520.495/530.495/580.495 Microfabrication Laboratory

Laboratory Assignment (Lab 1b)

Instrumentation and Measurements

Mask Design Using LEDIT (this lecture is held in Barton 120, not in Clark)

This week we will learn how to do the physical layout for designing masks using the program LEDIT.

LAB OBJECTIVES

1. To get familiar with the physical layout editor LEDIT for designing masks

I. PRELAB WORK (no prelab to turn in)

1. Browse the web page for the class project done a decade ago in our lab! (click on the Fall 2004 link in the archives section of our website). Read the final report by T. Edwards. (http://www2.ece.jhu.edu/faculty/andreou/495/1998/TE94Report/sensor.html)

II. LAB WORK

1. Login in one of the Windows machines in the ECE computer lab room in Barton Hall 120. Use the login names and passwds that were given in the class.
2. Open the LEDIT 11 User Guide in Acrobat and read Section 1 pages 28 to 227. While reading through, practice the various commands. You will find the quick reference guide very helpful at this point.
3. Start the program and load the file *PXMask.tdb*. You will see the various structures that make up the MEMS pressure sensor because they are coded by different colors and patterns. The diffusion mask patterns are green, the metallization mask patterns are blue, the contact cuts are black and the membrane etch mask is coded by purple grid pattern. The design is done hierarchically and you can navigate through the individual cells. If you make changes in a leaf cell, these changes will manifest themselves to all instances of the leaf cell. As our lab facilities are limited, the number of mask steps are also limited. A typical CMOS process has a minimum of nine mask layers and more advance processes will have eleven or twelve. The design is done on a grid and the size of the basic grid spacing is one lambda (minimum feature size). This is a parameter that depends on the process. For example, state of the art CMOS processes today have a lambda of 90nm!
4. Find out the dimensions of the basic structures on the mask using ruler function. Get a hardcopy of the design by printing it and indicate on it these dimensions. What do you think lambda is for our process?
5. Ask the Lab Assistants to show you the mask set for this project next time in Microfab.

III. Postlab Work:

1. Check out MOSIS (Metal Oxide Semiconductor Implementation Service) (http://www.mosis.com//), a silicon foundry that provides services for state of the art IC processes. What is the state of the art fabrication process offered by the foundry today? How many metal layers and how many polysilicon layers are offered in this process?
2. On a hardcopy of pressure sensor design, mark dimensions of the basic structures. What is the lambda in our process?
3. In IC process, “mask” is a general term that can refer to several different things. What are these things that called “mask”?

BIBLIOGRAPHY

1. Download from the CAD Lab and Resources section of the course website. Alternatively, the LEDIT user guides and quick reference guides can be accessed through “START/Programs/Tanner EDA”, or in the installation directories for the respective programs. In the ECE computers these programs are installed in:

C:\Program Files\Tanner EDA\L-Edit 11.0

Lab procedure prepared by A.G. Andreou, Fall 2004. Revised by H. Vo, T. Yeh, M. Ho and A.G. Andreou, Fall 2007.