CHAPTER 1: INTRODUCTION

1.1 Introduction

Recently, on 28th December 2013, Bangalore-Nanded express caught fire in Ananthpur district resulting in the death of at least 26 people and injuring 12 others. We have similarly seen many other massive incidents of trains catching fire and many people losing their precious life. It is the primary duty to assure the safety of a passenger, else such mode of travel becomes useless. Hence, for the safety reasons we have devised a plan of an automatic system which controls the loss of life and property due to fire accidents in trains. Our model takes umpteen care of all possible solutions that can be incorporated to avoid major fire accidents. The model is expected to perform the following tasks-

1. It drives an extinguisher which senses the direction of fire and rotates in that particular direction to perform the extinguishing action. This is the first measure to put off fire.
2. Usually the fire accidents cause more harm when fire opens up at night. The above mentioned incident took place at around 3:15 am. A fire alarm rings loudly so that if the passengers are sleeping, they turn wide awake by which they can form their own rescue operation.
3. A warning signal reaches the train driver because of which he has to stop the train in the safest place nearby and help the passengers to get down.
4. The door automatically opens so that the passengers can get down easily.

1.2 Block diagram

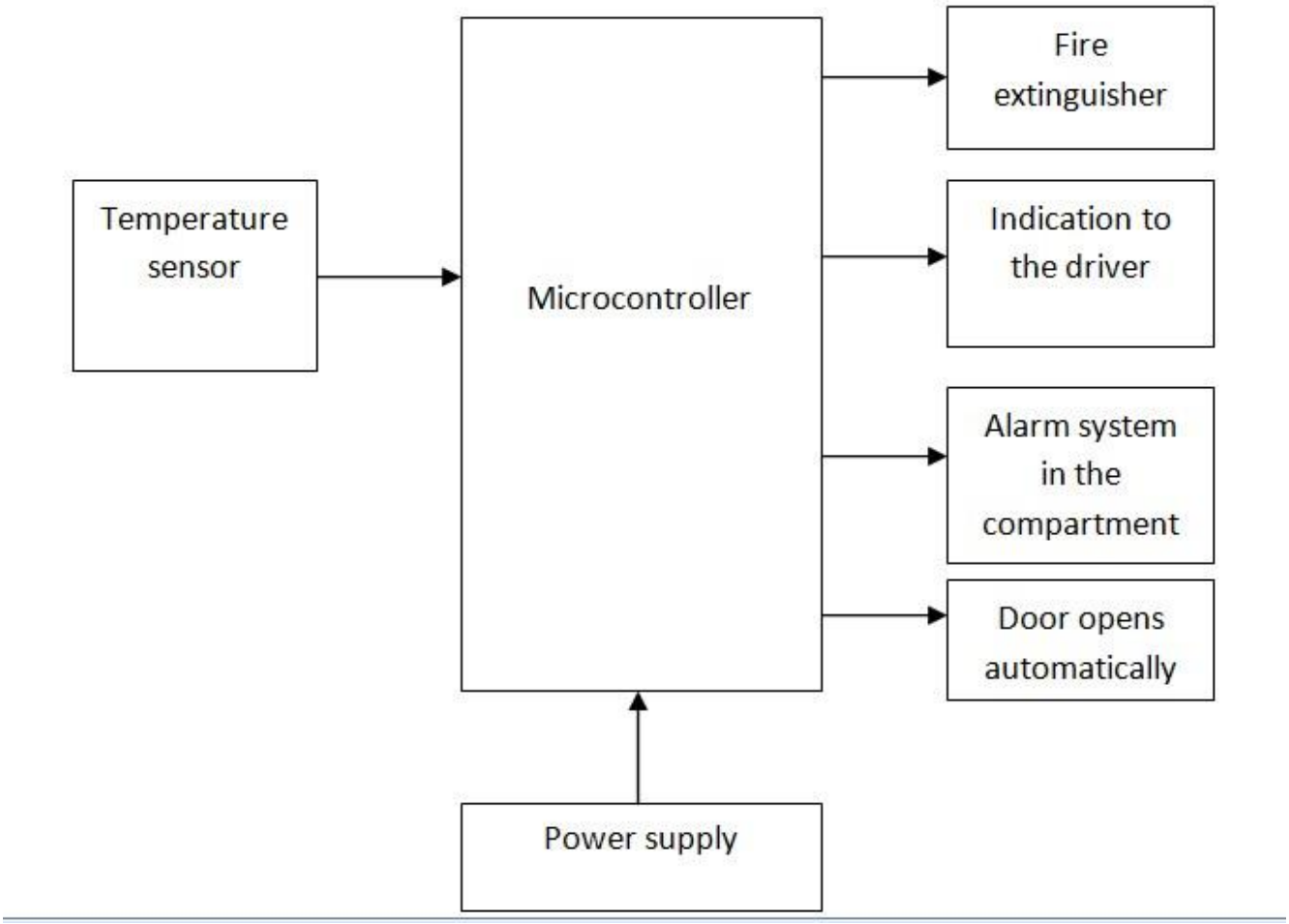


Fig 1 : Block Diagram

Description of block diagram

The temperature sensor senses the increase in temperature due to fire. Based on a threshold, the increase in temperature runs the microcontroller which performs the required tasks like automatic opening of door, alarm rings in the compartment, alarm at the driver spot, fire extinguishing action etc.

1.3 Type of power input

The power is required to run the microcontroller, alarms and buzzers. The power input required is constant DC of 5 volts, 9 volts and 12 volts.

1.4 Applications

The same system can be expanded to other public transport vehicles like

1. Buses
2. Trams
3. Cabs
4. Tempo travellers
3. Double deckers etc

1.5 Mode of demo in the lab

For the implementation of this model, we are using the microcontroller Atmega 16 along with a few hardware components like sensors, resistors, capacitors, motor etc. Fire alarm is realized in the form of buzzer. Two buzzers are involved where one buzzer is to awaken the passengers and the other buzzer to signal the drivers.

CHAPTER2 : ALGORITHM

Step 1: Start

Step 2: Read the digitized output of the three sensors.

Step 3: If output of any sensor is greater than the value at room temperature indicating there is fire, then a control signal is sent by micro-controller to open the door and to turn on the buzzer.

Step 4: If the digitized output of any one sensor is greater than the values of other two sensors and greater than the value at room temperature, a flag is set.

Step 5: Depending upon the flag value and initial position, the extinguisher opening control signal is sent by micro-controller to rotate in clock-wise or anti-clockwise direction.

Step 6: Once the extinguisher opening is set in the direction of fire, the micro-controller sends control signal and the extinguisher is pumped.

Step 7: Repeat Step 6 till the sensor output returns to that at room temperature that is fire is set off

Step 8: If the sensors output is not greater than that at room temperature then go to step 2.

Step 9: Stop

CHAPTER 3 : CIRCUIT DIAGRAM

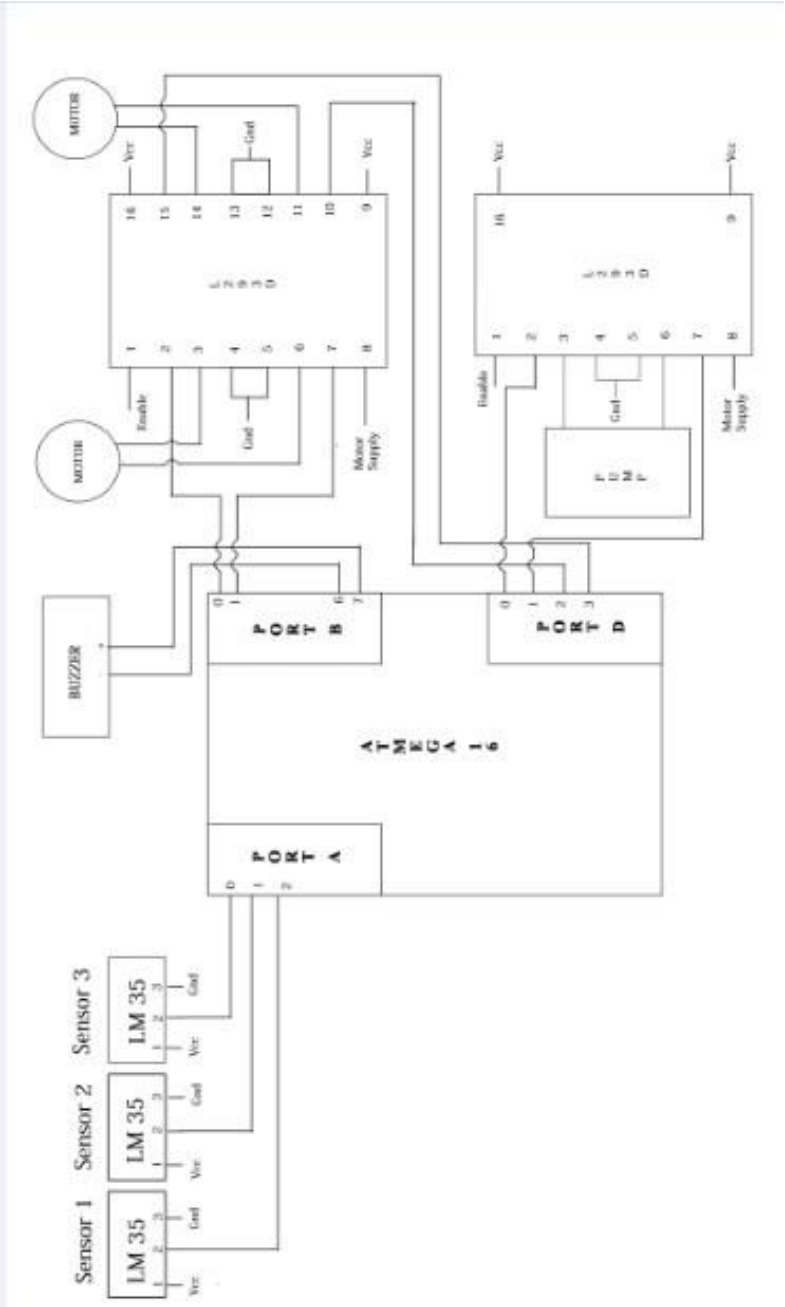


Fig 2 : Circuit Diagram

CHAPTER 4 : HARDWARE AND SOFTWARE

REQUIREMENTS

HARDWARE REQUIREMENTS:

Microcontroller (ATMEGA16)

LCD (16X2)

+5V, +12V Power supply

Temperature sensors: LM35CAZ

L293D- H Bridge

Low RPM DC motor

Water pump (+12V)

Buzzer

Geared DC motor

SOFTWARE REQUIREMENTS:

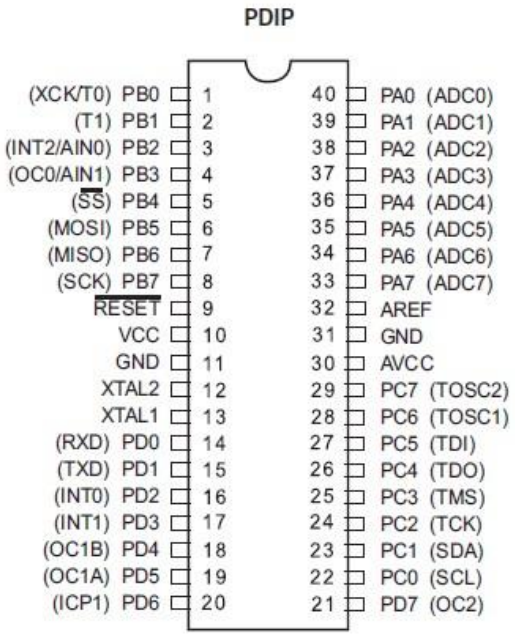
Embedded C Language Eclipse-

For execution

Khazama AVR Programmer

COMPONENT DESCRIPTION:

4.1 MICROCONTROLLER [ATMEGA16]:



- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture

– 131 Powerful Instructions – Most Single-clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 16 MIPS Throughput at 16 MHz

– On-chip 2-cycle Multiplier

- High Endurance Non-volatile Memory segments

– 16K Bytes of In-System Self-programmable Flash program memory

– 512 Bytes EEPROM

– 1K Byte Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

– Optional Boot Code Section with Independent Lock Bits

- JTAG (IEEE std. 1149.1 Compliant) Interface

– Boundary-scan Capabilities According to the JTAG Standard

– Extensive On-chip Debug Support

– Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface

- Peripheral Features

– Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes

– One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode

– Real Time Counter with Separate Oscillator

– Four PWM Channels

– 8-channel, 10-bit ADC

- 8 Single-ended Channels
- 7 Differential Channels in TQFP Package Only
- 2 Differential Channels with Programmable Gain at 1x, 10x, or 200x

– Byte-oriented Two-wire Serial Interface

– Programmable Serial USART

– Master/Slave SPI Serial Interface

- I/O and Packages

– 32 Programmable I/O Lines

– 40-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF

- Operating Voltages

– 2.7 - 5.5V for ATmega16L

– 4.5 - 5.5V for ATmega16

- Speed Grades

– 0 - 8 MHz for ATmega16L

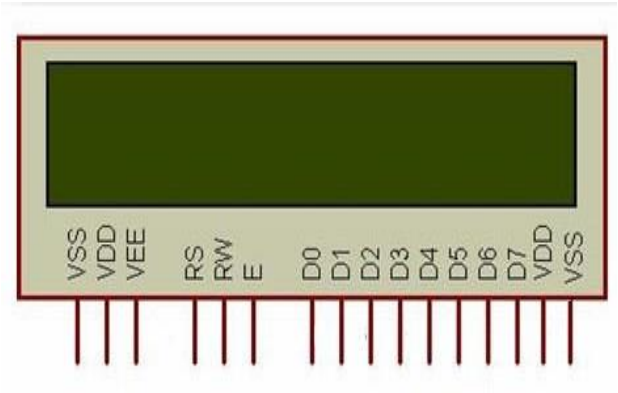
– 0 - 16 MHz for ATmega16

- Power Consumption @ 1 MHz, 3V, and 25.C for ATmega16L

– Active: 1.1 mA

– Idle Mode: 0.35 mA

4.2 16X2 LCDDISPLAY (JHD-162A):



FEATURES:

- Driving voltage-single supply +5
- type-Chip On Board.
- Number of data lines-8 bit parallel
- backlight-LED LCD consists of two Registers:

- Command Register.
- Data Register.

Command Registers are used to control LCD sequence like display clear, display ON, display OFF etc.

Data Register is used to display user provided information on to display.

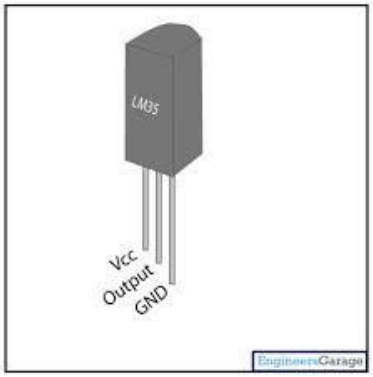
- RS=0 means Command Register is selected.
- RS=1 means Data Register is selected.

4.3 LM35

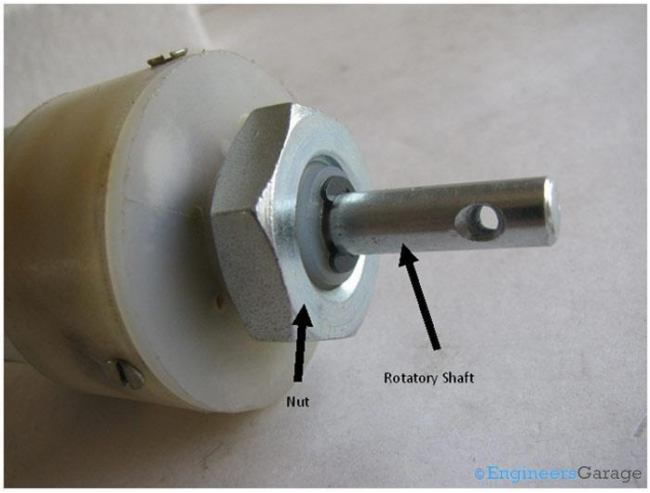
The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature.

Features

- Linear +10mV/Celsius
- Suitable for remote applications
- Operates from 4 to 30 volts
- Low impedance output



4.4 LOW RPM DC MOTOR



4.5 GEARED DC MOTOR

A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

4.6 BUZZER

A buzzer or 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.

4.7 IC L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. It can drive two motors simultaneously. The l293d can drive small and quiet big motors as well. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. In a single l293d chip there two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors

4.8 WASHER PUMP

Washer pump is a motorized electrical device. It works at 12V. It is responsible for injecting the stored fluid. The pump provides pressure that will enable the fluid to flow through the nozzle and out. A pipe can be fit into the nozzle so that the fluid can be pumped anywhere required.

CHAPTER 5 : RESULTS AND DISCUSSIONS

5.1 ADVANTAGES

- Easily employable
- System is compact and can be made available as a package
- Can track fire very easily
- Fairly good response time

5.2 DISADVANTAGES

- System should be calibrated before use
- Electronic components are delicate to handle

5.3 FUTURE SCOPE

The safety aspects are already neatly managed in the model. In the future, a GSM module can be implemented to give a message to the nearest railway station about the fire accident so that better safety measures, first aid response and ambulance can be arranged in advance.

REFERENCES :

[1] www.wikipedia.com

[2] www.instructables.com

APPENDIX

DATASHEETS

Atmega 16

Features

- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
  - 131 Powerful Instructions – Most Single-clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation
  - Up to 16 MIPS Throughput at 16 MHz
  - On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory segments
  - 16K Bytes of In-System Self-programmable Flash program memory
  - 512 Bytes EEPROM
  - 1K Byte Internal SRAM
  - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
  - Data retention: 20 years at 85°C/100 years at 25°C[1]
  - 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
- JTAG (IEEE std. 1149.1 Compliant) Interface
  - Boundary-scan Capabilities According to the JTAG Standard
  - Extensive On-chip Debug Support
  - Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
  - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Four PWM Channels
  - 8-channel, 10-bit ADC
    8 Single-ended Channels
    7 Differential Channels in TQFP Package Only
    2 Differential Channels with Programmable Gain at 1x, 10x, or 200x
  - Byte-oriented Two-wire Serial Interface
  - Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with Separate On-chip Oscillator
  - On-chip Analog Comparator
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- I/O and Packages
  - 32 Programmable I/O Lines
  - 40-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF
- Operating Voltages
  - 2.7 - 5.5V for ATmega16L
  - 4.5 - 5.5V for ATmega16
- Speed Grades
  - 0 - 8 MHz for ATmega16L
  - 0 - 16 MHz for ATmega16
- Power Consumption @ 1 MHz, 3V, and 25°C for ATmega16L
  - Active: 1.1 mA
  - Idle Mode: 0.35 mA
  - Power-down Mode: < 1 µA

ATMEL

8-bit AVR® Microcontroller with 16K Bytes In-System Programmable Flash

ATmega16
ATmega16L

Note: Not recommended for new designs.

Rev. 2466S–AVR–05/06

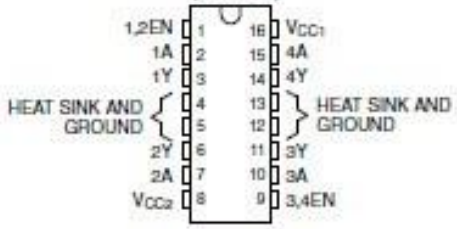
L293D

L293, L293D
QUADRUPLE HALF-H DRIVERS

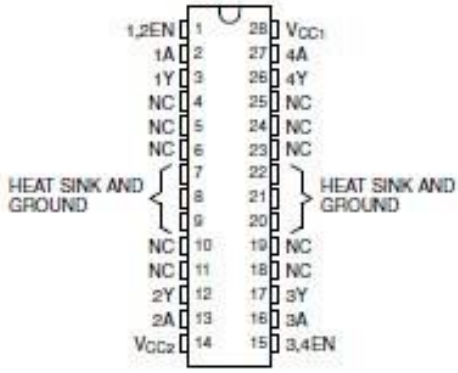
SLRS009C – SEPTEMBER 1986 – REVISED NOVEMBER 2004

- Featuring Unitrode L293 and L293D Products Now From Texas Instruments
- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Functionally Similar to SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

L293 . . . N OR NE PACKAGE
L293D . . . NE PACKAGE
(TOP VIEW)



L293 . . . DWP PACKAGE
(TOP VIEW)



description/ordering information

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	HSOP (DWP)	Tube of 20	L293DWP	L293DWP
	PDIP (N)	Tube of 25	L293N	L293N
	PDIP (NE)	Tube of 25	L293NE	L293NE
		Tube of 25	L293DNE	L293DNE

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

LM35

Product Folder | Sample & Buy | Technical Documents | Tools & Software | Support & Community

TEXAS INSTRUMENTS

LM35

www.ti.com

SNIS159D – AUGUST 1999 – REVISED OCTOBER 2013

LM35 Precision Centigrade Temperature Sensors

FEATURES

- Calibrated Directly in ° Celsius (Centigrade)
- Linear + 10 mV/°C Scale Factor
- 0.5°C Ensured Accuracy (at +25°C)
- Rated for Full −55°C to +150°C Range
- Suitable for Remote Applications
- Low Cost Due to Wafer-Level Trimming
- Operates from 4 to 30 V
- Less than 60-µA Current Drain
- Low Self-Heating, 0.08°C in Still Air
- Nonlinearity Only ±¼°C Typical
- Low Impedance Output, 0.1 Ω for 1 mA Load

DESCRIPTION

The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The low output impedance, linear output, and precise inherent calibration of the LM35 make interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 is rated to operate over a −55°C to +150°C temperature range, while the LM35C is rated for a −40°C to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.

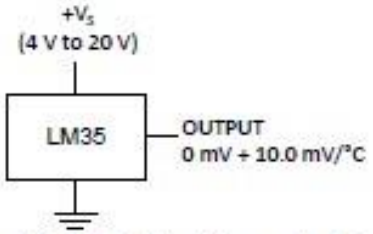
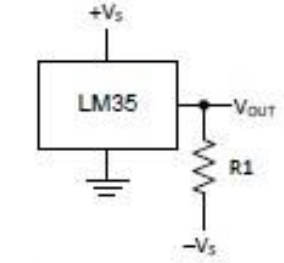


Figure 1. Basic Centigrade Temperature Sensor (+2°C to +150°C)



Choose $R_1 = -V_S / 50\ \mu A$
$V_{OUT} = 1500$ mV at 150°C
$V_{OUT} = 250$ mV at 25°C
$V_{OUT} = -550$ mV at −55°C

Figure 2. Full-Range Centigrade Temperature Sensor