# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

MINI PROJECT REPORT ON

## "REVERSE CAR PARKING SENSOR "

SUBMITTED BY:

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

# CERTIFICATE

Certified that the mini project work entitled "**Reverse car parking sensor**" carried out by **Mouneesh (1NH18E011)** bonafide students of Electronics and Communication Department , New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

| | |
|---|---|
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**External Viva**

| Name of Examiner | Signature with Date |
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Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

**Mouneesh 1NH18EC011**

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# ABSTRACT

Reverse car parking sensor it adopts infra-red light sensors which measurethedistanceaccuratelywhenreversingacar.Thiscircuitwasdesignedasanaidin parking thecarnearthegaragewellwhenbackingup.Inthismannerwearealertedwhen approaching tooclosetothewall.ThefirstLEDilluminateswhenbumper-walldistanceis about65cm,1more LEDilluminatesatabout50cm,andinall3LEDsatabout45cm.Inthis way it is provided with the visual feedback

Thisreversecarparkingsensorcircuitsolveallthese problems.Youcaneasilyinstallatthe backside ofyourcar.Youcanalsousethemasshadowalarmatdoorstoprotectyourcar. Whenshadowof anintruderfallonitwillalsogiveyoualarm.Thisalarmwillprovideyou the musical sound that's why it will not tease your ears.

Reverse car parking sensor circuit solves this problem by inducting the distance with the helpof threeLED's.Wecaneasilyarrangethissystematthebacksideofthecar.This system operates with 9v rechargeable battery.

ThisReversecarparkingsensorcircuitisquiteeasyandusefewcommonlyavailable componentswhich are resistors, LED's, battery, IC LM358, buzzer, etc.

# CHAPTER 1

# INTRODUCTION

We are often afraid that our brand new Hummer is going to get scratched while parking it in the tight space. Or we have trouble backing our large Mercedes S- class into our small garage. There is no need to fear anymore! This car parking sensor circuit can sense how far we are away from the wall or a hidden object behind your car and warn us visually using LEDs. It is to note that we have kept our project scope only till the visual feedback using infra- red technology.

A significant portion of the people around the world owns cars or are daily drivers. Among these drivers, it's not entirely untrue to assume that parallel parking or rearward parking is one of the most cumbersome parts of their driving experience. It takes years of driving experience and rigorous practices to avoid an ugly scratch across the bumper. Some old school auto– enthusiasts may like to do everything manually, but most of us like to take advantage of the advanced car electronics and technologies to make our life a little bit easier and also to avoid common accidents during parking. Hence, we decided to design and build an infra-red parking assistant system that will help the driver get a sense of how far the car is away from a wall or an object behind the car.

# CHAPTER 2

## LITERATURE SURVEY

Intelligent Transportation Systems are defined as those systems utilizing synergistic technologies and systems engineering concepts to develop and improve transportation systems of all kinds. The scope of this interdisciplinary activity include the promotion, consolidation and coordination of ITS technical activities among IEEE entities and providing a focus for cooperative activities, both internally and externally.

In urban areas, congested traffics results in a large number of accidents at low speeds. This paper describes an accurate and fast driver assistance system (DAS) that detects obstacles and warns the driver in advance of possible collisions is such a congested traffic environment. A laboratory prototype of the system is built and tested by simulating different weather conditions in the laboratory. The proposed DAS is also suitable as parking.

IR sensors are used for more appropriate for target which can measure the distance of the object which may not be easily detected by ultrasonic sensors.

A review of automobile –guidance research projects carried out in European universities and advanced safety vehicle development by Japanese car manufacturers is followed by a description of driver assistance systems in current use. A new research initiative for autonomous unnamed aircraft is then discussed. Fully autonomous prototype vehicle have demonstrated impressive feats on public roads, but car manufacturers are currently concentrating on driver assistance systems. Research is underway to extend the use of unnamed aircraft into the civil field, and to allow them to share airspace with piloted planes. Present current policies in automotive and aerospace development, and describes the range of sensor technologies applied to collision avoidance.

# Chapter: 3

# Principle and Working

## Principle

Reversecarparkingsensorisaprojectthatoperateson IRpowersupply.Thereversecar parking sensor is a circuit that works on the concept of 2 main components that is ICLM358, IR transmitter receiver.

Todesignthiscarparkingsystemcircuit,weplacedanIRtransmitterreceiverpairattherear side of the car. IR transmitter transmits infrared signal or rays into the environment continuously. WhenthesetransmittedIRraysreflectbacktoIRreceiverafterstrikingonan obstacle,somevoltage differencegeneratesacrossthisIRreceiverLED.Thisgeneratedvoltage differencedependinguponthe powerofIRraysthatarereflectedbacktothereceiver.More powered signal leads to more voltage difference. This voltage difference is used in our project to measure the distance. Here more voltage difference indicates the lesser distance from the object. Here we have shown distance from the obstacle by using three LED's. meaning of these LEDD'S are explained in working of this project.

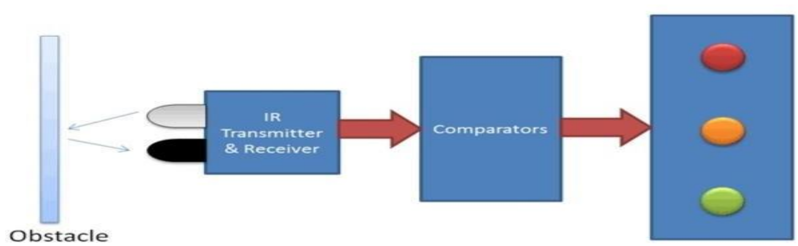



**Fig 3.1**

## Circuit Diagram and Explanation

Inthiscarparkingcircuitwehaveusedan IRpairfordetectingobstacleandtwoLM358dual comparator ICs for comparing voltages. Comparator configured in non- inverting mode and 10K potentiometer is connected at its inverting terminal for adjusting reference voltage and IR receiver's output is directly connected at non-inverting pins of all comparators. One red LED is connected at output of U1: B IC (LM358), a yellow LED is connected at output pi of U2:A IC(LM358) And an Green LED is connected at output pin of U2:B IC(LM358) a 1K resistor. A buzzer is also added at Red LED.

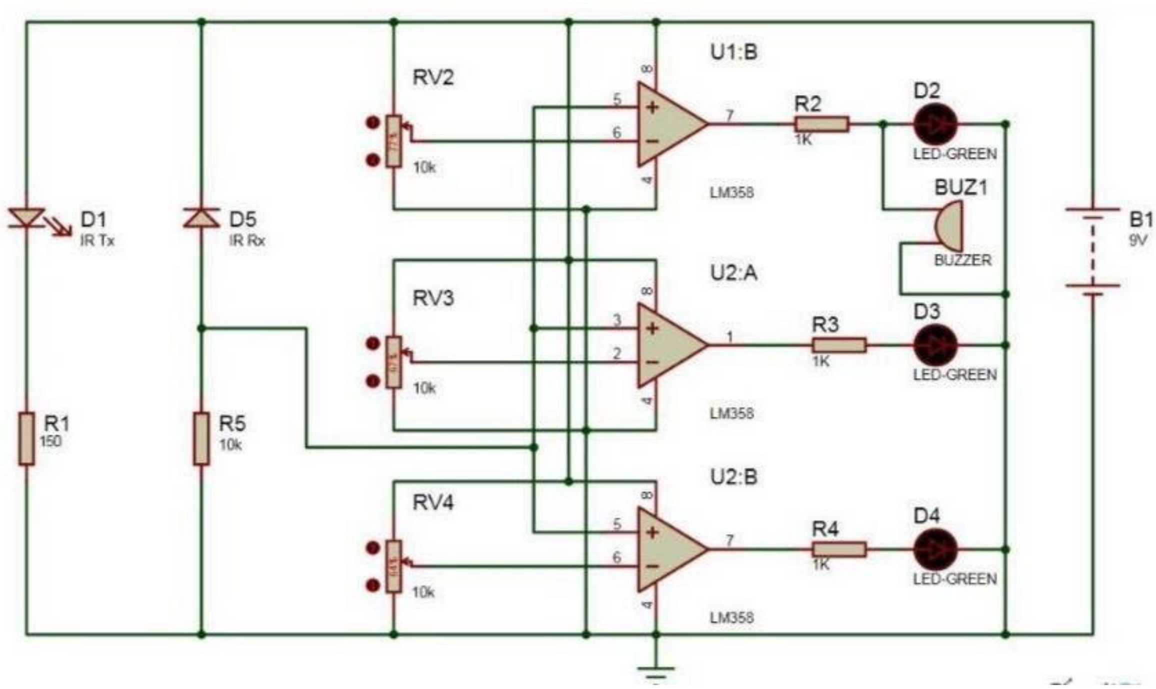



Fig 3.2

## Working

We have shown the reference voltage and relative parameters in the below table. But one can set distance by changing the value of potentiometer

| Obstacle v/s Vehicle | LED status | Reference Voltage | Distance |
|---|---|---|---|
| not close | All OFF | | Greater than 15 cm |
| Close | Green ON | 2.0 Volt | About 15 cm |
| More Close | Yellow ON | 4.0 Volt | About 10 cm |
| More Close | Red ON | 6.0 Volt | About 5 cm |
| Touch | Car Damaged | | About 0 cm |

Fig 3.3

This system is placed at the rear of the car and sensor's front side toward the obstacle (wall). Now suppose car is moving back toward the wall or obstacle in the parking slot. If distance between car and obstacle is more than 15cm then no LED will glow. Now if car moves toward the obstacles and suppose green light turned on, it means car is about 15cm away from the obstacle. Now car is moving more close toward the obstacle and yellow light appears or turned on it means car is about 10cm away from the obstacle. Now car is moving closer toward the obstacle and red light appears it means car is about 5cm away from the obstacle and same time buzzer start beeping. Buzzer and red light indicates that the car need to stop now otherwise car may be damaged.

# CHAPTER-4

# PROJECT DESCRIPTION

## 1. IC LM358:

LM358 is a great,lowpower and easy use with dual channel op-amp. It consists of two internally frequency compensated, high gain, independent op-amps. This is specially designed to operate from a single power supply over a wide range of voltages.

Pin configuration is given as:

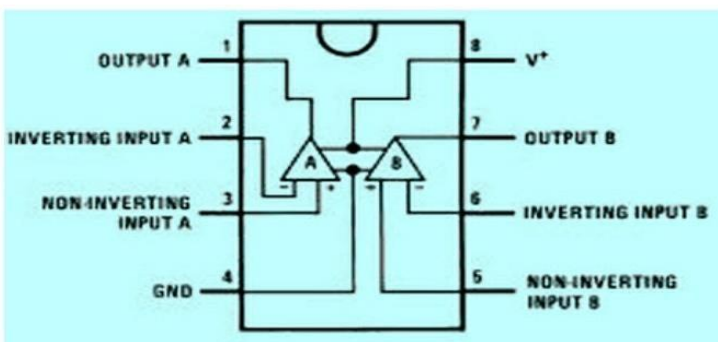
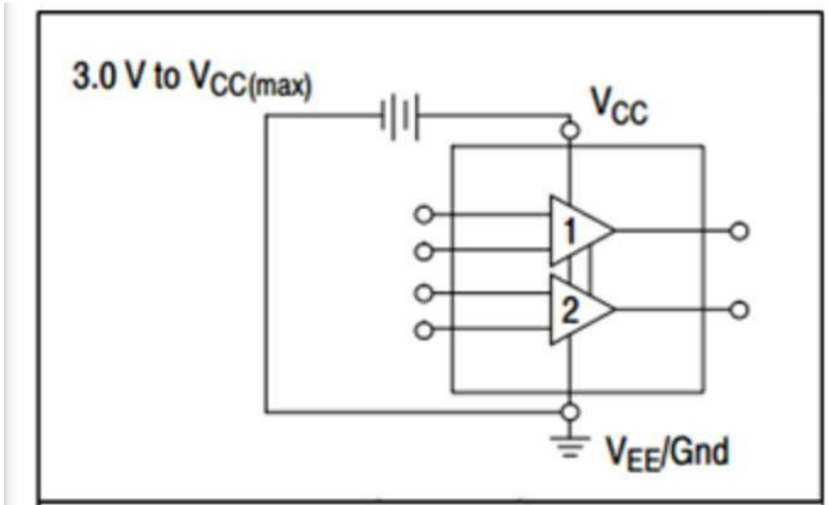
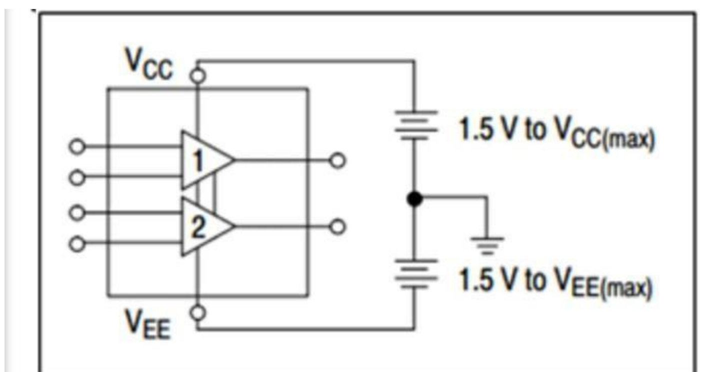



Fig 1.a:pin configuration of LM358




Single supply connection

Fig 1.b:Singlesupply connection




Dual supply connection

fig 1.c: Dual supply connections

If the inverting pin is HIGH, the output is NEGATIVE If the inverting pin is LOW, the output is POSITIVE
If the non-inverting pin is HIGH, the output is POSITIVE If the non-inverting pin is LOW, the output is NEGATIVE

## Features of LM358:

1. It consists of two op-amps internally and frequency compensated for unity gain.
2. Max voltage gain of 100dB
3. Max wide of bandwidth is 1MHz
4. It includes both single and dual power supplies
5. Single power supply ranges from 3V to 32V
6. Dual power supply ranges from -1.5V to -16V
7. Drain current is very low i.e, is 500uA
8. Low input offset voltage of 2mV
9. Common mode input voltage comprises to ground
10. Output swing is large

## Applications:

1. Transducer amplifiers
2. Conventional op-amp circuits
3. Integrator, differentiator, summer, adder, voltage follower
4. Dc gain blocks, digital multi-meters, oscilloscopes
5. Comparators

## 2. Resistor

A resistor is passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltage, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators.

Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, forces, or chemical activity.

Fig2.1

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

## 3. Potentiometer (pot):

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage driver. If only two terminals are used , one end and the wiper, it acts as a variable resistor orrheostat.


Fig:3.1

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential the component is an implementation of the same principle, hence its name.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipments. Potentiometers are operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

There are a number of terms in the electronics industry used to describe certain types of potentiometers:

- **Slide pot or slider pot:** A potentiometer that is adjusted by sliding the wiper left or right, usually with a finger or a thumb.
- **Thumb pot or thumbwheel pot:** A small rotating potentiometer meant to be adjusted infrequently by means of a small thumbwheel.
- **Trim pot or trimmer pot:** A trimmer potentiometer typically meant to be adjusted once or infrequently for “fine-tuning” an electrical signal.

## 4. Power Supply:

A Power supply is a device that supplies electric power to electric load. The term is the most commonly referred electric power that converts one form of electrical energy to other, through it may also refer to that convert another form of mechanical, chemical or solar energy to electricalenergy.Theregulatedpowersupplyisthatcontrolstheoutputvoltageorcurrenttoa specific value.

## 5.LED Working

The light emitting diode (LED) is a two-lead semiconductor light source. In 1962, Nick Holonyk came up with an idea of light emitting diode, and he was working for the general electric company. The LED is a special type of diode and they have similar electric characteristics of a PN junction diode. Hence the led allows the flow of current in the forward direction and blocks the current in the reverse direction. The led occupies the small area which is less than the 1mm2.

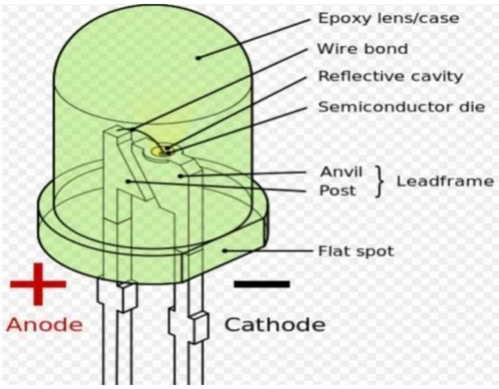



Fig 5.1

### Light Emitting Diode

The light emitting diode simply, we know as a diode. When the diode is forward biased, then the electrons and holes are moving fast across the junction and they are combining constantly, removing one another out. Soon after the electrons are moving from the n-type to the p-type silicon, it combines with the holes, and then it disappears. Hence it makes the complete atom and more stable and it gives the little burst of energy in the form of a tiny packet or photon of light.

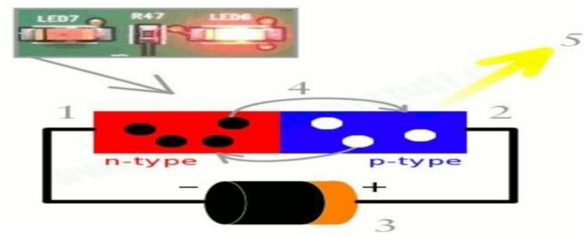



Fig5.2

## Working of Light Emitting Diode

The above diagram shows how the light emitting diode works and the step by step process of the diagram.

Fromthediagram,wecanobservethattheN-typesiliconisinredcoloranditcontainsthe electrons, they are indicated by the black circles.

TheP-typesiliconisintheblue coloranditcontainsholes,theyareindicatedbythewhite circles.

The power supply across the p-n junction makes the diode forward biased and pushing the electrons from n-type to p-type pushing the holes in the opposite direction.

The electron and holes at the junction are combined.

The photons are given off as the electrons and holes are recombined.

## Fabrication of LED device

GaNandtherelatedgroup3nitridesarekeymaterialsinhigh-efficiencyLED's.Mostofthe commercially available GaN –based LED's have been fabricated by MOCVD on single crystalline Sapphire wafers because of their high thermal and chemical stability. However , application of GaNbased on LED's 'those are often restricted because of the use of sapphire as the substrate for GaNepitaxy has significant problems of small area, high cost, and difficulty in processing.

GaN on sapphire also suffers from large mismatches in lattice constants (16%) and thermal expansionCoefficient (34%), which leads to the formation of high-density crystalline defects in

GaNfilms.Toaddresstheseissuesandexpandtheapplicationfieldof GaN-basedLED's,a technique to grow high-quality GaN films on alternative substrate needs to be developed.

Metalhaverecentlyemergedasapromisingsubstrateforthispurpose,sincemetalfoils generallyposses flexibility and high thermal and electrical conductivity, and large-area metal foils can beprepared by a rolling process at a reasonable cost. Among various metals , hafnium(Hf) is an ideal substrate material for GaN growth because it shares many similarities in structural properties with GaN , including a similar space symmetry group (P6 /mmc(Hf) and P6 mc(GaN)and small mismatches in the axis lattice constant(0.3%) and the thermal expansion coefficient(5.3%)between GaN and Hf.

Despitetheseadvantages,GaNgrowthonaHffoilhasnotbeenpracticalbecauseoftwo significant problems. One problem is the randomly oriented grains of commercially available Hf foils,whichleadsto poorcrystallinequalityoftheoverlaidGaNfilm.Tosolvethisproblem,a highlyc-axisorientedHffoil withalargegrainsizeshouldbepreparedbeforeGaNgrowth.
Annealingcanbeasimpleapproachtopromoterecrystallizationofametalfoil,whichcan producea highlyorientedstructure.Theotherproblemistheseriousinterfacialreactions betweenGaNand Hfduringhigh-temperaturegrowthinconventionaltechniquessuchas MOCVD.Theinterfacial reactionsmustbesuppressedtogrowhigh-qualityGaNfilmsonHf foils. Recentprogressinthe epitaxialgrowthprocessbasedonPDShasmadeitpossibletogrow high-qualitygroup3atomsduring PDSgrowth.SuchLTgrowthcansuppresstheinterfacial reactionsbetweenGaNandachemically vulnerablesubstratesuchasmetals.Infact,LT epitaxialgrowth of GaN and AIN films on various single-crystalline metal substrates has been achieved. It should be noted that PDS is capable of industry-scale growth of GaN due to its high productivityandscalability.Inthisstudy,weinvestigatedGaNgrowth onHffoilsbyPDSand
explored the feasibility GaN based full color LED's on the Hf foils.

Ascanningelectron microscope (SEM) image of an as-received 50-μm-thick Hf shows the foil surface to be rough(Fig.1a), as expected from the rolling process for producing foils. The halo reflectionhigh-energy diffraction(RHEED)patternintheinsetofFig.1aindicatesthatthe surface is covered with an amorphous oxide layer. Fig 1b shows the crystal orientation map collected by election backscattered diffraction(EBSD) in the normal direction of the surface.

The randomly oriented grains with a size as small as 5µm. To improve the crystalline quality and surface smoothness of Hf foils, we annealed the foils above 1000°C in vaccum .

After annealing, the surface smoothness was drastically improved, as seen in the SEM image of Fig.1c.

A sharp streaky diffraction pattern was seen in RHEED observation (inset of Fig.1c),indicatingremoval of the amorphous oxide layer and appearance of crystalline Hf with the smooth surface.

Fig 1d shows the EBSD crystal orientation map along the surface normal direction.One canclearly see that the annealed Hf foils have highly c-axis oriented structure in the entire area.

Also, the map in the rolling direction revealed that the grain size of the annealed c-axis orientedHf foils was as large as 500µm , as shown in Fig.1e. X-ray diffraction(XRD) measurements werealso performed to investigate the before and after annealing .As shown in Fig .1f ,the as-receivedHf foil showed multiple peaks indicating randomly oriented crystalline structure,whileonly{0001}related diffractionpeakswereobservedfortheannealedHffoil.
TheseXRD data are consistentto the EBSD results. The full width at half- maximum (FWHM) value of 0002 x-ray rockingcurve (XRC)of the annealed Hf foil was as small as 151 arcsec, which is attributed to the highlyc-axis orientation of the annealed Hf foil . These results indicates process makes the Hf foils suitablefor GaN crystalline growth.

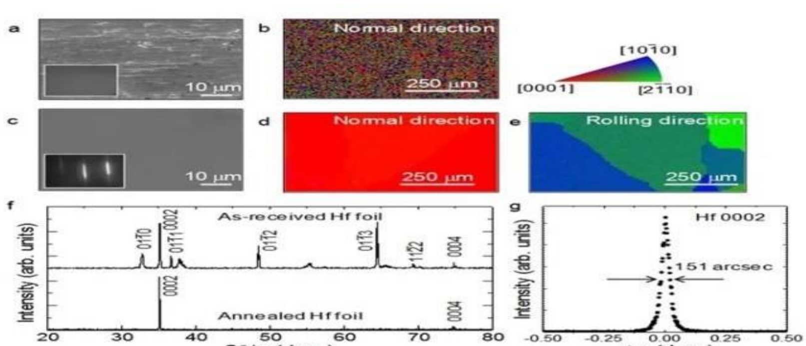


Fig.5.3

Surfacestructureandcrystalorientations of Hf foils. (a)SEM image and (b) EBSD crystal orientationmap along surface normal direction for the as –receive Hf foil.(c)SEM image for the annealedHffoil.(dande)EBSDcrystalorientationmapsalongthesurfacenormalabdrolling directions fortheannealed Hf foil, respectively. Insets of (a and c) shows RHEED patterns .(f)XRD curves of the as-received and annealed Hf foils.(g) XRC for the Hf 0002 diffraction of the annealed Hffoil.AftertheHf foilwasannealed,a1µm-thickGaNfilmwasgrownbyPDSwitha LT-grown reactionbarrier layer.SEM observations showed that the GaN film surface is smooth (Fig.2a),and atomicforce microscope (AFM) observations revealed the surface has step-and- terrace structures witha root-mean-square(rms) value of 2.0nm(inset of Fig.2a), which indicates that GaN growth is twodimensional .Fig 2b illustrates the cross-section transmission electron microscope(TEM) imageof the GaN film on the Hf foil. The heterointerface between GaN and Hf was smooth and sharp, indicating that introduction of the LT-grown reaction barrier layer significallysuppressestheinterfacialreactionduringGaNgrowthonHf.Fig 2cshowsEBSDpole figuresfor20*20µm²areaoftheGaNfilm.The{0001}spotfortheGaNfilmswas sharpandthe

{1$\bar{1}$24}polefigureshowedaclearsix-foldrotationalsymmetry.Thisresultindicatesthatthe GaNhas asingledomainstructure,atleastintheEBSDscannedarea(20*20µm²),duetothe constraint fromHf atoms. To investigate the crystalline quality of the GaN film ,XRC measurementswerePerformed (Fig.2d). The FWHM values of 0002 and 10$\bar{1}$2 XRCs of the GaN film were 324 and684 acres, respectively. It should be noted that these values are comparable to those on conventionalsubstrates such as sapphire or Si.Fig 2e shows the photoluminescence(PL) spectrum of the GaNfilm at RT .The GaN film exhibited a sharp near- band-edge emission from a hexagonal phaseat around 3.4eV,with the FWHM value as small as 38meV.From these results, we infer that the use of LT-growth by PDS enables the production of epitaxialGaNfilmsonHffoilswithoutinterfacialreactions,whichcanbepotentially usedfor fabrication of electronicdevices.

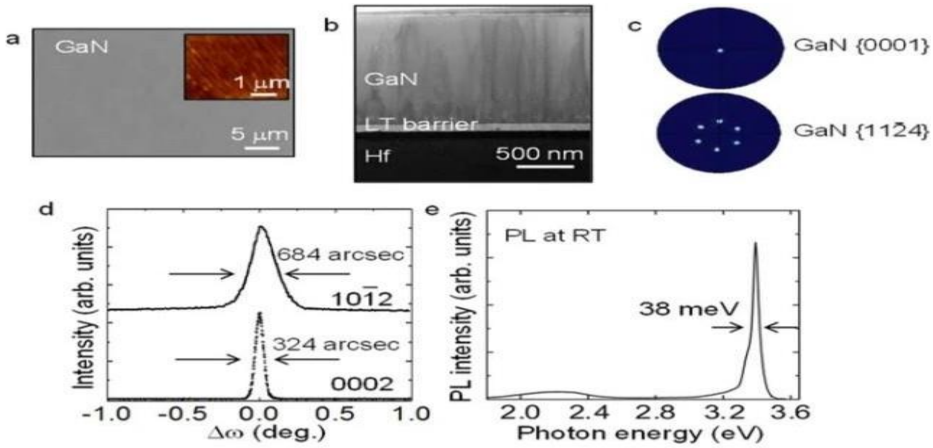



Fig 5.4

Structuralandopticalpropertiesof GaNfilmonHffoilwithaLT-grownreactionbarrierlayer.

(a)SurfaceSEMand(b)cross-sectionalTEMimagesoftheGaNfilm.Insetof(a)isasurfaceAFM image.(c) EBSDpolefiguresof{0001] GaNand{11$\bar{2}$4}GaN.(d)0002and10$\bar{1}$2XRCs,and(e)a

RT-PL spectrum of the GaN film.

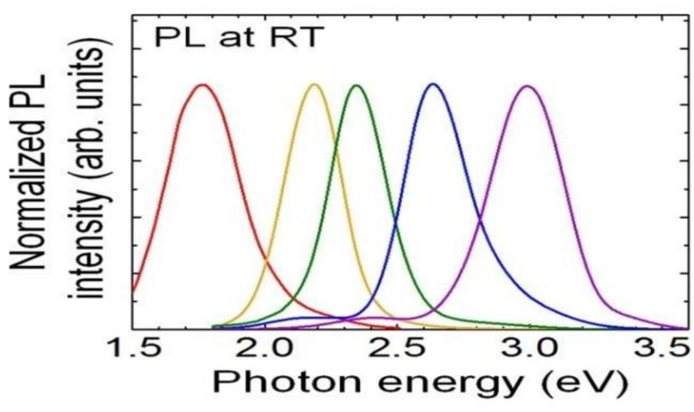



Fig 5.5

Opticalproperties of InGaNfilms.RT-PLspectra ofInGaNfilmswithoutvariousin compositions.

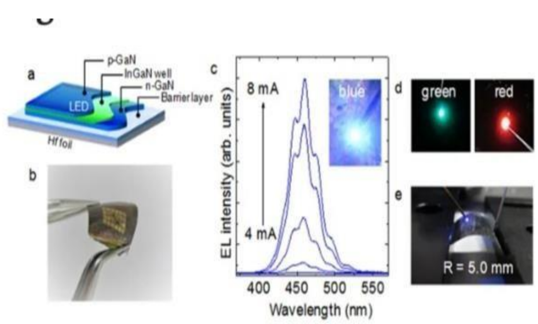



fig 5.6

Fabrication of LEDs on Hf foils.(a) Schematic illustration of an LED structure .(b)Optical image of a flexible Hf foil with a GaN-based LED array.(c) EL spectra of the LED structure at forward currents ranging from 4 to 8mA. The inset shows an optical image of blue EL at a forword current of 8mA.(d) Photographs during the operation of green and red LEDs.(e) Light emission photograph at a bending radius of 5.0mm.

## 6. Buzzer:

A buzzer or a beeper is an audio signalling device which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Fig 6.1

### Types of buzzers:

**Electromechanical:** Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchoredtoawallorceilingtouseitasasoundingboard.Theword“buzzer” comes from the rasping noise that electromechanicalbuzzers made.

Fig 6.2

**Mechanical:** Ajoybuzzerisanexampleofapurelymechanicalbuzzerandtheyrequire drivers. Other examples of them are doorbells.

Fig 6.3

**Piezoelectric:** Apiezoelectricelementsmaybedrivenbyanoscillatingelectroniccircuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonlyusedtoindicatethatabuttonhasbeenpressedareclick,aringorabeep.


Fig 6.4

ApiezoelectricbuzzeralsodependsonacousticcavityresonanceorHelmholtz resonance to produce an audible beep.

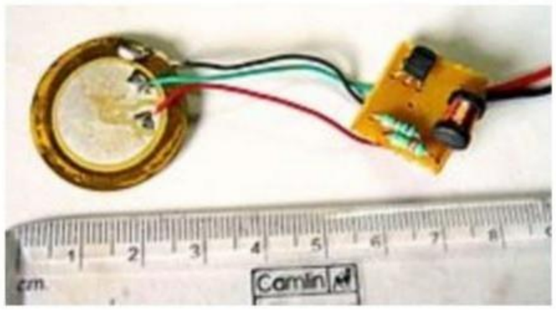


Fig 6.5

## 7. IR Pair:

Sensorsarebasicallyelectronicdeviceswhichareusedtoscenethechangesthatoccurintheir surroundings.Thechangemaybeincolor,temperature,moisture,sound,heatetc.Theysense thechange andworkaccordingly.InIRsensorthethereisemitteranddetector.Emitteremits the IR rays and detector detects it.

TheIRsensorbasicallyconsistsofthreecomponents: IR
LED(emitter)
Photodiode(detector)
Op-Amp

IR LED:

IR LED:

Fig 7.1

IR LED is a light emitting diode which emits the IRradiations.The basic function of the emitter is to convertelectricityintolight.Itworksontheprincipleofcombinationofelectron-holepair.As inthe conductionbandofadiode,electronsarethemajoritycarrierandinthevalenceband, holes are majority carrier.So when an electron from a conduction bandre combines with a hole ofvalance band,someamountofenergyisreleasedandthisenergyisintheformoflight.The amountofenergy releasedisdependsupontheforbiddenenergygap.TheIRLedhastwo legs,the leg which is longer is positive and other leg is negative.

Photo diode

Fig 7.2

The photo diode is a p-n junction diode which is connected in reverse bias direction. The basic function of thedetectoristoconvert lightintoelectricity. Asitsname impliesthat itworks effectivelyonlywhen thecertainnumberofphotonorcertainamountoflightfallsonit. When thereisnofalloflightonthe photodiodeithasaninfiniteresistanceandactasanopenswitch butasthelightstartsfallingonthe photodiode,theresistancebecomeslowandwhenthefull intensityoflightfallonthephotodiodethen itsresistancebecomeszeroanditstartsactlikea closed switch.

OP-AMP:

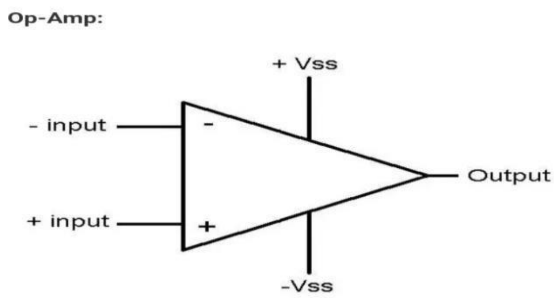



Fig 7.3

OP-AMP stands for operational amplifier. It is a DC-coupled high gain amplifier with differential inputs and single output. Typically the output of the op-amp is controlled by either negative or positive feedback. Due to the fact that it performs several operations like addition, subtraction, etc. It is named as operational amplifier. It has two inputs pins and one output pin.

## 8. IR Transmitter:

Infrared Transmitter is a light emitting diode (LED) which will emits infrared radiations. Hence, theyare calledasIRLED's.EventhoughanIRLEDlookslikeanormalLED,theradiationemitted by it is invisible to the human eye.

The picture of a typical infrared LED is shown below

Fig 8.1

There are different types of infrared transmitters depending on their wavelengths, output power and responsetime.

A simple infrared transmitter can be constructed using an infrared LED, a current limiting resistor and also power supply.

IR Transmitter can be found in several applications. Some applications require infrared heat and the best infrared source is infrared transmitter. When infrared emitters are use with Quartz, solar cells can be made.

## Distinguishing Between Black and White colours:

It is a universal that all the black colours absorb the entire radiation incident on it. Based on this principle, the second positioning of the sensor couple can be made. The IR LED and the photodiode are placed side by side. When the IR transmitter emits infrared radiation, since there is no direct line of contact between the transmitter and receiver, the emitted radiation must reflect back to the photodiode after hitting any object. The surface of the object can be divided into two types: reflective surface and non- reflective surface.

If the surface of the object is reflective in nature i.e. it is white or other light colour, most of the radiation incident on it will get reflected back and reaches the photodiode. Depending on the intensity of the radiation reflected back to the current flows in the photodiode.

If the surface of the object is non-reflective in nature i.e. it is black or other dark colour, it absorbs almost all the radiation incident on it. As there is no reflected radiation there will be no radiation incident on the photodiode and the resistance of the photodiode remains higher no current to flow. This is the main situation is similar to there being no object to all.

The pictorial representation of the above scenarios is shown below:

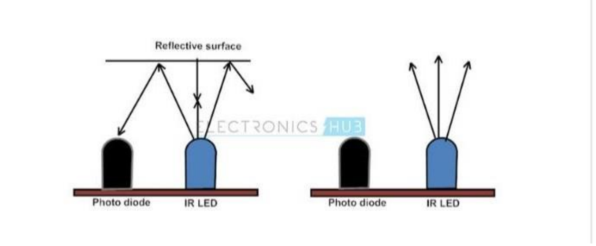



Fig 8.2

The positioning and enclosing of the IR transmitter and the Receiver is very important. Both the transmitter and the receiver must be placed at a certain angle, so that the detection of an object happens properly. This angle is the directivity of the sensor which is +/-45 degrees.

The directivity is shown below:

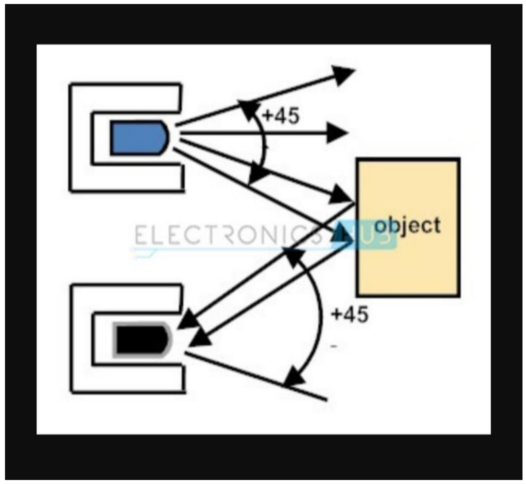
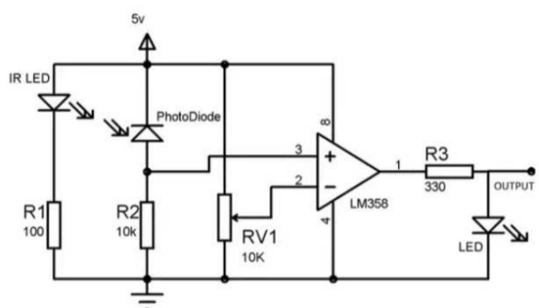



Fig 8.3

In order to avoid reflections from surrounding objects other than the object, both the IR transmitter and the IR receiver must be enclosed properly. Generally the enclosure is made of plastic and is painted with the black colour.

Working:

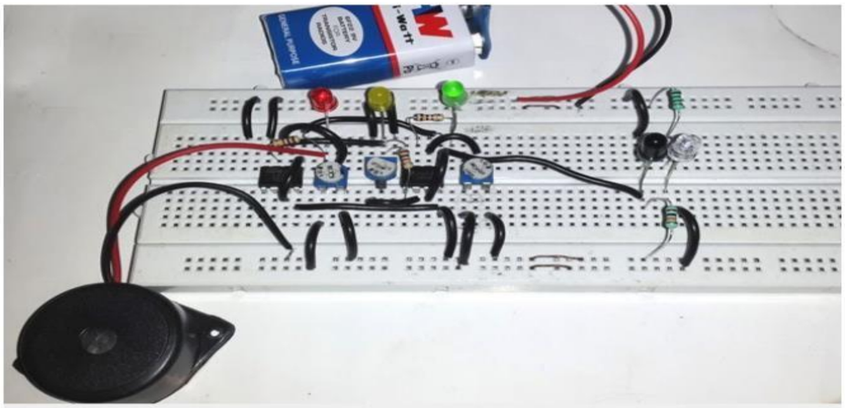



We know that the white surface reflects all the radiations falls on it whereas the black color absorbs them. When the supply is given to IR sensor, LED starts emitting light radiations. If the surface is of white color then it reflects all the radiations. As these radiations starts falling on the photodiode which is connected in reverse bias the resistance of the photodiode starts decreasing rapidly and the voltage drop across the diode also decreases. The voltage at pin 3 starts increases, as it reaches just beyond the voltage pin 2 the comparator gives high output. In case of the black surface, LED emits light but it is not reflected by the surface. Hence the comparator gives low output.

# Chapter: 5

## Results and Discussion

### Results:



Reverse Car Parking Circuit using IC LM358

### Discussion:

The effective range is proportional to the power of the transmitted pulses. As we have found out from our circuit, that as the distance of the car from the wall got less and less, the reflected IR needed less time and also it bought back a more intensified beam back reflected.

This system is placed at the rear of the car and sensors front side towards the obstacle. Now suppose car is moving back towards the wall or obstacle in the parking slot. If distance between car and obstacle is more than 15cm then no LED will glow. Now if car moves towards the obstacles and suppose green light turned on, it means car is about 15cm away from the obstacle. Now car is moving more close towards the obstacle and yellow light appears or turned on it means car is about 10cm away from the obstacle. Now car is moving closer towards the obstacle and red light appears it means car is about 5cm away from the obstacle and same time buzzer start beeping. Buzzer and red light indicates that the car need to stop now otherwise car may be damaged.

To test the accuracy of the device we measured the actual distance between the sensors and the objectwithrulerandcomparedthattothedistancereadingwhichwehaveexpectedfrom the calculations.

| **Obstacle v/s Vehicle** | **LED status** | **Reference Voltage** | **Distance** |
| --- | --- | --- | --- |
| not close | All OFF | | Greater than 15 cm |
| Close | Green ON | 2.0 Volt | About 15 cm |
| More Close | Yellow ON | 4.0 Volt | About 10 cm |
| More Close | Red ON | 6.0 Volt | About 5 cm |
| Touch | Car Damaged | | About 0 cm |

Table 5.1 Distance intervals and corresponding lighted LEDs

# Chapter: 6

## Conclusion and Future Scope

### Conclusion:

Usingthiscircuit,theefficiencyinalleviatingthetrafficproblemthatarisesespeciallyinthecity .Where traffic congestion and the insufficient parking spaces are undeniable.

### Future Scope:

Newandbettertechnologyforthecarsandotherautomobiles,withbothvisualaswellas audible feedback**.**

This is a valuable car accessory technology because not only is it great addition to our high-tech car gadgets, it greatly lowers the risk of vehicle accidents.

### Advantages:

1. By this parking area can be easily identified so the traffic is reduced and also carbon emission is also reduced.

2. Low cost

3. Low power consumption

4. Moreaccurateandwellsuitedforrealtimeimplementation

5.Helps the driver a better and convenient for parking.

### Applications:

1.This circuit can be used in auto mobiles to park the vehicle safely. 2.We can

use this circuit to measure the distance.

3.We can also use this circuit as IR Liquid Level Detector by making few modifications.

## Limitations:

1.IR receiver may receive the normal light. As a result, parking sensor may not work properly. 2.We should arrange IR sensors accurately; otherwise they may not detect the obstacle.

## Reference:

www.circuitdigest.com

www.electronichub.com

Reverse Car Parking Sensor

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