International Journal of Engineering Research in Computer Science and Engineering (IJERCSE) Vol 3, Issue 3, March 2016

Mobile Heat Control by Using Lm35 PCT Sensors with LPC2148 Thermostat Microcontroller

[1] Sharmila.R, [2] Solai A.L [3] Ms. Gomathi S
[1][2][3] Department of Information Technology
Sri Sairam Engineering College,
[1] sharmilakrishen@gmail.com, [2] anithasolai96@gmail.com, [3] gomathi.it@sairam.edu.in

Abstract: **This paper presents novel low-cost system for controlling the heat generated in the mobile by using LPC2148 microcontroller with LM35 temperature sensor. In the proposed temperature controlling system, LM35 sensor is used to sense the heat which is generated in the mobile. The microcontroller is provided with LM35 sensor. This sensor is used to display the temperature in the display of the mobile phone. The microcontroller is embedded with LM35 precision centigrade temperature sensors and the microcontroller is coded with java language which acts as thermostat to control the heat whenever the mobile generates heat. It controls the heat automatically when it goes beyond the heat level by using the LM35 precision centigrade temperature sensor.**

Keywords: **ARM-Advanced Risk Machines-LPC2148-Linear Programming Control microprocessor**

I. INTRODUCTION

As mobile devices are required to provide very low power consumption, schemes such as monitoring the internal temperature of a chip and adjusting its power consumption based on this temperature are popularly used. Usually, the mobile generates heat mostly in smart phones because of using many applications (apps). It is very important to control the internal device itself rather than using mobile applications. So that, we can avoid mobile burst while charging and the generation of heat in mobile phones. It affects the ease of use generally when using the mobile phones. The proposed system deals with the microcontroller which controls the temperature itself. So, the problem can be solved internally without the knowledge of users .

Over the last few years, the ARM architecture has become the most pervasive 32-bitarchitecture in the world, with wide range of ICs available from various IC manufacturers. ARM processor are embedded in products ranging from A worldwide community of ARM partners and third-party vendors has developed among semiconductor and product design companies, including hardware engineers, system designers, and software developers.ARM7 is one of the widely used micro-controller family in embedded system application. This section is humble effort for explaining basic features of ARM-7.**ARM** is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings.

A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces costs, heat and power use. These are desirable traits for light, portable, battery-powered devices—including smart phones, laptops, tablet and notepad computers), and other embedded systems. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and supercomputers.

According to ARM Holdings, in 2010 alone, producers of chips based on ARM architectures reported shipments of 6.1 billion ARM Based processors, representing 95% of smart phones, 35% of digital televisions and set-top boxes and 10% of mobile computers. It is the most widely used 32-bit instruction set architecture in terms of quantity produced.

II. EXISTING SYSTEM

There are more applications here to control the heat which is generated in the mobile phone like clean master. But it needs to be updated regularly which is not effective for all users. Otherwise turn off unused apps on our phone. Allowing apps to run in the background runs

battery and increase heat on your phone. This makes inconvenience for users.

III. PROPOSED SYSTEM

LPC2148 microcontroller is used with LM35 Precision Centigrade Temperature Sensors to sense the temperature level.The Microcontroller is coded as programmable thermostat which is used to control the temperature internally.The thermostat has some temperature limits which doesn't let the temperature to be high.

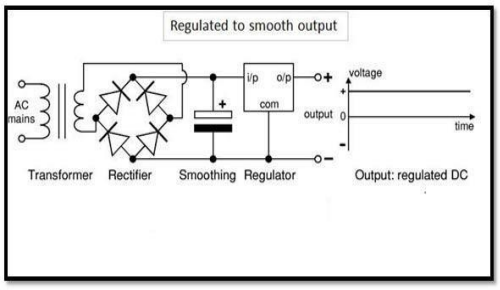
IV. LPC2148 MICROCONTROLLER

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

LPC2148 works on 3.3 V power supply. LM 117 can be used for generating 3.3 V supply. However, basic peripherals like LCD, ULN 2003 (Motor Driver IC) etc. works on 5V. So AC mains supply is converted into 5V using below mentioned circuit and after that LM 117 is used to convert 5V into 3.3V.

Transformer: It is used to step down 230V AC to 9V AC supply and provides isolation between power grids and circuit. **Rectifier:** It is used to convert AC supply into DC. **Filter:** It is used to reduce ripple factor of DC output available from rectifier end. **Regulator:** It is used to regulate DC supply output.

Circuit for this is as shown below.



Here, Regulator IC 7805 is used to provide fix 5V dc supply. Now we can use LM 117 for generating 3.3V supply from 5V using below circuit.

Reset Circuit: Reset button is essential in a system to avoid programming pitfalls and sometimes to manually bring back the system to the initialization mode. Circuit diagram for reset is as shown below.
MCP 130T is a special IC used for providing stable RESET signal to LPC 2148.

Oscillator: Oscillations, the heartbeat, are provided using a crystal and are necessary for the system to work.The value of capacitors C20 & C21 depends upon the frequency of crystal Y3. General circuit and its equivalent circuit is as shown below

***UART*:** LPC 2148 has inbuilt ISP which means we can program it within the system using serial communication on COM0. It has also COM1 for serial communication. MAX 232/233 IC must be used for voltage logic conversion.

CODE: The code used in implementing a thermostat included many separate routines from timing to analog-to-digital conversion.

Timing: Any useful thermostat is programmable and at the very minimum should accept a target temperature. Optionally, it could apply this target temperature for a specified time interval (for example, as in a toaster), or it could have several target temperatures which change during the course of the day (as in a building thermostat). Since this requires accurate, programmable timing, a useful and practical step is to include a clock display on the LCD.

We used Timer1 with a clock division of 64, a Compare/MatchA value of 62,500, and the Clear Timer1 Counter flag set, to yield precise timing intervals of 1 second. After implementing our conversion routines, we are able use this to accurately sample temperatures at one second intervals.

Recording: The thermostat was also desired to keep minimum and maximum temperatures. This was a simple comparison routine which looked at the current min and max temperatures in memory and replaced them if the new temperature exceeded either of the current min or max. We also included a button option which allowed us to reset the min and max temperatures at any time.

Control: In order to turn on or turn off a heater, a control segment was coded which applied either a logical 1 or 0 to PortB0 depending on whether the current temperature was above or below the user input target temperature. Because the microcontroller was not capable of driving the power transistor which was necessary for the application of running a heater, we used an LED to indicate the status of PortB0. If given another fifteen minutes we could have used two transistors in a Darlington configuration to

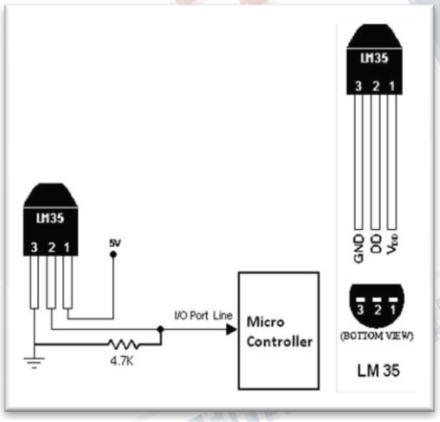
increase the current gain of the transistor switch and in this manner control the heater.

***Display routines*:** Display routines were also triggered once every second in one of two states: the primary state and the display hi/lo temperature mode. The 16-character LCD display has enough room to output two temperatures and the time.

V. LM35 PCT SENSOR

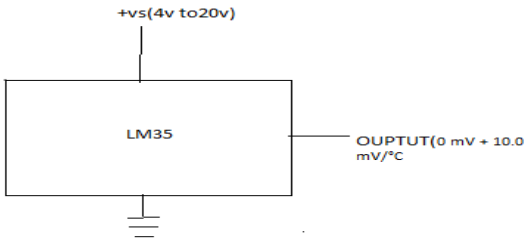
A. *LM35 Precision Centigrade Temperature Sensors*

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensorscalibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require anyexternal calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level.

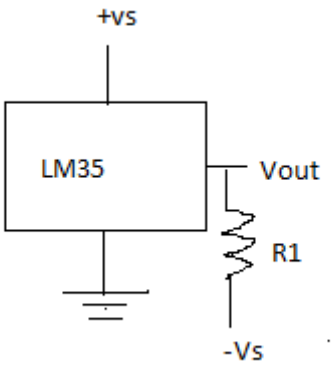


The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plasticTO-220 package.

B. *Basic Centigrade Temperature Sensor* (2°to 150°C)

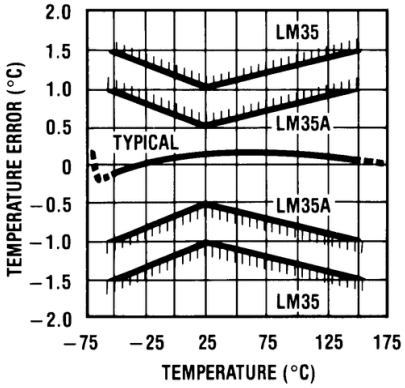


Full-Range Centigrade Temperature Sensor



VI. MEASUREMENT RESULTS

Typical performance of sensor about temperature:



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

VII.POWER SUPPLY RECOMMENDATIONS:

The LM35 device has a very wide 4-V to 5.5-V power supply voltage range, which makes it ideal for many applications. In noisy environments, TI recommends adding a 0.1 µF from V+ to GND to bypass the power supply voltage. Larger capacitances maybe required and are dependent on the power-supply noise.

VIII. CONCLUSION

In this paper, the LPC2148 microcontroller is used..The LPC2148 microcontroller is coded as thermostat to control the generation of heat either due to using android application or during charging of mobiles itself by using the LM35 sensors to sense without the knowledge of users. It increases the ease of use. The existing mobile system is using VLSI which is embedded in their chip. though it produces the heat beyond its level. By using LPC2148 microcontroller, we can reduce the heat generation. It will be very effective.

REFERENCES

[1] Karim Arabi and Bozena Kaminska, "Built-In Temperature Sensors for On-Line Thermal Monitoring of Microelectronics Structures", IEEE
International Conference on VLSI in computers and processors, pp. 462-467, 1997

[2] S. M. Metev and V. P. Veiko, *Laser Assisted Microtechnology*, 2nd ed.,R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.