FinFET Self-heating: Measurements, Concerns and Applications

Zakariae Chbili – Intel Corporation

Abstract:
FinFET Self-heating has been an emerging reliability concern in advanced nodes. Understanding self-heating measurement results and accuracy is extremely important. In this tutorial we will present several methods for self-heating characterization and a detailed methodology guide. We will also discuss the impact of several parameters on the interpretation of the results. Some parameters include test structure type, layout, location, variability and ambient temperature. Next, we will dive into the impact of self-heating on FEOL reliability mechanisms such as hot carrier and TDDB during characterization and in normal usage, including a case study on a ring oscillator circuit. Finally, we will show a non-volatile memory application where self-heating is used to improve the programming and retention of the memory device.

Biography:
Zakariae Chbili received the B.S. degree in electrical engineering from Sidi Mohamed Ben Abdellah University, Fes, Morocco, in 2007, the M.S. degree in electrical engineering from the Institut National des Sciences Appliquées, Toulouse, France, in 2008, and the Ph.D. degree in electrical and computer engineering from George Mason University. He was with the National Institute of Standard and Technology, Gaithersburg, MD, USA as a Guest Researcher from 2010 to 2015 and with GLOBALFOUNDRIES Inc. from 2015 to 2019 where he managed the Northeast Reliability Labs. Zak is currently with Intel Corporation Folsom CA, as a Quality reliability R&D engineer in the Intel Optane Group. His research interests include the reliability of emerging memory devices, reliability of advanced nodes, physics of degradation and breakdown in ultrathin gate oxides, and FinFET self-heating. Zak served as the General Chairman of IIRW 2019.