

10.Tilt_Ball_Switch

Introduction

This is a ball tilt-switch with a metal ball inside. It is used to detect inclinations of a small angle.

Hardware Required

- ✓ 1 * Raspberry Pi
- ✓ 1 * T-Extension Board
- ✓ 1 * Tilt
- ✓ 2 * LED
- ✓ 1 * 40-pin Cable
- ✓ Several Jumper Wires
- ✓ 1 * Breadboard
- ✓ 2 * Resistor(220 Ω)
- ✓ 1 * Resistor(10K Ω)

Principle

Tilt Ball switch

Tilt Switch with internal ball that will switch to ON state of approx. 15 degrees tilt. Also great for sensing excessive vibration

Material: Housing and cover: PE heat shrinkable tubing

Ball: Stainless steel

Shape: Round

Color: Black

Contact Rating:12V

Contact Resistance: <10 ohm

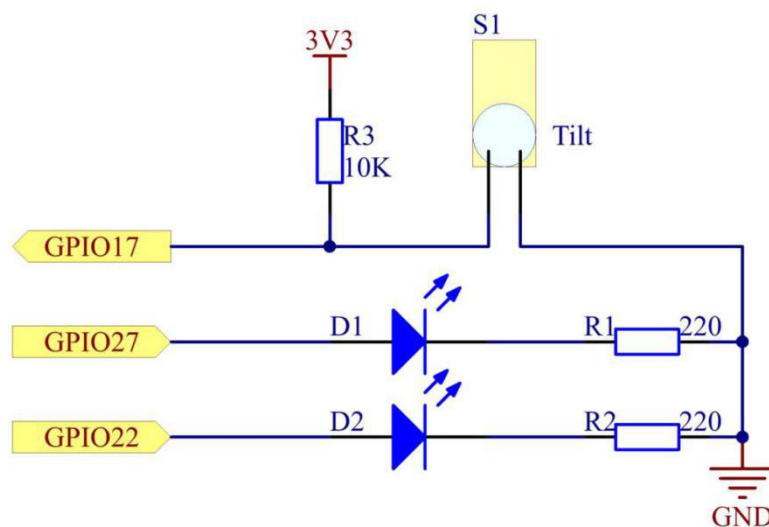
Insulation Resistance:>10M ohm

Capacitance:5PF



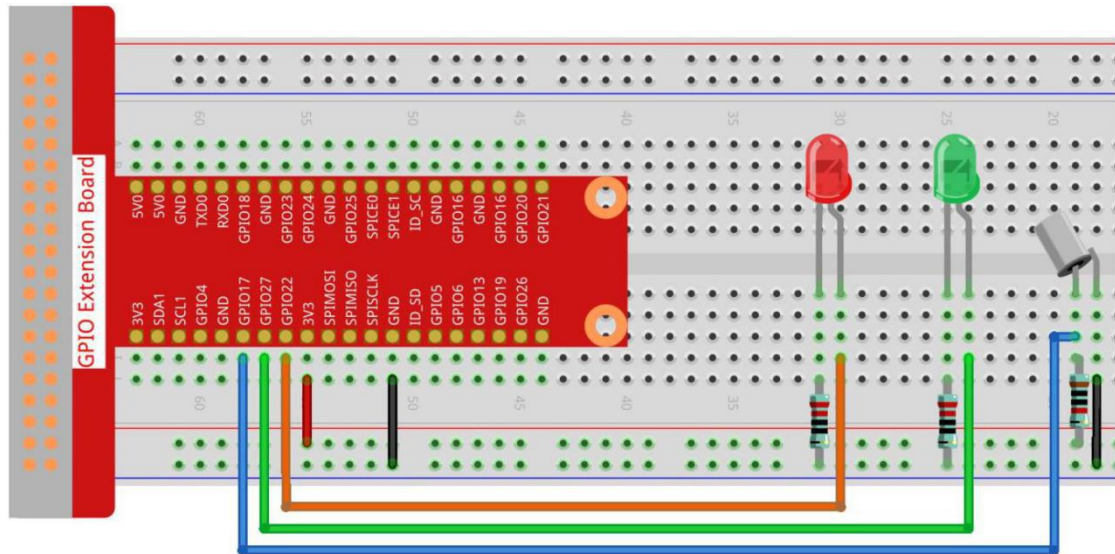
Schematic Diagram

T-Board Name	physical	wiringPi	BCM
GPIO17	Pin 11	0	17
GPIO22	Pin 15	3	22
GPIO27	Pin 13	2	27



Experimental Procedures

Step 1: Build the circuit.



For C Language Users

Step 2: Change directory.

```
cd /home/pi/REXQualis_Raspberry_Pi_Complete_Starter_Kit/C/10.Tilt_Ball_Switch
```

Step 3: Compile.

```
gcc 10.Tilt_Ball_Switch.c -o Tilt_Ball_Switch.out -lwiringPi
```

Step 4: Run.

```
sudo ./Tilt_Ball_Switch.out
```

Place the tilt horizontally, and the green LED will turn on. If you tilt it, "Tilt!" will be printed on the screen and the red LED will light on. Place it horizontally again, and the green LED will turn on again.

Code

```
#include <wiringPi.h>
#include <stdio.h>

#define TiltPin    0
#define Gpin       2
#define Rpin       3

void LED(char* color)
{
```

```

pinMode(Gpin, OUTPUT);
pinMode(Rpin, OUTPUT);
if (color == "RED")
{
    digitalWrite(Rpin, HIGH);
    digitalWrite(Gpin, LOW);
}
else if (color == "GREEN")
{
    digitalWrite(Rpin, LOW);
    digitalWrite(Gpin, HIGH);
}
else
    printf("LED Error");
}

int main(void)
{
    if(wiringPiSetup() == -1){ //when initialize wiring failed,print message to screen
        printf("setup wiringPi failed !");
        return 1;
    }
    pinMode(TiltPin, INPUT);
    LED("GREEN");
    while(1){
        if(0 == digitalRead(TiltPin)){
            delay(10);
            if(0 == digitalRead(TiltPin)){
                LED("RED");
                printf("Tilt!\n");
            }
        }
    }
}

```

```

    }

    else if(1 == digitalRead(TiltPin)){
        delay(10);

        if(1 == digitalRead(TiltPin)){
            LED("GREEN");
        }
    }

    }

    return 0;
}

```

Code Explanation

```

void LED(char* color)
{
    pinMode(Gpin, OUTPUT);
    pinMode(Rpin, OUTPUT);
    if (color == "RED")
    {
        digitalWrite(Rpin, HIGH);
        digitalWrite(Gpin, LOW);
    }
    else if (color == "GREEN")
    {
        digitalWrite(Rpin, LOW);
        digitalWrite(Gpin, HIGH);
    }
    else
        printf("LED Error");
}

```

Define a function LED () to turn the two LEDs on or off. If the parameter color is

RED, the red LED lights up; similarly, if the parameter color is GREEN, the green LED will turn on.

```
while(1){  
    if(0 == digitalRead(TiltPin)){  
        delay(10);  
        if(0 == digitalRead(TiltPin)){  
            LED("RED");  
            printf("Tilt!\n");  
        }  
    }  
    else if(1 == digitalRead(TiltPin)){  
        delay(10);  
        if(1 == digitalRead(TiltPin)){  
            LED("GREEN");  
        }  
    }  
}
```

If the read value of tilt switch is 0, it means that the tilt switch is tilted then you write the parameter "RED" into function LED to get the red LED light up; otherwise, the green LED will lit.

For Python Language Users

Step 2: Change directory.

```
cd /home/pi/REXQualis_Raspberry_Pi_Complete_Starter_Kit/Python
```

Step 3: Run.

```
sudo python3 10.Tilt_Ball_Switch.py
```

Place the tilt horizontally, and the green LED will turn on. If you tilt it, "Tilt!" will be printed on the screen and the red LED will turn on. Place it horizontally again, and the green LED will light on.

Code

```
import RPi.GPIO as GPIO

TiltPin = 11

Gpin    = 13

Rpin    = 15

def setup():

    GPIO.setmode(GPIO.BOARD)      # Numbers GPIOs by physical location

    GPIO.setup(Gpin, GPIO.OUT)    # Set Green Led Pin mode to output

    GPIO.setup(Rpin, GPIO.OUT)    # Set Red Led Pin mode to output

    GPIO.setup(TiltPin, GPIO.IN, pull_up_down=GPIO.PUD_UP)

    # Set BtnPin's mode is input, and pull up to high level(3.3V)

    GPIO.add_event_detect(TiltPin, GPIO.BOTH, callback=detect, bouncetime=200)

def Led(x):

    if x == 0:

        GPIO.output(Rpin, 1)

        GPIO.output(Gpin, 0)

    if x == 1:

        GPIO.output(Rpin, 0)

        GPIO.output(Gpin, 1)

def Print(x):

    if x == 0:

        print ('*****')

        print ('*   Tilt!   *')

        print ('*****')

def detect(chn):

    Led(GPIO.input(TiltPin))

    Print(GPIO.input(TiltPin))

def loop():

    while True:
```

```

    pass

def destroy():
    GPIO.output(Gpin, GPIO.HIGH)      # Green led off
    GPIO.output(Rpin, GPIO.HIGH)     # Red led off
    GPIO.cleanup()                   # Release resource

if __name__ == '__main__':          # Program start from here
    setup()

    try:
        loop()

    except KeyboardInterrupt:
        # When 'Ctrl+C' is pressed, the program destroy() will be executed.

        destroy()

```

Code Explanation

```
GPIO.add_event_detect(TiltPin, GPIO.BOTH, callback=detect, bouncetime=200)
```

Set up a detect on TiltPin, and callback function to detect.

```

def Led(x):
    if x == 0:
        GPIO.output(Rpin, 1)
        GPIO.output(Gpin, 0)

    if x == 1:
        GPIO.output(Rpin, 0)
        GPIO.output(Gpin, 1)

```

Define a function Led() to turn the two LEDs on or off. If x=0, the red LED lights up; otherwise, the green LED will be lit.


```
def Print(x):  
    if x == 0:  
        print ('*****!')  
        print ('*   Tilt!   *')  
        print ('*****!')
```

Create a function, Print() to print the characters above on the screen.

```
def detect(chn):  
    Led(GPIO.input(TiltPin))  
    Print(GPIO.input(TiltPin))
```

Define a callback function for tilt callback. Get the read value of the tilt switch then the function Led () controls the turning on or off of the two LEDs that is depended on the read value of the tilt switch.

Phenomenon Picture

