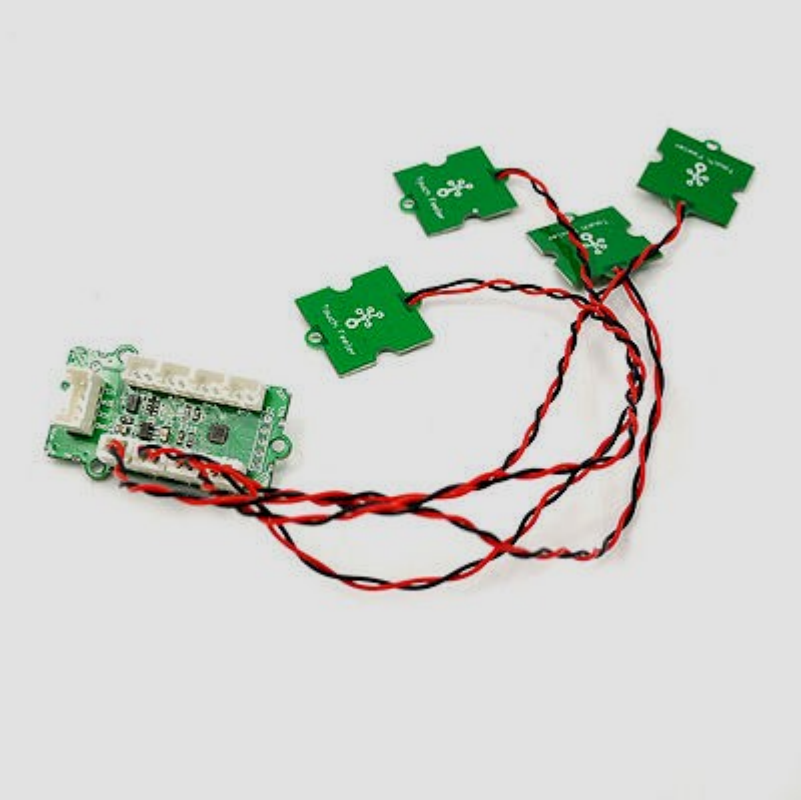
SEED TECHNOLOGY INC (SEEEDUINO)

Grove - I2C Touch Sensor

Model: SEN51153P

Introduction

The I2C Touch Sensor is based on FreeScale MPR121, to feel the touch or proximity of human being fingers. This sensor include 2 parts: one Touch Sensor controller, and 4 finger feelers. Insert the connectors of feelers into base of Sensor controller, you can begin your touch controlling.
MPR121: The MPR121 is a capacitive touch sensor controller,features internal intelligence, include an hardware configurable I2C address, an expended filtering system with debounce, and completely independent electrodes with auto-configuration built in .
Touch Sensor feeler: The Touch Sensor feelers, which was 4 included in Touch Sensor module,can be set in any place you like, to feel your finger's touch or proximity. Notice it must not get in touch with any conductive material.



Features

- Grove compatible interface
- Low power operation
- I2C interface,with interrupt output
- 12 capacitance sensing inputs,besides,8 inputs are multifuction for LED driver and GPIO
- Complete touch detection,Include Auto-configuration and Auto-calibration
- Excellent temperature stability

Application Ideas

- PC Peripherals
- MP3 Players
- Remote Controls
- Mobile Phones

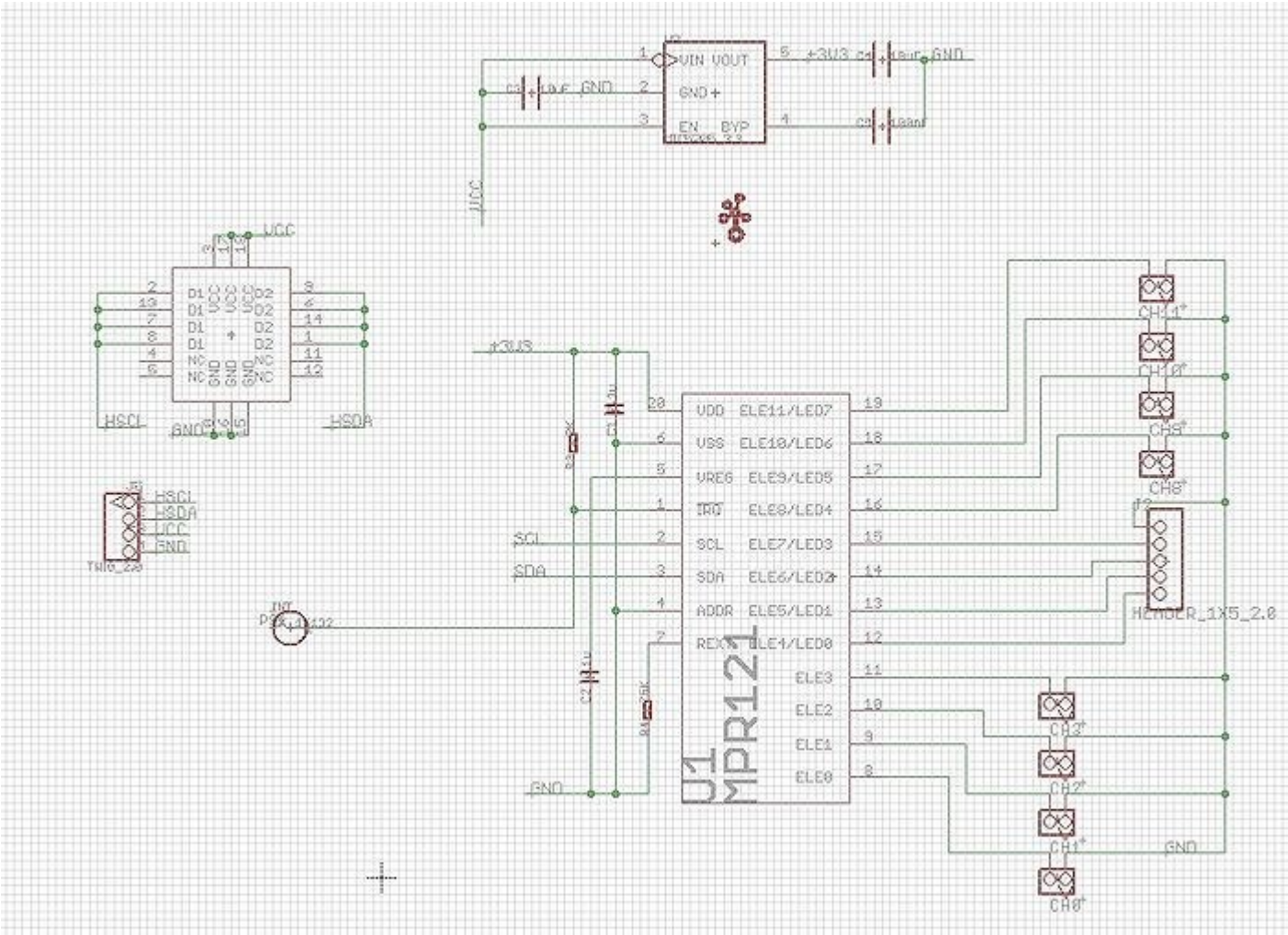
Library

there is also a library for you to Manipulate this module, thank our friend **wendellz**

Cautions

When install the feeler, it must not get in touch with any conductive material, or it may cause the circult short.

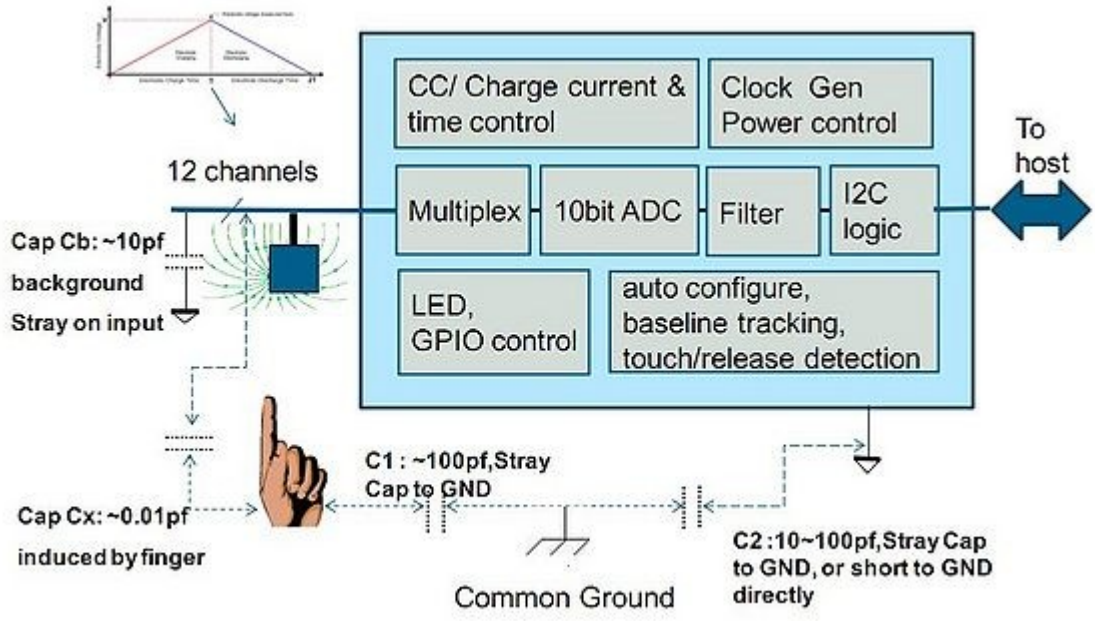
Schematic



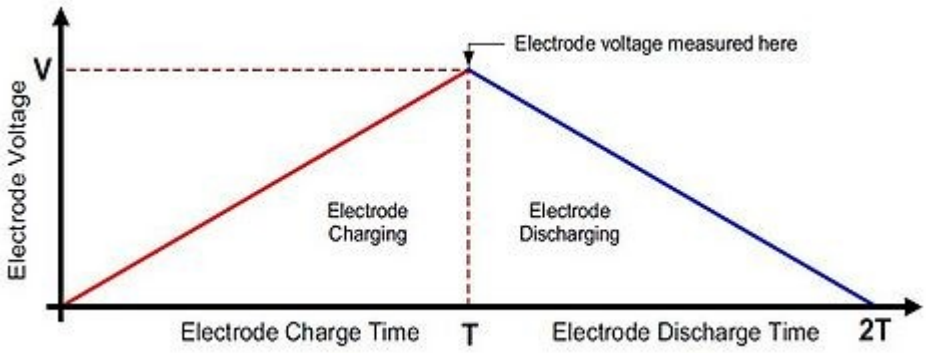
Capatance measurment and Touch Sensing

1.How to Measure Capatance

The complete capacitance measurement system is composed by sensing electrode pads connected to MPR121 sensing inputs, and the MPR121 communicating with the host processor via I2C bus and interrupt output .



The capacitance measured on each sensing channel is the total capacitance to ground which can be the combination of background parasitic capacitance to ground(Cb) and finger touch induced capacitance to ground(Cx). The MPR121 uses a constant DC charge current scheme for capacitance measurement. Each channel is charged and then discharged completely to ground periodically to measure the capacitance. All the channels are measured sequentially, when one channel is in the charge/discharge and measurement period the other channels are shorted to ground.



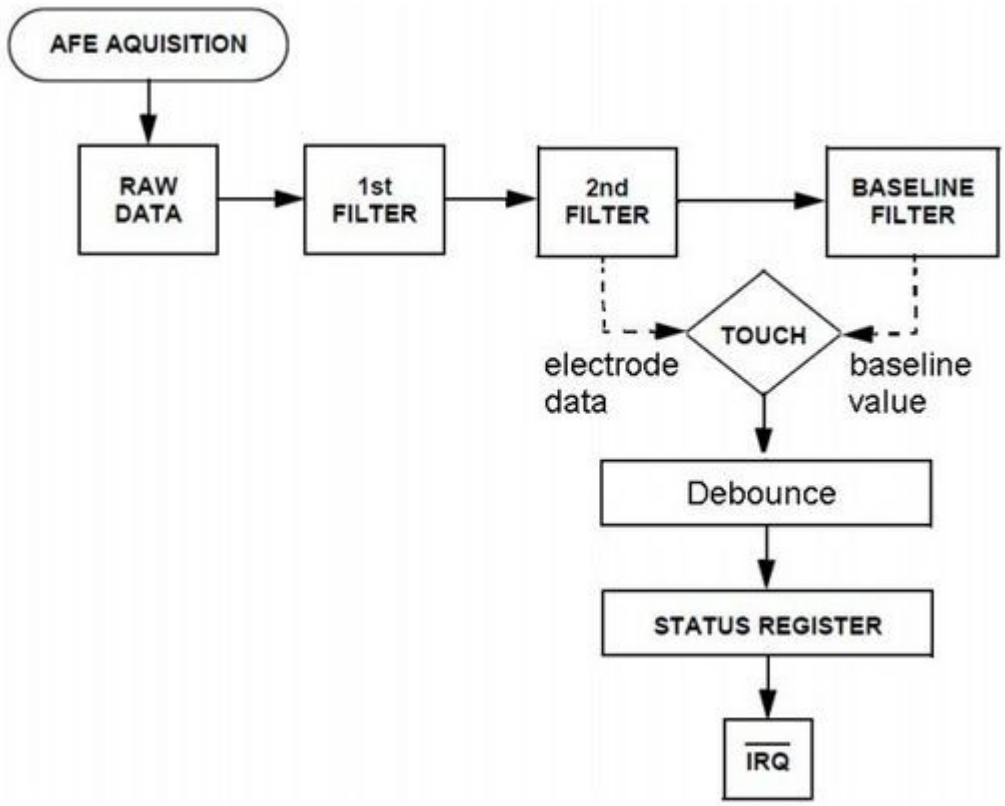
The amount of charge(Q)applied is programmable by setting the charge current(I), And the charge time(T). Once the electrode is charged, the peak voltage(V)at the end of chage is measured by internal 10 bit ADC. This voltage V is reverse proportional to the capatance(C)on the sensing channel.

```
C = Q/V = (I*T)/V
```

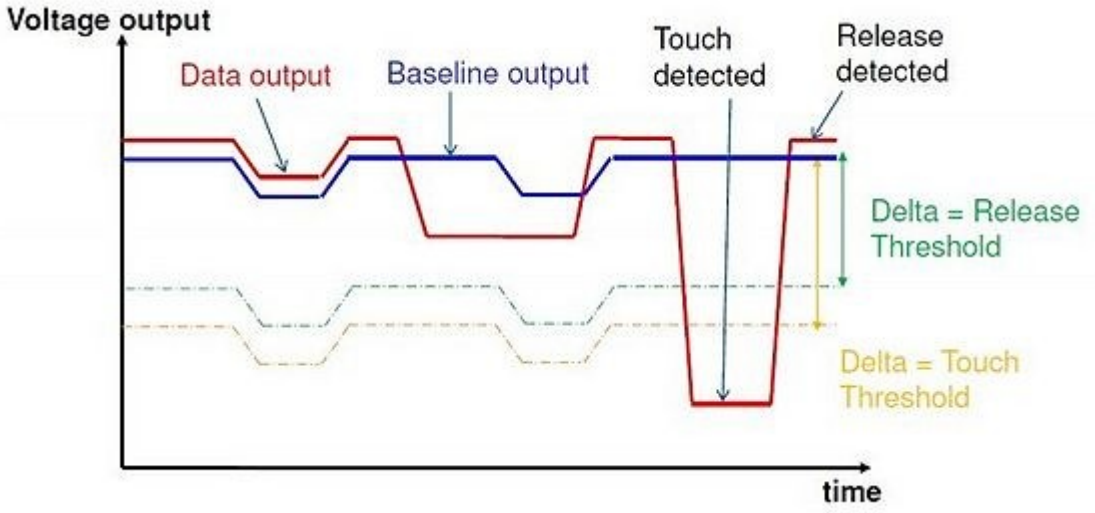
That is, If charge the outside cap with a some value of current(I) and time(T), and get the voltage(V), We can get the value of captance, using this way, the C measureble range can be calculated.

2.How to Touch Sensing

The ADC raw data outputs run through 3 levels of digital filtering to filter out the high frequency and low frequency noise encountered. The first level filter is a simple running average filter, the sencond level filter result is 10bit and stored in the output data registers as the imemediate capacitance of each sensing input, the third level filter result is an even lower freqency content of signal change using the second level filter output, mainly used as the baseline value representing the capacitance variation over the long term and slow environment change such as atmospheric moisture and dirt for touch detection.



Touch and release is determined by comparing the immediate capacitance diviation that is the electrode second leval filtered output data deviation to the baseline value. If the deviation passed the setting threshold, then a touch or release status is detected and reported in the status register. The touch and release threshold are independent and individually programmable for each eletrode, providing hysteresis and electrode independence. Debounce setting can be used for further noise filtering to provide glitch free touch and release detection.



Specifications

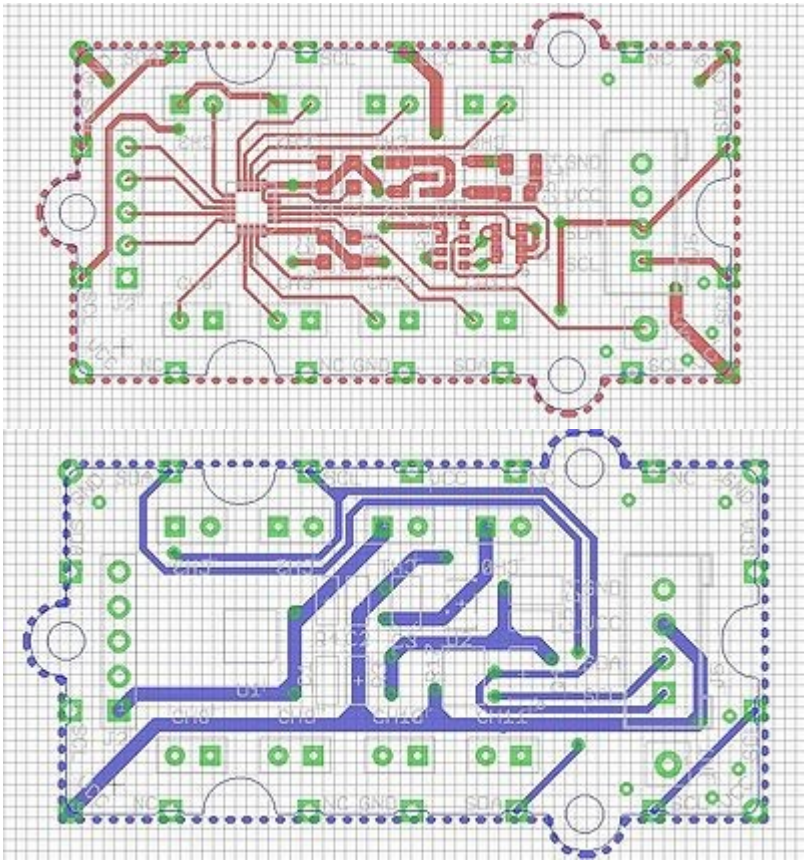
- Working voltage: 3V- 5V
- Recommended Working voltage: 5V
- Standby Mode Current: 2 μA
- Range:±1.5g
- Weight: 2g

Pin definition and Rating

Pad Type	Pin Status	Description
GND	Input	Ground port
INT	Output	Interrupt/Data Ready

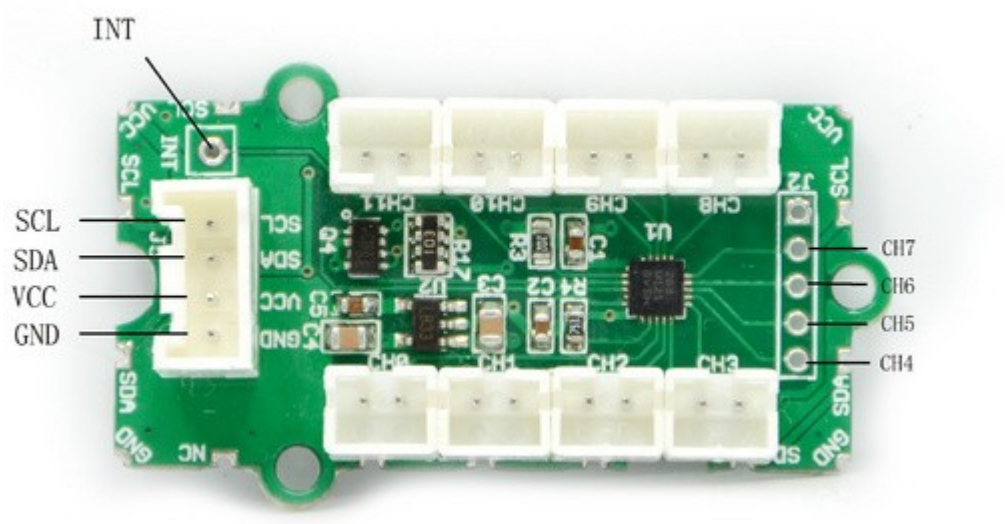
SDA	Input and Output	I2C Serial Data
SCL	Input	I2C Serial Clock
VCC	Input	Designed for 5V(+)supply using IC MPR121

Mechanic Dimensions



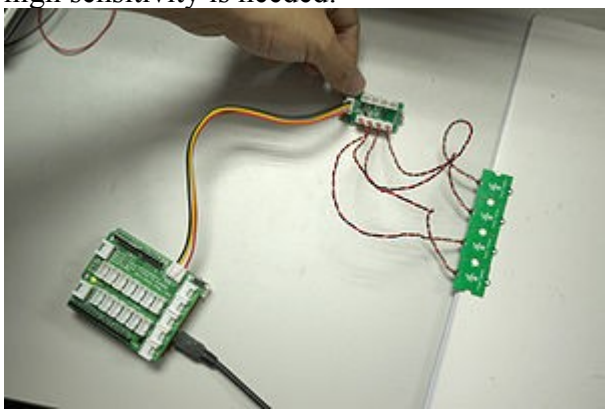
Dimensions:4cm X 2cm

Usage



The INT pin has to be led out by customers themselves if customers want to use the interrupt pin of MPR121. The CH4~CH11 are for customer expanding the function, there are 4 feelers within the pack. If you needs more, you can make the feelers by yourself or buy them in the www.seeedstudio.com

The wires of feelers are twisted to reduce the impact of environment. The black(ground) wire can be cut off if high sensitivity is needed.

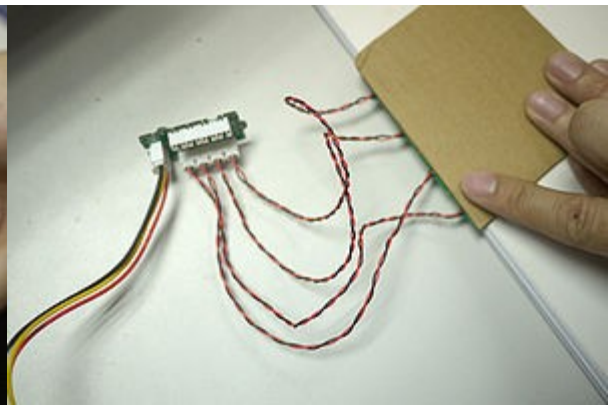


- 1.Connect the touch sensor controller to the seeeduino via I2C bus, and the feelers to the touch sensor controller as shown above.
- 2.Upload the firmware to seeeduino.

```
channel 1 has pressed..channel 2 has
pressed..
channel 3 has pressed..
channel 4 has pressed..
channel 1 has pressed..
channel 2 has pressed..
channel 3 has pressed..
channel 4 has pressed..
channel 1 has pressed..channel 2 has
pressed..
channel 3 has pressed..
channel 4 has pressed..
channel 1 has pressed..
channel 2 has pressed..
channel 3 has pressed..
channel 4 has pressed..
channel 1 has pressed..
channel 2 has pressed..
channel 3 has pressed..
channel 4 has pressed..
channel 1 has pressed..
channel 2 has pressed..
channel 3 has pressed..
channel 4 has pressed..
```

- 3.Touch the feelers, you would see the results via serial port tools(baud:9600).

NOTE: Because each electrode needs to be auto-configurated by the MPR121 when power up and there is no power reset on the touch sensor controller, Every time you insert or extract a feeler you need to reset the power of seeeduino.
The feelers can also feel the human being fingers with something between, that's to say, you do not need to touch the feelers with your fingers indeed.

With a paperboard about 3 mm thick, the feeler can feel the touch of fingers , makes it a good solution for many applications.

Programming

There are 2 ways to program the microcontroller to get Touch&Release:
1.***NO INT:*** Microcontroller check the Touch controller MPR121 periodically, Check the related register if Touch&Release take place.In this way, Only the twig connector is needed, and, the Microcontroller need to check periodically all the time. It is recommended that a timer is needed. For Arduino IDE, it is convenient to use the time functions, millis() for example.
2.***INT:*** Connect the INT on the I2C Touch Sensor to a INT Pin of Microcontroller. When Touch&Release take place , This INT goes low, Making the Microcontroller jump into related IRQ. In this IRQ, Microcontroller can begin I2C bus to check which channel Touched&Rleased happened. This way applys situation when strict response time is needed. PLEASE Ref the code in RESOURCE

Bill of Materials (BOM) /parts list

FAQ

Please list your question here:

Support

If you have questions or other better design ideas, you can go to our forum or wish to discuss.

Version Tracker

Revision	Descriptions	Release Date
Grove - I2C Touch Sensor0.93b	Initial public release	April 12, 2011

Bug Tracker

Bug Tracker is the place you can publish any bugs you think you might have found during use. Please write down what you have to say, your answers will help us improve our products.

Additional Idea

The Additional Idea is the place to write your project ideas about this product, or other usages you've found. Or you can write them on Projects page.

Resources

I2C Touch Sensor_Resource Demo code

See Also

- GROVE - Starter Bundle
- 2-axis compass Module
- Grove - 3-axis Compass
- Grove - 3-axis Gyro
- Grove - Water Sensor
- Grove - Light Sensor
- Grove - Touch Sensor
- Grove - Temperature and Humidity Sensor
- Grove - Magnetic Switch
- Grove - Alcohol Sensor
- Grove - OLED Display 128*64
- Grove - Serial LCD
- Grove - RTC
- Grove - Electricity Sensor
- Grove - Sound Sensor

Licensing