

ChannelExpert: High Speed Channel Exploration

High speed serial channel design is becoming more and more challenging because of the ever increasing data rate. At multi-gigabit per second data rate, channel designers must characterize all the pieces in the signal path from transmit to receiver including connector, via, and trace, which are typically represented by either IBIS model, AMI model, S-parameter blocks or RLGC transmission line (TML) model. Conventional SPICE-like circuit simulator has difficulty to efficiently handle the channel with mixed S-parameter and TML models, especially with large number of ports. ChannelExpert provides a fast and accurate way to address the signal integrity issue arising from the cascaded network of S-parameter blocks and TML models. Its frequency domain cascading technology and 2D RLGC full wave transmission line solver enable quick and accurate channel simulation. Its intuitive graphic interface lets you easily design, analyze and optimize your high speed serial links for compliance with design standards. Its quick channel build by table allows easy channel setup. Its parametric support enables the quick what-if analysis by sweeping the different S-parameter models for the channel element of interest. S-parameter based fast circuit solver supports the latest IBIS and AMI model, and provides the next generation modulation PAM-4 analysis flow.

ChannelExpert Solution

ChannelExpert provides a fast, accuracy and easy way to evaluate, analyze and optimize pre-layout or post-layout high speed channel performance with its built-in advanced, accurate and fast circuit and EM solver technologies.

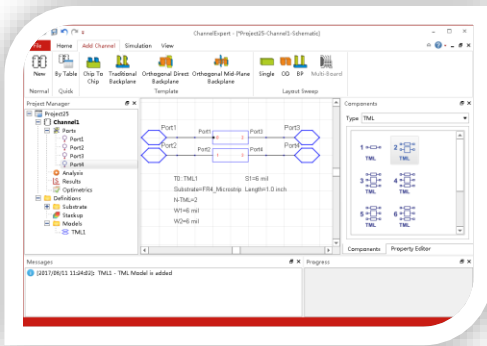
Key Points

- Implementation of Ribbon UI offered by Microsoft in their office solutions, and makes Xpeedic application keeping up with the time, and has a modern look and feel.
- Support both frequency domain and time domain analysis, including run frequency sweep analysis, crosstalk analysis, COM analysis, transient analysis and statistical eye diagram analysis.
- Built-in leading edge S-parameter based fast circuit solver to support latest IBIS and AMI model, even the next generation modulation PAM-4.
- Built-in Tline2D solver to support N trace transmission line simulation, and improve both accuracy and simulation speed, make it more efficient.
- Built-in fast 3D via solver for via discontinuities simulation.
- Built-in enough components for signal integrity analysis, including IBIS, IBIS AMI, N-trace transmission line, lumped device, S-parameter, spice subcircuit and so on.
- Easy multiple channel creation by table with only one-click.
- Built-in template to quickly create chip to chip, traditionally backplane and OD backplane channel.
- Built-in substrate and stackup database enable easy transmission line model creation, simulation and parametric.
- Easy multiple high speed channel batch creation for post-layout board to board connection based on pin and connector connectivity relation.
- Support S-parameter and transmission line physical parameters parametric and optimization sweep for easy channel exploration.
- Integrate ViaExpert model into ChannelExpert to automate via model evaluation and extraction flow.
- Code-level integration of SnpExpert S-parameter plotting feature to improve ChannelExpert usability.
- Integrate SnpExpert into ChannelExpert to automate crosstalk plot and compliance check for Ethernet, computing and storage standard.
- Display channel 3D view feature for layout sweep flow with a separate tool named "ChannelView".

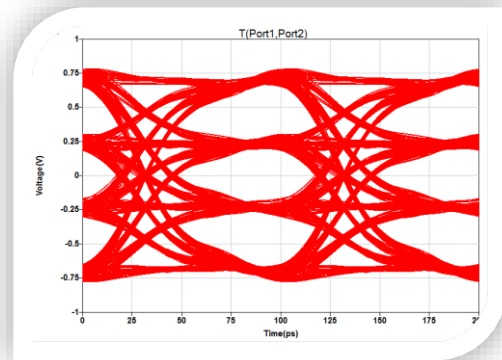
FEATURES

Modern Look and Feel

Implement the concept of Microsoft Ribbon, and makes ChannelExpert keeping up with the times.



ChannelExpert



PAM-4 Eye Diagram

Statistical Eye Diagram Analysis with IBIS and AMI

With built-in statistical eye diagram analysis engine, designers can accurately simulate bit error rate and display bathtub plots.

- One statistical simulation to attain the same coverage as a million transient simulations.
- Accurate modeling of SERDES pre-emphasis and equalizers for AMI model with both NRZ and PAM-4 modulation.

Powerful Parallelized COM Calculation

COM analysis flow help qualify a channel in the context of built-in specification, including 100GBASE-CR4, 100GBASE-KP4, 100GBASE-KR4, 200GBASE-CR4, CAUI-4_C2C. Tabular COM values display and 2D CTLE, PDF, ISI, Jitter and ICR plotting help user get intuitive understanding of high speed channel performance.

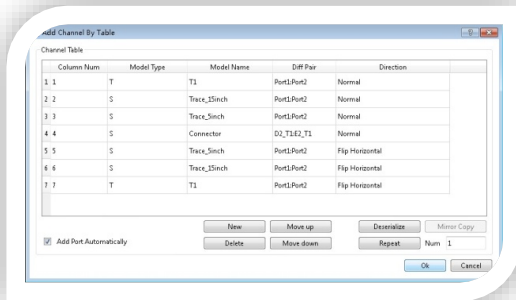
Full Channel Crosstalk Analysis

Full channel crosstalk analysis automation with only one click, including NEXT, FEXT, ICN, ILD, ICR, TDR and so on.

Multiple Ways to Create Channel

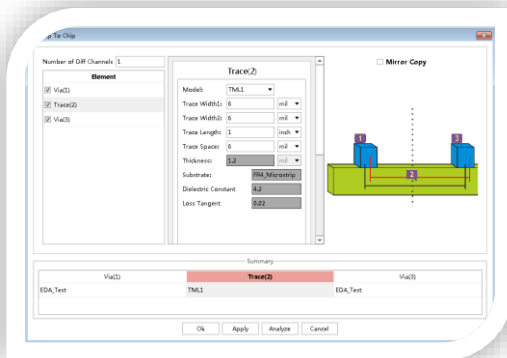
Support several ways to quickly create channel for signal integrity analysis:

- Built-in “Add Channel by Table” to easy create channel with only one-click.



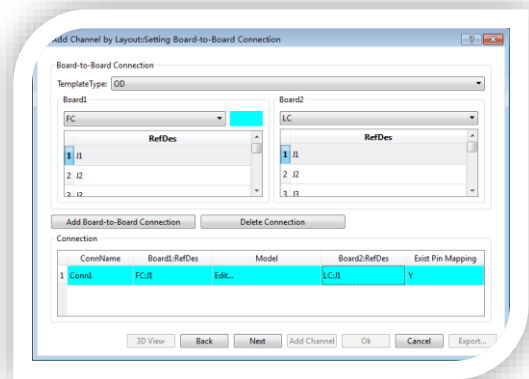
Add Channel by Table

- Built-in “Add Channel by Template” to easy create “Chip to Chip”, “Traditional Backplane”, “Orthogonal Direct Backplane” and “Orthogonal Mid-Plane Backplane”.



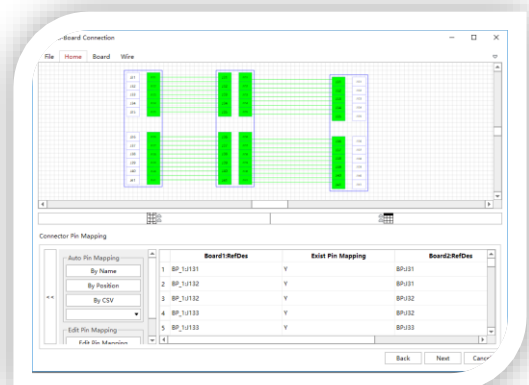
Add Channel-by Template

- Built-in “Add Channel by Layout” to batch create multiple channel based on post-layout connectivity relation. Support OD/BP channel quick creation and fast parametric sweep with built-in WYSIWYG slot number flow.



Add Channel-by Layout

- Built-in “Add Channel by Multi-board flow” to create channels based on layout flow. designers can build, debug and analysis channels more efficiently due to a friendly graphical driven interface. When importing board files, a quick interconnection relationship can be built between board connectors, the signal mappings may be implemented by pin name, position, csv file or directly connect by lines.

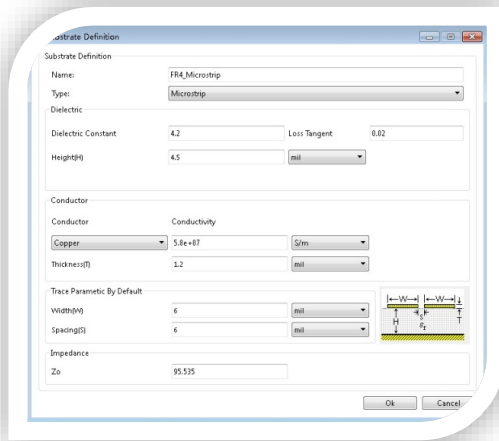


Add Channel by Multi-Board Flow

Multiple Ways to Create TML Model

Provides two ways to create transmission line model:

- Built-in Substrate Model, Tline2D use substrate model to define transmission line physical parameters.



Substrate Model

- Built-in Stackup Model, Tline2D use extracted stackup to define transmission line signal layer.

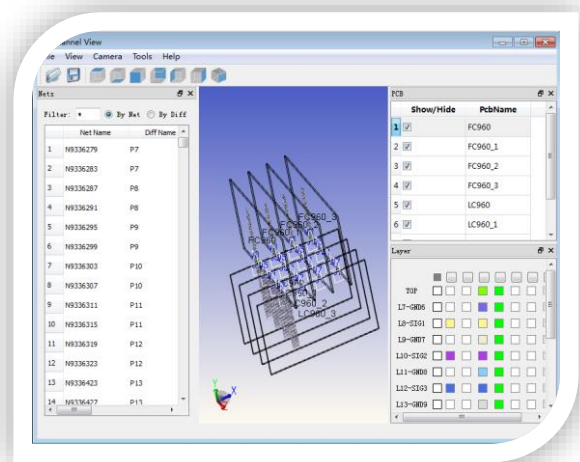


Stackup Model

3D View Display

Xpedic developed a tool named ChannelView to display backplane and pin connectivity information in 3D view.

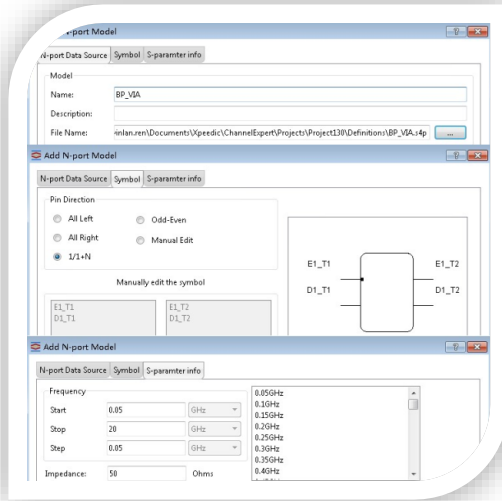
- Support hierarchical display
- Support show and hide any board
- Support highlight channel
- Support save x3d file



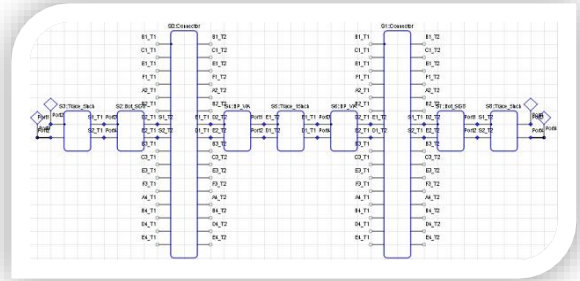
ChannelView

Easy Create S-parameter Model

- Allows users to edit S-parameter's name
- Support reset pin direction
- Can review frequency



Model import and edit



Schematic View

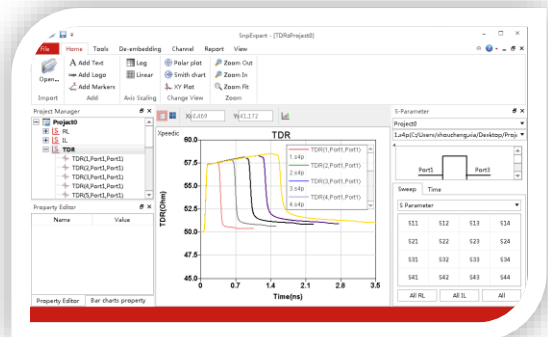
Explore Parametric Results

Support parametric and optimization for high speed channel, and easily explore parametric results in SnPExpert.

- Built-in parametric of length and Substrate
- Support S-parameter parametric
- Support TML parametric

Compose Schematic

- In order to do channel simulation, ChannelExpert has the interface to put all models together.
- Support all the general operation for components in schematic like copy, flip, rotate and so on.
- To create a more intuitive simulation diagram.
- Support several independent excitation sources, such as pattern source, PRBS, pulse, PWL and DC voltage.
- Support both unencrypted and encrypted HSPICE subcircuit transient analysis with fast simulation speed.



ID	Variable	g	RL_min	RL_max	TDR_min	TDR_max
1	1.540	0.05	50.0000	50.0000	0.0000	0.0000
2	2.940	0.05	50.0000	50.0000	0.0000	0.0000
3	3.940	0.05	50.0000	50.0000	0.0000	0.0000
4	6.140	0.05	50.0000	50.0000	0.0000	0.0000

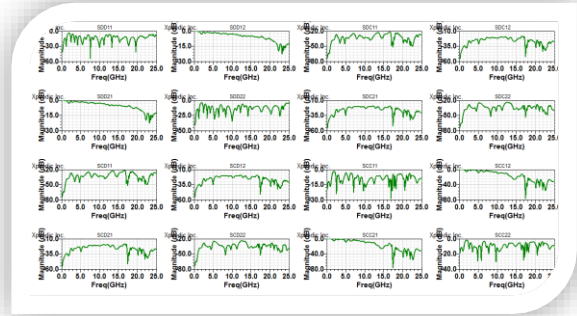
Parametric Results

Post Process

S-parameter, v/t curve, eye diagram and all other generated results are quite convenient to display in ChannelExpert with its built-in plot module. User can enjoy more advanced features offered by SnpExpert to explore the S-parameter such as:

- Built-in FEXT, NEXT, PSXT, ILD, ICN and ICR plots
- Built-in compliance metrics such as IEEE 802.3ba and OIF CEI-25G/28G

- Built-in passivity, causality, reciprocity, stability metrics and enforcements



S-parameter Display

US Office

Seattle

14205 SE 36th St, Bellevue, WA
98006

Silicon Valley

19925 Stevens Creek Blvd #100
Cupertino, CA 95014

sales_us@xpeedic.com

China, Shanghai Office

No.608, ShengXia Road, Building
2, Room210-211, Pudong New
Area, Shanghai, 201203

Tel: 86-021-61636350

sales@xpeedic.com

China, Suzhou Office

No.2358, Changan Road, Bldg 1, Floor
5, Wujiang, Suzhou, 215200

Tel: 86 512 63989910

sales@xpeedic.com