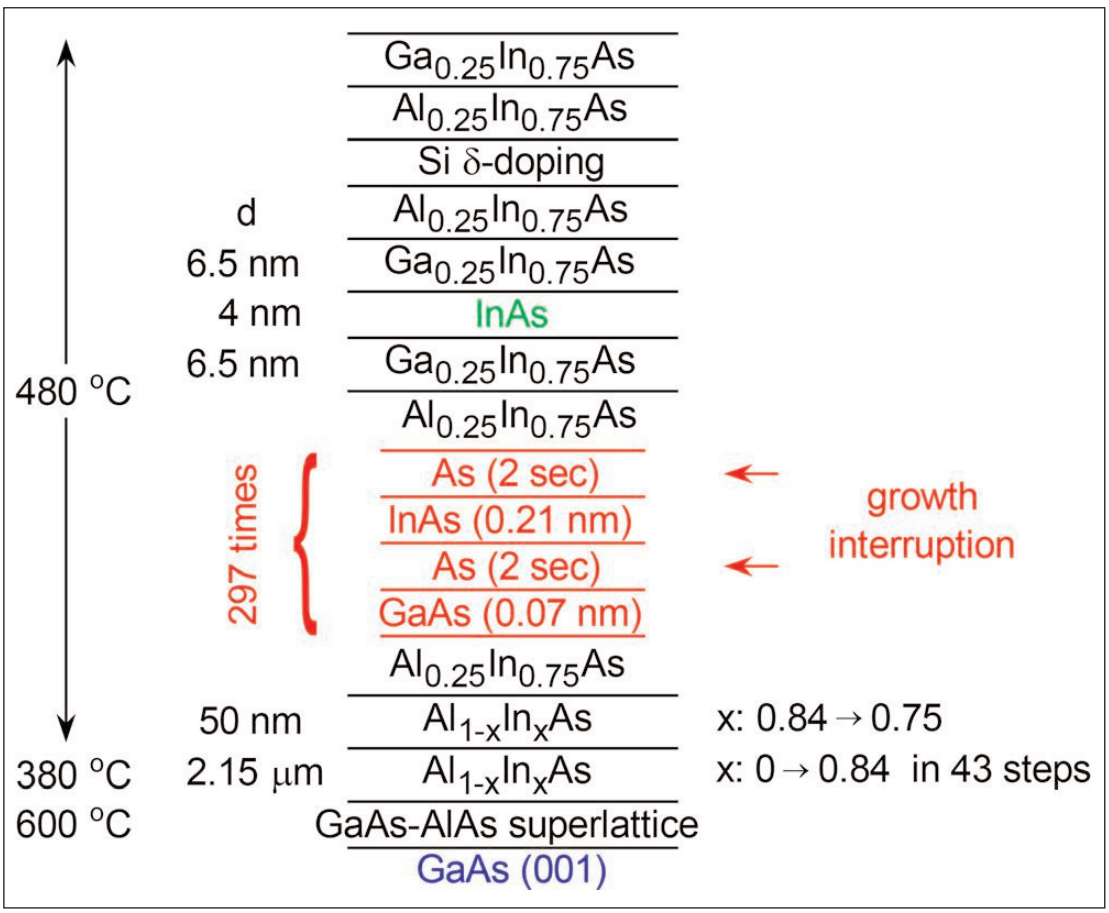

Figure 1. MBE growth sequence for InAs QW in AlInAs barriers. Red section shows growth interruption measures before $Al_{0.25}In_{0.75}As$ layer for surface smoothing.

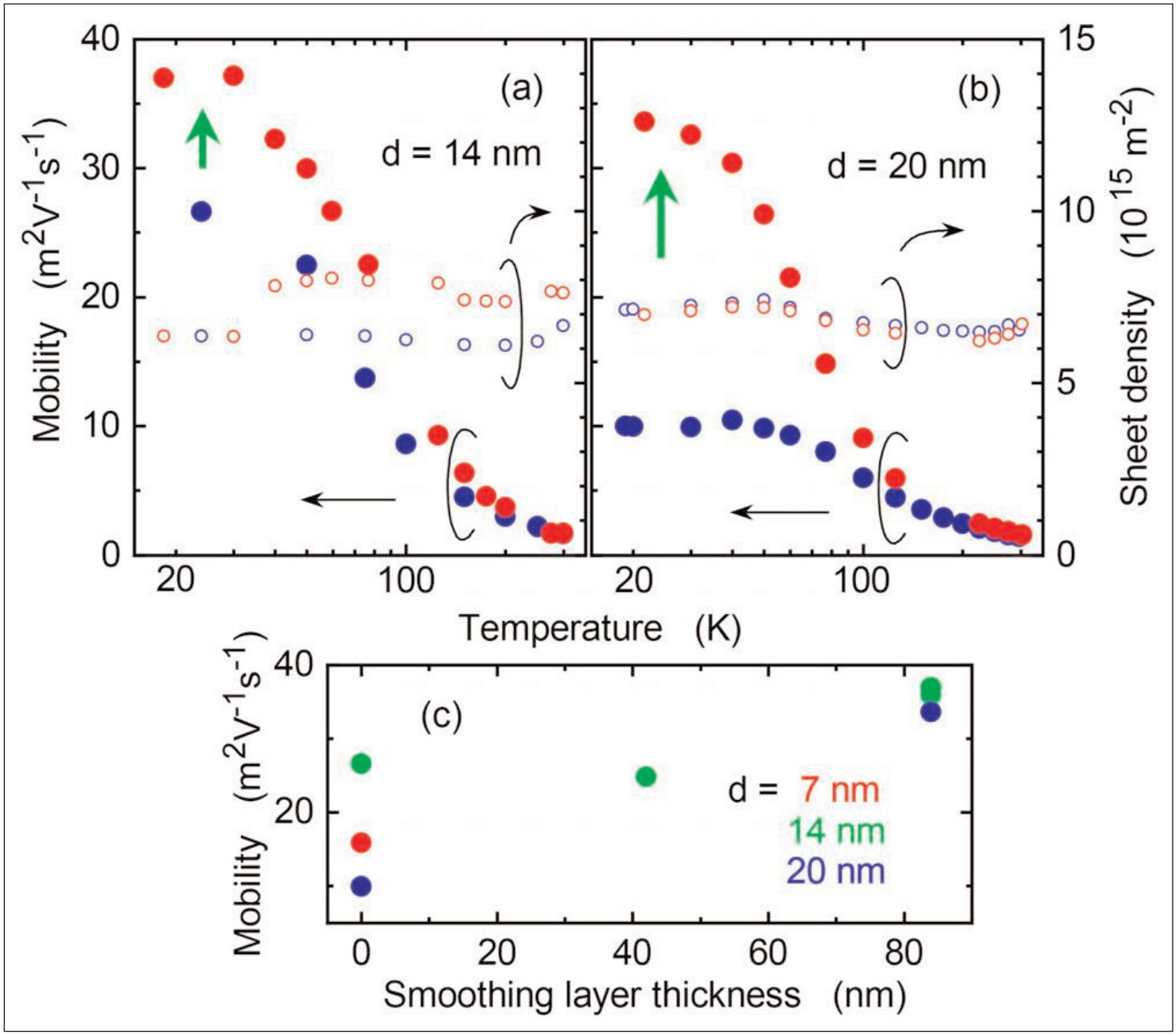

Figure 2. Improvement of electron mobility by introduction of smoothing layer. (a, b) Filled and open circles show respective mobility and sheet carrier concentration variations with temperature in InAs QW two-dimensional electron gas (2DEG). Red and blue circles correspond to QWs with and without the smoothing layer, respectively. Distance d of δ-doping from (Ga,In)As layer was 14nm in (a) and 20nm in (b). Green arrows indicate mobility increase enabled by surface smoothing. (c) Variation of mobility with thickness of smoothing layer.

substrate and QW undergoes plastic relaxation with such a large lattice mismatch, one effect of which is to present a cross-hatch pattern on the material surface.

The MBE on GaAs began with a sequence of buffer layers (Figure 1). These consisted of a short-period superlattice grown at high temperature, and a sequence of AlInAs layers with graded indium composition in 50nm steps at low temperature. The final indium content in the buffer was 0.84.

The growth temperature was then increased to 480°C for the final layers, including the InAs QW. The first layer was AlInAs continuously graded down to 0.75 content in 50nm. The indium content overshoot in the buffer was designed to prevent further dislocations forming.

The team grew InAs QWs with and without surface smoothing measures. An insertion of 6.5nm GaInAs was used between the InAs QW and AlInAs barrier material. The researchers comment: "This insertion is crucial as Al-containing surfaces attract O_2 molecules to be adsorbed. The resultant interface charges cause strong Coulomb scattering for the 2DEG in the QW if the InAs layer is not interfaced with the $Ga_{0.25}In_{0.75}As$ layers."

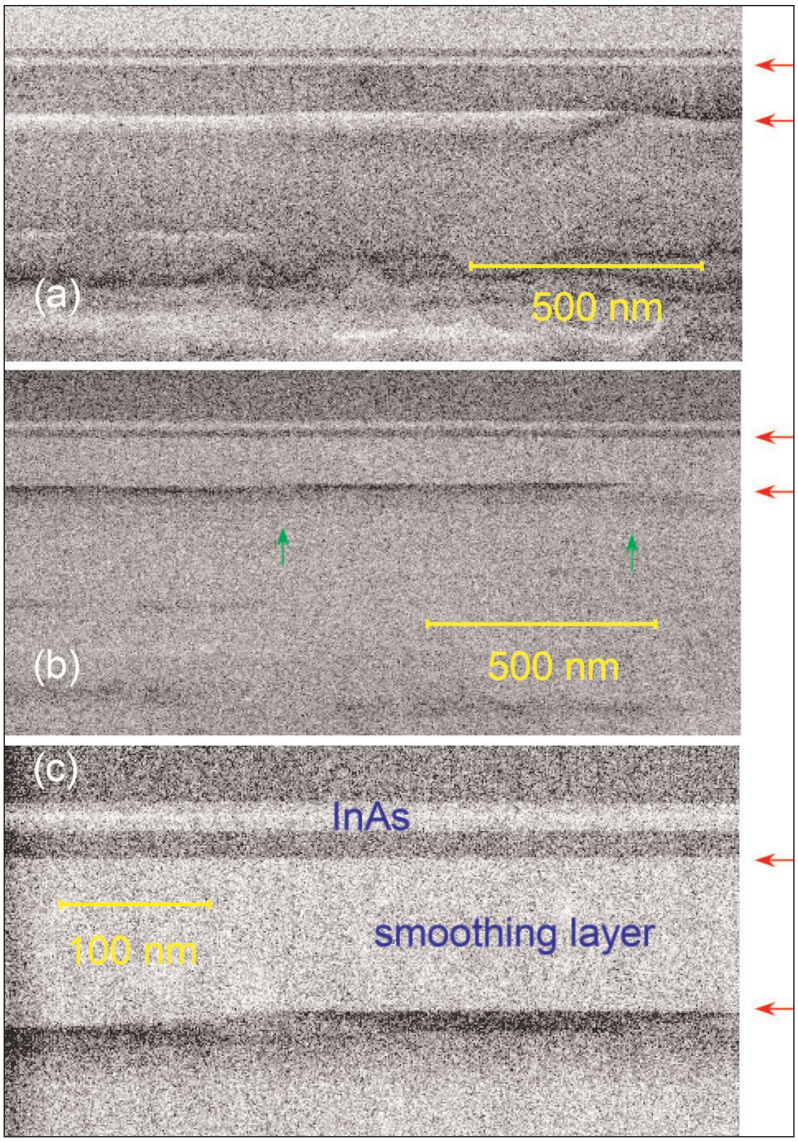

Figure 3. Removal of surface steps from smoothing. Transmission electron micrographs of QW region in BF (a) and HAADF (b) modes. (c) Magnified view of HAADF image.

The surface smoothing measures consisted of a sequence of growth interruptions between GaAs and InAs layers to enhance adatom diffusion. The individual GaAs and InAs growth steps had target thicknesses of 0.25 and 0.75 atomic layers, respectively. The layers were thus equivalent to $Ga_{0.25}In_{0.75}As$.

A Si δ-doping layer was inserted in the upper barrier above the InAs QW. The position above the QW was varied.

Inspection with transmission electron microscopy (TEM) in bright-field (BF) and high-angle annular dark field (HAADF) modes showed that the threading dislocations were effectively trapped in the buffer layers with minimal penetration into the QW region. The team comments: "Even if the QWs were not entirely free of the threading dislocations, the dislocation density was too small to reduce the mobility of the 2DEGs."

The surface smoothing was particularly effective in improving mobility at cryogenic temperatures (less than 120K) where the impact of phonon scattering is much reduced (Figure 2). The researchers point to previous work that showed that the mobility performance on GaAs substrate was comparable to that on more expensive InP.

A puzzling aspect was that the cross-hatch pattern associated with strain relaxation between the substrate and upper layers of the heterostructure continued to be apparent even with the surface smoothing process. The researchers comment: "It is emphasized that the surface smoothing does not change the cross-hatch morphology since the height modulation associated with it is much larger than what the enhancement of the surface migration by growth interruptions can smooth out."

According to cross-sectional transmission electron microscope inspection (Figure 3), the surface smoothing reduces the effect of 'step bunching' introduced during the buffer growth. The team comments: "The surface smoothing must eliminate the steps whose height is increased to be much larger than the monoatomic-layer thickness by the step bunching."

The step bunching occurred over distances significantly less than the carrier mean free path, creating opportunities for scattering and thus negatively impacting mobility. By contrast, the quasi-period of the cross-hatch surface was typically larger than the mean free path, and thus minimally impacted mobility.

The researchers comment: "Owing to the enhancement of the surface migration, the interfaces of the InAs QW became flat and abrupt when the smoothing layer was introduced. The interface scattering was consequently suppressed with improving the mobility, at least, to be as large as that obtained using InP substrates."

The team also reports that they have attempted to use the surface smoothing technique on InP substrates, but the resulting InAs QWs showed no recognizable improvement of mobility. The researchers comment: "The interface scattering originating from the surface steps in the case of the InP substrates is hence suggested to be negligible compared to the impurity-limited mobility achievable with our MBE system."

Another potential variation would be to use AlAs rather than GaAs in the smoothing sequence. However, this again failed — indeed, the surface became rougher and there was no mobility improvement.

The researchers comment: "The surface migration of the adatoms is indicated to be more difficult to enhance for AlAs than for GaAs. To be specific, AlAs may prefer to form islands, presumably due to a limited diffusion of the adatoms. The growth interruption would enlarge the island size instead of contributing to the step flow for the existing terraces." ■

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Gallium oxide HFET combines polytypes

First ε-/α-Ga_2O_3 transistor achieves promising breakdown and on-resistance performance.

Taiwan's National Sun Yat-sen University claims the first demonstration of gallium oxide (Ga_2O_3) heterostructure field-effect transistors (HFETs) consisting of ε- on α-polymorph layers with tin (Sn)-doped transition between the two [Han-Yin Liu et al, IEEE Electron Device Letters published online 27 June 2025]. The heterostructure increased the off-state breakdown voltage (V_{BD}) to 1725V, and reduced the specific on-resistance ($R_{on,sp}$) to 49.2mΩ-cm^2, compared with a similar homostructure metal-semiconductor field-effect transistor (MESFET) consisting of just α-polytype material with Sn-doped channel (1239V breakdown, 260mΩ-cm^2 specific on-resistance).

Gallium oxide is being intensively studied as a potential next-generation material for power electronics, based on its ultrawide bandgap and the associated expected higher critical breakdown field, relative to wide-bandgap semiconductors such as gallium nitride (GaN) and silicon carbide (SiC). Other potentials include deep-ultraviolet (DUV) optoelectronics, and radio-frequency (RF) electronics.

Most of this research is based on the stable β-polytype. The α and ε phases are metastable. The team comments that, among the various metastable polytypes, "ε-Ga_2O_3 is the second-most stable structure that exhibits ferroelectric characteristics with significant spontaneous polarization, surpassing III–nitrides, and enabling the formation of a high-density two-dimensional electron gas (2DEG) at heterojunctions without modulation doping."

The researchers used mist chemical vapor deposition (mist-CVD) to apply the Ga_2O_3 polytype HFET layers to a 1cmx1cm c-plane sapphire substrate (Figure 1). The Ga precursor consisted of its acetylacetonate dissolved in deionized water. The Sn-doping precursor was tin (IV) chloride pentahydrate. The 150nm α-polytype layer was grown at 450°C, before the Sn doped and ε-polytype materials. A reference device was also fabricated from an all α-polytype structure grown on r-plane sapphire deposited at 600°C.

The team comments: "The Sn-doped layer in the HFET serves dual functions:
(1) providing high electron concentration to reduce the resistivity of the channel layer and
(2) acting as a phase transition layer to promote the formation of ε-Ga_2O_3."

Thermal evaporation was used to deposit metal electrodes for the HFETs: titanium/gold (Ti/Au) for the

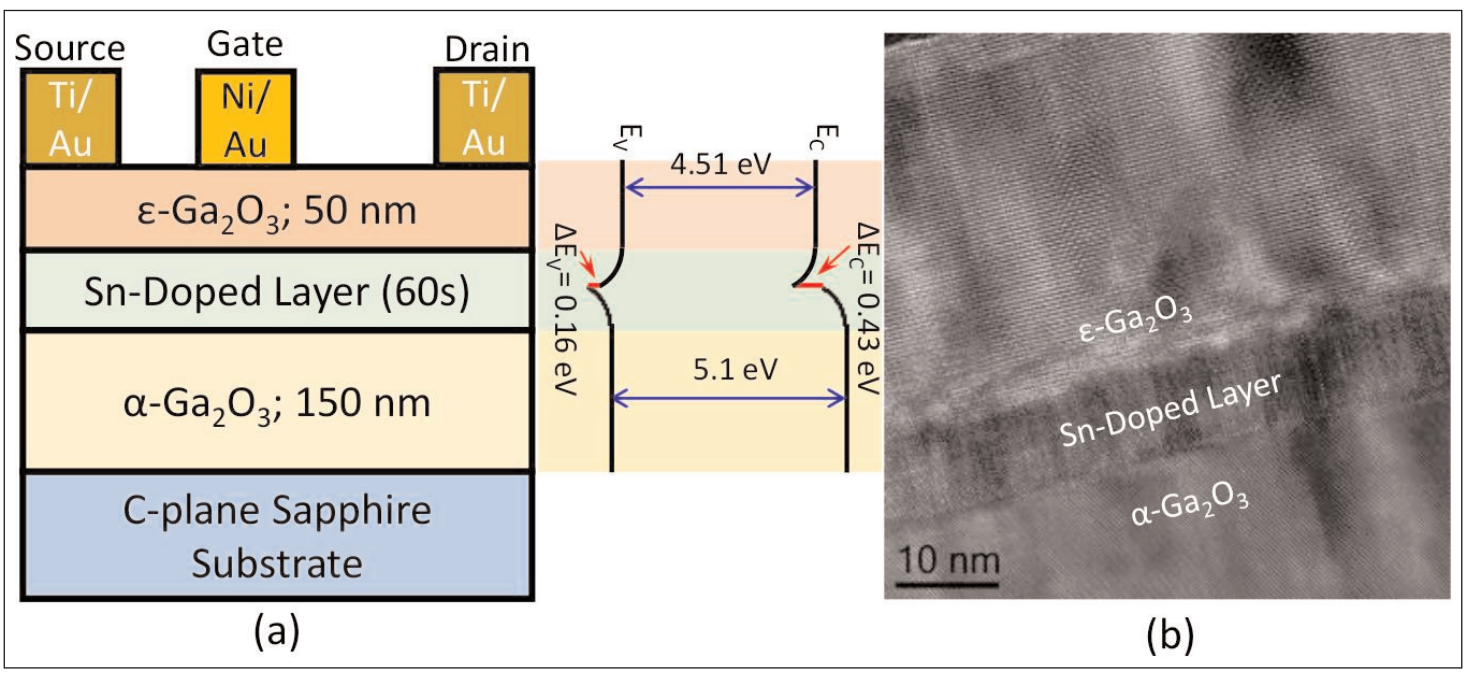

Figure 1. (a) ε-/α-Ga_2O_3 HFET structure and corresponding energy band diagram. (b) Transmission electron microscope (TEM) cross-sectional image.

Table 1. On/off current ratio (I_{ON}/I_{OFF}), threshold voltage (V_t), maximum transconductance ($g_{m,max}$), gate leakage current (I_G) at –10V gate potential, maximum drain current (I_D) at 2V V_{GS} and 30V V_{DS} (300K and 450K), specific on-resistance ($R_{on,sp}$ at 300K/450K), off-state (–18V gate) breakdown voltage (V_{BD}), and power figure-of-merit (PFoM).

Characteristic	α-Ga_2O_3 MESFET	ε-Ga_2O_3/α-Ga_2O_3 HFET
I_{ON}/I_{OFF}	$1.4x10^9$	10^9
V_t	–3.5V	–6.7V
$g_{m,max}$	1.63mS/mm	8.67mS/mm
I_G	$6.41x10^{-7}$mA/mm	$6.79x10^{-8}$mA/mm
I_D @ 300K	5.71mA/mm	33.47mA/mm
I_D @ 450K	3.54mA/mm	25.77mA/mm
$R_{on,sp}$ @ 300K	260mΩ-cm^2	49.2mΩ-cm^2
$R_{on,sp}$ @ 450K	419mΩ-cm^2	61mΩ-cm^2
V_{BD}	1239V	1725V
PFoM	5.9MW/cm^2	60.48MW/cm^2

source and drain, nickel/gold (Ni/Au) for the 5μm-long Schottky-barrier gate. The gate width was 754μm. The gate was placed 10μm from the drain in the 20μm source–drain gap.

The effect of the Sn doping was expected to be an accumulation of electron (i.e. negative charge) carriers due to a conduction-band minimum there. The researchers add a caution: "Further experimental validation is required to confirm the detailed band alignment at the heterointerface."

The crystal structures of the various layers were confirmed by x-ray diffraction analysis. While the Ga_2O_3 grown on c-plane sapphire showed an ε/α composition, the material on the r-plane substrate was all α. Study of the widths of the various peaks suggested that the material on c-plane sapphire was more crystalline. This was due mostly to a better lattice match between the bottom α layer with c-plane sapphire, relative to r-plane. The researchers note that the ε layer had even narrower x-ray peaks, suggesting that it had even better crystallinity than the α-Ga_2O_3.

The effect of more crystalline ε/α structure was seen in Hall-effect measurements: $2.91x10^{18}/cm^3$ carrier density and $19.1cm^2$/V-s mobility, compared with $6.5x10^{17}/cm^3$ and 51.42/V-s, respectively, for the all-α material.

The team comments: "The better crystallinity, fewer trapping centers, and conduction-band offset barrier make ε-Ga_2O_3/α-Ga_2O_3 exhibit higher electron density than α-Ga_2O_3 even with the same Sn doping concentration."

Linear transmission-line model (TLM) measurements also showed lower Ti/Au contact and channel sheet resistances (R_{sh}) for the ε/α HFET: 4517Ω/❑ sheet resistance, 11.63Ω-mm contact resistance, and $2.66x10^{-4}$Ω-cm^2 specific contact resistivity, compared with 7428Ω/❑, 46.35Ω-mm, and $4.62x10^{-3}$Ω-cm^2, respectively, for the MESFET material.

Secondary-ion mass spectroscopy (SIMS) showed that the Sn-doped layer was thinner in the ε/α structure, 13.24nm, compared with 26.12nm in the all α material.

The researchers point out: "Normally, a wider Sn distribution range allows more Sn^{4+} ions to diffuse into the Ga_2O_3 epi-layer, replacing a greater number of Ga^{3+} ions with Sn^{4+}. This substitution effectively reduces resistivity. However, contrary to this expectation, ε-Ga_2O_3/α-Ga_2O_3 demonstrates a lower R_{sh} and higher electron density compared to α-Ga_2O_3 as characterized in TLM and Hall-effect measurements. Previous research has predicted that polarization charges are induced at the ε-Ga_2O_3/α-Ga_2O_3 heterojunction. It is therefore presumed that these induced polarization charges increase the electron density, thereby reducing R_{sh}."

The HFET showed much better performance for almost all the usual transistor characteristics (Table b). The more negative threshold (V_t) might be seen as a drawback for the normally-off performance often desired in power systems. This threshold behavior is a natural result of the higher carrier concentration in the channel for the ε-Ga_2O_3/α-Ga_2O_3 HFET structure.

The off-state leakage was dominated by current flow through the gate. The team comments that this may be due to "surface leakage paths caused by electrons hopping through the surface traps in the off-state," adding: "The higher lattice mismatch between α-Ga_2O_3 and the r-plane sapphire substrate results in a higher density of surface traps, increasing surface leakage and I_G."

The HFET also demonstrated a smaller degradation in performance between room temperature (300K) and 450K. The researchers write: "The better thermal stability of ε-Ga_2O_3/α-Ga_2O_3 HFET is attributed to the conduction-band offset at the heterointerface, which acts as a barrier to confine electrons within the channel region, even at 450K."

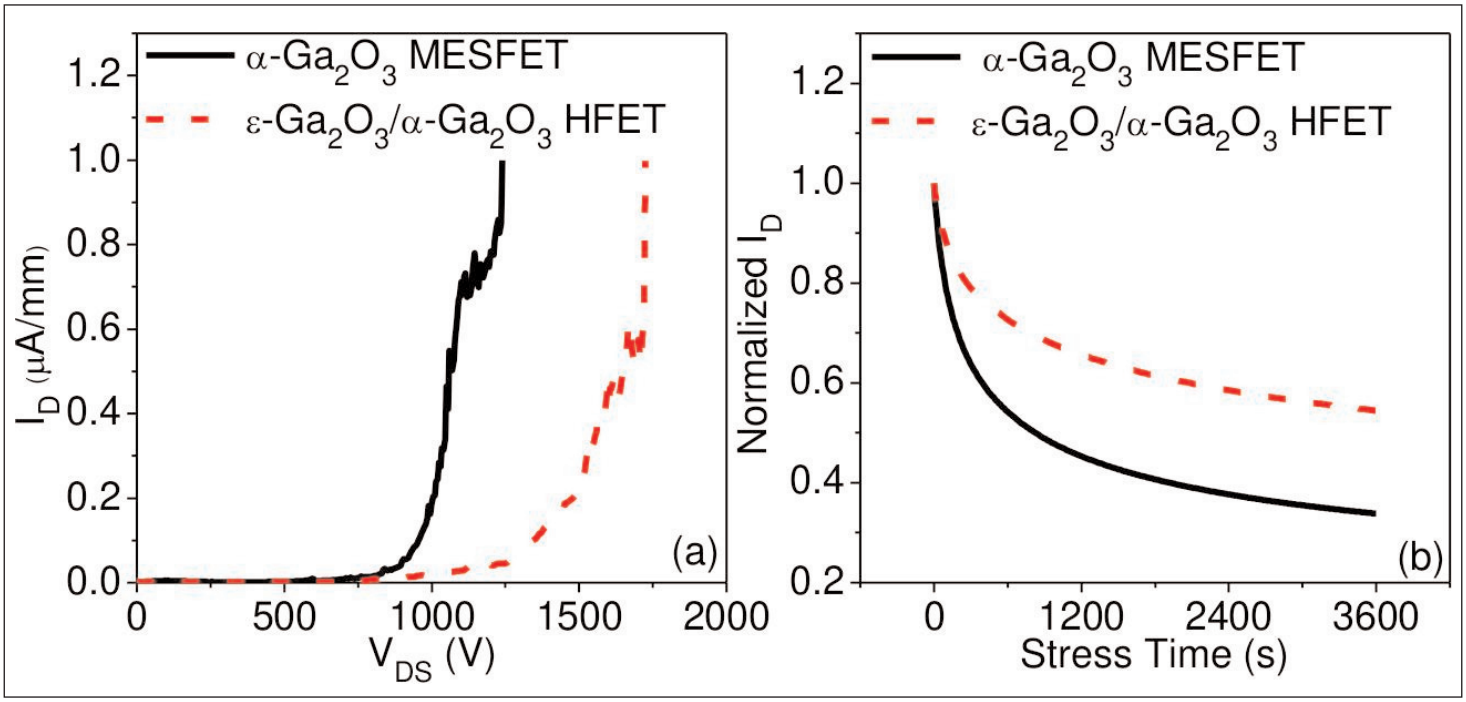

Figure 2. (a) Off-state breakdown voltage and (b) I_D variation during drain stress test for α-Ga_2O_3 MESFET and ε-Ga_2O_3/α-Ga_2O_3 HFET with Sn-doped channel layers.

The higher off-state breakdown (Figure 2), and lower on-resistance lead to a high power figure-of-merit ($V_{BD}^2/R_{on,sp}$) of 60.48MW/cm^2. The researchers comment: "The smaller Sn distribution range in ε-Ga_2O_3/α-Ga_2O_3 heterostructure shows that electrons are well-confined within a localized region, effectively suppressing leakage current and subsequently enhancing V_{BD}."

Drain bias stress testing was carried out at 0V V_{GS} and 20V V_{DS}. Over the 3600 seconds (also known as 1 hour) of the test, the drain current in the HFET degraded by 45.6%, compared with 66.2% for the homostructure MESFET. The team comments: "The relatively stable I_D variation in the α-Ga_2O_3/α-Ga_2O_3 HFET indicates that trapping effects are less significant compared to those in the α-Ga_2O_3 MESFET." ■

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Tel: +1 408 748 0100
Fax: +1 408 748 0111
Contact Person: Cathy W. Hung
E-mail: sales@tecdia.com
www.tecdia.com

Wafer Technology Ltd
34 Maryland Road, Tongwell,
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www.wafertech.co.uk
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www.waferworld.com

4 Epiwafer foundry

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Unit 5 Chesterton Mills,
French's Road, Cambridge CB4 3NP,
UK
Tel: +44 (0)1223 352244
Fax: +44 (0)1223 352444
www.camchem.co.uk

Intelligent Epitaxy Technology Inc
1250 E Collins Blvd,
Richardson, TX 75081-2401,
USA
Tel: +1 972 234 0068
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www.intelliepi.com

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Quebec H9R 6A8, Canada
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Fax: +1 514 630 0227
www.thefoxgroupinc.com

5 Deposition materials

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USA
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Fax: +1 716 833 2926
www.williams-adv.com

Matheson Tri-Gas
6775 Central Avenue,
Newark, CA 94560, USA
Tel: +1 510 793 2559
Fax: +1 510 790 6241
www.mathesontrigas.com

Nouryon Functional Chemicals B.V.
Zutphenseweg 10, 7418 AJ
Deventer,
The Netherlands
Tel. +31 652 478554
https://hpmo.nouryon.com

Praxair Electronics
542 Route 303,
Orangeburg, NY 10962,
USA
Tel: +1 845 398 8242
Fax: +1 845 398 8304
www.praxair.com/electronics

Vital Thin Film Materials (Guangdong) Co Ltd (Vital Materials subsidiary)
18G, 18th Floor, Shenzhen Free
Trade Centre, No.111 Taizi Road,
Nanshan District,
Shenzhen, Guangdong, China 518067
Tel: (+86) 0755-21651348
sales@vitaltfm.com

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6 Deposition equipment

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Fax: +49 2407 9030 40
www.aixtron.com

ETC (LPE subsidiary)
Via Falzarego, 820021 Baranzate (Mi),
Italy
Tel: +39 02 383 41 51
Fax: +39 02 383 06 118
www.lpe-epi.com

Evatec AG
Hauptstrasse 1a,
CH-9477 Trübbach,
Switzerland
Tel: +41 81 403 8000
Fax: +41 81 403 8001
www.evatecnet.com

FHR Anlagenbau Gmbh
(Vital Materials subsidiary)
Am Hügel 2, D-01458
Ottendorf-Okrilla,
Germany
Tel: +49 35205 520-0
E-mail: sales@fhr.de
E-mail: sales@vitalchem.com
www.fhr.biz
Vital Materials is the world's leading producer of rare metals as well as the first Chinese manufacturer to deliver G11 rotary ITO target. Vital is also one of the world's three major supplier of infrared materials, a key supplier of compound semiconductor substrates, and a strategic partner of the world's largest thin film solar manufacturer.

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Fax: +39 02 383 06 118
www.lpe-epi.com

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Austria
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www.plansee.com

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Fax: +1 727 577 7035
www.plasmatherm.com

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Veeco Instruments Inc
100 Sunnyside Blvd.,
Woodbury, NY 11797,
USA
Tel: +1 516 677 0200
Fax: +1 516 714 1231
www.veeco.com

7 Wafer processing materials

Kayaku Advanced Materials Inc
200 Flanders Road,
Westborough, MA 01581,
USA
Tel: +1 617 965 5511
www.kayakuam.com

Praxair Electronics
(see section 5 for full contact details)

Versum Materials
8555 S. River Parkway,
Tempe, AZ 85284,
USA
Tel: +1 602 282 1000
www.versummaterials.com

8 Wafer processing equipment

Evatec AG
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Fax: +41 81 403 8001
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Plasma-Therm LLC
(see section 6 for full contact details)

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Fax: +1 408 734 0961
www.samcointl.com

SPTS Technology Ltd
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Wales, UK
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Fax: +44 (0)1633 414141
www.spts.com

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85748 Garching, Germany
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Fax: +49 89 32007 162
www.suss.com

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1024 Ecublens,
Switzerland
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Fax +41 21 694 35 01
www.synova.ch

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
Email: sales@tecdia.com
www.tecdia.com

Veeco Instruments Inc
(see section 6 for full contact details)

9 Materials & metals

Goodfellow Cambridge Ltd
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Cambridgeshire PE29 6WR, UK
Tel: +44 (0) 1480 424800
Fax: +44 (0) 1480 424900
www.goodfellow.com

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6600 Reutte,
Austria
Tel: +43 5672 600 2422
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www.plansee.com

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Tel: +1 408 748 0100
Fax: +1 408 748 0111
www.tecdia.com

10 Gas and liquid handling equipment

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12 Trafalgar Way, Bar Hill,
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www.cambridge-fluid.com

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www.iemtec.com

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www.versummaterials.com

11 Process monitoring and control

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USA
Tel: +1 800 223 2389
Tel: +1 716 684 4500
www.conaxtechnologies.com

k-Space Associates Inc
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USA
Tel: +1 734 426 7977
Fax: +1 734 426 7955
www.k-space.com

KLA-Tencor
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CA 95035, USA
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Fax: +1 408 875 4144
www.kla-tencor.com

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www.vacuumbarrier.com

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Tel: +49 7723 9197 0
Fax: +49 7723 9197 22
www.wepcontrol.com

12 Inspection equipment

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Tel: +49 (0)721 595 2888
Fax: +49 (0)721 595 4587
www.bruker.com

KLA–Tencor
160 Rio Robles, Suite 103D,
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USA
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Fax: +1 510 456-2498
www.kla-tencor.com

13 Characterization equipment

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Fax: +1 402 477 8214
www.jawoollam.com

Lake Shore Cryotronics Inc
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Westerville, OH 43082, USA
Tel: +1 614 891 2244
Fax: +1 614 818 1600
www.lakeshore.com

14 Chip test equipment

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Fax: +1 203-250-7389
www.riff-co.com

Tektronix Inc
14150 SW Karl Braun Drive,
P.O.Box 500, OR 97077, USA
www.tek.com

15 Assembly/packaging materials

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4926 Spicewood Springs Road,
Austin, TX 78759, USA
Tel: +1 512 231 8083
Fax: +1 512 231 8183
www.epak.com

Gel-Pak
31398 Huntwood Avenue,
Hayward, CA 94544, USA
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Fax: +1 510 576 2282
www.gelpak.com

Wafer World Inc
(see section 3 for full contact details)

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Tel: +1 716 837 1000
Fax: +1 716 833 2926
www.williams-adv.com

16 Assembly/packaging equipment

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www.cstglobal.uk

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Fax: +1 215 784 6001
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Fax: +1 508-832-0506
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www.pi-usa.us

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www.tecdia.com

17 Assembly/packaging foundry

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Fax: +1 8586 74 4681
www.quikicpak.com

18 Chip foundry

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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

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3838 Western Way NE,
Albany, OR 97321, USA
Tel: +1 541 917 3626
www.rena-na.com

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www.vacuumbarrier.com

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20 Facility consumables

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Fax: +1 410 506 8749
www.gore.com

21 Computer hardware & software

Crosslight Software Inc
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Canada
Tel: +1 604 320 1704
Fax: +1 604 320 1734
www.crosslight.com

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Fax: +1 804 740 3814
www.semitech.us

22 Used equipment

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24 Resources

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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

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8–11 September 2025
51st IEEE European Solid-State Electronics Research Conference (ESSERC 2025)
Munich, Germany
E-mail:esserc@sistemacongressi.com
www.esserc2025.org

10–12 September 2025
SEMICON Taiwan 2025
TaiNEX 1&2, Taipei, Taiwan
E-mail: semicontaiwan@semi.org
www.semicontaiwan.org

10–12 September 2025
China International Optoelectronic Exposition (CIOE 2025)
Shenzhen, Guangdong, China
E-mail: cioe@cioe.cn
www.cioe.cn/en

10–12 September 2025
The 7th Shenzhen International Semiconductor Exhibition (SEMI-e 2025)
Shenzhen, Guangdong, China
E-mail: Info.Semi-e@informa.com
www.semi-e.com/email/2025/web/Brief.html

14–19 September 2025
22nd International Conference on Silicon Carbide and Related Materials (ICSCRM 2025)
BEXCO, Busan, South Korea
E-mail: icscrm2025@benepeople.co.kr
www.icscrm2025.org

21–24 September 2025
8th International Workshop on Ultra-Wide Bandgap Materials and Devices (IWUMD-2025)
Congress Centre, Wroclaw University of Science and Technology (WUST), Wroclaw, Poland
E-mail: iwumd2025@pwr.edu.pl
https://iwumd2025.pwr.edu.pl/

21–26 September 2025
28th European Microwave Week (EuMW 2025)
Jaarbeurs, Utrecht, The Netherlands
E-mail: eumwreg@itnint.com
www.eumweek.com

22–26 September 2025
42nd European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC 2025)
BEC Bilbao Exhibition Centre, Bilbao, Spain
E-mail: pv.conference@wip-munich.de
www.eupvsec.org

24–25 September 2025
Microelectronics UK
Excel, London
E-mail: Enquiries@microelectronicsuk.com
www.microelectronicsuk.com

24–26 September 2025
International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management

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Shanghai New International Expo Centre,
Shanghai, China
E-mail:pcimasia@china.messefrankfurt.com
www.pcimasia-expo.com

28 September – 2 October 2025
ECOC 2025: 51st European Conference on Optical Communication
Bella Center, Copenhagen, Denmark
E-mail:ecoc2025@cap-partner.eu
www.ecoc2025.org

7–9 October 2025
SEMICON West 2025
Phoenix, AZ, USA
E-mail: semiconwest@semi.org
www.semiconwest.org

7–11 October 2025
48th International Semiconductor Conference — CAS 2025
Hotel Sinaia,
Sinaia, Romania
E-mail: cas@imt.ro
www.imt.ro/cas

8–10 October 2025
23rd International Symposium on POWER ELECTRONICS Ee2025
Novi Sad/Belgrade, Serbia
E-mail: dee@uns.ac.rs
www.dee.uns.ac.rs

12–15 October 2025
2025 IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS)
Scottsdale, AZ, USA
E-mail: cs@cshawevent.com
www.bcicts.org

10–12 November 2025
12th IEEE Workshop on Wide Bandgap Power Devices & Applications (WiPDA 2025)
Fayetteville, AR, USA
E-mail: admin@wipda-europe.org
https://wipda.org/

18–21 November 2025
SEMICON Europa 2025
Messe München, Munich, Germany
E-mail: semiconeuropa@semi.org
www.semiconeuropa.org

30 November – 5 December 2025
2025 Materials Research Society (MRS) Fall Meeting & Exhibit
Hynes Convention Center,
Boston, MA, USA
E-mail: info@mrs.org
www.mrs.org/meetings-events/fall-meetingsexhibits/2024-mrs-fall-meeting

6–10 December 2025
71st annual IEEE International Electron Devices Meeting (IEDM 2025)
Hilton San Francisco Union Square Hotel,
San Francisco, CA, USA
E-mail: iedm-info@ieee.org
www.ieee-iedm.org

4–6 February 2026
Asia Photonics Expo (APE 2026)
Level 1, Sands Expo & Convention Centre
(Marina Bay Sands),
Singapore
E-mail: visitors-ape@informa.com
www.asiaphotonicsexpo.com

11–13 February 2026
SEMICON Korea 2026
Korea World Trade Tower,
Seoul, South Korea
E-mail: semiconkorea@semi.org
www.semiconkorea.org/en

15–19 February 2026
2026 IEEE International Solid- State Circuits Conference (ISSCC 2026)
San Francisco, CA USA
E-mail: Isscinfo@yesevents.com
www.isscc.org

15–19 March 2026
Optical Fiber Communication Conference and Exhibition (OFC 2026)
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)
Henry B Gonzalez Convention Center,
San Antonio, TX, USA
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