INVESTIGATION OF EFFECT GATE SIZE'S SCALING IN NMOSFET ON CURRENT-VOLTAGE (I-V) CHARACTERISTIC

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

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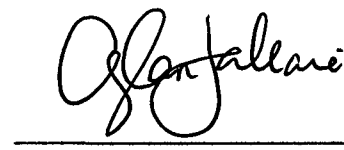
This Final Year Project report entitled "**Investigation of effect gate size's scaling in NMOSFET on current-voltage (I-V) characteristic**" was submitted by Mazuin Binti Ab Rahman, in partial fulfillment of the requirement for the Bachelor of Science (Hons.) Industrial Physics, in the Faculty of Applied Sciences, was approved by



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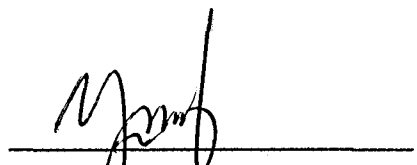

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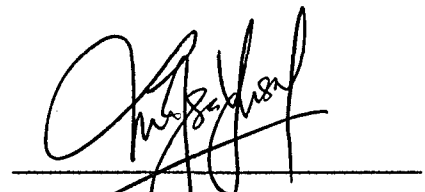

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ABSTRACT

INVESTIGATION OF EFFECT GATE SIZE'S SCALING IN NMOSFET ON CURRENT-VOLTAGE (I-V) CHARACTERISTIC

MOSFET is metal oxide semiconductor field effect transistor have been scale down in the critical device parameter to achieve highest integration density and performance. Smaller size of transistor give higher speed, it is consumes very low power and has a high yield of working devices. This report present an investigation of effect gate size's scaling in NMOSFET *on current-voltage (I-V) characteristic. The parameters* understudy to investigate the effect on (I-V) characteristic is threshold voltage and saturation current. An initial research found that, among the process parameter involved in the manufacture of devices, gate length has the most influential effect on those parameter. This study showed that it is capable to fabricated transistor in the normal environment laboratory but it is difficult to get ideal transistor because of some limitation and factor. The study also proved that, producing MOSFET with gate lengths much smaller than micrometer is a challenge, and the difficulties of semiconductor device fabrication are always a limiting factor in advancing integrated circuit technology.

CHAPTER 1

INTRODUCTION

1.1 Background

This research was executed as an attempt to observe the effect of gate scaling of n-channel MOSFET (NMOSFET) on its I-V characteristic. This project study about the Metal Oxide Semiconductor Field Effect Transistor (MOSFET) because it is heart or core of integrated circuit design and it is a device used to amplify or switch electronic signals. The MOSFET is used widely in digital circuit application because of its relatively small size; millions of devices can be fabricated in a single integrated circuit. MOSFET is increasingly used in areas as varied as main frame computers and power electronics because it consumes very low power and has a high yield of working devices.

MOSFET is made up from an MOS diode and two p-n junctions placed directly closest to the MOS diode. Generally, MOSFET consists of source, drain and gate but actually MOSFET is a four-terminal device which is source, drain, gate and body. In most cases, the substrate or body terminal will be at ground potential. The current in the MOSFET is due to the flow