IBIS Interconnect SPICE Subcircuits IBIS-ISS

Supporting high-bandwidth connector, package and module interconnect modeling

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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 it's 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
 - SPICE LTI Elements R,L,C,E,F,G,H,K,T,S,X
 - .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 subcircuits

Current Status

- http://www.vhdl.org/pub/ibis/macromodel_wip/ site contains a working draft of the IBIS-ISS document
- 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

