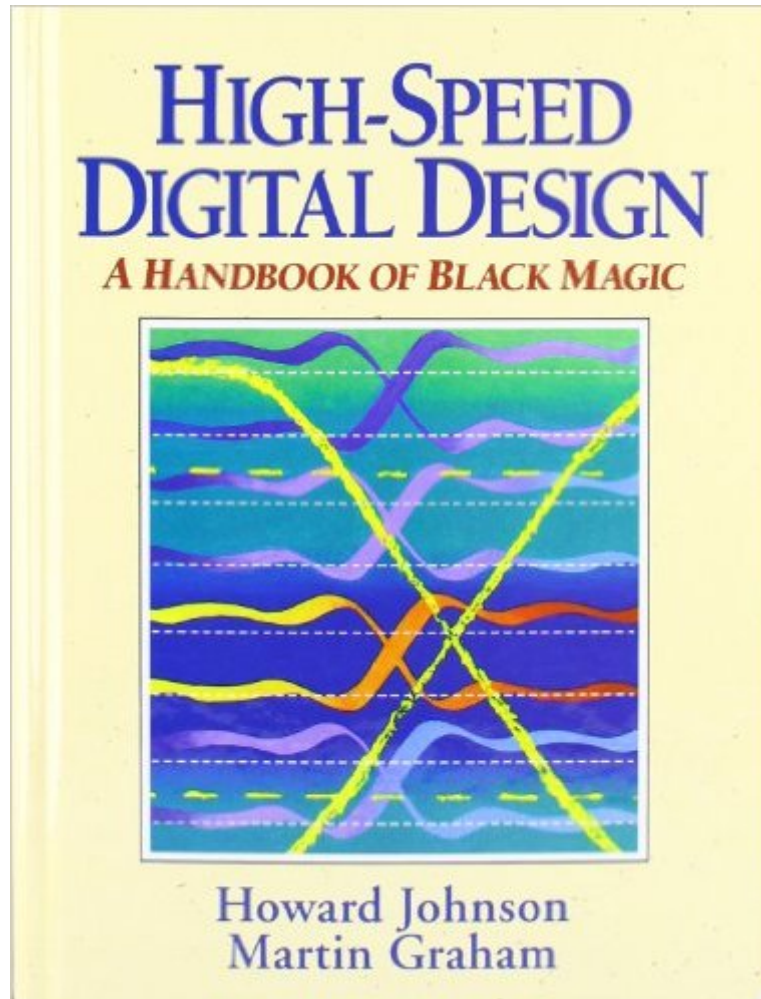# High Speed Digital Design: A Handbook Of Black Magic

## Synopsis

Focused on the field of knowledge lying between digital and analog circuit theory, this new text will help engineers working with digital systems shorten their product development cycles and help fix their latest design problems.   The scope of the material covered includes signal reflection, crosstalk, and noise problems which occur in high speed digital machines (above 10 megahertz). This volume will be of practical use to digital logic designers, staff and senior communications scientists, and all those interested in digital design.

## Book Information

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## Customer Reviews

This book is useful if you want to have a long series of equations available in one place to jog your memory. But if you want to learn something useful and practical- and real-world - then perhaps you would be better off doing a web search for application notes, tutorial papers, and articles, particularly from semiconductor manufacturers, and vendors of high-performance test equipment such as Agilent, Tektronix, and others.To take one example (page 134,) Johnson purports to describe problems associated with a wire-wrapped prototype processor board containing TTL devices operating at high edge rates ( 2 ns.) According to Johnson, the design engineers failed to realize that the circuits would ring excessively, making the board unusable. To "prove" this he posits a model consisting of a 30 ohm TTL driver, with a 2 ns rise time, a 4" length of wire with 89 nH of self inductance, and a 15pf load - a series LRC circuit. Yes, this circuit will ring wildly, but the model

is totally incorrect. The TTL input is not considered, which has a relatively low input impedance in the low state since it is current operated. This circuit -effectively a parallel LRC - does not ring nearly as much, as any experienced engineer knows. As a reality check, remember that wire wrap was successfully used for years by thousand of engineers. To listen to Johnson, though, this technology is almost unusable. Wire wrap circuits do ring, but under his example, the real amount of overshoot/undershoot is well within the limits of TTL. Further, no real circuit produces textbook looking traces, so the role of experience is to learn what worst-case design means, and what is acceptable for good manufacturing yield. Lesson: real experience teaches you how to produce correct, functional models.

Add Johnson and Graham to the list of people who can write large, highly technical books full of useful, pertinent information, and package it all in a way that's mostly very readable and which mixes just the right blend of rigorous academic structure with good old-fashioned "when all else fails, you might get away with this" hacks. This book is by no means a thorough, academic grounding in the subject matter, but it works well as an introduction for people who have some background in conventional electronics, yet little or no background in the specifics of high-speed digital design.Considering how specialized and complex the book's subject matter is, it's surprising how well the authors manage to avoid hard math; they obviously made a conscious effort to use the most intuitive formulas possible whenever they could. There are maybe a handful of differential equations in the book, but most of the math requires no calculus, just basic algebra. The moderately math-phobic should be able to handle this book if you can understand what derivatives and integrals are.A bit of a rant: Everybody gets so hung up on the title! Did any of the people who complain that HSDD isn't really "black magic" actually bother to even open the book? Right in the preface, the authors explain that HSDD is regarded as something of a "black magic" by engineers because it isn't taught in most college programs, but "The authors would like to dispel the popular myth that anything unusual or unexplained happens at high speeds. It's simply a matter of knowing which principles apply, and how." The title is meant to be humorous, people; lighten up! A lack of a sense of humor is a sign of an ineffective engineer.This book really is just an introduction.

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