IBIS V7 and IEEE 2401
Harmonization

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LSI Package Board needs...

- Mutual Communication
- Design Consistency
- Shorten Development Time

Enabled by

**Standard formats IEC 63055**

**IEEE 2401 (dual logo)**
Contents

• Introduction
• IEC 63055/ IEEE 2401 Concept
• IBIS V7 harmonization & schedule
• Conclusion
Background

◆ Need Seamless Data Transformation among LSI (large scale integration), Package and Board
  • Conversion is needed from one to another
  • Mistakes may occur in manual operation
  • Long verification time even for correct setup

◆ Time is Money!!
  • Engineers need to spend time for innovation
  • Early production gets market share
  • Simpler operation makes better quality
Standardization Strategy

- Make **Abstraction Level** Higher
- Make **Business** More Successful
- Make **Cost** Smaller
- Make **Design** More Effective
- Make **Ecosystem** More Attractive
Effect of IEC 63055/IEEE 2401

Parameter collection

setup

calculation

2 weeks

1 day

EDA / computer / Academic challenge

Common formats

List of information, exchange format, common terms & definitions

Community / e-commerce

Extremely shorten total simulation time

time
What is IEC 63055/IEEE 2401-2015?

Standard Format for LSI Package Board (LPB) Interoperable Design.

For effective information exchange in supply chain.

1. Management of Project (M-Format)
2. Netlist (N-Format)
3. Component (C-Format)
4. Rule of Design (R-Format)
5. Geometry (G-Format)
What is IEC 63055/IEEE 2401-2015?

In the deployment of electronic products...

Simulation Platform

- **C-Format**
  - Die Size
  - Pad location
  - Spice Model correspondence
  - Die models IBIS/SPICE CPM/LPM

- **G-Format**
  - Package size
  - Terminal location
  - Spice/IBIS/S-param model correspondence
  - Package models IBIS S-param SPICE

- **R-Format**
  - Line/Space
  - Via pitch/size/hole
  - Layer Stack up
  - Material parameter

- **N-Format**
  - Netlist

- **M-Format**
  - Combination of C, G, R, N which constitute the analysis target

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Die mount
Coordinate, Orientation, Flip, etc.

Package mount
Coordinate, Orientation, Flip, etc.

PWB Routing /Plane

Connectivity

Netlist
Model “Wrapper”

- Function to wrap models to pass models and IPs information to CAD / CAE simultaneously

Geometry
Terminal correspondence
Models
  - SPICE
  - S parameter
  - VHDL (AMS)
  - Verilog-HDL
  - IEC 62433
  - IBIS V4, AMI
  - IBIS V7
  - SystemC (AMS)
  - Thermal models

CAE
  (SI, PI, EMC, thermal mechanical)

CAD
  (Artwork, place, route planning)
In many cases, **IBIS6.0 does’t have die pad information.** Therefore IBIS is linked to LPB PKG module.

If you obtain .pkg file and .ibs file without package model, you can use them for PKG module and DIE module separately. Then PKG module can be stacked with DIE module.
[Interconnect Model] can define die pad. In this case LPB DIE module may be available.

However, there is a possibility that the tool recognizes each model twice – double counting problem.
Concerns and required actions

Concern: double count of die and PKG model in case LPB with IBIS7.0
Action: add the optimal function to LPB ?

<table>
<thead>
<tr>
<th>Example of modification to correspond to IBIS 7.0</th>
<th>[Model]</th>
<th>[Package]</th>
<th>[Pin]</th>
<th>[Package Model]</th>
<th>[Interconnect]</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;ibis:ref_port component=aaa/&gt;</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
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</tr>
<tr>
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<td>&lt;interconnect name=xxx/&gt;</td>
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<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

<pkg/> and <interconnect/> can be written together. More than one <interconnect/> can be written.
Solution

[Interconnect Model] can define die pad.

LPB is going to support directly referring the die pad on IBIS like [Interconnect Model], and to add Touchstone and IBIS-ISS as referring models.

Therefore, DIE and PKG module can be available separately without double counting problem.

```xml
<reference xmlns:ibis="http://www.jeita.or.jp/LPB/ibis"
  reffile="XXXX.ibs" format="IBIS">
  <connection socket_name="socket1" port_id="A1">
    <ibis:ref_port component="ibis_die" signal_name="VCC1"
      terminal_type="Pad_Rail" />
  </connection>
  <connection socket_name="socket1" port_id="A2">
    <ibis:ref_port component="ibis_die" pin_name="3"
      terminal_type="Pad_I/O" />
  </connection>
  ...
</reference>
```
Development of IEEE 2401 revision

Current Ver.: IEEE 2401-2015


Dual Logo: IEC 63055/ IEEE 2401-2015

Revision work
Project profile:
https://standards.ieee.org/project/2401.html

Current status/plan (@ 2019-01-29)

D2(Draft 2) in circulation, (followed by D3, D4 …)
Draft with WG approval  May, 2019
Sponsor ballot;       June to October, 2019
Publish

Target IEEE 2401-2020
Conclusion

- Share IEC63055 / IEEE 2401 Concept
  - Mutual Communication
  - Design Consistency
  - Shorten Development Time

- Modifications of IEEE 2401 for IBIS V7
  - Example
  - Schedule IEEE 2401-2020

Collaboration for making Designers Happy!!
Appendix
Who provides LPB?

For the components, LPB files should be released by component vendors. Some commodity parts are getting ready!

JEITA has released the sample data and tools for either vendor or user to create LPB files.

In case you have to make LPB by yourself, use ‘LPB design kit’ released by JEITA that can export simple LPB files.

http://www.lpb-forum.com/lpb-open-source-project/download/

Sorry, this web site is Japanese.
System Design

- V-Model
  Ideal: Should work
  Real: Gaps exist

- Design/Verification Languages/Tools tackle
  ex.
  High Level Abstraction Model
  High Level Synthesis
  Formal Verification
  LPB format (IEEE 2401)

- Little Digital Issue
  but Analog Ones
System Design

- **Analog Issues**
  - Found at final stage
- **Because**
  - Current HLD could consider little analog phenomena
    - Overshoot
    - Undershoot
    - Eye Opening
    - Jitter
    - Vdrop
    - Thermal

![System Design Diagram](image)
System Design

- **Potential Solution**
  - Library/IP w/Analog Info. for High Level Design
  - Common Language which cover different stages
  - That enables Feed Forward Design Short TAT Margin Less High Accuracy