

Crack Sensing Circuit

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Abstract—This report explains the design of a mixed signal SoC to detect cracks using the strain gauges. Strain gauge is a type of sensor which changes its resistance on application of strain on its surface. For the sake of this design, the strain gauge has been mapped to a resistor in the electrical domain. This specific resistor is connected in a voltage divider circuit to get the corresponding voltage output as per the reference source voltage. This is then connected to a 3-bit flash type analog to digital converter. The priority encoder of this ADC is fed to a PIPO which in turn gives data to the LCD interfacing circuit to display on the LCD letting us know about the crack.

I. DESCRIPTION

The problem of detecting a crack can be solved by using a strain gauge. If the surface on which the strain gauge is kept develops a crack, there is a change in the strain profile of the material resulting change in the electrical resistance of the strain gauge. This change can be detected using the following setup.

II. PROPOSED DESIGN

A. Voltage divider circuit

The voltage divider circuit can be drawn in the following way:

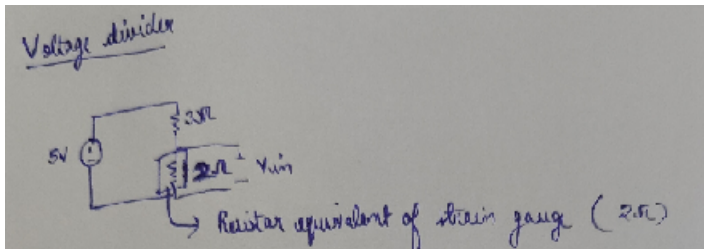


Fig. 1. Voltage Divider

B. 3 Bit Flash type ADC Comparator

The ADC looks like Fig.2.

C. Encoder-PIPO-LCD stage

The 3x8 priority encoder - PIPO - LCD stage will look like Fig 3.

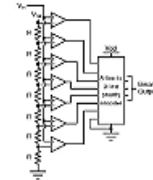


Fig. 2. 3 bit Flash type ADC

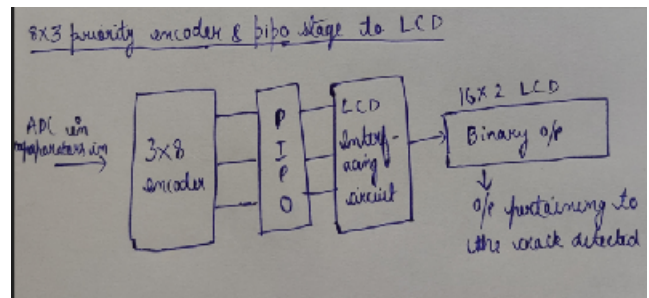


Fig. 3. Encoder to LCD stage

D. Results

All the stages will be connected and the following results are expected (fig 4.). The strain gauge resistance is assumed to be equal to 2 ohms for this case. This generates a voltage of 2 Volts which is then fed to the ADC. The LCD then prints the encoder output coming through the PIPO.

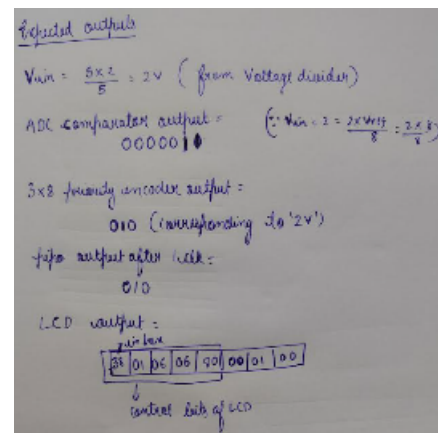


Fig. 4. Results