

10 I²C communication

I²C is an abbreviation of Inter IC Communication⁸⁴. It is a serial protocol like RS232, developed by Philips in the 1980 for communication between integrated circuits within the same machine.

The I²C bus uses only two communication lines, a clock line and a data line. Just like in a microcontroller the clock determines the speed of the I²C bus. The original design of the bus allows a maximum speed of 100 kbit per second. The clock signal is put on the clock line. The data is put on the data line in a speed dictated by the clock. In idle state both the clock and the data lines are pulled high with external resistors.

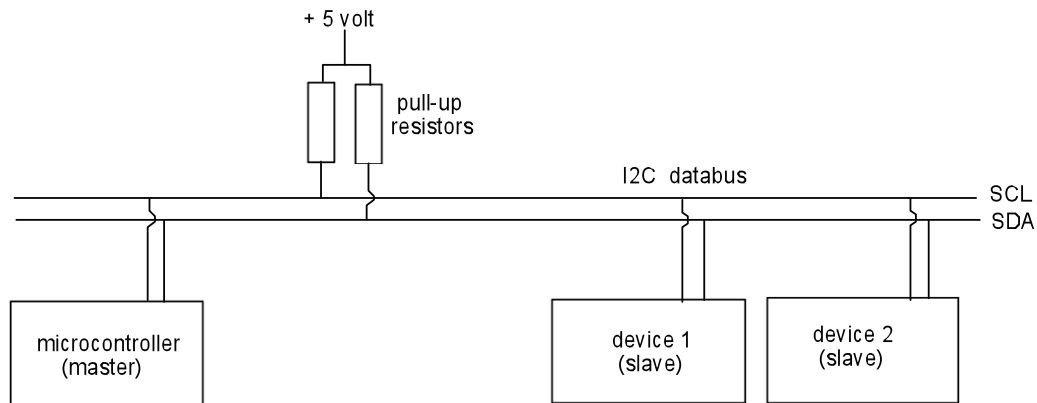


Figure 343. I²C master with two slaves.

In the basic setup one of the devices on the bus is called the master, the other devices are called slaves. In this course the microcontroller is the master. A temperature sensor on the course board is the slave.

The master controls the communication by addressing each IC on the bus individually. It also controls the speed of the bus because it controls the clock line. The slaves do have influence on the speed because they can pull the clock line down when they are busy, preventing the master from giving a new clock pulse. This happens for example when the master requests data from a slave and the slave needs a bit of time to generate and send the answer.

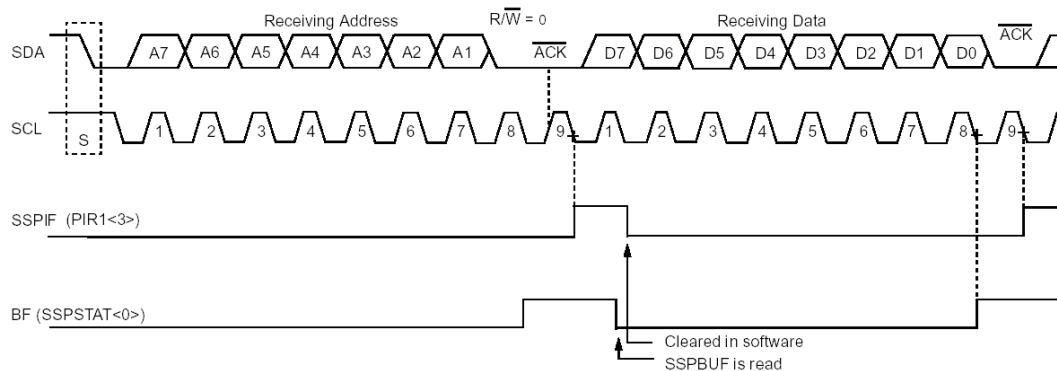


Figure 344. Example of I²C transmission.

The previous Figure shows an example of I²C communication, as seen from the slave's point of view. At the left side of the Figure both lines are idle, and thus pulled high. The data line is made low. This is a "start condition". All slaves on the line must now pay attention because the master is about to send something. Then the clock line goes low. At every pulse on the clock line data is sent at the same time on the data line. If during clock pulse 1 the data line is high than that represents a high bit. If the data line is low than that

⁸⁴ Sometimes also abbreviated to IIC or I2C.