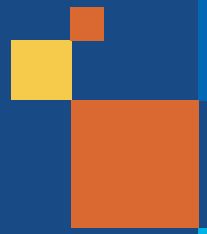
IBIS Interconnect Task Group Update

Port Mapping in Touchstone 3.0

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Presented at 2026 Japan IBIS Summit
Tokyo, Japan
November 10, 2026

Updated from material originally presented at the Hybrid Asian IBIS Summit 2025, Tokyo and the Asian IBIS Summit 2024, Shanghai



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Touchstone 3.0 Core Updates

*More detailed history in "**Touchstone Immediate and Long-Term Future**" from 2023*

- Touchstone Issue Resolution Documents
  - 7.2 Standardized Pole-Residue Representation
  - 8 Option line changes
  - (9) Standardized Port Mapping (WIP): Draft 36



These address major industry requests for Touchstone improvement.

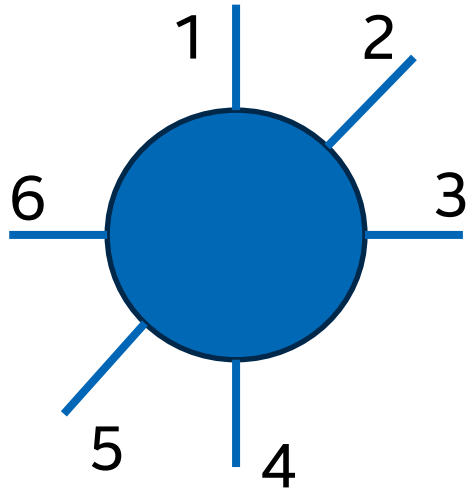
Note that clarifications to Touchstone referencing are part of the Port Mapping standardization effort.

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Review – The Mapping Problem

- In Touchstone today, what can we say about this component?
  - Interconnect or device?
  - If interconnect, what is the relationship between terminals?
  - Can I make inferences from the data?
  - What is the referencing scheme (how do terminals become ports)?

- For interconnects, we need to know the terminal arrangement to focus properly on losses, crosstalk, etc.
  - Is S21 insertion loss? Or is S21 crosstalk?




```
# MHz Y RI R 50
5.00 8.0 9.0 2.0 -1.0 3.0 -2.0 1.0 3.0 1.0 0.1 0.2 -0.2
2.0 -1.0 7.0 7.0 1.8 -2.0 -1.0 -1.0 -0.5 0.5 0.2 -0.1
3.0 -2.0 1.8 -2.0 5.8 6.0 1.2 0.8 0.9 0.7 0.3 -0.5
1.0 3.0 -1.0 -1.0 1.2 0.8 6.3 8.0 2.0 -0.5 1.5 0.6
1.0 0.1 -0.5 0.5 0.9 0.7 2.0 -0.5 4.7 -6.0 -1.0 2.0
0.2 -0.2 0.2 -0.1 0.3 -0.5 1.5 0.6 -1.0 2.0 5.5 -7.0
```

For interconnects, we need a structure that establishes expectations for terminal behavior automatically and in advance of detailed data analysis.

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The Port Mapping Solution

- A single IBIS-like keyword section that declares ports as pairs of connection points to a data set generated from simulation or measurement: [Begin Port Map]/[End Port Map]

- Parameters identify connection points and their contexts
  - "Physical", "Net": identify connection points and signal paths
  - "Logical": a functional label (how will the port be used)
  - "Side": a location label (e.g., PCB-side or Die-side for a package)
  - "Symbol_leftside", "Symbol_rightside"…: schematic symbol arrangement

For automation, "Physical", "Net", and sometimes "Side" define the structure and connectivity

"Port" is a pair of terminals – one for measurement and one as a reference.
The structure must support both Kirchoff and Maxwell/Heaviside approaches.

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Port Mapping Syntax Example

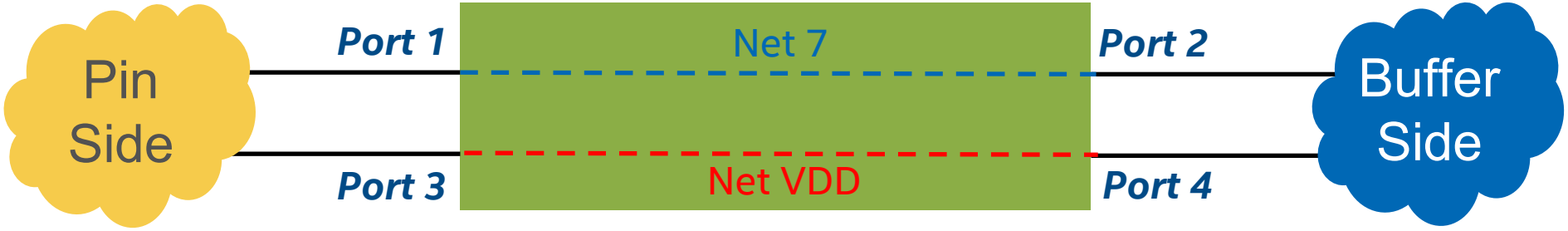
```
[Begin Port Map]
|
Data_usage "IBIS_Interconnect"
Port 1 (Physical Pin:7)              (Type S)(Side Pin)     (Net 7)   (Logical DQ3pin)
Port 2 (Physical Buffer:7)           (Type S)(Side Buffer)  (Net 7)   (Logical DQ3buffer)
Port 3 (Physical Pin:Bus_label:VDD)  (Type P)(Side Pin)     (Net VDD)(Logical VDDpin)
Port 4 (Physical Pullup_ref:7)       (Type P)(Side Buffer)  (Net VDD)(Logical VDDbuffer)
Symbol_leftside 1 3
Symbol_rightside 2 4
|
[End Port Map]
```

Data_usage is optional, and supports IBIS structures EMD, C_comp_model and Ts4file as well.

Reference and Diff_Port identifiers are also available.

A port is a pair of terminals. The reference terminal is A_gnd for all ports in this example.

DQ3 and VDD from pin to buffer



Physical and Net provide connectivity guidance;
all other identifiers are informative (e.g., for schematic symbols)

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Limitations of IBIS Interconnect and EMD

- A challenge of linking IBIS structures to Touchstone…

For File_TS, the Terminal_number entry shall match the Touchstone file port number or reference terminal line, as shown below. The Terminal_number entries may be listed in any order as long as there are no duplicate entries. The terminal line for Terminal_number N+1 is required as a reference terminal for each port and shall be connected to a rail terminal or A_gnd in the EMD Model. At least one other terminal line entry is required.

Terminal_number	Port
1	1
2	2
…	
N	N
N+1	Reference terminal for the Touchstone file

IBIS EMD only supports Touchstone structures with a single reference terminal

All other "ports" are terminals paired with this reference

- The initial release of Touchstone 3.0 Port Mapping will support multiple references in ways that IBIS Interconnect and EMD cannot
  - Updates to IBIS will be needed (BIRDs); Touchstone 3.x updates to follow

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Our Request to the Community



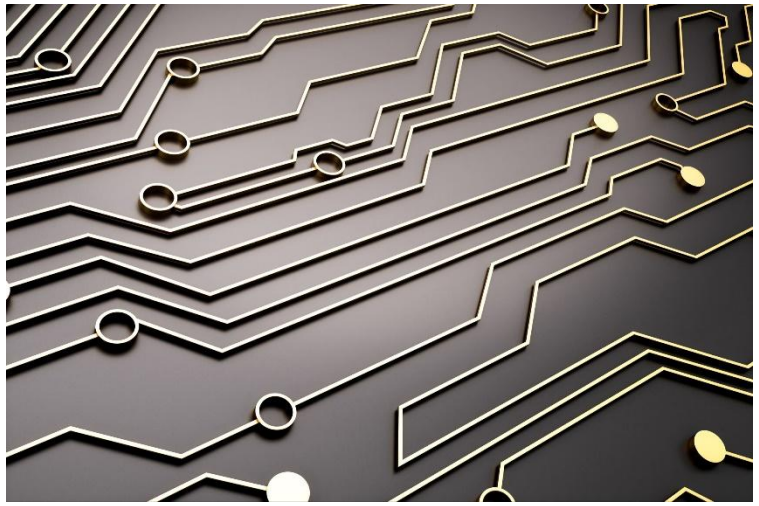
- Port Mapping is one of several changes to Touchstone to address industry needs and requests
- Are the features (links to IBIS EMD & Interconnect) useful?
  - If not, what is missing?
- What test cases are needed to evaluate Touchstone 3.0?
  - What examples should be present in the standard?
- How does this interact with IEEE 2401 LPB?
  - The connectivity in Touchstone 3.0 overlaps with LPB definitions

Your feedback now will help prevent issues later. Thank you!

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Backup

Who Is The IBIS Interconnect Task Group?



- Designs and writes technical changes to support passive interconnect modeling formats
  - Supports IBIS, Touchstone and IBIS-ISS
  - Live teleconferences are held Wednesdays 8-9 AM US Pacific Time
  - Web site: https://ibis.org/interconnect_wip/
  - Freelists is the most up-to-date source for documents and discussion:
  - https://freelists.org/archive/ibis-interconn/

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