Green Electronics Design and Manufacturing: Implementing Lead-Free and RoHS Compliant Global Products

By Sammy Shina

Successfully Design and Manufacture Reliable Environmentally-Friendly Electronic Products

This state-of-the-art resource brings together contributions by a team of experts from the total electronics supply chain who show how to master the strategy, design, test and implementation issues of meeting global environmental regulations.

Edited by the founder of the New England Lead-Free Consortium and filled with over 130 detailed illustrations, *Green Electronics Design and Manufacturing* features:

- Guidance for lead-free conversions while maintaining quality and reliability for printed circuit board production and rework of surface mount technology and palted through holes
- Restriction of hazardous substances (RoHS) compliance for hex-chrome and future halogen free issues
- Detailed coverage of global environmental regulations and their impact on manufacturing and design processes
- Techniques for managing corporate strategy and project design teams for green products
- Proven methods for testing and analyzing green products
- Proven methods for dealing with the adverse results of green production such as tin whiskers and finish interactions

Inside this Cutting-Edge Guide to Creating Green Electronic Products

• Basics, Test Methods, and Experimental Techniques for Green Quality and Reliability • Electronics Industry Global Environmental Regulations • Managing Corporate Strategy, Design Projects, and Teams for Green Products • Converting to Lead-Free Electronics Manufacturing, Including Rework, for SMT, BGA, and PTH • Conversion Issues with Design Changes, Laminates, IC Packages, and Printed Circuit Boards • Adverse Consequences of Lead-Free, Including Tin Whiskers and Finish Interactions • Nanotechnology and Its Future in Electronics Applications

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Green Electronics Design and Manufacturing: Implementing Lead-Free and RoHS Compliant Global Products Summary Details

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editorial:

Review
Views on News Blog, David Lammers The environmental impact of electronics manufacturing has become a prime concern of governments and people everywhere. A new book written and organized by Professor Sammy Shina, Green Electronics, Design and Manufacturing (McGraw Hill; 2008), provides a highly practical examination of how electronics companies can create products which meet environmental standards. Green Electronics is aimed at managers and engineers; readers who seek a variety of perspectives on how to successfully negotiate the path to a "green" product. It is aimed at teams which seek to develop environmentally benign materials and manufacturing processes. Shina spent two decades in industry after graduating from M.I.T., and has an equally long period teaching under his belt. He now teaches mechanical engineering at the University of Massachusetts at Lowell. Equally to the point, he is the founder of the New England Lead-Free Consortium, founded in 1999 and counting ~30 electronics manufacturers as members. He is, in short, an authority on the subject who doesn't talk down to his readers one bit. How To Think The first chapters of Green Electronics explain the scientific and mathematical underpinning to a successful conversion to "green" materials, products and processes, including quality and reliability concerns. There is guidance on statistical tests that can be applied to green materials and process selection. To weed out the casual reader, perhaps, the book starts out with a mini-course on statistics and sampling, with two key bits of advice: a sample size of 30 "is usually sufficient," Shina advises, and testing should be spread out over different days and times. Shina recommends that a product design team seeking to meet environmental standards should include a member who is a statistician, or who has received design of experiment (DoE) training. He provides a short course on DoE techniques, including problem definition: how to outline the goals of a project and define the quality characteristics of the process or design to be optimized. Shina and his co-authors don't shy away from environmental degradation issues, including the issue that made Massachusetts (in)famous: the chemical "disposal and leaching, with affect on city water supplies and affect on human health." With a view to the future, Green Electronics outlines how to avoid those problems, including what it takes to get away from lead-based solders. The reader learns quite a bit about the guts of RoHS materials, their higher processing temperatures, and the nitty gritty of using green materials. In a chapter on converting to lead-free assembly, contributors Robert Farrell and Scott Mazur of Benchmark Electronics (Hudson, N. H.) describe the conversion to RoHS compliance (lead free) as "one of the greatest changes to the electronics assembly in over 20 years, which exceeds the impact of the more recent

conversions of through-hole to surface mount technology (SMT), and high-pin-count lead frame components to ball grid array packages." The lead-free solders require processing temperatures 30-40 C higher than tin/lead based solders, making hot air surface leveling (HASL) more likely to cause thermal damage to the board. I've been reading Green Electronics bit-by-bit, moving from the first chapters written by Prof. Shina to the seven chapters contributed by managers from a variety of well-known electronics companies, most of them based in the northeast area of the United States. Every author contributed with passion and clarity, and the net effect is that the reader learns not only how to design a "green" product, but gains broad insights how to conduct a modern product engineering project that happens to have an environmentally-sound product as the end result. http://www.semiconductor.net/blog/270000427.html#1050030905 Semiconductor International Magazine 20080730

About the Author
Sammy Shina is professor of mechanical engineering and director of the Electronics Manufacturing Laboratory at the University of Massachusetts-Lowell. He is the author of a previous bestseller.

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