# Design Of Microfabricated Inductors Power Electronics

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*Research in Progress: Microfabricated Inductors A deeper look at the approximate design of power inductors with gapped ferrite cores Power Electronics -Inductors*

Fundamentals of Power Electronics - Buck Converter Critical Inductance Value **ElectronicBits#22 - HF Power Inductor Design** *High frequency Power Inductor Design: DC \u0026 AC* ~~Power Electronics - 5.4.3 - Filter Inductor Design~~ ~~How INDUCTOR's~~

~~work \u0026 How to make your own~~

Mod-04 Lec-05 Inductor~~Energy Stored in an Inductor~~ DIY 2400W SMPS Inductor Design: You can do this! 8.02x - Lect 20 - Inductance, RL Circuits, Magnetic Field Energy ~~Inductors and Inductance~~ Induction Heater - 6\" Coil vs.

1/2\" bar

How to making inductor part 2(Ferrite \u0026 Iron powder toroid cores) 8.02x - Lect 16 - Electromagnetic Induction, Faraday's Law, Lenz Law, SUPER DEMO *How Inductors Work Within a Circuit - Inductance* **SMPS Tutorial (5): Inductor Basics,**

**Magnetic Circuits, Switched Mode Power Supplies**

#90: Measure Capacitors and Inductors with an Oscilloscope and some basic parts

Inductive spiking, and how to fix it!~~How to choose the right coil type (inductor)?!~~ ~~What is Inductance? The 3 Effects of Inductors -~~

~~The 2-Minute Guru (s2e9)~~ *[Webinar] - Inductor Design for Power Electronics Applications Using EMS* ~~Coupled Inductor Basics~~ The \"Power-Inductor Checker\": A tester for power-inductors

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Magic of Magnetism \u0026 Inductors (Ele ctroBOOM101-007) Basics of coupled

inductors in power supplies How to decrease inductor size in a 10A DC/DC converter design How to Design a Coil for Specific Inductance **Würth Elektronik Webinar: How do I select the right inductor for a DC/DC converter design?**

Design Of Microfabricated

Inductors Power IEEE TRANSACTIONS ON POWER ELECTRONICS, VOL. 14, NO. 4, JULY 1999 709 Design of Microfabricated Inductors Luca Daniel, Student Member, IEEE, Charles R. Sullivan, Member, IEEE, and Seth R. Sanders,

Member, IEEE Abstract—Possible con?gurations for microfabricated inductors are considered. Inductance can be set by adjusting perme-

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Design of microfabricated inductors - Power Electronics ...

603-646-2851 http://e

ngineering.dartmouth.edu/inductor/

Abstract— Microfabricated inductor designs are proposed for convertersfor microprocessorpower delivery. The fabrication pro-cess uses anisotropic silicon etching to form V-grooves; granular metal/insulator

nanoscale composite magnetic materials; and cop-per conductors.

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Design of Microfabricated Inductors for Microprocessor ...
Design of Microfabricated Inductors for Microprocessor

Power Delivery G J Mehas K D Coonley C R Sullivan Found in IEEE Applied Power Electronics Conference, Mar 1999, pp 1181–1187 °c …

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[MOBI] Design Of Microfabricated Inductors Power Electronics

Design of Microfabricated Inductors for Microprocessor Power Delivery G J Mehas K D Coonley C R Sullivan Found in IEEE Applied Power Electronics Conference, Mar 1999, pp 1181–1187 °c 1999 IEEE Personal use of this material is permitted

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[Books] Design Of Microfabricated Inductors Power Electronics

Design of microfabricated inductors - Power Electronics ...

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Design Of Microfabricated Inductors Power Electronics

Abstract: Possible configurations for microfabricated inductors are considered. Inductance can be set by adjusting permeability through control of anisotropy

of a permalloy core or via a patterned quasi-distributed gap. A design methodology based on a simple model is proposed. A more accurate model and a numerical optimization are also developed.

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Design of microfabricated

inductors - IEEE Journals & Magazine Design of microfabricated inductors for microprocessor power delivery by G J Mehas , K D Coonley , C R Sullivan , Gustavo J Mehas , Kip D Coonley , Charles R Sullivan - in IEEE Applied Power Electronics Conf.

Proceedings , 1999

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CiteSeerX — Citation Query Design of Microfabricated Inductors

Abstract: Transformers and inductors fabricated with micron-scale magnetic-alloy and copper thin films are designed for high-

frequency power conversion applications. Fine patterning produced by photolithography reduces eddy current losses, thus enabling very high power densities.

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Possible configurations for microfabricated inductors are considered. Inductance can be set by adjusting permeability through

control of anisotropy of a permalloy core, or via a patterned quasi-distributed gap. A design methodology based on a simple model is proposed. Analysis of secondary effects is also developed. A design example for a 5 MHz buck power converter application is presented.

Design of microfabricated inductors | Semantic Scholar

Nov 2, 2012 - Contact mask layout for microfabricated inductors with thin-film magnetic cores. These magnetic components will be used for high-

efficiency integrated power converters in LED lighting systems. Image courtesy of Ph.D. candidate Dan Harburg, working under advisor Professor Victor Petrenko. Submitted as part of the …

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Microfabricated inductors | Inductors,

Power converters ... Transformers and inductors fabricated with micronscale magnetic-alloy and copper thin films are designed for high-frequency power conversion applications. Fine patterning produced by photolithography reduces eddy current losses, thus enabling

very high power densities. Calculated design graphs and ...

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Design of microfabricated transformers and inductors for ...

Microfabricated Inductors Power Electronics Design Of Microfabricated Inductors Power

Electronics When people should go to the ebook stores, search commencement by shop, shelf by shelf, it is truly problematic. This is why we provide the ebook compilations in this website. It will entirely ease you to see guide design of microfabricated ...

Design Of Microfabricated Inductors Power Electronics

We are developing high-frequency (8 MHz) power inductors fabricated by thin-film deposition and photolithography. They are described in " Design of

Microfabricated Inductors for Microprocessor Power Delivery " and " Converter and Inductor Design for Fast-Response Microprocessor Power Delivery ", and in the first and second papers titled "Fabrication of Thin-Film V-Groove Inductors Using

Composite Magnetic Materials."

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Publications from Dartmouth Magnetic Component and Power ...

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er.dartmouth.edu/in... (external link)

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Design of microfabricated inductors for microprocessor ... Design equations and closed-form expressions for losses are presented. Special design considerations for the

key dynamic voltage scaling enabler, called the dynamic DC-DC converter are given. The focus throughout is on low-power portable applications, where small size, low cost, and high energy efficiency are the primary design objectives.

Design of microfabricated transformers and inductors for ...

Nov 14, 2012 - Contact mask layout for microfabricated inductors with thin-film magnetic cores. These magnetic components will be used for high-efficiency integrated power converters in

LED lighting systems. Image courtesy of Ph.D. candidate Dan Harburg, working under advisor and Professor

Trends in the miniaturisation of electronic products, especially in the portable products

area, has sparked considerable interest in the miniaturisation of the energy processing electronics i.e. the power conversion circuits such as the switched mode power supply (SMPS). Unlike digital electronics which have benefited from miniaturisation and integration in

microelectronics, power conversion electronics have not significantly reduced in size. This is directly due to the fact that power conversion requires energy storage components such as inductors and capacitors. The value of the inductors and capacitors required can be reduced if the

switching frequency of the power converter is increased. In order to miniaturise the power converter, the switching frequency must be increased so that passive components can be miniaturised and integrated. Traditionally the inductive components have been difficult to

integrate on chip. This work focused on the design and fabrication of integrated inductors-on-silicon for very high frequency power conversion (20 {u2013} 100 MHz). Initially an analytical model for micro-inductors which was developed in previous work was used to design inductors for

operation up to 20 MHz. The designs selected for fabrication had a footprint area between 5 {u2013} 9 mm2 and a predicted device efficiency of 90% and above. These models were validated by finite element analysis before fabrication. The fabricated

prototypes displayed a low loss of inductance to 20 MHz and current handling ability to 0.5 A. The micro-inductors were then interfaced with a high frequency dc-dc converter (20 {u2013} 100 MHz) developed by NXP Semiconductor, and achieved an inductor efficiency of 93% at

20 MHz. The maximum converter efficiency with the micro-inductor was measured to be 78.5%, which to date is highest quoted inductor-on-silicon device efficiency in a converter application at 20 MHz. Circuit equivalent lumped-element models of the micro-inductor for use

in circuit simulation software were also developed. This equivalent circuit model includes elements such as capacitance, which are not accounted for in the previously developed analytical model. The initial micro-inductor devices performance was found to be

comparable to commercial chip inductors for inductor efficiency when used in a converter. However, if the micro-inductor technology is to compete as a viable alternative to commercial devices, it needed to reduce its footprint area dramatically. This was achieved by using an

optimisation software engine to find the inductor designs with maximum efficiency for a given footprint area. The footprint of these optimised devices ranged from 0.5 {u2013} 2.5 mm2 for a range of inductances to 200 nH. A range of optimised devices were fabricated and

the measured optimised devices displayed a low loss of inductance to tens of MHz and good current handling capability. However, measured dc resistance was found to be substantially higher than design, due to issues in the fabrication process. The fabricated

inductors also highlighted the trade-offs that are introduced in micro-inductor performance vs. footprint area. This design trade-off was also reflected in micro-inductor performance in a converter. An optimised 2.5 mm2 area device was tested in a dc-dc converter at 20 MHz,

which resulted in a slightly lower peak micro-inductor efficiency of 90.5% than the previous larger devices. The fabricated optimised micro-inductors achieve an inductance density (inductance per unit area) ranging from 66 - 110 nH/mm2 and display current

handling ability of 500mA for the 2.5 mm2, 250mA for the 1.3 mm2 and 150mA for the 0.5 mm2 area device. For inductors aimed at power conversion applications, this work shows a significant improvement to what is reported in literature - in high frequency operation

to tens of MHz, inductance density and current handling.

Although they are some of the main components in the design of power electronic converters, the design of inductors and transformers is often still a trial-and-error process due to a long

working-in time for these components. Inductors and Transformers for Power Electronics takes the guesswork out of the design and testing of these systems and provides a broad overview of all aspects of design. Inductors and Transformers for Power Electronics

uses classical methods and numerical tools such as the finite element method to provide an overview of the basics and technological aspects of design. The authors present a fast approximation method useful in the early design as well as a more detailed analysis. They

address design aspects such as the magnetic core and winding, eddy currents, insulation, thermal design, parasitic effects, and measurements. The text contains suggestions for improving designs in specific cases, models of thermal behavior with various

levels of complexity, and several loss and thermal measurement techniques. This book offers in a single reference a concise representation of the large body of literature on the subject and supplies tools that designers desperately need to improve the accuracy and performance of

their designs by eliminating trial-and-error.

Based on the fundamentals of electromagnetics, this clear and concise text explains basic and applied principles of transformer and inductor design for power electronic applications. It details

both the theory and practice of inductors and transformers employed to filter currents, store electromagnetic energy, provide physical isolation between circuits, and perform stepping up and down of DC and AC voltages. The authors present a broad range of

applications from modern power conversion systems. They provide rigorous design guidelines based on a robust methodology for inductor and transformer design. They offer real design examples, informed by proven and working field examples. Key

features include: emphasis on high frequency design, including optimisation of the winding layout and treatment of non-sinusoidal waveforms a chapter on planar magnetic with analytical models and descriptions of the processing technologies analysis of the role of variable

inductors, and their applications for power factor correction and solar power unique coverage on the measurements of inductance and transformer capacitance, as well as tests for core losses at high frequency worked examples in MATLAB, end-of-chapter

problems, and an accompanying website containing solutions, a full set of instructors' presentations, and copies of all the figures. Covering the basics of the magnetic components of power electronic converters, this book is a comprehensive reference for students

and professional engineers dealing with specialised inductor and transformer design. It is especially useful for senior undergraduate and graduate students in electrical engineering and electrical energy systems, and engineers working with power supplies

and energy conversion systems who want to update their knowledge on a field that has progressed considerably in recent years.

This book describes the structured design and optimization of efficient, energy processing integrated

circuits. The approach is multidisciplinary, covering the monolithic integration of IC design techniques, power electronics and control theory. In particular, this book enables readers to conceive, synthesize, design and implement integrated circuits with high-density high-

efficiency on-chip switching power regulators. Topics covered encompass the structured design of the on-chip power supply, efficiency optimization, IC-compatible power inductors and capacitors, power MOSFET switches and efficient switch drivers in standard

CMOS technologies.

CMOS DC-DC Converters aims to provide a comprehensive dissertation on the matter of monolithic inductive Direct-Current to Direct-Current (DC-DC) converters. For this purpose seven chapters are defined

which will allow the designer to gain specific knowledge on the design and implementation of monolithic inductive DC-DC converters, starting from the very basics.

This book deals with energy delivery challenges of the power processing unit

of modern computer microprocessors. It describes in detail the consequences of current trends in miniaturization and clock frequency increase, upon the power delivery unit, referred to as voltage regulator. This is an invaluable reference for anybody needing to understand the key

performance limitations and opportunities for improvement, from both a circuit and systems perspective, of state-of-the-art power solutions for next generation CPUs.

Recent catastrophic

blackouts have exposed major vulnerabilities in the existing generation, transmission, and distribution systems of transformers widely used for energy transfer, measurement, protection, and signal coupling. As a result, the reliability of the entire power system

is now uncertain, and many blame severe underinvestment, aging technology, and a conservative approach to innovation. Composed of contributions from noted industry experts around the world, Transformers: Analysis, Design, and Measurement offers

invaluable information to help designers and users overcome these and other challenges associated with the design, construction, application, and analysis of transformers. This book is divided into three sections to address contemporary economic, design,

diagnostic, and maintenance aspects associated with power, instrument, and high-frequency transformers. Topics covered include: Design considerations Capability to withstand short circuits Insulation problems Stray losses, screening, and local excessive

heating hazard Shell type and superconducting transformers Links between design and maintenance Component-related diagnostics and reliability Economics of life-cycle cost, design review, and risk-management methods Parameter measurement and

prediction This book is an essential tool for understanding and implementing solutions that will ensure improvements in the development, maintenance, and life-cycle management of optimized transformers. This will lead to enhanced safety and reliability and lower costs for

the electrical supply. Illustrating the need for close cooperation between users and manufacturers of transformers, this book outlines ways to achieve man

The accelerating trend to miniaturize electronic systems and devices is placing large demands on the

components responsible for delivering electrical power to these systems. Most power conversion circuits require magnetic components (inductors and transformers) in order to operate at high efficiencies; these components, however, have not yet

been widely miniaturized and integrated with electronic components that are fabricated in a CMOS process and are most often realized as discrete off-chip components. Improved on-chip inductors are therefore required to realize a monolithic

Power Supply On-Chip (PwrSoC) for electronic systems where size and efficiency are of critical importance. This thesis presents design, modeling, optimization, and micro-fabrication techniques for building chip-scale racetrack power inductors with thin-film

magnetic cores. Our inductors are designed for high-power-density and high efficiency dc-dc converters which transfer 25 W of power at frequencies between 5 and 30 MHz. The dc-dc converter is designed to serve as a high-input-voltage solid-state lighting driver.

Magnetic components on silicon substrates with sputtered Co-Zr-O magnetic cores are optimized using a series of models that characterize each inductor loss mechanism. The optimized designs were fabricated and tested at small-signal levels and in the high-frequency power

converter. The converter achieves an 89% conversion efficiency at 5 MHz with an inductor power density of 1 W/mm2 of substrate area. Small-signal measurements of the inductors are compared with modeled predictions to validate the design optimization

approach. Fabricated components achieve inductance values of 1.2 [mu]H and peak quality factors of 15.1 at 8.3 MHz.