Resolving DMSMS Component Shortages Using Commercial Non-Destructive Die Extraction and Re-Assembly Techniques

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With the increased usage of commercial integrated circuits (ICs) in long lifetime military systems (with 20 - 30 year life cycles), coupled with the steady decrease of commercial IC life cycles (typically 2 - 3 years), component obsolescence is becoming an increasingly difficult aspect of managing production logistics and procurement. In many cases, due to component obsolescence, the required device package configuration in the original build of materials (e.g., DIP, SOIC, LCC, PQFP, etc., or possibly even bare die cannot be located despite the correct silicon die revision which is readily available in an alternate package footprint(s). Giga Connections, Inc. has developed a reliable, cost-effective, high-volume extraction technology to remove silicon die from any plastic package and re-assemble them into any other plastic and/or ceramic package footprint. Thus, ceramic upgrades are also possible, with all of the benefits associated with ceramic packaging. This technology provides many potential solutions targeting the need for part re-creation and microcircuit re-fabrication, both current topics pertinent to resolving DMSMS issues.

Fig 1) fully functional extracted dice

The technology associated with die extraction and re-assembly has been in use for many years within the commercial industry (Fig. 1). The die extraction process relies on chemical and mechanical processes no more aggressive than those with which the original die was exposed during device manufacture.

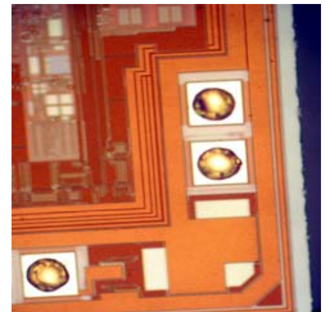

Fig 2) die removed, cleaned with gold wires removed ready for installing in new package

Once the die has been successfully harvested, the original gold wires are mechanically removed just above the original gold ball bond, providing a clean, uncontaminated gold surface for high-adhesion re-bonding (Fig. 2). The only subsequent non-standard assembly process is that a new gold ball bond is made to the existing gold ball bond surface, rather than to the original aluminum pad interface.

Under proper process optimization, the new gold bond on the existing gold ball bond adheres extremely well (Fig. 3). This statement can be supported with pre and post die extraction/re-assembly bond pull data which is not only indistinguishable in both cases, but also generally limited to the tensile strength of the bond wire used. Additional test data referencing die shear and bond shear is also statistically identical for pre and post extraction/re-assembly processing. Lastly, the extraction and re-assembly processing can be shown to have the added benefit of providing inspected, genuine silicon for subsequent re-assembly, while significantly reducing the possibility of inadvertent use of counterfeit devices in military systems.

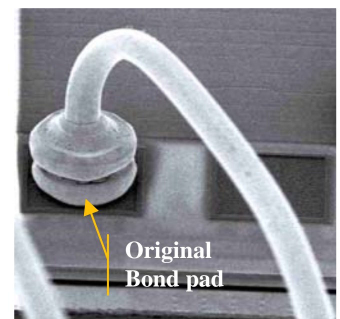

Fig 3) the original bond pads are left on the die. New gold bond pad adheres extremely well. A bond pull test typically exceeds the 3 oz required by MIL-STD-883H.

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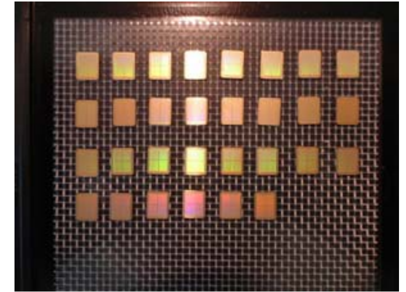
Available Services

Extract Raw Die for Reassembly by Customer

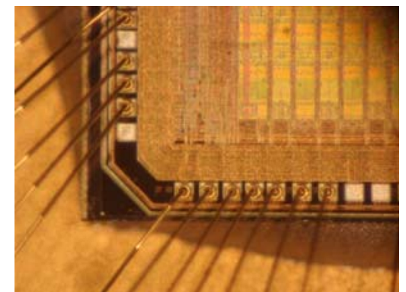
Customer provides Components or GCI purchases them – GCI removes dice - keeps them functional - Dice are installed and shipped in vacuum gel packets. Raw dice are now available to be installed by customer in MCM or custom package.



Example of dice installed in vacuum gel packets for shipment to customer

Device Repackaging to Replace Obsolete Components

Customer provides Components or GCI purchases them - GCI removes dice - keeps die functional – repackage die in plastic or ceramic package to operate at 125C or upgrade to 185C - 100% wire bond verification is performed



Example of extracted die installed in a ceramic package

- **De-capping**
- **Die Thinning**
- **Full Service Packaging**
- **Wire Bonding**

Pricing or Additional Information

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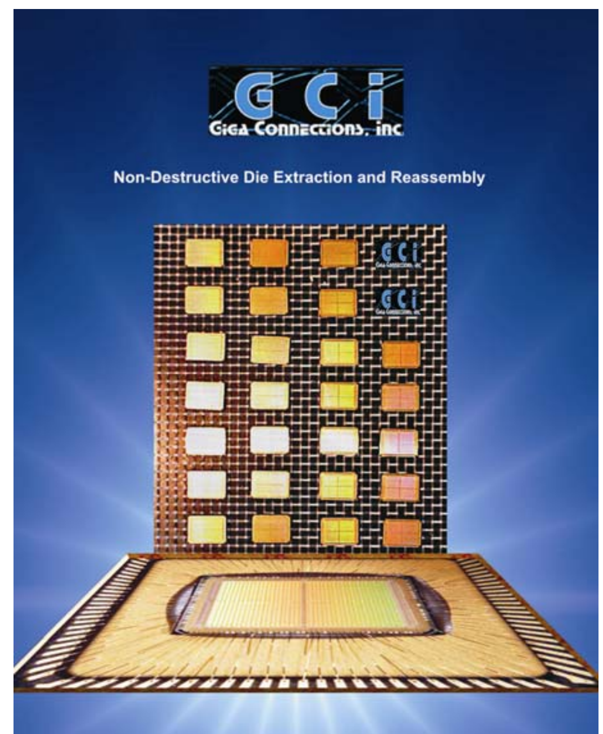

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