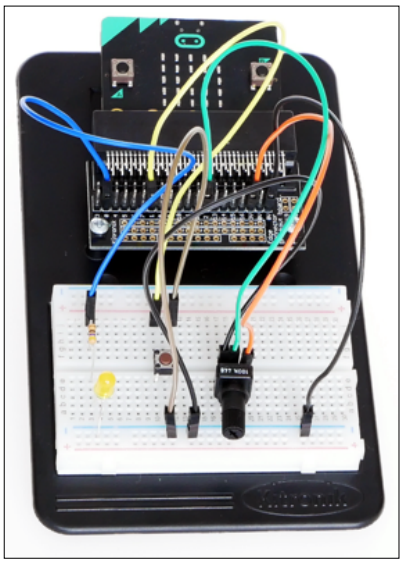
Interreg
EUROPÄISCHE UNION
Österreich-Tschechische Republik
DigiMe
Europäischer Fonds für regionale Entwicklung

Dimming LED



Goal: Brightness adjustment of a LED

Contents: Potentiometer (rotary controller)
LED + series resistor, button
Use of an ADC
Pulse width modulation (PWM)

LESSON 1

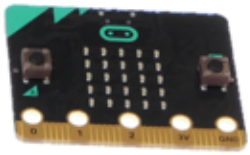
Assignment

With a potentiometer (rotary controller), the brightness of a LED can be adjusted. Independent from this, the LED can also be switched on and off with the button.

Ingredie

Breadboard

Microbit



Potentiometer
Button

LED + series resistor

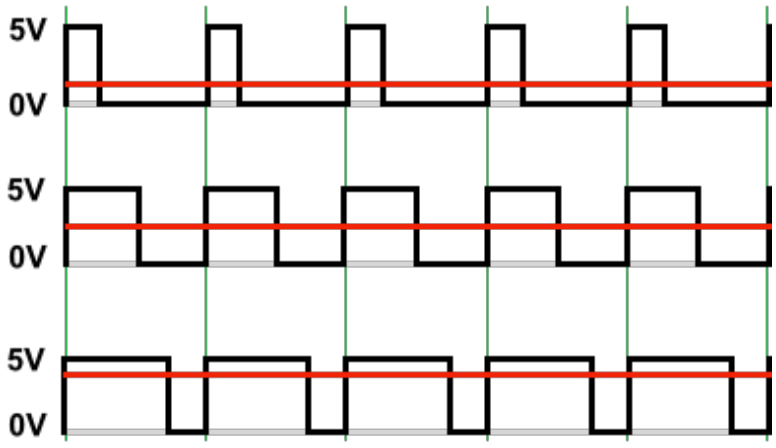
LESSON 2

Pulse width modulation (PWM)

As the digital pins of the Micro Bit only enable output of 3V or 0V, a range of voltage values must be generated, for example, for dimming of LEDs or control of the speed of a motor.
This is realised by **pulse width modulation (PWM)**.

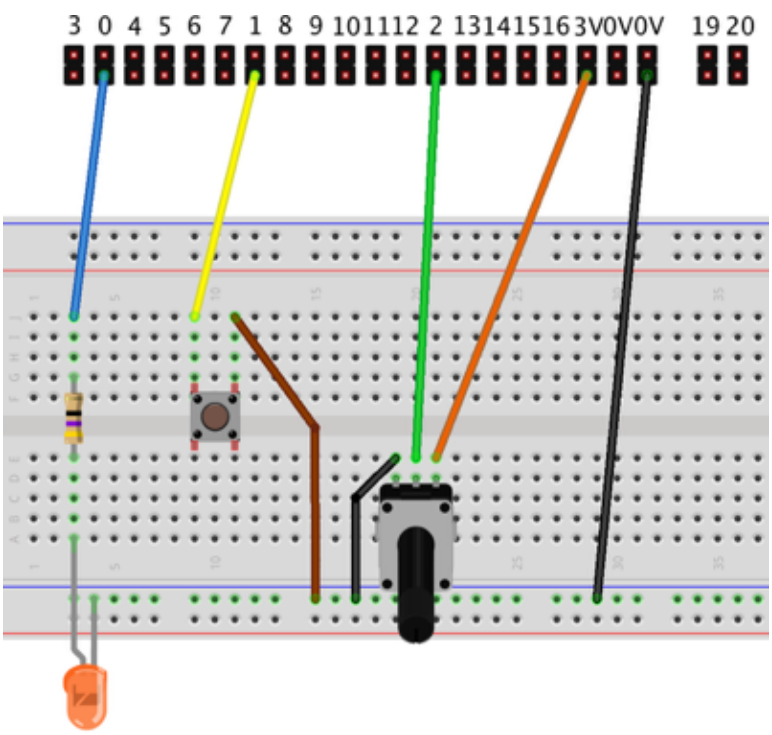
In this process, the voltage itself is not adjusted but the output duration of the voltage. This means, the LED or the motor is switched on and off in a rapid sequence.
As rapid switching on and off of an LED cannot be seen with the human eye and the motor is running continuously due to its inertia despite the PWM, the brightness of the LED or speed of the motor is defined by the ratio between pulse (on) and pause (off).

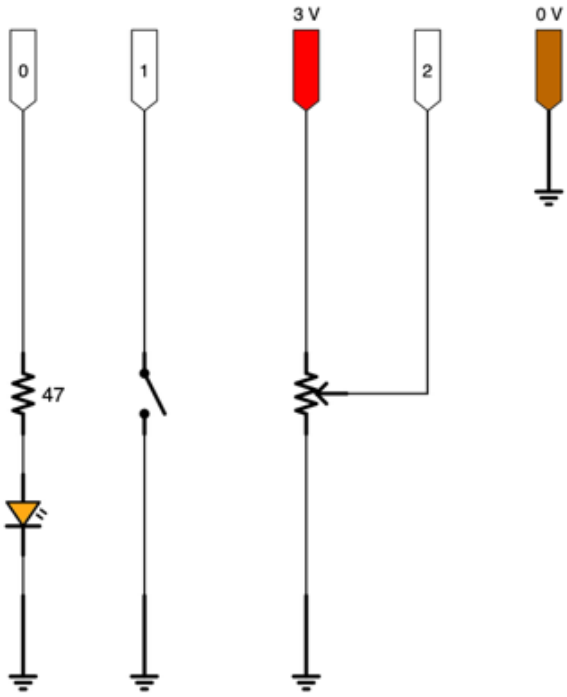
At a pulse-pause ratio of 50:50, the motor is rotating at half power (LED => brightness 50%).
At a pulse-pause ratio of 80:20, the motor is rotating at 80%, the maximum speed (LED => brightness 80%).



LESSON 3

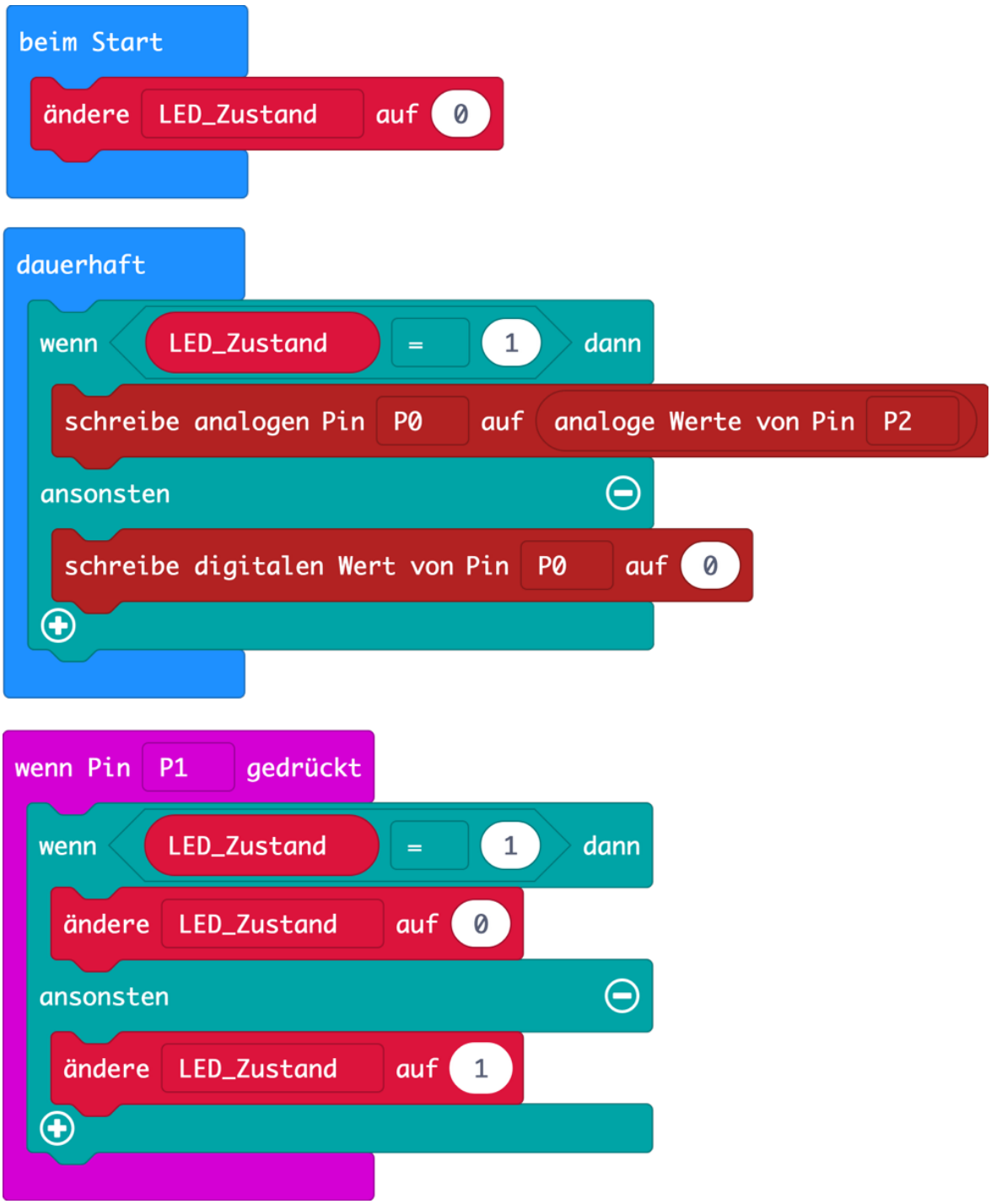
Circuit set-up





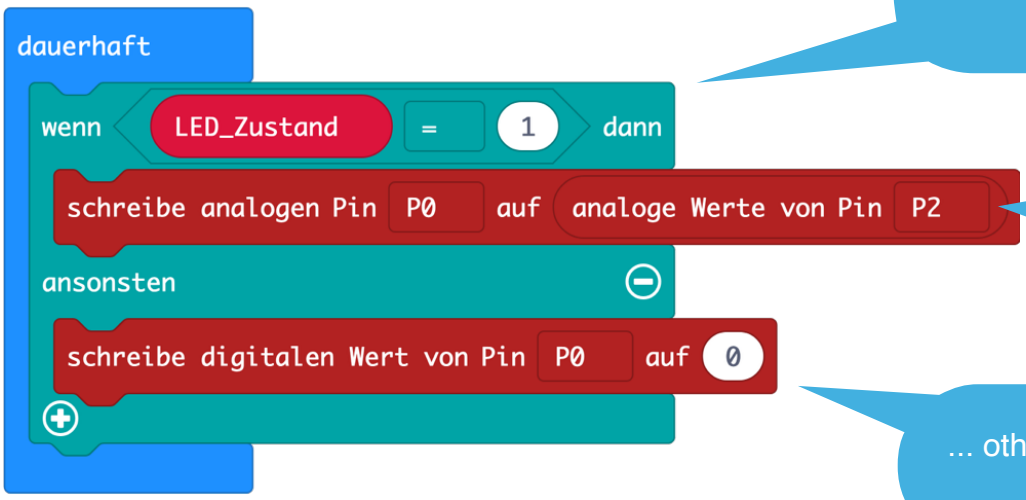
- Position the LED as illustrated. The long pin (anode) faces upwards to the series resistor.
- The short pin (cathode) is routed to the common Gnd (- pole).
- The long pin is routed via a series resistor (47 Ohm) to the output pin of the Micro Bit.
  [**Blue cable - Pin0**]
- Position the button on the breadboard in such a way that two close pins are over and under the notch (see figure). One connection of the button is routed to the Pin1, the other to the common ground bar.
- Now, position the potentiometer. The connection on the left is also routed to the ground bar. The connection on the right is connected with an orange cable to the 3V pin of the Micro Bit. The centre connection is routed via a green cable to pin 2.
- In the end, the ground bar (Gnd - 0V) is connected to the Micro Bit.
  [**Black cable - 0V**]

LESSON 4



Information on block code

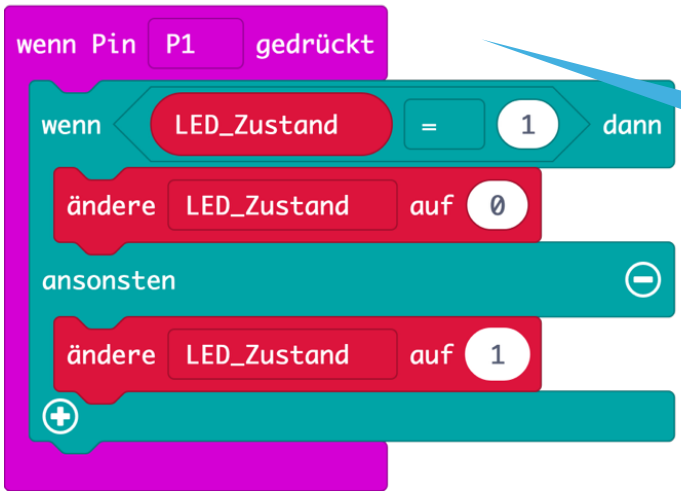
The LED_Status specifies whether the LED is currently on or off. At program start, it is off.



If the LED is on ...

... the value provided by the potentiometer (ADC pin 2) is returned to the LED (PWM pin 0)

... otherwise, the LED is switched off.



If the button is pressed, it is checked whether it is on or off.

If on => LED_Status changed to 0.
If off => LED_Status changed to 1.