

Thought Leadership

Planar Transformers in
Military and Aerospace
Applications

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A lot of performance in a small, low weight package - by Bob Rieck, Product Manager, Standex Electronics

Over the past decade or so, the use of planar transformers in military and aerospace applications has grown rapidly. Military and aerospace (Mil-Aero) applications typically require a lot of performance in a small, low-weight package. Planar transformers are a good choice for applications where space and weight savings are vital. Aside from their footprint, height, and weight, they also have the ideal power density for high frequency applications. In general, they are better than traditional wire-wound transformers for a given power rating. Managing heat from components are key in these applications, so the planar transformer core's large surface area and its flat windings make these parts ideal for heat sinks and heat dissipation.

Some manufactures, including Standex Electronics draw from designs that have worked in past commercial and Mil-Aero applications to develop transformers that meet rigorous standards, requirements, and specifications.

not change, but new designs incorporate weight and space savings. Figure 1 shows a few of the latest planar transformer designs.

Historically, manufacturers of the power sources used to generate power for commercial aerospace accessories have had to use larger part sizes to get more power to a system. Now the trend in the industry is to ask the question, "How can power components scale down in size and yet still provide increased power?"

In power applications, smaller size has a by-product of additional heat generated by the component. This heat must be dissipated for the component to function properly and for the component's long term survival. Planar parts are smaller and run hotter – but they are also easier to cool. Because of their flat and open design, the component can be cooled either by mounting them to heat sinks that draw heat away, or by directing air flow around them to help cool them. By contrast, traditional transformers are wrapped and contained, so the internal heat generated is far more difficult to get rid of.

It should be noted that there is still a need for wire-wound products for some aerospace applications, since planar(s) cannot replace all frequency ranges, current sensing applications, and power conversion requirements. Wire-wound

be fit in places with minimal room.

As in other areas of electronics, the trend towards miniaturization is in effect in Mil-Aero applications and does have an influence on transformer designs. When devices or equipment powered by a transformer get smaller, it takes more power to make them work. As devices get smaller, more power may be needed to do the same job. Historically, to do more one had to get bigger, and this limited what an end customer could do. Now, planars can incorporate more because the components can take higher power through their low-profile surface mount designs.

Customizing Planar Transformers For Specific Demanding Applications

Planar transformer designs must be reliable, lightweight, low profile, and have high-efficiency – but that's just the starting point. Developing the right planar transformer design requires optimizing weight, size, and materials for the specific application.

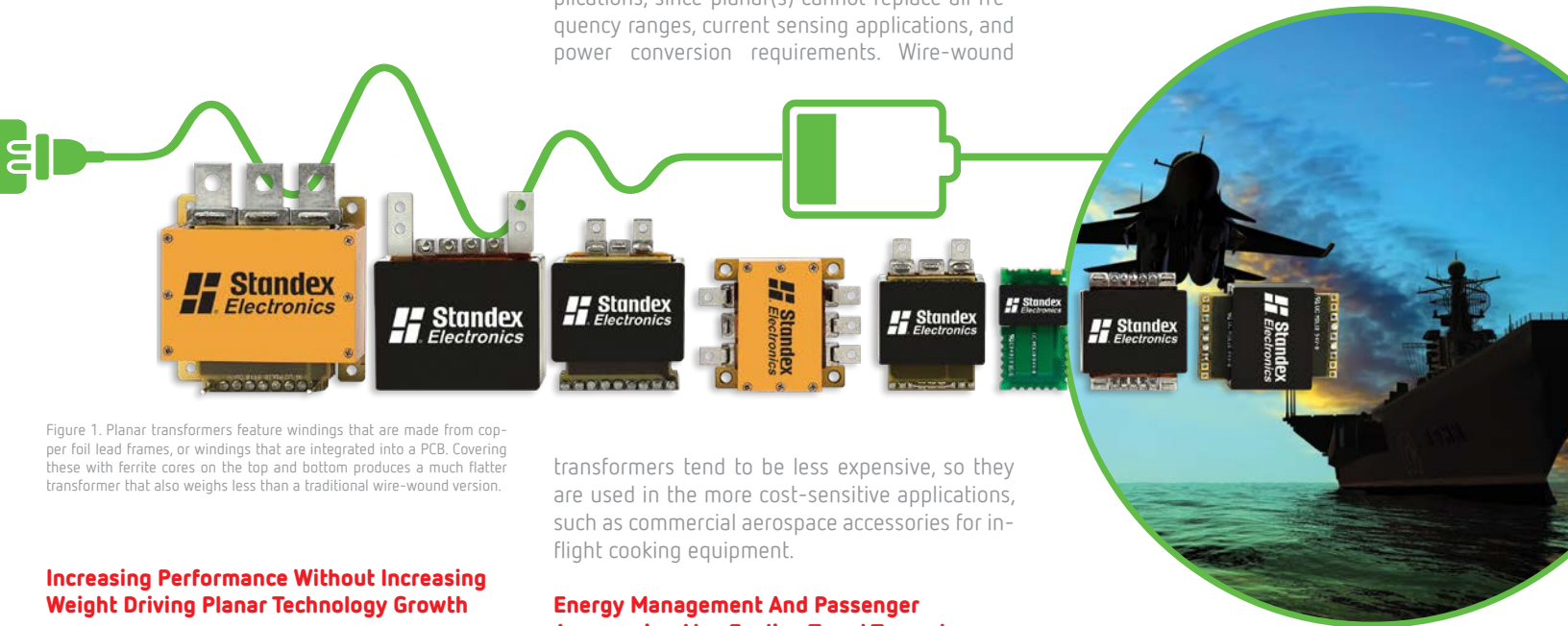


Figure 1. Planar transformers feature windings that are made from copper foil lead frames, or windings that are integrated into a PCB. Covering these with ferrite cores on the top and bottom produces a much flatter transformer that also weighs less than a traditional wire-wound version.

Increasing Performance Without Increasing Weight Driving Planar Technology Growth

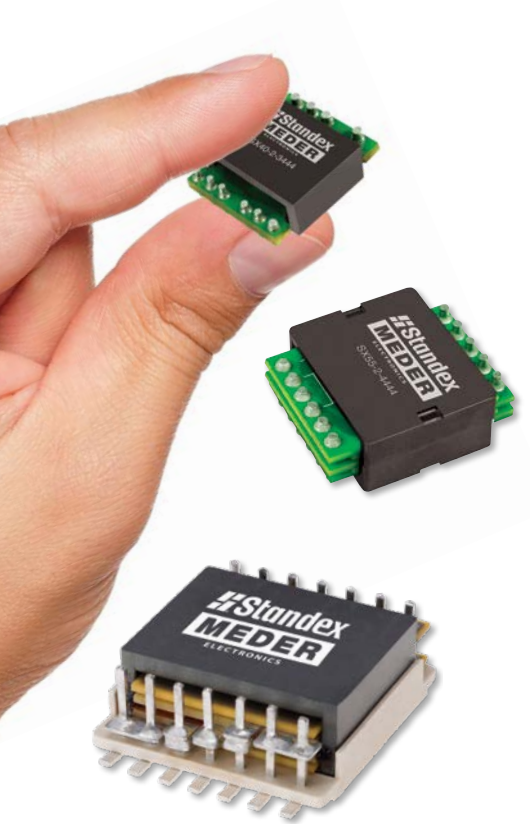
Fuel cost, commercial aerospace accessories, increasing performance without increasing weight – are factors in driving growth of planar transformer products in Mil-Aero applications. There is a trend towards re-packaging and re-designing more into the same physical space of many existing designs that adapt to stringent requirements. The overall functions of the systems do

transformers tend to be less expensive, so they are used in the more cost-sensitive applications, such as commercial aerospace accessories for in-flight cooking equipment.

Energy Management And Passenger Accessories Also Fueling Trend Towards Planar

Energy management is increasingly important in Mil-Aero applications, and we are seeing more battery charging and power generation systems. We also see commercial aerospace applications for more in-seat powered passenger accessories and compartments, requiring power supplies to

For example: in space applications, weight really matters, in military applications designed for harsh environments – heat may play a larger part. Components for parts used in space would be different than those used on a radar unit on ground – and different from those used in a unit on an aircraft. Regardless, the design and function of the planar are crucial to these applications.



There are very few standard designs in this market, and the ability to adapt the design to exactly fit the customer's needs is extremely important. In addition to transformer engineering, manufacturers must also have packaging and testing capabilities to meet U.S. military standard (MIL-STD) requirements of which Standex Electronics has these abilities.

Standex Electronics has developed a **Partner, Solve, and Deliver®** approach, which draws from a broad range of planar and wire-wound engineering, packaging, and testing experience to develop components that power various application needs.

Engineering experts strategically partner by conducting detailed discussions with customers that cover packaging, how to design the transformer, and how it will be mounted. Prototyping and testing are frequently part of the equation. For example, Standex Electronics Cincinnati engineering headquarters has a complete in-house environmental test lab where all testing is done to support their Mil-Aero customer base in North American and worldwide. The availability of an in-house testing lab means testing can be conducted faster and at a lower cost.

ITAR products can be produced in the USA and higher volume production can be performed in a magnetics facility in Mexico. This is convenient for customers who cover different niche markets, broad demands, requirements, and volumes.

Engineering application experts also perform prototyping to build samples and modify them and to meet specific application needs. However, in many cases, engineers can save on prototyping time by developing workable designs based on past successes, without having to go through

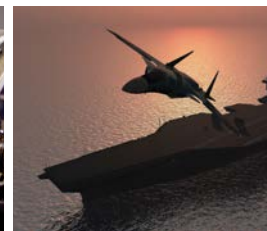
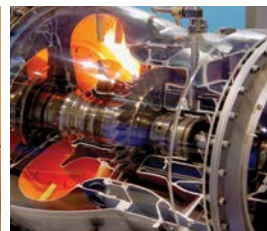
trial and error tests to prove the concept. In addition, new processes and techniques in Mil-Aero markets are frequently integrated into commercial products.

Standex Electronics has also supplied custom wire-wound products for aerospace applications, particularly for cost sensitive commercial airline accessories that must meet more strict requirements than those of household items – such as in-aircraft coffee makers and microwaves.

Furthermore, Mil-Aero manufacturers are under pressure to reduce costs and improve delivery time. Some suppliers are working to provide value-added services that help end customers with this goal. For example, Standex Electronics provides end-users with larger assemblies, mounting its planar transformers on frames, or adding brackets and other parts to a transformer. This speeds up their assembly time, saving time and money in the form of lower labor costs.

Planar transformer technology is typically higher in-cost technology compared to wire-wound, but in the Mil-Aero market, the need for performance in a small low-profile package drives the designs. Manufacturers are working to develop customized planar designs adapted to fit application-specific engineering and packaging requirements.

Standex Electronics is available to discuss your standard and/or custom planar transformer design needs. To request additional information, please visit us on the web at standexelectronics.com.



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