A close-up photograph of a custom magnetic component, likely a power inductor, mounted on a green printed circuit board (PCB). The component consists of several thick, cylindrical copper wire turns that are tightly wound together. The background is blurred, showing other components and traces on the PCB.

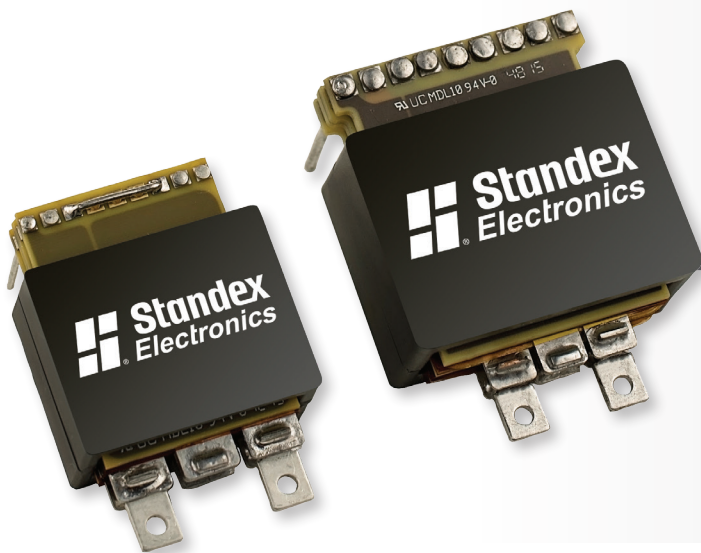
The Advantages of Custom Magnetic Components in Next-Generation Electronics



Today's electronic system performance demands require optimum magnetic component solutions. Using semi-standard or custom-made inductors and transformers enables design optimization and best possible performance.

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The industry migration to more complex and sophisticated electronic solutions is putting a great deal of pressure on the board-level infrastructure, especially the power electronics. There are no electronics without electricity, and how your product manages power is directly related to its reliability, efficiency, cost-effectiveness, and safety. The efforts to make a device that operates well, addresses the application properly, and is compliant to the multiple regulatory environments will put a great deal of pressure on the electronic systems designer, as these demands are often contradictory in addressing an application.

These electronic solution demands are becoming more and more strident in today's device-driven economy. Today's users, devices, and infrastructures are more integrated than ever before, and each application space has its own power demands and regulatory environments. Products and services based on the Internet of Things (IoT) leverage the wireless Cloud ecosystem, and those enhanced by Edge computing often require their own separate power and RF methodologies.

The New Importance of Advanced Magnetics

The combined pressure of increased user performance expectations and the evolving regulatory environment is making it necessary for manufacturers to create products that are more functional, efficient, safe, and reliable than ever before. This requires designers to optimize the logic, power, and RF systems in order to achieve the highest levels of efficiency, power density, and cost-effectiveness available. This often requires magnetic components that are tailored for the circuit, or at least modified to best serve the application involved.

Products are expected to be small, efficient, and cost-effective. The perceived higher cost at the component level for custom magnetic components is outweighed by the ability to more cost-effectively address the increased demands of the marketplace.

The need for lower power consumption, longer battery life, and high wireless functionality are reflected in the standards and reg-

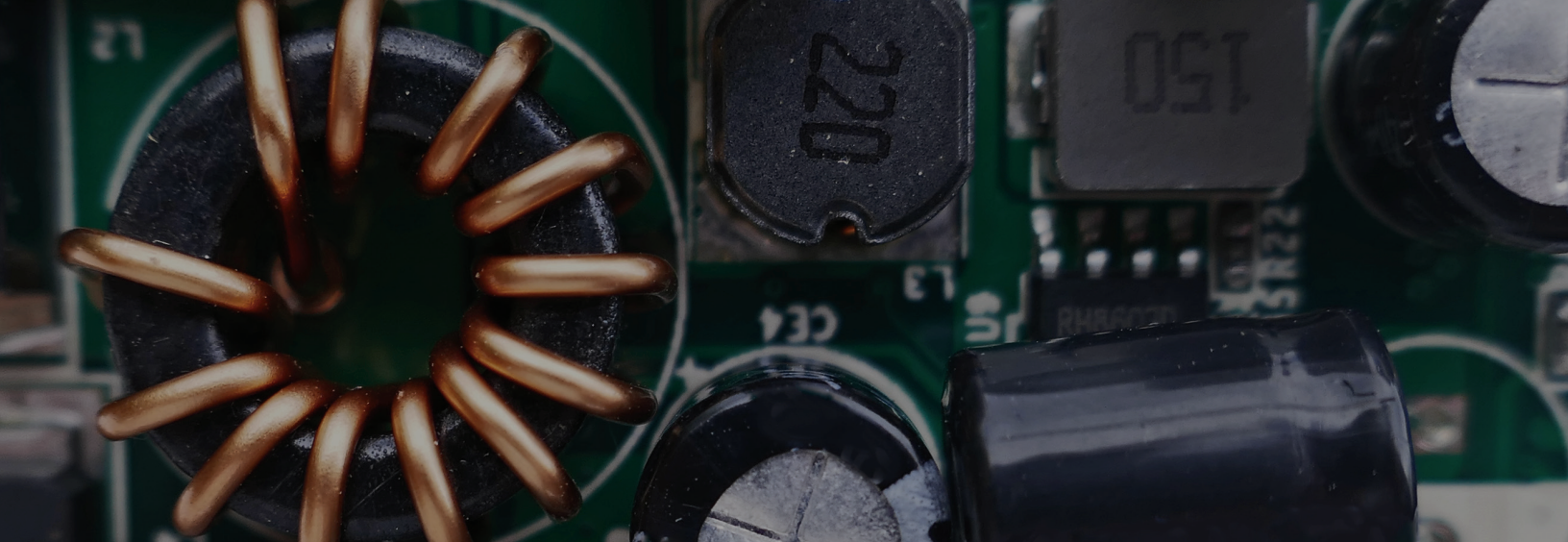
ulations the product must comply with. Product compliance is as important as its functionality. The design process should begin by listing the needs of the application and the market involved, as well as the desired performance, precision, and durability of the end result. Custom magnetic solutions can make it easier to create market-compliant solutions for different situations.

Off the Shelf or Custom?

Deciding between an off-the-shelf or custom solution for your magnetic components is a serious consideration that directly impacts every other aspect of your product's development, manufacturing, and deployment. Custom devices enable you to optimize very specific and important aspects of your design, to flexibly meet performance and compliance demands. Customizing the inductors, transformers, chokes, and other magnetic components yourself gives you complete control of their performance parameters, and you and your development partner(s) are in control of the design and process.

For example, energy efficiency is one of the items at the top of everyone's checklist for an electronic product today. Beyond addressing obvious issues like the battery life and the size and number of cells needed, the power efficiency directly impacts design aspects like thermal management. The more efficient the circuit is, the less waste heat, and therefore the less heat-sinking, potting, and ventilation needed. This also directly relates to important user issues like form factor and device ergonomics, as reduced packaging needs enables more flexibility in the final product design.

The ability to tailor your magnetics to the application enables you to be more flexible in creating your products than those who limit themselves to a line-card choice of standard components. Being able to design with available materials and pre-qualify alternate constructions is a strong enhancement to competitiveness in a disruptive supply environment. The flexibility in the ability to design for manufacture, among other development advantages, cannot be understated.



Electronic Performance Is Dependent on the Magnetics

The latest advancements in semiconductor and switch-mode power supply topologies present a new set of challenges to magnetic design. Components must manage additional high frequency losses in the core and winding and also be designed to properly dissipate heat generated from the losses. Heat sinks can also be directly attached to the component to further provide heat dissipation - a common practice for planar transformers.

Beyond core electronic performance, custom devices can also more directly address system ruggedness and product form factor requirements. A custom magnetic solution can easily meet difficult creepage & clearance requirements. Custom bobbins and cores can be designed to optimize size while meeting difficult to obtain safety distances.

Another advantage to custom magnetic solutions is that the ability to adjust the geometries of the components can address other issues like form factor requirements. Or the need to change geometries may be related to board-level issues like cooling airflow path creation, or other related issues. Customization can be as simple as specific marking, pre-forming leads for easy assembly, or the addition of terminals.

Partnering for Success

The expertise and manufacturing capabilities of the right development partner can not only help with these myriad demands, but they can also ensure that each of these solutions does so in a cost-effective manner.

The highly flexible aspect of a custom magnetic component solution can solve issues on both sides of the business table, as your development partner can adjust the bill of materials to address both design needs and supply-chain realities. Deciding whether to go with “off-the-shelf or custom” is a serious one, and in today’s disruptive and competitive electronics marketplace, the importance of an optimal electronics solution for your products or services is critical.

The advantages of using a custom solution include the ability to address size and form-factor issues, thermal performance, and manufacturability. That is why it is important to have a good partner. The right custom solutions development partner can remove a great deal of the difficulty of going it alone in today’s environment, and custom devices are designed from the ground up to address the unique needs of the application in question, leveraging and integrating the latest technologies and solutions.



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