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PSoC Multisensor for Temperature, Humidity & Light Intensity

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Abstract: **- This review paper presents for embedded sensor design with PSoC controller for measuring the temperature, humidity and light intensity. The PSoC family consist of many Programmable System-on-Chip controller devices. These devices are design to replace multiple traditional MCU-based system components with one, low cost single chip programmable device. With the help of microcontroller it is difficult to implement multiple sensors on single chip. But PSoC family provides this flexibility and ease of designig.**

Keywords: **– PsoC, Sensor.**

I.INTRODUCTION

Modern embedded control systems incorporate a microcontroller as the principal component - a self contained computer-on-a-chip consisting of a central processing unit, RAM memory for data storage, a variety of input/output functions and non-volatile program memory to hold the software written to implement the specific application. The new generation of re-configurable PSoC (Programmable System-on-Chip) controllers, which integrates all the above components, will become the dominant system architecture for the majority of micro-based designs, by employing advanced lithography and FLASH-based programming technology. The PSoC family consists of many Programmable System-on-Chip Controller devices. These devices are designed to replace multiple traditional MCU-based system components with one, low cost single-chip programmable device. PSoC based data logger measuring temperature and humidity levels. With the help of microcontroller it is difficult to implement multiple sensors on single chip. But PSoC family provides this flexibility and ease of designing. [1]

II. RELATED WORK

Bo Chang, Xinrong Zhang has designed environmental information monitoring, an indoor temperature and humidity monitoring system based on fuzzy-PID strategy. The system uses CC2430 as the core to develop wireless sensor nodes which follow the ZigBee communication protocol, uses the data collection terminal with high-precision temperature and humidity sensor to collect temperature and humidity data of the environment, uses ZigBee technology to achieve networking of wireless sensors and the automatic aggregation of monitoring data, and uses the fuzzy PID control algorithm to improve the accuracy of test data. The indoor temperature and humidity regulation is achieved based on fuzzy PID control technology. The management function of various sensor nodes and a large number of environmental data is achieved based on embedded database. The monitoring results for temperature and humidity have shown that this system is stable, high reliable in data transmission and easy to use, and can be widely used in various areas of automatic monitoring of environmental parameters [6].

Temperature sensors are one of the fastest growing fields in the sensors market because of the abundance of applications where temperature must be monitored and controlled, including personal computers, mobile phones, automobiles, medical equipments, process industries, nuclear plants, within different sensors and many others. Temperature sensors are also necessary in other sensors, such as flow sensors, pressure sensors IR detectors, humidity sensors etc. [4].

Data loggers are electronic devices capable of recording data from sensors at a certain location over time. The recorded values can be printed using a compact thermal printer or can be saved in

files on an USB flash drive using an USB host controller board [3].

Home power consumption makes up the major part of energy consumption. In particular, the power consumption of lamps in a typical home is a factor which can't be ignored. The typical user needs different light intensities in different places. Sometimes the light intensity from outside is sufficient, and thus we don't need to turn on any light. But sometimes the user leaves but forgets to turn off the light. These factors cause energy waste. Therefore some power management of light control in a home is necessary in order to save energy. In some designs one must install specific hardware and software to control the lights, resulting in unacceptable costs. Furthermore this type of system cannot detect either the temperature of the human body or the room light intensity [5].

III. SCOPE

PSoC system is the user friendly system; each one operated it very easily. Here system design of any application done in minimum time. On chip analog blocks are present which is programmable, so we reconfigure pin connections, or completely change the block function if necessary.

IV. SYSTEM ARCHITECTURE

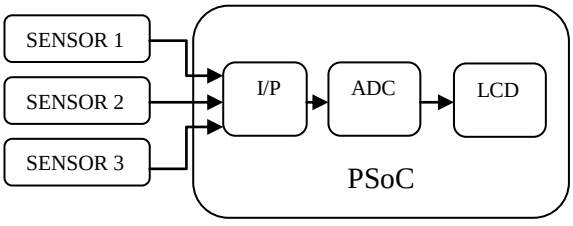

Figure: System architecture

- The proposed system architecture as shown in Figure consists of a PSoC chip to interface directly with sensors from one side and to exchange sensors data with the signal converter.
- The important feature of PSoC is the capability to change the configuration of analog circuitry for the ease of configuration by changing some software parameters.[7]
- This is especially important because of the nature of the sensor interfacing problem.
- Due to the diverse sensor types, signal conditioning circuits are a limiting factor of sensors interoperability.
- PSoC solves such problem by allowing the signal conditioning to be executed inside the chip.
- The operation of the PSoC can be changed by software means.
- In addition to all the standard elements of 8-bit microcontrollers, PSoC chips feature digital and analog programmable blocks such as Analog multiplexer, ADC and DAC, Analog Comparators,Switched capacitors block, Op-Amp circuits.[8]

V. FEATURES

- Temperature and light intensity is sensed through respective sensor.
- Measured values are displayed on LCD.
- After some time interval data will be stored in EEPROM.
- In the mean time values are displayed on LCD.
- Using these measured values we control the operation of systems.

VI. TYPES OF SENSOR

For measuring temperature, humidity and light intensity we can use different sensors like bipolar junction transistor, LM35, photocell, LDR etc. The temperature characteristics of the bipolar transistor are well known. Normally, the base-emitter voltage of the bipolar transistor is used as a temperature-reference signal in band gap references and temperature transducers.

➢ Temperature Sensor

Temperature is the most-measured process variable in industrial automation. Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are the key to read temperatures correctly and to control temperature in industrials applications.

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 to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C 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. [2]

➢ Humidity Sensor

Humidity sensor is used to detect the quantity of humidity from the environment. Humidity is measured into percentage and different types of Humidity Sensors are used to measure humidity. With interfacing with microcontrollers it becomes a standalone system to measure the percentage in the environment. Relative humidity/temperature and relative humidity sensors are configured with integrated circuitry to provide on-chip signal conditioning. Absorption-based humidity sensors provide both temperature and %RH (Relative
Humidity) outputs. On-chip signal processing ensures linear voltage output versus %RH. Sensor laser trimming offers +5 %RH accuracy and achieves 2 %RH accuracy with calibration. Packages are chemically resistant and operate in ranges of -40 °C to 85 °C [-40 °F to 185 °F] to accommodate harsh environments. They are following types:

- Relative Humidity Sensor
- Digital Humidity Sensor
- Soil Humidity Sensor
- Humidity And Temperature Sensor
- Humidity Sensor Switch
- Humidity Sensor probe

Applications of Humidity Sensors:-

Relative Humidity Sensors are used in every field. It has lots of importance and plays an important role in measuring Humidity from environment. They are also useful in all applications where humidity compensation is needed. It is used to develop following applications:

- Office Automation Applications
- Automotive Cabin Applications
- Air Control Applications
- Home Appliances Applications
- Industrial Process Control Systems & Applications
- Refrigeration And Cooling Systems & Applications
- Drying Systems & Applications
- Meteorology Applications
- Battery Powered Systems Applications
- OEM Assemblies and Applications
- Official Applications

VII. CONCLUSION

A PSoC implementation of multisensor system is given here, which presents a new methodology to approach sensor solutions. The implementation takes the advantage of dynamically configuration changing for measuring different physical parameters. It's simplicity and effectiveness makes it suitable for fast prototyping and low cost solutions. P-soc is the new technology in the Core Industries. In P-soc on chip Analog blocks are Present which are programmable . So we can reconfigure pin connections, or completely change the block functions if necessary. So that System can be upgraded in minimum time.

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