SOI Lubistors: Lateral, Unidirectional, Bipolar-type Insulated-gate Transistors
Yasuhisa Omura

DESCRIPTION

Advanced level consolidation of the technology, physics and design aspects of silicon-on-insulator (SOI) lubistors

No comprehensive description of the physics and possible applications of the Lubistor can be found in a single source even though the Lubistor is already being used in SOI LSIs. The book provides, for the first time, a comprehensive understanding of the physics of the Lubistor. The author argues that a clear understanding of the fundamental physics of the pn junction is essential to allowing scientists and engineers to propose new devices. Since 2001 IBM has been applying the Lubistor to commercial SOI LSIs (large scale integrated devices) used in PCs and game machines. It is a key device in that it provides electrostatic protection to the LSIs. The book explains the device modeling for such applications, and covers the recent analog circuit application of the voltage reference circuit.

The author also reviews the physics and the modeling of ideal and non-ideal pn junctions through reconsideration of the Shockley’s theory, offering readers an opportunity to study the physics of pn junction. Pn-junction devices are already applied to the optical communication system as the light emitter and the receiver. Alternatively, optical signal modulators are proposed for coupling the Si optical waveguide with the pn-junction injector. The book also explores the photonic crystal physics and device applications of the Lubistor.

- Advanced level consolidation of the technology, physics and design aspects of silicon-on-insulator (SOI) lubistors
- Written by the inventor of the Lubistor, this volume describes the technology for readers to understand the physics and applications of the device
• First book devoted to the Lubistor transistor, presently being utilized in electrostatic discharge (ESD) applications in SOI technology, a growing market for semiconductor devices and advanced technologies

• Approaches the topic in a systematic manner, from physical theory, through to modelling, and finally circuit applications

This is an advanced level book requiring knowledge of electrical and electronics engineering at graduate level.

Contents includes: Concept of Ideal pn Junction/Proposal of Lateral, Unidirectional, Bipolar-Type Insulated-Gate Transistor (Lubistor)/ Noise Characteristics and Modeling of Lubistor/Negative Conductance Properties in Extremely Thin SOI Lubistors/

Two-Dimensionally Confined Injection Phenomena at Low Temperatures in Sub-10-nm-Thick SOI Lubistors/ Experimental Study of Two-Dimensional Confinement Effects on Reverse-Biased Current Characteristics of Ultra-Thin SOI Lubistors/

Gate-Controlled Bipolar Action in Ultra-thin Dynamic Threshold SOI MOSFET/Sub-Circuit Models of SOI Lubistors for Electrostatic Discharge Protection Circuit Design and Their Applications/A New Basic Element for Neural Logic Functions and Functionality in Circuit Applications/Possible Implementation of SOI Lubistors into Conventional Logic Circuits/Potentiality of Electro-Optic Modulator Based on SOI Waveguide/Principles of Parameter Extraction/Feasibility of Lubistor-Based Avalanche Photo Transistor

⚠️ ABOUT THE AUTHOR

Professor Yasuhisa Omura, Department of Electric, Electronics and Information Engineering, Kansai University, Osaka, Japan

Professor Omura obtained his Ph D in Engineering from Kyushu University, Japan, in 1984, having been awarded Young Researcher Award (for the proposal of the Lubistor) from IEICE, Japan the previous year. Since inventing the Lubistor in 1982, he has published 12 papers and 10 conference papers characterizing its operation, its physics, and possible applications, in addition to almost 300 published articles and conference papers on other area of interest, including physics-based device modeling and photonic crystal design and propagation mode control. He has been an IEEE Fellow since 2010.

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