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Synergy, The Occam Process And Twisted Wire Interconnect

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Synergy is broadly defined as the additive benefit that is garnered when two or more seemingly unrelated elements are joined, combined or brought together in some manner. Perhaps the most common example used to help explain in simplest terms the fundamental idea of synergy is the equation 1 + 1 = 3. The term/concept of synergy seems very apt when applied to the interaction of the Occam process solderless assembly concept in combination with a unique PCB interconnection technology called twisted wire interconnect or TWI. A description of this novel technology will help illustrate the potential.

The TWI approach has been around for a number of years, having been developed initially by Cray Computer Corporation in the late 80's. However, the technology is now being prepared for commercialization by Medallion Technology (www.medalliontech.com) as the industry begins to face some of the challenges that face Cray Computer at that time. The idea came into being as a simple alternative to creating ever more complex and costly laminated multilayer boards. Simplicity was one of the signature features of Seymour Cray's development. The basic idea of joining simple two-metal-layer circuits is similar in some ways to a concept developed by Tessera called TLS, an acronym for Tessera laminated substrate. TLS was employed to create multilayer substrates from simple two-metal-layer circuits that were joined, and interconnection in the lamination step and components are then attached. In contrast, with TWI there is no lamination, and components are already attached on both sides. This is the technology's unique "twist" instead (if a pun can be tolerated).

The fundamental unit of TWI technology is based on a twisted wire bundles of a high modulus (i.e. spring-like) metal which, by means of a specially developed tool, is clamped on one end and then twisted in reverse to unwind the wires creating something which looks similar to a string of small birds cages. (See Figure 1) These "spring bulges" can then be inserted into plated through hole vias to make interconnection between traditional PCB assemblies where required. TWI has some very compelling benefits and can be deployed it appears with relative ease, though designers must think and understand the design process in some new ways.

In practice, this enabling technology is implemented using two or more simple, low-cost, double-sided printed circuit boards, which are fabricated and then populated on both sides with components. These assemblies are then joined and interconnected with TWI elements with expanded bulges in aligned plated though-hole vias to form a robust, solderless and compact assembly with free path convection cooling channels to assist in thermal management.
TWI technology has been demonstrated to provide an uncommonly facile and layout friendly means of PCB-to-PCB connection. Moreover, in many cases, the technology can obviate need for circuit route restriction and expensive, high-density connectors by allowing more direct interconnection pathways between assemblies offering shortest path interconnections down to a single point-to-point interconnection. Applications cited by the developers include those having restricted space in X, Y or Z dimensions, those having high thermal load challenges, needing improved overall reliability or those where cost reductions are required. With that shopping list of capabilities and prospective benefits, it is clear that TWI technology should eventually find many customers, including those having interest in the Occam solderless assembly process.

For those unfamiliar with the Occam process, it is a simplified reverse electronic interconnection technology, wherein components are first encapsulated and then joined and interconnected by electroplating the circuits directly to component terminations. While the technique has been described as one where plated through holes are not normally required, when stacking Occam assemblies, in a manner similar to that anticipated for use in the twisted wire interconnection concept, there could be found significant synergistic benefits, chief among them is an robust 3D electronic assembly with limited elements and wherein no high temperature excursions are ever encountered. The high temperatures of lead-free solder remain one of the biggest challenges for electronics assembly today. There is also the fact that reliability is inversely related to thermal management and the number and range of thermal excursions encountered. The combined benefits are compelling and this is best illustrated by means of an illustration which is provided in Figure 2.

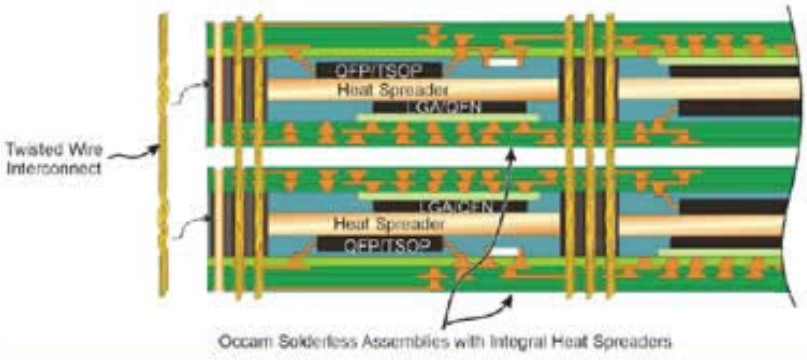

Figure 2. Occam and TWI technologies can be prospectively combined create a powerful high density and high performance solderless interconnection solution.

In summary, synergy, though not always predictable, is often an important part of both new technology development and the normal process of industry growth and expansion. While both twisted wire interconnection, as applied to standard electronic assemblies, and solderless assembly of electronics can exist and prosper apart from one another, when combined, they open the doors to new advantages and possibilities for future electronics.

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