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COMPOUNDS & ADVANCED SILICON

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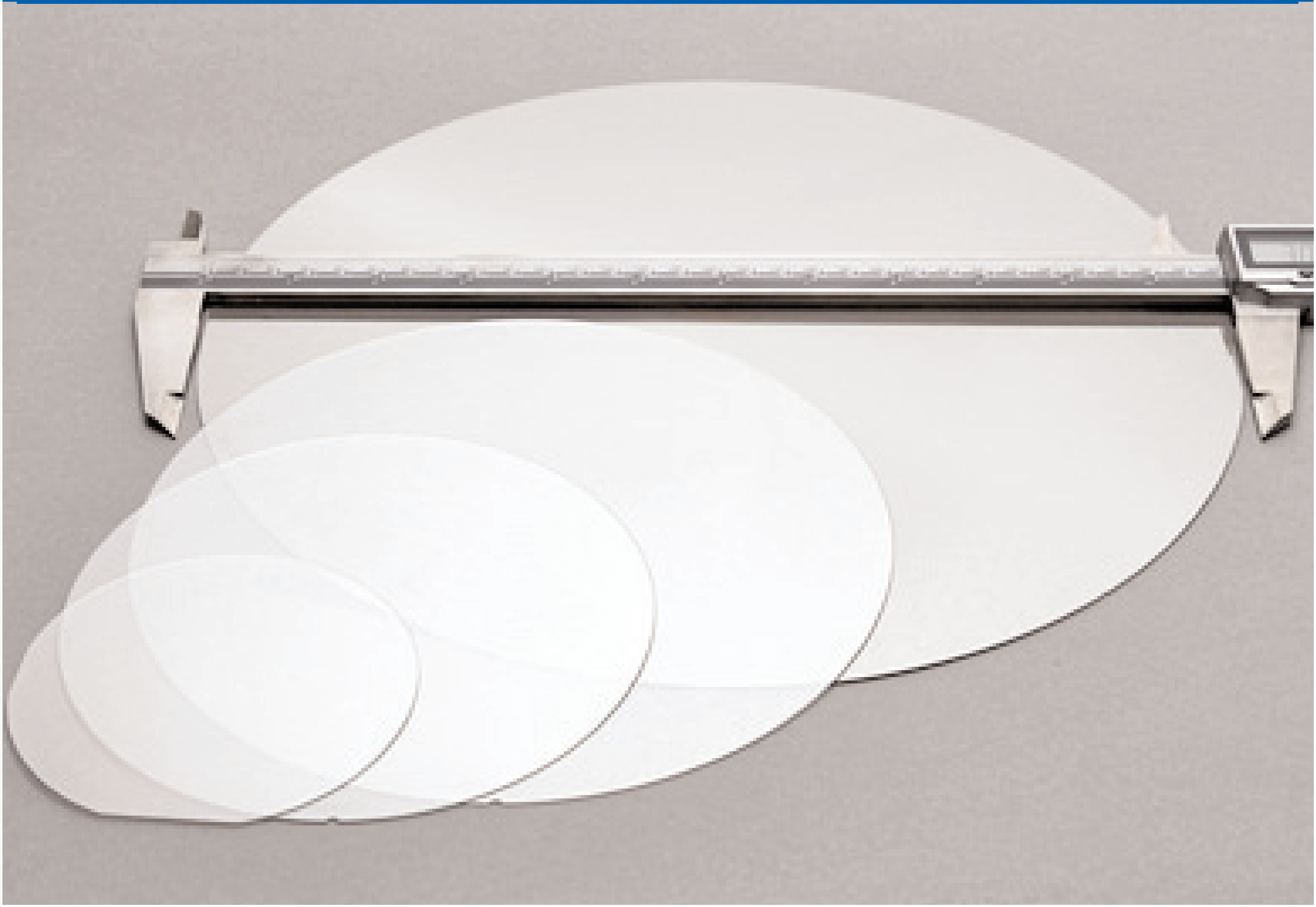
Wolfspeed produces first single-crystal 300mm SiC wafer



US gallium production funded • Navitas samples 3300V & 2300V SiC
US orders HieFo to divest Emcore InP assets • VisIC raises $26m

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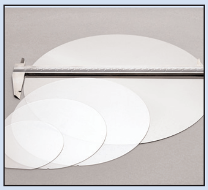

Cover image: Wolfspeed has produced the first single-crystal 300mm silicon carbide wafer, targeted at next-generation computing platforms, immersive AR/VR systems and high-efficiency, advanced power devices. **p12**

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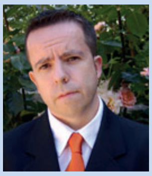

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***Semiconductor Today* covers the R&D and manufacturing of compound semiconductor and advanced silicon materials and devices** (e.g. GaAs, InP and SiGe wafers, chips and modules for microelectronic and optoelectronic devices such as RFICs, lasers 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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Co-packaged optics market to grow at 37% CAGR to $20bn by 2036

Migration of optical engine closer to switching silicon transforming network and AI architecture

In its new report ‘Co-Packaged Optics (CPO) 2026-2036: Technologies, Market, and Forecasts’ by principal technology analyst Dr Yu-Han Chang, market research firm IDTechEx notes that, in recent years, optical transceiver technology has been steadily shifting toward placing the optics closer to the ASIC. Traditionally, pluggable modules inserted into the front panel of a switch sit at the edge of the printed circuit board and have long served as the standard solution for connecting switches and servers in data centers. They remain popular for their flexibility, ease of replacement, and straightforward scaling. However, they face growing challenges, especially rising power consumption and limits on how much bandwidth can be delivered per unit of front-panel area.

To address these constraints, the industry has begun migrating the optical engine closer to the switch ASIC in an effort to shorten the copper trace used for electrical signalling. Although these near-packaged approaches improve electrical performance, they still diverge from the well-established pluggable ecosystem, and key limitations remain. As a result, many in the industry expect the transition to progress directly toward fully integrated solutions such as co-packaged optics.

Importance of advanced packaging technologies for co-packaged optics

Traditional pluggable optical modules are increasingly constrained by signal loss, power consumption and latency because they require long electrical traces between the switch ASIC and the optical engine. Co-packaged optics overcomes these limitations by placing the optical engine much closer to the switching silicon. Its success depends on advanced semiconductor packaging technologies that enable high-density integration of photonic and electronic ICs, along with the seamless attachment of optical engines to switch ASICs or XPUs. This requires a range of packaging approaches, including 2.5D interposers, through-silicon vias (TSVs), fan-out wafer-level packaging (FO-WLP) and, more recently, 3D integration supported by hybrid bonding.

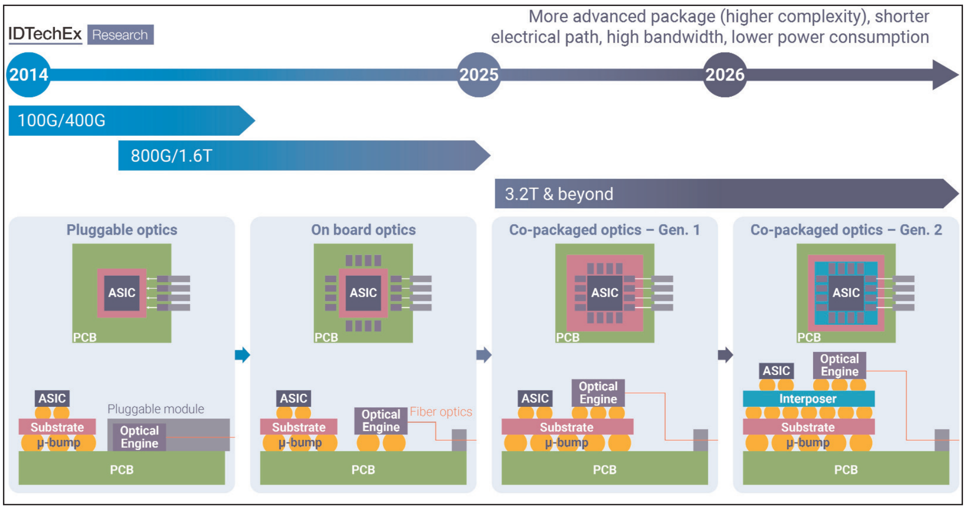
At its GPU Technology Conference (GTC 2025), NVIDIA introduced two new networking switch platforms, Spectrum X Photonics and Quantum X Photonics, both built on co packaged optics. Central to these platforms is TSMC’s System on Integrated Chips technology, which provides the 3D integration infrastructure for NVIDIA’s design. The SoIC X variant, TSMC’s advanced bumpless hybrid bonding process, enables vertical stacking of logic dies and other heterogeneous components at sub-ten-micron pitch. This dramatically shortens interconnect length and reduces resistance and latency.

Other major players, including Broadcom, have also adopted TSMC’s COUPE platform, underscoring the growing importance of 3D integration and hybrid bonding in CPO.

Co-packaged optics market trajectory

IDTechEx forecasts that the co-packaged optics market will rise at a robust compound annual growth rate (CAGR) of 37% from 2026 to more than $20bn by 2036. CPO network switches are expected to dominate revenue generation, driven by each switch potentially incorporating up to 16 CPO photonic integrated circuits (PICs). Optical interconnects for AI systems will constitute about 10% of the market, with each AI accelerator typically utilizing one optical interconnect PIC to meet increasing demands for high-speed data processing and communication in advanced computing applications.

www.IDTechEx.com/CPO



Key trends of optical transceivers in high-end data centers. Source: IDTechEx.

Swansea's CISM to lead new UK Centre for Doctoral Training in semiconductor skills

Centre for Integrative Semiconductor Materials to collaborate with University of Leeds

Swansea University is to lead a major national initiative to address the UK's semiconductor skills gap with the launch of a new Centre for Doctoral Training (CDT) in semiconductor skills.

The UK Semiconductor Industry Future Skills (UK-SIFS) CDT will be led by Swansea University's Centre for Integrative Semiconductor Materials (CISM) in close collaboration with the University of Leeds, and is backed by the UK Government Department for Science, Innovation and Technology as part of its broader Industrial Strategy.

The CDT will deliver advanced doctoral-level training in semiconductor skills that are critical to the UK's ambitions for a resilient and competitive semiconductor manufacturing sector.


The CISM building at Swansea University's Bay Campus.

By combining rigorous academic research with industry-embedded training, UK-SIFS aims to produce a pipeline of up to 60 highly skilled PhD students over five cohorts, who will be equipped to drive innovation and meet the technical demands of next-generation semiconductor technologies.

Students will engage in four-year research projects in partnership with leading UK companies in semiconductors and related sectors. The program will offer flexible training pathways, including part-time study and opportunities for professionals to undertake research projects with their current employers while continuing their professional development. A key focus will be on retraining talent from other high-skill industries where opportunities are diminishing to ensure a robust and adaptable workforce for the future.

UK-SIFS represents a joint investment of about £18m, including £10m from the UK Government Department for Science, Innovation and Technology with additional contributions from Swansea University, the University of Leeds, and 24 industry and civic mission partners.

Training and research will take place in cleanroom facilities at Swansea's CISM and the Bragg Centre for Materials Research at Leeds — which together represent over £80m in investment. These facilities are designed to be industrially relevant, offering services such as start-up incubation to further support the UK semiconductor ecosystem.

"UK-SIFS is a completely different way of thinking about doctoral training for the UK semiconductor sector – flexible, practical training coupled with industrially relevant, world-class research," says professor Paul Meredith, CISM director and UK-SIFS co-director.

"UK-SIFS will support a wide range of cutting-edge projects from across science and engineering, training the future highly skilled and diverse workforce needed by the semiconductor sector," says UF-SIFS co-director professor Edmund Linfield, director of the Bragg Centre for Materials Research at Leeds University.

"We need to accelerate and diversify workforce provision, and this is especially important to support rapid growth of the semiconductor manufacturing Cluster in South Wales, driven by significant investment by multi-nationals such as Vishay, KLA, Microchip and IQE," comments Howard Rupprecht, managing director of CSconnected Ltd.

"The UK:SIFS CDT announcement marks the beginning of a hugely exciting and vital investment in the future of the UK's semiconductor capability and the next generation of world-leading scientists in the area," believes professor Charles JM Footer, QinetiQ Fellow. "At QinetiQ, we recognise the strategic importance of developing a highly skilled workforce to support sovereign advanced manufacturing and national security, and we look forward very much to collaborating with the CDT."

www.swansea.ac.uk/research/research-with-us/postgraduate-research/doctoral-training-programmes/uk-sifs

Cloudberry launches Europe's first semiconductor venture fund

Fund focusing on semiconductors, photonics and advanced materials to advance compute, connectivity, sensing and power

Helsinki- and London-based venture capital firm Cloudberry has launched Europe's first semiconductor venture fund with an initial close of €30m. The fund invests in companies advancing the technological frontier with semiconductors, photonics and advanced materials to advance compute, connectivity, sensing and power.

Anchored by Finnish state-owned investment company Tesi, Cloudberry's fund is supported by international LPs across Europe, Asia and the USA, including GlobalFoundries, Radiant OptoElectronics, and numerous family offices and angel investors. Other than Tesi's support, the fund has secured 85% of its capital from outside Finland.

The launch comes as Europe accelerates its EU Chips Act, a €43bn initiative to double the continent's global semiconductor market share to 20% by 2030. The act aims to ensure Europe's capacity in advanced chip design and manufacturing, strengthening resilience across global supply chains.

Beyond recent policy shifts, the semiconductor and photonics industries are expanding rapidly. Together, they form a global market of about US$1.5trillion, expected to surpass US$2 trillion within the decade. Both sectors continue to grow faster than global GDP and underpin strategically critical industries in AI, space, telecoms, and defence.

"We see this as the start of a long-term effort to build Europe's semiconductor ecosystem," says Veera Pietikäinen, founding partner at Cloudberry. "Europe has world-class talent and deep technology capabilities in semiconductors and photonics, but has lacked investors who truly understand how to support and scale them. We are now building a specialist platform that helps these companies grow and strengthen Europe's technological sovereignty in the process."

In Europe, the photonics sector includes more than 5000 companies and employs over 430,000 people, while the semiconductor industry adds hundreds of thousands more across design, materials, equipment, packaging and specialized R&D. Despite their strategic importance, most investment still flows to large manufacturing and infrastructure projects, leaving early-stage innovation and deep-tech ventures underfunded.

Cloudberry aims to close this gap by investing up to €1m in pre-seed and seed rounds as well as maintaining sufficient reserves to support portfolio companies as they scale. The team plans to invest in up to 20 companies across Europe, ranging from early R&D spinouts to teams commercializing innovations within the fund's core focus areas of semiconductors, photonics and advanced materials.

"The Cloudberry team, experienced deep-tech investors and industry operators with broad networks, are in a good position to capture value in domains that not only have significant market opportunities but also advance strategically critical technologies," believes Asseri Lehtiniemi, investment director in Tesi's Fund Investments team. "Finland has a strong legacy of innovation in semiconductors and photonics, so the new fund is a welcome addition to the local VC ecosystem."

Cloudberry's long-term ambition is to build Europe's leading platform for semiconductor investment and support, spanning from early-stage to growth-stage capital. The firm's team combines decades of operational, technical and venture expertise from companies such as ASML, Bosch, Heptagon and leading deep-tech VC firms, giving Cloudberry what it claims is a unique ability to identify and scale Europe's most promising semiconductor innovators.

"The semiconductor industry requires investors who understand technical complexity and the rigorous qualification needed to build strong foundry partnerships," says Manfred Horstmann, general manager & senior VP at GlobalFoundries Europe. "We are committed to supporting the next generation of innovators as they scale from prototype to volume, and we can help them reach global scale. Cloudberry's focused approach fills a crucial gap in early-stage hardware funding, giving these companies the backing and expertise they need to grow," he adds.

"Cloudberry connects us directly to Europe's semiconductor and photonics ecosystem," says Radiant Opto-Electronics' chairman & president Justin Wang. "We've expanded significantly in the Nordics because the region is central to next-generation materials and optics. This partnership gives us early visibility to the teams building these breakthroughs."

www.cloudberry.vc

Move2Thz project targets sustainable InP-on-silicon platform and European ecosystem upscaling to mass market sub-THz applications

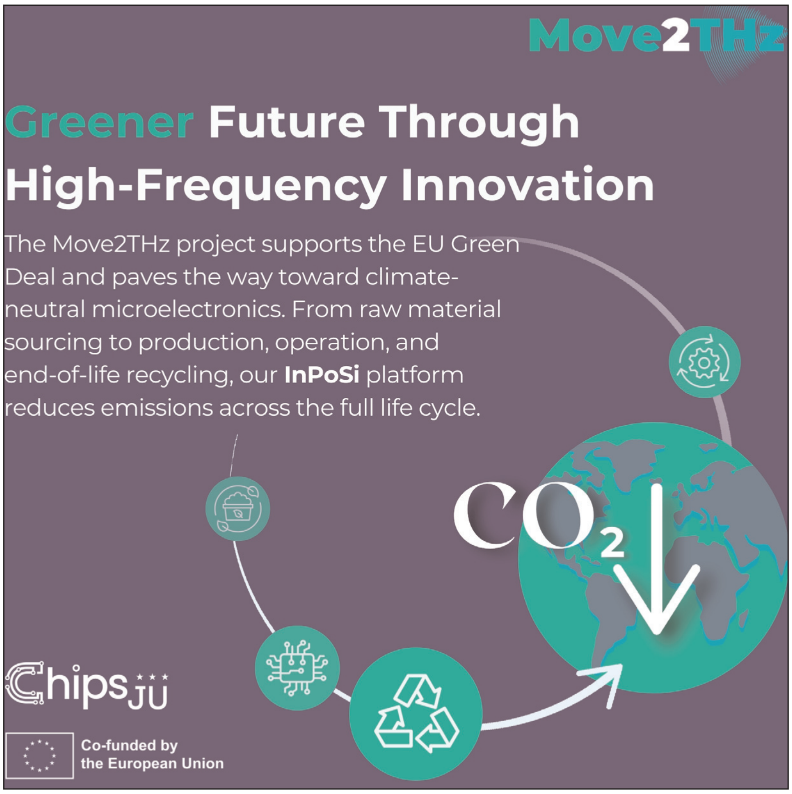
Smart Cut process for InP donor wafer reuse to enable more than tenfold reduction in raw material usage

Move2Thz — Sustainable Indium Phosphide (InP) platform and ecosystem upscaling, enabling future mass market (sub-)THz applications — is a collaborative project to address existing indium phosphide (InP) shortcomings and build a mature European ecosystem to obtain a commercially and industry-viable platform for use in various mass-market applications utilizing the higher-frequency spectrum towards THz and beyond.

The Move2THz project directly supports the policy objectives of the European Green Deal — the European Union (EU) roadmap to make Europe the first climate-neutral continent by 2050. In line with this vision, the project promotes sustainable growth and technological sovereignty by advancing resource-efficient innovation in next-generation semiconductor technologies. By developing an indium phosphide-on-silicon (InPoSi) platform, Move2THz aims to introduce a new era of high-frequency performance that is both environmentally responsible and commercially viable. The project reduces dependence on scarce materials, lowers the ecological footprint of manufacturing, and strengthens Europe's circular economy by creating a fully integrated and sustainable value chain.

Reducing CO_2 footprint across the entire product life cycle

Green Innovation is a key objective of the Move2THz project, aiming to achieve sustainable carbon efficiency by reducing emissions throughout the entire product life cycle — from raw material sourcing to production, operation, and end-of-life recycling.



Greener Future Through High-Frequency Innovation

The Move2THz project supports the EU Green Deal and paves the way toward climate-neutral microelectronics. From raw material sourcing to production, operation, and end-of-life recycling, our **InPoSi** platform reduces emissions across the full life cycle.

This 'cradle-to-grave' approach ensures that sustainability is embedded in every phase of technology development. By optimizing the InP-on-silicon manufacturing process, Move2THz lowers energy consumption, minimizes the use of rare materials, and promotes resource-efficient wafer production, supported by eco-friendly supply chains within Europe.

The project also aims to quantify and demonstrate measurable CO_2 reductions using life cycle assessment (LCA) methodologies to evaluate environmental impact at each stage. These actions form the foundation for all sustainability efforts within Move2THz — ensuring that high technological performance goes hand in hand with measurable climate impact reduction and long-term environmental responsibility.

Smart and sustainable use of resources

In line with these goals, Move2THz is pioneering new ways to drastically reduce the consumption of indium phosphide (InP, one of the rare and resource-intensive materials in semiconductor manufacturing). Using the Smart Cut process and its wafer reclaiming capability, the project enables each InP donor wafer to be reused multiple times, achieving more than a tenfold reduction in raw material usage. This not only minimizes production waste and environmental impact but also reinforces Europe's ability to secure a sustainable and resilient semiconductor supply for future generations of wireless technologies. Through such resource-efficient innovation, Move2THz demonstrates how advanced microelectronics can drive technological progress while respecting environmental limits and contributing to Europe's path toward climate neutrality.

Together, it is reckoned that these efforts show how Move2THz can translate sustainability principles into tangible results — combining innovation, resource efficiency, and industrial excellence to help shape a globally competitive, lower-carbon semiconductor future.

www.move2thz.eu

CEA-Leti and ST demo path to fully monolithic silicon RF front-ends with 3D sequential integration

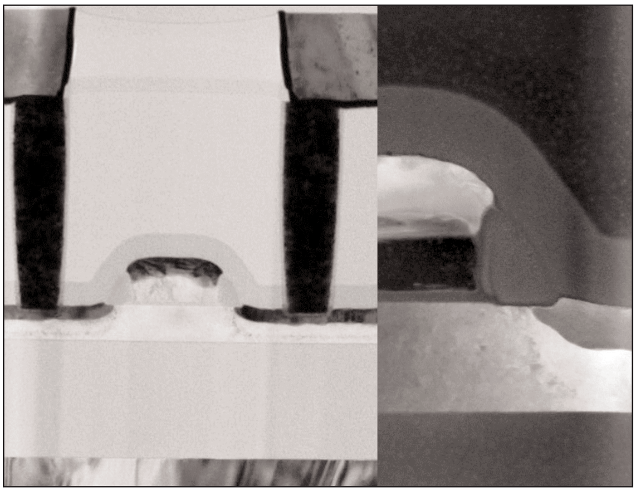
Wafer-level assembly of SiGe HBT, RF SOI and passive technologies allows dense co-integration of best-in class functions

At the 71st IEEE International Electron Devices Meeting (IEDM 2025) in San Francisco (6–10 December), micro/nanotechnology R&D center CEA-Leti of Grenoble, France and STMicroelectronics of Geneva, Switzerland presented results showcasing key enablers for a new high-performance and versatile RF silicon platform cointegrating best-in-class active and passive devices used in RF and optical front-end modules (FEM). Their paper details 3D sequential integration of silicon-germanium (SiGe) heterojunction bipolar transistors (HBT), RF silicon-on-insulator (SOI) switches, and high-quality passives on a single wafer — opening a path to highly integrated, low parasitic, and targeting cost-efficient systems for next-generation wireless and wireline communications.

The paper 'Unlocking High-Performance Si RF Platforms with SiGe HBT and RFSOI Switch Technologies' describes how those high-performance components can be built directly on the same silicon wafer rather than packaged or stacked as separate chips. This can be achieved through 3D sequential integration, which layers different device types, such as SiGe HBT and SOI CMOS switches, without overheating the lower tiers during processing.

Efficient and cost-effective

"Our team has shown that high-performance SiGe HBT has been conceived to be compatible with the top-tier fabrication steps, and that trap-rich isolation can be localized and thermally robust, and low-temperature (600°C) SOI switches can match state-of-the-art figures of merits," says CEA-Leti's Thibaud Fache, lead author of the paper. "These results pave the way to an all-silicon RF front-end module that is efficient and cost-effective," he adds.



TEM cross section of 600°C RF switch processed on standard TR commercial wafer. (Photo: Julie Loche/STMicroelectronics.)

The team showed that a localized trap-rich layer can achieve RF isolation and linearity comparable to costly commercial trap-rich substrates, while withstanding thermal cycles up to 600°C — preserving the performance of the underlying SiGe HBT layer.

From advanced research to manufacturable solutions'

By extending silicon's reach of sequential integration into the RF domain, the CEA-Leti/ST team's work points to a future of more accessible, energy-efficient connectivity. Fully integrated RF and optical front ends could simplify manufacturing and enable cost-effective deployment of dense wireless networks essential for smart cities, autonomous systems, and AI data centers.

"This joint result demonstrates a credible path from advanced research to manufacturable solutions," says co-author Thomas Bordignon of ST. "By combining CEA-Leti's sequential integration know-how with ST's RF technology expertise, we're enabling the co-integration of state-of-the-art SiGe HBT, switches & passive devices that are key elements of the FEM."

Materials science milestone

Achieving a functioning RF partially depleted (PD) SOI switch at 600°C rather than standard ~1000°C is a first. Also, the process flow of this low-temperature device does not rely on new equipment or costly steps and is thus quickly industrially viable due to the relatively relaxed thermal budget constraints of the bottom tier (600°C). The team demonstrated high-quality, low-loss RF switches fabricated at 600°C, maintaining the performance of the SiGe HBT below and confirming the feasibility of a fully integrated silicon RF platform.

Additional breakthrough presentation

CEA-Leti researchers also reported a breakthrough (session 33-4) with the design of high-performance silicon-on-insulator (SOI) MOSFETs processed at 400°C. NMOS and pMOS transistors demonstrate state-of-the-art performances among the back-end-of-line devices, fulfilling all industrial figures of merit without any compromise.

CEA-Leti says that this reliable versatile analog transistor targets More Than Moore applications bringing differential advantage for smart sensors, near memory computing and RF devices.

More details are in the paper '33-4 | High Performance 2.5V N&P 400°C SOI MOSFETs: A Breakthrough for Versatile 3D Sequential Integration'.

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Fraunhofer IAF and Max Planck Institute for Radio Astronomy provide low-noise amplifiers for ALMA radio telescope array

MPIfR assembles and qualifies modules incorporating IAF's InGaAs mHEMT-based MMICs

As one of the world's most powerful radio telescope facilities, the Atacama Large Millimeter/Submillimeter Array (ALMA) at 5000m above sea level on the Chajnantor Plateau in the Chilean Andes observes dark and distant regions of the universe by measuring the millimeter and submillimeter radiation emitted by cold molecular clouds (interstellar gas clouds with a temperature of only a few tens of Kelvin, in which stars form when the density and temperature are right) in order to better understand how stars, planets, galaxies and life are formed.

ALMA has a total of 66 individual parabolic antennas with diameters of 12m or 7m, each equipped with high-frequency receivers for ten wavelength ranges (ALMA bands) between 6mm and 8.6mm (35–50GHz) and 0.3mm and 0.4mm (787–950GHz) in the electromagnetic spectrum.

For Band 2, which covers wavelengths from 2.6mm to 4.5mm (67–116GHz), Germany's Fraunhofer Institute for Applied Solid State Physics IAF in Freiburg and the Max Planck Institute for Radio Astronomy (MPIfR) in Bonn have now provided 145 low-noise amplifiers (LNAs). So, all ALMA bands are now fully equipped for the first time.

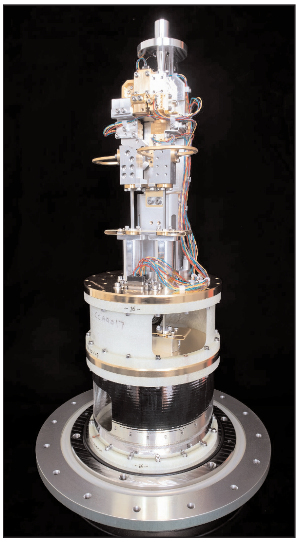
With ALMA's Band 2, researchers hope to gain a better understanding of the cold interstellar medium (a mixture of dust, gas, radiation and magnetic fields from which stars are formed). Complex organic molecules in nearby galaxies, which are considered precursors to biological building blocks, as well as planet-forming disks, will also be studied in greater detail thanks to the improved measurement capabilities.

Unique average noise temperature of 22K enables highly sensitive measurements in Band 2 of the ALMA telescopes

"The performance of receivers depends largely on the performance of the first high-frequency amplifiers installed in them," says Dr Fabian Thome, head of the subproject at Fraunhofer IAF. "Our technology is characterized by an average noise temperature of 22K, which is unmatched worldwide." With the new LNAs, signals can be amplified more than 300-fold in the first step. "This enables the ALMA receivers to measure millimeter and submillimeter radiation from the depths of the universe much more precisely and obtain better data," he adds. "We are incredibly proud that our LNA technology is helping us to better understand the origins of stars and entire galaxies."

Development, production and qualification of InGaAs mHEMT LNAs for ALMA

At the heart of the LNAs for ALMA's Band 2 are monolithic microwave integrated circuits (MMICs) based on indium gallium arsenide (InGaAs) metamorphic high-electron-mobility transistors (mHEMTs) developed by Fraunhofer IAF. The technology enables LNAs with particularly low noise temperatures, which significantly increases the sensitivity of the receivers. Low-noise amplifiers improve the quality of incoming signals by amplifying the signal while causing as little disruptive background noise as possible.



ALMA Band 2 high-frequency receiver (courtesy of NOVA/ESO).

Fraunhofer IAF and MPIfR were jointly commissioned by the European Southern Observatory (ESO), which operates ALMA in cooperation with other international institutions. Fraunhofer IAF was responsible for the specific design of the MMICs, their manufacturing, their testing at room temperature and the selection of the chips. MPIfR took over the modules' complex assembly and qualification, including cryogenic test measurements at 15K for use in the ALMA Band 2 receivers matching ESO specifications.

Operation of ALMA

ALMA is jointly operated by ESO, the US National Science Foundation (NSF) and the Japanese National Institutes of Natural Sciences (NINS) in cooperation with the Republic of Chile. ALMA is supported by ESO on behalf of its member countries (Belgium, Denmark, Germany, Finland, France, Great Britain, Ireland, Italy, the Netherlands, Austria, Poland, Portugal, Spain, Sweden, Switzerland, the Czech Republic, and the host country Chile), by the NSF in collaboration with the Canadian National Research Council (NRC), the Taiwanese National Science Council (NSC) and NINS in cooperation with the Academia Sinica (AS) in Taiwan and the Korea Astronomy and Space Science Institute (KASI).

www.iaf.fraunhofer.de/en/researchers/electronic-circuits.html
www.mpifr-bonn.mpg.de
www.eso.org/public/unitedkingdom/teles-instr/alma/?lang

Wolfspeed produces first single-crystal 300mm silicon carbide wafer

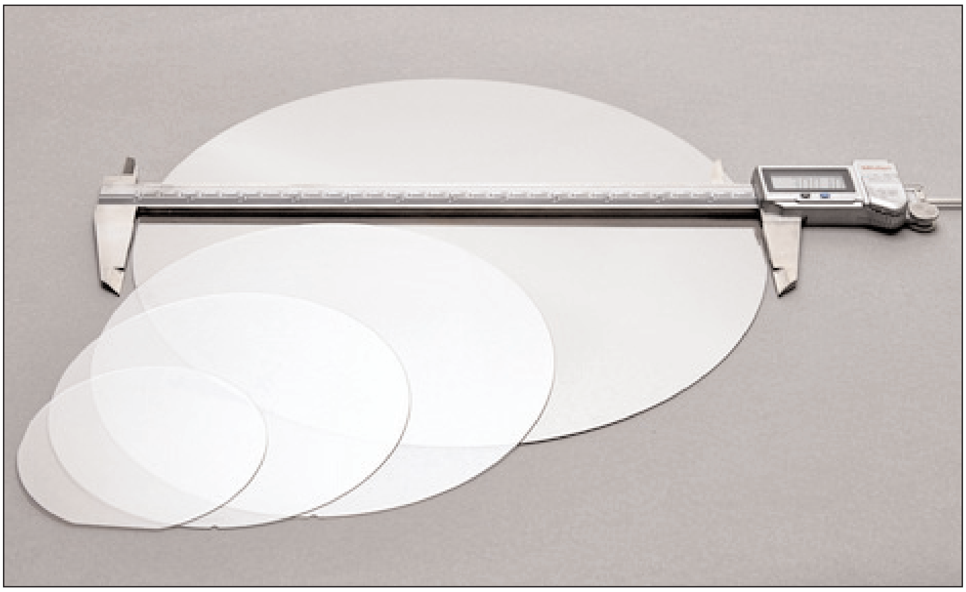
Scalable platform for powering AI infrastructure, AR/VR and advanced power devices

Wolfspeed Inc of Durham, NC, USA — which makes silicon carbide (SiC) materials and power semiconductor devices — has announced what it says is a significant industry milestone with the production of a single-crystal 300mm (12-inch) silicon carbide wafer. Backed by a silicon carbide IP portfolios comprising more than 2300 issued and pending patents worldwide, Wolfspeed is pioneering the transition to 300mm technology, establishing a path to future volume commercialization.

The technology advance is targeted at next-generation computing platforms, immersive augmented reality/virtual reality (AR/VR) systems, and high-efficiency, advanced power devices. By expanding silicon carbide to 300mm, Wolfspeed says it is boosting performance thresholds and manufacturing scalability for demanding semiconductor applications.

"Producing a 300mm single-crystal silicon carbide wafer is a significant technology achievement and the result of years of focused innovation in crystal growth, boule and wafer processing," says chief technology officer Elif Balkas. "It positions Wolfspeed to support the industry's most transformative technologies, especially critical elements of the AI ecosystem, immersive augmented and virtual reality systems, and other advanced power device applications."

Wolfspeed's 300mm platform will unify high-volume silicon carbide manufacturing for power electronics with advanced capabilities in high-purity semi-insulating substrates used in optical and RF systems. Such convergence can support a new class of wafer-scale integration across optical, photonic, thermal and power domains, the firm adds.



Wolfspeed's silicon carbide wafers, scaling up to 300mm.

AI – unlocking More than Moore

As AI workloads push data centers to their power limits, the demand for improved power density, thermal performance, and energy efficiency will continue to accelerate, expects Wolfspeed. The firm reckons that its 300mm silicon carbide technology will enable the integration of high-voltage power delivery systems, advanced thermal solutions, and active interconnects at wafer scale, extending system performance beyond traditional transistor scaling.

AR/VR – powering optical and thermal integration

Next-generation AR/VR systems require compact, lightweight configurations that integrate high-brightness displays with expansive fields of view and effective thermal management. Silicon carbide's unique material properties, including mechanical strength, thermal conductivity, and optical refractive control, make it ideal for multi-functional optical architectures, reckons Wolfspeed.

Beyond AI infrastructure and AR/VR, transitioning silicon carbide to a 300mm platform represents a major step forward in scaling the production of advanced power devices, the firm adds. The larger wafer diameter enhances the ability to cost-effectively meet growing demand for applications including high-voltage grid transmission and next-generation industrial systems.

"This 300mm breakthrough is more than a technical milestone — it unlocks new opportunities for silicon carbide as a strategic material," comments Poshun Chiu, principal analyst, Compound Semiconductor, at market analyst firm Yole Group. "It clearly demonstrates that silicon carbide is advancing to the next level of manufacturing maturity required for the coming decade of electrification, digitalization, and AI," he adds. "It provides the market with a credible roadmap toward higher-volume production, improved economics and long-term supply assurance [see the report 'Power SiC 2025 – Front-End Manufacturing Equipment' and 'Power SiC 2025 – Markets and Applications']."

www.wolfspeed.com

Wolfspeed powering Toyota's EV platforms with silicon carbide components

Enhanced efficiency & performance for Toyota's battery electric vehicles

Wolfspeed Inc of Durham, NC, USA says that its automotive MOSFETs will power onboard charger systems for Toyota.

Wolfspeed's silicon carbide (SiC) components will be integrated into Toyota's battery electric vehicles (BEV), reflecting confidence in the ability to meet the automaker's standards for quality and long-term reliability.

"Toyota is known for its uncompromising approach to quality and reliability, and we're honored to be supporting their next wave of electrification," says Wolfspeed's Robert Feurle. "Wolfspeed's US-based supply chain and domestic silicon carbide manufacturing footprint ensure the stability and continuity they need to achieve their electrification goals," he adds.

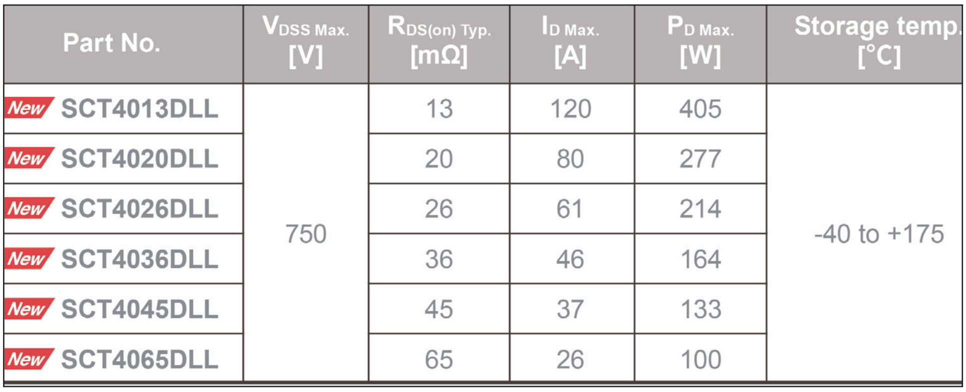
The widespread adoption of silicon carbide as the industry-standard semiconductor for high-voltage onboard power systems supports the automotive industry's rapid transition to clean energy vehicles, says Wolfspeed. While silicon carbide is renowned for powering fast, efficient and high-power-density EV powertrains, its application in onboard automotive auxiliary power systems — such as an onboard charger — also offers benefits. By providing higher power and more efficient power systems, silicon carbide enables shorter charging times for EV owners and minimizes energy loss across the vehicle. This results in improved driving range and reduced costs associated with each recharge.

"Our work with Toyota is built upon years of trust in engineering expertise, supply reliability, as well as a shared obsession with quality," says chief business officer Cengiz Balkas. "This reinforces our role in driving electrification with silicon carbide technology that delivers performance, efficiency and safety."

www.wolfspeed.com

ROHM launches 13–65mΩ SiC MOSFETs in TOLL package

About 39% improved thermal performance enables high-power handling despite 26% smaller footprint and low 2.3mm profile



Part No.	V_{DSS} Max. [V]	$R_{DS(on)}$ Typ. [mΩ]	I_D Max. [A]	P_D Max. [W]	Storage temp. [°C]
New SCT4013DLL	750	13	120	405	-40 to +175
New SCT4020DLL		20	80	277	
New SCT4026DLL		26	61	214	
New SCT4036DLL		36	46	164	
New SCT4045DLL		45	37	133	
New SCT4065DLL		65	26	100	

Japan-based ROHM has begun mass production of the SCT40xxDLL series of silicon carbide (SiC) MOSFETs in TOLL (TO-Leadless) packages. Compared to conventional packages (TO-263-7L) with equivalent voltage ratings and on-resistance, the new packages offer about 39% improved thermal performance, enabling high-power handling despite their compact size and low profile. It is suitable for industrial equipment such as server power supplies and ESS (energy storage systems) where the power density is increasing, and low-profile components are required to enable miniaturized product design.

In applications like AI servers and compact photovoltaic (PV) inverters, the trend toward higher power ratings is occurring simultaneously with the contradictory demand for miniaturization, requiring power MOSFETs to achieve higher power density. Particularly in totem-pole power factor correction (PFC) circuits for slim ('pizza-box type') power supplies, stringent requirements demand thicknesses of 4mm or less for discrete semiconductors.

ROHM's new product addresses these needs by reducing component footprint by about 26% and achieving a low profile of 2.3mm thickness — roughly half that of conventional packaged products. Furthermore, while most standard TOLL package products are limited by a drain–source rated voltage of 650V, ROHM's new products support up to 750V. This allows for lower gate resistance and increased safety margin for surge voltages, contributing to reduced switching losses.

The lineup consists of six models with on-resistance ranging from 13mΩ to 65mΩ, with mass production started in September. These products are available for online purchase from online distributors such as DigiKey, Mouser and Farnell. Simulation models for all six new products are available on ROHM's official website, supporting rapid circuit design evaluation.

www.rohm.com/products/sic-power-devices/sic-mosfet

Fuji Electric and Robert Bosch collaborate on silicon carbide power semiconductor modules for EVs

Mechanical compatibility of module packages to shorten customers' design time and diversify procurement sources

Japan-based power electronics manufacturer Fuji Electric Co Ltd and automotive parts maker Robert Bosch GmbH of Reutlingen, Germany have agreed to collaborate on silicon carbide (SiC) power semiconductor modules for electric vehicles (EVs) that feature package compatibility.

With power semiconductors are essential components in EV inverter systems to convert and control electric power, SiC power semiconductors (which have characteristics such as high breakdown voltage and low loss) are becoming increasingly prevalent. They enable automotive manufacturers to achieve smaller and lighter inverter systems, extending the cruising range (one of the critical challenges for the widespread adoption of EVs).

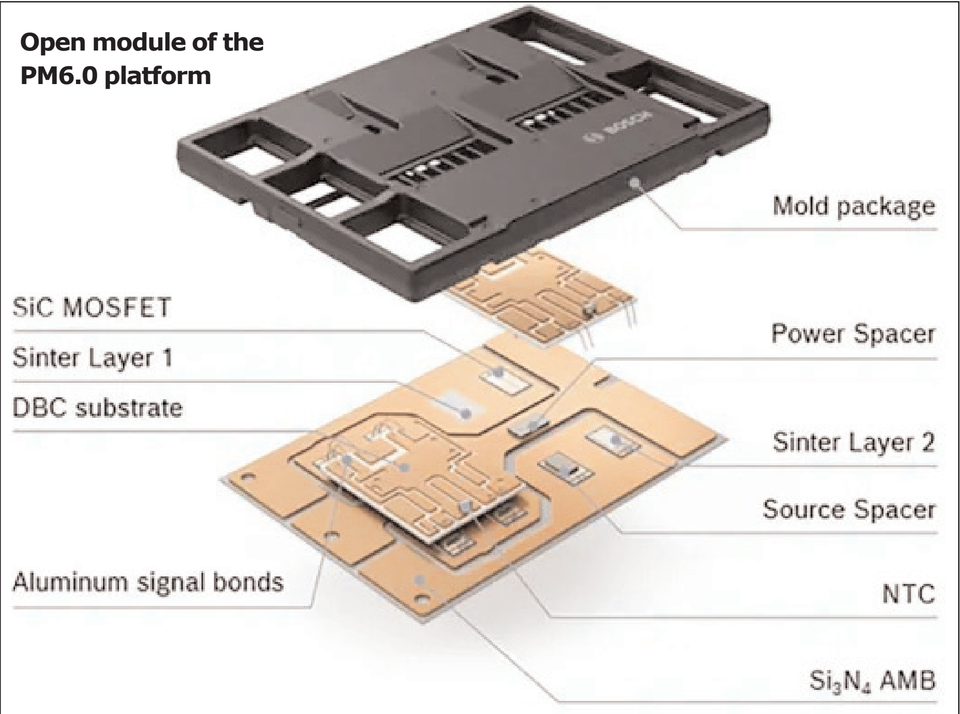
Fuji Electric says that its SiC power semiconductor modules for EVs incorporate its unique packaging technology, contributing to the realization of compact and highly efficient inverter systems with high power density. Furthermore, by flexibly modifying the size and number of mounted chips, these modules can accommodate a wide range of power requirements and circuit configurations from automotive manufacturer customers.

Moving forward, both companies intend to develop SiC power semiconductor modules with mechanical compatibility in terms of package outer dimensions and terminal positions. This will enable either module to be integrated into an inverter system without additional mechanical modifications, minimizing the adjustment effort required for customers when using both module options in their systems. This collaboration aims to shorten design periods and contribute to diversifying procurement sources. As a result, customers will be able to use SiC power semiconductor modules from both companies without altering their inverter system specifications, leading to reduced design time and diversified procurement.

Furthermore, both companies plan to jointly develop user application technologies related to cooler design and various terminal connections when integrating SiC power semiconductor modules into inverter systems, and plan to provide technical support to customers. Through this initiative, Fuji Electric and Bosch aim to contribute to enhancing supply chain stability and further promoting the adoption of electric vehicles.

www.bosch.com
www.fujielectric.com

Open module of the PM6.0 platform



Mitsubishi Electric shipping samples of four new trench SiC MOSFET bare dies for power semiconductors

Advanced bare dies for diverse embedding needs, enabling lower power consumption in power electronics equipment

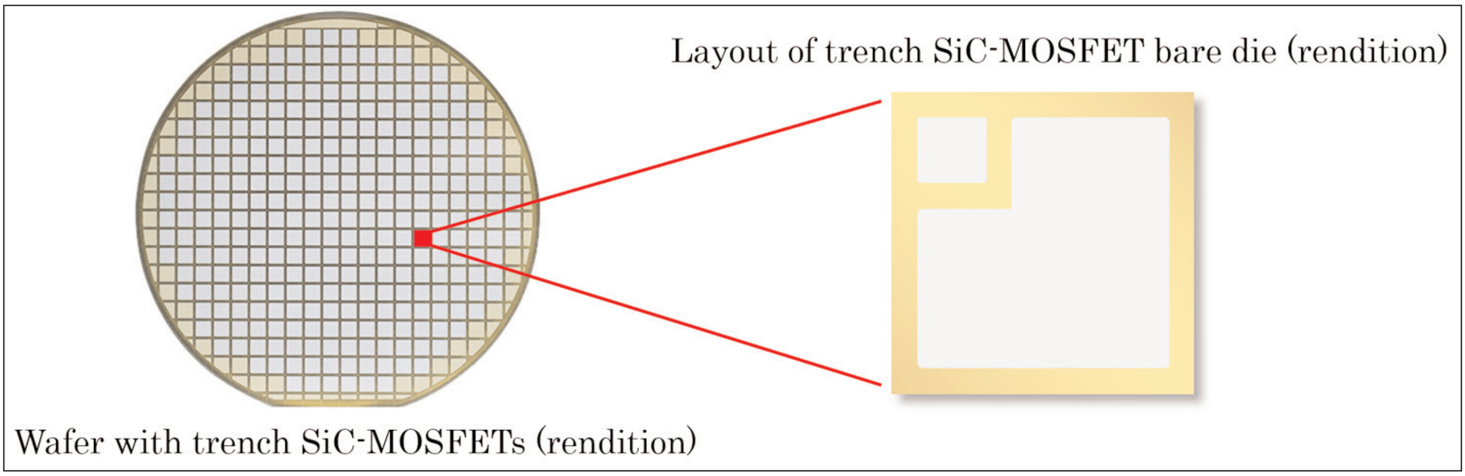
On 21 January, Tokyo-based Mitsubishi Electric Corp will start shipping samples of four new trench silicon carbide metal-oxide-semiconductor field-effect transistor (SiC MOSFET) bare dies designed for use in power electronics equipment, such as electric vehicle (EV) traction inverters, onboard chargers, and power supply systems for renewable energy sources including solar power. The new power semiconductor bare dies will contribute to efforts to embed advanced bare dies in various power electronics equipment to lower power consumption while maintaining performance.

Mitsubishi Electric is exhibiting the new trench SiC MOSFET bare dies at the 40th Nepcon Japan R&D and Manufacturing show in Tokyo (21–23 January), as well as exhibitions in North America, Europe, China, India and elsewhere.

The market for power electronics equipment is expected to expand in line with global efforts targeting decarbonization. As part of this trend, the demand is growing for power semiconductors embedded with highly efficient bare dies that enable EV traction inverters and renewable energy power supply systems to consume less power while maintaining their high performance and quality.

Since 2010, Mitsubishi Electric has been selling SiC power semiconductor modules that significantly reduce the power consumption of air conditioners, industrial equipment and railway vehicle inverter systems. To meet the demand for advanced power semiconductor bare dies, Mitsubishi Electric is now introducing four new trench SiC MOSFET bare dies that are similar to the company's existing trench SiC MOSFET bare dies (launched on 12 November 2024), but utilize a proprietary trench SiC MOSFET structure to reduce power loss by about 50% compared to planar SiC MOSFETs. Furthermore, manufacturing processes including Mitsubishi Electric's proprietary gate oxide film manufacturing method suppress variations in power loss and on-resistance to ensure stable quality over a long period of use.

www.mitsubishielectric.com/semiconductors/powerdevices



(Left) Wafer with trench SiC MOSFETs (rendition). (Right) Layout of trench SiC MOSFET bare die (rendition of shipping sample).

SemiQ adds 7.4mΩ, 14.5mΩ and 34mΩ SOT-227 modules to 1200V Gen3 SiC MOSFET line

QSiC power modules tested beyond 1400V, targeting battery chargers, photovoltaic inverters, server power supplies & energy storage systems

SemiQ Inc of Lake Forest, CA, USA — which designs, develops and manufactures silicon carbide (SiC) power semiconductors and 150mm SiC epitaxial wafers for high-voltage applications — has expanded its family of 1200V Gen3 SiC MOSFETs, launching five SOT-227 modules that offer R_{DSon} values of 7.4mΩ, 14.5mΩ and 34mΩ. The firm's GCMS modules, which feature Schottky barrier diodes (SBDs), have lower switching losses at high temperature, especially compared to non-SBDs GCMX modules.

The devices target medium-voltage, high-power conversion applications, including battery chargers, photovoltaic inverters, server power supplies, and energy storage systems. All parts are screened using wafer-level gate-oxide burn-in tests exceeding 1400V and are avalanche tested to 800mJ (330mJ for 34mΩ modules).

All modules are said to be highly rugged, easy to mount, and feature an isolated backplate as well as direct mounts for a heat sink. They have been engineered to enhance performance and switching speeds while minimizing losses in such applications.

The 7.4mΩ GCMX007C120S1-E1 reduces switching losses to 4.66mJ (3.72mJ turn-on, 0.94mJ turn-off) and has a body diode reverse recovery charge of 593nC.

The devices' junction-to-case thermal resistance ranges from 0.23°C/W for the 7.4mΩ SiC MOSFET module up to 0.70°C/W for the 34mΩ SiC MOSFET module.

"The expansion of our third-generation 1200V SiC MOSFET family marks another key milestone in SemiQ's mission to deliver superior silicon carbide solutions for high-performance power applications," says president Dr Timothy Han. "By broadening our portfolio with lower-resistance options and rugged, easy-to-mount SOT-227 packages, we're empowering designers to achieve higher efficiency, faster switching, and greater reliability across a wide range of energy and industrial systems."

www.SemiQ.com

SemiQ launches Gen3 1200V S3 modules for high-power industrial and EV applications

Family includes 608A half-bridge module with 2.4mΩ R_{DSon} and best-in-class thermal resistance

SemiQ Inc of Lake Forest, CA, USA — which designs, develops and manufactures silicon carbide (SiC) power semiconductors and 150mm SiC epitaxial wafers for high-voltage applications — has expanded its third-generation QSiC MOSFET product line, including devices with what is claimed to be an industry-leading current density and thermal resistance.

Seven devices have been launched, including high-current S3 half-bridge, B2T1 six-pack and B3 full-bridge packages. The new modules are said to dramatically increase performance, reduce cooling complexity, and cut switching losses for the next wave of EV chargers, energy storage systems, and industrial motor drives.

The expansion addresses the growing demand for ultra-efficient conversion in high-power systems, and features devices engineered for current capabilities of up to 608A and a junction-to-case thermal resistance of just 0.07ºC/W (in the 62mm standard S3 half-bridge format).

The six-pack modules integrate the three-phase power stage into a compact housing and have an R_{DSon} range of 19.5mΩ to 82mΩ. They are designed to optimize layout and minimize parasitics in motor drives and advanced AC–DC converters.

The full-bridge modules deliver high current capabilities of up to 120A and an ultra-low on-resistance down to 8.6mΩ. This combination, coupled with a low thermal resistance of 0.28ºC/W, maximizes power density and efficiency in single-phase inverters and high-voltage DC–DC systems.

All parts are screened using wafer-level gate-oxide burn-in tests to guarantee the gate oxide quality. They are also breakdown voltage tested to over 1350V. Modules using these third-generation chips operate at lower gate voltages than previous generations as a result of the 18V/−4.5V gate voltage of the third-generation chips. SemiQ says that its Gen3 technology reduces both R_{ONsp} and turn-off energy losses (E_{OFF}) by up to 30% versus previous generations.

"EV infrastructure and new industrial applications require ever increasing levels of performance," notes Dr Timothy Han. "With industry-leading current density and significantly lower on-resistance, our new Gen3 full-bridge, half-bridge and six-pack modules are helping organizations meet these requirements."

www.semiq.com

Infineon enhances Electreon's wireless in-road EV charging with silicon carbide technology

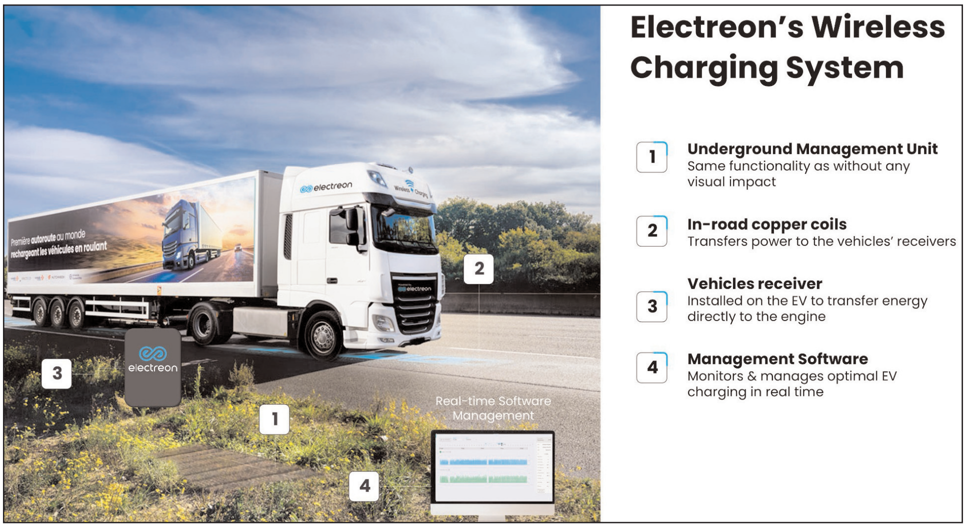
Customized SiC modules maximize power density, enabling EV to operate 24 hours a day with smaller batteries

Infineon Technologies AG of Munich, Germany will supply customized silicon carbide (SiC) power modules to Electreon, a provider of wireless charging solutions for electric vehicles (EVs), for its dynamic in-road charging technology.

This wireless electric road system (wERS) lets EVs charge wirelessly using inductive charging. Copper coils embedded beneath the road surface transfer power to buses, trucks and other EVs as they travel. The system connects to the power grid, activating vehicles when they're above the coils.

Infineon's customized SiC modules are at the heart of the application and efficiently convert the energy that comes from the power grid for seamless wireless battery charging. Electreon's system leverages these modules to maximize performance, reliability and energy efficiency. This technology is especially beneficial on highways, toll roads and in other high-traffic areas like ports and critical mobility hubs such as airports.

The system's power transfer is boosted to an average of 200kW, with peaks exceeding 300kW, using EasyPACK 3B CoolSiC 2000V modules from Infineon that were specifically developed to meet Electreon's requirements. This performance was confirmed recently on France's A10 highway, the world's first highway to wirelessly charge heavy- and medium-duty trucks, buses, vans and passenger cars in motion.



Electreon's wireless charging system leverages Infineon's SiC modules to maximize performance, reliability and energy efficiency.

Continuous on-route charging keeps the battery topped up, allowing vehicles to travel further and use much smaller battery packs. This cuts upfront vehicle costs and reduces vehicle weight, freeing up more capacity for cargo.

Electreon has already incorporated Infineon's customized EasyPACK 3B CoolSiC 2000V modules in test tracks in the USA, Germany, France, Norway, Portugal, Sweden, Italy, Israel and Japan. There are current plans to integrate the technology into upcoming longer-distance projects.

"Electreon's wireless charging system is a real game changer on the road to reducing carbon emissions in transportation," says Dominik Bilo, executive VP & chief sales officer Industrial & Infrastructure at Infineon Technologies. "We're proud to contribute to this groundbreaking innovation with our customized SiC power modules, which efficiently convert electrical energy to charge vehicles on the go, tailored to meet Electreon's specific needs," he adds.

"Wireless EV charging is already happening today, and Electreon is at the forefront of this transformation," says the firm's CEO Oren Ezer. "We're using Infineon's advanced silicon carbide technology to make in-road charging even more powerful and efficient, allowing electric buses and trucks to operate continuously without relying on traditional charging stations," he adds. "This breakthrough reduces operational costs, lowers emissions and expedites EV adoption on a global scale."

www.infineon.com/coolsic

US ITC preliminary determination finds violation of Infineon patent by Innoscience

Final determination could lead to import ban of products into USA

In a preliminary determination, the US International Trade Commission (ITC) has found violation of one patent (US 9,899,481) owned by Infineon Technologies AG of Munich, Germany concerning gallium nitride (GaN) technology by China-based Innoscience (Suzhou) Technology Holding Co Ltd, which manufactures GaN-on-silicon power chips on 8” silicon wafers. In addition, the ITC confirmed that both patents asserted by Infineon in the proceedings before the ITC (US 9,899,481 and 9,070,755) are legally valid.

The case centers on the unauthorized use of Infineon’s patented GaN technologies by Innoscience.

The Commission’s final determination is expected to be issued on 2 April 2026. If this preliminary decision is confirmed, then it will lead to an import ban of Innoscience’s allegedly infringing products into the USA.

“This ruling is another testament to the strength of Infineon’s intellectual property and confirms our commitment to vigorously defend our patent portfolio against infringements and ensuring fair competition in the market,” says Johannes Schoiswohl, senior VP & head of Infineon’s GaN Systems business line. “We remain dedicated to fostering innovation and advancing semiconductor technology to address the world’s most pressing challenges, from decarbonization to digital transformation.”

In a parallel dispute in Germany, the German patent office recently confirmed the validity of an Infineon patent and upheld it in slightly amended form. Infineon is asserting infringement of this patent (DE102017100947) in the Munich District Court. Already in August, the Munich District Court I (Landgericht München I) found infringement by Innoscience of another Infineon patent (DE102014113465).

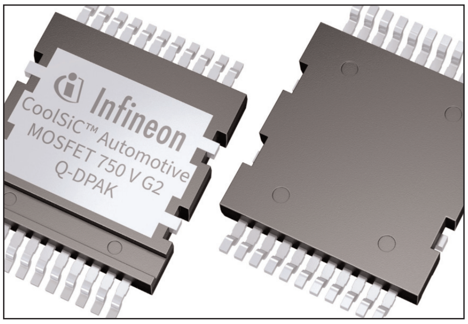
www.infineon.com
www.innoscience.com

Infineon adds packages to CoolSiC MOSFET 750V G2 range

Samples available for Q-DPAK 4/7/20/33/40/50mΩ and D2PAK 7/25/33/40/50/60mΩ

Infineon Technologies AG of Munich, Germany has launched new packages for its CoolSiC MOSFET 750V G2 technology, engineered to deliver the highest system efficiency and power density in automotive and industrial power conversion applications. This latest innovation is now available in a range of packages, including Q-DPAK and D2PAK, offering a portfolio with typical $R_{DS(on)}$ values up to 60mΩ at 25°C.

The portfolio extension includes products for various applications, such as onboard chargers and HV-LV DCDC converters in the automotive sector, and server and telecom SMPS, along with EV charging infrastructure in industrial applications. The ultra-low $R_{DS(on)}$ values of 4mΩ enables applications that require exceptional static-switching performance, such as eFuse, high-voltage battery disconnect switches, solid-state circuit breakers, and solid-state relays.



Top-side-cooled Q-DPAK packaged variant of CoolSiC MOSFET 750V G2.

This performance enables designers to create more efficient, compact and reliable systems that meet the most demanding requirements.

A key feature of CoolSiC MOSFET 750V G2 technology is its top-side-cooled Q-DPAK package, which provides optimal thermal performance and reliability. This package is designed to handle high-power applications with ease, making it suitable for designers seeking to push the boundaries of power density and efficiency. The technology also exhibits what is claimed to be excellent $R_{DS(on)}$x Q_{OSS} and best-in-class $R_{DS(on)}$ x Q_{fr}, contributing to reduced switching loss in both hard-switching and soft-switching topologies with superior efficiency in hard-switching user cases.

Additionally, the CoolSiC MOSFETs 750V G2 offer a combination of high threshold voltage $V_{GS(th),typ}$ of 4.5V at 25°C and ultra-low Q_{GD}/Q_{GS} ratio, reinforcing robustness against parasitic turn-on (PTO). Furthermore, the technology allows for extended gate driving capabilities, supporting static gate voltages of up to −7V and transient gate voltages of up to −11V. This enhanced voltage tolerance provides engineers with greater design margins and best compatibility with other devices in the market.

CoolSiC MOSFET 750V G2 Q-DPAK 4/7/20/33/40/50mΩ and D2PAK 7/25/33/40/50/60mΩ samples are available now.

www.infineon.com/coolsic-750v

CHIPX plans 8-inch GaN-on-SiC fab for Malaysia

Front-end manufacturing to span infrastructure, R&D, engineering, talent development, and technology transfer

Semiconductor and photonics manufacturer CHIPX of Dublin, Ireland plans to establish an 8-inch wafer fabrication facility in Malaysia, the first of its kind in the ASEAN (Association of Southeast Asian Nations) region. The facility will introduce gallium nitride on silicon carbide (GaN/SiC) manufacturing, driving Malaysia's entry into front-end semiconductor production and accelerating domestic capability in photonics, high-bandwidth optical interconnects, and advanced materials engineering essential to next-generation AI and high-performance compute systems.

CHIPX says its vertically integrated platform combines advanced materials, high-voltage ICs and system-level design to deliver resilient, performance-driven technologies.

CHIPX is establishing front-end manufacturing capabilities in Malaysia, spanning infrastructure, R&D, engineering teams, talent development programs, and structured technology-transfer initiatives that build local expertise. Leveraging Malaysia's emerging silicon photonics ecosystem, CHIPX aims to provide the fabrication foundation for next-generation transceivers and receivers, enabling ultra-high-speed connectivity for AI data centers and intelligent systems.

"Malaysia is emerging as a leader in the next wave of semiconductor and photonics innovation," says CHIPX's CEO & founder Chinmoy Baruah. "We are bringing advanced front-end manufacturing and photonics capabilities to Malaysia to accelerate the country's move into front-end semiconductor production and to establish the ultra-high-bandwidth, energy-optimized compute architectures required to scale the next generation of AI systems."

CHIPX is executing the venture with strategic international investors and leading Taiwanese semiconductor partners to bring advanced engineering depth into Malaysia's semiconductor ecosystem. Reflected in this collaboration is CHIPX's long-term commitment to building high-performance, energy-optimized front-end semiconductor capabilities in the region.

The project aligns with Malaysia's key industrial policy frameworks — including the National Semiconductor Strategy, the New Industrial Master Plan (NIMP 2030), and the National Energy Transition Roadmap – by supporting national efforts to develop a resilient, competitive, and sustainable semiconductor sector.

www.chipxglobal.com

Leonardo to develop and deliver first four Italian next-generation radars for Michelangelo Dome long-range ballistic defence system

Contract includes supply of Ground Based Radar and Mobile Long Range Radar featuring fully digital AESA GaN technology

Aerospace, Defense & security firm Leonardo S.p.A. of Rome, Italy has announced a major step forward in the development and implementation of the Michelangelo Dome advanced integrated defence system technology enablers, signing a contract with Italy-based TELEDIFE (Direzione Informatica Telematica e Tecnologie Avanzate) to develop and deliver four next-generation radars, designed to counter long-range ballistic threats (3000km).

The signing sets a second milestone for the Michelangelo Dome advanced integrated defence system since its official unveiling in November. The contract follows the first qualification launch of the Italian SAMP/T NG surface-to-air missile system in early December, equipped with Leonardo's latest-generation KRONOS Grand Mobile High Power Radar Sensor.

The contract includes the supply of the Ground Based Radar (GBR) and the Mobile Long Range Radar (MLRR). These systems feature fully digital AESA GaN (active electronically scanned array – gallium nitride) technology, allowing high efficiency and extended detection range, and able to deliver advanced surveillance and early warning, accurate identification and timely tracking, enabling real-time tactical picture update and effectively cueing Fire Control Radars (FCR) and the relevant effectors, according to the open architecture and asset integration versatility in multi-domain scenarios, consistent with the Michelangelo Dome's design and operational philosophy.

These characteristics, combined with other advanced capabilities, make the new radars one of the effective measures to meet the integrated ballistic defence requirements, positioning this technology at the top of European advanced radar sensor capabilities. With this program, Italy is the first European country featuring national integrated air and missile defence capabilities to counter new long-range threats.

www.leonardo.com

onsemi to develop power devices using GlobalFoundries' 200mm lateral GaN-on-silicon

GF's 200mm eMode GaN-on-Si process to combine with onsemi's silicon drivers, controllers and thermally enhanced packaging for smaller, more efficient systems

Intelligent power and sensing technology firm onsemi of Scottsdale, AZ, USA has signed a collaboration agreement with GlobalFoundries of Malta, NY (GF, the only US-based pure-play foundry with a global manufacturing footprint, including facilities in the USA, Europe and Singapore) to develop and manufacture gallium nitride (GaN) power products using GF's 200mm eMode GaN-on-silicon process for critical markets, starting with 650V.

The collaboration accelerates onsemi's roadmap for high-performance GaN devices and integrated power stages, expanding its portfolio with high-voltage products to meet the growing power demands of AI data centers, electric vehicles (EV), renewable energy, industrial systems, and aerospace, defense and security.

"This collaboration brings together onsemi's system and product expertise with GlobalFoundries' advanced GaN process to deliver new 650V power devices for high-growth markets. Paired with our silicon drivers and controllers, these GaN products will enable customers to innovate and build smaller, more efficient power systems for AI data centers, EVs, space applications, and beyond," says Dinesh Ramanathan, senior VP of corporate strategy, onsemi. "We are on track to begin providing samples to customers in first-half 2026, and scale rapidly to volume production," he adds.

"By combining our 200mm GaN-on-Si platform and US-based manufacturing with onsemi's deep system and product expertise, we're accelerating high-efficiency solutions and building resilient supply chains for data centers, automotive, industrial, aerospace & defense, and other critical markets," says GlobalFoundries' chief business officer Mike Hogan. "With onsemi as a key partner, we will continue to advance GaN semiconductors that meet the evolving demands of AI, electrification, and sustainable energy."

onsemi will pair its silicon drivers, controllers and thermally enhanced packages with GF's 650V GaN technology platform to deliver optimized GaN devices with higher power density and efficiency. These include power supplies and DC–DC converters for AI data centers, onboard chargers and DC–DC converters for electric vehicles, solar microinverters and energy storage systems, motor drives and DC–DC converters, for industrial and aerospace, defense, and security applications.

This effort expands onsemi's power semiconductor portfolio, which now includes the full spectrum of GaN technologies — from low-, medium- and high-voltage lateral GaN to ultra high-voltage vertical GaN — enabling system designers to build next-generation power architectures that deliver more power in smaller footprints. These GaN advantages include:

- **Higher-frequency operation** — By operating at higher switching frequencies, GaN allows designers to reduce component count, system size and cost while improving efficiency and thermal performance.
- **Bidirectional capability** — Bidirectional GaN capabilities enable entirely new topologies that can replace up to four traditional unidirectional transistors, cutting costs and simplifying designs.
- **Integrated functionality** — Combining GaN FETs with drivers, controllers, isolation and protection in a single package allows for faster design cycles and lower electromagnetic interference.

The thermally enhanced packages and optimized gate drivers push performance and reliability even at high switching speeds.

www.gf.com

www.onsemi.com

Navitas and Cyient partner for GaN adoption in India

Firms to co-develop GaN products, digital and mixed-signal ICs, GaN-based system modules and design enablement platforms

Navitas Semiconductor Corp of Torrance, CA, USA — which provides GaNFast gallium nitride (GaN) and GeneSiC silicon carbide (SiC) power semiconductors — and ASIC/ASSP and power solutions provider Cyient Semiconductor Pte Ltd of Hyderabad, India have announced a strategic long-term partnership intended to advance the adoption of GaN technology in India and establish a complete end-to-end GaN ecosystem.

Navitas and Cyient intend to co-develop GaN products, digital and mixed-signal ICs, GaN-based system modules and design enablement platforms targeting India's high-voltage, high-power market segments such as AI data centers, electric mobility, performance computing, energy grid infrastructure and industrial electrification.

The partnership seeks to build a robust local supply chain and manufacturing ecosystem in support of the Indian Government's 'Make in India' initiative. In addition, Navitas and Cyient aim to deploy IC technology in accelerating solution development for high-voltage and high-power markets.

This is expected to include products based on Navitas' existing GaN technologies, along with new products tailored for India's unique market needs. Cyient's work in establishing a secure local supply chain and ecosystem for GaN products in India should further accelerate time to market for developers and OEMs across the region.

"This partnership represents a pivotal step in India's semiconductor future in solving the complexities of power delivery at high voltages," says Cyient's CEO Suman Narayan. "By combining Navitas' proven GaN technology with Cyient Semi's design, manufacturing and supply chain strengths, we're creating a self-sustaining ecosystem that will accelerate the market adoption of GaN. Our goal is to make GaN accessible to every OEM looking to design, build, and scale from India," he adds.

"I believe the growth of GaN technology in India will exceed global trends, and Cyient Semiconductors is the perfect partner for Navitas to drive this revolution," comments Navitas' president & CEO Chris Allexandre.

The initiative is intended to empower Indian design houses and OEMs with locally sourced GaN components and manufacturing support, enabling faster development cycles and reducing barriers to GaN adoption in India. It also reinforces Cyient's ambition to drive semiconductor innovation, localization and scalability across critical technology sectors.

The collaboration between Cyient and Navitas establishes a direct channel for Indian customers to access GaN technology, along with reliable procurement, engineering collaboration and technical support.

www.cyientsemi.com

Navitas expands global distribution network with Avnet

Navitas has expanded its distribution agreement with Avnet, making Avnet a globally franchised strategic distribution partner.

The deal is part of the ongoing consolidation of Navitas' franchised distribution partners and represents a significant expansion of its channel presence with Avnet, one of the world's largest electronic component distributors. It follows Avnet Silica's success in reaching European customers.

Avnet will supply technical and commercial expertise for Navitas' GaN and SiC, high-voltage and high-power wide-bandgap semiconductor devices. This should better support the growth of AI data centers, high-performance computing, renewable energy, grid infrastructure and industrial electrification.

Navitas says this consolidation ensures that customers benefit from both regional specialists such as Avnet Silica in Europe and a globally aligned distribution framework with Avnet in all the geographies, giving fast, reliable access to Navitas products, as well as consistent technical support worldwide.

"This builds considerably on the successful role that Avnet Silica has played in reaching and developing our strategically important European customers," says Alessandro Squeri, VP global distribution, Operations & Transformation, Navitas. "As we consolidate our distribution network to align with high-power market focus, expanding Avnet's franchise globally was a natural next step, and their engineering expertise, global reach and deep customer relationships make them an ideal partner to accelerate adoption of our GaN and SiC platforms worldwide," he adds.

"The global expansion of the Avnet Silica partnership is testament to the strength of our teams in supporting customers in these demanding high-power markets," says Alex Iuorio, senior VP, global supplier development, Avnet. "Navitas' leadership in wide-bandgap innovation aligns strongly with Avnet's commitment to enabling advanced, energy-efficient solutions for our customers," he adds. "We look forward to further extending this successful collaboration as customers drive the next wave of electrification and high-performance power design."

www.navitassemi.com

Navitas sampling 3300V and 2300V ultrahigh-voltage silicon carbide product portfolio

Based on latest GeneSiC Trench-Assisted Planar technology & packaging

Navitas Semiconductor Corp of Torrance, CA, USA — which provides GaNFast gallium nitride (GaN) and GeneSiC silicon carbide (SiC) power semiconductors — has announced the sample availability of its new 3300V and 2300V ultrahigh-voltage (UHV) products in power module, discrete and known good die (KGD) formats. The new SiC products are claimed to set a benchmark for reliability and enhanced performance in ultrahigh-voltage power electronics.

Proprietary Trench-Assisted Planar (TAP) SiC MOSFET technology augments performance and reliability

The 3300V and 2300V UHV devices are based on Navitas' fourth-generation GeneSiC platform, which uses a TAP architecture to implement a multi-step e-field management profile that significantly reduces voltage stress and improves voltage blocking capabilities compared with trench and traditional planar SiC MOSFETs.

This TAP architecture is therefore able to provide increased long-term reliability and avalanche robustness. Navitas' TAP technology also features an optimal source contact for superior cell-pitch density and enhanced current spreading, which results in improved switching figures of merit and lower on-resistance at hot temperatures.

Innovative packaging maximizes system durability and power density

Navitas is hence expanding the 3300V and 2300V UHV SiC product portfolio in flexible packaging formats to meet diverse application requirements. For high-power-density and high-reliability systems, the products are integrated into an advanced SiCPAK G+ power module package, offered in both half-bridge and full-bridge circuit configurations.

The SiCPAK G+ power modules feature a unique epoxy-resin potting technology, which has been proven to deliver a >60% improvement in power cycling lifetime and a >10x improvement in thermal shock reliability over similar silicone-gel potted power module technology.

Key features of the SiCPAK G+ power modules also include an AlN DBC substrate for superior heat dissipation and new high-current press-fit pins that double the current-carrying capability per pin. Discrete SiC MOSFETs are available in the industry standard TO-247 and TO-263-7 packages.

Extended reliability testing validates long-term system lifetime

Navitas has created what it claims is an industry-first reliability qualification benchmark, AEC-Plus, indicating that SiC products are qualified above and beyond the existing AEC-Q101 and JEDEC product qualification standards. Navitas says that this new benchmark shows its understanding of system-level lifetime requirements, and a strong commitment to enabling rigorously designed and validated products for demanding mission profiles in grid and energy infrastructure applications. The AEC-Plus grade qualification standards extend further into rigorous multi-lot testing and qualification. Key additions to the existing AEC-Q101 requirements include:

- dynamic reverse bias (DRB) and dynamic gate switching (DGS) to represent stringent fast-switching application mission profiles;
- over 3x longer duration for static high-temperature, high-voltage tests (HTRB, HTGB, HTGB-R);
- HV-THB qualification for power modules and HV-H3TRB qualification for discrete and KGD;
- longer power cycling and temperature cycling.

Advanced KGD screening enables more stringent production screening

Navitas' latest-generation 3300V and 2300V SiC MOSFETs are also offered as KGD products, which gives system manufacturers greater flexibility in building custom SiC power modules. To deliver the highest quality for bare die products and SiCPAK G+ power module family, Navitas' devices pass through an advanced production screening process. This includes comprehensive room and hot temperature testing on singulated die (post-dicing) and a 6-side optical inspection. This rigorous KGD screening protocol ensures that only thoroughly tested die are used, improving manufacturing quality and increasing the final module's performance and reliability for critical ultrahigh-voltage applications.

"Navitas' new 3300V and 2300V SiC product portfolio allows our customers to push the boundaries of efficiency and reliability in solid-state transformers for AI data centers, as well as utility-scale battery energy storage and renewable energy to define a new standard for such mission-critical system applications," says Paul Wheeler, VP & general manager of the SiC business unit.

"This line of reliable, high-performance ultrahigh-voltage power semiconductors is expected to be a significant step in our roadmap to 10kV SiC solutions," he adds. "By combining our proprietary Trench-Assisted Planar SiC MOSFET technology with innovative power packages, we are able to extend reliability qualification and support more stringent production screening, to deliver industry-leading performance and robustness."

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

www.navitassemi.com

VisIC closes $26m round B investment

Hyundai/Kia joins as strategic investor

VisIC Technologies Ltd of Ness Ziona, Israel — a fabless supplier of power conversion devices based on gallium nitride (GaN) transistors — has announced the second closing of its Round B funding, securing $26m. The round was led by a global semiconductor leader, with Hyundai Motor Company and Kia (HKMC) joining as a strategic investor.

The lead investor's focus on advancing critical semiconductor technologies complements VisIC's proprietary D^3GaN platform, designed to deliver efficiency, scalability and reliability for automotive drivetrains. HKMC's participation underscores its commitment to integrating GaN technology into mass-production EV platforms.

Traditional silicon-based solutions struggle to deliver the efficiency and power density required for next-generation EV platforms, especially at higher voltages. While silicon carbide (SiC) devices offer improved performance, their high cost and complex manufacturing limit widespread adoption.

VisIC says that its GaN-based D^3GaN technology addresses these limitations by enabling smaller, lighter and more efficient EV traction inverters — unlocking new possibilities for both 400V and 800V architectures.

The new capital should accelerate VisIC's roadmap, including:

- optimization, qualification and release of Gen3 750V GaN dice and power modules;
- development of Gen4 1350V GaN technology, supporting the full spectrum of EV designs;
- stabilization of the supply chain and ramp-up of GaN product delivery for EV traction inverters;
- expansion into emerging 800V data-center power requirements, leveraging the same advanced GaN platform.

"Our D^3GaN technology is redefining power electronics for electric vehicles, and the support of our strategic partners accelerates our mission to deliver high-efficiency, scalable solutions for the next generation of mobility," says VisIC's CEO Tamara Baksht.

"Partnering with VisIC enables us to integrate cutting-edge GaN power technologies into our EV platforms, enhancing efficiency, reliability and performance as we shape the future of electric transportation," says Hyundai Motor Company and Kia.

www.visic-tech.com

CGD wins Hyundai Open Innovation challenge

One-chip ICeGaN solution selected for robustness and ease of use when integrated into EV traction inverter power modules

Fabless firm Cambridge GaN Devices Ltd (CGD) — which was spun out of the University of Cambridge in 2016 to design, develop and commercialize power transistors and ICs that use GaN-on-silicon substrates — has been named as one of the winners of Hyundai's Open Innovation Challenge on the future of sporty driving. Out of nearly 50 companies, CGD's one-chip ICeGaN solution has been selected for its robustness and ease of use, showing high potential for utilization in power modules for EV traction inverters. This technology enables GaN to be considered as a cost-effective alternative to expensive silicon carbide (SiC) solutions in the high-power EV inverter market, says CGD.

"Hyundai CRADLE is the global arm of open innovation within Hyundai Motor Group. Its mission is to search for and work with anyone or any association that has new ideas, products or technologies that can help build a world with better mobility experiences for all," says Daniel Murphy, CGD's senior director, product management. "We are honoured that CGD and our ICeGaN IC technology has been recognised as a winning technology, and we're excited to explore how GaN can drive a more dynamic and energy-efficient future for EVs," he adds.

ICeGaN's monolithically integrated control and protection features support the operation of multiple devices in parallel, for higher-power applications, and reduces the external component count, improving reliability and solution size.

"GaN presents significant advantages over both traditional silicon and silicon carbide, which we are investigating," says Dr Reza Fathi, senior manager, HYUNDAI CRADLE. "We are excited to collaborate with CGD on our ongoing proof-of-concept project to evaluate CGD's promising ICeGaN technology for potential automotive applications," he adds.

The Hyundai Motor Europe Technical Centre (HMETC) is part of the Hyundai, Kia and Genesis brands, and is the company's sole R&D centre in Europe. Together, Hyundai CRADLE and HMETC are looking for companies to elevate and support the future of sporty driving. The Hyundai CRADLE & HMETC Open Innovation Challenge 2025, themed 'Sporty Driving: An Open Call for Tech Visionaries' aims to discover the most innovative entrepreneurial and technological projects in Europe's and Israel's automotive and mobility sector, with the focus on high-performance applications.

https://innovationchallenge.pnp.tc/hyundai2025
www.camgandevices.com

Cambridge GaN Devices appoints Fabio Necco as new CEO

Co-founder & former CEO Giorgia Longobardi continues as chief marketing officer and board member

Giorgia Longobardi and Fabio Necco.

Fabless firm Cambridge GaN Devices Ltd (CGD) — which was spun out of the University of Cambridge in 2016 to design, develop and commercialize power transistors and ICs that use GaN-on-silicon substrates — has appointed Fabio Necco as chief executive officer. The move is designed to drive forward CGD's entry into key markets.

Necco takes over as CEO from CGD co-founder Giorgia Longobardi. "I am delighted to welcome Fabio to CGD and hand over the day-to-day leadership of the company while I channel my energy into my passion for bringing advanced, sustainable and energy-efficient power electronics solutions to market," says Longobardi. "Fabio is the right person with the right skill set to take CGD into its next growth phase, and I shall do all I can to support his initiatives as I transition into my new role as CMO [chief marketing officer]."

Longobardi will also continue to be a director on CGD's board and on the advisory board of the International Semiconductor Industry Group (I.S.I.G.).

Necco comes to CGD from intelligent power and sensing semiconductor technology provider onsemi of Scottsdale, AZ, USA, where he was VP & division general manager with more than 25 years' experience in power electronics, application engineering, vehicle electrification, and data centers, all primary market focus points of CGD.

"I have known CGD and Giorgia for years and have long been impressed with its success under her leadership," comments Necco. "I am very excited about CGD's unique technology and to have been chosen to lead our entire team to the next stages of product development as well as substantially increasing our presence in key markets."

CGD says that its energy-efficient GaN devices enable power electronic designers to develop sustainable, energy-efficient systems. These inherent benefits, coupled with the flexibility of the proven fabless model, make CGD believe that it is uniquely positioned to exploit rapidly growing markets, which can already be seen in the exponential demand for GaN technology.

Unlike many other GaN solutions, CGD's ICeGaN technology uses a monolithic, single-chip approach that integrates all necessary components onto a single die, which substantially improves efficiency and performance.

That monolithic design means that CGD delivers compact, engineer-led GaN power devices that combine next-generation design and innovation, making it suitable for the market-specific requirements of Traction/Aux inverters for electric vehicle (EV) and industrial power conversion solutions. The company's focus on bare die, ease of use, robust gate, and parallel operation makes it suitable for a wide range of power applications.

www.camgandevices.com

Mission Microwave to design and deliver solid-state power block upconverters for Telesat Lightspeed

Mission Microwave Technologies LLC of Cypress, CA, USA has been awarded a contract to design and deliver solid-state power block upconverters (BUCs) for the Telesat Lightspeed Landing Stations.

Each Telesat Lightspeed Landing Station will host multiple antennas that will be integrated with Mission Microwave's compact 100W BUCs with gallium nitride (GaN) amplifier modules and wide-band 27.5–30GHz upconverters. The globally deployed Landing Stations are fully integrated with the Telesat Lightspeed satellite network and play an important role in connecting user traffic to points-of-presence for telecom networks, internet and cloud services, and private interconnections for customer networks.

"We worked diligently with the Telesat Lightspeed engineering team to offer a solution that countered initial assumptions and improved the overall efficiency of the base stations," says president & CEO Francis Auricchio. "We enjoyed the challenge of working with a leading technology team that could appreciate the value of our company's innovative products," he adds.

"Thanks to Mission Microwave's innovative BUC technology, characterized by its compact design and exceptional RF efficiency, Telesat will benefit from significant improvements in energy efficiency and lower size, weight and power (SWAP)," comments Aneesh Dalvi, Telesat's VP of Lightspeed Systems Development. "The BUCs are a core component of our Landing Station infrastructure and we're excited to welcome the Mission Microwave team to the Telesat Lightspeed program."

www.missionmicrowave.com/mm_telesat_pr_jan05_2026

Wise Integration, Powernet and KEC sign MoU to co-develop SMPS solutions for AI server power supplies in Korea

Powernet to lead development of new SMPS designs using Wise's WiseGan and WiseWare technologies; KEC to manage back-end manufacturing

Fabless company Wise Integration of Hyeres, France, together with switched-mode power supply (SMPS) manufacturer Powernet Technologies Corp and power semiconductor firm KEC Corp (both of Seoul, South Korea), have signed a strategic memorandum of understanding (MoU) to co-develop next-generation SMPS solutions designed specifically for AI server applications in South Korea. The partnership aligns with the South Korea's push to expand AI infrastructure and build out the next generation of high-density data centers.

Wise Integration will supply its gallium nitride (GaN) power devices, digital-control expertise and technical support. Powernet will lead development of new SMPS designs using Wise's WiseGan and WiseWare technologies. KEC will manage back-end manufacturing, including module integration and system-in-package production tailored to the thermal and reliability demands of AI server racks.

In addition to accelerating the design and development of competitive AI server power supply solutions and creating business opportunities in Korea's AI server market, the project aims to shorten the solutions' time-to-market using WiseGan and WiseWare technologies. The collaboration builds on an earlier partnership between Wise Integration and Powernet, launched to serve OEMs that require compact, digitally controlled power supply systems for faster, smaller and more energy-efficient electronic equipment.

AI servers draw extensive power, generate intense heat, and depend on SMPS designs capable of converting high-voltage input (e.g. 400V) to stable 48V rails with minimal loss. GaN devices with digital control are uniquely suited for that task: they enable higher switching frequencies, greater efficiency, and more precise management of fast, high-current load transients.

Supporting South Korea's national ambition

The South Korean government's investments in AI-dedicated data centers includes high-performance GPU clusters and digital infrastructure that supports demand for more efficient, compact and scalable power conversion systems.

"Korea is moving quickly to build the next generation of AI data centers, and power architecture is a critical piece of that effort," says Wise Integration's CEO Ghislain Kaiser. "Working with Powernet and KEC lets us bring GaN-based digital control into server-grade designs at scale — delivering the efficiency, thermal performance, and responsiveness that modern AI hardware depends on."

Technology momentum: a logical extension of Wise Integration's roadmap

Beyond the memorandum of understanding, Wise Integration has been widening the foundation that supports strategic partnerships. As Korea accelerates AI-ready data-center development, the demands on power conversion systems intensify — higher switching frequencies, tighter thermal budgets and more aggressive efficiency targets. To meet those constraints, Wise has been expanding its GaN + digital control portfolio, ensuring that the technologies Korea aims to deploy at scale already have a maturing, production-validated base behind them.

For example, the company recently launched WiseWare 1.0 for totem-pole PFC and LLC topologies, its newest fully digital controller. While aimed currently at gaming, displays and industrial systems, it shares the same architecture — high-frequency GaN operation, compact form factor, digitally managed efficiency — that naturally scales into the server-class designs targeted under the Korea-focused collaboration.

www.wise-integration.com
www.gopowernet.com
www.keccorp.com

Cornell develop HEMTs on single-crystal AlN substrate for RF power amplifiers

Usage of gallium reduced by several orders of magnitude

Cornell University has developed a new transistor architecture for high-power wireless electronics that addresses supply chain vulnerabilities for gallium ('XHEMTs on Ultrawide Bandgap Single-Crystal AlN Substrates', Advanced Electronic Materials, 29 November 2025, https://doi.org/10.1002/aelm.202500393).

The single-crystal high-electron-mobility transistor (XHEMT) includes an ultra-thin pseudomorphic gallium nitride (GaN) channel layer sandwiched between AlN layers, fabricated on a bulk single-crystal aluminium nitride substrate, whose low defect densities and ultrawide bandgap allow it to withstand higher temperatures and voltages while reducing electrical losses.

The research was co-led by Huili Grace Xing, the William L. Quackenbush Professor, Debdeep Jena, the David E. Burr Professor – both in the School of Electrical and Computer Engineering, the Department of Materials Science and Engineering, and the Kavli Institute at Cornell for Nanoscale Science – and doctoral student Eungkyun Kim.

The XHEMT is designed for radio frequency power amplifiers in 5G and emerging 6G wireless networks, as well as radar systems for national defense applications. Pushing large amounts of electrical power at high frequencies generates heat and degrades performance.

"Because we're using an aluminium nitride substrate with much higher thermal conductivity, the channel temperature is lower compared to other technologies," notes Kim. "This opens the possibility of operating at even higher power, extending the present communication range or radar capability."

The XHEMT's material layers are lattice matched from top to bottom, resulting in about a one-million-fold fewer crystalline defects than traditional GaN-based devices grown on silicon, silicon carbide or sapphire.

"These defects can propagate all the way through a device, whereas our new aluminium nitride substrate basically eliminates them," Xing says. "While this needs to be studied in more detail, I think it will translate to a tremendous advantage in the upcoming iterations of this device."

Reducing reliance on gallium

As demand for high-performance electronics grows, so does demand for materials like gallium nitride in applications ranging from smartphone chargers to cell towers. Reducing dependence on gallium is becoming increasingly important for US research and manufacturing, notes Jena.

"More than 90% of all gallium is produced outside the US, and the critical need for it in semiconductor technology has attracted export restrictions," notes Jena. "The supply chain has been highly disrupted but, with this particular aluminium nitride XHEMT, we use very, very little gallium, cutting down on its usage by several orders of magnitude," he adds.

The aluminium nitride single crystal used in the research was produced in collaboration with Crystal IS of Albany, NY, USA (one of only a few manufacturers in the world capable of growing it with the quality required for the XHEMT).

"Aluminium nitride substrates have been used for photonics, but this research really opens the door for electronics applications," Jena says. "We're showing that we can take semiconductor materials that were produced here in the US and create new value and new markets for them."

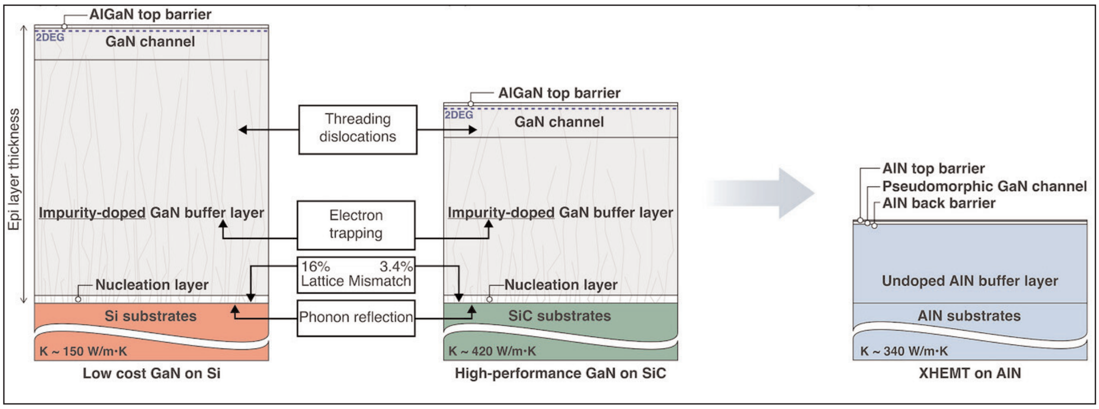
The technology's progress toward commercial readiness was highlighted on 1 December in APL Materials, which showed wafer-scale growth of the XHEMT structure on 3-inch AlN wafers – work supported through the Northeast Regional Defense Technology Hub NORDTECH.

The material layers used in the XHEMT were developed at Cornell by doctoral student Yu-Hsin Chen and research associate Jimy Encomendero. Their atomic structures were investigated by doctoral student Naomi Pieczulewski and David Muller (the Samuel B. Eckert Professor of Engineering in the School of Applied and Engineering Physics).

The research was supported by the Army Research Office, the Defense Advanced Research Projects Agency and the Asahi-Kasei Corp. Parts of the research were performed at the Cornell NanoScale Facility and the Cornell Center for Materials Research, both supported by the National Science Foundation.

www.engineering.cornell.edu

https://advanced.onlinelibrary.wiley.com/doi/10.1002/aelm.202500393



Aegis Aerospace partners with United Semiconductors

Firms to launch first in-space advanced materials manufacturing facility

To pioneer semiconductor manufacturing in space, Aegis Aerospace Inc of Webster, TX, USA (which provides technical services and turn-key solutions to government and commercial space & defense customers) has partnered with United Semiconductors LLC (USLLC, which since 2005 has been supplying the US defense sector and national laboratories with critical substrates from its production facility in Los Alamitos, CA, USA).

USLLC is claimed to be the only domestic US-based company with the capability for 6-inch diameter substrate production of III-V binary semiconductors and the only global company with the capability for large-area substrate production of III-V ternary semiconductors. In recent years, USLLC has expanded its crystal growth capabilities to establish in-space manufacturing of bulk crystals leveraging the benefits of microgravity and space environment.

The collaboration follows Aegis Aerospace's recent grant agreement with the Texas Space Commission to develop an in-space manufacturing platform for advanced materials in low Earth orbit (LEO).

Aegis Aerospace's CEO Stephanie Murphy and United Semiconductors' chief technologist Dr Partha Dutta officially pen contract to advance the manufacturing of semiconductors in space via Aegis Aerospace's AMMP platform.

"Together, we will accelerate the in-space manufacturing of essential semiconductor materials, pushing the boundaries of what is possible in space technology," says Aegis Aerospace's CEO Stephanie Murphy.

The Aegis Advanced Materials Manufacturing Platform (AMMP) aims to showcase the unique properties and manufacturing capabilities afforded by the microgravity environment of LEO. By leveraging United Semiconductors' established expertise as a provider to the US Department of Defense, the partnership will expedite the commercialization of semiconductor manufacturing in space. As a result, Aegis Aerospace anticipates creating new job opportunities in Texas and offering this service globally.

"Our decades of experience in semiconductor manufacturing, including successful experiments aboard the International Space Station, combined with Aegis Aerospace's expertise in building and operating space infrastructure, will create a powerful partnership," reckons United Semiconductors' chief technologist Dr Partha Dutta.

Together, Aegis Aerospace's AMMP and United Semiconductors products are believed to comprise the first dedicated commercial facility for in-space materials production.

www.aegisaero.com
www.unitedsemiconductorsllc.com

Space Forge generates plasma aboard ForgeStar-1 satellite

Conditions needed for gas-phase crystal growth can now be created and controlled on autonomous platform in low Earth orbit

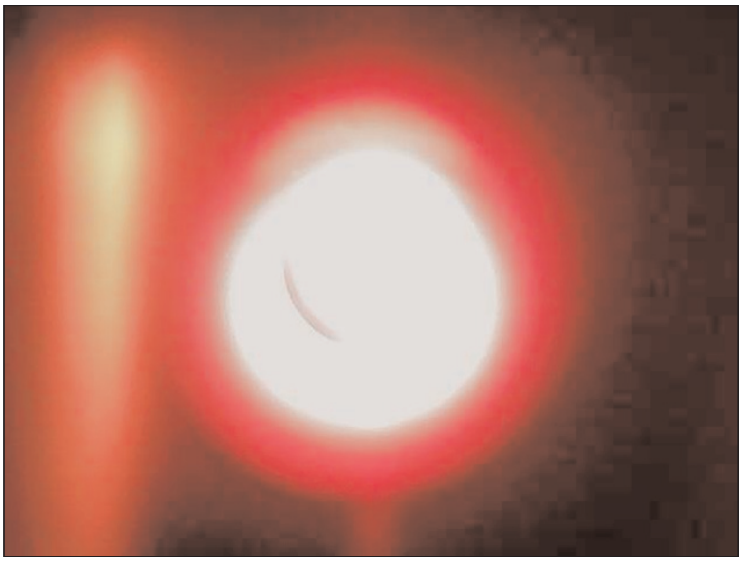
Space Forge of Cardiff, UK (which has operations on Florida's Space Coast) has generated plasma aboard its ForgeStar-1 satellite, marking a world-first for commercial in-space manufacturing and a step toward producing a new class of high-performance semiconductor materials on orbit.

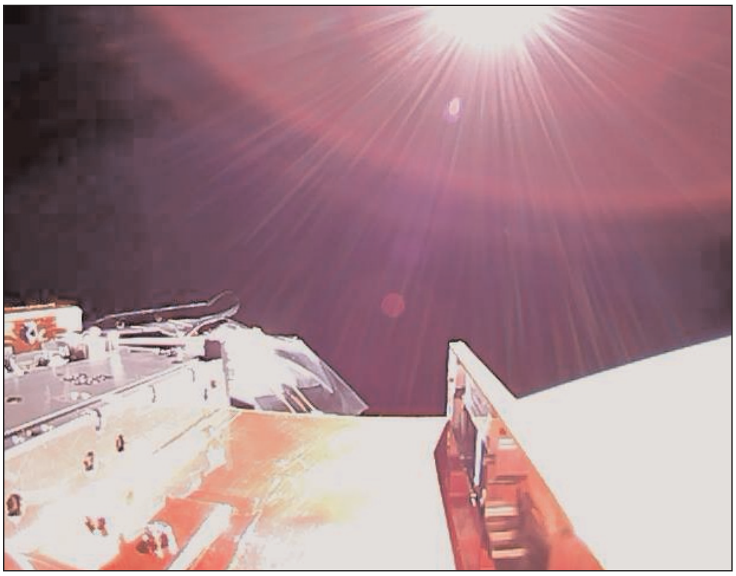
The achievement establishes ForgeStar-1 as the first free-flying commercial semiconductor manufacturing tool ever operated in space, and follows Space Forge's earlier mission milestone as the first and only organization in the UK and Europe licensed to conduct in-space manufacturing.

The plasma demonstration confirms that the extreme conditions needed for gas-phase crystal growth can now be created and controlled on an autonomous platform in low Earth orbit (LEO). This is the first time a commercial spacecraft has demonstrated this capability, building on science carried out on board the International Space Station.

"Generating plasma on orbit represents a fundamental shift, it proves that the essential environment for advanced crystal growth can be achieved on a dedicated, commercial satellite — opening the door to a completely new manufacturing frontier," says Space Forge's CEO & co-founder Joshua Western.

Space Forge's focus is on wide- and ultrawide-bandgap materials such as gallium nitride, silicon carbide, aluminium nitride and diamond. These materials underpin critical technologies including power electronics, advanced communications, quantum systems, defence platforms and high-performance computing. On Earth, their development is constrained by defect formation, impurity incorporation and thermal instability during growth.





Space offers a different pathway: the absence of convection in microgravity, the ultra-high-quality vacuum with near-zero nitrogen contamination and the stable thermal conditions can enable semiconductor crystals several orders of magnitude cleaner than those produced terrestrially.

ForgeStar-1's plasma strike is the first step in testing how those advantages translate into real materials performance. The satellite will run a series of parameter sweeps to map plasma behaviour in microgravity and collect data that will directly inform the design and operation of future missions.

As the spacecraft begins its natural orbital decay, its trajectory will be monitored using onboard systems and external support from the Science and Technology Facilities Council, with the mission concluding in a controlled demise. This deliberate, controlled end-of-life scenario is a world-first test of safe satellite demise — and a foundational step toward a future of reusable, returnable missions.

The company's long-term vision is to unite orbital crystal growth with terrestrial processing. Space-grown seeds will be returned to Earth and scaled at the Centre for Integrative Semiconductor Materials (CISM), creating a hybrid manufacturing model that complements existing supply chains rather than replacing them. The aim is to produce materials of a quality not achievable on Earth — materials that could improve efficiency, performance and resilience across industries central to economic and technological progress.

www.spaceforge.com/usa

Public–private funding of $450m for ATALCO includes USA's first large-scale primary gallium production

Atlantic Alumina Company LLC (ATALCO), the only operating alumina refinery in the USA, has announced a partnership with the United States Department of War (DOW) and Concord Resources Holdings Ltd, in conjunction with Concord's majority shareholder (a fund managed by commodities investment firm Pinnacle Asset Management L.P.), to sustain and increase domestic alumina production and establish the USA's first large-scale primary gallium production circuit in Gramercy, Louisiana.

Since 1959, alumina produced by ATALCO has been used as the essential raw material for aluminium metal required for American aerospace, defense, and automotive supply chains, while the firm's chemical-grade alumina has supplied important industries aligned with the national interest, including catalysts for oil and gas refineries, refractories, fire suppressants, ceramic casing for semiconductors, and municipal water treatment. Both alumina and gallium are essential minerals for the production of aerospace & defense systems, catalysts, semiconductors, and next-generation energy technology.

With the support of leadership from the DOW, the Governor of Louisiana, and members of Congress from Louisiana, ATALCO says that the partnership underscores its unique ability to secure the future of critical mineral production in the USA. The firm expects to produce over 1 million metric tons of alumina per year and up to 50 metric tons of gallium per year with its 500 majority-United Steelworkers workforce in Gramercy, Louisiana.

"Aligning this essential public sector support with private sector investment will secure onshore supply of alumina and gallium, which are contested commodity market segments currently dominated by China," says ATALCO. "This deal shows how quickly and decisively America can act to ensure long-term national security and economic resilience."

Meeting USA's critical mineral needs

ATALCO will provide a secure supply of alumina to its customers in the USA, including aluminum smelters and critical mineral consumers in diverse industries, becoming capable of meeting the total gallium demand signal of the USA including the DOW and domestic innovators. The revitalization of the Gramercy site should secure more than 500 jobs in Louisiana as ATALCO brings its existing facility back to nameplate production while designing and constructing a new gallium production circuit. This strategic partnership is regarded as an essential step in reducing reliance on foreign nations for critical minerals.

Strategic investment through public and private collaboration

The DOW's Industrial Base Analysis and Sustainment program has invested $150m of preferred equity in ATALCO. Additional funding from the US Government is expected to close within 30 days of the equity closing. As the majority shareholder in ATALCO via Concord, Pinnacle's fund has invested more than $300m in private capital.

"For the past decade, our investment philosophy has centered on bolstering the US supply chain for critical minerals and other commodities," says Jason Kellman, chief investment officer, Pinnacle Asset Management L.P. "This strategic partnership plays an important role in strengthening our country's critical minerals supply," he adds.

"In addition to the core expansion of the ATALCO facility, this investment unlocks significant growth potential, including increasing the site's mineral processing and power generation capabilities, all of which contributes to the long-term security of America's materials supply chain," says Scott Kellman, managing partner, Pinnacle Asset Management L.P.

www.atalco.com

5N Plus added to S&P/TSX Composite Index

Inclusion follows entry into MSCI Canada Small Cap Index

Following its entry into the MSCI Canada Small Cap Index on 24 November, specialty semiconductor and performance materials producer 5N Plus Inc (5N+) of Montréal, Québec, Canada has been included in the S&P/TSX Composite Index, effective prior to the open of trading on 22 December.

"Our inclusion in Canada's flagship equity benchmark, home to the country's largest and most actively traded companies, rewards the hard work of our team and our ability to deliver in any business environment," says CEO Gervais Jacques. "Our addition to both S&P and MSCI indexes in 2025 broadens our visibility with global investors and represents strong recognition of our unique market positioning and leadership in specialty semiconductors and performance materials."

The S&P/TSX Composite Index is the headline index for the Canadian equity market, the broadest in the S&P/TSX family and the basis for multiple sub-indices. More assets are invested in products based on S&P Dow Jones indices than products based on indices from any other provider in the world.

www.5nplus.com

Germanium Mining Corp joins US National Defense Industrial Association

Canada-based firm gains access to defense-focused industry forums, policy discussions, technical working groups, and networking opportunities

Publicly traded mineral exploration company Germanium Mining Corp of Vancouver, BC, Canada has been accepted as a new member of the US National Defense Industrial Association (NDIA), which supports collaboration across industry, government and academia to strengthen US national security and the defense industrial base. Germanium Mining Corp is already a member of the Nevada Mining Association.

"Becoming a member of NDIA reflects our commitment to aligning our critical minerals strategy with the priorities of national security, supply chain resilience, and responsible domestic resource development," says CEO Mario Pezzente. "We look forward to engaging with NDIA's membership, participating in constructive dialog, and contributing to discussions that support secure and sustainable access to strategic materials. Our exploration team has been dispatched to the historical Azure Ridge mine in Nevada; USA and we will be providing an exploration update shortly."

Membership in NDIA provides the company with access to defense-focused industry forums, policy discussions, technical working groups, and networking opportunities relevant to critical minerals, advanced materials, and supply chain security. Through its participation, the firm aims to remain informed on evolving defense requirements, regulatory considerations, and partnership opportunities that support the development of a resilient and secure USA.

Historical Azure Ridge Mine – Nevada

The Azure Ridge Historical Mine, formerly known as the Bonelli Mine, last reported production in 1918. Early development on the property includes five adits totaling about 377 feet in length, one shallow shaft about 11 feet deep, two open cuts, and ten surface pits. Since its brief period of historical production, the property has remained largely inactive.

The USBM, Western Field Operations Center, previously reported that the Azure Ridge deposit consists of fault-controlled, carbonate-hosted copper–zinc–lead–cobalt–germanium–gallium mineralization, interpreted as Kipushi-type (carbonate replacement) style mineralization. As part of a 1994 study conducted by the USGS and the USBM (https://pubs.usgs.gov/bul/1730e/report.pdf), a sampling program comprising 43 samples was completed at Azure Ridge. The results identified anomalous values of germanium, gallium, gold, silver, copper, lead, zinc, and cobalt.

According to the study, mineralized rock was observed sporadically over an area about 5000 feet in length, with mineralized structures reaching thicknesses of up to about 9 feet in outcrop.

Becoming a member of NDIA reflects our commitment to aligning our critical minerals strategy with the priorities of national security, supply chain resilience, and responsible domestic resource development. The firm aims to remain informed on evolving defense requirements, regulatory considerations, and partnership opportunities

Reconnaissance and maiden exploration program

The reconnaissance and maiden exploration program has been led by veteran geologist William 'Bill' Feyerabend CPG, and Amazona Enterprises is expected to consist of a short-duration field examination utilizing a small field team and appropriate equipment. The planned work is structured to address key geological questions related to host rock characteristics, structural controls and mineralizing processes, including those relevant to germanium–gallium-bearing systems, and to assist the company in refining its exploration strategy for this critical-minerals-focused project.

Germanium Mining Corp further plans to continue working with Amazona on the preparation of a planned NI 43-101 technical report and technical overview of the Azure Ridge historical mine. This work is expected to include a review of available historical information, regional- and property-scale geological context, and the results of planned field activities, with an emphasis on evaluating the property's potential relevance within the North American critical minerals supply chain, including germanium and gallium.

Additionally, the company is evaluating future multi-agency submissions to relevant US federal and state authorities in connection with potential support programs focused on critical minerals development. These initiatives may include studies related to historical mine infrastructure, site conditions and the potential refurbishment of the Azure Ridge historical mine, subject to further technical evaluation, regulatory review and financing considerations.

www.germaniummining.com
www.ndia.org

IQE reports strong second-half 2025 demand, driven by military & defence, AI, data center and handset markets

Strong Q1/2026 order book with improved visibility

In a trading update for full-year 2025, epiwafer and substrate maker IQE plc of Cardiff, Wales, UK says it saw strong trading momentum in second-half 2025 due to faster-than- expected funding releases for some US military and defence programs, previously anticipated for 2026.

IQE also experienced higher-than-forecasted photonics demand in the period, reflecting continued growth in AI and data-center markets, and increased sales of wireless products tied to new handset introductions which benefitted the group's Taiwan operations.

This is expected to result in revenue of about £97m, at the upper end of the previously announced full-year 2025 forecast range of £90–100m. Due to improved operating leverage as capacity utilization improves, this should result in an adjusted EBITDA position of at least £2m, exceeding the forecast of between −£5m to +£2m.

Additionally, good progress has been made with stakeholders including customers and suppliers to improve near-term liquidity and working capital, resulting in a cash position of £15.6m as at end-2025.

IQE's banking facilities provided by HSBC Bank plc are subject to certain covenant tests. IQE has received a waiver from HSBC in relation to Q4/2025 EBITDA covenant testing, reflecting the established and supportive relationship with the bank.

Current trading

IQE says that it enters 2026 with a strong first-quarter order book, reflecting improved demand visibility across core segments including consumer mobile, data-center and AI-related photonics markets. The momentum in wireless demand observed in Q4/2025 is expected to continue, supported by existing customers and recent platform wins.

Growth in data-center deployments and AI-enabled compute, alongside ongoing strength in consumer mobile, is also supporting increased demand for IQE's photonics products.

"Coupled with a strong Q1 order book and sustained demand across key end markets, the firm is well positioned to enter 2026," says IQE's CEO Jutta Meier

Strategic Review

The board is negotiating non-binding offers for IQE as a whole in addition to separate bids for certain other group assets with a view to maximizing shareholder value. The board says that it is encouraged by the level of interest received and the recognition of the intrinsic value of the group and its component parts. However, given the nature of such discussions there can be no certainty which, if any, of these will progress to a completed deal.

"I am pleased to report a positive second half of trading for IQE in 2025. Coupled with a strong Q1 order book and sustained demand across key end markets, the firm is well positioned to enter 2026," says CEO Jutta Meier. "We continue to advance our Strategic Review and I am encouraged by the progress we are making. I remain confident in the opportunity ahead for the company."

www.iqep.com

IQE extends multi-year strategic supply agreement with Lumentum

Epiwafers for advanced sensing applications extending to new generation of consumer and automotive products

Epiwafer and substrate maker IQE plc of Cardiff, Wales, UK has signed a multi-year extension to its strategic agreement with Lumentum Holdings Inc of San Jose, CA, USA (which designs and makes photonics products for optical networks and lasers for industrial and consumer markets) for the supply of epiwafers supporting advanced sensing technologies.

The extended agreement will build on the long-standing relationship between the two companies, where IQE's vertical-cavity surface-emitting laser (VCSEL) expertise has advanced 3D sensing technologies across Lumentum's photonics product portfolio. These technologies are key enablers in consumer, automotive light detection & ranging (LiDAR) and in-cabin sensing applications.

"Together we have achieved significant innovation in sensing technologies, from development through to mass production," notes IQE's CEO Jutta Meier. "We are excited to build on our success moving forward, as we expand advanced sensing into a new generation of consumer and automotive products."

www.iqep.com
www.lumentum.com

AXT cuts Q4/2025 revenue guidance to $22.5–23.5m

Fewer export control permits for InP issued by China than previously expected

For fourth-quarter 2025, AXT Inc of Fremont, CA, USA — which makes gallium arsenide (GaAs), indium phosphide (InP) and germanium (Ge) substrates and raw materials at plants in China — has cut its revenue guidance from $27–30m to $22.5–23.5m, due mainly to fewer export control permits for indium phosphide being issued by China's Ministry of Commerce than previously expected.

"While we are disappointed that we were not able to ship indium phosphide substrates to fulfil more customer orders in December, we continue to work diligently with the Ministry of Commerce on the export permit process and are hopeful that we will receive additional permits in first-quarter 2026," says CEO Morris Young. "The timing for permit issuance can be fluid and doesn't necessarily align with our quarterly reporting," he adds.

"That said, customer demand for our products continues to be very strong. Our industry is in the early stages of a multi-year growth cycle, driven by the AI infrastructure build-out and growing demand for high-speed optical connectivity. As such, we are on target to more than double our indium phosphide capacity in the second half of the year. In addition, we are making plans for continued growth and capacity expansion," Young continues.

"We were very pleased to complete a capital raise in December and intend to use some of the proceeds to increase manufacturing capacity in anticipation of a multi-year trend in data-center expansion. We believe we are uniquely positioned to serve the global market with industry-leading technology, an integrated supply chain, and world-class manufacturing capabilities."

AXT will announce its financial results for Q4/2025 on 19 February.

www.axt.com

AXT closes public offering, with full exercise of underwriters' option

Gross proceeds of $100m to boost Tongmei subsidiary's InP substrate capacity, plus R&D on new or improved products

AXT has closed its underwritten public offering of 8,163,265 shares of common stock at a price to the public of $12.25 per share, including the full exercise of the underwriters' option to purchase an additional 1,064,773 shares. The firm received total gross proceeds of about $100m, before deducting the underwriting discounts and commissions and other offering expenses.

AXT intends to use the net proceeds mainly to boost the manufacturing capacity of its subsidiary Beijing Tongmei Xtal Technology Co Ltd (to produce indium phosphide substrates for export worldwide in response to growing industry demand), for R&D of new or improved products, and for general corporate and working capital purposes.

Northland Capital Markets acted as sole bookrunner for the offering. Wedbush Securities Inc and Craig-Hallum Capital Group LLC acted as co-managers.

AlixLabs raises €15m in Series A funding round to accelerate APS beta testing

Funding will scale up toward advanced semiconductor manufacturing by 2027

Sweden-based AlixLabs AB (which was spun off from Lund University in 2019) has closed a €15m (~SEK165m) Series A funding round led by long-term investors Navigare Ventures, Industrifonden, and FORWARD.one, and joined by Sweden-based STOAF as well as Global Brain (an independent Japanese venture capital firm that manages strategic funds and invests in semiconductor startups), further strengthening AlixLabs' international reach and industry partnerships.

The investment will enable AlixLabs to accelerate development and scaling of its proprietary Atomic Layer Etching Pitch Splitting (APS) technology, which enables more cost-effective leading-edge chip manufacturing. The proceeds will be used to expand R&D and production capacity in Lund and the Netherlands, deepen collaboration with foundry partners, and initiate industrial deployment of APS.

"This Series A enables us to transform our APS innovation from customer validation to industrial adoption," says CEO Jonas Sundqvist. "Our focus [now] turns toward beta testing with leading customers — a critical step on the path to full-scale manufacturing by 2027. Our technology has the potential to dramatically lower both energy use and costs per wafer, helping to make advanced semiconductor production more accessible," he adds.

"Their technology tackles a critical bottleneck in semiconductor scaling and opens a path to more cost-efficient advanced chip manufacturing," comments Navigare Ventures' chief investment officer Alex Basu. "We're excited to see APS validated with real customers — the next phase is all about bringing it onto the fab floor," he adds.

"Their APS technology could fundamentally reshape the economics of advanced chipmaking while contributing to the industry's sustainability goals," says Tobias Elmquist, senior investment director at Industrifonden.

With the global semiconductor industry facing rising capital intensity, soaring energy demands and an urgent need to decarbonize production, AlixLabs says that its APS platform offers a powerful new approach — enabling ultra-fine pitch splitting through atomic-scale precision etching, without the need for prohibitively expensive multi-patterning or exclusive reliance on EUV lithography. The result is lower process complexity, reduced power consumption, and smaller environmental footprint per wafer.

With its Series A funding secured, AlixLabs aims to accelerate APS beta testing with key customers starting 2026, targeting early manufacturing implementation by 2027.

AlixLabs appoints Arthur van der Poel to advisory board

To further strengthen its strategic and technological leadership as it advances its semiconductor innovation roadmap, Sweden-based AlixLabs AB (which was spun off from Lund University in 2019) has appointed Arthur van der Poel to its advisory board.

van der Poel has decades of senior leadership experience across the global semiconductor and microelectronics ecosystem. He previously served as CEO of Philips Semiconductors and has held board and governance roles at several technology leaders, including ASML. He has also played a key role in advancing European semiconductor collaboration through leadership positions in major R&D initiatives.

van der Poel will advise on long-term strategy, industry partnerships, and scaling pathways for AlixLabs' flagship APS product, with a particular focus on the evolving needs of the global semiconductor market.

"AlixLabs is addressing challenges that are highly relevant to the future of semiconductor manufacturing," says van der Poel. "I look forward to supporting the team as they move from demonstrated technology solutions into industrial and commercial impact."

van der Poel joins the advisory board as Jacques Kools, who began his career at Philips Research Laboratories in Eindhoven, steps down from his role. Kools has been an important contributor to AlixLabs' development, offering guidance and insight during key phases of the company's growth.

"We are deeply grateful to Jacques for his commitment and contributions to AlixLabs," states CEO Jonas Sundqvist. "At the same time, we are honored to welcome Arthur van der Poel. His experience across semiconductor leadership, governance, and European industry collaboration will be invaluable as we move into our next stage."

van der Poel's appointment further strengthens AlixLabs' advisory network aligned with the future of semiconductor technology.

www.alixlabs.com

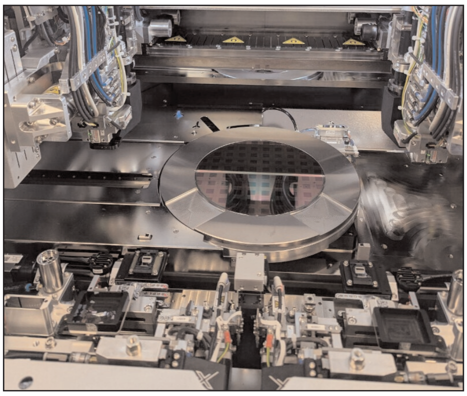
NHanced supporting mixed-material heterogeneous hybrid bonding production with copper or nickel bonds

Besi Datacon 8800 CHAMEO$^{\text{ultra plus}}$ system is the first operational bonder of its kind to enter production

NHanced Semiconductors Inc of Batavia, IL (the first US-based pure-play advanced packaging foundry) says that it uniquely supports mixed-material hybrid bonding with either copper or nickel bonds. Its new Besi bonding system further expands its advanced packaging yield and throughput.

NHanced announced earlier this year that it had taken delivery of the first Datacon 8800 CHAMEO$^{\text{ultra plus}}$ hybrid bonding system from BE Semiconductor Industries NV (Besi) of Duiven, The Netherlands, at its advanced packaging facility in Morrisville, NC.

The Besi Datacon 8800 CHAMEO$^{\text{ultra plus}}$ is described as an advanced hybrid bonding system that cost-effectively addresses increased demands for performance, speed, accuracy and warpage control in fine-pitch copper interconnects with submicron pad sizes. Based on Besi's field-proven Datacon platform, the Datacon 8800 CHAMEO$^{\text{ultra plus}}$ hybrid bonder supports room temperature direct fusion bonding of dielectric followed by batch annealing to complete electrical connections and incorporates state-of-the art vision systems.



The Besi Datacon 8800 CHAMEO$^{\text{ultra plus}}$ system.

The new bonding system represents the latest in ongoing investments by NHanced to expand its advanced packaging production. Among its suite of technologies, NHanced delivers the Direct Bond Interconnect (DBI) room temperature hybrid bonding process that joins wafers, dies and chiplets with both dielectric covalent bonds and metal-to-metal fusion bonds. DBI produces what is claimed to be unmatched fine-grained interconnects for 2.5D and 3D assemblies. NHanced has uniquely expanded its DBI process capabilities to include heterogeneous integration of gallium nitride (GaN), gallium arsenide (GaAs), indium phosphide (InP), lithium niobate ($LiNbO_3$), glass, and diamond substrates, and is the only company offering both copper and nickel for bonding.

"NHanced has already successfully delivered more hybrid bonding products than anyone else in the industry," claims president Robert Patti. "The new Besi system significantly expands the hybrid bonding capabilities of our Morrisville, NC facility."

NHanced is the first pure-play advanced packaging foundry to operate this Besi hybrid bonding platform – a key enabler for ultra-precise die-to-wafer alignment of 200nm with interconnect pitches down to 1µm. The system can process up to 2000 dies per hour, resulting in ~10x faster throughput with increased yields and superior warpage control.

NHanced says that it has pioneered a 'Foundry 2.0' paradigm shift in semiconductor manufacturing – applying foundry processes and advanced packaging & assembly technologies to dies and chiplets sourced from traditional foundries. The results are customized 3D IC and 2.5D advanced packaging and interposer assemblies. NHanced claims that it is the only US-based foundry that can support this manufacturing model.

www.besi.com

https://nhanced-semi.com

RENA joins UK-funded consortium to strengthen national semiconductor metrology capabilities

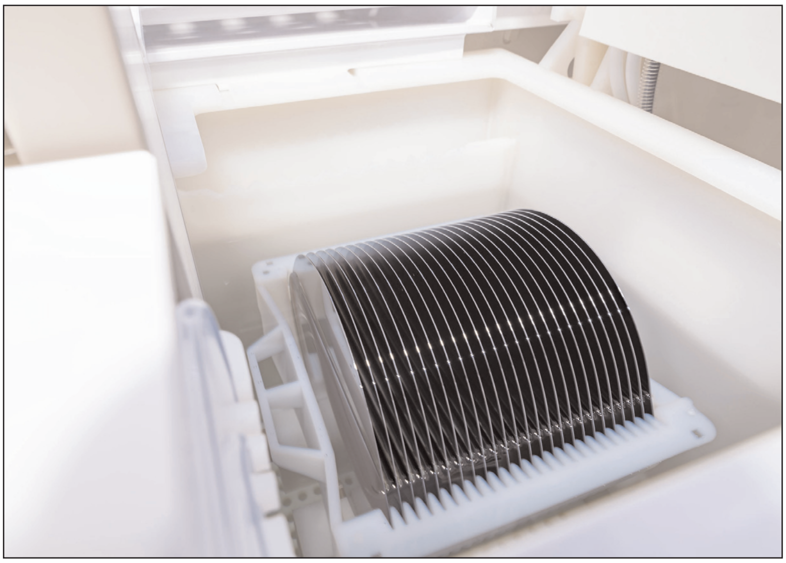
Wet chemical surface preparation equipment supplier supporting UK ecosystem

RENA Technologies GmbH of Gütenbach, Germany (which supplies production machines for wet chemical surface preparation) is a key industrial partner in a new €1.3m (£1.2m) Government-funded project led by the National Physical Laboratory (NPL) – the UK's National Metrology Institute (NMI) – and supported by the Department for Science, Innovation and Technology (DSIT). The initiative aims to establish critical new metrology capabilities to strengthen the UK's semiconductor innovation infrastructure and accelerate the development and adoption of next-generation semiconductor materials and processes.

The strategic investment underlines the UK's commitment to maintaining global competitiveness in semiconductors, helping to attract private investment, strengthen supply chains, and support long-term economic growth. As advanced semiconductor materials become central to technologies such as electric vehicles, renewable energy, 5G communications and advanced electronics, robust measurement, verification and standards are increasingly essential.

The project brings together a broad consortium spanning industry and academia, including Vishay Newport Ltd; GEN3; Custom Interconnect Ltd; Element Six; RENA; Viper RF; Keysight Technologies; the Henry Royce Institute; Power Roll; Poro Technologies; Oxford Instruments; Swansea University; the University of Cambridge; and the University of Warwick. Together, the partners cover the full innovation landscape, from materials research and process development to device fabrication and performance verification.

"We develop advanced wet processing and surface treatment solutions that are critical in manufacturing of compound semiconductors and emerging materials," notes RENA's CEO Peter Schneidewind. "Through this collaboration, RENA will contribute industrial insight and process expertise to ensure that new measurement and testing capabilities are closely aligned with real manufacturing challenges."



RENA's wet processing solutions are contributing production know-how for compound semiconductor materials.

Many high-growth applications increasingly depend on compound semiconductor materials such as gallium arsenide (GaAs), gallium nitride (GaN), silicon carbide (SiC), and indium phosphide (InP). Although they offer superior performance in high-power, high-frequency and optoelectronic applications, they also introduce new complexities in processing, characterization and quality assurance. Reliable standards and independent measurement methods are therefore essential to derisk innovation and support scale-up.

Through the project, consortium partners will work with NPL to:

- develop new UK measurement and test capabilities for advanced semiconductor materials by combining academic research excellence with world-leading metrology expertise;
- apply these capabilities to critical industry challenges, including assessing material integrity, verifying RF performance, and testing device reliability under demanding operating conditions;
- share the resulting capabilities openly with industry, helping to build national consensus and strengthen the UK's influence in international standards development for novel semiconductor technologies.

Following extensive consultation the consortium has identified three priority application areas where the UK can have the greatest global impact: power electronics, RF communications, and optoelectronics. These areas align closely with RENA's customer base and technology roadmap, particularly in power and compound semiconductor manufacturing.

RENA says that, by participating in this program, it is reinforces its commitment to supporting the UK semiconductor ecosystem with industrially relevant innovation, enabling customers to adopt advanced materials with confidence, and helping to position the UK as a global leader in next-generation semiconductor technologies.

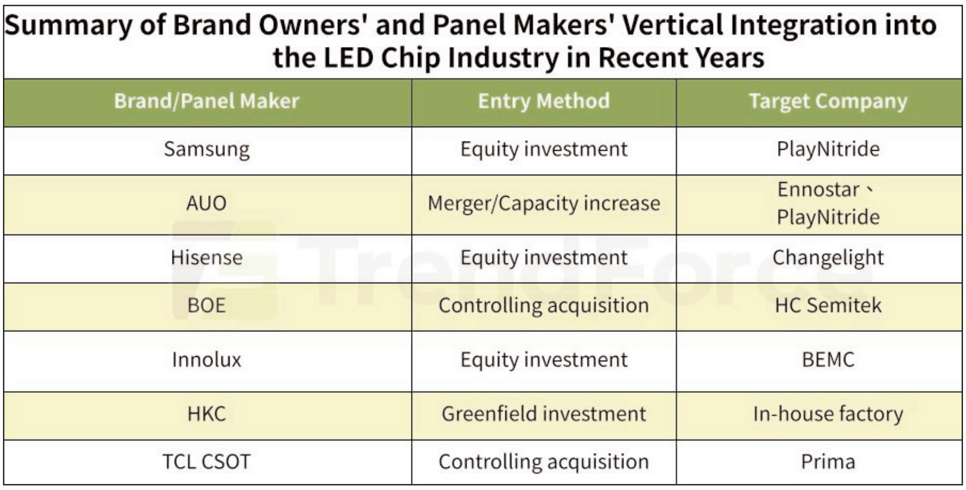
www.npl.co.uk

www.rena.com

Panel maker TCL CSOT acquires LED chip maker Prima Optoelectronics

Acquisition deepens vertical integration in micro/mini-LED across panel makers, notes TrendForce

TCL Technology's Shenzhen-based subsidiary TCL China Star Optoelectronic Technology Co Ltd (TCL CSOT) recently acquired an 80% equity stake — along with creditor rights — in Fujian Prima Optoelectronics Co Ltd (also known as Fujian ZhaoYuan Optoelectronics). This transaction marks TCL CSOT's formal entry into the LED chip segment. It represents a critical step toward completing a vertically integrated supply chain spanning from LED chips to mini-LED video wall applications, notes market analyst firm TrendForce.



Summary of Brand Owners' and Panel Makers' Vertical Integration into the LED Chip Industry in Recent Years

Brand/Panel Maker	Entry Method	Target Company
Samsung	Equity investment	PlayNitride
AUO	Merger/Capacity increase	Ennostar、 PlayNitride
Hisense	Equity investment	Changelight
BOE	Controlling acquisition	HC Semitek
Innolux	Equity investment	BEMC
HKC	Greenfield investment	In-house factory
TCL CSOT	Controlling acquisition	Prima

The acquisition underscores the increasing trend of brand owners and panel manufacturers venturing into the upstream LED chip market. Since 2018, companies like Samsung, AUO, Hisense, BOE, Innolux, and HKC have been progressively expanding their involvement in this sector.

TrendForce estimates that the global merchant market value for LED chips (external sales) will reach US$2.841bn in 2025. Ranked ninth by revenue, Prima derives most of its LED chip sales from lighting, backlight, and mini-LED video wall applications.

TrendForce's analysis indicates that, as brand owners and panel makers advance critical integration in the LED chip industry, coordination costs between chip supply and end-product development are being significantly reduced. A strategy of leveraging economies of scale and closer technological cooperation is likely to speed up the adoption of micro/mini-LED technologies in both display and non-display sectors, helping to sustain growth in the overall LED chip market.

TCL CSOT's recent acquisition of an 80% stake in Prima for CNY490m (about US$70m) highlights the growing trend of brand owners and panel makers extending upstream into LED chip manufacturing. Similar moves have been observed across the industry: Samsung launched micro-LED TV products following its investment in PlayNitride; AUO, after investing in Ennostar and PlayNitride, has entered mass production of micro-LED smartwatches and automotive communication displays; and Hisense introduced TVs featuring RGB mini-LED backlight after acquiring a stake in Changelight.

Meanwhile, BOE introduced glass-based mini-LED video walls after acquiring a controlling stake in HC Semitek, while HKC achieved mass production of mini-LED video walls in 2023. TCL CSOT's Suzhou mini-LED video wall production line commenced operations in 2025 and currently has a monthly capacity of 6000m^2. With the added support of Prima's LED chip capabilities, TCL CSOT is expected to strengthen its product competitiveness and further emerge as a leading player among brand and panel makers.

https://en.tclcsot.com

SemiLEDs revenue falls quarter-to-quarter, but doubles year-on-year; cash reserves rise as net loss is cut

For its fiscal first-quarter 2026 (ended 30 November 2025), SemiLEDs Corp of Hsinchu, Taiwan has reported revenue of $2.6m, down on $13.2m last quarter but double that of $1.261m a year ago.

Gross margin fell to 1%, from 2% last quarter.

Operating expenses have been cut from $1.215m to $1.03m, due mainly to Selling, general and administrative expenses being cut from $0.853m to $0.703m, while R&D spending remained about $0.36m.

Operating loss rose from $0.986m to $1.011m. Operating margin worsened from –7% to –39%.

Nevertheless, net loss has been cut from $1.2m ($0.15 per diluted share) last quarter to $742,000 ($0.09 per diluted share).

During the quarter, cash and cash equivalents rose from $2.6m to $2.9m.

www.semileds.com

PlayNitride to acquire Lumiode

Acquisition targets micro-LED development for near-eye displays and medical and other non-display markets

Taiwan-based micro-LED developer PlayNitride Technologies says that its board has approved the acquisition, for US$2m, of Lumiode Inc of New York, NY, USA, which was founded in 2012 and specializes in high-brightness micro-displays for augmented reality (AR) and other display applications. Market research company TrendForce reports that Lumiode has complementary technologies and patents that can help PlayNitride to expand its intellectual property portfolio and improve access to North American customers and sales channels. The acquisition is expected to enhance PlayNitride's global competitiveness in near-eye display applications and in medical and other non-display markets.

PlayNitride provides a wide array of services including micro-LED chips, COC processes, mass transfer technologies, turnkey solutions, and equipment sales. It has successfully been integrated into the supply chains of Samsung Micro LED TVs, Sony Honda's Afeela 1, and Garmin's Fenix 8 Pro, delivering micro-LED chips and COC products.

Recently, PlayNitride introduced a full-color 0.18-inch micro-LED chip designed for near-eye displays and, in partnership with Taiwan's ITRI and ChaseWind, unveiled high-resolution AR smart glasses.

Lumiode has in recent years focused on near-eye display and medical applications. Leveraging its proprietary Active TFT thin-film patent technology, Lumiode aims to replace conventional CMOS wafer bonding approaches, addressing long-standing challenges such as high CMOS development costs and low utilization rates caused by bonding size mismatches.

The acquisition is projected to be finalized by the end of 2025. It is expected to open new technical avenues for micro-LED adoption in near-eye displays, enabling PlayNitride to accelerate the development of micro-LED AR glasses without relying on existing CMOS-based solutions. Additionally, the expanded patent portfolio will support the company's efforts to grow in the US market and expand its customer base.

TrendForce predicts that, by 2030, worldwide shipments of micro-LED AR glasses will hit 21 million units, with micro-LED technology comprising 65% of the overall AR glasses market.

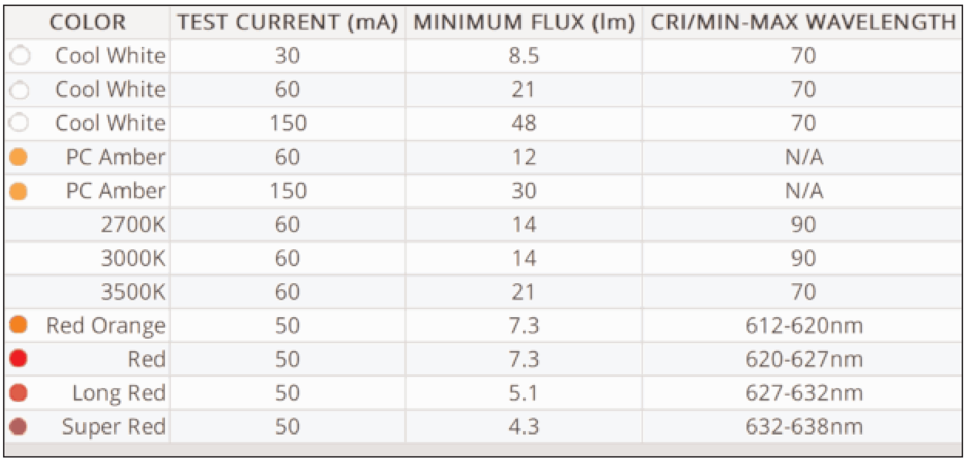
www.trendforce.com
www.lumiode.com
www.playnitride.com

Lumileds LUXEON Versat 2016 qualified for AEC-Q

Ultra-small-footprint LED package addresses growing demand for dynamic car-body lighting and styling

Lumileds of Eindhoven, The Netherlands says that its Versat 2016 is designed to address the necessary illumination specifications, reduce the engineering complexity and support the economic requirements for the growing segment of animated, personalized car-body lighting. With LUXEON Versat 2016 singular optical elements, backlit optical surfaces and 3D illuminated structures can all be successfully addressed, ushering in the expansion of car illumination beyond traditional signaling into styling and communication lighting.

LUXEON Versat 2016 is an AEC-Q qualified LED portfolio offered in a broad color and performance range. At just 2.0mm x 1.6mm and with a z-height of just 0.52mm, design options are maximized. In addition to the standard direct and phosphor-converted colors, LED-emission spectral tuning is available to match transmission of foils as used in car-body and grille illumination for superior color control.



	COLOR	TEST CURRENT (mA)	MINIMUM FLUX (lm)	CRI/MIN-MAX WAVELENGTH
○	Cool White	30	8.5	70
○	Cool White	60	21	70
○	Cool White	150	48	70
●	PC Amber	60	12	N/A
●	PC Amber	150	30	N/A
	2700K	60	14	90
	3000K	60	14	90
	3500K	60	21	70
●	Red Orange	50	7.3	612-620nm
●	Red	50	7.3	620-627nm
●	Long Red	50	5.1	627-632nm
●	Super Red	50	4.3	632-638nm

In addition to car-body lighting and styling, LUXEON Versat 2016 is claimed to be a superior solution for daytime running lights (DRL), turn, stop, tail, and side-marker applications. Complete product and performance data for LUXEON Versat 2016 is available on the web.

Lumileds global automotive team is available to support development of car-body and styling applications.

www.lumileds.com

ams OSRAM announces partial repurchase offer for up to €300m of outstanding convertible bonds due 2027

ams OSRAM GmbH of Premstaetten, Austria, and Munich, Germany has launched a convertible bond tender and invites current bondholders to submit offers to sell up to €300m in principal amount of the outstanding €760m convertible bonds due 2027.

The repurchase price per bond tendered will be determined through a Dutch auction procedure and will be set between 94.00% and 96.00% of the principal amount per bond (equal to €94,000 and €96,000 per bond). The firm will also pay interest accrued on the purchased bonds from and including the interest payment date of the bonds immediately preceding the settlement date (which is expected to be 21 January 2026) to but excluding the settlement date.

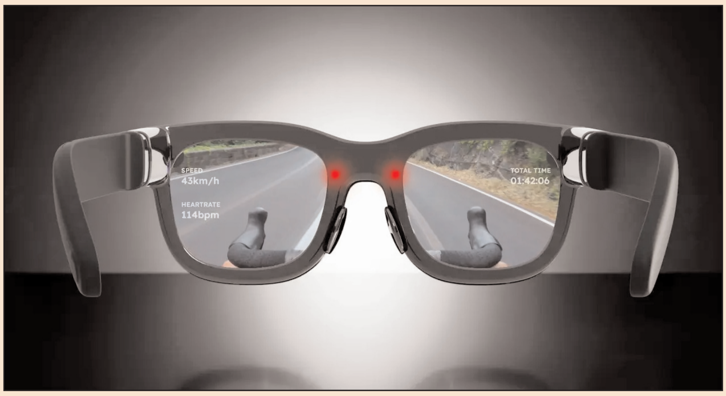
The cooling-off period, during which no tenders are accepted, commenced on 19 December and ends on 9 January. The repurchase period spans 12 January to 16 January at 5pm CET.

The bonds are listed and trade on the non-regulated open market segment (Freiverkehr) of the Frankfurt Stock Exchange (ISIN: DE000A283WZ3).

www.ams-osram.com

FIREFLY SFH 4030B and SFH 4060B IREDs launched

New-generation infrared LEDs tailored for AR/VR headsets and smart glasses



ams OSRAM GmbH of Premstätten, Austria and Munich, Germany has launched the new-generation FIREFLY SFH 4030B and SFH 4060B infrared light-emitting diodes (IREDs), which are claimed to set new standards for infrared LEDs in augmented reality (AR) and virtual reality (VR) applications such as eye tracking in smart glasses and AR/VR headsets.

VR is advancing toward unprecedented levels of immersion, seamlessness, energy efficiency and connectivity. This is made possible by innovations that, while compact, have the power to fundamentally redefine the user experience, operating at the core of next-generation devices, says ams OSRAM. The new-generation FIREFLY IREDs SFH 4030B and SFH 4060B IREDs are said to meet the demands of next-generation AR and VR headsets. Leveraging advanced IR:6 thin-film chip technology, they deliver up to 50% brighter infrared illumination and 33% higher efficiency, resulting in longer battery life and optimized system performance.

Notably, the new generation of FIREFLY SFH 4030B and SFH 4060B are the first in their class to feature a fully black package, setting a new benchmark in terms of discreet integration, it is claimed, and offering maximum design flexibility for nearly invisible placement in AR/VR headsets and smart glasses. Specifically designed for eye tracking, an additional new 930nm wavelength has been introduced. It offers an extra option to operate the system within the optimal range of maximum camera sensitivity, while simultaneously minimizing the red-glow effect.

“With the new generation of FIREFLY IREDs, we provide AR/VR headsets and smart glasses with a compact and efficient solution for biometric applications,” says product manager Markus Heller. “The combination of high performance, small size and flexible integration with the new all-black package supports the development of modern, user-friendly devices.”

The launch of the new FIREFLY generation is in line with key trends in VR and AR. As headsets become lighter and wireless, there is growing demand for compact, energy-efficient components. Eye tracking and other biometric features are becoming the standard, enabling intuitive interfaces and advanced analytics. Cloud-based VR is increasing, requiring reliable hardware for real-time rendering and AI features. The new generation of FIREFLY IREDs meets the demands of modern AR and VR applications while emphasizing sustainability, offering long-term availability and robust qualification for extended lifetimes across industries such as healthcare, education, and entertainment.

The FIREFLY SFH 4030B and SFH 4060B are suitable for smart glasses with advanced eye tracking and iris scanning, as well as optical sensing in mobile, wearable and industrial devices.

www.ams-osram.com/innovation/technology/irled-ir6

FBH presenting latest advances at Photonics West

GaAs-based laser wavelength range expanded from 620nm to 614nm

At SPIE Photonics West 2026 in San Francisco, CA, USA, the Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH) of Berlin, Germany is delivering 20 scientific presentations at the conferences (17–22 January) and exhibiting at the trade fair (20–22 January).

In the German Pavilion, FBH is presenting its full portfolio, from device design to prototype development and small-series production. A key highlight remains its chip technology. Among recent breakthroughs: FBH has expanded the wavelength range of gallium arsenide (GaAs)-based lasers from 620nm to 614nm, which is of particular relevance for quantum computing. This wavelength enables the reset of barium ions used as qubits in quantum processors. Additional focus areas include tailored modules and systems, supporting applications such as direct material processing, hyperspectral imaging in the mid-infrared using entangled photon pairs, and solutions designed for deployment in space.

Photonic integration based on gallium arsenide

Using its expertise in chip design and the fabrication of GaAs-based diode lasers, FBH has developed a monolithic GaAs-based photonic integrated waveguide platform that combines on-chip amplification with passive, shallow and deep-etched waveguides. This technology provides the foundation for ring-resonator-coupled lasers and can cover a wavelength range from 950nm to 1180nm. Potential applications include quantum physics, spectroscopy, and biosensing.

High-power diode lasers – from advanced chips to real-life industrial testing

FBH has continued successful field trials of its SAMBA laser head, demonstrating metal 3D printing of test structures directly at an industrial partner's site. At the core of this direct diode laser system is a compact module providing 1kW continuous wave (CW) output power. Its 780nm wavelength is tailored to the absorption peak of aluminium. In parallel, the team at FBH has introduced lasers with narrower stripe widths and shorter resonators, raising CW conversion efficiency at the 1kW level to 50%. These improvements also doubled the achievable powerdensity to 2kW/mm^2.

Further progress has been achieved in the development of pump laser sources, a key technology for inertial fusion energy (IFE) systems. FBH is employing new device concepts that enhance performance while reducing manufacturing costs. These innovations include multi-junction designs as well as advanced technological approaches for facet passivation and grating stabilization.

Meanwhile, FBH is steadily advancing its technological foundations, resulting in a substantial increase in the brilliance of broad-area lasers. A customized current profile along the resonator results in a homogeneous device temperature distribution, reducing the lateral far field by 30% for the first time worldwide.

Modules for demanding space applications

For many years, FBH has been developing and manufacturing diode laser modules for use in challenging environments including space, with their reliability confirmed in multiple microgravity experiments. The institute is currently manufacturing 55 ultra-narrowband modules for the BECCAL apparatus, which will support quantum-optical experiments aboard the International Space Station (ISS).

These modules are based on the patented MiLas technology, developed in-house. Micro-integrated MiLas laser modules are said to be exceptionally robust and extremely compact, with dimensions of only 125mm x 75mm x 23mm and a weight of 750g. They provide output powers above 500mW with an intrinsic linewidth below 1kHz. This technology is currently being further developed for use in MEO and GEO satellite orbits with operational lifetimes exceeding 15 years.

In parallel, FBH is pushing further miniaturization efforts by transferring the established hybrid External Cavity Diode Laser (ECDL) concept to a single chip to realize a monolithically integrated ECDL (mECDL).

FBH's pulsed nanosecond laser sources for time-of-flight (ToF) LiDAR systems are also aimed at space applications. The distance-measurement modules for mid-range scanning are equally suited for robotics and autonomous driving. They are developed in several variants, each featuring in-house-developed driver electronics tailored to the specific application and delivering high output power along with excellent lateral beam quality. For example, 48-emitter laser bars with a 50μm stripe width achieve pulse powers exceeding 2000W.

Miniaturized and powerful: Isolator with broad wavelength coverage

Optical isolators are critical components in semiconductor laser systems, ensuring that emitted light travels only in one direction and protecting the laser from harmful feedback. FBH has developed a technology platform for highly compact isolators with a volume of less than 0.5ml. These miniaturized components cover a wide wavelength range from around 400nm to 950nm and deliver impressive performance, providing more than 30dB isolation and transmission above 70%. FBH hence closes a gap in the current commercial landscape and enables new applications, including photonic modules for compact quantum computers, high-precision optical clocks, and mobile quantum sensors. One of these isolators has already been deployed in space aboard a nanosatellite.

www.fbh-berlin.de

BluGlass appoints CEO Jim Haden as executive director, replacing non-exec director Jean Michel Pelaprat

Continued board refresh brings leadership structure in-line with US best practice

BluGlass Ltd of Silverwater, Australia — which develops and manufactures gallium nitride (GaN) blue laser diodes based on its proprietary low-temperature, low-hydrogen remote-plasma chemical vapor deposition (RPCVD) technology — has appointed CEO Jim Haden as executive director, subject to obtaining a director's ID.

Haden joined BluGlass as president in September 2021 and transitioned to CEO in March 2023. Since then, he has led the business to secure strategic partnerships with the US Department of War (DoW), the Indian Ministry of Defence, and industry pioneers serving critical defence, aerospace and quantum verticals. He led the acquisition of a dedicated Silicon Valley laser production facility, enabling faster development and production, improved manufacturing quality, and the ability to pursue next-generation high-fidelity capabilities to capture high-growth precision markets.

Haden has more than three decades' laser expertise and a track record of transitioning advanced technology businesses to profitable, high-growth commercial entities. Before joining BluGlass he held senior leadership positions at several potential customers and competitors, including Kyocera SLD, nLight, Coherent and JDS Uniphase (now Lumentum).

Haden replaces Jean-Michel Pelaprat, who is stepping down as non-executive director. The board thanks him for his industry perspectives and guidance over several years during the most critical development phase in the company's history.

"To further align management's interests with those of our shareholders; and to embed a true 'founder mentality' across the business, we are pleased to appoint Jim to the board — signalling to the market that the CEO is not simply an employee but an owner-operator with long-term strategic accountability," notes executive chair Omer Granit. "It also strengthens alignment between the board and shareholders as we adopt governance practices common among leading US public companies and expand our US footprint across both commercial and capital markets. BluGlass is currently at a critical crossroads, with demonstrated technical progress executed at a pace that stands out in the global GaN laser sector; however, it also has some significant growth and commercialization hurdles to overcome to ensure it is positioned to capture tactical markets across the global defence, aerospace, quantum and biotech sectors," he adds.

"Jim's appointment expands his remit, further supporting the turn-around from an underfunded innovator to a global leader as we continue to build our US laser fab capability, accelerate product development, and secure strategic defence and quantum opportunities that validate both our technology and our strategy," Granit continues. "Jim and his team have cultivated trust with tier-1 partners and defence primes… as we scale BluGlass into a leading commercial force in next-generation GaN lasers," he adds.

"I thank Jean-Michel for his long-standing, valuable contribution and guidance as the company completed its pivot to a pure-play GaN laser leader," Granit concludes.

"Leadership's fresh approach to market execution and capital strategy positions us to leverage our strong project pipeline, collectively valued at over US$100m," comments Haden. "We are in advanced negotiations with several major industry players, and these projects are expected to deliver significant revenue contracts, strengthen our industry reputation, and further enhance our technical capabilities. Alongside our proven go-to-market strategy, the board is actively exploring broader opportunities to accelerate growth by leveraging our US manufacturing capabilities and innovative product portfolio."

www.bluglass.com.au

BluGlass secures contract extension with NCSU-led CLAWS Hub

Third year, worth US$680,000, is part of Commercial Leap Ahead for Wide Bandgap Semiconductors Hub

The US subsidiary of BluGlass Ltd of Silverwater, Australia and North Carolina State University (NCSU) have extended their existing contract to include a third year, valued at A$1.05m (US$680,000). Under the extension, BluGlass will continue developing gallium nitride (GaN) lasers to support defence, quantum, and dual-use technology development for the US Department of War (DoW) as part of the Commercial Leap Ahead for Wide Bandgap Semiconductors (CLAWS) Hub, which is led by NCSU.

The CLAWS Hub is one of eight Microelectronic Commons innovation hubs established by the US DoW (formerly the US Department of Defense) and funded by the CHIPS and Science Act. The Microelectronics Commons program is a collaborative capability-building program developing sovereign next-generation microelectronics for critical defence and dual-use technologies.
Hub members include Coherent, MACOM, and General Electric.

Under its core-development contract for Year 3 of the Microelectronics Program, BluGlass will continue developing its high-fidelity, high-precision GaN laser and integrated photonic technology to address both the scalability challenges and the exacting precision requirements of next-generation quantum computing and intelligence applications. The contract award follows BluGlass' completion of all development milestones of its A$2.9m Year-2 core-development contract for US fiscal year 2025.

Under the Year-2 CLAWS Hub development program BluGlass continued to develop its GaN laser platform and demonstrated significant power conversion efficiency improvements across its portfolio from violet to blue wavelengths as well as enhanced distributed feedback (DFB) laser capabilities. BluGlass has been awarded a combined A$6.5m (US$4.4m) for the first three years of the 5-year Microelectronics Commons program.

"Securing a third consecutive year of support from the US Department of War is a strong endorsement of our technology leadership and the accelerating momentum of our GaN laser roadmap," says BluGlass' CEO Jim Haden. "Building on last year's success with the CLAWS Hub, this renewed contract further strengthens our role in developing critical next-generation quantum, defence, and dual-use technologies supported by robust sovereign supply chains," he adds.

"Our continued collaboration with hub members and industry partners is fast-tracking the transition of advanced photonics and optoelectronic devices from early-stage research through to commercial manufacturing," Haden continues. "BluGlass is establishing itself as a commercial off-ramp within the US lab-to-fab ecosystem — enabling new capabilities in sensing, communications, materials processing, aviation, and future quantum systems. This contract reflects the conversion of an opportunity within our US$100m pipeline, with this non-dilutive funding enhancing both our technology roadmap and manufacturing excellence as we team with Hub members to deliver technologies vital to national security and emerging quantum markets."

www.bluglass.com.au

NUBURU secures $25m financing to complete acquisitions

Transaction with YA II PN enables accelerated execution of multi-asset integrated defense & security platform

NUBURU Inc of Centennial, CO, USA — which was founded in 2015 and developed and previously manufactured high-power industrial blue lasers — has entered into a securities purchase agreement with YA II PN Ltd pursuant to which it will receive a gross cash infusion of $23.25m in exchange for the issuance of a $25m unsecured debenture and related warrant packages.

The financing will strengthen NUBURU's capital position and enable it to accelerate execution of its acquisition and integration roadmap, advancing its transformation into a vertically integrated, multi-domain defense & security platform. NUBURU says it will be positioned to move from strategy into execution across its target industries — defense-grade laser and photonics systems, mission-critical software, advanced UAV platforms, and specialized defense mobility solutions. Closing is subject to customary closing conditions.

Strategic plan implementation

The financing will support NUBURU's transformation plan, including allowing it to hire key personnel and advisers, develop existing intellectual property, and continue to pursue key acquisitions and investments.

Transaction update

NUBURU is pursuing key transactions, including the following:

● **Orbit acquisition** — mission-critical software & operational resilience

Through Nuburu Defense LLC, NUBURU is advancing toward full control of Orbit Srl, a mission-critical SaaS platform supporting operational resilience, crisis management, and situational-awareness use cases.

Orbit will serve as the digital backbone of NUBURU's platform, delivering real-time data fusion, decision support, and end-to-end operational visibility across highly regulated industries and critical-infrastructure environments.

● **Lyocon acquisition & photonics expansion**

On 1 December, NUBURU entered into binding heads of terms to acquire Lyocon Srl, an Italian photonics and laser-engineering company with advanced cleanroom and precision-manufacturing capabilities.

The Lyocon acquisition is anticipated to revitalize NUBURU's blue laser business by establishing a European manufacturing footprint and enhancing its potential, subject to future developments, to support the delivery of defense-grade photonics systems at scale.

● **Tekne strategic-interest program** — defense mobility & systems integration

NUBURU confirms that the first €2m tranche of its €15m strategic support program for Tekne was executed during fourth-quarter 2025. It anticipates that, subject to ongoing negotiations and the satisfaction of agreed commercial stipulations, it may fund the remaining €13m convertible shareholder loan in combination with the acquisition of an initial 2.9% equity stake in Tekne and commence operations under a network contract (Contratto di Rete) between the two companies. Conversion of the Tekne loan, as well as any further strategic investment in Tekne that could result in the acquisition of a controlling interest, remain subject to applicable regulatory approvals, including 'Golden Power' authorization from the Italian government.

Tekne would add specialized defense mobility, armored vehicle and electronic systems capabilities to NUBURU's expanding platform.

● **Maddox Defense joint venture** — advanced UAV platforms

Nuburu Defense is pursuing a controlling interest in a joint venture with Maddox Defense Inc, which will focus on next-generation — dual-use — UAV solutions, through deployable additive-manufacturing pods rather than single-platform systems.

Key development areas include:

● containerized mobile additive-manufacturing pods utilizing multi-printer hybrid fleets (SLS and continuous-fiber composite systems) capable of producing structural, mission-critical defense components in forward or austere environments;

● EM3D/advanced additive manufacturing for defense, enabling rapid production of UAS components, ground systems parts, mission payload housings, tooling, and spares without reliance on centralized supply chains;

● defense manufacturing-as-a-service models, allowing allied forces and government customers to deploy production capacity where and when needed;

● ISR-enabling platforms and mission hardware, produced, repaired and iterated directly within theater;

● training, certification and sustainment programs, including deployed Master Trainer teams and remote operational support;

● field deployment, lifecycle sustainment, and after-sales services, creating recurring revenue through consumables, upgrades, and support contracts.

The Maddox JV's 2026–2028 business plan prioritizes the assessment and development of military and defense-oriented drone applications, while also evaluating commercial and civil-sector deployments, leveraging NUBURU's core blue laser platform, enabled by Lyocon's advanced manufacturing and engineering capabilities, together with the Orbit operational-resilience system and Tekne's defense-mobility suite.

Financing structure and additional capital upside

Under the securities purchase agreement, in exchange for a capital infusion of $23.25m, NUBURU will issue a $25m unsecured debenture, together with four series of warrants with per-share exercise prices of $0.01 (for 80 million shares), $0.25 (for 100 million shares), $0.375 (25 million shares), and $0.47 (25 million shares), respectively. The debenture will bear 8% annual interest, begin monthly amortization in March 2026, and mature in December 2026, subject to extension at the holder's option.

If all warrants are exercised for cash, NUBURU may receive up to about $46.9m in additional gross proceeds, providing potential incremental liquidity to support future strategic and growth initiatives. The warrants may be exercised on a cashless basis until such time as the underlying shares have been registered for resale with the Securities and Exchange Commission.

Full details of the transaction will be disclosed in a Form 8-K filed within the applicable reporting period.

"This financing represents a pivotal execution milestone for NUBURU," says executive chairman & co-CEO Alessandro Zamboni. "We have the capital we need to continue our acquisition roadmap, honor our strategic commitments, and accelerate the integration of laser, photonics, software, mobility, and UAV capabilities into a unified defense & security platform," he adds.

"Entering 2026 with this strengthened capital position allows us to scale with speed and precision across multiple defense domains," says Dario Barisoni, co-CEO of NUBURU and CEO of Nuburu Defense. "Our strategy is intentionally integrated — software informing hardware, photonics enhancing mobility and UAV platforms. This financing ensures we can execute without delay."

www.nuburu.net

Phlux showcasing 1550nm IR sensor APDs for laser range finders, optical test, LiDAR and free-space optical communications

Aura Noiseless InGaAs APD technology makes final in 2026 SPIE Prism Awards' 'Sensors' category

Phlux Technology — which was spun off from the University of Sheffield in 2020 and designs and manufactures 1550nm avalanche photodiode (APD) infrared (IR) sensors — is showcasing its Aura family of Noiseless InGaAs APDs in booth 5528 at SPIE Photonics West 2026, San Francisco, CA, USA (20–22 January).

The booth features two demonstrations: one for 1550nm LiDAR, an essential long-distance IR sensing technology for assisted driving (ADAS) and autonomous vehicle applications, and the second for optical time-domain reflectometers (OTDR), where the sensors boost range and improve fault-detection accuracy.

The Aura family of sensors, available in 30µm, 80µm and 200µm versions, are 12x more sensitive than traditional InGaAs (indium gallium arsenide) APDs and extend the range and accuracy of IR systems by up to 50% for a given laser power. Alternatively, for a given range, significantly lower laser power is needed, which reduces system costs by up to 40% and size and weight by up to 30%, not least due to simplified thermal management. The sensors are designed for professional laser range finders, fiber-optic test equipment (OTDRs), long-distance LiDAR, and free-space optical communications. In all these applications, the adoption of 1550nm ensures eye-safe operation, eliminating one of the biggest disadvantages of 905nm IR systems.

Aura APDs will operate at up to +85°C with minimal performance degradation, which is significantly higher than traditional sensors. They feature high dynamic range and fast recovery from powerful reflected signals to minimize dead zones in OTDR applications, which can otherwise mean that faults close to the instruments may go undetected. The high sensitivity of the APDs also enables higher resolution so that even minor faults can be detected in fiber-optic networks, and tiny objects with low reflectivity identified in range finding and LiDAR applications. These benefits are equally applicable to emerging hollow-core fiber (HCF) technologies, which promise up to 47% greater data speeds and significantly lower latency than current networks.

Aura Noiseless InGaAs APDs are designed to meet MIL-STD-883, are qualified to Telcordia GR-468 and are drop-in replacements for existing surface-mount or TO-packaged components, enabling instant upgrades to existing systems.

Noiseless InGaAs APD technology was developed by adding an antimony alloy to the compound semiconductor manufacturing process. The resulting devices operate with internal gain of up to 120, enabling the smallest signals to be detected above the noise floor.

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

Perceptra secures €1.2m funding from PhotonDelta

MIT spin-off and Global Photonics Engineering Contest winner relocating R&D facilities to Netherlands to scale photonic sensing for chemical monitoring

Perceptra of Oakland, CA, USA — spun off from Massachusetts Institute of Technology (MIT) in 2021 to pioneer photonic chip-based AI-enabled Raman sensors for chemical monitoring — has secured €1.2m in funding from photonic chip industry accelerator PhotonDelta of Eindhoven, the Netherlands (which connects and collaborates with an ecosystem of photonic chip technology organizations worldwide).

The funding will accelerate the development and commercialization of its next-generation photonic chip-based Raman sensors.

The €1.2m funding with a loan marks the next stage in the collaboration between Perceptra and PhotonDelta, following the startup's victory in the 2025 Global Photonics Engineering Contest for its ultra-compact photonic chip-based Raman sensor for real-time molecular monitoring in biomanufacturing. The contest highlighted Perceptra's potential to disrupt industries where real-time sensing and control are key to efficiency and innovation.

Perceptra is focused on developing the first ultra-compact, low-cost photonic chip-based Raman sensor for real-time molecular monitoring in biomanufacturing and other process industries. Based on a hybrid silicon nitride (SiN) and gallium arsenide (GaAs) photonic integrated circuit (PIC) platform, its technology replaces traditional bulky dispersive spectrometers with on-chip tunable lasers for performing swept-source Raman spectroscopy, drastically reducing system size and enabling high-sensitivity molecular analysis directly on the chip.

Key features therefore include:

- ultra-compact design — a 1000x reduction in size compared to traditional systems;
- low-cost architecture — 100x cheaper to produce and deploy;
- high sensitivity — comparable to lab-scale Raman systems; and
- self-contained operation — no external optics or fibers needed.

Having demonstrated proof-of-concept, Perceptra will use the new funding to develop a first PIC-based version of the system.

Launching its solution at the PIC Summit Europe 2025 in October, Perceptra shared its journey from early-stage concept to ecosystem-backed venture, and outline the next stage of its technology roadmap. They also demonstrated a working prototype on the show floor developed in collaboration with PhiX Photonics Assembly and LioniX International (initiator and orchestrator of the establishment of PHIX B.V.), both of Enschede, the Netherlands.

The startup is relocating its integrated photonic R&D to the Netherlands to join the vibrant PhotonDelta ecosystem. This will facilitate access to a world-leading infrastructure, research networks, and a large engineering talent pool, enabling Perceptra to advance its technology and scale its business in Europe.

"PhotonDelta's funding marks a milestone moment in turning our research into a scalable venture," says Perceptra's CEO & co-founder Amir Atabaki. "Integrated photonics is redefining what's possible in molecular sensing and, by joining the PhotonDelta ecosystem in the Netherlands, we will be able to accelerate development, access world-class fabrication, and bring our first photonic sensing products to market," he adds.

"Perceptra's announcement at PIC Summit Europe showcases the major strides the integrated photonics space is taking," says PhotonDelta executive director & CFO Laurens Weers. "It represents the kind of breakthrough thinking that integrated photonics enables. Their work at the intersection of photonic chip technology and AI is an example of how this technology can transform entire industries. We are excited to support Perceptra as they expand to the Netherlands and bring their vision to market."

www.perceptra.io
www.photondelta.com
www.phix.com
www.lionix-international.com

Lumentum appoints onsemi's CFO Thad Trent to board

Firm gains expertise in corporate finance, merger & acquisition activity, in-house manufacturing and process efficiency

Lumentum Holdings Inc of San Jose, CA, USA (which designs and makes photonics products for optical networks and lasers for industrial and consumer markets) has appointed Thad Trent to its board of birectors, expanding the board membership to nine members.

"He brings a wealth of expertise in corporate finance, M&A activity, in-house manufacturing and process efficiency that is mission-critical to our future," comments board chair Penelope Herscher. "His valuable insights will accelerate the execution of our long-term strategy, helping us drive growth and deliver sustainable shareholder value," she adds.

"Lumentum's portfolio of foundational optics is vital for the significant build-out of artificial intelligence and cloud infrastructure," says Trent. "I look forward to collaborating with the senior leadership team and the rest of the board to ensure we capitalize on these significant opportunities and build lasting value for our shareholders," he adds.

Trent is a finance professional with leadership and management experience at a variety of complex, global public companies.

He is currently executive VP & chief financial officer of onsemi, a role held since February 2021.

Prior to onsemi, he was CFO of Cypress Semiconductor Corp from 2014 until its acquisition by Infineon Technologies in 2020.

His career, which began in 1992, includes progressive finance leadership roles at companies such as Wind River Systems and Wyle Electronics.

Trent holds a B.S. in Business Administration and Finance from San Diego State University.

www.lumentum.com

CORNERSTONE and Future Worlds seek applicants for new silicon photonics startup stream

CORNERSTONE Photonics Innovation Centre (C-PIC) — the UK's dedicated Innovation and Knowledge Centre (IKC) for silicon photonics (affiliated with the University of Southampton and the University of Glasgow, plus the UK government's Science and Technology Facilities Council) — partnered with Future Worlds (the University of Southampton's startup accelerator) to launch a dedicated Silicon Photonics Stream at a Future Worlds Bootcamp on 29–30 November.

The new stream gives researchers working in silicon photonics the chance to explore the commercial potential of their technology through an intensive, fully funded weekend designed to fast-track entrepreneurial thinking. This is a national program open to UK researchers, students, founders and SMEs. Hosted by experienced founders and startup experts, the Bootcamp provides an introduction to startup fundamentals — from validating business ideas to understanding investment pathways and building high-impact ventures.

For some, Bootcamp is a motivational first step towards exploring the business landscape. For others, it could be the start of a longer journey into the Future Worlds Cohort, a six-month acceleration program that offers mentoring, training and a trip to Silicon Valley, culminating in a pitch at Demo Day 2026.

Participants progressing to the Cohort also have the opportunity to apply for up to £40,000 in equity-free funding for prototyping, technical services, and specialist support, further accelerating their journey from breakthrough research to real-world innovation. This funding aims to remove early barriers to commercialization, helping founders refine their technology, develop demonstrators, and engage potential customers or investors with confidence. Funding is subject to EPSRC eligibility and terms and conditions.

Future Worlds helps University of Southampton researchers, students and graduates to launch and scale startups and spinouts. By connecting aspiring founders with expert mentors, investors, and industry networks, it supports the commercialization of new technologies emerging from the University.

Since its inception, Future Worlds startups have raised over £115m, supporting more than 409 jobs across 69 active companies, and helping over 120 aspiring founders every year to take their first steps into entrepreneurship. The new Silicon Photonics program further strengthens that mission – creating a pathway for innovators in one of the UK's most advanced and high-impact technology sectors. This year Future Worlds celebrates its 10-year anniversary. Over the past decade, Future Worlds has grown into an innovation ecosystem, and its expansion continues with the launch of two new national cohort programs: AI and Photonics. These additions reflect its commitment to nurturing cutting-edge technologies and empowering the next generation of founders and researchers.

The CORNERSTONE Photonics Innovation Centre builds upon the existing CORNERSTONE Foundry, aiming to enhance the openness and availability of silicon photonics. It is intended to foster a commercialization pipeline that nurtures silicon photonics-enabled technologies and companies with the potential to enrich everyday life.

www.cornerstone.sotonfab.co.uk

US orders HieFo to divest Emcore InP assets

Control by China citizen deemed to be national security risk

US President Donald Trump has issued an executive order requiring Delaware-registered optical communications device developer and manufacturer HieFo Corp of Alhambra, CA, USA to divest the assets it acquired when it was formed on 30 April 2024 through a management buy-out of the digital chips business line and indium phosphide (InP) wafer fabrication operations of New Jersey-based Emcore Corp.

"There is credible evidence that leads me to believe that HieFo… controlled by a citizen of the People's Republic of China… might take action that threaten to impair the national security of the USA," it is stated.

The executive order follows a review by the Committee on Foreign Investment in the United States (CFIUS), which determined that the acquisition represented a national security risk relating to potential access to Emcore's intellectual property, proprietary know-how and expertise, and to the potential diversion of supply of InP chips manufactured by the Emcore digital chips business away from the USA.

According to CFIUS, HieFo did not submit the transaction for review until after CFIUS' non-notified team had initiated an investigation.

Within 180 days of the executive order (unless CFIUS grants an extension), the order directs HieFo to divest all interests and rights in the Emcore assets, including contracts, inventory, tangible property, parts, fixed assets, accounts receivable, permits, real property leased or owned by Emcore, and intellectual property.

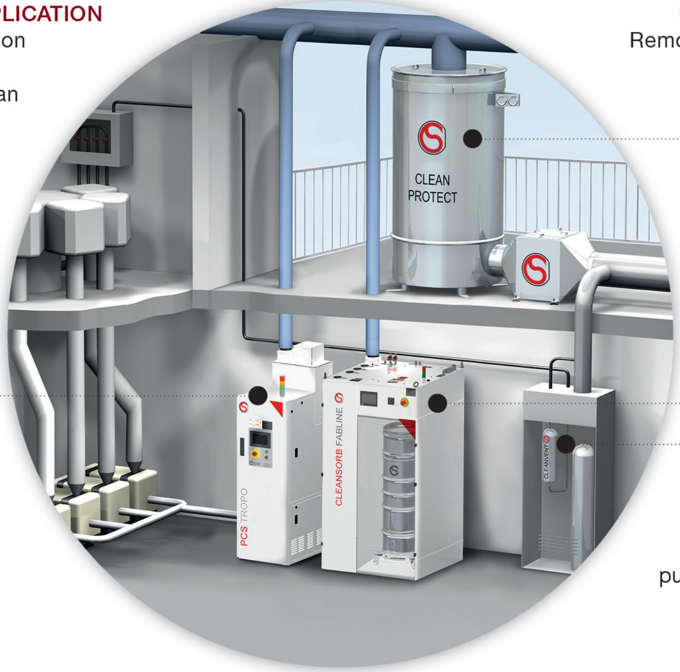
HieFo is required to certify to CFIUS that it has destroyed or transferred all intellectual property associated with the Emcore assets. After certification is provided to it, CFIUS shall conclude its verification procedures within 90 days.

Until divestment is completed and verified by CFIUS, HieFo is barred from granting any non-Hiefo personnel any access to the Emcore assets or associated non-public technical information, information technology systems, products, parts and components, books and records, or facilities in the USA without CFIUS approval.

The order also bars dissolving, reorganizing or transferring any interest or rights in any of the Emcore assets or other actions that could impede compliance.

CFIUS is authorized to require auditing of HieFo to ensure compliance with the order and any conditions imposed by it.

www.hiefo.com



UK and Canada collaborate on optical engine for faster, more efficient and more sustainable AI data centers

Trans-Atlantic partnership to accelerate global innovation and build new international supply chain

A new UK–Canada technology partnership is building an advanced optical engine designed to make the world's AI data centers faster, more efficient and more sustainable.

The project is the first major technical collaboration to emerge from the memorandum of understanding (MoU) signed earlier this year between:

- the UK's Compound Semiconductor Applications (CSA) Catapult (a not-for-profit center of excellence established in 2018, specializing in the measurement, characterization, integration and validation of compound semiconductor technology spanning power electronics, advanced packaging, radio frequency and microwave, and photonics applications);
- the National Research Council of Canada (NRC) Canadian Photonics Fabrication Centre (CPFC, Canada's only pure-play indium phosphide wafer fab, which specializes in custom photonics components and photonic integrated circuits); and
- the Centre de Collaboration MiQro Innovation (C2MI, a Canadian, global center for MEMS manufacturing, advanced semiconductor assembly and printable electronics).

In July, CSA Catapult, C2MI and the NRC signed an MoU to strengthen UK–Canada collaboration in photonic devices and compound semiconductor technologies.

The teams in both countries are now engineering new technology solutions, sharing expertise and building a new end-to-end supply chain for photonics applications.

Funded with £400,000 from the UK Research and Innovation (UKRI) Technology Missions Fund, delivered by government agency Innovate UK, the organizations will develop a co-packaged optical engine – technology that integrates multiple optical components into a single package to handle extreme data loads with far lower power consumption.

Tackling the energy cost of AI

Training and running AI systems requires huge amounts of electricity, and data-center energy use is rising quickly. The new optical engine aims to support higher bandwidth, lower latency and reduced power consumption – laying the foundations for more sustainable, high-performance AI systems.

Making a global mark

CSA Catapult's recent visit to Canada highlighted how the UK supply chain can fill critical gaps and where Canadian expertise accelerates UK innovation. This led to establishing the new joint project, and it has already attracted international attention.

The partnership and new project were presented at this year's G7 meeting as an example of countries moving beyond intent and actively working together to deliver practical, real-world innovation.

The optical engine will be validated at CSA Catapult's Future Telecoms Hub in Bristol (new translational research facility for telecoms hardware and technology platforms) before being tested on JOINER, an international experimentation platform born out of the UK, which allows new hardware to be trialled under realistic operating conditions.

"By linking our UK design skills and expertise with Canada's outstanding laser fabrication and assembly capabilities, we're creating a robust and exciting new trans-Atlantic supply chain and developing ground-breaking optical hardware that will help AI run faster and more sustainably," says Joe Gannicliffe, head of Photonics and RF at CSA Catapult. "The technology demonstrator we'll create will have been tested in the lab and in real world, and UK companies working with us will be able to access and build on this in future, helping them integrate next-generation optical technology into their own systems and strengthening the UK's position within a growing global market," he adds.

www.csa.catapult.org.uk/case_studies/futuretelecomshub
www.joiner.org.uk

Vitrealab closes $11m Series A financing round

Funding to accelerate development of quantum light chip for AR displays

Vitrealab GmbH of Vienna, Austria, a developer of photonic integrated circuits (PICs) for laser–LCoS-based augmented reality (AR) light engines, has closed a significantly oversubscribed $11m Series A financing round, led by LIFTT Italian Venture Capital and LIFTT EuroInvest with participation from Constructor Capital, aws Gründungsfonds, Gateway Ventures, PhotonVentures, xista Science Ventures, Moveon Technologies, and Hermann Hauser Investment.

Investor interest was driven by an industry-wide inflection in augmented reality and Vitrealab's technology's fit with the performance, efficiency and form-factor demands of next-generation AR devices.

The funding will help to accelerate the development and industrialization of Vitrealab's Quantum Light Chip (QLC). Vitrealab plans to strengthen collaborations with customers and partners, demonstrate next-generation light-engine architectures, and continue building the technical foundation required to bring AR displays into everyday use.

Vitrealab's core technology leverages photonic integrated circuits to precisely guide and shape coherent laser light for laser–LCoS light engines. The approach is said to significantly reduce system complexity, optical losses, and size, while preserving polarization and beam quality. This enables higher brightness, wider fields of view, and lower power consumption in form factors suitable for lightweight AR smart glasses.

"This funding allows us to move from advanced prototypes to industrial-grade solutions, while continuing to push the boundaries of what is possible with photonic integrated circuits in display applications," says chief technology officer Dr Jonas Zeuner.

The investor group brings together deep expertise in photonics, semiconductors, hardware commercialization and photonics mass manufacturing. Vitrealab reckons that their support will help it to strengthen its position as a key technology supplier within the AR ecosystem and accelerate partnerships across the optical value chain.

"Augmented reality has reached a point where the market is ready but the hardware is not, and in particular the display," notes Marco Cravetto, business analyst at LIFTT. "Vitrealab addresses this challenge at its core with a proprietary laser-based technology that combines performance, industrial scalability and a strong European IP foundation."

www.vitrealab.com

MicroLink Devices UK awarded in Call 2 of CSconnected Supply Chain Development Programme

Funding for SALMAT Solar Array Lamination MATerials project to develop UK-based source

The South Wales-based compound semiconductor cluster CSconnected has announced MicroLink Devices UK Ltd as an awardee of the CSconnected Supply Chain Development Programme — Call 2.

Delivered in partnership with Cardiff Capital Region, the £1m program provides grants of up to £100,000 to support supply chain innovation and capability development across South Wales. It supports suppliers and buyers to invest in equipment, enhance competitiveness and capacity, and accelerate the development of new products and services, contributing directly to continued growth of the South Wales compound semiconductor cluster.

MicroLink Devices UK has been awarded funding for its SALMAT (Solar Array Lamination MATerials) project. The project addresses a critical supply chain challenge for aerospace solar arrays, which rely on specialist lamination materials. Currently, these materials are dependent on a single overseas supplier, revealing potential for future supply chain disruption. Through SALMAT, MicroLink Devices UK will look to develop a UK-based supply of this specialist material, strengthening resilience and capability within the UK supply chain.

"The SALMAT project will allow us to strengthen local manufacturing capability, deepen collaboration across the South Wales compound semiconductor cluster, and take practical steps towards a more resilient, UK-based supply chain," comments MicroLink Devices UK's CEO Julie Fazackerley.

The CSconnected Supply Chain Development Programme remains a cornerstone initiative to deliver long-term growth, capability, and economic value for the Welsh and wider UK semiconductor industry.

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

Ascent Solar closes up to $5.5m private placement

$2m upfront with up to $3.5m of potential proceeds upon full exercise of warrants

Ascent Solar Technologies Inc of Thornton, CO, USA – which designs and makes lightweight, flexible copper indium gallium diselenide (CIGS) thin-film photovoltaic (PV) panels that can be integrated into consumer products, off-grid applications and aerospace applications – has closed its private placement for the purchase and sale of an aggregate of 1,025,643 shares of common stock (or pre-funded warrants in lieu thereof), series A warrants to purchase up to 1,025,643 shares and short-term series B warrants to purchase up to 1,025,643 shares at a purchase price of $1.95 per share (or per pre-funded warrant in lieu thereof) and accompanying warrants priced at-the-market under Nasdaq rules.

The series A warrants and the short-term series B warrants have an exercise price of $1.70 and are exercisable immediately upon issuance. The series A warrants will expire five years from the effective date of the resale registration statement and the short-term series B warrants will expire 18 months from the effective date of the resale registration statement.

Gross proceeds from the offering were about $2m, prior to deducting placement agent's fees and other offering expenses payable by the company. The potential additional gross proceeds from the series A warrants and the short-term series B warrants, if fully exercised on a cash basis, will be about $3.5m.

No assurance can be given that any of the series warrants will be exercised, or that the company will receive cash proceeds from the exercise of the series warrants. Ascent intends to use the net proceeds from the offering for general working capital needs.

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Efficiency droop in nitride & phosphide LEDs

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Semi-polar epitaxial layer overgrowth improves micro-LED performance

Researchers report benefits for both efficiency and power.

University of California Santa Barbara in the USA reports on the potential of epitaxial layer overgrowth (ELO) to improve the efficiency and light output of micro-light-emitting diodes (μLEDs) [Stephen Gee et al, Semicond. Sci. Technol., v40, p115009, 2025].

The researchers comment: "Gallium nitride (GaN)-based micro-light-emitting diodes have emerged as a key technology enabling high-brightness, energy-efficient solutions for visible light communication, biosensing, and next-generation displays such as near-eye displays for virtual and augmented reality."

ELO is a technique for reducing defects in the GaN material such as threading dislocations, which create leakage paths that sap energy efficiency. The researchers used the technique to create semi-polar material with reduced internal electric fields resulting from the charge polarization of the chemical bonds. The fields give rise to the quantum-confined Stark effect (QCSE), which can result in significant shifts in emission wavelength, something not wanted in displays.

The researchers chose semi-polar growth from the (20-21) plane as "particularly favorable for longer-wavelength emitters". They add: "Its capability to support high-indium-content InGaN quantum wells with excellent crystal quality makes it especially promising for long-wavelength emission. The reduced polarization-related electric fields on this plane helps suppress the QCSE, especially at longer wavelengths where the QCSE is more pronounced, thereby enabling more stable emission wavelengths and lower efficiency droop."

The researchers compared μLEDs fabricated from material grown on (20$\bar{2}$1) ELO and (20$\bar{2}$1) planar freestanding GaN (Figure 1). "Lateral growth stops the vertical propagation of threading dislocations (TDs) and reduces the TDD, improving device performance," the researchers comment.

The ELO material was grown out of 5μm-wide windows in a 200nm-thick plasma-enhanced chemical vapor deposition (PECVD) silicon dioxide (SiO_2) mask layer. The spacing between the windows was 55μm. Metal-organic chemical vapor deposition (MOCVD) was used for the ELO.

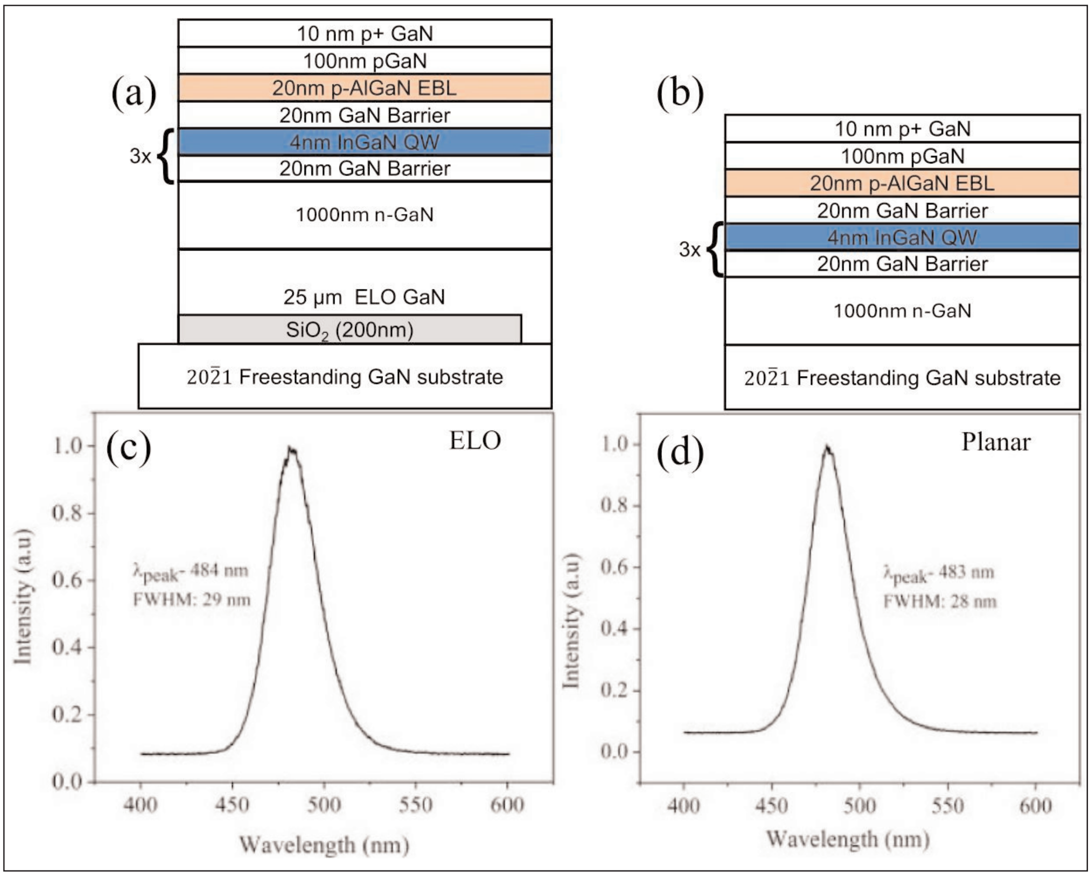

Figure 1. Schematic diagrams of (a) ELO and (b) planar μLED epitaxial structures with corresponding emission spectra for (c) ELO and (d) planar μLEDs.

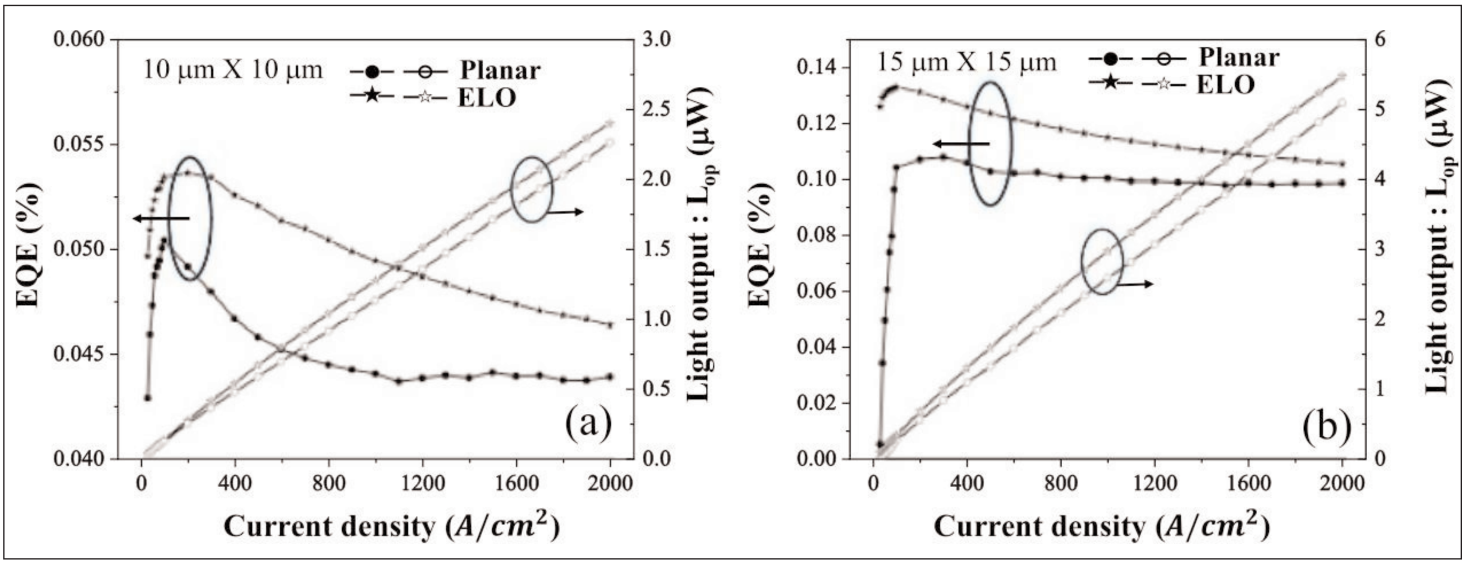

Figure 2. Dependence of EQE on current density for (a) 10µm and (b) 15µm-square ELO and planar µLEDs.

Table 1. Comparison of measured light output for square µLEDs.

Device type	Size	Injection current density	Measured light output
ELO	10µm	1×10^3A/cm^2	1.27µW
Planar	10µm	1×10^3A/cm^2	1.10µW
ELO	10µm	2×10^3A/cm^2	2.4µW
Planar	10µm	2×10^3A/cm^2	2.26µW
ELO	15µm	1×10^3A/cm^2	3.0µW
Planar	15µm	1×10^3A/cm^2	2.6µW
ELO	15µm	2×10^3A/cm^2	5.5µW
Planar	15µm	2×10^3A/cm^2	5.1µW

The first 400 minute ELO growth step resulted in GaN bars that were 25µm high and 40µm wide. The SiO_2 mask was then removed using hydrofluoric acid with the aim of improving uniformity and surface quality for the MOCVD device layers.

The electroluminescence (EL) spectra of the ELO had a peak at 484nm, close to the 483nm of the device on planar GaN.

The team comments: "This small wavelength shift observed in the ELO sample is attributed to its increased layer thickness and higher thermal impedance due to the air gap formed beneath the ELO GaN bars during the HF etching."

Micro-LEDs were fabricated with an indium tin oxide (ITO) current-spreading layer on the p-GaN. Sputtered SiO_2 was deposited as a 300nm isolation layer. The metal electrodes consisted of titanium/gold on the p-side, titanium/aluminium/nickel/gold on the n-side.

The researchers report increased light output from the ELO devices relative to the µLEDs fabricated on planar material (Table b). The improved performance was attributed to reduced threading dislocation density in the ELO, which decreases leakage and non-radiative recombination, such as through the Shockley–Read–Hall (SRH) mechanism.

The light output was measured from a calibrated silicon detector. The team comments: "While on-chip measurements suffer optical losses due to limited light collection, surface absorption, and limited light extraction, they provide consistent comparisons between devices."

The measurement setup also resulted in very low EQE measurements for similar reasons (Figure 2). For what it is worth, the peak EQE of the 10µm-square LEDs were 0.051% and 0.054% for the planar and ELO devices, respectively. The ELO peak came at 200A/cm^2, compared with 100A/cm^2 for the planar LEDs. The larger 15µm LEDs achieved higher EQEs: 0.11% at 300A/cm^2 for the planar device, and 0.13%, 100A/cm^2 for ELO.

The researchers comment: "The change in EQE with LED size was likely due to the increased SRH recombination at the sidewall of the devices. We expect to get greatly improved EQE and light output power measurements with an improved device, encapsulation, and measurement in an integrating sphere to capture all emitted light."

The wavelength (blue-)shift was smaller in the ELO device: 3nm at 2kA/cm^2, compared with 6nm for the planar µLED.

The researchers conclude: "Future studies will implement improved sidewall treatments to reduce SRH recombination and further isolate the effects of lowered defect density. The combination of these improvements with previously reported liftoff techniques could allow for the development of highly efficiency semi-polar µLED displays." ■

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Author: Mike Cooke

Patterning gallium nitride for improved red LEDs

A square 300µm-square patterned template region is found to enhance red LED external quantum efficiency by 57%.

Hefei University of Technology and Nanjing University in China have reported on the use of gallium nitride (GaN) template patterning as a means to enhance red light emission from high-indium-content quantum wells (QWs) in light-emitting diodes (LEDs) [Kun Xing et al, IEEE Transactions On Electron Devices, published online 18 November 2025].

The researchers found that the optimal template region was a 300µm x 300µm square on which the LED material was grown and then formed into devices.

The team reports: "A red mini-LED fabricated on the optimal template exhibited a peak emission wavelength of 634.0nm at 1A/cm^2, with the peak EQE [external quantum efficiency] enhanced by 57% compared to the LED grown on the unpatterned template."

Red mini-LEDs and micro-LEDs are being developed for micro-displays and other displays. At present the efficiencies are low, both for standard red-emitting semiconductors such as aluminium indium gallium phosphide (AlInGaP), and InGaN. AlInGaP in small form factors suffers from high surface recombination rates at sidewalls, killing efficiency. For InGaN, this has been found to be much less of a problem. Rather, it is still the high defect levels and other problems of incorporating sufficient indium to enable stable red light emission.

The researchers describe the effect of the template size on the GaN material grown on top: "The compressive stress within the lattice is relieved when the

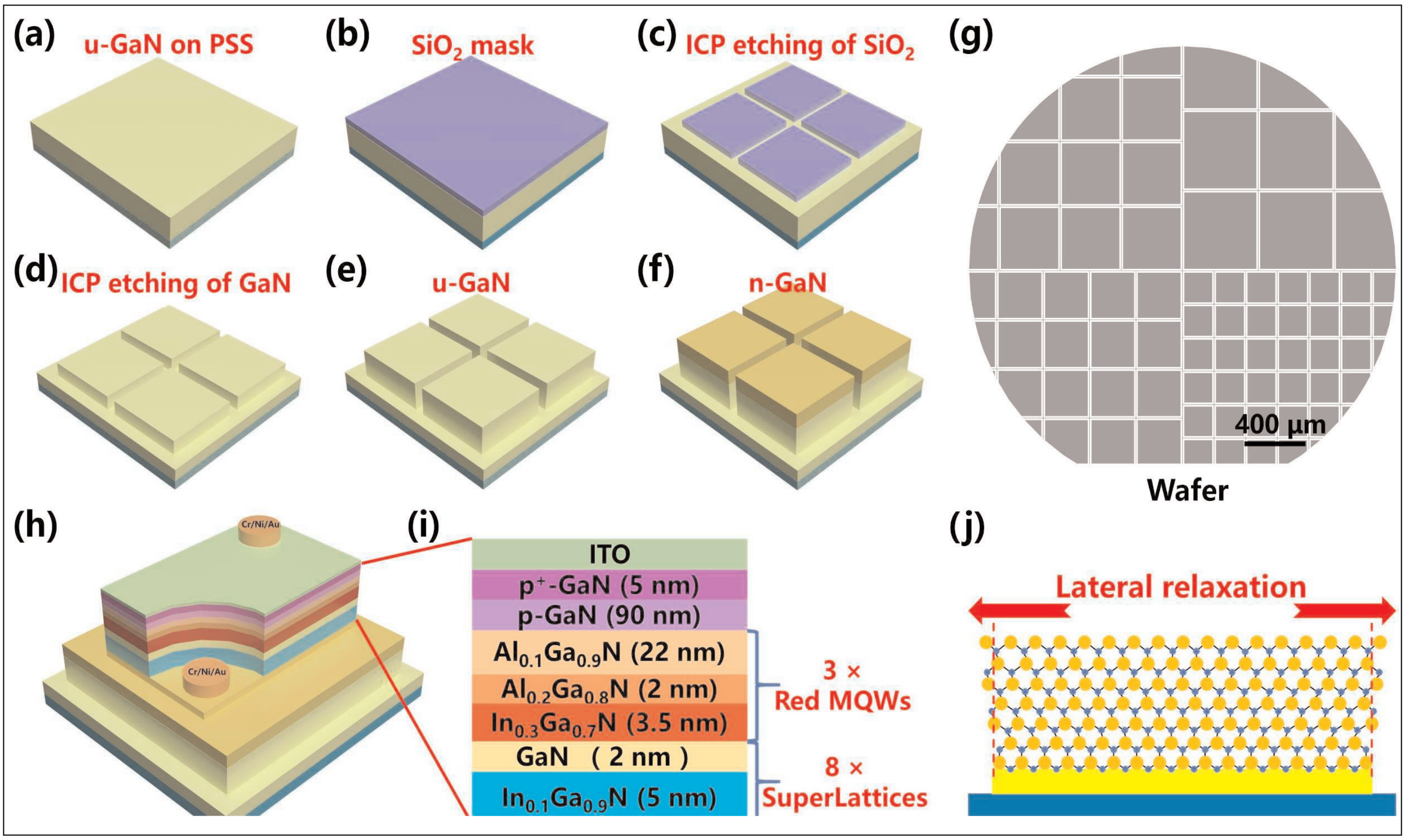

Figure 1. Template process scheme: (a) GaN on PSS; (b) deposition of silicon dioxide (SiO_2) mask; (c) inductively coupled plasma (ICP) etching of mask; (d) ICP etching to expose GaN; (e) epitaxial undoped (u-)GaN layer; (f) epitaxial n-GaN layer. (g) Different dimensioned GaN templates fabricated on same epitaxial wafer. (h) Full structure of InGaN-based red mini-LED. (i) Red-emitting quantum well (QW) structure. (j) Atomic structure of laterally relaxed GaN layer.

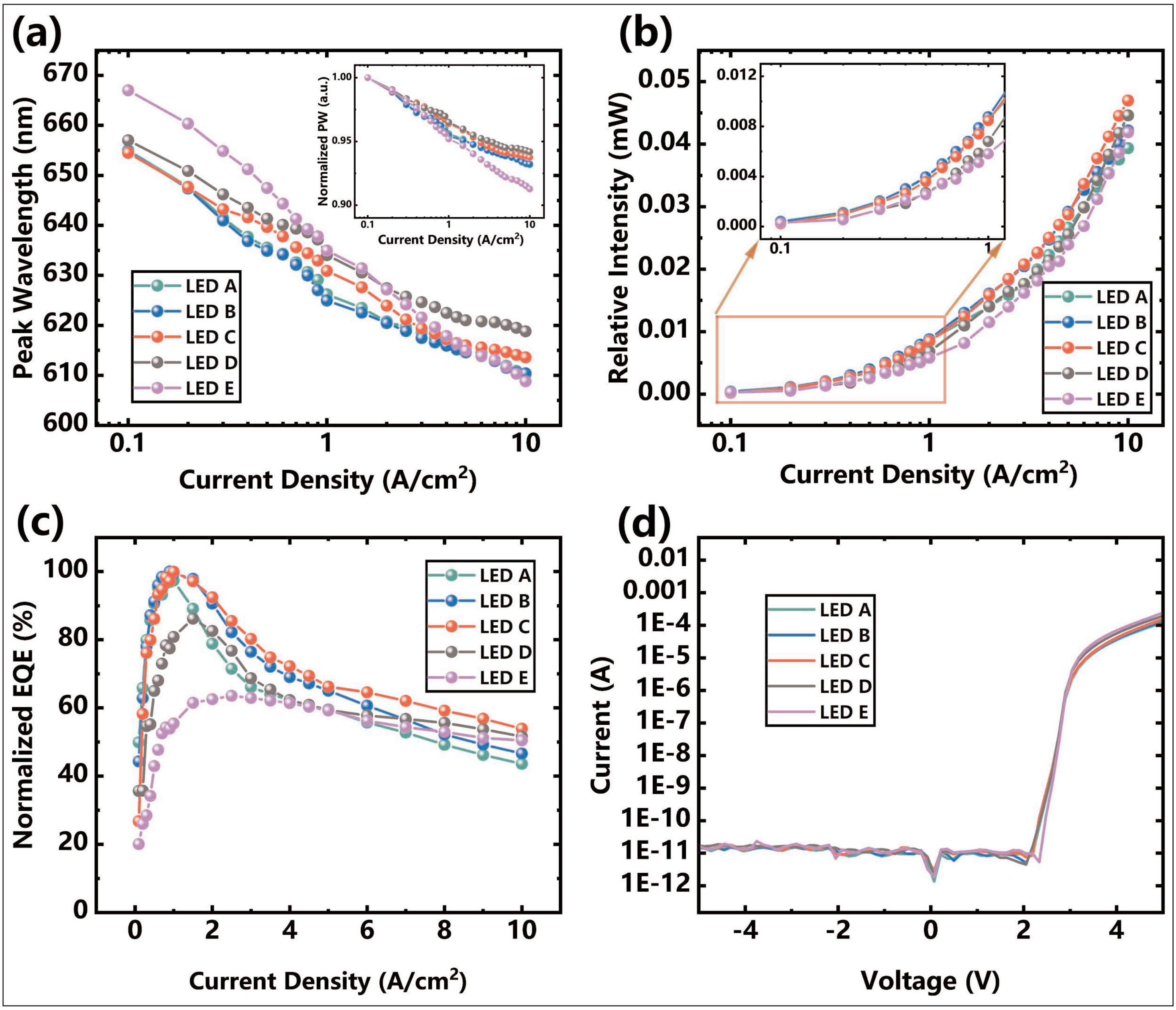

Figure 2. Current density dependences of prototype red InGaN-based mini-LEDs grown on GaN templates A–E. (a) Peak wavelength. (b) Relative luminous intensity. (c) Normalized EQE. (d) Current–voltage curves of LEDs A–E.

external lattice expands freely toward the periphery after the material surrounding the template has been etched away, inducing lateral relaxation of the internal lattice structure. Hence, the size of the patterned template is expected to influence the compressive strain within the GaN layer by affecting the degree of relaxation."

The patterning was carried out in a GaN template layer on patterned sapphire substrates (PSS), using inductively coupled plasma (ICP) etch through a SiO_2 mask (Figure 1). The pattern pitch was 20μm at an etch depth of 3μm. The patterning was performed in squares up to 500μm on a side.

The patterned template was used for metal-organic epitaxy of red LED structure with triple InGaN QWs with 30% indium content. Devices, 90μmx150μm, were fabricated with an indium tin oxide (ITO) current-spreading layer. The metal contacts were chromium/nickel/gold.

The tested LEDs were from the central region of the wafer to minimize wafer-edge growth issues. The LEDs themselves were fabricated near the center of each GaN tile, well away from etched boundaries. Also, reference devices (LED E) were fabricated on material on an unpatterned template processed in the same epitaxy furnace.

Reciprocal space mapping analysis of x-ray measurements showed that smaller template sizes encouraged lateral strain relaxation. Screw and edge dislocation densities were estimated from x-ray rocking curve behaviors. The screw dislocations were an order of magnitude lower than that for edge defects.

➤

Table 1. Peak wavelength blue-shift and value at 10A/cm^2 injection.

LED	A	B	C	D	E
Template	500µm	400µm	300µm	200µm	N/A
Blue-shift 0.1–10A/cm^2	45nm	44nm	40nm	38nm	60nm
Peak wavelength 10A/cm^2	610.3nm	610.4nm	613.6nm	618.8nm	

The lowest screw dislocation density of 1.63x10^7/cm^2 was found for the smallest template square region of side 200µm (LED D). The edge defects were lowest for the slightly larger 300µm squares of LED C: 3.06x10^8/cm^2. The researchers potentially attribute the increase in edge defects for the smallest patterned template region "to the emergence of sidewall defects during the etching process, which created pathways for the generation and propagation of edge dislocations."

Electroluminescence (EL) studies showed reduced blue-shift of the spectrum with increased current injection (Table b). The blue-shift was also lessened in the LEDs on reduced size templates. Such blue-shift effects are typically attributed to quantum-confined Stark effects (QCSEs) where lattice strain and charge polarization of the different materials lead to electric fields across the QWs that tend to discourage radiative recombination of electrons and holes, reducing light output, particularly in longer-wavelength devices.

The researchers believe that the enhanced relaxation that comes with a reduced template size increased indium incorporation in the QWs, allowing LED D to maintain a longer peak wavelength at higher current injection (Figure 2).

In terms of emission intensity, LED C provides better performance. The researchers suggest that the degradation of LED D was the result of "degraded crystal quality, with a higher indium fraction typically leading to an increased defect density (e.g. V-defects or dislocations that form to relieve strain)".

The external quantum efficiency (EQE) performance of LED C maintained an edge over the others. The reference LED E had a low EQE peak, but only slowly declined, almost matching the EQE of LED C at 10A/cm^2.

The team comments: "We attribute LED E's small droop to its higher density of dislocations and non-radiative recombination centers (due to the lack of strain-relief patterning) relative to the patterned LEDs, which leads to strong SRH recombination even at low and moderate currents. As a result, LED E's EQE is already suppressed at low injection levels by defect-related SRH recombination. As the current density increases, SRH recombination becomes saturated at high currents, and the remaining efficiency droop is dominated by Auger recombination and leakage mechanisms, which are common to all LEDs." ■

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Author: Mike Cooke

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Far-UVC LEDs on c-plane sapphire

Devices with a 225nm wavelength achieve 0.12 external quantum efficiency and 0.08mW light output power.

The RIKEN Pioneering Research Institute and Saitama University in Japan have reported far-UVC light-emitting diodes fabricated from aluminium gallium nitride (AlGaN) heterostructures directly grown on c-plane sapphire [Taiga Kirihara et al, J. Appl. Phys., v138, p174501, 2025].

Far-UVC radiation is used for microbial disinfection in space and terrestrial environments. The researchers explain: "Humans and animals worldwide die every year from infections caused by multidrug-resistant organisms (MROs) such as methicillin-resistant Staphylococcus aureus (MRSA) and fungi such as Candida auris, as well as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)."

In human-occupied environments, UVC from existing excimer lamps needs to be specially filtered to wavelengths shorter than 230nm so that the skin or eye's cornea is not penetrated significantly. These bulky, inefficient lamps also contain toxic gases.

AlGaN-based LEDs with high aluminium content could provide far-UVC radiation, if technical and cost challenges can be met.

The RIKEN/Saitama team believes their work shows the potential of low-cost far-UVC LED devices on c-sapphire, relative to more expensive approaches using bulk AlN wafers or sputtered AlN assisted by double growth and double annealing (DGA). The researchers put the cost of bulk AlN at around $8000 for 2-inch substrates.

The researchers used 1300–1400°C ammonia-pulsed metal-organic chemical vapor deposition (MOCVD) to grow 4μm AlN template layers on c-plane sapphire (Figure 1). The total dislocation density was of order $10^9/cm^2$. The surface had fine steps and terraces at the atomic resolution level with root-mean-square 0.068nm surface roughness, according to atomic force microscopy (AFM).

The far-UVC LED materials consisted of an undoped buffer, an n-type silicon (Si)-doped electron injection layer (EIL), a quantum well (QW) active light-emitting region, an electron-blocking layer (EBL), a p-type magnesium (Mg)-doped hole injection layer (HIL), and a p-GaN contact layer.

The team comments: "The key innovation lies in optimizing the AlN molar fraction (ranging from 0.84 to 0.90) to balance optical transparency and electrical conductivity, critical for achieving efficient 225nm emissions. As the AlN molar fraction increases, the

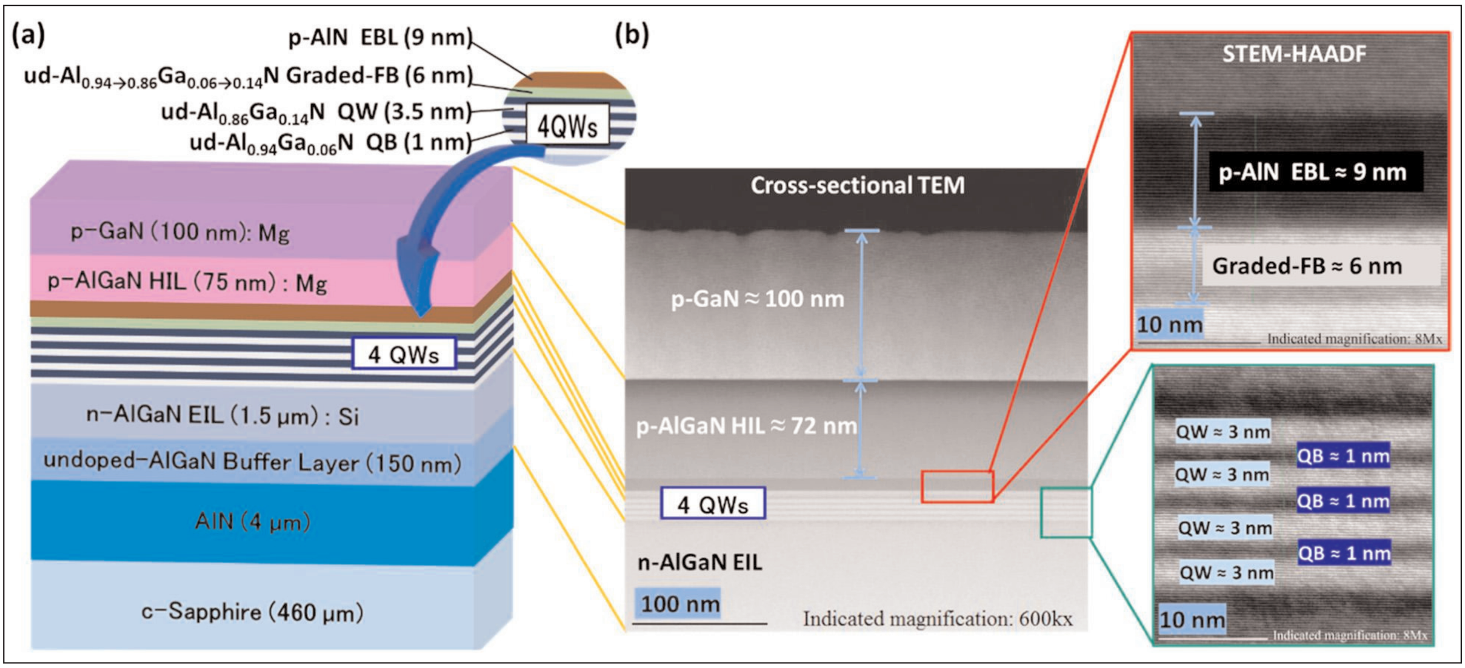

Figure 1. (a) Designed far-UVC LED structure with varying AlN molar fractions in n-AlGaN EIL and (b) structural confirmation of LED with designed parameters.

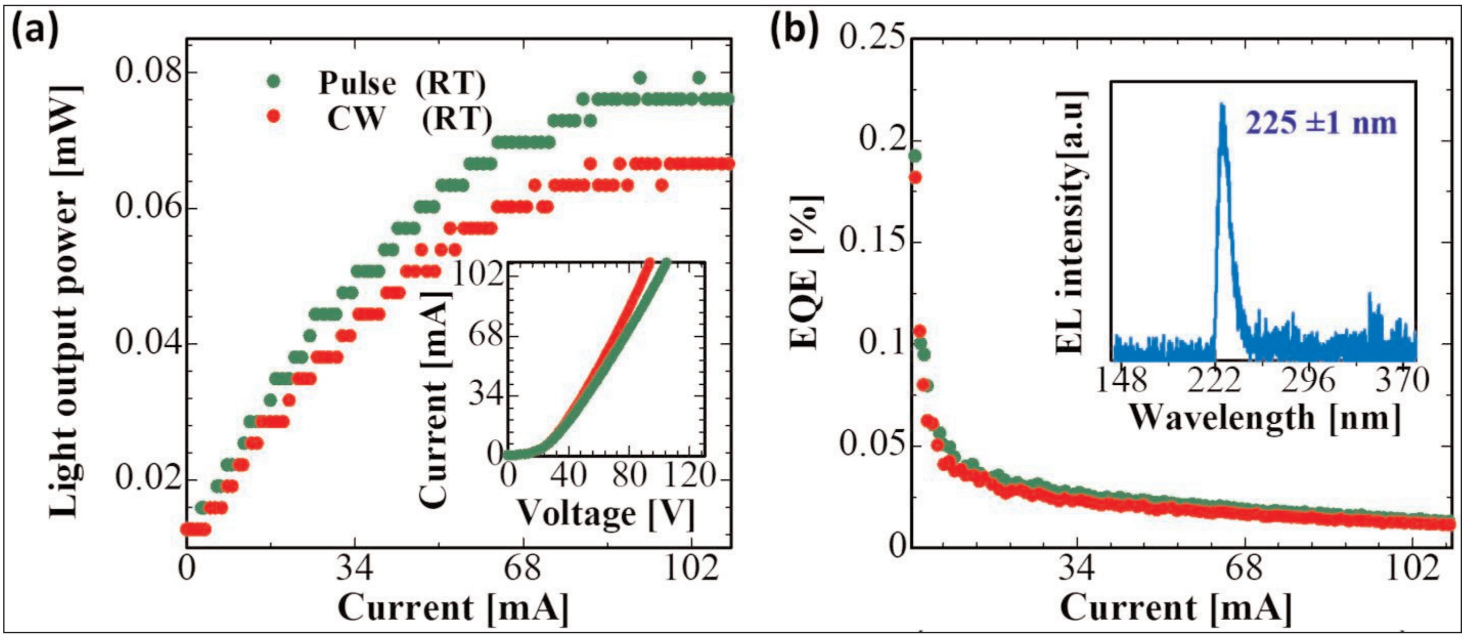

Figure 2. Performance evaluation of 225nm far-UVC LED: (a) current versus light power characteristics (current–voltage inset), (b) current–EQE characteristics (spectral intensity inset).

absorption edge of AlGaN shifts to shorter wavelengths, improving the light transmission at 225nm. However, this also raises electrical resistivity due to the reduced carrier concentration, especially beyond the AlN molar fraction of 0.85 using a low Si flow rate."

The undoped AlGaN buffer was designed to improve crystal quality and to reduce the relaxation ratio of the AlGaN EIL to the 30–35% range. At high AlN fractions, strain affects the nature of the emitted radiation and the transparency of the material route to the outside world, affecting the light extraction efficiency of devices.

One aspect is the positions of the light-hole (LH), heavy-hole (HH) and crystal-field splitting- (CH) hole energies in the valence band structure.

The researchers explain: "When Al$_x$Ga$_{1-x}$N is grown coherently on c-plane AlN, the upper end of the valence band switches from the HH-band to the CH-band at an AlN molar fraction above 0.65 due to lattice distortion and, as a result, the polarization properties change from transverse electric (TE) to transverse magnetic (TM) polarization"

TE-polarized light has better light extraction out of the back-side of the device. The researchers also used thicker QWs and reduced the quantum barrier (QB) thickness to reduce TM emission. Other options for controlling the light polarization and light extraction include using materials with non-polar and semi-polar AlN instead of polar c-plane oriented templates. Such growth methods are almost certainly more challenging, and hence costly.

The researchers found that the optimum Al fraction for the buffer was around 0.88 to balance between efficient current injection and high external quantum efficiency (EQE). A lower 86% Al fraction in the buffer resulted in devices with better current injection for a given voltage, but lower EQE, than for LEDs with 90% Al.

The resulting LEDs on Al$_{0.88}$Ga$_{0.12}$N with a big 400μmx400μm chip size achieved a peak wavelength of 225nm (Figure 2). The peak EQE was around 0.12%, and the maximum light output power (LOP) was 0.08mW. ■

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Author: Mike Cooke

Quasi-vertical selective area growth GaN diode on silicon

Device demonstrates non-destructive avalanche breakdown at 720V.

Researchers based in France, USA and Italy claim the first demonstration of avalanche breakdown behavior in quasi-vertical gallium nitride (GaN) diodes fabricated from selective area growth (SAG) material on silicon (Si) substrate [Mohammed El Amrani et al, J. Appl. Phys., v138, p215701, 2025]. The advantage of avalanche breakdown is that it is non-destructive. The breakdown of the diodes was 720V at room temperature.

The team, from Université Grenoble Alpes in France, Stanford University in the USA, and University of Padova in Italy, believes that the performance of the devices can be improved "through the optimization of the design geometry and the implementation of an effective edge termination scheme."

GaN enables high-voltage devices through the material's wide bandgap, high electron mobility, and high electric field breakdown strength. Standard lateral device structures limit current and voltage handling to the low to medium range. Vertical devices should enable current to flow through a larger-area cross section, as opposed to the thin two-dimensional electron gas (2DEG) channel of lateral device structures.

Vertical device structures are typically fabricated from material grown on freestanding or native GaN substrates. This inhibits commercialization due to the high cost and small size of such wafers. The researchers comment: "GaN-on-silicon (GaN-on-Si) technology presents a promising alternative by combining the performance of GaN with the cost-effectiveness and mature infrastructure of large-diameter silicon wafers."

Growth of GaN-on-Si suffers from lower material quality due to the large lattice mismatch and thermal expansion mismatch between the respective materials. SAG is a popular method for enhancing the quality of III–nitride heteroepitaxy on substrates such as silicon, sapphire, etc. SAG on Si has the added potential for integration between GaN power and silicon mainstream electronics.

The team comments: "Our results highlight the potential of SAG as a scalable platform for high-performance, avalanche-capable GaN power devices, bridging the gap between lateral GaN-on-silicon HEMTs and truly vertical GaN technologies."

The SAG was performed on a substrate with AlGaN/AlN buffer layers and three n+-type GaN current-spreading layers with increased doping (Figure 1). The SAG used a 50nm atomic layer deposition (ALD) aluminium oxide (Al_2O_3) hard mask. The SAG device structure consisted of a 8μm n$^-$-GaN drift layer, and a 0.8μm p-GaN anode. The growth resulted in 100μm-diameter hexagonal device mesas with around 65° bevel angle.

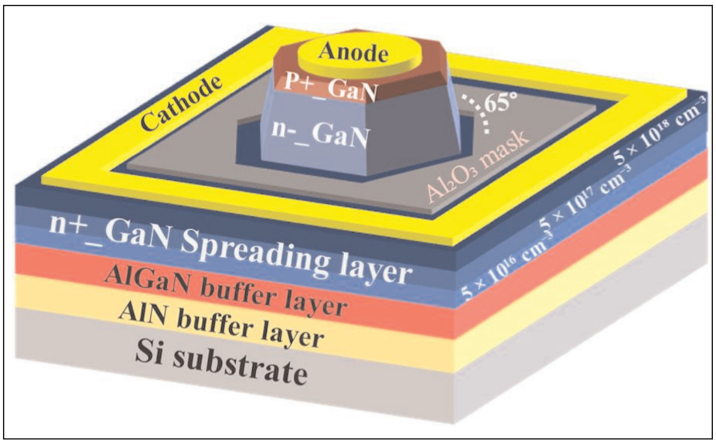


Figure 1. Schematic 3D cross section of quasi-vertical p–n diode.

The researchers comment: "This unintentionally formed bevel serves a critical function in mitigating electric field crowding at the p–n junction edges. By providing a gradual transition at the mesa sidewalls, it helps reduce peak electric fields that typically lead to premature breakdown."

Using the natural bevel as part of the fabrication strategy for directing the electric field away from the edges avoids the etch damage that normally arises when crafting device mesas. However, the researchers have found that additional peripheral protection is desirable for such diodes. The researchers estimated the dislocation density in the SAG material to be in the range 1–3x10^8/cm^2.

The magnesium-doped p-type layer of the diode was activated by thermal annealing at 800°C for 3 minutes. The researchers also applied a second thermal anneal at 700°C for 10 minutes in an effort "to improve the GaN crystal structure and further stabilize the activated Mg". The 40μm-diameter anode metal contact consisted of nickel/gold; the cathode was formed by opening a window in the Al_2O_3 mask for the titanium/aluminium/nickel/gold electrode.

Capacitance–voltage measurements indicated a net doping concentration in the n$^-$-drift layer of 1.6x10^{16}/cm^3.

The team reports: “The device achieves a current density of 1.4kA/cm^2 at 10V and a specific on-resistance ($R_{on,sp}$) of 3.3mΩ-cm^2 (determined from the slope of the V–J curve). Additionally, the diode exhibits a favorable turn-on voltage of 3V, measured at a current density of 1A/cm^2, along with a high on/off current ratio of 10^{10}.”

The ideality was non-ideal at around 3, indicating that the dominant recombination was through defects via the Shockley–Read–Hall mechanism. The high $R_{on,sp}$ was mainly attributed to the quasi-vertical structure with an approximate 300μm lateral current conduction path between anode and cathode. A fully vertical device would reduce this to just the thickness of the layers.

Under reverse bias, the device underwent non-destructive breakdown at −720V at 298K (Figure 2). The devices were protected with Fluorinert to prevent arcing in air. The researchers attribute the “robust” breakdown performance in part to the avoidance of mesa etching in the SAG diode fabrication.

The team reports: “The fabricated devices achieve up to ~75% of the theoretical parallel-plane breakdown voltage and ~91% of the Technology Computer-Aided Design (TCAD) Sentaurus Synopsys-simulated value, using the same bevel angle and doping profile, underscoring the effectiveness of the SAG approach.”

The behavior beyond −700V showed a rapid current increase, suggesting that the electric field was large enough for carrier multiplication through impact ionization, initiating avalanche breakdown. The researchers comment: “The observed positive temperature dependence of the breakdown voltage further confirms avalanche breakdown behavior—a hallmark of impact ionization.”

The researchers used Stanford’s unclamped inductive switching (UIS) test set up to evaluate the diode’s capability for withstanding transient voltage overshoot events. Energy stored in an inductor was applied to the diode by switching off a 1.7kV-rated silicon carbide transistor. The stress duration was 2.5μs.

The researchers comment: “The device under test (DUT) successfully endured over 3000 UIS pulses at a repetition rate of 1kHz before failure. During these cycles, the DUT consistently reached a voltage of approximately 800V, exceeding its static avalanche breakdown voltage of 720V, along with a peak current of 150mA.”

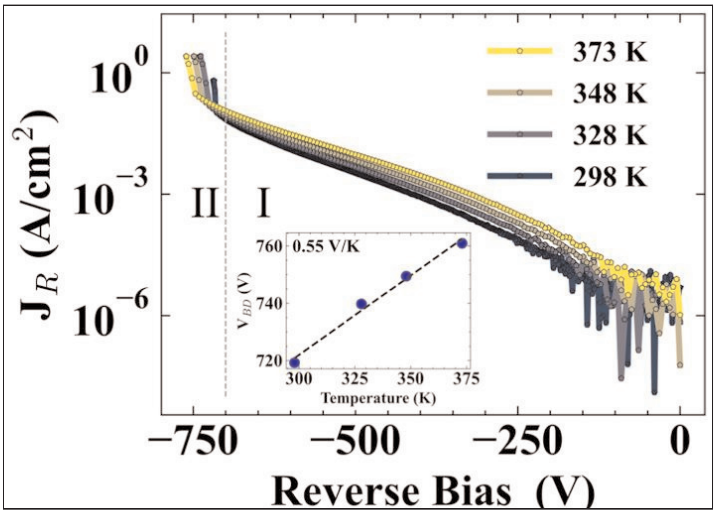


Figure 2. Typical temperature-dependent reverse current density–voltage (J–V) log-scale characteristics. Inset: extracted breakdown voltage as function of temperature.

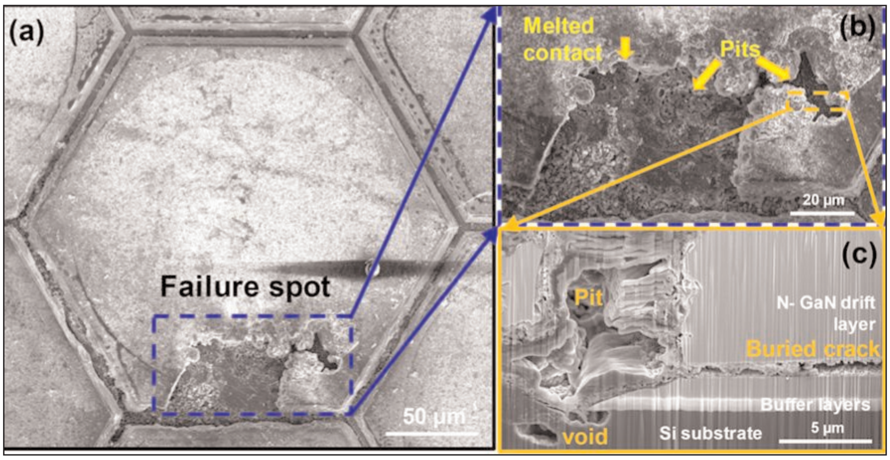


Figure 3. Post-failure scanning electron microscope (SEM) analysis of GaN diode: (a) top-view image showing surface damage; (b) magnified focused ion-beam (FIB)-SEM image near the anode edge; (c) cross-sectional FIB-SEM image revealing damage through n-GaN drift layer and underlying structure.

Destructive breakdown occurred when the UIS duration increased to 30μs (Figure 3). The team comments on experiments where light from the device was collected by a CCD detector: “When the stored energy in the inductor exceeds the diode’s safe operational limit — achieved by extending the gate-pulse duration — a sudden, bright flash appears as a narrow filament at the anode mesa edge. This localized glow marks the onset of destructive breakdown: the intense electric field concentrates at the mesa perimeter, initiating a high-current-density path that heats the material rapidly.”

The researchers add: “Due to the absence of dedicated edge termination structures in the diode mesa, the device underwent catastrophic structural failure likely driven by high localized current densities and intensified electric fields at the anode edge, exacerbating thermal stress and, thus, significant thermoelastic strain within the contact metal and GaN layer, consequently promoting crack initiation and pit formation. Implementing an effective edge termination structure is expected to mitigate localized electric field peaks, thereby enhancing the diode’s avalanche and surge voltage robustness.” ■

https://doi.org/10.1063/5.0299842

Author:
Mike Cooke

IDTechEx assesses the status of 800V for EV power electronics

IDTechEx analyses the adoption of silicon carbide and gallium nitride.

With the transition to 800V electric vehicles (EVs) affecting the whole powertrain (including the power electronics), IDTechEx's report 'Power Electronics for Electric Vehicles 2026–2036: Technologies, Markets, and Forecasts', this trend is analysed and used to forecast the adoption of wide-bandgap semiconductors silicon carbide (SiC) and gallium nitride (GaN), as well as the entire power electronics market for EVs.

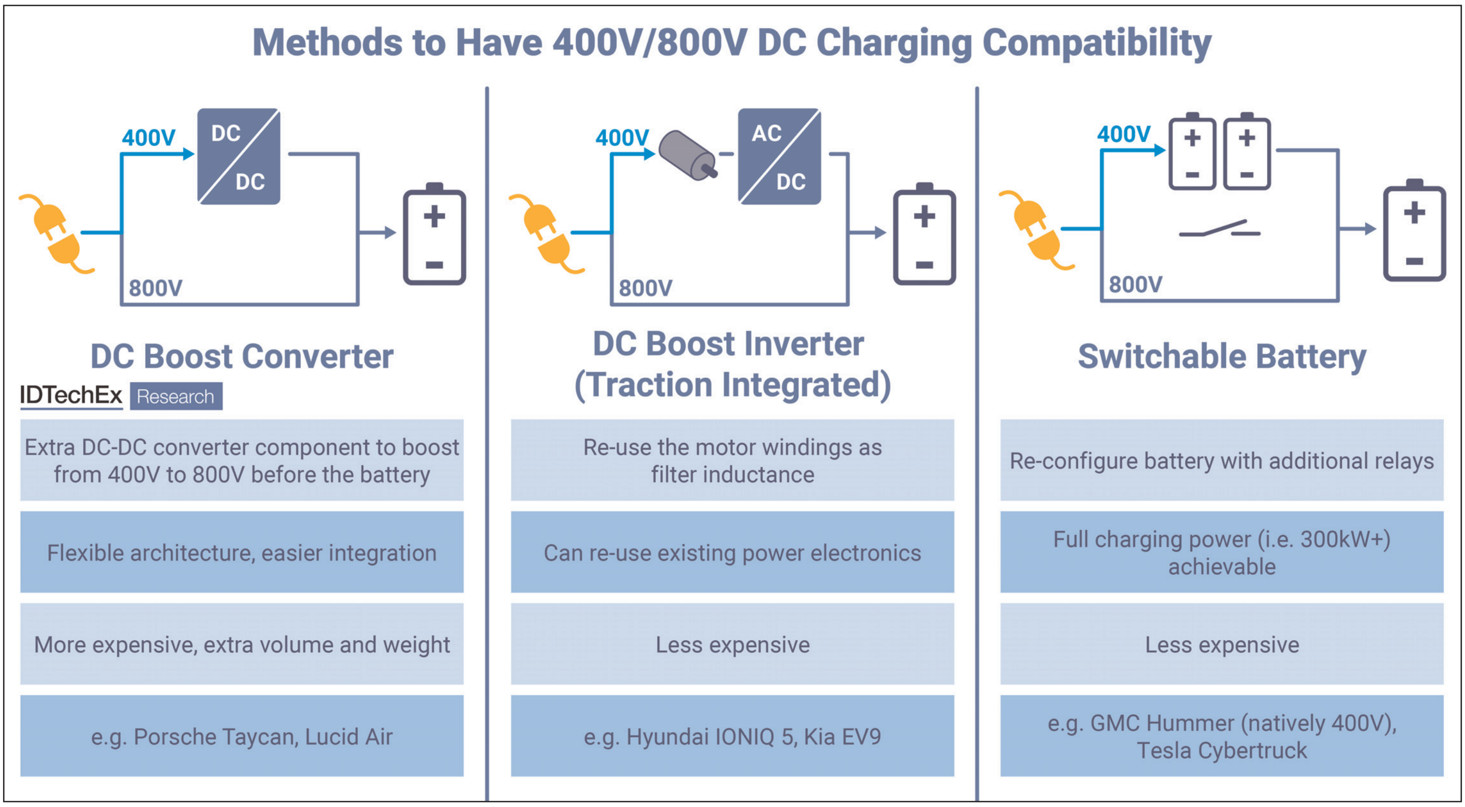
800V is mature and proven

The automotive industry is converging on 800V platforms for battery electric vehicles (BEVs), when earlier generations of vehicle were 400V. While 400V will certainly have a part to play in the next decade, the advantages of 800V platforms are undeniable and, in most cases, worth the re-engineering of the powertrain to accommodate this.

Firstly, the higher voltage means that the battery can charge at greater power while using less current. For consumers that want charging to be as quick as refueling an internal combustion engine (ICE) vehicle, 800V vehicles can deliver greater average and peak rates of power. While this is generally the case, other parameters in the vehicle and also in the charger will determine the actual charging speed.

Secondly, since the voltage is much higher, significantly less current is required to deliver the same amount of power to the traction inverter and the motor. The end result is fewer losses and greater efficiency, allowing for either a small increase in range, or a reduction in battery size (and therefore weight and cost). Either case is advantageous, and SiC MOSFETs are much more efficient than Si IGBTs at 800V due to its material and device properties, such that the transition to 800V EVs and SiC MOSFETs go hand in hand.

Finally, since less current runs through the wiring harnesses in the vehicle, the diameter of the wiring harness can be significantly reduced. Copper is heavy and expensive, so a theoretical halving of the wiring harness diameter (excluding insulation and cooling requirements) delivers a compounded cost and weight saving. Even though BEVs are much more efficient than ICE vehicles, squeezing out extra efficiency at


Methods to Have 400V/800V DC Charging Compatibility

DC Boost Converter	DC Boost Inverter (Traction Integrated)	Switchable Battery
Extra DC-DC converter component to boost from 400V to 800V before the battery	Re-use the motor windings as filter inductance	Re-configure battery with additional relays
Flexible architecture, easier integration	Can re-use existing power electronics	Full charging power (i.e. 300kW+) achievable
More expensive, extra volume and weight	Less expensive	Less expensive
e.g. Porsche Taycan, Lucid Air	e.g. Hyundai IONIQ 5, Kia EV9	e.g. GMC Hummer (natively 400V), Tesla Cybertruck

IDTechEx compares the three different ways to have charging compatibility between 400V and 800V.

lower cost is beneficial not only to the consumer but also to the OEM, many of which have struggled with the profitability of their BEVs.

Various ways to achieve 400V-to-800V compatibility

There is one glaring issue with building an 800V platform EV: the majority of DC chargers in the world are 400V, meaning that there needs to be an onboard system to convert the 400V DC from the charger to 800V DC to charge the high-voltage battery. Without such a system, the majority of DC chargers cannot be used. Mercedes controversially did not include an 800V booster in its announcement for the Mercedes CLA EV earlier in 2025, although this has since been reversed.

IDTechEx has identified three key ways to achieve 400V-to-800V charging compatibility, each with its own advantages and disadvantages. While each system is complex, IDTechEx has found that battery switching, DC boost converters, and traction integrated onboard chargers are the three main approaches from OEMs and tier-one suppliers to achieve 800V compatibility.

Boost converters are the simplest method, whereby an extra DC–DC converter is installed onto the vehicle to boost the voltage from 400V to 800V before feeding into the high-voltage battery. While this is simple, it is also costly to add this extra unit, especially when space in a vehicle is limited to begin with. This is the method used in the Porsche Taycan.

By switching the configuration of cells in charging, the battery pack can be charged as a mix of series and parallel connections to match the incoming voltage from the DC charger. The GMC Hummer and Tesla Cybertruck run variants of this technique to ensure charging compatibility.

Finally, traction integrated onboard chargers are a unique way to boost the voltage without the need for a separate DC–DC converter. The windings in the electric motor act as filter inductance, and are used to boost the voltage of the incoming DC from the charger without requiring a separate DC–DC converter unit. This is the approach used by Hyundai and Kia, and multiple tier-one suppliers have similar methods to boost voltage.

IDTechEx analyzes different power electronics innovations alongside semiconductor technologies to forecast what the market will look like in 10 years time. ■

www.idtechex.com/en/research-report/power-electronics-for-electric-vehicles/1125

Power SiC faces overcapacity downturn until 2027–2028, before device market grows to nearly $10bn by 2030

In 2025, utilization rates in the silicon carbide supply chain are down to about 50% for upstream processing and 70% for device processing, reckons Yole.

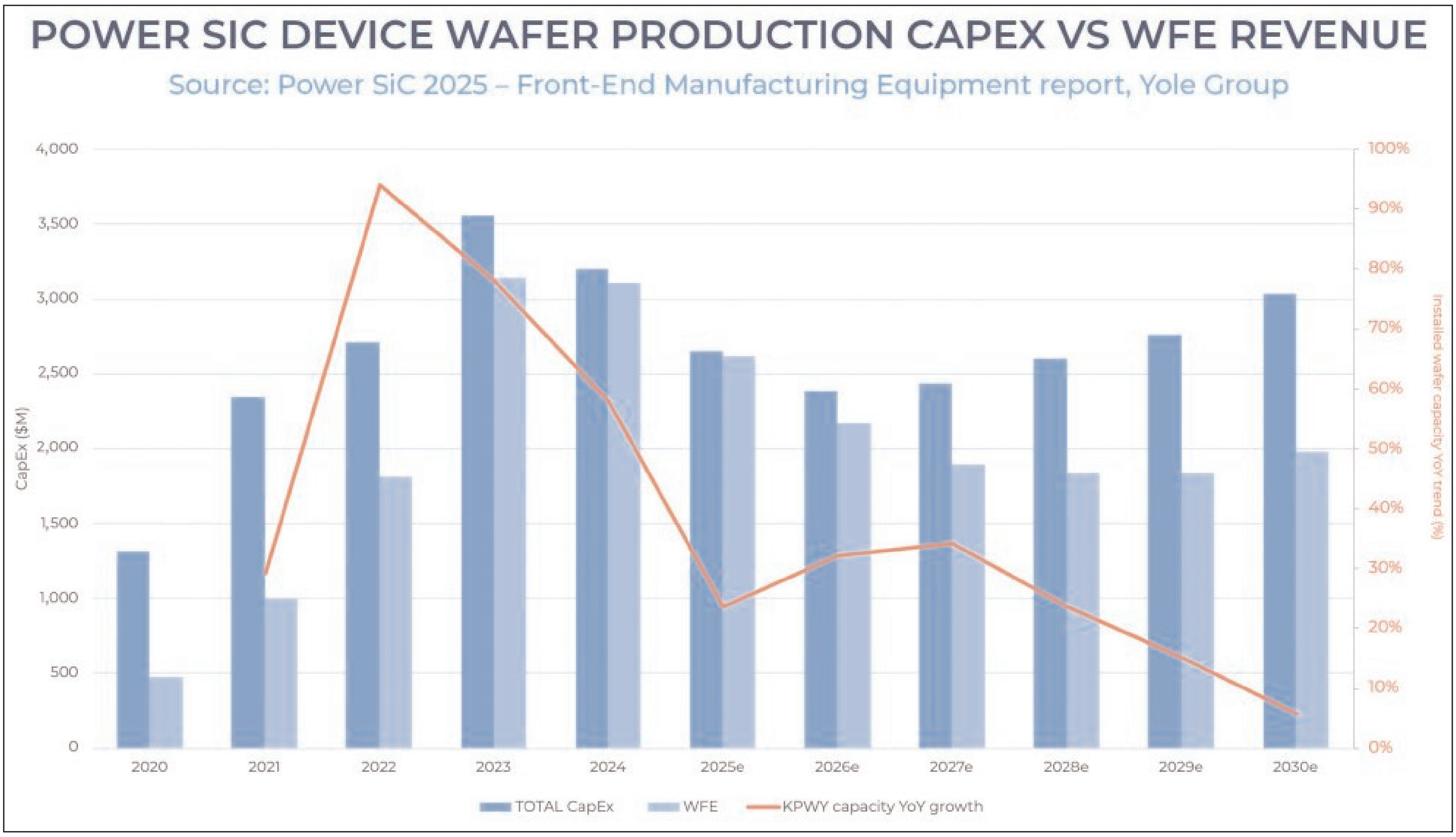
After an unprecedented investment wave between 2019 and 2024, the power silicon carbide (SiC) industry is now entering a correction cycle, according to Yole Group's report 'Power SiC 2025 — Front-End Manufacturing Equipment'.

The industry's first major investment cycle, driven by the 2019–2024 capital expenditure (CapEx) boom, created significant upstream overcapacity. The slowdown in the automotive market has reduced demand for SiC, transforming the SiC supply chain, notes Yole. As of 2025, utilization rates have dropped to around 50% for upstream processes and 70% for device lines.

The cycle of falling utilization rates, excess capacity, and reduced investment is raising concerns among industry players. Yet, despite the slowdown, SiC remains central to the electrification roadmap. The downturn is expected to persist until 2027–2028.

"SiC has entered a necessary correction phase. Indeed, after five years of massive investment, the market must absorb capacity before new tools and technologies can drive the next expansion," says Taguhi Yeghoyan, Yole's principal technology & market analyst, Semiconductor Equipment.

After 2027–2028, renewed growth will come from 8-inch production platforms and next-generation trench and superjunction MOSFETs, reckons Yole. Device revenue forecast to reach nearly $10bn by 2030.



POWER SIC DEVICE WAFER PRODUCTION CAPEX VS WFE REVENUE

Source: Power SiC 2025 – Front-End Manufacturing Equipment report, Yole Group

OVERVIEW OF CHINESE POWER SIC ECOSYSTEM*

Source: Power SiC 2025 – Front-End Manufacturing Equipment report, Yole Group

Regional dynamics: China's fast rise

Much of the new equipment CapEx is centered in mainland China, where the government's strategy encourages local procurement of equipment. In 2024, Chinese players already captured about 40% of SiC wafer and epiwafer capacity and are rapidly expanding into device manufacturing. While the equipment ecosystem is not yet fully self-sufficient, domestic suppliers have made significant progress in the physical vapor transport (PVT) and high-temperature chemical vapor deposition (HTCVD) tool segments.

"China is catching up fast on SiC front-end capability," notes Yeghoyan. "Local vendors now compete head-to-head in SiC crystal growth and epitaxy, even as international players retain leadership in thinning, metrology, and advanced ion implantation."

Equipment ecosystem outlook

- PVT (boule growth): A mature ecosystem with 8-inch capabilities has been established. The open PVT equipment market, led by Naura, is expected to contract sharply before stabilizing with a compound annual growth rate (CAGR) of about –11% over 2024–2030.
- Epitaxy (HTCVD): European players ASM International and AIXTRON lead, followed by NuFlare and TEL. Chinese vendors Naura, JSG, and NASO Tech are expanding aggressively.
- Wafer fab equipment (WFE) tools: SiC-specific adaptation is required for etch, CMP, ion implantation, and inspection. The market will maintain a CAGR of roughly –7% through 2030, supported by upgrades of the existing installed base.
- Overcapacity in burn-in systems is offsetting the overall growth in test-related equipment, leading to a modest 3% CAGR.

Despite the downturn, IDMs continue strategic investments in 200mm SiC capacity and advanced MOSFET architectures, maintaining global leadership even as China's domestic ecosystem gains traction.

"After a period of accelerated expansion, the power SiC industry is recalibrating," notes Poshun Chiu, Yole's principal technology & market analyst, Compound Semiconductor. "The short-term slowdown masks a long-term transformation toward 200mm production, localized supply chains, and new device architectures that will define the next growth cycle." ■

www.yolegroup.com

Index

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5 Deposition materials

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7 Wafer processing materials

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8 Wafer processing equipment

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10 Gas and liquid handling equipment

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18 Chip foundry

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19 Facility equipment

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www.semitech.us

22 Used equipment

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4–6 February 2026

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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: Issccinfo@yesevents.com
www.isscc.org

15–19 March 2026

OFC 2026 (Optical Fiber Communication Conference and Exhibition)

Los Angeles Convention Center, Los Angeles, CA, USA
E-mail: custserv@optica.org
www.ofcconference.org

22–26 March 2026

IEEE Applied Power Electronics Conference and Exposition (APEC 2026)

San Antonio, TX, USA
E-mail: apec@apec-conf.org
www.apec-conf.org

22–24 April 2026

OPIE'26 (OPTICS & PHOTONICS International Exhibition)

Pacifico Yokohama, Japan
E-mail: event@optronics.co.jp
www.opie.jp

28–30 April 2026

29th annual Components for Military & Space Electronics conference & exhibition (CMSE 2026)

Renaissance Los Angeles Airport Hotel, CA, USA
E-mail: info@tjgreenllc.com
www.tjgreenllc.com/cmse

3–8 May 2026

SID Display Week 2026

Los Angeles, CA, USA
E-mail: registration@sid.org
www.displayweek.org

17–21 May 2026

2026 Conference on Lasers & Electro-Optics (CLEO)

Charlotte, NC, USA
E-mail: info@cleoconference.org
www.cleoconference.org

24–28 May 2026

WOCSDICE–EXMATEC 2026:
49th Workshop on Compound Semiconductor Devices and Integrated Circuits (WOCSDICE)
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Gdansk, Poland

E-mail: we2026@unipress.waw.pl

https://wocsdice-exmatec-2026.syskonf.pl/

26–29 May 2026

IEEE 76th Electronic Components and Technology Conference (ECTC 2026)

JW Marriott & Ritz-Carlton Grande Lakes Resort,
Orlando, FL, USA

E-mail: borabal@ieee.org

www.ectc.net

31 May–4 June 2026

International Power Electronics Conference (IPEC-Nagasaki 2026- ECCE Asia)

Dejima Messe Nagasaki, Nagasaki, Japan

E-mail: ipec2026@or.knt.co.jp

www.ipec2026.org

7–12 June 2026

2026 IEEE/MTT-S International Microwave Symposium (IMS 2026)

Boston, MA, USA

E-mail: exhibits@horizonhouse.com

www.ims-ieee.org/about-ims/past-and-future-ims

9–11 June 2026

PCIM 2026 (Expo & Conference on Power Electronics, Intelligent Motion, Renewable Energy and Energy Management)

Nuremberg, Germany

E-mail: pcim_visitors@mesago.com

www.mesago.de/en/PCIM/main.htm

14–18 June 2026

2026 IEEE/JSAP Symposium on VLSI Technology & Circuits

Hilton Hawaiian Village, Honolulu, HI, USA

E-mail: vlsi@vlsisymposium.org

www.vlsisymposium.org

28 June – 1 July 2026

ALD/ALE 2026: AVS 26th International Conference on Atomic Layer Deposition (ALD 2026), featuring the 13th International Atomic Layer Etching Workshop (ALE 2026)

Tampa, FL, USA

E-mail: della@avs.org

https://ald2026.avs.org

20–21 July 2026

Global Summit on Optics, Photonics and Laser Technologies (GPOL 2026)

Paris, France

E-mail: optics@intellimeetings.org

https://optics.intelliglobalconferences.com

26–28 August 2026

PCIM Asia Shenzhen 2026 (International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management)

Shenzhen, China

E-mail: pcimasia@china.messefrankfurt.com

https://pcimasia-shanghai.cn.messefrankfurt.com

4–9 September 2026

29th European Microwave Week (EuMW 2026)

ExCel, London, UK

E-mail: eumwreg@itnint.com

www.eumweek.com

14–18 September 2026

Energy Conversion Congress & Expo Europe (ECCE Europe 2026)

Valencia, Spain

E-mail: info@ecce-europe.org

https://ipec2026.org/ecce-europe/

4–8 October 2026

IEEE Energy Conversion Congress & Expo (ECCE 2026)

Vancouver, British Columbia, Canada

E-mail: info@ieee-ecce.org

www.ieee-ecce.org/2026

13–15 October 2026

SEMICON West 2026

Moscone Center, San Francisco, CA, USA

E-mail: semiconwest@semi.org

www.semiconwest.org

19–21 October 2026

Global Photonics, Optics and Lasers Conference (GPOLC2026)

Radisson Blu Hotel, Dubai Deira Creek,
Dubai, UAE

E-mail: gpolc2026@synergiasummits.com

https://gpolc2026.synergiasummits.com

8–13 November 2026

12th International Workshop on Nitride Semiconductors (IWN 2026)

Kumamoto, Japan

E-mail: info@iwn2026.org

www.iwn2026.jp

9–12 November 2026

IEEE 13th Workshop on Wide Bandgap Power Devices and Applications (WiPDA 2026)

Burlington, Vermont, USA

E-mail: NKim@ieee.org

https://wipda.org/

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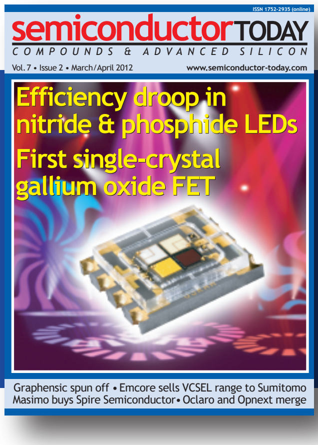

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