

Broadband Circuits for Optical Fiber Communication

Contributors

Kohei Takayama, Sotaro Ooto et al. Edited and Compiled by Koros Press Editorial Board



Broadband Circuits For Optical Fiber Communication

Moh Yasin,Sulaiman Wadi Harun,Hamzah Arof

Broadband Circuits For Optical Fiber Communication:

Broadband Circuits for Optical Fiber Communication Eduard Säckinger, 2005-05-13 An expert guide to the new and emerging field of broadband circuits for optical fiber communication This exciting publication makes it easy for readers to enter into and deepen their knowledge of the new and emerging field of broadband circuits for optical fiber communication The author's selection and organization of material have been developed tested and refined from his many industry courses and seminars Five types of broadband circuits are discussed in detail Transimpedance amplifiers Limiting amplifiers Automatic gain control AGC amplifiers Lasers drivers Modulator drivers Essential background on optical fiber photodetectors lasers modulators and receiver theory is presented to help readers understand the system environment in which these broadband circuits operate For each circuit type the main specifications and their impact on system performance are explained and illustrated with numerical values Next the circuit concepts are discussed and illustrated with practical implementations A broad range of circuits in MESFET HFET BJT HBT BiCMOS and CMOS technologies is covered Emphasis is on circuits for digital continuous mode transmission in the 2 5 to 40 Gb s range typically used in SONET SDH and Gigabit Ethernet applications Burst mode circuits for passive optical networks PON and analog circuits for hybrid fiber coax HFC cable TV applications also are discussed Learning aids are provided throughout the text to help readers grasp and apply difficult concepts and techniques including Chapter summaries that highlight the key points Problem and answer sections to help readers apply their new knowledge Research directions that point to exciting new technological breakthroughs on the horizon Product examples that show the performance of actual broadband circuits Appendices that cover eye diagrams differential circuits S parameters transistors and technologies A bibliography that leads readers to more complete and in depth treatment of specialized topics This is a superior learning tool for upper level undergraduates and graduate level students in circuit design and optical fiber communication Unlike other texts that concentrate on analog circuits in general or mostly on optics this text provides balanced coverage of electronic optic and system issues Professionals in the fiber optic industry will find it an excellent reference incorporating the latest technology and discoveries in the industry Circuits for Optical Fiber Communication Eduard Sackinger, 2015-04-01 An expert guide to the new and emerging field of broadband circuits for optical fiber communication This exciting publication makes it easy for readers to enter into and deepen their knowledge of the new and emerging field of broadband circuits for optical fiber communication. The author's selection and organization of material have been developed tested and refined from his many industry courses and seminars Five types of broadband circuits are discussed in detail Transimpedance amplifiers Limiting amplifiers Automatic gain control AGC amplifiers Lasers drivers Modulator drivers Essential background on optical fiber photodetectors lasers modulators and receiver theory is presented to help readers understand the system environment in which these broadband circuits operate For each circuit type the main specifications and their impact on system performance are explained and

illustrated with numerical values Next the circuit concepts are discussed and illustrated with practical implementations A broad range of circuits in MESFET HFET BJT HBT BiCMOS and CMOS technologies is covered Emphasis is on circuits for digital continuous mode transmission in the 2 5 to 40 Gb s range typically used in SONET SDH and Gigabit Ethernet applications Burst mode circuits for passive optical networks PON and analog circuits for hybrid fiber coax HFC cable TV applications also are discussed Learning aids are provided throughout the text to help readers grasp and apply difficult concepts and techniques including Chapter summaries that highlight the key points Problem and answer sections to help readers apply their new knowledge Research directions that point to exciting new technological breakthroughs on the horizon Product examples that show the performance of actual broadband circuits Appendices that cover eve diagrams differential circuits S parameters transistors and technologies A bibliography that leads readers to more complete and in depth treatment of specialized topics This is a superior learning tool for upper level undergraduates and graduate level students in circuit design and optical fiber communication Unlike other texts that concentrate on analog circuits in general or mostly on optics this text provides balanced coverage of electronic optic and system issues Professionals in the fiber optic industry will find it an excellent reference incorporating the latest technology and discoveries in the industry Opto-Electrical Receivers in Standard CMOS Carolien Hermans, Michiel Steyaert, 2007-06-13 Broadband Opto Electrical Receivers in Standard CMOS starts from the basic fundamentals necessary for the design of opto electronic interface circuits The book continues with an in depth analysis of the photodiode transimpedance amplifier TIA and limiting amplifier LA To thoroughly understand the light detection mechanisms in silicon first a one dimensional and second a two dimensional model is developed Analytical design equations are derived to guide the design of the amplifying circuits For the TIA the focus is on the sensitivity speed trade off For the LA a high gain bandwidth is pursued Several practical design examples reveal the subtleties and challenges encountered during the design of high performance analog circuits Broadband Opto Electrical Receivers in Standard CMOS covers the total design flow of monolithic CMOS optical receivers All material is experimentally verified with several CMOS implementations with ultimately a fully integrated Gbit's optical receiver front end including Optical Fiber Communications and Devices Moh Yasin, Sulaiman Wadi Harun, Hamzah photodiode TIA and LA Arof, 2012-02-01 This book is a collection of works dealing with the important technologies and mathematical concepts behind today s optical fiber communications and devices It features 17 selected topics such as architecture and topologies of optical networks secure optical communication PONs LANs and WANs and thus provides an overall view of current research trends and technology on these topics The book compiles worldwide contributions from many prominent universities and research centers bringing together leading academics and scientists in the field of photonics and optical communications This compendium is an invaluable reference edited by three scientists with a wide knowledge of the field and the community Researchers and practitioners working in photonics and optical communications will find this book a valuable resource

Near-Earth Laser Communications Hamid Hemmati, 2018-10-03 Invented more than a hundred years ago by Alexander Graham Bell the technology of free space optical communications or lasercom has finally reached the level of maturity required to meet a growing demand for operational multi-giga bit per second data rate systems communicating to and from aircrafts and satellites Putting the emphasis on near earth links including air LEO MEO and GEO orbits Near Earth Laser Communications presents a summary of important free space laser communication subsystem challenges and discusses potential ways to overcome them This comprehensive reference provides up to date information on component and subsystem technologies fundamental limitations and approaches to reach those limits It covers basic concepts and state of the art technologies emphasizing device technology implementation techniques and system trades The authors discuss hardware technologies and their applications and also explore ongoing research activities and those planned for the near future The analytical aspects of laser communication have been covered to a great extent in several books However a detailed approach to system design and development including trades on subsystem choices and implications of the hardware selection for satellite and aircraft telecommunications is missing Highlighting key design variations and critical differences between them this book distills decades worth of experience into a practical resource on hardware technologies Receiver Front-ends for Gigabit Short-Range Optical Communications Francisco Aznar, Santiago Celma Pueyo, Belén Calvo Lopez, 2012-08-09 This book describes optical receiver solutions integrated in standard CMOS technology attaining high speed short range transmission within cost effective constraints These techniques support short reach applications such as local area networks fiber to the home and multimedia systems in cars and homes The authors show how to implement the optical front end in the same technology as the subsequent digital circuitry leading to integration of the entire receiver system in the same chip The presentation focuses on CMOS receiver design targeting gigabit transmission along a low cost standardized plastic optical fiber up to 50m in length This book includes a detailed study of CMOS optical receiver design Reconfigurable Technology for Future Optical Access Networks She-Hwa from building blocks to the system level Yen, 2011 Fiber based access is recognized as the most promising technology for solving broadband bandwidth bottlenecks Time division multiplexing passive optical networks TDM PONs that are passive and non reconfigurable are currently the most widely deployed type of fiber access networks However due to their passive nature TDM PONs faces several limitations such as inflexible service area coverage lack of intelligence for control and inability to counteract security attacks In order to address the current limitations of optical access networks we propose reconfigurable technologies for next generation PONs Two novel reconfigurable technologies are proposed analyzed and experimentally evaluated The first solution is a reconfigurable power and wavelength assignment technology based on a novel non volatile reconfiguration node The proposed remote node can reconfigure the network to adapt it to varying degrees of deployment conditions and or network attacks Moreover the proposed remote node incorporates a novel quasi passive device that does not consume energy once it

is reconfigured into a new latching state Therefore the proposed remote node has very low energy consumption and does not require local power supply to preserve the passive character of the distribution network In particular two novel quasi passive optical power splitter technologies based on Micro Electro Mechanical Systems MEMS and transition metal oxide have been designed for the reconfigurable device A simulation study shows the proposed reconfigurable device would outperform traditional passive splitter in terms of maximum number of supportable users under realistic deployment conditions The second solution addresses the issue of reconfigurable network consolidation and infrastructure simplification Current TDM PONs suffers from limited reach and split ratio To enhance the performance in terms of service range and quality of service reconfigurable network consolidation is a promising solution It can also simplify the network and reduce cost We propose the following novel reconfigurable technologies for consolidation and simplification of next generation access networks 1 Passive reach extension technology for the drop section of optical access networks 2 Sleep mode ONUs for energy saving 3 Centrally managed optical signature that can monitor and protect the upstream link and 4 Multi rate burst mode receivers These reconfigurable technologies can bring the intelligence into optical access networks and improve the efficiency and flexibility for next generation optical access networks Monolithically Integrated Transceiver Chips for Bidirectional Optical Data Transmission Alexander Kern, 2016-02-03 Vertical cavity surface emitting lasers VCSELs emitting at 850 nm wavelength are known for their attractive optical features and a continuously growing range of applications. The main goal of the present thesis is to demonstrate the feasibility of a monolithical integration of VCSELs with PIN type photodiodes PDs for the operation as transceiver TRx chips in optical data links The project milestones comprise the chip and the epitaxial layer design of the VCSEL PIN PD device based on a traditional AlGaAs GaAs material system its fabrication development electro optical characterizations and data transmission in a bidirectional optical link over a single two side butt coupled standard graded index GI multimode fiber MMF The monolithic design lowers the costs in the semiconductor technology as well as in packaging and additionally avoids the use of external optics even though it is employed with a single 50 m core diameter GI MMF Thus the very compact optical link saves space weight and module cost Deep insights into the electro optical properties of VCSELs and PIN PDs are given by the theoretical description and measurements The limitations of small signal modulation responses are of main interest of this thesis Thus the dynamic characteristics including the extraction of modeled parasitics are presented Also the electrical and optical crosstalk between the integrated devices and both transmission channels as well as the fiber alignment tolerances are covered The results in optical data transmission consisting of various experiments in half duplex and full duplex mode both free space and fiber coupled over a single MMF are comprised The monolithic TRx design is well suited for low cost compact optical links over distances of a few hundred meters Capable to handle data rates of up to 10 Gbit's and more these TRx chips can be employed e.g. to upgrade existing standard MMF networks to bidirectional operation or in mobile low cost automotive networks **Optical Guided-wave Chemical and Biosensors I**

Mohammed Zourob, Akhlesh Lakhtakia, 2010-03-18 For the first time distinguished scientists from key institutions worldwide provide a comprehensive approach to optical sensing techniques employing the phenomenon of guided wave propagation for chemical and biosensors This includes both state of the art fundamentals and innovative applications of these techniques The authors present a deep analysis of their particular subjects in a way to address the needs of novice researchers such as graduate students and post doctoral scholars as well as of established researchers seeking new avenues Researchers and practitioners who need a solid foundation or reference will find this work invaluable This first of two volumes contains eight chapters covering planar waveguides for sensing as well as sensing techniques based on plasmonic waveguides

High-Frequency Integrated Circuits Sorin Voinigescu,2013-02-28 A transistor level design intensive overview of high speed and high frequency monolithic integrated circuits for wireless and broadband systems from 2 GHz to 200 GHz this comprehensive text covers high speed RF mm wave and optical fibre circuits using nanoscale CMOS SiGe BiCMOS and III V technologies Step by step design methodologies end of chapter problems and practical simulation and design projects are provided making this an ideal resource for senior undergraduate and graduate courses in circuit design With an emphasis on device circuit topology interaction and optimization it gives circuit designers and students alike an in depth understanding of device structures and process limitations affecting circuit performance

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