



1) Introduction

2) Crosstalk

3) Inter Symbol Interference (ISI)

4) Power Integrity

5) Resources



Eric Bogatin citation:

There are two kinds of engineers:

Those who do have signal integrity problems...

and those who will!

Simulating an embedded design ?



Intel recommends to simulate any design that is not exactly following the Design Guide.

- Usually it is very difficult to follow the design guide in all points (not even the reference designs are able to do this)
- Sometimes the provided models are difficult to use, but with some experience a useful model can be built.

Following an example based on a Intel Atom FSB bus simulation



The routing can be simulated based on a theoretical transmissionline or a physical layout model

Modeling based on a theoretical model requires experience how accurate the modeling needs to be done

Using a physical Layout requires a field solver

Even a Stripline trace can build up significant X-talk when the reference planes are not "perfect"

Example: Non terminated FSB on Atom platform



Crosstalk: Pattern selection



Need to combine worst case X-talk and ISI (Inter Symbol interference)

Pattern definition for Worst case X-talk Simulation:

Statistical simulators can run uncorrelated crosstalk pattern as they can simulate a huge number of bits in acceptable time

Transient simulators need optimized crosstalk pattern to get worst case crosstalk in a reasonable amount of time







imes Each bit sees some information from previous sent bits

Reflections on the bus

Settling time defines the length of the PRBS pattern.



Example for ISI critical bus: Memory CCA bus



DDR2



Example for ISI critical bus: DDR3 CA Bus simulation





WEAK CASE





Signal Integrity Resources

imesBooks

- , Black Magic" and "Advanced Black Magic" (Howard Johnson)
- Signal Integrity Simplified" and "Signal and Power Integrity Simplified" (Eric Bogatin)

SI – List

<u>http://www.freelists.org/archive/si-list</u>

Intel Website:

http://download.intel.com/design/intarch/papers/321098.pdf

Your Simulator:

 \sim All vendors do have a huge variety of support options (Forums, papers, ...)

And of course:

<u>www.EyeKnowHow.de</u>

✓ Wo das "Datenaugenwissen" zu Hause ist ;-)

EYE KNOW



Thank you very much for your Attention!

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