



# **Can IBIS Accurately Model SSO ?**

## **PCB East IBIS Summit Oct 4, 2004**

**Robert Haller**

**[rhaller@sisoft.com](mailto:rhaller@sisoft.com)**

**Signal Integrity Software, Inc.**

**6 Clock Tower Place – Suite 250**

**Maynard MA. 01754**

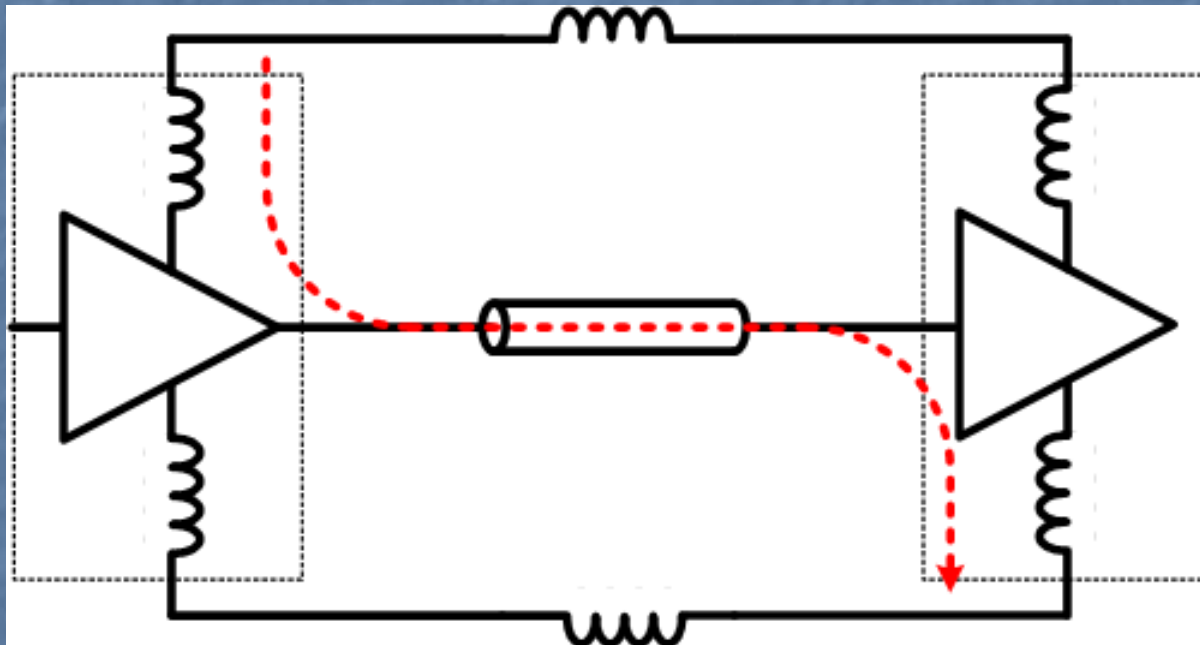
**978-461-0449 X 15**

# Can IBIS Accurately Model SSO ?

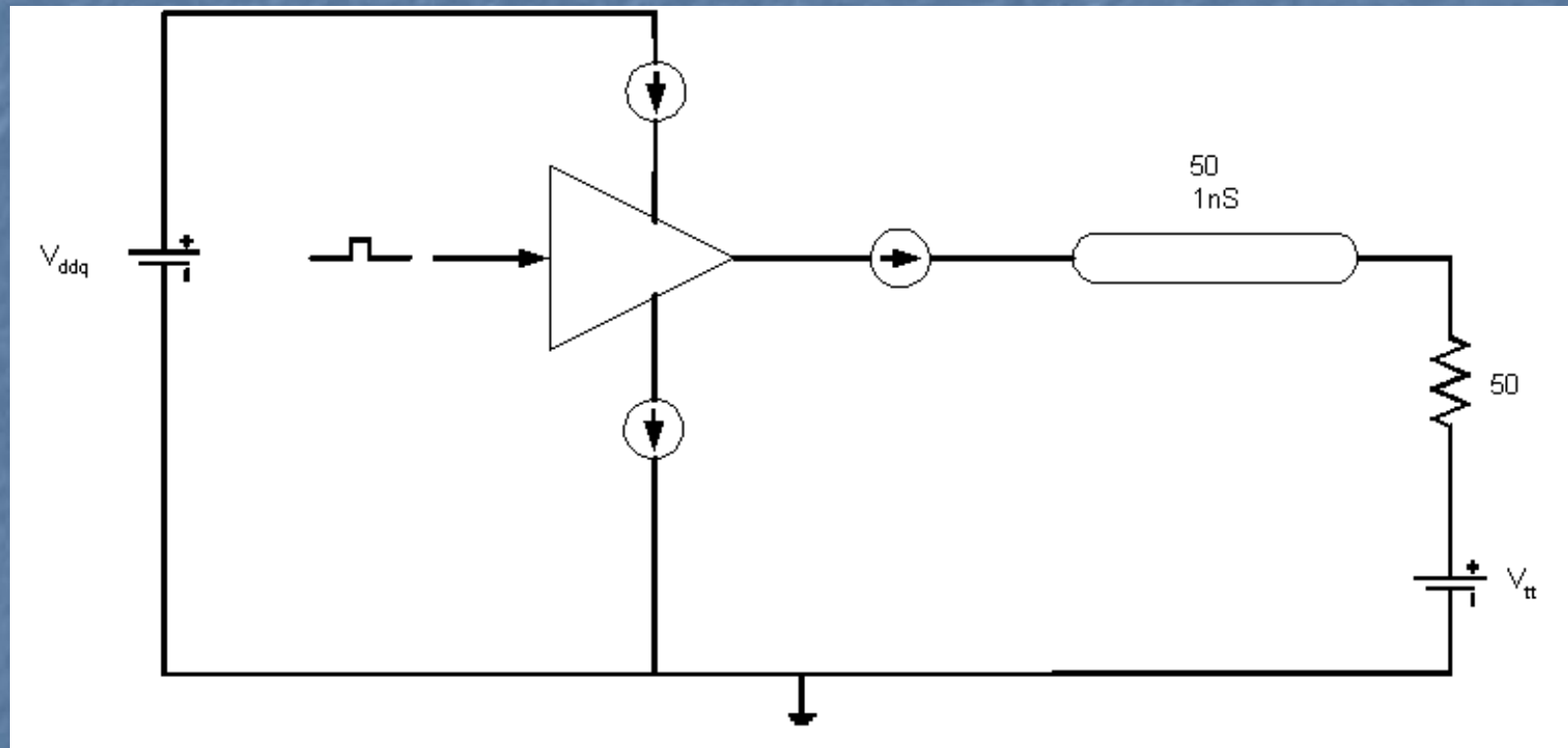
- Sometimes ...
- Issues Include
  - Accurate IBIS model
  - Accurate Package model
  - What does Simulator do with crossover current ?
    - Voltage/Current on IO Pin can be correct
    - Voltage/Current on Power Node ?
    - Voltage/Current on Ground Node ?
- Do we need IT tables ?
  - Added complexity
  - May be difficult to bench characterize
  - Contains required current information

# What Is SSO

- Two major contributors to Simultaneous Switching Outputs
  - Inductance in Power/Ground of Package causes rails collapse
  - Coupling in Package Signal path can also cause pull-in or push-out

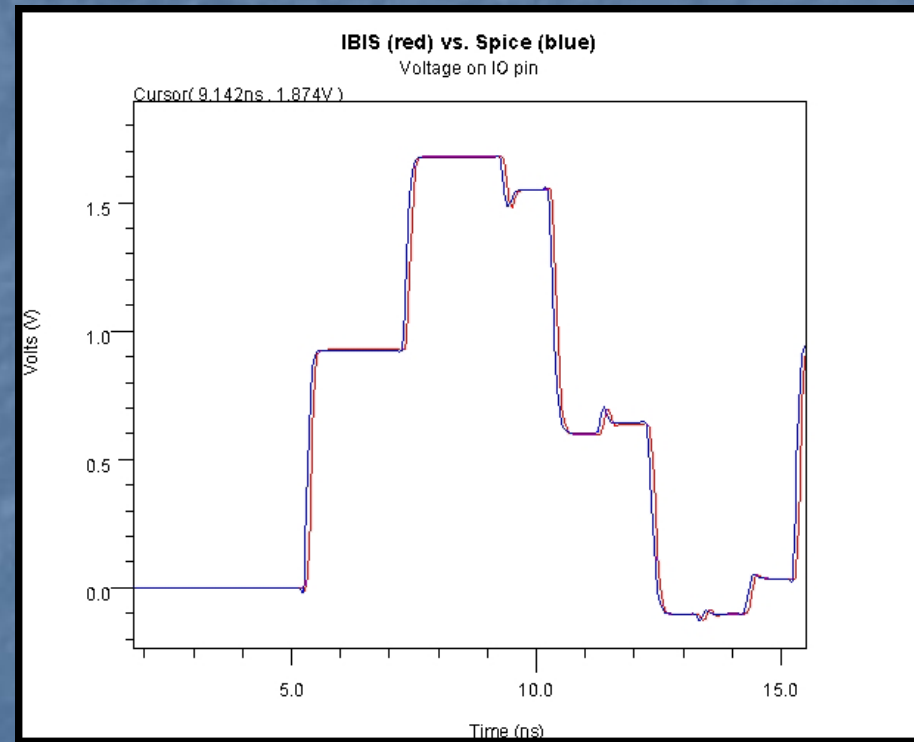
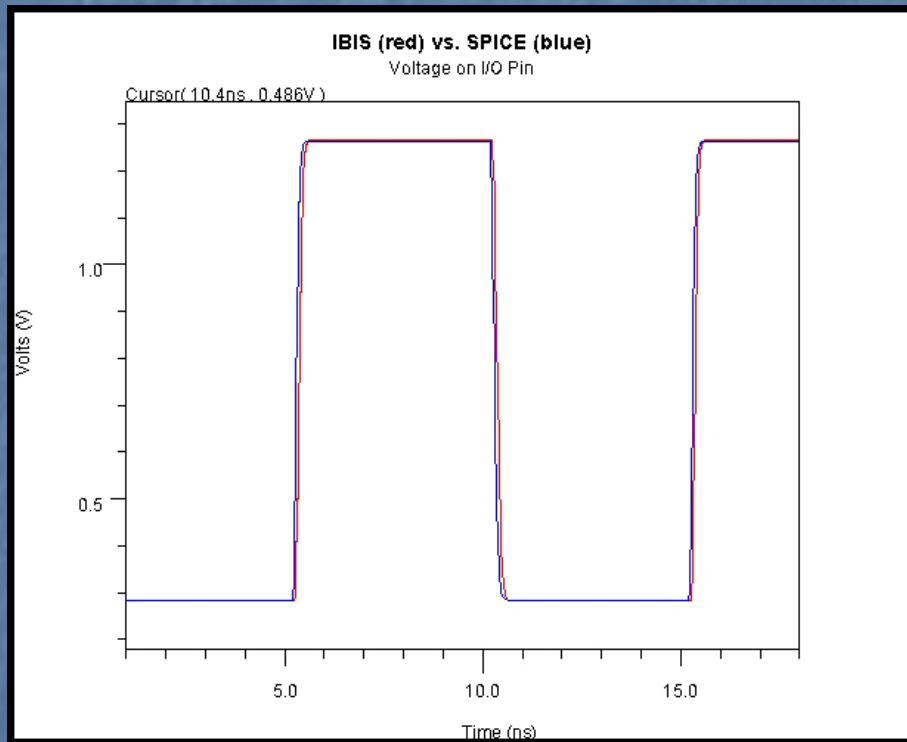


# A Simple Circuit



# Voltage - Pin of I/O Buffer

## IBIS versus Spice

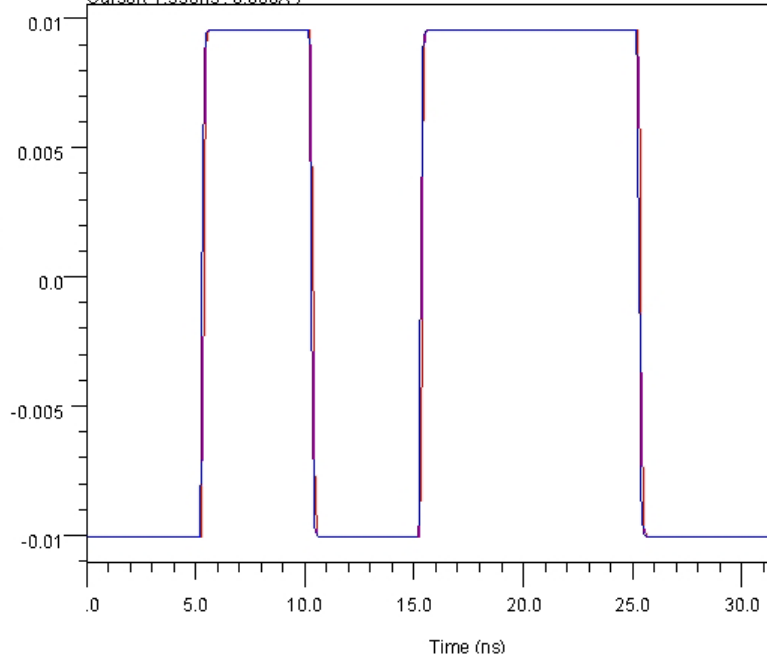


# Current - Pin of I/O Buffer

IBIS (red) vs. SPICE (blue)

Current - I/O Pin

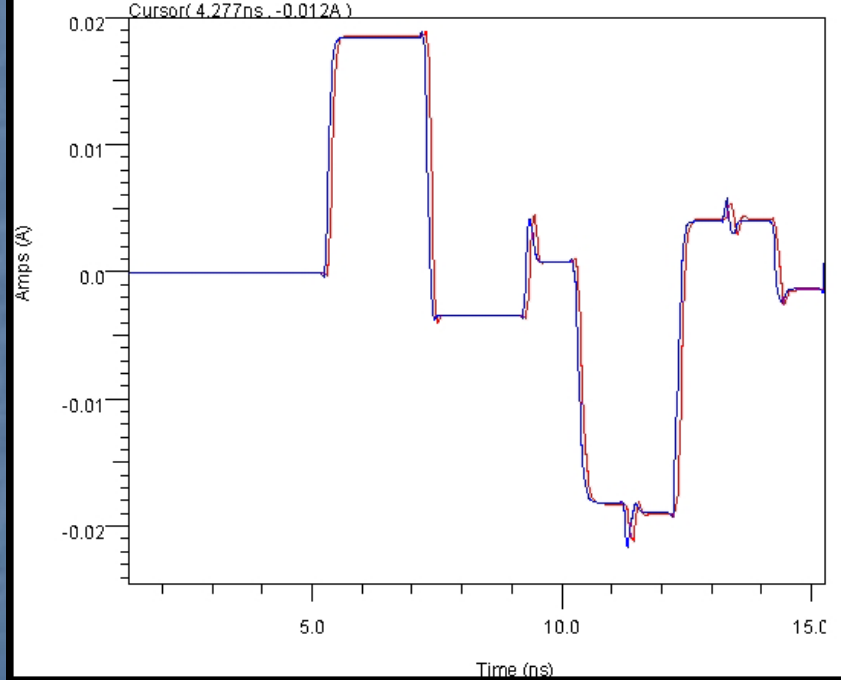
Cursor(1.996ns, 0.008A)



IBIS (red) vs. Spice (blue)

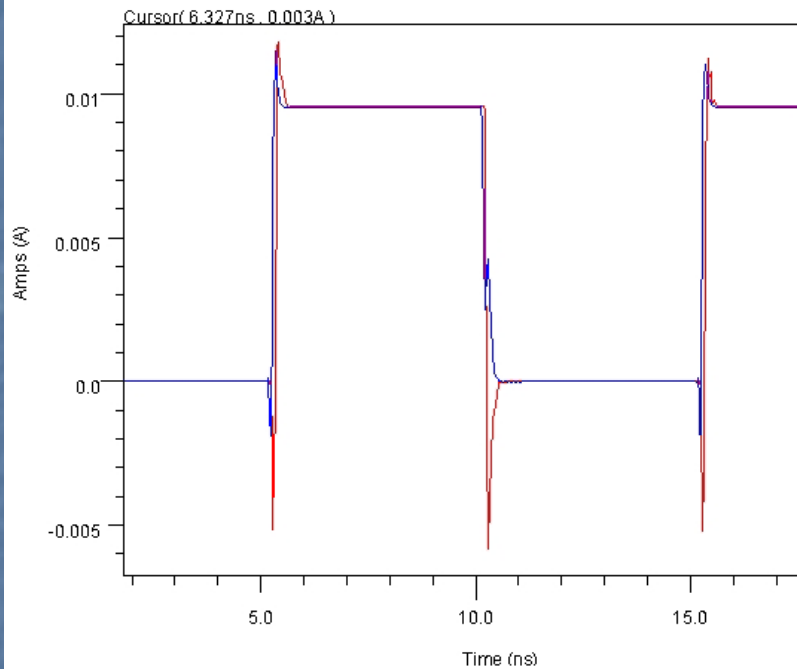
Current - IO pin

Cursor(4.277ns, -0.012A)

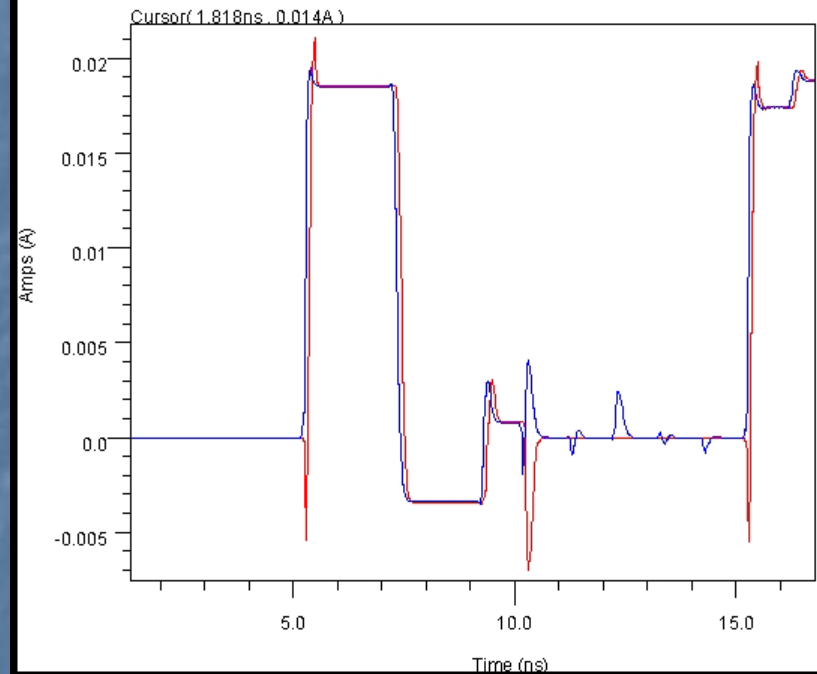


# Current - Power Node of I/O Buffer

IBIS (red) vs. SPICE (blue)  
Current - Power Pin



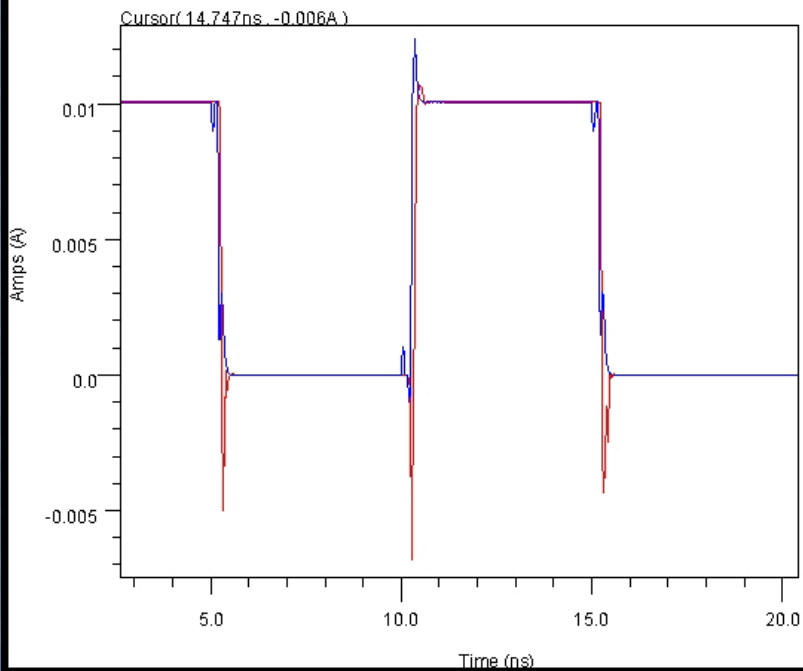
IBIS (red) vs. Spice (blue)  
Current - Power pin



# Current - Ground Node of I/O Buffer

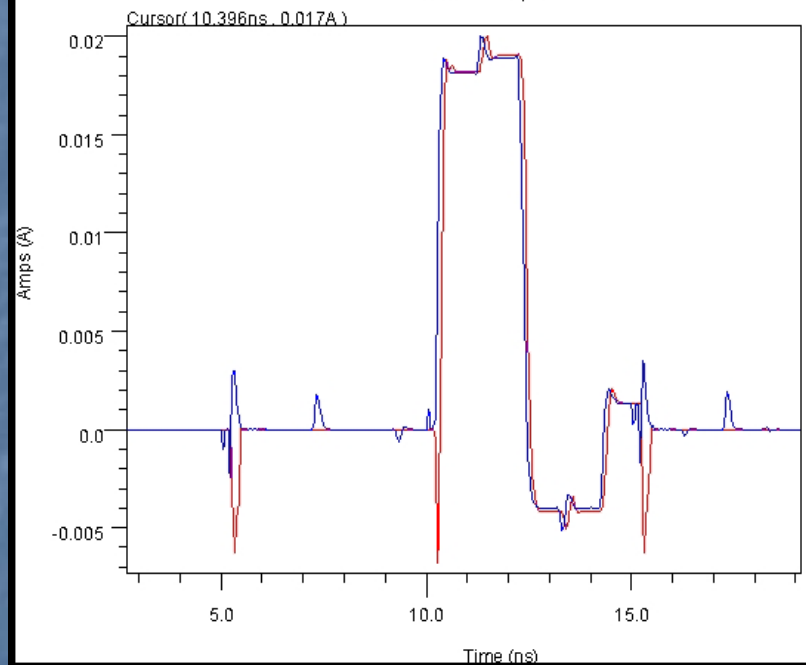
IBIS (red) vs. SPICE (blue)

Current - Ground Pin

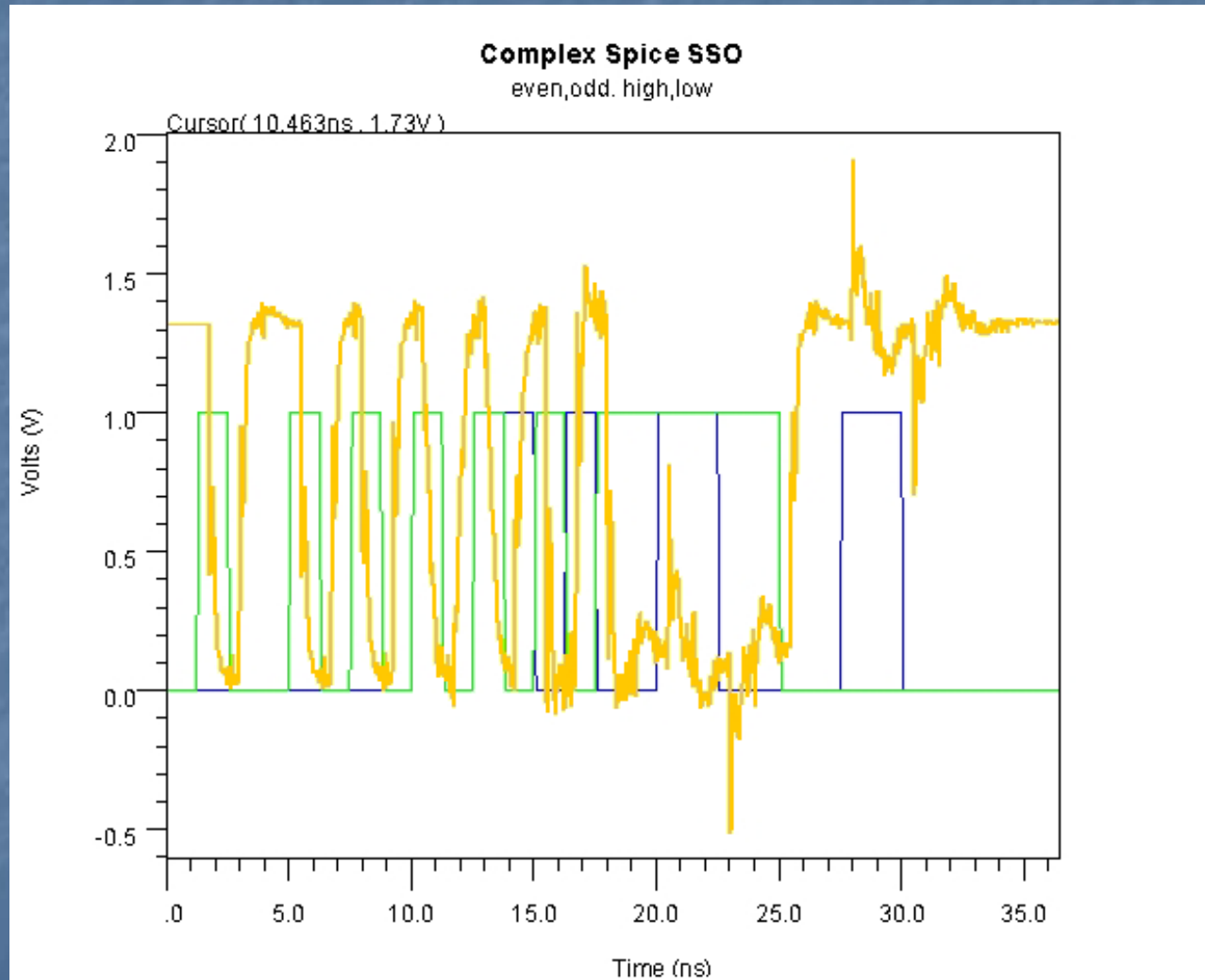


IBIS (red) vs. Spice (blue)

Current - Ground pin



# Complex SSO (SPICE simulation)



# Summary

- Can IBIS model SSO ?
  - Sometimes
  - On-die power network (decoupling) critical
  - Buyer beware
- Are IT tables the answer ?
  - Clearly current is an issue
  - Work for another day...

# Additional Resources

- Plug for the IBIS Quality Committee !
  - IQ\_Specification.txt
  - IQ\_Example.ibs
  - IQ\_Checklist.xls
- Mailing list
  - Ibis-quality@freelists.org
  - <http://www.freelists.org/archives/ibis-quality>
- Web site
  - <http://www.sisoft.com/ibis-quality>
  - <http://www.sisoft.com/ibis-quality/docs>
- Questions ?