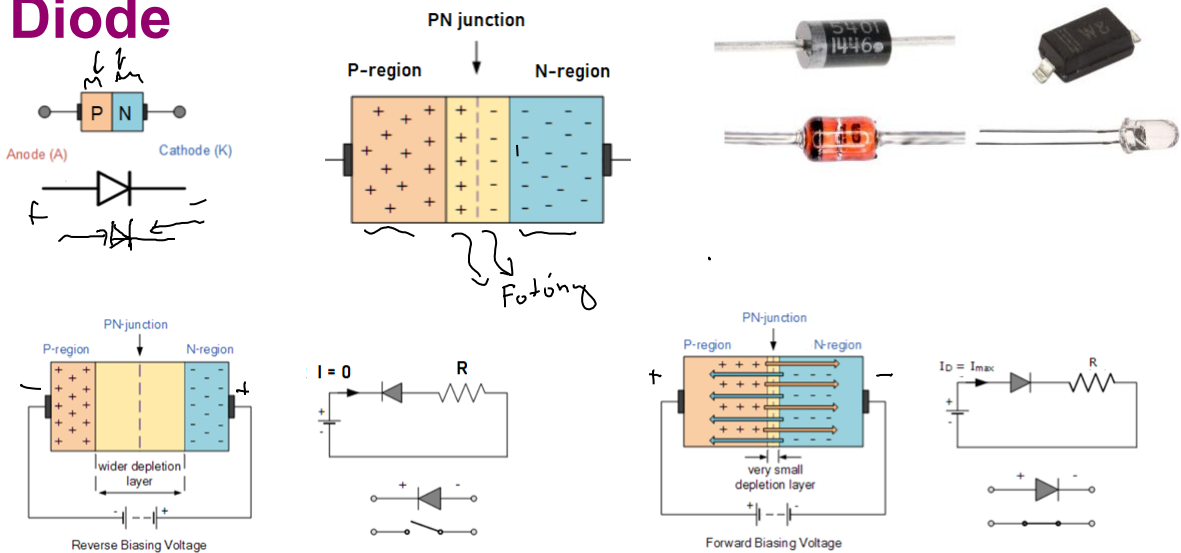


# Part I: sensors on micro:bit

Photo by Eathan Hood from Pexels

1

## Diode

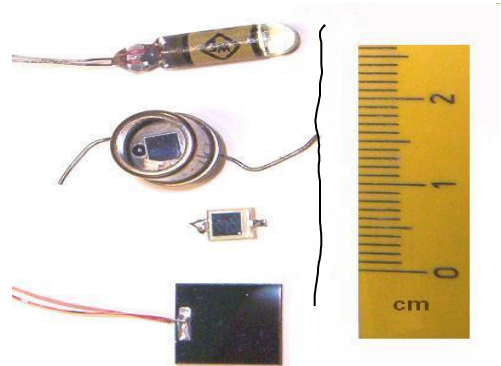
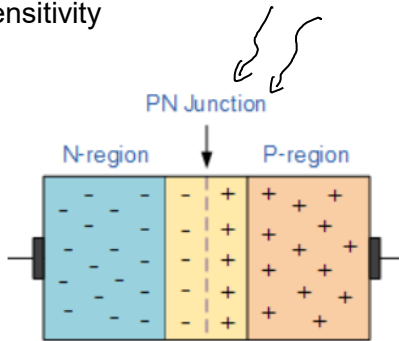


2

# Light detection

## photodiode

- + fast
- low sensitivity



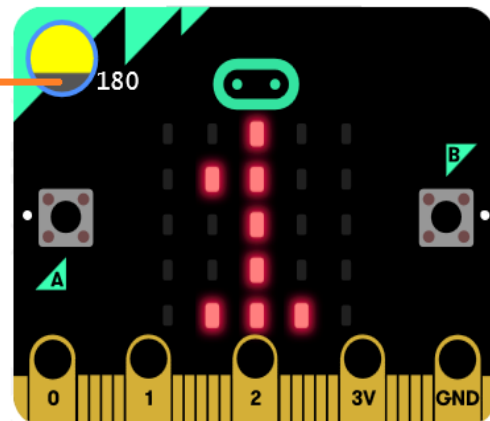
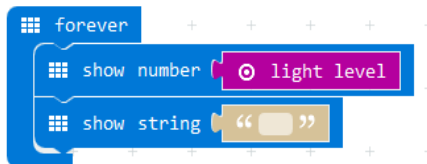
LED?

3

# Light sensor

Values: 0 -- 255 [-]

Simulator: use this shield to change „light“



4

Let's try to play with light sensor...



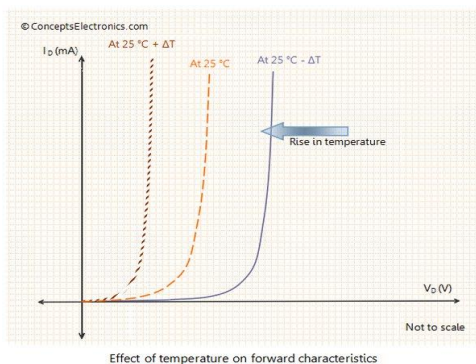
<http://makecode.microbit.org>

<http://www.robotics.sk/w>

5

## Temperature diode

- + linearity
- + low price



Effect of temperature on forward characteristics



[www.vishay.com](http://www.vishay.com)

1N4148

Vishay Semiconductors

### Small Signal Fast Switching Diodes



#### FEATURES

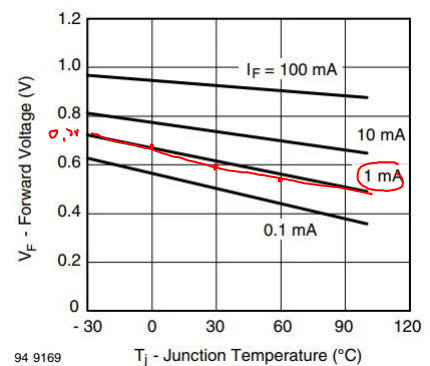
- Silicon epitaxial planar diode
- Electrically equivalent diodes: 1N4148 - 1N914
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

#### APPLICATIONS

- Extreme fast switches

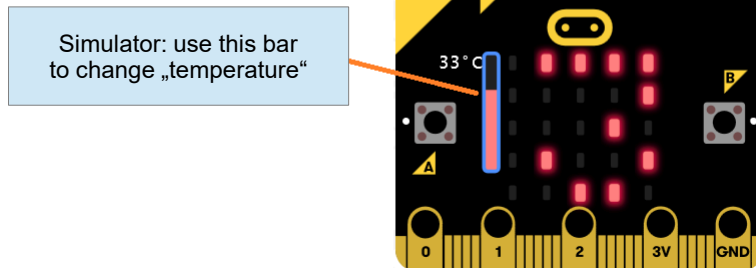


RoHS  
COMPLIANT  
HALOGEN  
FREE

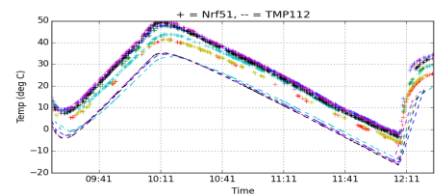


6

# Temperature sensor



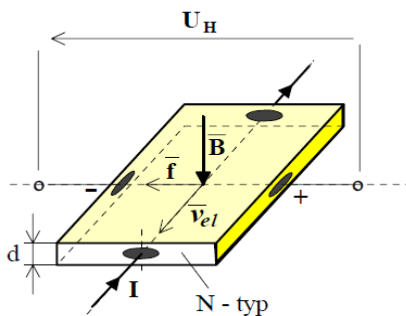
Values: -5 -- 50 [°C]  
 +/- 4 °C  
 offset: <12 °C unofficial



Source:  
<https://devzone.nordicsemi.com/f/nordic-q-a/5997/nrf51822-temp-internal-temperature-sensor-characteristic>

7

# Magnetic field sensor: Hall effect



Hall voltage

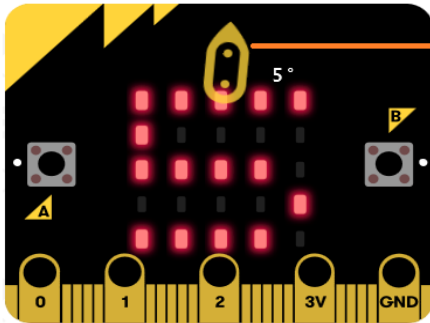
$$U_H = \frac{IB}{ned}$$

where

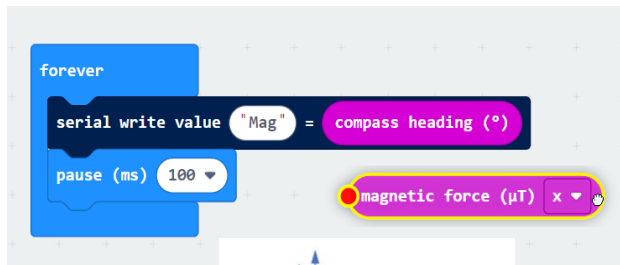
$I$  - current,  
 $B$  - intensity of mag. field,  
 $d$  - thickness of material,  
 $n$  = density of mobile charges,  
 $e$  = electron charge.

8

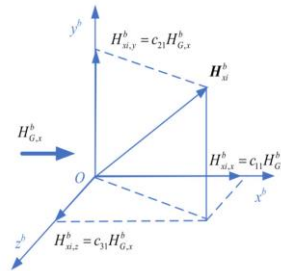
## Magnetic field sensor



Simulator only

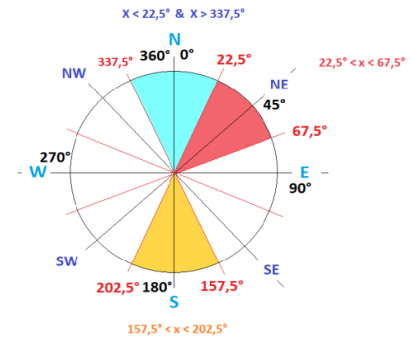
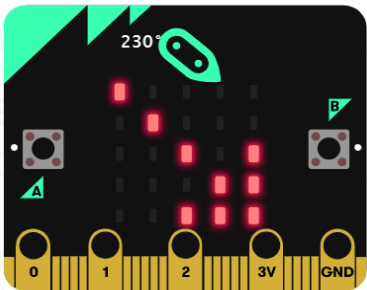


Values: 0 - 360 [°deg]  
+/- 2048 [μT]



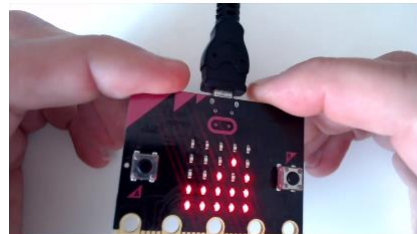
9

## Magnetic field sensor

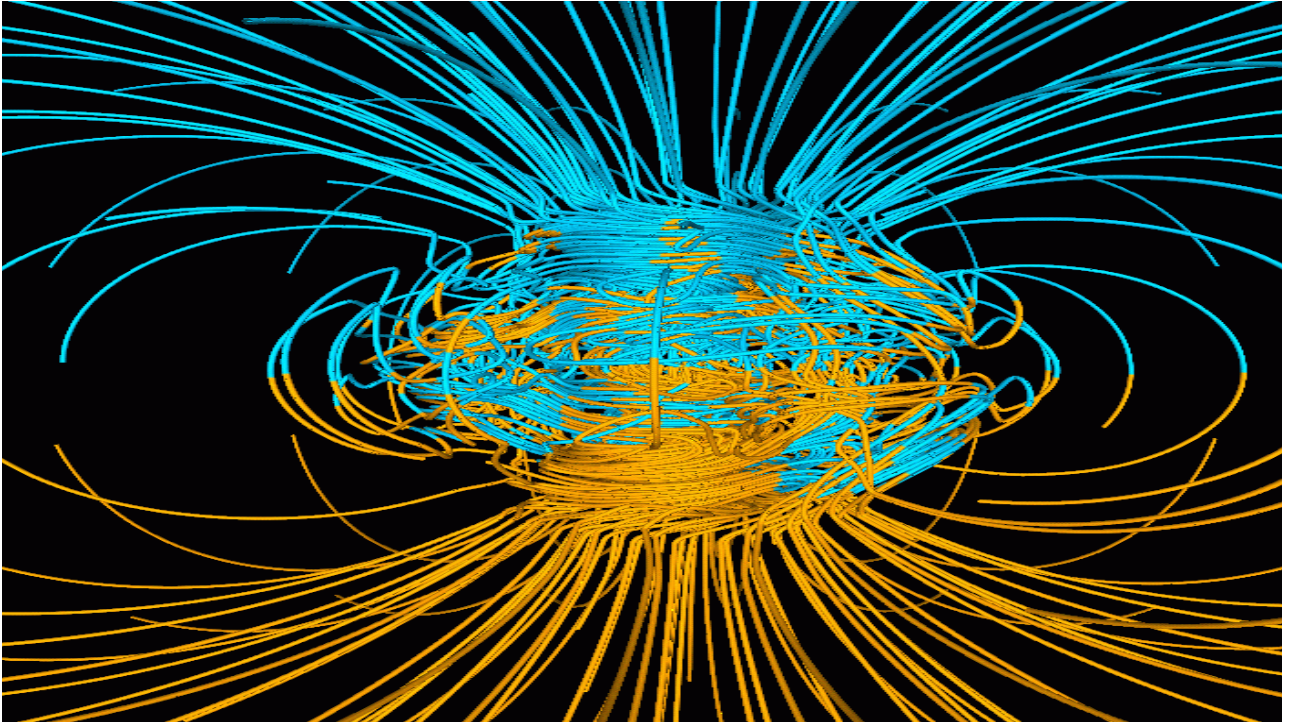


on start

calibrate compass



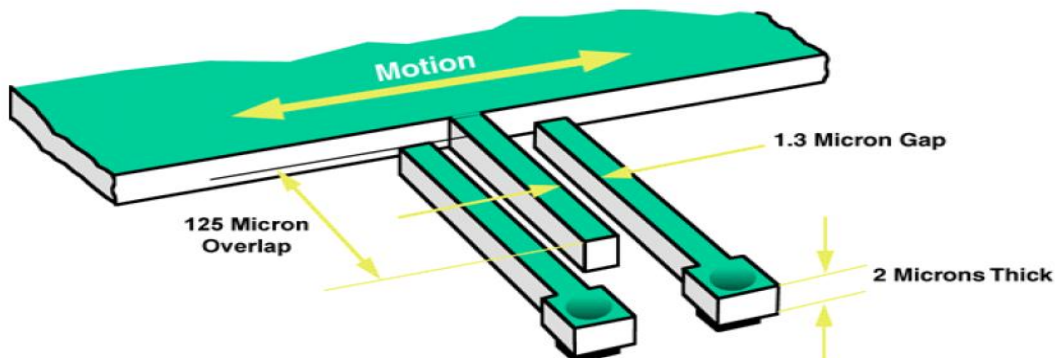
10



11

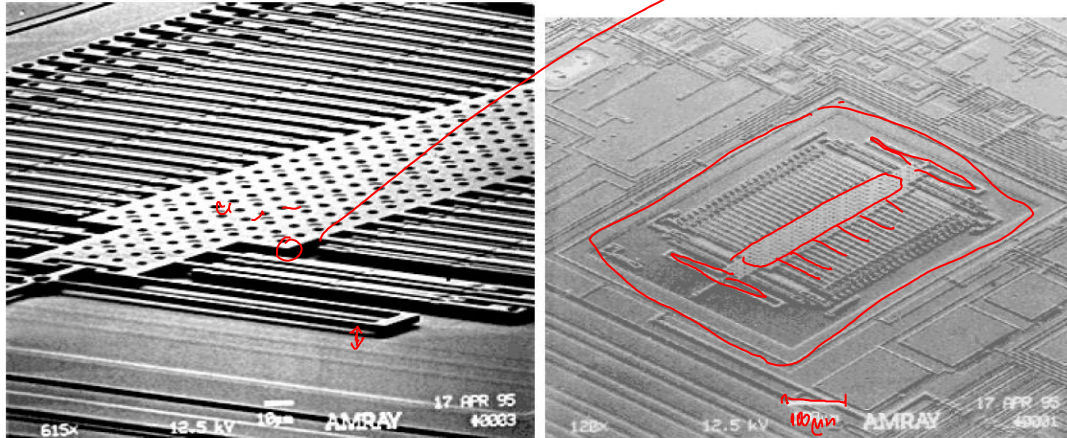
#### 9. 4. Acceleration

### **MEMS accelerometer**

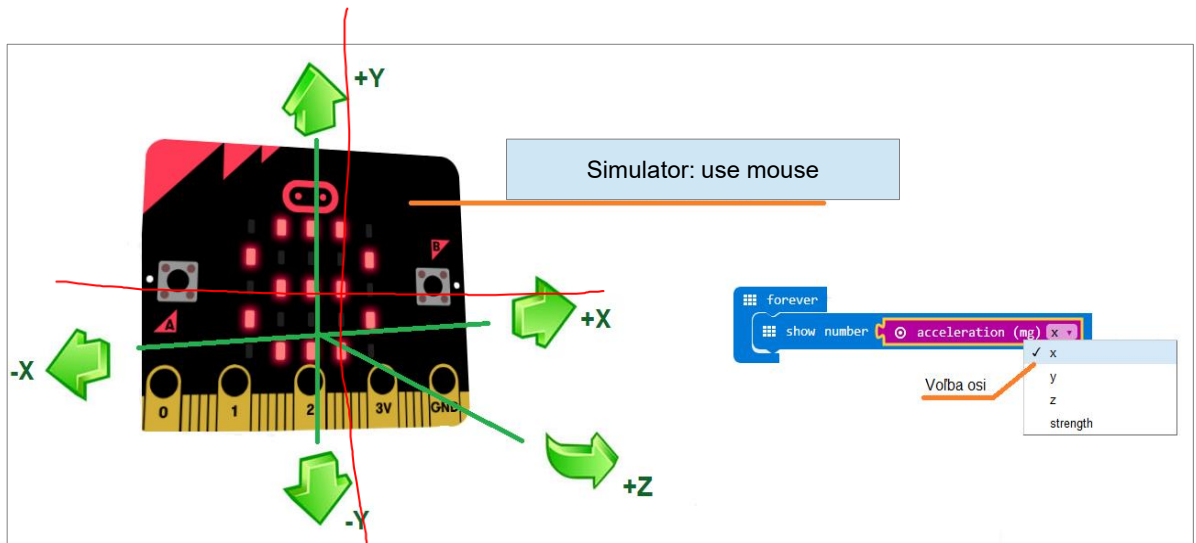


12

## 9. 4. Acceleration

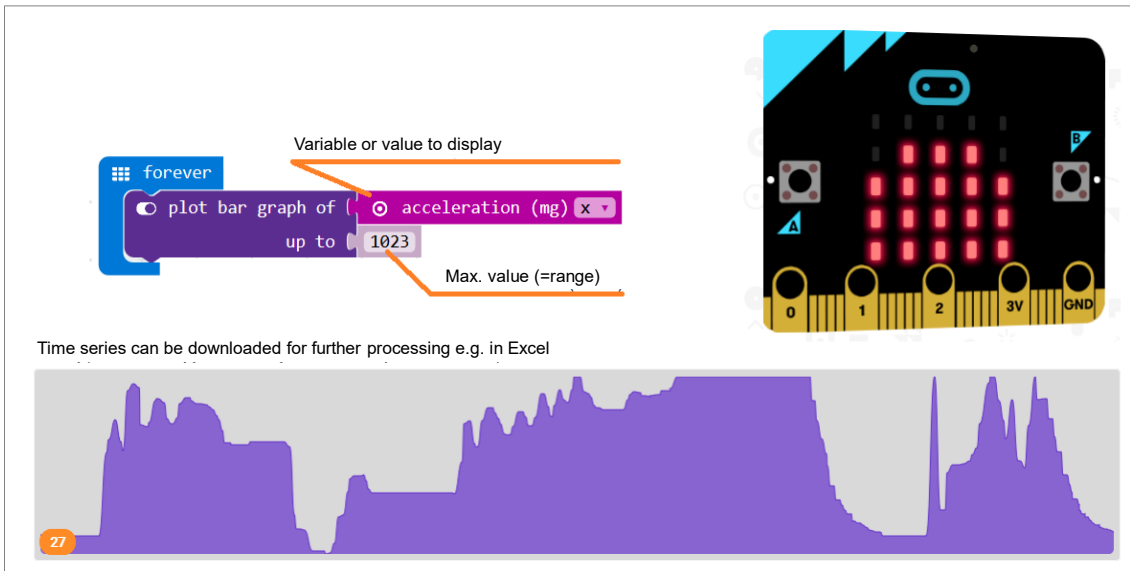
**MEMS accelerometer**

13

**Akcelerometer**

14

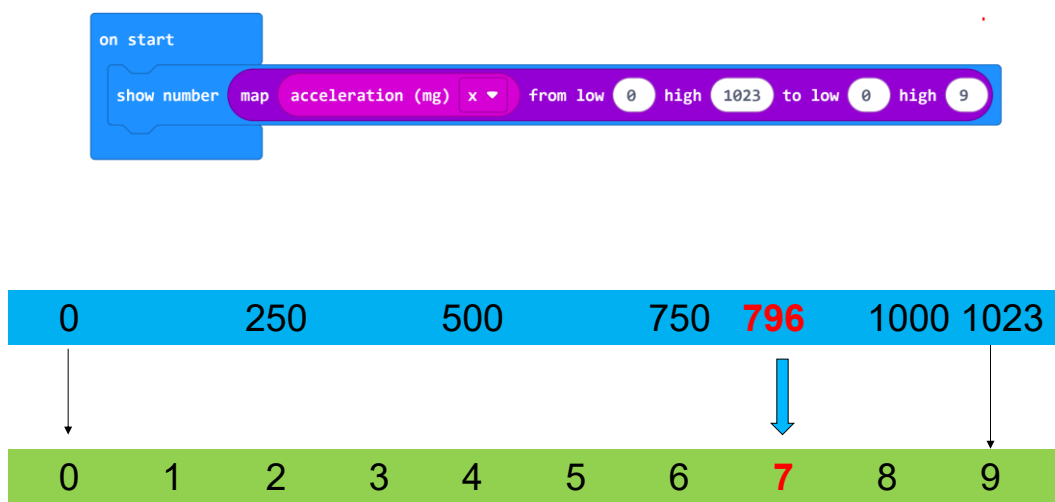
## Bar graph



The image shows a Scratch script for a bar graph. The script consists of a 'forever' loop containing a 'plot bar graph of acceleration (mg) x' block, with 'up to 1023' specified. Annotations indicate that 'acceleration (mg) x' is the 'Variable or value to display' and '1023' is the 'Max. value (=range)'. To the right is a photograph of a sensor module with a grid of red LEDs. Below the script, a text box states: 'Time series can be downloaded for further processing e.g. in Excel'. At the bottom is a purple area chart representing the acceleration data over time, with a small orange box containing the number '27' in the bottom left corner.

15

## Funkcia map



16