德律科技股份有限公司

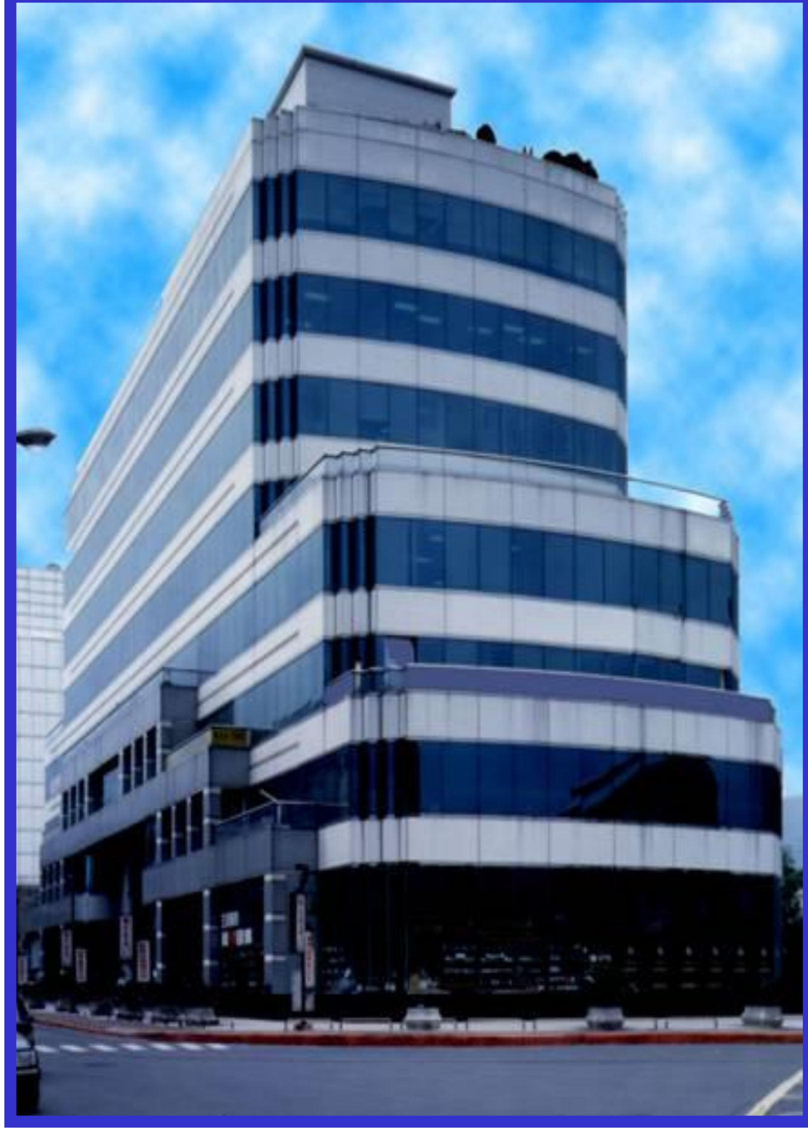
www.tri.com.tw

May 2024

報告人: 陳冠元/財務長兼代理發言人

德律科技股份有限公司

- 成立時間：1989年4月10日
- 創立人：陳玠源董事長
- 資本額：新台幣23.62億



製造廠區擴展

地點: 德律林口二期廠區 (地上10層樓, 地下4層樓)

二期廠區面積: 35,000 平方米 / 10,600 坪

完工啟用日程: 2024 Q1

提升產能及產品開發/驗證使用空間

各產品線及智慧工廠應用展示

研討會/代理商大會舉辦

TÜV NORD TÜV Asia Pacific Ltd. Taiwan Branch ISO 9001 : 2008

CERTIFIED ISO14001

Information Security Management ISO 27001 Certified

HEALTH AND SAFETY ISO 45001 CERTIFIED

CE

RoHS

ESG應用方案進展

發行永續報告書

投資人關係

永續報告書

日期	標題
2023/08/28	2022年永續報告書

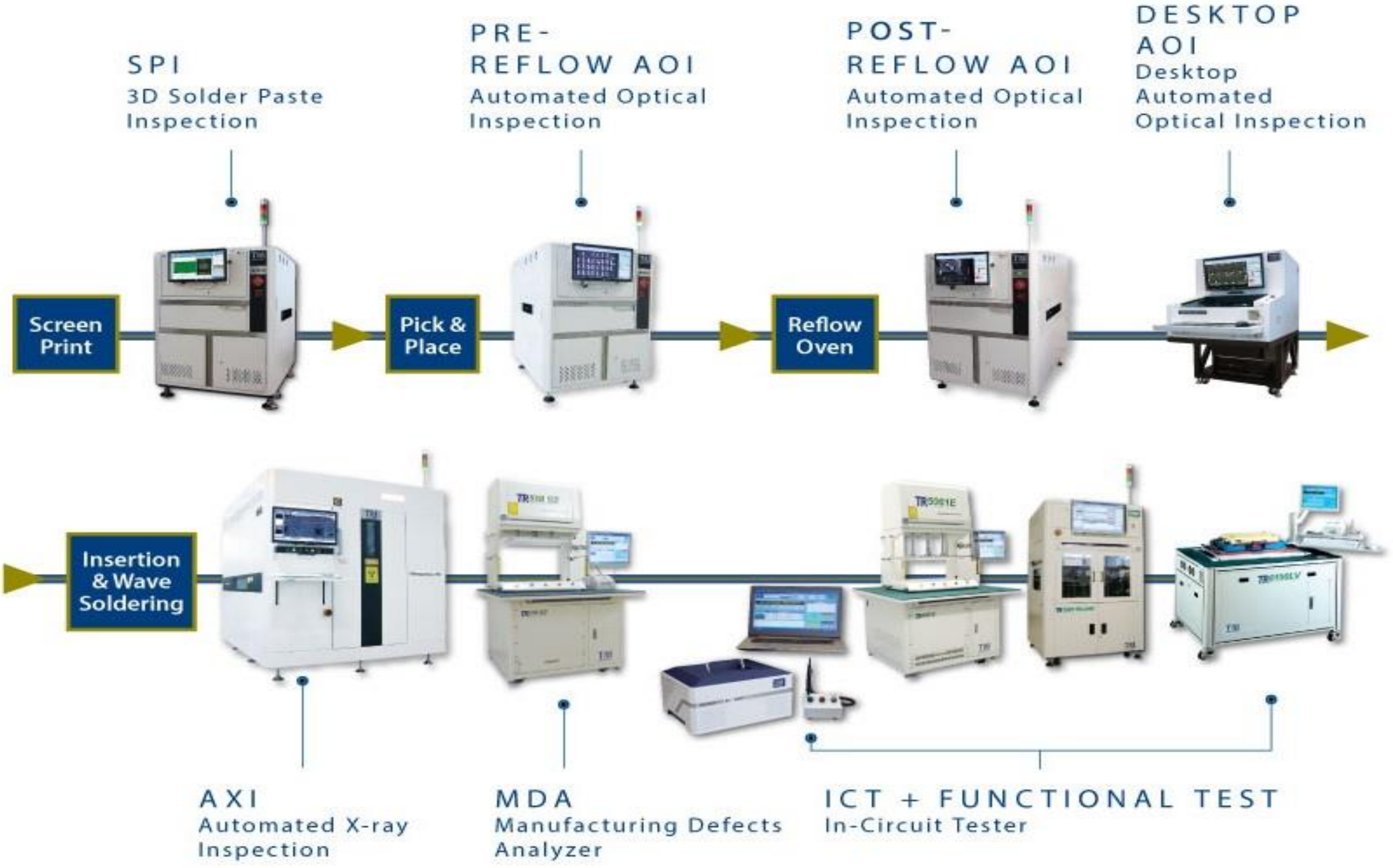
Click to download the ESG Report

主力產品:電路板組裝檢測設備

- ☆ 自動光學檢測設備(IT/Image Tester)
  - ☆ 錫膏自動光學影像檢測機(SPI)
  - ☆ 自動光學影像檢測機(AOI)
  - ☆ X-ray自動檢測機(AXI)
- ☆ 電路板測試機(BT/In-Circuit Board Tester)
  - ☆ 組裝電路板測試機(MDA)
  - ☆ 全功能電路板自動測試機(ICT)

全球唯一“一條龍”電路板組裝檢測設備廠

德律產品在客戶的電路板組裝產線的應用



SPI
3D Solder Paste Inspection

PRE-REFLOW AOI
Automated Optical Inspection

POST-REFLOW AOI
Automated Optical Inspection

DESKTOP AOI
Desktop Automated Optical Inspection

Screen Print

Pick & Place

Reflow Oven

Insertion & Wave Soldering

AXI
Automated X-ray Inspection

MDA
Manufacturing Defects Analyzer

ICT + FUNCTIONAL TEST
In-Circuit Tester

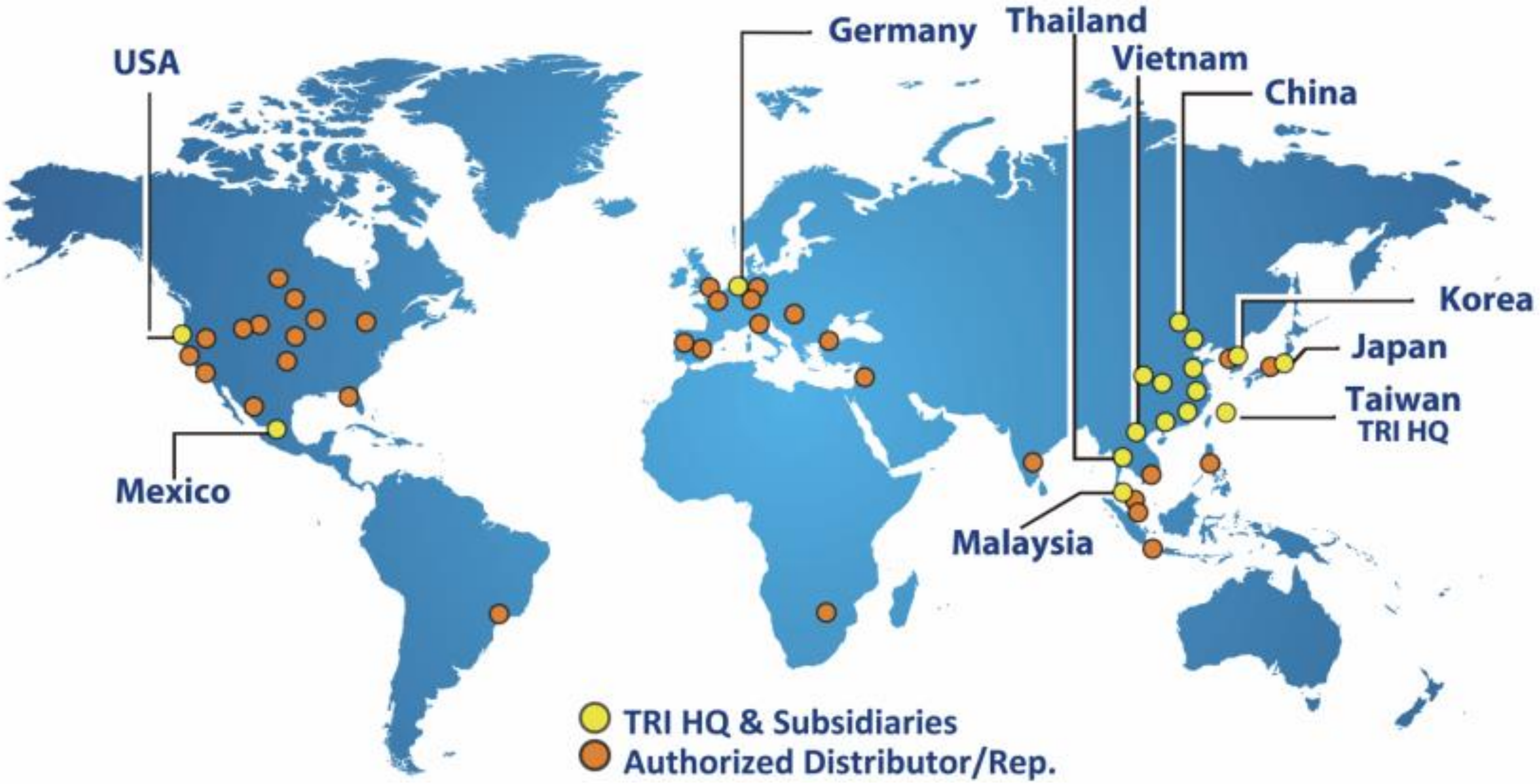
主要競爭對手

- 韓國: Koh Young, Pemtron, Parmi, Mirtec
- 日本: Omron, Saki
- 中國大陸: Jutze/Sinic-Tek/Holly
- 馬來西亞: Vitrox
- 美國: Keysight/Teradyne
- 德國: Viscom/SPEA

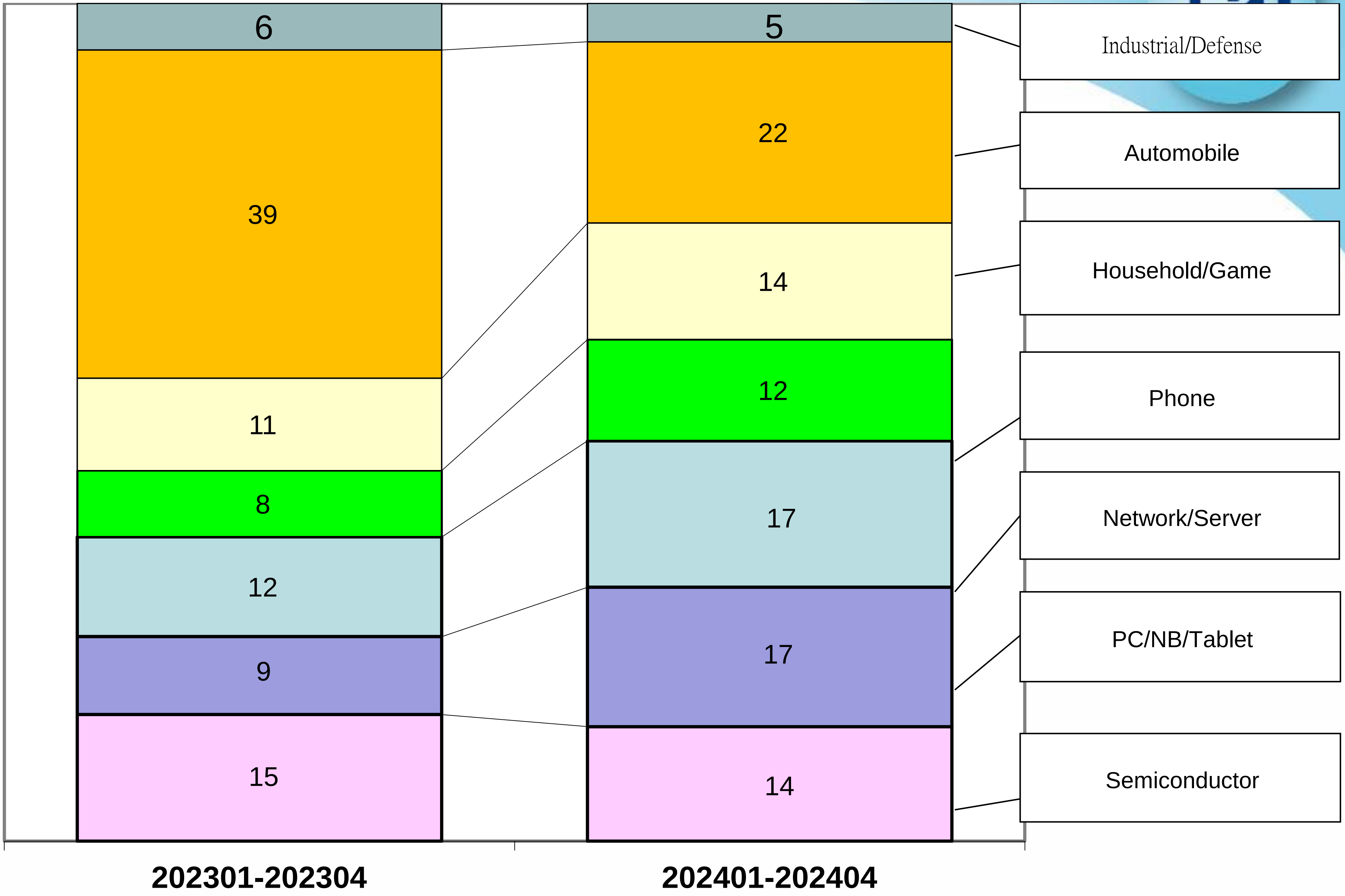
全球銷售服務網

More than 3000 customers have been serviced through worldwide partners.
More than 50 distributors and Rep. worldwide.

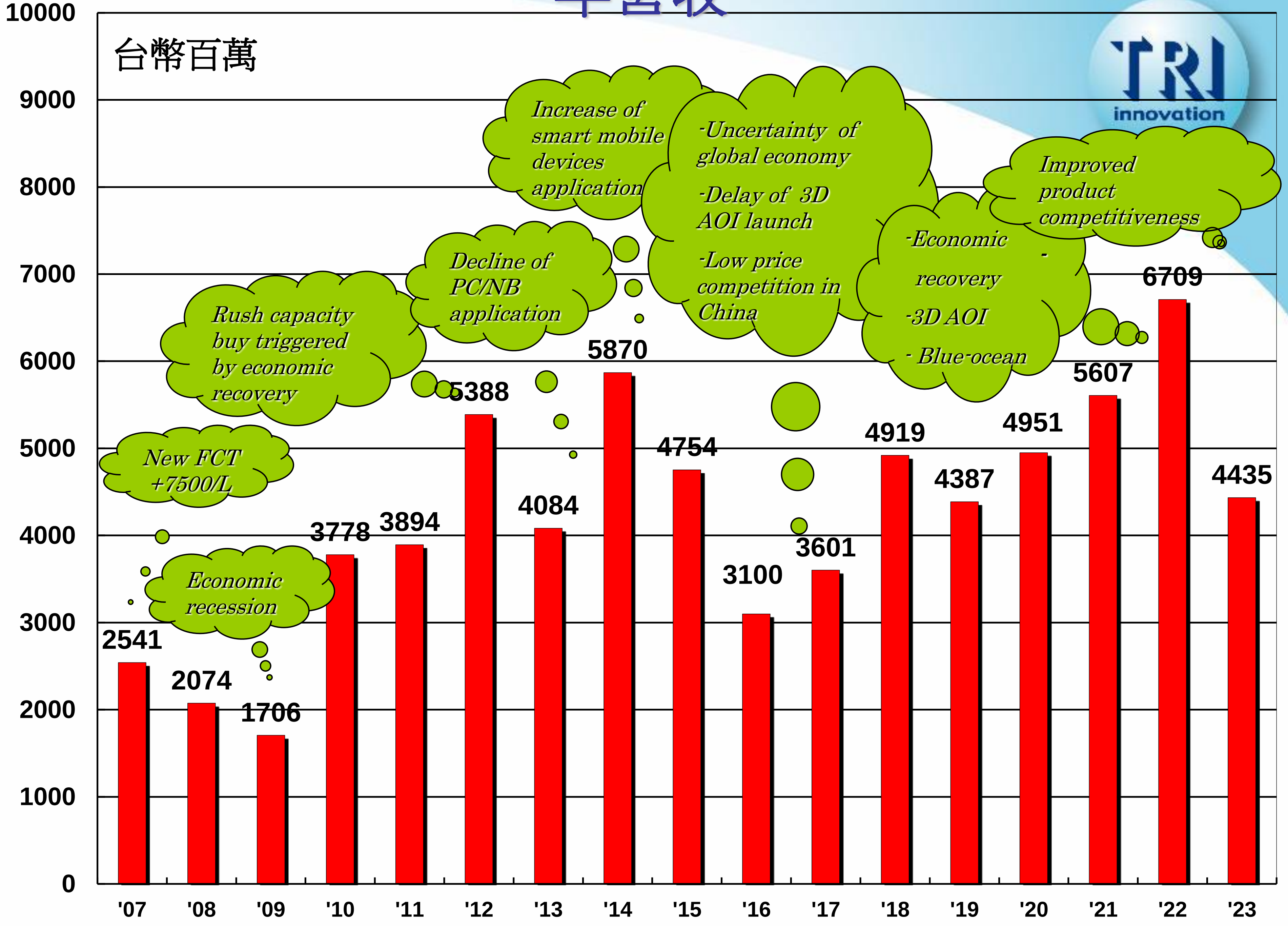
主要客戶為全球電子產品以及半導體大廠



Electronic Industry/Revenue Movement



年營收



New FCT +7500/L

Economic recession

Rush capacity buy triggered by economic recovery

Decline of PC/NB application

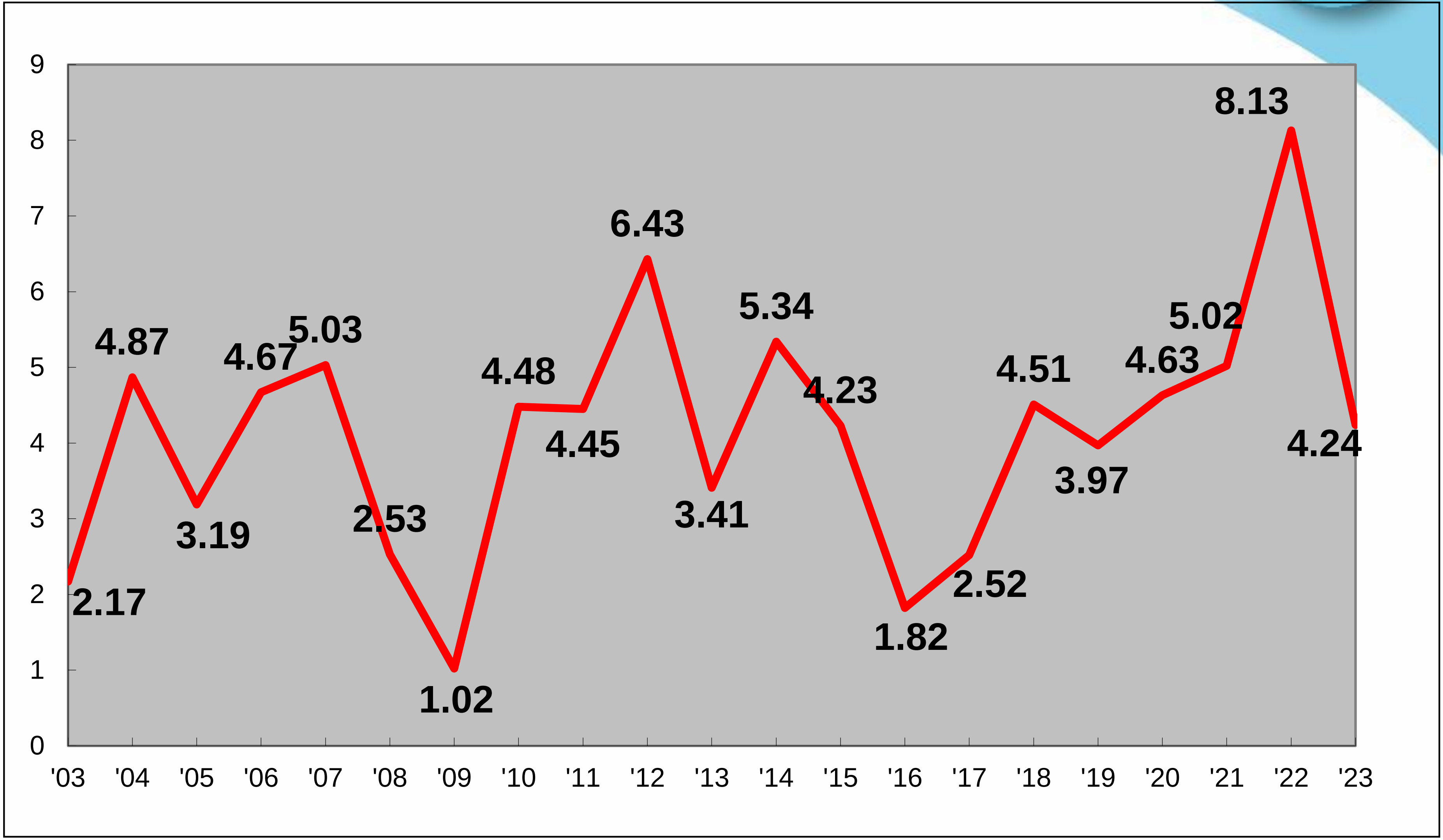
Increase of smart mobile devices application

- *Uncertainty of global economy*
- *Delay of 3D AOI launch*
- *Low price competition in China*

- *Economic recovery*
- *3D AOI*
- *Blue-ocean*

Improved product competitiveness

每股盈餘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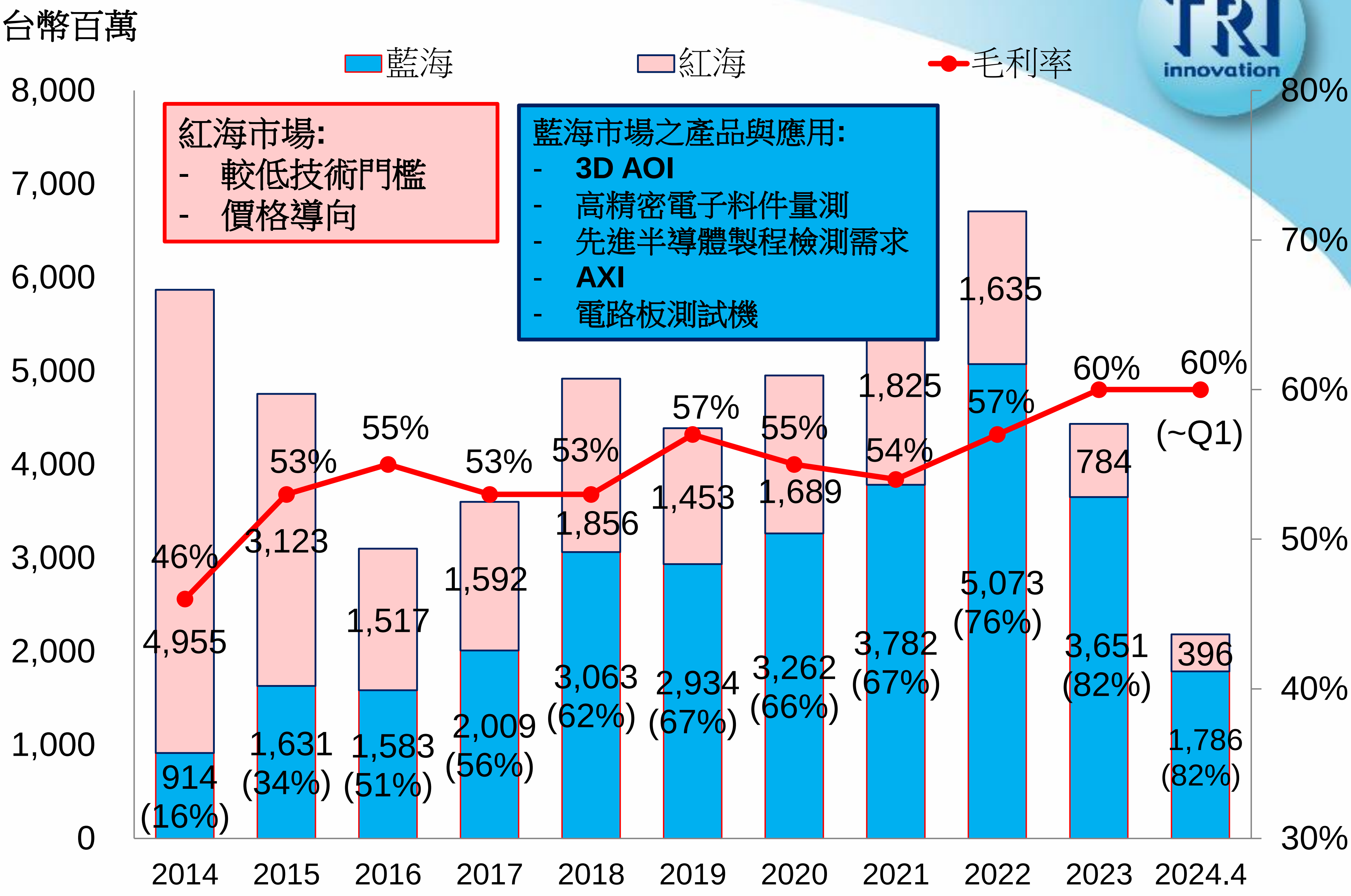
4.87
3.19
4.67
5.03
2.53
1.02
4.48
4.45
6.43
3.41
5.34
4.23
1.82
2.52
4.51
3.97
4.63
5.02
8.13
4.24

紅海與藍海市場營收變化



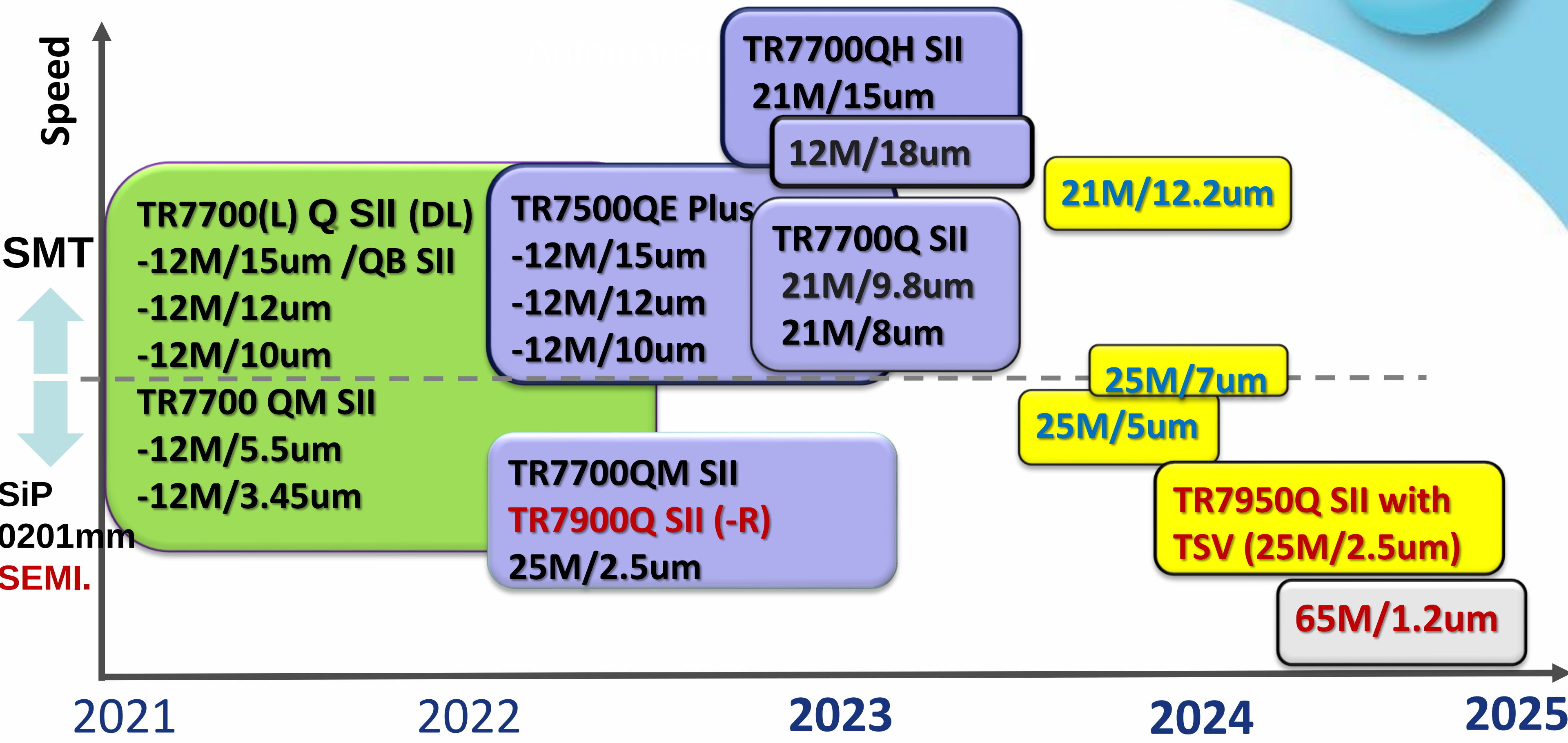
紅海市場:

- 較低技術門檻
- 價格導向

藍海市場之產品與應用:

- **3D AOI**
- 高精密電子料件量測
- 先進半導體製程檢測需求
- **AXI**
- 電路板測試機

TRI 3D AOI Product Roadmap



Speed

SMT

SiP
0201mm
SEMI.

TR7700(L) Q SII (DL)
-12M/15um /QB SII
-12M/12um
-12M/10um

TR7700 QM SII
-12M/5.5um
-12M/3.45um

TR7500QE Plus
-12M/15um
-12M/12um
-12M/10um

TR7700QH SII
21M/15um

12M/18um

TR7700Q SII
21M/9.8um
21M/8um

TR7700QM SII
TR7900Q SII (-R)
25M/2.5um

21M/12.2um

25M/7um

25M/5um

TR7950Q SII with
TSV (25M/2.5um)

65M/1.2um

2021 2022 2023 2024 2025

- AOM & AI SW module
- Optional Laser module
- Optional DFF module
- Optional SWIR module

- **Complete AOM & TRI-AI solution**
- **Optional high resolution Laser module**
- **Optional high speed DFF module**
- **Optional high speed SWIR module**
- **CCI with single point 3D sensor**

TRI 3D AOI 優勢

High Speed Line

AI-Powered Algorithms

Metrology Measurements

Smart Programming

Top or Bottom View Camera

Side-View Cameras

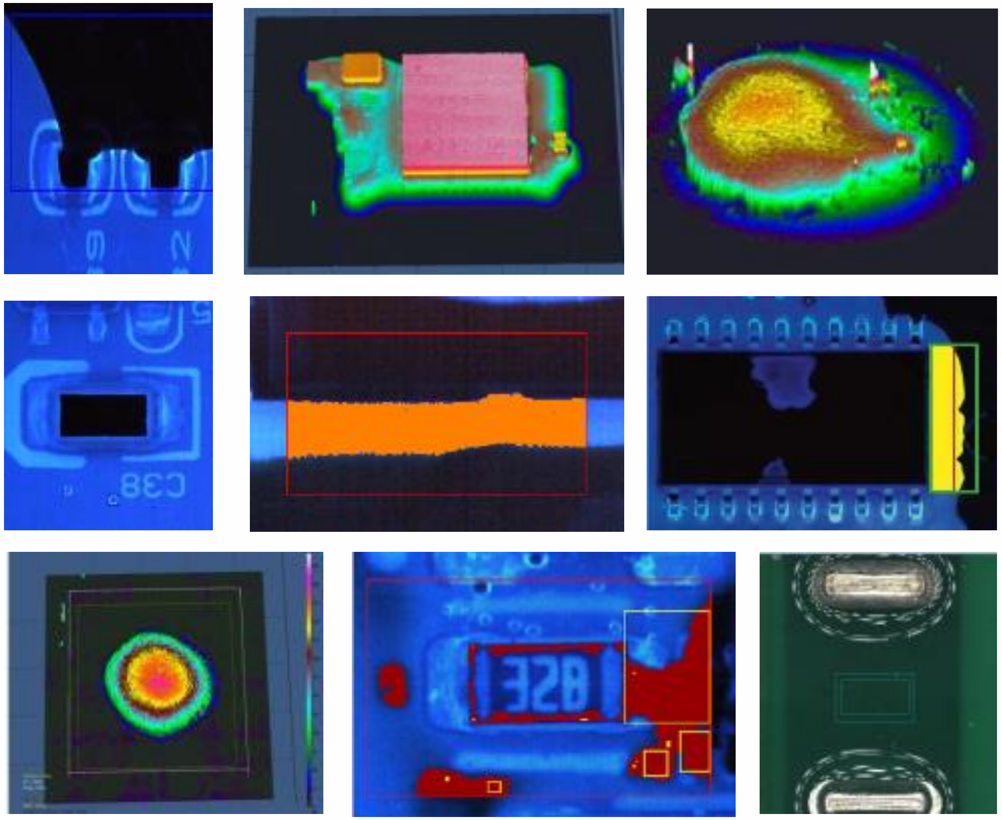
Smart Factory Solution

Ultra High Speed 3D Inspection!

防護塗層檢測AOI

Conformal Coating, Flux, and Glue Inspection

Detects: Missing Coating, Insufficient Coating, Crack, Bubble, Splash, Contamination, Spill Coating, Thickness



NEW

半導體先進封裝檢測應用 -SEMI AOI

TR7720S

2D SEMI
AOI

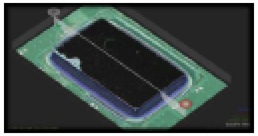
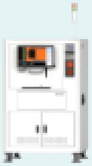
TR7900Q SII

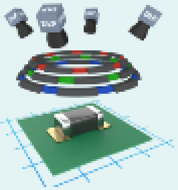
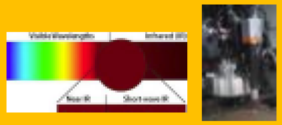
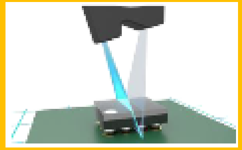
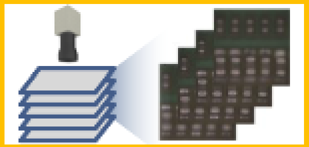
Magazine & Strip
3D SEMI AOI

TR7900Q SII-R

3D SEMI AOI &
Reject Station

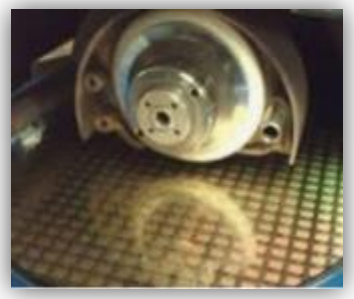
TRI SEMI AOI 應用

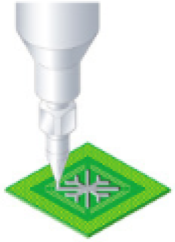
<table>
<tr><td>DUT</td><td colspan="6">Wafer / InFO / CoWoS (Inner crack, AVI…)
</td><td colspan="2">Die Bond
</td><td colspan="2">Wire Bond
</td><td colspan="6">SiP / Underfill
</td></tr>
<tr><td>AOI</td><td colspan="6">EFEM + TR7700Q SII-S
1.25 µm / 2.5 µm / 5.5 µm / 10 µm
</td><td colspan="4">TR7700Q SII-S,
TR7720S Pure-2D (Standard AOI)
TR7900Q SII / SII-R (Magazine AOI)
1.25 µm / 2.5 µm / 5.5 µm / 10 µm

 </td><td colspan="6">TR7700Q SII-S
2.5 µm / 5.5 µm / 10 µm
TR7700 SII Plus CI
(UV Lighting)</td></tr>
<tr><td>Main 3D Measurement + 2D Imaging</td><td colspan="16">3D Quad Fringe Pattern
2D Omni-color LEDs
</td></tr>
<tr><td>Resolution</td><td colspan="2">1.25 µm (Pure-2D)</td><td colspan="2">2.5 µm</td><td colspan="2">5.5 µm</td><td>2.5 µm</td><td>5.5 µm</td><td>1.25 µm (Pure-2D)</td><td>2.5 µm</td><td colspan="2">2.5 µm</td><td colspan="2">5.5 µm</td><td colspan="2">10 µm</td></tr>
<tr><td>Optional Measurement</td><td colspan="6">SWIR (2D)
</td><td colspan="2">Laser
</td><td colspan="2">DFF
</td><td colspan="6">Laser
</td></tr>
<tr><td>Resolution</td><td colspan="3">4 µm</td><td colspan="3">2 µm</td><td>10 µm</td><td>20 µm</td><td>0.5 µm</td><td>1.0 µm</td><td colspan="3">10 µm</td><td colspan="3">20 µm</td></tr>
</table>

Back-End半導體製程封裝檢測應用

Wafer Saw / Dicing → Fillet Inspection Epoxy / Underfill → Die Bonding → Wire Bonding





TR7950Q SII
8"/12" Wafer
3D Saw Measuring
2D Surface AVI
Back Side & Top
Side Chipping
SWIR Support

TR7700Q SII-S
TR7720S
Bond Pad
Epoxy
Underfill
Surface
Inspection

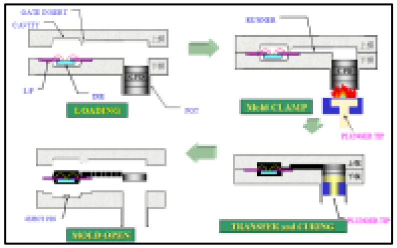
TR7700Q SII-S
TR7700QE-S IR
Die Inner & Outer
Crack / Chipping
Surface Particle
Scratch / Residue
Foreign Material
Inspection

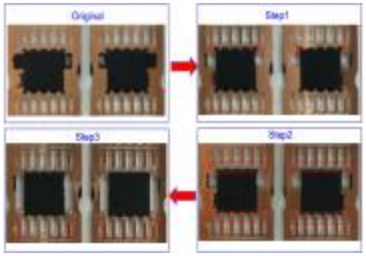
Magazine AOI
TR7900Q SII
TR7900Q SII-R
Die Bonding
2D / 3D
Inspection

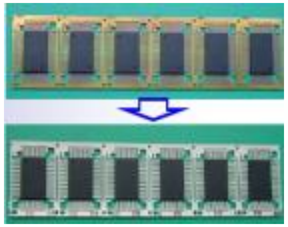
Magazine AOI
TR7900Q SII
TR7900Q SII-R
Wire Bonding
2D / 3D
Inspection

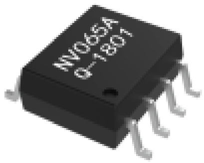
Back-End半導體製程封裝檢測應用

Molding → Ink / Laser Marking → Trim → Electroplating → Form









**TR7700Q SII-S
TR7720S(2D)
Molding
Quality
Inspection**

**TR7700Q SII-S
TR7720S(2D)
TR7960C (Inside)
IC OCV/COR
Inspection**

**SiP Package
TR7700QM SII-S
TR7720S(2D)
SiP 2D/3D
Inspection**

Powerful / AI + AOI + AOM

**AI Deep
Learning
In AOI**

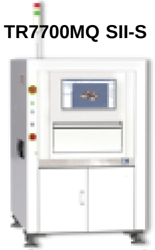
**AOM Tool
(Automated
Optical
Measurement)**

TR7700Q SII-S

TR7720S

750 mm

TR7700MQ SII-S



1000 mm

TR7720S

750 mm

TRI AOI可支援多種3D技術

Quad Digital
Fringe Pattern
Technology

Laser
Module

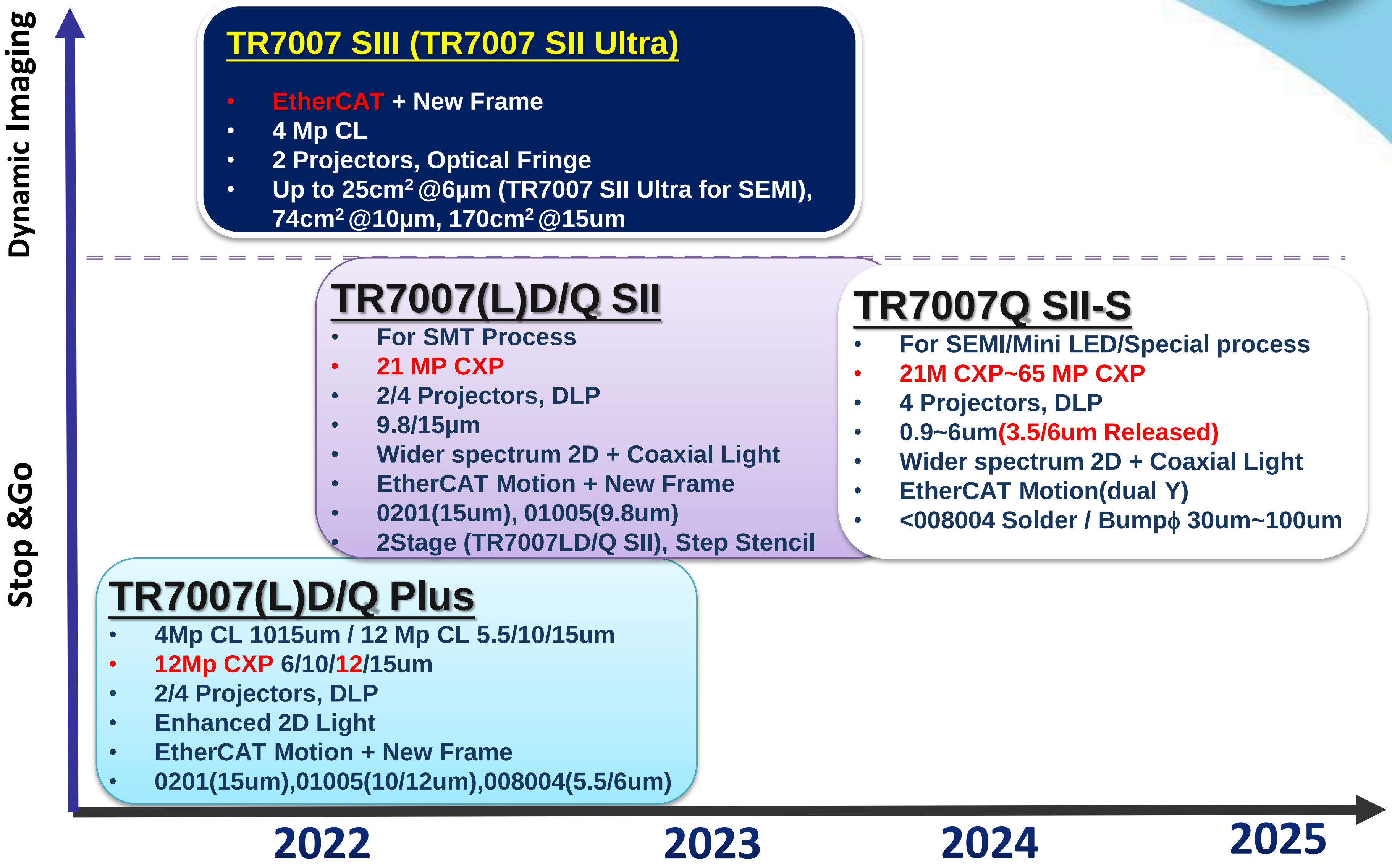
Depth from Focus (DFF)
Module

General Application

**Reflective &
Transparent
Part Inspection**

**Optimal Focus
0.5/1μm
High Resolution**

TRI SPI Product Roadmap



TR7007 SIII (TR7007 SII Ultra)

- EtherCAT + New Frame
- 4 Mp CL
- 2 Projectors, Optical Fringe
- Up to 25cm^2 @6µm (TR7007 SII Ultra for SEMI), 74cm^2 @10µm, 170cm^2 @15um

TR7007(L)D/Q SII

- For SMT Process
- 21 MP CXP
- 2/4 Projectors, DLP
- 9.8/15µm
- Wider spectrum 2D + Coaxial Light
- EtherCAT Motion + New Frame
- 0201(15um), 01005(9.8um)
- 2Stage (TR7007LD/Q SII), Step Stencil

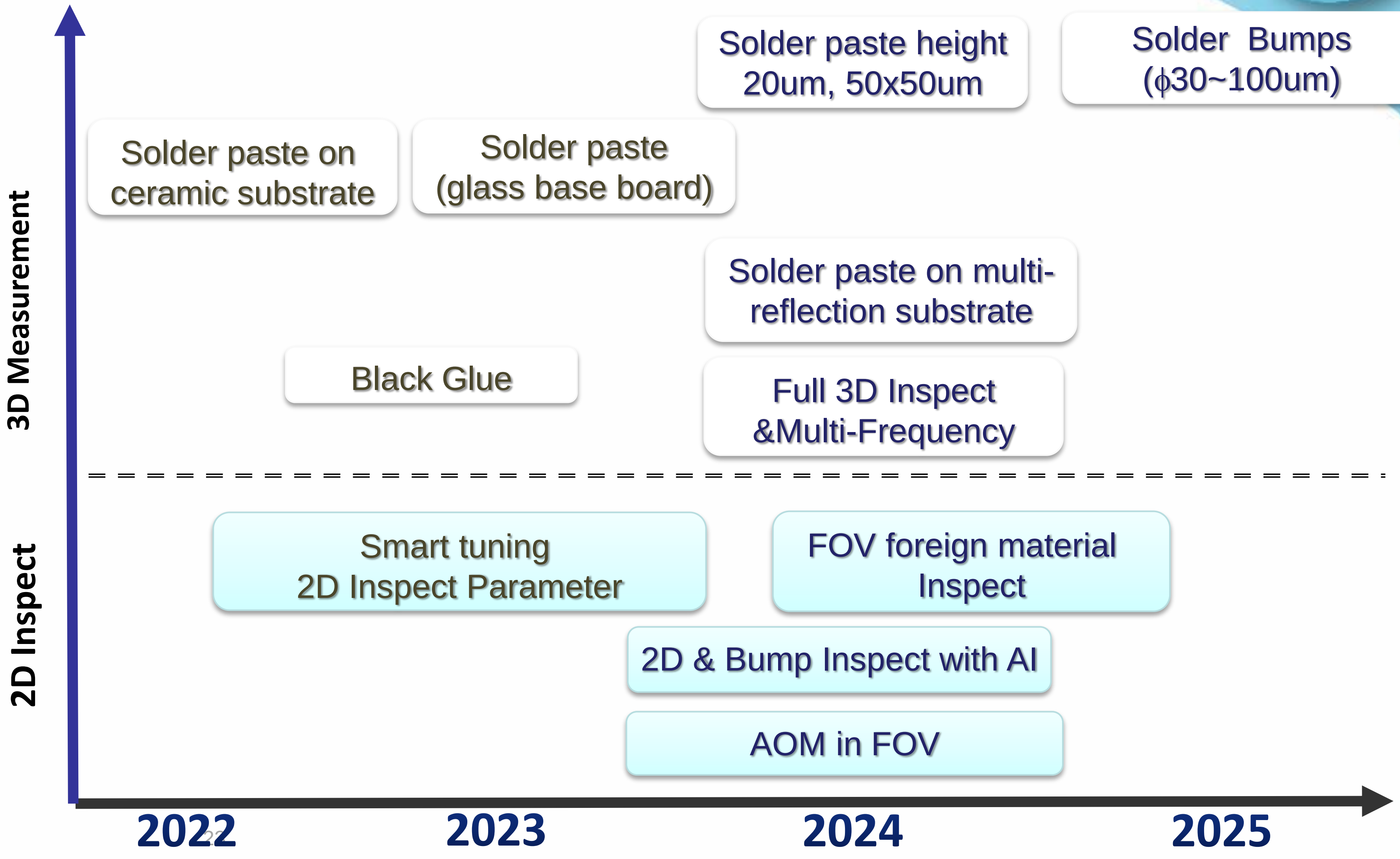
TR7007Q SII-S

- For SEMI/Mini LED/Special process
- 21M CXP~65 MP CXP
- 4 Projectors, DLP
- 0.9~6um(3.5/6um Released)
- Wider spectrum 2D + Coaxial Light
- EtherCAT Motion(dual Y)
- <008004 Solder / Bumpϕ 30um~100um

TR7007(L)D/Q Plus

- 4Mp CL 1015um / 12 Mp CL 5.5/10/15um
- 12Mp CXP 6/10/12/15um
- 2/4 Projectors, DLP
- Enhanced 2D Light
- EtherCAT Motion + New Frame
- 0201(15um),01005(10/12um),008004(5.5/6um)

TRI 3D SPI - 應用發展



3D Measurement

Solder paste height
20um, 50x50um

Solder Bumps
(ϕ30~100um)

Solder paste on
ceramic substrate

Solder paste
(glass base board)

Solder paste on multi-reflection substrate

Black Glue

Full 3D Inspect
&Multi-Frequency

2D Inspect

Smart tuning
2D Inspect Parameter

FOV foreign material
Inspect

2D & Bump Inspect with AI

AOM in FOV

2022 2023 2024 2025

TRI AXI Product Roadmap

PCBA

TR7600LL SV
~20% speed improvement from SIII

TR7600F3D SII
5~30µm, 2X Speed of F3D, PCB size : 700 x 320
TR7600F3DLL SII
5~30µm, 2X Speed of F3D, PCB size : 1000 x 660 mm

TR7600F3DLL SII (2024 Q1)
5~30µm, 3X Speed of F3D

TR7600F3D SII (2024 Q2)
5~30µm, 3X Speed of F3D

EV Module

TR7600HP (2024 Q2)
High Power AXI Model
(Power Module)

Advanced Packaging

TR7600 SIII Plus (2024 Q2)
2µm, 110kV tube

TR7600F3DLL SII Plus
3~15µm, PCB size : 1000 x 660 mm
TR7600F3D SII Plus
3~15µm , PCB size : 780x 260 mm

TR7650
High Resolution AXI

2022 **2023** **2024** **2025**

TR7600LL SV 3D AXI

High-Speed Robust Platform,
20% Performance Improvement*

AI-Powered Inspection Algorithms,
AI-Void Detection, AI Repair Station, and more

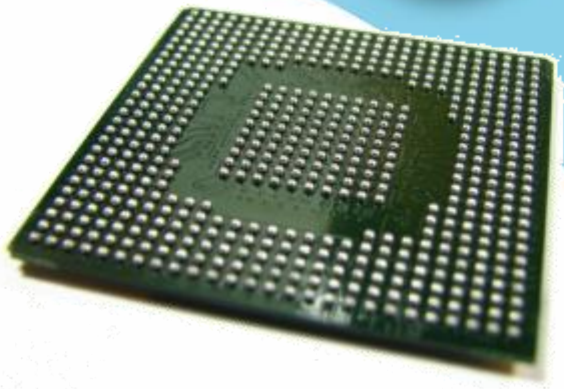
Smart Factory Ready for
Easy MES Connectivity

NEW

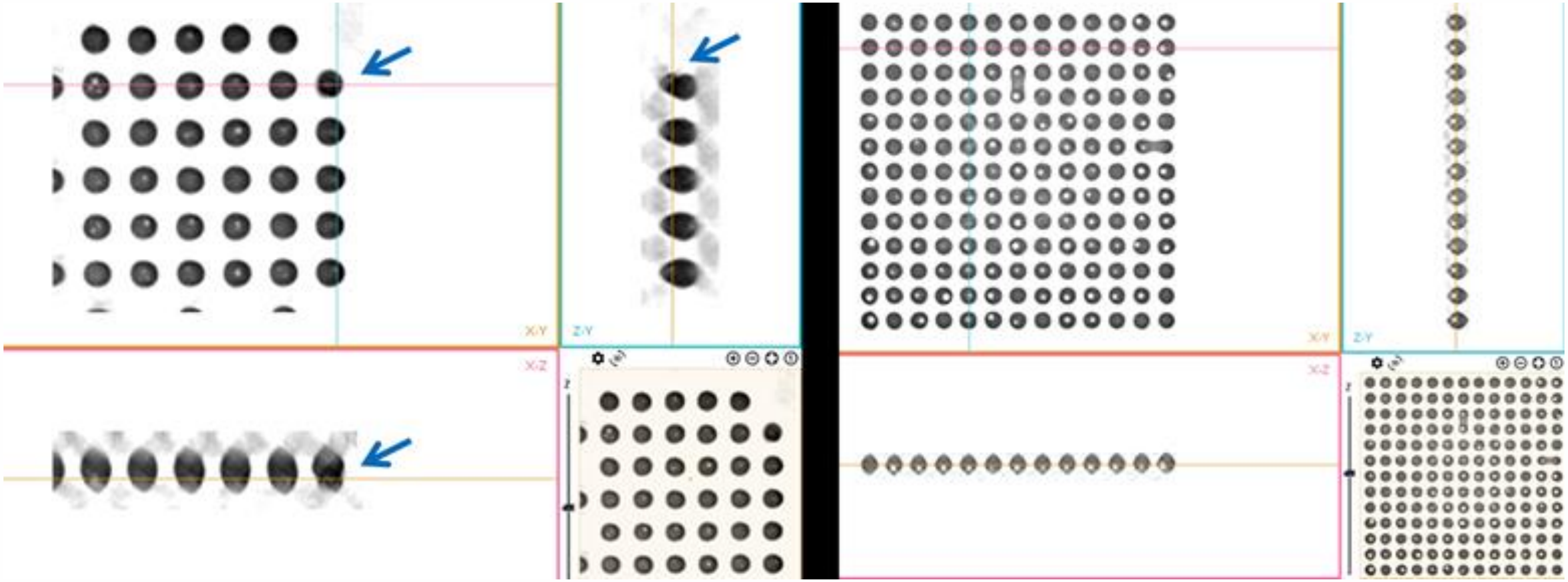
*Compared to Previous Mode, TR7600 SIII

TRI AXI - BGA 檢測應用

Product Type Examples	ADAS, Radar Module, Communication Module
Inspection Criteria	***BGA Void, Open***
TRI AXI Application	3D CT Inspection

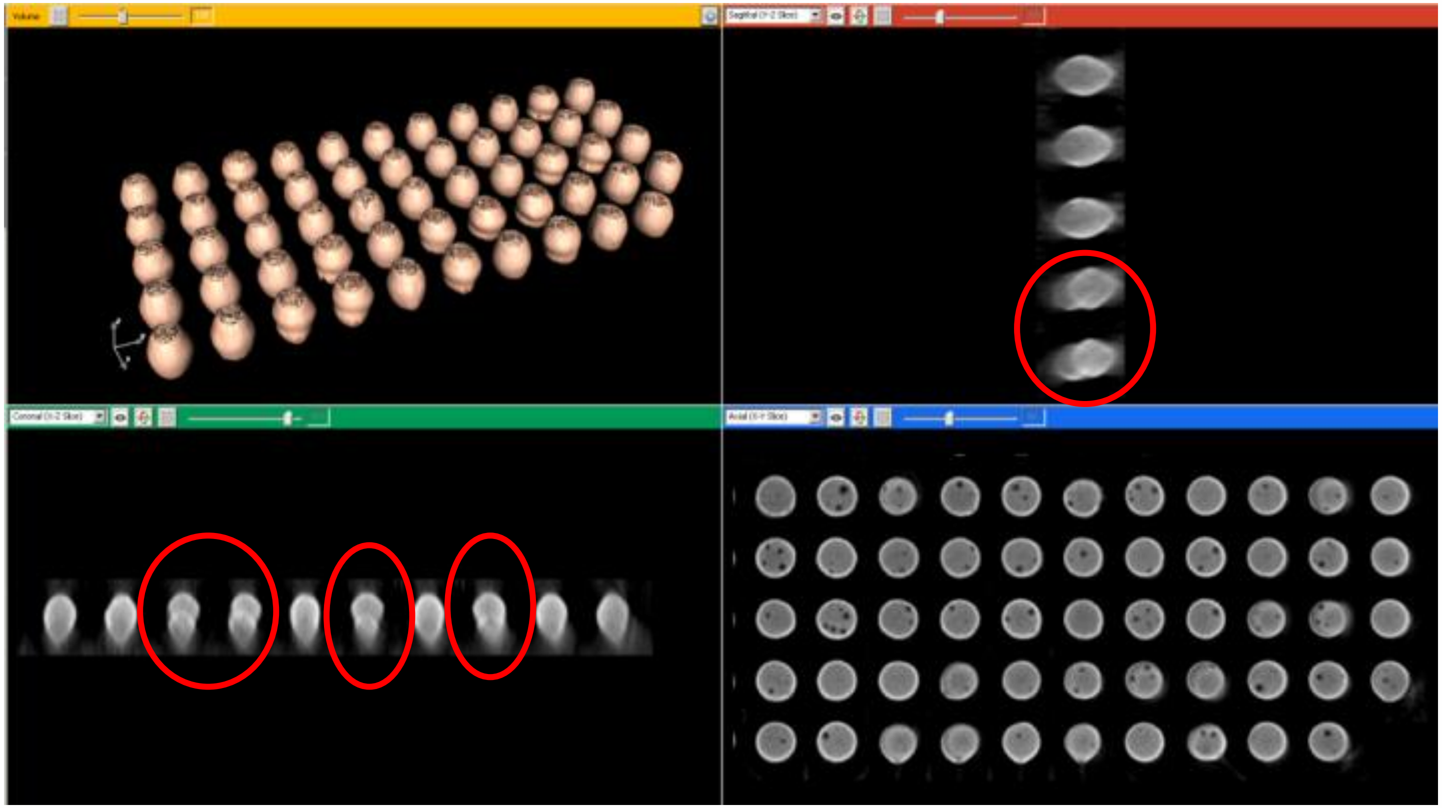


3D CT (電腦斷層掃描)



BGA CT Review at Repair Station

Users can confirm with XY / XZ / YZ interface



CT viewer is sent to repair station

TRI AXI 優勢

High Speed Line

AI Algorithms:
AI Voids Detection,
AI Programming,
AI Repair Station

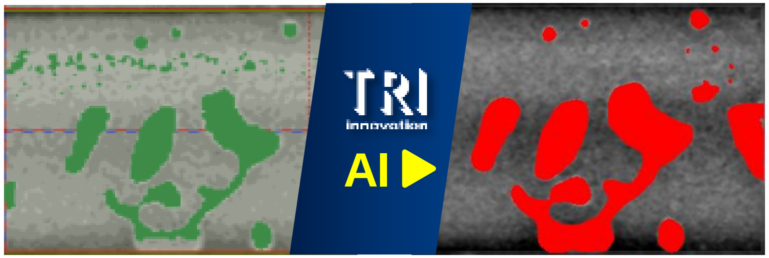
2- 30 µm

Multi-Resolution
Multi-Applications

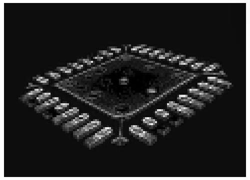
Big Data
Applications

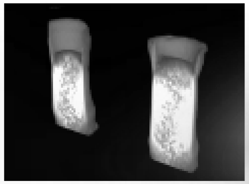
Up to 2100 x 510 mm

Large Board
Inspection

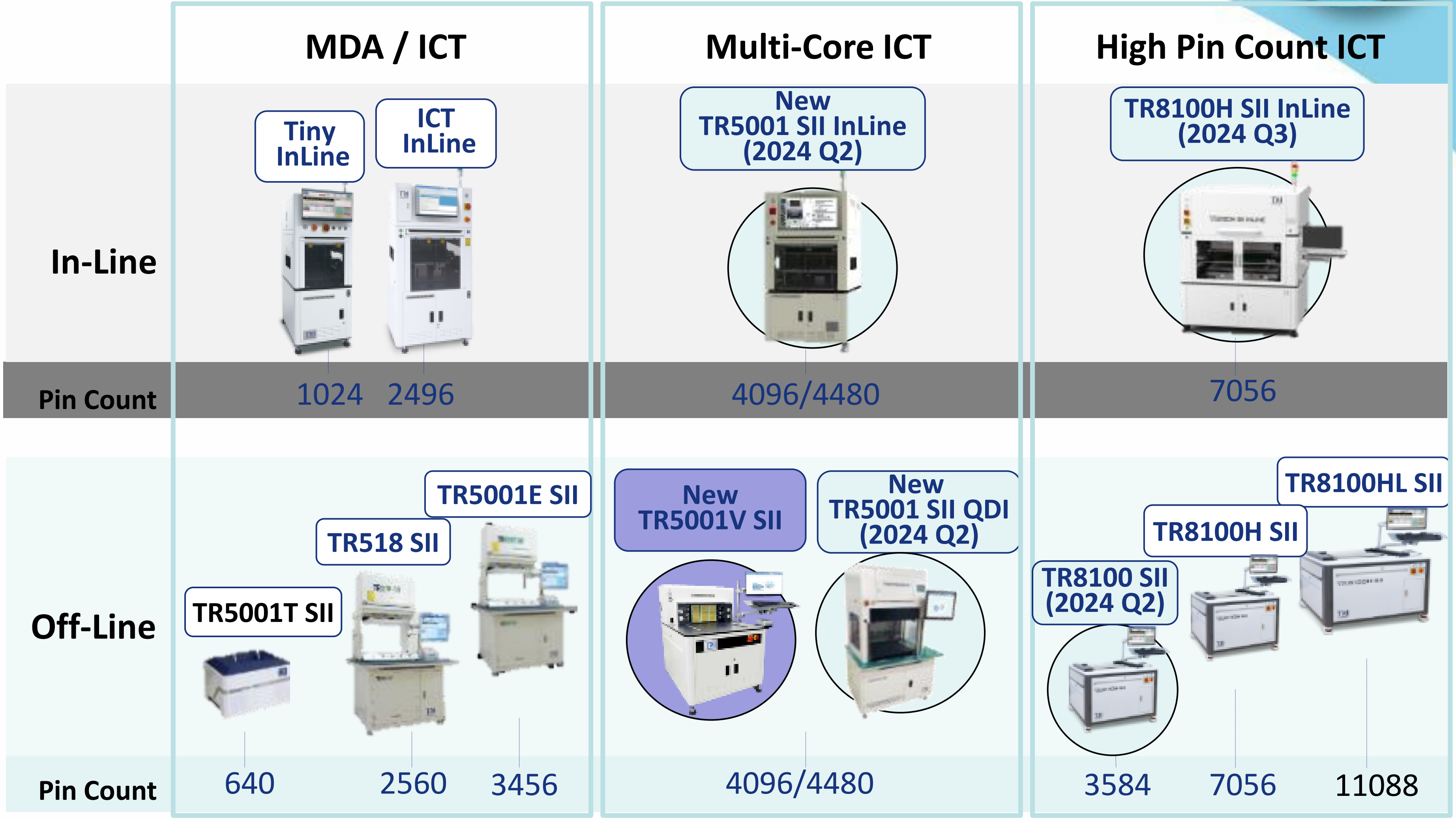



BGA
Inspection


QFN
3D AXI


PTH/THT
Filling level

TRI ICT/BT 產品組合



	MDA / ICT	Multi-Core ICT	High Pin Count ICT
In-Line	Tiny InLine ICT InLine	New TR5001 SII InLine (2024 Q2)	TR8100H SII InLine (2024 Q3)
Pin Count	1024 2496	4096/4480	7056
Off-Line	TR5001T SII TR518 SII TR5001E SII	New TR5001V SII New TR5001 SII QDI (2024 Q2)	TR8100 SII (2024 Q2) TR8100H SII TR8100HL SII
Pin Count	640 2560 3456	4096/4480	3584 7056 11088

TR8100H SII 系列 ICT應用特點

High Pin-Count ICT
Up to 11,088 Testing Points

Full Coverage Test Solution
with Vacuum Fixture

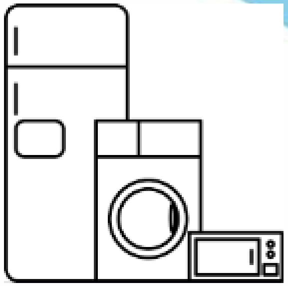
High Speed Testing

Confidential

TRI ICT/BT 應用

Automation

Laptops

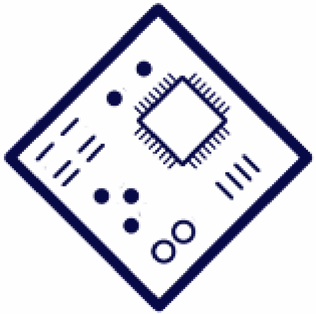


White Goods

Flex Boards

Automobile

Smart Factory



Customized FCT

TRI量測功能(AOM)

- UI: New designed and friendly user interface

线 - 圆

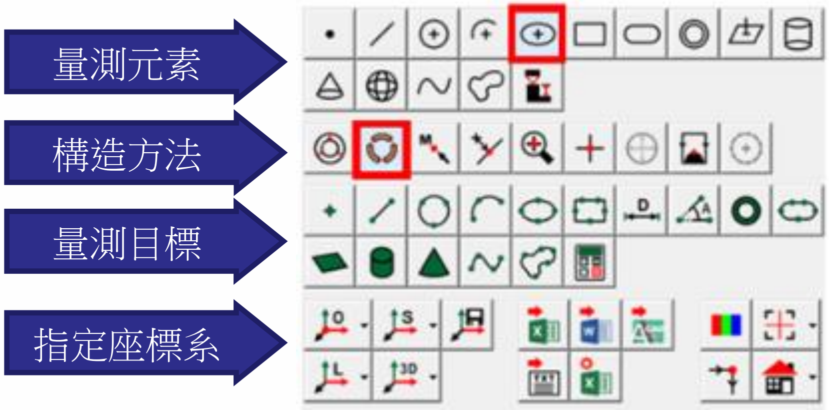
☐ 平行

☑ 垂直

☐ 镜像

☐ 选择所有方法

- Features: More complete measurement functions will be available



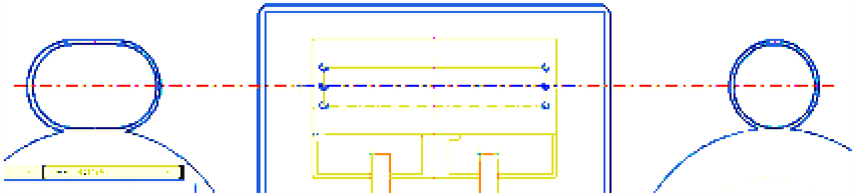
量測元素

構造方法

量測目標

指定座標系

- High Flexibility: Multi-Layer measurements



TRI的AI應用

1. **AI 智慧編程 (Smart Programing)**

2. **AI 工作站:**伺服器-終端架構的 AI 檢測及調試

3. **AI 智慧複判主機 (Verify Host):**

   AI 維修/複判站(Repair Station) 管理 (開發中)

4. **AI 檢測:**

- 字元辨識 (OCV/OCR)
- 瑕疵檢測
- 待測物外觀檢測
- 異物檢測

TRI AI Roadmap

短期

中期

長期

- ❖ **技術深耕**
  - ❖ AI Station/ Training Tool
  - ❖ Big Data: 更多內建AI網路
  - ❖ 提升檢測能力
- ❖ **擴大發展**
  - ❖ 更快速及更精確
  - ❖ 更簡易及更快速的訓練
  - ❖ 提速平台
- ❖ **願景**
  - ❖ AI應用面擴展
  - ❖ 零漏測、零誤判
  - ❖ 無人化 AOI

➢ AI 應用特點:

2023-2024

- ♦ Classification
- ♦ Segmentation
- ♦ Detection
- ♦ OCR
- ♦ Smart Programming
- ♦ AOI/AXI Support

2024-2025

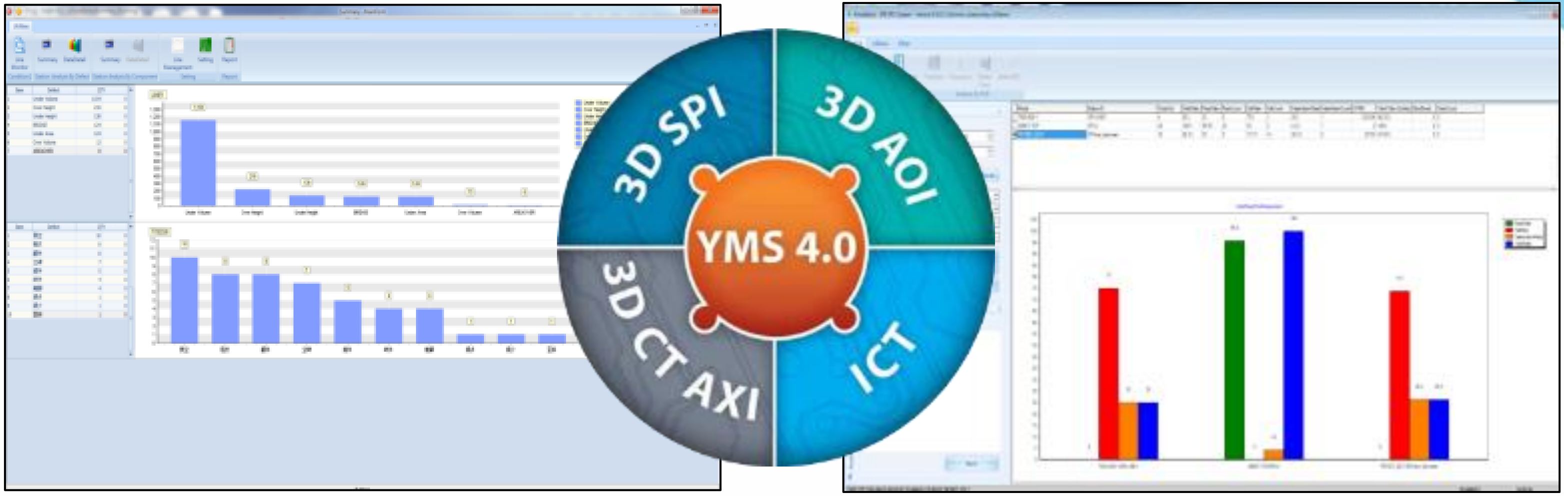
- ♦ Anomaly Detection
- ♦ Smart Labeling
- ♦ Defect Generation
- ♦ 3D Reconstruct
- ♦ New Verify Host
- ♦ SPI Support

2025~

- ♦ Whole-New S4 with built-in AI
- ♦ Smart Tuning
- ♦ Auto Training
- ♦ All Product Support

TRI YMS 4.0 良率管理系統

協助客戶提升生產力及品質管理



- 實時狀態檢查
- SPC和生產力監控
- 列出排名前10的不良項目和對應圖像
- 依各站別, 線別, 流程找出問題點

- 監控生產問題改善狀況
- PDCA改善循環
- 支持品質優化
- 輸出報告到MES / SFCS

工業4.0解決方案

YMS 4.0 WEB 網頁版本

Portable Monitoring experience for your production line

User-friendly interface to access real-time statistical data such as the Yield Rate, Top defects and Top Defective Components from the comfort of your mobile device.

Yield
Rate Monitor

Real-time
SPC Trends

Responsive Design:
Smart Phone, Tablets, PC

工業4.0應用方案

MES Connectivity

Real Time SPC Trends

Closed Loop Solution

Repair Station

MES 客製化 – 大數據收集

TRI solutions generate Big Data for your MES Applications

To Improve your Production Yield Rate

Data

- PCB ID
- Component ID
- Inspection Image
- Area / Height / Volume
- Position (X,Y,Z)
- Shift (X,Y,Z)
- Void %
- *and more…*

支援 IPC-HERMES-9852 規範

IPC-HERMES-9852

The global standard for "M2M" in SMT assembly

M2M Communication Standard

- Based on TCP/IP and XML
- Automatically Change the Program.
- Automatically adjusts the conveyor belt width.
- Continuous tracing of boards throughout a SMT line.
- Requirement: At least one Bar Code Scanner

支援 IPC-CFX (IPC-2591) 規範

Qualified Products

SPI

TR7007 SII Series
TR7007 SII Ultra
TR7007D Series
TR7007Q Series
TR7007Q Plus Series

AOI

TR7500QE Series
TR7700 SIII Series
TR7700Q SII Series
TR7700QE Series

AXI

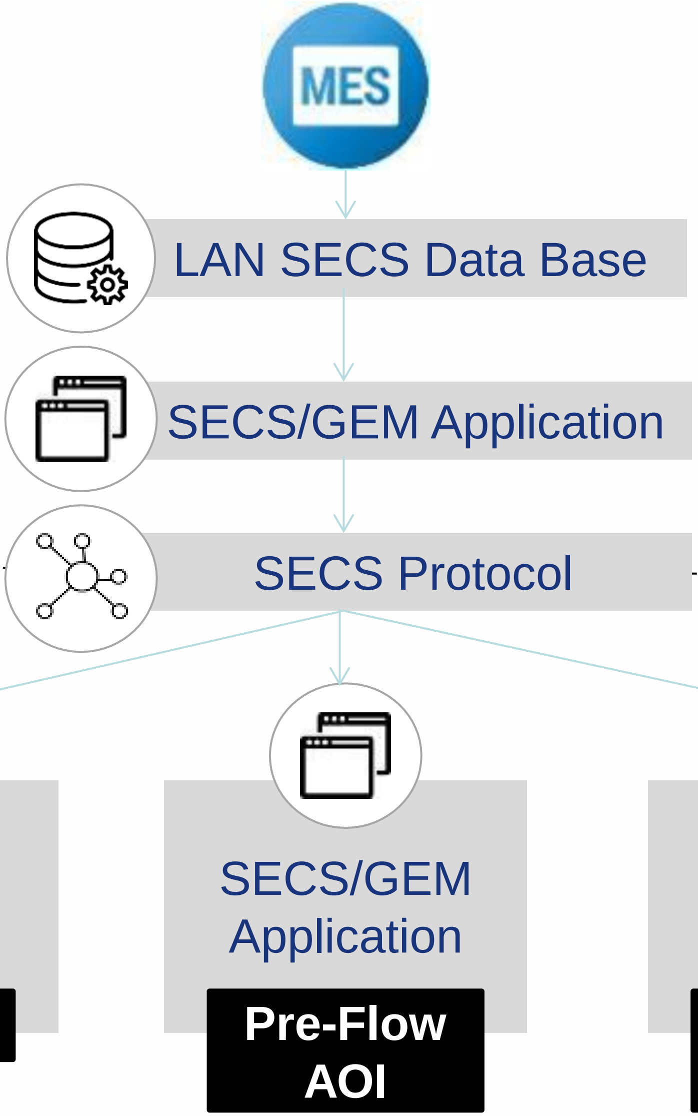
TR7600 Series
TR7600F3D Series

ICT

TR5001 Series

支援SECS/GEM 架構

半導體設備通訊標準



MES

LAN SECS Data Base

SECS/GEM Application

Host

SECS Protocol

Equipment

SECS/GEM Application

SPI

SECS/GEM Application

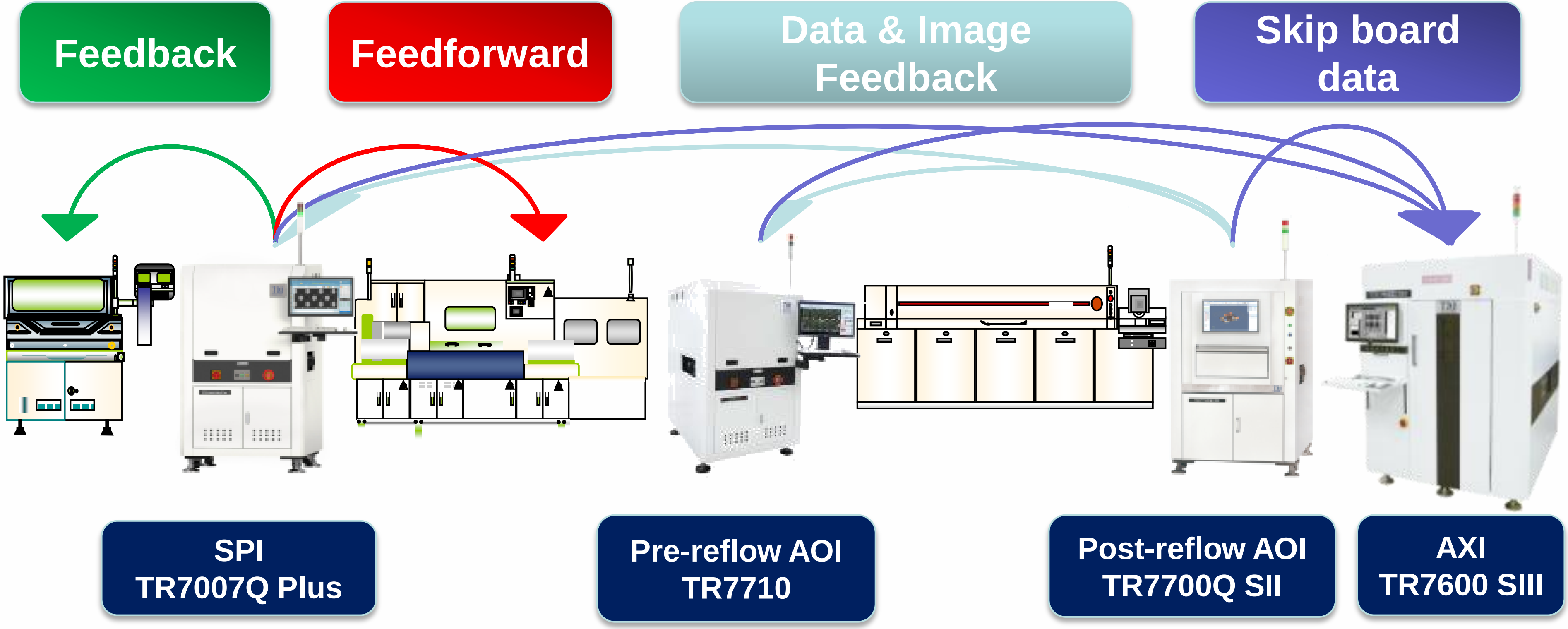
Pre-Flow AOI

SECS/GEM Application

Post-Flow AOI

TRI支援封閉迴路控制系統

TRI SPI, AOI, AXI 檢測資訊的串流
IPC CFX(data)/HERMES(M2M)



Feedback

Feedforward

Data & Image Feedback

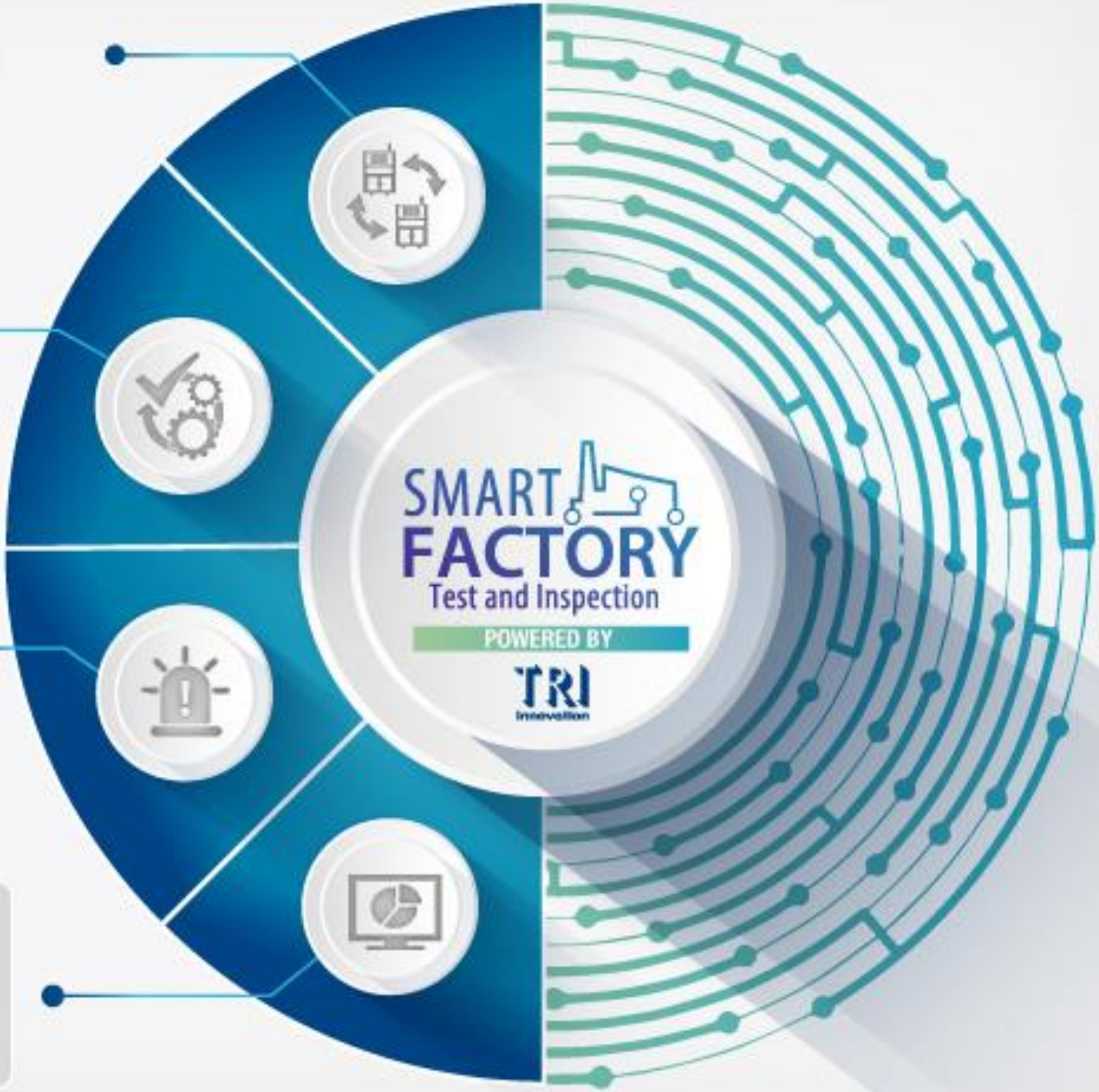
Skip board data

SPI
TR7007Q Plus

Pre-reflow AOI
TR7710

Post-reflow AOI
TR7700Q SII

AXI
TR7600 SIII



連接

數據共享
工業4.0通訊標準
MES 定制

優化

AI 智能複判主機
AI 智能工作站
共享檢測數據庫
遠端微調功能

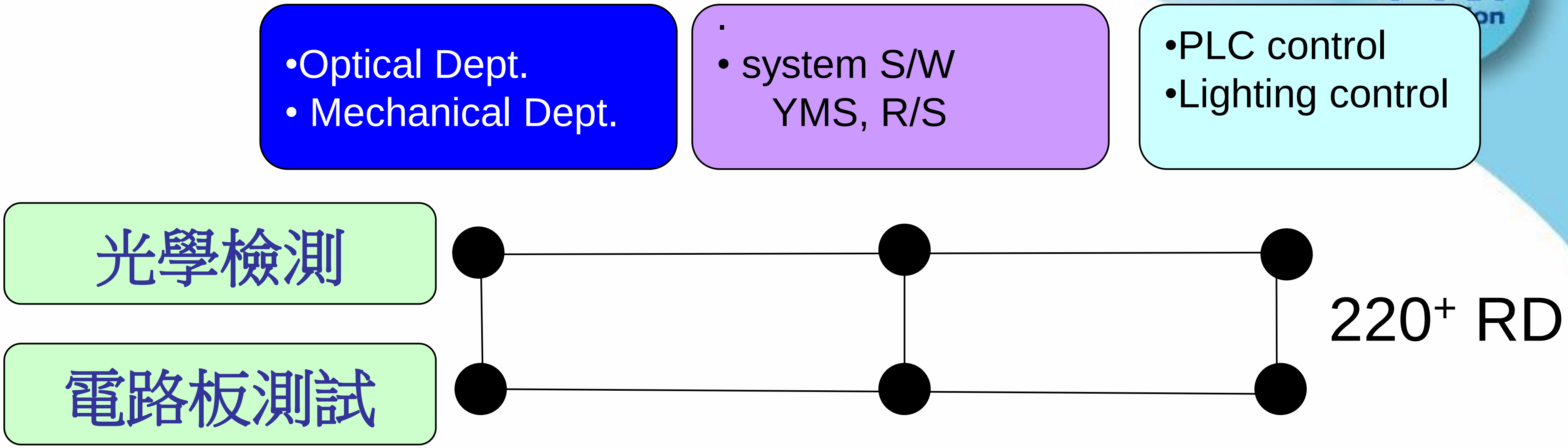
監控

遠端通報
遠端控制

視覺化

圖表操作介面
即時SPC趨勢
檢測實況狀態

內部研發團隊



- •Optical Dept.
- • Mechanical Dept.

.
- • system S/W
  YMS, R/S

- •PLC control
- •Lighting control

光學檢測

電路板測試

220$^+$ RD

外部機構技術支援

Department of Computer science, 台灣大學
- 影像處理 **/ Understanding**

Department of Power Mechanical, 清華大學
 - **X-ray 3D Reconstruction/Digital Tomosynsis Algorithm/**電腦切層演算法

Center of Measurement Standards, 工研院
- **Length/ Camera /** 色彩校正

近年獲獎

- 2018 Circuits Assembly NPI Award
- 2018 EM Asia 最佳供應商獎
- 2019 Global Technology Award
- 2019 EM Asia 傑出產品獎
- 2020 Global Technology Award
- 2021 EM Asia 創新獎
- 2021 Global Technology Award
- 2022 EM Asia 傑出產品獎
- 2023 EM Asia 創新獎及傑出產品獎
- 2024 EM Asia 傑出產品獎及最佳供應商獎

* TRI's Company Milestones:
https://www.tri.com.tw/tw/about/about-21-1-2.html

免責聲明

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THANK YOU!

For more information about Test Research, Inc.

Please visit:

www.tri.com.tw

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ISO 9001

SYMBOL OF EXCELLENCE
WINNER

TRI one stop solution