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Graphene Material for Microelectronic Devices and Circuits: Challenges and Perspectives

Graphene is a material with unique electronic transport properties, which make it an excellent candidate for advanced applications in future microelectronic devices and circuits. In this paper, we discuss first the basic electronic structure and transport properties of graphene and the fabrication of field-effect transistor (FET) and other devices, then focus on the explorations of ESD protection application of graphene-based nanoelectro-mechanical system (gNEMS) with characteristics of almost zero leakage, excellent high speed switching and high frequency application of graphene transistors with record-high cutoff frequencies, maximum oscillation frequencies and voltage gain. Results of experimental investigations and physical insights into the reliability issue and failure mechanism of the graphene ESD device by transient transmission line pulse (TLP) measurement will be presented in detail, while the potential of graphene in high-speed analog electronics is being explored.

Biography

Yuhua Cheng, IEEE Fellow, received the BSEE, MSEE and Ph.D. EE degrees in Shandong Polytechnic University, Tianjin University and Tsinghua University, China in 1982, 1985 and 1989, respectively. In 1990, he joined in the Institute of Microelectronics (IME), Peking University, China and become an associate professor in 1992. From 1994 to 1996, he worked at academic research positions in Norwegian University of Science and Technology and UC Berkeley. From 1997-2006, he worked at technical and management positions in Rockwell, Conexant, Skyworks and Siliconix in USA. He is now a full professor of Peking University and Dean of Shanghai Research Institute of Microelectronics, a remote research center located in Shanghai. His research interests include advanced analog/mixed-signal/RF IC designs and SiP design for system integration applications.