Magnetic Components for the Manufacture of Low Cost On-Chip Power Supplies

Advantages
- Enables the creation of an efficient power-supply-on-a-chip
- Utilizes well-established manufacturing techniques
- Eliminates expensive metal-oxide-semiconductor and mechanical-electrical-micro-systems processing
- Improves performance, increases quality factor and boost conductance by a factor of 5 to 10
- Reduces overall size and weight of power supply

Invention
Low-cost method for manufacturing on-chip inductors and transformers (needed to create a power supply on a chip)

Background
Power supplies can be found in almost all electronic products. Conventionally, these electrical circuits were composed of semi-conductor chips, capacitors and inductors all mounted on a large and heavy printed circuit board. Recently, a new approach known as Power Supply On a Chip (PSOC) or System On a Chip (SOC) has emerged. These methods combine all of the conventional components of a power supply into an integrated circuit on one single chip. Since the manufacturing processes typically used for the necessary magnetic components (inductors and transformers) are incompatible, it is challenging to integrate such components into the semiconductor chip. This has generated a need to find ways to successfully develop integrated circuits on a chip, using compatible fabrication processes. Various approaches using standard Complementary Metal-Oxide-Semiconductor (CMOS) fabrication processes have been presented for fabricating on-chip integrated inductors. However, these methods result in very poor quality and poor inductance performance. To improve the quality, Mechanical-Electrical-Micro-Systems (MEMS) fabrication techniques are used after the CMOS fabrication process. Unfortunately, this has not produced the expected improvement and is also too costly and difficult to actually integrate with CMOS.

UCF scientists have designed an integrated circuit chip that addresses these issues. Using a low cost manufacturing process, they have designed a system on a chip that integrates passive and active components used in power management. They have also managed to improve the overall inductance by a factor of 5 to 10 compared to prior art by forming magnetic components on bond wires of the chip. The result is a small, lightweight, efficient power supply on a chip which overcomes the complications experienced by previously utilized designs.

Application
The techniques employed in this technology can be used to form magnetic components onto practically any chip. The technology is necessary to create a power supply on a chip, and can thus be used to replace the conventional power supply on a board. Electronics manufactures, especially those who require power supplies with smaller form factors, can utilize this technology to create products with a superior inductance and lighter weight.

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