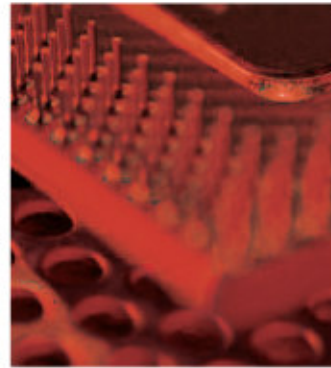




FSA



FSA MIXED-SIGNAL/RF SPICE MODEL CHECKLIST

Importance and Value of Modeling

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MODELING IMPORTANCE AND VALUE HISTORICAL VIEW

10-20 years ago:

- Deliverables from foundry were two documents; one describing the Design Rules, the other the Electrical specifications.
- Fabless company hired full time modeling engineer(s), created model extraction test chip, and created proprietary simulation models.

Today:

- Deliverable is a full PDK, with Device Symbols, P-Cells, Models, DRC/LVS/Parasitic Extraction rule decks.
- Most startups and small companies do not have Modeling Engineers.





MODELING IMPORTANCE AND VALUE EXAMPLE 1

- Foundry provided equation for Poly resistor which had error. Previous version of model was ok, Foundry tried fixing a modeling problem and introduced error.
- $R = \text{Width/Length} * \text{Ohms/Square Value} + \text{Constant}$
Where constant = 20
- Constant implied minimum value of resistor was 20 ohms; yet we had clearly built a 10 ohm resistor with prior equation, and circuit worked properly.
- At least one customer didn't notice that equation had 20 ohms built in, and had circuit that didn't meet specs.
- Constant should have been a function of Width.





MODELING IMPORTANCE AND VALUE EXAMPLE 2

- The Foundry supplied a value for Delta W of a Poly Resistor that was 2 microns, in a 0.6u process.
- Delta W is a measure of the variation in the width of a resistor. In analog design, to design a chip that has good yield of process variations, we need to design the variance out of the circuit. To to that we need to know the variance.
- Delta W cannot be greater than the minimum feature size; and might typically be 10% of the minimum feature size.
- In this case some modeling structures (from a test chip) were measured, and more reasonable value of Delta W was computed.





MODELING IMPORTANCE AND VALUE THE IMPACT

Bad Models = Bad Silicon
= Missed Market Opportunity
= Lost Revenue

- Most Design Engineers expect models to be accurate.
- Debugging model problems in silicon is very difficult, and likely will involve lots of time and money spent at a failure analysis lab.

