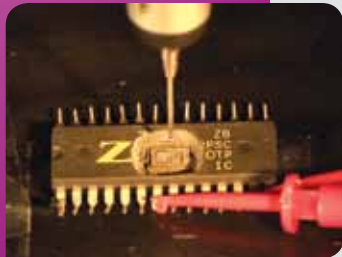




# MIMOS SHARED SERVICES LABS





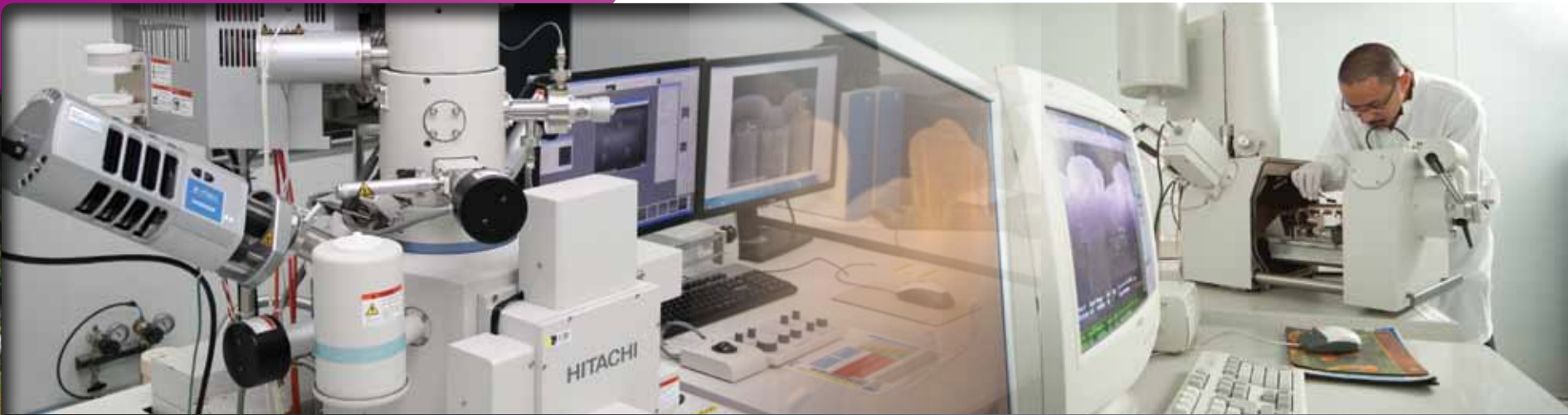
**MIMOS Nano-Semiconductor Technology (NST)** provides analytical shared services and facilities as part of the Malaysian Economic Transformation Program (ETP) under the Electrical and Electronics National Key Economic Area (E&E NKEA).

We aim to be a major catalyst for the development of E&E sectors in Malaysia and the region by offering a flexible engagement model, short turnaround time and integrated value-added services at competitive prices.

Among the services offered are Failure Analysis/Material Analysis, Reliability Testing, Wafer & IC Testing, IC Design, Wafer Prototyping and Hands-On Industrial Upskilling Programme.



## MIMOS FAILURE ANALYSIS LAB



**MIMOS Failure Analysis Lab** is equipped with a complete spectrum of advanced analytical tools to provide high value-added services for E&E industries and academia.

The lab is a strategic cross-cutting enabler to complete the E&E ecosystem support by providing much needed services in Malaysia.

Innovative and flexible engagement models are offered to suit the needs of industries, academia and local Failure Analysis consultants.

MIMOS NST has more than 20 years of experience in areas of semiconductor wafer fabrication and devices to ensure optimal analytical solutions.

We also comply with MS ISO/IEC 17025 guidelines.

# Capabilities

## Electrical Verification

- **Logic and High Voltage Curve Tracer (CT - Logic + HV)**  
Electrical/parametric test verification tool for logic and high voltage devices

## Non-Destructive Inspection

- **Real-time X-Ray (X-Ray)**  
2D inspection tool to determine internal conditions of sealed devices
- **3D X-Ray**  
2D and 3D inspection tool to determine internal conditions of sealed devices
- **Scanning Acoustic Microscope (SAM)**  
Inspection tool using ultrasonic waves to locate internal discontinuities of sealed devices

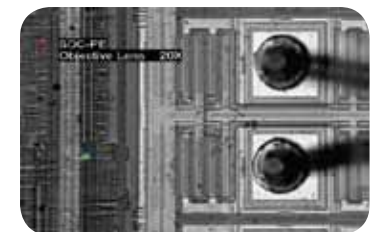
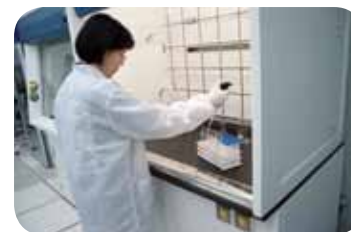


## Fault Localisation

- **Photon Emission Microscope (PEM) Front and Backside, and Optical Beam Induced Resistance Change (OBIRCH)**  
Fault localisation system for low leakage failure and OBIRCH capability to localise metal defects
- **Thermal Emission Microscope**  
Fault localisation system for high leakage and shorting
- **Magnetic Current Imaging (MCI)**  
Fault localisation system for short, leakage (IDDQ and I/O) and low resistive open failures

## Physical Analysis

- **Laser and Chemical Decapsulator**  
Package opening tool for semiconductor packages
- **Confocal and Digital Microscopes (CM)**  
Visual inspection tool with Brightfield, Darkfield, DIC (interference contrast) and Confocal capabilities
- **Reactive Ion Etching (RIE) with Electron Dispersion Spectroscopy (EDS)**  
Etching dielectric materials for IC stripping or delayering with EDS
- **Dual-Beam (FIB + FESEM)**  
High resolution inspection system for precision micro cross-sections of IC features and deposition of conductor and insulator within sub-micron tolerances, and EDS for elemental information



- **FEG-Scanning Electron Microscope with EDS**

Inspection system to examine fine details within nanometre-level resolution and equipped with EDS for elemental information

- **Transmission Electron Microscope (TEM) with EDS**

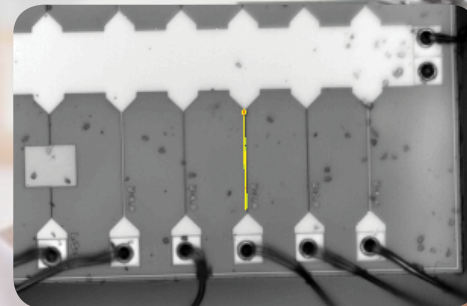
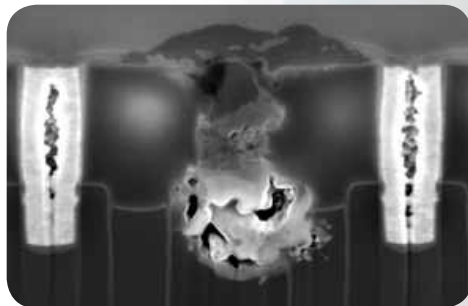
Inspection system to examine fine details within angstrom-level resolution and equipped with EDS for elemental information

- **Atomic Force Microscopy with RAMAN**

3D imaging profile for topographical information used in surface roughness analysis with RAMAN for chemical and molecular analysis

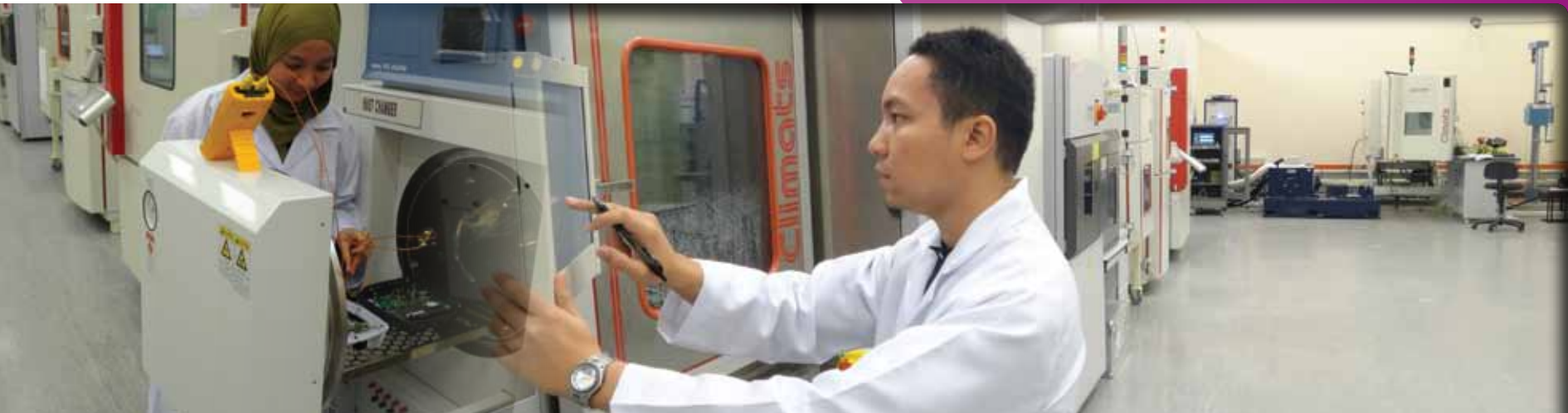
### Material Analysis (2014)

- Auger Electron Spectroscopy
- TOF Secondary Ion Mass Spectrometry
- X-Ray Photoelectron Spectroscopy
- Fourier Transform Infrared Spectroscopy
- TEM Upgrades with Electron Energy Loss Spectroscopy





## MIMOS RELIABILITY LAB



**MIMOS Reliability Lab** was established in 2009 to provide strategic, internationally-compliant reliability testing services. The lab provides comprehensive technical support for a wide range of industries from telecommunications and automotive to consumer electrical and electronic products and appliances for multinational corporations, local industries and universities.

MIMOS Reliability Lab is accredited with MS ISO/IEC 17025 Testing Lab Competency by Standards Malaysia (DSM), and staffed by highly competent R&D engineers in testing, internationally-compliant standards and product qualification.



# Capabilities

## Mechanical Testing

Determines robustness of products and mechanical properties such as housing material and sealing mechanism against dynamic stresses during storage, transportation and operation.

- **3-Axis Vibration Shaker**  
Resonance check, shock, random and sinusoidal waveforms (5 to 2000Hz at max 30GRMS)
- **Drop Tester**  
Free fall testing on concrete or steel plate (up to 1m in any direction, max 85kg load)
- **Ingression Protection Tester**  
Water testing; complies with IEC 60529 (water jet IPX5 and IPX6, immersion tank IPX7)
- **Impact Tester**  
Material ruggedness (up to 1kg in 1m fall)

## Environmental Testing

Determines resistance of products to various environmental conditions during storage, transportation and operation. Applies to product's ability to withstand stresses related to rapid temperature change, hot, cold and high humidity weather, heavy rain, direct sunlight or sea mist.

- **Temperature/Humidity Cycling Chamber**  
-70°C to 180°C; up to 98% RH
- **Thermal Shock Chamber**  
-80°C to 180°C
- **Combined Temperature/Humidity/Vibration**  
-70°C to 180°C up to 98% RH and max 30GRMS
- **Autoclave Chamber**  
105°C to 150°C, max 2 bar pressure; up to 100% RH

- **High Temperature Ovens**  
25°C to 300°C
- **Salt Spray Chamber**  
Corrosion testing
- **Blowing Rain Chamber**  
Simulates heavy rain with winds up to 40mph
- **Xenon Weather-Ometer**  
Solar radiation testing

## Electrical Testing

Determines product compliance with safety requirements.

- **Electrostatic Discharge (ESD) Stimulator**
- **Electrical Safety Test**
  - **Insulation Resistance**
  - **Overload Protection**  
Short Circuit Strength

## Custom (Specialised Testing)

Customised tests can be designed per product or end user application such as usability, life cycle, simulation jig for manufacturing and green house application.

- **Cyclic Latch/Unlatch**
- **Switch and Joystick Life Cycle**
  - Altitude Test
  - High Air Pressure Test
  - Hydrostatic Pressure Test
- **Chemical Resistance Test**
- **Flex 10-pin Connectivity Tester**
- **Water Pressure Pipe Endurance Test**

## Future Expansion (2015)

- **Component Reliability Testing**

# MIMOS WAFER & IC TESTING LAB



**MIMOS Wafer & IC Testing Lab** provides wafer sort and testing services for processing of up to 200mm wafers. The lab is equipped with Automatic Test Equipment (ATE) for evaluating and testing Digital, Analog/Mixed-Signal (AMS) and Power Devices, and provides engineering support for product prototyping.

## The key services provided are:

- Parametric Test (PCM)/Wafer Acceptance Test (WAT)
- Wafer Sort Capabilities/Chip Probe Test (CP)
- Wafer-Level Reliability Testing and Monitoring  
*\*Including Hot Carrier Injection (HCI) and Mobile Ionic Contamination (MIC)*
- Device and Interconnect Modelling





# Capabilities

## Parametric Test (PCM)/Wafer Acceptance Test (WAT)

Auto Parametric Test Systems enable semiconductor manufacturers to significantly reduce test time for DC and capacitance measurements in semiconductor wafer manufacturing processes.

- **4072 Auto Parametric Test System**
  - Agilent 4072A Advanced DC Auto Parametric Tester with 4 Source Measurement Units (SMUs) and 48-pin switch matrix
  - Tester is directly docked to Electroglas 4090µ Fully Automatic Prober
- **4073 Auto Parametric Test System**
  - Agilent 4073A Ultra Advanced DC Auto Parametric Tester with 8 Source Measurement Units (SMUs), 48-pin switch matrix and 1fA low current measurement capability
  - Tester is directly docked to Accretech UF200 Fully Automatic Prober with 150°C Hot Chuck capability
- **4082A Auto Parametric Test System**
  - Agilent 4082A Advanced DC Auto Parametric Tester with 4 Source Measurement Units (SMUs), 38-pin switch matrix and highthroughput testing
  - Tester is directly docked to TEL Precio Octo Fully Automatic Prober with 150°C Hot Chuck and 150µm Thin Wafer capability

## Wafer Sort Capabilities/Chip Probe Test (CP)

Wafer-level functional chip testing provides sorting of good and fail die binning to ensure cost-effective assembly and support further test processes. There is available tester integration to Electroglas 4090µ Fully Automatic Prober with 150°C Hot Chuck or TEL Precio Octo Fully Automatic Prober with 150°C Hot Chuck and 150µm Thin Wafer capability.

- **Analog/Mixed-Signal Test System**

LTXC ASL1000 Tester for advanced linear and analog/mixed-signal markets

- **Functional Test System (Microcontroller and Consumer ICs)**

LTXC Diamond 10 (D10) Tester is a low-cost and high-throughput production test solution with speeds up to 200MHz and a 96-pin digital channel

## Wafer-Level Reliability Testing and Monitoring

Wafer-level reliability determines the reliability and lifetime of devices at wafer level to ensure faster characterisation, even prior to packaging.

- **Plasma Damage and Hot Carrier Injection (HCI Degradation) Test System (Automatic)**

PDQ-WLR Test Software and PDQ-AT Analysis Software for Hot Carrier Injection (HCI) and Plasma Damage integrated to MIMOS 4073 Auto Parametric Test System
- **Mobile Ionic Contamination (MIC), Electromigration, CV Measurement and Gate Oxide Integrity Test System (Manual)**

Keithley CV and IV System bench equipment with up to 250°C Hot Chuck capability for Bias Temperature Stress (BTS) characterisation

## Device and Interconnect Modelling

This modelling method determines the circuit simulator models for behaviour of electrical devices based on fundamental physics and wafer fab processes to ensure accuracy of integrated circuit (IC) designs.

- **Device Modelling and Simulation for Device & IC Design (BSIM3v3)**

Integrated Circuit Characterisation and Analysis Program (ICCAP) device modelling software and SPICE Circuit Simulation
- **Interconnect Parasitics Modelling**

Mentor Graphics XCalibrate modelling software

## Bench Test Equipment

Bench test equipment allows for verification of auto tester results and manual test investigation. This is available with Micromanipulator 8060-FS8-VO-1-C Manual Probe Station (with and without light-tight enclosure), Temptronic TP0315A-TS-2 Temperature Controller (from 25°C to 250°C) and Metric ICS software.

- **Keithley CV System**  
Keithley 230 Programmable Voltage Source, Keithley 595 Quasi Static CV Meter and Keithley 590 High Frequency CV Analyser
- **Keithley IV System**  
Keithley 236 Source Measurement Unit and Keithley 2361 Trigger Controller
- **HP IV System**  
HP 4145B Semiconductor Parametric Analyser

## Wafer Thinning Services

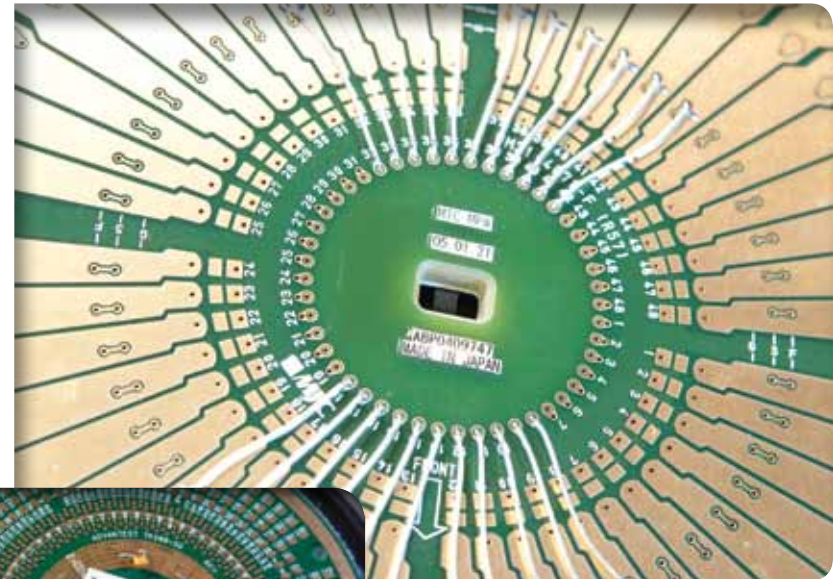
Also available is a complete backgrinding system for wafers inclusive of taper and detaper.

- **Backgrinding System**  
Disco DFG840 Wafer Back Grinder (with capability to backgrind wafers up to 250µm thickness), Takatori ATM-1100E Wafer Protective Tape-Laminating Machine (Taper) and Takatori ATM-2100D Wafer Protector Tape Remover (Detaper)

## Data Analysis

For in-depth process and yield, these software provide statistical analysis and integrated data analysis.

- **Standalone Tools**  
JMP and Minitab Statistical Analysis Software
- **Integrated Data analysis**  
Galaxy Examiner Pro Software (for data testing, device characterisation, test program qualification and yield analysis from standard semiconductor data files integrated to MIMOS Automatic Testers)



# HANDS-ON SKILLS DEVELOPMENT PROGRAMME



With over 20 years' experience in Wafer Fabrication, Failure Analysis, Wafer & IC Testing and IC Design, MIMOS NST offers on-the-job, high-end customised training schemes based on real industry needs. To date, we have trained more than 800 engineers to become highly qualified experts in semiconductors. Training courses are built on 20:80 ratios of theory and hands-on experience.

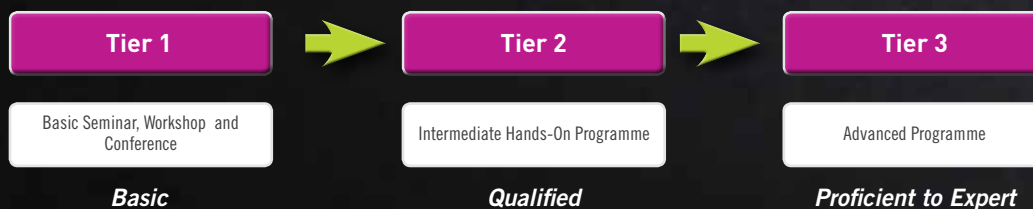
The skills development programme focuses on:

- 1) Wafer Fabrication Processes
- 2) Failure Analysis
- 3) Reliability Testing
- 4) Semiconductor Testing
- 5) Integrated Circuit Design

## Training Objectives

- Equip undergraduates with relevant industry experience through structured development schemes
- Enhance graduates' and engineers' skills through upskilling and advanced skills development programmes
- Experiential hands-on learning environment using MIMOS' industrial-grade facilities

## Development Programme Track





## OTHER SERVICES

### Wafer Fabrication

MIMOS NST's second facility, Fab 2, produces 200mm wafers at medium volume capacity. Our operation is backed by robust technologies from IMS Germany and NTT Japan.

The 200mm wafer fabrication plant is fully-equipped with industry-standard technology as well as machinery, to cater the various industrial and research requirements. We are able to provide a wide range of service including Design Support, Customised Processes, Multi-Project Wafer (MPW) programmes and Product Development & Fabrication in CMOS, HVMOS, Digital, Analog and Microelectromechanical Systems (MEMS) technology platforms.



Capability	Process Technology	Process Description	Features
CMOS	0.35 $\mu$ m	CMOS Analog/Mixed-Signal Technology	2P3M, 3.3V I/O, Device Model Verification
	0.5 $\mu$ m		2P2M, 5.0V I/O, Device Model Verification
HVMOS	0.2 $\mu$ m	Trench HVNMOS	Low RDSon, Trench, 20V and 30V Manufacturing Proven
	0.4 $\mu$ m		Low RDSon, Trench, 60V and 70V Manufacturing Proven
Schottky Diode	0.2 $\mu$ m	Trench Schottky Diode	Low Vf, 45V and 60V Manufacturing Proven

# IC Design Services

MIMOS NST's IC Design Lab is fully equipped with the latest EDA tools and provides consultation services to industries and academia. The team consists of experienced designers and experts with years of experience in the semiconductor industry.

The lab's technical capabilities include:

## System Architecture/SoC

- MCU, DSP, ASIC, Memory, Peripherals
- System Specification
- System Analysis and Modelling
- System Budgeting

## Analog IC

- Interface/Driver for Chemical and Physical Sensors
- 12-bit and 10-bit SAR Analog-to-Digital Converter
- 16-bit SD Analog-to-Digital Converter
- 10-bit Pipeline Analog-to-Digital Converter
- Auto Digital Calibration

## ASIC

- Top Level and Module Specification
- Design Partitioning: Microarchitecture
- RTL
- Verification: RTL, Formal, Netlist and System Verification
- Synthesis and DFT
- STA and Timing Closure

## Layout

- Deep Nanometre APR (Multi-Mode Multi-Corner APR)
- Floorplanning, Place and Route
- DRC and LVS
- ECO and Timing Closure
- High Performance Analog IC Layout

## FPGA and System Prototyping

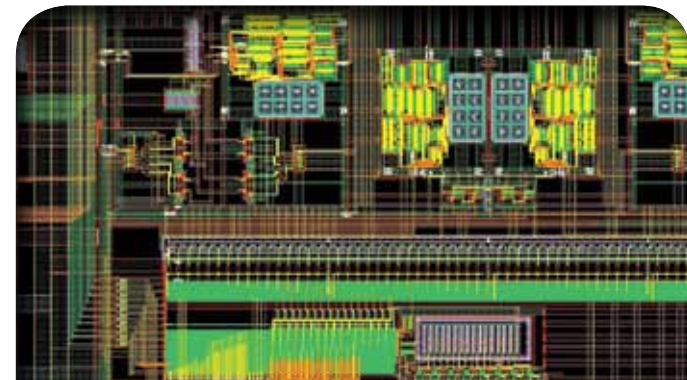
- System Design
- ASIC to FPGA Prototyping
- ASIC Emulation on Multi-FPGA Platform
- System Integration
- Verification and Validation on Hardware

## Technology Library

- CMOS 90nm Logic
- CMOS 0.18 $\mu$ m Logic and Mixed-Signal
- CMOS 0.18 $\mu$ m (MVdd, MVth)
- CMOS 0.35 $\mu$ m Logic and Mixed-Signal

## EDA Tools

- Cadence, Synopsys and Mentor Graphics
- FPGA



## CONNECT WITH US



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**MIMOS Wafer Fab Semiconductor Services**

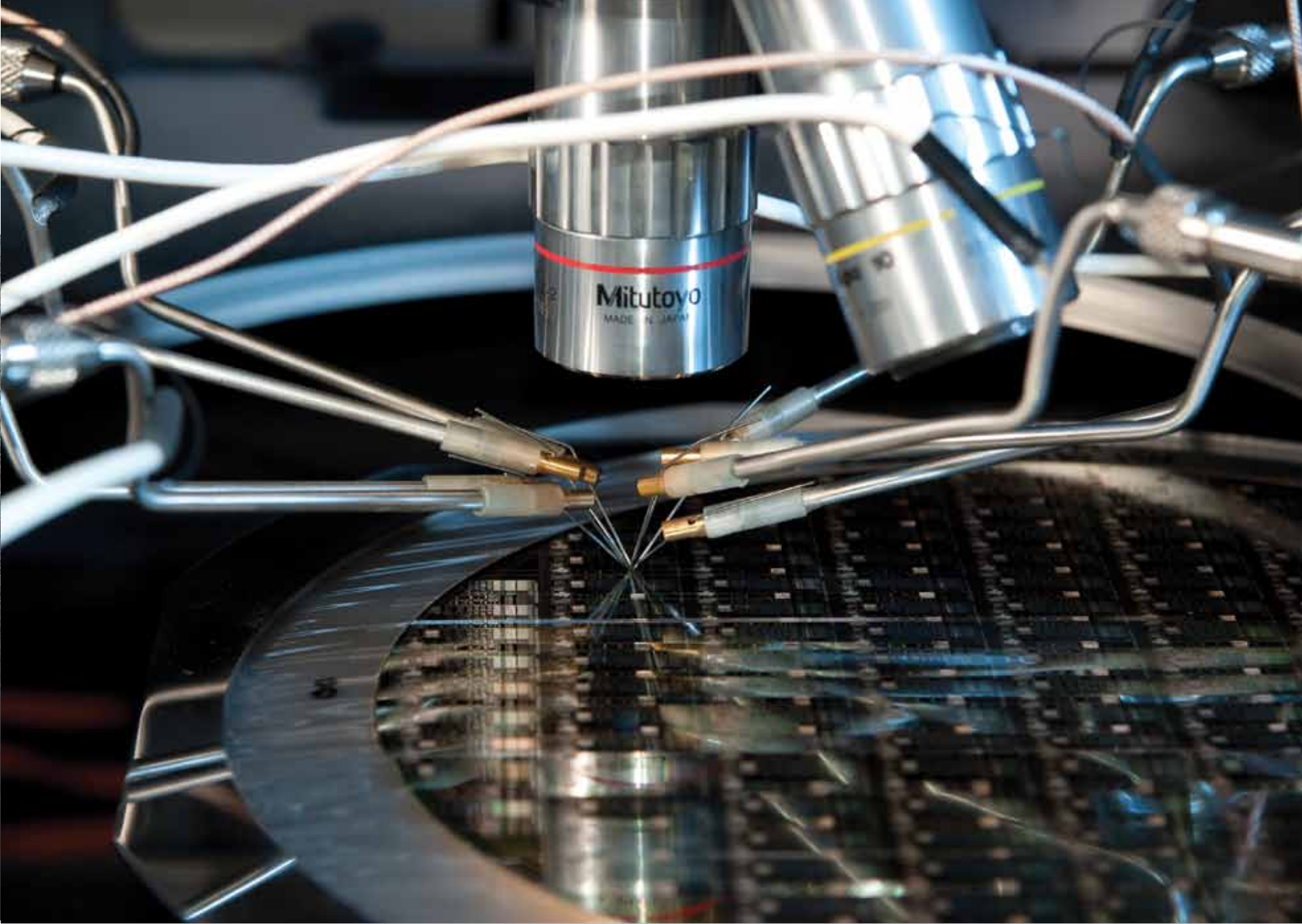


**MIMOSMalaysia**



**MIMOS Semiconductor Services**





## BUSINESS AND TECHNOLOGY COLLABORATION

**MIMOS Nano-Semiconductor Technology (NST)** provides Wafer Fabrication, IC Design, Failure Analysis/Material Analysis, Hands-On Skills Development Programme, Testing & Reliability, Mechanical Design & Rapid Prototyping, and MEMS/Nano Design & Integration. We offer a full chain of services with excellent business value through technology collaborations with fabless design houses, end product customers and technology partners.



### Nano-Semiconductor Technology

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