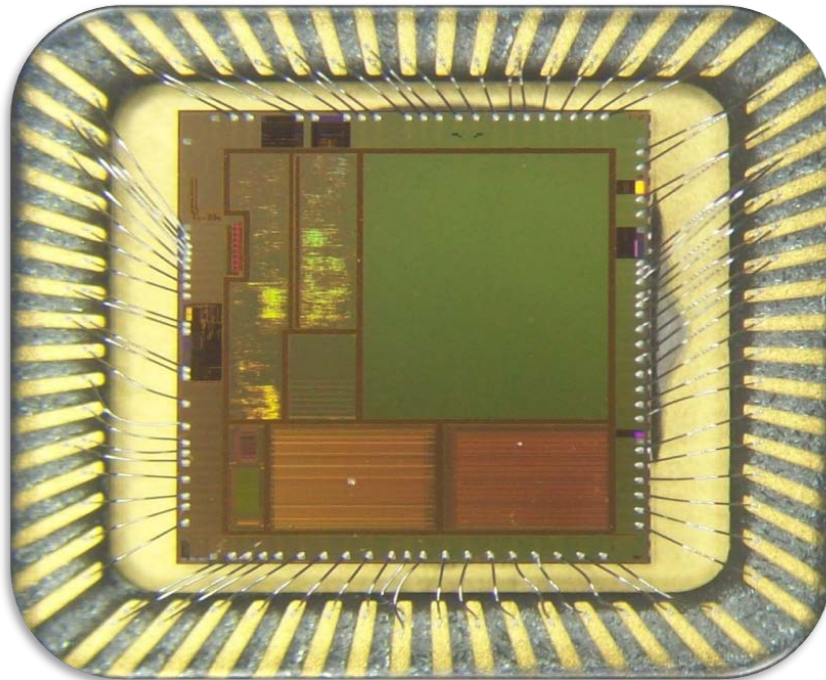
XTREME
Semiconductor

Chip Recovery “C_{hi}PR” Product

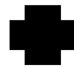
Breathing New Life into Obsolescence



12908 Trails End Road, Suite E, Leander TX 78641
Austin Office: tel 512-255-5401 ◦ San Diego Office: tel 858-230-6961
www.xtremesemi.com

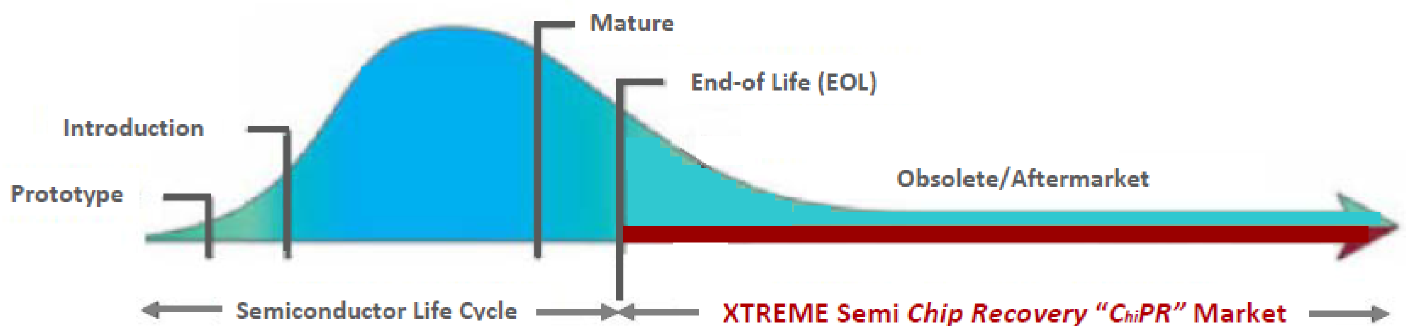
What Drives Todays Component Obsolescence in Military Systems?

Military's Continued Demand for IC's in Critical Systems with 20+Year Life Cycles



Military Dependence on Commercial IC's With 2-3 Year Life Cycles

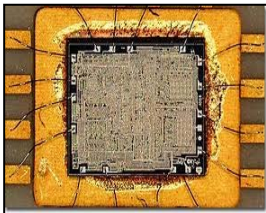
Increased demand for Obsolete Components



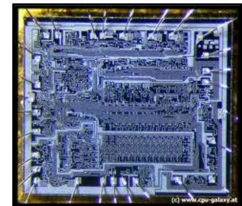
Chip Recovery Product
“C$_{hi}$PR”

Breathing New Life into Obsolescence

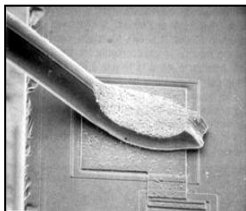
Increased usage of commercial integrated circuits (ICs) in long lifetime High Reliability systems, having life cycles exceeding 20-30 years, coupled with the steady decrease of commercial IC life cycles, typically 2-3 years, has caused component obsolescence to become an increasingly difficult aspect of managing production logistics and procurement. In many cases, due to component obsolescence, the required device package configuration (e.g., DIP, TSOP, SOIC, LCC, PQFP, etc.), or bare die cannot be located, even though the product may be readily available in an alternate package footprint from the manufacturer or through distribution.



XTREME Semiconductor now offers a reliable, cost-effective, high or low volume ***Chip Recovery*** service to remove silicon die from any plastic or ceramic package while maintaining full die functionality. These die are then available to be used in bare die form or they can be re-assembled into any available alternate plastic or hermetic package that meets the form, fit and function of the desired obsolete semiconductor product. ***Chip Recovery*** also provides a low-cost, quick-turn source for die required for hybrid development projects where small quantities of die are required and purchasing a full wafer or multiple wafers is not cost-effective.

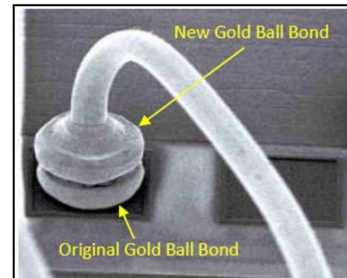


Chip Recovery provides a cost-effective alternative to other higher-cost solutions such as redesign or re-fabrication of the microcircuit chip to resolve Diminishing Manufacturing Sources and Material Shortage (DMSMS) issues. Our ***Chip Recovery*** process uses chemical and mechanical processes that are no more aggressive than those used when the original die was manufactured.



Once the die has been successfully recovered from the package, the original gold or aluminum wires are mechanically removed just above the original gold ball or aluminum wedge bond, providing a clean, uncontaminated surface for new high adhesion bonding.

The only subsequent non-standard assembly process is that a new gold ball bond or aluminum wedge bond is made to the existing gold ball bond or aluminum 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 as well as the original bond and is generally limited to the tensile strength of the bond wire used. With proper process control, the resulting new bond made to the existing gold ball or aluminum bond provides excellent bond adhesion.



Die shear and bond pull results have shown that this production process is extremely robust and is statistically identical for pre and post ***Chip Recovery*** assembly processing. The ***Chip Recovery*** process provides additional assurance in knowing that only fully inspected, authentic Original Component Manufacturer (OCM) die are re-assembled into the finished product significantly reducing the risks associated with receiving counterfeit devices. ***Chip Recovery*** provides *XTREME* Semiconductor one more tool to assist our customers with finding reliable and cost effective solutions to solve their product obsolescence issues.
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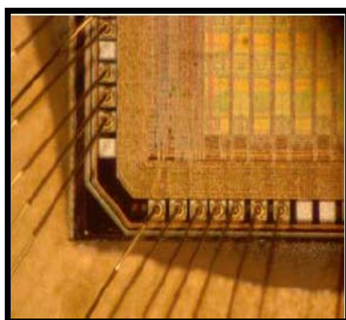
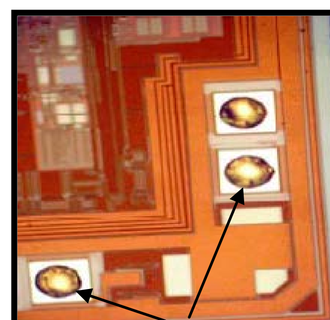
Fully Functional Recovered Die



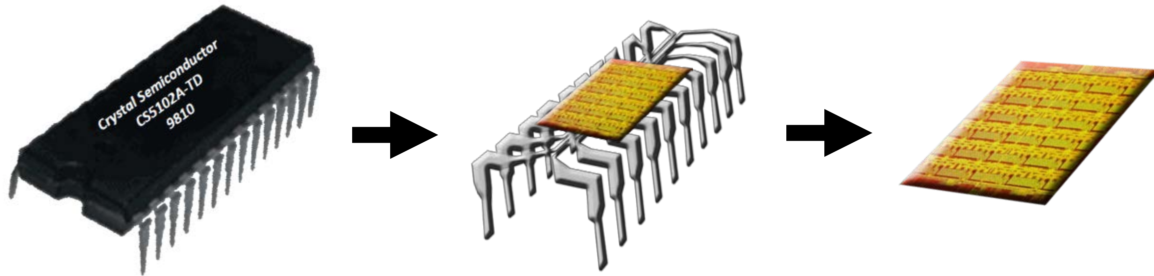
Recovered Die Assembled in New Ceramic Package



Bond Pads Ready for Re-assembly

What is *Chip Recovery "ChiPR" Product?*

A cost effective and reliable process of recovering a semiconductor chip or die from an "undesirable" package configuration and re-assembling that die into a "desired" package configuration or preparing it for use as bare die.



The uses for ***Chip Recovery "ChiPR"*** are many but two of the more common would be DMSMS replacement product, in ceramic or plastic packages or for use as bare die for hybrid or multi-chip module applications.

Hermetic Packages

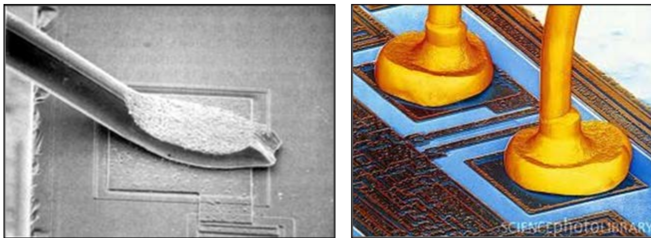
Hybrids & MCM's

Plastic Packages

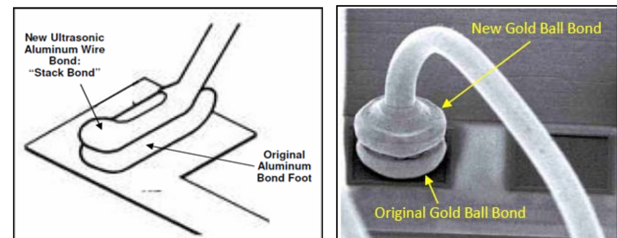
Wire Bonding

Original gold or aluminum wires are removed at the top of the original bond leaving the original bonding pad undisturbed. The resulting surface is a clean and uncontaminated gold or aluminum surface ready for a new high adhesion wire connection. The new bold or aluminum bond is made to a pristine bond, NOT a re-bond.

Original Gold Ball and Ultrasonic Aluminum Wire Bond



New Gold Ball and Ultrasonic Aluminum Wire Bonds



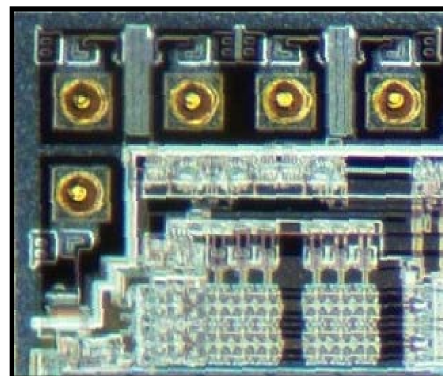
Cleaning and Preparation

Chip Recovery relies on chemical and mechanical processes which are no more aggressive than those used during the original wafer fabrication process.

Sample *Chip Recovery* Die

Bond Pads Clean and Ready for New Bonding

Die Surface Clean and Free of all Contaminates



Die Shear and Bond Pull

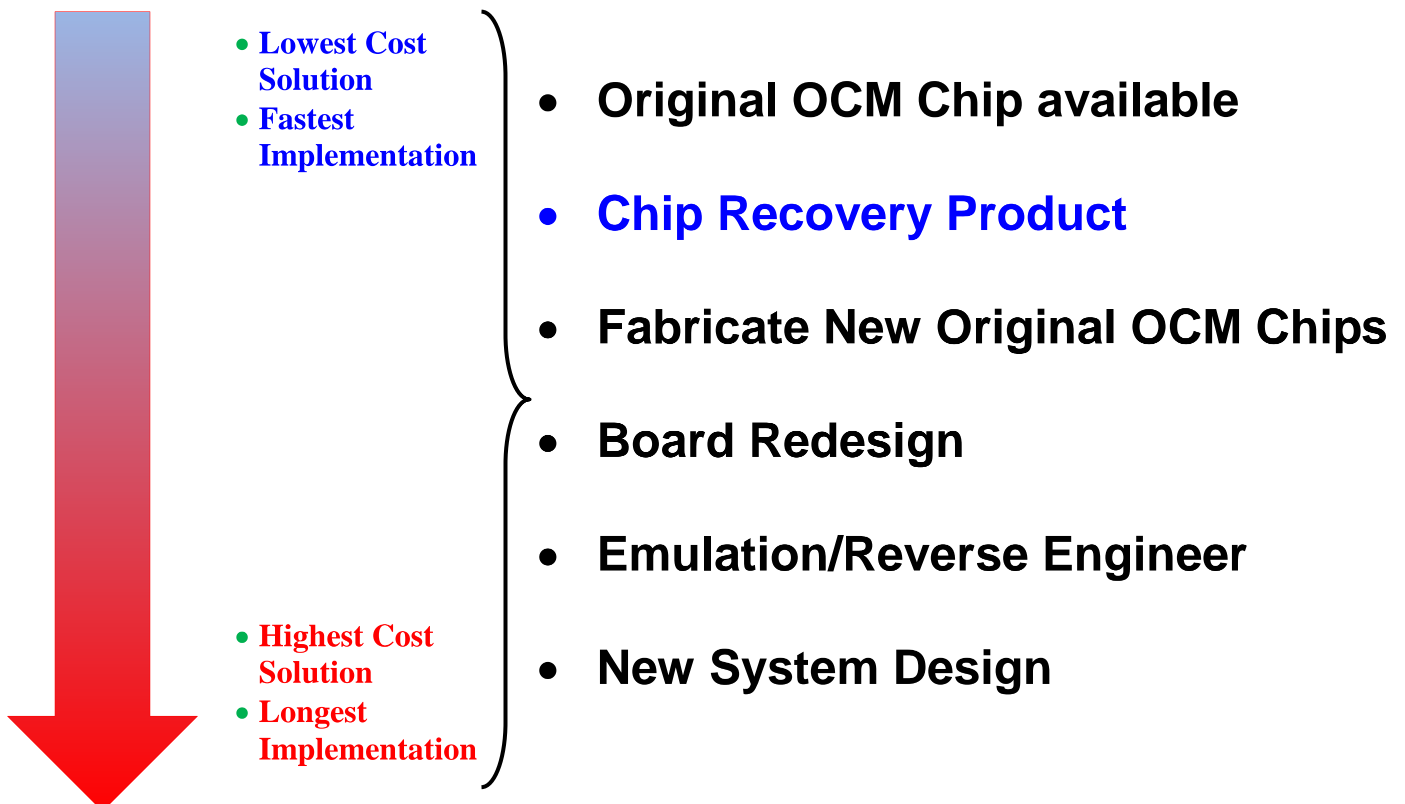
Test data has confirmed that die attach adherence of the re-assembled package meets or exceeds original specification. Die Shear data is indistinguishable for pre and post ***Chip Recovery*** measurements (Typically 2x the standard minimum MIL-STD-883 die shear requirements)

Bond Pull data is has also shown that pull strengths are indistinguishable for pre and post ***Chip Recovery*** measurements. Test data from re-assembled devices meet or Exceed MIL-STD-883 bond pull requirements.

Benefits of *Chip Recovery "ChiPR" Product*

- Provides almost instant access to original OCM die that can be packaged into almost any desired package configuration.
- Die can be recovered from ANY package style (e.g. plastic, metal or ceramic) without damaging the die while maintaining FULL functionality.
- Avoids expense of a product redesign or board modification providing the exact product and package configuration required.
- Provides high product yields since it begins with "known-good" tested die.
- Reduces lead time for product redesign from months or years to weeks or month.
- Allows access to original OCM die stock while avoiding costly minimum order die purchases.

Analysis of System Redesign Options



Standard Process Flows

Hi-Rel Product Flow:

Military 2nd Optical Inspection
Die Attach
Aluminum or Gold Wire Bond
3rd Optical Inspection
Seal
Temperature Cycle
Centrifuge
Fine Leak
Gross Leak
Marking
25°C Test
Burn-in
25°C Test
Final Test (-55°C to +125°C)

Commercial/Industrial Flow:

Commercial 2nd Optical Inspection
Die Attach
Aluminum or Gold Wire Bond
3rd Optical Inspection
Seal
Temperature Cycle
Centrifuge
Fine Leak
Gross Leak
Marking
Burn-In (If required)
25°C Test
Final Test (Hot and Cold Temperatures)

Quality Conformance Inspection:

QCI in accordance with MIL-STD-883 Method 5005 shall be performed as required by purchase order or drawing specification.

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