Kit Setup and SPI Transmission of Data

This short introduction will explain how set up the kit and how the cc2541 circuitry on the flex PCB is sending data using SPI.

Kit Setup

The kit you received consists of a flex PCB, two batteries, a connector and a power cable as shown in Figure 1.

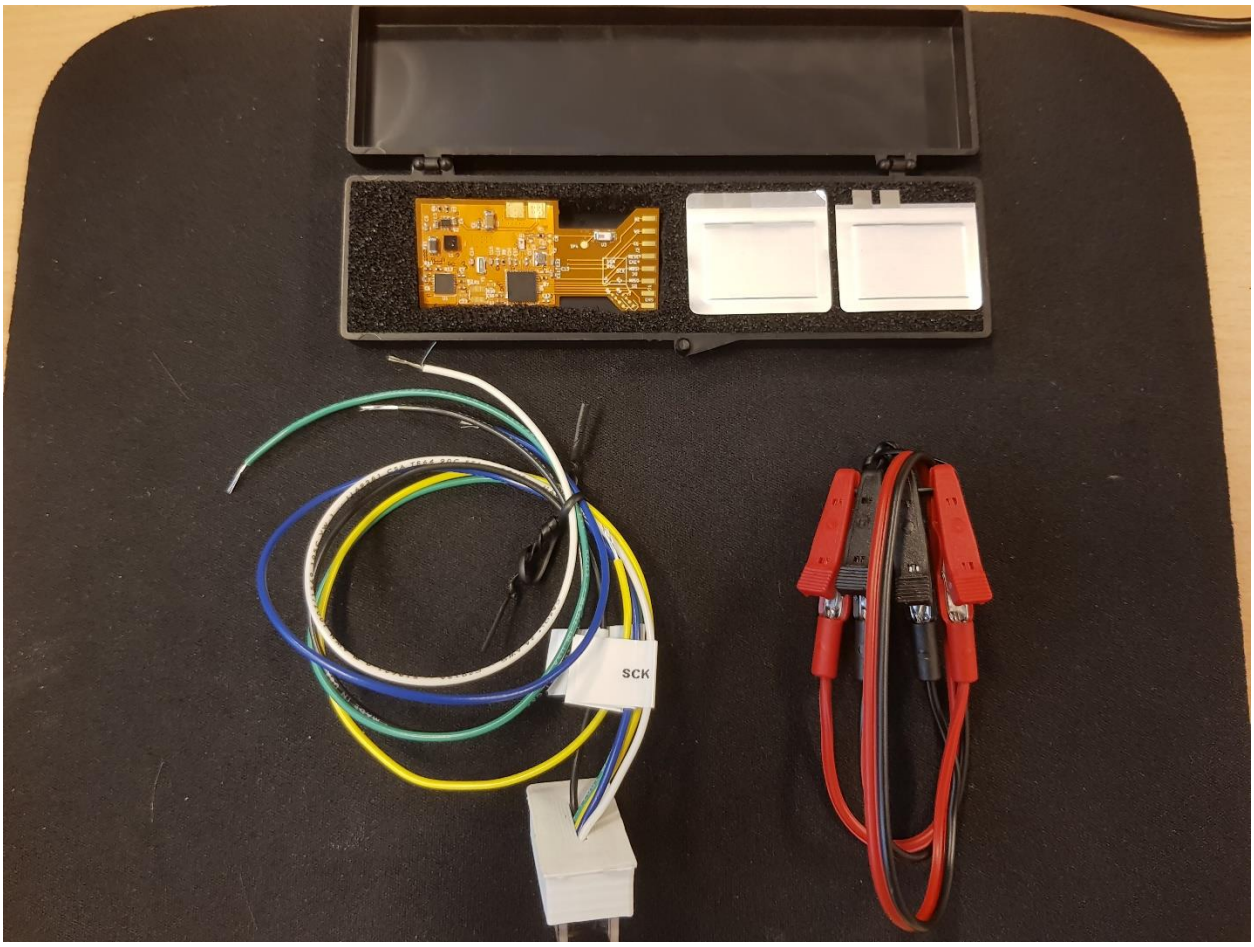

Figure 1. The kit consists of a flex board, two batteries, connector and power cable.

Insert the PCB flex into the connector as shown in Figure 2. Ensure that the flex is oriented such that the text “TOP” on the connector is readable when the component side of the flex is pointing upwards.

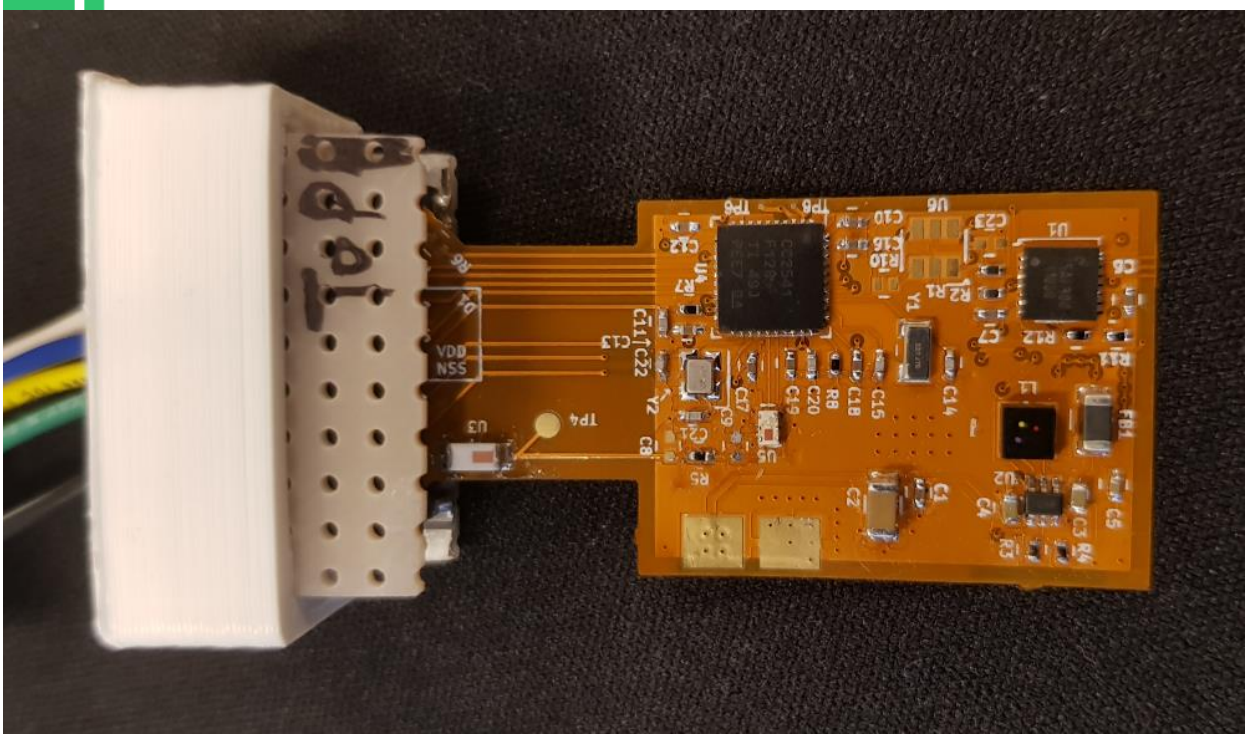

Figure 2. Proper insertion of the flex PCB into the connector.

Then connect the cables to your readout device according to the following color code:

White = SCK
Blue = SS
Yellow = MOSI
Green = MISO
Black = GND

The flex PCB should then be powered by connecting the power cable with ground to the gold colored rectangle on the right hand side and a +2.7 V voltage source to the gold colored rectangle on the left hand side with reference to the orientation in the figure above. Ensure that the black cable is connected to ground and the red cable is connected to the voltage source. Alternatively, you can use one of the batteries as a power source. The cc2541 on the flex PCB will start to send data as soon as the power is connected.

Receiving and Interpreting the Data

The data is sent as a bit string on the MOSI line from the master with a baud rate of 2 Mbaud (2 MHz clock frequency). The ones are sent as 3 V pulses and the zeroes are 0 V with reference to ground. An illustration of how the signals are transferred is shown in Figure 3.

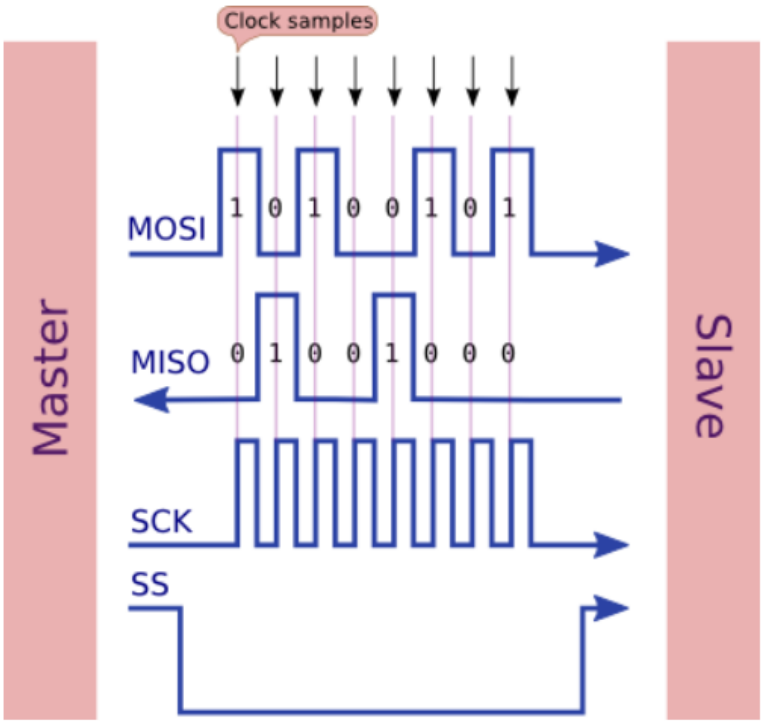

Figure 3. Illustration of the SPI signal transfer. The cc2541 is the master and your readout device will be the slave.

The time, temperature and sensor data from the ADC is sent in 4 char hex values for each parameter through the MOSI line as shown below.

Sent bit string in hex values:
D2D6 89C0 8A40
Time Temp ADC

Note that the least significant bit is sent first such that the string must be reversed to interpret the data correctly as shown in the example below.

Reversed bit string in hex values:
0251 0391 6B4B
ADC Temp Time

Reverse bit string in decimal values:
593 913 27467
ADC Temp Time

The values in this example should be interpreted as following:
Output from sensor = 59.3 mV
Temperature = 91.3 °C
Time = 27467 ms