

REALTIME INFRARED THERMAL ANALYSER MOD FOR SMARTPHONE

Submitted in partial fulfilment of requirements for the award of
Bachelor of Engineering in Electronics and Communication Engineering

by

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **G RAMESH KUMAR REDDY(Reg.No.37130340)** and **DASARI TEJA SAI (Reg.No.37130102)** who carried out the project entitled “**REAL TIME INFRARED THERMAL ANALYSER MOD FOR SMART PHONE**” under my supervision from December 2020 to April 2021.

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Submitted for Viva voce Examination held on_____

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DECLARATION

We, **G RAMESH KUMAR REDDY (37130340)** and **DASARI TEJA SAI (37130102)** hereby declare that the Project Report entitled “**REAL TIME INFRARED THERMAL ANALYSER MOD FOR SMARTPHONE**” done by us under the guidance of **Dr. G.JEGAN M.E., Ph.D.** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE: 18-04-2021

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATES

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We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

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We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr. G.JEGAN M.E., Ph.D.** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

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ABSTRACT

The objective of the project is to develop a Infrared thermal analyzer mod which can able to scan the people using a smartphone using a laser diode pointer guide. This product uses a custom developed android application for real time scanning and analysis. Using the smartphone camera this product software stores the user images along with temperature. Thissystem can be used in malls and office spaces for scanning the people.

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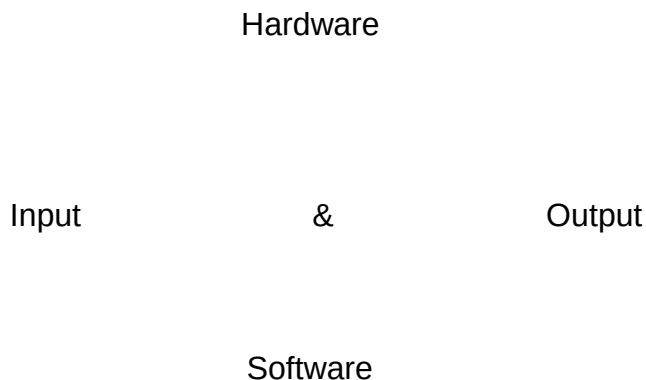
CHAPTER 1

1.1 INTRODUCTION:

Installed Systems are indistinguishable piece of our life. Regardless of whether we are at home or office or progressing, we are constantly encircled by installed frameworks. Beginning from home apparatuses like TV, clothes washer and frameworks like printer and lift in working environment to the cars and programmed traffic light framework are largely instances of installed frameworks. A wide range of magazines and diaries consistently dole out insights regarding most recent advancements, new gadgets; speedy applications which cause us to accept that our essential endurance is constrained by these inserted items.

Implanted frameworks is a blend of Hardware and Software Design to meet a particular need with execution in given time period.

Component in an embedded system are as



1.2 Characteristics of embedded products

They do a solitary arrangement of undertakings. Working in a period compelled climate.

Guarantee an undeniable degree of consistency and steadfastness.

Since installed frameworks are mass fabricated in millions, they are by and large cheap.

1.2 Embedded products in Today's industry:-

1. Telecommunications

Modems, routers, and mobile phone networks

2.Auto applications:

Engine control units, slowing mechanisms, footing frameworks, airbag discharge frameworks, steer-by-wire frameworks

3.Domestic appliances:

Automotive applications, Engine control units, braking systems, traction systems, airbag release systems, steer-by-wire systems

4.Robotic:

Robotic weapons, firefighting robots, and automatic floor cleaners as well as.

5.Aerospace applications:

Flight control frameworks, motor regulators, autopilots, traveler in-flight theater setups.

6.Medical equipment:

An aesthesis checking frameworks, ECG screens, pacemakers, drug conveyance Systems, MRI scanners

7.Defense systems:

Radar frameworks, contender airplane flight control frameworks, radio frameworks.

8.Office automation:

Indoor regulators, grain analyzers, laser printers, fax machines, pagers, sales registers, gas siphons, credit/charge card per users

CHAPTER 2

2.0 LITERATURE SURVEY

Zhixue Dong ; Yila Su; Xiangyong Yan in their paper Temperature Control System of the Thermal Analyzer Based on Fuzzy PID Controller. The warm analyzer's temperature control strategy has nonlinear, time-differing, and delay attributes.

Sarun Sumriddetchkajorn; Armote Somboonkaew in their paper Thermal analyzer empowers improved untruth recognition in criminal-suspect cross examinations.

Continuous examination of IR emanation from eye and nose zones gives a nonintrusive strategy to assessing explanations.

JoelPérez; A.Rodríguez; Manfredi in their paper The Thermal Infrared Sensor (TIRS) of the Mars Environmental Dynamics Analyzer (MEDA) instrument installed Mars 2020, an overall depiction and execution investigation.

The Mars Environmental Dynamics Analyzer (MEDA) is a bunch of ecological sensors that will be utilized on NASA's Mars 2020 mission. One of MEDA's six sensors, the Thermal Infrared Sensor (TIRS), was created at Spain's Centro de Astrobiologia. It can gauge net warm infrared radiation and reflected sun oriented radiation at the surface, just as surrounding and surface skin temperature.

Hasmah Mansor; Muhammad Helmy Abdul Shukor; Siti Sarah Meskam; Nur Quraisyia Aqilah Mohd Rusli; Nasiha Sakinah Zamery In their paper, they portray how specialists can utilize a distant wellbeing checking framework to follow patients' essential signs by means of the web, which is moderately new in Malaysia and different nations. They additionally plan and assemble an internal heat level estimation gadget that can be observed by specialists progressively just as foundation information through the web, with a caution/sign if there should be an occurrence of irregularities. In the proposed wellbeing reconnaissance framework. The temperature sensors will send the readings to a microcontroller utilizing Xbee remote correspondence. To send the ongoing information to wellbeing checking data set, remote neighborhood (WLAN) has been utilized.

Arduino with Ethernet safeguard dependent on IEEE 802.11 standard has been utilized for this reason. Test results from a gathering of intentional shows the ongoing temperature perusing effectively observed locally (at home) and distantly (at specialist's PC) and the readings are similar to business thermo meter. Keywords—wellbeing checking; temperature sensor; Arduino; internal heat level; clinical gadget. Carl Wunderlich the principal German doctor played out the fundamental estimation of human center internal heat level in solid people, the normal announced worth was 37 °C or 98.6 degree Fahrenheit. As a result of his work on temperature Wunderlich is by and large viewed as the dad of clinical thermometry²⁰⁻²¹. As indicated by Wunderlich, ordinary internal heat level exists in a scope of 97.2 °F/36.2 °C to 99.5 °F/37.5 °C. Wunderlich tracked down that the internal heat level isn't consistent and changes in both sound and undesirable people. He stated, "The absolute bottom is reached toward the beginning of the day hours somewhere in the range of two and eight, and the most noteworthy in the early evening between four. In his examination the internal heat level ascends in mental effort, clogging and pee retention. He saw that ladies have marginally higher internal heat level than men and among age gatherings; more seasoned people have altogether lower internal heat level contrast with more youthful individuals²⁰.

Internal heat level is impacted by a few elements, like diurnal variety and cell digestion, because of muscle movement during the day practice and encompassing temperature ²²⁻²³.

Day by day internal heat level isn't reliant on hand of estimation, which is non-straight, and portrayed by second to second complex inconstancy ⁴. The cosinor investigation of temperature fluctuation information is grounded in circadian exploration of internal heat level rhythms, which is depicted in a straightforward cosine wave, which is commonly described regarding acrophase, sufficiency

CHAPTER 3

3.1 EXISTING SYSTEM

The existing work of this project is to improve the object of the thermal analyzer .Previously we using the thermometer and now we using the camera from android phone and Bluetooth from it

A digital thermometer can be used three different ways. These include:

Oral: For this method, the thermometer is placed under the tongue. This method is used for adults and children 4 and over who are able to hold thermometer in mouth.

Rectal: For this method, the thermometer is inserted gently into the rectum. This is mostlydone in babies but can used in children up to 3 years of age. You can take rectal temperatures in children older than 3 years, but it might be difficult to keep them as still asthey need to stay.

Axillary: For this method, the thermometer is placed in the armpit for young children or adults whosetemperature can't safely be done orally. This method is not as accurate as oral or rectal but can beused as a quick first check. You can follow this with an oral or rectal reading.

Other types of thermometers (young children and adults):

Tympanic (ear): This type of thermometer measures the temperature inside of the ear by reading the infrared heat there. For best results, make sure to follow the instructions on thedevice about placing the tip correctly. For older babies and children, ear thermometers canbe quicker and easier to use. However, they are not recommended if your baby is three months old or younger. They should not be used if your child has too much earwax.

Temporal artery (forehead): Forehead thermometers are also used to measure temperature, but may not be as reliable as the digital thermometers and are usually more expensive. They are placed on the temporal artery of the forehead and measure the infrared heat that comes off of the head.

CHAPTER 4

4.1 PROPOSED SYSTEM

- The objective of the project is to develop a Infrared thermal analyzer mod which can able to scan the people using a smartphone using a laser diode pointer guide.
- This product uses a custom developed android application for real time scanning and analysis.
- Using the smartphone camera this product software stores the user images along with temperature.
- This system can be used in malls and office spaces for scanning the people.

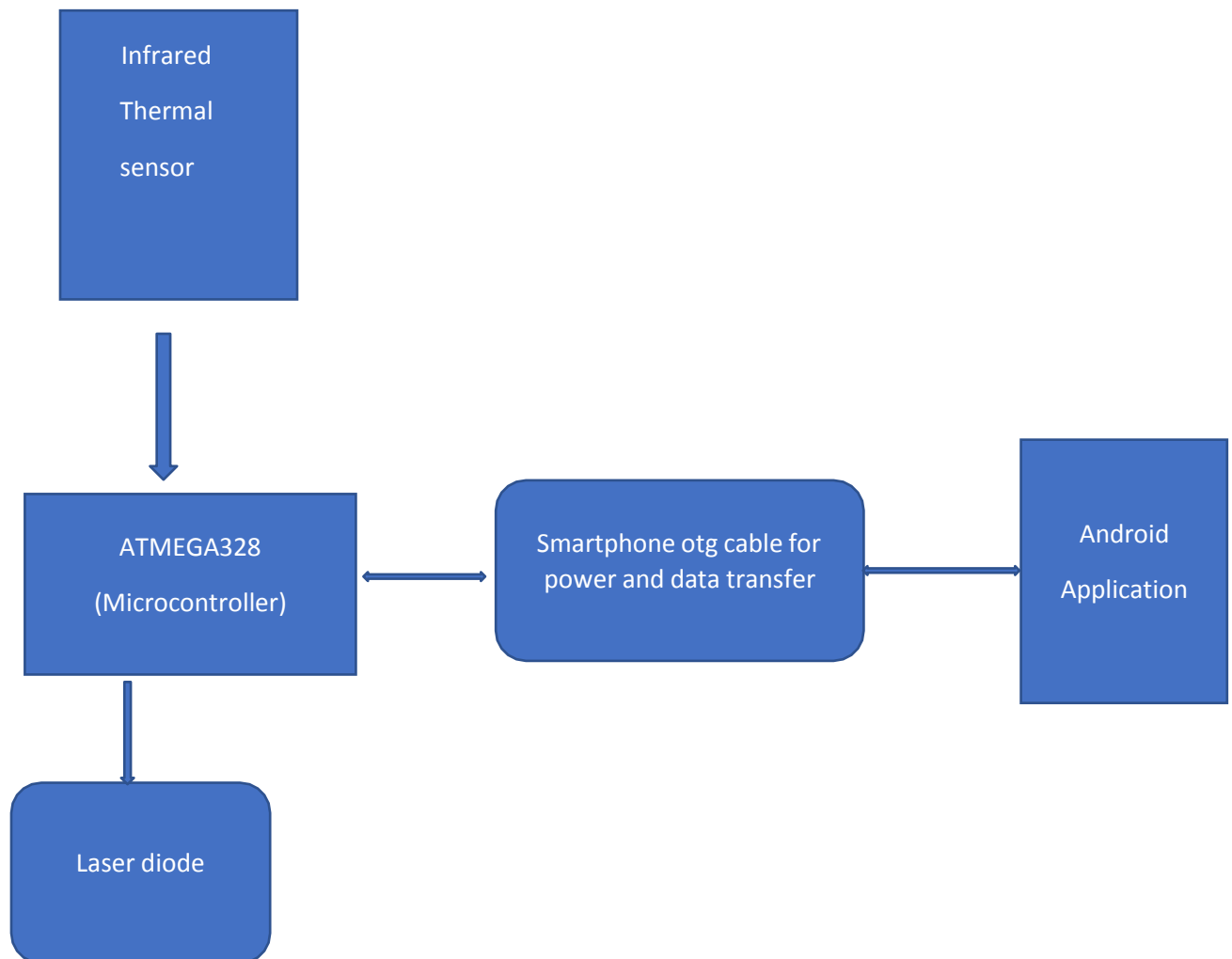


Fig 4.2.scanning mod

4.3 INFRARED THERMAL SENSOR: into the same TO-39 can. The Integrated MLX90614 GY-906 is a low noise amplifier, 17-bit ADC, and powerful DSP unit thus achieving high accuracy and resolution of the thermometer.

The user can configure the digital output to be PWM. As a standard, the 10-bit PWM is configured to continuously transmit the measured temperature in the range of -20 to 120 °C, with an output resolution of 0.14 °C.

The MLX90614 ESF is an Infra-Red thermometer for non-contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASIC are integrated

4.4 Application:

- High precision non-contact temperature measurements
- Thermal Comfort sensor for Mobile Air Conditioning control system
- The temperature sensing element for residential, commercial and industrial building air conditioning Windshield defogging
- The automotive blind angle detection Industrial temperature control of moving parts
- Temperature control in printers and copiers
- Home appliances with temperature control
- Healthcare
- Movement detection
- Multiple zone temperature control – up to 127 sensors can be read via common 2 wires
- Thermal relay/alert
- Body temperature measurement

4.5 Features:

- Works from 3.3V to 5V input, Module has power regulator IC built-in.
- Standard I2C interface with built 2x pull up resistors
- When measuring the temperature, please maintain a measuring distance of 1 cm

- Small size, low cost
- Easy to integrate
- Factory calibrated in a wide temperature range: -40 to 125 °C for sensor temperature and -70 to 380 °C for object temperature.
- High accuracy of 0.5°C over the wide temperature range (0..+50 C for both Ta and To)
- Medical accuracy of 0.1°C in a limited temperature range available on request
- The measurement resolution of 0.01°C
- SMBus compatible digital interface for fast temperature readings and building sensor networks
- Customizable PWM output for continuous reading

Simple adaptation for 8 to 16V applications

- Operating Voltage (V 3- 5)

Operating Current(mA)

2

Communication protocol

I2C

Sensor working temperature(Degree C)

-40 to +125

Sensing temperature range(Degree C)

-70 to +380

4.6 ATMEGA328 MICROCONTROLLER:

The ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per 1MHz. This empowers system engineer to optimize the device for power consumption versus processing speed.

4.6.1 Fully FEATURES:

High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family

- Advanced RISC Architecture
- 131 Powerful Instructions
- Static Operation
- Up to 20 MIPS Throughput at 20MHz
- On-chip 2-cycle Multiplier Most Single Clock Cycle Execution
- 131 Powerful Instructions
- Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers

4.7 High Endurance Non-volatile Memory Segments

- 32KBytes of In-System Self-Programmable Flash program Memory
- 1KBytes EEPROM – 2KBytes Internal SRAM
- Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Data Retention: 20 years
- Optional Boot Code Section with Independent Lock Bits
- In-System Programming by On-chip Boot Program
- True Read-While-Write Operation – Programming Lock for Software Security
- Atmel® QTouch® Library Support
- Capacitive Touch Buttons, Sliders and Wheels
- QTouch and QMatrix® Acquisition
- Up to 64 sense channels

4.8 Peripheral Features

- Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- Real Time Counter with Separate Oscillator
- Six PWM Channels
- 8-channel 10-bit ADC in TQFP and QFN/MLF package
- Temperature Measurement – 6-channel 10-bit ADC in PDIP Package
- Temperature Measurement – Two Master/Slave SPI Serial Interface
- One Programmable Serial USART
- One Byte-oriented 2-wire Serial Interface (Philips I2C compatible)
- Programmable Watchdog Timer with Separate On-chip Oscillator
- One On-chip Analog Comparator – Interrupt and Wake-up on Pin Change

4.9 Special Microcontroller Features

- Power-on Reset and Programmable Brown-out Detection
- Internal Calibrated Oscillator
- External and Internal Interrupt Sources
- Central processing unit-ranging from small and simple and simple 4 bit processors
- Volatile memory for data storage
- ROM, EPROM, EEPROM memory for program and operating parameter storage.
- Rom full form read only memory.
- Ram means random access memory.
- A micro controller may have more than one timer and counters.

- –Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- I/O and Packages
- 23 Programmable I/O Lines
- 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF
- Operating Voltage: – 1.8 - 5.5V
- Temperature Range: – -40°C to 105°C
- Speed Grade: – 0 - 4MHz @ 1.8 - 5.5V – 0 - 10MHz @ 2.7 - 5.5V – 0 - 20MHz @ 4.5 - 5.5V
- Power Consumption at 1MHz, 1.8V, 25°C
- Active Mode: 0.2mA
- Power-down Mode: 0.1µA
- Power-save Mode: 0.75µA (Including 32kHz RTC)

Description:

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base

while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully debounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite toolchain allows you to explore, develop and debug your own touch applications. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program

memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications. The ATmega328/P is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.

4.10 CONFIGURATION SUMMARY :

FEATURES	ATMEGA328
Pin count	28/32
Flash	32k
Spram	2k
Eeprom	1k
Spi	2
Usart	1
Twi	1
Usart	1
Adc	10 -bit 15ksps
Adc channels	8
8-bit timer/counters	2
16-bit timer	1

4.11 ORDERING INFORMATION:

Speed(mhz)	Power supply(v)	Ordering code	package	Operating range
20	1.8 - 5.5	ATmega328-AU ATmega328-AUR(5) ATmega328-MMH(4) ATmega328-MMHR(4)(5) ATmega328-MU ATmega328-MUR(5) ATmega328-PU	32A 32A 28M1 28M1 32M1-A 32M1-A 28P3	Industrial (-40°C to 85°C)

Note:

- This device can also be supplied in wafer form. Please contact your local Atmel sales office for

detailed ordering information and minimum quantities.

- Pb-free packaging, complies to the European Directive for Restriction of Hazardous Substances

(RoHS directive). Also Halide free and fully Green.

PACKAGE TYPE:

28M1	28-pad, 4 x 4 x 1.0 body, Lead Pitch 0.45mm Quad Flat No-Lead/Micro Lead Frame Package
28P3	28-lead, 0.300" Wide, Plastic Dual Inline Package
32M1-A	32-pad, 5 x 5 x 1.0 body, Lead Pitch 0.50mm Quad Flat No-Lead/Micro Lead Frame Package
32A	32-lead, Thin (1.0mm) Plastic Quad Flat Package

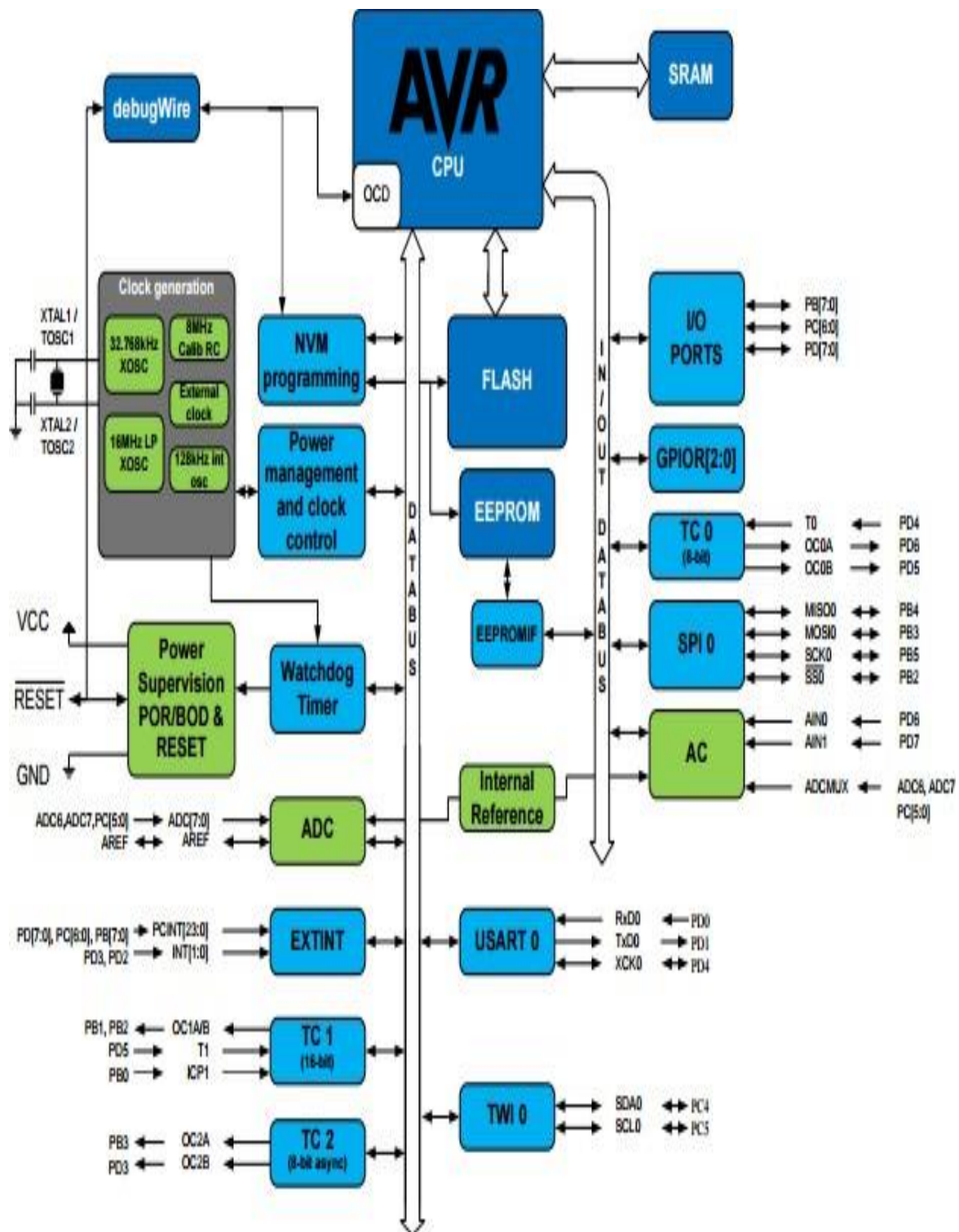


Fig 4.12. Atmega328

Pin Configuration:

Pin-out:

28-pin PDIP:

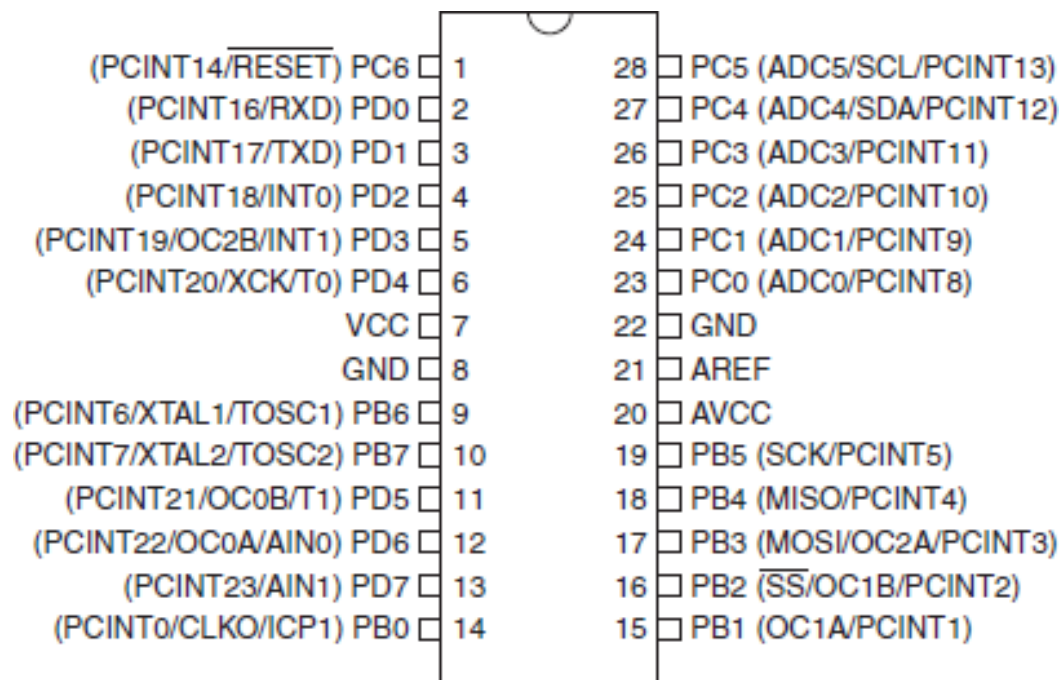


Fig:4.13.28-pin-pdip

Pin description:

VCC

Digital supply

voltage. GND

Ground.

Port B (PB[7:0]) XTAL1/XTAL2/TOSC1/TOSC2

Port B has inner draw up resistors and is a 8-digit bi-directional I/O port (chosed for each piece). The yield cushions on Port B have balanced drive qualities and high sink and source capacities. On the off chance that the draw up resistors are set off, Port B sticks that are remotely pulled low will source current as information sources. At the point when the reset condition is dynamic, the Port B pins are tri-expressed. at the point when a reset condition becomes dynamic, regardless of whether the clock isn't running.

PB6 can be utilized as a contribution to the rearranging Oscillator speaker and as a contribution to the inner clock working circuit, contingent upon the clock range combine settings.

PB7 can be utilized as a yield from the altering Oscillator speaker relying upon the clock choice circuit settings. If the chip clock source is the Internal Calibrated RC Oscillator, the TO is PB[7:6].

.Port C (PC[5:0])

Port C has inward draw up resistors and is a 7-piece bi-directional I/O port (chosed for each piece). The PC[5:0] yield cushions have even drive attributes and a huge sink and source limit. On the off chance that the draw up resistors are set off, Port C pins that are remotely pulled low will source current as sources of info. At the point when the reset condition is dynamic, the Port C pins are tri-expressed.

PC6/RESET

PC6 is utilized as an I/O pin if the RSTDISBL Fuse is modified. It's significant that the electrical properties of PC6 differ from those of the other Port C pins. PC6 is utilized as a Reset input if the RSTDISBL Fuse isn't modified. Regardless of whether the clock isn't working, a low level on this pin for more than the base heartbeat term will trigger a Reset. More limited heartbeats don't generally bring about a reset. The different unique highlights of Port C are expounded in the Alternate Functions of Port C segment.

Port D (PD[7:0])

Port D is a 8-digit bi-directional I/O port with pull-up resistors worked will low source current as data sources. At the point when the reset condition is dynamic, the Port D pins are tri-expressed.

AVCC

AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

will low source current as data sources. At the point when the reset condition is dynamic, the Port D pins are tri-expressed.

AVCC

AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

AREF

AREF is the analog reference pin for the A/D Converter.

ADC[7:6] (TQFP and VFQFN Package Only) In the TQFP and VFQFN package, ADC[7:6]

serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

I/O Multiplexing

Each pin is by default controlled by the PORT as a general purpose I/O and alternatively it can be assigned to one of the peripheral functions.

4.14 LASER DIODE: Light amplification by stimulated emission of radiation, or LASER, is an acronym for light amplification by stimulated emission of radiation. A laser diode emits a single wavelength or a narrow band of wavelengths that are closely spaced.

When an incident photon strikes a semiconductor atom, the higher energy level electrons recombine with the lower energy level hole, resulting in light emission. Two photons are released as a result of this, one incident and the other due to electron and hole recombination.

LEDs operate on the same idea, but the internal architecture is somewhat different. A laser diode is made up of narrow channels that function as a light waveguide. LEDs, on the other hand, are made up of large channels. Light sources such as laser diodes and other light sources

The laser diode emits coherent and monochromatic light due to its composition (Single colour).The light emitted by Laser diode consists of single wavelength while LEDs emit light consisting of a wide band of wavelengths. Thus, the light emitted by LED is incoherent.

The diode emits coherent and monochromatic light due to its composition (Single colour).The light emitted by diode consists of single wavelength while LEDs emit light consisting of a wide band of wavelengths. Thus, the light emitted by LED is incoherent.



Fig:4.15.laser diode

4.16 BLUETOOTH: Bluetooth is a short-range radio innovation that was made for Personal Area Networks (PANs) (PAN). Bluetooth is a standard created by a gathering of hardware producers that permits any sort of electronic gear to make its own associations without the utilization of wires, links, or any immediate activity from the buyer. It is an impromptu kind organization operable over a little region like a room. Bluetooth remote innovation makes it conceivable to send signals over brief distances between phones, PCs and different gadgets and in this manner improve on correspondence and synchronization between gadgets. It is a worldwide standard that:

- Eliminates wires and links between both fixed and cell phones
- Facilitates both information and voice correspondence
- Offers the chance of impromptu organizations and conveys a definitive
- synchronicity between the entirety of your own gadgets
- Bluetooth is a powerful standard where gadgets can consequently discover each other, establish associations, and find how they can help each other on an impromptu premise. Bluetooth is planned to be a standard that works at two levels:
- It gives understanding at the actual level - Bluetooth is a radio-recurrence standard.

- It also works with agreement at the following stage, where merchandise should concede to when pieces are sent, the number of will be sent without a moment's delay, and how the gatherings in a discussion can be sure that the message got matches the message sent. Bluetooth is a norm for a lightweight, minimal effort radio chip that was created by Ericsson prior to being received by a huge number of different organizations into PCs, printers, cell phones, and so on A Bluetooth chip is intended to supplant links by taking the data typically conveyed by the link, and sending it at a unique recurrence to a beneficiary Bluetooth chip, which will at that point give the data got to the PC, telephone whatever.

4.17 Topology:

Piconet and Scatternet are the two styles of Bluetooth topologies. Piconets are small ad hoc networks of devices (typically 8 stations). It possesses the following characteristics:

- One is called Master and the others are called Slaves All slave stations synchronizes their clocks with the expert
- Possible correspondence - One-to-one or one-to-numerous
- There might be one station in stopped state
- Each piconet has an exceptional jumping design/ID
 - Each expert can associate with 7 synchronous or 200+ dormant (stopped) slaves per piconet.

By making one slave as expert of another Piconet, Scatternet is framed by joining a few Piconets . Key highlights of the scatternet geography are referenced underneath:

- A Scatternet is the connecting of various co-found piconets through the sharing of regular expert or slave gadgets.
- A gadget can be both an expert and a slave.
- Radios are symmetric (same radio can be expert or slave).

4.18 Bluetooth Architecture:

The Bluetooth design, showing every one of the significant layers in the Bluetooth framework, are portrayed. The layers underneath can be viewed as various obstacles in a snag course. This is on the grounds that every one of the layers work in a steady progression. One layer becomes possibly the most important factor solely after the information has experienced the past layer

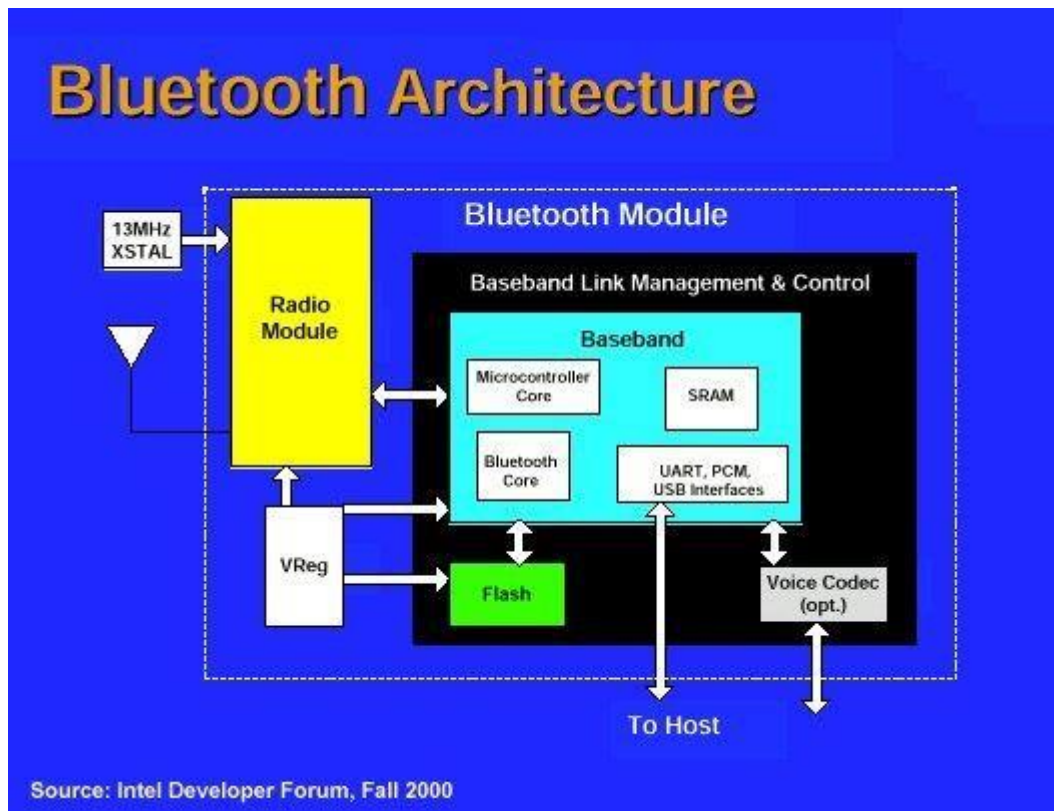


Fig:4.18. Bluetooth Architecture

Radio: The Radio layer characterizes the necessities for a Bluetooth handset working in the 2.4 GHz ISM band.

1. **Baseband:** The Baseband layer portrays the determination of the Bluetooth Link Controller (LC), which does the baseband protocols routines. It indicates Piconet/Channel definition, "Low-level" bundle definition, Channel sharing
2. **LMP:** The Link Manager Protocol (LMP) is utilized by the Link Managers (on one or the other side) for connect set-up and control.
3. **HCI:** The Host Controller Interface (HCI) gives an order interface to the Baseband Link Controller and Link Manager, and admittance to .

4. RFCOMM: The RFCOMM convention gives imitating of sequential ports over the L2CAP convention. The convention depends on the ETSI standard TS 07.10.

SDP: The Service Discovery Protocol (SDP) gives a way to applications to find, which administrations are given by or accessible through a Bluetooth gadget. It additionally permits applications to decide the qualities of those accessible administrations.

OTG:

OTG simply stands for 'on the go'

OTG allows the connection of input devices, data storage, and A/V devices

OTG can allow you to connect up your USB mic to your Android phone

You could even use it to edit with your mouse, or to type an article with your phone

An OTG cable is different from a USB cable

There are powered and unpowered varieties

OTG works on most newer Android devices.



Fig:4.19 otg cable

4.20 POWER SUPPLY: and advances becaElectric force is shipped on wires either as an

immediate flow (DC) streaming in one bearing at a non-swaying consistent voltage, or as an exchanging flow (AC) streaming in reverse use of a wavering voltage.

Due to the innovation of the transformer, it is the prevailing technique for sending power since it has numerous advantages over DC, including lower conveyance costs and a helpful method of exchanging between voltage levels. AC power that is sent at a high voltage over a significant distance and afterward changed over to a lower voltage is a more dependable and more secure force source in homes. A DC power supply unit deriving power from the AC mains supply plays out various undertakings:

1. it change the degree of supply to a worth reasonable for driving the heap circuits.
2. It produces a DC supply from an unadulterated AC wave.
3. It keeps any AC from showing up at the stock yield.
4. It will guarantee that the output voltage is kept at a consistent level, autonomous of progress in:
 - a) The AC supply voltage at the inventory input.
 - b) The load current drawn from the inventory yield.
 - c) Temperature.

4.21 TRANSFORMER:

A transformer is characterized as a detached electrical gadget that moves electrical energy starting with one circuit then onto the next through the interaction of electromagnetic acceptance. It is most usually used to expand ('venture up') or decline ('venture down') voltage levels between the circuits.

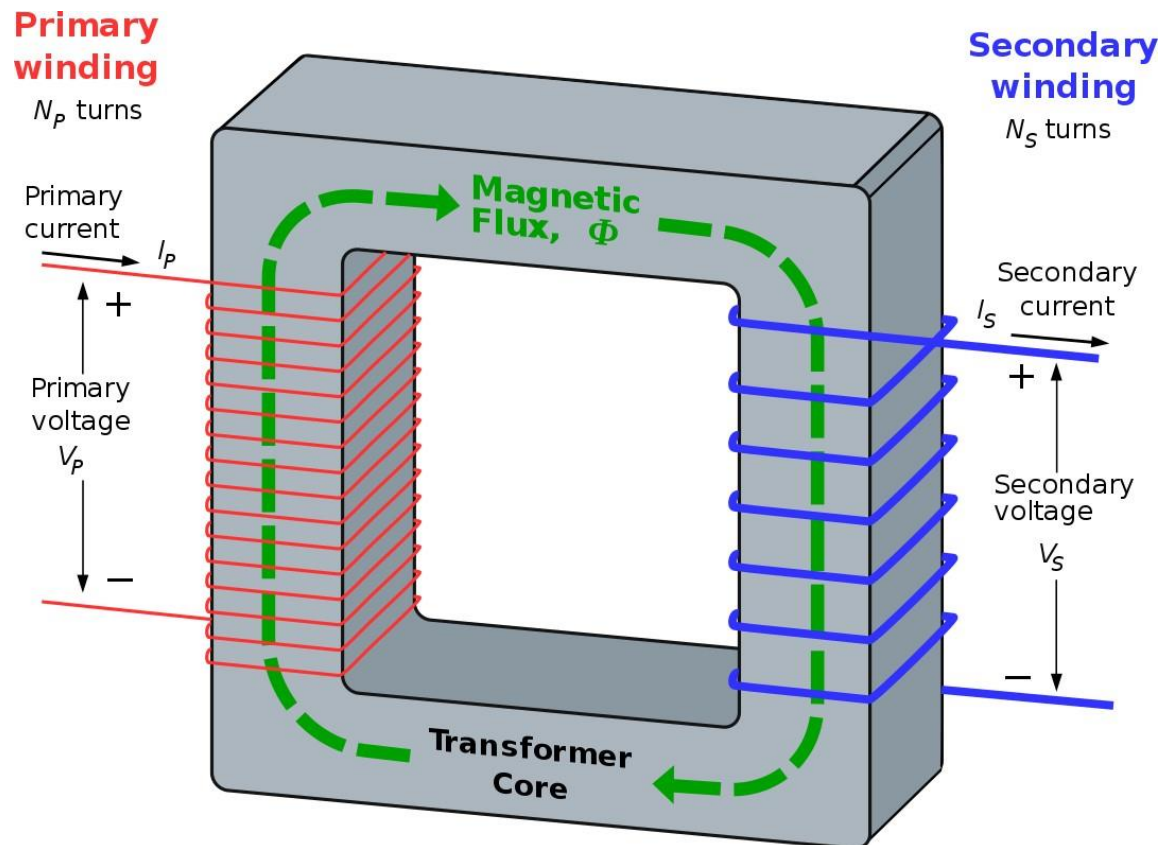


Fig:4.22 Transformer

4.23 RECTIFIER: A rectifier is an electrical gadget that converts substituting flow (AC), which occasionally switches heading, to coordinate flow (DC), which streams in just a single direction. It has two sorts

- Half wave rectifier
- Full wave rectifier

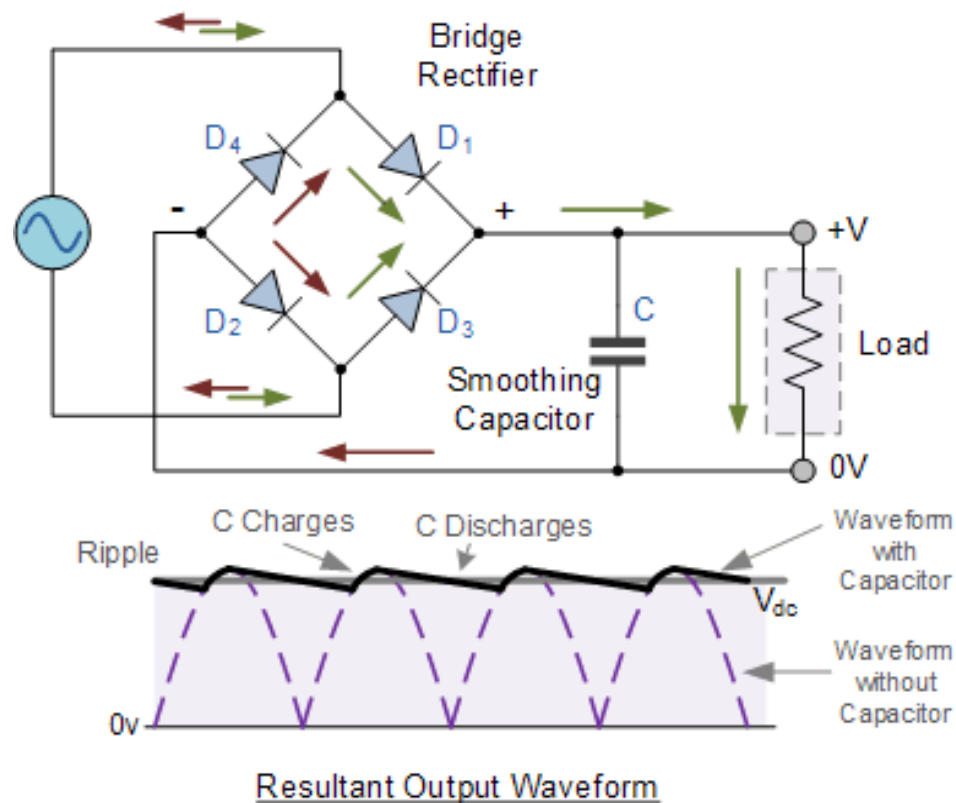


Fig:4.24 .Rectifier

4.25 FILTER:

Electronic channels are a sort of sign handling channel as electrical circuits. Electronic channels eliminate undesirable recurrence segments from applied signal, enhance needed ones or both. They can be detached or dynamic.

4.25 REGULATOR:

The voltage controller is expected to keep voltages within the endorsed range that can be endured by the electrical hardware utilizing that voltage.

4.26 ANDROID APPLICATION:

Android is a Linux-based open source working framework for cell phones including cell phones and tablets. The Open Handset Alliance, driven by Google, and different organizations teamed up to make

Android adopts a normalized strategy to portable application advancement, which guarantees that designers just need to code for Android, and their applications can run on an assortment of Android-fueled gadgets.

Google dispatched the principal beta rendition of the Android Software Development Kit (SDK) in 2007, trailed by the main business adaptation, Android 1.0, in September 2008.

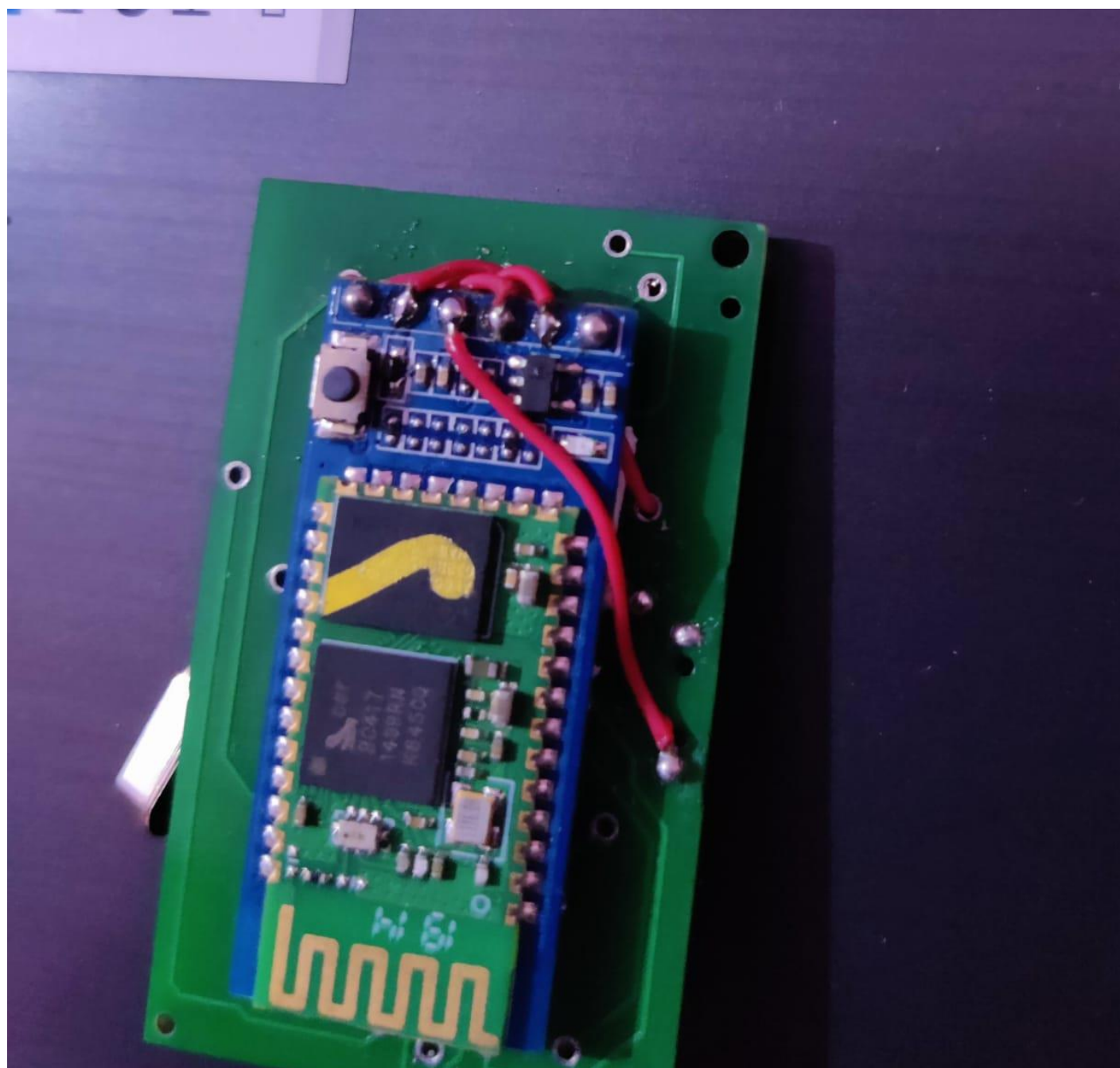
On June 27, 2012, at the Google I/O meeting, Google reported the following Android rendition, 4.1 Jelly Bean. Jam Bean is a gradual update, with the essential point of improving the UI, both as far as usefulness and execution.

CHAPATER-5

5.1 CONCLUSION: The infrared waves transmitted and detected from infrared sensor . By using atmega328 analog information should be converted into digital signal here laser diode acts as pointer guide.

The information from microcontroller to smart phone through OTG cable . When we switch on the camera the temperature is copied on the image The image is stored on the drive. This help to maintain proper health. This project is used in malls, schools, colleges, etc. This is the output of the project







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