JEITA IBIS Quality WG Update

IBIS Summit Tokyo, Japan
November 6, 2009

JEITA EDA-WG
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Agenda

1. Motivation
2. IBIS Quality Framework
3. Verification of IBIS Quality Framework
4. Conclusion and Future Direction
1. Motivation - IBIS Quality issues are confusing

We need the framework with which one can verify IBIS quality.

EDA vendor

Is the simulator implemented correctly?

Is the simulator used correctly?

Chip vendor

Is the simulator implemented correctly?

Is the simulator used correctly?

Set maker

Is the IBIS generated correctly?

Is the IBIS generated correctly?
1. Motivation – The Purpose of JEITA IBIS Quality WG

JEITA IBIS Quality WG

Provides the framework with which one can verify IBIS quality.

- How to get better IBIS
- How to carry out accurate simulation

EDA vendor

Chip vendor

Set maker

How to qualify the simulator

How to qualify IBIS
## 1. Motivation - Schedule

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic study of IBIS quality framework</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Today’s topic</strong></td>
</tr>
<tr>
<td><strong>Verification of IBIS quality framework</strong></td>
<td>Single ended IBIS model-low speed (10Mbps class)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Single ended IBIS model-high speed (100Mbps class)</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Differential IBIS model</td>
<td></td>
<td></td>
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<tr>
<td><strong>Promotion</strong></td>
<td></td>
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<tr>
<td></td>
<td>Prepare WEB contents</td>
<td>Enhance contents (high-speed, differential)</td>
<td>Open web site (low-speed IBIS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. IBIS Quality Framework - Definition of Qualified IBIS

- Simulation results for test circuits with qualified IBIS, qualified transmission line simulator, and qualified user, show good agreements with those of SPICE based simulator.
2. IBIS Quality Framework - Test circuits (1/2)

<table>
<thead>
<tr>
<th>Name</th>
<th>Termination</th>
<th>Transmission line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit 1</td>
<td>50ohm</td>
<td>0cm</td>
</tr>
<tr>
<td>Circuit 2</td>
<td>50ohm</td>
<td>5cm</td>
</tr>
<tr>
<td>Circuit 3</td>
<td>50ohm</td>
<td>30cm</td>
</tr>
<tr>
<td>Circuit 4</td>
<td>3pF</td>
<td>0cm</td>
</tr>
<tr>
<td>Circuit 5</td>
<td>3pF</td>
<td>5cm</td>
</tr>
<tr>
<td>Circuit 6</td>
<td>3pF</td>
<td>30cm</td>
</tr>
<tr>
<td>Circuit 7</td>
<td>3pF</td>
<td>30cm + 5cm</td>
</tr>
</tbody>
</table>

Input: PULSE
Frequency = 10MHz
# 2. IBIS Quality Framework - Test circuits (2/2)

<table>
<thead>
<tr>
<th>Name</th>
<th>Termination</th>
<th>Transmission line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit 8</td>
<td>3pF</td>
<td>30cm + 5cm + 5cm + 5cm + 5cm</td>
</tr>
<tr>
<td>Circuit 9</td>
<td>12pF</td>
<td>0cm</td>
</tr>
<tr>
<td>Circuit 10</td>
<td>100ohm + 100ohm</td>
<td>0cm</td>
</tr>
<tr>
<td>Circuit 11</td>
<td>10nH + 3pF</td>
<td>0cm</td>
</tr>
<tr>
<td>Circuit 12</td>
<td>3pF</td>
<td>5cm (Lumped circuit)</td>
</tr>
</tbody>
</table>

Input: PULSE  
Frequency = 10MHz

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Circuit 8

![Circuit 8 diagram](image)

Circuit 9

![Circuit 9 diagram](image)

Circuit 10

![Circuit 10 diagram](image)

Circuit 11

![Circuit 11 diagram](image)

Circuit 12

![Circuit 12 diagram](image)
2. IBIS Quality Framework - Usage (1/4)

Upload the following data to website:
1. Golden IBIS data
2. Test circuit group
3. Golden results (Excel data)
2. IBIS Quality Framework - Usage (2/4)

JEITA

Upload the following data to website:
(1) golden IBIS model
(2) test circuit group
(3) golden results (EXCEL data)

EDA vendor
Qualify the simulator
2. IBIS Quality Framework - Usage (3/4)

- Golden IBIS
- Test circuit group
- Upload
- Web (open site)
- Golden IBIS
- Test circuit group
- Golden results
- (1) golden IBIS model
- (2) test circuit group
- (3) golden results (EXCEL data)
- EDA vendor
- Chip vendor
- Qualify the simulator
- Provide the qualified IBIS

Upload the following data to website:
- (1) golden IBIS model
- (2) test circuit group
- (3) golden results (EXCEL data)

Download

Download

- JEITA
2. IBIS Quality Framework - Usage (4/4)

EDA vendor

Qualify the simulator

Chip vendor

Set maker

- Get the qualified IBIS
- Get the ability to carry out correct simulation

Upload the following data to website
(1) golden IBIS model
(2) test circuit group
(3) golden results (EXCEL data)

Download

- Get the qualified IBIS
- Reduce possibility to get unreasonable claim for released IBIS
3. Verification of IBIS Quality Framework - Method(1/6)

Chip Vendor provides Golden IBIS and Golden results.
Golden IBIS means qualified IBIS. Golden results mean qualified results.
3. Verification of IBIS Quality Framework - Method(2/6)

Golden input means qualified input.
3. Verification of IBIS Quality Framework - Method (3/6)

Set maker provides simulation results of IBIS1, IBIS2 (ver. 1)
3. Verification of IBIS Quality Framework - Method (4/6)

JEITA makes comparison report of IBIS1
3. Verification of IBIS Quality Framework - Method(5/6)

EDA vendor would give the information on how to carry out accurate simulation.

- Set maker checks IBIS1 Golden results and Golden inputs.
- Set maker provides IBIS2 ver.2 results using knowledge from IBIS1 report.

Golden IBIS1
Test circuit group 1
Golden IBIS2
Test circuit group 2

IBIS1 Result Ver.1
IBIS1 Result Ver.2
IBIS2 Result Ver.1
IBIS2 Result Ver.2

IBIS1 Golden Result
IBIS2 Golden Result
Golden Input

IBIS1 comparison report
EDV vendor

IBIS Model
Simulator
Operator

Time
Voltage
EDA vendor

Compare

Golden Input
3. Verification of IBIS Quality Framework - Method (6/6)

We can complete the verification of this framework by evaluating difference between IBIS2 ver.1 and ver.2.
3. Verification of IBIS Quality Framework - Result : Ver.1

IBIS2

Circuit 3

Set maker ver.1 result does not agree with chip vendor one.
3. Verification of IBIS Quality Framework - Result : Ver.2

IBIS2

Circuit 3

Ver.2: after using IBIS quality framework

Added simulation option

Set maker ver.2 result agree with chip vendor one.
3. Verification of IBIS Quality Framework - All results

IBIS quality framework helped users to enhance simulation accuracy.

<table>
<thead>
<tr>
<th>Simulator</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
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<td>C</td>
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<td>D</td>
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<td>H</td>
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<td>H</td>
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<tr>
<td>I</td>
<td>○○</td>
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Ver.1 (before using IBIS quality framework)

Ver.2 (after using IBIS quality framework)
4. Conclusion and Future Direction

- Conclusion
  - Completed the verification of IBIS Quality Framework for single-ended 10Mbps-class IBIS model.

- Near Future Direction
  - Extend the applicability of IBIS Quality Framework to other IBIS model
    - Single-ended 100Mbps-class IBIS model (ex. DDR2)
    - Differential IBIS model
  - Promote this framework
    - Website
    - Seminar
Thank you