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### **Technical procedure**

# QUALITY CONTROL PROCEDURE OF MICRO OSCILLATING HEAT PIPE

#### **Abstract**

This document describes the quality control procedure for micro oscillating heat pipe ( $\mu OHP$ ).

Prepared by:	Verified by:	Approved by:
Timothée Frei	Click here to enter text. Click here to enter text.	
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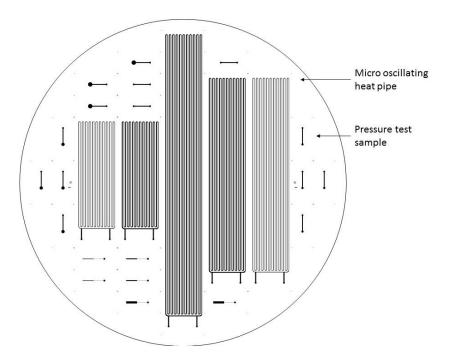
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#### 1. INTRODUCTION

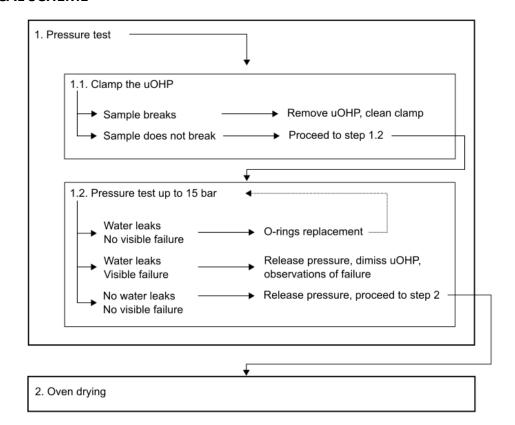
The micro oscillating heat pipes ( $\mu$ OHPs) are produced by microfabrication: the microchannels are etched in silicon and the inlets are drilled in glass wafers. Anodic bonding bonds the silicon and glass wafers together.

Control of the quality of the bonding is mandatory to ensure the resistance of the devices to pressure. In this goal, the layout of the wafers includes  $\mu OHPs$  and pressure test samples. The  $\mu OHPs$  and pressure test samples are separated after the bonding by dicing.



The pressure test samples are treated accordingly to the EDMS document 1845828, part 2.1. They are increasingly pressurized until burst occurs. In contrary, the  $\mu$ OHPs are pressurized up to **15 bar** to control the quality of the bonding. The present document presents the procedure used under the form of a logical scheme and steps to follow.

#### 2. LOGICAL SCHEME



#### 3. DESCIPTION OF THE STEPS

#### 1. Pressure test

- a) Turn on the computer and log in.
- b) Run the "Manual Waterpump" software.
- c) Name the file. For example, a file for a  $\mu$ OHP that is 60mm long with 225um and has 400um wide microchannels from wafer C1 will be "C1 60 400".

#### 1.1. Clamping the μOHP

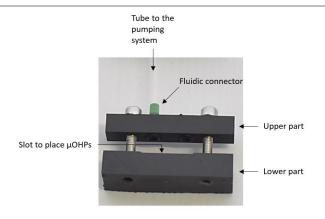
- d) Unscrew the middle knob of the manual pump.
- e) Open the safety chamber using the safety pin and open the connector by unscrewing the two screws.
- f) Manually fill the μOHPs with DI water
- g) Place your sample in the slots of the clamping system.
- h) Carefully press the upper part of the clamp and then screw the counterpart to clamp the  $\mu$ OHP. The screws have to be alternately screw by a ½ or 1/6 of turn.
- i) Connect the clamping system to the pumping system.
- j) Close the safety chamber.

#### 1.2. Pressure test

- k) Screw the middle knob of the manual pump.
- I) Pump keeping while keeping the sample under surveillance.
- m) Stop pumping when **15 bar** is reached or when water starts leaking out of the sample
- n) Release pressure by unscrewing the manual pump's middle knob.
- o) If water started leaking and no break is visible on the sample, change the O-ring and perform the test again on the sample.
- p) To unmount the clamp, unscrew the screws by a ¼ of turn every time.
- q) Save the data.
- r) Inspect the parts for defects.

#### 2. Oven drying

- a) Place the samples in the support in the oven
- b) Set the temperature to 60°C
- c) Dry the parts in the oven overnight
- d) Inspect the parts for defects when all water is removed



Slot to place  $\mu OHPs$ 

Figure 1. Clamping system

Figure 2. CAD model of the lower part of the clamping system

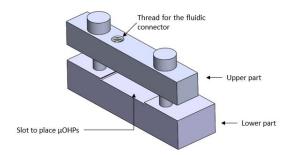


Figure 3. CAD model of the clamping system



Figure 4. Manual pump used to pressurise the  $\mu\text{OHPs}$ 



Figure 5. Safety chamber and its pin

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