

# Solving Microelectronic Obsolescence Through Die Extraction and Reassembly for Military Systems



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A Proven Solution to Provide Management  
Support for Diminishing Manufacturing Sources  
and Material Shortages (DMSMS)



[http://www.gigaconnections.com/images/solving\\_microelectronic\\_obsolescence\\_through\\_die\\_extraction.pdf](http://www.gigaconnections.com/images/solving_microelectronic_obsolescence_through_die_extraction.pdf)

# Introduction to Giga Connections Inc.



Giga Connections Inc.  
Colorado Springs, CO

- ▶ How Giga Connections' die extraction and reassembly services can reduce the cost and time for replacing obsolete microelectronics
- ▶ Giga Connections Inc. – Company Overview
  - Product-focused manufacturer with Die Extraction/Re-assembly, Conductive Diamond Plating (CDP), and IC/System Failure Analysis (F/A) capabilities
  - Current Capacity of 16K+ die extractions per month
  - Highly talented staff each possessing 20+ years of semiconductor IC manufacturing experience in IC design, fabrication, assembly, test, operations, failure analysis, product/test engr and program mgmt
  - Performing die extractions since 1992 and providing same as a commercial service since 2006



# Overview

- ▶ Causes for Obsolete Components in Military Systems
- ▶ “Parts Substitution” is the Lowest Cost Solution for Obtaining Obsolete Microelectronics
- ▶ How GCI Die Extraction and Reassembly Service Supports “Parts Substitution”
- ▶ Die Extraction and Reassembly Photos
- ▶ Die Extraction and Reassembly Benefits for Solving Component Obsolescence Issues
- ▶ Summary
- ▶ Contacts for Additional Information



# Causes for Obsolete Microelectronics in Military Systems

- ▶ Commercial system lifetimes are often 2 to 3 years.
  - ▶ Military system lifetimes are often 20–30 years. Many commercial components used in these systems are obsolete the day that the military systems are introduced and new commercial replacement ICs are already obsolete.
  - ▶ DoD Requirement to use Commercial Off The Shelf (COTS) solution wherever possible for military systems creates a demand that is not supported by commercial manufacturers
  - ▶ Heavy systems usage in ongoing conflicts increase wear-out
    - Current inventory status of components used in a Legacy Avionics Program (27%)
    - In 1996, obsolescence ranged from 10%–20%
    - In 2005, obsolescence ranged from 20%–30%
- Source: i2 TACTRAC (03/28/05)    Source: ARINC (06/28/06)



# Lowest Cost Solution for Obtaining Obsolete Microelectronics

## Substitution with an Alternate:

- If an IC or package footprint is no longer available, the lowest cost and lowest risk solution is nearly always to locate a substitute commercial IC – a different IC with the same or similar form, fit and function. \*
- GCI Routinely Performs Cost-Effective Commercial Die Extraction and Reassembly for Device/Package Hardening and Replacement – Die are ALWAYS remarked as GCI Product with GCI Logo
- \*Source: Government Trends – URL:

<http://aero-defense.ihs.com/news/newsletters/government/govmil-jul04-weapons.htm>

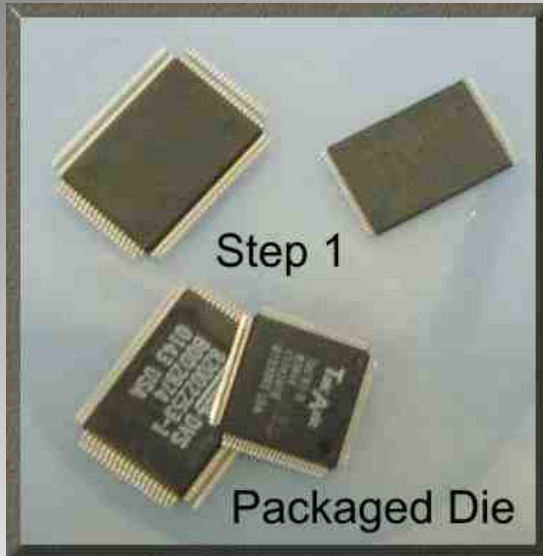


# How Die Extraction and Reassembly Service Supports “Parts Substitution”

- ▶ Remove die from plastic or ceramic packages without damaging the die in any manner
  - ▶ Die can then be reassembled into ANY available ceramic or plastic packages (multiple package footprint varieties)
  - ▶ Create Multi-Chip Modules (MCM) from available components
- ▶ Turn-key Reassembly Service
  - ▶ Reassemble extracted die from plastic packages into hermetically sealed ceramic packages
    - ▶ Extends component (MTBF) reliability necessary for rugged and/or high temperature environments
    - ▶ Utilize commercially available IC’s in plastic packages to replicate discontinued ICs in ceramic packages
- Potential Service for Management of Diminishing Manufacturing Sources and Material Shortages (DMSMS)



# From Plastic Packaged ICs to Bare Die



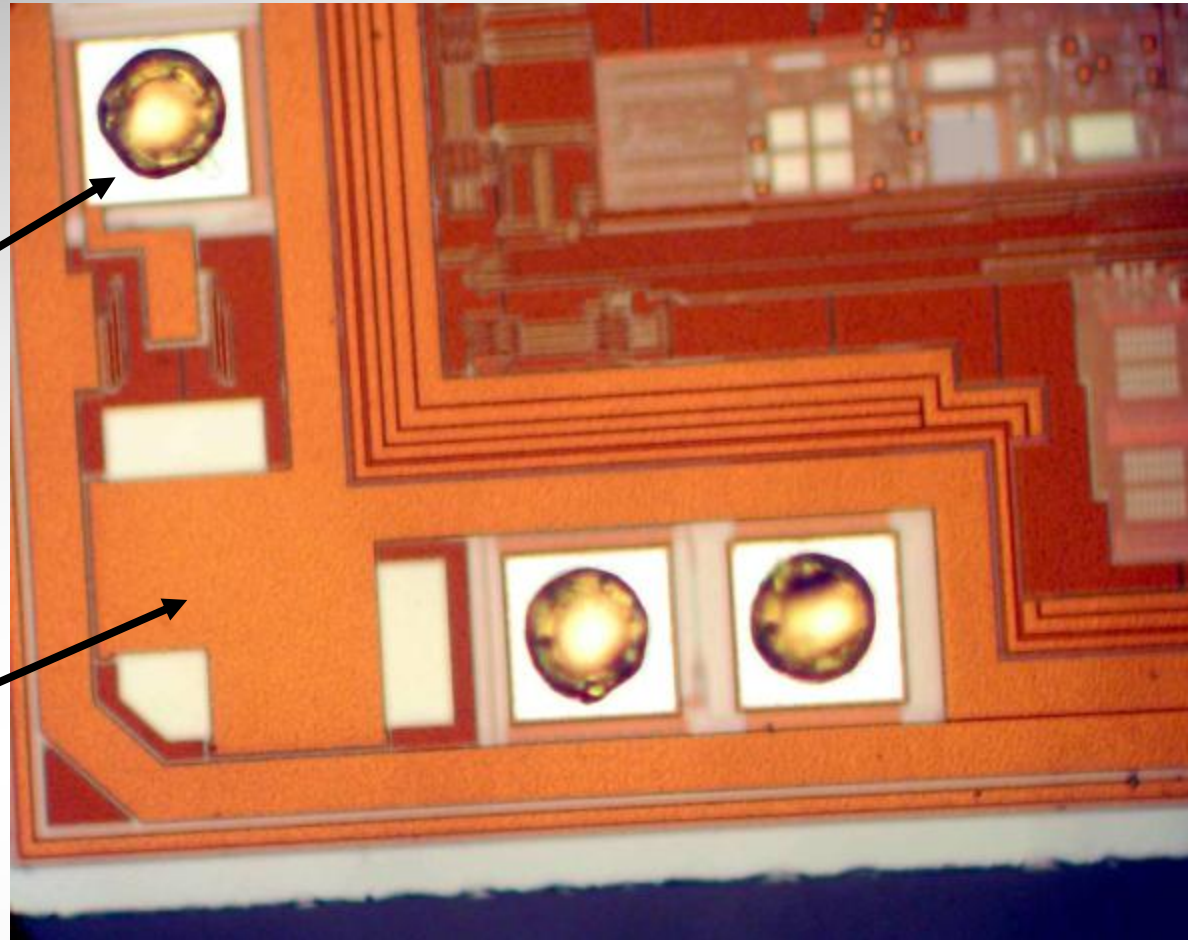
Bare die are now ready to be reassembled into any IC package and placed into a military system



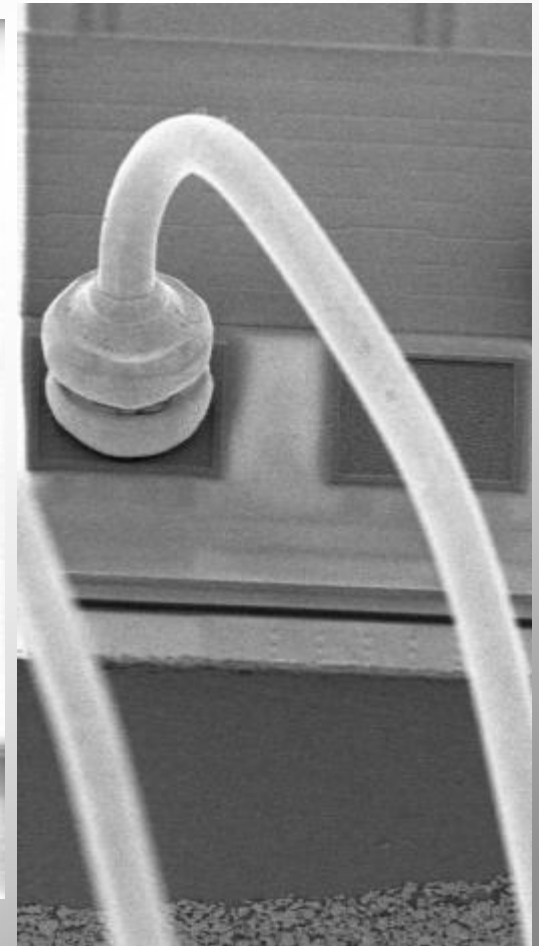
# Example of Bond Pads from an Extracted Die

Extremely clean bond pads and original gold ball bond

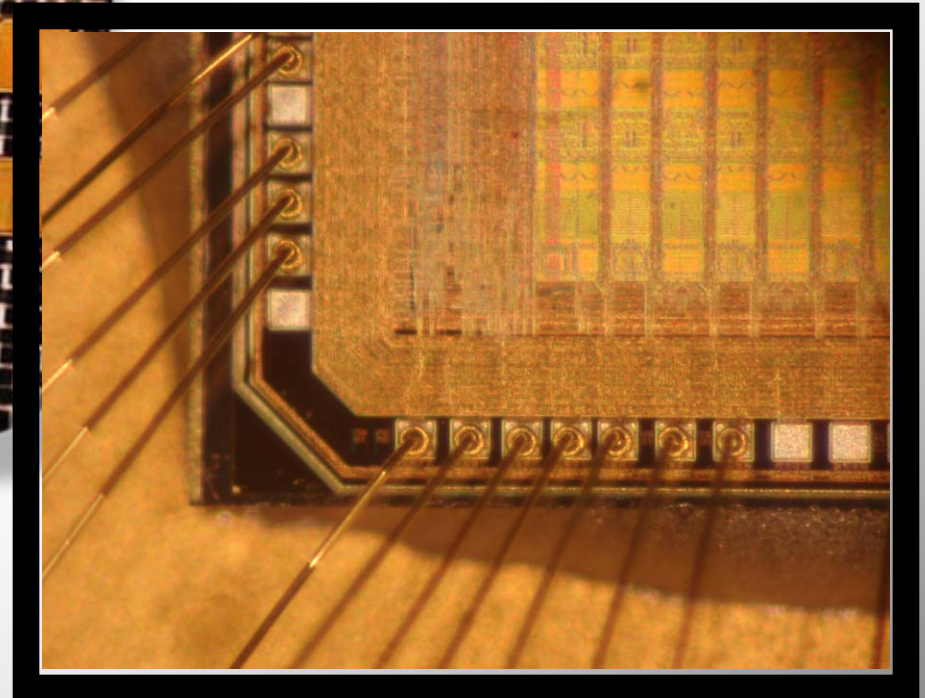
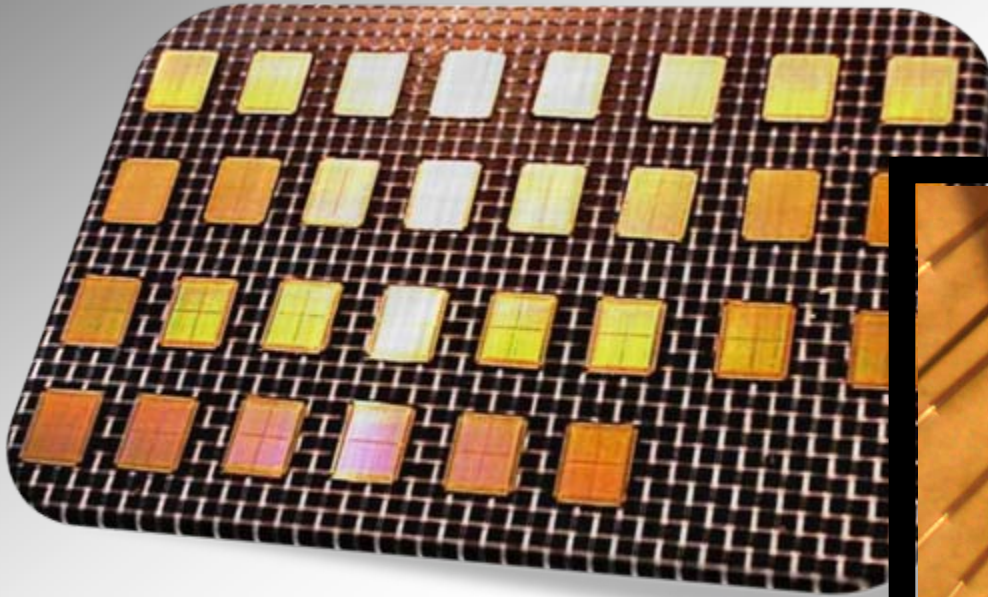
Extremely clean die surface free of any and all contaminants



# SEM Photo of Re-bonded Ball Bond

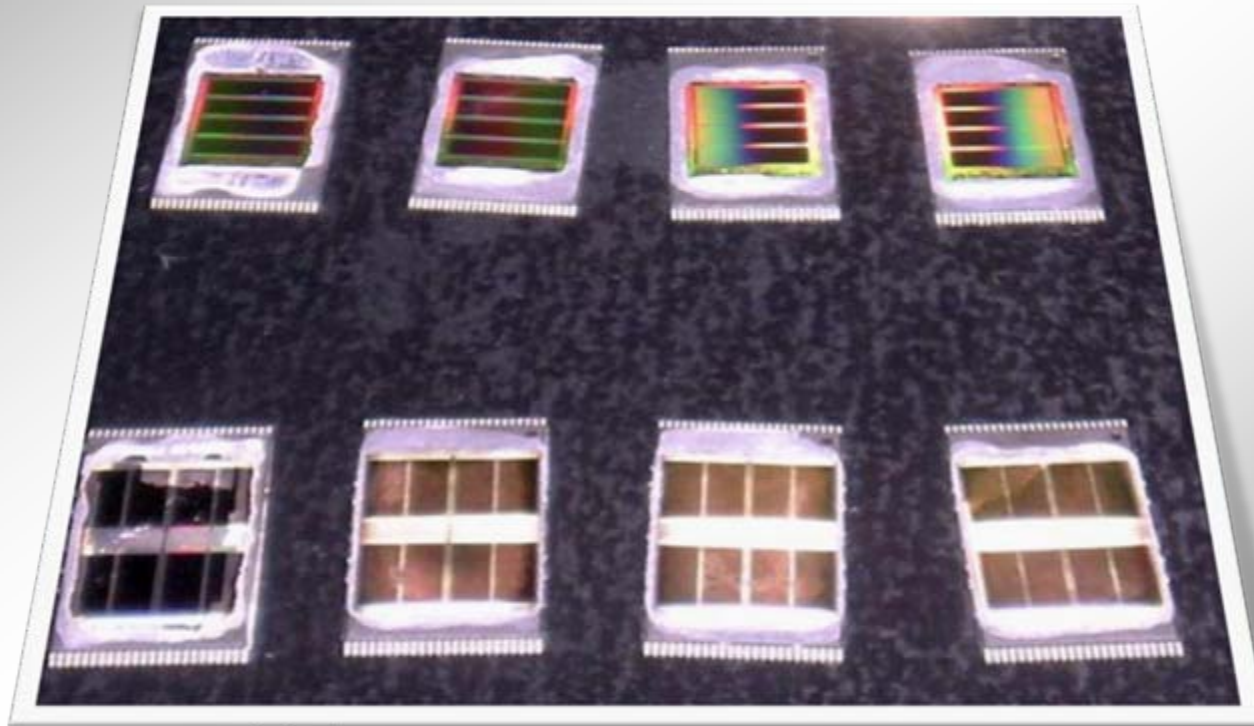


# Example of Removed Die in Gel Pack Ready for Shipment and/or Reassembly



Final package test can be implemented to guarantee functionality to any specification.

# Example of De-Capped Packages – the IC is Fully Functional in the Package With the Die Completely Exposed



# Benefits of Using Die Extraction and Reassembly for Component Obsolescence

- ▶ Reduces need to reclaim ICs from other equipment
  - Reclamation involves significant cost, time and risk to find an exact component solution while potentially disabling a portion of the fleet
- ▶ Eliminates the need to redesign an IC or a Board which is the most costly alternative for parts obsolescence
  - The US Government Defense Microelectronics Agency estimates the cost of a redesign ranges from \$100K – \$1M or more \*

\*<http://aero-defense.ihs.com/news/newsletters/government/govmil-jul04-weapons.htm>



# Benefits of using Die Extraction and Reassembly for IC Obsolescence

- ▶ Many more commercial component sources are available to fill need for obsolete microelectronics
- ▶ Reduces engineering cost/time to locate/research obsolete components
- ▶ Repackage plastic packages into otherwise unavailable ceramic components for military systems requiring rugged or high temperature/vibration component survivability
- ▶ \*Added Benefit – Reduces potential need to buy full wafer (\$10K–\$25K) for prototype MCM development if prepackaged commercial components are readily available for die extraction



# Summary

- ▶ Military systems suffer from large quantities of obsolete microelectronics due to:
  - Long product lifetimes (>30 years) compounded by low volume requirements and long development times
  - Reliance on Commercial Off The Shelf (COTS) market for IC components with short product lifetimes (~3 yrs) as a source for microelectronics
- ▶ Substitution with an alternate component is already known to provide the lowest cost and lowest risk solution for resolving obsolete microelectronics issues



# Summary – continued

- ▶ Giga Connections' proven die extraction and reassembly service can remove die from ANY package and reassemble them into ANY available package
  - More sources of commercially available components are available for substitution of obsolete components with an alternate component
- ▶ Benefits for die extraction and reassembly
  - reduces engineering resources and is the lowest cost for replacing obsolete microelectronics



# Contacts for Additional Information

- ▶ Erick Spory – President and CTO
- ▶ Charlie Beebout – VP Engineering
- ▶ Brian Shumaker – Sales



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# Questions?

