THE EFFECT OF TEMPERATURE IN FABRICATING THE P-N-P JUNCTION TRANSISTOR BY USING LIQUID DOPANT ON SILICON (100) WAFER

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ABSTRACT

THE EFFECT OF TEMPERATURE IN FABRICATING THE P-N-P JUNCTION TRANSISTOR BY USING LIQUID DOPANT ON SILICON (100) WAFER

In this study, a P-N-P junction by using solid dopant on silicon (100) wafer was designed and fabricated. Silicon has been used as the substrate to fabricating a device. Bipolar junction transistor (BJT) were made either PNP or NPN junction depending on the configuration of the layers. From this study, P-N-P junction transistor was fabricated. In the photolithography process of the P-N-P junction transistor, there were five mask design pattern that would be used.

P-type dopant which was boron would be used during the diffusion process. The fabrication of P-N-P junction transistors would be made on silicon (100) wafer. The process can be controlled by using the different of temperature and time during the diffusion process. An observation done to ensure the effect of temperature. The relationship between dopant concentration and sheet resistivity would be analyzed by using 4-point probe measurement. The I-V characteristic testing also were tested to obtained the electrical characteristic of the devices.

The result show that the devices were fabricated at 6 different values of diffusion temperatures which were at 700°C, 750°C, 800°C, 900°C, 950°C, and 1000°C. After characterized processed, its found that the sheet resistance is depending on the temperature in diffusion process . At temperature 700°C, 750°C, 900°C, 950°C, and 1000°C, the value of the sheet resistance were 61108.16 Ω/sq, 33677.90Ω/sq, 14565.02 Ω/sq, 1747.88 Ω/sq and 545.43Ω/sq respectively but only one sample given the different value of sheet resistance that was diffused at temperature 800°C which the value of sheet resistance got was 96155.02 Ω/sq respectively. So it concluded that , there have a relationship between sheet resistance, diffusion time, concentration of dopant and temperature during the fabrication process.