2009 PSTA WINNER CITATIONS

PRESIDENT'S TECHNOLOGY AWARDS 2009

(from left to right)
Mr Goh Szu Huat
Mr Alfred C.T. Quah
Professor Jacob C.H. Phang
Mr Chua Choon Meng
Department of Electrical and Computer Engineering, National University of Singapore
SEMICAPS Pte Ltd, Singapore

"For their outstanding contributions to the research, development and commercialisation of scanning optical microscope systems for design debug and failure analysis of advanced integrated circuits which have been adopted by some of the world's top semiconductor manufacturers"

Failure analysis is integral to the development and manufacture of semiconductor integrated circuits. With every technology node that results in smaller geometries and faster devices, the incidence of failure increases significantly.

The new circuit architecture and advanced fabrication processes associated with the new technology nodes mean that new failure mechanisms have evolved which would require new failure analysis techniques for fault localisation and characterisation. Since failure analysis is a reactive step, the tools and techniques which lag behind the design and process technologies have, in recent years, been responsible for the delay in transition to the next technology node.

Led by Professor Jacob Phang, the team developed an integrated multi-laser near-infrared scanning optical microscope system for the design debug and failure analysis of advanced integrated circuits down to the 32 nm technology node. The system incorporates a suite of backside techniques for fault localisation jointly developed by National University of Singapore and SEMICAPS Pte Ltd. The joint project has resulted in active fault localisation techniques with the highest sensitivity and spatial resolution achievable.

Recently, the resolution and sensitivity enhancements techniques have also led to the successful imaging of a single defective via from 65 nm technology node. The joint project has also established a new paradigm of tester-based fault localisation techniques which allows design debug and failure analysis to take place at full device operating speeds.

This project has resulted in 13 publications, two best paper awards, four invited papers, four invited presentations and six patents.

In addition, SEMICAPS has also developed and commercialised five system configurations for analytical, tester-docked and wafer prober applications that meet the diverse needs of design debug,

product engineering, yield enhancements and customer returns for integrated device manufacturers, foundries, fab-less and failure analysis service companies.

The impact of the project is evident from the extensive adoption of these systems and techniques by integrated device manufacturers, foundries, fab-less companies and failure analysis service providers. As of 31 December 2008, the systems have been adopted by seven of the world's top 25 semiconductor manufacturers. Twenty-five systems with invoice values of more than SGD25M have been delivered worldwide, more than 90% of which were to destinations outside Singapore.

The development has provided the team with a strategic position to collaborate with leading semiconductor companies, research institutes and technology companies in projects that will lead to failure analysis technologies that will meet the future challenges of advanced semiconductor technology nodes.

For their outstanding contributions to the research, development and commercialisation of scanning optical microscope systems for design debug and failure analysis of advanced integrated circuits which have been adopted by some of the world's top semiconductor manufacturers, the team, made up of Professor Jacob C.H. Phang, Mr Chua Choon Meng, Mr Alfred C.T. Quah and Mr Goh Szu Huat from the Department of Electrical and Computer Engineering, National University of Singapore, and SEMICAPS Pte Ltd, Singapore, is awarded the 2009 President's Technology Award.