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F1E2TL - HAILIE RODGERS

The large scale integration and planar scaling of individual system chips is reaching an expensive limit. If individual chips now, and later terrabyte memory blocks, memory macros, and processing cores, can be tightly linked in optimally designed and processed small footprint vertical stacks, then performance can be increased, power reduced and cost contained. This book reviews for the electronics industry engineer, professional and student the critical areas of development for 3D vertical memory chips including: gate-all-around and junction-less nanowire memories, stacked thin film and double gate memories, terrabit vertical channel and vertical gate stacked NAND flash, large scale stacking of Resistance RAM cross-point arrays, and 2.5D/3D stacking of memory and processor chips with through-silicon-via connections now and remote links later. Key features: Presents a review of the status and trends in 3-dimensional vertical memory chip technologies. Extensively reviews advanced vertical memory chip technology and development Explores technology process routes and 3D chip integration in a single reference

The technology behind computers, fiber optics, and networks did not originate in the minds of engineers attempting to build an Internet. The Internet is a culmination of intellectual work by thousands of minds spanning hundreds of years. We have built concept upon concept and technology upon technology to arrive at where we are today, in a world constructed of silicon pathways and controlled by silicon processors. From computers to optical communications, The Silicon Web: Physics for the Internet Age explores the core principles of physics that underlie those technologies that continue to revolutionize our everyday lives. Designed for the nonscientist, this text requires no higher math or prior experience with physics. It starts with an introduction to physics, silicon, and the Internet and then details the basic physics principles at the core of the information technology revolution. A third part ex-

amines the quantum era, with in-depth discussion of digital memory and computers. The final part moves onto the Internet era, covering lasers, optical fibers, light amplification, and fiber-optic and wireless communication technologies. The relation between technology and daily life is so intertwined that it is impossible to fully understand modern human experience without having at least a basic understanding of the concepts and history behind modern technology, which continues to become more prevalent as well as more ubiquitous. Going beyond the technical, the book also looks at ways in which science has changed the course of history. It clarifies common misconceptions while offering insight on the social impacts of science with an emphasis on information technology. As a pioneering researcher in quantum mechanics of light, author Michael Raymer has made his own significant contributions to contemporary communications technology

Digital photography, MP3, digital video, etc. make extensive use of NAND-based Flash cards as storage media. To realize how much NAND Flash memories pervade every aspect of our life, just imagine how our recent habits would change if the NAND memories suddenly disappeared. To take a picture it would be necessary to find a film (as well as a traditional camera...), disks or even magnetic tapes would be used to record a video or to listen a song, and a cellular phone would return to be a simple mean of communication rather than a multimedia console. The development of NAND Flash memories will not be set down on the mere evolution of personal entertainment systems since a new killer application can trigger a further success: the replacement of Hard Disk Drives (HDDs) with Solid State Drives (SSDs). SSD is made up by a microcontroller and several NANDs. As NAND is the technology driver for IC circuits, Flash designers and technologists have to deal with a lot of challenges. Therefore, SSD (system) developers must understand Flash technology in order to exploit its benefits and countermeasure its weaknesses. Inside NAND Flash Memories is a comprehensive guide of the NAND world: from circuits design (analog and digital) to Flash reliability (including radiation effects), from testing issues to high-performance (DDR) interface, from error correction codes to NAND applications like Flash cards and SSDs.

Must-have reference on electronic packaging technology! The electronics industry is shifting towards system packaging technology due to the need for higher chip circuit density without increasing production costs. Electronic packaging, or circuit integration, is seen as a necessary strategy to achieve a performance growth of electronic circuitry in next-generation electronics. With the implementation of novel materials with specific and tunable electrical and magnetic properties, electronic packaging is highly attractive as a solution to achieve denser levels of circuit integration. The first part of the book gives an overview of electronic packaging and provides the reader with the fundamentals of the most important packaging techniques such as wire bonding, tap automatic bonding, flip chip solder joint bonding, microbump bonding, and low temperature direct Cu-to-Cu bonding. Part two consists of concepts of electronic circuit design and its role in low power devices, biomedical devices, and

circuit integration. The last part of the book contains topics based on the science of electronic packaging and the reliability of packaging technology.

Undoubtedly the applications of polymers are rapidly evolving. Technology is continually changing and quickly advancing as polymers are needed to solve a variety of day-to--day challenges leading to improvements in quality of life. The Encyclopedia of Polymer Applications presents state-of-the-art research and development on the applications of polymers. This groundbreaking work provides important overviews to help stimulate further advancements in all areas of polymers. This comprehensive multi-volume reference includes articles contributed from a diverse and global team of renowned researchers. It offers a broad-based perspective on a multitude of topics in a variety of applications, as well as detailed research information, figures, tables, illustrations, and references. The encyclopedia provides introductions, classifications, properties, selection, types, technologies, shelf-life, recycling, testing and applications for each of the entries where applicable. It features critical content for both novices and experts including, engineers, scientists (polymer scientists, materials scientists, biomedical engineers, macromolecular chemists), researchers, and students, as well as interested readers in academia, industry, and research institutions.

In the development of next-generation nanoscale devices, higher speed and lower power operation is the name of the game. Increasing reliance on mobile computers, mobile phone, and other electronic devices demands a greater degree of speed and power. As chemical mechanical planarization (CMP) progressively becomes perceived less as black art and more as a cutting-edge technology, it is emerging as the technology for achieving higher performance devices. Nanoparticle Engineering for Chemical-Mechanical Planarization explains the physicochemical properties of nanoparticles according to each step in the CMP process, including dielectric CMP, shallow trend isolation CMP, metal CMP, poly isolation CMP, and noble metal CMP. The authors provide a detailed guide to nanoparticle engineering of novel CMP slurry for next-generation nanoscale devices below the 60nm design rule. They present design techniques using polymeric additives to improve CMP performance. The final chapter focuses on novel CMP slurry for the application to memory devices beyond 50nm technology. Most books published on CMP focus on the polishing process, equipment, and cleaning. Even though some of these books may touch on CMP slurries, the methods they cover are confined to conventional slurries and none cover them with the detail required for the development of next-generation devices. With its coverage of fundamental concepts and novel technologies, this book delivers expert insight into CMP for all current and next-generation systems.

A comprehensive guide to 3D IC integration and packaging technology 3D IC Integration and Packaging fully explains the latest microelectronics techniques for increasing chip density and maximizing performance while reducing power consumption. Based on a course developed by its author, this practical guide offers real--world problem-solving methods and teaches the trade-offs inherent in mak-

ing system-level decisions. Explore key enabling technologies such as TSV, thin-wafer strength measurement and handling, microsolder bumping, redistribution layers, interposers, wafer--to-wafer bonding, chip--to-wafer bonding, 3D IC and MEMS, LED, and complementary metal-oxide semiconductor image sensors integration. Assembly, thermal management, and reliability are covered in complete detail. 3D IC Integration and Packaging covers: • 3D integration for semiconductor IC packaging• Through-silicon vias modeling and testing• Stress sensors for thin-wafer handling and strength measurement• Package substrate technologies• Microbump fabrication, assembly, and reliability• 3D Si integration• 2.5D/3D IC integration• 3D IC integration with passive interposer• Thermal management of 2.5D/3D IC integration• Embedded 3D hybrid integration• 3D LED and IC integration• 3D MEMS and IC integration• 3D CMOS image sensors and IC integration• PoP, chip-to-chip interconnects, and embedded fan-out WLP

Offers a comprehensive overview of NAND flash memories, with insights into NAND history, technology, challenges, evolutions, and perspectives Describes new program disturb issues, data retention, power consumption, and possible solutions for the challenges of 3D NAND flash memory Written by an authority in NAND flash memory technology, with over 25 years' experience

Today's integrated silicon circuits and systems for wireless communications are of a huge complexity.This unique compendium covers all the steps (from the system-level to the transistor-level) necessary to design, model, verify, implement, and test a silicon system. It bridges the gap between the system-world and the transistor-world (between communication, system, circuit, device, and test engineers).It is extremely important nowadays (and will be more important in the future) for communication, system, and circuit engineers to understand the physical implications of system and circuit solutions based on hardware/-software co-design as well as for device and test engineers to cope with the system and circuit requirements in terms of power, speed, and data throughput.Related Link(s)

Three-dimensional (3D) integrated circuit (IC) stacking is the next big step in electronic system integration. It enables packing more functionality, as well as integration of heterogeneous materials, devices, and signals, in the same space (volume). This results in consumer electronics (e.g., mobile, handheld devices) which can run more powerful applications, such as full-length movies and 3D games, with longer battery life. This technology is so promising that it is expected to be a mainstream technology a few years from now, less than 10-15 years from its original conception. To achieve this type of end product, changes in the entire manufacturing and design process of electronic systems are taking place. This book provides readers with an accessible tutorial on a broad range of topics essential to the non-expert in 3D System Integration. It is an invaluable resource for anybody in need of an overview of the 3D manufacturing and design chain.

Based on unprecedented access to the corporation's archives, The Intel Trinity is the first full history of Intel Corporation—the essential company of the digital age—told through the lives of

the three most important figures in the company's history: Robert Noyce, Gordon Moore, and Andy Grove. Often hailed the "most important company in the world," Intel remains, more than four decades after its inception, a defining company of the global digital economy. The legendary inventors of the microprocessor-the single most important product in the modern world-Intel today builds the tiny "engines" that power almost every intelligent electronic device on the planet. But the true story of Intel is the human story of the trio of geniuses behind it. Michael S. Malone reveals how each brought different things to Intel, and at different times. Noyce, the most respected high tech figure of his generation, brought credibility (and money) to the company's founding; Moore made Intel the world's technological leader; and Grove, has relentlessly driven the company to ever-higher levels of success and competitiveness. Without any one of these figures, Intel would never have achieved its historic success; with them, Intel made possible the personal computer, Internet, telecommunications, and the personal electronics revolutions. The Intel Trinity is not just the story of Intel's legendary past; it also offers an analysis of the formidable challenges that lie ahead as the company struggles to maintain its dominance, its culture, and its legacy. With eight pages of black-and-white photos.

Storage Systems: Organization, Performance, Coding, Reliability and Their Data Processing was motivated by the 1988 Redundant Array of Inexpensive/Independent Disks proposal to replace large form factor mainframe disks with an array of commodity disks. Disk loads are balanced by striping data into strips—with one strip per disk— and storage reliability is enhanced via replication or erasure coding, which at best dedicates k strips per stripe to tolerate k disk failures. Flash memories have resulted in a paradigm shift with Solid State Drives (SSDs) replacing Hard Disk Drives (HDDs) for high performance applications. RAID and Flash have resulted in the emergence of new storage companies, namely EMC, NetApp, SanDisk, and Purestorage, and a multibillion--dollar storage market. Key new conferences and publications are reviewed in this book. The goal of the book is to expose students, researchers, and IT professionals to the more important developments in storage systems, while covering the evolution of storage technologies, traditional and novel databases, and novel sources of data. We describe several prototypes: FAWN at CMU, RAMCloud at Stanford, and Lightstore at MIT; Oracle's Exadata, AWS' Aurora, Alibaba's PolarDB, Fungible Data Center; and author's paper designs for cloud storage, namely heterogeneous disk arrays and hierarchical RAID. • Surveys storage technologies and lists sources of data: measurements, text, audio, images, and video • Familiarizes with paradigms to improve performance: caching, prefetching, log-structured file systems, and merge-trees (LSMs) • Describes RAID organizations and analyzes their performance and reliability • Conserves storage via data compression, deduplication, compaction, and secures data via encryption • Specifies implications of storage technologies on performance and power consumption • Exemplifies database parallelism for big data, analytics, deep learning via multicore CPUs, GPUs, FPGAs, and ASICs, e.g., Google's Ten-

sor Processing Units

This volume constitutes the refereed proceedings of the International Conference on Digital Enterprise and Information Systems, held in London during July 20 - 22, 2011. The 70 revised full papers presented were carefully reviewed and selected. They are organized in topical sections on cryptography and data protection, embedded systems and software, information technology management, e-business applications and software, critical computing and storage, distributed and parallel applications, digital management products, image processing, digital enterprises, XML-based languages, digital libraries, and data mining.

Life-Cycle Assessment of Semiconductors presents the first and thus far only available transparent and complete life cycle assessment of semiconductor devices. A lack of reliable semiconductor LCA data has been a major challenge to evaluation of the potential environmental benefits of information technologies (IT). The analysis and results presented in this book will allow a higher degree of confidence and certainty in decisions concerning the use of IT in efforts to reduce climate change and other environmental effects. Coverage includes but is not limited to semiconductor manufacturing trends by product type and geography, unique coverage of life-cycle assessment, with a focus on uncertainty and sensitivity analysis of energy and global warming missions for CMOS logic devices, life cycle assessment of flash memory and life cycle assessment of DRAM. The information and conclusions discussed here will be highly relevant and useful to individuals and institutions.

Solid State Drives (SSDs) are gaining momentum in enterprise and client applications, replacing Hard Disk Drives (HDDs) by offering higher performance and lower power. In the enterprise, developers of data center server and storage systems have seen CPU performance growing exponentially for the past two decades, while HDD performance has improved linearly for the same period. Additionally, multi-core CPU designs and virtualization have increased randomness of storage I/Os. These trends have shifted performance bottlenecks to enterprise storage systems. Business critical applications such as online transaction processing, financial data processing and database mining are increasingly limited by storage performance. In client applications, small mobile platforms are leaving little room for batteries while demanding long life out of them. Therefore, reducing both idle and active power consumption has become critical. Additionally, client storage systems are in need of significant performance improvement as well as supporting small robust form factors. Ultimately, client systems are optimizing for best performance/power ratio as well as performance/cost ratio. SSDs promise to address both enterprise and client storage requirements by drastically improving performance while at the same time reducing power. Inside Solid State Drives walks the reader through all the main topics related to SSDs: from NAND Flash to memory controller (hardware and software), from I/O interfaces (PCIe/SAS/SATA) to reliability, from error correction codes (BCH and LDPC) to encryption, from Flash signal processing to hybrid storage. We hope you enjoy this tour inside Solid State Drives.

Physical Design for 3D In-

tegrated Circuits reveals how to effectively and optimally design 3D integrated circuits (ICs). It also analyzes the design tools for 3D circuits while exploiting the benefits of 3D technology. The book begins by offering an overview of physical design challenges with respect to conventional 2D circuits, and then each chapter delivers an in--depth look at a specific physical design topic. This comprehensive reference: Contains extensive coverage of the physical design of 2.5D/3D ICs and monolithic 3D ICs Supplies state-of-the-art solutions for challenges unique to 3D circuit design Features contributions from renowned experts in their respective fields Physical Design for 3D Integrated Circuits provides a single, convenient source of cutting-edge information for those pursuing 2.5D/3D technology.

This book provides an introduction to digital storage for consumer electronics. It discusses the various types of digital storage, including emerging non-volatile solid-state storage technologies and their advantages and disadvantages. It discusses the best practices for selecting, integrating, and using storage devices for various applications. It explores the networking of devices into an overall organization that results in always-available home storage combined with digital storage in the cloud to create an infrastructure to support emerging consumer applications and the Internet of Things. It also looks at the role of digital storage devices in creating security and privacy in consumer products.

Our report on 3D stacked memory technology covers the Intellectual Property (Patent) landscape of this rapidly evolving technology and monitors its various sub-domains for licensing activity. We have analyzed the IP portfolios of SanDisk, Micron, Samsung, IBM and other major players to find the focus areas of their patenting efforts. Using our proprietary patent analytics tool, LexScore™, we identify the front runners in this technology domain with strong patent portfolio quality as well as a heavy patent filing activity. Using our proprietary Licensing Heat-map framework, we also predict licensing activity trend in various technology sub domains.

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This book systematically reviews the development process of the world Internet and comprehensively reveals the great contributions of the Internet to economic development and social progress. The world today is marked by changes unseen in a century, and Internet development is facing new opportunities and challenges. In 2020, the COVID-19 epidemic broke out and spread at the global scale, which enormously impacted the global economy and society. Internet played an increasingly important role. Meanwhile, based on the development status of the global Internet, this book fully reflects the development process, status and trend of the world Internet in 2020, systematically summarizes the development status and highlights of the Internet in the major countries around the world, and makes an in--depth analysis of the new conditions, new dynamics and new trends of the development in the key Internet fields; the contents

cover the information infrastructure, information technology, digital economy, digital government, internet media, network security, and international cyberspace governance, and other aspects. Moreover, this book further adjusts and enriches the development index systems of the world Internet, in the hope of better showing the development strength and development advantages of the Internet in various countries, and reflecting the overall development trend of the world Internet more comprehensively, accurately and objectively. From an objective perspective, this book collects the latest research results in the global internet field, featuring comprehensive contents and highlights; from a historical perspective, this book reviews the significant development process of the global internet, summarizes the experience and faces the future; from a global perspective, this book tries to construct the cyberspace community with a common future based on the new concepts, new ideas and new achievements of various countries in participating in cyberspace development and construction. This book provides an important reference value for employees in Internet fields, such as government departments, Internet enterprises, scientific research institutions, colleges and universities, to fully understand and master the development of the world internet.

This book provides a comprehensive overview of the differenttechnological approaches currently being studied to fulfill futurememory requirements. Two main research paths are identified anddiscussed. Different “evolutionary paths” based on newmaterials and new transistor structures are investigated to extendclassical floating gate technology to the 32 nm node.“Disruptive paths” are also covered, addressing 22 nmand smaller IC generations. Finally, the main factors at the originof these phenomena are identified and analyzed, providing pointerson future research activities and developments in this area.

What do we mean when we say designing risk? Every event that occurs does not happen in isolation. An event is a combination of people, places, and things, and is associated with a time period. Each event affects other events, like a ripple in a pond. They are all interrelated and woven into an invisible fabric that is the current state of being. One cannot ignore this fact when designing an IT infrastructure or planning a long-term technological strategy, because infrastructures are not comprised of detached components operating in isolation. Risk is defined by a probability and an impact, which can be represented qualitatively or quantitatively. Or in simple terms: something may happen and it might hurt a lot or a little. You can guess and gamble your way through it, or you can truly understand what your options are and start planning. This book will give you the ability to see beyond a fault or failure, and start understanding the relationships between risk response, resources, cost and acceptance.

Issues in Electronic Circuits, Devices, and Materials: 2012 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Lasers and Photonics. The editors have built Issues in Electronic Circuits, Devices, and Materials: 2012 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Lasers and Photon-

ics in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Electronic Circuits, Devices, and Materials: 2012 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Rising consumer demand for low power consumption electronics has generated a need for scalable and reliable memory devices with low power consumption. At present, scaling memory devices and lowering their power consumption is becoming more difficult due to unresolved challenges, such as short channel effect, Drain Induced Barrier Lowering (DIBL), and sub-surface punch-through effect, all of which cause high leakage currents. As a result, the introduction of different memory architectures or materials is crucial. Nanomaterials-based Charge Trapping Memory Devices provides a detailed explanation of memory device operation and an in-depth analysis of the requirements of future scalable and low powered memory devices in terms of new materials properties. The book presents techniques to fabricate nanomaterials with the desired properties. Finally, the book highlights the effect of incorporating such nanomaterials in memory devices. This book is an important reference for materials scientists and engineers, who are looking to develop low-powered solutions to meet the growing demand for consumer electronic products and devices. Explores in depth memory device operation, requirements and challenges Presents fabrication methods and characterization results of new nanomaterials using techniques, including laser ablation of nanoparticles, ALD growth of nano-islands, and agglomeration-based technique of nanoparticles Demonstrates how nanomaterials affect the performance of memory devices

This book walks the reader through the next step in the evolution of NAND flash memory technology, namely the development of 3D flash memories, in which multiple layers of memory cells are grown within the same piece of silicon. It describes their working principles, device architectures, fabrication techniques and practical implementations, and highlights why 3D flash is a brand new technology. After reviewing market trends for both NAND and solid state drives (SSDs), the book digs into the details of the flash memory cell itself, covering both floating gate and emerging charge trap technologies. There is a plethora of different materials and vertical integration schemes out there. New memory cells, new materials, new architectures (3D Stacked, BiCS and P-BiCS, 3D FG, 3D VG, 3D advanced architectures); basically, each NAND manufacturer has its own solution. Chapter 3 to chapter 7 offer a broad overview of how 3D can materialize. The 3D wave is impacting emerging memories as well and chapter 8 covers 3D RRAM (resistive RAM) crosspoint arrays. Visualizing 3D structures can be a challenge for the human brain: this is way all these chapters

contain a lot of bird's-eye views and cross sections along the 3 axes. The second part of the book is devoted to other important aspects, such as advanced packaging technology (i.e. TSV in chapter 9) and error correction codes, which have been leveraged to improve flash reliability for decades. Chapter 10 describes the evolution from legacy BCH to the most recent LDPC codes, while chapter 11 deals with some of the most recent advancements in the ECC field. Last but not least, chapter 12 looks at 3D flash memories from a system perspective. Is 14nm the last step for planar cells? Can 100 layers be integrated within the same piece of silicon? Is 4 bit/cell possible with 3D? Will 3D be reliable enough for enterprise and datacenter applications? These are some of the questions that this book helps answering by providing insights into 3D flash memory design, process technology and applications.

Offering first-hand insights by top scientists and industry experts at the forefront of R&D into nanoelectronics, this book neatly links the underlying technological principles with present and future applications. A brief introduction is followed by an overview of present and emerging logic devices, memories and power technologies. Specific chapters are dedicated to the enabling factors, such as new materials, characterization techniques, smart manufacturing and advanced circuit design. The second part of the book provides detailed coverage of the current state and showcases real future applications in a wide range of fields: safety, transport, medicine, environment, manufacturing, and social life, including an analysis of emerging trends in the internet of things and cyber-physical systems. A survey of main economic factors and trends concludes the book. Highlighting the importance of nanoelectronics in the core fields of communication and information technology, this is essential reading for materials scientists, electronics and electrical engineers, as well as those working in the semiconductor and sensor industries.

The management magazine for the electronics industry.

Solar Panel Processing discusses solar cell technology including theory of operation, efficiency, materials, research on silicon processing, thin-film processing, polymer processing, nanoparticle processing, and transparent conductors. The hand book presents detailed descriptions of thin film processing of amorphous silicon, CdTe, CIGS, and GaAs panels. The handbook details Key Growth Drivers us solar panel usage, Challenges Facing The Solar Power Industry , Cost Of A Photovoltaic System, and Operating Metrics 0f A Photovoltaic Systems Increasing focus on the demand for energy led to conduct this study, which determines the current status of thin films used in various kinds of energy. Our goal was to assess the value of thin films used in the fabrication of six energy technologies for 2007, project 2008 demand, and then forecast thin film demand growth to 2013. This study focuses on the merits of thin films and main key objective was to present a comprehensive analysis of the current market for thin films and its future direction. Global demand for traditional fossil fuels has risen at an unprecedented rate over the lest several years. The economics of supply and demand have driven prices of oil, gas, and coal to record levels. In addition, fossil fuels are considered a source of pol-

lution that aids climate change. Nations have responded by instituting reductions in activities that require the use of fossil fuels and by searching for alternative energy methods. This handbook examines traditional crystalline and thin film photovoltaic fabrication and operation. Thin films are often applied to reduce the cost of product fabrication, improve performance, and provide more flexibility in product design. In addition, they are environmentally benign. The Solar Panel Processing Handbook study of thin films in energy presents current and emerging technologies for various types of solar cells, detaisl the industry structure of each segment, discusses the competitive environment of each type of energy, and reviews current and future applications for thin films. Handbook study will be of interest to those who make solar cells, semiconductors and their manufacturing equipment, thin films, materials, chemicals and gases.

The revised second edition of this respected text provides a state-of-the-art overview of the main topics relating to solid state drives (SSDs), covering NAND flash memories, memory controllers (including booth hardware and software), I/O interfaces (PCIe/SAS/SATA), reliability, error correction codes (BCH and LDPC), encryption, flash signal processing and hybrid storage. Updated throughout to include all recent work in the field, significant changes for the new edition include: A new chapter on flash memory errors and data recovery procedures in SSDs for reliability and lifetime improvement Updated coverage of SSD Architecture and PCI Express Interfaces moving from PCIe Gen3 to PCIe Gen4 and including a section on NVMe over fabric (NVMf) An additional section on 3D flash memories An update on standard reliability procedures for SSDs Expanded coverage of BCH for SSDs, with a specific section on detection A new section on non-binary Low-Density Parity-Check (LDPC) codes, the most recent advancement in the field A description of randomization in the protection of SSD data against attacks, particularly relevant to 3D architectures The SSD market is booming, with many industries placing a huge effort in this space, spending billions of dollars in R&D and product development. Moreover, flash manufacturers are now moving to 3D architectures, thus enabling an even higher level of storage capacity. This book takes the reader through the fundamentals and brings them up to speed with the most recent developments in the field, and is suitable for advanced students, researchers and engineers alike.

This book is an important outcome of the Fifth World Internet Conference. It provides a comprehensive account of the new trends and highlights of global Internet development over the past year, covering network infrastructure, information technology, digital economy, world internet media, cyber security, and international cyberspace governance. This year, the book improves the Global Internet Development Index System and adds more countries into the assessed list, in order to reflect more comprehensively, objectively and accurately the general situation of the world Internet development and thus to provide reference for all countries in promoting Internet development and governance.

This book is an introduction to the fundamentals of emerging non-volatile memories and provides

an overview of future trends in the field. Readers will find coverage of seven important memory technologies, including Ferroelectric Random Access Memory (FeRAM), Ferromagnetic RAM (FMRAM), Multiferroic RAM (MFRAM), Phase-Change Memories (PCM), Oxide-based Resistive RAM (RRAM), Probe Storage, and Polymer Memories. Chapters are structured to reflect diffusions and clashes between different topics. Emerging Non-Volatile Memories is an ideal book for graduate students, faculty, and professionals working in the area of non-volatile memory. This book also: Covers key memory technologies, including Ferroelectric Random Access Memory (FeRAM), Ferromagnetic RAM (FMRAM), and Multiferroic RAM (MFRAM), among others. Provides an overview of non-volatile memory fundamentals. Broadens readers' understanding of future trends in non-volatile memories.

The primary focus of this book is on basic device concepts, memory cell design, and process technology integration. The first part provides in-depth coverage of conventional nonvolatile memory devices, stack structures from device physics, historical perspectives, and identifies limitations of conventional devices. The second part reviews advances made in reducing and/or eliminating existing limitations of NVM device parameters from the standpoint of device scalability, application extendibility, and reliability. The final part proposes multiple options of silicon based unified (nonvolatile) memory cell concepts and stack designs (SUMs). The book provides Industrial R&D personnel with the knowledge to drive the future memory technology with the established silicon FET-based establishments of their own. It explores application potentials of memory in areas such as robotics, avionics, health-industry, space vehicles, space sciences, bio-imaging, genetics etc.

This Springer Handbook comprehensively covers the topic of semiconductor devices, embracing all aspects from theoretical background to fabrication, modeling, and applications. Nearly 100 leading scientists from industry and academia were selected to write the handbook's chapters, which were conceived for professionals and practitioners, material scientists, physicists and electrical engineers working at universities, industrial R&D, and manufacturers. Starting from the description of the relevant technological aspects and fabrication steps, the handbook proceeds with a section fully devoted to the main conventional semiconductor devices like, e.g., bipolar transistors and MOS capacitors and transistors, used in the production of the standard integrated circuits, and the corresponding physical models. In the subsequent chapters, the scaling issues of the semiconductor-device technology are addressed, followed by the description of novel concept-based semiconductor devices. The last section illustrates the numerical simulation methods ranging from the fabrication processes to the device performances. Each chapter is self-contained, and refers to related topics treated in other chapters when necessary, so that the reader interested in a specific subject can easily identify a personal reading path through the vast contents of the handbook.

Heterogeneous integration uses packaging technology to integrate dissimilar chips, LED, MEMS, VCSEL, etc. from different fa-

bless houses and with different functions and wafer sizes into a single system or subsystem. How are these dissimilar chips and optical components supposed to talk to each other? The answer is redistribution layers (RDL-s). This book addresses the fabrication of RDLs for heterogeneous integrations, and especially focuses on RDLs on: A) organic substrates, B) silicon substrates (through-silicon via (TSV)-interposers), C) silicon substrates (bridges), D) fan-out substrates, and E) ASIC, memory, LED, MEMS, and VCSEL systems. The book offers a valuable asset for researchers, engineers, and graduate students in the fields of semiconductor packaging, materials sciences, mechanical engineering, electronic engineering, telecommunications, networking, etc.

This study investigates social and environmental impacts caused by an ecolabeled notebook along its entire life cycle. In order to analyse the divers effects of the laptop, a social life cycle assessment and an environmental life cycle assessment were performed in parallel. Both assessments together provide a holistic overview of positive and negative impacts in regard to social and environmental sustainability.This book contains the complete final report written by GreenDeltaTC on behalf of the Belgian Federal Public Planning Service Sustainable Development. It comprises the methodological background, the social inventory, process modifications with regard to the environmental inventory, and detailed results of the impact assessment phase. Further, a newly developed social impact assessment method is presented and applied. In addition, recommendations on company and policy level were derived.

Apple is renowned for introducing some of the most acclaimed software on the market. It holds an impressive reputation, making improvements aimed at modernizing old models layout. Apple has recognized that TV is a significant part of our lives and that in recent times, apps have become the future of TV. The Apple New TV is similar to its predecessors in terms of its design and build, however, it a bit thicker and heavier that previous televisions. The addition of the New Apple TV to the streaming device landscape will be welcomed by Apple fans. Apple has created a new operating system called tvOS which operates similar to a hybrid of iOS and OSX. This allows you to connect to your screen, using a smart Siri to search for something to watch. It also includes universal search result that allow searches across a wide number of streaming video services in addition to Apple’s iTune Store.

Nanoscale memories are used everywhere. From your iPhone to a supercomputer, every electronic device contains at least one such type. With coverage of current and prototypical technologies, Nanoscale Semiconductor Memories: Technology and Applications presents the latest research in the field of nanoscale memories technology in one place. It also covers a myriad of applications that nanoscale memories technology has enabled. The book begins with coverage of SRAM, addressing the design challenges as the technology scales, then provides design strategies to mitigate radiation induced upsets in SRAM. It discusses the current state-of-the-art DRAM technology and the need to develop high performance sense amplifier circuitry. The text then covers the novel concept of capacitorless 1T DRAM,

termed as Advanced-RAM or A-RAM, and presents a discussion on quantum dot (QD) based flash memory. Building on this foundation, the coverage turns to STT-RAM, emphasizing scalable embedded STT-RAM, and the physics and engineering of magnetic domain wall "racetrack" memory. The book also discusses state-of-the-art modeling applied to phase change memory devices and includes an extensive review of RRAM, highlighting the physics of operation and analyzing different materials systems currently under investigation. The hunt is still on for universal memory that fits all the requirements of an "ideal memory" capable of high-density storage, low-power operation, unparalleled speed, high endurance, and low cost. Taking an interdisciplinary approach, this book bridges technological and application issues to provide the groundwork for developing custom designed memory systems.

A comprehensive guide to TSV and other enabling technologies for 3D integration Written by an expert with more than 30 years of experience in the electronics industry, Through-Silicon Vias for 3D Integration provides cutting-edge information on TSV, wafer thinning, thin-wafer handling, microbumping and assembly, and thermal management technologies. Applications to highperformance, high-density, low-power-consumption, wide-bandwidth, and small-form-factor electronic products are discussed. This book offers a timely summary of progress in all aspects of this fascinating field for professionals active in 3D integration research and development, those who wish to master 3D integration problem--solving methods, and anyone in need of a low-power, wide-bandwidth design and high-yield manufacturing process for interconnect systems. Coverage includes: Nanotechnology and 3D integration for the semiconductor industry TSV etching, dielectric-, barrier-, and seed-layer deposition, Cu plating, CMP, and Cu revealing TSVs: mechanical, thermal, and electrical behaviors Thin-wafer strength measurement Wafer thinning and thin-wafer handling Microbumping, assembly, and reliability Microbump electromigration Transient liquid-phase bonding: C2C, C2W, and W2W 2.5D IC integration with interposers 3D IC integration with interposers Thermal management of 3D IC integration 3D IC packaging