Power Devices for Efficient Energy Conversion

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Preface

Recently the role of power electronics and power devices in addressing the challenges in power and energy conversion and storage has been given wide attention as climate change has become a crucial global issue. In power electronics applications, the power density factor related to system design has improved remarkably in the past two decades. The main contributions in this growth have come from timely development of newer power modules, achieved through multidimensional major breakthroughs in insulated gate bipolar transistor (IGBT) and other power chip technologies; packaging structures; and functionality integration concepts. Driven by various application needs in the past decades, various generations of the IGBT and intelligent power modules (IPMs) have evolved so far and have been widely applied in different power electronics devices, covering industrial motor controls, household appliances, railway traction, automotive power-train electronics, windmill and solar power generation systems, etc. Additionally, aggressive R&D achievements have been made in wide-bandgap (WBG) power devices, especially by employing SiC as the base semiconductor material.

In this book, state-of-the-art power device technologies, their physics and operating principles, features related to design, and tips for applications that have driven the various device evolutions will be discussed. Also, the major development trends in the areas of power chip and module technologies will be introduced, including perspectives of WBG devices.

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