Lab 1: ECGR 4090/6185/8185 – Spring 2008
Air pressure measurement using MPX 4100A sensor

Introduction:

A **pressure sensor** measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a gas or fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor generates an electric, optic, visual or auditory signals related to the pressure imposed.

Pressure sensors are used in numerous ways for control and monitoring in thousands of everyday applications. Pressure sensors can be used in systems to measure other variables such as fluid/gas flow, speed, water level, and altitude. Pressure sensors can alternatively called pressure transducers, pressure transmitters, pressure senders, pressure indicators among other names.

Pressure sensors can vary drastically in technology, design, performance, application suitability and cost. A conservative estimate would be that there may be over 50 technologies and at least 300 companies making pressure sensors worldwide.

There are also a category of pressure sensors that are designed to measure in a dynamic mode for capturing very high speed changes in pressure. Example applications for this type of sensor would be in the measuring of combustion pressure in an engine cylinder or in a gas turbine. These sensors are commonly manufactured out of piezoelectric materials like quartz.

Motivation:

The primary motivation for this project is that, the applications of pressure sensors are being increased day-by-day. It has got many applications in the field of weather instrumentation, aircraft, automotive and non-automotive.

The pressure sensor being used for this lab is the Freescale MPX4100A.

MPX4100A

The basic idea behind this project is to measure the atmospheric pressure.

Connections:

UNIBODY PACKAGE PIN NUMBERS(1)			
1	V_{OUT}	4	N/C
2	GND	5	N/C
3	V_S	6	N/C

Fig2: Connections of MPX 4100A

The table above gives the connections to be made. The pin1 is used for measuring the output of the pressure sensor.

Circuit:

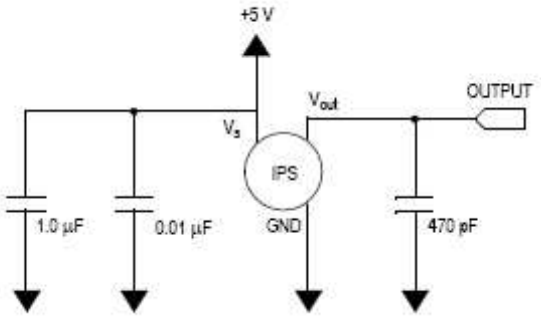

Fig3: Circuit diagram of the decoupling circuit used to interface the SKP16C62P with the Pressure sensor MPX4100A.

Working of the Pressure sensor MPX 4100A:

The pressure sensor MPX 4100A contains a silicon gel which separates the die from the environment. The pressure side on the silicon gel is the pressure which is measured. The pressure measured in voltage is being given to the SKP16C62P board and the ADC converts the voltage value to the respective pressure.

Formula to find the pressure measured from the output voltage:

$V_{out} = V_S (P \times 0.01059 - 0.1518)$
$\pm$ (Pressure Error x Temp. Factor x $0.01059 \times V_S$)
$V_S = 5.1\ V \pm 0.25\ Vdc$

The temperature factor and pressure error as given in the data sheet are:

Temp	Multiplier
–40	3
0 to 85	1
+125	3

Pressure	Error (Max)
20 to 105 (kPa)	±1.5 (kPa)

Requirments:

1. Measure the pressure inside a 20oz. drink bottle. It should show some change when the sealed bottle is squeezed.
2. Display the raw A/D value on the LCD.
3. Compute the Pounds per Square Inch (PSI) and display it to the hundreth's place on the LCD (i.e. 15.04 psi).
4. Be accurate within 0.05 psi

Write your lab report following the same guidelines as last semester.

Written with the help of Sri Anusha Katta.