METAL

## 2D and 3D Interconnect Simulation Tool

METAL™ Features:

◄ **Models 2D and full 3D interconnect geometry**

◄ **2D and 3D wizard input geometry creation programs**

◄ **Graphic 3D display with dynamic rotation and zoom**

◄ **Full R,C,L,M extracted**

◄ **Automatic mesh generation and refinement**

◄ **Extremely fast, efficient and accurate calculation**

◄ **Optimized SPICE subcircuit generation with RC, RCL, or RCLM model choice**

◄ **Full 2D/3D results graphing package**

◄ **Simulates any PCB, MCM, Hybrid, and IC interconnect**

◄ **Simulates packages, cables and connectors**

◄ **Analyzes buses, vias, crossovers, and corners**

◄ **Runs on all popular workstation platforms**
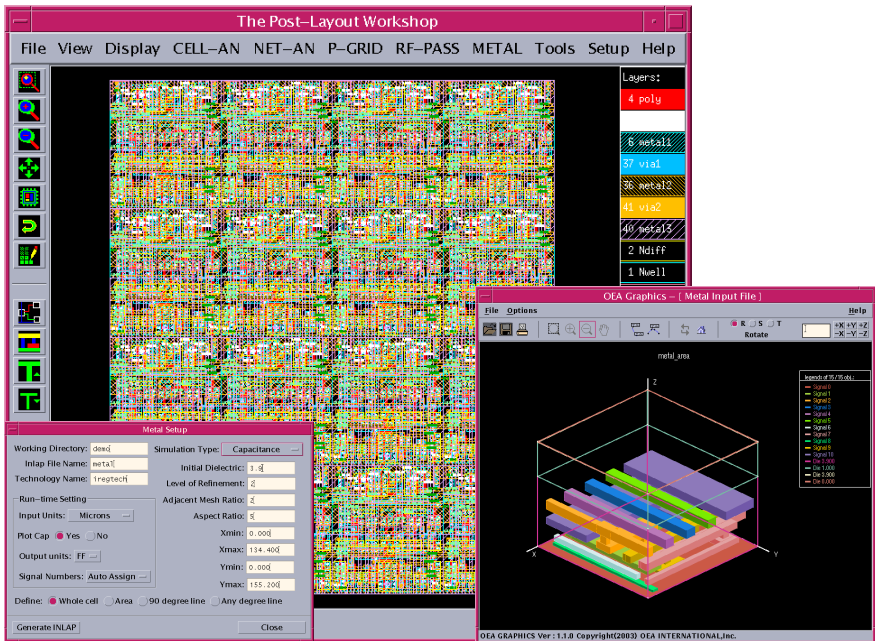
METAL is not just one program, but a collection of easy-to-use, fast, and extremely accurate programs for two and three-dimensional modeling of interconnect parasitics from integrated circuits, printed circuit boards, multi-chip modules and hybrids.

METAL solves the most difficult problems facing a circuit engineer today, the accurate analysis of the signal integrity as it travels through complex physical structures. Changes in the signal integrity will show up as increased delay or non-switching lines and false highs or lows caused by line noise, commonly called cross-talk. METAL helps solve these problems by characterizing the physical effects in terms of an accurate electrical equivalent circuit. This circuit is then used for prediction of interconnect delay and cross-talk in a given net simulation or a global circuit simulation.

Through the use of METAL and other circuit information, the user can effectively set-up interconnect design rules to avoid or minimize signal interference in high speed circuits and assure necessary timing constraints are met. METAL reports the predicted parasitic resistances, capacitances, inductances, and mutual capacitance and inductance for both regular and irregular interconnect geometries.

One important feature of METAL is that it automatically generates an optimally partitioned SPICE deck file. This allows the user to easily link the METAL product with any industry standard SPICE simulator. Simulation through SPICE or other analog simulators will assure an accurate simulation and waveform output without the use of approximate modeling methods based on transmission-line or other theories.

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Three optional SPICE compatible file formats are provided depending on the application, RC only, RC & L, or full RCL & M models.

Extremely Fast and Accurate Algorithms
METAL operates more than twice as fast as other general purpose interconnect modeling packages, and does so with extreme accuracy. Thus, METAL will handle much more complex modeling situations than any other software in the market today.

Three-Dimensional Graphics Viewing
METAL allows you to visually review your defined two and three-dimensional structures with a powerful graphics viewing window. Structures can be rotated, panned and zoomed in 3D space with the click of a mouse button. Objects can be shown as wire-frame or as solids. You can also use the same graphics viewing capability for displaying the 3D field and potential plots available from the METAL simulations. This allows you to gain a complete understanding of all the electrical effects of your structures.

Full Chip Capacitance Extraction Parameters
METAL is easily automated to calculate accurate capacitance coefficient values for full chip formula based extractors. The METAL wizard programs can be used to quickly create common characterization structures and variables inserted to obtain capacitive curves with different spacing and width variables.

GDSII Interface and Model Builder
The Post-Layout WorkShop (PLWS) interface option is a full function hierarchical GDSII viewer and converter to the METAL 2D and 3D formats. A whole cell or window can be converted to a 3D METAL file or a cross-section line converted to a 2D METAL file. The third dimension or heigh information is supplied through a process technology file which maps layers to heights. A full set of GDSII filters is also provided including layer operations, converters, and scaling.

Other Related OEA Products

P-GRID - A power network analysis tool that extracts power network parasitics and solves them for low voltage violations and current density violations.

P-PLAN - A VLSI power distribution network floorplanning tool used with P-GRID for optimizing the geometric configuration of VDD and VSS rings, internal power rails, and ring voltage source pad locations using estimated block current sources.

HENRY - A three-dimensional simulator that calculates inductance and mutual inductance of interconnect and ground plane structures.

BUS-AN - A tool for exploring the design space of a process technology as it relates to interconnect design limits and interconnect behavior. BUS-AN performs a variety of pre-design explorations such as inductive shielding effects, buffering strategies, clock-tree prototyping, and process corner simulations.

CELL-AN - A three-dimensional level SPICE extraction tool that generates a cell or macro sub-circuit with significant RC, S/D resistances, and geometry dependent transistor SPICE model parameters.

NET-AN - A three-dimensional IC multi-net analysis tool for extracting distributed RCLM SPICE networks from critical IC nets.

SPIRAL - A design synthesis tool set for creating embedded spiral inductors, baluns and transformers in RFICs. It integrates together a geometry building engine, an optimizer, a 3D field solver for extraction of RCLM, and a frequency dependent circuit simulator. Outputs include GDSII, graphical plot file, SPICE models, and S-Parameter and Z-Parameter files.

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