

PROCEEDINGS



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MESSAGE FROM THE CHAIRMAN



Ir. Dr. Hazian Mamat

Assalamualaikum warahmatullahi wabarakatuh.

Dear esteemed Guests, Distinguished Participants, and Honoured Sponsors,

We are delighted to extend our warmest welcome to all of you to the Regional Symposium on Micro and Nanoelectronics (RSM 2023). This year 2023 is the first time after the COVID-19 pandemic we are able to organise a physical event and hopefully the event will run smoothly.

RSM 2023 brings together exceptional participants including esteemed lecturers, industry engineers and researchers from various disciplines, each contributing their expertise to the pursuit of innovative engineering solutions. This vibrant convergence of minds promises to inspire ground-breaking ideas and set new benchmarks for progress in the field of engineering.

On behalf of the organizing committee, we thank you for your active participation in RSM 2023. Your strong continuous support in selecting RSM 2023 as the platform to publish your latest research in semiconductor electronics is greatly appreciated. During the 2-day conference, 38 oral presentations will be delivered across a broad spectrum of technical sessions. These include three keynote speakers which are Dato Prof. Dr. Zaliman Sauli (UNIMAP), Prof. Dr. Azrul Azlan Hamzah (UKM) and Dr. Yik Yee Tan (YOLE Group)

This is the 14th RSM organized by the Electron Devices Chapter of IEEE Malaysia Section and technically co-sponsored by the IEEE Electron Devices Society. Over the last Thirty years, RSM conference series has become the prominent international forum on semiconductor electronics embracing all aspects of the semiconductor technology under 4 main clusters which are Devices, Nanophotonic, IC Design and Manufacturing and Material, Process and Products.

As we embark on this remarkable journey of the Regional Symposium on Micro and Nanoelectronics (RSM 2023) we express our profound gratitude to all participants, sponsors and collaborators for their unwavering support in realizing this exceptional event. Together let us pave the way for a resilient, sustainable and transformative future through pioneering solutions. Finally, I hope that RSM 2023 will be successful and enjoyable to all participants.

Thank you and Terima kasih.

Ir. Dr. Hazian Mamat

Chairman

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2023 & 2024 IEEE EDS Malaysia Chapter**

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KEYNOTE 1

MICROELECTRONICS: A CONCISE OVERVIEW OF THE INDUSTRY LANDSCAPE IN MALAYSIA AND IN THE EMERGENCE OF IR 4.0.

Prof. Dato' Ts. Dr. Zaliman Sauli

Abstract: Microelectronics has been a prominent field for several decades since the introduction of the world's first transistor at Bell Laboratories in 1947. Over the years, significant progress has been made in microelectronics, including the development of the Integrated Circuit (IC), advancements in microfabrication processes, and the utilization of these technologies in the fabrication of MEMS and other advanced small-scale devices.

As the world embraces the era of Industrial Revolution 4.0 (IR 4.0), the importance of microelectronics in driving this revolutionary transformation becomes increasingly crucial. Malaysia has also been actively striving to keep pace with the ever-evolving microelectronics industry and semiconductor supply chain by fostering collaboration between relevant industries, government, and higher education institutions.

This talk aims to explore the evolutionary change of microelectronics in the IR 4.0 era with a glimpse of its application. The need for Microelectronic in the advent of IR 4.0 is highly required to fulfill the nation's aspiration to produce more sophisticated and holistic engineers and technologists.



Prof. Dato' Ts. Dr. Zaliman bin Sauli was born on 9 September 1967 in Kota Bharu, Kelantan. He furthered his studies at Universiti Teknologi Malaysia (UTM) in Physics followed by his Master's in Advanced Semiconductor Materials & Devices at the University of Surrey, United Kingdom and his Doctor of Philosophy (PhD) in Microelectronic Engineering at Universiti Malaysia Perlis (UniMAP).

Prof. Zaliman's career began at MIMOS in 1992 to 2002 where his final post there was as a Wafer Fabrication Product Manager and Training Services Manager. He then joined UniMAP on 09 January 2003 where he has been appointed as the Dean of the Centre for Communication and Entrepreneurship Skills, Director of the Centre for Industrial Collaboration, Dean of the School of Microelectronic Engineering, Director of the Co- Curriculum Centre and Dean of the Centre for Graduate Studies. Prof. Zaliman was appointed as the Deputy Vice Chancellor (Student & Alumni Affairs) of Universiti Malaysia Kelantan for a period of 3 years from 15 March 2018 until 14 March 2021. Beginning on August 09, 2021, Prof. Zaliman has been entrusted by the Ministry of Higher Education (MOHE) as the Vice Chancellor of UniMAP.

Prof. Zaliman has published over 200 WoS/Scopus indexed Journals and Proceedings as lead author and co -author and has also been a lead and co-researcher for 16 research grants. Some of his main research interests are in Wafer Fabrication Process Technologies, Device Characterization, Parametric and Functional Testing, Failure Analysis & Wafer Packaging, MEMS Technologies as well as Solid State & Theoretical Physics.

Currently, he is also serving as a Board Member for the Malaysia Board of Technologist (MBOT) beginning on the 22nd of July 2022 and is also a member of the national Specialized Task Force TVET (STF TVET).

KEYNOTE 2

MARKET AND TECHNOLOGY TRENDS OF ADVANCED PACKAGING

Dr. Tan Yik Yee
(Yole Intelligence, Malaysia)

Abstract: Advanced packaging has been rapidly growing in recent years, driven by the increasing demand in high-performance computing, artificial intelligence, and autonomous driving. It is getting traction from semiconductor industry as more than Moore solution to enhance system performance to enable higher device performance, increase bandwidth, offer lower latency, and lower power consumption. This keynote will give an overview of the market and technology trend in the advanced packaging. Other than that, the presentation will highlight the emerging trend of chiplet and how it drives the advanced packaging to attain heterogeneous integration. Advanced packaging players and their innovation direction and commercial product will be briefly discussed. Last, the presentation will highlight the importance of IC substrate in advanced packaging supply chain of semiconductor.



Dr. Tan Yik-Yee is a Senior Technology & Market Analyst, Semiconductor Packaging & Assembly at Yole Intelligent, within the Semiconductor, Memory & Computing division. Based in Malaysia, Yik Yee follows the semiconductor packaging industry and its evolution. Based on her technical expertise and market knowledge, she develops technology & market reports and is engaged in dedicated custom projects. Prior to Yole, Yik Yee Tan worked as a failure analyst and interconnect principal at Infineon Technologies (Malaysia) and later as an open innovation senior manager at Onsemi (Malaysia). While at Onsemi, Yik Yee was deeply involved in numerous innovative advanced packaging projects. Yik Yee Tan holds a Ph.D. in Engineering from Multimedia University (MMU, Malaysia).

KEYNOTE 3

GRAPHENE NANOBALLS FOR PERFORMANCE IMPROVEMENT OF THERMOELECTRIC ENERGY HARVESTER

Prof. Dr. Azrul Azlan Hamzah

Abstract: Renewable energy has been the center of attention in sustainable energy research for the past decade, as it is in line with the Sustainable Development Goals (SDG) of the United Nations. It supports SDG 7: affordable and clean energy, SDG 11: sustainable cities and communities, and SDG 13: climate action. Among the renewable energy sources, thermoelectric energy (TE) harvester stands out as a clean and environmental friendly energy source as it directly converts waste heat into electrical energy. Upon successful implementation, TE harvester would greatly reduce world's dependency on fossil fuel, promotes clean energy conversion and supply for domestic and industrial use, while reducing global carbon footprint and greenhouse effect. In this context, our prototype increases the thermoelectric conversion efficiency of a TE harvester by infusing graphene nanoballs into bismuth telluride (Bi_2Te_3) thermoelectric generator (TEG). The graphene nanoballs increase the total ZT value of the Bi_2Te_3 /graphene nanoballs composite, resulting in a better performance TEG. In our laboratory prototype, the ZT value increased by 22.7%, which plausibly increases TEG efficiency from the typical 8% to 11%, thus pushing this Bi_2Te_3 /graphene nanoballs TEG into a commercially viable product.



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