Capacitive Touch Sensor

Aim:

To find the Characteristics of Touch Sensor.

Materials Required:

Arduino Uno, ProtoCentral FDC1004 capacitance sensor breakout board, Flexible Capacitive force Sensor, Arduino IDE, Jumper cables.

Theory of Operation:

A capacitive flexible force sensor is a type of sensor designed to measure force or pressure while being adaptable to curved or irregular surfaces due to its flexible structure. It operates on the principle of capacitive sensing, where changes in capacitance are detected as the sensor deforms in response to applied force. This deformation alters the distance between capacitive plates, resulting in a proportional change in capacitance. These sensors find applications in diverse fields such as robotics, medical devices, and wearable technology, offering the advantage of conforming to various shapes.

The FDC1004 is a high-resolution, 4-channel capacitance-to-digital converter for implementing capacitive sensing solutions. Each channel has a full-scale range of ±15 pF and can handle a sensor offset capacitance of up to 100 pF, which can be either programmed internally or can be an external capacitor for tracking environmental changes over time and temperature. The large offset capacitance capability allows for the use of remote sensors.

Pin Configuration:
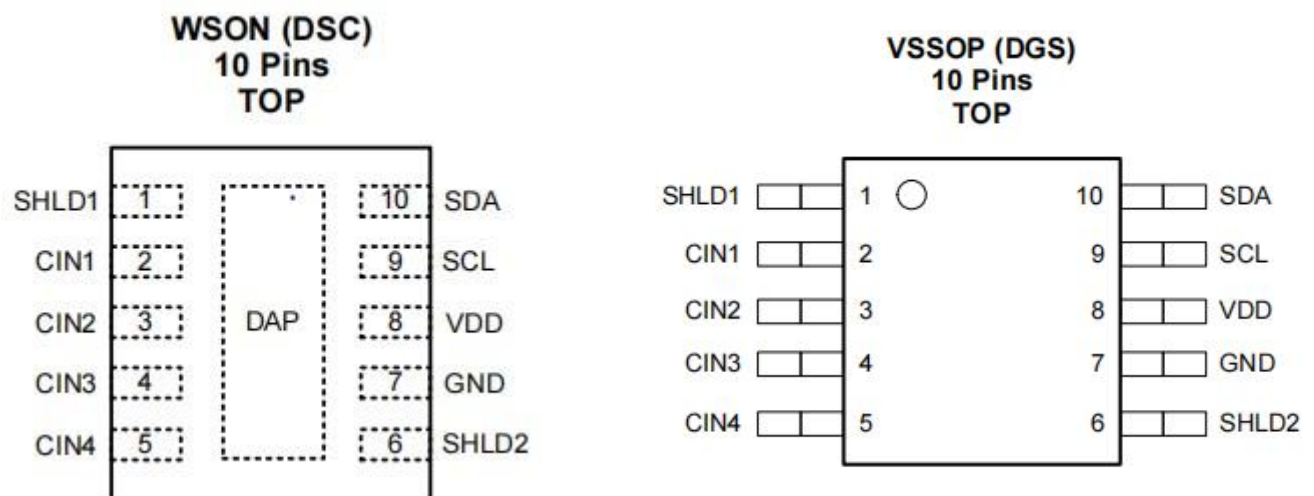
Circuit Diagram:
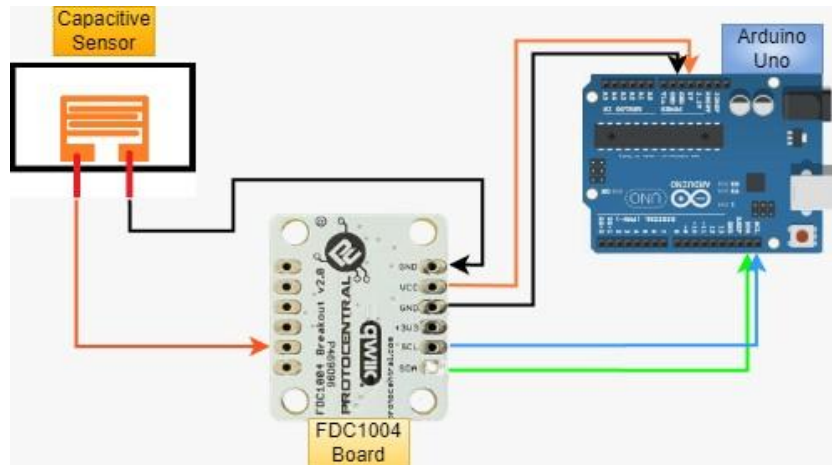
Arduino UNO	FDC1004	Sensor
5V	VCC	
GND	GND	
SDA	SDA	
SCL	SCL	
	GND	BLACK
	CIN1	RED

Procedure:

- Rig up the circuit as shown in the above diagram.
- Upload the provided code to Arduino Uno with help of Arduino IDE.
- Note down the Initial Capacitance.
- Apply the Provided Weights ranging from 50 g to 200 g on the Sensor and note down the change in the capacitance.
- Plot the change in capacitance vs Force graph based on the observed value.
- Map the Change in capacitance to proper voltage with a help of full-scale range of FDC1004.

Results/Observations:

- Comment on type of communication used for data Transmission.
- Initial Capacitance = **17.347 pF** {Without any external force}
- Plot the Dynamic characteristics of Sensor.
- Max change in Capacitance before Saturation = **6.1641 pF**

Weight Applied [g]	Applied Force [N]	Capacitance [pF]
0	0	17.347
5	0.04905	17.222
15	0.14715	17.1825
35	0.34335	17.1029
135	1.32435	14.7328
155	1.52055	14.1149
195	1.91295	14.0014
205	2.01105	11.425
235	2.30535	11.325
255	2.50155	11.159
300	2.943	11.233
355	3.48255	11.1829