



## Heterogeneous Integration of Power Conversion using Power Supply on Chip and Power Supply in Package

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### Abstract:

The talk will discuss the performance opportunities and technology challenges through the emergence of heterogeneous integration of power converters (including power management ICs, power switches, magnetics and capacitors) into processor packages using PCB-embedding, 2.5D or even 3D packaging concepts to deliver significant system-level energy savings.

This talk will discuss the impact of the commercial emergence, of magnetics-on-silicon technology and associated PCB-embedded magnetics technologies which are enabling Power Supply on Chip and Power Supply in Package platforms. These technologies, along with integrated high density capacitor technologies, PMICs and power switches, are central to the ongoing development of the concept of integrated, granular power for multi-core microprocessors and other complex system-on-chip (SOC) platforms.

### Curriculum Vitae:



**Cian Ó Mathúna** is Head of Micronamo Systems at Ireland's Tyndall National Institute. His research, over three decades, into the miniaturisation and integration of magnetics-on-silicon, has played a key role in disruptive developments in integrated power management for applications in portable electronics and high performance computing. Using semiconductor processing of thin-film magnetics, Ó Mathúna's team have made bulky power magnetic components disappear onto silicon chips. Referred to as MagIC, Tyndall's magnetics-on-silicon technology has been licensed to two of the world's leading consumer electronics companies as well as a leading semiconductor foundry.

In 2008, Cian founded the International Workshop on Power Supply on Chip (PwrSoC) which has become the highly-influential flagship workshop for the IEEE Power Electronics Society and the US-based Power Sources Manufacturers Association (PSMA). Through his leadership in PwrSoC, and his extensive collaborations with world-leading industry players in Europe, USA and Asia, Ó Mathúna has had a significant influence on the emergence of a global supply-chain that, in 2021, began delivery of high-volume production of magnetics-on-silicon for use in commercial product.

In 2013, Prof. Ó Mathúna was elevated to IEEE Fellow with the citation "*for leadership in the development of power supply using micromagnetics on silicon*". For his impact on the



industry, Ó Mathúna has, in 2021, been awarded the IEEE Power Electronics Society Technical Achievement Award for Integration and Miniaturisation of Switching Power Converters. For the development of the MagIC technology and its expected impact over the next decade, the Integrated Magnetics team has, in 2021, also received one of two 2021 EARTO (European Association of Research and Technology Organisations) Impact Innovation Awards.



**Seamus O'Driscoll** is currently Head of Group for Integrated Power Systems at Microelectronics Circuits Centre Ireland, Tyndall National Institute, Cork, Ireland. He is leading a number of research themes spanning ultralow-power management integrated circuits (PMIC), isolated PwrSiP converters, smart gate drivers, and point-of-load dc-dc, with all employing thin-film magnetics-on-silicon or substrate-embedded magnetic solutions. Earlier career roles have included a Power Control Silicon Systems Architect with Texas Instruments Ltd., Cork, and a Corporate Technology Staff Engineer with Artesyn Technologies Ltd., Youghal, Cork. He has released many professional power product designs to the world's leading communications and computer companies.

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