THE EFFECT(S) OF MASK ALIGNMENT TO P-N JUNCTION

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Final Year Project Report Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Industrial Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA

MAY 2010

ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah S.W.T. because give me such a great opportunity to do my final year project I and complete this final proposal.

I would like to take this opportunity to express my sincere gratitude to my supervisor, Miss Farah Liyana for her keen effort, interest, advice and insightful comments throughout the period of this project. Thank you for giving me this good chance to learn and gain very valuable knowledge during this project preparation. May Allah shower His blessing and mercy for her sincere guidance.

I also would like to convey sincere thanks to Lecturers, friends and staffs that involved for their, cooperation, guidance, and helpful in sharing their knowledge and ideas throughout the project.

Finally, thanks to those who have contributed directly or indirectly until the completion of this project. Above all, I thank Allah the Almighty for His grace, mercy and guidance throughout my life.

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ABSTRACT

This project was a study about the effects of mask alignment to p-n junction. A p-n junction is a junction formed by joining the p-type and n-type semiconductor together in a very close contact. The term junction referred to the region of the boundary for both type of the semiconductor. Mask was a piece of paper that contain image that would covered the entire wafer. Photolithography process would transfer the image on the mask to the wafer surface. A computer aided design (CAD) system used in which designers can completely describe the selected patterns that was desired to be fabricated. The digital data produced by the CAD system then drives a pattern generator, which is an electron beam lithographic system that transfers the pattern directly to electron-sensitized mask. TURBO CAD was a suite of CAD software products for 2-dimensional design and drafting. By using this software, different kind of masks with different kind of dimensions and alignment mark would be produced. Dimensions of device were important for determining the goodness and reability of the mask design. Mask need to be precisely aligned with the original aligned mask or otherwise it cannot successfully transfer the designed pattern to the wafer surface, causing device and circuit failures. By using different design of masks, many type of p-n junction can be fabricated. From this project it shown that mask alignment was very important and gave bad effects to our devices. It can be observed that the dimension (length and width) of device on the mask design affect the doping process. The most suitable mask of all the masks that have been created was mask for sample 4. The significance of the mask dimension and mask alignment determined through its effects to the p-n junction.

CHAPTER 1

INTRODUCTION

1 BACKGROUND OF STUDY

1.1.1 SEMICONDUCTOR

A semiconductor was a material that has an electrical resistivity between a conductor and an insulator. One of the important properties of semiconductor was the ability to change the conductivity that has made it as a good material in producing devices. In a metallic conductor, current is carried by the flow of electrons. However, in semiconductors, current can be carried either by the flow of electrons or by the flow of positively charged holes. Both of electron and hole carriers can contribute to a current. The most commonly used material for semiconductor are silicon (Si) and germanium (Ge). Other compounds, such as gallium arsenate (GeAs), silicon carbide (SiC) and silicon germanium (SiGe) were also classified as semiconductor material.