FLipMouse MPRLS Pressure Sensor Board

Fabrication Note v1.0, AsTeRICS Foundation

Scope

The FLipMouse uses a pressure sensor to detect any sip and puff input on the mouthpiece.

Version 2 uses a MPXV7007GP pressure sensor, which provides an analog value, exactly half of the supply voltage when idle.

From 2022 onwards, this sensor is getting VERY expensive (~11$ 2021; ~35$ 2022) and hard to buy (~52 weeks lead time).

Version 3 of the mouse supports 2 different types of sensors:

- MPXV7007GP (same sensor as in FMv2)
- MPRLS0025PA00001A

There are major differences between these two:

- MPRLS uses I2C
- MPRLS is an absolute pressure sensor, needs calibration on FM startup
- MPRLS is not hand-solder friendly

Because this sensor is basically impossible to solder with a solder iron. We still want to ship this sensor with assembled devices as well as construction kits, therefore we designed a small adapter PCB which needs to be **reflow soldered** before further use.
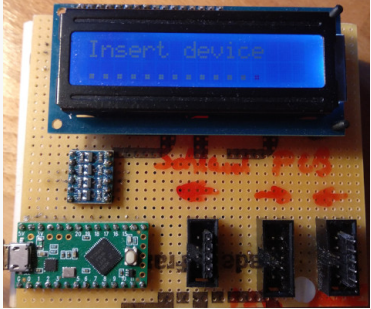
Preparation

Material

Nr.	Description	Source	Image
1	MPRLS adapter PCB	<TBA: check in PCB to repo & add link>	
2	3 parts as stated in BOM	<TBA: check in PCB to repo & add link>	

Note: Material will be referenced in square brackets: []

Tools

Nr.	Description	Source	Image
1	Reflow solder equipment	Fablab, or university. You need a reflow oven, a stencil, solder paste, tweezers	
2	Testbench for MPRLS	<TBA: add repository link to test firmware & HW>	
3	Permanent marker (red/blue/green)	DYI store, paper store (possibly any store)	

Note: Tools will be referenced in curly brackets: {}

Procedure

Prepare PCB:

1. Mount the stencil on your holder *{1}*
2. Apply solder paste on PCB(s) *[1]*

Place parts: (note: guaranteed information is available in the KiCAD project, this is for reference only)

1. Place the MPRLS sensor, pin one has a small triangle *{2}*
2. Place both capacitors (1nF / 100nF) *{2}*

Solder:

1. Follow the instructions for your reflow solder equipment to solder the PCBs

Testing:

1. This sensor can be prone to solder errors, especially if you are not experienced in reflow soldering & paste application
2. Follow the test procedure for **EVERY** soldered sensor PCB

Testing

Sensor testing is done via the testbench for sensors, which is based on a Teensy.

1. Attach the testbench to a USB port (micro USB cable)
2. Wait for finished initialisation, `Insert device` should be shown on the display
3. Attach each sensor under test on the left pin header (4pins):
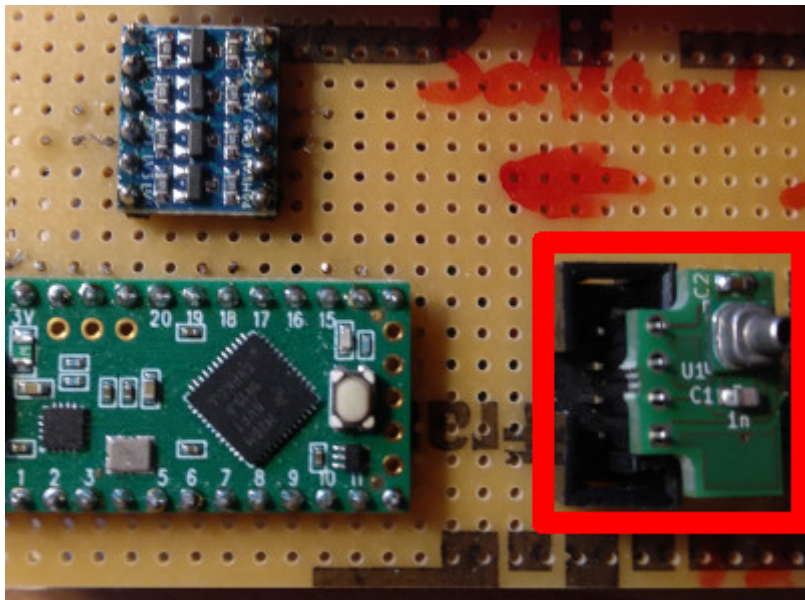
4. Hold down the sensor for the test to provide sufficient contact without soldering
5. The display should show `Found dev @0x18`, `MPRLS pressure`. **If not:** This sensor is broken
6. Wait for the tester to run a test cycle
7. The display should show now: `Fin, avg.: xxx`, the actual value depends on your ambient pressure, but should be in the **range of 400-600**. **If not:** this sensor is broken.
8. Every character on the **second line** should be a `+` symbol. **If not:** Either there was a bad contact (press the sensor against the pins and re-run the test) or this sensor is broken (if you

tried it more than once).

9. If the test finished successfully, **mark this sensor** with a permanent marker *{3}*.

10. Repeat the procedure with another sensor from **step 3**.

Documentation

For each produced batch, fill out one document **template_MPRLS_production.ots** and save it as:
`mprls_<date>.ods` (e.g.: mprls_20221118.ods)