



# Thunder

-- **Ultimate System Integration Solution**



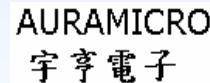
# Company Profile

## AnaGlobe Technology, Inc.

- founded in 2000
- privately held and maintains with headquarters in Taiwan
- distributors in Japan, USA, China, Korea
- key members come from Cadence, Mentor, SpringSoft, etc.
- a member of the OpenAccess Coalition and the OpenPDK Coalition of Si2
- major products:
  - Thunder (GDS/OASIS/OpenAccess/LEF/DEF): huge capacity chip level layout integration, consolidation, and debugging tool
  - GOLF (OpenAccess-based): next generation PCell design environment
  - PLAG (OpenAccess-based): flat panel layout design solution

# Success Stories & Customers

*“I was very impressed by Thunders loading and display speed. It handles large DRC files with ease and has many extra functions for debugging. The GDS reference library and consolidation concepts are very useful and really enable system integration. Thunder has a 3D display capability that makes connectivity tracing and locating shorts extremely clear and easy,” said Michael Pelham, Principal DA Engineer from Applied Micro Circuit Corporation.*



*More than 200 successful tapeout chips*



# Thunder Technology

## ■ Thunder DB

- Support GDS/OASIS/OA/LEF/DEF
- Smallest editing DB
- In Memory DB
  - Memory usage: 1/3 of GDS file size
  - Speed: 35 second per GB data
- Treat each IP as a library
- True memory swapping and dynamic loading
  - Ideal for parallel processing
- Disk DB
  - 1/10 of GDS file size
  - Open in 10 seconds



# Thunder Technology (cont)

## ■ Boolean Engine

- Fast
- Support Multi-Boolean-Operation (MBO)
  - ((L13\_P0 SIZING 0.1) AND (L16\_P0 NOT L18\_P0))  
OR (L13\_P0 XOR L17\_P0)
- Directly create shapes on original design

## ■ LVL Comparison Engine

- Hierarchical
- Fast: < 30 min per GB data
- Linear to GDS/OASIS file size



# Thunder Technology (cont)

## ■ Scripting Engine

- Support Perl/Tcl/Python/C++
- Object-oriented
- Auto re-playable log
- Support batch mode
- Observer based GUI and Undo/Redo



# Thunder Format/Compatibility

## ■ Supported Input Format

- GDS
- OA
- OASIS
- LEF/DEF

## ■ Supported Output Format

- GDS
- OASIS

## ■ Compatibility

- Support Virtuoso tech file and display resource
- Support Virtuoso layer map
- Support Laker tech file and display resource
- Support DesignREV display resource



# Thunder Key Applications

## ■ Layout vs. Layout Comparison

- Fastest hierarchical LVL comparison
- Linear to GDS size, < 30 seconds per GB
- Smallest memory foot-print
- User benchmark: 30G GDS 12 minutes, 50G GDS 17 minutes
- Highlight LVL result in layout with sync viewport



# Thunder Key Applications (cont)

## ■ IP Merge (System Integration)

- Handle multiple IP with cross reference instance
- Merge designs with different DBU
- Automatic IP merge: name and priority based
- GUI based interactive IP merge
  - Switch cells from different designs
  - Log/Load switch map
- Naming option
  - prefix, postfix, rename only necessary, name mapping file
  - Skip empty cell
- Layer option
  - Visible layer only
  - Top layer only
  - Layer map



## Thunder Key Features (cont)

### ■ Design Consolidation

- Std cell replacement
- Consolidate identical via and standard cells

### ■ Tracing

- Show tracing/short result in 3D display
- Support find shot with routing highlight
- Support coordinate/layer based tracing
- Support text based tracing
- Dynamically modify connectivity
- Support stop layer
- Support area based tracing
- Save tracing result to GDS



## Thunder Key Features (cont)

### ■ Calibre DRC Result Debugging

- Fast
- Handle very large file, < 1.5 minutes per GB  
(User bench mark: open 5G DRC result in 7 minutes)
- Identical shape grouping

### ■ Calibre Short Isolation Debugging

- Fast
- 3D display with cross probing
- Step-by-step tracing

### ■ Calibre RVE support

- Display RVE highlight in layout



## Thunder Key Features (cont)

- **Design Browser (OA, LEF/DEF or GDS): keep inst/net property**
  - Show net and instance
- **Boolean Operation**
  - Use simple MBO expression
  - Generate shapes directly
- **Metal Density Generation and Check**
  - Fastest, **1M shape per second**
  - Generate overlapping colormap on layout
  - Check low limit, high limit and adjacent difference



## Thunder Key Features (cont)

### ■ Edit

- Full layout editor
- Hierarchy operation: Make cell, flatten cell, EIP
- Mouse/key in coordinate
- Support align (snapping)
- Calibre DRC driven
- Property viewing/editing

### ■ Customization

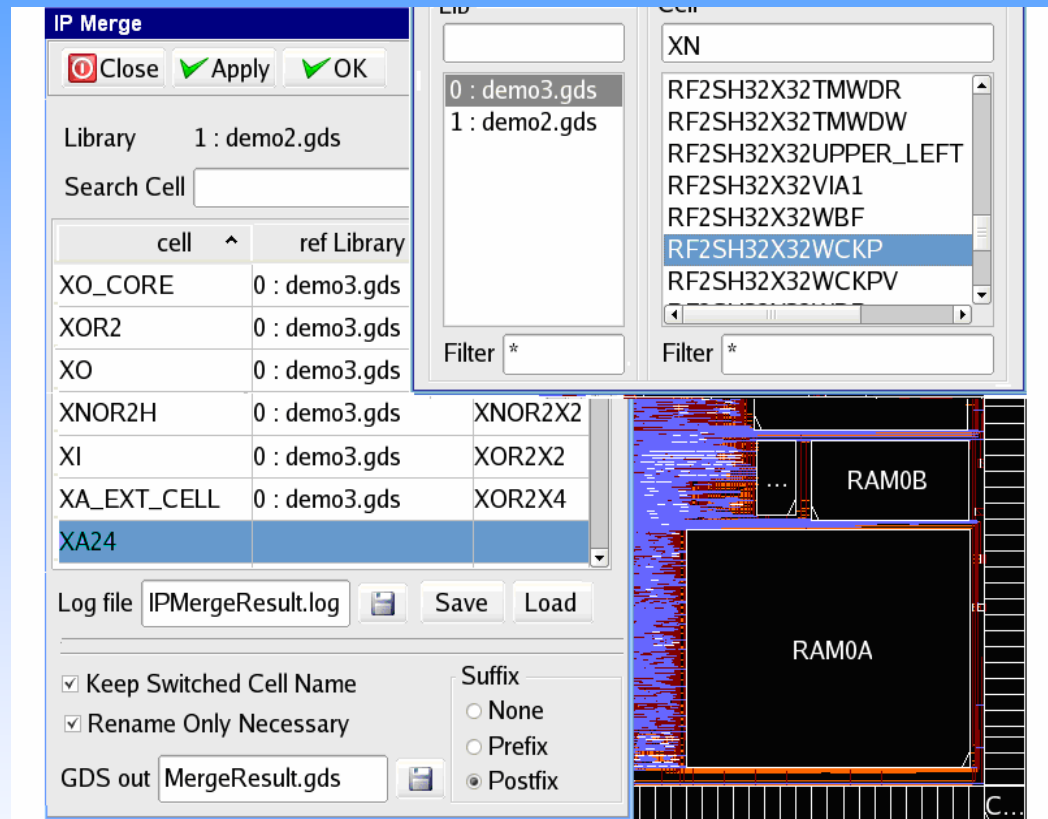
- Centralized utilities, with multi-language support
- Support customizable GUI and menu
- Full document support



# Thunder Utilities

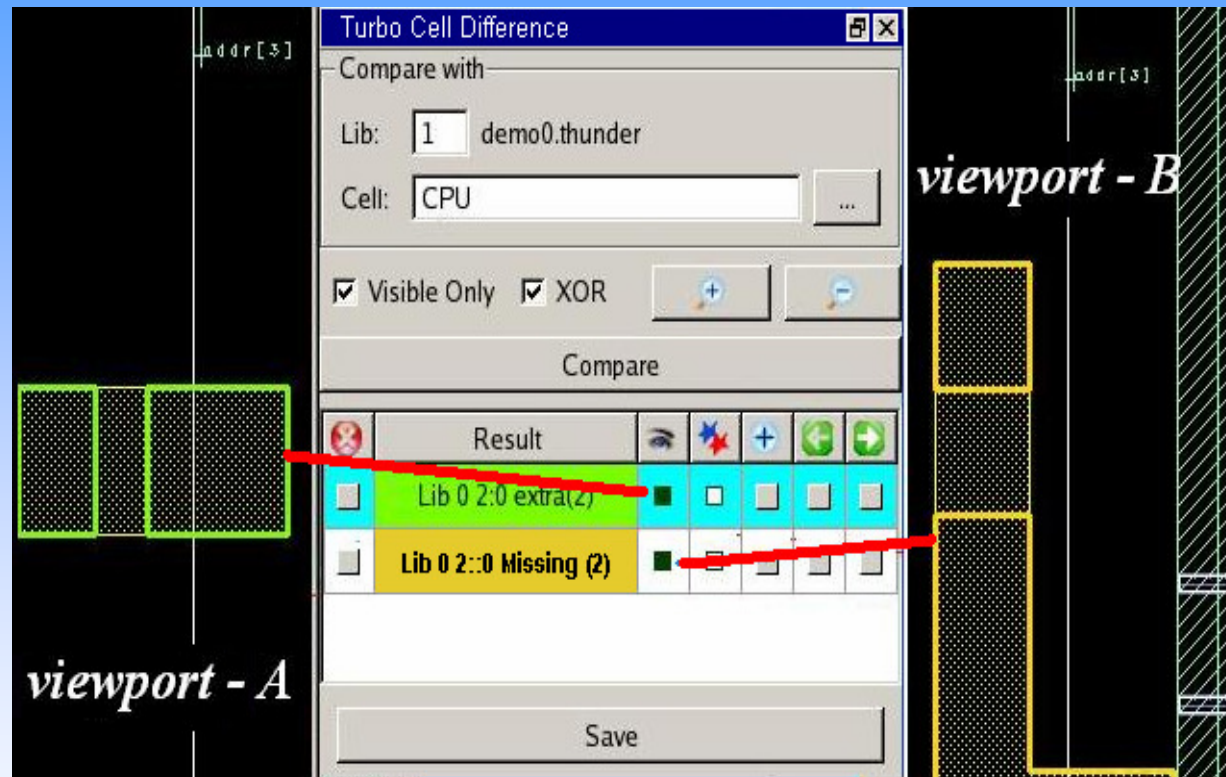
- Search instance/text/shape
- Hierarchy browser
- Area clipping GDS out
- Tapping: show shape/instance information under mouse
- Distance/Ruler
- Resistance calculation
- Marker View
- 3D display and cross probing

# Screen Shots



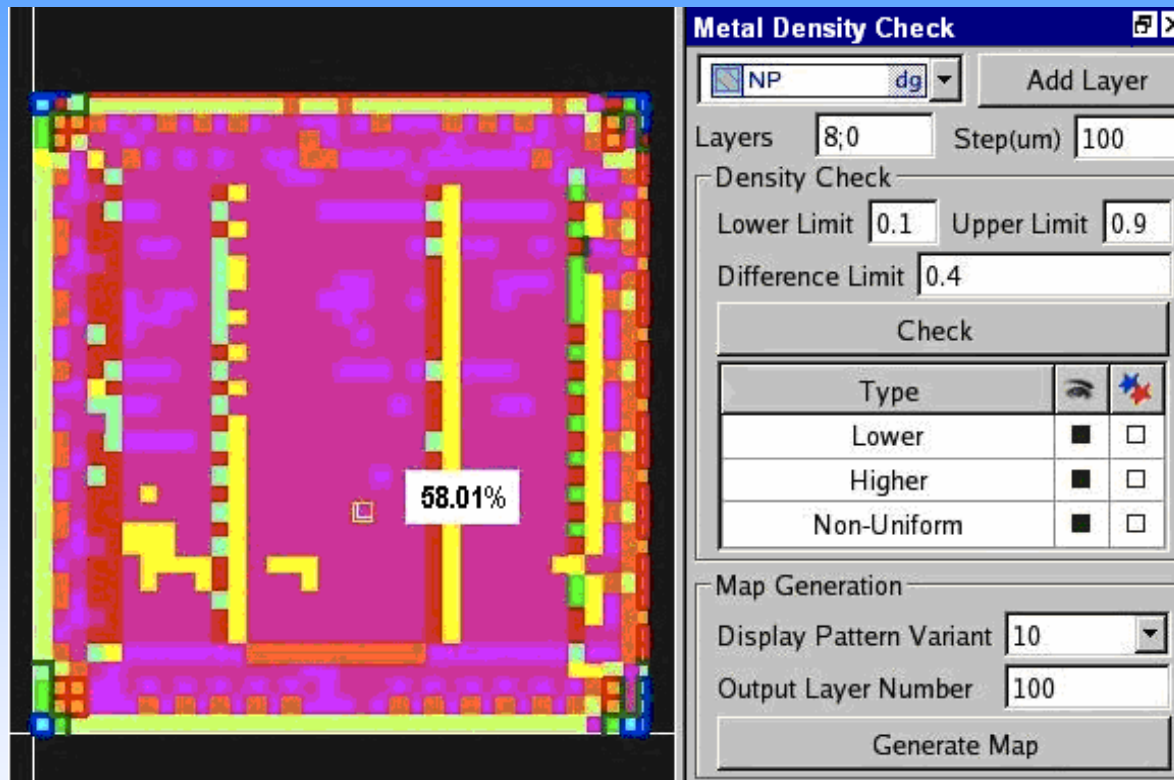
*IP Merge*

## Screen Shots (cont)



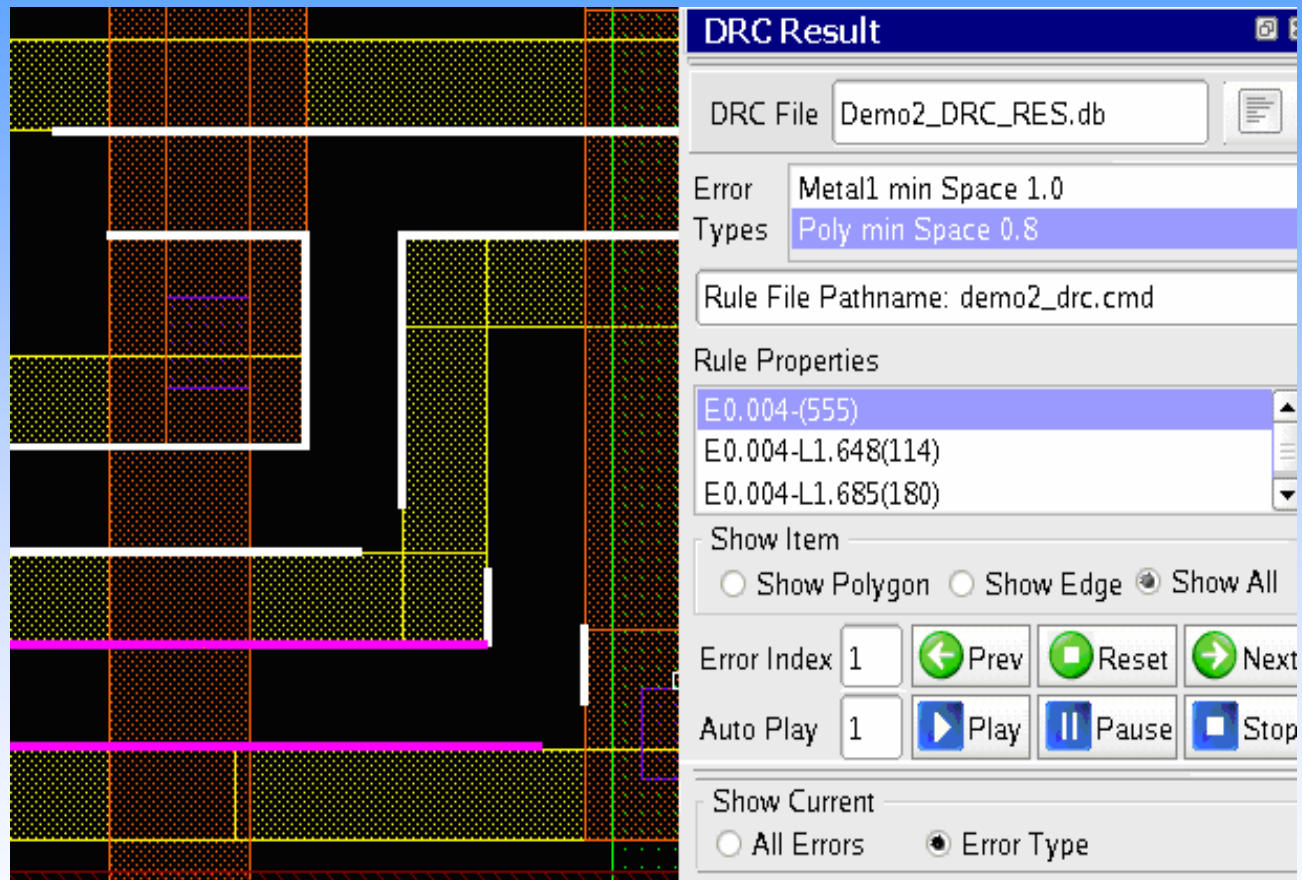
*Interactive LVL Comparison*

## Screen Shots (cont)



*Interactive Metal Density Checking*

## Screen Shots (cont)



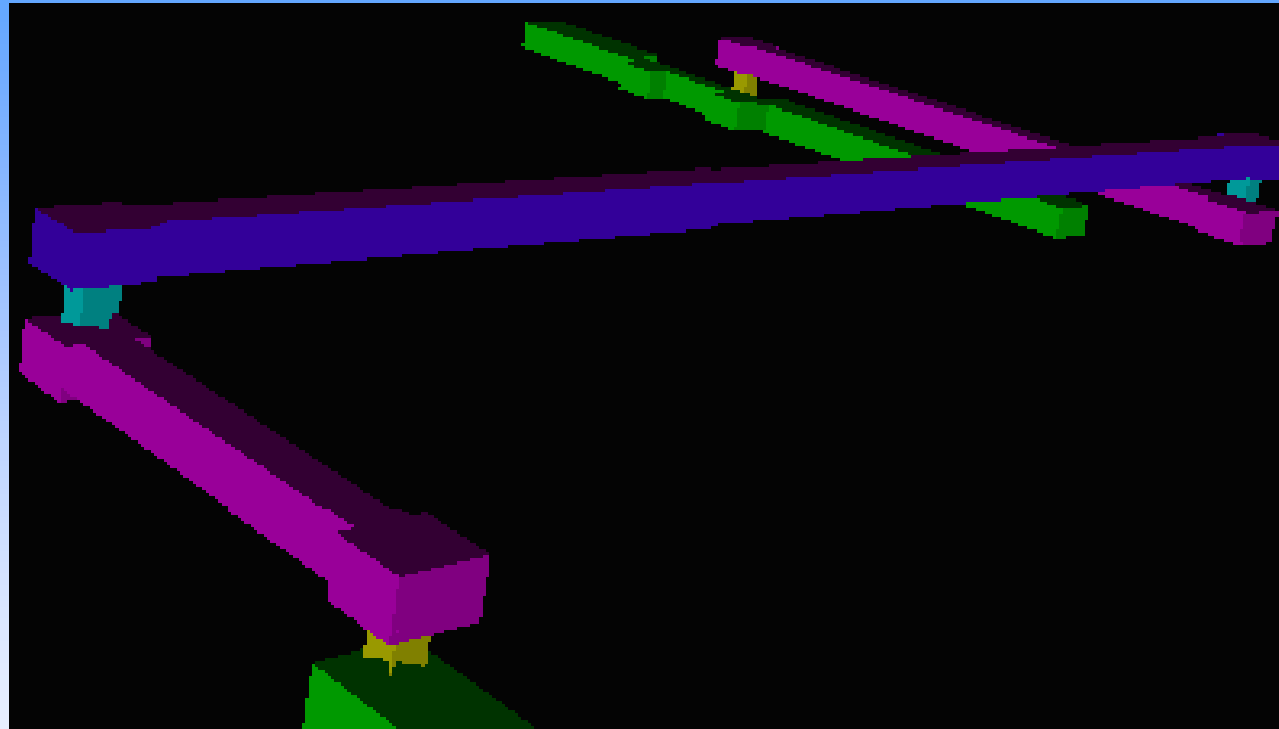
The screenshot displays the DRC Viewer interface. On the left, a PCB layout is shown with a grid and various colored highlights indicating errors. A white rectangular area highlights a specific region, and a purple rectangular area highlights another. On the right, the 'DRC Result' panel is visible, showing the following information:

- DRC File: Demo2\_DRC\_RES.db
- Error: Metal1 min Space 1.0
- Types: Poly min Space 0.8
- Rule File Pathname: demo2\_drc.cmd
- Rule Properties:
  - E0.004-(555)
  - E0.004-L1.648(114)
  - E0.004-L1.685(180)
- Show Item:
  - Show Polygon
  - Show Edge
  - Show All
- Error Index: 1
- Auto Play: 1
- Show Current:
  - All Errors
  - Error Type

Navigation buttons include Prev, Reset, Next, Play, Pause, and Stop.

*DRC Viewer*

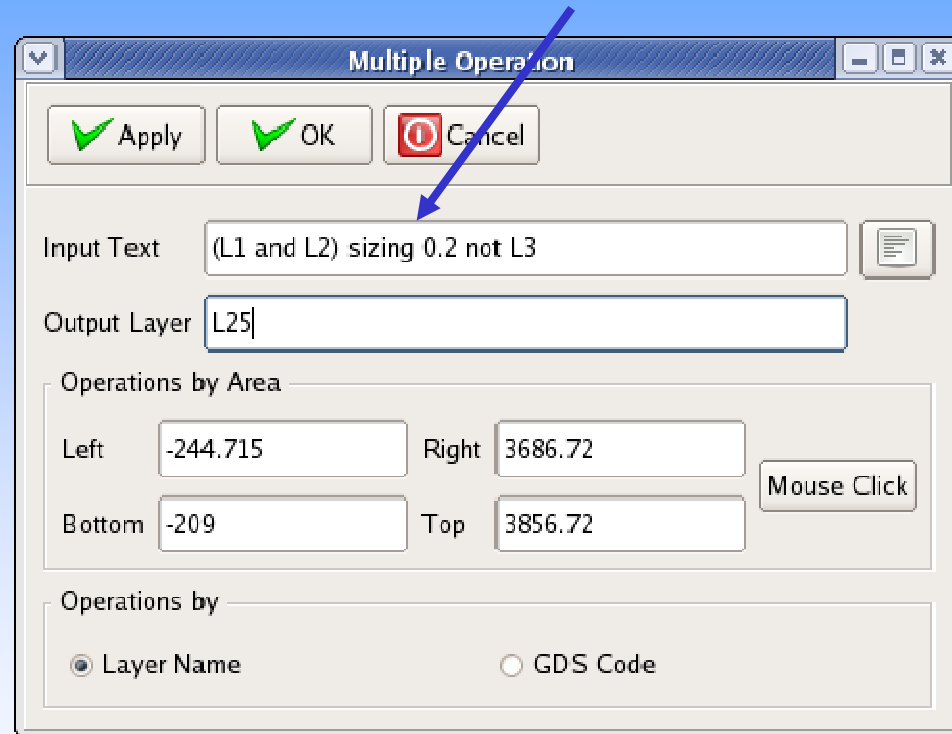
## Screen Shots (cont)



*3D View of LVS short-location*

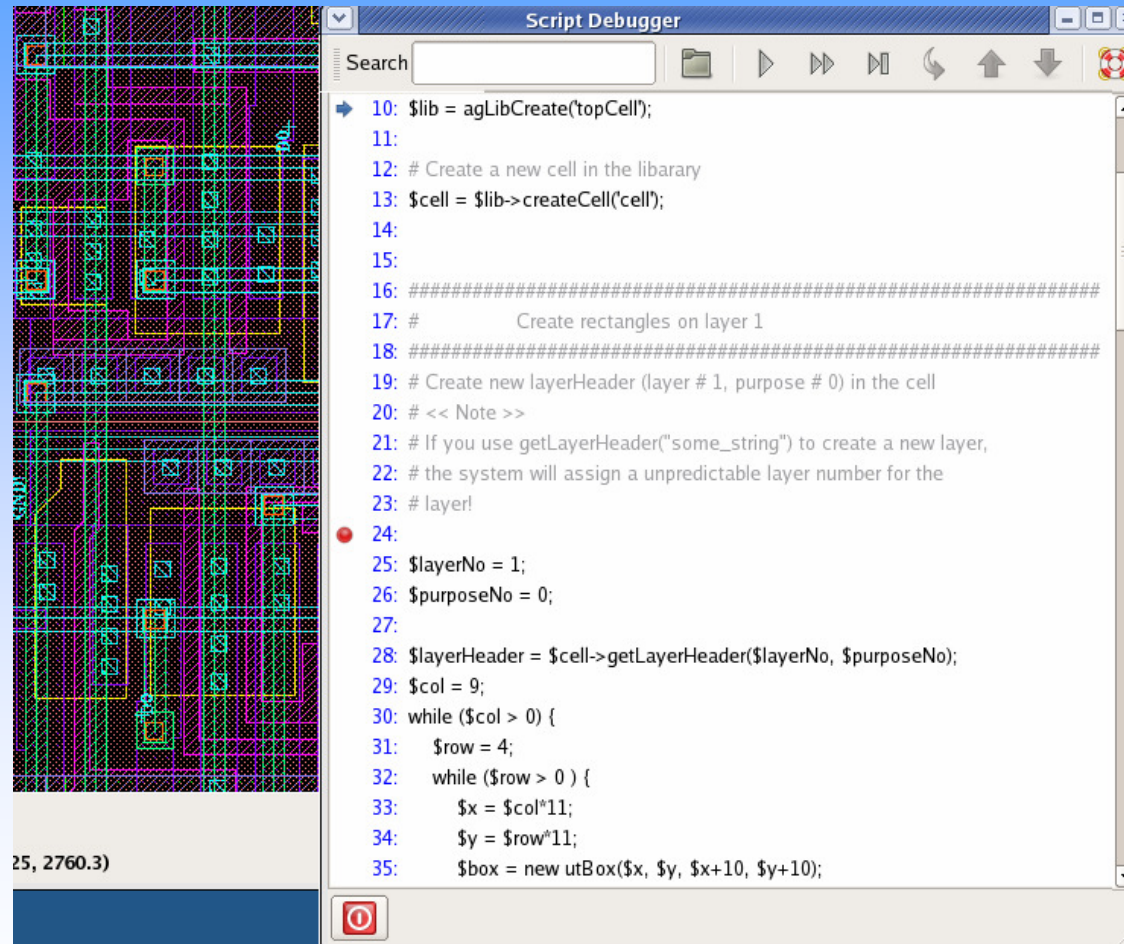
## Screen Shots (cont)

((L13\_P0 SIZING 0.1) AND (L16\_P0 NOT L18\_P0))OR (L13\_P0 XOR L17\_P0)



*Multiple Boolean Operations*

# Screen Shots (cont)



## Script Debugger