Lesson 4
Examples of the Sensors

Temperature Measuring and Control sensors

- Thermistor applications in home automation
- Sensing the cloud cover
- The output of thermistor connected to circuit of a signal conditioning amplifier, ADC and then to microcontroller serial port

Sensor Termistor characteristics

- Shows larger changes in resistance within narrow environment temperature range (120°C to –90°C)
- A ‘Negative Temperature Coefficient’ (NTC) thermistor shows a drop in the resistance value with rise in temperature

Sensor with Positive Temperature coefficient

- Resistance value of a PTC resistor rises with rise in temperature. A thin wire of platinum or other metallic alloys
- Shows nearly linear changes with its temperature
- Used for temperature sensing and measuring the values over very wide ranges of temperatures, say (0–1600°C).

Temperature IC sensor

- Certain ICs, AD590 function as temperature transducer, generates 1 mA for every 1°C rise in temperature
- The output of transducer connected to a signal conditioning amplifier, ADC and then to serial port interface at microcontroller.

Readily available with circuit Temperature Sensor

- Readily available temperature sensors have inbuilt circuitry, just have three terminals, two for 5 V or 3.6 V supply + and - terminals and one for ADC input, Vin.

Readily available Humidity Sensor

- Output voltage proportional to RH% (Humidity sensor available from Sparkfun, an US company)
- The sensor given input supply at + and – (ground) potential terminals
- Generates output VRH as a function of RH%.

Distance IR based Sensor

- Readily available
- Output voltage proportional to distance (Sparkfun distance IR sensor)
- Sensor IR LED is given input supply at + and – (ground) potential terminals
- An IR-FPT along with internal circuitry generates output Vdis as a function of distance.
- Vdis is directly given as input to the ADC and ADC output to microcontroller serial Port.
- Compute for distance.

Light Intensity Sensor

- Use of photoconductor
- p-n junction photodiode
- phototransistor for measuring

microelectromechanical sensor (MEMS) sensor Acceleration Sensor

- A detects the linear accelerations *ax, ay and az along three axes x, y and z,* respectively.

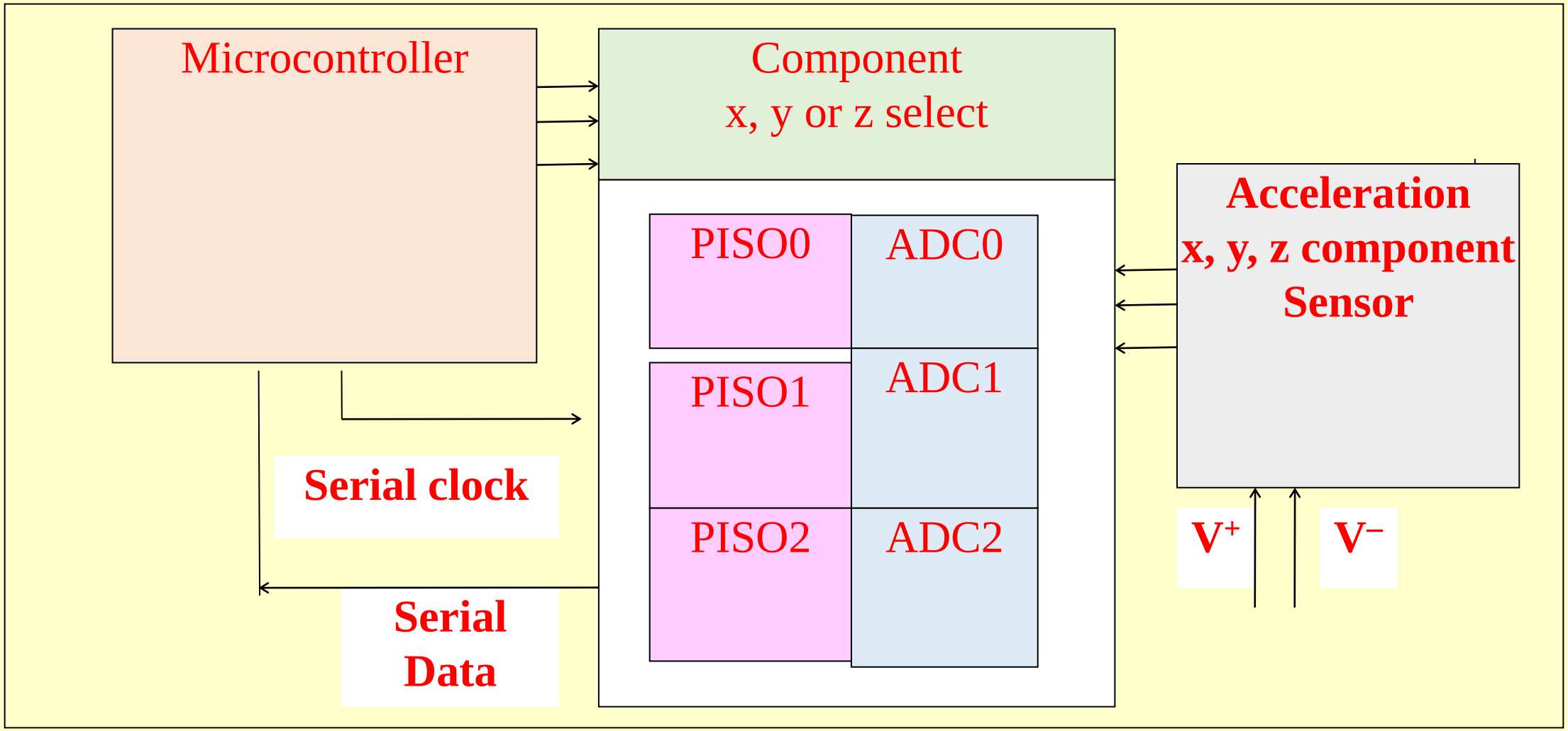

Fig. 7.8 Microcontroller electronic circuit for measuring three acceleration components from the accelerometer sensor

Vibrations and Shocks Sensor

- MEMS may use piezoelectric effect in place of the
- capacitive change effects

Gyroscope Sensor

- Angular Acceleration and Change in Direction (Angle)
- Accelerometer and system initiates actions as programmed
- Mobile gaming application uses in-motion gestures of a player when deploying a gyroscope.

Compass Orientation and Direction Compass

- A gyroscope used as electronic compass or digital compass and show change in direction (angle)
- Digital compass sensor sends 1s and 0s to microcontroller
- serial port. The sensor is given input supply connect serial-port terminals, SCL (serial clock) and SDA (serial data)
- The sequence of serial bits corresponds to a byte (8-bit binary number)
- Compute for angle f with respect to the north direction.

Environmental Monitoring Sensors

- Environment parameters temperature, humidity, barometric pressure and light
- A collective use of these parameter sensors
- Circuit with associated sensors as one compact electronic board

Global Positioning System (GPS)

- A location determination using computations of data from circuits to receive GPS satellite signals
- Alternatively, user receiving the location from a service provider

Other physical parameter Sensors

- Refer text Section 7.2.2

Summary

We learnt sensors for

- Temperature
- Relative Humidity
- Light intensity
- Distance
- Acceleration
- Gyroscope and Compass

Summary

- Environmental parameters integrated circuit board with sensors as compact unit
- GPS

End of Lesson 4 on Examples of the Sensors