

# Core Technology & Equipment Integration Solutions

From PCB & IC Substrates to Panel-Level Advanced Packaging

# Manz Asia — Innovating across domains to unlock new applications.

Delivering scalable innovation from concept to manufacturing excellence, enabling reliable, high-volume manufacturing through engineering expertise.

In markets defined by speed, complexity, and uncompromising quality, staying ahead is essential. Manz Asia continuously advances its technologies to help customers unlock new growth opportunities and bring innovation into production.

Through application-driven engineering and close collaboration, we enable key technologies to achieve industrial breakthroughs and support the realization of next-generation products.

Manz Asia co-develops next-generation production solutions with customers to enable scalable, sustainable manufacturing. With advanced mechatronic integration, optimized equipment design, and a scalable architecture, we support flexible upgrades and rapid capacity expansion for evolving technologies and markets.

## Engineering Excellence for Manufacturing Performance

With 40 years of engineering expertise and proprietary core technologies, Manz Asia helps customers to:

- Improve productivity
- Enhance process quality
- Reduce time-to-market

A strong global presence and close customer collaboration enable organizations to scale with technical and operational confidence.

- Accelerate time-to-market
- Focus on core competencies
- Scale with technical and operational confidence



**Manz Asia**

- Founded in 1986
- Location in Taiwan, China, and India
- Approx. 400 employees (130 engineers) worldwide

**Core technologies**

- Wet Chemistry
- Plating
- Automation
- Digital printing

**Business areas**

- System solutions: Thick PCBs / IC Substrates (organic core & glass core) / Panel-level Packaging (FOPLP)
- Contract manufacturing
- Sales representative

# Accelerating time-to-market. Strengthening your core focus.

Leverage decades of engineering expertise and co-develop innovative solutions—fully supported by advanced manufacturing capabilities.

## From advanced laboratory validation to large-scale production equipment

Backed by strong R&D capabilities, Manz Asia has established dedicated laboratories to bridge innovation and industrialization.

Our lab platforms deliver advanced solutions ranging from process validation to mass production, tailored to evolving market and application requirements.

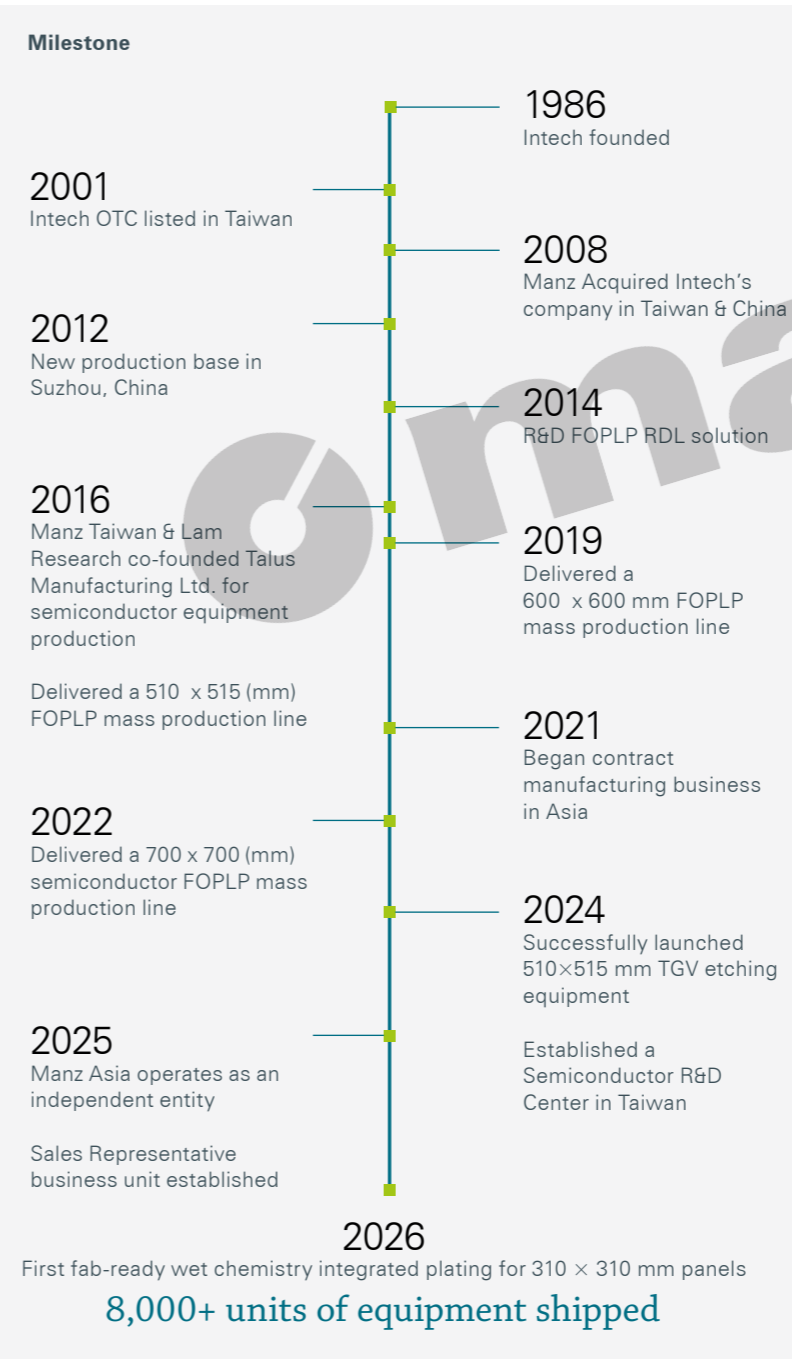
Through customized process validation and sample production services, we accelerate the global adoption of RDL processes and advanced digital printing technologies, shortening development cycles and reducing scale-up risks.

## Speed, agility & competitiveness define success

In today's fast-moving high-tech environment, innovation alone is not enough. Efficient, stable and scalable production determines success.

With decades of industry experience and deep process expertise, Manz Asia transforms advanced concepts into competitive manufacturing solutions.

Built on core strengths in wet chemistry, plating, automation and digital printing, we deliver integrated equipment solutions from PCB and IC substrates to panel-level advanced packaging.



# From core technologies to production-ready solutions

Decades of experience and integrated technologies enabling scalable, high-performance manufacturing solutions across the semiconductor value chain.

Manz Asia combines proprietary technologies, deep process know-how, and intelligent software to deliver modular, scalable equipment platforms that seamlessly bridge laboratory validation and high-volume manufacturing.

Our integrated portfolio enables high-performance, production-ready solutions across the semiconductor value chain, with real-time monitoring, data-driven optimization, and advanced process control—empowering customers to innovate faster and scale with confidence.

## Automation & Handling

High-precision handling and panel-level automation, combined with scalable mechanical design, ensure reliable processing of diverse substrates while maximizing throughput, yield and operational stability.

## Wet chemistry

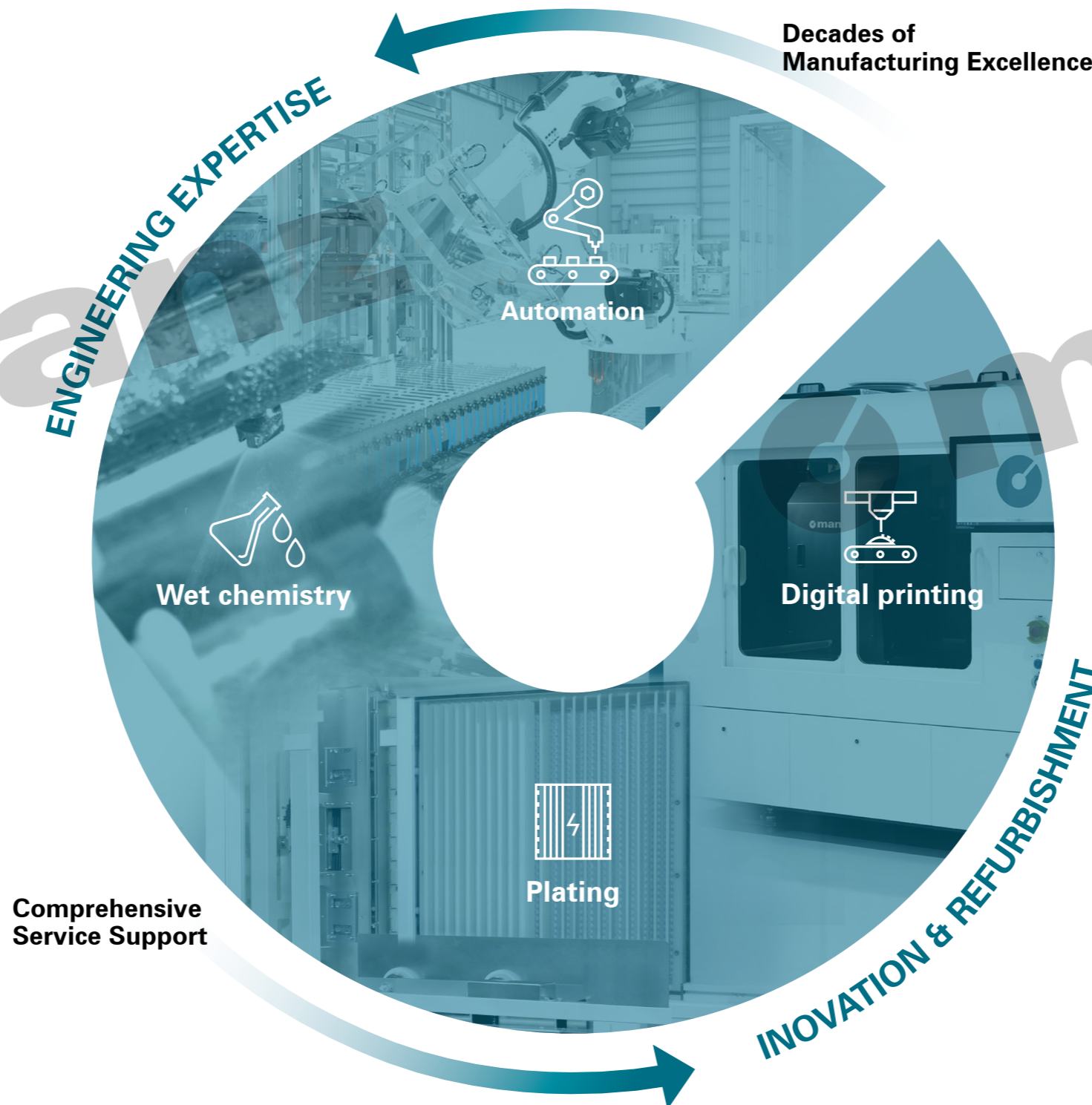
Advanced cleaning, developing, etching, and stripping processes for fine-line, high-density interconnect structures.

## Plating

Electroless and electroplating solutions delivering uniform, high-reliability metallization for advanced packaging and substrate applications.

## Digital Printing

Maskless, additive printing enables precise 2D and 3D deposition of conductive, photoresist, and functional inks across a variety of products, components, and surfaces. Ideal for semiconductor processes such as 2.5D/3D antenna traces, heatsinks, and bonding layers, our flexible, scalable, and cost-effective inkjet systems support advanced packaging and emerging device architectures.



**Decades of Manufacturing Excellence**

From PCB and IC substrates to advanced semiconductor packaging, Manz Asia delivers scalable, production-ready RDL solutions for next-generation manufacturing.

Our validated fine-line and multilayer redistribution technologies enable high-density architectures and customized solutions across diverse applications.

## Panel-Level Packaging

- Scalable RDL manufacturing for large-area panels
- High-throughput, cost-efficient production
- Supports heterogeneous integration and complex chip layouts

## IC Substrate

- High-density interconnects for organic and glass substrates
- High Aspect Ratio features TGV (Through-Glass Via) process
- Advanced RDL solutions for probe card multilayer organic (MLO) applications

## PCB

- High-aspect-ratio (HAR) features for advanced PCB manufacturing
- Thick, multilayer PCBs for load board applications

With decades of integrated production expertise, Manz Asia is a trusted technology and process partner for advanced electronics manufacturing, especially in AI and high-performance computing applications.

**Close collaboration with customers across the product lifecycle, from planning and process integration to development, installation and beyond.**

## Engineered automation for stable, flexible, and reliable production for multiple industries

Proven worldwide with numerous customers, with state-of-the-art technologies for high quality, high throughput, and competitive production.



Our automation solutions combine buffer modules, vision inspection, and MES/CIM connectivity for smooth, traceable, and fully controlled operations. High-precision systems handle materials from fragile glass to silicon wafers, supporting TFT-LCD, OLED, PCB, IC substrates, and panel-level packaging. Scalable and customizable platforms integrate seamlessly into diverse fab workflows for reliable, future-ready production.

### Comprehensive Solutions for Every Need

Expert automation solutions safely handle high-value materials—**from glass and ceramics to FR4, PI, silicon wafers, and molded components**—ensuring precise, consistent, and reliable operations.

As manufacturers move toward Industry 4.0, these systems tackle workforce challenges, maintain consistent quality, and enable rapid adaptation to market demands.

- Ultra-low breakage: < 10 ppm glass breakage with proprietary grippers.
- High throughput performance: < 50 second TACT time for G8.6 panels.
- Clean handling: magnetic transport validated for class 100 cleanroom.
- Flexible & versatile: rotation, lift, flip, and shift functions.
- Scalable & customizable: panel sizes 60 × 125 mm to 3300 × 2250 mm.
- Seamless integration: MES / CIM ready, buffer modules, and intelligent vision systems.

» Engineered Precision Handling for Diverse Materials. Proven Stability You Can Rely On «

## Wet chemistry solutions for configurable applications & superior results

Enable clean, defect-free micro-patterns with advanced wet chemical solutions to deliver uniform, stable yields, and reliable performance.

PCB, IC substrates, and panel-level packaging rely on precise wet processing to enable reliable patterning, effective surface preparation, and contamination control for high yield and performance.

### Combining Stability & Efficiency

Manz Asia delivers comprehensive wet chemistry solutions for pre- and post-singulation processes, combining stable, efficient, and automated operations to ensure consistent, high-quality results while maximizing yield and reliability.

Our equipment portfolio:

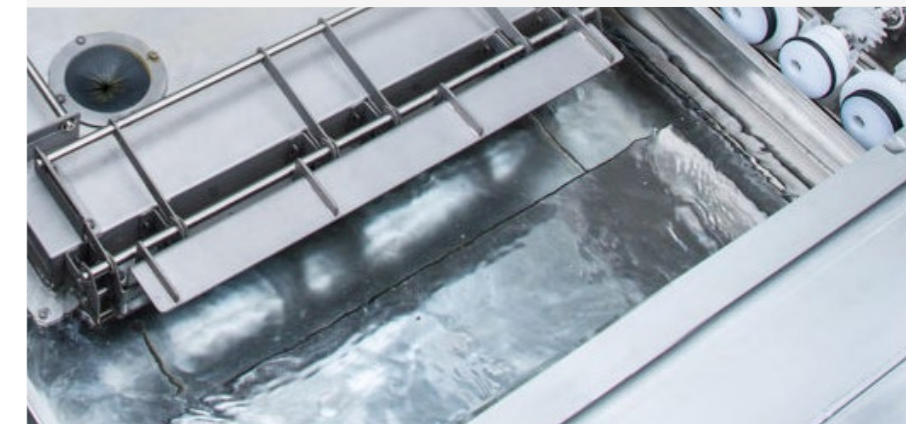
- Cleaning: removes residues, particles, and metal contaminants for optimal surface treatment.
- Developing: dissolves photoresist to form temporary masks with high uniformity and stability.
- Etching: achieves desired patterns with < 10% deviation
- Stripping: ensures clean, residue-free surfaces by removing all remaining photoresist.
- Desmear & PTH: Cleans vias and deposits electroless copper for reliable conductive layers; optimized for HDI, high-aspect-ratio, and server boards.

The fully integrated wet chemistry equipment works with a variety of solutions to ensure optimal surface preparation, precise pattern formation, and reliable conductive layers. Engineered for high uniformity and stability, these systems remove residues, particles, and metals, dissolve photoresist masks, and deposit electroless copper for HDI and high-aspect-ratio processes.

They deliver tight process control, high productivity, sustainable chemical use, and cost-efficient manufacturing for semiconductor panel-level advanced packaging, IC substrates with organic or glass cores, and thick PCB applications.

Advantages of Manz wet chemistry solutions:

- **Proven technology**  
Full wet chemistry solutions supporting semiconductor, IC substrate, and display manufacturing across multiple substrate types.
- **Integrated expertise**  
Design, simulation, construction, process optimization, and service—all from a single source.
- **Fast integration & time-to-market**  
Enables rapid process adoption, shortens development cycles, and accelerates product launch.
- **Reliable & Consistent Performance**  
Ensures stable, high-quality results for maximum yield and process reliability.



## Reliable plating achieving precise and uniform metal deposition

Achieve uniform, high-quality RDL and PCB copper layers with advanced plating equipment, delivering stable yields, high throughput, and reliable process performance.

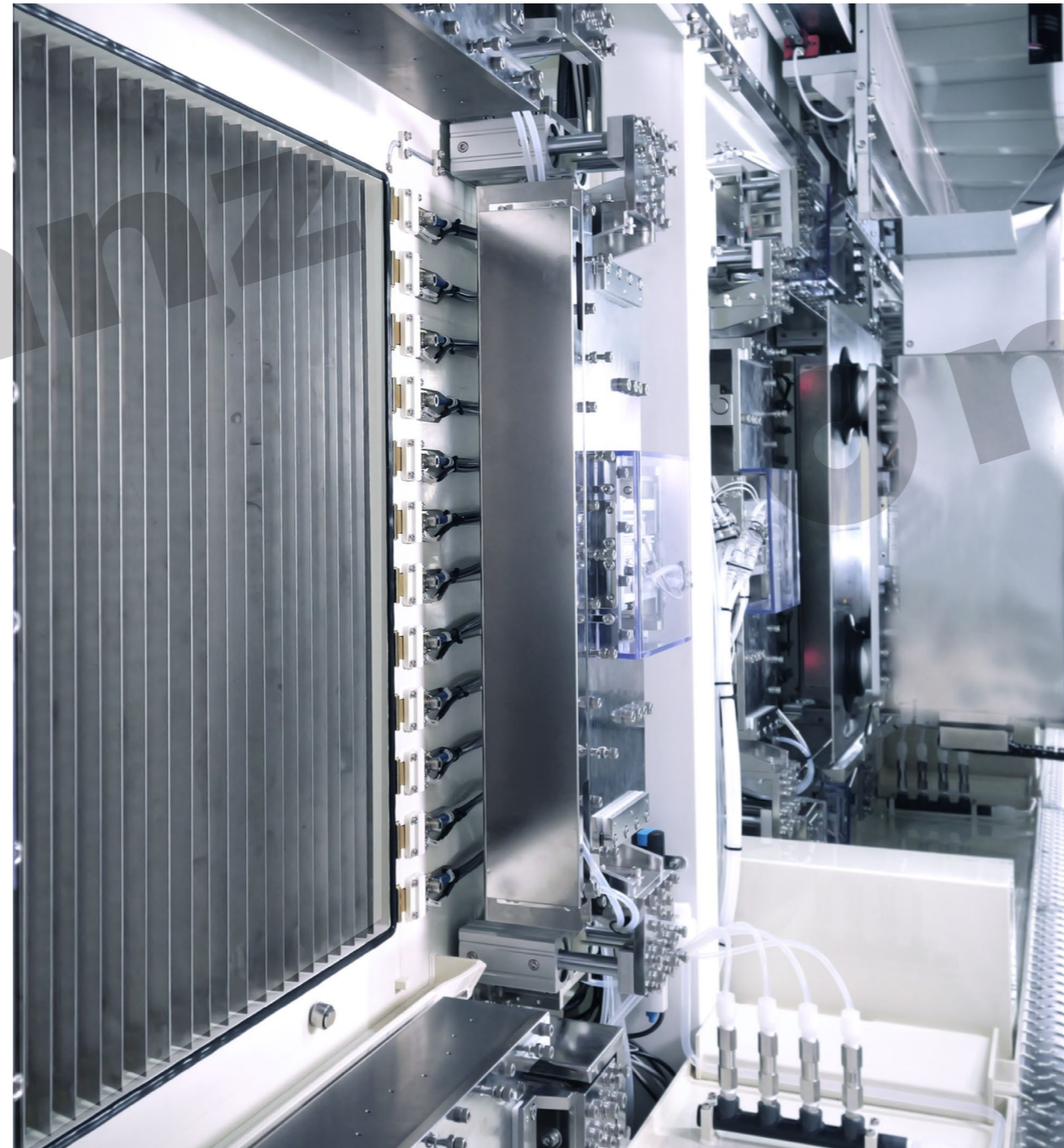
Manz Asia's plating solutions accommodate 300–700 mm substrates with single- or double-sided, horizontal or vertical architectures. This flexible platform delivers uniform performance and reliable uptime, supports high-density interconnects, and ensures high-throughput production across diverse industries.

### Seamless Integration for Mass Production

The plating system integrates advanced automation with robotic and AGV systems to enable fully automated inline manufacturing and smooth process flow. Modular plating platforms are designed to fit diverse fab layouts and production targets, supporting flexible line configuration and phased capacity expansion while maximizing equipment utilization and simplifying maintenance.

#### Key advantage:

- **Uniformity across large panel**  
Consistent deposition across substrates up to 700 mm, maintaining RDL formation even under potential warpage conditions.
- **Advanced process control**  
Vertical continuous plating with precise chemistry management ensures stable deposition and minimizes edge effects for large-area processing.
- **High-resolution performance**  
Supports fine line / space structures with low internal stress and strong mechanical properties for high-density interconnection.



## Your advantages at a glance

Optimized mechanical design, precise current control, and intelligent chemical management deliver reliable plating for high-density semiconductor advanced packaging production.

### Smart, Flexible Features

- Jig-free design: easy operation, reduced maintenance costs.
- Modular architecture: flexible capacity optimization and maintenance.
- Multi-anode system: precise current control to reduce edge effects, ensuring >95 % uniformity.
- Automatic contact assessment: prevents non-contact issues before plating, enhancing reliability.
- High ASD capability: supports >15 ASD for copper thickness > 150  $\mu\text{m}$ , enabling throughput.
- CMS integration: Inline chemical concentration control with auto-dosing, ensuring consistency.
- Advanced agitation systems: paddle or jet flow ensures consistent ion distribution.
- Flexible anode placement: customized for complex geometries.
- Real-time monitoring: tracks current, temperature, and pH for stable, high-yield production.

### Tailored for High-Performance Applications

From early project stages, Manz Asia collaborates closely with customers to develop tailored plating solutions through continuous process discussion and validation. Supports advanced panel-level packaging for high-performance, high-density devices, enabling mass production of PMIC and high-frequency RF applications.

**Trusted high-uniformity plating for panels from 300 mm to 700 mm, proven in mass production by leading manufacturers.**

## New R&D center for digital printing technology – leading semiconductor manufacturing innovation

Building a strong ecosystem for scalable, high-performance digital printing technology — from lab innovation to mass production.

### Launching innovation in semiconductor manufacturing

Digital printing enables maskless deposition of functional materials by converting them into printable inks and directly patterning substrates such as PI, ABF, EMC, silicon wafers, and glass. This approach simplifies circuit formation, improves material utilization, and enhances process flexibility — supporting more sustainable semiconductor manufacturing.

To accelerate technology validation and industrialization for advanced packaging and metallization, Manz Asia has established a semiconductor innovation lab in Taiwan, providing comprehensive process development capabilities to support stable scale-up toward mass production.

### Industrial inkjet printing systems for mass production

The ICJet series integrates inline measurement & process control for high-volume manufacturing, offering high compatibility for 2D and 2.5D functional patterning with conductive, photoresist, and specialty inks.

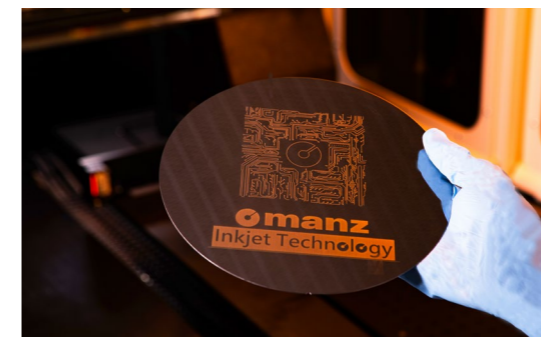
The systems support key applications such as antenna traces, heatsink structures, and bonding layers for RFIC, PMIC, and CPO devices, ensuring enhanced efficiency, yield, and production competitiveness.

- Tailored for diverse semiconductor manufacturing.
- Exceptional X/Y drop accuracy for precise dot/space definition.
- Supports \*.TIFF and DXF formats at 5400 dpi with intuitive GUI
- Automatic nozzle calibration ensures consistent precision.
- HEPA assembly meets class 100–1000 standards for semiconductor use.

» From Lab Validation to Large-Scale Production: Seamless Lab-to-Fab Equipment & Process Integration «

## Functional inkjet printing system – enabling efficient and sustainable manufacturing

Inkjet printing lowers process costs and environmental impact, offering a sustainable and high-performance solution for semiconductor packaging.



From the project's initial stages, we collaborate closely with customers to design tailored solutions through continuous process discussions.

### R&D inkjet printing solutions equipment for laboratory

Specially designed for advanced semiconductor packaging processes, this equipment is supported by a skilled R&D team and strong supply chain partners. We focus on validating new functional inks and various substrates, providing comprehensive laboratory solutions and technical support to help customers achieve precise and efficient process development. Features of RDjet:

- Quick Installation: Engineered with a single home plug for hassle-free setup and minimal installation time.
- Compact & Space-Saving Design: Optimized for efficient use of space.
- Open Architecture: Designed for maximum flexibility, seamlessly integrating with various components and workflows.
- Versatile: Highly adaptable to different processes and applications, providing solutions for diverse needs.
- Automatic Alignment: Automatically adjusts the table position to ensure optimal alignment and accuracy.

#### Our production portfolio:

- ➔ Compatible with diverse materials
  - PI, ABF, EMC, silicon wafers, and glass.
- ➔ Enhances cost-effectiveness
  - Reduces ink usage and process steps.
- ➔ Boosts production efficiency
  - Completes coating in just 1 to 5 minutes.



# RDL technology driving seamless connectivity in various packaging formations

RDL (Redistribution Layer) technology enhances design flexibility, chip compatibility, and scalable high-throughput manufacturing.

The growing demand for modern electronics is driving homogeneous and heterogeneous integration. RDL (Redistribution Layer) technology enables the latest multi-chip packaging trends to move beyond traditional packaging toward advanced integration, delivering compact, high-performance packages.

## Key advantages of RDL

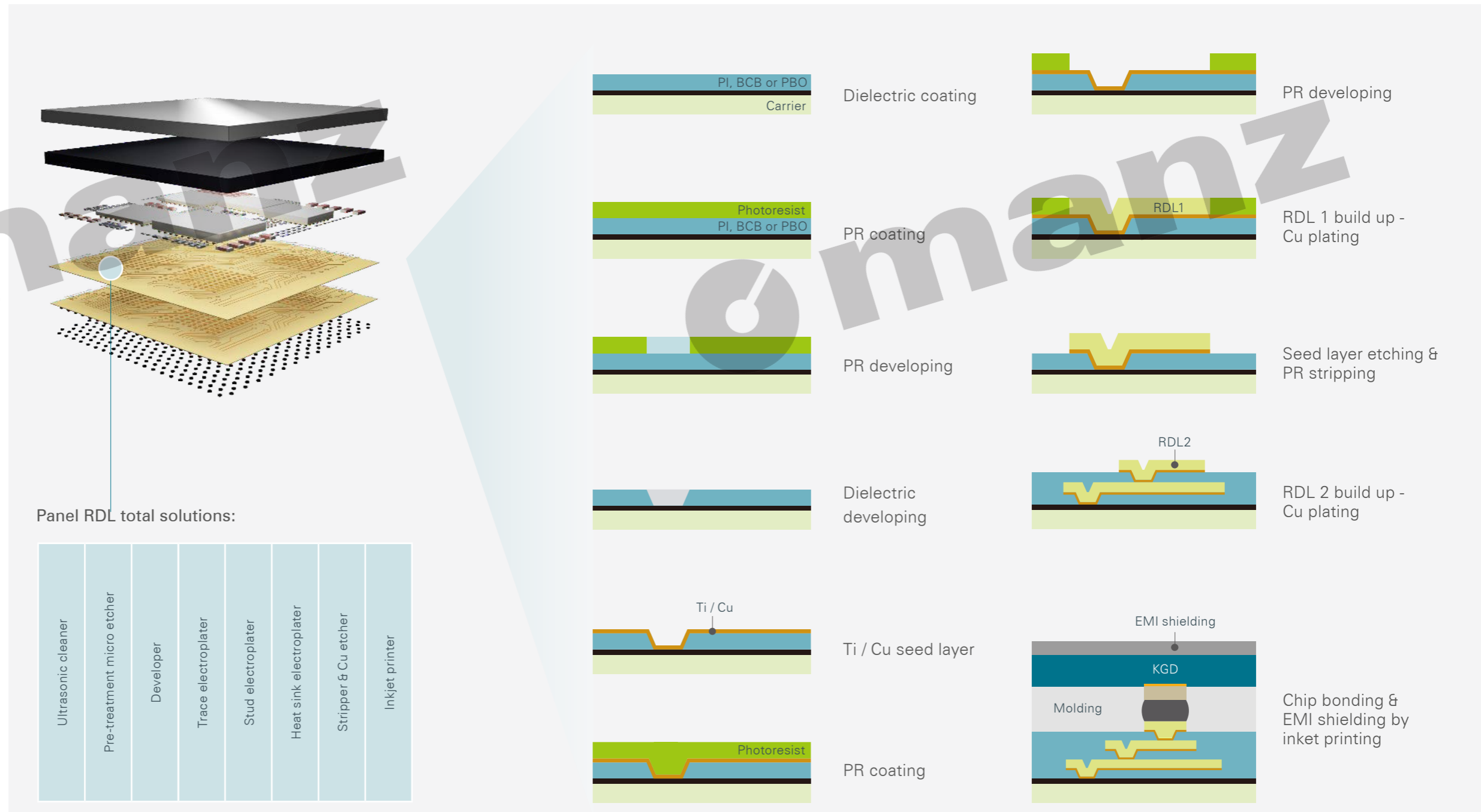
- Simplified process & lower costs: multi-die interconnection via RDL allows simultaneous stacking, boosting performance over tenfold while reducing material use and streamlining production.
- Enabling advanced integration: RDL interconnects same or different ICs onto glass or other substrates, consolidating full system functionality into a single package.

## RDL fabrication is the key to high-performance panel-level packaging

Manz Asia's RDL solutions integrate core technologies with deep process expertise, enabling seamless connectivity across advanced packaging architectures, delivering:

- High-density RDL manufacturing
- Optimized processes for high quality and productivity
- Cost-efficient, customized solutions for FOPLP

Leveraging Manz Asia's integrated expertise, RDL in PLP production delivers high-performance packaging with improved productivity, reliability, and process efficiency.



Manz Asia's RDL solutions deliver high-density interconnection, improving integration efficiency and enabling electrical extension, interconnection, and signal redistribution within the XY plane.

## High-stability solutions for high-density IC substrate interconnects

Optimizing critical processes with integrated equipment and process solutions to enable reliable high-density interconnect manufacturing and mass production.

Manz Asia delivers high-stability and cost-efficient manufacturing solutions designed to maximize production efficiency for high-density IC substrate interconnects.

With extensive experience supporting leading PCB and IC substrate manufacturers, we build reliable, scalable production platforms that meet the evolving demands of modern electronics.

### Reliable high-density interconnects, integrated for high yield

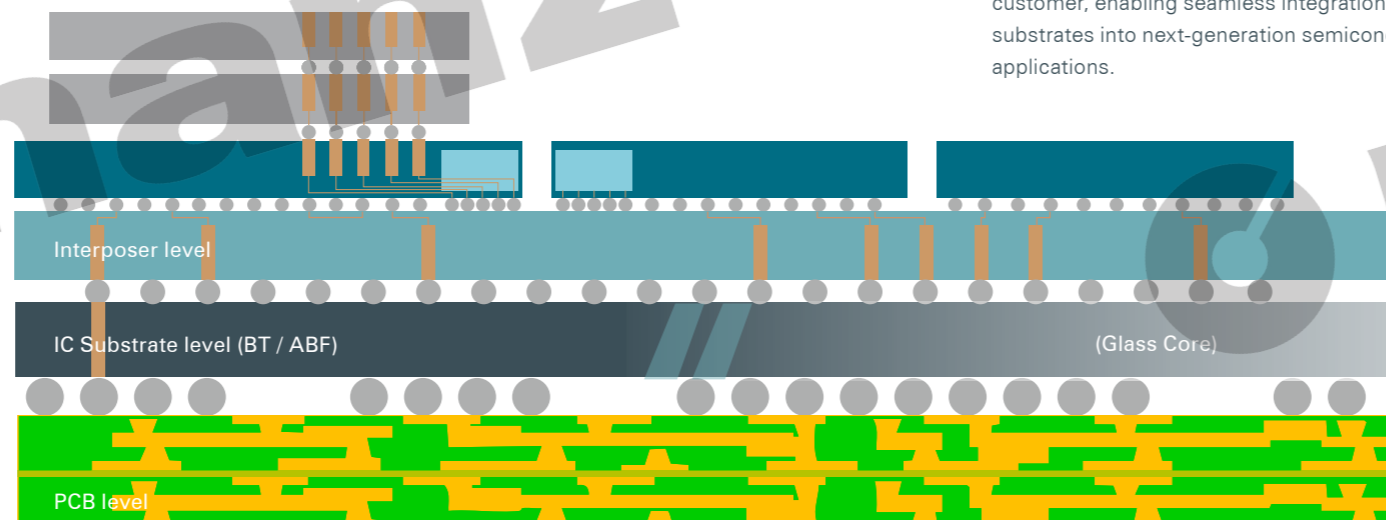
Focused on critical processes, Manz Asia provides integrated equipment solutions covering imaging, surface treatment, metallization, and patterning for both organic and glass substrates.

By combining wet processing, electroplating, and advanced automation, we ensure stable, repeatable, and high-volume manufacturing performance.

Through seamless hardware and software integration, Manz Asia offers a one-stop solution for complete

production line integration, empowering customers to achieve higher yield, tighter control, and smarter manufacturing. The strengths of Manz Asia's one-stop solutions:

- Equipment and software integrated with process automation
- Reliable high-density interconnects, integrated for high yield
- Scalable solutions enabling precise, high-density interconnects
- Precision, scalability, and reliability for high-density interconnects
- High-density interconnects with stable, repeatable processes



Imaging					Surface Treatment				Metallization		Patterning					
Inner / Outer pretreatment	Solder mask pre-process	Solder mask developer	Outer layer developer	Semi - additive developer	Cu roughener	Brown oxide	Finished cleaner	OSP process	Thin, reduced copper	DSM & PTH	Flash, electroplater	Fast etcher	Semi - additive stripper	Inner / Outer layer stripper	DES process	Initial cleaner

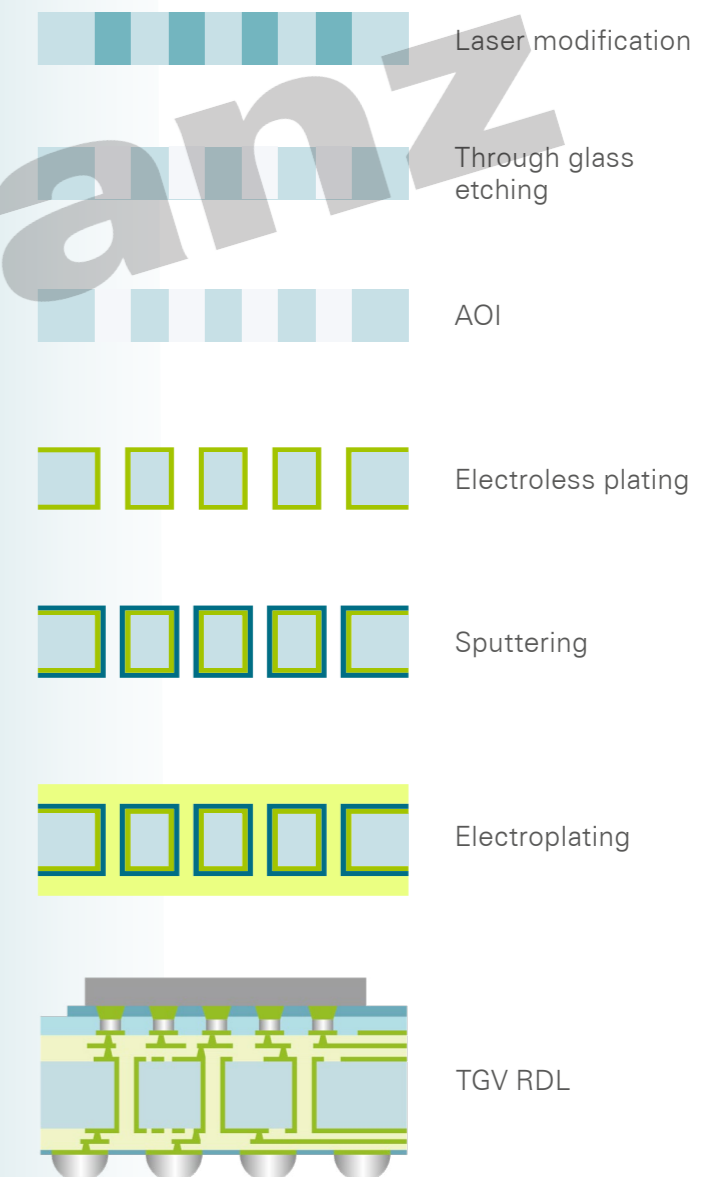
## TGV technology driving high-performance, high-aspect-ratio glass substrate integration

Glass forming processes enable panel-format production across multiple thicknesses, providing low electrical-loss solutions—especially for high-frequency applications.

Manz Asia leverages extensive glass handling and wet chemical expertise to deliver TGV and RDL build-up equipment. Combined with through-hole etching and double-sided electroplating, our solutions ensure uniformity, high aspect ratios, and enhanced electrical and thermal performance.

Flexible and scalable, they are tailored to each customer, enabling seamless integration of glass substrates into next-generation semiconductor applications.

### TGV & TGV RDL Process



TGV		TGV RDL					
Glass etcher	Via filling plater	Dry film developer	Dry film stripper	DSM & PTH	Seed layer etcher	Double-sided blind via copper plater	Double-sided trace copper plater

# Probe card & load board manufacturing solution for accurate and reliable chip testing

The precision and reliability of probe cards and load boards are crucial for semiconductor yield. As the interface between test equipment and wafers, each chip must be accurately screened before packaging to ensure quality, maximize yield, and reduce costs.

As AI and high-performance computing applications accelerate, chip designs continue to evolve toward higher I/O densities, smaller nodes, and more complex packaging size. From probe cards to load boards, stable signal transmission throughout pre- and post-packaging test flows is essential to ensure accurate test results and yield verification.

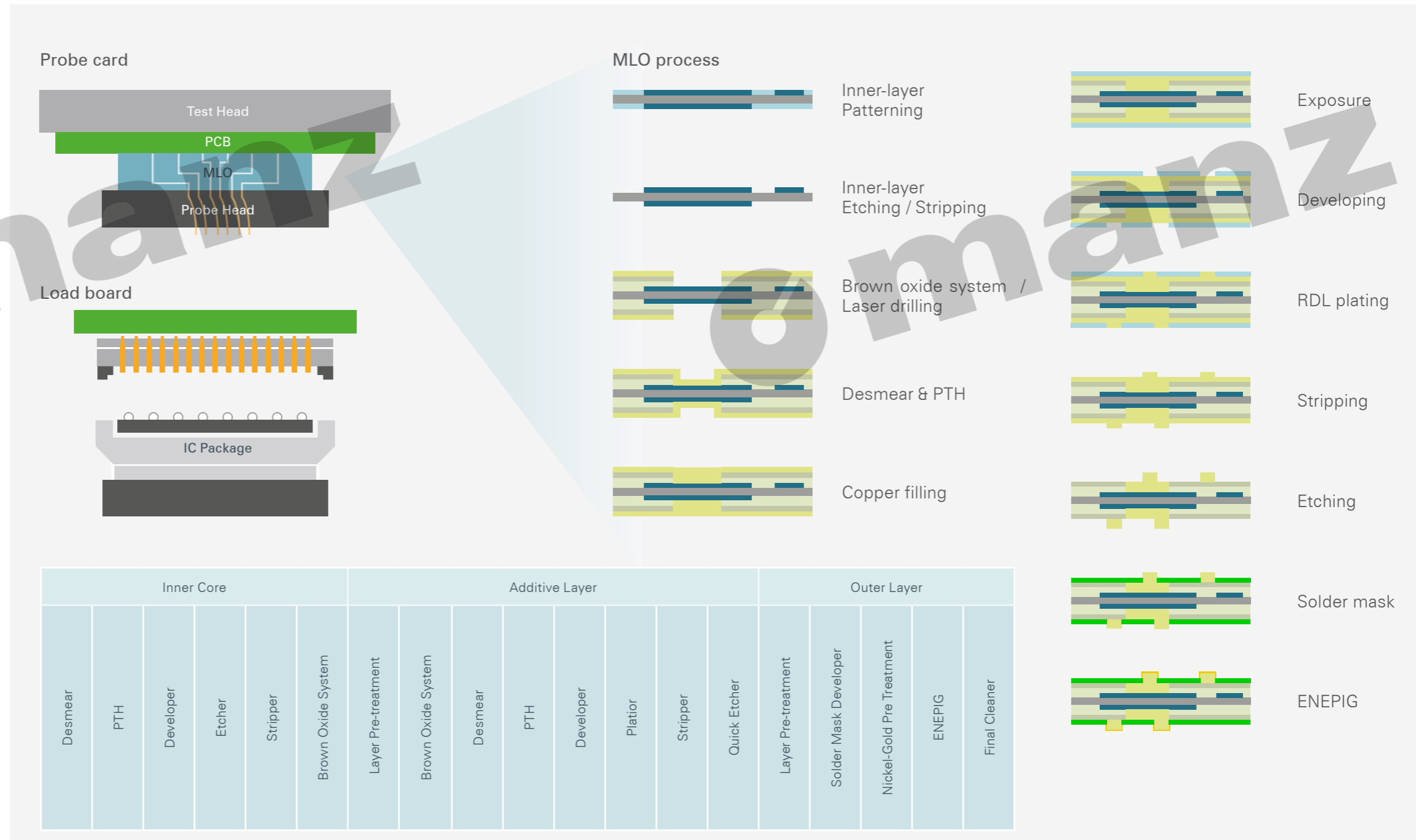
Manz Asia's wet process equipment covers surface treatment, development, etching, stripping, and metal patterning plating, features flexible, tunable parameters and robust monitoring, enabling precise, high-density, high-frequency, and high-current probe card and load board fabrication.

### Key equipment advantages:

- High process flexibility: adjust development and etching parameters for varying line widths/spacing and board thicknesses to achieve precise fine-line patterning.
- Stable operation: corrosion-resistant materials and precise chemical control maintain consistent performance under high-volume production.
- Modular architecture: Scalable architecture supports equipment upgrades and expanded production for future probe cards and load boards generations.

With comprehensive in-house R&D and equipment integration capabilities spanning mechanical design, electronic control, software systems, and modular equipment development, Manz Asia collaborates closely with customer process teams to deliver highly customized solutions that accelerate the development and mass production of next-generation probe cards and load boards.

Manz Asia's wet process solutions precisely control key parameters, enabling stable production of multi-layer, high-aspect-ratio probe cards and load boards of varying thickness, with fine-line accuracy, high-density interconnects, and high-frequency signal performance.

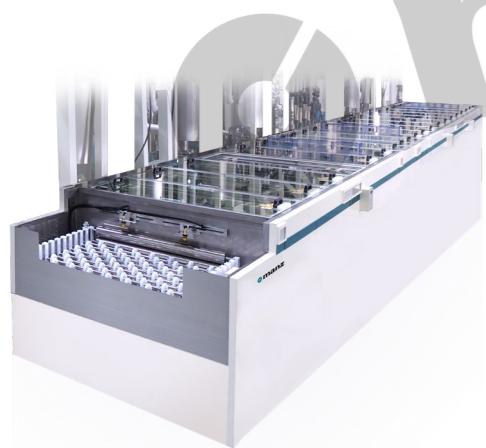


# Thick PCB production solutions for High-Speed & AI Applications

Multi-layer thick PCB designs enable ultra-high-speed transmission, optimized signal integrity, and high interconnection capability to meet the demands for ultra-high-density applications.

As AI server PCBs grow from 12–24 layers to nearly 50, the aspect ratio of through-holes in thick PCBs rises accordingly, placing stringent demands on hole processing and electrical reliability to ensure overall PCB performance. DSM and PTH equipment are essential for consistent through-hole formation and high-quality chemical copper deposition, enabling high transmission capacity, excellent signal integrity, and high interconnection capability.

## DSM & PTH driving thick PCB manufacturing yield



Manz Asia's DSM and PTH equipment are engineered for high aspect-ratio through-holes in thick PCBs. The DSM process ensures uniform hole cleaning and consistent wall roughening through optimized water-jet and chemical flow, combined with precise temperature and concentration control, delivering reliable through-hole formation. PTH plating then creates continuous, dense, and highly adherent chemical copper layers, enhancing through-hole quality and reliability.

The system is designed for high reliability, stable operation, and high-volume production, meeting the demanding standards of high-speed, high-current-density PCB applications.

Mass-production-ready DSM and PTH process solutions ensure reliable filling and interconnection performance in high aspect ratio through-holes.



**Manz Taiwan Ltd.**

4F., No. 168-1,  
Zhongyuan Rd., Zhongli Dist.,  
Taoyuan City 320021, Taiwan  
Phone +886 3452 9811

[www.manz.com.tw](http://www.manz.com.tw)  
[info.tw@manz.com](mailto:info.tw@manz.com)

**Manz China Suzhou Ltd.**

No. 405 Jialingjiang Rd.,  
Suzhou New District,  
Jiangsu Province, 215153, China  
Phone +86 512 6278 2588

[www.manz.com.cn](http://www.manz.com.cn)  
[info.cn@manz.com](mailto:info.cn@manz.com)

**Manz India Pvt. Ltd.**

AKC House, E-27 Ring Road  
Defence Colony  
110024 New Delhi, India  
Phone +91 11 2433 0001

[www.manz.com.tw/en/  
service.in@manz.com](http://www.manz.com.tw/en/service.in@manz.com)