



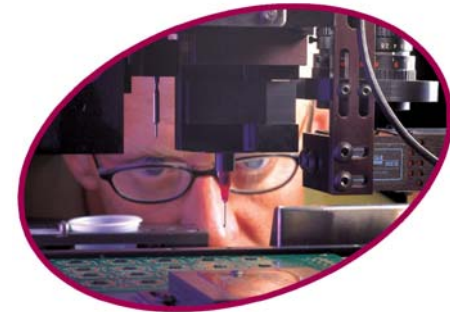
Advanced Process Lab

Process Support

defining the future

Binghamton Advanced Process Laboratory

- **Founded in 1987**
 - First and most complete advanced process laboratory in the equipment industry generally accessible to customers
- **Founded first Consortium 1992**
- **Provides**
 - Research and development
 - Process audits and support
 - Prototyping
 - Root cause failure analysis
 - Knowledge transfer and training
- **Complete analytical laboratory**
- **ITAR-compliant**
- **ISO 9001-certified**



Partnering Throughout The Product Life Cycle



- Process and Material Research and Development

- Product Layout and Design
- Process Design
- Applications Review

- Process Development
- Process Solutions
- Prototyping on Manufacturing Equipment

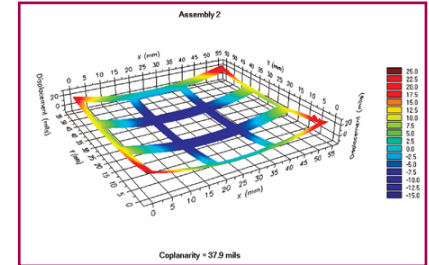
- Process Optimization
- Design for Manufacturability
- Process and Equipment Optimization
- Reliability Testing
- Qualification

- Assembly Equipment Solutions
- Integrated Process Solutions
- Process Scale-up
- Failure Analysis
- Incremental Production
- Capacity Increase
- Worldwide Scalability
- New Products Support

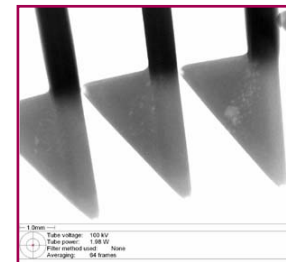


Process Audits and Support

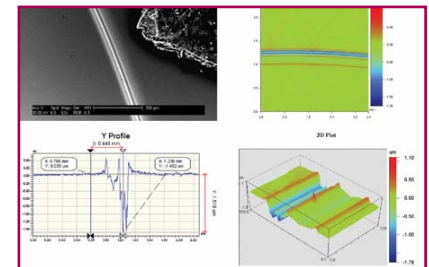
- **Optimize and refine your processes**
 - Implement continuous improvement, and direct future investment
 - Analyze and fine-tune materials, process parameters and procedures
 - Meet product, corporate or environmental targets
- **Achieve measurable improvement**
 - Maximize throughput, yield, efficiency and quality/reliability
- **Direct cost savings**
 - Reduced material costs through lower rework and process optimization
 - Reduced labor costs through lower rework and less unplanned maintenance
 - Reduced assembly time and process steps
 - Faster pay-off on capital equipment
 - Lower utility costs
 - Reduced work in progress



Shadow Moiré



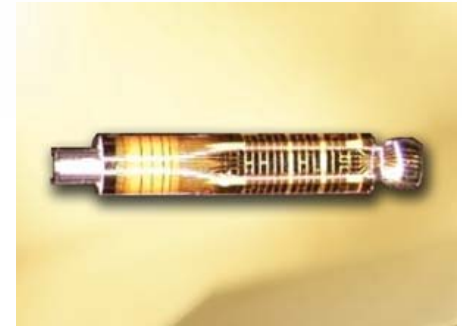
X-Ray



Topographical profiling

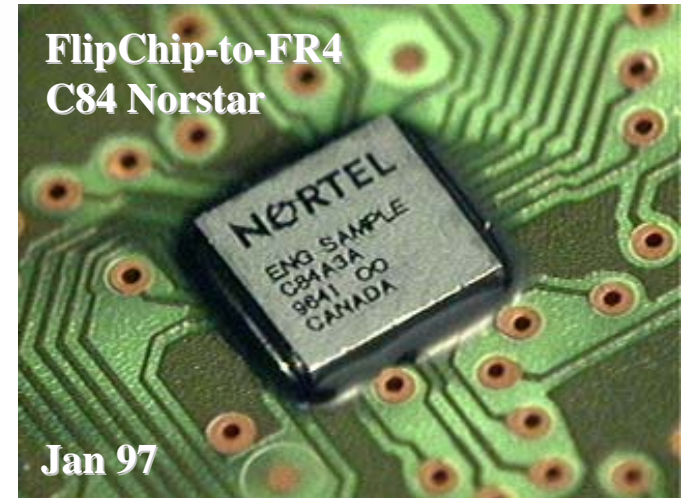
Prototyping and Product Development Support

- **Skills and technologies for advanced product development**
 - Solve difficult assembly issues quickly and cost-effectively
 - Engineer success into each new product from the start, from initial consultation to first article build and new product introduction
 - Confidently prepare for volume production
 - OEMs and prototype specialists leverage our skills at all stages, for fast turnaround and cost-effective, reliable, high quality products:
 - Cutting-edge knowledge gained from our process, materials, and reliability research
 - Expertise to assemble complex devices involving new components, materials, products, and processes
 - Industry-first equipment innovations to overcome difficult prototyping challenges
 - Technology-inspired design for manufacture



Prototyping Example - Nortel Development Project

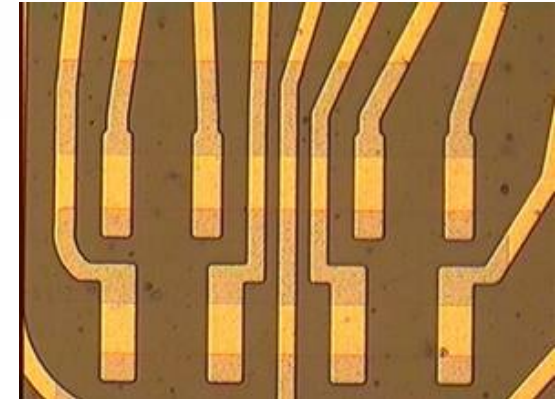
- **Norstar 7310 Desk Top Set - Flip Chip Demo**
- **Successful Technology Trial**
 - PLCC to Flip Chip: > 10 X Volume Reduction
 - Demonstrated high yield process
 - Functional phones at CRK and Calgary
- **Cooperation with Universal on:**
 - Initial technology development
 - Basic process development
 - Early test builds
 - Qualification testing
 - Material selection
 - Chip bump geometry
 - PCB pad design
 - Equipment purchase at Calgary and Ottawa



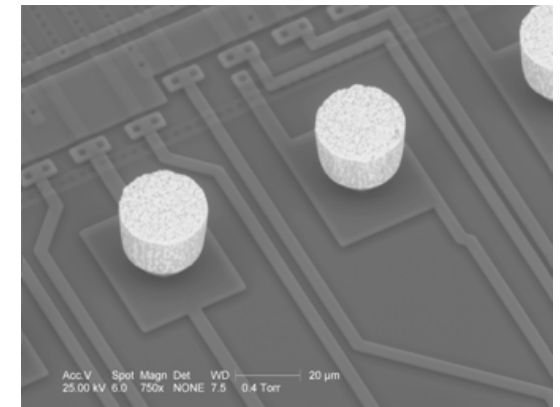
Prototyping Example – *Medical Application*

Development and Manufacturing Partnership for World's Finest Pitch Soldered Flip Chip Interconnect

- **Universal APL Lab**
 - Defined packaging concept, re-designed substrate
 - Developed complete assembly process
 - Assembled prototypes
 - Assisted in qualification process
 - Conducted analytical and reliability testing
 - Provided automation solution and associated fixturing
- **Endicott Interconnect Technologies**
 - Developed a state-of-the-art flexible substrate to support the packaging concept
 - Manufactured the flexible circuit
 - Provided assembly services per the manufacturer's specifications



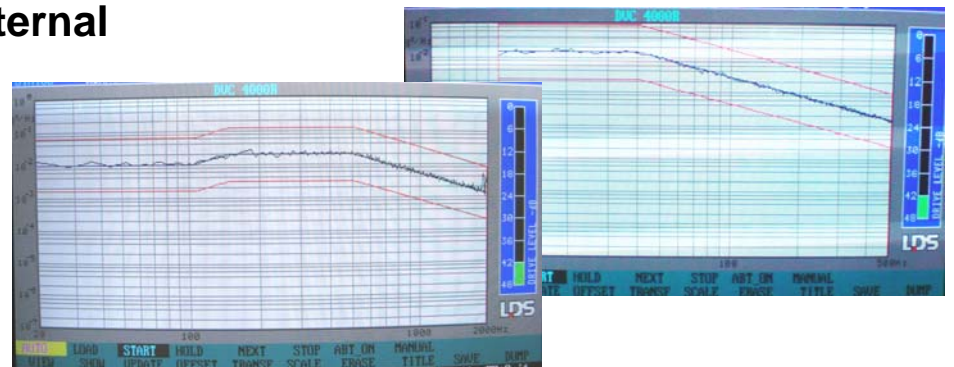
14 μ m lines and spaces



70 μ m pitch flip chip

Post-assembly Support and Testing – *Product-level Random Vibration*

- Product transitioned to Pb-Free brought about concerns over quality and reliability, especially during shipping
- Evaluated product shipping history
- Identified risks
- Developed rigorous random vibration procedure based on product history and current industry standards
- Performed initial packing level test
- Provided procedural recommendations to customer to be incorporated in internal specifications



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