

1 Overview

- [L-Edit: An Integrated Circuit Layout Tool](#) 1-2
- [Documentation Conventions](#) 1-8



L-Edit: An Integrated Circuit Layout Tool

L-Edit is a layout tool that uses elements drawn on layers to represent the masks that are used to fabricate an integrated circuit. Layers are represented by different colors and patterns.

L-Edit describes a layout design in terms of files, cells, instances, and original drawn “primitive” objects. You may open as many files as you like within the memory constraints of your computer system. A file may be composed of any number of cells. These cells may be hierarchically related, as in a typical design, or they may be independent, as in a “library” file. Cells may contain any number or combination of mask primitives and instances of other cells.

L-Edit is full-featured, high-performance, interactive, and easy to use. It generates layouts quickly and easily, supports fully hierarchical designs, and allows an unlimited number of layers, cells, and levels of hierarchy. It includes all major drawing primitives and supports 90°, 45°, and all-angle drawing modes.

Cells and Instances: The Basic Building Blocks

The basic building block of the integrated circuit design in L-Edit is a cell. Design layout occurs within cells. A cell can:

- Contain part or all of the entire design

- Be referenced in other cells as a sub-cell, or *instance*
- Be made up entirely of instances of other cells
- Contain original drawn objects, or *primitives*
- Be cross referenced in other design files
- Be made up entirely of primitives or a combination of primitives and instances of other cells.

Hierarchy

L-Edit supports fully hierarchical mask design, where cells may contain instances of other cells. An instance is a reference to a cell; should you edit the instanced cell, the change is reflected in all the instances of that cell.

Instances simplify the process of updating a design, and also reduce data storage requirements, because an instance does not need to store all the data within the instanced cell. Instead, only a reference to the instanced cell is stored, along with information on the position of the instance and how it may be rotated and mirrored.

There is no preset limit to the size or complexity of the hierarchy. Cells may contain instances of others cells that in turn contain instances of other cells, to an arbitrary number of levels (subject only to hardware constraints).

L-Edit does not use a “separated” hierarchy: instances and primitives may coexist in the same cell at any level in the hierarchy.

When cells are copied from one file to another, L-Edit automatically copies across any cells that are instanced by the copied cell, to maintain the self-contained nature of the destination file.

Design Rules

Manufacturing constraints can be defined in L-Edit as design rules. Layouts can be checked against these design rules.



Floorplans



L-Edit is a manual floorplanning tool. You have the choice of displaying instances in outline, identified only by name, or as fully fleshed-out mask geometry.

When you display your design in outline, you can manipulate the arrangement of the cells in your design quickly and easily to achieve the desired floorplan.

You can manipulate instances at any level in the hierarchy, with insides hidden or displayed, using the same graphical move and select operations or rotation and mirror commands that you use on primitive mask geometry.

File Formats

L-Edit can import and export two standard mask layout interchange formats (GDSII and CIF), as well as read and write Tanner Database (TDB), Tanner Research's proprietary binary database format.

TDB files contain the same information as CIF or GDSII files, plus additional information such as the last view of each cell, user preferences, and technology information (e.g., layer names, colors, grid and design rules, and stipple patterns).

During the design process, the TDB format is used to load and store design data. The CIF or GDSII formats are typically used to transfer designs to a fabricator or to a CAD platform other than L-Edit.

Although CIF and GDSII are industry-standard formats, each design tool employs its own customizations and extensions, and enforces its own limitations within the standard format. L-Edit's interpretations of these formats are fully described in this guide.

Memory Limits

You can make your L-Edit design files as large as you'd like, given available RAM and disk space.

Hard Copy

L-Edit provides the capability to print the design in hard copy. A multipage option allows you to print very large plots to a specific scale on multiple 8 1/2 x 11 inch pages. An L-Edit macro is available to support large-format, high-resolution color plotting on inkjet plotters.

Variable Grid

L-Edit's grid options support lambda-based design as well as micron-based and mil-based design.

Error Recovery

L-Edit's error-trapping mechanism catches system errors and in most cases provides a means to recover without losing or damaging data.

L-Edit Modules

- L-EditTM: a layout editor
- L-Edit/SPRTM: an automatic standard cell placement and routing package
- L-Edit/BPRTM: an automatic block place and route package
- L-Edit/ExtractTM: a layout extractor

- L-Edit/DRCTM: a design rule checker
- LVS: a layout versus schematic netlist comparison tool

L-Edit/SPR generates layouts for standard cell design and can automatically construct entire chips. It includes cell placement and routing, pad frame generation, and pad routing. SPR accepts netlists produced by S-Edit and creates masks ready for fabrication.

L-Edit/BPR performs automatic block placement and routing and includes interactive signal integrity and timing analysis

L-Edit/Extract creates SPICE-compatible circuit netlists from L-Edit layouts. It can recognize active and passive devices, subcircuits, and the most common device parameters, including resistance, capacitance, device length, width, and area, and device source and drain area.

L-Edit/DRC features user-programmable rules and handles minimum width, exact width, minimum space, minimum surround, non-exist, overlap, and extension rules. It can handle full chip and region-only DRC. You can easily locate design rule violations in two ways, either by searching for ports placed on the Error layer or by reviewing the text of the **.drc** design rule errors file.

LVS is a stand-alone application that can be invoked from within L-Edit. It compares two netlists to determine whether they describe the same circuit. When they do not, LVS works in conjunction with L-Edit to identify and correct errors.

Documentation Conventions

This section contains information about the typographical and stylistic conventions used in this user guide.

Special Fonts

The following inline references are represented by a bold font:

- Menu and simulation commands (For example: **.print tran v(out).**)
- Literal user input (For example: Enter **14.5**.)
- Program output (For example: S-Edit generates names for the ports on the symbol based on the **PAD** string.)
- All dialog elements—fields, checkboxes, drop-down menus, titles, etc. (For example: Click **Add**.)

Freestanding quotations of input examples, file listings, and output messages are represented by a constant-width font—for example:

```
.ac DEC 5 1MEG 100MEG
```

Variables for which context-specific substitutions should be made are represented by bold italics—for example, ***myfile.tdb***.

Sequential steps in a tutorial are set off with a checkbox (☑) in the margin.

References to mouse buttons are given in all capitals—for example, MOVE/EDIT. When a key is to be pressed and held while a mouse button is used, the key and button are adjoined by a plus sign (+). For example, **Shift**+SELECT means that the **Shift** key is pressed and held while the SELECT mouse button is used.

The terms “left-click,” “right-click,” and “middle-click” all assume default mappings for mouse buttons.

Text omitted for clarity or brevity is indicated by an ellipsis (...).



Menu Commands and Dialog Titles



Elements in hierarchical menu paths are separated by a > sign. For example, **File > Open** means the **Open** command in the **File** menu.

Tabs in dialog boxes are set off from the command name or dialog box title by a dash. For example, **Setup > Layers—General** and **Setup Layers—General** both refer to the **General** tab of the **Setup Layers** dialog.

Special Keys

Special keys are represented by the following abbreviations:

<i>Key</i>	<i>Abbreviation</i>
Shift	Shift
Enter	Enter
Control	Ctrl
Alternate	Alt
Backspace	Back
Delete	Del
Escape	Esc
Insert	Ins
Tab	Tab
Home	Home
End	End
Page Up	PgUp
Page Down	PgDn

<i>Key</i>	<i>Abbreviation</i>
Function Keys	F1 F2 F3 ...
Arrow Keys	↓, ←, →, ↑

When certain keys are to be pressed simultaneously, their abbreviations are adjoined by a plus sign (+). For example, **Ctrl+R** means that the **Ctrl** and **R** keys are pressed at the same time.

When certain keys are to be pressed in sequence, their abbreviations are separated by a space (). For example, **Alt+E R** means that the **Alt** and **E** keys are pressed at the same time and then released, immediately after which the **R** key is pressed.

Abbreviations for alternative key-presses are separated by a slash (/). For example, **Shift+↑ / ↓** means that the **Shift** key can be pressed together with either the up (↑) arrow key or the down (↓) arrow key.

Online User Guide Conventions

Text

Chapter title

Text or **Text**

Indicates a hypertext link

Contents/Search

Indicates a link to the Table of Contents file

Index

Indicates a link to the Index file

Indicates a link to the previous/next page

Acrobat Reader Toolbar Tips



Go to previous/next page



Go to start/end of chapter





Go back/forward through pages viewed



Perform a full-text search



Open the search results list



Go to previous/next search result item