SYSTEM INTEGRATION

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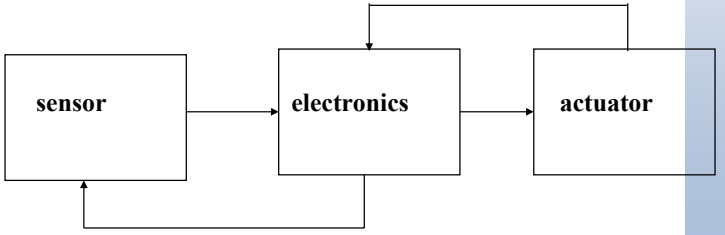
Fundamentals of Micromachining

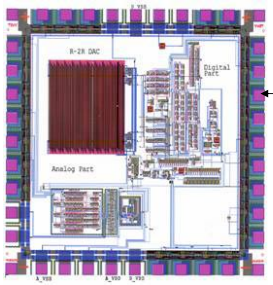
System Integration

- Interfacing of electronics with sensors/actuators
  - (decision making capability or intelligence)

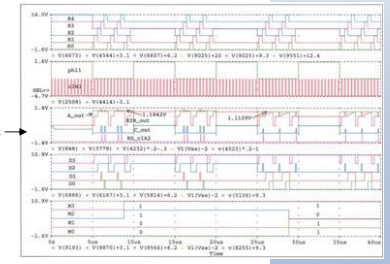


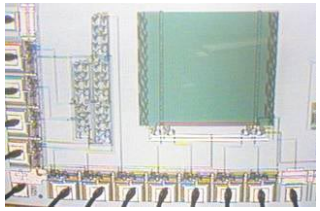
Monolithic Integration

Integration of chemical, mechanical, biochemical or optical microsystems with electronics

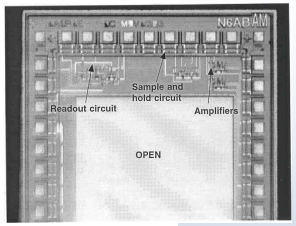


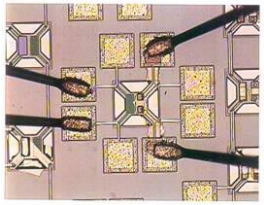
circuit design and simulation





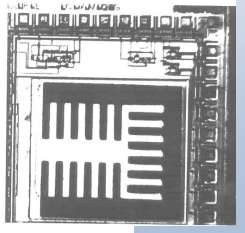
circuit fabrication at a foundry





Gas sensor

fabricated microsystem on a chip with circuits



Accelerometer

System Integration

- Pre-IC fabrication
- Co-IC fabrication
- Post-IC fabrication

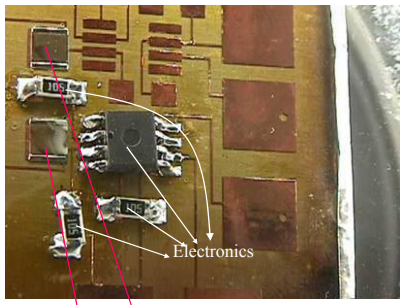
Post-IC fabrication requires:

- Low temperature < 450 C
- Benign chemical environment
- Benign radiation requirement

Summary of steps

- Circuit design and simulation
- CMOS circuit fabrication at foundry
- Co- and Post-IC MEMS fabrication
- System packaging

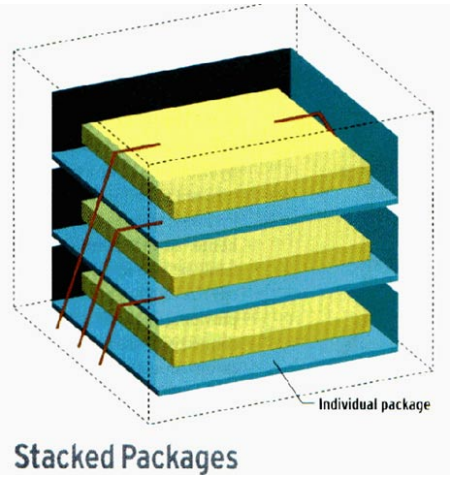
Hybrid or Modular Integration

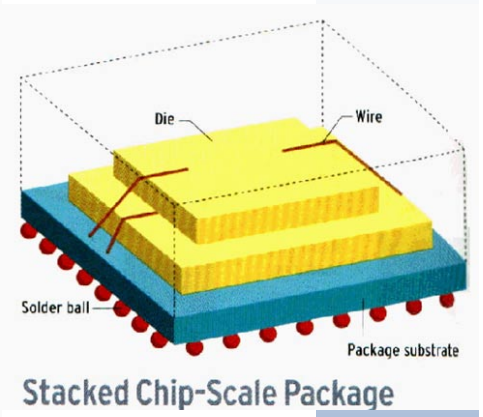


MEMS pressure sensor array

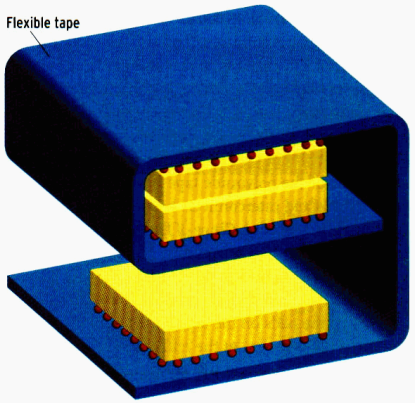
Micrograph of pressure sensor array

3-D Packages



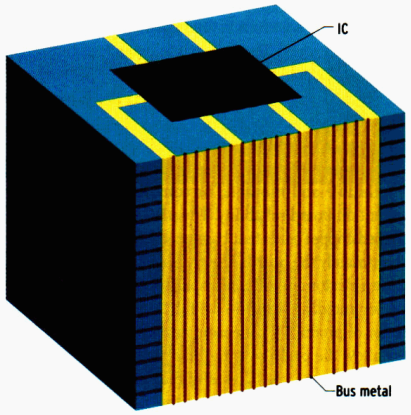


3-D Packages



Folded Package

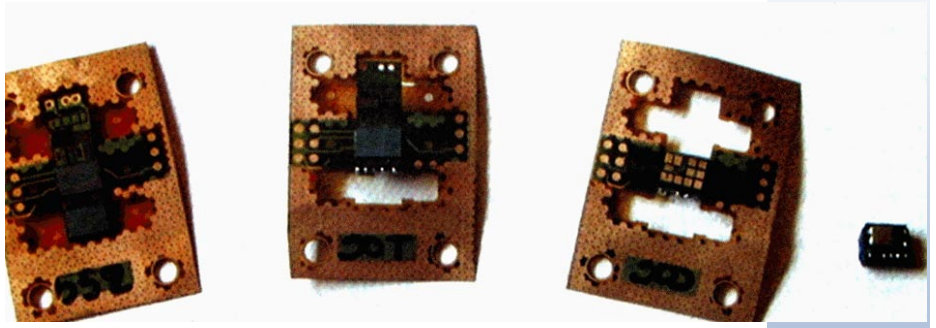
One of the newer ways for cramming capability into a small package starts with packaged chips on a flat polyimide tape. The flexible tape is then folded to yield a small footprint.



System-in-a-Cube

The densest package so far relies on a stack of epoxy layers in which are embedded different kinds of chips. Metal interconnects to the layers run along the sides of the stack.

Folded Packaging



Both passive and active components included in this hearing aid