

# CST

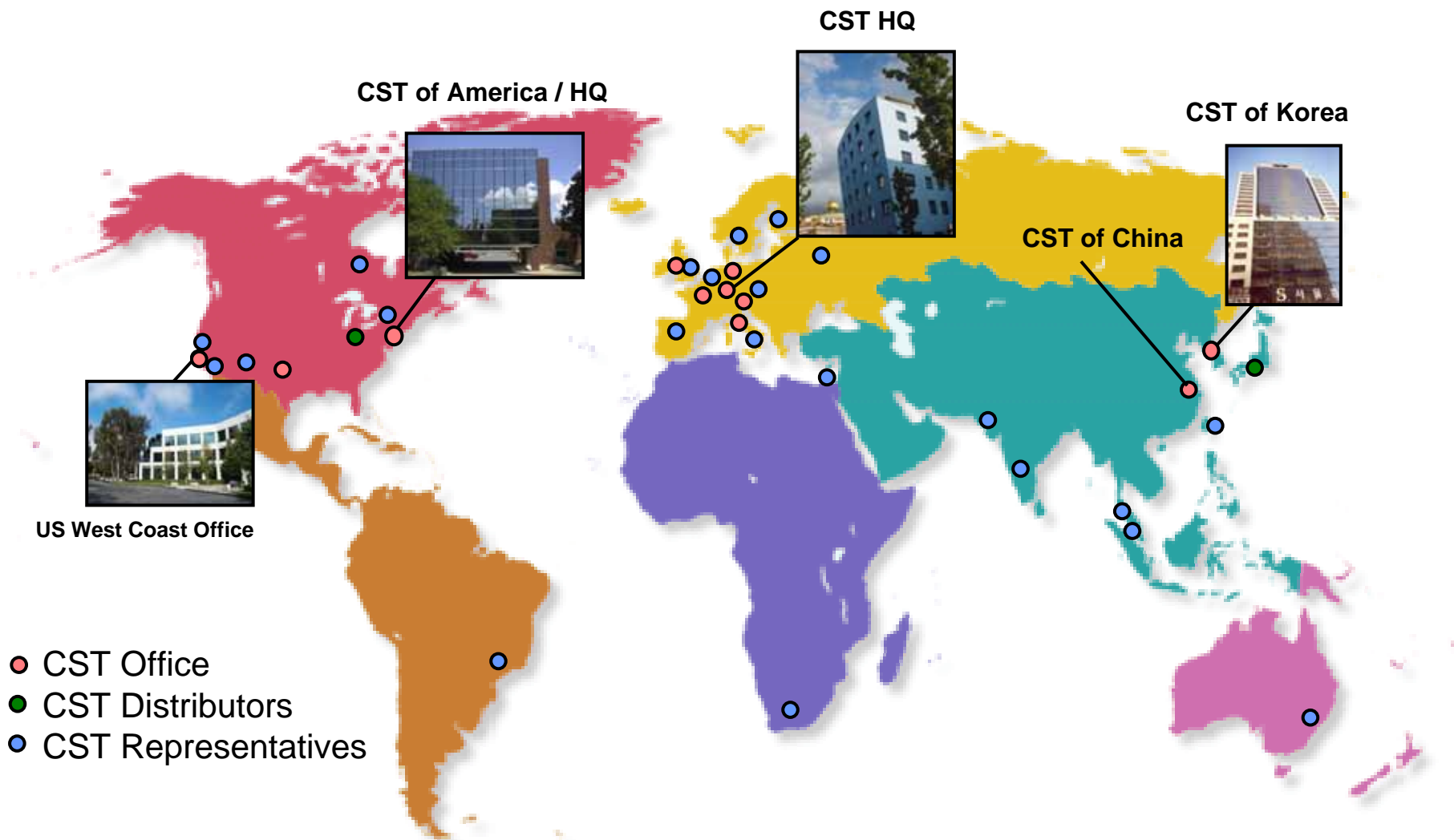
## 3D EM Simulation of Circuit Environments

### CMOS VCSEL Driver Design using CST MICROWAVE STUDIO® and Agilent ADS

"CST MICROWAVE STUDIO® (CST MWS) is a specialist tool for the fast and accurate 3D EM simulation of high frequency problems. Along with a broad application range, CST MICROWAVE STUDIO® offers considerable product to market advantages: Shorter development cycles - Virtual prototyping before physical trials - Optimisation instead of experimentation. CST MWS is also recommended to be employed in modeling integrated circuit environments. This poster presents different applications and in particular the case in which CST MWS and Agilent ADS have been successfully employed in OEIC driver design - an example of a high speed analog/broadband IC application. The package model was imported from Agilent momentum and the model was simulated upto a 100 GHz in CST MWS. The resulting eye diagrams of the driver design from CST MWS are compared with those from Agilent momentum and other test cases."



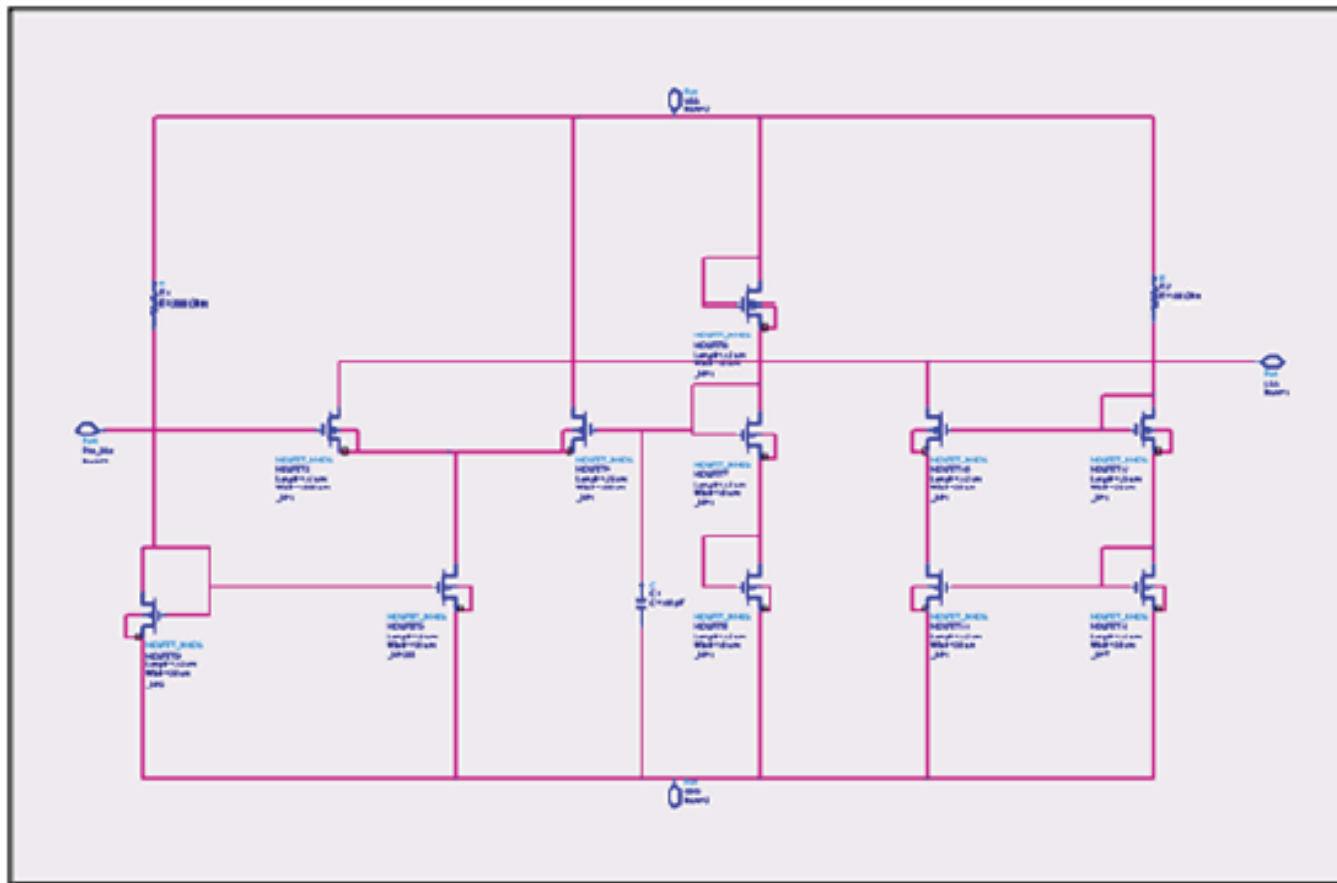
# Worldwide CST Network



90 Employees + Worldwide Distributors (~ 120 total)

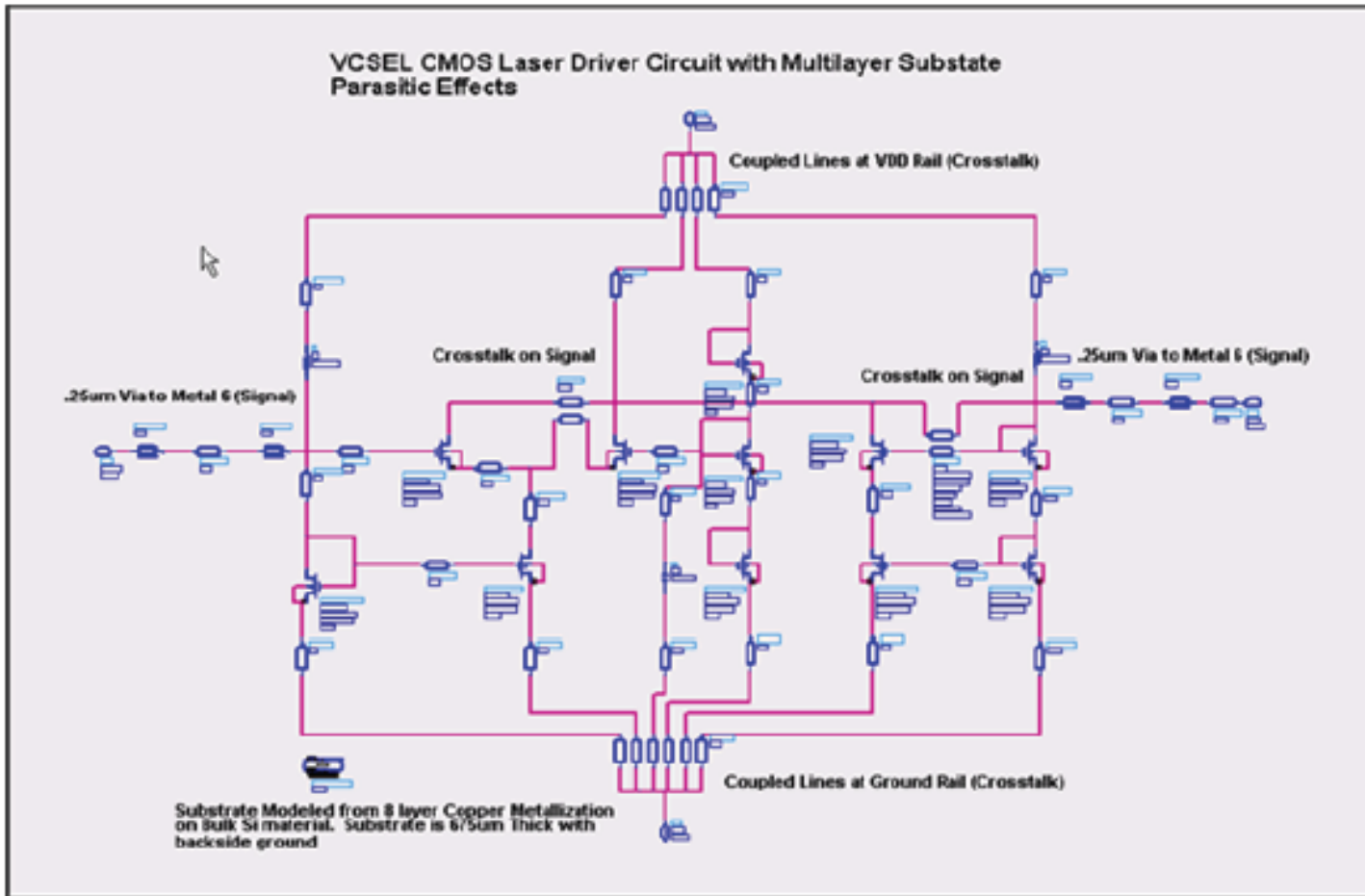
# VCSEL CMOS Laser Driver

We briefly explore several approaches to modeling the OEIC driver design starting with a purely analog approach with no parasitics or other physical effects. The circuit performance is monitored as more and more physical effects are included. The highest fidelity modeling includes a CST MWS 3D model for the package.



# VCSEL CMOS Laser Driver

Multilayer parasitics and substrate modeling



# VCSEL CMOS Laser Driver

Package model imported to CST MWS from Agilent momentum

The image displays two software windows. The top window is the ADS Layout environment, showing a circuit board layout with various components and a menu bar. The bottom window is the CST MICROWAVE STUDIO interface, showing a 3D model of the package with a color-coded mesh. A context menu is open over the 3D model, listing various import options, with 'ADS Model...' selected. The menu options include: SAT..., STL..., IGES (up to 5.3)..., VDA-FS (up to 2.0)..., STEP (AP203, AP214)..., Autodesk Inventor (up to 7)..., Pro/E Release 16 to 2001..., CATIA Release 4..., CATIA Release 5..., ADS Model..., CoventorWare..., Sonnet Model..., DXF..., GDSTL..., GERBER..., and Voxel Data... The 3D model shows a complex structure with a purple top layer and a yellow bottom layer. The status bar at the bottom of the CST window indicates 'Raster=2000.000 Meshcells=155904 um GHz ns'.

ADS Layout

CST MICROWAVE STUDIO

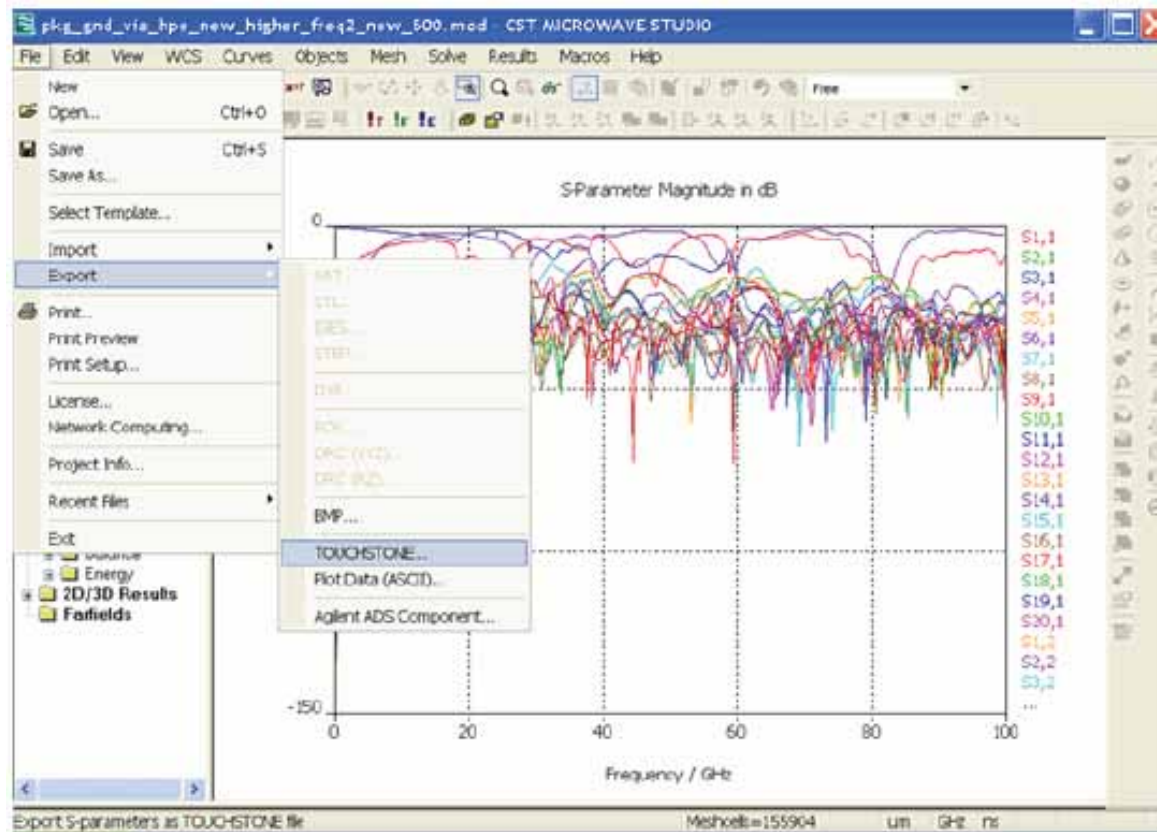
Import

- SAT...
- STL...
- IGES (up to 5.3)...
- VDA-FS (up to 2.0)...
- STEP (AP203, AP214)...
- Autodesk Inventor (up to 7)...
- Pro/E Release 16 to 2001...
- CATIA Release 4...
- CATIA Release 5...
- ADS Model...
- CoventorWare...
- Sonnet Model...
- DXF...
- GDSTL...
- GERBER...
- Voxel Data...

Raster=2000.000 Meshcells=155904 um GHz ns

# VCSEL CMOS Laser Driver

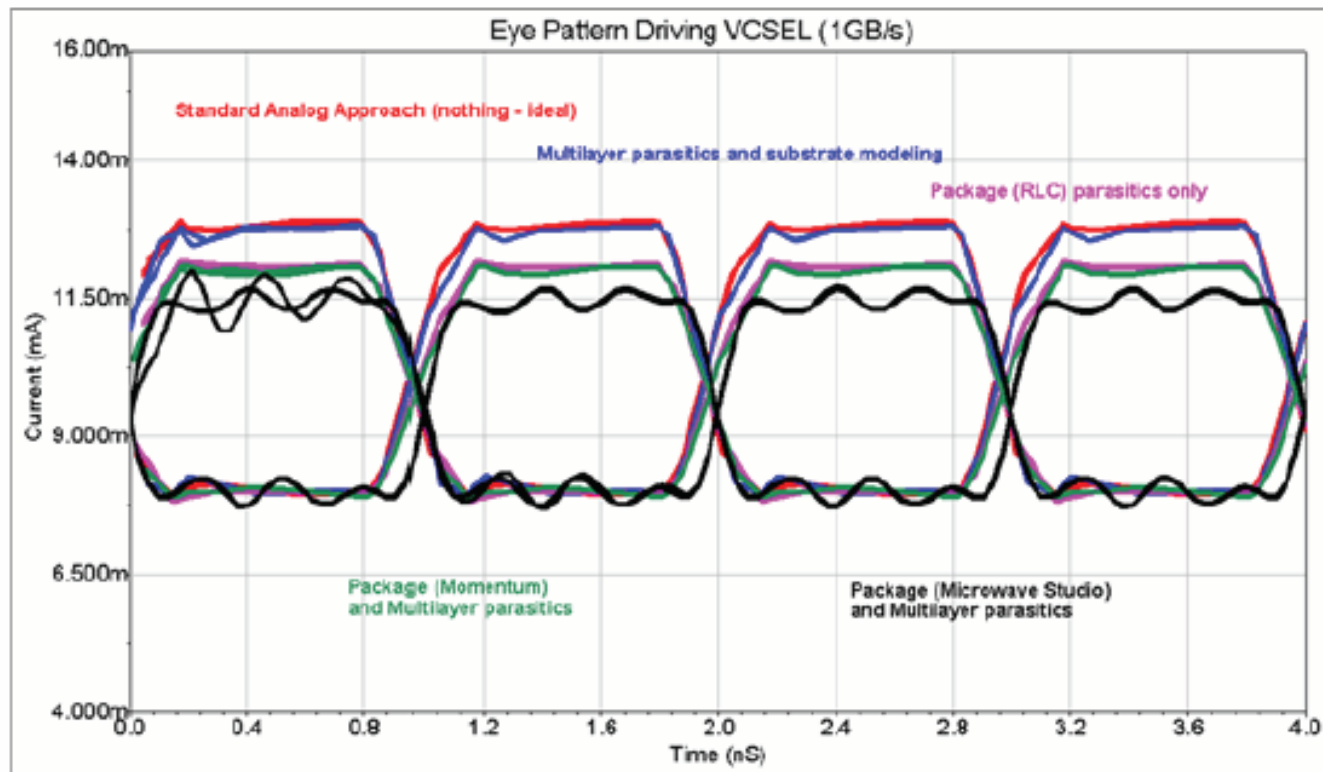
The test bench for the driver design was used to simulate various cases (ideal circuit with no parasitics, circuit with multilayer library components, circuit with multilayer components and Agilent momentum solution of the package, circuit with multilayer components and CST MWS solution of the package), all at two different data rates of 1GB/sec and 2.5 GB/sec.





# VCSEL CMOS Laser Driver

At 1 gigabit per second, the circuit is well behaved and the eye transitions which include the 3D EM effects are distinct. At 2.5 gigabits per second, once again it is evident that increasing the level of physical effects in the simulation results in greater emphasis of non-idealities in the design.

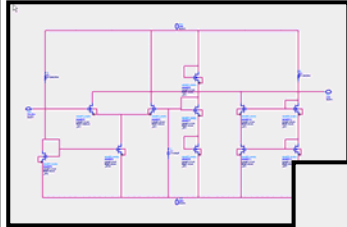


Results for 1 GB/sec data rate simulation

# Agilent ADS and CST MWS Co-Simulation Flow

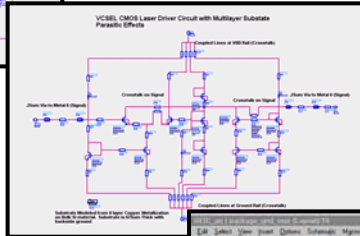
*Increasing fidelity of models leads to accurate circuit and system verification*

"Ideal" models



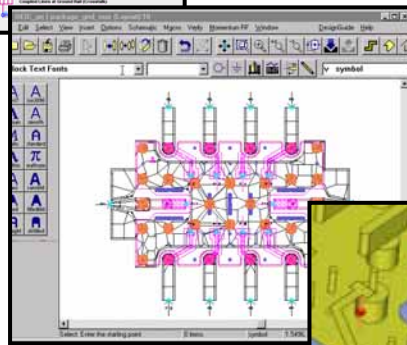
IC Design

Add Multilayer models

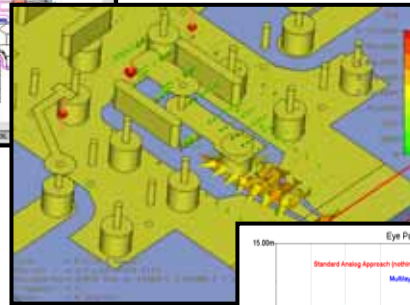


Add Substrate parasitics

Planar EM model (ADS Momentum)

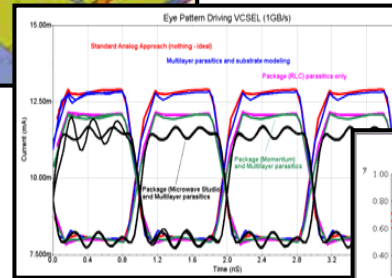


Add Package parasitics (planar and/or 3D)



3D EM model (CST Microwave Studio)

Circuit simulation



System simulation

Design Verification through circuit simulation and system co-simulation

