IBIS Interconnect Specification

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Current Status

- In the process of final editorial review
  - Rev 1.0 release set for June 20, 2002.
  - Available on IBIS website under the “Connector Info” link
- Major changes/enhancements since the last report:
  - Removed auto pinmap functionality, removed redundant info, streamlined keyword organization.
  - Added the “G” to LRGC matrices
  - Added support for non-regular interconnect (nodal path descriptions)
  - Added support for freq dependent transmission line parameters (via S-parameters)
- “Connector” spec now encompasses both connectors and package interconnect!

Overview

- A .icm file supports one (1) interconnect family
  - Each interconnect family includes one or more individual interconnect descriptions
- Individual interconnect descriptions include the following:
  - Basic info like manufacture, description, mating conditions, model limit (max slew rate), etc.
  - The model type (MLM, SLM or S-parameter).
  - A path description, either ‘tree’ or ‘nodal’, that describes how the matrices are interconnected.
  - Where applicable, info that allows pin swathing.
  - Mapping between external pins/node of interconnect and the rows of the matrix.
- Matrixes contain either LRGC or S-parameter data (via external Touchstone file).

Overview (cont.)

- Specification supports three different types of interconnect:
  - Regular (no pins missing) rectangular connectors
    - Swathable, can use either path description
  - Regular, non-rectangular connectors
    - Not swathable, can use either path description
  - Irregular connector/interconnect
    - Not swathable, must use nodal path description
- Nodal vs. Tree type path descriptions
  - [Tree Path Description] cascades matrices back to back, each row of matrix corresponds to a single pin, same # of pins front and back
  - [Nodal Path Description] connects matrices via explicit node names, can build arbitrary structures with missing pins, different size matrices, etc.

MLM and SLM Models

- MLM = Multi-line (coupled) models
  - Use for including pin-to-pin coupling
  - Spec specifies partial inductance values and Maxwell capacitance values in matrix
  - Intent is to support xtalk and return path simulations.
- SLM = Single lines (un-coupled) models
  - SLM_EvenMode/OddMode/Quiescent models have documented ground return paths(!)
  - SLM_General only documents GSR ratio
  - Spec specifies loop inductance in matrix
  - The intent is to ‘bracket’ interconnect performance under specific conditions
- S-parameter models
  - By definition are coupled models, unused terminals terminated by reference impedance

Length vs. Multiplier Matrix Specification

- Path description specifies how to interpret the data in an RLGC matrix
  - Len = per-unit-length, intended for distributed transmission line elements. Expansion by multiplication.
  - Mult = lumped elements, intended to be rendered into circuit netlists. Expansion by cascading sections.
  - S-parameter is always lumped, non-cascade
- [Derivation Method] keyword in matrix section provides a cross reference
- Two styles for two different purposes…
  - Per unit length results from a 2-D extraction of parallel structures (I.e. package traces)
  - Unit multiplier results from a 3-D extraction of non-regular structure (I.e. connectors)