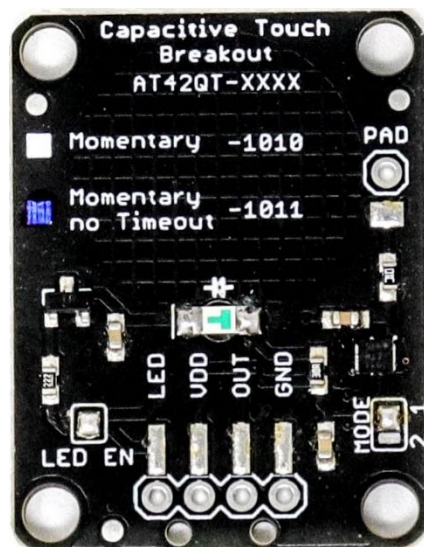




SmartElex Capacitive Touch Breakout - AT42QT1011

The AT42QT1011 Capacitive Touch Breakout boards offer a single capacitive touch button with easy-to-use digital I/O pins.



The AT42QT101X is a dedicated, single-button capacitive sense chip. The chip handles monitoring a conductive area for touch. As long as a touch (e.g. from a finger) is detected, the AT42QT101X keeps the output line high. Otherwise, the line is kept low. You just need to provide a power source (1.8V - 5V) and ground for the AT42QT101X to work. The breakout board contains an on-board electrode capable of detecting touches. Additionally, a PAD pin is available if you would like to create your own external electrode.

Hardware Overview

If we look at the front of the board, we see a large, circular pad (the "electrode") and several pins. The on-board electrode will detect touches when pressed with a finger as long as the board is powered.

GND should be connected to the ground of the host circuit.

OUT is the output of the AT42QT101X. HIGH on touch, LOW otherwise.

VDD is the power supply for the AT42QT101X and needs to be connected to a voltage between **1.8V - 5V**.

LED controls the operation of the on-board LED. By default, it is connected to the OUT pin. If you de-solder the "LED Enable" jumper on the back side, you can independently control the LED.

PAD is located in the upper-left corner and allows you to connect to an external electrode. Note that there is a small surface mount pad on the back side by the PAD pin hole. If you want to mount the board flush, you can solder a wire directly to the surface mount pad.

How It Works

Take a look at the back side of the AT42QT101X. The AT42QT101X chip is located on the right side of the board. It uses a resistor and a capacitor network to adjust the sensitivity of the electrode. High frequency pulses are sent to the pad. When a fleshy object (such as a finger) approaches the pad, it acts like a very small capacitor and changes the shape of the pulses. When the AT42QT101X detects these slight changes, it raises the OUT line to HIGH, indicating a touch is present. The duration of the output depends on the chip that is populated. Once the pulses return to normal, the AT42QT101X drives the OUT line LOW.

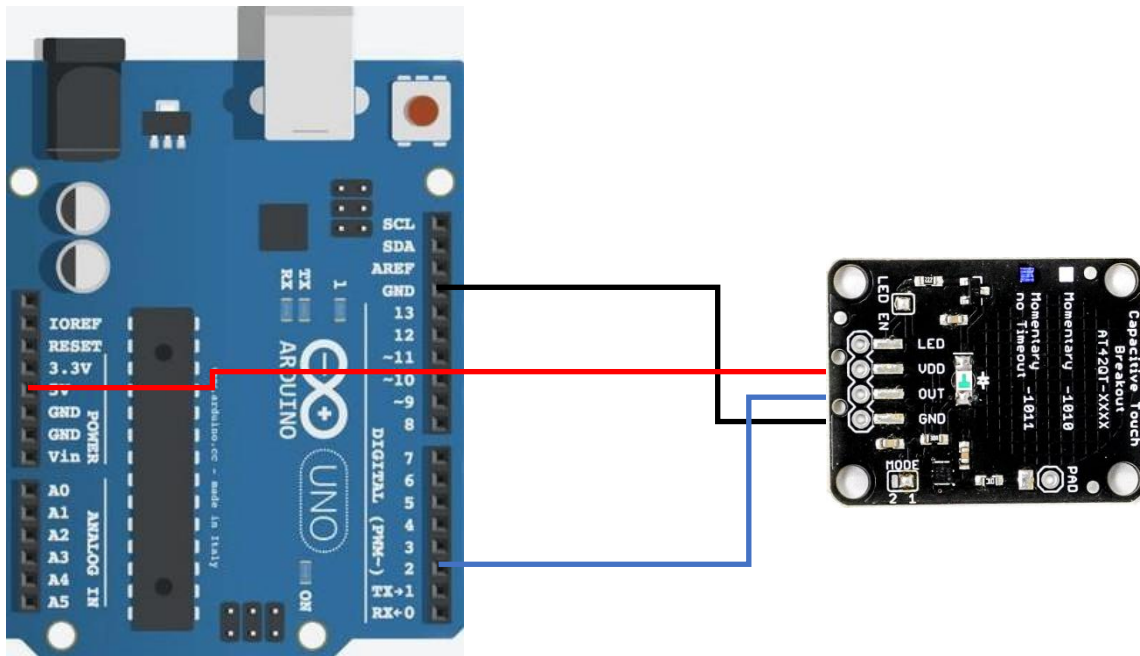
LED Enable

The output from the AT42QT101X goes directly to the OUT pin on the board as well as to the transistor (left side), which operates the LED (center of board). By default, the OUT line and LED lines are connected, which means that on a touch, the on-board LED lights up. You can disconnect the LED by de-soldering the jumper labeled "LED Enable." This will cause the LED to no longer light up on a touch, but you can still drive the LED using the LED pin on the board.

Mode

On the right side of the board, you will also notice a jumper labeled "Mode" with "1" and "2" markers. By default, the center pad and the "1" pad are connected, which puts the AT42QT101X in "Fast" mode. In Fast mode, the chip is more responsive to touch events but draws **200µA - 750µA** in normal operation. If you de-solder this jumper and connect the center pad to the "2" pad, the AT42QT101X will be in "Low Power" mode. In this mode, the chip is slightly less responsive to events but only uses **15µA - 75µA**. Keep in mind that the current draw of the IC itself. The LED draws another 30-40mA but can be disabled by removing solder from the "LED enable" solder jumper.

Wiring:



For an Arduino UNO, make the following connections:

| Arduino | AT42QT1011 |
|---------|------------|
| 5V | VDD |
| 2 | OUT |
| GND | GND |

Mounting the Board

One advantage of capacitive touch boards is their ability to be mounted to panels and detect touch through thin plastic, cardboard, etc. Using a drill or laser cutter, cut four 0.125 inch holes in the same pattern as the mounting holes on the breakout board.

Attach the board to the panel using #4-40 screws and #4-40 nuts.

External Electrode

You can create your own electrode by using foil, copper tape, or any other conductive material. Cut or shape the electrode and attach a wire between the electrode and the PAD pin on the AT42QT101X breakout board. For a secure connection, make sure to solder the external electrode together. The electrode can be almost any shape and size.

Example Code:

```
/*
Description:
This sketch shows how to use the AT42QT101X Breakout
Board. If you touch the Capacitive Touch area on the breakout
board, the LED attached to the Arduino will light up (in addition
to the LED on the AT42QT101X breakout board).

Simply connect power and ground to the breakout board,
and the AT42QT101X handles all the capacitive touch functions.
By default, the board will light up the green LED when the pad
is touched. A wire may also be connected from OUT on the
breakout board to a digital input pin on an Arduino. This signal
is normally LOW but goes HIGH on a touch detection.

The "LED Enable" solder jumper may be de-soldered in order to
control the LED directly from the LED pin. This is useful if you
want to light up a button that the user needs to push.

Hardware connections:

Uno Pin      AT42QT101X Board  Function
+5V          VDD                Power supply
GND          GND                Ground
2            OUT                Capacitive touch state output
*/
// Constants
const int TOUCH_BUTTON_PIN = 2; // Input pin for touch state
const int LED_PIN = 13;        // Pin number for LED
// Global Variables
int buttonState = 0;           // Variable for reading button

void setup() {

  // Configure button pin as input
  pinMode(TOUCH_BUTTON_PIN, INPUT);
  // Configure LED pin as output
  pinMode(LED_PIN, OUTPUT);
```

```
}  
  
void loop() {  
  
  // Read the state of the capacitive touch board  
  buttonState = digitalRead(TOUCH_BUTTON_PIN);  
  
  // If a touch is detected, turn on the LED  
  if (buttonState == HIGH) {  
    digitalWrite(LED_PIN, HIGH);  
  } else {  
    digitalWrite(LED_PIN, LOW);  
  }  
}  
}  
/////////////////////////////////////////////////////////////////END/////////////////////////////////////////////////////////////////
```

Plug in the Arduino and upload the code. You should see the LED on the AT42QT101X board and the LED on the Arduino light up when you touch the electrode.