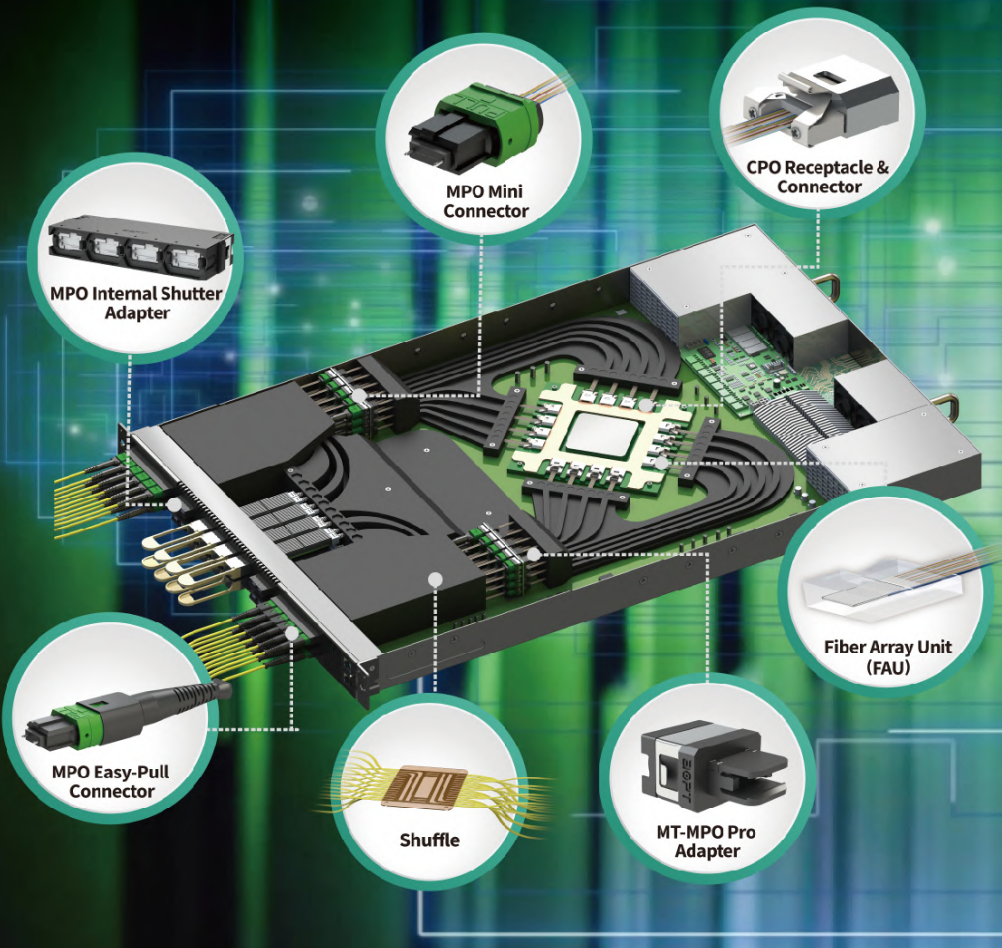


Optical Communications and Si-Photonics SIG

CPO Connectivity Solutions

Precision Optical Connectivity
for AI-Scale CPO Architectures



ACON OPTICS COMMUNICATIONS INC.

5F., No.4, Aly.9, Ln.45, Baoxing Rd.,
Xindian Dist., New Taipei City 231,
Taiwan.

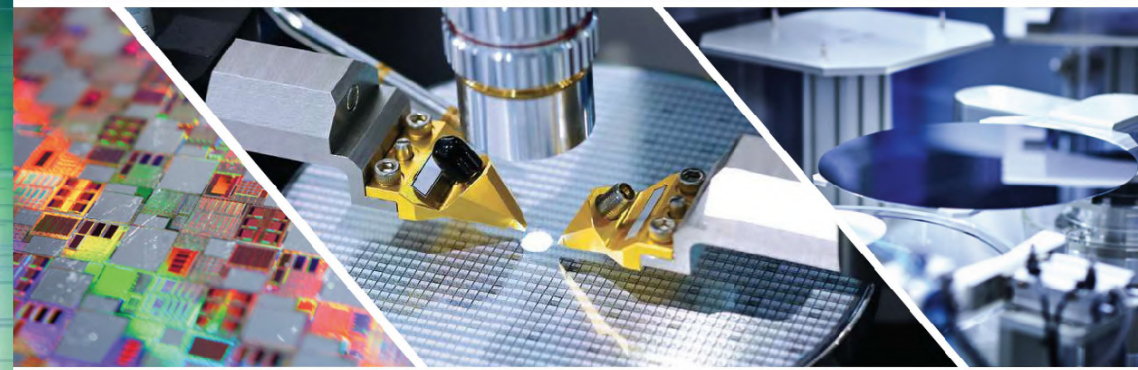
TEL : +886-2-2917-7668 FAX : +886-2-2917-0410
contactus@aconoptics.com
www.aconoptics.com

SILICON PHOTONICS WAFER TESTING

Automated Alignments to Scale Silicon Photonics (SiPh) Wafer Probing

To scale silicon photonics wafer probing and meet high-volume throughput requirements, an industry-leading wafer test machine manufacturer had to solve new system design challenges.

THEIR GOAL: Develop a new, high-throughput wafer probing system to expand their market reach.



CHALLENGE

To combine their existing systems' precision with industrial high-volume manufacturing equipment and meet production-level throughput requirements, this OEM needed:

- ◆ Positioning flexibility in several degrees of freedom to precisely align photonic sources & detectors
- ◆ High-dynamic motion for rapid alignment of test components
- ◆ Tightly coordinated motion between wafer positioning & probing stages
- ◆ Extreme accuracy & repeatability for movement between die without manual user interaction
- ◆ Specialized software & algorithms to reduce development time
- ◆ Sensor integration to prevent undesired motions & collisions

SOLUTION

Aerotech's engineering teams addressed all of these challenges with a solution that included:

- ◆ Modular stages enabling complex kinematic motion needed for precision alignment in 6 degrees of freedom
- ◆ Direct-drive servo motors for move-and-settle performance that exceeded throughput requirements
- ◆ A high-performance, multi-axis motion controller that coordinates all axes' motion
- ◆ Nanometer-level positioning accuracy & repeatability across all ranges of travel, including 0.5 nm minimum incremental step sizes
- ◆ Out-of-the-box optical alignment algorithms & custom algorithm development support
- ◆ Analog & digital interface options & configurable fault thresholds

LEARN MORE

Scan the QR code or visit
us at aerotech.com

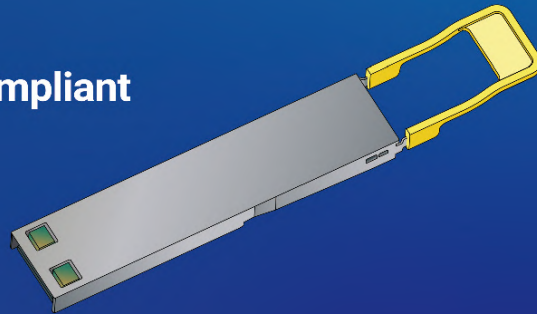


ELS

External Laser Source

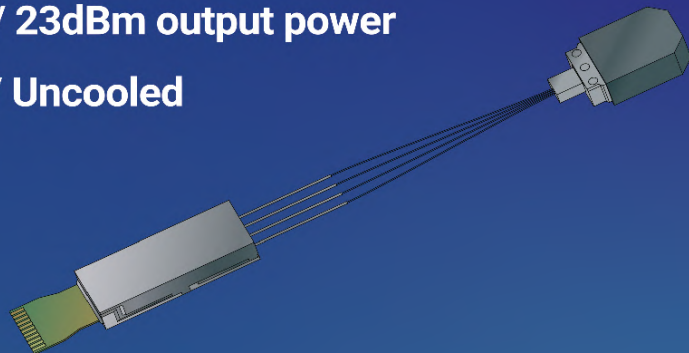
Module

OIF-ELSFP-02.0 Compliant



TOSA

- » 1310nm / CWDM / DWDM
- » 20dBm / 23dBm output power
- » Cooled / Uncooled



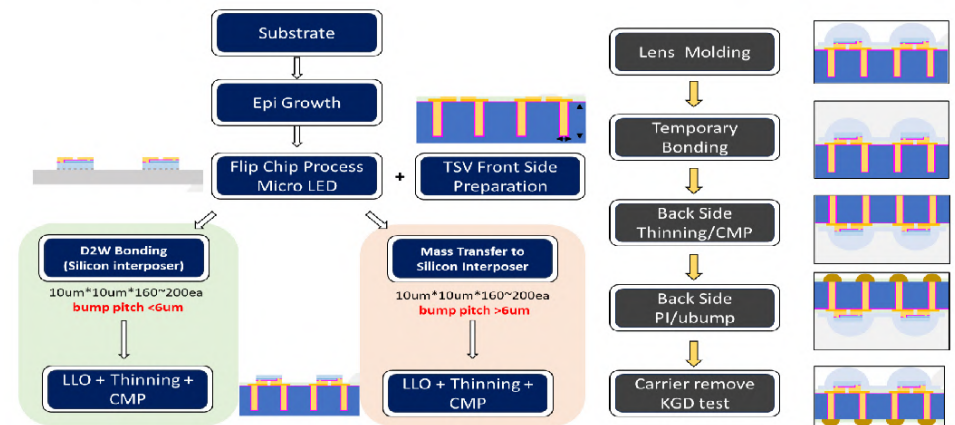
>> Contact Us

Ted Kuo
E-mail: tedkuo@apacoe.com.tw
APAC Opto Electronics Inc.
www.apacoe.com.tw



bEMC Heterogenous Integration Technology

bEMC's competitive advantage stems from a convergence of **Material Physics**, **Photonics**, and **Advanced Packaging**, delivering superior RF bandwidth and optical efficiency compared to conventional c-plane approaches.



bEMC u3DOE™ - ultra lower power CPO



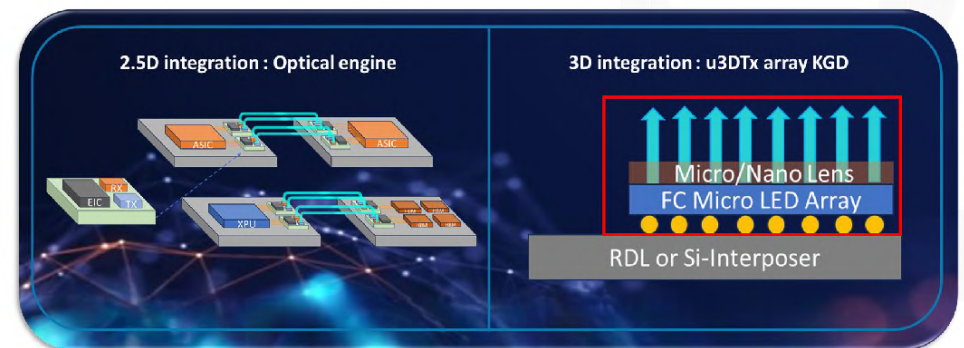
Implementation
High Reflectivity DBR



Implementation
Wafer Level Lens WLO



Implementation
Silicon Interposer



www.best-epitaxy.com
sales@best-epitaxy.com

⇒ MTP / MPO Cable Assembly



MPO/MTP® multi-fiber patch cords can be used in high-density optical interconnection environments for communication, data transmission modules, and cabinets. MPO/MTP® connectors have achieved multi-fiber connections, enabling data center designers to deploy ten to twenty times more fibers in the same space compared to traditional methods. 8/12/16/24/32 fiber MPO/MTP® patch cords, fan-out cables, and fiber assemblies with various cable sheath types, colors, and lengths to meet different system requirements and applications.



⇒ VSFF Cable Assembly



The VSFF (Very Small Form Factor) connector is a high-density optical fiber connector designed to be more compact than traditional connectors, offering superior port density. This miniaturization is ideal for environments that require efficient space utilization and high bandwidth capacity, such as data centers, enterprise networks, and high-performance computing systems.



With the first iteration of **800 Gig** parallel fiber optic applications (and future **1.6 Terabit & beyond applications**) set to use 16-fiber MPOs, leading connector manufacturers have introduced very small 16-fiber MPOs that offer nearly three times the density of traditional 16-fiber MPOs. This is critical for

enabling higher switch port and patch panel densities to save space in high-performance computing environments. VSFF 16-fiber MPO connectors include the SN-MT from Senko and the MMC-16 from US Conec. **To put the size difference into context, 216 SN-MT or MMC-16 connectors fit in the same space as 80 traditional 16-fiber MPO connectors.**

New VSFF 16-fiber MPO connectors are nearly one-third the size of traditional 16-fiber MPO connectors. They offer improved density in high-performance computing MPO connector structures.

⇒ Features

- G.657A1, etc. (SMF)
- 12/16/24/32 x Fiber Ferrule MPO connector female or male
- LSZH, OFNP, OFNR cable jacket types selection
- Simplex and Duplex LC tails generic options
- Optimized performance: Low loss Premium MPO, discrete Premium (LC) connectors and fiber assures low insertion losses and power penalties in tight power budget high speed network environments.
- 12/16/24 x Fiber Ferrule SN-MT connector female or male
- 12/16/24 x Fiber Ferrule MMC connector female or male
- With **large-scale manufacturing** capabilities, we deliver high-quality products with consistent and reliable shipment performance.

⇒ FA (Fiber Array) Cable Assembly

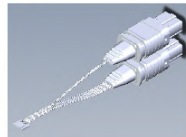


A fiber array (FA) utilizes a V-groove substrate, with a bundle of optical fibers or a fiber ribbon mounted at specified intervals on the substrate. The V-groove spacing, the number of fiber channels, and the polishing angle are all customized to meet specific requirements. The center-to-center accuracy of adjacent grooves is within $\pm 0.5\mu\text{m}$, and the parallelism of adjacent grooves along their lengths is within ± 0.1 degrees. The optical fibers used in FAs are often colored ribbons, offering excellent bend resistance and allowing for easy channel identification.

Fiber arrays are commonly used in planar waveguides, arrayed waveguide gratings (AWGs), active/passive array fiber devices, photonic integrated circuits (PICs), microelectromechanical systems (MEMSs), and multi-channel optical modules. Fiber arrays are a key component of planar waveguide splitters (PLC splitters), significantly reducing losses in optical waveguide devices and optical coupling alignment.

⇒ Features

- **High precision:** The typical pitch tolerance is $\pm 0.7\mu\text{m}$.
- **High density:** product configurations range from 1 to 128 channels.
- **Low insertion loss:** signal loss, typically below 0.05 dB
- **Customization:** Can be configured with various fiber types, including polarization-maintaining fiber, and customized for specific spacing, channel counts, and array geometries (1D or 2D).
- **Design flexibility:** Can integrate with other components like lenses and can be fan-out to standard connectors like MPO/MT.
- **Integrated photonics packaging/testing services:** With strong expertise in **PIC-to-Fiber** packaging and testing, we offer flexible, on-demand characterization services to meet customer needs.



1 1.6T / 3.2T DR-8 Silicon Photonics Tx PIC

- ◆ Ultra-Compact: Integrated UCMZM + 0° PVGC
- ◆ ~80% Smaller Footprint: vs. conventional 1.6T / 3.2T MZM
- ◆ Low Loss: <1.5 dB MZM IL
- ◆ High Throughput: >200 / >400 Gbps/ch

2 1.6T OCI-8 Silicon Photonics PIC

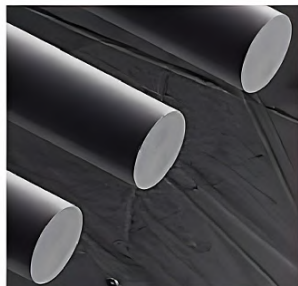
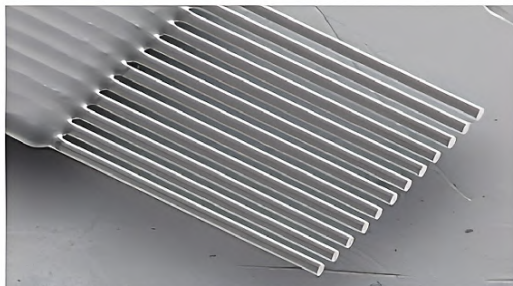
- ◆ High Bandwidth Density: OCI PIC integrating UCMZM, 0° PVGC & DWDM
- ◆ High Rate/Fiber: >50 Gbps/ $\lambda \times 4$ wavelengths (>200 Gbps total)
- ◆ Target Application: AI scale-up interconnects

3 $\geq 1.6\text{T}$ / 3.2T Nex-Gen Array-based Scale-Up Solution

- ◆ 2D direct modulating micron-scale array light source (LED / VCSEL)
- ◆ Up to 800 chs parallel interconnect
- ◆ Ultra high sensitivity photo detection (≤ -25 dBm)
- ◆ Power efficiency ≤ 1 pJ/bit
- ◆ Ultra-compact folded optics ≤ 5 mm

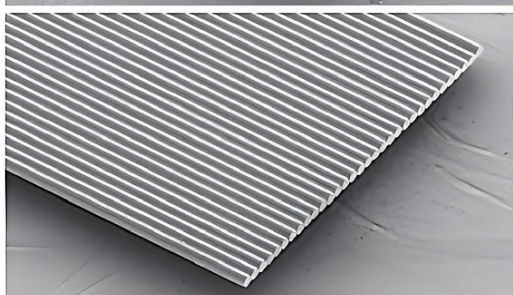
Application:

- Fiber ribbon for V-groove attachment
- Collimator array for detachable connector
- PMF Collimator array with isolator for ELS coupler



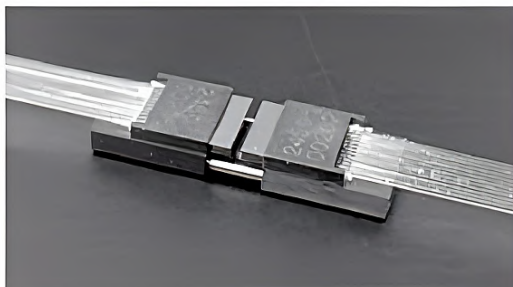
Fiber Ribbon without 250um Coating

- Up to 32 fibers
- Fiber pitch: 127um / 250um
- Fiber protrusion length: min 3mm
- Fiber protrusion consistency: 20um
- Both polish and mechanical cleaving are available
- PMF is available



Detachable Collimator Array

- Up to 12 fibers
- Fiber pitch: 127um / 250um
- Coupling IL: typical 0.5dB



PMF Collimator with Isolator

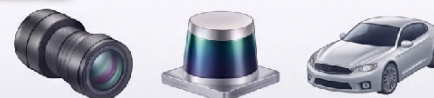
- Up to 16 fibers
- Fiber pitch: 127um / 250um
- Coupling IL from laser: typical 2dB (depends on MFD of laser)



Comprehensive Precision Optical Solutions



Automotive Optics / LiDar



ADAS / LiDar Components



Security / Surveillance



High-Spec Tri-Light Module



Consumer Electronics



Projector Lenses / Digital Cameras / Video Conference Cameras



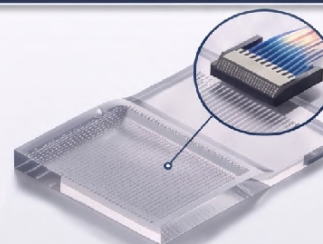
Medical & Industrial



Medical Endoscopes / Industrial FA Lenses / Precision Measurement

Leading Core Components for Optical Communications Emerging CPO Technology for Precision FA Comp Solution

High-Precision Glass Molding V-Groove

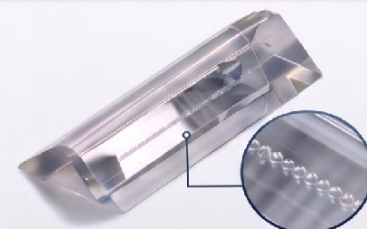


GMO Ultra-Precision Molding Technology

- Ultra-Precision Mold Processing Technology
- High-Density Mini Fiber Alignment
- Precision Control <0.3um
- GMO Precision Molding

GMO Technology Advantages:
Vertical Integration & GMO Mold Molding Technology:
Achieving Self-Protection of Key Components

Prism Micro Lens Array (Collimating/Splitting Prism Assembly)



GMO Mold Molding Technology (Prism & Lens Integration)

- Ultra-Precision Prism Machining
- Low Coupling Loss & High Shaping
- Applicable for High-Density CPO Coupling

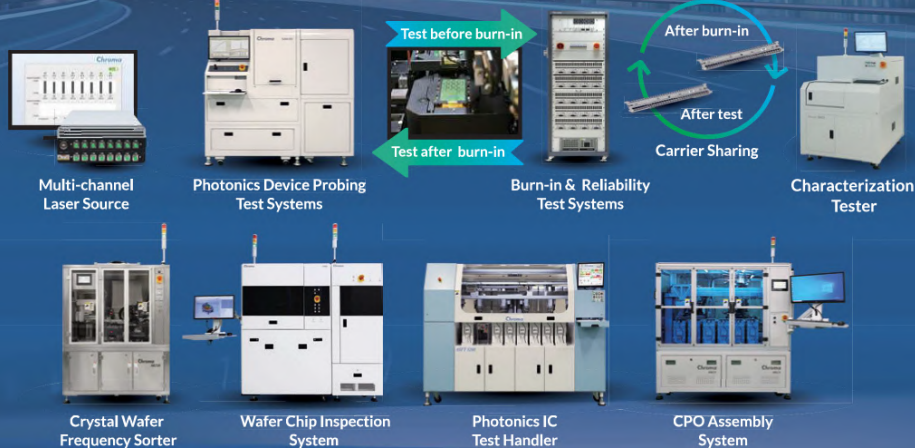
Contact Us



Learn more about Chroma's
Photonics Test Solutions

Meet All Your New Test Challenges

Photonics Test Solutions



Behind Every
PHOTONICS
Breakthrough

Light Source Solutions for Datacom

CW-DFB Laser | High-bandwidth links and CPO External Light Source (ELS)

MicroLED | New choice for scale-in and scale-up interconnects

VCSEL / microVCSEL | Efficient short-to-medium interconnects



We Connect with Light –
powering next-generation, high-speed optical interconnects for the AI era.

Ennostar leverages over 30 years of III-V compound semiconductor and photonics expertise to serve the AI optical-communication market. We deliver complete light-source solutions for short, medium, and long-reach transmission, helping customers transition to high-speed, low-power, high-density optical interconnects. Flexible offerings include light source solutions and foundry services.

Contact us at Renee.Liao@ennostar.com to learn more about our light-source solutions.



Facebook



LinkedIn



Youtube



Website





矽光子
解決方案

Silicon Photonics



光電半導體
測試解決方案

VCSEL | EEL | PD



雷射微細加工
解決方案

Cutter | Driller | Scriber
Marker | Cleaning



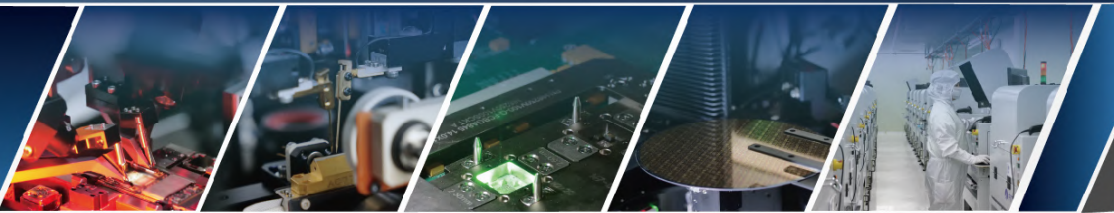
半導體元件
測試解決方案

Diode | Schottky | TVS
MOSFET | IGBT

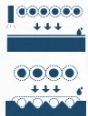


測試及分選
代工服務

DFB | EML



矽光子解決方案 Silicon Photonics Solution



FAS series
Optical Engine Assembly System

- Supports edge and grating coupling active alignment
- Utilizes in-house developed optical coupling algorithms
- Supports PIC/FAU, PIC/Lens/FAU, PLC/FAU, etc., for NPO/CPO applications
- Supports automated FAU loading and unloading modules
- Supports adhesive dispensing and UV curing
- Supports software customization



FAI series
Beam Profiler System

- Beam waist
- Beam divergence angle
- Rayleigh length
- Bad emitter detection
- M2 Propagation quality



FOT series
Photonic Device Testing System

- Supports Grating & Edge Coupling
- Supports probe card auto alignment
- Supports a 6-axis precision alignment platform
- Supports Dual FAU 6-axis precision alignment platform



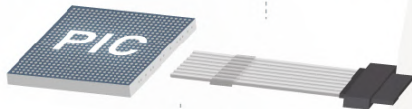
CMV series
PIC AOI System

- Top/Bottom/Facet 3 sides Inspection
- Top/Bottom defect inspection $\geq 3 \mu m$
- Facet defect inspection $\geq 1 \mu m$
- Vision Accuracy : sub-pixel



MFR series

- PIC Rework System**
- Integrated laser and thrust system for removing malfunction FAU from PIC for PIC reassembly
 - Axis precision : $3 \mu m$



矽光子 高精度耦合解決方案

Silicon Photonics High-Precision Coupling Solutions



Tx FAU Bonder



Tx FAU Aligner

重複定位精度
 $\pm 50nm$



Dual LD Lens



Rx FAU Aligner



Fit Your Requirement!

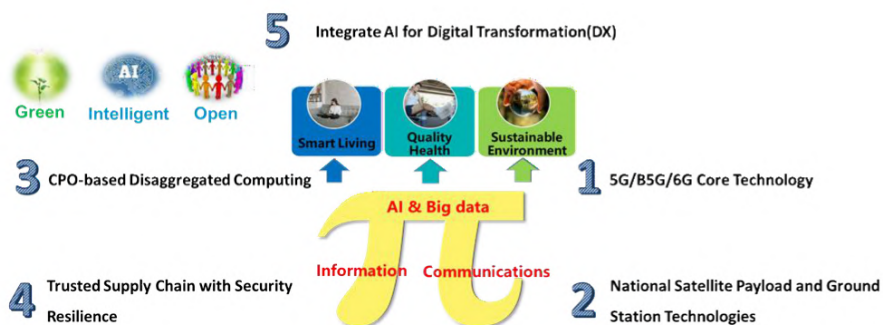


Founded in 1990, the Information and Communications Research Laboratories (ICL) of ITRI focuses on the development of advanced and core technologies for the ICT industrial upgrading and value-added in Taiwan. From personal computers (including laptops) and network communications in the early days, to new smart devices and cloud application services, ICL built the foundation for industrial development by leading technology research and cultivating talents. In line with government policy, ICL also consolidates national industry, government and academic resources to participate in international ICT standard organizations to enhance Taiwan's visibility and influence in the global market.

In response to the cross-domain integration trend in the ICT industry, ICL combines the technical fields of communication, information and data science and focuses on the following priorities, with the vision of developing essential ICT technologies and building Taiwan into a reliable global supply chain partner.

1. Establish Taiwan's Core Technologies for the 5G/B5G/6G Industry
2. Develop National Satellite Payload and Ground Station Technologies
3. Advance Disaggregated Computing with Silicon Photonics CPO
4. Build a trustworthy ICT Cyber-Security System and Supply Chain worldwide
5. Integrate AI and ICT Technologies to Accelerate companies' Digital Optimization and Transformation

To Enable New ICT Development in Taiwan



Looking forward to the future, ICL will accelerate the development of three application fields: smart life, healthy living, and sustainable environment, and by taking digital transformation as the guidance, to provide services on industry essential technology independence, embedded supply chain, and enterprise flexibility and resilience.

Contact:
Robert Hsu
Email: roberthsu@itri.org.tw



LEARN MORE

DEPLOYABLE ALTERNATIVE TO CPO

Near-Packaged Connectivity For AI Infrastructure



Scale-Up NPC connects to AI chips and PCIe interfaces through DAC, AEC, AOC, or ACC.



Scale-Out NPC connects through copper-based DAC, AEC, or ACC, while NPO connects through optical interfaces such as MPO, MTP, and MMC.

COMPREHENSIVE AI SERVER SOLUTIONS



Interconnect Solution

- MCIO
- MXIO
- SlimSAS
- PCIe Riser Cables



Datacom Solution

- DAC, ACC, AEC, AOC
- Transceiver
- On Board Optic
- Patch Cord
- Loopback



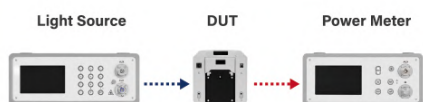
OTH-3000

Multi-Channel Alignment Platform



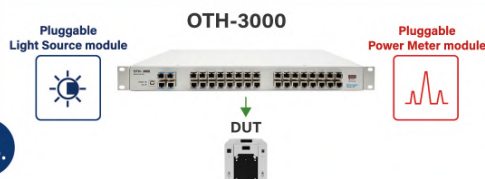
One platform. Flexible Configurations. Faster Alignment.

TRADITIONAL ALIGNMENT SETUP



VS.

OTH-3000 INTEGRATED SOLUTION



- ✗ Two Instruments
- ✗ Separate Software
- ✗ Two Communication Interfaces
- ✗ Higher Setup Time
- ✗ Complex Synchronization
- ✗ Larger Footprint

Higher Cost • More Setup Time • Lower Efficiency

- ✓ One Instrument
- ✓ All-in-one Software
- ✓ One Communication Interface
- ✓ Faster Alignment
- ✓ Simpler Workflow
- ✓ Smaller Footprint

Lower Cost • Less Setup Time • Higher Efficiency

SCALABLE & MODULAR

Start from 36 Channels and Expand as You Grow

36 Channels
(1U)



72 Channels
(2U)



108 Channels
(3U)



Scalable to meet your
requirement (nU)



EASY TO EXPAND

KEY FEATURES



Flexible module configuration

Flexible configuration of Light Source, Power Meter, and **Electrical signal output module** (E-Power meter)



High-Precision Optical Measurement

Real-time optical power monitoring with high accuracy and stability.



Hot-Swappable Module design

Easy replacement, minimizing downtime.



User-Defined algorithms

Provide commands for user-defined alignment algorithms



User Friendly GUI

Intuitive GUI for easy operation, monitoring, and data analysis.

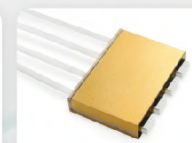
Highly Integrated Optical Engine System

高度集成式光學系統 Integrated Optical System in Package Area

- 高效耦合光透鏡 (Coupling Lens)
- 光隔離器 (Isolator)
- 準直透鏡組 (Collimator lens)
- 高效耦合光纖 (High Efficiency Coupling Fiber)
- 高精度透鏡組裝對位設計 (High-precision lens assembly alignment design)
- 抗噪擋板設計 (Aperture Stop)

集成式電控系統 Integrated Electrical Control System in Package Area

- DFB CW Laser / substrate
- TEC元件 (TEC component)
- 熱敏電阻 (Thermistor)
- 監控PD (Monitor PD)
- MCU
- 驅動IC (雷射 / TEC) (Driver IC: Laser / TEC)
- 高精度COS組裝架構設計 (High-precision COS assembly)



相關技術已申請專利案
Related technologies have been filed as a patent family

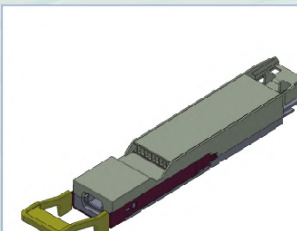
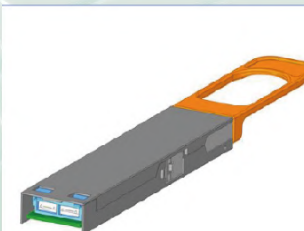
Application

CPO/NPO

- ELSFP

光收發模組 Transceiver

- LPO
- LRO
- FRO



Optical Power Classes	Power/λ/Core (+/- 1.5dB)
Low Power - LP	11 cBm
Medium Power - MP	14 cBm
High Power - HP	17 cBm
Very High Power - VHP	20 cBm
Ultra High Power - UHP	23 cBm
Super High Power - SHP	26 cBm

Laser Module	quantity	Transceiver
Optical Power		
≥ 20 dBm	2	1.6T DR8 / PAM4
	4	3.2T DR8 x 2 / PAM4
≥ 26 dBm	2	3.2T DR8 / PAM4

Precision Process Equipment



PARA light PARA LIGHT
PARA LIGHT ELECTRONICS CO., LTD.



PARA LIGHT Electronics was founded in 1987, and was listed on the Taiwan Stock Exchange in 2008 (TWSE Code: 6226). It is one of the global leaders in LED packaging design and manufacturing.

In 2019, Para Light established an Optical Laboratory Center, dedicated to optical application research to provide customers with integrated solutions encompassing optics, circuitry, structure, and thermal management. Thereby, the company has expanded the sales scope from LED components to LED modules and optical finished products.

Functional Spin Coating System



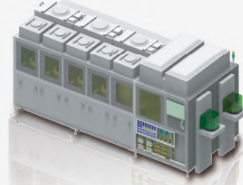
uLED Spin Coater



Auto-Spin Developer

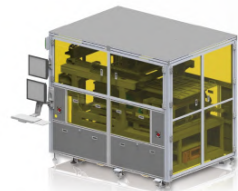


Auto-Spin Cleaner

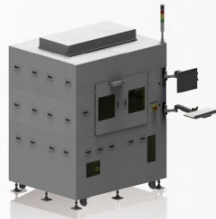


Auto-Spin Track

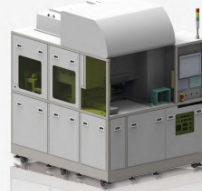
Lamination and Imprinting System



Functional Laminator



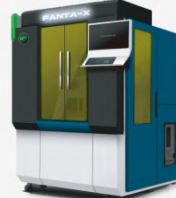
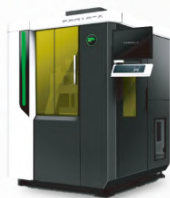
Nano-Imprinter for Wafer



Nano-Imprinter for Panel

Maskless Lithography System

Maskless Exposure System



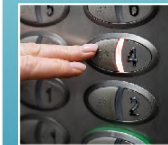
Smarter Light

SIC MOSFET



- Discretes
- Modules

SMD



- Top View
- Side View
- Dome Lens

PLCC



- Top View
- Side View

Display



- 8 Digit
- Bar
- Alpha-Numeric
- SMT
- Dot

Lamp



- 3 / 5 / 8mm
- Square
- Tapping
- Full Color

Holder



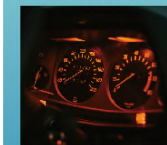
- Single Level
- Dual Level
- Tri Level
- Four Level
- Multiple

Invisible



- Infrared LED and Silicon Detector
- Sensor
- Optical Switch

Automotive



- Headlight
- Interior / External
- Custom Product

Lighting Solution



- Indoor
- Outdoor
- Customized

Lighting Module



- Our Values
- Design Process
- Milestone

Brighter Life



Taipei-Taiwan



China-Lianyungang



China-Nanjing



California-USA



Yangon-Myanmar



New Delhi-India



Website



WeChat



MEC
Marketech International Corp.

Contact | Tommy Chao

✉ tommychao@micb2b.com ☎ 0921-540-533

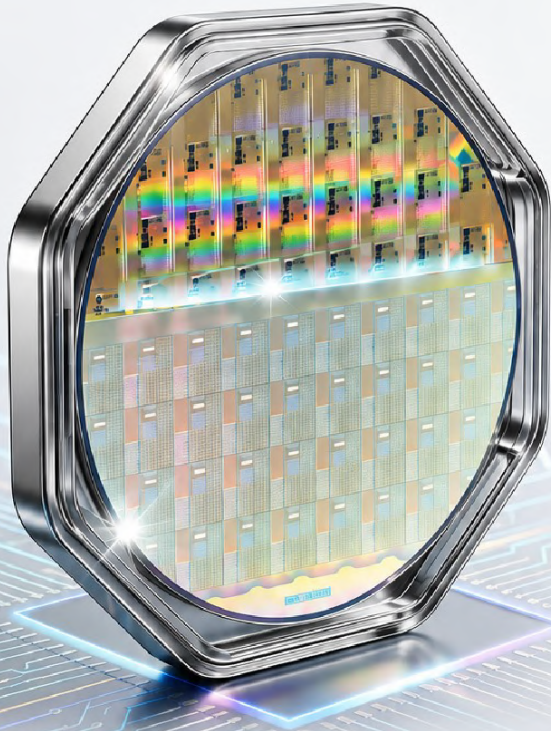
886-2-2225-3733

✉ PARA@PARA.COM.TW

📍 11F, No. 8, Jiankang Rd., Zhonghe Dist. New Taipei City, 23586 Taiwan

400Gb DR4 Silicon Photonics Chip

Low-Power High-Speed Optical Connectivity for AI Data Centers



KEY FEATURES



HIGH SPEED

Supports data transmission rates of up to 400Gbps.



COMPACT DESIGN

CMOS process used and small chip size facilitates integration into various device.



HIGH-DENSITY INTEGRATION

Integrates multiple optical components:

- Edge Coupler (loss<1dB)
- Grating Coupler (loss<1.8dB)



LOW POWER CONSUMPTION

Offers lower power consumption compared to traditional electronic solutions, applied to LPO (Linear-drive Pluggable Optics) packaging.

APPLICATIONS



High-speed Optical Transceiver



Light Engine



AI Data Center



High-Performance Computing



400Gb DR4 Optical Transceiver Module

CONTACT

Addr.: 3A3, No.1, Lixing 1st. Rd.,
Hsinchu Science Park,
Hsinchu City, 30078, Taiwan

TEL: 03-579-8308

Email: it@promos.com.tw

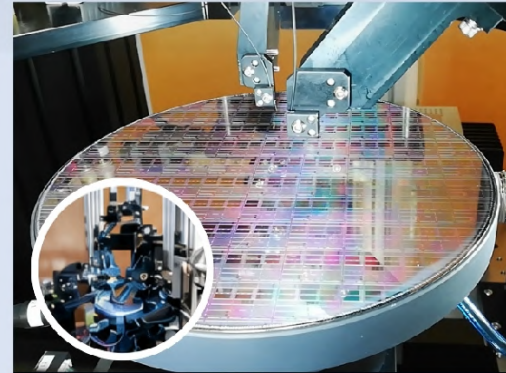
WWW.PROMOS.COM.TW



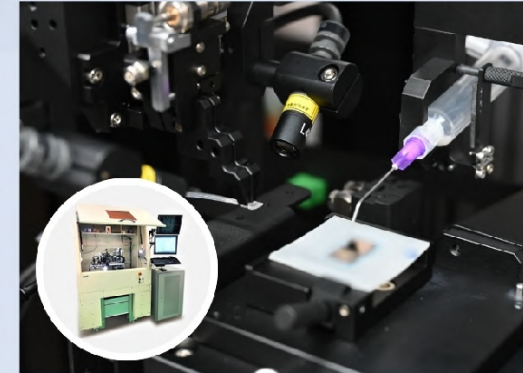
茂德科技
ProMOS
TECHNOLOGIES

Photonics Wafer & PIC Testing, Alignment & Packaging

Testing Solution



Assembly Solution



Application

- AI, HPC, Quantum Computing
- CPO, NPO, LPO, XPO
- Optical Circuit Switch (OCS), Optical Interconnect
- 1.6T/3.2T Pluggable Transceiver



► Alignment System Video

SURUGA SEIKI provides cutting-edge technology on photonics testing and assembly solutions from components, alignment module, to system by high efficiency domestic service.

Key Features

- PIC wafer level and die level coupling are supported at the same platform
- Fast changeover from EC to GC
- From R&D, Engineering to HVM
- Highly efficient alignment algorithms
- 10 nm resolution for ultra-precise positioning

Edge Coupling



Grating Coupling



**SURUGA
SEIKI**

SURUGA SEIKI CO., LTD. TAIWAN BRANCH

✉ ml-twost-maillist@suruga-g.co.jp

✉ alex.wu@suruga-g.co.jp; chris.yu@suruga-g.co.jp



Website

Worldwide standard for optical metrology

We develop and produce the widest range of optical measurement and manufacturing systems.

In this way we support industry leaders in semiconductors, AR/VR/MR, consumer electronics, and automotive optics with high-precision measurement systems and comprehensive local service.

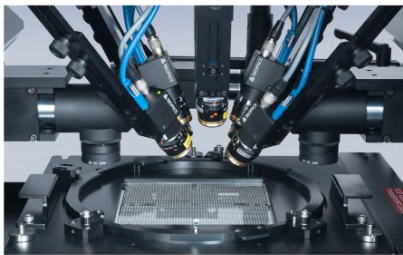


Image quality testing solution for meta lens, micro lens array, and diffractive optics



AR waveguide testing solution for wafer level optics in mass production



Wavefront measurement solution for micro lens array and meta lens



www.trioptics.com.tw
A member of the JENOPTIK Group

Find out more

Discover our solutions

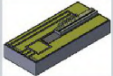
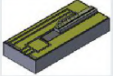
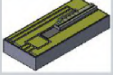
www.wavesplitter.com

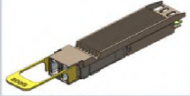
Contact person:

Cliff_wang@wavesplitter.com

TEL: +886 2 2698 7208

FAX: +886 2 2698 7210

LD chip	Application	Status	Layout
70mW CW LD	Pluggable Transceiver	MP	 
100mW CW LD	Pluggable Transceiver	MP	 
200mW CW LD	ELSFP	Pilot	 
400mW CW LD	ELSFP	RD	

Module	Status	Layout
800GBASE OSFP SR8 TRx	Pilot	
800GBASE OSFP SR8 AOC	Pilot	
400GBASE QSFP-DD SR8 TRx	Pilot	
400GBASE QSFP-DD SR8 AOC	Pilot	