

Design For Manufacturability Guidelines

Manufacturers know the value of a knowledgeable workforce. The challenge today is finding skilled people to fill these positions. Since publication of the first edition in 1961, instructors, students, and practitioners have relied on *Manufacturing Processes and Materials* for the foundational knowledge needed to perform in manufacturing roles across a myriad of industries. As an on-the-job reference, anyone working in a technical department of a manufacturing company — regardless of education, experience, and skill level — will use this book to gain a basic understanding of manufacturing processes, materials, and equipment. Now in its fifth edition, the book covers the basic processes, materials, and machinery used in the job shop, toolroom, or small manufacturing facility. At the same time, it describes advanced equipment used in larger production environments. The reader is given a thorough review of metals, composites, plastics, and other engineering materials, including their physical properties, testing, treatment, and suitability for use in manufacturing. Quality, measurement and gaging, process planning and cost analysis, and manufacturing systems are all addressed. Questions and problems at the end of each chapter can be used as a self-test or as assignments in the classroom. *Manufacturing Processes and Materials* is also available as an eBook. Additional teaching materials for instructors: Instructor's Guide (eBook only) Instructor's Slides (zip file)

From raw materials ... to machining and casting ... to assembly and finishing, the Second Edition of this classic guide will introduce you to the principles and procedures of Design for Manufacturability (DFM) — the art of developing high-quality products for the lowest possible manufacturing cost. Written by over 70 experts in manufacturing and product design, this update features cutting-edge techniques for every stage of manufacturing — plus entirely new chapters on DFM for Electronics, DFX (Designing for all desirable attributes), DFM for Low-Quality Production, and Concurrent Engineering.

This book is intended to introduce and familiarize design, production, quality, and process engineers, and their managers to the importance and recent developments in concurrent engineering (CE) and design for manufacturing (DFM) of new products. CE and DFM are becoming an important element of global competitiveness in terms of achieving high-quality and low-cost products. The new product design and development life cycle has become the focus of many manufacturing companies as a road map to shortening new product introduction cycles, and to achieving a quick ramp-up of production volumes. Customer expectations have increased in demanding high-quality, functional, and user-friendly products. There is little time to waste in solving manufacturing problems or in redesigning products for ease of manufacture, since product life cycles have become very short because of technological breakthroughs or competitive pressures. Another important reason for the increased attention to DFM is that global products have developed into very opposing roles: either they are commodities, with very similar features, capabilities, and specifications; or they are very focused on a market niche. In the first case, the manufacturers are competing on cost and quality, and in the second they are in race for time to market. DFM could be a very important competitive weapon in either case, for lowering cost and increasing quality; and for increasing production ramp-up to mature volumes. In the area of computer-integrated manufacturing, concurrent engineering is recognized as the manufacturing philosophy for the next decade. The design and manufacture of reliable products is a major challenge for engineers and managers. This book arms technical managers and engineers with the tools to compete effectively through the design and production of reliable technology products.

Design for Manufacturability How to Use Concurrent Engineering to Rapidly Develop Low-Cost, High-Quality Products for Lean

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ProductionCRC Press

The International Symposium for Testing and Failure Analysis (ISTFA) 2018 is co-located with the International Test Conference (ITC) 2018, October 28 to November 1, in Phoenix, Arizona, USA at the Phoenix Convention Center. The theme for the November 2018 conference is "Failures Worth Analyzing." While technology advances fast and the market demands the latest and the greatest, successful companies strive to stay competitive and remain profitable.

This best-selling textbook for major manufacturing engineering programs across the country masterfully covers the basic processes and machinery used in the job shop, tool room, or small manufacturing facility. At the same time, it describes advanced equipment and processes used in larger production environments. Questions and problems at the end of each chapter can be used as self-tests or assignments. An Instructor's Guide is available to tailor a more structured learning experience. Additional resources from SME, including the Fundamental Manufacturing Processes videotape series can also be used to supplement the book's learning objectives. With 31 chapters, 45 tables, 586 illustrations, 141 equations and an extensive index, Manufacturing Processes & Materials is one of the most comprehensive texts available on this subject.

A practical "how to" guide that effectively deals with the control of both contamination and ESD This book offers effective strategies and techniques for contamination and electrostatic discharge (ESD) control that can be implemented in a wide range of high-technology industries, including semiconductor, disk drive, aerospace, pharmaceutical, medical device, automobile, and food production manufacturing. The authors set forth a new and innovative methodology that can manage both contamination and ESD, often considered to be mutually exclusive challenges requiring distinct strategies. Beginning with two general chapters on the fundamentals of contamination and ESD control, the book presents a logical progression of topics that collectively build the necessary skills and knowledge: Analysis methods for solving contamination and ESD problems Building the contamination and ESD control environment, including design and construction of cleanrooms and ESD protected environments Cleaning processes and the equipment needed to support these processes Tooling design and certification Continuous monitoring Consumable supplies and packaging materials Controlling contamination and ESD originating from people Management of cleanrooms and ESD protected workplace environments Contamination and ESD Control in High-Technology Manufacturing conveys a practical, working knowledge of contamination and ESD control strategies and techniques, and it is filled with case studies that illustrate key principles and the benefits of contamination and ESD control. Moreover, its straightforward style makes the material, which integrates many disciplines of engineering and science, clear and accessible. Written by three leading industry experts, this book is an essential guide for engineers and designers across the many industries where contamination and ESD control is a concern. This work on a systems approach to ergonomic design-manufacturing includes information on ease of manual/automatic assembly, biomechanical, cognitive and perceptual workload, task allocation, job satisfaction, socio-technical systems design, A unique book that describes the practical processes necessary to achieve failure free equipment performance, for quality and reliability engineers, design, manufacturing process and environmental test engineers. This book studies the essential

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requirements for successful product life cycle management. It identifies key contributors to failure in product life cycle management and particular emphasis is placed upon the importance of thorough Manufacturing Process Capability reviews for both in-house and outsourced manufacturing strategies. The readers' attention is also drawn to the many hazards to which a new product is exposed from the commencement of manufacture through to end of life disposal. Revolutionary in focus, as it describes how to achieve failure free performance rather than how to predict an acceptable performance failure rate (reliability technology rather than reliability engineering) Author has over 40 years experience in the field, and the text is based on classroom tested notes from the reliability technology course he taught at Massachusetts Institute of Technology (MIT), USA Contains graphical interpretations of mathematical models together with diagrams, tables of physical constants, case studies and unique worked examples With more emphasis being placed on the cost and quality of new products and on reducing the lead time to develop them, attention is turning to the increasingly important topic of design for manufacturability (DFM). This involves the collaboration among research and development, manufacturing, and other company functions and is aimed at accelerating the new product development process from product conception to market introduction. A company can create a competitive advantage for itself by managing the process and its related organizational dynamics effectively. This book includes chapters by experts who focus on the development of strategic capabilities, such as the systematic development and introduction of new technologies into products and processes, as well as the use of appropriate tools and techniques to facilitate communication and problem-solving between design and manufacturing. Other topics covered include learning from experience; the social, political, and cultural contexts within which key players interact; and the degree to which management of information and development of an effective structure are critical to new product development success. The information-intensive nature of the product development process is demonstrated throughout the book. The final chapter contains a model that links the role of information in the development of products to a company's capability to organize, process, and learn from that information.

This book discusses a new method for the design and engineering of complex façades. Based on the file-to-factory concept, the method combines parametric design approaches and additive manufacturing. Parametric design and additive manufacturing are both growing trends that open up new possibilities. Parametric design approaches change how planners / designers perceive building details. Further, new engineering concepts are needed to cope with the increasing complexity of architectural geometries due to the rapid developments in areas such as façade systems, modeling software and digital manufacturing techniques.

This leading-edge circuit design resource offers the knowledge needed to quickly pinpoint transmission problems that can compromise circuit design. Discusses both design and debug issues at gigabit per second data rates.

These guidelines form a comprehensive overview of Failure Mode and Effects Analysis (FMEA) and examines why FMEA has become a powerful and respected analytical technique for effectively managing and reducing risks. Readers learn how to use FMEA throughout the life cycles of their product to improve customer satisfaction and assure safety and regulatory compliance. They will obtain sound advice on selecting a study team, setting up and conducting a study, and

analyzing the results. Other topics include Failure Mode, Effects, and Criticality Analysis, Risk Management Planning, Advanced Quality Planning, Product Quality Control Plans, and Dynamic Control Plans.

This book explains integrated circuit design for manufacturability (DfM) at the product level (packaging, applications) and applies engineering DfM principles to the latest standards of product development at 22 nm technology nodes. It is a valuable guide for layout designers, packaging engineers and quality engineers, covering DfM development from 1D to 4D, involving IC design flow setup, best practices, links to manufacturing and product definition, for process technologies down to 22 nm node, and product families including memories, logic, system-on-chip and system-in-package.

Because of the continuous evolution of integrated circuit manufacturing (ICM) and design for manufacturability (DfM), most books on the subject are obsolete before they even go to press. That's why the field requires a reference that takes the focus off of numbers and concentrates more on larger economic concepts than on technical details. Semiconductors: Integrated Circuit Design for Manufacturability covers the gradual evolution of integrated circuit design (ICD) as a basis to propose strategies for improving return-on-investment (ROI) for ICD in manufacturing. Where most books put the spotlight on detailed engineering enhancements and their implications for device functionality, in contrast, this one offers, among other things, crucial, valuable historical background and roadmapping, all illustrated with examples. Presents actual test cases that illustrate product challenges, examine possible solution strategies, and demonstrate how to select and implement the right one This book shows that DfM is a powerful generic engineering concept with potential extending beyond its usual application in automated layout enhancements centered on proximity correction and pattern density. This material explores the concept of ICD for production by breaking down its major steps: product definition, design, layout, and manufacturing. Averting extended discussion of technology, techniques, or specific device dimensions, the author also avoids the clumsy chapter architecture that can hinder other books on this subject. The result is an extremely functional, systematic presentation that simplifies existing approaches to DfM, outlining a clear set of criteria to help readers assess reliability, functionality, and yield. With careful consideration of the economic and technical trade-offs involved in ICD for manufacturing, this reference addresses techniques for physical, electrical, and logical design, keeping coverage fresh and concise for the designers, manufacturers, and researchers defining product architecture and research programs.

Making sure your product's straight-from-the-line quality lasts in the field.

Presents a summary of the analytical tools used to evaluate the cost and difficulty of manufacturing and assembling proposed product designs, encouraging a continuous dialogue between designers and manufacturing engineers during the early stages of design.

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Design for Manufacturability: How to Use Concurrent Engineering to Rapidly Develop Low-Cost, High-Quality Products for Lean Production shows how to use concurrent engineering teams to design products for all aspects of manufacturing with the lowest cost, the highest quality, and the quickest time to stable production. Extending the concepts of design for manufacturability into to an advanced product development model, the book explains how to simultaneously make major improvements in all these product development goals, while enabling effective implementation of Lean Production and quality programs. Illustrating how to make the most of lessons learned from previous projects, the book proposes numerous improvements to current product development practices, education, and management. It outlines effective procedures to standardize parts and materials, save time and money with off-the-shelf parts, and implement a standardization program. It also spells out how to work with the purchasing department early on to select parts and materials that maximize quality and availability while minimizing part lead-times and ensuring desired functionality. Describes how to design families of products for Lean Production, build-to-order, and mass customization Emphasizes the importance of quantifying all product and overhead costs and then provides easy ways to quantify total cost Details dozens of design guidelines for product design, including assembly, fastening, test, repair, and maintenance Presents numerous design guidelines for designing parts for manufacturability Shows how to design in quality and reliability with many quality guidelines and sections on mistake-proofing (poka-yoke) Describing how to design parts for optimal manufacturability and compatibility with factory processes, the book provides a big picture perspective that emphasizes designing for the lowest total cost and time to stable production. After reading this book you will understand how to reduce total costs, ramp up quickly to volume production without delays or extra cost, and be able to scale up production rapidly so as not to limit growth.

"It's about time that a practicing engineer with casting and academic experience has written a book that provides answers to questions about squeeze casting and semi-solid molding/forming that many engineers and students of casting need answered." —Joseph C. Bedyk, PhD, Consultant and retired technical director, Alcoa High Integrity Die Casting Processes provides a comprehensive look at the concepts behind advanced die casting technologies, including vacuum die casting, squeeze casting, and several variants of semi-solid metalworking. Practical applications for these processes are illustrated in numerous case studies. This single-source reference tool presents the latest material in five sections: Basic concepts of die casting and molten metal flow High integrity die casting processes with case studies Product design considerations Controlling quality and avoiding defects Future advances under development Key coverage includes a survey of liquid metal flow, strategies to overcome the limitations of conventional die casting, and potential defects unique to high integrity die casting processes. Also featured are methods for minimizing porosity, reducing cost

by design, practical applied statistical process control techniques, designing for manufacturability, and containment methods for potential processing defects. Several chapters present detailed real-world examples illustrating the broad range of applications possible using high integrity die casting processes. Included with this book is a CD-ROM containing PowerPoint(r) presentations for each chapter. These presentations can be used for training purposes in conjunction with numerous study questions designed to practically apply the content of the book to real-world situations. Selected PowerPoint(r) slides can be used to support engineering proposals, marketing presentations, or customer education seminars. High Integrity Die Casting Processes is a valuable reference for both component producers and component users alike. Process engineers, tool designers, manufacturing engineers, production managers, and machine operators will acquire a better understanding of these advanced die casting processes to optimize manufacturing and improve product quality. Component designers, product engineers, purchasing agents, buyers, supplier quality engineers, and project managers will gain insight into these processes and develop superior products by design.

This second monograph in the Mechanical Design Engineering Series deals with the subject of Design for Assembly. It consists of five chapters whose content descriptions follow. Chapter-1 deals with the importance of DFA, an operational definition of assembly, part characterization, reasons for separate parts and creating a apart sequence diagram. Chapter-2 presents and discusses with examples generally accepted DFA product development guidelines. These include: providing a base for assembly, layering and stacking, using multi-functional parts, accommodating for errors, reducing fasteners, limiting flexible items and minimizing part count. Chapter-3 discusses the design of parts to facilitate their feeding and insertion. Topics include the avoidance of tangling, overlapping and nesting, the role of gravity, the value of geometric symmetry and the use of asymmetry. Chapter-4 presents a four-step process for applying DFA principles to the improvement of existing products. A number of examples of the process application are included and discussed in detail. Chapter-5 introduces a technique that numerically quantifies the ease of assembly based on the feeding, insertion and fastening of parts. It is used to quantitatively compare the degree of improvement that DFA can make in a number of product examples.

Design for Manufacturability: How to Use Concurrent Engineering to Rapidly Develop Low-Cost, High-Quality Products for Lean Production shows how to use concurrent engineering teams to design products for all aspects of manufacturing with the lowest cost, the highest quality, and the quickest time to stable production. Extending the concepts of design for manufacturability to an advanced product development model, the book explains how to simultaneously make major improvements in all these product development goals, while enabling effective implementation of Lean Production and quality programs. Illustrating how to make the most of lessons learned from previous projects, the book proposes numerous improvements to current product development practices, education, and management. It outlines effective procedures to standardize parts and materials, save time and money with off-the-shelf parts, and implement a standardization program. It also spells out how to work with the purchasing department

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Product design significantly influences product cost and quality, as well as market share and profitability of a firm. Design projects often involve many people belonging to different functional areas and in many organizations several design projects may be under way at the same time. Due to this complexity, management of design has given rise to a rich set of research problems in management and engineering. In this volume, design is considered as the planning and specification activity prior to fabrication. Design determines what products will be produced, how they will be produced, and when they will be introduced into the market. The quality of the products and the speed with which they are developed are significantly affected by the design process. The design process by which a product is developed is determined by the managerial and engineering practices, tools and techniques. This book presents engineering and management perspectives on design. Topics covered include: Decomposition of product development projects; Tools and techniques for preliminary evaluation of designs; Interface between design and manufacturing, assembly and distribution; Design information flows, and Determination of the scope, timing and duration of projects, and the allocation of resources.

Unrivaled coverage of a broad spectrum of industrial engineering concepts and applications The Handbook of Industrial Engineering, Third Edition contains a vast array of timely and useful methodologies for achieving increased productivity, quality, and competitiveness and improving the quality of working life in manufacturing and service industries. This astoundingly comprehensive resource also provides a cohesive structure to the discipline of industrial engineering with four major classifications: technology; performance improvement management; management, planning, and design control; and decision-making methods. Completely updated and expanded to reflect nearly a decade of important developments in the field, this Third Edition features a wealth of new information on project management, supply-chain management and logistics, and systems related to service industries. Other important features of this essential reference include: * More than 1,000 helpful tables, graphs, figures, and formulas * Step-by-step descriptions of hundreds of problem-solving methodologies * Hundreds of clear, easy-to-follow application examples * Contributions from 176 accomplished international professionals with diverse training and affiliations * More than 4,000 citations for further reading The Handbook of Industrial Engineering, Third Edition is an immensely useful one-stop

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resource for industrial engineers and technical support personnel in corporations of any size; continuous process and discrete part manufacturing industries; and all types of service industries, from healthcare to hospitality, from retailing to finance. Of related interest . . . HANDBOOK OF HUMAN FACTORS AND ERGONOMICS, Second Edition Edited by Gavriel Salvendy (0-471-11690-4) 2,165 pages 60 chapters "A comprehensive guide that contains practical knowledge and technical background on virtually all aspects of physical, cognitive, and social ergonomics. As such, it can be a valuable source of information for any individual or organization committed to providing competitive, high-quality products and safe, productive work environments."-John F. Smith Jr., Chairman of the Board, Chief Executive Officer and President, General Motors Corporation (From the Foreword)

Hailed as a groundbreaking and important textbook upon its initial publication, the latest iteration of Product Design for Manufacture and Assembly does not rest on those laurels. In addition to the expected updating of data in all chapters, this third edition has been revised to provide a top-notch textbook for university-level courses in product

The book covers fundamental concepts, description, terminology, force analysis and methods of analysis and design. The emphasis in treating the machine elements is on methods and procedures that give the student competence in applying these to mechanical components in general. The book offers the students to learn to use the best available scientific understanding together with empirical information, good judgement, and often a degree of ingenuity, in order to produce the best product. Few unique articles e.g., chain failure modes, lubrication of chain drive, timing belt pulleys, rope lay selection, wire rope manufacturing methods, effect of sheave size etc., are included. Friction materials are discussed in detail for both wet and dry running with the relevant charts used in industry. Design of journal bearing is dealt exhaustively. Salient Features: " Compatible with the Machine Design Data Book (same author and publisher). " Thorough treatment of the requisite engineering mechanics topics. " Balance between analysis and design. " Emphasis on the materials, properties and analysis of the machine element. " Material, factor of safety and manufacturing method are given for each machine element. " Design steps are given for all important machine elements. " The example design problems and solution techniques are spelled out in detail. " Objective type, short answer and review problems are given at the end of each chapter. " All the illustrations are done with the help of suitable diagrams. " As per Indian Standards.

This book presents the state-of-the-art in quality and reliability engineering from a product life-cycle standpoint. Topics in reliability include reliability models, life data analysis and modeling, design for reliability as well as accelerated life testing and reliability growth analysis, while topics in quality include design for quality, acceptance sampling and supplier selection, statistical process control, production tests such as environmental stress screening and burn-in, warranty and maintenance. The book provides comprehensive insights into two closely related subjects, and includes a wealth of examples and problems to enhance readers' comprehension and link theory and practice. All numerical examples can be easily solved using Microsoft Excel. The book is intended for senior undergraduate and postgraduate students in related engineering and management programs such as mechanical engineering, manufacturing engineering, industrial engineering and engineering management programs, as well as for

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researchers and engineers in the quality and reliability fields. Dr. Renyan Jiang is a professor at the Faculty of Automotive and Mechanical Engineering, Changsha University of Science and Technology, China.

"Covers the core concepts and theories of production and operations management in the global as well as Indian context. Includes boxes, solved numerical examples, real-world examples and case studies, practice problems, and videos. Focuses on strategic decision making, design, planning, and operational control"--Provided by publisher.

A foreword is usually prepared by someone who knows the author or who knows enough to provide additional insight on the purpose of the work. When asked to write this foreword, I had no problem with what I wanted to say about the work or the author. I did, however, wonder why people read a foreword. It is probably of value to know the background of the writer of a book; it is probably also of value to know the background of the individual who is commenting on the work. I consider myself a good friend of the author, and when I was asked to write a few words I felt honored to provide my view of Ray Prasad, his expertise, and the contribution that he has made to our industry. This book is about the industry, its technology, and its struggle to learn and compete in a global market bursting with new ideas to satisfy a voracious appetite for new and innovative electronic products. I had the good fortune to be there at the beginning (or almost) and have witnessed the growth and excitement in the opportunities and challenges afforded the electronic industries' engineering and manufacturing talents. In a few years my involvement will span half a century.

This book walks the reader through all the aspects of manufacturability and yield in a nano-CMOS process. It covers all CAD/CAE aspects of a SOC design flow and addresses a new topic (DFM/DFY) critical at 90 nm and beyond. This book is a must read book the serious practicing IC designer and an excellent primer for any graduate student intent on having a career in IC design or in EDA tool development.

The author compiles valuable lessons learned from his work with hundreds of suppliers and customers world-wide. The design of electronics is fundamental to quality and reliability; manufacturing must follow rules regarding what to and what not to do to make defect-free products; transportation, storage and warehousing operations must adhere to certain disciplines; installation should be done correctly to avoid premature degradation; and failed products must be repaired carefully to avoid damage. Large volume and complex logistics will amplify errors so mistakes in these steps will cost the business huge amounts of money. Also covered are criteria for relevant metrics. The book concisely summarizes few very specific and high impact precautions necessary to build the quality in design. It highlights pitfalls that must be avoided in subsequent manufacturing and delivery operations that can degrade product reliability. The author emphasizes the leadership team must inspire team dynamics and collaboration with central focus on customers. The book will be useful to management and technical ranks involved in design, manufacturing and deployment and customer service. Service provider companies will also benefit from this book. As technology evolves, new products are reaching the market faster, and customers are demanding higher quality and lower cost. For your business to thrive in this environment, it will need to master the processes discussed in these pages that will serve as a valuable reference for a roadmap to success.

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Argues that a company's capability to conceive and design quality prototypes and bring a variety of products to market more quickly than its competitors is increasingly the focal point of competition. The authors present principles for developing speed and efficiency.

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