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Very Low Cost Probe Cards

A Two Piece Approach

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Agenda

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- 2 Piece Approach
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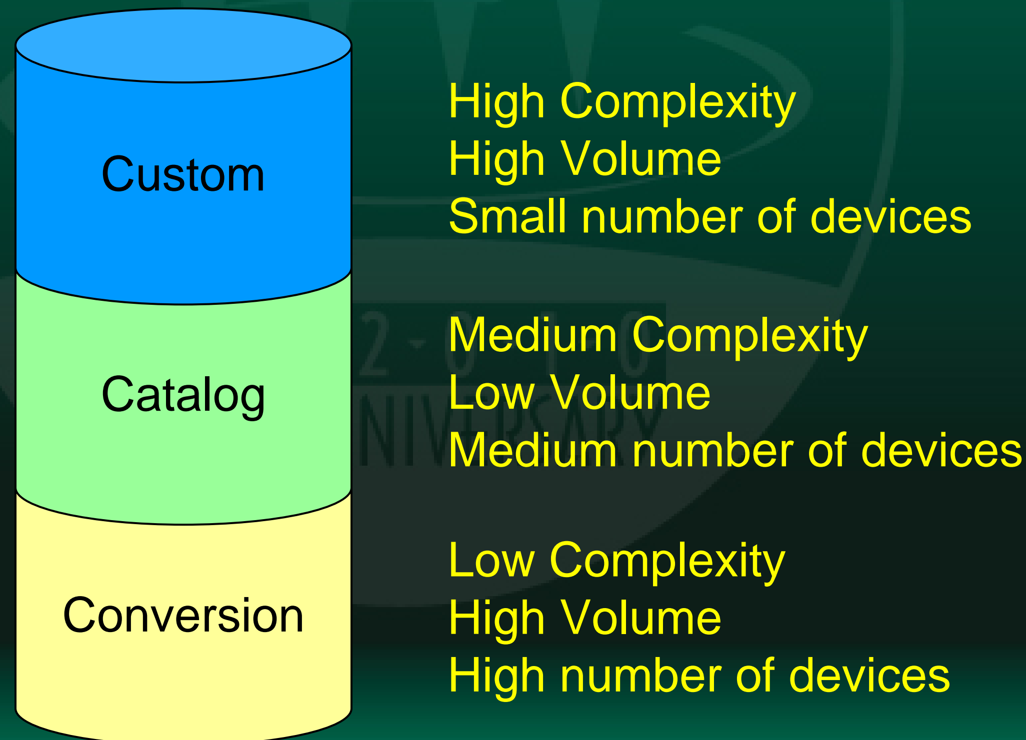
Problem Statement

- TI needed a very low cost probe card solution for sample probe on Medium Complexity - Low Volume devices.
- Many catalog products currently have no probe solutions could be sample probed if the probe card costs were lowered.
- Solution had to be implemented with minimal changes to the existing probe floor infrastructure.

Scope

- Catalog Parts needed a method by which probe could be implemented for Medium Complexity - Low Volume devices



2 Piece Approach

- Current probe costs are too high for many catalog products.
- New solution needs to be single-site and <$1000 per card.
- Initial idea was to build a probe solution based on an older project with a low profile connector.

  “Would today’s market conditions overcome the issues that hindered adoption of the previous attempt?”

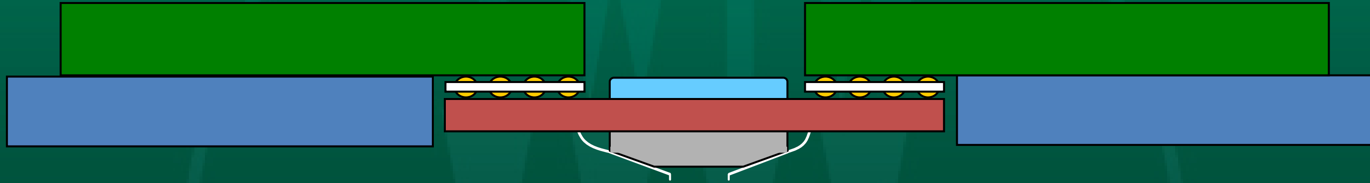
Previous 2P PC Design

The initial attempt failed in several key areas…

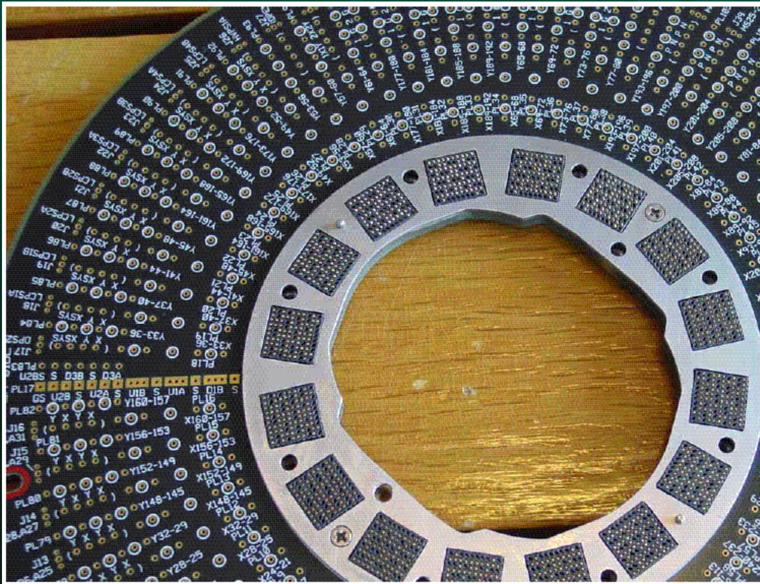
- Too complicate for manufacturing, too many parts and processes needed to function in production.
- Custom connector added too much cost.
- Parallelism lost every time the probe card is removed.
- Very little room for components.
- Probe head swapping inconvenient.

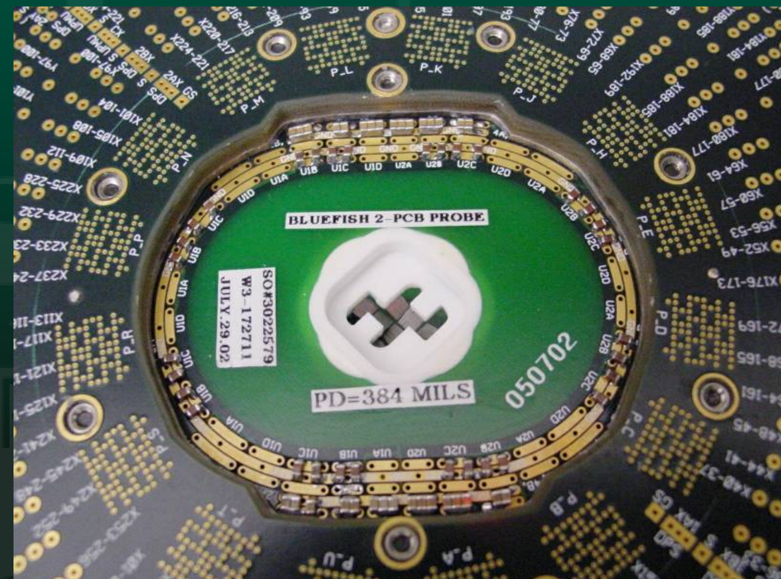
Previous 2P PC Design

FIB-FAMILY INTERFACE BOARD



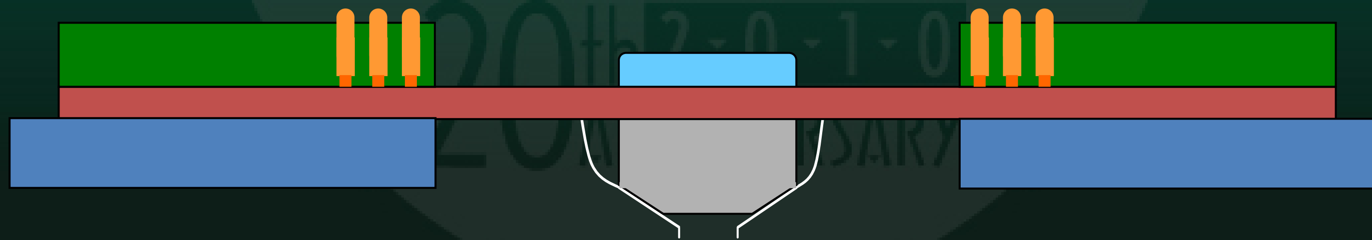
PROBE CARD



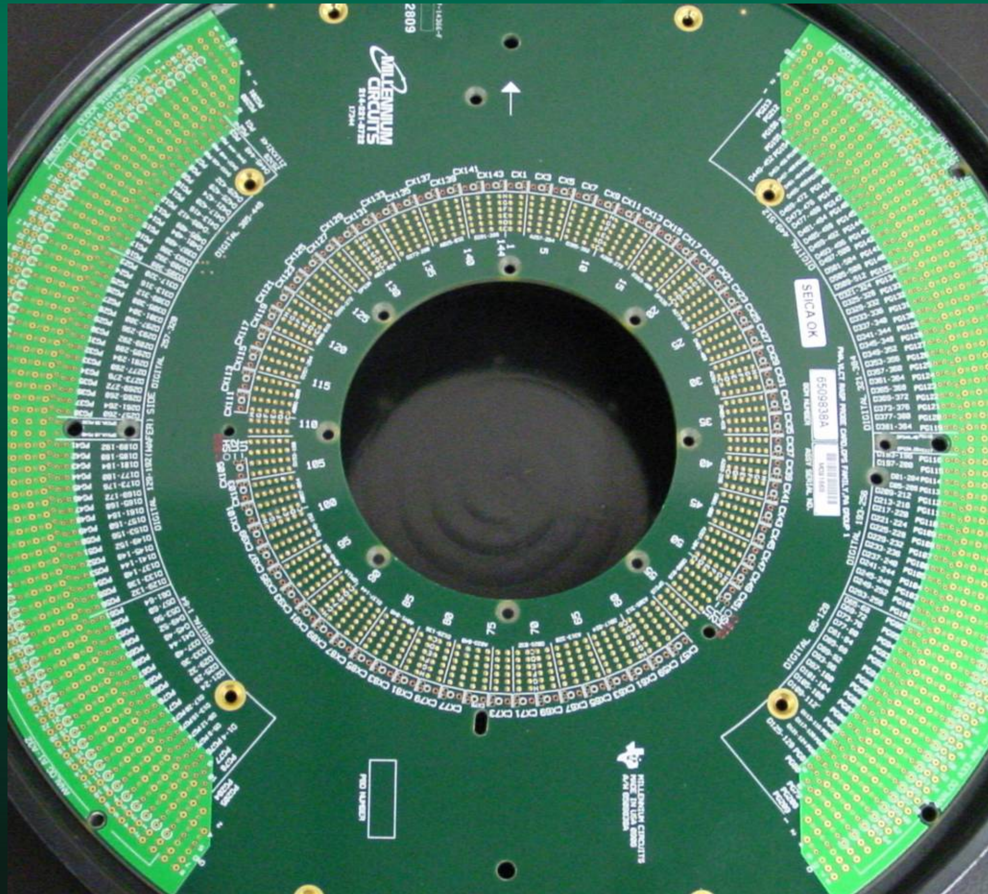


Enhanced 2P PC Solution

- Concept was reorganized and redesigned with Millennium Circuits.
- Result: A drop-in solution for the TI's VLCT tester setup using a 2 PCB methodology.

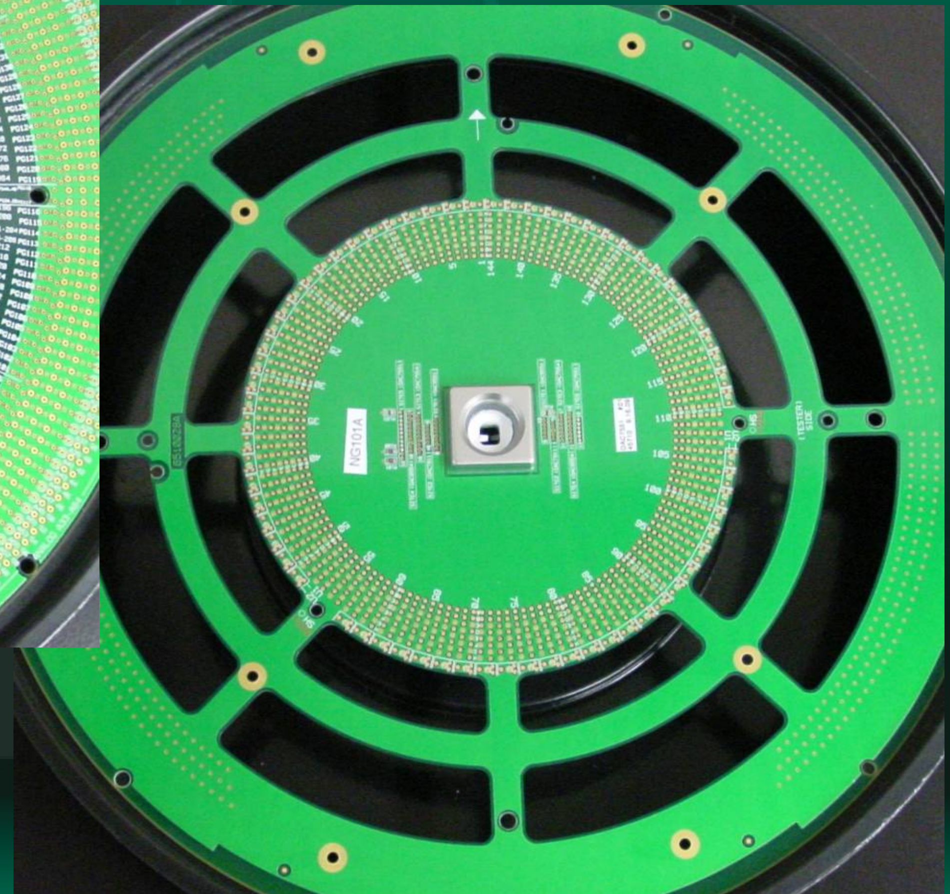


Enhanced 2P PC Solution



FIB-FAMILY INTERFACE BOARD

PROBE CARD



Enhanced 2P PC Solution

- 0.125" thick Family Interface Board (FIB) and 0.062" thick probe card (PC) = 0.187" thick standard PC PCB for the VLCT.
- PC rests on, and is therefore referenced by, the prober support plate.
- PC cut-outs zones provided for through-hole components.
- Uses original PC alignment pins.
- Each PC is generic to 10 or more products within the same family.

Cost Benefit & Savings

Custom PC Vs. VLCPC

Cost

$350,000.00
$300,000.00
$250,000.00
$200,000.00
$150,000.00
$100,000.00
$50,000.00
$-

0 10 20 30 40 50

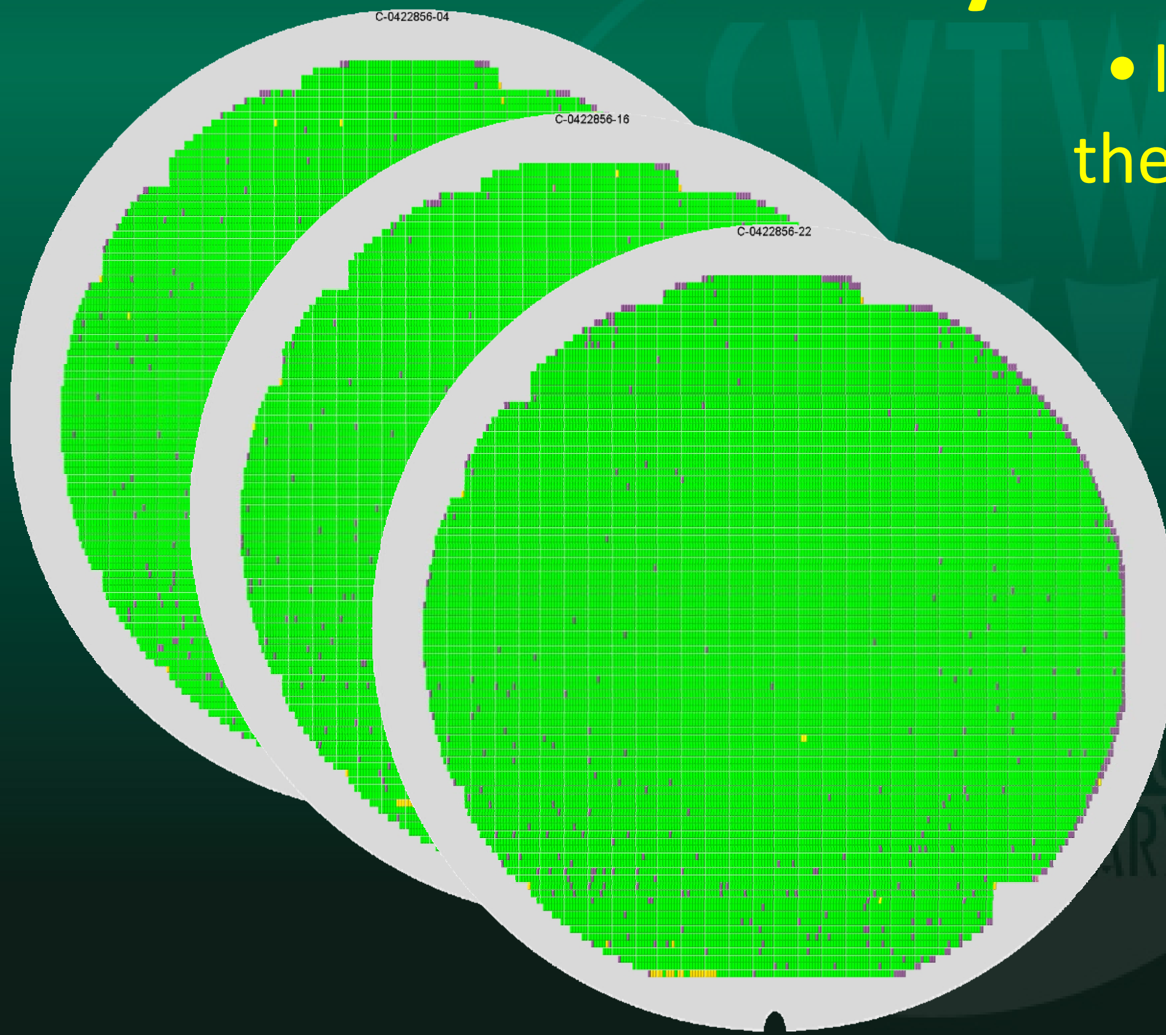
Devices

Custom PCs
VLCPC

Analysis

- Specialty hardware was designed to facilitate mounting pogo pins in the FIB.
- Initial FIB boards had issues with sticking pogo pins.
- Wiggle tests passed initial device design, loopback test failed for unused channels.
- Planarity and CRes are excellent.

Analysis



- Initial yields highlight the need for wafer test.
- Projected savings due to packaging cost avoidance justifies the expenditure.
- Further savings expected when test scheme moved to sample probe.

Constraints

- Probe needle count needs to be kept low to reduce cost, i.e. no PCB stiffeners.
- Family of devices must be sufficient to justify implementation costs.
- No multisite will be allowed.

Summary & Future Work

- TI Business Unit Test Group has been very pleased with the performance and cost benefits associated with the 2 Piece Probe Card solution.
- As a result, more tester platforms, alternate probe head technologies and device families are being considered for implementation.
- Additional validation is currently underway in terms of Gauge R&R and Yield Correlation to Packaging Yield.

Acknowledgements

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