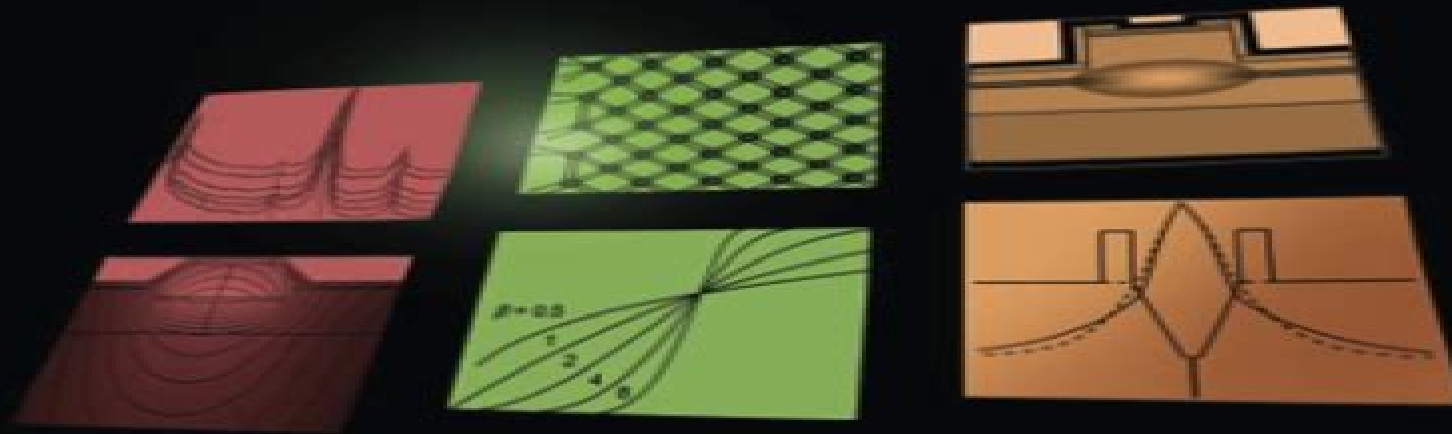


# Semiconductor Laser Engineering, Reliability and Diagnostics



**A Practical Approach to  
High Power and Single Mode Devices**

**Peter W. Epperlein**

**WILEY**

# **Semiconductor Laser Engineering Reliability And Diagnostics Hardcover**

**Hussin A.Rothana**



## Semiconductor Laser Engineering Reliability And Diagnostics Hardcover

**Semiconductor Laser Engineering, Reliability and Diagnostics** Peter W. Epperlein, 2013-03-18 This reference book provides a fully integrated novel approach to the development of high power single transverse mode edge emitting diode lasers by addressing the complementary topics of device engineering reliability engineering and device diagnostics in the same book and thus closes the gap in the current book literature Diode laser fundamentals are discussed followed by an elaborate discussion of problem oriented design guidelines and techniques and by a systematic treatment of the origins of laser degradation and a thorough exploration of the engineering means to enhance the optical strength of the laser Stability criteria of critical laser characteristics and key laser robustness factors are discussed along with clear design considerations in the context of reliability engineering approaches and models and typical programs for reliability tests and laser product qualifications Novel advanced diagnostic methods are reviewed to discuss for the first time in detail in book literature performance and reliability impacting factors such as temperature stress and material instabilities Further key features include practical design guidelines that consider also reliability related effects key laser robustness factors basic laser fabrication and packaging issues detailed discussion of diagnostic investigations of diode lasers the fundamentals of the applied approaches and techniques many of them pioneered by the author to be fit for purpose and novel in the application systematic insight into laser degradation modes such as catastrophic optical damage and a wide range of technologies to increase the optical strength of diode lasers coverage of basic concepts and techniques of laser reliability engineering with details on a standard commercial high power laser reliability test program Semiconductor Laser Engineering Reliability and Diagnostics reflects the extensive expertise of the author in the diode laser field both as a top scientific researcher as well as a key developer of high power highly reliable devices With invaluable practical advice this new reference book is suited to practising researchers in diode laser technologies and to postgraduate engineering students Dr Peter W Epperlein is Technology Consultant with his own semiconductor technology consulting business Pwe Photonics Electronics Issue Resolution in the UK He looks back at a thirty years career in cutting edge photonics and electronics industries with focus on emerging technologies both in global and start up companies including IBM Hewlett Packard Agilent Technologies Philips NXP Essient Photonics and IBM JDSU Laser Enterprise He holds Pre Dipl B Sc Dipl Phys M Sc and Dr rer nat Ph D degrees in physics magna cum laude from the University of Stuttgart Germany Dr Epperlein is an internationally recognized expert in compound semiconductor and diode laser technologies He has accomplished R it is best skimmed with deep diving into any areas of special interest to the reader The book is remarkable also for how comprehensive it is even experts will discover something new and useful Dr Epperlein s book is an essential read for anyone looking to develop semiconductor lasers for anything other than pure research use and I give it my highest recommendation Robert W Herrick Ph D Senior Component Reliability Engineer Intel Corp Santa Clara California USA

**Advanced Laser Diode Reliability** Massimo Vanzi, Laurent Bechou, Mitsuo Fukuda, Giovanna Mura, 2021-07-24 Advanced Laser Diode Reliability focuses on causes and effects of degradations of state of the art semiconductor laser diodes It aims to provide a tool for linking practical measurements to physical diagnostics To this purpose it reviews the current technologies addressing their peculiar details that can promote specific failure mechanisms Two sections will support this kernel a Failure Analysis techniques procedures and examples b Device oriented laser modelling and parameter extraction Talk about Natural continuity with the most widespread existing textbooks published by Mitsuo Fukuda Present the extension to new failure mechanisms new technologies new application fields new environments Introduce a specific self consistent model for the physical description of a laser diode expressed in terms of practically measurable quantities

**Reliability and Degradation of Semiconductor Lasers and LEDs** Mitsuo Fukuda,1991-01-01 This comparative tutorial describes the reasons behind device failures and provides practical information on what can be done to minimize failure prone designs and enhance device reliability The text demonstrates how with such advantages as smaller size low cost and simple operation LEDs are well suited for a wide range of applications especially in the field of optical fibre communication This book should prove of interest to engineers and scientists in research design manufacturing and development of semiconductor lasers LEDs and optical transmission systems

**Accurate Determination of Transparency Current in Packaged Semiconductor Lasers and Semiconductor Optical Amplifiers** ,1994 The reliability of semiconductor laser diodes and related devices is a significant issue for their deployment in many applications creating demand for device diagnostics applicable to packaged devices Measurements of the transparency current density  $J_0$  in laser diodes and traveling wave semiconductor optical amplifiers SOAs can provide such a diagnostic It is essential however to measure  $J_0$  on packaged devices so that they can be characterized after aging or degradation This precludes techniques requiring data from multiple devices e g an ensemble with different lengths  $J_0$  is conventionally measured using a junction voltage technique in which an input optical signal induces a change in carrier density in the active region due to stimulated absorption or emission The result is a voltage drop across the diode At material transparency the stimulated absorption is exactly balanced by the stimulated emission and the voltage drop goes to zero Since the polarity of the voltage drop changes sign at current densities above  $J_0$  the optical input beam is typically modulated and lock in amplification is employed to sensitively detect the polarity sign flip Here we show that this technique is not reliable for certain types of laser structures because the deduced  $J_0$  is strongly dependent on device packaging that is the measured  $J_0$  varies with the manner in which light is coupled into the diode waveguide For packaged SOAs we propose and demonstrate an alternative all optical technique to overcome this problem One important advantage of the optical method over the junction voltage method is that the actual device optically guided mode is directly sampled In the case of packaged semiconductor lasers our all optical method can complement the junction voltage method to resolve device versus packaging degradation

**Principles Of Semiconductor Laser Diodes And Amplifiers: Analysis And Transmission Line Laser Modeling** Hooshang Ghafouri-shiraz,2003-12-15 Optical communications technology is growing increasingly in importance with a rapid pace of development Innovative optical devices have emerged from the integration of semiconductor laser diodes amplifiers and filters with optical waveguide technology This well researched volume traces the evolution of semiconductor laser amplifiers SLAs from these technologies Focusing on the principle applications of SLAs the author illustrates the growing importance of these functional components in the future of optical communications systems This book will provide engineering and science students with a basic understanding of laser diode and optical amplification through the analysis of the performance characteristics of these devices both in theory and application Practising device engineers wishing to consolidate their knowledge in lightwave technology will also find this book an invaluable reference a

*Reliability Problems of Semiconductor Lasers* P. G. Eliseev,1991

**Reliability Problems in Semiconductor Lasers** Ajay R. Patel,1988

**Diode Lasers and Photonic Integrated Circuits** Larry A. Coldren,S. W. Corzine,1995-10-30 Throughout the material is supplemented with extensive appendices addressing readers of varied backgrounds and providing both review material and details of advanced topics What emerges is a comprehensive self contained treatment of diode lasers and photonic integrated circuits that makes this an ideal textbook for a one year course at either the senior or graduate level

*Semiconductor Laser Diode* Dnyaneshwar Patil,2012-04-25 This book represents a unique collection of the latest developments in the rapidly developing world of semiconductor laser diode technology and applications An international group of distinguished contributors have covered particular aspects and the book includes optimization of semiconductor laser diode parameters for fascinating applications This collection of chapters will be of considerable interest to engineers scientists technologists and physicists working in research and development in the field of semiconductor laser diode as well as to young researchers who are at the beginning of their career

**RELIABILITY & DEGRADATION OF SEMICONDUCTOR LASERS.** M. FUKUDA,1991

*Semiconductor Laser Diodes Handbook* Jared Jones,2015-01-31 A descriptive account based on semiconductor laser diodes has been presented in this book It presents recent advances and research in the fast growing field of semiconductor laser diode technology and applications Prominent researchers and experts from all over the world have made valuable contributions in this book The book provides detailed discussions on optimization of semiconductor laser diode parameters for extensive applications across various fields It aims to assist physicists scientists engineers and technologists in their research and academic activities associated with the field of semiconductor laser diodes

**Reliability Data Analysis of Semiconductor Laser Diodes** Roland Olen Roberts,1985

**Problem Solutions for Diode Lasers and Photonic in Tegrated Circuits** JOHN WILEY & SONS INC,Larry A. Coldren,1998-03-01

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