

Bend me, shape me

Flexible circuit technology has been associated with the aerospace industry for a number of years due to its significant benefits as an interconnect solution. The lightweight, space saving, repeatability and cost-effective nature of such circuits are just some of the benefits being capitalised on.

In more recent years it is the 3D nature of flexible circuits that has seen the technology achieve widespread adoption in the industry as functionality increases and space decreases. With over 50 years experience in PCB manufacture, Teknoflex has established a reputation as a major supplier of flexible and flex-rigid multilayer circuits and assemblies. Teknoflex supplies all types of flexible circuit technologies for many blue chip companies in the aerospace sector, including air data computers, landing gear, navigation systems, fuel control, flight deck instrumentation, engine control systems, sensors and in-flight entertainment systems.

In its simplest form, a flexible circuit offers a point to point connection in more than one plane. But with advances in technology, the industry has seen a trend towards the common use of traditional rigid PCBs, combining them with a flexible substrate on limbs to reach other parts of the unit. This is more commonly known as a flex-rigid multi-layer, which provides an excellent substrate for component integration between terminations with the minimum number of interconnects in the minimum space. A cable harness could never do this on its own. Flexible circuits can also take the form of either single sided, double sided, or multilayer configurations, and can be rigidised locally to offer a stable component platform.

Flexible circuits give electronics designers more scope and creative freedom when designing interconnect solutions, due to their inherent properties and low thicknesses, which make them ideal for both static (bend to install) and dynamic applications, where points of the circuit are required to move.

The range of flexible circuit technologies that Teknoflex can offer – such as sculptured flex, flex-rigid multi-layers or its own PinFlex – each hold relative merits for the aerospace industry. For example, sculptured circuits offer differential conductor thickness, permitting mechanical robustness and enabling higher currents to be carried through the circuit, whilst PinFlex offers excellent vibration resistance and a low profile connection system to rigid PCBs. Where enhanced thermal stability for 3D interconnect is required the aerospace industry is now adopting Teknoflex's flex circuit technology, Regal Flex.

Flex to impress

Regal Flex is an advanced flex-rigid multi-layer circuit offering enhanced reliability, performance and adaptability as an interconnect solution, enabling high layer count circuits to be designed and manufactured. Regal Flex resembles a flex-rigid multi-layer circuit, but is quite different in construction. Firstly, it uses very specific thermally stable epoxy/glass prepreps to make the circuit board thermally stable, which prevents barrel crack formation in plated holes during extreme thermal cycling. Secondly, the flexible substrate, usually that of polyimide, does not run through the entirety of the board, but only at the required flexible limbs. This

Teknoflex technical director, Keith Netting and marketer, Simon Larbey examine the importance of flexible circuit technology and why it is experiencing such widespread adoption in modern aircraft.

ensures that only the lower coefficient of thermal expansion of materials is present in the rigid areas further reducing the risk of barrel cracking failure for high layer count boards.

Again, the technology achieves the same advantages to that of a flexible circuit, such as reductions in weight, space and cost. However, Regal Flex also offers a thermally stable circuit board with high density. This is particularly relevant to the aerospace industry as aircraft experience such dramatic changes in temperature, from the sub-zero temperatures of the earth's troposphere to the average temperature of the earth's surface. Therefore, in achieving true homogeneity in the rigid material structure, Regal Flex circuits offer greater reliability in such demanding high density applications.

Designs on flexibility

Teknoflex supports design for manufacture (DFM) ideology as a key component for customers to consider when using flexible circuit technology as an interconnect solution. DFM should be indicative of all designers within the aerospace industry, as the design itself has multiple ramifications for manufacturers throughout the supply chain and can be overlooked at peril when a new design comes to fruition. Therefore, the importance of communication and transparency is imperative between organisations to ensure reliability and quality when manufacturing a new product.

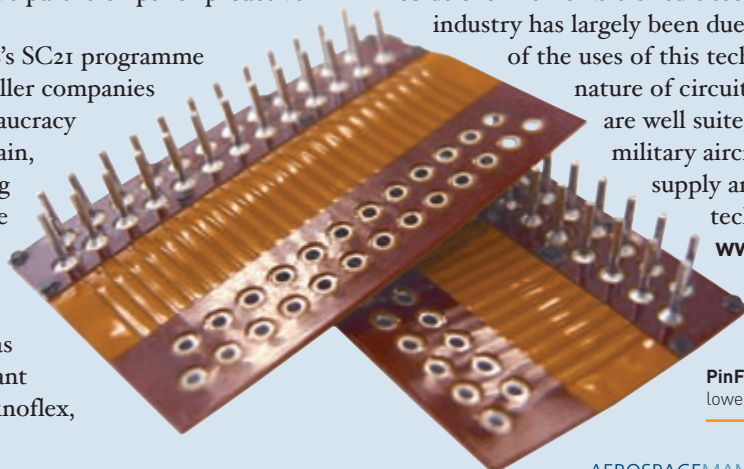
In recognition of the importance of communication, Teknoflex recently hosted a Designers Forum, which brought together electronics designers from the aerospace and defence industries to discuss a host of design principles that permit an improved understanding between organisations and to establish the importance of collaborative partnerships for proactive engineering.

In recognition of the SBAC's SC21 programme and its aim of supporting smaller companies to help them reduce the bureaucracy associated with the supply chain, Teknoflex is currently working towards the AS9100 aerospace accreditation in which the quality management system must provide an essential role in reducing risk. Aerospace has become an extremely significant market sector not just for Teknoflex,



Teknoflex technical director Keith Netting and marketer Simon Larbey

but for the many other SMEs that represent the UK industry. In doing this, Teknoflex has introduced methods of collating and analysing data regarding company performance through using tools such as On Time and In Full (OTIF) and Not Right First Time (NRFT) as core performance indicators. Teknoflex has found that this has been effective in obtaining the necessary visibility to track and improve its methods of manufacturing to meet the needs of customers in the aerospace and defence industries. It is evident the UK aerospace industry has created a framework to aid suppliers in the market with the intention of improving quality, competitiveness and driving technological advances – all derived from the SC21 initiative. In conclusion, the widespread adoption of interconnection solutions like flexible circuit technology in the aerospace industry has largely been due to the better understanding of the uses of this technology. The lightweight nature of circuits and their space saving ability are well suited for both commercial and military aircraft, permitting the continued supply and success of flexible circuit technology in the industry. | www.teknoflex.com



PinFlex: improves vibration resistance and lowers profile connection to rigid PCBs



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