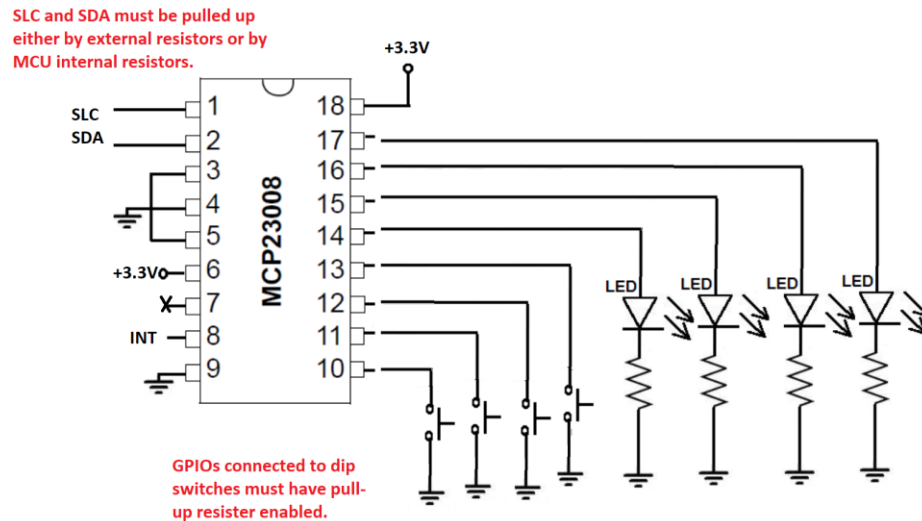


Goals:

- How to communicate with an external device using I²C
- Be familiar with IO expanders; An IO expander is a common IC for expanding number of IOs for a microcontroller, thus allow the use of smaller MCUs.

**Setup:**

- The device we are using is Microchip I²C IO expander (Check the datasheet: [MCP23008](#))
- Connections:
 - Connect 4 LEDs and 4 dip switches to IO expander as shown in the image above
 - Connect power and ground as shown.
 - Connect I²C signals to PB8 and PB9 (to use MCU I2C1 peripheral)
 - Connect the IO expander INT signal to PC6.

Requirements:

- You need to write a program that makes the 4 LEDs follow the dip switches. In other words, when the value of the switches changes, the LEDs must change.
- You are free to choose the way you design your code.
- **Notes:**
 - You can use the MCU internal pull-up resistors for the I²C signals, check GPIO register PUPDR. These resistors are not optimized for the I²C bus use so you may need to slow the speed of the I²C (100Khz should be a good target).
 - The IO expander has internal pull-up resistors which must be enabled for the dip switches connected to GPIO0-3 (controlled using register GPPU).
- Do not use any prebuilt high-level functions but you may use your functions developed in previous labs. Like what you learned in class, write your program in a register level abstraction.
- Add comments to each line in your code.