شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics Engineering and Electrical Communications

Integrated Circuits for Photodiode Applications

A Thesis submitted in partial fulfilment for the requirements of a

Master of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

by

Mostafa Mohamed Hesham Kamel Toubar

Master of Science in Electrical Engineering
(Electronics Engineering and Electrical Communications)
Faculty of Engineering, Ain Shams University, 2021
Supervised By

Prof. Mohamed Amin Ebrahim Dessouky

Assoc. Prof. Sameh Assem Ibrahim

Dr. Yousr Ismail

Cairo - (2021)

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics and Communications

Integrated Circuits for Photodiode Applications

by

Mostafa Mohamed Hesham Kamel Toubar

Bachelor of Science in Electrical Engineering
(Electronics Engineering and Electrical Communications)
Faculty of Engineering, Ain Shams University, 2017

Examiners' Committee

Name and Affiliation	**Signature**
Prof. Ahmed Nader Mohieldin Faculty of Engineering, Cairo University, Electronics and Communication Engineering Dept.	……..
Prof. Hani Fikry Ragaai Faculty of Engineering, Ain Shams University, Electronics and Communication Engineering Dept.	……..
Prof. Mohamed Amin Dessouky Faculty of Engineering, Ain Shams University, Electronics and Communication Engineering Dept.	……..
Assoc. Prof. Sameh Assem Ibrahim Faculty of Engineering, Ain Shams University, Electronics and Communication Engineering Dept.	……..

Statement

This thesis is submitted as a partial fulfilment of Master of Science in Electrical Engineering and Communications Engineering Department, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

Student name: Mostafa Mohamed Hesham Kamel Toubar

Signature

……

Acknowledgement

All glory is due to Allah, the Lord of the Worlds, the Most Merciful. I would like to thank Almighty God for giving me the opportunity, courage, and desire to finish this work.

I would like to express my gratitude to all my family, my father, my mother, my sister, my son, my wife and her family who always supports and encourages me in my career path. Many thanks to my supervisors Prof. Mohamed Dessouky, Assoc. Prof. Sameh Ibrahim and Dr. Yousr Ismail for their guidance, useful suggestions, continuous motivation, and feedback.

I would like to thank all the IC Lab professors and my colleagues Ahmed Mansour, Khaled Hafez, Hazem Hassan, Bishoy Milad, Omaira Hamada, Mostafa Hosny, Andrew Mikheal, and Mohamed Fouad for their continuous support and useful technical discussions.

Mostafa Mohamed Hesham Kamel Toubar

Electronics and Communications Engineering Department Ain Shams University, Cairo, Egypt

June 2021

Researcher Data

Name	: Mostafa Mohamed Hesham Kamel Toubar
Date of birth	: 15/09/1994
Place of birth	: Cairo, Egypt
Last academic degree	: B.Sc. in Electrical Engineering
Field of specialization	: Electronics and Communications
University issued the degree	: Ain Shams University
Date of issued degree	: August 2017
Current job	: Teaching Assistant in Faculty of Engineering Ain shams University Electronics and Communications Department.

Summary

This thesis aims to study and design charge pump circuits for photodiode applications. The thesis is divided into three main parts photodiodes and the need for charge pump circuit in photo diode applications, both photodiode and charge pump integration limitations, and the study of charge pump circuits and the proposed design of the charge pump. The thesis consists of six chapters including lists of contents, tables and figures as well as list of references.

Chapter 1

Chapter 1 gives a brief introduction to the motivation, objectives, major contributions and organization of the thesis.

Chapter 2

Chapter 2 discusses the photodiode types and characteristics.

Chapter 3

Chapter 3 shows the study and comparison of different architectures of charge pump circuits.

Chapter 4

Chapter 4 shows the integration of the charge pump and photodiode and its limitations.

Chapter 5:

Chapter 5 discusses the proposed charge pump circuits.

Chapter 6:

Chapter 6 discusses the conclusions for this work and the suggested future work including optimization or extra features.

Keywords: High Voltage Charge Pump, Photodiode, SPAD, APD, PD, High Voltage Driver, Optical detectors.