Interposer – A Unique Method for Ensuring the Reliability of Mix-Tech in BGA Components

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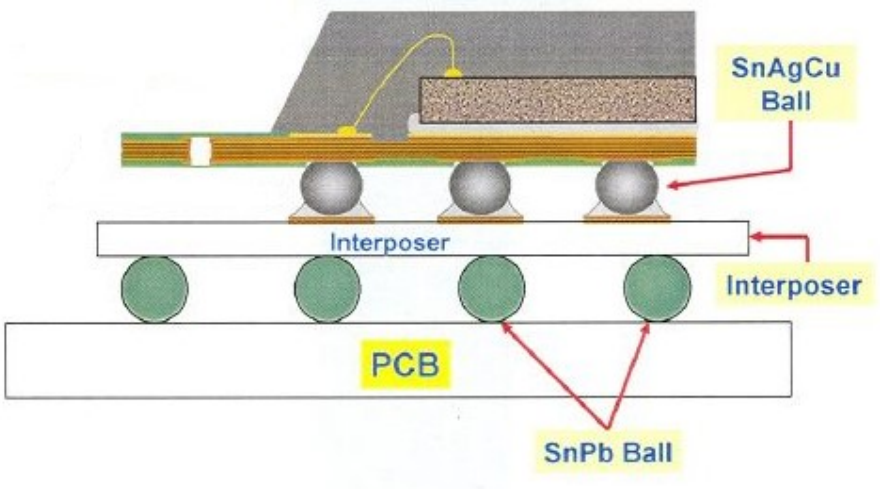
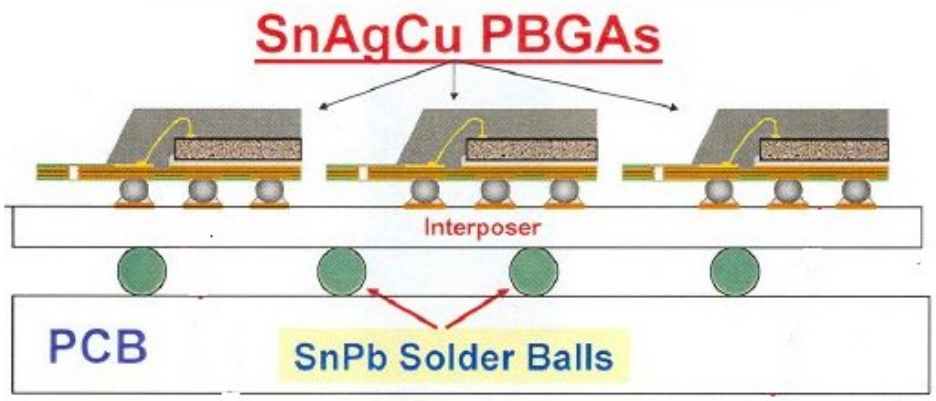
The transition to lead-free production as a result of the European regulations (RoHS) raises many questions as regards the reliability of electronic products, particularly during the transition phase (Mix-Tech), in which work with two types of components is required: RoHS compliant and non-compliant. In a seminar that was recently held by the Nistec Company in collaboration with Iltam (Advance Metal Technologies Users Association), Dr. John Lau, an expert from the USA, revealed a unique method which significantly improves the reliability of the products assembled using a technological intermixture.

This unique method is based on an Interposer placed between the PCB and the RoHS-compliant BGA component. The Interposer is a substrate / circuit / adapter between a single component or a group of components and their connection on a new substrate, the Motherboard.



The Interposer is not a new invention. It has already been in use in a number of forms and applications, among them:

- Component manufacturing.
- Memory increase.
- Addition of additional functions to the Motherboard.



- Compensation for errors in the PCB design or malfunctions during the manufacturing process of PCB's that have been assembled and include expensive components and long lead times.
- The assembly of special sockets intended for product testing and component burning.
- There are cases in which this unit is pre-designed and we call it a Piggy-bag.

A new reason for using an Interposer has transpired as a result of the transition to the lead-free soldering era. Despite the tough regulations imposed on us by the European Union regarding this issue, indeed certain fields are exempt from the regulations and hence there will be quite a few cases in which the OEM (Original Equipment Manufacturer) companies that manufacture products such as: medical equipment, servers, military equipment etc., will be able to supply electronic assemblies bearing the RoHS 5/6 Standard, that is, using the traditional tin-lead technology. Even companies that supply equipment that requires them to implement full RoHS,

will be able to continue supplying the product using the old technology, in case they succeeded in introducing the product to Europe before 07/01/2006.

Seemingly it appears that the continued manufacture using tin-lead will facilitate this process for the companies, yet there is “a fly in the ointment”: the component manufacturers are racing forward and there will be numerous cases in which they will not take into consideration the reliefs attained by the OEM companies. The transition rate to RoHS components is rapid, and thus companies that have obtained permits suitable for tin-lead soldering, will be able to obtain solely full RoHS components. As long as these are discrete components (such as resistors, capacitors etc.), ICs with leads (TSOP, PQFP etc.) and components without any leads (no-leads) at all (QFN), an orderly tin-lead process can still be realized.

The significant point is the presence of the BGA components on the PCB, which actually determine the real soldering process for us. The new BGA components can be found almost exclusively in lead-free solder balls, and even existent BGA components exhibit a rapid transition to the replacement of tin-lead solder balls with lead-free solder balls and the improvement of their structure such that it complies with full RoHS.

In the near future, the OEM companies may find themselves with mixed components, including BGA RoHS components for PCB’s that are presently designed and manufactured using tin-lead technology. Despite the approval to supply the product using the old technology even after 07/01/2006, they will experience problems in performing two different assembly processes on the same PCB.

Undeniably there are several methods that can be used to assemble lead-free BGA components by means of a tin-lead process, yet their reliability is uncertain.

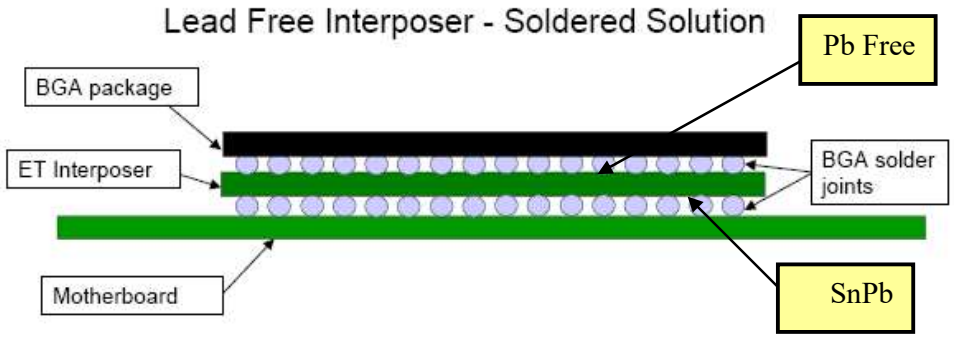
At this point, the Interposer method comes to our aid.

In order to obtain good reliability, it is possible to design a circuit, on which BGA RoHS components will be assembled on its upper side by means of a full “lead-free” process, afterwards tin-lead solder balls must be added on its bottom part and then it should be assembled as a new component on the

PCB, at the same location where a tin-lead BGA was originally installed, using a full high-quality tin-lead process.

The NRE process includes:

- Mechanical specifications as well as full and meticulous DFM, DFA and DFT in advance.
- Electrical design and simulation.
- Design of the Interposer's PCB.
- Manufacture of the Interposer's circuit.
- Assembly of lead-free components on the Interposer.
- Addition of tin-lead solder balls on the other side of the Interposer using the Reballing method.
- Electrical testing of the "new component" before its assembly.
- Assembly of the new unit by means of a tin-lead process on the Motherboard.



The NRE expenses up to the models' assembly, amount to about $2,000, and the assembly schedule may require up to three to four weeks, in the event that all the components do exist.

The advantages of the Interposer method, apart from obtaining high quality, are:

- Extending the product life.
- Increasing the memory or adding new functions without the need to design and modify the Motherboard.
- Reducing the risk and obtaining industrial peace vis-à-vis the RoHS regulations.