

Heptagon Wafer-Level Offerings for Emerging Applications

2025-05

CONTENTS

HEPTAGON

- **Company Overview**
- **Foundry Service and Typical Applications**
- **Added Value to Customers**
 - Benefits of Wafer-Level Optics (WLO) Technology
 - How WLO Technology Enables Your Applications
 - Ensuring the Performance and Reliability of Our Products
 - Work with Us – From Design to Mass Production
- **Summary**

Focuslight Overview

- Founded in 2007 by Dr. Victor X. Liu, headquartered in Xi'an, China.
- A fast-growing company that develops and manufactures:
 - **High-power diode laser components and materials** (Photon Generation)
 - **Laser optics components** (Photon Control)
 - **Photonics module and system solutions** (Application Solutions) focusing on optical communication, automotive, pan-semiconductor, and medical and health applications.
- A **global photonics foundry** offering process development and manufacturing services to the global photonics community.
- Publicly listed in the Shanghai Stock Exchange (Ticker Symbol: 688167).

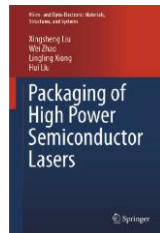


Milestones



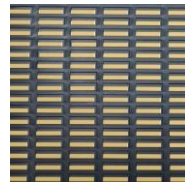
2007

Founding of
Focuslight



2013

World's first
monograph on
packaging of
HPDL published



2017

Technology
breakthrough of gold-
tin film deposition



2018

UV-L750 Ultraviolet
Line Laser System
won Prism Award



2017

Acquisition of LIMO;
Started providing photon control and
photonics application solutions



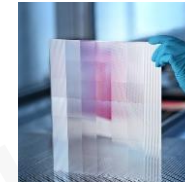
2019

Automotive LiDAR
transmitter project
awarded from
international Tier 1



2018

Dongguan delivery
and high-volume
manufacturing center
officially in operation



2019

Production of micro-
optics on world's
largest glass wafer
(300 x 300 mm²)



2019

Global branding
identity upgrade



2023

Line Beam LiDAR
Transmitter
Module awarded
nomination from
European Tier 1

IPO

2021

Successful IPO
at Shanghai
Stock Market



2024

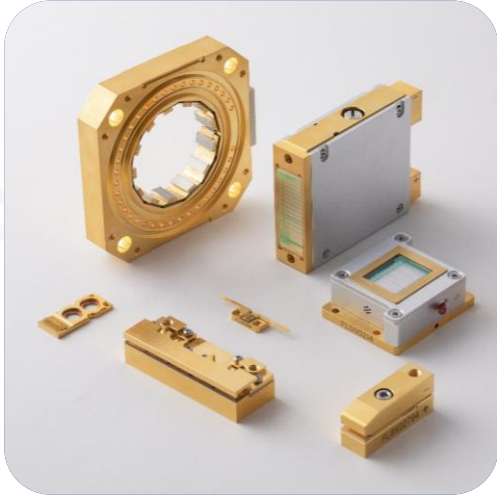
Acquisition of
SUSS MicroOptics



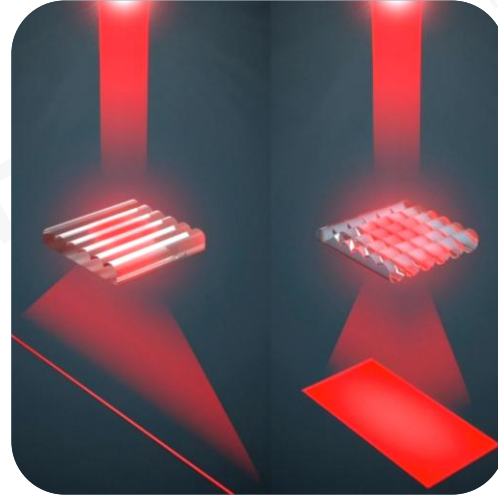
2024

Acquisition of ams
OSRAM's optical
component assets;
Adopt Heptagon
brand for global
photonics foundry
services

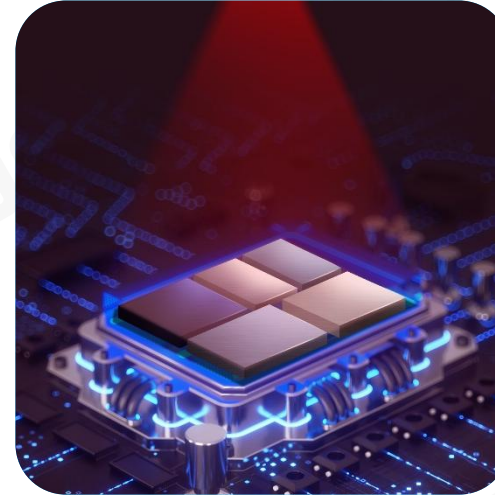
Products and Businesses



Photon
Generation



Photon
Control

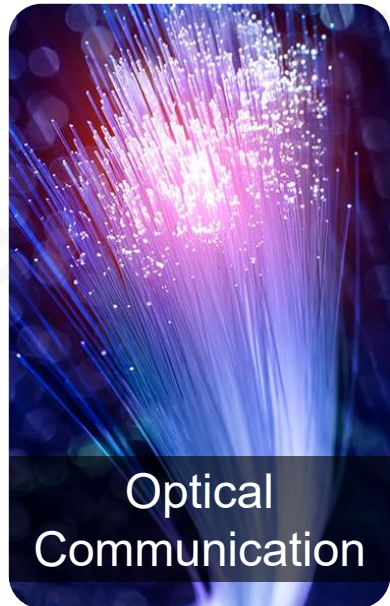


Photonics
Application
Solutions



Global
Photonics
Foundry

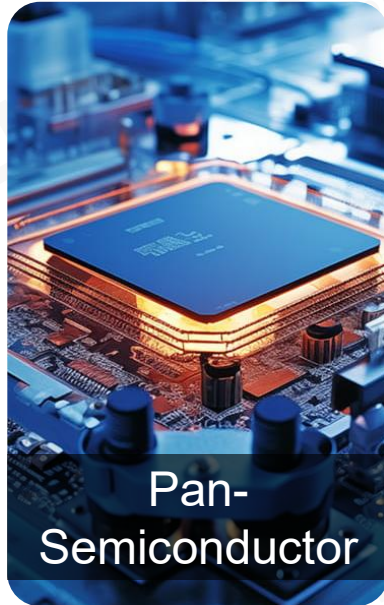
Markets



6%
revenue



2%
revenue



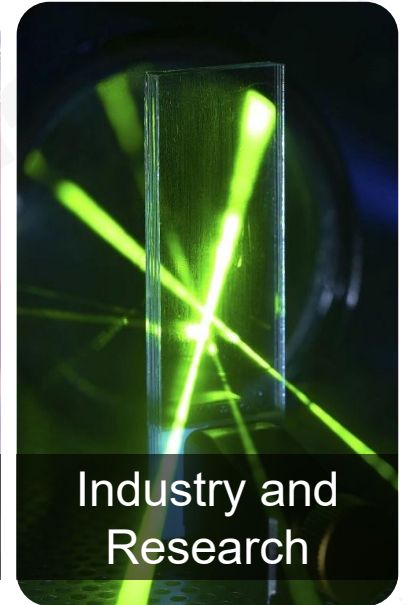
21%
revenue



12%
revenue



13%
revenue



46%
revenue

** Based on accumulated revenue data from 2025 Q1 (figures unaudited)*

Focuslight Global Operations System

Leverage the strengths and capabilities of each location to cater to specific customer demands and optimize operational efficiency.

Through centralized decision-making, integrated operations, and lean management, a high-efficiency, low-cost global operations system is established.



Zurich, Switzerland
R&D Office



Neuchâtel, Switzerland
Operations Center



Dortmund, Germany
Operations Center



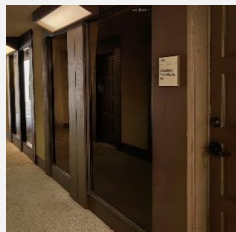
Xi'an, China
Focuslight HQ, Operations Center



Haining, China
Operations Center



Hefei, China
Operations Center
(being constructed)



Silicon Valley, USA
Innovation Lab



Ang Mo Kio (AMK), Singapore
Operations Center
Business Center

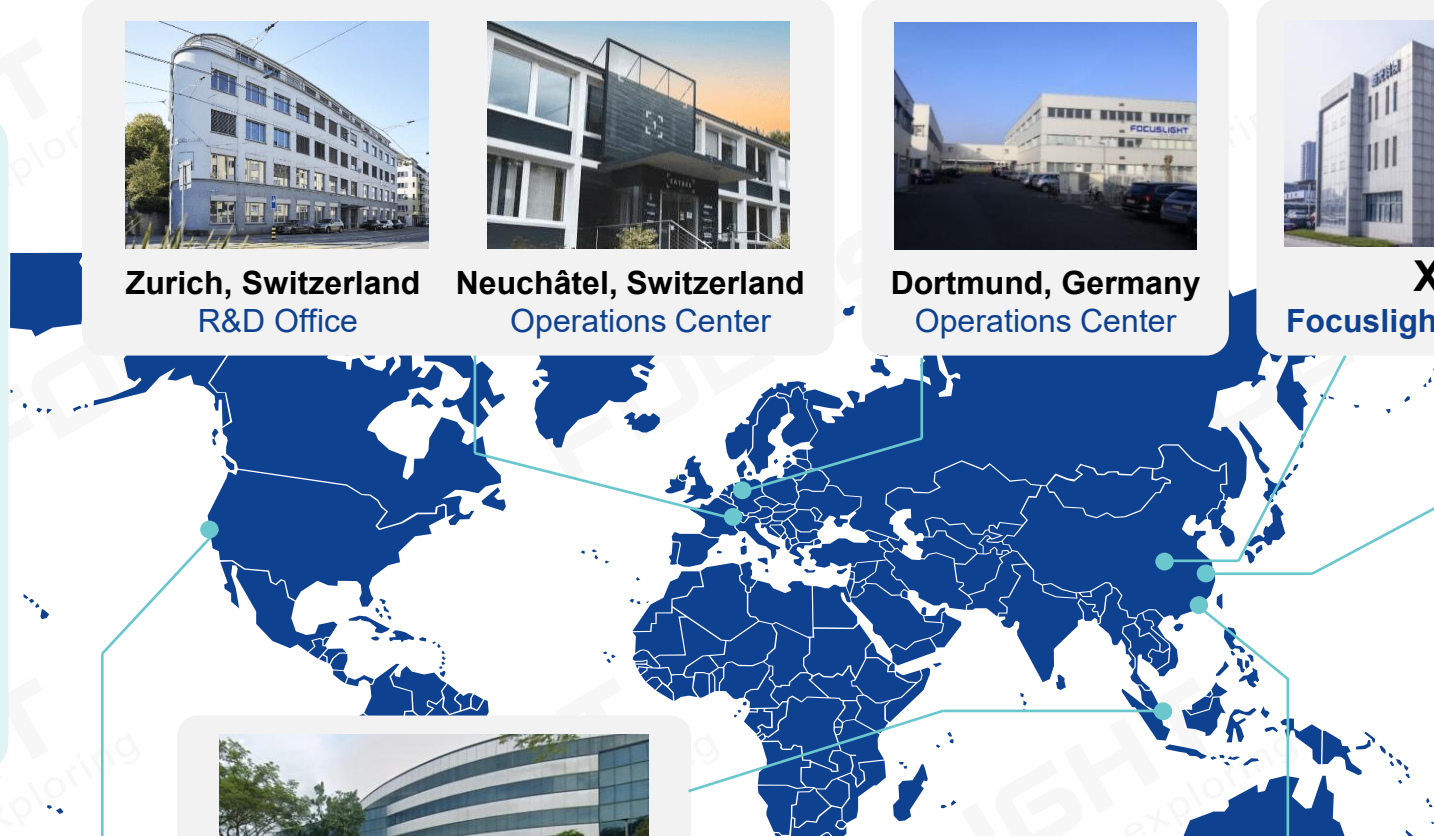
Malaysia (being expanded)
Operations Center



Shaoguan, China
Operations Center



Dongguan, China
Operation Center



Further Expanding Flexibility

- **Strong International Presence:** Focuslight has strong presences in China, Germany, Switzerland, Singapore, and other global regions. We can leverage our existing manufacturing capabilities in these locations to meet customer demand efficiently.
- **Flexibility in Manufacturing:** As demand grows, we are exploring additional manufacturing capacity in Malaysia to complement our global operations. This flexibility allows us to adapt to the evolving needs of customers worldwide.



In a world of evolving market dynamics, we provide the solutions you need to stay ahead—flexible, efficient, and forward-thinking.

Heptagon is Back as a Focuslight Brand



FOCUSLIGHT
Never stop exploring

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Products Applications Core Technologies Investor Relations News & Events Support About Us Career Contact

HEPTAGON
A FOCUSLIGHT BRAND

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Focuslight Technologies Inc. Completes Acquisition of ams OSRAM's Optical Component Assets, Further Strengthening Its Global Competitiveness in Optics Solutions

Time: 2024-09-02

Download

Xi'an, China, September 2nd, 2024 – Focuslight Technologies Inc. (Shanghai Stock Exchange: 688167), a global provider of high-power diode lasers and materials, laser optics and photonics modules and system solutions, **today announces the successful acquisition of optical component assets from ams OSRAM AG**. This marks another strategic move and milestone following Focuslight's acquisitions of LIMO GmbH in 2017 and SUSS MicroOptics SA (now as Focuslight Switzerland SA) in January 2024, providing a strong foundation on its commitment to expanding its capabilities and footprint in the global photonics market.

News source: <https://focuslight.com/news-events/newslist/focuslight-technologies-inc-completes-acquisition-of-ams-osrams-optical-component-assets-further-strengthening-its-global-competitiveness-in-optics-solutions/>

Focuslight also plans a full integration of the acquired assets into its existing business structure. The company will reorganize and integrate certain assets into its Automotive Business Unit to strengthen its capabilities in serving global automotive customers. A **Strategic Growth Division** will be established to house the R&D teams and equipment related to consumer electronics, disposable medical solutions, and other emerging applications. All products associated with these assets will be unified under the **Focuslight** brand.

Meanwhile, a **Global Photonics Foundry Business Unit** will be established serving as a global center for photonics industry process development and manufacturing services under the historic **Heptagon** brand, which was originally founded in 1993 and will now continue its legacy of innovation, quality, and high-volume manufacturing under Focuslight's global operations, transforming its customer's ideas and designs into industry-powering photonics solutions.

Story of Heptagon



Established in 1993, Heptagon became a leading brand in the micro-optics industry, renowned for its expertise in advanced optical packaging, wafer-level micro-optical modules, and high-volume manufacturing for consumer electronics.

Now reborn as Heptagon Photonics, we continue this world-class legacy, delivering miniaturized, high-performance, and cost-effective photonics solutions to drive innovation in emerging markets.

Visit www.hptg.com for more information

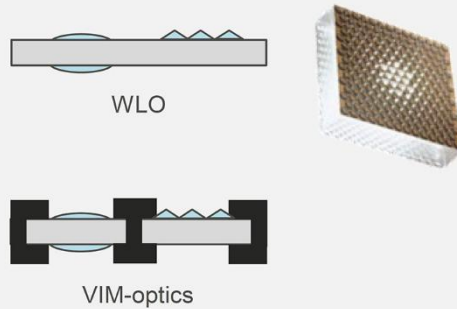
- 2024 The Heptagon brand is restored after acquisition by Focuslight for its wafer-level-optics-based businesses
- 2017 Acquired by ams
- 2016 2 billion units shipped
- 2015 Entry into 3D and IoT
- 2014 Entry into wearables
- 2013 1 billion (1,000,000,000) units shipped
- 2010 First light WLO solution for leading smartphone OEM
- 2007 Imaging WLO high-volume manufacturing in Singapore
- 2006 First wafer-level CMOS micro-optics solution to leading handset OEM
- 2002 First wafer-level micro-optics solution
- 1993 The company Heptagon was founded

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 - Work with Us – From Design to Mass Production
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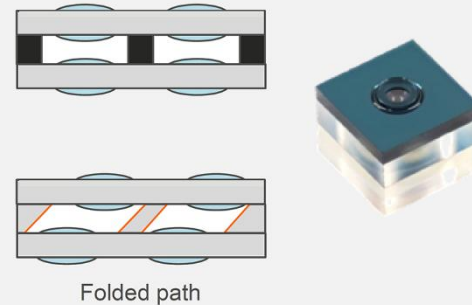
Global Photonics Foundry Services



Wafer Level Optics

Imprinted optics from mm to nm scale

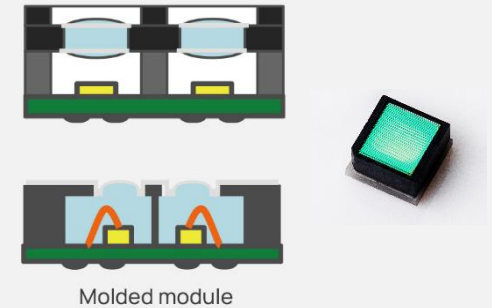
- Diffractive and refractive optics
- Micro lens arrays (MLAs)
- Diffusers



Wafer Level Stacking

From imprinted optics from mm to nm scale

- Imaging lenses
- Projector lenses



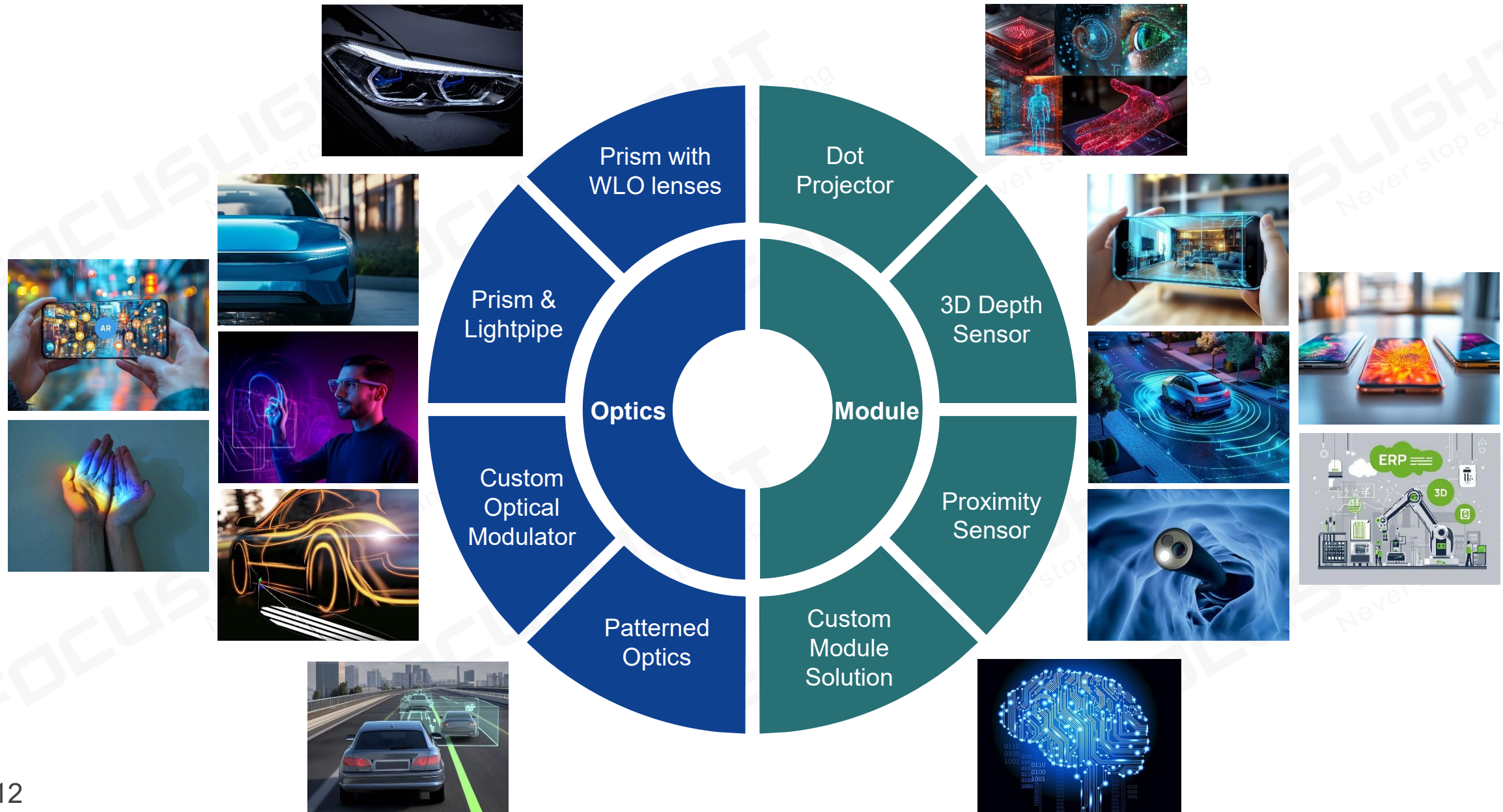
Wafer Level Integration

From imprinted optics from mm to nm scale

- Optical sensor and illumination modules

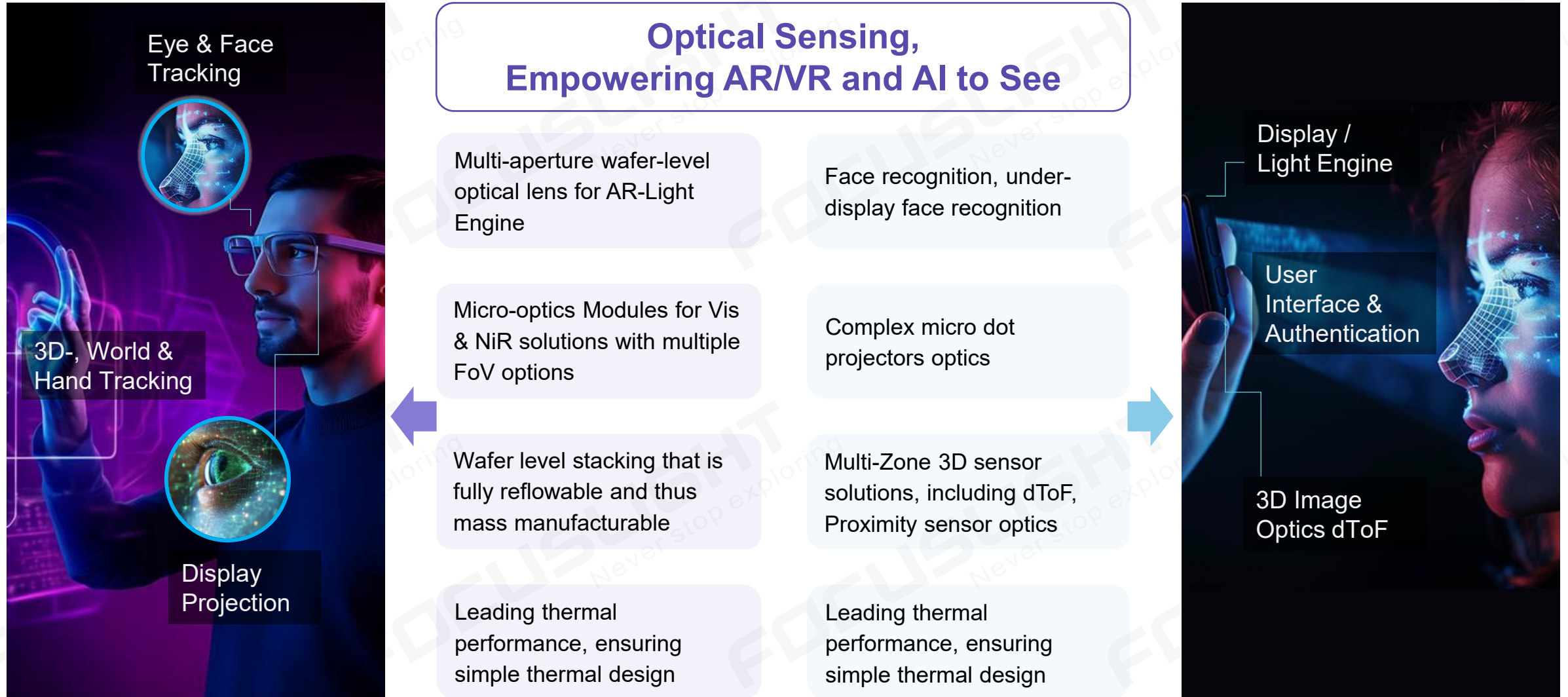
With the Heptagon legacy of know-how in **wafer-level technologies**, **excellent design**, **development**, and **mass production capabilities** of micro-optics based solutions, the foundry will be a global hub for photonics process development and manufacturing to the global photonics community, offering manufacturing facilities worldwide based on customer needs.

Wide Application Spectrum of Solutions



Typical Application and Products

Consumer Electronics

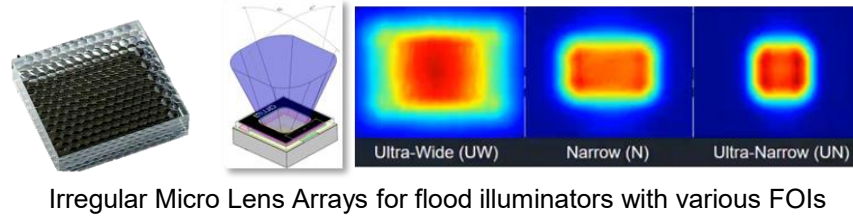


Typical Application and Products

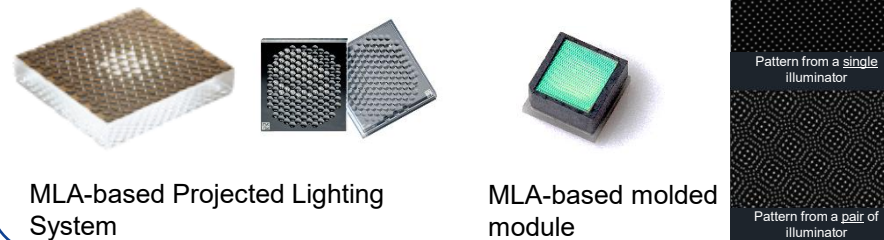
Automotive, Robotics, Medical



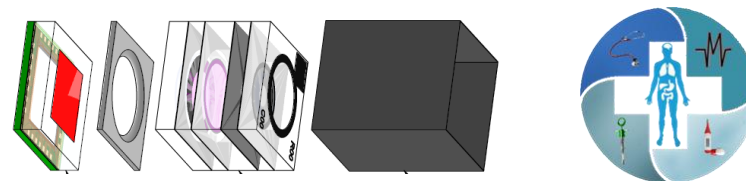
Tailored Diffusor Micro-Optics



Pattern-Generating Micro-Optics



Imaging and Projection Micro-Optics



WLO lens & camera integration for chip-on-tip medical endoscopes



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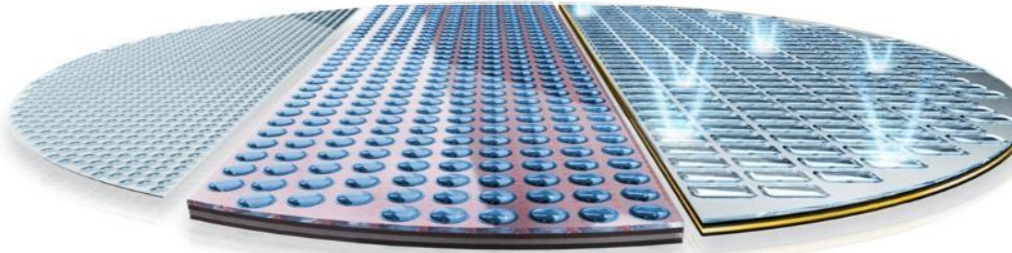
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Wafer Level Optics – Common Technology Base

Design for Manufacturing by In-House Wafer Level Optics & Stacking Technology

Wafer-Level Optics, Electronics, Packaging, Integration, Testing and Processing



Wafer-level imprinted optics from mm down to nm-scale

WLO

(Wafer Level Optics)



WLO

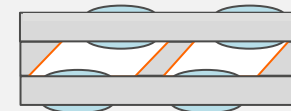
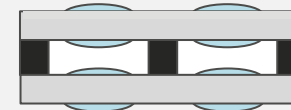


VIM-optics

Diffractive & refractive optics, MLAs, diffusers

WLS

(Wafer Level Stacking)

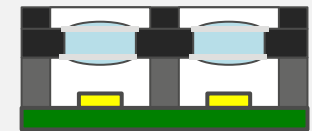


Folded path

Imaging lenses, projector lenses

WLI

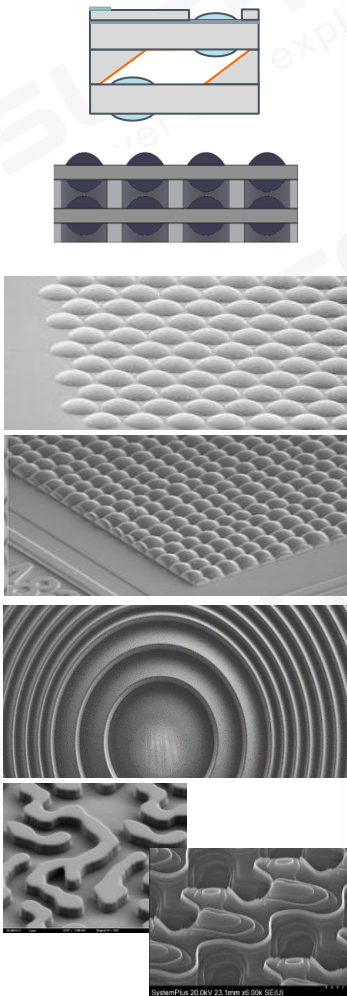
(Wafer Level Integration)



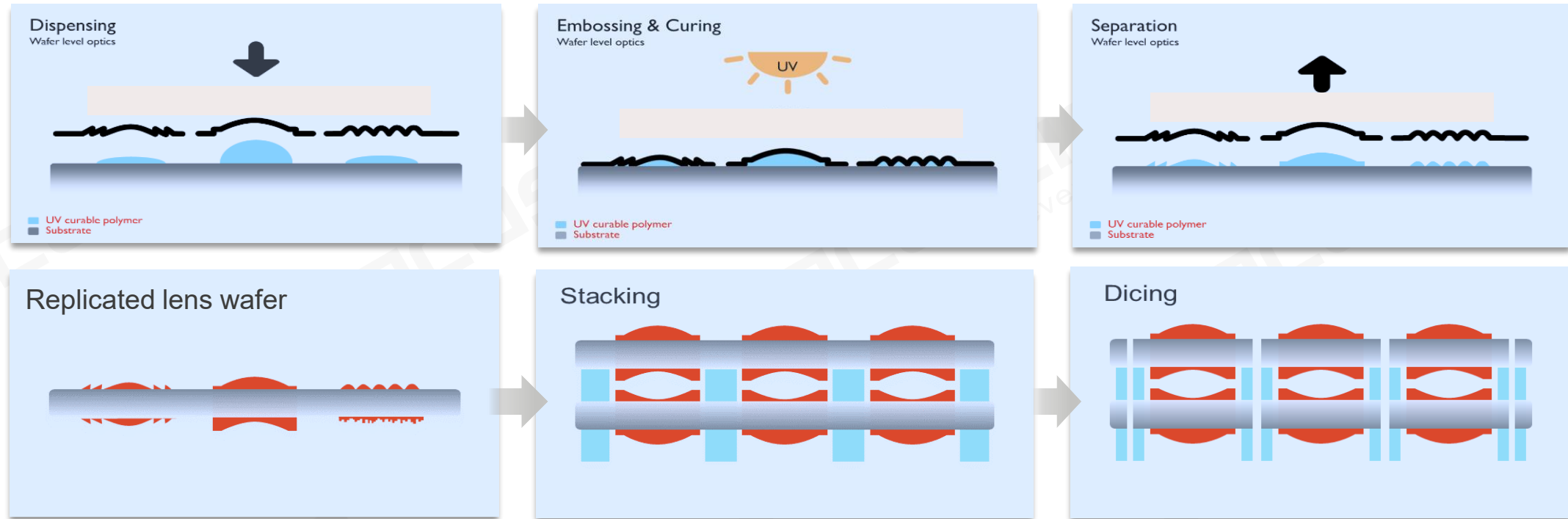
Molded module

Optical sensor & illumination modules

1's mm	Flat & Hybrid Optics
100's μ m	Refractive lens
10's μ m	MLA
1's μ m	Diffractive
10's nm	



Wafer Level Optics – Basic Manufacturing Process



WLO Competitive Advantages:

- Full wafer-scale process for high volume mass production
- UV curing, Low temperature, low pressure process
- Conformal, microfluidic filling for micro/nano structures
- Conformal reproduction of features less than 1µm
- Reflowable optical material with high thermal performance

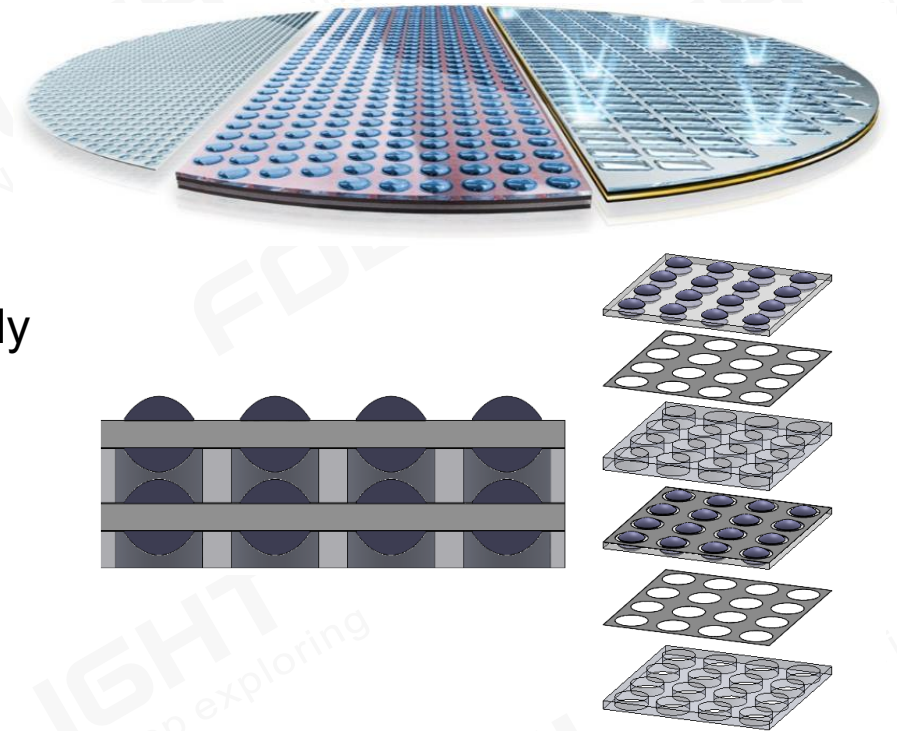
Unique Advantages for High Performance u-Camera:

- Full Solution reflowability, no Compromise of Function, Fit, Cosmetics
- No barrels, mounts, highly compact, highly integrated optical solutions
- Miniaturization (mm²) flexibility, advanced capabilities, performance
- Concepts to ensure quality mass production volume solutions
- Active Alignment to sensor delivering µWLO+Image Sensor Modules

Reflowable WLO-lens systems enable smallest footprint for µcamera devices and integration

Benefits – Wafer-Level Optics and Stacking

- **Wafer-Level Optics (WLO)** is an extremely high-precise fabrication technology for micro-optics at large volume
 - ✓ Wafer-scale process rapidly scalable for mass production
 - ✓ Tends to be profitable at high volume (MP >100 wafers per production) due to relatively high master & tooling cost
- **Wafer-Level Stacking (WLS)** enables high-performance and highly integrated micro-optical system products
 - ✓ Micron-level precision stacking of multiple optics wafers using leading-edge mask aligners
 - ✓ Wafer-scale bonding using rigid spacers and materials with excellent thermal and mechanical stability
 - ✓ Economic wafer-scale integration of added functions such as apertures, coatings, spectral filters, a.o.

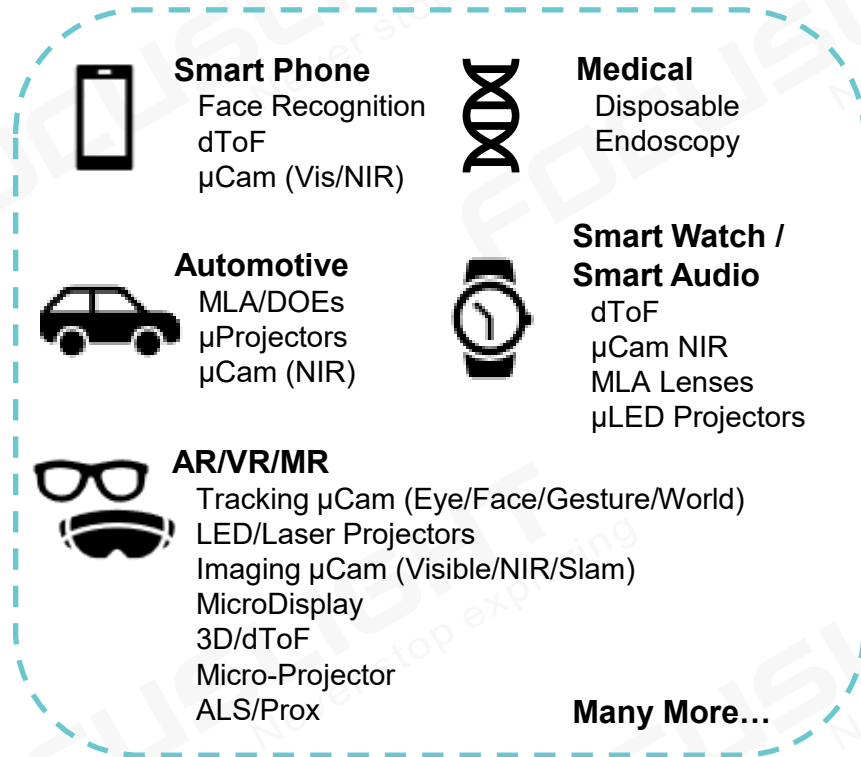


- WLO & WLS benefits can be leveraged best in high-volume markets such as Consumer Electronics, AR/VR & Automotive
- Committed to providing reliable, high-performance WLO products and superior development services to our customers

How WLO Technology Enables Your Applications

Developing Customized Wafer-Level Optics Solutions for our Customers

Customer Concepts, Requirements...
Target Application Spec Sharing

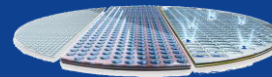


Optical Component
System Level Solutions

Optics Solution Provider

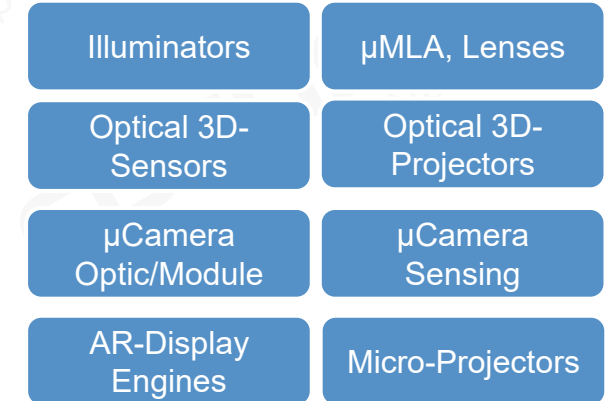
"From concept idea to mass production solution"

Feasibility Study,
Product Design,
POC-Sampling
Validation,
Product Development,
Qualification,
Mass Production



Delivering the Optic or Module to Customer,
Semicon or indeed ISP partner

Final Solutions
Module or Application Level



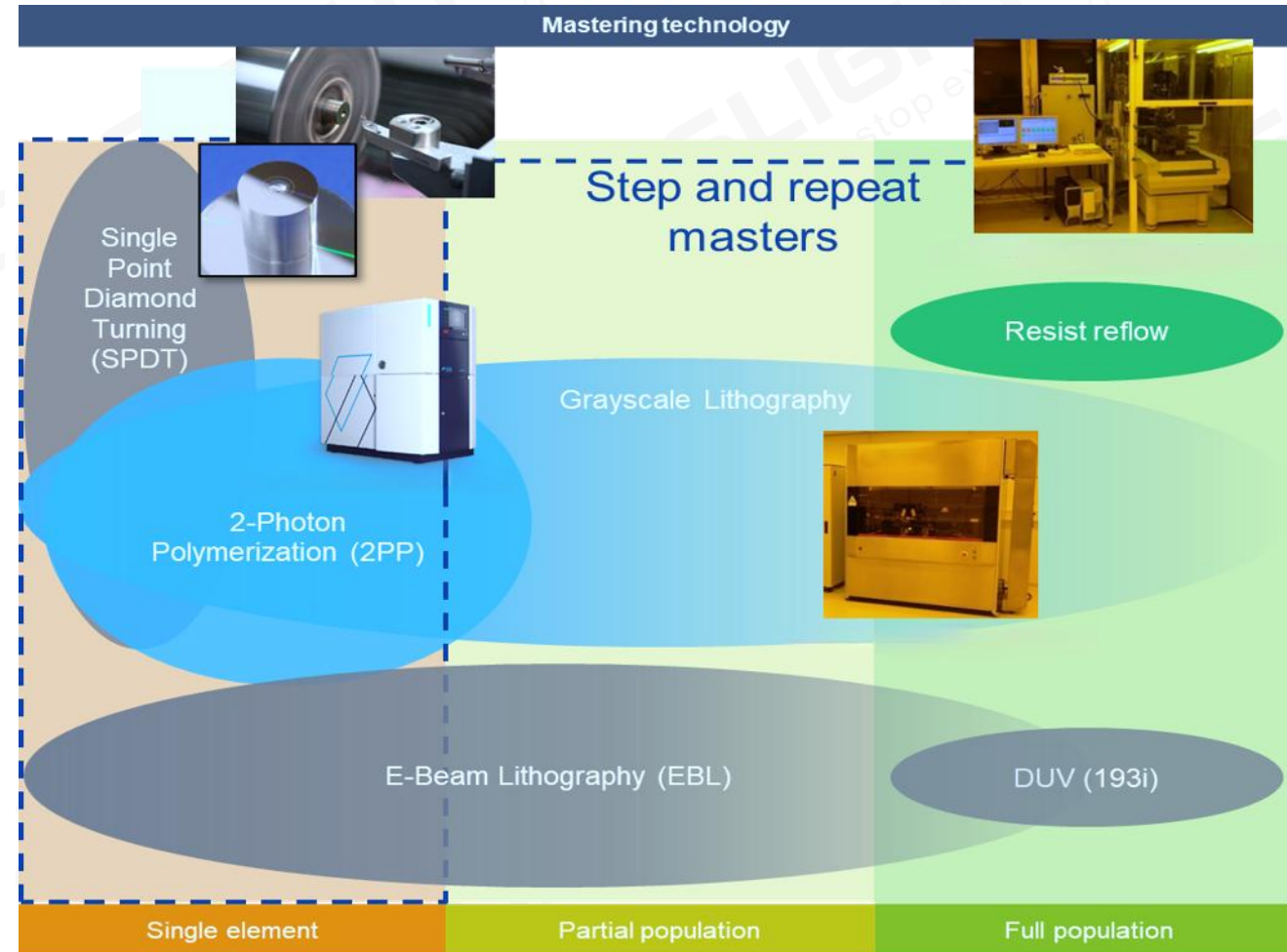
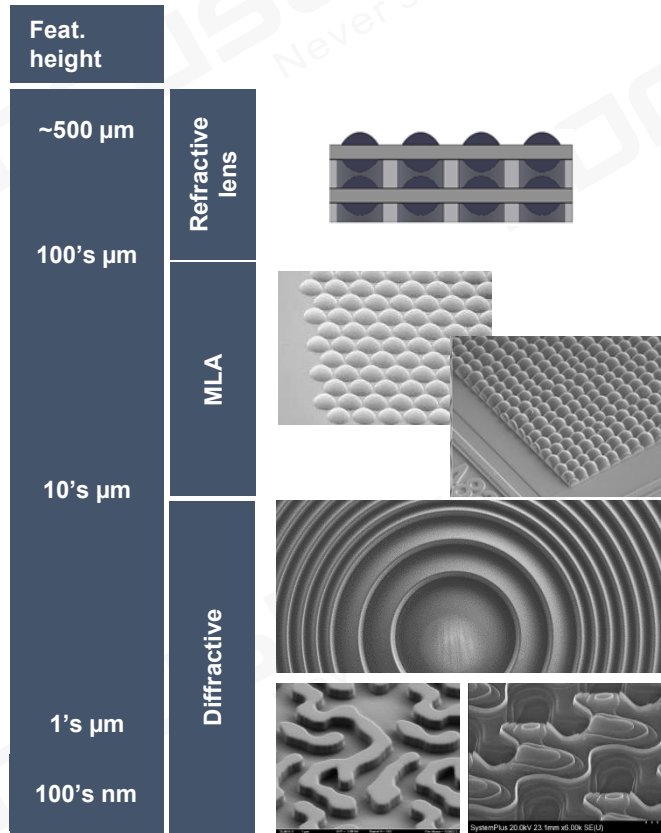
USP for WLO, WLS, WLI

- Outstanding Performance
- Micro Size
- Reflowability
- High Volume Manufacturing

Wafer-Level Optics solutions are generally **customer and application specific**, due to specific targets as well as specific semiconductor light source, μ-display and light detector components

Our Mastering Capabilities – All Starts from Here

Our R&D Lab and Equipment



Ensuring the Optical Performance of Products

Metrology Capabilities



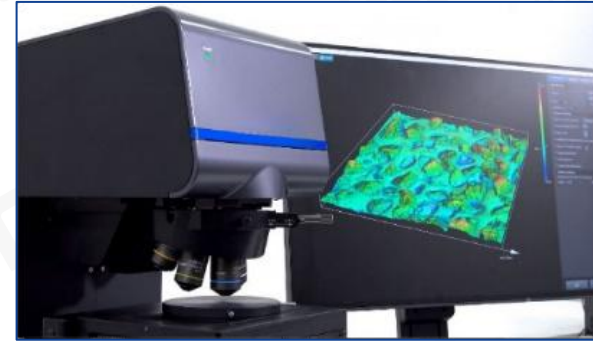
**Coordinate
Measuring Machine**



**Contour Measuring
Instrument**



**White Light
Interferometer**



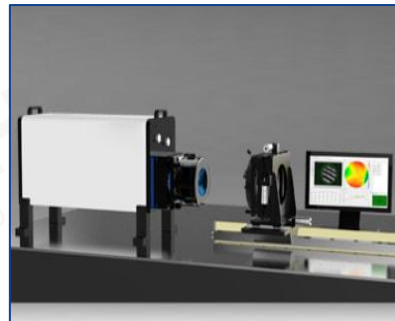
Confocal Microscope



SEM



**Precision
Goniometer**



**Large-diameter
horizontal planar &
cylindrical
interferometer**



**Full Size Measuring
Instrument**



**Off-Center
Measuring
Instrument**



Ion-miller



3D Optical Profiler

Ensuring the Product Reliability



Temperature Shock Chamber x3

Temp. range: -55~150°C
Thermal shock (Switching time≤1min) : <30s



Thermal Cycling Chamber x3

Temp. range: -55~150°C
Heating/freezing rate: ≤15°C/min



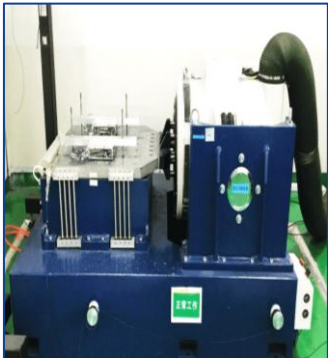
High / Low Temperature & High Humidity Chamber x5

Temp. range: -55~150°C
R.H. range: 20~98% RH



High-pressure boiling testing chamber x1

Temp. range: 100~132°C
R.H. range: 100% R.H.
Pressure: <5atm



Vibration table x1

10000kgf max force; 2~2500Hz frequency, 2m/s max speed



Salt Spray Test device x1

According to ISO 9227:2017



Xenon lamp aging tester x1

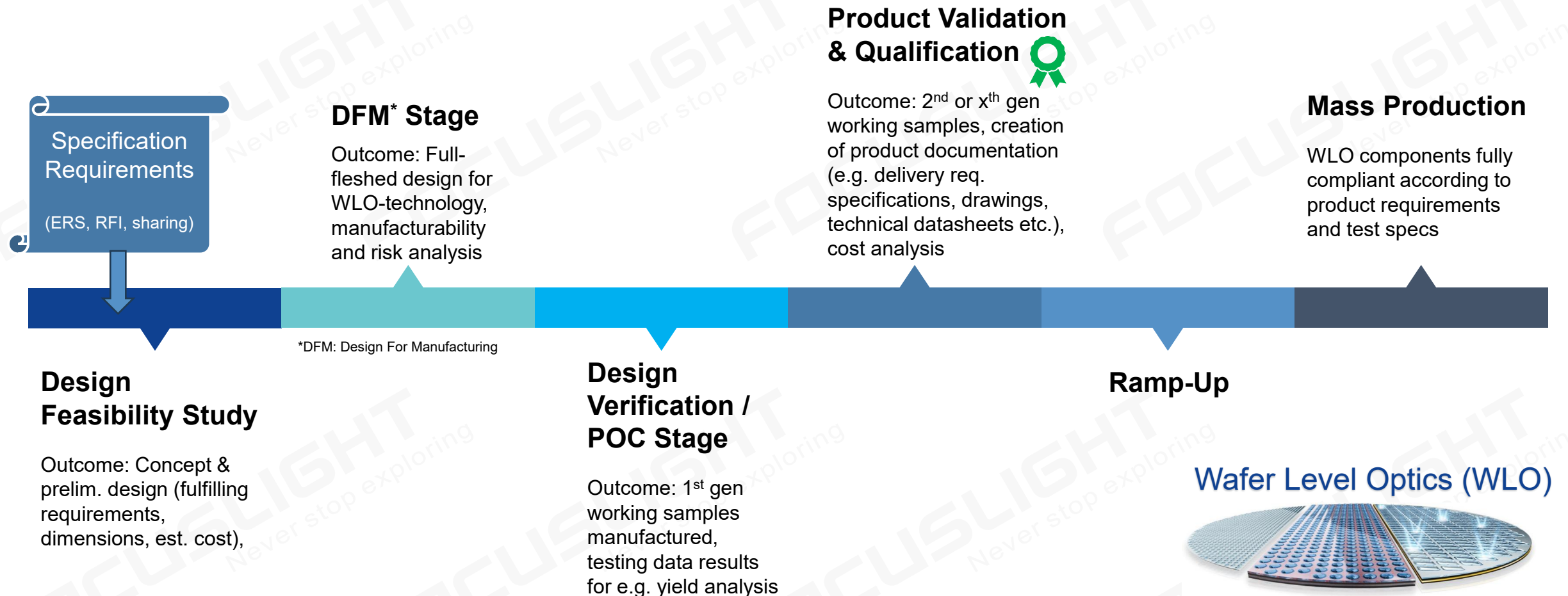
According to DIN 75220



Reflow Oven x1

Work with Us – From Concept to Mass Production

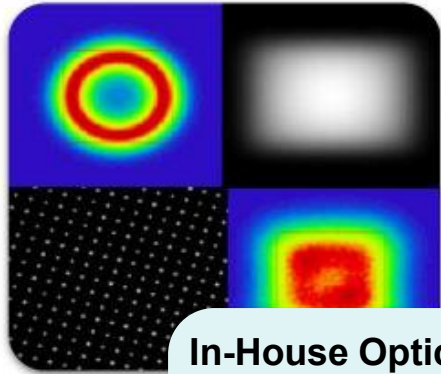
Value Chain for Customer-Specific Micro-Optics Solutions



In-House Skills and Capabilities, Delivering Concepts, Design using DFM Development Cycle and Testing
Ensuring high volume manufacturing, with reliability delivering proven Quality

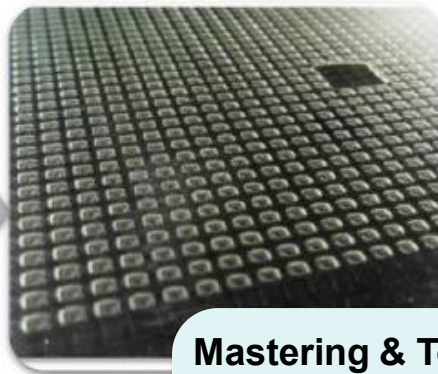
Work with Us – From Concept to Mass Production

Full-Scale Capabilities for the Whole Process



In-House Optical & Mechanical Design

- Location: Switzerland
- Ray trace and wave optics
- Full CAD capacity
- Physics simulation
- Single-Element to Full System Designs



Mastering & Tooling

- Master in-house and 3rd party
- Tooling: in-house
- Locations: Singapore and Switzerland
- Wide range of micro- and nano-structures possible



In-House Wafer Rep., Stacking and BE Process

- Location: Singapore
- Epoxy on glass, multiple materials options available
- Capacity for high volume production of micro-optics



In-House Optical & Final Testing

- Location: Singapore
- High UPH
- Wafer level, unit level, and module level testing with standard and customized systems

In-House Vertically Integrated Capability: Design, Development, Manufacturing, Reliability and Optical Test

1

Based on the available technical capabilities, we provide our **product portfolio** (standard, customizable) or pure custom **Heptagon designs**. The customer can then integrate these **Heptagon products** into their application solutions.

2

Based on the available technical capabilities, we cooperate with the customer, provide our **foundry service** to convert **customer's designs** into mass produced products. These products will then be the **customer's own products**.

Both business models (products and foundry service) share the same technology base, yet they power the customer's business in different ways.

Summary



- **30+ Years of Optical Design & Simulation + Volume Production Expertise**
- **Advanced & Unique Wafer-level-Technologies to Provide Various Optical Solutions**
- **Reliable, Stable Quality + High Precision Products for Various Applications**
- **Fast Response + Customized Service Available**



Your committed and reliable long-term partner in photonics application solutions

THANK YOU



www.focuslight.com
www.hptg.com

