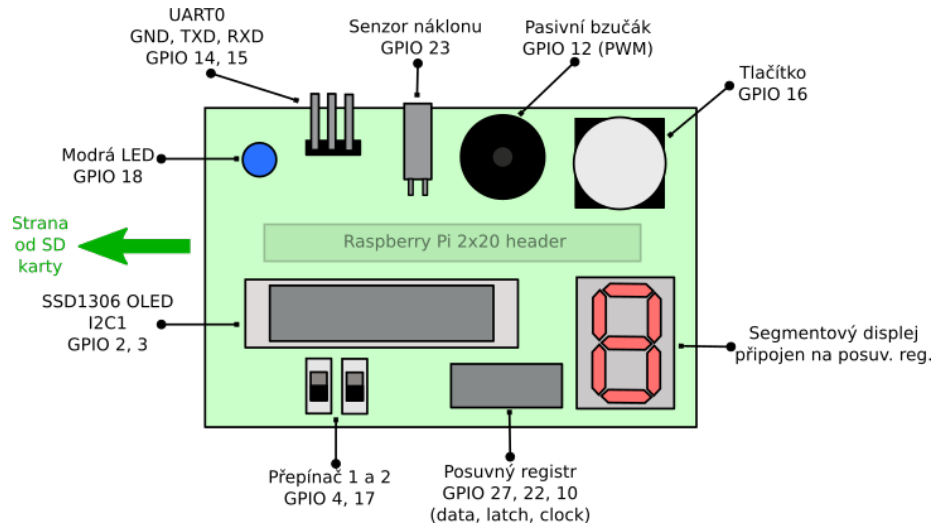# KIV-DPP-01

Expansion board documentation

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1 Overview

The KIV-DPP-01 expansion board houses the following set of peripherals:

- Blue LED (GPIO 18)

- UART header (GPIO 14, 15)

- Tilt sensor (GPIO 23)

- Passive buzzer (GPIO 12)

- Push button (GPIO 16)

- 7-segment display (directly connected to the shift register)

- Shift register 74HC595N (GPIO 27, 22, 10)

- Switch 1 (GPIO 4)

- Switch 2 (GPIO 17)

- SSD1306 OLED display (I2C1; GPIO 2, 3)

2 Connection

The board contains 2x20-pin F header, which is intended to be directly connected to M header on the Raspberry Pi side. It is important to rotate the board correctly – LED on the expansion board must be on the same side, as the SD card slot on the host board. The shift register and segment display is then localized on the same side, as USB ports on the host board.

3 LED

- Color: blue (455-465 nm)
- GPIO: 18
- Wiring: IN - LED - GND
- Current: max. 20 mA
- Luminosity: max. 3000 mcd

Standard blue LED, anode is connected to GPIO 18, cathode is connected to GND.

4 UART header

- GPIO: 14 (TXD), 15 (RXD)
- Wiring: direct

Header for UART terminal connection, e.g. the USB-TTL converter to host PC. Pins are connected (from left to right) to: GND, TXD, RXD. The wiring is direct – wiring should be crossed over to the other end.

5 Tilt sensor

- GPIO: 23
- Wiring: pull-up
- Datasheet: `http://home.zcu.cz/~ublm/files/os/SW-520D.pdf`

Ball tilt sensor SW-520D, which is soldered to the expansion board under 15°angle. This sensor is able to sense, if the device is in horizontal or vertical position (or „half-position" due to the sensor type).

6 Passive buzzer

- GPIO: 12

- Wiring: direct

- Resistance: 16 Ω

Passive buzzer connected to GPIO 12. The buzzer is passive, so it does not have the internal oscilator – the pulse-width modulation (PWM) is needed to drive the buzzer.

7 Push button

- GPIO: 16

- Wiring: pull-up

Standard push button with plastic cap.

8 7-segment display

- GPIO: -

- Wiring: common cathode, IN - LED - 3.3V

- Current: max. 15 mA

- Datasheet: http://home.zcu.cz/~ublm/files/os/5161AS.pdf

7-segment display 5161AS is connected directly to the outputs of the shift register. It's not possible to control it directly. It is wired with common cathode.
The display is connected to the shift register as follows:
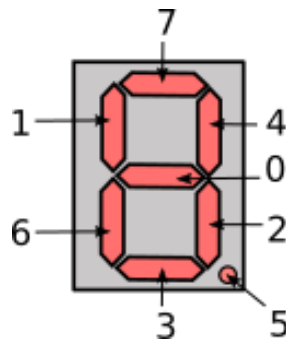
9 Shift register

- GPIO: 27 (data), 22 (latch), 10 (clock)

- Wiring: direct

- Datasheet: `http://home.zcu.cz/~ublm/files/os/74HC565.pdf`

The shift register 74HC595N is connected to GPIO 27 (data pin), 22 (latch pin, bank shift) and 10 (timing signal). Outputs are connected to inputs of the 7-segment display.

10 Switches

- GPIO: 4 (sw. 1), 17 (sw. 2)

- Zapojení: pull-down

Common switches, connected independently.

11 OLED display

- I2C: channel 1

- GPIO: 2 (SDA), 3 (SCL)

- Wiring: direct

- Type: monochromatic (blue or white)

- Matrix size: 128x32 pixels

- Datasheet: `http://home.zcu.cz/~ublm/files/os/SSD1306.pdf`

The SSD1306 display is directly connected to pins 2 and 3, on which the host board operates I2C channel 1. The protocol is common for all SSD1306 displays (all variants and dimensions). Pixels glow either blue or white.