

GSFC Support for Hybrids, MCMs and Advanced Packaging

Risk and cost reduction for space microelectronics

Harry Shaw

Associate Branch Head

Component Technology and Radiation Effects Branch

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Background

- GSFC has developed a low-cost, rapid turnaround, microelectronics development capability
- We are moving into new labs and clean rooms in 1st qtr CY01
- This facility can serve as a development facility for low-cost microelectronics

Potential Customers

- Explorers Projects
- ESSP Projects
- University principal investigators
- Code 600/900 In-House Instruments

Background

- The potential customers are typically low volume, cost constrained users, without a wide variety of packaging options and materials.
- Potential applications may require many design iterations and are too much trouble for commercial hybrid manufacturers
- These projects are missing out on opportunities to reduce size and mass because of the cost of advanced packaging efforts.

Proposed GSFC Approach

- Work directly with customers' electronics designers to explore packaging options (hybrids, chip-on-board, stacked MCM, etc.)
- Unlike commercial companies, we bring no technical bias as to the best packaging solutions and can we work at the chip level, MCM level, board level or box level or any mix of these.
- Limit the number of design efforts to 6-8 per year and fabricate prototypes and flight hardware only for these efforts.
- Amortize costs over these projects.
- Utilize the facility like a captive in-house manufacturer

Requirements to Make This Happen

- During FY01, we would work with individual projects within Explorers, ESSP and In-house instruments in 600/900 to find suitable candidates for development.
- Suitable candidates would include circuits that have been previously no-bid, designs that are still “up-in-the-air”, high risk-high reward opportunities for miniaturization.
- The customers would “set aside” this work for GSFC for FY02 (unless there was a need to start in FY01).
- 6-8 design efforts would saturate our capability in FY02 (staffing of 3 contractors/3 civil servants).

Advantages

- Advantageous scheduling and priority - Typically low volume work from NASA is low priority work in the commercial world
- Flexibility - Unlike a commercial company, the only cost of engineering changes will be additional materials and schedule required to accommodate the changes. We can accommodate changes.
- Cost - Hybrid and MCM designs incur large non-recurring engineering charges for design work from commercial companies. This will be greatly reduced under our plan.
- Risk mitigation - If a project chooses to use an outside entity as the primary manufacturer for a given circuit, GSFC can act as a backup or alternate.

Component Technology and Radiation Effects Branch (GSFC)

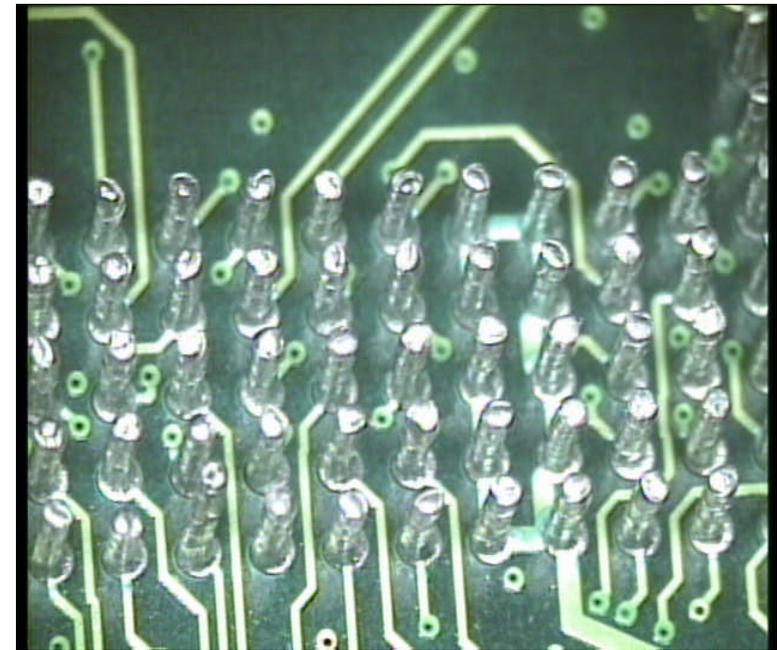
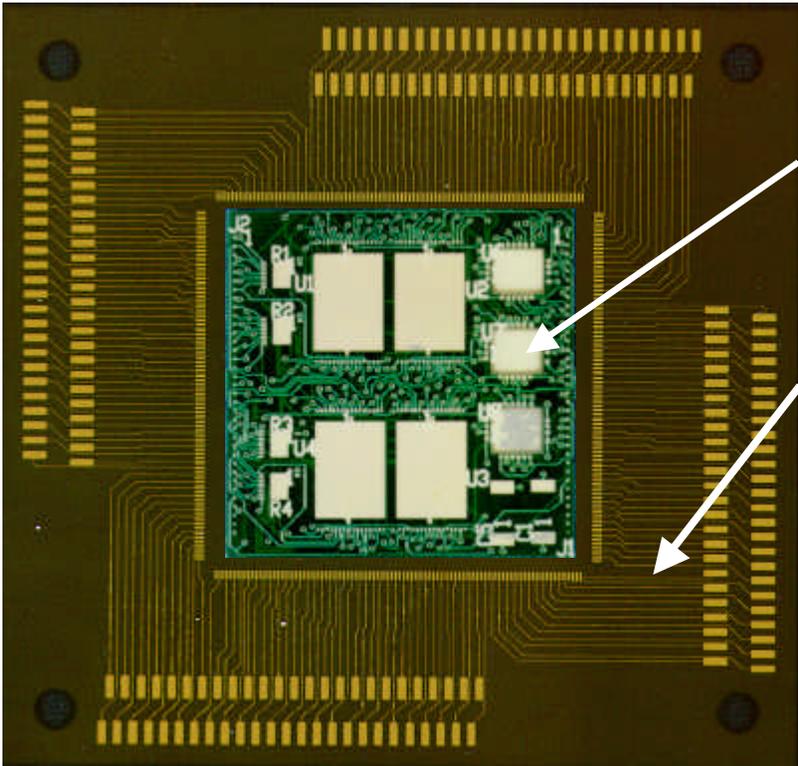
Potential Technologies of interest to
Codes 600/900

Harry Shaw

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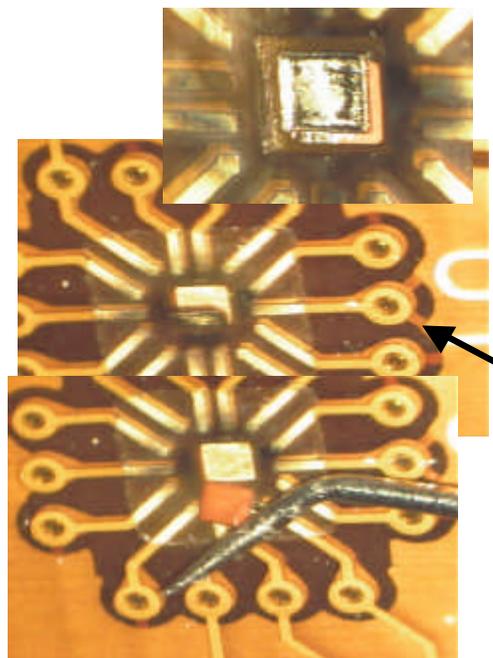
Laser Repairable Chip On Board

CVD Diamond Substrates with plated Au traces

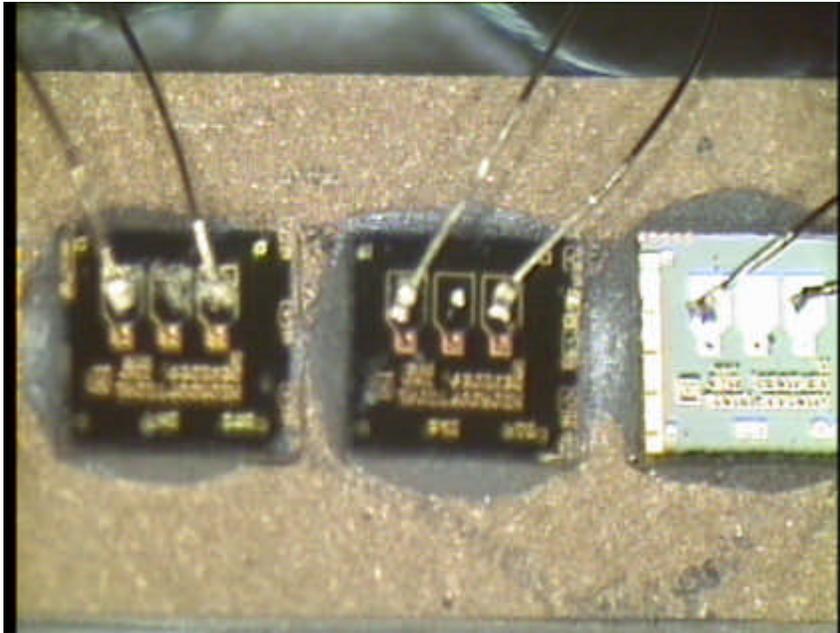


Column Grid Array for 3D Packaging

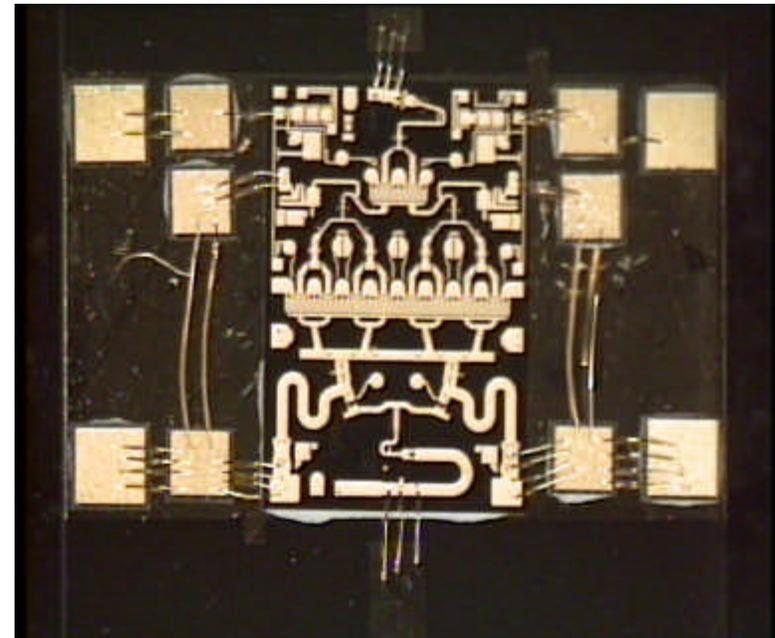
Laser repairable Chip on Flex



VCSEL on CVD Diamond



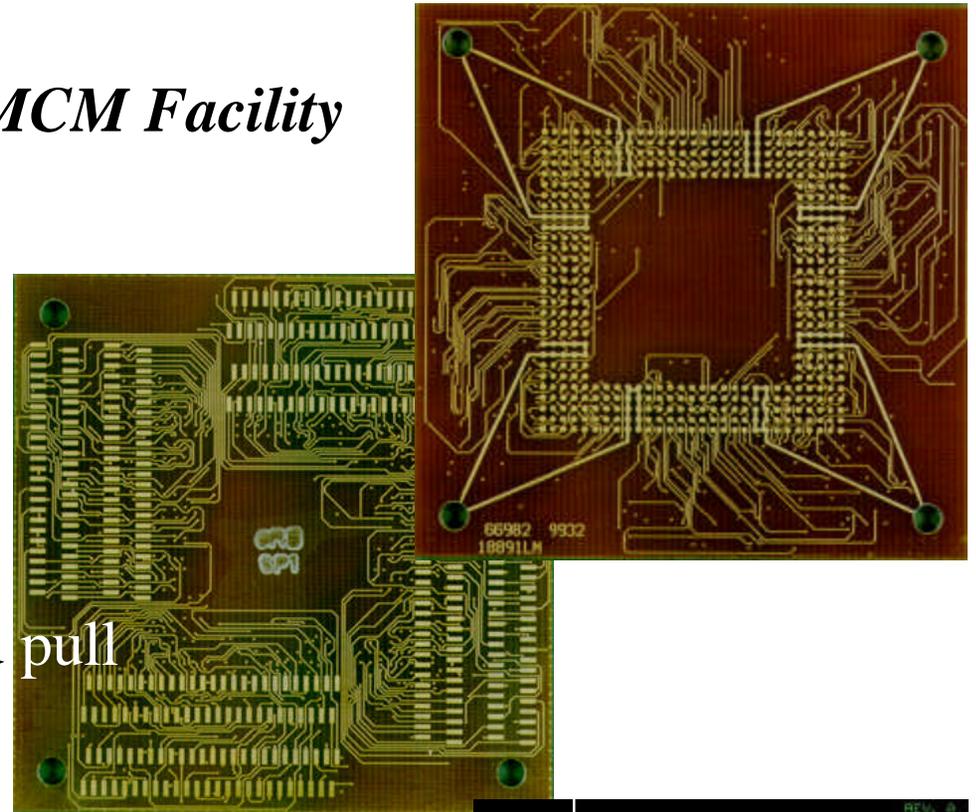
X-band GaAs MMIC on CVD Diamond



3D Stacked MCM with CVD Diamond substrates and Alumina support substrates

Prototyping / Small Quantity MCM Facility

- Substrate design and layout
- Material Selection
- Thermal/Mechanical Analysis
- Die probe
- Die attach, wire bond
- Pre-cap visual, die shear, bond pull
- Electrical test
- Finite Element Analysis



Fiber Optics Prototyping / Termination Facilities

- Advanced Photonics Lab for flight terminations
- TVA lab for photonics development and assessment of fiber optic bus components

