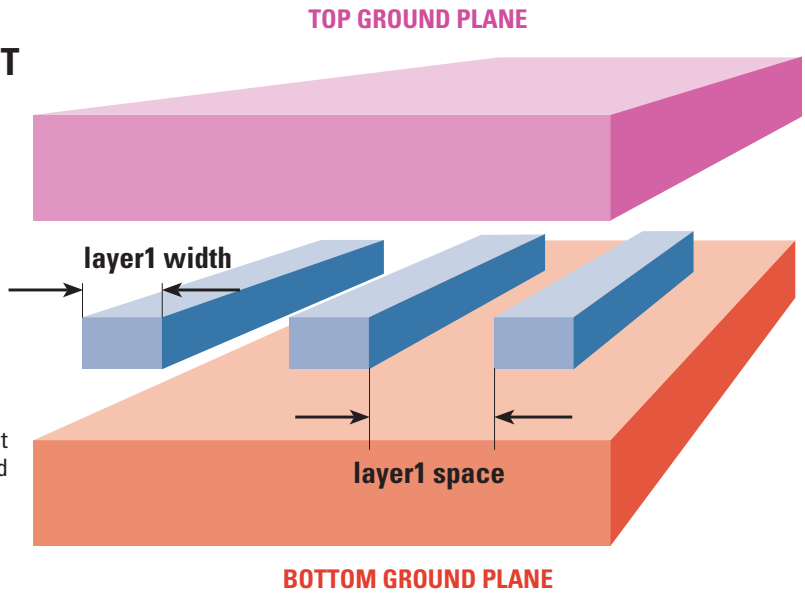
Parasitic Extraction Services

Passive Element and Cell Level Parasitic Extraction Services provide solutions for customers who have occasional cell level passive element and parasitic modeling requirements. All extractions are physics-based—not rule based, so novel structures can be analyzed accurately for all coupling effects. Silvaco products EXACT and QUEST are used for Passive Element Extraction Services. CLEVER product is used for Cell Level Extraction Services.

Interconnect Parasitic Capacitance Coefficient Extraction Service Using EXACT

We use EXACT – Interconnect Parasitic Coefficient Generation package to deliver the most accurate interconnect models for nanometer semiconductor processes and generate layout parameter extraction (LPE) rule files for leading full chip extraction tools. EXACT uses powerful 3D field solver technology.



Example of a 3D test structure created and used in EXACT.

```
CAPACITANCE INTRINSIC FRINGE metal2
[
        PROPERTY C
        max_caldistance = 5
        max_distance = 3
        C= 0.0
        if (distance() > 0.0) {
              C =0.01001*(1.0 - exp(-1.65*(distance()+0.075)))*length()
        }
        if (distance() <= 0.0) {
        C = 0.0304042* length()
        }
]


CAPACITANCE NEARBODY poly1

[
        PROPERTY C
        max_width = 3
        max_distance = 3
        C=0.932762*length()*pow(0.1,0.0536348)*1.0*(exp((-distance()*1.60124)-2.96352)
           +(0.00677904/pow(distance(),1.3288)))
]
```

A typical deliverable.

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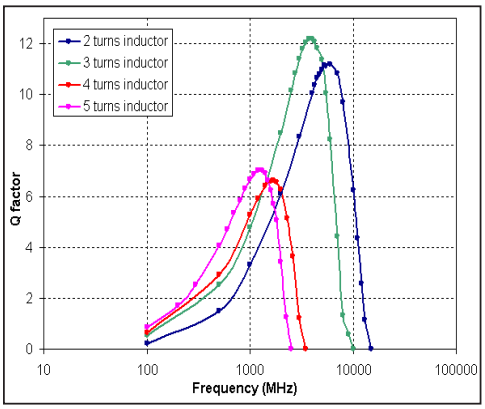
RF Passive Element Characterization Service Using QUEST

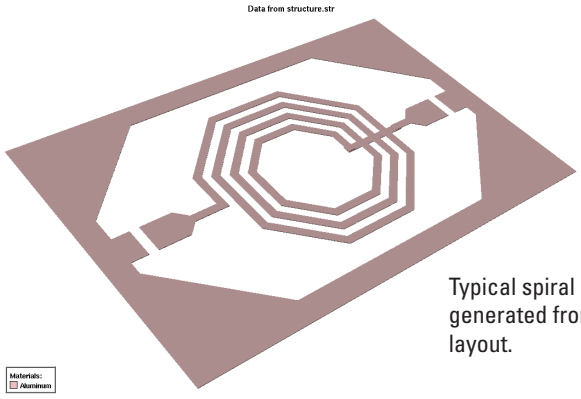
- 2-port inductor analysis providing frequency dependent or frequency independent SPICE inductor models at gigahertz frequencies
- Multi-port S, Y or Z parameter analysis of passive elements, W-element Transmission Line SPICE model extraction
- Turnkey optimized inductor library generation based on your process capabilities and desired range of inductances (delivery includes GDSII)

Deliverables

- Frequency dependent inductor models, multi-port S parameters, W-element transmission line elements, RLCG and Q factor data files, 3D structure files, interactive 2D and 3D graphics



Examples of generated frequency dependent Q factor for spiral inductors with multiple number of turns.



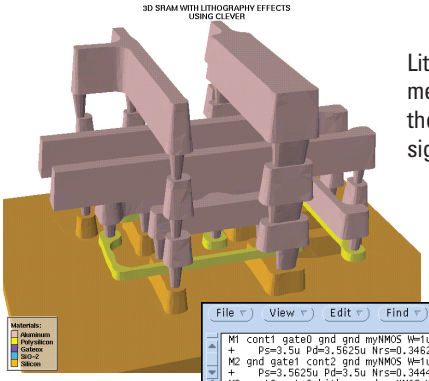
Typical spiral inductor generated from GDSII layout.

High Accurate Bit Cell RC Extraction Service Using CLEVER

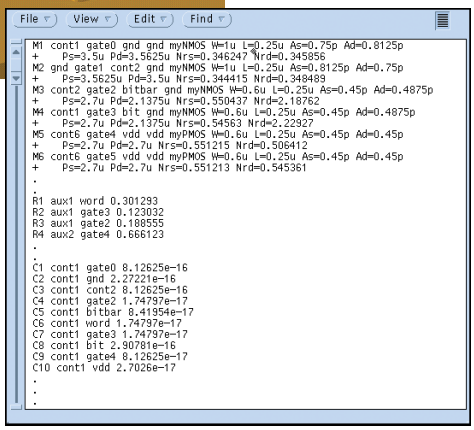
- Cell level field solver provides automated resistance and capacitance inter-connect parasitics, back-annotated onto extracted SPICE netlist
- 3D structures RC modeled using opto-lithographic simulator to include photo-resist corner rounding
- Masks containing Optical Proximity Correction (OPC) are correctly modeled
- Realistic deposition and etch processing included in RC extraction to create the most realistic 3D model possible of the device structure prior to field solving resulting in the highest possible level of extracted parasitic accuracy

Deliverables

- SPICE netlist with active devices and RC parasitics, annotated layout file showing active device connections, interactive 2D and 3D graphics



Lithographic effects on metal geometry can affect the resulting capacitance significantly.



CLEVER uses a 3D field solver to extract the parasitic R and C components and back-annotates them onto the extracted active device SPICE netlist

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