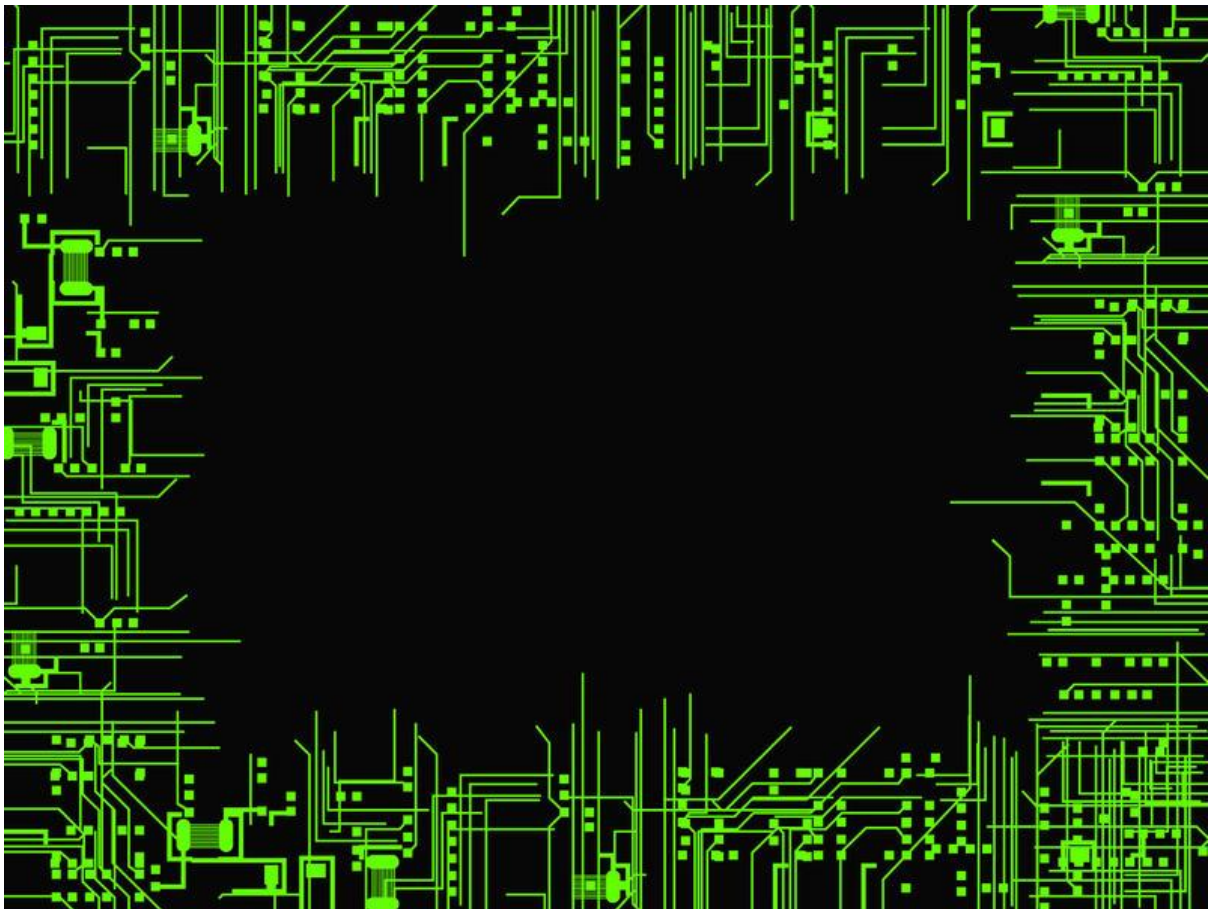


CELL PHONE DETECTOR

PROJECT REPORT

SUBMITTED BY: PULKIT PANDEY – 2K19/EP/076



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DEPARTMENT OF APPLIED PHYSICS
DELHI TECHNOLOGICAL UNIVERSITY, DELHI

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OBJECTIVE

This project is concerned with mobile phone detector circuit(simulated in MULTISIM) which can sense the presence of an activated mobile phone from a distance of four to five metres. So, it can come handy in an examination hall or meetings where mobile phones are not permitted. The circuit can detect incoming and outgoing calls, SMSs, Internet and video transmissions even if a mobile phone is kept in silent mode. When it detects a signal from an activated mobile phone, its LED starts blinking and continues to blink until the signal stops.

DESCRIPTION OF CIRCUIT COMPONENTS

❖ RESISTOR

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law: $V = IR$

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance

Resistors can be integrated into printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

Resistors are found in nearly every circuit because their ability to limit current allows them to protect electronics from circuit overload or destruction. Diodes, for example, are current sensitive and so are almost always coupled with a resistor when they are placed inside of a circuit. Resistors are also combined with other electrical components to form important fundamental circuits. They can be paired with capacitors to perform as filters or voltage dividers.

❖ CAPACITORS

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

Capacitance (symbol C) is a measure of a capacitor's ability to store charge. A large capacitance means that more charge can be stored. Capacitance is measured in farads, symbol F.

❖ TRANSISTOR

A transistor is a semiconductor device commonly used to amplify or switch electronic signals. A transistor is made of a solid piece of a semiconductor material, with at least three terminals for connection to

an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be much more than the controlling (input) power, the transistor provides amplification of a signal. Some transistors are packaged individually but most are found in integrated circuits.

❖ **LED**

A light-emitting diode (LED) is an electronic light source. LEDs are used as indicator lamps in many kinds of electronics and increasingly for lighting. LED are based on the semiconductor diode. When the diode is forward biased (switched on), electrons are able to recombine with holes and energy is released in the form of light. This effect is called electroluminescence and the colour of the light is determined by the energy gap of the semiconductor.

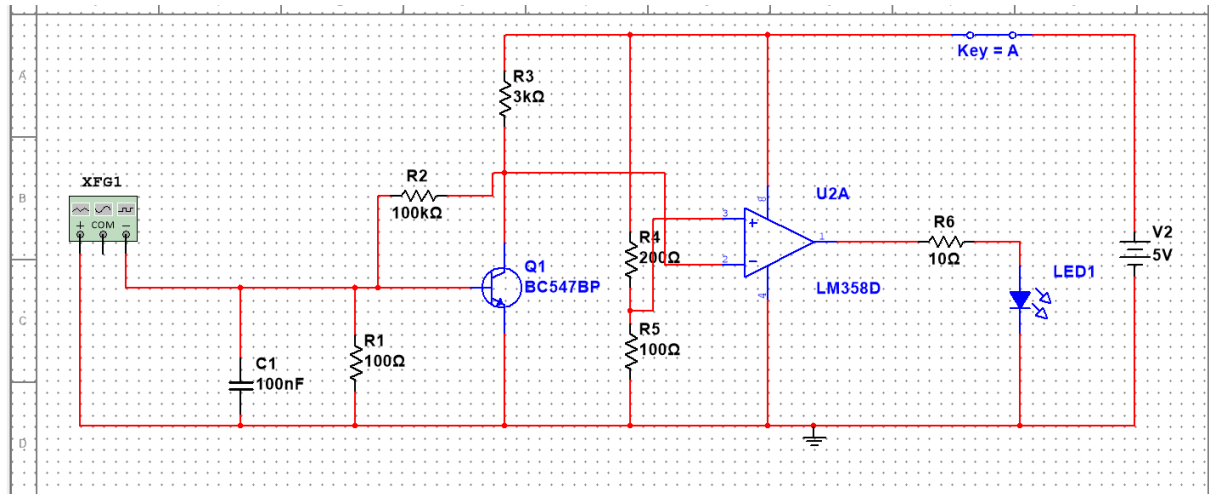
❖ **LM358 IC**

The LM358 IC is a great, low power and easy to use op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers.

LM358 IC is a good, standard operational amplifier. It can handle 3-32V DC supply & source up to 20mA per channel. This op-amp is apt, if you want to operate two separate op-amps for a single power supply.

- It consists of two op-amps internally and frequency compensated for unity gain
- The large voltage gain is 100 dB
- Wide bandwidth is 1MHz
- Range of wide power supplies includes single and dual power supplies
- Range of Single power supply is from 3V to 32V
- Range of dual power supplies is from + or -1.5V to + or -16V
- The supply current drain is very low, i.e., 500 μ A
- 2mV low i/p offset voltage
- Common mode i/p voltage range comprises ground
- The power supply voltage and differential i/p voltages are similar

DESCRIPTION OF CIRCUIT



SIMULATED IN MULTISIM

Function generator is used to give RF (radio frequency signal) which is fed up to the circuit. As simulation is LED1 flashes which depicts the presence of activated device.

This mobile phone detector can sense the presence of an activated mobile phone from a distance of four to five metres. So, it can come handy in an examination hall or meetings where mobile phones are not permitted. The circuit can detect incoming and outgoing calls, SMSs, Internet and video transmissions even if a mobile phone is kept in silent mode.

When it detects a signal from an activated mobile phone, its LED starts blinking and continues to blink until the signal stops. When a mobile phone is active (as represented by function generator), it radiates RF signal that passes through nearby space. The signal contains electromagnetic RF radiation from the phone. Capacitor C1 is used in the circuit to detect the RF signal from the mobile phone. When the mobile phone radiates energy in the form of RF signal, C1 absorbs it and passes on to the inputs of U2A. This is indicated by the flashing of LED1. Transistor Q1 is used to amplify the signal.

WORKING OF CIRCUIT

This circuit is intended to detect unauthorized use of mobile phones in examination halls, confidential rooms etc. It also helps to detect unauthorized video and audio recordings. It detects the signal from mobile phones even if it is kept in the silent mode. It also detects SMS. Mobile phone uses RF signal. That is the signal is high frequency with huge energy. When the mobile phone is active, it transmits the signal in the form of sine wave which passes through the space. The encoded audio/video signal contains electromagnetic radiation which is picked up by the receiver in the base station. Mobile phone system is referred to as “Cellular Telephone system” because the coverage area is divided into “cells” each of which has a base station. The transmitter power of the modern 2G antenna in the base station is 20-100 watts. When a GSM (Global System of Mobile communication) digital phone is transmitting, the signal is time shared with 7 other users. That is at any one second, each of the 8 users on the same frequency is allotted $1/8$ of the time and the signal is reconstituted by the receiver to form the speech. Peak power output of a mobile phone corresponds to 2 watts with an average of 250 milli watts of continuous power. Each handset with in a ‘cell’ is allotted a particular frequency for its use. The mobile phone transmits short signals at regular intervals to register its availability to the nearest base station. The network data base stores the information transmitted by the mobile phone. If the mobile phone moves from one cell to another, it will keep the connection with the base station having strongest transmission. Mobile phone always tries to make connection with the available base station. That is why, the back light of the phone turns on intermittently while traveling. This will cause severe battery drain. Waves at higher frequencies but within the RF region is called Micro waves. Mobile phone uses high frequency RF wave in the micro wave region carrying huge amount of electromagnetic

energy. That is why burning sensation develops in the ear if the mobile is used for a long period. Just like a micro wave oven, mobile phone is 'cooking' the tissues in the ear. RF radiation from the phone causes oscillation of polar molecules like water in the tissues. This generates heat through friction just like the principle of microwave oven. The strongest radiation from the mobile phone is about 2 watts which can make connection with a base station located 2 to 3 km away.

Ordinary LC (Coil-Capacitor) circuits are used to detect low frequency radiation in the AM and FM bands. The tuned tank circuit having a coil and a variable capacitor retrieve the signal from the carrier wave. But such LC circuits cannot detect high frequency waves near the microwave region. Hence in the circuit, a capacitor is used to detect RF from mobile phone considering that, a capacitor can store energy even from an outside source and oscillate like LC circuit.

A capacitor has two electrodes separated by a 'dielectric' like paper, mica etc. Capacitor can store energy and pass AC signals during discharge.

One lead of the capacitor gets DC from the positive rail and the other lead goes to the negative input of IC. So, the capacitor gets energy for storage. This energy is applied to the inputs of IC. In this state output is zero. When the mobile phone radiates high energy pulsations, capacitor oscillates and release energy in the inputs of IC. This oscillation is indicated by the flashing of the LED. In short, capacitor carries energy and is in an electromagnetic field. So, a slight change in field caused by the RF from phone will disturb the field and forces the capacitor to release energy

APPLICATIONS

- ❖ During examination the use of mobile phones is prohibited, for the students could use it to send answers among each other. This kind of practice is prohibited. The presence of this circuit model can work in a preventing way, the use of mobile phones does not stay unnoticed.
- ❖ In a cinema the use of a mobile phone is undesired. Being called by someone during a movie is of course very bothering for other people. The presence of this circuit model, the use of mobile phones is detected, so the visitor can be informed that this is not allowed.
- ❖ When tanking at a petrol station, the use of mobile phones is prohibited, because the mobile signals can interfere with the tanking equipment and because a small spark within the mobile phone could set fire to possible gasoline vapour. The presence of this circuit model can help in such scenario.
- ❖ In airplanes the use of mobile phones is prohibited, for it could interfere with the equipment in the airplane. All the while phones are still used illegally, especially in restrooms. The presence of this circuit model can be used to prevent this.
- ❖ It is often distracting to be called during a meeting. Also, confidential conversation could be overheard by using cell phones.
- ❖ The signals emitted by mobile phones can interfere with some electronic equipment inside the hospital. This could have fatal consequences.

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