Laboratory Report Format
PMOS Fabrication Process

1. Introduction and Background (~ 0.5 – 1 page)

In this short section, introduce the PMOS process, giving an overview of the goals. Mention which processes were undertaken and what was expected.

When writing, assume that your audience that will be reading this report is composed of senior undergraduate students that have just begun the EE/MSE 5211 course. The overall goal of this report will be to describe the process to these hypothetical students and to present and interpret the results for them. Respond to the questions in this handout in the corresponding sections.

The format of the report should be similar to the format of this handout. Include a cover page with the title "PMOS Fabrication Process", the course name and number, your name, your TA's name, and the date. Number all of the pages. Figures should be numbered and may either be inserted within the text or included as individual pages. Staple the report together with a single staple. The report should end up being approximately as long as the sum of suggested lengths given by the indicated section headings. An important aspect of this assignment is to write a very good, accurate, and easily readable report that is not too long. Do not include page after page of irrelevant data, such a the numerical output of the Detak – instead, make a plot.

Please Note: This report *must* be individually written by each student. Reports that share text and writing will be graded very harshly.

2. Fabrication processes and characterization (~ 3 – 5 pages)

In these initial paragraphs of this Section, briefly cover the process steps and characterization techniques that will be presented in the Subsections. Indicate how these may relate to one another. For example, you may want to discuss issues of over all mask alignment or oxide thickness. However, give the *details* of each process step in the appropriate Subsection below.

In the following Subsection for each processing step, include the process conditions and parameters, the results of any pre-process calculations you did (like oxide thickness

or sheet resistance resulting from a diffusion), and observations of the results. Consider including simple plots or diagrams as appropriate.

2.1 Boron diffusion

Describe the processes for patterned boron pre-deposition and drive in. What are the specific goals of these processes? What was the result for *your* wafer? What steps were necessary to correct any problems? Report the process conditions. Give not only the intended process parameters, but also the actual parameters, including any unintentional variations or problems.

2.2 Gate oxide

Describe the processes for aligning and growing the gate oxide layers. What are the specific goals of these processes? What was the result for *your* wafer? What steps were necessary to correct any problems? Report the process conditions. Give not only the intended process parameters, but also the actual parameters, including any unintentional variations or problems.

2.3 Contact vias

Describe the processes for etching contact vias. What are the specific goals of these processes? What was the result for *your* wafer? What steps were necessary to correct any problems? Report the process conditions. Give not only the intended process parameters, but also the actual parameters, including any unintentional variations or problems.

2.4 Metallization

Describe the processes for applying and patterning the aluminum metallization layer. How does electron beam evaporation work? What are the specific goals of these processes? What was the result for *your* wafer? What steps were necessary to correct any problems? Report the process conditions. Give not only the intended process parameters, but also the actual parameters, including any unintentional variations or problems.

3. Measurements and Discussion of Results (~ 0.25 – 1 page)

Most of the wafers processed by the class were completed by the end of the semester, with the lab sections generally overcoming a number of difficulties. The measurements of the resistors and *pn* diodes did not produce results that may be used to analyze the intended characteristics of these devices. However, in working with the Laboratory

Instructors and some students, we were able to make some observations and take some data that may be used to draw some conclusions about what may have went wrong. In your report, you may cite these data and observations as well as observations from your own processing results (such as alignment and etching quality). Then discuss the possibilities of what may have happened and what you think the most likely problem was.

Our collective observations included: For the wafers that are apparently aligned and processed correctly, almost all of the resistors and diodes do not conduct a current, and behave as open circuits. However, we measured the IV characteristics of at least one resistor with a symmetric, nonlinear IV curve suggestive of back-to-back Schottky diodes that were breaking down in reverse bias. When the aluminum and oxide was etched off to directly probe a *pn* diode and a resistor, we found a reasonable *pn* diode IV characteristic and a linear resistor characteristic with a resistance on the order of 100 ohms.

4. Conclusions and Recommendations (~ 0.25 – 1 page)

Give a very short recapitulation of your overall process and characterization results. What did you find valuable? How may the course be improved, in terms of the course content and the practical laboratory arrangements?