IBIS-X Model Examples

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## IBIS 3.2 Pinlist

<table>
<thead>
<tr>
<th>PIN</th>
<th>signal_name</th>
<th>model_name</th>
<th>R_pin</th>
<th>L_pin</th>
<th>C_pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vcc</td>
<td>Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sig1</td>
<td>buffer1</td>
<td>0.1</td>
<td>6n</td>
<td>9p</td>
</tr>
<tr>
<td>4</td>
<td>Sig2</td>
<td>buffer2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is a fixed I/O Topology
Values can be overridden
Things can be omitted (Input/Output)
But nothing can be added
What is a Model?

- The IBIS 3.2 “Circuit” Model
  - Pre-defined topology
- “Component” Model
  - Pins and packages
- “Buffer” Model
  - Numbers, Vectors, and Data tables
What is a Model?

- The IBIS-X “Behavioral” Model
  - Model maker defines topology
- “Component” Model
  - Pins and packages
- “Buffer” Model
  - Numbers, Vectors, and Data tables
Defining a Simple Model

[Define Model] my_driver
| Using a pre-defined model based on IBIS 3.2
| This defines the power/gnd/pad/pin nodes
.inherit model_base
| Add a voltage-dependent cap between output pin and Vcc
capacitor c_top1 (pad vcc) C = [C_top] (V.pad)
| Add a temperature-dependent pullup resistor
resistor R_up (pad vcc) R = [R_pull] (Temperature)
[End Define Model]
Model Data

[Model] buffer1 | a name to use in the pinlist
model_type my_driver | which model_type uses this data
| followed by all the data required for my_driver models
C_comp   3pF  2pF  4pF
[Supply Voltage] 3.3v 3.0v 3.6v
[C_top]
  0   1p
  3   3p
[R_pull]
  0   10k
  125 20k
[End Model]
Model Data

[Model] buffer2 | a name to use in the pinlist
model_type my_driver | which model to use
| a second buffer, same type, new data
C_comp 12p 6p 20p
[Supply Voltage] 3.3v 3.0v 3.6v
[C_top]
0 1.5p
3 4.0p
[R_pull]
0 8k
75 4k
[End Model]
IBIS-X “Behavioral” Models

• Behavioral model concepts
  – Add components that model effects (such as vsource)
  – Symbolic values (such as C_comp)
  – Tables and equations for components
  – Time, Temperature, etc.
IBIS-X Primitives

- Resistor
- Capacitor
- Inductor
- Voltage source
- Current source
- Voltage-controlled voltage source
- Voltage-controlled current source
- Transmission lines (including coupling)
IBIS-X Primitives

• Resistor Examples

resistor R1 (n1  GND) R = 10k
resistor r2 (12 13) R = (10k * (1+ (Temperature-273)*0.001))
resistor a1 (VCC v1) R = (123 * v.v1 / Vcc)
resistor a2 (na GND) I = TABLE [Series MOSFET](v.na)
resistor a3 (nc, nd) V = TABLE [Table_x](i.nd)
IBIS-X “Behavioral” Models

• Model Maker provides
  – Model behavior
  – Model data
  – Pinlist

• User provides
  – Pinlist (such as FPGA)
  – Model Selector