Supporting high-bandwidth connector, package and module interconnect modeling

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IBIS Summit Meeting at DAC 2009
San Francisco, CA
July 28, 2009
Connector, Package, and Module Modeling Requirements

- Signal Interconnect Modeling
- Signal Coupling (crosstalk)
- Power Distribution
  - Rail voltage AC coupling
  - DC drop
- Coupling between Signal Interconnects and Power Distribution (SSO)
Current IBIS Package Models are Not Sufficient > 1Gb/s

• High speed channels require connector, package and module (e.g. DIMM) models that are:
  – Broadband
  – Distributed
  – Coupled
  – Power distribution

• Consider the following simple package design
  – Typical interconnect length of 1”
  – 11Gb/s
  – Coupling between adjacent pins
  – Adjacent connections are different length
Electronic Module Description (EMD) Needs a Netlisting Language

- The IBIS-ATM committee decided that since EMD required an interconnect sub-circuit netlisting language, IBIS-ATM should focus on this first.

- We would like to thank Synopsys for putting a subset of its HSPICE® manual into the public domain for the purpose of defining a generic interconnect SPICE language.

- HSPICE® is a registered trademark of Synopsys, Inc.

- See http://www.vhdl.org/pub/ibis/macromodel_wip/page for presentations about IBIS-ISS and EMD.
Solution Requirements

• High level description language of connector, package, and module describing “pins” and “models” between pins/pads

• Sub-circuit netlisting language
  – Standardized wrapper describing subckt ports
  – .parameter and .include

• Sparse Touchstone® File
  – Standardized wrapper describing ports
  – Sparse port matrix of pointers to transfer functions
Sub-circuit Netlisting Language

IBIS-ISS Elements

- R Resistor
- L Inductor
- C Capacitor
- Linear Controlled Sources
  - E, F, G, H
  - Include Pole-Zero and Laplacian
- K Inductor coupling element
- T Tline

- W Line (RLGC/Table)
- S-Parameter
- V DC=0 Shunt Element
- X-Element
  - Subckts made of IBIS-ISS instances
- Support .include
- Support .parameter
- Support parameter passing
IBIS-ISS Design Decisions

- Limited to linear time invariant (LTI) elements
- Parameters are included, but some specific features such as Global Parameters, Ternary Operators and User Defined Functions have not been included
- Scaling not supported (.option scale=x, M=x)
- All elements must be contained inside one or more subcircuit
Current Status


• We request that IBIS members who either produce, or consume interconnect models review and comment on this proposal

• IBIS-ATM meetings are held every Tuesday at noon Pacific time

• To join in on the discussion ibis-macro@freelists.org