

MSE's 30th Anniversary Colloquium Series



Ultralow Power Flexible Electronics

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Abstract

A key design consideration in flexible electronics, particularly for wearables and sensing applications, is low voltage, low power operation. This requirement not only serves to maximise battery lifetime but crucially ensures operational stability of thin film transistor (TFT) circuits and systems. Ultralow voltage/current operation is especially important in sensor interfaces so as to achieve a high resolution of the sensory signal. This presentation will review the TFT design and materials selection strategies for ultralow power operation. We examine the main issues that lead to a high operating voltage of the TFT, and discuss processing conditions for suppressing the interface trap density. Recent advances in low-voltage thin-film transistors show it is possible for the subthreshold slope to approach the thermionic limit, q/kT . Based on these considerations, an all-inkjet-printed ultra-low-power high-gain amplifier, applied to eye movement tracking by detecting human electrooculogram signals, is presented.

Biography

Arokia Nathan is a leading pioneer in the development and application of thin film transistor technologies to flexible electronics, display and sensor systems. Following his PhD in Electrical Engineering, University of Alberta, Canada in 1988, he joined LSI Logic USA and subsequently the Institute of Quantum Electronics, ETH Zürich, Switzerland, before joining the Electrical and Computer Engineering Department, University of Waterloo, Canada. In 2006, he joined the London Centre for Nanotechnology, University College London as the Sumitomo Chair of Nanotechnology. He moved to Cambridge University in 2011 as the Chair of Photonic Systems and Displays, and he is currently a Bye-Fellow and Tutor at Darwin College. He has over 600 publications including 4 books, and more than 110 patents and four spin-off companies. He is a Fellow of IEEE, a Distinguished Lecturer of the IEEE Electron Devices Society and Sensor Council, a Chartered Engineer (UK), Fellow of the Institution of Engineering and Technology (UK), and winner of the 2020 IEEE EDS JJ Ebers Award.

31 Aug 2021 (Tuesday)

4:00 PM (Singapore) / 9:00 AM (UK)

Live streaming via: <https://ntu-sg.zoom.us/j/91780057633>

Meeting ID: 917 8005 7633 Passcode: **310821**