

LASER-PRO Annual Conference 2026
ELI Beamlines, Dolní Břežany, 1-Oct-26

onsemi × HiLASE Centre
Case study for laser processing in semiconductor industry

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onsemi

onsemi (Nasdaq: ON) is a global semiconductor company focused on **intelligent power** and **intelligent sensing** technologies for automotive, industrial and AI data-centre end markets

In the Czech Republic**, onsemi** operates in Rožnov P. R. and Brno with approximately 2,200 employees, combining **high-volume semiconductor manufacturing** with **technology/product development** and **IC design**

The Rožnov site represents two manufacturing lines: Si, SOI and SiC **wafering technologies and epitaxy**, producing around **3 million wafers** per year; and 6“/8“ **wafer fab for power devices** with **>4 bn. chips/year**

Broad **R&D capability** spanning semiconductor materials, process and device engineering, metrology, failure analysis

Czech design teams (Rožnov and Brno) contribute expertise in power management, analog/mixed-signal ICs and sensing-related solutions, >300 patents

onsemi cooperates closely with Czech universities and research institutes and is an active industry member of the **Czech National Semiconductor Cluster** and industrial partner in the **Czech Semiconductor Centre**

onsemi plans for IPF (Integrated Production Facility) in Rožnov notified by EC as FOAK (first of a kind) facility (Nov’25)

CZECH NATIONAL SEMICONDUCTOR CLUSTER

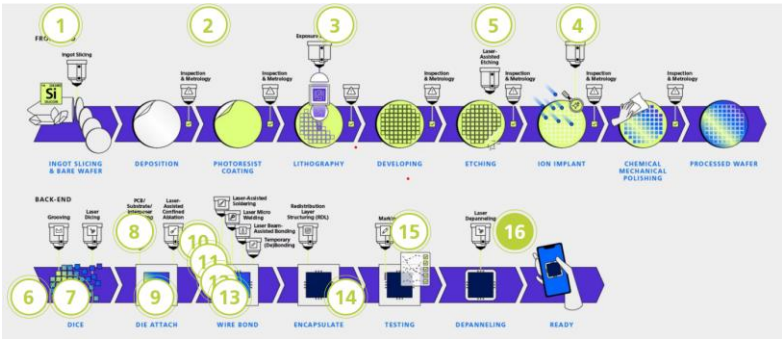
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Lasers in the Semiconductor Industry

Established industrial applications

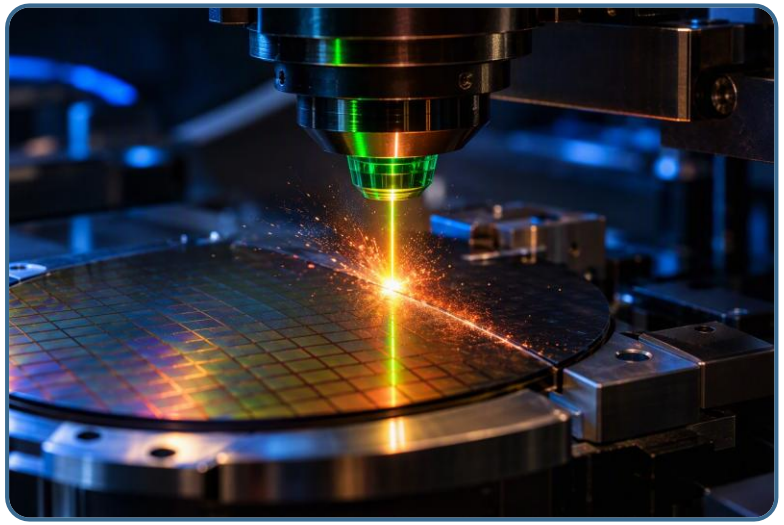
- Laser dicing / singulation: replaces or complements mechanical saw-dicing for thin, fragile or multi-material wafers, reducing chipping and kerf loss
- Laser annealing: ultra-short, localized heating for dopant activation and defect recovery – widely used in advanced CMOS and power-device flows
- Laser drilling, via formation and scribing: through-silicon vias, micro-holes and non-contact wafer/die traceability



Semiconductor manufacturing | TRUMPF

Emerging & advanced techniques

- Laser lift-off (LLO): separates epitaxial device layers from growth substrates – key for LED and power-device production
- Ultrafast (fs/ps) laser processing: precision material removal with minimal heat-affected zone, increasingly relevant for wide-bandgap materials such as SiC and GaN
- EUV lithography light sources and laser-assisted bonding: enable leading-edge chip patterning and heterogeneous/chiplet packaging



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Laser Processes for Semiconductors – proven HiLASE Capabilities

High-energy / high-power laser platforms

- Perla100 / Bivoj family: Yb:YAG thin-disk lasers at 1030 nm (+515/343 nm harmonics), up to 200 W average power, pulse durations from 1 ps to 10 ns – developed and operated by HiLASE, Dolní Břežany
- Bessel multibeam processing: six simultaneous beams, over 100,000 holes per minute – used for through-material drilling and metallization vias
- Dedicated SiC-cutting laser stations (Pharos, Perla E4, Perla C) spanning femtosecond-to-picosecond pulse regimes for dicing and scribing trials



Semiconductor process capabilities

- Laser-assisted grinding, polishing, edge-shaping and laser-based wafer separation for SiC
- Laser rapid thermal annealing for ion-implant activation and backside Ni-silicidation – already used in onsemi's backside contact-formation flow
- Laser-induced periodic surface structuring (LIPSS), wafer metallization and glass/scintillator dicing relevant to advanced packaging

… cooperation with onsemi since 2022

Opportunities for onsemi & HiLASE

Wafer shaping & finishing

- Laser-assisted SiC grinding and polishing
- Laser SiC dicing and through-SiC via formation
- Wafer bow / warp control (stress relief)
- Laser wafer-edge polishing
- Laser-split solution
- Laser cleaning

Process integration & metrology

- Ion-implant activation and Ni-silicidation for backside contacts
- Laser-assisted crystal-defect “healing” / recrystallisation
- Laser-assisted backside epi-defect removal and epi-process heating
- Wafer ID marking inside the wafer bulk
- Laser-assisted bonding for advanced packaging

Public Information

LaPSiC, ALPSW, Semiconductors4All

LaPSiC - Laser Grinding of SiC (TQ16000033)

- TAČR SIGMA DC4, CZ–Taiwan bilateral cooperation; 2025–27
- Partners: onsemi (lead), HiLASE, DEUVtek and iDesyn (Taiwan)
- 2025 results: HiLASE picosecond laser source and processing-station design completed at subsystem level; laser-assisted edge "chamfering" demonstrated at 200 mm with up to +1.0% post-epi usable area and lower bump density vs. the diamond-wheel baseline
- 2026 focus: integrate the laser-grinding head, commission the upgraded AOM driver, and run a process-window DoE toward a functional 200 mm / 350 µm wafer lot
- 2027: prototype of laser grinder and related technology

ALPSW - Advanced Laser Processing of Semiconductor Wafers (CZ.01.01.01/01/24_063/0006908)

- OP TAK DEEP TECH; Jul 2025 – Jun 2028
- Partners: onsemi (lead), HiLASE / FZU, Brno University of Technology, Masaryk University, Activair
- Scope: laser grinding / polishing, edge processing, dopant activation, deep-bulk laser scribing and laser-based wafer separation, targeting production flows up to 12″
- First result (Dec 2025): laser split trialled as a replacement for mechanical backside grinding of finished SiC device wafers – feasibility confirmed; laser-focus depth and laser/split-layer-thickness control now under R&D

Co-funded by the European Union

Ministry of Industry and Trade of the Czech Republic

Semiconductors4All – National Centre of Applied Semiconductor Research (TQ28000004)

- TAČR SIGMA DC5 programme; coordinated by Brno University of Technology; 19 partners
- onsemi and HiLASE both participate as industrial/research partners, alongside the wider Czech semiconductor ecosystem
- Complements the bilateral SiC laser-processing work under LaPSiC and ALPSW with a broader national research-infrastructure framework

From Bilateral R&D to a European Ecosystem

- Projects **LaPSiC**, **ALPSW** with **Semiconductors4All** have built a working, results-based laser-processing partnership between onsemi & HiLASE – covering grinding, dicing, annealing and wafer-separation routes for SiC
- onsemi's LOS for **GIGABURST**, High-energy GigaBurst Laser System for Semiconductor Dicing (HiLase)
- This bilateral track is now scaling into the pan-European **IPCEI AST** project **TECH4CHIPS** - Advanced Technologies for Semiconductor Manufacturing, led by CRYTUR with FZU/HiLASE, Argotech, NenoVision, Sympulse and onsemi, spanning both R&D&I (48 months) and First Industrial Deployment (24 months)
- onsemi's role in TECH4CHIPS**:** industrial end-user and validation partner for **laser-processed SiC/WBG** materials and laser-enabled advanced packaging. Key topics include laser processing for diamond, GaN, AlN, Ga_2O_3 / with application of ML/AI for effective process setup and control
- Outlook: **deepen the onsemi & HiLASE cooperation** and, together with the **Czech National Semiconductor Cluster**, anchor laser-based SiC processing as a core competence of the Czech and European semiconductor ecosystem with application of unique know-how via the **Czech Semiconductor Centre**

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Thank you for attention!

Appreciation for funding!

Technology Agency of the Czech Republic:

- LaPSiC - Laser Grinding of SiC (TQ16000033)
- Semiconductors4All (TQ28000004)

Ministry of Industry and Trade and OP TAC funded by European Union:

- ALPSW - Advanced Laser Processing of Semiconductor Wafers (CZ.01.01.01/01/24_063/0006908)

