MOL Testing Solutions

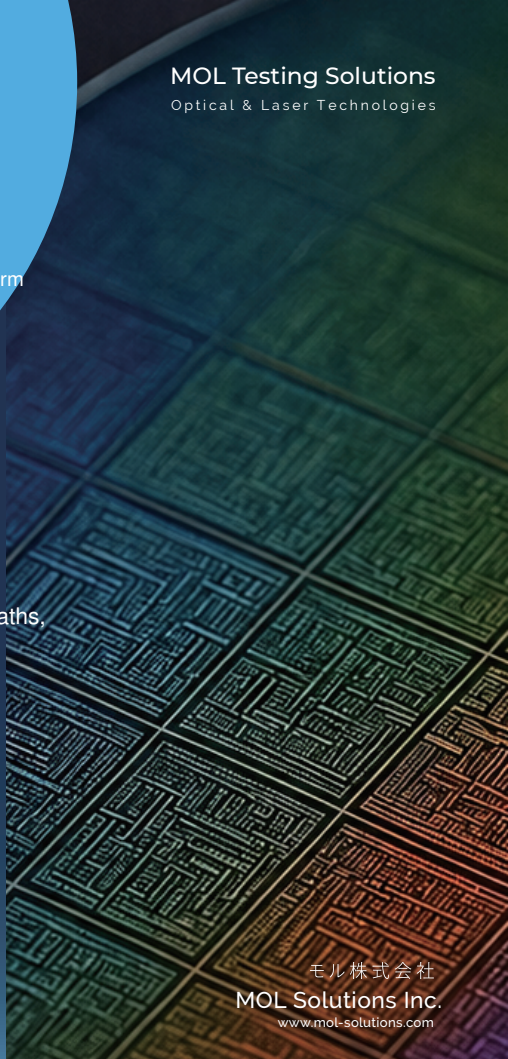
Optical & Laser Technologies

APEIT

Advanced Packaging Electrical Integrity Test Platform

Advanced Packaging Electrical Integrity Tester

Production electrical testing for CPO signal paths,
power delivery and panel-level interconnects



CPO · CoPoS · AI / HPC · FOPLP

モル株式会社
MOL Solutions Inc.
www.mol-solutions.com

Reference-Grade Measurement. Production-Scale Test.

A high-speed electrical test platform for CPO, CoPoS, FOPLP and AI packaging. MOL translates measurement standards established by customer R&D teams into scalable production test capability.

APEIT bridges reference metrology and production electrical testing. Multi-channel TDR, precision high-current testing and high-speed inspection improve throughput and coverage while reducing total test cost.

From signal integrity to power integrity, MOL Testing Solutions supports production testing for CPO, CoPoS, FOPLP, AI chips and heterogeneous integration.

Three Electrical Test Paths

01 Signal

Impedance, opens/shorts, electrical length

02 Power

Impedance, opens/shorts, electrical length

03 Panel

RDL continuity, known-good screening

Measurement Workflow

Measure	Scale	Classify
Reference data	Multi-channel modules	Pass/fail classification

Scale reference-grade measurement rigor into production testing.

MOL Test & Inspection Portfolio

Define the required electrical assessment first, then combine modules when the DUT requires multiple test paths.

01 Multi-Channel TDR 06-07

High-speed signal paths

Impedance, opens/shorts, via chains and electrical length

02 MOL DC-UP500 08-09

Power delivery paths

Parallel precision measurement with a high-current option for power-path and contact screening

03 FOPLP Test System 10-17

Panel-level interconnects

Screen RDL continuity and known-good units before singulation

\+ Platform Extensions

Functional test prototype, planned BERT and a standard 1,024-channel test head

04 NPO (New Package Optics) 18-31

Next-generation optical packaging test platform

Optical, electrical, thermal and power control in one platform for 3.2T/6.4T module R&D, validation and automated production testing

05 ILORA-2000 32-38

High-speed optical metrology

Non-contact, nondestructive wafer, thin-film, advanced packaging and PCB inspection

Advanced Packaging Redefines Production Test

AI accelerators, CPO, silicon photonics, CoPoS, glass cores and FOPLP are increasing packaging density, bandwidth, current demand and panel size.

MORE

Signal channels

FASTER

Interconnect speed

HIGHER

Current demand

LARGER

Substrate and panel size

MORE

Vias, RDL and bumps

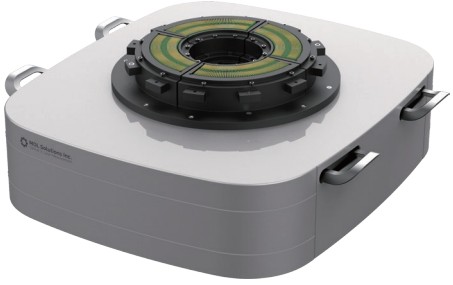
FASTER

Production screening speed

Signal	Power	Panel
More paths and faster edges expose impedance discontinuities, via variation and electrical-length mismatch.	Higher current and lower resistance tighten contact, leakage and power-rail integrity tolerances.	Larger panels and denser I/O increase probing, warpage and test-cost challenges.

A Scalable Platform for Signal, Power & Panel Test

Shared control, reusable I/O and application-specific measurement modules expand test capability without rebuilding the entire test cell.



Standard Test Head

1,024 Channels

01 **Control & Software**
LAN, FPGA and dedicated test bus

02 **Measurement Modules**
TDR, DC-UP500, functional test, BERT

03 **I/O & Test Head**
Standard 1,024-channel or compatible head

04 **Probing, Fixtures & Handling**
Package, module or panel contacts

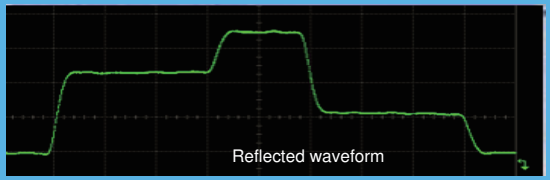
05 **DUT (Device Under Test)**
Signal, power and interconnects

Multi-Channel TDR

Multi-Channel Time-Domain Reflectometry

MOL Multi-Channel TDR is a high-speed parallel electrical inspection platform for AI chips, advanced packaging, glass cores, FOPLP, CPO and high-speed interconnects. It lowers per-channel test cost, rapidly screens manufacturing defects and supports fault localization.





Key Advantages

Parallel Test

Synchronous channels increase throughput

Nondestructive

Assess interconnects without cross-sectioning

High Resolution

Locate impedance anomalies and reflections

Process Monitoring

Inline screening and SPC quality monitoring

High-Speed Analysis

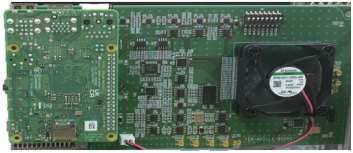
For AI, HBM, CPO and glass-core high-speed packaging

Cost Advantage

Lower cost per channel than high-end single-channel instruments

Failure Analysis

Rapid localization of opens, shorts, voids and microcracks



3.2 Gbps TDR Prototype / Demo Modules

- CPO
- Silicon photonics
- ABF / glass core
- TGV / probe cards

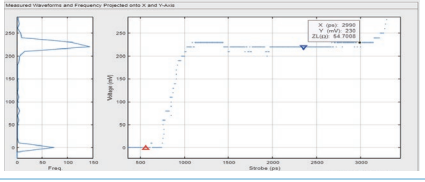
From Waveforms to Defect Classification

Prototype, demonstration and target specifications are listed separately. Analysis progresses from data acquisition to production screening.

MODULE PATH

3.2 Gbps TDR Prototype

3.2 Gbps TDR Demo Module



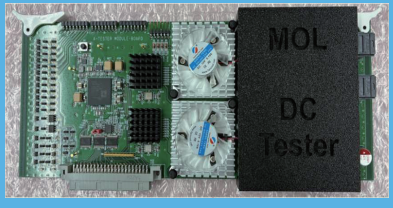
Parameter	Prototype V1	Demo	Target
Line length	Max. 500 mV	Max. 12 in	Max. 12 in
Line impedance	50 Ω	50 Ω	50 Ω
Transition time	180 ps	180 ps	40 ps
Delay resolution	10 ps	10 ps	2 ps
Output voltage	Max. 500 mV	Max. 500 mV	Max. 300 mV
Voltage resolution	Max. 5 mV	Max. 5 mV	Max. 5 mV
Signal type	Single-ended	SE / Differential	SE / Differential
Channels/module	4 channels	4 SE / 2 differential	8 channels

Target Specification **8 channels | 40 ps transition | 2 ps delay resolution**

MOL DC-UP500

Multi-Channel Precision High-Current Test Platform

MOL DC-UP500 is a parallel precision DC test platform for AI chips, power semiconductors, CPO, optical communications and advanced packaging. Synchronous channels, high-current output, precision measurement and high-speed automation increase production throughput and reduce test cost beyond conventional single-channel SMUs and DC testers.



Standard Configuration

16 ch	512 mA / 12 V	2 A / 8 V	< 1 mV
Standard DC module	Standard range	Option in development	Verified result

Key Advantages

Parallel Channels

Test multiple devices simultaneously

Modular Design

Configure channels and measurement specs

Optoelectronic Integration

Combine optical power with L-I-V analysis

High-Current Output

Drive high-power devices; expandable beyond 1 A

Precision Measurement

Measure current, voltage, impedance and I-V characteristics

Automation Integration

Supports probe cards, handlers, MES and production equipment

Ideal Devices

- VCSEL Array
- Silicon Photonics
- Optical Engine
- CPO Module

Test Capabilities

- Multi-channel DC testing
- Precision current source / voltage measurement
- High-current resistance testing
- Power-rail and contact screening

Target Applications

- VCSELs and laser diodes
- CPO / optical engines
- AI package power rails
- Power contacts / microbumps
- High-current interconnects

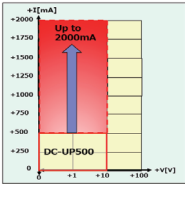
Standard & High-Current Configurations

Measurement modes: IS/VM | VS/IM | VM

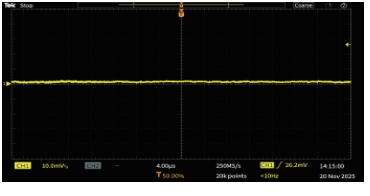
Released specifications and options under development are identified separately.

Parameter	Standard	High-Current Option
Test functions	IS/VM +512 mA / +12 V VS/IM +12 V / +512 mA	IS/VM +2 A / +8 V VS/IM +8 V / +2 A
Channels/module	Up to 16 channels	Up to 16 channels
Module size	W15 × H133 × D256 mm	3U size
Current ranges	512 mA · 25.6 mA · 2.56 mA 256 µA · 25.6 µA · 2.56 µA	2A
Current accuracy	0.10% + 0.05% of Imax	-
Voltage ranges	+12 V / +8 V	+8 V
Voltage accuracy	0.05% + 3 mV	-
CPU interface	LAN	LAN

This table includes modules under development. Output accuracy below 1 mV has been demonstrated; formal accuracy specifications for the high-current option are not yet published.



High-current range

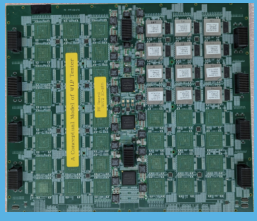


High-current evaluation

FOPLP
High-Speed Electrical Test

Screen electrical integrity before downstream processing adds value and cost.

Scalable panel inspection identifies RDL, continuity and interconnect defects before singulation, assembly and final test add cost.



48-DEVICE ULTIMATE-LSI TEST BOARD

3,072	48	30 MHz
Tester pins in development	Ultimate-LSI devices	Full-spec target

Key Functions

Panel-level electrical inspection
High-speed signal-path screening
RDL and interconnect continuity testing
Known-good area / package screening
Warpage-tolerant probing concept
Multi-site / multi-channel scalability
Prober or custom panel handling integration

In development: 48 Ultimate-LSI devices and 3,072 tester pins
Panel probing and handling integration ongoing | Full-spec target: 30 MHz

Connect Test Resources to the Entire Panel

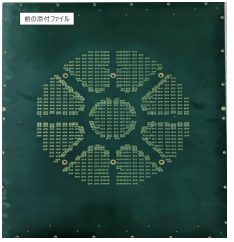
This development architecture integrates tester capacity, signal routing, contact interfaces and panel handling into one inspection flow.

Tester
48 Ultimate-LSI devices | 3,072 pins

Interface Unit
Signal fan-out and mechanical interface

Probe Card
Panel-specific contact architecture

FOPLP Panel
RDL, vias, bumps and interconnects



Architecture Benefits

Early Defect Isolation

Identify electrical defects before singulation and assembly add cost.

Broader Test Coverage

Scale pin count, site count and application-specific contacts.

Flexible Handling

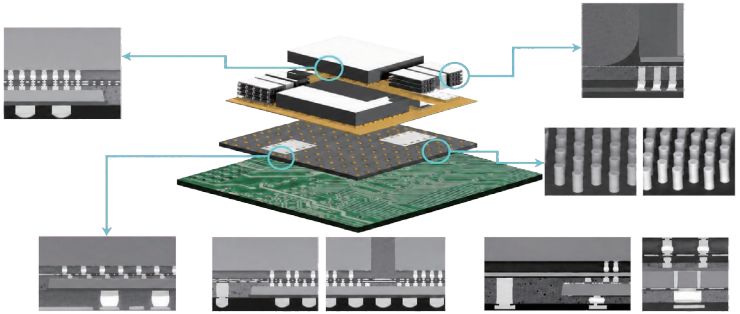
Integrate a prober or custom panel handling solution.

Production Results

Support continuity, comparative analysis and known-good screening.

FOPLP Production Test Capability

Designed for high-pin-count, highly parallel production testing, this packaging test platform increases throughput while reducing test cost.



Highly Parallel Testing

- Up to 384 DUTs in parallel, depending on pin allocation
- High-volume, high-throughput testing
- Shorter test time; higher utilization

Ultra-High Pin Count

- Up to 3,072 I/O
- Supports high-pin-count AI, HPC, chiplet and large SoC devices
- Ready for high-density packaging

Modular Test Architecture

Combine dedicated test boards:

- PE board
- PG board
- DPS board
- DFM board
- Application-specific configuration

Lower customization cost with easier expansion and upgrades.

Interchangeable Probe Interface

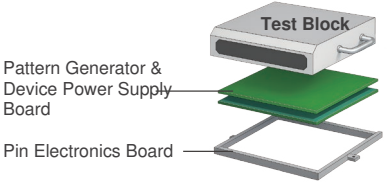
Swap the interface unit to quickly adapt to different probe cards and probing interfaces.

- Supports multiple products
- Supports different package sizes
- Shorter fixture changeover
- Higher equipment utilization

Flexible Configuration

Modular interfaces enable rapid changeover for different test requirements:

- Multiple product lines
- High-mix, low-volume production
- New product introduction (NPI)
- Production changeovers



Key Specifications

Parameter	Specification
Maximum pins	3072pin
Multi-site	Up to 384 sites (min. 16 pins/site)
Test rate	≦30MHz
Pattern memory	≦64MW
Timing generator	80 edges/site; 625 ps steps
Waveform formats	NRZ, RZ, FIX-L/H, EX-OR, etc.
Driver	2 levels / -1 to 7 V / 610 µV steps
Comparator	2 levels / -1 to 7 V / 610 µV steps
Fail memory	256W
DC measurement	1 ch/site (VSIM / ISVM / VM)
Output impedance	50 ohms ±10 ohms (adjustable)
Device power	Up to 8 V, 0.5 A / 2 ch/site
Timing accuracy	±5ns

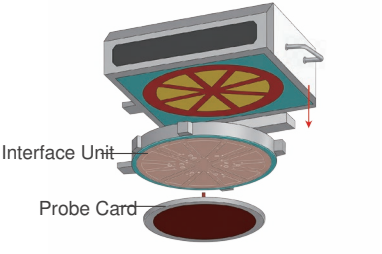
Technical Advantages

Scalable Capacity
Expand test resources for future pin-count and site-count upgrades.

High Throughput
Test 384 DUTs in parallel to increase UPH and reduce unit test cost.

Flexible Interfaces
Quick-change probe cards and interface units support multiple packages and products.

Modular Design
Combine PE, PG, DPS and DFM modules to optimize the test architecture for each IC.



Advanced Packaging Applications

- FOPLP
- FOWLP
- Chiplet
- AI Accelerator
- HPC
- CoWoS
- Panel Level Packaging

Select by Electrical Path & Test Requirement

Use the application matrix for an initial configuration, then select modules for the DUT and required electrical assessment.

Product	Test Focus	Configuration	Status
Multi-Channel TDR	Signal paths, impedance, opens/shorts and electrical length	Demo: 4 SE / 2 differential channels. Target: 8 channels, 40 ps, 2 ps.	Demo + target
MOL DC-UP500	Power paths, precision I-V, resistance, leakage and contacts	Standard: up to 16 ch, 512 mA, 12 V. Option: up to 2 ch, 2 A, 8 V.	Standard + option
FOPLP Tester	Panel interconnects, RDL continuity, known-good screening and probing/handling	In development: 3,072 pins, 48 Ultimate-LSI devices	In development

Combine Test Paths for Multi-Function DUTs

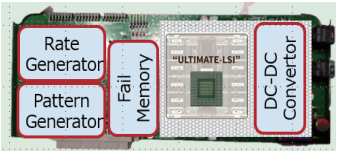
CPO and optical engines often combine TDR signal-path tests with DC-UP500 laser-device, power-rail and contact validation. FOPLP moves continuity and known-good screening upstream.

Select by Electrical Path & Test Requirement

APEIT extends electrical integrity screening to device functionality and link-quality testing on a shared modular platform.

Ultimate-LSI prototype evaluated

64-Pin Functional Test Module



> 64 pins/chip; up to 8 sites; up to 30 MHz test rate

> TG + FMT + PE + PMU + PS + deskew calibration

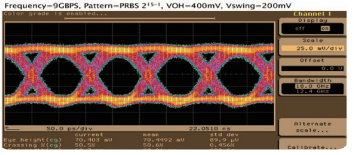
> Up to 64 MWords pattern memory; 625 ps timing steps

> Driver/comparator: -1 to 7 V; 610 µV steps

> ±1 ns timing accuracy; 4-channel DC measurement

Planned development

MOL BERT Module



Evaluation waveform

> PRBS7／PRBS15／PRBS31

> Single-ended / differential I/O

> Output swing up to 500 mV

> Data rate up to 10 Gbps

> Up to 8 channels/module

Configure the Test Cell Around the DUT

Select measurements, define parallelism, configure contacts and integrate the production workflow.

01 **Select Measurements**

Select TDR, DC-UP500, functional test or BERT modules.

02 **Define Parallelism**

Define channels, pins, sites and target throughput.

03 **Configure Contacts**

Select test heads, probe cards, fixtures, cables or panel interfaces.

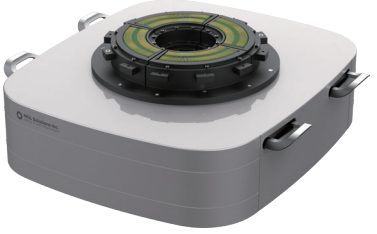
04 **Integrate the Test Flow**

Integrate software, pass/fail rules, data export and automated handling.

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Channel Standard Test Head

Compatible with test heads from other manufacturers, allowing interfaces to fit existing production environments.

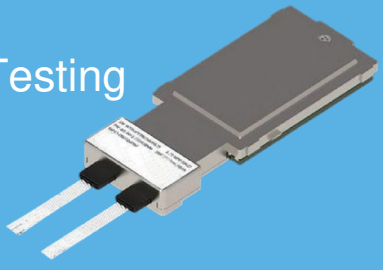


New Package Optics

Next-Generation NPO Testing

3.2T / 6.4T Comprehensive Test System

Up to 6.4T | Dual NPO | RF Cable-Free Architecture



Core Capabilities

End-to-End Testing

Debug, test, validate and analyze 3.2T / 6.4T NPO optical modules.

All-in-One Integration

Integrates light sources, DSPs, optical matrix, VOA, TEC, power control and instruments.

DUT / Golden Comparison

Dual NPO tests the DUT and golden device simultaneously for faster comparison and diagnosis.

Environmental Control

High-current programmable power, optical power control and -10°C to 85°C temperature cycling.

3.2T / 6.4T NPO Integrated Test Platform

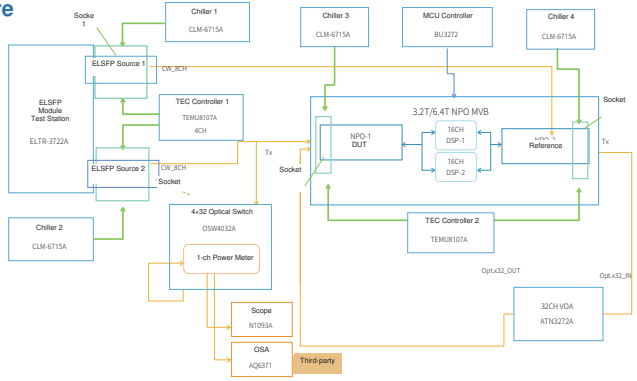
More than BERT: A Platform Beyond Bit Error Rate Testing

An integrated optoelectronic platform for high-speed 3.2T / 6.4T NPO testing.



System Architecture

Overview of the NPO test system and subsystem configuration.



Complete System Diagram

Signal flow through NPO, light source, DSP, VOA, TEC and optical switching.

3.2T / 6.4T NPO Platform Features

Integrated optical, electrical, thermal and automation control, from R&D debug and validation to production test.

6.4 T	DUAL NPO	4×32 + 32CH	-10°C ~ 85°C
Maximum data rate	DUT + GOLDEN	Optical matrix + VOA	TEC thermal cycling

01 **High Integration**
Consolidates instruments into one platform to reduce equipment count and integration cost.

02 **Dual NPO Architecture**
Test the DUT and golden device simultaneously for faster validation.

03 **High-Speed Optical Test**
Up to 6.4T for next-generation AI, data centers and CPO optical modules.

04 **Optical Path Management**
A 4×32 optical matrix and 32-channel VOA automate routing and precise per-channel optical power control.

05 **Precision TEC Control**
Rapid -10°C to 85°C cycling for reliability and lifetime testing.

06 **RF Cable-Free Design**
Reduces RF cable loss, crosstalk and routing complexity for stable testing.

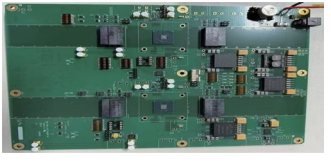
07 **Production-Ready Design**
GUI and control optimized for automated production. MVB architecture delivers efficient, low-cost, easy operation.

Core Modules

Four key modules: ELSFP light source, NPO MVB, TEC control and optical subsystem.



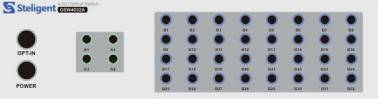
ELSFP Light Source



NPO MVB



TEC Control



Optical Subsystem

MVB Hardware Demonstration

Actual installation of the MVB with NPO modules.

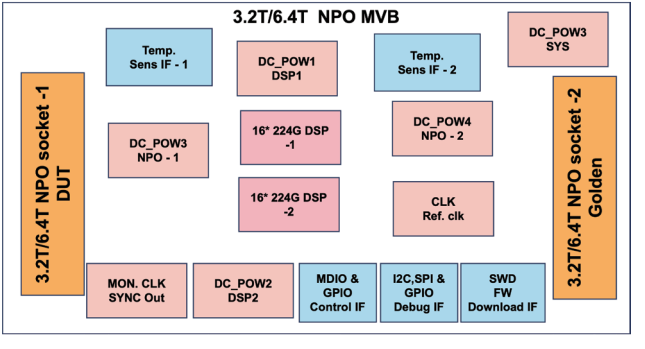




MVB with installed NPO modules

MVB Hardware Architecture

Dual DSPs, dual NPO sockets, control interfaces and power configuration.



- 3.2T NPO Socket: 14144C,Amphenol
- 6.4T NPO Socket: 14144D, Amphenol

MVB Test Capabilities

Supports PRBS, FEC, clock recovery, multiple rates and high-speed BER testing.

01 **Independent Channels**

16 independent channels (16 TX + 16 RX)

02 **Multi-Rate Support**

Supports 6.4T / 3.2T / 1.6T / 800G / 400G testing

03 **High Data Rates**

51.5625 / 53.125 / 106.25 / 212.5 Gbps (PAM4 and NRZ)

04 **Flexible Output Control**

Independent voltage-level adjustment on all 16 output channels

05 **Integrated Clock Recovery**

TX/RX polarity inversion; adjustable amplitude, pre-cursor and post-cursor; up to 7 taps

Advanced Patterns & FEC

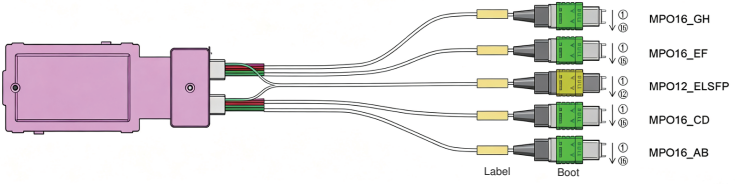
Standard PRBS Patterns

- PRBS7/9/11/13/15/16/23/31/58, inverted patterns and PRBS13Q
- Independent PRBS on 4 MSBs and 4 LSBs
- Two programmable, repeating 64-bit patterns
- Square wave, JP03A/B and TX linearity patterns
- SSPRO support

Comprehensive FEC Analysis

- KP4 TX/RX with FEC margin analysis
- Symbol error rate (SER) measurement
- Post-FEC calculation / Pre-FEC monitoring

3.2T / 6.4T NPO Modules

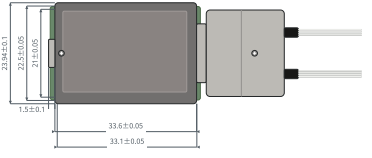


- **Power consumption: approx. 25 W**
- **Data rate: 3.2T / 6.4T**
- **Channels: 32 TX and 32 RX**
- **Center wavelength: 1310 nm**

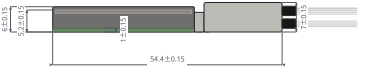
- **Fiber: single-mode fiber (SMF)**
- **Optical interface: MPO-16**
- **Case temperature: 15 to 85°C**

NPO Mechanical Dimensions

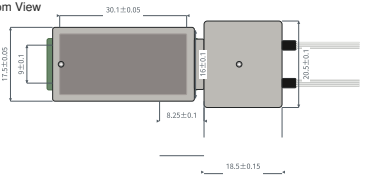
Top View



Side View



Bottom View



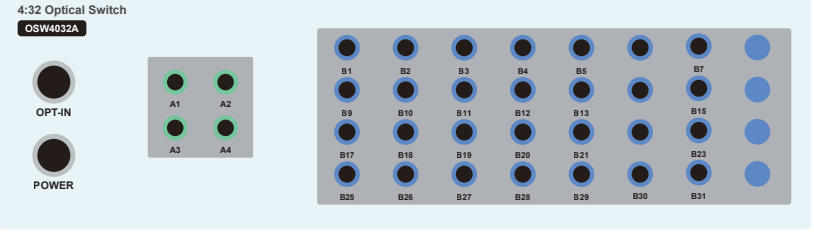
System Components

Model: OSW4032A

4×32 Flexible Optical Matrix Switch

Key Features

- 4×32 flexible optical matrix switch
- Built-in optical power meter (±0.01 dB)
- Low insertion loss (<1.5 dB) and polarization-dependent loss (PDL <0.5 dB)
- Wavelength range: 1270-1650 nm
- Switching time: <= 10 ms
- Repeatability: within ±0.1 dB
- Fiber: single-mode fiber (SMF)
- Optical interface: FC/UPC
- Control interfaces: USB and LAN

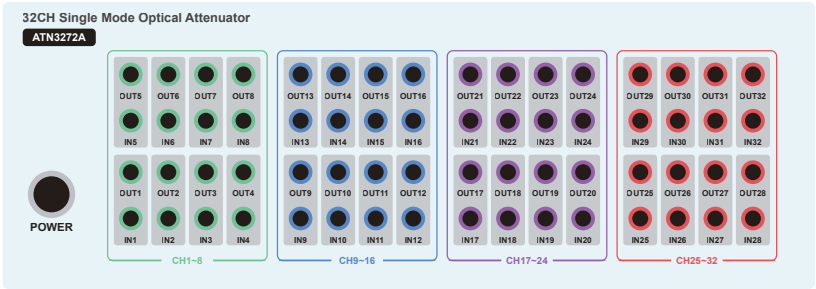


Model: ATN3272A

32-Channel Variable Optical Attenuator (VOA)

Key Features

- Attenuation range: 0-60 dB
- Low polarization mode dispersion (PMD)
- Precision MPD on every channel
- Low insertion loss (<1.5 dB) and polarization-dependent loss (PDL <0.05 dB)
- Wavelength range: 1260-1650 nm
- Setting resolution: 0.01 dB
- Attenuation accuracy: ±0.015 dB
- Fiber: single-mode fiber (SMF)
- Target optical power setting
- FC/UPC interface; fast settling
- Control interfaces: USB and LAN
- Switching time: <= 10 ms
- Repeatability: within ±0.1 dB
- Fiber: single-mode fiber (SMF)
- Optical interface: FC/UPC
- Control interfaces: USB and LAN



Steligent 32-Channel Integrated VOA

Redefining High-Density Optical Attenuation Test

High-Density Integration

Combines multiple 8-channel VOAs in one compact unit to reduce rack space and production-line cabling for a simpler, more efficient test environment.

Performance & Value

Precision and stability comparable to high-end imported instruments, with lower test infrastructure total cost of ownership (TCO).

Expert Local Support

Responsive local specialists provide reliable support, shorter lead times, rapid troubleshooting and system optimization.

A high-density, lightweight solution for 3.2T / 6.4T NPO production testing.

BU3272

Compact High-Performance MCU Controller

High-Performance ARM Core

An integrated high-performance ARM MCU delivers robust processing capability.

High-Speed Gigabit LAN

High-speed Gigabit LAN enables seamless PC communication.

Integrated GUI Platform

A user-friendly graphical interface provides intuitive control of the entire test system.





Extensive I/O Interfaces

MDIO, I²C and GPIO support versatile peripheral control.

DLL Library & Data Transfer

DLL support for I²C, SPI, MDIO, GPIO and UART passthrough simplifies ADC, DAC, DSP and peripheral control for custom development.

HDMI Expansion

An HDMI interface enables flexible control expansion.

Model: TEMU-8107A

Temperature Control Unit

A high-performance thermal management solution for precision TEC control, combining precise regulation and energy efficiency for demanding test environments.

01 Precision PID Control

Advanced PID algorithms deliver ±0.01°C control accuracy for stable temperatures on sensitive devices.

02 High-Current TEC Drive

Adjustable voltage/current outputs drive TEC modules directly for rapid heating and cooling.

03 Energy-Efficient Operation

Uses just 1/20 the energy of conventional thermal forcing systems, reducing operating cost.

04 Patented Interface Design

A dedicated connector combines power and sensing in one low-noise, reliable and secure interface.

05 Flexible 1-8 Channel Expansion

Modular interfaces scale from 1 to 8 channels to accommodate different test requirements.

06 Comprehensive Protection

Overcurrent, overvoltage and overtemperature protection ensure safe, stable operation.



CLM-6015A

Precision Recirculating Chiller

A compact chiller for hot/cold optical module testing, combining efficient cooling and intelligent temperature control for lab validation and production.

01 Rapid Heat Dissipation

Efficient TEC heat removal enables rapid optical module temperature cycling, shorter test cycles and higher throughput.

02 Low-Noise Operation

Optimized airflow and a quiet pump minimize operating noise for precision laboratory testing.

03 Stable Cooling Performance

Microchannel heat exchange and intelligent PID control maintain ±0.1°C water temperature stability for reliable results.

04 Ultra-Compact Design

A compact 345 × 248 × 215 mm enclosure fits on a test bench or in a rack to save space.

05 Wide Range: 2°C to 35°C

One unit covers a broad operating range for diverse test requirements.





Model: ELTR-3722A

ELSFP Light Source Test Platform

Precision testing of ELSFP modules for NPO light-source applications



Two Independent Stations

Two independent test stations with isolated thermal control validate ELSFP modules in parallel, increasing laboratory throughput and efficiency.

Precision TEC Control

Steligent patented TEC technology enables rapid temperature cycling (>15°C/min) and stable setpoints for optical module stress and reliability testing.

Precision High-Current Output

Low-noise, precision current output up to 10 A with 0.1 mA resolution meets demanding NPO light-source power requirements.

Integrated DUT Control

Full I²C/SPI communication and read/write control in a compact rack-mount enclosure for automated test integration.



ILORA-2000
High-Speed Laser Metrology

Nondestructive submicron surface and subsurface measurement

ILORA-2000 combines a nonmechanical high-speed swept laser with sensitive laser interferometry for semiconductor and electronics optical metrology.



> 100 kHz	MHz-Class	2D / 3D / 4D	Nonmechanical
High-speed sweep rate	Maximum imaging rate	High-speed imaging	Swept laser source

Core Performance

Fast, high-resolution imaging over long ranges; motion-artifact resistance and repeated sampling to reduce speckle.

System Support

Fiber-guided probes for diverse applications, with complete hardware, firmware and software support.

Core technology co-developed with the University of Tokyo RCAST Laser Photonic Sensing industry-academia program

See Deeper. Measure Faster.

ILORA-2000 is a non-contact laser reflectometry system combining patented swept-laser technology with high-speed acquisition for high-resolution surface and internal inspection and 3D imaging. Co-developed with the University of Tokyo, it provides high-speed optical sectioning for semiconductors, MEMS, packaging and advanced materials. Dispersion-tuned harmonic mode-locking eliminates mechanical tuning, enabling MHz-class sweep rates, submicron precision and flexible integration.



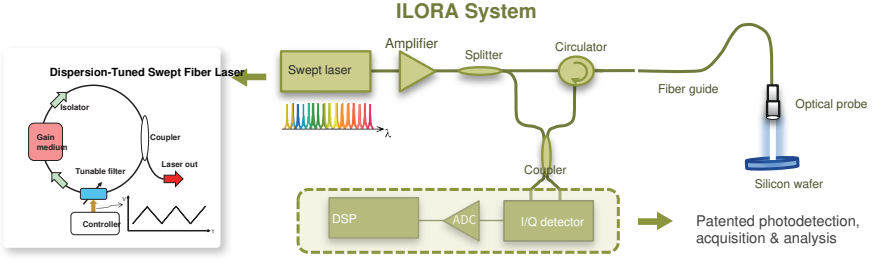
Technical Features

- High-speed swept laser: MHz-class sweep rates with stable mode-locking.
- High-resolution imaging: submicron precision and 2D/3D/4D imaging.
- Depth measurement: silicon, ABF substrates, LCDs, adhesives and multilayer stacks.
- Nonmechanical tuning: no moving parts for high speed and long-term reliability.
- Software compensation: corrects refraction-induced image distortion in real time.
- Integrated fiber-guided optical probe for existing test platforms.

High-Performance Laser Reflectometry

Swept laser, fiber-guided probe and patented photodetection

A complete high-speed, nondestructive measurement chain from light source and probe to detection and signal analysis.



Advanced Laser Source

Nonmechanical high-speed swept laser

Fiber-Guided Probe

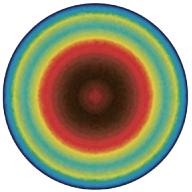
Flexible access to measurement locations

Patented photodetection, acquisition and analysis | I/Q detection | ADC | DSP

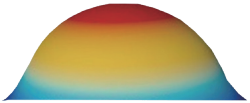
From Wafers & Thin Films to Advanced Packaging

High-speed optical metrology for thickness, defects and process monitoring

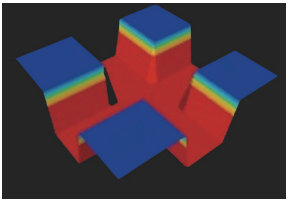
Applications span semiconductor processing, advanced packaging and PCBs, with models selected by measurement speed.



Laser Thickness Measurement



Wafer Warp & Bow Inspection



Laser Dicing Grooves

Wafers & MEMS

Thickness, parallelism, bubbles/cracks and real-time grinding thickness

Thin Films & Processes

Single/multilayer films, refractive index, deposition/etch and CMP endpoints

Advanced Packaging / PCB

Bondline thickness, voids/delamination, flatness and ABF thickness

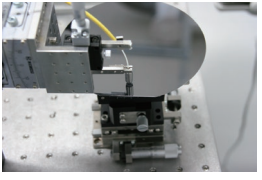
ILORA-2000 SERIES

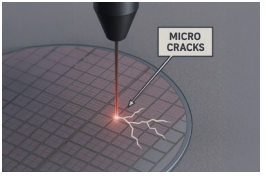
ILORA-2000-B	ILORA-2000-HS	ILORA-2000-UHS	ILORA-2000-EHS
20 - 100 Hz	1,250 - 2,500 Hz	> 200,000 Hz	> 10 MHz
Entry-Level	High-Speed	Advanced	Flagship

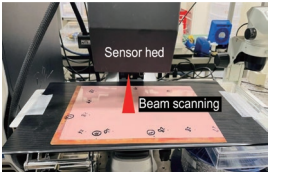
From Measurement Architecture to Real Processes

Wafer, microcrack and PCB ABF measurement examples

ILORA-2000 supports process monitoring, defect inspection and reliability analysis.







Real-Time Silicon Thickness

Real-time silicon etch thickness monitoring for MEMS accelerometers and gyroscopes

Wafer Microcracks

Nondestructive post-dicing microcrack detection and reliability analysis

PCB ABF Thickness

Front/back PCB ABF thickness and interlayer substrate defect inspection

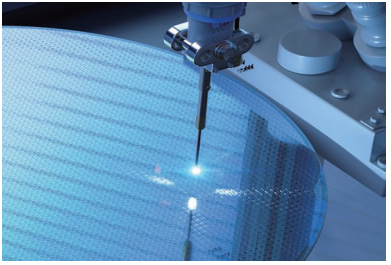
Extended Process Applications

Thin-Film Metrology	Optical Constants	Process Control	Advanced Packaging
Single/multilayer thickness	Determine n and k	Deposition/etch, CMP endpoint	BLT, voids, delamination, flatness

ILORA in Practice

Nondestructive metrology for die thickness, substrate defects and MEMS cavities

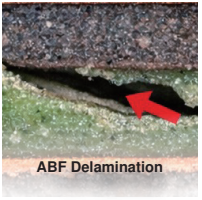
ILORA provides precise, nondestructive optical metrology for semiconductors, advanced packaging, substrates and biomedical applications. Capabilities include die thickness, MEMS cavities, LCD/ABF/PCB multilayers, backside power rails, underfill defects, inline multilayer packaging inspection and OCT imaging. Fast, stable measurements improve defect detection and process monitoring for precision manufacturing.

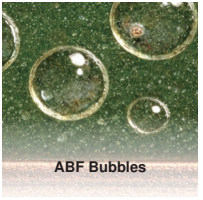


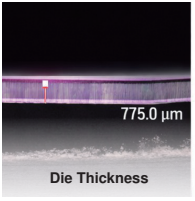
Measurement & Defect Identification

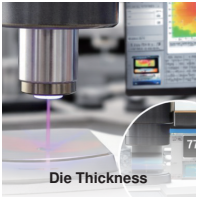


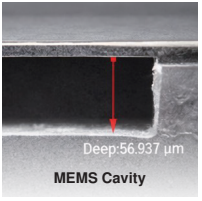


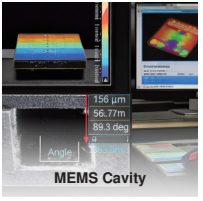








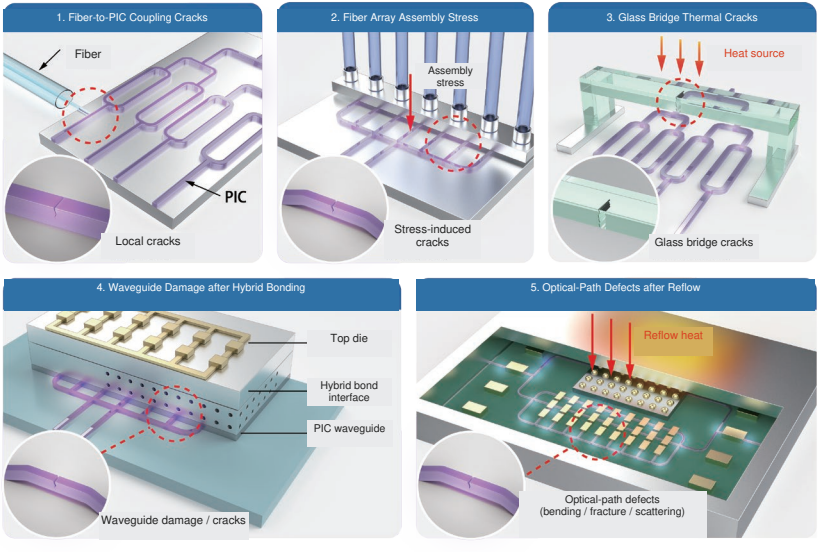




CPO Package Microcrack Detection

Nondestructive optical inspection of coupling and packaging microcracks

ILORA nondestructively detects local microcracks and optical-path defects caused by fiber coupling, component assembly and thermal processing in CPO packages.



Coupling | Assembly stress | Thermal cracks | Hybrid bonding | Reflow optical defects

MOL Solutions Inc
Optical & laser measurement
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Plan Your APEIT Test Solution

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Far East Headquarters

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> Channel or pin count
> Line length and impedance
> Current and voltage ranges
> Probing, fixtures or contact method
> Panel size and warpage
> Throughput and handler interface

APPLICATION COVERAGE

CPO, silicon photonics, AI/HPC packaging, glass cores, TGV, ABF, FOPLP, probe cards, connectors and cables

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APEIT

R&D Defines the Measurement Standard

MOL Delivers Production Electrical Integrity Test

Signal | Power | Device Function | Panel-Level Test

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Advanced Packaging Electrical Integrity Test System

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