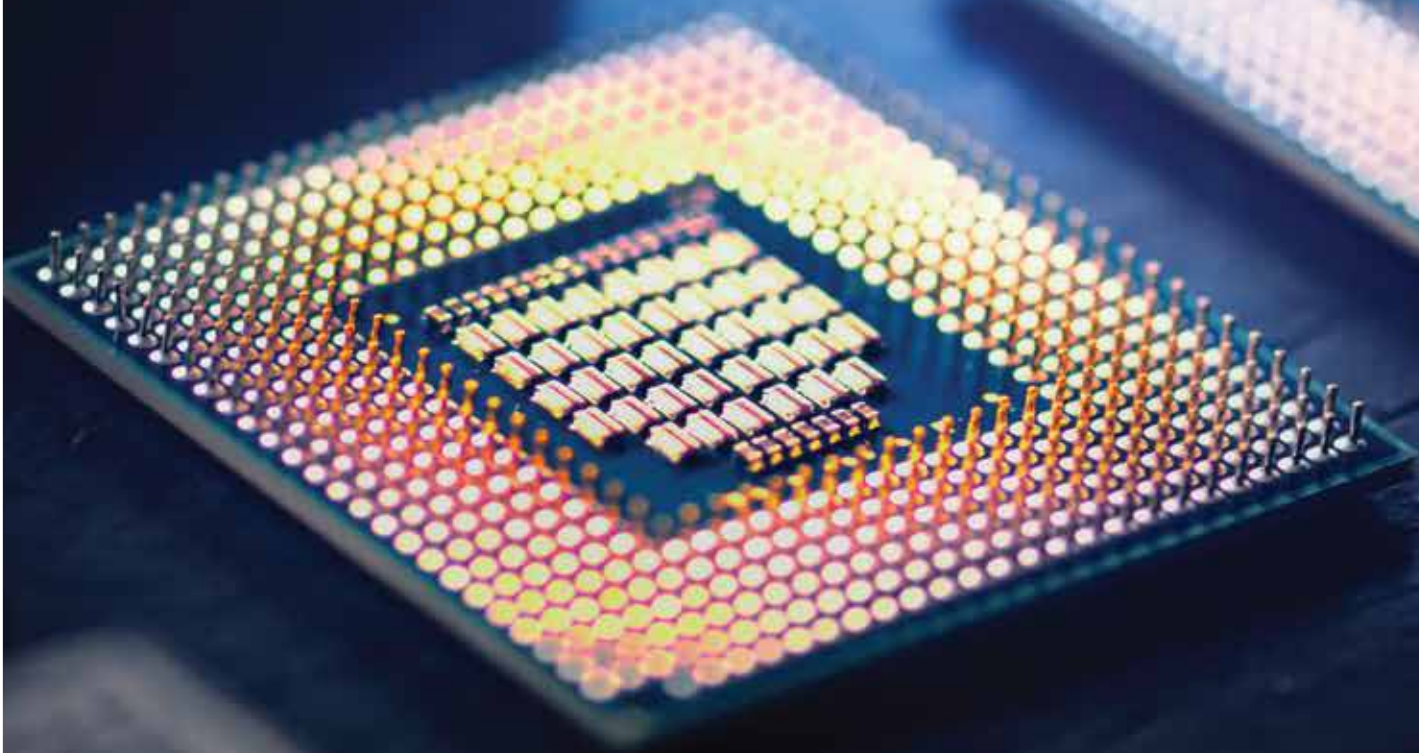


HCLTech | Supercharging
Progress™

Semiconductor **OEM** and **FAB/OSAT** services



Chip production is witnessing a major boom as digital transformation technologies such as AI/ML find traction in smart manufacturing, sustainability, automation, capacity planning, yield simulation, and predictions. Not only are Fabs and OSATs under significant pressure to reduce capital expenditures, they need to stay ahead in current volatile R&D-intensive semiconductor industry. This requires a dynamic shift in the way they optimize R&D spending, perceive customers needs better than the competition and make necessary investments to develop differentiated products 'first time right'.

At HCLTech, we combine our extensive engineering expertise with modern sensibility to deliver comprehensive and innovative engineering solutions to meet the complex and challenging needs of our customers.

Our credentials and strengths



Recognition

HCLTech was recognized amongst top two players in Everest Group's Semiconductor Engineering Services PEAK Matrix® Assessment 2021.



Successful partnerships

6/10 top semiconductor OEMs, 3/5 top semiconductor chip companies, and leading foundries.



22+ years of experience

17,000+ person years engineering experience across all stages of the IC manufacturing process.



Field support experience

Service support across FABs in APAC, North America, and EU.



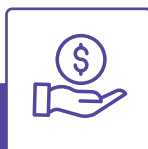
2900+ engineers and SMEs

Largest engineering team cutting across services focused on semiconductor industry.



Global presence

HCLTech's engineering footprint delivers time and cost advantages due to proximity to FABs.



\$ 5M+ strategic investments

5 labs, 10K clean rooms, solution frameworks, and 25+ customer equipment in labs.

Our semiconductor domain competencies

Lithography



- Ray tracing, opto-mechanical packaging and laser beam delivery from source to point of use
- Design of droplet generator and high-pressure lines
- Design of tin mitigation system
- System GUI and software design and integration

Etching



- Multi variant analysis
- Online recipe editing
- Fault revealing
- Automatic front-end
- Process chambers

Ion implant



- Experience in high current, medium current and high energy implanters
- End-to-end ownership design and productization of ion implanter
- High voltage engineering (200kV), vacuum technology (ultra-high vacuum 10-8 torr), toxic and hazardous gas delivery system, radiation shield (X-ray and particles) and others

CVD/PVD/ALD



- Process and system-level knowledge in MOCVD, ALD, CVD, ECD, PVD and ion beam equipment
- Subsystem design of shower head, heater assy, wafer carriers, source delivery system, ion source assy, wafer transfer module and others
- Software system architecture and protocols

Inspection and Metrology



- Experience in optical, X-ray and e-beam inspection equipment
- EUV metrology module packaging for reticle inspection
- High precision stage (2g force) design to handle stability/vibration with accuracy of +/- 5 microns
- System engineering expertise in managing wafer handling platform.
- Imaging algorithm development and support
- 300mm FA standards compliance and enablement during equipment integration in Fab

Assembly and Packaging



- Assembly equipment
- Package design
- Simulation (thermal/electrical/mechanical)
- Reliability test and silicon qualification
- Advance packing design
- Multi-die and hybrid package

Testing



ATE Expertise

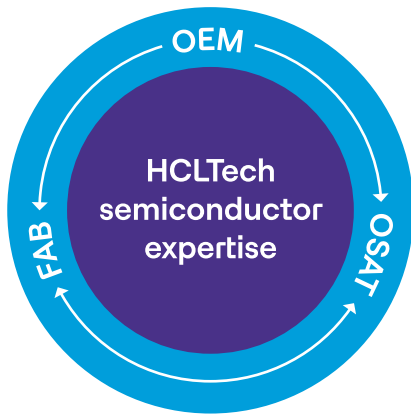
- Scalable and modular tester platform
- High-density/single-board digital, analog and RF instrumentation enabling high parallel testing
- Simulators

Test Engineering Expertise

- DIB board and Probe card design
- Device expertise: SOC, RF, analog, digital, memory
- Test program platform conversion
- Correlation and qualifications for Fabs and yield management

Solution accelerators for semiconductor: HCLTech SIMQUALIFY | HCLTech 200mm and 300mm factory automation standards – IP products

Our engineering service offerings across the semiconductor ecosystem



Fab/OSAT/service offering

Fab Services

Legacy support | OEE and automation tools | Yield optimization | RPA | Cybersecurity

Fab Management

MES and FA | Process engineering | Supply chain administration | Equipment/ Manufacturing engineering | secured remote connect

Fab Transformation

Migration to cloud | IoT / Industry 4.0 | Data analytics | AI/ML | AR/VR

Test Engineering Services

Test Program development | Conversions | DIB and probe card | Test optimization | Characterization

OEM service offering

Software

- Software development and validation control system software
- Sustenance engineering | L3 support
- Simulator development | Test automation | DevOps
- Performance engineering
- Data analytics | AI/ML

Mechatronics

- Equipment sub-system engineering
- Value analysis and value engineering
- Component engineering | ECO and BOM

- Schematics and PCB design
- Low volume manufacturing and prototype
- Pre-compliance testing and certification (CE/FCC/RoHS)
- Cabling and harness design and routing
- Obsolescence management

Value added services

- Clean room | ATE lab | Product support | AR/VR based training and technical publication

Our value proposition



Equipment life-time extension



Value engineering and Cost down



Equipment standard enablement



Technology upgrade and migration



Product development acceleration



Continuous integration and regression optimization



Equipment uptime maximization



OEE through data analytics

Transforming with key enabling technologies



DevOps

Equipment simulation | SCM | CI-CD and DevSecOps | CloudOps | Cloud IAAC



Cloud computing

Consulting | Build | Transformation | Deploy | Onboarding | Operations



Cyber security

Application security, equipment, and manufacturing security in accordance with semi standards



IoT WoRKS™

Application security, equipment, and manufacturing security in accordance with semi standards



Digital Transformation

Sustainability

Sustainability dashboard | Monitor and optimize | Environmental compliance



AR/VR

Enables organizations with remote assist | Field services | Training and other shop floor activities



Digital manufacturing

MES | MOM | ALM | PLM | Supply chain | Digital twin | RPA



Data Analytics/AI/ML

Yield management | Predictive and preventive maintenance | Operational efficiency improvement



Experiences engineered for our customers

- Setup customer specific labs and clean rooms for autonomy of projects and established a collaborative engagement model with customers' India captive center, resulting in cost savings of \$150M in 12 years.
- Designed and developed tester health monitoring dashboard for a leading OSAT. The company experienced 70% savings in total effort and reduction in the equipment downtime.
- Helped a leading ion implantation customer improve their market share by delivering a time-critical NPD program. Client witnessed 20 percent improvement on time to market, met the product cost targets, and managed program budget constraints.
- Developed test automation framework for a wafer inspection and metrology OEM. This resulted in 40 percent automation of manual regression with improved test coverage to 90 percent and test time reduction from 2 months to 2 weeks with a savings of \$300K annually.

Supercharging customer business objectives with engineering experience

HCLTech has partnered with semiconductor equipment manufacturers for over 22+ years with 17,000+ person years of engineering experience, across all stages of the complex IC manufacturing process. We have also partnered with 200 mm and 300 mm Fabs and OSATs to improve their operational efficiency, productivity and process by solving their most challenging equipment automation, data management and process control problems.

For more information on how we can help you improve your time to market, increase quality and reduce cost, visit hclsemi@hcl.com

HCLTech | Supercharging Progress™

HCLTech is a global technology company, home to 225,900+ people across 60 countries, delivering industry-leading capabilities centered around digital, engineering and cloud, powered by a broad portfolio of technology services and products. We work with clients across all major verticals, providing industry solutions for Financial Services, Manufacturing, Life Sciences and Healthcare, Technology and Services, Telecom and Media, Retail and CPG, and Public Services. Consolidated revenues as of 12 months ending March 2023 totaled \$12.6 billion. To learn how we can supercharge progress for you, visit hcltech.com

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