Skill 16: Electronics

HW Design
Part 3 "Assembling" (Day 3)
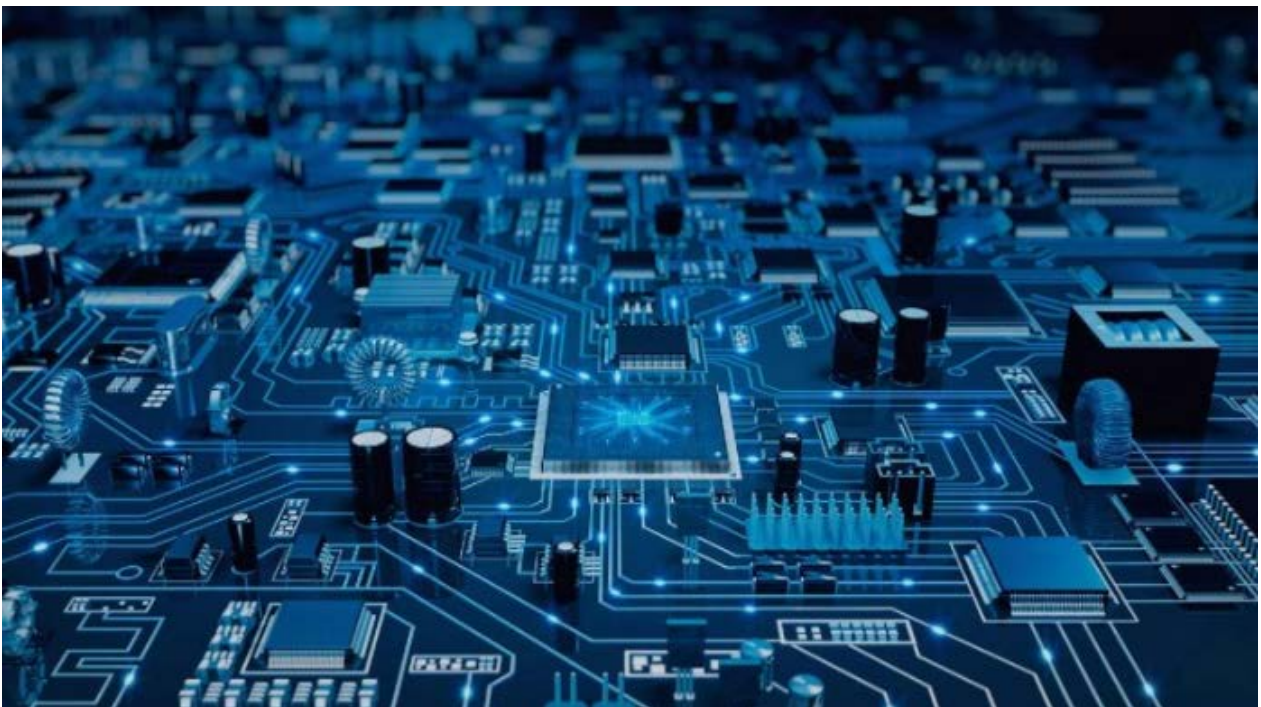

Fig. 1: Cover picture

Table of Contents

1 Introduction

After engineering and production of your PCB, we can start with the assembly.

You should proceed with the following steps today:

1. Assemble PCB "Remote Controller" (your own PCB) and make all function tests
2. Assemble the additional PCB "AddOn-Controller", let the MCU program from the expert and make all function tests
3. Assemble the additional PCB "AddOn-Thumbstick" and make all function tests

You get the additional boards for step two and three only when the function tests before was successful. Also, make sure everything is working fine, before go to this step. If this is so, we will find out with a password. You can collect information for the password with each successful test. If there is enough time left to assemble the PCB, you will get the PCB and the parts for it from the expert und you can gain some additional points.

2 Detailed description of the working steps

The whole setup consists of three PCBs, connected together. The following chapters describe the working steps for each PCB:

2.1 PCB „Remote Controller"

2.1.1 Assembly

This is your own PCB, thus you already know how to assemble it. Regardless of the number of implemented blocks, you will get all the parts that would have been needed for the full functionality.

The parts for the basic-part this PCB are in the large bag. In the smaller bag are the parts for your extended-part ("Save I/O pins", "Acoustic output" & "Gesture recognition"), if you have done it.

Decide on your own when you want to do the functional test of the PCB as described followed.

2.1.2 Power test

Choose the power supply you think is the best for you. You can take the given USB-Power supply if you use the USB connector X1. You can take instead of this your own power supply with 5V if you use the pin header X2. The 3.3V voltage converter is a part of the ESP-Pico-Kit. If it is not assembled, you should not expect a lot of action. A few other parts should be also assembled for correct working. I am sure you will find them.

Write down here the lighting LED colors for:

LED	color
5V	
3V3	

IO25	

2.1.3   Function test switches

Check the functionality of your own PCB. If it does not work, no one is better suited to solve the problems than you are.

You can press the switches and something will happen. Some more information you get over the display. For example: There should be left some colored caps for the switches. Which color for which switch is you will find in a message on the display.

Please fill out the following table (write answer or make a cross):

switch	color of the RGB LEDs	color of the cap	monoflop LED V1	read po-tentiome-ter	event counter	change questions
S2						
S3						
S4						
S5						
S6						

Password for AddOn-Controller PCB:

The password is the number of the switch for the following information.

RGB-color = yellow + color cap = red + monoflop + potentiometer + event counter + change question (for example like 256534)

_____

Additional question:

- What is the message, if the potentiometer is on the maximum?

  _____

- What is the time of the monoflop?

  _____

- Answer for question 1:

  _____

- Answer for question 2:

  _____

- Answer for question 3:

_____

- Answer for question 4:

_____

- Answer for question 5:

_____

- There are three Bonus points => write the HEX-Codes (0x__) you found :

_____

Hints:

- The written software uses S2 to S6 in the digital reading mode. Assembling and/or configure your board for this operation mode.

- The written software generates a rising edge, when the event counter increments. The signal is "high" as long you press the button. You can uses the pin "Piezo" and the software mode "event counter" to test your acoustic part, when you press the corresponding switch.

- There is at moment no software included to test the gesture mode. For testing the hardware, see 2.1.4.

2.1.4   Function test of your own engineering work

Show the expert that your own engineering blocks works correct:

- Measure the different voltages on I_39. Show the expert on voltage meter, that the voltage is changing when you press the switches S2 until S6.

- Let the expert hear, that the piezo sounds with your own frequencies. You can use the signal "piezo".

- Measure the analog voltage on ADC input, when the light changes.

2.2   PCB „AddOn Controller"

If all the function tests before are successful you should have the password complete. Write it down and show it to an expert. He will give you the bag with the parts for this PCB, if there is still more than 30 minutes left.

Functionality test: Press switch T1 and the eight RGB-LEDs should change the color and the LED "V1" toggles between "on" and "off". If you can change the color or toggle the LED, you know that T1 works, if the LED "V1" lights, the Led works and if all the eight RGB-LEDs light white you know they are working correct.

2.3 PCB „AddOn Thumbstick"

If there is still more than 15 minutes left, show the correct functionality of the PCB "AddOn-Controller" to the expert and ask for the material and production documents

2.4 Housing

If there, is some more time left, make a drawing for a housing?

- On the bottom side, we need the outline of all your PCBs and the positions and the dimensions for all mounting holes.
- On the rear side, we need the information at least for the USB-Connector X1, switch S1 and S2 and for remote receiver and transmitter.

3 Resources

The following resources are needed to solve the tasks:

- Production documents & material for the PCB "Remote-Controller". Take your own production data, as well the ones from the expert for reference "Ref Des" & material
- Production documents & material for the PCB "AddOn-Controller"
- Production documents & material for the PCB "AddOn-ThumbStick"
- Own tools and measurement devices