Can IEEE P1581 Test Fully Buffered DIMMs?

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Purpose

Testing Fully Buffered DIMMs maybe outside of IEEE P1581’s capabilities because they are cascaded.

The test challenges are presented and alternate solutions offered.
Outline

• Introducing Fully Buffered DIMMs (FBDs) and applications
• Current Test Strategies
• P1581 FBD Test Challenges
• Other Test Strategies
• Conclusion
Fully Buffered DIMM (FBD)

- Differential point to point
- Up to 4 GB of DDR memory per DIMM @ 4.8 Gb/Sec – today
- A typical DIMM has 240 pins
Typical FBD System

- Used on high end servers, high end workstations, high end desktop & network equipment
- FBDs are cascaded
- Scalable to 192GB

Note: The Advanced Memory Buffer (AMB) buffers all signals from the DRAMs to the Motherboard and buffers signals to each DIMM

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Typical FBD System

- Resolves PCB complexity
- Resolves signal integrity with shorter traces
Current FBD Test Strategy

• Memory is typically not populated at ICT

• DIMM sockets are typically through-hole
  ➔ Testpoints are “free”

• ICT – MCH (Memory Controller Hub) tested using available test modes

• ICT – FBD sockets are tested using a vectorless test mode – Note: Tests signal pins only

• Functional Test – Uses typical test patterns/algorithms
• What if the sockets are SMT?
  ➔ No “free” testpoints

• There are limited testpoints available

• Assume the MCH is 1149.1/6 compliant

• A P1581 compliant DIMM is populated at ICT
  ➔ P1581 will test the interconnects to the first DIMM

• But....
• How are the 2\textsuperscript{nd}, 3\textsuperscript{rd}, 4\textsuperscript{th}, etc. DIMMs?

• The 1149.1/.6 MCH cannot reach FBD1
  \[ \Rightarrow \text{P1581 will } \textit{AGAIN} \text{ test the interconnects to the } \textit{FIRST} \text{ DIMM} \]
  \[ \Rightarrow \text{FBD1 (2\textsuperscript{nd} DIMM) is not tested – it can’t be tested using P1581} \]
Test Strategies to Consider

• IBIST (Interconnect Built In Self Test)
  – IBIST is supported by FBD
  – Not an ICT solution, targeted at Functional Test or standalone station

• MBIST (Memory Built In Self Test)
  – Functional Test Solution

• Drive for Boundary Scan 1149.1 or .6
  – Not currently supported by AMB and FBD
  – Note: If the AMB supported 1149.1, the DIMM manufacturer could use P1581, assuming the DDR DRAMs have P1581
Conclusion

The proposed IEEE P1581 standard cannot test FBDs. As test access is lost, another strategy needs to be considered.