

# Printing Masks on Transparency Film at Princeton University

Last update on 5/12/2006

The Princeton University Office of Printing and Mailing in Forrestal can no longer print mask designs on transparency films. An outside vendor, Infinite Graphics Incorporated, [www.igi.com](http://www.igi.com), can do this for you. Please call them and inquire about the minimum feature size and the overlay accuracy. In general, consider printing your mask if your minimum feature size is larger than 10  $\mu\text{m}$ . Also, printed masks are not very good for complicated multilayer designs, due to the difficulty of registering the printed designs. The outside vendors prefer GDSII or DXF files.

1. Create design using a standard CAD program (like *L-Edit Pro* or *AutoCAD LT*).

The printing service can usually reverse the process designs you submit (i.e. print white as black, black as white). Keep this in mind when drawing your design. (It is of course also convenient if you wish to switch to a negative resist, without redrawing the design.)

2. If using L-Edit, export your design to a GDS file. To do this, go to the "File" menu and choose "Export Mask Data" and then "GDSII". If using AutoCAD, save the file as a DXF. If you need to perform any file conversions, use the software *LinkCAD*.

If your minimum feature size is fairly large, you may even print your mask on a transparency using regular 600 dpi postscript printer. To do that you need to convert the file into Post-Script.

3. File conversion. Open the shortcut to *LinkCAD* on the desktop. *LinkCAD* will automatically take you through several menus, most of which are self-explanatory. However, it is important to remember the following:

In the window titled "File Structure", you will see on the LHS a layout of the file's cell structure, and on the RHS a list of the different layers contained in the file. The name of each layer is given and also the layer's color is indicated in a box next to the layer name. Click on a box to change its color. Change the color of each box to black, as you want to print features with the highest optical density.

In the window titled "Post-Script Export Options", you can adjust a number of options regarding the paper format, the layer layout and the scaling. Under the scaling heading on this window, select the "True Scale" option (this will ensure the original scaling of your L-Edit file is retained).

4. Check postscript file using *Ghostview*. You may print the design and ensure that it is to scale.

5. PRISM requires users to transfer their transparency designs to a chrome mask. This is quite simple and requires only that you purchase a chrome mask (usually obtained prespun with photoresist) and learn how to use the MA6 mask aligner at PRISM. To transfer a design from transparency film to a chrome mask using the MA6, lay the printed transparency on the blank resist-covered chrome mask, making sure that the printed side (i.e. the “dull” side of the transparency) faces down against the mask (with the shiny back of the transparency facing upwards). Then place a clear mask (i.e. a mask with chrome etched away) in the mask holder. The transparency film will then be pressed flat against the clear glass mask during the exposure, ensuring that the design is transferred without too much distortion.

Photoresist/Cr-coated glass plates for mask making can be purchased from:

Nanofilm  
2641 Townsgate Road  
Westlake Village, CA 91361  
(805) 496-5031  
<http://www.nanofilm.com>