Tailoring Verification Models to Customer Needs

Stephan Rosner – Spansion, LLC

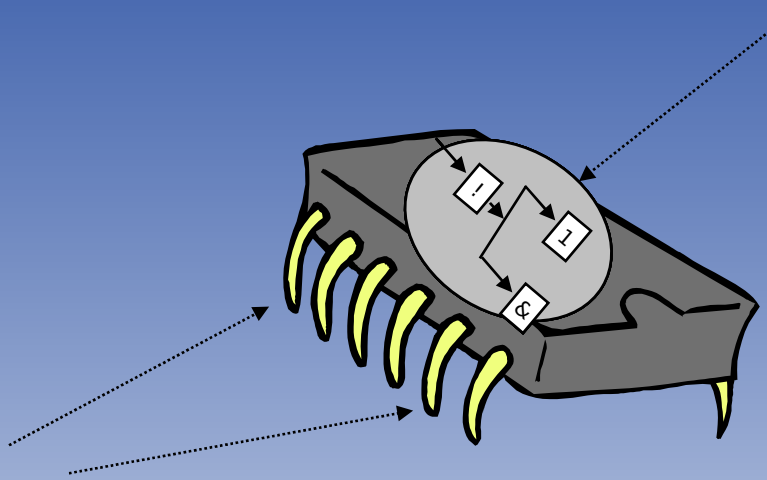
Richard Munden – Free Model Foundry

Two Types of Verification Activities

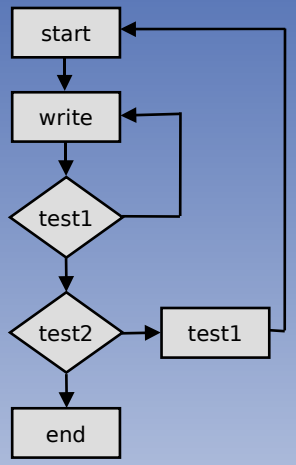
- ASIC and PCB verification have different focus

What Models are Needed for Board-Level Verification?

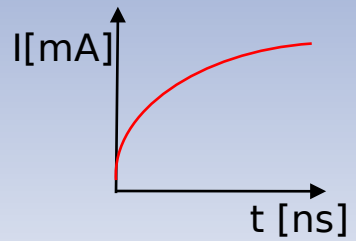
Verilog/VHDL/C:



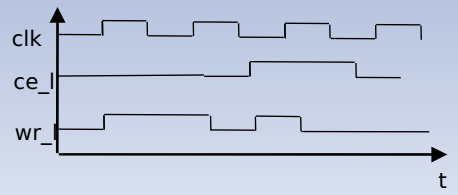
behavioral



IBIS: I/O characteristics for circuit simulation

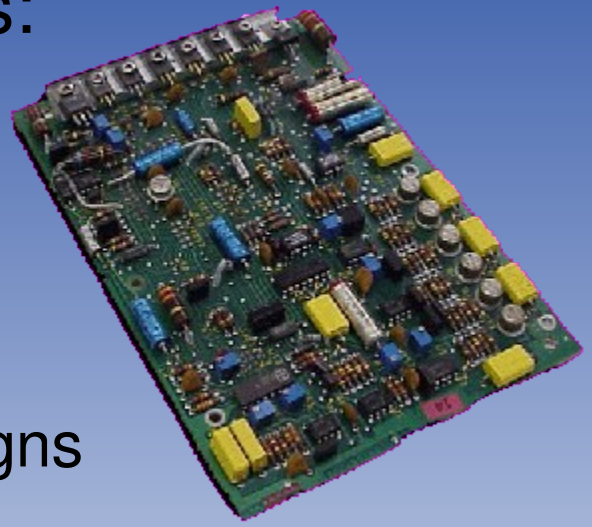


timing



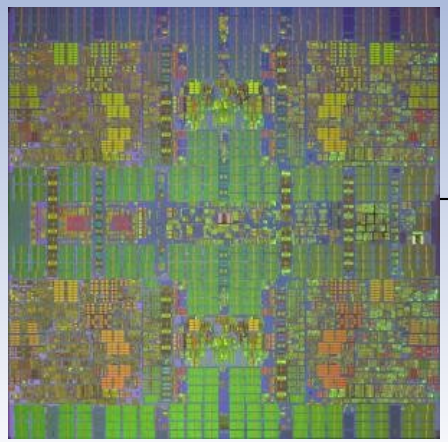
Board-Level Verification

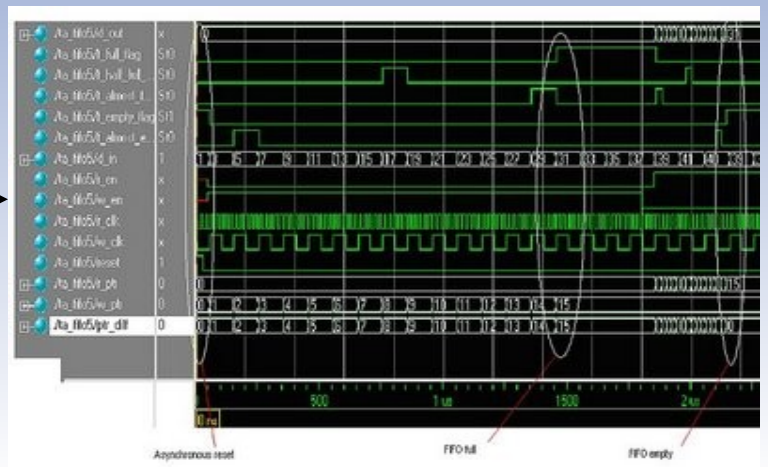
- Board designers face problems:
  - Interconnects
  - Development time
  - Board spins
- This is FMF's world
  - Used in thousands of board designs
  - Saved time and money
  - Accelerate customers time to volume purchase



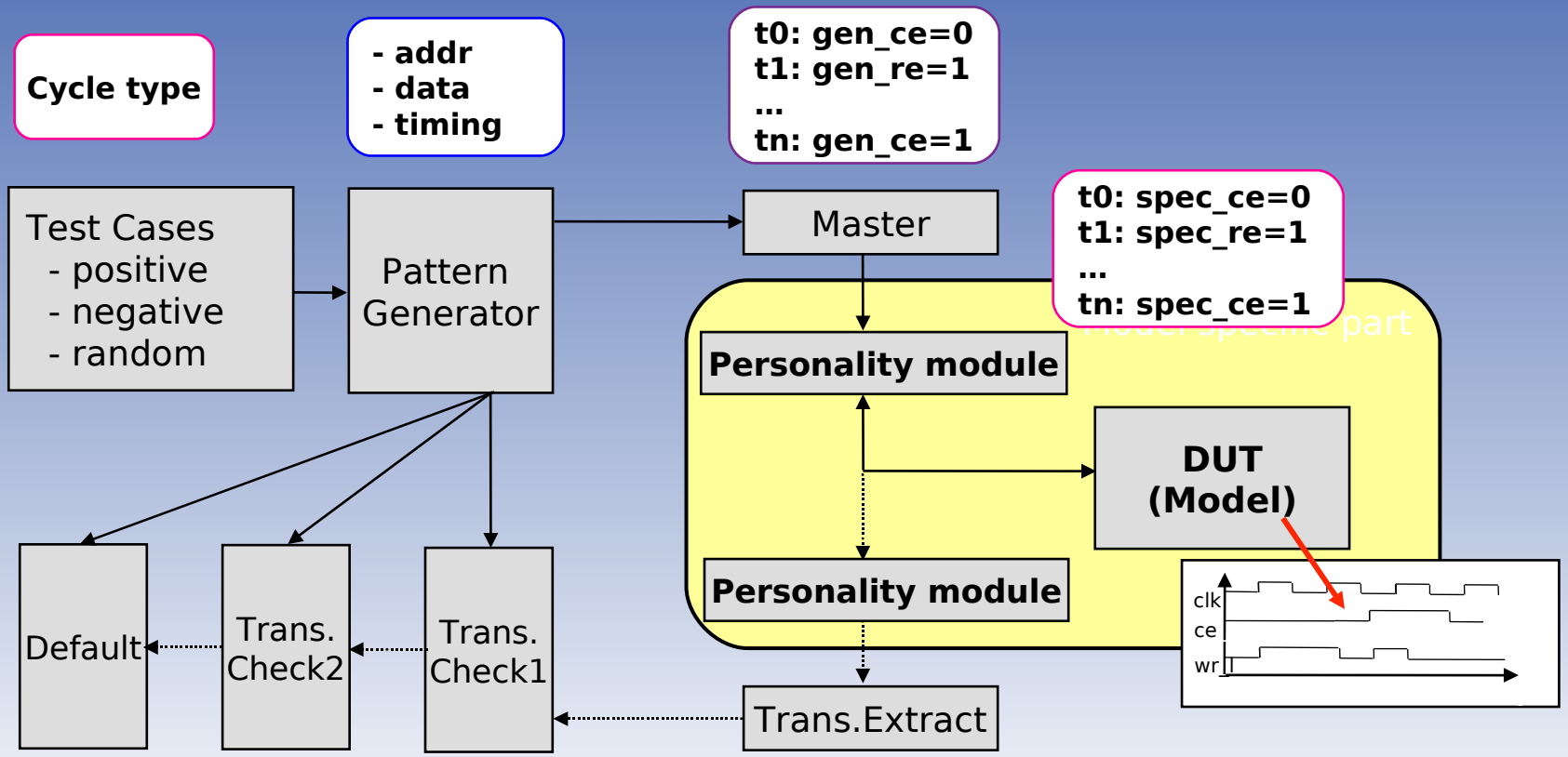
Chip-Level Verification

- ASIC designers face problems:
  - IP integration
  - Endless verification
- This is Denali's world
  - Few, but very expensive projects
  - Expensive, specialized verification tools
  - Dedicated verification engineers

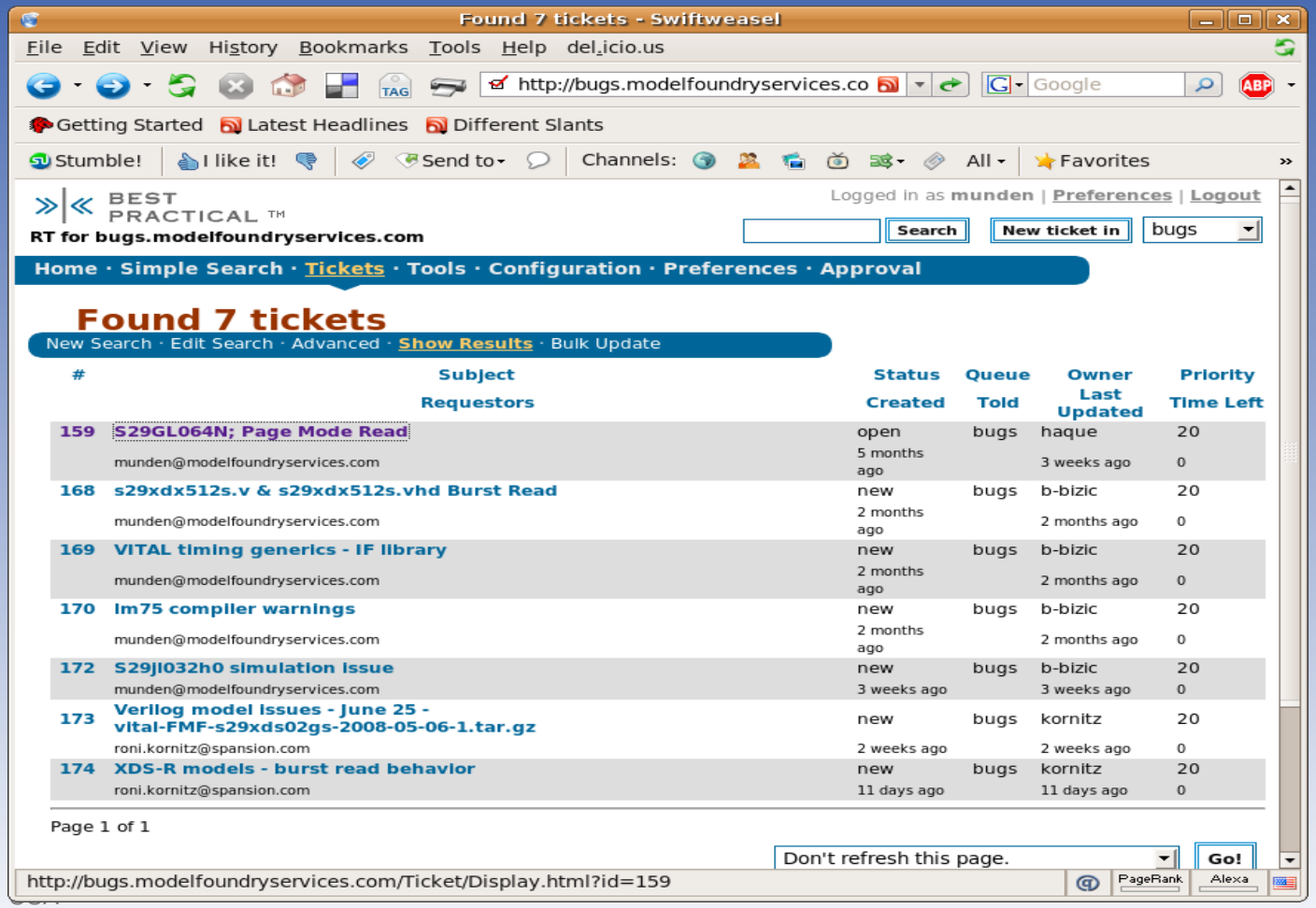




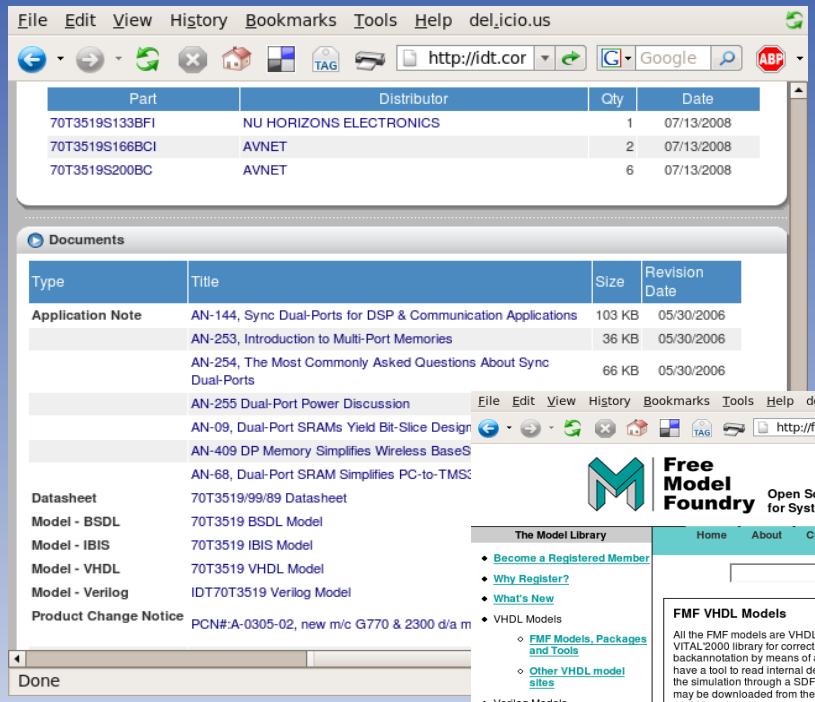
Reliable Models and Superior Support - FMF verification Flow

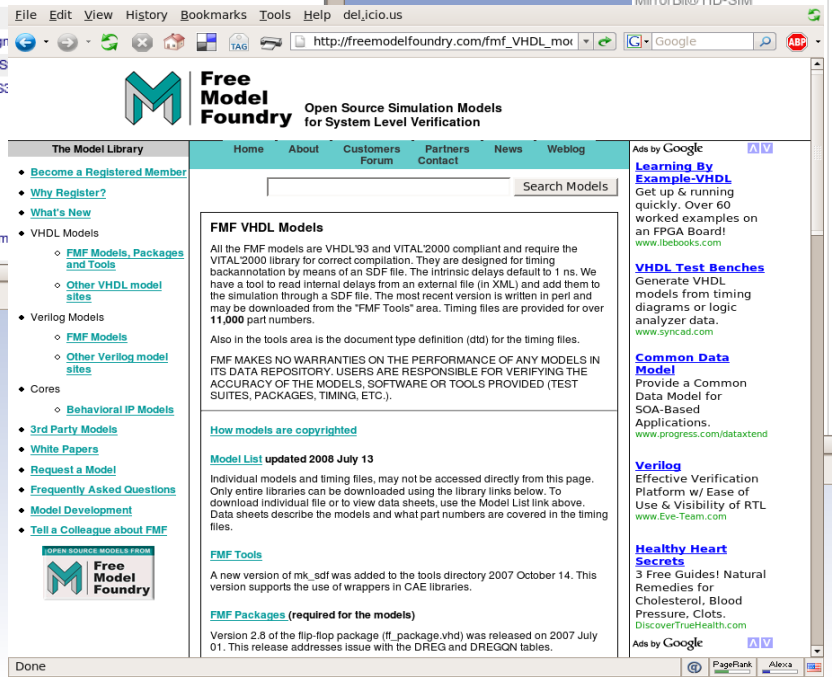


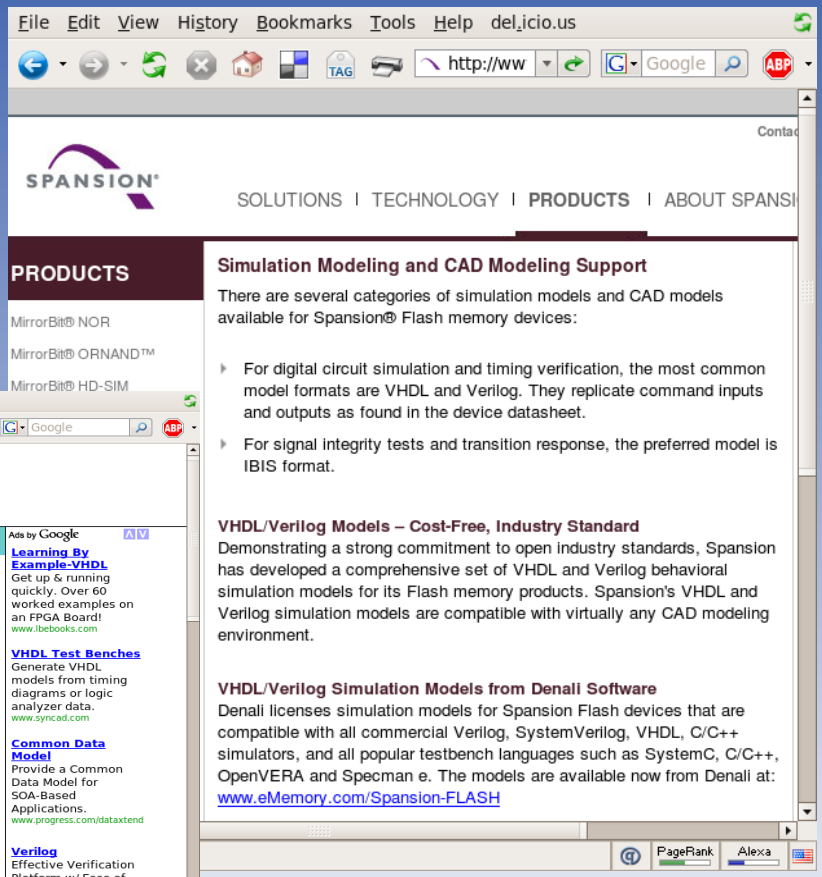
Reliable Models and Superior Support - FMF Issue Tracking



Reliable Models and Superior Support - FMF Model Availibilty





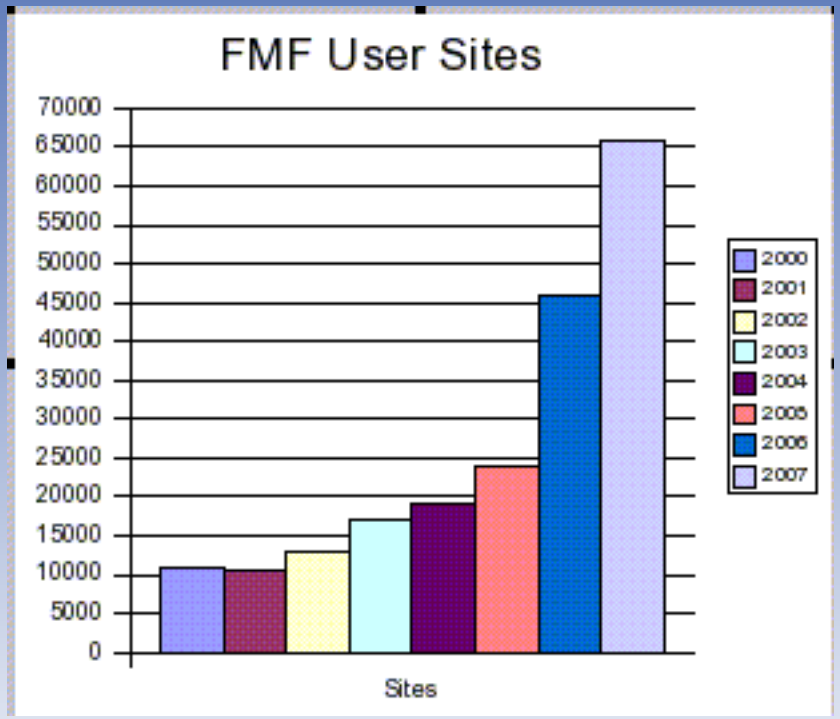


A Typical Use Case for FMF Models

- System Verification
  - Flash Interfaces with FPGAs and Std Components
  - Uses “standard” VHDL and Verilog tools
  - Models of non-memory components also required
  - Little or no budget for models
  - Good fit for free, open source models

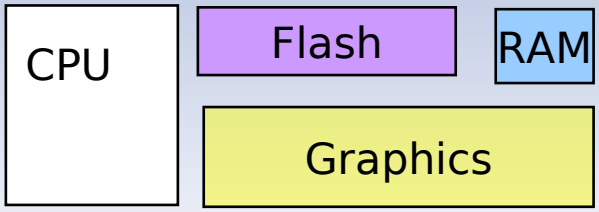
Industry Proven FMF Models

The number of sites using FMF models continues to grow



Key Features of Foundry Models

- Models are open source VHDL and Verilog
  - Engineers can read and understand models
  - Models can be archived and used as long as needed
- Models are Optimized for Board-Level Verification
  - Allow backannotation of interconnect delays
  - Integrate well with schematic capture tools




```
// Global SDF file

// SDF RAM - not available

// SDFGraphics
(IOPATH A0 DQ0 (30:60:90) (30:60:90))
...
// Flash SDF
(IOPATH RDY WR (30:60:90) (30:60:90))
...
// SDF CPU - not available
```

Free Model Foundry Models

- Written At Highest Level of Abstraction Practical
  - Very fast simulation
  - Can be created from datasheets only
  - Non-synthesizable
- Paid for by Manufacturer
  - Free to all potential customers
  - No barrier to trial
  - Accelerate customers time to volume purchase

Spansion Success Story

- Spansion uses FMF models for its complete portfolio
  - In 2007, monthly downloads of Spansion models exceeded 40,000
    - These downloads are from the FMF website only
    - Spansion website downloads are not monitored.
  - Download numbers continue to increase
  - Spansion funds models so its customers do not have to

Conclusions

- FMF Provides Open Source Models
  - Models are free to end users
- Models are Very Popular among Designers
  - More than 810,000 downloads in 2007
  - Over 200 companies and Universities are registered with FMF
    - Registration is not required for downloading
- Models Solve Critical Problem of PCB Verification

Your Chip Doesn't Work in a Vacuum