Foreword

With the exception of the tragedy on September 11th, the year 2001 was relatively normal and uneventful — remember, this should have been the year of the *Clarke's* and *Kubrick's* Space Odyssey, mission to Jupiter; it should have been the year of the HAL-9000 computer.

Today, the Personal Computer is as ubiquitous and omnipresent as was HAL on the Discovery spaceship. And the rate of technology development and market growth in electronics industry still follows the famous 'Moore Law', almost four decades after it has been first formulated: in 1965, *Gordon Moore* of Intel Corporation predicted the doubling of the number of transistors on a chip every 2 years, corrected to 18 months in 1967; at that time, the landing on the Moon was in full preparation.

Curiously enough, today no one cares to go to the Moon again, let alone Jupiter. And, in spite of all the effort in digital engineering, we still do not have anything close to 0.1% of HAL's capacity (fortunately?!). Whilst there are many research labs striving to put artificial intelligence into a computer, there are also rumors that this has already happened (with Windows-95, of course!).

In the early 1990s it was felt that digital electronics will eventually render analog systems obsolete. This never happened. Not only is the analog sector vital as ever, the job market demands are expanding in all fields, from high-speed measurement instrumentation and data acquisition, telecommunications and radio frequency engineering, high-quality audio and video, to grounding and shielding, electromagnetic interference suppression and low-noise printed circuit board design, to name a few. And it looks like this demand will be going on for decades to come.

But while the proliferation of digital systems attracted a relatively high number of hardware and software engineers, analog engineers are still rare birds. So, for creative young people, who want to push the envelope, there are lots of opportunities in the analog field.

However, analog electronics did not earn its 'Black-Magic Art' attribute in vain. If you have ever experienced the problems and frustrations from circuits found in too many 'cook-books' and 'sure-working schemes' in electronics magazines, and if you became tired of performing exorcism on every circuit you build, then it is probably the time to try it in a different way: in our own experience, the 'hard' way of doing the correct math first often turns out to be the 'easy' way!

Here is the book **'Wideband Amplifiers'**. The book was intended to serve both as a design manual to more experienced engineers and as a good learning guide to beginners. It should help you to improve your analog design, making better and faster amplifier circuits, especially when time-domain performance is of major concern. We have striven to provide the complete math for every design stage. And, to make learning a joyful experience, we explain the derivation of important math relations from a design engineer's point of view, in an intuitive and self-evident manner (rigorous mathematicians might not like our approach). We have included many schematics and performance plots, some practical applications, and a number of computer routines.

However, as with any interesting subject, the greatest problem was never what to include, but rather what to leave out!

In the foreword of a very popular book 'A Brief History of Time', the author *Steven Hawking* wrote that his publisher warned him not to include any math, since the number of readers would be halved by each formula. So he included the $E = m\,c^2$ and bravely cut one half of the world population out.

We went further: there are some 220 formulae in Part 1 only. By estimating the current world population to some $6{\times}10^9$, of which 0.01% could be electronics engineers and assuming an average lifetime interest in the subject of, say, 30 years, if the publisher's rule holds, there ought to be one reader of our book once every:

$$2^{220}/(6 \times 10^9 \times 10^{-4} \times 30 \times 356 \times 24 \times 3600) \approx 3 \times 10^{51} \text{ seconds}$$

or something like $6.6{\times}10^{33}$ times the total age of the Universe!

Now, whatever you might think of it, this book is **not** about math! It is about getting your design to run right first time! Be warned, though, that it will be not enough to just read the book. To have any value, a theory must be put into practice. Although there is no theoretical substitute for hands-on experience, this book should help you to significantly shorten the trial-and-error phase.

We hope that by studying this book thoroughly you will find yourself at the **beginning of a wonderful journey**!

Peter Starič and Erik Margan,

Ljubljana, June 2003

Important Note:

We would like to reassure the Concerned Environmentalists that during the writing of this book, no animal or plant had suffered any harm whatsoever, either in direct or indirect form (excluding the authors, one computer 'mouse' and countless computation 'bugs'!).

More Important Note:

Probably a book without errors still has to be written. We shall be grateful for any error brought to our attention, so that we can make the necessary corrections in the next edition. To report the errors please use one of the e-mail addresses below:

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