PROGRAMMABLE DIGITAL TEMPERATURE CONTROLLER

Dissertation submitted in partial fulfilment of the requirement for the Degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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UNDER THE GUIDANCE OF:

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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

May , 2016

TABLE OF CONTENTS

DECLARATION BY THE SCHOLAR

I hereby declare that the work reported in the M-Tech thesis entitled **"PROGRAMMABLE TEMPERATURE CONTROLLER"** submitted at **Jaypee University of Information Technology,Waknaghat India,** is an authentic record of my work carried out under the supervision of **Prof. Dr.Sunil Bhooshan.** I have not submitted this work elsewhere for any other degree or diploma.

(Signature of the Scholar)

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Date -

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT, SOLAN, H.P.

MAY - 2016

CERTIFICATE

This is to certify that the work titled **"PROGRAMMABLE TEMPERATURE CONTROLLER DEVICE"** is submitted by **VIDITH KAPOOR** and **NIKHIL NARULA** in partial fulfilment for the award of Degree of Bachelors of Technology in Jaypee University of Information Technology, Waknaghat, H.P. has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of Supervisor ....

Name of Supervisor ....

Designation ....

Date ....

ACKNOWLEDGEMENT

We would like to express our sincere thanks to **Prof. Dr. Sunil Bhooshan**, H.O.D. Dept. of Electronics and Communication, for his constant support and encouragement during the project. Without his motivating discussions and unwavering desire for achieving high standards, this work wouldn’t have been possible. His flawless and forthright suggestions blended with an innate intelligent application have crowned our task with success.

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Nikhil Narula(121026)

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ABSTRACT

Recently with the rise in the technology , now many systems , be it laptops , phones or be it any devices used in industries have a temperature problem. Without proper temperature control they are fragile to any heating issues.

The project describes a practical temperature controller that conrtols the temperature of any device according to its requirement. It also displays the temperature on an LCD in the range of –55°C to +125°C. A microcontroller of the 8051 family that controls all its functions is the heart of this project circuit. IC DS1621 is used as temperature sensor that provides 9-bit temperature readings, for the microcontroller input.

User-defined temperature settings are stored in nonvolatile memory EEPROM through 8051 series microcontroller. The maximum and minimum temperature settings are stored in EEPROM -24C02 entered to the MC through a set of switches. Maximum and minimum settings are meant for allowing any hysteresis necessary. Relay is driven from MC through transistor driver.

Heating and cooling losses from a building (or any other container) become greater as the difference in temperature increases. A programmable thermostat allows reduction of these losses by allowing the temperature difference to be reduced at times when the reduced amount of heating or cooling would not be objectionable.The purpose is to set a device at a particular temperature that is required for its functioning and maintain the heat levels for the device. It also displays the temperature on an LCD. User defined settings can be stored.

<u>MOTIVATION</u>

Recently with the rise in the technology , now many systems , be it laptops , phones or be it any devices used in industries have a temperature problem. Without proper temperature control they are fragile to any heating issues. This can surely damage the device in some way or completely. This device controls the temperature of these devices , also showing the temperature required and hence saving the device from malfunctioning or getting destroyed by overheating.

So to save the expenses that people have to pay due to the devices getting destroyed by heating, this temperature controller can surely prove out to be a good contribution to the world of technology.

1.INTRODUCTION

Recently with the rise in the technology , now many systems , be it laptops , phones or be it any devices used in industries have a temperature problem. Without proper temperature control they are fragile to any heating issues.The project describes a practical temperature controller that conrtols the temperature of any device according to its requirement. It also displays the temperature on an LCD in the range of –55°C to +125°C. A microcontroller of the 8051 family that controls all its functions is the heart of this project circuit. IC DS1621 is used as temperature sensor that provides 9-bit temperature readings, for the microcontroller input.

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The contacts of the relay is used for load, shown as lamp in the circuit. For high-power heater load a contactor may be used – the coil of which is to be operated by relay contacts in place of lamp as shown. A standard power supply of 12 volt DC and 5 volt through a regulator are made from a step-down transformer along with the bridge rectifier and filter capacitor.

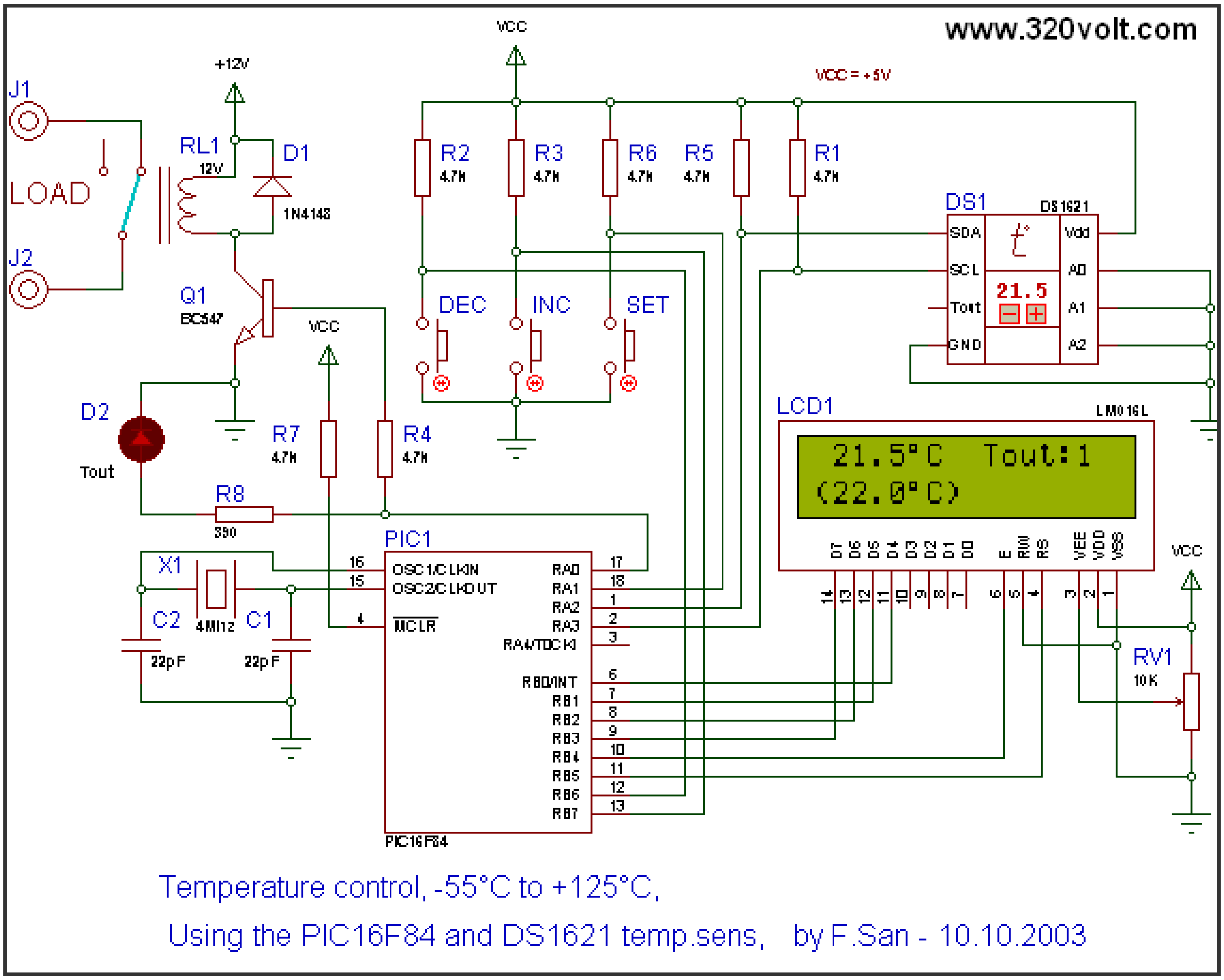

Figure 1.1 : Circuit diagram of temperature contoller

2.PURPOSE

Heating and cooling losses from a building (or any other container) become greater as the difference in temperature increases. A programmable thermostat allows reduction of these losses by allowing the temperature difference to be reduced at times when the reduced amount of heating or cooling would not be objectionable.The purpose is to set a device at a particular temperature that is required for its functioning and maintain the heat levels for the device. It also displays the temperature on an LCD. User defined settings can be stored.

3.TEMPERATURE CONTROLLER ESSENTIALS

After deciding to create the temperature controller , we had to decide what electronics to use. This included various hardware components including microcontroller , temperature sensor , resistors , diodes , capactiors , relays.

Serial No.	Parts.
1.	Transformer
2.	Voltage Regulator
3.	Diodes
4.	Capacitor
5.	Resistors
6.	Microcontroller(AT89S52)
7.	Temperature Sensor

Table 3.1

3.1 HARDWARESPECIFICATIONS

3.1.1 TRANSFORMER

A **transformer** is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Electromagnetic induction produces an electromotive force within a conductor which is exposed to time varying magnetic fields. Transformers are used to increase or decrease the alternating voltages in electric power applications.

A varying current in the transformer's primary winding creates a varying magnetic flux in the transformer core and a varying field impinging on the transformer's secondary winding. This varying magnetic field at the secondary winding induces a varying electromotive force (EMF) or voltage in the secondary winding due to electromagnetic induction. Making use ofFaraday's Law (discovered in 1831) in conjunction with high magnetic permeability core properties, transformers can be designed to efficiently change AC voltages from one voltage level to another within power networks.

Since the invention of the first constant potential transformer in 1885, transformers have become essential for the transmission, distribution, and utilization of alternating current electrical energy.[3] A wide range of transformer designs is encountered in electronic and electric power applications. Transformers range in size from RF transformers less than a cubic centimeter in volume to units interconnecting the power gridweighing hundreds of tons.

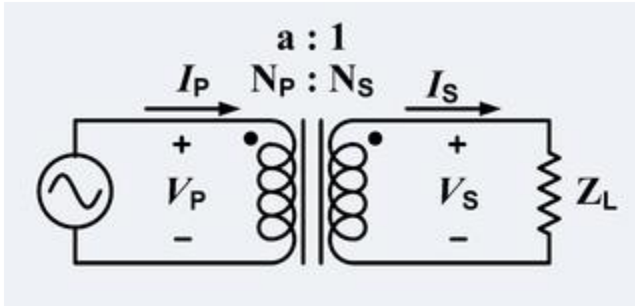

Figure 3.1 : Circuit of a transformer

3.1.2 VOLTAGE REGULATOR

A **voltage regulator** is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line

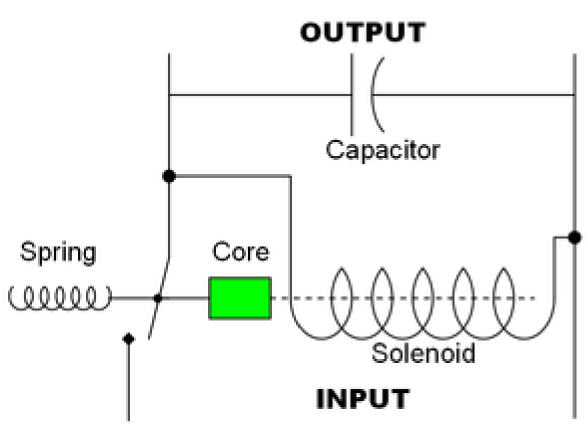

Figure 3.2 : Circuit of a simple voltage regulator

3.1.3 DIODES

In electronics, a **diode** is a two-terminal electronic component that conducts primarily in one direction (asymmetric conductance); it has low (ideally zero) resistance to the flow of current in one direction, and high (ideally infinite) resistance in the other. A **semiconductor diode**, the most common type today, is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals.[5] A vacuum tube diode has two electrodes, a plate (anode) and a heated cathode. Semiconductor diodes were the first semiconductor electronic devices. The discovery of crystals' rectifying abilities was made by German physicist Ferdinand Braun in 1874. The first semiconductor diodes, called cat's whisker diodes, developed around 1906, were made of mineral crystals such as galena. Today, most diodes are made of silicon, but other semiconductors such as selenium or germanium are sometimes used.

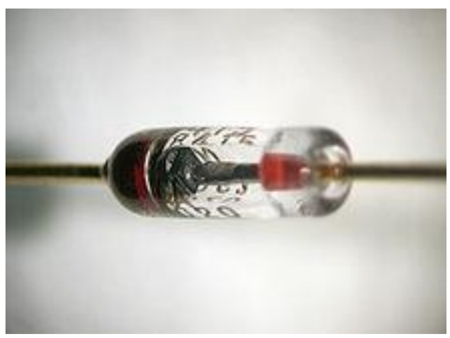

Figure 3.3 : Closeup Of A Diode

3.1.4 CAPACITOR

A **capacitor** (originally known as a **condenser**) is a passive two-terminal electrical component used to store electrical energy temporarily in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e. an insulator that can store energy by becoming polarized). The conductors can be thin films, foils or sintered beads of metal or conductive electrolyte, etc. The nonconducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, air, vacuum, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

When there is a potential difference across the conductors (e.g., when a capacitor is attached across a battery), an electric field develops across the dielectric, causing positive charge $+Q$ to collect on one plate and negative charge $-Q$ to collect on the other plate. If a battery has been attached to a capacitor for a sufficient amount of time, no current can flow through the capacitor. However, if a time-varying voltage is applied across the leads of the capacitor, a displacement current can flow.

An ideal capacitor is characterized by a single constant value, its capacitance. Capacitance is defined as the ratio of the electric charge Q on each conductor to the potential difference V between them. The SIunit of capacitance is the farad (F), which is equal to one coulomb per volt (1 C/V). Typical capacitance values range from about 1 pF (10^{-12} F) to about 1 mF (10^{-3} F).

The larger the surface area of the "plates" (conductors) and the narrower the gap between them, the greater the capacitance is. In practice, the dielectric between the plates passes a small amount of leakage current and also has an electric field strength limit, known as the breakdown voltage. The conductors and leads introduce an undesired inductance and resistance.

Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass. In analog filter networks, they smooth the output of power supplies. In resonant circuits they tune radios to particular frequencies. In electric power transmission systems, they stabilize voltage and power flow.[1]

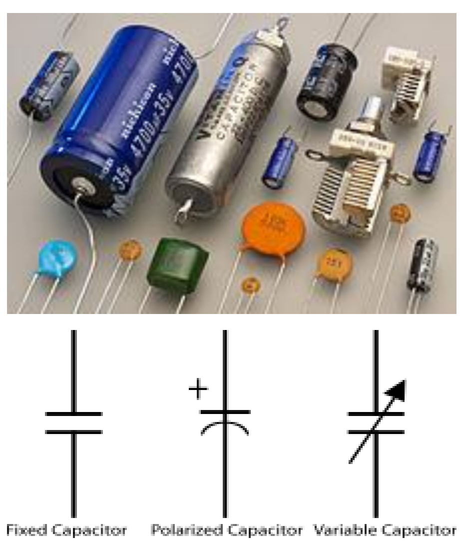

Figure 3.4 : Capacitor with the circuit symbol

3.1.5 RESISTORS

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors may be used to reduce current flow, and, at the same time, may act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, 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, force, or chemical activity.

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 will fall within a manufacturing tolerance.

`

Figure 3.5 : An axial lead resistor

3.1.6 MICROCONTROLLER(AT89S52)

1. Description : The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the indus-try-standard

80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory pro-grammer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2. Pin Configuration

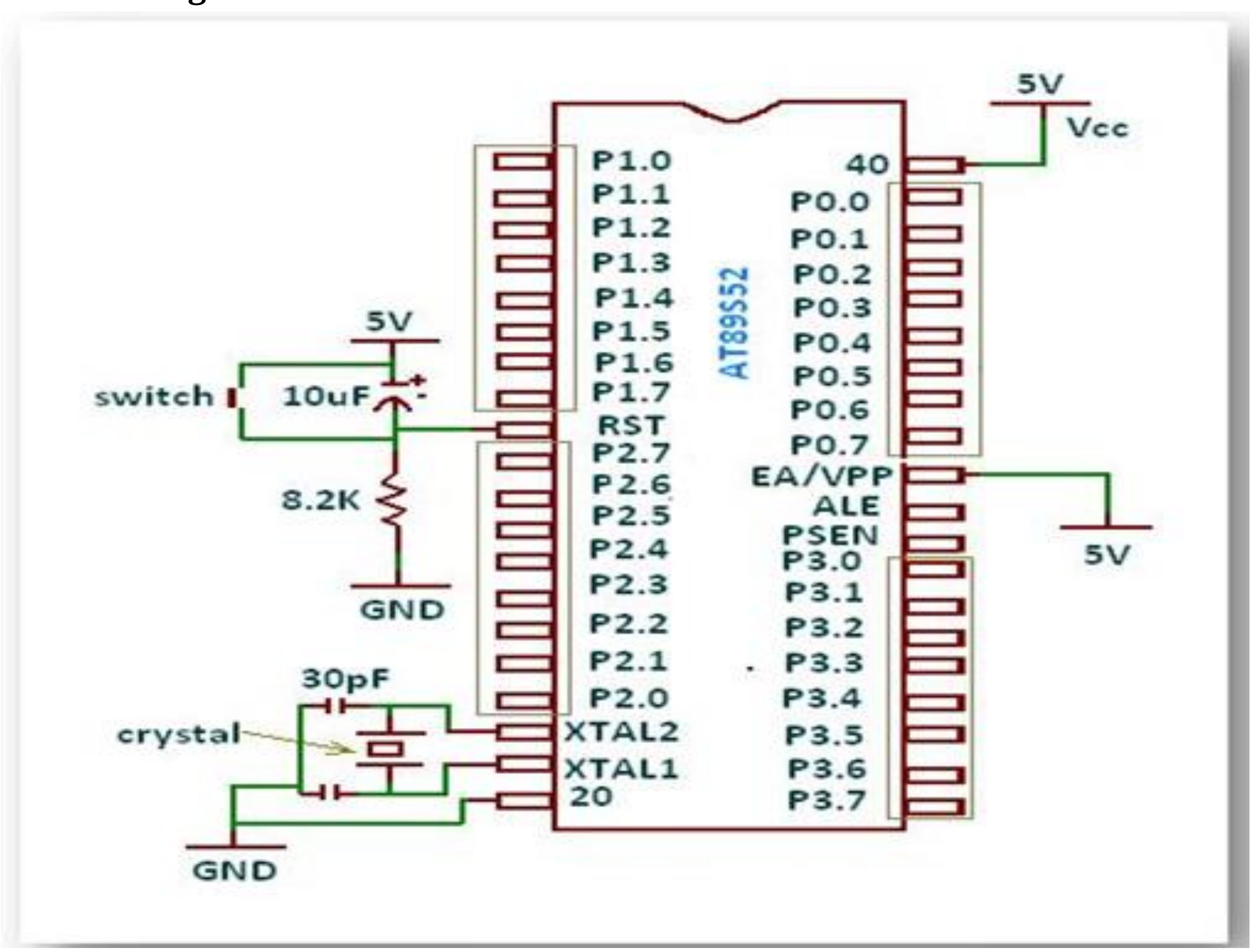

Figure 3.6 : Pin Diagram Of AT89S52

3. Block Diagram

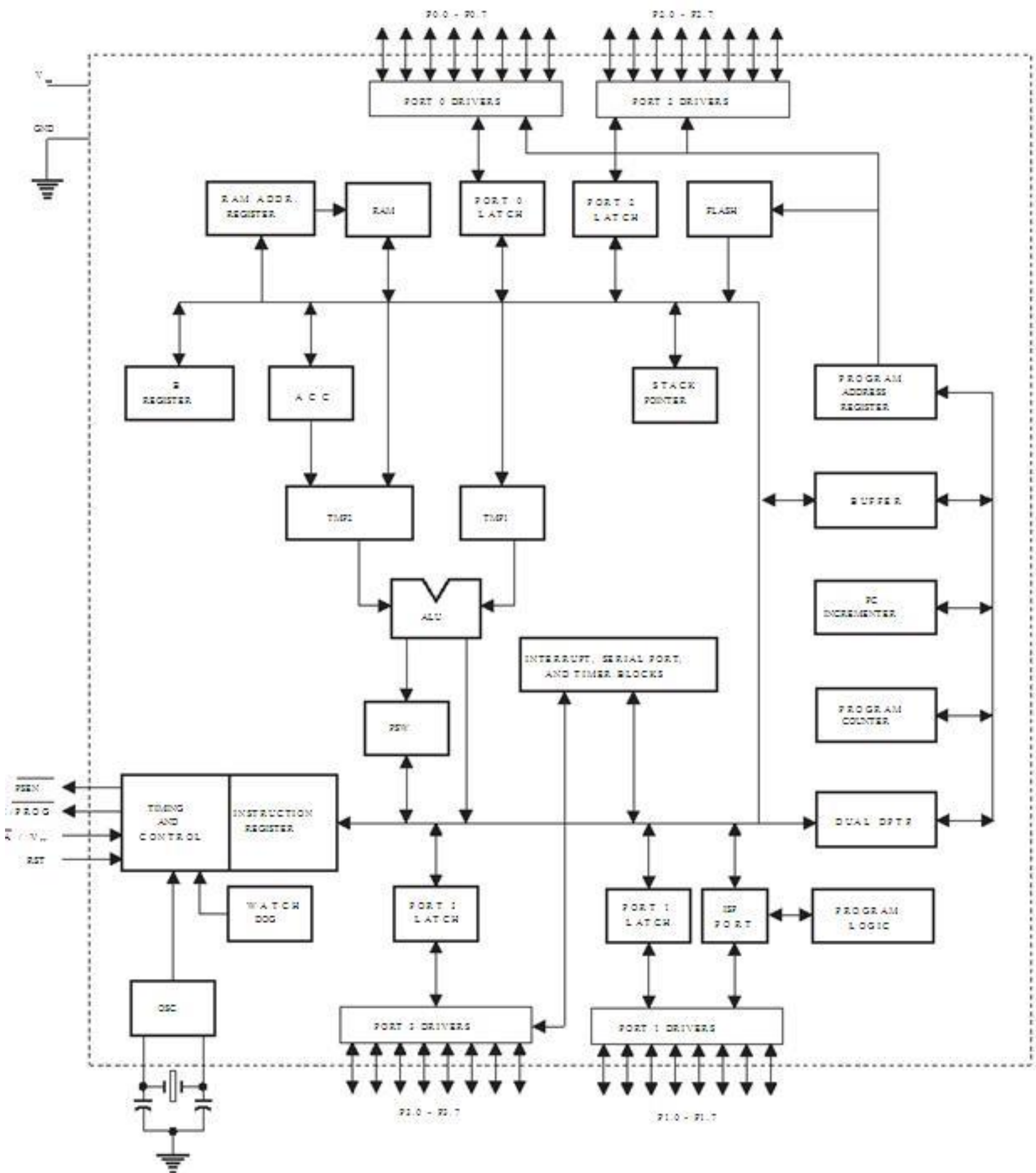

Figure 3.7：Block Diagram

4. Memory Organizatiom

MCS-51 devices have a separate address space for Program and Data Memory. Up to 64K bytes each of external Program and Data Memory can be addressed.

3.1.7 BC54

- The BC547 transistor is an NPN Epitaxial Silicon Transistor.
- The BC547 transistor is a general-purpose transistor in small plastic packages.
- It is used in general-purpose switching and amplification BC847/BC547 series 45 V, 100 mA NPN general-purpose transistors.

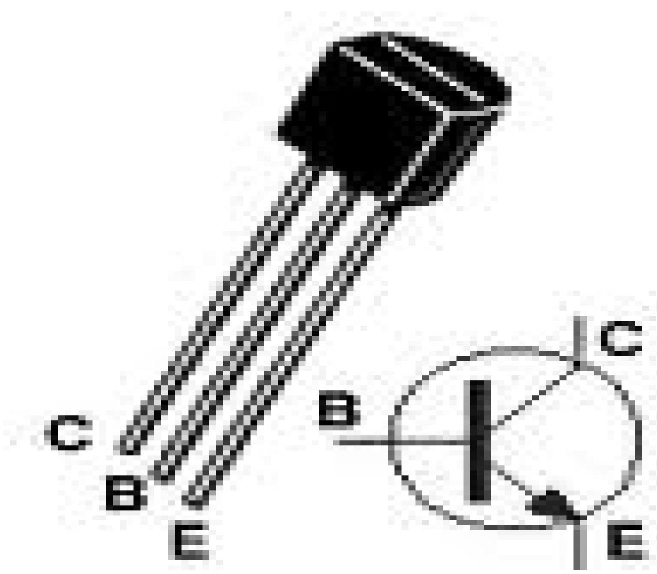

Figure 3.8 : Circuitory of BC54

3.1.8 RTD's

Resistance temperature detectors (RTDs) are resistors whose resistance varies with temperature. Platinum is the most common, most accurate wire material; platinum RTDs are referred to as Pt-RTDs. Nickel, copper, and other metals may also be used to make RTDs.Platinum RTD characteristics include a wide temperature range (up to roughly 800°C), excellent accuracy and repeatability, reasonable linearity, and the necessity for signal conditioning.

Because of their accuracy, stability, and wide temperature range, platinum RTDs are used in a variety of precision applications, including instruments, process control, and automotive systems.

For Pt-RTDs, the most common values for nominal resistance at 0°C are 100Ω and 1kΩ, though other values are available. The average slope between 0°C and +100°C is called alpha (α). This value depends on the impurities and their concentrations in the platinum. The two most widely used values for alpha are 0.00385 and 0.00392, corresponding to the IEC 751 (PT100) and SAMA standards.

The resistance vs. temperature curve is reasonably linear, but has some curvature, as described by the Callendar-Van Dusen equation:

R(T) = R0(1 + aT + bT2 + c(T - 100)T3)

Where:

T = temperature (°C)

R(T) = resistance at T

R0 = resistance at T = 0°C

IEC 751 specifies α = 0.00385055 and the following Callendar-Van Dusen coefficient values:

a = 3.90830 x 10-3

b = -5.77500 x 10-7

c = -4.18301 x 10-12 for -200°C □ T □ 0°C, 0 for 0°C □ T □ +850°C

]

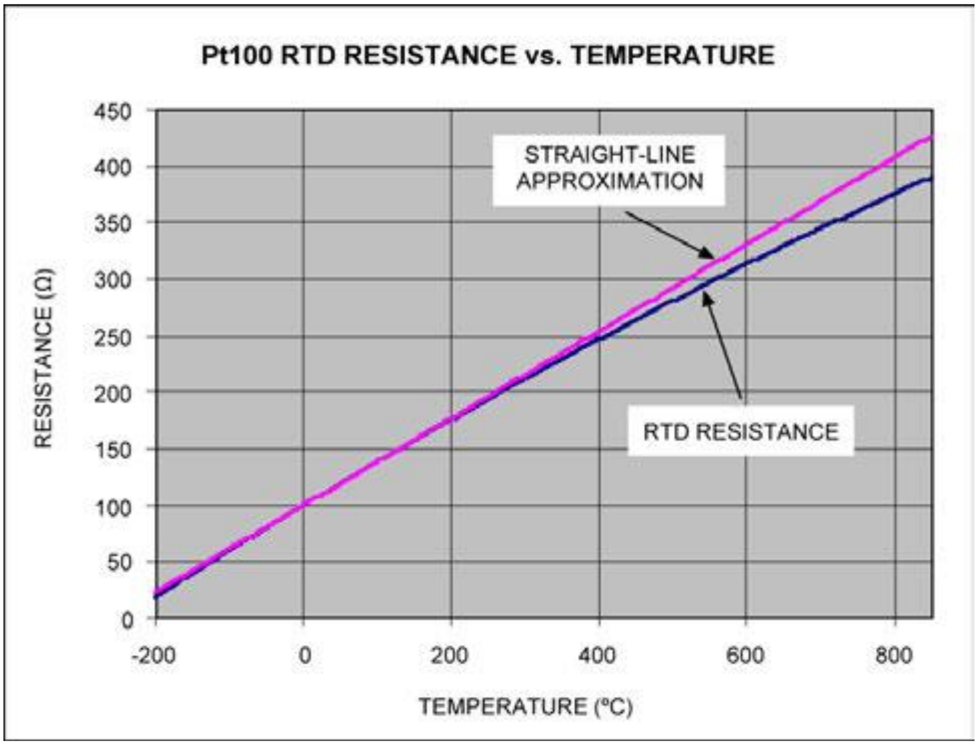

Figure 3.9 : Graph for Resistance Vs Temperature

3.1.9 RELAY

- IT IS A ELECTRO MAGNETIC SWITCH
- USED TO CONTROL THE ELECTRICAL DEVICES
- COPPER CORE MAGNETIC FLUX PLAYS MAIN ROLE HERE

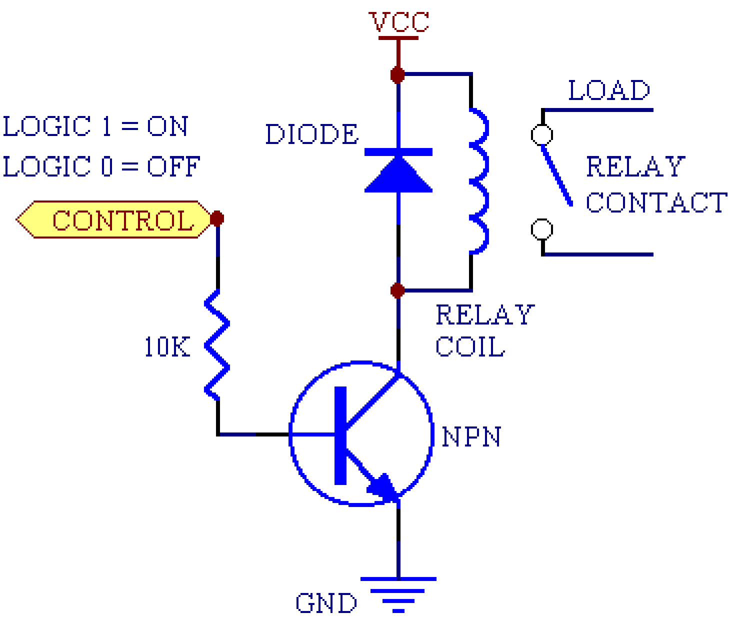

Figure 3.10 : Circuit of a Relay

3.1.10 SEVEN SEGMENT DISPLAY

The segments themselves are identified with lower-case letters "a" through "g," with segment "a" at the top and then counting clockwise.

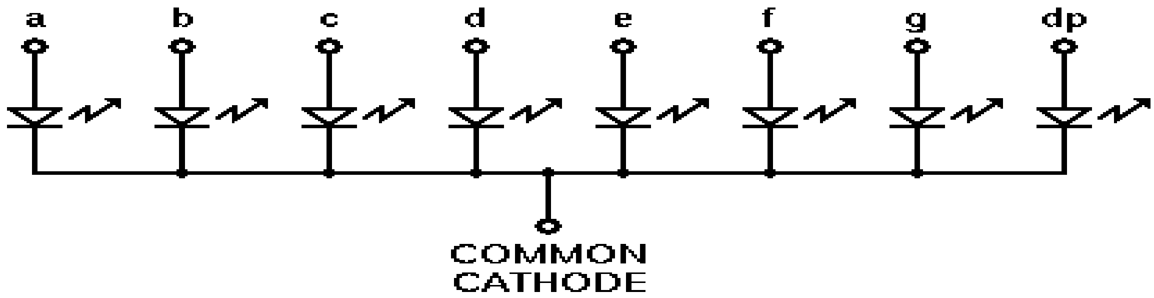

Figure3.10 : Common Cathode Side

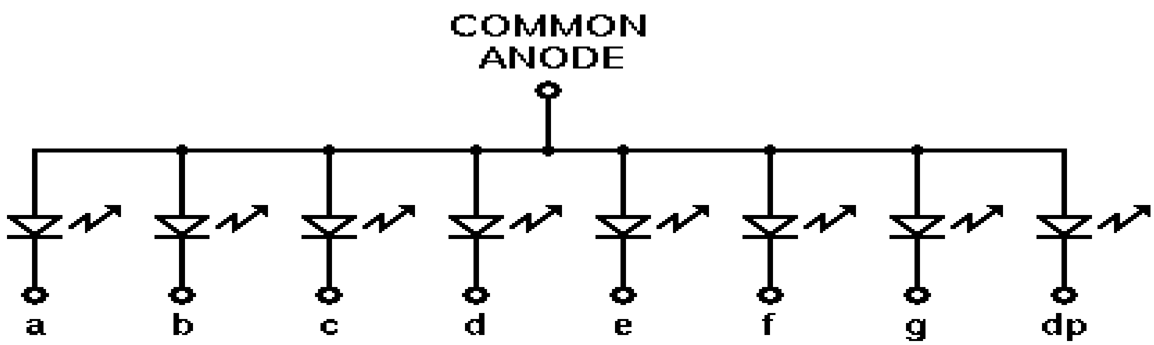

Figure 3.11 : Common Anode Side

3.1.11 DS1621(Temperature Controller)

1.Descreption

The DS1621 Digital Thermometer and Thermostat provides 9-bit temperature readings, which indicate the temperature of the device. The thermal alarm output, T_{OUT} is active when the temperature of the device exceeds a user-defined temperature T_H. The output remains active until the temperature drops below user defined temperature T_L, allowing for any hysteresis necessary. User-defined temperature settings are stored in nonvolatile memory so parts may be programmed prior to insertion in a system. Temperature settings and temperature readings are all communicated to/from the DS1621 over a simple 2-wire serial interface.

2.Key Features

Simply Adds Temperature Monitoring and Control to Any System

  - Measures Temperatures From -55°C to +125°C in 0.5°C Increments. Fahrenheit Equivalent is -67°F to 257°F in 0.9°F Increments
  - Temperature is Read as a 9-Bit Value (2-Byte Transfer)
  - Converts Temperature to Digital Word in Less than 1s
  - Thermostatic Settings are User Definable And Nonvolatile
- Can Be Used in a Wide Variety of Applications
  - Power Supply Range (2.7V to 5.5V)
  - Data is Read From/Written Via a 2-Wire Serial Interface (Open Drain I/O Lines)
- Saves Space
  - Temperature Measurements Require No External Components

8-pin DIP or SO package (208-mil) Packages

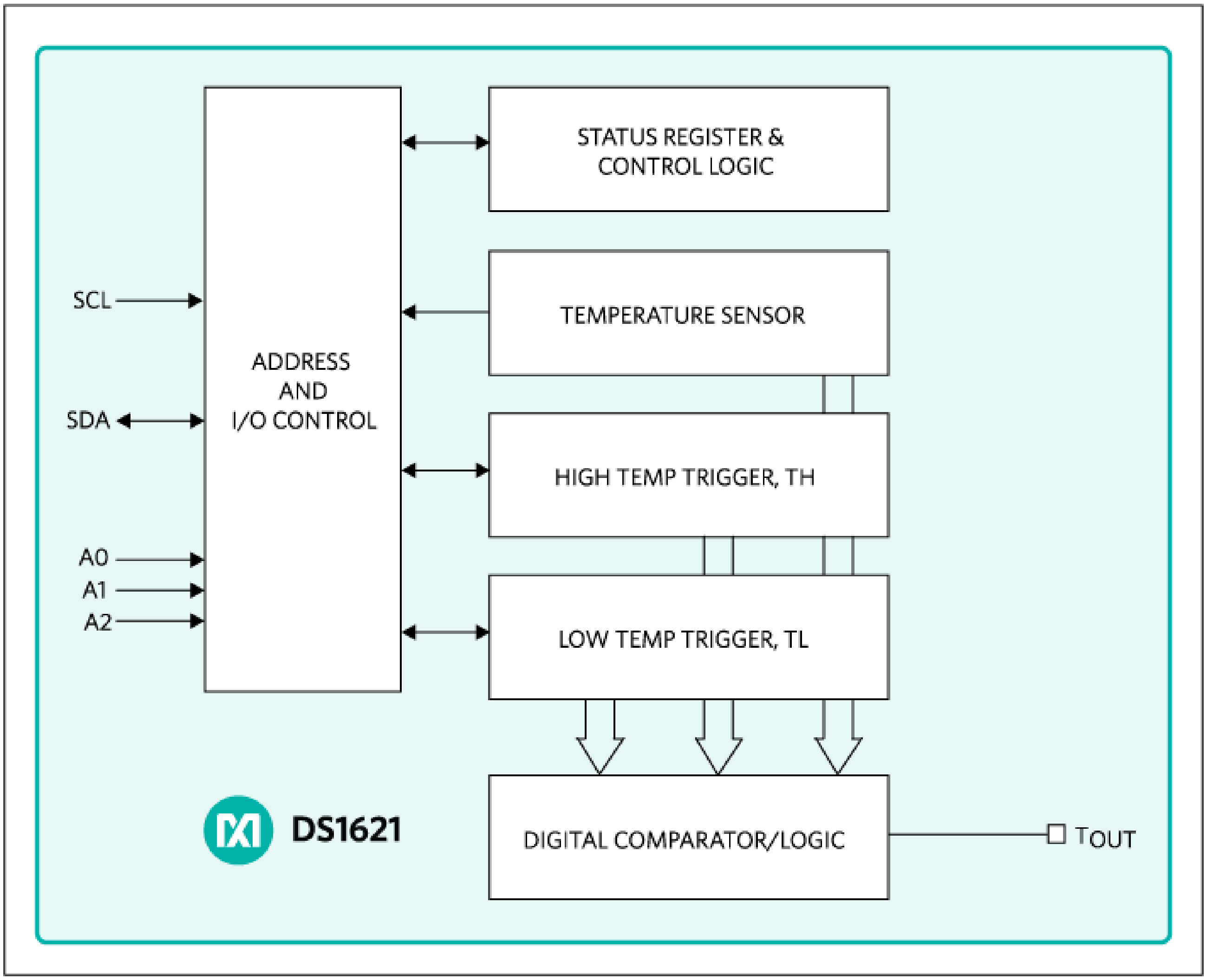

Figure 3.12 : Functional Block Diagram

3.Applications/Uses

- Medical
- Networking
- Personal Computing
- Routers/Switches
- Test Measurement Systems
- Wireless Base Stations
- { Declarations section }

4.Code

- var TempFahr : LongInt;
-     TempCelsius, TempCelsiusLSB : Short;
-     ByteStr:array[4] of char;
-     LCDString, FTempStr, CTempStr, FTHAStr, FTLAStr, CTHAStr, CTLAStr: String[23];
-
- // Software I2C connections
- // =========== REMEMBER TO USE 2.2k PULLUP RESISTORS ON AVR SCL & SDA PORTS ===============
-    Soft_I2C_Scl_Output   : sbit at PORTC5_bit; // Setup SCL Port for AVR ATMega88=PortC Pin 5
-    Soft_I2C_Sda_Output   : sbit at PORTC4_bit; // Setup SDA Port for AVR ATMega88=PortC Pin 4
-    Soft_I2C_Scl_Input   : sbit at PINC5_bit;   // Setup SCL Pin as Input
-    Soft_I2C_Sda_Input   : sbit at PINC4_bit;   // Setup SDA Pin as Input
-    Soft_I2C_Scl_Direction : sbit at DDC5_bit;   // Setup SCL DataDirection
-    Soft_I2C_Sda_Direction : sbit at DDC4_bit;   // Setup SDA DataDirection
- // =========== REMEMBER TO USE 2.2k PULLUP RESISTORS ON AVR SCL & SDA PORTS ===============
- // End Software I2C connections
-
- // LCD module connections
-    LCD_RS : sbit at PORTD2_bit;
-    LCD_EN : sbit at PORTD3_bit;
-    LCD_D4 : sbit at PORTD4_bit;
-    LCD_D5 : sbit at PORTD5_bit;
-    LCD_D6 : sbit at PORTD6_bit;
-    LCD_D7 : sbit at PORTD7_bit;
-
-    LCD_RS_Direction : sbit at DDD2_bit;
-    LCD_EN_Direction : sbit at DDD3_bit;
-    LCD_D4_Direction : sbit at DDD4_bit;
-    LCD_D5_Direction : sbit at DDD5_bit;
-    LCD_D6_Direction : sbit at DDD6_bit;
-    LCD_D7_Direction : sbit at DDD7_bit;
- // End LCD module connections
-
- Const
-      MeID0='K0RU DS1621 I2C';

- MeID1='DEMO PROGRAM';
- MeID2='BY ROB UNDERWOOD';
- CDegreeChr=chr(0xDF)+'C'; // '°' Dec# 248
- FDegreeChr=chr(0xDF)+'F'; // '°' Dec# 248
- SpaceChr=chr(32); // ' '
- NegativeChr=chr(45); // '-'
-
- // ===== TEMPERATURE DEVICE CONSTANTS
- WAddress=0x90; // Address Default address when A0,A1,A2 pins are grounded = 1001000x = x=ReadCmd(1)/WriteCmd(0)
- RAddress=0x91; // 10010001, Temp Read Register Address
- HiTempSet=0x2D; // 45° C HighTemp Value = 113°F MSB (Whole Value)
- LoTempSet=0x1C; // Stores 28° C HighTemp Value = 82°F MSB (Whole Value)
- NilByte=0xFF; // Represents a nil or blank bytecmd
- CStatReg=0xAC; // 0xAC=Write to the Configuration/Status Register
- THCmd=0xA1; // 0xA1=HiTemp Access(TH) CMD
- THMSB=0x2D; // Stores 45° C HighTemp Value = 113°F MSB (Whole Value)
- THLSB=0x00; // Stores 0° C HighTemp Value = 0°F LSB (Decimal Value)
- POL1Shot=0x00; // 0x00= bRRRRXXab - R=Readonly bits, XX=Reserved bits, ab=Programmable
- // 0x00= bRRRRXXab - R=Readonly bits, XX=Reserved bits, ab=Programmable
- // a=POL=0=Low(output pin is normally HIGH goes LOW on ALERT,
- // b=1Shot=0 force Contnuous Temp Conversion
- TLCmd=0xA2; // 0xA2=LoTemp Access(TL) CMD
- TLMSB=0x1C; // Stores 28° C HighTemp Value = 82°F MSB (Whole Value)
- TLLSB=0x00; // Stores 0° C HighTemp Value = 0°F LSB (Decimal Value)
- SConvCmd=0xEE; // 0xEE=Initiates Temp Conversion process internally to the chip begin reading Temperatures.
- RTCmd=0xAA; // Read the LAST temperature conversion result, devices sends 2-bytes MSB & LSB
-
- Procedure ExcuteCmd(AddrByte,CmdByte,ValByte1,ValByte2:Byte);
- begin
- Soft_I2C_Stop(); // Issue stop signal before excuting any Start;
- Delay_ms(15); // Force 15ms delay before any CMD
- Soft_I2C_Start(); // Issue start signal
- Soft_I2C_Write(AddrByte); // Address to Issue CMD
- if NOT (CmdByte=NilByte) then Soft_I2C_Write(CmdByte); // if NilByte 0xFF, do nothing

- if NOT (ValByte1=NilByte) then Soft_I2C_Write(ValByte1); // if NilByte 0xFF, do nothing
- if NOT (ValByte2=NIlByte) then Soft_I2C_Write(ValByte2); // if NilByte 0xFF, do nothing
- end;
-
- Function ReadTemp():Boolean;
- begin
- // Read Temperature Device
- // ExcuteCmd(WAddress,RTCmd,NilByte,NilByte);
- // ExcuteCmd(RAddress,NilByte,NilByte,NilByte);
- // TempCelsius := Soft_I2C_Read(0); // Read MSB of TempData
- // TempCelsiusLSB := Soft_I2C_Read(1); // Read LSB of TempData
- // Soft_I2C_Stop(); // Issue stop signal
-
- // Read Temperature Device
- Soft_I2C_Stop(); // Issue stop signal
- Delay_ms(15);
-
- end;
-
- { Main program }
- begin
-
- DDRB := %00110000; // Port B setup MISO & SCK as OUTPUTS 16 + 32
- PORTB:= %00010011; // Set PB0 & PB1, PB4, PB5 HIGH, SCK PORT LOW
-
- Soft_I2C_Init(); // Initialize Soft I2C communication
-
- // Initiates Temperature Conversion process and stores temp value in Hightemp register
-
- ExcuteCmd(WAddress,CStatReg,POL1Shot,NilByte);
- // 0x90 = Address Default address when A0,A1,A2 pins are grounded = 1001000x = x=ReadCmd(1)/WriteCmd(0)
- // 0xAC=Write to the Configuration/Status Register
- // 0x00= bRRRRXXab - R=Readonly bits, XX=Reserved bits, ab=Programmable
- // a=POL=0=Low(output pin is normally HIGH goes LOW on ALERT,
- // b=1Shot=0 force Contnuous Temp Conversion
- // 0xFF Buffer Byte = NUL, Not excuted
-

- ExcuteCmd(WAddress,THCmd,THMSB,THLSB);
- ByteToStr(THMSB,CTHAStr);
- LTrim(CTHAStr);
- CTHAStr:='H'+CTHAStr+chr(0xDF);
- // 0x90 = Address Default address when A0,A1,A2 pins are grounded = 1001000x = x=ReadCmd(1)/WriteCmd(0)
- // THCmd = 0xA1=HiTemp Access(TH) CMD
- // THMSB = Stores 45° C HighTemp Value = 113°F MSB (Whole Value)
- // THLSB = Stores 0° C HighTemp Value = 0°F LSB (Decimal Value)
-
- ExcuteCmd(WAddress,TLCmd,TLMSB,TLLSB);
- ByteToStr(TLMSB,CTLAStr);
- LTrim(CTLAStr);
- CTLAStr:='L'+CTLAStr+Chr(0xDF);
- // 0xA2=LoTemp Access(TL) CMD
- // Stores 28° C HighTemp Value = 82°F MSB (Whole Value)
- // Stores 0° C HighTemp Value = 0°F LSB (Decimal Value)
-
- ExcuteCmd(WAddress,SConvCmd,NilByte,NilByte);
- // Address Default address when A0,A1,A2 pins are grounded = 1001000x = x=ReadCmd(1)/WriteCmd(0)
- Lcd_Init();   // Initialize LCD
- Lcd_Cmd(_LCD_CURSOR_OFF);   // Cursor off
- Lcd_Cmd(_LCD_CLEAR);   // Clear display
-
- LCDString:=MeID0;
- LCD_Out(1,1,LCDString);
- LCDString:=MeID1;
- LCD_Out(2,1,LCDString);
- Delay_ms(1000);
- LCDString:=MeID2;
- Delay_ms(1000);
-
- Lcd_Cmd(_LCD_CLEAR);   // Clear display
-
- while true do
- begin
- ReadTemp;
- LCD_Out(1,1,FTempStr);
- LCD_Out(2,1,CTempStr);

- LCD_Out(2,8,CTHAStr+' '+CTLAStr);
- Delay_ms(10);
- end;

4.WORKING

- The project uses a digital temperature sensor DS1621 the surface which is capable of sensing the temperature & delivering digital data at its output which are connected to the controller.
- The LCD displays the present temperature, maximum temperature and minimum temperature. The maximum and minimum values are entered through switches attached to the microcontroller. The maximum and minimum settings are stored in the EEPROM. If the temperature goes below the minimum value the heater is on as indicated by a lamp connected through a relay driven by a transistor connected to the microcontroller. If the temperature crosses the maximum value the heater is switched off.

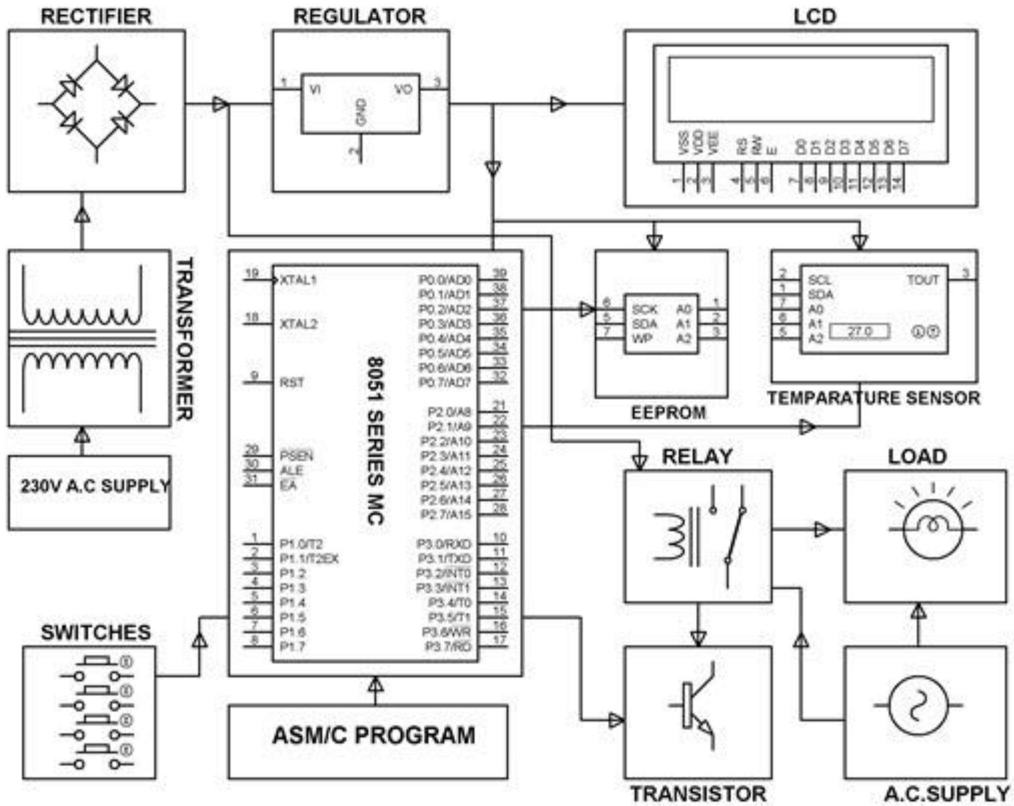

Figure 4.1 : Working Block Diagram Of Temperature Controller

5. POWER SUPPLY

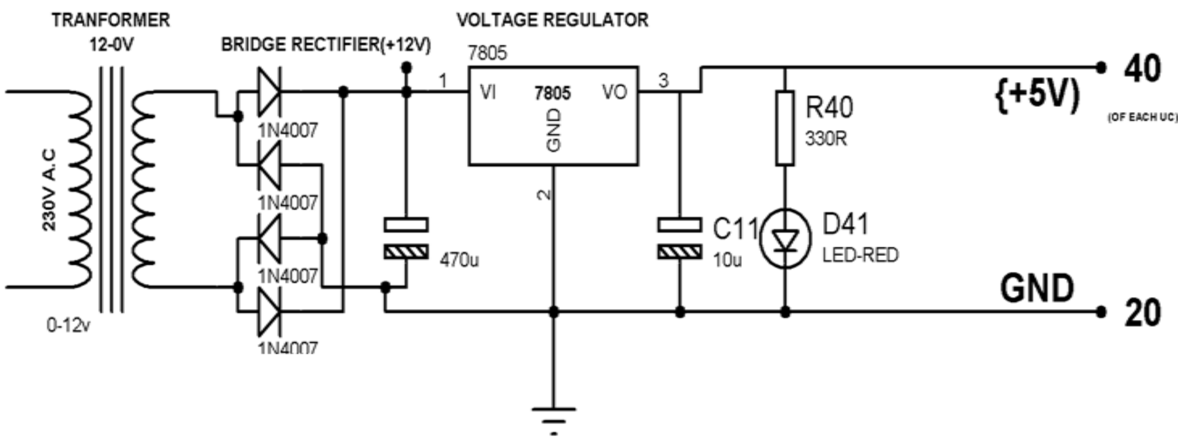

Figure 5.1 : Circuit Diagram Of Power Supply

6.RESULTS AND DISCUSSIONS

The LCD will show the values that we input into it , and the max. and min. temperature values that are set. As soon as the temperature rises from the max. value the device will be shut off and as soon as the value decreases the device turns on again. This helps further to save the loss of extra energy by cutting off the power supply once the required temperature is reached. Without this there can be loss of machinaries , loss of energy , and loss of time.

7.CONCLUSION

Programmable Digital Temperature Controllers basically helps to maintain a particular temperature of a device , so that it does not exceed that given temperature . It can be beneficial in saving energy and hence can help minimizing energy loss.

Heating and cooling losses from a building (or any other container) become greater as the difference in temperature increases. A programmable thermostat allows reduction of these losses by allowing the temperature difference to be reduced at times when the reduced amount of heating or cooling would not be objectionable.

The purpose is to set a device at a particular temperature that is required for its functioning and maintain the heat levels for the device. It also displays the temperature on an LCD. User defined settings can be stored.

To conclude , this forms an important part of today's machinary world and is a must in most of the industries where temperature maintainance is required.

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