cādence®

Allegro PCB Designer Analog/RF Option
Integrating RF circuits onto mixed-signal PCB design

The Cadence® Allegro® PCB Designer Analog/RF Option is a mixed-signal design environment, spanning from schematic to layout with backannotation, and proven to increase RF design productivity up to 50%. It allows engineers to create, integrate, and update RF/microwave circuits with digital/analog circuits in the Allegro PCB Designer environment. With its rich layout capability and powerful interfaces with RF simulation tools, it allows engineers to start RF design from Allegro Design Entry-HDL, Allegro PCB Editor, or Agilent ADS.

Analog/RF Design Challenges

PCB designers face significant challenges in integrating RF circuits on a mixed-signal design. Today's advanced designs are more complex and need to incorporate all design portions such as digital, RF/microwave, and analog circuits on the same board. To deal with this complexity on a PCB, designers must be able to create a mixed-signal design within an integrated, production-ready PCB design environment.

RF/microwave modules are different from digital circuits in many respects. For example, distributed RF components are usually parameterized with widths and lengths; RF circuits have symmetric structures, with many large irregular shapes used for RF layout. Designers need a feature-rich, efficient, reliable, and easy-to-use mixed-signal PCB design tool to handle all of these design needs.

Analog/RF Option

The Allegro PCB Designer Analog/RF Option is the answer. This RF design solution combines the strength of both Cadence Allegro and Agilent ADS design environments for

designing and integrating RF circuits on mixed-signal PCBs. The Analog/RF Option provides everything needed to develop complex RF/mixed-signal designs simply and quickly in an integrated environment with Allegro Design Entry-HDL (DE-HDL) and Allegro PCB Editor.

The Analog/RF Option provides a robust set of layout functionalities: parameterized etch element generation, quick placement, RF-style routing, editing of RF etch elements, and the ability to place via arrays along user-specified objects such as an RF component, a connect line (cline), or a discrete component. The generated etch elements will be recognized as RF components with parameters. Users can easily change the parameters of the elements after they are placed; the system will re-generate those elements.

The Analog/RF Option also supports complex copper shape creation and editing with its Flexible Shape Editor, which is a supplement to the existing shape functionality of Allegro PCB Editor. With the ability to understand RF components in PCB layout, the Analog/RF Option offers the unique capability of layout-driven design,

which generates the RF circuit schematic changes in Allegro DE-HDL for new RF elements introduced in PCB design.

The Analog/RF Option also supports different design flows working with RF design and analysis tools from Agilent. It provides a bi-directional interface for design data exchange (partial or complete), a discrete component translator, and import of schematics from Agilent ADS.

Benefits

- Shortens time to integrate RF circuits on a mixed-signal design

- Seamlessly integrated with Allegro DE-HDL and Allegro PCB Editor

- Provides a complete RF/microwave design solution using a unified design environment and database

- Improves design productivity and reduces design time for complex RF shape creation, RF trace routing, and via arrays

- Enables designers to use the same front-to-back and backannotation flow for both digital and RF/mixed-signal designs
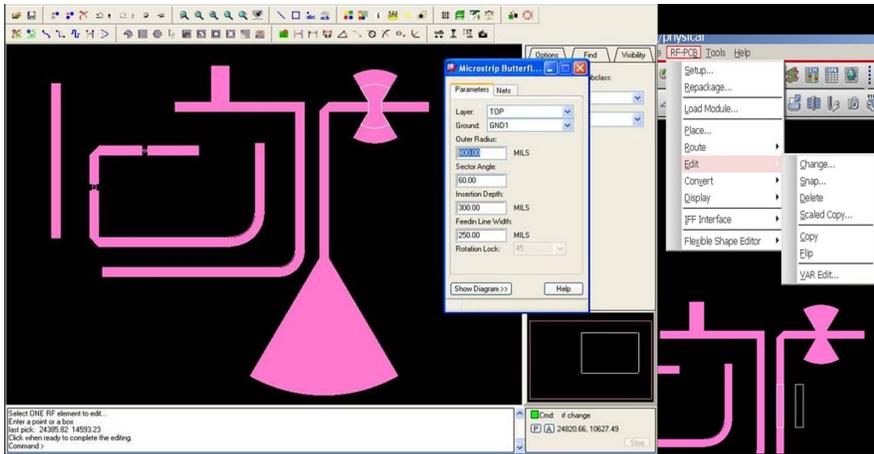
Figure 1: The Analog/RF Option supports creation and editing of complex RF components

- Integrates with Agilent ADS RF design and analysis environment

- Shortens time to update schematics through layout-driven design for RF circuits

Features

Parameterized etch elements

The Analog/RF Option enables creation and editing of RF etch elements that are parameterized to enable their use in RF circuit design creation. There are more than 600 such parameterized elements, from microstrip to stripline to lumped components.

RF layout

The Analog/RF Option provides a powerful and flexible set of manual and interactive placement, routing, and editing tools within Allegro PCB Editor. Since the Analog/RF Option understands RF etch elements, it provides a very easy mechanism for the creation, placement, and connection of RF components. It easily routes an RF trace with different bend styles such as optimally mitered RF bend, curve, or square. It can also connect two points by a direct RF trace or a meander. Other RF layout features include:

- Move, rotate, flip, and copy individual RF components or a selected set of objects (shape, cline, etch elements, vias)

- Group copy, flip, and rotate RF components or a selected set of objects

- Push RF components or a group of etch objects from one layer to another

- Change RF parameters and re-generate RF etch components

- Insert an RF component during the RF routing process

- Electrical calculation and display for RF trace

- Define a custom RF component

- Convert RF components to shapes

- Convert Allegro clines to transmission line components

- Chamfer corners of a RF trace

- Variable/expression display and modification

- Replicate RF circuits quickly, including flip mode for symmetrical/balanced circuits

Flexible Shape Editor (FSE)

The FSE module includes a robust set of editing functionality for line, shape edge, vertex, or whole shapes. It enhances the existing Allegro PCB Editor line/shape editing functions; it provides powerful and flexible functions for copper editing, adjustment, and resizing. This capability increases the flexibility to modify RF shapes and is particularly helpful for

cases in which irregular shapes are used heavily, such as power amplifier circuits and filter circuits.

Allegro DFI from Agilent ADS

The Advanced Design System (ADS) from Agilent includes a design flow integration (DFI) for Allegro technology that allows import of traces, vias, lumped elements, bonds wires, and ball grid arrays for analysis using the 3D electromagnetic field simulators in ADS. Besides the multi-port frequency response output data (S-parameters), ADS provides 3D visualization tools for geometry, fields, and currents. This insight into the physical behavior of internal nodes lets engineers adjust the design to meet performance goals.

RF schematic import

Allegro DE-HDL allows engineers to import RF circuits from the Agilent ADS design environment to integrate with digital/analog portions of the mixed-signal PCB design. The schematic import uses a wizard-driven flow, simplifying the process of symbol creation and schematic update. All parametric RF components are mapped to Allegro RF libraries automatically. A packaged part can be mapped to an existing library using the Universal Component Browser or an Allegro symbol can be created using the information from the imported design. It supports variables/expressions and hierarchical structures.

Via arrays

RF designers use via arrays on RF circuits to provide good grounding/shielding and to mitigate electromagnetic radiation effects. The Analog/RF Option provides an easy method to instantiate an array of vias. Users can place these vias along the boundaries of RF etch components, any copper shape boundary, or along the discrete components.

Layout-driven RF design

The Analog/RF Option enables the backannotation process to automatically generate schematics for RF subcircuits that were added to the PCB RF layout.

This allows RF engineers to create elements in layout, model them using Momentum, and then validate them through simulation using ADS. Automating the creation of schematics for added RF elements reduces the time it takes to update schematics once the RF circuit is validated.

Bi-directional interface with ADS layout

The bi-directional physical interface between Allegro PCB Editor and Agilent ADS enables designers to implement their RF layout designs either in Allegro PCB Editor or in the ADS environment. With PCB RF features, designers can implement the RF design with parameterized components based on a pre-defined RF library or create desired flexible shapes and lines with FSE functionality. The layout structure in Allegro PCB Editor can be transferred to ADS quickly and accurately. It also enables any change/optimization for layout structure in ADS based on electromagnetic simulation to be backannotated to Allegro PCB Editor.
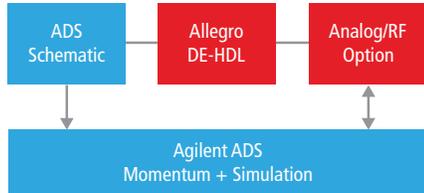

Figure 3: The Analog/RF Option supports various RF design flows with the Agilent ADS environment

Discrete components library translation

The Analog/RF Option allows users to translate discrete, packaged parts from ADS to the Allegro parts library, such
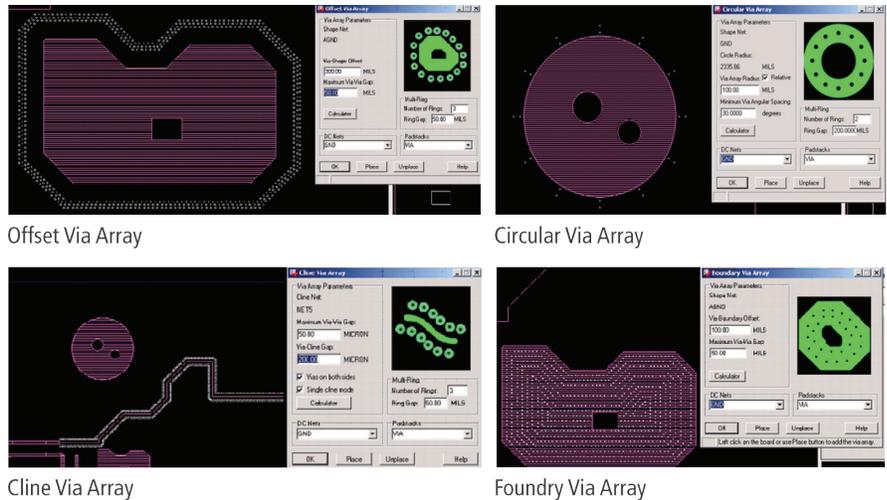

Offset Via Array

Circular Via Array

Cline Via Array

Foundry Via Array

Figure 2: Via arrays are easily instantiated around a user-selected group of objects

as schematic symbols and package footprints. The schematic and layout files are handled at the same time.

Operating System Support

Allegro platform technology

- Linux

- Windows

Cadence Services and Support

- Cadence application engineers can answer your technical questions by telephone, email, or Internet—they can also provide technical assistance and custom training

- Cadence certified instructors teach more than 70 courses and bring their real-world experience into the classroom

- More than 25 Internet Learning Series (iLS) online courses allow you the flexibility of training at your own computer via the Internet

- Cadence Online Support gives you 24x7 online access to a knowledgebase of the latest solutions, technical documentation, software downloads, and more

For More Information

Contact Cadence sales at 1.800.746.6223 or visit www.cadence.com for additional information. To locate a Cadence sales office or Cadence Channel Partner in your area, visit **www.cadence.com/contact_us**.