

Lecture 2: Siwave Introduction

2015.1 Release

A horizontal banner with a yellow background. It features four distinct visual elements: a blue fluid flow simulation on the left, a purple gear with a glowing center in the middle-left, a green concentric circle pattern in the middle-right, and a 3D isometric view of a circuit board on the right. Below these elements is a dark blue bar with white text labels for each section.

Fluid Dynamics

Structural Mechanics

Electromagnetics

Systems and Multiphysics

Introduction to ANSYS Siwave

- **What is Siwave?**

- Siwave is an electromagnetic-based software solution for power-ground plane and signal integrity analysis. It employs a powerful full-wave analysis engine to generate both frequency-domain and time-domain results. Using the highly optimized internal field solver, Siwave simulates complete board/package designs with full-wave accuracy. Simulation results can be reported graphically using advanced 2D and 3D plotting methods.
- The Siwave layout editor allows you to draw your own structure, and then analyze it. Siwave also gives you the flexibility to import an existing geometry in ANF format.
- Siwave can verify and analyze complex PCBs comprising multiple arbitrarily shaped power and ground layers and any number of vias and signal traces. SI effects that can be modeled include:
 - resonance frequencies of complete power and ground structures with decoupling capacitors,
 - power and ground bounce,
 - simultaneous switching noise,
 - impedance discontinuities due to changes in signal layers or split supply planes,
 - noise coupling between signal lines and supply planes,
 - time-domain effects such as propagation delay, rise and fall times, reflections and ringing,
 - frequency-domain phenomena such as resonant modes and S, Y, and Z-parameters.
- The key feature of Siwave is the ability to export SPICE files. Siwave enables you to export SPICE files in HSPICE, Maxwell SPICE, or Nexxim formats.
- Siwave provides a seamless and integrated design flow that allows you to easily import design geometry from commercial layout packages such as:
 - Cadence Allegro and APD,
 - Synopsys Encore,
 - Zuken CR5000 Board Siwave,
 - Mentor BoardStation, Expedition, and PADS Layout.

Layout Generated in ECAD System

- Cadence Allegro, APD, Sip, Virtuoso
- Zuken CR5000, CR8000, Cadstar
- Mentor Graphics Board Station
- Mentor Graphics Expedition
- Mentor Graphics PADS Layout
- Altium Designer

Siwave

Drawing Editor

Analyzer

DC Analysis

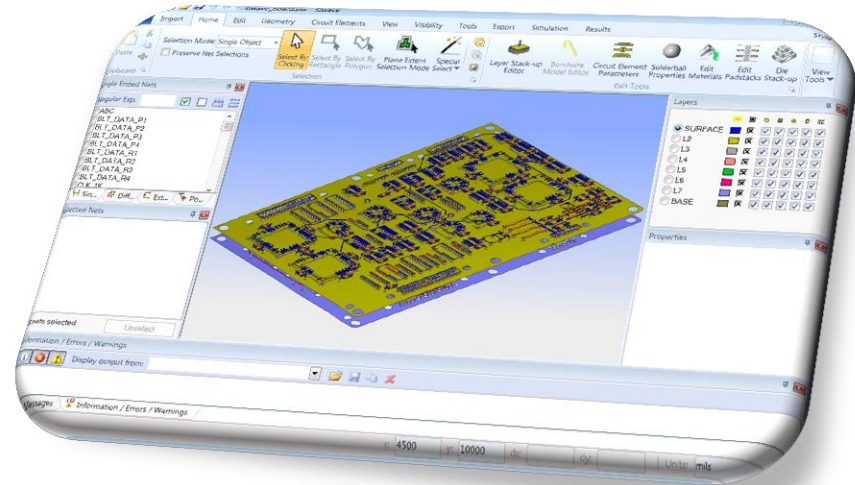
AC Analysis

Resonant Modes

S, Y, Z
Parameters

SPICE Models

- Nexxim
- HSPICE
- Cadence Spectre
- PSPICE
- Maxwell Spice



Installing the SIwave software

- **System Requirements**

- For up-to-date information, refer to the SIwave Installation Guide

- **Installing the SIWave Software**

- For up-to-date information, refer to the SIwave Installation Guide

- **Starting SIwave**

- To launch SIwave, click the Microsoft **Start** Button, select: **All Programs > ANSYS Electromagnetics > ANSYS Electromagnetics Suite 16.1 > ANSYS SIwave 2015.1**



NOTE: You should make backup copies of all SIwave projects created with a previous version of the software before opening them in SIwave v2015.1

- **Getting Help**

- If you have any questions while you are using Ansys SIwave you can find answers in several ways:
 - Ansoft SIwave Online Help provides assistance while you are working.
 - To get help about a specific, active dialog box, click the Help button in the dialog box or press the F1 key.
 - Select the menu item *Help > Contents* to access the online help system.
 - Tooltips are available to provide information about tools on the toolbars or dialog boxes. When you hold the pointer over a tool for a brief time, a tooltip appears to display the name of the tool.
 - The Ansoft SIwave Getting Started guide provides detailed information about using Ansoft SIwave.

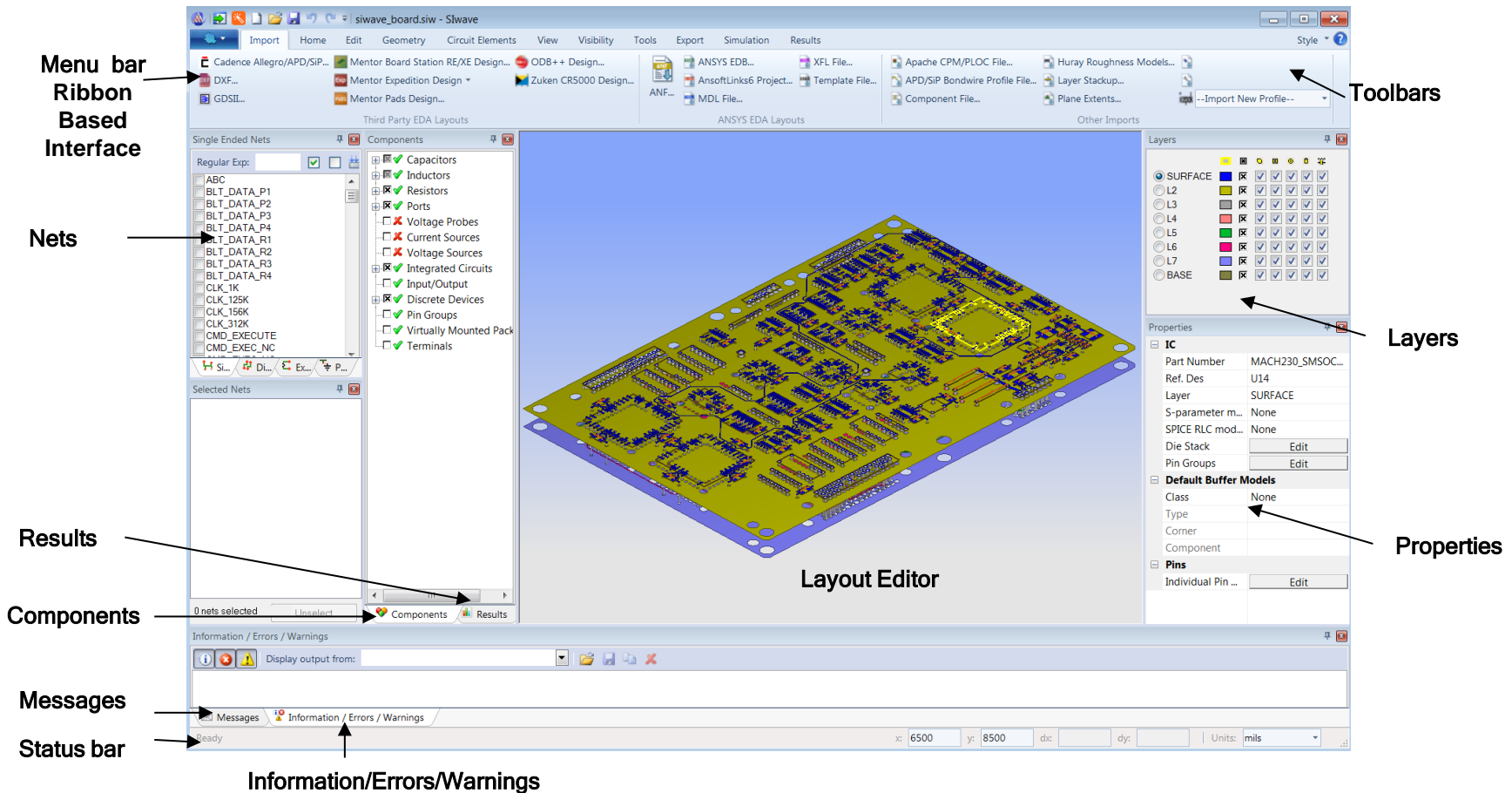
- **Visiting the ANSYS Web Site**

- If your computer is connected to the Internet, you can visit the ANSYS Web site to learn more about the ANSYS and ANSYS products.
 - From your Internet browser
 - Visit www.ansys.com

- **Technical Support**

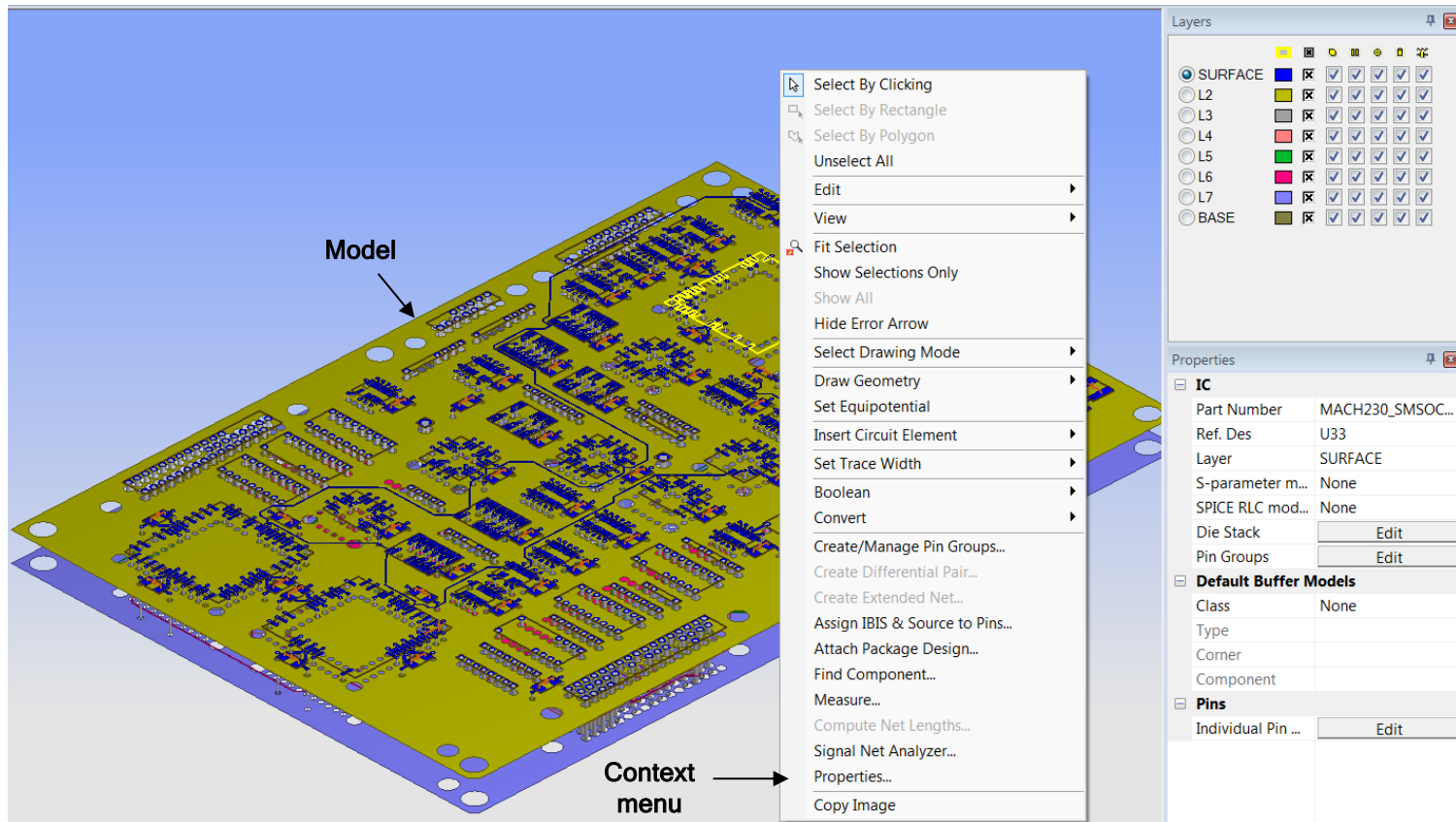
- For technical support, please have your ANSYS Individual Customer Number ready, and use one of the following methods. If you do not know your Individual Customer Number, please contact your ANSYS Account Manager.
 - Log into the ANSYS Customer Portal, <http://www.ansys.com/customerportal>, and click on Submit Support Request
 - If you are not registered with the Customer Portal, please use your Customer number and company information to register for an account.
 - http://www1.ansys.com/customer/New_Login_siebel.asp
 - Call our support hotline @ 1-800-711-7199, enter 1 for Technical Support, and follow the prompts to be connected to an Applications Engineer.

- **Siwave Desktop**
 - **Modeler Window**
 - Each window can be Floating or Docking

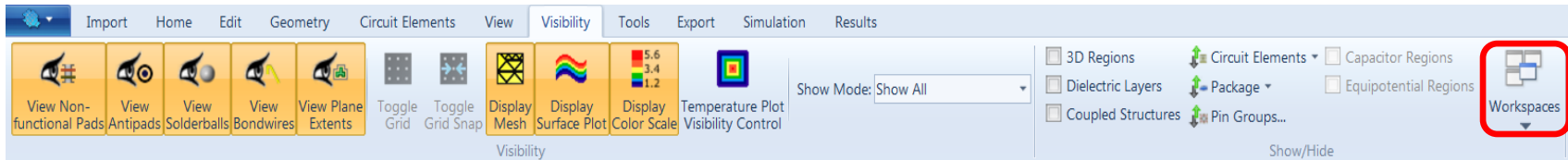


• Modeler Window

- Rotate and view model
- Toggle Layer and Geometry Visualization

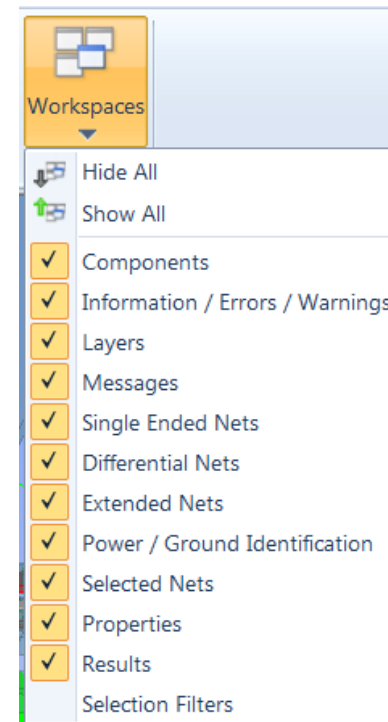


- **SIwave Workspaces**



- The SIwave window has several optional workspaces:

- Components
- Information/Errors/Warnings
- Layers
- Messages
- Single Ended Nets
- Extended Nets
- Power/Ground Identification
- Selected Nets
- Properties
- Results
- Selection Filters

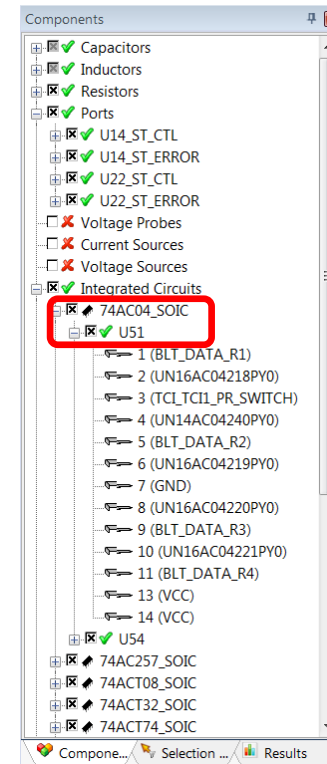
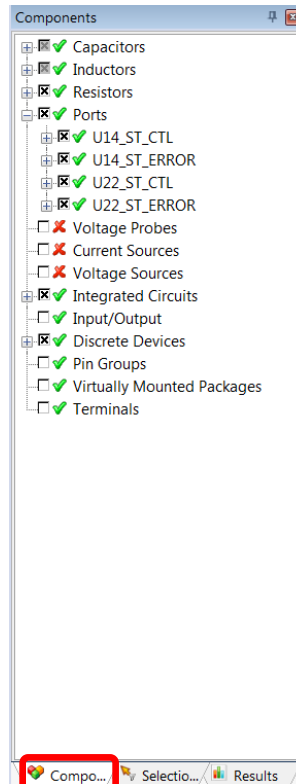
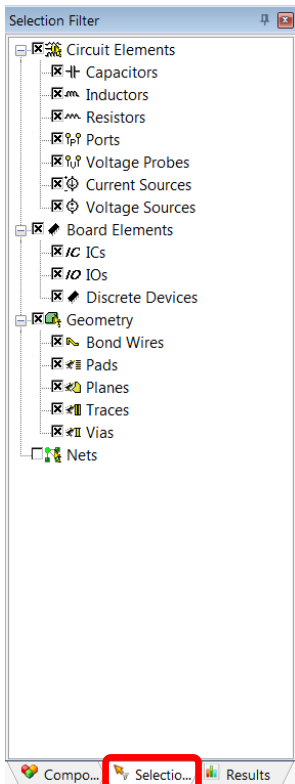


• Selection Filter Window

- Check or uncheck boxes to select certain elements. For example, all types of elements can be selected except for Nets since the box is unchecked

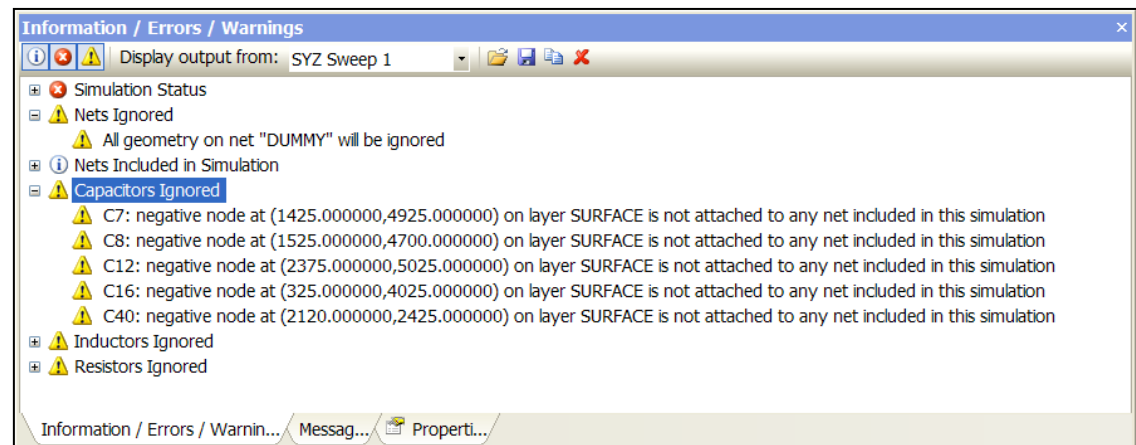
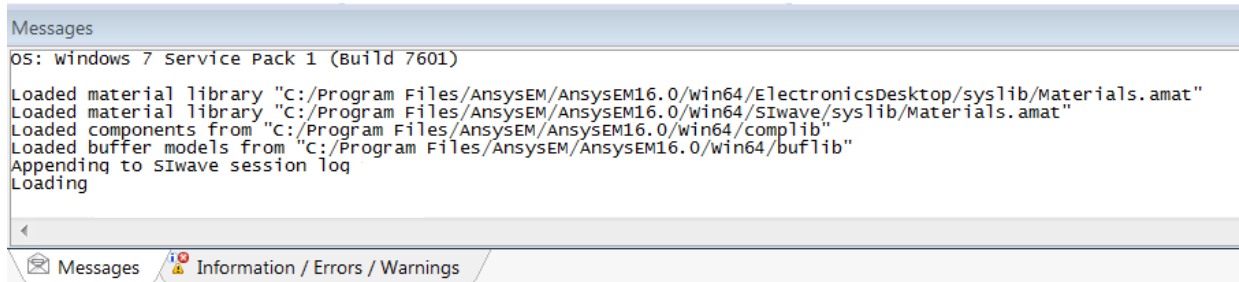
• Components Window

- For manufacturer supplied components the name, series number, global parts, circuit elements, and pins can be viewed
- For local components (created and placed by the user) the part name, circuit elements and pins can be viewed



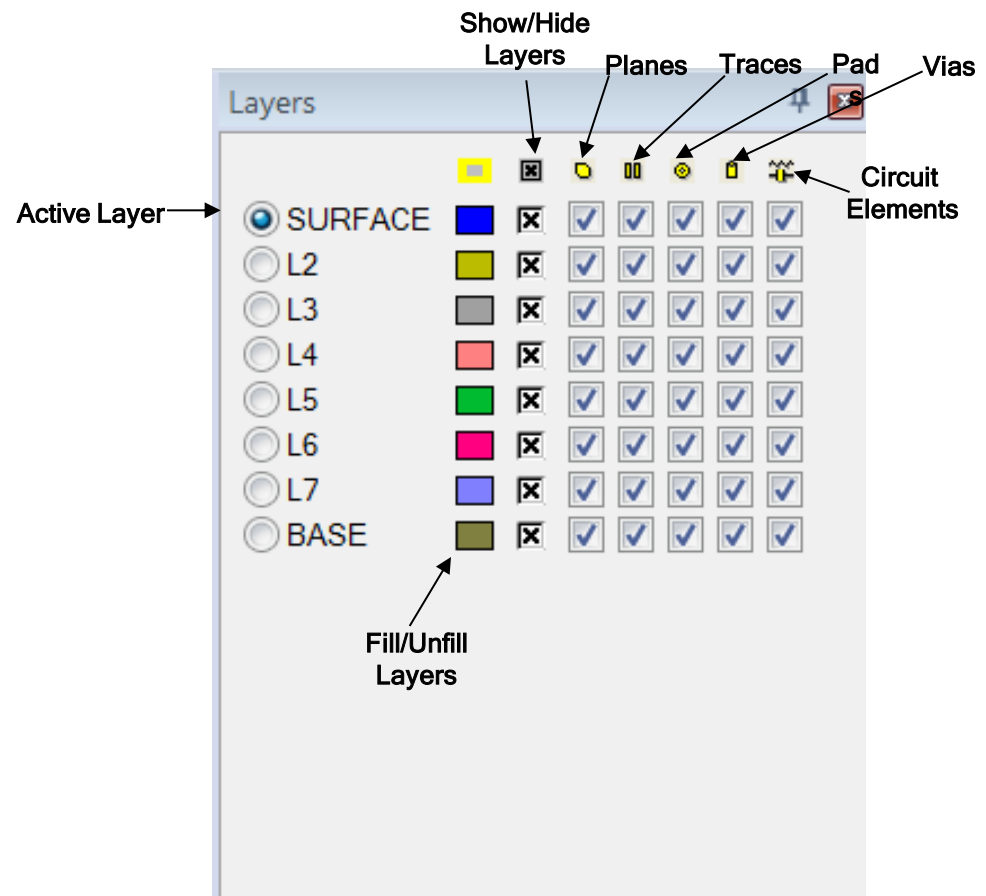
• Information/Errors/Warning and Messages Window

- Messages
 - General information related to various tasks will be displayed in the message window.
- Information/Errors/Warnings Window
 - Errors must be corrected before the simulation will run
 - Warnings should be further investigated but SIwave will run the simulation
 - Information messages should be reviewed



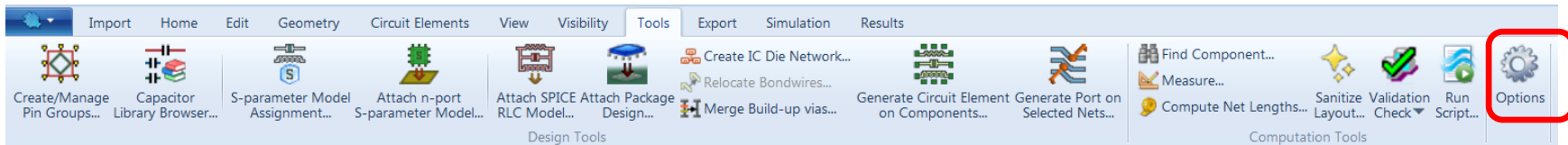
• Layers Window

- Layer Selection
 - Select the active layer by clicking on the circular radio button. The active layer is important when geometry is being created in the SIwave interface
- Fill/Unfill Layers
 - Toggle between Opaque and Wireframe layer views
- Show/Hide Layers
 - Click the X to either view or hide a layer
- To select planes, traces, pads, vias or circuit elements in a particular layer, select the corresponding check boxes
- Click on the icons to hide or view all layers

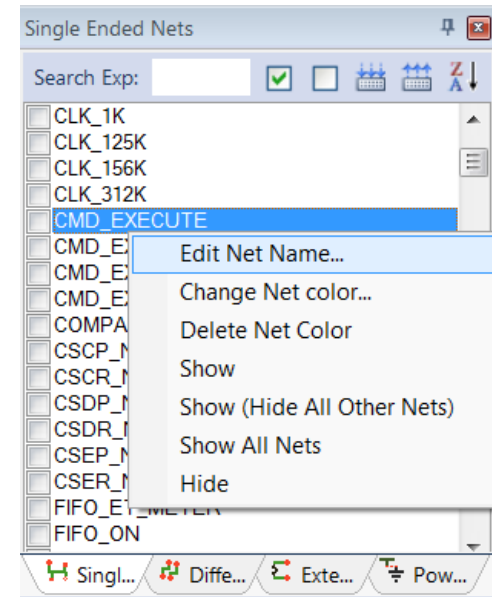
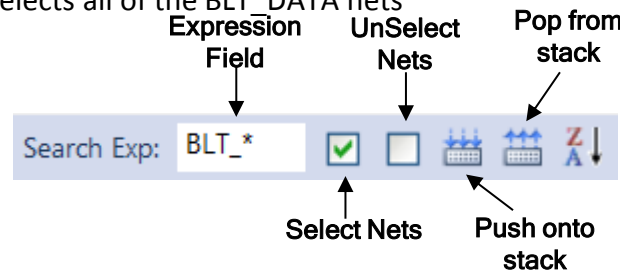
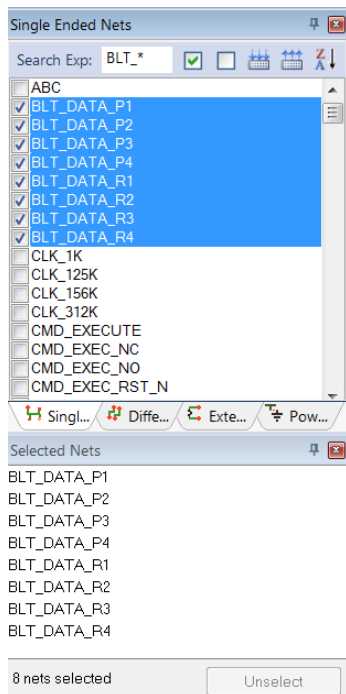


• Nets Window

- Select and Deselect Nets by clicking the checkbox. Also, Nets can be selected and unselected by using a Regular Expression. Search Type : Perl RegEx or Wild Cards

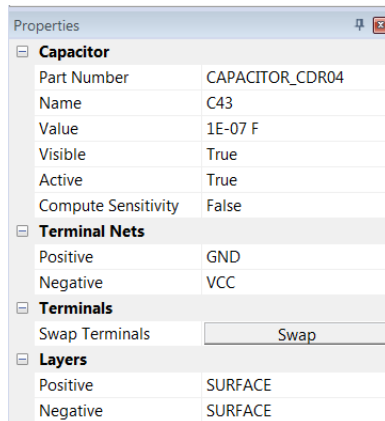


- Note that the expression field is case sensitive and that both * and ? are supported for Wild Cards.
- In the following window BLT_* selects all of the BLT_DATA nets

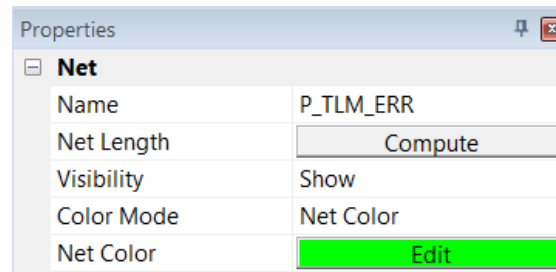


• Properties Window

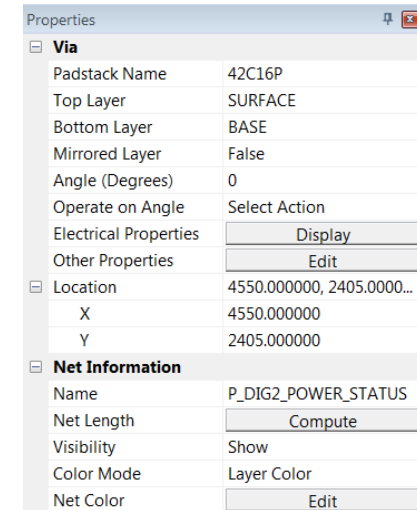
- Information displayed in the Properties Window will vary based on the type of object selected
- Types of Objects that can be selected graphically in the Modeler Window:
 - Circuit Elements
 - Capacitors, Inductors, Resistors
 - Ports, Voltage Probes, Current Sources, Voltage Sources
 - Board Elements
 - ICs
 - IOs
 - Discrete Devices
 - Geometry
 - Bond Wires, Pads, Planes, Traces, Vias
 - Nets



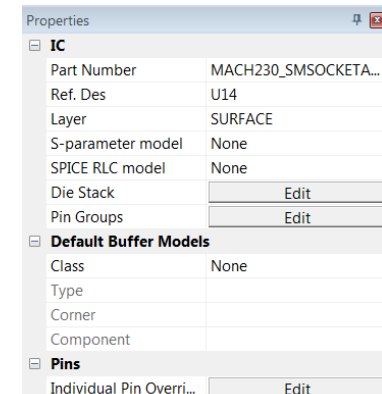
Circuit Element Properties



Net Properties

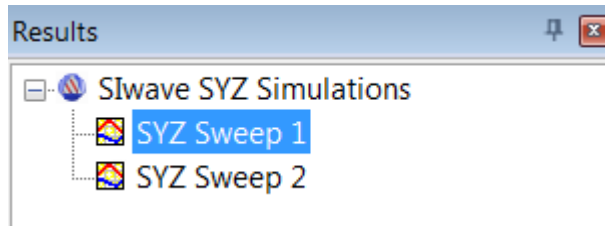


Geometry Properties



Board Element Properties

- **SIwave Desktop**
 - Results Window
 - Users can define solve, and post-process multiple resonant mode, frequency, SYZ, etc., simulations
 - Simulation results are no longer stored in the *.siw file but rather are stored in the *.siwaveresults subdirectory. Far-field results and network parameters are accessed from the Ansys Electronics Desktop



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