CELL PHONE DETECTOR

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Submission date: 21-Nov-2019 12:27PM (UTC+0530)
Submission ID: 1218532067
File name: 1NH18EC002.pdf (848.57K)
Word count: 4063
Character count: 20428

CELL PHONE DETECTOR

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ABSTRACT

Cell phone detector is basically a device which is used to detect mobile phone when a call comes. When a call comes to a phone, the RF signals near the phone amplifies. An antenna is used to detect these signals and these signals are amplified using the CA 3130 IC which is an operational amplifier IC. This CA 3130 is a BiMOS operational amplifier with mosfet. The op-amp is built using MOSFETS and hence it has high input impedance. It has high bandwidth fast sample rate and high power consumption. This handy pocket sized mobile phone detector can sense the presence of an activated mobile cell phone. So it can be used to prevent the use of mobile phone for Spying and unauthorized calls. The circuit can detect the incoming and outgoing calls. The moment the Bug detects RF transmission signal from an activated mobile phone, it starts sounding and the LED blinks. The alarm continues until the signal transmission ceases. Assemble the circuit on a general purpose bread board and it can be enclosed in a small box too if required. Use the minimum 9V battery of a remote control and a small buzzer to make the gadget pocket -size. The unit will give the warning indication if someone uses the mobile phone.

CHAPTER 1

INTRODUCTION

As technology is increasing in the world using the electronic equipment are being used in a wrong way like, in the examination halls and confidential rooms. To avoid this we are introducing a project called CELL PHONE DETECTOR.

This handy, pocket size mobile transmission detector or sniffer can sense the presence of an activated mobile cell phone from a distance of 1.5 meters. So it can be used to prevent the use of mobile phones in examination halls, confidential rooms, etc. The circuit can detect the incoming and outgoing calls, SMS transmission even if the mobile phone is kept in the silent mode. The moment the bug detects RF transmission signal from an activated mobile phone, it starts sounding a beep alarm and the LED blinks.

When the class is going on, students intend to use their cell phones and not listening to what is being taught. These days, students are also carrying their cell phones to the examination halls to copy which would help them get good marks.to avoid this problem the cell phone detector is introduced.

The most common electronic equipment used now-a-days is Cell Phone or Mobile Phone. With advancement in communication technology, the requirement of cell phones has increased dramatically. A cell phone typically transmits and receives signals in the frequency range of 0.9 to 3GHz. This project provides a simple circuit to detect the presence of an activated cell phone by detecting these signals.

CAHPTER 2

LITERATURE SURVEY

An indoor location tracking map on a mobile phone

Mobile phone tracking is a process for identifying the location of a mobile phone, whether stationary or moving. Localization may be effected by a number of technologies, such as using multilateration of radio signals between (several) cell towers of the network and the phone, or simply using GPS. To locate a mobile phone using multilateration of radio signals, it must emit at least the roaming signal to contact the next nearby antenna tower, but the process does not require an active call. The Global System for Mobile Communications (GSM) is based on the phone's signal strength to nearby antenna masts.

Mobile positioning may include location-based services that disclose the actual coordinates of a mobile phone, which is a technology used by telecommunication companies to approximate the location of a mobile phone, and thereby also its user

Alternatives Comparator Op-Amp IC

LM311,LM741, LM358, LM339, LM324

CHAPTER 3

PROPOSED METHODOLOGY

In this cell phone detector, we use a CA 3130 to amplify the signal received by the antenna. When a call is received on the phone, the rf signals amplify near the phone, we use an antenna to receive these signals and these signals are converted to electrical signals using capacitors and are sent to the amplifier ic to amplify these signals. Then these amplified signals are sent to the transmitter for even more amplification of the signals and these signals are in turn sent to the 555 timer ic. Which is connected to the buzzer. When the timer ic receives the input, it sends it to the buzzer and the buzzer gets activated.

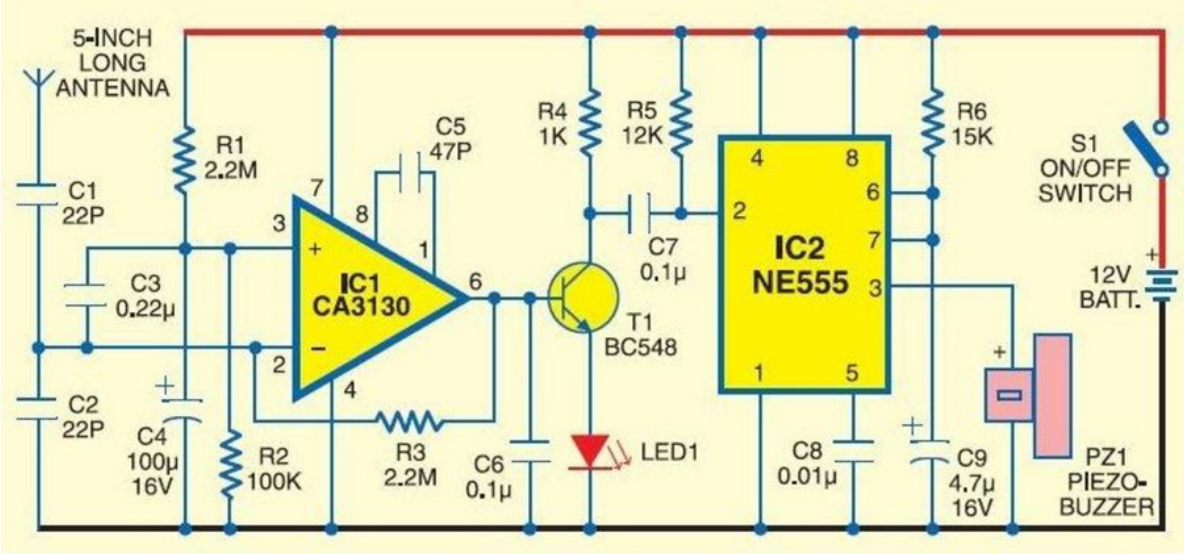


Fig 1. Circuit diagram

COMPONENTS REQUIRED

S.No.	Required Components	Remarks	Quantity
1	IC's	NE555,CA3130	1
2	Transistor	BC548 NPN transistor	1
3	Buzzer	Pizo magnetic	1
4	LED	Low power	1
5	Resistor	Quarter watt	1k ohm - 3 100k Ohm – 1 2.2M Ohm – 2 12k Ohm - 1 15k OHM – 1
6	Capacitor	Ceramic	0.01uf – 1
		Electrolytic	100uf – 1
7	Antenna	12v 150 Ohm	1

CHAPTER 4

PROJECT DESCRIPTION

Mobile phone uses RFwith a wavelength of 30cm at 872 to 210MHz. 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. The transmisitter power of the modern 2G antenna in the base station 20-100 watts.

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.

The Op-amp part of the circuit acts as the RF Signal Detector while Transistor part of the circuit act as the indicator. The capacitors collection along with the antenna are used to detect RF Signals when a cell phone makes (or receives) a phone call or sends (or receives) a text message.

Use of Capacitor

A capacitor has two electrodes separated by a 'dielectric' like paper,mica etc. The non polarized disc capacitor is used to pass AC and not DC,Capacitor can store energy and pass AC signals during discharge 0.22uF capacitor is selected because it is a low value one and has large surface area to accept energy from the mobile radiation. To detect the signal,the sensor part should be like an aerial. So the capacitor is arranged as a mini loop aerial (similar to the dipole antenna used in TV). In short with this arrangement,the capacitor works like an air core coil with ability to oscillate and discharge current.

How the capacitor senses RF?

One lead of the capacitor gets DC positive rail and the other lead goes to the negative input of the IC. So the capacitor gets energy for storage. This energy is applied to the inputs of IC so that the inputs of IC are almost balanced with 1.4V. In this state output is zero. But at any time IC can give a high output if a small current is induced to its inputs. There a natural electromagnetic field around the capacitor caused by the 50Hz from electrical wiring. When the mobile phone radiates high energy pulsations, capacitor oscillates and releases energy in the inputs of IC. This oscillation is indicated by the flashing of the LED and beeping of Buzzer. In short, capacitor carries energy and is in an electromagnetic field. So a slight change in field caused by the RF from the phone will disturb the field and forces the capacitor to release energy.

HARDWARE DESCRIPTION

NE555 IC pin diagram

This IC contains 2 SR flip flops as shown in the figure

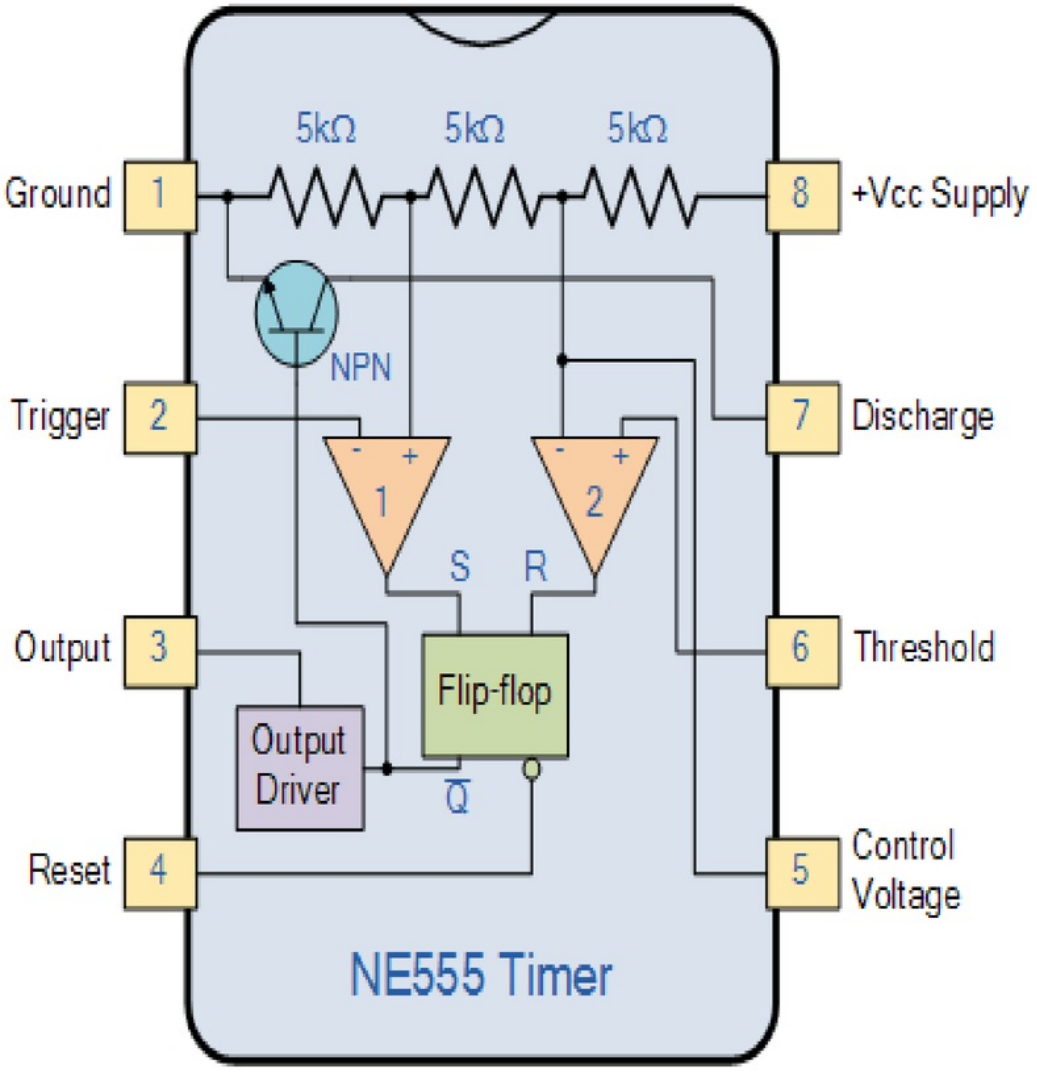


Fig 2.NE555 IC

Some important features of the 555 timer:

555 timer is used in almost every electronic circuit today. For a 555 timer working as a flip flop or as a multi-vibrator, it has a particular set of configurations. Some of the major features of the 555 timer would be,

- It operates from a wide range of power ranging from +5 Volts to +18 Volts supply voltage.
- Sinking or sourcing 200 mA of load current.
- The external components should be selected properly so that the timing intervals can be made into several minutes along with the frequencies exceeding several hundred kilohertz.
- The output of a 555 timer can drive a transistor-transistor logic (TTL) due to its high current output.
- It has a temperature stability of 50 parts per million (ppm) per degree Celsius change in temperature which is equivalent to 0.005 %/ °C.
- The duty cycle of the timer is adjustable.
- Also, the maximum power dissipation per package is 600 mW and its trigger and reset inputs has logic compatibility.

Pin diagram and description

Pin	Name	Purpose
1	GND	Ground reference voltage, low level (0 V)
2	TRIG	The OUT pin goes high and a timing interval starts when this input falls below 1/2 of CTRL voltage (which is typically 1/3 *V*cc, CTRL being 2/3 *V*cc by default if CTRL is left open). In other words, OUT is high as long as the trigger low. Output of the timer totally depends upon the amplitude of the external trigger voltage applied to this pin.
3	OUT	This output is driven to approximately 1.7 V below +*V*cc, or to GND.
4	RESET	A timing interval may be reset by driving this input to GND, but the timing does not begin again until RESET rises above approximately 0.7 volts. Overrides TRIG which overrides threshold.
5	CTRL	Provides "control" access to the internal voltage divider (by default, 2/3 *V*cc).
6	THR	The timing (OUT high) interval ends when the voltage at threshold is greater than that at CTRL (2/3 *V*cc if CTRL is open).
7	DIS	Open collector output which may discharge a capacitor between intervals. In phase with output.
8	*V*cc	Positive supply voltage, which is usually between 3 and 15 V depending is

		variable

Antenna

An antenna is the interface between radio waves propagating through space and electric currents moving in metal conductors, used with a transmitter or receiver. In transmission, a radio transmitter supplies an electric current to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves. In reception, an antenna intercepts some of the power of a radio wave in order to produce an electric current at its terminals, that is applied to a receiver to be amplified. Antennas are essential components of all radio equipment.

Fig 3.Antenna

CA3130 IC Pin Diagram

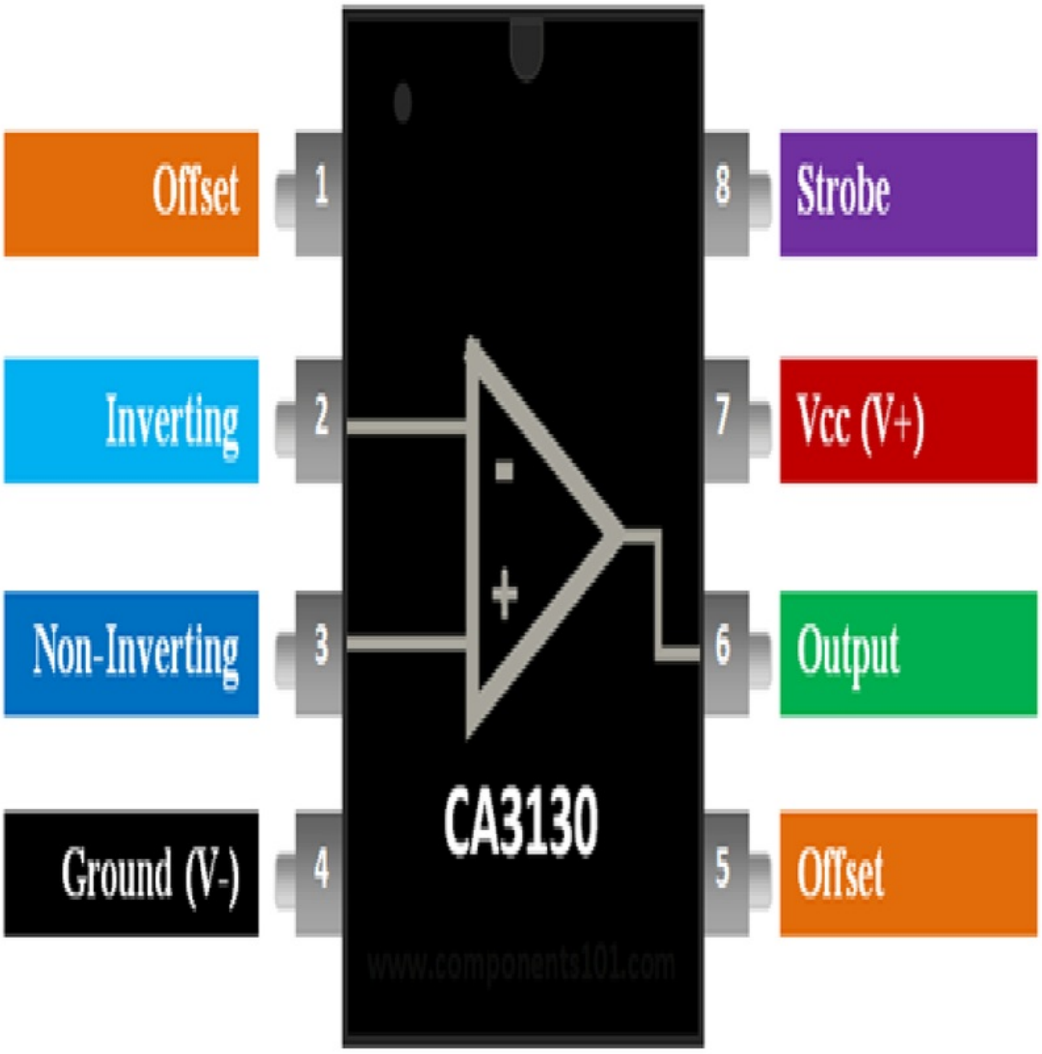


Fig 4.CA3130

SOME IMPORTANT THINGS ABOUT THE IC

This IC is a 15MHz BiMOS Operational amplifier with MOSFET inputs and bipolar output. The inputs contain MOSFET transistors to provide very high input impedance and very low input current as low as 10pA.It has high speed of performance and suitable for low input current applications.

Pin Configuration

Pin Number	Pin Name	Description
1,5	Offset Null Pins	Optionally used to remove the offset voltage at the output pin to make it perfect 0V during off state.
2	Inverting Input (IN-)	The Inverting pin is also given a fixed voltage which is compared with the (IN+)
3	Non-Inverting Input (IN+)	The Non-Inverting Pin of the comparator is give a variable voltage to compare
4	Ground (VCC-)	This pin is connected to the ground of the system (Negative voltage can also be used)
6	Output	This is the output pin of the op-amp
7	VCC+	Provide the operating voltage for the Op-Amp. For CA3130 it is upto +16V
8	Strobe	Allows you to turn off output stage

CA3130 Specifications

- Op-amp coupled with MOSFET at output
- Wide power supply Range

1. Singe supply – 5V to 16V
2. Dual supply – ±2.5V to ±8V

- Input Terminal current: 1mA
- Maximum Output Voltage: 13.3V
- Maximum source current: 22mA
- Maximum sink current: 20mA
- Supply current: 10mA
- Common Mode Rejection Ration (CMRR): 80dB

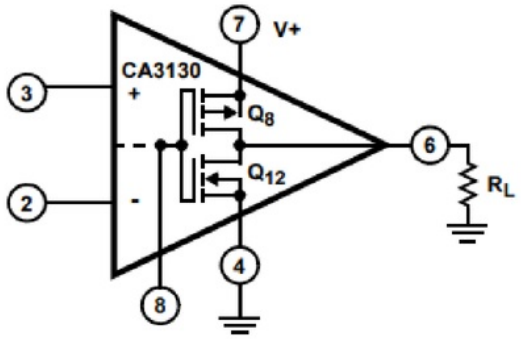
The CA3130 is a BiMOS Operational Amplifier with MOSFET. The term BiMOS implies that it combines the advantage of both Bipolar and CMOS op-amp technology. Bipolar op-amps perform well under high bandwidths (fast switching) and CMOS op-amps perform well by consuming less current. So the CA3130 being a BiMOS op-amp has the advantage of high bandwidth operation and less current consumption.

The op-amp is built using MOSFETS and hence it has high input impedance. Meaning, when a sensor's output voltage is connected to the inverting or non-inverting pin of the op-amp, the op-amp will not act as a load to the sensor and thus the output voltage from sensor will not be disturbed. So if you are looking for a Op-amp with high bandwidth, fast sample rate, less power consumption and high input impedance then this op-amp might be the right choice for you

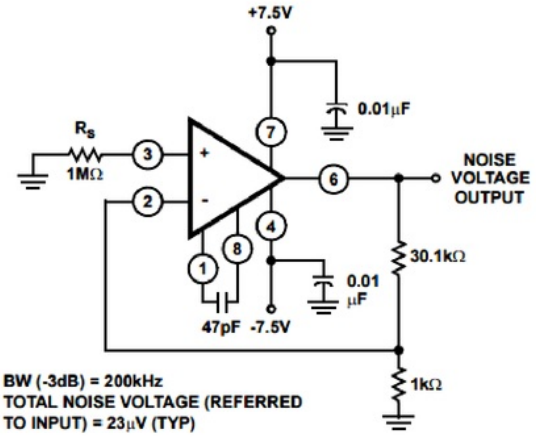
Like all voltage Comparators the CA3130 also has an Inverting Pin and a Non-Inverting Pin. If the voltage at the Non-Inverting Terminal (pin 3) is high than the Inverting Terminal (pin 2) the output (pin 7) will also be high else the output will be low.

The CA3130 can work in a Single supply voltage or in a dual supply mode. For now let's concentrate on the +5V supply voltage circuit since this is the most used design for digital

circuits. In this type, the VCC+ (pin 8) is connected to +5V supply voltage and the VCC (pin 4) is grounded to hold it at 0V potential. A sample circuit is shown below



The special ability of this op-amp is to work with high frequencies; it has a CMRR of 80dB and the rise time is as low as 0.09uS. This makes it ideal for voltage followers and other switching related applications



Applications

- Frequency Generator/Distorter
- Mobile jammers
- Voltage follower circuits
- DAC circuits
- Peak Signal/Noise detectors
- Oscillator circuit

CAPACITORS

A Capacitor 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 poles.

(1)CERAMIC CAPACITORS

Fig 5.Capacitor

These capacitors are constructed of various levels of metal and ceramic, with the ceramic material acting as the dielectric. It is a two-terminal ,non-polar device.

Chemical-formula	Relative permittivity ε	Temperature-coefficient α 10^{-6}/K
$MgNb_2O_6$	21	−70
$ZnNb_2O_6$	25	−56
$MgTa_2O_6$	28	18
$ZnTa_2O_6$	38	9
$(ZnMg)TiO_3$	32	5
$(ZrSn)TiO_4$	37	0
$Ba_2Ti_9O_{20}$	40	2

(2)ELECTROLYTIC CAPACITORS

Fig 6.Electrolytic capacitor

An electrolytic capacitor is a type of capacitor that has an ionic conducting liquid as one of its plats with a larger capacitance per unit volume than the other types.

The large capacitance of electrolytic capacitors makes them particularly suitable for passing or bypassing low-frequency signals, and for storing large amounts of energy. They are widely used for decoupling or noise filtering in power supplies and DC link circuits for variable-frequency drives, for coupling signals between amplifier stages, and storing energy as in a flashlamp.

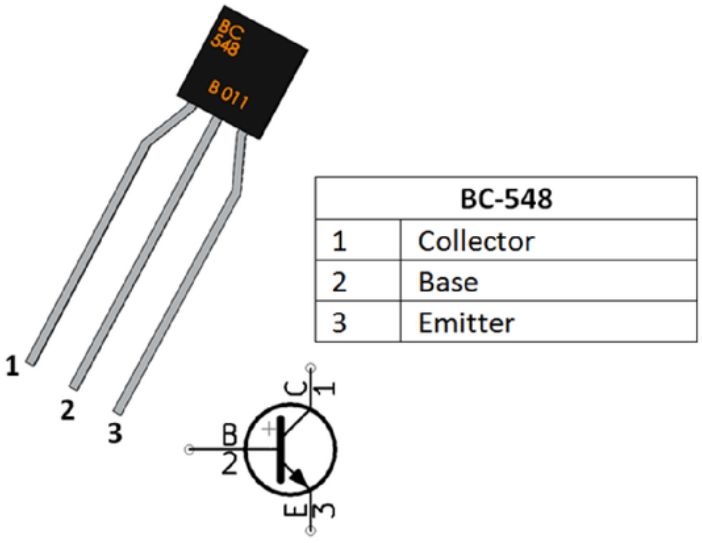
Electrolytic capacitors are polarized components due to their asymmetrical construction and must be operated with a higher voltage (ie, more positive) on the anode than on the cathode at all times. For this reason the anode terminal is marked with a plus sign and the cathode

with a minus sign. Applying a reverse polarity voltage, or a voltage exceeding the maximum rated working voltage of as little as 1 or 1.5 volts, can destroy the dielectric and thus the capacitor. The failure of electrolytic capacitors can be hazardous, resulting in an explosion or fire. Bipolar electrolytic capacitors which may be operated with either polarity are also made, using special constructions with two anodes connected in series.

Transistor :

There are typically three electrical leads in a transistor, called the emitter, the collector, and the base. An electrical signal applied to the base (or gate) influences the semiconductor material's ability to conduct electrical current, which flows between the emitter and collector in most applications. A voltage source such as a battery drives the current, while the rate of current flow through the transistor at any given moment.

- Driver Modules like Relay Driver, LED driver
- Amplifier modules like Audio amplifiers, signal Amplifier



BC-548	
1	Collector
2	Base
3	Emitter

Fig 7.Transistor

LIGHT EMITTING DIODE

Fig 8: LED

A light emitting diode is an electronic light source. LEDs are used as indicator lamps in many kinds of electronic items. LEDs are based on the semiconductor diode. When the diode is forward biased, electrons are able to recombine with holes and energy is released in the form of light. This effect is known as Electroluminescence and the color of the light is determined by the energy gap of the semiconductor.

Advantages

- **Efficiency:** LEDs emit more lumens per watt than incandescent light bulbs. The efficiency of LED lighting fixtures is not affected by shape and size, unlike fluorescent light bulbs or tubes.

- **Color:** LEDs can emit light of an intended color without using any color filters as traditional lighting methods need. This is more efficient and can lower initial costs.
- **Size:** LEDs can be very small (smaller than 2 mm^2) and are easily attached to printed circuit boards.
- **Warmup time:** LEDs light up very quickly. A typical red indicator LED achieves full brightness in under a microsecond.LEDs used in communications devices can have even faster response times.
- **Cycling:** LEDs are ideal for uses subject to frequent on-off cycling, unlike incandescent and fluorescent lamps that fail faster when cycled often, or high-intensity discharge lamps (HID lamps) that require a long time before restarting.
- **Dimming:** LEDs can very easily be dimmed either by pulse-width modulation or lowering the forward current. This pulse-width modulation is why LED lights, particularly headlights on cars, when viewed on camera or by some people, seem to flash or flicker. This is a type of stroboscopic effect.
- **Cool light:** In contrast to most light sources, LEDs radiate very little heat in the form of IR that can cause damage to sensitive objects or fabrics. Wasted energy is dispersed as heat through the base of the LED.
- **Slow failure:** LEDs mainly fail by dimming over time, rather than the abrupt failure of incandescent bulbs.
- **Lifetime:** LEDs can have a relatively long useful life. One report estimates 35,000 to 50,000 hours of useful life, though time to complete failure may be shorter or longer. Fluorescent tubes typically are rated at about 10,000 to 25,000 hours, depending partly on the conditions of use, and incandescent light bulbs at 1,000 to 2,000 hours. Several DOE demonstrations have shown that reduced maintenance costs from this extended lifetime, rather than energy savings, is the primary factor in determining the payback period for an LED product.

- **Shock resistance:** LEDs, being solid-state components, are difficult to damage with external shock, unlike fluorescent and incandescent bulbs, which are fragile.
- **Focus:** The solid package of the LED can be designed to focus its light. Incandescent and fluorescent sources often require an external reflector to collect light and direct it in a usable manner. For larger LED packages total internal reflection (TIR) lenses are often used to the same effect. However, when large quantities of light are needed many light sources are usually deployed, which are difficult to focus or collimate towards the same target.

Disadvantages

- **Temperature dependence:** LED performance largely depends on the ambient temperature of the operating environment – or thermal management properties. Overdriving an LED in high ambient temperatures may result in overheating the LED package, eventually leading to device failure. An adequate heat sink is needed to maintain long life. This is especially important in automotive, medical, and military uses where devices must operate over a wide range of temperatures, which require low failure rates. Toshiba has produced LEDs with an operating temperature range of −40 to 100 °C, which suits the LEDs for both indoor and outdoor use in applications such as lamps, ceiling lighting, street lights, and floodlights.
- **Voltage sensitivity:** LEDs must be supplied with a voltage above their threshold voltage and a current below their rating. Current and lifetime change greatly with a small change in applied voltage. They thus require a current-regulated supply (usually just a series resistor for indicator LEDs).
- **Color rendition:** Most cool-white LEDs have spectra that differ significantly from a black body radiator like the sun or an incandescent light. The spike at 460 nm and dip at 500 nm can make the color of objects appear differently under cool-white LED illumination than sunlight or incandescent sources, due to metamerism, red surfaces being rendered particularly poorly by typical phosphor-based cool-white LEDs. The same is true with green surfaces.

- **Area light source:** Single LEDs do not approximate a point source of light giving a spherical light distribution, but rather a lambertian distribution. So, LEDs are difficult to apply to uses needing a spherical light field; however, different fields of light can be manipulated by the application of different optics or "lenses". LEDs cannot provide divergence below a few degrees.
- **Light pollution:** Because white LEDs emit more short wavelength light than sources such as high-pressure sodium vapor lamps, the increased blue and green sensitivity of scotopic vision means that white LEDs used in outdoor lighting cause substantially more sky glow.
- **Efficiency droop:** The efficiency of LEDs decreases as the electric current increases. Heating also increases with higher currents, which compromises LED lifetime. These effects put practical limits on the current through an LED in high power applications.
- **Impact on insects:** LEDs are much more attractive to insects than sodium-vapor lights, so much so that there has been speculative concern about the possibility of disruption to food webs.
- **Use in winter conditions:** Since they do not give off much heat in comparison to incandescent lights, LED lights used for traffic control can have snow obscuring them, leading to accidents.
- **Thermal runaway:** Parallel strings of LEDs will not share current evenly due to the manufacturing tolerance in their forward voltage. Running two or more strings from a single current source will likely result in LED failure as the devices warm up. A circuit is required to ensure even distribution of current between parallel strands.

Buzzer:

A piezo buzzer is a sound producing device. The main working principle is based on the theory that, whenever an electric potential is applied across a piezoelectric material, a pressure variation is generated. A piezobuzzerconsists of piezo crystals in between two conductors.

Fig 9 : Buzzer

Working Principle of Magnetic Buzzers

The vibrating disk in a magnetic buzzer is attracted to the pole by the magnetic field. When an oscillating signal is moved through the coil, it produces a fluctuating magnetic field which vibrates the disk at a frequency equal to that of the drive signal.

There are many types of applications which use buzzers, typically for alarm or identification purposes. These include:

- Security and safety products
- Portable devices
- Medical equipment
- Remote monitoring systems
- Timers
- Household appliances
- Measurement and flow instruments
- Weighing machines
- User input recognition

BREADBOARD:

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

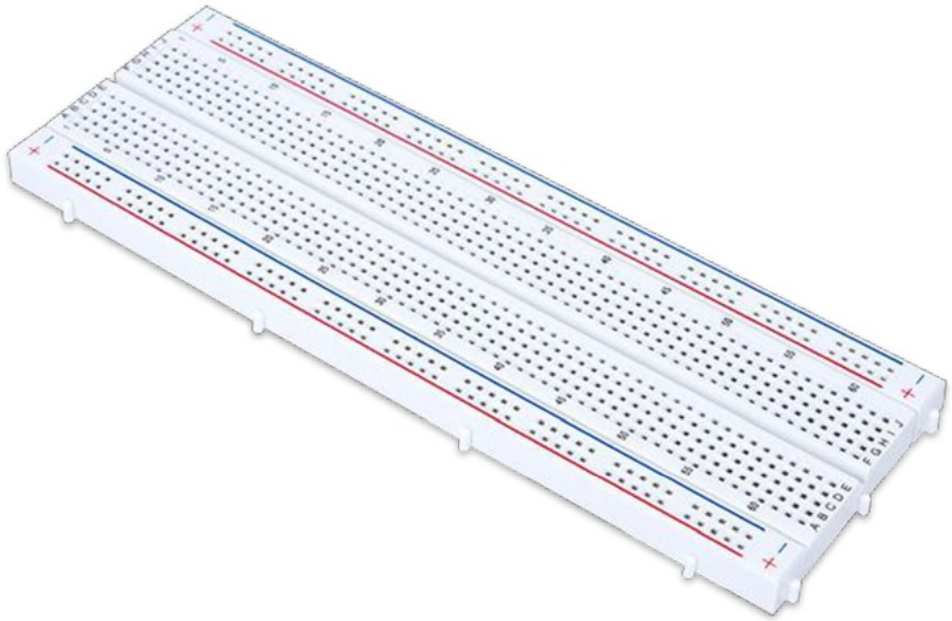


Fig 10 : Bread Board

CHAPTER 5

RESULT AND DISCUSSION

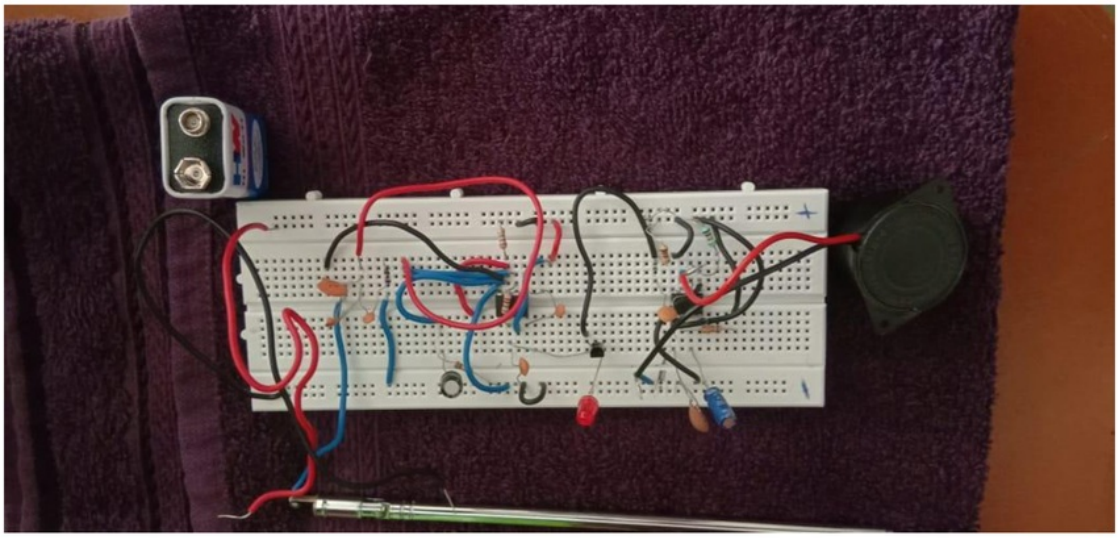


Fig 11 : Final Circuit

The project works successfully, it takes some time for the capacitors to charge initially, and the project starts working whenever a call is received and the buzzer starts running. And later the power supply needs to be cut off to reset the circuit after each call.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

CONCLUSION

This pocket sized mobile transmission detector or sniffer can sense the presence of an activated mobile cell phone from a distance of one and a half meters. So it can be used to prevent use of mobile phones in examination halls,confidentialrooms,etc.It is also useful for detecting the use of mobile phone for spying and unauthorized video transmission.

FUTURE SCOPE

Trying to increase the detecting range of cell phone detector to few more meters for observing wide range of area.

CELL PHONE DETECTOR

ORIGINALITY REPORT

24%	%	24%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Oluwaseyi Akinyele Ogungbenro, Michael C. Ndinechi. "Design, construction and testing of multipurpose energy saving LEDs and its implications on energy crisis in Nigeria", 3rd IEEE International Conference on Adaptive Science and Technology (ICAST 2011), 2011 Publication	4%
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