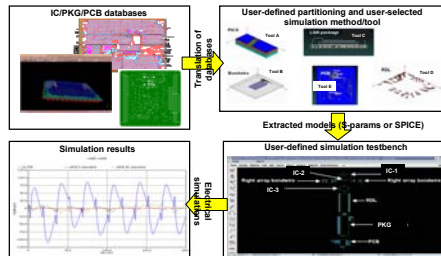


Application of Integral Analysis Technique to Determine Signal- and Power Integrity of Advanced Packages

Nebojša Nenadović, Ekkehard Miersch, Martin Versleijen and Sidina Wane

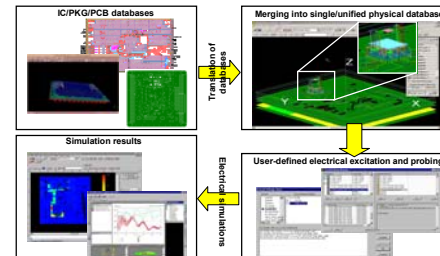
Two methodologies for PI/SI analysis of complex packaging structures

Cascaded methodology



- Extraction of models with different EM tools.
- Manual assembly of test-bench.
- Problems with correct modeling of return current path.

Integral methodology

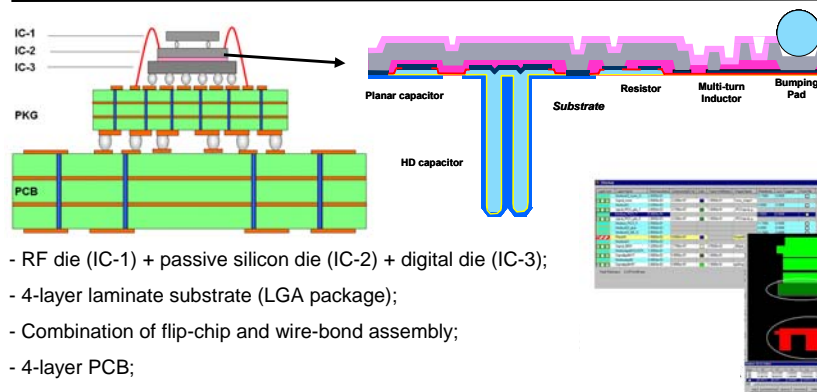


- Single tool with hybrid analysis method.
- Semi automatic generation of test-bench.
- Correct modeling of return current loops.

Goal of the work

Investigate if integral analysis methodology can be used for analysis of complex multi-die, multi-technology and mixed signal designs.

Carrier design



- RF die (IC-1) + passive silicon die (IC-2) + digital die (IC-3);

- 4-layer laminate substrate (LGA package);

- Combination of flip-chip and wire-bond assembly;

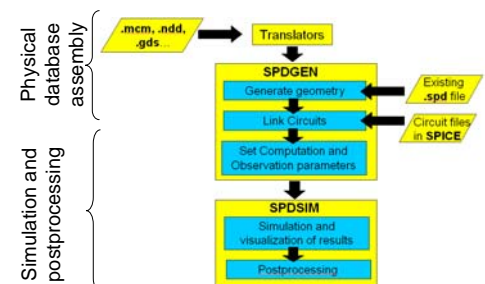
- 4-layer PCB;

- Aggressor: digital switching of IC-3; Victim: RF part of IC-1.

Capability to account for distributed high-density capacitors.

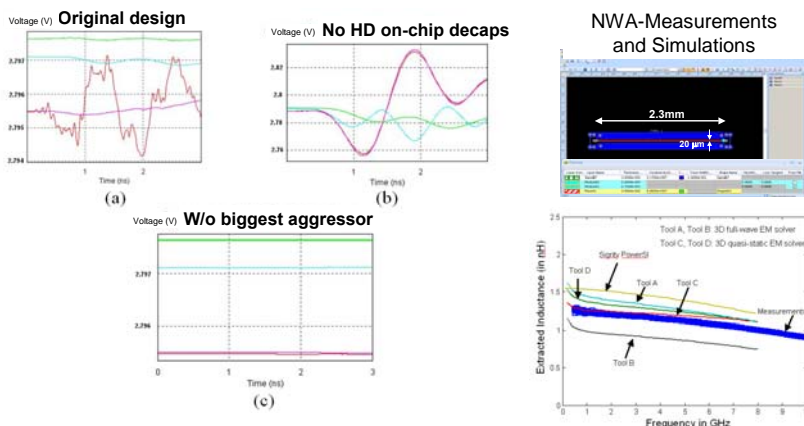
The flow

Integral analysis method of Sigrity is applied:



Biggest effort in the flow is creation of integral physical database.

Simulation test-case, examples and measurements



Examples of what-if analysis:

- Easy analysis of decoupling schemes,
- Easy analysis of different IC activities, etc.

Record speed of analysis and fair accuracy

Conclusions

Complex IC/package/PCB designs with RF, analog and digital content can be analyzed by integrated SI/PI methodology of Sigrity:

- Assembling the integral database takes most of the design/analysis time,
- Easy modification of simulation setup,
- Balance between speed and accuracy,
- Accounting for distributed high-density capacitors,
- Accounting for return current loops of complete design,
- Access to accurate IC activity models important for comparison with measurements.



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