# STUDY AND IMPLEMENTATION OF TOUCH PANEL THAT GENERATES ELECTRICITY TO CHARGE GADGET

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Industrial Electronics) With Honours

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**Sesi Pengajian** : 0 9 / 1 0

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Dedicated to my family, especially Tuan Haji Harun Bin Mat Isa (father), and Puan Habshah Binti Sulaiman (mother). Also to my Projek Sarjana Muda supervisor, Puan Afifah Maheran Binti Abdul Hamid. Not to forget, to all my friends.

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# ABSTRACT

This project of Study and Implementation of Touch Panel That Generates Electricity to Charge Gadget is to develop electronic charger using touch panel as the main power source. This project will not use any external power source except the touch panel. The purpose of developing this project is to solve problems of time consume when charging electronic gadget. Also, this project can help in reducing the usage of electricity, thus, also reduce the cost. This study and implementation of touch panel as a charger has gone through research and testing which has proven that the touch panel can generate enough electricity that can be use for charging electronic device. From the result, the touch panel generates average output of 2.0V DC voltage when normal mechanical stress is applied on it. This output is low for charging device, therefore, this project also has came out with a combined circuit of boost regulator and voltage regulator circuit to produce the sufficient output of 5V DC voltage which is suitable for charging electronic devices.

# ABSTRAK

Projek ini bertujuan untuk membuktikan bahawa panel sentuh dapat menghasilkan kuasa sebagai input untuk mengecas peranti atau alat elektronik seperti telefon dan sebagainya. Projek dan penyelidikan ini bertujuan untuk mengatasi masalah menunggu sesuatu alat elektonik untuk dicas apabila kehabisan kuasa. Selain itu, dengan penciptaan pengecas menggunakan panel sentuh ini, penggunaan elektrik dapat dikurangkan, dan seterusnya dapat mengurangkan perbelanjaan untuk penggunaan elektrik. Projek ini telah menjalani kajian dan juga ujian dimana keputusan yang diperolehi menunjukkan bahawa panel sentuh ini dapat menghasilkan kuasa yang boleh digunakan untuk mengacas alatan elektronik. Hasil kajian menunjukkan panel sentuh dapat menghasilkan kuasa purata setinggi 2.0V DC apabila tekanan dikenakan ke atas panel sentuh. Kuasa yang terhasil ini agak rendah, oleh itu satu litar telah dihasilkan iaitu dengan menggabungkan litar "boost regulator" dan "voltage regulator" untuk menghasilkan keluaran kuasa 5V DC voltan yang boleh digunakan untuk mengecas alatan elektronik.

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| | |
|---|---|
| PVDF | – Polyvinylidene Fluoride |
| PZT | – Piezoelectric Lead Zirconate Titanate |
| ITO | – Indium Tine Oxide |
| DC | – Direct Current |
| AC | – Alternating Current |
| PSM | – Projek Sarjana Muda |
| PCB | – Printed Circuit Board |
| THUNDER™ | – Thin Layer Composite Unimorph Ferroelectric Driver and Sensor |
| NASA | – National Aeronautics and Space Administration |

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# CHAPTER I

# INTRODUCTION

## 1.1 Project Background

Most of the people today consider electronic gadget as an important device that can help improving and helping their daily life. People reliance upon electronic devices has risen significantly throughout the ten years, and most people demands for decreased size and enhanced capabilities for new ways to supply electric energy to these devices. On top of that, people always rush in doing jobs or works because of the challenges and competitions from others. Therefore, they will have less time to spend on waiting to charge their gadget that need to be use in their daily life.

Traditionally, batteries have been sufficient, but this solution will become less practical and inefficient as demands evolve. Further, normal batteries or cells (chemical type) have a limited lifetime, and their frequent replacement can be costly to anyone. Therefore, this project is one of the solutions for the problem of spending time waiting to charge the electronic the normal way.

This project is to study and undergo research and development to produce a product that is using touch panel that can generates electricity to charge gadget while moving. To be more specific, the purpose of this project is to develop a charger using touch panel that is implemented in shoes that can be connected to the gadget. The

function of the shoes is to apply mechanical force on the touch panel inside of the shoes to generate electricity using piezoelectric effect.

As a result, users are able to charge their gadget while walking or running with the charger in their shoes and continue their daily activities without worrying their gadget will be out of power. Users do not need to spend time charging their gadget.

## 1.2 **Objectives**

The main objectives of the project are :

i. To study and do research on how the touch panel can generate electricity as an output.

ii. To implement the touch panel as a charger that can charge electronic gadgets

iii. To design a suitable circuit to convert the output from the touch panel to meet the requirement to charge electronic gadgets.

iv. To produce a final product which is charger by using touch panel and being implemented in shoes.

## 1.3 Problem Statements

i. As we know, today's life is getting busy as time flies and electronic gadgets play a very important role in completing or doing daily activities. Currently, the charger provided by gadget's manufacturer, users need to connect the charger to the power supply. User has to wait for their gadget to be charged. As a result, users will waste a lot of time waiting for their gadget.

ii. The normal charger uses the power source that supplied by electric provider. Almost all electric providers generate electricity from oil, charcoal and many more natural resources which lead to pollution to environment. So, charging device will increase the usage of electricity, thus increase the pollution made to the environment.

iii. Conventional charger cannot give mobility to the users when charging their electronic device. To use the electronic device when it is still charging, users need to stay at the place where the charger is connected to power supply. Therefore, users can not go anywhere to do other works and need to stay to use their electronic device when the electronic device is charging.

## 1.4 Work Scope

The work scopes also include the study and research on how the touch panel will generates electricity and the concept use. This is very important to make sure that this project can be done. The touch panel must be research in all aspect such as specification, element of construction, size, durability and the working condition of the touch panel. Also, the concept use in this project need to be suitable and can produce desired electricity from device charging.

After the study and research have been carried out, a simulation of the project will be carried out. The simulation will be focus on the output voltage that need to be produce which is 5V from the variable input from the output of the touch panel. This part of work scope is very important to observe the output voltage using the variable input from the voltage the touch panel generates.

When the simulation and all the specification of the project have been obtained, the project will begin with the real product. The touch panel will be tested to observe the real performance and the output generates in working condition. If there is any error or anything that did not meet the desired requirement desired, adjustment will be made.

The last work scope is, hopefully to produce the final product. The circuit and the touch panel need to be implemented correctly in shoes to make sure that the touch panel and circuit can be functional and the users can use the shoes as comfortable as it can. The safety of the product also will be observed and tested under all condition to ensure the project meet all the safety requirements.

## 1.5 Advantages Of The Project

i. Save time consume

Users can charge their gadget while doing daily activities such as moving, like walking or running. As we know, today's life is getting busy as time flies. Therefore the people should optimize their time wisely. Besides, electronic gadgets play a very important role in completing or doing daily activities. Currently, the charger provided by gadget's manufacturer, users need to connect the charger to the power supply. User has to wait for their gadget to be charged. As a result, users will waste a lot of time waiting for their gadget. This project is a solution to avoid the problem of running out of power of their gadget of to this where users can charge their electronic gadget while moving.

ii. Save the environment

This project is to develop a charger that can generate its own electricity using piezoelectricity effect (will be discuss later). It can be categorized as a renewable energy which means energy that naturally replenish. The normal charger uses the power source that supplied by electric provider and almost all electric providers generate electricity from oil, charcoal and many more natural resources. In comparison to this project which is environmentally safe which use touch panel to generate electricity.

iii. Easy to use

This project is designed to be easy to use by all level of citizens. The touch panel and the circuit will be designed to suit the shoes design. Users only need to wear the shoes and connect the device to their gadget. Touch panel and the circuit implemented in the shoes will be placed carefully and maintain the comfortability of the shoes.

iv. Economical

Due to this device generates its own electricity to charge gadget by applying mechanical force on it, users do not have to pay for electrical usage, unlike the normal charger using power supply. So, it can save a lot of money and users can still charge their gadget.

v. Healthy lifestyle

This project also can promote a healthy lifestyle as it need mechanical force. In other words, body movement like walking or running is useful for it to be functional. Users can do daily exercise like jogging, running and playing games and at the same time charging their electronic device.

## 1.6 Overview of the Report

This report can be divided into five chapters. Below is brief explanation of each chapter.

**Chapter 1** briefly discusses about the introduction of the project. This chapter covers objectives, problem statement, work scopes, and advantages of this project.

**Chapter 2** covers the literature review and theoretical aspect of this project. This chapter is an important part of the project in which it discusses the concept used and also about the touch panel as the main element of the project. All the aspects needed to be considered such as specification, requirements, and standards of the touch panel are covered in this chapter.

**Chapter 3** covers the methodology used in this research and development. The touch panel hardware research is discussed as well as the construction and fabrication of the circuit that will be used in this project. For the simulation, the circuit is tested using engineering software.

**Chapter 4** discusses the analysis and results. The result will determine whether the touch panel that is being tested is compatible and suitable for this project.

**Chapter 5** summarizes and discusses the overall status of the research of the project and also the discussion about it. Future recommendations and suggestions for this project also included in this chapter.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 Concept

For the literature review of the touch panel, research and study has been done on the concept that the touch panel use to generate electricity. Piezoelectric effect is the concept use to generate electricity from the touch panel. Based on the study and research made, the piezoelectric effect is the concept that the touch panel will use to generate electricity. Piezoelectric effect means the ability of some materials (notably crystals and certain ceramics, including bone) to generate an electric field or electric potential in response to applied mechanical stress, [1]. The piezoelectric effect was discovered in 1880 by the Jacques and Pierre Curie brothers. They found out that when a mechanical stress was applied on crystals such as tourmaline, tourmaline, topaz, quartz, Rochelle salt and cane sugar, electrical charges appeared, and this voltage was proportional to the stress, The piezoelectric effect occurs only in non conductive materials. Piezoelectric materials can be divided in 2 main groups: crystals and ceramics, [2].

The term *piezo* comes from a Greek word meaning to press or squeeze, [3]. This mechanical force (stress) can be caused by hitting or twisting the material just enough to deform its crystal lattice without fracturing it. The effect also works in the opposite way, with the material deforming slightly when a small electric current is applied, [4]. This concept of piezoelectric effect was found hundreds years ago and is

very useful to many applications, but need to bare in mind that not all material have the ability of piezoelectric effect.

Interest in piezoelectric crystals, ceramics, and films has grown rapidly over the past two decades as new applications in active control systems and transducers have emerged. It has been shown in a variety of aerospace applications that the electromechanical coupling properties of these materials can be utilized for active structural damping of high frequency dynamics, [5]. A wide variety of crystal and flexible film types exist today, most of which are inexpensive, easy to manufacture and adapt, and display well-documented electromechanical properties.

When an external force mechanically strains a piezoelectric element, the ions in these unit cells are displaced and aligned in a regular pattern within the crystal lattice. The discrete dipole effects accumulate, resulting in an electrostatic potential developed between opposing faces of the structure, [6]. Relationships between applied force and the subsequent response of a piezoelectric element depend upon three factors:

i. the dimensions and geometry of the element
ii. the piezoelectric properties of the material
iii. the directions of the mechanical or electrical excitation

To designate these directions, a three-dimensional, orthogonal modal space is defined.