"Student Version" of Simulator Is Powerful – And Free

by Ansoft Corp.

Ansoft has been supporting students and working professionals with free versions of its Serenade SV and Ensemble SV RF and microwave design software for several years. The student versions are far from simple demonstrators of Ansoft products, offering the breadth and depth required to create and analyze a wide array of circuits. It's not surprising that the concept has been extremely popular, with more than 10,000 downloads to date. Ansoft continues this tradition with Ansoft Designer SV (Student Version), which features the same desktop design environment utilized by the company's latest high-frequency electronic design software, Ansoft Designer and HFSS v9. The capabilities of this comprehensive linear simulation package range from a complete set of linear component electrical models to filter synthesis and physics-based distributed models. They are all integrated within the same modern integrated design suite as in the full commercial versions of the products.

Integration is pervasive in Ansoft Designer SV, linking schematic and layout editors, dynamic project and solution managers, advanced results graphing, post-processing, a 3D viewer, and a scripted and parameterized footprint editor. The software's state-of-the-art solver technology includes a complete linear circuit simulator, a large set of physics-based linear distributed transmission line models, discontinuities, about 80,000 commercial components, and ideal circuit elements. Circuit simulation results include S, Y, and Z parameters, VSWR, insertion and return loss, gain, stability circles, noise figure, and group delay. The capabilities together create a linear simulation package that rivals products today sold for thousands of dollars.

The schematic capture and layout editors operate from a single database. This makes it possible to fully synchronize physical and symbol views of a design, and allows designers to work from either view. When a change is made to any component parameter it is automatically updated in both views so that a real-time understanding of a circuit's electrical performance and physical layout can be visualized.

The software also includes transmission line models and a utility to characterize them before they are placed in a circuit or system.

Transmission lines and couplers can be analyzed and synthesized in seconds using the integrated transmission line (TRL) utility. By entering the electrical properties, the utility will automatically synthesize the physical description or vice versa. The TRL utility includes microstrip, stripline, and coplanar waveguide mediums.

An extremely large set of distributed models for common and obscure geometries required for RF and microwave circuit design is also available within Ansoft Designer SV. Mediums range from microstrip, stripline, coplanar waveguide, and grounded coplanar waveguide, to coaxial cables. The physics-based models perform over wide frequency ranges, which makes them highly useful when creating designs for millimeter-wave applications. The software also uses Ansoft's approach to discontinuity modeling, which is derived from a solvable electromagnetic problem and provides a high level of accuracy.

The fastest, most accurate approach to characterizing full-wave, uniform, coupled transmission lines is by the spectral-domain method employed by Ansoft Designer SV, and it boasts a wider range of applications than other methods. As a result, the multiple coupled line model in Ansoft Designer SV (and Ansoft Designer as well) has become a workhorse in the analysis of interdigital microwave filters, coupled "hairpin" filters, edge-coupled filters, combline filters, and interdigital capacitors. The algorithm allows the distributed component model to provide a highly accurate characterization of up to 20 parallel transmission lines constructed in microstrip, stripline, and suspended stripline mediums. The technique accounts for the coupling that occurs between adjacent and non-adjacent lines for any arbitrary line width and spacing and has been expanded to include lines on up to five different substrate layers.

The huge component library in Ansoft Designer SV includes discrete linear and nonlinear surface-mount components based on manufacturer-supplied model data. The user can add models to this library by importing them from vendors or by creating them using Ansoft's internal model development toolkit. All vendor parts include model data and symbol representation as well as package footprint data for direct layout implementation and floor planning. The component
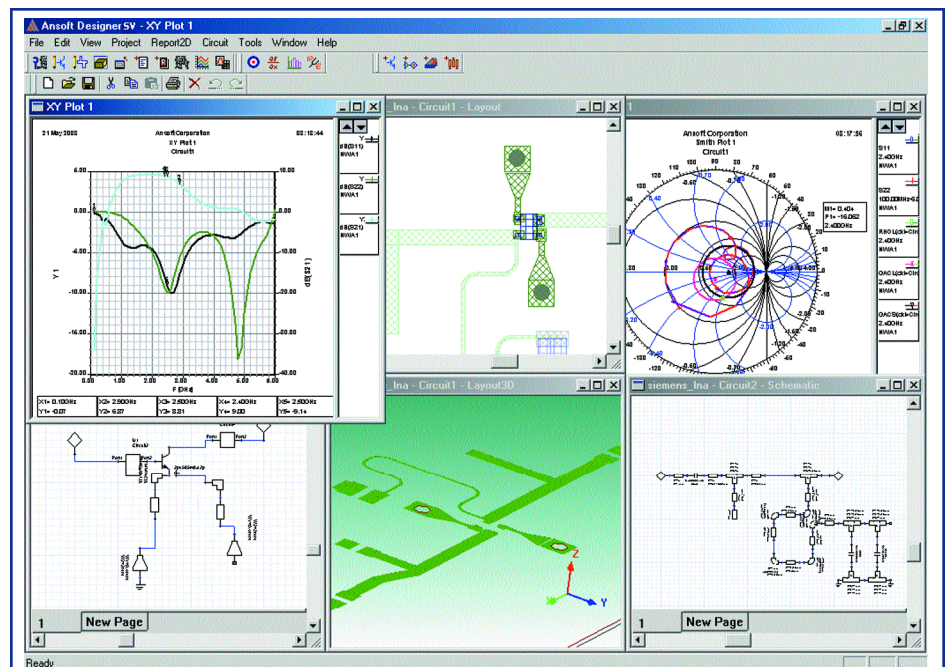
Ansoft Designer SV features a completely integrated design environment.

libraries are easily expanded by utilizing the component/library manager interface.

Ansoft Designer and Ansoft Designer SV's neutral model format (NMF) supports truth-table modeling and parametric S-parameters and links these tools to parametric results provided by HFSS, Ansoft's 3D high-frequency electromagnetic (EM) simulator. Ansoft Designer SV can read and write industry-standard formats such as the SnP and FLP. The linear table-based data addresses the need for transferability of linear network data, which can be arbitrarily parameterized, such as physical and material parameters. These formats offer multi-port network data (S, Y, Z, etc.) as a function of frequency. Supporting these formats allows HFSS or third-party tools to generate model data that can be incorporated into an Ansoft Designer SV simulation.

Highly unusual in a "student" version of a software package, Ansoft Designer SV includes the most powerful tool available for matching and network extraction, the same one used by Ansoft Designer. Through this Smith Chart Tool, an exact match can be created and exported directly into the schematic. The tool plots critical design information, such as stability, gain, and noise circles, and then lets the user select ideal lumped and distributed components to interactively design an impedance transformation network that can be directly inserted into a hierarchical design. The Smith

Tool works directly with the load-pull-analysis feature that enables matching networks based on large-signal circuit behavior to be created.

The physical layout capabilities within Ansoft Designer SV let the user draw patterns composed of simple geometric shapes, such as rectangles, polygons, circles, and arcs that can be placed on the circuit board or IC. Components in the design often consist of groups of basic shapes, called "footprints," which are the "stamp" of the component on one or more board/IC layers. If the footprint depends on component parameters such as transistor width, then it is a "parameterized footprint," which requires a capability beyond simple scaling to describe it. Ansoft Designer SV's layout tool eliminates the need for a user to program in C to manipulate footprint information. The tool embraces a standard interpretive language (Visual Basic script or JavaScript), and allows the script to be developed directly in the CAD environment so that changes can immediately be tested without any compilation or program restart. Ansoft Designer SV requires a PC with Windows 2000 or XP, and is available for download at www.ansoft.com.

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