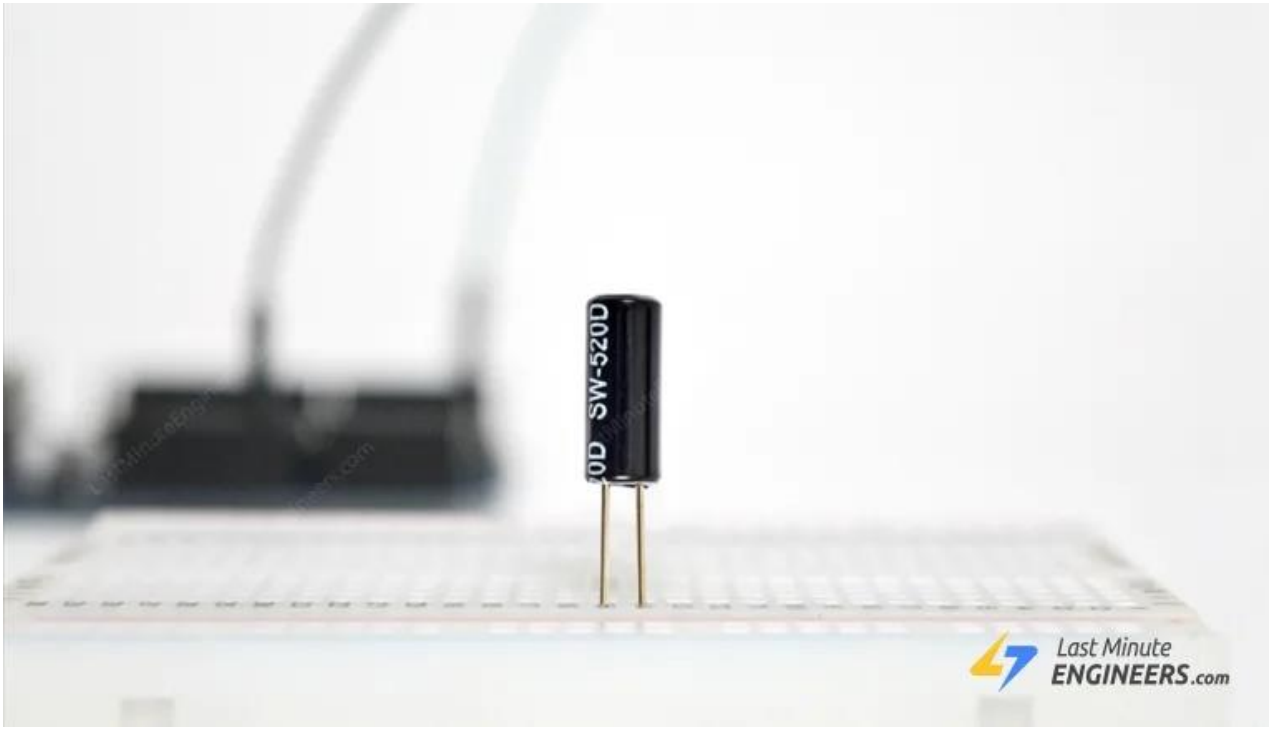
TILT BALL SWITCH



If you want to detect when something is moved, tilted, or shaken without getting into the complexities of an accelerometer, the ball tilt sensor might be the cheapest option.

OVERVIEW

A ball tilt sensor is more of a switch that can detect basic motion, orientation or inclination. These switches are designed in such a way that a sufficient level of inclination makes or breaks the electrical connection. Such a signal can either be used as an indicator or can be used to turn something ON or OFF.

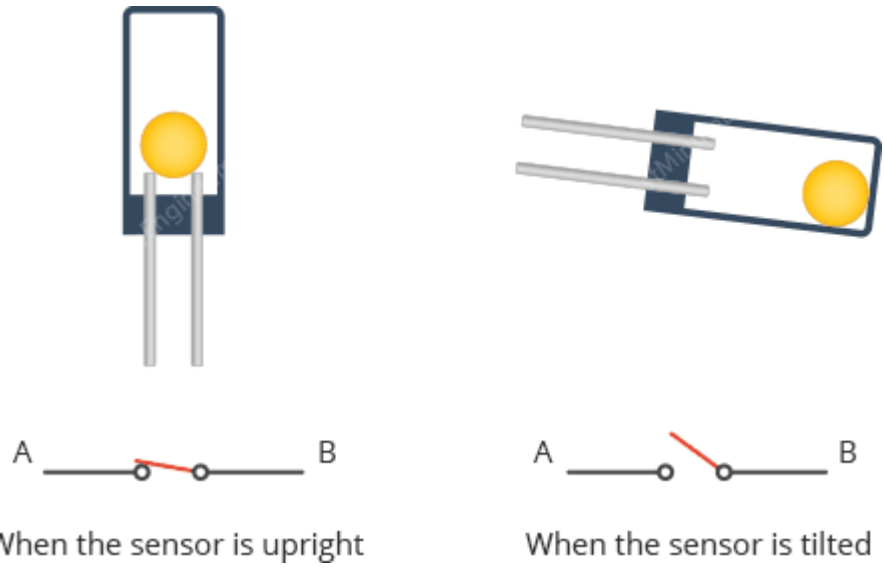
They are small, cheap, easy to use and never wear out. Their simplicity makes them popular for use in toys, gadgets, robots, and other devices whose functioning depends on inclination. This is why they are sometimes called the "poor man's accelerometer".

Although all tilt sensors work pretty much the same, their sizes and specifications may differ slightly.

Dimensions	5.5mm (0.22") diameter & 13.5mm (0.53") long
Maximum operating voltage (VCC)	Up to 20V
Maximum operating current (Imax)	30mA
Sensitivity range	Movements of around 5 to 10 degrees
Lifetime	50,000+ cycles (switches)

HOW DO BALL TILT SENSORS WORK?

A ball tilt sensor is typically made up of a metal tube with a little metal ball that rolls around in it. One end of the cavity has two conductive elements (poles). The sensor is designed in such a way that a sufficient level of tilt allows the ball to roll, making or breaking an electrical connection.



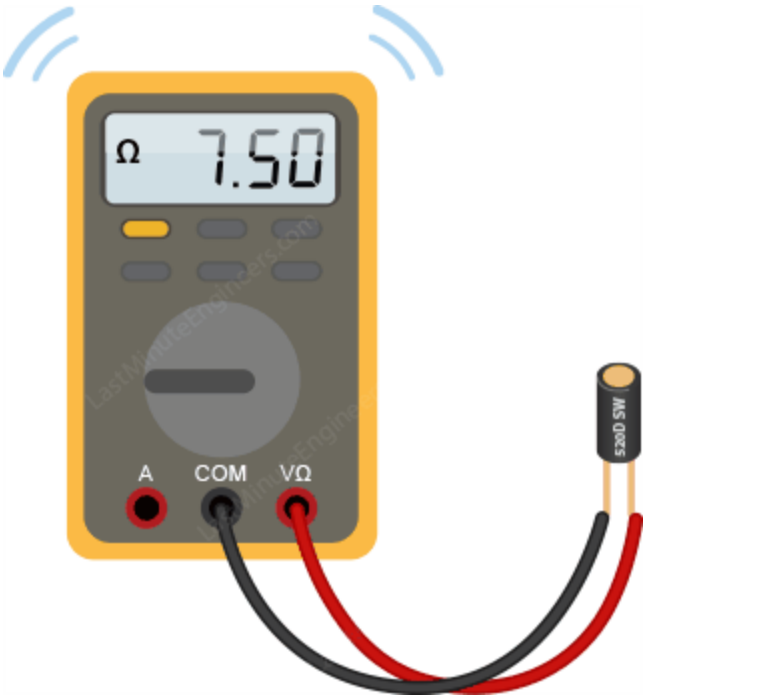
When the sensor is upright When the sensor is tilted

When the sensor is upright the ball touches the poles and makes an electrical connection. And when the sensor is tilted the ball rolls off the poles and the connection is broken.

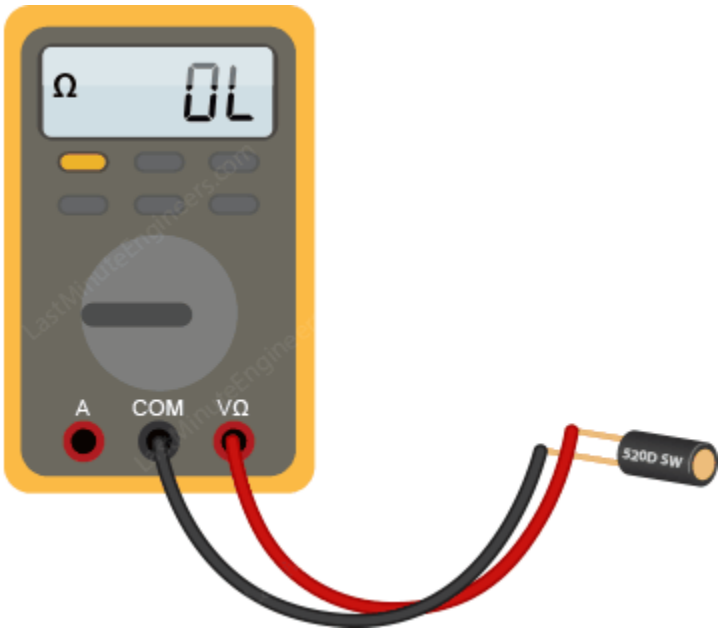
TESTING A BALL TILT SENSOR

Testing a ball tilt sensor is very simple. Put your multimeter in 'continuity-test' mode and touch the probes to the two leads. Then tilt it to determine the angle at which the switch opens and closes.

When pointing up, the switch is closed (full continuity).



When pointing down, the switch is open (no continuity).

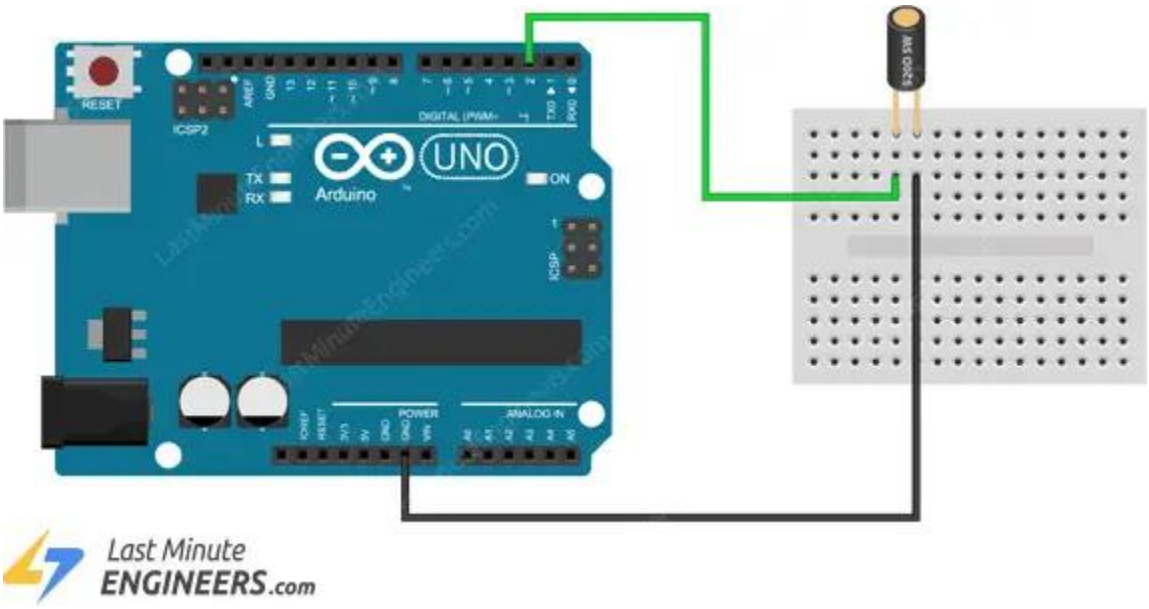


Wiring up a Ball Tilt Sensor to an Arduino

Wiring the tilt sensor up to your Arduino is pretty straightforward. All you need to do is connect one pin to any digital pin of the Arduino and the other to GND.

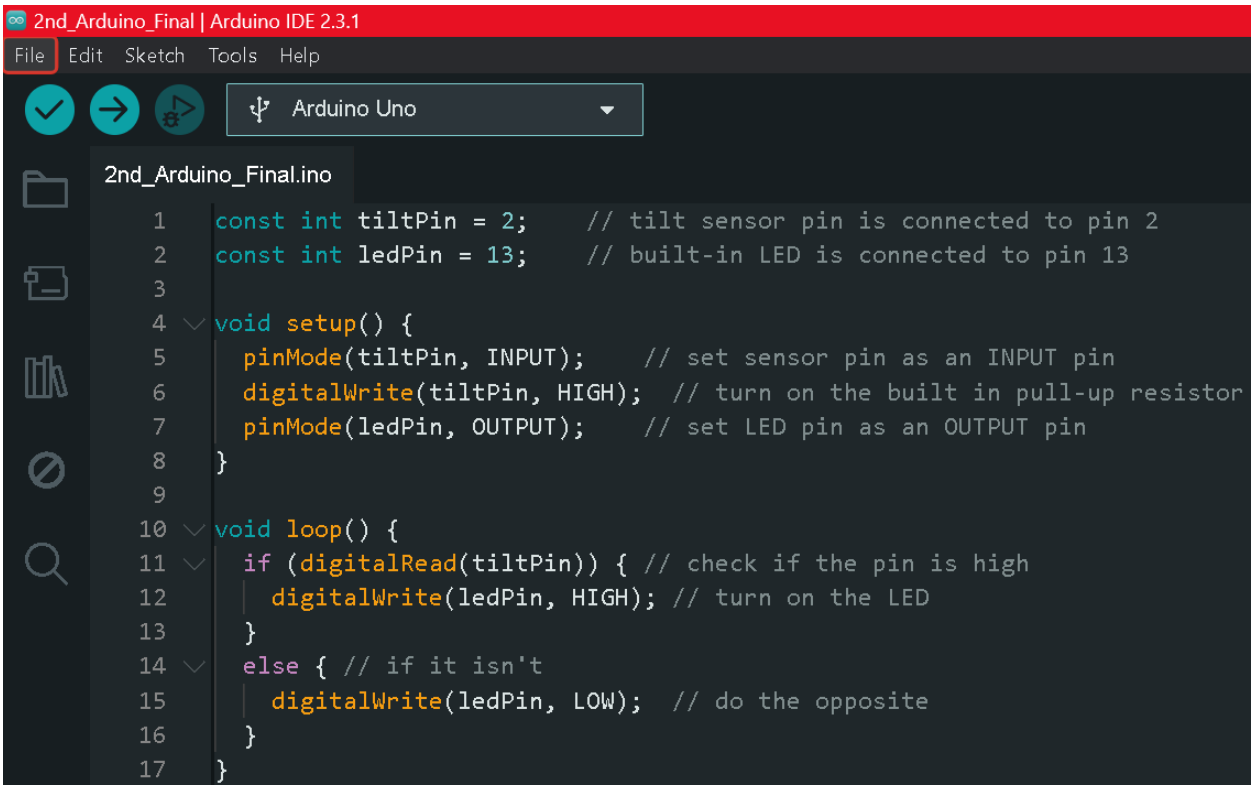
If you connect the sensor this way, you will need to activate the arduino's 'built-in' pull-up resistor for the input pin. Otherwise, you must use an external 10K pull-up resistor in your circuit.

The following illustration shows the wiring.



CODE

Below is a very basic Arduino sketch that will switch-on the built-in LED (attached to pin 13) when the tilt sensor is tilted one way, and switch-off when it is tilted the other way.



The code is quite self-explanatory. Initially two constants are defined which declare the Arduino pins to which the tilt sensor and built-in LED are connected. In the setup, the sensor pin is configured as an input while the LED pin is configured as an output. Also the internal pull-up is enabled for the sensor pin. In the loop, the built-in LED is turned ON if the sensor pin is HIGH, otherwise turned OFF.

It's a pretty short sketch, works great, but there is a problem. If you have looked at the LED while tilting the sensor, you may have noticed it flickering. That's because something called 'switch bounce'.

REFERENCE:

https://lastminuteengineers.com/ball-tilt-switch-sensor-arduino-tutorial/